

Benthic community data from 17 sites in McMurdo Sound, Antarctica from 2002 to 2014

Website: <https://www.bco-dmo.org/dataset/745874>

Data Type: Other Field Results

Version: 1

Version Date: 2018-09-13

Project

- » [Decadal Variation in Antarctic Marine Benthic Ecosystems](#) (McMurdo Marine Benthos)
- » [Food web dynamics in an intact ecosystem: the role of top predators in McMurdo Sound](#) (McMurdo Predator Prey)
- » [Development of a Remotely Operated Vehicle for Under Sea Ice Research in Polar Environments](#) (SCINI)
- » [Community Dynamics in a Polar Ecosystem: Benthic Recovery From A Large Scale Organic Enrichment in the Antarctic](#) (Antarctic Benthic Recovery)

Contributors	Affiliation	Role
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Abstract

Sample images were collected by SCUBA divers during the austral spring between September and November each year from 2002 to 2014 in McMurdo Sound. Organisms visible in the images were identified to the lowest possible taxonomic category and enumerated.

Table of Contents

- [Coverage](#)
- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
- [Data Files](#)
- [Parameters](#)
- [Deployments](#)
- [Project Information](#)
- [Funding](#)

Coverage

Spatial Extent: N:-77.5283 E:166.77 S:-77.9317 W:163.1683

Temporal Extent: 2002 - 2014

Dataset Description

Related datasets:

McMurdo sediment: <https://www.bco-dmo.org/dataset/746035>

McMurdo epifauna species list: <https://www.bco-dmo.org/dataset/746999>

Methods & Sampling

Sample images were collected by SCUBA divers during the austral spring between September and November each year. To quantify common species we used ten replicate still images, and cropped each image to cover 1 m². To quantify rare species we used three replicate transects encompassing 10 m² each. For the cryptic species *Laternula elliptica* P. P. King, we made in situ counts in six replicate 0.25 m² areas. Species that could not be counted as individuals were not quantified (e.g. some hydroids, bryozoans, and sponges). Organisms

visible in each quadrat or transect were identified to the lowest possible taxonomic category and enumerated. Taxonomy follows that of the World Register of Marine Species (WoRMS, <http://www.marinespecies.org/about.php>). Individual taxa were counted in either quadrats or transects, depending on abundance. The counts were area-adjusted and combined into a single megafaunal data set.

Two 4 cm diameter, 5 cm deep cores were collected, one for grainsize analysis which was refrigerated until processing, and one for carbon and nitrogen analysis that was frozen until analysis. Results and methodology of grainsize, carbon and nitrogen analysis can be found in the dataset "McMurdo sediment" <https://www.bco-dmo.org/dataset/746035>.

Data Processing Description

BCO-DMO Data Manager Processing Notes:

- * added a conventional header with dataset name, PI name, version date
- * modified parameter names to conform with BCO-DMO naming conventions
- * Dataset transposed rows to columns
- * World Register of Marine Species taxa match tool used to find misspellings and unaccepted names (2018-09-10). No misspellings but three unaccepted names found. Name changes to use the accepted species name reviewed and accepted by the data contributor.
- ** Tetilla leptoderma -> Antarctotetilla leptoderma (aphialD: 885825)
- ** Margarites antarctica -> Margarella antarctica (aphialD: 197257)
- ** Corymorpha parvula -> Zyzzyzus parvula (aphialD: 231614)

[[table of contents](#) | [back to top](#)]

Data Files

File
McMurdoEpifauna.csv (Comma Separated Values (.csv), 88.43 KB) MD5:b16fdbb5768499ecf07e64c96f42084
Primary data file for dataset ID 745874

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
year	Year	unitless
site	Site name	unitless
lat_dd	Latitude	decimal degrees
lon_dd	Longitude	decimal degrees
replicate	Replicate number	unitless
Perkinsiana_sp	Number of Perkinsiana sp.	per individual
Flabegraviera_mundata	Number of Flabegraviera mundata	per individual
Chaetopterus_variopedatus	Number of Chaetopterus variopedatus	per individual
Chorismus_antarcticus	Number of Chorismus antarcticus	per individual
Glyptonotus_antarcticus	Number of Glyptonotus antarcticus	per individual
Natatolana_sp	Number of Natatolana sp.	per individual

Pycnogonoidea	Number of Pycnogonoidea	per individual
Camptoplites_sp	Number of Camptoplites sp.	per individual
Gymnodraco_acuticeps	Number of Gymnodraco acuticeps	per individual
Trematomus_bernacchii	Number of Trematomus bernacchii	per individual
Cnemidocarpa_verrucosa	Number of Cnemidocarpa verrucosa	per individual
Tunicate	Number of Tunicate	per individual
Isotealia_antarctica	Number of Isotealia antarctica	per individual
Urticinopsis_antarctica	Number of Urticinopsis antarctica	per individual
Edwardsia_sp	Number of Edwardsia sp.	per individual
Edwardsiella_ignota	Number of Edwardsiella ignota	per individual
Artemidactis_victrix	Number of Artemidactis victrix	per individual
White_anemone	Number of White anemone	per individual
Alcyonium_antarcticum	Number of Alcyonium antarcticum	per individual
Clavularia_frankliniana	Number of Clavularia frankliniana	per individual
Gersemia_antarctica	Number of Gersemia antarctica	per individual
Corymorpha_microrhiza	Number of Corymorpha microrhiza	per individual
Zyzyzus_parvula	Number of Zyzyzus parvula	per individual
Hydractinia_angusta	Number of Hydractinia angusta	per individual
Hydrodendron_arboreum	Number of Hydrodendron arboreum	per individual
White_bundle_hyroid	Number of White bundle hydroid	per individual
Diplasterias_brucei	Number of Diplasterias brucei	per individual
Macroptychaster_accrescens	Number of Macroptychaster accrescens	per individual
Perknaster_fuscus_subspecies_antarcticus	Number of Perknaster fuscus subsp.ecies antarcticus	per individual
Acodontaster_sp	Number of Acodontaster sp.	per individual
Odontaster_meridionalis	Number of Odontaster meridionalis	per individual
Odontaster_validus	Number of Odontaster validus	per individual
Seastar	Number of Seastar	per individual
Promachocrinus_kerguelensis	Number of Promachocrinus kerguelensis	per individual
Sterechinus_neumayeri	Number of Sterechinus neumayeri	per individual
Ctenocidaris_perrieri	Number of Ctenocidaris perrieri	per individual
Abatus_sp	Number of Abatus sp.	per individual
Cucumariidae_cucumber	Number of Cucumariidae cucumber	per individual
Ophiacantha_antarctica	Number of Ophiacantha antarctica	per individual
Ophionotus_victoriae	Number of Ophionotus victoriae	per individual
Ophiosparte_gigas	Number of Ophiosparte gigas	per individual
Laternula_elliptica	Number of Laternula elliptica	per individual
Adamussium_colbecki	Number of Adamussium colbecki	per individual
Marseniopsis_mollis	Number of Marseniopsis mollis	per individual
Amauropsis_rossiana	Number of Amauropsis rossiana	per individual
Neobuccinum_eatoni	Number of Neobuccinum eatoni	per individual

Aeolidiidae_nudibranch	Number of Aeolidiidae nudibranch	per individual
Doris_kerguelenensis	Number of Doris kerguelenensis	per individual
Tritonia_challengeriana	Number of Tritonia challengeriana	per individual
Tritoniella_belli	Number of Tritoniella belli	per individual
Margarella_antarctica	Number of Margarella antarctica	per individual
Parborlasia_corrugatus	Number of Parborlasia corrugatus	per individual
White_sponge	Number of White sp.onge	per individual
Dendrilla_antarctica	Number of Dendrilla antarctica	per individual
Polymastia_invaginata	Number of Polymastia invaginata	per individual
Sphaerotylus_antarcticus	Number of Sphaerotylus antarcticus	per individual
Homaxinella_balfourensis	Number of Homaxinella balfourensis	per individual
Pseudosuberites_montiniger	Number of Pseudosuberites montiniger	per individual
Haliclona_dancoi	Number of Haliclona dancoi	per individual
Haliclona_sp	Number of Haliclona sp.	per individual
Haliclona_sp_A	Number of Haliclona sp. A	per individual
Hemigellius_fimbriatus	Number of Hemigellius fimbriatus	per individual
Microxina_benedeni	Number of Microxina benedeni	per individual
Calyx_arcuarius	Number of Calyx arcuarius	per individual
Inflatella_belli	Number of Inflatella belli	per individual
Kirkpatrickia_variolosa	Number of Kirkpatrickia variolosa	per individual
Phorbas_areolatus	Number of Phorbas areolatus	per individual
Isodictya_setifera	Number of Isodictya setifera	per individual
Latrunculia_apicalis	Number of Latrunculia apicalis	per individual
Mycale_acerata	Number of Mycale acerata	per individual
Cinachyra_antarctica	Number of Cinachyra antarctica	per individual
Antarctotetilla_leptoderma	Number of Antarctotetilla leptoderma	per individual
Anoxycalyx_joubini	Number of Anoxycalyx joubini	per individual
Rossella_racovitzae	Number of Rossella racovitzae	per individual

[[table of contents](#) | [back to top](#)]

Deployments

McMurdo epifauna 2002-2014

Website	https://www.bco-dmo.org/deployment/746177
Platform	McMurdo Station

[[table of contents](#) | [back to top](#)]

Project Information

Decadal Variation in Antarctic Marine Benthic Ecosystems (McMurdo Marine Benthos)

Website: <http://iceaged2010.mlml.calstate.edu/>

Coverage: Western Antarctic

From proposal abstract:

The ability to document and understand long-term trends in ocean climate and ecology, including the role of human activities on the biosphere, depends on an adequate knowledge of natural interdecadal fluctuations. The proposed research will document changes in benthic ecosystems in McMurdo Sound over the last four decades, i.e., since the beginning of quantitative studies of population and community organization in this region. The investigators will retrieve, analyze, and archive historical data of benthic assemblages in both hard and soft substrata, and continue work on several time series projects begun in the mid-1960s and early 1970s. The investigators will focus on the succession of marine invertebrate communities that have settled and survived on a variety of artificial substrates placed on the sea floor from the late 1960s to 1989. The substrates harbor several decades of information on patterns of settlement, growth, survival, longevity, overgrowth and other biological interactions and processes. The original researchers will relocate and permanently mark (with GPS) historical sampling sites; recover data from as much of the historical work as possible; provide meta-data to insure that past data are understood and sites can be properly resampled; and make all data available to the general science community in a permanent database housed at SCAR-MarBIN. The proposed work will be closely coordinated with an international macroecology program in the Ross Sea, represented by collaborator Simon Thrush (Latitudinal Gradient Project). In addition to reporting results in peer-reviewed publications and providing research support and opportunities for at least two graduate students, the investigators also will involve undergraduate and high school interns in the project, and participate in teacher education programs. The investigators will continue ongoing collaborations with K-12 outreach and college programs that focus on ocean science, and develop a new, broader public outreach effort with the Birch Aquarium at Scripps Institution of Oceanography.

Food web dynamics in an intact ecosystem: the role of top predators in McMurdo Sound (McMurdo Predator Prey)

Website: <https://scini-penguin.mlml.calstate.edu/pauls-wordpress-test-site/>

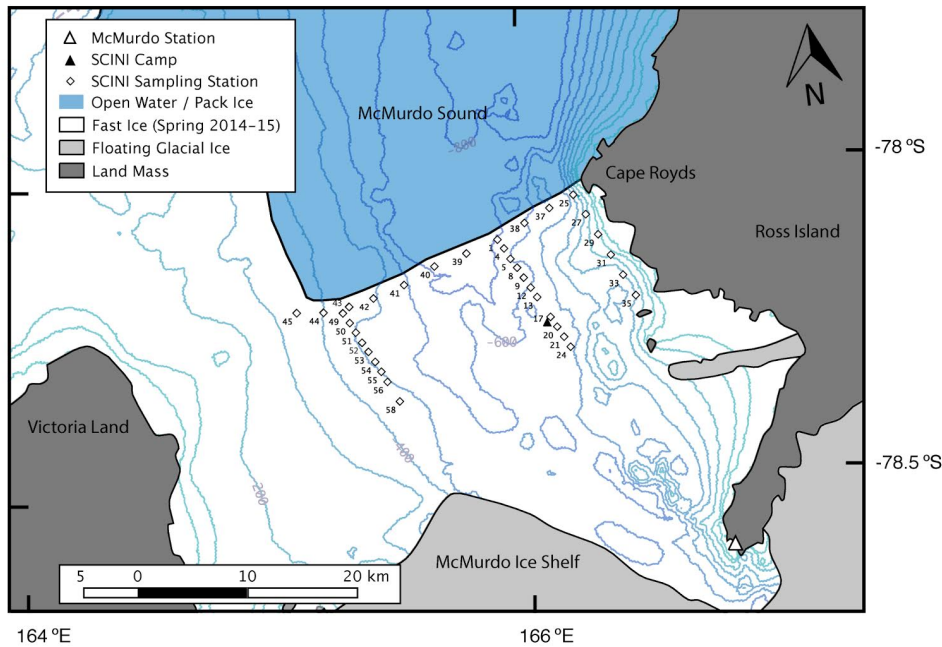
Coverage: McMurdo Sound, Antarctica

Extracted from the NSF award abstract:

The research project investigates the importance of top down forcing on pelagic food webs. The relatively pristine Ross Sea includes large populations of upper-level predators such as minke and killer whales, Adélie and Emperor penguins, and Antarctic toothfish. This project focuses on food web interactions of Adélie penguins, minke whales, and the fish-eating Ross Sea killer whales, all of which exert foraging pressure on their main prey, crystal krill (*Euphausia cyrstorophias*) and silver fish (*Pleuragramma antarcticum*) in McMurdo Sound.

The investigators used a video- and acoustic-capable ROV, and standard biological and environmental sensors to quantify the abundance and distribution of phytoplankton, sea ice biota, prey, and relevant habitat data. The sampling area included 37 stations across an 30 x 15 km section of McMurdo Sound, stratified by distance from the ice edge as a proxy for air-breathing predator access. This study will be among the first to assess top-down forcing in the Ross Sea ecosystem and will form the basis for multidisciplinary studies in the future.

Map sampling stations



Development of a Remotely Operated Vehicle for Under Sea Ice Research in Polar Environments (SCINI)

Coverage: McMurdo Sound, McMurdo Ice Shelf

NSF Award Abstract:

In marine habitats worldwide, the zone between scuba-diving depths (to 40 m) and surge-free depths (below 200 m) has been poorly studied. Under ice-covered seas, wave motion is minimal to nonexistent, and the zone between 40 and 200 m is accessible to ROVs. Polar marine research has the benefit of stable sea ice platforms for staging and deploying instruments like ROVs, but this requires a hole that is, for most ROVs, a meter in diameter. This proposal develops an ROV that can be deployed through a 15 cm hole that can be drilled with a hand-held power head, requiring minimal logistical support and technical expertise. The new ROV provides access to regions that remain unstudied, expanding our scientific reach and ability to address new questions. We will develop, test, and modify the ROV while accomplishing several overlapping and interdependent science objectives, including (1) exploration and documentation of rates and patterns of ecological succession from one of the most extreme coastal habitats in the world, (2) a survey of two unique benthic habitats and communities beyond scuba diving depths (at 40-170 m), which are almost completely unknown to most researchers and assembly of individual photographs into high-resolution images of the seafloor and (3) testing of protocols for conducting sonar mapping and creating high resolution continuous bathymetric maps of the entire seafloor around McMurdo Station. The ROV will be constructed as modules; this allows flexibility to change the ROV capabilities to suit different missions. Some components can be purchased off the shelf (e.g. VideoRay high resolution and low light video cameras), but may require development of some custom integration software. Power is provided from the surface via a 2 conductor tether; bi-directional high speed data is modulated on the tether as well, providing 84 mbs of data and unlimited dive duration. The topside controls consist of a laptop computer and joystick for the pilot. Many of the control functions and display screens could be accessed via the Internet for educational demonstrations and interactions. Two graduate students will participate fully in the project. Several other Antarctic scientists have indicated a strong interest in utilizing this tool in their research and it will be available to a pool of users on completion of the project.

Community Dynamics in a Polar Ecosystem: Benthic Recovery From A Large Scale Organic Enrichment in the Antarctic (Antarctic Benthic Recovery)

Coverage: Antarctic

NSF abstract:

Antarctic marine ecosystems differ from other polar, temperate and tropical systems at the level of individuals, populations and communities. The environment is characterized by extreme seasonality in light and food availability, along with cold stenothermal conditions. Additionally, human impacts are more limited in Antarctica than in highly populated or exploited areas. A unique research opportunity will occur in 2003 with the installation of a sewage treatment plant at McMurdo Station. This will allow for the conduct of a large-scale experiment on community recovery from organic enrichment and physical disturbance. This research will test whether major hypotheses related to community structure and disturbance recovery, which were formulated and demonstrated in more accessible marine communities, applies to Antarctic ecosystems. This research will build on a ten-year time-series that follows benthic community degradation resulting from emplacement of a sewage outfall. A complicating factor in the local McMurdo ecosystem is the input of fecal matter from the abundant populations of marine mammals and large fishes. Sampling will span the implementation of sewage treatment and the data will be incorporated in a meta-analysis of community recovery from organic disturbance in a variety of habitats, to test the generality of recovery patterns. Experimental manipulations will compare the potentially complex roles of burial and patch size in recovery dynamics. The knowledge gained from this research can be applied to other examples of high organic loading in polar habitats. Significant anthropogenic inputs in high latitudes include pulp mills and increases in human occupation and visitation as well as natural sources including woody debris in river outputs and carcass-falls from the productive surface waters above also present significant carbon inputs to high latitude environments. This study will significantly further the understanding of anthropogenic impacts in polar environments using an integrated approach to evaluate the recovery of the infaunal and epifaunal assemblages after a substantial carbon-loading perturbation sustained over ten years.

[[table of contents](#) | [back to top](#)]

Funding

Funding Source	Award
NSF Antarctic Sciences (NSF ANT)	ANT-0842064
NSF Division of Polar Programs (NSF PLR)	PLR-0944511
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	PLR-0619622
NSF Division of Polar Programs (NSF PLR)	PLR-0126319

[[table of contents](#) | [back to top](#)]