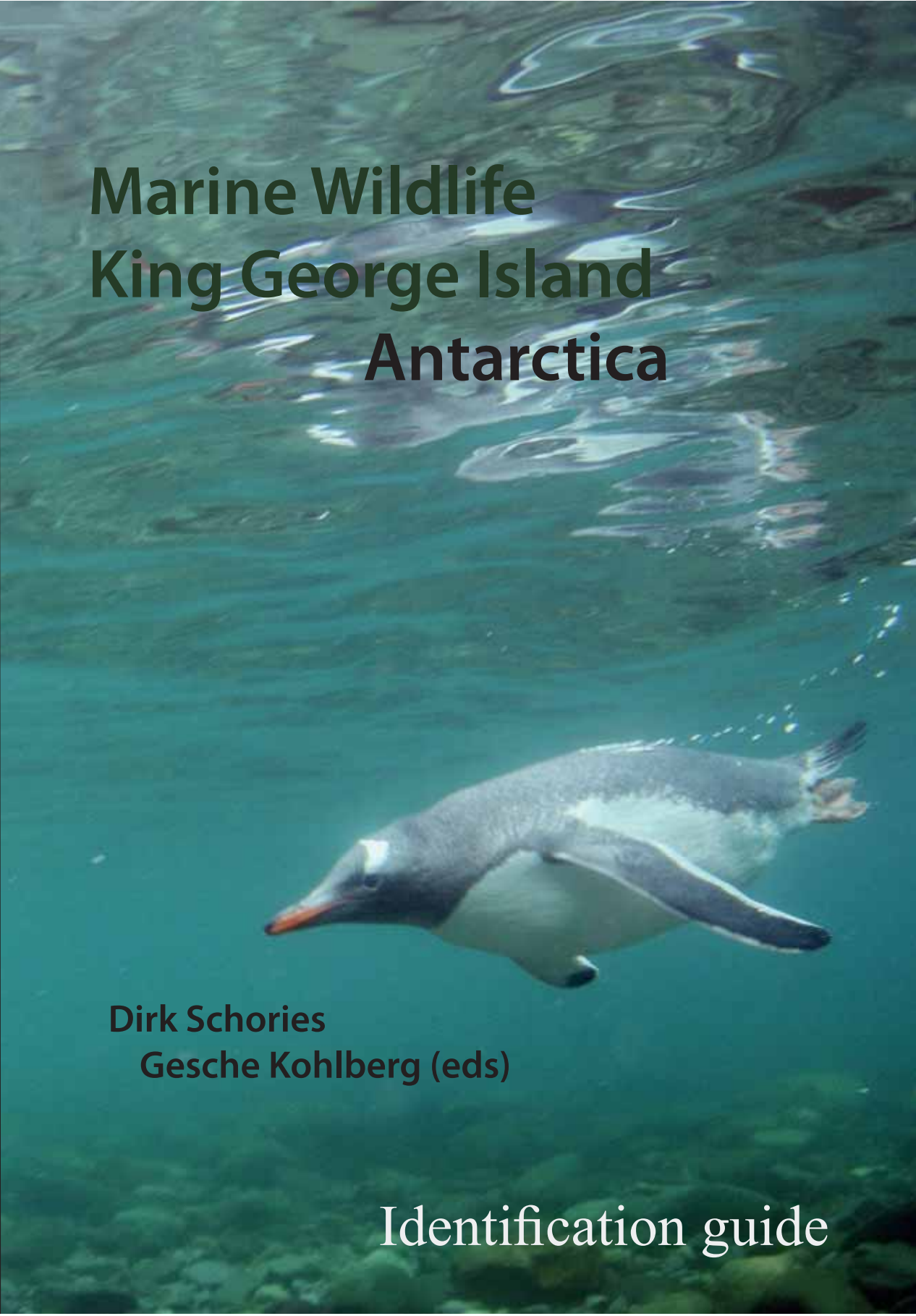
Marine Wildlife King George Island Antarctica



Dirk Schories
Gesche Kohlberg (eds)

Identification guide

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MARINE WILDLIFE KING GEORGE ISLAND ANTARCTICA

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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

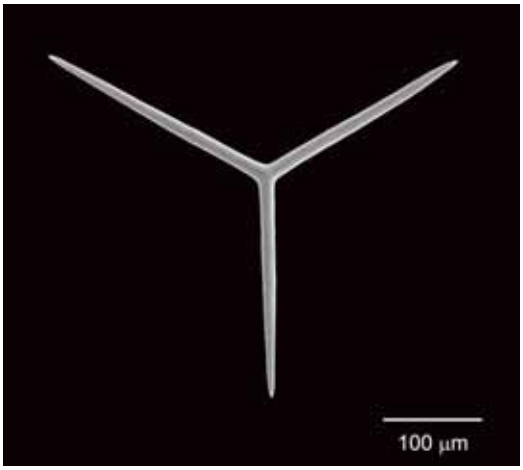
Worldwide 650 calcareous sponges are known [84], over 50 of them reported from the Antarctic Ocean [67]. The class occurs from warm tropical waters to the polar regions, and from shallow waters to the deep sea. Species of Calcarea are often small and devoid of the bright colours commonly seen among the 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

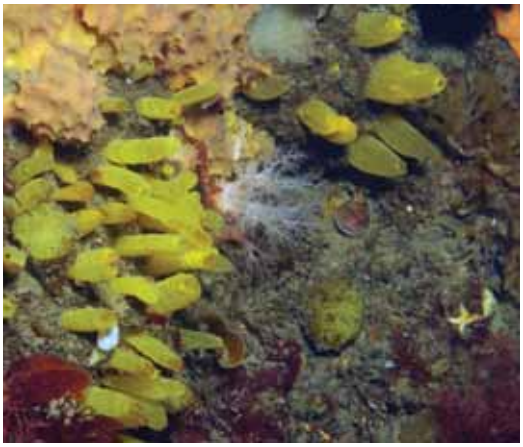

Dendrilla antarctica

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.

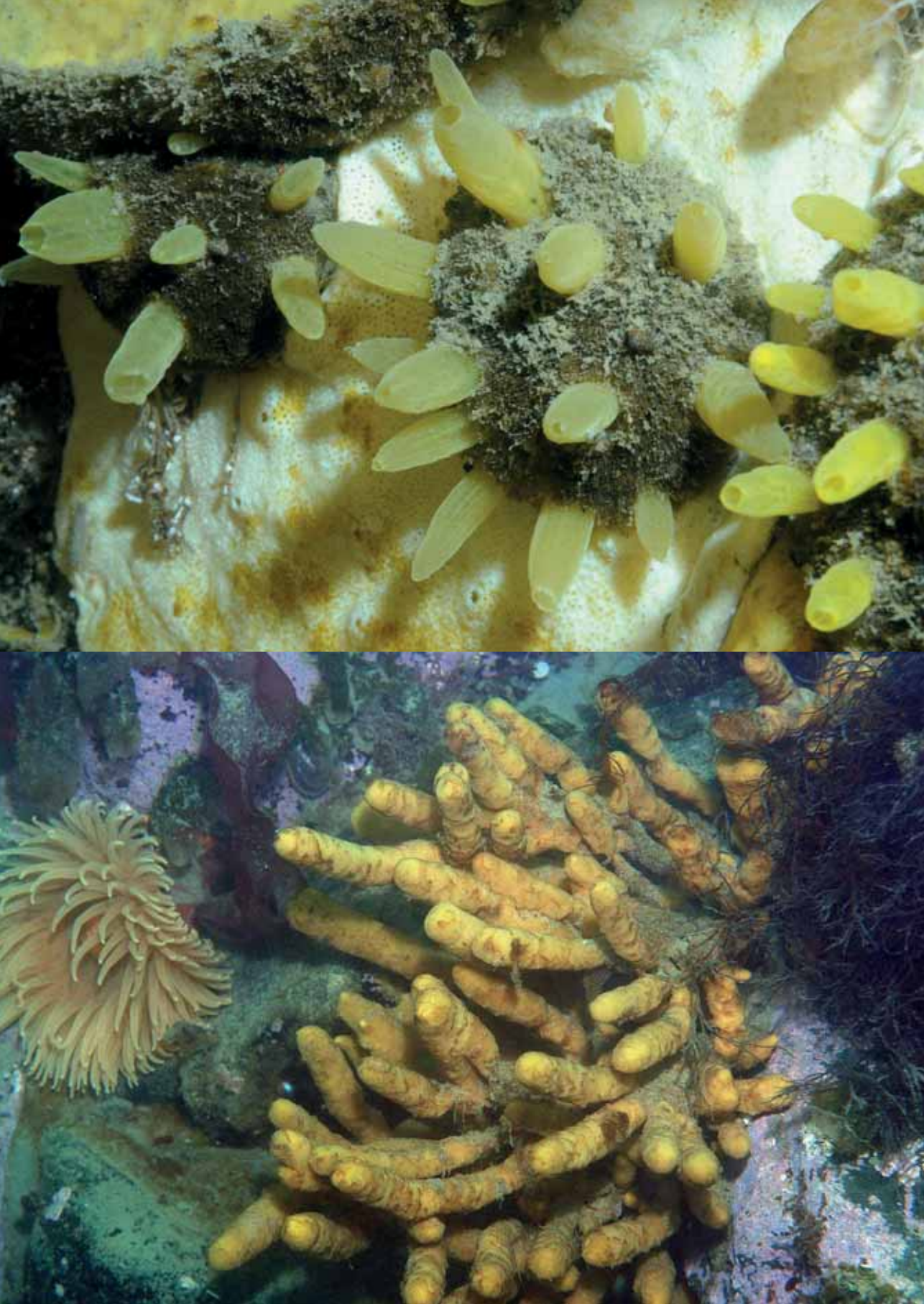
Museum Voucher: MNRJ 13813, 13831



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.

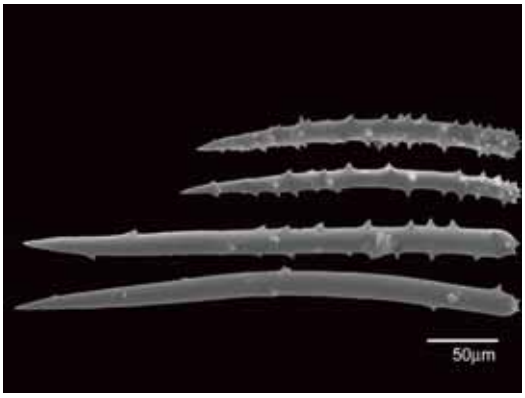
Museum Voucher: MNRJ 13808, 13816, 13836, 13844, 13850, 14839, 16274

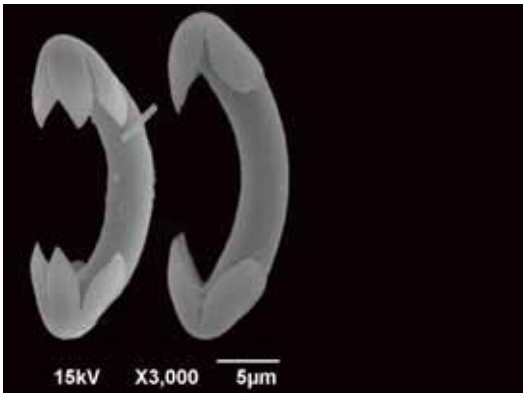
Phorbas cf. domini

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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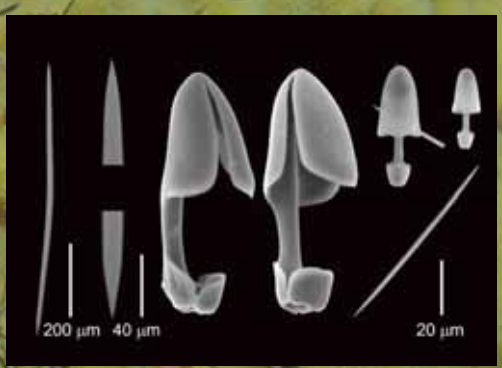
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Isodictya erinacea (Topsent, 1916)

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.

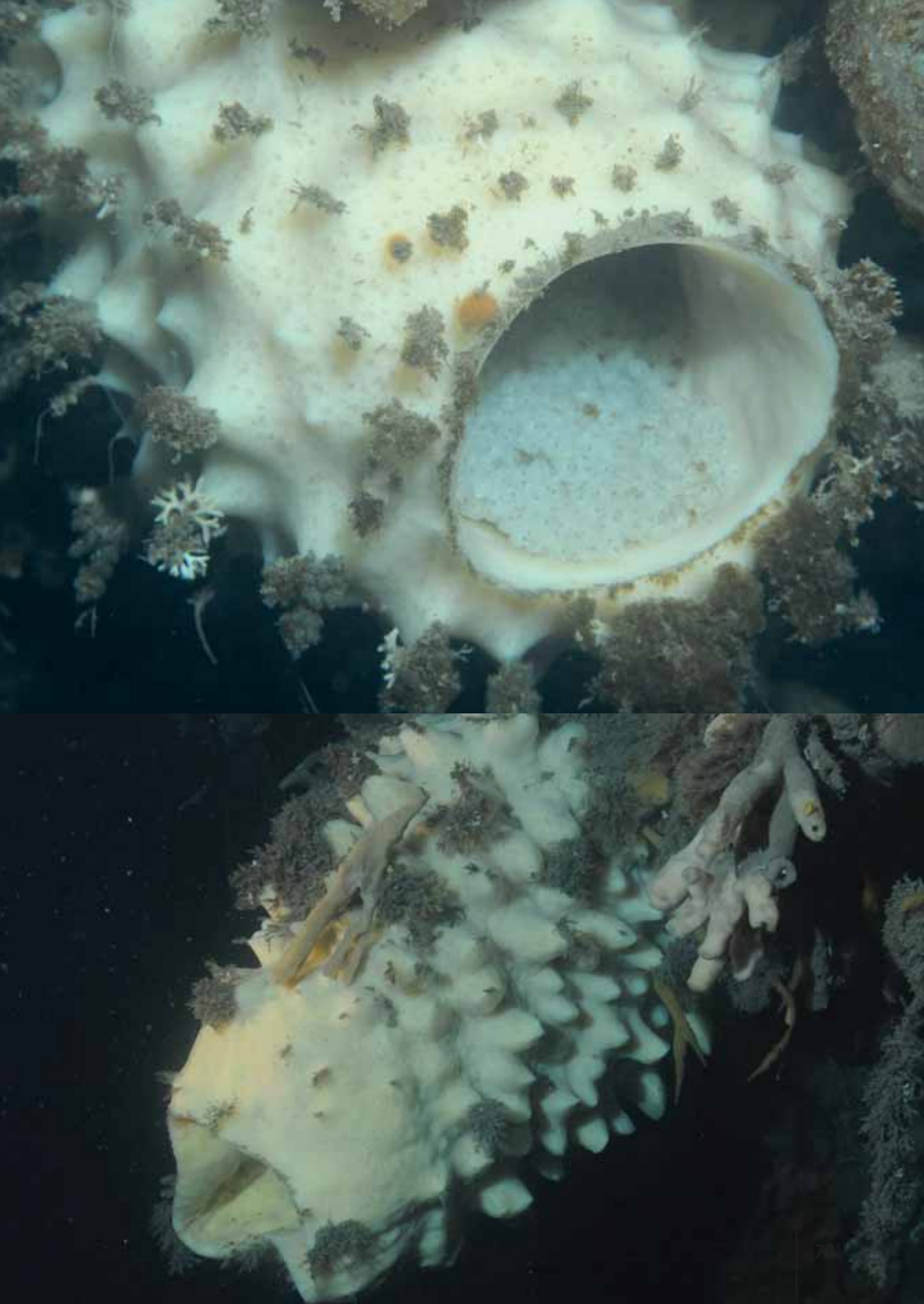
Museum Voucher: MNRJ 13827

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



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