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Investigation of SeqA as a transcription regulator of bacteriophages and host genes in Salmonella enterica and Escherichia coli and the phages potential role in genome duplications

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Investigation of SeqA as a transcription regulator of bacteriophages and host genes in *Salmonella enterica* and *Escherichia coli* and the phages potential role in genome duplications

A dissertation submitted in partial satisfaction of the requirements for the degree

Doctor of Philosophy

in

Biology

by

Gregory Alexander Peters

Committee in charge:

University of California San Diego

Professor Suckjoon Jun
Professor Joseph Pogliano

San Diego State University

Professor Anca Segall, Chair
Professor Barbara Bailey
Professor Stanley Maloy
Professor Forest Rohwer

2019

The Dissertation of Gregory Alexander Peters is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

Chair

University of California San Diego

San Diego State University

2019

Dedication

This dissertation is dedicated to my family and friends.

Epigraph

“The field of bacterial viruses is a fine playground for serious children who ask ambitious questions.”

Max Delbrück

[…] “our knowledge of bacteriophages is an inch wide and a mile deep.”

Ry Young

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List of Abbreviations

AMR	Antimicrobial resistance
ANOVA	Analysis of Variance
BED	Browser Extensible Data
BLAST	Basic Local Alignment Search Tool
bp	Basepair
ChIP-Chip	Chromatin immunoprecipitation with DNA microarray
Chip-Seq	ChIP-sequencing
cm	Centimeter
DNA	Deoxyribonucleic Acid
DNase	Deoxyribonuclease
EBU	Evans Blue Uranine
EDTA	Ethylenediaminetetraacetic acid
FDR	False Discovery Rate
GCT	Gene Cluster Text
GEO	Gene Expression Omnibus
GFF	General Feature Format
GFP	Green Fluorescent Protein
IGV	Integrative Genomics Viewer
IPTG	Isopropyl β-D-1-thiogalactopyranoside
KB	Kilobase
KEGG	Kyoto Encyclopedia of Genes and Genomes
LB	Lysogeny Broth
M	Molar
Mb	Megabase
mm	Millimeter
mL	Milliliter
MHB	Mueller-Hinton Broth
MMC	Mitomycin
MOPS	(3-(N-morpholino) propanesulfonic acid)
ORF	Open Reading Frame
OriC	Origin of Replication
padj	Adjusted p value
PCR	Polymerase Chain Reaction
PFU	Plaque Forming Unit
Phage	Bacteriophage
RFP	Red Fluorescent Protein
RNA	Ribonucleic Acid
RNAP	RNA Polymerase

RNase	Ribonuclease
RPM	Revolutions per minute
rrn	Ribosomal RNA gene
SAM	Sequence Alignment Map
SDS	Sodium dodecyl sulfate
TBE	Tris-Borate-EDTA
Ter	Terminus
λ	Lambda
µL	microliter
UV	Ultraviolet
µg	Microgram
V	Volt

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Acknowledgements

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2008 Bachelor of Science, University of California, Santa Barbara

2009 - 2015 Biologist-AME, Eli Lilly and Company; Applied Molecular Evolution

2012 - 2018 Teaching Assistant, San Diego State University

2014 Master of Science, San Diego State University

2019 Doctor of Philosophy, University of California San Diego and San Diego State University

Honors and Awards

Aztec Mentor Program Honor Roll – SDSU, Fall 2015

GEN Ten Runner Up – Genetic Engineering & Biotechnology News, May 2014

Outstanding Teacher's Assistant – UC and SDSU – q-Bio Bootcamp, July 2014

Sigma Alpha Lambda – SDSU Chapter, December 2013

Sigma Xi – San Diego Chapter – Elected to Associate Membership, September 2013

Shiley Life Sciences Scholarship – SDSU, May 2013

Fully funded tuition for SDSU M.S. Program – Eli Lilly, August 2012

Golden Key International Honor Society – SDSU Chapter, August 2012

Phi Kappa Phi – SDSU Chapter – Top 10% of Graduate Students, March 2012

Eli Lilly Spotlight Awards – 1 for Action and 2 for Teamwork – Eli Lilly, July 2012

BRIDGE Grant: Life Sciences Immersion Program – BIOCOM Institute, June 2011

Certifications

Entrepreneurship Certificate UC San Diego. San Diego, CA November 2018

Intro to Python for Data Science Course DataCamp. San Diego, CA November 2018

Intro to SQL for Data Science Course DataCamp. San Diego, CA November 2018

Introduction to R Course DataCamp. San Diego, CA October 2018

100 Hour Community Service Certificate SDSU. San Diego, CA June 2018

Leadership Certificate San Diego State University. San Diego, CA April 2016

Gibco® Cell Culture Basics Certificate UC Irvine. San Diego, CA January 2015

Micro-MBA Certificate UC San Diego Rady School. San Diego, CA November 2014

Synthetic Biology Certificate UC San Diego. San Diego, CA August 2013

Life Sciences Immersion Program Certificate BIOCOM Institute. SD, CA Jan. 2012

Organizations

AAAS: American Association for the Advancement of Science

ASBMB: American Society for Biochemistry and Molecular Biology

ASCB: The American Society for Cell Biology

ASM: American Society for Microbiology

CES: Cancer Epigenetics Society

GK: Golden Key

ISCB: International Society for Computational Biology

ISPE: International Society for Pharmaceutical Engineering

NPA: National Postdoctoral Association

PKP: Phi Kappa Phi

SLAS: Society for Laboratory Automation and Screening

Sigma Xi, The Scientific Research Society

The Antibody Society

Presentations

San Diego State University – Student Research Symposium – January 2018

Prophages contribute to the formation of duplications in Salmonella enterica LT2. **G A. Peters**. P Parks, and A Segall. - Poster Presentation

San Diego State University – Student Research Symposium – March 2016

Investigating the Interplay between Chromosome Segregation, Recombination, and Phages in Salmonella Typhimurium. **G A. Peters**. N Agrawal, and A Segall. - Poster Presentation

Southern California American Society for Microbiology 79th Annual Meeting – October 2015

Investigating the Interplay between Chromosome Segregation, Recombination, and Phages in Salmonella Typhimurium. **G A. Peters**. N Agrawal, and A Segall. - Poster Presentation

San Diego State University – Cell and Molecular Biology Graduate Student Symposium – April 2015

Investigating Prophage Induction in Salmonella enterica serovar Typhimurium LT2. **G A. Peters**. N Agrawal, and A Segall. - Poster Presentation

San Diego State University – Student Research Symposium – March 2015

Development of Highly Efficient Synthetic Biology Cloning System: LBC For Use In High Throughput Cloning on Automated Robots. **G A. Peters**.- Oral Presentation

San Diego State University – Student Research Symposium – March 2014

Using a Lung Cell Microfluidics Device to Study the Bacteriophage Adherence to Mucus (BAM) Model. **G A. Peters**, R Auro, J N Sam-Soon, S Kassegne, F Rohwer, JJ. Barr. - Poster Presentation

The 7th Annual q-Bio Conference – August 2013

Using a Lung Cell Microfluidics Device to Study the Bacteriophage Adherence to Mucus (BAM) Model. **G A. Peters**, J J. Barr, R Auro, and F Rohwer Oral Presentation

The 7th q-Bio Summer School – Student Symposium – August 2013

Programmable Pulse Generator: Engineering a Synthetic Gene Network. **G A. Peters**, J J. Barr, R Auro, and F Rohwer - Oral Presentation

San Diego State University – Student Research Symposium – March 2012

Design of New Highly Efficient Recombination Based Cloning System: LBC for Use in High Throughput Antibody Cloning at the Lilly Biotechnology Center. **G A. Peters**. - Oral Presentation

Publications

Barr JJ, Auro R, Sam-Soon N, Kassegne S, **Peters G**, Bonilla N, Hatay M, Mourtada S, Bailey B, Youle M, Felts B, Baljon A, Nulton J, Salamon P, Rohwer F. 2015. Subdiffusive motion of bacteriophage in mucosal surfaces increases the frequency of bacterial encounters. Proc Natl Acad Sci U S A 112:13675–80.

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Abstract of the Dissertation

Investigation of SeqA as a transcription regulator of bacteriophages and host genes in *Salmonella enterica* and *Escherichia coli* and the phages potential role in genome duplications

by

Gregory Alexander Peters

Doctor of Philosophy in Biology

University of California San Diego, 2019
San Diego State University, 2019

Professor Anca Segall, Chair

An estimated 10^{24} infections per second occur between bacteriophages and bacteria. This dissertation investigates these interactions of *E.coli* and *Salmonella* and their prophages. Chapter 1 is an introduction to the history of bacteriophages and their influence on molecular biology and studies of DNA replication. Chapter 2 includes an analysis of the binding of SeqA, a negative regulator of replication, throughout the bacterial chromosome and introduces a new mechanism of how SeqA is potentially

involved in transcription regulation and regulating prophage life cycles. This mechanism was found by reanalyzing protein binding data from multiple ChIP-Chip studies and analyzing them with new bioinformatics programs BEDOPS and BEDTools and Markov modeling. The ChIP-Chip data is randomized and both random and observed signals filtered into varying signal strengths. The signals are chopped to 1 bp “regions” in order to get a fine-detailed analysis of the signals and comparison of randomized vs. observed. A method for analyzing GATCs based on pairing is developed and GATCs are randomized GATC locations are compared to observed GATCs. Multiple phage are very low in GATC content. Chapter 3 involves Illumina RNA-Seq analysis of *Salmonella* and its prophages to observe the *Salmonella* prophage activity. A workflow was developed using Galaxy and DEBrowser to observe differential expression using DESeq2, EdgeR, and Limma. Chapter 4 involves the investigation and development of an assay to observe genome duplications *in vivo* using the ParB:*parS* system and see if prophages recombination proteins are involved in this process. A P1 *parS* was placed in a region in which duplications occur frequently *purH* in between *rrn* operons *rrnE* and *rrnB* and compared to a region in which duplications do not occur frequently at *argD*. A second pMT1 *parS* is placed in a region in which duplications do not occur frequently at *putA*. Gifsy-1 prophage recombination genes (*recE*, *recT*, *ninG*) were cloned onto pRHA109-Kan^R plasmid and duplications can be assayed using pFH4034, which encodes for multiple fluorescent ParB fusions. Chapter 5 is the conclusion and is a perspective on the future of phage-related research. Appendix 1 contains programs and additional RNA-Seq analysis for Chapter 2 and Chapter 3.

Chapter 1: Introduction

Bacteriophages (Phages)

Bacteriophages, viruses that infect bacteria, are the most abundant biological entity on earth, with an estimated 10^{32} present throughout the world (1–3). An estimated 10^{24} infections per second occur throughout the world (4, 5). This dissertation aims to further investigate the roles of phages with their bacteria hosts and focuses on the phages of *Escherica coli* and *Salmonella enterica*. When a phage infects a cell it can undergo different life cycle stages, either lytic or lysogenic growth (Fig. 1) (6–12). In the lytic cycle, the phage replicates its DNA and lyses the cell to release progeny which can go on to infect other cells (13). In the lysogenic cycle, the phage injects its DNA and integrates into the host genome or replicates as a low-copy plasmid. During the lysogenic cycle the phage can replicate with the host chromosome without producing new virions, or upon an induction event, the virus can switch into the lytic phase. Here I will introduce some pertinent history on phages and put the dissertation in context with the interesting field of phages and emphasize the importance of phage research over the past 104 years since their discovery.

Phage history and molecular biology

Phages and lysis were first discovered in 1915 and 1917 by Frederick Twort and Félix d'Herelle respectively (14, 15, 24, 16–23). There was a dispute over who discovered phages, and the lysis phenomenon was later referred to as the Twort-d'Herelle phenomenon (17, 25). Ernest Hankin also found evidence of what was likely phage lysis in 1896 (26, 27). Lysogeny was discovered shortly after the lysis phenomenon and as lysis, it was also controversial. The first evidence of Lysogeny was discovered in 1921 when Jules Bordet and Mihai Ciuca found bacteria produced self lysing phages (28). This was also found in 1921 by E. Gildemeister and Herzberg and in 1925 by Oskar Bail (29–31). In 1925 Bordet later named this phenomenon 'pouvair lysogène' which in English is translated as lysogenic power (32). Felix d'Herelle and Jules Bordet had disagreements over the phenomena as they are in direct contrast with each other. How could a phage virus do both?

Phage research initially was focused in two areas, one for phage therapy where phage were to be used to lyse pathogenic bacteria in a patient and the other for diagnostic tools for typing bacteria. Initial phage therapy worked but large scale clinical trials failed because of lack of knowledge of how to handle and dose the phages (33–36). Antibiotics were discovered and were very effective and more simple to use and this led to a decline in phage therapy research (37). Phage therapy was still pursued in France, Russia, Indian, and countries of the former Soviet Union including Georgia, Poland, and Slovenia (38). Two key centers focused on phage therapy were founded and one of them is the Polish Academy of Sciences in Wroclaw where Stefan Slopek published detailed phage therapy studies. A second key center, the Eliava Institute, was founded by Felix d'Herelle and George Eliava in Tbilisi, Georgia. For technical and economic reasons phage therapy was furthered pursued in these countries became a standard of care and was used during World War II. The United States distanced itself from Soviet Union related research after the war and during the Cold war and phage therapy became politically unsound for the United States to pursue.

Research on phages led to the advent of molecular biology and many important discoveries including DNA as the genetic material, solving of the structure of DNA, elucidation of the genetic code, operons, and many others (21). Multiple Nobel Prizes have been awarded for the uncovering of biological phenomenon by researchers that have either been pursued phage research or have been influenced by it. Phages have also played an important role in the knowledge about the nature of viruses as whole. Phage research has greatly influenced society as a whole and will continue to do so.

The advent of molecular biology started in 1938, around the time of World War 2 which started in 1939 (39). Max Delbrück was a physicist who pursued biological questions and he formed and led the American phage group which met in Cold Spring Harbor in New York (21, 39, 40). This American phage group set out to study *Escherichia coli* phages T1 - T7 and work out in great detail phage-related biological processes (39). Salvador Luria worked with Max Delbrück and they studied the randomness of mutations (41). Alfred Hershey and Martha Chase were also in this group and performed experiments showing that DNA is the genetic material. Max Delbrück, Alfred Hershey, and Salvador Luria won the Nobel Prize in Physiology or Medicine in 1969 for their work (42).

A French phage group also formed in France at the Institute Pasteur and was led by André Lwoff, Jacques Monod, and François Jacob (43). André Lwoff studied lysogeny and investigated how this phenomenon occurs using Bacillus Megaterium and found it was possible to induce lysogenic phages to the lytic phase using UV light (6, 44, 45). André Lwoff also coined the term prophage which and he defines in a review as the following; the “Prophage is the form in which lysogenic bacteria to perpetuate the power to produce phage” (6). Jacob and Monod developed the operon model which greatly helped to understand how genes were regulated (46–48). The three won the Nobel

Prize in Physiology or Medicine in 1965 for their work on the genetic control of enzymes and virus synthesis (49).

E. coli and prophages

Escherichia coli K-12 was first isolated in 1922 and its lineages are well studied (50). In 1951 Esther Lederberg serendipitously discovered that *E. coli* K-12 contains a lysogenic phage, Lambda (λ) phage, when she shined UV light on the strain and it lysed (51). New *E. coli* strains were made and Lambda was cured from the bacteria and *E. coli* K-12 MG1655 became a main lab workhorse. Lambda phage was introduced to the American phage group but they did not initially want to study lambda because they did want to study lysogenic phage (39, 43). Lysogeny later became a major area of focus and Lambda phage served as a model phage for understanding lysogeny (39, 43). Lambda like phages are called lambdoid phage. After infection Lambda phage makes a decision to go into the lytic phase or a lysogenic phase and this has been called the genetic switch.

Mark Ptashne discovered the cI repressor in Lambda phage in 1967 (52). The cI plays a major role in the control of the life cycle of the phage and switching from one life cycle to another (9, 10, 53, 54). In the lysogenic life cycle, the cI repressor binds to operator sites at the promoters of genes involved in lysis and represses the lytic growth phase. Upon DNA damaged by UV light or another DNA damaging agent RecA* is produced, which is an activated form of the recombination RecA. RecA* cleaves the cI repressor and cI is repression is relieved. This loss of repression causes an increase of genes involved in lysis and the switch into the lytic phase. Phage progeny are produced and go on to infect other cells.

Lambda phage was also used to study how the phage integrates its genome into the host (55–59). After the phage injects its DNA and decides to enter the lysogenic state, it uses Integrase to integrate its genome into the chromosome using site-specific recombination. In this reaction, *attP* sites on the phage chromosome and *attB* sites in the bacteria undergo recombination catalyzed by Integrase and the phage is then integrated into the genome. During the recombination event, the *attP* and *attB* sites are converted into *attL* and *attR* sites. After integration, the cI repressor represses genes involved in replication and lysis, and the phage remains stably integrated into the genome. Excisionase genes are involved in the reverse step of this reaction and are necessary to promote excision of the phage.

When the *E. coli* K-12 MG1655 genome was sequenced in 1997, multiple cryptic prophages were found integrated into the genome which are inactive and unable to produce virions (60–62). This extra DNA does not appear to be detrimental to the cell, but instead can be advantageous to the bacteria (63). Genes from cryptic prophages are expressed and used by their bacterial hosts (63). It is likely that active phages also influence the host and make it more pathogenic. In studies of *E. coli* K-12 MG1655, cells with prophages were found to grow faster in lab conditions than isogenic cured cells (63). Phages also spread toxin genes by transduction (i.e. lateral gene transfer), which can make bacteria more virulent (64, 65). Bacterial pathogens are a major public health concern and phages also can increase antibiotic resistance through horizontal gene transfer (66). Lysogenic conversion is the process where a prophage changes the phenotype of its host; for example, an avirulent strain can be converted into a virulent strain through expression of genes gained via a prophage (9). Lysogenic conversion occurred in *E. coli* HO157:H7, where Shiga toxin genes were transferred to *E. coli* by a phage carrying the Shiga toxin gene (67). *E. coli* strains containing Shiga toxin genes are denoted STEC for Shiga toxin-producing *E. coli.* These strains cause Hemorrhagic Colitis and Hemolytic Uremic Syndrome (HUS) and are a major public health concern with an estimated 2.8 million infections and 230 deaths annually. The pathogen first emerged in 1982 and has continued to cause outbreaks with the most recent outbreak in 2018 being related to Romaine lettuce (68, 69). Multiple strains have been isolated and sequenced *E*. *coli* O157:H7 strain EDL933 from the 1982 multi-state outbreak in Michigan associated with Hamburgers was sequenced in 2001(70). A second strain of *E. coli* O157:H7 strain Sakai from the 1996 Sakai outbreak in Osaka, Japan was sequenced in 2001. EDL933 and Sakai have many prophages (12 in EDL933 and 18 in Sakai) and Shiga toxin-encoding genes *stx1* and *stx2* are found in prophages (64, 71). Prophages are linked to the virulence of these strains and having more prophages has been correlated to increased pathogenecity (64, 71, 72).

Salmonella enterica **and prophages**

The *Salmonella* genus is also very well studied and *Salmonella enterica* serovar Typhimurium, originally known as *Salmonella typhimurium* (STm for short), became one of the organisms studied as a model pathogenic enteric bacterium. In the 1950s, around the same time as the Phage group was formed, fundamental studies on the growth of bacteria were being performed using *Salmonella* (73, 74). These studies were performed by Moselio Schaechter, Ole Maaløe, and Nils Ole Kjeldgaard and they introduced quantitative growth laws (75–77). Jaques Monod was also influential in this field and was one of the first scientists to quantitatively study the growth of *E. coli* cells

(77, 78). *Salmonella* species also have well-established genetics, including transduction with P22 phage, discovered by Norton Zinder and Joshua Lederberg, and this aids in the study and creation of new strains (79).

Salmonella species of bacteria are highly diverse, with over 2500 serovars, and infect a broad range of organisms including humans, chickens, and amphibians (80–82). *Salmonella enterica* subspecies *enterica* serovar Typhi causes Typhoid fever in humans, but Non-Typhoidal serovars are also major public health concerns. Serovars are typed using antibodies and typed according to the Kaufmann-White classification scheme. Antibodies are used and these antibodies are targeted to the outermost portion of the Lipopolysaccharide named the O antigen or to flagella regions named H antigens. *Salmonella* are able to change the polysaccharides on the surface of their cells, and this allows for the pathogen to evade the host immune response. This diversity mechanism has been correlated with *Salmonella* phages and other horizontal gene transfer events. More recently strains are being sequenced which gives more insight of what makes the strains different, and many *Salmonella* have prophages integrated in their genomes.

Salmonella enterica subspecies *enterica* (Non-Typhoidal) causes 153 million cases of gastroenteritis and 57,000 deaths annually (83). The most well-studied lab strain is *Salmonella enterica* serovar Typhimurium LT2. This strain is used as a model organism for studying Typhoid Fever in mice. The strain was sequenced in 2001 and its genome is 4.8 Mb and it contains 4 active prophages, Gifsy-1, Gifsy-2, Fels-1 and Fels-2 (84–86). Gifsy-1, Gifsy-2 are known to be linked to virulence and are similar in genome structure and regulation to phage lambda. The Gifsy-2 prophage in this strain carries a *sodC* gene, which encodes a superoxide dismutase that permits intracellular survival when the *Salmonella* is engulfed by macrophages (65, 87). Fels-1 is also lambdoid, whereas Fels-2 shares similarity to the *E. coli* P2 phage, a myophage. The genetic switch between lysogeny and lysis is also similar to phage lambda's cI repressor-based switch, but these phages have antirepressor proteins (Tum) which bind to the the cI repressor and prevents the cI repressor from binding to operator sites leading to induction of the phage and active phage (88–90). Gifsy-1 and Gifsy-2 are highly similar and share 99% similarity over long homologies. Their repressors and antirepressors can act in trans to each other, leading to complicated life cycles which overlap. There are also multiple cryptic/defective prophages which are unable to form active virions. Another well studied strain is *Salmonella enterica* serovar Typhimurium 14028s and this strain causes virulence in mice and also contains prophages, including a Gifsy-2 homolog (91).

Salmonella enterica serovar Typhi strains are pathogenic and cause typhoid fever and cause multiple outbreaks (92, 93). According to the CDC data from May 31, 2017, there are 26 million cases of typhoid fever globally with 250,000 deaths (93). *Salmonella enterica* serovar Typhi CT18 was isolated in December 1993 from Vietnam from a 9-year-old girl suffering from typhoid fever (94). The genome was sequenced in 2001 and it is multidrug resistant and contains seven prophages (94). One of the *Salmonella* pathogenicity islands SPI7 contains a *sopE* containing phage and *sopE* is a virulence gene which encodes a Type III secretion effector (T3SS) protein that is a strong inducer of intestinal inflammation (95–97). A second *Salmonella enterica* serovar Typhi Ty2 was sequenced in 2003 (98). Comparing the two strains shows that both contain seven prophages, one of which encodes a *sopE* gene. The two genomes differ from each other by a large inversion spanning almost half the genome. The *Salmonella* genome is dynamic and an inversion is one example that occurs, other events such as duplications and deletions can also occur and will further be expanded upon.

Dissertation aims

This dissertation covers two main projects with an overall goal to better understand how phages in *E. coli* and *Salmonella* interact with their hosts. In Chapter 2, we uncover a new mechanism of how a bacterial protein involved in DNA replication, SeqA, may interact with the prophages in the genomes of *E. coli* and *Salmonella*. In Chapters 3 and 4 we develop a system to investigate if phages are involved in genome duplications and amplifications (a known mechanism of antibiotic resistance) using RNA-Seq analysis and fluorescence microscopy.

DNA replication and the cell cycle

DNA replication is a fundamental process of the cell and is orchestrated by numerous processes and works in concert with processes regulating the cell cycle (99–102). The cell cycle requires replication of the bacterial chromosome and the segregation of the second chromosome into the daughter cell. The mechanisms of DNA replication were uncovered by studying mutants of bacteria and aided by phage (74, 99, 103).

Stephen Cooper and Charles Helmstetter worked on the timing of the cell cycle in *E. coli* (103–105). They defined the cell cycle as the sum of different periods I + C + D, where I is the time before initiation of DNA replication, C is the time necessary to replicate the chromosome and D is the time to for the division of the cell. C and D were found to be constants, whereas I was variable. Donachie found cells divide at constant mass (106–108). All of these processes must be coordinated in the cell, and bacteria served as a useful model organism due to their fast generation times. Many of the growth laws are thought to be universal to all cellular life.

DnaA is one of the major bacterial proteins involved in initiation of DNA replication. It binds to the origin of replication, *oriC*, and changes the topology of this region. It binding recruits a cascade of multiple other proteins, including DnaC, DnaB, DNA polymerase, and DNA topoisomerases that work in concert to faithfully replicate the chromosome (103, 109–113). DnaA is both autoregulated and regulated by multiple other proteins (99, 109, 114). Several rounds of replication can occur at one time depending on the growth phase of the cell.

Prophages in the chromosome are replicated with the rest of the chromosome using their hosts' cellular processes. This method of phage replication does not directly yield progeny but has the advantage that the phages can replicate without having to form infectious particles and search for bacterial prey. Recently a Piggyback-the-Winner model has been proposed that shows that phage lysogeny of bacteria (piggybacking) that grow faster than their competitors (i.e., the winners) is one of the most widespread lifestyle strategies of phages in a broad range of environments (115). This model contrasts the earlier Kill-the-Winner model, which proposed that phages infect and kill the winner by lysis (116).

DNA replication and SeqA

The DNA replication cycle is not fully understood and the complete details of how the initiation of DNA replication is regulated are still not known (99). The conversion of DnaA-ATP to DNA-ADP plays a role, along with other mechanisms; nevertheless, there is still much more to be researched in this area (99, 117). SeqA was discovered and characterized as a a protein that prevents overinitiation of DNA replication, it also plays roles in other cellular processes such as chromosome organization and segregation (109, 118, 119). In *seqA* mutants the DNA cycle is misregulated: too many copies of the chromosome are made in an asynchronous manner, which also misregulates the cell cycle (118).

A number of studies, using *in vitro* biochemistry assays and *in vivo* tracking the distribution of SeqA binding in *E. coli* cells, have shown that SeqA binds to GATC sites in DNA (120–124). *In vitro* biochemical reactions with purified SeqA protein and DNA showed that it binds to DNA optimally when pairs of GATC sites are found close together (< 41 basepairs apart). SeqA protein can also bind GATCs at much longer distances, even across the chromosome, through protein-protein interactions to other SeqA proteins. SeqA proteins have been shown to cluster together and form higher order structures in a positive cooperative manner. GATC sites are distributed throughout the chromosome, with the highest concentration near the origin of replication at *oriC* and *dnaA* promoters. Current models propose that SeqA regulates the DNA cycle by sequestering origin-proximal DNA to the membrane, thereby preventing overinitiation of replication.

During the DNA cycle, the chromosome starts fully methylated. Immediately after replication the DNA is transiently hemimethylated, until Dam methylase, which follows the replication fork, adds methyl groups to the adenine within all chromosomal GATC sequences. SeqA binds with higher affinity to hemimethylated than fully methylated DNA, and has the lowest affinity for unmethylated DNA (125). The highest SeqA binding follows the replication fork and this has been shown *in vivo* with SeqA fused to GFP (122, 126).

Two different labs have assessed SeqA binding to the chromosome in *E. coli* using chromatin immunoprecipitation (ChIP-Chip) (120–122). These ChIP-Chip assays were performed by growing bacteria, crosslinking DNA using formaldehyde, and then using anti-SeqA antibodies to immunoprecipitate SeqA-bound DNA. This DNA was then hybridized onto a microarray chip with short oligonucleotides of *E. coli* DNA sequences spanning the chromosome. The SeqA-immunoprecipitated DNA hybridized to these regions was measured using fluorescent dyes. Two reports of SeqA binding using ChIP-Chip were published in 2010 and a third was published in 2012 (120–122). SeqA had the highest binding in regions with high GATC counts in the 2010 studies and the 2012 study (120–122). These reports showed that high SeqA binding correlated with a high density of GATC sites. The highest peaks of the signal were near the origin of replication at *oriC*, *dnaA*, and the *dnaA* promoter, all of which have numerous and clustered GATC sites. It is possible that SeqA binds to the *oriC* region and affects binding of DnaA but this has not been shown directly. Sánchez-Romero et al. suggested that SeqA binds the GATC sites in the promoter, thereby repressing transcription of the *dnaA* gene (120). This may not be the case, since mutations of GATC sites in the *dnaA* promoter region do not appear to affect the DNA and cell cycles. Zyskind and colleagues mutated the GATCs sites in the major *dnaAp2* promoter and found no change in the synchrony of replication initiation in either minimal or enriched media; thus it is unclear if SeqA directly affects the *dnaA* gene (127).

Transcription and SeqA

Multiple studies have been performed to study SeqA's potential effect on transcription using quantitative assays in both *E. coli* and *Salmonella.* Transcription of *dnaA* was previously shown to increase 1.8 fold in *E. coli seqA* mutants using quantitative S1 nuclease transcription assays (128). Protein levels of DnaA in *E. coli seqA* mutants were also shown to increase over 1.8 fold in a separate study using immunoblotting (129).

In 2003, a microarray study of *E. coli* measuring total transcription effects of wildtype and *seqA* mutants was performed. In contrast to the previous *dnaA* transcription studies, this one found no significant increase of *dnaA* transcription in *seqA* mutants (130). They showed that SOS genes (*recA*, *oraA*, *recN*, *sulA*, *dinI*, and *umuDC*) were upregulated in *seqA* mutants. They also found that the *seqA* mutants share similar transcription profiles to Dam-overproducing cells (130).

In 2007 Prieto et al. published a paper that included microarray data of *seqA* mutants of *Salmonella* Typhimurium 14028s (131). They found that the *seqA* mutants had decreased virulence in mice and displayed membrane instability, but the absence of SeqA had no effect on lysogenization by P22. In the microarray data, they did not show a significant increase of *dnaA* transcription (130, 131). The SOS response was moderately increased in both exponential and stationary phases. The study showed that two genes were repressed and four were activated in exponential phase, whereas four genes were repressed and 16 were activated in stationary phase. Interestingly, they noted that ~30% (16/42) of the genes that were either activated or repressed by SeqA were *Salmonella*-specific genes and many of these had unknown functions. One of the genes activated by SeqA is STM4212, a phage tail core gene of a phage remnant in the genome (72).

In chapter 2 we studied SeqA's role in the cell and suggest another mechanism of how SeqA acts. We also propose a model that provides a link between SeqA and the regulation of the exit from lysogeny into lytic replication. SeqA protein binding studies and microscopy studies have shown that SeqA and RNA Polymerase (RNAP) binding is mutually exclusive, and we propose that SeqA affects RNAP transcription (121, 132). We integrate the three Chip-ChIP studies and use bioinformatics tools to uncover the likelihood that SeqA interferes with transcription. In addition, we focused further on comparing GATC site distribution within the chromosome versus phage sequences.

Genome duplications

In Chapter 3 we further investigated the active prophages in *Salmonella* LT2 (those that can form infectious virions) and look at their activity specifically to see if they contribute to the formation of genome duplications (133–136). *Salmonella* LT2 is the most well-studied organism for how genome duplications and amplifications arise. The formation of these rearrangements is thought to be universal and has been implicated in antibiotic resistance and cancer. When an antibiotic resistance gene is duplicated, selection for the function of the gene can result in further amplification and higher number of gene copies that "answer" the selection.

Genome duplications occur frequently between regions of the genome that have high homology or homeology (imperfect similarity). In both *E. coli* and *Salmonella* Typhimurium, duplications often occur between the seven *rrn* operons (ribosomal RNA operons) (Figs. 2 - 3). The RecBCD and RecFOR are major recombination pathways implicated in genome duplications (137, 138). RecA-dependent and RecA-independent mechanisms have been proposed for the formation of genome duplications. Amplifications are thought to be highly dependent on RecA and *recA* mutations decrease the frequency of both duplications and amplifications. The Gifsy-1 and Gifsy-2 prophages carry recombination genes (*recE*, *recT*, and *ninG*) that could influence the formation of genome duplications and amplifications. We used next Illumina next-generation sequencing (RNA-Seq) to investigate if the prophage-encoded recombination genes are active and investigate if prophage functions are involved in genome duplications.

In Chapter 4, we developed methods to investigate if the phages are involved in genome duplications using fluorescence based microscopy. We inserted *parS* sites at multiple regions in the chromosome and used ParB proteins fused to fluorescent proteins. These ParB fusions bind specifically to the *parS* sites and form foci. We created a system where we can quantify the foci at one location in a region known to be duplicated (*purH*) and compared this frequency to another location expected to have a low frequency of duplications (139). We compared strains with prophages with strains from which the prophages were cured in order to quantify the contribution of the phages to the generation of rearrangements between *rrn* operons. We also tested the effect of a *recA* mutation on the formation of duplications (140). In order to see if the prophage recombination genes (*recE*, *recT*, and *ninG*) were involved, we cloned them into a tightly regulated plasmid and designed a system to test if these proteins can complement the loss of RecA function in duplication and amplification formation.

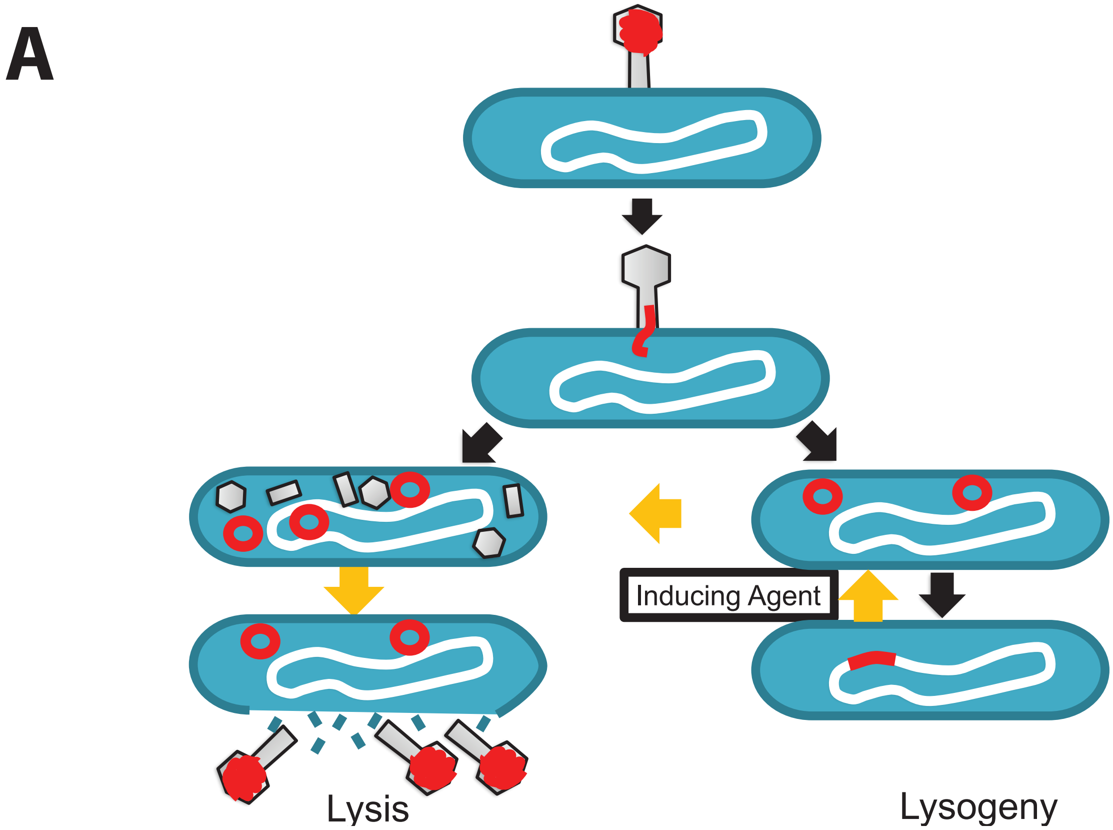

Figure 1: Prophage induction. A. Bacteriophage life cycle: When a phage infects it can inject its DNA and this can be integrated into the chromosome in the lysogenic life cycle or it can undergo lysis and replicate and can lyse the cell and release phage progeny. An inducing agent can induce the switch from the lysogenic to the lytic life cycle. Adapted from (10).

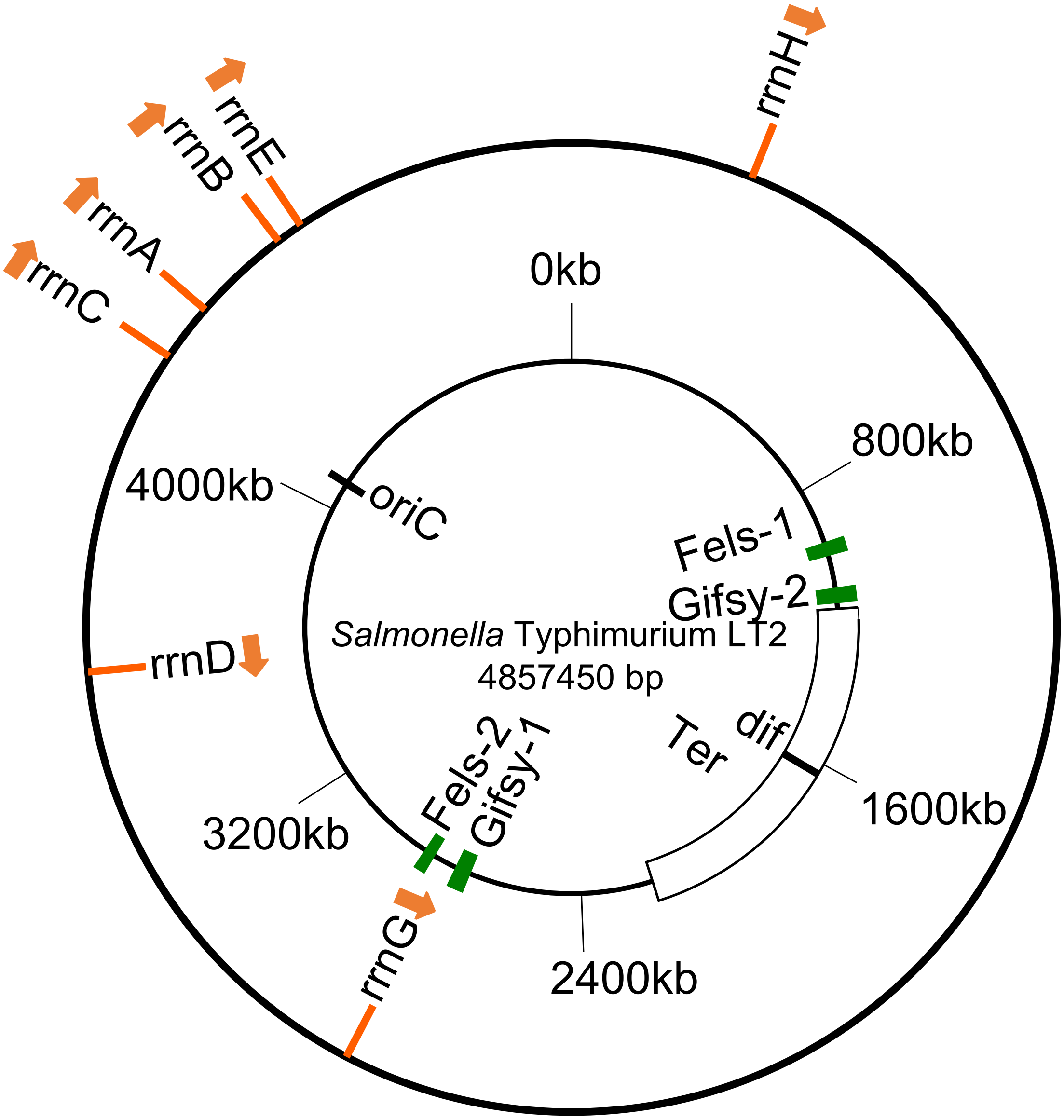

Figure 2: *Salmonella* LT2 chromosome organization. A. *Salmonella* LT2 chromosome with regions mapped and not drawn to scale using GenomeVX (141). The outside circle shows sites facing outwards and these are in the opposite orientation of sites facing inwards. Locations of the 7 *rrn* operons on the *Salmonella* LT2 chromosome are shown in orange on the outside of the circle; orange arrows indicate rrn operon direction. Gifsy-1, Gifsy-2, Fels-1, Fels-2 active prophages are shown in dark green. *oriC* was found from BLAST with the *E. coli* MG1655 *oriC* site and is the origin of replication. The Ter macrodomain where replication ends is indicated and was identified from (142, 143). Dif site was located from (144).

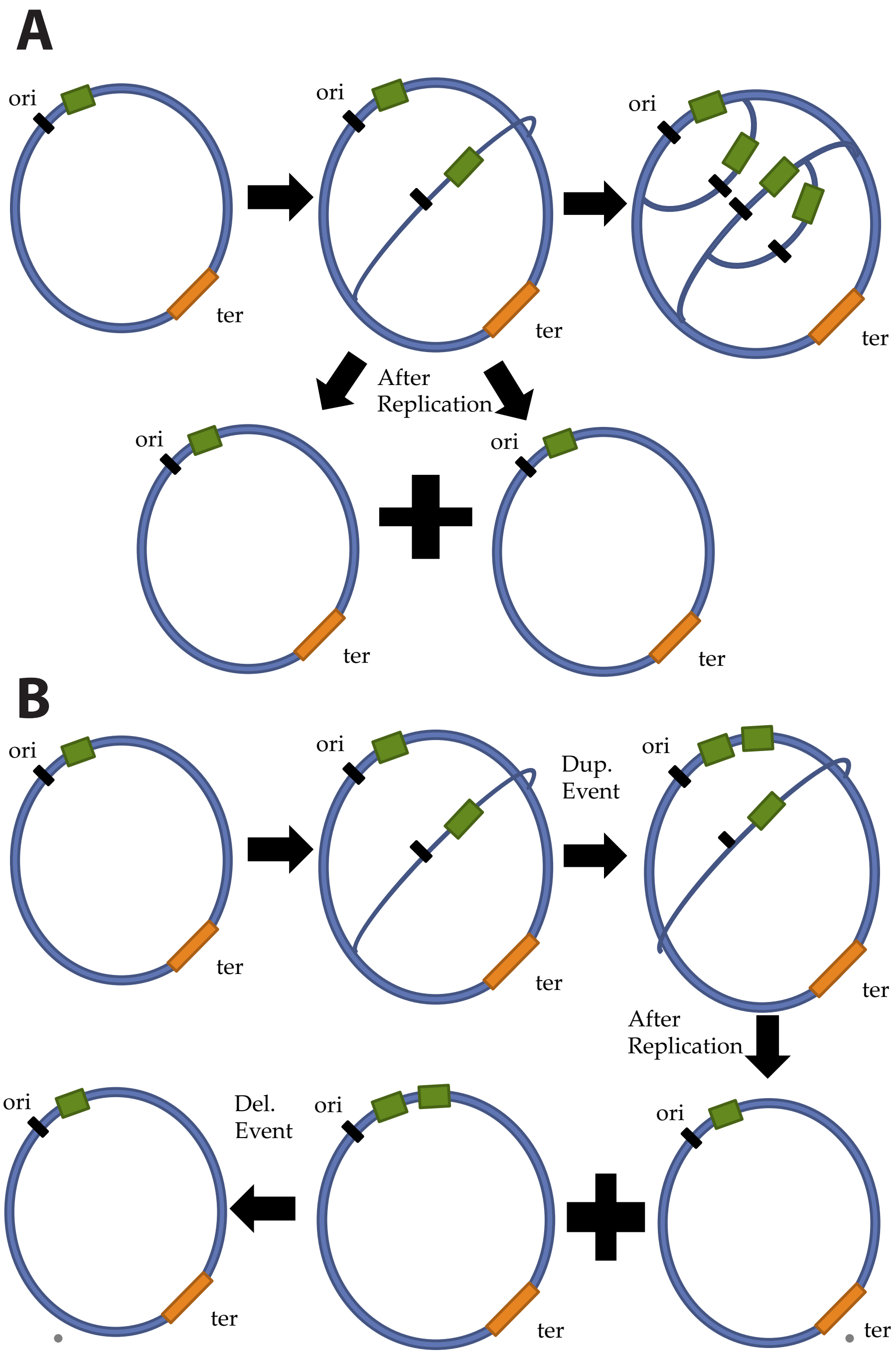

Figure 3: DNA replication vs. DNA replication with a duplication event. A. A circular chromosome with an ori site (origin of replication) denoted with a black box and a ter (terminus) denoted with an orange rectangle. A gene is shown in green box to the right of the origin of replication. Replication starts at oriC and proceeds in both directions bidirectionally and can have a second firing of the origin in high amounts of growth. After replication a second chromosome is made **A.** DNA replication with a duplication event. After a duplication event a second green is formed and the second copy of the chromosome has two copies whereas the original has one copy. A duplication event can then delete the duplication.

Acknowledgements

Chapter 1, in part, is currently being prepared for submission for publication of the material. Peters, Gregory. The dissertation/thesis author was the primary investigator and author of this material.

Chapter 2: SeqA as a regulator of genes and bacteriophages

SeqA as a regulator of genes and bacteriophage replication and life cycles in *Salmonella enterica* serovars Typhimurium and Typhi and *Escherichia coli* K-12 and O157:H7

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Abstract

In gammaproteobacteria, SeqA is a protein that prevents overinitiation of DNA replication and is involved in chromosome organization and segregation. SeqA binds DNA at GATC sites throughout the chromosome that are close together with highest binding around the origin of replication and dnaA. While working with *seqA* mutants of *Salmonella* LT2, we found increased induction of prophages and investigated the mechanism of how this was occurring. The SOS response is constitutively induced in these mutants and this could allow for increased replication of the prophages. We provide evidence that SeqA directly affects prophage gene expression. A search within the prophage DNA revealed pairs of GATCs in the open reading frames (ORFs) of prophage lifecycle genes (integrase, excisionase, cI repressor, *dnaA*, and *dnaC* analogs). Previous microarray and microscopy studies of SeqA in *Escherichia coli* found that RNA polymerase and SeqA mutually exclude each other. After reanalyzing the previous ChIP-Chip data we find that SeqA signals are over-represented inside ORFs despite being generally under-represented in prophage sequences. SeqA may downregulate gene expression by excluding RNA polymerase and impede transcript elongation. Phage may have evolved to escape this down-regulation although SeqA binding sites and exclusion of RNA polymerase are present in phage genes important for the maintenance of lysogeny and phage DNA replication initiation. This study presents evidence of SeqA acting as a secondary mechanism to prevent spurious prophage induction. SeqA exclusion of RNAP polymerase appears to occur in phage ORFs and bacterial ORFs involved in the cell cycle (*dnaA*, *mioC*, *mnmG*) and these

ORFs have pairs of GATC inside them. This study provides evidence that SeqA affects gene regulation and phages directly.

Importance

SeqA is an important and abundant chromosome organizing protein in gammaproteobacteria and has been best studied in *E. coli* K-12 MG1655 and *Salmonella* Typhimurium LT2. SeqA was identified as a protein necessary to prevent overinitation of DNA replication. SeqA binds to GATC sites, which occur throughout the chromosome, but are organized in clusters near the origin of replication, leading to increased SeqA binding in these regions. Both the Grainger and Skarstad labs have published binding data of SeqA binding in the chromosome and also RNAP polymerase binding (120–122). In this paper we reanalyze this data using recently developed bioinformatic tools and present new insights into how SeqA acts. In *seqA* mutants of *Salmonella* LT2 we find increased bacteriophage replication of prophages that are integrated in the chromosome. The default hypothesis is that the *seqA* mutation leads to induction of the SOS response, which consequently leads to prophage instability and entry into the lytic cycle. However, we wanted to investigate whether SeqA might have a more direct role in the lysis-lysogeny decision, and/or in the maintenance of the lysogenic state. Because *seqA* mutants are highly pleiotropic, however a bioinformatic analysis of SeqA binding and differential interactions with the bacterial chromosome offered a more promising approach. SeqA binding has been examined in detail. SeqA binding sites occur inside many ORFs important for the replication and life cycle of these viruses. SeqA appears to affect these genes by binding inside the ORF and occluding RNA Polymerase, impeding transcription of the ORF. Our analysis of the occurrence of multiple GATC sites indicates significantly lower than average in prophage ORFs. Some lytic bacteriophages have very few GATC sites and the viruses could evolve in order to decrease SeqA binding. Gene regulation is primarily thought to occur outside the ORFs in promoter regions. We find evidence for transcription regulation by interfering with the elongation process.

Keywords

SeqA, Bacteriophages, Prophages, Chromosome Organization, Chromosome Structure, Epigenetics, Gene Regulation, RNA Polymerase, Transcription Regulation

Introduction

Bacteriophages are abundant and can increase pathogenicity of hosts

There are huge numbers of bacteriophages an estimated 10^{32}, however, despite their abundance we do not know relatively little about their interactions with their hosts (1, 145). A recent analysis of the SEED database spanning phyla of Bacteria and Archaea with the prophage-finding program PhiSpy revealed that 82.76% of the bacteria have at least one prophage (146, 147). Many have more with an average of 3 prophages per bacterial genome (36,488 prophages / 11,941 bacteria) (146, 147). 43.23% have an annotated integrase gene (*int)* of the tyrosine and serine recombinase families suggesting they integrate into their hosts. Prophages can increase pathogenicity of the host by transferring virulence factors such as antibiotic resistance genes, between bacteria, a major health concern. *Escherichia coli* O157:H7 - EDL933 and *Escherichia coli* O157:H7 - Sakai have caused multiple outbreaks and contain 18 and 24 prophages respectively (64, 70, 71, 148, 149). *Salmonella* Typhi - CT18 and *Salmonella* Typhi - Ty2 also cause outbreaks and contain 7 and 6 prophages respectively (64, 94, 98, 149). Some prophages can have suffered deletion events to form cryptic prophages, which are unable to form active infectious particles, but which provide genetic material to the host. For example, the common laboratory strain *Escherichia coli* MG1655 K-12 has 11 cryptic prophages. *Salmonella enterica* serovar Typhimurium LT2 has four active prophages, which have temperate life cycles: Gifsy-1, Gifsy-2, Fels-1, and Fels-2, as well as two likely cryptic prophage fragments (63, 86). We have found that the SeqA protein, which is involved in chromosome replication and segregation, also binds to prophage regions and is likely regulating bacteriophage replication and the lysis/lysogeny decision in *Escherichia coli* K-12, *Escherichia coli* O157:H7, *Salmonella* LT2, and *Salmonella* Typhi.

SeqA and DNA Methylation

SeqA was identified as a negative regulator of DNA replication in *E. coli* that binds to methylated GATC sites in the chromosome (118, 119, 129). While GATC sites are spread throughout the chromosome, their highest density is near the origin of replication (150). SeqA is thought to bind to these sites and sequester the origin of replication from the DNA replication initiation protein, DnaA, thus preventing overinitiation of replication (151, 152).

Biochemical studies *in vitro* show that two SeqA monomers form a dimer that binds hemimethylated GATC sites in DNA with greater affinity than fully methylated DNA, and does not bind to unmethylated DNA (123, 124, 153, 154). SeqA has been shown *in vitro* to bind most efficiently GATC sites that are close together separated by fewer than 41 bp and introduces positive supercoils when bound (123, 124, 126, 155–159).

To assess SeqA binding to the *E. coli* chromosome in two separate labs used chromatin immunoprecipitation (ChIP-Chip) (120–122). In these reports, they showed high SeqA binding correlated with a high density of GATC sites. The highest peaks of signal were near the origin of replication at *oriC,* and in the *dnaA* gene and the *dnaA* promoter all of which have numerous and clustered GATC sites. The *dnaA* gene is both autoregulated and regulated by multiple other proteins (99, 109, 114). Sánchez-Romero et al. suggested SeqA that binds the GATC sites in the promoter, thereby repressing transcription of *dnaA* (120). However there was no significant increase of *dnaA* transcription in *seqA* mutants of either *E. coli* and *Salmonella* (130, 131). In addition, mutation of the GATCs sites in the *dnaAp2* promoter does not change the synchrony of initiation in either minimal or enriched media, thus it is unclear if SeqA directly affects the *dnaA* gene (127).

One of the most striking results in the 2010 Sánchez-Romero et al. ChIP-Chip data is that the *rrn* operons, which are the most highly transcribed operons in *E. coli*, lack GATC sites and thus have little if any SeqA binding (120). RNA polymerase has a strong signal at the *rrn* operons, as expected. The *rrnC* operon is unusual: it is very close to *oriC*, where a higher SeqA binding would be expected. Instead, *rrnC* has a lower SeqA binding signal than the surrounding area. The authors suggest that SeqA binds within genes and affects their transcription and point to low RNAP signals in SeqA-bound regions, but many regions with no SeqA bound have low RNAP signals. They show a weak inverse correlation when they compare data from this experiment of SeqA binding to RNAP binding data from a 2006 RNAP ChIP-Chip experiment (-0.13 correlation coefficient).

SeqA and RNAP are also mutually exclusive in the 2010 Waldminghaus et al. ChIP-Chip data (121). Of the genes with a detectable signal, 998 (48.26%) showed high RNAP binding, 1058 (51.16%) showed high SeqA binding and only 12 (0.58%) had overlapping RNAP and SeqA signals. In 2014 this was confirmed *in vivo* using super-resolution-structured illumination microscopy (132). Together, these studies together suggest that SeqA binding to DNA may exclude RNA Polymerase and in turn reduce or prevent transcription.

The 2012 Waldminghaus et al. ChIP-Chip data shows SeqA binds to regions with newly synthesized hemimethylated DNA more frequently near the terminus (122). During exponential growth, genes near the origin of replication, such as *mioC* and *mnmG*, were more likely to be affected by SeqA. The data show very high binding signals at *oriC*, *dnaA*, and in the *dnaA* promoters in synchronized *dnaC2* mutant cells 5 minutes after the initiation of replication (121). The signal “travels” bidirectionally around the chromosome following the replication fork. However, signals at *oriC*, *mioC*, *mnmG*, *dnaA*, and the *dnaA* promoters are constant and persist after 15 minutes, 35 minutes, and 50 minutes. It is likely that SeqA is bound to newly synthesized hemimethylated DNA at *dnaA* and *oriC* and that SeqA this affects transcription as well as replication. Over time the SeqA signal “travels” along the chromosome and appears to bind within other coding sequences, which would likely affect the transcription of these other genes. When SeqA binds it would introduce positive supercoils and thereby exclude RNA polymerase.

Here we reanalyze the 2010 and 2012 ChIP-Chip data and show that it is likely that SeqA is binding within Open Reading Frames (ORFs), excluding RNA polymerase and presumably reducing transcription. This phenomenon is likely to affect bacteriophage genes and influencing the phages’ life cycles.

Results

Prophages are highly induced in *Salmonella* LT2 *seqA* mutants

For our study we used *Salmonella* LT2 since it has four active prophages and allows for the study of regulation of its prophages. Our experiments show higher levels of bacteriophage induction in our *Salmonella* LT2 *seqA* mutant than wildtype LT2 (Fig. 4). This effect could be due either to the constitutive SOS response induction in *seqA* mutants and/or a LexA-independent mechanism affected by SeqA. The transcription repressor LexA controls the SOS response. To test whether the high induction in *seqA* mutants is SOS-related, we introduced a noncleavable allele of the LexA repressor, *lexAind3*. LT2, *seqA*, *seqA lexAind3* strains were grown in LB without treatment or treated with 0.1 μg/mL mitomycin C (MMC) a known inducer of the SOS regulon. Cells were lysed with chloroform, and lysates were tittered on a recipient strain lacking Fels and Gifsy prophages (SDT2739). Numerous very small (~1 mm) plaques characteristic of Gifsy-2 formed and a 1 cm^2 sector was counted with three 1 cm^2 sectors counted for each plate (Fig. 1) (160). The increase of phages in the *seqA* mutants could result either from the induced SOS response and/or due to a direct effect of the absence of SeqA see discussion.

Pairs of GATC Sites are in or near Gifsy-1 and Gifsy-2 prophage ORFs including cI repressor analogs, *dnaA* analogs, and *dnaC* analogs

In order to investigate whether SeqA may have a direct effect on the regulation of induction, we identified potential SeqA binding sites (i.e. pairs of GATCs) with respect to the prophages. We searched for pairs of GATC motifs within 41 basepairs in or near prophage ORFs, because SeqA binding to these motifs has been well characterized *in vitro* (123, 124, 126, 155, 156). Pairs of GATCs were found inside or near ORFs that could potentially regulate the lysis/lysogeny switch, and phage replication, including the analogs of integrases, excisionases, cI lambda repressor, *dnaA*, and *dnaC* (Fig. 5). An analysis of GATC sites was also done for *E. coli* prophage related regions. The occurrence of pairs at this distance is not likely to occur by chance: after shuffling the genome 1000 times with a k-mer size of four, to keep the same number of GATCs, the occurrence of any pairs and pairs within 41 bp in the whole genome decreased by 20% in both *E. coli* and *Salmonella* LT2 (P value: <0.0001, ****) (Fig. 13/S1).

To further explore SeqA protein binding chromosome wide, *E. coli* ChIP-Chip data was analyzed and no SeqA binding data is available for *Salmonella*. SeqA binding was compared to RNAP binding using the 2010 ChIP-Chip data from both Sánchez-Romero et al. and from Waldminghaus et al. (120, 121). A two-tailed t-test was performed on both data sets which revealed loci in which SeqA binding was enriched and RNAP binding was depleted (Fig. 6) (120). The 2012 Waldminghaus et al. data was also processed to compare overall SeqA binding and a two tailed t-test was used to compare signals at 0 min vs. 50 min. The 0 min time point was chosen since it had little to no SeqA binding and the 50 min time point had SeqA binding distributed throughout the chromosome. The data was sorted by % rank, yielding the most highly occupied (Top) SeqA binding sites (122). The Top 50%, Top 25%, and Top 10% were obtained by filtering the signals into their respective ranks and these signals were used to create independent files to compare against the total signals. These tracks for the three data sets were co-visualized with GATC sites to give a better overall view of overall where SeqA is acting (Fig. 6, Table 1). Pairs of GATC sites were also found within the integrase ORF of the *E. coli* cryptic prophage CP4-6 (Fig. 6). This provided evidence that SeqA binds prophage ORFs and excludes RNAP.

SeqA binding signals and GATCs are over-represented in ORFs and under-represented in prophage

In order to quantify and compare the signals in prophage sequences and in ORFs throughout the whole genome, BEDOPs and BEDTools were used (161, 162). These computational tools provide a range of functions to further analyze the signals and genomic features such as GATC sites. The BEDOPs “element-of” function was used to find GATCs that were elements of the SeqA ChIP-Chip data sets for the weak Top 50% and the strong Top 10% interactions (Fig. 14/S2). Even pairs of GATC sites had an increase in SeqA signal of 10-15%, showing that SeqA interacts with pairs of GATC within bacteriophage ORFs. A new method of analysis of GATCs was developed based on pairing of GATCs *in vitro*, see methods and Han J.S and Hwang D.S. 2003 (123). Further pairing into higher order GATCs increased the SeqA microarray signals 10-15% for each GATC site to a GATC site pair ($GATC_2$) to form the ($GATC_3$) third GATC was paired, to form the ($GATC_4$) a fourth GATC pair was formed (Fig. 14/S2).

To see how often pairing and formation of higher order structures occurs we compared the observed counts vs. shuffled counts. Shuffling of the genome of *E. coli* and *Salmonella* LT2 was done using uShuffle with a k-mer size of four in order to keep the same number of GATCs (Fig. 13/S1) (163). After 1000 shuffles, there was a 20% decrease of $GATC_2$ instances both *E. coli* and *Salmonella* LT2 and a further 20% decrease of $GATC_3$ and $GATC_4$ higher order complexes, indicating that pairing of

GATCs is not random. These observations suggest that the role of paired and higher multiple of GATCs is biologically important (Fig. 13/S1).

The SeqA Signals for SeqA Only 1 (Waldminhaus et al. 2010), SeqA Only 2 (Sánchez-Romero et al. 2010), and SeqA Binding (Waldminhaus et al. 2012) (120–122) and the GATCs occurrences were quantified using BEDTools and BEDOPS (161, 162) to see overall binding to regions in the genome in prophage, ORFs, and promoters. The signals were shuffled 1000 times and randomized in order to compare randomized SeqA signals to the actual SeqA signals. GATC locations were also randomized to compare these to the observed GATCs. Cryptic prophage locations were identified in *E. coli* and both cryptic and active locations were identified in *Salmonella* LT2. BEDTools complement was used to create regions opposite (inverse) of prophage ORFs, and promoters and named nonprophage, noncoding, and nonpromoters respectively. The signals were divided into 1 basepair "regions" and BEDOPS "element-of" was used to quantify signals in regions vs. their complement.

There was a decrease of all of the signals (SeqA Only 1, SeqA Only 2, SeqA binding) and GATCs in prophage-related regions in both *E. coli* and *Salmonella* LT2 and these decreases were significant using χ^2 statistics comparing random vs. observed (Fig. 7). In addition, there are decreasing. strong signals apparent in all of the signals (SeqA Only 1, SeqA Only 2, SeqA binding) and higher order GATCs (Fig. 7). SeqA signals and GATCs were all increased in ORFs in both *E. coli* and *Salmonella* LT2 and significant using χ^2 statistics of random vs. observed for *E. coli* and not *Salmonella* LT2 (Fig. 8). There was an increasing trend of the SeqA signals inside ORFs with no apparent trend in the GATCs (Fig. 8). There was a decreasing trend of SeqA Only 1

(Waldminhaus et al. 2010) and GATCs in promoters and no trend in SeqA Only 2 (Sánchez-Romero et al. 2010), or SeqA Binding (Waldminhaus et al. 2012)(120–122) and these trends were significant using χ^2 of random vs. observed(Fig. 15/S3).

Both SeqA signals and phages correlate with GATC Odds Markov ratio

After finding that phage have decreased GATCs, pairing, and signals we further analyzed the sequences using tetranucleotide frequencies on the microarray signals, signals, and bacteriophages. GATC tetranucleotide frequencies are lower in phage when calculated using a second order Markov model and pairing is less frequent in phage (164, 165). We used the CMBL Signature web server and calculated GATC tetranucleotide relative abundances with second order Markov modeling (166). The formula used for GATC Odds Markov ratio is $\tilde{\tau}_{GATC} = \frac{\mathrm{f}^{*}{}_{GATC}\mathrm{f}^{*}{}_{AT}}{\mathrm{f}^{*}{}_{GAT}\mathrm{f}^{*}{}_{ATC}}$ (167–169). Conservative statistical cutoffs of extremely high/low occurrences were previously developed by the Karlin lab (167–170). The cutoffs are based on statistical theory and on sequence motifs present in bacteriophage, bacteria, large human viruses, eukaryotes, and mitochondria in the European Molecular Biology Laboratory database in June 1991 (167–170).

Increasing SeqA signals correlate with increasing GATC Odds Markov ratio modeling (Fig. 9A). RNAP signals are always significantly low in GATC Odds Markov ratio (Fig. 9A). In order to see if this occurred in other phage both lytic and lysogenic phage were analyzed. Multiple lytic phage (T4, T7, P22, Felix O1) are extremely low for GATC Odds Markov ratio, and multiple cryptic phage are significantly lower but not as low as the fully lytic phage (Fig. 9). It is likely that phage evolve to avoid the effect of transcriptional regulation of SeqA on their life cycles.

To see an effect in virulent strains of *E. coli* and *Salmonella* an GATC Odds Markov ratio analysis was performed. *E. coli* O157:H7 - EDL933, *E. coli* O157:H7 – Sakai, *Salmonella* Typhi Ty2 and CT18.   Many *E. coli* O157:H7 prophage are significantly low in GATC Odds Markov ratio for both EDL933 and Sakai including the shiga toxin encoding phage: CP-933V-stx1 , BP-933W-stx2, Sp15-stx1 and SP5-stx2 (Fig. 10A-B). Many *Salmonella* Typhi prophage are significantly low in GATC Odds Markov ratio as well for both CT18 and Ty2 (Fig. 10C-D).

Pairs of GATC sites are in cell cycle ORFs (*dnaA*, *mioC*, *mnmG/gidA*)

It was interesting that phage are very low in GATCs and that there were pairs of GATC sites in *dnaA* analogs, so we also investigated the *E. coli dnaA*, *mioC*, and *mnmG* (*gidA*) cell cycle ORFs. A search for GATC sites in them in *E. coli* yields clusters of GATCs with high binding by SeqA (Fig. 11). When SeqA is present in these locations RNAP polymerase is excluded and it is likely that transcription is regulated. It could bind directly inside these ORFs it could repress transcription of *dnaA*, other cell cycle ORFs, and preventing overinitation of replication.

Discussion

High prophage induction in *seqA* mutants of *Salmonella* LT2 led to the finding that there are pairs of GATC sites inside important prophage life cycle ORFs and these do not appear to be random for both *E. coli* and *Salmonella*. SeqA binding inside an ORF and affecting transcription has not been shown before so it was unclear if SeqA was acting directly on the prophages or if it was because the SOS response was constitutively on. In Fels-2 and both Gifsy prophages, SOS regulation of prophage induction differs from that in *E. coli* λ. In λ, cI repressor controls the lysis-lysogeny switch and when the SOS response is on the phage switch to the lytic life cycle. The Fels-2 and Gifsy prophages have an antirepressor tum that prevents cI analog from binding to its operator sites, thus keeping the phage active. There are lexA boxes upstream of the antirepressor tum gene for Gifsy-1, Gifsy-2, and Fels-2 and a capsid gene of Gifsy-1 and tail ORFs of Gifsy-2 and these have previously been shown to be strongly repressed by LexA overexpression (90). LexAind3 is an allele of the protein that is resistant to proteolysis and functions as a constitutive repressor. LexAind3 could have a negative effect on the genes of the prophages reducing their induction independently of the SOS response. *lexA* null mutants were shown to be lethal due to induction of the prophage. Therefore it is difficult to separate the effects of the *seqA* mutation and the SOS response (90).

After reanalyzing *E. coli* SeqA ChIP-Chip signals we found they are under-represented in prophages. These cryptic prophages do not form virions and thus it would be difficult to study the effect of SeqA on their life cycles. It appears the increased prophage induction is both direct and indirect. The SeqA signals are over-represented in ORFs. Our model is that SeqA binds inside ORFs causing positive supercoiling which interferes with RNA Polymerase transcription elongation (Fig. 12). SeqA might act to repress prophage induction directly, which could provide benefits to the host. SeqA might be acting to prevent overinitation of replication by phage and stabilize phage lysogeny. SeqA could be acting to dysregulate phage leading to the formation of cryptic prophages. Interestingly some phage have extremely low GATC Odds Markov ratio, so it is possible phage evolve to escape the effect of SeqA.

In eukaryotes, CpG DNA methylation can cause increased compaction of DNA into inactive heterochromatin regions and transcriptionally silenced regions of DNA (171–176). SeqA could act similarly to histones and nucleosomes, providing another link between gene regulation in prokaryotes and eukaryotes. In addition, in yeast, forkhead box proteins are highly homologous to human forkhead box proteins and act similarly to SeqA (177–179). Forkhead 1 (Fkh1) and Forkhead 2 (Fkh2) bind to DNA and are involved in regulation of DNA replication initiation timing (177–179). Fkh1 and Fkh2 also bind throughout the chromosome and are slightly enriched in ORFs compared to flanking regions (177–179). Interestingly Fkh1 and Fkh2 have been shown *in vitro* to inhibit transcription elongation of RNAPII in coding regions of multiple genes (180). Further studies could further elucidate the effect of chromosome binding proteins on transcription regulation and similarities with eukaryotes and prokaryotes.

Materials and Methods

Recombineering

Recombineering was carried out using established protocols and the pSIM6 plasmid (181). The tetracycline resistance regulon (TetRA) was PCR amplified from Tn*10*dTet with primers with 40 basepairs of homology targeting SeqA. Forward primer SeqA - tetRA – Forward and SeqA - tetRA – Reverse (Table 3). Q5® High-Fidelity DNA polymerase was used with 1 µL purified genomic DNA of the G270 strain (*recD543*::Tn*10*dTet) and forward and reverse primers. 2 µL of the PCR product was electroporated into electrocompetent cells which had been grown at in low salt LB (2.5 g NaCl, 5 g Tryptone, 2.5 g Yeast Extract in 500 mL H_2O) at 30 °C with pSIM6 and with recombineering genes induced for 15 minutes at 42°C. Cells were recovered for 2 hours at 30°C and on LB + 15 µg/mL tetracycline plates. The pSIM6 plasmids were cured from recombinants by subculturing cells with a 1:1000 dilution into 2 mL LB and grown for 8 hours at 37 °C. Cells were streaked from the culture onto an LB plate and then let to grow overnight and colonies were patch plated onto LB and LB + 30 µg/mL chloramphenicol. Cells that were sensitive to chloramphenicol were streak isolated and used for downstream assays.

P22 Transductions

Phage P22 was used for transductions and phage lysates were made according to previous protocols (182). Lysates were made by inoculating 2 mL of pre-phage broth (100 mL LB + 2 mL 50X NCE salts + 1 mL 20% glucose) with 0.5 mL donor cells and infecting with 5 µL P22HT. Cells were allowed to grow at 30 °C for 6 to 16 hours. Cultures were transferred to two 1.5 mL microcentrifuge tubes and lysed with 0.25 mL chloroform ($CHCl_3$). The tubes were vortexed, incubated on the bench for 10 minutes at room temperature and spun down at 13200 RPM for 5 minutes. Two phases formed, and the top phase was transferred to new tubes and treated with $CHCl_3$ vortexed, incubated, and spun down again. This was repeated until the lysate was clear and lysates were stored with drops of $CHCl_3$ in a 4 °C refrigerator. Transductions of *lexAind3* were set up on LB plates by adding 100 µL recipient cells with 20 µL, 10 µL, or 5 µL lysates. Plates were spread and incubated at 37 °C for 4 hours. They were then replica plated using sterile autoclaved velvets and transferred to LB plates + 30 µg/mL chloramphenicol. Transductants were streak purified twice on EBU agar plates. P22H5 was used to test for P22 sensitivity and sensitive colonies were streak purified onto LB plates.

Phage Induction

A sterile toothpick was used to streak out the glycerol freezer stock of G905, SDT2991, and SDT2993 onto LB Agar Plates (5 g NaCl, 5 g Tryptone, 2.5 g Yeast Extract, 7 g Agar in 500 mL H_2O) and allowed to grow at 37 °C for 12 hours. Single colonies were picked and inoculated into 1 mL Mueller Hinton Broth (MHB) and grown overnight for 16 hours. Overnights were subcultured 1:100 into 2 mL MHB and grown at 37 °C to Optical Density (OD600) 0.17. Cells were diluted 1:3 into LB or different treatments of Mitomycin C (MilliporeSigma) to get final concentrations of 0.1 µg/mL to a final volume of 150 µL in microtiter plates (183). Cells were grown overnight for 20 hours at 37 °C with shaking in VersaMax™ Microplate Reader to monitor growth. The cells were taken out of the VersaMax™ Microplate Reader and were transferred to microcentrifuge tubes and whole cell lysates were made with the addition of 15 µL $CHCl_3$ (184). The lysates were centrifuged at 13200 RPM for 5 minutes in an Eppendorf 5415 D centrifuge and two layers formed. 0.6% Top agar (5g NaCl, 5g Tryptone, 2.5g Yeast Extract, 3g Agar in 500 mL H_2O) was melted in a microwave at 30% power and transferred to glass tubes in a water bath set at 50 °C (185). For full plate plaque assays 100 µL lysates was added with 100 µL of LT2 –phage and 3 mL of top agar and mixed together and plated onto EBU-Agar plates. Plates were incubated facing up overnight at 37 °C and checked the next day for plaques. 10 biological replicates were performed and plaques in a 1 cm^2 sector for each plate were counted with three technical replicates per plate. Using GraphPad Prism 6, two-way repeated measures ANOVA with matching was performed on averages of the three technical replicates. For strains and treatments, Tukey’s multiple comparisons with 95% confidence interval was performed.

Differential Binding of SeqA vs. RNAP and Analysis of SeqA Binding from ChIP-Chip data

Integrative Genomics Viewer (IGV) version 2.4.6 was used to view the *Salmonella enterica subsp. enterica serovar* Typhimurium str. LT2 (ASM694v2), and *Escherichia coli* str. K-12 substr. MG1655 (ASM584v2) genome assemblies (62, 186–191). GATC positive strand motifs were identified using find motif and searching for “GATC”. Prophage locations and ORFs were identified from assembly annotations and PHASTER (https://phaster.ca/) (149, 191). Gene annotations and KEGG was used to identify functions of ORFs in prophages (192). ChIP-Chip Data was obtained from the Gene Expression Omnibus (GEO) for the 2010 (GSE19053) and 2012 (GSE28280) Waldminghaus et al. data (121, 122, 193–195) using GenePattern (193). ChIP-Chip data from Sánchez-Romero et al. was downloaded from supplemental data and manually converted to a GCT file (120). Microarray loci were converted from U00096.2 to U00096.3 locations using the EcoGene: Gene Interval Updater (61). Updated ChIP-Chip data was uploaded to GenePattern and Sánchez-Romero et al. data were preprocessed to obtain $\log_2$ transformed data and GSE19053/GSE28280 data were already $\log_2$ transformed. SeqA vs. RNAP differential binding was assessed by using ComparativeMarkerSelection (196). A two-tailed t-test was performed on the SeqA-new vs. RNAP old duplicate samples for GSE19053: (GSM471486 SeqA new rep1, GSM471487 SeqA new rep2 vs. GSM471482 RNAP old rep1 GSM471483 RNAP old rep2). A two-tailed t-test was also performed on the SeqA timepoint 1 vs. RNAP duplicate samples for the Sánchez-Romero et al. data. To assess SeqA binding a two-tailed t-test was performed on the SeqA 0-minute timepoint vs. SeqA 50-minute timepoint duplicate samples for GSE28280: (GSM699908 SeqA in 0 min dnaC2 rep1, GSM699909 SeqA in 0 min dnaC2 rep2, GSM699921 SeqA in 50 min dnaC2 rep1 GSM699922 SeqA in 50 min dnaC2 rep2). 50-minutes was selected as it has the most SeqA binding coverage compared to other time points. ComparativeMarkerSelectionViewer was used to download the data and then sorted by rank of the test statistic (P value) (196). GCT files were made for all ranks 100% and the top ranks (5%, 10%, 25%, 50%) were obtained by filtering for the specified percentage in Microsoft Excel. In IGV the GCT files were used to make tracks onto the genome assembly with the updated probe locations and compared to GATC motifs and ORF locations.

GATC Odds Markov Ratio on Signals and Regions

The GCT files created from Waldminghaus et al. 2010 and Sánchez-Romero for all ranks and 5%, 10%, 25%, and 50% for both RNAP Only and SeqA Only were converted to BED files using Microsoft Excel (120, 121). The GCT files created from Waldminghaus et al. 2012 for SeqA Binding all ranks and the top ranks (5%, 10%, 25% and 50%) were converted to BED files using Microsoft Excel (122). Prophage regions for *E. coli* and *Salmonella* were annotated on Integrative Genomics Viewer and exported to BED files (186, 187). To obtain ORFs, GFF files from the *E. coli* MG1655 (ASM584v2) and LT2 (ASM694v2) assemblies were converted into Microsoft Excel files and duplicate annotations, annotations that were internal to other annotations, and ID annotations were deleted (62, 188–191). BEDTools v2.27.1 was downloaded from https://bedtools.readthedocs.io/ and BEDOPs v2.3.45 was downloaded from https://bedops.readthedocs.io/en/latest/ and both were installed on a local computer (161, 162). The ORFs were then converted into BED files and overlapping ORFs were merged using BEDOPS with the “--merge” command (161). Noncoding BED files for both *E. coli* and *Salmonella* were made using BEDTools and the “complement” command on the ORFs BED file and two .genome files containing the genome sizes and chromosomes (162). Cryptic prophage locations for *E. coli* K-12 were identified from the RefSeq assembly, a patent, and PHASTER (62, 149, 188, 190, 191, 197). Prophage locations for *E. coli* O157:H7 were identified from the RefSeq assemblies, the literature, and PHASTER (64, 70, 71, 148, 149). Five new prophages of *E. coli* O157:H7 - EDL933 were identified using PHASTER in locations NC_002655.2:1748351-1756006, NC_002655.2:2142479-2177204, NC_002655.2:2272752-2342415,NC_002655.2:3260475-3274334, NC_002655.2:3544753-3565707 and named GP-9338, GP-93311, GP-93312, GP-93316, GP-93317 respectively. Prophage locations for *Salmonella* LT2 were identified from the RefSeq assembly, Defective prophages 1-4 were identified using the literature and PHASTER (85, 189). A fifth defective prophage was identified using PHASTER in location: “AE006468.2:2,899,841-2,931,190” and named SD-9 (149). Prophage locations for *Salmonella* Typhi were identified from the RefSeq assemblies, the literature, and PHASTER (64, 94, 98, 149). Prophage locations for *E. coli* and *Salmonella* were annotated on Integrative Genomics Viewer and saved as BED files. Active prophages for *Salmonella* LT2 were distinguished from cryptic in an active prophage BED file containing regions for Gifsy-1, Gifsy-2, Fels-1, and Fels-2. The all prophage BED file contains the regions for the

Salmonella LT2 active prophages and the five defective prophages. Nonprophage regions for *E. coli* and *Salmonella* were created using BEDtools “complement” with the prophage BED file for *E. coli* and the all prophage BED file for *Salmonella* and their respective genome files (162). All promoter sequences for *E. coli* K-12 were obtained from RegulonDB 9.0 and converted to FASTA files using Microsoft Excel (198). Bowtie2 version 2.3.4.1 was downloaded from http://bowtie-bio.sourceforge.net/bowtie2/index.shtml and installed on a local computer (199, 200). The FASTA promoter files were aligned to the *E. coli* genome using Bowtie2 (199, 200). The SAM output file from Bowtie2 was converted to a BED file using the BEDOPS “sam2bed” command (161). EMBOSS seqret was used to convert BED files for the signals, prophage regions, and promoters to GenBank files using the FNA files from the *E. coli* MG1655 (ASM584v2), *E. coli* O157:H7-EDL933 (ASM666v1), *E. coli* O157:H7-Sakai (ASM886v2), *Salmonella* LT2 (ASM694v2), *Salmonella* CT18 (ASM19599v1), and *Salmonella* Ty2 (ASM754v1) assemblies (62, 70, 94, 98, 148, 188–191). *E. coli* infecting phage genome sequences of GenBank files were downloaded from NCBI with the following names and accession numbers: T1 (GenBank: AY216660.1), T4 (Refseq: NC_000866.4), T5 (Refseq: NC_005859.1), T7 (Refseq: NC_001604.1) and Lambda (Refseq: NC_001416.1) (191, 201–205). *Salmonella* infecting phage genome GenBank files were downloaded from NCBI with the following names and accession numbers, P22 (Refseq: NC_002371.2), Felix O1 (Refseq: NC_005282.1) (191, 206). All GenBank files for all regions and phage were run on the CMBL Signature web server (http://cmbl.uga.edu/software/signature.html) to calculate GATC Odds Markov Ratio: $\tilde{\boldsymbol{\tau}}_{GATC} = \frac{\mathbf{f}^*_{GATC}\mathbf{f}^*_{AT}}{\mathbf{f}^*_{GAT}\mathbf{f}^*_{ATC}}$ (167–169). GenBank files for signals with over 10,000 sequences 50

Min All, RNAP Only 1, RNAP Only 2), were converted into separate GenBank files of less than 10,000 and then the GATC Odds Markov ratio were averaged across the runs. *E. coli* cryptic prophage PR-X was not included in GATC Odds Markov Ratio analysis because of the small size.

Shuffling and Randomization of Signals and Genomes

The BED files created from Waldminghaus et al. 2010 and Sánchez-Romero for all ranks and 5%, 10%, 25%, and 50% for SeqA Only and Waldminghaus et al. 2012 for SeqA Binding all ranks and the top ranks (5%, 10%, 25% and 50%) were shuffled 1000 times using a shell script written in Python3 (120–122, 207). The BEDtools "shuffle" command with seed 1 and sort the bed file using the Unix sort command "sort -k1,1 -k2,2n" (162). The signals were then placed in locations in the microarray sorted by a cell created by the Microsoft Excel RAND function to create random locations. The locations were then sorted in Microsoft Excel using sort for the start site of the microarray probe and then the Excel files were converted to BED files.

GATC Sites, GATC Pairs, and Higher Order GATCs and Randomization

Integrative Genomics Viewer (IGV) was used to view the *Salmonella enterica subsp. enterica serovar* Typhimurium str. LT2 (ASM694v2), and *Escherichia coli* str. K-12 substr. MG1655 (ASM584v2) genome assemblies and Ushuffle sorted genome assemblies (62, 163, 186–191). GATC positive strand motifs were identified using find motif and searching for "GATC". The GATC locations were saved as BED files and converted to Microsoft Excel spreadsheets. To analyze pairing *in vivo* GATCs were grouped in five different categories: GATCs on the positive sense strand were labeled as GATC All; GATCs within 41 basepairs were categorized as GATC Pairs, GATC Pairs that were near within 41 basepairs third GATC were categorized as GATC Higher Order 1 (i.e., two pairs of GATCs). If the GATC Higher Order 1 had a fourth GATC within 41 basepairs, it was categorized as a GATC Higher Order 2 (i.e., three pairs of GATCs). Microsoft Excel was used to find GATC sites were that were < 41 basepairs from the middle of the another GATC site (GA$^{\downarrow}$TC < 41 basepairs from a GA$^{\downarrow}$TC) and placed in a column and defined GATC Pairs. A second column was created to find GATC Pairs < 41 basepairs from the middle of the first GATC site and defined GATC Higher Order 1. A third column was created to find GATC Higher Order 1 sites < 41 basepairs from the middle of the first GATC site and defined GATC Higher Order 2. GATCs were sorted for All GATCs, GATC Pairs, GATC Higher Order 1, and GATC Higher Order 2 were copied into new spreadsheets and then sorted by location. GATC spreadsheets were then converted into BED files. Random GATC locations for *E. coli* and *Salmonella* LT2 were created using BEDtools “random” function using a “.genome” text file with the “-n” option followed by the number containing the count of all GATCs (162). The random locations for GATC pairs, GATC Higher Order 1, GATC Higher Order 2 were created the same way using a “.genome” text file and the “-n” option followed by the original counts of GATC pairs, GATC Higher Order 1, GATC Higher Order 2 respectively (162).

Genome Arithmetic

Bash shell scripts were created to run BEDOPS on microarray BED observed and randomized signals. The “--chop” function with the “1” option to chop the signals into single basepairs (161). Scripts were run using the BEDOPS “--element-of” function to find counts of observed chopped signals, randomized chopped signals, observed GATCs, and randomized GATCs in the ORFs and prophage regions (161). Scripts were also run using BEDOPS and the “--element-of” function and range 75 to find counts of GATCs, GATC Pairs, and Higher Order GATCs with signals (161). Contingency tables of random vs. observed were made in GraphPad Prism 6 and χ^2 statistics were performed using a 95% confidence interval. Results were graphed as percentage of counts vs. total of counts for the regions:

$$\left(\frac{\text{Signals in ORFs}}{\text{Signals in ORFs + Signals in Noncoding}}\right) * 100\text{ , }\left(\frac{\text{GATCs in Noncoding}}{\text{GATCs in ORFs + GATCs in Noncoding}}\right)*100$$

$$\left(\frac{\text{Signals in Prophage}}{\text{Signals in Prophage + Signals in Nonprophage}}\right) * 100\text{ , }\left(\frac{\text{GATCs in Nonprophage}}{\text{GATCs in ORFs + GATCs in Noncoding}}\right)*100$$

$$\left(\frac{\text{Signals in Promoters}}{\text{Signals in Promoters + Signals in Nonpromoters}}\right) * 100\text{ , }\left(\frac{\text{GATCs in Nonpromoters}}{\text{GATCs in Promoters + GATCs in Nonpromoters}}\right)*100$$

Table 1: Supplemental File S1: ChIP-Chip IGV Tracks and Bed Files.

GCT_files_and_BED_files.zip. Zip files containing .gct and .bed files for each track and region.

Track/Bed	File	Source
SeqA Only 1_Top 5%	SeqAOnlyTop5PercentRank_W_2010_GSE19053.zip	Waldminghaus et al. 2010
SeqA Only 1_Top 10%	SeqAOnlyTop10PercentRank_W_2010_GSE19053.zip	Waldminghaus et al. 2010
SeqA Only 1_Top 25%	SeqAOnlyTop25PercentRank_W_2010_GSE19053.zip	Waldminghaus et al. 2010
SeqA Only 1_Top 50%	SeqAOnlyTop50PercentRank_W_2010_GSE19053.zip	Waldminghaus et al. 2010
SeqA Only 1_100%	SeqAOnly_W_2010_GSE19053.zip	Waldminghaus et al. 2010
RNAP Only 1 100%	RNAPOnly_W_2010_GSE19053.zip	Waldminghaus et al. 2010
RNAP Only 1_Top 50%	RNAPOnlyTop50PercentRank_W_2010_GSE19053.zip	Waldminghaus et al. 2010
RNAP Only 1_Top 25%	RNAPOnlyTop25PercentRank_W_2010_GSE19053.zip	Waldminghaus et al. 2010
RNAP Only 1_Top 10%	RNAPOnlyTop10PercentRank_W_2010_GSE19053.zip	Waldminghaus et al. 2010
RNAP Only 1_Top 5%	RNAPOnlyTop5PercentRank_W_2010_GSE19053.zip	Waldminghaus et al. 2010
SeqA Only 2_Top 5%	SeqAOnlyTop5PercentRank_SR_2010.zip	Sánchez-Romero et al. 2010
SeqA Only 2_Top 10%	SeqAOnlyTop10PercentRank_SR_2010.zip	Sánchez-Romero et al. 2010
SeqA Only 2_Top 25%	SeqAOnlyTop25PercentRank_ SR_2010.zip	Sánchez-Romero et al. 2010
SeqA Only 2_Top 50%	SeqAOnlyTop50PercentRank_SR_2010.zip	Sánchez-Romero et al. 2010
SeqA Only 2_ 100%	SeqAOnly_SR_2010.zip	Sánchez-Romero et al. 2010

Table 1: Supplemental File S1: ChIP-Chip IGV Tracks and Bed Files.

GCT_files_and_BED_files.zip. Zip files containing .gct and .bed files for each track and region.

Track/Bed	File	Source
RNAP Only 2 100%	RNAPOnly_SR_2010.zip	Sánchez-Romero et al. 2010
RNAP Only 2_Top 50%	RNAPOnlyTop50PercentRank_SR_2010.zip	Sánchez-Romero et al. 2010
RNAP Only 2_Top 25%	RNAPOnlyTop25PercentRank_SR_2010.zip	Sánchez-Romero et al. 2010
RNAP Only 2_Top 10%	RNAPOnlyTop10PercentRank_SR_2010.zip	Sánchez-Romero et al. 2010
RNAP Only 1_Top 5%	RNAPOnlyTop5PercentRank_SR_2010.zip	Sánchez-Romero et al. 2010
SeqA Binding 5%	0vs50MinTop5PercentSignal_W_2012.zip	Waldminghaus et al. 2012
SeqA Binding 10%	0vs50MinTop10PercentSignal_W_2012.zip	Waldminghaus et al. 2012
SeqA Binding 25%	0vs50MinTop25PercentSignal_W_2012.zip	Waldminghaus et al. 2012
SeqA Binding 50%	0vs50MinTop50PercentSignal_W_2012.zip	Waldminghaus et al. 2012
SeqA Binding 100%	0vs50Min_W_2012.zip	This study
***E. coli* GATC**	EcoliGATC_All.zip	This study
***E. coli* GATC$_2$**	EcoliGATC_HigherO1.zip	This study
***E. coli* GATC$_3$**	EcoliGATC_HigherO2.zip	This study
***E. coli* GATC$_4$**	EcoliGATC_HigherO3.zip	This study
LT2 GATC	LT2GATC_All.zip	This study
LT2 GATC$_2$	LT2GATC_HigherO1.zip	This study
LT2 GATC$_3$	LT2GATC_HigherO2.zip	This study
LT2 GATC$_4$	LT2GATC_HigherO3.zip	This study
***E. coli* ORFs**	EcoliORFs.zip	This study
***E. coli* Prophage**	EcoliProphage.zip	This study
***E. coli* Promoters**	EcoliPromoters.zip	This study

Table 1: Supplemental File S1: ChIP-Chip IGV Tracks and Bed Files.

GCT_files_and_BED_files.zip. Zip files containing .gct and .bed files for each track and region.

Track/Bed	File	Source
***E. coli* Noncoding**	EcoliNoncoding.zip	This study
***E. coli* Nonphage**	EcoliNonphage.zip	This study
***E. coli* Nonpromoters**	EcoliNonpromoters.zip	This study
LT2 ORFs	LT2ORFs.zip	This study
LT2 Prophage	LT2Prophage.zip	This study
LT2 Promoters	LT2Promoters.zip	This study
LT2 Noncoding	LT2Noncoding.zip	This study

Table 2: Supplemental File S2: Strain List.

Strain_list.zip. Zip files containing strain list.

Strain		Genotype
G905	LT2	Lab collection
SDT2937	LT2 *lexA33*::(Cm^{R} lexA3IND)(sw)	This study
SDT2991	LT2 Δ *seqA*::Tet^{R}	This study
SDT2993	LT2 Δ *seqA*::Tet^{R} *lexA33*::(Cm^{R} *lexA3*IND)(sw)	This study

Table 3: Primers (5’ -> 3’):

Name	Sequence
SeqA - tetRA – Forward	GTTGATGATGAACTCTATAGCTAAGCACTTGTCTCCTGTT
SeqA - tetRA – Reverse	TGGTCCTTCTAATGCAAGGAGCTGCTTTTAAGACCCACTT

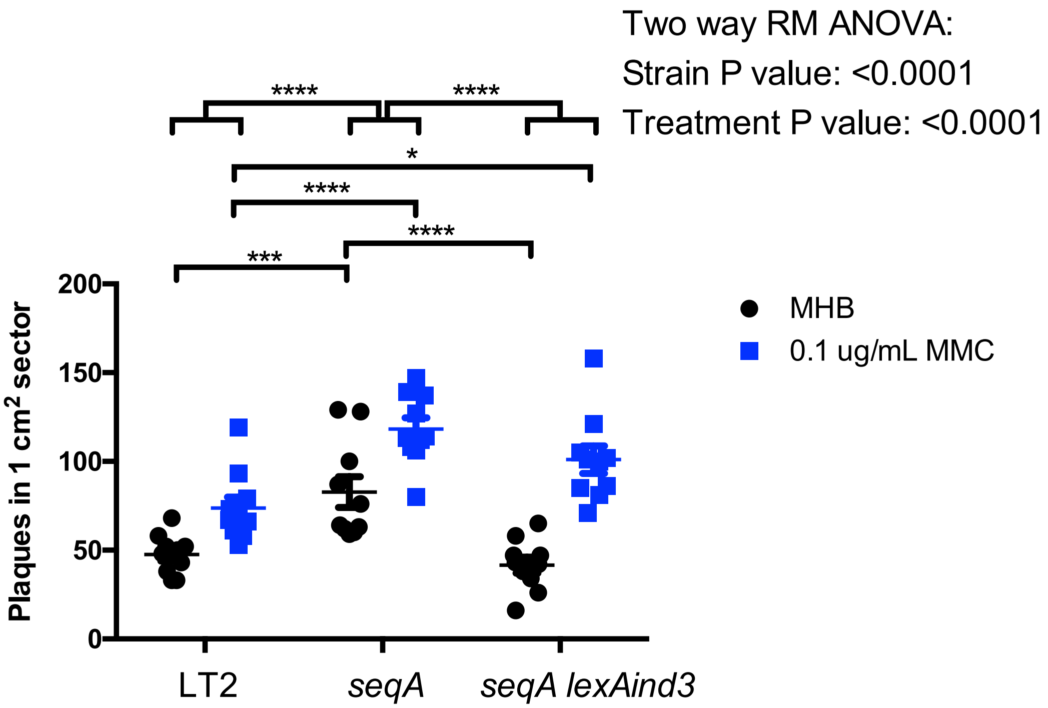


Figure 4: Prophage induction in LT2, *seqA*, and *seqA lexAind3* strains. A. Gifsy-2 size (~1 mm) plaque counts in a 1 cm^2 sector on an Evans Blue Uranine (EBU) plate of G905 LT2 strains, SDT2991 *seqA* strains, and SDT2993 *seqA lexAind3*. Cultures were treated with MHB (●) alone or 0.1 µg/mL MMC (■). Experiments are done with ten biological replicates with three technical replicates from each plate and error bars indicating standard error of the mean. Two-way repeated measures (RM) ANOVA for strain (P Value: <0.0001) and treatment (P Value: <0.0001). Tukey's multiple comparisons test: MHB[LT2:*seqA*] (***), MHB[*seqA*:*seqA lexAind3*] (****), 0.1 µg/mL MMC[LT2:*seqA*] (***), 0.1 µg/mL MMC[LT2:*seqA lexAind3*] (*), MHB and 0.1 µg/mL [LT2:*seqA*] (****), MHB and 0.1 µg/mL [*seqA*: *seqA lexAind3*] (****) all other comparisons were not significant.

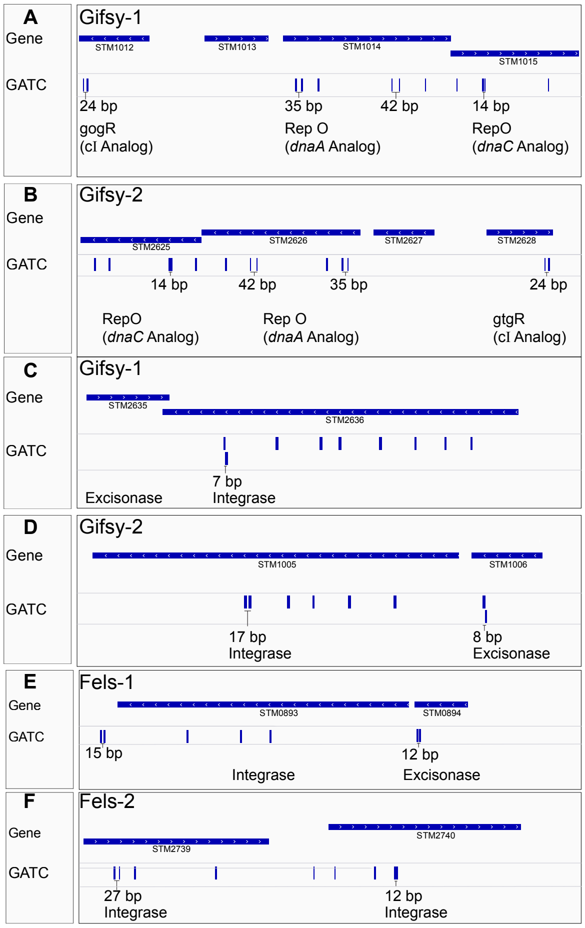


Figure 5: Pairs of GATC sites in active *Salmonella* LT2 prophages: Gifsy-1, Gifsy-2, Fels-1 and Fels-2 regulatory ORFs.GATC sites are denoted by vertical lines. **A**. Gifsy-1: STM1012 (Lambda cI repressor analog) - GATC pair 24 bp apart in ORF; STM1014 (*dnaA* analog) – two GATC pairs 35 bp and 42 bp apart in ORF; STM1015 (*dnaC* analog) - GATC pair 14 bp apart in ORF. **B**. Gifsy-1: STM2628 (Lambda cI repressor analog) - GATC pair 24 bp apart in ORF; STM2626 (*dnaA* analog) – two GATC pairs 35 bp and 42 bp apart in ORF; STM2625 (*dnaC* analog) - GATC pair 14 bp apart in ORF. Gifsy-1 and Gifsy-2 are integrated into the chromosome in opposite orientations and are highly homologous between the A and B. **C**. Gifsy-1: STM2636 (Integrase) - GATC pair 7 bp apart in ORF; STM2635 (Excisionase). STM2635 does not have a pair of GATC sites. **D**. Gifsy-1: STM1005 (Integrase) - GATC pair 17 bp apart in ORF; STM1006 (Excisionase) - GATC pair 8 bp apart in ORF. **E**. Fels-1: STM0893 (Integrase) - GATC pair 15 bp apart downstream of ORF; STM0894 (Excisionase) - GATC pair 12 bp apart in ORF. **F**. Fels-2: STM2740 (Integrase) - GATC pair 12 bp apart in ORF; STM2739 (Integrase) - GATC pair 27 bp apart in ORF. An excisionase was not identified in Fels-2. Fels-1 and Fels-2 are in different bacteriophage families and are not highly homologous between the regions.

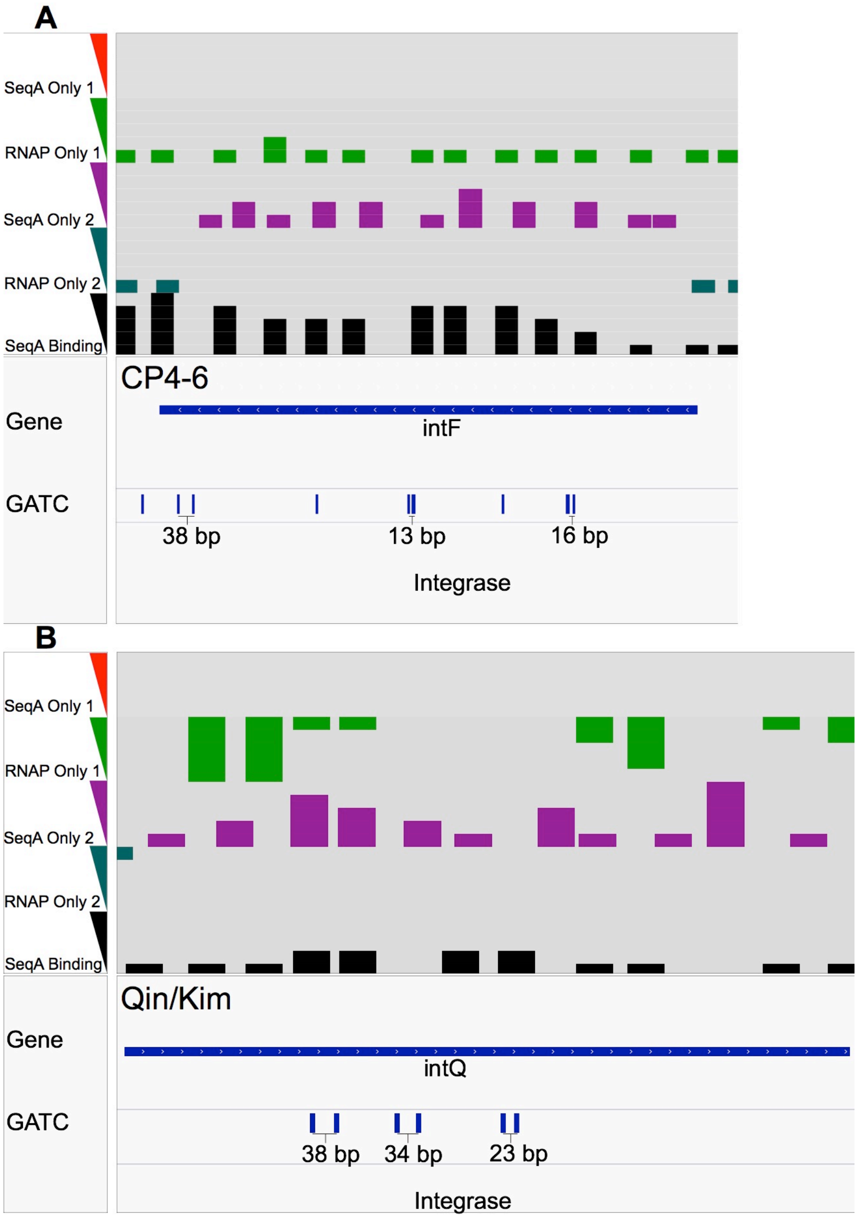


Figure 6: Pairs of GATC sites in cryptic *E. coli* prophage CP4-6 and Qin/Kim Integrase ORFs. GATC sites are denoted by vertical lines. SeqA vs. RNAP differential binding and SeqA binding signals are shown in rank by two-tailed t-test by the test statistic (P value) with top ranks (5%,10%, 25%, 50%) and all ranks (100%) (120, 122). SeqA Only 2 rows in purple and RNAP Only 2 rows in dark green indicate differential binding by the rank of ChIP-Chip data from Sánchez-Romero et al. 2010 (120). SeqA Binding rows in black indicate SeqA binding by the rank of 50-minute ChIP-Chip data from Waldminghaus et al. 2012 (122). GATC sites on the positive strand are shown. A. CP4-6: intF (Integrase) - three GATC pairs 38 bp and 13 bp and 16 bp apart in ORF. B. Qin/Kim: intF (Integrase) - three GATC pairs 38 bp and 34 bp and 23 bp apart in ORF.

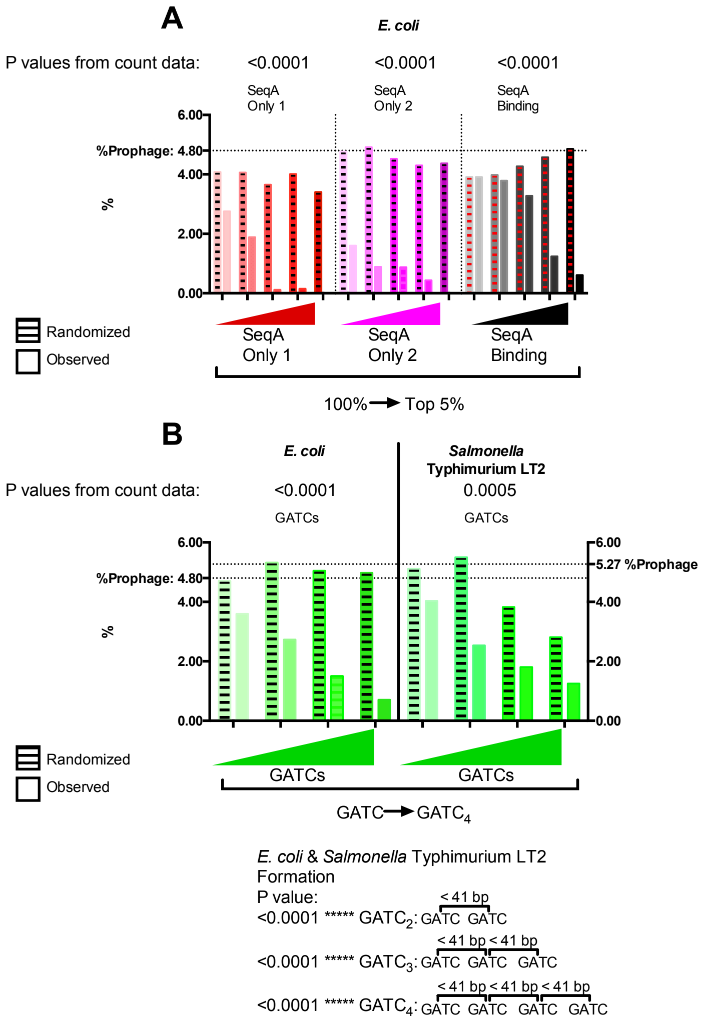


Figure 7: SeqA signals and GATCs in prophages of *E. coli* and *Salmonella* LT2. BEDOPS frequency counts of signals in prophages (161). Signals were chopped to 1 bp regions and results graphed as a percentage of signals in prophage regions. Bars are shaded light to dark to indicate increasing strength of signal from weak to strong. %Prophage for *E. coli* of 4.8% is indicated on the left Y axis with a dashed bar and %Prophage for *Salmonella* LT2 of 5.27% is indicated on the right Y axis. χ^2 statistics were performed on counts and P values were calculated and shown on graph. **A**. *E. coli* ChIP-Chip of SeqA Only 1 (Red) from Waldminghaus et al. 2010 (121). ChIP-Chip of SeqA Only 2 (Purple) from Sánchez-Romero et al. 2010 (120). *E. coli* ChIP-Chip of SeqA Binding (Black) from Waldminghaus et al. 2012 (122). Dashed bars for signals indicate signals that had been shuffled 1000 times and placed in random locations. **B**. GATCs (Green) in prophage for both *E. coli* and *Salmonella* LT2. Dashed bars for GATCs indicate GATCs that had been placed in random locations in the genome.

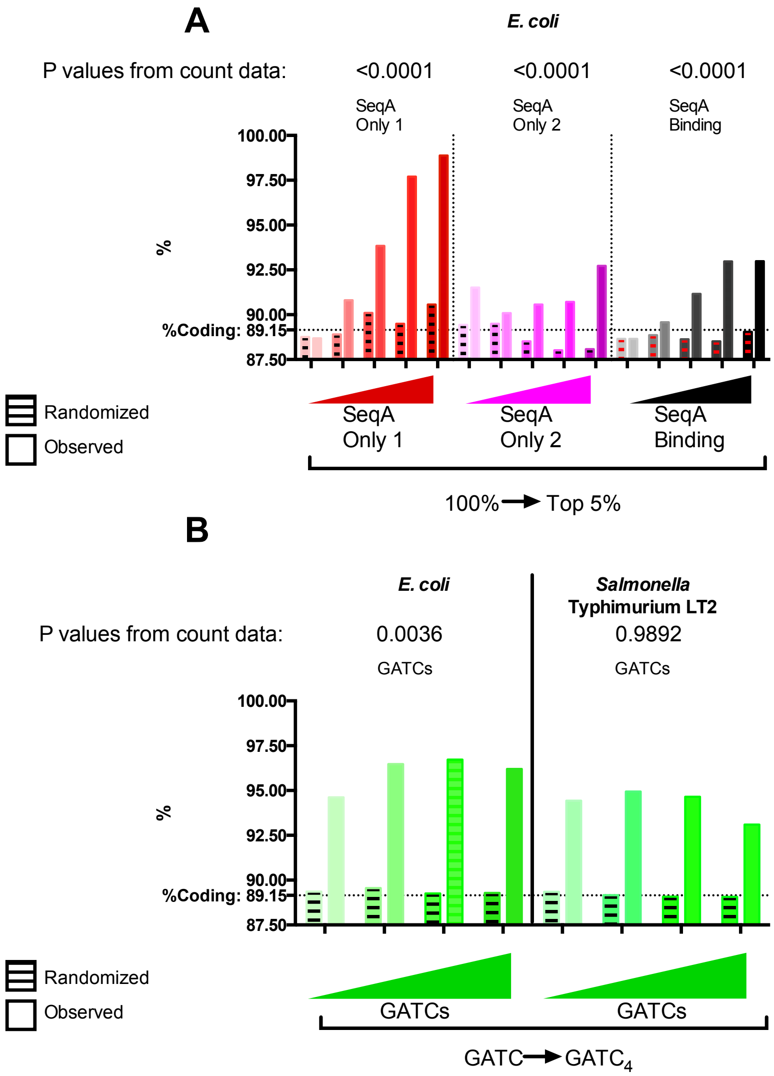


Figure 8: SeqA signals and GATCs in ORFs of *E. coli* and *Salmonella* LT2. BEDOPS frequency counts of signals in ORFs (161). Signals were chopped to 1 bp regions and results graphed as a percentage of signals in ORFs. Bars are shaded light to dark to indicate increasing strength of signal from weak to strong. %Coding for *E. coli* and *Salmonella* LT2 of 89.15% is indicated on the left Y axis. χ^2 statistics were performed on counts and P values were calculated and shown on graph. **A**. ChIP-Chip of SeqA Only 1 (Red) from Waldminghaus et al. 2010 (121). ChIP-Chip of SeqA Only 2 (Purple) from Sánchez-Romero et al. 2010 (120). *E. coli* ChIP-Chip of SeqA Binding (Black) from Waldminghaus et al. 2012 (122). Dashed bars for signals indicate signals that had been shuffled 1000 times and placed in random locations. **B**. GATCs (Green) in coding sequence for both *E. coli* and *Salmonella* LT2. Dashed bars for GATCs indicate GATCs that had been placed in random locations in the genome.

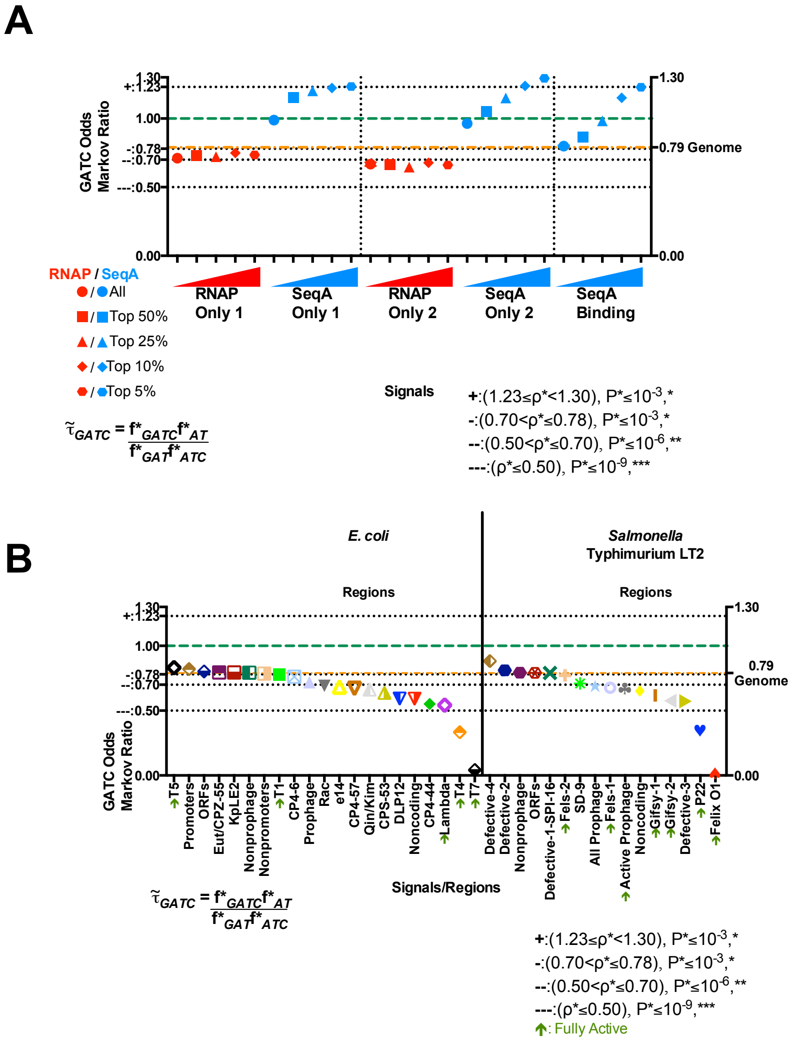


Figure 9: GATC Odds Markov ratio of SeqA signals and genomic regions of *E. coli* K-12 and *Salmonella* LT2. GATC Odds Markov Ratio ρ^* calculated using the Signature web interface on signals of *E. coli* regions of *E. coli* K-12 and *Salmonella* LT2 using equation: $\tilde{\tau}_{GATC} = \frac{f^*_{GATC} f^*_{AT}}{f^*_{GAT} f^*_{ATC}}$ (167–169). 1.0 denotes average relative abundance and is indicated. Significance cutoffs are +1.23 for overrepresented GATCs (+), P^* value $\leq 10^{-3}$, -0.78 underrepresented (-),value $\leq 10^{-3}$, -0.70 highly underrepresented (--), P^* value $\leq 10^{-6}$, -0.50 very highly underrepresented (---), P value $\leq 10^{-9}$ (167–169). The ratios for both the *E. coli* and *Salmonella* LT2 genomes are 0.79 and is indicated. **A**. *E. coli* ChIP-Chip of RNAP Only 1 (Red) and SeqA Only 1 (Blue) from Waldminghaus et al. 2010 (121). *E. coli* ChIP-Chip RNAP Only 2 (Red) and SeqA Only 2 (Blue) from Sánchez-Romero et al. 2010 (120). *E. coli* ChIP-Chip of SeqA Binding Waldminghaus et al. 2012 (122). **B**. Regions of *E. coli* and *Salmonella* Typhimurium and bacteriophages are included. Fully active phage are denoted by green arrow.

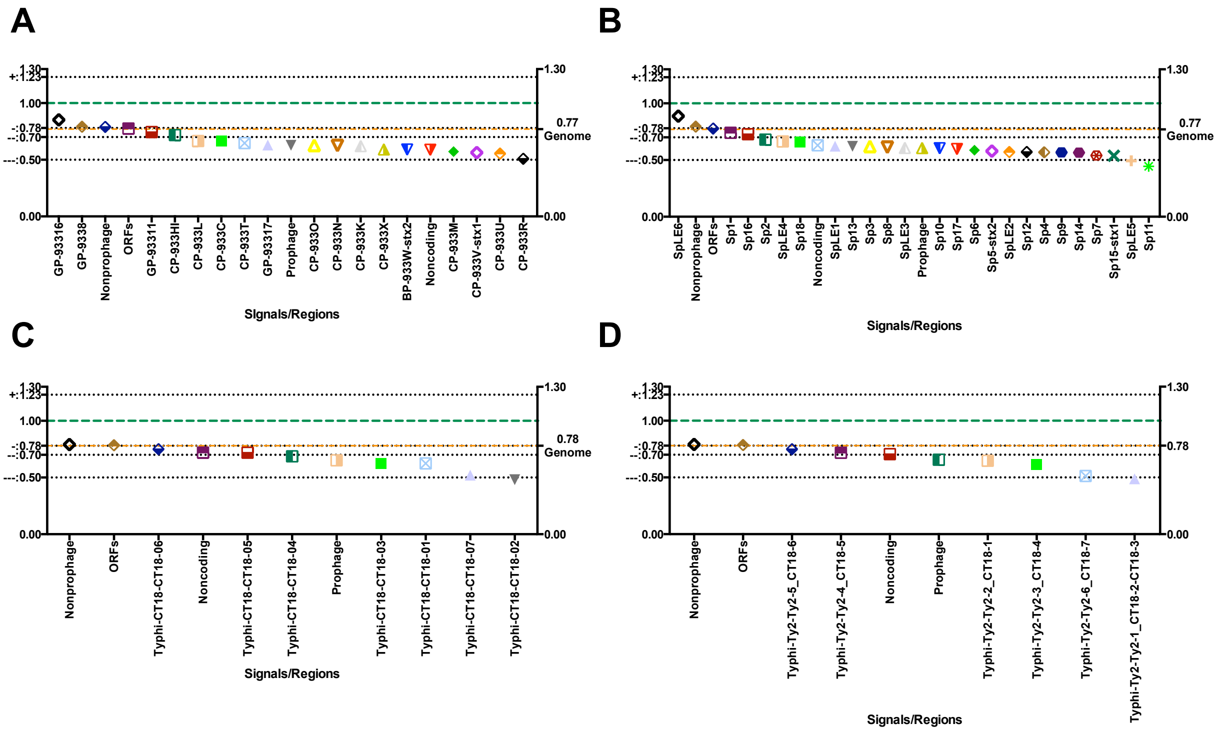


Figure 10: GATC Odds Markov ratio of genomic regions of *E. coli* O157:H7 and *Salmonella* Typhi. GATC Odds Markov Ratio ρ^* calculated using the Signature web interface on signals of *E. coli* regions of *E. coli* O157:H7 and *Salmonella* Typhi using equation: $\tilde{\tau}_{GATC} = \frac{f^*_{GATC} f^*_{AT}}{f^*_{GAT} f^*_{ATC}}$ (167–169). 1.0 denotes average relative abundance and is indicated. Significance cutoffs are +1.23 for overrepresented GATCs (+), P^* value $\leq 10^{-3}$, -0.78 underrepresented (-),value $\leq 10^{-3}$, -0.70 highly underrepresented (--), P^* value $\leq 10^{-6}$, -0.50 very highly underrepresented (---), P value $\leq 10^{-9}$ (167–169). The ratios for *E. coli* O157:H7 and *Salmonella* Typhi genomes are 0.77 and 0.78 respectively and are indicated. **A**. *E. coli* O157:H7 - EDL933 **B**. *E. coli* O157:H7 - Sakai **C**. *Salmonella* Typhi CT18 **D**. *Salmonella* Typhi Ty2.

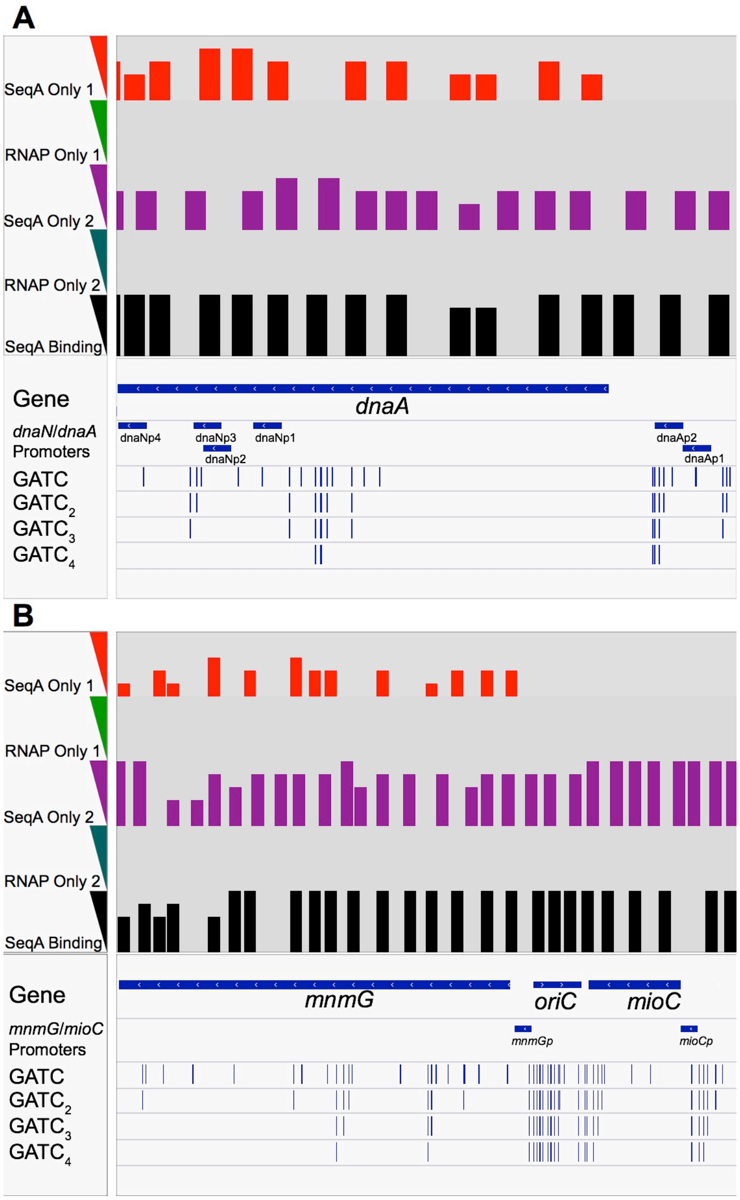


Figure 11: Pairs of GATC sites in *E. coli* cell cycle ORFs: *dnaA*, *mioC*, *mnmG* (*gidA*). GATC sites, pairs, and higher order GATCs are denoted by vertical lines. SeqA vs. RNAP differential binding and SeqA binding signals are shown in rank by two-tailed t-test by the test statistic (P value) with top ranks (5%,10%, 25%, 50%) and all ranks (100%) (120–122). SeqA Only 1 rows in red and RNAP Only 1 1 rows in light green indicate differential binding by the rank of ChIP-Chip data from Waldminghaus et al. 2010 (121). SeqA Only 2 rows in purple and RNAP Only 2 rows in dark green indicate differential binding by the rank of ChIP-Chip data from Sánchez-Romero et al. 2010 (120). SeqA Binding rows in black indicate SeqA binding by the rank of 50-minute ChIP-Chip data from Waldminghaus et al. 2012 (122). GATC sites on positive strand are shown with GATC Pairs, GATC Higher Order 1 to GATC Higher Order 4. **A**. *dnaA* **B**. *mnmG*, *mioC*. *oriC* is labeled.

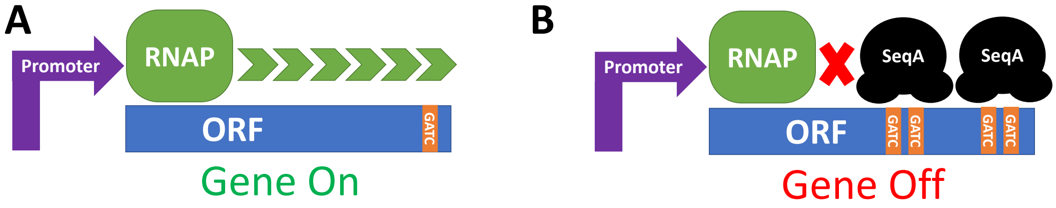


Figure 12: Model of how SeqA regulates genes. A. In phage or bacteria genes with few GATC sites (Orange) in the ORF (Blue), RNA Polymerase (Green) is able to freely access a coding sequence and the gene is on. **B**. When SeqA (Black) is bound to pairs of GATC sites it introduces positive supercoils in the ORF which limits the accessibility by RNA Polymerase and the gene is off.

Supplemental Materials

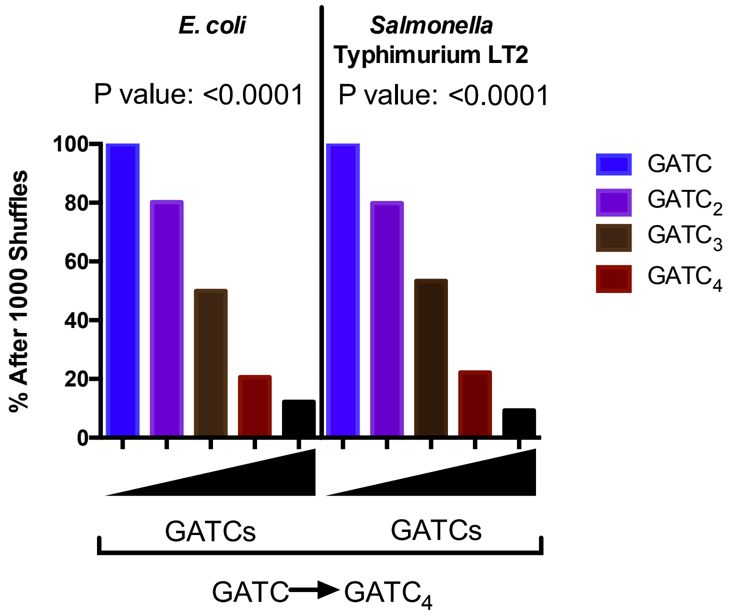
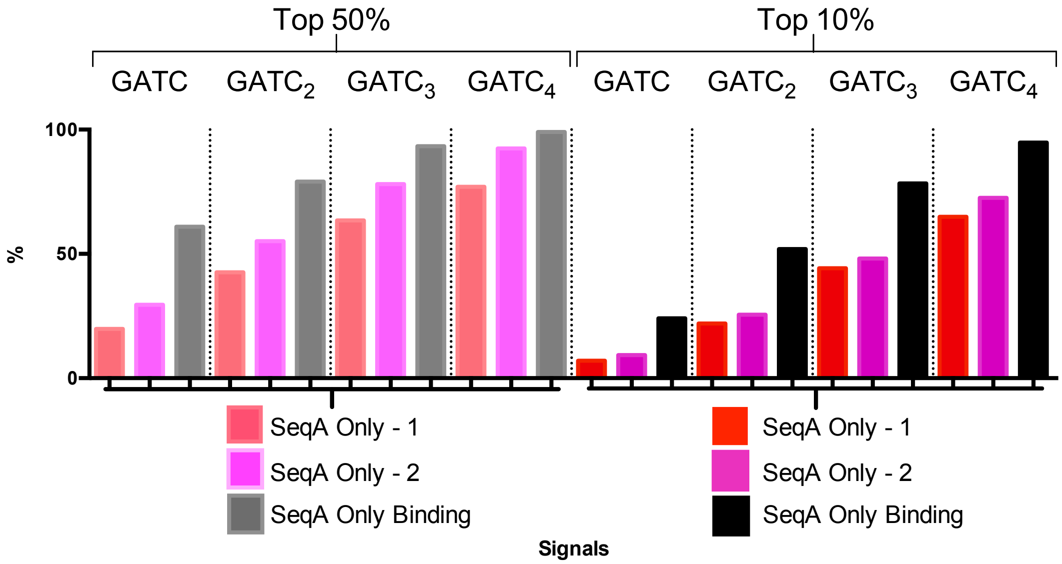


Figure 13/S1: GATC pairing in *E. coli* and *Salmonella* LT2 after 1000 times shuffling. The genomes of *E. coli* and *Salmonella* LT2 were shuffled with ushuffle 1000 times and a k-mer size of four in order to preserve GATCs (163). Pairs of < 41 basepairs and higher order GATCs, were counted and compared to counts before shuffling and percentage decrease after 1000 shuffles was graphed. χ^2 statistics were performed on counts of shuffled counts vs. observed counts. P values were calculated and shown on the graph.



P values from count data for SeqA Only - 1	P values from count data for SeqA Only - 2	P values from count data for SeqA Only Binding
GATC$_2$: <0.0001	GATC$_2$: <0.0001	GATC$_2$: <0.0001
GATC$_3$: <0.0001	GATC$_3$: <0.0001	GATC$_3$: <0.0001
GATC$_4$: <0.0001	GATC$_4$: <0.0001	GATC$_4$: <0.0001

Figure 14/S2: SeqA signals with higher order GATCs. A. In phage or bacteria genes with few GATC sites (Orange) in the ORF (Blue), RNA Polymerase (Green) is able to freely access a coding sequence and the gene is on. **B**. When SeqA (Black) is bound to pairs of GATC sites it introduces positive supercoils in the ORF which limits the accessibility by RNA Polymerase and the gene is off.

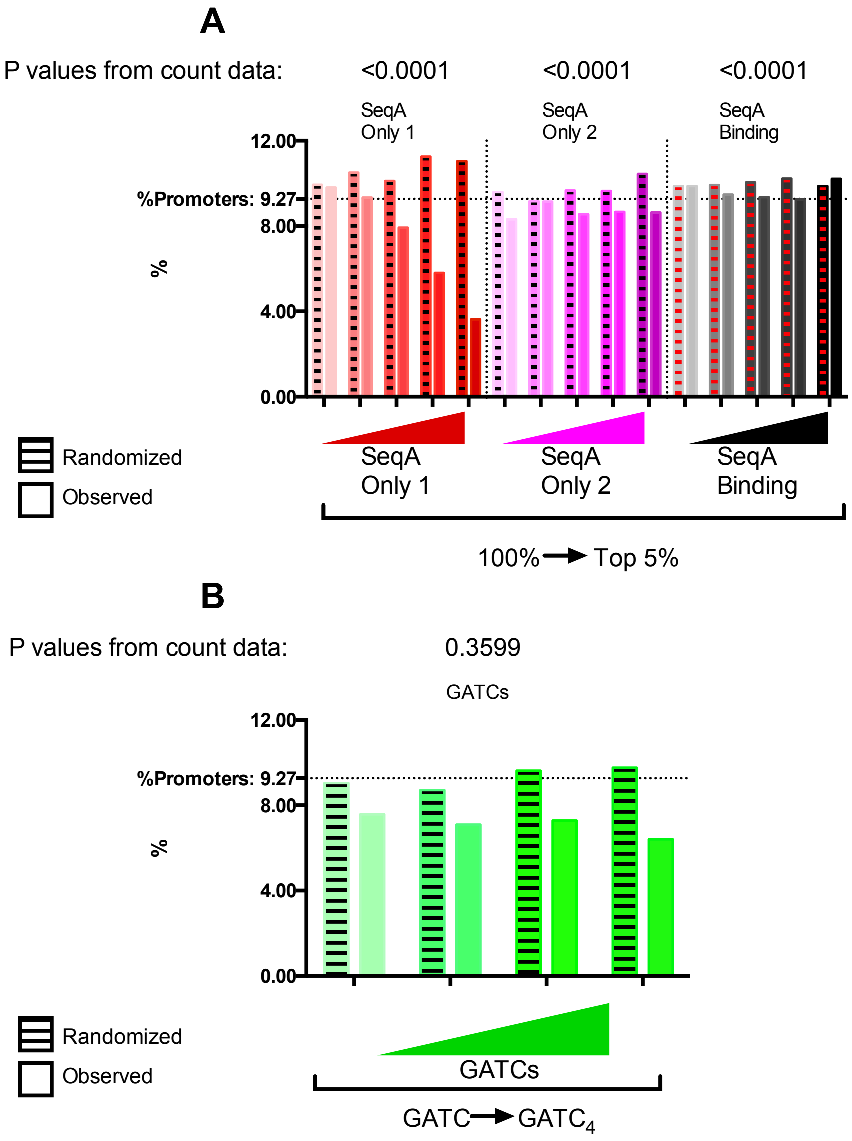


Figure 15/S3: SeqA signals and GATCs in promoters. BEDOPS frequency counts of signals in promoter regions (161). Signals were chopped to 1 bp regions and results graphed as a percentage of signals in promoter regions. %Promoters for *E. coli* is 4.8%. χ^2 statistics were performed on counts and P values were calculated and shown on the graph. A. *E. coli* ChIP-Chip of SeqA Only 1 (Red) from Waldminghaus et al. 2010 (121). ChIP-Chip of SeqA Only 2 (Purple) from Sánchez-Romero et al. 2010 (120). *E. coli* ChIP-Chip of SeqA Binding (Black) from Waldminghaus et al. 2012 (122). Dashed bars for signals indicate signals that had been shuffled 1000 times and placed in random locations. B. GATCs (Green) in prophage for both *E. coli* and *Salmonella* LT2. Dashed bars for GATCs indicate GATCs that had been placed in random locations in the genome.

Acknowledgements

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Chapter 3: RNA-Seq Analysis of Salmonella Prophage Activity

Introduction

Genome duplications and recombination pathways

The chromosome is dynamic and during active growth, mutations arise in the form of insertions, deletions, point changes, duplications, and large genome duplications (134, 135, 139, 140, 208, 209). Genome duplications are a major driving force in evolution and are well studied (210–212). It is thought that gene duplications occur by conserved mechanisms in all domains of life. In Eukaryotes genome duplications occur in cancers and may give rise to resistance to chemotherapeutics (134). Genome duplications are also intermediates in the evolution of new genes with novel functions and lead to the adaptation of the organism to environmental stresses or resistance to antibiotics (209, 213, 214). As cells undergo DNA damage during growth, the pathways involved in DNA repair and recombination may contribute to genome duplications (215).

Recombination, strand annealing, and transposition may all give rise to genome duplications (134, 140) by exchanges between sister chromatids at replication forks or by insertion of a replicated region of DNA into a new location in the same chromatid (Fig. 16A)(134). The mechanism of giving rise to a duplication by an exchange between regions (a) and (b) to duplicate a gene and the concomitant formation of a (b/a) duplication join point is shown (Fig. 16A). Due to high homology between both the original sequence and the duplicated regions, a gene duplication event can subsequently be deleted. If the gene duplication confers an advantage under selection during growth, the duplication may persist in the chromosome. This duplication can then undergo further amplification (Fig. 16A), an event that is thought to be highly dependent on recombination and RecA-like functions. Genome amplifications of up to 100 copies have been reported (134, 216).

Bacterial genomes also contain multiple mobile elements such as prophages and insertion elements (60, 71, 217, 218). *Salmonella* LT2 has four active prophages, Gifsy-1, Gifsy-2, Fels-1, and Fels-2, which are temperate phages and which are able to form infectious virions (86, 89, 90, 219, 220). Gifsy-1 and Gifsy-2 were discovered due to their ability to suppress a *recB* mutation (219). Because these prophages encode several recombination-related genes, we hypothesized that they may contribute to the formation of genome duplications. We performed RNA-Seq analysis on wildtype STm and isogenic recombination mutants in order to see whether prophage-associated genes are transcribed during growth.

Recombination pathways

Recombination pathways are thought to play an important role in genome duplications between long regions of homology (134, 138–140, 215). These recombination pathways are involved in DNA repair of double-strand breaks and single-stranded breaks or gaps (Fig. 16B) (221). RecBCD acts on the break and degrades the DNA to form a long single-stranded DNA “tail,” until the RecBCD complex reaches a Chi site, where RecA is loaded onto the DNA and catalyzes strand invasion into a region of homology. A Holliday junction is formed, allowing branch migration and formation of stretches of heterologous DNA. The RuvABC complex resolves Holliday junctions, creating recombinant chromosomes. During gap repair, the RecJ nuclease enlarges

DNA gaps sufficiently to permit binding of RecFOR, leading to the subsequent loading of RecA and the catalysis of strand invasion into a homologous DNA region (Fig. 16B). One or two Holliday junctions are formed, again permitting branch migration; these Holiday junction intermediates must also be resolved by RuvABC. In 2014 Reams et al. published a report studying multiple recombination mutants and the effect on duplication rates between *rrn* operons (139). One locus they tested was *purHD*, between the *rrnE* and *rrnH* operons, and found a high (2.5%) frequency of duplications. They also found that a *recA* mutation did not significantly decrease the duplication rate, whereas mutations in *ruvC* and *ruvAB* did significantly decrease the duplication rate. Interestingly when a *recA* mutation was introduced into *ruvC* mutants, the frequency of duplications was increased back to wild-type. They reasoned that there are likely other pathways involved in duplication formation and suggested an alternate single-stranded annealing pathway to explain the results.

Results

RNA-Seq

We further investigated alternative sources of RecA function and whether prophage-associated recombination genes could complement for the missing cellular functions. To do this, we compared wild-type LT2 and,*recA*, *ruvAB*, and *ruvC* mutants in strains that either had the four Gifsy and Fels prophages or were cured of these prophages. All of the strains had a shortened *parS* site inserted into the chromosome between the *rrnA* and *rrnC* operons at the *metE* locus (222). The strains also contained the pALA2702 plasmid that encodes a fused GFP-ParB protein. When expressed, the

GFP-ParB protein binds to *parS* sites and forms a filament that fluoresces green when excited with an appropriate laser (223, 224). Data obtained from analysis of fluorescent foci suggested that genes encoded by one or more of the prophages are partly active in the recombination mutants and contribute to the copy number of the ParB foci (Polly Parks, Master's thesis, 2015) (225). Our hypothesis s that *recE* and *recT* genes from Gifsy-1 and/or Gifsy-2 are able to at least partially replace RecA function and suppress a *recA* mutant phenotype. Induction of the SOS response may also affect duplication formation as well.

In order to investigate the expression of genes and test if any prophage genes were upregulated or downregulated in the wild-type and recombination mutants, we performed an Illumina RNA-Seq experiment on RNA from strains SDT2913 "wt Lysogens", SDT2914 "wt Cured", SDT2917 "*recA* Lysogens", SDT2918 "*recA* Cured", SDT2925 "*ruvC* Lysogens", SDT2927 "*ruvC* Cured", SDT2930 "*ruvAB* Cured", SDT2939 "*ruvAB* Lysogens" (226). The sequencing produced 32.6 million paired-end reads. These reads were processed after quality checks to remove primer sequences and were aligned against the *Salmonella* LT2 genome. Differential Expression Analysis was performed using the DEBrowser with Harman batch correction and DESeq2, EdgeR, and Limma functions (227–231). Tables 7-9 show the genes differentially expressed using DESeq2, EdgeR, and Limma respectively in wild-type lysogens, *recA* lysogens*, ruvAB* lysogens*, and ruvC* lysogens vs. the isogenic prophage-cured wild-type, *recA, ruvAB, and ruvC* strains (Figs. 16 - 18). The combinations compared were were r*uvAB* lysogens *ruvAB* cured vs. *ruvC* Lysogens *ruvC* cured (Table 7); r*uvAB* cured *ruvC* cured vs. *ruvAB* Lysogens *ruvC* lysogens (Table 8); wild-type cured *recA* cured vs. wild-type Lysogens *recA* lysogens (Table 9); and wild-type lysogens wild-type cured vs. *recA* cured *recA* lysogens. Appendix 1 contains more data on prophage activities and comparisons of wild-type cured *recA* cured *ruvAB* cured *ruvC* cured.

Conclusions

Prophage genes are active in the lysogens vs. cured using each of the methods. Using all three methods is important as it gives a more complete view of the actual differential gene expression than each method alone. DEBrowser permits the dynamic viewing of the results and obtaining these results all in one R program.

STM2632 is a recombination gene and encodes the Gifsy-1 recombinase. This gene was upregulated in *ruvC* Lysogens *ruvC* cured vs. r*uvAB* lysogens *ruvAB cured* and also *ruvAB* lysogens *ruvC* lysogens vs. *ruvAB* cured *ruvC* cured. This indicates the prohage recombination genes are active.

One virulence gene not coded by the prophages, *sodC*-2, was found to be overexpressed by both DESeq2 and Limma analyses. This gene is a superoxide dismutase and is similar to *sodC*-1 is found in Gifsy-2, it is possible that this gene is being expressed in Gifsy-2 and that there is a misalignment of the transcripts to the duplicate gene outside Gifsy-2.

There were multiple groups of strains for which RNA was purified from cells grown on different days, and DEBrowser's built-in Harman Batch removal functionality was applied which normalizes batch effects based on Principal Components Analysis (PCA) among the groups. There was only one replicate per sample and it would be useful to redo this experiment and add replicates (ideally biologically independent triplicates would be analyzed). This same "purification through analysis" workflow can be used for analysis on the triplicate samples. Follow-up experiments will be needed to be performed in order to see if the prophage genes are directly involved in genome duplications and Chapter 4.

Methods

RNA purification and library preparation for RNA-Seq

Recombination mutants with and without the prophages were grown for RNA purification and RNA Sequencing. Single colonies were picked and inoculated into 1 mL MGCV media [3-(N-morpholino) propanesulfonate (MOPS)/glucose/casamino acids/vitamins] with 50 µg/mL ampicillin and grown overnight at 37°C for 16 hours (232). Cells were subcultured 1:100 by adding 50 µL into 5 mL of MGCV media with 50 µg/mL ampicillin and 100 µM IPTG in 15 mL Falcon tubes. Cells were grown for 3.5 hours at 37°C and then harvested by centrifugation for 5 minutes at 4000 rpm in an Eppendorf Centrifuge 5810. Cells were transferred to microcentrifuge tubes and flash frozen using a dry ice-ethanol bath. The RNA*snap*™ RNA isolation method for Gram-negative bacteria protocol was followed (233). Media was aspirated and pellets were resuspended in 100 µL or RNA extraction solution (18 mM EDTA, 0.025% SDS, 1% β-mercaptoethanol, 95% formamide) and then vortexed. Cells were lysed by incubating at 95°C in a Bio-Rad PTC-100 thermal cycler. The tubes were centrifuged at 13200 RPM for 5 minutes in an Eppendorf 5415 R centrifuge. RNA was precipitated using Ethanol purification and 10 µL 3M Sodium Acetate was added to samples. 330 µL of ice-cold 100% Ethanol was added and incubated on ice for 2 hours. Samples were centrifuged for 1 hour at 12000 RPM at room temperature and ethanol was aspirated from samples. Pellets were washed with 250 µL ice-cold 70% Ethanol and samples briefly vortexed and centrifuged at 12000 RPM for 5 minutes. Ethanol was aspirated and pellets were dried for 5 minutes and resuspended in 80 µL of HyClone™ HyPure™ molecular biology grade water. Samples were further dissolved by heating at 60°C in a Bio-Rad PTC-100 Thermal Cycler. 2 Units of Thermo Scientific RNase-Free DNase I was used with the Thermo Scientific 1x buffer to a total volume of 100 µL and treated for 30 minutes at room temperature in a Bio-Rad PTC-100 Thermal cycler (234). DNase-treated samples were purified using QIAGEN (Valencia, CA) RNAEasy® Mini spin columns according to the manufacturer's protocol (235). Columns were washed with QIAGEN Buffers and eluted for 10 minutes twice in 30 µL to maximize RNA quantity. Samples were run on an Agilent 2100 Bioanalyzer using an RNA 6000 Pico chip on the Eukaryote Total RNA Pico protocol (236). Ribosomal RNA was depleted from samples using the Illumina Ribo-Zero Gold rRNA Removal Kit (Epidemiology) according to the manufacturer's protocol (237). Ribo-Zero treated RNA was purified using the Ethanol/Sodium acetate precipitation protocol. 16s PCR with Q5® High-Fidelity DNA polymerase was performed according to manufacturer's protocols with purified RNA and universal 27F and 1492R and verified there was no bacterial DNA contamination (Table 5) (238). Libraries were prepared using the Illumina TruSeq Stranded mRNA Library Prep Kit according to manufacturer's High Sample protocol and a 1-minute library insert fragmentation time (226). Libraries were quantified using a Qubit® 2.0 fluorometer and pooled and 0.4x size selected using Agencourt® AMPure® XP beads (Beckman Coulter, Inc.) and the Size Selection of Adaptor-ligated DNA (E7370) protocol (New England Biolabs) (239–241). Libraries were run on an Illumina HiSeq 2500 sequencer using dual indexing and the PE250 Rapid Run Protocol by the UC Irvine Genomics High-Throughput Facility (242, 243).

RNA-Seq analysis

FastQ files were uploaded to Galaxy and quality checked using FastQC (244, 245). PEAR was used to assemble paired-end reads (246). FASTQ Groomer was used to convert to fastqsanger format (247). Trimmomatic was used to trim ends using ILLUMINACLIP with TruSeq3 adapters with Sliding Window trimming (SLIDINGWINDOW) on assembled and unassembled reads. Concatenate tail to head was used to concatenate assembled and unassembled reads. HISAT2 was used to align reads to the Salmonella LT2 ASM694v2 reference genome (fna file) from NCBI FTP (248). Picard SortSam was used to sort alignments by coordinate order (249). StringTie was used to assemble transcripts to the ASM694v2 reference annotation genome (gff file) from NCBI FTP with the Forward stranded option (250). Gene count tables were produced, and gene IDs were column joined in Galaxy. The count tables were downloaded and manually converted to TSV (Tab separated values) files. RStudio Version 1.1.456 with R version 3.5.2.was used and DEBrowser v1.10.2 was used for Differential Expression analysis (227, 251, 252). In DEBrowser the TSV file was uploaded as a Count Data File and a metadata file was uploaded with sample names, batch, and condition information. Low count filtering was performed using Max and Max Value < 1. Batch effect correction and normalization was performed using TMM normalization (Trimmed mean of M-values normalization method) and Harman batch correction with samples option for treatment and batch option for batch (231). DESeq2 was run using parametric fit type, False betaPrior option and LRT Test type (228).

EdgeR was run using TMM Normalization, 0 Dispersion and exactTest Test type (229). Limma was run using TMM Normalization, ls Fit Type, None option chose for Norm. Bet. Arrays (230). DEBrowser was used to produce scatter, volcano, and MA plots (253).

Table 4: Strains:

Strain	Genotype
SDT2913	LT2 pALA2702 (Amp^R) *gfp*::*parB*, *metE*::*parS*-FRT scar, Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) a.k.a. "wt Lysogens"
SDT2914	LT2 pALA2702 (Amp^R) *gfp*::*parB*, *metE*::*parS*-FRT scar, Δ(*hin-fljA7731*)::*tetRA* (Tet^R), Δ*fliC7716* (no drug), MOD Gifsy-1::FRT scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] a.k.a. "wt Cured"
SDT2917	LT2 *recA651*::*rif* (Rif^R), pALA2702 (Amp^R) *gfp*::*parB*, *metE*::*parS*-FRT scar, Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) a.k.a. "*recA* Lysogens"
SDT2918	LT2 *recA651*::*rif* (Rif^R), pALA2702 (Amp^R) *gfp*::*parB*, *metE*::*parS*-FRT scar, Δ(*hin-fljA7731*)::*tetRA* (Tet^R), Δ*fliC7716* (no drug), MOD Gifsy-1::FRT scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] a.k.a. "*recA* Cured"
SDT2925	LT2 *ruvC4*::Cm^R, pALA2702 (Amp^R) *gfp*::*parB*, *metE*::*parS*-FRT scar, Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) a.k.a. "*ruvC* Lysogens"
SDT2927	LT2 *ruvC4*::Cm^R, pALA2702 (Amp^R) *gfp*::*parB*, *metE*::*parS*-FRT scar, Δ(*hin-fljA7731*)::*tetRA* (Tet^R), Δ*fliC7716* (no drug), MOD Gifsy-1::FRT scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] a.k.a. "*ruvC* Cured"
SDT2930	LT2 *ruvAB*::Cm^R, pALA2702 (Amp^R) *gfp*::*parB*, *metE*::*parS*-FRT scar, Δ(*hin-fljA7731*)::*tetRA* (Tet^R), Δ*fliC7716* (no drug), MOD Gifsy-1::FRT scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] a.k.a. "*ruvAB* Cured"
SDT2939	LT2 *ruvAB*::Cm^R, pALA2702 (Amp^R) *gfp*::*parB*, *metE*::*parS*-FRT scar, Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) a.k.a. "*ruvAB* Lysogens"

Table 5: 16s Primers (5’ -> 3’):

Name	Sequence
27F	AGAGTTTGATCTGGCTCAG
1492R	GGTTACCTTGTTACGACTT

Table 6: Samples with Illumina Primer Index IDs and Sequences (5’ -> 3’)

Name	I7_Index_ID	I7 Sequence	I5_Index_ID	I5 Sequence
SDT2913	D705	ATTCAGAA	D508	GTACTGAC
SDT2913	D706	GAATTCGT	D508	GTACTGAC
SDT2914	D707	CTGAAGCT	D508	GTACTGAC
SDT2914	D708	TAATGCGC	D508	GTACTGAC
SDT2917	D709	CGGCTATG	D508	GTACTGAC
SDT2918	D710	TCCGCGAA	D508	GTACTGAC
SDT2925	D711	TCTCGCGC	D508	GTACTGAC
SDT2927	D712	AGCGATAG	D508	GTACTGAC
SDT2930	D711	TCTCGCGC	D508	GTACTGAC
SDT2939	D705	ATTCAGAA	D508	GTACTGAC

Table 7: RNA-Seq differential expression using DESeq2, EdgeR, and Limma of *ruvAB* lysogens *ruvAB* cured vs. *ruvC* Lysogens *ruvC* cured.

Type indicates DESeq2, EdgeR, or Limma. The description indicates the KEGG annotation (p adj/adjusted p value <0.01). A positive fold change indicates an increase in *ruvC* Lysogens *ruvC* cured vs. r*uvAB* lysogens *ruvAB cured.*

Type	**Gene**	**Log_2 fold change**	**KEGG annotation**
Limma	STM0904	9.58	no KO assigned | (RefSeq) Fels-1 prophage protein
Limma	*nanH* - STM0928	8.71	K01186 sialidase-1 [EC:3.2.1.18] | (RefSeq) *nanH*; sialidase; Fels-1 associated (based on RefSeq annotn)
Limma	STM0913	7.1	no KO assigned | (RefSeq) Fels-1 prophage protein
Limma	STM0929	6.87	putative inner membrane protein; Fels-1 associated
Limma	STM1025	6.52	no KO assigned | (RefSeq) Gifsy-2 prophage protein
Limma	*yaaU* - STM0079	5.99	K08368 MFS family transporter, putative metabolite transport protein | (RefSeq) *yaaU*; MFS transporter
Limma	STM2632	5.89	K10906 exodeoxyribonuclease VIII [EC:3.1.11.-] | (RefSeq) Gifsy-1 prophage *recE*
Limma	STM1053	5.78	no KO assigned | (RefSeq) Gifsy-2 prophage protein
Limma	*sipD* - STM2883	5.74	K13287 invasin D | (RefSeq) *sipD*; cell invasion protein SipD
Limma	STM2724	5.69	Fels-2 prophage protein
EdgeR	STM2870	8.94	no KO assigned | (RefSeq) putative inner membrane protein

Table 8: RNA-Seq differential expression using DESeq2, EdgeR, and Limma of r*uvAB* cured *ruvC* cured vs. *ruvAB* Lysogens *ruvC* lysogens.

Type indicates DESeq2, EdgeR, or Limma. The description indicates the KEGG annotation (p adj/adjusted p value <0.01). A positive fold change indicates an increase in *ruvAB* lysogens *ruvC* lysogens vs. *ruvAB* cured *ruvC* cured.

Type	Gene	Log$_2$ fold change	KEGG annotation
DESeq2	STM2734	8.35	no KO assigned | (RefSeq) Fels-2 prophage protein
DESeq2	STM1025	8.04	no KO assigned | (RefSeq) Gifsy-2 prophage protein
DESeq2	STM1026	7.58	no KO assigned | (RefSeq) Gifsy-2 prophage protein
DESeq2	*yaaU* - STM0079	7.5	K08368 MFS transporter, putative metabolite transport protein | (RefSeq) yaaU; MFS transporter
DESeq2	STM4204	7.28	no KO assigned | (RefSeq) hypothetical protein; defective 4 prophage-related; inner membrane protein; same operon glucose translocase / glycosyltransferase
DESeq2	STM2614	7.02	no KO assigned | (RefSeq) Gifsy-1 prophage protein
DESeq2	STM1005	7	K14059 integrase | (RefSeq) Gifsy-2 prophage integrase
DESeq2	STM2600	6.62	no KO assigned | (RefSeq) hypothetical protein
DESeq2	*cysU* - STM2443	5.39	K02046 sulfate/thiosulfate transport system permease protein | (RefSeq) *cysU*; sulfate ABC transporter permease subunit CysT
DESeq2	*dcuR* - STM4303	4.98	K07703 two-component system, CitB family, response regulator DcuR | (RefSeq) *dcuR*; two-component system response regulator
EdgeR	STM1005	9.78	K14059 integrase | (RefSeq) Gifsy-2 prophage integrase
EdgeR	STM1025	12.27	no KO assigned | (RefSeq) Gifsy-2 prophage protein
EdgeR	STM2705	11.93	no KO assigned | (RefSeq) Fels-2 prophage protein
EdgeR	STM2734	11.73	no KO assigned | (RefSeq) Fels-2 prophage protein
EdgeR	STM1026	10.38	no KO assigned | (RefSeq) Gifsy-2 prophage protein
EdgeR	STM4204	9.95	no KO assigned | (RefSeq) hypothetical protein; defective 4 prophage-related; inner membrane protein; same operon glucose translocase / glycosyltransferase
EdgeR	STM2614	9.59	no KO assigned | (RefSeq) Gifsy-1 prophage protein
EdgeR	STM2588	9.41	no KO assigned | (RefSeq) Gifsy-1 prophage protein
EdgeR	STM2600	9.01	no KO assigned | (RefSeq) hypothetical protein - Gifsy-1 protein
EdgeR	*cysU* - STM2443	7.56	K02046 sulfate/thiosulfate transport system permease protein | (RefSeq) *cysU*; sulfate ABC transporter permease subunit CysT
EdgeR	STM2585A	-6.21	K07801 PhoPQ-activated protein | (RefSeq) Gifsy-1 prophage protein
Limma	STM0904	9.58	no KO assigned | (RefSeq) Fels-1 prophage protein
Limma	*nanH* - STM0928	8.71	K01186 sialidase-1 [EC:3.2.1.18] | (RefSeq) *nanH*; sialidase Fels-1 associated
Limma	STM0913	7.1	no KO assigned | (RefSeq) Fels-1 prophage protein
Limma	STM0929	6.87	putative inner membrane protein; Fels-1 associated
Limma	STM1025	6.52	no KO assigned | (RefSeq) Gifsy-2 prophage protein
Limma	*yaaU* - STM0079	5.99	K08368 MFS transporter, putative metabolite transport protein | (RefSeq) yaaU; MFS transporter
Limma	STM2632	5.89	K10906 exodeoxyribonuclease VIII [EC:3.1.11.-] | (RefSeq) Gifsy-1 prophage protein
Limma	STM1053	5.78	no KO assigned | (RefSeq) Gifsy-2 prophage protein
Limma	*sipD* - STM2883	5.74	K13287 invasin D | (RefSeq) *sipD*; cell invasion protein SipD
Limma	STM2724	5.69	Fels-2 prophage protein

Table 91: RNA-Seq differential expression using DESeq2, EdgeR, and Limma of wild-type cured *recA* cured vs. wild-type lysogens *recA* lysogens.

Type indicates DESeq2, EdgeR, or Limma. The description indicates the KEGG annotation (p adj/adjusted p value <0.01). A positive fold change indicates an increase in wild-type lysogens *recA* lysogens compared to wild-type cured *recA* cured.

Type	Gene	Log_2 fold change	KEGG annotation
DESeq2	STM2870	9.62	no KO assigned | (RefSeq) putative inner membrane protein
DESeq2	STM1049	8.6	no KO assigned | (RefSeq) Gifsy-2 prophage probable tail fiber protein
DESeq2	*nagC* - STM0682	8.02	K02565 N-acetylglucosamine repressor | (RefSeq) *nagC*; transcriptional regulator
DESeq2	STM1043	7.89	no KO assigned | (RefSeq) Gifsy-2 prophage attachment and invasion protein homolog
DESeq2	*yjdB* -> *eptA* STM4293	7.87	no entry in KEGG LT2; EcoCyc phosphoethanolamine transferase
DESeq2	STM2600	6.68	no KO assigned | (RefSeq) hypothetical protein; Gifsy-1 protein
DESeq2	STM2585A	-7.63	K07801 PhoPQ-activated protein | (RefSeq) Gifsy-1 prophage protein
EdgeR	STM1049	13.15	no KO assigned | (RefSeq) Gifsy-2 prophage probable tail fiber protein
EdgeR	*nagC* - STM0682	12.32	K02565 N-acetylglucosamine repressor | (RefSeq) *nagC*; transcriptional regulator
EdgeR	STM1043	12.15	no KO assigned | (RefSeq) Gifsy-2 prophage attachment and invasion protein homolog
EdgeR	*yjdB* -> *eptA* STM4293	12.08	no entry in KEGG LT2; EcoCyc phosphoethanolamine transferase
EdgeR	*sspH2* - STM2241	11.67	K15353 E3 ubiquitin-protein ligase SspH2 | (RefSeq) *sspH2*; E3 ubiquitin--protein ligase - def-3 prophage associated
EdgeR	STM2735	11.3	no KO assigned | (RefSeq) Fels-2 prophage protein
EdgeR	STM2600	9.37	no KO assigned | (RefSeq) hypothetical protein; Gifsy-1protein
EdgeR	STM2585A	-10.56	K07801 PhoPQ-activated protein | (RefSeq) Gifsy-1 prophage protein

Table 102: RNA-Seq differential expression using DESeq2, EdgeR, and Limma of wild-type lysogens wild-type cured vs. *recA* cured *recA* lysogens.

Type indicates DESeq2, EdgeR, or Limma. The description indicates the KEGG annotation. (p adj/adjusted p value <0.01). NA indicates there were no significant changes observed.

Type	Gene	Log_2 fold change	KEGG annotation
DESeq2	NA	NA	NA
EdgeR	NA	NA	NA
LImma	NA	NA	NA

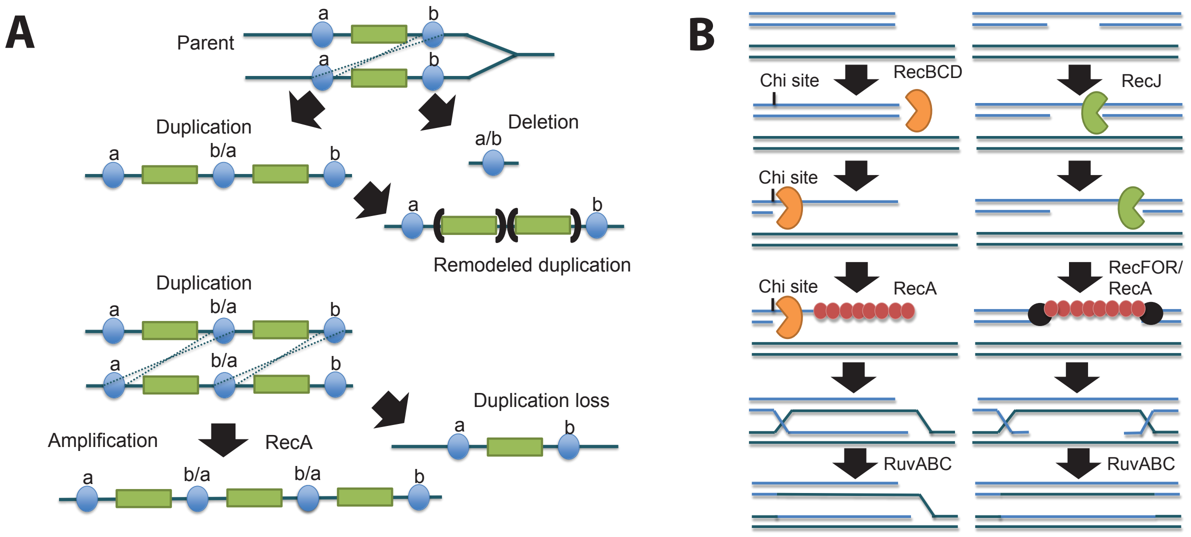

Figure 16: Genome duplications and amplifications are mediated by recombination proteins. A. Mechanisms of gene duplication and amplification. A gene shown as a green box can be duplicated in the chromosome. During replication if (b) recombines with (a) a duplication can occur with a (b/a) join point to form a duplicated gene, this can be remodeled with a loss of the join point. Deletions of the gene can occur. After duplication occurs, amplification of the duplication can occur, and this process is thought to be mediated by RecA protein. Due to high homologies, the duplication is frequently lost. Adapted from (134). **B.** Proteins involved in DNA repair and recombination. RecBCD acts on a double-strand break in DNA and acts as an exonuclease degrading DNA until it reaches a Chi site and forms ssDNA. RecA protein binds to the ssDNA and catalyzes strand invasion to a region of homology on another strand of DNA. Holliday junctions are formed and must be resolved by the resolvase RuvABC. RecJ acts on gaps in DNA and acts as an exonuclease and degrades DNA. RecFOR proteins bind and load RecA onto the ssDNA. RecA catalyzes strand invasion to a homologous sequence and RuvABC resolves the Holliday junctions (221, 225).

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Chapter 4: Methods to detect genome duplications in vivo

Introduction

Strategy to observe genome duplications

Genome duplications in *E. coli* and *Salmonella* have been observed between the regions of long homology present within the 7 *rrn* operons, first detected in *Salmonella* by Anderson *et al*. in 1981 (133, 135, 139, 254) (Fig. 17A) (134, 135, 139, 255). The *rrn* operons are highly transcribed and encode the genes for ribosomal RNAs, which have regions of high secondary structure (134, 139, 143, 256). Duplications occur frequently between the *rrn* operons, at rates as high as 10^{-3} between *rrnE* and *rrnB* (133, 134, 139). Duplications occur much less frequently (rates of 10^{-6}) between *rrnH* and *rrnG* at *pyrD*, near the Ter region.

We developed an *in vivo* assay to study genome duplications using fluorescence microscopy, by using fluorescently-labeled DNA binding proteins to mark specific sites in the chromosome. We have taken advantage of the ParB-*parS* system, in which a ParB protein (originally encoded by a phage and/or plasmid) fused to a fluorescent protein domain binds to its specific *parS* site (Fig. 17B). To monitor duplication frequency in real time, these sites can be placed in different locations around the chromosome in regions in which duplications are known to occur (223, 224). The pFH4034 plasmid encodes several fusion genes between distinct fluorescent proteins fused to ParB proteins that recognize different *parS* sequences: the P1parB-RFPch that binds to the P1 *parS* sequence and the yGFP-pMT1ParB that binds to the pMT1 plasmid's *parS* site (257, 258). A P1 *parS* site was placed at *purH*, which is located between *rrnE* and *rrnH*, where duplications occur frequently (Fig. 17A). To compare the frequency of duplications at this site with the frequency of duplications in locations within the origin domain that do not duplicate frequently, a P1 *parS* site was placed at *argD*, between *rrnC* and *rrnD*. The *argD* gene was between two *rrn* operons that are in inverse orientation with respect to each other, and thus recombination cannot form duplications between them. (While inversion rearrangements could arise by recombination between *rrnC* and *rrnD*, this rearrangement would not change the copy number of the *argD* locus.) Another pMT1 *parS* site is placed at *putA*, between *rrnH* and *rrnG;* these *rrn* operons are far apart and duplications occur much less frequently between them (157). When duplication of a *parS* site occurs, the parent will have 1X fluorescence intensity and the cells with a duplication of the relevant region will have 2X fluorescence intensity (Fig. 17B).

Potential involvement of prophages

Our hypothesis is that under certain physiological conditions, the recombination genes encoded by the Gifsy and/or Fels prophages may be transcribed sufficiently to contribute to the frequency of duplication formation in the host, and thus help mitigate environmental stresses that may slow or prevent the growth of the host. We will focus on testing the involvement of Gifsy-1 prophage's recombination genes. Gifsy-1 encodes *recE* and *recT*, which function similarily to RecBCD and RecA, respectively. Gifsy-1 also encodes a *ninG* gene. NinG is similar to the NinG protein encoded by phage λ, which was also named Rap (86, 259–261). NinG has been shown to be involved in recombination and acts as an endonuclease similar to RuvC. NinG has been shown to increase RecBCD mediated recombination. It is likely these proteins are involved in forming genome duplications.

Results

Cloning and strain construction

Strains were constructed in order to assay duplications in lysogenic strains and in strains cured of the prophages; in addition, all of the strains have mutations that render the cells nonmotile due to removal of the two flagellin genes, which would permit us to analyze these strains in real time in microfluidic chambers called the “mother machine”. The mutations that knock out the two *Salmonella* LT2 flagellin genes allow the strains to be analyzed in real time in the mother machine (262). The cured nonmotile strain contained a modified Gifsy-1 prophage, which was completely cured from the set of strains in Table 11. Recombineering was performed using a FRT-Cm^R-FRT cassette with homology to regions flanking Gifsy-1 (181, 263). P22 transduction was used to move this marker into the nonmotile cured strain and pCP20 was used to Flp out the Cm^R cassette (182, 264).

The wild type LT2 genetic background, from which the nonmotile lysogen and cured strains were derived, contains the low copy number virulence plasmid pSLT, which encodes a *parS* site. This *parS* has the same specificity as the P1 *parS* site and interfered with the fluorescence focus assay, and therefore the pSLT plasmid was cured from the set of strains shown in Table 13. A recombineering selection of *tetA*-*sacB* to delete the *samAB* operon, which overlaps *parS,* and the *parS* was performed (181, 265). This *tetA-sacB* was transduced into the nonmotile lysogens and phage-cured strains in which the whole of Gifsy-1 prophage was deleted. Subsequently pSLT was cured from these strains using a counterselection against the Tet/SacB cassette on counter-selection medium (265).

P1 *parS* sites and pMT1 *parS* sites were chosen to insert between *rrn* operons because the two sequences are recognized by their cognate ParB protein, and because the P1 *parS* site would appear red and the pMT1 *parS* site would appear green. This combination of GFP proteins allows greater resolution for the microscopy experiments. The P1 *parS* was synthesized as part of an oligonucleotide and then integrated with FRT-Cm^R-FRT at *metE,* using recombineering (181, 263). This P1 *parS* site FRT-Cm^R-FRT was then moved to *argD* and *purH*. The pMT1 *parS* site was synthesized into a different oligonucleotide and integrated with FRT-Cm^R-FRT, as above, into the genome at *putA*. P22 transductions were used to move P1 *pars* FRT:Cm^R FRT and pMT1 *parS*::FRT-Kan^R-FRT into strains with different genetic backgrounds, as necessary (182, 263).

Finally, to test whether phage recombination functions are able to complement the chromosomal *rec* mutations, appropriate pRHA109-Kan^R constructs (described below) were transformed into the relevant different strains (.1). The pRHA109 vector is a medium copy plasmid (266) which was used for cloning the Gifsy-1 prophage recombination genes. However, both pRHA109 and pFH4034 encode β-lactamase mediated ampicillin resistance, so the *bla* gene of pRHA109 was changed to knock out its function and insert a kanamycin resistance cassette (266). PstI cuts once inside the *bla* gene; the kanamycin resistance gene of the pUC4K plasmid was liberated using the flanking PstI sites and moved into pRHA109 using the NEB Instant Ligation (266, 267). This new pRHA109-Kan^R was used for cloning of the Gifsy-1 recombination genes (Fig. 18A). PCR was performed using the genome of a strain cured of Gifsy-2 as the template to produce PCR fragments. These fragments encoding the *recE*, *recT*, *ninG*, *recET* and the *recET* and *ninG* genes were digested with BamHI and SalI and introduced into pRHA109-Kan^R cut with BamHI and SalI using the NEB HiFi DNA Assembly kit (268). In the case of *recET* and *recET ninG* constructs, they are arranged as an operon transcribed by the p*rha* promoter of the plasmid. All clones were Sanger sequenced verified (Fig. 18B-F).

Microscopy

The presence of ParB foci in the strains wa confirmed using agar pad microscopy at 1000x (Figs. 19– 22). Strains with single P1 *parS* sites formed red foci and strains with pMT1 *parS* sites formed green foci. Strains with P1 *parS* sites formed red foci and strains with pMT1 *parS* sites formed green foci. Strains with a combination of P1 *parS* sites with pMT1 *parS* sites formed red and green foci in the same cell.

Conclusions

Multiple strains were constructed to test the genome duplications at regions in the chromosome *in vivo*. The strains were verified by microscopy and are now ready for further assays. These duplication or amplification of various chromosomal regions in these strains can now be quantified in real time using a quantitate microfluidic device such as the mother machine (262). The program Oufti or a similar program can be used to quantify foci in the cells during growth (269). Rhamnose will be used to induce expression of prophage recombination genes from pRHA109-in order to test whether these genes affect the duplication rate.

Methods

Strains

Salmonella strains are listed in Tables 11 and *E. coli* strains are listed in Table 12.

Cloning to create pRHA109-Kan^R and pRHA109-Kan^R with Gifsy-1 prophage recombination genes

For high copy plasmid purification of pUC4K, a QIAGEN Plasmid Miniprep protocol was followed (267, 270). For medium copy plasmid purification of pRHA109, a QIAGEN Plasmid Midiprep protocol was followed with the low copy plasmid protocol (271). Restriction enzyme digestion of plasmid DNA of 1 µg pUC4K and 1 µg pRHA109 was performed using 10 units of PstI-HF (NEB) and 1X CutSmart® buffer (NEB) (267). 1 µL of Quick CIP (NEB) was included in the pRHA109 digestion reaction. Digests were incubated at 37°C for 1 hour in a Bio-Rad PTC-100 thermal cycler. pUC4K DNA was run on 0.8% agarose gel in 0.5X TBE with 0.25x SYBR^{TM} Safe in the gel for 2 hours at 100V (267). Two bands formed, and the 1.2 KB band was cut out with a sterile razor blade and placed in a microcentrifuge tube. The 1.2KB gel cut band and digestion reaction were further purified using the Wizard® SV Gel and PCR Clean-Up System (Promega) according to the manufacturer’s protocols (272). Ligations of pUC4K gel purified DNA and pRHA109 were set up with purified DNA using the NEB Quick Ligation™ Kit using 3:1 vector:insert ratio (267, 273). Chemically competent DH5α cells were transformed with reactions and successful clones were obtained.

pRHA109-Kan^R was further used for cloning of phage genes and to purify DNA a QIAGEN Plasmid Midiprep protocol was followed with the low copy plasmid protocol (271). Genomic DNA of strain lacking Gifsy-2 (G756) was purified by CTAB-NaCl genomic DNA purification. PCRs were performed using primers using Q5® High-Fidelity DNA polymerase by manufacturers protocols (Table 14) (238). PCRs sizes were verified by running DNA on a 1% agarose gel in 0.5X TBE with 0.25x SYBR^{TM} Safe in the gel for 1 hour at 100V (274). *recE* produced a band of 2930 bp, *recT* produced a band of 1198 bp, *ninG* produced a band of 657 bp, *recET* produced a band of 4046 bp, and RecETNinG PCR blocks produced two separate blocks of 4046 bp and 657 bp. Restriction enzyme digestion of plasmid DNA of 1 µg pRHA109-Kan^R and 100 ng PCR fragments was performed using 20 units of BamHI-HF (NEB), 20 units of SalI-HF (NEB), 1 µL of Quick CIP (NEB), and 1X CutSmart® buffer (NEB). Digests were incubated at 37°C for 1 hour with a 65°C restriction enzyme inactivation for 20 minutes in a Bio-Rad PTC-100 thermal cycler. Digests were purified using a Wizard® SV Gel and PCR Clean-Up System (Promega) according to the manufacturer’s protocols (272). NEBuilder® HiFi DNA Assembly Master Mix was used to set up cloning reactions with cut pRHA109-Kan^R and insert fragments with a vector:insert ratio of 1:2 (268). Electrocompetent DH5α cells were transformed with reactions and successful clones were obtained. QIAGEN plasmid minipreps were performed with clones and plasmid inserts were verified using Sanger sequencing (270).

Recombineering to delete Gifsy-1 Mod with FRT-Cm^R-FRT

Nonmotile LT2 strains were used with prophages “Lysogens” and strains cured of prophages “Cured”. The nonmotile “cured” strain contains a modified Gifsy-1 and this was completely cured using recombineering protocols (181). pSIM29 was transformed into both Lysogens strain and the strain with the modified Gifsy-1 (275). PCR was performed to amplify FRT-Cm^R-FRT from pKD3 with 40 bps of homology to the beginning and end of Gifsy-1 (263). PCR was performed off of 1 pg pKD3 using the Q5® High-Fidelity DNA polymerase protocol (263). PCR products were run on 1.5% agarose gel in 0.5X TBE for 1 hour at 100V with 0.25x SYBR^{TM} Safe and an 1113 bp band formed (274). PCRs were purified using a Wizard® SV Gel and PCR Clean-Up System (Promega) according to the manufacturer's protocols (272). The nonmotile strain with modified Gifsy-1 was grown and recombineering was performed according to established protocol and successful recombinants were obtained (181).

Recombineering to insert *tetA sacB* in pSLT plasmid at *samAB parS*

The *tetA sacB* cassette was amplified from T-SACK with primers with 40 bp primers to target *samAB parS* (Table 14). PCR was performed off genomic DNA of T-SACK purified by CTAB-NaCl protocol using the Q5® High-Fidelity DNA polymerase protocol (238). PCRs were purified using a Wizard® SV Gel and PCR Clean-Up System (Promega) according to the manufacturer's protocols (272). PCR products were run on a 1.5% agarose gel in 0.5X TBE for 1 hour at 100V with 0.25x SYBR^{TM} Safe and a 3527 bp band formed (274). Recombineering was performed using nonmotile strains with pSIM29 and cured of Gifsy-1 and prophages according to established protocols (181, 275).

Recombineering to insert P1 *parS*::FRT-Cm^R-FRT in the genome at *metE, argD, and purH*

The P1 *parS* was synthesized in an Ultramer® DNA Oligonucleotide (IDT) and used in overlap extension PCR with a second block from pKD3 to amplify FRT-Cm^R-FRT (263). PCR was performed off of the Ultramer® DNA Oligonucleotide (IDT) for block 1 and 100 pg pKD3 DNA for block 2 using the Q5® High-Fidelity DNA polymerase protocol (238, 263). PCRs were purified using a Wizard® SV Gel and PCR Clean-Up System (Promega) according to the manufacturer's protocols (272). DpnI Restriction enzyme digestion of PCR for block 2 was set up with PCR products and 20 units of DpnI (NEB) in 1X CutSmart® buffer (NEB). Digests were incubated at 37°C for 3 hours with an 80°C restriction enzyme inactivation for 20 minutes in a Bio-Rad PTC-100 thermal cycler. Digests were purified using a Wizard® SV Gel and PCR Clean-Up System (Promega) according to the manufacturer's protocols (272). A second DpnI digest was performed with the same protocol, and a second PCR cleanup was performed using the Wizard® SV Gel and PCR Clean-Up System (Promega) (272). A second overlap extension PCR was performed and introduced homology to target *metE*. PCR products were run on a 1.5% agarose gel in 0.5X TBE for 1 hour at 100V with 0.25x SYBR^{TM} Safe and a 1650 bp band formed (274). Recombineering was performed using nonmotile strains with pSIM29 and cured of Gifsy-1 and prophages according to established protocols (181, 275). Successful recombinants were obtained, and this strain was used as a template for PCR to move P1 *parS*::FRT-Cm^R-FRT to *argD* and *purH*. PCR primers with 40 bp homology to target *argD* and *purH* were used (Table 14). PCR was performed off of cultures with P1 *parS*::FRT-Cm^R-FRT at *metE* diluted 1:10 in water using the Q5® High-Fidelity DNA polymerase protocol (238). PCR products were run on 1.5% agarose gel in 0.5X TBE for 1 hour at 100V with 0.25x SYBR^{TM} Safe and 1232 bp bands formed (274). Recombineering was performed using nonmotile strains with pSIM29 and cured of Gifsy-1 and prophages according to established protocols (181, 275).

Recombineering to insert pMT1 *parS*::FRT-Kan^{R}-FRT in the genome at *putA*

The pMT1 *parS* was synthesized in an Ultramer® DNA Oligonucleotide (IDT) and used to amplify FRT-Kan^{R}-FRT from pKD4 with 40 bp homology in recombineering primers to target *putA* (Table 14) (181, 263). PCR was performed off of 1 pg pKD4 using the Q5® High-Fidelity DNA polymerase protocol (238, 263). PCR products were run on 1.5% agarose gel in 0.5X TBE for 1 hour at 100V with 0.25x SYBR^{TM} Safe and a 1650 bp band formed (274). DpnI Restriction enzyme digestion of PCR was set up with PCR products and 20 units of DpnI (NEB) in 1X CutSmart® buffer (NEB). Digests were incubated at 37°C for 3 hours with an 80°C restriction enzyme inactivation for 20 minutes in a Bio-Rad PTC-100 thermal cycler. Digests were purified using a Wizard® SV Gel and PCR Clean-Up System (Promega) according to the manufacturer's protocols (272). Recombineering was performed using nonmotile strains with pSIM29 and cured of Gifsy-1 and prophages according to established protocols (181, 275).

P22 transductions of *samAB parS*::FRT-Cm^{R}-FRT, Gifsy-1 Mod::FRT-Cm^{R}-FRT, P1 *parS*:FRT-Cm^{R}-FRT at *argD*, P1 *parS*:FRT-Cm^{R}-FRT at *purH*, pMT1 *parS*:FRT-Kan^{R}-FRT at *putA*, Rif^{R} at *recA* and strain construction

P22 lysates of *samAB parS*::*FRT*-Cm^{R}-FRT, Gifsy-1 Mod::FRT-Cm^{R}-FRT, P1 *parS*:FRT-Cm^{R}-FRT at *argD*, P1 *parS*:FRT-Cm^{R}-FRT at *purH*, pMT1 *parS*:FRT-Kan^{R}-FRT at *putA*, Rif^{R} at *recA* were made according to protocols (182). After recombineering, a P22 lysate was made to transduce the markers to the nonmotile Lysogens and nonmotile Cured strains. 5 µL P22HT was added to 2 mL Pre-phage broth and 500 µL overnight culture of the donor cells. Cells were grown for 16 hours and transferred to microcentrifuge tubes and lysed with the addition of 250 µL chloroform. Tubes were incubated at room temperature for 10 minutes, vortexed briefly, and were then centrifuged at 13200 RPM for 5 minutes in an Eppendorf 5415 D centrifuge. Lysates were transferred to new microcentrifuge tubes and treated with a second addition of 250 µL chloroform. Tubes were incubated at room temperature for 10 minutes, vortexed briefly, and were then centrifuged at 13200 RPM for 5 minutes in an Eppendorf 5415 D centrifuge. Lysates were transferred to new microcentrifuge tubes and used in transductions according to established protocols. Transductions to nonmotile lysogens and nonmotile cured strains were set up in microcentrifuge tubes using 100 µL recipient strains in tubes and varying amounts of the P22 lysates (20 µL, 10 µL, 5 µL, 5 µL of 1:10 dilution of phage lysate, 5 µL of 1:100 dilution of phage lysate, 5 µL of 1:1000 dilution of phage lysate). Tubes were incubated on the bench for 15 minutes and 1 mL of LB was added to tubes. Tubes were incubated at 37°C with shaking at 200 RPM for 1 hour. After 1 hour tubes were taken out and were then centrifuged at 13200 RPM for 5 minutes in an Eppendorf 5415 D centrifuge. The supernatant was removed and cells were resuspended with 100 µL and plated onto selective LB plates (30 µg/mL chloramphenicol, 50 µg/mL kanamycin, 15 µg/mL tetracycline, or 100 µg/mL rifampicin) and incubated overnight for 16 hours at 37°C. Successful transductants formed and colonies from the transduction with the lowest amount of phage were picked with a sterile toothpick and streaked onto EBU plates. Plates were incubated overnight for 16 hours at 37°C and colonies formed. The light whitish colonies were streaked a second time onto EBU plates. Plates were incubated overnight for 16 hours at 37°C and colonies formed. To verify P22 was no longer present a P22 cross streak test was performed. 20 µL P22H5 was dropped on an EBU plate and inverted to create a line across the plate. Plates were allowed to dry for 5 minutes and white colonies from the second EBU were used in the cross-streak test. Colonies were picked with a sterile toothpick and the toothpick was touched to one side of the EBU plate with P22H5 and then picked up and streaked across the plate perpendicular to P22H5. Plates were incubated overnight for 16 hours at 37°C and P22 sensitive streaks formed.

Curing of pSLT plasmid with Tet/SacB counter selection, Flp out of FRT-Cm^R-FRT and FRT-Kan^R-FRT using pCP20, the transformation of pFH4034 and pRHA109-Kan^R constructs

The pSLT plasmid was cured with a Tet/SacB counter-selection according to protocols (265). Cells were streaked onto Tet/SacB counter-selection agar plates and grown at 16 hours at 42°C (265). Cells were streaked a second time onto Tet/SacB counter-selection agar plates and grown at 16 hours at 42°C (265). Colonies formed and were patch patched onto LB plates, LB plate with 15 µg/mL tetracycline, 30 µg/mL chloramphenicol. Streaks formed and colonies sensitive to 15 µg/mL tetracycline, 30 µg/mL chloramphenicol were picked and streaked onto new LB plates.

pCP20 was used to Flp out FRT-Cm^R-FRT and FRT-Kan^R-FRT according to protocols (263, 264). Single colonies were picked from plates and inoculated with sterile sticks into 1 mL LB medium with 100 µg/mL ampicillin and grown for 16 hours at 30°C. Cells were subcultured 1:100 in LB medium and grown for 1 hour at 30°C. The culture was shifted to a shaking 42°C water bath for 2 hours at 300 RPM to cure pCP20 from strains (264). Cells were streaked onto LB plates and grown for 16 hours at 37°C. Colonies were then patch plated onto LB and LB + 100 µg/mL ampicillin. Streaks that were sensitive to ampicillin formed and were used in transformations. pFH4034 was electroporated into strains onto selective LB plates with 100 µg/mL ampicillin according to protocols (257, 258). pRHA109-Kan^R and constructs with Gifsy-1 prophage genes cloned were electroporated into strains onto selective LB plates with 50 µg/mL kanamycin according to protocols.

Microscopy

Single colonies were picked and inoculated into 1 mL MGCV media [3-(N-morpholino) propanesulfonate (MOPS)/glucose/casamino acids/vitamins] with 50 µg/mL ampicillin and 0.75 mM adenine and grown overnight at 37°C for 16 hours (232). Cells were subcultured 1:100 by adding 10 µL into 1 mL of MGCV media with 50 µg/mL ampicillin, 0.75 mM adenine, and 100 µM IPTG in 1 mL glass culture tubes. Cells were grown for 3 hours at 37°C and transferred to sterile microcentrifuge tubes. To fix cells formamide was added to tubes at a final concentration of 0.25% and let to sit for 5 minutes. To concentrate the cells, the tubes were centrifuged at 13200 RPM for 1 minute in an Eppendorf 5415 D centrifuge. The supernatant was removed and cells were resuspended by pipetting 50 µL MGCV media with 50 µg/mL ampicillin, 0.75 mM adenine, and 100 µM IPTG. 5 µL of cells were transferred to agar pads made with 2% agarose and coverslips were placed over cells. Cells were then visualized at 100x magnification using a ZEISS Axio Observer Z.1 inverted microscope.

Table 11: *Salmonella* Strains:

Strain	Genotype
SDT3065	LT2 Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) $pSLT- #COM -GAP
SDT3098	LT2 $pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and #COM: Flp out FRT:Cm^{R} and cure pCP20 -GAP
SDT3159	LT2 Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) $pSLT- pMT1 *parS*(FRT:Scar):: Δ*putA* #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3160	LT2 Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] $pSLT- pMT1 *parS*(FRT:Scar):: Δ*putA* #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3161	LT2 Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*argD* $pSLT- #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3162	LT2 $pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3163	LT2 Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*purH* $pSLT- #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3164	LT2 $pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3165	LT2 Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* $pSLT- #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3166	LT2 $pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3167	LT2 Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* $pSLT- #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3168	LT2 $pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3169	LT2 *recA*::*rif* (Rif^{R}) Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* $pSLT- #COM Flp Out FRT Cassettes and cure pCP20 -GAP

Table 113: *Salmonella* Strains:

Strain	Genotype
SDT3170	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3171	LT2 *recA*::*rif* (Rif^{R}) Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* \$pSLT- #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3172	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and #COM Flp Out FRT Cassettes and cure pCP20 -GAP
SDT3173	LT2 Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) \$pSLT- pMT1 *parS*(FRT:Scar):: Δ*putA* / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3174	LT2 Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] \$pSLT- pMT1 *parS*(FRT:Scar):: Δ*putA* / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3175	LT2 Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*argD* \$pSLT- / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3176	LT2 \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3177	LT2 Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*purH* \$pSLT- / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3178	LT2 \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3179	LT2 Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* \$pSLT- / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3180	LT2 \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP

Table 114: *Salmonella* Strains:

Strain	Genotype
SDT3181	LT2 Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* \$pSLT- / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3182	LT2 \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3183	LT2 *recA*::*rif* (Rif^{R}) Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* \$pSLT- / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3184	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3185	LT2 *recA*::*rif* (Rif^{R}) Δ*fliC7716* (no drug), Δ(*hin-fljA7731*) (no drug) P1 *parS*(FRT:Scar):: Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* \$pSLT- / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3186	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] and / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3205	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] / pRHA109-Kan^{R} / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* #COM Empty Vector-GAP
SDT3206	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] / pRHA109-Kan^{R}-Gifsy-1 *recE* / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3207	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] /pRHA109-Kan^{R}-Gifsy-1 *recT* / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP

Table 115: *Salmonella* Strains:

Strain	**Genotype**
SDT3208	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] / pRHA109-Kan^{R}-Gifsy-1 *ninG* / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3209	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] / pRHA109-Kan^{R}-Gifsy-1 *recET* / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3210	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar):: Δ*argD* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] / pRHA109-Kan^{R}-Gifsy-1 *recET_ninG*/ pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3211	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] / pRHA109-Kan^{R} / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* #COM Empty Vector-GAP
SDT3212	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-]/ pRHA109-Kan^{R}-Gifsy-1 *recE* / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3213	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] / pRHA109-Kan^{R}-Gifsy-1 *recT* / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3214	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] / pRHA109-Kan^{R}-Gifsy-1 *ninG* / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP
SDT3215	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] / pRHA109-Kan^{R}-Gifsy-1 *recET* / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP

Table 116: *Salmonella* Strains:

Strain	Genotype
SDT3216	LT2 *recA*::*rif* (Rif^{R}) \$pSLT- Δ(*hin-fljA7731*)::*tetRA* (Tet^{R}), Δ*fliC7716* (no drug), P1 *parS*(FRT:Scar)::Δ*purH* pMT1 *parS*(FRT:Scar):: Δ*putA* Δ(MOD Gifsy-1 (Kan^{R}))::FRT:scar, ΔFels-1::FRT scar, Gifsy-2 [-], Fels-2 [-] / pRHA109-Kan^{R}-Gifsy-1 *recET_ninG* / pFH4034 #COM (Amp^{R}) :*cfp::*P7*parB*, P1*parB*::*rfpch*, *ygfp*::pMT1*parB* -GAP

Table 127: *E. coli* Strains:

Strain	Genotype
EDT2822	DH5α pRHA109-Kan^R from pUC4K PstI-Kan^R #COM Medium copy # ~50 copies Gel Purified 1.2KB Kan^R Insert - Ligation Cloned - and BamHI/SalI Cuts - GAP
EDT2825	DH5α pRHA109-Kan^R-Gifsy-1 *recE* #COM Cloned with NEB HiFi cloning Q5® High-Fidelity DNA Polymerase and BamHI/SalI restriction enzymes and Sanger Sequence Verified -GAP
EDT2826	DH5α pRHA109-Kan^R-Gifsy-1 *recT* #COM Cloned with NEB HiFi cloning Q5® High-Fidelity DNA Polymerase and BamHI/SalI restriction enzymes and Sanger Sequence Verified -GAP
EDT2827	DH5α pRHA109-Kan^R-Gifsy-1 *ninG* #COM Cloned with NEB HiFi cloning Q5® High-Fidelity DNA Polymerase and BamHI/SalI restriction enzymes and Sanger Sequence Verified -GAP
EDT2828	DH5α pRHA109-Kan^R-Gifsy-1 *recET* #COM Cloned with NEB HiFi cloning Q5® High-Fidelity DNA Polymerase and BamHI/SalI restriction enzymes and Sanger Sequence Verified -GAP
EDT2829	DH5α pRHA109-Kan^R-Gifsy-1 *recET_ninG* #COM Cloned with NEB HiFi cloning Q5® High-Fidelity DNA Polymerase and BamHI/SalI restriction enzymes and Sanger Sequence Verified-GAP

Table 138: Duplication strain table.

Containing strain numbers, genotypes, and *parS* location. All of these strains were cured of pSLT plasmid and harbor mutations that render the cells nonmotile, The presence or absence of prophage**s is indicated, as is the presence of the pRHA109 plasmid with the relevant phage recombination gene (or the absence of any cloned insert) and NA denotes plasmid is absent.** [a]All subsequent strains were constructed in either the SDT3065 or SDT3098 genetic background, as indicated by the "lysogen" or "cured" designation. [b]Color of ParB foci expected when IPTG is added to the cells..

Strain Number	**Genotype**	**P1 *parS***	**pMT1 *parS***	**pFH4034**	**Rec Genes**	**1 mM IPTG Red** [b]	**1 mM IPTG Green** [b]
SDT3065[a]	LT2 No *parS* Δ*fliC7716, Δ(hin-fljA7731) $pSLT-* Lysogens	No	No	No	No	No	No
SDT3098[a]	LT2 No *parS* Δ(*hin-fljA7731*)::*tetRA* (Tet^R), Δ*fliC7716* $pSLT- Cured	No	No	No	No	No	No
SDT3159	*putA*::pMT1 *parS* Lysogens	No	Yes	No	No	No	No
SDT3160	*putA*::pMT1 *parS* Cured	No	Yes	No	No	No	No
SDT3161	*argD*::P1 *parS* Lysogens	Yes	No	No	No	No	No
SDT3162	*argD*::P1 *parS* Cured	Yes	No	No	No	No	No
SDT3163	*purH*::P1 *parS* Lysogens	Yes	No	No	No	No	No
SDT3164	*purH*::P1 *parS* Cured	Yes	No	No	No	No	No
SDT3165	*argD*::P1 *parS* *putA*::pMT1 *parS* Lysogens	Yes	Yes	No	No	No	No
SDT3166	*argD*::P1 *parS* *putA*::pMT1 *parS* Cured	Yes	Yes	No	No	No	No

Table 139: Duplication strain table.

Containing strain numbers, genotypes, and *parS* location. All of these strains were cured of pSLT plasmid and harbor mutations that render the cells nonmotile, The presence or absence of prophages is indicated, as is the presence of the pRHA109 plasmid with the relevant phage recombination gene (or the absence of any cloned insert) and NA denotes plasmid is absent. [a]All subsequent strains were constructed in either the SDT3065 or SDT3098 genetic background, as indicated by the “lysogen” or “cured” designation. [b]Color of ParB foci expected when IPTG is added to the cells..

Strain Number	**Genotype**	**P1 *parS***	**pMT1 *parS***	**pFH4034**	**Rec Genes**	**1 mM IPTG Red** [b]	**1 mM IPTG Green** [b]
SDT3167	*purH*:P1 *parS* *putA*::pMT1 *parS* Lysogens	Yes	Yes	No	No	No	No
SDT3168	*purH*::P1 *parS* *putA*::pMT1 *parS* Cured	Yes	Yes	No	No	No	No
SDT3169	*recA argD*::P1 *parS putA*::*pMT1 parS* Lysogens	Yes	Yes	No	No	No	No
SDT3170	*recA argD*::P1 *parS putA*::pMT1 *parS* Cured	Yes	Yes	No	No	No	No
SDT3171	*recA purH*:P1 *parS putA*::pMT1 *parS* Lysogens	Yes	Yes	No	No	No	No
SDT3172	*recA* purH::P1 *parS putA*::pMT1 *parS* Cured	Yes	Yes	No	No	No	No
SDT3187	No *parS* Lysogens / pFH4034	No	No	Yes	No	No	No
SDT3188	No *parS* Cured /pFH4034	No	No	Yes	No	No	No

Table 1310: Duplication strain table.

Containing strain numbers, genotypes, and *parS* location. All of these strains were cured of pSLT plasmid and harbor mutations that render the cells nonmotile, The presence or absence of prophages is indicated, as is the presence of the pRHA109 plasmid with the relevant phage recombination gene (or the absence of any cloned insert) and NA denotes plasmid is absent. [a]All subsequent strains were constructed in either the SDT3065 or SDT3098 genetic background, as indicated by the "lysogen" or "cured" designation. [b]Color of ParB foci expected when IPTG is added to the cells.

Strain Number	**Genotype**	**P1 *parS***	**pMT1 *parS***	**pFH4034**	**Rec Genes**	**1 mM IPTG Red** [b]	**1 mM IPTG Green** [b]
SDT3173	*putA*::pMT1 *parS* Lysogens / pFH4034	No	Yes	Yes	No	No	Yes
SDT3174	*putA*::pMT1 parS Cured / pFH4034	No	Yes	Yes	No	No	Yes
SDT3175	*argD*::P1 *parS* Lysogens / pFH4034	Yes	No	Yes	No	Yes	No
SDT3176	*argD*::P1 *parS* Cured / pFH4034	Yes	No	Yes	No	Yes	No
SDT3177	*purH*::P1 *parS* Lysogens / pFH4034	Yes	No	Yes	No	Yes	No
SDT3178	*purH*::P1 *parS* Cured / pFH4034	Yes	No	Yes	No	Yes	No
SDT3179	*argD*::P1 *parS* *putA*::pMT1 *parS* Lysogens / pFH4034	Yes	Yes	Yes	No	Yes	Yes
SDT3180	*argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034	Yes	Yes	Yes	No	Yes	Yes

Table 1311: Duplication strain table.

Containing strain numbers, genotypes, and *parS* location. All of these strains were cured of pSLT plasmid and harbor mutations that render the cells nonmotile, The presence or absence of prophages is indicated, as is the presence of the pRHA109 plasmid with the relevant phage recombination gene (or the absence of any cloned insert) and NA denotes plasmid is absent. [a]All subsequent strains were constructed in either the SDT3065 or SDT3098 genetic background, as indicated by the "lysogen" or "cured" designation. [b]Color of ParB foci expected when IPTG is added to the cells..

Strain Number	**Genotype**	**P1 *parS***	**pMT1 *parS***	**pFH4034**	**Rec Genes**	**1 mM IPTG Red**[b]	**1 mM IPTG Green**[b]
SDT3181	*purH*:P1 *parS* *putA*::pMT1 *parS* Lysogens / pFH4034	Yes	Yes	Yes	No	Yes	Yes
SDT3182	*purH*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034	Yes	Yes	Yes	No	Yes	Yes
SDT3183	*recA argD*::P1 *parS putA*::pMT1 *parS* Lysogens / pFH4034	Yes	Yes	Yes	No	Yes	Yes
SDT3184	*recA argD*::P1 *parS putA*::pMT1 *parS* Cured / pFH4034	Yes	Yes	Yes	No	Yes	Yes
SDT3185	*recA purH*:P1 *parS putA*::pMT1 *parS* Lysogens / pFH4034	Yes	Yes	Yes	No	Yes	Yes
SDT3186	*recA purH*::P1 *parS putA*::pMT1 *parS* Cured / pFH4034	Yes	Yes	Yes	No	Yes	Yes

Table 1312: Duplication strain table.

Containing strain numbers, genotypes, and *parS* location. All of these strains were cured of pSLT plasmid and harbor mutations that render the cells nonmotile, The presence or absence of prophages is indicated, as is the presence of the pRHA109 plasmid with the relevant phage recombination gene (or the absence of any cloned insert) and NA denotes plasmid is absent. [a]All subsequent strains were constructed in either the SDT3065 or SDT3098 genetic background, as indicated by the "lysogen" or "cured" designation. [b]Color of ParB foci expected when IPTG is added to the cells..

Strain Number	**Genotype**	**P1 *parS***	**pMT1 *parS***	**pFH4034**	**Rec Genes**	**1 mM IPTG Red [b]**	**1 mM IPTG Green [b]**
SDT3205	*recA argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034 / pRHA109-Kan^R	Yes	Yes	Yes	No	Yes	Yes
SDT3206	*recA argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034 / pRHA109-Kan^R-*recE*	Yes	Yes	Yes	*recE*	Yes	Yes
SDT3207	*recA argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034 / pRHA109-Kan^R-*recT*	Yes	Yes	Yes	*recT*	Yes	Yes
SDT3208	*recA argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034 / pRHA109-Kan^R-*ninG*	Yes	Yes	Yes	*ninG*	Yes	Yes

Table 1313: Duplication strain table.

Containing strain numbers, genotypes, and *parS* location. All of these strains were cured of pSLT plasmid and harbor mutations that render the cells nonmotile, The presence or absence of prophages is indicated, as is the presence of the pRHA109 plasmid with the relevant phage recombination gene (or the absence of any cloned insert) and NA denotes plasmid is absent. [a]All subsequent strains were constructed in either the SDT3065 or SDT3098 genetic background, as indicated by the "lysogen" or "cured" designation. [b]Color of ParB foci expected when IPTG is added to the cells..

Strain Number	**Genotype**	**P1 *parS***	**pMT1 *parS***	**pFH4034**	**Rec Genes**	**1 mM IPTG Red** [b]	**1 mM IPTG Green** [b]
SDT3209	*recA argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034 / pRHA109-Kan^R-*recET*	Yes	Yes	Yes	*recET*	Yes	Yes
SDT3210	*recA argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034 / pRHA109-Kan^R-*recET ninG*	Yes	Yes	Yes	*recET ninG*	Yes	Yes
SDT3211	*recA argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034 / pRHA109-Kan^R	Yes	Yes	Yes	No	Yes	Yes
SDT3212	*recA argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034 / pRHA109-Kan^R-*recE*	Yes	Yes	Yes	*recE*	Yes	Yes

Table 1314: Duplication strain table.

Containing strain numbers, genotypes, and *parS* location. All of these strains were cured of pSLT plasmid and harbor mutations that render the cells nonmotile, The presence or absence of prophages is indicated, as is the presence of the pRHA109 plasmid with the relevant phage recombination gene (or the absence of any cloned insert) and NA denotes plasmid is absent. [a]All subsequent strains were constructed in either the SDT3065 or SDT3098 genetic background, as indicated by the “lysogen” or “cured” designation. [b]Color of ParB foci expected when IPTG is added to the cells..

Strain Number	**Genotype**	**P1 *parS***	**pMT1 *parS***	**pFH4034**	**Rec Genes**	**1 mM IPTG Red** [b]	**1 mM IPTG Green** [b]
SDT3213	*recA argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034 / pRHA109-Kan^{R}-*recT*	Yes	Yes	Yes	*recT*	Yes	Yes
SDT3214	*recA argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034 / pRHA109-Kan^{R}-*ninG*	Yes	Yes	Yes	*ninG*	Yes	Yes
SDT3215	*recA argD*::P1 *parS* *putA*::pMT1 *parS* Cured / pFH4034 / pRHA109-Kan^{R}-*recET*	Yes	Yes	Yes	*recET*	Yes	Yes
SDT3216	recA argD::P1 parS putA::pMT1 parS Cured / pFH4034 / pRHA109-Kan^{R}-*recET ninG*	Yes	Yes	Yes	*recET ninG*	Yes	Yes

Table 1415: Primers (5’ -> 3’):

Name	**Sequence**
recT **FWD**	GAAATTCAGGAGGTTGTCGAATGTGCGCCGCCTTGAAGCG
recT **REV**	CGGATGAGGGCGCGGGGATCTTAGCCGATGTATTCCGGTTTCATATCG
recE **FWD**	GAAATTCAGGAGGTTGTCGAATGAGTGGAACTAATCCTGTATTTTTAGTCCG
recE **REV**	CGGATGAGGGCGCGGGGATCTTAATTATGCCTGTACGCGCAACGCTTC
ninG **FWD**	GAAATTCAGGAGGTTGTCGAATGGCTAAATTACCGCGCCG
ninG **REV**	CGGATGAGGGCGCGGGGATCTTATTTCATGCGGCCTCCAGCTTTTTTAGC
recT_recE **REV (1)**	CACTCATTCGACAACCTCCTTTAGCCGATGTATTCCGGTTTCATATCG
recT_recE **FWD (2)**	CGGCTAAAGGAGGTTGTCGAATGAGTGGAACTAATCCTGTATTTTTAGTCCG
recT_recE_ninG **FWD (2)**	CGGCTAAAGGAGGTTGTCGAATGAGTGGAACTAATCCTGTATTTTTAG
recT_recE_ninG **REV (2)**	CATTCGACAACCTCCTTTAATTATGCCTGTACGCGCAACG
recT_recE_ninG **FWD (3)**	TAATTAAAGGAGGTTGTCGAATGGCTAAATTACCGCGCCG
delGifsy-1_andattL-Forward	TGGCGTGCATATTACACTGTAGCTTTGAAATCGTCAGCATGTGTAGGCTGGAGCTGCTTC
delGifsy-1_andattL-Reverse	TAAAACAGACGTTAAGCTCAGAACAGCGACCTCTAAAGTCATGGGAATTAGCCATGGTCC
pSLT delete ***samABparS tetA sacB*** **F**	AGCTATCAACGAGGTCCTTGAGAGAAATTTGAGTCAATAATCCTAATTTTTGTTGACACTCTA
pSLT delete ***samAB tetA sacB*** **R**	TAATGCTGTATATAAAAACAGGCATTTTAAGAGGTATGCCATCAAAGGGAAAACTGTCCATAT
P1 ***parS metE*** **Ultramer F**	TATTGACTCATACCCTCGGTTTTCCTCGCGTTGGCCTGCGAAACTTTCGCCATTCAAATTTCACTATTAACTGACTGTTTTTAAAGTAAATTACTCTAAAATTTCAAGGTGAAATCGCCACGATTTCACCTTGGGTGTAGGCTGGAGCTGCTTC

Table 1416: Primers (5’ -> 3’):

Name	Sequence
P1 *parS metE* Block 1 Forward	TATTGACTCATACCCTCGGTTTTCCTCGCGTTGGCCTGCGAAACTTTCGCCATTCAAATT
P1 *parS metE* Block 2 Forward	TCTAAAATTTCAAGGTGAAATCGCCACGATTTCACCTTGGGTGTAGGCTGGAGCTGCTTC
P1 *parS metE* Block 1 Reverse	CTAGAAAGTATAGGAACTTCGAAGCAGCTCCAGCCTACACCCAAGGTGAAATCGTGGCGA
P1 *parS metE* Block 2 Reverse	CACGCCTTCAAAATAGGTCGTCAGCAACAGCTTCACCTGGATGGGAATTAGCCATGGTCC
***argD* P1 *parS* F**	CCGACCGCCGGATGCGCTACGCTTATCCGGCAATCCGCCAAGTGTCCAGGTTTGGCGTCA
***argD* P1 *parS* R**	GCTGAAAAATTTCCTCCGGCGTTGATTTGTGGTTGCTATTCTCGGTTTTCCTCGCGTTGG
***purH* P1 *parS* F**	CGTTACCAATCACTAATACTTTCATGTTTCGCTCCATTAACTCGGTTTTCCTCGCGTTGG
***purH* P1 *parS* R**	TCTTTCAGGGATAAAAGCGGGGCCAGAATTTAAAAAGAAAAGTGTCCAGGTTTGGCGTCA
pMT1 *putA* F	AGCCTTAATTAACCACAGTAGAGGTTGAAAAGCGTGGTGATTTCAGTGTGAAAGAATTTTCAATTTTCCTTTATAATCAAACAAATAACCATGAAATTGGCGTGGTGAAAAACAGTGTAGGCTGGAGCTGCTTC
pMT1 *putA* R	AAAATAAATCCAGATGGTTTTCTCGTCAGACACTCCCTTAATGGGAATTAGCCATGGTCC

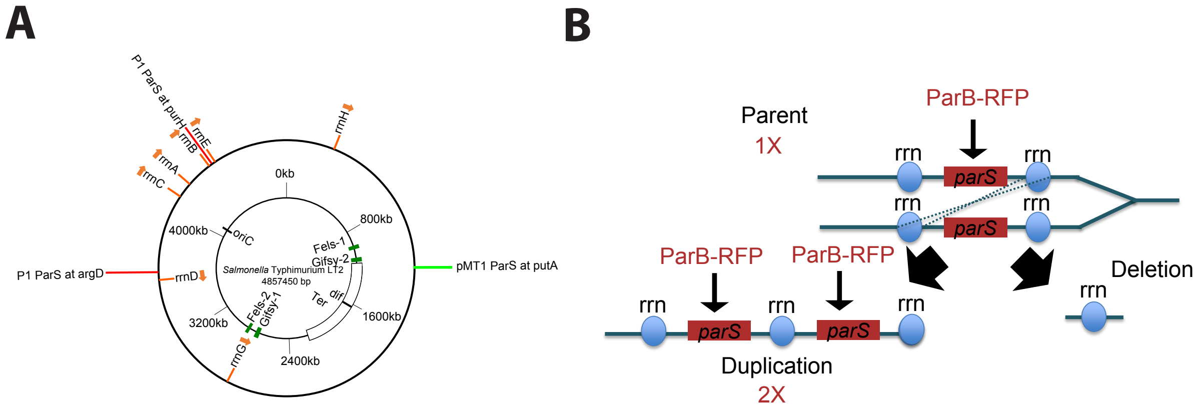

Figure 17: Chromosome organization and assay used to detect duplicationsA. *Salmonella* LT2 chromosome with regions mapped and not drawn to scale using GenomeVX (141). The outside circle shows sites facing outwards and these are in the opposite orientation of sites facing inwards. Locations of the 7 *rrn* operons on the *Salmonella* LT2 chromosome are shown in orange on the outside of the circle; orange arrows indicate *rrn* operon direction. Gifsy-1, Gifsy-2, Fels-1, Fels-2 active prophages are shown in dark green. A P1 *parS* site was recombineered into the chromosome at *argD* or *purH* and is shown in red (223). A pMT1 *parS* site was recombineered into *putA* and is shown in green (223). *oriC* was found from BLAST with the *E. coli* MG1655 *oriC* site and is the origin of replication. The Ter macrodomain where replication ends is indicated and was identified from (142, 143). Dif site was located from (144). **B.** A P1 *parS* site was placed between *rrn* operons and ParB-RFP can bind specifically and fluoresce red when excited with a laser with 1x signal intensity. This site can be duplicated and fluoresce red with 2x or higher signal intensity if the *parS* site undergoes a duplication or amplification. Adapted from (134).

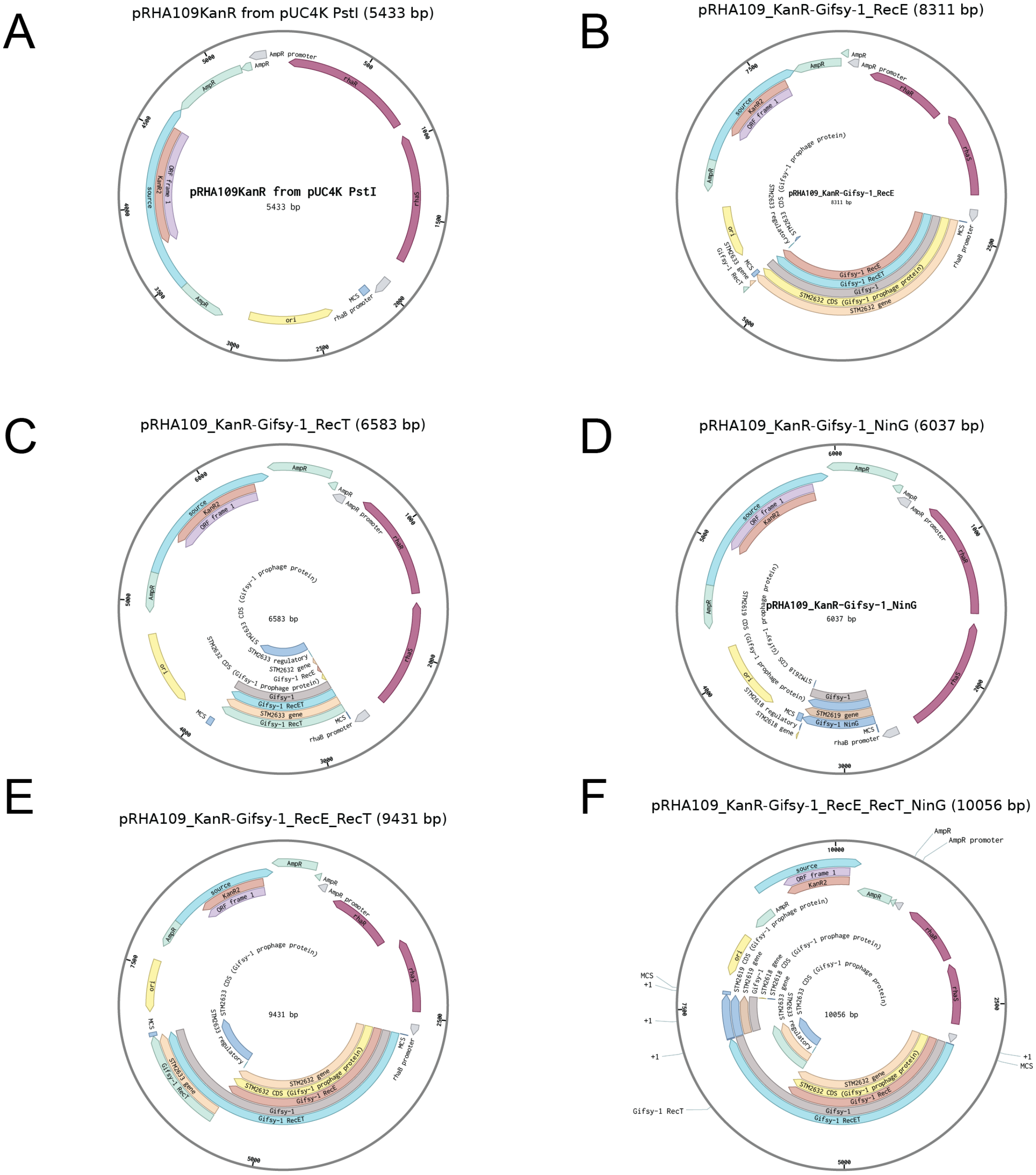

Figure 18: pRHA109-Kan^{R} plasmids with Gifsy-1 recombination proteinsA. pRHA109-Kan^{R}. **B.** pRHA109-Kan^{R}_Gifsy-1_*recE*. **C.** pRHA109-Kan^{R}_Gifsy-1_*recT*. **D.** pRHA109-Kan^{R}_Gifsy-1_*ninG*. **E.** pRHA109-Kan^{R}_Gifsy-1_*recE_recT*. **F.** pRHA109-Kan^{R}_Gifsy-1_*recE_recT_ninG*.

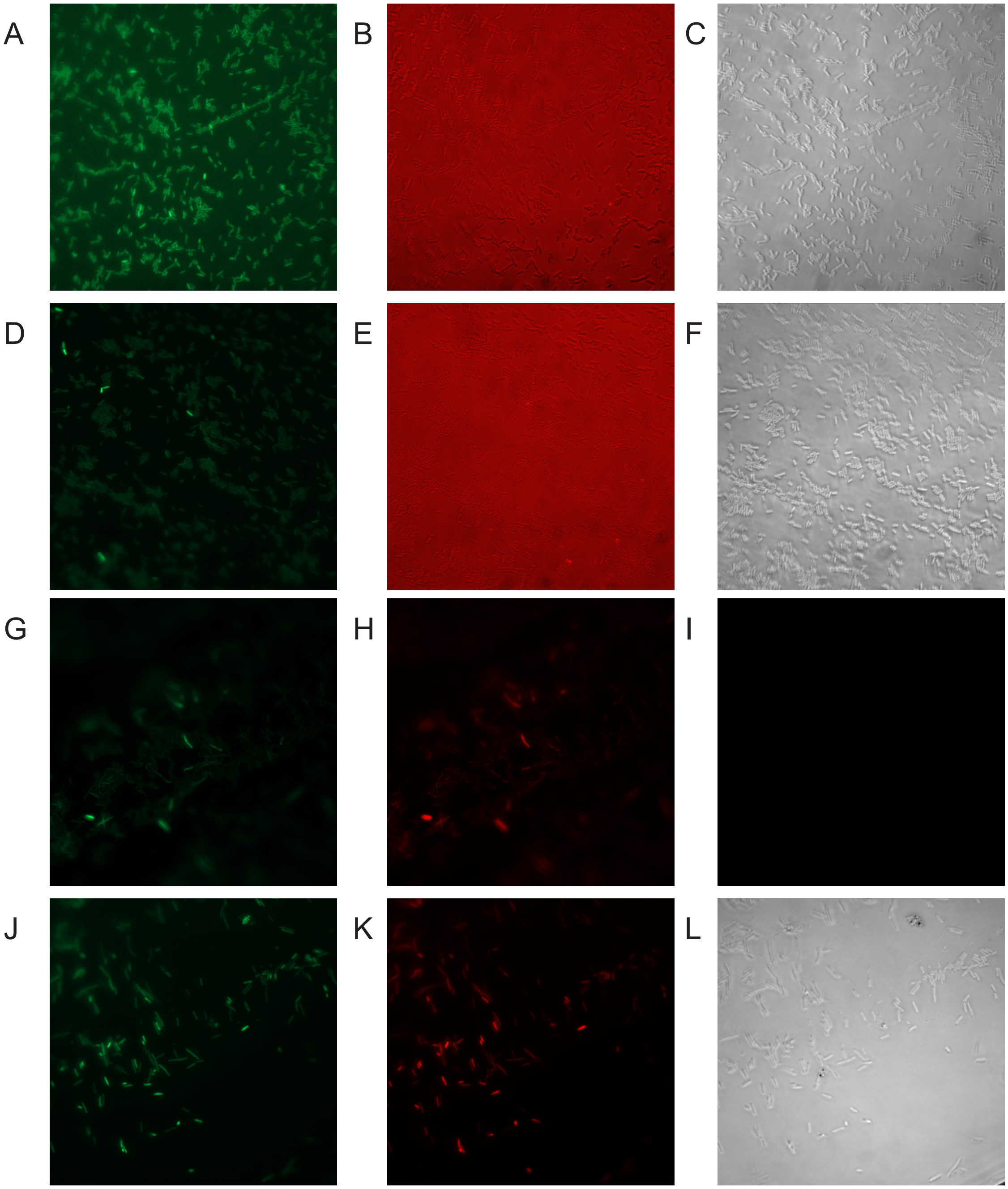

Figure 19: Microscopy – SDT3173 – SDT3176A. SDT3173 - Green Channel **B.** SDT3173 - Red Channel. **C.** SDT3173 - Phase Channel. **D.** SDT3174 - Green Channel. **E.** SDT3174 - Red Channel. **F.** SDT3174 - Phase Channel. **G.** SDT3175 - Green Channel. **H.** SDT3175 - Red Channel. **I.** SDT3175 - Phase Channel. **J.** SDT3176 - Green Channel. **K.** SDT3176 - Red Channel. **L.** SDT3176 - Phase Channel.

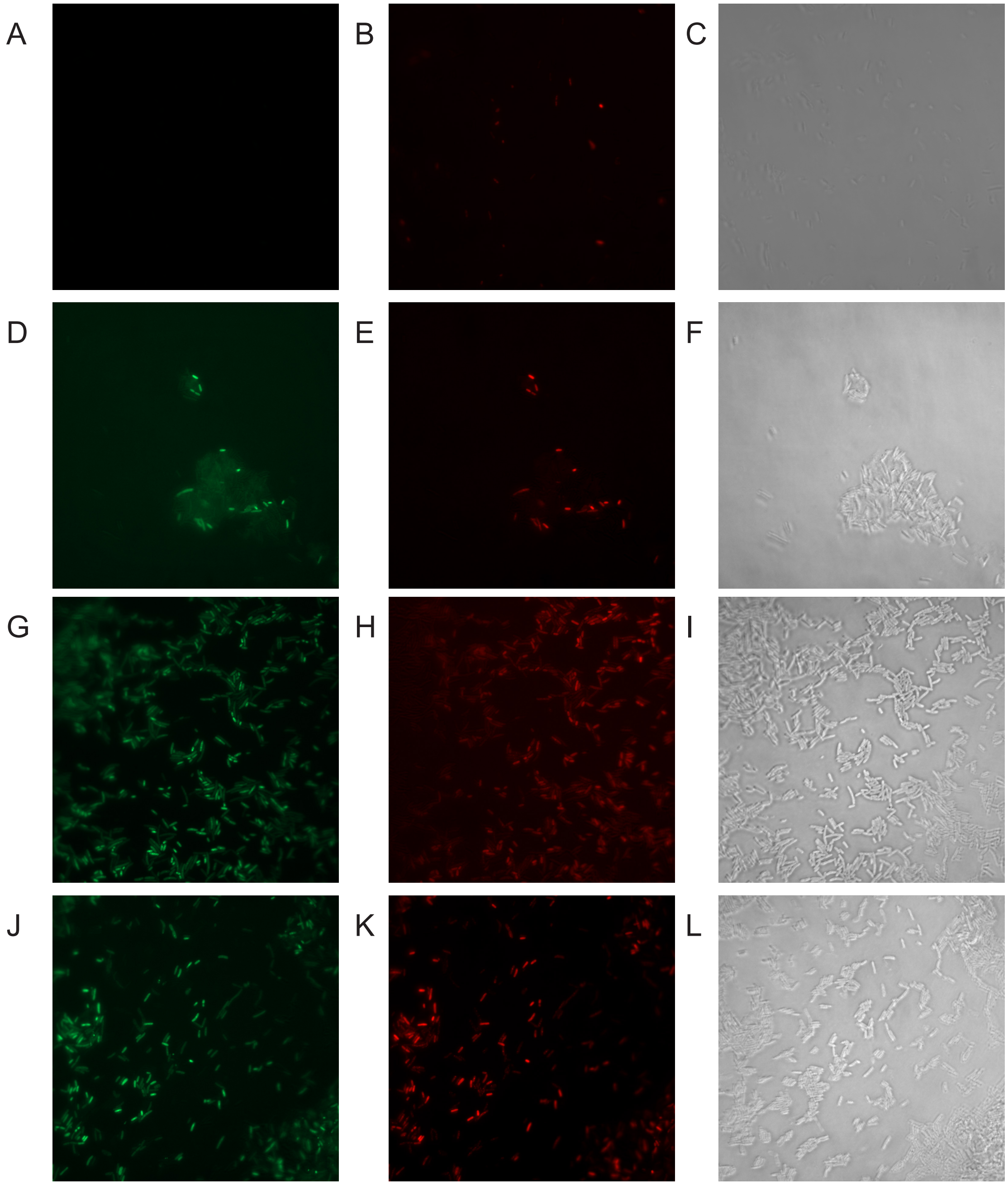

Figure 20: Microscopy – SDT3177 – SDT3180A. SDT3177 - Green Channel **B.** SDT3177 - Red Channel. **C.** SDT3177 - Phase Channel. **D.** SDT3178 - Green Channel. **E.** SDT3178 - Red Channel. **F.** SDT3178 - Phase Channel. **G.** SDT3179 - Green Channel. **H.** SDT3179 - Red Channel. **I.** SDT3179 - Phase Channel. **J.** SDT3180 - Green Channel. **K.** SDT3180 - Red Channel. **L.** SDT3180 - Phase Channel.

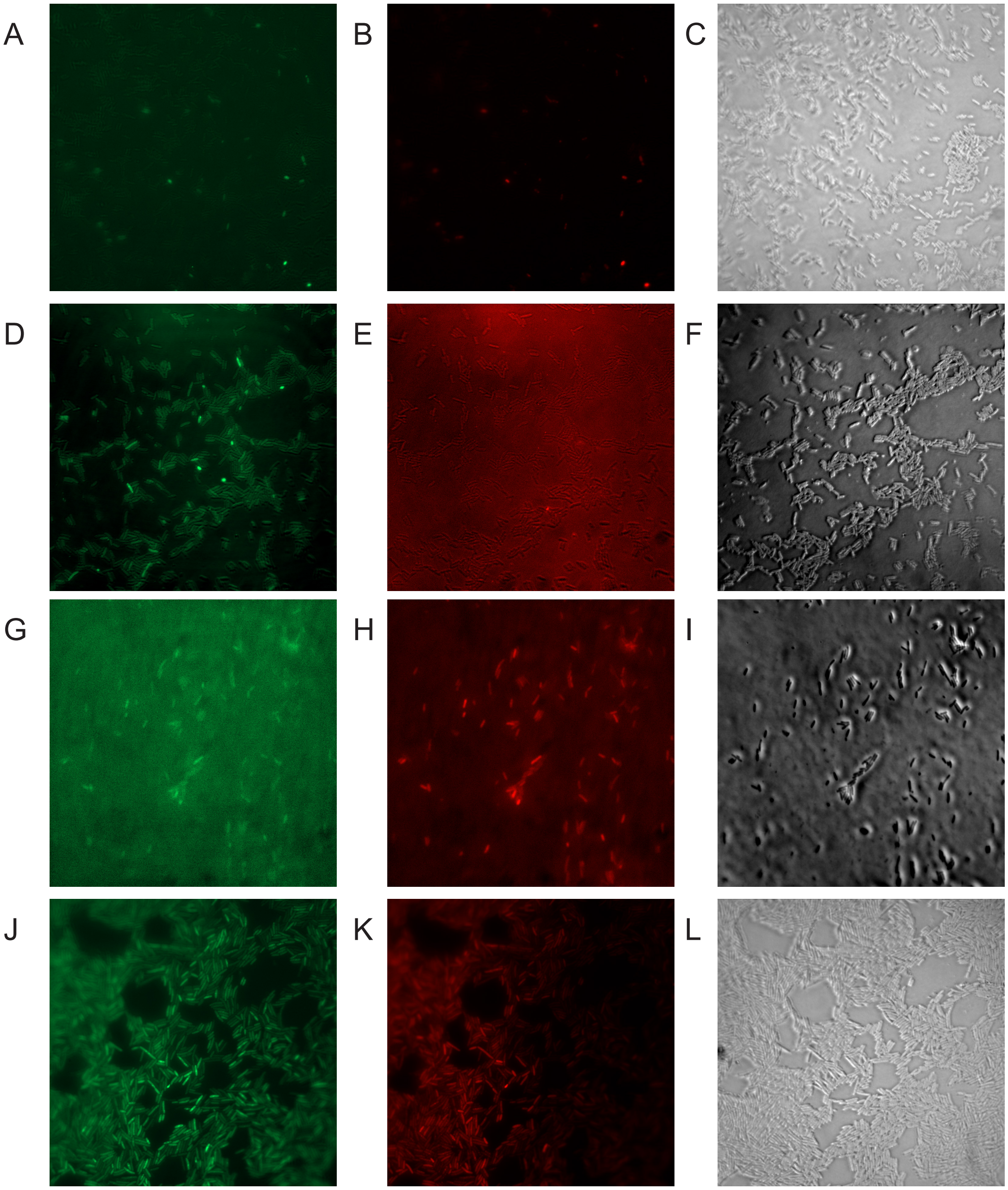

Figure 21: Microscopy – SDT3181 – SDT3184A. SDT3181 - Green Channel **B.** SDT3181 - Red Channel. **C.** SDT3181 - Phase Channel. **D.** SDT3182 - Green Channel. **E.** SDT3182 - Red Channel. **F.** SDT3182 - Phase Channel. **G.** SDT3183 - Green Channel. **H.** SDT3183 - Red Channel. **I.** SDT3183 - Phase Channel. **J.** SDT3184 - Green Channel. **K.** SDT3184 - Red Channel. **L.** SDT3184 - Phase Channel.

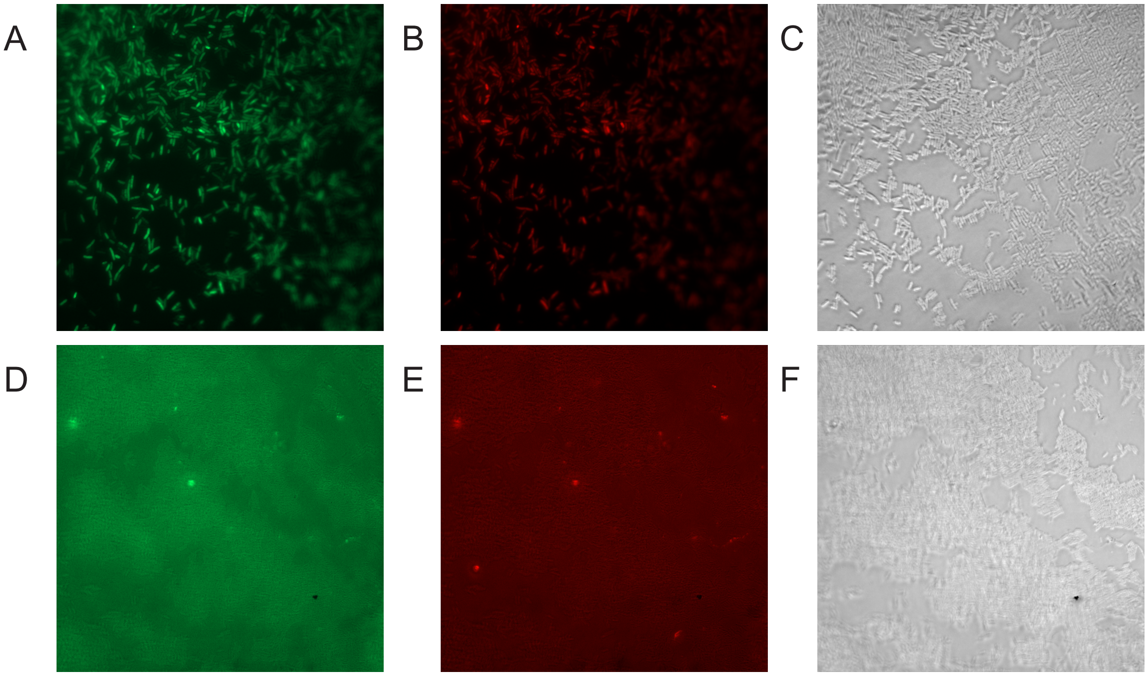

Figure 22: Microscopy– SDT3185 – SDT3186A. SDT3185 - Green Channel **B.** SDT3185 - Red Channel. **C.** SDT3185 - Phase Channel. **D.** SDT3186 - Green Channel. **E.** SDT3186 - Red Channel. **F.** SDT3186 - Phase Channel.

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Chapter 4, in part, is currently being prepared for submission for publication of the material. Peters, Gregory; Segall, Anca. The dissertation/thesis author was the primary investigator and author of this material.

Chapter 5: Conclusion

SeqA, GATCs, transcription and phage regulation

This dissertation helps to uncover some of the intricacies of interactions between phage and bacteria. While pursuing research from a Phage-centric point of view we were able to uncover a new transcription regulation mechanism and found a connection between a host gene, SeqA, and control of the life cycle of phage. Previously it was known that the binding site of SeqA, GATC motifs, were low in phage but now we have a better idea and found a connection with the host protein SeqA. SeqA is involved in numerous cell processes and while working with *Salmonella* LT2 which has four active prophages we found that SeqA mutants of *Salmonella* LT2 had increased prophage induction compared to wildtype. This led to the investigation into and finding that the SeqA is likely to affect the transcription regulation of viruses. This was found by investigating where GATC motifs are in comparison to genes and integrating multiple sources of protein binding data from different labs. Pairs of GATC sites are in multiple genes which likely could affect regulation of prophages. Pairs of GATC sites occur in both the host *dnaA* gene and also prophage *dnaA* and *dnaC* analogs. After investigating protein binding data of SeqA vs. RNAP polymerase in *E. coli* we find many regions across the genome in which SeqA binding affects RNAP binding. SeqA binds to and likely affects and occludes RNA Polymerase from completing transcription regulation in important genes such as *dnaA* and phage life cycle genes. SeqA is likely binding and affecting regulation of phages could cause dysregulation of phage life cycles.

SeqA could bind to phage and prevent a phage from replicating and be a defense mechanism against phage. It is not clear if SeqA acts by stabilizing lysogeny or lysis, but phage genes are appeared to be regulated to an extent. From the phage "point of view", having a "connection" to a host cellular process involved in DNA replication would be useful to "sense" the growth level of the bacteria. From the bacteria point of view, it would be useful to have a control on the phages infecting it. This might be an immune mechanism and SeqA might act to dysregulate the phage life cycle and prevent it from replicating. One hypothesis along this line is that SeqA "traps" phages and this can lead to the acquisition of new genes by the bacteria. SeqA could allow for brief and quick bursts of otherwise toxic genes which could aid in pathogenicity of the host. From either point of view, both are in a way advantage both the virus and host.

This study could lead to a new mechanism of how SeqA prevents overinitiation of DNA replication and further investigation into this would be useful. One way to study this would be to make mutations of the GATCs into synonymous codons and see if there is an effect on DNA initiation and the cell cycle. Another way to study this would be to synthesize genes with GATC in them and with no GATCs and clone onto a plasmid and compare and monitor transcription or RNA lengths. If SeqA binds it is likely that numerous short RNAs are produced in the wildtype in comparison to the full-length RNAs in the GATC mutant. It is likely there is a gradient of both sizes and at this is dependent on the cell cycle and stage of growth the bacteria is in. Exponential and stationary phases are likely to both have different effects of SeqA transcription regulation. There are many other host genes in which SeqA transcription regulation yielding many new genes to study of how SeqA potentially regulates.

During this study we developed two statistical approaches to investigate SeqA binding, the first involved a t-test of SeqA binding vs. RNAP binding and SeqA binding from 0 minutes and 50-minutes and then filtering the signals into different strengths and comparing them against randomized signals using BEDOPS (161). BEDOPS allows the chopping of signals into one basepair and this allowed for higher resolution of where the signals bind (161). The BEDOPS shuffle allows for the creation of randomized signals which allowed for the comparison of randomized signals helping to identify where the signals localize to (161). The differences are very difficult to observe unless these steps are taken and can be missed. This method could also be applied to ChIP-Seq data in the future and randomize sequencing read locations. Both experimental data of ChIP-Chip microarray data and theoretical data of the location of paired GATC sites follow the same trends, reinforcing each other.

The second new statistical method involved using the GATC Odds Markov ratio on the ChIP-Chip signals, this could be applied to Chip-Seq signals as well. This allowed us to get an idea of SeqA signals compares to the Odds Markov ratio of the genomes of the phage and bacteria. Phage have previously been shown to have very low GATC Odds Ratios and this provides a link to SeqA binding. Multiple lytic phages have the lowest GATC odds ratio and some phage have extremely low amounts of GATC sites and maybe evolved to avoid SeqA binding.

During this study, it became even more apparent that the line between virus genes and host genes is very fine. How do we know which gene comes from a virus and which gene comes from the host? Currently, phage sequences are located by experienced scientists that search for phage features like attR and attL or known phage genes. Multiple bioinformatics programs have been developed that aid with this program such as PhiSpy and PHASTER. But what if the attR and attL are deleted from a host event, it is likely both experienced and intuitive scientists and programs will miss the identification of the phage genes. This seems to have occurred during the annotation of *E. coli* O157-H7 EDL933 strain. In the EDL933 strain, there were numerous prophage regions that had been previously missed and PHASTER readily identified these (149). These regions shared homology with the Sakai strain in phage regions that were previously annotated. Most of the regions in the EDL933 had been annotated as bacteria genes so it is likely there are many more misannotations that occur during the annotation of genomes. It is important to improve this process so we can better clarify what is virus and what is host. Even bigger questions arise along this line; how do we distinguish the virus from the host if many of the genes are shared or evolved from rapidly replicating and evolving viruses?

It would be interesting to search for SeqA like proteins in other organisms such as Eukaryotes and other Bacteria which don't have SeqA homologs. The forkhead box protein 1 and 2 proteins act similarly to SeqA and are involved in the initiation of DNA replication in Eukaryotes. The motif is different and regions, where the protein binds, are different, but it is possible these or other transcription factors bind within the coding sequence of important genes. Retroviruses infect multiple organisms and make up 8% of the Human genome (276). The retroviruses are RNA viruses and integrate reverse transcribed DNA their DNA these are similar to bacterial prophages, so it is possible there is a protein that binds to and effects retroviruses life cycles and other genes (276–278).

Genome duplications

The active viruses in Bacteria are likely to be involved in genome duplications and amplifications. The mechanism of genome duplications and amplifications is thought to be universal in all organisms and involve recombination genes. The viruses contain genes which are involved in recombination and likely to affect these mechanisms. In Chapters 3 and 4 we developed assays to study the viruses potential roll in genome duplications. We performed RNA-Seq on Bacteria with and without lysogens to see what genes were differentially expressed and see if the lysogens could potentially compensate for a recombination mutant defect. We also developed a system to monitor the effects using fluorescence of specific sites in the genome. It would be interesting to see if expressing the prophage genes were able to recover genome duplications from a recombination defect. It would also be interesting to see if expressing the genes alone causes duplications or amplifications to arise.

Duplications and amplifications are becoming even more important since cancers that are sequenced exhibit chromosomal rearrangements and amplifications. It is not known what causes these and viruses could potentially play a larger role than previously thought. A recent study of Alzheimer's disease shows a link with the disease and gene recombination. What if a virus infects the cells and rearranges the genome to produce misfolded proteins? Other diseases of unknown etiology could also be linked to viruses.

The phast, phresent, and phuture of Phages

The study of Phages are over 100 years old but and there likely will be many new discoveries over the next 100 years (279). The Year of the Phage meeting occurred in 2015 at SDSU celebrating 100 years since the discovery of Phages (280). A meeting website is here: http://2015phage.org/. Videos of lectures of the history and future of phages are located at this website: http://2015phage.org/program.php and https://www.youtube.com/user/rohwerlab/videos?sort=dd&shelf_id=0&view=0. An illustrated timeline is located here: http://2015phage.org/phage_art.php. A Second meeting occurred in 2017 at the Pasteur Institute (281). More information about phages can also be found on the ASM:Division M website archived here: https://web.archive.org/web/20170302164211/http://www.asm.org:80/division/m/OfcMemb.html

We are coming on into a new age of phage research as evidenced by recent research considerable drop in DNA sequencing revealing many more DNA sequences, many of which have viruses. In addition, phage therapy is making a comeback and will be more important as antibiotic resistance is rapidly spreading and becoming a public health concern. A recent report by “The Review on Antimicrobial Resistance (AMR)” predicted that cases of antimicrobial resistant superbugs will cause more deaths than cancer in 2050 (282). Recently in 2017, there was a case study with a patient who had acquired an MDR *Actinobacter baumannii* infection which was resistant to all known antibiotics who was successfully treated by phage (283). This shows the success of phage therapy in times of dire need and more phage therapy studies are currently underway (284). Cancer has had a dramatic reduction of phases and this year on January 8, 2019, the American Cancer Society reports show that cancer deaths have decreased 27% in the past 25 years from 1991 to 2016 (285). Perhaps it is time to switch the funding into other areas of research such as phage-oriented research and stimulate the economy to tackle the large antimicrobial threat.

Phage are becoming more popular as well by recent talks on YouTube. Dr. Steffanie Strathdee, a professor at UCSD, whose Husband Dr. Tom Patterson was treated by Phage Therapy in the 2014 case study. Steffanie Strathdee gave a TedXTalk talk at TedXNashville titled “How Sewage Saved My Husband's Life from a Superbug” (286). The video link is here: https://www.youtube.com/watch?v=AbAZU8FqzX4. In 2018, Stephanie Strathdee was named to TIME’s 50 Most Influential People in Health Care (287). Also on May 13, 2018, a YouTube video titled “The Deadliest Being on Planet Earth – The Bacteriophage" was published by Kurzgesagt – In a Nutshell (288). The video link is here: https://www.youtube.com/watch?v=YI3tsmFsrOg. This video was #2 trending on YouTube when it was first published and has reached millions of views and is at 7.5 million views as of January 2019. These videos will likely inspire more phage researchers. The reader is also suggested to read the recent books Life in Our Phage World published in December 2014 and Thinking Like a Phage: The Genius of the Viruses That Infect Bacteria and Archaea published in May 2017 (4, 289). These books help the public and scientists gain an even greater appreciation and inspiration from the wonderful phages. We have entered into the next century of phage may the super cool and important phages yield many new insights of how life works.

Acknowledgements

Chapter 5, in part, is currently being prepared for submission for publication of the material. Peters, Gregory. The dissertation/thesis author was the primary investigator and author of this material.

Appendix 1: Source code and RNA-Seq analysis of prophage activity

Introduction

Protocol to run programs used in Chapter 2

The appendix contains Python programs and shell scripts used in the analysis of Chapter 2. The Python programs bedtools_shuffle_sort_SeqAOnly.py, bedtools_shuffle_sort_SeqAOnly_Grainger, http://bedtools_shuffle_sort_0vs50Min.py are Python3 programs that prints to standard output a shell script to randomize the SeqA Only 1, SeqA Only 2, and SeqA Binding signals respectively 1000 times. In order to run the following command is run in the terminal:

```
python3 ./Filename.py > ./Filename.sh
```

The "Filename" denotes the Python program being run and creates a .sh file or shell script file of the same name. The appendix also contains shell scripts to run these a file with the same filename listed in the comments section, the second comment in all comment shell scripts denotes the filename and ends in .sh (comment lines begin with # and the first comment line is always "#!/bin/bash" for a bash shell script). In order to run the created shell script and all shell scripts the Unix permissions must first be changed to enable execute using the change mode command:

```
chmod +x ./Filename.sh
```

In order to run the shell script the following command would be run:

```
./Filename.sh
```

Additional RNA-Seq analysis for prophage activity for Chapter 3

The appendix also contains additional analysis of prophage activity. Tables 15 - 17 show the genes differentially expressed using DESeq2, EdgeR, and Limma respectively in wild-type lysogens, *recA* lysogens, *ruvAB* lysogens, *and ruvC* lysogens vs. the isogenic prophage-cured wild-type, *recA, ruvAB, and ruvC* strains (Figs. 23 - 25)

Python programs

Python program to make shell script to shuffle SeqA Only signals (SeqA Only 1) 1000 times

```python
#bedtools_shuffle_sort_SeqAOnly.py
#Python 3.6.5 |Anaconda, Inc.| (default, Apr 26 2018, 08:42:37)
#[GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)] on darwin

#Python 3 script to make shell script to run uShuffle 1000 times on SeqAOnly signal


import sys
sys.stdout.flush()

sys.stdout.write('cp ./SeqAOnly.bed ./SeqAOnly_r0s0.bed')
print()
for a in range (1, 1001):
        b = a-1
        sys.stdout.write('bedtools shuffle -seed 1 -i SeqAOnly_r')
        sys.stdout.write(str(b))
        sys.stdout.write('s')
        sys.stdout.write(str(b))
        sys.stdout.write('.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r')
        sys.stdout.write(str(a))
        sys.stdout.write('s')
        sys.stdout.write(str(b))
        sys.stdout.write('.bed')
        print()
        sys.stdout.write('sort -k1,1 -k2,2n ./SeqAOnly_r')
        sys.stdout.write(str(a))
        sys.stdout.write('s')
        sys.stdout.write(str(b))
        sys.stdout.write('.bed > ./SeqAOnly_r')
        sys.stdout.write(str(a))
        sys.stdout.write('s')
        sys.stdout.write(str(a))
        sys.stdout.write('.bed')
        print()
```

Python program to make shell script to shuffle SeqA Only (Grainger) signals (SeqA Only 2) 1000 times

```
#bedtools_shuffle_sort_SeqAOnly_Grainger.py
#Python 3.6.5 |Anaconda, Inc.| (default, Apr 26 2018, 08:42:37)
#[GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)] on darwin

#Python 3 script to make shell script to run uShuffle 1000 times on SeqAOnly_Grainger signal


import sys
sys.stdout.flush()

sys.stdout.write('cp ./SeqAOnly_Grainger.bed ./SeqAOnly_Grainger_r0s0.bed')
print()
for a in range (1, 1001):
        b = a-1
        sys.stdout.write('bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r')
        sys.stdout.write(str(b))
        sys.stdout.write('s')
        sys.stdout.write(str(b))
        sys.stdout.write('.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r')
        sys.stdout.write(str(a))
        sys.stdout.write('s')
        sys.stdout.write(str(b))
        sys.stdout.write('.bed')
        print()
        sys.stdout.write('sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r')
        sys.stdout.write(str(a))
        sys.stdout.write('s')
        sys.stdout.write(str(b))
        sys.stdout.write('.bed > ./SeqAOnly_Grainger_r')
        sys.stdout.write(str(a))
        sys.stdout.write('s')
        sys.stdout.write(str(a))
        sys.stdout.write('.bed')
        print()
```

Python program to make shell script to shuffle 0 vs. 50 Min signals (SeqA Binding) 1000 times

```
#bedtools_shuffle_sort_0vs50Min.py
#Python 3.6.5 |Anaconda, Inc.| (default, Apr 26 2018, 08:42:37)
#[GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)] on darwin

#Python 3 script to make shell script to run uShuffle 1000 times on 0vs50Min signal


import sys
sys.stdout.flush()

sys.stdout.write('cp ./0vs50Min.bed ./0vs50Min_r0s0.bed')
print()
for a in range (1, 1001):
    b = a-1
    sys.stdout.write('bedtools shuffle -seed 1 -i 0vs50Min_r')
    sys.stdout.write(str(b))
    sys.stdout.write('s')
    sys.stdout.write(str(b))
    sys.stdout.write('.bed -g Ecoli-genomesize.txt > ./0vs50Min_r')
    sys.stdout.write(str(a))
    sys.stdout.write('s')
    sys.stdout.write(str(b))
    sys.stdout.write('.bed')
    print()
    sys.stdout.write('sort -k1,1 -k2,2n ./0vs50Min_r')
    sys.stdout.write(str(a))
    sys.stdout.write('s')
    sys.stdout.write(str(b))
    sys.stdout.write('.bed > ./0vs50Min_r')
    sys.stdout.write(str(a))
    sys.stdout.write('s')
    sys.stdout.write(str(a))
    sys.stdout.write('.bed')
    print()
```

Python program to parse and rename CMBL signature output from unzipped zip file to zip file name

```
#RenameSignatureFilesInFolders.py
#Python 3.6.5 |Anaconda, Inc.| (default, Apr 26 2018, 08:42:37)
#[GCC 4.2.1 Compatible Clang 4.0.1 (tags/RELEASE_401/final)] on darwin

#Python 3 script to rename signature output from: "http://www.cmbl.uga.edu/software/signature.html"
#Email output is sent after signature is run
#Download and name the Zip file with a descriptive name of the DNA sequence being analyzed.
#Unzip zip file
#This script recursively renames individual files from unzipped zip file to name of unzipped folder

import os

for root, dirs, files in os.walk("."):
    path = root.split(os.sep)
    print(os.path.basename(root))
    for file in files:
        for filename in os.listdir("."):
            if filename.endswith(".txt"):
                os.rename(filename, "Changed-", + filename ".txt")
```

Shell scripts

BEDTools shuffle SeqA Only signals (SeqA Only 1) 1000 times

```
#!/bin/bash

#bedtools_shuffle_sort_SeqAOnly.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to shuffle SeqAOnly signals 1000 times

cp ./SeqAOnly.bed ./SeqAOnly_r0s0.bed
bedtools shuffle -seed 1 -i SeqAOnly_r0s0.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r1s0.bed
sort -k1,1 -k2,2n ./SeqAOnly_r1s0.bed > ./SeqAOnly_r1s1.bed
bedtools shuffle -seed 1 -i SeqAOnly_r1s1.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r2s1.bed
sort -k1,1 -k2,2n ./SeqAOnly_r2s1.bed > ./SeqAOnly_r2s2.bed
bedtools shuffle -seed 1 -i SeqAOnly_r2s2.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r3s2.bed
sort -k1,1 -k2,2n ./SeqAOnly_r3s2.bed > ./SeqAOnly_r3s3.bed
bedtools shuffle -seed 1 -i SeqAOnly_r3s3.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r4s3.bed
sort -k1,1 -k2,2n ./SeqAOnly_r4s3.bed > ./SeqAOnly_r4s4.bed
bedtools shuffle -seed 1 -i SeqAOnly_r4s4.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r5s4.bed
sort -k1,1 -k2,2n ./SeqAOnly_r5s4.bed > ./SeqAOnly_r5s5.bed
bedtools shuffle -seed 1 -i SeqAOnly_r5s5.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r6s5.bed
sort -k1,1 -k2,2n ./SeqAOnly_r6s5.bed > ./SeqAOnly_r6s6.bed
bedtools shuffle -seed 1 -i SeqAOnly_r6s6.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r7s6.bed
sort -k1,1 -k2,2n ./SeqAOnly_r7s6.bed > ./SeqAOnly_r7s7.bed
bedtools shuffle -seed 1 -i SeqAOnly_r7s7.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r8s7.bed
sort -k1,1 -k2,2n ./SeqAOnly_r8s7.bed > ./SeqAOnly_r8s8.bed
bedtools shuffle -seed 1 -i SeqAOnly_r8s8.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r9s8.bed
sort -k1,1 -k2,2n ./SeqAOnly_r9s8.bed > ./SeqAOnly_r9s9.bed
bedtools shuffle -seed 1 -i SeqAOnly_r9s9.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r10s9.bed
sort -k1,1 -k2,2n ./SeqAOnly_r10s9.bed > ./SeqAOnly_r10s10.bed
bedtools shuffle -seed 1 -i SeqAOnly_r10s10.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r11s10.bed
sort -k1,1 -k2,2n ./SeqAOnly_r11s10.bed > ./SeqAOnly_r11s11.bed
bedtools shuffle -seed 1 -i SeqAOnly_r11s11.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r12s11.bed
sort -k1,1 -k2,2n ./SeqAOnly_r12s11.bed > ./SeqAOnly_r12s12.bed
bedtools shuffle -seed 1 -i SeqAOnly_r12s12.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r13s12.bed
sort -k1,1 -k2,2n ./SeqAOnly_r13s12.bed > ./SeqAOnly_r13s13.bed
bedtools shuffle -seed 1 -i SeqAOnly_r13s13.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r14s13.bed
sort -k1,1 -k2,2n ./SeqAOnly_r14s13.bed > ./SeqAOnly_r14s14.bed
bedtools shuffle -seed 1 -i SeqAOnly_r14s14.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r15s14.bed
sort -k1,1 -k2,2n ./SeqAOnly_r15s14.bed > ./SeqAOnly_r15s15.bed
bedtools shuffle -seed 1 -i SeqAOnly_r15s15.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r16s15.bed
sort -k1,1 -k2,2n ./SeqAOnly_r16s15.bed > ./SeqAOnly_r16s16.bed
bedtools shuffle -seed 1 -i SeqAOnly_r16s16.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r17s16.bed
sort -k1,1 -k2,2n ./SeqAOnly_r17s16.bed > ./SeqAOnly_r17s17.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r17s17.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r18s17.bed
sort -k1,1 -k2,2n ./SeqAOnly_r18s17.bed > ./SeqAOnly_r18s18.bed
bedtools shuffle -seed 1 -i SeqAOnly_r18s18.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r19s18.bed
sort -k1,1 -k2,2n ./SeqAOnly_r19s18.bed > ./SeqAOnly_r19s19.bed
bedtools shuffle -seed 1 -i SeqAOnly_r19s19.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r20s19.bed
sort -k1,1 -k2,2n ./SeqAOnly_r20s19.bed > ./SeqAOnly_r20s20.bed
bedtools shuffle -seed 1 -i SeqAOnly_r20s20.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r21s20.bed
sort -k1,1 -k2,2n ./SeqAOnly_r21s20.bed > ./SeqAOnly_r21s21.bed
bedtools shuffle -seed 1 -i SeqAOnly_r21s21.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r22s21.bed
sort -k1,1 -k2,2n ./SeqAOnly_r22s21.bed > ./SeqAOnly_r22s22.bed
bedtools shuffle -seed 1 -i SeqAOnly_r22s22.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r23s22.bed
sort -k1,1 -k2,2n ./SeqAOnly_r23s22.bed > ./SeqAOnly_r23s23.bed
bedtools shuffle -seed 1 -i SeqAOnly_r23s23.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r24s23.bed
sort -k1,1 -k2,2n ./SeqAOnly_r24s23.bed > ./SeqAOnly_r24s24.bed
bedtools shuffle -seed 1 -i SeqAOnly_r24s24.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r25s24.bed
sort -k1,1 -k2,2n ./SeqAOnly_r25s24.bed > ./SeqAOnly_r25s25.bed
bedtools shuffle -seed 1 -i SeqAOnly_r25s25.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r26s25.bed
sort -k1,1 -k2,2n ./SeqAOnly_r26s25.bed > ./SeqAOnly_r26s26.bed
bedtools shuffle -seed 1 -i SeqAOnly_r26s26.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r27s26.bed
sort -k1,1 -k2,2n ./SeqAOnly_r27s26.bed > ./SeqAOnly_r27s27.bed
bedtools shuffle -seed 1 -i SeqAOnly_r27s27.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r28s27.bed
sort -k1,1 -k2,2n ./SeqAOnly_r28s27.bed > ./SeqAOnly_r28s28.bed
bedtools shuffle -seed 1 -i SeqAOnly_r28s28.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r29s28.bed
sort -k1,1 -k2,2n ./SeqAOnly_r29s28.bed > ./SeqAOnly_r29s29.bed
bedtools shuffle -seed 1 -i SeqAOnly_r29s29.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r30s29.bed
sort -k1,1 -k2,2n ./SeqAOnly_r30s29.bed > ./SeqAOnly_r30s30.bed
bedtools shuffle -seed 1 -i SeqAOnly_r30s30.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r31s30.bed
sort -k1,1 -k2,2n ./SeqAOnly_r31s30.bed > ./SeqAOnly_r31s31.bed
bedtools shuffle -seed 1 -i SeqAOnly_r31s31.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r32s31.bed
sort -k1,1 -k2,2n ./SeqAOnly_r32s31.bed > ./SeqAOnly_r32s32.bed
bedtools shuffle -seed 1 -i SeqAOnly_r32s32.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r33s32.bed
sort -k1,1 -k2,2n ./SeqAOnly_r33s32.bed > ./SeqAOnly_r33s33.bed
bedtools shuffle -seed 1 -i SeqAOnly_r33s33.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r34s33.bed
sort -k1,1 -k2,2n ./SeqAOnly_r34s33.bed > ./SeqAOnly_r34s34.bed
bedtools shuffle -seed 1 -i SeqAOnly_r34s34.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r35s34.bed
sort -k1,1 -k2,2n ./SeqAOnly_r35s34.bed > ./SeqAOnly_r35s35.bed
bedtools shuffle -seed 1 -i SeqAOnly_r35s35.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r36s35.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r36s35.bed > ./SeqAOnly_r36s36.bed
bedtools shuffle -seed 1 -i SeqAOnly_r36s36.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r37s36.bed
sort -k1,1 -k2,2n ./SeqAOnly_r37s36.bed > ./SeqAOnly_r37s37.bed
bedtools shuffle -seed 1 -i SeqAOnly_r37s37.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r38s37.bed
sort -k1,1 -k2,2n ./SeqAOnly_r38s37.bed > ./SeqAOnly_r38s38.bed
bedtools shuffle -seed 1 -i SeqAOnly_r38s38.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r39s38.bed
sort -k1,1 -k2,2n ./SeqAOnly_r39s38.bed > ./SeqAOnly_r39s39.bed
bedtools shuffle -seed 1 -i SeqAOnly_r39s39.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r40s39.bed
sort -k1,1 -k2,2n ./SeqAOnly_r40s39.bed > ./SeqAOnly_r40s40.bed
bedtools shuffle -seed 1 -i SeqAOnly_r40s40.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r41s40.bed
sort -k1,1 -k2,2n ./SeqAOnly_r41s40.bed > ./SeqAOnly_r41s41.bed
bedtools shuffle -seed 1 -i SeqAOnly_r41s41.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r42s41.bed
sort -k1,1 -k2,2n ./SeqAOnly_r42s41.bed > ./SeqAOnly_r42s42.bed
bedtools shuffle -seed 1 -i SeqAOnly_r42s42.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r43s42.bed
sort -k1,1 -k2,2n ./SeqAOnly_r43s42.bed > ./SeqAOnly_r43s43.bed
bedtools shuffle -seed 1 -i SeqAOnly_r43s43.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r44s43.bed
sort -k1,1 -k2,2n ./SeqAOnly_r44s43.bed > ./SeqAOnly_r44s44.bed
bedtools shuffle -seed 1 -i SeqAOnly_r44s44.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r45s44.bed
sort -k1,1 -k2,2n ./SeqAOnly_r45s44.bed > ./SeqAOnly_r45s45.bed
bedtools shuffle -seed 1 -i SeqAOnly_r45s45.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r46s45.bed
sort -k1,1 -k2,2n ./SeqAOnly_r46s45.bed > ./SeqAOnly_r46s46.bed
bedtools shuffle -seed 1 -i SeqAOnly_r46s46.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r47s46.bed
sort -k1,1 -k2,2n ./SeqAOnly_r47s46.bed > ./SeqAOnly_r47s47.bed
bedtools shuffle -seed 1 -i SeqAOnly_r47s47.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r48s47.bed
sort -k1,1 -k2,2n ./SeqAOnly_r48s47.bed > ./SeqAOnly_r48s48.bed
bedtools shuffle -seed 1 -i SeqAOnly_r48s48.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r49s48.bed
sort -k1,1 -k2,2n ./SeqAOnly_r49s48.bed > ./SeqAOnly_r49s49.bed
bedtools shuffle -seed 1 -i SeqAOnly_r49s49.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r50s49.bed
sort -k1,1 -k2,2n ./SeqAOnly_r50s49.bed > ./SeqAOnly_r50s50.bed
bedtools shuffle -seed 1 -i SeqAOnly_r50s50.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r51s50.bed
sort -k1,1 -k2,2n ./SeqAOnly_r51s50.bed > ./SeqAOnly_r51s51.bed
bedtools shuffle -seed 1 -i SeqAOnly_r51s51.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r52s51.bed
sort -k1,1 -k2,2n ./SeqAOnly_r52s51.bed > ./SeqAOnly_r52s52.bed
bedtools shuffle -seed 1 -i SeqAOnly_r52s52.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r53s52.bed
sort -k1,1 -k2,2n ./SeqAOnly_r53s52.bed > ./SeqAOnly_r53s53.bed
bedtools shuffle -seed 1 -i SeqAOnly_r53s53.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r54s53.bed
sort -k1,1 -k2,2n ./SeqAOnly_r54s53.bed > ./SeqAOnly_r54s54.bed
```

```
    bedtools shuffle -seed 1 -i SeqAOnly_r54s54.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r55s54.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r55s54.bed > ./SeqAOnly_r55s55.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r55s55.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r56s55.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r56s55.bed > ./SeqAOnly_r56s56.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r56s56.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r57s56.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r57s56.bed > ./SeqAOnly_r57s57.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r57s57.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r58s57.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r58s57.bed > ./SeqAOnly_r58s58.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r58s58.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r59s58.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r59s58.bed > ./SeqAOnly_r59s59.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r59s59.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r60s59.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r60s59.bed > ./SeqAOnly_r60s60.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r60s60.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r61s60.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r61s60.bed > ./SeqAOnly_r61s61.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r61s61.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r62s61.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r62s61.bed > ./SeqAOnly_r62s62.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r62s62.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r63s62.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r63s62.bed > ./SeqAOnly_r63s63.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r63s63.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r64s63.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r64s63.bed > ./SeqAOnly_r64s64.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r64s64.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r65s64.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r65s64.bed > ./SeqAOnly_r65s65.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r65s65.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r66s65.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r66s65.bed > ./SeqAOnly_r66s66.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r66s66.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r67s66.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r67s66.bed > ./SeqAOnly_r67s67.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r67s67.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r68s67.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r68s67.bed > ./SeqAOnly_r68s68.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r68s68.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r69s68.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r69s68.bed > ./SeqAOnly_r69s69.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r69s69.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r70s69.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r70s69.bed > ./SeqAOnly_r70s70.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r70s70.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r71s70.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r71s70.bed > ./SeqAOnly_r71s71.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r71s71.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r72s71.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r72s71.bed > ./SeqAOnly_r72s72.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r72s72.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r73s72.bed
```

```
	sort -k1,1 -k2,2n ./SeqAOnly_r73s72.bed > ./SeqAOnly_r73s73.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r73s73.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r74s73.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r74s73.bed > ./SeqAOnly_r74s74.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r74s74.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r75s74.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r75s74.bed > ./SeqAOnly_r75s75.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r75s75.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r76s75.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r76s75.bed > ./SeqAOnly_r76s76.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r76s76.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r77s76.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r77s76.bed > ./SeqAOnly_r77s77.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r77s77.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r78s77.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r78s77.bed > ./SeqAOnly_r78s78.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r78s78.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r79s78.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r79s78.bed > ./SeqAOnly_r79s79.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r79s79.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r80s79.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r80s79.bed > ./SeqAOnly_r80s80.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r80s80.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r81s80.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r81s80.bed > ./SeqAOnly_r81s81.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r81s81.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r82s81.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r82s81.bed > ./SeqAOnly_r82s82.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r82s82.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r83s82.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r83s82.bed > ./SeqAOnly_r83s83.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r83s83.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r84s83.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r84s83.bed > ./SeqAOnly_r84s84.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r84s84.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r85s84.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r85s84.bed > ./SeqAOnly_r85s85.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r85s85.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r86s85.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r86s85.bed > ./SeqAOnly_r86s86.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r86s86.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r87s86.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r87s86.bed > ./SeqAOnly_r87s87.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r87s87.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r88s87.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r88s87.bed > ./SeqAOnly_r88s88.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r88s88.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r89s88.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r89s88.bed > ./SeqAOnly_r89s89.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r89s89.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r90s89.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r90s89.bed > ./SeqAOnly_r90s90.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r90s90.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r91s90.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r91s90.bed > ./SeqAOnly_r91s91.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r91s91.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r92s91.bed
sort -k1,1 -k2,2n ./SeqAOnly_r92s91.bed > ./SeqAOnly_r92s92.bed
bedtools shuffle -seed 1 -i SeqAOnly_r92s92.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r93s92.bed
sort -k1,1 -k2,2n ./SeqAOnly_r93s92.bed > ./SeqAOnly_r93s93.bed
bedtools shuffle -seed 1 -i SeqAOnly_r93s93.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r94s93.bed
sort -k1,1 -k2,2n ./SeqAOnly_r94s93.bed > ./SeqAOnly_r94s94.bed
bedtools shuffle -seed 1 -i SeqAOnly_r94s94.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r95s94.bed
sort -k1,1 -k2,2n ./SeqAOnly_r95s94.bed > ./SeqAOnly_r95s95.bed
bedtools shuffle -seed 1 -i SeqAOnly_r95s95.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r96s95.bed
sort -k1,1 -k2,2n ./SeqAOnly_r96s95.bed > ./SeqAOnly_r96s96.bed
bedtools shuffle -seed 1 -i SeqAOnly_r96s96.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r97s96.bed
sort -k1,1 -k2,2n ./SeqAOnly_r97s96.bed > ./SeqAOnly_r97s97.bed
bedtools shuffle -seed 1 -i SeqAOnly_r97s97.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r98s97.bed
sort -k1,1 -k2,2n ./SeqAOnly_r98s97.bed > ./SeqAOnly_r98s98.bed
bedtools shuffle -seed 1 -i SeqAOnly_r98s98.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r99s98.bed
sort -k1,1 -k2,2n ./SeqAOnly_r99s98.bed > ./SeqAOnly_r99s99.bed
bedtools shuffle -seed 1 -i SeqAOnly_r99s99.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r100s99.bed
sort -k1,1 -k2,2n ./SeqAOnly_r100s99.bed > ./SeqAOnly_r100s100.bed
bedtools shuffle -seed 1 -i SeqAOnly_r100s100.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r101s100.bed
sort -k1,1 -k2,2n ./SeqAOnly_r101s100.bed > ./SeqAOnly_r101s101.bed
bedtools shuffle -seed 1 -i SeqAOnly_r101s101.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r102s101.bed
sort -k1,1 -k2,2n ./SeqAOnly_r102s101.bed > ./SeqAOnly_r102s102.bed
bedtools shuffle -seed 1 -i SeqAOnly_r102s102.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r103s102.bed
sort -k1,1 -k2,2n ./SeqAOnly_r103s102.bed > ./SeqAOnly_r103s103.bed
bedtools shuffle -seed 1 -i SeqAOnly_r103s103.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r104s103.bed
sort -k1,1 -k2,2n ./SeqAOnly_r104s103.bed > ./SeqAOnly_r104s104.bed
bedtools shuffle -seed 1 -i SeqAOnly_r104s104.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r105s104.bed
sort -k1,1 -k2,2n ./SeqAOnly_r105s104.bed > ./SeqAOnly_r105s105.bed
bedtools shuffle -seed 1 -i SeqAOnly_r105s105.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r106s105.bed
sort -k1,1 -k2,2n ./SeqAOnly_r106s105.bed > ./SeqAOnly_r106s106.bed
bedtools shuffle -seed 1 -i SeqAOnly_r106s106.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r107s106.bed
sort -k1,1 -k2,2n ./SeqAOnly_r107s106.bed > ./SeqAOnly_r107s107.bed
bedtools shuffle -seed 1 -i SeqAOnly_r107s107.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r108s107.bed
sort -k1,1 -k2,2n ./SeqAOnly_r108s107.bed > ./SeqAOnly_r108s108.bed
bedtools shuffle -seed 1 -i SeqAOnly_r108s108.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r109s108.bed
sort -k1,1 -k2,2n ./SeqAOnly_r109s108.bed > ./SeqAOnly_r109s109.bed
bedtools shuffle -seed 1 -i SeqAOnly_r109s109.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r110s109.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r110s109.bed > ./SeqAOnly_r110s110.bed
bedtools shuffle -seed 1 -i SeqAOnly_r110s110.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r111s110.bed
sort -k1,1 -k2,2n ./SeqAOnly_r111s110.bed > ./SeqAOnly_r111s111.bed
bedtools shuffle -seed 1 -i SeqAOnly_r111s111.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r112s111.bed
sort -k1,1 -k2,2n ./SeqAOnly_r112s111.bed > ./SeqAOnly_r112s112.bed
bedtools shuffle -seed 1 -i SeqAOnly_r112s112.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r113s112.bed
sort -k1,1 -k2,2n ./SeqAOnly_r113s112.bed > ./SeqAOnly_r113s113.bed
bedtools shuffle -seed 1 -i SeqAOnly_r113s113.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r114s113.bed
sort -k1,1 -k2,2n ./SeqAOnly_r114s113.bed > ./SeqAOnly_r114s114.bed
bedtools shuffle -seed 1 -i SeqAOnly_r114s114.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r115s114.bed
sort -k1,1 -k2,2n ./SeqAOnly_r115s114.bed > ./SeqAOnly_r115s115.bed
bedtools shuffle -seed 1 -i SeqAOnly_r115s115.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r116s115.bed
sort -k1,1 -k2,2n ./SeqAOnly_r116s115.bed > ./SeqAOnly_r116s116.bed
bedtools shuffle -seed 1 -i SeqAOnly_r116s116.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r117s116.bed
sort -k1,1 -k2,2n ./SeqAOnly_r117s116.bed > ./SeqAOnly_r117s117.bed
bedtools shuffle -seed 1 -i SeqAOnly_r117s117.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r118s117.bed
sort -k1,1 -k2,2n ./SeqAOnly_r118s117.bed > ./SeqAOnly_r118s118.bed
bedtools shuffle -seed 1 -i SeqAOnly_r118s118.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r119s118.bed
sort -k1,1 -k2,2n ./SeqAOnly_r119s118.bed > ./SeqAOnly_r119s119.bed
bedtools shuffle -seed 1 -i SeqAOnly_r119s119.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r120s119.bed
sort -k1,1 -k2,2n ./SeqAOnly_r120s119.bed > ./SeqAOnly_r120s120.bed
bedtools shuffle -seed 1 -i SeqAOnly_r120s120.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r121s120.bed
sort -k1,1 -k2,2n ./SeqAOnly_r121s120.bed > ./SeqAOnly_r121s121.bed
bedtools shuffle -seed 1 -i SeqAOnly_r121s121.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r122s121.bed
sort -k1,1 -k2,2n ./SeqAOnly_r122s121.bed > ./SeqAOnly_r122s122.bed
bedtools shuffle -seed 1 -i SeqAOnly_r122s122.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r123s122.bed
sort -k1,1 -k2,2n ./SeqAOnly_r123s122.bed > ./SeqAOnly_r123s123.bed
bedtools shuffle -seed 1 -i SeqAOnly_r123s123.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r124s123.bed
sort -k1,1 -k2,2n ./SeqAOnly_r124s123.bed > ./SeqAOnly_r124s124.bed
bedtools shuffle -seed 1 -i SeqAOnly_r124s124.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r125s124.bed
sort -k1,1 -k2,2n ./SeqAOnly_r125s124.bed > ./SeqAOnly_r125s125.bed
bedtools shuffle -seed 1 -i SeqAOnly_r125s125.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r126s125.bed
sort -k1,1 -k2,2n ./SeqAOnly_r126s125.bed > ./SeqAOnly_r126s126.bed
bedtools shuffle -seed 1 -i SeqAOnly_r126s126.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r127s126.bed
sort -k1,1 -k2,2n ./SeqAOnly_r127s126.bed > ./SeqAOnly_r127s127.bed
bedtools shuffle -seed 1 -i SeqAOnly_r127s127.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r128s127.bed
sort -k1,1 -k2,2n ./SeqAOnly_r128s127.bed > ./SeqAOnly_r128s128.bed
```

```
	bedtools shuffle -seed 1 -i SeqAOnly_r128s128.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r129s128.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r129s128.bed > ./SeqAOnly_r129s129.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r129s129.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r130s129.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r130s129.bed > ./SeqAOnly_r130s130.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r130s130.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r131s130.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r131s130.bed > ./SeqAOnly_r131s131.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r131s131.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r132s131.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r132s131.bed > ./SeqAOnly_r132s132.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r132s132.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r133s132.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r133s132.bed > ./SeqAOnly_r133s133.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r133s133.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r134s133.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r134s133.bed > ./SeqAOnly_r134s134.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r134s134.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r135s134.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r135s134.bed > ./SeqAOnly_r135s135.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r135s135.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r136s135.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r136s135.bed > ./SeqAOnly_r136s136.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r136s136.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r137s136.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r137s136.bed > ./SeqAOnly_r137s137.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r137s137.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r138s137.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r138s137.bed > ./SeqAOnly_r138s138.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r138s138.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r139s138.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r139s138.bed > ./SeqAOnly_r139s139.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r139s139.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r140s139.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r140s139.bed > ./SeqAOnly_r140s140.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r140s140.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r141s140.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r141s140.bed > ./SeqAOnly_r141s141.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r141s141.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r142s141.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r142s141.bed > ./SeqAOnly_r142s142.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r142s142.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r143s142.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r143s142.bed > ./SeqAOnly_r143s143.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r143s143.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r144s143.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r144s143.bed > ./SeqAOnly_r144s144.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r144s144.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r145s144.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r145s144.bed > ./SeqAOnly_r145s145.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r145s145.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r146s145.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r146s145.bed > ./SeqAOnly_r146s146.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r146s146.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r147s146.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r147s146.bed > ./SeqAOnly_r147s147.bed
bedtools shuffle -seed 1 -i SeqAOnly_r147s147.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r148s147.bed
sort -k1,1 -k2,2n ./SeqAOnly_r148s147.bed > ./SeqAOnly_r148s148.bed
bedtools shuffle -seed 1 -i SeqAOnly_r148s148.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r149s148.bed
sort -k1,1 -k2,2n ./SeqAOnly_r149s148.bed > ./SeqAOnly_r149s149.bed
bedtools shuffle -seed 1 -i SeqAOnly_r149s149.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r150s149.bed
sort -k1,1 -k2,2n ./SeqAOnly_r150s149.bed > ./SeqAOnly_r150s150.bed
bedtools shuffle -seed 1 -i SeqAOnly_r150s150.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r151s150.bed
sort -k1,1 -k2,2n ./SeqAOnly_r151s150.bed > ./SeqAOnly_r151s151.bed
bedtools shuffle -seed 1 -i SeqAOnly_r151s151.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r152s151.bed
sort -k1,1 -k2,2n ./SeqAOnly_r152s151.bed > ./SeqAOnly_r152s152.bed
bedtools shuffle -seed 1 -i SeqAOnly_r152s152.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r153s152.bed
sort -k1,1 -k2,2n ./SeqAOnly_r153s152.bed > ./SeqAOnly_r153s153.bed
bedtools shuffle -seed 1 -i SeqAOnly_r153s153.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r154s153.bed
sort -k1,1 -k2,2n ./SeqAOnly_r154s153.bed > ./SeqAOnly_r154s154.bed
bedtools shuffle -seed 1 -i SeqAOnly_r154s154.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r155s154.bed
sort -k1,1 -k2,2n ./SeqAOnly_r155s154.bed > ./SeqAOnly_r155s155.bed
bedtools shuffle -seed 1 -i SeqAOnly_r155s155.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r156s155.bed
sort -k1,1 -k2,2n ./SeqAOnly_r156s155.bed > ./SeqAOnly_r156s156.bed
bedtools shuffle -seed 1 -i SeqAOnly_r156s156.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r157s156.bed
sort -k1,1 -k2,2n ./SeqAOnly_r157s156.bed > ./SeqAOnly_r157s157.bed
bedtools shuffle -seed 1 -i SeqAOnly_r157s157.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r158s157.bed
sort -k1,1 -k2,2n ./SeqAOnly_r158s157.bed > ./SeqAOnly_r158s158.bed
bedtools shuffle -seed 1 -i SeqAOnly_r158s158.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r159s158.bed
sort -k1,1 -k2,2n ./SeqAOnly_r159s158.bed > ./SeqAOnly_r159s159.bed
bedtools shuffle -seed 1 -i SeqAOnly_r159s159.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r160s159.bed
sort -k1,1 -k2,2n ./SeqAOnly_r160s159.bed > ./SeqAOnly_r160s160.bed
bedtools shuffle -seed 1 -i SeqAOnly_r160s160.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r161s160.bed
sort -k1,1 -k2,2n ./SeqAOnly_r161s160.bed > ./SeqAOnly_r161s161.bed
bedtools shuffle -seed 1 -i SeqAOnly_r161s161.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r162s161.bed
sort -k1,1 -k2,2n ./SeqAOnly_r162s161.bed > ./SeqAOnly_r162s162.bed
bedtools shuffle -seed 1 -i SeqAOnly_r162s162.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r163s162.bed
sort -k1,1 -k2,2n ./SeqAOnly_r163s162.bed > ./SeqAOnly_r163s163.bed
bedtools shuffle -seed 1 -i SeqAOnly_r163s163.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r164s163.bed
sort -k1,1 -k2,2n ./SeqAOnly_r164s163.bed > ./SeqAOnly_r164s164.bed
bedtools shuffle -seed 1 -i SeqAOnly_r164s164.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r165s164.bed
sort -k1,1 -k2,2n ./SeqAOnly_r165s164.bed > ./SeqAOnly_r165s165.bed
```

```
	bedtools shuffle -seed 1 -i SeqAOnly_r165s165.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r166s165.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r166s165.bed > ./SeqAOnly_r166s166.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r166s166.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r167s166.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r167s166.bed > ./SeqAOnly_r167s167.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r167s167.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r168s167.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r168s167.bed > ./SeqAOnly_r168s168.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r168s168.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r169s168.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r169s168.bed > ./SeqAOnly_r169s169.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r169s169.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r170s169.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r170s169.bed > ./SeqAOnly_r170s170.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r170s170.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r171s170.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r171s170.bed > ./SeqAOnly_r171s171.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r171s171.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r172s171.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r172s171.bed > ./SeqAOnly_r172s172.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r172s172.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r173s172.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r173s172.bed > ./SeqAOnly_r173s173.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r173s173.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r174s173.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r174s173.bed > ./SeqAOnly_r174s174.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r174s174.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r175s174.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r175s174.bed > ./SeqAOnly_r175s175.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r175s175.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r176s175.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r176s175.bed > ./SeqAOnly_r176s176.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r176s176.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r177s176.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r177s176.bed > ./SeqAOnly_r177s177.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r177s177.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r178s177.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r178s177.bed > ./SeqAOnly_r178s178.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r178s178.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r179s178.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r179s178.bed > ./SeqAOnly_r179s179.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r179s179.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r180s179.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r180s179.bed > ./SeqAOnly_r180s180.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r180s180.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r181s180.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r181s180.bed > ./SeqAOnly_r181s181.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r181s181.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r182s181.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r182s181.bed > ./SeqAOnly_r182s182.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r182s182.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r183s182.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r183s182.bed > ./SeqAOnly_r183s183.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r183s183.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r184s183.bed
```

```
	sort -k1,1 -k2,2n ./SeqAOnly_r184s183.bed > ./SeqAOnly_r184s184.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r184s184.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r185s184.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r185s184.bed > ./SeqAOnly_r185s185.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r185s185.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r186s185.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r186s185.bed > ./SeqAOnly_r186s186.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r186s186.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r187s186.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r187s186.bed > ./SeqAOnly_r187s187.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r187s187.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r188s187.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r188s187.bed > ./SeqAOnly_r188s188.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r188s188.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r189s188.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r189s188.bed > ./SeqAOnly_r189s189.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r189s189.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r190s189.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r190s189.bed > ./SeqAOnly_r190s190.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r190s190.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r191s190.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r191s190.bed > ./SeqAOnly_r191s191.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r191s191.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r192s191.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r192s191.bed > ./SeqAOnly_r192s192.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r192s192.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r193s192.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r193s192.bed > ./SeqAOnly_r193s193.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r193s193.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r194s193.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r194s193.bed > ./SeqAOnly_r194s194.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r194s194.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r195s194.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r195s194.bed > ./SeqAOnly_r195s195.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r195s195.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r196s195.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r196s195.bed > ./SeqAOnly_r196s196.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r196s196.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r197s196.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r197s196.bed > ./SeqAOnly_r197s197.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r197s197.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r198s197.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r198s197.bed > ./SeqAOnly_r198s198.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r198s198.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r199s198.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r199s198.bed > ./SeqAOnly_r199s199.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r199s199.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r200s199.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r200s199.bed > ./SeqAOnly_r200s200.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r200s200.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r201s200.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r201s200.bed > ./SeqAOnly_r201s201.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r201s201.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r202s201.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r202s201.bed > ./SeqAOnly_r202s202.bed
```

```
    bedtools shuffle -seed 1 -i SeqAOnly_r202s202.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r203s202.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r203s202.bed > ./SeqAOnly_r203s203.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r203s203.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r204s203.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r204s203.bed > ./SeqAOnly_r204s204.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r204s204.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r205s204.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r205s204.bed > ./SeqAOnly_r205s205.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r205s205.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r206s205.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r206s205.bed > ./SeqAOnly_r206s206.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r206s206.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r207s206.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r207s206.bed > ./SeqAOnly_r207s207.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r207s207.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r208s207.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r208s207.bed > ./SeqAOnly_r208s208.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r208s208.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r209s208.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r209s208.bed > ./SeqAOnly_r209s209.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r209s209.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r210s209.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r210s209.bed > ./SeqAOnly_r210s210.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r210s210.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r211s210.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r211s210.bed > ./SeqAOnly_r211s211.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r211s211.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r212s211.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r212s211.bed > ./SeqAOnly_r212s212.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r212s212.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r213s212.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r213s212.bed > ./SeqAOnly_r213s213.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r213s213.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r214s213.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r214s213.bed > ./SeqAOnly_r214s214.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r214s214.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r215s214.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r215s214.bed > ./SeqAOnly_r215s215.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r215s215.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r216s215.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r216s215.bed > ./SeqAOnly_r216s216.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r216s216.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r217s216.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r217s216.bed > ./SeqAOnly_r217s217.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r217s217.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r218s217.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r218s217.bed > ./SeqAOnly_r218s218.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r218s218.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r219s218.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r219s218.bed > ./SeqAOnly_r219s219.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r219s219.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r220s219.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r220s219.bed > ./SeqAOnly_r220s220.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r220s220.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r221s220.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r221s220.bed > ./SeqAOnly_r221s221.bed
bedtools shuffle -seed 1 -i SeqAOnly_r221s221.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r222s221.bed
sort -k1,1 -k2,2n ./SeqAOnly_r222s221.bed > ./SeqAOnly_r222s222.bed
bedtools shuffle -seed 1 -i SeqAOnly_r222s222.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r223s222.bed
sort -k1,1 -k2,2n ./SeqAOnly_r223s222.bed > ./SeqAOnly_r223s223.bed
bedtools shuffle -seed 1 -i SeqAOnly_r223s223.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r224s223.bed
sort -k1,1 -k2,2n ./SeqAOnly_r224s223.bed > ./SeqAOnly_r224s224.bed
bedtools shuffle -seed 1 -i SeqAOnly_r224s224.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r225s224.bed
sort -k1,1 -k2,2n ./SeqAOnly_r225s224.bed > ./SeqAOnly_r225s225.bed
bedtools shuffle -seed 1 -i SeqAOnly_r225s225.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r226s225.bed
sort -k1,1 -k2,2n ./SeqAOnly_r226s225.bed > ./SeqAOnly_r226s226.bed
bedtools shuffle -seed 1 -i SeqAOnly_r226s226.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r227s226.bed
sort -k1,1 -k2,2n ./SeqAOnly_r227s226.bed > ./SeqAOnly_r227s227.bed
bedtools shuffle -seed 1 -i SeqAOnly_r227s227.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r228s227.bed
sort -k1,1 -k2,2n ./SeqAOnly_r228s227.bed > ./SeqAOnly_r228s228.bed
bedtools shuffle -seed 1 -i SeqAOnly_r228s228.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r229s228.bed
sort -k1,1 -k2,2n ./SeqAOnly_r229s228.bed > ./SeqAOnly_r229s229.bed
bedtools shuffle -seed 1 -i SeqAOnly_r229s229.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r230s229.bed
sort -k1,1 -k2,2n ./SeqAOnly_r230s229.bed > ./SeqAOnly_r230s230.bed
bedtools shuffle -seed 1 -i SeqAOnly_r230s230.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r231s230.bed
sort -k1,1 -k2,2n ./SeqAOnly_r231s230.bed > ./SeqAOnly_r231s231.bed
bedtools shuffle -seed 1 -i SeqAOnly_r231s231.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r232s231.bed
sort -k1,1 -k2,2n ./SeqAOnly_r232s231.bed > ./SeqAOnly_r232s232.bed
bedtools shuffle -seed 1 -i SeqAOnly_r232s232.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r233s232.bed
sort -k1,1 -k2,2n ./SeqAOnly_r233s232.bed > ./SeqAOnly_r233s233.bed
bedtools shuffle -seed 1 -i SeqAOnly_r233s233.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r234s233.bed
sort -k1,1 -k2,2n ./SeqAOnly_r234s233.bed > ./SeqAOnly_r234s234.bed
bedtools shuffle -seed 1 -i SeqAOnly_r234s234.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r235s234.bed
sort -k1,1 -k2,2n ./SeqAOnly_r235s234.bed > ./SeqAOnly_r235s235.bed
bedtools shuffle -seed 1 -i SeqAOnly_r235s235.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r236s235.bed
sort -k1,1 -k2,2n ./SeqAOnly_r236s235.bed > ./SeqAOnly_r236s236.bed
bedtools shuffle -seed 1 -i SeqAOnly_r236s236.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r237s236.bed
sort -k1,1 -k2,2n ./SeqAOnly_r237s236.bed > ./SeqAOnly_r237s237.bed
bedtools shuffle -seed 1 -i SeqAOnly_r237s237.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r238s237.bed
sort -k1,1 -k2,2n ./SeqAOnly_r238s237.bed > ./SeqAOnly_r238s238.bed
bedtools shuffle -seed 1 -i SeqAOnly_r238s238.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r239s238.bed
sort -k1,1 -k2,2n ./SeqAOnly_r239s238.bed > ./SeqAOnly_r239s239.bed
```

```
	bedtools shuffle -seed 1 -i SeqAOnly_r239s239.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r240s239.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r240s239.bed > ./SeqAOnly_r240s240.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r240s240.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r241s240.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r241s240.bed > ./SeqAOnly_r241s241.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r241s241.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r242s241.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r242s241.bed > ./SeqAOnly_r242s242.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r242s242.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r243s242.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r243s242.bed > ./SeqAOnly_r243s243.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r243s243.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r244s243.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r244s243.bed > ./SeqAOnly_r244s244.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r244s244.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r245s244.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r245s244.bed > ./SeqAOnly_r245s245.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r245s245.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r246s245.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r246s245.bed > ./SeqAOnly_r246s246.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r246s246.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r247s246.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r247s246.bed > ./SeqAOnly_r247s247.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r247s247.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r248s247.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r248s247.bed > ./SeqAOnly_r248s248.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r248s248.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r249s248.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r249s248.bed > ./SeqAOnly_r249s249.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r249s249.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r250s249.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r250s249.bed > ./SeqAOnly_r250s250.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r250s250.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r251s250.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r251s250.bed > ./SeqAOnly_r251s251.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r251s251.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r252s251.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r252s251.bed > ./SeqAOnly_r252s252.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r252s252.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r253s252.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r253s252.bed > ./SeqAOnly_r253s253.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r253s253.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r254s253.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r254s253.bed > ./SeqAOnly_r254s254.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r254s254.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r255s254.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r255s254.bed > ./SeqAOnly_r255s255.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r255s255.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r256s255.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r256s255.bed > ./SeqAOnly_r256s256.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r256s256.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r257s256.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r257s256.bed > ./SeqAOnly_r257s257.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r257s257.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r258s257.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r258s257.bed > ./SeqAOnly_r258s258.bed
bedtools shuffle -seed 1 -i SeqAOnly_r258s258.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r259s258.bed
sort -k1,1 -k2,2n ./SeqAOnly_r259s258.bed > ./SeqAOnly_r259s259.bed
bedtools shuffle -seed 1 -i SeqAOnly_r259s259.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r260s259.bed
sort -k1,1 -k2,2n ./SeqAOnly_r260s259.bed > ./SeqAOnly_r260s260.bed
bedtools shuffle -seed 1 -i SeqAOnly_r260s260.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r261s260.bed
sort -k1,1 -k2,2n ./SeqAOnly_r261s260.bed > ./SeqAOnly_r261s261.bed
bedtools shuffle -seed 1 -i SeqAOnly_r261s261.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r262s261.bed
sort -k1,1 -k2,2n ./SeqAOnly_r262s261.bed > ./SeqAOnly_r262s262.bed
bedtools shuffle -seed 1 -i SeqAOnly_r262s262.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r263s262.bed
sort -k1,1 -k2,2n ./SeqAOnly_r263s262.bed > ./SeqAOnly_r263s263.bed
bedtools shuffle -seed 1 -i SeqAOnly_r263s263.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r264s263.bed
sort -k1,1 -k2,2n ./SeqAOnly_r264s263.bed > ./SeqAOnly_r264s264.bed
bedtools shuffle -seed 1 -i SeqAOnly_r264s264.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r265s264.bed
sort -k1,1 -k2,2n ./SeqAOnly_r265s264.bed > ./SeqAOnly_r265s265.bed
bedtools shuffle -seed 1 -i SeqAOnly_r265s265.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r266s265.bed
sort -k1,1 -k2,2n ./SeqAOnly_r266s265.bed > ./SeqAOnly_r266s266.bed
bedtools shuffle -seed 1 -i SeqAOnly_r266s266.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r267s266.bed
sort -k1,1 -k2,2n ./SeqAOnly_r267s266.bed > ./SeqAOnly_r267s267.bed
bedtools shuffle -seed 1 -i SeqAOnly_r267s267.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r268s267.bed
sort -k1,1 -k2,2n ./SeqAOnly_r268s267.bed > ./SeqAOnly_r268s268.bed
bedtools shuffle -seed 1 -i SeqAOnly_r268s268.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r269s268.bed
sort -k1,1 -k2,2n ./SeqAOnly_r269s268.bed > ./SeqAOnly_r269s269.bed
bedtools shuffle -seed 1 -i SeqAOnly_r269s269.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r270s269.bed
sort -k1,1 -k2,2n ./SeqAOnly_r270s269.bed > ./SeqAOnly_r270s270.bed
bedtools shuffle -seed 1 -i SeqAOnly_r270s270.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r271s270.bed
sort -k1,1 -k2,2n ./SeqAOnly_r271s270.bed > ./SeqAOnly_r271s271.bed
bedtools shuffle -seed 1 -i SeqAOnly_r271s271.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r272s271.bed
sort -k1,1 -k2,2n ./SeqAOnly_r272s271.bed > ./SeqAOnly_r272s272.bed
bedtools shuffle -seed 1 -i SeqAOnly_r272s272.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r273s272.bed
sort -k1,1 -k2,2n ./SeqAOnly_r273s272.bed > ./SeqAOnly_r273s273.bed
bedtools shuffle -seed 1 -i SeqAOnly_r273s273.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r274s273.bed
sort -k1,1 -k2,2n ./SeqAOnly_r274s273.bed > ./SeqAOnly_r274s274.bed
bedtools shuffle -seed 1 -i SeqAOnly_r274s274.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r275s274.bed
sort -k1,1 -k2,2n ./SeqAOnly_r275s274.bed > ./SeqAOnly_r275s275.bed
bedtools shuffle -seed 1 -i SeqAOnly_r275s275.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r276s275.bed
sort -k1,1 -k2,2n ./SeqAOnly_r276s275.bed > ./SeqAOnly_r276s276.bed
```

```
    bedtools shuffle -seed 1 -i SeqAOnly_r276s276.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r277s276.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r277s276.bed > ./SeqAOnly_r277s277.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r277s277.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r278s277.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r278s277.bed > ./SeqAOnly_r278s278.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r278s278.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r279s278.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r279s278.bed > ./SeqAOnly_r279s279.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r279s279.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r280s279.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r280s279.bed > ./SeqAOnly_r280s280.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r280s280.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r281s280.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r281s280.bed > ./SeqAOnly_r281s281.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r281s281.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r282s281.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r282s281.bed > ./SeqAOnly_r282s282.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r282s282.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r283s282.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r283s282.bed > ./SeqAOnly_r283s283.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r283s283.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r284s283.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r284s283.bed > ./SeqAOnly_r284s284.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r284s284.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r285s284.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r285s284.bed > ./SeqAOnly_r285s285.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r285s285.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r286s285.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r286s285.bed > ./SeqAOnly_r286s286.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r286s286.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r287s286.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r287s286.bed > ./SeqAOnly_r287s287.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r287s287.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r288s287.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r288s287.bed > ./SeqAOnly_r288s288.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r288s288.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r289s288.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r289s288.bed > ./SeqAOnly_r289s289.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r289s289.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r290s289.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r290s289.bed > ./SeqAOnly_r290s290.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r290s290.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r291s290.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r291s290.bed > ./SeqAOnly_r291s291.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r291s291.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r292s291.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r292s291.bed > ./SeqAOnly_r292s292.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r292s292.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r293s292.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r293s292.bed > ./SeqAOnly_r293s293.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r293s293.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r294s293.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r294s293.bed > ./SeqAOnly_r294s294.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r294s294.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r295s294.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r295s294.bed > ./SeqAOnly_r295s295.bed
bedtools shuffle -seed 1 -i SeqAOnly_r295s295.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r296s295.bed
sort -k1,1 -k2,2n ./SeqAOnly_r296s295.bed > ./SeqAOnly_r296s296.bed
bedtools shuffle -seed 1 -i SeqAOnly_r296s296.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r297s296.bed
sort -k1,1 -k2,2n ./SeqAOnly_r297s296.bed > ./SeqAOnly_r297s297.bed
bedtools shuffle -seed 1 -i SeqAOnly_r297s297.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r298s297.bed
sort -k1,1 -k2,2n ./SeqAOnly_r298s297.bed > ./SeqAOnly_r298s298.bed
bedtools shuffle -seed 1 -i SeqAOnly_r298s298.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r299s298.bed
sort -k1,1 -k2,2n ./SeqAOnly_r299s298.bed > ./SeqAOnly_r299s299.bed
bedtools shuffle -seed 1 -i SeqAOnly_r299s299.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r300s299.bed
sort -k1,1 -k2,2n ./SeqAOnly_r300s299.bed > ./SeqAOnly_r300s300.bed
bedtools shuffle -seed 1 -i SeqAOnly_r300s300.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r301s300.bed
sort -k1,1 -k2,2n ./SeqAOnly_r301s300.bed > ./SeqAOnly_r301s301.bed
bedtools shuffle -seed 1 -i SeqAOnly_r301s301.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r302s301.bed
sort -k1,1 -k2,2n ./SeqAOnly_r302s301.bed > ./SeqAOnly_r302s302.bed
bedtools shuffle -seed 1 -i SeqAOnly_r302s302.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r303s302.bed
sort -k1,1 -k2,2n ./SeqAOnly_r303s302.bed > ./SeqAOnly_r303s303.bed
bedtools shuffle -seed 1 -i SeqAOnly_r303s303.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r304s303.bed
sort -k1,1 -k2,2n ./SeqAOnly_r304s303.bed > ./SeqAOnly_r304s304.bed
bedtools shuffle -seed 1 -i SeqAOnly_r304s304.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r305s304.bed
sort -k1,1 -k2,2n ./SeqAOnly_r305s304.bed > ./SeqAOnly_r305s305.bed
bedtools shuffle -seed 1 -i SeqAOnly_r305s305.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r306s305.bed
sort -k1,1 -k2,2n ./SeqAOnly_r306s305.bed > ./SeqAOnly_r306s306.bed
bedtools shuffle -seed 1 -i SeqAOnly_r306s306.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r307s306.bed
sort -k1,1 -k2,2n ./SeqAOnly_r307s306.bed > ./SeqAOnly_r307s307.bed
bedtools shuffle -seed 1 -i SeqAOnly_r307s307.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r308s307.bed
sort -k1,1 -k2,2n ./SeqAOnly_r308s307.bed > ./SeqAOnly_r308s308.bed
bedtools shuffle -seed 1 -i SeqAOnly_r308s308.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r309s308.bed
sort -k1,1 -k2,2n ./SeqAOnly_r309s308.bed > ./SeqAOnly_r309s309.bed
bedtools shuffle -seed 1 -i SeqAOnly_r309s309.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r310s309.bed
sort -k1,1 -k2,2n ./SeqAOnly_r310s309.bed > ./SeqAOnly_r310s310.bed
bedtools shuffle -seed 1 -i SeqAOnly_r310s310.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r311s310.bed
sort -k1,1 -k2,2n ./SeqAOnly_r311s310.bed > ./SeqAOnly_r311s311.bed
bedtools shuffle -seed 1 -i SeqAOnly_r311s311.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r312s311.bed
sort -k1,1 -k2,2n ./SeqAOnly_r312s311.bed > ./SeqAOnly_r312s312.bed
bedtools shuffle -seed 1 -i SeqAOnly_r312s312.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r313s312.bed
sort -k1,1 -k2,2n ./SeqAOnly_r313s312.bed > ./SeqAOnly_r313s313.bed
```

```
    bedtools shuffle -seed 1 -i SeqAOnly_r313s313.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r314s313.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r314s313.bed > ./SeqAOnly_r314s314.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r314s314.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r315s314.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r315s314.bed > ./SeqAOnly_r315s315.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r315s315.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r316s315.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r316s315.bed > ./SeqAOnly_r316s316.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r316s316.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r317s316.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r317s316.bed > ./SeqAOnly_r317s317.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r317s317.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r318s317.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r318s317.bed > ./SeqAOnly_r318s318.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r318s318.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r319s318.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r319s318.bed > ./SeqAOnly_r319s319.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r319s319.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r320s319.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r320s319.bed > ./SeqAOnly_r320s320.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r320s320.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r321s320.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r321s320.bed > ./SeqAOnly_r321s321.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r321s321.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r322s321.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r322s321.bed > ./SeqAOnly_r322s322.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r322s322.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r323s322.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r323s322.bed > ./SeqAOnly_r323s323.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r323s323.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r324s323.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r324s323.bed > ./SeqAOnly_r324s324.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r324s324.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r325s324.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r325s324.bed > ./SeqAOnly_r325s325.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r325s325.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r326s325.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r326s325.bed > ./SeqAOnly_r326s326.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r326s326.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r327s326.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r327s326.bed > ./SeqAOnly_r327s327.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r327s327.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r328s327.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r328s327.bed > ./SeqAOnly_r328s328.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r328s328.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r329s328.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r329s328.bed > ./SeqAOnly_r329s329.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r329s329.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r330s329.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r330s329.bed > ./SeqAOnly_r330s330.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r330s330.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r331s330.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r331s330.bed > ./SeqAOnly_r331s331.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r331s331.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r332s331.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r332s331.bed > ./SeqAOnly_r332s332.bed
bedtools shuffle -seed 1 -i SeqAOnly_r332s332.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r333s332.bed
sort -k1,1 -k2,2n ./SeqAOnly_r333s332.bed > ./SeqAOnly_r333s333.bed
bedtools shuffle -seed 1 -i SeqAOnly_r333s333.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r334s333.bed
sort -k1,1 -k2,2n ./SeqAOnly_r334s333.bed > ./SeqAOnly_r334s334.bed
bedtools shuffle -seed 1 -i SeqAOnly_r334s334.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r335s334.bed
sort -k1,1 -k2,2n ./SeqAOnly_r335s334.bed > ./SeqAOnly_r335s335.bed
bedtools shuffle -seed 1 -i SeqAOnly_r335s335.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r336s335.bed
sort -k1,1 -k2,2n ./SeqAOnly_r336s335.bed > ./SeqAOnly_r336s336.bed
bedtools shuffle -seed 1 -i SeqAOnly_r336s336.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r337s336.bed
sort -k1,1 -k2,2n ./SeqAOnly_r337s336.bed > ./SeqAOnly_r337s337.bed
bedtools shuffle -seed 1 -i SeqAOnly_r337s337.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r338s337.bed
sort -k1,1 -k2,2n ./SeqAOnly_r338s337.bed > ./SeqAOnly_r338s338.bed
bedtools shuffle -seed 1 -i SeqAOnly_r338s338.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r339s338.bed
sort -k1,1 -k2,2n ./SeqAOnly_r339s338.bed > ./SeqAOnly_r339s339.bed
bedtools shuffle -seed 1 -i SeqAOnly_r339s339.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r340s339.bed
sort -k1,1 -k2,2n ./SeqAOnly_r340s339.bed > ./SeqAOnly_r340s340.bed
bedtools shuffle -seed 1 -i SeqAOnly_r340s340.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r341s340.bed
sort -k1,1 -k2,2n ./SeqAOnly_r341s340.bed > ./SeqAOnly_r341s341.bed
bedtools shuffle -seed 1 -i SeqAOnly_r341s341.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r342s341.bed
sort -k1,1 -k2,2n ./SeqAOnly_r342s341.bed > ./SeqAOnly_r342s342.bed
bedtools shuffle -seed 1 -i SeqAOnly_r342s342.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r343s342.bed
sort -k1,1 -k2,2n ./SeqAOnly_r343s342.bed > ./SeqAOnly_r343s343.bed
bedtools shuffle -seed 1 -i SeqAOnly_r343s343.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r344s343.bed
sort -k1,1 -k2,2n ./SeqAOnly_r344s343.bed > ./SeqAOnly_r344s344.bed
bedtools shuffle -seed 1 -i SeqAOnly_r344s344.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r345s344.bed
sort -k1,1 -k2,2n ./SeqAOnly_r345s344.bed > ./SeqAOnly_r345s345.bed
bedtools shuffle -seed 1 -i SeqAOnly_r345s345.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r346s345.bed
sort -k1,1 -k2,2n ./SeqAOnly_r346s345.bed > ./SeqAOnly_r346s346.bed
bedtools shuffle -seed 1 -i SeqAOnly_r346s346.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r347s346.bed
sort -k1,1 -k2,2n ./SeqAOnly_r347s346.bed > ./SeqAOnly_r347s347.bed
bedtools shuffle -seed 1 -i SeqAOnly_r347s347.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r348s347.bed
sort -k1,1 -k2,2n ./SeqAOnly_r348s347.bed > ./SeqAOnly_r348s348.bed
bedtools shuffle -seed 1 -i SeqAOnly_r348s348.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r349s348.bed
sort -k1,1 -k2,2n ./SeqAOnly_r349s348.bed > ./SeqAOnly_r349s349.bed
bedtools shuffle -seed 1 -i SeqAOnly_r349s349.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r350s349.bed
sort -k1,1 -k2,2n ./SeqAOnly_r350s349.bed > ./SeqAOnly_r350s350.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r350s350.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r351s350.bed
sort -k1,1 -k2,2n ./SeqAOnly_r351s350.bed > ./SeqAOnly_r351s351.bed
bedtools shuffle -seed 1 -i SeqAOnly_r351s351.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r352s351.bed
sort -k1,1 -k2,2n ./SeqAOnly_r352s351.bed > ./SeqAOnly_r352s352.bed
bedtools shuffle -seed 1 -i SeqAOnly_r352s352.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r353s352.bed
sort -k1,1 -k2,2n ./SeqAOnly_r353s352.bed > ./SeqAOnly_r353s353.bed
bedtools shuffle -seed 1 -i SeqAOnly_r353s353.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r354s353.bed
sort -k1,1 -k2,2n ./SeqAOnly_r354s353.bed > ./SeqAOnly_r354s354.bed
bedtools shuffle -seed 1 -i SeqAOnly_r354s354.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r355s354.bed
sort -k1,1 -k2,2n ./SeqAOnly_r355s354.bed > ./SeqAOnly_r355s355.bed
bedtools shuffle -seed 1 -i SeqAOnly_r355s355.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r356s355.bed
sort -k1,1 -k2,2n ./SeqAOnly_r356s355.bed > ./SeqAOnly_r356s356.bed
bedtools shuffle -seed 1 -i SeqAOnly_r356s356.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r357s356.bed
sort -k1,1 -k2,2n ./SeqAOnly_r357s356.bed > ./SeqAOnly_r357s357.bed
bedtools shuffle -seed 1 -i SeqAOnly_r357s357.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r358s357.bed
sort -k1,1 -k2,2n ./SeqAOnly_r358s357.bed > ./SeqAOnly_r358s358.bed
bedtools shuffle -seed 1 -i SeqAOnly_r358s358.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r359s358.bed
sort -k1,1 -k2,2n ./SeqAOnly_r359s358.bed > ./SeqAOnly_r359s359.bed
bedtools shuffle -seed 1 -i SeqAOnly_r359s359.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r360s359.bed
sort -k1,1 -k2,2n ./SeqAOnly_r360s359.bed > ./SeqAOnly_r360s360.bed
bedtools shuffle -seed 1 -i SeqAOnly_r360s360.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r361s360.bed
sort -k1,1 -k2,2n ./SeqAOnly_r361s360.bed > ./SeqAOnly_r361s361.bed
bedtools shuffle -seed 1 -i SeqAOnly_r361s361.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r362s361.bed
sort -k1,1 -k2,2n ./SeqAOnly_r362s361.bed > ./SeqAOnly_r362s362.bed
bedtools shuffle -seed 1 -i SeqAOnly_r362s362.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r363s362.bed
sort -k1,1 -k2,2n ./SeqAOnly_r363s362.bed > ./SeqAOnly_r363s363.bed
bedtools shuffle -seed 1 -i SeqAOnly_r363s363.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r364s363.bed
sort -k1,1 -k2,2n ./SeqAOnly_r364s363.bed > ./SeqAOnly_r364s364.bed
bedtools shuffle -seed 1 -i SeqAOnly_r364s364.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r365s364.bed
sort -k1,1 -k2,2n ./SeqAOnly_r365s364.bed > ./SeqAOnly_r365s365.bed
bedtools shuffle -seed 1 -i SeqAOnly_r365s365.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r366s365.bed
sort -k1,1 -k2,2n ./SeqAOnly_r366s365.bed > ./SeqAOnly_r366s366.bed
bedtools shuffle -seed 1 -i SeqAOnly_r366s366.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r367s366.bed
sort -k1,1 -k2,2n ./SeqAOnly_r367s366.bed > ./SeqAOnly_r367s367.bed
bedtools shuffle -seed 1 -i SeqAOnly_r367s367.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r368s367.bed
sort -k1,1 -k2,2n ./SeqAOnly_r368s367.bed > ./SeqAOnly_r368s368.bed
bedtools shuffle -seed 1 -i SeqAOnly_r368s368.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r369s368.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_r369s368.bed > ./SeqAOnly_r369s369.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r369s369.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r370s369.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r370s369.bed > ./SeqAOnly_r370s370.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r370s370.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r371s370.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r371s370.bed > ./SeqAOnly_r371s371.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r371s371.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r372s371.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r372s371.bed > ./SeqAOnly_r372s372.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r372s372.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r373s372.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r373s372.bed > ./SeqAOnly_r373s373.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r373s373.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r374s373.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r374s373.bed > ./SeqAOnly_r374s374.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r374s374.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r375s374.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r375s374.bed > ./SeqAOnly_r375s375.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r375s375.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r376s375.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r376s375.bed > ./SeqAOnly_r376s376.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r376s376.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r377s376.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r377s376.bed > ./SeqAOnly_r377s377.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r377s377.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r378s377.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r378s377.bed > ./SeqAOnly_r378s378.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r378s378.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r379s378.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r379s378.bed > ./SeqAOnly_r379s379.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r379s379.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r380s379.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r380s379.bed > ./SeqAOnly_r380s380.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r380s380.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r381s380.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r381s380.bed > ./SeqAOnly_r381s381.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r381s381.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r382s381.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r382s381.bed > ./SeqAOnly_r382s382.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r382s382.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r383s382.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r383s382.bed > ./SeqAOnly_r383s383.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r383s383.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r384s383.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r384s383.bed > ./SeqAOnly_r384s384.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r384s384.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r385s384.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r385s384.bed > ./SeqAOnly_r385s385.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r385s385.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r386s385.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r386s385.bed > ./SeqAOnly_r386s386.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r386s386.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r387s386.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r387s386.bed > ./SeqAOnly_r387s387.bed
```

```
	bedtools shuffle -seed 1 -i SeqAOnly_r387s387.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r388s387.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r388s387.bed > ./SeqAOnly_r388s388.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r388s388.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r389s388.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r389s388.bed > ./SeqAOnly_r389s389.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r389s389.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r390s389.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r390s389.bed > ./SeqAOnly_r390s390.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r390s390.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r391s390.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r391s390.bed > ./SeqAOnly_r391s391.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r391s391.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r392s391.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r392s391.bed > ./SeqAOnly_r392s392.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r392s392.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r393s392.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r393s392.bed > ./SeqAOnly_r393s393.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r393s393.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r394s393.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r394s393.bed > ./SeqAOnly_r394s394.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r394s394.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r395s394.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r395s394.bed > ./SeqAOnly_r395s395.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r395s395.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r396s395.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r396s395.bed > ./SeqAOnly_r396s396.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r396s396.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r397s396.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r397s396.bed > ./SeqAOnly_r397s397.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r397s397.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r398s397.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r398s397.bed > ./SeqAOnly_r398s398.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r398s398.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r399s398.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r399s398.bed > ./SeqAOnly_r399s399.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r399s399.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r400s399.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r400s399.bed > ./SeqAOnly_r400s400.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r400s400.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r401s400.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r401s400.bed > ./SeqAOnly_r401s401.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r401s401.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r402s401.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r402s401.bed > ./SeqAOnly_r402s402.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r402s402.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r403s402.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r403s402.bed > ./SeqAOnly_r403s403.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r403s403.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r404s403.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r404s403.bed > ./SeqAOnly_r404s404.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r404s404.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r405s404.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r405s404.bed > ./SeqAOnly_r405s405.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r405s405.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r406s405.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r406s405.bed > ./SeqAOnly_r406s406.bed
bedtools shuffle -seed 1 -i SeqAOnly_r406s406.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r407s406.bed
sort -k1,1 -k2,2n ./SeqAOnly_r407s406.bed > ./SeqAOnly_r407s407.bed
bedtools shuffle -seed 1 -i SeqAOnly_r407s407.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r408s407.bed
sort -k1,1 -k2,2n ./SeqAOnly_r408s407.bed > ./SeqAOnly_r408s408.bed
bedtools shuffle -seed 1 -i SeqAOnly_r408s408.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r409s408.bed
sort -k1,1 -k2,2n ./SeqAOnly_r409s408.bed > ./SeqAOnly_r409s409.bed
bedtools shuffle -seed 1 -i SeqAOnly_r409s409.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r410s409.bed
sort -k1,1 -k2,2n ./SeqAOnly_r410s409.bed > ./SeqAOnly_r410s410.bed
bedtools shuffle -seed 1 -i SeqAOnly_r410s410.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r411s410.bed
sort -k1,1 -k2,2n ./SeqAOnly_r411s410.bed > ./SeqAOnly_r411s411.bed
bedtools shuffle -seed 1 -i SeqAOnly_r411s411.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r412s411.bed
sort -k1,1 -k2,2n ./SeqAOnly_r412s411.bed > ./SeqAOnly_r412s412.bed
bedtools shuffle -seed 1 -i SeqAOnly_r412s412.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r413s412.bed
sort -k1,1 -k2,2n ./SeqAOnly_r413s412.bed > ./SeqAOnly_r413s413.bed
bedtools shuffle -seed 1 -i SeqAOnly_r413s413.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r414s413.bed
sort -k1,1 -k2,2n ./SeqAOnly_r414s413.bed > ./SeqAOnly_r414s414.bed
bedtools shuffle -seed 1 -i SeqAOnly_r414s414.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r415s414.bed
sort -k1,1 -k2,2n ./SeqAOnly_r415s414.bed > ./SeqAOnly_r415s415.bed
bedtools shuffle -seed 1 -i SeqAOnly_r415s415.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r416s415.bed
sort -k1,1 -k2,2n ./SeqAOnly_r416s415.bed > ./SeqAOnly_r416s416.bed
bedtools shuffle -seed 1 -i SeqAOnly_r416s416.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r417s416.bed
sort -k1,1 -k2,2n ./SeqAOnly_r417s416.bed > ./SeqAOnly_r417s417.bed
bedtools shuffle -seed 1 -i SeqAOnly_r417s417.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r418s417.bed
sort -k1,1 -k2,2n ./SeqAOnly_r418s417.bed > ./SeqAOnly_r418s418.bed
bedtools shuffle -seed 1 -i SeqAOnly_r418s418.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r419s418.bed
sort -k1,1 -k2,2n ./SeqAOnly_r419s418.bed > ./SeqAOnly_r419s419.bed
bedtools shuffle -seed 1 -i SeqAOnly_r419s419.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r420s419.bed
sort -k1,1 -k2,2n ./SeqAOnly_r420s419.bed > ./SeqAOnly_r420s420.bed
bedtools shuffle -seed 1 -i SeqAOnly_r420s420.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r421s420.bed
sort -k1,1 -k2,2n ./SeqAOnly_r421s420.bed > ./SeqAOnly_r421s421.bed
bedtools shuffle -seed 1 -i SeqAOnly_r421s421.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r422s421.bed
sort -k1,1 -k2,2n ./SeqAOnly_r422s421.bed > ./SeqAOnly_r422s422.bed
bedtools shuffle -seed 1 -i SeqAOnly_r422s422.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r423s422.bed
sort -k1,1 -k2,2n ./SeqAOnly_r423s422.bed > ./SeqAOnly_r423s423.bed
bedtools shuffle -seed 1 -i SeqAOnly_r423s423.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r424s423.bed
sort -k1,1 -k2,2n ./SeqAOnly_r424s423.bed > ./SeqAOnly_r424s424.bed
```

```
	bedtools shuffle -seed 1 -i SeqAOnly_r424s424.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r425s424.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r425s424.bed > ./SeqAOnly_r425s425.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r425s425.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r426s425.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r426s425.bed > ./SeqAOnly_r426s426.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r426s426.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r427s426.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r427s426.bed > ./SeqAOnly_r427s427.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r427s427.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r428s427.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r428s427.bed > ./SeqAOnly_r428s428.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r428s428.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r429s428.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r429s428.bed > ./SeqAOnly_r429s429.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r429s429.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r430s429.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r430s429.bed > ./SeqAOnly_r430s430.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r430s430.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r431s430.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r431s430.bed > ./SeqAOnly_r431s431.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r431s431.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r432s431.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r432s431.bed > ./SeqAOnly_r432s432.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r432s432.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r433s432.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r433s432.bed > ./SeqAOnly_r433s433.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r433s433.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r434s433.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r434s433.bed > ./SeqAOnly_r434s434.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r434s434.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r435s434.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r435s434.bed > ./SeqAOnly_r435s435.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r435s435.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r436s435.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r436s435.bed > ./SeqAOnly_r436s436.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r436s436.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r437s436.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r437s436.bed > ./SeqAOnly_r437s437.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r437s437.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r438s437.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r438s437.bed > ./SeqAOnly_r438s438.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r438s438.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r439s438.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r439s438.bed > ./SeqAOnly_r439s439.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r439s439.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r440s439.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r440s439.bed > ./SeqAOnly_r440s440.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r440s440.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r441s440.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r441s440.bed > ./SeqAOnly_r441s441.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r441s441.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r442s441.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r442s441.bed > ./SeqAOnly_r442s442.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r442s442.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r443s442.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r443s442.bed > ./SeqAOnly_r443s443.bed
bedtools shuffle -seed 1 -i SeqAOnly_r443s443.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r444s443.bed
sort -k1,1 -k2,2n ./SeqAOnly_r444s443.bed > ./SeqAOnly_r444s444.bed
bedtools shuffle -seed 1 -i SeqAOnly_r444s444.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r445s444.bed
sort -k1,1 -k2,2n ./SeqAOnly_r445s444.bed > ./SeqAOnly_r445s445.bed
bedtools shuffle -seed 1 -i SeqAOnly_r445s445.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r446s445.bed
sort -k1,1 -k2,2n ./SeqAOnly_r446s445.bed > ./SeqAOnly_r446s446.bed
bedtools shuffle -seed 1 -i SeqAOnly_r446s446.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r447s446.bed
sort -k1,1 -k2,2n ./SeqAOnly_r447s446.bed > ./SeqAOnly_r447s447.bed
bedtools shuffle -seed 1 -i SeqAOnly_r447s447.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r448s447.bed
sort -k1,1 -k2,2n ./SeqAOnly_r448s447.bed > ./SeqAOnly_r448s448.bed
bedtools shuffle -seed 1 -i SeqAOnly_r448s448.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r449s448.bed
sort -k1,1 -k2,2n ./SeqAOnly_r449s448.bed > ./SeqAOnly_r449s449.bed
bedtools shuffle -seed 1 -i SeqAOnly_r449s449.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r450s449.bed
sort -k1,1 -k2,2n ./SeqAOnly_r450s449.bed > ./SeqAOnly_r450s450.bed
bedtools shuffle -seed 1 -i SeqAOnly_r450s450.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r451s450.bed
sort -k1,1 -k2,2n ./SeqAOnly_r451s450.bed > ./SeqAOnly_r451s451.bed
bedtools shuffle -seed 1 -i SeqAOnly_r451s451.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r452s451.bed
sort -k1,1 -k2,2n ./SeqAOnly_r452s451.bed > ./SeqAOnly_r452s452.bed
bedtools shuffle -seed 1 -i SeqAOnly_r452s452.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r453s452.bed
sort -k1,1 -k2,2n ./SeqAOnly_r453s452.bed > ./SeqAOnly_r453s453.bed
bedtools shuffle -seed 1 -i SeqAOnly_r453s453.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r454s453.bed
sort -k1,1 -k2,2n ./SeqAOnly_r454s453.bed > ./SeqAOnly_r454s454.bed
bedtools shuffle -seed 1 -i SeqAOnly_r454s454.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r455s454.bed
sort -k1,1 -k2,2n ./SeqAOnly_r455s454.bed > ./SeqAOnly_r455s455.bed
bedtools shuffle -seed 1 -i SeqAOnly_r455s455.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r456s455.bed
sort -k1,1 -k2,2n ./SeqAOnly_r456s455.bed > ./SeqAOnly_r456s456.bed
bedtools shuffle -seed 1 -i SeqAOnly_r456s456.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r457s456.bed
sort -k1,1 -k2,2n ./SeqAOnly_r457s456.bed > ./SeqAOnly_r457s457.bed
bedtools shuffle -seed 1 -i SeqAOnly_r457s457.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r458s457.bed
sort -k1,1 -k2,2n ./SeqAOnly_r458s457.bed > ./SeqAOnly_r458s458.bed
bedtools shuffle -seed 1 -i SeqAOnly_r458s458.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r459s458.bed
sort -k1,1 -k2,2n ./SeqAOnly_r459s458.bed > ./SeqAOnly_r459s459.bed
bedtools shuffle -seed 1 -i SeqAOnly_r459s459.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r460s459.bed
sort -k1,1 -k2,2n ./SeqAOnly_r460s459.bed > ./SeqAOnly_r460s460.bed
bedtools shuffle -seed 1 -i SeqAOnly_r460s460.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r461s460.bed
sort -k1,1 -k2,2n ./SeqAOnly_r461s460.bed > ./SeqAOnly_r461s461.bed
```

```
	bedtools shuffle -seed 1 -i SeqAOnly_r461s461.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r462s461.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r462s461.bed > ./SeqAOnly_r462s462.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r462s462.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r463s462.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r463s462.bed > ./SeqAOnly_r463s463.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r463s463.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r464s463.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r464s463.bed > ./SeqAOnly_r464s464.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r464s464.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r465s464.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r465s464.bed > ./SeqAOnly_r465s465.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r465s465.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r466s465.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r466s465.bed > ./SeqAOnly_r466s466.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r466s466.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r467s466.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r467s466.bed > ./SeqAOnly_r467s467.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r467s467.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r468s467.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r468s467.bed > ./SeqAOnly_r468s468.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r468s468.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r469s468.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r469s468.bed > ./SeqAOnly_r469s469.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r469s469.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r470s469.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r470s469.bed > ./SeqAOnly_r470s470.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r470s470.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r471s470.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r471s470.bed > ./SeqAOnly_r471s471.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r471s471.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r472s471.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r472s471.bed > ./SeqAOnly_r472s472.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r472s472.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r473s472.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r473s472.bed > ./SeqAOnly_r473s473.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r473s473.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r474s473.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r474s473.bed > ./SeqAOnly_r474s474.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r474s474.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r475s474.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r475s474.bed > ./SeqAOnly_r475s475.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r475s475.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r476s475.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r476s475.bed > ./SeqAOnly_r476s476.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r476s476.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r477s476.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r477s476.bed > ./SeqAOnly_r477s477.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r477s477.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r478s477.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r478s477.bed > ./SeqAOnly_r478s478.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r478s478.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r479s478.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r479s478.bed > ./SeqAOnly_r479s479.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r479s479.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r480s479.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r480s479.bed > ./SeqAOnly_r480s480.bed
bedtools shuffle -seed 1 -i SeqAOnly_r480s480.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r481s480.bed
sort -k1,1 -k2,2n ./SeqAOnly_r481s480.bed > ./SeqAOnly_r481s481.bed
bedtools shuffle -seed 1 -i SeqAOnly_r481s481.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r482s481.bed
sort -k1,1 -k2,2n ./SeqAOnly_r482s481.bed > ./SeqAOnly_r482s482.bed
bedtools shuffle -seed 1 -i SeqAOnly_r482s482.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r483s482.bed
sort -k1,1 -k2,2n ./SeqAOnly_r483s482.bed > ./SeqAOnly_r483s483.bed
bedtools shuffle -seed 1 -i SeqAOnly_r483s483.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r484s483.bed
sort -k1,1 -k2,2n ./SeqAOnly_r484s483.bed > ./SeqAOnly_r484s484.bed
bedtools shuffle -seed 1 -i SeqAOnly_r484s484.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r485s484.bed
sort -k1,1 -k2,2n ./SeqAOnly_r485s484.bed > ./SeqAOnly_r485s485.bed
bedtools shuffle -seed 1 -i SeqAOnly_r485s485.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r486s485.bed
sort -k1,1 -k2,2n ./SeqAOnly_r486s485.bed > ./SeqAOnly_r486s486.bed
bedtools shuffle -seed 1 -i SeqAOnly_r486s486.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r487s486.bed
sort -k1,1 -k2,2n ./SeqAOnly_r487s486.bed > ./SeqAOnly_r487s487.bed
bedtools shuffle -seed 1 -i SeqAOnly_r487s487.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r488s487.bed
sort -k1,1 -k2,2n ./SeqAOnly_r488s487.bed > ./SeqAOnly_r488s488.bed
bedtools shuffle -seed 1 -i SeqAOnly_r488s488.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r489s488.bed
sort -k1,1 -k2,2n ./SeqAOnly_r489s488.bed > ./SeqAOnly_r489s489.bed
bedtools shuffle -seed 1 -i SeqAOnly_r489s489.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r490s489.bed
sort -k1,1 -k2,2n ./SeqAOnly_r490s489.bed > ./SeqAOnly_r490s490.bed
bedtools shuffle -seed 1 -i SeqAOnly_r490s490.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r491s490.bed
sort -k1,1 -k2,2n ./SeqAOnly_r491s490.bed > ./SeqAOnly_r491s491.bed
bedtools shuffle -seed 1 -i SeqAOnly_r491s491.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r492s491.bed
sort -k1,1 -k2,2n ./SeqAOnly_r492s491.bed > ./SeqAOnly_r492s492.bed
bedtools shuffle -seed 1 -i SeqAOnly_r492s492.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r493s492.bed
sort -k1,1 -k2,2n ./SeqAOnly_r493s492.bed > ./SeqAOnly_r493s493.bed
bedtools shuffle -seed 1 -i SeqAOnly_r493s493.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r494s493.bed
sort -k1,1 -k2,2n ./SeqAOnly_r494s493.bed > ./SeqAOnly_r494s494.bed
bedtools shuffle -seed 1 -i SeqAOnly_r494s494.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r495s494.bed
sort -k1,1 -k2,2n ./SeqAOnly_r495s494.bed > ./SeqAOnly_r495s495.bed
bedtools shuffle -seed 1 -i SeqAOnly_r495s495.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r496s495.bed
sort -k1,1 -k2,2n ./SeqAOnly_r496s495.bed > ./SeqAOnly_r496s496.bed
bedtools shuffle -seed 1 -i SeqAOnly_r496s496.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r497s496.bed
sort -k1,1 -k2,2n ./SeqAOnly_r497s496.bed > ./SeqAOnly_r497s497.bed
bedtools shuffle -seed 1 -i SeqAOnly_r497s497.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r498s497.bed
sort -k1,1 -k2,2n ./SeqAOnly_r498s497.bed > ./SeqAOnly_r498s498.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r498s498.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r499s498.bed
sort -k1,1 -k2,2n ./SeqAOnly_r499s498.bed > ./SeqAOnly_r499s499.bed
bedtools shuffle -seed 1 -i SeqAOnly_r499s499.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r500s499.bed
sort -k1,1 -k2,2n ./SeqAOnly_r500s499.bed > ./SeqAOnly_r500s500.bed
bedtools shuffle -seed 1 -i SeqAOnly_r500s500.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r501s500.bed
sort -k1,1 -k2,2n ./SeqAOnly_r501s500.bed > ./SeqAOnly_r501s501.bed
bedtools shuffle -seed 1 -i SeqAOnly_r501s501.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r502s501.bed
sort -k1,1 -k2,2n ./SeqAOnly_r502s501.bed > ./SeqAOnly_r502s502.bed
bedtools shuffle -seed 1 -i SeqAOnly_r502s502.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r503s502.bed
sort -k1,1 -k2,2n ./SeqAOnly_r503s502.bed > ./SeqAOnly_r503s503.bed
bedtools shuffle -seed 1 -i SeqAOnly_r503s503.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r504s503.bed
sort -k1,1 -k2,2n ./SeqAOnly_r504s503.bed > ./SeqAOnly_r504s504.bed
bedtools shuffle -seed 1 -i SeqAOnly_r504s504.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r505s504.bed
sort -k1,1 -k2,2n ./SeqAOnly_r505s504.bed > ./SeqAOnly_r505s505.bed
bedtools shuffle -seed 1 -i SeqAOnly_r505s505.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r506s505.bed
sort -k1,1 -k2,2n ./SeqAOnly_r506s505.bed > ./SeqAOnly_r506s506.bed
bedtools shuffle -seed 1 -i SeqAOnly_r506s506.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r507s506.bed
sort -k1,1 -k2,2n ./SeqAOnly_r507s506.bed > ./SeqAOnly_r507s507.bed
bedtools shuffle -seed 1 -i SeqAOnly_r507s507.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r508s507.bed
sort -k1,1 -k2,2n ./SeqAOnly_r508s507.bed > ./SeqAOnly_r508s508.bed
bedtools shuffle -seed 1 -i SeqAOnly_r508s508.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r509s508.bed
sort -k1,1 -k2,2n ./SeqAOnly_r509s508.bed > ./SeqAOnly_r509s509.bed
bedtools shuffle -seed 1 -i SeqAOnly_r509s509.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r510s509.bed
sort -k1,1 -k2,2n ./SeqAOnly_r510s509.bed > ./SeqAOnly_r510s510.bed
bedtools shuffle -seed 1 -i SeqAOnly_r510s510.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r511s510.bed
sort -k1,1 -k2,2n ./SeqAOnly_r511s510.bed > ./SeqAOnly_r511s511.bed
bedtools shuffle -seed 1 -i SeqAOnly_r511s511.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r512s511.bed
sort -k1,1 -k2,2n ./SeqAOnly_r512s511.bed > ./SeqAOnly_r512s512.bed
bedtools shuffle -seed 1 -i SeqAOnly_r512s512.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r513s512.bed
sort -k1,1 -k2,2n ./SeqAOnly_r513s512.bed > ./SeqAOnly_r513s513.bed
bedtools shuffle -seed 1 -i SeqAOnly_r513s513.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r514s513.bed
sort -k1,1 -k2,2n ./SeqAOnly_r514s513.bed > ./SeqAOnly_r514s514.bed
bedtools shuffle -seed 1 -i SeqAOnly_r514s514.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r515s514.bed
sort -k1,1 -k2,2n ./SeqAOnly_r515s514.bed > ./SeqAOnly_r515s515.bed
bedtools shuffle -seed 1 -i SeqAOnly_r515s515.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r516s515.bed
sort -k1,1 -k2,2n ./SeqAOnly_r516s515.bed > ./SeqAOnly_r516s516.bed
bedtools shuffle -seed 1 -i SeqAOnly_r516s516.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r517s516.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_r517s516.bed > ./SeqAOnly_r517s517.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r517s517.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r518s517.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r518s517.bed > ./SeqAOnly_r518s518.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r518s518.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r519s518.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r519s518.bed > ./SeqAOnly_r519s519.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r519s519.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r520s519.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r520s519.bed > ./SeqAOnly_r520s520.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r520s520.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r521s520.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r521s520.bed > ./SeqAOnly_r521s521.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r521s521.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r522s521.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r522s521.bed > ./SeqAOnly_r522s522.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r522s522.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r523s522.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r523s522.bed > ./SeqAOnly_r523s523.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r523s523.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r524s523.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r524s523.bed > ./SeqAOnly_r524s524.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r524s524.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r525s524.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r525s524.bed > ./SeqAOnly_r525s525.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r525s525.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r526s525.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r526s525.bed > ./SeqAOnly_r526s526.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r526s526.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r527s526.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r527s526.bed > ./SeqAOnly_r527s527.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r527s527.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r528s527.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r528s527.bed > ./SeqAOnly_r528s528.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r528s528.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r529s528.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r529s528.bed > ./SeqAOnly_r529s529.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r529s529.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r530s529.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r530s529.bed > ./SeqAOnly_r530s530.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r530s530.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r531s530.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r531s530.bed > ./SeqAOnly_r531s531.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r531s531.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r532s531.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r532s531.bed > ./SeqAOnly_r532s532.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r532s532.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r533s532.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r533s532.bed > ./SeqAOnly_r533s533.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r533s533.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r534s533.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r534s533.bed > ./SeqAOnly_r534s534.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r534s534.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r535s534.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r535s534.bed > ./SeqAOnly_r535s535.bed
```

```
    bedtools shuffle -seed 1 -i SeqAOnly_r535s535.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r536s535.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r536s535.bed > ./SeqAOnly_r536s536.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r536s536.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r537s536.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r537s536.bed > ./SeqAOnly_r537s537.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r537s537.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r538s537.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r538s537.bed > ./SeqAOnly_r538s538.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r538s538.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r539s538.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r539s538.bed > ./SeqAOnly_r539s539.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r539s539.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r540s539.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r540s539.bed > ./SeqAOnly_r540s540.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r540s540.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r541s540.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r541s540.bed > ./SeqAOnly_r541s541.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r541s541.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r542s541.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r542s541.bed > ./SeqAOnly_r542s542.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r542s542.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r543s542.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r543s542.bed > ./SeqAOnly_r543s543.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r543s543.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r544s543.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r544s543.bed > ./SeqAOnly_r544s544.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r544s544.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r545s544.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r545s544.bed > ./SeqAOnly_r545s545.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r545s545.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r546s545.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r546s545.bed > ./SeqAOnly_r546s546.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r546s546.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r547s546.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r547s546.bed > ./SeqAOnly_r547s547.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r547s547.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r548s547.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r548s547.bed > ./SeqAOnly_r548s548.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r548s548.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r549s548.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r549s548.bed > ./SeqAOnly_r549s549.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r549s549.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r550s549.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r550s549.bed > ./SeqAOnly_r550s550.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r550s550.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r551s550.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r551s550.bed > ./SeqAOnly_r551s551.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r551s551.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r552s551.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r552s551.bed > ./SeqAOnly_r552s552.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r552s552.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r553s552.bed
    sort -k1,1 -k2,2n ./SeqAOnly_r553s552.bed > ./SeqAOnly_r553s553.bed
    bedtools shuffle -seed 1 -i SeqAOnly_r553s553.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r554s553.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r554s553.bed > ./SeqAOnly_r554s554.bed
bedtools shuffle -seed 1 -i SeqAOnly_r554s554.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r555s554.bed
sort -k1,1 -k2,2n ./SeqAOnly_r555s554.bed > ./SeqAOnly_r555s555.bed
bedtools shuffle -seed 1 -i SeqAOnly_r555s555.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r556s555.bed
sort -k1,1 -k2,2n ./SeqAOnly_r556s555.bed > ./SeqAOnly_r556s556.bed
bedtools shuffle -seed 1 -i SeqAOnly_r556s556.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r557s556.bed
sort -k1,1 -k2,2n ./SeqAOnly_r557s556.bed > ./SeqAOnly_r557s557.bed
bedtools shuffle -seed 1 -i SeqAOnly_r557s557.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r558s557.bed
sort -k1,1 -k2,2n ./SeqAOnly_r558s557.bed > ./SeqAOnly_r558s558.bed
bedtools shuffle -seed 1 -i SeqAOnly_r558s558.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r559s558.bed
sort -k1,1 -k2,2n ./SeqAOnly_r559s558.bed > ./SeqAOnly_r559s559.bed
bedtools shuffle -seed 1 -i SeqAOnly_r559s559.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r560s559.bed
sort -k1,1 -k2,2n ./SeqAOnly_r560s559.bed > ./SeqAOnly_r560s560.bed
bedtools shuffle -seed 1 -i SeqAOnly_r560s560.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r561s560.bed
sort -k1,1 -k2,2n ./SeqAOnly_r561s560.bed > ./SeqAOnly_r561s561.bed
bedtools shuffle -seed 1 -i SeqAOnly_r561s561.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r562s561.bed
sort -k1,1 -k2,2n ./SeqAOnly_r562s561.bed > ./SeqAOnly_r562s562.bed
bedtools shuffle -seed 1 -i SeqAOnly_r562s562.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r563s562.bed
sort -k1,1 -k2,2n ./SeqAOnly_r563s562.bed > ./SeqAOnly_r563s563.bed
bedtools shuffle -seed 1 -i SeqAOnly_r563s563.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r564s563.bed
sort -k1,1 -k2,2n ./SeqAOnly_r564s563.bed > ./SeqAOnly_r564s564.bed
bedtools shuffle -seed 1 -i SeqAOnly_r564s564.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r565s564.bed
sort -k1,1 -k2,2n ./SeqAOnly_r565s564.bed > ./SeqAOnly_r565s565.bed
bedtools shuffle -seed 1 -i SeqAOnly_r565s565.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r566s565.bed
sort -k1,1 -k2,2n ./SeqAOnly_r566s565.bed > ./SeqAOnly_r566s566.bed
bedtools shuffle -seed 1 -i SeqAOnly_r566s566.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r567s566.bed
sort -k1,1 -k2,2n ./SeqAOnly_r567s566.bed > ./SeqAOnly_r567s567.bed
bedtools shuffle -seed 1 -i SeqAOnly_r567s567.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r568s567.bed
sort -k1,1 -k2,2n ./SeqAOnly_r568s567.bed > ./SeqAOnly_r568s568.bed
bedtools shuffle -seed 1 -i SeqAOnly_r568s568.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r569s568.bed
sort -k1,1 -k2,2n ./SeqAOnly_r569s568.bed > ./SeqAOnly_r569s569.bed
bedtools shuffle -seed 1 -i SeqAOnly_r569s569.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r570s569.bed
sort -k1,1 -k2,2n ./SeqAOnly_r570s569.bed > ./SeqAOnly_r570s570.bed
bedtools shuffle -seed 1 -i SeqAOnly_r570s570.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r571s570.bed
sort -k1,1 -k2,2n ./SeqAOnly_r571s570.bed > ./SeqAOnly_r571s571.bed
bedtools shuffle -seed 1 -i SeqAOnly_r571s571.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r572s571.bed
sort -k1,1 -k2,2n ./SeqAOnly_r572s571.bed > ./SeqAOnly_r572s572.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r572s572.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r573s572.bed
sort -k1,1 -k2,2n ./SeqAOnly_r573s572.bed > ./SeqAOnly_r573s573.bed
bedtools shuffle -seed 1 -i SeqAOnly_r573s573.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r574s573.bed
sort -k1,1 -k2,2n ./SeqAOnly_r574s573.bed > ./SeqAOnly_r574s574.bed
bedtools shuffle -seed 1 -i SeqAOnly_r574s574.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r575s574.bed
sort -k1,1 -k2,2n ./SeqAOnly_r575s574.bed > ./SeqAOnly_r575s575.bed
bedtools shuffle -seed 1 -i SeqAOnly_r575s575.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r576s575.bed
sort -k1,1 -k2,2n ./SeqAOnly_r576s575.bed > ./SeqAOnly_r576s576.bed
bedtools shuffle -seed 1 -i SeqAOnly_r576s576.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r577s576.bed
sort -k1,1 -k2,2n ./SeqAOnly_r577s576.bed > ./SeqAOnly_r577s577.bed
bedtools shuffle -seed 1 -i SeqAOnly_r577s577.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r578s577.bed
sort -k1,1 -k2,2n ./SeqAOnly_r578s577.bed > ./SeqAOnly_r578s578.bed
bedtools shuffle -seed 1 -i SeqAOnly_r578s578.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r579s578.bed
sort -k1,1 -k2,2n ./SeqAOnly_r579s578.bed > ./SeqAOnly_r579s579.bed
bedtools shuffle -seed 1 -i SeqAOnly_r579s579.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r580s579.bed
sort -k1,1 -k2,2n ./SeqAOnly_r580s579.bed > ./SeqAOnly_r580s580.bed
bedtools shuffle -seed 1 -i SeqAOnly_r580s580.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r581s580.bed
sort -k1,1 -k2,2n ./SeqAOnly_r581s580.bed > ./SeqAOnly_r581s581.bed
bedtools shuffle -seed 1 -i SeqAOnly_r581s581.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r582s581.bed
sort -k1,1 -k2,2n ./SeqAOnly_r582s581.bed > ./SeqAOnly_r582s582.bed
bedtools shuffle -seed 1 -i SeqAOnly_r582s582.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r583s582.bed
sort -k1,1 -k2,2n ./SeqAOnly_r583s582.bed > ./SeqAOnly_r583s583.bed
bedtools shuffle -seed 1 -i SeqAOnly_r583s583.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r584s583.bed
sort -k1,1 -k2,2n ./SeqAOnly_r584s583.bed > ./SeqAOnly_r584s584.bed
bedtools shuffle -seed 1 -i SeqAOnly_r584s584.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r585s584.bed
sort -k1,1 -k2,2n ./SeqAOnly_r585s584.bed > ./SeqAOnly_r585s585.bed
bedtools shuffle -seed 1 -i SeqAOnly_r585s585.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r586s585.bed
sort -k1,1 -k2,2n ./SeqAOnly_r586s585.bed > ./SeqAOnly_r586s586.bed
bedtools shuffle -seed 1 -i SeqAOnly_r586s586.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r587s586.bed
sort -k1,1 -k2,2n ./SeqAOnly_r587s586.bed > ./SeqAOnly_r587s587.bed
bedtools shuffle -seed 1 -i SeqAOnly_r587s587.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r588s587.bed
sort -k1,1 -k2,2n ./SeqAOnly_r588s587.bed > ./SeqAOnly_r588s588.bed
bedtools shuffle -seed 1 -i SeqAOnly_r588s588.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r589s588.bed
sort -k1,1 -k2,2n ./SeqAOnly_r589s588.bed > ./SeqAOnly_r589s589.bed
bedtools shuffle -seed 1 -i SeqAOnly_r589s589.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r590s589.bed
sort -k1,1 -k2,2n ./SeqAOnly_r590s589.bed > ./SeqAOnly_r590s590.bed
bedtools shuffle -seed 1 -i SeqAOnly_r590s590.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r591s590.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r591s590.bed > ./SeqAOnly_r591s591.bed
bedtools shuffle -seed 1 -i SeqAOnly_r591s591.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r592s591.bed
sort -k1,1 -k2,2n ./SeqAOnly_r592s591.bed > ./SeqAOnly_r592s592.bed
bedtools shuffle -seed 1 -i SeqAOnly_r592s592.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r593s592.bed
sort -k1,1 -k2,2n ./SeqAOnly_r593s592.bed > ./SeqAOnly_r593s593.bed
bedtools shuffle -seed 1 -i SeqAOnly_r593s593.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r594s593.bed
sort -k1,1 -k2,2n ./SeqAOnly_r594s593.bed > ./SeqAOnly_r594s594.bed
bedtools shuffle -seed 1 -i SeqAOnly_r594s594.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r595s594.bed
sort -k1,1 -k2,2n ./SeqAOnly_r595s594.bed > ./SeqAOnly_r595s595.bed
bedtools shuffle -seed 1 -i SeqAOnly_r595s595.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r596s595.bed
sort -k1,1 -k2,2n ./SeqAOnly_r596s595.bed > ./SeqAOnly_r596s596.bed
bedtools shuffle -seed 1 -i SeqAOnly_r596s596.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r597s596.bed
sort -k1,1 -k2,2n ./SeqAOnly_r597s596.bed > ./SeqAOnly_r597s597.bed
bedtools shuffle -seed 1 -i SeqAOnly_r597s597.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r598s597.bed
sort -k1,1 -k2,2n ./SeqAOnly_r598s597.bed > ./SeqAOnly_r598s598.bed
bedtools shuffle -seed 1 -i SeqAOnly_r598s598.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r599s598.bed
sort -k1,1 -k2,2n ./SeqAOnly_r599s598.bed > ./SeqAOnly_r599s599.bed
bedtools shuffle -seed 1 -i SeqAOnly_r599s599.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r600s599.bed
sort -k1,1 -k2,2n ./SeqAOnly_r600s599.bed > ./SeqAOnly_r600s600.bed
bedtools shuffle -seed 1 -i SeqAOnly_r600s600.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r601s600.bed
sort -k1,1 -k2,2n ./SeqAOnly_r601s600.bed > ./SeqAOnly_r601s601.bed
bedtools shuffle -seed 1 -i SeqAOnly_r601s601.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r602s601.bed
sort -k1,1 -k2,2n ./SeqAOnly_r602s601.bed > ./SeqAOnly_r602s602.bed
bedtools shuffle -seed 1 -i SeqAOnly_r602s602.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r603s602.bed
sort -k1,1 -k2,2n ./SeqAOnly_r603s602.bed > ./SeqAOnly_r603s603.bed
bedtools shuffle -seed 1 -i SeqAOnly_r603s603.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r604s603.bed
sort -k1,1 -k2,2n ./SeqAOnly_r604s603.bed > ./SeqAOnly_r604s604.bed
bedtools shuffle -seed 1 -i SeqAOnly_r604s604.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r605s604.bed
sort -k1,1 -k2,2n ./SeqAOnly_r605s604.bed > ./SeqAOnly_r605s605.bed
bedtools shuffle -seed 1 -i SeqAOnly_r605s605.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r606s605.bed
sort -k1,1 -k2,2n ./SeqAOnly_r606s605.bed > ./SeqAOnly_r606s606.bed
bedtools shuffle -seed 1 -i SeqAOnly_r606s606.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r607s606.bed
sort -k1,1 -k2,2n ./SeqAOnly_r607s606.bed > ./SeqAOnly_r607s607.bed
bedtools shuffle -seed 1 -i SeqAOnly_r607s607.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r608s607.bed
sort -k1,1 -k2,2n ./SeqAOnly_r608s607.bed > ./SeqAOnly_r608s608.bed
bedtools shuffle -seed 1 -i SeqAOnly_r608s608.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r609s608.bed
sort -k1,1 -k2,2n ./SeqAOnly_r609s608.bed > ./SeqAOnly_r609s609.bed
```

```
	bedtools shuffle -seed 1 -i SeqAOnly_r609s609.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r610s609.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r610s609.bed > ./SeqAOnly_r610s610.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r610s610.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r611s610.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r611s610.bed > ./SeqAOnly_r611s611.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r611s611.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r612s611.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r612s611.bed > ./SeqAOnly_r612s612.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r612s612.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r613s612.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r613s612.bed > ./SeqAOnly_r613s613.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r613s613.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r614s613.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r614s613.bed > ./SeqAOnly_r614s614.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r614s614.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r615s614.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r615s614.bed > ./SeqAOnly_r615s615.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r615s615.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r616s615.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r616s615.bed > ./SeqAOnly_r616s616.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r616s616.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r617s616.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r617s616.bed > ./SeqAOnly_r617s617.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r617s617.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r618s617.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r618s617.bed > ./SeqAOnly_r618s618.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r618s618.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r619s618.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r619s618.bed > ./SeqAOnly_r619s619.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r619s619.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r620s619.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r620s619.bed > ./SeqAOnly_r620s620.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r620s620.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r621s620.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r621s620.bed > ./SeqAOnly_r621s621.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r621s621.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r622s621.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r622s621.bed > ./SeqAOnly_r622s622.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r622s622.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r623s622.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r623s622.bed > ./SeqAOnly_r623s623.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r623s623.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r624s623.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r624s623.bed > ./SeqAOnly_r624s624.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r624s624.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r625s624.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r625s624.bed > ./SeqAOnly_r625s625.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r625s625.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r626s625.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r626s625.bed > ./SeqAOnly_r626s626.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r626s626.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r627s626.bed
	sort -k1,1 -k2,2n ./SeqAOnly_r627s626.bed > ./SeqAOnly_r627s627.bed
	bedtools shuffle -seed 1 -i SeqAOnly_r627s627.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r628s627.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r628s627.bed > ./SeqAOnly_r628s628.bed
bedtools shuffle -seed 1 -i SeqAOnly_r628s628.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r629s628.bed
sort -k1,1 -k2,2n ./SeqAOnly_r629s628.bed > ./SeqAOnly_r629s629.bed
bedtools shuffle -seed 1 -i SeqAOnly_r629s629.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r630s629.bed
sort -k1,1 -k2,2n ./SeqAOnly_r630s629.bed > ./SeqAOnly_r630s630.bed
bedtools shuffle -seed 1 -i SeqAOnly_r630s630.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r631s630.bed
sort -k1,1 -k2,2n ./SeqAOnly_r631s630.bed > ./SeqAOnly_r631s631.bed
bedtools shuffle -seed 1 -i SeqAOnly_r631s631.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r632s631.bed
sort -k1,1 -k2,2n ./SeqAOnly_r632s631.bed > ./SeqAOnly_r632s632.bed
bedtools shuffle -seed 1 -i SeqAOnly_r632s632.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r633s632.bed
sort -k1,1 -k2,2n ./SeqAOnly_r633s632.bed > ./SeqAOnly_r633s633.bed
bedtools shuffle -seed 1 -i SeqAOnly_r633s633.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r634s633.bed
sort -k1,1 -k2,2n ./SeqAOnly_r634s633.bed > ./SeqAOnly_r634s634.bed
bedtools shuffle -seed 1 -i SeqAOnly_r634s634.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r635s634.bed
sort -k1,1 -k2,2n ./SeqAOnly_r635s634.bed > ./SeqAOnly_r635s635.bed
bedtools shuffle -seed 1 -i SeqAOnly_r635s635.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r636s635.bed
sort -k1,1 -k2,2n ./SeqAOnly_r636s635.bed > ./SeqAOnly_r636s636.bed
bedtools shuffle -seed 1 -i SeqAOnly_r636s636.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r637s636.bed
sort -k1,1 -k2,2n ./SeqAOnly_r637s636.bed > ./SeqAOnly_r637s637.bed
bedtools shuffle -seed 1 -i SeqAOnly_r637s637.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r638s637.bed
sort -k1,1 -k2,2n ./SeqAOnly_r638s637.bed > ./SeqAOnly_r638s638.bed
bedtools shuffle -seed 1 -i SeqAOnly_r638s638.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r639s638.bed
sort -k1,1 -k2,2n ./SeqAOnly_r639s638.bed > ./SeqAOnly_r639s639.bed
bedtools shuffle -seed 1 -i SeqAOnly_r639s639.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r640s639.bed
sort -k1,1 -k2,2n ./SeqAOnly_r640s639.bed > ./SeqAOnly_r640s640.bed
bedtools shuffle -seed 1 -i SeqAOnly_r640s640.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r641s640.bed
sort -k1,1 -k2,2n ./SeqAOnly_r641s640.bed > ./SeqAOnly_r641s641.bed
bedtools shuffle -seed 1 -i SeqAOnly_r641s641.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r642s641.bed
sort -k1,1 -k2,2n ./SeqAOnly_r642s641.bed > ./SeqAOnly_r642s642.bed
bedtools shuffle -seed 1 -i SeqAOnly_r642s642.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r643s642.bed
sort -k1,1 -k2,2n ./SeqAOnly_r643s642.bed > ./SeqAOnly_r643s643.bed
bedtools shuffle -seed 1 -i SeqAOnly_r643s643.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r644s643.bed
sort -k1,1 -k2,2n ./SeqAOnly_r644s643.bed > ./SeqAOnly_r644s644.bed
bedtools shuffle -seed 1 -i SeqAOnly_r644s644.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r645s644.bed
sort -k1,1 -k2,2n ./SeqAOnly_r645s644.bed > ./SeqAOnly_r645s645.bed
bedtools shuffle -seed 1 -i SeqAOnly_r645s645.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r646s645.bed
sort -k1,1 -k2,2n ./SeqAOnly_r646s645.bed > ./SeqAOnly_r646s646.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r646s646.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r647s646.bed
sort -k1,1 -k2,2n ./SeqAOnly_r647s646.bed > ./SeqAOnly_r647s647.bed
bedtools shuffle -seed 1 -i SeqAOnly_r647s647.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r648s647.bed
sort -k1,1 -k2,2n ./SeqAOnly_r648s647.bed > ./SeqAOnly_r648s648.bed
bedtools shuffle -seed 1 -i SeqAOnly_r648s648.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r649s648.bed
sort -k1,1 -k2,2n ./SeqAOnly_r649s648.bed > ./SeqAOnly_r649s649.bed
bedtools shuffle -seed 1 -i SeqAOnly_r649s649.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r650s649.bed
sort -k1,1 -k2,2n ./SeqAOnly_r650s649.bed > ./SeqAOnly_r650s650.bed
bedtools shuffle -seed 1 -i SeqAOnly_r650s650.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r651s650.bed
sort -k1,1 -k2,2n ./SeqAOnly_r651s650.bed > ./SeqAOnly_r651s651.bed
bedtools shuffle -seed 1 -i SeqAOnly_r651s651.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r652s651.bed
sort -k1,1 -k2,2n ./SeqAOnly_r652s651.bed > ./SeqAOnly_r652s652.bed
bedtools shuffle -seed 1 -i SeqAOnly_r652s652.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r653s652.bed
sort -k1,1 -k2,2n ./SeqAOnly_r653s652.bed > ./SeqAOnly_r653s653.bed
bedtools shuffle -seed 1 -i SeqAOnly_r653s653.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r654s653.bed
sort -k1,1 -k2,2n ./SeqAOnly_r654s653.bed > ./SeqAOnly_r654s654.bed
bedtools shuffle -seed 1 -i SeqAOnly_r654s654.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r655s654.bed
sort -k1,1 -k2,2n ./SeqAOnly_r655s654.bed > ./SeqAOnly_r655s655.bed
bedtools shuffle -seed 1 -i SeqAOnly_r655s655.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r656s655.bed
sort -k1,1 -k2,2n ./SeqAOnly_r656s655.bed > ./SeqAOnly_r656s656.bed
bedtools shuffle -seed 1 -i SeqAOnly_r656s656.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r657s656.bed
sort -k1,1 -k2,2n ./SeqAOnly_r657s656.bed > ./SeqAOnly_r657s657.bed
bedtools shuffle -seed 1 -i SeqAOnly_r657s657.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r658s657.bed
sort -k1,1 -k2,2n ./SeqAOnly_r658s657.bed > ./SeqAOnly_r658s658.bed
bedtools shuffle -seed 1 -i SeqAOnly_r658s658.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r659s658.bed
sort -k1,1 -k2,2n ./SeqAOnly_r659s658.bed > ./SeqAOnly_r659s659.bed
bedtools shuffle -seed 1 -i SeqAOnly_r659s659.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r660s659.bed
sort -k1,1 -k2,2n ./SeqAOnly_r660s659.bed > ./SeqAOnly_r660s660.bed
bedtools shuffle -seed 1 -i SeqAOnly_r660s660.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r661s660.bed
sort -k1,1 -k2,2n ./SeqAOnly_r661s660.bed > ./SeqAOnly_r661s661.bed
bedtools shuffle -seed 1 -i SeqAOnly_r661s661.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r662s661.bed
sort -k1,1 -k2,2n ./SeqAOnly_r662s661.bed > ./SeqAOnly_r662s662.bed
bedtools shuffle -seed 1 -i SeqAOnly_r662s662.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r663s662.bed
sort -k1,1 -k2,2n ./SeqAOnly_r663s662.bed > ./SeqAOnly_r663s663.bed
bedtools shuffle -seed 1 -i SeqAOnly_r663s663.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r664s663.bed
sort -k1,1 -k2,2n ./SeqAOnly_r664s663.bed > ./SeqAOnly_r664s664.bed
bedtools shuffle -seed 1 -i SeqAOnly_r664s664.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r665s664.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r665s664.bed > ./SeqAOnly_r665s665.bed
bedtools shuffle -seed 1 -i SeqAOnly_r665s665.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r666s665.bed
sort -k1,1 -k2,2n ./SeqAOnly_r666s665.bed > ./SeqAOnly_r666s666.bed
bedtools shuffle -seed 1 -i SeqAOnly_r666s666.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r667s666.bed
sort -k1,1 -k2,2n ./SeqAOnly_r667s666.bed > ./SeqAOnly_r667s667.bed
bedtools shuffle -seed 1 -i SeqAOnly_r667s667.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r668s667.bed
sort -k1,1 -k2,2n ./SeqAOnly_r668s667.bed > ./SeqAOnly_r668s668.bed
bedtools shuffle -seed 1 -i SeqAOnly_r668s668.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r669s668.bed
sort -k1,1 -k2,2n ./SeqAOnly_r669s668.bed > ./SeqAOnly_r669s669.bed
bedtools shuffle -seed 1 -i SeqAOnly_r669s669.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r670s669.bed
sort -k1,1 -k2,2n ./SeqAOnly_r670s669.bed > ./SeqAOnly_r670s670.bed
bedtools shuffle -seed 1 -i SeqAOnly_r670s670.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r671s670.bed
sort -k1,1 -k2,2n ./SeqAOnly_r671s670.bed > ./SeqAOnly_r671s671.bed
bedtools shuffle -seed 1 -i SeqAOnly_r671s671.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r672s671.bed
sort -k1,1 -k2,2n ./SeqAOnly_r672s671.bed > ./SeqAOnly_r672s672.bed
bedtools shuffle -seed 1 -i SeqAOnly_r672s672.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r673s672.bed
sort -k1,1 -k2,2n ./SeqAOnly_r673s672.bed > ./SeqAOnly_r673s673.bed
bedtools shuffle -seed 1 -i SeqAOnly_r673s673.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r674s673.bed
sort -k1,1 -k2,2n ./SeqAOnly_r674s673.bed > ./SeqAOnly_r674s674.bed
bedtools shuffle -seed 1 -i SeqAOnly_r674s674.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r675s674.bed
sort -k1,1 -k2,2n ./SeqAOnly_r675s674.bed > ./SeqAOnly_r675s675.bed
bedtools shuffle -seed 1 -i SeqAOnly_r675s675.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r676s675.bed
sort -k1,1 -k2,2n ./SeqAOnly_r676s675.bed > ./SeqAOnly_r676s676.bed
bedtools shuffle -seed 1 -i SeqAOnly_r676s676.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r677s676.bed
sort -k1,1 -k2,2n ./SeqAOnly_r677s676.bed > ./SeqAOnly_r677s677.bed
bedtools shuffle -seed 1 -i SeqAOnly_r677s677.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r678s677.bed
sort -k1,1 -k2,2n ./SeqAOnly_r678s677.bed > ./SeqAOnly_r678s678.bed
bedtools shuffle -seed 1 -i SeqAOnly_r678s678.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r679s678.bed
sort -k1,1 -k2,2n ./SeqAOnly_r679s678.bed > ./SeqAOnly_r679s679.bed
bedtools shuffle -seed 1 -i SeqAOnly_r679s679.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r680s679.bed
sort -k1,1 -k2,2n ./SeqAOnly_r680s679.bed > ./SeqAOnly_r680s680.bed
bedtools shuffle -seed 1 -i SeqAOnly_r680s680.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r681s680.bed
sort -k1,1 -k2,2n ./SeqAOnly_r681s680.bed > ./SeqAOnly_r681s681.bed
bedtools shuffle -seed 1 -i SeqAOnly_r681s681.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r682s681.bed
sort -k1,1 -k2,2n ./SeqAOnly_r682s681.bed > ./SeqAOnly_r682s682.bed
bedtools shuffle -seed 1 -i SeqAOnly_r682s682.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r683s682.bed
sort -k1,1 -k2,2n ./SeqAOnly_r683s682.bed > ./SeqAOnly_r683s683.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r683s683.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r684s683.bed
sort -k1,1 -k2,2n ./SeqAOnly_r684s683.bed > ./SeqAOnly_r684s684.bed
bedtools shuffle -seed 1 -i SeqAOnly_r684s684.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r685s684.bed
sort -k1,1 -k2,2n ./SeqAOnly_r685s684.bed > ./SeqAOnly_r685s685.bed
bedtools shuffle -seed 1 -i SeqAOnly_r685s685.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r686s685.bed
sort -k1,1 -k2,2n ./SeqAOnly_r686s685.bed > ./SeqAOnly_r686s686.bed
bedtools shuffle -seed 1 -i SeqAOnly_r686s686.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r687s686.bed
sort -k1,1 -k2,2n ./SeqAOnly_r687s686.bed > ./SeqAOnly_r687s687.bed
bedtools shuffle -seed 1 -i SeqAOnly_r687s687.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r688s687.bed
sort -k1,1 -k2,2n ./SeqAOnly_r688s687.bed > ./SeqAOnly_r688s688.bed
bedtools shuffle -seed 1 -i SeqAOnly_r688s688.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r689s688.bed
sort -k1,1 -k2,2n ./SeqAOnly_r689s688.bed > ./SeqAOnly_r689s689.bed
bedtools shuffle -seed 1 -i SeqAOnly_r689s689.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r690s689.bed
sort -k1,1 -k2,2n ./SeqAOnly_r690s689.bed > ./SeqAOnly_r690s690.bed
bedtools shuffle -seed 1 -i SeqAOnly_r690s690.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r691s690.bed
sort -k1,1 -k2,2n ./SeqAOnly_r691s690.bed > ./SeqAOnly_r691s691.bed
bedtools shuffle -seed 1 -i SeqAOnly_r691s691.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r692s691.bed
sort -k1,1 -k2,2n ./SeqAOnly_r692s691.bed > ./SeqAOnly_r692s692.bed
bedtools shuffle -seed 1 -i SeqAOnly_r692s692.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r693s692.bed
sort -k1,1 -k2,2n ./SeqAOnly_r693s692.bed > ./SeqAOnly_r693s693.bed
bedtools shuffle -seed 1 -i SeqAOnly_r693s693.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r694s693.bed
sort -k1,1 -k2,2n ./SeqAOnly_r694s693.bed > ./SeqAOnly_r694s694.bed
bedtools shuffle -seed 1 -i SeqAOnly_r694s694.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r695s694.bed
sort -k1,1 -k2,2n ./SeqAOnly_r695s694.bed > ./SeqAOnly_r695s695.bed
bedtools shuffle -seed 1 -i SeqAOnly_r695s695.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r696s695.bed
sort -k1,1 -k2,2n ./SeqAOnly_r696s695.bed > ./SeqAOnly_r696s696.bed
bedtools shuffle -seed 1 -i SeqAOnly_r696s696.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r697s696.bed
sort -k1,1 -k2,2n ./SeqAOnly_r697s696.bed > ./SeqAOnly_r697s697.bed
bedtools shuffle -seed 1 -i SeqAOnly_r697s697.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r698s697.bed
sort -k1,1 -k2,2n ./SeqAOnly_r698s697.bed > ./SeqAOnly_r698s698.bed
bedtools shuffle -seed 1 -i SeqAOnly_r698s698.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r699s698.bed
sort -k1,1 -k2,2n ./SeqAOnly_r699s698.bed > ./SeqAOnly_r699s699.bed
bedtools shuffle -seed 1 -i SeqAOnly_r699s699.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r700s699.bed
sort -k1,1 -k2,2n ./SeqAOnly_r700s699.bed > ./SeqAOnly_r700s700.bed
bedtools shuffle -seed 1 -i SeqAOnly_r700s700.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r701s700.bed
sort -k1,1 -k2,2n ./SeqAOnly_r701s700.bed > ./SeqAOnly_r701s701.bed
bedtools shuffle -seed 1 -i SeqAOnly_r701s701.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r702s701.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r702s701.bed > ./SeqAOnly_r702s702.bed
bedtools shuffle -seed 1 -i SeqAOnly_r702s702.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r703s702.bed
sort -k1,1 -k2,2n ./SeqAOnly_r703s702.bed > ./SeqAOnly_r703s703.bed
bedtools shuffle -seed 1 -i SeqAOnly_r703s703.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r704s703.bed
sort -k1,1 -k2,2n ./SeqAOnly_r704s703.bed > ./SeqAOnly_r704s704.bed
bedtools shuffle -seed 1 -i SeqAOnly_r704s704.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r705s704.bed
sort -k1,1 -k2,2n ./SeqAOnly_r705s704.bed > ./SeqAOnly_r705s705.bed
bedtools shuffle -seed 1 -i SeqAOnly_r705s705.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r706s705.bed
sort -k1,1 -k2,2n ./SeqAOnly_r706s705.bed > ./SeqAOnly_r706s706.bed
bedtools shuffle -seed 1 -i SeqAOnly_r706s706.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r707s706.bed
sort -k1,1 -k2,2n ./SeqAOnly_r707s706.bed > ./SeqAOnly_r707s707.bed
bedtools shuffle -seed 1 -i SeqAOnly_r707s707.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r708s707.bed
sort -k1,1 -k2,2n ./SeqAOnly_r708s707.bed > ./SeqAOnly_r708s708.bed
bedtools shuffle -seed 1 -i SeqAOnly_r708s708.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r709s708.bed
sort -k1,1 -k2,2n ./SeqAOnly_r709s708.bed > ./SeqAOnly_r709s709.bed
bedtools shuffle -seed 1 -i SeqAOnly_r709s709.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r710s709.bed
sort -k1,1 -k2,2n ./SeqAOnly_r710s709.bed > ./SeqAOnly_r710s710.bed
bedtools shuffle -seed 1 -i SeqAOnly_r710s710.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r711s710.bed
sort -k1,1 -k2,2n ./SeqAOnly_r711s710.bed > ./SeqAOnly_r711s711.bed
bedtools shuffle -seed 1 -i SeqAOnly_r711s711.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r712s711.bed
sort -k1,1 -k2,2n ./SeqAOnly_r712s711.bed > ./SeqAOnly_r712s712.bed
bedtools shuffle -seed 1 -i SeqAOnly_r712s712.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r713s712.bed
sort -k1,1 -k2,2n ./SeqAOnly_r713s712.bed > ./SeqAOnly_r713s713.bed
bedtools shuffle -seed 1 -i SeqAOnly_r713s713.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r714s713.bed
sort -k1,1 -k2,2n ./SeqAOnly_r714s713.bed > ./SeqAOnly_r714s714.bed
bedtools shuffle -seed 1 -i SeqAOnly_r714s714.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r715s714.bed
sort -k1,1 -k2,2n ./SeqAOnly_r715s714.bed > ./SeqAOnly_r715s715.bed
bedtools shuffle -seed 1 -i SeqAOnly_r715s715.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r716s715.bed
sort -k1,1 -k2,2n ./SeqAOnly_r716s715.bed > ./SeqAOnly_r716s716.bed
bedtools shuffle -seed 1 -i SeqAOnly_r716s716.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r717s716.bed
sort -k1,1 -k2,2n ./SeqAOnly_r717s716.bed > ./SeqAOnly_r717s717.bed
bedtools shuffle -seed 1 -i SeqAOnly_r717s717.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r718s717.bed
sort -k1,1 -k2,2n ./SeqAOnly_r718s717.bed > ./SeqAOnly_r718s718.bed
bedtools shuffle -seed 1 -i SeqAOnly_r718s718.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r719s718.bed
sort -k1,1 -k2,2n ./SeqAOnly_r719s718.bed > ./SeqAOnly_r719s719.bed
bedtools shuffle -seed 1 -i SeqAOnly_r719s719.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r720s719.bed
sort -k1,1 -k2,2n ./SeqAOnly_r720s719.bed > ./SeqAOnly_r720s720.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r720s720.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r721s720.bed
sort -k1,1 -k2,2n ./SeqAOnly_r721s720.bed > ./SeqAOnly_r721s721.bed
bedtools shuffle -seed 1 -i SeqAOnly_r721s721.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r722s721.bed
sort -k1,1 -k2,2n ./SeqAOnly_r722s721.bed > ./SeqAOnly_r722s722.bed
bedtools shuffle -seed 1 -i SeqAOnly_r722s722.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r723s722.bed
sort -k1,1 -k2,2n ./SeqAOnly_r723s722.bed > ./SeqAOnly_r723s723.bed
bedtools shuffle -seed 1 -i SeqAOnly_r723s723.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r724s723.bed
sort -k1,1 -k2,2n ./SeqAOnly_r724s723.bed > ./SeqAOnly_r724s724.bed
bedtools shuffle -seed 1 -i SeqAOnly_r724s724.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r725s724.bed
sort -k1,1 -k2,2n ./SeqAOnly_r725s724.bed > ./SeqAOnly_r725s725.bed
bedtools shuffle -seed 1 -i SeqAOnly_r725s725.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r726s725.bed
sort -k1,1 -k2,2n ./SeqAOnly_r726s725.bed > ./SeqAOnly_r726s726.bed
bedtools shuffle -seed 1 -i SeqAOnly_r726s726.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r727s726.bed
sort -k1,1 -k2,2n ./SeqAOnly_r727s726.bed > ./SeqAOnly_r727s727.bed
bedtools shuffle -seed 1 -i SeqAOnly_r727s727.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r728s727.bed
sort -k1,1 -k2,2n ./SeqAOnly_r728s727.bed > ./SeqAOnly_r728s728.bed
bedtools shuffle -seed 1 -i SeqAOnly_r728s728.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r729s728.bed
sort -k1,1 -k2,2n ./SeqAOnly_r729s728.bed > ./SeqAOnly_r729s729.bed
bedtools shuffle -seed 1 -i SeqAOnly_r729s729.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r730s729.bed
sort -k1,1 -k2,2n ./SeqAOnly_r730s729.bed > ./SeqAOnly_r730s730.bed
bedtools shuffle -seed 1 -i SeqAOnly_r730s730.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r731s730.bed
sort -k1,1 -k2,2n ./SeqAOnly_r731s730.bed > ./SeqAOnly_r731s731.bed
bedtools shuffle -seed 1 -i SeqAOnly_r731s731.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r732s731.bed
sort -k1,1 -k2,2n ./SeqAOnly_r732s731.bed > ./SeqAOnly_r732s732.bed
bedtools shuffle -seed 1 -i SeqAOnly_r732s732.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r733s732.bed
sort -k1,1 -k2,2n ./SeqAOnly_r733s732.bed > ./SeqAOnly_r733s733.bed
bedtools shuffle -seed 1 -i SeqAOnly_r733s733.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r734s733.bed
sort -k1,1 -k2,2n ./SeqAOnly_r734s733.bed > ./SeqAOnly_r734s734.bed
bedtools shuffle -seed 1 -i SeqAOnly_r734s734.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r735s734.bed
sort -k1,1 -k2,2n ./SeqAOnly_r735s734.bed > ./SeqAOnly_r735s735.bed
bedtools shuffle -seed 1 -i SeqAOnly_r735s735.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r736s735.bed
sort -k1,1 -k2,2n ./SeqAOnly_r736s735.bed > ./SeqAOnly_r736s736.bed
bedtools shuffle -seed 1 -i SeqAOnly_r736s736.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r737s736.bed
sort -k1,1 -k2,2n ./SeqAOnly_r737s736.bed > ./SeqAOnly_r737s737.bed
bedtools shuffle -seed 1 -i SeqAOnly_r737s737.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r738s737.bed
sort -k1,1 -k2,2n ./SeqAOnly_r738s737.bed > ./SeqAOnly_r738s738.bed
bedtools shuffle -seed 1 -i SeqAOnly_r738s738.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r739s738.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r739s738.bed > ./SeqAOnly_r739s739.bed
bedtools shuffle -seed 1 -i SeqAOnly_r739s739.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r740s739.bed
sort -k1,1 -k2,2n ./SeqAOnly_r740s739.bed > ./SeqAOnly_r740s740.bed
bedtools shuffle -seed 1 -i SeqAOnly_r740s740.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r741s740.bed
sort -k1,1 -k2,2n ./SeqAOnly_r741s740.bed > ./SeqAOnly_r741s741.bed
bedtools shuffle -seed 1 -i SeqAOnly_r741s741.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r742s741.bed
sort -k1,1 -k2,2n ./SeqAOnly_r742s741.bed > ./SeqAOnly_r742s742.bed
bedtools shuffle -seed 1 -i SeqAOnly_r742s742.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r743s742.bed
sort -k1,1 -k2,2n ./SeqAOnly_r743s742.bed > ./SeqAOnly_r743s743.bed
bedtools shuffle -seed 1 -i SeqAOnly_r743s743.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r744s743.bed
sort -k1,1 -k2,2n ./SeqAOnly_r744s743.bed > ./SeqAOnly_r744s744.bed
bedtools shuffle -seed 1 -i SeqAOnly_r744s744.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r745s744.bed
sort -k1,1 -k2,2n ./SeqAOnly_r745s744.bed > ./SeqAOnly_r745s745.bed
bedtools shuffle -seed 1 -i SeqAOnly_r745s745.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r746s745.bed
sort -k1,1 -k2,2n ./SeqAOnly_r746s745.bed > ./SeqAOnly_r746s746.bed
bedtools shuffle -seed 1 -i SeqAOnly_r746s746.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r747s746.bed
sort -k1,1 -k2,2n ./SeqAOnly_r747s746.bed > ./SeqAOnly_r747s747.bed
bedtools shuffle -seed 1 -i SeqAOnly_r747s747.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r748s747.bed
sort -k1,1 -k2,2n ./SeqAOnly_r748s747.bed > ./SeqAOnly_r748s748.bed
bedtools shuffle -seed 1 -i SeqAOnly_r748s748.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r749s748.bed
sort -k1,1 -k2,2n ./SeqAOnly_r749s748.bed > ./SeqAOnly_r749s749.bed
bedtools shuffle -seed 1 -i SeqAOnly_r749s749.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r750s749.bed
sort -k1,1 -k2,2n ./SeqAOnly_r750s749.bed > ./SeqAOnly_r750s750.bed
bedtools shuffle -seed 1 -i SeqAOnly_r750s750.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r751s750.bed
sort -k1,1 -k2,2n ./SeqAOnly_r751s750.bed > ./SeqAOnly_r751s751.bed
bedtools shuffle -seed 1 -i SeqAOnly_r751s751.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r752s751.bed
sort -k1,1 -k2,2n ./SeqAOnly_r752s751.bed > ./SeqAOnly_r752s752.bed
bedtools shuffle -seed 1 -i SeqAOnly_r752s752.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r753s752.bed
sort -k1,1 -k2,2n ./SeqAOnly_r753s752.bed > ./SeqAOnly_r753s753.bed
bedtools shuffle -seed 1 -i SeqAOnly_r753s753.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r754s753.bed
sort -k1,1 -k2,2n ./SeqAOnly_r754s753.bed > ./SeqAOnly_r754s754.bed
bedtools shuffle -seed 1 -i SeqAOnly_r754s754.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r755s754.bed
sort -k1,1 -k2,2n ./SeqAOnly_r755s754.bed > ./SeqAOnly_r755s755.bed
bedtools shuffle -seed 1 -i SeqAOnly_r755s755.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r756s755.bed
sort -k1,1 -k2,2n ./SeqAOnly_r756s755.bed > ./SeqAOnly_r756s756.bed
bedtools shuffle -seed 1 -i SeqAOnly_r756s756.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r757s756.bed
sort -k1,1 -k2,2n ./SeqAOnly_r757s756.bed > ./SeqAOnly_r757s757.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r757s757.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r758s757.bed
sort -k1,1 -k2,2n ./SeqAOnly_r758s757.bed > ./SeqAOnly_r758s758.bed
bedtools shuffle -seed 1 -i SeqAOnly_r758s758.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r759s758.bed
sort -k1,1 -k2,2n ./SeqAOnly_r759s758.bed > ./SeqAOnly_r759s759.bed
bedtools shuffle -seed 1 -i SeqAOnly_r759s759.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r760s759.bed
sort -k1,1 -k2,2n ./SeqAOnly_r760s759.bed > ./SeqAOnly_r760s760.bed
bedtools shuffle -seed 1 -i SeqAOnly_r760s760.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r761s760.bed
sort -k1,1 -k2,2n ./SeqAOnly_r761s760.bed > ./SeqAOnly_r761s761.bed
bedtools shuffle -seed 1 -i SeqAOnly_r761s761.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r762s761.bed
sort -k1,1 -k2,2n ./SeqAOnly_r762s761.bed > ./SeqAOnly_r762s762.bed
bedtools shuffle -seed 1 -i SeqAOnly_r762s762.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r763s762.bed
sort -k1,1 -k2,2n ./SeqAOnly_r763s762.bed > ./SeqAOnly_r763s763.bed
bedtools shuffle -seed 1 -i SeqAOnly_r763s763.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r764s763.bed
sort -k1,1 -k2,2n ./SeqAOnly_r764s763.bed > ./SeqAOnly_r764s764.bed
bedtools shuffle -seed 1 -i SeqAOnly_r764s764.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r765s764.bed
sort -k1,1 -k2,2n ./SeqAOnly_r765s764.bed > ./SeqAOnly_r765s765.bed
bedtools shuffle -seed 1 -i SeqAOnly_r765s765.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r766s765.bed
sort -k1,1 -k2,2n ./SeqAOnly_r766s765.bed > ./SeqAOnly_r766s766.bed
bedtools shuffle -seed 1 -i SeqAOnly_r766s766.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r767s766.bed
sort -k1,1 -k2,2n ./SeqAOnly_r767s766.bed > ./SeqAOnly_r767s767.bed
bedtools shuffle -seed 1 -i SeqAOnly_r767s767.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r768s767.bed
sort -k1,1 -k2,2n ./SeqAOnly_r768s767.bed > ./SeqAOnly_r768s768.bed
bedtools shuffle -seed 1 -i SeqAOnly_r768s768.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r769s768.bed
sort -k1,1 -k2,2n ./SeqAOnly_r769s768.bed > ./SeqAOnly_r769s769.bed
bedtools shuffle -seed 1 -i SeqAOnly_r769s769.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r770s769.bed
sort -k1,1 -k2,2n ./SeqAOnly_r770s769.bed > ./SeqAOnly_r770s770.bed
bedtools shuffle -seed 1 -i SeqAOnly_r770s770.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r771s770.bed
sort -k1,1 -k2,2n ./SeqAOnly_r771s770.bed > ./SeqAOnly_r771s771.bed
bedtools shuffle -seed 1 -i SeqAOnly_r771s771.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r772s771.bed
sort -k1,1 -k2,2n ./SeqAOnly_r772s771.bed > ./SeqAOnly_r772s772.bed
bedtools shuffle -seed 1 -i SeqAOnly_r772s772.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r773s772.bed
sort -k1,1 -k2,2n ./SeqAOnly_r773s772.bed > ./SeqAOnly_r773s773.bed
bedtools shuffle -seed 1 -i SeqAOnly_r773s773.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r774s773.bed
sort -k1,1 -k2,2n ./SeqAOnly_r774s773.bed > ./SeqAOnly_r774s774.bed
bedtools shuffle -seed 1 -i SeqAOnly_r774s774.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r775s774.bed
sort -k1,1 -k2,2n ./SeqAOnly_r775s774.bed > ./SeqAOnly_r775s775.bed
bedtools shuffle -seed 1 -i SeqAOnly_r775s775.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r776s775.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r776s775.bed > ./SeqAOnly_r776s776.bed
bedtools shuffle -seed 1 -i SeqAOnly_r776s776.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r777s776.bed
sort -k1,1 -k2,2n ./SeqAOnly_r777s776.bed > ./SeqAOnly_r777s777.bed
bedtools shuffle -seed 1 -i SeqAOnly_r777s777.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r778s777.bed
sort -k1,1 -k2,2n ./SeqAOnly_r778s777.bed > ./SeqAOnly_r778s778.bed
bedtools shuffle -seed 1 -i SeqAOnly_r778s778.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r779s778.bed
sort -k1,1 -k2,2n ./SeqAOnly_r779s778.bed > ./SeqAOnly_r779s779.bed
bedtools shuffle -seed 1 -i SeqAOnly_r779s779.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r780s779.bed
sort -k1,1 -k2,2n ./SeqAOnly_r780s779.bed > ./SeqAOnly_r780s780.bed
bedtools shuffle -seed 1 -i SeqAOnly_r780s780.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r781s780.bed
sort -k1,1 -k2,2n ./SeqAOnly_r781s780.bed > ./SeqAOnly_r781s781.bed
bedtools shuffle -seed 1 -i SeqAOnly_r781s781.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r782s781.bed
sort -k1,1 -k2,2n ./SeqAOnly_r782s781.bed > ./SeqAOnly_r782s782.bed
bedtools shuffle -seed 1 -i SeqAOnly_r782s782.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r783s782.bed
sort -k1,1 -k2,2n ./SeqAOnly_r783s782.bed > ./SeqAOnly_r783s783.bed
bedtools shuffle -seed 1 -i SeqAOnly_r783s783.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r784s783.bed
sort -k1,1 -k2,2n ./SeqAOnly_r784s783.bed > ./SeqAOnly_r784s784.bed
bedtools shuffle -seed 1 -i SeqAOnly_r784s784.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r785s784.bed
sort -k1,1 -k2,2n ./SeqAOnly_r785s784.bed > ./SeqAOnly_r785s785.bed
bedtools shuffle -seed 1 -i SeqAOnly_r785s785.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r786s785.bed
sort -k1,1 -k2,2n ./SeqAOnly_r786s785.bed > ./SeqAOnly_r786s786.bed
bedtools shuffle -seed 1 -i SeqAOnly_r786s786.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r787s786.bed
sort -k1,1 -k2,2n ./SeqAOnly_r787s786.bed > ./SeqAOnly_r787s787.bed
bedtools shuffle -seed 1 -i SeqAOnly_r787s787.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r788s787.bed
sort -k1,1 -k2,2n ./SeqAOnly_r788s787.bed > ./SeqAOnly_r788s788.bed
bedtools shuffle -seed 1 -i SeqAOnly_r788s788.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r789s788.bed
sort -k1,1 -k2,2n ./SeqAOnly_r789s788.bed > ./SeqAOnly_r789s789.bed
bedtools shuffle -seed 1 -i SeqAOnly_r789s789.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r790s789.bed
sort -k1,1 -k2,2n ./SeqAOnly_r790s789.bed > ./SeqAOnly_r790s790.bed
bedtools shuffle -seed 1 -i SeqAOnly_r790s790.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r791s790.bed
sort -k1,1 -k2,2n ./SeqAOnly_r791s790.bed > ./SeqAOnly_r791s791.bed
bedtools shuffle -seed 1 -i SeqAOnly_r791s791.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r792s791.bed
sort -k1,1 -k2,2n ./SeqAOnly_r792s791.bed > ./SeqAOnly_r792s792.bed
bedtools shuffle -seed 1 -i SeqAOnly_r792s792.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r793s792.bed
sort -k1,1 -k2,2n ./SeqAOnly_r793s792.bed > ./SeqAOnly_r793s793.bed
bedtools shuffle -seed 1 -i SeqAOnly_r793s793.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r794s793.bed
sort -k1,1 -k2,2n ./SeqAOnly_r794s793.bed > ./SeqAOnly_r794s794.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r794s794.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r795s794.bed
sort -k1,1 -k2,2n ./SeqAOnly_r795s794.bed > ./SeqAOnly_r795s795.bed
bedtools shuffle -seed 1 -i SeqAOnly_r795s795.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r796s795.bed
sort -k1,1 -k2,2n ./SeqAOnly_r796s795.bed > ./SeqAOnly_r796s796.bed
bedtools shuffle -seed 1 -i SeqAOnly_r796s796.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r797s796.bed
sort -k1,1 -k2,2n ./SeqAOnly_r797s796.bed > ./SeqAOnly_r797s797.bed
bedtools shuffle -seed 1 -i SeqAOnly_r797s797.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r798s797.bed
sort -k1,1 -k2,2n ./SeqAOnly_r798s797.bed > ./SeqAOnly_r798s798.bed
bedtools shuffle -seed 1 -i SeqAOnly_r798s798.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r799s798.bed
sort -k1,1 -k2,2n ./SeqAOnly_r799s798.bed > ./SeqAOnly_r799s799.bed
bedtools shuffle -seed 1 -i SeqAOnly_r799s799.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r800s799.bed
sort -k1,1 -k2,2n ./SeqAOnly_r800s799.bed > ./SeqAOnly_r800s800.bed
bedtools shuffle -seed 1 -i SeqAOnly_r800s800.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r801s800.bed
sort -k1,1 -k2,2n ./SeqAOnly_r801s800.bed > ./SeqAOnly_r801s801.bed
bedtools shuffle -seed 1 -i SeqAOnly_r801s801.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r802s801.bed
sort -k1,1 -k2,2n ./SeqAOnly_r802s801.bed > ./SeqAOnly_r802s802.bed
bedtools shuffle -seed 1 -i SeqAOnly_r802s802.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r803s802.bed
sort -k1,1 -k2,2n ./SeqAOnly_r803s802.bed > ./SeqAOnly_r803s803.bed
bedtools shuffle -seed 1 -i SeqAOnly_r803s803.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r804s803.bed
sort -k1,1 -k2,2n ./SeqAOnly_r804s803.bed > ./SeqAOnly_r804s804.bed
bedtools shuffle -seed 1 -i SeqAOnly_r804s804.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r805s804.bed
sort -k1,1 -k2,2n ./SeqAOnly_r805s804.bed > ./SeqAOnly_r805s805.bed
bedtools shuffle -seed 1 -i SeqAOnly_r805s805.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r806s805.bed
sort -k1,1 -k2,2n ./SeqAOnly_r806s805.bed > ./SeqAOnly_r806s806.bed
bedtools shuffle -seed 1 -i SeqAOnly_r806s806.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r807s806.bed
sort -k1,1 -k2,2n ./SeqAOnly_r807s806.bed > ./SeqAOnly_r807s807.bed
bedtools shuffle -seed 1 -i SeqAOnly_r807s807.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r808s807.bed
sort -k1,1 -k2,2n ./SeqAOnly_r808s807.bed > ./SeqAOnly_r808s808.bed
bedtools shuffle -seed 1 -i SeqAOnly_r808s808.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r809s808.bed
sort -k1,1 -k2,2n ./SeqAOnly_r809s808.bed > ./SeqAOnly_r809s809.bed
bedtools shuffle -seed 1 -i SeqAOnly_r809s809.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r810s809.bed
sort -k1,1 -k2,2n ./SeqAOnly_r810s809.bed > ./SeqAOnly_r810s810.bed
bedtools shuffle -seed 1 -i SeqAOnly_r810s810.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r811s810.bed
sort -k1,1 -k2,2n ./SeqAOnly_r811s810.bed > ./SeqAOnly_r811s811.bed
bedtools shuffle -seed 1 -i SeqAOnly_r811s811.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r812s811.bed
sort -k1,1 -k2,2n ./SeqAOnly_r812s811.bed > ./SeqAOnly_r812s812.bed
bedtools shuffle -seed 1 -i SeqAOnly_r812s812.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r813s812.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r813s812.bed > ./SeqAOnly_r813s813.bed
bedtools shuffle -seed 1 -i SeqAOnly_r813s813.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r814s813.bed
sort -k1,1 -k2,2n ./SeqAOnly_r814s813.bed > ./SeqAOnly_r814s814.bed
bedtools shuffle -seed 1 -i SeqAOnly_r814s814.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r815s814.bed
sort -k1,1 -k2,2n ./SeqAOnly_r815s814.bed > ./SeqAOnly_r815s815.bed
bedtools shuffle -seed 1 -i SeqAOnly_r815s815.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r816s815.bed
sort -k1,1 -k2,2n ./SeqAOnly_r816s815.bed > ./SeqAOnly_r816s816.bed
bedtools shuffle -seed 1 -i SeqAOnly_r816s816.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r817s816.bed
sort -k1,1 -k2,2n ./SeqAOnly_r817s816.bed > ./SeqAOnly_r817s817.bed
bedtools shuffle -seed 1 -i SeqAOnly_r817s817.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r818s817.bed
sort -k1,1 -k2,2n ./SeqAOnly_r818s817.bed > ./SeqAOnly_r818s818.bed
bedtools shuffle -seed 1 -i SeqAOnly_r818s818.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r819s818.bed
sort -k1,1 -k2,2n ./SeqAOnly_r819s818.bed > ./SeqAOnly_r819s819.bed
bedtools shuffle -seed 1 -i SeqAOnly_r819s819.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r820s819.bed
sort -k1,1 -k2,2n ./SeqAOnly_r820s819.bed > ./SeqAOnly_r820s820.bed
bedtools shuffle -seed 1 -i SeqAOnly_r820s820.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r821s820.bed
sort -k1,1 -k2,2n ./SeqAOnly_r821s820.bed > ./SeqAOnly_r821s821.bed
bedtools shuffle -seed 1 -i SeqAOnly_r821s821.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r822s821.bed
sort -k1,1 -k2,2n ./SeqAOnly_r822s821.bed > ./SeqAOnly_r822s822.bed
bedtools shuffle -seed 1 -i SeqAOnly_r822s822.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r823s822.bed
sort -k1,1 -k2,2n ./SeqAOnly_r823s822.bed > ./SeqAOnly_r823s823.bed
bedtools shuffle -seed 1 -i SeqAOnly_r823s823.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r824s823.bed
sort -k1,1 -k2,2n ./SeqAOnly_r824s823.bed > ./SeqAOnly_r824s824.bed
bedtools shuffle -seed 1 -i SeqAOnly_r824s824.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r825s824.bed
sort -k1,1 -k2,2n ./SeqAOnly_r825s824.bed > ./SeqAOnly_r825s825.bed
bedtools shuffle -seed 1 -i SeqAOnly_r825s825.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r826s825.bed
sort -k1,1 -k2,2n ./SeqAOnly_r826s825.bed > ./SeqAOnly_r826s826.bed
bedtools shuffle -seed 1 -i SeqAOnly_r826s826.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r827s826.bed
sort -k1,1 -k2,2n ./SeqAOnly_r827s826.bed > ./SeqAOnly_r827s827.bed
bedtools shuffle -seed 1 -i SeqAOnly_r827s827.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r828s827.bed
sort -k1,1 -k2,2n ./SeqAOnly_r828s827.bed > ./SeqAOnly_r828s828.bed
bedtools shuffle -seed 1 -i SeqAOnly_r828s828.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r829s828.bed
sort -k1,1 -k2,2n ./SeqAOnly_r829s828.bed > ./SeqAOnly_r829s829.bed
bedtools shuffle -seed 1 -i SeqAOnly_r829s829.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r830s829.bed
sort -k1,1 -k2,2n ./SeqAOnly_r830s829.bed > ./SeqAOnly_r830s830.bed
bedtools shuffle -seed 1 -i SeqAOnly_r830s830.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r831s830.bed
sort -k1,1 -k2,2n ./SeqAOnly_r831s830.bed > ./SeqAOnly_r831s831.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r831s831.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r832s831.bed
sort -k1,1 -k2,2n ./SeqAOnly_r832s831.bed > ./SeqAOnly_r832s832.bed
bedtools shuffle -seed 1 -i SeqAOnly_r832s832.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r833s832.bed
sort -k1,1 -k2,2n ./SeqAOnly_r833s832.bed > ./SeqAOnly_r833s833.bed
bedtools shuffle -seed 1 -i SeqAOnly_r833s833.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r834s833.bed
sort -k1,1 -k2,2n ./SeqAOnly_r834s833.bed > ./SeqAOnly_r834s834.bed
bedtools shuffle -seed 1 -i SeqAOnly_r834s834.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r835s834.bed
sort -k1,1 -k2,2n ./SeqAOnly_r835s834.bed > ./SeqAOnly_r835s835.bed
bedtools shuffle -seed 1 -i SeqAOnly_r835s835.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r836s835.bed
sort -k1,1 -k2,2n ./SeqAOnly_r836s835.bed > ./SeqAOnly_r836s836.bed
bedtools shuffle -seed 1 -i SeqAOnly_r836s836.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r837s836.bed
sort -k1,1 -k2,2n ./SeqAOnly_r837s836.bed > ./SeqAOnly_r837s837.bed
bedtools shuffle -seed 1 -i SeqAOnly_r837s837.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r838s837.bed
sort -k1,1 -k2,2n ./SeqAOnly_r838s837.bed > ./SeqAOnly_r838s838.bed
bedtools shuffle -seed 1 -i SeqAOnly_r838s838.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r839s838.bed
sort -k1,1 -k2,2n ./SeqAOnly_r839s838.bed > ./SeqAOnly_r839s839.bed
bedtools shuffle -seed 1 -i SeqAOnly_r839s839.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r840s839.bed
sort -k1,1 -k2,2n ./SeqAOnly_r840s839.bed > ./SeqAOnly_r840s840.bed
bedtools shuffle -seed 1 -i SeqAOnly_r840s840.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r841s840.bed
sort -k1,1 -k2,2n ./SeqAOnly_r841s840.bed > ./SeqAOnly_r841s841.bed
bedtools shuffle -seed 1 -i SeqAOnly_r841s841.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r842s841.bed
sort -k1,1 -k2,2n ./SeqAOnly_r842s841.bed > ./SeqAOnly_r842s842.bed
bedtools shuffle -seed 1 -i SeqAOnly_r842s842.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r843s842.bed
sort -k1,1 -k2,2n ./SeqAOnly_r843s842.bed > ./SeqAOnly_r843s843.bed
bedtools shuffle -seed 1 -i SeqAOnly_r843s843.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r844s843.bed
sort -k1,1 -k2,2n ./SeqAOnly_r844s843.bed > ./SeqAOnly_r844s844.bed
bedtools shuffle -seed 1 -i SeqAOnly_r844s844.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r845s844.bed
sort -k1,1 -k2,2n ./SeqAOnly_r845s844.bed > ./SeqAOnly_r845s845.bed
bedtools shuffle -seed 1 -i SeqAOnly_r845s845.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r846s845.bed
sort -k1,1 -k2,2n ./SeqAOnly_r846s845.bed > ./SeqAOnly_r846s846.bed
bedtools shuffle -seed 1 -i SeqAOnly_r846s846.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r847s846.bed
sort -k1,1 -k2,2n ./SeqAOnly_r847s846.bed > ./SeqAOnly_r847s847.bed
bedtools shuffle -seed 1 -i SeqAOnly_r847s847.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r848s847.bed
sort -k1,1 -k2,2n ./SeqAOnly_r848s847.bed > ./SeqAOnly_r848s848.bed
bedtools shuffle -seed 1 -i SeqAOnly_r848s848.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r849s848.bed
sort -k1,1 -k2,2n ./SeqAOnly_r849s848.bed > ./SeqAOnly_r849s849.bed
bedtools shuffle -seed 1 -i SeqAOnly_r849s849.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r850s849.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r850s849.bed > ./SeqAOnly_r850s850.bed
bedtools shuffle -seed 1 -i SeqAOnly_r850s850.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r851s850.bed
sort -k1,1 -k2,2n ./SeqAOnly_r851s850.bed > ./SeqAOnly_r851s851.bed
bedtools shuffle -seed 1 -i SeqAOnly_r851s851.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r852s851.bed
sort -k1,1 -k2,2n ./SeqAOnly_r852s851.bed > ./SeqAOnly_r852s852.bed
bedtools shuffle -seed 1 -i SeqAOnly_r852s852.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r853s852.bed
sort -k1,1 -k2,2n ./SeqAOnly_r853s852.bed > ./SeqAOnly_r853s853.bed
bedtools shuffle -seed 1 -i SeqAOnly_r853s853.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r854s853.bed
sort -k1,1 -k2,2n ./SeqAOnly_r854s853.bed > ./SeqAOnly_r854s854.bed
bedtools shuffle -seed 1 -i SeqAOnly_r854s854.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r855s854.bed
sort -k1,1 -k2,2n ./SeqAOnly_r855s854.bed > ./SeqAOnly_r855s855.bed
bedtools shuffle -seed 1 -i SeqAOnly_r855s855.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r856s855.bed
sort -k1,1 -k2,2n ./SeqAOnly_r856s855.bed > ./SeqAOnly_r856s856.bed
bedtools shuffle -seed 1 -i SeqAOnly_r856s856.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r857s856.bed
sort -k1,1 -k2,2n ./SeqAOnly_r857s856.bed > ./SeqAOnly_r857s857.bed
bedtools shuffle -seed 1 -i SeqAOnly_r857s857.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r858s857.bed
sort -k1,1 -k2,2n ./SeqAOnly_r858s857.bed > ./SeqAOnly_r858s858.bed
bedtools shuffle -seed 1 -i SeqAOnly_r858s858.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r859s858.bed
sort -k1,1 -k2,2n ./SeqAOnly_r859s858.bed > ./SeqAOnly_r859s859.bed
bedtools shuffle -seed 1 -i SeqAOnly_r859s859.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r860s859.bed
sort -k1,1 -k2,2n ./SeqAOnly_r860s859.bed > ./SeqAOnly_r860s860.bed
bedtools shuffle -seed 1 -i SeqAOnly_r860s860.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r861s860.bed
sort -k1,1 -k2,2n ./SeqAOnly_r861s860.bed > ./SeqAOnly_r861s861.bed
bedtools shuffle -seed 1 -i SeqAOnly_r861s861.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r862s861.bed
sort -k1,1 -k2,2n ./SeqAOnly_r862s861.bed > ./SeqAOnly_r862s862.bed
bedtools shuffle -seed 1 -i SeqAOnly_r862s862.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r863s862.bed
sort -k1,1 -k2,2n ./SeqAOnly_r863s862.bed > ./SeqAOnly_r863s863.bed
bedtools shuffle -seed 1 -i SeqAOnly_r863s863.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r864s863.bed
sort -k1,1 -k2,2n ./SeqAOnly_r864s863.bed > ./SeqAOnly_r864s864.bed
bedtools shuffle -seed 1 -i SeqAOnly_r864s864.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r865s864.bed
sort -k1,1 -k2,2n ./SeqAOnly_r865s864.bed > ./SeqAOnly_r865s865.bed
bedtools shuffle -seed 1 -i SeqAOnly_r865s865.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r866s865.bed
sort -k1,1 -k2,2n ./SeqAOnly_r866s865.bed > ./SeqAOnly_r866s866.bed
bedtools shuffle -seed 1 -i SeqAOnly_r866s866.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r867s866.bed
sort -k1,1 -k2,2n ./SeqAOnly_r867s866.bed > ./SeqAOnly_r867s867.bed
bedtools shuffle -seed 1 -i SeqAOnly_r867s867.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r868s867.bed
sort -k1,1 -k2,2n ./SeqAOnly_r868s867.bed > ./SeqAOnly_r868s868.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r868s868.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r869s868.bed
sort -k1,1 -k2,2n ./SeqAOnly_r869s868.bed > ./SeqAOnly_r869s869.bed
bedtools shuffle -seed 1 -i SeqAOnly_r869s869.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r870s869.bed
sort -k1,1 -k2,2n ./SeqAOnly_r870s869.bed > ./SeqAOnly_r870s870.bed
bedtools shuffle -seed 1 -i SeqAOnly_r870s870.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r871s870.bed
sort -k1,1 -k2,2n ./SeqAOnly_r871s870.bed > ./SeqAOnly_r871s871.bed
bedtools shuffle -seed 1 -i SeqAOnly_r871s871.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r872s871.bed
sort -k1,1 -k2,2n ./SeqAOnly_r872s871.bed > ./SeqAOnly_r872s872.bed
bedtools shuffle -seed 1 -i SeqAOnly_r872s872.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r873s872.bed
sort -k1,1 -k2,2n ./SeqAOnly_r873s872.bed > ./SeqAOnly_r873s873.bed
bedtools shuffle -seed 1 -i SeqAOnly_r873s873.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r874s873.bed
sort -k1,1 -k2,2n ./SeqAOnly_r874s873.bed > ./SeqAOnly_r874s874.bed
bedtools shuffle -seed 1 -i SeqAOnly_r874s874.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r875s874.bed
sort -k1,1 -k2,2n ./SeqAOnly_r875s874.bed > ./SeqAOnly_r875s875.bed
bedtools shuffle -seed 1 -i SeqAOnly_r875s875.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r876s875.bed
sort -k1,1 -k2,2n ./SeqAOnly_r876s875.bed > ./SeqAOnly_r876s876.bed
bedtools shuffle -seed 1 -i SeqAOnly_r876s876.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r877s876.bed
sort -k1,1 -k2,2n ./SeqAOnly_r877s876.bed > ./SeqAOnly_r877s877.bed
bedtools shuffle -seed 1 -i SeqAOnly_r877s877.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r878s877.bed
sort -k1,1 -k2,2n ./SeqAOnly_r878s877.bed > ./SeqAOnly_r878s878.bed
bedtools shuffle -seed 1 -i SeqAOnly_r878s878.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r879s878.bed
sort -k1,1 -k2,2n ./SeqAOnly_r879s878.bed > ./SeqAOnly_r879s879.bed
bedtools shuffle -seed 1 -i SeqAOnly_r879s879.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r880s879.bed
sort -k1,1 -k2,2n ./SeqAOnly_r880s879.bed > ./SeqAOnly_r880s880.bed
bedtools shuffle -seed 1 -i SeqAOnly_r880s880.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r881s880.bed
sort -k1,1 -k2,2n ./SeqAOnly_r881s880.bed > ./SeqAOnly_r881s881.bed
bedtools shuffle -seed 1 -i SeqAOnly_r881s881.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r882s881.bed
sort -k1,1 -k2,2n ./SeqAOnly_r882s881.bed > ./SeqAOnly_r882s882.bed
bedtools shuffle -seed 1 -i SeqAOnly_r882s882.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r883s882.bed
sort -k1,1 -k2,2n ./SeqAOnly_r883s882.bed > ./SeqAOnly_r883s883.bed
bedtools shuffle -seed 1 -i SeqAOnly_r883s883.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r884s883.bed
sort -k1,1 -k2,2n ./SeqAOnly_r884s883.bed > ./SeqAOnly_r884s884.bed
bedtools shuffle -seed 1 -i SeqAOnly_r884s884.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r885s884.bed
sort -k1,1 -k2,2n ./SeqAOnly_r885s884.bed > ./SeqAOnly_r885s885.bed
bedtools shuffle -seed 1 -i SeqAOnly_r885s885.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r886s885.bed
sort -k1,1 -k2,2n ./SeqAOnly_r886s885.bed > ./SeqAOnly_r886s886.bed
bedtools shuffle -seed 1 -i SeqAOnly_r886s886.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r887s886.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r887s886.bed > ./SeqAOnly_r887s887.bed
bedtools shuffle -seed 1 -i SeqAOnly_r887s887.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r888s887.bed
sort -k1,1 -k2,2n ./SeqAOnly_r888s887.bed > ./SeqAOnly_r888s888.bed
bedtools shuffle -seed 1 -i SeqAOnly_r888s888.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r889s888.bed
sort -k1,1 -k2,2n ./SeqAOnly_r889s888.bed > ./SeqAOnly_r889s889.bed
bedtools shuffle -seed 1 -i SeqAOnly_r889s889.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r890s889.bed
sort -k1,1 -k2,2n ./SeqAOnly_r890s889.bed > ./SeqAOnly_r890s890.bed
bedtools shuffle -seed 1 -i SeqAOnly_r890s890.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r891s890.bed
sort -k1,1 -k2,2n ./SeqAOnly_r891s890.bed > ./SeqAOnly_r891s891.bed
bedtools shuffle -seed 1 -i SeqAOnly_r891s891.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r892s891.bed
sort -k1,1 -k2,2n ./SeqAOnly_r892s891.bed > ./SeqAOnly_r892s892.bed
bedtools shuffle -seed 1 -i SeqAOnly_r892s892.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r893s892.bed
sort -k1,1 -k2,2n ./SeqAOnly_r893s892.bed > ./SeqAOnly_r893s893.bed
bedtools shuffle -seed 1 -i SeqAOnly_r893s893.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r894s893.bed
sort -k1,1 -k2,2n ./SeqAOnly_r894s893.bed > ./SeqAOnly_r894s894.bed
bedtools shuffle -seed 1 -i SeqAOnly_r894s894.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r895s894.bed
sort -k1,1 -k2,2n ./SeqAOnly_r895s894.bed > ./SeqAOnly_r895s895.bed
bedtools shuffle -seed 1 -i SeqAOnly_r895s895.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r896s895.bed
sort -k1,1 -k2,2n ./SeqAOnly_r896s895.bed > ./SeqAOnly_r896s896.bed
bedtools shuffle -seed 1 -i SeqAOnly_r896s896.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r897s896.bed
sort -k1,1 -k2,2n ./SeqAOnly_r897s896.bed > ./SeqAOnly_r897s897.bed
bedtools shuffle -seed 1 -i SeqAOnly_r897s897.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r898s897.bed
sort -k1,1 -k2,2n ./SeqAOnly_r898s897.bed > ./SeqAOnly_r898s898.bed
bedtools shuffle -seed 1 -i SeqAOnly_r898s898.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r899s898.bed
sort -k1,1 -k2,2n ./SeqAOnly_r899s898.bed > ./SeqAOnly_r899s899.bed
bedtools shuffle -seed 1 -i SeqAOnly_r899s899.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r900s899.bed
sort -k1,1 -k2,2n ./SeqAOnly_r900s899.bed > ./SeqAOnly_r900s900.bed
bedtools shuffle -seed 1 -i SeqAOnly_r900s900.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r901s900.bed
sort -k1,1 -k2,2n ./SeqAOnly_r901s900.bed > ./SeqAOnly_r901s901.bed
bedtools shuffle -seed 1 -i SeqAOnly_r901s901.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r902s901.bed
sort -k1,1 -k2,2n ./SeqAOnly_r902s901.bed > ./SeqAOnly_r902s902.bed
bedtools shuffle -seed 1 -i SeqAOnly_r902s902.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r903s902.bed
sort -k1,1 -k2,2n ./SeqAOnly_r903s902.bed > ./SeqAOnly_r903s903.bed
bedtools shuffle -seed 1 -i SeqAOnly_r903s903.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r904s903.bed
sort -k1,1 -k2,2n ./SeqAOnly_r904s903.bed > ./SeqAOnly_r904s904.bed
bedtools shuffle -seed 1 -i SeqAOnly_r904s904.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r905s904.bed
sort -k1,1 -k2,2n ./SeqAOnly_r905s904.bed > ./SeqAOnly_r905s905.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r905s905.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r906s905.bed
sort -k1,1 -k2,2n ./SeqAOnly_r906s905.bed > ./SeqAOnly_r906s906.bed
bedtools shuffle -seed 1 -i SeqAOnly_r906s906.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r907s906.bed
sort -k1,1 -k2,2n ./SeqAOnly_r907s906.bed > ./SeqAOnly_r907s907.bed
bedtools shuffle -seed 1 -i SeqAOnly_r907s907.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r908s907.bed
sort -k1,1 -k2,2n ./SeqAOnly_r908s907.bed > ./SeqAOnly_r908s908.bed
bedtools shuffle -seed 1 -i SeqAOnly_r908s908.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r909s908.bed
sort -k1,1 -k2,2n ./SeqAOnly_r909s908.bed > ./SeqAOnly_r909s909.bed
bedtools shuffle -seed 1 -i SeqAOnly_r909s909.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r910s909.bed
sort -k1,1 -k2,2n ./SeqAOnly_r910s909.bed > ./SeqAOnly_r910s910.bed
bedtools shuffle -seed 1 -i SeqAOnly_r910s910.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r911s910.bed
sort -k1,1 -k2,2n ./SeqAOnly_r911s910.bed > ./SeqAOnly_r911s911.bed
bedtools shuffle -seed 1 -i SeqAOnly_r911s911.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r912s911.bed
sort -k1,1 -k2,2n ./SeqAOnly_r912s911.bed > ./SeqAOnly_r912s912.bed
bedtools shuffle -seed 1 -i SeqAOnly_r912s912.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r913s912.bed
sort -k1,1 -k2,2n ./SeqAOnly_r913s912.bed > ./SeqAOnly_r913s913.bed
bedtools shuffle -seed 1 -i SeqAOnly_r913s913.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r914s913.bed
sort -k1,1 -k2,2n ./SeqAOnly_r914s913.bed > ./SeqAOnly_r914s914.bed
bedtools shuffle -seed 1 -i SeqAOnly_r914s914.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r915s914.bed
sort -k1,1 -k2,2n ./SeqAOnly_r915s914.bed > ./SeqAOnly_r915s915.bed
bedtools shuffle -seed 1 -i SeqAOnly_r915s915.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r916s915.bed
sort -k1,1 -k2,2n ./SeqAOnly_r916s915.bed > ./SeqAOnly_r916s916.bed
bedtools shuffle -seed 1 -i SeqAOnly_r916s916.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r917s916.bed
sort -k1,1 -k2,2n ./SeqAOnly_r917s916.bed > ./SeqAOnly_r917s917.bed
bedtools shuffle -seed 1 -i SeqAOnly_r917s917.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r918s917.bed
sort -k1,1 -k2,2n ./SeqAOnly_r918s917.bed > ./SeqAOnly_r918s918.bed
bedtools shuffle -seed 1 -i SeqAOnly_r918s918.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r919s918.bed
sort -k1,1 -k2,2n ./SeqAOnly_r919s918.bed > ./SeqAOnly_r919s919.bed
bedtools shuffle -seed 1 -i SeqAOnly_r919s919.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r920s919.bed
sort -k1,1 -k2,2n ./SeqAOnly_r920s919.bed > ./SeqAOnly_r920s920.bed
bedtools shuffle -seed 1 -i SeqAOnly_r920s920.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r921s920.bed
sort -k1,1 -k2,2n ./SeqAOnly_r921s920.bed > ./SeqAOnly_r921s921.bed
bedtools shuffle -seed 1 -i SeqAOnly_r921s921.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r922s921.bed
sort -k1,1 -k2,2n ./SeqAOnly_r922s921.bed > ./SeqAOnly_r922s922.bed
bedtools shuffle -seed 1 -i SeqAOnly_r922s922.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r923s922.bed
sort -k1,1 -k2,2n ./SeqAOnly_r923s922.bed > ./SeqAOnly_r923s923.bed
bedtools shuffle -seed 1 -i SeqAOnly_r923s923.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r924s923.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r924s923.bed > ./SeqAOnly_r924s924.bed
bedtools shuffle -seed 1 -i SeqAOnly_r924s924.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r925s924.bed
sort -k1,1 -k2,2n ./SeqAOnly_r925s924.bed > ./SeqAOnly_r925s925.bed
bedtools shuffle -seed 1 -i SeqAOnly_r925s925.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r926s925.bed
sort -k1,1 -k2,2n ./SeqAOnly_r926s925.bed > ./SeqAOnly_r926s926.bed
bedtools shuffle -seed 1 -i SeqAOnly_r926s926.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r927s926.bed
sort -k1,1 -k2,2n ./SeqAOnly_r927s926.bed > ./SeqAOnly_r927s927.bed
bedtools shuffle -seed 1 -i SeqAOnly_r927s927.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r928s927.bed
sort -k1,1 -k2,2n ./SeqAOnly_r928s927.bed > ./SeqAOnly_r928s928.bed
bedtools shuffle -seed 1 -i SeqAOnly_r928s928.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r929s928.bed
sort -k1,1 -k2,2n ./SeqAOnly_r929s928.bed > ./SeqAOnly_r929s929.bed
bedtools shuffle -seed 1 -i SeqAOnly_r929s929.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r930s929.bed
sort -k1,1 -k2,2n ./SeqAOnly_r930s929.bed > ./SeqAOnly_r930s930.bed
bedtools shuffle -seed 1 -i SeqAOnly_r930s930.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r931s930.bed
sort -k1,1 -k2,2n ./SeqAOnly_r931s930.bed > ./SeqAOnly_r931s931.bed
bedtools shuffle -seed 1 -i SeqAOnly_r931s931.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r932s931.bed
sort -k1,1 -k2,2n ./SeqAOnly_r932s931.bed > ./SeqAOnly_r932s932.bed
bedtools shuffle -seed 1 -i SeqAOnly_r932s932.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r933s932.bed
sort -k1,1 -k2,2n ./SeqAOnly_r933s932.bed > ./SeqAOnly_r933s933.bed
bedtools shuffle -seed 1 -i SeqAOnly_r933s933.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r934s933.bed
sort -k1,1 -k2,2n ./SeqAOnly_r934s933.bed > ./SeqAOnly_r934s934.bed
bedtools shuffle -seed 1 -i SeqAOnly_r934s934.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r935s934.bed
sort -k1,1 -k2,2n ./SeqAOnly_r935s934.bed > ./SeqAOnly_r935s935.bed
bedtools shuffle -seed 1 -i SeqAOnly_r935s935.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r936s935.bed
sort -k1,1 -k2,2n ./SeqAOnly_r936s935.bed > ./SeqAOnly_r936s936.bed
bedtools shuffle -seed 1 -i SeqAOnly_r936s936.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r937s936.bed
sort -k1,1 -k2,2n ./SeqAOnly_r937s936.bed > ./SeqAOnly_r937s937.bed
bedtools shuffle -seed 1 -i SeqAOnly_r937s937.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r938s937.bed
sort -k1,1 -k2,2n ./SeqAOnly_r938s937.bed > ./SeqAOnly_r938s938.bed
bedtools shuffle -seed 1 -i SeqAOnly_r938s938.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r939s938.bed
sort -k1,1 -k2,2n ./SeqAOnly_r939s938.bed > ./SeqAOnly_r939s939.bed
bedtools shuffle -seed 1 -i SeqAOnly_r939s939.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r940s939.bed
sort -k1,1 -k2,2n ./SeqAOnly_r940s939.bed > ./SeqAOnly_r940s940.bed
bedtools shuffle -seed 1 -i SeqAOnly_r940s940.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r941s940.bed
sort -k1,1 -k2,2n ./SeqAOnly_r941s940.bed > ./SeqAOnly_r941s941.bed
bedtools shuffle -seed 1 -i SeqAOnly_r941s941.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r942s941.bed
sort -k1,1 -k2,2n ./SeqAOnly_r942s941.bed > ./SeqAOnly_r942s942.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r942s942.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r943s942.bed
sort -k1,1 -k2,2n ./SeqAOnly_r943s942.bed > ./SeqAOnly_r943s943.bed
bedtools shuffle -seed 1 -i SeqAOnly_r943s943.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r944s943.bed
sort -k1,1 -k2,2n ./SeqAOnly_r944s943.bed > ./SeqAOnly_r944s944.bed
bedtools shuffle -seed 1 -i SeqAOnly_r944s944.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r945s944.bed
sort -k1,1 -k2,2n ./SeqAOnly_r945s944.bed > ./SeqAOnly_r945s945.bed
bedtools shuffle -seed 1 -i SeqAOnly_r945s945.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r946s945.bed
sort -k1,1 -k2,2n ./SeqAOnly_r946s945.bed > ./SeqAOnly_r946s946.bed
bedtools shuffle -seed 1 -i SeqAOnly_r946s946.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r947s946.bed
sort -k1,1 -k2,2n ./SeqAOnly_r947s946.bed > ./SeqAOnly_r947s947.bed
bedtools shuffle -seed 1 -i SeqAOnly_r947s947.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r948s947.bed
sort -k1,1 -k2,2n ./SeqAOnly_r948s947.bed > ./SeqAOnly_r948s948.bed
bedtools shuffle -seed 1 -i SeqAOnly_r948s948.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r949s948.bed
sort -k1,1 -k2,2n ./SeqAOnly_r949s948.bed > ./SeqAOnly_r949s949.bed
bedtools shuffle -seed 1 -i SeqAOnly_r949s949.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r950s949.bed
sort -k1,1 -k2,2n ./SeqAOnly_r950s949.bed > ./SeqAOnly_r950s950.bed
bedtools shuffle -seed 1 -i SeqAOnly_r950s950.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r951s950.bed
sort -k1,1 -k2,2n ./SeqAOnly_r951s950.bed > ./SeqAOnly_r951s951.bed
bedtools shuffle -seed 1 -i SeqAOnly_r951s951.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r952s951.bed
sort -k1,1 -k2,2n ./SeqAOnly_r952s951.bed > ./SeqAOnly_r952s952.bed
bedtools shuffle -seed 1 -i SeqAOnly_r952s952.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r953s952.bed
sort -k1,1 -k2,2n ./SeqAOnly_r953s952.bed > ./SeqAOnly_r953s953.bed
bedtools shuffle -seed 1 -i SeqAOnly_r953s953.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r954s953.bed
sort -k1,1 -k2,2n ./SeqAOnly_r954s953.bed > ./SeqAOnly_r954s954.bed
bedtools shuffle -seed 1 -i SeqAOnly_r954s954.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r955s954.bed
sort -k1,1 -k2,2n ./SeqAOnly_r955s954.bed > ./SeqAOnly_r955s955.bed
bedtools shuffle -seed 1 -i SeqAOnly_r955s955.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r956s955.bed
sort -k1,1 -k2,2n ./SeqAOnly_r956s955.bed > ./SeqAOnly_r956s956.bed
bedtools shuffle -seed 1 -i SeqAOnly_r956s956.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r957s956.bed
sort -k1,1 -k2,2n ./SeqAOnly_r957s956.bed > ./SeqAOnly_r957s957.bed
bedtools shuffle -seed 1 -i SeqAOnly_r957s957.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r958s957.bed
sort -k1,1 -k2,2n ./SeqAOnly_r958s957.bed > ./SeqAOnly_r958s958.bed
bedtools shuffle -seed 1 -i SeqAOnly_r958s958.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r959s958.bed
sort -k1,1 -k2,2n ./SeqAOnly_r959s958.bed > ./SeqAOnly_r959s959.bed
bedtools shuffle -seed 1 -i SeqAOnly_r959s959.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r960s959.bed
sort -k1,1 -k2,2n ./SeqAOnly_r960s959.bed > ./SeqAOnly_r960s960.bed
bedtools shuffle -seed 1 -i SeqAOnly_r960s960.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r961s960.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r961s960.bed > ./SeqAOnly_r961s961.bed
bedtools shuffle -seed 1 -i SeqAOnly_r961s961.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r962s961.bed
sort -k1,1 -k2,2n ./SeqAOnly_r962s961.bed > ./SeqAOnly_r962s962.bed
bedtools shuffle -seed 1 -i SeqAOnly_r962s962.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r963s962.bed
sort -k1,1 -k2,2n ./SeqAOnly_r963s962.bed > ./SeqAOnly_r963s963.bed
bedtools shuffle -seed 1 -i SeqAOnly_r963s963.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r964s963.bed
sort -k1,1 -k2,2n ./SeqAOnly_r964s963.bed > ./SeqAOnly_r964s964.bed
bedtools shuffle -seed 1 -i SeqAOnly_r964s964.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r965s964.bed
sort -k1,1 -k2,2n ./SeqAOnly_r965s964.bed > ./SeqAOnly_r965s965.bed
bedtools shuffle -seed 1 -i SeqAOnly_r965s965.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r966s965.bed
sort -k1,1 -k2,2n ./SeqAOnly_r966s965.bed > ./SeqAOnly_r966s966.bed
bedtools shuffle -seed 1 -i SeqAOnly_r966s966.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r967s966.bed
sort -k1,1 -k2,2n ./SeqAOnly_r967s966.bed > ./SeqAOnly_r967s967.bed
bedtools shuffle -seed 1 -i SeqAOnly_r967s967.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r968s967.bed
sort -k1,1 -k2,2n ./SeqAOnly_r968s967.bed > ./SeqAOnly_r968s968.bed
bedtools shuffle -seed 1 -i SeqAOnly_r968s968.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r969s968.bed
sort -k1,1 -k2,2n ./SeqAOnly_r969s968.bed > ./SeqAOnly_r969s969.bed
bedtools shuffle -seed 1 -i SeqAOnly_r969s969.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r970s969.bed
sort -k1,1 -k2,2n ./SeqAOnly_r970s969.bed > ./SeqAOnly_r970s970.bed
bedtools shuffle -seed 1 -i SeqAOnly_r970s970.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r971s970.bed
sort -k1,1 -k2,2n ./SeqAOnly_r971s970.bed > ./SeqAOnly_r971s971.bed
bedtools shuffle -seed 1 -i SeqAOnly_r971s971.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r972s971.bed
sort -k1,1 -k2,2n ./SeqAOnly_r972s971.bed > ./SeqAOnly_r972s972.bed
bedtools shuffle -seed 1 -i SeqAOnly_r972s972.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r973s972.bed
sort -k1,1 -k2,2n ./SeqAOnly_r973s972.bed > ./SeqAOnly_r973s973.bed
bedtools shuffle -seed 1 -i SeqAOnly_r973s973.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r974s973.bed
sort -k1,1 -k2,2n ./SeqAOnly_r974s973.bed > ./SeqAOnly_r974s974.bed
bedtools shuffle -seed 1 -i SeqAOnly_r974s974.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r975s974.bed
sort -k1,1 -k2,2n ./SeqAOnly_r975s974.bed > ./SeqAOnly_r975s975.bed
bedtools shuffle -seed 1 -i SeqAOnly_r975s975.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r976s975.bed
sort -k1,1 -k2,2n ./SeqAOnly_r976s975.bed > ./SeqAOnly_r976s976.bed
bedtools shuffle -seed 1 -i SeqAOnly_r976s976.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r977s976.bed
sort -k1,1 -k2,2n ./SeqAOnly_r977s976.bed > ./SeqAOnly_r977s977.bed
bedtools shuffle -seed 1 -i SeqAOnly_r977s977.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r978s977.bed
sort -k1,1 -k2,2n ./SeqAOnly_r978s977.bed > ./SeqAOnly_r978s978.bed
bedtools shuffle -seed 1 -i SeqAOnly_r978s978.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r979s978.bed
sort -k1,1 -k2,2n ./SeqAOnly_r979s978.bed > ./SeqAOnly_r979s979.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_r979s979.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r980s979.bed
sort -k1,1 -k2,2n ./SeqAOnly_r980s979.bed > ./SeqAOnly_r980s980.bed
bedtools shuffle -seed 1 -i SeqAOnly_r980s980.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r981s980.bed
sort -k1,1 -k2,2n ./SeqAOnly_r981s980.bed > ./SeqAOnly_r981s981.bed
bedtools shuffle -seed 1 -i SeqAOnly_r981s981.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r982s981.bed
sort -k1,1 -k2,2n ./SeqAOnly_r982s981.bed > ./SeqAOnly_r982s982.bed
bedtools shuffle -seed 1 -i SeqAOnly_r982s982.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r983s982.bed
sort -k1,1 -k2,2n ./SeqAOnly_r983s982.bed > ./SeqAOnly_r983s983.bed
bedtools shuffle -seed 1 -i SeqAOnly_r983s983.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r984s983.bed
sort -k1,1 -k2,2n ./SeqAOnly_r984s983.bed > ./SeqAOnly_r984s984.bed
bedtools shuffle -seed 1 -i SeqAOnly_r984s984.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r985s984.bed
sort -k1,1 -k2,2n ./SeqAOnly_r985s984.bed > ./SeqAOnly_r985s985.bed
bedtools shuffle -seed 1 -i SeqAOnly_r985s985.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r986s985.bed
sort -k1,1 -k2,2n ./SeqAOnly_r986s985.bed > ./SeqAOnly_r986s986.bed
bedtools shuffle -seed 1 -i SeqAOnly_r986s986.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r987s986.bed
sort -k1,1 -k2,2n ./SeqAOnly_r987s986.bed > ./SeqAOnly_r987s987.bed
bedtools shuffle -seed 1 -i SeqAOnly_r987s987.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r988s987.bed
sort -k1,1 -k2,2n ./SeqAOnly_r988s987.bed > ./SeqAOnly_r988s988.bed
bedtools shuffle -seed 1 -i SeqAOnly_r988s988.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r989s988.bed
sort -k1,1 -k2,2n ./SeqAOnly_r989s988.bed > ./SeqAOnly_r989s989.bed
bedtools shuffle -seed 1 -i SeqAOnly_r989s989.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r990s989.bed
sort -k1,1 -k2,2n ./SeqAOnly_r990s989.bed > ./SeqAOnly_r990s990.bed
bedtools shuffle -seed 1 -i SeqAOnly_r990s990.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r991s990.bed
sort -k1,1 -k2,2n ./SeqAOnly_r991s990.bed > ./SeqAOnly_r991s991.bed
bedtools shuffle -seed 1 -i SeqAOnly_r991s991.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r992s991.bed
sort -k1,1 -k2,2n ./SeqAOnly_r992s991.bed > ./SeqAOnly_r992s992.bed
bedtools shuffle -seed 1 -i SeqAOnly_r992s992.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r993s992.bed
sort -k1,1 -k2,2n ./SeqAOnly_r993s992.bed > ./SeqAOnly_r993s993.bed
bedtools shuffle -seed 1 -i SeqAOnly_r993s993.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r994s993.bed
sort -k1,1 -k2,2n ./SeqAOnly_r994s993.bed > ./SeqAOnly_r994s994.bed
bedtools shuffle -seed 1 -i SeqAOnly_r994s994.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r995s994.bed
sort -k1,1 -k2,2n ./SeqAOnly_r995s994.bed > ./SeqAOnly_r995s995.bed
bedtools shuffle -seed 1 -i SeqAOnly_r995s995.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r996s995.bed
sort -k1,1 -k2,2n ./SeqAOnly_r996s995.bed > ./SeqAOnly_r996s996.bed
bedtools shuffle -seed 1 -i SeqAOnly_r996s996.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r997s996.bed
sort -k1,1 -k2,2n ./SeqAOnly_r997s996.bed > ./SeqAOnly_r997s997.bed
bedtools shuffle -seed 1 -i SeqAOnly_r997s997.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r998s997.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_r998s997.bed > ./SeqAOnly_r998s998.bed
bedtools shuffle -seed 1 -i SeqAOnly_r998s998.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r999s998.bed
sort -k1,1 -k2,2n ./SeqAOnly_r999s998.bed > ./SeqAOnly_r999s999.bed
bedtools shuffle -seed 1 -i SeqAOnly_r999s999.bed -g Ecoli-genomesize.txt > ./SeqAOnly_r1000s999.bed
sort -k1,1 -k2,2n ./SeqAOnly_r1000s999.bed > ./SeqAOnly_r1000s1000.bed
```

BEDTools shuffle SeqA Only (Grainger) signals (SeqA Only 2) 1000 times

```
#!/bin/bash

#bedtools_shuffle_sort_SeqAOnly_Grainger.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to shuffle SeqAOnly_Grainger signals 1000 times

cp ./SeqAOnly_Grainger.bed ./SeqAOnly_Grainger_r0s0.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r0s0.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r1s0.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r1s0.bed > ./SeqAOnly_Grainger_r1s1.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r1s1.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r2s1.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r2s1.bed > ./SeqAOnly_Grainger_r2s2.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r2s2.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r3s2.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r3s2.bed > ./SeqAOnly_Grainger_r3s3.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r3s3.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r4s3.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r4s3.bed > ./SeqAOnly_Grainger_r4s4.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r4s4.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r5s4.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r5s4.bed > ./SeqAOnly_Grainger_r5s5.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r5s5.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r6s5.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r6s5.bed > ./SeqAOnly_Grainger_r6s6.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r6s6.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r7s6.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r7s6.bed > ./SeqAOnly_Grainger_r7s7.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r7s7.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r8s7.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r8s7.bed > ./SeqAOnly_Grainger_r8s8.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r8s8.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r9s8.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r9s8.bed > ./SeqAOnly_Grainger_r9s9.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r9s9.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r10s9.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r10s9.bed > ./SeqAOnly_Grainger_r10s10.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r10s10.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r11s10.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r11s10.bed > ./SeqAOnly_Grainger_r11s11.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r11s11.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r12s11.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r12s11.bed > ./SeqAOnly_Grainger_r12s12.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r12s12.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r13s12.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r13s12.bed > ./SeqAOnly_Grainger_r13s13.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r13s13.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r14s13.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r14s13.bed > ./SeqAOnly_Grainger_r14s14.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r14s14.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r15s14.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r15s14.bed > ./SeqAOnly_Grainger_r15s15.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r15s15.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r16s15.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r16s15.bed > ./SeqAOnly_Grainger_r16s16.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r16s16.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r17s16.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r17s16.bed > ./SeqAOnly_Grainger_r17s17.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r17s17.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r18s17.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r18s17.bed > ./SeqAOnly_Grainger_r18s18.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r18s18.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r19s18.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r19s18.bed > ./SeqAOnly_Grainger_r19s19.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r19s19.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r20s19.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r20s19.bed > ./SeqAOnly_Grainger_r20s20.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r20s20.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r21s20.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r21s20.bed > ./SeqAOnly_Grainger_r21s21.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r21s21.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r22s21.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r22s21.bed > ./SeqAOnly_Grainger_r22s22.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r22s22.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r23s22.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r23s22.bed > ./SeqAOnly_Grainger_r23s23.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r23s23.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r24s23.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r24s23.bed > ./SeqAOnly_Grainger_r24s24.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r24s24.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r25s24.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r25s24.bed > ./SeqAOnly_Grainger_r25s25.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r25s25.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r26s25.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r26s25.bed > ./SeqAOnly_Grainger_r26s26.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r26s26.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r27s26.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r27s26.bed > ./SeqAOnly_Grainger_r27s27.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r27s27.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r28s27.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r28s27.bed > ./SeqAOnly_Grainger_r28s28.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r28s28.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r29s28.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r29s28.bed > ./SeqAOnly_Grainger_r29s29.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r29s29.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r30s29.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r30s29.bed > ./SeqAOnly_Grainger_r30s30.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r30s30.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r31s30.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r31s30.bed > ./SeqAOnly_Grainger_r31s31.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r31s31.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r32s31.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r32s31.bed > ./SeqAOnly_Grainger_r32s32.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r32s32.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r33s32.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r33s32.bed > ./SeqAOnly_Grainger_r33s33.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r33s33.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r34s33.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r34s33.bed > ./SeqAOnly_Grainger_r34s34.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r34s34.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r35s34.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r35s34.bed > ./SeqAOnly_Grainger_r35s35.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r35s35.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r36s35.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r36s35.bed > ./SeqAOnly_Grainger_r36s36.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r36s36.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r37s36.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r37s36.bed > ./SeqAOnly_Grainger_r37s37.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r37s37.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r38s37.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r38s37.bed > ./SeqAOnly_Grainger_r38s38.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r38s38.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r39s38.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r39s38.bed > ./SeqAOnly_Grainger_r39s39.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r39s39.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r40s39.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r40s39.bed > ./SeqAOnly_Grainger_r40s40.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r40s40.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r41s40.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r41s40.bed > ./SeqAOnly_Grainger_r41s41.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r41s41.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r42s41.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r42s41.bed > ./SeqAOnly_Grainger_r42s42.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r42s42.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r43s42.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r43s42.bed > ./SeqAOnly_Grainger_r43s43.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r43s43.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r44s43.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r44s43.bed > ./SeqAOnly_Grainger_r44s44.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r44s44.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r45s44.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r45s44.bed > ./SeqAOnly_Grainger_r45s45.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r45s45.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r46s45.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r46s45.bed > ./SeqAOnly_Grainger_r46s46.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r46s46.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r47s46.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r47s46.bed > ./SeqAOnly_Grainger_r47s47.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r47s47.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r48s47.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r48s47.bed > ./SeqAOnly_Grainger_r48s48.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r48s48.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r49s48.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r49s48.bed > ./SeqAOnly_Grainger_r49s49.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r49s49.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r50s49.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r50s49.bed > ./SeqAOnly_Grainger_r50s50.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r50s50.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r51s50.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r51s50.bed > ./SeqAOnly_Grainger_r51s51.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r51s51.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r52s51.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r52s51.bed > ./SeqAOnly_Grainger_r52s52.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r52s52.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r53s52.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r53s52.bed > ./SeqAOnly_Grainger_r53s53.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r53s53.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r54s53.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r54s53.bed > ./SeqAOnly_Grainger_r54s54.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r54s54.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r55s54.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r55s54.bed > ./SeqAOnly_Grainger_r55s55.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r55s55.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r56s55.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r56s55.bed > ./SeqAOnly_Grainger_r56s56.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r56s56.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r57s56.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r57s56.bed > ./SeqAOnly_Grainger_r57s57.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r57s57.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r58s57.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r58s57.bed > ./SeqAOnly_Grainger_r58s58.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r58s58.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r59s58.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r59s58.bed > ./SeqAOnly_Grainger_r59s59.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r59s59.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r60s59.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r60s59.bed > ./SeqAOnly_Grainger_r60s60.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r60s60.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r61s60.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r61s60.bed > ./SeqAOnly_Grainger_r61s61.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r61s61.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r62s61.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r62s61.bed > ./SeqAOnly_Grainger_r62s62.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r62s62.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r63s62.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r63s62.bed > ./SeqAOnly_Grainger_r63s63.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r63s63.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r64s63.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r64s63.bed > ./SeqAOnly_Grainger_r64s64.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r64s64.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r65s64.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r65s64.bed > ./SeqAOnly_Grainger_r65s65.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r65s65.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r66s65.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r66s65.bed > ./SeqAOnly_Grainger_r66s66.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r66s66.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r67s66.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r67s66.bed > ./SeqAOnly_Grainger_r67s67.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r67s67.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r68s67.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r68s67.bed > ./SeqAOnly_Grainger_r68s68.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r68s68.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r69s68.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r69s68.bed > ./SeqAOnly_Grainger_r69s69.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r69s69.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r70s69.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r70s69.bed > ./SeqAOnly_Grainger_r70s70.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r70s70.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r71s70.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r71s70.bed > ./SeqAOnly_Grainger_r71s71.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r71s71.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r72s71.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r72s71.bed > ./SeqAOnly_Grainger_r72s72.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r72s72.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r73s72.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r73s72.bed > ./SeqAOnly_Grainger_r73s73.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r73s73.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r74s73.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r74s73.bed > ./SeqAOnly_Grainger_r74s74.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r74s74.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r75s74.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r75s74.bed > ./SeqAOnly_Grainger_r75s75.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r75s75.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r76s75.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r76s75.bed > ./SeqAOnly_Grainger_r76s76.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r76s76.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r77s76.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r77s76.bed > ./SeqAOnly_Grainger_r77s77.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r77s77.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r78s77.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r78s77.bed > ./SeqAOnly_Grainger_r78s78.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r78s78.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r79s78.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r79s78.bed > ./SeqAOnly_Grainger_r79s79.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r79s79.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r80s79.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r80s79.bed > ./SeqAOnly_Grainger_r80s80.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r80s80.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r81s80.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r81s80.bed > ./SeqAOnly_Grainger_r81s81.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r81s81.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r82s81.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r82s81.bed > ./SeqAOnly_Grainger_r82s82.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r82s82.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r83s82.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r83s82.bed > ./SeqAOnly_Grainger_r83s83.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r83s83.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r84s83.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r84s83.bed > ./SeqAOnly_Grainger_r84s84.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r84s84.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r85s84.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r85s84.bed > ./SeqAOnly_Grainger_r85s85.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r85s85.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r86s85.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r86s85.bed > ./SeqAOnly_Grainger_r86s86.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r86s86.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r87s86.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r87s86.bed > ./SeqAOnly_Grainger_r87s87.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r87s87.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r88s87.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r88s87.bed > ./SeqAOnly_Grainger_r88s88.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r88s88.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r89s88.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r89s88.bed > ./SeqAOnly_Grainger_r89s89.bed
```

```
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r89s89.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r90s89.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r90s89.bed > ./SeqAOnly_Grainger_r90s90.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r90s90.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r91s90.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r91s90.bed > ./SeqAOnly_Grainger_r91s91.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r91s91.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r92s91.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r92s91.bed > ./SeqAOnly_Grainger_r92s92.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r92s92.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r93s92.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r93s92.bed > ./SeqAOnly_Grainger_r93s93.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r93s93.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r94s93.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r94s93.bed > ./SeqAOnly_Grainger_r94s94.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r94s94.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r95s94.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r95s94.bed > ./SeqAOnly_Grainger_r95s95.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r95s95.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r96s95.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r96s95.bed > ./SeqAOnly_Grainger_r96s96.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r96s96.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r97s96.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r97s96.bed > ./SeqAOnly_Grainger_r97s97.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r97s97.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r98s97.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r98s97.bed > ./SeqAOnly_Grainger_r98s98.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r98s98.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r99s98.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r99s98.bed > ./SeqAOnly_Grainger_r99s99.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r99s99.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r100s99.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r100s99.bed > ./SeqAOnly_Grainger_r100s100.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r100s100.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r101s100.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r101s100.bed > ./SeqAOnly_Grainger_r101s101.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r101s101.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r102s101.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r102s101.bed > ./SeqAOnly_Grainger_r102s102.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r102s102.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r103s102.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r103s102.bed > ./SeqAOnly_Grainger_r103s103.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r103s103.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r104s103.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r104s103.bed > ./SeqAOnly_Grainger_r104s104.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r104s104.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r105s104.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r105s104.bed > ./SeqAOnly_Grainger_r105s105.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r105s105.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r106s105.bed
```

```
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r106s105.bed > ./SeqAOnly_Grainger_r106s106.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r106s106.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r107s106.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r107s106.bed > ./SeqAOnly_Grainger_r107s107.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r107s107.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r108s107.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r108s107.bed > ./SeqAOnly_Grainger_r108s108.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r108s108.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r109s108.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r109s108.bed > ./SeqAOnly_Grainger_r109s109.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r109s109.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r110s109.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r110s109.bed > ./SeqAOnly_Grainger_r110s110.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r110s110.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r111s110.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r111s110.bed > ./SeqAOnly_Grainger_r111s111.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r111s111.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r112s111.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r112s111.bed > ./SeqAOnly_Grainger_r112s112.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r112s112.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r113s112.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r113s112.bed > ./SeqAOnly_Grainger_r113s113.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r113s113.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r114s113.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r114s113.bed > ./SeqAOnly_Grainger_r114s114.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r114s114.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r115s114.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r115s114.bed > ./SeqAOnly_Grainger_r115s115.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r115s115.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r116s115.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r116s115.bed > ./SeqAOnly_Grainger_r116s116.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r116s116.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r117s116.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r117s116.bed > ./SeqAOnly_Grainger_r117s117.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r117s117.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r118s117.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r118s117.bed > ./SeqAOnly_Grainger_r118s118.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r118s118.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r119s118.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r119s118.bed > ./SeqAOnly_Grainger_r119s119.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r119s119.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r120s119.bed
```

```
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r120s119.bed > ./SeqAOnly_Grainger_r120s120.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r120s120.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r121s120.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r121s120.bed > ./SeqAOnly_Grainger_r121s121.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r121s121.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r122s121.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r122s121.bed > ./SeqAOnly_Grainger_r122s122.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r122s122.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r123s122.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r123s122.bed > ./SeqAOnly_Grainger_r123s123.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r123s123.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r124s123.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r124s123.bed > ./SeqAOnly_Grainger_r124s124.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r124s124.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r125s124.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r125s124.bed > ./SeqAOnly_Grainger_r125s125.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r125s125.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r126s125.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r126s125.bed > ./SeqAOnly_Grainger_r126s126.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r126s126.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r127s126.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r127s126.bed > ./SeqAOnly_Grainger_r127s127.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r127s127.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r128s127.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r128s127.bed > ./SeqAOnly_Grainger_r128s128.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r128s128.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r129s128.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r129s128.bed > ./SeqAOnly_Grainger_r129s129.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r129s129.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r130s129.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r130s129.bed > ./SeqAOnly_Grainger_r130s130.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r130s130.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r131s130.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r131s130.bed > ./SeqAOnly_Grainger_r131s131.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r131s131.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r132s131.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r132s131.bed > ./SeqAOnly_Grainger_r132s132.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r132s132.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r133s132.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r133s132.bed > ./SeqAOnly_Grainger_r133s133.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r133s133.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r134s133.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r134s133.bed > ./SeqAOnly_Grainger_r134s134.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r134s134.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r135s134.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r135s134.bed > ./SeqAOnly_Grainger_r135s135.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r135s135.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r136s135.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r136s135.bed > ./SeqAOnly_Grainger_r136s136.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r136s136.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r137s136.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r137s136.bed > ./SeqAOnly_Grainger_r137s137.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r137s137.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r138s137.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r138s137.bed > ./SeqAOnly_Grainger_r138s138.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r138s138.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r139s138.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r139s138.bed > ./SeqAOnly_Grainger_r139s139.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r139s139.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r140s139.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r140s139.bed > ./SeqAOnly_Grainger_r140s140.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r140s140.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r141s140.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r141s140.bed > ./SeqAOnly_Grainger_r141s141.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r141s141.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r142s141.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r142s141.bed > ./SeqAOnly_Grainger_r142s142.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r142s142.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r143s142.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r143s142.bed > ./SeqAOnly_Grainger_r143s143.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r143s143.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r144s143.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r144s143.bed > ./SeqAOnly_Grainger_r144s144.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r144s144.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r145s144.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r145s144.bed > ./SeqAOnly_Grainger_r145s145.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r145s145.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r146s145.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r146s145.bed > ./SeqAOnly_Grainger_r146s146.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r146s146.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r147s146.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r147s146.bed > ./SeqAOnly_Grainger_r147s147.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r147s147.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r148s147.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r148s147.bed > ./SeqAOnly_Grainger_r148s148.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r148s148.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r149s148.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r149s148.bed > ./SeqAOnly_Grainger_r149s149.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r149s149.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r150s149.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r150s149.bed > ./SeqAOnly_Grainger_r150s150.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r150s150.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r151s150.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r151s150.bed > ./SeqAOnly_Grainger_r151s151.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r151s151.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r152s151.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r152s151.bed > ./SeqAOnly_Grainger_r152s152.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r152s152.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r153s152.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r153s152.bed > ./SeqAOnly_Grainger_r153s153.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r153s153.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r154s153.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r154s153.bed > ./SeqAOnly_Grainger_r154s154.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r154s154.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r155s154.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r155s154.bed > ./SeqAOnly_Grainger_r155s155.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r155s155.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r156s155.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r156s155.bed > ./SeqAOnly_Grainger_r156s156.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r156s156.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r157s156.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r157s156.bed > ./SeqAOnly_Grainger_r157s157.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r157s157.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r158s157.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r158s157.bed > ./SeqAOnly_Grainger_r158s158.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r158s158.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r159s158.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r159s158.bed > ./SeqAOnly_Grainger_r159s159.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r159s159.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r160s159.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r160s159.bed > ./SeqAOnly_Grainger_r160s160.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r160s160.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r161s160.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r161s160.bed > ./SeqAOnly_Grainger_r161s161.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r161s161.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r162s161.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r162s161.bed > ./SeqAOnly_Grainger_r162s162.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r162s162.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r163s162.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r163s162.bed > ./SeqAOnly_Grainger_r163s163.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r163s163.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r164s163.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r164s163.bed > ./SeqAOnly_Grainger_r164s164.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r164s164.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r165s164.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r165s164.bed > ./SeqAOnly_Grainger_r165s165.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r165s165.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r166s165.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r166s165.bed > ./SeqAOnly_Grainger_r166s166.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r166s166.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r167s166.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r167s166.bed > ./SeqAOnly_Grainger_r167s167.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r167s167.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r168s167.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r168s167.bed > ./SeqAOnly_Grainger_r168s168.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r168s168.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r169s168.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r169s168.bed > ./SeqAOnly_Grainger_r169s169.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r169s169.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r170s169.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r170s169.bed > ./SeqAOnly_Grainger_r170s170.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r170s170.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r171s170.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r171s170.bed > ./SeqAOnly_Grainger_r171s171.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r171s171.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r172s171.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r172s171.bed > ./SeqAOnly_Grainger_r172s172.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r172s172.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r173s172.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r173s172.bed > ./SeqAOnly_Grainger_r173s173.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r173s173.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r174s173.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r174s173.bed > ./SeqAOnly_Grainger_r174s174.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r174s174.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r175s174.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r175s174.bed > ./SeqAOnly_Grainger_r175s175.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r175s175.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r176s175.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r176s175.bed > ./SeqAOnly_Grainger_r176s176.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r176s176.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r177s176.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r177s176.bed > ./SeqAOnly_Grainger_r177s177.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r177s177.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r178s177.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r178s177.bed > ./SeqAOnly_Grainger_r178s178.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r178s178.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r179s178.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r179s178.bed > ./SeqAOnly_Grainger_r179s179.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r179s179.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r180s179.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r180s179.bed > ./SeqAOnly_Grainger_r180s180.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r180s180.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r181s180.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r181s180.bed > ./SeqAOnly_Grainger_r181s181.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r181s181.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r182s181.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r182s181.bed > ./SeqAOnly_Grainger_r182s182.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r182s182.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r183s182.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r183s182.bed > ./SeqAOnly_Grainger_r183s183.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r183s183.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r184s183.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r184s183.bed > ./SeqAOnly_Grainger_r184s184.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r184s184.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r185s184.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r185s184.bed > ./SeqAOnly_Grainger_r185s185.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r185s185.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r186s185.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r186s185.bed > ./SeqAOnly_Grainger_r186s186.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r186s186.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r187s186.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r187s186.bed > ./SeqAOnly_Grainger_r187s187.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r187s187.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r188s187.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r188s187.bed > ./SeqAOnly_Grainger_r188s188.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r188s188.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r189s188.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r189s188.bed > ./SeqAOnly_Grainger_r189s189.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r189s189.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r190s189.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r190s189.bed > ./SeqAOnly_Grainger_r190s190.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r190s190.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r191s190.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r191s190.bed > ./SeqAOnly_Grainger_r191s191.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r191s191.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r192s191.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r192s191.bed > ./SeqAOnly_Grainger_r192s192.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r192s192.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r193s192.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r193s192.bed > ./SeqAOnly_Grainger_r193s193.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r193s193.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r194s193.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r194s193.bed > ./SeqAOnly_Grainger_r194s194.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r194s194.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r195s194.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r195s194.bed > ./SeqAOnly_Grainger_r195s195.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r195s195.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r196s195.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r196s195.bed > ./SeqAOnly_Grainger_r196s196.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r196s196.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r197s196.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r197s196.bed > ./SeqAOnly_Grainger_r197s197.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r197s197.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r198s197.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r198s197.bed > ./SeqAOnly_Grainger_r198s198.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r198s198.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r199s198.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r199s198.bed > ./SeqAOnly_Grainger_r199s199.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r199s199.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r200s199.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r200s199.bed > ./SeqAOnly_Grainger_r200s200.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r200s200.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r201s200.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r201s200.bed > ./SeqAOnly_Grainger_r201s201.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r201s201.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r202s201.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r202s201.bed > ./SeqAOnly_Grainger_r202s202.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r202s202.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r203s202.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r203s202.bed > ./SeqAOnly_Grainger_r203s203.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r203s203.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r204s203.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r204s203.bed > ./SeqAOnly_Grainger_r204s204.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r204s204.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r205s204.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r205s204.bed > ./SeqAOnly_Grainger_r205s205.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r205s205.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r206s205.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r206s205.bed > ./SeqAOnly_Grainger_r206s206.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r206s206.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r207s206.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r207s206.bed > ./SeqAOnly_Grainger_r207s207.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r207s207.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r208s207.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r208s207.bed > ./SeqAOnly_Grainger_r208s208.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r208s208.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r209s208.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r209s208.bed > ./SeqAOnly_Grainger_r209s209.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r209s209.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r210s209.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r210s209.bed > ./SeqAOnly_Grainger_r210s210.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r210s210.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r211s210.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r211s210.bed > ./SeqAOnly_Grainger_r211s211.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r211s211.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r212s211.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r212s211.bed > ./SeqAOnly_Grainger_r212s212.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r212s212.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r213s212.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r213s212.bed > ./SeqAOnly_Grainger_r213s213.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r213s213.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r214s213.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r214s213.bed > ./SeqAOnly_Grainger_r214s214.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r214s214.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r215s214.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r215s214.bed > ./SeqAOnly_Grainger_r215s215.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r215s215.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r216s215.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r216s215.bed > ./SeqAOnly_Grainger_r216s216.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r216s216.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r217s216.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r217s216.bed > ./SeqAOnly_Grainger_r217s217.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r217s217.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r218s217.bed
```

```
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r218s217.bed > ./SeqAOnly_Grainger_r218s218.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r218s218.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r219s218.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r219s218.bed > ./SeqAOnly_Grainger_r219s219.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r219s219.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r220s219.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r220s219.bed > ./SeqAOnly_Grainger_r220s220.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r220s220.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r221s220.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r221s220.bed > ./SeqAOnly_Grainger_r221s221.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r221s221.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r222s221.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r222s221.bed > ./SeqAOnly_Grainger_r222s222.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r222s222.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r223s222.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r223s222.bed > ./SeqAOnly_Grainger_r223s223.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r223s223.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r224s223.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r224s223.bed > ./SeqAOnly_Grainger_r224s224.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r224s224.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r225s224.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r225s224.bed > ./SeqAOnly_Grainger_r225s225.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r225s225.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r226s225.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r226s225.bed > ./SeqAOnly_Grainger_r226s226.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r226s226.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r227s226.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r227s226.bed > ./SeqAOnly_Grainger_r227s227.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r227s227.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r228s227.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r228s227.bed > ./SeqAOnly_Grainger_r228s228.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r228s228.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r229s228.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r229s228.bed > ./SeqAOnly_Grainger_r229s229.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r229s229.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r230s229.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r230s229.bed > ./SeqAOnly_Grainger_r230s230.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r230s230.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r231s230.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r231s230.bed > ./SeqAOnly_Grainger_r231s231.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r231s231.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r232s231.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r232s231.bed > ./SeqAOnly_Grainger_r232s232.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r232s232.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r233s232.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r233s232.bed > ./SeqAOnly_Grainger_r233s233.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r233s233.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r234s233.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r234s233.bed > ./SeqAOnly_Grainger_r234s234.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r234s234.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r235s234.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r235s234.bed > ./SeqAOnly_Grainger_r235s235.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r235s235.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r236s235.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r236s235.bed > ./SeqAOnly_Grainger_r236s236.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r236s236.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r237s236.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r237s236.bed > ./SeqAOnly_Grainger_r237s237.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r237s237.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r238s237.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r238s237.bed > ./SeqAOnly_Grainger_r238s238.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r238s238.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r239s238.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r239s238.bed > ./SeqAOnly_Grainger_r239s239.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r239s239.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r240s239.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r240s239.bed > ./SeqAOnly_Grainger_r240s240.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r240s240.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r241s240.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r241s240.bed > ./SeqAOnly_Grainger_r241s241.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r241s241.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r242s241.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r242s241.bed > ./SeqAOnly_Grainger_r242s242.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r242s242.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r243s242.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r243s242.bed > ./SeqAOnly_Grainger_r243s243.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r243s243.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r244s243.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r244s243.bed > ./SeqAOnly_Grainger_r244s244.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r244s244.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r245s244.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r245s244.bed > ./SeqAOnly_Grainger_r245s245.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r245s245.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r246s245.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r246s245.bed > ./SeqAOnly_Grainger_r246s246.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r246s246.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r247s246.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r247s246.bed > ./SeqAOnly_Grainger_r247s247.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r247s247.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r248s247.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r248s247.bed > ./SeqAOnly_Grainger_r248s248.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r248s248.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r249s248.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r249s248.bed > ./SeqAOnly_Grainger_r249s249.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r249s249.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r250s249.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r250s249.bed > ./SeqAOnly_Grainger_r250s250.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r250s250.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r251s250.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r251s250.bed > ./SeqAOnly_Grainger_r251s251.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r251s251.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r252s251.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r252s251.bed > ./SeqAOnly_Grainger_r252s252.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r252s252.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r253s252.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r253s252.bed > ./SeqAOnly_Grainger_r253s253.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r253s253.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r254s253.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r254s253.bed > ./SeqAOnly_Grainger_r254s254.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r254s254.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r255s254.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r255s254.bed > ./SeqAOnly_Grainger_r255s255.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r255s255.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r256s255.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r256s255.bed > ./SeqAOnly_Grainger_r256s256.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r256s256.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r257s256.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r257s256.bed > ./SeqAOnly_Grainger_r257s257.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r257s257.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r258s257.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r258s257.bed > ./SeqAOnly_Grainger_r258s258.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r258s258.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r259s258.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r259s258.bed > ./SeqAOnly_Grainger_r259s259.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r259s259.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r260s259.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r260s259.bed > ./SeqAOnly_Grainger_r260s260.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r260s260.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r261s260.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r261s260.bed > ./SeqAOnly_Grainger_r261s261.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r261s261.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r262s261.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r262s261.bed > ./SeqAOnly_Grainger_r262s262.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r262s262.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r263s262.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r263s262.bed > ./SeqAOnly_Grainger_r263s263.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r263s263.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r264s263.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r264s263.bed > ./SeqAOnly_Grainger_r264s264.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r264s264.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r265s264.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r265s264.bed > ./SeqAOnly_Grainger_r265s265.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r265s265.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r266s265.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r266s265.bed > ./SeqAOnly_Grainger_r266s266.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r266s266.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r267s266.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r267s266.bed > ./SeqAOnly_Grainger_r267s267.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r267s267.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r268s267.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r268s267.bed > ./SeqAOnly_Grainger_r268s268.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r268s268.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r269s268.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r269s268.bed > ./SeqAOnly_Grainger_r269s269.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r269s269.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r270s269.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r270s269.bed > ./SeqAOnly_Grainger_r270s270.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r270s270.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r271s270.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r271s270.bed > ./SeqAOnly_Grainger_r271s271.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r271s271.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r272s271.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r272s271.bed > ./SeqAOnly_Grainger_r272s272.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r272s272.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r273s272.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r273s272.bed > ./SeqAOnly_Grainger_r273s273.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r273s273.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r274s273.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r274s273.bed > ./SeqAOnly_Grainger_r274s274.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r274s274.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r275s274.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r275s274.bed > ./SeqAOnly_Grainger_r275s275.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r275s275.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r276s275.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r276s275.bed > ./SeqAOnly_Grainger_r276s276.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r276s276.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r277s276.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r277s276.bed > ./SeqAOnly_Grainger_r277s277.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r277s277.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r278s277.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r278s277.bed > ./SeqAOnly_Grainger_r278s278.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r278s278.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r279s278.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r279s278.bed > ./SeqAOnly_Grainger_r279s279.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r279s279.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r280s279.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r280s279.bed > ./SeqAOnly_Grainger_r280s280.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r280s280.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r281s280.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r281s280.bed > ./SeqAOnly_Grainger_r281s281.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r281s281.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r282s281.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r282s281.bed > ./SeqAOnly_Grainger_r282s282.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r282s282.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r283s282.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r283s282.bed > ./SeqAOnly_Grainger_r283s283.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r283s283.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r284s283.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r284s283.bed > ./SeqAOnly_Grainger_r284s284.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r284s284.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r285s284.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r285s284.bed > ./SeqAOnly_Grainger_r285s285.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r285s285.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r286s285.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r286s285.bed > ./SeqAOnly_Grainger_r286s286.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r286s286.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r287s286.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r287s286.bed > ./SeqAOnly_Grainger_r287s287.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r287s287.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r288s287.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r288s287.bed > ./SeqAOnly_Grainger_r288s288.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r288s288.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r289s288.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r289s288.bed > ./SeqAOnly_Grainger_r289s289.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r289s289.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r290s289.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r290s289.bed > ./SeqAOnly_Grainger_r290s290.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r290s290.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r291s290.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r291s290.bed > ./SeqAOnly_Grainger_r291s291.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r291s291.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r292s291.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r292s291.bed > ./SeqAOnly_Grainger_r292s292.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r292s292.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r293s292.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r293s292.bed > ./SeqAOnly_Grainger_r293s293.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r293s293.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r294s293.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r294s293.bed > ./SeqAOnly_Grainger_r294s294.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r294s294.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r295s294.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r295s294.bed > ./SeqAOnly_Grainger_r295s295.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r295s295.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r296s295.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r296s295.bed > ./SeqAOnly_Grainger_r296s296.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r296s296.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r297s296.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r297s296.bed > ./SeqAOnly_Grainger_r297s297.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r297s297.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r298s297.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r298s297.bed > ./SeqAOnly_Grainger_r298s298.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r298s298.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r299s298.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r299s298.bed > ./SeqAOnly_Grainger_r299s299.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r299s299.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r300s299.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r300s299.bed > ./SeqAOnly_Grainger_r300s300.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r300s300.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r301s300.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r301s300.bed > ./SeqAOnly_Grainger_r301s301.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r301s301.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r302s301.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r302s301.bed > ./SeqAOnly_Grainger_r302s302.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r302s302.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r303s302.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r303s302.bed > ./SeqAOnly_Grainger_r303s303.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r303s303.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r304s303.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r304s303.bed > ./SeqAOnly_Grainger_r304s304.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r304s304.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r305s304.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r305s304.bed > ./SeqAOnly_Grainger_r305s305.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r305s305.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r306s305.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r306s305.bed > ./SeqAOnly_Grainger_r306s306.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r306s306.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r307s306.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r307s306.bed > ./SeqAOnly_Grainger_r307s307.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r307s307.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r308s307.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r308s307.bed > ./SeqAOnly_Grainger_r308s308.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r308s308.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r309s308.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r309s308.bed > ./SeqAOnly_Grainger_r309s309.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r309s309.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r310s309.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r310s309.bed > ./SeqAOnly_Grainger_r310s310.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r310s310.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r311s310.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r311s310.bed > ./SeqAOnly_Grainger_r311s311.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r311s311.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r312s311.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r312s311.bed > ./SeqAOnly_Grainger_r312s312.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r312s312.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r313s312.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r313s312.bed > ./SeqAOnly_Grainger_r313s313.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r313s313.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r314s313.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r314s313.bed > ./SeqAOnly_Grainger_r314s314.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r314s314.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r315s314.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r315s314.bed > ./SeqAOnly_Grainger_r315s315.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r315s315.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r316s315.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r316s315.bed > ./SeqAOnly_Grainger_r316s316.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r316s316.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r317s316.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r317s316.bed > ./SeqAOnly_Grainger_r317s317.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r317s317.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r318s317.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r318s317.bed > ./SeqAOnly_Grainger_r318s318.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r318s318.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r319s318.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r319s318.bed > ./SeqAOnly_Grainger_r319s319.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r319s319.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r320s319.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r320s319.bed > ./SeqAOnly_Grainger_r320s320.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r320s320.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r321s320.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r321s320.bed > ./SeqAOnly_Grainger_r321s321.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r321s321.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r322s321.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r322s321.bed > ./SeqAOnly_Grainger_r322s322.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r322s322.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r323s322.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r323s322.bed > ./SeqAOnly_Grainger_r323s323.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r323s323.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r324s323.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r324s323.bed > ./SeqAOnly_Grainger_r324s324.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r324s324.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r325s324.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r325s324.bed > ./SeqAOnly_Grainger_r325s325.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r325s325.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r326s325.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r326s325.bed > ./SeqAOnly_Grainger_r326s326.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r326s326.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r327s326.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r327s326.bed > ./SeqAOnly_Grainger_r327s327.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r327s327.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r328s327.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r328s327.bed > ./SeqAOnly_Grainger_r328s328.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r328s328.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r329s328.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r329s328.bed > ./SeqAOnly_Grainger_r329s329.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r329s329.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r330s329.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r330s329.bed > ./SeqAOnly_Grainger_r330s330.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r330s330.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r331s330.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r331s330.bed > ./SeqAOnly_Grainger_r331s331.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r331s331.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r332s331.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r332s331.bed > ./SeqAOnly_Grainger_r332s332.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r332s332.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r333s332.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r333s332.bed > ./SeqAOnly_Grainger_r333s333.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r333s333.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r334s333.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r334s333.bed > ./SeqAOnly_Grainger_r334s334.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r334s334.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r335s334.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r335s334.bed > ./SeqAOnly_Grainger_r335s335.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r335s335.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r336s335.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r336s335.bed > ./SeqAOnly_Grainger_r336s336.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r336s336.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r337s336.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r337s336.bed > ./SeqAOnly_Grainger_r337s337.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r337s337.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r338s337.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r338s337.bed > ./SeqAOnly_Grainger_r338s338.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r338s338.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r339s338.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r339s338.bed > ./SeqAOnly_Grainger_r339s339.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r339s339.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r340s339.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r340s339.bed > ./SeqAOnly_Grainger_r340s340.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r340s340.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r341s340.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r341s340.bed > ./SeqAOnly_Grainger_r341s341.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r341s341.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r342s341.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r342s341.bed > ./SeqAOnly_Grainger_r342s342.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r342s342.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r343s342.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r343s342.bed > ./SeqAOnly_Grainger_r343s343.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r343s343.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r344s343.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r344s343.bed > ./SeqAOnly_Grainger_r344s344.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r344s344.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r345s344.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r345s344.bed > ./SeqAOnly_Grainger_r345s345.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r345s345.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r346s345.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r346s345.bed > ./SeqAOnly_Grainger_r346s346.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r346s346.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r347s346.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r347s346.bed > ./SeqAOnly_Grainger_r347s347.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r347s347.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r348s347.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r348s347.bed > ./SeqAOnly_Grainger_r348s348.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r348s348.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r349s348.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r349s348.bed > ./SeqAOnly_Grainger_r349s349.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r349s349.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r350s349.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r350s349.bed > ./SeqAOnly_Grainger_r350s350.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r350s350.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r351s350.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r351s350.bed > ./SeqAOnly_Grainger_r351s351.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r351s351.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r352s351.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r352s351.bed > ./SeqAOnly_Grainger_r352s352.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r352s352.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r353s352.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r353s352.bed > ./SeqAOnly_Grainger_r353s353.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r353s353.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r354s353.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r354s353.bed > ./SeqAOnly_Grainger_r354s354.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r354s354.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r355s354.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r355s354.bed > ./SeqAOnly_Grainger_r355s355.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r355s355.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r356s355.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r356s355.bed > ./SeqAOnly_Grainger_r356s356.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r356s356.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r357s356.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r357s356.bed > ./SeqAOnly_Grainger_r357s357.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r357s357.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r358s357.bed
```

```
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r358s357.bed > ./SeqAOnly_Grainger_r358s358.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r358s358.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r359s358.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r359s358.bed > ./SeqAOnly_Grainger_r359s359.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r359s359.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r360s359.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r360s359.bed > ./SeqAOnly_Grainger_r360s360.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r360s360.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r361s360.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r361s360.bed > ./SeqAOnly_Grainger_r361s361.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r361s361.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r362s361.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r362s361.bed > ./SeqAOnly_Grainger_r362s362.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r362s362.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r363s362.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r363s362.bed > ./SeqAOnly_Grainger_r363s363.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r363s363.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r364s363.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r364s363.bed > ./SeqAOnly_Grainger_r364s364.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r364s364.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r365s364.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r365s364.bed > ./SeqAOnly_Grainger_r365s365.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r365s365.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r366s365.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r366s365.bed > ./SeqAOnly_Grainger_r366s366.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r366s366.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r367s366.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r367s366.bed > ./SeqAOnly_Grainger_r367s367.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r367s367.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r368s367.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r368s367.bed > ./SeqAOnly_Grainger_r368s368.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r368s368.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r369s368.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r369s368.bed > ./SeqAOnly_Grainger_r369s369.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r369s369.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r370s369.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r370s369.bed > ./SeqAOnly_Grainger_r370s370.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r370s370.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r371s370.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r371s370.bed > ./SeqAOnly_Grainger_r371s371.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r371s371.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r372s371.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r372s371.bed > ./SeqAOnly_Grainger_r372s372.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r372s372.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r373s372.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r373s372.bed > ./SeqAOnly_Grainger_r373s373.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r373s373.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r374s373.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r374s373.bed > ./SeqAOnly_Grainger_r374s374.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r374s374.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r375s374.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r375s374.bed > ./SeqAOnly_Grainger_r375s375.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r375s375.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r376s375.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r376s375.bed > ./SeqAOnly_Grainger_r376s376.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r376s376.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r377s376.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r377s376.bed > ./SeqAOnly_Grainger_r377s377.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r377s377.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r378s377.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r378s377.bed > ./SeqAOnly_Grainger_r378s378.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r378s378.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r379s378.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r379s378.bed > ./SeqAOnly_Grainger_r379s379.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r379s379.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r380s379.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r380s379.bed > ./SeqAOnly_Grainger_r380s380.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r380s380.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r381s380.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r381s380.bed > ./SeqAOnly_Grainger_r381s381.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r381s381.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r382s381.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r382s381.bed > ./SeqAOnly_Grainger_r382s382.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r382s382.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r383s382.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r383s382.bed > ./SeqAOnly_Grainger_r383s383.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r383s383.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r384s383.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r384s383.bed > ./SeqAOnly_Grainger_r384s384.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r384s384.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r385s384.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r385s384.bed > ./SeqAOnly_Grainger_r385s385.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r385s385.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r386s385.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r386s385.bed > ./SeqAOnly_Grainger_r386s386.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r386s386.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r387s386.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r387s386.bed > ./SeqAOnly_Grainger_r387s387.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r387s387.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r388s387.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r388s387.bed > ./SeqAOnly_Grainger_r388s388.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r388s388.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r389s388.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r389s388.bed > ./SeqAOnly_Grainger_r389s389.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r389s389.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r390s389.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r390s389.bed > ./SeqAOnly_Grainger_r390s390.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r390s390.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r391s390.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r391s390.bed > ./SeqAOnly_Grainger_r391s391.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r391s391.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r392s391.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r392s391.bed > ./SeqAOnly_Grainger_r392s392.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r392s392.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r393s392.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r393s392.bed > ./SeqAOnly_Grainger_r393s393.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r393s393.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r394s393.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r394s393.bed > ./SeqAOnly_Grainger_r394s394.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r394s394.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r395s394.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r395s394.bed > ./SeqAOnly_Grainger_r395s395.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r395s395.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r396s395.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r396s395.bed > ./SeqAOnly_Grainger_r396s396.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r396s396.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r397s396.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r397s396.bed > ./SeqAOnly_Grainger_r397s397.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r397s397.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r398s397.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r398s397.bed > ./SeqAOnly_Grainger_r398s398.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r398s398.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r399s398.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r399s398.bed > ./SeqAOnly_Grainger_r399s399.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r399s399.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r400s399.bed
```

```
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r400s399.bed > ./SeqAOnly_Grainger_r400s400.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r400s400.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r401s400.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r401s400.bed > ./SeqAOnly_Grainger_r401s401.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r401s401.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r402s401.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r402s401.bed > ./SeqAOnly_Grainger_r402s402.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r402s402.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r403s402.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r403s402.bed > ./SeqAOnly_Grainger_r403s403.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r403s403.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r404s403.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r404s403.bed > ./SeqAOnly_Grainger_r404s404.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r404s404.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r405s404.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r405s404.bed > ./SeqAOnly_Grainger_r405s405.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r405s405.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r406s405.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r406s405.bed > ./SeqAOnly_Grainger_r406s406.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r406s406.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r407s406.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r407s406.bed > ./SeqAOnly_Grainger_r407s407.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r407s407.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r408s407.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r408s407.bed > ./SeqAOnly_Grainger_r408s408.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r408s408.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r409s408.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r409s408.bed > ./SeqAOnly_Grainger_r409s409.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r409s409.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r410s409.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r410s409.bed > ./SeqAOnly_Grainger_r410s410.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r410s410.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r411s410.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r411s410.bed > ./SeqAOnly_Grainger_r411s411.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r411s411.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r412s411.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r412s411.bed > ./SeqAOnly_Grainger_r412s412.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r412s412.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r413s412.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r413s412.bed > ./SeqAOnly_Grainger_r413s413.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r413s413.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r414s413.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r414s413.bed > ./SeqAOnly_Grainger_r414s414.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r414s414.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r415s414.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r415s414.bed > ./SeqAOnly_Grainger_r415s415.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r415s415.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r416s415.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r416s415.bed > ./SeqAOnly_Grainger_r416s416.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r416s416.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r417s416.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r417s416.bed > ./SeqAOnly_Grainger_r417s417.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r417s417.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r418s417.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r418s417.bed > ./SeqAOnly_Grainger_r418s418.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r418s418.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r419s418.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r419s418.bed > ./SeqAOnly_Grainger_r419s419.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r419s419.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r420s419.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r420s419.bed > ./SeqAOnly_Grainger_r420s420.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r420s420.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r421s420.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r421s420.bed > ./SeqAOnly_Grainger_r421s421.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r421s421.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r422s421.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r422s421.bed > ./SeqAOnly_Grainger_r422s422.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r422s422.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r423s422.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r423s422.bed > ./SeqAOnly_Grainger_r423s423.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r423s423.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r424s423.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r424s423.bed > ./SeqAOnly_Grainger_r424s424.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r424s424.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r425s424.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r425s424.bed > ./SeqAOnly_Grainger_r425s425.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r425s425.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r426s425.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r426s425.bed > ./SeqAOnly_Grainger_r426s426.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r426s426.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r427s426.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r427s426.bed > ./SeqAOnly_Grainger_r427s427.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r427s427.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r428s427.bed
```

```
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r428s427.bed > ./SeqAOnly_Grainger_r428s428.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r428s428.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r429s428.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r429s428.bed > ./SeqAOnly_Grainger_r429s429.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r429s429.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r430s429.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r430s429.bed > ./SeqAOnly_Grainger_r430s430.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r430s430.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r431s430.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r431s430.bed > ./SeqAOnly_Grainger_r431s431.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r431s431.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r432s431.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r432s431.bed > ./SeqAOnly_Grainger_r432s432.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r432s432.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r433s432.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r433s432.bed > ./SeqAOnly_Grainger_r433s433.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r433s433.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r434s433.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r434s433.bed > ./SeqAOnly_Grainger_r434s434.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r434s434.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r435s434.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r435s434.bed > ./SeqAOnly_Grainger_r435s435.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r435s435.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r436s435.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r436s435.bed > ./SeqAOnly_Grainger_r436s436.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r436s436.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r437s436.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r437s436.bed > ./SeqAOnly_Grainger_r437s437.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r437s437.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r438s437.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r438s437.bed > ./SeqAOnly_Grainger_r438s438.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r438s438.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r439s438.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r439s438.bed > ./SeqAOnly_Grainger_r439s439.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r439s439.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r440s439.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r440s439.bed > ./SeqAOnly_Grainger_r440s440.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r440s440.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r441s440.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r441s440.bed > ./SeqAOnly_Grainger_r441s441.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r441s441.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r442s441.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r442s441.bed > ./SeqAOnly_Grainger_r442s442.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r442s442.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r443s442.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r443s442.bed > ./SeqAOnly_Grainger_r443s443.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r443s443.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r444s443.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r444s443.bed > ./SeqAOnly_Grainger_r444s444.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r444s444.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r445s444.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r445s444.bed > ./SeqAOnly_Grainger_r445s445.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r445s445.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r446s445.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r446s445.bed > ./SeqAOnly_Grainger_r446s446.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r446s446.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r447s446.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r447s446.bed > ./SeqAOnly_Grainger_r447s447.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r447s447.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r448s447.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r448s447.bed > ./SeqAOnly_Grainger_r448s448.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r448s448.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r449s448.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r449s448.bed > ./SeqAOnly_Grainger_r449s449.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r449s449.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r450s449.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r450s449.bed > ./SeqAOnly_Grainger_r450s450.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r450s450.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r451s450.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r451s450.bed > ./SeqAOnly_Grainger_r451s451.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r451s451.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r452s451.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r452s451.bed > ./SeqAOnly_Grainger_r452s452.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r452s452.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r453s452.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r453s452.bed > ./SeqAOnly_Grainger_r453s453.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r453s453.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r454s453.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r454s453.bed > ./SeqAOnly_Grainger_r454s454.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r454s454.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r455s454.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r455s454.bed > ./SeqAOnly_Grainger_r455s455.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r455s455.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r456s455.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r456s455.bed > ./SeqAOnly_Grainger_r456s456.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r456s456.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r457s456.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r457s456.bed > ./SeqAOnly_Grainger_r457s457.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r457s457.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r458s457.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r458s457.bed > ./SeqAOnly_Grainger_r458s458.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r458s458.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r459s458.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r459s458.bed > ./SeqAOnly_Grainger_r459s459.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r459s459.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r460s459.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r460s459.bed > ./SeqAOnly_Grainger_r460s460.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r460s460.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r461s460.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r461s460.bed > ./SeqAOnly_Grainger_r461s461.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r461s461.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r462s461.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r462s461.bed > ./SeqAOnly_Grainger_r462s462.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r462s462.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r463s462.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r463s462.bed > ./SeqAOnly_Grainger_r463s463.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r463s463.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r464s463.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r464s463.bed > ./SeqAOnly_Grainger_r464s464.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r464s464.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r465s464.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r465s464.bed > ./SeqAOnly_Grainger_r465s465.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r465s465.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r466s465.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r466s465.bed > ./SeqAOnly_Grainger_r466s466.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r466s466.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r467s466.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r467s466.bed > ./SeqAOnly_Grainger_r467s467.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r467s467.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r468s467.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r468s467.bed > ./SeqAOnly_Grainger_r468s468.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r468s468.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r469s468.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r469s468.bed > ./SeqAOnly_Grainger_r469s469.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r469s469.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r470s469.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r470s469.bed > ./SeqAOnly_Grainger_r470s470.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r470s470.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r471s470.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r471s470.bed > ./SeqAOnly_Grainger_r471s471.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r471s471.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r472s471.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r472s471.bed > ./SeqAOnly_Grainger_r472s472.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r472s472.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r473s472.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r473s472.bed > ./SeqAOnly_Grainger_r473s473.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r473s473.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r474s473.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r474s473.bed > ./SeqAOnly_Grainger_r474s474.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r474s474.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r475s474.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r475s474.bed > ./SeqAOnly_Grainger_r475s475.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r475s475.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r476s475.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r476s475.bed > ./SeqAOnly_Grainger_r476s476.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r476s476.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r477s476.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r477s476.bed > ./SeqAOnly_Grainger_r477s477.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r477s477.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r478s477.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r478s477.bed > ./SeqAOnly_Grainger_r478s478.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r478s478.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r479s478.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r479s478.bed > ./SeqAOnly_Grainger_r479s479.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r479s479.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r480s479.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r480s479.bed > ./SeqAOnly_Grainger_r480s480.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r480s480.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r481s480.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r481s480.bed > ./SeqAOnly_Grainger_r481s481.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r481s481.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r482s481.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r482s481.bed > ./SeqAOnly_Grainger_r482s482.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r482s482.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r483s482.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r483s482.bed > ./SeqAOnly_Grainger_r483s483.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r483s483.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r484s483.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r484s483.bed > ./SeqAOnly_Grainger_r484s484.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r484s484.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r485s484.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r485s484.bed > ./SeqAOnly_Grainger_r485s485.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r485s485.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r486s485.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r486s485.bed > ./SeqAOnly_Grainger_r486s486.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r486s486.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r487s486.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r487s486.bed > ./SeqAOnly_Grainger_r487s487.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r487s487.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r488s487.bed
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bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r497s497.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r498s497.bed
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bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r506s506.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r507s506.bed
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bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r515s515.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r516s515.bed
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sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r523s522.bed > ./SeqAOnly_Grainger_r523s523.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r523s523.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r524s523.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r524s523.bed > ./SeqAOnly_Grainger_r524s524.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r524s524.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r525s524.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r525s524.bed > ./SeqAOnly_Grainger_r525s525.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r525s525.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r526s525.bed
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    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r526s525.bed > ./SeqAOnly_Grainger_r526s526.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r526s526.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r527s526.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r527s526.bed > ./SeqAOnly_Grainger_r527s527.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r527s527.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r528s527.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r528s527.bed > ./SeqAOnly_Grainger_r528s528.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r528s528.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r529s528.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r529s528.bed > ./SeqAOnly_Grainger_r529s529.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r529s529.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r530s529.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r530s529.bed > ./SeqAOnly_Grainger_r530s530.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r530s530.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r531s530.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r531s530.bed > ./SeqAOnly_Grainger_r531s531.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r531s531.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r532s531.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r532s531.bed > ./SeqAOnly_Grainger_r532s532.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r532s532.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r533s532.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r533s532.bed > ./SeqAOnly_Grainger_r533s533.bed
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    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r539s539.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r540s539.bed
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    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r540s539.bed > ./SeqAOnly_Grainger_r540s540.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r540s540.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r541s540.bed
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    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r541s541.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r542s541.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r542s541.bed > ./SeqAOnly_Grainger_r542s542.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r542s542.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r543s542.bed
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    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r543s543.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r544s543.bed
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    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r554s553.bed > ./SeqAOnly_Grainger_r554s554.bed
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    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r566s566.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r567s566.bed
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sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r568s567.bed > ./SeqAOnly_Grainger_r568s568.bed
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sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r569s568.bed > ./SeqAOnly_Grainger_r569s569.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r569s569.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r570s569.bed
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sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r573s572.bed > ./SeqAOnly_Grainger_r573s573.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r573s573.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r574s573.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r574s573.bed > ./SeqAOnly_Grainger_r574s574.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r574s574.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r575s574.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r575s574.bed > ./SeqAOnly_Grainger_r575s575.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r575s575.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r576s575.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r576s575.bed > ./SeqAOnly_Grainger_r576s576.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r576s576.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r577s576.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r577s576.bed > ./SeqAOnly_Grainger_r577s577.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r577s577.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r578s577.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r578s577.bed > ./SeqAOnly_Grainger_r578s578.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r578s578.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r579s578.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r579s578.bed > ./SeqAOnly_Grainger_r579s579.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r579s579.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r580s579.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r580s579.bed > ./SeqAOnly_Grainger_r580s580.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r580s580.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r581s580.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r581s580.bed > ./SeqAOnly_Grainger_r581s581.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r581s581.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r582s581.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r582s581.bed > ./SeqAOnly_Grainger_r582s582.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r582s582.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r583s582.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r583s582.bed > ./SeqAOnly_Grainger_r583s583.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r583s583.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r584s583.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r584s583.bed > ./SeqAOnly_Grainger_r584s584.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r584s584.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r585s584.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r585s584.bed > ./SeqAOnly_Grainger_r585s585.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r585s585.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r586s585.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r586s585.bed > ./SeqAOnly_Grainger_r586s586.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r586s586.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r587s586.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r587s586.bed > ./SeqAOnly_Grainger_r587s587.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r587s587.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r588s587.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r588s587.bed > ./SeqAOnly_Grainger_r588s588.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r588s588.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r589s588.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r589s588.bed > ./SeqAOnly_Grainger_r589s589.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r589s589.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r590s589.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r590s589.bed > ./SeqAOnly_Grainger_r590s590.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r590s590.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r591s590.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r591s590.bed > ./SeqAOnly_Grainger_r591s591.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r591s591.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r592s591.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r592s591.bed > ./SeqAOnly_Grainger_r592s592.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r592s592.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r593s592.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r593s592.bed > ./SeqAOnly_Grainger_r593s593.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r593s593.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r594s593.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r594s593.bed > ./SeqAOnly_Grainger_r594s594.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r594s594.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r595s594.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r595s594.bed > ./SeqAOnly_Grainger_r595s595.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r595s595.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r596s595.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r596s595.bed > ./SeqAOnly_Grainger_r596s596.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r596s596.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r597s596.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r597s596.bed > ./SeqAOnly_Grainger_r597s597.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r597s597.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r598s597.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r598s597.bed > ./SeqAOnly_Grainger_r598s598.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r598s598.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r599s598.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r599s598.bed > ./SeqAOnly_Grainger_r599s599.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r599s599.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r600s599.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r600s599.bed > ./SeqAOnly_Grainger_r600s600.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r600s600.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r601s600.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r601s600.bed > ./SeqAOnly_Grainger_r601s601.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r601s601.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r602s601.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r602s601.bed > ./SeqAOnly_Grainger_r602s602.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r602s602.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r603s602.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r603s602.bed > ./SeqAOnly_Grainger_r603s603.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r603s603.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r604s603.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r604s603.bed > ./SeqAOnly_Grainger_r604s604.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r604s604.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r605s604.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r605s604.bed > ./SeqAOnly_Grainger_r605s605.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r605s605.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r606s605.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r606s605.bed > ./SeqAOnly_Grainger_r606s606.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r606s606.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r607s606.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r607s606.bed > ./SeqAOnly_Grainger_r607s607.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r607s607.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r608s607.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r608s607.bed > ./SeqAOnly_Grainger_r608s608.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r608s608.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r609s608.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r609s608.bed > ./SeqAOnly_Grainger_r609s609.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r609s609.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r610s609.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r610s609.bed > ./SeqAOnly_Grainger_r610s610.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r610s610.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r611s610.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r611s610.bed > ./SeqAOnly_Grainger_r611s611.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r611s611.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r612s611.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r612s611.bed > ./SeqAOnly_Grainger_r612s612.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r612s612.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r613s612.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r613s612.bed > ./SeqAOnly_Grainger_r613s613.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r613s613.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r614s613.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r614s613.bed > ./SeqAOnly_Grainger_r614s614.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r614s614.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r615s614.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r615s614.bed > ./SeqAOnly_Grainger_r615s615.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r615s615.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r616s615.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r616s615.bed > ./SeqAOnly_Grainger_r616s616.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r616s616.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r617s616.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r617s616.bed > ./SeqAOnly_Grainger_r617s617.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r617s617.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r618s617.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r618s617.bed > ./SeqAOnly_Grainger_r618s618.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r618s618.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r619s618.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r619s618.bed > ./SeqAOnly_Grainger_r619s619.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r619s619.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r620s619.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r620s619.bed > ./SeqAOnly_Grainger_r620s620.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r620s620.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r621s620.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r621s620.bed > ./SeqAOnly_Grainger_r621s621.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r621s621.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r622s621.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r622s621.bed > ./SeqAOnly_Grainger_r622s622.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r622s622.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r623s622.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r623s622.bed > ./SeqAOnly_Grainger_r623s623.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r623s623.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r624s623.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r624s623.bed > ./SeqAOnly_Grainger_r624s624.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r624s624.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r625s624.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r625s624.bed > ./SeqAOnly_Grainger_r625s625.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r625s625.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r626s625.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r626s625.bed > ./SeqAOnly_Grainger_r626s626.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r626s626.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r627s626.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r627s626.bed > ./SeqAOnly_Grainger_r627s627.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r627s627.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r628s627.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r628s627.bed > ./SeqAOnly_Grainger_r628s628.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r628s628.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r629s628.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r629s628.bed > ./SeqAOnly_Grainger_r629s629.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r629s629.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r630s629.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r630s629.bed > ./SeqAOnly_Grainger_r630s630.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r630s630.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r631s630.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r631s630.bed > ./SeqAOnly_Grainger_r631s631.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r631s631.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r632s631.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r632s631.bed > ./SeqAOnly_Grainger_r632s632.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r632s632.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r633s632.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r633s632.bed > ./SeqAOnly_Grainger_r633s633.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r633s633.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r634s633.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r634s633.bed > ./SeqAOnly_Grainger_r634s634.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r634s634.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r635s634.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r635s634.bed > ./SeqAOnly_Grainger_r635s635.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r635s635.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r636s635.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r636s635.bed > ./SeqAOnly_Grainger_r636s636.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r636s636.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r637s636.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r637s636.bed > ./SeqAOnly_Grainger_r637s637.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r637s637.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r638s637.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r638s637.bed > ./SeqAOnly_Grainger_r638s638.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r638s638.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r639s638.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r639s638.bed > ./SeqAOnly_Grainger_r639s639.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r639s639.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r640s639.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r640s639.bed > ./SeqAOnly_Grainger_r640s640.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r640s640.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r641s640.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r641s640.bed > ./SeqAOnly_Grainger_r641s641.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r641s641.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r642s641.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r642s641.bed > ./SeqAOnly_Grainger_r642s642.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r642s642.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r643s642.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r643s642.bed > ./SeqAOnly_Grainger_r643s643.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r643s643.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r644s643.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r644s643.bed > ./SeqAOnly_Grainger_r644s644.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r644s644.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r645s644.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r645s644.bed > ./SeqAOnly_Grainger_r645s645.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r645s645.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r646s645.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r646s645.bed > ./SeqAOnly_Grainger_r646s646.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r646s646.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r647s646.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r647s646.bed > ./SeqAOnly_Grainger_r647s647.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r647s647.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r648s647.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r648s647.bed > ./SeqAOnly_Grainger_r648s648.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r648s648.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r649s648.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r649s648.bed > ./SeqAOnly_Grainger_r649s649.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r649s649.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r650s649.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r650s649.bed > ./SeqAOnly_Grainger_r650s650.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r650s650.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r651s650.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r651s650.bed > ./SeqAOnly_Grainger_r651s651.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r651s651.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r652s651.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r652s651.bed > ./SeqAOnly_Grainger_r652s652.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r652s652.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r653s652.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r653s652.bed > ./SeqAOnly_Grainger_r653s653.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r653s653.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r654s653.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r654s653.bed > ./SeqAOnly_Grainger_r654s654.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r654s654.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r655s654.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r655s654.bed > ./SeqAOnly_Grainger_r655s655.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r655s655.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r656s655.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r656s655.bed > ./SeqAOnly_Grainger_r656s656.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r656s656.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r657s656.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r657s656.bed > ./SeqAOnly_Grainger_r657s657.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r657s657.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r658s657.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r658s657.bed > ./SeqAOnly_Grainger_r658s658.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r658s658.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r659s658.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r659s658.bed > ./SeqAOnly_Grainger_r659s659.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r659s659.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r660s659.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r660s659.bed > ./SeqAOnly_Grainger_r660s660.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r660s660.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r661s660.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r661s660.bed > ./SeqAOnly_Grainger_r661s661.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r661s661.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r662s661.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r662s661.bed > ./SeqAOnly_Grainger_r662s662.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r662s662.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r663s662.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r663s662.bed > ./SeqAOnly_Grainger_r663s663.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r663s663.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r664s663.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r664s663.bed > ./SeqAOnly_Grainger_r664s664.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r664s664.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r665s664.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r665s664.bed > ./SeqAOnly_Grainger_r665s665.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r665s665.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r666s665.bed
```

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	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r666s665.bed > ./SeqAOnly_Grainger_r666s666.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r666s666.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r667s666.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r667s666.bed > ./SeqAOnly_Grainger_r667s667.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r667s667.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r668s667.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r668s667.bed > ./SeqAOnly_Grainger_r668s668.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r668s668.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r669s668.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r669s668.bed > ./SeqAOnly_Grainger_r669s669.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r669s669.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r670s669.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r670s669.bed > ./SeqAOnly_Grainger_r670s670.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r670s670.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r671s670.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r671s670.bed > ./SeqAOnly_Grainger_r671s671.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r671s671.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r672s671.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r672s671.bed > ./SeqAOnly_Grainger_r672s672.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r672s672.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r673s672.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r673s672.bed > ./SeqAOnly_Grainger_r673s673.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r673s673.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r674s673.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r674s673.bed > ./SeqAOnly_Grainger_r674s674.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r674s674.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r675s674.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r675s674.bed > ./SeqAOnly_Grainger_r675s675.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r675s675.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r676s675.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r676s675.bed > ./SeqAOnly_Grainger_r676s676.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r676s676.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r677s676.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r677s676.bed > ./SeqAOnly_Grainger_r677s677.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r677s677.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r678s677.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r678s677.bed > ./SeqAOnly_Grainger_r678s678.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r678s678.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r679s678.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r679s678.bed > ./SeqAOnly_Grainger_r679s679.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r679s679.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r680s679.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r680s679.bed > ./SeqAOnly_Grainger_r680s680.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r680s680.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r681s680.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r681s680.bed > ./SeqAOnly_Grainger_r681s681.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r681s681.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r682s681.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r682s681.bed > ./SeqAOnly_Grainger_r682s682.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r682s682.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r683s682.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r683s682.bed > ./SeqAOnly_Grainger_r683s683.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r683s683.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r684s683.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r684s683.bed > ./SeqAOnly_Grainger_r684s684.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r684s684.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r685s684.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r685s684.bed > ./SeqAOnly_Grainger_r685s685.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r685s685.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r686s685.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r686s685.bed > ./SeqAOnly_Grainger_r686s686.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r686s686.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r687s686.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r687s686.bed > ./SeqAOnly_Grainger_r687s687.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r687s687.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r688s687.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r688s687.bed > ./SeqAOnly_Grainger_r688s688.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r688s688.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r689s688.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r689s688.bed > ./SeqAOnly_Grainger_r689s689.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r689s689.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r690s689.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r690s689.bed > ./SeqAOnly_Grainger_r690s690.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r690s690.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r691s690.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r691s690.bed > ./SeqAOnly_Grainger_r691s691.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r691s691.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r692s691.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r692s691.bed > ./SeqAOnly_Grainger_r692s692.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r692s692.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r693s692.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r693s692.bed > ./SeqAOnly_Grainger_r693s693.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r693s693.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r694s693.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r694s693.bed > ./SeqAOnly_Grainger_r694s694.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r694s694.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r695s694.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r695s694.bed > ./SeqAOnly_Grainger_r695s695.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r695s695.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r696s695.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r696s695.bed > ./SeqAOnly_Grainger_r696s696.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r696s696.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r697s696.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r697s696.bed > ./SeqAOnly_Grainger_r697s697.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r697s697.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r698s697.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r698s697.bed > ./SeqAOnly_Grainger_r698s698.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r698s698.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r699s698.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r699s698.bed > ./SeqAOnly_Grainger_r699s699.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r699s699.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r700s699.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r700s699.bed > ./SeqAOnly_Grainger_r700s700.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r700s700.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r701s700.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r701s700.bed > ./SeqAOnly_Grainger_r701s701.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r701s701.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r702s701.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r702s701.bed > ./SeqAOnly_Grainger_r702s702.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r702s702.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r703s702.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r703s702.bed > ./SeqAOnly_Grainger_r703s703.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r703s703.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r704s703.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r704s703.bed > ./SeqAOnly_Grainger_r704s704.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r704s704.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r705s704.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r705s704.bed > ./SeqAOnly_Grainger_r705s705.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r705s705.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r706s705.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r706s705.bed > ./SeqAOnly_Grainger_r706s706.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r706s706.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r707s706.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r707s706.bed > ./SeqAOnly_Grainger_r707s707.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r707s707.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r708s707.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r708s707.bed > ./SeqAOnly_Grainger_r708s708.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r708s708.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r709s708.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r709s708.bed > ./SeqAOnly_Grainger_r709s709.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r709s709.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r710s709.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r710s709.bed > ./SeqAOnly_Grainger_r710s710.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r710s710.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r711s710.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r711s710.bed > ./SeqAOnly_Grainger_r711s711.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r711s711.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r712s711.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r712s711.bed > ./SeqAOnly_Grainger_r712s712.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r712s712.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r713s712.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r713s712.bed > ./SeqAOnly_Grainger_r713s713.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r713s713.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r714s713.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r714s713.bed > ./SeqAOnly_Grainger_r714s714.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r714s714.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r715s714.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r715s714.bed > ./SeqAOnly_Grainger_r715s715.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r715s715.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r716s715.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r716s715.bed > ./SeqAOnly_Grainger_r716s716.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r716s716.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r717s716.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r717s716.bed > ./SeqAOnly_Grainger_r717s717.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r717s717.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r718s717.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r718s717.bed > ./SeqAOnly_Grainger_r718s718.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r718s718.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r719s718.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r719s718.bed > ./SeqAOnly_Grainger_r719s719.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r719s719.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r720s719.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r720s719.bed > ./SeqAOnly_Grainger_r720s720.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r720s720.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r721s720.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r721s720.bed > ./SeqAOnly_Grainger_r721s721.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r721s721.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r722s721.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r722s721.bed > ./SeqAOnly_Grainger_r722s722.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r722s722.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r723s722.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r723s722.bed > ./SeqAOnly_Grainger_r723s723.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r723s723.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r724s723.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r724s723.bed > ./SeqAOnly_Grainger_r724s724.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r724s724.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r725s724.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r725s724.bed > ./SeqAOnly_Grainger_r725s725.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r725s725.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r726s725.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r726s725.bed > ./SeqAOnly_Grainger_r726s726.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r726s726.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r727s726.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r727s726.bed > ./SeqAOnly_Grainger_r727s727.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r727s727.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r728s727.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r728s727.bed > ./SeqAOnly_Grainger_r728s728.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r728s728.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r729s728.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r729s728.bed > ./SeqAOnly_Grainger_r729s729.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r729s729.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r730s729.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r730s729.bed > ./SeqAOnly_Grainger_r730s730.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r730s730.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r731s730.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r731s730.bed > ./SeqAOnly_Grainger_r731s731.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r731s731.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r732s731.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r732s731.bed > ./SeqAOnly_Grainger_r732s732.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r732s732.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r733s732.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r733s732.bed > ./SeqAOnly_Grainger_r733s733.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r733s733.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r734s733.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r734s733.bed > ./SeqAOnly_Grainger_r734s734.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r734s734.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r735s734.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r735s734.bed > ./SeqAOnly_Grainger_r735s735.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r735s735.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r736s735.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r736s735.bed > ./SeqAOnly_Grainger_r736s736.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r736s736.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r737s736.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r737s736.bed > ./SeqAOnly_Grainger_r737s737.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r737s737.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r738s737.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r738s737.bed > ./SeqAOnly_Grainger_r738s738.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r738s738.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r739s738.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r739s738.bed > ./SeqAOnly_Grainger_r739s739.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r739s739.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r740s739.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r740s739.bed > ./SeqAOnly_Grainger_r740s740.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r740s740.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r741s740.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r741s740.bed > ./SeqAOnly_Grainger_r741s741.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r741s741.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r742s741.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r742s741.bed > ./SeqAOnly_Grainger_r742s742.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r742s742.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r743s742.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r743s742.bed > ./SeqAOnly_Grainger_r743s743.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r743s743.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r744s743.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r744s743.bed > ./SeqAOnly_Grainger_r744s744.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r744s744.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r745s744.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r745s744.bed > ./SeqAOnly_Grainger_r745s745.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r745s745.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r746s745.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r746s745.bed > ./SeqAOnly_Grainger_r746s746.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r746s746.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r747s746.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r747s746.bed > ./SeqAOnly_Grainger_r747s747.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r747s747.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r748s747.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r748s747.bed > ./SeqAOnly_Grainger_r748s748.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r748s748.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r749s748.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r749s748.bed > ./SeqAOnly_Grainger_r749s749.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r749s749.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r750s749.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r750s749.bed > ./SeqAOnly_Grainger_r750s750.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r750s750.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r751s750.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r751s750.bed > ./SeqAOnly_Grainger_r751s751.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r751s751.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r752s751.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r752s751.bed > ./SeqAOnly_Grainger_r752s752.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r752s752.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r753s752.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r753s752.bed > ./SeqAOnly_Grainger_r753s753.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r753s753.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r754s753.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r754s753.bed > ./SeqAOnly_Grainger_r754s754.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r754s754.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r755s754.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r755s754.bed > ./SeqAOnly_Grainger_r755s755.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r755s755.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r756s755.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r756s755.bed > ./SeqAOnly_Grainger_r756s756.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r756s756.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r757s756.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r757s756.bed > ./SeqAOnly_Grainger_r757s757.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r757s757.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r758s757.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r758s757.bed > ./SeqAOnly_Grainger_r758s758.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r758s758.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r759s758.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r759s758.bed > ./SeqAOnly_Grainger_r759s759.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r759s759.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r760s759.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r760s759.bed > ./SeqAOnly_Grainger_r760s760.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r760s760.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r761s760.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r761s760.bed > ./SeqAOnly_Grainger_r761s761.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r761s761.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r762s761.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r762s761.bed > ./SeqAOnly_Grainger_r762s762.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r762s762.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r763s762.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r763s762.bed > ./SeqAOnly_Grainger_r763s763.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r763s763.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r764s763.bed
```

```
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r764s763.bed > ./SeqAOnly_Grainger_r764s764.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r764s764.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r765s764.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r765s764.bed > ./SeqAOnly_Grainger_r765s765.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r765s765.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r766s765.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r766s765.bed > ./SeqAOnly_Grainger_r766s766.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r766s766.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r767s766.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r767s766.bed > ./SeqAOnly_Grainger_r767s767.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r767s767.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r768s767.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r768s767.bed > ./SeqAOnly_Grainger_r768s768.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r768s768.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r769s768.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r769s768.bed > ./SeqAOnly_Grainger_r769s769.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r769s769.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r770s769.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r770s769.bed > ./SeqAOnly_Grainger_r770s770.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r770s770.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r771s770.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r771s770.bed > ./SeqAOnly_Grainger_r771s771.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r771s771.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r772s771.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r772s771.bed > ./SeqAOnly_Grainger_r772s772.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r772s772.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r773s772.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r773s772.bed > ./SeqAOnly_Grainger_r773s773.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r773s773.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r774s773.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r774s773.bed > ./SeqAOnly_Grainger_r774s774.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r774s774.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r775s774.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r775s774.bed > ./SeqAOnly_Grainger_r775s775.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r775s775.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r776s775.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r776s775.bed > ./SeqAOnly_Grainger_r776s776.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r776s776.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r777s776.bed
	sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r777s776.bed > ./SeqAOnly_Grainger_r777s777.bed
	bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r777s777.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r778s777.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r778s777.bed > ./SeqAOnly_Grainger_r778s778.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r778s778.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r779s778.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r779s778.bed > ./SeqAOnly_Grainger_r779s779.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r779s779.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r780s779.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r780s779.bed > ./SeqAOnly_Grainger_r780s780.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r780s780.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r781s780.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r781s780.bed > ./SeqAOnly_Grainger_r781s781.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r781s781.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r782s781.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r782s781.bed > ./SeqAOnly_Grainger_r782s782.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r782s782.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r783s782.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r783s782.bed > ./SeqAOnly_Grainger_r783s783.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r783s783.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r784s783.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r784s783.bed > ./SeqAOnly_Grainger_r784s784.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r784s784.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r785s784.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r785s784.bed > ./SeqAOnly_Grainger_r785s785.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r785s785.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r786s785.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r786s785.bed > ./SeqAOnly_Grainger_r786s786.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r786s786.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r787s786.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r787s786.bed > ./SeqAOnly_Grainger_r787s787.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r787s787.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r788s787.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r788s787.bed > ./SeqAOnly_Grainger_r788s788.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r788s788.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r789s788.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r789s788.bed > ./SeqAOnly_Grainger_r789s789.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r789s789.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r790s789.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r790s789.bed > ./SeqAOnly_Grainger_r790s790.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r790s790.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r791s790.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r791s790.bed > ./SeqAOnly_Grainger_r791s791.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r791s791.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r792s791.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r792s791.bed > ./SeqAOnly_Grainger_r792s792.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r792s792.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r793s792.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r793s792.bed > ./SeqAOnly_Grainger_r793s793.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r793s793.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r794s793.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r794s793.bed > ./SeqAOnly_Grainger_r794s794.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r794s794.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r795s794.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r795s794.bed > ./SeqAOnly_Grainger_r795s795.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r795s795.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r796s795.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r796s795.bed > ./SeqAOnly_Grainger_r796s796.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r796s796.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r797s796.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r797s796.bed > ./SeqAOnly_Grainger_r797s797.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r797s797.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r798s797.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r798s797.bed > ./SeqAOnly_Grainger_r798s798.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r798s798.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r799s798.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r799s798.bed > ./SeqAOnly_Grainger_r799s799.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r799s799.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r800s799.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r800s799.bed > ./SeqAOnly_Grainger_r800s800.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r800s800.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r801s800.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r801s800.bed > ./SeqAOnly_Grainger_r801s801.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r801s801.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r802s801.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r802s801.bed > ./SeqAOnly_Grainger_r802s802.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r802s802.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r803s802.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r803s802.bed > ./SeqAOnly_Grainger_r803s803.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r803s803.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r804s803.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r804s803.bed > ./SeqAOnly_Grainger_r804s804.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r804s804.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r805s804.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r805s804.bed > ./SeqAOnly_Grainger_r805s805.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r805s805.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r806s805.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r806s805.bed > ./SeqAOnly_Grainger_r806s806.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r806s806.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r807s806.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r807s806.bed > ./SeqAOnly_Grainger_r807s807.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r807s807.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r808s807.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r808s807.bed > ./SeqAOnly_Grainger_r808s808.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r808s808.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r809s808.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r809s808.bed > ./SeqAOnly_Grainger_r809s809.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r809s809.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r810s809.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r810s809.bed > ./SeqAOnly_Grainger_r810s810.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r810s810.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r811s810.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r811s810.bed > ./SeqAOnly_Grainger_r811s811.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r811s811.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r812s811.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r812s811.bed > ./SeqAOnly_Grainger_r812s812.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r812s812.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r813s812.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r813s812.bed > ./SeqAOnly_Grainger_r813s813.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r813s813.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r814s813.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r814s813.bed > ./SeqAOnly_Grainger_r814s814.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r814s814.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r815s814.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r815s814.bed > ./SeqAOnly_Grainger_r815s815.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r815s815.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r816s815.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r816s815.bed > ./SeqAOnly_Grainger_r816s816.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r816s816.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r817s816.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r817s816.bed > ./SeqAOnly_Grainger_r817s817.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r817s817.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r818s817.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r818s817.bed > ./SeqAOnly_Grainger_r818s818.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r818s818.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r819s818.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r819s818.bed > ./SeqAOnly_Grainger_r819s819.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r819s819.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r820s819.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r820s819.bed > ./SeqAOnly_Grainger_r820s820.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r820s820.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r821s820.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r821s820.bed > ./SeqAOnly_Grainger_r821s821.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r821s821.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r822s821.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r822s821.bed > ./SeqAOnly_Grainger_r822s822.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r822s822.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r823s822.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r823s822.bed > ./SeqAOnly_Grainger_r823s823.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r823s823.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r824s823.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r824s823.bed > ./SeqAOnly_Grainger_r824s824.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r824s824.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r825s824.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r825s824.bed > ./SeqAOnly_Grainger_r825s825.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r825s825.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r826s825.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r826s825.bed > ./SeqAOnly_Grainger_r826s826.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r826s826.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r827s826.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r827s826.bed > ./SeqAOnly_Grainger_r827s827.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r827s827.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r828s827.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r828s827.bed > ./SeqAOnly_Grainger_r828s828.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r828s828.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r829s828.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r829s828.bed > ./SeqAOnly_Grainger_r829s829.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r829s829.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r830s829.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r830s829.bed > ./SeqAOnly_Grainger_r830s830.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r830s830.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r831s830.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r831s830.bed > ./SeqAOnly_Grainger_r831s831.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r831s831.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r832s831.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r832s831.bed > ./SeqAOnly_Grainger_r832s832.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r832s832.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r833s832.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r833s832.bed > ./SeqAOnly_Grainger_r833s833.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r833s833.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r834s833.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r834s833.bed > ./SeqAOnly_Grainger_r834s834.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r834s834.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r835s834.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r835s834.bed > ./SeqAOnly_Grainger_r835s835.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r835s835.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r836s835.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r836s835.bed > ./SeqAOnly_Grainger_r836s836.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r836s836.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r837s836.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r837s836.bed > ./SeqAOnly_Grainger_r837s837.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r837s837.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r838s837.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r838s837.bed > ./SeqAOnly_Grainger_r838s838.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r838s838.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r839s838.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r839s838.bed > ./SeqAOnly_Grainger_r839s839.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r839s839.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r840s839.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r840s839.bed > ./SeqAOnly_Grainger_r840s840.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r840s840.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r841s840.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r841s840.bed > ./SeqAOnly_Grainger_r841s841.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r841s841.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r842s841.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r842s841.bed > ./SeqAOnly_Grainger_r842s842.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r842s842.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r843s842.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r843s842.bed > ./SeqAOnly_Grainger_r843s843.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r843s843.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r844s843.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r844s843.bed > ./SeqAOnly_Grainger_r844s844.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r844s844.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r845s844.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r845s844.bed > ./SeqAOnly_Grainger_r845s845.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r845s845.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r846s845.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r846s845.bed > ./SeqAOnly_Grainger_r846s846.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r846s846.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r847s846.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r847s846.bed > ./SeqAOnly_Grainger_r847s847.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r847s847.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r848s847.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r848s847.bed > ./SeqAOnly_Grainger_r848s848.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r848s848.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r849s848.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r849s848.bed > ./SeqAOnly_Grainger_r849s849.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r849s849.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r850s849.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r850s849.bed > ./SeqAOnly_Grainger_r850s850.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r850s850.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r851s850.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r851s850.bed > ./SeqAOnly_Grainger_r851s851.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r851s851.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r852s851.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r852s851.bed > ./SeqAOnly_Grainger_r852s852.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r852s852.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r853s852.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r853s852.bed > ./SeqAOnly_Grainger_r853s853.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r853s853.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r854s853.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r854s853.bed > ./SeqAOnly_Grainger_r854s854.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r854s854.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r855s854.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r855s854.bed > ./SeqAOnly_Grainger_r855s855.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r855s855.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r856s855.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r856s855.bed > ./SeqAOnly_Grainger_r856s856.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r856s856.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r857s856.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r857s856.bed > ./SeqAOnly_Grainger_r857s857.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r857s857.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r858s857.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r858s857.bed > ./SeqAOnly_Grainger_r858s858.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r858s858.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r859s858.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r859s858.bed > ./SeqAOnly_Grainger_r859s859.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r859s859.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r860s859.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r860s859.bed > ./SeqAOnly_Grainger_r860s860.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r860s860.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r861s860.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r861s860.bed > ./SeqAOnly_Grainger_r861s861.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r861s861.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r862s861.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r862s861.bed > ./SeqAOnly_Grainger_r862s862.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r862s862.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r863s862.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r863s862.bed > ./SeqAOnly_Grainger_r863s863.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r863s863.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r864s863.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r864s863.bed > ./SeqAOnly_Grainger_r864s864.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r864s864.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r865s864.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r865s864.bed > ./SeqAOnly_Grainger_r865s865.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r865s865.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r866s865.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r866s865.bed > ./SeqAOnly_Grainger_r866s866.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r866s866.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r867s866.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r867s866.bed > ./SeqAOnly_Grainger_r867s867.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r867s867.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r868s867.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r868s867.bed > ./SeqAOnly_Grainger_r868s868.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r868s868.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r869s868.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r869s868.bed > ./SeqAOnly_Grainger_r869s869.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r869s869.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r870s869.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r870s869.bed > ./SeqAOnly_Grainger_r870s870.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r870s870.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r871s870.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r871s870.bed > ./SeqAOnly_Grainger_r871s871.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r871s871.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r872s871.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r872s871.bed > ./SeqAOnly_Grainger_r872s872.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r872s872.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r873s872.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r873s872.bed > ./SeqAOnly_Grainger_r873s873.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r873s873.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r874s873.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r874s873.bed > ./SeqAOnly_Grainger_r874s874.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r874s874.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r875s874.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r875s874.bed > ./SeqAOnly_Grainger_r875s875.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r875s875.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r876s875.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r876s875.bed > ./SeqAOnly_Grainger_r876s876.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r876s876.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r877s876.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r877s876.bed > ./SeqAOnly_Grainger_r877s877.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r877s877.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r878s877.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r878s877.bed > ./SeqAOnly_Grainger_r878s878.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r878s878.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r879s878.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r879s878.bed > ./SeqAOnly_Grainger_r879s879.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r879s879.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r880s879.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r880s879.bed > ./SeqAOnly_Grainger_r880s880.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r880s880.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r881s880.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r881s880.bed > ./SeqAOnly_Grainger_r881s881.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r881s881.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r882s881.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r882s881.bed > ./SeqAOnly_Grainger_r882s882.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r882s882.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r883s882.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r883s882.bed > ./SeqAOnly_Grainger_r883s883.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r883s883.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r884s883.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r884s883.bed > ./SeqAOnly_Grainger_r884s884.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r884s884.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r885s884.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r885s884.bed > ./SeqAOnly_Grainger_r885s885.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r885s885.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r886s885.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r886s885.bed > ./SeqAOnly_Grainger_r886s886.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r886s886.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r887s886.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r887s886.bed > ./SeqAOnly_Grainger_r887s887.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r887s887.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r888s887.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r888s887.bed > ./SeqAOnly_Grainger_r888s888.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r888s888.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r889s888.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r889s888.bed > ./SeqAOnly_Grainger_r889s889.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r889s889.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r890s889.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r890s889.bed > ./SeqAOnly_Grainger_r890s890.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r890s890.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r891s890.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r891s890.bed > ./SeqAOnly_Grainger_r891s891.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r891s891.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r892s891.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r892s891.bed > ./SeqAOnly_Grainger_r892s892.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r892s892.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r893s892.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r893s892.bed > ./SeqAOnly_Grainger_r893s893.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r893s893.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r894s893.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r894s893.bed > ./SeqAOnly_Grainger_r894s894.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r894s894.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r895s894.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r895s894.bed > ./SeqAOnly_Grainger_r895s895.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r895s895.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r896s895.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r896s895.bed > ./SeqAOnly_Grainger_r896s896.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r896s896.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r897s896.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r897s896.bed > ./SeqAOnly_Grainger_r897s897.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r897s897.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r898s897.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r898s897.bed > ./SeqAOnly_Grainger_r898s898.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r898s898.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r899s898.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r899s898.bed > ./SeqAOnly_Grainger_r899s899.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r899s899.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r900s899.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r900s899.bed > ./SeqAOnly_Grainger_r900s900.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r900s900.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r901s900.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r901s900.bed > ./SeqAOnly_Grainger_r901s901.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r901s901.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r902s901.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r902s901.bed > ./SeqAOnly_Grainger_r902s902.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r902s902.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r903s902.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r903s902.bed > ./SeqAOnly_Grainger_r903s903.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r903s903.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r904s903.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r904s903.bed > ./SeqAOnly_Grainger_r904s904.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r904s904.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r905s904.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r905s904.bed > ./SeqAOnly_Grainger_r905s905.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r905s905.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r906s905.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r906s905.bed > ./SeqAOnly_Grainger_r906s906.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r906s906.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r907s906.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r907s906.bed > ./SeqAOnly_Grainger_r907s907.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r907s907.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r908s907.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r908s907.bed > ./SeqAOnly_Grainger_r908s908.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r908s908.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r909s908.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r909s908.bed > ./SeqAOnly_Grainger_r909s909.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r909s909.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r910s909.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r910s909.bed > ./SeqAOnly_Grainger_r910s910.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r910s910.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r911s910.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r911s910.bed > ./SeqAOnly_Grainger_r911s911.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r911s911.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r912s911.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r912s911.bed > ./SeqAOnly_Grainger_r912s912.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r912s912.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r913s912.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r913s912.bed > ./SeqAOnly_Grainger_r913s913.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r913s913.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r914s913.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r914s913.bed > ./SeqAOnly_Grainger_r914s914.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r914s914.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r915s914.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r915s914.bed > ./SeqAOnly_Grainger_r915s915.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r915s915.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r916s915.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r916s915.bed > ./SeqAOnly_Grainger_r916s916.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r916s916.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r917s916.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r917s916.bed > ./SeqAOnly_Grainger_r917s917.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r917s917.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r918s917.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r918s917.bed > ./SeqAOnly_Grainger_r918s918.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r918s918.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r919s918.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r919s918.bed > ./SeqAOnly_Grainger_r919s919.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r919s919.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r920s919.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r920s919.bed > ./SeqAOnly_Grainger_r920s920.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r920s920.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r921s920.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r921s920.bed > ./SeqAOnly_Grainger_r921s921.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r921s921.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r922s921.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r922s921.bed > ./SeqAOnly_Grainger_r922s922.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r922s922.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r923s922.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r923s922.bed > ./SeqAOnly_Grainger_r923s923.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r923s923.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r924s923.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r924s923.bed > ./SeqAOnly_Grainger_r924s924.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r924s924.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r925s924.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r925s924.bed > ./SeqAOnly_Grainger_r925s925.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r925s925.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r926s925.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r926s925.bed > ./SeqAOnly_Grainger_r926s926.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r926s926.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r927s926.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r927s926.bed > ./SeqAOnly_Grainger_r927s927.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r927s927.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r928s927.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r928s927.bed > ./SeqAOnly_Grainger_r928s928.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r928s928.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r929s928.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r929s928.bed > ./SeqAOnly_Grainger_r929s929.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r929s929.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r930s929.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r930s929.bed > ./SeqAOnly_Grainger_r930s930.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r930s930.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r931s930.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r931s930.bed > ./SeqAOnly_Grainger_r931s931.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r931s931.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r932s931.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r932s931.bed > ./SeqAOnly_Grainger_r932s932.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r932s932.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r933s932.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r933s932.bed > ./SeqAOnly_Grainger_r933s933.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r933s933.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r934s933.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r934s933.bed > ./SeqAOnly_Grainger_r934s934.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r934s934.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r935s934.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r935s934.bed > ./SeqAOnly_Grainger_r935s935.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r935s935.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r936s935.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r936s935.bed > ./SeqAOnly_Grainger_r936s936.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r936s936.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r937s936.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r937s936.bed > ./SeqAOnly_Grainger_r937s937.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r937s937.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r938s937.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r938s937.bed > ./SeqAOnly_Grainger_r938s938.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r938s938.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r939s938.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r939s938.bed > ./SeqAOnly_Grainger_r939s939.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r939s939.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r940s939.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r940s939.bed > ./SeqAOnly_Grainger_r940s940.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r940s940.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r941s940.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r941s940.bed > ./SeqAOnly_Grainger_r941s941.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r941s941.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r942s941.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r942s941.bed > ./SeqAOnly_Grainger_r942s942.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r942s942.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r943s942.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r943s942.bed > ./SeqAOnly_Grainger_r943s943.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r943s943.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r944s943.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r944s943.bed > ./SeqAOnly_Grainger_r944s944.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r944s944.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r945s944.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r945s944.bed > ./SeqAOnly_Grainger_r945s945.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r945s945.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r946s945.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r946s945.bed > ./SeqAOnly_Grainger_r946s946.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r946s946.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r947s946.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r947s946.bed > ./SeqAOnly_Grainger_r947s947.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r947s947.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r948s947.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r948s947.bed > ./SeqAOnly_Grainger_r948s948.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r948s948.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r949s948.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r949s948.bed > ./SeqAOnly_Grainger_r949s949.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r949s949.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r950s949.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r950s949.bed > ./SeqAOnly_Grainger_r950s950.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r950s950.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r951s950.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r951s950.bed > ./SeqAOnly_Grainger_r951s951.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r951s951.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r952s951.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r952s951.bed > ./SeqAOnly_Grainger_r952s952.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r952s952.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r953s952.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r953s952.bed > ./SeqAOnly_Grainger_r953s953.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r953s953.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r954s953.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r954s953.bed > ./SeqAOnly_Grainger_r954s954.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r954s954.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r955s954.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r955s954.bed > ./SeqAOnly_Grainger_r955s955.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r955s955.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r956s955.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r956s955.bed > ./SeqAOnly_Grainger_r956s956.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r956s956.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r957s956.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r957s956.bed > ./SeqAOnly_Grainger_r957s957.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r957s957.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r958s957.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r958s957.bed > ./SeqAOnly_Grainger_r958s958.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r958s958.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r959s958.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r959s958.bed > ./SeqAOnly_Grainger_r959s959.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r959s959.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r960s959.bed
```

```
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r960s959.bed > ./SeqAOnly_Grainger_r960s960.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r960s960.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r961s960.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r961s960.bed > ./SeqAOnly_Grainger_r961s961.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r961s961.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r962s961.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r962s961.bed > ./SeqAOnly_Grainger_r962s962.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r962s962.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r963s962.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r963s962.bed > ./SeqAOnly_Grainger_r963s963.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r963s963.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r964s963.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r964s963.bed > ./SeqAOnly_Grainger_r964s964.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r964s964.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r965s964.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r965s964.bed > ./SeqAOnly_Grainger_r965s965.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r965s965.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r966s965.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r966s965.bed > ./SeqAOnly_Grainger_r966s966.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r966s966.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r967s966.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r967s966.bed > ./SeqAOnly_Grainger_r967s967.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r967s967.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r968s967.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r968s967.bed > ./SeqAOnly_Grainger_r968s968.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r968s968.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r969s968.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r969s968.bed > ./SeqAOnly_Grainger_r969s969.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r969s969.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r970s969.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r970s969.bed > ./SeqAOnly_Grainger_r970s970.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r970s970.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r971s970.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r971s970.bed > ./SeqAOnly_Grainger_r971s971.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r971s971.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r972s971.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r972s971.bed > ./SeqAOnly_Grainger_r972s972.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r972s972.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r973s972.bed
    sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r973s972.bed > ./SeqAOnly_Grainger_r973s973.bed
    bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r973s973.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r974s973.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r974s973.bed > ./SeqAOnly_Grainger_r974s974.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r974s974.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r975s974.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r975s974.bed > ./SeqAOnly_Grainger_r975s975.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r975s975.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r976s975.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r976s975.bed > ./SeqAOnly_Grainger_r976s976.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r976s976.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r977s976.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r977s976.bed > ./SeqAOnly_Grainger_r977s977.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r977s977.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r978s977.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r978s977.bed > ./SeqAOnly_Grainger_r978s978.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r978s978.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r979s978.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r979s978.bed > ./SeqAOnly_Grainger_r979s979.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r979s979.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r980s979.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r980s979.bed > ./SeqAOnly_Grainger_r980s980.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r980s980.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r981s980.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r981s980.bed > ./SeqAOnly_Grainger_r981s981.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r981s981.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r982s981.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r982s981.bed > ./SeqAOnly_Grainger_r982s982.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r982s982.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r983s982.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r983s982.bed > ./SeqAOnly_Grainger_r983s983.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r983s983.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r984s983.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r984s983.bed > ./SeqAOnly_Grainger_r984s984.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r984s984.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r985s984.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r985s984.bed > ./SeqAOnly_Grainger_r985s985.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r985s985.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r986s985.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r986s985.bed > ./SeqAOnly_Grainger_r986s986.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r986s986.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r987s986.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r987s986.bed > ./SeqAOnly_Grainger_r987s987.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r987s987.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r988s987.bed
```

```
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r988s987.bed > ./SeqAOnly_Grainger_r988s988.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r988s988.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r989s988.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r989s988.bed > ./SeqAOnly_Grainger_r989s989.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r989s989.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r990s989.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r990s989.bed > ./SeqAOnly_Grainger_r990s990.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r990s990.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r991s990.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r991s990.bed > ./SeqAOnly_Grainger_r991s991.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r991s991.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r992s991.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r992s991.bed > ./SeqAOnly_Grainger_r992s992.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r992s992.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r993s992.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r993s992.bed > ./SeqAOnly_Grainger_r993s993.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r993s993.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r994s993.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r994s993.bed > ./SeqAOnly_Grainger_r994s994.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r994s994.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r995s994.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r995s994.bed > ./SeqAOnly_Grainger_r995s995.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r995s995.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r996s995.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r996s995.bed > ./SeqAOnly_Grainger_r996s996.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r996s996.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r997s996.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r997s996.bed > ./SeqAOnly_Grainger_r997s997.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r997s997.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r998s997.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r998s997.bed > ./SeqAOnly_Grainger_r998s998.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r998s998.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r999s998.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r999s998.bed > ./SeqAOnly_Grainger_r999s999.bed
bedtools shuffle -seed 1 -i SeqAOnly_Grainger_r999s999.bed -g Ecoli-genomesize.txt > ./SeqAOnly_Grainger_r1000s999.bed
sort -k1,1 -k2,2n ./SeqAOnly_Grainger_r1000s999.bed > ./SeqAOnly_Grainger_r1000s1000.bed
```

BEDTools shuffle 0 vs. 50 Min signals (SeqA Binding) 1000 times

```
#!/bin/bash

#bedtools_shuffle_sort_0vs50Min.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to shuffle 0vs50Min signals 1000 times

cp ./0vs50Min.bed ./0vs50Min_r0s0.bed
bedtools shuffle -seed 1 -i 0vs50Min_r0s0.bed -g Ecoli-genomesize.txt > ./0vs50Min_r1s0.bed
sort -k1,1 -k2,2n ./0vs50Min_r1s0.bed > ./0vs50Min_r1s1.bed
bedtools shuffle -seed 1 -i 0vs50Min_r1s1.bed -g Ecoli-genomesize.txt > ./0vs50Min_r2s1.bed
sort -k1,1 -k2,2n ./0vs50Min_r2s1.bed > ./0vs50Min_r2s2.bed
bedtools shuffle -seed 1 -i 0vs50Min_r2s2.bed -g Ecoli-genomesize.txt > ./0vs50Min_r3s2.bed
sort -k1,1 -k2,2n ./0vs50Min_r3s2.bed > ./0vs50Min_r3s3.bed
bedtools shuffle -seed 1 -i 0vs50Min_r3s3.bed -g Ecoli-genomesize.txt > ./0vs50Min_r4s3.bed
sort -k1,1 -k2,2n ./0vs50Min_r4s3.bed > ./0vs50Min_r4s4.bed
bedtools shuffle -seed 1 -i 0vs50Min_r4s4.bed -g Ecoli-genomesize.txt > ./0vs50Min_r5s4.bed
sort -k1,1 -k2,2n ./0vs50Min_r5s4.bed > ./0vs50Min_r5s5.bed
bedtools shuffle -seed 1 -i 0vs50Min_r5s5.bed -g Ecoli-genomesize.txt > ./0vs50Min_r6s5.bed
sort -k1,1 -k2,2n ./0vs50Min_r6s5.bed > ./0vs50Min_r6s6.bed
bedtools shuffle -seed 1 -i 0vs50Min_r6s6.bed -g Ecoli-genomesize.txt > ./0vs50Min_r7s6.bed
sort -k1,1 -k2,2n ./0vs50Min_r7s6.bed > ./0vs50Min_r7s7.bed
bedtools shuffle -seed 1 -i 0vs50Min_r7s7.bed -g Ecoli-genomesize.txt > ./0vs50Min_r8s7.bed
sort -k1,1 -k2,2n ./0vs50Min_r8s7.bed > ./0vs50Min_r8s8.bed
bedtools shuffle -seed 1 -i 0vs50Min_r8s8.bed -g Ecoli-genomesize.txt > ./0vs50Min_r9s8.bed
sort -k1,1 -k2,2n ./0vs50Min_r9s8.bed > ./0vs50Min_r9s9.bed
bedtools shuffle -seed 1 -i 0vs50Min_r9s9.bed -g Ecoli-genomesize.txt > ./0vs50Min_r10s9.bed
sort -k1,1 -k2,2n ./0vs50Min_r10s9.bed > ./0vs50Min_r10s10.bed
bedtools shuffle -seed 1 -i 0vs50Min_r10s10.bed -g Ecoli-genomesize.txt > ./0vs50Min_r11s10.bed
sort -k1,1 -k2,2n ./0vs50Min_r11s10.bed > ./0vs50Min_r11s11.bed
bedtools shuffle -seed 1 -i 0vs50Min_r11s11.bed -g Ecoli-genomesize.txt > ./0vs50Min_r12s11.bed
sort -k1,1 -k2,2n ./0vs50Min_r12s11.bed > ./0vs50Min_r12s12.bed
bedtools shuffle -seed 1 -i 0vs50Min_r12s12.bed -g Ecoli-genomesize.txt > ./0vs50Min_r13s12.bed
sort -k1,1 -k2,2n ./0vs50Min_r13s12.bed > ./0vs50Min_r13s13.bed
bedtools shuffle -seed 1 -i 0vs50Min_r13s13.bed -g Ecoli-genomesize.txt > ./0vs50Min_r14s13.bed
sort -k1,1 -k2,2n ./0vs50Min_r14s13.bed > ./0vs50Min_r14s14.bed
bedtools shuffle -seed 1 -i 0vs50Min_r14s14.bed -g Ecoli-genomesize.txt > ./0vs50Min_r15s14.bed
sort -k1,1 -k2,2n ./0vs50Min_r15s14.bed > ./0vs50Min_r15s15.bed
bedtools shuffle -seed 1 -i 0vs50Min_r15s15.bed -g Ecoli-genomesize.txt > ./0vs50Min_r16s15.bed
sort -k1,1 -k2,2n ./0vs50Min_r16s15.bed > ./0vs50Min_r16s16.bed
bedtools shuffle -seed 1 -i 0vs50Min_r16s16.bed -g Ecoli-genomesize.txt > ./0vs50Min_r17s16.bed
sort -k1,1 -k2,2n ./0vs50Min_r17s16.bed > ./0vs50Min_r17s17.bed
bedtools shuffle -seed 1 -i 0vs50Min_r17s17.bed -g Ecoli-genomesize.txt > ./0vs50Min_r18s17.bed
sort -k1,1 -k2,2n ./0vs50Min_r18s17.bed > ./0vs50Min_r18s18.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r18s18.bed -g Ecoli-genomesize.txt > ./0vs50Min_r19s18.bed
sort -k1,1 -k2,2n ./0vs50Min_r19s18.bed > ./0vs50Min_r19s19.bed
bedtools shuffle -seed 1 -i 0vs50Min_r19s19.bed -g Ecoli-genomesize.txt > ./0vs50Min_r20s19.bed
sort -k1,1 -k2,2n ./0vs50Min_r20s19.bed > ./0vs50Min_r20s20.bed
bedtools shuffle -seed 1 -i 0vs50Min_r20s20.bed -g Ecoli-genomesize.txt > ./0vs50Min_r21s20.bed
sort -k1,1 -k2,2n ./0vs50Min_r21s20.bed > ./0vs50Min_r21s21.bed
bedtools shuffle -seed 1 -i 0vs50Min_r21s21.bed -g Ecoli-genomesize.txt > ./0vs50Min_r22s21.bed
sort -k1,1 -k2,2n ./0vs50Min_r22s21.bed > ./0vs50Min_r22s22.bed
bedtools shuffle -seed 1 -i 0vs50Min_r22s22.bed -g Ecoli-genomesize.txt > ./0vs50Min_r23s22.bed
sort -k1,1 -k2,2n ./0vs50Min_r23s22.bed > ./0vs50Min_r23s23.bed
bedtools shuffle -seed 1 -i 0vs50Min_r23s23.bed -g Ecoli-genomesize.txt > ./0vs50Min_r24s23.bed
sort -k1,1 -k2,2n ./0vs50Min_r24s23.bed > ./0vs50Min_r24s24.bed
bedtools shuffle -seed 1 -i 0vs50Min_r24s24.bed -g Ecoli-genomesize.txt > ./0vs50Min_r25s24.bed
sort -k1,1 -k2,2n ./0vs50Min_r25s24.bed > ./0vs50Min_r25s25.bed
bedtools shuffle -seed 1 -i 0vs50Min_r25s25.bed -g Ecoli-genomesize.txt > ./0vs50Min_r26s25.bed
sort -k1,1 -k2,2n ./0vs50Min_r26s25.bed > ./0vs50Min_r26s26.bed
bedtools shuffle -seed 1 -i 0vs50Min_r26s26.bed -g Ecoli-genomesize.txt > ./0vs50Min_r27s26.bed
sort -k1,1 -k2,2n ./0vs50Min_r27s26.bed > ./0vs50Min_r27s27.bed
bedtools shuffle -seed 1 -i 0vs50Min_r27s27.bed -g Ecoli-genomesize.txt > ./0vs50Min_r28s27.bed
sort -k1,1 -k2,2n ./0vs50Min_r28s27.bed > ./0vs50Min_r28s28.bed
bedtools shuffle -seed 1 -i 0vs50Min_r28s28.bed -g Ecoli-genomesize.txt > ./0vs50Min_r29s28.bed
sort -k1,1 -k2,2n ./0vs50Min_r29s28.bed > ./0vs50Min_r29s29.bed
bedtools shuffle -seed 1 -i 0vs50Min_r29s29.bed -g Ecoli-genomesize.txt > ./0vs50Min_r30s29.bed
sort -k1,1 -k2,2n ./0vs50Min_r30s29.bed > ./0vs50Min_r30s30.bed
bedtools shuffle -seed 1 -i 0vs50Min_r30s30.bed -g Ecoli-genomesize.txt > ./0vs50Min_r31s30.bed
sort -k1,1 -k2,2n ./0vs50Min_r31s30.bed > ./0vs50Min_r31s31.bed
bedtools shuffle -seed 1 -i 0vs50Min_r31s31.bed -g Ecoli-genomesize.txt > ./0vs50Min_r32s31.bed
sort -k1,1 -k2,2n ./0vs50Min_r32s31.bed > ./0vs50Min_r32s32.bed
bedtools shuffle -seed 1 -i 0vs50Min_r32s32.bed -g Ecoli-genomesize.txt > ./0vs50Min_r33s32.bed
sort -k1,1 -k2,2n ./0vs50Min_r33s32.bed > ./0vs50Min_r33s33.bed
bedtools shuffle -seed 1 -i 0vs50Min_r33s33.bed -g Ecoli-genomesize.txt > ./0vs50Min_r34s33.bed
sort -k1,1 -k2,2n ./0vs50Min_r34s33.bed > ./0vs50Min_r34s34.bed
bedtools shuffle -seed 1 -i 0vs50Min_r34s34.bed -g Ecoli-genomesize.txt > ./0vs50Min_r35s34.bed
sort -k1,1 -k2,2n ./0vs50Min_r35s34.bed > ./0vs50Min_r35s35.bed
bedtools shuffle -seed 1 -i 0vs50Min_r35s35.bed -g Ecoli-genomesize.txt > ./0vs50Min_r36s35.bed
sort -k1,1 -k2,2n ./0vs50Min_r36s35.bed > ./0vs50Min_r36s36.bed
bedtools shuffle -seed 1 -i 0vs50Min_r36s36.bed -g Ecoli-genomesize.txt > ./0vs50Min_r37s36.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r37s36.bed > ./0vs50Min_r37s37.bed
bedtools shuffle -seed 1 -i 0vs50Min_r37s37.bed -g Ecoli-genomesize.txt > ./0vs50Min_r38s37.bed
sort -k1,1 -k2,2n ./0vs50Min_r38s37.bed > ./0vs50Min_r38s38.bed
bedtools shuffle -seed 1 -i 0vs50Min_r38s38.bed -g Ecoli-genomesize.txt > ./0vs50Min_r39s38.bed
sort -k1,1 -k2,2n ./0vs50Min_r39s38.bed > ./0vs50Min_r39s39.bed
bedtools shuffle -seed 1 -i 0vs50Min_r39s39.bed -g Ecoli-genomesize.txt > ./0vs50Min_r40s39.bed
sort -k1,1 -k2,2n ./0vs50Min_r40s39.bed > ./0vs50Min_r40s40.bed
bedtools shuffle -seed 1 -i 0vs50Min_r40s40.bed -g Ecoli-genomesize.txt > ./0vs50Min_r41s40.bed
sort -k1,1 -k2,2n ./0vs50Min_r41s40.bed > ./0vs50Min_r41s41.bed
bedtools shuffle -seed 1 -i 0vs50Min_r41s41.bed -g Ecoli-genomesize.txt > ./0vs50Min_r42s41.bed
sort -k1,1 -k2,2n ./0vs50Min_r42s41.bed > ./0vs50Min_r42s42.bed
bedtools shuffle -seed 1 -i 0vs50Min_r42s42.bed -g Ecoli-genomesize.txt > ./0vs50Min_r43s42.bed
sort -k1,1 -k2,2n ./0vs50Min_r43s42.bed > ./0vs50Min_r43s43.bed
bedtools shuffle -seed 1 -i 0vs50Min_r43s43.bed -g Ecoli-genomesize.txt > ./0vs50Min_r44s43.bed
sort -k1,1 -k2,2n ./0vs50Min_r44s43.bed > ./0vs50Min_r44s44.bed
bedtools shuffle -seed 1 -i 0vs50Min_r44s44.bed -g Ecoli-genomesize.txt > ./0vs50Min_r45s44.bed
sort -k1,1 -k2,2n ./0vs50Min_r45s44.bed > ./0vs50Min_r45s45.bed
bedtools shuffle -seed 1 -i 0vs50Min_r45s45.bed -g Ecoli-genomesize.txt > ./0vs50Min_r46s45.bed
sort -k1,1 -k2,2n ./0vs50Min_r46s45.bed > ./0vs50Min_r46s46.bed
bedtools shuffle -seed 1 -i 0vs50Min_r46s46.bed -g Ecoli-genomesize.txt > ./0vs50Min_r47s46.bed
sort -k1,1 -k2,2n ./0vs50Min_r47s46.bed > ./0vs50Min_r47s47.bed
bedtools shuffle -seed 1 -i 0vs50Min_r47s47.bed -g Ecoli-genomesize.txt > ./0vs50Min_r48s47.bed
sort -k1,1 -k2,2n ./0vs50Min_r48s47.bed > ./0vs50Min_r48s48.bed
bedtools shuffle -seed 1 -i 0vs50Min_r48s48.bed -g Ecoli-genomesize.txt > ./0vs50Min_r49s48.bed
sort -k1,1 -k2,2n ./0vs50Min_r49s48.bed > ./0vs50Min_r49s49.bed
bedtools shuffle -seed 1 -i 0vs50Min_r49s49.bed -g Ecoli-genomesize.txt > ./0vs50Min_r50s49.bed
sort -k1,1 -k2,2n ./0vs50Min_r50s49.bed > ./0vs50Min_r50s50.bed
bedtools shuffle -seed 1 -i 0vs50Min_r50s50.bed -g Ecoli-genomesize.txt > ./0vs50Min_r51s50.bed
sort -k1,1 -k2,2n ./0vs50Min_r51s50.bed > ./0vs50Min_r51s51.bed
bedtools shuffle -seed 1 -i 0vs50Min_r51s51.bed -g Ecoli-genomesize.txt > ./0vs50Min_r52s51.bed
sort -k1,1 -k2,2n ./0vs50Min_r52s51.bed > ./0vs50Min_r52s52.bed
bedtools shuffle -seed 1 -i 0vs50Min_r52s52.bed -g Ecoli-genomesize.txt > ./0vs50Min_r53s52.bed
sort -k1,1 -k2,2n ./0vs50Min_r53s52.bed > ./0vs50Min_r53s53.bed
bedtools shuffle -seed 1 -i 0vs50Min_r53s53.bed -g Ecoli-genomesize.txt > ./0vs50Min_r54s53.bed
sort -k1,1 -k2,2n ./0vs50Min_r54s53.bed > ./0vs50Min_r54s54.bed
bedtools shuffle -seed 1 -i 0vs50Min_r54s54.bed -g Ecoli-genomesize.txt > ./0vs50Min_r55s54.bed
sort -k1,1 -k2,2n ./0vs50Min_r55s54.bed > ./0vs50Min_r55s55.bed
```

```
    bedtools shuffle -seed 1 -i 0vs50Min_r55s55.bed -g Ecoli-genomesize.txt > ./0vs50Min_r56s55.bed
    sort -k1,1 -k2,2n ./0vs50Min_r56s55.bed > ./0vs50Min_r56s56.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r56s56.bed -g Ecoli-genomesize.txt > ./0vs50Min_r57s56.bed
    sort -k1,1 -k2,2n ./0vs50Min_r57s56.bed > ./0vs50Min_r57s57.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r57s57.bed -g Ecoli-genomesize.txt > ./0vs50Min_r58s57.bed
    sort -k1,1 -k2,2n ./0vs50Min_r58s57.bed > ./0vs50Min_r58s58.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r58s58.bed -g Ecoli-genomesize.txt > ./0vs50Min_r59s58.bed
    sort -k1,1 -k2,2n ./0vs50Min_r59s58.bed > ./0vs50Min_r59s59.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r59s59.bed -g Ecoli-genomesize.txt > ./0vs50Min_r60s59.bed
    sort -k1,1 -k2,2n ./0vs50Min_r60s59.bed > ./0vs50Min_r60s60.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r60s60.bed -g Ecoli-genomesize.txt > ./0vs50Min_r61s60.bed
    sort -k1,1 -k2,2n ./0vs50Min_r61s60.bed > ./0vs50Min_r61s61.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r61s61.bed -g Ecoli-genomesize.txt > ./0vs50Min_r62s61.bed
    sort -k1,1 -k2,2n ./0vs50Min_r62s61.bed > ./0vs50Min_r62s62.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r62s62.bed -g Ecoli-genomesize.txt > ./0vs50Min_r63s62.bed
    sort -k1,1 -k2,2n ./0vs50Min_r63s62.bed > ./0vs50Min_r63s63.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r63s63.bed -g Ecoli-genomesize.txt > ./0vs50Min_r64s63.bed
    sort -k1,1 -k2,2n ./0vs50Min_r64s63.bed > ./0vs50Min_r64s64.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r64s64.bed -g Ecoli-genomesize.txt > ./0vs50Min_r65s64.bed
    sort -k1,1 -k2,2n ./0vs50Min_r65s64.bed > ./0vs50Min_r65s65.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r65s65.bed -g Ecoli-genomesize.txt > ./0vs50Min_r66s65.bed
    sort -k1,1 -k2,2n ./0vs50Min_r66s65.bed > ./0vs50Min_r66s66.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r66s66.bed -g Ecoli-genomesize.txt > ./0vs50Min_r67s66.bed
    sort -k1,1 -k2,2n ./0vs50Min_r67s66.bed > ./0vs50Min_r67s67.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r67s67.bed -g Ecoli-genomesize.txt > ./0vs50Min_r68s67.bed
    sort -k1,1 -k2,2n ./0vs50Min_r68s67.bed > ./0vs50Min_r68s68.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r68s68.bed -g Ecoli-genomesize.txt > ./0vs50Min_r69s68.bed
    sort -k1,1 -k2,2n ./0vs50Min_r69s68.bed > ./0vs50Min_r69s69.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r69s69.bed -g Ecoli-genomesize.txt > ./0vs50Min_r70s69.bed
    sort -k1,1 -k2,2n ./0vs50Min_r70s69.bed > ./0vs50Min_r70s70.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r70s70.bed -g Ecoli-genomesize.txt > ./0vs50Min_r71s70.bed
    sort -k1,1 -k2,2n ./0vs50Min_r71s70.bed > ./0vs50Min_r71s71.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r71s71.bed -g Ecoli-genomesize.txt > ./0vs50Min_r72s71.bed
    sort -k1,1 -k2,2n ./0vs50Min_r72s71.bed > ./0vs50Min_r72s72.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r72s72.bed -g Ecoli-genomesize.txt > ./0vs50Min_r73s72.bed
    sort -k1,1 -k2,2n ./0vs50Min_r73s72.bed > ./0vs50Min_r73s73.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r73s73.bed -g Ecoli-genomesize.txt > ./0vs50Min_r74s73.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r74s73.bed > ./0vs50Min_r74s74.bed
bedtools shuffle -seed 1 -i 0vs50Min_r74s74.bed -g Ecoli-genomesize.txt > ./0vs50Min_r75s74.bed
sort -k1,1 -k2,2n ./0vs50Min_r75s74.bed > ./0vs50Min_r75s75.bed
bedtools shuffle -seed 1 -i 0vs50Min_r75s75.bed -g Ecoli-genomesize.txt > ./0vs50Min_r76s75.bed
sort -k1,1 -k2,2n ./0vs50Min_r76s75.bed > ./0vs50Min_r76s76.bed
bedtools shuffle -seed 1 -i 0vs50Min_r76s76.bed -g Ecoli-genomesize.txt > ./0vs50Min_r77s76.bed
sort -k1,1 -k2,2n ./0vs50Min_r77s76.bed > ./0vs50Min_r77s77.bed
bedtools shuffle -seed 1 -i 0vs50Min_r77s77.bed -g Ecoli-genomesize.txt > ./0vs50Min_r78s77.bed
sort -k1,1 -k2,2n ./0vs50Min_r78s77.bed > ./0vs50Min_r78s78.bed
bedtools shuffle -seed 1 -i 0vs50Min_r78s78.bed -g Ecoli-genomesize.txt > ./0vs50Min_r79s78.bed
sort -k1,1 -k2,2n ./0vs50Min_r79s78.bed > ./0vs50Min_r79s79.bed
bedtools shuffle -seed 1 -i 0vs50Min_r79s79.bed -g Ecoli-genomesize.txt > ./0vs50Min_r80s79.bed
sort -k1,1 -k2,2n ./0vs50Min_r80s79.bed > ./0vs50Min_r80s80.bed
bedtools shuffle -seed 1 -i 0vs50Min_r80s80.bed -g Ecoli-genomesize.txt > ./0vs50Min_r81s80.bed
sort -k1,1 -k2,2n ./0vs50Min_r81s80.bed > ./0vs50Min_r81s81.bed
bedtools shuffle -seed 1 -i 0vs50Min_r81s81.bed -g Ecoli-genomesize.txt > ./0vs50Min_r82s81.bed
sort -k1,1 -k2,2n ./0vs50Min_r82s81.bed > ./0vs50Min_r82s82.bed
bedtools shuffle -seed 1 -i 0vs50Min_r82s82.bed -g Ecoli-genomesize.txt > ./0vs50Min_r83s82.bed
sort -k1,1 -k2,2n ./0vs50Min_r83s82.bed > ./0vs50Min_r83s83.bed
bedtools shuffle -seed 1 -i 0vs50Min_r83s83.bed -g Ecoli-genomesize.txt > ./0vs50Min_r84s83.bed
sort -k1,1 -k2,2n ./0vs50Min_r84s83.bed > ./0vs50Min_r84s84.bed
bedtools shuffle -seed 1 -i 0vs50Min_r84s84.bed -g Ecoli-genomesize.txt > ./0vs50Min_r85s84.bed
sort -k1,1 -k2,2n ./0vs50Min_r85s84.bed > ./0vs50Min_r85s85.bed
bedtools shuffle -seed 1 -i 0vs50Min_r85s85.bed -g Ecoli-genomesize.txt > ./0vs50Min_r86s85.bed
sort -k1,1 -k2,2n ./0vs50Min_r86s85.bed > ./0vs50Min_r86s86.bed
bedtools shuffle -seed 1 -i 0vs50Min_r86s86.bed -g Ecoli-genomesize.txt > ./0vs50Min_r87s86.bed
sort -k1,1 -k2,2n ./0vs50Min_r87s86.bed > ./0vs50Min_r87s87.bed
bedtools shuffle -seed 1 -i 0vs50Min_r87s87.bed -g Ecoli-genomesize.txt > ./0vs50Min_r88s87.bed
sort -k1,1 -k2,2n ./0vs50Min_r88s87.bed > ./0vs50Min_r88s88.bed
bedtools shuffle -seed 1 -i 0vs50Min_r88s88.bed -g Ecoli-genomesize.txt > ./0vs50Min_r89s88.bed
sort -k1,1 -k2,2n ./0vs50Min_r89s88.bed > ./0vs50Min_r89s89.bed
bedtools shuffle -seed 1 -i 0vs50Min_r89s89.bed -g Ecoli-genomesize.txt > ./0vs50Min_r90s89.bed
sort -k1,1 -k2,2n ./0vs50Min_r90s89.bed > ./0vs50Min_r90s90.bed
bedtools shuffle -seed 1 -i 0vs50Min_r90s90.bed -g Ecoli-genomesize.txt > ./0vs50Min_r91s90.bed
sort -k1,1 -k2,2n ./0vs50Min_r91s90.bed > ./0vs50Min_r91s91.bed
bedtools shuffle -seed 1 -i 0vs50Min_r91s91.bed -g Ecoli-genomesize.txt > ./0vs50Min_r92s91.bed
sort -k1,1 -k2,2n ./0vs50Min_r92s91.bed > ./0vs50Min_r92s92.bed
```

```
	bedtools shuffle -seed 1 -i 0vs50Min_r92s92.bed -g Ecoli-genomesize.txt > ./0vs50Min_r93s92.bed
	sort -k1,1 -k2,2n ./0vs50Min_r93s92.bed > ./0vs50Min_r93s93.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r93s93.bed -g Ecoli-genomesize.txt > ./0vs50Min_r94s93.bed
	sort -k1,1 -k2,2n ./0vs50Min_r94s93.bed > ./0vs50Min_r94s94.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r94s94.bed -g Ecoli-genomesize.txt > ./0vs50Min_r95s94.bed
	sort -k1,1 -k2,2n ./0vs50Min_r95s94.bed > ./0vs50Min_r95s95.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r95s95.bed -g Ecoli-genomesize.txt > ./0vs50Min_r96s95.bed
	sort -k1,1 -k2,2n ./0vs50Min_r96s95.bed > ./0vs50Min_r96s96.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r96s96.bed -g Ecoli-genomesize.txt > ./0vs50Min_r97s96.bed
	sort -k1,1 -k2,2n ./0vs50Min_r97s96.bed > ./0vs50Min_r97s97.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r97s97.bed -g Ecoli-genomesize.txt > ./0vs50Min_r98s97.bed
	sort -k1,1 -k2,2n ./0vs50Min_r98s97.bed > ./0vs50Min_r98s98.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r98s98.bed -g Ecoli-genomesize.txt > ./0vs50Min_r99s98.bed
	sort -k1,1 -k2,2n ./0vs50Min_r99s98.bed > ./0vs50Min_r99s99.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r99s99.bed -g Ecoli-genomesize.txt > ./0vs50Min_r100s99.bed
	sort -k1,1 -k2,2n ./0vs50Min_r100s99.bed > ./0vs50Min_r100s100.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r100s100.bed -g Ecoli-genomesize.txt > ./0vs50Min_r101s100.bed
	sort -k1,1 -k2,2n ./0vs50Min_r101s100.bed > ./0vs50Min_r101s101.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r101s101.bed -g Ecoli-genomesize.txt > ./0vs50Min_r102s101.bed
	sort -k1,1 -k2,2n ./0vs50Min_r102s101.bed > ./0vs50Min_r102s102.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r102s102.bed -g Ecoli-genomesize.txt > ./0vs50Min_r103s102.bed
	sort -k1,1 -k2,2n ./0vs50Min_r103s102.bed > ./0vs50Min_r103s103.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r103s103.bed -g Ecoli-genomesize.txt > ./0vs50Min_r104s103.bed
	sort -k1,1 -k2,2n ./0vs50Min_r104s103.bed > ./0vs50Min_r104s104.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r104s104.bed -g Ecoli-genomesize.txt > ./0vs50Min_r105s104.bed
	sort -k1,1 -k2,2n ./0vs50Min_r105s104.bed > ./0vs50Min_r105s105.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r105s105.bed -g Ecoli-genomesize.txt > ./0vs50Min_r106s105.bed
	sort -k1,1 -k2,2n ./0vs50Min_r106s105.bed > ./0vs50Min_r106s106.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r106s106.bed -g Ecoli-genomesize.txt > ./0vs50Min_r107s106.bed
	sort -k1,1 -k2,2n ./0vs50Min_r107s106.bed > ./0vs50Min_r107s107.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r107s107.bed -g Ecoli-genomesize.txt > ./0vs50Min_r108s107.bed
	sort -k1,1 -k2,2n ./0vs50Min_r108s107.bed > ./0vs50Min_r108s108.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r108s108.bed -g Ecoli-genomesize.txt > ./0vs50Min_r109s108.bed
	sort -k1,1 -k2,2n ./0vs50Min_r109s108.bed > ./0vs50Min_r109s109.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r109s109.bed -g Ecoli-genomesize.txt > ./0vs50Min_r110s109.bed
	sort -k1,1 -k2,2n ./0vs50Min_r110s109.bed > ./0vs50Min_r110s110.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r110s110.bed -g Ecoli-genomesize.txt > ./0vs50Min_r111s110.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r111s110.bed > ./0vs50Min_r111s111.bed
bedtools shuffle -seed 1 -i 0vs50Min_r111s111.bed -g Ecoli-genomesize.txt > ./0vs50Min_r112s111.bed
sort -k1,1 -k2,2n ./0vs50Min_r112s111.bed > ./0vs50Min_r112s112.bed
bedtools shuffle -seed 1 -i 0vs50Min_r112s112.bed -g Ecoli-genomesize.txt > ./0vs50Min_r113s112.bed
sort -k1,1 -k2,2n ./0vs50Min_r113s112.bed > ./0vs50Min_r113s113.bed
bedtools shuffle -seed 1 -i 0vs50Min_r113s113.bed -g Ecoli-genomesize.txt > ./0vs50Min_r114s113.bed
sort -k1,1 -k2,2n ./0vs50Min_r114s113.bed > ./0vs50Min_r114s114.bed
bedtools shuffle -seed 1 -i 0vs50Min_r114s114.bed -g Ecoli-genomesize.txt > ./0vs50Min_r115s114.bed
sort -k1,1 -k2,2n ./0vs50Min_r115s114.bed > ./0vs50Min_r115s115.bed
bedtools shuffle -seed 1 -i 0vs50Min_r115s115.bed -g Ecoli-genomesize.txt > ./0vs50Min_r116s115.bed
sort -k1,1 -k2,2n ./0vs50Min_r116s115.bed > ./0vs50Min_r116s116.bed
bedtools shuffle -seed 1 -i 0vs50Min_r116s116.bed -g Ecoli-genomesize.txt > ./0vs50Min_r117s116.bed
sort -k1,1 -k2,2n ./0vs50Min_r117s116.bed > ./0vs50Min_r117s117.bed
bedtools shuffle -seed 1 -i 0vs50Min_r117s117.bed -g Ecoli-genomesize.txt > ./0vs50Min_r118s117.bed
sort -k1,1 -k2,2n ./0vs50Min_r118s117.bed > ./0vs50Min_r118s118.bed
bedtools shuffle -seed 1 -i 0vs50Min_r118s118.bed -g Ecoli-genomesize.txt > ./0vs50Min_r119s118.bed
sort -k1,1 -k2,2n ./0vs50Min_r119s118.bed > ./0vs50Min_r119s119.bed
bedtools shuffle -seed 1 -i 0vs50Min_r119s119.bed -g Ecoli-genomesize.txt > ./0vs50Min_r120s119.bed
sort -k1,1 -k2,2n ./0vs50Min_r120s119.bed > ./0vs50Min_r120s120.bed
bedtools shuffle -seed 1 -i 0vs50Min_r120s120.bed -g Ecoli-genomesize.txt > ./0vs50Min_r121s120.bed
sort -k1,1 -k2,2n ./0vs50Min_r121s120.bed > ./0vs50Min_r121s121.bed
bedtools shuffle -seed 1 -i 0vs50Min_r121s121.bed -g Ecoli-genomesize.txt > ./0vs50Min_r122s121.bed
sort -k1,1 -k2,2n ./0vs50Min_r122s121.bed > ./0vs50Min_r122s122.bed
bedtools shuffle -seed 1 -i 0vs50Min_r122s122.bed -g Ecoli-genomesize.txt > ./0vs50Min_r123s122.bed
sort -k1,1 -k2,2n ./0vs50Min_r123s122.bed > ./0vs50Min_r123s123.bed
bedtools shuffle -seed 1 -i 0vs50Min_r123s123.bed -g Ecoli-genomesize.txt > ./0vs50Min_r124s123.bed
sort -k1,1 -k2,2n ./0vs50Min_r124s123.bed > ./0vs50Min_r124s124.bed
bedtools shuffle -seed 1 -i 0vs50Min_r124s124.bed -g Ecoli-genomesize.txt > ./0vs50Min_r125s124.bed
sort -k1,1 -k2,2n ./0vs50Min_r125s124.bed > ./0vs50Min_r125s125.bed
bedtools shuffle -seed 1 -i 0vs50Min_r125s125.bed -g Ecoli-genomesize.txt > ./0vs50Min_r126s125.bed
sort -k1,1 -k2,2n ./0vs50Min_r126s125.bed > ./0vs50Min_r126s126.bed
bedtools shuffle -seed 1 -i 0vs50Min_r126s126.bed -g Ecoli-genomesize.txt > ./0vs50Min_r127s126.bed
sort -k1,1 -k2,2n ./0vs50Min_r127s126.bed > ./0vs50Min_r127s127.bed
bedtools shuffle -seed 1 -i 0vs50Min_r127s127.bed -g Ecoli-genomesize.txt > ./0vs50Min_r128s127.bed
sort -k1,1 -k2,2n ./0vs50Min_r128s127.bed > ./0vs50Min_r128s128.bed
bedtools shuffle -seed 1 -i 0vs50Min_r128s128.bed -g Ecoli-genomesize.txt > ./0vs50Min_r129s128.bed
sort -k1,1 -k2,2n ./0vs50Min_r129s128.bed > ./0vs50Min_r129s129.bed
```

```
    bedtools shuffle -seed 1 -i 0vs50Min_r129s129.bed -g Ecoli-genomesize.txt > ./0vs50Min_r130s129.bed
    sort -k1,1 -k2,2n ./0vs50Min_r130s129.bed > ./0vs50Min_r130s130.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r130s130.bed -g Ecoli-genomesize.txt > ./0vs50Min_r131s130.bed
    sort -k1,1 -k2,2n ./0vs50Min_r131s130.bed > ./0vs50Min_r131s131.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r131s131.bed -g Ecoli-genomesize.txt > ./0vs50Min_r132s131.bed
    sort -k1,1 -k2,2n ./0vs50Min_r132s131.bed > ./0vs50Min_r132s132.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r132s132.bed -g Ecoli-genomesize.txt > ./0vs50Min_r133s132.bed
    sort -k1,1 -k2,2n ./0vs50Min_r133s132.bed > ./0vs50Min_r133s133.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r133s133.bed -g Ecoli-genomesize.txt > ./0vs50Min_r134s133.bed
    sort -k1,1 -k2,2n ./0vs50Min_r134s133.bed > ./0vs50Min_r134s134.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r134s134.bed -g Ecoli-genomesize.txt > ./0vs50Min_r135s134.bed
    sort -k1,1 -k2,2n ./0vs50Min_r135s134.bed > ./0vs50Min_r135s135.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r135s135.bed -g Ecoli-genomesize.txt > ./0vs50Min_r136s135.bed
    sort -k1,1 -k2,2n ./0vs50Min_r136s135.bed > ./0vs50Min_r136s136.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r136s136.bed -g Ecoli-genomesize.txt > ./0vs50Min_r137s136.bed
    sort -k1,1 -k2,2n ./0vs50Min_r137s136.bed > ./0vs50Min_r137s137.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r137s137.bed -g Ecoli-genomesize.txt > ./0vs50Min_r138s137.bed
    sort -k1,1 -k2,2n ./0vs50Min_r138s137.bed > ./0vs50Min_r138s138.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r138s138.bed -g Ecoli-genomesize.txt > ./0vs50Min_r139s138.bed
    sort -k1,1 -k2,2n ./0vs50Min_r139s138.bed > ./0vs50Min_r139s139.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r139s139.bed -g Ecoli-genomesize.txt > ./0vs50Min_r140s139.bed
    sort -k1,1 -k2,2n ./0vs50Min_r140s139.bed > ./0vs50Min_r140s140.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r140s140.bed -g Ecoli-genomesize.txt > ./0vs50Min_r141s140.bed
    sort -k1,1 -k2,2n ./0vs50Min_r141s140.bed > ./0vs50Min_r141s141.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r141s141.bed -g Ecoli-genomesize.txt > ./0vs50Min_r142s141.bed
    sort -k1,1 -k2,2n ./0vs50Min_r142s141.bed > ./0vs50Min_r142s142.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r142s142.bed -g Ecoli-genomesize.txt > ./0vs50Min_r143s142.bed
    sort -k1,1 -k2,2n ./0vs50Min_r143s142.bed > ./0vs50Min_r143s143.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r143s143.bed -g Ecoli-genomesize.txt > ./0vs50Min_r144s143.bed
    sort -k1,1 -k2,2n ./0vs50Min_r144s143.bed > ./0vs50Min_r144s144.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r144s144.bed -g Ecoli-genomesize.txt > ./0vs50Min_r145s144.bed
    sort -k1,1 -k2,2n ./0vs50Min_r145s144.bed > ./0vs50Min_r145s145.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r145s145.bed -g Ecoli-genomesize.txt > ./0vs50Min_r146s145.bed
    sort -k1,1 -k2,2n ./0vs50Min_r146s145.bed > ./0vs50Min_r146s146.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r146s146.bed -g Ecoli-genomesize.txt > ./0vs50Min_r147s146.bed
    sort -k1,1 -k2,2n ./0vs50Min_r147s146.bed > ./0vs50Min_r147s147.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r147s147.bed -g Ecoli-genomesize.txt > ./0vs50Min_r148s147.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r148s147.bed > ./0vs50Min_r148s148.bed
bedtools shuffle -seed 1 -i 0vs50Min_r148s148.bed -g Ecoli-genomesize.txt > ./0vs50Min_r149s148.bed
sort -k1,1 -k2,2n ./0vs50Min_r149s148.bed > ./0vs50Min_r149s149.bed
bedtools shuffle -seed 1 -i 0vs50Min_r149s149.bed -g Ecoli-genomesize.txt > ./0vs50Min_r150s149.bed
sort -k1,1 -k2,2n ./0vs50Min_r150s149.bed > ./0vs50Min_r150s150.bed
bedtools shuffle -seed 1 -i 0vs50Min_r150s150.bed -g Ecoli-genomesize.txt > ./0vs50Min_r151s150.bed
sort -k1,1 -k2,2n ./0vs50Min_r151s150.bed > ./0vs50Min_r151s151.bed
bedtools shuffle -seed 1 -i 0vs50Min_r151s151.bed -g Ecoli-genomesize.txt > ./0vs50Min_r152s151.bed
sort -k1,1 -k2,2n ./0vs50Min_r152s151.bed > ./0vs50Min_r152s152.bed
bedtools shuffle -seed 1 -i 0vs50Min_r152s152.bed -g Ecoli-genomesize.txt > ./0vs50Min_r153s152.bed
sort -k1,1 -k2,2n ./0vs50Min_r153s152.bed > ./0vs50Min_r153s153.bed
bedtools shuffle -seed 1 -i 0vs50Min_r153s153.bed -g Ecoli-genomesize.txt > ./0vs50Min_r154s153.bed
sort -k1,1 -k2,2n ./0vs50Min_r154s153.bed > ./0vs50Min_r154s154.bed
bedtools shuffle -seed 1 -i 0vs50Min_r154s154.bed -g Ecoli-genomesize.txt > ./0vs50Min_r155s154.bed
sort -k1,1 -k2,2n ./0vs50Min_r155s154.bed > ./0vs50Min_r155s155.bed
bedtools shuffle -seed 1 -i 0vs50Min_r155s155.bed -g Ecoli-genomesize.txt > ./0vs50Min_r156s155.bed
sort -k1,1 -k2,2n ./0vs50Min_r156s155.bed > ./0vs50Min_r156s156.bed
bedtools shuffle -seed 1 -i 0vs50Min_r156s156.bed -g Ecoli-genomesize.txt > ./0vs50Min_r157s156.bed
sort -k1,1 -k2,2n ./0vs50Min_r157s156.bed > ./0vs50Min_r157s157.bed
bedtools shuffle -seed 1 -i 0vs50Min_r157s157.bed -g Ecoli-genomesize.txt > ./0vs50Min_r158s157.bed
sort -k1,1 -k2,2n ./0vs50Min_r158s157.bed > ./0vs50Min_r158s158.bed
bedtools shuffle -seed 1 -i 0vs50Min_r158s158.bed -g Ecoli-genomesize.txt > ./0vs50Min_r159s158.bed
sort -k1,1 -k2,2n ./0vs50Min_r159s158.bed > ./0vs50Min_r159s159.bed
bedtools shuffle -seed 1 -i 0vs50Min_r159s159.bed -g Ecoli-genomesize.txt > ./0vs50Min_r160s159.bed
sort -k1,1 -k2,2n ./0vs50Min_r160s159.bed > ./0vs50Min_r160s160.bed
bedtools shuffle -seed 1 -i 0vs50Min_r160s160.bed -g Ecoli-genomesize.txt > ./0vs50Min_r161s160.bed
sort -k1,1 -k2,2n ./0vs50Min_r161s160.bed > ./0vs50Min_r161s161.bed
bedtools shuffle -seed 1 -i 0vs50Min_r161s161.bed -g Ecoli-genomesize.txt > ./0vs50Min_r162s161.bed
sort -k1,1 -k2,2n ./0vs50Min_r162s161.bed > ./0vs50Min_r162s162.bed
bedtools shuffle -seed 1 -i 0vs50Min_r162s162.bed -g Ecoli-genomesize.txt > ./0vs50Min_r163s162.bed
sort -k1,1 -k2,2n ./0vs50Min_r163s162.bed > ./0vs50Min_r163s163.bed
bedtools shuffle -seed 1 -i 0vs50Min_r163s163.bed -g Ecoli-genomesize.txt > ./0vs50Min_r164s163.bed
sort -k1,1 -k2,2n ./0vs50Min_r164s163.bed > ./0vs50Min_r164s164.bed
bedtools shuffle -seed 1 -i 0vs50Min_r164s164.bed -g Ecoli-genomesize.txt > ./0vs50Min_r165s164.bed
sort -k1,1 -k2,2n ./0vs50Min_r165s164.bed > ./0vs50Min_r165s165.bed
bedtools shuffle -seed 1 -i 0vs50Min_r165s165.bed -g Ecoli-genomesize.txt > ./0vs50Min_r166s165.bed
sort -k1,1 -k2,2n ./0vs50Min_r166s165.bed > ./0vs50Min_r166s166.bed
```

```
	bedtools shuffle -seed 1 -i 0vs50Min_r166s166.bed -g Ecoli-genomesize.txt > ./0vs50Min_r167s166.bed
	sort -k1,1 -k2,2n ./0vs50Min_r167s166.bed > ./0vs50Min_r167s167.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r167s167.bed -g Ecoli-genomesize.txt > ./0vs50Min_r168s167.bed
	sort -k1,1 -k2,2n ./0vs50Min_r168s167.bed > ./0vs50Min_r168s168.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r168s168.bed -g Ecoli-genomesize.txt > ./0vs50Min_r169s168.bed
	sort -k1,1 -k2,2n ./0vs50Min_r169s168.bed > ./0vs50Min_r169s169.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r169s169.bed -g Ecoli-genomesize.txt > ./0vs50Min_r170s169.bed
	sort -k1,1 -k2,2n ./0vs50Min_r170s169.bed > ./0vs50Min_r170s170.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r170s170.bed -g Ecoli-genomesize.txt > ./0vs50Min_r171s170.bed
	sort -k1,1 -k2,2n ./0vs50Min_r171s170.bed > ./0vs50Min_r171s171.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r171s171.bed -g Ecoli-genomesize.txt > ./0vs50Min_r172s171.bed
	sort -k1,1 -k2,2n ./0vs50Min_r172s171.bed > ./0vs50Min_r172s172.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r172s172.bed -g Ecoli-genomesize.txt > ./0vs50Min_r173s172.bed
	sort -k1,1 -k2,2n ./0vs50Min_r173s172.bed > ./0vs50Min_r173s173.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r173s173.bed -g Ecoli-genomesize.txt > ./0vs50Min_r174s173.bed
	sort -k1,1 -k2,2n ./0vs50Min_r174s173.bed > ./0vs50Min_r174s174.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r174s174.bed -g Ecoli-genomesize.txt > ./0vs50Min_r175s174.bed
	sort -k1,1 -k2,2n ./0vs50Min_r175s174.bed > ./0vs50Min_r175s175.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r175s175.bed -g Ecoli-genomesize.txt > ./0vs50Min_r176s175.bed
	sort -k1,1 -k2,2n ./0vs50Min_r176s175.bed > ./0vs50Min_r176s176.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r176s176.bed -g Ecoli-genomesize.txt > ./0vs50Min_r177s176.bed
	sort -k1,1 -k2,2n ./0vs50Min_r177s176.bed > ./0vs50Min_r177s177.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r177s177.bed -g Ecoli-genomesize.txt > ./0vs50Min_r178s177.bed
	sort -k1,1 -k2,2n ./0vs50Min_r178s177.bed > ./0vs50Min_r178s178.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r178s178.bed -g Ecoli-genomesize.txt > ./0vs50Min_r179s178.bed
	sort -k1,1 -k2,2n ./0vs50Min_r179s178.bed > ./0vs50Min_r179s179.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r179s179.bed -g Ecoli-genomesize.txt > ./0vs50Min_r180s179.bed
	sort -k1,1 -k2,2n ./0vs50Min_r180s179.bed > ./0vs50Min_r180s180.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r180s180.bed -g Ecoli-genomesize.txt > ./0vs50Min_r181s180.bed
	sort -k1,1 -k2,2n ./0vs50Min_r181s180.bed > ./0vs50Min_r181s181.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r181s181.bed -g Ecoli-genomesize.txt > ./0vs50Min_r182s181.bed
	sort -k1,1 -k2,2n ./0vs50Min_r182s181.bed > ./0vs50Min_r182s182.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r182s182.bed -g Ecoli-genomesize.txt > ./0vs50Min_r183s182.bed
	sort -k1,1 -k2,2n ./0vs50Min_r183s182.bed > ./0vs50Min_r183s183.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r183s183.bed -g Ecoli-genomesize.txt > ./0vs50Min_r184s183.bed
	sort -k1,1 -k2,2n ./0vs50Min_r184s183.bed > ./0vs50Min_r184s184.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r184s184.bed -g Ecoli-genomesize.txt > ./0vs50Min_r185s184.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r185s184.bed > ./0vs50Min_r185s185.bed
bedtools shuffle -seed 1 -i 0vs50Min_r185s185.bed -g Ecoli-genomesize.txt > ./0vs50Min_r186s185.bed
sort -k1,1 -k2,2n ./0vs50Min_r186s185.bed > ./0vs50Min_r186s186.bed
bedtools shuffle -seed 1 -i 0vs50Min_r186s186.bed -g Ecoli-genomesize.txt > ./0vs50Min_r187s186.bed
sort -k1,1 -k2,2n ./0vs50Min_r187s186.bed > ./0vs50Min_r187s187.bed
bedtools shuffle -seed 1 -i 0vs50Min_r187s187.bed -g Ecoli-genomesize.txt > ./0vs50Min_r188s187.bed
sort -k1,1 -k2,2n ./0vs50Min_r188s187.bed > ./0vs50Min_r188s188.bed
bedtools shuffle -seed 1 -i 0vs50Min_r188s188.bed -g Ecoli-genomesize.txt > ./0vs50Min_r189s188.bed
sort -k1,1 -k2,2n ./0vs50Min_r189s188.bed > ./0vs50Min_r189s189.bed
bedtools shuffle -seed 1 -i 0vs50Min_r189s189.bed -g Ecoli-genomesize.txt > ./0vs50Min_r190s189.bed
sort -k1,1 -k2,2n ./0vs50Min_r190s189.bed > ./0vs50Min_r190s190.bed
bedtools shuffle -seed 1 -i 0vs50Min_r190s190.bed -g Ecoli-genomesize.txt > ./0vs50Min_r191s190.bed
sort -k1,1 -k2,2n ./0vs50Min_r191s190.bed > ./0vs50Min_r191s191.bed
bedtools shuffle -seed 1 -i 0vs50Min_r191s191.bed -g Ecoli-genomesize.txt > ./0vs50Min_r192s191.bed
sort -k1,1 -k2,2n ./0vs50Min_r192s191.bed > ./0vs50Min_r192s192.bed
bedtools shuffle -seed 1 -i 0vs50Min_r192s192.bed -g Ecoli-genomesize.txt > ./0vs50Min_r193s192.bed
sort -k1,1 -k2,2n ./0vs50Min_r193s192.bed > ./0vs50Min_r193s193.bed
bedtools shuffle -seed 1 -i 0vs50Min_r193s193.bed -g Ecoli-genomesize.txt > ./0vs50Min_r194s193.bed
sort -k1,1 -k2,2n ./0vs50Min_r194s193.bed > ./0vs50Min_r194s194.bed
bedtools shuffle -seed 1 -i 0vs50Min_r194s194.bed -g Ecoli-genomesize.txt > ./0vs50Min_r195s194.bed
sort -k1,1 -k2,2n ./0vs50Min_r195s194.bed > ./0vs50Min_r195s195.bed
bedtools shuffle -seed 1 -i 0vs50Min_r195s195.bed -g Ecoli-genomesize.txt > ./0vs50Min_r196s195.bed
sort -k1,1 -k2,2n ./0vs50Min_r196s195.bed > ./0vs50Min_r196s196.bed
bedtools shuffle -seed 1 -i 0vs50Min_r196s196.bed -g Ecoli-genomesize.txt > ./0vs50Min_r197s196.bed
sort -k1,1 -k2,2n ./0vs50Min_r197s196.bed > ./0vs50Min_r197s197.bed
bedtools shuffle -seed 1 -i 0vs50Min_r197s197.bed -g Ecoli-genomesize.txt > ./0vs50Min_r198s197.bed
sort -k1,1 -k2,2n ./0vs50Min_r198s197.bed > ./0vs50Min_r198s198.bed
bedtools shuffle -seed 1 -i 0vs50Min_r198s198.bed -g Ecoli-genomesize.txt > ./0vs50Min_r199s198.bed
sort -k1,1 -k2,2n ./0vs50Min_r199s198.bed > ./0vs50Min_r199s199.bed
bedtools shuffle -seed 1 -i 0vs50Min_r199s199.bed -g Ecoli-genomesize.txt > ./0vs50Min_r200s199.bed
sort -k1,1 -k2,2n ./0vs50Min_r200s199.bed > ./0vs50Min_r200s200.bed
bedtools shuffle -seed 1 -i 0vs50Min_r200s200.bed -g Ecoli-genomesize.txt > ./0vs50Min_r201s200.bed
sort -k1,1 -k2,2n ./0vs50Min_r201s200.bed > ./0vs50Min_r201s201.bed
bedtools shuffle -seed 1 -i 0vs50Min_r201s201.bed -g Ecoli-genomesize.txt > ./0vs50Min_r202s201.bed
sort -k1,1 -k2,2n ./0vs50Min_r202s201.bed > ./0vs50Min_r202s202.bed
bedtools shuffle -seed 1 -i 0vs50Min_r202s202.bed -g Ecoli-genomesize.txt > ./0vs50Min_r203s202.bed
sort -k1,1 -k2,2n ./0vs50Min_r203s202.bed > ./0vs50Min_r203s203.bed
```

```
    bedtools shuffle -seed 1 -i 0vs50Min_r203s203.bed -g Ecoli-genomesize.txt > ./0vs50Min_r204s203.bed
    sort -k1,1 -k2,2n ./0vs50Min_r204s203.bed > ./0vs50Min_r204s204.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r204s204.bed -g Ecoli-genomesize.txt > ./0vs50Min_r205s204.bed
    sort -k1,1 -k2,2n ./0vs50Min_r205s204.bed > ./0vs50Min_r205s205.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r205s205.bed -g Ecoli-genomesize.txt > ./0vs50Min_r206s205.bed
    sort -k1,1 -k2,2n ./0vs50Min_r206s205.bed > ./0vs50Min_r206s206.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r206s206.bed -g Ecoli-genomesize.txt > ./0vs50Min_r207s206.bed
    sort -k1,1 -k2,2n ./0vs50Min_r207s206.bed > ./0vs50Min_r207s207.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r207s207.bed -g Ecoli-genomesize.txt > ./0vs50Min_r208s207.bed
    sort -k1,1 -k2,2n ./0vs50Min_r208s207.bed > ./0vs50Min_r208s208.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r208s208.bed -g Ecoli-genomesize.txt > ./0vs50Min_r209s208.bed
    sort -k1,1 -k2,2n ./0vs50Min_r209s208.bed > ./0vs50Min_r209s209.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r209s209.bed -g Ecoli-genomesize.txt > ./0vs50Min_r210s209.bed
    sort -k1,1 -k2,2n ./0vs50Min_r210s209.bed > ./0vs50Min_r210s210.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r210s210.bed -g Ecoli-genomesize.txt > ./0vs50Min_r211s210.bed
    sort -k1,1 -k2,2n ./0vs50Min_r211s210.bed > ./0vs50Min_r211s211.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r211s211.bed -g Ecoli-genomesize.txt > ./0vs50Min_r212s211.bed
    sort -k1,1 -k2,2n ./0vs50Min_r212s211.bed > ./0vs50Min_r212s212.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r212s212.bed -g Ecoli-genomesize.txt > ./0vs50Min_r213s212.bed
    sort -k1,1 -k2,2n ./0vs50Min_r213s212.bed > ./0vs50Min_r213s213.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r213s213.bed -g Ecoli-genomesize.txt > ./0vs50Min_r214s213.bed
    sort -k1,1 -k2,2n ./0vs50Min_r214s213.bed > ./0vs50Min_r214s214.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r214s214.bed -g Ecoli-genomesize.txt > ./0vs50Min_r215s214.bed
    sort -k1,1 -k2,2n ./0vs50Min_r215s214.bed > ./0vs50Min_r215s215.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r215s215.bed -g Ecoli-genomesize.txt > ./0vs50Min_r216s215.bed
    sort -k1,1 -k2,2n ./0vs50Min_r216s215.bed > ./0vs50Min_r216s216.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r216s216.bed -g Ecoli-genomesize.txt > ./0vs50Min_r217s216.bed
    sort -k1,1 -k2,2n ./0vs50Min_r217s216.bed > ./0vs50Min_r217s217.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r217s217.bed -g Ecoli-genomesize.txt > ./0vs50Min_r218s217.bed
    sort -k1,1 -k2,2n ./0vs50Min_r218s217.bed > ./0vs50Min_r218s218.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r218s218.bed -g Ecoli-genomesize.txt > ./0vs50Min_r219s218.bed
    sort -k1,1 -k2,2n ./0vs50Min_r219s218.bed > ./0vs50Min_r219s219.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r219s219.bed -g Ecoli-genomesize.txt > ./0vs50Min_r220s219.bed
    sort -k1,1 -k2,2n ./0vs50Min_r220s219.bed > ./0vs50Min_r220s220.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r220s220.bed -g Ecoli-genomesize.txt > ./0vs50Min_r221s220.bed
    sort -k1,1 -k2,2n ./0vs50Min_r221s220.bed > ./0vs50Min_r221s221.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r221s221.bed -g Ecoli-genomesize.txt > ./0vs50Min_r222s221.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r222s221.bed > ./0vs50Min_r222s222.bed
bedtools shuffle -seed 1 -i 0vs50Min_r222s222.bed -g Ecoli-genomesize.txt > ./0vs50Min_r223s222.bed
sort -k1,1 -k2,2n ./0vs50Min_r223s222.bed > ./0vs50Min_r223s223.bed
bedtools shuffle -seed 1 -i 0vs50Min_r223s223.bed -g Ecoli-genomesize.txt > ./0vs50Min_r224s223.bed
sort -k1,1 -k2,2n ./0vs50Min_r224s223.bed > ./0vs50Min_r224s224.bed
bedtools shuffle -seed 1 -i 0vs50Min_r224s224.bed -g Ecoli-genomesize.txt > ./0vs50Min_r225s224.bed
sort -k1,1 -k2,2n ./0vs50Min_r225s224.bed > ./0vs50Min_r225s225.bed
bedtools shuffle -seed 1 -i 0vs50Min_r225s225.bed -g Ecoli-genomesize.txt > ./0vs50Min_r226s225.bed
sort -k1,1 -k2,2n ./0vs50Min_r226s225.bed > ./0vs50Min_r226s226.bed
bedtools shuffle -seed 1 -i 0vs50Min_r226s226.bed -g Ecoli-genomesize.txt > ./0vs50Min_r227s226.bed
sort -k1,1 -k2,2n ./0vs50Min_r227s226.bed > ./0vs50Min_r227s227.bed
bedtools shuffle -seed 1 -i 0vs50Min_r227s227.bed -g Ecoli-genomesize.txt > ./0vs50Min_r228s227.bed
sort -k1,1 -k2,2n ./0vs50Min_r228s227.bed > ./0vs50Min_r228s228.bed
bedtools shuffle -seed 1 -i 0vs50Min_r228s228.bed -g Ecoli-genomesize.txt > ./0vs50Min_r229s228.bed
sort -k1,1 -k2,2n ./0vs50Min_r229s228.bed > ./0vs50Min_r229s229.bed
bedtools shuffle -seed 1 -i 0vs50Min_r229s229.bed -g Ecoli-genomesize.txt > ./0vs50Min_r230s229.bed
sort -k1,1 -k2,2n ./0vs50Min_r230s229.bed > ./0vs50Min_r230s230.bed
bedtools shuffle -seed 1 -i 0vs50Min_r230s230.bed -g Ecoli-genomesize.txt > ./0vs50Min_r231s230.bed
sort -k1,1 -k2,2n ./0vs50Min_r231s230.bed > ./0vs50Min_r231s231.bed
bedtools shuffle -seed 1 -i 0vs50Min_r231s231.bed -g Ecoli-genomesize.txt > ./0vs50Min_r232s231.bed
sort -k1,1 -k2,2n ./0vs50Min_r232s231.bed > ./0vs50Min_r232s232.bed
bedtools shuffle -seed 1 -i 0vs50Min_r232s232.bed -g Ecoli-genomesize.txt > ./0vs50Min_r233s232.bed
sort -k1,1 -k2,2n ./0vs50Min_r233s232.bed > ./0vs50Min_r233s233.bed
bedtools shuffle -seed 1 -i 0vs50Min_r233s233.bed -g Ecoli-genomesize.txt > ./0vs50Min_r234s233.bed
sort -k1,1 -k2,2n ./0vs50Min_r234s233.bed > ./0vs50Min_r234s234.bed
bedtools shuffle -seed 1 -i 0vs50Min_r234s234.bed -g Ecoli-genomesize.txt > ./0vs50Min_r235s234.bed
sort -k1,1 -k2,2n ./0vs50Min_r235s234.bed > ./0vs50Min_r235s235.bed
bedtools shuffle -seed 1 -i 0vs50Min_r235s235.bed -g Ecoli-genomesize.txt > ./0vs50Min_r236s235.bed
sort -k1,1 -k2,2n ./0vs50Min_r236s235.bed > ./0vs50Min_r236s236.bed
bedtools shuffle -seed 1 -i 0vs50Min_r236s236.bed -g Ecoli-genomesize.txt > ./0vs50Min_r237s236.bed
sort -k1,1 -k2,2n ./0vs50Min_r237s236.bed > ./0vs50Min_r237s237.bed
bedtools shuffle -seed 1 -i 0vs50Min_r237s237.bed -g Ecoli-genomesize.txt > ./0vs50Min_r238s237.bed
sort -k1,1 -k2,2n ./0vs50Min_r238s237.bed > ./0vs50Min_r238s238.bed
bedtools shuffle -seed 1 -i 0vs50Min_r238s238.bed -g Ecoli-genomesize.txt > ./0vs50Min_r239s238.bed
sort -k1,1 -k2,2n ./0vs50Min_r239s238.bed > ./0vs50Min_r239s239.bed
bedtools shuffle -seed 1 -i 0vs50Min_r239s239.bed -g Ecoli-genomesize.txt > ./0vs50Min_r240s239.bed
sort -k1,1 -k2,2n ./0vs50Min_r240s239.bed > ./0vs50Min_r240s240.bed
```

```
    bedtools shuffle -seed 1 -i 0vs50Min_r240s240.bed -g Ecoli-genomesize.txt > ./0vs50Min_r241s240.bed
    sort -k1,1 -k2,2n ./0vs50Min_r241s240.bed > ./0vs50Min_r241s241.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r241s241.bed -g Ecoli-genomesize.txt > ./0vs50Min_r242s241.bed
    sort -k1,1 -k2,2n ./0vs50Min_r242s241.bed > ./0vs50Min_r242s242.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r242s242.bed -g Ecoli-genomesize.txt > ./0vs50Min_r243s242.bed
    sort -k1,1 -k2,2n ./0vs50Min_r243s242.bed > ./0vs50Min_r243s243.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r243s243.bed -g Ecoli-genomesize.txt > ./0vs50Min_r244s243.bed
    sort -k1,1 -k2,2n ./0vs50Min_r244s243.bed > ./0vs50Min_r244s244.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r244s244.bed -g Ecoli-genomesize.txt > ./0vs50Min_r245s244.bed
    sort -k1,1 -k2,2n ./0vs50Min_r245s244.bed > ./0vs50Min_r245s245.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r245s245.bed -g Ecoli-genomesize.txt > ./0vs50Min_r246s245.bed
    sort -k1,1 -k2,2n ./0vs50Min_r246s245.bed > ./0vs50Min_r246s246.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r246s246.bed -g Ecoli-genomesize.txt > ./0vs50Min_r247s246.bed
    sort -k1,1 -k2,2n ./0vs50Min_r247s246.bed > ./0vs50Min_r247s247.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r247s247.bed -g Ecoli-genomesize.txt > ./0vs50Min_r248s247.bed
    sort -k1,1 -k2,2n ./0vs50Min_r248s247.bed > ./0vs50Min_r248s248.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r248s248.bed -g Ecoli-genomesize.txt > ./0vs50Min_r249s248.bed
    sort -k1,1 -k2,2n ./0vs50Min_r249s248.bed > ./0vs50Min_r249s249.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r249s249.bed -g Ecoli-genomesize.txt > ./0vs50Min_r250s249.bed
    sort -k1,1 -k2,2n ./0vs50Min_r250s249.bed > ./0vs50Min_r250s250.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r250s250.bed -g Ecoli-genomesize.txt > ./0vs50Min_r251s250.bed
    sort -k1,1 -k2,2n ./0vs50Min_r251s250.bed > ./0vs50Min_r251s251.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r251s251.bed -g Ecoli-genomesize.txt > ./0vs50Min_r252s251.bed
    sort -k1,1 -k2,2n ./0vs50Min_r252s251.bed > ./0vs50Min_r252s252.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r252s252.bed -g Ecoli-genomesize.txt > ./0vs50Min_r253s252.bed
    sort -k1,1 -k2,2n ./0vs50Min_r253s252.bed > ./0vs50Min_r253s253.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r253s253.bed -g Ecoli-genomesize.txt > ./0vs50Min_r254s253.bed
    sort -k1,1 -k2,2n ./0vs50Min_r254s253.bed > ./0vs50Min_r254s254.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r254s254.bed -g Ecoli-genomesize.txt > ./0vs50Min_r255s254.bed
    sort -k1,1 -k2,2n ./0vs50Min_r255s254.bed > ./0vs50Min_r255s255.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r255s255.bed -g Ecoli-genomesize.txt > ./0vs50Min_r256s255.bed
    sort -k1,1 -k2,2n ./0vs50Min_r256s255.bed > ./0vs50Min_r256s256.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r256s256.bed -g Ecoli-genomesize.txt > ./0vs50Min_r257s256.bed
    sort -k1,1 -k2,2n ./0vs50Min_r257s256.bed > ./0vs50Min_r257s257.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r257s257.bed -g Ecoli-genomesize.txt > ./0vs50Min_r258s257.bed
    sort -k1,1 -k2,2n ./0vs50Min_r258s257.bed > ./0vs50Min_r258s258.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r258s258.bed -g Ecoli-genomesize.txt > ./0vs50Min_r259s258.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r259s258.bed > ./0vs50Min_r259s259.bed
bedtools shuffle -seed 1 -i 0vs50Min_r259s259.bed -g Ecoli-genomesize.txt > ./0vs50Min_r260s259.bed
sort -k1,1 -k2,2n ./0vs50Min_r260s259.bed > ./0vs50Min_r260s260.bed
bedtools shuffle -seed 1 -i 0vs50Min_r260s260.bed -g Ecoli-genomesize.txt > ./0vs50Min_r261s260.bed
sort -k1,1 -k2,2n ./0vs50Min_r261s260.bed > ./0vs50Min_r261s261.bed
bedtools shuffle -seed 1 -i 0vs50Min_r261s261.bed -g Ecoli-genomesize.txt > ./0vs50Min_r262s261.bed
sort -k1,1 -k2,2n ./0vs50Min_r262s261.bed > ./0vs50Min_r262s262.bed
bedtools shuffle -seed 1 -i 0vs50Min_r262s262.bed -g Ecoli-genomesize.txt > ./0vs50Min_r263s262.bed
sort -k1,1 -k2,2n ./0vs50Min_r263s262.bed > ./0vs50Min_r263s263.bed
bedtools shuffle -seed 1 -i 0vs50Min_r263s263.bed -g Ecoli-genomesize.txt > ./0vs50Min_r264s263.bed
sort -k1,1 -k2,2n ./0vs50Min_r264s263.bed > ./0vs50Min_r264s264.bed
bedtools shuffle -seed 1 -i 0vs50Min_r264s264.bed -g Ecoli-genomesize.txt > ./0vs50Min_r265s264.bed
sort -k1,1 -k2,2n ./0vs50Min_r265s264.bed > ./0vs50Min_r265s265.bed
bedtools shuffle -seed 1 -i 0vs50Min_r265s265.bed -g Ecoli-genomesize.txt > ./0vs50Min_r266s265.bed
sort -k1,1 -k2,2n ./0vs50Min_r266s265.bed > ./0vs50Min_r266s266.bed
bedtools shuffle -seed 1 -i 0vs50Min_r266s266.bed -g Ecoli-genomesize.txt > ./0vs50Min_r267s266.bed
sort -k1,1 -k2,2n ./0vs50Min_r267s266.bed > ./0vs50Min_r267s267.bed
bedtools shuffle -seed 1 -i 0vs50Min_r267s267.bed -g Ecoli-genomesize.txt > ./0vs50Min_r268s267.bed
sort -k1,1 -k2,2n ./0vs50Min_r268s267.bed > ./0vs50Min_r268s268.bed
bedtools shuffle -seed 1 -i 0vs50Min_r268s268.bed -g Ecoli-genomesize.txt > ./0vs50Min_r269s268.bed
sort -k1,1 -k2,2n ./0vs50Min_r269s268.bed > ./0vs50Min_r269s269.bed
bedtools shuffle -seed 1 -i 0vs50Min_r269s269.bed -g Ecoli-genomesize.txt > ./0vs50Min_r270s269.bed
sort -k1,1 -k2,2n ./0vs50Min_r270s269.bed > ./0vs50Min_r270s270.bed
bedtools shuffle -seed 1 -i 0vs50Min_r270s270.bed -g Ecoli-genomesize.txt > ./0vs50Min_r271s270.bed
sort -k1,1 -k2,2n ./0vs50Min_r271s270.bed > ./0vs50Min_r271s271.bed
bedtools shuffle -seed 1 -i 0vs50Min_r271s271.bed -g Ecoli-genomesize.txt > ./0vs50Min_r272s271.bed
sort -k1,1 -k2,2n ./0vs50Min_r272s271.bed > ./0vs50Min_r272s272.bed
bedtools shuffle -seed 1 -i 0vs50Min_r272s272.bed -g Ecoli-genomesize.txt > ./0vs50Min_r273s272.bed
sort -k1,1 -k2,2n ./0vs50Min_r273s272.bed > ./0vs50Min_r273s273.bed
bedtools shuffle -seed 1 -i 0vs50Min_r273s273.bed -g Ecoli-genomesize.txt > ./0vs50Min_r274s273.bed
sort -k1,1 -k2,2n ./0vs50Min_r274s273.bed > ./0vs50Min_r274s274.bed
bedtools shuffle -seed 1 -i 0vs50Min_r274s274.bed -g Ecoli-genomesize.txt > ./0vs50Min_r275s274.bed
sort -k1,1 -k2,2n ./0vs50Min_r275s274.bed > ./0vs50Min_r275s275.bed
bedtools shuffle -seed 1 -i 0vs50Min_r275s275.bed -g Ecoli-genomesize.txt > ./0vs50Min_r276s275.bed
sort -k1,1 -k2,2n ./0vs50Min_r276s275.bed > ./0vs50Min_r276s276.bed
bedtools shuffle -seed 1 -i 0vs50Min_r276s276.bed -g Ecoli-genomesize.txt > ./0vs50Min_r277s276.bed
sort -k1,1 -k2,2n ./0vs50Min_r277s276.bed > ./0vs50Min_r277s277.bed
```

```
	bedtools shuffle -seed 1 -i 0vs50Min_r277s277.bed -g Ecoli-genomesize.txt > ./0vs50Min_r278s277.bed
	sort -k1,1 -k2,2n ./0vs50Min_r278s277.bed > ./0vs50Min_r278s278.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r278s278.bed -g Ecoli-genomesize.txt > ./0vs50Min_r279s278.bed
	sort -k1,1 -k2,2n ./0vs50Min_r279s278.bed > ./0vs50Min_r279s279.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r279s279.bed -g Ecoli-genomesize.txt > ./0vs50Min_r280s279.bed
	sort -k1,1 -k2,2n ./0vs50Min_r280s279.bed > ./0vs50Min_r280s280.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r280s280.bed -g Ecoli-genomesize.txt > ./0vs50Min_r281s280.bed
	sort -k1,1 -k2,2n ./0vs50Min_r281s280.bed > ./0vs50Min_r281s281.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r281s281.bed -g Ecoli-genomesize.txt > ./0vs50Min_r282s281.bed
	sort -k1,1 -k2,2n ./0vs50Min_r282s281.bed > ./0vs50Min_r282s282.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r282s282.bed -g Ecoli-genomesize.txt > ./0vs50Min_r283s282.bed
	sort -k1,1 -k2,2n ./0vs50Min_r283s282.bed > ./0vs50Min_r283s283.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r283s283.bed -g Ecoli-genomesize.txt > ./0vs50Min_r284s283.bed
	sort -k1,1 -k2,2n ./0vs50Min_r284s283.bed > ./0vs50Min_r284s284.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r284s284.bed -g Ecoli-genomesize.txt > ./0vs50Min_r285s284.bed
	sort -k1,1 -k2,2n ./0vs50Min_r285s284.bed > ./0vs50Min_r285s285.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r285s285.bed -g Ecoli-genomesize.txt > ./0vs50Min_r286s285.bed
	sort -k1,1 -k2,2n ./0vs50Min_r286s285.bed > ./0vs50Min_r286s286.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r286s286.bed -g Ecoli-genomesize.txt > ./0vs50Min_r287s286.bed
	sort -k1,1 -k2,2n ./0vs50Min_r287s286.bed > ./0vs50Min_r287s287.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r287s287.bed -g Ecoli-genomesize.txt > ./0vs50Min_r288s287.bed
	sort -k1,1 -k2,2n ./0vs50Min_r288s287.bed > ./0vs50Min_r288s288.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r288s288.bed -g Ecoli-genomesize.txt > ./0vs50Min_r289s288.bed
	sort -k1,1 -k2,2n ./0vs50Min_r289s288.bed > ./0vs50Min_r289s289.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r289s289.bed -g Ecoli-genomesize.txt > ./0vs50Min_r290s289.bed
	sort -k1,1 -k2,2n ./0vs50Min_r290s289.bed > ./0vs50Min_r290s290.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r290s290.bed -g Ecoli-genomesize.txt > ./0vs50Min_r291s290.bed
	sort -k1,1 -k2,2n ./0vs50Min_r291s290.bed > ./0vs50Min_r291s291.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r291s291.bed -g Ecoli-genomesize.txt > ./0vs50Min_r292s291.bed
	sort -k1,1 -k2,2n ./0vs50Min_r292s291.bed > ./0vs50Min_r292s292.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r292s292.bed -g Ecoli-genomesize.txt > ./0vs50Min_r293s292.bed
	sort -k1,1 -k2,2n ./0vs50Min_r293s292.bed > ./0vs50Min_r293s293.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r293s293.bed -g Ecoli-genomesize.txt > ./0vs50Min_r294s293.bed
	sort -k1,1 -k2,2n ./0vs50Min_r294s293.bed > ./0vs50Min_r294s294.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r294s294.bed -g Ecoli-genomesize.txt > ./0vs50Min_r295s294.bed
	sort -k1,1 -k2,2n ./0vs50Min_r295s294.bed > ./0vs50Min_r295s295.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r295s295.bed -g Ecoli-genomesize.txt > ./0vs50Min_r296s295.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r296s295.bed > ./0vs50Min_r296s296.bed
bedtools shuffle -seed 1 -i 0vs50Min_r296s296.bed -g Ecoli-genomesize.txt > ./0vs50Min_r297s296.bed
sort -k1,1 -k2,2n ./0vs50Min_r297s296.bed > ./0vs50Min_r297s297.bed
bedtools shuffle -seed 1 -i 0vs50Min_r297s297.bed -g Ecoli-genomesize.txt > ./0vs50Min_r298s297.bed
sort -k1,1 -k2,2n ./0vs50Min_r298s297.bed > ./0vs50Min_r298s298.bed
bedtools shuffle -seed 1 -i 0vs50Min_r298s298.bed -g Ecoli-genomesize.txt > ./0vs50Min_r299s298.bed
sort -k1,1 -k2,2n ./0vs50Min_r299s298.bed > ./0vs50Min_r299s299.bed
bedtools shuffle -seed 1 -i 0vs50Min_r299s299.bed -g Ecoli-genomesize.txt > ./0vs50Min_r300s299.bed
sort -k1,1 -k2,2n ./0vs50Min_r300s299.bed > ./0vs50Min_r300s300.bed
bedtools shuffle -seed 1 -i 0vs50Min_r300s300.bed -g Ecoli-genomesize.txt > ./0vs50Min_r301s300.bed
sort -k1,1 -k2,2n ./0vs50Min_r301s300.bed > ./0vs50Min_r301s301.bed
bedtools shuffle -seed 1 -i 0vs50Min_r301s301.bed -g Ecoli-genomesize.txt > ./0vs50Min_r302s301.bed
sort -k1,1 -k2,2n ./0vs50Min_r302s301.bed > ./0vs50Min_r302s302.bed
bedtools shuffle -seed 1 -i 0vs50Min_r302s302.bed -g Ecoli-genomesize.txt > ./0vs50Min_r303s302.bed
sort -k1,1 -k2,2n ./0vs50Min_r303s302.bed > ./0vs50Min_r303s303.bed
bedtools shuffle -seed 1 -i 0vs50Min_r303s303.bed -g Ecoli-genomesize.txt > ./0vs50Min_r304s303.bed
sort -k1,1 -k2,2n ./0vs50Min_r304s303.bed > ./0vs50Min_r304s304.bed
bedtools shuffle -seed 1 -i 0vs50Min_r304s304.bed -g Ecoli-genomesize.txt > ./0vs50Min_r305s304.bed
sort -k1,1 -k2,2n ./0vs50Min_r305s304.bed > ./0vs50Min_r305s305.bed
bedtools shuffle -seed 1 -i 0vs50Min_r305s305.bed -g Ecoli-genomesize.txt > ./0vs50Min_r306s305.bed
sort -k1,1 -k2,2n ./0vs50Min_r306s305.bed > ./0vs50Min_r306s306.bed
bedtools shuffle -seed 1 -i 0vs50Min_r306s306.bed -g Ecoli-genomesize.txt > ./0vs50Min_r307s306.bed
sort -k1,1 -k2,2n ./0vs50Min_r307s306.bed > ./0vs50Min_r307s307.bed
bedtools shuffle -seed 1 -i 0vs50Min_r307s307.bed -g Ecoli-genomesize.txt > ./0vs50Min_r308s307.bed
sort -k1,1 -k2,2n ./0vs50Min_r308s307.bed > ./0vs50Min_r308s308.bed
bedtools shuffle -seed 1 -i 0vs50Min_r308s308.bed -g Ecoli-genomesize.txt > ./0vs50Min_r309s308.bed
sort -k1,1 -k2,2n ./0vs50Min_r309s308.bed > ./0vs50Min_r309s309.bed
bedtools shuffle -seed 1 -i 0vs50Min_r309s309.bed -g Ecoli-genomesize.txt > ./0vs50Min_r310s309.bed
sort -k1,1 -k2,2n ./0vs50Min_r310s309.bed > ./0vs50Min_r310s310.bed
bedtools shuffle -seed 1 -i 0vs50Min_r310s310.bed -g Ecoli-genomesize.txt > ./0vs50Min_r311s310.bed
sort -k1,1 -k2,2n ./0vs50Min_r311s310.bed > ./0vs50Min_r311s311.bed
bedtools shuffle -seed 1 -i 0vs50Min_r311s311.bed -g Ecoli-genomesize.txt > ./0vs50Min_r312s311.bed
sort -k1,1 -k2,2n ./0vs50Min_r312s311.bed > ./0vs50Min_r312s312.bed
bedtools shuffle -seed 1 -i 0vs50Min_r312s312.bed -g Ecoli-genomesize.txt > ./0vs50Min_r313s312.bed
sort -k1,1 -k2,2n ./0vs50Min_r313s312.bed > ./0vs50Min_r313s313.bed
bedtools shuffle -seed 1 -i 0vs50Min_r313s313.bed -g Ecoli-genomesize.txt > ./0vs50Min_r314s313.bed
sort -k1,1 -k2,2n ./0vs50Min_r314s313.bed > ./0vs50Min_r314s314.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r314s314.bed -g Ecoli-genomesize.txt > ./0vs50Min_r315s314.bed
sort -k1,1 -k2,2n ./0vs50Min_r315s314.bed > ./0vs50Min_r315s315.bed
bedtools shuffle -seed 1 -i 0vs50Min_r315s315.bed -g Ecoli-genomesize.txt > ./0vs50Min_r316s315.bed
sort -k1,1 -k2,2n ./0vs50Min_r316s315.bed > ./0vs50Min_r316s316.bed
bedtools shuffle -seed 1 -i 0vs50Min_r316s316.bed -g Ecoli-genomesize.txt > ./0vs50Min_r317s316.bed
sort -k1,1 -k2,2n ./0vs50Min_r317s316.bed > ./0vs50Min_r317s317.bed
bedtools shuffle -seed 1 -i 0vs50Min_r317s317.bed -g Ecoli-genomesize.txt > ./0vs50Min_r318s317.bed
sort -k1,1 -k2,2n ./0vs50Min_r318s317.bed > ./0vs50Min_r318s318.bed
bedtools shuffle -seed 1 -i 0vs50Min_r318s318.bed -g Ecoli-genomesize.txt > ./0vs50Min_r319s318.bed
sort -k1,1 -k2,2n ./0vs50Min_r319s318.bed > ./0vs50Min_r319s319.bed
bedtools shuffle -seed 1 -i 0vs50Min_r319s319.bed -g Ecoli-genomesize.txt > ./0vs50Min_r320s319.bed
sort -k1,1 -k2,2n ./0vs50Min_r320s319.bed > ./0vs50Min_r320s320.bed
bedtools shuffle -seed 1 -i 0vs50Min_r320s320.bed -g Ecoli-genomesize.txt > ./0vs50Min_r321s320.bed
sort -k1,1 -k2,2n ./0vs50Min_r321s320.bed > ./0vs50Min_r321s321.bed
bedtools shuffle -seed 1 -i 0vs50Min_r321s321.bed -g Ecoli-genomesize.txt > ./0vs50Min_r322s321.bed
sort -k1,1 -k2,2n ./0vs50Min_r322s321.bed > ./0vs50Min_r322s322.bed
bedtools shuffle -seed 1 -i 0vs50Min_r322s322.bed -g Ecoli-genomesize.txt > ./0vs50Min_r323s322.bed
sort -k1,1 -k2,2n ./0vs50Min_r323s322.bed > ./0vs50Min_r323s323.bed
bedtools shuffle -seed 1 -i 0vs50Min_r323s323.bed -g Ecoli-genomesize.txt > ./0vs50Min_r324s323.bed
sort -k1,1 -k2,2n ./0vs50Min_r324s323.bed > ./0vs50Min_r324s324.bed
bedtools shuffle -seed 1 -i 0vs50Min_r324s324.bed -g Ecoli-genomesize.txt > ./0vs50Min_r325s324.bed
sort -k1,1 -k2,2n ./0vs50Min_r325s324.bed > ./0vs50Min_r325s325.bed
bedtools shuffle -seed 1 -i 0vs50Min_r325s325.bed -g Ecoli-genomesize.txt > ./0vs50Min_r326s325.bed
sort -k1,1 -k2,2n ./0vs50Min_r326s325.bed > ./0vs50Min_r326s326.bed
bedtools shuffle -seed 1 -i 0vs50Min_r326s326.bed -g Ecoli-genomesize.txt > ./0vs50Min_r327s326.bed
sort -k1,1 -k2,2n ./0vs50Min_r327s326.bed > ./0vs50Min_r327s327.bed
bedtools shuffle -seed 1 -i 0vs50Min_r327s327.bed -g Ecoli-genomesize.txt > ./0vs50Min_r328s327.bed
sort -k1,1 -k2,2n ./0vs50Min_r328s327.bed > ./0vs50Min_r328s328.bed
bedtools shuffle -seed 1 -i 0vs50Min_r328s328.bed -g Ecoli-genomesize.txt > ./0vs50Min_r329s328.bed
sort -k1,1 -k2,2n ./0vs50Min_r329s328.bed > ./0vs50Min_r329s329.bed
bedtools shuffle -seed 1 -i 0vs50Min_r329s329.bed -g Ecoli-genomesize.txt > ./0vs50Min_r330s329.bed
sort -k1,1 -k2,2n ./0vs50Min_r330s329.bed > ./0vs50Min_r330s330.bed
bedtools shuffle -seed 1 -i 0vs50Min_r330s330.bed -g Ecoli-genomesize.txt > ./0vs50Min_r331s330.bed
sort -k1,1 -k2,2n ./0vs50Min_r331s330.bed > ./0vs50Min_r331s331.bed
bedtools shuffle -seed 1 -i 0vs50Min_r331s331.bed -g Ecoli-genomesize.txt > ./0vs50Min_r332s331.bed
sort -k1,1 -k2,2n ./0vs50Min_r332s331.bed > ./0vs50Min_r332s332.bed
bedtools shuffle -seed 1 -i 0vs50Min_r332s332.bed -g Ecoli-genomesize.txt > ./0vs50Min_r333s332.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r333s332.bed > ./0vs50Min_r333s333.bed
bedtools shuffle -seed 1 -i 0vs50Min_r333s333.bed -g Ecoli-genomesize.txt > ./0vs50Min_r334s333.bed
sort -k1,1 -k2,2n ./0vs50Min_r334s333.bed > ./0vs50Min_r334s334.bed
bedtools shuffle -seed 1 -i 0vs50Min_r334s334.bed -g Ecoli-genomesize.txt > ./0vs50Min_r335s334.bed
sort -k1,1 -k2,2n ./0vs50Min_r335s334.bed > ./0vs50Min_r335s335.bed
bedtools shuffle -seed 1 -i 0vs50Min_r335s335.bed -g Ecoli-genomesize.txt > ./0vs50Min_r336s335.bed
sort -k1,1 -k2,2n ./0vs50Min_r336s335.bed > ./0vs50Min_r336s336.bed
bedtools shuffle -seed 1 -i 0vs50Min_r336s336.bed -g Ecoli-genomesize.txt > ./0vs50Min_r337s336.bed
sort -k1,1 -k2,2n ./0vs50Min_r337s336.bed > ./0vs50Min_r337s337.bed
bedtools shuffle -seed 1 -i 0vs50Min_r337s337.bed -g Ecoli-genomesize.txt > ./0vs50Min_r338s337.bed
sort -k1,1 -k2,2n ./0vs50Min_r338s337.bed > ./0vs50Min_r338s338.bed
bedtools shuffle -seed 1 -i 0vs50Min_r338s338.bed -g Ecoli-genomesize.txt > ./0vs50Min_r339s338.bed
sort -k1,1 -k2,2n ./0vs50Min_r339s338.bed > ./0vs50Min_r339s339.bed
bedtools shuffle -seed 1 -i 0vs50Min_r339s339.bed -g Ecoli-genomesize.txt > ./0vs50Min_r340s339.bed
sort -k1,1 -k2,2n ./0vs50Min_r340s339.bed > ./0vs50Min_r340s340.bed
bedtools shuffle -seed 1 -i 0vs50Min_r340s340.bed -g Ecoli-genomesize.txt > ./0vs50Min_r341s340.bed
sort -k1,1 -k2,2n ./0vs50Min_r341s340.bed > ./0vs50Min_r341s341.bed
bedtools shuffle -seed 1 -i 0vs50Min_r341s341.bed -g Ecoli-genomesize.txt > ./0vs50Min_r342s341.bed
sort -k1,1 -k2,2n ./0vs50Min_r342s341.bed > ./0vs50Min_r342s342.bed
bedtools shuffle -seed 1 -i 0vs50Min_r342s342.bed -g Ecoli-genomesize.txt > ./0vs50Min_r343s342.bed
sort -k1,1 -k2,2n ./0vs50Min_r343s342.bed > ./0vs50Min_r343s343.bed
bedtools shuffle -seed 1 -i 0vs50Min_r343s343.bed -g Ecoli-genomesize.txt > ./0vs50Min_r344s343.bed
sort -k1,1 -k2,2n ./0vs50Min_r344s343.bed > ./0vs50Min_r344s344.bed
bedtools shuffle -seed 1 -i 0vs50Min_r344s344.bed -g Ecoli-genomesize.txt > ./0vs50Min_r345s344.bed
sort -k1,1 -k2,2n ./0vs50Min_r345s344.bed > ./0vs50Min_r345s345.bed
bedtools shuffle -seed 1 -i 0vs50Min_r345s345.bed -g Ecoli-genomesize.txt > ./0vs50Min_r346s345.bed
sort -k1,1 -k2,2n ./0vs50Min_r346s345.bed > ./0vs50Min_r346s346.bed
bedtools shuffle -seed 1 -i 0vs50Min_r346s346.bed -g Ecoli-genomesize.txt > ./0vs50Min_r347s346.bed
sort -k1,1 -k2,2n ./0vs50Min_r347s346.bed > ./0vs50Min_r347s347.bed
bedtools shuffle -seed 1 -i 0vs50Min_r347s347.bed -g Ecoli-genomesize.txt > ./0vs50Min_r348s347.bed
sort -k1,1 -k2,2n ./0vs50Min_r348s347.bed > ./0vs50Min_r348s348.bed
bedtools shuffle -seed 1 -i 0vs50Min_r348s348.bed -g Ecoli-genomesize.txt > ./0vs50Min_r349s348.bed
sort -k1,1 -k2,2n ./0vs50Min_r349s348.bed > ./0vs50Min_r349s349.bed
bedtools shuffle -seed 1 -i 0vs50Min_r349s349.bed -g Ecoli-genomesize.txt > ./0vs50Min_r350s349.bed
sort -k1,1 -k2,2n ./0vs50Min_r350s349.bed > ./0vs50Min_r350s350.bed
bedtools shuffle -seed 1 -i 0vs50Min_r350s350.bed -g Ecoli-genomesize.txt > ./0vs50Min_r351s350.bed
sort -k1,1 -k2,2n ./0vs50Min_r351s350.bed > ./0vs50Min_r351s351.bed
```

```
	bedtools shuffle -seed 1 -i 0vs50Min_r351s351.bed -g Ecoli-genomesize.txt > ./0vs50Min_r352s351.bed
	sort -k1,1 -k2,2n ./0vs50Min_r352s351.bed > ./0vs50Min_r352s352.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r352s352.bed -g Ecoli-genomesize.txt > ./0vs50Min_r353s352.bed
	sort -k1,1 -k2,2n ./0vs50Min_r353s352.bed > ./0vs50Min_r353s353.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r353s353.bed -g Ecoli-genomesize.txt > ./0vs50Min_r354s353.bed
	sort -k1,1 -k2,2n ./0vs50Min_r354s353.bed > ./0vs50Min_r354s354.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r354s354.bed -g Ecoli-genomesize.txt > ./0vs50Min_r355s354.bed
	sort -k1,1 -k2,2n ./0vs50Min_r355s354.bed > ./0vs50Min_r355s355.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r355s355.bed -g Ecoli-genomesize.txt > ./0vs50Min_r356s355.bed
	sort -k1,1 -k2,2n ./0vs50Min_r356s355.bed > ./0vs50Min_r356s356.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r356s356.bed -g Ecoli-genomesize.txt > ./0vs50Min_r357s356.bed
	sort -k1,1 -k2,2n ./0vs50Min_r357s356.bed > ./0vs50Min_r357s357.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r357s357.bed -g Ecoli-genomesize.txt > ./0vs50Min_r358s357.bed
	sort -k1,1 -k2,2n ./0vs50Min_r358s357.bed > ./0vs50Min_r358s358.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r358s358.bed -g Ecoli-genomesize.txt > ./0vs50Min_r359s358.bed
	sort -k1,1 -k2,2n ./0vs50Min_r359s358.bed > ./0vs50Min_r359s359.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r359s359.bed -g Ecoli-genomesize.txt > ./0vs50Min_r360s359.bed
	sort -k1,1 -k2,2n ./0vs50Min_r360s359.bed > ./0vs50Min_r360s360.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r360s360.bed -g Ecoli-genomesize.txt > ./0vs50Min_r361s360.bed
	sort -k1,1 -k2,2n ./0vs50Min_r361s360.bed > ./0vs50Min_r361s361.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r361s361.bed -g Ecoli-genomesize.txt > ./0vs50Min_r362s361.bed
	sort -k1,1 -k2,2n ./0vs50Min_r362s361.bed > ./0vs50Min_r362s362.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r362s362.bed -g Ecoli-genomesize.txt > ./0vs50Min_r363s362.bed
	sort -k1,1 -k2,2n ./0vs50Min_r363s362.bed > ./0vs50Min_r363s363.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r363s363.bed -g Ecoli-genomesize.txt > ./0vs50Min_r364s363.bed
	sort -k1,1 -k2,2n ./0vs50Min_r364s363.bed > ./0vs50Min_r364s364.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r364s364.bed -g Ecoli-genomesize.txt > ./0vs50Min_r365s364.bed
	sort -k1,1 -k2,2n ./0vs50Min_r365s364.bed > ./0vs50Min_r365s365.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r365s365.bed -g Ecoli-genomesize.txt > ./0vs50Min_r366s365.bed
	sort -k1,1 -k2,2n ./0vs50Min_r366s365.bed > ./0vs50Min_r366s366.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r366s366.bed -g Ecoli-genomesize.txt > ./0vs50Min_r367s366.bed
	sort -k1,1 -k2,2n ./0vs50Min_r367s366.bed > ./0vs50Min_r367s367.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r367s367.bed -g Ecoli-genomesize.txt > ./0vs50Min_r368s367.bed
	sort -k1,1 -k2,2n ./0vs50Min_r368s367.bed > ./0vs50Min_r368s368.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r368s368.bed -g Ecoli-genomesize.txt > ./0vs50Min_r369s368.bed
	sort -k1,1 -k2,2n ./0vs50Min_r369s368.bed > ./0vs50Min_r369s369.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r369s369.bed -g Ecoli-genomesize.txt > ./0vs50Min_r370s369.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r370s369.bed > ./0vs50Min_r370s370.bed
bedtools shuffle -seed 1 -i 0vs50Min_r370s370.bed -g Ecoli-genomesize.txt > ./0vs50Min_r371s370.bed
sort -k1,1 -k2,2n ./0vs50Min_r371s370.bed > ./0vs50Min_r371s371.bed
bedtools shuffle -seed 1 -i 0vs50Min_r371s371.bed -g Ecoli-genomesize.txt > ./0vs50Min_r372s371.bed
sort -k1,1 -k2,2n ./0vs50Min_r372s371.bed > ./0vs50Min_r372s372.bed
bedtools shuffle -seed 1 -i 0vs50Min_r372s372.bed -g Ecoli-genomesize.txt > ./0vs50Min_r373s372.bed
sort -k1,1 -k2,2n ./0vs50Min_r373s372.bed > ./0vs50Min_r373s373.bed
bedtools shuffle -seed 1 -i 0vs50Min_r373s373.bed -g Ecoli-genomesize.txt > ./0vs50Min_r374s373.bed
sort -k1,1 -k2,2n ./0vs50Min_r374s373.bed > ./0vs50Min_r374s374.bed
bedtools shuffle -seed 1 -i 0vs50Min_r374s374.bed -g Ecoli-genomesize.txt > ./0vs50Min_r375s374.bed
sort -k1,1 -k2,2n ./0vs50Min_r375s374.bed > ./0vs50Min_r375s375.bed
bedtools shuffle -seed 1 -i 0vs50Min_r375s375.bed -g Ecoli-genomesize.txt > ./0vs50Min_r376s375.bed
sort -k1,1 -k2,2n ./0vs50Min_r376s375.bed > ./0vs50Min_r376s376.bed
bedtools shuffle -seed 1 -i 0vs50Min_r376s376.bed -g Ecoli-genomesize.txt > ./0vs50Min_r377s376.bed
sort -k1,1 -k2,2n ./0vs50Min_r377s376.bed > ./0vs50Min_r377s377.bed
bedtools shuffle -seed 1 -i 0vs50Min_r377s377.bed -g Ecoli-genomesize.txt > ./0vs50Min_r378s377.bed
sort -k1,1 -k2,2n ./0vs50Min_r378s377.bed > ./0vs50Min_r378s378.bed
bedtools shuffle -seed 1 -i 0vs50Min_r378s378.bed -g Ecoli-genomesize.txt > ./0vs50Min_r379s378.bed
sort -k1,1 -k2,2n ./0vs50Min_r379s378.bed > ./0vs50Min_r379s379.bed
bedtools shuffle -seed 1 -i 0vs50Min_r379s379.bed -g Ecoli-genomesize.txt > ./0vs50Min_r380s379.bed
sort -k1,1 -k2,2n ./0vs50Min_r380s379.bed > ./0vs50Min_r380s380.bed
bedtools shuffle -seed 1 -i 0vs50Min_r380s380.bed -g Ecoli-genomesize.txt > ./0vs50Min_r381s380.bed
sort -k1,1 -k2,2n ./0vs50Min_r381s380.bed > ./0vs50Min_r381s381.bed
bedtools shuffle -seed 1 -i 0vs50Min_r381s381.bed -g Ecoli-genomesize.txt > ./0vs50Min_r382s381.bed
sort -k1,1 -k2,2n ./0vs50Min_r382s381.bed > ./0vs50Min_r382s382.bed
bedtools shuffle -seed 1 -i 0vs50Min_r382s382.bed -g Ecoli-genomesize.txt > ./0vs50Min_r383s382.bed
sort -k1,1 -k2,2n ./0vs50Min_r383s382.bed > ./0vs50Min_r383s383.bed
bedtools shuffle -seed 1 -i 0vs50Min_r383s383.bed -g Ecoli-genomesize.txt > ./0vs50Min_r384s383.bed
sort -k1,1 -k2,2n ./0vs50Min_r384s383.bed > ./0vs50Min_r384s384.bed
bedtools shuffle -seed 1 -i 0vs50Min_r384s384.bed -g Ecoli-genomesize.txt > ./0vs50Min_r385s384.bed
sort -k1,1 -k2,2n ./0vs50Min_r385s384.bed > ./0vs50Min_r385s385.bed
bedtools shuffle -seed 1 -i 0vs50Min_r385s385.bed -g Ecoli-genomesize.txt > ./0vs50Min_r386s385.bed
sort -k1,1 -k2,2n ./0vs50Min_r386s385.bed > ./0vs50Min_r386s386.bed
bedtools shuffle -seed 1 -i 0vs50Min_r386s386.bed -g Ecoli-genomesize.txt > ./0vs50Min_r387s386.bed
sort -k1,1 -k2,2n ./0vs50Min_r387s386.bed > ./0vs50Min_r387s387.bed
bedtools shuffle -seed 1 -i 0vs50Min_r387s387.bed -g Ecoli-genomesize.txt > ./0vs50Min_r388s387.bed
sort -k1,1 -k2,2n ./0vs50Min_r388s387.bed > ./0vs50Min_r388s388.bed
```

```
	bedtools shuffle -seed 1 -i 0vs50Min_r388s388.bed -g Ecoli-genomesize.txt > ./0vs50Min_r389s388.bed
	sort -k1,1 -k2,2n ./0vs50Min_r389s388.bed > ./0vs50Min_r389s389.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r389s389.bed -g Ecoli-genomesize.txt > ./0vs50Min_r390s389.bed
	sort -k1,1 -k2,2n ./0vs50Min_r390s389.bed > ./0vs50Min_r390s390.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r390s390.bed -g Ecoli-genomesize.txt > ./0vs50Min_r391s390.bed
	sort -k1,1 -k2,2n ./0vs50Min_r391s390.bed > ./0vs50Min_r391s391.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r391s391.bed -g Ecoli-genomesize.txt > ./0vs50Min_r392s391.bed
	sort -k1,1 -k2,2n ./0vs50Min_r392s391.bed > ./0vs50Min_r392s392.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r392s392.bed -g Ecoli-genomesize.txt > ./0vs50Min_r393s392.bed
	sort -k1,1 -k2,2n ./0vs50Min_r393s392.bed > ./0vs50Min_r393s393.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r393s393.bed -g Ecoli-genomesize.txt > ./0vs50Min_r394s393.bed
	sort -k1,1 -k2,2n ./0vs50Min_r394s393.bed > ./0vs50Min_r394s394.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r394s394.bed -g Ecoli-genomesize.txt > ./0vs50Min_r395s394.bed
	sort -k1,1 -k2,2n ./0vs50Min_r395s394.bed > ./0vs50Min_r395s395.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r395s395.bed -g Ecoli-genomesize.txt > ./0vs50Min_r396s395.bed
	sort -k1,1 -k2,2n ./0vs50Min_r396s395.bed > ./0vs50Min_r396s396.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r396s396.bed -g Ecoli-genomesize.txt > ./0vs50Min_r397s396.bed
	sort -k1,1 -k2,2n ./0vs50Min_r397s396.bed > ./0vs50Min_r397s397.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r397s397.bed -g Ecoli-genomesize.txt > ./0vs50Min_r398s397.bed
	sort -k1,1 -k2,2n ./0vs50Min_r398s397.bed > ./0vs50Min_r398s398.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r398s398.bed -g Ecoli-genomesize.txt > ./0vs50Min_r399s398.bed
	sort -k1,1 -k2,2n ./0vs50Min_r399s398.bed > ./0vs50Min_r399s399.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r399s399.bed -g Ecoli-genomesize.txt > ./0vs50Min_r400s399.bed
	sort -k1,1 -k2,2n ./0vs50Min_r400s399.bed > ./0vs50Min_r400s400.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r400s400.bed -g Ecoli-genomesize.txt > ./0vs50Min_r401s400.bed
	sort -k1,1 -k2,2n ./0vs50Min_r401s400.bed > ./0vs50Min_r401s401.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r401s401.bed -g Ecoli-genomesize.txt > ./0vs50Min_r402s401.bed
	sort -k1,1 -k2,2n ./0vs50Min_r402s401.bed > ./0vs50Min_r402s402.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r402s402.bed -g Ecoli-genomesize.txt > ./0vs50Min_r403s402.bed
	sort -k1,1 -k2,2n ./0vs50Min_r403s402.bed > ./0vs50Min_r403s403.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r403s403.bed -g Ecoli-genomesize.txt > ./0vs50Min_r404s403.bed
	sort -k1,1 -k2,2n ./0vs50Min_r404s403.bed > ./0vs50Min_r404s404.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r404s404.bed -g Ecoli-genomesize.txt > ./0vs50Min_r405s404.bed
	sort -k1,1 -k2,2n ./0vs50Min_r405s404.bed > ./0vs50Min_r405s405.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r405s405.bed -g Ecoli-genomesize.txt > ./0vs50Min_r406s405.bed
	sort -k1,1 -k2,2n ./0vs50Min_r406s405.bed > ./0vs50Min_r406s406.bed
	bedtools shuffle -seed 1 -i 0vs50Min_r406s406.bed -g Ecoli-genomesize.txt > ./0vs50Min_r407s406.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r407s406.bed > ./0vs50Min_r407s407.bed
bedtools shuffle -seed 1 -i 0vs50Min_r407s407.bed -g Ecoli-genomesize.txt > ./0vs50Min_r408s407.bed
sort -k1,1 -k2,2n ./0vs50Min_r408s407.bed > ./0vs50Min_r408s408.bed
bedtools shuffle -seed 1 -i 0vs50Min_r408s408.bed -g Ecoli-genomesize.txt > ./0vs50Min_r409s408.bed
sort -k1,1 -k2,2n ./0vs50Min_r409s408.bed > ./0vs50Min_r409s409.bed
bedtools shuffle -seed 1 -i 0vs50Min_r409s409.bed -g Ecoli-genomesize.txt > ./0vs50Min_r410s409.bed
sort -k1,1 -k2,2n ./0vs50Min_r410s409.bed > ./0vs50Min_r410s410.bed
bedtools shuffle -seed 1 -i 0vs50Min_r410s410.bed -g Ecoli-genomesize.txt > ./0vs50Min_r411s410.bed
sort -k1,1 -k2,2n ./0vs50Min_r411s410.bed > ./0vs50Min_r411s411.bed
bedtools shuffle -seed 1 -i 0vs50Min_r411s411.bed -g Ecoli-genomesize.txt > ./0vs50Min_r412s411.bed
sort -k1,1 -k2,2n ./0vs50Min_r412s411.bed > ./0vs50Min_r412s412.bed
bedtools shuffle -seed 1 -i 0vs50Min_r412s412.bed -g Ecoli-genomesize.txt > ./0vs50Min_r413s412.bed
sort -k1,1 -k2,2n ./0vs50Min_r413s412.bed > ./0vs50Min_r413s413.bed
bedtools shuffle -seed 1 -i 0vs50Min_r413s413.bed -g Ecoli-genomesize.txt > ./0vs50Min_r414s413.bed
sort -k1,1 -k2,2n ./0vs50Min_r414s413.bed > ./0vs50Min_r414s414.bed
bedtools shuffle -seed 1 -i 0vs50Min_r414s414.bed -g Ecoli-genomesize.txt > ./0vs50Min_r415s414.bed
sort -k1,1 -k2,2n ./0vs50Min_r415s414.bed > ./0vs50Min_r415s415.bed
bedtools shuffle -seed 1 -i 0vs50Min_r415s415.bed -g Ecoli-genomesize.txt > ./0vs50Min_r416s415.bed
sort -k1,1 -k2,2n ./0vs50Min_r416s415.bed > ./0vs50Min_r416s416.bed
bedtools shuffle -seed 1 -i 0vs50Min_r416s416.bed -g Ecoli-genomesize.txt > ./0vs50Min_r417s416.bed
sort -k1,1 -k2,2n ./0vs50Min_r417s416.bed > ./0vs50Min_r417s417.bed
bedtools shuffle -seed 1 -i 0vs50Min_r417s417.bed -g Ecoli-genomesize.txt > ./0vs50Min_r418s417.bed
sort -k1,1 -k2,2n ./0vs50Min_r418s417.bed > ./0vs50Min_r418s418.bed
bedtools shuffle -seed 1 -i 0vs50Min_r418s418.bed -g Ecoli-genomesize.txt > ./0vs50Min_r419s418.bed
sort -k1,1 -k2,2n ./0vs50Min_r419s418.bed > ./0vs50Min_r419s419.bed
bedtools shuffle -seed 1 -i 0vs50Min_r419s419.bed -g Ecoli-genomesize.txt > ./0vs50Min_r420s419.bed
sort -k1,1 -k2,2n ./0vs50Min_r420s419.bed > ./0vs50Min_r420s420.bed
bedtools shuffle -seed 1 -i 0vs50Min_r420s420.bed -g Ecoli-genomesize.txt > ./0vs50Min_r421s420.bed
sort -k1,1 -k2,2n ./0vs50Min_r421s420.bed > ./0vs50Min_r421s421.bed
bedtools shuffle -seed 1 -i 0vs50Min_r421s421.bed -g Ecoli-genomesize.txt > ./0vs50Min_r422s421.bed
sort -k1,1 -k2,2n ./0vs50Min_r422s421.bed > ./0vs50Min_r422s422.bed
bedtools shuffle -seed 1 -i 0vs50Min_r422s422.bed -g Ecoli-genomesize.txt > ./0vs50Min_r423s422.bed
sort -k1,1 -k2,2n ./0vs50Min_r423s422.bed > ./0vs50Min_r423s423.bed
bedtools shuffle -seed 1 -i 0vs50Min_r423s423.bed -g Ecoli-genomesize.txt > ./0vs50Min_r424s423.bed
sort -k1,1 -k2,2n ./0vs50Min_r424s423.bed > ./0vs50Min_r424s424.bed
bedtools shuffle -seed 1 -i 0vs50Min_r424s424.bed -g Ecoli-genomesize.txt > ./0vs50Min_r425s424.bed
sort -k1,1 -k2,2n ./0vs50Min_r425s424.bed > ./0vs50Min_r425s425.bed
```

```
    bedtools shuffle -seed 1 -i 0vs50Min_r425s425.bed -g Ecoli-genomesize.txt > ./0vs50Min_r426s425.bed
    sort -k1,1 -k2,2n ./0vs50Min_r426s425.bed > ./0vs50Min_r426s426.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r426s426.bed -g Ecoli-genomesize.txt > ./0vs50Min_r427s426.bed
    sort -k1,1 -k2,2n ./0vs50Min_r427s426.bed > ./0vs50Min_r427s427.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r427s427.bed -g Ecoli-genomesize.txt > ./0vs50Min_r428s427.bed
    sort -k1,1 -k2,2n ./0vs50Min_r428s427.bed > ./0vs50Min_r428s428.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r428s428.bed -g Ecoli-genomesize.txt > ./0vs50Min_r429s428.bed
    sort -k1,1 -k2,2n ./0vs50Min_r429s428.bed > ./0vs50Min_r429s429.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r429s429.bed -g Ecoli-genomesize.txt > ./0vs50Min_r430s429.bed
    sort -k1,1 -k2,2n ./0vs50Min_r430s429.bed > ./0vs50Min_r430s430.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r430s430.bed -g Ecoli-genomesize.txt > ./0vs50Min_r431s430.bed
    sort -k1,1 -k2,2n ./0vs50Min_r431s430.bed > ./0vs50Min_r431s431.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r431s431.bed -g Ecoli-genomesize.txt > ./0vs50Min_r432s431.bed
    sort -k1,1 -k2,2n ./0vs50Min_r432s431.bed > ./0vs50Min_r432s432.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r432s432.bed -g Ecoli-genomesize.txt > ./0vs50Min_r433s432.bed
    sort -k1,1 -k2,2n ./0vs50Min_r433s432.bed > ./0vs50Min_r433s433.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r433s433.bed -g Ecoli-genomesize.txt > ./0vs50Min_r434s433.bed
    sort -k1,1 -k2,2n ./0vs50Min_r434s433.bed > ./0vs50Min_r434s434.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r434s434.bed -g Ecoli-genomesize.txt > ./0vs50Min_r435s434.bed
    sort -k1,1 -k2,2n ./0vs50Min_r435s434.bed > ./0vs50Min_r435s435.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r435s435.bed -g Ecoli-genomesize.txt > ./0vs50Min_r436s435.bed
    sort -k1,1 -k2,2n ./0vs50Min_r436s435.bed > ./0vs50Min_r436s436.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r436s436.bed -g Ecoli-genomesize.txt > ./0vs50Min_r437s436.bed
    sort -k1,1 -k2,2n ./0vs50Min_r437s436.bed > ./0vs50Min_r437s437.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r437s437.bed -g Ecoli-genomesize.txt > ./0vs50Min_r438s437.bed
    sort -k1,1 -k2,2n ./0vs50Min_r438s437.bed > ./0vs50Min_r438s438.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r438s438.bed -g Ecoli-genomesize.txt > ./0vs50Min_r439s438.bed
    sort -k1,1 -k2,2n ./0vs50Min_r439s438.bed > ./0vs50Min_r439s439.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r439s439.bed -g Ecoli-genomesize.txt > ./0vs50Min_r440s439.bed
    sort -k1,1 -k2,2n ./0vs50Min_r440s439.bed > ./0vs50Min_r440s440.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r440s440.bed -g Ecoli-genomesize.txt > ./0vs50Min_r441s440.bed
    sort -k1,1 -k2,2n ./0vs50Min_r441s440.bed > ./0vs50Min_r441s441.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r441s441.bed -g Ecoli-genomesize.txt > ./0vs50Min_r442s441.bed
    sort -k1,1 -k2,2n ./0vs50Min_r442s441.bed > ./0vs50Min_r442s442.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r442s442.bed -g Ecoli-genomesize.txt > ./0vs50Min_r443s442.bed
    sort -k1,1 -k2,2n ./0vs50Min_r443s442.bed > ./0vs50Min_r443s443.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r443s443.bed -g Ecoli-genomesize.txt > ./0vs50Min_r444s443.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r444s443.bed > ./0vs50Min_r444s444.bed
bedtools shuffle -seed 1 -i 0vs50Min_r444s444.bed -g Ecoli-genomesize.txt > ./0vs50Min_r445s444.bed
sort -k1,1 -k2,2n ./0vs50Min_r445s444.bed > ./0vs50Min_r445s445.bed
bedtools shuffle -seed 1 -i 0vs50Min_r445s445.bed -g Ecoli-genomesize.txt > ./0vs50Min_r446s445.bed
sort -k1,1 -k2,2n ./0vs50Min_r446s445.bed > ./0vs50Min_r446s446.bed
bedtools shuffle -seed 1 -i 0vs50Min_r446s446.bed -g Ecoli-genomesize.txt > ./0vs50Min_r447s446.bed
sort -k1,1 -k2,2n ./0vs50Min_r447s446.bed > ./0vs50Min_r447s447.bed
bedtools shuffle -seed 1 -i 0vs50Min_r447s447.bed -g Ecoli-genomesize.txt > ./0vs50Min_r448s447.bed
sort -k1,1 -k2,2n ./0vs50Min_r448s447.bed > ./0vs50Min_r448s448.bed
bedtools shuffle -seed 1 -i 0vs50Min_r448s448.bed -g Ecoli-genomesize.txt > ./0vs50Min_r449s448.bed
sort -k1,1 -k2,2n ./0vs50Min_r449s448.bed > ./0vs50Min_r449s449.bed
bedtools shuffle -seed 1 -i 0vs50Min_r449s449.bed -g Ecoli-genomesize.txt > ./0vs50Min_r450s449.bed
sort -k1,1 -k2,2n ./0vs50Min_r450s449.bed > ./0vs50Min_r450s450.bed
bedtools shuffle -seed 1 -i 0vs50Min_r450s450.bed -g Ecoli-genomesize.txt > ./0vs50Min_r451s450.bed
sort -k1,1 -k2,2n ./0vs50Min_r451s450.bed > ./0vs50Min_r451s451.bed
bedtools shuffle -seed 1 -i 0vs50Min_r451s451.bed -g Ecoli-genomesize.txt > ./0vs50Min_r452s451.bed
sort -k1,1 -k2,2n ./0vs50Min_r452s451.bed > ./0vs50Min_r452s452.bed
bedtools shuffle -seed 1 -i 0vs50Min_r452s452.bed -g Ecoli-genomesize.txt > ./0vs50Min_r453s452.bed
sort -k1,1 -k2,2n ./0vs50Min_r453s452.bed > ./0vs50Min_r453s453.bed
bedtools shuffle -seed 1 -i 0vs50Min_r453s453.bed -g Ecoli-genomesize.txt > ./0vs50Min_r454s453.bed
sort -k1,1 -k2,2n ./0vs50Min_r454s453.bed > ./0vs50Min_r454s454.bed
bedtools shuffle -seed 1 -i 0vs50Min_r454s454.bed -g Ecoli-genomesize.txt > ./0vs50Min_r455s454.bed
sort -k1,1 -k2,2n ./0vs50Min_r455s454.bed > ./0vs50Min_r455s455.bed
bedtools shuffle -seed 1 -i 0vs50Min_r455s455.bed -g Ecoli-genomesize.txt > ./0vs50Min_r456s455.bed
sort -k1,1 -k2,2n ./0vs50Min_r456s455.bed > ./0vs50Min_r456s456.bed
bedtools shuffle -seed 1 -i 0vs50Min_r456s456.bed -g Ecoli-genomesize.txt > ./0vs50Min_r457s456.bed
sort -k1,1 -k2,2n ./0vs50Min_r457s456.bed > ./0vs50Min_r457s457.bed
bedtools shuffle -seed 1 -i 0vs50Min_r457s457.bed -g Ecoli-genomesize.txt > ./0vs50Min_r458s457.bed
sort -k1,1 -k2,2n ./0vs50Min_r458s457.bed > ./0vs50Min_r458s458.bed
bedtools shuffle -seed 1 -i 0vs50Min_r458s458.bed -g Ecoli-genomesize.txt > ./0vs50Min_r459s458.bed
sort -k1,1 -k2,2n ./0vs50Min_r459s458.bed > ./0vs50Min_r459s459.bed
bedtools shuffle -seed 1 -i 0vs50Min_r459s459.bed -g Ecoli-genomesize.txt > ./0vs50Min_r460s459.bed
sort -k1,1 -k2,2n ./0vs50Min_r460s459.bed > ./0vs50Min_r460s460.bed
bedtools shuffle -seed 1 -i 0vs50Min_r460s460.bed -g Ecoli-genomesize.txt > ./0vs50Min_r461s460.bed
sort -k1,1 -k2,2n ./0vs50Min_r461s460.bed > ./0vs50Min_r461s461.bed
bedtools shuffle -seed 1 -i 0vs50Min_r461s461.bed -g Ecoli-genomesize.txt > ./0vs50Min_r462s461.bed
sort -k1,1 -k2,2n ./0vs50Min_r462s461.bed > ./0vs50Min_r462s462.bed
```

```
    bedtools shuffle -seed 1 -i 0vs50Min_r462s462.bed -g Ecoli-genomesize.txt > ./0vs50Min_r463s462.bed
    sort -k1,1 -k2,2n ./0vs50Min_r463s462.bed > ./0vs50Min_r463s463.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r463s463.bed -g Ecoli-genomesize.txt > ./0vs50Min_r464s463.bed
    sort -k1,1 -k2,2n ./0vs50Min_r464s463.bed > ./0vs50Min_r464s464.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r464s464.bed -g Ecoli-genomesize.txt > ./0vs50Min_r465s464.bed
    sort -k1,1 -k2,2n ./0vs50Min_r465s464.bed > ./0vs50Min_r465s465.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r465s465.bed -g Ecoli-genomesize.txt > ./0vs50Min_r466s465.bed
    sort -k1,1 -k2,2n ./0vs50Min_r466s465.bed > ./0vs50Min_r466s466.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r466s466.bed -g Ecoli-genomesize.txt > ./0vs50Min_r467s466.bed
    sort -k1,1 -k2,2n ./0vs50Min_r467s466.bed > ./0vs50Min_r467s467.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r467s467.bed -g Ecoli-genomesize.txt > ./0vs50Min_r468s467.bed
    sort -k1,1 -k2,2n ./0vs50Min_r468s467.bed > ./0vs50Min_r468s468.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r468s468.bed -g Ecoli-genomesize.txt > ./0vs50Min_r469s468.bed
    sort -k1,1 -k2,2n ./0vs50Min_r469s468.bed > ./0vs50Min_r469s469.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r469s469.bed -g Ecoli-genomesize.txt > ./0vs50Min_r470s469.bed
    sort -k1,1 -k2,2n ./0vs50Min_r470s469.bed > ./0vs50Min_r470s470.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r470s470.bed -g Ecoli-genomesize.txt > ./0vs50Min_r471s470.bed
    sort -k1,1 -k2,2n ./0vs50Min_r471s470.bed > ./0vs50Min_r471s471.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r471s471.bed -g Ecoli-genomesize.txt > ./0vs50Min_r472s471.bed
    sort -k1,1 -k2,2n ./0vs50Min_r472s471.bed > ./0vs50Min_r472s472.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r472s472.bed -g Ecoli-genomesize.txt > ./0vs50Min_r473s472.bed
    sort -k1,1 -k2,2n ./0vs50Min_r473s472.bed > ./0vs50Min_r473s473.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r473s473.bed -g Ecoli-genomesize.txt > ./0vs50Min_r474s473.bed
    sort -k1,1 -k2,2n ./0vs50Min_r474s473.bed > ./0vs50Min_r474s474.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r474s474.bed -g Ecoli-genomesize.txt > ./0vs50Min_r475s474.bed
    sort -k1,1 -k2,2n ./0vs50Min_r475s474.bed > ./0vs50Min_r475s475.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r475s475.bed -g Ecoli-genomesize.txt > ./0vs50Min_r476s475.bed
    sort -k1,1 -k2,2n ./0vs50Min_r476s475.bed > ./0vs50Min_r476s476.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r476s476.bed -g Ecoli-genomesize.txt > ./0vs50Min_r477s476.bed
    sort -k1,1 -k2,2n ./0vs50Min_r477s476.bed > ./0vs50Min_r477s477.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r477s477.bed -g Ecoli-genomesize.txt > ./0vs50Min_r478s477.bed
    sort -k1,1 -k2,2n ./0vs50Min_r478s477.bed > ./0vs50Min_r478s478.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r478s478.bed -g Ecoli-genomesize.txt > ./0vs50Min_r479s478.bed
    sort -k1,1 -k2,2n ./0vs50Min_r479s478.bed > ./0vs50Min_r479s479.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r479s479.bed -g Ecoli-genomesize.txt > ./0vs50Min_r480s479.bed
    sort -k1,1 -k2,2n ./0vs50Min_r480s479.bed > ./0vs50Min_r480s480.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r480s480.bed -g Ecoli-genomesize.txt > ./0vs50Min_r481s480.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r481s480.bed > ./0vs50Min_r481s481.bed
bedtools shuffle -seed 1 -i 0vs50Min_r481s481.bed -g Ecoli-genomesize.txt > ./0vs50Min_r482s481.bed
sort -k1,1 -k2,2n ./0vs50Min_r482s481.bed > ./0vs50Min_r482s482.bed
bedtools shuffle -seed 1 -i 0vs50Min_r482s482.bed -g Ecoli-genomesize.txt > ./0vs50Min_r483s482.bed
sort -k1,1 -k2,2n ./0vs50Min_r483s482.bed > ./0vs50Min_r483s483.bed
bedtools shuffle -seed 1 -i 0vs50Min_r483s483.bed -g Ecoli-genomesize.txt > ./0vs50Min_r484s483.bed
sort -k1,1 -k2,2n ./0vs50Min_r484s483.bed > ./0vs50Min_r484s484.bed
bedtools shuffle -seed 1 -i 0vs50Min_r484s484.bed -g Ecoli-genomesize.txt > ./0vs50Min_r485s484.bed
sort -k1,1 -k2,2n ./0vs50Min_r485s484.bed > ./0vs50Min_r485s485.bed
bedtools shuffle -seed 1 -i 0vs50Min_r485s485.bed -g Ecoli-genomesize.txt > ./0vs50Min_r486s485.bed
sort -k1,1 -k2,2n ./0vs50Min_r486s485.bed > ./0vs50Min_r486s486.bed
bedtools shuffle -seed 1 -i 0vs50Min_r486s486.bed -g Ecoli-genomesize.txt > ./0vs50Min_r487s486.bed
sort -k1,1 -k2,2n ./0vs50Min_r487s486.bed > ./0vs50Min_r487s487.bed
bedtools shuffle -seed 1 -i 0vs50Min_r487s487.bed -g Ecoli-genomesize.txt > ./0vs50Min_r488s487.bed
sort -k1,1 -k2,2n ./0vs50Min_r488s487.bed > ./0vs50Min_r488s488.bed
bedtools shuffle -seed 1 -i 0vs50Min_r488s488.bed -g Ecoli-genomesize.txt > ./0vs50Min_r489s488.bed
sort -k1,1 -k2,2n ./0vs50Min_r489s488.bed > ./0vs50Min_r489s489.bed
bedtools shuffle -seed 1 -i 0vs50Min_r489s489.bed -g Ecoli-genomesize.txt > ./0vs50Min_r490s489.bed
sort -k1,1 -k2,2n ./0vs50Min_r490s489.bed > ./0vs50Min_r490s490.bed
bedtools shuffle -seed 1 -i 0vs50Min_r490s490.bed -g Ecoli-genomesize.txt > ./0vs50Min_r491s490.bed
sort -k1,1 -k2,2n ./0vs50Min_r491s490.bed > ./0vs50Min_r491s491.bed
bedtools shuffle -seed 1 -i 0vs50Min_r491s491.bed -g Ecoli-genomesize.txt > ./0vs50Min_r492s491.bed
sort -k1,1 -k2,2n ./0vs50Min_r492s491.bed > ./0vs50Min_r492s492.bed
bedtools shuffle -seed 1 -i 0vs50Min_r492s492.bed -g Ecoli-genomesize.txt > ./0vs50Min_r493s492.bed
sort -k1,1 -k2,2n ./0vs50Min_r493s492.bed > ./0vs50Min_r493s493.bed
bedtools shuffle -seed 1 -i 0vs50Min_r493s493.bed -g Ecoli-genomesize.txt > ./0vs50Min_r494s493.bed
sort -k1,1 -k2,2n ./0vs50Min_r494s493.bed > ./0vs50Min_r494s494.bed
bedtools shuffle -seed 1 -i 0vs50Min_r494s494.bed -g Ecoli-genomesize.txt > ./0vs50Min_r495s494.bed
sort -k1,1 -k2,2n ./0vs50Min_r495s494.bed > ./0vs50Min_r495s495.bed
bedtools shuffle -seed 1 -i 0vs50Min_r495s495.bed -g Ecoli-genomesize.txt > ./0vs50Min_r496s495.bed
sort -k1,1 -k2,2n ./0vs50Min_r496s495.bed > ./0vs50Min_r496s496.bed
bedtools shuffle -seed 1 -i 0vs50Min_r496s496.bed -g Ecoli-genomesize.txt > ./0vs50Min_r497s496.bed
sort -k1,1 -k2,2n ./0vs50Min_r497s496.bed > ./0vs50Min_r497s497.bed
bedtools shuffle -seed 1 -i 0vs50Min_r497s497.bed -g Ecoli-genomesize.txt > ./0vs50Min_r498s497.bed
sort -k1,1 -k2,2n ./0vs50Min_r498s497.bed > ./0vs50Min_r498s498.bed
bedtools shuffle -seed 1 -i 0vs50Min_r498s498.bed -g Ecoli-genomesize.txt > ./0vs50Min_r499s498.bed
sort -k1,1 -k2,2n ./0vs50Min_r499s498.bed > ./0vs50Min_r499s499.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r499s499.bed -g Ecoli-genomesize.txt > ./0vs50Min_r500s499.bed
sort -k1,1 -k2,2n ./0vs50Min_r500s499.bed > ./0vs50Min_r500s500.bed
bedtools shuffle -seed 1 -i 0vs50Min_r500s500.bed -g Ecoli-genomesize.txt > ./0vs50Min_r501s500.bed
sort -k1,1 -k2,2n ./0vs50Min_r501s500.bed > ./0vs50Min_r501s501.bed
bedtools shuffle -seed 1 -i 0vs50Min_r501s501.bed -g Ecoli-genomesize.txt > ./0vs50Min_r502s501.bed
sort -k1,1 -k2,2n ./0vs50Min_r502s501.bed > ./0vs50Min_r502s502.bed
bedtools shuffle -seed 1 -i 0vs50Min_r502s502.bed -g Ecoli-genomesize.txt > ./0vs50Min_r503s502.bed
sort -k1,1 -k2,2n ./0vs50Min_r503s502.bed > ./0vs50Min_r503s503.bed
bedtools shuffle -seed 1 -i 0vs50Min_r503s503.bed -g Ecoli-genomesize.txt > ./0vs50Min_r504s503.bed
sort -k1,1 -k2,2n ./0vs50Min_r504s503.bed > ./0vs50Min_r504s504.bed
bedtools shuffle -seed 1 -i 0vs50Min_r504s504.bed -g Ecoli-genomesize.txt > ./0vs50Min_r505s504.bed
sort -k1,1 -k2,2n ./0vs50Min_r505s504.bed > ./0vs50Min_r505s505.bed
bedtools shuffle -seed 1 -i 0vs50Min_r505s505.bed -g Ecoli-genomesize.txt > ./0vs50Min_r506s505.bed
sort -k1,1 -k2,2n ./0vs50Min_r506s505.bed > ./0vs50Min_r506s506.bed
bedtools shuffle -seed 1 -i 0vs50Min_r506s506.bed -g Ecoli-genomesize.txt > ./0vs50Min_r507s506.bed
sort -k1,1 -k2,2n ./0vs50Min_r507s506.bed > ./0vs50Min_r507s507.bed
bedtools shuffle -seed 1 -i 0vs50Min_r507s507.bed -g Ecoli-genomesize.txt > ./0vs50Min_r508s507.bed
sort -k1,1 -k2,2n ./0vs50Min_r508s507.bed > ./0vs50Min_r508s508.bed
bedtools shuffle -seed 1 -i 0vs50Min_r508s508.bed -g Ecoli-genomesize.txt > ./0vs50Min_r509s508.bed
sort -k1,1 -k2,2n ./0vs50Min_r509s508.bed > ./0vs50Min_r509s509.bed
bedtools shuffle -seed 1 -i 0vs50Min_r509s509.bed -g Ecoli-genomesize.txt > ./0vs50Min_r510s509.bed
sort -k1,1 -k2,2n ./0vs50Min_r510s509.bed > ./0vs50Min_r510s510.bed
bedtools shuffle -seed 1 -i 0vs50Min_r510s510.bed -g Ecoli-genomesize.txt > ./0vs50Min_r511s510.bed
sort -k1,1 -k2,2n ./0vs50Min_r511s510.bed > ./0vs50Min_r511s511.bed
bedtools shuffle -seed 1 -i 0vs50Min_r511s511.bed -g Ecoli-genomesize.txt > ./0vs50Min_r512s511.bed
sort -k1,1 -k2,2n ./0vs50Min_r512s511.bed > ./0vs50Min_r512s512.bed
bedtools shuffle -seed 1 -i 0vs50Min_r512s512.bed -g Ecoli-genomesize.txt > ./0vs50Min_r513s512.bed
sort -k1,1 -k2,2n ./0vs50Min_r513s512.bed > ./0vs50Min_r513s513.bed
bedtools shuffle -seed 1 -i 0vs50Min_r513s513.bed -g Ecoli-genomesize.txt > ./0vs50Min_r514s513.bed
sort -k1,1 -k2,2n ./0vs50Min_r514s513.bed > ./0vs50Min_r514s514.bed
bedtools shuffle -seed 1 -i 0vs50Min_r514s514.bed -g Ecoli-genomesize.txt > ./0vs50Min_r515s514.bed
sort -k1,1 -k2,2n ./0vs50Min_r515s514.bed > ./0vs50Min_r515s515.bed
bedtools shuffle -seed 1 -i 0vs50Min_r515s515.bed -g Ecoli-genomesize.txt > ./0vs50Min_r516s515.bed
sort -k1,1 -k2,2n ./0vs50Min_r516s515.bed > ./0vs50Min_r516s516.bed
bedtools shuffle -seed 1 -i 0vs50Min_r516s516.bed -g Ecoli-genomesize.txt > ./0vs50Min_r517s516.bed
sort -k1,1 -k2,2n ./0vs50Min_r517s516.bed > ./0vs50Min_r517s517.bed
bedtools shuffle -seed 1 -i 0vs50Min_r517s517.bed -g Ecoli-genomesize.txt > ./0vs50Min_r518s517.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r518s517.bed > ./0vs50Min_r518s518.bed
bedtools shuffle -seed 1 -i 0vs50Min_r518s518.bed -g Ecoli-genomesize.txt > ./0vs50Min_r519s518.bed
sort -k1,1 -k2,2n ./0vs50Min_r519s518.bed > ./0vs50Min_r519s519.bed
bedtools shuffle -seed 1 -i 0vs50Min_r519s519.bed -g Ecoli-genomesize.txt > ./0vs50Min_r520s519.bed
sort -k1,1 -k2,2n ./0vs50Min_r520s519.bed > ./0vs50Min_r520s520.bed
bedtools shuffle -seed 1 -i 0vs50Min_r520s520.bed -g Ecoli-genomesize.txt > ./0vs50Min_r521s520.bed
sort -k1,1 -k2,2n ./0vs50Min_r521s520.bed > ./0vs50Min_r521s521.bed
bedtools shuffle -seed 1 -i 0vs50Min_r521s521.bed -g Ecoli-genomesize.txt > ./0vs50Min_r522s521.bed
sort -k1,1 -k2,2n ./0vs50Min_r522s521.bed > ./0vs50Min_r522s522.bed
bedtools shuffle -seed 1 -i 0vs50Min_r522s522.bed -g Ecoli-genomesize.txt > ./0vs50Min_r523s522.bed
sort -k1,1 -k2,2n ./0vs50Min_r523s522.bed > ./0vs50Min_r523s523.bed
bedtools shuffle -seed 1 -i 0vs50Min_r523s523.bed -g Ecoli-genomesize.txt > ./0vs50Min_r524s523.bed
sort -k1,1 -k2,2n ./0vs50Min_r524s523.bed > ./0vs50Min_r524s524.bed
bedtools shuffle -seed 1 -i 0vs50Min_r524s524.bed -g Ecoli-genomesize.txt > ./0vs50Min_r525s524.bed
sort -k1,1 -k2,2n ./0vs50Min_r525s524.bed > ./0vs50Min_r525s525.bed
bedtools shuffle -seed 1 -i 0vs50Min_r525s525.bed -g Ecoli-genomesize.txt > ./0vs50Min_r526s525.bed
sort -k1,1 -k2,2n ./0vs50Min_r526s525.bed > ./0vs50Min_r526s526.bed
bedtools shuffle -seed 1 -i 0vs50Min_r526s526.bed -g Ecoli-genomesize.txt > ./0vs50Min_r527s526.bed
sort -k1,1 -k2,2n ./0vs50Min_r527s526.bed > ./0vs50Min_r527s527.bed
bedtools shuffle -seed 1 -i 0vs50Min_r527s527.bed -g Ecoli-genomesize.txt > ./0vs50Min_r528s527.bed
sort -k1,1 -k2,2n ./0vs50Min_r528s527.bed > ./0vs50Min_r528s528.bed
bedtools shuffle -seed 1 -i 0vs50Min_r528s528.bed -g Ecoli-genomesize.txt > ./0vs50Min_r529s528.bed
sort -k1,1 -k2,2n ./0vs50Min_r529s528.bed > ./0vs50Min_r529s529.bed
bedtools shuffle -seed 1 -i 0vs50Min_r529s529.bed -g Ecoli-genomesize.txt > ./0vs50Min_r530s529.bed
sort -k1,1 -k2,2n ./0vs50Min_r530s529.bed > ./0vs50Min_r530s530.bed
bedtools shuffle -seed 1 -i 0vs50Min_r530s530.bed -g Ecoli-genomesize.txt > ./0vs50Min_r531s530.bed
sort -k1,1 -k2,2n ./0vs50Min_r531s530.bed > ./0vs50Min_r531s531.bed
bedtools shuffle -seed 1 -i 0vs50Min_r531s531.bed -g Ecoli-genomesize.txt > ./0vs50Min_r532s531.bed
sort -k1,1 -k2,2n ./0vs50Min_r532s531.bed > ./0vs50Min_r532s532.bed
bedtools shuffle -seed 1 -i 0vs50Min_r532s532.bed -g Ecoli-genomesize.txt > ./0vs50Min_r533s532.bed
sort -k1,1 -k2,2n ./0vs50Min_r533s532.bed > ./0vs50Min_r533s533.bed
bedtools shuffle -seed 1 -i 0vs50Min_r533s533.bed -g Ecoli-genomesize.txt > ./0vs50Min_r534s533.bed
sort -k1,1 -k2,2n ./0vs50Min_r534s533.bed > ./0vs50Min_r534s534.bed
bedtools shuffle -seed 1 -i 0vs50Min_r534s534.bed -g Ecoli-genomesize.txt > ./0vs50Min_r535s534.bed
sort -k1,1 -k2,2n ./0vs50Min_r535s534.bed > ./0vs50Min_r535s535.bed
bedtools shuffle -seed 1 -i 0vs50Min_r535s535.bed -g Ecoli-genomesize.txt > ./0vs50Min_r536s535.bed
sort -k1,1 -k2,2n ./0vs50Min_r536s535.bed > ./0vs50Min_r536s536.bed
```

```
    bedtools shuffle -seed 1 -i 0vs50Min_r536s536.bed -g Ecoli-genomesize.txt > ./0vs50Min_r537s536.bed
    sort -k1,1 -k2,2n ./0vs50Min_r537s536.bed > ./0vs50Min_r537s537.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r537s537.bed -g Ecoli-genomesize.txt > ./0vs50Min_r538s537.bed
    sort -k1,1 -k2,2n ./0vs50Min_r538s537.bed > ./0vs50Min_r538s538.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r538s538.bed -g Ecoli-genomesize.txt > ./0vs50Min_r539s538.bed
    sort -k1,1 -k2,2n ./0vs50Min_r539s538.bed > ./0vs50Min_r539s539.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r539s539.bed -g Ecoli-genomesize.txt > ./0vs50Min_r540s539.bed
    sort -k1,1 -k2,2n ./0vs50Min_r540s539.bed > ./0vs50Min_r540s540.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r540s540.bed -g Ecoli-genomesize.txt > ./0vs50Min_r541s540.bed
    sort -k1,1 -k2,2n ./0vs50Min_r541s540.bed > ./0vs50Min_r541s541.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r541s541.bed -g Ecoli-genomesize.txt > ./0vs50Min_r542s541.bed
    sort -k1,1 -k2,2n ./0vs50Min_r542s541.bed > ./0vs50Min_r542s542.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r542s542.bed -g Ecoli-genomesize.txt > ./0vs50Min_r543s542.bed
    sort -k1,1 -k2,2n ./0vs50Min_r543s542.bed > ./0vs50Min_r543s543.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r543s543.bed -g Ecoli-genomesize.txt > ./0vs50Min_r544s543.bed
    sort -k1,1 -k2,2n ./0vs50Min_r544s543.bed > ./0vs50Min_r544s544.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r544s544.bed -g Ecoli-genomesize.txt > ./0vs50Min_r545s544.bed
    sort -k1,1 -k2,2n ./0vs50Min_r545s544.bed > ./0vs50Min_r545s545.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r545s545.bed -g Ecoli-genomesize.txt > ./0vs50Min_r546s545.bed
    sort -k1,1 -k2,2n ./0vs50Min_r546s545.bed > ./0vs50Min_r546s546.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r546s546.bed -g Ecoli-genomesize.txt > ./0vs50Min_r547s546.bed
    sort -k1,1 -k2,2n ./0vs50Min_r547s546.bed > ./0vs50Min_r547s547.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r547s547.bed -g Ecoli-genomesize.txt > ./0vs50Min_r548s547.bed
    sort -k1,1 -k2,2n ./0vs50Min_r548s547.bed > ./0vs50Min_r548s548.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r548s548.bed -g Ecoli-genomesize.txt > ./0vs50Min_r549s548.bed
    sort -k1,1 -k2,2n ./0vs50Min_r549s548.bed > ./0vs50Min_r549s549.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r549s549.bed -g Ecoli-genomesize.txt > ./0vs50Min_r550s549.bed
    sort -k1,1 -k2,2n ./0vs50Min_r550s549.bed > ./0vs50Min_r550s550.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r550s550.bed -g Ecoli-genomesize.txt > ./0vs50Min_r551s550.bed
    sort -k1,1 -k2,2n ./0vs50Min_r551s550.bed > ./0vs50Min_r551s551.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r551s551.bed -g Ecoli-genomesize.txt > ./0vs50Min_r552s551.bed
    sort -k1,1 -k2,2n ./0vs50Min_r552s551.bed > ./0vs50Min_r552s552.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r552s552.bed -g Ecoli-genomesize.txt > ./0vs50Min_r553s552.bed
    sort -k1,1 -k2,2n ./0vs50Min_r553s552.bed > ./0vs50Min_r553s553.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r553s553.bed -g Ecoli-genomesize.txt > ./0vs50Min_r554s553.bed
    sort -k1,1 -k2,2n ./0vs50Min_r554s553.bed > ./0vs50Min_r554s554.bed
    bedtools shuffle -seed 1 -i 0vs50Min_r554s554.bed -g Ecoli-genomesize.txt > ./0vs50Min_r555s554.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r555s554.bed > ./0vs50Min_r555s555.bed
bedtools shuffle -seed 1 -i 0vs50Min_r555s555.bed -g Ecoli-genomesize.txt > ./0vs50Min_r556s555.bed
sort -k1,1 -k2,2n ./0vs50Min_r556s555.bed > ./0vs50Min_r556s556.bed
bedtools shuffle -seed 1 -i 0vs50Min_r556s556.bed -g Ecoli-genomesize.txt > ./0vs50Min_r557s556.bed
sort -k1,1 -k2,2n ./0vs50Min_r557s556.bed > ./0vs50Min_r557s557.bed
bedtools shuffle -seed 1 -i 0vs50Min_r557s557.bed -g Ecoli-genomesize.txt > ./0vs50Min_r558s557.bed
sort -k1,1 -k2,2n ./0vs50Min_r558s557.bed > ./0vs50Min_r558s558.bed
bedtools shuffle -seed 1 -i 0vs50Min_r558s558.bed -g Ecoli-genomesize.txt > ./0vs50Min_r559s558.bed
sort -k1,1 -k2,2n ./0vs50Min_r559s558.bed > ./0vs50Min_r559s559.bed
bedtools shuffle -seed 1 -i 0vs50Min_r559s559.bed -g Ecoli-genomesize.txt > ./0vs50Min_r560s559.bed
sort -k1,1 -k2,2n ./0vs50Min_r560s559.bed > ./0vs50Min_r560s560.bed
bedtools shuffle -seed 1 -i 0vs50Min_r560s560.bed -g Ecoli-genomesize.txt > ./0vs50Min_r561s560.bed
sort -k1,1 -k2,2n ./0vs50Min_r561s560.bed > ./0vs50Min_r561s561.bed
bedtools shuffle -seed 1 -i 0vs50Min_r561s561.bed -g Ecoli-genomesize.txt > ./0vs50Min_r562s561.bed
sort -k1,1 -k2,2n ./0vs50Min_r562s561.bed > ./0vs50Min_r562s562.bed
bedtools shuffle -seed 1 -i 0vs50Min_r562s562.bed -g Ecoli-genomesize.txt > ./0vs50Min_r563s562.bed
sort -k1,1 -k2,2n ./0vs50Min_r563s562.bed > ./0vs50Min_r563s563.bed
bedtools shuffle -seed 1 -i 0vs50Min_r563s563.bed -g Ecoli-genomesize.txt > ./0vs50Min_r564s563.bed
sort -k1,1 -k2,2n ./0vs50Min_r564s563.bed > ./0vs50Min_r564s564.bed
bedtools shuffle -seed 1 -i 0vs50Min_r564s564.bed -g Ecoli-genomesize.txt > ./0vs50Min_r565s564.bed
sort -k1,1 -k2,2n ./0vs50Min_r565s564.bed > ./0vs50Min_r565s565.bed
bedtools shuffle -seed 1 -i 0vs50Min_r565s565.bed -g Ecoli-genomesize.txt > ./0vs50Min_r566s565.bed
sort -k1,1 -k2,2n ./0vs50Min_r566s565.bed > ./0vs50Min_r566s566.bed
bedtools shuffle -seed 1 -i 0vs50Min_r566s566.bed -g Ecoli-genomesize.txt > ./0vs50Min_r567s566.bed
sort -k1,1 -k2,2n ./0vs50Min_r567s566.bed > ./0vs50Min_r567s567.bed
bedtools shuffle -seed 1 -i 0vs50Min_r567s567.bed -g Ecoli-genomesize.txt > ./0vs50Min_r568s567.bed
sort -k1,1 -k2,2n ./0vs50Min_r568s567.bed > ./0vs50Min_r568s568.bed
bedtools shuffle -seed 1 -i 0vs50Min_r568s568.bed -g Ecoli-genomesize.txt > ./0vs50Min_r569s568.bed
sort -k1,1 -k2,2n ./0vs50Min_r569s568.bed > ./0vs50Min_r569s569.bed
bedtools shuffle -seed 1 -i 0vs50Min_r569s569.bed -g Ecoli-genomesize.txt > ./0vs50Min_r570s569.bed
sort -k1,1 -k2,2n ./0vs50Min_r570s569.bed > ./0vs50Min_r570s570.bed
bedtools shuffle -seed 1 -i 0vs50Min_r570s570.bed -g Ecoli-genomesize.txt > ./0vs50Min_r571s570.bed
sort -k1,1 -k2,2n ./0vs50Min_r571s570.bed > ./0vs50Min_r571s571.bed
bedtools shuffle -seed 1 -i 0vs50Min_r571s571.bed -g Ecoli-genomesize.txt > ./0vs50Min_r572s571.bed
sort -k1,1 -k2,2n ./0vs50Min_r572s571.bed > ./0vs50Min_r572s572.bed
bedtools shuffle -seed 1 -i 0vs50Min_r572s572.bed -g Ecoli-genomesize.txt > ./0vs50Min_r573s572.bed
sort -k1,1 -k2,2n ./0vs50Min_r573s572.bed > ./0vs50Min_r573s573.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r573s573.bed -g Ecoli-genomesize.txt > ./0vs50Min_r574s573.bed
sort -k1,1 -k2,2n ./0vs50Min_r574s573.bed > ./0vs50Min_r574s574.bed
bedtools shuffle -seed 1 -i 0vs50Min_r574s574.bed -g Ecoli-genomesize.txt > ./0vs50Min_r575s574.bed
sort -k1,1 -k2,2n ./0vs50Min_r575s574.bed > ./0vs50Min_r575s575.bed
bedtools shuffle -seed 1 -i 0vs50Min_r575s575.bed -g Ecoli-genomesize.txt > ./0vs50Min_r576s575.bed
sort -k1,1 -k2,2n ./0vs50Min_r576s575.bed > ./0vs50Min_r576s576.bed
bedtools shuffle -seed 1 -i 0vs50Min_r576s576.bed -g Ecoli-genomesize.txt > ./0vs50Min_r577s576.bed
sort -k1,1 -k2,2n ./0vs50Min_r577s576.bed > ./0vs50Min_r577s577.bed
bedtools shuffle -seed 1 -i 0vs50Min_r577s577.bed -g Ecoli-genomesize.txt > ./0vs50Min_r578s577.bed
sort -k1,1 -k2,2n ./0vs50Min_r578s577.bed > ./0vs50Min_r578s578.bed
bedtools shuffle -seed 1 -i 0vs50Min_r578s578.bed -g Ecoli-genomesize.txt > ./0vs50Min_r579s578.bed
sort -k1,1 -k2,2n ./0vs50Min_r579s578.bed > ./0vs50Min_r579s579.bed
bedtools shuffle -seed 1 -i 0vs50Min_r579s579.bed -g Ecoli-genomesize.txt > ./0vs50Min_r580s579.bed
sort -k1,1 -k2,2n ./0vs50Min_r580s579.bed > ./0vs50Min_r580s580.bed
bedtools shuffle -seed 1 -i 0vs50Min_r580s580.bed -g Ecoli-genomesize.txt > ./0vs50Min_r581s580.bed
sort -k1,1 -k2,2n ./0vs50Min_r581s580.bed > ./0vs50Min_r581s581.bed
bedtools shuffle -seed 1 -i 0vs50Min_r581s581.bed -g Ecoli-genomesize.txt > ./0vs50Min_r582s581.bed
sort -k1,1 -k2,2n ./0vs50Min_r582s581.bed > ./0vs50Min_r582s582.bed
bedtools shuffle -seed 1 -i 0vs50Min_r582s582.bed -g Ecoli-genomesize.txt > ./0vs50Min_r583s582.bed
sort -k1,1 -k2,2n ./0vs50Min_r583s582.bed > ./0vs50Min_r583s583.bed
bedtools shuffle -seed 1 -i 0vs50Min_r583s583.bed -g Ecoli-genomesize.txt > ./0vs50Min_r584s583.bed
sort -k1,1 -k2,2n ./0vs50Min_r584s583.bed > ./0vs50Min_r584s584.bed
bedtools shuffle -seed 1 -i 0vs50Min_r584s584.bed -g Ecoli-genomesize.txt > ./0vs50Min_r585s584.bed
sort -k1,1 -k2,2n ./0vs50Min_r585s584.bed > ./0vs50Min_r585s585.bed
bedtools shuffle -seed 1 -i 0vs50Min_r585s585.bed -g Ecoli-genomesize.txt > ./0vs50Min_r586s585.bed
sort -k1,1 -k2,2n ./0vs50Min_r586s585.bed > ./0vs50Min_r586s586.bed
bedtools shuffle -seed 1 -i 0vs50Min_r586s586.bed -g Ecoli-genomesize.txt > ./0vs50Min_r587s586.bed
sort -k1,1 -k2,2n ./0vs50Min_r587s586.bed > ./0vs50Min_r587s587.bed
bedtools shuffle -seed 1 -i 0vs50Min_r587s587.bed -g Ecoli-genomesize.txt > ./0vs50Min_r588s587.bed
sort -k1,1 -k2,2n ./0vs50Min_r588s587.bed > ./0vs50Min_r588s588.bed
bedtools shuffle -seed 1 -i 0vs50Min_r588s588.bed -g Ecoli-genomesize.txt > ./0vs50Min_r589s588.bed
sort -k1,1 -k2,2n ./0vs50Min_r589s588.bed > ./0vs50Min_r589s589.bed
bedtools shuffle -seed 1 -i 0vs50Min_r589s589.bed -g Ecoli-genomesize.txt > ./0vs50Min_r590s589.bed
sort -k1,1 -k2,2n ./0vs50Min_r590s589.bed > ./0vs50Min_r590s590.bed
bedtools shuffle -seed 1 -i 0vs50Min_r590s590.bed -g Ecoli-genomesize.txt > ./0vs50Min_r591s590.bed
sort -k1,1 -k2,2n ./0vs50Min_r591s590.bed > ./0vs50Min_r591s591.bed
bedtools shuffle -seed 1 -i 0vs50Min_r591s591.bed -g Ecoli-genomesize.txt > ./0vs50Min_r592s591.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r592s591.bed > ./0vs50Min_r592s592.bed
bedtools shuffle -seed 1 -i 0vs50Min_r592s592.bed -g Ecoli-genomesize.txt > ./0vs50Min_r593s592.bed
sort -k1,1 -k2,2n ./0vs50Min_r593s592.bed > ./0vs50Min_r593s593.bed
bedtools shuffle -seed 1 -i 0vs50Min_r593s593.bed -g Ecoli-genomesize.txt > ./0vs50Min_r594s593.bed
sort -k1,1 -k2,2n ./0vs50Min_r594s593.bed > ./0vs50Min_r594s594.bed
bedtools shuffle -seed 1 -i 0vs50Min_r594s594.bed -g Ecoli-genomesize.txt > ./0vs50Min_r595s594.bed
sort -k1,1 -k2,2n ./0vs50Min_r595s594.bed > ./0vs50Min_r595s595.bed
bedtools shuffle -seed 1 -i 0vs50Min_r595s595.bed -g Ecoli-genomesize.txt > ./0vs50Min_r596s595.bed
sort -k1,1 -k2,2n ./0vs50Min_r596s595.bed > ./0vs50Min_r596s596.bed
bedtools shuffle -seed 1 -i 0vs50Min_r596s596.bed -g Ecoli-genomesize.txt > ./0vs50Min_r597s596.bed
sort -k1,1 -k2,2n ./0vs50Min_r597s596.bed > ./0vs50Min_r597s597.bed
bedtools shuffle -seed 1 -i 0vs50Min_r597s597.bed -g Ecoli-genomesize.txt > ./0vs50Min_r598s597.bed
sort -k1,1 -k2,2n ./0vs50Min_r598s597.bed > ./0vs50Min_r598s598.bed
bedtools shuffle -seed 1 -i 0vs50Min_r598s598.bed -g Ecoli-genomesize.txt > ./0vs50Min_r599s598.bed
sort -k1,1 -k2,2n ./0vs50Min_r599s598.bed > ./0vs50Min_r599s599.bed
bedtools shuffle -seed 1 -i 0vs50Min_r599s599.bed -g Ecoli-genomesize.txt > ./0vs50Min_r600s599.bed
sort -k1,1 -k2,2n ./0vs50Min_r600s599.bed > ./0vs50Min_r600s600.bed
bedtools shuffle -seed 1 -i 0vs50Min_r600s600.bed -g Ecoli-genomesize.txt > ./0vs50Min_r601s600.bed
sort -k1,1 -k2,2n ./0vs50Min_r601s600.bed > ./0vs50Min_r601s601.bed
bedtools shuffle -seed 1 -i 0vs50Min_r601s601.bed -g Ecoli-genomesize.txt > ./0vs50Min_r602s601.bed
sort -k1,1 -k2,2n ./0vs50Min_r602s601.bed > ./0vs50Min_r602s602.bed
bedtools shuffle -seed 1 -i 0vs50Min_r602s602.bed -g Ecoli-genomesize.txt > ./0vs50Min_r603s602.bed
sort -k1,1 -k2,2n ./0vs50Min_r603s602.bed > ./0vs50Min_r603s603.bed
bedtools shuffle -seed 1 -i 0vs50Min_r603s603.bed -g Ecoli-genomesize.txt > ./0vs50Min_r604s603.bed
sort -k1,1 -k2,2n ./0vs50Min_r604s603.bed > ./0vs50Min_r604s604.bed
bedtools shuffle -seed 1 -i 0vs50Min_r604s604.bed -g Ecoli-genomesize.txt > ./0vs50Min_r605s604.bed
sort -k1,1 -k2,2n ./0vs50Min_r605s604.bed > ./0vs50Min_r605s605.bed
bedtools shuffle -seed 1 -i 0vs50Min_r605s605.bed -g Ecoli-genomesize.txt > ./0vs50Min_r606s605.bed
sort -k1,1 -k2,2n ./0vs50Min_r606s605.bed > ./0vs50Min_r606s606.bed
bedtools shuffle -seed 1 -i 0vs50Min_r606s606.bed -g Ecoli-genomesize.txt > ./0vs50Min_r607s606.bed
sort -k1,1 -k2,2n ./0vs50Min_r607s606.bed > ./0vs50Min_r607s607.bed
bedtools shuffle -seed 1 -i 0vs50Min_r607s607.bed -g Ecoli-genomesize.txt > ./0vs50Min_r608s607.bed
sort -k1,1 -k2,2n ./0vs50Min_r608s607.bed > ./0vs50Min_r608s608.bed
bedtools shuffle -seed 1 -i 0vs50Min_r608s608.bed -g Ecoli-genomesize.txt > ./0vs50Min_r609s608.bed
sort -k1,1 -k2,2n ./0vs50Min_r609s608.bed > ./0vs50Min_r609s609.bed
bedtools shuffle -seed 1 -i 0vs50Min_r609s609.bed -g Ecoli-genomesize.txt > ./0vs50Min_r610s609.bed
sort -k1,1 -k2,2n ./0vs50Min_r610s609.bed > ./0vs50Min_r610s610.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r610s610.bed -g Ecoli-genomesize.txt > ./0vs50Min_r611s610.bed
sort -k1,1 -k2,2n ./0vs50Min_r611s610.bed > ./0vs50Min_r611s611.bed
bedtools shuffle -seed 1 -i 0vs50Min_r611s611.bed -g Ecoli-genomesize.txt > ./0vs50Min_r612s611.bed
sort -k1,1 -k2,2n ./0vs50Min_r612s611.bed > ./0vs50Min_r612s612.bed
bedtools shuffle -seed 1 -i 0vs50Min_r612s612.bed -g Ecoli-genomesize.txt > ./0vs50Min_r613s612.bed
sort -k1,1 -k2,2n ./0vs50Min_r613s612.bed > ./0vs50Min_r613s613.bed
bedtools shuffle -seed 1 -i 0vs50Min_r613s613.bed -g Ecoli-genomesize.txt > ./0vs50Min_r614s613.bed
sort -k1,1 -k2,2n ./0vs50Min_r614s613.bed > ./0vs50Min_r614s614.bed
bedtools shuffle -seed 1 -i 0vs50Min_r614s614.bed -g Ecoli-genomesize.txt > ./0vs50Min_r615s614.bed
sort -k1,1 -k2,2n ./0vs50Min_r615s614.bed > ./0vs50Min_r615s615.bed
bedtools shuffle -seed 1 -i 0vs50Min_r615s615.bed -g Ecoli-genomesize.txt > ./0vs50Min_r616s615.bed
sort -k1,1 -k2,2n ./0vs50Min_r616s615.bed > ./0vs50Min_r616s616.bed
bedtools shuffle -seed 1 -i 0vs50Min_r616s616.bed -g Ecoli-genomesize.txt > ./0vs50Min_r617s616.bed
sort -k1,1 -k2,2n ./0vs50Min_r617s616.bed > ./0vs50Min_r617s617.bed
bedtools shuffle -seed 1 -i 0vs50Min_r617s617.bed -g Ecoli-genomesize.txt > ./0vs50Min_r618s617.bed
sort -k1,1 -k2,2n ./0vs50Min_r618s617.bed > ./0vs50Min_r618s618.bed
bedtools shuffle -seed 1 -i 0vs50Min_r618s618.bed -g Ecoli-genomesize.txt > ./0vs50Min_r619s618.bed
sort -k1,1 -k2,2n ./0vs50Min_r619s618.bed > ./0vs50Min_r619s619.bed
bedtools shuffle -seed 1 -i 0vs50Min_r619s619.bed -g Ecoli-genomesize.txt > ./0vs50Min_r620s619.bed
sort -k1,1 -k2,2n ./0vs50Min_r620s619.bed > ./0vs50Min_r620s620.bed
bedtools shuffle -seed 1 -i 0vs50Min_r620s620.bed -g Ecoli-genomesize.txt > ./0vs50Min_r621s620.bed
sort -k1,1 -k2,2n ./0vs50Min_r621s620.bed > ./0vs50Min_r621s621.bed
bedtools shuffle -seed 1 -i 0vs50Min_r621s621.bed -g Ecoli-genomesize.txt > ./0vs50Min_r622s621.bed
sort -k1,1 -k2,2n ./0vs50Min_r622s621.bed > ./0vs50Min_r622s622.bed
bedtools shuffle -seed 1 -i 0vs50Min_r622s622.bed -g Ecoli-genomesize.txt > ./0vs50Min_r623s622.bed
sort -k1,1 -k2,2n ./0vs50Min_r623s622.bed > ./0vs50Min_r623s623.bed
bedtools shuffle -seed 1 -i 0vs50Min_r623s623.bed -g Ecoli-genomesize.txt > ./0vs50Min_r624s623.bed
sort -k1,1 -k2,2n ./0vs50Min_r624s623.bed > ./0vs50Min_r624s624.bed
bedtools shuffle -seed 1 -i 0vs50Min_r624s624.bed -g Ecoli-genomesize.txt > ./0vs50Min_r625s624.bed
sort -k1,1 -k2,2n ./0vs50Min_r625s624.bed > ./0vs50Min_r625s625.bed
bedtools shuffle -seed 1 -i 0vs50Min_r625s625.bed -g Ecoli-genomesize.txt > ./0vs50Min_r626s625.bed
sort -k1,1 -k2,2n ./0vs50Min_r626s625.bed > ./0vs50Min_r626s626.bed
bedtools shuffle -seed 1 -i 0vs50Min_r626s626.bed -g Ecoli-genomesize.txt > ./0vs50Min_r627s626.bed
sort -k1,1 -k2,2n ./0vs50Min_r627s626.bed > ./0vs50Min_r627s627.bed
bedtools shuffle -seed 1 -i 0vs50Min_r627s627.bed -g Ecoli-genomesize.txt > ./0vs50Min_r628s627.bed
sort -k1,1 -k2,2n ./0vs50Min_r628s627.bed > ./0vs50Min_r628s628.bed
bedtools shuffle -seed 1 -i 0vs50Min_r628s628.bed -g Ecoli-genomesize.txt > ./0vs50Min_r629s628.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r629s628.bed > ./0vs50Min_r629s629.bed
bedtools shuffle -seed 1 -i 0vs50Min_r629s629.bed -g Ecoli-genomesize.txt > ./0vs50Min_r630s629.bed
sort -k1,1 -k2,2n ./0vs50Min_r630s629.bed > ./0vs50Min_r630s630.bed
bedtools shuffle -seed 1 -i 0vs50Min_r630s630.bed -g Ecoli-genomesize.txt > ./0vs50Min_r631s630.bed
sort -k1,1 -k2,2n ./0vs50Min_r631s630.bed > ./0vs50Min_r631s631.bed
bedtools shuffle -seed 1 -i 0vs50Min_r631s631.bed -g Ecoli-genomesize.txt > ./0vs50Min_r632s631.bed
sort -k1,1 -k2,2n ./0vs50Min_r632s631.bed > ./0vs50Min_r632s632.bed
bedtools shuffle -seed 1 -i 0vs50Min_r632s632.bed -g Ecoli-genomesize.txt > ./0vs50Min_r633s632.bed
sort -k1,1 -k2,2n ./0vs50Min_r633s632.bed > ./0vs50Min_r633s633.bed
bedtools shuffle -seed 1 -i 0vs50Min_r633s633.bed -g Ecoli-genomesize.txt > ./0vs50Min_r634s633.bed
sort -k1,1 -k2,2n ./0vs50Min_r634s633.bed > ./0vs50Min_r634s634.bed
bedtools shuffle -seed 1 -i 0vs50Min_r634s634.bed -g Ecoli-genomesize.txt > ./0vs50Min_r635s634.bed
sort -k1,1 -k2,2n ./0vs50Min_r635s634.bed > ./0vs50Min_r635s635.bed
bedtools shuffle -seed 1 -i 0vs50Min_r635s635.bed -g Ecoli-genomesize.txt > ./0vs50Min_r636s635.bed
sort -k1,1 -k2,2n ./0vs50Min_r636s635.bed > ./0vs50Min_r636s636.bed
bedtools shuffle -seed 1 -i 0vs50Min_r636s636.bed -g Ecoli-genomesize.txt > ./0vs50Min_r637s636.bed
sort -k1,1 -k2,2n ./0vs50Min_r637s636.bed > ./0vs50Min_r637s637.bed
bedtools shuffle -seed 1 -i 0vs50Min_r637s637.bed -g Ecoli-genomesize.txt > ./0vs50Min_r638s637.bed
sort -k1,1 -k2,2n ./0vs50Min_r638s637.bed > ./0vs50Min_r638s638.bed
bedtools shuffle -seed 1 -i 0vs50Min_r638s638.bed -g Ecoli-genomesize.txt > ./0vs50Min_r639s638.bed
sort -k1,1 -k2,2n ./0vs50Min_r639s638.bed > ./0vs50Min_r639s639.bed
bedtools shuffle -seed 1 -i 0vs50Min_r639s639.bed -g Ecoli-genomesize.txt > ./0vs50Min_r640s639.bed
sort -k1,1 -k2,2n ./0vs50Min_r640s639.bed > ./0vs50Min_r640s640.bed
bedtools shuffle -seed 1 -i 0vs50Min_r640s640.bed -g Ecoli-genomesize.txt > ./0vs50Min_r641s640.bed
sort -k1,1 -k2,2n ./0vs50Min_r641s640.bed > ./0vs50Min_r641s641.bed
bedtools shuffle -seed 1 -i 0vs50Min_r641s641.bed -g Ecoli-genomesize.txt > ./0vs50Min_r642s641.bed
sort -k1,1 -k2,2n ./0vs50Min_r642s641.bed > ./0vs50Min_r642s642.bed
bedtools shuffle -seed 1 -i 0vs50Min_r642s642.bed -g Ecoli-genomesize.txt > ./0vs50Min_r643s642.bed
sort -k1,1 -k2,2n ./0vs50Min_r643s642.bed > ./0vs50Min_r643s643.bed
bedtools shuffle -seed 1 -i 0vs50Min_r643s643.bed -g Ecoli-genomesize.txt > ./0vs50Min_r644s643.bed
sort -k1,1 -k2,2n ./0vs50Min_r644s643.bed > ./0vs50Min_r644s644.bed
bedtools shuffle -seed 1 -i 0vs50Min_r644s644.bed -g Ecoli-genomesize.txt > ./0vs50Min_r645s644.bed
sort -k1,1 -k2,2n ./0vs50Min_r645s644.bed > ./0vs50Min_r645s645.bed
bedtools shuffle -seed 1 -i 0vs50Min_r645s645.bed -g Ecoli-genomesize.txt > ./0vs50Min_r646s645.bed
sort -k1,1 -k2,2n ./0vs50Min_r646s645.bed > ./0vs50Min_r646s646.bed
bedtools shuffle -seed 1 -i 0vs50Min_r646s646.bed -g Ecoli-genomesize.txt > ./0vs50Min_r647s646.bed
sort -k1,1 -k2,2n ./0vs50Min_r647s646.bed > ./0vs50Min_r647s647.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r647s647.bed -g Ecoli-genomesize.txt > ./0vs50Min_r648s647.bed
sort -k1,1 -k2,2n ./0vs50Min_r648s647.bed > ./0vs50Min_r648s648.bed
bedtools shuffle -seed 1 -i 0vs50Min_r648s648.bed -g Ecoli-genomesize.txt > ./0vs50Min_r649s648.bed
sort -k1,1 -k2,2n ./0vs50Min_r649s648.bed > ./0vs50Min_r649s649.bed
bedtools shuffle -seed 1 -i 0vs50Min_r649s649.bed -g Ecoli-genomesize.txt > ./0vs50Min_r650s649.bed
sort -k1,1 -k2,2n ./0vs50Min_r650s649.bed > ./0vs50Min_r650s650.bed
bedtools shuffle -seed 1 -i 0vs50Min_r650s650.bed -g Ecoli-genomesize.txt > ./0vs50Min_r651s650.bed
sort -k1,1 -k2,2n ./0vs50Min_r651s650.bed > ./0vs50Min_r651s651.bed
bedtools shuffle -seed 1 -i 0vs50Min_r651s651.bed -g Ecoli-genomesize.txt > ./0vs50Min_r652s651.bed
sort -k1,1 -k2,2n ./0vs50Min_r652s651.bed > ./0vs50Min_r652s652.bed
bedtools shuffle -seed 1 -i 0vs50Min_r652s652.bed -g Ecoli-genomesize.txt > ./0vs50Min_r653s652.bed
sort -k1,1 -k2,2n ./0vs50Min_r653s652.bed > ./0vs50Min_r653s653.bed
bedtools shuffle -seed 1 -i 0vs50Min_r653s653.bed -g Ecoli-genomesize.txt > ./0vs50Min_r654s653.bed
sort -k1,1 -k2,2n ./0vs50Min_r654s653.bed > ./0vs50Min_r654s654.bed
bedtools shuffle -seed 1 -i 0vs50Min_r654s654.bed -g Ecoli-genomesize.txt > ./0vs50Min_r655s654.bed
sort -k1,1 -k2,2n ./0vs50Min_r655s654.bed > ./0vs50Min_r655s655.bed
bedtools shuffle -seed 1 -i 0vs50Min_r655s655.bed -g Ecoli-genomesize.txt > ./0vs50Min_r656s655.bed
sort -k1,1 -k2,2n ./0vs50Min_r656s655.bed > ./0vs50Min_r656s656.bed
bedtools shuffle -seed 1 -i 0vs50Min_r656s656.bed -g Ecoli-genomesize.txt > ./0vs50Min_r657s656.bed
sort -k1,1 -k2,2n ./0vs50Min_r657s656.bed > ./0vs50Min_r657s657.bed
bedtools shuffle -seed 1 -i 0vs50Min_r657s657.bed -g Ecoli-genomesize.txt > ./0vs50Min_r658s657.bed
sort -k1,1 -k2,2n ./0vs50Min_r658s657.bed > ./0vs50Min_r658s658.bed
bedtools shuffle -seed 1 -i 0vs50Min_r658s658.bed -g Ecoli-genomesize.txt > ./0vs50Min_r659s658.bed
sort -k1,1 -k2,2n ./0vs50Min_r659s658.bed > ./0vs50Min_r659s659.bed
bedtools shuffle -seed 1 -i 0vs50Min_r659s659.bed -g Ecoli-genomesize.txt > ./0vs50Min_r660s659.bed
sort -k1,1 -k2,2n ./0vs50Min_r660s659.bed > ./0vs50Min_r660s660.bed
bedtools shuffle -seed 1 -i 0vs50Min_r660s660.bed -g Ecoli-genomesize.txt > ./0vs50Min_r661s660.bed
sort -k1,1 -k2,2n ./0vs50Min_r661s660.bed > ./0vs50Min_r661s661.bed
bedtools shuffle -seed 1 -i 0vs50Min_r661s661.bed -g Ecoli-genomesize.txt > ./0vs50Min_r662s661.bed
sort -k1,1 -k2,2n ./0vs50Min_r662s661.bed > ./0vs50Min_r662s662.bed
bedtools shuffle -seed 1 -i 0vs50Min_r662s662.bed -g Ecoli-genomesize.txt > ./0vs50Min_r663s662.bed
sort -k1,1 -k2,2n ./0vs50Min_r663s662.bed > ./0vs50Min_r663s663.bed
bedtools shuffle -seed 1 -i 0vs50Min_r663s663.bed -g Ecoli-genomesize.txt > ./0vs50Min_r664s663.bed
sort -k1,1 -k2,2n ./0vs50Min_r664s663.bed > ./0vs50Min_r664s664.bed
bedtools shuffle -seed 1 -i 0vs50Min_r664s664.bed -g Ecoli-genomesize.txt > ./0vs50Min_r665s664.bed
sort -k1,1 -k2,2n ./0vs50Min_r665s664.bed > ./0vs50Min_r665s665.bed
bedtools shuffle -seed 1 -i 0vs50Min_r665s665.bed -g Ecoli-genomesize.txt > ./0vs50Min_r666s665.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r666s665.bed > ./0vs50Min_r666s666.bed
bedtools shuffle -seed 1 -i 0vs50Min_r666s666.bed -g Ecoli-genomesize.txt > ./0vs50Min_r667s666.bed
sort -k1,1 -k2,2n ./0vs50Min_r667s666.bed > ./0vs50Min_r667s667.bed
bedtools shuffle -seed 1 -i 0vs50Min_r667s667.bed -g Ecoli-genomesize.txt > ./0vs50Min_r668s667.bed
sort -k1,1 -k2,2n ./0vs50Min_r668s667.bed > ./0vs50Min_r668s668.bed
bedtools shuffle -seed 1 -i 0vs50Min_r668s668.bed -g Ecoli-genomesize.txt > ./0vs50Min_r669s668.bed
sort -k1,1 -k2,2n ./0vs50Min_r669s668.bed > ./0vs50Min_r669s669.bed
bedtools shuffle -seed 1 -i 0vs50Min_r669s669.bed -g Ecoli-genomesize.txt > ./0vs50Min_r670s669.bed
sort -k1,1 -k2,2n ./0vs50Min_r670s669.bed > ./0vs50Min_r670s670.bed
bedtools shuffle -seed 1 -i 0vs50Min_r670s670.bed -g Ecoli-genomesize.txt > ./0vs50Min_r671s670.bed
sort -k1,1 -k2,2n ./0vs50Min_r671s670.bed > ./0vs50Min_r671s671.bed
bedtools shuffle -seed 1 -i 0vs50Min_r671s671.bed -g Ecoli-genomesize.txt > ./0vs50Min_r672s671.bed
sort -k1,1 -k2,2n ./0vs50Min_r672s671.bed > ./0vs50Min_r672s672.bed
bedtools shuffle -seed 1 -i 0vs50Min_r672s672.bed -g Ecoli-genomesize.txt > ./0vs50Min_r673s672.bed
sort -k1,1 -k2,2n ./0vs50Min_r673s672.bed > ./0vs50Min_r673s673.bed
bedtools shuffle -seed 1 -i 0vs50Min_r673s673.bed -g Ecoli-genomesize.txt > ./0vs50Min_r674s673.bed
sort -k1,1 -k2,2n ./0vs50Min_r674s673.bed > ./0vs50Min_r674s674.bed
bedtools shuffle -seed 1 -i 0vs50Min_r674s674.bed -g Ecoli-genomesize.txt > ./0vs50Min_r675s674.bed
sort -k1,1 -k2,2n ./0vs50Min_r675s674.bed > ./0vs50Min_r675s675.bed
bedtools shuffle -seed 1 -i 0vs50Min_r675s675.bed -g Ecoli-genomesize.txt > ./0vs50Min_r676s675.bed
sort -k1,1 -k2,2n ./0vs50Min_r676s675.bed > ./0vs50Min_r676s676.bed
bedtools shuffle -seed 1 -i 0vs50Min_r676s676.bed -g Ecoli-genomesize.txt > ./0vs50Min_r677s676.bed
sort -k1,1 -k2,2n ./0vs50Min_r677s676.bed > ./0vs50Min_r677s677.bed
bedtools shuffle -seed 1 -i 0vs50Min_r677s677.bed -g Ecoli-genomesize.txt > ./0vs50Min_r678s677.bed
sort -k1,1 -k2,2n ./0vs50Min_r678s677.bed > ./0vs50Min_r678s678.bed
bedtools shuffle -seed 1 -i 0vs50Min_r678s678.bed -g Ecoli-genomesize.txt > ./0vs50Min_r679s678.bed
sort -k1,1 -k2,2n ./0vs50Min_r679s678.bed > ./0vs50Min_r679s679.bed
bedtools shuffle -seed 1 -i 0vs50Min_r679s679.bed -g Ecoli-genomesize.txt > ./0vs50Min_r680s679.bed
sort -k1,1 -k2,2n ./0vs50Min_r680s679.bed > ./0vs50Min_r680s680.bed
bedtools shuffle -seed 1 -i 0vs50Min_r680s680.bed -g Ecoli-genomesize.txt > ./0vs50Min_r681s680.bed
sort -k1,1 -k2,2n ./0vs50Min_r681s680.bed > ./0vs50Min_r681s681.bed
bedtools shuffle -seed 1 -i 0vs50Min_r681s681.bed -g Ecoli-genomesize.txt > ./0vs50Min_r682s681.bed
sort -k1,1 -k2,2n ./0vs50Min_r682s681.bed > ./0vs50Min_r682s682.bed
bedtools shuffle -seed 1 -i 0vs50Min_r682s682.bed -g Ecoli-genomesize.txt > ./0vs50Min_r683s682.bed
sort -k1,1 -k2,2n ./0vs50Min_r683s682.bed > ./0vs50Min_r683s683.bed
bedtools shuffle -seed 1 -i 0vs50Min_r683s683.bed -g Ecoli-genomesize.txt > ./0vs50Min_r684s683.bed
sort -k1,1 -k2,2n ./0vs50Min_r684s683.bed > ./0vs50Min_r684s684.bed
```

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bedtools shuffle -seed 1 -i 0vs50Min_r684s684.bed -g Ecoli-genomesize.txt > ./0vs50Min_r685s684.bed
sort -k1,1 -k2,2n ./0vs50Min_r685s684.bed > ./0vs50Min_r685s685.bed
bedtools shuffle -seed 1 -i 0vs50Min_r685s685.bed -g Ecoli-genomesize.txt > ./0vs50Min_r686s685.bed
sort -k1,1 -k2,2n ./0vs50Min_r686s685.bed > ./0vs50Min_r686s686.bed
bedtools shuffle -seed 1 -i 0vs50Min_r686s686.bed -g Ecoli-genomesize.txt > ./0vs50Min_r687s686.bed
sort -k1,1 -k2,2n ./0vs50Min_r687s686.bed > ./0vs50Min_r687s687.bed
bedtools shuffle -seed 1 -i 0vs50Min_r687s687.bed -g Ecoli-genomesize.txt > ./0vs50Min_r688s687.bed
sort -k1,1 -k2,2n ./0vs50Min_r688s687.bed > ./0vs50Min_r688s688.bed
bedtools shuffle -seed 1 -i 0vs50Min_r688s688.bed -g Ecoli-genomesize.txt > ./0vs50Min_r689s688.bed
sort -k1,1 -k2,2n ./0vs50Min_r689s688.bed > ./0vs50Min_r689s689.bed
bedtools shuffle -seed 1 -i 0vs50Min_r689s689.bed -g Ecoli-genomesize.txt > ./0vs50Min_r690s689.bed
sort -k1,1 -k2,2n ./0vs50Min_r690s689.bed > ./0vs50Min_r690s690.bed
bedtools shuffle -seed 1 -i 0vs50Min_r690s690.bed -g Ecoli-genomesize.txt > ./0vs50Min_r691s690.bed
sort -k1,1 -k2,2n ./0vs50Min_r691s690.bed > ./0vs50Min_r691s691.bed
bedtools shuffle -seed 1 -i 0vs50Min_r691s691.bed -g Ecoli-genomesize.txt > ./0vs50Min_r692s691.bed
sort -k1,1 -k2,2n ./0vs50Min_r692s691.bed > ./0vs50Min_r692s692.bed
bedtools shuffle -seed 1 -i 0vs50Min_r692s692.bed -g Ecoli-genomesize.txt > ./0vs50Min_r693s692.bed
sort -k1,1 -k2,2n ./0vs50Min_r693s692.bed > ./0vs50Min_r693s693.bed
bedtools shuffle -seed 1 -i 0vs50Min_r693s693.bed -g Ecoli-genomesize.txt > ./0vs50Min_r694s693.bed
sort -k1,1 -k2,2n ./0vs50Min_r694s693.bed > ./0vs50Min_r694s694.bed
bedtools shuffle -seed 1 -i 0vs50Min_r694s694.bed -g Ecoli-genomesize.txt > ./0vs50Min_r695s694.bed
sort -k1,1 -k2,2n ./0vs50Min_r695s694.bed > ./0vs50Min_r695s695.bed
bedtools shuffle -seed 1 -i 0vs50Min_r695s695.bed -g Ecoli-genomesize.txt > ./0vs50Min_r696s695.bed
sort -k1,1 -k2,2n ./0vs50Min_r696s695.bed > ./0vs50Min_r696s696.bed
bedtools shuffle -seed 1 -i 0vs50Min_r696s696.bed -g Ecoli-genomesize.txt > ./0vs50Min_r697s696.bed
sort -k1,1 -k2,2n ./0vs50Min_r697s696.bed > ./0vs50Min_r697s697.bed
bedtools shuffle -seed 1 -i 0vs50Min_r697s697.bed -g Ecoli-genomesize.txt > ./0vs50Min_r698s697.bed
sort -k1,1 -k2,2n ./0vs50Min_r698s697.bed > ./0vs50Min_r698s698.bed
bedtools shuffle -seed 1 -i 0vs50Min_r698s698.bed -g Ecoli-genomesize.txt > ./0vs50Min_r699s698.bed
sort -k1,1 -k2,2n ./0vs50Min_r699s698.bed > ./0vs50Min_r699s699.bed
bedtools shuffle -seed 1 -i 0vs50Min_r699s699.bed -g Ecoli-genomesize.txt > ./0vs50Min_r700s699.bed
sort -k1,1 -k2,2n ./0vs50Min_r700s699.bed > ./0vs50Min_r700s700.bed
bedtools shuffle -seed 1 -i 0vs50Min_r700s700.bed -g Ecoli-genomesize.txt > ./0vs50Min_r701s700.bed
sort -k1,1 -k2,2n ./0vs50Min_r701s700.bed > ./0vs50Min_r701s701.bed
bedtools shuffle -seed 1 -i 0vs50Min_r701s701.bed -g Ecoli-genomesize.txt > ./0vs50Min_r702s701.bed
sort -k1,1 -k2,2n ./0vs50Min_r702s701.bed > ./0vs50Min_r702s702.bed
bedtools shuffle -seed 1 -i 0vs50Min_r702s702.bed -g Ecoli-genomesize.txt > ./0vs50Min_r703s702.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r703s702.bed > ./0vs50Min_r703s703.bed
bedtools shuffle -seed 1 -i 0vs50Min_r703s703.bed -g Ecoli-genomesize.txt > ./0vs50Min_r704s703.bed
sort -k1,1 -k2,2n ./0vs50Min_r704s703.bed > ./0vs50Min_r704s704.bed
bedtools shuffle -seed 1 -i 0vs50Min_r704s704.bed -g Ecoli-genomesize.txt > ./0vs50Min_r705s704.bed
sort -k1,1 -k2,2n ./0vs50Min_r705s704.bed > ./0vs50Min_r705s705.bed
bedtools shuffle -seed 1 -i 0vs50Min_r705s705.bed -g Ecoli-genomesize.txt > ./0vs50Min_r706s705.bed
sort -k1,1 -k2,2n ./0vs50Min_r706s705.bed > ./0vs50Min_r706s706.bed
bedtools shuffle -seed 1 -i 0vs50Min_r706s706.bed -g Ecoli-genomesize.txt > ./0vs50Min_r707s706.bed
sort -k1,1 -k2,2n ./0vs50Min_r707s706.bed > ./0vs50Min_r707s707.bed
bedtools shuffle -seed 1 -i 0vs50Min_r707s707.bed -g Ecoli-genomesize.txt > ./0vs50Min_r708s707.bed
sort -k1,1 -k2,2n ./0vs50Min_r708s707.bed > ./0vs50Min_r708s708.bed
bedtools shuffle -seed 1 -i 0vs50Min_r708s708.bed -g Ecoli-genomesize.txt > ./0vs50Min_r709s708.bed
sort -k1,1 -k2,2n ./0vs50Min_r709s708.bed > ./0vs50Min_r709s709.bed
bedtools shuffle -seed 1 -i 0vs50Min_r709s709.bed -g Ecoli-genomesize.txt > ./0vs50Min_r710s709.bed
sort -k1,1 -k2,2n ./0vs50Min_r710s709.bed > ./0vs50Min_r710s710.bed
bedtools shuffle -seed 1 -i 0vs50Min_r710s710.bed -g Ecoli-genomesize.txt > ./0vs50Min_r711s710.bed
sort -k1,1 -k2,2n ./0vs50Min_r711s710.bed > ./0vs50Min_r711s711.bed
bedtools shuffle -seed 1 -i 0vs50Min_r711s711.bed -g Ecoli-genomesize.txt > ./0vs50Min_r712s711.bed
sort -k1,1 -k2,2n ./0vs50Min_r712s711.bed > ./0vs50Min_r712s712.bed
bedtools shuffle -seed 1 -i 0vs50Min_r712s712.bed -g Ecoli-genomesize.txt > ./0vs50Min_r713s712.bed
sort -k1,1 -k2,2n ./0vs50Min_r713s712.bed > ./0vs50Min_r713s713.bed
bedtools shuffle -seed 1 -i 0vs50Min_r713s713.bed -g Ecoli-genomesize.txt > ./0vs50Min_r714s713.bed
sort -k1,1 -k2,2n ./0vs50Min_r714s713.bed > ./0vs50Min_r714s714.bed
bedtools shuffle -seed 1 -i 0vs50Min_r714s714.bed -g Ecoli-genomesize.txt > ./0vs50Min_r715s714.bed
sort -k1,1 -k2,2n ./0vs50Min_r715s714.bed > ./0vs50Min_r715s715.bed
bedtools shuffle -seed 1 -i 0vs50Min_r715s715.bed -g Ecoli-genomesize.txt > ./0vs50Min_r716s715.bed
sort -k1,1 -k2,2n ./0vs50Min_r716s715.bed > ./0vs50Min_r716s716.bed
bedtools shuffle -seed 1 -i 0vs50Min_r716s716.bed -g Ecoli-genomesize.txt > ./0vs50Min_r717s716.bed
sort -k1,1 -k2,2n ./0vs50Min_r717s716.bed > ./0vs50Min_r717s717.bed
bedtools shuffle -seed 1 -i 0vs50Min_r717s717.bed -g Ecoli-genomesize.txt > ./0vs50Min_r718s717.bed
sort -k1,1 -k2,2n ./0vs50Min_r718s717.bed > ./0vs50Min_r718s718.bed
bedtools shuffle -seed 1 -i 0vs50Min_r718s718.bed -g Ecoli-genomesize.txt > ./0vs50Min_r719s718.bed
sort -k1,1 -k2,2n ./0vs50Min_r719s718.bed > ./0vs50Min_r719s719.bed
bedtools shuffle -seed 1 -i 0vs50Min_r719s719.bed -g Ecoli-genomesize.txt > ./0vs50Min_r720s719.bed
sort -k1,1 -k2,2n ./0vs50Min_r720s719.bed > ./0vs50Min_r720s720.bed
bedtools shuffle -seed 1 -i 0vs50Min_r720s720.bed -g Ecoli-genomesize.txt > ./0vs50Min_r721s720.bed
sort -k1,1 -k2,2n ./0vs50Min_r721s720.bed > ./0vs50Min_r721s721.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r721s721.bed -g Ecoli-genomesize.txt > ./0vs50Min_r722s721.bed
sort -k1,1 -k2,2n ./0vs50Min_r722s721.bed > ./0vs50Min_r722s722.bed
bedtools shuffle -seed 1 -i 0vs50Min_r722s722.bed -g Ecoli-genomesize.txt > ./0vs50Min_r723s722.bed
sort -k1,1 -k2,2n ./0vs50Min_r723s722.bed > ./0vs50Min_r723s723.bed
bedtools shuffle -seed 1 -i 0vs50Min_r723s723.bed -g Ecoli-genomesize.txt > ./0vs50Min_r724s723.bed
sort -k1,1 -k2,2n ./0vs50Min_r724s723.bed > ./0vs50Min_r724s724.bed
bedtools shuffle -seed 1 -i 0vs50Min_r724s724.bed -g Ecoli-genomesize.txt > ./0vs50Min_r725s724.bed
sort -k1,1 -k2,2n ./0vs50Min_r725s724.bed > ./0vs50Min_r725s725.bed
bedtools shuffle -seed 1 -i 0vs50Min_r725s725.bed -g Ecoli-genomesize.txt > ./0vs50Min_r726s725.bed
sort -k1,1 -k2,2n ./0vs50Min_r726s725.bed > ./0vs50Min_r726s726.bed
bedtools shuffle -seed 1 -i 0vs50Min_r726s726.bed -g Ecoli-genomesize.txt > ./0vs50Min_r727s726.bed
sort -k1,1 -k2,2n ./0vs50Min_r727s726.bed > ./0vs50Min_r727s727.bed
bedtools shuffle -seed 1 -i 0vs50Min_r727s727.bed -g Ecoli-genomesize.txt > ./0vs50Min_r728s727.bed
sort -k1,1 -k2,2n ./0vs50Min_r728s727.bed > ./0vs50Min_r728s728.bed
bedtools shuffle -seed 1 -i 0vs50Min_r728s728.bed -g Ecoli-genomesize.txt > ./0vs50Min_r729s728.bed
sort -k1,1 -k2,2n ./0vs50Min_r729s728.bed > ./0vs50Min_r729s729.bed
bedtools shuffle -seed 1 -i 0vs50Min_r729s729.bed -g Ecoli-genomesize.txt > ./0vs50Min_r730s729.bed
sort -k1,1 -k2,2n ./0vs50Min_r730s729.bed > ./0vs50Min_r730s730.bed
bedtools shuffle -seed 1 -i 0vs50Min_r730s730.bed -g Ecoli-genomesize.txt > ./0vs50Min_r731s730.bed
sort -k1,1 -k2,2n ./0vs50Min_r731s730.bed > ./0vs50Min_r731s731.bed
bedtools shuffle -seed 1 -i 0vs50Min_r731s731.bed -g Ecoli-genomesize.txt > ./0vs50Min_r732s731.bed
sort -k1,1 -k2,2n ./0vs50Min_r732s731.bed > ./0vs50Min_r732s732.bed
bedtools shuffle -seed 1 -i 0vs50Min_r732s732.bed -g Ecoli-genomesize.txt > ./0vs50Min_r733s732.bed
sort -k1,1 -k2,2n ./0vs50Min_r733s732.bed > ./0vs50Min_r733s733.bed
bedtools shuffle -seed 1 -i 0vs50Min_r733s733.bed -g Ecoli-genomesize.txt > ./0vs50Min_r734s733.bed
sort -k1,1 -k2,2n ./0vs50Min_r734s733.bed > ./0vs50Min_r734s734.bed
bedtools shuffle -seed 1 -i 0vs50Min_r734s734.bed -g Ecoli-genomesize.txt > ./0vs50Min_r735s734.bed
sort -k1,1 -k2,2n ./0vs50Min_r735s734.bed > ./0vs50Min_r735s735.bed
bedtools shuffle -seed 1 -i 0vs50Min_r735s735.bed -g Ecoli-genomesize.txt > ./0vs50Min_r736s735.bed
sort -k1,1 -k2,2n ./0vs50Min_r736s735.bed > ./0vs50Min_r736s736.bed
bedtools shuffle -seed 1 -i 0vs50Min_r736s736.bed -g Ecoli-genomesize.txt > ./0vs50Min_r737s736.bed
sort -k1,1 -k2,2n ./0vs50Min_r737s736.bed > ./0vs50Min_r737s737.bed
bedtools shuffle -seed 1 -i 0vs50Min_r737s737.bed -g Ecoli-genomesize.txt > ./0vs50Min_r738s737.bed
sort -k1,1 -k2,2n ./0vs50Min_r738s737.bed > ./0vs50Min_r738s738.bed
bedtools shuffle -seed 1 -i 0vs50Min_r738s738.bed -g Ecoli-genomesize.txt > ./0vs50Min_r739s738.bed
sort -k1,1 -k2,2n ./0vs50Min_r739s738.bed > ./0vs50Min_r739s739.bed
bedtools shuffle -seed 1 -i 0vs50Min_r739s739.bed -g Ecoli-genomesize.txt > ./0vs50Min_r740s739.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r740s739.bed > ./0vs50Min_r740s740.bed
bedtools shuffle -seed 1 -i 0vs50Min_r740s740.bed -g Ecoli-genomesize.txt > ./0vs50Min_r741s740.bed
sort -k1,1 -k2,2n ./0vs50Min_r741s740.bed > ./0vs50Min_r741s741.bed
bedtools shuffle -seed 1 -i 0vs50Min_r741s741.bed -g Ecoli-genomesize.txt > ./0vs50Min_r742s741.bed
sort -k1,1 -k2,2n ./0vs50Min_r742s741.bed > ./0vs50Min_r742s742.bed
bedtools shuffle -seed 1 -i 0vs50Min_r742s742.bed -g Ecoli-genomesize.txt > ./0vs50Min_r743s742.bed
sort -k1,1 -k2,2n ./0vs50Min_r743s742.bed > ./0vs50Min_r743s743.bed
bedtools shuffle -seed 1 -i 0vs50Min_r743s743.bed -g Ecoli-genomesize.txt > ./0vs50Min_r744s743.bed
sort -k1,1 -k2,2n ./0vs50Min_r744s743.bed > ./0vs50Min_r744s744.bed
bedtools shuffle -seed 1 -i 0vs50Min_r744s744.bed -g Ecoli-genomesize.txt > ./0vs50Min_r745s744.bed
sort -k1,1 -k2,2n ./0vs50Min_r745s744.bed > ./0vs50Min_r745s745.bed
bedtools shuffle -seed 1 -i 0vs50Min_r745s745.bed -g Ecoli-genomesize.txt > ./0vs50Min_r746s745.bed
sort -k1,1 -k2,2n ./0vs50Min_r746s745.bed > ./0vs50Min_r746s746.bed
bedtools shuffle -seed 1 -i 0vs50Min_r746s746.bed -g Ecoli-genomesize.txt > ./0vs50Min_r747s746.bed
sort -k1,1 -k2,2n ./0vs50Min_r747s746.bed > ./0vs50Min_r747s747.bed
bedtools shuffle -seed 1 -i 0vs50Min_r747s747.bed -g Ecoli-genomesize.txt > ./0vs50Min_r748s747.bed
sort -k1,1 -k2,2n ./0vs50Min_r748s747.bed > ./0vs50Min_r748s748.bed
bedtools shuffle -seed 1 -i 0vs50Min_r748s748.bed -g Ecoli-genomesize.txt > ./0vs50Min_r749s748.bed
sort -k1,1 -k2,2n ./0vs50Min_r749s748.bed > ./0vs50Min_r749s749.bed
bedtools shuffle -seed 1 -i 0vs50Min_r749s749.bed -g Ecoli-genomesize.txt > ./0vs50Min_r750s749.bed
sort -k1,1 -k2,2n ./0vs50Min_r750s749.bed > ./0vs50Min_r750s750.bed
bedtools shuffle -seed 1 -i 0vs50Min_r750s750.bed -g Ecoli-genomesize.txt > ./0vs50Min_r751s750.bed
sort -k1,1 -k2,2n ./0vs50Min_r751s750.bed > ./0vs50Min_r751s751.bed
bedtools shuffle -seed 1 -i 0vs50Min_r751s751.bed -g Ecoli-genomesize.txt > ./0vs50Min_r752s751.bed
sort -k1,1 -k2,2n ./0vs50Min_r752s751.bed > ./0vs50Min_r752s752.bed
bedtools shuffle -seed 1 -i 0vs50Min_r752s752.bed -g Ecoli-genomesize.txt > ./0vs50Min_r753s752.bed
sort -k1,1 -k2,2n ./0vs50Min_r753s752.bed > ./0vs50Min_r753s753.bed
bedtools shuffle -seed 1 -i 0vs50Min_r753s753.bed -g Ecoli-genomesize.txt > ./0vs50Min_r754s753.bed
sort -k1,1 -k2,2n ./0vs50Min_r754s753.bed > ./0vs50Min_r754s754.bed
bedtools shuffle -seed 1 -i 0vs50Min_r754s754.bed -g Ecoli-genomesize.txt > ./0vs50Min_r755s754.bed
sort -k1,1 -k2,2n ./0vs50Min_r755s754.bed > ./0vs50Min_r755s755.bed
bedtools shuffle -seed 1 -i 0vs50Min_r755s755.bed -g Ecoli-genomesize.txt > ./0vs50Min_r756s755.bed
sort -k1,1 -k2,2n ./0vs50Min_r756s755.bed > ./0vs50Min_r756s756.bed
bedtools shuffle -seed 1 -i 0vs50Min_r756s756.bed -g Ecoli-genomesize.txt > ./0vs50Min_r757s756.bed
sort -k1,1 -k2,2n ./0vs50Min_r757s756.bed > ./0vs50Min_r757s757.bed
bedtools shuffle -seed 1 -i 0vs50Min_r757s757.bed -g Ecoli-genomesize.txt > ./0vs50Min_r758s757.bed
sort -k1,1 -k2,2n ./0vs50Min_r758s757.bed > ./0vs50Min_r758s758.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r758s758.bed -g Ecoli-genomesize.txt > ./0vs50Min_r759s758.bed
sort -k1,1 -k2,2n ./0vs50Min_r759s758.bed > ./0vs50Min_r759s759.bed
bedtools shuffle -seed 1 -i 0vs50Min_r759s759.bed -g Ecoli-genomesize.txt > ./0vs50Min_r760s759.bed
sort -k1,1 -k2,2n ./0vs50Min_r760s759.bed > ./0vs50Min_r760s760.bed
bedtools shuffle -seed 1 -i 0vs50Min_r760s760.bed -g Ecoli-genomesize.txt > ./0vs50Min_r761s760.bed
sort -k1,1 -k2,2n ./0vs50Min_r761s760.bed > ./0vs50Min_r761s761.bed
bedtools shuffle -seed 1 -i 0vs50Min_r761s761.bed -g Ecoli-genomesize.txt > ./0vs50Min_r762s761.bed
sort -k1,1 -k2,2n ./0vs50Min_r762s761.bed > ./0vs50Min_r762s762.bed
bedtools shuffle -seed 1 -i 0vs50Min_r762s762.bed -g Ecoli-genomesize.txt > ./0vs50Min_r763s762.bed
sort -k1,1 -k2,2n ./0vs50Min_r763s762.bed > ./0vs50Min_r763s763.bed
bedtools shuffle -seed 1 -i 0vs50Min_r763s763.bed -g Ecoli-genomesize.txt > ./0vs50Min_r764s763.bed
sort -k1,1 -k2,2n ./0vs50Min_r764s763.bed > ./0vs50Min_r764s764.bed
bedtools shuffle -seed 1 -i 0vs50Min_r764s764.bed -g Ecoli-genomesize.txt > ./0vs50Min_r765s764.bed
sort -k1,1 -k2,2n ./0vs50Min_r765s764.bed > ./0vs50Min_r765s765.bed
bedtools shuffle -seed 1 -i 0vs50Min_r765s765.bed -g Ecoli-genomesize.txt > ./0vs50Min_r766s765.bed
sort -k1,1 -k2,2n ./0vs50Min_r766s765.bed > ./0vs50Min_r766s766.bed
bedtools shuffle -seed 1 -i 0vs50Min_r766s766.bed -g Ecoli-genomesize.txt > ./0vs50Min_r767s766.bed
sort -k1,1 -k2,2n ./0vs50Min_r767s766.bed > ./0vs50Min_r767s767.bed
bedtools shuffle -seed 1 -i 0vs50Min_r767s767.bed -g Ecoli-genomesize.txt > ./0vs50Min_r768s767.bed
sort -k1,1 -k2,2n ./0vs50Min_r768s767.bed > ./0vs50Min_r768s768.bed
bedtools shuffle -seed 1 -i 0vs50Min_r768s768.bed -g Ecoli-genomesize.txt > ./0vs50Min_r769s768.bed
sort -k1,1 -k2,2n ./0vs50Min_r769s768.bed > ./0vs50Min_r769s769.bed
bedtools shuffle -seed 1 -i 0vs50Min_r769s769.bed -g Ecoli-genomesize.txt > ./0vs50Min_r770s769.bed
sort -k1,1 -k2,2n ./0vs50Min_r770s769.bed > ./0vs50Min_r770s770.bed
bedtools shuffle -seed 1 -i 0vs50Min_r770s770.bed -g Ecoli-genomesize.txt > ./0vs50Min_r771s770.bed
sort -k1,1 -k2,2n ./0vs50Min_r771s770.bed > ./0vs50Min_r771s771.bed
bedtools shuffle -seed 1 -i 0vs50Min_r771s771.bed -g Ecoli-genomesize.txt > ./0vs50Min_r772s771.bed
sort -k1,1 -k2,2n ./0vs50Min_r772s771.bed > ./0vs50Min_r772s772.bed
bedtools shuffle -seed 1 -i 0vs50Min_r772s772.bed -g Ecoli-genomesize.txt > ./0vs50Min_r773s772.bed
sort -k1,1 -k2,2n ./0vs50Min_r773s772.bed > ./0vs50Min_r773s773.bed
bedtools shuffle -seed 1 -i 0vs50Min_r773s773.bed -g Ecoli-genomesize.txt > ./0vs50Min_r774s773.bed
sort -k1,1 -k2,2n ./0vs50Min_r774s773.bed > ./0vs50Min_r774s774.bed
bedtools shuffle -seed 1 -i 0vs50Min_r774s774.bed -g Ecoli-genomesize.txt > ./0vs50Min_r775s774.bed
sort -k1,1 -k2,2n ./0vs50Min_r775s774.bed > ./0vs50Min_r775s775.bed
bedtools shuffle -seed 1 -i 0vs50Min_r775s775.bed -g Ecoli-genomesize.txt > ./0vs50Min_r776s775.bed
sort -k1,1 -k2,2n ./0vs50Min_r776s775.bed > ./0vs50Min_r776s776.bed
bedtools shuffle -seed 1 -i 0vs50Min_r776s776.bed -g Ecoli-genomesize.txt > ./0vs50Min_r777s776.bed
```

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sort -k1,1 -k2,2n ./0vs50Min_r777s776.bed > ./0vs50Min_r777s777.bed
bedtools shuffle -seed 1 -i 0vs50Min_r777s777.bed -g Ecoli-genomesize.txt > ./0vs50Min_r778s777.bed
sort -k1,1 -k2,2n ./0vs50Min_r778s777.bed > ./0vs50Min_r778s778.bed
bedtools shuffle -seed 1 -i 0vs50Min_r778s778.bed -g Ecoli-genomesize.txt > ./0vs50Min_r779s778.bed
sort -k1,1 -k2,2n ./0vs50Min_r779s778.bed > ./0vs50Min_r779s779.bed
bedtools shuffle -seed 1 -i 0vs50Min_r779s779.bed -g Ecoli-genomesize.txt > ./0vs50Min_r780s779.bed
sort -k1,1 -k2,2n ./0vs50Min_r780s779.bed > ./0vs50Min_r780s780.bed
bedtools shuffle -seed 1 -i 0vs50Min_r780s780.bed -g Ecoli-genomesize.txt > ./0vs50Min_r781s780.bed
sort -k1,1 -k2,2n ./0vs50Min_r781s780.bed > ./0vs50Min_r781s781.bed
bedtools shuffle -seed 1 -i 0vs50Min_r781s781.bed -g Ecoli-genomesize.txt > ./0vs50Min_r782s781.bed
sort -k1,1 -k2,2n ./0vs50Min_r782s781.bed > ./0vs50Min_r782s782.bed
bedtools shuffle -seed 1 -i 0vs50Min_r782s782.bed -g Ecoli-genomesize.txt > ./0vs50Min_r783s782.bed
sort -k1,1 -k2,2n ./0vs50Min_r783s782.bed > ./0vs50Min_r783s783.bed
bedtools shuffle -seed 1 -i 0vs50Min_r783s783.bed -g Ecoli-genomesize.txt > ./0vs50Min_r784s783.bed
sort -k1,1 -k2,2n ./0vs50Min_r784s783.bed > ./0vs50Min_r784s784.bed
bedtools shuffle -seed 1 -i 0vs50Min_r784s784.bed -g Ecoli-genomesize.txt > ./0vs50Min_r785s784.bed
sort -k1,1 -k2,2n ./0vs50Min_r785s784.bed > ./0vs50Min_r785s785.bed
bedtools shuffle -seed 1 -i 0vs50Min_r785s785.bed -g Ecoli-genomesize.txt > ./0vs50Min_r786s785.bed
sort -k1,1 -k2,2n ./0vs50Min_r786s785.bed > ./0vs50Min_r786s786.bed
bedtools shuffle -seed 1 -i 0vs50Min_r786s786.bed -g Ecoli-genomesize.txt > ./0vs50Min_r787s786.bed
sort -k1,1 -k2,2n ./0vs50Min_r787s786.bed > ./0vs50Min_r787s787.bed
bedtools shuffle -seed 1 -i 0vs50Min_r787s787.bed -g Ecoli-genomesize.txt > ./0vs50Min_r788s787.bed
sort -k1,1 -k2,2n ./0vs50Min_r788s787.bed > ./0vs50Min_r788s788.bed
bedtools shuffle -seed 1 -i 0vs50Min_r788s788.bed -g Ecoli-genomesize.txt > ./0vs50Min_r789s788.bed
sort -k1,1 -k2,2n ./0vs50Min_r789s788.bed > ./0vs50Min_r789s789.bed
bedtools shuffle -seed 1 -i 0vs50Min_r789s789.bed -g Ecoli-genomesize.txt > ./0vs50Min_r790s789.bed
sort -k1,1 -k2,2n ./0vs50Min_r790s789.bed > ./0vs50Min_r790s790.bed
bedtools shuffle -seed 1 -i 0vs50Min_r790s790.bed -g Ecoli-genomesize.txt > ./0vs50Min_r791s790.bed
sort -k1,1 -k2,2n ./0vs50Min_r791s790.bed > ./0vs50Min_r791s791.bed
bedtools shuffle -seed 1 -i 0vs50Min_r791s791.bed -g Ecoli-genomesize.txt > ./0vs50Min_r792s791.bed
sort -k1,1 -k2,2n ./0vs50Min_r792s791.bed > ./0vs50Min_r792s792.bed
bedtools shuffle -seed 1 -i 0vs50Min_r792s792.bed -g Ecoli-genomesize.txt > ./0vs50Min_r793s792.bed
sort -k1,1 -k2,2n ./0vs50Min_r793s792.bed > ./0vs50Min_r793s793.bed
bedtools shuffle -seed 1 -i 0vs50Min_r793s793.bed -g Ecoli-genomesize.txt > ./0vs50Min_r794s793.bed
sort -k1,1 -k2,2n ./0vs50Min_r794s793.bed > ./0vs50Min_r794s794.bed
bedtools shuffle -seed 1 -i 0vs50Min_r794s794.bed -g Ecoli-genomesize.txt > ./0vs50Min_r795s794.bed
sort -k1,1 -k2,2n ./0vs50Min_r795s794.bed > ./0vs50Min_r795s795.bed
```

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bedtools shuffle -seed 1 -i 0vs50Min_r795s795.bed -g Ecoli-genomesize.txt > ./0vs50Min_r796s795.bed
sort -k1,1 -k2,2n ./0vs50Min_r796s795.bed > ./0vs50Min_r796s796.bed
bedtools shuffle -seed 1 -i 0vs50Min_r796s796.bed -g Ecoli-genomesize.txt > ./0vs50Min_r797s796.bed
sort -k1,1 -k2,2n ./0vs50Min_r797s796.bed > ./0vs50Min_r797s797.bed
bedtools shuffle -seed 1 -i 0vs50Min_r797s797.bed -g Ecoli-genomesize.txt > ./0vs50Min_r798s797.bed
sort -k1,1 -k2,2n ./0vs50Min_r798s797.bed > ./0vs50Min_r798s798.bed
bedtools shuffle -seed 1 -i 0vs50Min_r798s798.bed -g Ecoli-genomesize.txt > ./0vs50Min_r799s798.bed
sort -k1,1 -k2,2n ./0vs50Min_r799s798.bed > ./0vs50Min_r799s799.bed
bedtools shuffle -seed 1 -i 0vs50Min_r799s799.bed -g Ecoli-genomesize.txt > ./0vs50Min_r800s799.bed
sort -k1,1 -k2,2n ./0vs50Min_r800s799.bed > ./0vs50Min_r800s800.bed
bedtools shuffle -seed 1 -i 0vs50Min_r800s800.bed -g Ecoli-genomesize.txt > ./0vs50Min_r801s800.bed
sort -k1,1 -k2,2n ./0vs50Min_r801s800.bed > ./0vs50Min_r801s801.bed
bedtools shuffle -seed 1 -i 0vs50Min_r801s801.bed -g Ecoli-genomesize.txt > ./0vs50Min_r802s801.bed
sort -k1,1 -k2,2n ./0vs50Min_r802s801.bed > ./0vs50Min_r802s802.bed
bedtools shuffle -seed 1 -i 0vs50Min_r802s802.bed -g Ecoli-genomesize.txt > ./0vs50Min_r803s802.bed
sort -k1,1 -k2,2n ./0vs50Min_r803s802.bed > ./0vs50Min_r803s803.bed
bedtools shuffle -seed 1 -i 0vs50Min_r803s803.bed -g Ecoli-genomesize.txt > ./0vs50Min_r804s803.bed
sort -k1,1 -k2,2n ./0vs50Min_r804s803.bed > ./0vs50Min_r804s804.bed
bedtools shuffle -seed 1 -i 0vs50Min_r804s804.bed -g Ecoli-genomesize.txt > ./0vs50Min_r805s804.bed
sort -k1,1 -k2,2n ./0vs50Min_r805s804.bed > ./0vs50Min_r805s805.bed
bedtools shuffle -seed 1 -i 0vs50Min_r805s805.bed -g Ecoli-genomesize.txt > ./0vs50Min_r806s805.bed
sort -k1,1 -k2,2n ./0vs50Min_r806s805.bed > ./0vs50Min_r806s806.bed
bedtools shuffle -seed 1 -i 0vs50Min_r806s806.bed -g Ecoli-genomesize.txt > ./0vs50Min_r807s806.bed
sort -k1,1 -k2,2n ./0vs50Min_r807s806.bed > ./0vs50Min_r807s807.bed
bedtools shuffle -seed 1 -i 0vs50Min_r807s807.bed -g Ecoli-genomesize.txt > ./0vs50Min_r808s807.bed
sort -k1,1 -k2,2n ./0vs50Min_r808s807.bed > ./0vs50Min_r808s808.bed
bedtools shuffle -seed 1 -i 0vs50Min_r808s808.bed -g Ecoli-genomesize.txt > ./0vs50Min_r809s808.bed
sort -k1,1 -k2,2n ./0vs50Min_r809s808.bed > ./0vs50Min_r809s809.bed
bedtools shuffle -seed 1 -i 0vs50Min_r809s809.bed -g Ecoli-genomesize.txt > ./0vs50Min_r810s809.bed
sort -k1,1 -k2,2n ./0vs50Min_r810s809.bed > ./0vs50Min_r810s810.bed
bedtools shuffle -seed 1 -i 0vs50Min_r810s810.bed -g Ecoli-genomesize.txt > ./0vs50Min_r811s810.bed
sort -k1,1 -k2,2n ./0vs50Min_r811s810.bed > ./0vs50Min_r811s811.bed
bedtools shuffle -seed 1 -i 0vs50Min_r811s811.bed -g Ecoli-genomesize.txt > ./0vs50Min_r812s811.bed
sort -k1,1 -k2,2n ./0vs50Min_r812s811.bed > ./0vs50Min_r812s812.bed
bedtools shuffle -seed 1 -i 0vs50Min_r812s812.bed -g Ecoli-genomesize.txt > ./0vs50Min_r813s812.bed
sort -k1,1 -k2,2n ./0vs50Min_r813s812.bed > ./0vs50Min_r813s813.bed
bedtools shuffle -seed 1 -i 0vs50Min_r813s813.bed -g Ecoli-genomesize.txt > ./0vs50Min_r814s813.bed
```

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sort -k1,1 -k2,2n ./0vs50Min_r814s813.bed > ./0vs50Min_r814s814.bed
bedtools shuffle -seed 1 -i 0vs50Min_r814s814.bed -g Ecoli-genomesize.txt > ./0vs50Min_r815s814.bed
sort -k1,1 -k2,2n ./0vs50Min_r815s814.bed > ./0vs50Min_r815s815.bed
bedtools shuffle -seed 1 -i 0vs50Min_r815s815.bed -g Ecoli-genomesize.txt > ./0vs50Min_r816s815.bed
sort -k1,1 -k2,2n ./0vs50Min_r816s815.bed > ./0vs50Min_r816s816.bed
bedtools shuffle -seed 1 -i 0vs50Min_r816s816.bed -g Ecoli-genomesize.txt > ./0vs50Min_r817s816.bed
sort -k1,1 -k2,2n ./0vs50Min_r817s816.bed > ./0vs50Min_r817s817.bed
bedtools shuffle -seed 1 -i 0vs50Min_r817s817.bed -g Ecoli-genomesize.txt > ./0vs50Min_r818s817.bed
sort -k1,1 -k2,2n ./0vs50Min_r818s817.bed > ./0vs50Min_r818s818.bed
bedtools shuffle -seed 1 -i 0vs50Min_r818s818.bed -g Ecoli-genomesize.txt > ./0vs50Min_r819s818.bed
sort -k1,1 -k2,2n ./0vs50Min_r819s818.bed > ./0vs50Min_r819s819.bed
bedtools shuffle -seed 1 -i 0vs50Min_r819s819.bed -g Ecoli-genomesize.txt > ./0vs50Min_r820s819.bed
sort -k1,1 -k2,2n ./0vs50Min_r820s819.bed > ./0vs50Min_r820s820.bed
bedtools shuffle -seed 1 -i 0vs50Min_r820s820.bed -g Ecoli-genomesize.txt > ./0vs50Min_r821s820.bed
sort -k1,1 -k2,2n ./0vs50Min_r821s820.bed > ./0vs50Min_r821s821.bed
bedtools shuffle -seed 1 -i 0vs50Min_r821s821.bed -g Ecoli-genomesize.txt > ./0vs50Min_r822s821.bed
sort -k1,1 -k2,2n ./0vs50Min_r822s821.bed > ./0vs50Min_r822s822.bed
bedtools shuffle -seed 1 -i 0vs50Min_r822s822.bed -g Ecoli-genomesize.txt > ./0vs50Min_r823s822.bed
sort -k1,1 -k2,2n ./0vs50Min_r823s822.bed > ./0vs50Min_r823s823.bed
bedtools shuffle -seed 1 -i 0vs50Min_r823s823.bed -g Ecoli-genomesize.txt > ./0vs50Min_r824s823.bed
sort -k1,1 -k2,2n ./0vs50Min_r824s823.bed > ./0vs50Min_r824s824.bed
bedtools shuffle -seed 1 -i 0vs50Min_r824s824.bed -g Ecoli-genomesize.txt > ./0vs50Min_r825s824.bed
sort -k1,1 -k2,2n ./0vs50Min_r825s824.bed > ./0vs50Min_r825s825.bed
bedtools shuffle -seed 1 -i 0vs50Min_r825s825.bed -g Ecoli-genomesize.txt > ./0vs50Min_r826s825.bed
sort -k1,1 -k2,2n ./0vs50Min_r826s825.bed > ./0vs50Min_r826s826.bed
bedtools shuffle -seed 1 -i 0vs50Min_r826s826.bed -g Ecoli-genomesize.txt > ./0vs50Min_r827s826.bed
sort -k1,1 -k2,2n ./0vs50Min_r827s826.bed > ./0vs50Min_r827s827.bed
bedtools shuffle -seed 1 -i 0vs50Min_r827s827.bed -g Ecoli-genomesize.txt > ./0vs50Min_r828s827.bed
sort -k1,1 -k2,2n ./0vs50Min_r828s827.bed > ./0vs50Min_r828s828.bed
bedtools shuffle -seed 1 -i 0vs50Min_r828s828.bed -g Ecoli-genomesize.txt > ./0vs50Min_r829s828.bed
sort -k1,1 -k2,2n ./0vs50Min_r829s828.bed > ./0vs50Min_r829s829.bed
bedtools shuffle -seed 1 -i 0vs50Min_r829s829.bed -g Ecoli-genomesize.txt > ./0vs50Min_r830s829.bed
sort -k1,1 -k2,2n ./0vs50Min_r830s829.bed > ./0vs50Min_r830s830.bed
bedtools shuffle -seed 1 -i 0vs50Min_r830s830.bed -g Ecoli-genomesize.txt > ./0vs50Min_r831s830.bed
sort -k1,1 -k2,2n ./0vs50Min_r831s830.bed > ./0vs50Min_r831s831.bed
bedtools shuffle -seed 1 -i 0vs50Min_r831s831.bed -g Ecoli-genomesize.txt > ./0vs50Min_r832s831.bed
sort -k1,1 -k2,2n ./0vs50Min_r832s831.bed > ./0vs50Min_r832s832.bed
```

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bedtools shuffle -seed 1 -i 0vs50Min_r832s832.bed -g Ecoli-genomesize.txt > ./0vs50Min_r833s832.bed
sort -k1,1 -k2,2n ./0vs50Min_r833s832.bed > ./0vs50Min_r833s833.bed
bedtools shuffle -seed 1 -i 0vs50Min_r833s833.bed -g Ecoli-genomesize.txt > ./0vs50Min_r834s833.bed
sort -k1,1 -k2,2n ./0vs50Min_r834s833.bed > ./0vs50Min_r834s834.bed
bedtools shuffle -seed 1 -i 0vs50Min_r834s834.bed -g Ecoli-genomesize.txt > ./0vs50Min_r835s834.bed
sort -k1,1 -k2,2n ./0vs50Min_r835s834.bed > ./0vs50Min_r835s835.bed
bedtools shuffle -seed 1 -i 0vs50Min_r835s835.bed -g Ecoli-genomesize.txt > ./0vs50Min_r836s835.bed
sort -k1,1 -k2,2n ./0vs50Min_r836s835.bed > ./0vs50Min_r836s836.bed
bedtools shuffle -seed 1 -i 0vs50Min_r836s836.bed -g Ecoli-genomesize.txt > ./0vs50Min_r837s836.bed
sort -k1,1 -k2,2n ./0vs50Min_r837s836.bed > ./0vs50Min_r837s837.bed
bedtools shuffle -seed 1 -i 0vs50Min_r837s837.bed -g Ecoli-genomesize.txt > ./0vs50Min_r838s837.bed
sort -k1,1 -k2,2n ./0vs50Min_r838s837.bed > ./0vs50Min_r838s838.bed
bedtools shuffle -seed 1 -i 0vs50Min_r838s838.bed -g Ecoli-genomesize.txt > ./0vs50Min_r839s838.bed
sort -k1,1 -k2,2n ./0vs50Min_r839s838.bed > ./0vs50Min_r839s839.bed
bedtools shuffle -seed 1 -i 0vs50Min_r839s839.bed -g Ecoli-genomesize.txt > ./0vs50Min_r840s839.bed
sort -k1,1 -k2,2n ./0vs50Min_r840s839.bed > ./0vs50Min_r840s840.bed
bedtools shuffle -seed 1 -i 0vs50Min_r840s840.bed -g Ecoli-genomesize.txt > ./0vs50Min_r841s840.bed
sort -k1,1 -k2,2n ./0vs50Min_r841s840.bed > ./0vs50Min_r841s841.bed
bedtools shuffle -seed 1 -i 0vs50Min_r841s841.bed -g Ecoli-genomesize.txt > ./0vs50Min_r842s841.bed
sort -k1,1 -k2,2n ./0vs50Min_r842s841.bed > ./0vs50Min_r842s842.bed
bedtools shuffle -seed 1 -i 0vs50Min_r842s842.bed -g Ecoli-genomesize.txt > ./0vs50Min_r843s842.bed
sort -k1,1 -k2,2n ./0vs50Min_r843s842.bed > ./0vs50Min_r843s843.bed
bedtools shuffle -seed 1 -i 0vs50Min_r843s843.bed -g Ecoli-genomesize.txt > ./0vs50Min_r844s843.bed
sort -k1,1 -k2,2n ./0vs50Min_r844s843.bed > ./0vs50Min_r844s844.bed
bedtools shuffle -seed 1 -i 0vs50Min_r844s844.bed -g Ecoli-genomesize.txt > ./0vs50Min_r845s844.bed
sort -k1,1 -k2,2n ./0vs50Min_r845s844.bed > ./0vs50Min_r845s845.bed
bedtools shuffle -seed 1 -i 0vs50Min_r845s845.bed -g Ecoli-genomesize.txt > ./0vs50Min_r846s845.bed
sort -k1,1 -k2,2n ./0vs50Min_r846s845.bed > ./0vs50Min_r846s846.bed
bedtools shuffle -seed 1 -i 0vs50Min_r846s846.bed -g Ecoli-genomesize.txt > ./0vs50Min_r847s846.bed
sort -k1,1 -k2,2n ./0vs50Min_r847s846.bed > ./0vs50Min_r847s847.bed
bedtools shuffle -seed 1 -i 0vs50Min_r847s847.bed -g Ecoli-genomesize.txt > ./0vs50Min_r848s847.bed
sort -k1,1 -k2,2n ./0vs50Min_r848s847.bed > ./0vs50Min_r848s848.bed
bedtools shuffle -seed 1 -i 0vs50Min_r848s848.bed -g Ecoli-genomesize.txt > ./0vs50Min_r849s848.bed
sort -k1,1 -k2,2n ./0vs50Min_r849s848.bed > ./0vs50Min_r849s849.bed
bedtools shuffle -seed 1 -i 0vs50Min_r849s849.bed -g Ecoli-genomesize.txt > ./0vs50Min_r850s849.bed
sort -k1,1 -k2,2n ./0vs50Min_r850s849.bed > ./0vs50Min_r850s850.bed
bedtools shuffle -seed 1 -i 0vs50Min_r850s850.bed -g Ecoli-genomesize.txt > ./0vs50Min_r851s850.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r851s850.bed > ./0vs50Min_r851s851.bed
bedtools shuffle -seed 1 -i 0vs50Min_r851s851.bed -g Ecoli-genomesize.txt > ./0vs50Min_r852s851.bed
sort -k1,1 -k2,2n ./0vs50Min_r852s851.bed > ./0vs50Min_r852s852.bed
bedtools shuffle -seed 1 -i 0vs50Min_r852s852.bed -g Ecoli-genomesize.txt > ./0vs50Min_r853s852.bed
sort -k1,1 -k2,2n ./0vs50Min_r853s852.bed > ./0vs50Min_r853s853.bed
bedtools shuffle -seed 1 -i 0vs50Min_r853s853.bed -g Ecoli-genomesize.txt > ./0vs50Min_r854s853.bed
sort -k1,1 -k2,2n ./0vs50Min_r854s853.bed > ./0vs50Min_r854s854.bed
bedtools shuffle -seed 1 -i 0vs50Min_r854s854.bed -g Ecoli-genomesize.txt > ./0vs50Min_r855s854.bed
sort -k1,1 -k2,2n ./0vs50Min_r855s854.bed > ./0vs50Min_r855s855.bed
bedtools shuffle -seed 1 -i 0vs50Min_r855s855.bed -g Ecoli-genomesize.txt > ./0vs50Min_r856s855.bed
sort -k1,1 -k2,2n ./0vs50Min_r856s855.bed > ./0vs50Min_r856s856.bed
bedtools shuffle -seed 1 -i 0vs50Min_r856s856.bed -g Ecoli-genomesize.txt > ./0vs50Min_r857s856.bed
sort -k1,1 -k2,2n ./0vs50Min_r857s856.bed > ./0vs50Min_r857s857.bed
bedtools shuffle -seed 1 -i 0vs50Min_r857s857.bed -g Ecoli-genomesize.txt > ./0vs50Min_r858s857.bed
sort -k1,1 -k2,2n ./0vs50Min_r858s857.bed > ./0vs50Min_r858s858.bed
bedtools shuffle -seed 1 -i 0vs50Min_r858s858.bed -g Ecoli-genomesize.txt > ./0vs50Min_r859s858.bed
sort -k1,1 -k2,2n ./0vs50Min_r859s858.bed > ./0vs50Min_r859s859.bed
bedtools shuffle -seed 1 -i 0vs50Min_r859s859.bed -g Ecoli-genomesize.txt > ./0vs50Min_r860s859.bed
sort -k1,1 -k2,2n ./0vs50Min_r860s859.bed > ./0vs50Min_r860s860.bed
bedtools shuffle -seed 1 -i 0vs50Min_r860s860.bed -g Ecoli-genomesize.txt > ./0vs50Min_r861s860.bed
sort -k1,1 -k2,2n ./0vs50Min_r861s860.bed > ./0vs50Min_r861s861.bed
bedtools shuffle -seed 1 -i 0vs50Min_r861s861.bed -g Ecoli-genomesize.txt > ./0vs50Min_r862s861.bed
sort -k1,1 -k2,2n ./0vs50Min_r862s861.bed > ./0vs50Min_r862s862.bed
bedtools shuffle -seed 1 -i 0vs50Min_r862s862.bed -g Ecoli-genomesize.txt > ./0vs50Min_r863s862.bed
sort -k1,1 -k2,2n ./0vs50Min_r863s862.bed > ./0vs50Min_r863s863.bed
bedtools shuffle -seed 1 -i 0vs50Min_r863s863.bed -g Ecoli-genomesize.txt > ./0vs50Min_r864s863.bed
sort -k1,1 -k2,2n ./0vs50Min_r864s863.bed > ./0vs50Min_r864s864.bed
bedtools shuffle -seed 1 -i 0vs50Min_r864s864.bed -g Ecoli-genomesize.txt > ./0vs50Min_r865s864.bed
sort -k1,1 -k2,2n ./0vs50Min_r865s864.bed > ./0vs50Min_r865s865.bed
bedtools shuffle -seed 1 -i 0vs50Min_r865s865.bed -g Ecoli-genomesize.txt > ./0vs50Min_r866s865.bed
sort -k1,1 -k2,2n ./0vs50Min_r866s865.bed > ./0vs50Min_r866s866.bed
bedtools shuffle -seed 1 -i 0vs50Min_r866s866.bed -g Ecoli-genomesize.txt > ./0vs50Min_r867s866.bed
sort -k1,1 -k2,2n ./0vs50Min_r867s866.bed > ./0vs50Min_r867s867.bed
bedtools shuffle -seed 1 -i 0vs50Min_r867s867.bed -g Ecoli-genomesize.txt > ./0vs50Min_r868s867.bed
sort -k1,1 -k2,2n ./0vs50Min_r868s867.bed > ./0vs50Min_r868s868.bed
bedtools shuffle -seed 1 -i 0vs50Min_r868s868.bed -g Ecoli-genomesize.txt > ./0vs50Min_r869s868.bed
sort -k1,1 -k2,2n ./0vs50Min_r869s868.bed > ./0vs50Min_r869s869.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r869s869.bed -g Ecoli-genomesize.txt > ./0vs50Min_r870s869.bed
sort -k1,1 -k2,2n ./0vs50Min_r870s869.bed > ./0vs50Min_r870s870.bed
bedtools shuffle -seed 1 -i 0vs50Min_r870s870.bed -g Ecoli-genomesize.txt > ./0vs50Min_r871s870.bed
sort -k1,1 -k2,2n ./0vs50Min_r871s870.bed > ./0vs50Min_r871s871.bed
bedtools shuffle -seed 1 -i 0vs50Min_r871s871.bed -g Ecoli-genomesize.txt > ./0vs50Min_r872s871.bed
sort -k1,1 -k2,2n ./0vs50Min_r872s871.bed > ./0vs50Min_r872s872.bed
bedtools shuffle -seed 1 -i 0vs50Min_r872s872.bed -g Ecoli-genomesize.txt > ./0vs50Min_r873s872.bed
sort -k1,1 -k2,2n ./0vs50Min_r873s872.bed > ./0vs50Min_r873s873.bed
bedtools shuffle -seed 1 -i 0vs50Min_r873s873.bed -g Ecoli-genomesize.txt > ./0vs50Min_r874s873.bed
sort -k1,1 -k2,2n ./0vs50Min_r874s873.bed > ./0vs50Min_r874s874.bed
bedtools shuffle -seed 1 -i 0vs50Min_r874s874.bed -g Ecoli-genomesize.txt > ./0vs50Min_r875s874.bed
sort -k1,1 -k2,2n ./0vs50Min_r875s874.bed > ./0vs50Min_r875s875.bed
bedtools shuffle -seed 1 -i 0vs50Min_r875s875.bed -g Ecoli-genomesize.txt > ./0vs50Min_r876s875.bed
sort -k1,1 -k2,2n ./0vs50Min_r876s875.bed > ./0vs50Min_r876s876.bed
bedtools shuffle -seed 1 -i 0vs50Min_r876s876.bed -g Ecoli-genomesize.txt > ./0vs50Min_r877s876.bed
sort -k1,1 -k2,2n ./0vs50Min_r877s876.bed > ./0vs50Min_r877s877.bed
bedtools shuffle -seed 1 -i 0vs50Min_r877s877.bed -g Ecoli-genomesize.txt > ./0vs50Min_r878s877.bed
sort -k1,1 -k2,2n ./0vs50Min_r878s877.bed > ./0vs50Min_r878s878.bed
bedtools shuffle -seed 1 -i 0vs50Min_r878s878.bed -g Ecoli-genomesize.txt > ./0vs50Min_r879s878.bed
sort -k1,1 -k2,2n ./0vs50Min_r879s878.bed > ./0vs50Min_r879s879.bed
bedtools shuffle -seed 1 -i 0vs50Min_r879s879.bed -g Ecoli-genomesize.txt > ./0vs50Min_r880s879.bed
sort -k1,1 -k2,2n ./0vs50Min_r880s879.bed > ./0vs50Min_r880s880.bed
bedtools shuffle -seed 1 -i 0vs50Min_r880s880.bed -g Ecoli-genomesize.txt > ./0vs50Min_r881s880.bed
sort -k1,1 -k2,2n ./0vs50Min_r881s880.bed > ./0vs50Min_r881s881.bed
bedtools shuffle -seed 1 -i 0vs50Min_r881s881.bed -g Ecoli-genomesize.txt > ./0vs50Min_r882s881.bed
sort -k1,1 -k2,2n ./0vs50Min_r882s881.bed > ./0vs50Min_r882s882.bed
bedtools shuffle -seed 1 -i 0vs50Min_r882s882.bed -g Ecoli-genomesize.txt > ./0vs50Min_r883s882.bed
sort -k1,1 -k2,2n ./0vs50Min_r883s882.bed > ./0vs50Min_r883s883.bed
bedtools shuffle -seed 1 -i 0vs50Min_r883s883.bed -g Ecoli-genomesize.txt > ./0vs50Min_r884s883.bed
sort -k1,1 -k2,2n ./0vs50Min_r884s883.bed > ./0vs50Min_r884s884.bed
bedtools shuffle -seed 1 -i 0vs50Min_r884s884.bed -g Ecoli-genomesize.txt > ./0vs50Min_r885s884.bed
sort -k1,1 -k2,2n ./0vs50Min_r885s884.bed > ./0vs50Min_r885s885.bed
bedtools shuffle -seed 1 -i 0vs50Min_r885s885.bed -g Ecoli-genomesize.txt > ./0vs50Min_r886s885.bed
sort -k1,1 -k2,2n ./0vs50Min_r886s885.bed > ./0vs50Min_r886s886.bed
bedtools shuffle -seed 1 -i 0vs50Min_r886s886.bed -g Ecoli-genomesize.txt > ./0vs50Min_r887s886.bed
sort -k1,1 -k2,2n ./0vs50Min_r887s886.bed > ./0vs50Min_r887s887.bed
bedtools shuffle -seed 1 -i 0vs50Min_r887s887.bed -g Ecoli-genomesize.txt > ./0vs50Min_r888s887.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r888s887.bed > ./0vs50Min_r888s888.bed
bedtools shuffle -seed 1 -i 0vs50Min_r888s888.bed -g Ecoli-genomesize.txt > ./0vs50Min_r889s888.bed
sort -k1,1 -k2,2n ./0vs50Min_r889s888.bed > ./0vs50Min_r889s889.bed
bedtools shuffle -seed 1 -i 0vs50Min_r889s889.bed -g Ecoli-genomesize.txt > ./0vs50Min_r890s889.bed
sort -k1,1 -k2,2n ./0vs50Min_r890s889.bed > ./0vs50Min_r890s890.bed
bedtools shuffle -seed 1 -i 0vs50Min_r890s890.bed -g Ecoli-genomesize.txt > ./0vs50Min_r891s890.bed
sort -k1,1 -k2,2n ./0vs50Min_r891s890.bed > ./0vs50Min_r891s891.bed
bedtools shuffle -seed 1 -i 0vs50Min_r891s891.bed -g Ecoli-genomesize.txt > ./0vs50Min_r892s891.bed
sort -k1,1 -k2,2n ./0vs50Min_r892s891.bed > ./0vs50Min_r892s892.bed
bedtools shuffle -seed 1 -i 0vs50Min_r892s892.bed -g Ecoli-genomesize.txt > ./0vs50Min_r893s892.bed
sort -k1,1 -k2,2n ./0vs50Min_r893s892.bed > ./0vs50Min_r893s893.bed
bedtools shuffle -seed 1 -i 0vs50Min_r893s893.bed -g Ecoli-genomesize.txt > ./0vs50Min_r894s893.bed
sort -k1,1 -k2,2n ./0vs50Min_r894s893.bed > ./0vs50Min_r894s894.bed
bedtools shuffle -seed 1 -i 0vs50Min_r894s894.bed -g Ecoli-genomesize.txt > ./0vs50Min_r895s894.bed
sort -k1,1 -k2,2n ./0vs50Min_r895s894.bed > ./0vs50Min_r895s895.bed
bedtools shuffle -seed 1 -i 0vs50Min_r895s895.bed -g Ecoli-genomesize.txt > ./0vs50Min_r896s895.bed
sort -k1,1 -k2,2n ./0vs50Min_r896s895.bed > ./0vs50Min_r896s896.bed
bedtools shuffle -seed 1 -i 0vs50Min_r896s896.bed -g Ecoli-genomesize.txt > ./0vs50Min_r897s896.bed
sort -k1,1 -k2,2n ./0vs50Min_r897s896.bed > ./0vs50Min_r897s897.bed
bedtools shuffle -seed 1 -i 0vs50Min_r897s897.bed -g Ecoli-genomesize.txt > ./0vs50Min_r898s897.bed
sort -k1,1 -k2,2n ./0vs50Min_r898s897.bed > ./0vs50Min_r898s898.bed
bedtools shuffle -seed 1 -i 0vs50Min_r898s898.bed -g Ecoli-genomesize.txt > ./0vs50Min_r899s898.bed
sort -k1,1 -k2,2n ./0vs50Min_r899s898.bed > ./0vs50Min_r899s899.bed
bedtools shuffle -seed 1 -i 0vs50Min_r899s899.bed -g Ecoli-genomesize.txt > ./0vs50Min_r900s899.bed
sort -k1,1 -k2,2n ./0vs50Min_r900s899.bed > ./0vs50Min_r900s900.bed
bedtools shuffle -seed 1 -i 0vs50Min_r900s900.bed -g Ecoli-genomesize.txt > ./0vs50Min_r901s900.bed
sort -k1,1 -k2,2n ./0vs50Min_r901s900.bed > ./0vs50Min_r901s901.bed
bedtools shuffle -seed 1 -i 0vs50Min_r901s901.bed -g Ecoli-genomesize.txt > ./0vs50Min_r902s901.bed
sort -k1,1 -k2,2n ./0vs50Min_r902s901.bed > ./0vs50Min_r902s902.bed
bedtools shuffle -seed 1 -i 0vs50Min_r902s902.bed -g Ecoli-genomesize.txt > ./0vs50Min_r903s902.bed
sort -k1,1 -k2,2n ./0vs50Min_r903s902.bed > ./0vs50Min_r903s903.bed
bedtools shuffle -seed 1 -i 0vs50Min_r903s903.bed -g Ecoli-genomesize.txt > ./0vs50Min_r904s903.bed
sort -k1,1 -k2,2n ./0vs50Min_r904s903.bed > ./0vs50Min_r904s904.bed
bedtools shuffle -seed 1 -i 0vs50Min_r904s904.bed -g Ecoli-genomesize.txt > ./0vs50Min_r905s904.bed
sort -k1,1 -k2,2n ./0vs50Min_r905s904.bed > ./0vs50Min_r905s905.bed
bedtools shuffle -seed 1 -i 0vs50Min_r905s905.bed -g Ecoli-genomesize.txt > ./0vs50Min_r906s905.bed
sort -k1,1 -k2,2n ./0vs50Min_r906s905.bed > ./0vs50Min_r906s906.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r906s906.bed -g Ecoli-genomesize.txt > ./0vs50Min_r907s906.bed
sort -k1,1 -k2,2n ./0vs50Min_r907s906.bed > ./0vs50Min_r907s907.bed
bedtools shuffle -seed 1 -i 0vs50Min_r907s907.bed -g Ecoli-genomesize.txt > ./0vs50Min_r908s907.bed
sort -k1,1 -k2,2n ./0vs50Min_r908s907.bed > ./0vs50Min_r908s908.bed
bedtools shuffle -seed 1 -i 0vs50Min_r908s908.bed -g Ecoli-genomesize.txt > ./0vs50Min_r909s908.bed
sort -k1,1 -k2,2n ./0vs50Min_r909s908.bed > ./0vs50Min_r909s909.bed
bedtools shuffle -seed 1 -i 0vs50Min_r909s909.bed -g Ecoli-genomesize.txt > ./0vs50Min_r910s909.bed
sort -k1,1 -k2,2n ./0vs50Min_r910s909.bed > ./0vs50Min_r910s910.bed
bedtools shuffle -seed 1 -i 0vs50Min_r910s910.bed -g Ecoli-genomesize.txt > ./0vs50Min_r911s910.bed
sort -k1,1 -k2,2n ./0vs50Min_r911s910.bed > ./0vs50Min_r911s911.bed
bedtools shuffle -seed 1 -i 0vs50Min_r911s911.bed -g Ecoli-genomesize.txt > ./0vs50Min_r912s911.bed
sort -k1,1 -k2,2n ./0vs50Min_r912s911.bed > ./0vs50Min_r912s912.bed
bedtools shuffle -seed 1 -i 0vs50Min_r912s912.bed -g Ecoli-genomesize.txt > ./0vs50Min_r913s912.bed
sort -k1,1 -k2,2n ./0vs50Min_r913s912.bed > ./0vs50Min_r913s913.bed
bedtools shuffle -seed 1 -i 0vs50Min_r913s913.bed -g Ecoli-genomesize.txt > ./0vs50Min_r914s913.bed
sort -k1,1 -k2,2n ./0vs50Min_r914s913.bed > ./0vs50Min_r914s914.bed
bedtools shuffle -seed 1 -i 0vs50Min_r914s914.bed -g Ecoli-genomesize.txt > ./0vs50Min_r915s914.bed
sort -k1,1 -k2,2n ./0vs50Min_r915s914.bed > ./0vs50Min_r915s915.bed
bedtools shuffle -seed 1 -i 0vs50Min_r915s915.bed -g Ecoli-genomesize.txt > ./0vs50Min_r916s915.bed
sort -k1,1 -k2,2n ./0vs50Min_r916s915.bed > ./0vs50Min_r916s916.bed
bedtools shuffle -seed 1 -i 0vs50Min_r916s916.bed -g Ecoli-genomesize.txt > ./0vs50Min_r917s916.bed
sort -k1,1 -k2,2n ./0vs50Min_r917s916.bed > ./0vs50Min_r917s917.bed
bedtools shuffle -seed 1 -i 0vs50Min_r917s917.bed -g Ecoli-genomesize.txt > ./0vs50Min_r918s917.bed
sort -k1,1 -k2,2n ./0vs50Min_r918s917.bed > ./0vs50Min_r918s918.bed
bedtools shuffle -seed 1 -i 0vs50Min_r918s918.bed -g Ecoli-genomesize.txt > ./0vs50Min_r919s918.bed
sort -k1,1 -k2,2n ./0vs50Min_r919s918.bed > ./0vs50Min_r919s919.bed
bedtools shuffle -seed 1 -i 0vs50Min_r919s919.bed -g Ecoli-genomesize.txt > ./0vs50Min_r920s919.bed
sort -k1,1 -k2,2n ./0vs50Min_r920s919.bed > ./0vs50Min_r920s920.bed
bedtools shuffle -seed 1 -i 0vs50Min_r920s920.bed -g Ecoli-genomesize.txt > ./0vs50Min_r921s920.bed
sort -k1,1 -k2,2n ./0vs50Min_r921s920.bed > ./0vs50Min_r921s921.bed
bedtools shuffle -seed 1 -i 0vs50Min_r921s921.bed -g Ecoli-genomesize.txt > ./0vs50Min_r922s921.bed
sort -k1,1 -k2,2n ./0vs50Min_r922s921.bed > ./0vs50Min_r922s922.bed
bedtools shuffle -seed 1 -i 0vs50Min_r922s922.bed -g Ecoli-genomesize.txt > ./0vs50Min_r923s922.bed
sort -k1,1 -k2,2n ./0vs50Min_r923s922.bed > ./0vs50Min_r923s923.bed
bedtools shuffle -seed 1 -i 0vs50Min_r923s923.bed -g Ecoli-genomesize.txt > ./0vs50Min_r924s923.bed
sort -k1,1 -k2,2n ./0vs50Min_r924s923.bed > ./0vs50Min_r924s924.bed
bedtools shuffle -seed 1 -i 0vs50Min_r924s924.bed -g Ecoli-genomesize.txt > ./0vs50Min_r925s924.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r925s924.bed > ./0vs50Min_r925s925.bed
bedtools shuffle -seed 1 -i 0vs50Min_r925s925.bed -g Ecoli-genomesize.txt > ./0vs50Min_r926s925.bed
sort -k1,1 -k2,2n ./0vs50Min_r926s925.bed > ./0vs50Min_r926s926.bed
bedtools shuffle -seed 1 -i 0vs50Min_r926s926.bed -g Ecoli-genomesize.txt > ./0vs50Min_r927s926.bed
sort -k1,1 -k2,2n ./0vs50Min_r927s926.bed > ./0vs50Min_r927s927.bed
bedtools shuffle -seed 1 -i 0vs50Min_r927s927.bed -g Ecoli-genomesize.txt > ./0vs50Min_r928s927.bed
sort -k1,1 -k2,2n ./0vs50Min_r928s927.bed > ./0vs50Min_r928s928.bed
bedtools shuffle -seed 1 -i 0vs50Min_r928s928.bed -g Ecoli-genomesize.txt > ./0vs50Min_r929s928.bed
sort -k1,1 -k2,2n ./0vs50Min_r929s928.bed > ./0vs50Min_r929s929.bed
bedtools shuffle -seed 1 -i 0vs50Min_r929s929.bed -g Ecoli-genomesize.txt > ./0vs50Min_r930s929.bed
sort -k1,1 -k2,2n ./0vs50Min_r930s929.bed > ./0vs50Min_r930s930.bed
bedtools shuffle -seed 1 -i 0vs50Min_r930s930.bed -g Ecoli-genomesize.txt > ./0vs50Min_r931s930.bed
sort -k1,1 -k2,2n ./0vs50Min_r931s930.bed > ./0vs50Min_r931s931.bed
bedtools shuffle -seed 1 -i 0vs50Min_r931s931.bed -g Ecoli-genomesize.txt > ./0vs50Min_r932s931.bed
sort -k1,1 -k2,2n ./0vs50Min_r932s931.bed > ./0vs50Min_r932s932.bed
bedtools shuffle -seed 1 -i 0vs50Min_r932s932.bed -g Ecoli-genomesize.txt > ./0vs50Min_r933s932.bed
sort -k1,1 -k2,2n ./0vs50Min_r933s932.bed > ./0vs50Min_r933s933.bed
bedtools shuffle -seed 1 -i 0vs50Min_r933s933.bed -g Ecoli-genomesize.txt > ./0vs50Min_r934s933.bed
sort -k1,1 -k2,2n ./0vs50Min_r934s933.bed > ./0vs50Min_r934s934.bed
bedtools shuffle -seed 1 -i 0vs50Min_r934s934.bed -g Ecoli-genomesize.txt > ./0vs50Min_r935s934.bed
sort -k1,1 -k2,2n ./0vs50Min_r935s934.bed > ./0vs50Min_r935s935.bed
bedtools shuffle -seed 1 -i 0vs50Min_r935s935.bed -g Ecoli-genomesize.txt > ./0vs50Min_r936s935.bed
sort -k1,1 -k2,2n ./0vs50Min_r936s935.bed > ./0vs50Min_r936s936.bed
bedtools shuffle -seed 1 -i 0vs50Min_r936s936.bed -g Ecoli-genomesize.txt > ./0vs50Min_r937s936.bed
sort -k1,1 -k2,2n ./0vs50Min_r937s936.bed > ./0vs50Min_r937s937.bed
bedtools shuffle -seed 1 -i 0vs50Min_r937s937.bed -g Ecoli-genomesize.txt > ./0vs50Min_r938s937.bed
sort -k1,1 -k2,2n ./0vs50Min_r938s937.bed > ./0vs50Min_r938s938.bed
bedtools shuffle -seed 1 -i 0vs50Min_r938s938.bed -g Ecoli-genomesize.txt > ./0vs50Min_r939s938.bed
sort -k1,1 -k2,2n ./0vs50Min_r939s938.bed > ./0vs50Min_r939s939.bed
bedtools shuffle -seed 1 -i 0vs50Min_r939s939.bed -g Ecoli-genomesize.txt > ./0vs50Min_r940s939.bed
sort -k1,1 -k2,2n ./0vs50Min_r940s939.bed > ./0vs50Min_r940s940.bed
bedtools shuffle -seed 1 -i 0vs50Min_r940s940.bed -g Ecoli-genomesize.txt > ./0vs50Min_r941s940.bed
sort -k1,1 -k2,2n ./0vs50Min_r941s940.bed > ./0vs50Min_r941s941.bed
bedtools shuffle -seed 1 -i 0vs50Min_r941s941.bed -g Ecoli-genomesize.txt > ./0vs50Min_r942s941.bed
sort -k1,1 -k2,2n ./0vs50Min_r942s941.bed > ./0vs50Min_r942s942.bed
bedtools shuffle -seed 1 -i 0vs50Min_r942s942.bed -g Ecoli-genomesize.txt > ./0vs50Min_r943s942.bed
sort -k1,1 -k2,2n ./0vs50Min_r943s942.bed > ./0vs50Min_r943s943.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r943s943.bed -g Ecoli-genomesize.txt > ./0vs50Min_r944s943.bed
sort -k1,1 -k2,2n ./0vs50Min_r944s943.bed > ./0vs50Min_r944s944.bed
bedtools shuffle -seed 1 -i 0vs50Min_r944s944.bed -g Ecoli-genomesize.txt > ./0vs50Min_r945s944.bed
sort -k1,1 -k2,2n ./0vs50Min_r945s944.bed > ./0vs50Min_r945s945.bed
bedtools shuffle -seed 1 -i 0vs50Min_r945s945.bed -g Ecoli-genomesize.txt > ./0vs50Min_r946s945.bed
sort -k1,1 -k2,2n ./0vs50Min_r946s945.bed > ./0vs50Min_r946s946.bed
bedtools shuffle -seed 1 -i 0vs50Min_r946s946.bed -g Ecoli-genomesize.txt > ./0vs50Min_r947s946.bed
sort -k1,1 -k2,2n ./0vs50Min_r947s946.bed > ./0vs50Min_r947s947.bed
bedtools shuffle -seed 1 -i 0vs50Min_r947s947.bed -g Ecoli-genomesize.txt > ./0vs50Min_r948s947.bed
sort -k1,1 -k2,2n ./0vs50Min_r948s947.bed > ./0vs50Min_r948s948.bed
bedtools shuffle -seed 1 -i 0vs50Min_r948s948.bed -g Ecoli-genomesize.txt > ./0vs50Min_r949s948.bed
sort -k1,1 -k2,2n ./0vs50Min_r949s948.bed > ./0vs50Min_r949s949.bed
bedtools shuffle -seed 1 -i 0vs50Min_r949s949.bed -g Ecoli-genomesize.txt > ./0vs50Min_r950s949.bed
sort -k1,1 -k2,2n ./0vs50Min_r950s949.bed > ./0vs50Min_r950s950.bed
bedtools shuffle -seed 1 -i 0vs50Min_r950s950.bed -g Ecoli-genomesize.txt > ./0vs50Min_r951s950.bed
sort -k1,1 -k2,2n ./0vs50Min_r951s950.bed > ./0vs50Min_r951s951.bed
bedtools shuffle -seed 1 -i 0vs50Min_r951s951.bed -g Ecoli-genomesize.txt > ./0vs50Min_r952s951.bed
sort -k1,1 -k2,2n ./0vs50Min_r952s951.bed > ./0vs50Min_r952s952.bed
bedtools shuffle -seed 1 -i 0vs50Min_r952s952.bed -g Ecoli-genomesize.txt > ./0vs50Min_r953s952.bed
sort -k1,1 -k2,2n ./0vs50Min_r953s952.bed > ./0vs50Min_r953s953.bed
bedtools shuffle -seed 1 -i 0vs50Min_r953s953.bed -g Ecoli-genomesize.txt > ./0vs50Min_r954s953.bed
sort -k1,1 -k2,2n ./0vs50Min_r954s953.bed > ./0vs50Min_r954s954.bed
bedtools shuffle -seed 1 -i 0vs50Min_r954s954.bed -g Ecoli-genomesize.txt > ./0vs50Min_r955s954.bed
sort -k1,1 -k2,2n ./0vs50Min_r955s954.bed > ./0vs50Min_r955s955.bed
bedtools shuffle -seed 1 -i 0vs50Min_r955s955.bed -g Ecoli-genomesize.txt > ./0vs50Min_r956s955.bed
sort -k1,1 -k2,2n ./0vs50Min_r956s955.bed > ./0vs50Min_r956s956.bed
bedtools shuffle -seed 1 -i 0vs50Min_r956s956.bed -g Ecoli-genomesize.txt > ./0vs50Min_r957s956.bed
sort -k1,1 -k2,2n ./0vs50Min_r957s956.bed > ./0vs50Min_r957s957.bed
bedtools shuffle -seed 1 -i 0vs50Min_r957s957.bed -g Ecoli-genomesize.txt > ./0vs50Min_r958s957.bed
sort -k1,1 -k2,2n ./0vs50Min_r958s957.bed > ./0vs50Min_r958s958.bed
bedtools shuffle -seed 1 -i 0vs50Min_r958s958.bed -g Ecoli-genomesize.txt > ./0vs50Min_r959s958.bed
sort -k1,1 -k2,2n ./0vs50Min_r959s958.bed > ./0vs50Min_r959s959.bed
bedtools shuffle -seed 1 -i 0vs50Min_r959s959.bed -g Ecoli-genomesize.txt > ./0vs50Min_r960s959.bed
sort -k1,1 -k2,2n ./0vs50Min_r960s959.bed > ./0vs50Min_r960s960.bed
bedtools shuffle -seed 1 -i 0vs50Min_r960s960.bed -g Ecoli-genomesize.txt > ./0vs50Min_r961s960.bed
sort -k1,1 -k2,2n ./0vs50Min_r961s960.bed > ./0vs50Min_r961s961.bed
bedtools shuffle -seed 1 -i 0vs50Min_r961s961.bed -g Ecoli-genomesize.txt > ./0vs50Min_r962s961.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r962s961.bed > ./0vs50Min_r962s962.bed
bedtools shuffle -seed 1 -i 0vs50Min_r962s962.bed -g Ecoli-genomesize.txt > ./0vs50Min_r963s962.bed
sort -k1,1 -k2,2n ./0vs50Min_r963s962.bed > ./0vs50Min_r963s963.bed
bedtools shuffle -seed 1 -i 0vs50Min_r963s963.bed -g Ecoli-genomesize.txt > ./0vs50Min_r964s963.bed
sort -k1,1 -k2,2n ./0vs50Min_r964s963.bed > ./0vs50Min_r964s964.bed
bedtools shuffle -seed 1 -i 0vs50Min_r964s964.bed -g Ecoli-genomesize.txt > ./0vs50Min_r965s964.bed
sort -k1,1 -k2,2n ./0vs50Min_r965s964.bed > ./0vs50Min_r965s965.bed
bedtools shuffle -seed 1 -i 0vs50Min_r965s965.bed -g Ecoli-genomesize.txt > ./0vs50Min_r966s965.bed
sort -k1,1 -k2,2n ./0vs50Min_r966s965.bed > ./0vs50Min_r966s966.bed
bedtools shuffle -seed 1 -i 0vs50Min_r966s966.bed -g Ecoli-genomesize.txt > ./0vs50Min_r967s966.bed
sort -k1,1 -k2,2n ./0vs50Min_r967s966.bed > ./0vs50Min_r967s967.bed
bedtools shuffle -seed 1 -i 0vs50Min_r967s967.bed -g Ecoli-genomesize.txt > ./0vs50Min_r968s967.bed
sort -k1,1 -k2,2n ./0vs50Min_r968s967.bed > ./0vs50Min_r968s968.bed
bedtools shuffle -seed 1 -i 0vs50Min_r968s968.bed -g Ecoli-genomesize.txt > ./0vs50Min_r969s968.bed
sort -k1,1 -k2,2n ./0vs50Min_r969s968.bed > ./0vs50Min_r969s969.bed
bedtools shuffle -seed 1 -i 0vs50Min_r969s969.bed -g Ecoli-genomesize.txt > ./0vs50Min_r970s969.bed
sort -k1,1 -k2,2n ./0vs50Min_r970s969.bed > ./0vs50Min_r970s970.bed
bedtools shuffle -seed 1 -i 0vs50Min_r970s970.bed -g Ecoli-genomesize.txt > ./0vs50Min_r971s970.bed
sort -k1,1 -k2,2n ./0vs50Min_r971s970.bed > ./0vs50Min_r971s971.bed
bedtools shuffle -seed 1 -i 0vs50Min_r971s971.bed -g Ecoli-genomesize.txt > ./0vs50Min_r972s971.bed
sort -k1,1 -k2,2n ./0vs50Min_r972s971.bed > ./0vs50Min_r972s972.bed
bedtools shuffle -seed 1 -i 0vs50Min_r972s972.bed -g Ecoli-genomesize.txt > ./0vs50Min_r973s972.bed
sort -k1,1 -k2,2n ./0vs50Min_r973s972.bed > ./0vs50Min_r973s973.bed
bedtools shuffle -seed 1 -i 0vs50Min_r973s973.bed -g Ecoli-genomesize.txt > ./0vs50Min_r974s973.bed
sort -k1,1 -k2,2n ./0vs50Min_r974s973.bed > ./0vs50Min_r974s974.bed
bedtools shuffle -seed 1 -i 0vs50Min_r974s974.bed -g Ecoli-genomesize.txt > ./0vs50Min_r975s974.bed
sort -k1,1 -k2,2n ./0vs50Min_r975s974.bed > ./0vs50Min_r975s975.bed
bedtools shuffle -seed 1 -i 0vs50Min_r975s975.bed -g Ecoli-genomesize.txt > ./0vs50Min_r976s975.bed
sort -k1,1 -k2,2n ./0vs50Min_r976s975.bed > ./0vs50Min_r976s976.bed
bedtools shuffle -seed 1 -i 0vs50Min_r976s976.bed -g Ecoli-genomesize.txt > ./0vs50Min_r977s976.bed
sort -k1,1 -k2,2n ./0vs50Min_r977s976.bed > ./0vs50Min_r977s977.bed
bedtools shuffle -seed 1 -i 0vs50Min_r977s977.bed -g Ecoli-genomesize.txt > ./0vs50Min_r978s977.bed
sort -k1,1 -k2,2n ./0vs50Min_r978s977.bed > ./0vs50Min_r978s978.bed
bedtools shuffle -seed 1 -i 0vs50Min_r978s978.bed -g Ecoli-genomesize.txt > ./0vs50Min_r979s978.bed
sort -k1,1 -k2,2n ./0vs50Min_r979s978.bed > ./0vs50Min_r979s979.bed
bedtools shuffle -seed 1 -i 0vs50Min_r979s979.bed -g Ecoli-genomesize.txt > ./0vs50Min_r980s979.bed
sort -k1,1 -k2,2n ./0vs50Min_r980s979.bed > ./0vs50Min_r980s980.bed
```

```
bedtools shuffle -seed 1 -i 0vs50Min_r980s980.bed -g Ecoli-genomesize.txt > ./0vs50Min_r981s980.bed
sort -k1,1 -k2,2n ./0vs50Min_r981s980.bed > ./0vs50Min_r981s981.bed
bedtools shuffle -seed 1 -i 0vs50Min_r981s981.bed -g Ecoli-genomesize.txt > ./0vs50Min_r982s981.bed
sort -k1,1 -k2,2n ./0vs50Min_r982s981.bed > ./0vs50Min_r982s982.bed
bedtools shuffle -seed 1 -i 0vs50Min_r982s982.bed -g Ecoli-genomesize.txt > ./0vs50Min_r983s982.bed
sort -k1,1 -k2,2n ./0vs50Min_r983s982.bed > ./0vs50Min_r983s983.bed
bedtools shuffle -seed 1 -i 0vs50Min_r983s983.bed -g Ecoli-genomesize.txt > ./0vs50Min_r984s983.bed
sort -k1,1 -k2,2n ./0vs50Min_r984s983.bed > ./0vs50Min_r984s984.bed
bedtools shuffle -seed 1 -i 0vs50Min_r984s984.bed -g Ecoli-genomesize.txt > ./0vs50Min_r985s984.bed
sort -k1,1 -k2,2n ./0vs50Min_r985s984.bed > ./0vs50Min_r985s985.bed
bedtools shuffle -seed 1 -i 0vs50Min_r985s985.bed -g Ecoli-genomesize.txt > ./0vs50Min_r986s985.bed
sort -k1,1 -k2,2n ./0vs50Min_r986s985.bed > ./0vs50Min_r986s986.bed
bedtools shuffle -seed 1 -i 0vs50Min_r986s986.bed -g Ecoli-genomesize.txt > ./0vs50Min_r987s986.bed
sort -k1,1 -k2,2n ./0vs50Min_r987s986.bed > ./0vs50Min_r987s987.bed
bedtools shuffle -seed 1 -i 0vs50Min_r987s987.bed -g Ecoli-genomesize.txt > ./0vs50Min_r988s987.bed
sort -k1,1 -k2,2n ./0vs50Min_r988s987.bed > ./0vs50Min_r988s988.bed
bedtools shuffle -seed 1 -i 0vs50Min_r988s988.bed -g Ecoli-genomesize.txt > ./0vs50Min_r989s988.bed
sort -k1,1 -k2,2n ./0vs50Min_r989s988.bed > ./0vs50Min_r989s989.bed
bedtools shuffle -seed 1 -i 0vs50Min_r989s989.bed -g Ecoli-genomesize.txt > ./0vs50Min_r990s989.bed
sort -k1,1 -k2,2n ./0vs50Min_r990s989.bed > ./0vs50Min_r990s990.bed
bedtools shuffle -seed 1 -i 0vs50Min_r990s990.bed -g Ecoli-genomesize.txt > ./0vs50Min_r991s990.bed
sort -k1,1 -k2,2n ./0vs50Min_r991s990.bed > ./0vs50Min_r991s991.bed
bedtools shuffle -seed 1 -i 0vs50Min_r991s991.bed -g Ecoli-genomesize.txt > ./0vs50Min_r992s991.bed
sort -k1,1 -k2,2n ./0vs50Min_r992s991.bed > ./0vs50Min_r992s992.bed
bedtools shuffle -seed 1 -i 0vs50Min_r992s992.bed -g Ecoli-genomesize.txt > ./0vs50Min_r993s992.bed
sort -k1,1 -k2,2n ./0vs50Min_r993s992.bed > ./0vs50Min_r993s993.bed
bedtools shuffle -seed 1 -i 0vs50Min_r993s993.bed -g Ecoli-genomesize.txt > ./0vs50Min_r994s993.bed
sort -k1,1 -k2,2n ./0vs50Min_r994s993.bed > ./0vs50Min_r994s994.bed
bedtools shuffle -seed 1 -i 0vs50Min_r994s994.bed -g Ecoli-genomesize.txt > ./0vs50Min_r995s994.bed
sort -k1,1 -k2,2n ./0vs50Min_r995s994.bed > ./0vs50Min_r995s995.bed
bedtools shuffle -seed 1 -i 0vs50Min_r995s995.bed -g Ecoli-genomesize.txt > ./0vs50Min_r996s995.bed
sort -k1,1 -k2,2n ./0vs50Min_r996s995.bed > ./0vs50Min_r996s996.bed
bedtools shuffle -seed 1 -i 0vs50Min_r996s996.bed -g Ecoli-genomesize.txt > ./0vs50Min_r997s996.bed
sort -k1,1 -k2,2n ./0vs50Min_r997s996.bed > ./0vs50Min_r997s997.bed
bedtools shuffle -seed 1 -i 0vs50Min_r997s997.bed -g Ecoli-genomesize.txt > ./0vs50Min_r998s997.bed
sort -k1,1 -k2,2n ./0vs50Min_r998s997.bed > ./0vs50Min_r998s998.bed
bedtools shuffle -seed 1 -i 0vs50Min_r998s998.bed -g Ecoli-genomesize.txt > ./0vs50Min_r999s998.bed
```

```
sort -k1,1 -k2,2n ./0vs50Min_r999s998.bed > ./0vs50Min_r999s999.bed
bedtools shuffle -seed 1 -i 0vs50Min_r999s999.bed -g Ecoli-genomesize.txt > ./0vs50Min_r1000s999.bed
sort -k1,1 -k2,2n ./0vs50Min_r1000s999.bed > ./0vs50Min_r1000s1000.bed
```

BEDTools create random locations for *E. coli* GATCs

```
#!/bin/bash


#bedtools_random_EcoliGATC.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to create random locations for E. Coli GATCs

bedtools random -g ./Ecoli-genomesize.txt -n 19122 -l 4 > EcoliGATC_All_r.bed
bedtools random -g ./Ecoli-genomesize.txt -n 3375 -l 4 > EcoliGATC_Pairs_r.bed
bedtools random -g ./Ecoli-genomesize.txt -n 1129 -l 4 > EcoliGATC_HigherO1_r.bed
bedtools random -g ./Ecoli-genomesize.txt -n 422 -l 4 > EcoliGATC_HigherO2_r.bed
bedtools random -g ./Ecoli-genomesize.txt -n 172 -l 4 > EcoliGATC_HigherO3_r.bed
```

BEDOPS chop random signals to 1 bp

```bash
#!/bin/bash

#Bedops_ChopRandom.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find chop randomized signals into 1bp

bedops --chop 1 ./Microarray/SeqAOnly-R1000e1.bed > ./Microarray/SeqAOnly-R1000e1-c.bed
bedops --chop 1 ./Microarray/SeqAOnly-R1000e1-Top50.bed > ./Microarray/SeqAOnly-R1000e1-c-Top50.bed
bedops --chop 1 ./Microarray/SeqAOnly-R1000e1-Top25.bed > ./Microarray/SeqAOnly-R1000e1-c-Top25.bed
bedops --chop 1 ./Microarray/SeqAOnly-R1000e1-Top10.bed > ./Microarray/SeqAOnly-R1000e1-c-Top10.bed
bedops --chop 1 ./Microarray/SeqAOnly-R1000e1-Top5.bed > ./Microarray/SeqAOnly-R1000e1-c-Top5.bed

bedops --chop 1 ./Microarray/SeqAOnly_Grainger-R1000e1.bed > ./Microarray/SeqAOnly_Grainger-R1000e1-c.bed
bedops --chop 1 ./Microarray/SeqAOnly_Grainger-R1000e1-Top50.bed > ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top50.bed
bedops --chop 1 ./Microarray/SeqAOnly_Grainger-R1000e1-Top25.bed > ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top25.bed
bedops --chop 1 ./Microarray/SeqAOnly_Grainger-R1000e1-Top10.bed > ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top10.bed
bedops --chop 1 ./Microarray/SeqAOnly_Grainger-R1000e1-Top5.bed > ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top5.bed

bedops --chop 1 ./Microarray/0vs50Min-R1000e1.bed > ./Microarray/0vs50Min-R1000e1-c.bed
bedops --chop 1 ./Microarray/0vs50Min-R1000e1-Top50.bed > ./Microarray/0vs50Min-R1000e1-c-Top50.bed
bedops --chop 1 ./Microarray/0vs50Min-R1000e1-Top25.bed > ./Microarray/0vs50Min-R1000e1-c-Top25.bed
bedops --chop 1 ./Microarray/0vs50Min-R1000e1-Top10.bed > ./Microarray/0vs50Min-R1000e1-c-Top10.bed
bedops --chop 1 ./Microarray/0vs50Min-R1000e1-Top5.bed > ./Microarray/0vs50Min-R1000e1-c-Top5.bed
```

BEDOPS SeqA Only randomized signals (SeqA Only 1) in *E. coli* regions

```

#Bedops_ElementSeqAOnly_r-cinEcoliGenes.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly randomized 1bp chopped signal in E. coli ORFs

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top50.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top25.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top10.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top5.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed


# Copy to excel
cp ./Element/SeqAOnly-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.txt

mkdir ./SeqAOnly-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged/
mv ./Element/ ./SeqAOnly-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged/
```

```bash
#!/bin/bash

#Bedops_ElementSeqAOnly_r-cinEcoliNoncoding.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly randomized 1bp chopped signal in E. coli Noncoding regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly-R1000e1-c-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top50.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top25.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top10.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top5.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliNoncoding-Complemented.bed


# Copy to excel
cp ./Element/SeqAOnly-R1000e1-c-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly-R1000e1-c-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliNoncoding-Complemented.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly-R1000e1-c-Element-EcoliNoncoding-Complemented.txt

mkdir ./SeqAOnly-R1000e1-c-Element-EcoliNoncoding-Complemented/
mv ./Element/ ./SeqAOnly-R1000e1-c-Element-EcoliNoncoding-Complemented/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly_r-cinEcoliNonphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly randomized 1bp chopped signal in E. coli Nonprophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly-R1000e1-c-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top50.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top25.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top10.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top5.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliNonphage.bed


# Copy to excel
cp ./Element/SeqAOnly-R1000e1-c-Element-EcoliNonphage.bed ./Element/SeqAOnly-R1000e1-c-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliNonphage.bed ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliNonphage.bed ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliNonphage.bed ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliNonphage.bed ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliNonphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly-R1000e1-c-Element-EcoliNonphage.txt

mkdir ./SeqAOnly-R1000e1-c-Element-EcoliNonphage/
mv ./Element/ ./SeqAOnly-R1000e1-c-Element-EcoliNonphage/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly_r-cinEcoliNonpromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly randomized 1bp chopped signal in E. coli Nonpromoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged-complement.bed


# Copy to excel
cp ./Element/SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged-complement.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.txt

mkdir ./SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement/
mv ./Element/ ./SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly_r-cinEcoliPromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly randomized 1bp chopped signal in E. coli Promoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed


# Copy to excel
cp ./Element/SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.txt

mkdir ./SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged/
mv ./Element/ ./SeqAOnly-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged/
```

```bash
#!/bin/bash

#Bedops_ElementSeqAOnly_r-cinEcoliProphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly randomized 1bp chopped signal in E. coli Prophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly-R1000e1-c-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top50.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top25.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top10.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly-R1000e1-c-Top5.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliProphage.bed


# Copy to excel
cp ./Element/SeqAOnly-R1000e1-c-Element-EcoliProphage.bed ./Element/SeqAOnly-R1000e1-c-Element-EcoliProphage.xls
cp ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliProphage.bed ./Element/SeqAOnly-R1000e1-c-Top50-Element-EcoliProphage.xls
cp ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliProphage.bed ./Element/SeqAOnly-R1000e1-c-Top25-Element-EcoliProphage.xls
cp ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliProphage.bed ./Element/SeqAOnly-R1000e1-c-Top10-Element-EcoliProphage.xls
cp ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliProphage.bed ./Element/SeqAOnly-R1000e1-c-Top5-Element-EcoliProphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly-R1000e1-c-Element-EcoliProphage.txt

mkdir ./SeqAOnly-R1000e1-c-Element-EcoliProphage/
mv ./Element/ ./SeqAOnly-R1000e1-c-Element-EcoliProphage/
```

BEDOPS SeqA Only (Grainger) randomized signals (SeqA Only 2) in *E. coli* regions

```
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger_r-cinEcoliGenes.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger randomized 1bp chopped signal in E. coli ORFs

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top50.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top25.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top10.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top5.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.xls

#Line count
```

```
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.txt

mkdir ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged/
mv ./Element/ ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger_r-cinEcoliNoncoding.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger randomized 1bp chopped signal in E. coli Noncoding regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top50.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top25.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top10.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top5.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliNoncoding-Complemented.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliNoncoding-Complemented.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-R1000e1-c-Element-EcoliNoncoding-Complemented.txt

mkdir ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliNoncoding-Complemented/
mv ./Element/ ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliNoncoding-Complemented/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger_r-cinEcoliNonphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger randomized 1bp chopped signal in E. coli Nonprophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top50.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top25.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top10.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top5.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliNonphage.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliNonphage.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliNonphage.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliNonphage.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliNonphage.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliNonphage.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliNonphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-R1000e1-c-Element-EcoliNonphage.txt

mkdir ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliNonphage/
mv ./Element/ ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliNonphage/
```

```bash
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger_r-cinEcoliNonpromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger randomized 1bp chopped signal in E. coli Nonpromoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged-complement.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged-complement.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.txt

mkdir ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement/
```

```
mv ./Element/ ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger_r-cinEcoliPromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger randomized 1bp chopped signal in E. coli Promoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.txt

mkdir ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged/
mv ./Element/ ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger_r-cinEcoliProphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger randomized 1bp chopped signal in E. coli Prophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top50.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top25.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top10.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-R1000e1-c-Top5.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliProphage.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliProphage.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Element-EcoliProphage.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliProphage.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top50-Element-EcoliProphage.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliProphage.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top25-Element-EcoliProphage.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliProphage.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top10-Element-EcoliProphage.xls
cp ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliProphage.bed ./Element/SeqAOnly_Grainger-R1000e1-c-Top5-Element-EcoliProphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-R1000e1-c-Element-EcoliProphage.txt

mkdir ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliProphage/
mv ./Element/ ./SeqAOnly_Grainger-R1000e1-c-Element-EcoliProphage/
```

BEDOPS 0 vs. 50 Min randomized signals (SeqA Binding) in *E. coli* regions

```
#!/bin/bash

#Bedops_Element0vs50Min_r-cinEcoliGenes.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min randomized 1bp chopped signal in E. coli ORFs

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-R1000e1-c.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/0vs50Min-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top50.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top25.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top10.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top5.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed


# Copy to excel
cp ./Element/0vs50Min-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/0vs50Min-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged.txt

mkdir ./0vs50Min-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged/
mv ./Element/ ./0vs50Min-R1000e1-c-Element-EcoliGenes_RemoveIDandDups-Merged/
```

```bash
#!/bin/bash

#Bedops_Element0vs50Min_r-cinEcoliNoncoding.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min randomized 1bp chopped signal in E. coli Noncoding regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-R1000e1-c.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/0vs50Min-R1000e1-c-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top50.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top25.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top10.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top5.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliNoncoding-Complemented.bed


# Copy to excel
cp ./Element/0vs50Min-R1000e1-c-Element-EcoliNoncoding-Complemented.bed ./Element/0vs50Min-R1000e1-c-Element-EcoliNoncoding-Complemented.xls
cp ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliNoncoding-Complemented.bed ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliNoncoding-Complemented.xls
cp ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliNoncoding-Complemented.bed ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliNoncoding-Complemented.xls
cp ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliNoncoding-Complemented.bed ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliNoncoding-Complemented.xls
cp ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliNoncoding-Complemented.bed ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliNoncoding-Complemented.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-R1000e1-c-Element-EcoliNoncoding-Complemented.txt

mkdir ./0vs50Min-R1000e1-c-Element-EcoliNoncoding-Complemented/
mv ./Element/ ./0vs50Min-R1000e1-c-Element-EcoliNoncoding-Complemented/
```

```
#!/bin/bash

#Bedops_Element0vs50Min_r-cinEcoliNonphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min randomized 1bp chopped signal in E. coli Nonprophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-R1000e1-c.bed ./Prophage/EcoliNonphage.bed > ./Element/0vs50Min-R1000e1-c-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top50.bed ./Prophage/EcoliNonphage.bed > ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top25.bed ./Prophage/EcoliNonphage.bed > ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top10.bed ./Prophage/EcoliNonphage.bed > ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top5.bed ./Prophage/EcoliNonphage.bed > ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliNonphage.bed


# Copy to excel
cp ./Element/0vs50Min-R1000e1-c-Element-EcoliNonphage.bed ./Element/0vs50Min-R1000e1-c-Element-EcoliNonphage.xls
cp ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliNonphage.bed ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliNonphage.xls
cp ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliNonphage.bed ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliNonphage.xls
cp ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliNonphage.bed ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliNonphage.xls
cp ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliNonphage.bed ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliNonphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-R1000e1-c-Element-EcoliNonphage.txt

mkdir ./0vs50Min-R1000e1-c-Element-EcoliNonphage/
mv ./Element/ ./0vs50Min-R1000e1-c-Element-EcoliNonphage/
```

```
#!/bin/bash

#Bedops_Element0vs50Min_r-cinEcoliNonpromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min randomized 1bp chopped signal in E. coli Nonpromoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-R1000e1-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged-complement.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged-complement.bed > ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged-complement.bed


# Copy to excel
cp ./Element/0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged-complement.xls
cp ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged-complement.bed ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged-complement.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement.txt

mkdir ./0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement/
mv ./Element/ ./0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged-complement/
```

```
#!/bin/bash

#Bedops_Element0vs50Min_r-cinEcoliPromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min randomized 1bp chopped signal in E. coli Promoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-R1000e1-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed


# Copy to excel
cp ./Element/0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliPromotersRemoveDupsMerged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged.txt

mkdir ./0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged/
mv ./Element/ ./0vs50Min-R1000e1-c-Element-EcoliPromotersRemoveDupsMerged/
```

```
#!/bin/bash


#Bedops_Element0vs50Min_r-cinEcoliProphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min randomized 1bp chopped signal in E. coli Prophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-R1000e1-c.bed ./Prophage/EcoliProphage.bed > ./Element/0vs50Min-R1000e1-c-Element-EcoliProphage.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top50.bed ./Prophage/EcoliProphage.bed > ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliProphage.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top25.bed ./Prophage/EcoliProphage.bed > ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliProphage.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top10.bed ./Prophage/EcoliProphage.bed > ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliProphage.bed
bedops --element-of ./Microarray/0vs50Min-R1000e1-c-Top5.bed ./Prophage/EcoliProphage.bed > ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliProphage.bed


# Copy to excel
cp ./Element/0vs50Min-R1000e1-c-Element-EcoliProphage.bed ./Element/0vs50Min-R1000e1-c-Element-EcoliProphage.xls
cp ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliProphage.bed ./Element/0vs50Min-R1000e1-c-Top50-Element-EcoliProphage.xls
cp ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliProphage.bed ./Element/0vs50Min-R1000e1-c-Top25-Element-EcoliProphage.xls
cp ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliProphage.bed ./Element/0vs50Min-R1000e1-c-Top10-Element-EcoliProphage.xls
cp ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliProphage.bed ./Element/0vs50Min-R1000e1-c-Top5-Element-EcoliProphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-R1000e1-c-Element-EcoliProphage.txt

mkdir ./0vs50Min-R1000e1-c-Element-EcoliProphage/
mv ./Element/ ./0vs50Min-R1000e1-c-Element-EcoliProphage/
```

BEDOPS randomized GATCs in *E. coli* regions

```bash
#!/bin/bash

#Bedops_ElementGATCSinEcoliGenes.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of random GATCs in E. coli ORFs

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All_r.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/EcoliGATC_All_r-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/EcoliGATC_Pairs_r.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/EcoliGATC_Pairs_r-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1_r.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/EcoliGATC_HigherO1_r-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2_r.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/EcoliGATC_HigherO2_r-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3_r.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/EcoliGATC_HigherO3_r-Element-EcoliGenes_RemoveIDandDups-Merged.bed


# Copy to excel
cp ./Element/EcoliGATC_All_r-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/EcoliGATC_All_r-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/EcoliGATC_Pairs_r-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/EcoliGATC_Pairs_r-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/EcoliGATC_HigherO1_r-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/EcoliGATC_HigherO1_r-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/EcoliGATC_HigherO2_r-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/EcoliGATC_HigherO2_r-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/EcoliGATC_HigherO3_r-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/EcoliGATC_HigherO3_r-Element-EcoliGenes_RemoveIDandDups-Merged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All_r-Element-EcoliGenes_RemoveIDandDups-Merged.txt

mkdir ./EcoliGATC_All_r-Element-EcoliGenes_RemoveIDandDups-Merged/
mv ./Element/ ./EcoliGATC_All_r-Element-EcoliGenes_RemoveIDandDups-Merged/
```

```bash
#!/bin/bash

#Bedops_ElementGATCSinEcoliNoncoding.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of random GATCs in E. coli Noncoding regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All_r.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/EcoliGATC_All_r-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./GATC/EcoliGATC_Pairs_r.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/EcoliGATC_Pairs_r-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1_r.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/EcoliGATC_HigherO1_r-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2_r.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/EcoliGATC_HigherO2_r-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3_r.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/EcoliGATC_HigherO3_r-Element-EcoliNoncoding-Complemented.bed


# Copy to excel
cp ./Element/EcoliGATC_All_r-Element-EcoliNoncoding-Complemented.bed ./Element/EcoliGATC_All_r-Element-EcoliNoncoding-Complemented.xls
cp ./Element/EcoliGATC_Pairs_r-Element-EcoliNoncoding-Complemented.bed ./Element/EcoliGATC_Pairs_r-Element-EcoliNoncoding-Complemented.xls
cp ./Element/EcoliGATC_HigherO1_r-Element-EcoliNoncoding-Complemented.bed ./Element/EcoliGATC_HigherO1_r-Element-EcoliNoncoding-Complemented.xls
cp ./Element/EcoliGATC_HigherO2_r-Element-EcoliNoncoding-Complemented.bed ./Element/EcoliGATC_HigherO2_r-Element-EcoliNoncoding-Complemented.xls
cp ./Element/EcoliGATC_HigherO3_r-Element-EcoliNoncoding-Complemented.bed ./Element/EcoliGATC_HigherO3_r-Element-EcoliNoncoding-Complemented.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All_r-Element-EcoliNoncoding-Complemented.txt

mkdir ./EcoliGATC_All_r-Element-EcoliNoncoding-Complemented/
mv ./Element/ ./EcoliGATC_All_r-Element-EcoliNoncoding-Complemented/
```

```
#!/bin/bash

#Bedops_ElementGATCSinEcoliNonphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of random GATCs in E. coli Nonprophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All_r.bed ./Prophage/EcoliNonphage.bed > ./Element/EcoliGATC_All_r-Element-EcoliNonphage.bed
bedops --element-of ./GATC/EcoliGATC_Pairs_r.bed ./Prophage/EcoliNonphage.bed > ./Element/EcoliGATC_Pairs_r-Element-EcoliNonphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1_r.bed ./Prophage/EcoliNonphage.bed > ./Element/EcoliGATC_HigherO1_r-Element-EcoliNonphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2_r.bed ./Prophage/EcoliNonphage.bed > ./Element/EcoliGATC_HigherO2_r-Element-EcoliNonphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3_r.bed ./Prophage/EcoliNonphage.bed > ./Element/EcoliGATC_HigherO3_r-Element-EcoliNonphage.bed


# Copy to excel
cp ./Element/EcoliGATC_All_r-Element-EcoliNonphage.bed ./Element/EcoliGATC_All_r-Element-EcoliNonphage.xls
cp ./Element/EcoliGATC_Pairs_r-Element-EcoliNonphage.bed ./Element/EcoliGATC_Pairs_r-Element-EcoliNonphage.xls
cp ./Element/EcoliGATC_HigherO1_r-Element-EcoliNonphage.bed ./Element/EcoliGATC_HigherO1_r-Element-EcoliNonphage.xls
cp ./Element/EcoliGATC_HigherO2_r-Element-EcoliNonphage.bed ./Element/EcoliGATC_HigherO2_r-Element-EcoliNonphage.xls
cp ./Element/EcoliGATC_HigherO3_r-Element-EcoliNonphage.bed ./Element/EcoliGATC_HigherO3_r-Element-EcoliNonphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All_r-Element-EcoliNonphage.txt

mkdir ./EcoliGATC_All_r-Element-EcoliNonphage/
mv ./Element/ ./EcoliGATC_All_r-Element-EcoliNonphage/
```

```
#!/bin/bash

#Bedops_ElementGATCSinEcoliNonpromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of random GATCs in E. coli Nonpromoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All_r.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./GATC/EcoliGATC_Pairs_r.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/EcoliGATC_Pairs_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1_r.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/EcoliGATC_HigherO1_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2_r.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/EcoliGATC_HigherO2_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3_r.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/EcoliGATC_HigherO3_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed


# Copy to excel
cp ./Element/EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/EcoliGATC_Pairs_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/EcoliGATC_Pairs_r-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/EcoliGATC_HigherO1_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/EcoliGATC_HigherO1_r-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/EcoliGATC_HigherO2_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/EcoliGATC_HigherO2_r-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/EcoliGATC_HigherO3_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/EcoliGATC_HigherO3_r-Element-EcoliPromotersRemoveDupsMerged-Complement.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement.txt

mkdir ./EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement/
mv ./Element/ ./EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement/
```

```
#!/bin/bash

#Bedops_ElementGATCSinEcoliPromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of random GATCs in E. coli Promoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All_r.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./GATC/EcoliGATC_Pairs_r.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/EcoliGATC_Pairs_r-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1_r.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/EcoliGATC_HigherO1_r-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2_r.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/EcoliGATC_HigherO2_r-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3_r.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/EcoliGATC_HigherO3_r-Element-EcoliPromotersRemoveDupsMerged.bed


# Copy to excel
cp ./Element/EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/EcoliGATC_Pairs_r-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/EcoliGATC_Pairs_r-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/EcoliGATC_HigherO1_r-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/EcoliGATC_HigherO1_r-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/EcoliGATC_HigherO2_r-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/EcoliGATC_HigherO2_r-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/EcoliGATC_HigherO3_r-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/EcoliGATC_HigherO3_r-Element-EcoliPromotersRemoveDupsMerged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged.txt

mkdir ./EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged/
mv ./Element/ ./EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged/
```

```bash
#!/bin/bash

#Bedops_ElementGATCSinEcoliProphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of random GATCs in E. coli Prophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All_r.bed ./Prophage/EcoliProphage.bed > ./Element/EcoliGATC_All_r-Element-EcoliProphage.bed
bedops --element-of ./GATC/EcoliGATC_Pairs_r.bed ./Prophage/EcoliProphage.bed > ./Element/EcoliGATC_Pairs_r-Element-EcoliProphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1_r.bed ./Prophage/EcoliProphage.bed > ./Element/EcoliGATC_HigherO1_r-Element-EcoliProphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2_r.bed ./Prophage/EcoliProphage.bed > ./Element/EcoliGATC_HigherO2_r-Element-EcoliProphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3_r.bed ./Prophage/EcoliProphage.bed > ./Element/EcoliGATC_HigherO3_r-Element-EcoliProphage.bed


# Copy to excel
cp ./Element/EcoliGATC_All_r-Element-EcoliProphage.bed ./Element/EcoliGATC_All_r-Element-EcoliProphage.xls
cp ./Element/EcoliGATC_Pairs_r-Element-EcoliProphage.bed ./Element/EcoliGATC_Pairs_r-Element-EcoliProphage.xls
cp ./Element/EcoliGATC_HigherO1_r-Element-EcoliProphage.bed ./Element/EcoliGATC_HigherO1_r-Element-EcoliProphage.xls
cp ./Element/EcoliGATC_HigherO2_r-Element-EcoliProphage.bed ./Element/EcoliGATC_HigherO2_r-Element-EcoliProphage.xls
cp ./Element/EcoliGATC_HigherO3_r-Element-EcoliProphage.bed ./Element/EcoliGATC_HigherO3_r-Element-EcoliProphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All_r-Element-EcoliProphage.txt

mkdir ./EcoliGATC_All_r-Element-EcoliProphage/
mv ./Element/ ./EcoliGATC_All_r-Element-EcoliProphage/
```

BEDOPS chop *E. coli* signals into 1 bp

```
#!/bin/bash

#Bedops_ChopObserved.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find chop observed signals into 1bp

bedops --chop 1 ./Microarray/SeqAOnly.bed > ./Microarray/SeqAOnly-c.bed
bedops --chop 1 ./Microarray/SeqAOnly-Top50.bed > ./Microarray/SeqAOnly-c-Top50.bed
bedops --chop 1 ./Microarray/SeqAOnly-Top25.bed > ./Microarray/SeqAOnly-c-Top25.bed
bedops --chop 1 ./Microarray/SeqAOnly-Top10.bed > ./Microarray/SeqAOnly-c-Top10.bed
bedops --chop 1 ./Microarray/SeqAOnly-Top5.bed > ./Microarray/SeqAOnly-c-Top5.bed

bedops --chop 1 ./Microarray/SeqAOnly_Grainger.bed > ./Microarray/SeqAOnly_Grainger-c.bed
bedops --chop 1 ./Microarray/SeqAOnly_Grainger-Top50.bed > ./Microarray/SeqAOnly_Grainger-c-Top50.bed
bedops --chop 1 ./Microarray/SeqAOnly_Grainger-Top25.bed > ./Microarray/SeqAOnly_Grainger-c-Top25.bed
bedops --chop 1 ./Microarray/SeqAOnly_Grainger-Top10.bed > ./Microarray/SeqAOnly_Grainger-c-Top10.bed
bedops --chop 1 ./Microarray/SeqAOnly_Grainger-Top5.bed > ./Microarray/SeqAOnly_Grainger-c-Top5.bed

bedops --chop 1 ./Microarray/0vs50Min.bed > ./Microarray/0vs50Min-c.bed
bedops --chop 1 ./Microarray/0vs50Min-Top50.bed > ./Microarray/0vs50Min-c-Top50.bed
bedops --chop 1 ./Microarray/0vs50Min-Top25.bed > ./Microarray/0vs50Min-c-Top25.bed
bedops --chop 1 ./Microarray/0vs50Min-Top10.bed > ./Microarray/0vs50Min-c-Top10.bed
bedops --chop 1 ./Microarray/0vs50Min-Top5.bed > ./Microarray/0vs50Min-c-Top5.bed
```

BEDOPS SeqA Only signals (SeqA Only 1) in *E. coli* regions

```bash
#!/bin/bash

#Bedops_ElementSeqAOnly-cinEcoliGenes.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly 1bp chopped signal in E. coli ORFs

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly-c.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top50.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top25.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top10.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top5.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed


# Copy to excel
cp ./Element/SeqAOnly-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly-c-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly-c-Element-EcoliGenes_RemoveIDandDups-Merged.txt

mkdir ./SeqAOnly-c-Element-EcoliGenes_RemoveIDandDups-Merged/
mv ./Element/ ./SeqAOnly-c-Element-EcoliGenes_RemoveIDandDups-Merged/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly-cinEcoliNoncoding.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly 1bp chopped signal in E. coli Noncoding regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly-c.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly-c-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top50.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly-c-Top50-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top25.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly-c-Top25-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top10.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly-c-Top10-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top5.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly-c-Top5-Element-EcoliNoncoding-Complemented.bed


# Copy to excel
cp ./Element/SeqAOnly-c-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly-c-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly-c-Top50-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly-c-Top50-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly-c-Top25-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly-c-Top25-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly-c-Top10-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly-c-Top10-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly-c-Top5-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly-c-Top5-Element-EcoliNoncoding-Complemented.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly-c-Element-EcoliNoncoding-Complemented.txt

mkdir ./SeqAOnly-c-Element-EcoliNoncoding-Complemented/
mv ./Element/ ./SeqAOnly-c-Element-EcoliNoncoding-Complemented/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly-cinEcoliNonphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly 1bp chopped signal in E. coli Nonprophage regions


mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly-c.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly-c-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top50.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly-c-Top50-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top25.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly-c-Top25-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top10.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly-c-Top10-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top5.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly-c-Top5-Element-EcoliNonphage.bed


# Copy to excel
cp ./Element/SeqAOnly-c-Element-EcoliNonphage.bed ./Element/SeqAOnly-c-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly-c-Top50-Element-EcoliNonphage.bed ./Element/SeqAOnly-c-Top50-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly-c-Top25-Element-EcoliNonphage.bed ./Element/SeqAOnly-c-Top25-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly-c-Top10-Element-EcoliNonphage.bed ./Element/SeqAOnly-c-Top10-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly-c-Top5-Element-EcoliNonphage.bed ./Element/SeqAOnly-c-Top5-Element-EcoliNonphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly-c-Element-EcoliNonphage.txt

mkdir ./SeqAOnly-c-Element-EcoliNonphage/
mv ./Element/ ./SeqAOnly-c-Element-EcoliNonphage/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly-cinEcoliNonpromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly 1bp chopped signal in E. coli Nonpromoter regions


mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/SeqAOnly-c-Top50-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/SeqAOnly-c-Top25-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/SeqAOnly-c-Top10-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/SeqAOnly-c-Top5-Element-EcoliPromotersRemoveDupsMerged-Complement.bed


# Copy to excel
cp ./Element/SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/SeqAOnly-c-Top50-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/SeqAOnly-c-Top50-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/SeqAOnly-c-Top25-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/SeqAOnly-c-Top25-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/SeqAOnly-c-Top10-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/SeqAOnly-c-Top10-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/SeqAOnly-c-Top5-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/SeqAOnly-c-Top5-Element-EcoliPromotersRemoveDupsMerged-Complement.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged-Complement.txt

mkdir ./SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged-Complement/
mv ./Element/ ./SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged-Complement/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly-cinEcoliPromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly 1bp chopped signal in E. coli Promoter regions


mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed


# Copy to excel
cp ./Element/SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly-c-Top50-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly-c-Top25-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly-c-Top10-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly-c-Top5-Element-EcoliPromotersRemoveDupsMerged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged.txt

mkdir ./SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged/
mv ./Element/ ./SeqAOnly-c-Element-EcoliPromotersRemoveDupsMerged/
```

BEDOPS SeqA Only (Grainger) signals (SeqA Only 2) in *E. coli* regions

```
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger-cinEcoliGenes.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger 1bp chopped signal in E. coli ORFs

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-c.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly_Grainger-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top50.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top25.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top10.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top5.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly_Grainger-c-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-c-Element-EcoliGenes_RemoveIDandDups-Merged.txt

mkdir ./SeqAOnly_Grainger-c-Element-EcoliGenes_RemoveIDandDups-Merged/
```

```
mv ./Element/ ./SeqAOnly_Grainger-c-Element-EcoliGenes_RemoveIDandDups-Merged/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger-cinEcoliNoncoding.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger 1bp chopped signal in E. coli Noncoding regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-c.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly_Grainger-c-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top50.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top25.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top10.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top5.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliNoncoding-Complemented.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-c-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly_Grainger-c-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliNoncoding-Complemented.xls
cp ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliNoncoding-Complemented.bed ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliNoncoding-Complemented.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-c-Element-EcoliNoncoding-Complemented.txt

mkdir ./SeqAOnly_Grainger-c-Element-EcoliNoncoding-Complemented/
mv ./Element/ ./SeqAOnly_Grainger-c-Element-EcoliNoncoding-Complemented/
```

```bash
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger-cinEcoliNonphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger 1bp chopped signal in E. coli Nonprophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-c.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly_Grainger-c-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top50.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top25.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top10.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top5.bed ./Prophage/EcoliNonphage.bed > ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliNonphage.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-c-Element-EcoliNonphage.bed ./Element/SeqAOnly_Grainger-c-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliNonphage.bed ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliNonphage.bed ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliNonphage.bed ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliNonphage.xls
cp ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliNonphage.bed ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliNonphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-c-Element-EcoliNonphage.txt

mkdir ./SeqAOnly_Grainger-c-Element-EcoliNonphage/
mv ./Element/ ./SeqAOnly_Grainger-c-Element-EcoliNonphage/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger-cinEcoliNonpromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger 1bp chopped signal in E. coli Noncoding regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliPromotersRemoveDupsMerged-Complement.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliPromotersRemoveDupsMerged-Complement.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged-Complement.txt

mkdir ./SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged-Complement/
mv ./Element/ ./SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged-Complement/
```

```
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger-cinEcoliPromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger 1bp chopped signal in E. coli Promoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliPromotersRemoveDupsMerged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged.txt

mkdir ./SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged/
mv ./Element/ ./SeqAOnly_Grainger-c-Element-EcoliPromotersRemoveDupsMerged/
```

```bash
#!/bin/bash

#Bedops_ElementSeqAOnly_Grainger-cinEcoliProphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of SeqAOnly_Grainger 1bp chopped signal in E. coli Prophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/SeqAOnly_Grainger-c.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly_Grainger-c-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top50.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top25.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top10.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliProphage.bed
bedops --element-of ./Microarray/SeqAOnly_Grainger-c-Top5.bed ./Prophage/EcoliProphage.bed > ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliProphage.bed


# Copy to excel
cp ./Element/SeqAOnly_Grainger-c-Element-EcoliProphage.bed ./Element/SeqAOnly_Grainger-c-Element-EcoliProphage.xls
cp ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliProphage.bed ./Element/SeqAOnly_Grainger-c-Top50-Element-EcoliProphage.xls
cp ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliProphage.bed ./Element/SeqAOnly_Grainger-c-Top25-Element-EcoliProphage.xls
cp ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliProphage.bed ./Element/SeqAOnly_Grainger-c-Top10-Element-EcoliProphage.xls
cp ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliProphage.bed ./Element/SeqAOnly_Grainger-c-Top5-Element-EcoliProphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-SeqAOnly_Grainger-c-Element-EcoliProphage.txt

mkdir ./SeqAOnly_Grainger-c-Element-EcoliProphage/
mv ./Element/ ./SeqAOnly_Grainger-c-Element-EcoliProphage/
```

BEDOPS 0 vs. 50 Min signals (SeqA Binding) in *E. coli* regions

```
#!/bin/bash

#Bedops_Element0vs50Min-cinEcoliGenes.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min 1bp chopped signal in E. coli ORFs

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-c.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/0vs50Min-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/0vs50Min-c-Top50.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/0vs50Min-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/0vs50Min-c-Top25.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/0vs50Min-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/0vs50Min-c-Top10.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/0vs50Min-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./Microarray/0vs50Min-c-Top5.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/0vs50Min-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed


# Copy to excel
cp ./Element/0vs50Min-c-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/0vs50Min-c-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/0vs50Min-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/0vs50Min-c-Top50-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/0vs50Min-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/0vs50Min-c-Top25-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/0vs50Min-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/0vs50Min-c-Top10-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/0vs50Min-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/0vs50Min-c-Top5-Element-EcoliGenes_RemoveIDandDups-Merged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-c-Element-EcoliGenes_RemoveIDandDups-Merged.txt

mkdir ./0vs50Min-c-Element-EcoliGenes_RemoveIDandDups-Merged/
mv ./Element/ ./0vs50Min-c-Element-EcoliGenes_RemoveIDandDups-Merged/
```

```
#!/bin/bash

#Bedops_Element0vs50Min-cinEcoliNoncoding.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min 1bp chopped signal in E. coli Noncoding regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-c.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/0vs50Min-c-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/0vs50Min-c-Top50.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/0vs50Min-c-Top50-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/0vs50Min-c-Top25.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/0vs50Min-c-Top25-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/0vs50Min-c-Top10.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/0vs50Min-c-Top10-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./Microarray/0vs50Min-c-Top5.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/0vs50Min-c-Top5-Element-EcoliNoncoding-Complemented.bed


# Copy to excel
cp ./Element/0vs50Min-c-Element-EcoliNoncoding-Complemented.bed ./Element/0vs50Min-c-Element-EcoliNoncoding-Complemented.xls
cp ./Element/0vs50Min-c-Top50-Element-EcoliNoncoding-Complemented.bed ./Element/0vs50Min-c-Top50-Element-EcoliNoncoding-Complemented.xls
cp ./Element/0vs50Min-c-Top25-Element-EcoliNoncoding-Complemented.bed ./Element/0vs50Min-c-Top25-Element-EcoliNoncoding-Complemented.xls
cp ./Element/0vs50Min-c-Top10-Element-EcoliNoncoding-Complemented.bed ./Element/0vs50Min-c-Top10-Element-EcoliNoncoding-Complemented.xls
cp ./Element/0vs50Min-c-Top5-Element-EcoliNoncoding-Complemented.bed ./Element/0vs50Min-c-Top5-Element-EcoliNoncoding-Complemented.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-c-Element-EcoliNoncoding-Complemented.txt

mkdir ./0vs50Min-c-Element-EcoliNoncoding-Complemented/
mv ./Element/ ./0vs50Min-c-Element-EcoliNoncoding-Complemented/
```

```bash
#!/bin/bash

#Bedops_Element0vs50Min-cinEcoliNonphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min 1bp chopped signal in E. coli Nonprophage regions


mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-c.bed ./Prophage/EcoliNonphage.bed > ./Element/0vs50Min-c-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/0vs50Min-c-Top50.bed ./Prophage/EcoliNonphage.bed > ./Element/0vs50Min-c-Top50-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/0vs50Min-c-Top25.bed ./Prophage/EcoliNonphage.bed > ./Element/0vs50Min-c-Top25-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/0vs50Min-c-Top10.bed ./Prophage/EcoliNonphage.bed > ./Element/0vs50Min-c-Top10-Element-EcoliNonphage.bed
bedops --element-of ./Microarray/0vs50Min-c-Top5.bed ./Prophage/EcoliNonphage.bed > ./Element/0vs50Min-c-Top5-Element-EcoliNonphage.bed


# Copy to excel
cp ./Element/0vs50Min-c-Element-EcoliNonphage.bed ./Element/0vs50Min-c-Element-EcoliNonphage.xls
cp ./Element/0vs50Min-c-Top50-Element-EcoliNonphage.bed ./Element/0vs50Min-c-Top50-Element-EcoliNonphage.xls
cp ./Element/0vs50Min-c-Top25-Element-EcoliNonphage.bed ./Element/0vs50Min-c-Top25-Element-EcoliNonphage.xls
cp ./Element/0vs50Min-c-Top10-Element-EcoliNonphage.bed ./Element/0vs50Min-c-Top10-Element-EcoliNonphage.xls
cp ./Element/0vs50Min-c-Top5-Element-EcoliNonphage.bed ./Element/0vs50Min-c-Top5-Element-EcoliNonphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-c-Element-EcoliNonphage.txt

mkdir ./0vs50Min-c-Element-EcoliNonphage/
mv ./Element/ ./0vs50Min-c-Element-EcoliNonphage/
```

```
#!/bin/bash

#Bedops_Element0vs50Min-cinEcoliNonpromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min 1bp chopped signal in E. coli Nonpromoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/0vs50Min-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/0vs50Min-c-Top50-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/0vs50Min-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/0vs50Min-c-Top25-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/0vs50Min-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/0vs50Min-c-Top10-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./Microarray/0vs50Min-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/0vs50Min-c-Top5-Element-EcoliPromotersRemoveDupsMerged-Complement.bed


# Copy to excel
cp ./Element/0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/0vs50Min-c-Top50-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/0vs50Min-c-Top50-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/0vs50Min-c-Top25-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/0vs50Min-c-Top25-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/0vs50Min-c-Top10-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/0vs50Min-c-Top10-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/0vs50Min-c-Top5-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/0vs50Min-c-Top5-Element-EcoliPromotersRemoveDupsMerged-Complement.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged-Complement.txt

mkdir ./0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged-Complement/
mv ./Element/ ./0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged-Complement/
```

```
#!/bin/bash

#Bedops_Element0vs50Min-cinEcoliPromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min 1bp chopped signal in E. coli Promoter regions


mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-c.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/0vs50Min-c-Top50.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/0vs50Min-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/0vs50Min-c-Top25.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/0vs50Min-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/0vs50Min-c-Top10.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/0vs50Min-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./Microarray/0vs50Min-c-Top5.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/0vs50Min-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed


# Copy to excel
cp ./Element/0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/0vs50Min-c-Top50-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/0vs50Min-c-Top50-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/0vs50Min-c-Top25-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/0vs50Min-c-Top25-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/0vs50Min-c-Top10-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/0vs50Min-c-Top10-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/0vs50Min-c-Top5-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/0vs50Min-c-Top5-Element-EcoliPromotersRemoveDupsMerged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged.txt

mkdir ./0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged/
mv ./Element/ ./0vs50Min-c-Element-EcoliPromotersRemoveDupsMerged/
```

```
#!/bin/bash

#Bedops_Element0vs50Min-cinEcoliProphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of 0vs50Min 1bp chopped signal in E. coli Prophage regions


mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./Microarray/0vs50Min-c.bed ./Prophage/EcoliProphage.bed > ./Element/0vs50Min-c-Element-EcoliProphage.bed
bedops --element-of ./Microarray/0vs50Min-c-Top50.bed ./Prophage/EcoliProphage.bed > ./Element/0vs50Min-c-Top50-Element-EcoliProphage.bed
bedops --element-of ./Microarray/0vs50Min-c-Top25.bed ./Prophage/EcoliProphage.bed > ./Element/0vs50Min-c-Top25-Element-EcoliProphage.bed
bedops --element-of ./Microarray/0vs50Min-c-Top10.bed ./Prophage/EcoliProphage.bed > ./Element/0vs50Min-c-Top10-Element-EcoliProphage.bed
bedops --element-of ./Microarray/0vs50Min-c-Top5.bed ./Prophage/EcoliProphage.bed > ./Element/0vs50Min-c-Top5-Element-EcoliProphage.bed


# Copy to excel
cp ./Element/0vs50Min-c-Element-EcoliProphage.bed ./Element/0vs50Min-c-Element-EcoliProphage.xls
cp ./Element/0vs50Min-c-Top50-Element-EcoliProphage.bed ./Element/0vs50Min-c-Top50-Element-EcoliProphage.xls
cp ./Element/0vs50Min-c-Top25-Element-EcoliProphage.bed ./Element/0vs50Min-c-Top25-Element-EcoliProphage.xls
cp ./Element/0vs50Min-c-Top10-Element-EcoliProphage.bed ./Element/0vs50Min-c-Top10-Element-EcoliProphage.xls
cp ./Element/0vs50Min-c-Top5-Element-EcoliProphage.bed ./Element/0vs50Min-c-Top5-Element-EcoliProphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-0vs50Min-c-Element-EcoliProphage.txt

mkdir ./0vs50Min-c-Element-EcoliProphage/
mv ./Element/ ./0vs50Min-c-Element-EcoliProphage/
```

BEDOPS GATCs in *E. coli* regions

```
#!/bin/bash

#Bedops_ElementGATCSinEcoliGenes.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of GATCs in E. coli ORFs

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/EcoliGATC_All-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/EcoliGATC_Pairs.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/EcoliGATC_Pairs-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/EcoliGATC_HigherO1-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/EcoliGATC_HigherO2-Element-EcoliGenes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3.bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed > ./Element/EcoliGATC_HigherO3-Element-EcoliGenes_RemoveIDandDups-Merged.bed


# Copy to excel
cp ./Element/EcoliGATC_All-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/EcoliGATC_All-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/EcoliGATC_Pairs-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/EcoliGATC_Pairs-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/EcoliGATC_HigherO1-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/EcoliGATC_HigherO1-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/EcoliGATC_HigherO2-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/EcoliGATC_HigherO2-Element-EcoliGenes_RemoveIDandDups-Merged.xls
cp ./Element/EcoliGATC_HigherO3-Element-EcoliGenes_RemoveIDandDups-Merged.bed ./Element/EcoliGATC_HigherO3-Element-EcoliGenes_RemoveIDandDups-Merged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All-Element-EcoliGenes_RemoveIDandDups-Merged.txt

mkdir ./EcoliGATC_All-Element-EcoliGenes_RemoveIDandDups-Merged/
mv ./Element/ ./EcoliGATC_All-Element-EcoliGenes_RemoveIDandDups-Merged/
```

```bash
#!/bin/bash

#Bedops_ElementGATCSinEcoliNoncoding.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of GATCs in E. coli Noncoding regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/EcoliGATC_All-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./GATC/EcoliGATC_Pairs.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/EcoliGATC_Pairs-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/EcoliGATC_HigherO1-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/EcoliGATC_HigherO2-Element-EcoliNoncoding-Complemented.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3.bed ./Genes/EcoliNoncoding-Complemented.bed > ./Element/EcoliGATC_HigherO3-Element-EcoliNoncoding-Complemented.bed


# Copy to excel
cp ./Element/EcoliGATC_All-Element-EcoliNoncoding-Complemented.bed ./Element/EcoliGATC_All-Element-EcoliNoncoding-Complemented.xls
cp ./Element/EcoliGATC_Pairs-Element-EcoliNoncoding-Complemented.bed ./Element/EcoliGATC_Pairs-Element-EcoliNoncoding-Complemented.xls
cp ./Element/EcoliGATC_HigherO1-Element-EcoliNoncoding-Complemented.bed ./Element/EcoliGATC_HigherO1-Element-EcoliNoncoding-Complemented.xls
cp ./Element/EcoliGATC_HigherO2-Element-EcoliNoncoding-Complemented.bed ./Element/EcoliGATC_HigherO2-Element-EcoliNoncoding-Complemented.xls
cp ./Element/EcoliGATC_HigherO3-Element-EcoliNoncoding-Complemented.bed ./Element/EcoliGATC_HigherO3-Element-EcoliNoncoding-Complemented.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All-Element-EcoliNoncoding-Complemented.txt

mkdir ./EcoliGATC_All-Element-EcoliNoncoding-Complemented/
mv ./Element/ ./EcoliGATC_All-Element-EcoliNoncoding-Complemented/
```

```bash
#!/bin/bash

#Bedops_ElementGATCSinEcoliNonphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of GATCs in E. coli Nonprophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All.bed ./Prophage/EcoliNonphage.bed > ./Element/EcoliGATC_All-Element-EcoliNonphage.bed
bedops --element-of ./GATC/EcoliGATC_Pairs.bed ./Prophage/EcoliNonphage.bed > ./Element/EcoliGATC_Pairs-Element-EcoliNonphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1.bed ./Prophage/EcoliNonphage.bed > ./Element/EcoliGATC_HigherO1-Element-EcoliNonphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2.bed ./Prophage/EcoliNonphage.bed > ./Element/EcoliGATC_HigherO2-Element-EcoliNonphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3.bed ./Prophage/EcoliNonphage.bed > ./Element/EcoliGATC_HigherO3-Element-EcoliNonphage.bed


# Copy to excel
cp ./Element/EcoliGATC_All-Element-EcoliNonphage.bed ./Element/EcoliGATC_All-Element-EcoliNonphage.xls
cp ./Element/EcoliGATC_Pairs-Element-EcoliNonphage.bed ./Element/EcoliGATC_Pairs-Element-EcoliNonphage.xls
cp ./Element/EcoliGATC_HigherO1-Element-EcoliNonphage.bed ./Element/EcoliGATC_HigherO1-Element-EcoliNonphage.xls
cp ./Element/EcoliGATC_HigherO2-Element-EcoliNonphage.bed ./Element/EcoliGATC_HigherO2-Element-EcoliNonphage.xls
cp ./Element/EcoliGATC_HigherO3-Element-EcoliNonphage.bed ./Element/EcoliGATC_HigherO3-Element-EcoliNonphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All-Element-EcoliNonphage.txt

mkdir ./EcoliGATC_All-Element-EcoliNonphage/
mv ./Element/ ./EcoliGATC_All-Element-EcoliNonphage/
```

```

#Bedops_ElementGATCSinEcoliNonpromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of GATCs in E. coli Nonpromoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./GATC/EcoliGATC_Pairs.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/EcoliGATC_Pairs_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/EcoliGATC_HigherO1_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/EcoliGATC_HigherO2_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3.bed ./Promoters/EcoliPromotersRemoveDupsMerged-Complement.bed > ./Element/EcoliGATC_HigherO3_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed


# Copy to excel
cp ./Element/EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/EcoliGATC_Pairs_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/EcoliGATC_Pairs_r-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/EcoliGATC_HigherO1_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/EcoliGATC_HigherO1_r-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/EcoliGATC_HigherO2_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/EcoliGATC_HigherO2_r-Element-EcoliPromotersRemoveDupsMerged-Complement.xls
cp ./Element/EcoliGATC_HigherO3_r-Element-EcoliPromotersRemoveDupsMerged-Complement.bed ./Element/EcoliGATC_HigherO3_r-Element-EcoliPromotersRemoveDupsMerged-Complement.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement.txt

mkdir ./EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement/
mv ./Element/ ./EcoliGATC_All_r-Element-EcoliPromotersRemoveDupsMerged-Complement/
```

```
#!/bin/bash

#Bedops_ElementGATCSinEcoliPromoters.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of GATCs in E. coli Promoter regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/EcoliGATC_All-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./GATC/EcoliGATC_Pairs.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/EcoliGATC_Pairs-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/EcoliGATC_HigherO1-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/EcoliGATC_HigherO2-Element-EcoliPromotersRemoveDupsMerged.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3.bed ./Promoters/EcoliPromotersRemoveDupsMerged.bed > ./Element/EcoliGATC_HigherO3-Element-EcoliPromotersRemoveDupsMerged.bed


# Copy to excel
cp ./Element/EcoliGATC_All-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/EcoliGATC_All-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/EcoliGATC_Pairs-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/EcoliGATC_Pairs-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/EcoliGATC_HigherO1-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/EcoliGATC_HigherO1-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/EcoliGATC_HigherO2-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/EcoliGATC_HigherO2-Element-EcoliPromotersRemoveDupsMerged.xls
cp ./Element/EcoliGATC_HigherO3-Element-EcoliPromotersRemoveDupsMerged.bed ./Element/EcoliGATC_HigherO3-Element-EcoliPromotersRemoveDupsMerged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All-Element-EcoliPromotersRemoveDupsMerged.txt

mkdir ./EcoliGATC_All-Element-EcoliPromotersRemoveDupsMerged/
mv ./Element/ ./EcoliGATC_All-Element-EcoliPromotersRemoveDupsMerged/
```

```

#Bedops_ElementGATCSinEcoliProphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of GATCs in E. coli Prophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/EcoliGATC_All.bed ./Prophage/EcoliProphage.bed > ./Element/EcoliGATC_All-Element-EcoliProphage.bed
bedops --element-of ./GATC/EcoliGATC_Pairs.bed ./Prophage/EcoliProphage.bed > ./Element/EcoliGATC_Pairs-Element-EcoliProphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO1.bed ./Prophage/EcoliProphage.bed > ./Element/EcoliGATC_HigherO1-Element-EcoliProphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO2.bed ./Prophage/EcoliProphage.bed > ./Element/EcoliGATC_HigherO2-Element-EcoliProphage.bed
bedops --element-of ./GATC/EcoliGATC_HigherO3.bed ./Prophage/EcoliProphage.bed > ./Element/EcoliGATC_HigherO3-Element-EcoliProphage.bed


# Copy to excel
cp ./Element/EcoliGATC_All-Element-EcoliProphage.bed ./Element/EcoliGATC_All-Element-EcoliProphage.xls
cp ./Element/EcoliGATC_Pairs-Element-EcoliProphage.bed ./Element/EcoliGATC_Pairs-Element-EcoliProphage.xls
cp ./Element/EcoliGATC_HigherO1-Element-EcoliProphage.bed ./Element/EcoliGATC_HigherO1-Element-EcoliProphage.xls
cp ./Element/EcoliGATC_HigherO2-Element-EcoliProphage.bed ./Element/EcoliGATC_HigherO2-Element-EcoliProphage.xls
cp ./Element/EcoliGATC_HigherO3-Element-EcoliProphage.bed ./Element/EcoliGATC_HigherO3-Element-EcoliProphage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-EcoliGATC_All-Element-EcoliProphage.txt

mkdir ./EcoliGATC_All-Element-EcoliProphage/
mv ./Element/ ./EcoliGATC_All-Element-EcoliProphage/
```

BEDTools create random locations for LT2 GATCs

```
#!/bin/bash

# bedtools_random_LT2GATC.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to create random locations for LT2 GATCs

bedtools random -g ./LT2-genomesize.txt -n 19168 -l 4 > LT2GATC_All_r.bed
bedtools random -g ./LT2-genomesize.txt -n 3271 -l 4 > LT2GATC_Pairs_r.bed
bedtools random -g ./LT2-genomesize.txt -n 993 -l 4 > LT2GATC_HigherO1_r.bed
bedtools random -g ./LT2-genomesize.txt -n 320 -l 4 > LT2GATC_HigherO2_r.bed
bedtools random -g ./LT2-genomesize.txt -n 108 -l 4 > LT2GATC_HigherO3_r.bed
```

BEDOPS randomized GATCs in LT2 regions

```
#!/bin/bash

#Bedops_ElementGATCS_r_inLT2Genes.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of random GATCs in LT2 ORFs

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/LT2GATC_All_r.bed ./Genes/LT2Genes_RemoveIDandDups-Merged.bed > ./Element/LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/LT2GATC_Pairs_r.bed ./Genes/LT2Genes_RemoveIDandDups-Merged.bed > ./Element/LT2GATC_Pairs_r-Element-LT2Genes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/LT2GATC_HigherO1_r.bed ./Genes/LT2Genes_RemoveIDandDups-Merged.bed > ./Element/LT2GATC_HigherO1_r-Element-LT2Genes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/LT2GATC_HigherO2_r.bed ./Genes/LT2Genes_RemoveIDandDups-Merged.bed > ./Element/LT2GATC_HigherO2_r-Element-LT2Genes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/LT2GATC_HigherO3_r.bed ./Genes/LT2Genes_RemoveIDandDups-Merged.bed > ./Element/LT2GATC_HigherO3_r-Element-LT2Genes_RemoveIDandDups-Merged.bed


# Copy to excel
cp ./Element/LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged.bed ./Element/LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged.xls
cp ./Element/LT2GATC_Pairs_r-Element-LT2Genes_RemoveIDandDups-Merged.bed ./Element/LT2GATC_Pairs_r-Element-LT2Genes_RemoveIDandDups-Merged.xls
cp ./Element/LT2GATC_HigherO1_r-Element-LT2Genes_RemoveIDandDups-Merged.bed ./Element/LT2GATC_HigherO1_r-Element-LT2Genes_RemoveIDandDups-Merged.xls
cp ./Element/LT2GATC_HigherO2_r-Element-LT2Genes_RemoveIDandDups-Merged.bed ./Element/LT2GATC_HigherO2_r-Element-LT2Genes_RemoveIDandDups-Merged.xls
cp ./Element/LT2GATC_HigherO3_r-Element-LT2Genes_RemoveIDandDups-Merged.bed ./Element/LT2GATC_HigherO3_r-Element-LT2Genes_RemoveIDandDups-Merged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged.txt

mkdir ./LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged/
mv ./Element/ ./LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged/
```

```
#!/bin/bash

#Bedops_ElementGATCS_r_inLT2Noncoding.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of random GATCs in LT2 Noncoding regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/LT2GATC_All_r.bed ./Genes/LT2Noncoding-Complemented.bed > ./Element/LT2GATC_All_r-Element-LT2Noncoding-Complemented.bed
bedops --element-of ./GATC/LT2GATC_Pairs_r.bed ./Genes/LT2Noncoding-Complemented.bed > ./Element/LT2GATC_Pairs_r-Element-LT2Noncoding-Complemented.bed
bedops --element-of ./GATC/LT2GATC_HigherO1_r.bed ./Genes/LT2Noncoding-Complemented.bed > ./Element/LT2GATC_HigherO1_r-Element-LT2Noncoding-Complemented.bed
bedops --element-of ./GATC/LT2GATC_HigherO2_r.bed ./Genes/LT2Noncoding-Complemented.bed > ./Element/LT2GATC_HigherO2_r-Element-LT2Noncoding-Complemented.bed
bedops --element-of ./GATC/LT2GATC_HigherO3_r.bed ./Genes/LT2Noncoding-Complemented.bed > ./Element/LT2GATC_HigherO3_r-Element-LT2Noncoding-Complemented.bed


# Copy to excel
cp ./Element/LT2GATC_All_r-Element-LT2Noncoding-Complemented.bed ./Element/LT2GATC_All_r-Element-LT2Noncoding-Complemented.xls
cp ./Element/LT2GATC_Pairs_r-Element-LT2Noncoding-Complemented.bed ./Element/LT2GATC_Pairs_r-Element-LT2Noncoding-Complemented.xls
cp ./Element/LT2GATC_HigherO1_r-Element-LT2Noncoding-Complemented.bed ./Element/LT2GATC_HigherO1_r-Element-LT2Noncoding-Complemented.xls
cp ./Element/LT2GATC_HigherO2_r-Element-LT2Noncoding-Complemented.bed ./Element/LT2GATC_HigherO2_r-Element-LT2Noncoding-Complemented.xls
cp ./Element/LT2GATC_HigherO3_r-Element-LT2Noncoding-Complemented.bed ./Element/LT2GATC_HigherO3_r-Element-LT2Noncoding-Complemented.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-LT2GATC_All_r-Element-LT2Noncoding-Complemented.txt

mkdir ./LT2GATC_All_r-Element-LT2Noncoding-Complemented/
mv ./Element/ ./LT2GATC_All_r-Element-LT2Noncoding-Complemented/
```

```bash
#!/bin/bash

#Bedops_ElementGATCS_r_inLT2Nonphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of random GATCs in LT2 Nonprophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/LT2GATC_All_r.bed ./Prophage/LT2AllPhageComplement.bed > ./Element/LT2GATC_All_r-Element-LT2AllPhageComplement.bed
bedops --element-of ./GATC/LT2GATC_Pairs_r.bed ./Prophage/LT2AllPhageComplement.bed > ./Element/LT2GATC_Pairs_r-Element-LT2AllPhageComplement.bed
bedops --element-of ./GATC/LT2GATC_HigherO1_r.bed ./Prophage/LT2AllPhageComplement.bed > ./Element/LT2GATC_HigherO1_r-Element-LT2AllPhageComplement.bed
bedops --element-of ./GATC/LT2GATC_HigherO2_r.bed ./Prophage/LT2AllPhageComplement.bed > ./Element/LT2GATC_HigherO2_r-Element-LT2AllPhageComplement.bed
bedops --element-of ./GATC/LT2GATC_HigherO3_r.bed ./Prophage/LT2AllPhageComplement.bed > ./Element/LT2GATC_HigherO3_r-Element-LT2AllPhageComplement.bed


# Copy to excel
cp ./Element/LT2GATC_All_r-Element-LT2AllPhageComplement.bed ./Element/LT2GATC_All_r-Element-LT2AllPhageComplement.xls
cp ./Element/LT2GATC_Pairs_r-Element-LT2AllPhageComplement.bed ./Element/LT2GATC_Pairs_r-Element-LT2AllPhageComplement.xls
cp ./Element/LT2GATC_HigherO1_r-Element-LT2AllPhageComplement.bed ./Element/LT2GATC_HigherO1_r-Element-LT2AllPhageComplement.xls
cp ./Element/LT2GATC_HigherO2_r-Element-LT2AllPhageComplement.bed ./Element/LT2GATC_HigherO2_r-Element-LT2AllPhageComplement.xls
cp ./Element/LT2GATC_HigherO3_r-Element-LT2AllPhageComplement.bed ./Element/LT2GATC_HigherO3_r-Element-LT2AllPhageComplement.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-LT2GATC_All_r-Element-LT2AllPhageComplement.txt

mkdir ./LT2GATC_All_r-Element-LT2AllPhageComplement/
mv ./Element/ ./LT2GATC_All_r-Element-LT2AllPhageComplement/
```

```bash
#!/bin/bash

#Bedops_ElementGATCS_r_inLT2Prophage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of random GATCs in LT2 Prophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/LT2GATC_All_r.bed ./Prophage/LT2AllPhage.bed > ./Element/LT2GATC_All_r-Element-LT2AllPhage.bed
bedops --element-of ./GATC/LT2GATC_Pairs_r.bed ./Prophage/LT2AllPhage.bed > ./Element/LT2GATC_Pairs_r-Element-LT2AllPhage.bed
bedops --element-of ./GATC/LT2GATC_HigherO1_r.bed ./Prophage/LT2AllPhage.bed > ./Element/LT2GATC_HigherO1_r-Element-LT2AllPhage.bed
bedops --element-of ./GATC/LT2GATC_HigherO2_r.bed ./Prophage/LT2AllPhage.bed > ./Element/LT2GATC_HigherO2_r-Element-LT2AllPhage.bed
bedops --element-of ./GATC/LT2GATC_HigherO3_r.bed ./Prophage/LT2AllPhage.bed > ./Element/LT2GATC_HigherO3_r-Element-LT2AllPhage.bed


# Copy to excel
cp ./Element/LT2GATC_All_r-Element-LT2AllPhage.bed ./Element/LT2GATC_All_r-Element-LT2AllPhage.xls
cp ./Element/LT2GATC_Pairs_r-Element-LT2AllPhage.bed ./Element/LT2GATC_Pairs_r-Element-LT2AllPhage.xls
cp ./Element/LT2GATC_HigherO1_r-Element-LT2AllPhage.bed ./Element/LT2GATC_HigherO1_r-Element-LT2AllPhage.xls
cp ./Element/LT2GATC_HigherO2_r-Element-LT2AllPhage.bed ./Element/LT2GATC_HigherO2_r-Element-LT2AllPhage.xls
cp ./Element/LT2GATC_HigherO3_r-Element-LT2AllPhage.bed ./Element/LT2GATC_HigherO3_r-Element-LT2AllPhage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-LT2GATC_All_r-Element-LT2AllPhage.txt

mkdir ./LT2GATC_All_r-Element-LT2AllPhage/
mv ./Element/ ./LT2GATC_All_r-Element-LT2AllPhage/
```

BEDOPS GATCs in LT2 regions

```bash
#!/bin/bash

#Bedops_ElementGATCSinLT2Genes.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of GATCs in LT2 ORF

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/LT2GATC_All.bed./Genes/LT2Genes_RemoveIDandDups-Merged.bed > ./Element/LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/LT2GATC_Pairs.bed./Genes/LT2Genes_RemoveIDandDups-Merged.bed > ./Element/LT2GATC_Pairs_r-Element-LT2Genes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/LT2GATC_HigherO1.bed./Genes/LT2Genes_RemoveIDandDups-Merged.bed > ./Element/LT2GATC_HigherO1_r-Element-LT2Genes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/LT2GATC_HigherO2.bed./Genes/LT2Genes_RemoveIDandDups-Merged.bed > ./Element/LT2GATC_HigherO2_r-Element-LT2Genes_RemoveIDandDups-Merged.bed
bedops --element-of ./GATC/LT2GATC_HigherO3.bed./Genes/LT2Genes_RemoveIDandDups-Merged.bed > ./Element/LT2GATC_HigherO3_r-Element-LT2Genes_RemoveIDandDups-Merged.bed


# Copy to excel
cp ./Element/LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged.bed ./Element/LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged.xls
cp ./Element/LT2GATC_Pairs_r-Element-LT2Genes_RemoveIDandDups-Merged.bed ./Element/LT2GATC_Pairs_r-Element-LT2Genes_RemoveIDandDups-Merged.xls
cp ./Element/LT2GATC_HigherO1_r-Element-LT2Genes_RemoveIDandDups-Merged.bed ./Element/LT2GATC_HigherO1_r-Element-LT2Genes_RemoveIDandDups-Merged.xls
cp ./Element/LT2GATC_HigherO2_r-Element-LT2Genes_RemoveIDandDups-Merged.bed ./Element/LT2GATC_HigherO2_r-Element-LT2Genes_RemoveIDandDups-Merged.xls
cp ./Element/LT2GATC_HigherO3_r-Element-LT2Genes_RemoveIDandDups-Merged.bed ./Element/LT2GATC_HigherO3_r-Element-LT2Genes_RemoveIDandDups-Merged.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged.txt

mkdir ./LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged/
mv ./Element/ ./LT2GATC_All_r-Element-LT2Genes_RemoveIDandDups-Merged/
```

```
#!/bin/bash

#Bedops_ElementGATCSinLT2Noncoding.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of GATCs in LT2 Noncoding regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/LT2GATC_All.bed ./Genes/LT2Noncoding-Complemented.bed > ./Element/LT2GATC_All-Element-LT2Noncoding-Complemented.bed
bedops --element-of ./GATC/LT2GATC_Pairs.bed ./Genes/LT2Noncoding-Complemented.bed > ./Element/LT2GATC_Pairs-Element-LT2Noncoding-Complemented.bed
bedops --element-of ./GATC/LT2GATC_HigherO1.bed ./Genes/LT2Noncoding-Complemented.bed > ./Element/LT2GATC_HigherO1-Element-LT2Noncoding-Complemented.bed
bedops --element-of ./GATC/LT2GATC_HigherO2.bed ./Genes/LT2Noncoding-Complemented.bed > ./Element/LT2GATC_HigherO2-Element-LT2Noncoding-Complemented.bed
bedops --element-of ./GATC/LT2GATC_HigherO3.bed ./Genes/LT2Noncoding-Complemented.bed > ./Element/LT2GATC_HigherO3-Element-LT2Noncoding-Complemented.bed


# Copy to excel
cp ./Element/LT2GATC_All-Element-LT2Noncoding-Complemented.bed ./Element/LT2GATC_All-Element-LT2Noncoding-Complemented.xls
cp ./Element/LT2GATC_Pairs-Element-LT2Noncoding-Complemented.bed ./Element/LT2GATC_Pairs-Element-LT2Noncoding-Complemented.xls
cp ./Element/LT2GATC_HigherO1-Element-LT2Noncoding-Complemented.bed ./Element/LT2GATC_HigherO1-Element-LT2Noncoding-Complemented.xls
cp ./Element/LT2GATC_HigherO2-Element-LT2Noncoding-Complemented.bed ./Element/LT2GATC_HigherO2-Element-LT2Noncoding-Complemented.xls
cp ./Element/LT2GATC_HigherO3-Element-LT2Noncoding-Complemented.bed ./Element/LT2GATC_HigherO3-Element-LT2Noncoding-Complemented.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-LT2GATC_All-Element-LT2Noncoding-Complemented.txt

mkdir ./LT2GATC_All-Element-LT2Noncoding-Complemented/
mv ./Element/ ./LT2GATC_All-Element-LT2Noncoding-Complemented/
```

```bash
#!/bin/bash

#Bedops_ElementGATCSinLT2Nonphage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of GATCs in LT2 Nonprophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/LT2GATC_All.bed ./Prophage/LT2AllPhageComplement.bed > ./Element/LT2GATC_All-Element-LT2AllPhageComplement.bed
bedops --element-of ./GATC/LT2GATC_Pairs.bed ./Prophage/LT2AllPhageComplement.bed > ./Element/LT2GATC_Pairs-Element-LT2AllPhageComplement.bed
bedops --element-of ./GATC/LT2GATC_HigherO1.bed ./Prophage/LT2AllPhageComplement.bed > ./Element/LT2GATC_HigherO1-Element-LT2AllPhageComplement.bed
bedops --element-of ./GATC/LT2GATC_HigherO2.bed ./Prophage/LT2AllPhageComplement.bed > ./Element/LT2GATC_HigherO2-Element-LT2AllPhageComplement.bed
bedops --element-of ./GATC/LT2GATC_HigherO3.bed ./Prophage/LT2AllPhageComplement.bed > ./Element/LT2GATC_HigherO3-Element-LT2AllPhageComplement.bed


# Copy to excel
cp ./Element/LT2GATC_All-Element-LT2AllPhageComplement.bed ./Element/LT2GATC_All-Element-LT2AllPhageComplement.xls
cp ./Element/LT2GATC_Pairs-Element-LT2AllPhageComplement.bed ./Element/LT2GATC_Pairs-Element-LT2AllPhageComplement.xls
cp ./Element/LT2GATC_HigherO1-Element-LT2AllPhageComplement.bed ./Element/LT2GATC_HigherO1-Element-LT2AllPhageComplement.xls
cp ./Element/LT2GATC_HigherO2-Element-LT2AllPhageComplement.bed ./Element/LT2GATC_HigherO2-Element-LT2AllPhageComplement.xls
cp ./Element/LT2GATC_HigherO3-Element-LT2AllPhageComplement.bed ./Element/LT2GATC_HigherO3-Element-LT2AllPhageComplement.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-LT2GATC_All-Element-LT2AllPhageComplement.txt

mkdir ./LT2GATC_All-Element-LT2AllPhageComplement/
mv ./Element/ ./LT2GATC_All-Element-LT2AllPhageComplement/
```

```bash
#!/bin/bash

#Bedops_ElementGATCSinLT2Prophage.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find amount of GATCs in LT2 Prophage regions

mkdir ./Element/

#bedops make bed files element of
bedops --element-of ./GATC/LT2GATC_All.bed ./Prophage/LT2AllPhage.bed > ./Element/LT2GATC_All-Element-LT2AllPhage.bed
bedops --element-of ./GATC/LT2GATC_Pairs.bed ./Prophage/LT2AllPhage.bed > ./Element/LT2GATC_Pairs-Element-LT2AllPhage.bed
bedops --element-of ./GATC/LT2GATC_HigherO1.bed ./Prophage/LT2AllPhage.bed > ./Element/LT2GATC_HigherO1-Element-LT2AllPhage.bed
bedops --element-of ./GATC/LT2GATC_HigherO2.bed ./Prophage/LT2AllPhage.bed > ./Element/LT2GATC_HigherO2-Element-LT2AllPhage.bed
bedops --element-of ./GATC/LT2GATC_HigherO3.bed ./Prophage/LT2AllPhage.bed > ./Element/LT2GATC_HigherO3-Element-LT2AllPhage.bed


# Copy to excel
cp ./Element/LT2GATC_All-Element-LT2AllPhage.bed ./Element/LT2GATC_All-Element-LT2AllPhage.xls
cp ./Element/LT2GATC_Pairs-Element-LT2AllPhage.bed ./Element/LT2GATC_Pairs-Element-LT2AllPhage.xls
cp ./Element/LT2GATC_HigherO1-Element-LT2AllPhage.bed ./Element/LT2GATC_HigherO1-Element-LT2AllPhage.xls
cp ./Element/LT2GATC_HigherO2-Element-LT2AllPhage.bed ./Element/LT2GATC_HigherO2-Element-LT2AllPhage.xls
cp ./Element/LT2GATC_HigherO3-Element-LT2AllPhage.bed ./Element/LT2GATC_HigherO3-Element-LT2AllPhage.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-LT2GATC_All-Element-LT2AllPhage.txt

mkdir ./LT2GATC_All-Element-LT2AllPhage/
mv ./Element/ ./LT2GATC_All-Element-LT2AllPhage/
```

BEDOPS GATCs in randomized *E. coli* SeqA Only signals (SeqA Only 1)

```
#!/bin/bash

#Bedops_Element-GATCSandSeqAOnly-R1000e1-All-Range75.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find GATCs with range 75 in randomized SeqAOnly signals

#bedops make bed files element of
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly-R1000e1-Top5.bed > ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly-R1000e1-Top5.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly-R1000e1-Top5.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly-R1000e1-Top5.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly-R1000e1-Top5.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly-R1000e1-Top10.bed > ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly-R1000e1-Top10.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly-R1000e1-Top10.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly-R1000e1-Top10.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly-R1000e1-Top10.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly-R1000e1-Top25.bed > ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly-R1000e1-Top25.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly-R1000e1-Top25.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly-R1000e1-Top25.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly-R1000e1-Top25.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly-R1000e1-Top50.bed > ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly-R1000e1-Top50.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly-R1000e1-Top50.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top50.bed
```

```
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly-R1000e1-Top50.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly-R1000e1-Top50.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly-R1000e1.bed > ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly-R1000e1.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly-R1000e1.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly-R1000e1.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly-R1000e1.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1.bed


# Copy to excel
cp ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top5.bed ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top5.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top5.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top5.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top5.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top5.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top5.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top5.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top5.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top5.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top10.bed ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top10.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top10.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top10.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top10.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top10.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top10.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top10.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top10.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top10.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top25.bed ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top25.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top25.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top25.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top25.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top25.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top25.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top25.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top25.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top25.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top50.bed ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1-Top50.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top50.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1-Top50.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top50.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1-Top50.xls
```

```
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top50.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1-Top50.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top50.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1-Top50.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1.bed ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-Bedops_Element-GATCSandSeqAOnlyAll-Range75.txt

mkdir ./Bedops_Element-GATCSandSeqAOnlyAll-Range75/
mv ./Element/ ./Bedops_Element-GATCSandSeqAOnlyAll-Range75/
```

BEDOPS GATCs in randomized *E. coli* SeqA Only (Grainger) signals (SeqA Only 2)

```bash
#!/bin/bash

#Bedops_Element-GATCSandSeqAOnly_Grainger-R1000e1-All-Range75.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find GATCs with range 75 in randomized SeqAOnly_Grainger signals

#bedops make bed files element of
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top5.bed > ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top5.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top5.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top5.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top5.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top10.bed > ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top10.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top10.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top10.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top10.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top25.bed > ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top25.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top25.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top25.bed
```

```
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top25.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top25.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top50.bed > ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top50.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top50.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top50.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly_Grainger-R1000e1-Top50.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly_Grainger-R1000e1.bed > ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly_Grainger-R1000e1.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly_Grainger-R1000e1.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly_Grainger-R1000e1.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly_Grainger-R1000e1.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1.bed


# Copy to excel
cp ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top5.bed ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top5.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top5.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top5.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top5.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top5.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top5.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top5.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top5.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top5.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top10.bed ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top10.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top10.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top10.xls
```

```
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top10.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top10.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top10.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top10.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top10.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top10.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top25.bed ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top25.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top25.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top25.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top25.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top25.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top25.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top25.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top25.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top25.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top50.bed ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1-Top50.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top50.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1-Top50.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top50.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1-Top50.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top50.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1-Top50.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top50.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1-Top50.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1.bed ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-Bedops_Element-GATCSandSeqAOnly_GraingerAll-Range75.txt

mkdir ./Bedops_Element-GATCSandSeqAOnly_GraingerAll-Range75/
mv ./Element/ ./Bedops_Element-GATCSandSeqAOnly_GraingerAll-Range75/
```

BEDOPS GATCs in randomized *E. coli* 0 vs. 50 Min signals (SeqA Binding)

```
bin/bash

#Bedops_Element-GATCSand0vs50Min-R1000e1-All-Range75.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find GATCs with range 75 in randomized 0vs50Min signals

bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/0vs50Min-R1000e1-Top5.bed > ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/0vs50Min-R1000e1-Top5.bed > ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/0vs50Min-R1000e1-Top5.bed > ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/0vs50Min-R1000e1-Top5.bed > ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/0vs50Min-R1000e1-Top5.bed > ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/0vs50Min-R1000e1-Top10.bed > ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/0vs50Min-R1000e1-Top10.bed > ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/0vs50Min-R1000e1-Top10.bed > ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/0vs50Min-R1000e1-Top10.bed > ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/0vs50Min-R1000e1-Top10.bed > ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/0vs50Min-R1000e1-Top25.bed > ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/0vs50Min-R1000e1-Top25.bed > ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/0vs50Min-R1000e1-Top25.bed > ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/0vs50Min-R1000e1-Top25.bed > ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/0vs50Min-R1000e1-Top25.bed > ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/0vs50Min-R1000e1-Top50.bed > ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/0vs50Min-R1000e1-Top50.bed > ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/0vs50Min-R1000e1-Top50.bed > ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/0vs50Min-R1000e1-Top50.bed > ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top50.bed
```

```
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/0vs50Min-R1000e1-Top50.bed > ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/0vs50Min-R1000e1.bed > ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/0vs50Min-R1000e1.bed > ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/0vs50Min-R1000e1.bed > ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/0vs50Min-R1000e1.bed > ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/0vs50Min-R1000e1.bed > ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1.bed


# Copy to excel
cp ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top5.bed ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top5.xls
cp ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top5.bed ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top5.xls
cp ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top5.bed ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top5.xls
cp ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top5.bed ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top5.xls
cp ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top5.bed ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top5.xls
cp ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top10.bed ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top10.xls
cp ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top10.bed ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top10.xls
cp ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top10.bed ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top10.xls
cp ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top10.bed ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top10.xls
cp ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top10.bed ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top10.xls
cp ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top25.bed ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top25.xls
cp ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top25.bed ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top25.xls
cp ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top25.bed ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top25.xls
cp ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top25.bed ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top25.xls
cp ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top25.bed ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top25.xls
cp ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top50.bed ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1-Top50.xls
cp ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top50.bed ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1-Top50.xls
cp ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top50.bed ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1-Top50.xls
cp ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top50.bed ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1-Top50.xls
cp ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top50.bed ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1-Top50.xls
```

```
cp ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1.bed ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1.xls
cp ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1.bed ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1.xls
cp ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1.bed ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1.xls
cp ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1.bed ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1.xls
cp ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1.bed ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1.xls

#Line count
wc -l ./Element/*.bed > ./Element/Bedops_Element-GATCSand0vs50MinAll-Range75.txt

mkdir ./Bedops_Element-GATCSand0vs50MinAll-Range75/
mv ./Element/ ./Bedops_Element-GATCSand0vs50MinAll-Range75/
```

BEDOPS GATCs in *E. coli* SeqA Only signals (SeqA Only 1)

```bash
#!/bin/bash

#Bedops_Element-GATCSandSeqAOnly-All-Range75.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find GATCs with range 75 in SeqAOnly signals

#bedops make bed files element of
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly-Top5.bed > ./Element/EcoliGATC_All-Element-SeqAOnly-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly-Top5.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly-Top5.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly-Top5.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly-Top5.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly-Top10.bed > ./Element/EcoliGATC_All-Element-SeqAOnly-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly-Top10.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly-Top10.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly-Top10.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly-Top10.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly-Top25.bed > ./Element/EcoliGATC_All-Element-SeqAOnly-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly-Top25.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly-Top25.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly-Top25.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly-Top25.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly-Top50.bed > ./Element/EcoliGATC_All-Element-SeqAOnly-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly-Top50.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly-Top50.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly-Top50.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly-Top50.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly-R1000e1.bed > ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly-R1000e1.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1.bed
```

```
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly-R1000e1.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly-R1000e1.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly-R1000e1.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1.bed


# Copy to excel
cp ./Element/EcoliGATC_All-Element-SeqAOnly-Top5.bed ./Element/EcoliGATC_All-Element-SeqAOnly-Top5.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top5.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top5.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top5.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top5.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top5.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top5.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top5.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top5.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly-Top10.bed ./Element/EcoliGATC_All-Element-SeqAOnly-Top10.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top10.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top10.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top10.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top10.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top10.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top10.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top10.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top10.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly-Top25.bed ./Element/EcoliGATC_All-Element-SeqAOnly-Top25.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top25.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top25.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top25.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top25.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top25.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top25.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top25.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top25.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly-Top50.bed ./Element/EcoliGATC_All-Element-SeqAOnly-Top50.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top50.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly-Top50.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top50.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-Top50.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top50.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-Top50.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top50.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-Top50.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1.bed ./Element/EcoliGATC_All-Element-SeqAOnly-R1000e1.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly-R1000e1.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly-R1000e1.xls
```

```
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly-R1000e1.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly-R1000e1.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-Bedops_Element-GATCSandSeqAOnlyAll-Range75.txt

mkdir ./Bedops_Element-GATCSandSeqAOnlyAll-Range75/
mv ./Element/ ./Bedops_Element-GATCSandSeqAOnlyAll-Range75/
```

BEDOPS GATCs in *E. coli* SeqA Only (Grainger) signals (SeqA Only 2)

```
#!/bin/bash

#Bedops_Element-GATCSandSeqAOnly_Grainger-All-Range75.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find GATCs with range 75 in SeqAOnly_Grainger signals

#bedops make bed files element of
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly_Grainger-Top5.bed > ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly_Grainger-Top5.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly_Grainger-Top5.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly_Grainger-Top5.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly_Grainger-Top5.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly_Grainger-Top10.bed > ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly_Grainger-Top10.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly_Grainger-Top10.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly_Grainger-Top10.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly_Grainger-Top10.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly_Grainger-Top25.bed > ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly_Grainger-Top25.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly_Grainger-Top25.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly_Grainger-Top25.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly_Grainger-Top25.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly_Grainger-Top50.bed > ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly_Grainger-Top50.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top50.bed
```

```
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly_Grainger-Top50.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly_Grainger-Top50.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly_Grainger-Top50.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/SeqAOnly_Grainger-R1000e1.bed > ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/SeqAOnly_Grainger-R1000e1.bed > ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/SeqAOnly_Grainger-R1000e1.bed > ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/SeqAOnly_Grainger-R1000e1.bed > ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/SeqAOnly_Grainger-R1000e1.bed > ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1.bed


# Copy to excel
cp ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top5.bed ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top5.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top5.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top5.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top5.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top5.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top5.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top5.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top5.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top5.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top10.bed ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top10.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top10.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top10.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top10.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top10.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top10.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top10.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top10.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top10.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top25.bed ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top25.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top25.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top25.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top25.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top25.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top25.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top25.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top25.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top25.xls
```

```
cp ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top50.bed ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-Top50.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top50.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-Top50.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top50.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-Top50.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top50.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-Top50.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top50.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-Top50.xls
cp ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1.bed ./Element/EcoliGATC_All-Element-SeqAOnly_Grainger-R1000e1.xls
cp ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1.bed ./Element/EcoliGATC_Pairs-Element-SeqAOnly_Grainger-R1000e1.xls
cp ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1.bed ./Element/EcoliGATC_HigherO1-Element-SeqAOnly_Grainger-R1000e1.xls
cp ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1.bed ./Element/EcoliGATC_HigherO2-Element-SeqAOnly_Grainger-R1000e1.xls
cp ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1.bed ./Element/EcoliGATC_HigherO3-Element-SeqAOnly_Grainger-R1000e1.xls

#Line count
wc -l ./Element/*.bed > ./Element/OverlapStats-Bedops_Element-GATCSandSeqAOnly_GraingerAll-Range75.txt

mkdir ./Bedops_Element-GATCSandSeqAOnly_GraingerAll-Range75/
mv ./Element/ ./Bedops_Element-GATCSandSeqAOnly_GraingerAll-Range75/
```

BEDOPS GATCs in *E. coli* 0 vs. 50 Min signals (SeqA Binding)

```
#!/bin/bash

#Bedops_Element-GATCSand0vs50MinAll-Range75.sh
#bedops version:  2.4.35 (typical)
#Uses Bedops to find GATCs with range 75 in 0vs50Min signals

bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/0vs50MinTop5.bed > ./Element/EcoliGATC_All-Element-0vs50MinTop5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/0vs50MinTop5.bed > ./Element/EcoliGATC_Pairs-Element-0vs50MinTop5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/0vs50MinTop5.bed > ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/0vs50MinTop5.bed > ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/0vs50MinTop5.bed > ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop5.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/0vs50MinTop10.bed > ./Element/EcoliGATC_All-Element-0vs50MinTop10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/0vs50MinTop10.bed > ./Element/EcoliGATC_Pairs-Element-0vs50MinTop10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/0vs50MinTop10.bed > ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/0vs50MinTop10.bed > ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/0vs50MinTop10.bed > ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop10.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/0vs50MinTop25.bed > ./Element/EcoliGATC_All-Element-0vs50MinTop25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/0vs50MinTop25.bed > ./Element/EcoliGATC_Pairs-Element-0vs50MinTop25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/0vs50MinTop25.bed > ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/0vs50MinTop25.bed > ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop25.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/0vs50MinTop25.bed > ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop25.bed
```

```
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/0vs50MinTop50.bed > ./Element/EcoliGATC_All-Element-0vs50MinTop50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/0vs50MinTop50.bed > ./Element/EcoliGATC_Pairs-Element-0vs50MinTop50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/0vs50MinTop50.bed > ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/0vs50MinTop50.bed > ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/0vs50MinTop50.bed > ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop50.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_All.bed ./Microarray/0vs50Min-R1000e1.bed > ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_Pairs.bed ./Microarray/0vs50Min-R1000e1.bed > ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO1.bed ./Microarray/0vs50Min-R1000e1.bed > ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO2.bed ./Microarray/0vs50Min-R1000e1.bed > ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1.bed
bedops --range 75 --element-of ./GATC/EcoliGATC_HigherO3.bed ./Microarray/0vs50Min-R1000e1.bed > ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1.bed


# Copy to excel
cp ./Element/EcoliGATC_All-Element-0vs50MinTop5.bed ./Element/EcoliGATC_All-Element-0vs50MinTop5.xls
cp ./Element/EcoliGATC_Pairs-Element-0vs50MinTop5.bed ./Element/EcoliGATC_Pairs-Element-0vs50MinTop5.xls
cp ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop5.bed ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop5.xls
cp ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop5.bed ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop5.xls
cp ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop5.bed ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop5.xls
cp ./Element/EcoliGATC_All-Element-0vs50MinTop10.bed ./Element/EcoliGATC_All-Element-0vs50MinTop10.xls
cp ./Element/EcoliGATC_Pairs-Element-0vs50MinTop10.bed ./Element/EcoliGATC_Pairs-Element-0vs50MinTop10.xls
cp ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop10.bed ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop10.xls
cp ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop10.bed ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop10.xls
cp ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop10.bed ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop10.xls
cp ./Element/EcoliGATC_All-Element-0vs50MinTop25.bed ./Element/EcoliGATC_All-Element-0vs50MinTop25.xls
cp ./Element/EcoliGATC_Pairs-Element-0vs50MinTop25.bed ./Element/EcoliGATC_Pairs-Element-0vs50MinTop25.xls
cp ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop25.bed ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop25.xls
cp ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop25.bed ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop25.xls
```

```
cp ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop25.bed ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop25.xls
cp ./Element/EcoliGATC_All-Element-0vs50MinTop50.bed ./Element/EcoliGATC_All-Element-0vs50MinTop50.xls
cp ./Element/EcoliGATC_Pairs-Element-0vs50MinTop50.bed ./Element/EcoliGATC_Pairs-Element-0vs50MinTop50.xls
cp ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop50.bed ./Element/EcoliGATC_HigherO1-Element-0vs50MinTop50.xls
cp ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop50.bed ./Element/EcoliGATC_HigherO2-Element-0vs50MinTop50.xls
cp ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop50.bed ./Element/EcoliGATC_HigherO3-Element-0vs50MinTop50.xls
cp ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1.bed ./Element/EcoliGATC_All-Element-0vs50Min-R1000e1.xls
cp ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1.bed ./Element/EcoliGATC_Pairs-Element-0vs50Min-R1000e1.xls
cp ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1.bed ./Element/EcoliGATC_HigherO1-Element-0vs50Min-R1000e1.xls
cp ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1.bed ./Element/EcoliGATC_HigherO2-Element-0vs50Min-R1000e1.xls
cp ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1.bed ./Element/EcoliGATC_HigherO3-Element-0vs50Min-R1000e1.xls

#Line count
wc -l ./Element/*.bed > ./Element/Bedops_Element-GATCSand0vs50MinAll-Range75.txt

mkdir ./Bedops_Element-GATCSand0vs50MinAll-Range75/
mv ./Element/ ./Bedops_Element-GATCSand0vs50MinAll-Range75/
```

uShuffle *E. coli* genome 1000 times with “4” k-mer size

```
#!/bin/bash

#uShuffle1000timesScript-k4.sh
#fasta_ushuffle version:  0.2
#Uses fasta_ushuffle to shuffle E. Coli genome [>gi|556503834|ref|NC_000913.3| Escherichia coli str. K-12 substr. MG1655, complete genome] 1000 times

cp ./NC_000913_Formatted.fna ./NC_000913_k4s1000_x1000a0.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a0.fna > ./NC_000913_k4s1000_x1000a1.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a1.fna > ./NC_000913_k4s1000_x1000a2.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a2.fna > ./NC_000913_k4s1000_x1000a3.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a3.fna > ./NC_000913_k4s1000_x1000a4.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a4.fna > ./NC_000913_k4s1000_x1000a5.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a5.fna > ./NC_000913_k4s1000_x1000a6.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a6.fna > ./NC_000913_k4s1000_x1000a7.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a7.fna > ./NC_000913_k4s1000_x1000a8.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a8.fna > ./NC_000913_k4s1000_x1000a9.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a9.fna > ./NC_000913_k4s1000_x1000a10.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a10.fna > ./NC_000913_k4s1000_x1000a11.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a11.fna > ./NC_000913_k4s1000_x1000a12.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a12.fna > ./NC_000913_k4s1000_x1000a13.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a13.fna > ./NC_000913_k4s1000_x1000a14.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a14.fna > ./NC_000913_k4s1000_x1000a15.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a15.fna > ./NC_000913_k4s1000_x1000a16.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a16.fna > ./NC_000913_k4s1000_x1000a17.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a17.fna > ./NC_000913_k4s1000_x1000a18.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a18.fna > ./NC_000913_k4s1000_x1000a19.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a19.fna > ./NC_000913_k4s1000_x1000a20.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a20.fna > ./NC_000913_k4s1000_x1000a21.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a21.fna > ./NC_000913_k4s1000_x1000a22.fna
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./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a22.fna > ./NC_000913_k4s1000_x1000a23.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a23.fna > ./NC_000913_k4s1000_x1000a24.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a24.fna > ./NC_000913_k4s1000_x1000a25.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a25.fna > ./NC_000913_k4s1000_x1000a26.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a26.fna > ./NC_000913_k4s1000_x1000a27.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a27.fna > ./NC_000913_k4s1000_x1000a28.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a28.fna > ./NC_000913_k4s1000_x1000a29.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a29.fna > ./NC_000913_k4s1000_x1000a30.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a30.fna > ./NC_000913_k4s1000_x1000a31.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a31.fna > ./NC_000913_k4s1000_x1000a32.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a32.fna > ./NC_000913_k4s1000_x1000a33.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a33.fna > ./NC_000913_k4s1000_x1000a34.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a34.fna > ./NC_000913_k4s1000_x1000a35.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a35.fna > ./NC_000913_k4s1000_x1000a36.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a36.fna > ./NC_000913_k4s1000_x1000a37.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a37.fna > ./NC_000913_k4s1000_x1000a38.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a38.fna > ./NC_000913_k4s1000_x1000a39.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a39.fna > ./NC_000913_k4s1000_x1000a40.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a40.fna > ./NC_000913_k4s1000_x1000a41.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a41.fna > ./NC_000913_k4s1000_x1000a42.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a42.fna > ./NC_000913_k4s1000_x1000a43.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a43.fna > ./NC_000913_k4s1000_x1000a44.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a44.fna > ./NC_000913_k4s1000_x1000a45.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a45.fna > ./NC_000913_k4s1000_x1000a46.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a46.fna > ./NC_000913_k4s1000_x1000a47.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a47.fna > ./NC_000913_k4s1000_x1000a48.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a48.fna > ./NC_000913_k4s1000_x1000a49.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a49.fna > ./NC_000913_k4s1000_x1000a50.fna
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./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a50.fna > ./NC_000913_k4s1000_x1000a51.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a51.fna > ./NC_000913_k4s1000_x1000a52.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a52.fna > ./NC_000913_k4s1000_x1000a53.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a53.fna > ./NC_000913_k4s1000_x1000a54.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a54.fna > ./NC_000913_k4s1000_x1000a55.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a55.fna > ./NC_000913_k4s1000_x1000a56.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a56.fna > ./NC_000913_k4s1000_x1000a57.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a57.fna > ./NC_000913_k4s1000_x1000a58.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a58.fna > ./NC_000913_k4s1000_x1000a59.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a59.fna > ./NC_000913_k4s1000_x1000a60.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a60.fna > ./NC_000913_k4s1000_x1000a61.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a61.fna > ./NC_000913_k4s1000_x1000a62.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a62.fna > ./NC_000913_k4s1000_x1000a63.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a63.fna > ./NC_000913_k4s1000_x1000a64.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a64.fna > ./NC_000913_k4s1000_x1000a65.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a65.fna > ./NC_000913_k4s1000_x1000a66.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a66.fna > ./NC_000913_k4s1000_x1000a67.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a67.fna > ./NC_000913_k4s1000_x1000a68.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a68.fna > ./NC_000913_k4s1000_x1000a69.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a69.fna > ./NC_000913_k4s1000_x1000a70.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a70.fna > ./NC_000913_k4s1000_x1000a71.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a71.fna > ./NC_000913_k4s1000_x1000a72.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a72.fna > ./NC_000913_k4s1000_x1000a73.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a73.fna > ./NC_000913_k4s1000_x1000a74.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a74.fna > ./NC_000913_k4s1000_x1000a75.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a75.fna > ./NC_000913_k4s1000_x1000a76.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a76.fna > ./NC_000913_k4s1000_x1000a77.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a77.fna > ./NC_000913_k4s1000_x1000a78.fna
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./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a78.fna > ./NC_000913_k4s1000_x1000a79.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a79.fna > ./NC_000913_k4s1000_x1000a80.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a80.fna > ./NC_000913_k4s1000_x1000a81.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a81.fna > ./NC_000913_k4s1000_x1000a82.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a82.fna > ./NC_000913_k4s1000_x1000a83.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a83.fna > ./NC_000913_k4s1000_x1000a84.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a84.fna > ./NC_000913_k4s1000_x1000a85.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a85.fna > ./NC_000913_k4s1000_x1000a86.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a86.fna > ./NC_000913_k4s1000_x1000a87.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a87.fna > ./NC_000913_k4s1000_x1000a88.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a88.fna > ./NC_000913_k4s1000_x1000a89.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a89.fna > ./NC_000913_k4s1000_x1000a90.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a90.fna > ./NC_000913_k4s1000_x1000a91.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a91.fna > ./NC_000913_k4s1000_x1000a92.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a92.fna > ./NC_000913_k4s1000_x1000a93.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a93.fna > ./NC_000913_k4s1000_x1000a94.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a94.fna > ./NC_000913_k4s1000_x1000a95.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a95.fna > ./NC_000913_k4s1000_x1000a96.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a96.fna > ./NC_000913_k4s1000_x1000a97.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a97.fna > ./NC_000913_k4s1000_x1000a98.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a98.fna > ./NC_000913_k4s1000_x1000a99.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a99.fna > ./NC_000913_k4s1000_x1000a100.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a100.fna > ./NC_000913_k4s1000_x1000a101.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a101.fna > ./NC_000913_k4s1000_x1000a102.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a102.fna > ./NC_000913_k4s1000_x1000a103.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a103.fna > ./NC_000913_k4s1000_x1000a104.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a104.fna > ./NC_000913_k4s1000_x1000a105.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a105.fna > ./NC_000913_k4s1000_x1000a106.fna
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./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a106.fna > ./NC_000913_k4s1000_x1000a107.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a107.fna > ./NC_000913_k4s1000_x1000a108.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a108.fna > ./NC_000913_k4s1000_x1000a109.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a109.fna > ./NC_000913_k4s1000_x1000a110.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a110.fna > ./NC_000913_k4s1000_x1000a111.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a111.fna > ./NC_000913_k4s1000_x1000a112.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a112.fna > ./NC_000913_k4s1000_x1000a113.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a113.fna > ./NC_000913_k4s1000_x1000a114.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a114.fna > ./NC_000913_k4s1000_x1000a115.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a115.fna > ./NC_000913_k4s1000_x1000a116.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a116.fna > ./NC_000913_k4s1000_x1000a117.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a117.fna > ./NC_000913_k4s1000_x1000a118.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a118.fna > ./NC_000913_k4s1000_x1000a119.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a119.fna > ./NC_000913_k4s1000_x1000a120.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a120.fna > ./NC_000913_k4s1000_x1000a121.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a121.fna > ./NC_000913_k4s1000_x1000a122.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a122.fna > ./NC_000913_k4s1000_x1000a123.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a123.fna > ./NC_000913_k4s1000_x1000a124.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a124.fna > ./NC_000913_k4s1000_x1000a125.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a125.fna > ./NC_000913_k4s1000_x1000a126.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a126.fna > ./NC_000913_k4s1000_x1000a127.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a127.fna > ./NC_000913_k4s1000_x1000a128.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a128.fna > ./NC_000913_k4s1000_x1000a129.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a129.fna > ./NC_000913_k4s1000_x1000a130.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a130.fna > ./NC_000913_k4s1000_x1000a131.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a131.fna > ./NC_000913_k4s1000_x1000a132.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a132.fna > ./NC_000913_k4s1000_x1000a133.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a133.fna > ./NC_000913_k4s1000_x1000a134.fna
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    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a134.fna > ./NC_000913_k4s1000_x1000a135.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a135.fna > ./NC_000913_k4s1000_x1000a136.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a136.fna > ./NC_000913_k4s1000_x1000a137.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a137.fna > ./NC_000913_k4s1000_x1000a138.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a138.fna > ./NC_000913_k4s1000_x1000a139.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a139.fna > ./NC_000913_k4s1000_x1000a140.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a140.fna > ./NC_000913_k4s1000_x1000a141.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a141.fna > ./NC_000913_k4s1000_x1000a142.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a142.fna > ./NC_000913_k4s1000_x1000a143.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a143.fna > ./NC_000913_k4s1000_x1000a144.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a144.fna > ./NC_000913_k4s1000_x1000a145.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a145.fna > ./NC_000913_k4s1000_x1000a146.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a146.fna > ./NC_000913_k4s1000_x1000a147.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a147.fna > ./NC_000913_k4s1000_x1000a148.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a148.fna > ./NC_000913_k4s1000_x1000a149.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a149.fna > ./NC_000913_k4s1000_x1000a150.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a150.fna > ./NC_000913_k4s1000_x1000a151.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a151.fna > ./NC_000913_k4s1000_x1000a152.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a152.fna > ./NC_000913_k4s1000_x1000a153.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a153.fna > ./NC_000913_k4s1000_x1000a154.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a154.fna > ./NC_000913_k4s1000_x1000a155.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a155.fna > ./NC_000913_k4s1000_x1000a156.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a156.fna > ./NC_000913_k4s1000_x1000a157.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a157.fna > ./NC_000913_k4s1000_x1000a158.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a158.fna > ./NC_000913_k4s1000_x1000a159.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a159.fna > ./NC_000913_k4s1000_x1000a160.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a160.fna > ./NC_000913_k4s1000_x1000a161.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a161.fna > ./NC_000913_k4s1000_x1000a162.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a162.fna > ./NC_000913_k4s1000_x1000a163.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a163.fna > ./NC_000913_k4s1000_x1000a164.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a164.fna > ./NC_000913_k4s1000_x1000a165.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a165.fna > ./NC_000913_k4s1000_x1000a166.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a166.fna > ./NC_000913_k4s1000_x1000a167.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a167.fna > ./NC_000913_k4s1000_x1000a168.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a168.fna > ./NC_000913_k4s1000_x1000a169.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a169.fna > ./NC_000913_k4s1000_x1000a170.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a170.fna > ./NC_000913_k4s1000_x1000a171.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a171.fna > ./NC_000913_k4s1000_x1000a172.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a172.fna > ./NC_000913_k4s1000_x1000a173.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a173.fna > ./NC_000913_k4s1000_x1000a174.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a174.fna > ./NC_000913_k4s1000_x1000a175.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a175.fna > ./NC_000913_k4s1000_x1000a176.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a176.fna > ./NC_000913_k4s1000_x1000a177.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a177.fna > ./NC_000913_k4s1000_x1000a178.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a178.fna > ./NC_000913_k4s1000_x1000a179.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a179.fna > ./NC_000913_k4s1000_x1000a180.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a180.fna > ./NC_000913_k4s1000_x1000a181.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a181.fna > ./NC_000913_k4s1000_x1000a182.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a182.fna > ./NC_000913_k4s1000_x1000a183.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a183.fna > ./NC_000913_k4s1000_x1000a184.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a184.fna > ./NC_000913_k4s1000_x1000a185.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a185.fna > ./NC_000913_k4s1000_x1000a186.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a186.fna > ./NC_000913_k4s1000_x1000a187.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a187.fna > ./NC_000913_k4s1000_x1000a188.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a188.fna > ./NC_000913_k4s1000_x1000a189.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a189.fna > ./NC_000913_k4s1000_x1000a190.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a190.fna > ./NC_000913_k4s1000_x1000a191.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a191.fna > ./NC_000913_k4s1000_x1000a192.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a192.fna > ./NC_000913_k4s1000_x1000a193.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a193.fna > ./NC_000913_k4s1000_x1000a194.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a194.fna > ./NC_000913_k4s1000_x1000a195.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a195.fna > ./NC_000913_k4s1000_x1000a196.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a196.fna > ./NC_000913_k4s1000_x1000a197.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a197.fna > ./NC_000913_k4s1000_x1000a198.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a198.fna > ./NC_000913_k4s1000_x1000a199.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a199.fna > ./NC_000913_k4s1000_x1000a200.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a200.fna > ./NC_000913_k4s1000_x1000a201.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a201.fna > ./NC_000913_k4s1000_x1000a202.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a202.fna > ./NC_000913_k4s1000_x1000a203.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a203.fna > ./NC_000913_k4s1000_x1000a204.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a204.fna > ./NC_000913_k4s1000_x1000a205.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a205.fna > ./NC_000913_k4s1000_x1000a206.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a206.fna > ./NC_000913_k4s1000_x1000a207.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a207.fna > ./NC_000913_k4s1000_x1000a208.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a208.fna > ./NC_000913_k4s1000_x1000a209.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a209.fna > ./NC_000913_k4s1000_x1000a210.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a210.fna > ./NC_000913_k4s1000_x1000a211.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a211.fna > ./NC_000913_k4s1000_x1000a212.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a212.fna > ./NC_000913_k4s1000_x1000a213.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a213.fna > ./NC_000913_k4s1000_x1000a214.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a214.fna > ./NC_000913_k4s1000_x1000a215.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a215.fna > ./NC_000913_k4s1000_x1000a216.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a216.fna > ./NC_000913_k4s1000_x1000a217.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a217.fna > ./NC_000913_k4s1000_x1000a218.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a218.fna > ./NC_000913_k4s1000_x1000a219.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a219.fna > ./NC_000913_k4s1000_x1000a220.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a220.fna > ./NC_000913_k4s1000_x1000a221.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a221.fna > ./NC_000913_k4s1000_x1000a222.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a222.fna > ./NC_000913_k4s1000_x1000a223.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a223.fna > ./NC_000913_k4s1000_x1000a224.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a224.fna > ./NC_000913_k4s1000_x1000a225.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a225.fna > ./NC_000913_k4s1000_x1000a226.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a226.fna > ./NC_000913_k4s1000_x1000a227.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a227.fna > ./NC_000913_k4s1000_x1000a228.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a228.fna > ./NC_000913_k4s1000_x1000a229.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a229.fna > ./NC_000913_k4s1000_x1000a230.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a230.fna > ./NC_000913_k4s1000_x1000a231.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a231.fna > ./NC_000913_k4s1000_x1000a232.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a232.fna > ./NC_000913_k4s1000_x1000a233.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a233.fna > ./NC_000913_k4s1000_x1000a234.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a234.fna > ./NC_000913_k4s1000_x1000a235.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a235.fna > ./NC_000913_k4s1000_x1000a236.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a236.fna > ./NC_000913_k4s1000_x1000a237.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a237.fna > ./NC_000913_k4s1000_x1000a238.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a238.fna > ./NC_000913_k4s1000_x1000a239.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a239.fna > ./NC_000913_k4s1000_x1000a240.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a240.fna > ./NC_000913_k4s1000_x1000a241.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a241.fna > ./NC_000913_k4s1000_x1000a242.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a242.fna > ./NC_000913_k4s1000_x1000a243.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a243.fna > ./NC_000913_k4s1000_x1000a244.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a244.fna > ./NC_000913_k4s1000_x1000a245.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a245.fna > ./NC_000913_k4s1000_x1000a246.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a246.fna > ./NC_000913_k4s1000_x1000a247.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a247.fna > ./NC_000913_k4s1000_x1000a248.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a248.fna > ./NC_000913_k4s1000_x1000a249.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a249.fna > ./NC_000913_k4s1000_x1000a250.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a250.fna > ./NC_000913_k4s1000_x1000a251.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a251.fna > ./NC_000913_k4s1000_x1000a252.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a252.fna > ./NC_000913_k4s1000_x1000a253.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a253.fna > ./NC_000913_k4s1000_x1000a254.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a254.fna > ./NC_000913_k4s1000_x1000a255.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a255.fna > ./NC_000913_k4s1000_x1000a256.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a256.fna > ./NC_000913_k4s1000_x1000a257.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a257.fna > ./NC_000913_k4s1000_x1000a258.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a258.fna > ./NC_000913_k4s1000_x1000a259.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a259.fna > ./NC_000913_k4s1000_x1000a260.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a260.fna > ./NC_000913_k4s1000_x1000a261.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a261.fna > ./NC_000913_k4s1000_x1000a262.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a262.fna > ./NC_000913_k4s1000_x1000a263.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a263.fna > ./NC_000913_k4s1000_x1000a264.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a264.fna > ./NC_000913_k4s1000_x1000a265.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a265.fna > ./NC_000913_k4s1000_x1000a266.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a266.fna > ./NC_000913_k4s1000_x1000a267.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a267.fna > ./NC_000913_k4s1000_x1000a268.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a268.fna > ./NC_000913_k4s1000_x1000a269.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a269.fna > ./NC_000913_k4s1000_x1000a270.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a270.fna > ./NC_000913_k4s1000_x1000a271.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a271.fna > ./NC_000913_k4s1000_x1000a272.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a272.fna > ./NC_000913_k4s1000_x1000a273.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a273.fna > ./NC_000913_k4s1000_x1000a274.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a274.fna > ./NC_000913_k4s1000_x1000a275.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a275.fna > ./NC_000913_k4s1000_x1000a276.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a276.fna > ./NC_000913_k4s1000_x1000a277.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a277.fna > ./NC_000913_k4s1000_x1000a278.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a278.fna > ./NC_000913_k4s1000_x1000a279.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a279.fna > ./NC_000913_k4s1000_x1000a280.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a280.fna > ./NC_000913_k4s1000_x1000a281.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a281.fna > ./NC_000913_k4s1000_x1000a282.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a282.fna > ./NC_000913_k4s1000_x1000a283.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a283.fna > ./NC_000913_k4s1000_x1000a284.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a284.fna > ./NC_000913_k4s1000_x1000a285.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a285.fna > ./NC_000913_k4s1000_x1000a286.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a286.fna > ./NC_000913_k4s1000_x1000a287.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a287.fna > ./NC_000913_k4s1000_x1000a288.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a288.fna > ./NC_000913_k4s1000_x1000a289.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a289.fna > ./NC_000913_k4s1000_x1000a290.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a290.fna > ./NC_000913_k4s1000_x1000a291.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a291.fna > ./NC_000913_k4s1000_x1000a292.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a292.fna > ./NC_000913_k4s1000_x1000a293.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a293.fna > ./NC_000913_k4s1000_x1000a294.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a294.fna > ./NC_000913_k4s1000_x1000a295.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a295.fna > ./NC_000913_k4s1000_x1000a296.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a296.fna > ./NC_000913_k4s1000_x1000a297.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a297.fna > ./NC_000913_k4s1000_x1000a298.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a298.fna > ./NC_000913_k4s1000_x1000a299.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a299.fna > ./NC_000913_k4s1000_x1000a300.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a300.fna > ./NC_000913_k4s1000_x1000a301.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a301.fna > ./NC_000913_k4s1000_x1000a302.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a302.fna > ./NC_000913_k4s1000_x1000a303.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a303.fna > ./NC_000913_k4s1000_x1000a304.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a304.fna > ./NC_000913_k4s1000_x1000a305.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a305.fna > ./NC_000913_k4s1000_x1000a306.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a306.fna > ./NC_000913_k4s1000_x1000a307.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a307.fna > ./NC_000913_k4s1000_x1000a308.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a308.fna > ./NC_000913_k4s1000_x1000a309.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a309.fna > ./NC_000913_k4s1000_x1000a310.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a310.fna > ./NC_000913_k4s1000_x1000a311.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a311.fna > ./NC_000913_k4s1000_x1000a312.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a312.fna > ./NC_000913_k4s1000_x1000a313.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a313.fna > ./NC_000913_k4s1000_x1000a314.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a314.fna > ./NC_000913_k4s1000_x1000a315.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a315.fna > ./NC_000913_k4s1000_x1000a316.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a316.fna > ./NC_000913_k4s1000_x1000a317.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a317.fna > ./NC_000913_k4s1000_x1000a318.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a318.fna > ./NC_000913_k4s1000_x1000a319.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a319.fna > ./NC_000913_k4s1000_x1000a320.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a320.fna > ./NC_000913_k4s1000_x1000a321.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a321.fna > ./NC_000913_k4s1000_x1000a322.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a322.fna > ./NC_000913_k4s1000_x1000a323.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a323.fna > ./NC_000913_k4s1000_x1000a324.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a324.fna > ./NC_000913_k4s1000_x1000a325.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a325.fna > ./NC_000913_k4s1000_x1000a326.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a326.fna > ./NC_000913_k4s1000_x1000a327.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a327.fna > ./NC_000913_k4s1000_x1000a328.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a328.fna > ./NC_000913_k4s1000_x1000a329.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a329.fna > ./NC_000913_k4s1000_x1000a330.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a330.fna > ./NC_000913_k4s1000_x1000a331.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a331.fna > ./NC_000913_k4s1000_x1000a332.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a332.fna > ./NC_000913_k4s1000_x1000a333.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a333.fna > ./NC_000913_k4s1000_x1000a334.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a334.fna > ./NC_000913_k4s1000_x1000a335.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a335.fna > ./NC_000913_k4s1000_x1000a336.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a336.fna > ./NC_000913_k4s1000_x1000a337.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a337.fna > ./NC_000913_k4s1000_x1000a338.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a338.fna > ./NC_000913_k4s1000_x1000a339.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a339.fna > ./NC_000913_k4s1000_x1000a340.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a340.fna > ./NC_000913_k4s1000_x1000a341.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a341.fna > ./NC_000913_k4s1000_x1000a342.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a342.fna > ./NC_000913_k4s1000_x1000a343.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a343.fna > ./NC_000913_k4s1000_x1000a344.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a344.fna > ./NC_000913_k4s1000_x1000a345.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a345.fna > ./NC_000913_k4s1000_x1000a346.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a346.fna > ./NC_000913_k4s1000_x1000a347.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a347.fna > ./NC_000913_k4s1000_x1000a348.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a348.fna > ./NC_000913_k4s1000_x1000a349.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a349.fna > ./NC_000913_k4s1000_x1000a350.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a350.fna > ./NC_000913_k4s1000_x1000a351.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a351.fna > ./NC_000913_k4s1000_x1000a352.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a352.fna > ./NC_000913_k4s1000_x1000a353.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a353.fna > ./NC_000913_k4s1000_x1000a354.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a354.fna > ./NC_000913_k4s1000_x1000a355.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a355.fna > ./NC_000913_k4s1000_x1000a356.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a356.fna > ./NC_000913_k4s1000_x1000a357.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a357.fna > ./NC_000913_k4s1000_x1000a358.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a358.fna > ./NC_000913_k4s1000_x1000a359.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a359.fna > ./NC_000913_k4s1000_x1000a360.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a360.fna > ./NC_000913_k4s1000_x1000a361.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a361.fna > ./NC_000913_k4s1000_x1000a362.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a362.fna > ./NC_000913_k4s1000_x1000a363.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a363.fna > ./NC_000913_k4s1000_x1000a364.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a364.fna > ./NC_000913_k4s1000_x1000a365.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a365.fna > ./NC_000913_k4s1000_x1000a366.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a366.fna > ./NC_000913_k4s1000_x1000a367.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a367.fna > ./NC_000913_k4s1000_x1000a368.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a368.fna > ./NC_000913_k4s1000_x1000a369.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a369.fna > ./NC_000913_k4s1000_x1000a370.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a370.fna > ./NC_000913_k4s1000_x1000a371.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a371.fna > ./NC_000913_k4s1000_x1000a372.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a372.fna > ./NC_000913_k4s1000_x1000a373.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a373.fna > ./NC_000913_k4s1000_x1000a374.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a374.fna > ./NC_000913_k4s1000_x1000a375.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a375.fna > ./NC_000913_k4s1000_x1000a376.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a376.fna > ./NC_000913_k4s1000_x1000a377.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a377.fna > ./NC_000913_k4s1000_x1000a378.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a378.fna > ./NC_000913_k4s1000_x1000a379.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a379.fna > ./NC_000913_k4s1000_x1000a380.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a380.fna > ./NC_000913_k4s1000_x1000a381.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a381.fna > ./NC_000913_k4s1000_x1000a382.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a382.fna > ./NC_000913_k4s1000_x1000a383.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a383.fna > ./NC_000913_k4s1000_x1000a384.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a384.fna > ./NC_000913_k4s1000_x1000a385.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a385.fna > ./NC_000913_k4s1000_x1000a386.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a386.fna > ./NC_000913_k4s1000_x1000a387.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a387.fna > ./NC_000913_k4s1000_x1000a388.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a388.fna > ./NC_000913_k4s1000_x1000a389.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a389.fna > ./NC_000913_k4s1000_x1000a390.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a390.fna > ./NC_000913_k4s1000_x1000a391.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a391.fna > ./NC_000913_k4s1000_x1000a392.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a392.fna > ./NC_000913_k4s1000_x1000a393.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a393.fna > ./NC_000913_k4s1000_x1000a394.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a394.fna > ./NC_000913_k4s1000_x1000a395.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a395.fna > ./NC_000913_k4s1000_x1000a396.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a396.fna > ./NC_000913_k4s1000_x1000a397.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a397.fna > ./NC_000913_k4s1000_x1000a398.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a398.fna > ./NC_000913_k4s1000_x1000a399.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a399.fna > ./NC_000913_k4s1000_x1000a400.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a400.fna > ./NC_000913_k4s1000_x1000a401.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a401.fna > ./NC_000913_k4s1000_x1000a402.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a402.fna > ./NC_000913_k4s1000_x1000a403.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a403.fna > ./NC_000913_k4s1000_x1000a404.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a404.fna > ./NC_000913_k4s1000_x1000a405.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a405.fna > ./NC_000913_k4s1000_x1000a406.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a406.fna > ./NC_000913_k4s1000_x1000a407.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a407.fna > ./NC_000913_k4s1000_x1000a408.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a408.fna > ./NC_000913_k4s1000_x1000a409.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a409.fna > ./NC_000913_k4s1000_x1000a410.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a410.fna > ./NC_000913_k4s1000_x1000a411.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a411.fna > ./NC_000913_k4s1000_x1000a412.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a412.fna > ./NC_000913_k4s1000_x1000a413.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a413.fna > ./NC_000913_k4s1000_x1000a414.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a414.fna > ./NC_000913_k4s1000_x1000a415.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a415.fna > ./NC_000913_k4s1000_x1000a416.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a416.fna > ./NC_000913_k4s1000_x1000a417.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a417.fna > ./NC_000913_k4s1000_x1000a418.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a418.fna > ./NC_000913_k4s1000_x1000a419.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a419.fna > ./NC_000913_k4s1000_x1000a420.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a420.fna > ./NC_000913_k4s1000_x1000a421.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a421.fna > ./NC_000913_k4s1000_x1000a422.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a422.fna > ./NC_000913_k4s1000_x1000a423.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a423.fna > ./NC_000913_k4s1000_x1000a424.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a424.fna > ./NC_000913_k4s1000_x1000a425.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a425.fna > ./NC_000913_k4s1000_x1000a426.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a426.fna > ./NC_000913_k4s1000_x1000a427.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a427.fna > ./NC_000913_k4s1000_x1000a428.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a428.fna > ./NC_000913_k4s1000_x1000a429.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a429.fna > ./NC_000913_k4s1000_x1000a430.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a430.fna > ./NC_000913_k4s1000_x1000a431.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a431.fna > ./NC_000913_k4s1000_x1000a432.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a432.fna > ./NC_000913_k4s1000_x1000a433.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a433.fna > ./NC_000913_k4s1000_x1000a434.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a434.fna > ./NC_000913_k4s1000_x1000a435.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a435.fna > ./NC_000913_k4s1000_x1000a436.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a436.fna > ./NC_000913_k4s1000_x1000a437.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a437.fna > ./NC_000913_k4s1000_x1000a438.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a438.fna > ./NC_000913_k4s1000_x1000a439.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a439.fna > ./NC_000913_k4s1000_x1000a440.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a440.fna > ./NC_000913_k4s1000_x1000a441.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a441.fna > ./NC_000913_k4s1000_x1000a442.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a442.fna > ./NC_000913_k4s1000_x1000a443.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a443.fna > ./NC_000913_k4s1000_x1000a444.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a444.fna > ./NC_000913_k4s1000_x1000a445.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a445.fna > ./NC_000913_k4s1000_x1000a446.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a446.fna > ./NC_000913_k4s1000_x1000a447.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a447.fna > ./NC_000913_k4s1000_x1000a448.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a448.fna > ./NC_000913_k4s1000_x1000a449.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a449.fna > ./NC_000913_k4s1000_x1000a450.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a450.fna > ./NC_000913_k4s1000_x1000a451.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a451.fna > ./NC_000913_k4s1000_x1000a452.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a452.fna > ./NC_000913_k4s1000_x1000a453.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a453.fna > ./NC_000913_k4s1000_x1000a454.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a454.fna > ./NC_000913_k4s1000_x1000a455.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a455.fna > ./NC_000913_k4s1000_x1000a456.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a456.fna > ./NC_000913_k4s1000_x1000a457.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a457.fna > ./NC_000913_k4s1000_x1000a458.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a458.fna > ./NC_000913_k4s1000_x1000a459.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a459.fna > ./NC_000913_k4s1000_x1000a460.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a460.fna > ./NC_000913_k4s1000_x1000a461.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a461.fna > ./NC_000913_k4s1000_x1000a462.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a462.fna > ./NC_000913_k4s1000_x1000a463.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a463.fna > ./NC_000913_k4s1000_x1000a464.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a464.fna > ./NC_000913_k4s1000_x1000a465.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a465.fna > ./NC_000913_k4s1000_x1000a466.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a466.fna > ./NC_000913_k4s1000_x1000a467.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a467.fna > ./NC_000913_k4s1000_x1000a468.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a468.fna > ./NC_000913_k4s1000_x1000a469.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a469.fna > ./NC_000913_k4s1000_x1000a470.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a470.fna > ./NC_000913_k4s1000_x1000a471.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a471.fna > ./NC_000913_k4s1000_x1000a472.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a472.fna > ./NC_000913_k4s1000_x1000a473.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a473.fna > ./NC_000913_k4s1000_x1000a474.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a474.fna > ./NC_000913_k4s1000_x1000a475.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a475.fna > ./NC_000913_k4s1000_x1000a476.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a476.fna > ./NC_000913_k4s1000_x1000a477.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a477.fna > ./NC_000913_k4s1000_x1000a478.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a478.fna > ./NC_000913_k4s1000_x1000a479.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a479.fna > ./NC_000913_k4s1000_x1000a480.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a480.fna > ./NC_000913_k4s1000_x1000a481.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a481.fna > ./NC_000913_k4s1000_x1000a482.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a482.fna > ./NC_000913_k4s1000_x1000a483.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a483.fna > ./NC_000913_k4s1000_x1000a484.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a484.fna > ./NC_000913_k4s1000_x1000a485.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a485.fna > ./NC_000913_k4s1000_x1000a486.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a486.fna > ./NC_000913_k4s1000_x1000a487.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a487.fna > ./NC_000913_k4s1000_x1000a488.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a488.fna > ./NC_000913_k4s1000_x1000a489.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a489.fna > ./NC_000913_k4s1000_x1000a490.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a490.fna > ./NC_000913_k4s1000_x1000a491.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a491.fna > ./NC_000913_k4s1000_x1000a492.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a492.fna > ./NC_000913_k4s1000_x1000a493.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a493.fna > ./NC_000913_k4s1000_x1000a494.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a494.fna > ./NC_000913_k4s1000_x1000a495.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a495.fna > ./NC_000913_k4s1000_x1000a496.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a496.fna > ./NC_000913_k4s1000_x1000a497.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a497.fna > ./NC_000913_k4s1000_x1000a498.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a498.fna > ./NC_000913_k4s1000_x1000a499.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a499.fna > ./NC_000913_k4s1000_x1000a500.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a500.fna > ./NC_000913_k4s1000_x1000a501.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a501.fna > ./NC_000913_k4s1000_x1000a502.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a502.fna > ./NC_000913_k4s1000_x1000a503.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a503.fna > ./NC_000913_k4s1000_x1000a504.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a504.fna > ./NC_000913_k4s1000_x1000a505.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a505.fna > ./NC_000913_k4s1000_x1000a506.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a506.fna > ./NC_000913_k4s1000_x1000a507.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a507.fna > ./NC_000913_k4s1000_x1000a508.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a508.fna > ./NC_000913_k4s1000_x1000a509.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a509.fna > ./NC_000913_k4s1000_x1000a510.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a510.fna > ./NC_000913_k4s1000_x1000a511.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a511.fna > ./NC_000913_k4s1000_x1000a512.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a512.fna > ./NC_000913_k4s1000_x1000a513.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a513.fna > ./NC_000913_k4s1000_x1000a514.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a514.fna > ./NC_000913_k4s1000_x1000a515.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a515.fna > ./NC_000913_k4s1000_x1000a516.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a516.fna > ./NC_000913_k4s1000_x1000a517.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a517.fna > ./NC_000913_k4s1000_x1000a518.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a518.fna > ./NC_000913_k4s1000_x1000a519.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a519.fna > ./NC_000913_k4s1000_x1000a520.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a520.fna > ./NC_000913_k4s1000_x1000a521.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a521.fna > ./NC_000913_k4s1000_x1000a522.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a522.fna > ./NC_000913_k4s1000_x1000a523.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a523.fna > ./NC_000913_k4s1000_x1000a524.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a524.fna > ./NC_000913_k4s1000_x1000a525.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a525.fna > ./NC_000913_k4s1000_x1000a526.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a526.fna > ./NC_000913_k4s1000_x1000a527.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a527.fna > ./NC_000913_k4s1000_x1000a528.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a528.fna > ./NC_000913_k4s1000_x1000a529.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a529.fna > ./NC_000913_k4s1000_x1000a530.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a530.fna > ./NC_000913_k4s1000_x1000a531.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a531.fna > ./NC_000913_k4s1000_x1000a532.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a532.fna > ./NC_000913_k4s1000_x1000a533.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a533.fna > ./NC_000913_k4s1000_x1000a534.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a534.fna > ./NC_000913_k4s1000_x1000a535.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a535.fna > ./NC_000913_k4s1000_x1000a536.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a536.fna > ./NC_000913_k4s1000_x1000a537.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a537.fna > ./NC_000913_k4s1000_x1000a538.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a538.fna > ./NC_000913_k4s1000_x1000a539.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a539.fna > ./NC_000913_k4s1000_x1000a540.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a540.fna > ./NC_000913_k4s1000_x1000a541.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a541.fna > ./NC_000913_k4s1000_x1000a542.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a542.fna > ./NC_000913_k4s1000_x1000a543.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a543.fna > ./NC_000913_k4s1000_x1000a544.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a544.fna > ./NC_000913_k4s1000_x1000a545.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a545.fna > ./NC_000913_k4s1000_x1000a546.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a546.fna > ./NC_000913_k4s1000_x1000a547.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a547.fna > ./NC_000913_k4s1000_x1000a548.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a548.fna > ./NC_000913_k4s1000_x1000a549.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a549.fna > ./NC_000913_k4s1000_x1000a550.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a550.fna > ./NC_000913_k4s1000_x1000a551.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a551.fna > ./NC_000913_k4s1000_x1000a552.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a552.fna > ./NC_000913_k4s1000_x1000a553.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a553.fna > ./NC_000913_k4s1000_x1000a554.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a554.fna > ./NC_000913_k4s1000_x1000a555.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a555.fna > ./NC_000913_k4s1000_x1000a556.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a556.fna > ./NC_000913_k4s1000_x1000a557.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a557.fna > ./NC_000913_k4s1000_x1000a558.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a558.fna > ./NC_000913_k4s1000_x1000a559.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a559.fna > ./NC_000913_k4s1000_x1000a560.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a560.fna > ./NC_000913_k4s1000_x1000a561.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a561.fna > ./NC_000913_k4s1000_x1000a562.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a562.fna > ./NC_000913_k4s1000_x1000a563.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a563.fna > ./NC_000913_k4s1000_x1000a564.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a564.fna > ./NC_000913_k4s1000_x1000a565.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a565.fna > ./NC_000913_k4s1000_x1000a566.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a566.fna > ./NC_000913_k4s1000_x1000a567.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a567.fna > ./NC_000913_k4s1000_x1000a568.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a568.fna > ./NC_000913_k4s1000_x1000a569.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a569.fna > ./NC_000913_k4s1000_x1000a570.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a570.fna > ./NC_000913_k4s1000_x1000a571.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a571.fna > ./NC_000913_k4s1000_x1000a572.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a572.fna > ./NC_000913_k4s1000_x1000a573.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a573.fna > ./NC_000913_k4s1000_x1000a574.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a574.fna > ./NC_000913_k4s1000_x1000a575.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a575.fna > ./NC_000913_k4s1000_x1000a576.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a576.fna > ./NC_000913_k4s1000_x1000a577.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a577.fna > ./NC_000913_k4s1000_x1000a578.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a578.fna > ./NC_000913_k4s1000_x1000a579.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a579.fna > ./NC_000913_k4s1000_x1000a580.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a580.fna > ./NC_000913_k4s1000_x1000a581.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a581.fna > ./NC_000913_k4s1000_x1000a582.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a582.fna > ./NC_000913_k4s1000_x1000a583.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a583.fna > ./NC_000913_k4s1000_x1000a584.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a584.fna > ./NC_000913_k4s1000_x1000a585.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a585.fna > ./NC_000913_k4s1000_x1000a586.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a586.fna > ./NC_000913_k4s1000_x1000a587.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a587.fna > ./NC_000913_k4s1000_x1000a588.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a588.fna > ./NC_000913_k4s1000_x1000a589.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a589.fna > ./NC_000913_k4s1000_x1000a590.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a590.fna > ./NC_000913_k4s1000_x1000a591.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a591.fna > ./NC_000913_k4s1000_x1000a592.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a592.fna > ./NC_000913_k4s1000_x1000a593.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a593.fna > ./NC_000913_k4s1000_x1000a594.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a594.fna > ./NC_000913_k4s1000_x1000a595.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a595.fna > ./NC_000913_k4s1000_x1000a596.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a596.fna > ./NC_000913_k4s1000_x1000a597.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a597.fna > ./NC_000913_k4s1000_x1000a598.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a598.fna > ./NC_000913_k4s1000_x1000a599.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a599.fna > ./NC_000913_k4s1000_x1000a600.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a600.fna > ./NC_000913_k4s1000_x1000a601.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a601.fna > ./NC_000913_k4s1000_x1000a602.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a602.fna > ./NC_000913_k4s1000_x1000a603.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a603.fna > ./NC_000913_k4s1000_x1000a604.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a604.fna > ./NC_000913_k4s1000_x1000a605.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a605.fna > ./NC_000913_k4s1000_x1000a606.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a606.fna > ./NC_000913_k4s1000_x1000a607.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a607.fna > ./NC_000913_k4s1000_x1000a608.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a608.fna > ./NC_000913_k4s1000_x1000a609.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a609.fna > ./NC_000913_k4s1000_x1000a610.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a610.fna > ./NC_000913_k4s1000_x1000a611.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a611.fna > ./NC_000913_k4s1000_x1000a612.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a612.fna > ./NC_000913_k4s1000_x1000a613.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a613.fna > ./NC_000913_k4s1000_x1000a614.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a614.fna > ./NC_000913_k4s1000_x1000a615.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a615.fna > ./NC_000913_k4s1000_x1000a616.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a616.fna > ./NC_000913_k4s1000_x1000a617.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a617.fna > ./NC_000913_k4s1000_x1000a618.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a618.fna > ./NC_000913_k4s1000_x1000a619.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a619.fna > ./NC_000913_k4s1000_x1000a620.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a620.fna > ./NC_000913_k4s1000_x1000a621.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a621.fna > ./NC_000913_k4s1000_x1000a622.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a622.fna > ./NC_000913_k4s1000_x1000a623.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a623.fna > ./NC_000913_k4s1000_x1000a624.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a624.fna > ./NC_000913_k4s1000_x1000a625.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a625.fna > ./NC_000913_k4s1000_x1000a626.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a626.fna > ./NC_000913_k4s1000_x1000a627.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a627.fna > ./NC_000913_k4s1000_x1000a628.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a628.fna > ./NC_000913_k4s1000_x1000a629.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a629.fna > ./NC_000913_k4s1000_x1000a630.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a630.fna > ./NC_000913_k4s1000_x1000a631.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a631.fna > ./NC_000913_k4s1000_x1000a632.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a632.fna > ./NC_000913_k4s1000_x1000a633.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a633.fna > ./NC_000913_k4s1000_x1000a634.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a634.fna > ./NC_000913_k4s1000_x1000a635.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a635.fna > ./NC_000913_k4s1000_x1000a636.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a636.fna > ./NC_000913_k4s1000_x1000a637.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a637.fna > ./NC_000913_k4s1000_x1000a638.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a638.fna > ./NC_000913_k4s1000_x1000a639.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a639.fna > ./NC_000913_k4s1000_x1000a640.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a640.fna > ./NC_000913_k4s1000_x1000a641.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a641.fna > ./NC_000913_k4s1000_x1000a642.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a642.fna > ./NC_000913_k4s1000_x1000a643.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a643.fna > ./NC_000913_k4s1000_x1000a644.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a644.fna > ./NC_000913_k4s1000_x1000a645.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a645.fna > ./NC_000913_k4s1000_x1000a646.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a646.fna > ./NC_000913_k4s1000_x1000a647.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a647.fna > ./NC_000913_k4s1000_x1000a648.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a648.fna > ./NC_000913_k4s1000_x1000a649.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a649.fna > ./NC_000913_k4s1000_x1000a650.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a650.fna > ./NC_000913_k4s1000_x1000a651.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a651.fna > ./NC_000913_k4s1000_x1000a652.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a652.fna > ./NC_000913_k4s1000_x1000a653.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a653.fna > ./NC_000913_k4s1000_x1000a654.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a654.fna > ./NC_000913_k4s1000_x1000a655.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a655.fna > ./NC_000913_k4s1000_x1000a656.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a656.fna > ./NC_000913_k4s1000_x1000a657.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a657.fna > ./NC_000913_k4s1000_x1000a658.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a658.fna > ./NC_000913_k4s1000_x1000a659.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a659.fna > ./NC_000913_k4s1000_x1000a660.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a660.fna > ./NC_000913_k4s1000_x1000a661.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a661.fna > ./NC_000913_k4s1000_x1000a662.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a662.fna > ./NC_000913_k4s1000_x1000a663.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a663.fna > ./NC_000913_k4s1000_x1000a664.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a664.fna > ./NC_000913_k4s1000_x1000a665.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a665.fna > ./NC_000913_k4s1000_x1000a666.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a666.fna > ./NC_000913_k4s1000_x1000a667.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a667.fna > ./NC_000913_k4s1000_x1000a668.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a668.fna > ./NC_000913_k4s1000_x1000a669.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a669.fna > ./NC_000913_k4s1000_x1000a670.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a670.fna > ./NC_000913_k4s1000_x1000a671.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a671.fna > ./NC_000913_k4s1000_x1000a672.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a672.fna > ./NC_000913_k4s1000_x1000a673.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a673.fna > ./NC_000913_k4s1000_x1000a674.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a674.fna > ./NC_000913_k4s1000_x1000a675.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a675.fna > ./NC_000913_k4s1000_x1000a676.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a676.fna > ./NC_000913_k4s1000_x1000a677.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a677.fna > ./NC_000913_k4s1000_x1000a678.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a678.fna > ./NC_000913_k4s1000_x1000a679.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a679.fna > ./NC_000913_k4s1000_x1000a680.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a680.fna > ./NC_000913_k4s1000_x1000a681.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a681.fna > ./NC_000913_k4s1000_x1000a682.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a682.fna > ./NC_000913_k4s1000_x1000a683.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a683.fna > ./NC_000913_k4s1000_x1000a684.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a684.fna > ./NC_000913_k4s1000_x1000a685.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a685.fna > ./NC_000913_k4s1000_x1000a686.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a686.fna > ./NC_000913_k4s1000_x1000a687.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a687.fna > ./NC_000913_k4s1000_x1000a688.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a688.fna > ./NC_000913_k4s1000_x1000a689.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a689.fna > ./NC_000913_k4s1000_x1000a690.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a690.fna > ./NC_000913_k4s1000_x1000a691.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a691.fna > ./NC_000913_k4s1000_x1000a692.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a692.fna > ./NC_000913_k4s1000_x1000a693.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a693.fna > ./NC_000913_k4s1000_x1000a694.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a694.fna > ./NC_000913_k4s1000_x1000a695.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a695.fna > ./NC_000913_k4s1000_x1000a696.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a696.fna > ./NC_000913_k4s1000_x1000a697.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a697.fna > ./NC_000913_k4s1000_x1000a698.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a698.fna > ./NC_000913_k4s1000_x1000a699.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a699.fna > ./NC_000913_k4s1000_x1000a700.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a700.fna > ./NC_000913_k4s1000_x1000a701.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a701.fna > ./NC_000913_k4s1000_x1000a702.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a702.fna > ./NC_000913_k4s1000_x1000a703.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a703.fna > ./NC_000913_k4s1000_x1000a704.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a704.fna > ./NC_000913_k4s1000_x1000a705.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a705.fna > ./NC_000913_k4s1000_x1000a706.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a706.fna > ./NC_000913_k4s1000_x1000a707.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a707.fna > ./NC_000913_k4s1000_x1000a708.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a708.fna > ./NC_000913_k4s1000_x1000a709.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a709.fna > ./NC_000913_k4s1000_x1000a710.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a710.fna > ./NC_000913_k4s1000_x1000a711.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a711.fna > ./NC_000913_k4s1000_x1000a712.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a712.fna > ./NC_000913_k4s1000_x1000a713.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a713.fna > ./NC_000913_k4s1000_x1000a714.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a714.fna > ./NC_000913_k4s1000_x1000a715.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a715.fna > ./NC_000913_k4s1000_x1000a716.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a716.fna > ./NC_000913_k4s1000_x1000a717.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a717.fna > ./NC_000913_k4s1000_x1000a718.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a718.fna > ./NC_000913_k4s1000_x1000a719.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a719.fna > ./NC_000913_k4s1000_x1000a720.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a720.fna > ./NC_000913_k4s1000_x1000a721.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a721.fna > ./NC_000913_k4s1000_x1000a722.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a722.fna > ./NC_000913_k4s1000_x1000a723.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a723.fna > ./NC_000913_k4s1000_x1000a724.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a724.fna > ./NC_000913_k4s1000_x1000a725.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a725.fna > ./NC_000913_k4s1000_x1000a726.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a726.fna > ./NC_000913_k4s1000_x1000a727.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a727.fna > ./NC_000913_k4s1000_x1000a728.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a728.fna > ./NC_000913_k4s1000_x1000a729.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a729.fna > ./NC_000913_k4s1000_x1000a730.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a730.fna > ./NC_000913_k4s1000_x1000a731.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a731.fna > ./NC_000913_k4s1000_x1000a732.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a732.fna > ./NC_000913_k4s1000_x1000a733.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a733.fna > ./NC_000913_k4s1000_x1000a734.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a734.fna > ./NC_000913_k4s1000_x1000a735.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a735.fna > ./NC_000913_k4s1000_x1000a736.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a736.fna > ./NC_000913_k4s1000_x1000a737.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a737.fna > ./NC_000913_k4s1000_x1000a738.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a738.fna > ./NC_000913_k4s1000_x1000a739.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a739.fna > ./NC_000913_k4s1000_x1000a740.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a740.fna > ./NC_000913_k4s1000_x1000a741.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a741.fna > ./NC_000913_k4s1000_x1000a742.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a742.fna > ./NC_000913_k4s1000_x1000a743.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a743.fna > ./NC_000913_k4s1000_x1000a744.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a744.fna > ./NC_000913_k4s1000_x1000a745.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a745.fna > ./NC_000913_k4s1000_x1000a746.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a746.fna > ./NC_000913_k4s1000_x1000a747.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a747.fna > ./NC_000913_k4s1000_x1000a748.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a748.fna > ./NC_000913_k4s1000_x1000a749.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a749.fna > ./NC_000913_k4s1000_x1000a750.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a750.fna > ./NC_000913_k4s1000_x1000a751.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a751.fna > ./NC_000913_k4s1000_x1000a752.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a752.fna > ./NC_000913_k4s1000_x1000a753.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a753.fna > ./NC_000913_k4s1000_x1000a754.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a754.fna > ./NC_000913_k4s1000_x1000a755.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a755.fna > ./NC_000913_k4s1000_x1000a756.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a756.fna > ./NC_000913_k4s1000_x1000a757.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a757.fna > ./NC_000913_k4s1000_x1000a758.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a758.fna > ./NC_000913_k4s1000_x1000a759.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a759.fna > ./NC_000913_k4s1000_x1000a760.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a760.fna > ./NC_000913_k4s1000_x1000a761.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a761.fna > ./NC_000913_k4s1000_x1000a762.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a762.fna > ./NC_000913_k4s1000_x1000a763.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a763.fna > ./NC_000913_k4s1000_x1000a764.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a764.fna > ./NC_000913_k4s1000_x1000a765.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a765.fna > ./NC_000913_k4s1000_x1000a766.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a766.fna > ./NC_000913_k4s1000_x1000a767.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a767.fna > ./NC_000913_k4s1000_x1000a768.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a768.fna > ./NC_000913_k4s1000_x1000a769.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a769.fna > ./NC_000913_k4s1000_x1000a770.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a770.fna > ./NC_000913_k4s1000_x1000a771.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a771.fna > ./NC_000913_k4s1000_x1000a772.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a772.fna > ./NC_000913_k4s1000_x1000a773.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a773.fna > ./NC_000913_k4s1000_x1000a774.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a774.fna > ./NC_000913_k4s1000_x1000a775.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a775.fna > ./NC_000913_k4s1000_x1000a776.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a776.fna > ./NC_000913_k4s1000_x1000a777.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a777.fna > ./NC_000913_k4s1000_x1000a778.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a778.fna > ./NC_000913_k4s1000_x1000a779.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a779.fna > ./NC_000913_k4s1000_x1000a780.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a780.fna > ./NC_000913_k4s1000_x1000a781.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a781.fna > ./NC_000913_k4s1000_x1000a782.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a782.fna > ./NC_000913_k4s1000_x1000a783.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a783.fna > ./NC_000913_k4s1000_x1000a784.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a784.fna > ./NC_000913_k4s1000_x1000a785.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a785.fna > ./NC_000913_k4s1000_x1000a786.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a786.fna > ./NC_000913_k4s1000_x1000a787.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a787.fna > ./NC_000913_k4s1000_x1000a788.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a788.fna > ./NC_000913_k4s1000_x1000a789.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a789.fna > ./NC_000913_k4s1000_x1000a790.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a790.fna > ./NC_000913_k4s1000_x1000a791.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a791.fna > ./NC_000913_k4s1000_x1000a792.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a792.fna > ./NC_000913_k4s1000_x1000a793.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a793.fna > ./NC_000913_k4s1000_x1000a794.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a794.fna > ./NC_000913_k4s1000_x1000a795.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a795.fna > ./NC_000913_k4s1000_x1000a796.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a796.fna > ./NC_000913_k4s1000_x1000a797.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a797.fna > ./NC_000913_k4s1000_x1000a798.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a798.fna > ./NC_000913_k4s1000_x1000a799.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a799.fna > ./NC_000913_k4s1000_x1000a800.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a800.fna > ./NC_000913_k4s1000_x1000a801.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a801.fna > ./NC_000913_k4s1000_x1000a802.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a802.fna > ./NC_000913_k4s1000_x1000a803.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a803.fna > ./NC_000913_k4s1000_x1000a804.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a804.fna > ./NC_000913_k4s1000_x1000a805.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a805.fna > ./NC_000913_k4s1000_x1000a806.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a806.fna > ./NC_000913_k4s1000_x1000a807.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a807.fna > ./NC_000913_k4s1000_x1000a808.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a808.fna > ./NC_000913_k4s1000_x1000a809.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a809.fna > ./NC_000913_k4s1000_x1000a810.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a810.fna > ./NC_000913_k4s1000_x1000a811.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a811.fna > ./NC_000913_k4s1000_x1000a812.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a812.fna > ./NC_000913_k4s1000_x1000a813.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a813.fna > ./NC_000913_k4s1000_x1000a814.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a814.fna > ./NC_000913_k4s1000_x1000a815.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a815.fna > ./NC_000913_k4s1000_x1000a816.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a816.fna > ./NC_000913_k4s1000_x1000a817.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a817.fna > ./NC_000913_k4s1000_x1000a818.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a818.fna > ./NC_000913_k4s1000_x1000a819.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a819.fna > ./NC_000913_k4s1000_x1000a820.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a820.fna > ./NC_000913_k4s1000_x1000a821.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a821.fna > ./NC_000913_k4s1000_x1000a822.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a822.fna > ./NC_000913_k4s1000_x1000a823.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a823.fna > ./NC_000913_k4s1000_x1000a824.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a824.fna > ./NC_000913_k4s1000_x1000a825.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a825.fna > ./NC_000913_k4s1000_x1000a826.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a826.fna > ./NC_000913_k4s1000_x1000a827.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a827.fna > ./NC_000913_k4s1000_x1000a828.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a828.fna > ./NC_000913_k4s1000_x1000a829.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a829.fna > ./NC_000913_k4s1000_x1000a830.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a830.fna > ./NC_000913_k4s1000_x1000a831.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a831.fna > ./NC_000913_k4s1000_x1000a832.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a832.fna > ./NC_000913_k4s1000_x1000a833.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a833.fna > ./NC_000913_k4s1000_x1000a834.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a834.fna > ./NC_000913_k4s1000_x1000a835.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a835.fna > ./NC_000913_k4s1000_x1000a836.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a836.fna > ./NC_000913_k4s1000_x1000a837.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a837.fna > ./NC_000913_k4s1000_x1000a838.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a838.fna > ./NC_000913_k4s1000_x1000a839.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a839.fna > ./NC_000913_k4s1000_x1000a840.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a840.fna > ./NC_000913_k4s1000_x1000a841.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a841.fna > ./NC_000913_k4s1000_x1000a842.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a842.fna > ./NC_000913_k4s1000_x1000a843.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a843.fna > ./NC_000913_k4s1000_x1000a844.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a844.fna > ./NC_000913_k4s1000_x1000a845.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a845.fna > ./NC_000913_k4s1000_x1000a846.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a846.fna > ./NC_000913_k4s1000_x1000a847.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a847.fna > ./NC_000913_k4s1000_x1000a848.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a848.fna > ./NC_000913_k4s1000_x1000a849.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a849.fna > ./NC_000913_k4s1000_x1000a850.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a850.fna > ./NC_000913_k4s1000_x1000a851.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a851.fna > ./NC_000913_k4s1000_x1000a852.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a852.fna > ./NC_000913_k4s1000_x1000a853.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a853.fna > ./NC_000913_k4s1000_x1000a854.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a854.fna > ./NC_000913_k4s1000_x1000a855.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a855.fna > ./NC_000913_k4s1000_x1000a856.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a856.fna > ./NC_000913_k4s1000_x1000a857.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a857.fna > ./NC_000913_k4s1000_x1000a858.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a858.fna > ./NC_000913_k4s1000_x1000a859.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a859.fna > ./NC_000913_k4s1000_x1000a860.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a860.fna > ./NC_000913_k4s1000_x1000a861.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a861.fna > ./NC_000913_k4s1000_x1000a862.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a862.fna > ./NC_000913_k4s1000_x1000a863.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a863.fna > ./NC_000913_k4s1000_x1000a864.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a864.fna > ./NC_000913_k4s1000_x1000a865.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a865.fna > ./NC_000913_k4s1000_x1000a866.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a866.fna > ./NC_000913_k4s1000_x1000a867.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a867.fna > ./NC_000913_k4s1000_x1000a868.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a868.fna > ./NC_000913_k4s1000_x1000a869.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a869.fna > ./NC_000913_k4s1000_x1000a870.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a870.fna > ./NC_000913_k4s1000_x1000a871.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a871.fna > ./NC_000913_k4s1000_x1000a872.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a872.fna > ./NC_000913_k4s1000_x1000a873.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a873.fna > ./NC_000913_k4s1000_x1000a874.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a874.fna > ./NC_000913_k4s1000_x1000a875.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a875.fna > ./NC_000913_k4s1000_x1000a876.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a876.fna > ./NC_000913_k4s1000_x1000a877.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a877.fna > ./NC_000913_k4s1000_x1000a878.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a878.fna > ./NC_000913_k4s1000_x1000a879.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a879.fna > ./NC_000913_k4s1000_x1000a880.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a880.fna > ./NC_000913_k4s1000_x1000a881.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a881.fna > ./NC_000913_k4s1000_x1000a882.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a882.fna > ./NC_000913_k4s1000_x1000a883.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a883.fna > ./NC_000913_k4s1000_x1000a884.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a884.fna > ./NC_000913_k4s1000_x1000a885.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a885.fna > ./NC_000913_k4s1000_x1000a886.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a886.fna > ./NC_000913_k4s1000_x1000a887.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a887.fna > ./NC_000913_k4s1000_x1000a888.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a888.fna > ./NC_000913_k4s1000_x1000a889.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a889.fna > ./NC_000913_k4s1000_x1000a890.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a890.fna > ./NC_000913_k4s1000_x1000a891.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a891.fna > ./NC_000913_k4s1000_x1000a892.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a892.fna > ./NC_000913_k4s1000_x1000a893.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a893.fna > ./NC_000913_k4s1000_x1000a894.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a894.fna > ./NC_000913_k4s1000_x1000a895.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a895.fna > ./NC_000913_k4s1000_x1000a896.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a896.fna > ./NC_000913_k4s1000_x1000a897.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a897.fna > ./NC_000913_k4s1000_x1000a898.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a898.fna > ./NC_000913_k4s1000_x1000a899.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a899.fna > ./NC_000913_k4s1000_x1000a900.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a900.fna > ./NC_000913_k4s1000_x1000a901.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a901.fna > ./NC_000913_k4s1000_x1000a902.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a902.fna > ./NC_000913_k4s1000_x1000a903.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a903.fna > ./NC_000913_k4s1000_x1000a904.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a904.fna > ./NC_000913_k4s1000_x1000a905.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a905.fna > ./NC_000913_k4s1000_x1000a906.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a906.fna > ./NC_000913_k4s1000_x1000a907.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a907.fna > ./NC_000913_k4s1000_x1000a908.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a908.fna > ./NC_000913_k4s1000_x1000a909.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a909.fna > ./NC_000913_k4s1000_x1000a910.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a910.fna > ./NC_000913_k4s1000_x1000a911.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a911.fna > ./NC_000913_k4s1000_x1000a912.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a912.fna > ./NC_000913_k4s1000_x1000a913.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a913.fna > ./NC_000913_k4s1000_x1000a914.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a914.fna > ./NC_000913_k4s1000_x1000a915.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a915.fna > ./NC_000913_k4s1000_x1000a916.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a916.fna > ./NC_000913_k4s1000_x1000a917.fna
    ./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a917.fna > ./NC_000913_k4s1000_x1000a918.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a918.fna > ./NC_000913_k4s1000_x1000a919.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a919.fna > ./NC_000913_k4s1000_x1000a920.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a920.fna > ./NC_000913_k4s1000_x1000a921.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a921.fna > ./NC_000913_k4s1000_x1000a922.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a922.fna > ./NC_000913_k4s1000_x1000a923.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a923.fna > ./NC_000913_k4s1000_x1000a924.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a924.fna > ./NC_000913_k4s1000_x1000a925.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a925.fna > ./NC_000913_k4s1000_x1000a926.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a926.fna > ./NC_000913_k4s1000_x1000a927.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a927.fna > ./NC_000913_k4s1000_x1000a928.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a928.fna > ./NC_000913_k4s1000_x1000a929.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a929.fna > ./NC_000913_k4s1000_x1000a930.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a930.fna > ./NC_000913_k4s1000_x1000a931.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a931.fna > ./NC_000913_k4s1000_x1000a932.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a932.fna > ./NC_000913_k4s1000_x1000a933.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a933.fna > ./NC_000913_k4s1000_x1000a934.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a934.fna > ./NC_000913_k4s1000_x1000a935.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a935.fna > ./NC_000913_k4s1000_x1000a936.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a936.fna > ./NC_000913_k4s1000_x1000a937.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a937.fna > ./NC_000913_k4s1000_x1000a938.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a938.fna > ./NC_000913_k4s1000_x1000a939.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a939.fna > ./NC_000913_k4s1000_x1000a940.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a940.fna > ./NC_000913_k4s1000_x1000a941.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a941.fna > ./NC_000913_k4s1000_x1000a942.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a942.fna > ./NC_000913_k4s1000_x1000a943.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a943.fna > ./NC_000913_k4s1000_x1000a944.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a944.fna > ./NC_000913_k4s1000_x1000a945.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a945.fna > ./NC_000913_k4s1000_x1000a946.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a946.fna > ./NC_000913_k4s1000_x1000a947.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a947.fna > ./NC_000913_k4s1000_x1000a948.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a948.fna > ./NC_000913_k4s1000_x1000a949.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a949.fna > ./NC_000913_k4s1000_x1000a950.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a950.fna > ./NC_000913_k4s1000_x1000a951.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a951.fna > ./NC_000913_k4s1000_x1000a952.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a952.fna > ./NC_000913_k4s1000_x1000a953.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a953.fna > ./NC_000913_k4s1000_x1000a954.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a954.fna > ./NC_000913_k4s1000_x1000a955.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a955.fna > ./NC_000913_k4s1000_x1000a956.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a956.fna > ./NC_000913_k4s1000_x1000a957.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a957.fna > ./NC_000913_k4s1000_x1000a958.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a958.fna > ./NC_000913_k4s1000_x1000a959.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a959.fna > ./NC_000913_k4s1000_x1000a960.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a960.fna > ./NC_000913_k4s1000_x1000a961.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a961.fna > ./NC_000913_k4s1000_x1000a962.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a962.fna > ./NC_000913_k4s1000_x1000a963.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a963.fna > ./NC_000913_k4s1000_x1000a964.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a964.fna > ./NC_000913_k4s1000_x1000a965.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a965.fna > ./NC_000913_k4s1000_x1000a966.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a966.fna > ./NC_000913_k4s1000_x1000a967.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a967.fna > ./NC_000913_k4s1000_x1000a968.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a968.fna > ./NC_000913_k4s1000_x1000a969.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a969.fna > ./NC_000913_k4s1000_x1000a970.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a970.fna > ./NC_000913_k4s1000_x1000a971.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a971.fna > ./NC_000913_k4s1000_x1000a972.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a972.fna > ./NC_000913_k4s1000_x1000a973.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a973.fna > ./NC_000913_k4s1000_x1000a974.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a974.fna > ./NC_000913_k4s1000_x1000a975.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a975.fna > ./NC_000913_k4s1000_x1000a976.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a976.fna > ./NC_000913_k4s1000_x1000a977.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a977.fna > ./NC_000913_k4s1000_x1000a978.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a978.fna > ./NC_000913_k4s1000_x1000a979.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a979.fna > ./NC_000913_k4s1000_x1000a980.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a980.fna > ./NC_000913_k4s1000_x1000a981.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a981.fna > ./NC_000913_k4s1000_x1000a982.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a982.fna > ./NC_000913_k4s1000_x1000a983.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a983.fna > ./NC_000913_k4s1000_x1000a984.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a984.fna > ./NC_000913_k4s1000_x1000a985.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a985.fna > ./NC_000913_k4s1000_x1000a986.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a986.fna > ./NC_000913_k4s1000_x1000a987.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a987.fna > ./NC_000913_k4s1000_x1000a988.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a988.fna > ./NC_000913_k4s1000_x1000a989.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a989.fna > ./NC_000913_k4s1000_x1000a990.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a990.fna > ./NC_000913_k4s1000_x1000a991.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a991.fna > ./NC_000913_k4s1000_x1000a992.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a992.fna > ./NC_000913_k4s1000_x1000a993.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a993.fna > ./NC_000913_k4s1000_x1000a994.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a994.fna > ./NC_000913_k4s1000_x1000a995.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a995.fna > ./NC_000913_k4s1000_x1000a996.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a996.fna > ./NC_000913_k4s1000_x1000a997.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a997.fna > ./NC_000913_k4s1000_x1000a998.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a998.fna > ./NC_000913_k4s1000_x1000a999.fna
./fasta_ushuffle -k 4 -s 1 < ./NC_000913_k4s1000_x1000a999.fna > ./NC_000913_k4s1000_x1000a1000.fna
```

uShuffle LT2 genome 1000 times with “4” k-mer size

```
#!/bin/bash


#uShuffle1000timesScript_LT2-k4.sh
#fasta_ushuffle version:  0.2
#Uses fasta_ushuffle to shuffle LT2 genome [>gi|556503834|ref|NC_000913.3| Escherichia coli str. K-12 substr. MG1655, complete genome] 1000 times

cp ./AE006468_2_Formatted.fna ./AE006468_2_k4s1000_x1000a0.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a0.fna > ./AE006468_2_k4s1000_x1000a1.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a1.fna > ./AE006468_2_k4s1000_x1000a2.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a2.fna > ./AE006468_2_k4s1000_x1000a3.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a3.fna > ./AE006468_2_k4s1000_x1000a4.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a4.fna > ./AE006468_2_k4s1000_x1000a5.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a5.fna > ./AE006468_2_k4s1000_x1000a6.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a6.fna > ./AE006468_2_k4s1000_x1000a7.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a7.fna > ./AE006468_2_k4s1000_x1000a8.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a8.fna > ./AE006468_2_k4s1000_x1000a9.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a9.fna > ./AE006468_2_k4s1000_x1000a10.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a10.fna > ./AE006468_2_k4s1000_x1000a11.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a11.fna > ./AE006468_2_k4s1000_x1000a12.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a12.fna > ./AE006468_2_k4s1000_x1000a13.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a13.fna > ./AE006468_2_k4s1000_x1000a14.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a14.fna > ./AE006468_2_k4s1000_x1000a15.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a15.fna > ./AE006468_2_k4s1000_x1000a16.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a16.fna > ./AE006468_2_k4s1000_x1000a17.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a17.fna > ./AE006468_2_k4s1000_x1000a18.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a18.fna > ./AE006468_2_k4s1000_x1000a19.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a19.fna > ./AE006468_2_k4s1000_x1000a20.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a20.fna > ./AE006468_2_k4s1000_x1000a21.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a21.fna > ./AE006468_2_k4s1000_x1000a22.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a22.fna > ./AE006468_2_k4s1000_x1000a23.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a23.fna > ./AE006468_2_k4s1000_x1000a24.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a24.fna > ./AE006468_2_k4s1000_x1000a25.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a25.fna > ./AE006468_2_k4s1000_x1000a26.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a26.fna > ./AE006468_2_k4s1000_x1000a27.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a27.fna > ./AE006468_2_k4s1000_x1000a28.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a28.fna > ./AE006468_2_k4s1000_x1000a29.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a29.fna > ./AE006468_2_k4s1000_x1000a30.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a30.fna > ./AE006468_2_k4s1000_x1000a31.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a31.fna > ./AE006468_2_k4s1000_x1000a32.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a32.fna > ./AE006468_2_k4s1000_x1000a33.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a33.fna > ./AE006468_2_k4s1000_x1000a34.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a34.fna > ./AE006468_2_k4s1000_x1000a35.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a35.fna > ./AE006468_2_k4s1000_x1000a36.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a36.fna > ./AE006468_2_k4s1000_x1000a37.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a37.fna > ./AE006468_2_k4s1000_x1000a38.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a38.fna > ./AE006468_2_k4s1000_x1000a39.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a39.fna > ./AE006468_2_k4s1000_x1000a40.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a40.fna > ./AE006468_2_k4s1000_x1000a41.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a41.fna > ./AE006468_2_k4s1000_x1000a42.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a42.fna > ./AE006468_2_k4s1000_x1000a43.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a43.fna > ./AE006468_2_k4s1000_x1000a44.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a44.fna > ./AE006468_2_k4s1000_x1000a45.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a45.fna > ./AE006468_2_k4s1000_x1000a46.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a46.fna > ./AE006468_2_k4s1000_x1000a47.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a47.fna > ./AE006468_2_k4s1000_x1000a48.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a48.fna > ./AE006468_2_k4s1000_x1000a49.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a49.fna > ./AE006468_2_k4s1000_x1000a50.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a50.fna > ./AE006468_2_k4s1000_x1000a51.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a51.fna > ./AE006468_2_k4s1000_x1000a52.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a52.fna > ./AE006468_2_k4s1000_x1000a53.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a53.fna > ./AE006468_2_k4s1000_x1000a54.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a54.fna > ./AE006468_2_k4s1000_x1000a55.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a55.fna > ./AE006468_2_k4s1000_x1000a56.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a56.fna > ./AE006468_2_k4s1000_x1000a57.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a57.fna > ./AE006468_2_k4s1000_x1000a58.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a58.fna > ./AE006468_2_k4s1000_x1000a59.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a59.fna > ./AE006468_2_k4s1000_x1000a60.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a60.fna > ./AE006468_2_k4s1000_x1000a61.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a61.fna > ./AE006468_2_k4s1000_x1000a62.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a62.fna > ./AE006468_2_k4s1000_x1000a63.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a63.fna > ./AE006468_2_k4s1000_x1000a64.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a64.fna > ./AE006468_2_k4s1000_x1000a65.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a65.fna > ./AE006468_2_k4s1000_x1000a66.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a66.fna > ./AE006468_2_k4s1000_x1000a67.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a67.fna > ./AE006468_2_k4s1000_x1000a68.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a68.fna > ./AE006468_2_k4s1000_x1000a69.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a69.fna > ./AE006468_2_k4s1000_x1000a70.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a70.fna > ./AE006468_2_k4s1000_x1000a71.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a71.fna > ./AE006468_2_k4s1000_x1000a72.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a72.fna > ./AE006468_2_k4s1000_x1000a73.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a73.fna > ./AE006468_2_k4s1000_x1000a74.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a74.fna > ./AE006468_2_k4s1000_x1000a75.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a75.fna > ./AE006468_2_k4s1000_x1000a76.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a76.fna > ./AE006468_2_k4s1000_x1000a77.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a77.fna > ./AE006468_2_k4s1000_x1000a78.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a78.fna > ./AE006468_2_k4s1000_x1000a79.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a79.fna > ./AE006468_2_k4s1000_x1000a80.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a80.fna > ./AE006468_2_k4s1000_x1000a81.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a81.fna > ./AE006468_2_k4s1000_x1000a82.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a82.fna > ./AE006468_2_k4s1000_x1000a83.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a83.fna > ./AE006468_2_k4s1000_x1000a84.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a84.fna > ./AE006468_2_k4s1000_x1000a85.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a85.fna > ./AE006468_2_k4s1000_x1000a86.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a86.fna > ./AE006468_2_k4s1000_x1000a87.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a87.fna > ./AE006468_2_k4s1000_x1000a88.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a88.fna > ./AE006468_2_k4s1000_x1000a89.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a89.fna > ./AE006468_2_k4s1000_x1000a90.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a90.fna > ./AE006468_2_k4s1000_x1000a91.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a91.fna > ./AE006468_2_k4s1000_x1000a92.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a92.fna > ./AE006468_2_k4s1000_x1000a93.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a93.fna > ./AE006468_2_k4s1000_x1000a94.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a94.fna > ./AE006468_2_k4s1000_x1000a95.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a95.fna > ./AE006468_2_k4s1000_x1000a96.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a96.fna > ./AE006468_2_k4s1000_x1000a97.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a97.fna > ./AE006468_2_k4s1000_x1000a98.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a98.fna > ./AE006468_2_k4s1000_x1000a99.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a99.fna > ./AE006468_2_k4s1000_x1000a100.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a100.fna > ./AE006468_2_k4s1000_x1000a101.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a101.fna > ./AE006468_2_k4s1000_x1000a102.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a102.fna > ./AE006468_2_k4s1000_x1000a103.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a103.fna > ./AE006468_2_k4s1000_x1000a104.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a104.fna > ./AE006468_2_k4s1000_x1000a105.fna
```

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./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a105.fna > ./AE006468_2_k4s1000_x1000a106.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a106.fna > ./AE006468_2_k4s1000_x1000a107.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a107.fna > ./AE006468_2_k4s1000_x1000a108.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a108.fna > ./AE006468_2_k4s1000_x1000a109.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a109.fna > ./AE006468_2_k4s1000_x1000a110.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a110.fna > ./AE006468_2_k4s1000_x1000a111.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a111.fna > ./AE006468_2_k4s1000_x1000a112.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a112.fna > ./AE006468_2_k4s1000_x1000a113.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a113.fna > ./AE006468_2_k4s1000_x1000a114.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a114.fna > ./AE006468_2_k4s1000_x1000a115.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a115.fna > ./AE006468_2_k4s1000_x1000a116.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a116.fna > ./AE006468_2_k4s1000_x1000a117.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a117.fna > ./AE006468_2_k4s1000_x1000a118.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a118.fna > ./AE006468_2_k4s1000_x1000a119.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a119.fna > ./AE006468_2_k4s1000_x1000a120.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a120.fna > ./AE006468_2_k4s1000_x1000a121.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a121.fna > ./AE006468_2_k4s1000_x1000a122.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a122.fna > ./AE006468_2_k4s1000_x1000a123.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a123.fna > ./AE006468_2_k4s1000_x1000a124.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a124.fna > ./AE006468_2_k4s1000_x1000a125.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a125.fna > ./AE006468_2_k4s1000_x1000a126.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a126.fna > ./AE006468_2_k4s1000_x1000a127.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a127.fna > ./AE006468_2_k4s1000_x1000a128.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a128.fna > ./AE006468_2_k4s1000_x1000a129.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a129.fna > ./AE006468_2_k4s1000_x1000a130.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a130.fna > ./AE006468_2_k4s1000_x1000a131.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a131.fna > ./AE006468_2_k4s1000_x1000a132.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a132.fna > ./AE006468_2_k4s1000_x1000a133.fna
```

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./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a133.fna > ./AE006468_2_k4s1000_x1000a134.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a134.fna > ./AE006468_2_k4s1000_x1000a135.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a135.fna > ./AE006468_2_k4s1000_x1000a136.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a136.fna > ./AE006468_2_k4s1000_x1000a137.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a137.fna > ./AE006468_2_k4s1000_x1000a138.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a138.fna > ./AE006468_2_k4s1000_x1000a139.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a139.fna > ./AE006468_2_k4s1000_x1000a140.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a140.fna > ./AE006468_2_k4s1000_x1000a141.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a141.fna > ./AE006468_2_k4s1000_x1000a142.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a142.fna > ./AE006468_2_k4s1000_x1000a143.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a143.fna > ./AE006468_2_k4s1000_x1000a144.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a144.fna > ./AE006468_2_k4s1000_x1000a145.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a145.fna > ./AE006468_2_k4s1000_x1000a146.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a146.fna > ./AE006468_2_k4s1000_x1000a147.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a147.fna > ./AE006468_2_k4s1000_x1000a148.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a148.fna > ./AE006468_2_k4s1000_x1000a149.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a149.fna > ./AE006468_2_k4s1000_x1000a150.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a150.fna > ./AE006468_2_k4s1000_x1000a151.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a151.fna > ./AE006468_2_k4s1000_x1000a152.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a152.fna > ./AE006468_2_k4s1000_x1000a153.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a153.fna > ./AE006468_2_k4s1000_x1000a154.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a154.fna > ./AE006468_2_k4s1000_x1000a155.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a155.fna > ./AE006468_2_k4s1000_x1000a156.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a156.fna > ./AE006468_2_k4s1000_x1000a157.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a157.fna > ./AE006468_2_k4s1000_x1000a158.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a158.fna > ./AE006468_2_k4s1000_x1000a159.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a159.fna > ./AE006468_2_k4s1000_x1000a160.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a160.fna > ./AE006468_2_k4s1000_x1000a161.fna
```

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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a161.fna > ./AE006468_2_k4s1000_x1000a162.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a162.fna > ./AE006468_2_k4s1000_x1000a163.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a163.fna > ./AE006468_2_k4s1000_x1000a164.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a164.fna > ./AE006468_2_k4s1000_x1000a165.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a165.fna > ./AE006468_2_k4s1000_x1000a166.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a166.fna > ./AE006468_2_k4s1000_x1000a167.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a167.fna > ./AE006468_2_k4s1000_x1000a168.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a168.fna > ./AE006468_2_k4s1000_x1000a169.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a169.fna > ./AE006468_2_k4s1000_x1000a170.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a170.fna > ./AE006468_2_k4s1000_x1000a171.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a171.fna > ./AE006468_2_k4s1000_x1000a172.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a172.fna > ./AE006468_2_k4s1000_x1000a173.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a173.fna > ./AE006468_2_k4s1000_x1000a174.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a174.fna > ./AE006468_2_k4s1000_x1000a175.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a175.fna > ./AE006468_2_k4s1000_x1000a176.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a176.fna > ./AE006468_2_k4s1000_x1000a177.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a177.fna > ./AE006468_2_k4s1000_x1000a178.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a178.fna > ./AE006468_2_k4s1000_x1000a179.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a179.fna > ./AE006468_2_k4s1000_x1000a180.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a180.fna > ./AE006468_2_k4s1000_x1000a181.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a181.fna > ./AE006468_2_k4s1000_x1000a182.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a182.fna > ./AE006468_2_k4s1000_x1000a183.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a183.fna > ./AE006468_2_k4s1000_x1000a184.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a184.fna > ./AE006468_2_k4s1000_x1000a185.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a185.fna > ./AE006468_2_k4s1000_x1000a186.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a186.fna > ./AE006468_2_k4s1000_x1000a187.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a187.fna > ./AE006468_2_k4s1000_x1000a188.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a188.fna > ./AE006468_2_k4s1000_x1000a189.fna
```

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./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a189.fna > ./AE006468_2_k4s1000_x1000a190.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a190.fna > ./AE006468_2_k4s1000_x1000a191.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a191.fna > ./AE006468_2_k4s1000_x1000a192.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a192.fna > ./AE006468_2_k4s1000_x1000a193.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a193.fna > ./AE006468_2_k4s1000_x1000a194.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a194.fna > ./AE006468_2_k4s1000_x1000a195.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a195.fna > ./AE006468_2_k4s1000_x1000a196.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a196.fna > ./AE006468_2_k4s1000_x1000a197.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a197.fna > ./AE006468_2_k4s1000_x1000a198.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a198.fna > ./AE006468_2_k4s1000_x1000a199.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a199.fna > ./AE006468_2_k4s1000_x1000a200.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a200.fna > ./AE006468_2_k4s1000_x1000a201.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a201.fna > ./AE006468_2_k4s1000_x1000a202.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a202.fna > ./AE006468_2_k4s1000_x1000a203.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a203.fna > ./AE006468_2_k4s1000_x1000a204.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a204.fna > ./AE006468_2_k4s1000_x1000a205.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a205.fna > ./AE006468_2_k4s1000_x1000a206.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a206.fna > ./AE006468_2_k4s1000_x1000a207.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a207.fna > ./AE006468_2_k4s1000_x1000a208.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a208.fna > ./AE006468_2_k4s1000_x1000a209.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a209.fna > ./AE006468_2_k4s1000_x1000a210.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a210.fna > ./AE006468_2_k4s1000_x1000a211.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a211.fna > ./AE006468_2_k4s1000_x1000a212.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a212.fna > ./AE006468_2_k4s1000_x1000a213.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a213.fna > ./AE006468_2_k4s1000_x1000a214.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a214.fna > ./AE006468_2_k4s1000_x1000a215.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a215.fna > ./AE006468_2_k4s1000_x1000a216.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a216.fna > ./AE006468_2_k4s1000_x1000a217.fna
```

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./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a217.fna > ./AE006468_2_k4s1000_x1000a218.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a218.fna > ./AE006468_2_k4s1000_x1000a219.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a219.fna > ./AE006468_2_k4s1000_x1000a220.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a220.fna > ./AE006468_2_k4s1000_x1000a221.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a221.fna > ./AE006468_2_k4s1000_x1000a222.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a222.fna > ./AE006468_2_k4s1000_x1000a223.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a223.fna > ./AE006468_2_k4s1000_x1000a224.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a224.fna > ./AE006468_2_k4s1000_x1000a225.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a225.fna > ./AE006468_2_k4s1000_x1000a226.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a226.fna > ./AE006468_2_k4s1000_x1000a227.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a227.fna > ./AE006468_2_k4s1000_x1000a228.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a228.fna > ./AE006468_2_k4s1000_x1000a229.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a229.fna > ./AE006468_2_k4s1000_x1000a230.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a230.fna > ./AE006468_2_k4s1000_x1000a231.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a231.fna > ./AE006468_2_k4s1000_x1000a232.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a232.fna > ./AE006468_2_k4s1000_x1000a233.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a233.fna > ./AE006468_2_k4s1000_x1000a234.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a234.fna > ./AE006468_2_k4s1000_x1000a235.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a235.fna > ./AE006468_2_k4s1000_x1000a236.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a236.fna > ./AE006468_2_k4s1000_x1000a237.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a237.fna > ./AE006468_2_k4s1000_x1000a238.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a238.fna > ./AE006468_2_k4s1000_x1000a239.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a239.fna > ./AE006468_2_k4s1000_x1000a240.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a240.fna > ./AE006468_2_k4s1000_x1000a241.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a241.fna > ./AE006468_2_k4s1000_x1000a242.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a242.fna > ./AE006468_2_k4s1000_x1000a243.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a243.fna > ./AE006468_2_k4s1000_x1000a244.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a244.fna > ./AE006468_2_k4s1000_x1000a245.fna
```

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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a245.fna > ./AE006468_2_k4s1000_x1000a246.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a246.fna > ./AE006468_2_k4s1000_x1000a247.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a247.fna > ./AE006468_2_k4s1000_x1000a248.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a248.fna > ./AE006468_2_k4s1000_x1000a249.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a249.fna > ./AE006468_2_k4s1000_x1000a250.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a250.fna > ./AE006468_2_k4s1000_x1000a251.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a251.fna > ./AE006468_2_k4s1000_x1000a252.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a252.fna > ./AE006468_2_k4s1000_x1000a253.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a253.fna > ./AE006468_2_k4s1000_x1000a254.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a254.fna > ./AE006468_2_k4s1000_x1000a255.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a255.fna > ./AE006468_2_k4s1000_x1000a256.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a256.fna > ./AE006468_2_k4s1000_x1000a257.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a257.fna > ./AE006468_2_k4s1000_x1000a258.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a258.fna > ./AE006468_2_k4s1000_x1000a259.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a259.fna > ./AE006468_2_k4s1000_x1000a260.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a260.fna > ./AE006468_2_k4s1000_x1000a261.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a261.fna > ./AE006468_2_k4s1000_x1000a262.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a262.fna > ./AE006468_2_k4s1000_x1000a263.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a263.fna > ./AE006468_2_k4s1000_x1000a264.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a264.fna > ./AE006468_2_k4s1000_x1000a265.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a265.fna > ./AE006468_2_k4s1000_x1000a266.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a266.fna > ./AE006468_2_k4s1000_x1000a267.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a267.fna > ./AE006468_2_k4s1000_x1000a268.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a268.fna > ./AE006468_2_k4s1000_x1000a269.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a269.fna > ./AE006468_2_k4s1000_x1000a270.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a270.fna > ./AE006468_2_k4s1000_x1000a271.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a271.fna > ./AE006468_2_k4s1000_x1000a272.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a272.fna > ./AE006468_2_k4s1000_x1000a273.fna
```

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./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a273.fna > ./AE006468_2_k4s1000_x1000a274.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a274.fna > ./AE006468_2_k4s1000_x1000a275.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a275.fna > ./AE006468_2_k4s1000_x1000a276.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a276.fna > ./AE006468_2_k4s1000_x1000a277.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a277.fna > ./AE006468_2_k4s1000_x1000a278.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a278.fna > ./AE006468_2_k4s1000_x1000a279.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a279.fna > ./AE006468_2_k4s1000_x1000a280.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a280.fna > ./AE006468_2_k4s1000_x1000a281.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a281.fna > ./AE006468_2_k4s1000_x1000a282.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a282.fna > ./AE006468_2_k4s1000_x1000a283.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a283.fna > ./AE006468_2_k4s1000_x1000a284.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a284.fna > ./AE006468_2_k4s1000_x1000a285.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a285.fna > ./AE006468_2_k4s1000_x1000a286.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a286.fna > ./AE006468_2_k4s1000_x1000a287.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a287.fna > ./AE006468_2_k4s1000_x1000a288.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a288.fna > ./AE006468_2_k4s1000_x1000a289.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a289.fna > ./AE006468_2_k4s1000_x1000a290.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a290.fna > ./AE006468_2_k4s1000_x1000a291.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a291.fna > ./AE006468_2_k4s1000_x1000a292.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a292.fna > ./AE006468_2_k4s1000_x1000a293.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a293.fna > ./AE006468_2_k4s1000_x1000a294.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a294.fna > ./AE006468_2_k4s1000_x1000a295.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a295.fna > ./AE006468_2_k4s1000_x1000a296.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a296.fna > ./AE006468_2_k4s1000_x1000a297.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a297.fna > ./AE006468_2_k4s1000_x1000a298.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a298.fna > ./AE006468_2_k4s1000_x1000a299.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a299.fna > ./AE006468_2_k4s1000_x1000a300.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a300.fna > ./AE006468_2_k4s1000_x1000a301.fna
```

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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a301.fna > ./AE006468_2_k4s1000_x1000a302.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a302.fna > ./AE006468_2_k4s1000_x1000a303.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a303.fna > ./AE006468_2_k4s1000_x1000a304.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a304.fna > ./AE006468_2_k4s1000_x1000a305.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a305.fna > ./AE006468_2_k4s1000_x1000a306.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a306.fna > ./AE006468_2_k4s1000_x1000a307.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a307.fna > ./AE006468_2_k4s1000_x1000a308.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a308.fna > ./AE006468_2_k4s1000_x1000a309.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a309.fna > ./AE006468_2_k4s1000_x1000a310.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a310.fna > ./AE006468_2_k4s1000_x1000a311.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a311.fna > ./AE006468_2_k4s1000_x1000a312.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a312.fna > ./AE006468_2_k4s1000_x1000a313.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a313.fna > ./AE006468_2_k4s1000_x1000a314.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a314.fna > ./AE006468_2_k4s1000_x1000a315.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a315.fna > ./AE006468_2_k4s1000_x1000a316.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a316.fna > ./AE006468_2_k4s1000_x1000a317.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a317.fna > ./AE006468_2_k4s1000_x1000a318.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a318.fna > ./AE006468_2_k4s1000_x1000a319.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a319.fna > ./AE006468_2_k4s1000_x1000a320.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a320.fna > ./AE006468_2_k4s1000_x1000a321.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a321.fna > ./AE006468_2_k4s1000_x1000a322.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a322.fna > ./AE006468_2_k4s1000_x1000a323.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a323.fna > ./AE006468_2_k4s1000_x1000a324.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a324.fna > ./AE006468_2_k4s1000_x1000a325.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a325.fna > ./AE006468_2_k4s1000_x1000a326.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a326.fna > ./AE006468_2_k4s1000_x1000a327.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a327.fna > ./AE006468_2_k4s1000_x1000a328.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a328.fna > ./AE006468_2_k4s1000_x1000a329.fna
```

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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a329.fna > ./AE006468_2_k4s1000_x1000a330.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a330.fna > ./AE006468_2_k4s1000_x1000a331.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a331.fna > ./AE006468_2_k4s1000_x1000a332.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a332.fna > ./AE006468_2_k4s1000_x1000a333.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a333.fna > ./AE006468_2_k4s1000_x1000a334.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a334.fna > ./AE006468_2_k4s1000_x1000a335.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a335.fna > ./AE006468_2_k4s1000_x1000a336.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a336.fna > ./AE006468_2_k4s1000_x1000a337.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a337.fna > ./AE006468_2_k4s1000_x1000a338.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a338.fna > ./AE006468_2_k4s1000_x1000a339.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a339.fna > ./AE006468_2_k4s1000_x1000a340.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a340.fna > ./AE006468_2_k4s1000_x1000a341.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a341.fna > ./AE006468_2_k4s1000_x1000a342.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a342.fna > ./AE006468_2_k4s1000_x1000a343.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a343.fna > ./AE006468_2_k4s1000_x1000a344.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a344.fna > ./AE006468_2_k4s1000_x1000a345.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a345.fna > ./AE006468_2_k4s1000_x1000a346.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a346.fna > ./AE006468_2_k4s1000_x1000a347.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a347.fna > ./AE006468_2_k4s1000_x1000a348.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a348.fna > ./AE006468_2_k4s1000_x1000a349.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a349.fna > ./AE006468_2_k4s1000_x1000a350.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a350.fna > ./AE006468_2_k4s1000_x1000a351.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a351.fna > ./AE006468_2_k4s1000_x1000a352.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a352.fna > ./AE006468_2_k4s1000_x1000a353.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a353.fna > ./AE006468_2_k4s1000_x1000a354.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a354.fna > ./AE006468_2_k4s1000_x1000a355.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a355.fna > ./AE006468_2_k4s1000_x1000a356.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a356.fna > ./AE006468_2_k4s1000_x1000a357.fna
```

```
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a357.fna > ./AE006468_2_k4s1000_x1000a358.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a358.fna > ./AE006468_2_k4s1000_x1000a359.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a359.fna > ./AE006468_2_k4s1000_x1000a360.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a360.fna > ./AE006468_2_k4s1000_x1000a361.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a361.fna > ./AE006468_2_k4s1000_x1000a362.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a362.fna > ./AE006468_2_k4s1000_x1000a363.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a363.fna > ./AE006468_2_k4s1000_x1000a364.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a364.fna > ./AE006468_2_k4s1000_x1000a365.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a365.fna > ./AE006468_2_k4s1000_x1000a366.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a366.fna > ./AE006468_2_k4s1000_x1000a367.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a367.fna > ./AE006468_2_k4s1000_x1000a368.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a368.fna > ./AE006468_2_k4s1000_x1000a369.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a369.fna > ./AE006468_2_k4s1000_x1000a370.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a370.fna > ./AE006468_2_k4s1000_x1000a371.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a371.fna > ./AE006468_2_k4s1000_x1000a372.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a372.fna > ./AE006468_2_k4s1000_x1000a373.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a373.fna > ./AE006468_2_k4s1000_x1000a374.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a374.fna > ./AE006468_2_k4s1000_x1000a375.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a375.fna > ./AE006468_2_k4s1000_x1000a376.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a376.fna > ./AE006468_2_k4s1000_x1000a377.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a377.fna > ./AE006468_2_k4s1000_x1000a378.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a378.fna > ./AE006468_2_k4s1000_x1000a379.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a379.fna > ./AE006468_2_k4s1000_x1000a380.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a380.fna > ./AE006468_2_k4s1000_x1000a381.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a381.fna > ./AE006468_2_k4s1000_x1000a382.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a382.fna > ./AE006468_2_k4s1000_x1000a383.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a383.fna > ./AE006468_2_k4s1000_x1000a384.fna
          ./fasta_ushuffle -k 4 -
s 1 < ./AE006468_2_k4s1000_x1000a384.fna > ./AE006468_2_k4s1000_x1000a385.fna
```

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./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a385.fna > ./AE006468_2_k4s1000_x1000a386.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a386.fna > ./AE006468_2_k4s1000_x1000a387.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a387.fna > ./AE006468_2_k4s1000_x1000a388.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a388.fna > ./AE006468_2_k4s1000_x1000a389.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a389.fna > ./AE006468_2_k4s1000_x1000a390.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a390.fna > ./AE006468_2_k4s1000_x1000a391.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a391.fna > ./AE006468_2_k4s1000_x1000a392.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a392.fna > ./AE006468_2_k4s1000_x1000a393.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a393.fna > ./AE006468_2_k4s1000_x1000a394.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a394.fna > ./AE006468_2_k4s1000_x1000a395.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a395.fna > ./AE006468_2_k4s1000_x1000a396.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a396.fna > ./AE006468_2_k4s1000_x1000a397.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a397.fna > ./AE006468_2_k4s1000_x1000a398.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a398.fna > ./AE006468_2_k4s1000_x1000a399.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a399.fna > ./AE006468_2_k4s1000_x1000a400.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a400.fna > ./AE006468_2_k4s1000_x1000a401.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a401.fna > ./AE006468_2_k4s1000_x1000a402.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a402.fna > ./AE006468_2_k4s1000_x1000a403.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a403.fna > ./AE006468_2_k4s1000_x1000a404.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a404.fna > ./AE006468_2_k4s1000_x1000a405.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a405.fna > ./AE006468_2_k4s1000_x1000a406.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a406.fna > ./AE006468_2_k4s1000_x1000a407.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a407.fna > ./AE006468_2_k4s1000_x1000a408.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a408.fna > ./AE006468_2_k4s1000_x1000a409.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a409.fna > ./AE006468_2_k4s1000_x1000a410.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a410.fna > ./AE006468_2_k4s1000_x1000a411.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a411.fna > ./AE006468_2_k4s1000_x1000a412.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a412.fna > ./AE006468_2_k4s1000_x1000a413.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a413.fna > ./AE006468_2_k4s1000_x1000a414.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a414.fna > ./AE006468_2_k4s1000_x1000a415.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a415.fna > ./AE006468_2_k4s1000_x1000a416.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a416.fna > ./AE006468_2_k4s1000_x1000a417.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a417.fna > ./AE006468_2_k4s1000_x1000a418.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a418.fna > ./AE006468_2_k4s1000_x1000a419.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a419.fna > ./AE006468_2_k4s1000_x1000a420.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a420.fna > ./AE006468_2_k4s1000_x1000a421.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a421.fna > ./AE006468_2_k4s1000_x1000a422.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a422.fna > ./AE006468_2_k4s1000_x1000a423.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a423.fna > ./AE006468_2_k4s1000_x1000a424.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a424.fna > ./AE006468_2_k4s1000_x1000a425.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a425.fna > ./AE006468_2_k4s1000_x1000a426.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a426.fna > ./AE006468_2_k4s1000_x1000a427.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a427.fna > ./AE006468_2_k4s1000_x1000a428.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a428.fna > ./AE006468_2_k4s1000_x1000a429.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a429.fna > ./AE006468_2_k4s1000_x1000a430.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a430.fna > ./AE006468_2_k4s1000_x1000a431.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a431.fna > ./AE006468_2_k4s1000_x1000a432.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a432.fna > ./AE006468_2_k4s1000_x1000a433.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a433.fna > ./AE006468_2_k4s1000_x1000a434.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a434.fna > ./AE006468_2_k4s1000_x1000a435.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a435.fna > ./AE006468_2_k4s1000_x1000a436.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a436.fna > ./AE006468_2_k4s1000_x1000a437.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a437.fna > ./AE006468_2_k4s1000_x1000a438.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a438.fna > ./AE006468_2_k4s1000_x1000a439.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a439.fna > ./AE006468_2_k4s1000_x1000a440.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a440.fna > ./AE006468_2_k4s1000_x1000a441.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a441.fna > ./AE006468_2_k4s1000_x1000a442.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a442.fna > ./AE006468_2_k4s1000_x1000a443.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a443.fna > ./AE006468_2_k4s1000_x1000a444.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a444.fna > ./AE006468_2_k4s1000_x1000a445.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a445.fna > ./AE006468_2_k4s1000_x1000a446.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a446.fna > ./AE006468_2_k4s1000_x1000a447.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a447.fna > ./AE006468_2_k4s1000_x1000a448.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a448.fna > ./AE006468_2_k4s1000_x1000a449.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a449.fna > ./AE006468_2_k4s1000_x1000a450.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a450.fna > ./AE006468_2_k4s1000_x1000a451.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a451.fna > ./AE006468_2_k4s1000_x1000a452.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a452.fna > ./AE006468_2_k4s1000_x1000a453.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a453.fna > ./AE006468_2_k4s1000_x1000a454.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a454.fna > ./AE006468_2_k4s1000_x1000a455.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a455.fna > ./AE006468_2_k4s1000_x1000a456.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a456.fna > ./AE006468_2_k4s1000_x1000a457.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a457.fna > ./AE006468_2_k4s1000_x1000a458.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a458.fna > ./AE006468_2_k4s1000_x1000a459.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a459.fna > ./AE006468_2_k4s1000_x1000a460.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a460.fna > ./AE006468_2_k4s1000_x1000a461.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a461.fna > ./AE006468_2_k4s1000_x1000a462.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a462.fna > ./AE006468_2_k4s1000_x1000a463.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a463.fna > ./AE006468_2_k4s1000_x1000a464.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a464.fna > ./AE006468_2_k4s1000_x1000a465.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a465.fna > ./AE006468_2_k4s1000_x1000a466.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a466.fna > ./AE006468_2_k4s1000_x1000a467.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a467.fna > ./AE006468_2_k4s1000_x1000a468.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a468.fna > ./AE006468_2_k4s1000_x1000a469.fna
```

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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a469.fna > ./AE006468_2_k4s1000_x1000a470.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a470.fna > ./AE006468_2_k4s1000_x1000a471.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a471.fna > ./AE006468_2_k4s1000_x1000a472.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a472.fna > ./AE006468_2_k4s1000_x1000a473.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a473.fna > ./AE006468_2_k4s1000_x1000a474.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a474.fna > ./AE006468_2_k4s1000_x1000a475.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a475.fna > ./AE006468_2_k4s1000_x1000a476.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a476.fna > ./AE006468_2_k4s1000_x1000a477.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a477.fna > ./AE006468_2_k4s1000_x1000a478.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a478.fna > ./AE006468_2_k4s1000_x1000a479.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a479.fna > ./AE006468_2_k4s1000_x1000a480.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a480.fna > ./AE006468_2_k4s1000_x1000a481.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a481.fna > ./AE006468_2_k4s1000_x1000a482.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a482.fna > ./AE006468_2_k4s1000_x1000a483.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a483.fna > ./AE006468_2_k4s1000_x1000a484.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a484.fna > ./AE006468_2_k4s1000_x1000a485.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a485.fna > ./AE006468_2_k4s1000_x1000a486.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a486.fna > ./AE006468_2_k4s1000_x1000a487.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a487.fna > ./AE006468_2_k4s1000_x1000a488.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a488.fna > ./AE006468_2_k4s1000_x1000a489.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a489.fna > ./AE006468_2_k4s1000_x1000a490.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a490.fna > ./AE006468_2_k4s1000_x1000a491.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a491.fna > ./AE006468_2_k4s1000_x1000a492.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a492.fna > ./AE006468_2_k4s1000_x1000a493.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a493.fna > ./AE006468_2_k4s1000_x1000a494.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a494.fna > ./AE006468_2_k4s1000_x1000a495.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a495.fna > ./AE006468_2_k4s1000_x1000a496.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a496.fna > ./AE006468_2_k4s1000_x1000a497.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a497.fna > ./AE006468_2_k4s1000_x1000a498.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a498.fna > ./AE006468_2_k4s1000_x1000a499.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a499.fna > ./AE006468_2_k4s1000_x1000a500.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a500.fna > ./AE006468_2_k4s1000_x1000a501.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a501.fna > ./AE006468_2_k4s1000_x1000a502.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a502.fna > ./AE006468_2_k4s1000_x1000a503.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a503.fna > ./AE006468_2_k4s1000_x1000a504.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a504.fna > ./AE006468_2_k4s1000_x1000a505.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a505.fna > ./AE006468_2_k4s1000_x1000a506.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a506.fna > ./AE006468_2_k4s1000_x1000a507.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a507.fna > ./AE006468_2_k4s1000_x1000a508.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a508.fna > ./AE006468_2_k4s1000_x1000a509.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a509.fna > ./AE006468_2_k4s1000_x1000a510.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a510.fna > ./AE006468_2_k4s1000_x1000a511.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a511.fna > ./AE006468_2_k4s1000_x1000a512.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a512.fna > ./AE006468_2_k4s1000_x1000a513.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a513.fna > ./AE006468_2_k4s1000_x1000a514.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a514.fna > ./AE006468_2_k4s1000_x1000a515.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a515.fna > ./AE006468_2_k4s1000_x1000a516.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a516.fna > ./AE006468_2_k4s1000_x1000a517.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a517.fna > ./AE006468_2_k4s1000_x1000a518.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a518.fna > ./AE006468_2_k4s1000_x1000a519.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a519.fna > ./AE006468_2_k4s1000_x1000a520.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a520.fna > ./AE006468_2_k4s1000_x1000a521.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a521.fna > ./AE006468_2_k4s1000_x1000a522.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a522.fna > ./AE006468_2_k4s1000_x1000a523.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a523.fna > ./AE006468_2_k4s1000_x1000a524.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a524.fna > ./AE006468_2_k4s1000_x1000a525.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a525.fna > ./AE006468_2_k4s1000_x1000a526.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a526.fna > ./AE006468_2_k4s1000_x1000a527.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a527.fna > ./AE006468_2_k4s1000_x1000a528.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a528.fna > ./AE006468_2_k4s1000_x1000a529.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a529.fna > ./AE006468_2_k4s1000_x1000a530.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a530.fna > ./AE006468_2_k4s1000_x1000a531.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a531.fna > ./AE006468_2_k4s1000_x1000a532.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a532.fna > ./AE006468_2_k4s1000_x1000a533.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a533.fna > ./AE006468_2_k4s1000_x1000a534.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a534.fna > ./AE006468_2_k4s1000_x1000a535.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a535.fna > ./AE006468_2_k4s1000_x1000a536.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a536.fna > ./AE006468_2_k4s1000_x1000a537.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a537.fna > ./AE006468_2_k4s1000_x1000a538.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a538.fna > ./AE006468_2_k4s1000_x1000a539.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a539.fna > ./AE006468_2_k4s1000_x1000a540.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a540.fna > ./AE006468_2_k4s1000_x1000a541.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a541.fna > ./AE006468_2_k4s1000_x1000a542.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a542.fna > ./AE006468_2_k4s1000_x1000a543.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a543.fna > ./AE006468_2_k4s1000_x1000a544.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a544.fna > ./AE006468_2_k4s1000_x1000a545.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a545.fna > ./AE006468_2_k4s1000_x1000a546.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a546.fna > ./AE006468_2_k4s1000_x1000a547.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a547.fna > ./AE006468_2_k4s1000_x1000a548.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a548.fna > ./AE006468_2_k4s1000_x1000a549.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a549.fna > ./AE006468_2_k4s1000_x1000a550.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a550.fna > ./AE006468_2_k4s1000_x1000a551.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a551.fna > ./AE006468_2_k4s1000_x1000a552.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a552.fna > ./AE006468_2_k4s1000_x1000a553.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a553.fna > ./AE006468_2_k4s1000_x1000a554.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a554.fna > ./AE006468_2_k4s1000_x1000a555.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a555.fna > ./AE006468_2_k4s1000_x1000a556.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a556.fna > ./AE006468_2_k4s1000_x1000a557.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a557.fna > ./AE006468_2_k4s1000_x1000a558.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a558.fna > ./AE006468_2_k4s1000_x1000a559.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a559.fna > ./AE006468_2_k4s1000_x1000a560.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a560.fna > ./AE006468_2_k4s1000_x1000a561.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a561.fna > ./AE006468_2_k4s1000_x1000a562.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a562.fna > ./AE006468_2_k4s1000_x1000a563.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a563.fna > ./AE006468_2_k4s1000_x1000a564.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a564.fna > ./AE006468_2_k4s1000_x1000a565.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a565.fna > ./AE006468_2_k4s1000_x1000a566.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a566.fna > ./AE006468_2_k4s1000_x1000a567.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a567.fna > ./AE006468_2_k4s1000_x1000a568.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a568.fna > ./AE006468_2_k4s1000_x1000a569.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a569.fna > ./AE006468_2_k4s1000_x1000a570.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a570.fna > ./AE006468_2_k4s1000_x1000a571.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a571.fna > ./AE006468_2_k4s1000_x1000a572.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a572.fna > ./AE006468_2_k4s1000_x1000a573.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a573.fna > ./AE006468_2_k4s1000_x1000a574.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a574.fna > ./AE006468_2_k4s1000_x1000a575.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a575.fna > ./AE006468_2_k4s1000_x1000a576.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a576.fna > ./AE006468_2_k4s1000_x1000a577.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a577.fna > ./AE006468_2_k4s1000_x1000a578.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a578.fna > ./AE006468_2_k4s1000_x1000a579.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a579.fna > ./AE006468_2_k4s1000_x1000a580.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a580.fna > ./AE006468_2_k4s1000_x1000a581.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a581.fna > ./AE006468_2_k4s1000_x1000a582.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a582.fna > ./AE006468_2_k4s1000_x1000a583.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a583.fna > ./AE006468_2_k4s1000_x1000a584.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a584.fna > ./AE006468_2_k4s1000_x1000a585.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a585.fna > ./AE006468_2_k4s1000_x1000a586.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a586.fna > ./AE006468_2_k4s1000_x1000a587.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a587.fna > ./AE006468_2_k4s1000_x1000a588.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a588.fna > ./AE006468_2_k4s1000_x1000a589.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a589.fna > ./AE006468_2_k4s1000_x1000a590.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a590.fna > ./AE006468_2_k4s1000_x1000a591.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a591.fna > ./AE006468_2_k4s1000_x1000a592.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a592.fna > ./AE006468_2_k4s1000_x1000a593.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a593.fna > ./AE006468_2_k4s1000_x1000a594.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a594.fna > ./AE006468_2_k4s1000_x1000a595.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a595.fna > ./AE006468_2_k4s1000_x1000a596.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a596.fna > ./AE006468_2_k4s1000_x1000a597.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a597.fna > ./AE006468_2_k4s1000_x1000a598.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a598.fna > ./AE006468_2_k4s1000_x1000a599.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a599.fna > ./AE006468_2_k4s1000_x1000a600.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a600.fna > ./AE006468_2_k4s1000_x1000a601.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a601.fna > ./AE006468_2_k4s1000_x1000a602.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a602.fna > ./AE006468_2_k4s1000_x1000a603.fna
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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a604.fna > ./AE006468_2_k4s1000_x1000a605.fna
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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a607.fna > ./AE006468_2_k4s1000_x1000a608.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a608.fna > ./AE006468_2_k4s1000_x1000a609.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a609.fna > ./AE006468_2_k4s1000_x1000a610.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a610.fna > ./AE006468_2_k4s1000_x1000a611.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a611.fna > ./AE006468_2_k4s1000_x1000a612.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a612.fna > ./AE006468_2_k4s1000_x1000a613.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a613.fna > ./AE006468_2_k4s1000_x1000a614.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a614.fna > ./AE006468_2_k4s1000_x1000a615.fna
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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a617.fna > ./AE006468_2_k4s1000_x1000a618.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a618.fna > ./AE006468_2_k4s1000_x1000a619.fna
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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a620.fna > ./AE006468_2_k4s1000_x1000a621.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a621.fna > ./AE006468_2_k4s1000_x1000a622.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a622.fna > ./AE006468_2_k4s1000_x1000a623.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a623.fna > ./AE006468_2_k4s1000_x1000a624.fna
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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a625.fna > ./AE006468_2_k4s1000_x1000a626.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a626.fna > ./AE006468_2_k4s1000_x1000a627.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a627.fna > ./AE006468_2_k4s1000_x1000a628.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a628.fna > ./AE006468_2_k4s1000_x1000a629.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a629.fna > ./AE006468_2_k4s1000_x1000a630.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a630.fna > ./AE006468_2_k4s1000_x1000a631.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a631.fna > ./AE006468_2_k4s1000_x1000a632.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a632.fna > ./AE006468_2_k4s1000_x1000a633.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a633.fna > ./AE006468_2_k4s1000_x1000a634.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a634.fna > ./AE006468_2_k4s1000_x1000a635.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a635.fna > ./AE006468_2_k4s1000_x1000a636.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a636.fna > ./AE006468_2_k4s1000_x1000a637.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a637.fna > ./AE006468_2_k4s1000_x1000a638.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a638.fna > ./AE006468_2_k4s1000_x1000a639.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a639.fna > ./AE006468_2_k4s1000_x1000a640.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a640.fna > ./AE006468_2_k4s1000_x1000a641.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a641.fna > ./AE006468_2_k4s1000_x1000a642.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a642.fna > ./AE006468_2_k4s1000_x1000a643.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a643.fna > ./AE006468_2_k4s1000_x1000a644.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a644.fna > ./AE006468_2_k4s1000_x1000a645.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a645.fna > ./AE006468_2_k4s1000_x1000a646.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a646.fna > ./AE006468_2_k4s1000_x1000a647.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a647.fna > ./AE006468_2_k4s1000_x1000a648.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a648.fna > ./AE006468_2_k4s1000_x1000a649.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a649.fna > ./AE006468_2_k4s1000_x1000a650.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a650.fna > ./AE006468_2_k4s1000_x1000a651.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a651.fna > ./AE006468_2_k4s1000_x1000a652.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a652.fna > ./AE006468_2_k4s1000_x1000a653.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a653.fna > ./AE006468_2_k4s1000_x1000a654.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a654.fna > ./AE006468_2_k4s1000_x1000a655.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a655.fna > ./AE006468_2_k4s1000_x1000a656.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a656.fna > ./AE006468_2_k4s1000_x1000a657.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a657.fna > ./AE006468_2_k4s1000_x1000a658.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a658.fna > ./AE006468_2_k4s1000_x1000a659.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a659.fna > ./AE006468_2_k4s1000_x1000a660.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a660.fna > ./AE006468_2_k4s1000_x1000a661.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a661.fna > ./AE006468_2_k4s1000_x1000a662.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a662.fna > ./AE006468_2_k4s1000_x1000a663.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a663.fna > ./AE006468_2_k4s1000_x1000a664.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a664.fna > ./AE006468_2_k4s1000_x1000a665.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a665.fna > ./AE006468_2_k4s1000_x1000a666.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a666.fna > ./AE006468_2_k4s1000_x1000a667.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a667.fna > ./AE006468_2_k4s1000_x1000a668.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a668.fna > ./AE006468_2_k4s1000_x1000a669.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a669.fna > ./AE006468_2_k4s1000_x1000a670.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a670.fna > ./AE006468_2_k4s1000_x1000a671.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a671.fna > ./AE006468_2_k4s1000_x1000a672.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a672.fna > ./AE006468_2_k4s1000_x1000a673.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a673.fna > ./AE006468_2_k4s1000_x1000a674.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a674.fna > ./AE006468_2_k4s1000_x1000a675.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a675.fna > ./AE006468_2_k4s1000_x1000a676.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a676.fna > ./AE006468_2_k4s1000_x1000a677.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a677.fna > ./AE006468_2_k4s1000_x1000a678.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a678.fna > ./AE006468_2_k4s1000_x1000a679.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a679.fna > ./AE006468_2_k4s1000_x1000a680.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a680.fna > ./AE006468_2_k4s1000_x1000a681.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a681.fna > ./AE006468_2_k4s1000_x1000a682.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a682.fna > ./AE006468_2_k4s1000_x1000a683.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a683.fna > ./AE006468_2_k4s1000_x1000a684.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a684.fna > ./AE006468_2_k4s1000_x1000a685.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a685.fna > ./AE006468_2_k4s1000_x1000a686.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a686.fna > ./AE006468_2_k4s1000_x1000a687.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a687.fna > ./AE006468_2_k4s1000_x1000a688.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a688.fna > ./AE006468_2_k4s1000_x1000a689.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a689.fna > ./AE006468_2_k4s1000_x1000a690.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a690.fna > ./AE006468_2_k4s1000_x1000a691.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a691.fna > ./AE006468_2_k4s1000_x1000a692.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a692.fna > ./AE006468_2_k4s1000_x1000a693.fna
```

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./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a693.fna > ./AE006468_2_k4s1000_x1000a694.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a694.fna > ./AE006468_2_k4s1000_x1000a695.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a695.fna > ./AE006468_2_k4s1000_x1000a696.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a696.fna > ./AE006468_2_k4s1000_x1000a697.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a697.fna > ./AE006468_2_k4s1000_x1000a698.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a698.fna > ./AE006468_2_k4s1000_x1000a699.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a699.fna > ./AE006468_2_k4s1000_x1000a700.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a700.fna > ./AE006468_2_k4s1000_x1000a701.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a701.fna > ./AE006468_2_k4s1000_x1000a702.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a702.fna > ./AE006468_2_k4s1000_x1000a703.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a703.fna > ./AE006468_2_k4s1000_x1000a704.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a704.fna > ./AE006468_2_k4s1000_x1000a705.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a705.fna > ./AE006468_2_k4s1000_x1000a706.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a706.fna > ./AE006468_2_k4s1000_x1000a707.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a707.fna > ./AE006468_2_k4s1000_x1000a708.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a708.fna > ./AE006468_2_k4s1000_x1000a709.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a709.fna > ./AE006468_2_k4s1000_x1000a710.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a710.fna > ./AE006468_2_k4s1000_x1000a711.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a711.fna > ./AE006468_2_k4s1000_x1000a712.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a712.fna > ./AE006468_2_k4s1000_x1000a713.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a713.fna > ./AE006468_2_k4s1000_x1000a714.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a714.fna > ./AE006468_2_k4s1000_x1000a715.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a715.fna > ./AE006468_2_k4s1000_x1000a716.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a716.fna > ./AE006468_2_k4s1000_x1000a717.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a717.fna > ./AE006468_2_k4s1000_x1000a718.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a718.fna > ./AE006468_2_k4s1000_x1000a719.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a719.fna > ./AE006468_2_k4s1000_x1000a720.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a720.fna > ./AE006468_2_k4s1000_x1000a721.fna
```

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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a721.fna > ./AE006468_2_k4s1000_x1000a722.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a722.fna > ./AE006468_2_k4s1000_x1000a723.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a723.fna > ./AE006468_2_k4s1000_x1000a724.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a724.fna > ./AE006468_2_k4s1000_x1000a725.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a725.fna > ./AE006468_2_k4s1000_x1000a726.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a726.fna > ./AE006468_2_k4s1000_x1000a727.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a727.fna > ./AE006468_2_k4s1000_x1000a728.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a728.fna > ./AE006468_2_k4s1000_x1000a729.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a729.fna > ./AE006468_2_k4s1000_x1000a730.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a730.fna > ./AE006468_2_k4s1000_x1000a731.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a731.fna > ./AE006468_2_k4s1000_x1000a732.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a732.fna > ./AE006468_2_k4s1000_x1000a733.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a733.fna > ./AE006468_2_k4s1000_x1000a734.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a734.fna > ./AE006468_2_k4s1000_x1000a735.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a735.fna > ./AE006468_2_k4s1000_x1000a736.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a736.fna > ./AE006468_2_k4s1000_x1000a737.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a737.fna > ./AE006468_2_k4s1000_x1000a738.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a738.fna > ./AE006468_2_k4s1000_x1000a739.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a739.fna > ./AE006468_2_k4s1000_x1000a740.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a740.fna > ./AE006468_2_k4s1000_x1000a741.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a741.fna > ./AE006468_2_k4s1000_x1000a742.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a742.fna > ./AE006468_2_k4s1000_x1000a743.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a743.fna > ./AE006468_2_k4s1000_x1000a744.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a744.fna > ./AE006468_2_k4s1000_x1000a745.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a745.fna > ./AE006468_2_k4s1000_x1000a746.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a746.fna > ./AE006468_2_k4s1000_x1000a747.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a747.fna > ./AE006468_2_k4s1000_x1000a748.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a748.fna > ./AE006468_2_k4s1000_x1000a749.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a749.fna > ./AE006468_2_k4s1000_x1000a750.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a750.fna > ./AE006468_2_k4s1000_x1000a751.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a751.fna > ./AE006468_2_k4s1000_x1000a752.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a752.fna > ./AE006468_2_k4s1000_x1000a753.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a753.fna > ./AE006468_2_k4s1000_x1000a754.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a754.fna > ./AE006468_2_k4s1000_x1000a755.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a755.fna > ./AE006468_2_k4s1000_x1000a756.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a756.fna > ./AE006468_2_k4s1000_x1000a757.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a757.fna > ./AE006468_2_k4s1000_x1000a758.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a758.fna > ./AE006468_2_k4s1000_x1000a759.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a759.fna > ./AE006468_2_k4s1000_x1000a760.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a760.fna > ./AE006468_2_k4s1000_x1000a761.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a761.fna > ./AE006468_2_k4s1000_x1000a762.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a762.fna > ./AE006468_2_k4s1000_x1000a763.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a763.fna > ./AE006468_2_k4s1000_x1000a764.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a764.fna > ./AE006468_2_k4s1000_x1000a765.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a765.fna > ./AE006468_2_k4s1000_x1000a766.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a766.fna > ./AE006468_2_k4s1000_x1000a767.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a767.fna > ./AE006468_2_k4s1000_x1000a768.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a768.fna > ./AE006468_2_k4s1000_x1000a769.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a769.fna > ./AE006468_2_k4s1000_x1000a770.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a770.fna > ./AE006468_2_k4s1000_x1000a771.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a771.fna > ./AE006468_2_k4s1000_x1000a772.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a772.fna > ./AE006468_2_k4s1000_x1000a773.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a773.fna > ./AE006468_2_k4s1000_x1000a774.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a774.fna > ./AE006468_2_k4s1000_x1000a775.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a775.fna > ./AE006468_2_k4s1000_x1000a776.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a776.fna > ./AE006468_2_k4s1000_x1000a777.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a777.fna > ./AE006468_2_k4s1000_x1000a778.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a778.fna > ./AE006468_2_k4s1000_x1000a779.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a779.fna > ./AE006468_2_k4s1000_x1000a780.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a780.fna > ./AE006468_2_k4s1000_x1000a781.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a781.fna > ./AE006468_2_k4s1000_x1000a782.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a782.fna > ./AE006468_2_k4s1000_x1000a783.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a783.fna > ./AE006468_2_k4s1000_x1000a784.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a784.fna > ./AE006468_2_k4s1000_x1000a785.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a785.fna > ./AE006468_2_k4s1000_x1000a786.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a786.fna > ./AE006468_2_k4s1000_x1000a787.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a787.fna > ./AE006468_2_k4s1000_x1000a788.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a788.fna > ./AE006468_2_k4s1000_x1000a789.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a789.fna > ./AE006468_2_k4s1000_x1000a790.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a790.fna > ./AE006468_2_k4s1000_x1000a791.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a791.fna > ./AE006468_2_k4s1000_x1000a792.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a792.fna > ./AE006468_2_k4s1000_x1000a793.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a793.fna > ./AE006468_2_k4s1000_x1000a794.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a794.fna > ./AE006468_2_k4s1000_x1000a795.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a795.fna > ./AE006468_2_k4s1000_x1000a796.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a796.fna > ./AE006468_2_k4s1000_x1000a797.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a797.fna > ./AE006468_2_k4s1000_x1000a798.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a798.fna > ./AE006468_2_k4s1000_x1000a799.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a799.fna > ./AE006468_2_k4s1000_x1000a800.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a800.fna > ./AE006468_2_k4s1000_x1000a801.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a801.fna > ./AE006468_2_k4s1000_x1000a802.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a802.fna > ./AE006468_2_k4s1000_x1000a803.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a803.fna > ./AE006468_2_k4s1000_x1000a804.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a804.fna > ./AE006468_2_k4s1000_x1000a805.fna
```

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    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a805.fna > ./AE006468_2_k4s1000_x1000a806.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a806.fna > ./AE006468_2_k4s1000_x1000a807.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a807.fna > ./AE006468_2_k4s1000_x1000a808.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a808.fna > ./AE006468_2_k4s1000_x1000a809.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a809.fna > ./AE006468_2_k4s1000_x1000a810.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a810.fna > ./AE006468_2_k4s1000_x1000a811.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a811.fna > ./AE006468_2_k4s1000_x1000a812.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a812.fna > ./AE006468_2_k4s1000_x1000a813.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a813.fna > ./AE006468_2_k4s1000_x1000a814.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a814.fna > ./AE006468_2_k4s1000_x1000a815.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a815.fna > ./AE006468_2_k4s1000_x1000a816.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a816.fna > ./AE006468_2_k4s1000_x1000a817.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a817.fna > ./AE006468_2_k4s1000_x1000a818.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a818.fna > ./AE006468_2_k4s1000_x1000a819.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a819.fna > ./AE006468_2_k4s1000_x1000a820.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a820.fna > ./AE006468_2_k4s1000_x1000a821.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a821.fna > ./AE006468_2_k4s1000_x1000a822.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a822.fna > ./AE006468_2_k4s1000_x1000a823.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a823.fna > ./AE006468_2_k4s1000_x1000a824.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a824.fna > ./AE006468_2_k4s1000_x1000a825.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a825.fna > ./AE006468_2_k4s1000_x1000a826.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a826.fna > ./AE006468_2_k4s1000_x1000a827.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a827.fna > ./AE006468_2_k4s1000_x1000a828.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a828.fna > ./AE006468_2_k4s1000_x1000a829.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a829.fna > ./AE006468_2_k4s1000_x1000a830.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a830.fna > ./AE006468_2_k4s1000_x1000a831.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a831.fna > ./AE006468_2_k4s1000_x1000a832.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a832.fna > ./AE006468_2_k4s1000_x1000a833.fna
```

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	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a833.fna > ./AE006468_2_k4s1000_x1000a834.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a834.fna > ./AE006468_2_k4s1000_x1000a835.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a835.fna > ./AE006468_2_k4s1000_x1000a836.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a836.fna > ./AE006468_2_k4s1000_x1000a837.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a837.fna > ./AE006468_2_k4s1000_x1000a838.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a838.fna > ./AE006468_2_k4s1000_x1000a839.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a839.fna > ./AE006468_2_k4s1000_x1000a840.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a840.fna > ./AE006468_2_k4s1000_x1000a841.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a841.fna > ./AE006468_2_k4s1000_x1000a842.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a842.fna > ./AE006468_2_k4s1000_x1000a843.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a843.fna > ./AE006468_2_k4s1000_x1000a844.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a844.fna > ./AE006468_2_k4s1000_x1000a845.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a845.fna > ./AE006468_2_k4s1000_x1000a846.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a846.fna > ./AE006468_2_k4s1000_x1000a847.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a847.fna > ./AE006468_2_k4s1000_x1000a848.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a848.fna > ./AE006468_2_k4s1000_x1000a849.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a849.fna > ./AE006468_2_k4s1000_x1000a850.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a850.fna > ./AE006468_2_k4s1000_x1000a851.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a851.fna > ./AE006468_2_k4s1000_x1000a852.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a852.fna > ./AE006468_2_k4s1000_x1000a853.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a853.fna > ./AE006468_2_k4s1000_x1000a854.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a854.fna > ./AE006468_2_k4s1000_x1000a855.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a855.fna > ./AE006468_2_k4s1000_x1000a856.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a856.fna > ./AE006468_2_k4s1000_x1000a857.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a857.fna > ./AE006468_2_k4s1000_x1000a858.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a858.fna > ./AE006468_2_k4s1000_x1000a859.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a859.fna > ./AE006468_2_k4s1000_x1000a860.fna
	./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a860.fna > ./AE006468_2_k4s1000_x1000a861.fna
```

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./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a861.fna > ./AE006468_2_k4s1000_x1000a862.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a862.fna > ./AE006468_2_k4s1000_x1000a863.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a863.fna > ./AE006468_2_k4s1000_x1000a864.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a864.fna > ./AE006468_2_k4s1000_x1000a865.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a865.fna > ./AE006468_2_k4s1000_x1000a866.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a866.fna > ./AE006468_2_k4s1000_x1000a867.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a867.fna > ./AE006468_2_k4s1000_x1000a868.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a868.fna > ./AE006468_2_k4s1000_x1000a869.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a869.fna > ./AE006468_2_k4s1000_x1000a870.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a870.fna > ./AE006468_2_k4s1000_x1000a871.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a871.fna > ./AE006468_2_k4s1000_x1000a872.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a872.fna > ./AE006468_2_k4s1000_x1000a873.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a873.fna > ./AE006468_2_k4s1000_x1000a874.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a874.fna > ./AE006468_2_k4s1000_x1000a875.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a875.fna > ./AE006468_2_k4s1000_x1000a876.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a876.fna > ./AE006468_2_k4s1000_x1000a877.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a877.fna > ./AE006468_2_k4s1000_x1000a878.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a878.fna > ./AE006468_2_k4s1000_x1000a879.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a879.fna > ./AE006468_2_k4s1000_x1000a880.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a880.fna > ./AE006468_2_k4s1000_x1000a881.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a881.fna > ./AE006468_2_k4s1000_x1000a882.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a882.fna > ./AE006468_2_k4s1000_x1000a883.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a883.fna > ./AE006468_2_k4s1000_x1000a884.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a884.fna > ./AE006468_2_k4s1000_x1000a885.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a885.fna > ./AE006468_2_k4s1000_x1000a886.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a886.fna > ./AE006468_2_k4s1000_x1000a887.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a887.fna > ./AE006468_2_k4s1000_x1000a888.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a888.fna > ./AE006468_2_k4s1000_x1000a889.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a889.fna > ./AE006468_2_k4s1000_x1000a890.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a890.fna > ./AE006468_2_k4s1000_x1000a891.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a891.fna > ./AE006468_2_k4s1000_x1000a892.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a892.fna > ./AE006468_2_k4s1000_x1000a893.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a893.fna > ./AE006468_2_k4s1000_x1000a894.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a894.fna > ./AE006468_2_k4s1000_x1000a895.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a895.fna > ./AE006468_2_k4s1000_x1000a896.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a896.fna > ./AE006468_2_k4s1000_x1000a897.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a897.fna > ./AE006468_2_k4s1000_x1000a898.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a898.fna > ./AE006468_2_k4s1000_x1000a899.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a899.fna > ./AE006468_2_k4s1000_x1000a900.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a900.fna > ./AE006468_2_k4s1000_x1000a901.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a901.fna > ./AE006468_2_k4s1000_x1000a902.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a902.fna > ./AE006468_2_k4s1000_x1000a903.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a903.fna > ./AE006468_2_k4s1000_x1000a904.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a904.fna > ./AE006468_2_k4s1000_x1000a905.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a905.fna > ./AE006468_2_k4s1000_x1000a906.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a906.fna > ./AE006468_2_k4s1000_x1000a907.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a907.fna > ./AE006468_2_k4s1000_x1000a908.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a908.fna > ./AE006468_2_k4s1000_x1000a909.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a909.fna > ./AE006468_2_k4s1000_x1000a910.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a910.fna > ./AE006468_2_k4s1000_x1000a911.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a911.fna > ./AE006468_2_k4s1000_x1000a912.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a912.fna > ./AE006468_2_k4s1000_x1000a913.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a913.fna > ./AE006468_2_k4s1000_x1000a914.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a914.fna > ./AE006468_2_k4s1000_x1000a915.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a915.fna > ./AE006468_2_k4s1000_x1000a916.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a916.fna > ./AE006468_2_k4s1000_x1000a917.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a917.fna > ./AE006468_2_k4s1000_x1000a918.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a918.fna > ./AE006468_2_k4s1000_x1000a919.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a919.fna > ./AE006468_2_k4s1000_x1000a920.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a920.fna > ./AE006468_2_k4s1000_x1000a921.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a921.fna > ./AE006468_2_k4s1000_x1000a922.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a922.fna > ./AE006468_2_k4s1000_x1000a923.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a923.fna > ./AE006468_2_k4s1000_x1000a924.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a924.fna > ./AE006468_2_k4s1000_x1000a925.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a925.fna > ./AE006468_2_k4s1000_x1000a926.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a926.fna > ./AE006468_2_k4s1000_x1000a927.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a927.fna > ./AE006468_2_k4s1000_x1000a928.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a928.fna > ./AE006468_2_k4s1000_x1000a929.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a929.fna > ./AE006468_2_k4s1000_x1000a930.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a930.fna > ./AE006468_2_k4s1000_x1000a931.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a931.fna > ./AE006468_2_k4s1000_x1000a932.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a932.fna > ./AE006468_2_k4s1000_x1000a933.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a933.fna > ./AE006468_2_k4s1000_x1000a934.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a934.fna > ./AE006468_2_k4s1000_x1000a935.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a935.fna > ./AE006468_2_k4s1000_x1000a936.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a936.fna > ./AE006468_2_k4s1000_x1000a937.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a937.fna > ./AE006468_2_k4s1000_x1000a938.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a938.fna > ./AE006468_2_k4s1000_x1000a939.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a939.fna > ./AE006468_2_k4s1000_x1000a940.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a940.fna > ./AE006468_2_k4s1000_x1000a941.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a941.fna > ./AE006468_2_k4s1000_x1000a942.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a942.fna > ./AE006468_2_k4s1000_x1000a943.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a943.fna > ./AE006468_2_k4s1000_x1000a944.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a944.fna > ./AE006468_2_k4s1000_x1000a945.fna
```

```
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a945.fna > ./AE006468_2_k4s1000_x1000a946.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a946.fna > ./AE006468_2_k4s1000_x1000a947.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a947.fna > ./AE006468_2_k4s1000_x1000a948.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a948.fna > ./AE006468_2_k4s1000_x1000a949.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a949.fna > ./AE006468_2_k4s1000_x1000a950.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a950.fna > ./AE006468_2_k4s1000_x1000a951.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a951.fna > ./AE006468_2_k4s1000_x1000a952.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a952.fna > ./AE006468_2_k4s1000_x1000a953.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a953.fna > ./AE006468_2_k4s1000_x1000a954.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a954.fna > ./AE006468_2_k4s1000_x1000a955.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a955.fna > ./AE006468_2_k4s1000_x1000a956.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a956.fna > ./AE006468_2_k4s1000_x1000a957.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a957.fna > ./AE006468_2_k4s1000_x1000a958.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a958.fna > ./AE006468_2_k4s1000_x1000a959.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a959.fna > ./AE006468_2_k4s1000_x1000a960.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a960.fna > ./AE006468_2_k4s1000_x1000a961.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a961.fna > ./AE006468_2_k4s1000_x1000a962.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a962.fna > ./AE006468_2_k4s1000_x1000a963.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a963.fna > ./AE006468_2_k4s1000_x1000a964.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a964.fna > ./AE006468_2_k4s1000_x1000a965.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a965.fna > ./AE006468_2_k4s1000_x1000a966.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a966.fna > ./AE006468_2_k4s1000_x1000a967.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a967.fna > ./AE006468_2_k4s1000_x1000a968.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a968.fna > ./AE006468_2_k4s1000_x1000a969.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a969.fna > ./AE006468_2_k4s1000_x1000a970.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a970.fna > ./AE006468_2_k4s1000_x1000a971.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a971.fna > ./AE006468_2_k4s1000_x1000a972.fna
    ./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a972.fna > ./AE006468_2_k4s1000_x1000a973.fna
```

```
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a973.fna > ./AE006468_2_k4s1000_x1000a974.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a974.fna > ./AE006468_2_k4s1000_x1000a975.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a975.fna > ./AE006468_2_k4s1000_x1000a976.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a976.fna > ./AE006468_2_k4s1000_x1000a977.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a977.fna > ./AE006468_2_k4s1000_x1000a978.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a978.fna > ./AE006468_2_k4s1000_x1000a979.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a979.fna > ./AE006468_2_k4s1000_x1000a980.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a980.fna > ./AE006468_2_k4s1000_x1000a981.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a981.fna > ./AE006468_2_k4s1000_x1000a982.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a982.fna > ./AE006468_2_k4s1000_x1000a983.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a983.fna > ./AE006468_2_k4s1000_x1000a984.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a984.fna > ./AE006468_2_k4s1000_x1000a985.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a985.fna > ./AE006468_2_k4s1000_x1000a986.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a986.fna > ./AE006468_2_k4s1000_x1000a987.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a987.fna > ./AE006468_2_k4s1000_x1000a988.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a988.fna > ./AE006468_2_k4s1000_x1000a989.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a989.fna > ./AE006468_2_k4s1000_x1000a990.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a990.fna > ./AE006468_2_k4s1000_x1000a991.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a991.fna > ./AE006468_2_k4s1000_x1000a992.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a992.fna > ./AE006468_2_k4s1000_x1000a993.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a993.fna > ./AE006468_2_k4s1000_x1000a994.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a994.fna > ./AE006468_2_k4s1000_x1000a995.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a995.fna > ./AE006468_2_k4s1000_x1000a996.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a996.fna > ./AE006468_2_k4s1000_x1000a997.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a997.fna > ./AE006468_2_k4s1000_x1000a998.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a998.fna > ./AE006468_2_k4s1000_x1000a999.fna
./fasta_ushuffle -k 4 -s 1 < ./AE006468_2_k4s1000_x1000a999.fna > ./AE006468_2_k4s1000_x1000a1000.fna
```

BEDTools shell scripts to convert BED files to FASTA

```bash
#!/bin/bash

#ConvertEcoliMicroarrayBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert Ecoli ORF and Noncoding bed files to fasta

bedtools getfasta -fi ./FASTA/NC_000913.fna -bed ./Genes/EcoliGenes_RemoveIDandDups-Merged.bed -name+ > ./Genes/EcoliGenes_RemoveIDandDups-Merged.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed ./Genes/EcoliNoncoding-Complemented.bed -name+ > ./Genes/EcoliNoncoding-Complemented.fasta
```

```bash
#!/bin/bash

#ConvertEcoliMicroarrayBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert Microarray bed files to fasta

bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly.bed -name+ > ./FASTA/SeqAOnly.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly-Top50.bed -name+ > ./FASTA/SeqAOnly-Top50.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly-Top25.bed -name+ > ./FASTA/SeqAOnly-Top25.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly-Top10.bed -name+ > ./FASTA/SeqAOnly-Top10.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly-Top5.bed -name+ > ./FASTA/SeqAOnly-Top5.fasta

bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/RNAPOnly.bed -name+ > ./FASTA/RNAPOnly.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/RNAPOnly-Top50.bed -name+ > ./FASTA/RNAPOnly-Top50.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/RNAPOnly-Top25.bed -name+ > ./FASTA/RNAPOnly-Top25.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/RNAPOnly-Top10.bed -name+ > ./FASTA/RNAPOnly-Top10.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/RNAPOnly-Top5.bed -name+ > ./FASTA/RNAPOnly-Top5.fasta

bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly_Grainger.bed -name+ > ./FASTA/SeqAOnly_Grainger.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly_Grainger-Top50.bed -name+ > ./FASTA/SeqAOnly_Grainger-Top50.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly_Grainger-Top25.bed -name+ > ./FASTA/SeqAOnly_Grainger-Top25.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly_Grainger-Top10.bed -name+ > ./FASTA/SeqAOnly_Grainger-Top10.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly_Grainger-Top5.bed -name+ > ./FASTA/SeqAOnly_Grainger-Top5.fasta

bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/RNAPOnly_Grainger.bed -name+ > ./FASTA/RNAPOnly_Grainger.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/RNAPOnly_Grainger-Top50.bed -name+ > ./FASTA/RNAPOnly_Grainger-Top50.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/RNAPOnly_Grainger-Top25.bed -name+ > ./FASTA/RNAPOnly_Grainger-Top25.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/RNAPOnly_Grainger-Top10.bed -name+ > ./FASTA/RNAPOnly_Grainger-Top10.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/RNAPOnly_Grainger-Top5.bed -name+ > ./FASTA/RNAPOnly_Grainger-Top5.fasta

bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/0vs50Min.bed -name+ > ./FASTA/0vs50Min.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/0vs50Min-Top50.bed -name+ > ./FASTA/0vs50Min-Top50.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/0vs50Min-Top25.bed -name+ > ./FASTA/0vs50Min-Top25.fasta
```

```
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/0vs50Min-Top10.bed -name+ > ./FASTA/0vs50Min-Top10.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/0vs50Min-Top5.bed -name+ > ./FASTA/0vs50Min-Top5.fasta

bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly_All.bed -name+ > ./FASTA/SeqAOnly_All.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly_All-Top50.bed -name+ > ./FASTA/SeqAOnly_All-Top50.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly_All-Top25.bed -name+ > ./FASTA/SeqAOnly_All-Top25.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly_All-Top10.bed -name+ > ./FASTA/SeqAOnly_All-Top10.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Microarray/SeqAOnly_All-Top5.bed -name+ > ./FASTA/SeqAOnly_All-Top5.fasta
```

```bash
#!/bin/bash

#ConvertEcoliO157H7-SakaiGenesBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert EcoliO157H7-Sakai ORF and Noncoding bed files to fasta

bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Genes/EcoliO157H7-SakaiGenes_RemoveIDandDups-Merged.bed -name+ > ./FASTA/EcoliO157H7-SakaiGenes_RemoveIDandDups-Merged.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Genes/EcoliO157H7-SakaiNoncoding-Complemented.bed -name+ > ./FASTA/EcoliO157H7-SakaiNoncoding-Complemented.fasta
```

```
#!/bin/bash

#ConvertEcoliO157H7-SakaiProphageBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert EcoliO157H7-Sakai Prophage and Nonprophage bed files to fasta

bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-SakaiProphage.bed -name+ > ./FASTA/EcoliO157H7-SakaiProphage.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-SakaiNonprophage.bed -name+ > ./FASTA/EcoliO157H7-SakaiNonprophage.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp1.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp1.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp2.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp2.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp3.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp3.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp4.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp4.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp5-stx2.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp5-stx2.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp6.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp6.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp7.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp7.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp8.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp8.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp9.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp9.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp10.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp10.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp11.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp11.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp12.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp12.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp13.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp13.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp14.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp14.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp15-stx1.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp15-stx1.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp16.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp16.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp17.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp17.fasta
```

```
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-Sp18.bed -name+ > ./FASTA/EcoliO157H7-Sakai-Sp18.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-SpLE1.bed -name+ > ./FASTA/EcoliO157H7-Sakai-SpLE1.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-SpLE2.bed -name+ > ./FASTA/EcoliO157H7-Sakai-SpLE2.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-SpLE3.bed -name+ > ./FASTA/EcoliO157H7-Sakai-SpLE3.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-SpLE4.bed -name+ > ./FASTA/EcoliO157H7-Sakai-SpLE4.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-SpLE5.bed -name+ > ./FASTA/EcoliO157H7-Sakai-SpLE5.fasta
bedtools getfasta -fi ./FASTA/O157_H7-Sakai_GCF_000008865.2_ASM886v2_genomic.fna -bed ./Prophage/EcoliO157H7-Sakai-SpLE6.bed -name+ > ./FASTA/EcoliO157H7-Sakai-SpLE6.fasta
```

```bash
#!/bin/bash

#ConvertEcoliO157H7GenesBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert EcoliO157H7 ORF and Noncoding bed files to fasta

bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Genes/EcoliO157H7Genes_RemoveIDandDups-Merged.bed -name+ > ./FASTA/EcoliO157H7Genes_RemoveIDandDups-Merged.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Genes/EcoliO157H7Noncoding-Complemented.bed -name+ > ./FASTA/EcoliO157H7Noncoding-Complemented.fasta
```

```bash
#!/bin/bash

#ConvertEcoliO157H7ProphageBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert EcoliO157H7 Prophage and Nonprophage bed files to fasta

bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-BP-933W-stx2.bed -name+ > ./FASTA/EcoliO157H7-EDL933-BP-933W-stx2.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933C.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933C.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933HI.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933HI.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933K.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933K.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933L.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933L.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933M.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933M.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933N.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933N.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933O.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933O.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933R.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933R.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933T.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933T.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933U.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933U.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933X.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933X.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-GP-9338.bed -name+ > ./FASTA/EcoliO157H7-EDL933-GP-9338.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-GP-93311.bed -name+ > ./FASTA/EcoliO157H7-EDL933-GP-93311.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-GP-93316.bed -name+ > ./FASTA/EcoliO157H7-EDL933-GP-93316.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-GP-93317.bed -name+ > ./FASTA/EcoliO157H7-EDL933-GP-93317.fasta
```

```
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933-CP-933V-stx1.bed -name+ > ./FASTA/EcoliO157H7-EDL933-CP-933V-stx1.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933NonProphage.bed -name+ > ./FASTA/EcoliO157H7-EDL933NonProphage.fasta
bedtools getfasta -fi ./FASTA/O157_H7-EDL933-GCF_000006665.1_ASM666v1_genomic.fna -bed ./Prophage/EcoliO157H7-EDL933Prophage.bed -name+ > ./FASTA/EcoliO157H7-EDL933Prophage.fasta
```

```
#!/bin/bash

#ConvertEcoliProphageBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert EcoliProphage and Nonprophage bed files to fasta

bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliCP4-6.bed -name+ > ./FASTA/EcoliCP4-6.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliCP4-44.bed -name+ > ./FASTA/EcoliCP4-44.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliCP4-57.bed -name+ > ./FASTA/EcoliCP4-57.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliCPS-53.bed -name+ > ./FASTA/EcoliCPS-53.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliDLP12.bed -name+ > ./FASTA/EcoliDLP12.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliEut-CPZ-55.bed -name+ > ./FASTA/EcoliEut-CPZ-55.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliKpLE2.bed -name+ > ./FASTA/EcoliKpLE2.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliNonphage.bed -name+ > ./FASTA/EcoliNonphage.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliPR-X.bed -name+ > ./FASTA/EcoliPR-X.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliProphage.bed -name+ > ./FASTA/EcoliProphage.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliQinKim.bed -name+ > ./FASTA/EcoliQinKim.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/EcoliRac.bed -name+ > ./FASTA/EcoliRac.fasta
bedtools getfasta -fi ./FASTA/NC_000913.fna -bed Prophage/Ecolie14.bed -name+ > ./FASTA/Ecolie14.fasta
```

```
#!/bin/bash

#ConvertLT2GenesBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert LT2 ORF and and Noncoding bed files to fasta

bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Genes/LT2Genes_RemoveIDandDups-Merged.bed -name+ > ./FASTA/LT2Genes_RemoveIDandDups-Merged.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Genes/LT2Noncoding-Complemented.bed -name+ > ./FASTA/LT2Noncoding-Complemented.fasta
```

```
#!/bin/bash

#ConvertLT2ProphageBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert LT2 Prophage and Nonprophage bed files to fasta

bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2ActivePhage.bed -name+ > ./FASTA/LT2ActivePhage.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2ActivePhageComplement.bed -name+ > ./FASTA/LT2ActivePhageComplement.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2AllPhage.bed -name+ > ./FASTA/LT2AllPhage.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2AllPhageComplement.bed -name+ > ./FASTA/LT2AllPhageComplement.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2Defective1-SPI-16.bed -name+ > ./FASTA/LT2Defective1-SPI-16.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2Defective2.bed -name+ > ./FASTA/LT2Defective2.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2Defective3.bed -name+ > ./FASTA/LT2Defective3.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2Defective4.bed -name+ > ./FASTA/LT2Defective4.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2Fels1.bed -name+ > ./FASTA/LT2Fels1.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2Fels2.bed -name+ > ./FASTA/LT2Fels2.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2Gifsy1.bed -name+ > ./FASTA/LT2Gifsy1.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2Gifsy2.bed -name+ > ./FASTA/LT2Gifsy2.fasta
bedtools getfasta -fi ./FASTA/GCA_000006945.2_ASM694v2_genomic.fna -bed ./Prophage/LT2Phaster-Region8.bed -name+ > ./FASTA/SD-9.fasta
```

```bash
#!/bin/bash

#ConvertTyphi-CT18GenesBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert Typhi-CT18 ORF and Noncoding  bed files to fasta

bedtools getfasta -fi ./FASTA_Genbank/Typhi-CT-18-GCF_000195995.1_ASM19599v1_genomic.fna -bed ./Genes/Typhi-CT18Genes_RemoveIDandDups-Merged.bed -name+ > ./FASTA_Genbank/Typhi-CT18Genes_RemoveIDandDups-Merged.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-CT-18-GCF_000195995.1_ASM19599v1_genomic.fna -bed ./Genes/Typhi-CT18Noncoding-Complemented.bed -name+ > ./FASTA_Genbank/Typhi-CT18Noncoding-Complemented.fasta
```

```
#!/bin/bash

#ConvertTyphi-CT18ProphageBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert Typhi-CT18 Prophage and Nonprophage bed files to fasta

bedtools getfasta -fi ./FASTA_Genbank/Typhi-CT-18-GCF_000195995.1_ASM19599v1_genomic.fna -bed ./Prophage/Typhi-CT18-CT18-01.bed -name+ > ./FASTA_Genbank/Typhi-CT18-CT18-01.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-CT-18-GCF_000195995.1_ASM19599v1_genomic.fna -bed ./Prophage/Typhi-CT18-CT18-02.bed -name+ > ./FASTA_Genbank/Typhi-CT18-CT18-02.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-CT-18-GCF_000195995.1_ASM19599v1_genomic.fna -bed ./Prophage/Typhi-CT18-CT18-03.bed -name+ > ./FASTA_Genbank/Typhi-CT18-CT18-03.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-CT-18-GCF_000195995.1_ASM19599v1_genomic.fna -bed ./Prophage/Typhi-CT18-CT18-04.bed -name+ > ./FASTA_Genbank/Typhi-CT18-CT18-04.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-CT-18-GCF_000195995.1_ASM19599v1_genomic.fna -bed ./Prophage/Typhi-CT18-CT18-05.bed -name+ > ./FASTA_Genbank/Typhi-CT18-CT18-05.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-CT-18-GCF_000195995.1_ASM19599v1_genomic.fna -bed ./Prophage/Typhi-CT18-CT18-06.bed -name+ > ./FASTA_Genbank/Typhi-CT18-CT18-06.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-CT-18-GCF_000195995.1_ASM19599v1_genomic.fna -bed ./Prophage/Typhi-CT18-CT18-07.bed -name+ > ./FASTA_Genbank/Typhi-CT18-CT18-07.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-CT-18-GCF_000195995.1_ASM19599v1_genomic.fna -bed ./Prophage/Typhi-CT18NonProphage.bed -name+ > ./FASTA_Genbank/Typhi-CT18NonProphage.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-CT-18-GCF_000195995.1_ASM19599v1_genomic.fna -bed ./Prophage/Typhi-CT18Prophage.bed -name+ > ./FASTA_Genbank/Typhi-CT18Prophage.fasta
```

```
#!/bin/bash

#ConvertTyphi-Ty2GenesBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert Typhi-Ty2 ORF and Noncoding bed files to fasta

bedtools getfasta -fi ./FASTA_Genbank/Typhi-Ty2-GCF_000007545.1_ASM754v1_genomic.fna -bed ./Genes/Typhi-Ty2Genes_RemoveIDandDups-Merged.bed -name+ > ./FASTA_Genbank/Typhi-Ty2Genes_RemoveIDandDups-Merged.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-Ty2-GCF_000007545.1_ASM754v1_genomic.fna -bed ./Genes/Typhi-Ty2Noncoding-Complemented.bed -name+ > ./FASTA_Genbank/Typhi-Ty2Noncoding-Complemented.fasta
```

```bash
#!/bin/bash

#ConvertTyphi-Ty2ProphageBedtoFasta.sh
#bedtools version:  bedtools v2.27.1
#Uses Bedtools to convert Typhi-Ty2 Prophage and Nonprophage bed files to fasta

bedtools getfasta -fi ./FASTA_Genbank/Typhi-Ty2-GCF_000007545.1_ASM754v1_genomic.fna -bed ./Prophage/Typhi-Ty2Nonprophage.bed -name+ > ./FASTA_Genbank/Typhi-Ty2Nonprophage.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-Ty2-GCF_000007545.1_ASM754v1_genomic.fna -bed ./Prophage/Typhi-Ty2Prophage.bed -name+ > ./FASTA_Genbank/Typhi-Ty2Prophage.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-Ty2-GCF_000007545.1_ASM754v1_genomic.fna -bed ./Prophage/Typhi-Ty2-Ty2-1_CT18-2-CT18-3.bed -name+ > ./FASTA_Genbank/Typhi-Ty2-Ty2-1_CT18-2-CT18-3.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-Ty2-GCF_000007545.1_ASM754v1_genomic.fna -bed ./Prophage/Typhi-Ty2-Ty2-2_CT18-1.bed -name+ > ./FASTA_Genbank/Typhi-Ty2-Ty2-2_CT18-1.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-Ty2-GCF_000007545.1_ASM754v1_genomic.fna -bed ./Prophage/Typhi-Ty2-Ty2-3_CT18-4.bed -name+ > ./FASTA_Genbank/Typhi-Ty2-Ty2-3_CT18-4.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-Ty2-GCF_000007545.1_ASM754v1_genomic.fna -bed ./Prophage/Typhi-Ty2-Ty2-4_CT18-5.bed -name+ > ./FASTA_Genbank/Typhi-Ty2-Ty2-4_CT18-5.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-Ty2-GCF_000007545.1_ASM754v1_genomic.fna -bed ./Prophage/Typhi-Ty2-Ty2-5_CT18-6.bed -name+ > ./FASTA_Genbank/Typhi-Ty2-Ty2-5_CT18-6.fasta
bedtools getfasta -fi ./FASTA_Genbank/Typhi-Ty2-GCF_000007545.1_ASM754v1_genomic.fna -bed ./Prophage/Typhi-Ty2-Ty2-6_CT18-7.bed -name+ > ./FASTA_Genbank/Typhi-Ty2-Ty2-6_CT18-7.fasta
```

EMBOSS seqret shell scripts to convert FASTA files to GenBank

```
#!/bin/bash

#ConvertEcoliGenesFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert Ecoli ORF and Noncoding fasta files to genbank

seqret -auto -sequence ./Genes/EcoliGenes_RemoveIDandDups-Merged.fasta -osformat genbank -outseq ./Genes/EcoliGenes_RemoveIDandDups-Merged.gb
seqret -auto -sequence ./Genes/EcoliNoncoding-Complemented.fasta -osformat genbank -outseq ./Genes/EcoliNoncoding-Complemented.gb
```

```
#!/bin/bash

#ConvertEcoliMicroarrayFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert Ecoli Microarray fasta files to genbank

seqret -auto -sequence ./FASTA/SeqAOnly.fasta -osformat genbank -outseq ./FASTA/SeqAOnly.gb
seqret -auto -sequence ./FASTA/SeqAOnly-Top50.fasta -osformat genbank -outseq ./FASTA/SeqAOnly-Top50.gb
seqret -auto -sequence ./FASTA/SeqAOnly-Top25.fasta -osformat genbank -outseq ./FASTA/SeqAOnly-Top25.gb
seqret -auto -sequence ./FASTA/SeqAOnly-Top10.fasta -osformat genbank -outseq ./FASTA/SeqAOnly-Top10.gb
seqret -auto -sequence ./FASTA/SeqAOnly-Top5.fasta -osformat genbank -outseq ./FASTA/SeqAOnly-Top5.gb

seqret -auto -sequence ./FASTA/RNAPOnly.fasta -osformat genbank -outseq ./FASTA/RNAPOnly.gb
seqret -auto -sequence ./FASTA/RNAPOnly-Top50.fasta -osformat genbank -outseq ./FASTA/RNAPOnly-Top50.gb
seqret -auto -sequence ./FASTA/RNAPOnly-Top25.fasta -osformat genbank -outseq ./FASTA/RNAPOnly-Top25.gb
seqret -auto -sequence ./FASTA/RNAPOnly-Top10.fasta -osformat genbank -outseq ./FASTA/RNAPOnly-Top10.gb
seqret -auto -sequence ./FASTA/RNAPOnly-Top5.fasta -osformat genbank -outseq ./FASTA/RNAPOnly-Top5.gb

seqret -auto -sequence ./FASTA/SeqAOnly_Grainger.fasta -osformat genbank -outseq ./FASTA/SeqAOnly_Grainger.gb
seqret -auto -sequence ./FASTA/SeqAOnly_Grainger-Top50.fasta -osformat genbank -outseq ./FASTA/SeqAOnly_Grainger-Top50.gb
seqret -auto -sequence ./FASTA/SeqAOnly_Grainger-Top25.fasta -osformat genbank -outseq ./FASTA/SeqAOnly_Grainger-Top25.gb
seqret -auto -sequence ./FASTA/SeqAOnly_Grainger-Top10.fasta -osformat genbank -outseq ./FASTA/SeqAOnly_Grainger-Top10.gb
seqret -auto -sequence ./FASTA/SeqAOnly_Grainger-Top5.fasta -osformat genbank -outseq ./FASTA/SeqAOnly_Grainger-Top5.gb


seqret -auto -sequence ./FASTA/RNAPOnly_Grainger.fasta -osformat genbank -outseq ./FASTA/RNAPOnly_Grainger.gb
seqret -auto -sequence ./FASTA/RNAPOnly_Grainger-Top50.fasta -osformat genbank -outseq ./FASTA/RNAPOnly_Grainger-Top50.gb
seqret -auto -sequence ./FASTA/RNAPOnly_Grainger-Top25.fasta -osformat genbank -outseq ./FASTA/RNAPOnly_Grainger-Top25.gb
seqret -auto -sequence ./FASTA/RNAPOnly_Grainger-Top10.fasta -osformat genbank -outseq ./FASTA/RNAPOnly_Grainger-Top10.gb
seqret -auto -sequence ./FASTA/RNAPOnly_Grainger-Top5.fasta -osformat genbank -outseq ./FASTA/RNAPOnly_Grainger-Top5.gb

seqret -auto -sequence ./FASTA/0vs50Min.fasta -osformat genbank -outseq ./FASTA/0vs50Min.gb
seqret -auto -sequence ./FASTA/0vs50Min-Top50.fasta -osformat genbank -outseq ./FASTA/0vs50Min-Top50.gb
```

```
seqret -auto -sequence ./FASTA/0vs50Min-Top25.fasta -osformat genbank -outseq ./FASTA/0vs50Min-Top25.gb
seqret -auto -sequence ./FASTA/0vs50Min-Top10.fasta -osformat genbank -outseq ./FASTA/0vs50Min-Top10.gb
seqret -auto -sequence ./FASTA/0vs50Min-Top5.fasta -osformat genbank -outseq ./FASTA/0vs50Min-Top5.gb

seqret -auto -sequence ./FASTA/SeqAOnly_All.fasta -osformat genbank -outseq ./FASTA/SeqAOnly_All.gb
seqret -auto -sequence ./FASTA/SeqAOnly_All-Top50.fasta -osformat genbank -outseq ./FASTA/SeqAOnly_All-Top50.gb
seqret -auto -sequence ./FASTA/SeqAOnly_All-Top25.fasta -osformat genbank -outseq ./FASTA/SeqAOnly_All-Top25.gb
seqret -auto -sequence ./FASTA/SeqAOnly_All-Top10.fasta -osformat genbank -outseq ./FASTA/SeqAOnly_All-Top10.gb
seqret -auto -sequence ./FASTA/SeqAOnly_All-Top5.fasta -osformat genbank -outseq ./FASTA/SeqAOnly_All-Top5.gb
```

```
#!/bin/bash

#ConvertEcoliO157H7-SakaiGenesFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert EcoliO157H7-Sakai ORF and Noncoding fasta files to genbank

seqret -auto -sequence ./FASTA/EcoliO157H7-SakaiGenes_RemoveIDandDups-Merged.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-SakaiGenes_RemoveIDandDups-Merged.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-SakaiNoncoding-Complemented.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-SakaiNoncoding-Complemented.gb
```

```bash
#!/bin/bash

#ConvertEcoliO157H7-SakaiProphageFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert EcoliO157H7-Sakai Prophage and Nonprophage fasta files to genbank

seqret -auto -sequence ./FASTA/EcoliO157H7-SakaiProphage.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-SakaiProphage.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-SakaiNonprophage.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-SakaiNonprophage.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp1.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp1.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp2.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp2.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp3.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp3.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp4.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp4.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp5-stx2.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp5-stx2.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp6.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp6.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp7.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp7.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp8.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp8.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp9.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp9.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp10.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp10.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp11.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp11.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp12.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp12.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp13.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp13.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp14.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp14.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp15-stx1.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp15-stx1.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp16.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp16.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp17.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp17.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-Sp18.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-Sp18.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-SpLE1.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-SpLE1.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-SpLE2.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-SpLE2.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-SpLE3.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-SpLE3.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-SpLE4.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-SpLE4.gb
```

```
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-SpLE5.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-SpLE5.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-Sakai-SpLE6.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-Sakai-SpLE6.gb
```

```
#!/bin/bash

#ConvertEcoliO157H7GenesFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert EcoliO157H7 ORF and Noncoding fasta files to genbank

seqret -auto -sequence ./FASTA/EcoliO157H7Genes_RemoveIDandDups-Merged.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7Genes_RemoveIDandDups-Merged.gb
seqret -auto -sequence ./FASTA/EcoliO157H7Noncoding-Complemented.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7Noncoding-Complemented.gb
```

```
#!/bin/bash

#ConvertEcoliO157H7ProphageFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert EcoliO157H7 Prophage and Nonprophage fasta files to genbank

seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-BP-933W-stx2.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-BP-933W-stx2.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933C.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933C.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933HI.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933HI.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933K.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933K.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933L.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933L.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933M.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933M.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933N.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933N.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933O.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933O.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933R.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933R.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933T.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933T.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933U.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933U.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933X.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933X.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-GP-9338.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-GP-9338.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-GP-93311.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-GP-93311.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-GP-93316.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-GP-93316.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-GP-93317.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-GP-93317.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933-CP-933V-stx1.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933-CP-933V-stx1.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933NonProphage.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933NonProphage.gb
seqret -auto -sequence ./FASTA/EcoliO157H7-EDL933Prophage.fasta -osformat genbank -outseq ./FASTA/EcoliO157H7-EDL933Prophage.gb
```

```bash
#!/bin/bash

#ConvertEcoliPromotersRemoveDupsMergedFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert Ecoli Promoters and Nonpromoters fasta files to genbank

seqret -auto -sequence ./EcoliPromotersRemoveDupsMerged.fasta -osformat genbank -outseq ./EcoliPromotersRemoveDupsMerged.gb
seqret -auto -sequence ./EcoliPromotersRemoveDupsComplement.fasta -osformat genbank -outseq ./EcoliPromotersRemoveDupsComplement.gb
```

```bash
#!/bin/bash

#ConvertEcoliProphageFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert Ecoli Prophage and Nonprophage fasta files to genbank

seqret -auto -sequence ./Prophage/EcoliCP4-6.fasta -osformat genbank -outseq ./Prophage/EcoliCP4-6.gb
seqret -auto -sequence ./Prophage/EcoliCP4-44.fasta -osformat genbank -outseq ./Prophage/EcoliCP4-44.gb
seqret -auto -sequence ./Prophage/EcoliCP4-57.fasta -osformat genbank -outseq ./Prophage/EcoliCP4-57.gb
seqret -auto -sequence ./Prophage/EcoliCPS-53.fasta -osformat genbank -outseq ./Prophage/EcoliCPS-53.gb
seqret -auto -sequence ./Prophage/EcoliDLP12.fasta -osformat genbank -outseq ./Prophage/EcoliDLP12.gb
seqret -auto -sequence ./Prophage/EcoliEut-CPZ-55.fasta -osformat genbank -outseq ./Prophage/EcoliEut-CPZ-55.gb
seqret -auto -sequence ./Prophage/EcoliKpLE2.fasta -osformat genbank -outseq ./Prophage/EcoliKpLE2.gb
seqret -auto -sequence ./Prophage/EcoliNonphage.fasta -osformat genbank -outseq ./Prophage/EcoliNonphage.gb
seqret -auto -sequence ./Prophage/EcoliPR-X.fasta -osformat genbank -outseq ./Prophage/EcoliPR-X.gb
seqret -auto -sequence ./Prophage/EcoliProphage.fasta -osformat genbank -outseq ./Prophage/EcoliProphage.gb
seqret -auto -sequence ./Prophage/EcoliQinKim.fasta -osformat genbank -outseq ./Prophage/EcoliQinKim.gb
seqret -auto -sequence ./Prophage/EcoliRac.fasta -osformat genbank -outseq ./Prophage/EcoliRac.gb
seqret -auto -sequence ./Prophage/Ecolie14.fasta -osformat genbank -outseq ./Prophage/Ecolie14.gb
```

```
#!/bin/bash

#ConvertLT2GenesFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert LT2 ORF and Noncoding fasta files to genbank

seqret -auto -sequence ./Genes/LT2Genes_RemoveIDandDups-Merged.fasta -osformat genbank -outseq ./Genes/LT2Genes_RemoveIDandDups-Merged.gb
seqret -auto -sequence ./Genes/LT2Noncoding-Complemented.fasta -osformat genbank -outseq ./Genes/LT2Noncoding-Complemented.gb
```

```bash
#!/bin/bash

#ConvertLT2ProphageFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert LT2 Prophage and Nonprophage fasta files to genbank

seqret -auto -sequence ./Prophage/LT2ActivePhage.fasta -osformat genbank -outseq ./Prophage/LT2ActivePhage.gb
seqret -auto -sequence ./Prophage/LT2ActivePhageComplement.fasta -osformat genbank -outseq ./Prophage/LT2ActivePhageComplement.gb
seqret -auto -sequence ./Prophage/LT2AllPhage.fasta -osformat genbank -outseq ./Prophage/LT2AllPhage.gb
seqret -auto -sequence ./Prophage/LT2AllPhageComplement.fasta -osformat genbank -outseq ./Prophage/LT2AllPhageComplement.gb
seqret -auto -sequence ./Prophage/LT2Defective1-SPI-16.fasta -osformat genbank -outseq ./Prophage/LT2Defective1-SPI-16.gb
seqret -auto -sequence ./Prophage/LT2Defective2.fasta -osformat genbank -outseq ./Prophage/LT2Defective2.gb
seqret -auto -sequence ./Prophage/LT2Defective3.fasta -osformat genbank -outseq ./Prophage/LT2Defective3.gb
seqret -auto -sequence ./Prophage/LT2Defective4.fasta -osformat genbank -outseq ./Prophage/LT2Defective4.gb
seqret -auto -sequence ./Prophage/LT2Fels1.fasta -osformat genbank -outseq ./Prophage/LT2Fels1.gb
seqret -auto -sequence ./Prophage/LT2Fels2.fasta -osformat genbank -outseq ./Prophage/LT2Fels2.gb
seqret -auto -sequence ./Prophage/LT2Gifsy1.fasta -osformat genbank -outseq ./Prophage/LT2Gifsy1.gb
seqret -auto -sequence ./Prophage/LT2Gifsy2.fasta -osformat genbank -outseq ./Prophage/LT2Gifsy2.gb
seqret -auto -sequence ./Prophage/LT2SD-9.fasta -osformat genbank -outseq ./Prophage/LT2SD-9.gb
```

```
#!/bin/bash

#ConvertTyphi-CT18GenesFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convertTyphi-CT18 ORF and Noncoding fasta files to genbank

seqret -auto -sequence ./FASTA_Genbank/Typhi-CT18Genes_RemoveIDandDups-Merged.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-CT18Genes_RemoveIDandDups-Merged.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-CT18Noncoding-Complemented.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-CT18Noncoding-Complemented.gb
```

```
#!/bin/bash

#ConvertTyphi-CT18ProphageFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert Typhi-CT18 Prophage and Nonprophage fasta files to genbank

#convert bed files to fasta

seqret -auto -sequence ./FASTA_Genbank/Typhi-CT18-CT18-01.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-CT18-CT18-01.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-CT18-CT18-02.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-CT18-CT18-02.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-CT18-CT18-03.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-CT18-CT18-03.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-CT18-CT18-04.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-CT18-CT18-04.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-CT18-CT18-05.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-CT18-CT18-05.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-CT18-CT18-06.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-CT18-CT18-06.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-CT18-CT18-07.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-CT18-CT18-07.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-CT18NonProphage.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-CT18NonProphage.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-CT18Prophage.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-CT18Prophage.gb
```

```
#!/bin/bash

#ConvertTyphi-Ty2GenesFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert Typhi-Ty2 ORF and Noncoding fasta files to genbank

#convert bed files to fasta

seqret -auto -sequence ./FASTA_Genbank/Typhi-Ty2Genes_RemoveIDandDups-Merged.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-Ty2Genes_RemoveIDandDups-Merged.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-Ty2Noncoding-Complemented.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-Ty2Noncoding-Complemented.gb
```

```
#!/bin/bash

#ConvertTyphi-Ty2ProphageFastatoGenbank.sh
#seqret version:  EMBOSS:6.6.0.0
#Uses EMBOSS seqret to convert Typhi-Ty2 Prophage and Nonprophage fasta files to genbank

seqret -auto -sequence ./FASTA_Genbank/Typhi-Ty2Nonprophage.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-Ty2Nonprophage.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-Ty2Prophage.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-Ty2Prophage.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-Ty2-Ty2-1_CT18-2-CT18-3.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-Ty2-Ty2-1_CT18-2-CT18-3.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-Ty2-Ty2-2_CT18-1.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-Ty2-Ty2-2_CT18-1.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-Ty2-Ty2-3_CT18-4.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-Ty2-Ty2-3_CT18-4.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-Ty2-Ty2-4_CT18-5.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-Ty2-Ty2-4_CT18-5.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-Ty2-Ty2-5_CT18-6.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-Ty2-Ty2-5_CT18-6.gb
seqret -auto -sequence ./FASTA_Genbank/Typhi-Ty2-Ty2-6_CT18-7.fasta -osformat genbank -outseq ./FASTA_Genbank/Typhi-Ty2-Ty2-6_CT18-7.gb
```

RNA-Seq analysis of *Salmonella* Prophage Activity

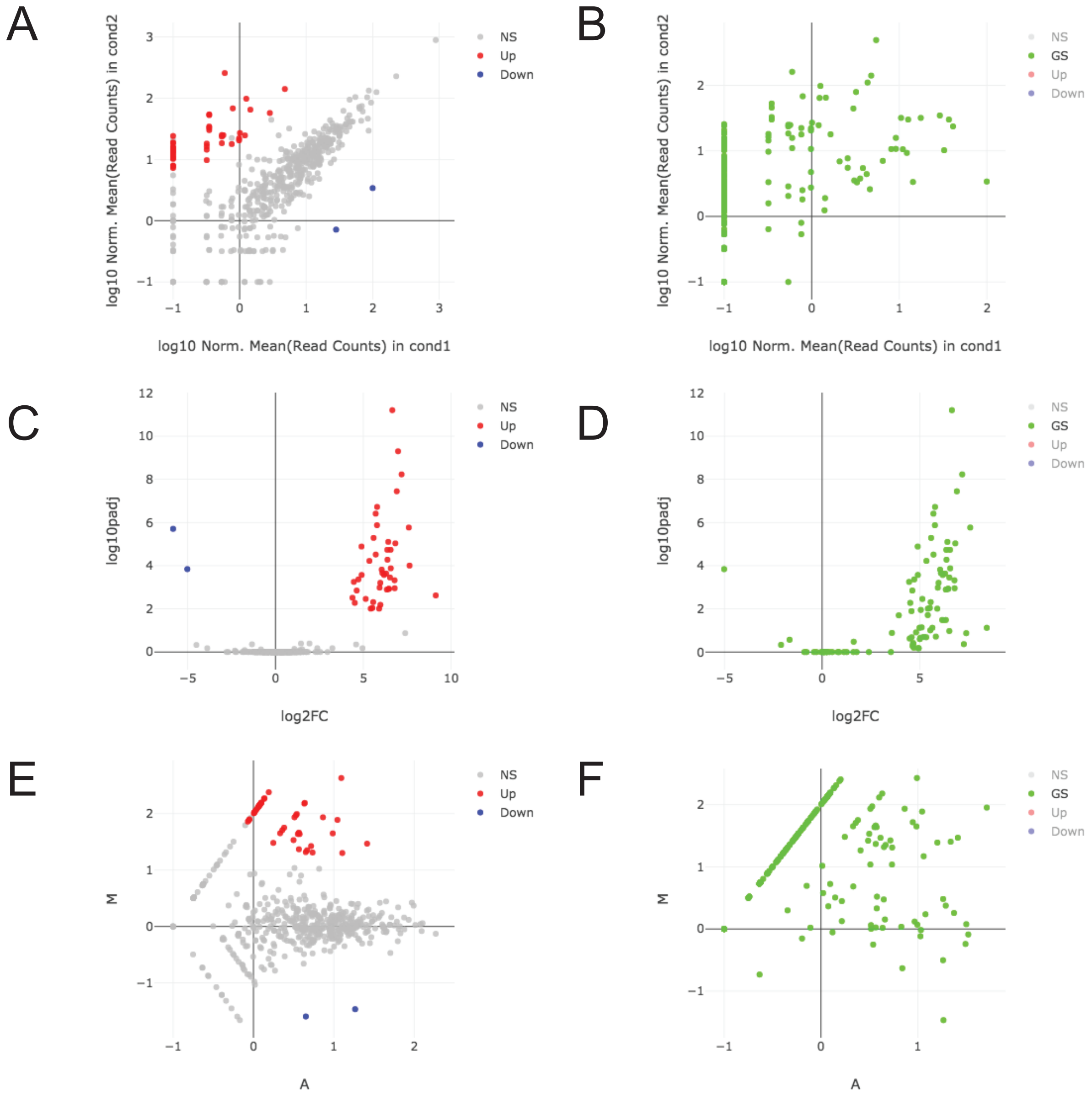

Figure 23: Prophage genes analyzed with DESeq2 in wild-type lysogens. Plots of differentially-expressed transcripts in lysogens vs. cured strains were made using the DEBrowser and DESeq2 (227, 228). GS indicates prophage genes searched. **A.** Scatter plot of all transcripts for *Salmonella* LT2 red dots are significantly upregulated and blue dots are significantly downregulated and Grey dots are nonsignificant. **B.** Scatter plot of A with prophage genes indicated with green dots. **C.** Volcano plot of all transcripts. **D.** Volcano plot of prophage transcripts. **D.** MA plot [M (log ratio) and A (mean average)] of all transcripts. **E.** MA plot of prophage transcripts.

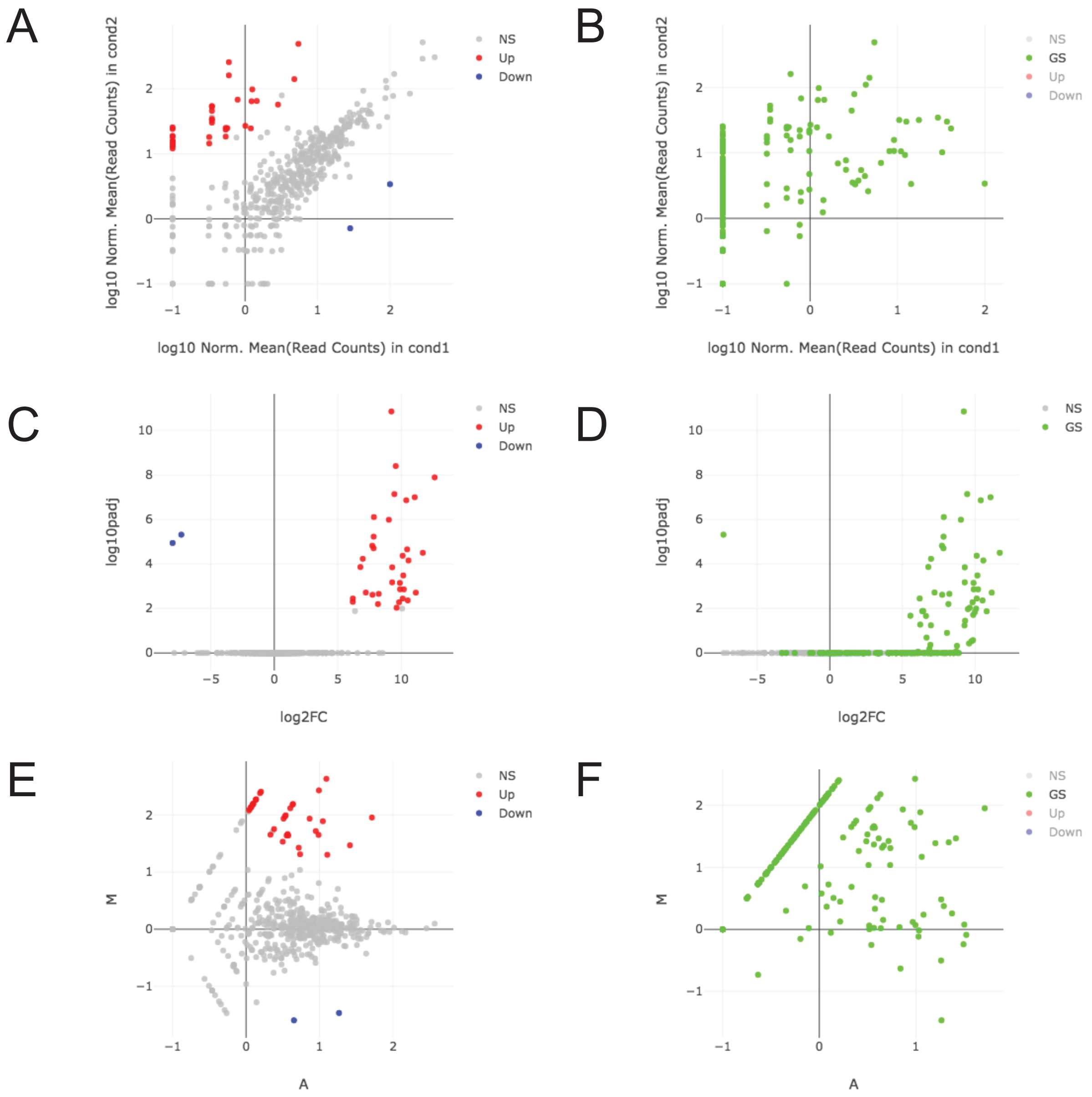

Figure 24: Prophage genes analyzed with EdgeR in wild-type lysogens. Plots of differentially-expressed transcripts in lysogens vs. cured strains were made using the DEBrowser and EdgeR (227, 229). GS indicates prophage genes searched. **A.** Scatter plot of all transcripts for *Salmonella* LT2 red dots are significantly upregulated and blue dots are significantly downregulated and Grey dots are nonsignificant. **B.** Scatter plot of A with prophage genes indicated with green dots. **C.** Volcano plot of all transcripts. **D.** Volcano plot of prophage transcripts. **D.** MA [M (log ratio) and A (mean average)] plot of all transcripts. **E.** MA plot of prophage transcripts.

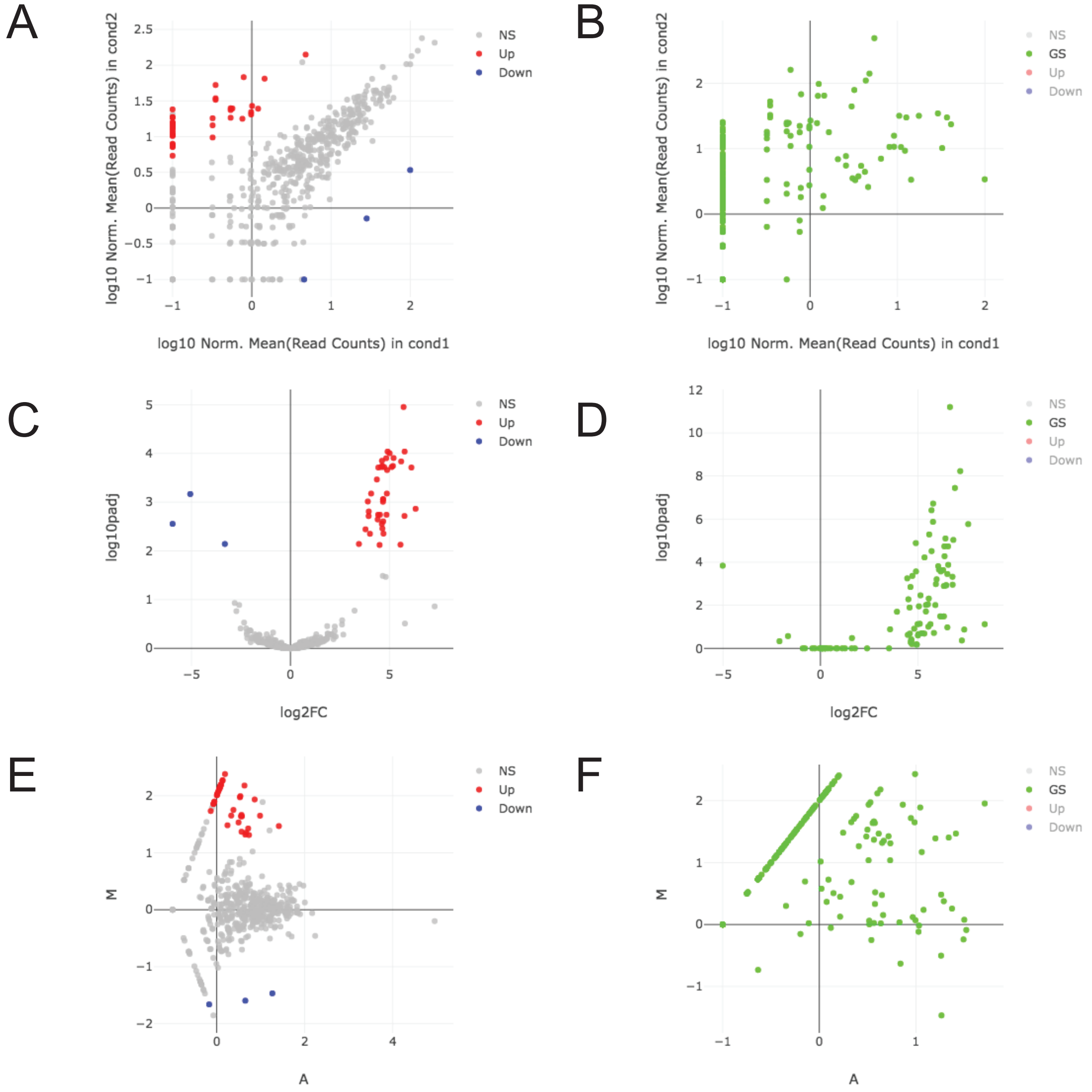

Figure 25: Prophage genes analyzed with Limma in wild-type lysogens. Plots of differentially-expressed transcripts in lysogens vs. cured strains were made using the DEBrowser and Limma (227, 230). GS indicates prophage genes searched. **A.** Scatter plot of all transcripts for *Salmonella* LT2 red dots are significantly upregulated and blue dots are significantly downregulated and Grey dots are nonsignificant. **B.** Scatter plot of A with prophage genes indicated with green dots. **C.** Volcano plot of all transcripts. **D.** Volcano plot of prophage transcripts. **D.** MA [M (log ratio) and A (mean average)] plot of all transcripts. **E.** MA plot of prophage transcripts.

Table 1517: RNA-Seq differential expression using DESeq2 of wild-type, *recA*, *ruvAB*, *ruvC* lysogens vs. wild-type, *recA*, *ruvAB*, *ruvC* cured.

Prophage-associated genes are shown in green. (p adj/adjusted p value <0.01)

Gene	Log$_2$ fold change	Gene	Log$_2$ fold change
nanH	9.12437169	*sodC-2*	5.97223704
STM0929	7.63121222	**STM2620**	5.96665641
STM1026	7.58891702	**STM0919**	5.92722728
STM2735	7.17832742	***ybjP***	5.90015782
nagC	6.97717116	**STM2632**	5.78566787
STM1043	6.90481845	**STM1023**	5.7794668
STM1010	6.82341145	**STM2594**	5.70769918
STM2592	6.78656788	**STM1053**	5.70429527
STM0927	6.77987866	**STM0903**	5.58443806
STM2600	6.65108109	**STM2706**	5.56336087
STM2729	6.56280224	**STM1038**	5.51941526
STM1013	6.55253245	**STM1033**	5.42125196
STM2724	6.51820242	**STM0898**	5.34568218
STM1031	6.45729464	**STM0920**	5.13683986
STM1056	6.44924088	**STM0893**	4.90586511
STM0924	6.41999902	**STM1024**	4.89718938
STM2723	6.37368173	**STM1048**	4.71936258
STM2726	6.36408232	**STM2694**	4.62311608
STM2636	6.33917544	**STM2635**	4.515137
STM1047	6.29817122	**STM0900**	4.45960403
STM2703	6.18036319	*dcuR*	4.38264146
STM2599	6.08631431	**STM2585A**	-5.0194594
STM2695	6.04706219	*citT*	-5.8287922

Table 1618: RNA-Seq differential expression using EdgeR of wild-type, *recA*, *ruvAB*, *ruvC* lysogens vs. wild-type, *recA*, *ruvAB*, *ruvC* cured.

Prophage-associated genes are shown in green. (p adj/adjusted p value <0.01)

Gene	Log$_2$ fold change	Gene	Log$_2$ fold change
nanH	12.6305514	**STM0904**	9.28866087
STM2734	11.699254	**STM0927**	9.28640148
STM1025	11.1479228	**STM2600**	9.22099443
STM2735	11.0614902	**STM0924**	9.02238017
STM1010	10.5687022	**STM2695**	8.22812458
STM2592	10.5129405	**STM0913**	8.16531643
STM0929	10.4634359	**STM0903**	7.84585391
STM1026	10.3924371	**STM2632**	7.82826105
STM2729	10.2031336	**STM1023**	7.82347298
STM1013	10.1588172	**STM2594**	7.73500481
STM2724	10.1147756	**STM1053**	7.7188986
STM1049	10.1119574	**STM0898**	7.21087253
STM2723	9.90388991	**STM0893**	6.96749624
STM2726	9.89322026	**STM1024**	6.78228225
STM1047	9.82693603	**STM0900**	6.18707295
STM2703	9.63152636	*dcuR*	6.18019868
nagC	9.56635742	**STM2585A**	-7.3213721
STM1043	9.45675048	*citT*	-8.0094532

Table 1719: RNA-Seq differential expression using Limma of wild-type, *recA*, *ruvAB*, *ruvC* lysogens vs. wild-type, *recA*, *ruvAB*, *ruvC* cured.

Prophage-associated genes are shown in green. (p adj/adjusted p value <0.01)

Gene	Log$_2$ fold change	Gene	Log$_2$ fold change
STM0893	6.32213961	**STM2694**	4.64549123
STM2600	6.10987649	**STM2703**	4.63993901
nagC	5.7685704	**STM2599**	4.62305315
STM1026	5.76058787	**STM1031**	4.61694721
STM2735	5.71513898	**STM2594**	4.59055082
STM1043	5.5933712	**STM1048**	4.52154531
STM0903	5.55847438	**STM2635**	4.50370207
STM1010	5.20936071	**STM2620**	4.43916339
STM2632	5.17753519	**STM2636**	4.42923291
STM1053	5.11148656	**STM1056**	4.40742825
STM1013	5.01056727	**STM0919**	4.36550883
STM2726	4.90775787	**STM2706**	4.07547432
STM2729	4.88337644	*sodC-2*	4.01629829
STM1023	4.86972666	**STM1038**	3.95612594
STM0900	4.85293331	**STM0920**	3.94991888
STM2723	4.83774942	**STM1033**	3.90877152
STM1047	4.73663507	**STM2739**	3.79171902
STM2592	4.69866777	**STM2727**	3.4595431
STM1024	4.6851338	*yraN*	-3.314713
STM0898	4.68390582	*citT*	-5.0626936
STM2695	4.6753989	**STM2585A**	-5.9545046
STM2724	4.67513752	**STM2694**	4.64549123

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Appendix I, in part, is currently being prepared for submission for publication of the material. Peters, Gregory. The dissertation/thesis author was the primary investigator and author of this material.

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