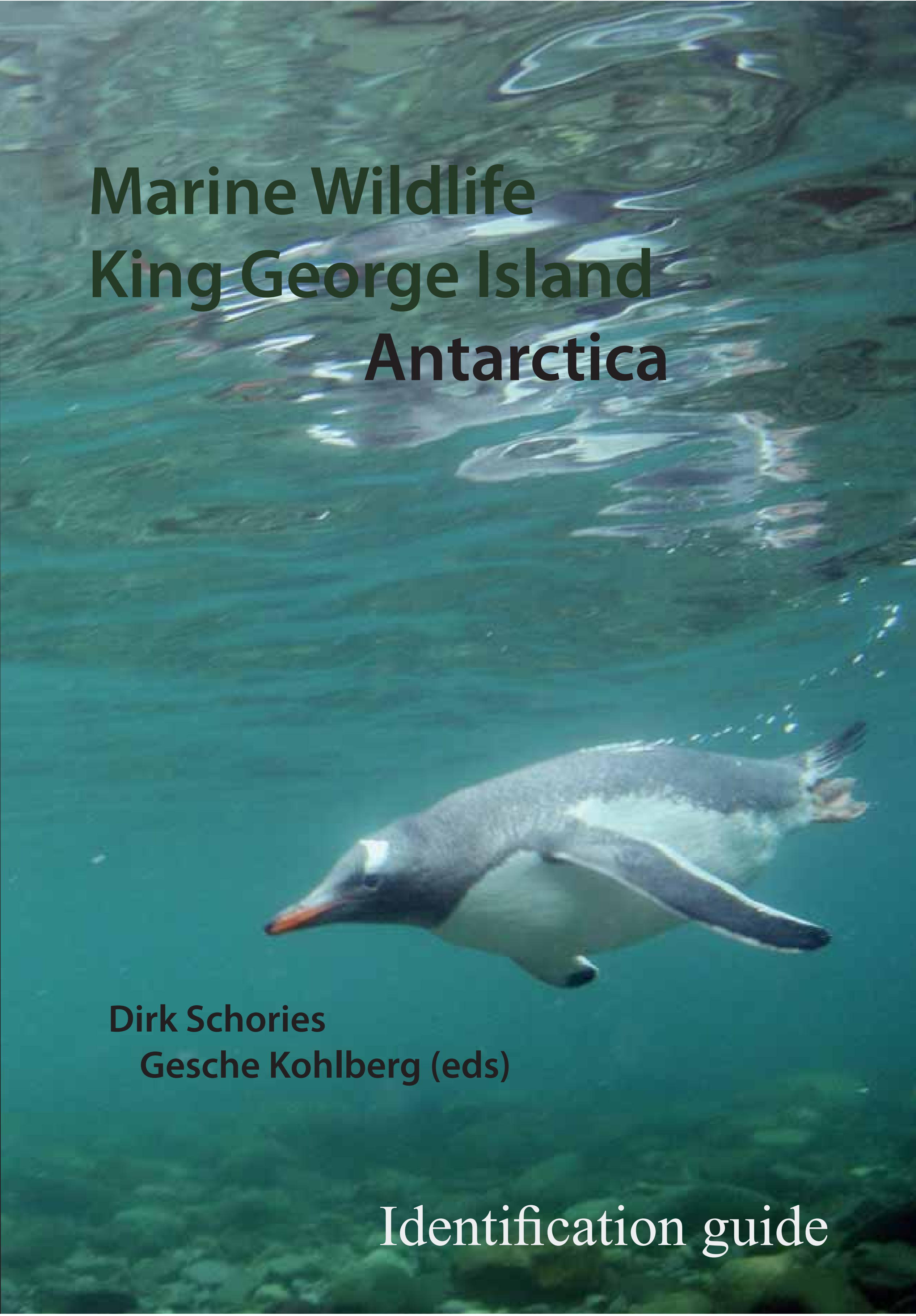

Marine Wildlife King George Island Antarctica

Dirk Schories
Gesche Kohlberg (eds)

Identification guide

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MARINE WILDLIFE
KING GEORGE ISLAND
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MARINE WILDLIFE KING GEORGE ISLAND ANTARCTICA

DIRK SCHORIES

GESCHE KOHLBERG

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Presentation

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Antarctica, particularly the Antarctic Peninsula and its maritime realm, is an important challenge and an opportunity to develop science of international significance. Particularly for Chilean scientists, who have the possibility to study this unique environment at reasonable costs whilst establishing international collaborations, much easier to engage with having thousands of scientists coming to the Antarctic Peninsula area through the Chilean Patagonia every summer. Living in a far away southern hemisphere country like Chile, possibly best known in the world for earthquakes, copper and wine, to collaborate in a scientific endeavor probably does not come as a first choice. At the Chilean Antarctic Institute we very much welcomed the project presented by Dr. Dirk Schories and collaborators from the Universidad Austral. Dirk and his team had very clear in their minds what they wanted, were hoping to achieve and the way to do it, although our facilities were still not that good as we would have liked them to be. This book demonstrates that our decision to fund Dr. Schories project was the right one and definitely they were up to the challenge. We must thank Dirk, not only for his expertise, dedication and professionalism but also for his kindness, enthusiasm and cooperative spirit, always ready to collaborate in the day to day challenges that present to work in an Antarctic Scientific Station. Chilean scientists diving in Antarctica has become now a normal sight. INACH is bringing back to life some of its old stations located 400 to 800 kilometers south of Professor Escudero Station where Dirk did all his work. There are therefore new opportunities to continue giving shape to books like the present one, showing the fantastic submarine Antarctic world at locations very far away from King George Island. The Chilean Government has recently decided to fund an INACH's old dream: To build an International Antarctic Centre in Punta Arenas where we hope to be able to build in three years time a few aquariums to show some of the world Dr. Schories has disclosed for us.

INACH
Ministerio de Relaciones Exteriores
Gobierno de Chile

Dr. José Retamales E.
National Director
Chilean Antarctic Institute

Universidad Austral de Chile

The origins of the Universidad Austral de Chile are historically intertwined with early efforts from the Chilean government to begin exploring the Antarctic continent. Indeed, the first Chilean Antarctic Expedition took place in early 1947, while the Universidad Austral de Chile was born in 1954 in Valdivia, a city located in Southern Chile. Later on, since the International Geophysical Year (1957-1958), scientific activity is one of the main occupations of the countries with Antarctic interests. Over the next few decades, the Universidad Austral de Chile became well established among the top Universities in the country, growth that was mirrored by a steady development in the areas of limnology, marine biology and ecophysiology, oceanography and aquaculture from its Faculty of Sciences. Collectively, these strengths contributed to continued research in the Antarctic and sub-Antarctic regions. Against this background, Chile -as an Antarctic country with sovereign rights over a sector of the continent-, has developed an active and ongoing scientific work as contribution to this action and other peaceful purposes, according to international administrative agreements that have managed to ensure the success of these aims. Aware of this international responsibility, the Government of Chile created the Chilean Antarctic Institute in 1963, responsible for coordinating, planning and implementing this action. Since the early beginning, scientists of the Universidad Austral de Chile have always participated in scientific expeditions to Antarctica coordinated by the Chilean Antarctic Institute. In 2007, Dr. Dirk Schories, a scientist from the Universidad Austral de Chile, introduced internationally recognized scientific diving courses at the University. Shortly thereafter, diver-supported expeditions were organized to explore King George Island in the Antarctica. Since then, the excellently trained divers of the Universidad Austral de Chile have frequently participated in scientific projects of the Universidad Austral de Chile and other institutions in Antarctica. Combined, these efforts have translated into a number of high-quality readouts, including the present unique and colourful book. For the first time, a book gives us an extremely detailed view of the underwater wild life of Antarctica. We truly hope for this field guide to become a seminal publication in terms of engaging both general public and young scientists, therefore contributing to keep this immense frozen continent as an object of strict conservation and wild life enjoyment for future generations.

Universidad Austral de Chile
Conocimiento y Naturaleza

Prof. Hans G. Richter, PhD.
Director of Research & Development
Universidad Austral de Chile

Foreword

The Antarctic was the last continent to be discovered by man. A British expedition, led by James Cook, crossed the Antarctic Circle on January 17th, 1773, and circumnavigated the continent. Cook was followed by several other famous explorers, including James Weddell, William Smith, Eduard Bransfield, Thaddeus Bellingshausen and James Clark Ross. Increasingly, these voyages were accompanied by scientists. In the late 1820s, William Webster made observations of the Antarctic gravitational and magnetic fields; however, it was to be another forty years before the first true biological and oceanographic expeditions took place; most famously, that of Charles Wyville Thomson who, in 1872, embarked on a circumnavigation of the Earth aboard *HMS Challenger*. This expedition crossed the Antarctic Circle, taking innumerable measurements, still of scientific importance today.

The 19th century was a time of great exploration, discovery and scientific interest. Great Britain, the United States, Germany, Norway and others, equipped famous expeditions, creating a foundation for our current knowledge. By the end of the century, interest in the Antarctic itself was increasing, culminating in a race to the South Pole between the Norwegian, Roald Amundsen, and the Englishman, Robert Falcon Scott. Amundsen arrived at the Pole first on December 14th, 1911. Scott arrived one month later, only for him and his two companions to tragically perish on their return journey, less than 19 kms from their base camp.

Another expedition was led by the Anglo-Irishman Ernest Shackleton, in 1914, aboard the ship *Endurance*. Shackleton planned to cross the Antarctic continent; however, his ship became trapped in the ice and sank, after nine months and drifting nearly 1000 km. After the loss of the *Endurance*, Shackleton and part of his crew commenced an unbelievable fourteen month journey to South Georgia, arriving in May, 1916. The remaining crew were rescued from Elephant Island in August, 1916. The Antarctic continent was eventually

D. Schories showing the Chilean President Sebastián Piñera some of the collected material in 2011 at Escudero station (left), G. Kohlberg (right) crossed by Vivian Fuchs and Edmund Hilary forty-two years later in 1958.

For several decades Antarctic exploration and exploitation were closely linked. South Georgia was home to millions of fur seals and, with their discovery, began a seal skin "gold rush". The search for fur seals and, later, whales were the driving force behind the initial exploration of the Antarctic seas. Due to hunting by man, within sixty years nearly all the blue whales had disappeared. During the summer of 1930-31, more than 29,000 blue whales were hunted in Antarctic waters, whereas 25 years later, only one individual was captured. In total, an incredible 1.5 million whales were hunted between 1903 and the closing of the last whaling station on South Georgia in 1965.

1957 was the International Geophysical Year, and during this time, Antarctic research took an important step forward, with twelve different countries sending research teams to the continent. The following year, the Scientific Committee on Antarctic Research (SCAR) was inaugurated to coordinate international research activities in the Antarctic and an international agreement on the proper use of the Antarctic was signed in 1961, stipulating certain research to be undertaken.

Today, during the summer months, about 5,000 scientists and support staff, from 18 countries, live and work in 25 research stations on the Antarctic continent and nearby islands. Nevertheless, the Antarctic is an empty continent and the only one without an indigenous human population. No human set foot there until the end of the 19th century. It is a strange place but not a barren one. Antarctic visitors can observe penguins and seals on its fringes and on ice-free land lichens predominate on the drier, more exposed sites, while bryophytes thrive in the humid, sheltered habitats; however, vascular plants reach their limit at 69° south. Whales ply the Antarctic waters and for those visitors who take the opportunity to dive in the shallow waters, the Antarctic white is replaced by a multi-coloured firework display, often against a backdrop of huge kelp beds.

This book focuses on the flora and fauna of King George Island and the South Shetland Islands, studied during three expeditions made there by the authors. It is not representative of the whole of the Antarctic but hopes to show the diversity of form and colour of the magnificent plants and animals collected or observed during these expeditions and to give an impression of the species richness in the area of the islands.

This book could not have been completed without the help of the Chilean Antarctic Institute and its field staff, the Universidad Austral de Chile, the International Bureau at the DLR-PT, the University of Rostock, a fantastic and unique dive team, and friends and colleagues who have revised and edited texts and images. Our grateful thanks go to them all.

Dirk Schories & Gesche Kohlberg,

January 2016

Authors

Aldea, Cristian
Programa GAIA-Antártica
Universidad de Magallanes
Avenida Bulnes 01855
Punta Arenas
Chile
e-mail: cristian.aldea@umag.cl

Eléaume, Marc
Muséum national d'Histoire naturelle
Département Systématique et Évolution
Institut de Systématique, Évolution, Biodiversité
UMR 7205 MNHN, CNRS, UPMC, EPHE
57 rue Cuvier
75231 Cedex 05, Paris
France
e-mail: eleaume@mnhn.fr

Engl, Winfried
Kölner Str. 231
40227 Düsseldorf
Germany
e-mail: winfried.engl@yahoo.de

Fonseca, Cássio
Museu Nacional/UFRJ
Depto. Invertebrados
Quinta da Boa Vista, s/n
20940-040, Rio de Janeiro, RJ
Brazil
e-mail: cassioalbernoz@bol.com.br

Galea, Horia
Hydrozoan Research Laboratory
405 Chemin des Gatiers
83170 Tourves
France
e-mail: horia.r.galea@laposte.net

Hajdu, Eduardo
Museu Nacional/UFRJ
Depto. Invertebrados
Quinta da Boa Vista, s/n
20940-040, Rio de Janeiro, RJ
Brazil
e-mail: eduardo.hajdu@gmail.com

Huene, Mathias
Fundación Ictiológica
Av. Pedro de Valdivia 2086, Of. 406
Providencia, Santiago
Chile
e-mail: mathiashune27@hotmail.com

Kohlberg, Gesche
Institute of Biological Sciences
University of Rostock
Albert-Einstein-Str.3
18059 Rostock
Germany
e-mail: geschekohlberg@gmx.de

Krapp, Franz
Zoologisches Forschungsmuseum A. Koenig
Adenauerallee 160
D-53113 Bonn
Germany
e-mail: franz.krapp.zfmk@uni-bonn.de

Kuklinski, Piotr
Institute of Oceanology
Polish Academy of Sciences
ul.Powstancow Warszawy 55
Sopot 81-712
Poland
e-mail: kuki@iopan.gda.pl

Lüter, Carsten
Museum für Naturkunde
Leibniz-Institut für Evolutions-
und Biodiversitätsforschung
Invalidenstrasse 43
10115 Berlin
Germany
e-mail: Carsten.Lueter@mfn-berlin.de

Montiel, Américo
Universidad de Magallanes
Instituto de la Patagonia
Av. Bulnes 1890, 6213029
Punta Arenas
Chile
e-mail: americo.montiel@umag.cl

Niedzwiedz, Gerd
Institute of Biological Sciences
University of Rostock
Albert-Einstein-Str.3
18059 Rostock
Germany
e-mail: gerd.niedzwiedz@uni-rostock.de

O'Loughlin, P. Mark
Peter Mark O'Loughlin
(Honorary Associate Museum Victoria)
Mount Sion Community
126 The Avenue
P.O. Box 851
Parkville. 3052
Australia
e-mail: pmoloughlin@edmundrice.org

Ramírez, Maria Eliana
Area Botánica
Museo Nacional de Historia Natural
Casilla 787. Correo 21
Santiago
Chile
e-mail: mramirezcasali@gmail.com

Reyes, Pablo
Fundación Ictiológica
Av. Pedro de Valdivia 2086, Of. 406
Providencia, Santiago
Chile
e-mail: pablorreyes@gmail.com

Sanamyan, Karen
Kamchatka Branch of Pacific Geographical Institute
Far-Eastern Branch of the Russian Academy of Sciences
Partizanskaya 6
Petropavlovsk-Kamchatsky, 683000
Russia
e-mail: actiniaria@sanamyan.com

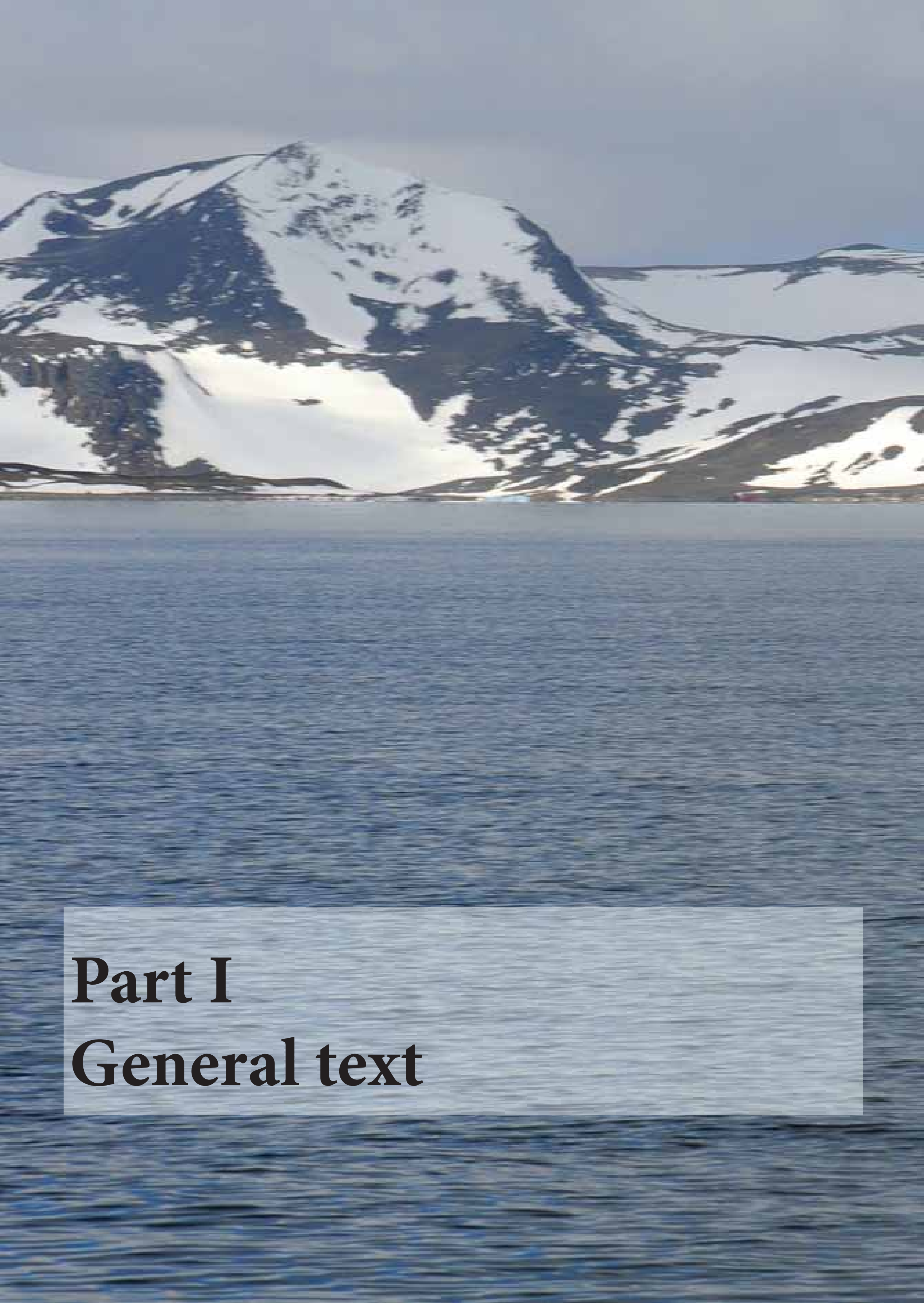
Sanamyan, Nadya
Kamchatka Branch of Pacific Geographical Institute
Far-Eastern Branch of the Russian Academy of Sciences
Partizanskaya 6
Petropavlovsk-Kamchatsky, 683000
Russia
e-mail: actiniaria@sanamyan.com

Schories, Dirk
Instituto de Ciencias Marinas y Limnológicas
Facultad de Ciencias
Universidad Austral de Chile
Valdivia
Chile
e-mail: dirk.schories@gmx.de

Schrödl, Michael
Bavarian State Collection of Zoology
Department Mollusca
Münchhausenstr. 31
81247 München
Germany
e-mail: michael.schroedl@zsm.mwn.de

Schwabe, Enrico
Bavarian State Collection of Zoology
Department Mollusca
Münchhausenstr. 31
81247 München
Germany
e-mail: enrico.schwabe@zsm.mwn.de

Content



Part I
General text

General text

G. Kohlberg, D. Schories

The southernmost continent on planet Earth, Antarctica lies almost concentrically around the geographic South Pole. The term "Antarctic" comprises the continent Antarctica and all waters, shelves and islands in the Southern Ocean situated south of the Antarctic Convergence; this is a zone approximately 32 to 48km wide, located between 48° and 61° south, its exact position at any given place is defined by the sudden drop in sea water temperature, on average 2.8°C to 5.6°C, to below 2°C.

Antarctica covers an area of about 14 million km^2 and is therefore somewhat larger than Europe, about 10 million km^2. Two principal deep bays, the Ross Sea and the Weddell Sea, in the southernmost Pacific and Atlantic oceans respectively, divide the continent into two unequal-sized parts. The larger part is called East Antarctica, as most of it lies within the eastern longitudes. The smaller, lying completely within the western longitudes, is known as West Antarctica.

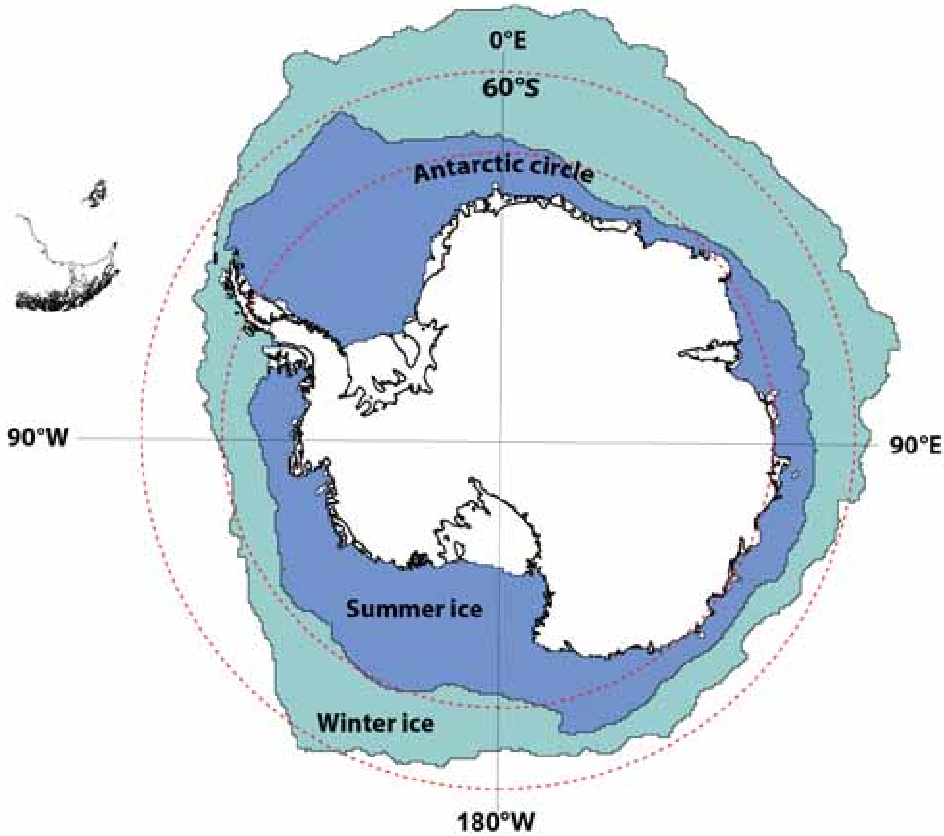
The Transantarctic Mountains make up the boundary between East and West Antarctica. With a length of 3500km (4800km, if the mountains of the Antarctic Peninsula are included), a width of between 100 and 300km and heights of up to 4500m, the Transantarctic Mountains are the fifth longest mountain range on Earth. There are also active volcanoes in Antarctica. The highest, at 3794m, is Mount Erebus and is the southernmost active volcano on the planet. Deception Island, a volcanic island near the Antarctic Peninsula has the only thermal springs in the Antarctic.

About 90% of the world´s ice and 70% of its freshwater are concentrated in the 2500 to 4500m thick ice-shield that covers the Antarctic continent. If all the ice were to melt, global sea levels would rise between 45 and 60m and the Antarctic continent would rise between 300 and 400m. The world´s largest glacier, the Lambert Glacier, flows for over 400km and is found in East Antarctica.

The Ross Ice Shelf and the Filchner-Ronne Ice Shelf cover great parts of the Ross and Weddell Seas and together with other shelves around the continental margins constitute about 10% of the area of the Antarctic ice. From these shelves large icebergs are formed. These are usually "table-topped" and up to 300m in height, the major part being submerged. One iceberg, originating from the Ross Ice Shelf, was recorded as having a length of 295km and a width of 37km [1]. Icebergs take several years to melt and during their time at sea can be transported far north by ocean currents. Other icebergs run aground in shallow coastal waters, where they destroy the benthic fauna and flora.

The appearance of Antarctica differs greatly as the seasons progress. In winter time the sea ice extends far north and almost doubles the summer continental area. Winter sea ice covers 20 million km^2, 57% of the Antarctic Ocean, and reaches 60°S in some areas. In February and March, sea ice extension is at a minimum 4 million km^2 [1]. Below the ice cover there are approximately 70 lakes. The largest is Lake Vostok, which is at least 240km long and 50km wide. It lies beneath the centre of the East Antarctica ice sheet [2]. The mean age of Lake Vostok's water is in the order of 1 million years and is the oldest isolated habitat on earth [2].

Due to the influence of the surrounding sea, the northern Antarctic Peninsula is the warmest part of Antarctica, with midsummer



Extension of Antarctic Summer and Winter Ice, left Southern tip of South America

temperatures reaching as high as 15°C. Elsewhere, temperatures range from a mean of 0°C on the coast to between -20 and -35°C in the interior. During the coldest months mean temperatures are -20 to -30°C near the coast and -40 to -70°C in the inner part of the continent. The lowest temperature ever measured on planet Earth, -89.2°C, was recorded on July 21st, 1983, at the Russian Station Vostok.

The Antarctic is affected by a phenomenon known as "polar night". This occurs when night lasts for more than 24 hours and only happens within the Antarctic (and Arctic) Circle. During wintertime, at the Antarctic Circle, the polar night lasts just one day; however, as the South Pole is approached, the polar night lasts increasingly longer until at the Pole itself, the polar night lasts almost half a year. In summertime, the opposite, the "polar day", occurs and at the South Pole, the sun does not set for half a year.

Mean precipitation over the Antarctic polar plateau is only about 50mm per year but at the coastal margins it is ten times this amount. Rain is almost unknown, with most of the water falling as snow. Despite its huge amounts of frozen water, Antarctica is considered one of the Earth's great deserts. Because of the low air temperature, the atmosphere above Antarctica contains only about 10% of the water vapor of the atmosphere at lower, temperate latitudes. Atmospheric water vapor ensures the warming, long wave radiation from the Sun is absorbed and reradiated to the Earth's surface. As the Antarctic lacks this layer of atmospheric water vapour, the continent loses heat energy to space. A further factor creating the low temperatures is the "albedo", the reflectivity, of the Earth's surface. Typically, Antartica, with its covering of white ice, reflects 80% of incoming solar radiation back to space, with only the remaining 20% being absorbed [1].

Only a few parts of the huge Antarctic continent are free of ice. Some of these are the dry valleys of the Transantarctic Mountains, found in an area of about 4900km^2 on the western coast of the McMurdo Sound. Extremely low temperatures and often gale force winds desiccate the soil, leaving it with a high salt content. Open water found there remains ice-free, unable to freeze because of its high salinity. The Antarctic valleys are more hostile than the North African Sahara or Chilean Atacama deserts. The blizzards of the Antarctic, the most extreme winds on Earth, reach speeds of 320km/h, with the highest velocities being experienced in the coastal areas. Global warming is occurring in the Antarctic, especially at the Antarctic Peninsula. Here the mean annual air temperature has risen 2.5°C since 1950 [3] and for the whole continent, an increase of 0.12°C per decade has been recorded. No other region on Earth is warming faster than the Antarctic. Between January 1995 and March 2002, much of the Larsen Ice Shelf, on the eastern side of the Antarctic Peninsula, disintegrated, a fact attributed to rising air temperatures.

History of Antarctica

300 million years ago (Mya), the present day Antarctic continent was part of the super-continent Pangaea. 200 Mya, this super-continent divided into a northern part, Laurasia, and a southern part, Gondwana. As Alfred Wegener's theory of continental drift explains, Laurasia and Gondwana further divided into the present continents. 65 to 55 Mya, Antarctica and Australia were joined, then, about 55 Mya, a final separation occurred and Australia drifted northwards. Since this time, Antarctica has been an isolated continent, surrounded by the icy waters of the Southern Ocean.

Plant and animal migration routes that had previously connected the continents of the southern hemisphere, were severed by this separation; however, the discovery of plant and animal fossils not only proved Antarctica was connected to other southern continents but that Gondwana was moving across the surface of the Earth and had gone through an earlier ice-age. 300 Mya, Gondwana moved northwards and the large glaciers that covered most of the super-continent withdrew until the area that was to become today's Antarctica was ice free. The northernmost point of Antarctica, still embedded in Gondwana, was in the position of today's Madagascar. With continued continental drift, Antarctica moved further south again, until it reached its present position around the South Pole [4].

Since the middle to late Mesozoic period, 160 to 66 Mya, the Antarctic has been in a high latitude position but glaciation did not start until the mid Tertiary period, 30 Mya. Fossils of leaves and wood can be found and point to the existence of extensive forests in earlier geological times. Fossils of the fern *Glossopteris* have been found in India, Australia, South America, Africa and also in the Victoria Land area of Antarctica, further proof of the landmasses once being connected [5].

Apart from fossils of reptiles and amphibians, a fossil land mammal belonging to the extinct marsupial family Polydolopidae, was recovered from 40 million year old rocks on

Antarctic tourism

Seymour Island, off the northern Antarctic Peninsula, supporting theories that predicted their former presence in Antarctica. It also strengthens the proposal that Australian marsupials might originate from South American, crossing from one continent to the other via Antarctica more than 56 Mya, when Australia still was attached to it [6].

Antarctica consists of two geologically different parts, separated by the Transantarctic Mountains. East Antarctica consists of 3.8 billion year old gneissic rock, overlain by marine and terrestrial sediments; whilst Western Antarctica is an archipelago of islands that appears to have resulted from three major crustal fragmentations, up to 700 million years ago. All areas are covered and connected by a common cap of ice and snow [1].

Humans in Antarctica

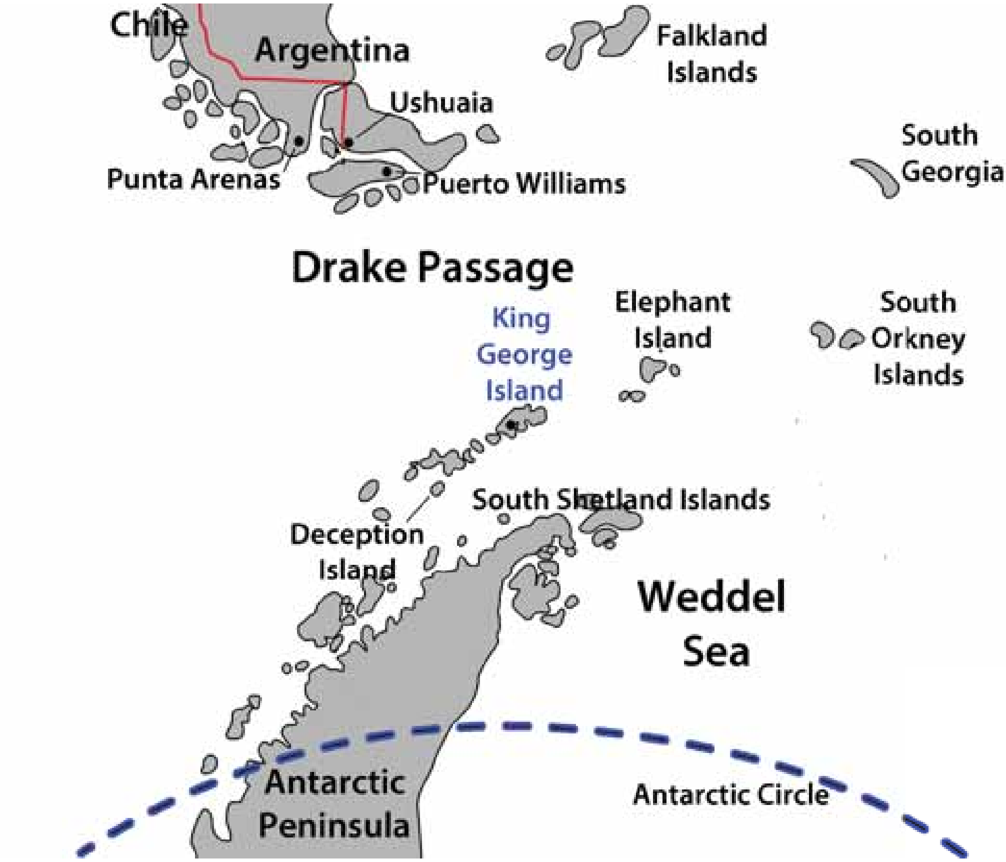
Since the times of antiquity, the Terra Australis Incognita ("Unknown Southern Land") at the end of the world has prompted myth and speculation. 2000 years ago the Greeks believed the Earth to be symmetrical and postulated the land south of the known world would serve as a balance to the land in the northern hemisphere. In 1520, Ferdinand Magellan passed through the straights later named after him and assumed the islands of Tierra del Fuego to be an extension of the unknown southern land. This was disproved in 1615 by Schouten and Le Maire when they sailed around Cape Horn. In 1675, Anthony de la Roché reached South Georgia; this being the first sight of land south of the Antarctic Convergence. About hundred years later, in 1773, during his circumnavigation of the globe in the high southern latitudes, Captain James Cook and Tobias Furneaux crossed the Antarctic Circle for the first time in history. With their ships *Resolution* and *Adventure*, they reached 67° 15' S, where they were stopped by the ice, without sighting the continent. In 1819, the English captain William Smith sighted Livingston Island and claimed the South Shetland Islands as British territory. One year later in 1820, the search for the southern continent came to an end, when three expeditions almost simultaneously sighted the continent of Antarctica. By order of the Tzar, the Russian Admiral Bellingshausen was circumnavigating the Antarctic continent with the ships *Vostok* and *Mirnyj*, and sighted the mainland. At the

Fingerprint near the Polish Arctowski station

same time Edward Bransfield, a captain in the British navy, and Nathaniel Palmer, an American seal hunter, also sighted land and it is still a controversial subject between Russia, England and North America who of them was the first; however, it is a commonly held belief that the honour goes to Bellingshausen [5].

Since Cook's reports in the 1770s, of the huge stocks of seals and whales in the Antarctic, many hunters have exploited these resources, with huge consequences. The seal hunting in South Georgia began around 1780 and ten years later, there were more than one hundred ships from Great Britain and North America hunting in the Antarctic waters [4]. The beginning of the 20th century was also the beginning of the heroic era of south polar exploration. In November 1908, Ernest Shackleton, Frank Wild, Eric Marshall and James Adams made an attempt to reach the geographic South Pole but, 108km from their target, bad weather forced their return [4]. Three years later, the race to the South Pole began. The Norwegian Roald Amundsen used a route from the Bay of Whales, while one month later Robert Falcon Scott, an English man, followed the route used by Shackleton and his group. On 14th December, 1911, Amundsen and his men raised the Norwegian flag over the South Pole and travelled back to their ship *Fram*. About one month later, the British party reached the already discovered pole. On their way back, Scott and his men died, less than 19km from their base camp, at the end of March 1912.

Many more expeditions with a variety of aims have been undertaken since then. The first aircraft were brought to Antarctica in 1928 by the Australian Hubert Wilkins, to make topographic surveys from the air. Only one year later the Americans, under Richard Byrd, landed three aircraft, 50 men and 95 dogs at Whale Bay, where they built their camp called Little America. Byrd's aim was to overfly the South Pole, which he succeeded in doing on November 28th, 1929. On November 24th 1957, the English Explorer Vivian Fuchs started the British Commonwealth Transantarctic Expedition, with the support of the first climber of the Mount Everest, Sir Edmund Hillary, a New Zealander. Their goal was to cross the Antarctic continent, from the Weddell Sea to the Ross Sea, via the South Pole, using caterpillar tractors. Hillary was to start from the Ross Sea and install depots of food and fuel for Fuchs on the second part of the crossing between the South Pole and the Ross Sea. Fuchs and his team reached the Ross Sea, on

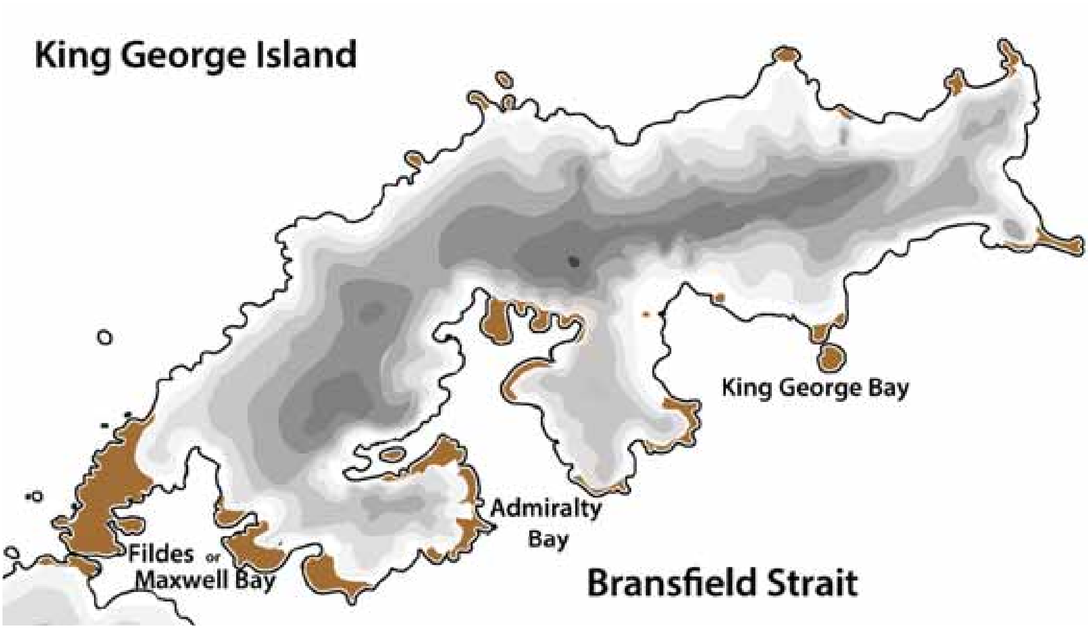


Drake Passage, King George Island and South Shetland Islands

March 2nd, 1958, after 99 days and almost 3500km [5].

After all these expeditions, many countries claimed parts of the Antarctic continent as their national territory, and in some parts, especially in the Antarctic Peninsula, these even overlapped. To help defuse this problem, an International Geophysical Year (IGY) was called for and from July 1957 to December 1958, twelve countries, including the USA and the former USSR, collaborated in a scientific research program for the Antarctic. The IGY led to a multitude of continuing scientific research programs and to the formation of the international Scientific Committee for Antarctic Research (SCAR), a non-governmental organization that still functions to this day [7].

To regulate peaceful use and scientific activity in the Antarctic, and to deflect territorial claims, an Antarctic Treaty was drawn up and signed on December 1st, 1959. The first signatories to the Treaty were Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the former Soviet Union, the United Kingdom and the United States. All territorial claims were put on hold and since 1961, thirty three more nations have signed the Treaty. The Treaty's fourteen articles determine the whole area south of 60°S may only be used for peaceful purposes. Article 1 forbids military installations and the conducting of military exercises and Article 5



Topography of King George Island

prohibits nuclear explosions and the disposal of radioactive waste within the Antarctic.

In addition to all the scientific personnel who are working temporarily in the Antarctic, each year many tourists come to visit this southernmost continent; and the number is rising. From 1958 to 1987, on average, fewer than 1000 tourists visited the Antarctic each season. During the 1993/1994 season, for the first time, the number of Antarctic tourists exceeded the number of scientists. In the years 1999 to 2003, the number of people landing on Antarctica rose to between 13,000 and 15,000 [8] and in the 2012/2013 season, more than 34,000 tourists visited the Antarctic, with 25,000 landing, the remainder either over-flying or remaining aboard their cruise vessel. Not only has the number of tourists intensified but the variety of activities has increased. Besides the cruise ships, which sometimes carry more than 1000 passengers, other activities include yachts, land-based excursions (possibly supported by air or sea) and non-landing over-flights. Today, activities conducted commercially in the Antarctic include helicopter excursions, skiing expeditions, mountain climbing, snowboarding, kayaking, marathon running and scuba diving [9].

Antarctic Peninsula, South Shetland Islands and King George Island

The Antarctic Peninsula is the northernmost part of Antarctica and is separated from the southern tip of the South American continent, 1000km away, by the Drake Passage. The Peninsula has a length of approximately 1300km and is very mountainous. Its mountains are considered to be a continuation of the South American Andes, the two being geologically connected by the Scotia Arc, an island arc system. Glaciers are common in the heights of the Peninsula and flow into the Larsen Ice Shelf, which is located to the east of the Peninsula but this has disintegrated in huge parts due to global warming. In comparison to the rest of Antarctica, the climate is mild and many parts are ice-free during the summer period.

Like that on the South Sandwich, South Orkney and South Shetland Islands, the climate of the west coast of the Antarctic Peninsula is maritime. From the northern tip of the Peninsula south to 68° S, during the southern winter, temperatures rarely fall below -10°C and for up to four months in the summer, rise to an average of 0°C. Much of the 35 to 50cm precipitation per year falls as rain in summer. In the dry centre of the continent there is only about 10cm of precipitation per year. Because of the extensive ice masses of the Weddell Sea, the climate is much colder on the eastern side of the Peninsula and south of 63°S the temperature falls to -25°C in winter and reaches only 0°C for less than a month in summer; also, precipitation is less than in the northern part of the Peninsula, ranging from 5 to 15cm per year [1].

Many islands are found along the Antarctic Peninsula with the South Shetland Islands archipelago situated to the northwest of the Peninsula and separated from it by the 160km wide Bransfield Strait. The archipelago extends for about 450km and much of it is glaciated. There are more than twenty islands in the group, some of which are quite small, and it covers an area of 3687km^2 between the eastern end of the Bellingshausen Sea and the western end of the Weddell Sea. One of the islands, Deception Island, is an active volcano with a sea-flooded horseshoe-shaped caldera, forming one of the safest harbours in the Antarctic. Hot springs can be found within the caldera and this attracts many cruise ship tourists a year.

Sixteen research stations, belonging to several different countries, are distributed across the islands of the archipelago, though most of them are situated on King George Island. With a length of 95km and a width of 25km, King George Island is the largest of the South Shetland Islands; however, more than 90% of its surface is covered by glaciers. It was on this island where the first expedition to over-winter in the Antarctic took place. Eleven British men from the ship *Lord Melville* were too late to leave the island at the end of the 1820/1821 season but they survived and were rescued the following summer.

In 1953, Argentina was the first nation to build a research station on King George Island, with Russia and Chile following. Along with Great Britain, Argentina and Chile claim the island as their territory. In the following years further bases have been built by Brazil, China, Peru, Poland, South Korea and Uruguay until there are now ten bases, researching the geology, biology and palaeontology of the island, with most of them being staffed throughout the year.

At the south western end in King George Island, at Fildes Bay, Chile has built a permanent village, Las Estrellas, where during the summer, 150 people, mostly as families, live. In winter this is reduced to about eighty. The airfield near the village operates 50 intercontinental and 150 domestic flights each season, with many of the nearby bases of other countries benefitting from its services. A lot of tourist activities also take place on King George Island, for example wildlife observation, trips in inflatable boats and the annual Antarctic marathon. A post office, a souvenir shop and two churches complete the tourist facilities.

The human impact on King George Island

Due to the number of research stations on King George Island, especially in the area of

*Gentoo Penguin (*Pygoscelis papua*)*

the Fildes Peninsula at the southwestern end of the island, there are high levels of pollution.

Electricity generation, waste disposal, motor vehicles, fuel management and airstrip and road construction all lead to the area suffering more from human impact than any other region on the continent [10]. According to a well-known environmental organization, 12% of the Fildes Peninsula is affected by the activities of the research stations, resulting in the area becoming one of the most damaged parts of Antarctica [11].

Tourism also affects the environment of King George Island. Land based and fly-cruise operations are developing on the Fildes Peninsula [11]. The increased use of aircraft as transport to and from King George Island and, therefore, the over-flying of ecologically sensitive areas such as bird and seal breeding grounds has lead to a decline in the animals breeding success. Studies in the vicinity of the Polish Arctowski station, for the years 1978 to 2008, reveal the Adélie penguin population has dropped by 56%, the Gentoo penguin by 84% and the Chinstrap penguins became practically extinct. Populations of the Southern Giant Petrel, the Weddell seal and the Southern Elephant seal have also significantly decreased. Only the numbers of Skuas have increased, in response to the garbage generated by the research stations [12].

Invasive species are also a problem on King George Island. During the summer of 1985/86, one research station recorded the presence of a European grass species, *Poa annua*. Its numbers are increasing and it is spreading into native grassland communities. It is possible it will have a negative impact on the Antarctic's only two flowering plants, the Antarctic Pearlwort (*Colobanthus quitensis*) and Antarctic Hairgrass (*Deschampsia antarctica*). It is supposed seeds of the grass were inadvertently brought to the island by research staff and tourists [13].

The marine wildlife

Antarctic climatic conditions allow only a limited number of animal and plant species to survive on land and these are restricted to mosses, lichens and grasses. Some insects, mites and ticks have also been found. The vast majority of Antarctic life is found in the surrounding ocean, or depends upon its richness for sustenance.

With the opening of the Drake Passage, about 20Mya, began the easterly flow of the Antarctic Circumpolar Current. The current is driven by the West Wind Drift, north of 65°S, and acts as a barrier to the warmer currents in the north, isolating Antarctica and most of the sub-Antarctic islands from the other oceans. The Antarctic Circumpolar Current is the greatest ocean current on Earth, transporting more water than any other. It extends from the surface to depths of 2000 to 4000m and can be as wide as 2000km [14]. The easterly winds of the East Wind Drift generate the Antarctic Continental Current, a weak, westward flowing current near the continental coast. On the eastern side of the Antarctic Peninsula, it is deflected and forms the Weddell Gyre and meets the West Wind Drift to the north. Another gyre is found in the Ross Sea [1]. Where the West Wind Drift and the East Wind Drift meet and turn away from each other is known as the Antarctic Divergence, with the Antarctic Continental Current being deflected south and the Antarctic Circumpolar Current going north. This causes an upwelling of nutrient rich water known as the Circumpolar Deep Water and forms the base of a species rich community [1]. In the waters near the Antarctic continental shelf, the ice masses and the strong winds cool the water and sea ice forms with a resultant increase in the salinity of the water. As the salinity increases so does the density of the water, to such an extent that it is the densest water of all the free oceans on Earth. The result is that it sinks down the continental margin and becomes the Antarctic Bottom Water. This water is rich in oxygen and serves to ventilate the ocean depths. The continental shelf is quite narrow and soon slopes to great depths. During the summertime, the Sun is above the horizon for up to 24 hours a day and almost all the sea ice melts. Though the water is extremely cold, it is rich in carbon dioxide and oxygen with high levels of phosphates, nitrates and other plant nutrients, stimulating a period of intense growth by unicellular algae, or phytoplankton, especially diatoms. In the East Wind Drift, where the winds are more moderate than those further north, growing conditions for these cold water species are ideal. Phytoplankton is at the base of the Antarctic food web and small zooplankton species like copepods, krill and fish larvae feed on them. Eleven species of krill have been observed in the Antarctic waters, with *Euphausia superba* being the best known [1]. *E. superba* are primary consumers and they are eaten by secondary consumers such as pelagic molluscs, arrow worms, salps and jellyfish. These are eaten by fish and squid, which are, in turn, eaten by penguins, seals and predatory fish. The top predators of the Antarctic food web are the leopard seals and orcas. Sometimes, stages of a food web can be omitted and one of shortest food chains in marine environments can be found

*Dives of the Gentoo Penguins (*Pygoscelis papua*) are up to 100m deep at Ardley Island (King George Island)*

Hard bottom fauna at 30m depth (Ras Tu, Fildes Bay, King George Island)

in Antarctic waters: huge baleen whales feed on krill. This shortcut results in a highly efficient resource exploitation [1].

The major part of the Antarctic coast is covered by ice and this slowly flows into the sea. Under the ice, lives the species rich community of the Antarctic benthos, the flora and fauna of the sea floor. Colonisation of the shallow water in the pack ice zone is limited due to erosion by the ice and the formation of "anchor ice". The latter are ice formations made from irregularly oriented ice crystals that adhere to submerged objects such as marine organisms, rocks and other ice formations like sea ice. Anchor ice formations can be of large proportions and allow the benthic animals to float to the surface because of the lesser density of the ice compared to that of the water. Disturbance by anchor ice rarely occurs below 30m, with that between 15 to 30m being disturbed only occasionally [15].

In areas north of the pack ice, there are rich intertidal and sub-littoral communities with particularly large kelp beds [1]. In water deeper than 30m, the benthic communities are dominated by suspension feeders such as sponges, bryozoans, ascidians and sea anemones and these are preyed upon by sea stars, small crustaceans and molluscs. Rocky surfaces, if not affected by ice, are often completely covered by colourful sessile animals or algae. As a consequence of the low water temperatures and seasonal food supply, these animals have a low basic metabolic rate. They grow more slowly than their relatives in warmer waters but often become larger and live longer [7, 16].

The Antarctic krill, *Euphausia superba*, is a 3 to 6cm long bioluminescent crustacean and is food to many animals of the Southern Ocean. The Crabeater seal relies on these planktonic arthropods for food and it is estimated the

*The Antarctic Fur seal (*Arctocephalus gazella*)*

seals consume 100 million tons of krill each year, seabirds another 40 million tons a year and a single large baleen whale as much as one ton a day [1]. *E. superba* live 2 to 3 years [17] with the larvae developing under the ice during the winter and emerging as juveniles in the spring [18]. Communities of microorganisms growing on the underside of sea ice provide food for overwintering adult and larval krill. The juveniles are dependent on this food source, though the adults are able to survive without it [19]. The larger the sea ice, the larger the communities of microorganisms and the more favourable the conditions for the Antarctic krill [20]. Swarms of krill can extend over many kilometers and consist of billions of individuals, colouring the water a reddish brown and, in the darkness, their bioluminescence gives the ocean a yellow-green glow [21]; however, in recent years, there has been a marked decline in the abundance of krill in the vicinity of the Antarctic Peninsula. It has been suggested this decline is the result of poor breeding success due to reduced winter sea ice development [22].

Mean air temperature in an Antarctic winter is between -18 and -29°C near the coast, whilst the temperature on the polar plateau can be as low as – 68°C. In summer temperatures can rise to 0°C on the coast and -40°C in the interior of the continent. In contrast to the air, water temperatures vary only a little, between 2 and -1.9°C. Many marine species are adapted to these low temperatures but can only survive within the small range.

Members of the suborder Notothenioidei, the Antarctic icefish, survive at temperatures of –1.9°C, the freezing point of sea water, and dominate the fish fauna of the Antarctic Ocean, accounting for more than half of all Antarctic fish species [23] and 90 to 95%

of the fish biomass [24, 25]. This success is linked to the presence of a special blood borne glycoprotein "anti-freeze", which prevents the freezing of their body fluids, whose equilibrium freezing point, −0.7 to −1°C, is significantly higher than that of seawater [26]. Those icefish of the family Channichthyidae are the only known vertebrate animals to lack hemoglobin as an adult. Oxygen is found solely as a physical solution in their blood, which has an oxygen carrying capacity of less than 10% of the other Notothenioidei fish [27]. Their blood volume is also greater and the diameter of the capillaries is unusually large [28].

The most conspicuous members of the Antarctic avifauna are the penguins. Three genera are present in the Antarctic: the *Pygoscelis* (Adélie, Chinstrap and Gentoo penguins), the *Eudyptes* (Crested penguins) and the *Aptenodytes* (King and Emperor penguins). Penguins are not capable of flying and on land they appear somewhat clumsy but in water, with their streamlined bodies, they are fast, agile swimmers, capable of hunting fish, squid and krill. With a dense water-repellant plumage, down and a thick layer of fat between the skin and the muscles, penguins are well adapted to the low temperatures on land and in the water. On land, skuas feed on penguin chicks and in the water, adult penguins are prey to leopard seals and orcas. In former times, whole colonies of penguins were exterminated by humans due to their eggs being collected for food and the killing of the adults for oil from their fat. Furthermore, penguins were used as fuel in the process of heating whale blubber to produce oil [29].

Two of the three Pinniped families, the seals, are present in the Antarctic. The majority belong to the Phocidae family, the true seals. They are distinguished by having rear flippers that cannot be moved forward, therefore on land these seals have to pull themselves along with their front flippers, whilst in water they use their rear flippers as propulsion. The Crabeater seal, the Leopard seal and the Southern Sea Elephant, the largest of the seals with a weight of up to 4000kg, are all Phocidae [7]. Otariid seals can walk using both their front and rear flippers and have external ears, hence they are sometime called eared seals. The Antarctic Fur Seal (*Arctocephalus gazella*) is the only representative of otariids in the Antarctic. Unlike the true seals, the Antarctic Fur Seals, because of their fur, have been the subject of commercial exploitation. Since Cook's reports of massive fur seal colonies in the southern polar regions, Antarctic Fur Seals were hunted close to extinction during the first half of the nineteenth century [30, 31]. Weddell calculated that 1.2 million fur seals had been killed on the island of South Georgia [32]. Latterly, agreements on the conservation of marine mammals have al-

Penguin colony at Ardley Island (King George Island) lowed most seal colonies to have recovered to their pre-1800 levels [1].

As well as the seals, the large baleen whales have also suffered severe persecution. About twenty species of whales can be observed in Antarctic waters; however, most are visitors. The majority of baleen whale species are Blue, Fin, Sei, Minke, Humpback and Southern Right whales, with the toothed whales represented by the Sperm and Southern Bottlenose whales. Baleen whales are migratory species and go to the Southern Ocean to feed. During the southern summer, they benefit from feeding on the large swarms of krill and build up layers of body fat for their long migration back to their breeding grounds in tropical and sub-tropical waters. In Antarctic waters, whales ingest approximately 90% of their annual food intake and double their weight [7]. Experts are concerned that the recent large scale exploitation of Antarctic krill (*Euphausia superba*) could have consequences for the development of whale populations, which are still affected by former intensive hunting and ongoing persecution for so called "scientific purposes".

Biological surveys are carried out, using different methods. Animals like seals and birds that breed on land can be counted and, in some cases, marked during their stay on land. Also, their off-spring can be relatively easy recorded whilst waiting for their parents. For those animals living totally in the water, counting is much more complicated. Whales are surveyed by flying transects in helicopters or small aircraft. Within a distinct area, a previously defined pattern is flown and individuals counted. It is also possible to identify individual whales by shape and patterns on their flukes. To get an impression of the phyto- and zooplankton populations, nets of different mesh sizes are used, dependent on the species to be studied. The nets are released from a ship and hauled up vertically, trapping and concentrating particles in a holding tank at the bottom of the net, from where they are removed for closer analysis.

With the help of trawl nets, pulled over a certain distance along the seabed and taking into account the mesh size, it is possible to get an idea of the fish biomass living on or above the seabed. Similar but more robust nets with sledge-like steel frames, Agassiz trawls, are used to investigate the sessile and benthic fauna. These nets can take quite a bit physical impact from rocks and boulders but they have the disadvantage of being non-selective and can catch smaller rocks and boulders with the potential to destroy the animal catch. A much less intrusive way to investigate the flora and fauna of the sea is to Scuba dive. The wildlife can be observed in its natural habitat and left largely intact. Photo or video transects can be conducted and, if required, selective samples taken.

Diving in Antarctic waters

G. Niedzwiedz, D. Schories, G. Kohlberg

At the beginning of the 19th century, more than 50 years before regular diving expeditions commenced, Willy Heinrich, a member of Erich von Drygalski's Deutsche Sudpolar Expedition, was diving below the Antarctic ice using a Siebe diving helmet and a canvas suit; however, this was not to make scientific observations but to conduct repairs to his ship [33]. Diving in general became popular during the 1950s, after Jacques-Yves Cousteau co-developed the Aqua-Lung and published his famous book, *The Silent World: A Story of Undersea Discovery and Adventure* [34] and so it is not surprising that diving in Antarctic waters for scientific research started in the same decade and today offers a tool for the collection of species and experimental work in shallow waters [35].

Thanks to the development of Scuba diving equipment, divers became independent of their air hoses and this led to a rapid increase in Antarctic diving. Sixty years ago, diving was more hazardous than it is today, when divers were unaware of many of the dangers we know of now. It is surprising that, so far, very few serious accidents have befallen divers on scientific expeditions within the Polar regions [36], with only one incident a year reported for the period 2007 to 2009 [37, 38].

From November, 1961 to October, 1962, Verne E. Peckham made thirty-five solo dives to depths of 50m in Antarctic waters and not only during summer but also in the dark winter period. Peckham reached depths where glass sponges were the prominent species of the benthic fauna [35]. A few months later, John S. Blunt was diving under sea ice 4 to 5 metres thick to collect microalgae. Until the 1967/1968 season, when recommendations drafted by James Stewart were adopted, diving in Antarctic waters, especially at the McMurdo Station, was unregulated [35].

Since the beginnings of Antarctic Scuba diving, divers have been reaching depths of up to 67 metres [35]. Recently, off Deception Island, a Russian dive team, breathing mixed gases, in an expedition organized by the Republic of Tartarstan branch of the Russian Geographical Society, reached a depth of 97 metres; though the reasoning behind such dives must be questioned.

Without doubt, Antarctica is a continent of high drama and immense beauty, both above and below the sea; however, the remoteness and harsh weather demand great attention to the hazards involved in diving there. These include water temperatures of near freezing to below -2°C at any depth, air temperatures far below these, combined with strong winds leading to even lower apparent temperatures (wind chill). Also, the long distances between dive sites, base camp and medical facilities (decompression chambers, etc.) are additional factors to be considered, as well as ice on shore and at sea, drifting ice fields and icebergs. There are also logistical and transport problems specific to Antarctica, which may affect and complicate the safety of a diving expedition (e.g. chain of rescue).

There is no doubt that the cold is the greatest problem. The dive team recruited for the expedition must be very experienced and have routines for handling diving equipment suitable for use in extremely cold water, including the dry-suit and full-face mask.

Soft bottom fauna near the Chilean station Escudero at 43m depth

Experience and training in the technical ways of responding to the additional physiological problems of diving under Polar conditions are also essential.

These physiological problems can be: 1) a reduction in working capacity because of decreased agility and strength in the arms, hands and fingers due to the cold, this in turn impairs the ability for self-rescue and even turning off a tank valve in the case of a frozen regulator; 2) a greater risk of compression sickness because of the increased amount of inert gas dissolved in the body tissues due to the decreased temperatures; 3) increased energy consumption to maintain the bodies temperature; 4) an increased risk of Nitrogen narcosis (Rapture of the Deep); 5) weakening mental abilities and cognitive performance and 6) accelerated diuresis – the production of urine by the kidneys.

In preparation for a Polar diving expedition, specific technical measures need to be taken. Owing to the expected extremely low temperatures and the susceptibility of the equipment to this cold, it is no longer absolutely safe: equipment made from plastic and rubber materials are brittle in the cold and and are susceptible to failure (regulator hoses, neoprene, lines). When diving into water below 10°C it is strongly recommended that a second regulator is connected to a second, separately lockable cylinder valve; however, this is of little use if the diver is no longer able to turn the correct cylinder valve because of limited mobility due to thicker diving suits and underclothes, cold, stiff fingers and lowered powers of concentration. In this situation, it is imperative that the diver has a dive-buddy in the immediate vicinity. Should a regulator blow off (a typical occurrence when a high pressure stage becomes frozen), not only must the air supply be immediately stopped to prevent further loss of gas but the diver must also change to the second regulator. Should a regulator blow off (a typical occurrence when a high pressure stage becomes frozen), not only must the air supply be immediately stopped to prevent further loss of gas but the diver must also change to the second regulator.

If the main regulator is inserted into a full-face mask, the mask must first be removed under water and this could lead to another physiological problem: the diving reflex. The diving reflex occurs in all mammals when receptors in the face are triggered by cold water and may cause respiratory standstill, a slowed heart beat and a centralizing of the bloodstream. Unless the full-face mask is fitted with a regulator specifically designed for use at such extreme temperatures, its use should be questioned.

A full-face mask should always be put on at the water's surface, consequently, breathing through the regulator also starts at the surface, with the possibility that the regulator could freeze if the air temperature is well below 0°C. This would not be a problem if the regulator could be placed into the mouth underwater but this cannot be achieved with a full-face mask.

The freezing of regulators is due to a phenomenon called the Joule-Thomson effect and can also occur at temperatures above 0°C. In situations where a flowing gas experiences a sudden reduction in pressure (e.g. as it passes through a valve, a sintered metal filter, etc.), a significant drop in temperature can be observed. This can cause the moisture in the gas to freeze and block valves, etc., preventing them from closing properly, allowing the gas to flow uncontrolled and cause a further reduction in temperature. At other times, the air supply might suddenly stop and to prevent this, the diver must avoid taking

Weather conditions can change quickly in Antarctica. Accumulating floating ice may complicate a safe return to the shoreline within minutes

*Brown algae (*Desmarestia *spp.) often cover vertical cliffs between 15 and 30m depth*

excessive amounts of air from his supply tanks by not, for example, simultaneously inhaling and inflating his dry suit; however, under all circumstances the humidity of the air in the tanks must be kept to a minimum and this is achieved by careful handling of the compressor when filling the tanks.

In the last two decades, more and more commercial enterprises offer the opportunity to visit Antarctica, with some of these facilitating Scuba diving. It is strongly recommended that anyone considering such a venture be very aware of their own abilities, the abilities of the provider to execute a competent rescue plan and how this plan differs from specific scientific diving regulations. These regulations vary from country to country but will provide very good background information [39]. IIrrespective of which dive regulations are consulted, it also recommended that details of the general risks of polar diving and the risks specific to the chosen dive site are known. Hence, diving in Antarctic waters must only be pursued with a high degree of professionalism and a great respect for the inherent dangers [40], including those presented by marine animals. Interactions between divers and leopard seals (H*ydrurga leptonyx*) were given in detail after a marine biologist from Rothera Research Station on Adelaide Island, to the west of the Antarctic Peninsula, was attacked and drowned by these animals [41]. Having said all the above, if all the difficulties can be overcome and the risks minimized, diving in Antarctic waters is a truly amazing experience.

Underwater monitoring, GPS techniques

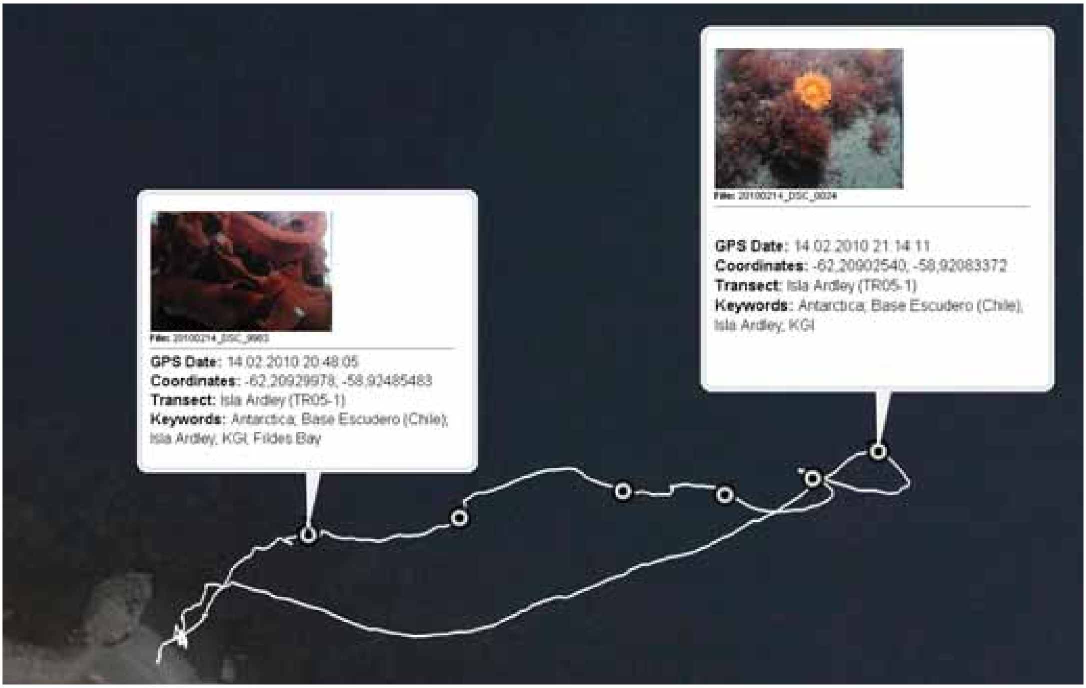
G. Kohlberg, D. Schories, G. Niedzwiedz

The quality of scientific sampling, monitoring and underwater mapping is becoming increasing dependent on the recording of the exact time and location of the object of interest. This might be the object itself or a visual record of the object by high resolution photography, video sequences or underwater mapping, or a combination of any of these.

Ideally, these data are accompanied by other geo-referenced physical and chemical information, for example, temperature, salinity, depth and light. Geo-referencing using a Global Positioning System (GPS) is commonly used for land-based work; however, it is not possible to use a GPS underwater as the connection between the receiver and the satellites is by high frequency radio waves and these only penetrate the water column by a few centimeters.

A "gateway" is required between the GPS receiver and a radio antenna mounted on a buoy on the surface of the water, to enable communication with the satellites. The gateway can be a cable carrying an electrical signal or a transducer using an acoustic signal. For scientific diving, a cable is the preferred option. This method is being continually developed and has been praised for its performance, as it is the only method allowing the continual correction of errors in the data stream [577, 578].

The GPS receivers are hand-held devices, carried by the divers in waterproof housings, with the gateway cable being connected to the receiver. The data and other information

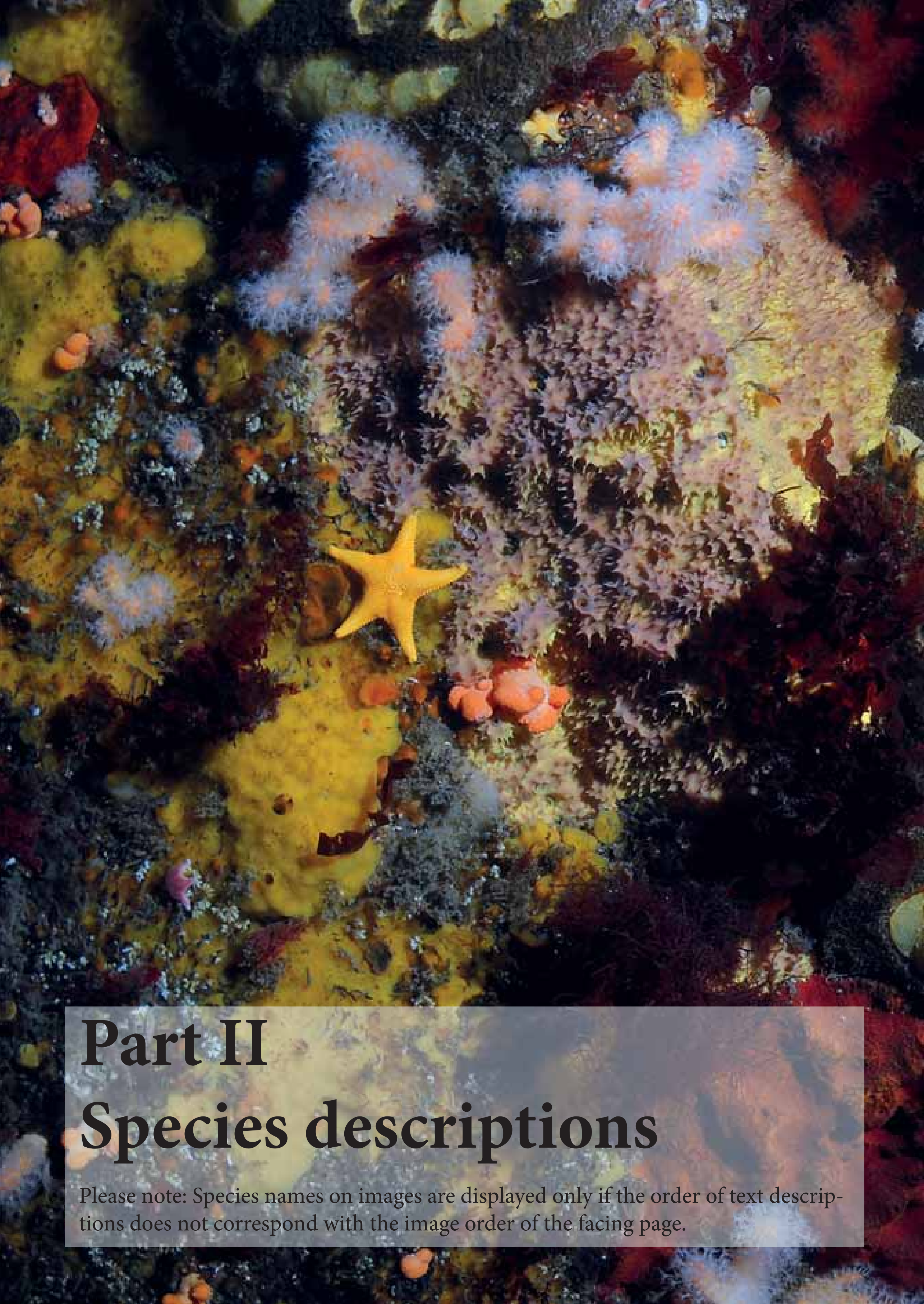


Geo-referencing of Underwater images using a diver-towed GPS buoy for positioning are clearly displayed on a screen on the receiver. The length of a diving operation, from a GPS point of view, is limited only by the data storage capacity of the receiver and its battery life. The positional accuracy of the system is sufficient for most purposes as the majority of scientific diving takes place in water less than 20m deep.

As well as being used for geo-referencing the various forms of data obtained during a diving operation, the system can be used as a navigational aid and the safety and efficiency of dive operations has significantly increased since GPS have been used, rather than the traditional methods using charts and compasses. Despite the benefits of the GPS system, there are some problems with it that cannot be ignored. If the gateway cable length exceeds the diving depth, then the buoy will not be directly above the diver and this difference is constantly changing. As the satellite gives the position of the high frequency antenna mounted on the buoy rather than the receiver held by the diver, this can lead to constant inaccuracies of the position of the object under study. The strength and direction of current at different depths of water make it almost impossible to accurately correct this offset. In some sea conditions, the movement of the buoy is too fast; also, if the cable length is insufficient and the sea heavy, the buoy can be dragged underwater, hindering the radio signal between the antenna and the satellites. In an attempt to overcome these issues, a mathematical model has been developed for use with underwater GPS.

Geo-referencing by GPS is now the standard method used for geo-referencing in both land-based and marine field research; however, during a Chilean Biodiversity project at Fildes Bay on King Georges Island in the South Shetland, the authors were the first to use a diver-towed GPS buoy in the harsh conditions of the Antarctic seas. The equipment was towed along predefined transects at depths of 2.5m to 30m, during a two month stay in the Antarctic. Although, due to the weather conditions, the GPS signal was often not perfect, a maximum horizontal error of only 10m was recorded and all transects were surveyed as planned. Using the diver-towed GPS buoy allowed the location of even small communities to be recorded over three consecutive years and the development of, for example, huge sponges to be observed. Additionally, it has been possible to record the position of underwater cameras without the need to deploy marker buoys on the water's surface, where they are at constant risk of being "relocated" by icebergs.

Determination of substrate coverage using the point count methodology of the software programme CPCe 3.6 [579]



Part II
Species descriptions

Please note: Species names on images are displayed only if the order of text descriptions does not correspond with the image order of the facing page.

Green Algae, Chlorophyta

M.E. Ramirez, D. Schories, G. Kohlberg

In contrast to red and brown algae, the green algae, Chlorophyta, live mainly in freshwater. About 4,000 species are described worldwide, with 22 occurring in Antarctica. A high percentage of marine chlorophytes are single-cell organisms; however, there are multi-cellular green algae, most having a simple structured thallus. The chlorophyll is normally not masked by other pigments, so Chlorophyta are bright green in colour.

Lambia antarctica (Skottsberg) Delepine 1967

Ulvophyceae, Bryopsidales, Bryopsidaceae

The thallus of *Lambia antarctica* is light to dark green. It has a stoloniferous basal system with unbranched, erect siphons, which are up to 40cm long and 3mm in diameter [41]. The reproduction is realized by swarmers of unknown nature [41]. *L. antarctica* is found off the Antarctic Peninsula, the Subantarctic Islands, South Orkney Islands and South Shetland Islands [42, 43] in depths from 17 to 105m [41]. In Fildes Bay *L. antarctica* was usually found on silt in depths between 25 to 45m.

Monostroma hariotii Gain 1911

Ulvophyceae, Bryopsidales, Bryopsidaceae

The thallus of *Monostroma hariotii* is delicate, unbranched and tubular and of light green to brownish green colour. The thallus is growing from a minute holdfast and its size is up to 6.5cm in diameter and 22cm in length [44, 45]. This species develops very quickly during summer months. *M. hariotii* is found in Argentina and the Falkland Islands, the Antarctic and Subantarctic Islands, Kerguelen Islands, South Shetland Islands, Macquarie Island, South Orkney Islands and in Wilkes Island. *M. hariotii* lives in the intertidal, tide pools and locally in the subtidal down to 26m depth [46], often epiphytic on big brown algae.


Brown Algae, Ochrophyta

M.E. Ramirez, D. Schories, G. Kohlberg

The brown algae are classified as a class, Phaeophyceae, within the Ochrophyta phylum. Most of the species are marine. As with all algae, they are photoautotrophic, satisfying their whole energy demand from solar radiation, CO2 and inorganic matter, and produce oxygen. Approximately 1500 species are described worldwide [47], twenty-seven for the Antarctic region [43]. In addition to chlorophylls a, c1 and c2, brown algae possess yellow-brown pigments, such as fucoxanthin. These mask the green chlorophylls and add colours ranging from olive green to various shades of brown. On temperate, rocky shores, brown algae are often the dominant primary producers. They include the largest and most complex seaweeds. *Macrocystis pyrifera* can grow to a length of 100 metres [47]. Many species can withstand exposure to the atmosphere at low tide. Some Ochrophyta are cultivated, or harvested from wild stocks, for the production of algin, an important phycocolloid used in the production of food and pharmaceuticals.

Ascoseira mirabilis Skottsberg, 1907

Phaeophyceae, Ascoseirales, Ascoseiraceae

The thallus of *Ascoseira mirabilis* is of light brown colour and consists of several strap-like fronds which can be up to 1.5m long and 12cm broad. The holdfast is discoid [43]. Maximum growth rates of perennial algae were measured in late winter and spring [43]. *A. mirabilis* is endemic to Antarctica, the Antarctic Peninsula, South Orkney Islands, South Shetland Islands, South Georgia, and Anvers Island [43, 48]. Depth distribution at King George Island is between the intertidal and 15m [46, 49]. This species can be found in very exposed areas on rocks and pebbles and is well adapted to shaded conditions [43].

Adenocystis utricularis (Bory de Saint-Vincent) Skottsberg 1907

Phaeophyceae, Ectocarpales, Adenocystaceae

The thallus of *Adenocystis utricularis* is brown, unbranched, saccate and filled with mucilage. This species reaches lengths of up to 10cm and grows gregariously. Surface depressions with hairs are scattered all over the thallus. The thallus wall consists of 1-8 layers, depending on the age of the specimen. Cells contain discoid chloroplasts with one pyrenoid [43, 50]. The sporophyte is macroscopic. The spores develop into microscopic filamentous, dioecious gametophytes, which produce plurilocular gametangia [51, 52].

A. utricularis is found along the Chilean coast [50], Argentina from 42°15'S-63°0'S [53], New Zealand, Southern Australia, South Shetland Islands, South Georgia, the Subantarctic Islands and the Antarctic Peninsula. *Adenocystis utricularis* grow abundantly in tide pools, the lower eulittoral and upper sublittoral region down to depths of 20m. It is a cold-, but not shade adapted species. This species can attach to hard bottom, living animals and other macroalgae.


Chordaria linearis (J.D. Hooker & Harvey) A.D. Cotton 1915

Phaeophyceae, Ectocarpales, Chordariaceae

Chordaria linearis is characterised by dark brown fronds which are formed by several main axes with several orders of branches. Antarctic specimens are up to 12cm long. The medulla consists of elongate colourless cells. Colourless hairs are sometimes present. The morphology is variable across its geographical range [43]. *C. linearis* has an obligate sexual life history in which a macroscopic sporophyte alternates with a monoecious microscopic gametophyte. Gametes are produced only in short days, whereas in long days, asexual zoospores are produced [54]. *C. linearis* is found in Argentina, Chile, Falkland Islands, Antarctic Peninsula and Subantarctic Islands, Anvers Island and King George Island [43, 54, 55] in depth of up to 3m. It is present in the sublittoral on hard substrata.

Desmarestia anceps Montagne 1842

Phaeophyceae, Desmarestiales, Desmarestiaceae

The sporophyte of *Desmarestia anceps* is bushy and up to 4m long. The brown thallus has a main axis and several orders of mostly opposite branches. The massive rhizoid consists of dense haptera passing into a flattened cauloid [43, 46]. Sporophytes are perennial achieving maximum growth in September [56]. This species is found in Chile, at the Antarctic and Subantarctic Islands, Anvers Island, South Shetland Islands, South Orkney Islands [42, 43, 55, 57]. *Desmarestia anceps* can form dense canopies at vertical cliffs and is very common on rock bottom. It is growing deeper than *D. meneziesii*. In the bays of King George Island *D. anceps* is widely distributed in depths between 10 to 30m, but may occur down to 90m [46].

Desmarestia antarctica R.L. Moe & P.C. Silva 1989

Phaeophyceae, Desmarestiales, Desmarestiaceae

The bushy thallus of *Desmarestia antarctica* is robust, of brown colour and irregulary branched. It can be up to 2m in length. Ligulate blades are up to 14mm long, narrowed at their base. Juvenile algae appear delicate [43, 46]. Sporophytes are annual and grow predominantly at the end of winter and spring. Microscopic gametophytes may grow endophytically [43]. *D. antarctica* is found at the Antarctic and Subantarctic Islands, Anvers Island, South Shetland Islands and South Orkney Islands [43, 55, 58]. It lives on rocks and pebbles, also often epiphytic in the low intertidal and the sublittoral at depths between 10 and 50m [46]. In Fildes Bay this species is less abundant than *D. menziesii* and *D. anceps*.

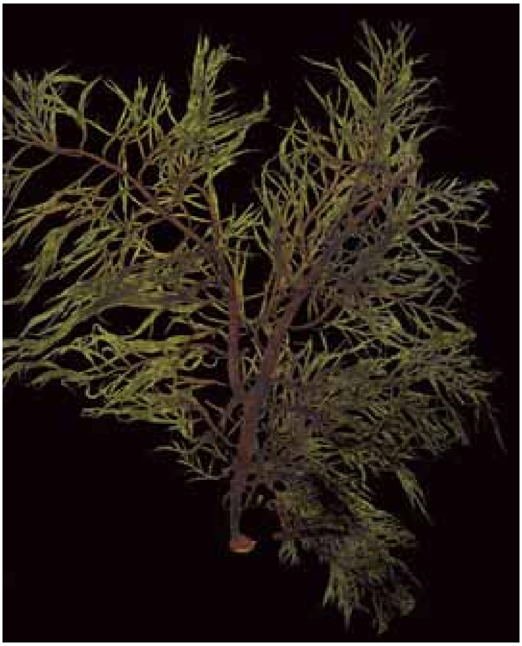


Desmarestia menziesii J. Agardh 1848

Phaeophyceae, Desmarestiales, Desmarestiaceae

The sporophyte of *Desmarestia menziesii* is brown, bushy and can be up to 3m long. The main axis with opposite branches is growing from a small conical holdfast. The flattened fronds are up to 2mm wide with up to four orders of branches [43, 46]. Sporophytes are perennial and grow predominantly at the end of winter and spring. This species is found at the Antarctic and the Subantarctic Islands, Anvers Island, Ross Sea, South Georgia, South Shetland Islands, Terre Adélie, Trinity Island and Wilkes Land [43, 55, 58-61].

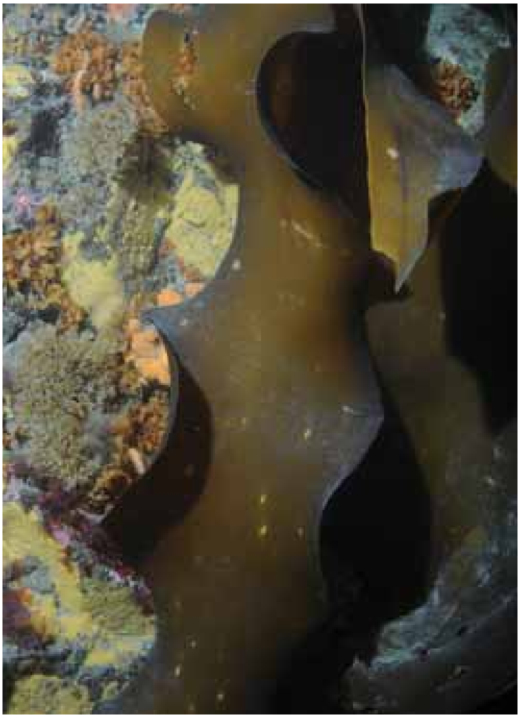
D. menziesii can form dense canopies at vertical cliffs and is very common on rocky bottoms. Sometimes it is also present in tide pools. It is growing shallower than *D. anceps*. In the bays of King George Island *D. menziesii* is widely distributed in depths down to 15m, but it may occur down to 60-80m [46].



Himantothallus grandifolius (A. Gepp & E.S. Gepp) Zinova 1959

Phaeophyceae, Desmarestiales, Desmarestiaceae

The thallus of *Himantothallus grandifolius* can be up to 1m and more wide and 25m long. It is of dark brown colour and a leathery texture with corrugated edges. The short cauloid is often helically twisted [43, 46]. The gametophytes are microscopic and dioecious. They become fertile during short days. *H. grandifolius* is the largest Antarctic kelp species. It is found at Antarctic and Subantarctic Islands, Anvers Island, South Georgia, South Shetland Islands, Terre Adélie and Trinity Island in depths from 10 to 100m [43, 46, 55, 59-61]. *H. grandifolius* lives attached to stones and rocks with a rhizoid formed by innumerate appendages. It can form dense aggregations or is canopy-building in the sublittoral [46]. It is a very common species around King George Island.



Phaeurus antarcticus Skottsberg 1907

Phaeophyceae, Desmarestiales, Desmarestiaceae

The thallus of *Phaeurus antarcticus* is filamentous and up to 30cm long. It is linear, whip-like and covered densely with fine hairs. Branching is opposite. The holdfast is up to 1cm in diameter and 1-3mm thick [42, 43, 62]. Sporophytes grow within a temperature range from 0 to 10°C. The upper survival temperature is about 11 to 13°C [63]. *P. antarcticus* is found off the Antarctic Peninsula, Subantarctic Islands, South Shetland Islands, South Orkney Islands and Anvers Island [43, 55, 64]. This species settles on substrata from tide pools down to 10m in the sublittoral, rarely at depths of 10-20m at rocky shores and exposed sites [46].

Cystosphaera jacquinotii (Montagne) Skottsberg 1907

Phaeophyceae, Fucales, Seirococcaceae

The thallus of *Cystosphaera jacquinotii* can reach a length of up to 3m and is attached by a conical holdfast. The main axis bears opposite, flat lateral branches. Marginal gas bladders develop in the axils of some laterals. Growth occurs from an apical meristem [41]. Life history is diplontic. Sexual reproduction is oogamous and individuals are monoecious [41]. *C. jacquinotii* is found at the Antarctic and the Subantarctic Islands, Antarctic Peninsula, Anvers Island and South Shetland Islands [43, 48]. Depth distribution at King George Island is between 20-50m [46]. *C. jacquinotii* grows attached to hard bottoms at semi- exposed and exposed sites.

Syringoderma australe Levring 1940

Phaeophyceae, Syringodermatales, Syringodermataceae

The thallus of *S. australe* is dark green or brown, flattened and generally fan shaped with a marginal row of apical cells. It is up to 4cm long and 3cm wide [43]. The species is relatively rare and known only from a few collections. *S. australe* is found at the Antarctic and Subantarctic Islands, South Shetland Islands and South Georgia [43, 65, 66]. Various individuals of *S. australe* were collected at Ras Tu in Fildes Bay in a depth between 30 and 40m. It was found on rocks and growing attached to other organisms.

Phaeurus antarcticus

Cystosphaera jacquinotii

Red Algae, Rhodophyta

M.E. Ramirez, D. Schories, G. Kohlberg

About 4000 species of the red algae Rhodophyta are known worldwide, with only a few of them living in freshwater environments [47]. In marine environments, there are more red algae than brown and green algae combined [47]. So far, in the Antarctic region, 66 species have been described [67]. The structure, size and complexity of the red algae thallus are less distinctive than the brown algae. The red to dark red or almost brown appearance of the Rhodophyta derives from the red pigments of the group phycobilins, the existing chlorophylls being covered by these. Coralline algae, like *Corallina*, have a calcified thallus and play a fundamental role in the development of coral reefs. As well as the Ochrophyta, the Rhodophyta are of economic importance, being cultivated and harvested for the phycocolloids carrageenan, an emulsifier, and agar, a thickener used to produce jellies in the food and pharmaceutical industries.

Pyropia endiviifolia (A. Gepp & E. Gepp) H.G. Choi & M.S. Hwang

Bangiophyceae, Bangiales, Bangiaceae

The thallus of *Pyropia endiviifolia* is dark olive-green. *P. endiviifolia* is known from the Antarctic Peninsula [58, 68], South Georgia [43], South Orkney Islands [43, 64] and the South Shetland Islands [43, 60, 69]. *P. endiviifolia* grows epilithic in the upper eulittoral.

Myriogramme manginii (Gain) Skottsberg 1953

Florideophyceae, Ceramiales, Delesseriaceae

The fronds´ colour of *Myriogramme manginii* varies from pink to purple red. Blades are leaflike and up to 20cm long and 8cm wide. The midrib is subdichotomously branched into minor veins [43]. The species is very shade and cold adapted. It has a triphasic isomorphic life history [43]. It is present at the Antarctic Peninsula [42, 58, 64, 68, 70], Subantarctic Islands [43], Anvers Island [71], South Orkney Islands [43] and South Shetland Islands [43]. It grows from the upper sublittoral down to 43m and it was found regularly at Fildes Bay in depths of about 30m.

Pyropia endiviifolia

Paraglossum salicifolium (Reinsch) S.-M. Lin, Fredericq & Hommersand 2012

Florideophyceae, Ceramiales, Delesseriaceae

The thallus is red with one to several foliose blades. The blade is up to 25cm long and 4 to 18mm wide, midrib with rhizoidal filaments, apices acute and cystocarp covered with outgrowths [43]. *P. salicifolium* has a triphasic isomorphic life history. Gametophytes are dioecious. Like in several other species of this family blades can develop from overwintering midribs. This species is similar to *D. lancifolia*, which can be differentiated from it by its bigger size, blunt apices and the lack of outgrowths of the cystocarps. *P. salicifolium* is reported from the Antarctic Peninsula [58, 70] South Georgia [43, 64], South Orkney Islands [43], South Sandwich Islands [43], South Shetland Islands and several Subantarctic Islands [43]. *P. salicifolium* was collected at Ras Tu (Fildes Bay) in depths between 30 - 45m, but it is also reported from shallower locations [43]. *P. salicifolium* was collected at Ras Tu (Fildes Bay) in depths between 30–45m, but it is also reported from shallower locations [3].

Phycodrys quercifolia (Bory) Skottsberg 1922

Florideophyceae, Ceramiales, Delesseriaceae

Fronds of *P. quercifolia* are pinkish red, reaching a length up to 25cm. Blades with percurrent midrib are resembling an oak-leaf [43]. The life cycle is triphasic and isomorphic [43]. The species is known from Southern Chile and Argentina [53, 57, 73], the Falkland Islands [43, 74], Peru [57], Australia and New Zealand [74-76]. It is also present in the Antarctic Peninsula [43, 64], South Georgia [43] and South Shetland Islands [43]. This species is known from the lower eulittoral down to 40m. It may grow epilithic, attached to other algae or sessile invertebrates.

Georgiella confluens (Reinsch) Kylin 1956

Florideophyceae, Ceramiales, Wrangeliaceae

The thallus of *G. confluens* is dark brown or purplish red with a size of up to 30cm, rarely bigger. Fronds are feathery and oppositely branched. Main axes are flattened and up to 4mm wide [43]. *G. confluens* has a triphasic isomorphic life history with dioecious gametophytes. This species is perenne and cystocarpic plants are present throughout the year [43]. *G. confluens* is endemic to Antarctic waters. It is reported from the Antarctic Peninsula [42, 58], the Balleny Islands [43], South Georgia [43], South Orkney Islands [43], South Sandwich Islands [43] and South Shetland Islands [43, 60, 69]. It grows attached to different types of hard substrate or epiphytic on other algae. In Fildes Bay it was frequently found in up to 30m depth.

Gigartina skottsbergii Setchell & N.L. Gardner 1936

Florideophyceae, Gigartinales, Gigartinaceae

The colour of the thallus varies from red, purple to dark pink and is umbilicate or irregularly lobate in shape containing many papillae on the upper surface. Largest individuals at King George Island had a diameter of about 80cm. The algae is attached by a short stipe and secondary haptera to the surface [43]. Gametophytes and tetrasporophytes are more or less isomorphic. Gametophytes are dioecious. The thallus is pseudoperennial with highest densities during summer months [43]. *G. skottsbergii* is widely distributed in Southern Chile and Argentina [53, 57], Falkland Islands [43], the Antarctic Peninsula [43, 58, 68, 70], Anvers Island [70], Kerguelen Islands [43], South Orkney Islands [43] and South Shetland Islands [43, 60, 69]. This species is usually found growing on hard substrate and can occur in high densities in intertidal pools and the upper sublittoral. Maximum distribution depth is about 30m [43].

Iridaea cordata (Turner) Bory de Saint-Vincent 1826

Florideophyceae, Gigartinales, Gigartinaceae

The thallus of *Iridaea cordata* is brown to dark reddish. The fronds are mainly cordate sometimes ovate or lanceolate and up to 1m long. The small holdfast is discoid with an up to 3cm long stipe [43]. The life-history is triphasic, gametophytes and tetrasporophytes are isomorphic. Sexual thalli are dioecious. The thallus is pseudoperennial with highest abundances during summer months [43]. This species is widely distributed in Southern Chile and Argentina [53, 57, 78], the Falkland Islands [72], Australia, New Zealand [72] and the Antarctic and Subantarctic Islands [58, 68, 70]. It ususally grows epilithic in tide pools, but is more abundant in depths down to 10m. Maximum distribution depth is about 30m.


Palmaria decipiens (Reinsch) R.W. Ricker 1987

Florideophyceae, Palmariales, Palmariaceae

Fronds of young tetrasporophytes and male gametophytes are simple in the first year whereas older plants proliferate from the lower parts of the blades from the previous year. The lancelote blades are up to 70cm long. Female gametophytes build small crusts [43], which develop a few days after spore settlement [43]. *P. decipiens* is known from the Antarctic Peninsula [58, 68], Anvers Island [71, 77], Deception Island [60], Heard Island [79], Kerguelen Islands [43], Macquarie Island [43, 79], South Georgia [79, 80], South Shetland Islands [60, 68, 69], Trinity Island [60] and Wilkes Land [61]. *P. decipiens* is mainly epilithic, but epiphytic individuals are known as well. It is distributed from the lower eulittoral, where it can form extensive mats down to 30m.

Plocamium hookeri Harvey in J.D. Hooker & Harvey 1845

Florideophyceae, Plocamiales, Plocamiaceae

P. hookeri is finely branched and looks bushy. Main axes are bearing laterals in groups of 2 to 3, determinate branchlets are leaf-like [43]. Female gametophytes and tetrasporophytes are isomorphic, male gametophytes are unknown. The species is found at Amsterdam Island (Indian Ocean) [81], Antarctic Peninsula [68], Heard Island [43], Kerguelen Islands [43], Macquarie Island [43], South Georgia [43, 72], South Orkney Islands [43], South Shetland Islands [43, 60]. *P. hookeri* is present in depths from 3 to 27m, where it often grows below *Desmarestia* spp. and other kelp forming species.

Trematocarpus antarcticus (Hariot) Fredericq & R.L. Moe in Hommersand et al. 2009, Florideophyceae, Plocamiales, Sarcodiaceae

The thallus of *Trematocarpus antarcticus* is brownish red. The dichotomous branched blades grow up to 30cm in length. The tips of the blades are furcate. The stipes are short and the holdfast is discoid [43]. *T. antarcticus* is a strongly cold adapted species, which is known from the Falkland Islands [43], the Antarctic Peninsula [42, 43, 58], South Orkney Islands [43] and South Shetland Islands [43, 69]. In Fildes Bay *T. antarcticus* is mainly distributed in the sublittoral between 5 and 30m, whereas it is also reported from tide pools at the Falkland Islands.

Sponges, Porifera

E. Hajdu, C. Fonseca, D. Schories, G. Kohlberg

The Porifera are the sponges, and the name is derived from the Latin porus (pore) and ferre (to bear). They are sessile filter-feeders and the most primitive form of multicellular animals. They grow in a diverse range of habitats, mostly on hard substrates, from in-shore waters to the ocean depths (8,800 metres). The majority occur in marine environments, though there are also varieties of freshwater-sponges. Worldwide over 8,500 different species are described [82], 284 of them in Antarctica [67], 50% of these being endemic [83]. The classification of sponges is based on their skeletal composition, which, in the vast majority of cases, consists of siliceous or calcareous spicules, or spongin fibres. Sponges do not have any organs but specialised cells. The outer layer, the pinacoderm, shields the animal from the surrounding medium. It is interspersed with several pores, or ostia, through which the water enters the inner part of the sponge. With their flagellum, specialized cells called choanocytes produce an unidirectional water flow through an intricate system of canals, the aquiferous system. They also capture food particles and extract dissolved substances and oxygen from the water, before the water is expelled through a large aperture called the osculum. Most sponge´s food-source consists of dissolved organic matter and small planktonic organisms (mostly bacteria); a few, mostly deep sea species are carnivorous. In Antarctica, nudibranchs (sea slugs) are the main predators of Porifera. Sponges of the same species may vary in colour, shape and size, therefore identification usually requires study of the shape and size of spicules.

Calcarious Sponges, Calcarea

Worldwide 650 calcareous sponges are known [84], over 50 of them reported from the Antarctic Ocean [67]. The class occurs from warm tropical waters to the polar regions, and from shallow waters to the deep sea. Species of Calcarea are often small and devoid of the bright colours commonly seen among the Demospongiae. Their skeletons are made from calcium carbonate ($CaCO_3$), mostly in the form of spicules, but also, rarely, as a dense basal coral-like carbonate. Spicules are mostly triradiate, but biradiate and tetraradiate forms occur as well as a single case of a pentaradiate form. Reproduction is viviparous with free swimming blastula larvae.

Representative parts of the present material have been deposited in the Museum de Historia Natural of Rio de Janeiro, Brazil Registration numbers are indicated by the abbreviation MNRJ-, followed by a number. We greatfully acknowledge the help of F.C. Azevedo for compiling information on Antarctic Calcarea.

Cinachyra barbata, Demospongiae

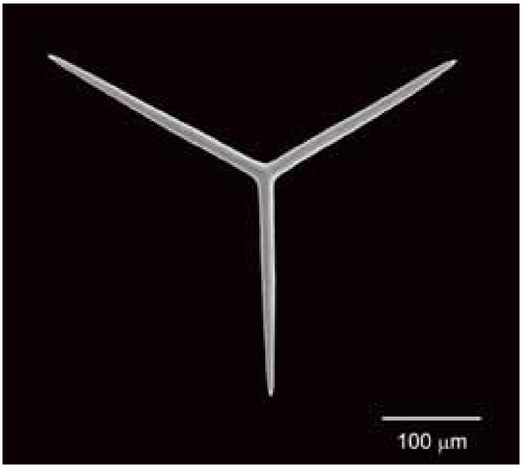
Leucetta antarctica Dendy, 1918

Calcarea, Clathrinida, Leucettidae

Leucetta antarctica is massive and lobate, with numerous apical oscula projected in conules. Its colour is white in vivo, turning to beige or yellowish-beige in ethanol. It has a smooth external surface, and is of hard consistency. The skeleton is composed solely by one type of triactine spicules made of calcium carbonate. The aquiferous system is leuconoid.

The studied specimens possessed a great number of embryos measuring about 200 µm, which indicates reproductive activity for the species in February 2010. *Leucetta antarctica* is found in western Antarctica and the South Shetland Islands in depths from 20 to 200m.

Museum Voucher: MNRJ 13798, 14847, 14850, 16284



Demosponges, Demospongiae

About 85% of the 8500 species of Porifera known worldwide belong to Demospongiae [84], of which 260 are reported from Antarctic waters [67]. They are widespread in all major aquatic habitats including freshwater and deep sea. Depending on environmental circumstances, for example wave action or strong currents, individuals of one species can differ considerably in their body shape - a characteristic known as plasticity. Most species are encrusting or cushion-shaped but spherical or erect forms such as ramified, bushy, can also be common. Their skeletons are made of spicules of the mineral silica (SiO_2), or of fibers of the protein spongin, a derivative of collagen, or both. As for the Calcarea, in a few cases, basally hyper-calcified skeletons have also been observed, the so called coralline sponges, an architecture that appears to have been much more frequent in the distant geological past. Reproduction is generally sexual and fertilization is mainly external, but viviparous species have also been reported. Like many marine species, sponges can regenerate from fragments of the adult by budding, a kind of asexual reproduction. Common in freshwater sponges but also known in a few marine species, reproductive bodies known as gemmules can be formed asexually upon the onset of unfriendly environmental conditions such as drying or freezing. The gemmules will hatch as soon as conditions improve.

Dendrilla antarctica Topsent, 1905
Dendroceratida, Darwinellidae

The appearance of *D. antarctica* varies from incrusting to massive, or irregularly branched, and has a smooth surface with conical papillae. Tissue is soft. The colour is often yellow, but can vary from grey, pink, or violet to brown. The skeleton comprises dendritic spongin fibers, where each ascending fiber ends in a surface conule. It can form dense mats extending several square meters. It can overgrow other sessile organisms and macroalgae [85]. The nudibranch *Austrodoris kerguelenensis* is often observed on it [86]. *D. antarctica* is a filter feeder, with important uptake of diatoms. *D. antarctica* is common throughout Antarctica, the Subantarctic region, the Falkland Islands and southern South America, in depths ranging from 5 to 549m. *D. antarctica* is a strong competitor for space [87]. It is found on rocks, algae and sometimes below pebbles and boulders. It is one of the commonest species around King George Island in shallow water.

Museum Voucher: MNRJ 13839, 13854, 13856, 13874, 14835, 16293, 16300

Polymastia invaginata Kirkpatrick, 1907
Hadromerida, Polymastiidae

Polymastia invaginata is a greenish grey to yellow, cushion-shaped or slightly hemispherical sponge with one or two conical papillae. Its diameter can be up to 11cm. The surface appears hairy due to spicules piercing around the papillae or near the base. The overall skeletal architecture is radial when approaching the surface, where a palisade of megascleres is usually found. Megascleres are pin-shaped, and separable in distinct categories. This species is preyed upon by seastars like *Odontaster meridionalis* and nudibranchs [88]. It is the most common species of *Polymastia* in Antarctica, repeatedly found since its original description. *P. invaginata* is found in Antarctic and Subantarctic waters, as well as in southern South America, at depths from 18 to 4800m [89, 90]. At Fildes Bay it is commonly found on cliffs, but also settling on stones in muddier areas.

Museum Voucher: MNRJ 13830, 14273, 16282

Dendrilla antarctica


Sphaerotylus antarcticus Kirkpatrick, 1907

Hadromerida, Polymastiidae

The body is dome-shaped or cushion shaped. The maximum length for cushion shaped species is 12cm. The colour is dark grey or brown and the bristled surface is covered by spicules and foreign debris. Several yellow tube-like papillae up to 4cm long are present on adult individuals. The overall skeletal architecture is radial when approaching the surface, where a palisade of megascleres is usually found. Megascleres are pin-shaped, and separable in distinct categories. The spicules of *S. antarcticus* contribute to bottom sediments [91]. The surface may contain a rich assemblage of benthic diatoms [92]. *S. antarcticus* is found all around Antarctica and the Antarctic Peninsula [93, 94] from 7m to 450m [95]. This species is widely distributed at Fildes Bay on hard bottoms like stones, rocks and boulders. Locally it is very common.

Museum Voucher: MNRJ 13813, 13831

Homaxinella balfourensis (Ridley & Dendy, 1886)

Hadromerida, Suberitidae

H. balfourensis is an arborescent species, usually possessing a stalk which ramifies into several branches. The oscula are usually scattered along the branches. The colour ranges from yellowish beige to greyish beige. The skeletal architecture with an axially compressed region is made up of ascending bundles of spicules, connected by a secondary reticulation. *H. balfourensis* was the first marine invertebrate from which anti-freezing peptides (AFP) were isolated [96]. Its extracts also revealed the presence of seven different sterols, comprising all stanols with conventional nucleus [97] and defensive properties against diatoms, although weak against bacteria and predators [98]. Ecologically, the species has already been pointed as one of the epibionts occurring on the scallop *Adamussium colbecki* [99]. Several sea stars are known to feed on *H. balfourensis*. The sponge diet seems to be mostly composed of flagellates or larger particles rather than bacterially derived sources [100]. *H. balfourensis* is capable to survive a certain degree of sedimentation, probably due to its commonly developed stalk [101]. The species generally suffers a great impact on its abundance from anchor ice, which can be responsible for the elimination of 90% of its individuals in shallow waters in Mc Murdo Sound [102], in spite of the great growth rate reported for the species [87]. There are plenty of records from Western and Eastern Antarctica and Subantarctic regions (South Shetland Islands, South Georgia Islands, Palmer Archipelago, Kerguelen Island), from 0 to 400m depth [103, 104]. It is growing very abundant on large boulders in shallow waters (8-10m depth) at Escudero Bay.


Haliclona (*Halichoclona*) sp.
Haplosclerida, Chalinidae

The specimen found at Ras Tu is about 10cm in diameter, encrusting to cushion-shaped, with oscula on top of the conical projections (up to 3cm high) and greyish white in colour. The skeletal architecture comprises a reticulation of a single toothpick-like spicule type.

A detailed taxonomic study has to be made of this species prior to the assessment of its natural history traits. There are no *Haliclona* (*Halichoclona*) reported for the Antarctic. It is a filter feeding species. The subgenus has already been reported from several areas, mostly around the tropics, but also from the Mediterranean, New Zealand and the Magellanic Region. Dozens of species of *Haliclona* remain unassigned as regards their subgeneric placement, some of which might be from the Antarctic. *Haliclona* (*Halichoclona*) sp. was found at Ras Tu in 30m depth attached to rock.

Museum Voucher: MNRJ 13824

Hemigellius pilosus (Kirkpatrick, 1907)
Haplosclerida, Niphatidae

This sponge is ramified, with long more or less cylindrical branches splitting dichotomously from a stem. The skeletal architecture is composed of larger structuring toothpick-like spicules and much smaller scattered C-shaped ones. Specimens reach 30cm in length and a diameter of about 2cm. The colour varies from dark yellow to orange. Nothing is known about this species' natural history. Recent results showed nevertheless that microbial associates of this species exhibit a decoupling of their enzymatic activity and heavy metal tolerance [105]. *Hemigellius pilosus* is formerly known only from Eastern Antarctica, dredged from 45–54m depth. The species is here reported from West Antarctica, from nearly the same depth (40m). *H. pilosus* was found on hard bottoms and vertical cliffs.

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Inflatella belli (Kirkpatrick, 1907)
Poecilosclerida, Coelopshaeridae

Inflatella belli has a spherical, pear-shaped or variously constricted body with large trumpet-shaped papillae all around. It is connected to the substrate by a short peduncle. The maximum reported diameter to date is 50cm. Papillae are up to 2.5cm long. When alive colour can be light grey, greenish brown, yellowish brown, or yellow [106]. *Inflatella* comprises six species which are characterized by a hollow body and confused skeletal architecture built from a single kind of megasclere. *I. belli* may host diatoms within its food- capturing cells that line the passages through which the sponge circulates water; these endobiont diatoms live by consuming carbohydrates produced by the sponge and also by photosynthesis. Diatoms produce large amounts of polysaccharids, thus giving the sponge an alternative food source during food-scarce periods [107]. *I. belli* lives on hard substrates from 18 to 1775m in the Sub-Antarctic realm, the Antarctic Peninsula and the Antarctic continent [108]. In Fildes Bay this species was found on hard bottom at a vertical cliff at Ras Tu between 35 and 42m.

Museum Voucher: MNRJ 13801, 13802, 16288



Kirkpatrickia variolosa (Kirkpatrick, 1907)

Poecilosclerida, Hymedesmiidae

Kirkpatrickia variolosa is a massive to incrusting, lobate, sponge with oscula present at the top of the lobes, and inhalant pores concentrated on slightly elevated, albeit flat areas known as areolate pore fields. It has already been registered in the literature with a thickly branched fan-shaped body [109]. The animals´ colour is dark or orange red. The skeleton is composed of fibers of spicules which diverge towards the surface, connected by secondary fibers (reticulation). Microscleres do not occur. This sponge species produces alkaloid pigments named variolins that inhibit predation by the seastar *Perknaster fuscus* [110], and show also antitumor and antiviral activities [111]. *K. variolosa* is found throughout Antarctica and South Georgia from 7 to 640m depth. It is a common species on vertical cliffs at Fildes Bay (Ras Tu) between 7 to 30m.

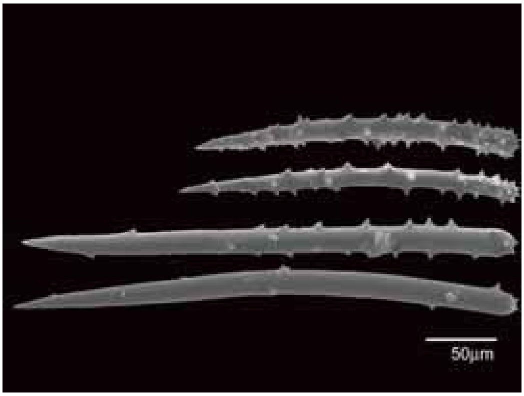
Museum Voucher: MNRJ 13808, 13816, 13836, 13844, 13850, 14839, 16274

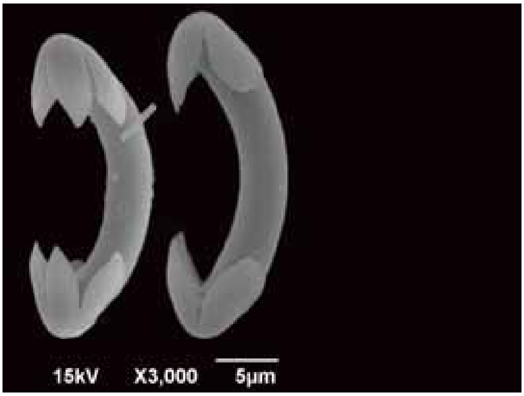
Phorbas cf. domini

Poecilosclerida, Hymedesmiidae

The bodies of specimens found at Fildes Bay are globular or lobate, up to 15cm high and 20cm wide. The surface has inhalant pores concentrated on slightly elevated, albeit flat areas known as areolate pore fields. The colour is variable from yellow to brown. The skeleton comprises megascleres of several kinds arranged in a plumose reticulation, and microscleres forming a crust on the surface. At least nine species of the genus are known from Antarctic waters [112]. *Phorbas domini* was already found at Admiralty Bay (King George Island) [113], but nothing is known about its natural history. *Phorbas domini* is known from Kerguelen Islands and the South Shetland Islands, in depth ranging from 30m to 155m [114]. *P. domini* was found at Ras Tu, Fildes Bay, on hard substrata.

Museum Voucher: MNRJ 16287





Phorbas cf. domini

Latrunculia (*Latrunculia*) *apicalis* Ridley & Dendy, 1886

Poecilosclerida, Latrunculiidae

Latrunculia (Latrunculia) apicalis has a massive spherical or hemispherical body of dark olive green colour. Its surface is covered with inhalant pores concentrated on slightly elevated, albeit flat areas known as areolate pore fields, and a few oscula, usually in apical position. Its size is up to 8cm wide and 11cm high. The skeleton is can be variously dense and confused, reticulated in parts, and near the surface a palisade of side by side microscleres is present. This species produces alkaloid pigments known as discorhabdins which were found to deter predation by seastars, and which show antimicrobial and cytotoxic activities too [115]. It is a filter feeding species. *L. apicalis* is found in Subantarctic and Antarctic waters, Kerguelen Island, Falkland Islands and Argentina in a depth range from 18 to 1124m. In Fildes Bay the species was found on hard substrata in depths between 30 to 40m associated with other sponges. It is present at different locations but not very common.

Museum Voucher: MNRJ 13817, 14848

Clathria (*Thalysias*) sp.

Poecilosclerida, Microcionidae

Two different *Clathria (Thalysias)* species were found at King George Island. Both species were yellowish brown in colour, and had an erect, tubular or flattened body. The skeleton comprises axially compressed bundles of spicules, which are organized in somewhat reticulate brushes fanning out towards the surface in the extra-axial region. A detailed taxonomic study has to be made of this species prior to the assessment of its natural history traits. *Clathria* species are ecologically successful from the intertidal to the abyssal [116]. This species has been found at Ras Tu between 40 and 50m depth, on a vertical cliff.

Museum Voucher:

sp. 1 MNRJ 13803

sp. 2 MNRJ 13805

Latrunculia (Latrunculia) apicalis


Mycale (*Aegogropila*) *magellanica* (Ridley, 1881)

Poecilosclerida, Mycalidae

Mycale (Aegogropila) magellanica is of massive or nearly tubular sub-cylindrical shape with apical oscula. It has a soft but not fragile consistency and is of ochre-yellow colour. The skeleton comprises megasclere spicules in a reticulation and scattered microscleres, some of them are disposed in starry structures known as rosettes. The species was already reported from areas as far as Japan, but such records are considered dubious. Anyhow, the plasticity observed in its skeletal characters demands a detailed revision. Originally reported from southern South America, records from the Antarctic should be confirmed by molecular tools. Recent findings observed a rich associated biota in this species. *Mycale (Aeogropila) magellanica* was found in Antarctic and Subantarctic waters, in Southern Chile and Argentina between 2 and 2350m depth [108]. In the Strait of Magellan *Mycale magellanica* can be common in very shallow waters (2-10m) [117]. The sponge settles on primary and secondary hard substrata including shells [118].

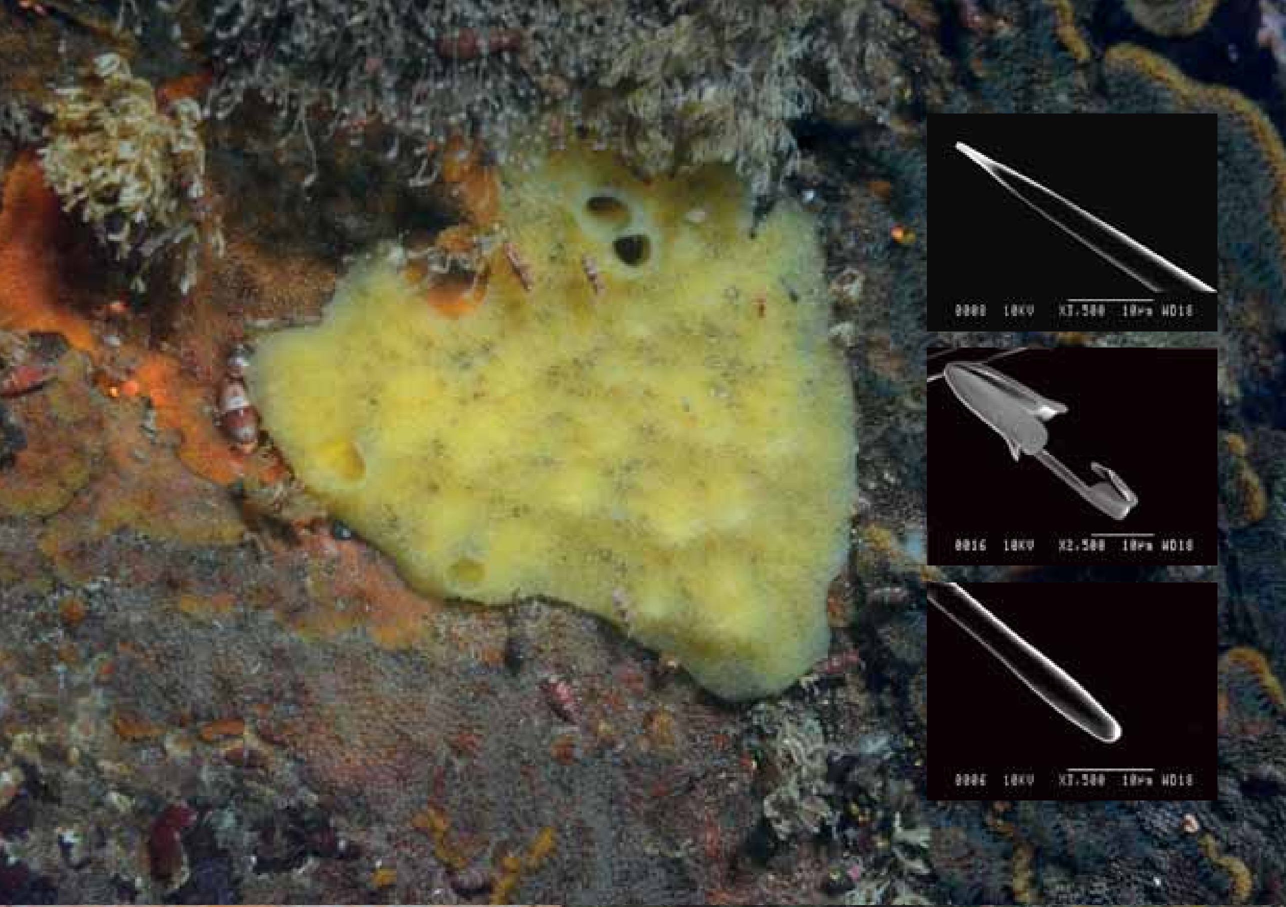
Museum Voucher: MNRJ 13840

Mycale (*Oxymycale*) *acerata* Kirkpatrick, 1907

Poecilosclerida, Mycalidae

Mycale (Oxymycale) acerata is a sponge with a cushion-shaped, massive, globular or cup-shaped body, reaching enormous dimensions, up to 1.5m high and 2m or more in diameter. Its colour is white, yellow or grey. The skeleton is composed of a stout reticulation of bundles of toothpick-like megascleres, frequently seen piercing the sponge surface. Microscleres occur dispersed, some of them are disposed in starry structures known as rosettes. This is a fast growing sponge, which is often fouled by diatoms and sessile invertebrates. It is preyed by several spongivorous sea stars and nudibranchs [119]. Its pumping rate in the laboratory is about 180ml per hour / g ash free dry weight [120]. Its secondary metabolites are highly toxic to fish [121], and their potential to inhibit microbial growth [122] has also been shown. It is not rare to find skeleton fragments of this species when trawling in Antarctic waters, which points to a possible role in substrate stabilization, as reported above for the Hexactinellida (personal observation). *M. acerata* is found in Antarctic and Subantarctic waters including, the Falkland Islands, as well as southern South America. Depth ranges between 0 and 731m [123]. It lives on hard and soft bottoms and epibenthic [124].

Museum Voucher: MNRJ 13828, MNRJ 16281




200 µm
40 µm
20 µm

Isodictya erinacea (Topsent, 1916)

Poecilosclerida, Myxillidae

The body of *Isodictya erinacea* is usually cylindrical, reaching up to 35cm high and 5cm thick at Ras Tu, with numerous conules on the surface which are the continuation of the fibers of the basal skeleton. Oscula are present on different parts of the body with a maximum diameter of 4-5mm. The colour is light brown or yellowish. The skeleton is formed of thick arborescent and reticulate fibers of large toothpick-like megascleres [109], with microscleres scattered around. Metabolites produced by *I. erinacea* were found to deter feeding of the sponge feeding sea star *Perknaster fuscus* [125] as well as to have antibacterial, antifungal and antiyeast activities [122]. *I. erinacea* is found in the South Atlantic Ocean (South Georgia, Burdwood Bank) and around the Antarctic continent in depths from 20 to 920m [123]. The majority of the about 40 known species of *Isodictya* is reported from the Antarctic/ Subantarctic region. This species was found on hard substrata, at Ras Tu on a vertical cliff below 40m.

Museum Voucher: MNRJ 13810, 13819, 14837, 16279

Cinachyra barbata Sollas, 1886

Spirophorida, Tetillidae

Cinachyra barbata has usually a heavily silted globular body, with columns of megascleres arranged in a spiral/radial skeleton, with their ends forming tufts of spicules which markedly pierce the surface up to 1cm. A specimen found in Fildes Bay reaches 10cm width and 7cm hight and has regularly distributed oscula surrounded by spicule brushes [90]. Its colour is uniform grey, beige or yellowish. Seastars and the sea urchin *Sterechinus neumayeri* have been observed feeding on the deposited detritus of the sponge surface. *C. barbata* obviously contributes to the formation of dense spicule mats facilitating the settlement of other epibenthic species [126]. Only few distinctive morphological characteristics differentiate *C. antarctica* from *C. barbata*, which reveals proximity and raises the possibility of their synonymy. It is known from 2-830m depth [127, 128], all around Antarctica and the Subantarctic Region. This species is one of the dominant sponge species on hard substrata in Fildes Bay between 8 and 30m.

Museum Voucher: MNRJ 13825, 14843

Glass Sponges, Hexactinellida

To date, approximately 600 Hexactinellida, or glass sponge, species have been reported worldwide [129], forty-two of these occurring in Antarctic waters. They are strictly marine and mainly deep sea, though exceptions can be found in the Antarctic, Subantarctic, North East Pacific and the Mediterranean at depths of 30m. Sponges belonging to Hexactinellida have a skeleton predominantly made of six-rayed siliceous (SiO_2) spicula, or their derivatives, frequently fused into a variously rigid architecture. Most cells are connected in a syncytium. The largest siliceous structure produced by an animal is the long supporting longitudinal spicule of the hexactinellid sponge *Monorhaphis chuni*, which can be up to 1.8m long and 2cm thick.

Anoxycalyx (Scolymastra) joubini (Topsent, 1916)

Lyssacinosida, Rossellidae

Anoxycalyx (Scolymastra) joubini is a large, hard, whitish, barrel or sac-like sponge with smooth walls, anchored to the substrate by prominent basal spicules. The main skeleton is composed of unfused megascleres and scattered microscleres. *A. joubini* is a dominant, structure-forming species in the McMurdo Sound region of Antarctica [130]. A wide range of invertebrates can be found out- and inside of these sponges including abundant amphipods, pycnogonids and seastars. *A. joubini* is preyed by the nudibranch *Doris kerguelenensis* and omnivorous sea stars [131]. Recent advances on the knowledge of the species' population dynamics imply that *A. joubini* is fast to respond to environmental shifts, so that former ideas of slow processes and stability over century time scales need to be re-evaluated [132]. It has been observed that diatoms may parasitise tissue of *Anoxycalyx joubini*, destroying parts of the sponge [133]. *Anoxycalyx joubini* is a filter-feeding species. *A. joubini* is present all around Antarctica and the South Shetland Islands at depths from 20 to 441m [132, 134]. We only found this species on a vertical cliff at Ras Tu starting at a depth of 45m. Dense groups of *A. joubini* could be seen deeper than 50m.

Museum Voucher: MNRJ 13827

Rossella racovitzae Topsent, 1901

Lyssacinosida, Rossellidae

The body is barrel-shaped, bearing numerous conules on the surface that are usually crowned by thick bundles of spicules on smaller specimens. When alive its colour is white to greyish. The main skeleton is composed of unfused megascleres, and scattered microscleres. At Ras Tu (King George Island) specimens were up to 70cm tall and 50cm in diameter. Three *Rossella* species are known from King George Island [113]. Species identification only on the basis of external appearance is rather tricky, and detailed examination of the microscleres is essential [135]. Despite their presumably slow growth rates, *Rossella* spp. are of high abundance in many areas of the Antarctic shelf, where they appear to be a structuring benthic element [130]. The intertwined spicules of dead sponges can form hard mats several decimeters thick thus allowing the recruitment of organisms otherwise unable to colonise soft bottoms. *Rossella* spp. are also important as substrate and habitat for several benthic invertebrates and juvenile fishes [136]. Important predators of Antarctic glass sponges in general are seastars and nudibranchs [137]. A specimen of *R. racovitzae*, 15cm tall, was calculated to be 440 years old [138]. The species is known to grow to over 1m in height. It reproduces sexually, as well as asexually by budding. The species has been reported from the Falkland Islands, the Subantarctic region, and all around Antarctica in depths from 20 to 2000m. *R. racovitzae* was found on a vertical cliff at Ras Tu on an exposed site as well as in the inner part of Fildes Bay on soft bottom below 45m.

Museum Voucher: MNRJ 13797

Cnidarians, Cnidaria

H. Galea, G. Kohlberg, K. Sanamyan, N. Sanamyan, D. Schories

The phylum Cnidaria is subdivided into four classes: Hydrozoa (hydroids, hydromedusae, siphonophores), Scyphozoa (jellyfish), Anthozoa (sea anemones, corals and gorgonians) and Cubozoa (box jellyfish). Worldwide, about 11,000 species are described [139]. In the Antarctic region, 448 Cnidaria species are known [67]. Solitary polyps and polyp colonies settle from the upper littoral to the deep sea, whereas the major part of the medusae belong to the plankton. Unlike the Anthozoans, alternation of generations occurs in the other three classes, with two generational forms: the mostly sessile tubular polyp and the free swimming medusa. Reproduction may be sexual or asexual. Depending on the species, in the case of sexual reproduction, eggs and sperm are produced by hermaphroditic or dioecious individuals and fertilization can be internal or external; whereas in the case of asexual reproduction, juveniles are generated by fission, budding or pedal laceration. All cnidarians, and only the cnidarians, have nematocysts. These specialized organelles contain stinging structures and are used for food capture, defense and aggression. The cnidarians prey consists of zooplankton, small particles suspended in the water and even molluscs, crustaceans, polychaetes, sea urchins and fish. Within the cnidarians, only Medusae have any real organs and these consist of accumulations of sensory cells to form light sensing organs (ocelli) and gravity sensing organs (statocysts).

Hydrozoans, Hydrozoa

H. Galea, D. Schories, G. Kohlberg

There are about 3700 species of Hydrozoa described worldwide [140], with more than 300 species living in Antarctica [67]. The hydrozoans are a quite heterogeneous group of aquatic, essentially marine animals, with a wide range of forms and life histories. Most are sessile and form bushy or feather-like colonies composed of numerous, interconnected small polyps. They attach to various substrates such as shells, rocks, seaweeds, etc. The colonies are polymorphic, that is, different types of polyps are specifically involved in feeding, reproduction or defence. With their outstretched tentacles, the hydrozoans await their prey to be transported to them by the surrounding water. The hydrozoans feed on small planktonic or benthic organisms, bacteria or phytoplankton and they in turn are fed by nudibranchs, pycnogonids and caprellid amphipods. Most hydrozoans have different sexes and may reproduce through tiny, usually planktonic, medusae which release gametes into the water. In other species, the medusae are reduced by varying degrees, ultimately with the gametes being borne directly on the hydroid colony. Fertilized eggs develop into free swimming larvae and, after settling on a suitable substrate, the larvae transform into polyps and form new colonies by asexual budding. Siphonophores, such as the Portuguese Man-of-War (*Physalia physalis*) look like jellyfish but are in fact floating colonies of hydrozoan polyps and therefore belong to the class Hydrozoa.




Candelabrum austrogeorgiae (Jäderholm, 1904)

Anthoathecata, Candelabridae

The worm-like body of *Candelabrum austrogeorgiae* is up to 12cm long, exhibits a characteristic bright orange colour, and is entirely covered with capitate tentacles, even within the blastostyle region, the latter being less clearly delimited from the distal part like in *C. penola*. The mouth is similarly situated at the distal end of the hydranth [141]. *C. austrogeorgiae* is reported from King George Island, South Shetland Islands from a depth of 20-30m. *C. austrogeorgiae* lives attached to rocks and algae phylloids.

Candelabrum penola (Manton, 1940)

Anthoathecata, Candelabridae

Candelabrum penola is a solitary polyp with a worm-like appearance and of a whitish colour. Individuals of this species may reach as much as 60cm in length. Their body consists of three parts: the foot, a blastostyle-bearing region immediately above, and a much longer, gradually tapering, distal body portion covered with numerous, short (ca. 2mm) tentacles, at the top of which is situated the mouth. The foot is hidden by the blastostyle region and not visible in attached animals [142]. So far, *C. penola* is only known from the Argentine Islands, the Bellingshausen Sea and the South Shetland Islands. All sites are situated on the western side of the Antarctic Peninsula [142], and the polyp occurs down to 492m [141]. *Candelabrum penola* uses the horny axes of pennatulacean anthozoans to attach [142].

Museum Voucher: MHNG-INVE-79800



Staurocladia charcoti (Bedot, 1908)
Anthoathecata, Cladonematidae

The peculiar, crawling hydromedusa *Staurocladia charcoti* is provided with a more or less watch-glass shaped umbrella in young individuals, this becoming nearly hemispherical in old specimens. It can reach diameters of up to 8mm and may bear at least 65 closely packed tentacles. The latter are divided into a lower branch, provided distally with an adhesive pad, and an upper branch, bearing alternate clusters of stinging cells. A red pigmentary spot, or ocellus, is found at each tentacle base. The number of radial canals can be up to 12, but varies among individuals. The gonads, lobate in males, and more irregular in females are arranged around a pendular, digestive organ (the manubrium), the latter ending in the mouth. *Staurocladia charcoti* was found in the Wilhelm Archipelago, McMurdo Sound, Graham Land, South Shetland Islands, South Georgia and Kerguelen Island [142].

Museum Voucher: MHNG-INVE-79801; 79802; 79803; 79804; 79805

Hydractinia angusta (Hartlaub, 1904)
Anthoathecata, Hydractiniidae

Hydractinia angusta forms dense colonies composed of numerous whitish polyps, which originate from an encrusting mat formed by coalescent stolons. Small spines are normally present on the hydrorhiza. Two types of polyps occur. On one hand, there are tall (ca. 5mm high), feeding polyps, called gastrozooids, each of which is provided with12-14 tentacles arranged in a single whorl around a distal, dome-shaped hypostome. On the other hand, there are comparatively smaller (ca. 0.5mm high), reproductive polyps, termed gonozooids, either devoid or possessing a reduced number of tentacles (up to 5), and possibly devoid of a mouth. Each polyp buds off 4-6 fixed gonophores near its base [142]. *H. angusta* feeds on tube feet and pedicellaria of sea urchins, that are grazing on the substrate to which it is attached. Food particles can exceed their own size. *H. angusta* also ingests diatoms, which are scraped from shell surfaces using their tentacles [143]. This species is found circumantarctic [144]. Colonies of *H. angusta* form dense layers on bivalve shells, for example *Adamussium colbecki*, or on worm tubes [143].

Museum Voucher: MHNG-INVE-79798; 79799

Obelia longissima (Pallas, 1766)

Leptothecata, Campanulariidae

Obelia longissima is a colonial species. The colonies of this quite large hydroid, reaching up to 35cm in height, are built around a thin, black-brownish stem, which gives rise to short, though profusely ramified side branches, each bearing numerous whitish polyps enclosed cup-shaped, chitinous hydrothecae. Mature colonies produce elongate, urn-shaped gonothecae, which release numerous small, disc-shaped medusae. *Obelia longissima* exhibits three stages in its life cycle: a sessile, colonial, hydroid, a free- swimming, sexually active medusa, and a planula larval stage. *Obelia longissima* is a suspension feeder and preys on small zooplankton, small crustaceans, oligochaetes, and probably detritus. *O. longissima* is a cosmopolitan species. In Antarctic waters, it has been reported from the tidal level down to 182m [145, 146]. *O. longissima* lives attached to algae, stones or shells of different origin.

Museum Voucher: MHNG-INVE-79786

Orthopyxis norvegiae (Broch, 1948)

Leptothecata, Campanulariidae

Colonies of *Orthopyxis norvegiae* arise from a creeping, branching, anastomozing hydrorhiza, giving rise irregularly to numerous, moderately long (less than 5mm), spirally-twisted pedicels, each of which supports distally a cup-shaped hydrotheca, enclosing a feeding polyp. Bottle-shaped to fusiform gonothecae, equally arising from the stolon through short pedicels, produce single, short-lived medusoids bearing four gonads. Alive, the colonies are of whitish to light skin colour [142]. Colonies of the genus *Orthopyxis* are often dioecious. The embryonic development takes place within the female gonotheca [142]. *Orthopyxis norvegiae* is a suspension feeder. This species is recorded from South Georgia, the Kerguelen Shelf, Marion and Prince Edward Islands and the South Shetland Islands, at depths of at least 30m [142, 147-149]. This species lives attached to algae or hard substrates.

Museum Voucher: MHNG-INVE-79663; 79780

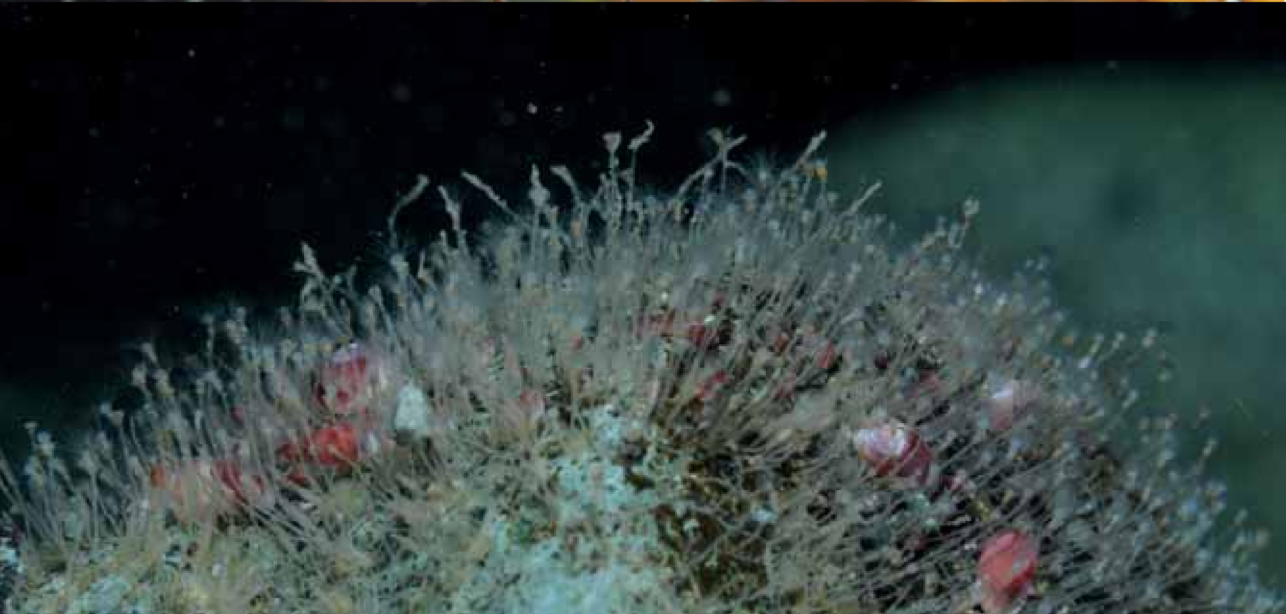
Silicularia pedunculata (Jäderholm, 1904)

Leptothecata, Campanulariidae

A basal, creeping, branching, anastomosing hydrorhiza gives rise to rather long (up to 8mm high), spirally twisted, hydrothecal pedicels, each of which is topped by a conical hydrotheca. The gonothecae, equally given off from the stolon through rather long, spirally twisted pedicels, are narrow and exceedingly elongate. Female gonothecae may reach 5-6mm in length, while the male ones 3.5-4.5mm. The dispersive stage is a medusoid provided with four gonads. The embryonic development takes place within the female gonotheca. *S. pedunculata* was recorded from the South Shetland Islands and South Georgia [142, 150] and lives attached to hard substrates.

Museum Voucher: MHNG-INVE-79779; 79781





Oswaldella shetlandica (Stepanjants, 1979)

Leptothecata, Kirchenpaueriidae

Oswaldella shetlandica forms colonies of up to 19cm high. The stems are brownish, unbranched, though apparent ramification occurs through auto-epizoism. They are divided into internodes, each of which bears one or two, sometimes three, alternately arranged apophyses supporting hydrocladia, the latter being also divided into internodes. The hydrothecae are elongate and situated in the middle of these internodes. Their aperture is kidney-shaped. The gonothecae of both sexes are pear-shaped, larger in females than in males, both with a large circular opening at the distal end [155]. Gonothecae were observed in January and February [155]. *O. shetlandica* is a common Antarctic species and has been reported from the South Shetland Islands, Palmer Archipelago, Antarctic Peninsula and from the north of the South Orkney Islands at depths of up to 952m. It seems to be endemic to the West Antarctic [155]. It is found epibiotic on other hydroids and on rocky or stony bottoms.

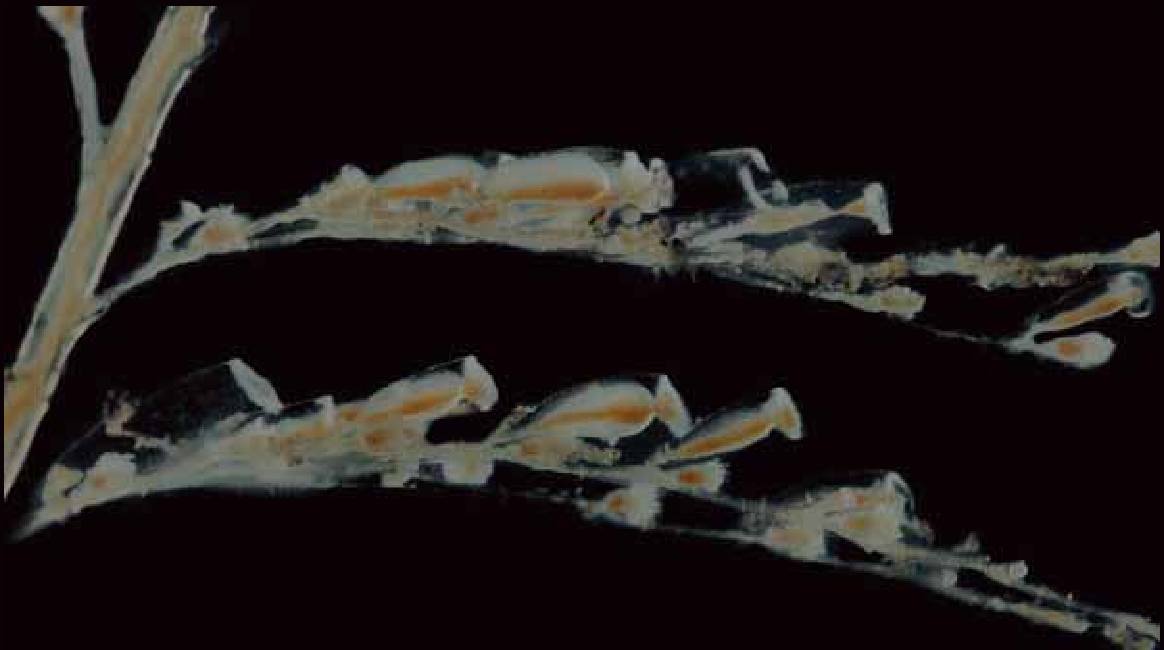
Museum Voucher: MHNG-INVE-79794; 79795

Oswaldella vervoorti (Peña-Cantero & García-Carrascosa, 1998)

Leptothecata, Kirchenpaueriidae

The colonies of *Oswaldella vervoorti* can reach heights of 45mm and are of whitish to slightly orange colour. The stems are unbranched and divided into internodes, each of which bears one or two alternate apophyses. The hydrocladia may be branched and are also divided into internodes, with one hydrotheca per internode. The hydrothecae are shallow and their apertures are circular [155]. The gonothecae insert on the hydrocladial internodes and are elongate-conical. *O. vervoorti* seems to be endemic to the West Antarctic. So far it is recorded from the South Shetland Islands, the South Orkney Islands, the Antarctic Peninsula and the Palmer Archipelago, from depths of up to 952m [155, 156]. *O. vervoorti* can be found epibiotic on other hydrozoans [155].

Museum Voucher: MHNG-INVE-79796



Lafoea dumosa (Fleming, 1820)

Leptothecata, Lafoeidae

Colonies of *Lafoea dumosa* are of a light brownish colour and may reach as much as 10cm or more. They can be either erect or stolonal, monosiphonic or polysiphonic, depending on their age and the substrate. The branching is irregular. The hydrothecae, arranged almost spirally on stems and branches, are tubular, straight or slightly curved, tapering basally. The gonothecae are aggregated into mitten-shaped structures called coppinia, located around the main stems or branches [140]. *Lafoea dumosa* is a cosmopolitan species found from shallow waters to bathial environments. *Lafoea dumosa* lives attached to hard substrates or epizootically on other hydroids [140].

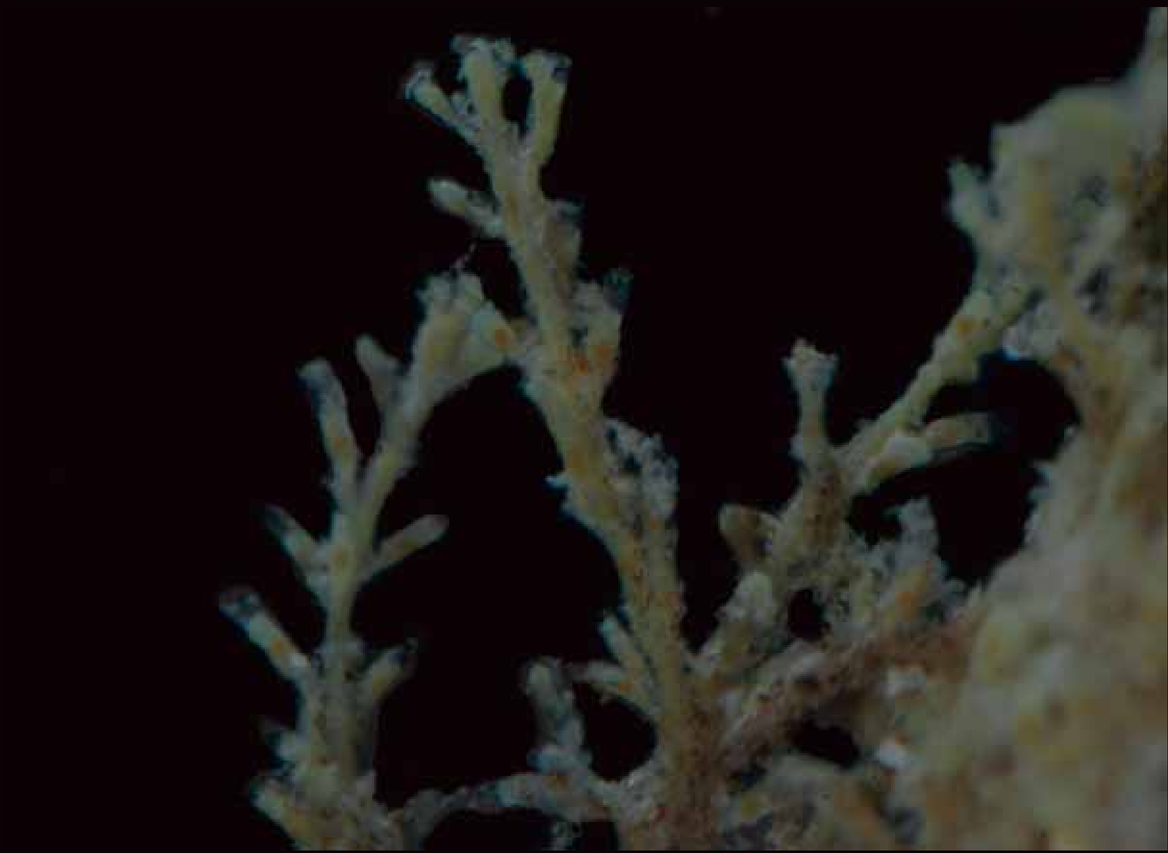
Museum Voucher: MHNG-INVE-79778

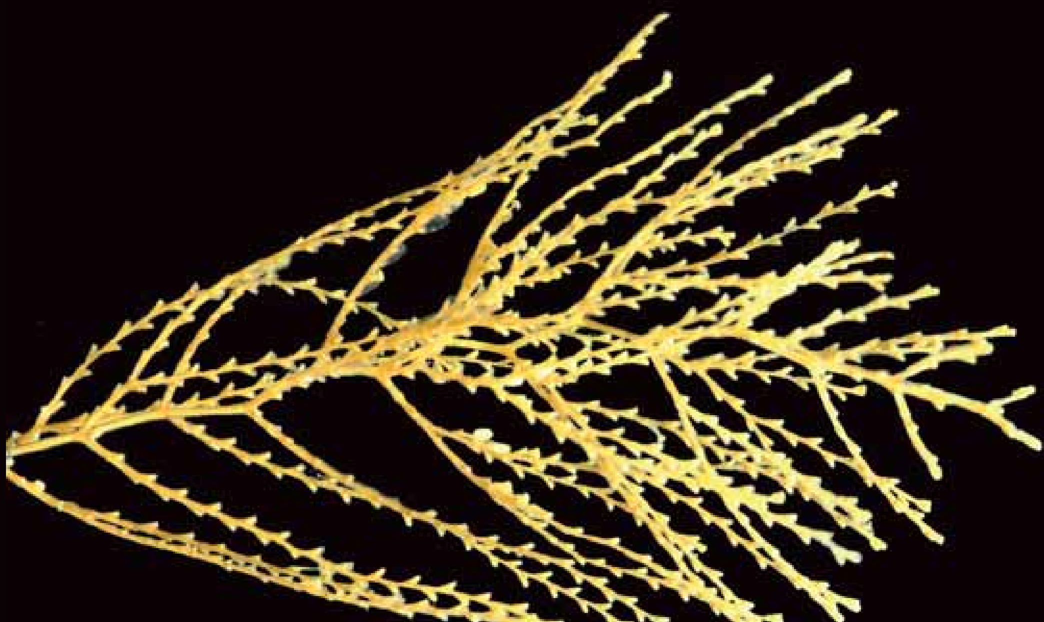
Antarctoscyphus elongatus (Jäderholm, 1904)

Leptothecata, Sertulariidae

This species builds colonies with monosiphonic stems reaching heights of up to 24cm. They are divided into strongly geniculate internodes, each of which bears an apophysis supporting two paired branches flanking a central hydrotheca [157, 158]. The hydrothecae are alternate on side branches, either in the same plane or shifted on to one side. Hydrothecal aperture provided with three pointed cusps. The gonotheca is elongate-ovoid, tapering basally, and provided with a rounded aperture distally. Gonothecae in *Antarctoscyphus elongatus* are found in December, January and April [146, 148, 154]. *Antarctoscyphus elongatus* has a wide Antarctic distribution and has been found additionally at Kerguelen Islands, Graham Land and South Georgia, Deception Island, Robertson Island, McMurdo Sound, Bouvet Islands, the Adelie Coast, Heard and Crozet Islands and the South Shetland Islands, at depths of up to 1958m [141, 157]. *A. elongatus* lives on muddy, sandy, or stony bottoms, but may be found attached to other hydroids, bryozoans or algae [157].

Museum Voucher: MHNG-INVE-79777





Sertularella gaudichaudi (Lamouroux, 1824)

Leptothecata, Sertulariidae

The rather tall colonies (up to 250mm high) of this species possess monosiphonic stems, with a typical irregular branching pattern. Both stems and side branches are divided into moderately long internodes, each carrying a hydrotheca at its distal end. The hydrothecae, characteristically shifted on to the anterior side of the colony, are flask shaped and provided with four marginal cusps; three internal, submarginal projection of perisarc are irregularly present. The aperture is closed by an operculum of 4 triangular flaps. The gonothecae, borne abundantly on both stems and branches, are elongate, with irregularly ringed walls and four distal spines encircling the aperture [160]. The colonies are of a whitish, brownish or reddish colour. *Sertularella gaudichaudi* is found off the South American continent from Mar del Plata to Tierra del Fuego. In Antarctic and Subantarctic regions it is reported from the Falkland Islands, the Kerguelen, Bouvet Island, South Shetland Islands, Low Island, Trinity Island and the Bellingshausen Sea [142]. We found this species at 40m depth. *S. gaudichaudi* lives attached to algae, bryozoans, sponges or gravel.

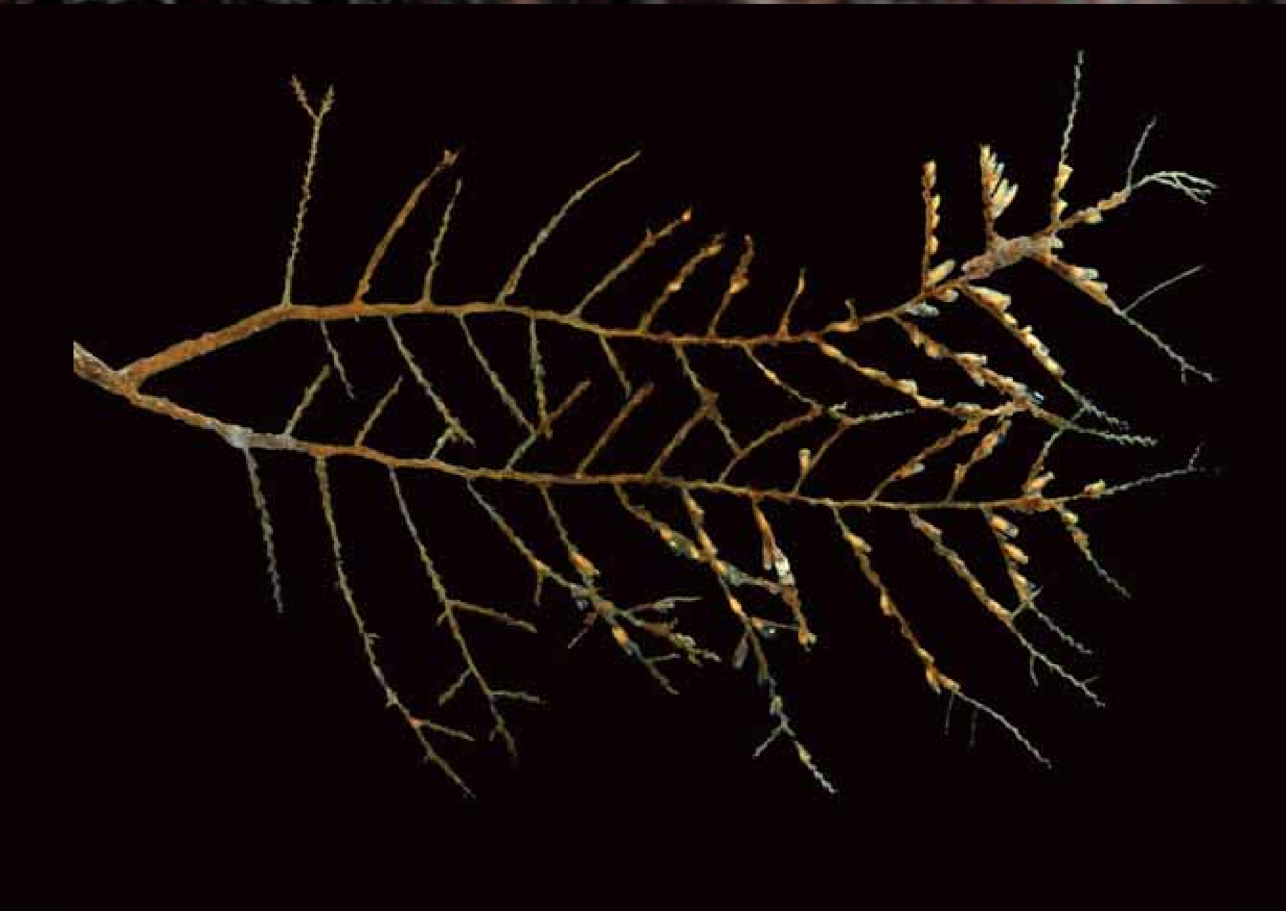
Museum Voucher: MHNG-INVE-79773; 79774; 79776; 79782; 79785

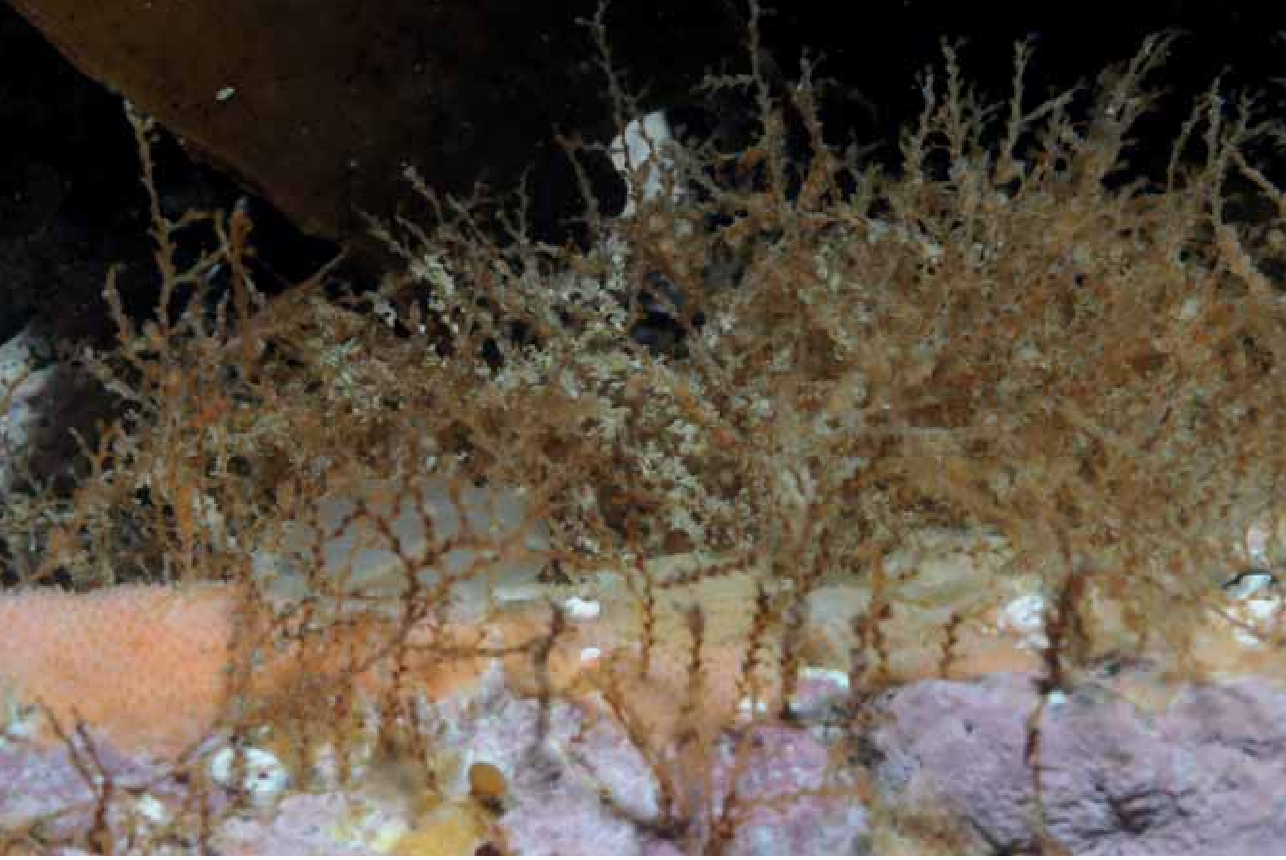
Symplectoscyphus cumberlandicus (Jädherholm, 1905)

Leptothecata, Sertulariidae

Colonies reach heigths of up to 15cm and are coplanar. The stems and the basal part of the side branches are polysiphonic. The latter are pinnately arranged on both sides of the stem, and may branch again once or twice. Both stem and branches are divided into rather short internodes, each of which bears distally a hydrotheca. The latter are tubular, deeply immersed in the internodes, and are provided with three marginal pointed cusps. Accessory hydrothecae often occur on the basal parts of the side branches, more rarely on the main stem. The gonothecae are generally situated on the 2nd and 3rd order branches and are elongate ovoid. Their surface is provided with 15-20 spiral grooves, and their aperture is situated at the top of a short, trumpet-shaped terminal tube. Colonies are of a brownish colour [142]. Colonies with gonothecae can be found in February [161]. *Symplectoscyphus cumberlandicus* has a circumantarctic distribution and is found at depths of up to 380m [142, 161, 162]. *S. cumberlandicus* lives attached to rocks or epibiotically on the ascidian *Cnemidocarpa verrucosa* [161].

Museum Voucher: MHNG-INVE-79783; 79784



Symplectoscyphus vanhoeffeni (Totton, 1930)
Leptothecata, Sertulariidae

The mass-like colonies of this species may reach as much as 7cm in height. They do not have distinct main stems, and their branching pattern is irregular, with a tendency for arrangement in one plane. Stems and branches are divided into short internodes, each bearing a hydrotheca distally. Hydrothecae are arranged alternately on stems and branches, and are flask-shaped, with their apertures facing outward and upward. Male and female gonothecae are elongate-ovate in shape, and are provided with 8-9 deep spiral grooves [163]. Their aperture is situated at the end of a short trumpet-shaped terminal tube. *S. vanhoeffeni* is found in Antarctica at depths exceeding 15m [142, 163]. *S. vanhoeffeni* can be found attached to rocks or algae [142].

Museum Voucher: MHNG-INVE-79775

True Jellyfish, Scyphozoa

D. Schories, G. Kohlberg

Scyphozoa, or jellyfish, are common in all oceans from the surface to very deep waters. About 200 species are known worldwide [129], whereof ten species occur in the Antarctic Ocean [67]. Scyphomedusae mainly feed on small crustaceans, fishes and planktonic particles. Prey is captured by tentacles covered with stinging cells, called cnidocysts. Sea turtles, fish, sea birds and even humans use jellyfish as a source of food. Unlike the hydrozoans in the class Scyphozoa, the medusae are the dominant stage in the life cycle. Almost all jellyfish have different sexes, with the males releasing sperm into the water to fertilize the females' eggs internally. After a planktonic stage, the free swimming planula-larvae settle on a suitable hard substrate and develop into polyps. The polyps reproduce asexually either by forming more polyps via cysts or by forming new tiny medusae via strobilation and these grow into the next generation, which reproduce sexually.

Periphylla periphylla (Peron and Lesueur, 1809)

Coronatae, Periphyllidae

The diameter of *P. periphylla* can reach up to 35cm, the central dome is thickened and conical. It has twelve tentacles. *P. periphylla* is pelagic and has a holopelagic life cycle with direct development and a developmental time between 2-3 months [164, 165]. Populations in Norwegian fjords show strong migrations between day and night with high abundances in shallow water during night time. Sea anemones may feed on *P. periphylla* [166], when it is close to the sea bottom. This species is an active predator in surface waters, especially on small zooplankton [167], including calanoid copepods, krill, chaetognaths, ostracods, small fish and other medusae [168]. It is supposed to live up to 30 years. *P. periphylla* is worldwide distributed in deep water between 200 and 2000m depth, locally occurring in extremely high abundances. *P. periphylla* produces bioluminescence [169] at all stages of life, which is interpreted as a warning signal to predators. It is known from the South Shetland Islands, South Sandwich Islands, South Georgia, and the Antarctic Peninsula, and also from innumerous other marine habitats worldwide except Arctic waters. In tropical and subtropical waters it tends to live in deeper waters [170]. However, it can survive in temperatures up to 20 °C, although most specimens were found in a temperature range between 4°C and 11°C.

Periphylla periphylla

Desmonema glaciale Larson, 1986
Semaeostomeae, Cyaneidae

The colouration of *Desmonema glaciale* is pink-violet, its umbrella is up to 1.2m in diameter. It is a pelagic species living near the surface. *D. glaciale* can be distinguished from other *Desmonema* species because of its large size and cordlike tentacles, that can reach up to 5m in length. Less than 10 tentacles are present per group [171]. Its distribution is restricted to the Southern Ocean. The amphipod crustacean *Hyperia macrocephala* is known to feed as a juvenile in the gastrovascular system of *D. glaciale*. As an adult the amphipod feeds on its epidermis. *D. glaciale* feeds on diverse pelagic and benthic organisms including fish. It is common in Antarctic waters, the Antarctic Peninsula, South Orkney Islands, South Shetland Islands and South Georgia.

Anthozoans, Anthozoa

K. Sanamyan, N. Sanamyan, D. Schories, G. Kohlberg

The class Anthozoa comprises about 7500 species worldwide, with Antarctica 127 species being described. Except for some species, the anthozoans are a purely marine class, inhabiting worldwide substrates from the intertidal zone to the deep sea. Most anthozoans are sessile, attaching to rocks or shells or burrow into soft sediments. This class is subdivided into the Octocorallia and the Hexacorallia, with the two differing in the number of their mesenteries and tentacles. Octocorals always possess eight tentacles and Hexacorals have a variable number of tentacles, often, but not always, in multiples of six. The animals of this class are solitary or colonial polyps and lack a medusal stage. Normally gametes are released into the water column, where fertilization takes place, but some brooding species are also known. Apart from sexual reproduction, asexual reproduction by fission, budding or laceration is quite common and occurs not only in the colonial species but also in solitary species. Pennatulacea, or sea pens, are colonial animals and belong to the octocorals, the polyps of which are arranged strictly symmetrically, with the colonies appearing like a feather or a quill pen. The whole colony develops from one main polyp that once settled onto the substrate, transformed into a rigid, erect stalk (the rachis) and lost its tentacles. Here are presented first the hexacorallian species and then the Octocorallia.

We gratefully thank Leen van Ofwegen and Stephen D. Cairns for identification of alcyonacean and gorgonacean samples.

Glyphoperidium bursa (Roule, 1909)

Actiniaria, Actiniidae

Glyphoperidium bursa is the largest and most conspicuous anemone species in Antarctica. The colouration of this species is plain orange, red or whitish. The number of the tentacles is very large, estimated to be over 2000 [172] or, in larger specimens even 3500 [173], although smaller specimens may have 500 tentacles or less. The tentacles are slightly paler than the column and have blunt tips. Individuals can reach a diameter of about 13cm and a length of 18cm [174]. The column of living specimens may be somewhat wrinkled but is usually smooth, sometimes covered by sparse particles of sediment which are not retained upon collecting. *G. bursa* is found in the Ross Sea, Antarctic Peninsula, South Shetland Islands, South Georgia and South Sandwich Islands in depths from 9 to 1890m [174, 175]. It lives attached to hard substrates such as rocks.


Isosicyonis alba (Studer, 1879)

Actiniaria, Actiniidae

Isosicyonis alba has a very wide pedal disc of up to 56mm in diameter. It is wider than the column and enclosures the shell of its host gastropod. The smooth column is broad but flattened in the oral-aboral axis. The colour of the column and the tentacles of living animals is whitish-pink to light brownish. *Isosicyonis alba* has a wide central mouth. The tentacles, up to 80 in number, are arranged in two cycles on the margin of the oral disc. The tentacles on the anterior part of the disc (the part directed towards the head of the mollusk) are significantly longer than the tentacles on the posterior part of the disk. The tentacles are thin, long, flexible and semitransparent. The surface of the column is smooth and clear. *Isosicyonis alba* lives in symbiosis with the gastropod *Harpovoluta charcoti*. The snail is protected from being preyed and the actinia obtains a better supply of food by being carried around. *I. alba* is probably a circumpolar species and found off the coast of Argentina, the Chilean coast, Antarctic Peninsula, South Shetland Islands, South Orkney Islands, in the Ross Sea and eastern Weddell Sea in depth from 27 to 928m [173, 175]. In the Antarctic this species lives always attached to the shell of the gastropod *Harpovoluta charcoti*. The mollusks to which shells this species was found attached in Subantarctic region and off Argentina coast was identified as *Provocator corderoi* [176].

Stomphia selaginella (Stephenson, 1918)

Actiniaria, Actinostolidae

Preserved specimens of *Stomphia selaginella* are up to 5cm in height [177], the living specimens should be larger. Living specimens have a characteristic colour model with radial orange markings on the disk and rather long, tapering, pointed tentacles with two transverse orange bands [175]. The column is smooth, orange or white with orange markings. The tentacles, up to 80 in number but usually less, are arranged in several cycles. Large embryos are often found incubated in the coelenteron. *S. selaginella* is a circumpolar Antarctic species found from 16 to 1674m [177]. *S. selaginella* lives attached to hard substrates, never buried in sediment.

Hormosoma scotti (Stephenson, 1918)

Actiniaria, Actinostolidae

Hormosoma scotti has a characteristic habitus with a relatively low but wide column, and wide circular pedal and oral discs. Preserved specimens are up to 8cm in diameter, the living specimens are larger. The colour is either plain reddish-brown, orange, or white-orange spotted. The oral disc is wide and flat. The tentacles, up to 96 in number, are arranged in three or four cycles on the periphery of the oral disc, so that the most part of the oral disc is devoid of tentacles. The tentacles are short, more or less stout and blunt tipped, of the same colour as the column or paler, sometimes with unclear pale markings at bases and tips. In many specimens the eggs are found in the coelenteron. *H. scotti* was found in the Weddell Sea, Ross Sea, the Antarctic Peninsula, South Shetland Island, South Orkney Islands, South Georgia and South Sandwich Islands in depths from 16 to 769m [172]. It lives attached to hard substrates, never buried in sediment.

Edwardsia inachi Sanamyan, Sanamyan, Schories, 2014

Actiniaria, Edwardsiidae

Edwardsia inachi is a rather large burrowing species with an elongated body. The body of the preserved specimens is up to 8cm long, but living specimens are significantly longer and may reach a body length of 12cm. The major part of the column surface is covered with large crowded papillae, arranged in eight wide longitudinal bands, and a greyish-brown to ochre coloured periderm. The number of the tentacles usually varies from 28 to 36. The most proximal part of the body, the physa, is small and inconspicuous. *E. inachi* was found on King George Island, South Shetland Islands in a depth of 7-10m. It is a burrowing species that lives unattached with the most part of column burrowed in mud, sand, or gravel so that only the oral disc and the very upper part of the column are exposed on the surface of the sediment.

Voucher: Holotype ZIN 11330; Paratypes ZIN 11331, ZIN 11332, KBPGI 428/1, KBPGI 429/2, KBPGI 430/3, KBPGI 431/4


Hormathia lacunifera (Stephenson, 1918)
Actiniaria, Hormathiidae

The column of *Hormathia lacunifera* is cylindrical with a length of up to 10cm and diameter up to 5cm [172] in preserved condition, living specimens are larger. The column is subdivided into two regions. The distal (upper) short part of the column called scapulus is more or less smooth, devoid of cuticle and pale, while the larger remaining part (scapus) is covered by dark cuticle and tuberculated with large crowded flattened tubercles arranged in longitudinal rows which are often not obvious. Fully developed specimens have 96 tentacles, which can be brownish, reddish or yellowish and are arranged in several cycles on the outer part of the oral disc. *H. lacunifera* is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia, Falkland Islands, Bouvet Island, and off Rio Plata in Argentina at depths from 15 to 3020m [172, 178, 179]. Shallow water specimens observed in vivo by divers were attached to hard objects, but most known specimens are trawled and there is little information on details of their habitat.

Armactinia antarctica Sanamyan, Sanamyan, Schories, 2015
Actiniaria, Isanthidae

Armactinia antarctica is a burrowing species. The body of known preserved specimens is barrel or spindle shaped, about 4cm long and 2-3cm in diameter, but in live the species is probably much larger and elongated. The most part of the column (the scapus) is covered by dark cuticle to which foreign particles like small stones and broken shells are firmly attached and form a kind of firm protective crust. The number of the tentacles is constant, 24, hexamerously arranged in three cycles. *A. antarctica* is probably carnivorous as most actinians. The species is known only from two specimens found near King George Island, in depths of 32 and 35m. The species lives burrowed in sand, not attached to rock or stones, only the oral disk and tentacles are exposed to the surface.

Voucher: Holotype ZIN 11333; Paratype KB-PGI 432/1

Dactylanthus antarcticus (Clubb, 1908)
Actiniaria, Preactiidae

Dactylanthus antarcticus has an elongated body and can reach a length of up to 20cm with a pedal disc diameter of about 2cm. This species has 24 tentacles arranged on the margin of the oral disk in two alternating cycles of 12 shorter and 12 longer tentacles. The column is very flexible and covered with up to 24 longitudinal rows of hollow protuberances resembling tentacles. The colour of *D. antarcticus* can be pale orange, pale yellow or translucent when inflated. *D. antarcticus* feeds on octocorals like *Primnoella* sp. and *Thouarella* sp. It is a circumantarctic species and found in the Ross Sea, Antarctic Peninsula, South Pacific, Strait of Magellan and Chilean fjord region in depth from 10 to 610m [172]. *D. antarcticus* is very mobile and flexible and climbs the octocorals for feeding, where it can be found in quite different shapes from contracted to stretched.

Artemidactis victrix (Stephensen, 1918)

Actiniaria, Sagartiidae

Preserved and therefore contracted animals can have a length of up to 13cm with a pedal disc diameter of 6.5cm [180], living specimens may be much larger. *Artemidactis victrix* has a cylindrical column with a smooth surface. Up to 300 tentacles are arranged in four or five circles around the oral disc [180]. The tentacle crown can be more than 8cm in diameter with tentacle lengths of about 2cm. The oral disc and the upper region of the column are wider than the rest of the column. The most peculiar feature of the species allowing easy identification on underwater photographs is a greatly expanded radially furrowed actinopharynx (throat) that usually occupies the most part of the oral disc. The colouration of *A. victrix* varies from white, yellowish-white to red. Numerous eggs are found in the coelenteron and in the tentacles of some specimens. *Artemidactis victrix* is found in the Ross Sea, South Shetland Islands South Georgia, and Burdwood Bank at depths from 5 to 437m [175, 178]. The species is found on hard substrates such as stones and rocks and does not–in contrast to other sagartiid species–burrow into the sediment.

Corallimorphus karinae Sanamyan, Sanamyan, Schories, 2015

Corallimorpharia, Corallimorphidae

Corallimorphus karinae is a medium sized (about 5cm in diameter in living specimens) rarely encountered species. The body is colourless, whitish and translucent, with very characteristic bright white opaque acrospheres on the tips of the tentacles. The tentacles, up to 80 in number, are arranged decamerously on the margin of the disc in four cycles. Unlike other species of this genus it usually has only marginal but no discal tentacles. The slit-like mouth is on the top of very prominent, sharply defined oral cone which occupies a significant part of the oral disc [175, 181]. *C. karinae* is a brooding species, blastulae and planulae are found incubated in the coelenteron [181]. It feeds on a wide range of food organisms and even sea stars of about the same size like *C. karinae* are not rejected [181]. The species is only known from shallow depths from King George Island and from Palmer Station, Antarctic Peninsula. It lives in habitats with large rocks and steep walls, where they hide in cracks and crevices or between other sessile organisms [181].

Voucher: Holotype ZIN 11336


Alcyonium antarcticum Wright & Studer, 1889

Alcyonacea, Alcyoniidae

The colour of the octocoral *Alcyonium antarcticum* can vary from white, greyish white, greyish brown, pale rose, orange, pale orange to orange pink with white tentacles. Each polyp bears eight tentacles [182-185]. *A. antarcticum* protects itself of predation and bacterial growth by producing chemicals, which are diluted in the surrounding water. These chemicals provoke tube-feet retraction in some sea stars, a sign for food deterrence [186, 187]. *A. antarcticum* feeds on plankton and is preyed itself amongst others by the sea spider *Colossendeis megalonyx* [186].

Clavularia sp.

Alcyonacea, Clavulariidae

Individual polyps of *Clavularia frankliniana* are translucent, white to yellowish white or pinkish and can reach a length of up to 25mm, but normally they are much smaller. The stolon adheres the colony to the substrata and connects all polyps with each other. As typical for the octocorals every single zooid (polyp) of *Clavularia* has eight tentacles. [182, 183, 186, 188, 189]. The tissue of *C. frankliniana* contains chimyl alcohol, which provokes feeding deterrence in some sea stars. For chemical defence the nudibranch *Tritoniella belli* feeds on *C. frankliniana* and obtains the chimylalcohol [186, 190]. *Clavularia* spp. feed on prey items near the sea floor like diatoms, protozoans, foraminiferans, nematodes and invertebrate larvae. *Clavularia* itself is preyed by the nudibranchs *Tritoniella belli* and *Notaeolidia gigas* and some sea spiders [186, 191-193]. Colonies of *Clavularia* are found attached to hard substrata like stones, shells, rocks or worm tubes [182, 183, 186, 192]. The colonies found at Fildes Bay were not identified to species level.

Isididae
Gorgonacea

Colonies are bushy, with thick branches having a yellow, green, or brown colour. The axis of members of the family Isididae is thick. Nodes of a hornlike protein alternate with internodes of calcium carbonate. Specimens of the family Isididae were found at King George Island, South Shetland Islands in a depth of 40m.

Arntzia gracilis (Molander, 1929)
Gorgonacea, Primnoidae

The flexible colonies of *Arntzia gracilis* are whip-like and reach lengths of up to 1.15m at a diametre of about 5mm. The polyps are of cylindrical shape, up to 4mm in length and 1mm in diametre. Each polyp is covered by eight longitudinal rows of slightly overlapping scales. 12-22 polyps make up a whorl, 3-6 whorls are arranged per each centimetre of the colony´s axial length. The holdfast is discoidal and devoid of polyps [194]. *A. gracilis* is found in the Weddell Sea, Ross Sea, South Shetland Islands, South Orkney Island, South Sandwich Islands and South Georgia in depth from 64 to 640m. It lives attached to hard substrata.

Onogorgia nodosa (Molander, 1929)
Gorgonacea, Primnoidae

The colonies of *Onogorgia nodosa* are unbranched and whip-like with a total length of up to 40cm including the stalk with up to 9cm in length and 5mm in diametre. The colour of living colonies is pinkish yellow. In alcohol preserved animals are white, a thin layer of the membranous cuticle gives them a brownish touch. The holdfast is very small with max. 5mm in diametre. The polyps have a cylindrical shape and are of irregular size reaching a maximum size of 3.9 x 1.1mm (height x diametre). The polyp´s surface is covered with scales, which slightly overlap. New polyps are interspersed between older ones within a whorl and also completely new whorls are added between old ones. The axis is dark brown and has longitudinal grooves. *O. nodosa* has eight up to 1.5mm long tentacles, each with 14 pairs of pinnules, the fingerlike extensions at each side of a tentacle [195]. *O. nodosa* is found in the Scotia Sea, Ross Sea, South Shetland Islands, South Georgia and Antarctic Peninsula in depths ranging from 21 to 433m.


Isididae



Thouarella (Epithouarella) crenelata (Kükenthal, 1907)

Gorgonacea, Primnoidae

Because of their one main stem, with numerous secondary diverging branchlets, colonies of *Thouarella (Epithouarella) crenelata* have a bottle-brush look. The polyps project perpendicular to the branchlets. *T. (Epithouarella) crenelata* is found in the South Atlantic Ocean, the Antarctic Peninsula, Prydz Bay, South Orkney Islands, South Shetland Island, South Sandwich Islands and South Georgia in depths from 75 to 686m. *T. crenelata* lives attached to hard substrate.

Thouarella (Thouarella) pendulina (Roule, 1908)

Gorgonacea, Primnoidae

Colonies of *Thouarella pendulina* consist of one main stem, from which numerous secondary branchlets diverge. This gives them a bottle- brush appearance. The polyps reach lengths of up to 1.5mm and are arranged densely but irregularly on all sides of the branchlets, up to 70 polyps per 1cm axial length. The operculum is well developed. The outer surface of the scales is smooth, the submarginal scales of *T. pendulina* bear a small spine [196]. *T. pendulina* is found in the Ross Sea, Antarctic Peninsula, South Shetland Islands and South Orkney Islands in depth from 35 to 655m. It lives attached to hard substrates.

Malacobelemnon daytoni (López-González, Gili, Fuentes 2007)

Pennatulacea, Kophobelemnidae

With a maximum reported adult size of less than 110mm *Malacobelemnon daytoni* is one of the smallest pennatulacean species. The colonies are erect and consist of a cylindrical, fleshy primary polyp (oozoid). With their peduncle the colonies are anchored in the substrate. The rachis takes about ¾ of the total colony length. Towards the basal part of the rachis (siphonozooids), the polyp sizes becomes very small [197]. The colour of living specimens is light brown in the rachis, with whitish long polyps [198]. *M. daytoni* is a gonochoristic species and male and female colonies can not be distinguished by external morphology. Gametes are generated by the gastrodermis along the longitudinal canal and are supposed to be released into the surrounding water for external fertilization, where they develop into lecithotrophic larvae. The oogenesis does not take more than 12 months and spawning events may be twice a year [197]. Pennatulacea are filter feeders and catch plankton from the water column with their tentacles. So far *M. daytoni* is only known from King George Island in depths from 10 to 30m, where it can reach abundances of up to 300 colonies per m^2 [198, 199]. *M. daytoni* lives on muddy and sandy sediments with its peduncle anchored in the substrate [198].


Thouarrella (Epithouarella) crenelata


Thouarella (Thouarella) pendulina


Malacobelemnon daytoni

Comb Jellies, Ctenophora

G. Kohlberg, D. Schories

There are about 100 species of the Ctenophora, or comb jellies, an exclusively marine group. Although these radially symmetrical animals may look like medusa, unlike these they lack nematocysts. Swimming is undertaken by continuous beating of their eight ciliary combs, which produce an iridescent effect. Ctenophores feed on plankton, fish larvae, small fish, cnidarians and other comb jellies, using two long tentacles equipped with sticky cells. Some species may occur in very high densities, to such an extent that they obstruct fishing nets.

Lyrocteis flavopallidus (Robilliard & Dayton, 1972)

Tentaculata, Platyctenida, Lyroctenidae

Lyrocteis flavopallidus can reach a length of up to 11cm, but most are between 5-9cm tall. Its colour is a pale straw-yellow colour with some variation in the shade and intensity. This species has a soft and fragile saddle-shaped trunk, which is somewhat wider than tall. It sits with its oral end down and moves only a few cm in a long time period [200]. Adults lack the characteristic comb rows like in many other ctenophores [200]. The aborally extended arms, taper slightly to a bluntly rounded tip. On its sides the trunk may show numerous small conical to subconical papillae, 1-3mm tall, as well as between the arms, and on the proximal half of the arms. The completely retractable main tentacles are sticky and bear numerous, long, filamentous branches. Specimens of *L. flavopallidus* were found at a depth of 36 to 761m in Antarctica and South Shetland Islands [136, 200, 201]. For better food capture conditions these animals crawl on elevated surfaces such as sponges like *Rosella racovitzae* and *Tetilla leptoderma* [200].

Flatworms, Platyhelminthes

D. Schories, G. Kohlberg

About 20,000 species of Platyhelminthes, 15,000 of them marine, are described worldwide [202-204], with 162 recorded in the Antarctic [67]. Platyhelminthes, or flatworms, are the simplest triploblastic, unsegmented, bilaterally symmetrical animals. They lack a respiratory or circulatory system, oxygen uptake is being done through the body wall and this explains the dorso-ventrally flattened body shape, as the distance from oxygen demand to oxygen supply must be kept short. Non-parasitic forms have a simple gut, with ingestion and egestion performed via one single opening. Parasitic species lack a gut. An aggregation of nerve cells in the head forms a simple brain. The well-developed muscular system is coordinated and moved by several nerve cords.

Polycladida

Rhabditophora

About 900 species of polycladid flatworms are known worldwide [205]. They mainly inhabit warm water environments, where they are often very colourful. Several species are also found in temperate and polar regions but here their colouration is less impressive. Specific colouration and patterns on the dorsal surface of the animal are used among others for species identification. Polycladids are carnivorous and prey on clams, corals and ascidians. Many Polycladida have special mating rituals after which internal fertilization takes place. Fertilized eggs are often adhered to hard substrates with mucus. Self-fertilization of several species is known.

Ribbon worms, Nemertea

D. Schories, G. Kohlberg

Animals of the phylum Nemertea are known as ribbon worms. There are more than 900 species worldwide, most of them marine [203]. 47 different species have so far been found in Antarctica [67]. They live in all the oceans but are most common in shallow temperate waters. While body length ranges from a few millimetres to 30 metres (*Lineus longissimus* is the longest extant invertebrate), the body diameter rarely exceeds a few millimeters but can be up to 20mm in the larger species. Ribbon worms are more complex than flatworms, possessing a complete digestive tract with mouth, gut and anus; a blood circulatory system and a so called proboscis, a tube everted from a cavity above the mouth, to catch prey such as worms and crustaceans. Nemertea move quite slowly by means of cilia or peristaltic movements of the body musculature. With all but a few exceptions, Nemertea have different sexes. Fertilization is external and the gametes are released into the water column or a mucus layer that encloses the "mating" adults (pseudocopulation). Development can be direct or indirect via a planktonic larva. Viviparism and asexual reproduction by segmentation is also known in some species.

We gratefully acknowledge the work of John Norenburg for helping with image revision and comments.

Heteronemertea

Anopla

Anoplean nemerteans usually have their mouth posterior to brain and separate from the proboscis pore, wheras enoplean nemerteans usually have their mouth combined with the proboscis pore at or close to their anterior end. The proboscis of anoplean nemerteans does not have stylets and is morphologically not specialized in different regions. Nearly all Heteronemertean species consist of three primary body-wall muscle strata: an outer longitudinal, a middle circular, and an inner longitudinal. The image shows an unidentified heteronemertean with a very long lateral cephalic slit on each side not quite reaching the white annulus. Its large size relative to the size of the worm suggests that it is a juvenile worm (Norenburg pers. comm.). About 500 species belong to the order Heteronemertea, including the largest and most muscular nemerteans. Nearly all nemerteans can regenerate their posterior portions of the body. The genus Lineus is known to produce asexually by multiple transverse fission into numerous fragments. Sexual reproduction of nemerteans shows strong variations. Most ribbon worms have separated sexes, but protandric and simultaneous hermaphrodites are known as well. Most nemerteans are active predators, whereas others are scavengers. They are distributed from the intertidal to abyssal region. The species on the image was found several times in the inner part of Fildes Bay on brown algae and on the sediment surface in depths between 10 and 15m.


Parborlasia corrugatus (McIntosh, 1876)

Anopla, Heteronemertea Cerebratulidae

This giant nemertinean measures up to 2m with a diameter of about 2cm and a maximum weight of 140 g. Its body width strongly depends upon the degree of contraction. The colouration of *P. corrugatus* is variable ranging from white to cream, the proboscis is unbranched. It has separate sexes. Fertile specimen release gametes into the water column. Presumably *P. corrugatus* is reproducing throughout the whole year. *P. corrugatus* is one of the most important epibenthic predator and scavenger in the Antarctic. It feeds on a wide range of invertebrates including jellyfish, mollusks, seastars and anemones but consumes detritus as well. It is widely distributed in the Antarctic. *P. corrugatus* is found from the intertidal zone to depths down to the abyssal zone (>3000m) [206]. It is also present in the South Atlantic, Southern Argentina, Chile and Peru. However, Thornhill, Mahon [207] reported the presence of two potential cryptic species that were previously considered to be *P. corrugatus*, one species present in the Antarctic and another one in southern South America. The species is found on all types of substrate, but it is more abundant on soft bottoms. It can reach densities of up to 26 individuals per m^2.

Hoplonemertea

Enopla, Nemertea

Enopla are typically armed nemerteans. The proboscis contains distinct stylets and is morphologically separated in three regions (except in Bdellonemertea). Identification of most Hoplonemertea requires observation of the number and pattern of ocelli (tiny dark eyespots imbedded in the head region), and sometimes also the structure of the stylet apparatus and accessory stylet pouches. Intertidal hoplonemerteans can reach very high abundances. *Prosohochmus nelsoni*, a common predator from the Chilean coast may reach abundances of up to 260 individuals per m^2 [208]. Depositing eggs in tubes is mostly a phenomenon known from intertidal nemertean. However tube-building nemerteans were found frequently in the inner part of Fildes Bay in depth between 5-10m. Most enoplans are members of the marine benthos, some are living in the pelagic zone, as active swimmers or passive drifters. Some also live in freshwater or are terrestrial. Only a very few species are commensals or live as parasites [209]. The species on the image was found below pebbles and boulders in shallow water.

Molluscs, Mollusca

W. Engl, G. Kohlberg, D. Schories, M. Schroedl, E. Schwabe

The Mollusca are a very speciose phylum with approximately 100,000 known species worldwide [210]. It is the largest marine phylum and there are also numerous freshwater and terrestrial species. The Mollusca are subdivided into eight classes: Bivalvia, Caudofoveata, Cephalopoda, Gastropoda, Monoplacophora, Polyplacophora, Solenogastres and Scaphopoda. Molluscs are bilateral invertebrates with a soft, unsegmented body. The basic anatomy of molluscs consists of four parts: the muscular foot, the head, the visceral mass and the mantle. In many species the mantle secretes a shell, which is made of calcium carbonate ($CaCO_3$) and proteins. The foregut bears the characteristic radula for rasping food, though this is lacking in the bivalve class; however, this generalized bodyplan varies considerably between different classes. All molluscs have sensors that allow them to detect chemicals and are sensitive to touch and most also have eyes. The feeding habits of molluscs vary with their lifestyle. Herbivore species, which feed on algae, exist as well as carnivores, detrivores and scavengers. Suspensivore species like bivalves filter their food from the surrounding sea water with their gills. Different sexes are common and chitons, bivalves and some gastropods shed their eggs and sperm into the water. After fertilization, the eggs develop into planktonic larvae. Cephalopods and other gastropods fertilize internally and deposit their eggs afterwards on rocks, or other types of, substrate.

Chitons, Polyplacophora

E. Schwabe, G. Kohlberg, D. Schories

More than 900 Polyplacophora species are known worldwide [211], ten of them in Antarctic waters [67]. They are purely marine and have an oval and dorsoventrally flattened bodyshape. The dorsal part is covered by eight calcareous shells. The foot is broad and muscular and enables the animals to adhere firmly to rocks even in the surf zone. The majority of Polyplacophora species live in the intertidal or the upper part of the subtidal zones. Chitons are grazers and many of them return to their home-site after feeding. Most species feed on the algae encrusting the rocks, diatoms and detritus but carnivorous species are also known. The sexes of chitons are usually different, with few hermaphroditic species being described. Fertilization generally takes place externally and the eggs develop into free swimming larvae. Parental care, where the juveniles remain attached below the adult, has been observed in some species.

Callochiton bouveti (Thiele, 1906)

Chitonida, Callochitonidae

Callochiton bouveti is a small species of oval shape and a size of 12x7.5mm. The dirty white colouration, together with the elongate, straight, smooth, and inward directed perinotum spicules make this species easy to identify. The plates are rather strongly keeled, with distinct lateral areas. Growth marks occur in all valves. The valve surface is porously granulated, and some hardly discernible black pigmentations may be found in the aesthetes of the terminal valves as well as in the lateral areas. *C. bouveti* mainly differs from *C. puniceus* in the more obliquely pleural folds, in its colour and size [212]. *C. bouveti* is a circum- and Subantarctic species. It is found off Bouvet Island, Falkland Islands, Palmer Archipelago, Petermann Island, South Georgia, South Sandwich Islands, South Orkney Island, South Shetland Islands, in the Weddell Sea, Ross Sea and in the Magellan Strait in depths from 9-567m [212]. The species may live on sandy bottoms, with algae and gravel, but mostly it was found attached to sponges and corals. We found it below stones and boulders in the inner part of Fildes Bay at depths between 5 and 8m.

Hemiarthrum setulosum (Carpenter in Dall, 1876)

Neoloricata, Hemiarthridae

With a maximum length of 15mm *Hemiarthrum setulosum* is approximately twice as long as broad. The first valve is semi-circular with a concave posterior margin. The valves II-VII are twice as long as broad and of brown-black colour. The girdle (perinotum) is leathery and brighter than the valves. There are two types of spicules that are arranged on the perinotum in clusters near the valve margins [83]. *H. setulosum* is a brooding species and the juveniles develop in the mantle cavity. *H. setulosum* is feeding on red and green algae. The species is found in Argentina, the Falkland Islands, Tierra del Fuego, Strait of Magellan, South Georgia, South Orkney Islands, South Shetland Islands and Kerguelen Island in depths from 0 to 380m. Locally it is very abundant. We sampled *H. setulosum* below stones and boulders in the inner and outer part of Fildes Bay at depths between 5 and 8m, but it is known from all kinds of hard substrata including mussel beds and holdfasts of algae.

Tonicina zschaui (Pfeffer in Martens & Pfeffer, 1886)

Neoloricata, Ischnochitonidae

Individuals of *Tonicina zschaui* are up to 13.5mm in length and more than twice as long as broad. They are coloured reddish-brown with darker spots or with brighter concentrical stripes. The girdle is covered with small needles. The dorsal view of the perinotum of *T. zschaui* shows besides the calcareous corpuscles a distinct median surrounding groove [213]. *Tonicina zschaui* is found so far off South Georgia, South Shetland Islands and in the Bellingshausen Sea [212, 214] and in the Beagle Channel (Argentina / Chile) [215]. It occurs from the intertidal down to 60m [216], where it inhabits sandy bottoms with gravel and algae. *T. zschaui* is widespread in the Fildes Bay at shallow depths below pebbles and boulders.



Leptochiton kerguelensis (Haddon, 1886)
Neoloricata, Leptochitonidae

The maximum reported size of *Leptochiton kerguelensis* is 5.5mm and the animal is approximately twice as long as broad. The valves are white and thin. The head valve and the tail valve are shaped semi-circular. On its dorsal side the girdle is covered with elongated scales and spicules, which do not overlap each other [83]. *L. kerguelensis* is a brooding species and is found circumpolar in the Ross Sea, Weddell Sea, Bellingshausen Sea, Antarctic Peninsula, South Georgia, South Orkney Islands, South Shetland Islands, Kerguelen Islands, Falkland Islands and Magellanic region in depth ranging from 2.5m to 1582m. *L. kerguelensis* can be found on and under stones, pebbles or boulders, it is common under kelp holdfasts and among bryozoans. In the Strait of Magellan it is locally very abundant [211].

Nuttallochiton mirandus (E. A. Smith MS, Thiele, 1906)
Neoloricata, Mopaliidae

With a length of up to 12cm *Nuttallochiton mirandus* is a quite large chiton species [214]. The upper surface is covered by eight overlapping and highly elevated valves which have a saw-toothed look in lateral view. The leathery girdle is of brownish colour and covered with elongate, sharply pointed, brownish spicules interspersed with white, long needles [212]. The valves are creamy white with reddish- brown flecks [217-219]. Fertilization is externally. Males and females release sperms and eggs synchronously into the water column. *N. mirandus* has a hooked radula and feeds on eggs of gastropods [220] and bryozoans [221]. Greenish mass, probably algae, were also found in gut content analyses of *N. mirandus*. This species is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Sandwich Islands, Bouvet Island, Falkland Islands, and Burdwood Bank from depths of 67 to 761m [212, 214, 217-219, 222, 223]. We found only a single specimen of *N. mirandus* at a depth of 20m attached to a rock in Fildes Bay.

Gastropods, Gastropoda

M. Schroedl, W. Engl, C. Aldea, G. Kohlberg, D. Schories

The class Gastropoda includes the snails, limpets, abalones and nudibranchs. It is the most diverse class within the molluscs and is mainly marine. Worldwide more than 40,000 species are known [224], 428 within the Antarctic region [67]. Gastropods are molluscs with a well developed head, usually bearing eyes and tentacles. The foot is usually broad and flattened. In snails, other than limpets, the visceral mass is wound spirally and often covered by a characteristic whorled shell. A shell is lacking in the Nudibranchia and other sea slugs, which are usually bilaterally symmetrical. The diets of the different gastropods vary from herbivore to carnivore species, with, especially, nudibranchs feeding on sessile invertebrates such as sponges and hydrozoans. Some of these sea slug species (Aeolids) are able to retain undischarged nematocysts taken from their prey and use them for their own defense. Most marine gastropods are hermaphroditic; however, sexes are different in heterobranchs, with fertilization normally taking place internally. After fecundation, the female deposits egg capsules onto a substrate, into the surrounding water or they remain with her. Development can be direct, especially in Antarctic waters, with infant gastropods emerging from the eggs, or indirect via planktonic larvae. The classification of Gastropoda is presently in a state of flux, driven by molecular systematics [225-227]. Here, for consistency with older literature, a more traditional system is used for prosobranchs but a modern phylogenetic system for heterobranchs. Molluscan taxonomy was mainly shell-based in Antarctica, with species delimitation relying on morphoanatomy in sea slugs. However, molecular studies indicate extreme genetic diversification, with complexes of more or less morphologically cryptic species having been radiated in the Pleistocene by glaciation cycles [228].

Laevilacunaria antarctica (Martens, 1885)

Caenogastropoda, Littorinimorpha, Littorinoidea, Littorinidae

The shell of *Laevilacunaria antarctica* is broad, depressed and heliciform. Its diametre is larger than its height. The shell can have a length of up to 8mm and is of dark brown colour with sometimes a slightly reddish gleam. A wide umbilicus is characteristical for this species [229]. The operculum is translucent brown. Noticeable is that up to one third of the shell surface is covered by the black mantle tissue which is slided over the rear shell margin. This species is one of the most conspicuous species in the rocky intertidal of Antarctic shallow waters [230]. *L. antarctica* and other species of the genus are known to be prey of demersal fish such as *Notothenia coriiceps* [231]. *L. antarctica* is a herbivorous species and feeds on epiphytic diatoms, that contribute about two thirds to their total diet, and on a variety of macroalgae [232]. This species can be observed at the Antarctic Peninsula, the Subantarctic Islands and especially at South Georgia, South Orkney Islands and the South Shetland Islands, Kerguelen Islands and the Palmer Archipelago in depths from 2 to 64m [229, 233, 234]. It occurs mainly on the fronds of macroalgae or, less frequently, on bare rocks [230].

Laevilitorina caliginosa (Gould, 1848)

Caenogastropoda, Littorinimorpha, Littorinoidea, Littorinidae

Laevilitorina caliginosa has a small shell with a length of up to 8mm and of dark brown colour. This species has a non-pelagic development in egg-masses [235]. *L. caliginosa* is preyed by sea stars [236]. It is a herbivorous species and can be found at the Subantarctic Islands, South Georgia, South Orkney Islands, South Shetland Islands, Kerguelen Islands, the Falkland Islands and in Tierra del Fuego in depths ranging from the surface to 40m [229]. In shallows it can be very abundant. *L. caliginosa* is always living in sublittoral conditions even when it is living in the intertidal zone (under boulders lying in pools). It was also found living on the kelp *Durvillaea antarctica* and *Macrocystis pyrifera* at some Subantarctic Islands.

Pellilitorina pellita (Martens, 1885)

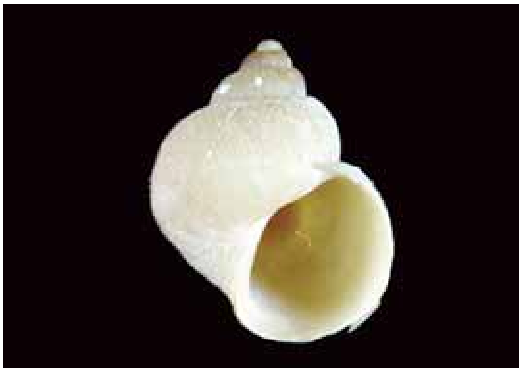
Caenogastropoda, Littorinimorpha, Littorinoidea, Littorinidae

Pellilitorina pellita has shell of dark brown colour with a lenght of up to 18mm. This species shows a periostracum with long fine curved bristles arranged in spiral rows [229]. It presents a non pelagic development [237]. *P. pellita* is a herbivorous species and has been found in stomach contents of *Notothenia neglecta* [236]. This species can be observed along the Antarctic Peninsula, South Georgia, South Orkney Islands and South Shetland Islands, Cape Adare, Heard Island and Kerguelen Islands in depths from 0 to 30m. *P. pellita* is mainly found among sublittoral seaweeds and kelps or in tide pools.

Pellilitorina setosa (E.A. Smith, 1875)

Caenogastropoda, Littorinimorpha, Littorinoidea, Littorinidae

Pellilitorina setosa has a pale brown shell with a length of up to 17.5mm. It has a periostracum with dense furrylike bristles. This species presents a non-pelagic development [237]. *P. setosa* and *P. pellita* newly emerged juveniles can be found in the sub-littoral in every month of the year [238]. *P. setosa* is a herbivorous species and is recorded from the Weddell Sea, Ross Sea, Scotia Arc, the Antarctic Peninsula, Kerguelen Islands and Crozet Islands in depths of 2-110m [222, 239]. *P. setosa* lives in tide pools as well as among seaweeds or on the kelp *Macrocystis pyrifera* [236].




Pellilitorina pellita

Leptocollonia innocens (Thiele, 1912)
Vetigastropoda, Phasianelloidea, Colloniidae

The maximum reported size of *Leptocollonia innocens* is 8mm in diameter [260]. The perforate shell is small, solid and depressed-turbinate. It has prominently raised spiral ridges and a calcareous multispiral operculum. *L. innocens* is found circumantarctic in depths of up to 385m [260].

Amauropsis aureolutea (Strebel, 1908)
Caenogastropoda, Littorinimorpha, Naticoidea, Naticidae

The shell of *Amauropsis aureolutea* is large with a maximum reported size of 32mm and of reddish-brown colour. It has a globose shape with four and a half whorls and the spire is moderately elevated. The aperture is large, oval and semicircular. The operculum is corneous and slightly larger than the aperture and because of its concave shape it seals the aperture. It is translucent and of a dark colour [253]. The umbilicus is closed [254]. *A. aureolutea* is carnivorous and feeds on bivalves and snails [83]. This species is reported from South Georgia, South Orkney Islands, South Sandwich Islands, South Shetland Islands and the Antarctic Peninsula in depths ranging from 6-1324m [253, 255].

Marseniopsis mollis (Smith, 1902)
Caenogastropoda, Littorinimorpha, Velutinoidea, Lamellariidae

The length of *Marseniopsis mollis* can be up to 7cm [222]. The thick translucent orange-white to yellow mantle is soft and smooth and covers the shell. It gives the animal a rounded, thick, and fleshy apperance. The fragile shell is internal and has two to three complete whorls [257]. *M. mollis* has been found in the stomach contents of the fish *Trematomus hansoni*. *M. mollis* feeds on the tunicate *Cnemidocarpa verrucosa* and fouling organisms like bryozoans and hydroids [259] from which this species obtains its defensive chemical homarine. It deters feeding and so the gastropod is protected from predation [258]. *M. mollis* is the most common species in the genus *Marseniopsis* in Antarctica. It is found around Antarctica, the Antarctic Peninsula and the South Shetland Islands at depths from 1 to 800m [222, 223, 233, 250, 257]. This species is abundant in shallow waters.


Marseniopsis mollis

Leptocollonia innocens

Amauropsis aureolata

Chlanidota signeyana (Powell, 1951)

Caenogastropoda, Neogastropoda, Buccinoidea, Buccinidae

With a length of up to 42.6mm the shell of *Chlanidota signeyana* is quite large for this genus. It is thin, fragile and elongate to ovate in outline, with medium to high, rounded to turreted spire. Shell colour is chalky-white to brownish or orange-tan [249]. *C. signeyana* is a necrophagous species [250] and is the only *Chlanidota* species, which reaches the Antarctic continent. It is reported from the South Orkney Islands, South Shetland Islands, Antarctic Peninsula, Queen Maud Land, Enderby Land, Weddell Sea and the eastern margins of the Ross Sea from depths ranging from 30 to 5194m [229, 249, 251].

Neobuccinum eatoni (E.A. Smith, 1879)

Caenogastropoda, Neogastropoda, Buccinoidea, Buccinidae

The colour of the shell of *Neobuccinum eatoni* can vary from whitish or creamy with a dull brownish yellow, but also light bluish-purple, dark purplish-brown or a dark brown pattern over a grey background have been reported [240, 241]. Shells with up to 9cm in length have been collected [222, 242], deep water specimens are usually elongated. The convex whorls are smooth with fine wrinkles or growth lines and with deep sutures between the whorls [240, 241]. The operculum is semi-ovoid and of black brown colour [241]. Eggs are deposited singly or as an egg mass. Each egg capsule has a diameter of about 8mm, and they are altogether surrounded by a marginal membrane [243]. *N. eatoni* is necrophagous but also preys on the Antarctic scallop *Adamussium colbecki* and *Laternula elliptica,* that become damaged or unburied for example by scouring icebergs [244-246]. *N. eatoni* itself has been found in the stomach contents of the fish *Trematomus hansoni*. This species is one of the most widely distributed Antarctic molluscs in space and depth [247]. It is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, Kerguelen Island, and Heard Island at depths from 4 to 2350m [222, 233, 240, 241, 246, 248]. *N. eatoni* is found on sandy and rocky substrates with pebble, sandy mud, and mud [248].

Prosipho harrietae Engl, 2003

Caenogastropoda, Neogastropoda, Buccinoidea, Buccinidae

The shell of *Prosipho harrietae* is small (up to 6mm), turriculate and brown coloured. The teleoconch has somewhat more than 4.5 whorls, with each whorl bearing two fine spiral cords. The base with three cords decreases in prominence towards the short, straight siphonal canal. The periostracum is thick, forming vertical lamellae. With *P. harrietae* and *P. turrita* Oliver & Picken, 1984 there are existing two turriculate, brown coloured species, living at the Subantarctic Islands. Both species can be separated by their sculpture and ratio of height and breadth. The spiral sculpture of *P. turrita* is much more evident with two keels becoming whitish at their tops. The shells of *P. turrita* are broader with a ratio of height and breadth in the holotype and five paratypes of 2.18. The ratio of eight shells of *P. harrietae* with similar heights is 2.51. Presently it is known from King George Island, South Shetland Islands. Aldea & Troncoso's *Prosipho hedleyi* from Peter I Island (Moluscos del Mar de Bellingshausen, 2010) can be referred to *P. harrietae*. *P. turrita* is so far only known from Signy Island, South Orkney Islands.

Belaturricula ergata (Hedley, 1916)

Caenogastropoda, Neogastropoda, Conoidea, Conidae

The shell of *Belaturricula ergata* is large with a length of up to 100mm, elongate fusiform, thin, dirty white in colour and with a highly elevated spire. The surface of the teleoconch is covered by a thin pale yellowish periostracum. The spiral cords are about 7 on the first teleoconch and about 20 on the penultimate whorl. The other *Belaturricula* species can be separated by the number of their spirals. *B. gaini* (Lamy, 1910) has about 30 and *B. turrita multispiralis* Dell, 1990 shows 51-63 fine spirals at the penultimate whorl. *B. turrita turrita* (Strebel, 1908) has about 35-41 spirals at the penultimate whorl but its distribution is restricted to Shag Rock Bank (type locality) and South Georgia. *B. ergata* is a circumantarctic species [229].

Harpovoluta charcoti (Lamy, 1910)

Caenogastropoda, Neogastropoda, Muricoidea, Volutidae

Harpovoluta charcoti is a very common gastropod in Antarctic waters with a length of up to 75mm. Individuals of this species always have a symbiotic anemone (*Isosicyonis alba* Studer, 1878) on their shells. The anemone covers the shell completely, so that it can easily be misidentified as mantle tissue. The thin white shell itself is quite big and has a voluminous terminal whorl. The dorsal foot tissue and the head region are of slightly pinkish colour, the margins are brighter. The eyes are situated at the edges of the lateral head appendages and the tentacles are quite short [252]. Short time after hatching the shell of *H. charcoti* is settled by an individual of the anemone *Isosicyonis alba*. It can be considered as a symbiosis, because the diet spectrum of the actinia is ampilified and the snail is protected from being preyed. *H. charcoti* presents egg capsules of about 16mm diametre with 3-5 hatchlings per capsule [220]. *H. charcoti* is a necrophagous species and feeds on dead animals. It is a circumantarctic species and found at the Scotia Arc, the South Sandwich Islands, South Shetland Islands, the Antarctic Peninsula and in the Ross Sea in depths from 0 to 1469m. It lives on soft and hard bottoms.

Trophon leptocharteres Oliver & Picken, 1984

Caenogastropoda, Neogastropoda, Muricoidea, Muricida

The shell length of *Trophon leptocharteres* is up to 26mm and of white to grey colour. It is brittle, fusiform and short-spired of six whorls. The surface is deeply ridged, but the ridges are close together. Thin raised axial sinous lamellae, which are crossing weak spiral ridges, especially good visible in juvenile specimens, are typical for this species. The aperture is large and ovate and has a short siphonal canal. The operculum is horny and ovate [229, 275]. *T. leptocharteres* is carnivorous. This species is reported from the South Orkney Islands, South Shetland Islands and the western Antarctic Peninsula from depths ranging from 15–130m [275]. It lives on hard substrates of bedrock, boulders, cobbles, stones and pebbles.

Trophon nucelliformis Oliver & Picken, 1984

Caenogastropoda, Neogastropoda, Muricoidea, Muricidae

The maximum reported size of *Trophon nucelliformis* is 23.4mm. The shell is fusiform, thick, short-spired of five whorls and of dull greyish white colour except for the pale brown aperture. The aperture is large -more than half of the shell´s height- and oval. The siphonal canal is very short and the operculum horny and ovate [275]. The shell surface shows irregular axial ridges, but in many adult and even juvenile specimens it is eroded [229]. *T. nucelliformis* has a direct life cycle, juveniles emerge from the egg capsules [238]. *T. nucelliformis* is a predatory snail. This species is found at the western Antarctic Peninsula, the South Orkney Islands, South Shetland Islands and the Scotia Arc in depths ranging from 2 to 44m [275, 276]. The species is found on hard substrates of bedrock, boulders, cobbles, stones and pebbles.

Cerithiella seymouriana (Strebel, 1908)

Caenogastropoda, [unassigned] Caenogastropoda, Triphoroidea, Cerithiopsidae

Cerithiella seymouriana has a yellowish-white shell covered with a periostracum, almost entirely. This species has a smooth protoconch and the teleoconch is characterised by two spiral chords per whorl. It presents ten and a half whorls, with axial ribs and spiral striae. There are in average 1.2- 1.5 whorls/mm [229]. *C. seymouriana* is found circum-antarctic, in the Ross Sea, the South Shetland Islands, South Orkney Islands, South Georgia, Enderby Land and Adelie Land [229, 256]. This species lives on sandy and gravelly bottoms.

Trophon leptocharteres

Trophon nucelliformis

Nacella (Patinigera) concinna (Strebel, 1908)

Patellogastropoda, Lottioidea, Nacellidae

The shell of *Nacella concinna* is oval and elongated with a maximum size of about 6cm in length. The cone is moderately elevated with a low apex situated towards the anterior margin. The shell surface shows about 30 radial ribs. The annual growth is indicated by fine concentric lines. Colour varies from shades of pale brown and grey, the interior is dark purplish-brown. Like many other Antarctic organisms, *N. concinna* is described as a long living species, shells of 41mm length grew in 21 years. Some specimens even reached an age of 70 years [272]. Fecundation is external and development indirect by free swimming larvae. For egg deposition *N. concinna* forms groups of 3-35 animals. These aggregations are formed in springtime and can last up to seven days. *N. concinna* is preyed upon by sea stars. Generally it is observed grazing on macroalgae and microalgae that are associated to the benthos. *N. concinna* can be found along the Antarctic Peninsula and the adjacent islands, especially at the Palmer Archipelago, the Islands Seymour and Paulet, along the islands of the Scotia Arc, South Georgia, South Sandwich Islands, South Orkney Islands, the South Shetland Islands and Bouvet Island [273]. It inhabits rocky and soft substrates [274].

Margarella antarctica (Lamy, 1905)

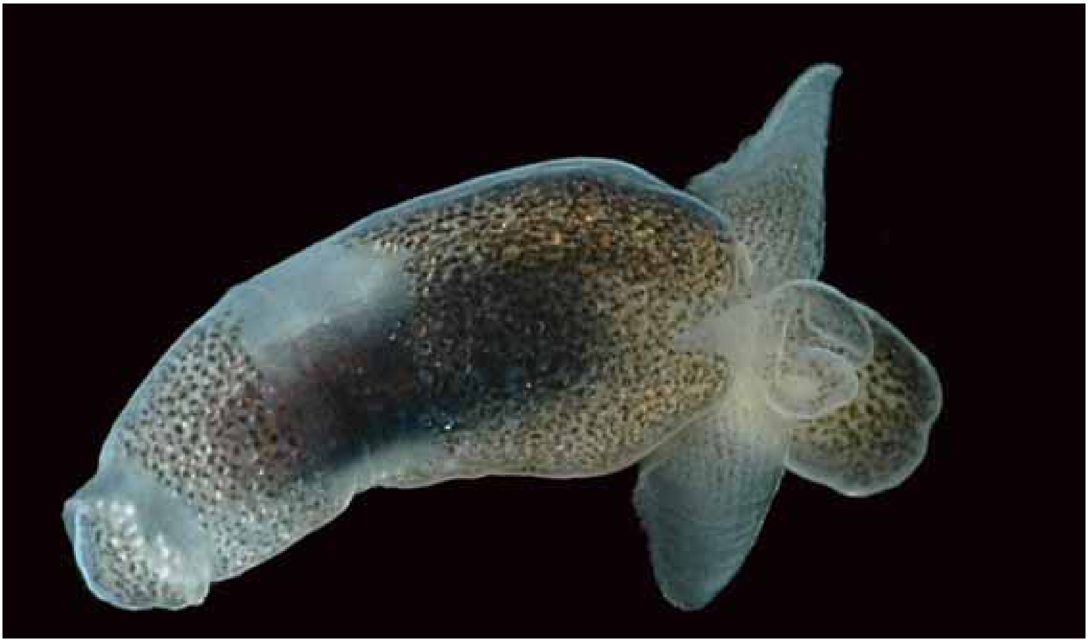
Vetigastropoda, Trochoidea, Calliostomatidae

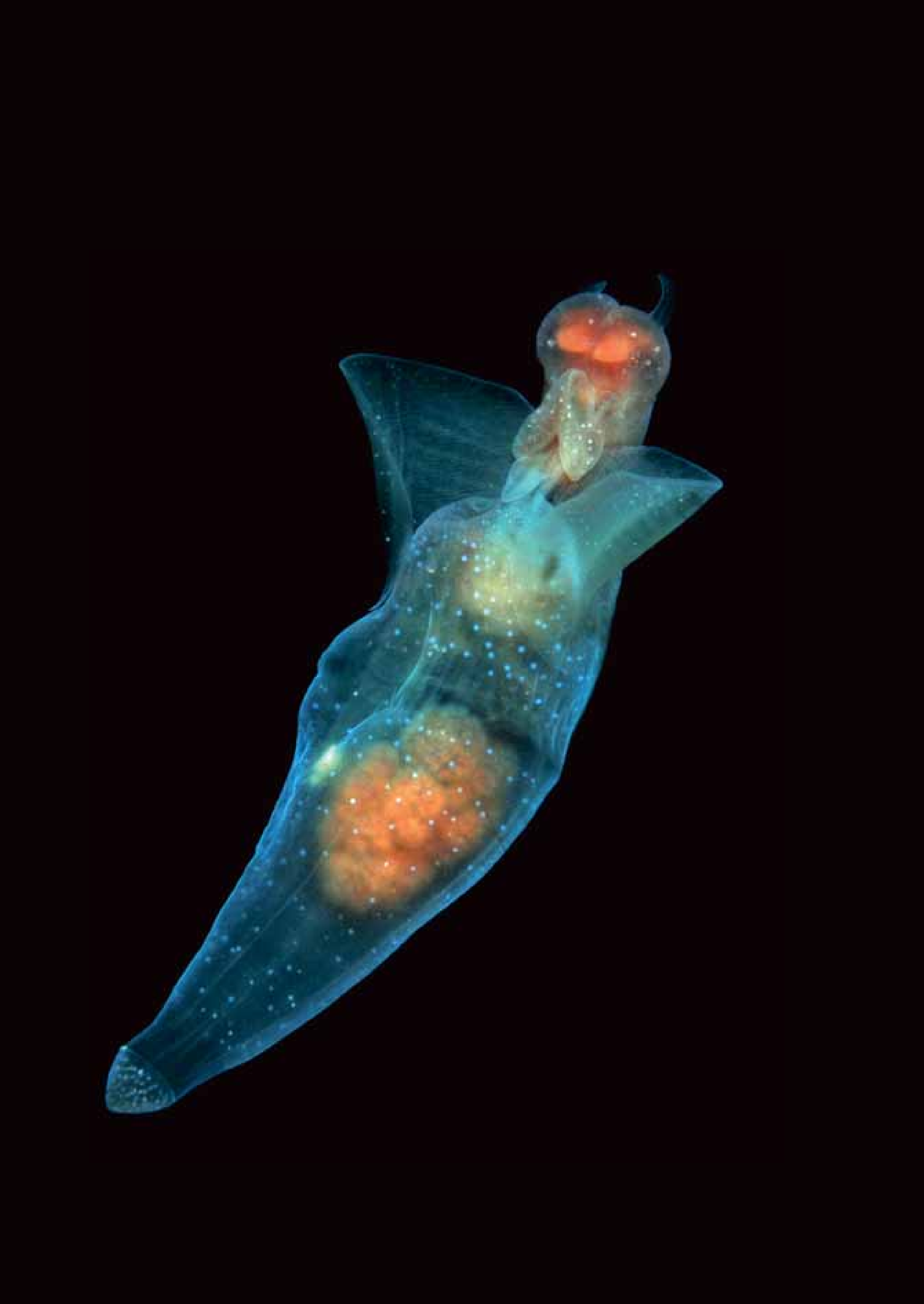
The shell of *Margarella antarctica* is flat and completely smooth. It is of whitish to violet colour reaching length of up to 15mm [229]. *M. antarctica* produces egg capsules which are fixed to rocky substrates or algae and juveniles emerge from these capsule [270]. *M. antarctica* is highly preyed by sea stars. The species usually feeds on macroalgae like *Desmarestia* sp. and *Himantothallus grandifolius*. It was observed at the Antarctic Peninsula, the South Shetland Islands, the Palmer Archipelago and the islands of the Scotia Arc in depths ranging from 0 to 460m [229, 271]. *M. antarctica* is associated to spots with macroalgae and rocks [270].


Clione antarctica E. A. Smith, 1902

Heterobranchia, Opisthobranchia, Gymnosomata, Clionoidea, Clionidae

Clione antarctica belongs to a group of pelagic marine gastropods called sea angels. All members of this group lose their shells during embryonic development. Sea angels are cylindrical, the foot is transformed into two wing-like flapping appendages, which are used for locomotion. The body length can be up to 30mm. Spawning takes place from November to January [278]. The eggs are deposited as free-floating, gelatinous masses. Their embryonic shells are lost within the first few days after hatching. In high Antarctic waters *Clione* feeds exclusively on the planktonic shelled pteropod mollusc *Limacina helicina*, further north, it feeds also on *L. retroversa* [278]. *Clione antarctica* itself is preyed upon by the medusa *Diplulmaris antarctica* [171, 265]. The hyperiid amphipod *Hyperiella dilatata* uses *Clione antarctica* as a chemical defense against predation by holding it to itself [279-281]. Predatory fish do not eat the amphipod with *C. antarctica* or *C. antarctica* itself, because of the chemical pteroenone which deters feeding [259, 279-281]. It is assumed that *C. antarctica* synthesizes pteroenone as part of its metabolic processes, because this chemical could not be proved in its prey *Limacina helicina* [259, 281]. *C. antarctica* is found throughout Antarctic and Subantarctic waters even to about 36°S in some areas, but normally not deeper than 20m [278, 282]. Population densities of up to 300 individuals per m^2 are reported [281]. In the past, *C. antarctica* was regarded as a subspecies of the similar, slightly larger species *C. limacina* from the northern hemisphere, and specific separation needs confirmation by suitable molecular approaches [283]. *C. antarctica* is a holopelagic species.





Limacina antarctica (Woodward, 1854)

Heterobranchia, Opisthobranchia, Thecosomata, Euthecosomata, Limacinoidea, Limacinidae

Limacina antarctica is a helicoid shell bearing holoplanktonic gastropod [261], belonging to the Thecosomata commonly known as sea butterflies. Its foot is transformed into wing-like parapodia, which are used for propulsion and mucus web feeding. The soft parts are of dark purple colour, the parapodia are paler translucent. The shell is very thin and fragile and its width can be up to 6mm. *L. antarctica* forms a important component of the zooplankon [262] and feeds mainly on phytoplankton and to an lesser extent on zooplankton. Therefore a mucus web is extended and when filled uptaken and completely digested with the prey [263]. *L. antarctica* is preyed by the other planktonic gastropod *Clione antarctica*, the medusas *Diplulmaris antarctica*, *Solmundella bitentaculata* and the nototheniid fish species *Pagothenia borchgrevinki*, *Trematomus bernacchii*, *T. hansoni* and *T. centronotus* [171, 262, 264-268]. This holoplanktonic species is found in all Antarctic waters between Antarctica and the Antarctic Convergence, but less common in Subantarctic waters of the Antarctic Circumpolar Current [269]. *L. antarctica* has also been reported north to 10°S in the Brazil Current and at 30°S near South Africa [269], but these records should be confirmed by morphoanatomical and molecular comparisons.

Note: Species limits between the Antarctic morphotype "antarctica", the Subantarctic "rangi" and northern hemispherical *Limacina helicina* (which also could refer to a species complex) are unclear yet (own data). It is crucial to explore species limits and ecological tolerances, since *Limacina* species and other thin-shelled thecosomes are both highly sensible to ocean acidification and important members of the polar pelagic food web; they are target to intensive physiological and ecological research without having any appropriate taxonomic base. *Limacina costulata* Preston 1916 can be distinguished from *L. antarctica* by the transversely costulated shell.


Limacina costulata

Doris kerguelenensis (Bergh, 1884)

Heterobranchia, Opisthobranchia, Nudibranchia, Euctenidiacea, Doridacea, Doridoidea, Dorididae

The body of *Doris kerguelenensis* is oval, with the notum covering head and foot completely. Rhinophores are perfoliate. The notum bears tubercles of different size and form. Mediodorsal gills are arranged in a circle around the anus, and are completely retractable into a pocket (cryptobranchiate condition). Specimens are white, pale or bright yellow, the gills and rhinophores are often slightly darker [290-293]. Maximum reported size is 12cm. *D. kerguelenensis* is a simultaneous hermaphrodite and deposits cross-fertilized embryos in a gelatinous matrix. Development is direct, and young sea slugs crawl out from the egg mass. Development period in Antarctica is estimated to be longer than 36 months [294, 295]. Gut content analyses showed that *D. kerguelenensis* feeds on the sponges *Rossella racovitzae*, *Rossella nuda*, *Anoxycalyx (Scolymastra) joubini*, *Tetilla leptoderma*, *Haliclona dancoi*, *Mycale (Oxymycale) acerata*, *Polymastia invaginata*, *Haliclona tenella*, *Calyx arcuarius*, *Isodictya setifera*, *Ectyodoryx cf. ramilobosa*, and *Dendrilla antarctica* [191, 285, 287, 291, 296, 297]. *D. kerguelenensis* is found in Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Georgia, Falkland Islands, Shag Rock, Bouvet Island, Kerguelen Island, Macquarie Island, New Caledonia, Heard Island, southern Chile, and southern Argentina at depths from 0 to 786m [290, 291, 293, 296, 298-300]. In the warmer regions it is found only in great depth, where water temperature is similar to those of the Antarctic region. *D. kerguelenensis* is a holobenthic species living on or close to sponges.

Note: The name *Doris kerguelenensis* refers to a complex of at least 42 morphologically cryptic species in Antarctic and Subantarctic waters alone, which have radiated "explosively" within the last 3 million years [228, 301]. Several of the (unnamed) species level clades show distinct chemicals; speciation driven by repeated glacial isolation and adaptation to different locally available food sponges under predatory pressure is assumed [301].

Notaeolidia gigas (Eliot, 1905)

Heterobranchia, Opisthobranchia, Nudibranchia, Dexiarchia, Cladobranchia, Aeolidida, Flabellinoidea, Notaeolidiidae

Notaeolidia gigas is an elongate aeolidoidean cladobranch. Rhinophores and oral tentacles are long and smooth, tips are white. The body is of translucent to milky white colour [288, 292, 302]. The orange coloured digestive gland is visible through the body wall [288]. At each side this species has three to four rows of at least 200 cerata. The largest cerata have a length of 9-10mm and are located in the inner rows, the smaller ones are towards the edges. The tips of the cerata are white pigmented [302]. The body of *Notaeolidia gigas* can be up to 8cm long. There are cnidosacs at the tips of the cerata hosting nematocysts from its cnidarian prey, supposedly used for defense [303]. *N. gigas* feeds on hydroids like *Tubularia* sp. and is also a predator of the stoloniferan soft coral *Clavularia frankliniana* [186, 191, 287, 304]. *N. gigas* is found at the Antarctic Peninsula, South Shetland Islands, and South Orkney Islands at depths from 3 to 50m [287, 288, 302]. *Notaeolidia gigas* lives associated with hydrozoan communities.

Note: *Notaeolidia gigas* (having a penial papilla) is externally similar to the aphallic *N. schmekelae* Wägele, 1990 also having larger jaws. The usually smaller sized *N. depressa* Elliot, 1905 has fewer cerata in 1-2 rows [288].

Tritoniella belli (Eliot, 1907)

Heterobranchia, Opisthobranchia, Nudibranchia, Dexiarchia, Cladobranchia, Dendronotida, Tritoniidae

Tritoniella belli is an elongate dendronotoidean cladobranch with the notum fused with the velum bearing head anteriorly. Rhinophores are surrounded by a sheath, which can be more or less expanded. The notum has more or less waved edges, and a typical middorsal longitudinal ridge, which also may lack. The notum can be almost smooth or covered with pustules. Two morphological types of this species were recognized [305]. The first one predominately found along the Antarctic Peninsula is of yellow to orange colour and has a tubercle-covered body with a ridged margin. The second type is reported from the Weddell Sea and Signy Island (South Orkney Islands) and is of white to transparent colour. It has few tubercles and a serrated margin sometimes with small finger-shaped processes. Both morphs can be found elsewhere in Antarctica [305], and transitional forms also occur (own observations). *T. belli* can grow up to a length of 8cm. It defends itself against predators like the sea star *Odontaster validus* using the chemical chimyl alcohol, which it obtains from its prey the soft coral *Clavularia frankliniana* [190]. This chemical is also noxious to the sea urchin *Sterechinus neumayeri*, several other seastars and two species of fish [306]. *T. belli* deposits its egg ribbons on bare rock surfaces, on the hydroid *Ophiodes arboreus* or the sponge *Homaxinella balfourensis* [307]. *T. belli* feeds mainly on the corals *Clavularia frankliniana* and *Ascolepis* sp. Also hydroids, anemones, tunicates, the bush sponge *Homaxinella balfourensis* and diatoms are supposed to be eaten [190, 191, 285, 307]. *T. belli* is found in Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Georgia, Shag Rock, and Kerguelen Island at depths from 7 to 699m [287, 305, 307, 308].

Note: The wide geographical distribution and morphoanatomical variation found in *T. belli* indicates the potential existence of a species complex, which is being tested via molecular analyses by the authors. At present it is problematic to distinguish individuals with almost smooth notum from similar Antarctic *Tritonia* species, which also need molecular taxonomic revision.

Charcotia granulosa (Vayssière, 1906)

Heterobranchia, Opisthobranchia, Nudibranchia, Dexiarchia, Cladobranchia, Charcotiidae

Charcotia granulosa is an elongate oval "arminoidean" cladobranch with the notum fused with the velum bearing head anteriorly. Rhinophores are digitiform with white tips. The notum is broader than the foot, having smooth and slightly wavy edges, covered with white pigment. The body is of whitish translucent colour, brownish or orange digestive gland branches are often visible. The notum bears small pustules with usually white tips. *Charcotia granulosa* grows up to a length of 3cm [286]. It feeds on bryozoans, mainly on *Beania* sp. [287] and is reported from the Antarctic Peninsula, the South Orkney Islands and King George Island from the shallow subtidal. The species is associated with hard substrate communities.


Pseudotritonia gracilidens (Odhner, 1944)

Heterobranchia, Opisthobranchia, Nudibranchia, Dexiarchia, Cladobranchia, [unassigned] Cladobranchia, Charcotiidae

Specimens of *Pseudotritonia gracilidens* can reach a length of up to 8cm. The mantle is translucent to light brown, so the digestive gland is visible through the body wall. The notal margin, foot margin and the margin of oral veil are seamed by a white pigmented line. The rhinophores are smooth, digitiform and with white pigmented tips [288]. *Pseudotritonia gracilidens* is supposed to be specialised on the foliaceous Bryozoan *Arachnopusia inchoata* [287]. *P. gracilidens* is found in the Scotia Arc and the Antarctic Peninsula in depth from 30 to 259m [289].

Aegires albus (Thiele, 1912)

Heterobranchia, Opisthobranchia, Nudibranchia, Euctenidiacea, Doridacea, Polyceroidea, Aegiridae

Aegires albus is an elongate oval phanerobranch dorid with the tail protruding under the notum. The rhinophores are retractile and of smooth surface [284]. Gills are arranged anterior to the anus; gills are usually protected by notum lobes, but are not retractable into a pocket. The dorsal surface (notum and tail) has a nobby appearance because of many high conical or columnar tubercles that are scattered more or less irregularly all over the mantle. Between these and sometimes on the bigger tubercles themselves, smaller tubercles can be observed. The body is of white colour and does sometimes have tiny white spots. The maximum reported length of preserved specimens of *Aegires albus* is 26mm, according to living animals are longer. Stomach contents included spicules of calcareous sponges [285]. The simple hamate radular teeth also suggest preying on soft organisms, such as sponges. *A. albus* is found in the Scotia Arc, the Antarctic Peninsula, Weddell Sea and Ross Sea in depth ranging from 104 to 604m. This species is found in hard substrate communities.


Bivalves, Bivalvia

W. Engl, C. Aldea, G. Kohlberg, D. Schories

With about 8,000 living species known worldwide [210], 130 in Antarctica alone [67], the Bivalvia are the second most diverse group of molluscs. The shell is divided into left and right halves, or valves, which are connected dorsally by an elastic ligament and closed by strong muscles. The body is laterally flattened and bilaterally symmetric. The head is reduced and lacks a radula. The gills are quite large and are used for respiration and also filter feeding. The foot is often strong and relatively large, and can be used to burrow into the sediment. Other bivalve species cement themselves to a hard substrate (oysters) or are capable of secreting bonding filaments, byssus-threads (mussels), allowing them to attach to a hard substrate or others of their kind. Scallops live unattached and are even capable of swimming short distances. Boring species like the shipworm (not a worm but a bivalve) rasp holes in wood, corals or rocks by the use of their valves. Sexes are mainly different in bivalves and gametes are released into the surrounding water, where fertilization takes place. The fecund eggs develop into free-swimming larvae. Parental care is established in several groups, where the larvaes´ development is partly or completely inside the females valves.

Laternula elliptica (King & Broderip, 1832)

Heterodonta, Euheterodonta, Anomalodesmata, Thracioidea, Laternulidae

The shell of *Laternula elliptica* can be up to 12cm in length. It takes the animal 12 - 13 years to grow up to a length of 9cm and it may live for more than 20 years [330, 331]. The shell has an elongated shape and is of white colour with a pinkish or greenish periostracum covering the shell when alive [240]. On the shell surface coarse growth lines and a brownish edge along the margin are visible [241]. The shell growth lines are formed annually. The shell cannot be closed completely because of a large gap through which the siphons are extruded. Due to its shell features it is an unmistakable species [229]. *L. elliptica* is a simultaneous hermaphrodite with external fertilization. Gametes are free-spawned directly into the water column. The embryos are lecithotrophic and develop intracapsularly until hatching. Adults spawn annually during the austral summer [332]. Lecithotrophic larval development in *L. elliptica* is known to proceed with nourishment from egg yolk reserves during the winter in the absence of primary production. *L. elliptica* is a suspension feeding species. Water is taken up through the inhalant siphon, filtered by the gills and expelled through the exhalant siphon. Unburied or damaged animals are preyed by the seastars *Odontaster validus* and *Cryptasterias turqueti*, the nemertean *Parborlasia corrugatus*, the Antarctic whelk *Neobuccinum eatoni*, *Trophonella longstaffi*, and amphipods [244]. *L. elliptica* is almost circumantarctic and found at the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia, Kerguelen Islands and Marion and Prince Edward Islands at water depths of 1 to 508m [199, 255, 333] where it can reach densities of up to 200 ind. m^{-2}. It is a predominantly shallow-water species, occurring in depths less than 100m [229] and lives buried in gravelly or soft mud. It is able to burrow as deep as 50cm.


Cyamiomactra laminifera (Lamy, 1906)

Heterodonta, Euheterodonta, Veneroida, Cyamioidea, Cyamiidae

Cyamiomactra laminifera is a small bivalve with a shell length of about 19mm in the largest reported specimens [229]. The length is always greater than the height. The thin, porcelaneous shell is of white-light brown colour and has a strong keel from the umbo to the posterior margin. The shell surface is characterized by fine concentric striae and prominent concentric ridges [335]. *C. laminifera* is preyed by the ophiuroidean *Ophionotus victoriae* [336]. *C. laminifera* is reported from South Georgia, South Sandwich Islands, South Orkney Islands, Falkland Islands, Weddell Sea, Ross Sea [337], Antarctic Peninsula and South Shetland Islands from depths ranging from 0 to 1281m [222]. This species lives in muddy sands and in substrates of stones and algae [319].

Kidderia bicolor (E. von Martens, 1885)

Heterodonta, Euheterodonta, Veneroida, Cyamioidea, Cyamiidae

The shell is small, elongated, flattened, very inequilateral, very short and much less high than the anteroposterior part. The largest reported specimen has a length of about 7mm. The ventral edge is convex. The ligament is internal and situated, behind the cardinal teeth. A pallial sinus is absent. Characteristic for the species is its reddish-purple coloured umbo [229]. In *Kidderia bicolor*, gametogenic cycles are longer than one year, and often take two years [338]. The females are ovoviviparous and retain their embryos in brood pouches of the demibranchs [339]. As a filter feeding bivalve the food of *K. bicolor,* consists of diatoms, algal fragments, dinoflagellates, and organic detritus. *Kidderia bicolor* is reported from the South Shetland Islands, South Orkney Islands, Kerguelen Islands, Falkland Islands and the Weddell Sea [229, 340]. It has been found on rocky substrates in the intertidal and subtidal zones and under stones [229].

Mysella charcoti (Lamy, 1906)

Heterodonta, Euheterodonta, Veneroida, Galeommatoidea, Galeommatidae

Mysella charcoti has a small but solid shell of up to 3.5mm in length. Except for weak growth lines, the external surface is smooth. This species is characterized by the rectangular outline of the shell [229]. The foot of *M. charcoti* is large and highly muscular. When completely extended it attains the length of the shell [341]. It is a free-living infaunal species that lives within the organic-rich, fine sediment near the surface. The epibiontic hydrozoan *Monobrachium antarcticum* is often found attached to the shell of *M. charcoti*. Undamaged animals of this species are able to survive the passage through the digestive tract of some fish. So they are dispersed for short distances [341]. *M. charcoti* is a brooding species [341]. Completely shelled juveniles are released from the adult. This species is predominantly deposit-feeding. Food particles are carried into the mantle cavity by the anterior–posterior current of water [342]. *M. charcoti* is found in South Georgia, South Shetland Islands, South Orkney Islands, Antarctic Peninsula, Bellingshausen Sea, Terra Nova Bay (Ross Sea), Palmer Archipelago, Kerguelen and Macquarie Islands in depths from 6 to 670m, but mostly in shallow waters. Below depths of 30m population size decreases [229, 341]. *M. charcoti* lives in soft sediments.




Waldo parasiticus (Dall, 1876)

Heterodonta, Euheterodonta, Veneroida, Galeommatoidea, Galeommatidae

The shell of *Waldo parasiticus* is ovate, elongate and small with a maximum length of 4.1mm. The anterior end is rounded and a little projecting while the posterior end is more truncate. The shell is moderately inflated, extremely thin and fragile with 30-35 well- marked ribs on its surface. The colouration is whitish translucent and shiny [343]. Characteristic for *W. parasiticus* is the crenulate ventral margin of the shell [229]. This species breeds its juveniles. 2.7mm long adult bivalve can carry more than 150 D-shaped larvae [343]. *W. parasiticus* is found in the Ross Sea, off Adelie Land, King George Island, Scotia Arc, South Georgia, Kerguelen Islands, Isla de los Estadios and Southern Chile [229]. This species lives epibiontic to several Antarctic species of regular and irregular echinoids. For fixation to the spines it uses its byssus [343].

Yoldia eightsii (Jay, 1839)

Protobranchia, Nuculanoida, Nuculanoidea, Yoldiidae

The shell of the infaunal bivalve *Yoldia eightsii* can reach a length of 4.6cm. It is of brown or yellow-olive colour with brown growth rings. Shell colouration may be dark brown in larger specimens [217, 323]. Growth rate calculations assume that an individual at 3.5cm in length is about 65 years old [324]. *Y. eightsii* has been shown to have a growth period which is not correlated with periods of food supply [325]. It is a deposit and suspension feeder and ingests mud as well as small planktonic organisms like diatoms [326]. The muricid gastropod *Trophonella longstaffi* and the brittle star *Ophiosparte gigas* are predators of *Y. eightsii* [327]. The species is found in the Weddell Sea, Ross Sea, at the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia, Kerguelen Islands, South Patagonia, and Falkland Islands at depths from the intertidal to 824m, but is most common at depths shallower than 100m [217, 222, 229, 240, 255, 316, 328, 329]. *Y. eightsii* inhabits soft sediments and burrows relatively shallow compared to other *Yoldia*-species. It is moving horizontally in the sediment [326, 329].

Limopsis lilliei (E.A. Smith, 1915)

Pteriomorphia, Arcoida, Limopsoidea, Limopsidae

The rather thin shell of *Limopsis lilliei* is quadrately rounded and flat. The yellowish surface is covered by very short, glossy and golden hairs, which are arranged in concentric and radiating series. Fertilization is external and the free-swimming larvae are lecithotrophic [220]. *L. lilliei* is a suspension-feeding species and is found circumpolar at the South Sandwich Islands, South Georgia, Bouvet Island, Antarctic Peninsula, in the Ross Sea, Adélie Land, Davis Sea, Enderby Land, Bouvet Island and Marion and Prince Edward Islands at depths ranging from 13 to 2100m [222, 255]. This species lives epifaunal.

Lissarca notorcadensis (Melvill & Standen, 1907)

Pteriomorphia, Arcoida, Limopsoidea, Philobryidae

The maximum reported shell size of *Lissarca notorcadensis* is 7mm. The shell is relatively thick and of white colour. The shape can be roundly to trapezoid. The surface is covered with fine and closely concentrically lines. Fertilization is internally and supposed to be done by transferring spermatophores directly into the female [309]. It is a brooding species. Development takes places in the maternal mantle cavity and juveniles are released in austral spring. *L. notorcadensis* is a suspension feeding bivalve and is found at the Antarctic Peninsula, South Orkney Islands, Weddell Sea, Ross Sea, Scotia Sea, South Pacific Ocean and the South Atlantic Ocean in depth ranging from 16 to 3900m. Individuals of this species live mainly attached to echinoid spines, but can also be found on hydrozoan and bryozoan colonies.

Philobrya sublaevis (Pelseneer, 1903)

Pteriomorphia, Arcoida, Limopsoidea, Philobryidae

Shell length of *Philobrya sublaevis* can be up to 18mm and the shell is of white colour. The valves are covered with radially lines of hairs that are connected among each other by concentric and translucent periostracum belts/ ribbons. These do outreach far the valves edges [83]. *P. sublaevis* is a brooding species and releases hundreds of shelled juveniles [220]. It is a suspension feeding species [310]and is found around the Antarctic continent, at the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia and Bouvet Islands in depths ranging from 1 to 923m [229]. It is one of the common circumantarctic bivalves and lives epifaunal.

Philobrya wandelensis Lamy, 1906

Pteriomorphia, Arcoida, Limopsoidea, Philobryidae

The fragile shell of *Philobrya wandelensis* is white and thin. Length can be up to 9mm with periostracum. The surface of the valves is covered with fine concentric lines and six prominent radial ridges at the central part of the valves. The periostracum is of light brown colour and overlaps slightly the ventral margin [311]. Characteristic for this species are its mytiloid shape and the periostracal ribs [229]. *P. wandelensis* is a brooding species [220]. It is probably a circumantarctic species and found at the Antarctic Peninsula, South Orkney Islands, South Georgia, Oates Land, Adelie Land, Ross Sea, Enderby Land, MacRobertson Land, Commonwealth Bay and Burdwood Bank in depths from 148 to 641m. *P. wandelensis* lives epifaunal.

Limatula hodgsoni (E.A. Smith, 1907)

Pteriomorphia, Arcoida, Limopsoidea, Philobryidae

The thin shell of *Limatula hodgsoni* is of white colour and up to 27mm long [312, 313]. *L. hodgsoni* has a roundly oval and swollen appearance. The surface is covered with 30-35 fine radially ribs, which are crossed by the growth lines. Gametes are spawned into the surrounding water column, where fertilization and development into free swimming larvae takes place [314]. *L. hodgsoni* have a lecithotrophic larvae [315]. It is a filter feeding species. Amongst others *L. hodgsoni* is preyed by the seastars *Diplasterias brucei*, *Odontaster validus* and the gastropod *Trophonella longstaffi*, which drills holes into the shell of *L. hodgsoni* [191, 304]. This speices is an almost circumantarctic species and found at the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia Island, Shag Rocks, Bouvet Island, Macquarie Island, Ross Sea and off Cape Horn from 6 to 1814m depth, but is commonly found in the upper 100m [222, 233, 255, 316]. This species lives epifaunal and is found within sponge spicule mats [317]. *L. hodgsoni* builds large residential tubes of up to 30cm length and 5cm diameter. These tubes are made of a dense byssus fibre net which is covered by terrigenous and organic sediment particles including living specimens of other bivalves [220].

Dacrydium albidum Pelseneer, 1903

Pteriomorphia, Mytiloida, Mytiloidea, Mytilidae

Several species of the genus *Dacrydium* are known from Atlantic waters [318], but only two species are present in Antarctic waters, *D. albidum* and *D. knudseni* Allen, 1998. *D. albidum* has been found close to the Antarctic continent only at 89°E, 74°E, in the Davis Sea and the Ross Sea [319]. The species is also present at the Amundsen Sea [320], the South Shetland Islands and it occurs relatively commonly in the Ross Sea in depths of 122-752m [321]. The lower limit of its bathymetric range seems to be 4636m [322]. We sampled the species at Ras Tu in 40m depth. *D. albidum* is an unmistakable species due to its shell features.

Philobrya wandelensis

Dacrydium albidum

Limatula hodgsoni

Priapulid worms or Penis Worms, Priapulia

D. Schories, G. Kohlberg

The name Priapulida alludes to the animals' penis-like shape, Priapus being the Greek god of fertility. Only 19 extant species of this marine class are known. The cylindrical body of the Priapulida is separated in a shorter proboscis region, which can be either ex- or invaginated, and a larger body reaching a length of 0.2cm to 38cm, depending on the species. Some show cylindrical or fascicular tails or other caudal appendages. Priapulida inhabit the interstitium of coralline sands, such as the muddy habitats of temperate and cold environments [129]. In former times, it is supposed, this class made up a major part of the soft-bodied invertebrate life of the benthos. Sexes are different and in most cases the development is indirect via a benthic larval stage. Priapulids belong to the Ecdysozoa, that is, they have to molt their cuticula during a growth phase because of its rigidity. Macrobenthic species are carnivorous, with the meiobenthic species feeding on small particles [129]. Prey is captured by the help of a widely opened pharynx and carried to the gut by retracting the proboscis region. On the inside, the pharynx is covered with numerous teeth to prevent the prey from escaping. The animals possess various nerve endings on the surface of their skin, especially in the proboscis region, where they facilitate mechano- and chemo-perception [129].

Priapulus tuberculatospinosus Baird, 1868

Priapulidae

Priapulus tuberculatospinosus belongs to the marine phylum of priapulid worms, which is already known from the Cambrian. In Antarctica there are three species all belonging to the family Priapulidae. They can reach lengths of more than 10cm. *Priapulus* grubs in often oxygen poor muddy sediments and feeds predatorily on benthic invertebrates in size of up to its own. This is done by extending the mouth part which is armored with hooks and teeth. On the Antarctic continent *P. tuberculatospinosus* has been recorded from Commonwealth Bay, Victoria Land, Cape Adare and Graham Land. In the South American sector records exist for Patagonia, Magellan Strait, Tierra del Fuego, Falkland Islands, South Georgia, South Orkney Islands and South Shetland Islands. It has also been recorded from the Subantarctic Islands of Kerguelen and Macquarie and New Zealand [344] *P. tuberculatospinosus* is part of the soft bottom community [216]. It occurs in shallow as well as in abyssal waters between 6 and 5289m.

Ringed worms, Annelida

A. Montiel

The Annelids, or ring worms, and formally called Annelida, are a large phylum of segmented worms. Although most textbooks still use the traditional division into polychaetes, oligochaetes and leech-like species, research 18 years ago, radically changed this scheme, viewing leeches as a sub-group of oligochaetes and oligochaetes as a sub-group of polychaetes. In addition, the Pogonophora, Echiura and Sipuncula, previously regarded as separate phyla, are now regarded as sub-groups of the polychaetes [345].

Polychaetes, Polychaeta

Polychaetes are a mainly marine class of species, with more than 15,000 species known worldwide [345]. In the Southern Ocean, the total number varies between 536 to a maximum estimated number of 1,000 polychaete species [348, 349]. King George Island is the most extensively sampled area of the Southern Ocean, for polychaete fauna. For instance, in Admiralty Bay the checklist of polychaetes arrived at a total of 120 benthic and 5 pelagic species [350]. Polychaetes inhabit all oceans, from the intertidal zone to deep sea; however, high numbers of eurybathic species do appear to be a characteristic of the Antarctic benthos [351-353]. The body plan of the Polychaeta are normally elongated, cylindrical and with bilateral symmetry. Each segment has a pair of appendages (parapodia) that usually bear numerous chitin bristles. Most polychaetes reproduce sexually and fertilization takes place in the water column after eggs and sperm have been expelled. Fertilized eggs transform into free-swimming larvae (Trochophora), that gradually become small worms. Some polychaetes exhibit remarkable reproductive strategies, for example, species of the Nereidae family have the primitive mode of sexual reproduction of epitoky (as epigamy and stolonization). Other species, belonging to the family Syllidae, exhibit a remarkable diversity of reproductive phenomena. Deviations from the primitive type, particularly evident in meiofaunal species, include external brooding, direct sperm transfer, internal fertilization, viviparity, parthenogenesis and simultaneous as well as successive hermaphroditism [346]. Polychaetes are classified into approximately 80 family-level taxa that are generally recorded as monophyletic. Since 1997, on the basis of morphological cladistic analyses, a monophyletic Polychaeta consisting of two major clades, Scolecida and Palpata, was proposed, with the latter clade divided into Canalipalpata and Aciculata [347]. All species display a variety in lifestyle and appearance. Some species with tentacle crowns capture or filter particles and plankton from the water column. Some vagile species are carnivorous and hunt small invertebrates, whilst others are omnivorous and also feed on algae and even the sediment of the sea floor. Tubiculous species often build tubes of sand, mud or calcium carbonate; the Antarctic species are no exception to this habit.

Perkinsiana sp.

Flabelligera mundata Gravier, 1911

Canalipalpata, Flabelligeridae

Body shape of *Flabelligera mundata* is vermiform or grub-shaped with numerous segments. The body is opaque and the gut usually not visible. If it is more or less transparent the gut is visible (gelatinous). A gelatinous body sheath can be absent or present. The epidermis is papillate with irregularly arranged papillae. The pygidium is a simple ring or cone. Pygidial appendages are absent. The head is retracted into the first segments and is not clearly identifiable. Palps are paired, longitudinally grooved and dorsolateral. Nuchal organs are indistinct paired dorsolateral patches. The foregut has a ventral pharyngeal organ. Dorsolateral ciliated folds are present. The first segment´s chaetiger show both notochaetae and neurochaetae which are more or less laterally directed and free from the head, or anteriorly directed and wrapping around the head when the prostomium is retracted. The chaetae are similar in orientation, length and thickness to other chaetae, or slender and elongate, forming a cage around the head. *F. mundata* differ from *F. picta* in the way that it lacks a transversal arranged dark spot. A tube is absent or unconsolidated. *F. mundata* is a deposit feeder using its pair of frilly palps to gather food from the surrounding surface. *F. mundata* is highly frequent in the different bays of King George Island. This species is found in the Southern Ocean with a circumpolar distribution from shallow to moderate depths. *F. mundata* occurs in coastal regions, the continental shelf, and in the deep sea on soft and hard substrates.

Perkinsiana sp.

Canalipalpata, Sabellidae

Branchial lobes of *Perkinsiana* sp. are fused dorsally. Radioles are numerous, usually more than eight pairs and increasing with the size of the worm. Radiolar flange forms expanded rounded flanges at the tips of the radioles. Paired stylodes are absent as well as radiolar eyes. The anterior margin of the peristomial ring produces into a membranous collar. A posterior peristomial ring collar is present. Dorsal lips show dorsal radiolar appendages. Dorsal pinnular appendages are present. The glandular girdle on chaetiger 2 is absent. Abdominal and thoracic interramal eye spots are absent as well as pygidial eyes. Teeth of thoracic uncini are equal in size and arranged in series above the main fang. The breast is well developed, resulting in a Z-shaped avicular appearance. The handle is as long as or slightly longer than the length of the neck of the uncinus. Abdominal notopodial uncini show a distinct main fang and several smaller teeth above. The filter feeder *Perkinsiana* sp. is similar to members of the familiy Serpulidae. It is found from southern South America to the Antarctic continent. *Perkinsiana* sp. lives on hard substrates and epizoic on many invertebrates and holdfasts of macroalgae, rarely on soft bottoms.


Spirorbidae
Canalipalpata

The body shape of Spirorbidae is vermiform, reaching a length of normally 12mm. Segments are numerous comprising a distinct thorax and abdomen. Regions are demarcated by inversion of parapodia. The thoracic membrane and a faecal groove are present. The pygidium is a simple ring or cone. The head comprises a radiolar crown around the mouth. Eyes may be absent or present. If they are present it can be one pair or multiple eyes situated on the radiolar crown or the peristomium. The peristomial ring is a single one with collar. The first segment is chaetigerous only with notochaetae. Parapodia are biramous with prominent parapodial lobes. Spirorbidae show many kinds of notochaetae. They may be capillary, hair-like, sharply bent, or with subdistal spur, smooth or hirsute-serrate. Uncini are present with teeth in vertical series. Teeth are usually similar-sized and arranged in one or two rows. Spirorbidae are very similar to Serpulidae. The tubes are usually attached to rocks, ship hulls or kelp holdfasts. In the Southern Ocean eleven species occur, at King George Island three species. Spirorbidae are filter feeder. They are cosmopolitans and live in marine and estuarine habitats on the continental shelf on hard substrata like rocks, epiphytic on algae or epizoic on invertebrates.

Terebellidae
Canalipalpata

The body shape of the Terebellidae is vermiform or arenicoliform. Segments are numerous (more than about 15) comprising a distinct thorax and abdomen. The head bears many tentacles around the mouth. Eyes can be absent or present, without lenses, multiple and are situated on the prostomium (a dorsal ridge). Palps are absent. The first segment is a smooth ring. Branchiae can be absent or present and arise from the dorsum. They occur on at least some chaetigerous segments and are branching or filiform. External chaetae can be absent or present. Notochaetae are present, whilst aciculae are absent. Capillary chaetae are present (rarely absent), hair-like, sharply bent, smooth, corn-eared or hirsute-serrate. Spines can be absent or present in most or all chaetigers. They are slightly curved and more or less smooth. Hooks are absent. Uncini can be present, or absent with teeth arranged in transverse series above an enlarged main fang, or with teeth in vertical series. Teeth are usually similar-sized and arranged in one or two rows. Terebellids might be confused with Ampharetidae and Trichobranchidae. Tubes are absent or unconsolidated, membraneous, leathery or parchment like. Burrow traces are absent. In King George Island a total of 16 species occurs. Terebellidae are surface deposit feeders collecting particles with their tentacles which are splayed out on the sea floor. They are found in the Antarctic and Antiboreal Oceanic, the Boreal Arctic, Mediterranean Sea/East Atlantic, Central West Atlantic, Eastern Pacific and West Pacific. Terebellids live in marine habitats from the coasts and the continental shelf to the deep sea on soft substrata as well as on hard substrata (algal holdfasts and seagrass).


Nereididae

Phyllodocida

The body shape of the Nereididae is vermiform with numerous segments. The pygidium is a simple ring or cone and the pygidial appendages sometimes present one pair of cirri. The head is discrete and compact. The prostomium´s shape is bluntly conical to trapezoidal. Two pairs of compound eyes with lenses are present and situated on the prostomium. Paired, smooth prostomial antennae arise anterolaterally. The ventrolateral palps are paired and bi-articulated with a robust basal part. The nuchal organs are indistinct paired dorsolateral patches. The foregut is a muscular axial pharynx with one pair of fang-like (often serrated) lateral jaws without teeth (rarely), or with teeth present in distinct areas. Parapodia are uniramous throughout, or biramous with prominent parapodial lobes (up to five lobes per parapodium). The appendage is distally tapering to slender tips (=spinigerous), or distally curved, not canaliculated and without hoods or guards. Nereididae can be confused with Hesionidae or Nepthyidae species. Tubes may be absent, unconsolidated, or membraneous. Burrow traces are absent or comprise interconnected galleries. In the Southern Ocean only 12 species occur and only two species are reported from Admiralty Bay, King George Island. Nereididae are raptorial feeder, facultative carnivore or omnivorous. Species belonging to this family are cosmopolitans. They are widely distributed in marine, estuarine and freshwater habitats from the continental shelf to the deep sea on soft and hard substrata and also epizoic, mostly on algae.

Polynoidae

Phyllodocida

The body shape of the Polynoidae is vermiform and dorsoventrally flattened. The epidermis is more or less smooth or papillate with irregularly arranged papillae. The pygidium is a simple ring or cone. One pair of cirri on the pygidium is present. The head is discrete and compact, and distinct from the first segment. The prostomium is rounded to oval and anteriorly incised. Two pairs of compound eyes with lenses are present and situated on the prostomium. Prostomial antennae are present. They are paired arising anterolaterally, or include paired anterolateral ones and a single medial one. Palps are paired, unarticulated and ventrolateral. The foregut is a muscular axial pharynx with two pairs of fang-like jaws. A distal ring of papillae is present. Parapodia are biramous with prominent parapodial lobes. Dorsal cirri are modified as elytra which are smooth or ornamented without concentric rings. Capillary chaetae are hair-like, spinose or corn-eared. Spines are present in most or all chaetigers in both notopodia and neuropodia with series of rings or half-rings of spinelets, or slightly curved and more-or-less smooth ones. Seven species are known from King George Island. Species belonging to this family are eurytrophic especially species of the genus Harmothoe. Polynoid polychaetes are raptorial feeder, but they can also be parasitic or commensal. Polynoids show a wide distribution in Antarctic waters from shallow to abyssal depths. They are found in the boreal Arctic, Mediterranean/East Atlantic, Central West Atlantic, Eastern Pacific and the West Pacific. Polynoidae are marine and live in coastal areas, the continental shelf and the deep sea on soft and hard substrates, also at hydrothermal vents and cold seeps or epizoic.


Syllidae

Phyllodocida

The body shape of Syllidae is vermiform or grub-shaped. It can be dorsoventrally flattened with numerous segments (more than about 15). The epidermis is more or less smooth or papillate with irregularly arranged papillae. The pygidium is a simple ring or cone. Pygidial appendages are present which may be one pair of cirri, or one pair of cirri and a single medial papilla. The head is discrete and compact, dorsal to mouth. The prostomium is rounded to oval. Two or three pairs of eyes are situated on the prostomium. They can be without lenses, or compound eyes with lenses. Smooth or articulated prostomial antennae are present including paired anterolateral ones and a single median one (the median one is rarely absent). Palps are paired. The foregut is a muscular axial pharynx without jaws (although fused teeth may resemble jaws) and teeth, or with a single tooth, or a trepan (fused teeth). The surface is smooth (chitinous) and a distal ring of papillae is present as well as a proventricle. The first segment bears 1-2 pair(s) of tentacular cirri which arise from a single segment. Parapodia are uniramous throughout. Aciculae in ventral position are present. Hair-like, smooth capillary chaetae are present. Spines may be absent or present in most or all chaetigers. Members of the family Syllidae can be confused with Hesionidae, Pilargidae and Sphaerodoridae. In the Southern Ocean 44 syllid species occur. In King George Island a total of 10 species are recorded. Syllidae are raptorial or omnivorous feeder. Syllids are found in most marine habitats from the intertidal to the deep sea and at all latitudes.

Leeches, Hirudinea, Clitellata

Around 500 species of Hirudinea are known worldwide, with only twelve species reported south of 35°S [354]. Like other annelids, the Hirudinea (leeches) are segmented worms. However, unlike other annelids, there is no correspondence between the external segmentation of the Hirudinean body surface and the segmentation of internal organs. Leeches are organized into three orders and five families, one of these, the Piscicolidae, includes most marine species. Leeches adhere to their host, such as fish or marine invertebrates, by means of suckers and, through this, ingest their hosts' blood. A secreted anticoagulant prevents the wound from closing. Hirudineans are hermaphrodites and development is direct, similar to the oligochaetes.

Trachelobdellina glabra Moore, 1957

Rhynchobdellida, Piscicolidae

Trachelobdellina glabra has a length of up to 30mm and a maximum width of 7mm. The body is distinctly divided into a long, narrow trachelosome and a wide, subcylindrical urosome. The trachelosome and the urosome are of approximately equal length. At the basis of the distance between the segmental ganglia the elongation of the trachelosome seems to occur between ganglia IX and X. The body is smooth, lacking branchiae or tubercles, but possesses 12 pairs of large pulsatile vesicles. Five pairs of dorsal and ventral ocelli are present in the clitellar region, one pair on the last trachelosome segment, three pairs on the clitellar segments and one pair on the first urosome segment. *T. glabra* is an ectoparasitic fish leech which parasitizes also on isopods. It is found at the Mawson Coast, the Pacific sector of the Antarctic region and the South Shetland Islands. Free living specimens were regularly present in the inner part of Fildes Bay below rocks and boulders in 6-10m depth. The holotype was found at 437m depth.

Arthropods, Arthropoda

G. Kohlberg, D. Schories, F. Krapp

With about one million described species, the phylum Arthropoda is the largest in the animal kingdom [47, 355]. Arthropoda include insects, spiders, scorpions, crabs, shrimps, barnacles and others. The class Insecta are the most abundant terrestrial animals on the planet. The body is segmented and appendages are articulated. Due to the sclerotized exoskeleton, growth is only possible by shedding the old exoskeleton and replacing it with a new one.

Sea Spiders, Pycnogonida

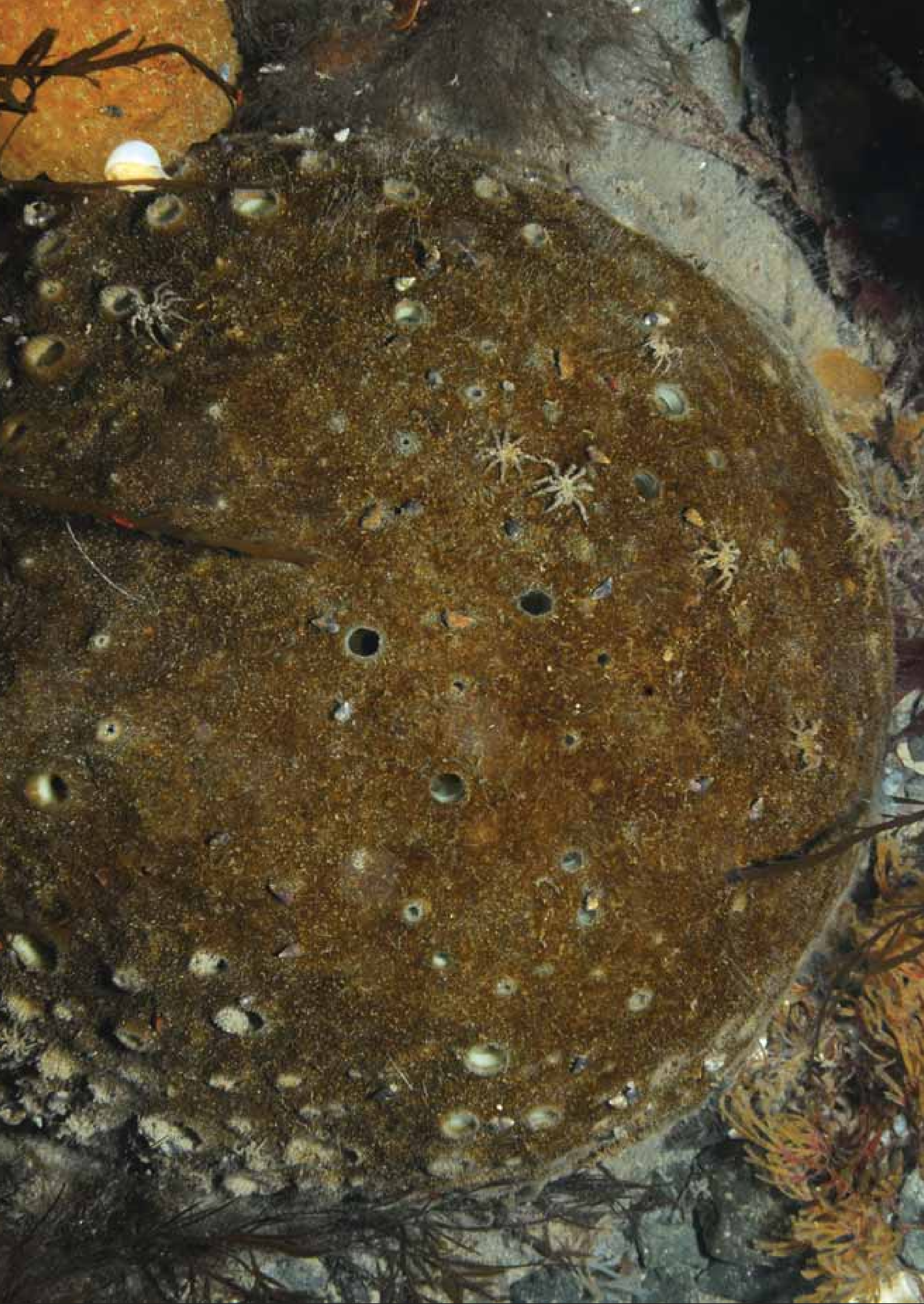
F. Krapp, D. Schories, G. Kohlberg

There are approximately 1300 species of Pycnogonida known worldwide [356], with 192 found in the Antarctic. They are a relatively small marine class, mostly of the benthos. The body consists of a head, a segmented trunk with eight long legs and a very small "abdomen". Pycnogonida have different sexes. In many families, males may carry the fertilized eggs on their ovigera. Yolk-rich larvae may go through several moults attached to the paternal ovigera, until hatching as juveniles. In the families Colossendeidae, Rhynchothorcidae and Austrodecidae, the development is totally unknown, as only the last larval instar is found and that rarely. Pycnogonids commonly inhabit sessile animals such as bryozoans and hydrozoans, and feed on bryozoans, sponges, cnidarians and polychaetes and occasionally trap fast moving prey.

Achelia communis (Bouvier, 1906)

Ammotheidae

The ovigers of *A. communis* are typical, the seventh segment is without stout recurved spines. The legs segment lengths and tubercles are variable. *A. communis* is very variable, and difficult to characterize. Fortunately its distribution is sufficiently different from any known Magellanic species [357]. The genus *Achelia* displays some of the most diverse variation found in any genus among known pycnogonids. *A. communis* is known from the South Sandwich and South Shetland Islands, the Antarctic Peninsula, Ross Sea, along the Adélie Coast, and South Georgia in depth between 7 and 714m [108, 358]. It lives on sand and hard bottom, on hydroids, bryozoans and sponges.



Ammothea carolinensis Leach, 1814
Ammotheidae

Ammothea carolinensis is a very large species, the trunk length is up to 19mm and the legs are up to 87mm. The proboscis is very large, longer or as long as the trunk. The trunk is segmented, with broad dorsomedian tubercles on raised rims [358]. This is a rare species around King George Island occurring in depth between 15 to 90m [359]. *A. carolinensis* is necrophagous (feeding on dead or decaying flesh), but feeds also on epibionts like encrusting bryozoans and foraminiferans. It´s distribution is circumpolar, known from the Magellanic region and South Shetland Islands in depths between 10 and 640m [360]. It lives on sand and hard bottom, on hydroids, bryozoans and sponges.

Ammothea cf. *magniceps* Thomson, 1884
Ammotheidae

Dorsal trunk tubercles are absent in *Ammothea magniceps*, spines on lateral processes are absent or very minute. The trunk length is up to 4.0mm and the proboscis length is up to 3.3mm [361]. Four adult specimens of the pycnogonid *A. magniceps* were observed swimming at the sea surface at night at Kaikoura. Even after capture the animals continued to swim at the surface of the water for over an hour. Such swimming behaviour is considered important in explaining the presence of "benthic" animals in plankton samples [362]. *A. magniceps* is known from the South Shetland Islands, the South West Pacific Ocean and New Zealand. The species lives on sand and hard bottom, on hydroids, bryozoans, and sponges.

Austropallene cristata (Bouvier, 1911)
Callipallenidae

The proboscis of *Austropallene cristata* is long. The trunk has small to large dorsomedian tubercles anterior to each segmentation line. Chelae fingers are of almost the same length. The legs of the major segments have conspicuous rows of crowded spines. *A. cristata* is the only known *Austropallene* species with dorsal trunk tubercles. The genus *Austropallene* might be confused with *Ammothea* species. Its proboscis and massive chelifores can be used to separate it from most *Ammothea* species [363]. Most probably *A. cristata* has a circumpolar distribution. It is known from the Antarctic Peninsula, South Shetland Islands and the Ross Sea [363]. It lives on sand and hard bottoms, on hydroids, bryozoans and sponges.

Ammothea carolinensis

Ammothea cf. magniceps

Pallenopsis patagonica (Hoek, 1881)
Callipallenidae

The size of *Pallenopsis patagonica* is larger than other Antarctic species of the same genus, leg span is greater than 10cm and body length is up to 1.6cm. Species seems to be glabrous, but patches of short setae are present. The proboscis is cylindrical and the abdomen long. Chelae fingers touch proximally when closed [363]. *P. patagonica* was used among other species in experiments to prove the oxygen hypothesis of polar gigantism, however the hypothesis was not supported by performance of *P. patagonica* in hypoxia [364]. species have also been found on the mesopelagic scyphomedusa *Periphylla periphylla* with nematocysts in their stomach contents [365] and have been observed on hydromedusae. The species is circumpolar, it has been found in the South Atlantic and Magellanic region, Scotia Sea, Antarctic Peninsula, Ross Sea, and along the Antarctic coast. It has a wide depth range starting from the low subtidal down to the abyssal (3-4540m) [108, 363, 366]. *P. patagonica* lives on sand and hard bottoms.

Cilunculus cactoides Fry & Hedgpeth, 1969
Ammotheidae

Cilunculus cactoides is a very spinose species. The palp is comparatively large for the size of the animal, it is slender and spiny. The trunk is oval in outline. The eyes are conspicuous and well developed and the chelicerae are 3-segmented. Legs are very spinose [367]. *C. cactoides* has a circumpolar distribution, it lives in Antarctic and Subantarctic waters, Ross Sea, South Shetland Islands, at depths of 22-433m [108]. The species was found on hydroids in Fildes Bay.

Nymphon cf. *australe* (Hodgson, 1902)
Nymphonidae

Nymphon australe has a short neck with large round oviger bases. Dorsal spines or setae, or both, are present on trunk and lateral processes. Chelifore scapes have long spines/setae and the chelae teeth are vary great in numbers, about 36 to 65 are present per finger. All characters of this species are very variable, even among specimens from the same sampling station [363]. Among all known pycnogonid species, this species is the most frequently captured within its known areas of distribution [363]. It has a circumpolar distribution and it is also present in temperate waters like the Cook Strait in New Zealand, Falkland Islands, off the Argentine and Chilean coasts, north of the South Sandwich Islands, and at various southern Indian Ocean localities. It´s depth distribution is from 3 to 379m [108]. *N. australe* lives on sand and hard bottom, on hydroids, bryozoans and sponges.

Pallenopsis patagonica

Nymphon cf. *australe*

Crustaceans, Crustacea

G. Kohlberg, D. Schories

In the class Malacostraca the Crustacea reach the highest level of development. They show remarkable sensory abilities and complex behaviour. The vascular and nervous systems of this class are quite perfect, whilst the segmented stomach is unique [129]. Malacostraca are characterised by a five-segmented head, an eight-segmented thorax and an abdomen of six segments. Up to eight thoracic segments can be fused with the head to become a cephalothorax. Also, the appendages can vary in their shape and be modified as additional mouthparts, known as maxillipeds. Each body segment bears a pair of assembled appendages, which may be lost secondarily [368]. The head bears two pairs of antennae and two pairs of maxillae. The abdominal segments, except the last one, each carry a pair of pleoplods, the swimming legs in caridoid species. On the last segment the appendages are normally flattened and join together with the tail-fan or telson. The compound eyes are stalked, but can be reduced or lost. The exoskeleton is composed of chitin, which is secreted by the underlying layer of tissue. All Crustacea used commercially by humans belong to the class Malacostraca.

Amphipods, Amphipoda

Presently about 8000 species are known worldwide [369], with more than 600 found only in Antarctica [67]. The name Amphipoda refers to the direction of the seven pairs of legs, pereopods, the anterior four pair being directed forward and the posterior three backward. Most Amphipoda are small Crustacea with a laterally flattened body, the head and tail typically curving downward. Feeding habits vary between predating, scavenging, grazing and feeding on detritus; parasitizing species also exist. Amphipods inhabit marine habitats as well as freshwater and humid terrestrial habitats and are considered to play an important role in benthic food-webs. Sexes are different and many amphipods have strong sexual dimorphism. Precopula behavior is common; in this case the male holds fast to a female and waits for her to moult, only then is the transfer of sperm possible. Fecundation is internal and the development of young direct.

We gratefully acknowledge the help of Cedric D'Udekem D'Acoz in the identification of amphipod images.


Pariphimedia integricauda

Paradexamine fissicauda (Chevreux, 1906)
Dexaminidae

Paradexamine fissicauda is of reddish pigmentation and the pleomeres are highly spinose. The length of the first antenna is about two thirds as long as the head and the body combined. The second antennae are a little shorter than the head and pereon combined. Ovigerous females can be found from April to October, except in July and August. Females with a body length of 20mm were observed to carry 56 eggs [370]. *P. fissicauda* is found at the Danco Coast, Palmer Archipelago, South Georgia, South Orkney Islands, South Shetland Islands, Trinity Peninsula and the Wilhelm Archipelago in a depth range from 1-129m [371]. *P. fissicauda* is mostly found on the clumpy red alga *Plocamium cartilagineum*. It is likely that *P. fissicauda* uses this alga for hiding. Because of its reddish pigmentation and the highly spinate pleomeres the amphipod mimics the colour and morphology of the fine, unilateral branched red alga. Furthermore the alga defends chemically against an omnivorous fish [70], so that *P. fissicauda* is additionally protected by staying amongst the branches of *Plocamium cartilagineum* [372].

Echiniphimedia echinata (Walker, 1906)
Iphimediidae

The dorsal and lateral plates of *Echiniphimedia echinata* are covered with many spines. Colours vary from bright yellow to pale yellow or pale rose. *Echiniphimedia echinata* is a brooding species retaining the juveniles in a brood pouche. Gut analizes indicate *E. echinata* as a sponge feeding species. It is found off Adélie Coast, Bransfield Strait, Marguerite Bay, Palmer Archipelago, Ross Sea, South Georgia, South Shetland Islands, and Weddell Sea in a depth range from 0 to 650m [371]. This species is mostly found in or on sponges.

Pariphimedia integricauda (Chevreux, 1906)
Iphimediidae

Specimens of *Pariphimedia integricauda* can reach lengths of 21mm. The colouration of live animals is brownish. The lower margin of the rostrum is continued as a low median keel on to the base of the epistome, rising at its upper end into a triangular pointed tooth. The telson is apically notched [373]. *P. integricauda* is found at the Danco Coast, Palmer Archipelago, South Orkney Islands, South Sandwich Islands, South Shetland Islands and the Wilhelm Archipelago in a depth range from 0-145m [371]. This species lives among algae and on sand, gravel and rocks.

Paradexamine fissicauda

Echiniphimedia echinata

Paraphimedia integricauda

Stegopanoploea joubini (Chevreux, 1912)

Iphimediidae

Individuals of *Stegopanoploea joubini* are red-orange coloured. The last segment of the pereon and first three segments of the pleon bear long and pointed teeth. The head is short and has a well developed rostrum [374]. *S. joubini* is found at the Adélie Coast, Davis Sea, Marguerite Bay, Palmer Archipelago, South Shetland Islands, and Weddell Sea in a depth range from 45 to 549m [371].

Jassa sp.

Ischyroceridae

Jassa sp. inhabits self constructed tubes from which it extends the anterior half of the body to gather detritus and to filter suspended particles and plankton [375]. This species was found at King George Island, South Shetland Islands in a depth of 20m. Individuals of *Jassa* sp. live commonly on hard bottoms among algae, sponges, hydroids and bryozoans [375].

Leucothoe sp.

Leucothoidae

The body of *Leucothoe* sp. is smooth and compressed. Both pairs of antennae are short and approximately of the same size. Individuals of this species possess large chelae at their first gnathopods. The telson is lamellar and long with an entire margin (information refer to Leucothoidae) [83]. This specimen was found at Fildes Bay, King George Island, South Shetland Islands.

Orchomenyx sp.

Lysianassidae

This specimen was found at King George Island/ South Shetland Islands in 20m depth. *Orchomenyx* sp. lives probably associated to an ascidian (*Ascidia challengeri*).

Waldeckia obesa (Chevreux, 1905)

Lysianassidae

Waldeckia obesa is a frequent amphipod in Antarctic waters. It can reach a length of up to 28mm, measured from the tip of the rostrum to the end of the telson along the dorsal midline. With more than 18 articles the second antennae are longer in males than in females (equal or less than 18 articles). The colouration of *W. obesa* varies from yellowish-brown to pale pink/ skin-coloured. This species can reach an age of 5 years, presumably up to 8 years in females [376]. It is a scavenging amphipod and has a large stomach that is used as a food store, as the intervals without feeding can be very long. Some specimens, maintained in aquaria, survived 18 months without feeding. *W. obesa* is preyed by nototheniid fish [377], penguins and Antarctic terns. It is found at the Adélie Coast, Coats Land, Danco Coast, Davis Sea, Enderby Land, Princess Ragnhild Coast, Palmer Archipelago, Ross Sea, South Shetland Islands, Weddell Sea and the Wilhelm Archipelago in depths from 0 to 1030m [371].

S. joubini

Jassa sp.

Leucothoe sp.

Orchomenyx **sp.**

Waldeckia sp.

Paraceradocus miersi (Pfeffer, 1888)
Maeridae

The body of *Paraceradocus miersi* is elongated and more or less compressed at a body length of about 4cm with very long antennae. The legs are facing back and the telson is splitted. The eyes are dark, while the body is of brown-red colour with two prominent white lines along the dorsal side from the eyes to the telson. The animals are not able to swim and are lying characteristically on their dorsoventral side. The juveniles develop insight the marsupium. Sometimes they leave it, walk around and return into the brood pouch of the female. When the adult is eating, the juveniles often sit between the propodi of the gnathopods and participate in feeding. At the beginning of May the juveniles definitively leave the marsupium [378]. Although *P. miersi* possesses large gnathopodal chelae it is not a predatory species. Gut content analyzes assume *P. miersi* feeding on detritus and grains of sand. The species is found at Danco Coast, Marguerite Bay, Palmer Archipelago, South Georgia, South Orkney Islands, South Sandwich Islands, South Shetland Islands, Trinity Peninsula, Weddell Sea and the Wilhelm Archipelago in depths from 0 to 344m [370, 371]. It is common on algae and under boulders where it digs burrows to hide from predators.

Bovallia gigantea (Pfeffer, 1888)
Pontogeneiidae

Specimens of *Bovallia gigantea* reach a length of up to 45mm measured from the tip of the rostrum to the base of the telson, hence in an extended position they are even longer [379]. They possess a pair of long antennae. The fertilized eggs develop within the female´s marsupium. Brooding in the marsupium extends from January to November [379]. *B. gigantea* feeds on small crustaceans like copepods, their egg masses and tiny amphipods. To a lesser extend they feed on diatoms and macroalgae material. The fish *Notothenia neglecta*, the giant isopod *Glyptonotus antarcticus* and Antarctic terns were observed feeding on *B. gigantea*. Juvenile stages of an acanthocephalid worm and ostracods can occur as parasites in the gut, the latter ones in the brood pouches of *B. gigantea* [379]. *B. gigantea* is found in the Bransfield Strait, Palmer Archipelago, South Orkney Islands, South Sandwich Islands, South Georgia, South Shetland Islands, Trinity Peninsula, and Wilhelm Archipelago in depth from the surface down to 91m [371]. It lives amongst algae or under in sand or gravel embedded boulders [379].


Eurymera monticulosa (Pfeffer, 1888)
Pontogeneiidae

Because of the shape of the dorsal plates *E. monticulosa* has a crookbacked appearance. It shows activity at night, during daytime the animals hide under boulders or algae [380]. *E. monticulosa* is preyed by nototheniid fishes [377]. This species is found in the Bransfield Strait, Palmer Archipelago, South Georgia, South Orkney Islands, South Shetland Islands, Trinity Peninsula and Wilhelm Archipelago in depths from 0 to 40m [371]. It lives on sand, gravel and rocks with possibilities for hiding [380].

Prostebbingia longicornis (Chevreux, 1906)
Pontogeneiidae

Prostebbingia longicornis was found at Danco Coast, Marguerite Bay, South Georgia, South Orkney Islands, South Shetland Islands, Trinity Peninsula and Wilhelm Archipelago in a depth range from 4 to 310m [371]. *P. longicornis* is found associated with sand, stones, clay and algae when catched with bottom trawl.

Schraderia gracilis (Pfeffer, 1888)
Pontogeneiidae

Schraderia gracilis is a relatively frequent amphipod in Antarctic and Subantarctic waters. It reaches a length of up to 16mm. The length of the first antenna is equal or greater than the head [370]. *S. gracilis* is reported from the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Georgia, Davis Sea, Adélie Land, Victoria Land, Falkland Islands and the Crozet Islands in depths from 0 to 310m [371]. This species lives in habitats, where large algae are prominent.

Isopods, Isopoda

G. Kohlberg, D. Schories

There are about 10,000 Isopoda species worldwide [129, 369], 441 from the Antarctic [67]. Like amphipods, they have seven pairs of pereopods; however, all legs point in the same direction (iso = same, podos = feet). They are found in all habitats, from the intertidal zone to the ocean depths, freshwater and terrestrial and found on soft and hard benthic substrates, many species living amongst algae or hidden under stones. Some species are parasitic. Isopoda sexes are different, fertilization normally internal and often can only occur during the female moult, when her gonoporus is accessible. For the male to be present at the correct time for fertilization, he is often carried by the female. After copulation, the fertilized eggs are often incubated in the female´s marsupium, until the juveniles are mature enough to be released into the open water.

Glyptonotus antarcticus (Eights, 1852)
Chaetiliidae

The Antarctic giant isopod *Glyptonotus antarcticus* can reach a total length of 12cm. Seen from above the body is fusiform and the long peraeopods bear spines, mainly at the ventral side. The body surface is sulcated with flat in parts lobated elevations. The pleotelson and the last pleomer are fusioned. The black eyes are small and devided into a smaller lower and a bigger upper section [83]. Females in all breeding stages are found throughout the year thus reproduction occurs the year round. Eggs and juveniles are hold back in the females marsupium, the breeding pouch, for up to 20 months [381]. The lack of seasonal variation in the *G. antarcticus* breeding cycle can be explained by the constant availability of food [381]. *G. antarcticus* is an active predator and feeds on a variety of prey organisms. But it is also known as scavenger and even shows cannibalistic behaviour [382]. *G. antarcticus* has a circumpolar distribution and has been recorded at South Georgia, South Orkney Islands, South Shetland Islands, the Antarctic Peninsula, and the Ross Sea in a depth range from the littoral level to 525m [383].

Krill, Euphausiacea

Commonly, the small crustaceans of the order Euphausiacea are called krill, from the Norwegian and meaning „young fry of fish". They are found worldwide in all oceans. Most krill species reach lengths of approximately 1cm to 2cm, a few species growing to 15cm. The exoskeleton of krill is chitinous and the, mostly transparent, body is tripartite, being divided into the head (cephalon), the pereion, which is fused to the cephalon creating a cephalothorax, and the pleon. The head bears two antennae and complex compound eyes. Several pairs of legs are attached to the thorax and are called pereiopods or thoracopods. The number of legs varies among the genera and species, and includes feeding legs and grooming legs. All species have five pairs of swimming legs, which are attached to the pleon and are called pleopods. Characteristically, krill have externally visible gills. Another feature of these animals are the photophores, organs emitting a bioluminescent light. The bioluminescence is generated by the oxidation of luciferin, a small-molecule substrate, activated by the enzyme luciferase. It is supposed krill do not produce the luciferin themselves but obtain it from dinoflagellates, which are a part of their diet [574]. Most euphausiacean species form large swarms as a defensive mechanism to confuse smaller predatory organisms. Krill undertake daily vertical migrations, spending the daytime in deeper waters and the night-time at the surface, providing food for predators at each depth. Many krill species are filter feeders [575], with the thoracopods forming a basket to filter food, such as phytoplankton, or, in carnivorous species, small zooplankton and fish larvae, from the water column [576]. Reproduction is by the male depositing a sperm sack at the female's genital opening. Depending on the species, the fertilized eggs are either released into the water or are carried attached to the rearmost pairs of thoracopods until hatching. After hatching, yolk reserves nourish the larvae. By the time a mouth and a digestive tract have developed and the yolk reserves are finished, the larvae must have reached the upper layers of the ocean, where algae are available as a source of food.

Euphausia superba Dana, 1850

Euphausiidae

Euphausia superba, or Antarctic krill, is a species of krill found in the Antarctic waters of the Southern Ocean. It reaches a length of up to 6.2cm. The eyes are spherical, whereas the females´ eyes are somewhat smaller than those of the males. The rostrum is short, triangular and truncated, again smaller in females. *E. superba* is a shrimp-like crustacean and except the antennas all extremities form a very effective "feeding basket" for filtering phytoplankton [129]. This species forms large schools which can extend from a few square metres to more than 100 km. *E. superba* plays a key role in the Antarctic food web and is preyed upon cephalopods, many fishes, birds, marine mammals such as seals and baleen whales. Because of its high protein and vitamin content krill is quite suitable for both direct human consumption and as food for animals [384]. The krill itself feeds directly on minute phytoplankton or scrapes diatoms from the surface of the underside of pack ice. *E. superba* is holoplanktic marine organism [129] and has a circumpolar distribution. The northern limit is usually at the Antarctic Convergence [385].

Echinoderms, Echinodermata

M. Eleaume, G. Kohlberg, M. O'Loughlin, D. Schories

There are about 6300 recent Echinodermata species [129] and all of them are strictly marine. They are important members of benthic communities from the poles to the tropics. Extant members of the phylum Echinodermata are subdivided into the classes Echinoidea (sea urchins), Holothuroidea (sea cucumbers), Asteroidea (sea stars), Ophiuroidea (brittle stars) and Crinoidea (feather stars). Echinoderms are uniquely characterized by their distinctive five-part radial symmetry; they are all secondarily radially symmetrical, which means, that the larvae are bilaterally symmetrical and these develop into radially symmetrical adults. They have a calcareous endoskeleton and a unique water vascular system. Regeneration of lost or damaged body parts is highly developed in echinoderms. In some sea star species, even an arm including a part of the central disc can grow into a new individual animal.

Sea stars, Asteroidea

G. Kohlberg, D. Schories

Sea stars, also known as starfish, are taxonomically diverse, and include 1900 known species worldwide [386], 208 of these are found in the Antarctic region [67]. They occur from the intertidal zone to the abyssal depths, in soft sediments to the rocky sea bottom. The Asteroidea possess a central disc, with between five and fifty arms radiating off it. Hundreds of tube feet are located on the oral side of the disc and arms. Feeding in the Asteroidea is diverse. Some species are detritivores and/or bottom predators, feeding on encrusting animals and molluscs. Some, such as the multi-armed *Labidiaster annulatus* are benthopelagic predators, feeding on krill and other swimming crustaceans. Many Asteroidea, such as *Diplasterias*, extrude their stomach to feed, others, for example *Bathybiaster*, swallow sediment and potential food into their disc. Asteroidea have separate sexes with no apparent sexual dimorphism, and usually release their eggs and sperm into the water column to achieve fertilization. Those several species present in Polar regions brood their juveniles or fertilized eggs in a specialized body region, sometimes around the mouth or stomach.

We gratefully acknowledge the help of Christopher Mah for the identification of sea star images.

Labidiaster annulatus

Anasterias antarctica (Lütken, 1857)

Forcipulatida, Asteriidae

Anasterias antarctica is a species with a disc diameter of approximately 2cm and five short arms. Colouration varies from dark olive green to vermilion. The spines have rounded tips and pedicellariae can be found on the surface. *A. antarctica* has four rows of tube feet at each arm. It is an oral brooding species. The female keeps the brood as a cluster in the oral region [387]. *A. antarctica* is found in the Antarctic Peninsula, South Shetland Islands, Subantarctic Islands, Falkland Islands, southern Chile, Tierra del Fuego, and Uruguay in depths from the intertidal down to 190m. It is mainly found on hard substrates like rocks and boulders.

Diplasterias brandti (Bell, 1881)

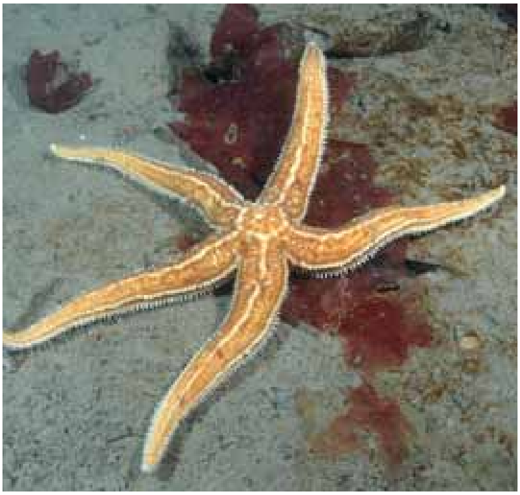
Forcipulatida, Asteriidae

Individuals of *Diplasterias brandti* have a spiny appearance and are of yellow colour. They can measure up to 12cm in radius. *D. brandti* is a brooding species and until being released the brood remains in the mouth region of the female [388]. *D. brandti* is found in the Southern Ocean, Antarctic Peninsula, Bellingshausen Sea, Ross Sea, South Georgia, South Sandwich Islands, South Shetland Islands, Falkland Islands, Strait of Magellan, Tierra del Fuego, and Uruguay in depths from 7 to 1116m [389].

Diplasterias brucei (Koehler, 1908)

Forcipulatida, Asteriidae

Diplasterias brucei has a small and convex disc and can measure up to 13cm in radius from the blunt tip of an arm to the centre of the disc. The colouration can vary from light blue-green on top with a whitish border to the disc and white spines. The arm tips can be reddish. Further recorded variations in colours are pale orange or pale blue-grey with a red eye spot at each arm tip or light brown to creamy white with red spots [83, 390, 391]. At South Georgia a six armed forma of *D. brucei* was found. This species breeds its young in a pocket at the underside of its body. Mature females have been observed year round [191, 392]. It is a significant predator of the bivalve *Limatula hodgsoni* and the gastropod *Trophon longstaffi*. But it preys also on other molluscs and scavenges on dead animals [304, 393]. *D. brucei* itself is prey for the anemone *Urticinopsis antarctica*. *D. brucei* is found circumantarctic in the Ross Sea, the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia, South Atlantic Ocean and the South Pacific Ocean in depths from 0 to 752m [83, 390, 391, 394-396].



Anasterias antarctica

Diplasterias brandti

Neosmilaster georgianus (Studer, 1885)

Forcipulatida, Asteriidae

Adult *Neosmilaster georgianus* measure approximately 5-7cm in radius. It is one of the common sea stars in Antarctic waters. *N. georgianus* populations are reproductively active throughout the year. Before spawning the male mounts the female as pseudocopulatory behaviour. In this way the likelihood of fertilization is increased. It is a brooding species and the juveniles are held for several months to more than a year within a sub-oral brood chamber. During this time feeding and movement of the adult are restricted or even inhibited [397]. *N. georgianus* feeds on small invertebrates and is also an opportunistic scavenger of organic detritus [88, 394]. This species is found off the Palmer Archipelago, South Georgia, South Sandwich Islands and the South Shetland Islands in depths from 6 to 640m, commonly seen on exposed surfaces.

Granaster nutrix (Studer, 1885)

Forcipulatida, Stichasteridae

Granaster nutrix is a small species with a radius of 1-1.5cm (tip of the arm to centre). *G. nutrix* is a brooding species and the initial stages of development occur within the stomach of the female. *G. nutrix* feeds almost exclusively on small gastropods [398], but has also been observed feeding on red algae [394]. It is a common species and found in the Southern Ocean, Antarctic Peninsula, South Georgia, South Shetland Islands, South Orkney Islands and the South Sandwich Islands from shallow waters down to 400m. During daylight it is often seen hiding in crevices.

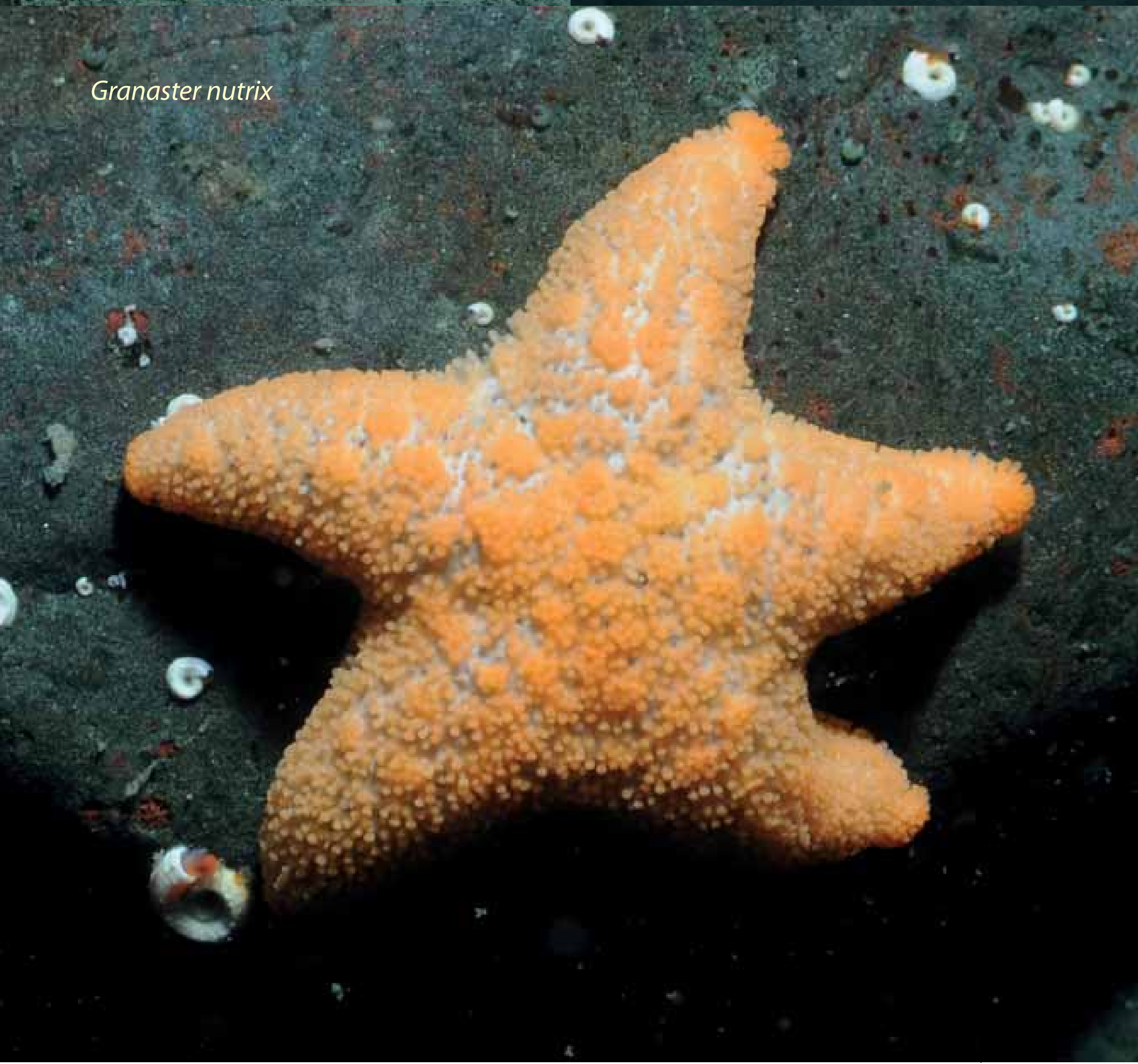
Psilaster charcoti (Koehler, 1906)

Paxillosida, Astropectinidae

Psilaster charcoti can reach up to 16cm in radius. The colouration of the slightly convex dorsal surface can vary from reddish- brown, brown-yellow, light brown, brigtht or pale pink to purplish. The edges are lightly coloured. Young *P. charcoti* are pale yellow [391, 399]. The tube feet are long and slender and like in most Paxillosida they lack of distinct sucking discs. The arms are broad at its base and taper steadyly towards the pointed arms´ tips. The madreporite is located between two arms near the disc´s margin. Development in *P. charcoti* is indirect via planktonic larvae [400]. *P. charcoti* was observed as an active predator feeding on small invertebrates, but also ingesting mud and scavenging on feces and dead organisms [394]. This species is found in the Weddell Sea, Ross Sea, the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia, Bouvet Island, and Macquarie Island from 10 to 3900m [390, 391, 394, 399]. *P. charcoti* prefers muddy substrates, where it digs for prey [390].

Neosmilaster georgianus

Psilaster charcoti



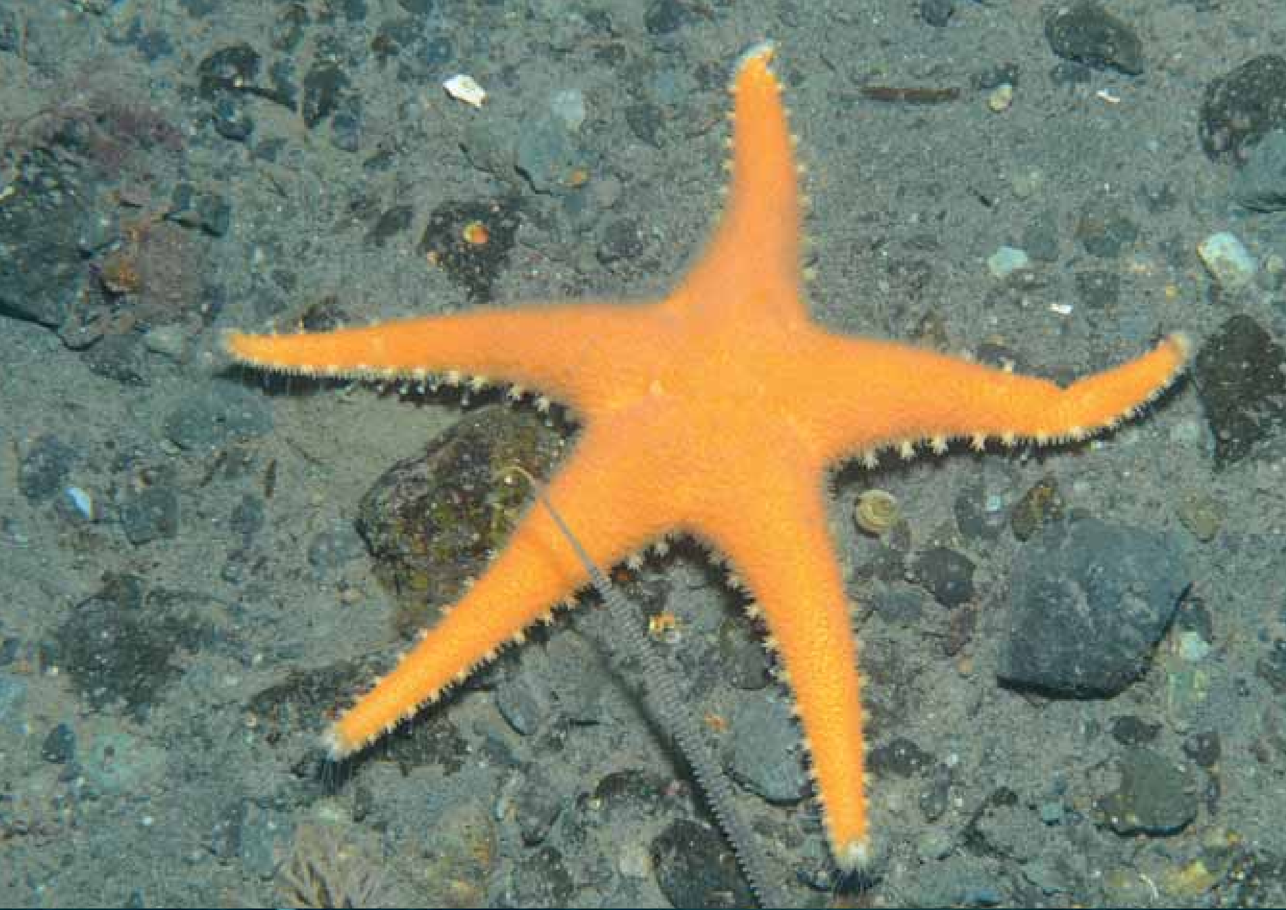
Granaster nutrix

Cuenotaster involutus (Koehler, 1912)
Valvatida, Ganeriidae

The central disc of *Cuenotaster involutus* is relatively big and is slightly convex to flat, between the arms it is depressed. Individuals can reach up to 11cm in radius from its centre to the tip of an arm. The arms are long and slender with blunt tips and very conspicuous paxilla at the arms sides, each with 10-12 long spinelets, that gives the animal its distinctive appearance. The colouration of this species can vary from grey-brown, yellow- brown, white, greenish grey, pinkish to grey white [83, 390, 391, 396]. The oral side is slightly brighter. *C. involutus* releases buoyant eggs of about 1mm in diameter into the water column. The hatching larvae are pelagic and lecithotrophic. *C. involutus* is an active predator but also a scavenger [394]. *C. involutus* is found circum-antarctic in the Ross Sea, Weddell Sea, the Antarctic Peninsula, South Shetland Islands, South Orkney Islands and South Georgia from 0 to 794m.

Perknaster sp.
Valvatida, Ganeriidae

Species of the genus *Perknaster* have large discs which are more or less inflated. The arms are cylindrical and tapering. The madreporit is situated about in the middle between the centre of the disc and the margin. Its surface shows fine, convoluted striations. The anal aperture is located subcentral and inconspicuous. The ambulacral tube-feet have large fleshy terminal discs and are arranged regular and biserial [401]. Four species of the genus *Perknaster* have been found at Admiralty Bay, King George Island [402]. The colour of *P. fuscus* is variable depending on circumstances and diet; often yellow to red. Chemical deterrents are known from the eggs of *P. fuscus* to protect them against predation [403]. Several species of the genus *Perknaster* are omnivorous, feeding for example on gastropods and ophiuroids but also on naturally dead or dying animals [404], whereas others are specialists. The species *P. fuscus* is known to be a important sponge predator (*Mycale acerata*) [137]. However, another sponge present at King George Island, *Latrunculia apicalis*, produces the bromine-containing discorhabdin G, that effectively repels *P. fuscus* [115]. All four *Perknaster* species known from King George Island have a wide depth distribution range from shallow water down to several hundreds of metres [402]. *Perknaster* species are generally present on mud or amongst sponges and are distributed from Sub-Antarctica to the Antarctic Peninsula and Continent.



Acodontaster hodgsoni (Bell, 1908)

Valvatida, Odontasteridae

From its center to the tip of an arm *Acodontaster hodgsoni* can reach up to 20cm in radius. The central disc is large and the five arms are broad. In comparison to *A. conspicuus* the species *A. hodgsoni* lacks the pincer-like pedicellariae at its underside [390]. The pelagic larvae of *A. hodgsoni* are large and buoyant. After more than three month after fertilization the larvae attach to the substrate and undergo the metamorphosis to adult [392]. *A. hodgsoni* feeds on sponges like *Haliclona dancoi*, *Calyx arcuarius*, *Rossella racovitzae* and *Haliclona tenella*. *A. hodgsoni* itselfs is preyed by the anemone *Urticinopsis antarcticus* and the sea star *Odontaster validus*. The nemertean worm *Parborlasia corrugatus* joins the feeding when *O. validus* has attacked a prey item [191]. *A. hodgsoni* is a circumantarctic species and found in the Ross Sea, the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands and South Georgia between 4 and 640m depth [390, 396].

Odontaster meridionalis (E.A. Smith, 1876)

Valvatida, Odontasteridae

Odontaster meridionalis can reach up to 9cm in radius [390]. The arms are broad and reduce their width on the latter half of their length [8]. On the dorsal surface *O. meridionalis* is generally pale brown or yellowish white, but the colour can also vary from dirty yellow, orange yellow to bright orange [390, 396]. The ventral surface is more pale in colour. Fertilization is external. During austral winter the gametes are spawned into the surrounding water where the fertilized eggs develop into freeswimming and feeding larvae [405]. *O. meridionalis* preys on sponges like *Homaxinella balfourensis*, *Rossella racovitzae*, *Haliclona dancoi*, *Mycale (Oxymycale) acerata*, *Polymastia invaginata*, *Haliclona tenella*, *Isodictya setifera* and *Haliclona pedunculata* [15, 191]. Predators of *O. meridionalis* are the anemone *Urticinopsis antarcticus* and the seastar *Macroptychaster accrescens* [394]. *O. meridionalis* is found in the Ross Sea, the Antarctic Peninsula, South Shetland Islands, South Sandwich Islands, South Georgia, Straits of Magellan, Kerguelen Island, and Heard Island from the surface to 647m depth.

Odontaster validus Koehler, 1906

Valvatida, Odontasteridae

Odontaster validus is a very common seastar in the shallow shelf waters of Antarctica. It measures up to 7cm in radius from its center to the tip of an arm. Usually the dorsal surface of this species is coloured bright to dull red. The ventral side is lighter in yellowish-white or pale pink. But the colouration of the dorsal side can vary from dark brown, purple-red, red-orange, dark carmine to pink. The arms´ tips may be coloured paler. Its arm tips slightly raised is a characteristic position of *O. validus* [390, 391, 396]. Fertilization and development takes places in the water column. The freeswimming larvae feed on bacteria and algae. [406, 407]. *O. validus* is a slow growing species, individuals need about nine years to reach a wet weight of 30 g [408]. Based on collected data *O. validus* is supposed to live more than 100 years. This species is omnivorous and feeds on seastars, molluscs, small crustaceans, sponges, bryozoans, hydroids, sea urchins, polychaetes, bryozoans, sponges, diatoms, algae, detritus, feces, and carrion. *O. validus* is prey item for the seastar *Macroptychaster accrescens* and the anemone *Urticinopsis antarcticus* [15, 191, 268]. *O. validus* is found circumantarctic in the Ross Sea, the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia and Bouvet Island at depths from 0 to 914m [390, 391, 395, 396, 409]. This species lives on a variety of substrates like mud, gravel and rocks.

Porania antarctica (E.A. Smith, 1876)

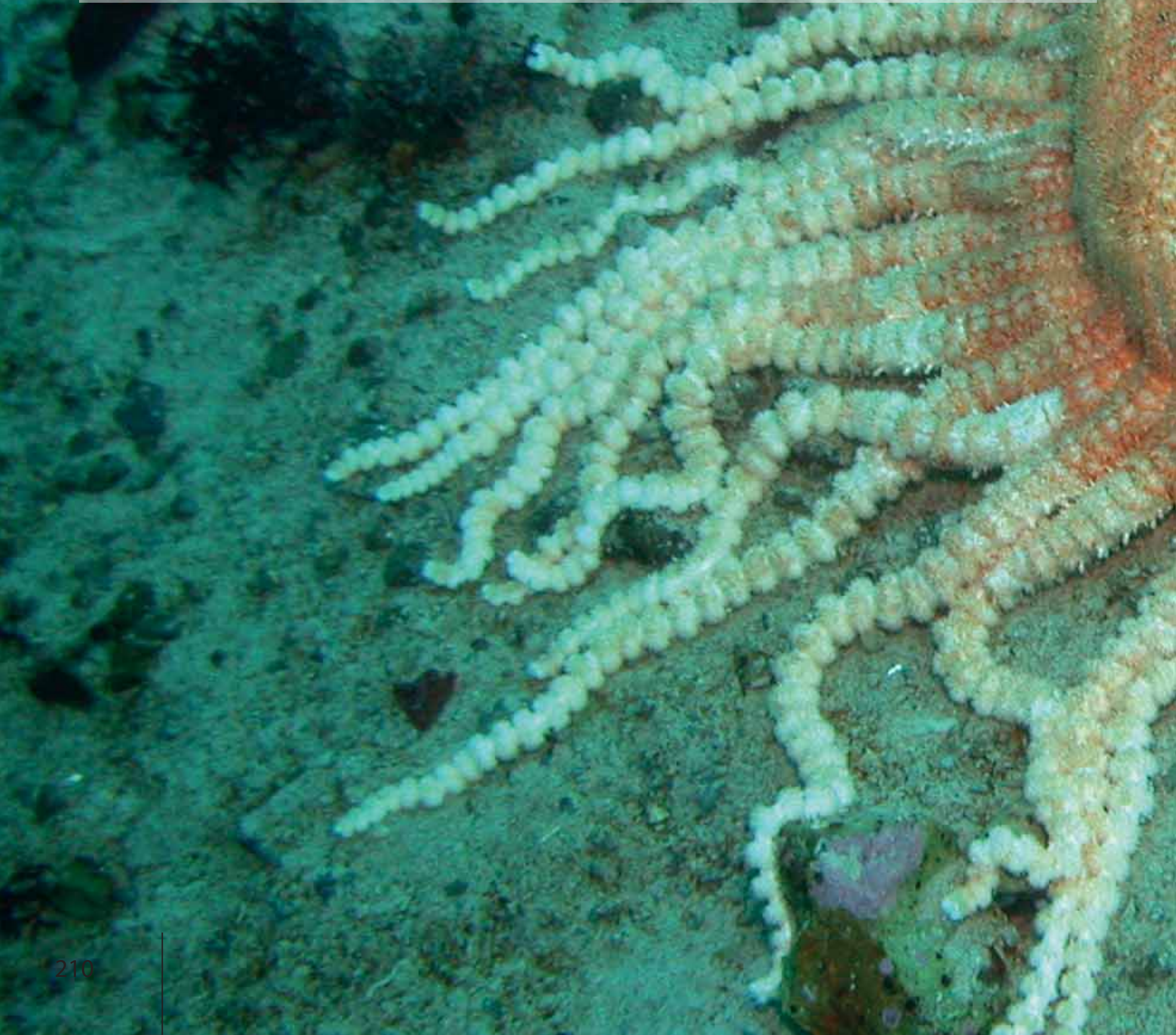
Valvatida, Poraniidae

Individuals of *Porania antarctica* can reach up to 7cm in radius from its center to the tip of an arm [410] with an inflated disc. The arms are short with a large central disc. The colouration of the thick and leathery skin of live animals varies from deep scarlet, carmine red, purple to pink, white and pale pink [396, 399, 409, 411]. Adults have well developed dorsal spines or tubercles. The development of *P. antarctica* is indirect via a planktotrophic larvae [410]. It is a detrivorous species, but also preys on small invertebrates like sea urchins and bryozoans. It is a circumantarctic species and found in the Ross Sea, Weddell Sea, South Shetland Islands, South Sandwich Islands, South Georgia, Shag Rocks, Marion and Prince Edward Islands, Marquarie Island, Heard Island, Bouvet Island, Crozet Island, Kerguelen Islands, Falkland Islands, Chile, and Argentina in depths from 0 to 2926m [395, 396, 399, 409, 411, 412]. *P. antarctica* lives on rocky and sandy substrates.


Labidiaster annulatus (Sladen, 1889)

Forcipulatida, Heliasteridae

Labidiaster annulatus is a large species reaching up to more than 37cm in radius. It has numerous flexible arms (between 36 and more than 50) which are fragile, but can be regenerated [413]. The disc is round or slightly oval. The colouration varies from reddish-brown to light-brown, the oral side is paler [83]. *L. annulatus* has an indirect mode of development with planktonic larvae [414]. It is one of the few sea star species that feeds on swimming prey like euphausids and to a lesser extent on fish, but also on benthic organisms like ophiuroids, gastropods, amphipods, bivalves, crinoids, polychaetes, asteroids, isopods, echinoids, and as well on smaller individuals of its own species [394, 413, 415]. *L. annulatus* is found circumantarctic in the Weddell Sea, Ross Sea, Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia, Kerguelen Islands, Palmer Archipelago and Heard Island and the southern part of South America in depth from 7 to 1684m. It lives on hard and soft bottoms.



Feather stars, Crinoidea

M. Eléaume, D. Schories, G. Kohlberg

The class Crinoidea contains 635 species worldwide [416], 45 of them appearing in Antarctica [417]. They inhabit only marine environments, from shallow waters to the ocean depths. Sea lilies possess stalks and remain attached to the bottom. They are restricted to deep water. Feather stars are able to crawl and perch on hard bottoms with their cirri and are also capable of swimming. Some crinoids have only five arms but most of them have many more (up to 200), because of branching of the initial five. Crinoids are suspension feeders and catch their prey with the help of mucus. This is secreted by small tube feet located on tiny side branches that proceed laterally from the arms. Particles are picked up and transported in ciliated ambulacral grooves to the mouth. Sexes are different in crinoids and eggs and sperm are released into the water column to achieve fertilization. The hatching larvae pass a free swimming planktonic stage, whereafter they settle on the sea bottom and develop into stalked larvae. Juvenile feather stars detach from the stalk as soon as they possess arms and cirri. Sea lilies remain attached to the stalk for their whole life.

Promachocrinus kerguelensis, Carpenter 1888

Comatulida, Antedonidade

About 50% of the known crinoid species from the Southern Ocean keep their larvae close to the maternal body (brooders) and another 50% shed their gametes in the water column (broadcast spawners) [417]. *P. kerguelensis* is a broadcast-spawner and one of the largest and most abundant crinoids on the Antarctic shelf [67]. Like most other feather stars *P. kerguelensis* is able to crawl over the substrate utilizing its arms. It has also been observed by ROV and by a camera mounted on a trawl swimming actively (Marc Eléaume, pers obs.). A single individual is thought to be able to release up to 29,000 eggs per year, which could be buoyant and therefore able to disperse over large distances [418]. Larvae are lecithotrophic, barrel-shaped and ciliated. *P. kerguelensis* is remarkable in having 10 rays of arms instead of 5. During its ontogeny, a secondary set of radials grow inbetween each existing primary radials, giving rise to an additional set of 5 dichotomous arms. *P. kerguelensis* are close relative to *Florometra mawsoni*, but not to other species in the genus *Florometra* [419]. Interestingly, *F. mawsoni* has 5 dichotomous arms arising from 5 primary radials and no secondary radials ever grow. Crinoids are worldwide distributed from the shallow subtidal to the abyssal zone. However they are absent from the Baltic Sea. *P. kerguelensis* is a circumpolar species. It is also recorded from the Antarctic Peninsula, South Shetland and South Sandwich Islands, South Georgia, Bouvet, Kerguelen and Heard Islands [420]. Two specimens were also dredged from the Campbell Plateau, south of New Zealand [421]. Molecular evidence suggest that *P. kerguelensis* is structured in 7 mitochondrial lineages [422] and at least 2 nuclear lineages. *P. kerguelensis* may represent at least two genetically distinct cryptic species [423]. It lives on hard substrates or attached to other epibenthic organisms. It has a depth range from 20 to 2100m.

Brittle Stars, Ophiuroidea

D. Schories, G. Kohlberg

More than 2100 species of Ophiuroidea are described worldwide [424], making them the largest class among recent Echinodermata. 129 species are known for the Antarctic region [67]. Like the Asteroidea, the brittle star have a star-shaped and dorso-ventrally flattened body-plan. The central disc is round or pentagonal and the five, or exceptionally more, delicate and flexible arms are sharply demarcated. They can reach lengths up to 20 times the diameter of the disc and, whilst moving them in a snake-like manner, are used for locomotion. The body is entirely covered by calcified plates. Ophiuroids inhabit all environments from the intertidal zone to the deep sea and can frequently be found as part of soft sea-bottom communities. They often hide under rocks or bury themselves in the sediment. Most brittle stars feed on detritus and small animals. Particles picked up by the tube feet are passed from foot to foot to the mouth. Normally ophiuroids have separate sexes and a metamorphosis from pelagic larvae to benthic adults. Brooding species are known. Like the Asteroidea, regneration of damaged or lost arms is common.

Ophionotus victoriae, Bell 1902
Ophiurida, Ophiuridae

Ophionotus victoriae is a large brittle star with a disc of up to 4cm in diameter and arms that can reach a length of 9cm. The colour can vary from white to grey, brown or bluish. This ophiuroid is characterized, as are many other Antarctic invertebrates, by a slow growth rate and high longevity, with an estimated maximum age of 22 years [425]. *O. victoriae* can contribute up to 40-80% of the total epifaunal biomass [426] in depths between 40 to 850m. *O. victoriae* is an opportunistic generalist, scavenger but also active predator on invertebrates [336]. This species is endemic to Antarctic waters with a circumpolar distribution. It is found on coarse as well as muddy sediments from shallow waters (5m) to depths of more than 1600m.

Sea Urchins, Echinoidea

D. Schories, G. Kohlberg

About 940 species of sea urchins are known worldwide [427], 80 species in Antarctica [67]. The sea urchins' endoskeleton, the test, is formed from several plates, interlocked at their edges. The surface is equipped with movable spines and pedicellariae, pincer-like organs of different shapes, which are used for defence and removal of debris and fouling organisms. When the test is cleaned of spines and tissue, bands of pores along the ambulacral grooves can be seen, these correspond to the bands of tube feet. The mouth is located at the underside and consists of a system of jaws and muscles, the so called Aristotle´s lantern, which enables the animal to bite off algae and other food. Regular sea urchins are common on rocky shores throughout the world, feeding on the algal turf. Irregular sea urchins, like sand dollars and heart urchins, are adapted to a soft sea-bottom by having a flattened body, short spines and feeding on detritus and mud. Echinoidea have different sexes but show sexual dimorphism only in different shapes of the gonopores or genital papillae. In most sea urchins fertilization is external. After a planktonic stage the larvae sink to the seafloor and adhere to the substrate with their tube feet. In less than one hour, the larvae undergo a metamorphosis to a benthic globose sea urchin. Brooding species are known especially in the Antarctic region and the juveniles remain on or inside the maternal echinoids until release.

Notocidaris sp.

Cidaroida, Cidaridae

Notocidaris sp. is a regular sea urchin. The primary spines are long and cylindrical, secondary spines are simple. This species shows sexual dimorphism, females have large gonopores. The spear-shaped spines with their lateral flanges distinguish the genus *Notocidaris* from other cidarid species. Two families of Antarctic sea urchins, the Schizasteridae (including *Abatus* spp.) and the Cidaridae are brooding their embryos and juveniles in a region around the mouth [428]. The epizoic bivalve *Lissarca notorcadensis* is often found on spines of the Cidaridae [429]. *Notocidaris* species are most probably omnivorous, carnivouros and scavenger [88]. Cidarid sea urchins are widespread and sympatrically distributed in the Antarctic. They live epibenthic, often on hard bottoms. In Fildes Bay it is often found on hard substrata in depth below 20m, including vertical cliffs.

Sterechinus neumayeri (Meissner, 1900)

Echinoida, Echinidae

The shell of the genus *Sterechinus* is characterized by a large periproct within its ring of apical plates [430]. Colouration of *S. neumayeri* is variable, from greenish-olive to dark violet. It is the most abundant echinoid species in shallow Antarctic coastal waters including Fildes Bay. It is a slow growing species, reaching its maximum size (about 70mm) at an age of about 40 years [431]. *S. neumayeri* covers it spines with fragments of shells and algae. *S. neumayeri* is an omnivorous grazer feeding on detritus, diatoms, macroalgae including coralline algae and several small sessile invertebrates. This species is widely distributed in the Antarctic. It is also present around the South Shetland Islands, South Orkney Islands, South Georgia, South Patagonia, Prince Edward Island, Marion Island, Crozet Island and Kerguelen Islands at depths from 5 to 800m [108]. It is found in depths of up to 800m, but it prefers shallow water depths from 3-15m, whereas the relative *S. antarcticus* prefers deeper regions. Depending on food availability it can reach very high densities [432].

Abatus agassizii (Pfeffer, 1889)

Spatangoida, Schizasteridae

Abatus agassizii belongs to the heart urchins. Its body has an oval form, with the mouth placed towards one end of the animal. *A. agassizii* is a type of brooding organism. This kind of reproduction is well documented in Subantarctic and Antarctic echinoderms. The females brood the juveniles in four depressed elongated brood pouches on their aboral surface. Heart urchins are buried in the sediment, however an innumerous number of spines prevents contact of the sediment with the urchin´s surface, fascilitating respiration while buried in the sediment. The species is, like all other heart urchins, a deposit feeder. It uses its oral tube feet to collect detritus. *A. agassizii* is present in the Antarctic, Southern Chile, Falklands Islands, South Georgia, the South Shetland Islands, the Uruguay-Buenos Aires Shelf and the Weddell Sea [433, 434]. *A. agassizii* lives embedded in mud and sand. It was found in Fildes Bay in very shallow water (3-10m) embedded in the sediment between stones and pebbles.


Sea cucumbers, Holothuroidea

M. O'Loughlin, G. Kohlberg, D. Schories

Sea cucumbers are one of the five classes of the phylum Echinodermata. The echinoderms have a pentamerous (five-rayed) body form that is most evident in the seastars (Asteroidea) and brittle stars (Ophiuroidea), a little less evident in the feather stars (Crinoidea) and sea urchins (Echinoidea), and not immediately obvious in the sea cucumbers. In the sea cucumbers a bilateral symmetry is superimposed on the pentamerous symmetry as specimens usually lie on one side and this creates upper (dorsal) and lower (ventral) surfaces. But the pentamerous form is evident in the presence of five internal longitudinal muscles, frequently five radial rows of tube feet along the body wall, and tentacles in multiples of five. Four of the classes of echinoderms have an external skeleton of plates, but these plates (scales) are evident in only relatively few sea cucumber species. In Holothuroidea the echinoderm calcareous plates are usually reduced to microscopic ossicles in the body wall. These have a variety of consistent forms, such as tables, cups, wheels, rods and plates. These forms are important for identification.

As in the other classes, most sea cucumbers have small tube feet (pedicels) and the ends of these feet have the capacity to adhere and disconnect immediately to an object. This capacity enables a sea cucumber to use the tube feet to move, to hold onto the substrate (evident in some photos here), and to cover itself with camouflage (evident in some photos here). The tentacle ends have the same capacities, which enables them to capture food. Sea cucumbers have an anterior internal collar of usually 10 plates that create a calcareous ring. This ring acts as a support base for the tentacles. The five longitudinal muscles are attached to the ring and enable the animal to withdraw the tentacle crown. All of the Antarctic sea cucumbers in this report belong to the order Dendrochirotida which are characterized by the tentacles of the species being branched in a tree-like form (dendritic), and the calcareous ring lacking posterior prolongations on the plates. All of the species described here use extended dendritic tentacles to capture food (small micro-fauna and micro-flora, and inorganic material) from the passing water currents. Each tentacle then pushes the food into the oesophagus that leads to the stomach (evident in some photos here). This is called "suspension feeding".

Most sea cucumbers have either male or female gonads, but some species are hermaphrodite and each individual has a gonad that produces both sperm and eggs. This may result in self-fertilization, and may be associated with internal development and brood-protection of embryos. Some sea cucumber species have a copulatory capacity and the males place sperm directly at the eggs through a genital papilla that is digitiform. The genital papilla is frequently situated between the dorsal tentacle pair. Females have only a knob-like papilla and gather the eggs into five internal pouches, each with an external opening for the copulatory activity. In these species there is thus an external sexual dimorphism. Some of the sea cucumber species in this report have these capacities, but they are not evident in the photos. Antarctic waters are with about 200 species particularly rich in sea cucumber species, many of them not yet described and named. They comprise about 4% of the Antarctic biota, and about 10% of the global sea cucumbers.

Cladodactyla sicinski (O'Loughlin, 2013) (in O'Loughlin P. Mark, Stępień, A, Kuźniak, M. and Van Den Spiegel, D. 2013)

Dendrochirotida, Cucumariidae

This species was described for a single, small and poorly preserved specimen. The combination of morphological characters suggested the need for the new genus *Dendrelasia* O'Loughlin, 2013. A more recent large collection of specimens from around the South Shetland Islands and Elephant Island includes many better-preserved and larger specimens. They are all conspecific and congeneric with *Cladodactyla crocea*. *Dendrelasia sicinski* is now referred to *Cladodactyla*. Like *Cladodactyla crocea*, this species is hermaphrodite, and protects the juveniles in a long grooved external marsupium along its dorsal surface. This species occurs from the shallows to 250m depth. Preserved specimens are up to 70mm long. [439]

Cucamba psolidiformis (Vaney, 1908)

Dendrochirotida, Cucumariidae

The new genus *Cucamba* O'Loughlin, 2009 was created for this species, principally for the fact that there are very small, close to inconspicuous, inter-radial tube feet in addition to the conspicuous radial series of tube feet. The body wall is firm and rough due to the presence of thick, knobbed, perforated plates. Ossicles disappear with growth. The body is cylindrical and strongly tapered anally. Specimens may be up to 120mm long. This species has been found in eastern and western Antarctica, from the shallows to 400m depth. Genetic data indicate an atypical complex of species that comprises clades of specimens that are not grouped geographically. [435, 440-442]


Cucumaria acuta Massin, 1992
Dendrochirotida, Cucumariidae

Like *Cucumaria attenuata*, this species is also associated with what has been called the "*Cucumaria georgiana* (Lampert, 1886) Group". The valid identities of the associated species are yet to be resolved. *Cucumaria acuta* has been provisionally recognized for specimens from eastern and western Antarctica, based on the 10 dendritic tentacles with the ventral pair distinctly smaller, tube feet confined to the radii, females with five marsupia, and perforated plate ossicles with sharp points around the margins. Genetic data confirm that there is a complex of species. These species exhibit sexual dimorphism, and females protect the juveniles in five anterior, inter-radial, internal marsupia. Presumably there is a copulatory process for fertilization of eggs in the marsupia. Specimens may reach lengths of up to 45mm, and have been found from the shallows down to 700m depth. [435, 437, 438, 443]

Cucumaria attenuata Vaney, 1906
Dendrochirotida, Cucumariidae

This species is associated with what has been called the "*Cucumaria georgiana* (Lampert, 1886) Group". The valid identities of the associated species are yet to be resolved. *Cucumaria attenuata* has been provisionally recognized for specimens from eastern and western Antarctica, based on the 10 dendritic tentacles with the ventral pair distinctly smaller (upper left of photo), tube feet confined to the radii, females with five marsupia, and perforated plate ossicles with rounded and smooth margins. Genetic data confirm that there is a complex of species. These species exhibit sexual dimorphism, and females protect the brood in five anterior, inter-radial, internal marsupia. Presumably there is a copulatory process for fertilization of eggs in the marsupia. Specimens may reach a length of up to 45mm, and have been found from the shallows to 500m depth. [435-438, 444]

Heterocucumis steineni (Ludwig, 1898)

Dendrochirotida, Cucumariidae

Heterocucumis steineni has 10 equal tentacles, five equal paired rows of radial tube feet, and a smooth leathery body wall that is finely spinous only in very small specimens. The plate ossicles with tapered spinous ends reduce in size and disappear with growth. The colour is dark brown, sometimes violet-brown. This species has been found in eastern and western Antarctica from the shallows to more than 1000m depth. To date genetic data do not provide evidence of a species complex. Specimens may be up to 100mm long. [435, 445]

Psolicrux iuvenilesi O'Loughlin & Manjón-Cabeza, 2009

Dendrochirotida, Cucumariidae

The new genus *Psolicrux* O'Loughlin, 2002 was created for the species *Cucumaria coatsi* Vaney, 1908, principally for the fact that there are very small cross ossicles amongst the spinous, spired plate ossicles in the body. Specimens of *Psolicrux iuvenilesi* are distinguished from specimens of *Psolicrux coatsi* principally by the absence of these small crosses. *Psolicrux coatsi* occurs in the eastern and western Antarctica, and genetic data indicate that this is a complex of species including *Psolicrux iuvenilesi*. Both species have a thin body wall that is prickly with small spines, a tapered upturned tail, radial series of ventrally tube feet, and dorsal tube feet that are scattered amongst the projecting spines. The body of specimens may be up to 30mm long. This species has been found in eastern and western Antarctica, from the shallows to 660m depth. [442]

Staurocucumis turqueti (Vaney, 1906)

Dendrochirotida, Cucumariidae

Presumably the specimen photographed here is a juvenile as these animals are typically dark brown in colour. There are ten equal dendritic tentacles, and five paired rows of radial tube feet that are more concentrated ventrally. The body wall of small specimens is finely spinous due to the projection of the spines on the ossicle plates. These ossicles disappear as the animal grows and the body wall becomes smooth. This species has a widespread Antarctic distribution and has been found in eastern and western Antarctica from the shallows to depths of up to 400m. If the species follows the pattern of other relatively shallow Antarctic species it is probably a species complex, but there are not sufficient genetic data available to confirm or reject this hypothesis. This is one of the largest Antarctic sea cucumber species and specimens may be up to 300mm long. [444]

Heterocucumis steineni

Psolicrux iuvenilesi

Psolus charcoti Vaney, 1906

Dendrochirotida, Psolidae

Psolus charcoti has always been referred to the genus *Psolus* that is characterized by having conspicuous plates covering the domed upper body, an absence of tube feet dorsally and laterally, and a thin ventral sole with marginal tube feet. *Psolus charcoti* is not an obvious *Psolus* species as there is a thick rough upper body wall that does not have clearly evident plates. This species has been found in eastern and western Antarctica from the shallows to 500m depth, but genetic data show that it is a complex of geographically localized species. *P. charcoti* exhibits sexual dimorphism, and females protect their juveniles in five anterior, inter-radial, internal marsupia. Presumably there is a copulatory process for fertilization of eggs in the marsupia. Specimens are up to 75mm long in Prydz Bay in eastern Antarctica. [435, 437, 438, 444]

Psolus granulosus Vaney, 1906

Dendrochirotida, Psolidae

As *Psolus charcoti* this species has always been referred to the genus *Psolus*. But *Psolus granulosus* is not an obvious *Psolus* species as the domed upper body wall is wrinkled and granule-covered and does not have clearly evident plates. This species has been found only in western Antarctica from the shallows to 250m depth around the South Shetland Islands and along the eastern side of the Antarctic Peninsula. As in many small Antarctic species it protects embryos and juveniles under the body. Specimens may be up to 25mm long. [444]

Moss animals, Bryozoa

Piotr Kuklinski

Bryozoa, from the Greek bryon (moss) and zoon (animal), wherefore they are commonly called moss animals. They live in both marine and freshwater environments. About 4000 recent species have been described worldwide [446], 318 in Antarctica [67], yet new species are still being discovered and the number of Antarctic bryozoan species is constantly increasing. These sessile animals are strictly colony forming and consist of tiny interconnected individuals, called zooids, secreting skeletons of various shapes. Recent bryozoans are divided into three orders: Cyclostomata, Cheilostomata and Ctenostomata. While Cyclostomata and Cheilostomata have calcium carbonate skeletons with very distinctive shapes of autozooids, Ctenostomatida are soft bodied. The order Cheilostomata is by far the most diverse in terms of species number. Within some colonies of bryozoans polymorphic individuals can be found, with certain individuals having different functions, including feeding, reproduction and defence. Colonies can be created and fixed to the substrate by a basal disc or rhizooid, others are encrusting and cover hard substrates such as stones, shells or algae. A characteristic feature of the Bryozoa is the so called lophophore, a circle of ciliated and flexible tentacles surrounding their mouth. The life cycle of the Bryozoa includes both sexual and asexual reproduction. Sperm and eggs are produced simultaneously in the same colony. Fertilized eggs develop into free swimming larvae and after a time they settle on a suitable substrate. Colonies grow and develop through budding. Bryozoans are suspension-feeders and feed on small planktonic organisms. Predators of the bryozoans include amphipods, nudibranchs, chitons and pycnogonids.

Cellarinella sp. Waters, 1904

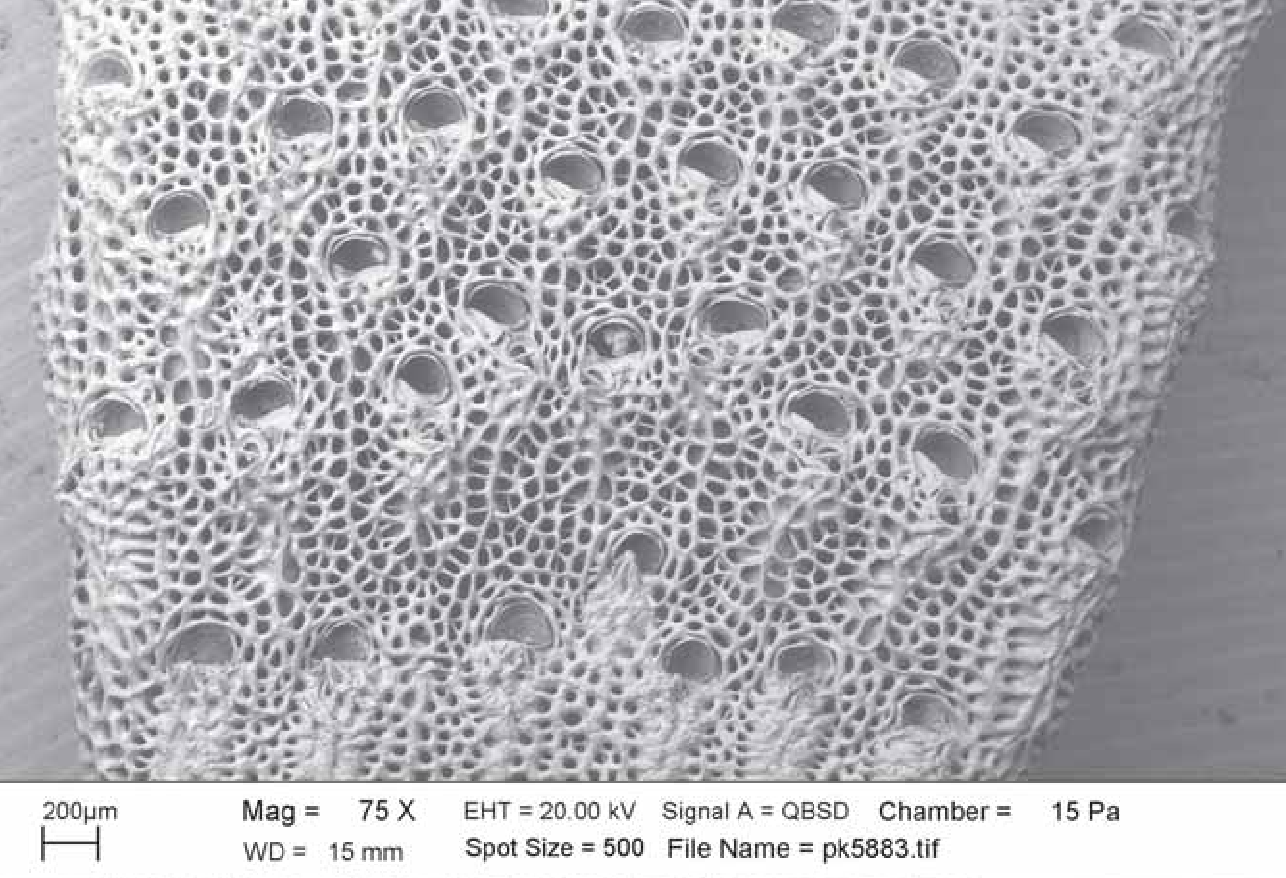
Gymnolaemata, Cheilostomatida, Sclerodomidae

The genus name *Cellarinella* was proposed for several problematic species. The species of this genus always form erect colonies which are heavily calcified. They are attached to the substrate by chitinous rhizooids or by the encrusting sheet of autozooids. Some species have transverse growth-check bandings. The frontal shield is imperforated. The orifice can be of various shapes from semicircular to subtriangular. Known species have one or two avicularia (these are specialized zooids probably with defensive or cleaning purposes) with triangular or semicircular mandibles. Species of the genus *Cellarinella* are difficult to distinguish without usage of scanning electron microscopy. Like all bryozoans, colonies of *Cellarinella* do also develop by budding from primary individuals called ancestrula. Life span of many species of the genus can be up to 15 years. Annual growth depends on species but also environmental parameters including food and temperature. Diet of *Cellarinella* species has never been studied. However, as for the rest of the ectoproct species of this genus they are suspension feeders, too. Therefore we can assume that species feed on phytoplankton, protists and invertebrate larvae of appropriate size. Species of the genus *Cellarinella* are almost exclusively distributed in the Antarctic therefore the majority of them are endemic to waters around this continent. They occur from shallow subtidal to deeper waters of the continental slope, e.g. the species *Cellarinella foveolata* (Waters, 1904) was found in the Southern Ocean in depths of up to 730m. Many species of *Cellarinella* have very localized occurrence however this is probably biased by low sampling effort. *Cellarinella* was found in Fildes Bay settling directly on hard bottom. In addition to hard bottom, species which use chitinous rhizooids for attachment are able to occur in less stable habitat composed of softer sandy sediment.

Nematoflustra flagellata (Waters, 1904)

Gymnolaemata, Cheilostomata, Flustridae

Colonies are bushy tufts up to 20cm high, lightly calcified, very flexible, attached to the substrate by chitinized rhizooids. Branches often divide dichotomously. Colonies are orange or orange/brown in colour. This species has very characteristic vibracula (whip-like seta) which are distributed on the entire surface of the colony and are probably used for defensive purposes. All these features mentioned above make the species recognizable for a trained person by the naked eye. For Antarctic environment it is a relatively fast growing bryozoan with an increase in height of up to 1cm per year [447, 448]. Nudibranchs and pycnogonids are known as predators of *Nematoflustra flagellata*. Nearly 40 other species of Antarctic bryozoans are known to settle on the surface of *N. flagellata* [449]. Larvae of this species are brooded for approximately 10 months and released into the water column in January/February. *Nematoflustra flagellata* is an endemic circumantarctic species. It is very common in shallow subtidal waters down to deeper parts of the continental shelf. The species can be found on hard and soft substrata. In Fildes Bay the shallowest record of *N. flagellata* was at 20m depth.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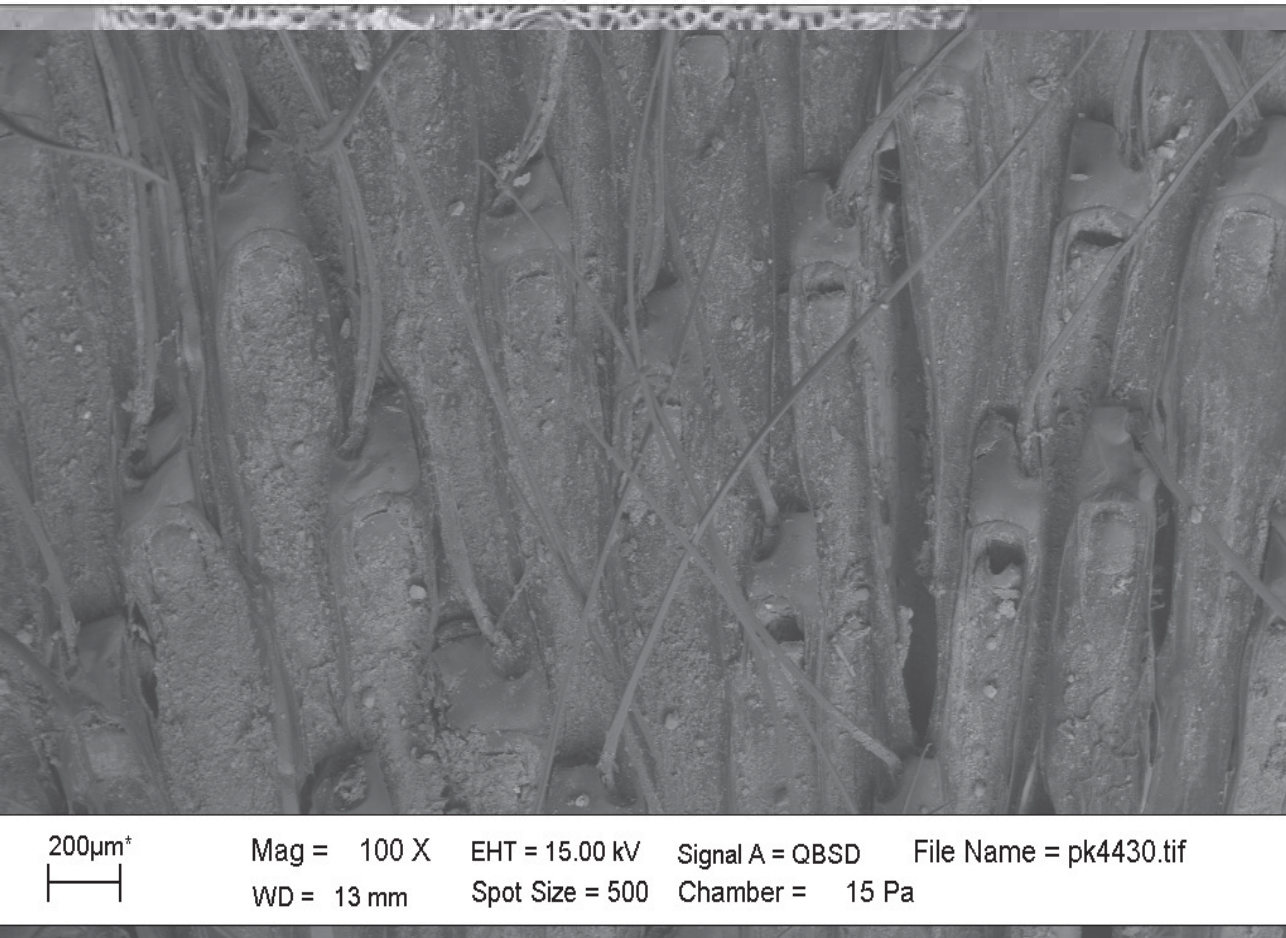
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Antarctothoa sp. Moyano, 1987

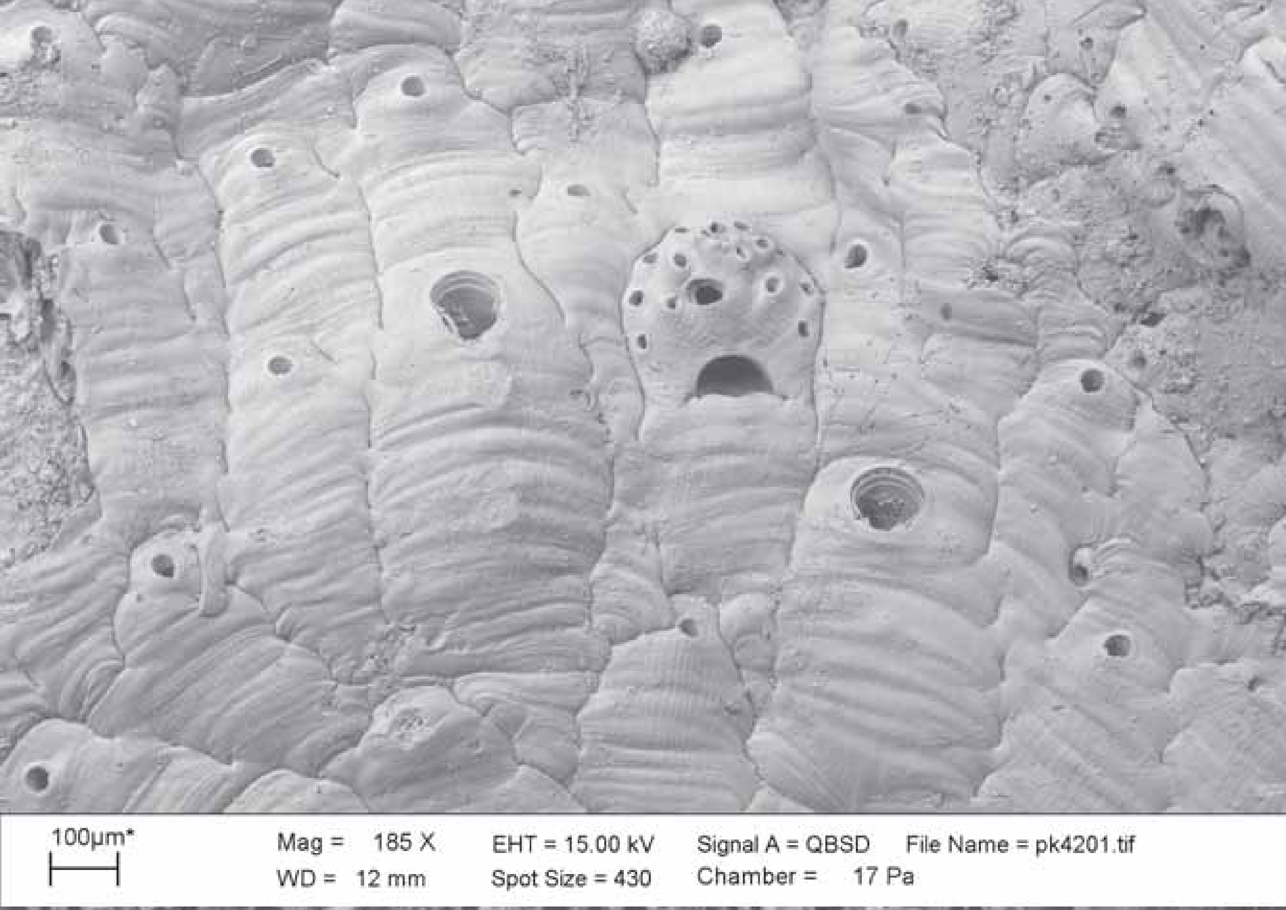
Gymnolaemata, Cheilostomata, Hippothoidae

Colonies of the genus *Antarctothoa* are encrusting, flat, and often rounded, unilaminar patches. The species of this genus are sone of few bryozoans which also possess male and female zooids in addition to autozooids. While autozooids are the largest zooids within the colonies male zooids are usually very minute. Female zooids have ovicells (embryo nursing structures) at their distal end. Ovicells are often very porous. The orifice is oval with usually an u-shape sinus at the proximal border. With some experience individuals are easy to assign to genus level with naked eye; however for the determination to species level the usage of more sophisticated equipment like a stereomicroscope is needed. It is a rather short living species. The genus follows the general pattern of life history like the rest of bryozoans which means the development of sexually produced pelagic larvae which settle on adequate substrate. By budding of zooids the colony becomes sexual mature. The genus *Antarctothoa* has been established relatively recently therefore its distribution is not fully understood yet. At the moment, species of the genus are known from Antarctic and Subantarctic waters. The genus depth occurrence ranges from shallow subtidal waters down to depths of even 1500m. *Antarctothoa* species encrust rocks, shells, and are very common on kelps. At King George Island it was found in the inner part of Fildes Bay on the underside of stones in shallow waters (5m). Most species are known from cold waters (< 7°C).

Inversiula nutrix Jullien, 1888,

Gymnolaemata, Cheilostomata, Inversiulidae

Inversiula nutrix forms encrusting colonies which are heavily calcified and are usually of orange to green colour. Young colonies may be almost translucent. The frontal wall is granular, evenly perforated by numerous pores. In the central part of the frontal wall there is the characteristic pore called ascopore. The orifice is transversely oval. Two distinct avicularia (defensive/cleaning zooids) are on the distal sides of autozooids. The species should be easily distinguishable with a magnifying glass. Life span of the species seems to be up to four years. *Inversiula nutrix* is one of the few bryozoans which are present in the intertidal zone indicating that the species can cope with high level of disturbance. It is very abundant on boulders and shells in shallow depths which means it can reproduce in high number. Colonies exhibit often characteristic growth bands which suggest feeding on the seasonally occurring food. This might most likely include phytoplankton or with phytoplankton associated seasonally occurring zooplankton species. It was recorded both in Antarctic and Subantarctic waters. The species is very common along the Antarctic Peninsula however there are records from other locations as well (e.g. Adelie Land). At present its distribution due to low sampling effort is not completely understood. Together with *Antarctothoa bougainvillea* and *Fenestrulina rugula*, *Inversiula nutrix* is a very common bryozoan faunal component in shallow waters between South Georgia and Adelaide Island [450]. Several colonies of *Inversiula nutrix* were found in the inner part of Fildes Bay on the underside of stones at depths between 4 and 10m. However, it was also found down to 119m in Admiralty Bay, King George Island and is present on hard bottom, boulders or shells in the intertidal zone.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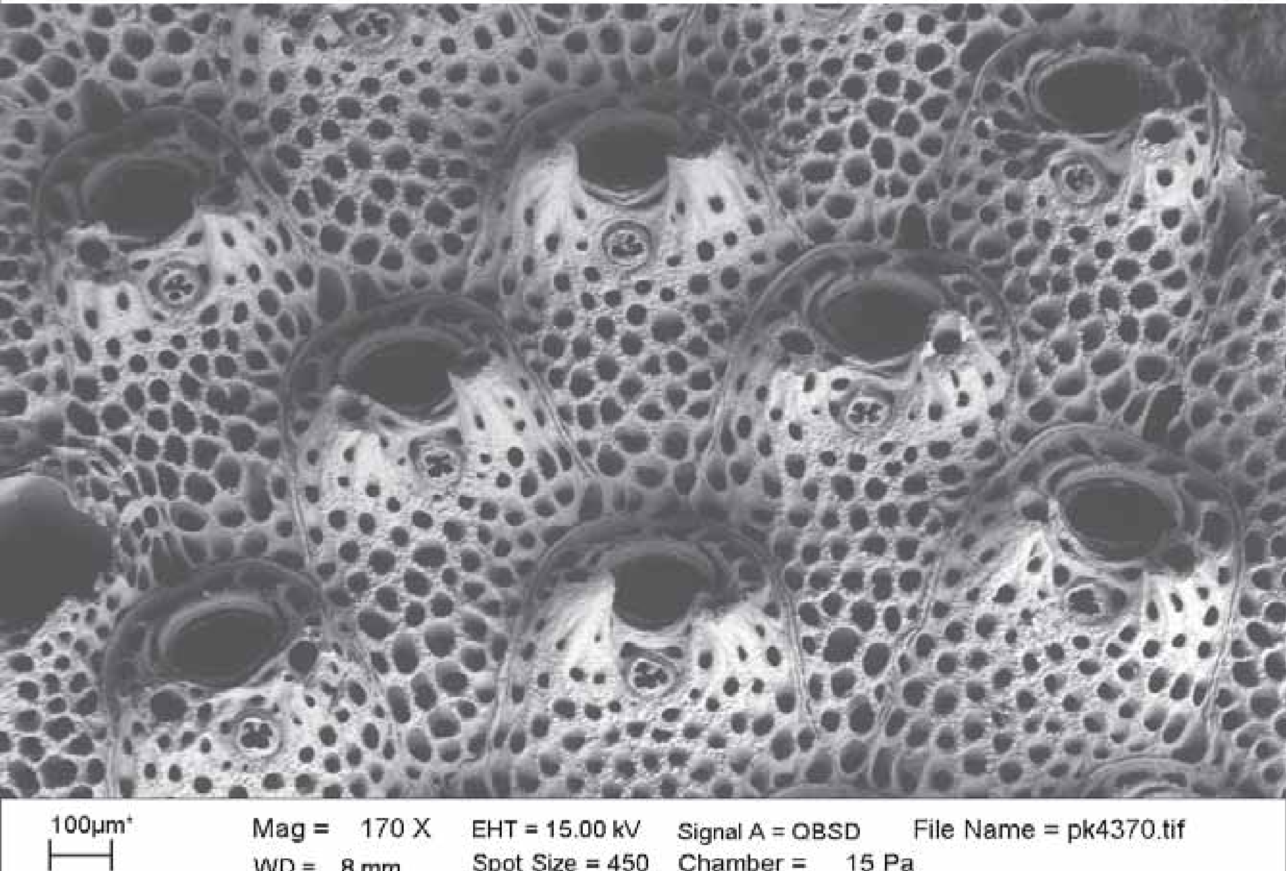
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Fenestrulina sp. Jullien, 1888

Gymnolaemata, Cheilostomata, Microporellidae

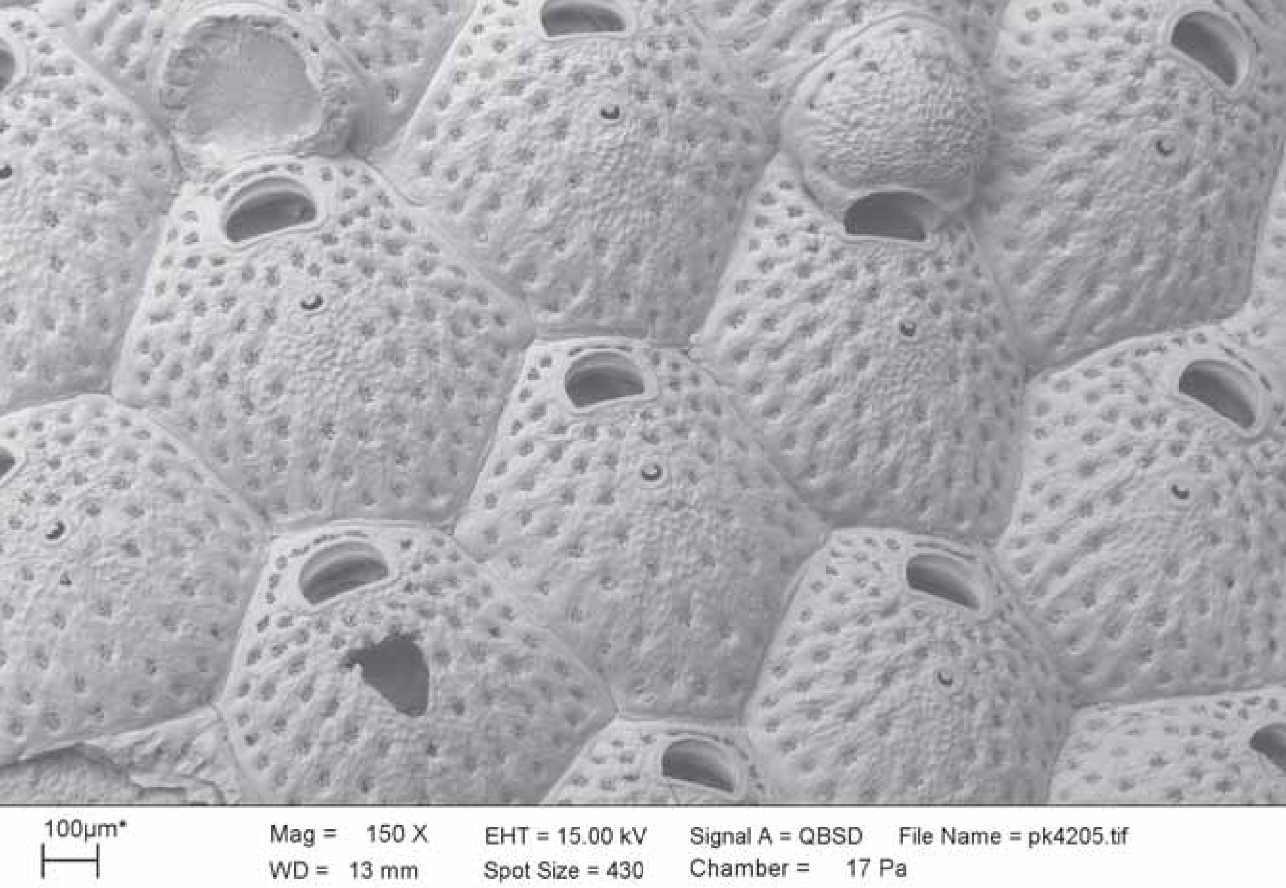
Species of the genus *Fenestrulina* form unilaminar encrusting colonies made of calcium carbonate. The frontal wall shows scattered pores whereof the central area often is imperforated. In the central area of each zooid there is also a characteristic pore called ascopore. The orifice is very distinct with straight proximal edge. Within the colony structures , so called ovicells, are often present. These are blobby like structures which are located at the distal edge of the autozooids where organisms develop embryos that are finally released to the environment as larvae. Distinguishing *Fenestrulina* species with a naked eye is almost impossible and the usage of a simple magnifying glass is required. Not much is known about life history of Antarctic species of *Fenestrulina*. Colony size of *Fenestrulina rugula*, which is a common species near King George Island, can be more than doubled within one year. In shallow water young colonies are predominant most likely due to frequent disturbance by ice which prevents colonies to grow to large sizes [450]. *Fenestrulina* species are suspension feeders, but details of the diet of the Antarctic *Fenestrulina* species are unknown.

Species of *Fenestrulina* have a broad global distribution and in Antarctic waters we have currently 11 discovered species. Species of *Fenestrulina* are known to occur commonly from the shallow subtidal to depths of at least 200m. Several colonies of *Fenestrulina* were found in Fildes Bay encrusting underside surfaces of stones at depths between 4 and 10m. Species of *Fenestrulina* are known to colonize rocks, shells and colonies of other bryozoans. In many places *Fenestrulina rugula* is found together with two other cheilostomid bryozoans, *Inversiula nutrix* and *Antarctothoa bougainvillea* the most common and abundant species in shallow waters [450]. It is occasionally present in deeper areas down to 100m depth.

Patinella sp. Gray, 1848

Stenolaemata, Cyclostomata, Lichenoporidae

Colonies of *Patinella* sp. are encrusting, discoidal, and small, less than 1cm in diameter. The collected material was of white colour. The taxonomy of species belonging to the genus *Patinella* is still very problematic and even the usage of sophisticated technologies like scanning electron microscopy is not always helpful in species determination. However with naked eye we can often distinguish individuals belonging to the genus. Colonies of the individuals of genus *Patinella* are always discoidal with very characteristic tubular, pipe like autozooids. Autozooids are often arranged in a regular pattern of radial rows. The central area of the colony is often porous. The life cycles of species belonging to this genus are very little known. In Antarctic waters they seem to colonize new substrates year round. Due to their problematic taxonomy there is lots of bias in the data as we do not know if it is a single species or a number of species. The genus *Patinella* is a cosmopolitan one with a worldwide distribution. Species of the genus occur from shallow subtidal waters to the deepest areas of the world oceans. At King George Island it was found in the Admiralty Bay and Fildes Bay in shallow waters on small stones. This taxon is known to occur also on shells, hydrozoans, other bryozoans and kelps.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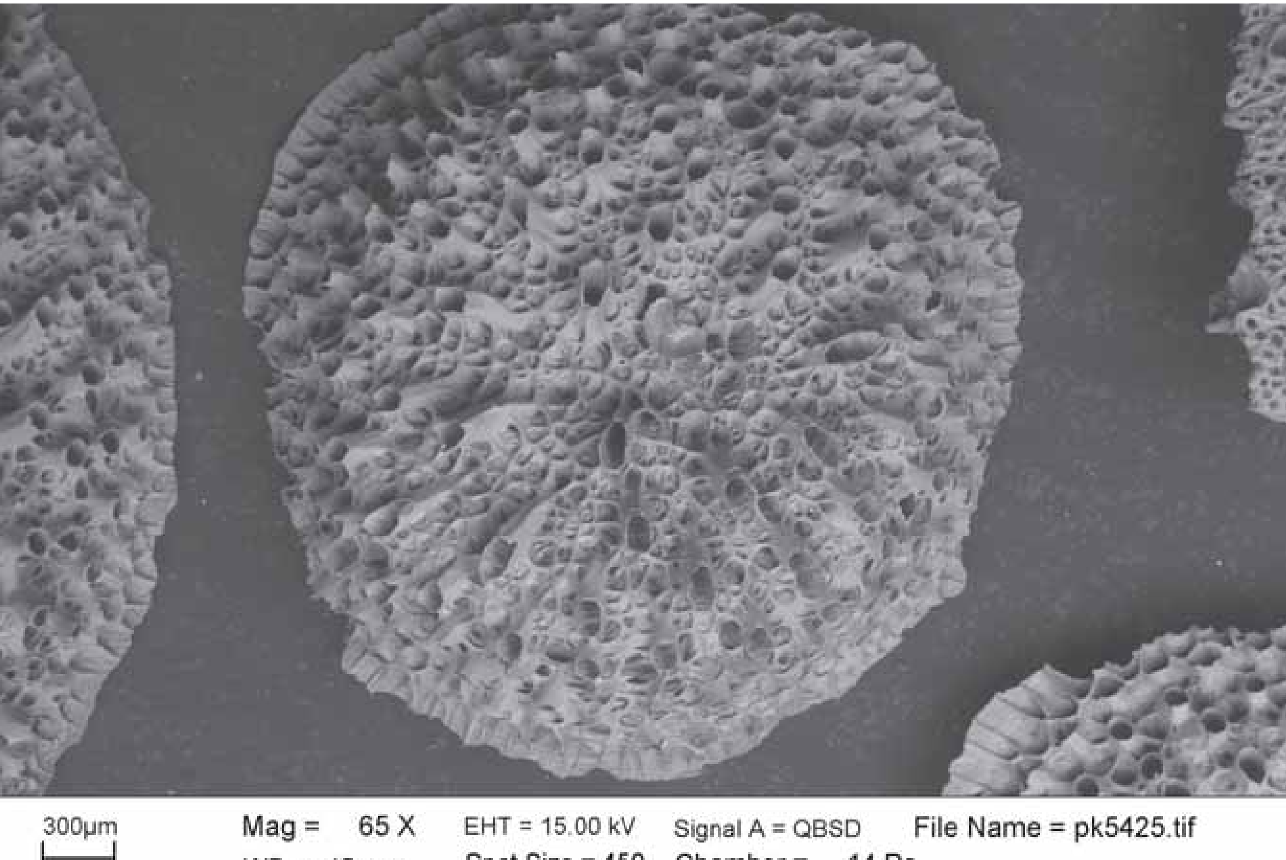
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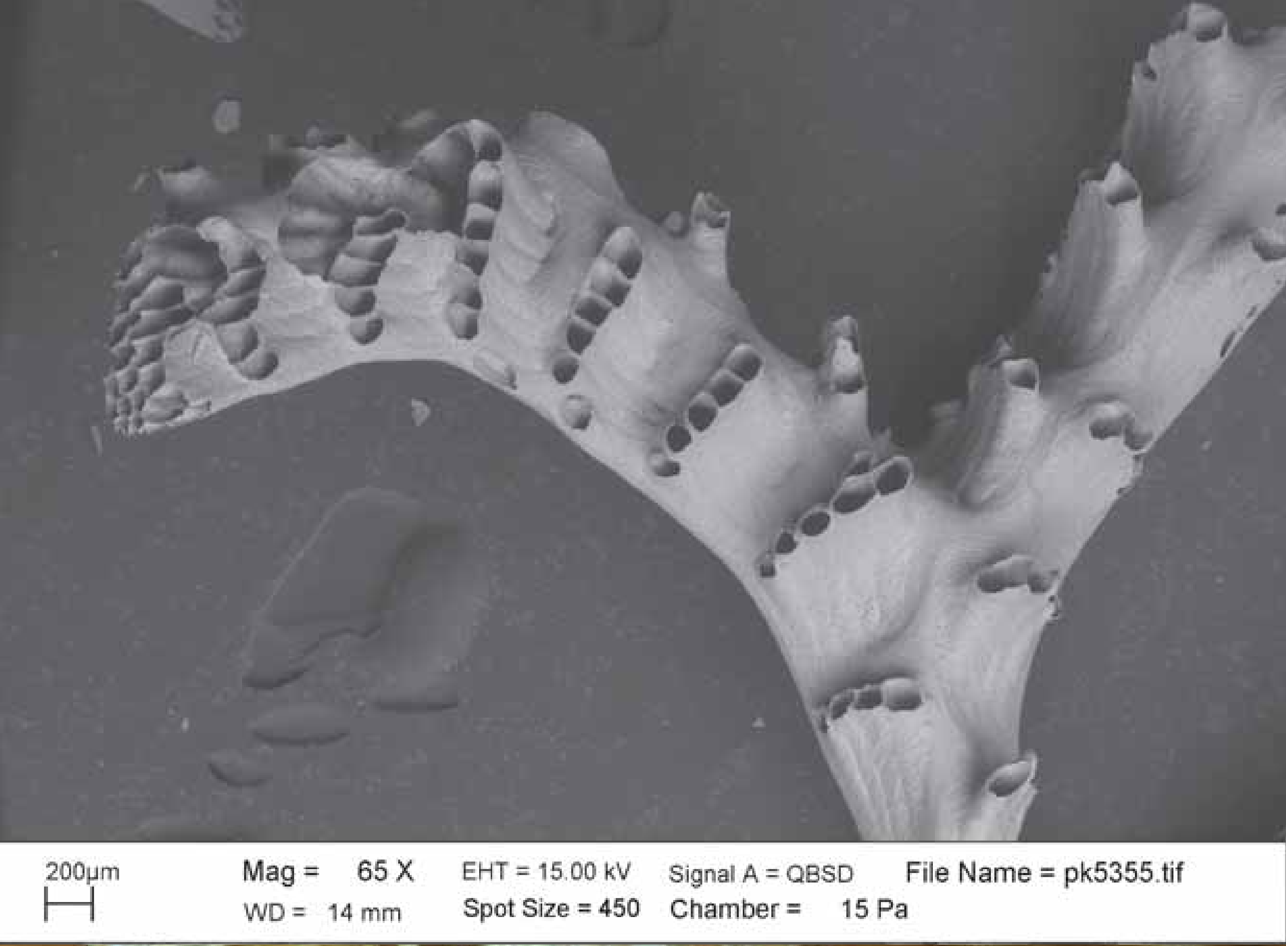
Tubuliporidae Johnston, 1838

Stenolaemata, Cyclostomata

Colonies of the family Tubuliporidae are very diverse in shape ranging from irregular to massive cylindrical branches. Several species produce only flat and lobate colonies without erect growth [451]. The family Tubuliporidae belongs to the order Cyclostomata which means their autozooids have a very characteristic form of tube-like structures. Combining the colony´s shape and the autozooids still does not make it easy to distinguish species of the family Tubuliporidae. Members of this family possess zooids which are termed gonozooids. These are structures where embryos of the individual are brooded. The shape of the gonozooid is often a good character to distinguish the species, but it is not always present in a colony as its development is often seasonal.

We do not know the life history for a single Antarctic Tubuliporidae species. From lower latitude studies, which can be probably also applied to Antarctic individuals, we know that the robustness of the branches in fan shaped colonies may depend on environmental conditions. More delicate branches are often seen at sheltered locations and more robust branches on exposed sites. The species of the family Tubuliporidae have a global distribution. In Antarctic waters we have several genera of Tubuliporidae family including *Idmidronea*, *Exidmonea*, or *Tubulipora*. However the species richness within the family is far from being fully known due to its challenging taxonomy. Some species most likely have circumantarctic distribution. Depth distribution of Tubuliporidae species ranges from the shallow subtidal to depths greater than 1000m. Colonies grow on all kinds of hard substrata including stones, pebbles, rocks, shells but also on other bryozoans, hydrozoans and kelps. We found species of the family Tubuliporidae in 4-10m depth below stones and boulders.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Lamp shells, Brachiopoda

C. Lüter, G. Kohlberg, D. Schories

In former times, Brachiopoda, or lamp shells, were very abundant with about 30,000 known fossil species. Today only approximately 380 species of these sessile animals remain worldwide [452], with 29 in Antarctica [67]. They inhabit all regions from the intertidal zone down to the ocean depths. They occur worldwide but only in few regions do they dominate the benthic fauna. Lamp shells live attached to a hard substrate or burrowed in soft sediment. Although appearing to be clams, they differ from these by having asymmetric valves and a completely different anatomy. Like the bryozoans, lamp shells also possess a lophophore and this occupies almost all of the space between the valves and is used for filtering their main prey of diatoms and also, due to its large surface, respiration. Fertilization is external and after a few days, the planktonic larvae settle on a hard substrate where metamorphosis takes place. In some species the eggs remain with the adult until the larvae hatch.

Liothyrella uva (Broderip, 1833)

Rhynchonellata, Terebratulida, Terebratulidae

Liothyrella uva is longitudinally oval in outline. Its maximum shell width is at about midvalve; the sides are rounded; the anterior margin is fairly strongly rounded and the posterolateral margins are forming an angle of 70°-90°. Its ventral valve is moderately convex in lateral profile [453]. Brachiopods are distributed worldwide in all oceans, but only exceptionally numerous. In paleozoic and mesozoic times they presented one of the most abundant marine invertebrate groups. Annual shell growth rates of *L. uva* are about 2-6 times slower than those of temperate species [454]. *L. uva* is a suspension feeder and is found around Antarctica at 7 to 974m depth. It occurs along the West coast of Central and South America, southern South America, Falkland Islands, Strait of Magellan, South Georgia and South Orkney Islands [455]. In Fildes Bay, King George Island, it is commonly present on overhanging rocks and crevices starting at 5m depth.


Chordates, Chordata

M. Huene, G. Kohlberg, P. Reyes, K. Sanamyan, D. Schories

The name Chordata is derived from the Greek word chorda (chord). This phylum unites all species that possess, at least during part of their development, a hollow nerve cord along the dorsal length of the animal, a notochord (flexible rod for support between nerve cord and gut), pharyngeal slits (small openings along the anterior part of the gut) and a post-anal tail (a tail extending beyond the anus). Human beings are part of the phylum Chordata and, like all other animals with a backbone, belong to the subphylum Vertebrata.

Tunicates, Tunicata

K. Sanamyan, N. Sanamyan, G. Kohlberg, D. Schories

Almost all tunicates are marine animals, with very few species inhabiting even brackish waters. The single-layer epidermis secretes the test, or tunic, producing a leathery or gelatinous exoskeleton that contains tunicine, a substance similar in chemical composition to cellulose, unique in the animal kingdom. Although most tunicates are filter-feeders, some deep water species have a mixed diet and some are carnivorous.

Sea squirts, Ascidiacea

Within the subphylum Tunicata, the class Ascidiacea is the most diverse group, with about 2550 species worldwide. 162 species are found in the Southern Polar Region [456]. Ascidiacea live attached to hard surfaces or anchored in soft sediments, and in all variety of marine communities around the world, from the intertidal zone to the abyssal depths, existing solitarily or in colonies. The body is protected by the test. Due to their sessile way of life they are suspension feeders, filtering bacteria, microalgae and organic matter from the surrounding water column. Water flows into the body through an intake, or branchial, siphon. Filtered particles pass into the gut and the remaining water is expelled through the outlet, or atrial, siphon. Colonial sea squirts usually form layers of an undefined shape on stones or other hard substrates. They consist of numerous individuals, called zooids, partly or completely covered by a common test. Sometimes the branchial and atrial siphons of each zooid open separately to the surface of the colony, in other cases the atrial siphons of many zooids unite into a cloacal cavity and this opens to the surface by one or several openings called cloacal apertures. Solitary Ascidiacea are often bag shaped with the two characteristic projecting siphons. Almost all species are hermaphroditic and fertilization is usually external. While many solitary sea squirts release eggs and sperm into the surrounding water, others, and in the majority of colonial species, eggs develop inside an atrium of the adult body. Asexual reproduction in colonial species complements sexual reproduction to ensure the growth of the colony.

Cnemidocarpa verrucosa

Didemnum biglans (Sluiter, 1906)

Enterogona, Aplousobranchia, Didemnidae

The incrusting colonies of *Didemnum biglans* are usually not large. The colonies described by most authors are typically less than 5cm in extent and 2.5-3mm thick, although on some underwater photos they seem larger. When it covers ramifying algae or bryozoans it commonly surrounds and encloses the branches and becomes thicker and more massive. The relatively firm test is white, pale grey or yellowish, depending on the amount of calcareous spicules. If the spicules are less numerous the colony may be semi transparent. Although didemnid species cannot be confused with the members of other ascidian families the species identification is very difficult and even not always possible if the colony is not in a perfect condition. Larvae develop inside the colony. *D. biglans* is found in the Ross Sea, Bellingshausen Sea, Antarctic Peninsula, South Shetland Islands, South Orkney Islands and South Georgia in depths from 2 to 3495m [456]. *D. biglans* encrusts stones and other hard substrates.

Didemnum studeri (Hartmeyer, 1911)

Enterogona, Aplousobranchia, Didemnidae

Didemnum studeri is a very common encrusting colonial ascidian of whitish to greyish colour. The surface of the test is smooth. The colonies reach several centimeters in extent and are of irregular shape. Only a few common cloacal openings are visible on the surface. Calcareous spicules are crowded in all layers of the test . This feature may help to distinguish this species from *D. biglans* in which the spicules are present mainly in the superficial layer of the test. On practice, however, this distinction is not always clear and the identification of many colonies may be problematic. Larvae develop inside the colony. *D. studeri* is found off New Zealand, in Tierra del Fuego, Kerguelen Islands, South Georgia, South Shetland Islands and in the South East Pacific in depths from 3 to 4804m [456]. The species encrusts rocks or other hard subjects including living animals and algae [457].

Distaplia colligans (Sluiter, 1932)

Enterogona, Aplousobranchia, Holozoidae

Distaplia colligans is a colonial species. The colonies are thin and encrusting, sometimes rather large in extension. The surface is smooth, clear and not covered by sand or any foreign matter. Numerous cloacal openings may be visible on underwater photos of living specimens but the arrangement of zooids and the shape of systems are difficult to identify. The test is soft and typically yellowish to slightly orange or translucent. In preservative (formalin) the colonies change the colour dramatically and become dark brown to almost black. The identification of this species, if zooids are examined (to confirm generic assignment), is easy; it is the only encrusting *Distaplia* species known from Antarctic waters. Larvae are incubated in the outgrows of the thoraces - the brood pouches, a feature characteristic for most *Distaplia* species. *D. colligans* is present in the SE Pacific, Strait of Magellan, South Georgia, South Orkney Islands, South Shetland Islands, Antarctic Peninsula and in the Ross Sea in depths from 2-428m [456]. *D. colligans* encrusts rocky substrates.

Distaplia cylindrica (Lesson, 1830)

Enterogona, Aplousobranchia, Holozoidae

Distaplia cylindrica is a conspiciuous colonial ascidia of cylindrical rod shape. It can only reach up to 5cm in diameter but several meters in length. The colony is flexible and of whitish to yellowish colour with a soft tunic. Zooids form numerous circular systems with a common cloacal opening in the centre. Each system may be composed of up to 16 zooids. The zooids are up to 5mm long and have a structure typical for most *Distaplia* species which is rather uniform in this genus: they have wide short thoraces with four rows of stigmata, an oral aperture with 6 lobes, an atrial aperture with a long languet and a short abdomen with an almost smooth stomach. Due to its very characteristic shape and conspicuous size this species can always easily be identified on underwater photos. Larvae are incubated in the brood pouches which are often detached from zooids and lie in the common test. *D. cylindrica* is found circumantarctic in the Ross Sea, Weddell-Sea, off Wilkes Land, South Georgia, South Orkney Islands, South Shetland Islands and in the Strait of Magellan in depth from normally not less than 7m down to 695m [456]. This species lives anchored to muddy or rocky substrates, preferably in areas with slight currents [457].


Sycozoa gaimardi (Herdman, 1886)

Enterogona, Aplousobranchia, Holozoidae

Sycozoa gaimardi is a small colonial ascidian that can easily be identified on underwater photos of living specimens due to the very characteristic shape of colony. The colony consists of a small globular or dome shaped head, typically not more than 1.2cm in diameter, supported by a thin wiry not branched peduncle which reaches a length of up to 4cm. The peduncle arises from the middle of the flattened lower surface of the colony and is thickest at the upper end, but even there usually not more than 2 to 3mm in diameter. In general the shape of the colony is very distinct and resembles small mushrooms. The test of the head is soft and transparent and the zooids can be seen clearly through it. There is only one common cloacal aperture at the summit of the colony. The colour of the colony varies from whitish or yellowish to pale orange [457, 458]. All zooids in one colony are of the same sex [457]. *S. gaimardi* is found in the Magellan Region, Falkland Islands, South Georgia, South Shetland Islands, Antarctic Peninsula and off the Antarctic continent in depths from 5 to 238m [456]. *S. gaimardi* lives on muddy sediments or as epibiont attached to other ascidians or algae [457].

Sycozoa sigillinoides (Lesson, 1830)

Enterogona, Aplousobranchia, Holozoidae

Sycozoa sigillinoides is a colonial species similar to *S. gaimardi*. The peduncle however may be thicker and can be branched so the colony may have several heads. The heads of older colonies vary in shape from ovate or pyriform to a thick cylinder more or less rounded at the ends. Young and small colonies are usually of a more rounded form. One wide common cloacal opening is situated at the summit of the colony. The colour of the stalk and the colony is white to pale orange but the colony is more translucent. The largest reported specimen measured about 60mm in length and 14mm in diameter, but normally they are much smaller. The heads can sometimes be found in the intertidal burst off from the stalks [457, 458]. The zooids of all *Sycozoa* species are very similar or even identical in their morphology, the larvae are also similar, and in many cases the different species can be separated only on the basis of the shape of colony. *S. sigillinoides* is found in the Magellan Region, South Georgia, South Shetland Islands, Antarctic Peninsula, Antarctic continental coast, Subantarctic Islands, Ross Sea and in the SW Atlantic off the Argentine coast in depths from 14 to 769m [456]. *S. sigillinoides* lives on different substrates such as muddy and sandy habitats as well as on and under rocks [457].


Aplidium imbutum (Monniot & Monniot, 1983) - no image

Enterogona, Aplousobranchia, Polyclinidae

Aplidium imbutum is a colonial ascidian forming colonies of variable shape, which are usually small and inconspicuous oval solid masses, but may be up to 20cm in greatest dimension. Up to now the species was known only from the original description [459]. The specimens from King George Islands are composed of several small, max. 2-4cm heads attached to the substrate by a wide area. The appearance of this species in living state is not known. The formalin preserved colonies are greyish due to the presence of small amounts of fine sand impregnated to the superficial layer of the test. The colonies do not present any features allowing species identification. The zooids have five stomach folds, which are characteristic for many Antarctic species of *Aplidium*, and long filiform outgrows running from the thorax (species specific feature). *Aplidium imbutum* is found in the Magellan Region, South Georgia, South Orkney Islands, South Shetland Islands, Antarctic Peninsula, Ross Sea and off the Antarctic continent in depths from 38-870m [456].

Aplidium loricatum (Harant & Vernières, 1938)

Enterogona, Aplousobranchia, Polyclinidae

Aplidium loricatum forms extensive yellowish colonies consisting of several to numerous rather large, more or less hemispherical, oval or clavate lobes or heads arising from the common basal test. When growing on soft muddy or sandy bottom the basal test may have root-like outgrows anchoring the colony in the substrate. Large zooids are arranged in double vertical rows along longitudinal common cloacal canals. Common cloacal openings are few and situated mainly on the top of each lobe of the colony. The arrangement of zooids and position of common cloacal openings are clearly visible on living and on preserved colonies. These features can help to identify the species in the field. Larvae develop in the atrial cavity, a feature characteristic for all *Aplidium* species. *A. loricatum* is found at the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, Ross Sea and off the Antarctic continent in depths ranging from 20 to 357m [456]. The species is most common on bottoms consisting of a mixture of small stones, gravel and mud.

Aplidium radiatum (Sluiter, 1906)
Enterogona, Aplousobranchia, Polyclinidae

Aplidium radiatum forms more or less rounded to elongated but also irregular shaped grey brown colonies, which look somehow potatoe- like. They can reach diameters of up to 10cm [460, 461]. Sometimes the colonies are stalked. The stalk varies in length and may be short and almost of the same diameter as the head. Sometimes more than one head arises from the stalk or the stalk is completely absent. In this case the colonies are flattened and have a wide base. The test is brittle and densely impregnated by sand. The zooids within the colony are vertical and not visible through the test, but their position in irregular double rows radiating from common cloacal openings may be marked on the surface of the colony by low elevations. The zooids have eight lobes at the branchial siphon, and on the basis of this feature the species was included in the genus *Sidnyum*. Currently *Sidnyum* (characterized by eight branchial lobes) and *Aplidium* (six branchial lobes) are considered synonyms and most species previously assigned to *Sidnyum* are moved to *Aplidium*. *A. radiatum* is found at the Antarctic Peninsula, South Orkney Islands, South Shetland Islands, in the Ross Sea, Davis Sea and Weddell Sea in depths from 15 to 412m [456]. Colonies of *A. radiatum* settle on mud or sand and are not attached to rocks or other organisms [460].

Tylobranchion speciosum (Herdman, 1886)
Enterogona, Aplousobranchia, Diazonidae

Tylobranchion speciosum is a colonial species forming pillar, clavate or wedge-like shaped colonies which are often flattened laterally and narrowing to the base. Sometimes colonies consist of several lobes. They reach lengths of up to 9cm and widths of 7cm at a thickness of 1.5cm. Often they have a short peduncle fixing the colony to the substrate, the area of attacment is often small. The tunic is whitish milky to translucent, so the zooids are visible through the test which is of firm but not hard consistency. Reddish brown colonies are also reported [462]. *T. speciosum* is found in the Magellan region, South Georgia, South Shetland Islands, South Orkney Islands, Antarctic Peninsula, in the Ross Sea and off the continental Antarctic coasts in depths from 15 to 2897m [456]. It lives as epibiont on other ascidians and algae or is found attached to small groups of pebbles overgrown by a basal test [460].


Cystodytes antarcticus (Sluiter, 1912)
Enterogona, Aplousobranchia, Polycitoridae

Cystodytes antarcticus is a colonial species. It forms slimy colonies which are usually flat and encrusting, but more thick ovoid colonies are also reported in literature (Kott, 1969). Most information on this species is based on few dredged and often damaged specimens. On underwater photos the living colony is colourless with a translucent test and poorly visible light orange zooids. Numerous small calcareous spicules are visible as minute white particles inside the colony so that superficially this species may be confused with a species of the family Didemnidae. The shape of the spicules, however, is very different from those occuring in Didemnidae, the spicules are discoidal and allow easy identification of the species. *C. antarcticus* is found in South Georgia, the Antarctic Peninsula, South Shetland Islands and in the Ross Sea in depths from 10 to 306m [456]. The only available photo of living specimen shows the colony encrusting a rock.

Synoicum adareanum (Herdman, 1902)
Enterogona, Aplousobranchia, Polyclinidae

The colony shape of *Synoicum adareanum* can vary from massive to irregular rounded, ovate or slightly elongate. Young and small colonies are of clavate shape. In contracted state the colonies look somehow like new potatoes and are of ochre to yellowish or a kind of orange colour. A narrowed base may form a stout to very short peduncle to attach the colony to the substrate. The lower part can be incrusted with sand grains and is often wrinkled. The zooids are arranged in numerous circular systems with one common cloacal opening in each. They are long and slender reaching a length of 20 to 30mm [458]. Larger, full grown colonies of this species can be easily identified on underwater photos, smaller colonies may be confused with other species of *Synoicum* or *Aplidium*. *S. adareanum* is a common circumantarctic species and found in South Georgia, South Shetland Islands, South Orkney Islands, Antarctic Peninsula, Antarctic continental coasts, in the Weddell Sea and Ross Sea in depths ranging from 15 to 867m [456]. *S. adareanum* is found on soft and hard substrates [458].


Synoicum georgianum (Sluiter, 1932)

Enterogona, Aplousobranchia, Polyclinidae

Synoicum georgianum normally forms only small colonies, reaching length of 3cm or less. The colony consists of one to several (usually few) heads arising from a common base. These are narrow in the lower part, but widen gradually towards the distal end, more or less elongated in preserved condition, but in live specimens their distal parts, containing thoraces of zooids, are inflated and rather round. Zooids are arranged in circular systems around common cloacal apertures. Each lobe or head may contain one to several of such systems. Sand grains can be embedded in the test, otherwise the test is very clear, flexible, soft and of whitish translucent colour [462]. This species may be confused with small colonies of *S. adareanum*, but fully grown colonies of *S. adareanum* are much larger and have a tendency to form colonies consisting of a single head, rather than several small heads. *S. georgianum* is found in the Magellan region, South Georgia, Falkland Islands, South Shetland Islands, South Orkney Islands, Antarctic Peninsula and off the continental coasts of Antarctica in depths of up to 552m [456]. The species lives on various types of substrates including stones and muddy gravel.

Agnezia biscoei (Monniot & Monniot, 1983)

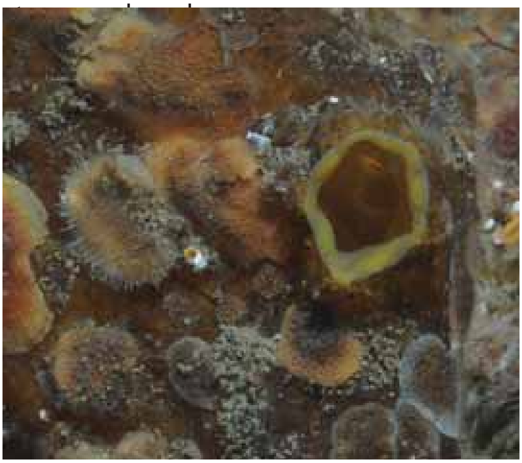
Enterogona, Phlebobranchia, Agnesiidae

Agnezia biscoei is a solitary ascidian. The body is oval or somewhat rectangular and more or less flattened. The largest specimens are up to 5cm long, but usually smaller. The test is always covered and impregnated with sand and other foreign matter that makes the species rather cryptic and not easy to see. Positive identification is possible only after dissecting. It does not have good external features which allow its separation from other sand covered ascidians. If siphons are withdrawn it is even possible to confuse it with colonial ascidians or just with a mass of sand. *A. biscoei* is found at the South Shetland Islands, South Orkney Islands, Antarctic Peninsula and off the continental Antarctic coasts in depths down to 200m [463]. The records of this species are not numerous and in the literature it sometimes was confused with *Agnezia glaciata* (Michaelsen, 1898). *A. biscoei* lives in sand or mud.


Ascidia challengeri (Herdman, 1882)

Enterogona, Phlebobranchia, Ascidiidae

Ascidia challengeri is a large solitary ascidian. The body is laterally flattened or more or less cylindrical, reaching a length of up to 10cm and a width of 3cm. The siphons are short. The branchial siphon usually has eight lobes and is almost terminal or slightly displaced to the side, the atrial siphon has six poorly defined lobes and is on the middle or one third of the distance down the dorsal side of the body. Pigment spots are present between the lobes, but they are not always well developed. The test is firm and only slightly translucent. The inner layers are colourless and the surface, which is usually free from attached foreign matter, may look dirty yellowish on underwater photos of living specimens. Like all shallow water ascidians *A. challengeri* is a filter feeder. The species is found circumantarctic at South Georgia, South Shetland Islands, South Orkney Islands, Antarctic Peninsula and the Subantarctic Islands from depths near the surface down to more than 4512m [456]. *A. challengeri* occurs on various types of substrates. Probably it prefers a bottom consisting of a mixture of small



Corella antarctica Sluiter, 1905

Enterogona, Phlebobranchia, Corellidae

The body of *Corella antarctica* is of ovate to elongate shape and more or less compressed laterally. It reaches a length of up to 25cm, but usually it is smaller. The animal lives attached to the substrate by the rear end or by a large part of either side. The apertures are sessile or on short siphons. The branchial siphon is placed terminally at the anterior end of the body. The atrial siphon is situated more or less in the middle of the dorsal side. The test is thick, transparent, gelatinous, colourless, whitish or with a thin dirty-brown coating as seen on some underwater photos. In living specimens gonad and gut loop may appear through the test as a mass of pinkish or orange colour. For a long time this species was considered as a junior synonym of *Corella eumyota* until recently it was reinstated [464] and redescribed in details [465]. The species is known only from Antarctic waters. The distribution is probably circumantarctic, although it is possible that more than one species may be involved [465]. *Corella antarctica* lives on sand and mud as well as attached to rocks and artificial substrate or as epibiont on other ascidians, algae or mussels.


Molgula enodis (Sluiter, 1912)

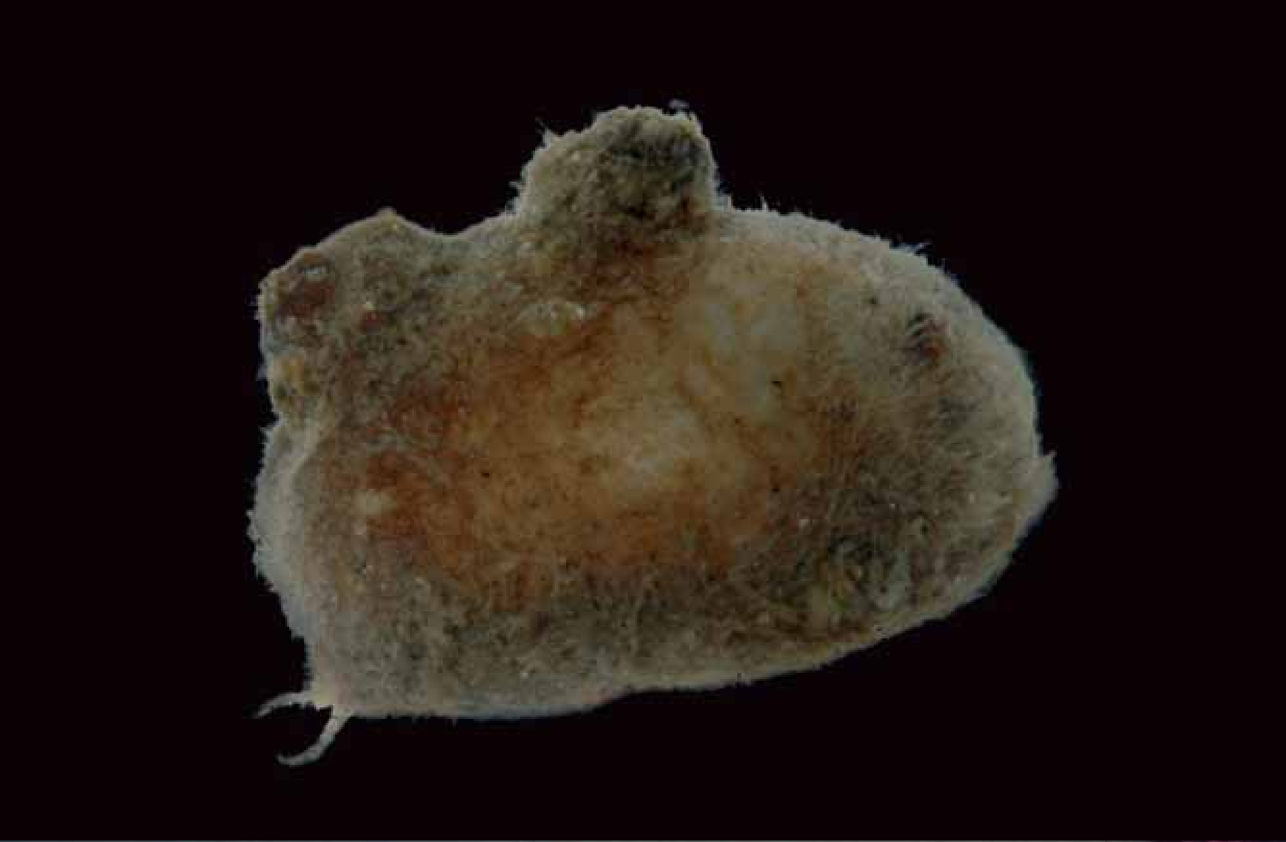
Pleurogona, Stolidobranchia, Molgulidae

Molgula enodis is a small solitary ascidian. The test is covered with short fine hairs and grains of sand which gives the test a dirty dark brown appearance. The test itself, in its inner layers is semitransparent and gelatinous like in most Molgulidae. The two apertures are situated close to each other on short siphons [460]. *Molgula enodis* is found at the South Shetland Islands, South Orkney Islands, Antarctic Peninsula, off the Antarctic continent and in Tierra del Fuego in depths from 8 to 548m [456]. *M. enodis* often lives as epibiont on other organisms especially other ascidians [460].

Molgula pedunculata (Herdman, 1881)

Pleurogona, Stolidobranchia, Molgulidae

Molgula pedunculata is a very large species reaching more than 20cm in height and 10cm in diameter. The voluminous body is supported by a cylindrical peduncle which is sharply demarcated from the body. This strong peduncle is contractile and of variable length, but normally shorter than the body. The body is sac-like or may be a triangular or somewhat rectangular. The test can be covered by sparse short hairs and is of whitish to brown colour. In many specimens gonads are visible as yellow masses through the semitransparent test. The large apertures are both placed on short siphons of large diameter in the upper part of the animal [83, 462]. The branchial siphon is usually directed upward, the atrial one bent somewhat down. *M. pedunculata* is a circumantarctic species and found in the Weddell Sea, Ross Sea, Antarctic Peninsula, South Georgia, South Shetland Islands and South Orkney Islands in depths from 7 to 2846m [456]. This species lives on muddy bottoms, often in large settlements of many specimens.




Pyura bouvetensis (Michaelsen, 1904)

Pleurogona, Stolidobranchia, Pyuridae

Pyura bouvetensis is a stalked solitary species. The body is oval or egg shaped with a length of up to 5cm and supported by a long stalk. The stalk reaches the two- to tenfold of the length of the body. It originates at the anterior end of the body, which means it is attached closer to the branchial siphon while the atrial siphon is on the opposite end of the body. The colour of the leathery test varies from milky white to light brown and does not show any hairs, [83] but may be covered by short thin spines of characteristic shape. *P. bouvetensis* is found in the Ross Sea, South Georgia, South Shetland Islands, South Orkney Islands, Antarctic Peninsula and the Subantarctic Islands in depths from 21 to 2350m [456]. This species lives attached by its stalk to hard substrates.

Pyura setosa (Sluiter, 1905)

Pleurogona, Stolidobranchia, Pyuridae

Pyura setosa is a solitary species of ovoid shape. It reaches a length of up to 75mm. Young individuals have a short peduncle, older ones lack it. The body surface is covered with pointed and slender processes that give the animal a hairy to spiny appearance. They are more or less flexible and reach a length of up to 2cm in large specimens. The bristles bear many short pointed spines. The animals are covered with sediments and epibionts and therefore they are of greyish, greenish to brown colour [83, 460]. The margin of the siphons is lined by short spines. The siphons are dull yellow inside. *P. setosa* is a circumpolar species and found off the Antarctic continent, South Shetland Islands, South Orkney Islands, Antarctic Peninsula and in the Ross Sea in depths from 14 to 638m [456]. *P. setosa* is found on hard and mixed bottoms.


Cnemidocarpa verrucosa (Lesson, 1830)

Pleurogona, Stolidobranchia, Styelidae

Cnemidocarpa verrucosa is a solitary ascidian species reaching a length of up to 20cm. The colour of live specimens is whitish, yellowish, slightly brown or orange. The large and stout body is broadly ovate, ellipsoidal or barrel shaped and it often looks like inflated. Although the tunic is thin it is quite tough, leathery and usually more or less rough with rather conspicuous papillae. They are best developed and more abundant on the anterior part of the body where also the two four-lobed apertures are placed. It is a very common species in Antarctic waters [457, 458]. The overall shape of the body, the test covered by papillae and the characteristic colour allow easy identification of this species on underwater photos. This species is probably oviparous. *C. verrucosa* is a circumantarctic species and also found in Subantarctic regions, the Falkland Islands, SE-Pacific and in Tierra del Fuego in depth from 2 to 5845m [456].

Styela wandeli (Sluiter, 1911)

Pleurogona, Stolidobranchia, Styelidae

Growing to only 1 or 2cm in height *Styela wandeli* is a small solitary species with a wrinkled and leathery test. It is of conical to cylindrical shape and can possess a short stalk. The branchial aperture is situated at the summit, the atrial aperture slightly more downwards. Both apertures have four lobes, a feature characteristic for all Styelidae, and are situated on short siphons. The colouration of this species resembles that of many other *Styela* species, it varies from yellowish grey to, more common, reddish orange and pinkish-red [458]. The tips of the siphons are intense red. *S. wandeli* is found in South Georgia, South Shetland Islands, South Orkney Islands, Antarctic Peninsula and in the Bellingshausen Sea in depths from 8 to 133m [456]. This species is always attached to hard surfaces such as stones and rocks.


Salps, Thaliacea

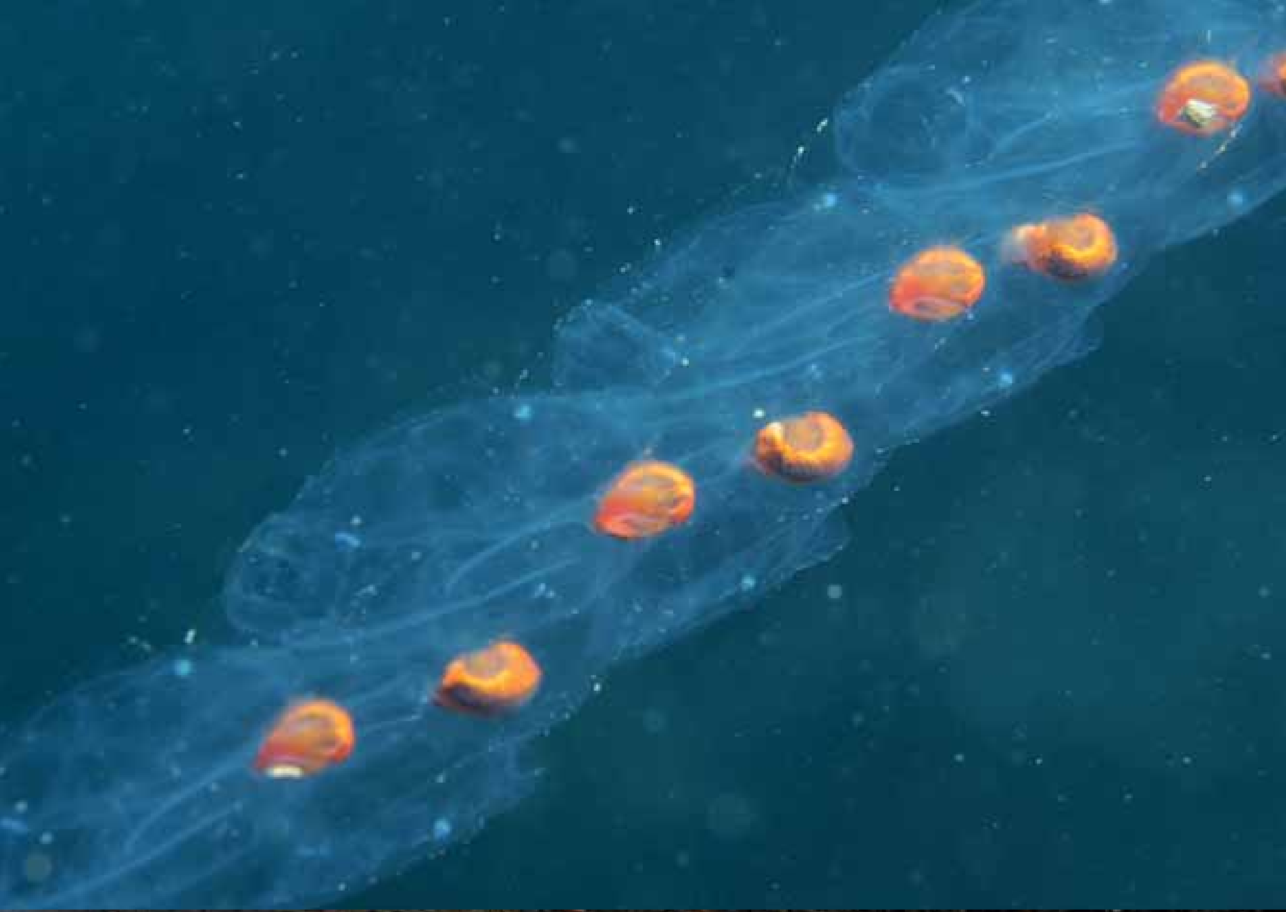
G. Kohlberg, D. Schories

Species of the class of Thaliacea, are free-living and remain their whole life as part of the plankton. Only 50 different species of these barrel-shaped animals are described worldwide (Westheide & Rieger) and nine of them are known in Antarctic waters [67]. Solitary salps exist as well as colonial species, the latter reaching several metres in length. Similar to the sea squirts, to feed, water enters through an intake siphon, is filtered for particles and is then expelled through an outlet siphon at the posterior end. In their life cycle, Thaliacea show alternation of generations with one single animal, the Oozoid, asexually producing a chain of individuals. These aggregated individuals are called Blastozooids and they remain together and grow in size; each blastozooid reproducing sexually, the newly formed embryo being the Oozoid of the next generation.

Salpa thompsoni Foxton, 1961

Salpida, Salpidae

Salpa thompsoni is a salp species that occurs because of alternation of generation as solitary zooid or aggregated chain of blastozoids. In solitary zooids the test is strongly echinate, in aggregate zooids the test is thick and also strongly echinate. Solitary individuals reach a length of up to 12cm [466]. This species is found in densities of up 41,000 individuals per m^2 surface area in the upper 200m of the water column [467]. A diel vertical migration is notable during the late night and early morning hours when the salps come to the surface from the lower water layers where they stay during daytime in up to 300m depth [466]. *S. thompsoni* is a filter feeding species and feeds on planktonic organisms, in parts on early larval stages of *E. superba* as crustacean bodies and fragments have been found in the gut contents [468]. A 2.5cm long Blastozoid pumps a volume of approximately 0.6 litre water per hour [469]. Although salps are not a major dietary item for Antarctic vertebrate predators, large aggregations can affect the survival of krill larvae and therefore the population of krill [22]. This species has a Antarctic-Subantarctic distribution, but although it occurs throughout the Southern Ocean it is most abundant at middle latitudes [470] from the sea surface to 955m.




Ray-finned Fishes, Actinopterygii

M. Huene, P. Reyes

Almost all the known fish species belong to the class Actinopterygii, or ray-finned fish, the most successful class of fish. Their name is derived from the words aktinos = ray, and pterygion = fin. The ray-finned fish first appeared in the Devonian period and by the late Paleozoic they had become the dominant aquatic vertebrates. With more than 26,000 living species, the Actinopterygii contain the vast majority of all living and fossil fish species and represent half of all vertebrate species worldwide. The fins of the Actinopterygii are webs of skin supported by long flexible bony or horny rays, which can be modified in a broad variety of ways; in contrast to the lobed fleshy fins of the Sarcopterygii. During the evolution of the Actinopterygii, they spread from freshwater habitats to the sea, and during their life-cycle many species, for example salmon and trout, return to rivers to reproduce. With such large numbers of Actinopterygii species, there are a vast variety of life stories and ecology, and they are found in every aquatic habitat from freshwater Alpine streams and ponds to the abyssal depths of the oceans. Some species are even able to crawl on land for a short time.

Parachaenichthys charcoti (Vaillant, 1906)

Actinopterygii, Perciformes, Bathydraconidae

Parachaenichthys charcoti is also called Charcot´s dragonfish. It is a demersal species of orange -reddish colour with irregular white blotches and small darker orange spots. The body is elongated and can attain a length of 60cm, but most individuals are much smaller. Females are larger than males. The comparatively large head is strongly depressed having a spatulate mouth. The maximum age of *Parachaenichthys charcoti* is assumed to be five years [471-473]. Spawning of *P. charcoti* takes place in February/ March. After depositing more than 2000 orange reddish eggs on flat stones the nest is guarded by an adult until hatching in late winter. Yolk larvae with lengths of approximately 2-3cm are found from late October to early December, small juveniles from mid-January to mid-March [471]. *P. charcoti* feeds on amphipods, krill and fish [471, 474]. Itself this species is preyed by the Antarctic fur seal [475], but as well by the Antarctic and the Imperial shag [476, 477]. *P. charcoti* is recorded from the Bellingshausen Sea, South Orkney Islands, South Shetland Islands, Elephant Island and the tip of the Antarctic Peninsula in a depth range of 5-400m [23, 478]. *P. charcoti* lives on sandy or gravel substrates.

Image below: The nemertean Parborlasia corrugatus *feeding on eggs of* P. charcoti


Harpagifer antarcticus (Nybelin, 1947)

Actinopterygii, Perciformes, Harpagiferidae

Harpagifer antarcticus is a stenothermal species that lives at temperatures between –2°C and +1°C throughout the year. Its common name is Antarctic spiny plunderfish. Individuals can reach a total length of approximately 10cm and an age of at least 11 years. The elongate shape body of *H. antarcticus* is scaleless and can show areas of pink colour like coralline algae while other specimens can be nearly white. The dorsal fins are well separated and the opercle bears two strong spines. The mouth can be thrust out, it is protactile [479-481]. *H. antarcticus* builds nests for its eggs. The spawning of up to 1500 eggs occurs in June and they are guarded by the male and female until hatching. The peak of the hatching period is in November. Hatched larvae have a length of 6-8mm. Early larval stages are found in the nearshore plankton in depths between 15-20m from November to May [480]. *H. antarcticus* feeds on gammarid amphipods, krill, polychaetes, gastropods, isopods and algae. *H. antarcticus* itself is preyed by the Antarctic and Imperial shag [482]. It occurs mainly to a depth of 12m but is also recorded from 100m [480]. Adult fish live in cavities beneath rocks or in crevices often next to sandy or gravel areas [480]. It is found more commonly in the intertidal zone.

Harpagifer bispinis (Forster, 1801)

Actinopterygii, Perciformes, Harpagiferidae

The common name of *Harpagifer bispinis* is Magellan plunderfish. It is a demersal eurythermal species that tolerates temperatures of up to 11°C in summer in the Magellan region. The scaleless body is of elongate shape reaching a length of 7cm. The dorsal fins are well separated and the opercle bears two strong spines with rounded tips. The mouth is protactile [479, 481]. The females construct a nest and guard it throughout the incubation period, which lasts four months. During this time they clean the eggs and protect them from predators and parasites. In case of removing a guarding female from its nest, another individual of *H. bispinis* keeps on guarding the eggs [474]. *H. bispinis* is an ambush feeder and preys mainly on small crustaceans. *H. bispinis* is found in the South Atlantic, South Pacific, the Strait of Magellan, in the Patagonian Region, Falkland Islands, Subantarctic Islands and South Shetland Islands in depths of up to 50m [483]. *H. bispinis* lives mainly in shallow waters and in tide pools, hidden under rocks and among algae [481].


Lepidonotothen nudifrons (Lönnberg, 1905)

Actinopterygii, Perciformes, Nototheniidae

Lepidonotothen nudifrons is a demersal species reaching a length of 20cm. The scale covered body is of yellowish-red colour with a slight whitish ground colour on lateral and dorsal parts, silvery white on the ventral side. The lateral to dorsal part is spotted with irregular brownish to blackish blotches. Five dark bars cross the back. The mouth is protactile. From April/May to October eggs with a diameter of 2.5mm are layed near or under rocks. The male cares the nest for about four months [484, 485]. *L. nudifrons* feeds on krill and amphipods but is also necrophagous. Itself this species is preyed by other fish like *N. neglecta* and *T. bernacchii* but as well by Weddell seals and the Antarctic shag [486-488]. *L. nudifrons* is found in South Georgia, South Shetland Islands, South Orkney Islands, South Sandwich Island and the Antarctic Peninsula in depths of up to 400m [489]. This species is demersal. *L. nudifrons* lives mainly in rocky areas and among algae.

Notothenia coriiceps (Richardson, 1844)

Actinopterygii, Perciformes, Nototheniidae

The common name of *Notothenia coriiceps* is Black rockcod and it can reach a total length of 62cm. Adults are more or less dark brown with spots of black, brown or greenish colour. The ventral side is yellowish to greenish. This demersal fish is dominant in inshore waters and most abundant in areas of dense macroalgal coverage [490]. *Notothenia coriiceps* is host for a variety of endo- and ectoparasites [491]. It was observed migrating to deeper waters for spawning. After spawning in April to June the egg´s incubation time is assumed to last 150 days [490, 492]. *N. coriiceps* feeds on krill, amphipods and other fish like *Gobionotothen gibberifrons* and *Pleuragramma antarcticum*, but also on macroalgae [488, 490]. This species is preyed by the Weddell seal and the Antarctic shag [493, 494]. *N. coriiceps* is probably a circumantarctic species on the continental shelf. It is recorded from the Weddell Sea, Ross Sea, Adélie Land, the Antarctic Peninsula with its circumjacent islands, Scotia Arc, South Georgia, Bouvet Island, and the Subantarctic Islands of the Indian Ocean sector in depths of up to 550m, but mainly found in less than 200m [495]. *N. coriiceps* lives on rocky substrates with a high percentage of macroalge coverage.


Trematomus newnesi (Boulenger, 1902)
Actinopterygii, Perciformes, Nototheniidae

Trematomus newnesi is a common inshore nototheniid fish. The colouration of the semi-pelagic dusky rockcod is greyish, brownish or almost black, dorsal darker than ventral. The maximum reported length of this species is 28cm. Two distinct morphs are known, that can be separated by the breadth of the head and the size of the mouth [496, 497]. Spawning takes place in March/April and in October/November. Larvae of 9mm length can be observed which settle down to benthic life in March [492, 498]. *T. newnesi* feeds in the water column or at the undersurface of ice and occasionally on the bottom. Prey items are amphipods, isopods, krill and fish [495, 499]. It is preyed by the Weddell seal and the Antarctic shag [493, 494]. *T. newnesi* has a circumantarctic distribution in the shallow shelf waters of the Antarctic continent and the islands on the Antarctic continental shelf. It is reported from depths of up to 400m [489, 496]. It inhabits shallow waters from 20-45m depths on rocky bottoms with macroalgae beds. Besides, this species is found in the permanent and seasonal pack ice zones [500].

Birds, Aves

G. Kohlberg, D. Schories

Compared to other parts of the world, the avifauna of Antarctica is quite poor. Only about 45 species breed in the region, with only a few nesting on the Antarctic continent itself. The most abundant species are the Emperor (*Aptenodytes forsteri*) and Adélie penguins (*Pygoscelis adeliae*), and Antarctic snow petrels (*Pagodroma nivea*). All these are well adapted to the harsh Polar conditions. Sub-dermal fat and layers of down and feathers are physiological adaptations that, with some behavioural adaptations, allow these species to survive in the region. Other species are restricted to the Subantarctic islands and ice-free locations during the southern summer. As there are no terrestrial fauna, all birds depend directly or indirectly on marine sources for food, such as fish, squid and crustaceans, or the eggs and chicks of other birds. Others, like Skuas, feed also on placenta, dead seal pups and other carrion. Many Antarctic and subantarctic birds have low reproduction rates and are vulnerable to environmental change. The potential for population recovery is low and human impact, like long-line fishing, is an additional threat to the populations of especially the albatross and petrel species.


Pygoscelis papua

Gulls, Snipe-like Waders, Plover-like Waders, Charadriiformes

The Charadriiformes is a large and quite diverse order, consisting of several families. New phylogenetic analyses show three suborders within the Charadriiformes: Lari (gulls), Scolopaci (snipe-like waders) and Charadrii (plover-like waders); altogether about 350 species [501]. Charadriiformes can be found around the world, most of them near water. The majority of species feed on invertebrates or other small animals. The waders are all more or less long-legged migratory birds. In times of migration and in winter they can be found in large groups, searching for food on mudflats, coasts and inland wetlands. The nest is just a simple scrape and immediately after hatching, the chicks leave this and start searching for food. Skuas travel along the coasts and over the sea to their wintering grounds. They feed on eggs, small vertebrates, fish, chicks, insects, carrion and berries, and fish are stolen from other birds by pursuing them.

Chionis albus (Gmelin, 1789)

Aves, Charadriiformes, Chionidae

Chionis albus is also known as Snowy Sheathbill or Pale-faced sheathbill and is Antarctica's only landbird. Adult birds are completely white except a pale rose face, a yellowish short and stout bill and dark grey legs. They reach a wingspan of up to 84cm and a weight of up to 780 g. Snowy Sheathbills have a hen-like appearance and a pigeon-like gait by bobbing their head [1]. They begin breeding in December. Up to four eggs are layed and incubated for 28-32 days. After a maximum of 60 days the chicks fledge. Because of food supply this species normally breeds near penguin or cormorant colonies [1]. *C. albus* is an opportunistic predator and scavenger, feeding on placentas, carcasses, feces, eggs, small chicks or steals fish and other prey from penguins [502]. It is found on South Georgia, South Orkney Islands, South Shetland Islands and on the Antarctic Peninsula. Non-breeding specimens can also be observed in South Patagonia, at the Falkland Islands and in Uruguay.

Larus dominicanus (Lichtenstein, 1823)

Aves, Charadriiformes, Laridae

The Kelp Gull *Larus dominicanus* is a widely distributed species in South America, Antarctica and Subantarctica [503]. It reaches a length of up to 65cm and a wingspan of up to 142cm. This species is the only white headed gull in the Southern Ocean. Adults have a white head, underparts and tail, while the upper sides of the wings are dark grey to almost black. The bill is yellow with a red dot. The eyes are also yellow with a red eye ring. Juveniles and immature specimens are brownish grey on white [1]. Kelp Gulls form breeding colonies and the nests are made of seaweeds or plants. The female lays 2-3 eggs which are incubated for 24-30 days. Seven weeks after hatching the chicks fledge. *L. dominicanus* feeds on a variety of food items like molluscs, fish and small vertebrates but also scavenges especially near human settlements or follows ships on sea. This species occurs on coasts in a wide range southwards from Ecuador, Brazil, Madagaskar, South Africa, Australia, New Zealand, and Subantarctic Islands to the Antarctic Peninsula [1].

Stercorarius antarcticus (Lesson, 1831)
Aves, Charadriiformes, Stercorariidae

Stercorarius antarcticus is a large skua species reaching a wingspan of 126-160cm and a weight of 1.25- 2.54kg. Females are larger than males. The plumage of the Subantarctic Skua *Stercorarius antarcticus* is brownish to blackish-brown with small irregular white blotches above and below. The head is more or less dark. The legs, the hooked bill and the eyes are black [1]. The breeding season begins in October/ November. The female lays 1-2 eggs which are incubated for 28-32 days. The chicks fledge 40-50 days after hatching and become sexual mature at the age of six years [1]. Like other skuas *S. antarcticus* is an opportunistic feeder. It preys on small seabirds, penguin chicks, eggs and fish but it is also a scavenger eating seal and penguin carcasses or the placentas of the seals [504, 505]. The Subantarctic Skua breeds on northern Antarctic and Subantarctic Islands. At sea it can be observed far more north even in tropical oceans [1, 506].

Stercorarius maccormicki (Saunders, 1893)
Aves, Charadriiformes, Stercorariidae

The South Polar Skua *Stercorarius maccormicki* might be confused with the Subantarctic Skua *S. antarcticus*. In its plumage colouration it is highly variable and varies from cream to black-brown. The majority of the *S. maccormicki* specimens belong to the pale and intermediate morph. In this case the head and underparts are paler than the dark wing surfaces and remaining upper parts. The dark morph is completely blackish brown with sometimes a slightly darker head and upperparts. Bill, legs, eye rings and eyes are black in all morphs. With a wingspan of up to 160cm and a weight of up to 1.7kg it is smaller than the Subantarctic Skua. In comparison to the latter it has also a proportionally smaller head, a slimmer bill and shorter legs. Its overall impression is more agile and slighter [1]. The South Polar Skua and the Subantarctic Skua occur sympatrically in the area of the Antarctic Peninsula. In some cases they produce viable and fertile hybrids [504, 507]. The female lays one or two eggs which are incubated for 28-31 days. The chicks fledge after approximately 40 days, but only one chick survives because the younger one is killed by its older sibling. South Polar Skuas become sexual mature at the age of six [1]. The diet of *S. maccormicki* varies from fish, krill and carrion to other birds, especially penguin chicks. In areas where the South Polar Skua and the Subantarctic Skua co-occur, the Subantarctic Skua dominates the terrestrial ressources [504]. The South Polar Skua lives from the Antarctic coasts northwards to the South Shetland Islands. In austral winter season it ranges at sea to North America and Greenland [1].

Sterna vittata (Gmelin, 1789)

Aves, Charadriiformes, Sternidae

Sterna vittata is a tern of medium size. The plumage is greyish at the upperpart with a black head cap and white at the tail and the rump. It reaches a wingspan of 74-79cm and a weight of up to 205g. The tail is deeply forked. Bill and legs are bright red and stout [1]. The breeding season of *S. vittata* begins in late October and lasts until March. After an incubation time of 23-25 days one to two chicks hatch. For a period of 27-32 days they are cared until they fledge [1]. The Antarctic Tern feeds on fish like *Notothenia coriiceps* and *Electrona antarctica*, amphipods and krill [508]. The species is found on various islands in the Southern Ocean, the Antarctic Peninsula, South Shetland Islands, South Orkney Islands and South Georgia. In winter months it moves further north and can be observed at sea near southern South America, in the South East Atlantic and in South Africa [1].

Shags, Pelicans, Pelecaniformes

The Phalacrocoracidae, or cormorants, long-necked sea-birds, mostly black in colour, are a family within the order Pelecaniformes. As with all Pelecaniformes, cormorants have a throat pouch where fish, their main prey, are stored before swallowing. All Pelecaniformes´ feet are webbed between all four toes and are used for propulsion over and through the water. Many species make a typical half-jump as they dive from the surface in pursuit of prey.

Phalacrocorax atriceps bransfieldensis (Murphy, 1936)

Aves, Pelecaniformes, Phalacrocoracidae

The Antarctic shag *Phalacrocorax atriceps bransfieldensis* is a rather large species reaching a length of 77cm and a weight of 1.5-3.0kg. Males are larger than females. The plumage is black at the upper parts, but does not include the cheeks. These are white like the foreneck and the belly. *P. atriceps bransfieldensis* has characteristic blue eye rings, yellow nasal caruncles and a blackish grey bill. The feet are skin coloured to pinkish [1, 509]. The monogamous Antarctic Shag builds truncated cone shaped nests and lays 2-3 greenish eggs. After 40-45 days the chicks fledge. The Antarctic Shag feeds on fish, octopods, polychaetes and crustaceans which it takes in pursuit-dives of max. 5.2min and in depths of up to 116m [509, 510]. This species breeds at the Antarctic Peninsula, South Shetland Islands and Elephant Island [1].

Albatross, Petrels, Procellariformes

The common name for the Procellariformes is tubenose, because of their distinctive tube-like nostrils. To rid themselves of excess salt, like all sea birds, the Procellariformes have a salt gland that empties into the nostrils. Their beaks are often strong, with a downward curving hook-like tip. Tubenoses spend most of their life off-shore and with wings of up to 3.5m. Albatrosses can glide for hours without flapping their wings; however, take-off and landing are difficult. Only during the breeding period do they return to land, where they nest in huge colonies.

Daption capense (Linnaeus, 1758)

Aves, Procellariiformes, Procellariidae

The Cape Petrel *Daption capense* is one of the most abundant seabirds breeding around the coasts of Antarctica and on Subantarctic Islands. It reaches a wingspan of up to 91cm and a weight of 440 g. It has unmistakable distinctive blackish brown and white chequered upperparts and upperwings, a dark brown head and throat and white underparts. The short bill, the eyes and legs are black. Characteristical is the round head [1, 511]. Cape Petrels build their nests made of pebbles in small crevices or under overhanging rocks. Egg laying starts by the end of November/ beginning December. One single egg is layed and incubated for a mean time of 46 days. It takes the chicks 45-57 days to fledge. Male and female are both incorporated with growing up the young [1]. The Cape Petrel preys on fish like *Pleuragramma antarcticum*, krill, benthic shallow water amphipods and cephalopods [512]. *D. capense* is found at the coasts of the Antarctic continent and South Georgia, South Shetland Islands, South Sandwich Islands, South Orkney Islands, Bouvet Island, Kerguelen Islands, Heard Island, Peter Island, and New Zealand. On sea it can be observed at latitudes near the Galápagos Islands, West Africa, NE Brazil and Vanuatu in the West Pacific [1].

Fregetta tropica (Gould, 1844)

Aves, Procellariiformes, Hydrobatidae

Specimens of the Black-bellied Storm Petrel *Fregetta tropica* reach a wingspan of 46cm and a weight of 63g. They have a blackish brown head, neck and upperparts. Characteristical is a dark central belly stripe of variable width. Rump sides are wide as well as the central underparts of the wings. Bill and legs are black. Black-bellied Storm Petrels breed in burrows or among rocks. The female lays one egg and incubation takes 39-42 days. The hatching is at beginning/middle of February. After 20-25 days the chicks reach adult body mass and fledge at the age of 65 -71 days. Male and female care for the young [513]. They only come back to land for feeding during night. *F. tropica* feeds on small fish and pelagic crustaceans like euphausiids, mysids and amphipods. Prey items are taken by dipping and surface- seizing [514]. The Black-bellied Storm Petrel can be found in the Southern Ocean on the Subantarctic Islands. At sea this species ranges much more north to Brazil, Australia and South Polynesia [1].


Macronectes giganteus (Gmelin, 1789)
Aves, Procellariiformes, Procellariidae

The Southern Giant Petrel *Macronectes giganteus* is of similar size to albatrosses reaching a wing span of 2.1m and a weight of up to 5kg. Two morphs are described. The dark morph has mottled greyish-brown feathers while the belly is a little paler. With increasing age the head and neck whitens. The more rare white form has irregular scattered blackbrown spots on a white plumage. In both morphs the bill is very large and of yellowish to skin colour with a greenish tip and a large single nostril tube. With its hooked bill the Southern Giant Petrel is able to open carcasses [1]. *M. giganteus* is monogamous and forms long-term pair-bonds. Both male and female construct the low cup-shaped nest, incubate the eggs and care for the single offspring. After 55-66 days the chick hatches and needs 104-132 days to fledge [1]. The Southern Giant Petrel is considered to be one of the principal scavengers of the Southern Ocean feeding e.g. on dead penguin chicks or carcasses of seals. Some studies indicate that they are also significant terrestrial predators at some localities [515-518]. Breeding colonies of the Southern Giant Petrel are known from the Falkland Islands, Staten Island, South Georgia, the South Orkney Islands, South Shetland Islands, islands near the Antarctic Continent and Peninsula, Prince Edward Islands, Crozet Islands, Heard Island and Macquarie Island, Kerguelen Islands and from the Adélie Coast.

Oceanites oceanicus (Kuhl, 1820)
Aves, Procellariiformes, Hydrobatidae

The Wilson's Storm Petrel *Oceanites oceanicus* is one of the most abundant bird species in the world. It reaches a wingspan of 38–42cm and a weight of 28-50 g and is therefore Antarctica´s smallest endotherm [519]. The plumage is dark brown, except for the white rump and flanks. In opposite to the Black-bellied Storm Petrel, the Wilson's Storm Petrel lacks the white belly stripe. The bill, legs and eyes are black. The webbing between the toes is yellowish [1]. *O. oceanicus* is a gregarious and monogamous species nesting in colonies close to the sea in rock crevices or small burrows. The female lays a single white egg which is incubated for 33-59 days. Chicks fledge at an age of 46-97 days [1]. Adults only return to the breeding sites at night to avoid predation by gulls and skuas. The nest burrows and the mates are identified by olfactory cues [520, 521]. Wilson's Storm Petrels feed on pelagic crustaceans, fish and carrion. They must consume between 120% and 154% of their body mass in krill per day to meet their energy requirements during their Antarctic breeding season [519, 522]. *O. oceanicus* has a circumpolar distribution. The non-brooding season this species spends at sea mainly in the southern hemisphere but also ranges far north to the Persian Gulf and coasts of North America and Japan.


Penguins, Sphenisciformes

The most conspicuous birds in Antarctica are those of the order Sphenisciformes, commonly known as penguins. Penguin distribution ranges from the Galapagos Islands to the Antarctic continent and islands, where the majority of all 18 known species live. Penguins are not capable of flight; however, with their wings modified into flippers, they propel their streamlined body through the water with speed and great agility. Because of a lack of predators on land, for adults at least, penguins are sedate and clumsy when out of the water. As with all birds, penguins are homeotherms, meaning they maintain a constant body temperature, regardless the environmental temperature. With a layer of fat under the skin and dense waterproof, air-trapping feathers for insulation, they are adapted to low temperatures and cold water. To make their plumage water-repellent, they apply an oil, secreted by a gland right above the base of the tail, to the feathers.

Aptenodytes patagonicus (Miller, 1778)

Aves, Spenisciformes, Spheniscidae

The King Penguin (*Aptenodytes patagonicus*) is the second largest penguin species reaching a hight of 95cm and an average weight of nearly 12kg. The head is black with orange to orange-yellow drop shaped patches on the sides of the head, narrowing towards upper neck sides and extending again into yellow-orange on upper breast. The back is silvery grey and the belly white. Both parts are separated by a narrow black band extending from the back of the head down the sides. The feet, tail and the flippers´ upper sides are black. Chicks have dark brown down. The colouration of the Emperor Penguin is less intensive. In captivity King Penguins can live up to 26 years [523]. The breeding cycle of *A. patagonicus* lasts more than one year and hence only two chicks per every three years can be fledged. The egg is deposited on the feet covered by a pouche of belly skin. Male and female alternate breeding during the 55-56 days of incubation time. Older chicks aggregate in larger groups and are supervised and defended against predators by a few adults. 14 to 16 months after hatching the chicks become independent from their parents and reach reproductive maturity by the age of 3 to 5 years. *A. patagonicus* feeds on small fish and squids which it hunts by pursuit-diving. During their dives King Penguins can stay for up to 8 minutes under water and are able to reach depths of more than 300m, but most are much more shallow [524, 525]. Breeding colonies of King Penguins are found on islands in high Subantarctic and low-latitude Antarctic zones. Non breeding individuals are also found sporadically in the southern Magellan region, New Zealand, South Africa and southern Australia i.a. [1]. The sometimes vast colonies of *A. patagonicus* normally inhabit flat and snowless beaches and adjacent areas with easy access to the sea.

Pygoscelis adeliae (Hombron & Jacquinot, 1841)

Aves, Spenisciformes, Spheniscidae

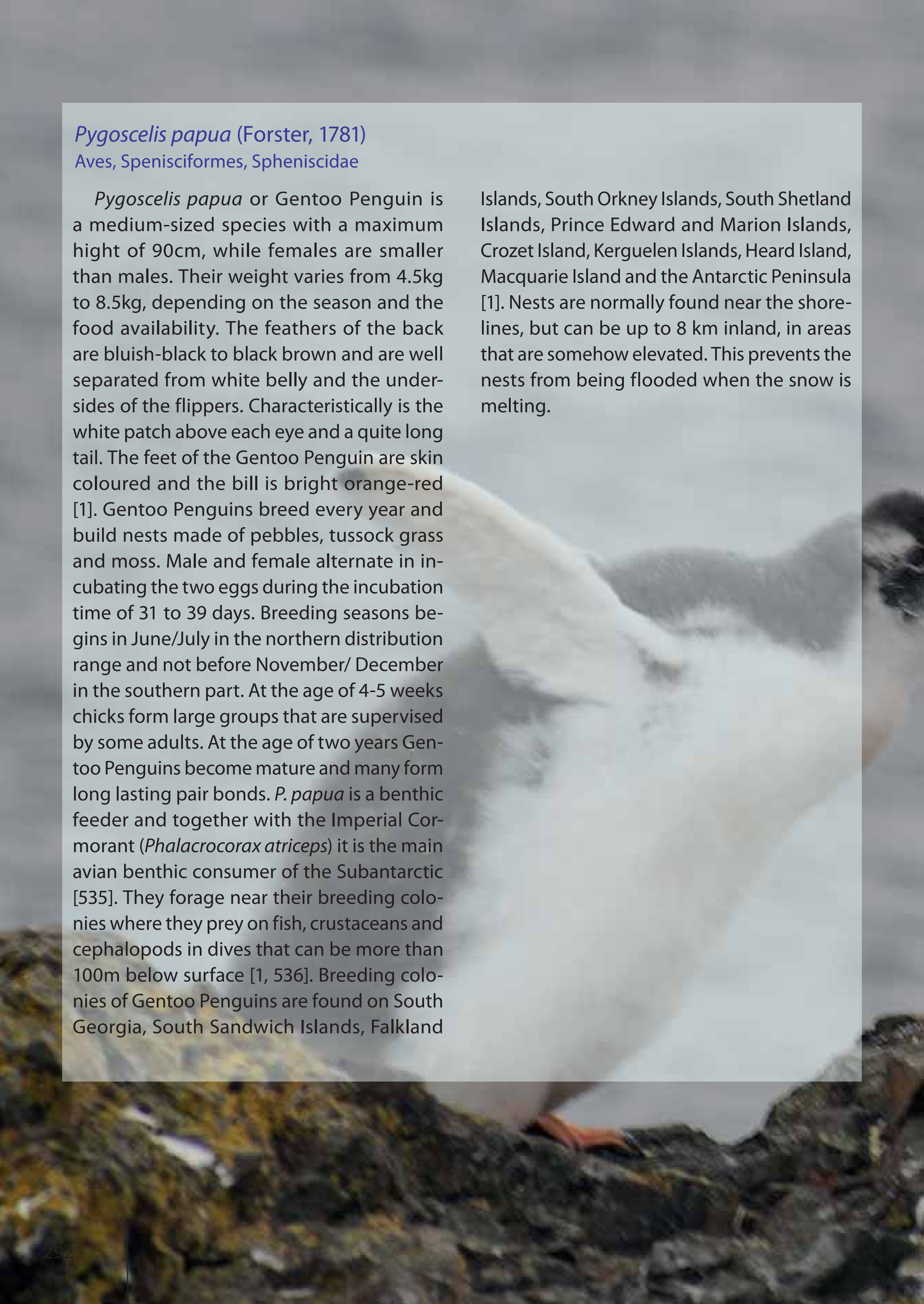
The common name of the social and gregarious *Pygoscelis adeliae* is Adélie Penguin. It is a medium sized penguin species with a black to bluish black back and a white belly. The black head has a characteristical angular shape and bears a small bill. Another character is the white orbital ring around the black iris. The feet are pale pinkish. Adult *P. adeliae* weigh 3.8-8.2kg, depending on the season, at a height of 70cm. Females are smaller than males [1]. Adélie Penguins breed each year laying two eggs in a simple nest made of pebbles in October/November. After an average of 36 days of incubation the chicks hatch. They have entirely dark brownish-grey down. At the age of 2-3 weeks the young join groups of other chicks. That enables the parents to forage simoultaneously because of the growing food demand of their offspring. Adélie penguins reach sexual maturity by the age of 4-6 years.

Adélie penguins forage on crustaceans like krill, fish (*Pleuragramma antarctica* e.g.) and cephalopods by pursuit-diving reaching depths of up to 175m but normally they dive between 20 and 40m [526]. They are found circumantarctic and settle the Antarctic coasts, Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands and Bouvet Island. Colonies of *Pygoscelis adeliae* often settle on huge open and ice-free areas of rocky coasts to provide enough space for the large colonies. Breeding grounds can be far from the open sea. After breeding adults move away from the colony and stay within the pack ice during February and March for molting. The winter months the birds spend moving northwards with the extending ice cover. Thus they always have access to their main food source krill, which is found at high concentrations near the ice edge in winter [527-529].

Pygoscelis antarcticus (Forster, 1781)

Aves, Spenisciformes, Spheniscidae

Pygoscelis antarcticus is a medium sized penguin with a black back and a white belly. Because of the conspicuous narrow black line leading from one head side to the other crossing the chin this species is also called Chinstrap Penguin. The undersides of the flippers are white as well as the sides of the head. Black feathers on the head are restricted to the neck and crown. The bill is black and the feet pinkish to skin colour. Chinstrap Penguins reach a maximum hight of 76cm and weigh 3.2-5.3kg depending on the season. Males are larger than females [1]. They build nest made of small stones and sometimes a few feathers and bones. In November/December the female lays two eggs that are incubated for 31-39 days alternating by both the male and the female. At an age of 3-4 weeks the young join groups of other chicks for warming and protecting. *P. antarcticus* feeds on Antarctic Krill (*Euphausia superba*), various fish species and amphipods. During the breeding season they typically forage 30-90 km from their colonies. Dives are short and shallow [530-533]. Chinstrap penguins breed in the northern regions of Antarctica, mainly on the Antarctic Peninsula, South Sandwich Islands, South Orkney Islands and South Shetland Islands. The winter time they spend in open water [534]. Breeding colonies of Chinstrap Penguins are found on icefree areas on rocky coasts.

Pygoscelis papua (Forster, 1781)

Aves, Spenisciformes, Spheniscidae

Pygoscelis papua or Gentoo Penguin is a medium-sized species with a maximum hight of 90cm, while females are smaller than males. Their weight varies from 4.5kg to 8.5kg, depending on the season and the food availability. The feathers of the back are bluish-black to black brown and are well separated from white belly and the undersides of the flippers. Characteristically is the white patch above each eye and a quite long tail. The feet of the Gentoo Penguin are skin coloured and the bill is bright orange-red [1]. Gentoo Penguins breed every year and build nests made of pebbles, tussock grass and moss. Male and female alternate in incubating the two eggs during the incubation time of 31 to 39 days. Breeding seasons begins in June/July in the northern distribution range and not before November/ December in the southern part. At the age of 4-5 weeks chicks form large groups that are supervised by some adults. At the age of two years Gentoo Penguins become mature and many form long lasting pair bonds. *P. papua* is a benthic feeder and together with the Imperial Cormorant (*Phalacrocorax atriceps*) it is the main avian benthic consumer of the Subantarctic [535]. They forage near their breeding colonies where they prey on fish, crustaceans and cephalopods in dives that can be more than 100m below surface [1, 536]. Breeding colonies of Gentoo Penguins are found on South Georgia, South Sandwich Islands, Falkland Islands, South Orkney Islands, South Shetland Islands, Prince Edward and Marion Islands, Crozet Island, Kerguelen Islands, Heard Island, Macquarie Island and the Antarctic Peninsula [1]. Nests are normally found near the shorelines, but can be up to 8 km inland, in areas that are somehow elevated. This prevents the nests from being flooded when the snow is melting.

Mammals, Mammalia

G. Kohlberg, D. Schories

About 65 million years ago, when the dinosaurs disappeared, the mammals took over their position. Nowadays, there are about 4600 species worldwide. With a few exceptions they are viviparous, the embryo developing inside the female uterus and supplied with oxygen and nutrients through the placenta. After birth, the juveniles are fed with milk secreted from the mammary glands of the female. Like the birds, all Mammalia are endothermic and homeothermic, that is, warm-blooded and maintaining the body temperature at a specific temperature. Another characteristic of mammals is their large brain in comparison to other vertebrates.

Carnivorans, Carnivora

Carnivora feed mainly on squid and fish. With their streamlined body, their paddle-shaped flippers and a thick layer of fat, or blubber, for insulation they are adapted to swimming in very cold waters. The blubber also provides a food reserve and aids buoyancy. They breed and rest on land. Many species have been, or are still, hunted for their fur, meat and blubber, many to the point where their existence as a species is threatened.

Arctocephalus gazella (Peters, 1875)

Chordata, Mammalia, Carnivora, Otariidae

The Antarctic Fur Seal *Arctocephalus gazella* is a species of eared seals with a long neck, a small head and pointed snout. Males and females differ in size and colouration. Males reach a length of average 1.9m and a mean weight of 188kg. Their fur is dark brown, but seems to be much paler and slightly greyish when dry. The neck bears a mane, which is especially heavy when males are territorial. Females are more slim and only reach an average length of 1.2m and a weight of 45kg. Their fur is paler than that of the males with a darker face. Because of its fur the species *Arctocephalus gazella* was hunted close to extinction during the first half of the nineteenth century [30]. The males are territorial and have harems of 5-15 females. Few days after arriving at the breeding ground the female gives birth to a pup that weighs approximately 5.5kg and mates again. When weaned the pups have reached a weight of 17kg. The age of first reproduction is three years for females and seven years for males [31, 537]. *A. gazella* preys on fish, krill, cephalopods and other invertebrates by diving in depths of normally 30-75m for an average time of 2 minutes, the recorded dive maximum is 181m and 10 minutes [1, 538]. Antarctic Fur Seals breed mainly on islands south of the Antarctic Convergence, on the South Orkney Islands, South Shetland Islands, South Georgia, South Sandwich Islands, Bouvet Island, Kerguelen Islands, Heard Island, MacDonald Islands, with only three colonies lying north of the Convergence (on Marion Island, Crozet Island and Macquarie Island) [539-541]. The largest breeding population of Antarctic fur seals in the world holds by far South Georgia [542]. Breeding grounds are on rocky beaches sheltered from the sea. During the non-breeding months Antarctic Fur Seals stay at sea, only some adult males may be found ashore or near the breeding islands year-round.

Hydrurga leptonyx (Blainville, 1820)
Chordata, Mammalia, Carnivora, Phocidae

The Leopard Seal *Hydrurga leptonyx* is a long and slender seal with a large reptilian-like head and a long snout. The eyes are small and dark. The pelage´s colour is dark grey to blue grey at the dorsal side and paler ventrally, a distinct boundary can be observed. The fur is spotted with dark and pale blotches. Females are larger than males reaching a length of 3.8m at a weight of 500kg, males 3.3m and 300kg. In October/December females give birth to a single pup on an ice floe. The lactation period lasts about four weeks and then the young is weaned. Female Leopard Seals become sexually mature by the age of 2-7 years and males 3-6 years [1]. They are one of the top predators in the Antarctic marine ecosystem and feed on diverse prey including krill, fish, cephalopods, crustaceans, penguins and other seals like Crabeater and Fur Seals [543-545]. Prey items vary with the age of a seal; juvenile seals feed mainly on krill, while older ones feed on penguins, seals and other prey [546]. Killing and skinning of penguins is done by bashing them against the water surface. The majority of dives is undertaken in depths of less than 50m with a mean dive duration of about three minutes. But a diving depth of 424m and a dive duration of more than nine minutes is reported [547]. *H. leptonyx* has a circumpolar distribution and occurs primarily throughout the Antarctic pack ice zone during the breeding season and on the Subantarctic Islands [544]. From time to time individuals are sighted on the coasts of South Africa, southern Australia, Tasmania, New Zealand and South America [1].

Leptonychotes weddellii (Lesson, 1826)
Chordata, Mammalia, Carnivora, Phocidae

The Weddell Seal *Leptonychotes weddellii* is among the largest seals worldwide. Males are 2.5 to 2.9m in length and females reach up to 3.5 m. They weigh between 400 and 600kg. Their flippers and the rounded head are relatively small. The eyes are dark and round. Adult Weddell Seals have a short and dark grey to bluish-grey coat that is marked with black and lighter grey blotches [1]. With their canine teeth they can chew breathing holes into the ice. In September/ October females give birth to the pups which have a mean weight of approximately 30kg [548]. At the age of 10 to 14 days they follow their mother and enter the water for extending their diet. During the first five weeks of lactation the young´s weight increases 3½ times and they are weaned between 6 and 7 weeks of age [548]. Females become mature at 3-6 years and males at 7-8 years. Longevity is at least 28 years [549]. The Weddell Seal preys on fish and cephalopods [550] by diving in depths of up to 750m and for up to 73 min, but the normal dives last 15-20 min in depth of 50-500m below the surface [1]. *L. weddellii* has a circumpolar distribution and is most abundant near the Antarctic coasts, but can also be observed at the South Orkney Islands, South Shetland Islands, South Georgia and the South Sandwich Islands. Some individuals have been reported even from New Zealand, S-Australia and South America. The Weddell Seal inhabits pack ice and fast ice and sometimes cobble and sandy beaches.


Lobodon carcinophagus (Hombron & Jacquinot, 1842)

Chordata, Mammalia, Carnivora, Phocidae

The Crabeater Seal *Lobodon carcinophagus* is a relatively slender seal with a slightly square-shaped head. The mouth is elongated with a dog-like snout and small dark eyes. The pelage is uniform and can vary in colour from any shade of grey to brown or dark brown sometimes spotted with blotches. Many specimens show large scars that result from attacks of Orcas or Leopard Seals. *L. carcinophagus* can reach a length of 2.6 m and a weight of 410kg, females are slightly larger than males. They are estimated to live up to 39 years [551]. In September/October the females give birth to a single pup weighing approximately 36kg at a length of 1.1m. The lactation period lasts 2-5 weeks and because of the fatty milk the young gains 4kg each day [552]. Crabeater Seals become sexually mature between 3 and 4 years [553]. They feed mainly on krill that they sieve from the water column by their specialized dentition. They forage largely at night, when the krill ascends to the water surface. It is supposed that the global Crabeater Seal population of estimated 10 to 15 million animals [554, 555] consumes around 60 to 70 million tonnes of krill per year [556]. This makes the species the single largest consumer of krill in the world [555]. Most dives are undertaken in depths of less than 20m, although a depth of 530m is reported [557]. The Crabeater Seal is mainly found on the pack ice of Antarctica south of 79°S, but because of the seasonal fluctuation of the pack ice the distribution range varies. In the winter months this species may be observed on the islands surrounding Antarctica and the shores of South America, Australia, South Africa, Tasmania and New Zealand [558].

Mirounga leonina (Linnaeus, 1758)

Chordata, Mammalia, Carnivora, Phocidae

The males of the Southern Elephant Seal *Mirounga leonina* are the largest pinnipeds worldwide. They can reach a length of up to 6.5m and a weight of up to 3.7t. Adult males have a square shaped head with a conspicious nose that can be inflated. Females are much smaller with a max. length of 4m, a weight of 800kg and a more rounded head than males. The fur colour can vary from dark grey to rusty-reddish or pale grey depending on the animals´ age, molting status and sex. The large eyes are round and very dark. Especially males are blotched with scars from previous fights [1]. The breeding season of the Southern Elephant Seals begins in August when the bulls arrive at the breeding grounds. Southern elephant seals are highly polygynous, a single bull may control a harem of up to 100 cows, but the average is 30 individuals. *Mirounga leonina* preys mainly on cephalopods and fish [559]. Prey items are caught in average depths of 300–600m [560], but they are able to reach depths of up to 1500m [561]. The mean dive duration of Southern Elephant Seals is approximately 25 min [562] but the longest recorded dive lasted 2 h [563]. When breeding and molting Southern Elephant Seals are found along the coast of Antarctica and on Subantarctic Islands as well as on Macquarie Island, Heard Island, Kerguelen Islands, and the Peninsula Valdez in Argentina. During the non-breeding season they are often thousands of miles away from their breeding grounds. The largest present population is on South Georgia. As breeding grounds Southern Elephant Seals prefer sandy and cobble beaches

Whales, Dolphins and Porpoises, Cetacea

With about 90 species, the Cetaceans, the whales, dolphins and porpoises, are the largest group of marine mammals. Like the Sirenians, they have adapted to an entirely marine life, only returning to the surface to breathe; they even mate and give birth in the water. The blowhole, their nostrils, through which they breathe, is located on top of the head and different species can be identified from the shape of the exhaled blow. Cetaceans have only a pair of front flippers, the rear ones having disappeared through evolution, and can only be seen in the embryo. Propulsion is by moving the tail flukes up and down. In contrast to the vertical tails of fish, whale flukes are horizontal. Cetacea are subdivided into toothless, filter-feeding, or baleen, whales and toothed, carnivorous whales, and these include the dolphins and porpoises.

Eubalaena australis (Desmoulins, 1822)

Chordata, Mammalia, Cetacea, Balaenidae

Eubalaena australis or Southern Right Whale is a baleen whale with a very broad body without a dorsal fin. This species reaches a length of 11-16m and a weight of up to more than 70t while females are slightly larger than males. Characteristic for this species is the very large head, (approximately 1/3 of the body length), which is covered by callosities, and the strongly bowed mouthline. The coloration varies from black or dark brown to greyish, brown or bluish, some individuals have irregular white patches ventrally [1]. The flippers are short and wide. Unlike other baleen whales *E. australis* lacks ventral throat grooves. The blow of the Southern Right Whale is V-shaped and up to 5m high. Sexual maturaty is reached at the age of 10 years in females. Once every three years after a gestation period of 11 to 12 months a calf of up to 6m and a weight of 1500kg is born [565]. The distribution of the Southern Right Whale ranges from approximately 20°S to 55°S, but they have been observed as far south as 63°S. This species feeds on copepods and krill which are filtered from the water column with the help of the 200 to 270 baleen plates per side that are dark grey to black, narrow and up to 3m in length. Surface and subsurface skim feeding is common. Southern Right Whale populations have been heavily depleted by commercial whaling [566].

Balaenoptera bonaerensis Burmeister, 1867

Chordata, Mammalia, Cetacea, Balaenopteridae

The Antarctic Minke Whale (*Balaenoptera bonaerensis*) is a small and slim rorqual. It reaches a length of up to 10m and a weight of 9t, while females are larger than males. At birth calves have a length of approximately 2.5m, and 7-8m at the age of one year. The head of *B. bonaerensis* is quite small and has a pointed snout. The colour of the head and back is bluish grey. It is considered a southern hemisphere species, although there is a single record from Suriname (60°N) (Rice 1998). In summer they are abundant throughout the Antarctic south of 60°S, occurring in greatest densities near the ice edge, and to some extent within the pack ice and in polynyas. Although *B. acutorostrata* has been found in the Antarctic as far south as 65°S, it is much less common there than *B. bonaerensis*, such that all “minke whale” abundance estimates south of 60°S can for practical purposes be treated as referring to *B. bonaerensis*.


Balaenoptera borealis, Lesson, 1828

Chordata, Mammalia, Cetacea, Baleaenopteridae

Balaenoptera borealis or Sei Whale reaches a length of up to 21m and a weight of up to 30t, females are usually larger than males. Characteristic is the single prominent ridge on the rostrum and a slightly arched snout with a downturned tip. Colouration is dark grey to bluish-grey on the back and a paler belly. It has 32 to 60 white throat grooves, which end just behind the flippers. When surfacing the dorsal fin and the up to 3m tall blow are often visible at the same time. When diving this species does not lift the tailstock and seems to sink below the surface. The hooklike fin is quite large and located two-thirds along the length of the body. Over short distances Sei Whales can reach speeds of up to 50 kilometres per hour. Dives last for 5-20min reaching normally only shallow depths, as it feeds on zooplankton, squid and small schooling fish by skimming the water surface [1]. Most common are groups of up to 5 individuals of *B. borealis*, which occurs from the tropics to the polar oceans, but mainly oceanic seldom near the coasts. At birth, Sei Whales are 4.5 to 4.8m long and weigh 0.65t. They are weaned for 6-9 months. At the age of 8-11 years sexual maturity is reached [1].

Balaenoptera musculus intermedia (Linnaeus, 1758)

Chordata, Mammalia, Cetacea, Balaenopteridae

With a maximum length of 33m and a weight of up to 190t the species *B. musculus intermedia* or Southern Blue Whale is one of the largest animals ever known on planet Earth. It has a flat and broad rostrum, which ends in a U-shaped tip. The dense and upright blow is emitted from double blowholes up to 12m high. The colouration of Blue Whales may vary from pale to dark grey mottled whitish-grey. When submersed right beyond the surface the rear body may appear turquoise. The quite small fin is located well back and the fluke raised in shallow angle when diving. Most of the individuals are sexually mature by the age of 8-10 years. New born calves have a bodylength of approximately 6-7m and a weight of 2.5-4t. Blue Whales migrate in groups of 2-5 individuals, the rest of the time they are alone or in twos. They feed on larger plankton by gulping, whereof they consume 3-8t per day. Four subspecies of the Blue Whales are known. For Antarctic waters the Southern Blue Whale and the Pygmy Blue Whale (*B. musculus brevicauda*) are described. The latter is with a maximum length of 24m much smaller than *B. musculus intermedia*, but resembles its larger relative. The population of the Southern Ocean stays near the pack ice during austral summer. In winter it migrates northward as far as southern Brazil, South Africa and even Equador [1].


Balaenoptera physalus (Linnaeus, 1758)

Chordata, Mammalia, Cetacea, Balaenopteridae

The Fin Whale is the second largest rorqual and reaches a length of up to 27m and a weight of more than 80t, females are usually larger than males. Colouration is dark grey to brown-black dorsally with a white belly and fluke and flipper undersides. Characteristically is the asymmetrical colouration of the head. The left lower jaw is dark while the right one is creamy-white extending a little to the upper jaw. The tall and narrow blow is is 4-8m high and the dorsal fin appears right after it when surfacing. When diving *B. physalus* shows at least twice as much hight of its back as the hight of the small dorsal fin, which is located three quarters of the way along the back. Dives normally last 3-15min but may be 30min reaching depths of up to more than 470m. This species feeds mainly on krill, squid and fish by engulfing the prey. When born, calves weigh 1 to almost 2t at a length of 6-7m. By the age of 6-8 months they nearly endoubled their initial length and are prepared to migrate to polar waters. Normally Fin Whales appear in groups of 3-20 individuals, but in good feeding grounds aggregations of up to 100 can be observed. There are two separate populations of *B. physalus*. The one of the southern hemisphere during summer stays in the productive areas of the Southern Ocean for feeding and migrates far northward in austral winter to the breeding grounds. It prefers the deep offshore waters of the oceans and normally avoids the ice [1].

Megaptera novaeangliae (Borowski, 1781)

Chordata, Mammalia, Cetacea, Balaenopteridae

M. novaeangliae or Humpback Whales reach lengths of up to 16m and weights of 35t, while males are usually 1-1.5m shorter than females. The dorsal parts are generally black or dark grey. The very large flippers, which have a length of up to one third of the body length, are white on the ventral side and are completely white to mostly black dorsally. The colouration of the ventral side of the flukes may also be from all-black to all-white and is used for individual identification. On the underside of the mouth are 12 to 36 throat grooves. The dorsal fin is stubby and normally located on a hump. The characteristically knobbly head has a single ridge and is covered with many raised tubercles and barnacles. Every 2-3 years a cow gives birth to a calv in tropical waters where this species spends the winter months. At birth the calv weighs 1-2t and has a length of 4-4.6m. At the age of 5-11 years young Humpback Whales are sexual mature [1]. *M. novaeangliae* feeds on krill and small schooling fish trapping it in bubble nets to concentrate the prey, which makes it easier to engulf it. Often hunting is undertaken in groups of several animals. When diving Humpback Whales usually arch their backs, this is where the common name derives from. At the surface this species is very active and shows behavior of breaching, lobtailing, flipper slapping and spyhopping. Males have long complex songs which can be heard in the breeding grounds and are part of the mating ritual. They compete aggressively for access to receptive females. Groups of 1 to 3 individuals are mainly seen, but in feeding and breeding areas larger aggregations develop. The distribution of *M. novaeangliae* is worldwide [566].


Lagenorhynchus cruciger (Quoy and Gaimard, 1824)

Chordata, Mammalia, Cetacea, Delphinidae

Because of its characteristic markings the common name of *Lagenorhynchus cruciger* is Hourglass Dolphin. It is a quite small species reaching lengths of maximum 2m and a weight of about 90kg. At birth calves have a length of approximately 1m. The colouration is black above and white below. The black sides are broken by a white pattern which resembles an hourglass. The thoracic patch begins behind the rostrum and ends just before the dorsal fin. The second patch is located between the dorsal fin and the tailstock. Both patches can be connected. The sometimes markedly hooked dorsal fin which is set midway along the back is relatively large. The flippers, dorsal fin, and flukes are all black [566]. The Hourglass Dolphin feeds on small fish, squids, and crustaceans, often in swarms of seabirds and in plankton aggregations. It is usually seen in groups of 4-8 individuals but herds with up to 40 animals have also been observed [1, 566]. *L. cruciger* has a circumpolar oceanic distribution in the higher latitudes of the southern oceans ranging to the ice edges in the south. The southernmost sighting was near 68°S. There are records of specimens of this species that were sighted as far north as 33°S in the Pacific off Chile. It is an enthusiastic bow and stern rider [569, 570].

Orcinus orca (both images on this page)

Orcinus orca (Linnaeus, 1758)

Chordata, Mammalia, Cetacea, Delphinidae

The cosmopolitan species *Orcinus orca* which is commonly known as Killer Whale or Orca is the largest of the dolphin family. In Antarctic waters three different morphological and biological types are described. Depending on the type males reach a length of 6 to nearly 10m and a weight of up to 5.5t whereas the females are only 5.2m to 8.5m in length. Characteristic is the black-and-white colouration with a white eye patch and contrasting white throat to abdomen and rear flanks. Flippers are quite large and rounded. Adult males have very large dorsal fins that may be up to 1.8m in length. This species travels in groups of 2-50 animals lead by an adult female and can reach velocities of up to 50 km/h. Sexual maturaty is reached at the age 8-16 years. At birth the calf has a length of 2.5m and weighs 160-200kg. It is dependent for approximately one year. Depending on the biological type potential prey varies from squid, fish, penguins, seals and dolphins to even larger whales which are attacked by groups of *O. orca*. They themselves are regarded as apex predators, lacking natural predators. Wild females reach an age of average 50 years, with a maximum of 80–90 years, while wild males live approximately 30 years with a maximum of 50–60 years [573].

Berardius arnuxii Duvernoy, 1851

Chordata, Mammalia, Cetacea, Hyperoodontidae

Specimens of *Berardius arnuxii*, the Arnoux's Beaked Whale, reach lengths of up to 9.75m and a weight of approximately 10t. Colouration varies from dark grey or bluish black to green brown with paler abdomen and sides. The back and the flanks are prominently scarred whitish. Characteristically for this species is the low melon, long beak and a very small dorsal fin, which is triangular, slightly hooked and positioned well back on the body. The short flippers have rounded tips. Males and females present two teeth extruding from the lower jaw, which are constantly exposed, because the lower jaw projects well beyond the upper one. In older specimens occurs a second pair of smaller teeth behind the first pair. *B. arnuxii* lives in small groups of six to ten animals and is supposed to feed on squid, fish and octopus in up to 1000m depth. Because functional teeth for gripping and biting prey are absent, they presumably capture most of their prey by suction.

Dives of 35-65min were recorded, so this species is thougt to be capable of swimming up to an estimated of 7km between breathing sites in sea ice. Arnoux's Beaked Whales seem to be well adapted to life in ice-covered waters and exploit food resources inaccessible to other predators in the region [564]. This species is regularly found in open leads in the pack ice, which are 50km or more from the open sea and ranges north to about 34°S. It may be confused with other beaked whales [1].

Hyperoodon planifrons Moreno, 1895
Chordata, Mammalia, Cetacea, Hyperoodontidae

The common name of *Hyperoodon planifrons* is Southern Bottlenose Whale. Males of this species reach length of up to 7.5m and a weight of approximately 8t while females are in average about 1m shorter. The body is cylindrical and has a greyish brown to dark brown colouration, the belly, throat and sides are paler. Male individuals, especially older ones, are heavily scarred dorsally. The 30 to 40cm high dorsal fin has a blunt tip and is located about 2/3 of the body length from the head. The small and short flippers are blunt-tipped. The fluke is broad and deeply concave. *Hyperoodon planifrons* has a short, dolphin like beak and a bulbous forehead, which is more pronounced in older males, where the melon rises abruptly from the beak. This species has 0-4, but normally two small cylindrical teeth located at the tip of the lower jaw, but they are only visible in males [1, 551, 567]. It feeds mainly on squid, to a lesser extent on fish and other invertebrates. It is supposed to be capable of diving as deep as 1000m. Shallow dives may last up to two hours, but normally they are shorter. Southern Bottlenose Whales are usually seen in groups of 1-3 individuals, in Antarctic waters up to 10 individuals have been observed. *H. planifrons* is found in the waters off of Australia, New Zealand, Brazil, Argentina, Tierra del Fuego, the Falkland Islands, South Georgia, the South Orkney Islands, South Africa, and the Pacific and Indian Ocean sectors of Antarctica [551]. It is most common in waters deeper than 1000m for example next to continental shelfs and rarely found in water less than 200m deep. During summer months this species stays in Antarctic waters [568].

Mesoplodon layardii (Gray, 1865)
Chordata, Mammalia, Cetacea, Hyperoodontidae

Mesoplodon layardii or Strap-toothed Whale is the largest of the genus *Mesoplodon* reaching lengths of 5-6m and weights between 1.1 and 3.4t, females are generally larger than males. The spindle-shaped body is robust and mainly black or brownish black. It has a dark mask over the eyes and melon and a dark shoulder. Grey to white patches are on the throat, the upper back, around the genital area and on the beak´s tip [566]. *M. layardii* has a long slender dolphin like beak and a rounded to slightly bulbous melon. The dorsal fin is falcate and small, the flippers narrow and short. Mature males show a pair of well developed teeth in the lower jaw reaching a length of up to 30cm and curling over the top of the upper jaw. These teeth are not visible in female and immature individuals [571]. Calves´ pigmentation is paler than that of adults and reversed [1]. Strap-toothed Whales feed nearly entirely on oceanic squids [572], which is probably ingested by intense suction. Dives last 10-15 minutes. This species, which can be observed singly or in groups of up to three individuals, has a continuous distribution in cold temperate waters of the southern hemisphere, mostly between 35° and 60°S. It occurs mainly in deep waters beyond the edge of the continental shelf [568].


Species Index

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Glossary

abdomen: the posterior section of the body of an arthropod, behind the **thorax** or the **cephalothorax**
abduction: refers to motions that move a structure away from or towards the center of the body
aboral: situated opposite to the mouth
abyssal: pelagic zone that includes the very deep benthic communities near the bottom of oceans, waters between depths of 4000m and 6000m
acidification: the decrease in the pH of the oceans, caused by the uptake of carbon dioxide (CO_2) from the atmosphere
albedo: reflection coefficient, the diffuse reflectivity or reflecting power of a surface
ambulacral: any of five radial bands on the **ventral** surface of echinoderms on which the tube feet are situated
anterolateral: situated in front and away from the middle line
anteroposterior: directed from the front towards the back
antiboreal: of the south temperate region
anticoagulant: class of drugs that work to prevent the clotting of blood
antifeedant: any substance that inhibits normal feeding behaviour
aphallic: hermaphrodite individual that lacks a penis
apical: situated nearer to the **apex** of a body in relation to a specific reference point
apex: the pointed end of a conical or pyramidal structure
aquifer: a geological formation of permeable rock, gravel, or sand containing or conducting groundwater
arenicoliform: body forms that are swollen anteriorly and tapered posteriorly
areolate: relating to or like or divided into areolae
areola: a small space or interstice in a **tissue**
armament: structures that are used to fight
ascidiofauna: ascidian fauna
ascopore: a small **asexual** reproductive body that is able to develop into a new individual without sexual fusion
asexual: reproduction without the union of male and female gametes
atrial: relating to a cavity or chamber in the body
auto-epizoism: species which live epizoic on the same or closely related species
autofluorescence: the natural emission of light by biological structures
autozooids: individuals in bryozoan, which are responsible for feeding and excretion
avicularium: modified, non-feeding **zooid** in cheilostome bryozoans
barcoding (DNA): a taxonomic method that uses a short genetic marker to identify it as belonging to a particular species
bathyal zone: the part of the pelagic zone that extends from a depth of 1000 to 4000 meters below the ocean surface
benthopelagic: relating to species living near the bottom of the sea
benthos: assemblage of organisms inhabiting the seafloor
biodiversity: diversity of plant and animal species in a habitat
biogeography: distribution of organisms and ecosystems in geographic space and through geological time
bioluminescence: production and emission of light by a living organism
biomass: biological material derived from living organisms
bionomics: the study of an organism and its relation to its environment
biramous: consisting of or having two branches
biserial: in two rows or series
blastostyle: a process in certain hydroids that may be regarded as a **zooid** without mouth or tentacles, its function is to produce **medusoid** buds
blastozooid: a member of a colony of animals which are produced by **asexual budding**
blastula: the stage of development of an animal embryo that results from cleavage of a fertilized egg
boreal: designating a climatic zone having snowy winters and short summers
brackish: water that has more salinity than fresh water, but not as much as seawater
broadcast-spawning: mass spawning or synchronous spawning, broadcast spawning takes place when animals release their eggs and sperm into the water
budding: form of **asexual** reproduction in which a new organism develops from an outgrowth or bud due to cell division at one particular site
buoyancy: the ability to float or to rise in a fluid
byssus: long fine silky filaments excreted by several bivalves by which they attach themselves to the sea bed
calanoid: group of planktonic copepods
camouflage: protective colouring or other

appearance that conceals an animal and enables it to blend into its surroundings
canaliculate: having thin parallel channels
cannibalistic: an animal that feeds on others of its own kind
capitate: enlarged and **globular** at the tip
caprellid: specific group of small amphipod crustacean
caridioid: type of crustacean with a shrimp-like habitus
carnivore: flesh-eating animal
carrageenan: a carbohydrate extracted from **seaweed** often used as a stabilizing ingredient in foods and pharmaceuticals
cauloid: resembling a stem
cenozoic: the most recent of the three major subdivisions of animal history; it spans about 65 million years
cephalothorax: the anterior part of the body in certain crustaceans, consisting of the coalesced head and **thorax**
cerata: a projection found on some nudibranchs
chaetae: any of the chitinous bristles on the body of certain annelids
chaetigerous: bearing bristles
chaetognath: arrow worms, predatory marine worm of the plankton
chelae: a pincerlike claw of a crustacean
chelicerae: first pair of appendages on the head of arachnids and other arthropods of the phylum chelicerata, having the form of pincers or claws and are used for grasping or tearing food
chelifore: either of the first pair of appendages on the cephalic segment of pycnogonids
chimyl alcohol: 2,3-dihydroxypropyl hexadecylether
chitin: principal component of the exoskeletons of arthropods
chlorophyll: a green pigment that "traps" sunlight for photosynthesis
chloroplast: a plastid that contains **chlorophyll**
choanocyte: any of the flagellated cells in sponges that maintain a flow of water through the body
chorda: **notochord**, a flexible rodlike structure that forms the main support of the body in the lowest chordates
cirrus: sensory appendage; usually slender and cylindrical
cloacal: the posterior part of the intestinal tract in various invertebrates
cnidosac: in certain nudibranchia, one of the internal sacs located near the tips of the **dorsal** projections from the body surface
coelenteron: the body cavity of a coelenterate
commensal: relationship in which one species derives some benefit while the other is unaffected
congeneric: an organism belonging to the same taxonomic genus as another organism
conspecific: of or belonging to the same species
copepod: any minute crustacean of the subclass copepoda
corpuscle: a small free floating biological cell
cosmopolitan: growing or occurring in many parts of the world; widely distributed
cross-fertilized: fusion of male and female gametes from different individuals of the same species
cryptic (species complex): very close relatives, or **sibling species**, which cannot be easily distinguished by molecular phylogenetic studies
cryptobranch: members of the nudibranch family doridoidea with the ability to hide their gills in pockets in their bodies
cystocarp: a reproductive body in red algae, developed after fertilization and consisting of filaments bearing carpospore
cyst: a sac or **vesicle** in the body or a small capsule like sac that encloses certain organisms in their dormant or larval stage
cytotoxic: a substance producing a toxic effect on cells
debris: fragmented remains of dead or damaged cells or **tissue**
demersal: living or occurring on the bottom of the sea
demibranch: a pair of ciliated gill filaments composed of two flat lamellae
deposit-feeding: benthic organisms that eat organic material in sediments
detrivores: heterotrophs that obtain nutrients by consuming decomposing plant and animal parts as well as feces
devonian: geologic period and system of the **paleozoic** era spanning from about 419 to 359 million years ago
dimorphism: existence of two different forms as of colour or size of a species
dinoflagellate: protozoan of the phylum Pyrrophyta having one **flagellum** extending from the center of the body and another wrapped around it
distal: situated farthest from the center
dorsal: relating to the back or spinal part of the body
dorsolateral: relating to, or involving both the back and the sides
dorsomedian: relating to the true middle line on the dorsum of an individual
dorsoventral: relating to both the **dorsal** and **ventral** sides
dredge: implement consisting of a net on a frame,

used for gathering **epibenthic** organisms
ebibiont: an organism that lives on the surface of another living organism
ectoparasite: an external parasite
endobiont: any organism that lives below a surface
endophyte: a fungus, or an alga or other organism, that lives within a plant or alga
endoskeleton: the internal skeleton of an animal
endotherm: a warm-blooded animal
epibenthic: species living on the surface of the bottom of the sea
epibiont: an organism that lives on the surface of another living organism
epidermis: the outer layer of cells of an invertebrate
epifaunal: animals living on the surface of the bottom of the sea
epigamy: structural modification of an entire adult individual into a reproductive state
epilithic: growing on the surface of rock
epipelagic: upper part of the oceanic zone into which enough light penetrates for photosynthesis
epiphytic: alga or plant growing on another alga or plant
epistome: a mouth-covering lobe or ridge in bryozoans and phoronids
epitoky: type of reproduction in polychaete marine worms, where the worms undergo a partial or complete transformation into a pelagic morph capable of sexual reproduction
epizoic: living upon the body of an animal
eulittoral: **intertidal** zone also known as the foreshore, it extends from the spring high tide line to the spring low tide line
eurybathic: organisms that can tolerate a wide range of depth
eurythermal: organisms able to tolerate a wide range of temperatures in the environment
eurytrophic: organisms using a wide range of food
eutrophication: enrichment of an ecosystem with chemical nutrients such as nitrogen and phosphorus
exoskeleton: external skeleton that supports and protects an animal's body
fang-like: having or made by a thin edge or sharp point
FAO: food and agriculture organization of the united nations
fission: form of **asexual** reproduction in single-celled animals and plants involving a division into two or more equal parts that develop into new cells
flagellate: protozoan that moves by means of a **flagellum** or flagella
flagellum: a long whiplike outgrowth from a cell that acts as an organ of locomotion
forage: looking or searching for food
foraminifera: marine protozoan of the phylum **foraminifera**, having a shell with openings through which cytoplasmic processes protrude
foregut: the first part of the alimentary canal in arthropods and annelids
foreneck: the whole front section of the neck
fouling: accumulation of unwanted material on solid surfaces to the detriment of function, the **fouling** material can consist of either living organisms or a non-living substance
free-spawning: eggs and sperm released into water by aquatic animals
fucoxanthin: accessory pigment in the chloroplasts of brown algae and other heterokonts
furcate: divided into branches; forked
fusiform: elongated and tapering at both ends; spindle-shaped
gametangium: organ or cell in which gametes are produced
gamete: a cell that fuses with another cell during fertilization
gametophyte: the haploid **gamete**-producing phase in an alga
gastrodermis: the epithelial lining of the digestive tract of certain invertebrates
gastrovascular: serving for digestion and circulation, as a cavity
gastrozooid: zooids in colonies of coelenterates, that bear tentacles and are specialized for feeding
gemmule: they serve in some marine sponge species as a normal reproductive process or as a means to carry the sponges over periods of unfavorable conditions
generic: relating to or descriptive of an entire group
geniculate: bent at a sharp angle
geodetic: pertaining to **geodesy**
geodesy: scientific study of the size and shape of the earth
(polar) gigantism: tendency to have much larger body sizes than their relatives that live elsewhere
glandular: pertaining to, or resembling a gland
globular: having the shape of a globe
glycopeptide: peptides that contain carbohydrate glycans covalently attached to the side chains of the amino acid residues that constitute the peptide
glycoprotein: proteins that contain oligosaccharide chains (glycans) covalently attached to polypeptide side-chains
gnathopod: an appendage which is modified to assist in feeding
Gondwana: former supercontinent of the southern hemisphere that broke up into India, Australia,

Antarctica, Africa, and South America
gonochoristic: separation of the sexes in different individuals
gonophore: reproductive structure that develops on a hydrozoan polyp
gonotheca: a capsule developed on hydroids, inclosing the **blastostyle** upon which the **medusoid** buds or gonophores are developed
gonozooid: sexual **zooid**, or **medusoid** bud of a hydroid
grazing: to scrape or scratch slightly; abrade
gregarious: living together in herds, flocks or colonies
helicoid: having the form of a helix; spiral
hemoglobin: oxygen-carrying pigment present in the red blood cells of vertebrates
herbivore: a plant-eating animal
hermaphroditism: presence of both male and female reproductive organs
hexamerously: arranged in groups of six
holdfast: basal, rootlike formation by which certain seaweeds or other algae are attached to a substrate
holopelagic: pelagic through the entire life cycle
holoplankton: plankton that spend their entire life cycle in the water column
holotype: a single specimen upon which a new nominal species is based in the original publication
homarine: 1-methyl-2-pyridinecarboxylic acid
hybrids: animal or plant resulting from a cross between genetically unlike individuals
hydranth: **asexual** feeding polyp in a hydroid colony
hydromedusa: a hydrozoan in the **medusoid** stage of its life cycle
hydrorhiza: rootlike base of a hydroid colony
hydrotheca: one of the calicles which, in some hydroids protect the hydrants
hypostome: the **oral** tip surrounded by tentacles in hydroids
hypoxia: depletion of dissolved oxygen to levels that are fatal to aerobic organisms
ichthyology: study of the physiology, history, economic importance, etc., of fishes
inequilateral: unsymmetrical; unequal-sided.
infauna: aquatic animals that live beneath the surface of the sea floor
inter-radial: situated between radii or rays
interramal: between rami or branches
intertidal: region between the high tide and the low tide mark
isomorphic: having the same form or appearance
kelp: any large brown **seaweed**, esp. any in the order Laminariales
(pedal) laceration: type of agametic reproduction in sea anemones
lactation: the period of milk production
lamellibranch: marine bivalve mollusk
leuconoid: largest and most complex type of sponge
lipofuscin: a class of fatty pigments consisting mostly of oxidized fats
lobate: divided into lobes
mandible: mouth organs of invertebrates used for seizing and biting food
manubrium: the tubular mouth that hangs down from the center of a coelenterate medusa
marsupial: any of various nonplacental mammals of the infraclass metatheria
mating: act of pairing for reproduction
maxillae: appendages situated behind the mandibles in most arthropods
maxilliped: any of three pairs of appendages in crustaceans, behind the **maxillae**
mediodorsal: relating to the median plane and the **dorsal** plane
medusivorous: feeding on jellyfish
medusoid: relating to the medusa stage in the life cycle of a cnidarian
megabenthos: not defined in terms of size, but meaning the largest benthic invertebrates
megasclere: a large skeletal **spicule** of a sponge
meiofaunal: very small benthic invertebrates
meristem: undifferentiated **tissue** of algae from which new cells are formed
mesenterium: septum that divides the **gastrovascular** cavity into chambers
mesopelagic: part of the pelagic zone that extends from a depth of 200m to 1000m below the ocean surface
mesozoic: geological time interval from about 252 to 66 million years ago
metamorphosis: a marked change in appearance, character, condition, or function
metapopulation: a group of spatially separated populations of the same species which interact at some level
microsclere: discrete mineral skeletal elements of sponges
mitochondrial: spherical or elongated organelle in the cytoplasm of eukaryotic cells, containing genetic material
monoecious: relating to or exhibiting **hermaphroditism**
monogamous: behaviour of having only one mate during a breeding season or during the breeding life of a pair
monophyletic: characterized by descent from a single ancestral group of animals or plants

monosiphonic: in hydroids, having the tubes of the hydrocaulus distinct from one another
morphogenesis: biological process that causes an organism to develop its shape
morphotype: a specimen chosen to illustrate a morphological variation within a population
moulting: periodic shedding of the cuticle in arthropods
mucilage: viscous, water-soluble polysaccharides produced by various plants, algae, and microorganisms
mucus: slimy protective secretion of the mucous membranes
mytiloid: bivalve pertaining to the family Mytilidae
necrophagous: feeding on carrion
nematothecae: a nematophore is a modified polyp on a hydroid colony, which lacks a mouth and functions in defence, all are richly armed with nematocysts, some are protected in thecae termed **nematothecae**
neurochaetae: chaeta of a neuropodium
neuropodia: **ventral** branch or ramus of a **parapodium**
notochaetae: chaeta of a **notopodium**
notopodium: **dorsal** branch or ramus of a **parapodium**
notochord: a fibrous longitudinal rod in all embryo and some adult chordates
ocellus: a simple eye consisting of a number of sensory cells and often a single lens
oesophagus: part of the alimentary canal between the **pharynx** and the stomach
olfactory: relating to the sense of smell
oogamous: one of a pair of structurally dissimilar gametes with the female **gamete** being large and nonmotile
oogenesis: creation of an ovum (egg cell)
oozoid: any individual developed from an egg
operculum: in bryozoans the calcareous or chitinous lid-like structure that protects the opening through which the polypide protrudes
oral: relating to the surface of an animal on which the mouth is situated
osculum: a large opening in a sponge, through which water is expelled
ossicle: small calcareous elements embedded in the dermis of the body wall of echinoderms
ostium: small openings or pores in a sponge, through which water is drawn in
ostracod: crustaceans possessing shrimplike bodies enclosed in hard bivalve shells, named also seed shrimp and mussel shrimp
ovicell: one of the dilatations of the body wall of bryozoa in which the ova sometimes undergo the first stages of their development
oviger: a modified leg used for carrying eggs in some pycnogonids
oviparous: producing eggs that develop and hatch externally
ovoviviparous: producing eggs that develop internally and hatch before or soon after extrusion
palatability: sufficiently agreeable in flavor to be eaten
paleoceanography: the study of the history of the oceans in the geologic past
paleocene: a geologic epoch that lasted from about 66 to 56 million years ago
paleozoic: a geologic era spanning from roughly 541 to 252 million years ago
pallial: relating to the mantle of a mollusk or brachiopod
palp: one of a pair of elongated appendages usually found near the mouth in invertebrate organisms such as mollusks, crustaceans
papillate: resembling or covered with papillae
parapodium: any of the paired unjointed lateral appendages of polychaete worms
paratype: one of two or more specimens from which a **holotype** was designated in the original published description of a species
parthenogenesis: a form of reproduction in which an unfertilized egg develops into a new individual
pedicellaria: a peculiar forcepslike organ which occurs in large numbers upon starfishes and sea urchins
pedicels: short **stalk** bearing an organ or organism
peduncle: a stalklike structure in invertebrate animals, usually serving as an attachment for a larger part or structure
perennial: lasting throughout the year or through many years
periderm: a hydroid **perisarc**
perinotum: flexible muscular integument holding the chiton valves in place
periostracum: thin organic coating or "skin" which is the outermost layer of the shell of many shelled animals like molluscs and brachiopods
periproct: final body segment in annelid worms
perisarc: the outer hardened integument that covers most hydroids
peristomium: second body segment in an annelid worm's body in the anterior end
perpendicular: at right angles (90°) to
phanerobranch: a paraphyletic group of dorid nudibranchs not able to retract the gill inside of the mantle
pharynx: the part of the alimentary canal

immediately behind the mouth
phenotypic: physical or biochemical characteristics of an organism determined by its genes and the environment
phlorotannins: a type of tannins found in brown algae and in some red algae
photoprotective: protection of the photosynthetic apparatus from harmful effects of light
phycobilins: water-soluble pigments found in the stroma of **chloroplast** organelles that are present only in Cyanobacteria and Rhodophyta
phycocolloid: colloids derived from seaweeds like alginates and agars
phylloids: leaflike part of **kelp** algae
phylogenomic: refer to analysis that involves genome data and evolutionary reconstructions
phylogeny: the evolutionary history of an organism
phylogeography: study of historical processes that may be responsible for the contemporary geographic distributions of species
phytoplankton: autotrophic organisms of the plankton community
pinacoderm: outermost layer of cells (pinacocytes) in sponges
pinnules: a small featherlike part or subdivision of an appendage, especially one of the small branches on the arm of a crinoid
planktivory: an animal feeding primarily on plankton
planktotrophic: feeding on plankton
planulae: free-swimming, flattened, ciliated, bilaterally symmetric larval form of various cnidarians
pleon: **abdomen**, posterior trunk region of crustaceans
pleopod: also called swimmerets; primarily swimming legs of crustaceans which are often also used for brooding eggs and catching food
pliocene: period in the geologic timescale that extends from 5.3 million to 2.6 million years before present
plurilocular: many-celled sporangia, each cell containing a single **spore**
polymorphic: occurring in or having many forms
polysaccharid: any one of a class of carbohydrates whose molecules contain linked monosaccharides
pore / porus: small opening in the skin or outer surface of an animal
post-breeding: following a period of physiological fitness for reproduction
pristine: unmodified from a natural state
prodissoconch: the rudimentary or embryonic shell of a bivalve mollusk
proliferate: to grow or produce by multiplication of parts or increase in number or spread rapidly and often excessively
prolongation: rates of increase and the process of increasing
propulsion: creating force leading to movement
prostomium: first body segment in an annelid worm's body in the anterior end in front of the mouth
protactile: Extensible, capable of being protracted
protandric: having male sexual organs while young, and female organs later in life
protoconch: embryonic or larval shell occuring in some classes of molluscs
protozoa: single-celled eukaryotes
proventricle: first part of the stomach of birds or the thick muscular stomach of crustaceans
pseudocopulation: behaviour similar to copulation that has a reproductive function for one or both participants but does not involve actual sexual union between the individuals
pseudoperennial: species with one part **perennial** and another part annual
psychrotrophic: microorganisms that thrive in a cold environment
pteroenone: a defensive metabolite of the Antarctic pteropod *Clione antarctica*
pulsatile: undergoing pulsation; vibrating
purine: heterocyclic aromatic organic compound
pustule: a **vesicle** or an elevation of the cuticle with an inflamed base
pyrenoid: a protein body in the chloroplasts of algae
rachis: a main axis or shaft
radiole: a heavily ciliated feather-like tentacle found in highly organized clusters on the crowns of certain polychaetes
radula: anatomical structure used by molluscs for feeding
ramification: a branching or armlike part of an animal
recolonisation: the process in biology by which a species spreads to new areas after habitat destruction
regeneration: process of renewal, restoration, and growth
repellant: resistant or impervious to a substance
reradiate: to radiate again or anew
rhinophore: one of the two tentacle-like organs on the back of the head or neck of a nudibranch
rhizoid: rootlike filament that grows from an alga
rostrum: an anterior projection of the **cephalothorax** of a crustacean
saccate: shaped like a pouch or sac
scale worms: a group of widely distributed free-moving, segmented marine worms with **dorsal** scales

scallop: common name applied to any one of numerous species of saltwater clams
scapus: the main stem of a sea pen
scavenger: an animal that feeds on dead organic matter
sclerotize: to harden and darken
seaweed: macroscopic, multicellular, marine algae
sedate: keeping a quiet steady attitude or pace
self-fertilization: fertilization by the union of male and female gametes from the same individual
semi-ovoid: having the form of half an ovoid solid
semipelagic: close to the seabed but without being in contact with it
senescent: cells no longer capable of dividing but still alive and metabolically active
setae: bristle- or hair-like structures
sheathbill: family of birds; Chionidae
shelf: extended perimeter of a continent, usually covered by shallow seas
shipworm: marine bivalve highly specialized for boring into wood
sibling species: species that are morphologically nearly indistinguishable
siphon: tubular organ in an animal through which water is drawn in or expelled
siphonozooid: degenerate zooids of some alcyonarians supposed to regulate the water supply of the colony
spatulate: broad at the **apex** and tapered to the base
spawner: animals that release or deposit eggs and sperm into water
spermatophore: a capsule or mass enclosing spermatozoa that is extruded by the male of various invertebrates and is transferred to the reproductive tract of the female
spicule: small needle-like anatomical structures in sponges
spinate: having spines
spongin: a scleroprotein occurring in the form of fibers forming the skeleton of certain sponges
spongivorous: organisms that feed primarily on sponges
spore: a small, usually single-celled reproductive body able to grow into a new organism
sporophyte: diploid form of algae that have alternation of generations
squid: any of various marine cephalopod mollusks of several families of the superorder Decapodiformes
sea squirt: any member of the invertebrate class ascidiacea
stalk: any long slender supporting shaft or column
stenothermal: capable to live only in a narrow range of temperatures
steroid: a large group of chemical substances classified by a specific carbon structure including drugs used to relieve swelling and inflammation and some sex hormones
sterol: **steroid** alcohols occuring naturally in plants, animals, and fungi
stigma: a small spot, mark, scar, or minute hole
stipe: a **stalk** that supports some other structure
stolon: horizontal connections between organisms which may be part of the organism or of its skeleton
stratum: a layer of sedimentary rock or soil with internally consistent characteristics that distinguish it from other layers
striation: a series of ridges, furrows or linear marks
strobilation: **asexual** reproduction by transverse division of the body into segments which develop into separate individuals
stylet: any small pointed bristle-like part
subantarctic: region in the southern hemisphere, located immediately north of the Antarctic region, roughly between 46° – 60° south of the equator.
subcentral: nearly central; not quite central
subdermal: situated or introduced under the skin
subdichotomous: almost dichotomous
subdistal: below **distal**
subglacial: beneath a glacier
sublittoral: zone between the low tide mark and 100m depth
submarginal: near the margin of a body or organ
sub-oral: placed under the mouth or **oral** orifice
subtidal: part of the neritic zone lying below the low-tide mark but still shallow and close to shore
subtriangular: nearly, but not perfectly, triangular
sulcate: having narrow, deep furrows or grooves
suspension-feeding: aquatic animals, that feed by filtering small organisms or organic particles from the water
suspensivore: a filder-feeding animal
swarmer: aggregation of animals
sympatry: occupying the same or overlapping geographic areas
synonym: a taxonomic name that has been superseded or rejected
tanaidacean: small, shrimp-like creatures within the class malacostraca
teleoconch: the entire shell, excluding the **protoconch**
terminal: related to an end or extremity
terrigenous: oceanic sediment derived directly from the destruction of rocks on the earth's surface
tertiary: geologic period from 66 million to 2.58 million years ago
tetrasporophyte: part of the life cycle of certain red

algae produced by diploid carpospores
thallus: undifferentiated vegetative **tissue**
thecosome: marine molluscs of the order thecosomata
thorax: middle region of the body of certain arthropods lying between the head and the **abdomen**
tidal: relating to or affected by tides
tissue: a part of an organism consisting of a large number of cells having a similar structure and function
trachelosome: part of the body of a leech having 5 to 10 postoral segments
trepan: to bore or otherwise make a hole in
triactine: having three rays, as a sponge **spicule**
triassic: a geologic period and system that extends from 252 to 201 million years ago
triphasic: having or existing in three phases
triploblastic: having three primary germ layers
truncate: to shorten by cutting off a part
tubercle: a small rounded projection or excrescence
tubiculous: living in tubes
tunicin: animal cellulose; a substance present in the mantle of tunicates
unarticulate: not having joints or segments
undulate: move with a smooth wave-like motion
unfused: not fused; distinct
urosome: the **abdomen** or postabdomen of an arthropod
vascular: having vessels that conduct and circulate liquids
veliger: planktonic larva of many marine and freshwater snails
velum: any of various membranous structure
ventral: relating to the front part of the body
ventrolateral: both **ventral** and lateral
vermiform: having the shape of a worm
vermilion: a bright red to reddish-orange colour
vesicle: a sac or **cyst**
visceral: relating to or affecting the viscera
viviparism: giving birth to living offspring that develop within the animal's body.
whelk: any of various large marine carnivorous snails
zoobenthos: community of animals which live on, in, or near the seabed
zoogeography: the branch of zoology concerned with the distribution patterns of animals
zooid: single animal that is part of a colony
zooplankton: aggregation of animal organisms that float or drift in the water column
zoospore: motile asexual spore that uses a flagellum for movement

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