Nature Conservation 4: 1–13 (2013)
doi: 10.3897/natureconservation.4.4499
http://www.pensoft.net/natureconservation

DATA PAPER

A peer-reviewed open-access journal
Nature Conservation
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Antarctic macrobenthic communities: A compilation of circumpolar information

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Academic editor: *L. Penev* | Received 12 December 2012 | Accepted 12 February 2013 | Published 19 February 2013

Citation: Gutt J, Barnes DKA, Lockhart SJ, van de Putte A (2013) Antarctic macrobenthic communities: A compilation of circumpolar information. Nature Conservation 4: 1–13. doi: 10.3897/natureconservation.4.4499

Abstract

Comprehensive information on Antarctic macrobenthic community structure has been publicly available since the 1960s. It stems from trawl, dredge, grab, and corer samples as well as from direct and camera observations (Table 1–2). The quality of this information varies considerably; it consists of pure descriptions, figures for presence (absence) and abundance of some key taxa or proxies for such parameters, e.g. sea-floor cover. Some data sets even cover a defined and complete proportion of the macrobenthos with further analyses on diversity and zoogeography. As a consequence the acquisition of data from approximately 90 different campaigns assembled here was not standardised. Nevertheless, it was possible to classify this broad variety of known macrobenthic assemblages to the best of expert knowledge (Gutt 2007; Fig. 1). This overview does not replace statistically sound community and diversity analyses. However, it shows from where which kind of information is available and it acts as an example of the feasibility and power of such data collections. The data set provides unique georeferenced biological basic information for the planning of future coordinated research activities, e.g. under the umbrella of the biology program "Antarctic Thresholds - Ecosystem Resilience and Adaptation" (AnT-ERA) of the Scientific Committee on Antarctic Research (SCAR) and especially for actual conservation issues, e.g. the planning of Marine Protected Areas (MPAs) by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR).

Keywords

Macrobenthic communities, trawls, dredges, grabs, corers, direct observations (scuba-diving, sea-bed video, sea-bed photography)

Data resources

Data published through GBIF: http://ipt.biodiversity.aq/resource.do?r=macrobenthos
Seabed images through Pangaea: http://www.pangaea.de/ (sample: http://doi.pangaea.de/10.1594/PANGAEA.702075)

General description

Additional information: Additional files uploaded: list of references (Table 1–2) and classification of macrobenthic communities (Fig. 1).

Project details

Project title: Antarctic macrobenthic communities: A compilation of circumpolar information.

Personnel: Julian Gutt.

Taxonomic coverage

General taxonomic coverage description (for detailed information see references in Table 1): Macrobenthic communities have been uploaded in the category "vernacularNames", abbreviations in "taxonRemarks".

"Sessile suspension feeders and associated fauna" can be dominated by both demosponges, e.g., *Cinachyra* or *Mycale* and hexactinellid (glass) sponges. The most common genus is *Rossella*. The sponges include fast growing genera, such as *Homaxinella* or those that grow slowly, at least during the adult life stage, such as the also common hexactinellid genus *Anoxycalix*. The associated fauna comprises specialised predators, such as nudibranches, asteroids (especially *Acodontaster conspicuous* and *Perknaster fuscus*, which control fast growing *Mycale acerata* populations) and gastropods. Other fauna groups are symbionts, amphipods and other macroorganisms that prefer an epibiotic life-mode (mainly from the echinoderms, such as sedentary holothurians, ophiuroids and crinoids). If space is not monopolised by sponges, then, cnidarians (such as gorgonians, pennatularians, alconarians or hydrocorals), solitary and compound ascidians, and a variety of bryozoans can be most abundant. A recently described population of lithodid crabs is speculated to grow fast due to oceanic warming and was associated with the "mobile deposit feeders, infauna and grazers". Other mobile epifauna assemblages can be dominated in shallow areas by the asteroid *Acodontaster validus*, by two species of the grazing echinoid *Sterechinus*, a variety of deposit feeding and scavenging ophiuroids and mobile holothurians. The infauna is comparably rare; however, polychaetes and the clams *Yoldia* as well as *Laternula* can reach high densities, especially in shallow muddy sediments. A general depth gradient exists for biomass and abundances. In addition, very low biomass and abundances are found in shallow habitats that are physically and permanently disturbed by sea-scour, in intermediately deep shelf areas that are scoured by icebergs and in extremely oligotrophic situations under or close to the ice-shelves. Intensively disturbed assemblages can be dominated by very few species, appearing to be almost "monospecific", during recolonisation by pioneers such as the ascidian *Mogula pedunculata*, bryozonas like *Cellarinella* and *Cellaria* or the gorgonian *Primnoisis antarctica* or in physically disturbed areas, where only opportunistic mobile species survive. Locally clams of the species *Adamussium colbecki* can live in several layers on top of each other simply due to suitable environmental conditions and low competition. Species can also become very abundant when they are better local competitors for space, such as the demosponge *Cinachyra barbata*, s.l. Recently, fauna-rich vent sites and far poorer seeps have been discovered.

Common names: sessile suspension feeders and associated fauna (SSFA), sessile suspension feeders and associated fauna - predator driven (SSFA-PRED), sessile suspension feeders and associated fauna - dominated by sponges (SSFA-SPO), sessile suspension feeders and associated fauna - dominated by taxa other than sponges (SSFA-OTH), mixed assemblage (MIX), very low biomass or absence of trophic guilds (VLB), “monospecific” (MONO), physically controlled (PHYCO), mobile deposit feeders, infauna and grazers (MOIN), mobile deposits feeders, infauna and grazers - infauna dominated (MOIN-INF), mobile deposit feeders, infauna and grazers - epifauna dominated (MOIN-EPI), vent (VENT), and seep (SEEP).

Spatial coverage

General spatial coverage: The study area generally covers almost the entire Southern Ocean, including single ice-shelf covered sites (Fig. 2). The vast majority of information is from shelf areas around the continent at water depth shallower than 800m. Non-ice shelf covered shelf areas can be up to 300km wide or the shelf-edge at 600 to 800m depth can “disappear” beneath the floating ice-shelf. Shallow areas (<50m) are rare because 86% of the coast-line is glaciated or consists of an ice-shelf edge. A non-glaciated coast mainly exists along the Antarctic Peninsula. The coastline is either extremely complex with bays, channels, peninsulas, islands etc. or less structured, especially where it is formed by the ice-shelf. Overdeepened basins (inner-shelf depressions) can reach >1200m water depth. Most islands exist west of the Antarctic Peninsula and along the Scotia Arc linking the Peninsula with the southern tip of South America. The coastal waters are mainly affected by the Antarctic Coastal Current (East Wind Drift), whilst the largest off-shore part of the Southern Ocean is dominated by the Antarctic Circumpolar Current (West Wind Drift) with gyres of different size. Sediments are predominantly poorly sorted but also cobble “fields”, bedrock, and pure soft sediments exist. The Antarctic marine ecosystem is shaped by a distinct seasonality of the sea-ice cover affecting a short and intensive primary production in austral summer, by predominantly stable low temperature to which most organisms are thought to be specifically adapted to, and very little terrestrial run-off. Most of the shelf-inhabiting macrobenthic species are endemic; some taxa reach above-average species richness (Clarke and Johnston 2003). Only few marine habitats are protected, most of which are small. Plans and proposals for large Marine Protected Areas (MPA's), e.g. in East Antarctica, in the Ross and Weddell Seas, exist but require good scientific knowledge and data to be meaningful.

Coordinates: 83°0'0"S and 52°0'0"S Latitude; 180°0'0"W and 180°0'0"E Longitude.

Temporal coverage: March 1, 1956–February 21, 2010.

Methods

Method step description: Attribution of the information from the different sources (for references see Table 1, for hyperlinks see Table 2) to the classified macrobenthic assemblages (Fig. 1) was done to the best of expert knowledge. This was done for the entire data set simultaneously and the results were made publically available for the first time via the database "Antarctic Biodiversity Facility" (ANTABIF). The principal parameter on which theses assumptions have been made was biomass or a proxy for biomass such as sea-floor coverage. Some information on benthic functioning is also included directly or indirectly, e.g. predation, competition, succession after iceberg scouring, epi-biotic life-mode and oligotrophic conditions under ice shelves. The source publications listed (Table 1) comprise descriptions of catches, other observations, and data on fauna and were mainly from historical and modern peer-reviewed articles. Other information sources were sea-bed videos and still images together with associated meta-data (Table 2). All the latter source material has an associated DOI and is available at the database PANGAEA (www.pangaea.de).

Study extent description: Southern Ocean with emphasize on coastal shelf areas and some islands without specific temporal patterns of sampling.

Sampling description: This project aggregates data from various expeditions with a full range of benthic sampling methods, such as grabs, corers, dredges, and trawls as well as non-invasive observations by scuba divers, stationary, towed, or ROV-based still and video-cameras. For detail descriptions see original publications in journals (Table 1) or data repositories (Table 2).

Quality control description: A first version of the classification of the macrobenthic communities had been published in a peer-reviewed journal (Gutt 2007). A modified version had been published in the Antarctic Climate Change and the Environment report (ACCE, Turner et al. 2009). The actual version is depicted in Fig. 1. Data presented here is available at ANTABIF/SCAR-MarBIN and will contribute to the biogeographic atlas project of SCAR and the Census of Marine Life (De Broyer et al. in prep.), http://atlas.biodiversity.aq/).

Table 1. References of results and data used for the compilation of information on Antarctic macrobenthic communities presented in this article.

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Table 2. Hyperlinks (DataCite DOIs), which provide access to seabed images and metadata from single stations where the images have been taken. The macrobenthos depicted in these images was classified and used for the compilation of information on Antarctic macro-benthic communities presented in this article.

doi: 10.1594/PANGAEA.702075	doi: 10.1594/PANGAEA.770359
doi: 10.1594/PANGAEA.702059	doi: 10.1594/PANGAEA.198690
doi: 10.1594/PANGAEA.702076	doi: 10.1594/PANGAEA.198691
doi: 10.1594/PANGAEA.702077	doi: 10.1594/PANGAEA.198692
doi: 10.1594/PANGAEA.702062	doi: 10.1594/PANGAEA.198693
doi: 10.1594/PANGAEA.702078	doi: 10.1594/PANGAEA.198694
doi: 10.1594/PANGAEA.702064	doi: 10.1594/PANGAEA.198695
doi: 10.1594/PANGAEA.702065	doi: 10.1594/PANGAEA.198696
doi: 10.1594/PANGAEA.702066	doi: 10.1594/PANGAEA.198697
doi: 10.1594/PANGAEA.702067	doi: 10.1594/PANGAEA.198698
doi: 10.1594/PANGAEA.702079	doi: 10.1594/PANGAEA.198699
doi: 10.1594/PANGAEA.702069	doi: 10.1594/PANGAEA.198667
doi: 10.1594/PANGAEA.702070	doi: 10.1594/PANGAEA.198668
doi: 10.1594/PANGAEA.702080	doi: 10.1594/PANGAEA.198669
doi: 10.1594/PANGAEA.702072	doi: 10.1594/PANGAEA.198670
doi: 10.1594/PANGAEA.702073	doi: 10.1594/PANGAEA.198671
doi: 10.1594/PANGAEA.702074	doi: 10.1594/PANGAEA.198672

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doi: 10.1594/PANGAEA.206413
doi: 10.1594/PANGAEA.198683
doi: 10.1594/PANGAEA.198684
doi: 10.1594/PANGAEA.198685
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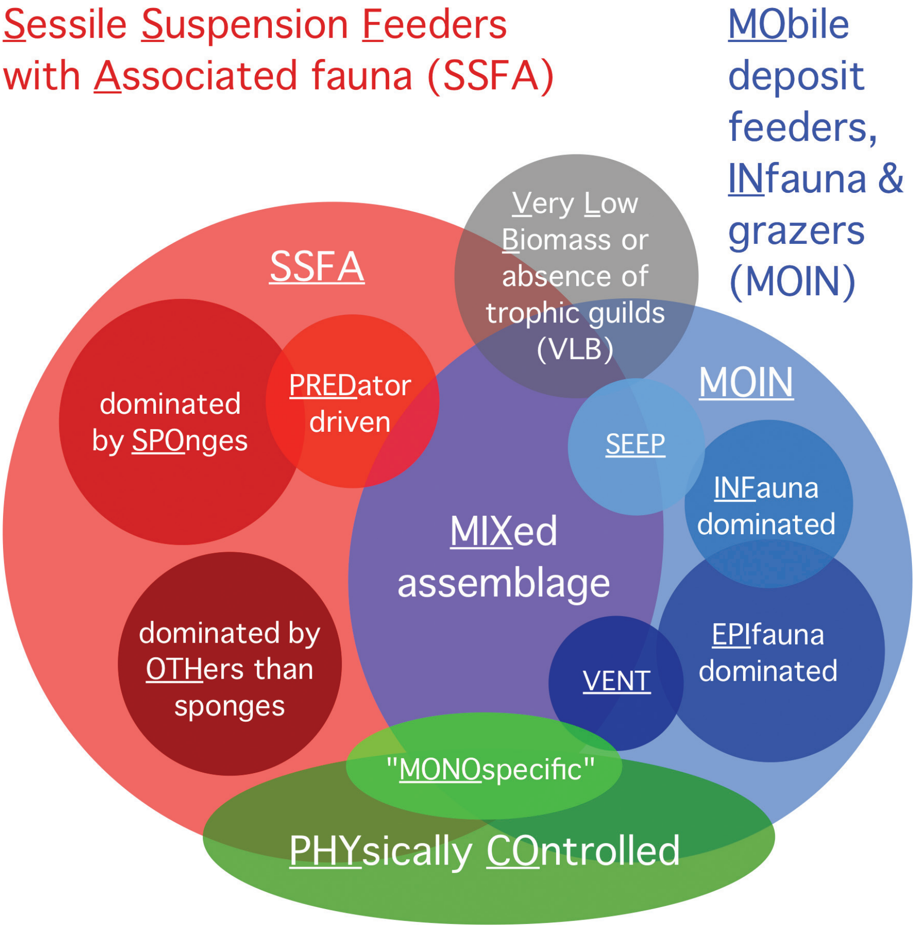

Figure 1. Classification of Antarctic macro-benthic communities (after Gutt 2007 and Turner et al. 2009).

Datasets

Dataset description

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Format name: Darwin Core Archive format
Format version: 1.0
Distribution: http://ipt.biodiversity.aq/archive.do?r=macrobenthos

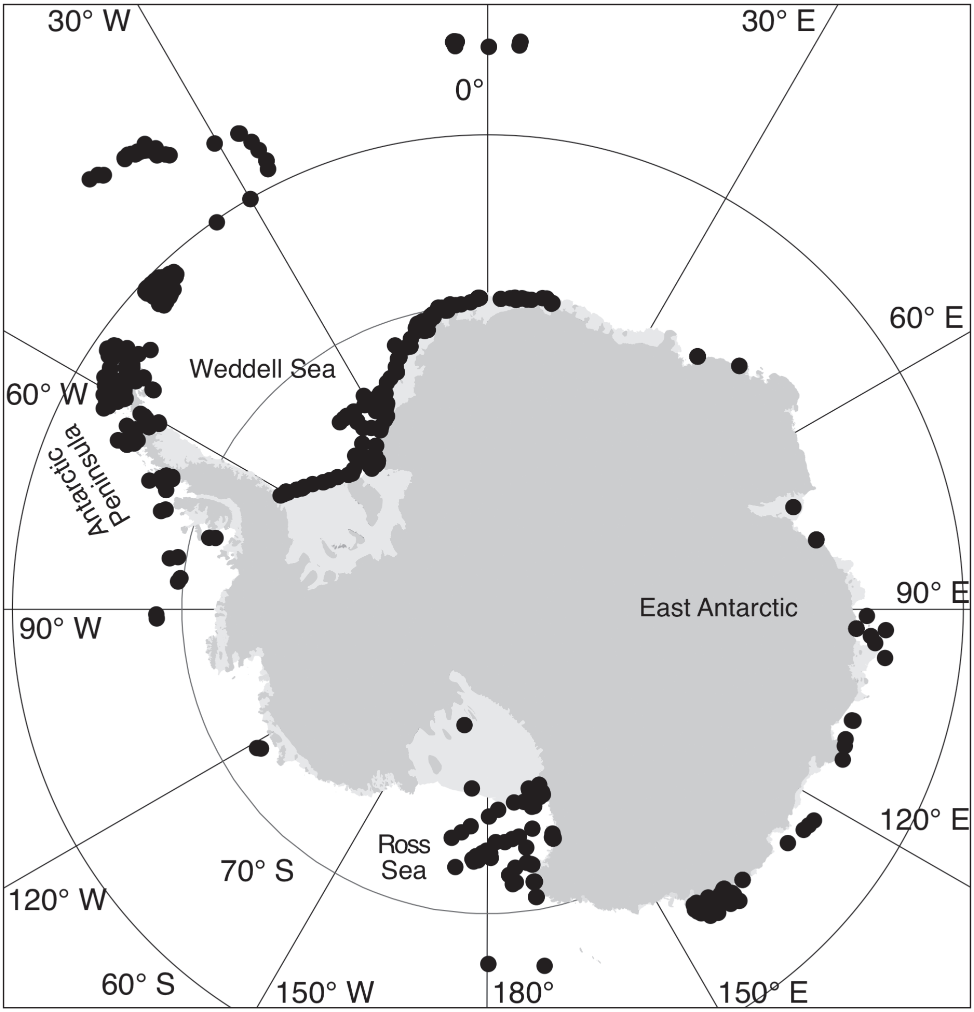

Figure 2. Geographic coverage of the circumpolar distribution of information on Antarctic macrobenthic communities provided by ANTABIF.

Publication date of data: 2012-07-19
Language: English
Licenses of use: This data-set is entitled "Antarctic macrobenthic communities: A compilation of circumpolar information" and has been uploaded to (ANTABIF). The data set has been made available under the Open Data Commons Attribution License: http://www.opendatacommons.org/licenses/by/1.0/
Metadata language: English
Date of metadata creation: 2012-07-19
Hierarchy level: Dataset

Acknowledgements

Thanks are due to all who provided data for this compilation.

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