

UC San Diego

Capstone Projects

Title

In a Pinch: Capitalizing on the Caribbean King Crab as a Restoration Tool in the Florida Keys National Marine Sanctuary

Permalink

<https://escholarship.org/uc/item/72h2v2ks>

Author

Bland, Amanda

Publication Date

2024-07-01

In a Pinch: Capitalizing on the Caribbean King Crab as a Restoration Tool in the Florida Keys National Marine Sanctuary

Amanda Bland

Master of Advanced Studies in Marine Biodiversity and Conservation

Scripps Institution of Oceanography, UC San Diego

June 6th, 2024

Capstone Advisory Committee

Megan Fraser, Blue Economy Manager, National Marine Sanctuary Foundation


Dr. Dale Squires, Program Lead, Economics and Social Science, Southwest Fisheries Science Center, Fisheries Resources Division


Dr. Jason Spadaro, Program Manager, Coral Reef Restoration Research Program, Mote Marine Laboratory

Matthew Warham, Restoration Manager, National Marine Sanctuary Foundation

Signature:  Date: June 7th, 2024
Megan Fraser, Blue Economy Manager, National Marine Sanctuary Foundation

Signature:  Date: June 7th, 2024
Dr. Jason Spadaro, Program Manager, Coral Reef Restoration Research Program, Mote Marine Laboratory

Signature:  Date: June 7th, 2024
Matthew Warham, Restoration Manager, National Marine Sanctuary Foundation

Signature:  Date: June 7th, 2024
Dr. Dale Squires, Program Lead, Economics and Social Science, Southwest Fisheries Science Center, Fisheries Resources Division

I. Executive Summary

The National Marine Sanctuary Foundation (the Foundation) is developing a new Blue Economy program and associated strategy to help envision and provide sustainable revenue generation for the benefit of Sanctuary conservation work across our nation's 15+ Sanctuaries. This Blue Economy Strategy will be first applied within the Florida Keys National Marine Sanctuary in support of its *Mission: Iconic Reefs* restoration initiative, by building critical revenue-generating initiatives that also support restoration work. Within this first overarching Florida Keys application, work will center around the native Caribbean king crab and its potential to become a novel fishery alongside its primary purpose as a coral reef restoration species. This project will contribute to the Florida Keys application of the Foundation's Blue Economy Strategy by providing critically necessary background market analysis research for a viability study of the Caribbean king crab (CKC) fishery within the Florida Keys.

II. Introduction

The National Marine Sanctuary Foundation is the federally-recognized non-profit arm of the National Oceanic and Atmospheric Administration's Office of National Marine Sanctuaries, and as such is chartered with supporting Sanctuaries in unique and tangible ways. The Blue Economy Strategy will provide the high-level framework for how the Foundation will seek to strengthen the local economies across the Sanctuary system. Additionally, and as part of that overarching Strategy, the Foundation will look to employ concrete pilots of Strategy-driven initiatives and programs within select Sanctuaries.

The Foundation will first apply this overarching Blue Economy Strategy within the Florida Keys National Marine Sanctuary, in conjunction with its localized NOAA-led *Mission: Iconic Reefs* (M:IR) coral reef restoration initiative. (NOAA Fisheries) M:IR is a large-scale restoration initiative, seeking to restore seven key reefs to an autonomous and flourishing state. (NOAA fisheries)

Florida's native Caribbean king crab has been identified as a species that supports M:IR restoration work due to the crabs' significant consumption of algae on the coral reefs, and thus its role in opening critical habitat to recruiting corals as well as maintaining the general health and natural trophic balances within the sensitive reef ecosystem. To develop Florida's CKC as part of the overarching Blue Economy Strategy, it is essential to first complete a comprehensive assessment of its overall marketability. The capstone project reviewed, where data is available,

like-minded (i.e. crustacean) fisheries in the Florida, Gulf, and Caribbean regions, and informed a comprehensive market analysis for Florida's CKC in light of this knowledge review.

III. Project Goals

The completion of this capstone project provides the necessary market analysis research for the viability of the native Caribbean king crab as a novel fishery alongside its primary purpose as a restoration organism within the Florida Keys National Marine Sanctuary (NMS). While there are various business models to consider this project explores the potential for CKC to be grown via aquaculture. This Market Analysis will inevitably provide the insight to create a CKC fishery, serving as the pilot project for a model that can be applied in other National Marine Sanctuaries. In doing so this project will support healthy coral reefs & generate revenue for the Keys community.

IV. Specific Objectives

To fulfill the goals of this project, I achieved the following objectives:

- Understand how **supporting literature can inform CKC operations and restoration**. Supporting literature includes:
 - Algae growth, comparable aquaculture species, aquaculture in Florida & the Caribbean, state and country-wide aquaculture goals, comparable fisheries supply and demand
- Understand the **current fisheries operating** in the Keys. This includes data on:
 - landing (catch) locations, landing quantities, revenue generated, and fluctuations in price per pound over the last decade
- Utilize the supporting literature and fisheries data to inform the market analysis thus determining the **marketability** of the CKC and provide intel for how a small-scale fishery may function within the Florida Keys community.

V. Deliverables

Deliverables completed as part of this Capstone project will become standing and historic resources for the Florida Keys restoration community and for the Foundation's greater Blue Economy Strategy. Deliverables include the following:

1. **Completed literature review** of like-minded fisheries within the Florida, Caribbean, and Gulf regions

2. **Completed corresponding market analysis** of Florida Keys Caribbean king crab – *e.g. SIPOC analysis (suppliers, inputs, process, outputs and customers) of local existing infrastructure and R&D components; and profitability analysis.*
3. **Incorporation of work** into the greater Foundation Blue Economy Strategy
4. **Presentation of work** to the National Marine Sanctuary Foundation, NOAA, and additional *Mission: Iconic Reefs* partners

VI. Methodology

- Conducted an in-depth literature review of state aquaculture goals, and existing like-minded (i.e., crustacean and/or reef or quarry-based) fisheries across Florida and the Gulf of Mexico as well as the greater Caribbean regions. This literature review informed the overarching direction of the subsequent market analysis.
- Traveled to the Florida Keys to meet and collaborate with project partners to gain a greater understanding of the comprehensive work of the Florida Keys National Marine Sanctuary. Brainstormed with partners at the Foundation-hosted Blue Economy workshop to discuss potential CKC opportunities and barriers.
- Conducted a SIPOC analysis (suppliers, inputs, process, outputs, customers) of comparable Keys fisheries including but not limited to clams, stone crabs, shrimp, spiny lobster, and blue crab.
- The components of the Market Analysis were informed by the literature review, Keys visit, and SIPOC analysis. Basic elements include, but are not limited to, the following: market demographics, growth opportunities; industry trends; business planning competitive landscape; and market entry.

VII. Findings and Takeaways

The Market Analysis is not complete, as one subject area alone may take months of research. My Market Analysis identified 12 main subject areas. Below I will share a brief overview of the findings from the primary subject areas.

- Growth Opportunities:
 - Existing quarries are fit for crab mariculture. (Brainstorm Session Blue Economy Workshop, 2024)

- Marketing: CKC can be marketed with an aquaculture 'label' that encompasses a conservation-focused message. Similar to a MSC Fisheries Standard label. (Brainstorm Session Blue Economy Workshop, 2024)
- R&D Optimization: The mariculture environment enables additional R&D for production optimization. (Brainstorm Session Blue Economy Workshop, 2024)
- Commercial Operation Opportunities: CKC mariculture has the potential to be a lucrative commercial operation. (Brainstorm Session Blue Economy Workshop, 2024)
- Ancillary Opportunities: The CKC mariculture production model has the possibility of being lucrative in other ways aside from purely CKC production and sales. CKC mariculture can incorporate Integrated Multi-Trophic Aquaculture (IMTA) such as seaweed thus expanding lucrative B.E. work. (Brainstorm Session Blue Economy Workshop, 2024)
- Workforce Development & Local Employment Opportunities
- Industry Trends: Since 2019, food prices have drastically increased. Because of this nearly 40% of people have started spending less.
 - There has been a consistent decrease in the total weight of seafood landings in Florida, dropping from 127 million pounds in 2004 to 110 million pounds in 2021. This decline indicates challenges in the seafood harvesting sector and the opportunity for aquaculture. (FDACS, 2021)
 - Strong market for crab in Florida and countrywide. (FDACS, 2021)
 - Snow crab demand is increasing, while king crab supply is decreasing creating an opportunity for a CKC fishery to meet demand. (Seafood Headlines, 2024)
- Competitive Landscape:
 - A CKC mariculture in Florida appears to be opportunistic due to the strong market demand for seafood particularly crabs, the significant profitability of both stone and blue crabs, and the potential for sustainable and restoration-focused production. (NOAA, 2024)
 - CKC mariculture aligns with the Florida aquaculture plan. (FDACS, 2023)
- Potential Risks: (Brainstorm Session Blue Economy Workshop, 2024)
 - Cost concerns
 - Mortality
 - Regulation
 - Optimizing CKC diet in an aquaculture facility
- Distribution/Product Positioning
 - Seafood markets
 - Grocery stores
 - Restaurants
 - Online platforms
 - Export channels

- Competitive Advantage: (Brainstorm Session Blue Economy Workshop, 2024)
 - High fecundity, high survival, and low food maintenance during the early life stage
 - Ecological/environmental benefits
 - Ability to be grown in labs
 - Mote Marine Labs' ability to grow larval CKC
 - High demand for crabs
- Pricing: CKC can be sold in the same price range as comparable species. Comparable Species include: (FF&W, 2024)
 - Alaskan King Crab
 - Snow Crab
 - Stone Crab
 - Spiny Lobster
 - Blue Crab

References

Florida Department of Agriculture and Consumer Services. (2021). Florida Seafood Report 2021. <https://ccmedia.fdacs.gov/content/download/110962/file/Florida-Seafood-Report-2021.pdf>

Florida Department of Agriculture and Consumer Services. (2023). Florida Aquaculture Plan 2023 [PDF].
<https://ccmedia.fdacs.gov/content/download/89185/file/Florida-Aquaculture-Plan-2023.pdf>

Florida Fish and Wildlife Conservation Commission. (2024).
<https://app.myfwc.com/FWRI/PFDM/ReportCreator.aspx>

Fraser, M., Warham, M., Howatt-Kinzler, M., Bland, A., Lesneski, K., Lopex, K., Desmaris, C., Spadaro, J., Wildrop, T., Beavers, A., Sicilano, J., Bozza, K. (2024 April 24th & 25th). Blue Economy [Workshop]. National Marine Sanctuaries Foundation, Florida Keys.

National Oceanic and Atmospheric Administration. (2024). Enhancing wild red king crab populations through hatchery rearing programs. NOAA Fisheries.
<https://www.fisheries.noaa.gov/feature-story/enhancing-wild-red-king-crab-populations-through-hatchery-rearing-programs>

NOAA Fisheries. (2021) “Restoring Seven Iconic Reefs: A Mission to Recover the Coral Reefs of the Florida Keys.”
https://media.fisheries.noaa.gov/dam-migration/restoring_seven_iconic_reefs_-_a_mission_to_recover_the_coral_reefs_of_the_florida_keys.pdf

Seafood Headlines. (2024). Crab market update. LinkedIn.
<https://www.linkedin.com/pulse/crab-market-update-seafood-headlines-dtl2f/>