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A data set on the distribution of Rotifera in Antarctica

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SUMMARY

We present a data set on Antarctic biodiversity for the phylum Rotifera, making it publicly available through the Antarctic Biodiversity Information facility. We provide taxonomic information, geographic distribution, location, and habitat for each record. The data set gathers all the published literature about rotifers found and identified across the Continental, Maritime, and Subantarctic biogeographic regions of Antarctica. A total of 1455 records of rotifers in Antarctica found from 1907 to 2018 is reported, with information on taxonomic hierarchies, updated nomenclature, geographic information, geographic coordinates, and type of habitat. The aim is to provide a georeferenced data set on Antarctic rotifers as a baseline for further studies, to improve our knowledge on what has been considered one of the most diverse and successful groups of animals living in Antarctica.

INTRODUCTION

Biodiversity in freshwater and terrestrial habitats of Antarctica is limited by the harsh conditions of extremely low temperatures, limiting the availability of liquid water in continental Antarctica (Lindgren et al. 2016), and by the remoteness of the Subantarctic islands (Convey 2007). Yet, even under such extreme conditions, microscopic animals can survive (Zeppilli et al. 2018). Among the most successful microscopic animals living in Antarctica are the nematodes, rotifers, and tardigrades (Convey 2010). Such microscopic animals were already known at the time of the first expeditions: ‘‘The microscope showed that rotifers, water-bears, and other forms of minute animal-life existed’’ (Shackleton 1909b). Among these microscopic animals, ‘‘It became a contest between rotifers and scientist, and generally the rotifers seemed to triumph’’ (Shackleton 1909a).

The aim of this review paper is to gather all the published information on rotifers found in Antarctica (Continental, Maritime) and Subantarctica since the discovery of this remote continent, and to make the data set publicly available. The data provided include the species of rotifers, sites where rotifers were collected and their coordinates, and type of habitat in which they were found. This data set is included in the Antarctic Biodiversity Information facility (ANTABIF), the Antarctic Node of the Global Biodiversity Information Facility (GBIF, https://www.gbif.org), under the collection of the Italian National Antarctic Museum (MNA) (https://www.gbif.org/publisher/4c882fee-876a-4b32-b218-67b2bdd42579).

RESULTS

Summary statistics

The data set consists of 22 columns (Table 1) per 1455 records of rotifers in Antarctica. A total of 124 original publications were searched to obtain the data gathered for rotifers from 171 different sites in Antarctica; 1084 records are reported to species (or subspecies) level, 231 to genus level, and 140 to family or higher taxonomic level (class or phylum). The total number of rotifer taxa included in the data set is 203; of these, 168 to species level, 30 to unidentified species at the genus level, 2 to family level only, 2 to class and 1 to phylum. The majority of the records (744) belongs to the class Bdelloidea, 679 to Monogononta, and only one belongs to Seisonacea; 31 records are at the phylum level.

Rotifers were recorded differently in the three Antarctic biogeographic regions: 807 records in Continental Antarctica, 405 in Subantarctica, and 231 in Maritime Antarctica. Within Continental Antarctica: 317 records were found in Scott sector, 273 in Enderby sector, 108 in Maud sector, and 109 in Wilkes sector. All records come from temporarily deglaciated areas along the coastal margins, except for one record of DNA from an unidentified bdelloid rotifer collected on accretion ice in Lake Vostok (Shtarkman et al. 2013) from the interior of Antarctica (Figure 1).

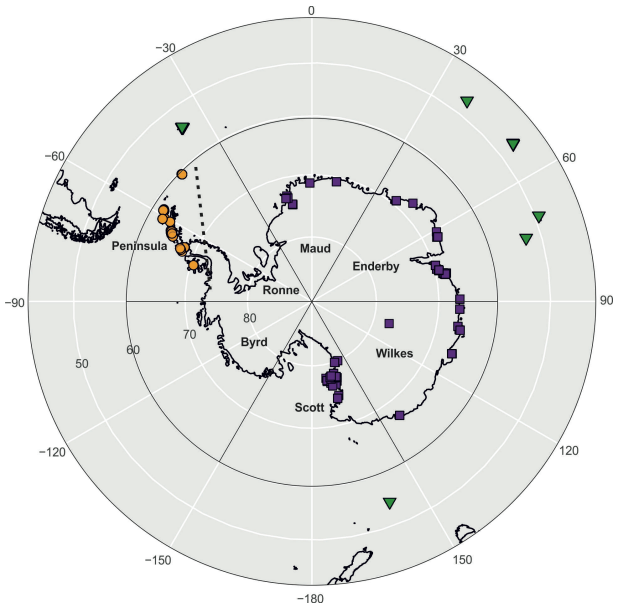

Figure 1. Map of Antarctica with a representation of the sites where the 1455 rotifer records were reported: purple squares represent records in Continental Antarctica, orange circles records in Maritime Antarctica, and green triangles records in Subantarctica. The 60° South latitude roughly divides Antarctica from Subantarctica and is marked with a dark line. The historical subdivisions of Continental Antarctica (Maud, Enderby, Wilkes, Scott, Byrd, Ronne) in addition to the Peninsula for Maritime Antarctica are marked on the map. Latitudes from 50°S to 80°S are reported along the parallels; longitudes for meridians are reported every 30°.

Table 1. Description of the data set with specific information relative to definitions, units and storage for each of the 22 columns of the data set, according to Darwin Core Standards.

Variables (columns)	Description	Units	Storage Type
id	Unique identification number for the record in the data set		Integer
OccurrenceID	Unique ID according to GBIF		String
basisOfRecord	Type of observation		String
type	The nature or genre of the resource		String
associatedReferences	Published reference in which the record was found		String
scientificName	Valid species name, used according to the list of available names (LAN) for phylum Rotifera		String
identificationQualifier	Identification qualification for taxon names		String
scientificNameAuthorship	Species authorship		String
scientificNameID	Life Science Identifier (LSID) for the record species		String
taxonRank	Lowest taxonomic level of biological classification by which the rotifer record was identified		String
family	Name of the family for the record		String
order	Name of the order for the record		String
class	Name of the class for the record		String
taxonRemarks	Taxonomic group to which the rotifer record belongs		String
originalNameUsage	Taxon name as provided by the publication		String
locality	Name of the site in which the record was found		String
habitat	Habitat type in which the record was found		String
decimalLatitude	Geographic latitude of the geographic centre of the sampling location	Decimal degrees (WGS84)	Numeric
decimalLongitude	Geographic longitude of the geographic centre of the sampling location	Decimal degrees (WGS84)	Numeric
occurrenceRemarks	Comments regarding classification provided by the reference papers		String
higherGeography	Biogeographic region of the record: Continental, Maritime, or Subantarctica		String
locationRemarks	Subdivision of Antarctic regions (excluding Subantarctica) in which the record was found		String

1

The information about habitat was found for 1088 records. The majority of sampled habitats were aquatic environments (779), mostly related to brackish or freshwater habitat (e.g. pools, ponds, lakes, algal and cyanobacterial mats). Terrestrial habitats (274 records) were related mostly to soils and mosses (Figure 2).

Data set

Object name: Antarctic Rotifera

Character encoding: UTF_8

Format name: csv, comma-separated values

Format version: 1.0

Distribution: the data set is available as a supplementary material to this paper (both as a csv and as a txt file), and is uploaded to Biodiversity.aq: https://ipt.biodiversity.aq/resource?r=rotifera_database (last update on 2019-12-16), as part of the Antarctic Biodiversity Information facility (ANTABIF), the Antarctic Node of the Global Biodiversity Information Facility (GBIF, https://www.gbif.org), under the

collection of the Italian National Antarctic Museum (MNA) (https://www.gbif.org/publisher/4c882fee-876a-4b32-b218-67b2bdd42579).

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Update policy: none

Language: English

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Metadata language: English

Metadata providers: Diego Fontaneto (diego.fontaneto@cnr.it) and Stefano Schiaparelli (stefano.schiaparelli@unige.it).

Resource Citation: Italian Antarctic National Museum (2019) MNA (Section of Genoa) – A data set on the distribution of Rotifera in Antarctica. Contributed Online at https://ipt.biodiversity.aq/resource?r=rotifera_database (last update on 2019-12-16), GBIF key: https://www.gbif.org/dataset/b109fc97-b7b8-4432-a89a-5eaaadeee431, Data Paper https://doi.org/10.21426/B635044786.

Management details

Project title: Antarctic Rotifera

Database manager: Diego Fontaneto

Temporal coverage: the present data set refers to more than a century of published papers (1907 to 2018)

Record basis: Literature records

Sampling methods: The data set was created collating different data sets and sampling records included in several published scientific papers

Funding grants: Italian National Antarctic Research Program (PNRA, www.pnra.it), projects 2013/AZ1.13 and PNRA16_00120-A1 (TNB-CODE).

Publishing organization: Italian National Antarctic Museum (MNA, Section of Genoa), University of Genoa, Genoa, Italy.

Geographic coverage

Study area: This data set covers all studies conducted in the three currently accepted biogeographic regions of Antarctica (Stonehouse 1982, Lewis-Smith 1984, Ochyra 1998, Van der Putten et al. 2012): (1) Subantarctica, representing all the islands at latitudes between 45° and 60°S, including the South Atlantic Ocean Province (South Georgia), the South Pacific Ocean Province (Macquarie Island) and the South Indian Ocean Province (Prince Edward Islands, Iles Crozet, Iles Kerguelen and the Heard Island group); (2) Maritime Antarctica, including the other islands and archipelagos in the South Atlantic (namely South Shetlands, South Orkneys, South Sandwich and Bouvetøya) and the Antarctic peninsula (Palmer Land and Graham Land); (3) Continental Antarctica, representing all the rest of the continent, excluding the peninsula, and the surrounding islands. Moreover, for Continental Antarctica, a further subdivision in the six traditional sectors (Pugh 1993, McInnes and Pugh 1998, Velasco-Castrillón et al. 2014a, b, c) was followed: (1) Maud (between 30°W and 30°E), (2) Enderby (between 30°E and 90°E), (3) Wilkes (between 90°E and 150°E), (4) Scott (between 150°E and 150°W), (5) Byrd (between 90°W and 150°W), (6) Ronne (between 30°W and 90°W, excluding the Peninsula, which belongs to Maritime Antarctica).

Bounding box: All habitats at latitudes lower than 60°S, plus Subantarctic islands.

Sampling design: The data set was created including all the available publications on Antarctic Rotifera, to the best of our knowledge through the literature search.

Habitat type: The type of habitat was reported as in the original paper. Some examples include cyanobacterial mat, cryoconite hole, lake, marine littoral, meltwater pool, moss, pond, soil, etc.

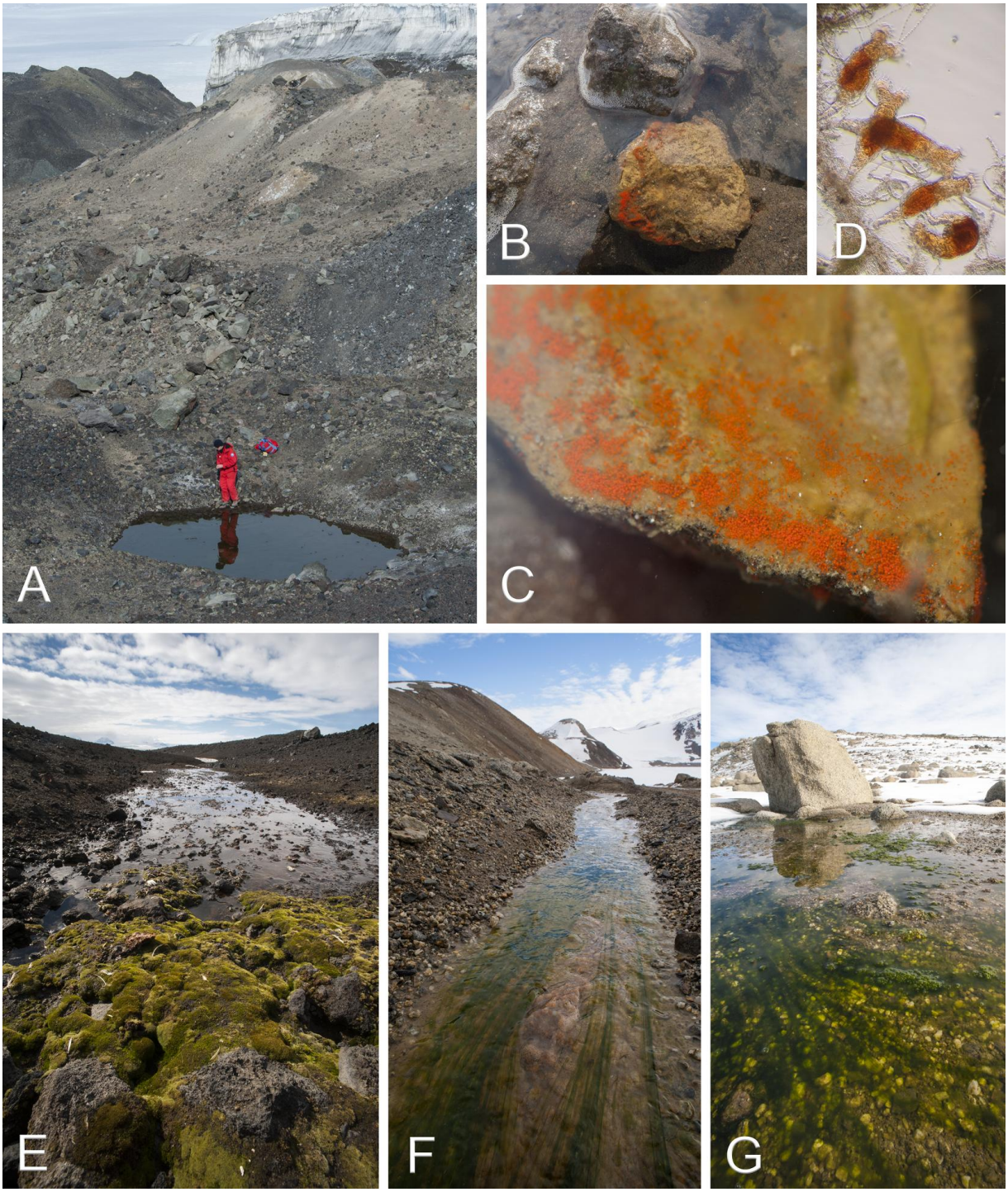

Figure 2. Different Antarctic habitats in the Terra Nova Bay area (Ross Sea, Victoria Land Coast) where rotifers can be collected. (A) A small ephemeral pond found along the moraines of Edmonson Point (Station EP17, January 10th 2019, 74.33525S 165.11920E). The water originates from the melting of glaciers, whose edge is visible in the top part of the photograph. (B, C, D) In another pond from the same area (Station EP20, January 10th 2019, 74.33606S 165.12308E) dense aggregations of *Philodina gregaria* Murray, 1910 could be spotted due to their conspicuous red coloration already while walking around the pond rim (B). At a closer look (C) smaller aggregates of individuals (D) became clearly visible. (E) The coastal area of Edmonson Point (Station EP10, December 29th 2018, 74.32798S 165.13324E) is characterized by a large Adelie penguin, *Pygoscelis adeliae* (Hombron & Jacquinot, 1841), rookery. Here the water streams originating from lakes are under a high organic load due to the nearby Adelie penguin rookery influence. The white spots on the green moss are Adelie penguin feathers. (F) A small water flow (Station TB4, January 8th 2019, 74.32798S 165.13324E) lining the road that connect the Italian Base "Mario Zucchelli" with Tethys bay is interested by the growth of filamentous green algae. Along the same road (G), very close to the Italian Base, there are puddles of all sizes where different green algae species flourish (Station TB9, January 26th 2019, 74.69591S 164.10266E). All pictures by Stefano Schiaparelli © PNRA.

Biogeographic region: Antarctica.

Country: Antarctica.

Quality control for geographic data: Quality control was performed using Google maps identification of sites, and latitude and longitude coordinates provided by data providers. Geographic coordinate format, coordinates within country/provincial boundaries, absence of ASCII anomalous characters in the data set were additionally controlled.Literature search

General description: We first based our data set on the records of the most recent review by Fontaneto et al. (2015). We then searched for additional papers about rotifers in Antarctica, covering especially the years from 2014 to 2018 to update the data set from Fontaneto et al. (2015).

Literature search method: Online bibliography research tools (i.e. Google Scholar, Scopus, and Clarivate Web of Science) were used with keywords "rotifer*" and "Antarctic*".

Literature list: Nine additional papers were found to update the data set for the period 2015 to 2018: De Smet (2015), Iakovenko et al. (2015), Sharov et al. (2015), Zawierucha et al. (2015), De Smet and Segers (2017), Gantait and Chandra (2017), Rochera et al. (2017), Smykla et al. (2018), and Velasco-Castrillón et al. (2018). In addition, other 20 papers published before 2015 but reporting unidentified rotifers were included in the current data set: Steele et al. (1994), Miller et al. (1996, 2001), Vincent and James (1996), McInnes et al. (2001), Sinclair (2001), Sinclair and Sjursen (2001), McInnes (2003), Sohlenius et al. (2004), McInnes and Convey (2005), Barrett et al. (2006), Cromer et al. (2006), Newsham et al. (2006), Nkem et al. (2006), Ayres et al. (2007), Sohlenius and Boström (2008), Simmons et al. (2009), Yeates et al. (2009), Hodgson et al. (2010), Smyckla et al. (2012).

Quality control for literature data: The completeness of the literature survey was confirmed by using three different search engines, and by not finding additional papers with species level records until 2014 not already listed in Fontaneto et al. (2015). The published data were considered reliable and simply checked for nomenclatural consistency.

Taxonomic coverage

General description: The data set covers all records of the phylum Rotifera in Antarctica. The inclusion of a taxon was based on its taxonomic assignation to the Rotifera in its traditional meaning, excluding parasitic Acanthocephala (Fontaneto and De Smet 2015).

Taxonomic ranks: All taxa belonging to Rotifera were considered. In particular, we gathered data from records at the species, genus, family, class (Bdelloidea, Monogononta, Seisonacea), and phylum (Rotifera) level (Fontaneto and De Smet 2015).

Taxon specialists: Diego Fontaneto, Willem H. De Smet, Nataliia Iakovenko, Christian D. Jersabek.

Quality control for taxonomic data: Taxonomic data were checked and updated to include revision of names, synonymizing, delimitation of genera and higher taxa, all conducted through a comparison with the List of Available Names for Rotifera (Segers et al. 2012, 2015, Jersabek et al. 2018) for all species described before year 2000, and with the original descriptions for all species described after year 2000. Both the original name reported in the paper reporting the record and the currently accepted name are included in the data set. In cases where DNA data was reported for undetermined taxa, if a later revision unambiguously identified those DNA sequences, we report the currently accepted name in the column with valid name.

Taxonomic remarks: several records of animals that resemble species from the Northern Hemisphere are dubious. For example, the records for *Habrotrocha constricta* and *H. elusa* are dubious and may refer to some of the species recently described by Iakovenko et al. (2015). The same for the records of *Macrotrachela nixa*, which most likely belong to *M. jankoi*. Nevertheless, in the data set, we report the names of the species mentioned in the original papers.

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