Underwater Field Guide to Ross Island & McMurdo Sound, Antarctica, Volume 5: Arthropoda

Technical Report · May 2022

DOI: 10.13140/RG.2.2.35469.82405

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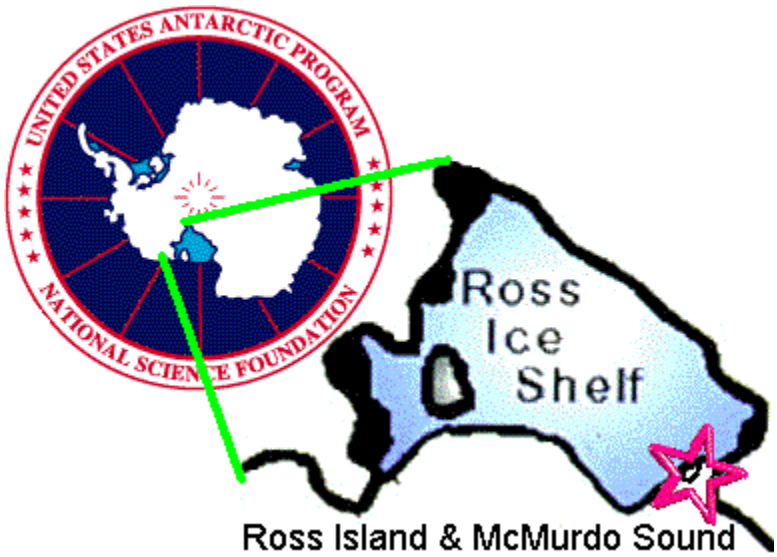
UNDERWATER FIELD GUIDE TO ROSS ISLAND & MCMURDO SOUND, ANTARCTICA, VOLUME 5: ARTHROPODA

sea spiders, amphipods, isopods, copepods, krill, ostracods, mysids, tanaids, barnacles, shrimp

Peter Brueggeman

Photographs: Steve Alexander, Peter Brueggeman, Canadian Museum of Nature (Kathleen Conlan), Paul Cziko, Shawn Harper, Uwe Kils, Adam G Marsh, Jim Mastro, Bruce A Miller, Rob Robbins, Steve Rupp/NSF, & M Dale Stokes, & Norbert Wu



The National Science Foundation's Office of Polar Programs sponsored Norbert Wu on an Artist's and Writer's Grant project, in which Peter Brueggeman participated. One outcome from Wu's endeavor is this Field Guide, which builds upon principal photography by Norbert Wu, with photos from other photographers, who are credited on their photographs and above. This Field Guide is intended to facilitate underwater/topside field identification from visual characters, and there can be some uncertainty in identifications solely from photographs.

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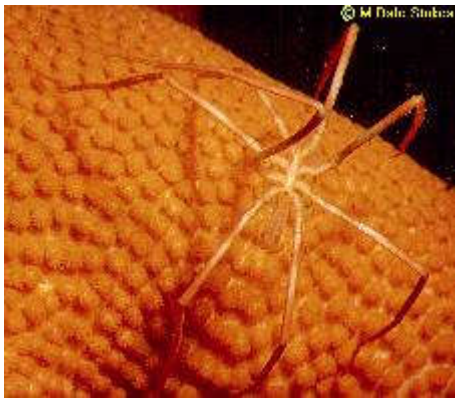

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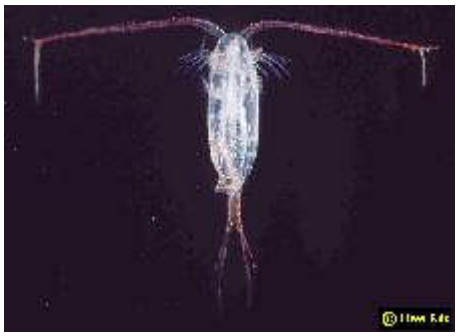

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C. Allen Child identified sea spider photos, except for the Canadian Museum of Nature photos which were identified by Roger Bamber.
November 2021: taxonomic names checked in Zoological Record and World Register of Marine Species

sea spider *Achelia* sp.

Here are *Achelia* sp. clinging to the nephtheid soft coral *Gersemia antarctica*.

Adult *Achelia* pycnogonids are small, spending their lives clinging to the substrate on which they feed [1]. The protonymphon stage of *Achelia* may be passed in the tissues of the organism on which juveniles and adults feed [1].

Achelia species are found worldwide with almost half found around the perimeter of the Pacific Ocean [3].

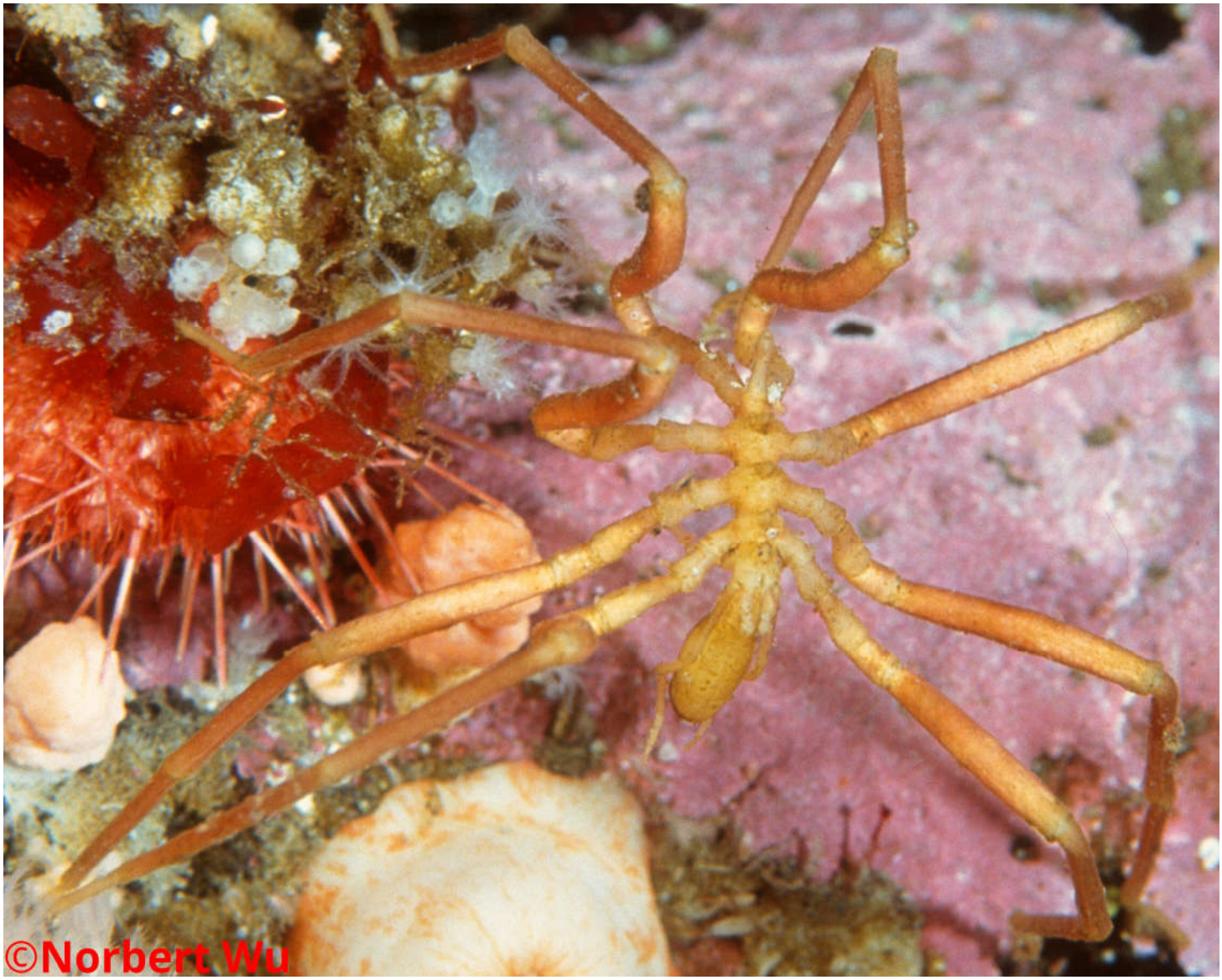
Antarctic and subantarctic sea spiders comprise 251 species, representing 21.5% of worldwide species, with 101 species endemic to Antarctica and 60 endemic to subantarctic areas [4].

Sea spiders are also called pycnogonids. Sea spiders are exclusively marine and mostly bottom dwelling (benthic) [3]. Adult sea spiders either suck the juices from soft-bodied invertebrates or browse on hydroids and bryozoans. Male sea spiders carry cemented egg clutches gathered from females until hatching and often after hatching in the larval stages [3]. Since sea spider larvae are not planktonic, sea spider dispersal is slow and intermittent leading to the development of many endemic species among shallow-water sea spiders [3].

Taxonomic Note: *Achelia* species need taxonomic re-arrangement [2].

References: 1: Fauna of the Ross Sea, Part 7. Pycnogonida, 1. Colossendeidae, Pycnogonidae, Endeidae, Ammotheidae. WG Fry & JW Hedgpeth. New Zealand Department of Scientific and Industrial Research Bulletin 198. New Zealand Oceanographic Institute Memoir 49. 1969; **2:** Antarctic and Subantarctic Pycnogonida : Ammotheidae and Austrodecidae. CA Child. Antarctic Research Series Volume 63, Biology of the Antarctic Seas 23. Washington DC : American Geophysical Union, 1994; **3:** Marine Fauna of New Zealand: Pycnogonida (Sea Spiders). CA Child. Wellington : National Institute of Water and Atmospheric Research, 1998. NIWA Biodiversity Memoir 109; **4:** Polar Biology 24:941-945, 2001; **5:** European Journal of Taxonomy 286:1-33, 2017

sea spider *Ammothea clausi*



Ammothea clausi is found in Antarctica and the Antarctic Peninsula, Peter I Island, South Shetland Islands, South Orkney Islands, South Sandwich Islands, and South Georgia Island at depths from 3 to 860 meters [1,2,7,8,9].

A closer view of the *Ammothea clausi* sea spider above.

Ammothea clausi is small for its genus with a leg span of five centimeters for males and nine centimeters for large females, and a trunk up to six millimeters long [1].

Ammothea clausi has two morphs which are almost separated geographically:

- Magellanic: erect abdomen, longer ocular tubercle;
- Victoria Land: almost horizontal abdomen, ocular tubercle about half as tall as Magellanic [1,9].

Forms have been collected in the western Ross Sea, Weddell Sea, and South Shetland Islands which are intermediate between the two morphs [1,9,10]. *Ammothea clausi* appears similar in appearance to *Ammothea minor*, but the proboscis on *Ammothea minor* is longer and wider, and *Ammothea clausi* has a pencil-like abdomen [4].

Ammothea species are found predominantly in Antarctic and subantarctic regions (19 of 31 known species); seven other species are known from the southern hemisphere and only five from the northern hemisphere [3]. Antarctic and subantarctic sea spiders comprise 251 species, representing 21.5% of worldwide species, with 101 species endemic to Antarctica and 60 endemic to subantarctic areas [6].

Sea spiders are also called pycnogonids. Sea spiders are exclusively marine and mostly bottom dwelling (benthic) [3]. Adult sea spiders either suck the juices from soft-bodied invertebrates or browse on hydroids and bryozoans. Male sea spiders carry cemented egg clutches gathered from females until hatching and often after hatching in the larval stages [3]. Since sea spider larvae are not planktonic, sea spider dispersal is slow and intermittent leading to the development of many endemic species among shallow-water sea spiders [3].

Ammothea clausi appears to be eating the soft coral *Clavularia frankliniana*.

A closer view of the *Ammothea clausi* sea spider above

Ammothea clausi appears to be climbing over or mating with another of the same species; without seeing them move, it is difficult to tell in a photo what they are doing when entwined [4]. The male finds a female with eggs, climbs under or over, and extrudes sperm from each of his leg vents (under one of the short joints near the trunk) as she extrudes eggs from similar vents in the same place [5]. In some sea spider genera, the eggs are relatively large and the female pops out only 4-5; in other genera, the eggs are not as wide as the smallest leg segment and the female puts out sometimes more than 100 eggs [5]. Sometimes males collect balls of eggs (they supply the binding cement) from 5-7 different females and walk with them carried under their body [5].

References: 1: Antarctic and Subantarctic Pycnogonida : Ammotheidae and Austrodecidae. CA Child. Antarctic Research Series Volume 63, Biology of the Antarctic Seas 23. Washington DC : American Geophysical Union, 1994; **2:** US National Museum Polar Invertebrate Catalog, Smithsonian Institution http://invertebrates.si.edu/; **3:** Marine Fauna of New Zealand: Pycnogonida (Sea Spiders). CA Child. Wellington : National Institute of Water and Atmospheric Research, 1998. NIWA Biodiversity Memoir 109; **4:** C Allan Child, personal communication, 2002; **5:** C Allan Child, personal communication, 2000; **6:** Polar Biology 24:941-945, 2001; **7:** Antarctic Science 13(2):144-149, 2001; **8:** Antarctic Science 21(2):99-111, 2009; **9:** Helgoland Marine Research 68(1):155-168, 2014; **10:** Marine Biology Research 14(8):769-777, 2018

sea spider *Ammothea* sp., probably *A. carolinensis*

Ammothea carolinensis is found throughout Antarctica and the Antarctic Peninsula, Peter I Island, South Shetland Islands, South Orkney Islands, South Georgia Island, and Bouvet Island from depths of 3 to 670 meters [1,2,3,6,7,8,9]. *Ammothea carolinensis* has a leg span about fourteen centimeters for males and eighteen centimeters for females [1].

Ammothea carolinensis is the most common Antarctic species of its genus [1,9]. *Ammothea* species are found predominantly in Antarctic and subantarctic regions (19 of 31 known species); seven other species are known from the southern hemisphere and only five from the northern hemisphere [4]. Antarctic and subantarctic sea spiders comprise 251 species, representing 21.5% of worldwide species, with 101 species endemic to Antarctica and 60 endemic to subantarctic areas [5].

Sea spiders are exclusively marine and mostly bottom dwelling (benthic) [4]. Adult sea spiders either suck the juices from soft-bodied invertebrates or browse on hydroids and bryozoans. Male sea spiders carry cemented egg clutches gathered from females until hatching and often after hatching in the larval stages [4]. Since sea spider larvae are not planktonic, sea spider dispersal is slow and intermittent leading to the development of many endemic species among shallow-water sea spiders [4].

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sea spider *Colossendeis australis*

Colossendeis australis is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Sandwich Islands, South Georgia Island, Falkland Islands, Kerguelen Island, New Zealand, and Southeast Pacific and Southwest Atlantic Basins off Chile and Argentina from depths of 15 to 3,935 meters [1,2,3,4,7,8,9].

Colossendeis australis has relatively short propodal claws and a leg span about 25 centimeters [1,4]. The *Colossendeis* sea spiders are mostly giant deep-sea species though some Antarctic species live in shallow depths [1,4]. The *Colossendeis* sea spiders are the largest sea spiders with some having leg spans as wide as fifty centimeters and trunks of five centimeters or more [1,4].

The large downcurved proboscis is characteristic of *Colossendeis australis*; there is one other species with such a bulbous curved proboscis, but its proboscis is longer and has almost a lip on its dorsal surface [1,5].

Antarctic and subantarctic sea spiders comprise 251 species, representing 21.5% of worldwide species, with 101 species endemic to Antarctica and 60 endemic to subantarctic areas [6]. Sea spiders are also called pycnogonids. Sea spiders are exclusively marine and mostly bottom dwelling (benthic) [4]. Adult sea spiders either suck the juices from soft-bodied invertebrates or browse on hydroids and bryozoans. Male sea spiders carry cemented egg clutches gathered from females until hatching and often after hatching in the larval stages [4]. Since sea spider larvae are not planktonic, sea spider dispersal is slow and intermittent leading to the development of many endemic species among shallow-water sea spiders [4].

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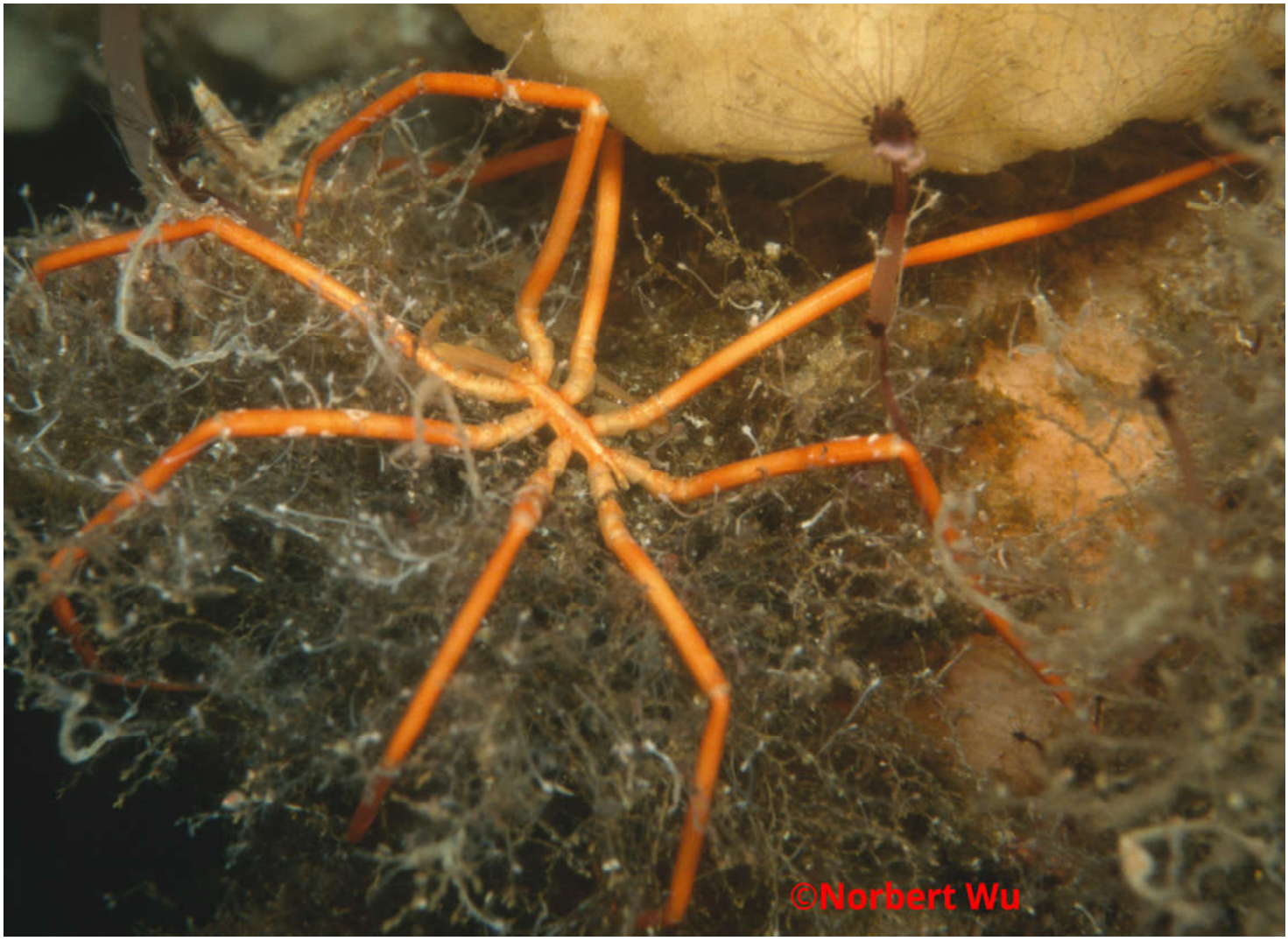
sea spider *Colossendeis drakei*



Colossendeis drakei is found in Antarctica and the South Shetland Islands, South Sandwich Islands, South Georgia Island, Falkland Islands, and off Tasmania from depths of 3 to 3,000 meters [1,5,6].

The *Colossendeis* sea spiders are mostly giant deep-sea species though some Antarctic species live in shallow depths [1,2]. The *Colossendeis* sea spiders are the largest sea spiders with some having leg spans as wide as fifty centimeters and trunks of five centimeters or more [1,2].

Colossendeis drakei is one of only two Antarctic species with its proboscis shorter or equal to the length of its trunk [1]. The very short proboscis of *Colossendeis drakei* is rare, and the only similar species is *Colossendeis hoeki*, which has other character differences [3].

Antarctic and subantarctic sea spiders comprise 251 species, representing 21.5% of worldwide species, with 101 species endemic to Antarctica and 60 endemic to subantarctic areas [4]. Sea spiders are also called pycnogonids. Sea spiders are exclusively marine and mostly bottom dwelling (benthic) [2]. Adult sea spiders either suck the juices from soft-bodied invertebrates or browse on hydroids and bryozoans. Male sea spiders carry cemented egg clutches gathered from females until hatching and often after hatching in the larval stages [2]. Since sea spider larvae are not planktonic, sea spider dispersal is slow and intermittent leading to the development of many endemic species among shallow-water sea spiders [2].

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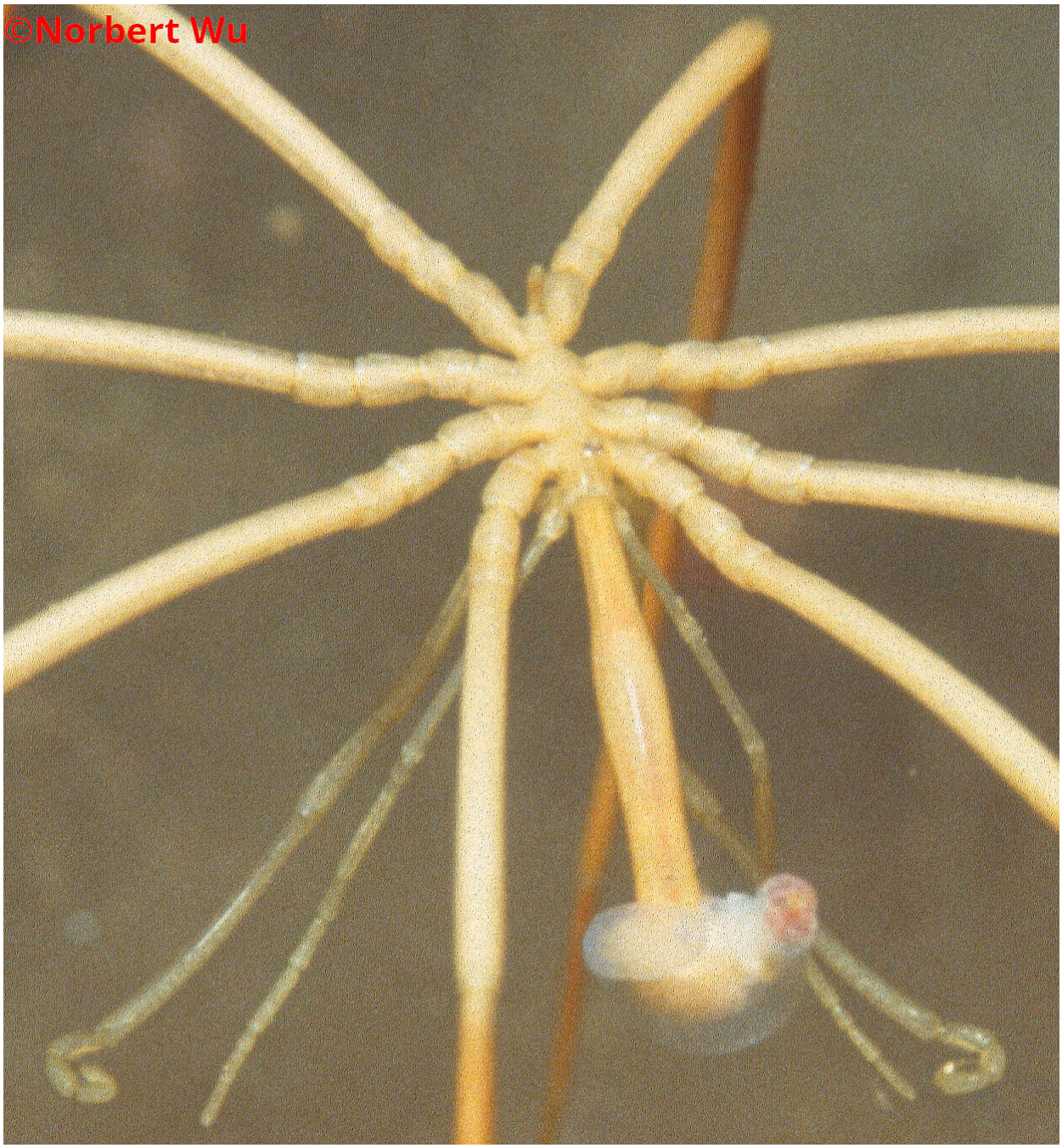
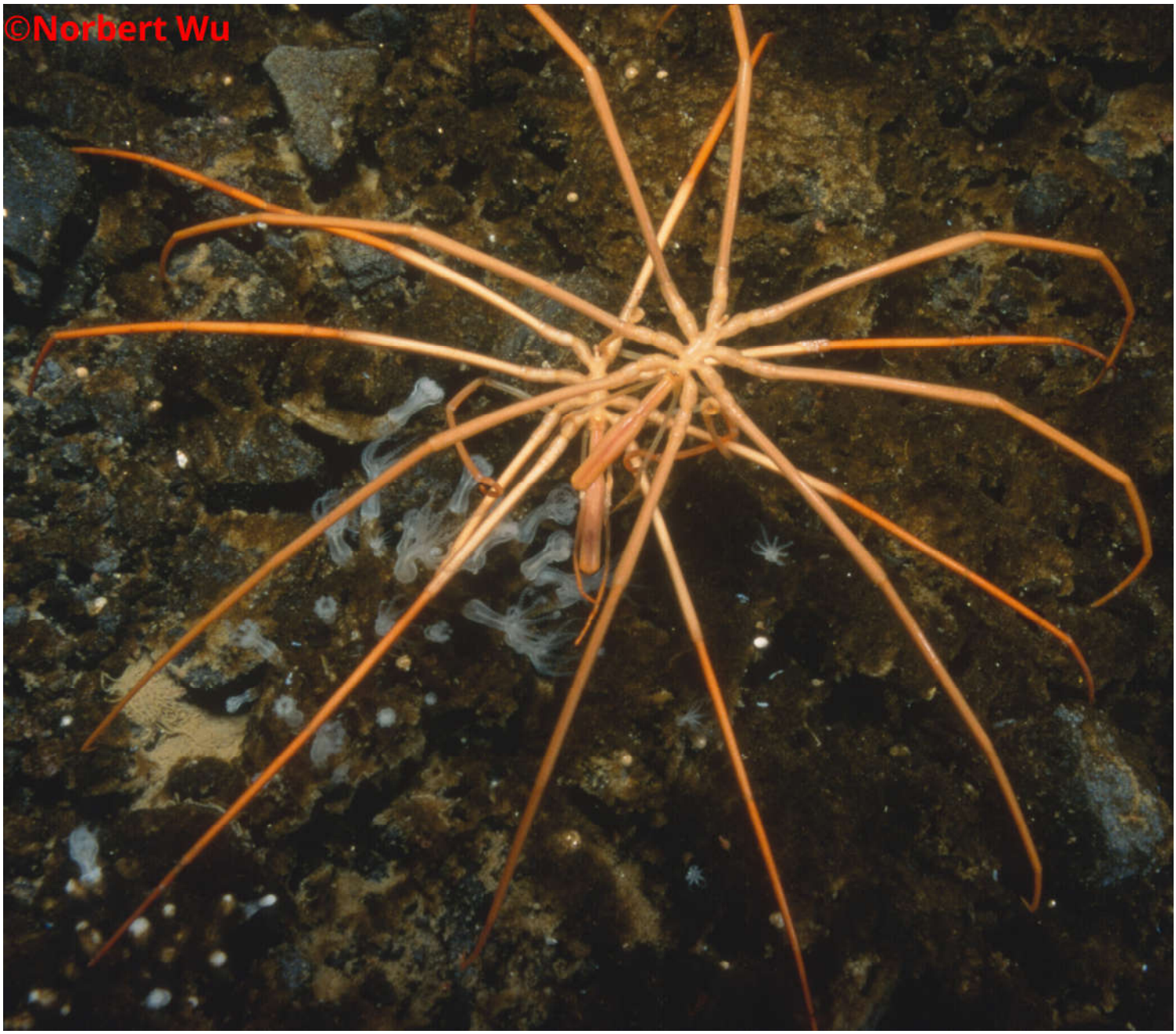
sea spider *Colossendeis megalonyx*

Colossendeis megalonyx is found throughout Antarctica and the South Shetland Islands, South Georgia Island, Antipodes Islands off New Zealand, Peter I Island, Marion and Prince Edward Islands, South Africa, southern Madagascar, South America, New Zealand, and the South Atlantic from depths of 3 to 4,900 meters [1,5,6,7,9,10,12].

Colossendeis megalonyx is shown here walking over an anchor ice formation with possibly some food in its mouth. *Colossendeis megalonyx* eats the soft corals *Alcyonium antarcticum* and *Clavularia frankliniana*, small hydroids on sponges, and pelagic invertebrates, including the gastropod *Clione antarctica*, jellyfish, and ctenophores like *Beroe cucumis* [2,3,4,11].



Colossendeis megalonyx is the most common of its genus in Antarctic waters [1]. *Colossendeis megalonyx* has a long proboscis, short eighth palp segment in relation to the two longer distal segments, and long slender legs bearing a tarsus longer than the propodus and a long slender claw [1]. Legs vary in length; the femur can be the longest segment or the first tibia can be longest [1].



Two *Colossendeis megalonyx* crossing paths.

Colossendeis sea spiders are mostly giant deep-sea species though some Antarctic species live in shallow depths [1,7]. The *Colossendeis* sea spiders are the largest sea spiders with some having leg spans as wide as fifty centimeters and trunks of five centimeters or more [1,7]. Antarctic and subantarctic sea spiders comprise 251 species, representing 21.5% of worldwide species, with 101 species endemic to Antarctica and 60 endemic to subantarctic areas [8]. *Colossendeis* sea spiders are opportunistic predators and scavengers on benthic and pelagic organisms, consuming many different food types and sizes [11].

Sea spiders are also called pycnogonids and sometimes whip scorpions. Sea spiders are exclusively marine and mostly bottom dwelling (benthic) [7]. Adult sea spiders either suck the juices from soft-bodied invertebrates or browse on hydroids and bryozoans.

The same two *Colossendeis megalonyx* sea spiders in closer view.

Male sea spiders carry cemented egg clutches gathered from females until hatching and often after hatching in the larval stages [7].

Since sea spider larvae are not planktonic, sea spider dispersal is slow and intermittent leading to the development of many endemic species among shallow-water sea spiders [7].

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sea spider *Colossendeis wilsoni*

Colossendeis wilsoni is found in Antarctica and the South Shetland Islands from depths of 36 to 801 meters [1,2,3,6,7]. *Colossendeis wilsoni* is small and compact, with short legs and short proboscis compared with many other Antarctic species [1].

The *Colossendeis* sea spiders are mostly giant deep-sea species though some Antarctic species live in shallow depths [1,4]. The *Colossendeis* sea spiders are the largest sea spiders with some having leg spans as wide as fifty centimeters and trunks of five centimeters or more [1,4].

Antarctic and subantarctic sea spiders comprise 251 species, representing 21.5% of worldwide species, with 101 species endemic to Antarctica and 60 endemic to subantarctic areas [5]. Sea spiders are also called pycnogonids. Sea spiders are exclusively marine and mostly bottom dwelling (benthic) [4]. Adult sea spiders either suck the juices from soft-bodied invertebrates or browse on hydroids and bryozoans. Male sea spiders carry cemented egg clutches gathered from females until hatching and often after hatching in the larval stages [4]. Since sea spider larvae are not planktonic, sea spider dispersal is slow and intermittent leading to the development of many endemic species among shallow-water sea spiders [4].

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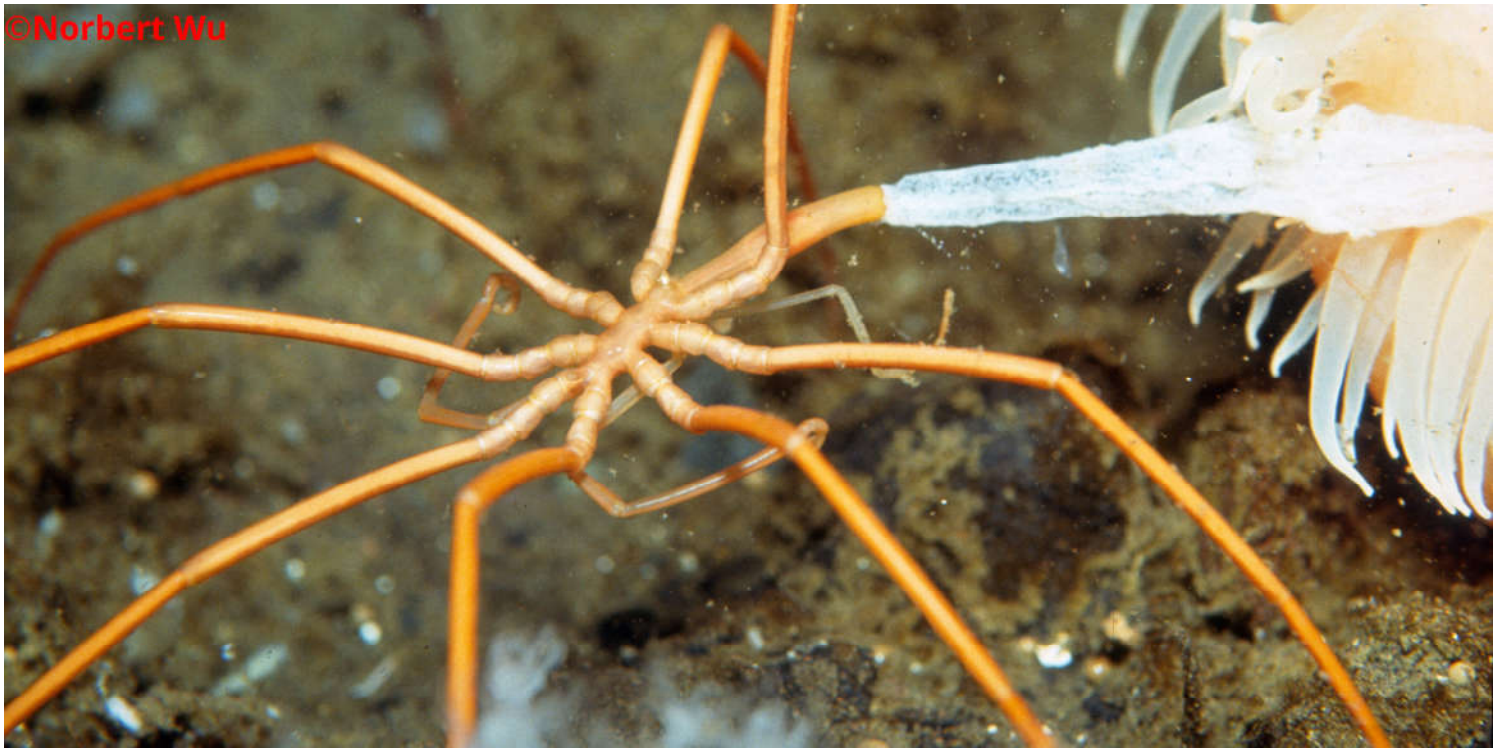
sea spider *Colossendeis* sp.

Antarctic *Colossendeis* species are identified by several characters that are hard to see in distant photos [1]. Adult sea spiders either suck the juices from soft-bodied invertebrates like these *Colossendeis* sp. sea spiders are doing with a jellyfish and an anemone, or browse on hydroids and bryozoans.

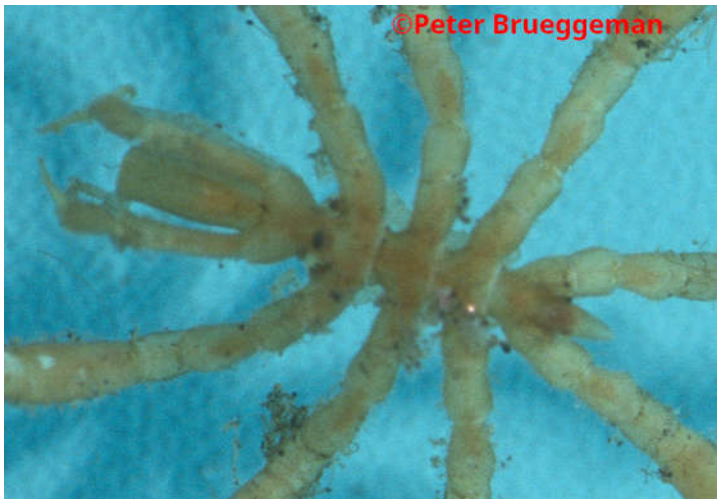


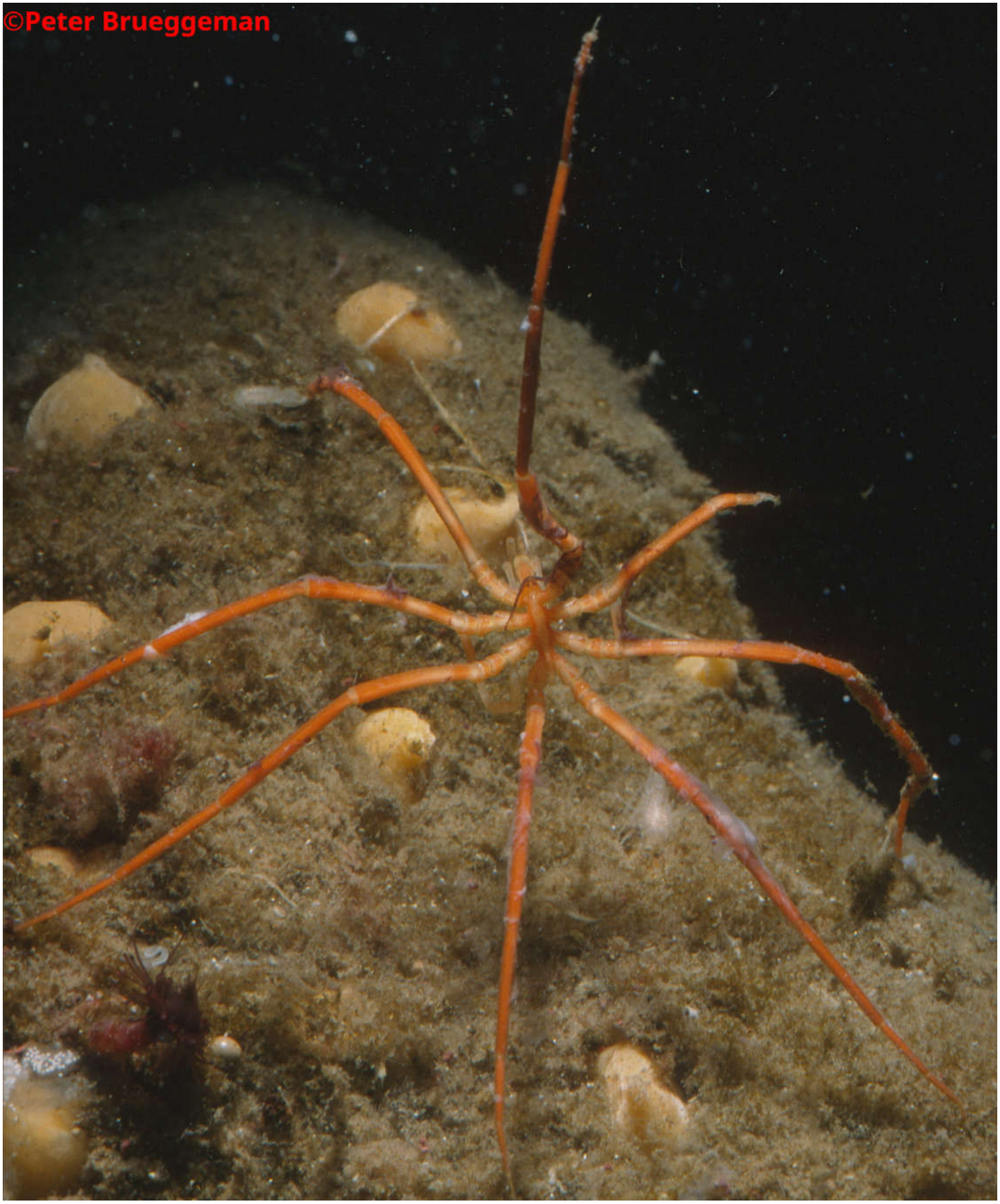
References: 1: C Allan Child, personal communication, 2000

sea spider *Nymphon australe*

Nymphon australe is found throughout Antarctica and Peter I Island, South Shetland Islands, South Sandwich Islands, Cook Strait in New Zealand, Falkland Islands, Bouvet Island, Argentina, Chile, and southern Indian Ocean at depths from 8 to 4,136 meters [1,2,3,4,6,7,8].

Nymphon australe has a robust trunk with a short neck; its eight legs span up to three centimeters, and usually have long or short spines in rows [1,4].





Nymphon australe is the most common and most often collected pycnogonid species in Antarctic and subantarctic waters [1,4,5,6]. There is a wide range of variations among specimens in this species [4].

Nymphon australe

The genus *Nymphon* has more species in Antarctic and subantarctic waters then in other bodies of water of similar size; they occur in a large diversity of species and are collected in great numbers [1,4]. The *Nymphon* genus has two character groupings -- *Australe* and *Hamatum*; the remaining species of *Nymphon* are unrelated by character groups [1]. *Nymphon* sp. have eight legs with the ocular tubercle toward the posterior of the cephalic segment [1].

Nymphon australe

Antarctic and subantarctic sea spiders comprise 251 species, representing 21.5% of worldwide species, with 101 species endemic to Antarctica and 60 endemic to subantarctic areas [5].

Nymphon australe

Sea spiders are exclusively marine and mostly bottom dwelling (benthic) [4]. Adult sea spiders either suck the juices from soft-bodied invertebrates or browse on hydroids and bryozoans. Male sea spiders carry cemented egg clutches gathered from females until hatching and often after hatching in the larval stages [4]. Since sea spider larvae are not planktonic, sea spider dispersal is slow and intermittent leading to the development of many endemic species among shallow-water sea spiders [4].

1: Antarctic and Subantarctic Pycnogonida : Nymphonidae, Colossendeidae, Rhynchothoraxidae, Pycnogonidae, Endeididae, and Callipallenidae. CA Child Antarctic Research Series Volume 69, Biology of the Antarctic Seas 24. Washington DC : American Geophysical Union, 1995; **2:** US National Museum Polar Invertebrate Catalog, Smithsonian Institution http://invertebrates.si.edu/; **3:** Tethys Supplement 4:135-156, 1972; **4:** Marine Fauna of New Zealand: Pycnogonida (Sea Spiders). CA Child. Wellington : National Institute of Water and Atmospheric Research, 1998. NIWA Biodiversity Memoir 109; **5:** Polar Biology 24:941-945, 2001; **6:** Antarctic Science 13(2):144-149, 2001; **7:** Polar Biology 29(2):83-96, 2006; **8:** Antarctic Science 21(2):99-111, 2009

sea spider, possibly *Pallenopsis* sp. or *Ammothea clausi*

Several species of *Pallenopsis* sea spiders have been collected in the Ross Sea [1,4,5].

Antarctic and subantarctic sea spiders comprise 251 species, representing 21.5% of worldwide species, with 101 species endemic to Antarctica and 60 endemic to subantarctic areas [3]. Sea spiders are also called pycnogonids. Sea spiders are exclusively marine and mostly bottom dwelling (benthic) [2]. Adult sea spiders either suck the juices from soft-bodied invertebrates or browse on hydroids and bryozoans. Male sea spiders carry cemented egg clutches gathered from females until hatching and often after hatching in the larval stages [2]. Since sea spider larvae are not planktonic, sea spider dispersal is slow and intermittent leading to the development of many endemic species among shallow-water sea spiders [2].

References: 1: Antarctic and Subantarctic Pycnogonida : Nymphonidae, Colossendeidae, Rhynchothoraxidae, Pycnogonidae, Endeididae, and Callipallenidae. CA Child Antarctic Research Series Volume 69, Biology of the Antarctic Seas 24. Washington DC : American Geophysical Union, 1995; **2:** Marine Fauna of New Zealand: Pycnogonida (Sea Spiders). CA Child. Wellington : National Institute of Water and Atmospheric Research, 1998. NIWA Biodiversity Memoir 109; **3:** Polar Biology 24:941-945, 2001; **4:** Antarctic Science 21(2):99-111, 2009; **5:** Polar Biology 39:677-688, 2016

sea spider *Pentanymphon antarcticum*

Pentanymphon antarcticum is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, and New Zealand from depths of 3 to 3,227 meters [1,2,3,4,6,8]. *Pentanymphon antarcticum* has similar characters as with *Nymphon* but with five pairs of legs instead of four [1,4]. *Pentanymphon antarcticum* is a common Antarctic species and is the only species in its genus [1]. One predator of *Pentanymphon antarcticum* is the fish *Trematomus bernacchii* [7]. .

Sea spiders are also called pycnogonids and sometimes whip scorpions. Sea spiders are exclusively marine and mostly bottom dwelling (benthic) [4]. Adult sea spiders either suck the juices from soft-bodied invertebrates or browse on hydroids and bryozoans. Male sea spiders carry cemented egg clutches gathered from females until hatching and often after hatching in the larval stages [4]. Since sea spider larvae are not planktonic, sea spider dispersal is slow and intermittent leading to the development of many endemic species among shallow-water sea spiders [4]. Antarctic and subantarctic sea spiders comprise 251 species, representing 21.5% of worldwide species, with 101 species endemic to Antarctica and 60 endemic to subantarctic areas [5]

References: 1: Antarctic and Subantarctic Pycnogonida : Nymphonidae, Colossendeidae, Rhynchothoraxidae, Pycnogonidae, Endeididae, and Callipallenidae. CA Child Antarctic Research Series Volume 69, Biology of the Antarctic Seas 24. Washington DC : American Geophysical Union, 1995; **2:** US National US National Museum Polar Invertebrate Catalog, Smithsonian Institution http://invertebrates.si.edu/; **3:** Tethys Supplement 4:135-156, 1972; **4:** Marine Fauna of New Zealand: Pycnogonida (Sea Spiders). CA Child. Wellington : National Institute of Water and Atmospheric Research, 1998. NIWA Biodiversity Memoir 109; **5:** Polar Biology 24:941-945, 2001; **6:** Antarctic Science 13(2):144-149, 2001; **7:** Polar Biology 27(11):721- 728, 2004; **8:** Antarctic Science 21(2):99-111, 2009

corophiid amphipod *Haplocheira plumosa*

Haplocheira plumosa is found in Antarctica and the Antarctic Peninsula, South Orkney Islands, South Georgia Island, and Kerguelen Island at depths from 0 to 250 meters [1].

Haplocheira plumosa is a filter-feeder and has been collected up to nine millimeters in length [1].

Antarctic benthic amphipod predators include fish and squid [3].

Among malacostracan crustaceans, amphipods are the most abundant and diverse group in benthic Antarctica [2].

References: 1: Zoological Journal of the Linnean Society 79(2):179-221, 1983; **2:** Polar Biology 11(1):73-79, 1990; **3:** Checklist of the Amphipods of the Sothern Ocean. C. De Broyer, K. Jazdzewski. ANT'PHIPODA www.natuurwetenschappen.be/amphi/

epimeriid amphipod *Epimeria (Drakepimeria)* sp.

Epimeria (Drakepimeria) species are differentiated by anatomical features not sufficiently evident in this photo [6]. *Epimeria* species are found throughout Antarctica [4]. Most *Epimeria* species have characteristic dorsal outgrowths on their bodies, though a few are smooth [3]. The body of many *Epimeria* species have protrusions, crests or teeth, which might function as disruptive camouflage, wherein their protrusions in combination with variegated coloration makes them blend into rocky habitat covered in flora and fauna [6].

The stomach contents of one species of *Epimeria* had 42% organic matter including 10% holothurian matter [1]. Some *Epimeria* species have been observed as ambush predators, sensing food or prey with their antennae and then grasping it [1,2]. With live, swimming zooplankton prey, one *Epimeria* species moves its first pair of antennae back and forth, creating a current to bring the prey closer to grasp [1].

Predators of Antarctic benthic amphipods include fish and squid [5]. Among malacostracan crustaceans, amphipods are the most abundant and diverse group in benthic Antarctica [1].

Taxonomic Note: Antarctic *Epimeria* species were distributed into subgenera in 2017 [6].

References: 1: Polar Biology 11(1):73-79, 1990; **2:** Antarctic Science 3(2):159-166, 1991; **3:** Journal of Natural History 28(3):555-576, 1994; **4:** Catalogue of the Marine Gammaridean Amphipoda of the Southern Ocean. JK Lowry, S Bullock. Wellington : Royal Society of New Zealand, 1976. Royal Society of New Zealand Bulletin 16; **5:** Checklist of the Amphipods of the Sothern Ocean. C. De Broyer, K. Jazdzewski. ANT'PHIPODA www.natuurwetenschappen.be/amphi/; **6:** European Journal of Taxonomy 359:1-553, 2017

epimeriid amphipod *Epimeria* (*Hoplepimeria*) *robusta*

Epimeria (*Hoplepimeria*) *robusta* occurs on the Adelie Coast to the western Ross Sea, and has been collected at 85 to 814 meters depth, and observed at scuba diving depths [5,7,8,9].

Some *Epimeria* species have been observed as ambush predators, sensing food or prey with their antennae and then grasping it [1,2]. With live, swimming zooplankton prey, one *Epimeria* species moves its first pair of antennae back and forth, creating a current to bring the prey closer to grasp [1].

A Weddell Sea species very similar to *Epimeria* (*Hoplepimeria*) *robusta* is an opportunistic predator, with its stomach contents including sedimenting plankton, sponges, cnidarians, polychaete worms, crustaceans, and holothurians [4].

Antarctic benthic amphipod predators include fish and squid [6].

Here a juvenile *Epimeria* (*Hoplepimeria*) *robusta* is perched on the back of its parent; clusters of juveniles have been observed riding piggy-backed on adults [5].

Here are several juvenile *Epimeria* (*Hoplepimeria*) *robusta* clustered on the bush sponge *Homaxinella balfourensis*.

A few *Epimeria* species are smooth dorsally as *Epimeria* (*Hoplepimeria*) *robusta* shown here, but most species have characteristic dorsal outgrowths [3]. *Epimeria* species are found throughout Antarctica [7]. Among malacostracan crustaceans, amphipods are the most abundant and diverse group in benthic Antarctica [1].

Taxonomic Note: *Epimeria robusta* formerly reported in the Weddell Sea were assigned to a new species *robustoides* [7,9]. Antarctic *Epimeria* species were distributed into subgenera in 2017 [9].

References: 1: Polar Biology 11(1):73-79, 1990; **2:** Antarctic Science 3(2):159- 166, 1991; **3:** Journal of Natural History 28(3):555-576, 1994; **4:** Polar Biology 24:657-662, 2001; **5:** Christian McDonald, personal communication, 1999; **6:** Checklist of the Amphipods of the Sothern Ocean. C. De Broyer, K. Jazdzewski. ANT'PHIPODA www.natuurwetenschappen.be/amphi/; **7:** ZooKeys 18:91-128, 2009; **8:** M Dale Stokes, personal communication, 2001; **9:** European Journal of Taxonomy 359:1-553, 2017

crested eusirid amphipod *Eusirus* spp.

Crested *Eusirus* amphipod species have six body segments with a strong blade-shaped crest with a posterior tooth (pereionites 5-7 and pleonites 1-3), whereas other Antarctic *Eusirus* amphipod species have only two or three toothed body segments [2].

This crested *Eusirus* amphipod at left was captured in a fish trap 2 miles off the end of Hut Point peninsula, from 415 meters [1].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References: 1: Paul Cziko, personal communication, 2004. Photographer Paul Cziko noted it as *Eusirus perdentatus* or *E. propeperdentatus*; **2:** Zoological Journal of the Linnean Society XX:1–47, 2020. https://doi.org/10.1093/zoolinnean/zlaa141

eusirid amphipod, probably *Paramoera walkeri*

Paramoera walkeri is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, and South Georgia Island from intertidal to 310 meters depth [1]. *P. walkeri* is usually found in shallow water and, at some locations, can be the most abundant benthic animal from 0 to 15 meters depth [2,3,5].

Here *Paramoera walkeri* is swarming on an anchor ice formation. Though living in close association with ice, *P. walkeri* doesn't freeze because its haemolymph ("blood") is hyperosmotic compared to seawater; seawater freezes at -1.86°C whereas *P. walkeri* haemolymph freezes at -2.06°C [3]. *P. walkeri* is a major benthic species during summer, and dominates the sub-fast ice community during winter [2,5]. *P. walkeri* moves off the bottom during late autumn and is found clinging to the underside of young fast ice soon after diatoms begin populating that ice; *P. walkeri* returns to the gravel bottom after the breakout of the fast ice [3]. *P. walkeri* is a detritivore-omnivore and feeds near the bottom or under fast ice upon fungi, bacteria, diatoms, algae, and zooplankton [2,5]. Predators of *P. walkeri* include

fish (*Trematomus bernacchii*, *Trematomus borchgrevinki*, *Trematomus newnesi*, and *Notothenia corriiceps neglecta*), Adelie and gentoo penguins, and cape pigeons [3,4,6].

Here is a closer view of *Paramoera walkeri* on anchor ice. *P. walkeri* grows rapidly during summer phytoplankton blooms, doesn't grow during winter, and breeds seasonally after its first or second year [2]. *P. walkeri* lays its large yolky eggs into a brood pouch in June [3]. The young hatch after 4.5 months and then remain in the pouch for another month while they do not grow or feed [3]. Newly-released young *P. walkeri* migrate offshore populating the fast ice, and then return to shallow water starting in December [3].

Paramoera walkeri has been collected at lengths up to 2.28 centimeters, and lives up to four summers [3].

References: 1: Catalogue of the Marine Gammaridean Amphipoda of the Southern Ocean. JK Lowry, S Bullock. Wellington : Royal Society of New Zealand, 1976. Royal Society of New Zealand Bulletin 16; **2:** Hydrobiologia 337(1-3):107-112, 1996; **3:** Journal of the Royal Society of New Zealand 10(3):259-270, 1980; **4:** Polar Biology 13:291-296, 1993; **5:** Polar Biology 38:1583-1596, 2015; **6:** Xavier, J. C. et al. Crustacean guide for predator studies in the Southern Ocean. Cambridge, UK.: Scientific Committee on Antarctic Research, 2020

hyperiid amphipods *Hyperia macrocephala* and *Hyperiella dilatata*

Hyperia macrocephala is found in Antarctic coastal regions and South Georgia Island [1].

The eyes of *Hyperia macrocephala* occupy most of the surface area of the large spherical head [11].

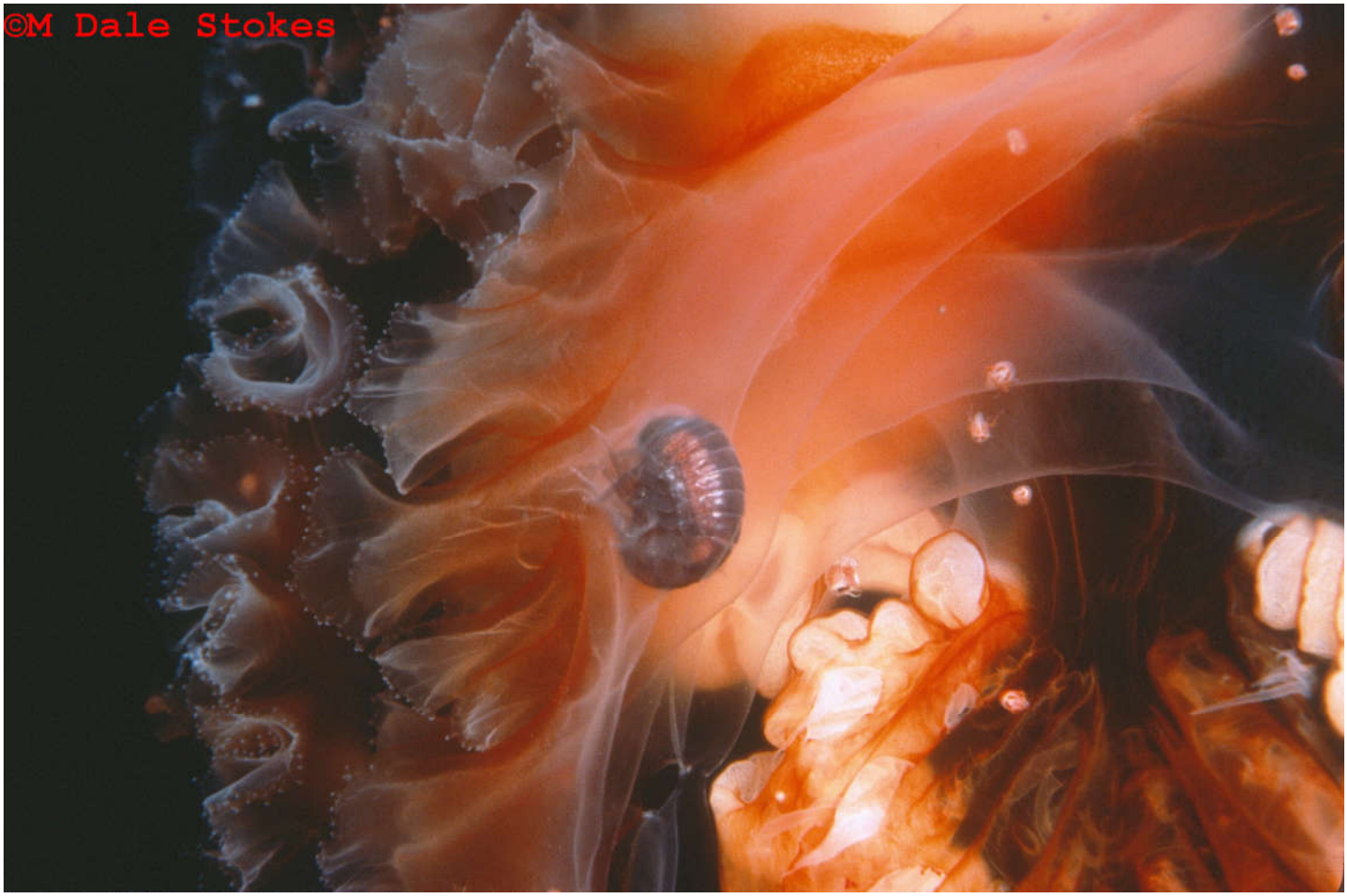
Hyperia macrocephala is large, up to 2.9 centimeters long [1,11].

Hyperiid amphipods are highly variable in body morphology due to their lifestyle and encompass these body forms: near-spherical; needle- like; very large -- up to fourteen centimeters with eyes comprising up to 25% of the body; nearly sightless; house-constructors; and free-living pelagic [1].

The medusa *Diplulmaris antarctica* can be infested with the hyperiid amphipod *Hyperiella dilatata* which sits with its dorsal (top) surface against the outside top of the medusa's bell, the exumbrellar surface [2]. The hyperiid amphipods are those white dots on the surface of the clear bell. *Hyperiella dilatata* is found in Antarctic and subantarctic waters up to the Subantarctic front, with lengths of 6 to 8 millimeters [11].

Collectors have found up to 54 of these hyperiid amphipods riding along, clinging tightly to the medusa. These riding amphipods are predominantly juveniles and females; this suggests that the medusa is both an amphipod mating platform (where females await more mobile males) and a predation refuge for juveniles and females [2]. The hyperiid amphipods do not appear to feed on the medusa and probably use it as a safe harbor between feeding forays [2].

The hyperiid amphipod *Hyperiella dilatata* grabs the pteropod *Clione antarctica* from the water and holds it to itself as a chemical defense against predation [6,7,9]. Predatory fish won't eat the amphipod/pteropod combination or the pteropod *Clione antarctica* itself which has a chemical, pteroenone, which deters feeding [6,7,8,9]. *C. antarctica* preys on the shelled pteropod *Limacina helicina antarctica* which doesn't have pteroenone so it appears that *C. antarctica* synthesizes it as part of its metabolic processes [8,9].



Here's *Hyperia macrocephala* on the medusa *Diplulmaris antarctica* [3].

Hyperiid amphipods are found throughout the world oceans and are found from the surface down to abyssopelagic depths, though they have not been collected deeper than 7,000 meters [1].

Hyperiid amphipods are mostly commensals and parasitoids of gelatinous zooplankton like medusas, salps, and coelenterates; they are pelagic and none are benthic [1].

Diplulmaris antarctica medusa which get close enough to the bottom in shallow water are prey to be captured by the tentacles of an anemone (*Isotealia antarctica* shown here) [4]. The struggle can continue for quite awhile. The medusa pulses its bell as it tries to swim away while the anemone slowly pulls the medusa into its mouth. Some of the hyperiid amphipods hitchhiking on this medusa are going to get consumed by the anemone, so the anemone is an indirect predator of the hyperiid amphipod.

Predators of *Hyperia macrocephala* are fish, Adelie penguins, chinstrap penguins, emperor penguins, gentoo penguins, grey-headed albatrosses, Antarctic fulmars, blue petrels and Antarctic prions [11]. Predators of *Hyperiella dilatata* include fish and the nototheniid fish (*Trematomus borchgrevinki*, *T. bernacchii*, *T. hansoni*, *T. pennellii*), royal penguins, light mantled sooty albatrosses, and southern elephant seals [5,10,11].

References: 1: Hyperiid Amphipods (Amphipoda, Hyperiidea) of the World Oceans. ME Vinogradov, AF Volkov, TN Semenova; scientific editor, D Siegel-Causey. Lebanon, NH : Science Publishers, 1996; **2:** Polar Biology 11(1):19-25, 1990; **3:** Pelagic Scyphomedusae (Scyphozoa: Coronatae and Semaeostomeae) of the Southern ocean. Ronald J. Larson. Washington, DC : American Geophysical Union, 1986; **4:** Antarctic Ecology, Volume 1. MW Holdgate, ed. NY: Academic Press, 1970. pp 244-258; **5:** Polar Biology 8(1):49-54, 1987; **6:** Journal of Organic Chemistry 60(3):780-782, 1995; **7:** Nature 346(6283):462-464, 1990; **8:** Antarctic Journal of the United States 29(5):151-153, 1994; **9:** Marine Biology 122:271-277, 1995; **10:** Environmental Biology of Fishes 36(3):313- 318, 1993; **11:** Xavier, J. C. et al. Crustacean guide for predator studies in the Southern Ocean. Cambridge, UK.: Scientific Committee on Antarctic Research, 2020

iphimediid amphipod, probably *Echiniphimedia hodgsoni*

Echiniphimedia hodgsoni is found in Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, and South Georgia Island, at depths from 20 to 1,120 meters [1]

Looks like *Echiniphimedia hodgsoni* [4,5].

Echiniphimedia hodgsoni feeds on sponges with a special cutting mechanism [2,3] Sponge spicules found in the gut of *E. hodgsoni* correspond to haplosclerid sponges, possibly the genera *Gellius*, *Hemigellius*, or *Haliclona* [2]

Gut content analysis of *E. hodgsoni* indicates that diatoms are either a food source or a prey item for a food source [3]

References: 1: Catalogue of the Marine Gammaridean Amphipoda of the Southern Ocean. JK Lowry, S Bullock. Wellington : Royal Society of New Zealand, 1976. Royal Society of New Zealand Bulletin 16; **2:** Polar Biology 9(5):287-294, 1989; **3:** Polar Biology 24(11):853-862, 2001; **4**: Rauschert Martin & Wolf Arntz. Antarctic Macrobenthos, a field guide to the invertebrates living at the Antarctic seafloor. Wurster Nordseekueste, Germany: Arntz & Rauschert Selbstverlag, 2015, p.66; **5:** Water & Atmosphere 17(1): 16-17, 2009

lysianassoid amphipod *Pseudorchomene plebs*

Pseudorchomene plebs is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, and Macquarie Island, from 0 to 2889 meters depth [2,6,8,11]. *P. plebs* is a dominant benthic amphipod in McMurdo Sound and is more commonly found deeper than fifty meters [1,4]. *Pseudorchomene plebs* has been collected at lengths up to 2.6 centimeters, and its eyes are dark brownish/ reddish when alive [5,11]. *P. plebs* is a voracious scavenger; it can swarm in hordes feeding on dead animals (necrophagous) and fecal material [1,4]. *Pseudorchomene plebs* can swarm a dead fish by the thousands, leaving a clean skeleton in three days [11]. *P. plebs* has also been observed attacking fish, clustering on gills, and causing death quickly [1]. *Pseudorchomene plebs* develop their eggs in winter with young hatching in spring [1]. Predators of *P. plebs* include fish (including *Trematomus borchgrevinki* and *T. bernacchii*), emperor penguins, gentoo penguins and Antarctic terns, who pick it from carrion washed ashore, on which the amphipod feeds in deeper water [3,6,10,12].

Taxonomic Note: Genus revised from *Orchomene* to *Abyssorchomene*, and then to *Pseudorchomene* [9,11].

References: 1: Polar Biology 1(1):47-54, 1982; **2:** Catalogue of the Marine Gammaridean Amphipoda of the Southern Ocean. JK Lowry, S Bullock. Wellington : Royal Society of New Zealand, 1976. Royal Society of New Zealand Bulletin 16; **3:** Polar Biology 8(1):49-54, 1987; **4:** Polar Biology 6(3):171-177, 1986; **5:** Proceedings of the Seventh Symposium on Polar Biology. Memoirs of the National Institute of Polar Research, Special Issue 40:249-258, 1986; **6:** Antarctic Science 11(3):316-321, 1999; **7:** Contribution to the Marine Biodiversity Inventory. A Checklist of the Amphipoda (Crustacea) of the Southern Ocean. C De Broyer, K Jazdzewski. Documents de Travail de l'Institut Royal des Sciences Naturelles de Belgique, Number 73 = Studiedocumenten van het Koninklijk Belgisch Instituut voor Natuurwetenschappen, Number 73. Bruxelles, 1993 ANT'PHIPODA www.natuurwetenschappen.be/amphi/; **8:** Polish Polar Research 12(3):461-472, 1991; **9:** Annales de la Societe Royale Zoologique de Belgique 114 (Supplement 1): 197-198, 1984; **10:** Polar Biology 27(11):721-728, 2004; **11:** Zootaxa 3310: 1-50, 2012; **12:** Xavier, J. C. et al. Crustacean guide for predator studies in the Southern Ocean. Cambridge, UK.: Scientific Committee on Antarctic Research, 2020

lysianassoid amphipod *Hippomedon kergueleni*

Hippomedon kergueleni is found in Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia Island, Bouvet Island, Kerguelen Island, the Snares Islands, and New Zealand at depths from 0 to 750 meters [1,3,4,5,9,10].

Hippomedon kergueleni has been found at lengths up to 2.2 centimeters [5,6]. Males live up to four years and females longer [4]. *H. kergueleni* is a burrowing bottom-feeding and necrophagous (carrion feeding) amphipod; its gut contents have been found to include diatoms, algal chains, crustaceans, polychaetes, and probably detritus [3,4]. Males live up to four years and females longer [4]. Its predators include octopus, fish (including *Trematomus bernacchii*), Adelie penguins, Antarctic terns, and southern elephant seals [7,8,10].

Hippomedon species are found in the Northeastern Pacific, North Atlantic, Arctic Ocean, Australia, New Zealand, and subantarctic islands [1,2]. Lysianassoid amphipods are found in diverse habitats including fish ectoparasites, invertebrate commensals, abyssopelagic, soft-bottom deposit-feeders or algal-dwellers, and demersal scavengers [1].

References: 1: Journal of the Royal Society of New Zealand 13(4):279-294, 1983; **2:** Studies on Amphipod Crustaceans of the Northeastern Pacific Region. I. 1. Family Ampeliscidae, Genus Ampelisca. 2. Family Ampithoidae. 3. Family Aoridae. 4. Family Lysianassidae. Genus Hippomedon. JJ Dickinson, KE Conlan, EL Bousfield, NE Jarrett. National Museum of Natural Sciences. Publications in Biological Oceanography, Number 10. Ottawa : National Museums of Canada, 1982; **3:** VIIth International Colloquium on Amphipoda: Proceedings of the VIIth International Colloquium on Amphipoda, held in Walpole, Maine, USA, September 14-16, 1990. L Watling, ed. Hydrobiologia, volume 223; Developments in Hydrobiology, number 70. Boston: Kluwer Academic, 1991 pp.105-117; **4:** British Antarctic Survey Bulletin 30:1-34, 1972; **5:** The Crustacea Amphipoda of Signy Island, South Orkney Islands. MH Thurston. British Antarctic Survey Scientific Reports, Number 71, 1972; **6:** Adaptations within Antarctic Ecosystems : Proceedings of the Third SCAR Symposium on Antarctic Biology. George A. Llano, ed. Washington : Smithsonian Institution ; Houston, Tex. : distributed by Gulf Pub. Co., 1977. pp. 327-334; **7:** Polar Biology 13:291-296, 1993; **8:** Biodiversity, Molecular Phylogeny and Trophodynamics of Amphipod Crustaceans in the Antarctic Deep- sea. C De Broyer et al. IN: ANDEEP, Cruise Report ANT- XIX/3 and ANT-XIX/4 (ANDEEP I and II), ANtarctic Benthic DEEP-sea Biodiversity (ANDEEP): Colonisation History and Recent Community Patterns. Zoological Institute and Zoological Museum, University of Hamburg, Germany. pp. 43-46. www.biologie.uni-hamburg.de/zim/niedere2/cruise_report.pdf; **9:** Polar Biology 29(2):83-96, 2006; **10:** Xavier, J. C. et al. Crustacean guide for predator studies in the Southern Ocean. Cambridge, UK.: Scientific Committee on Antarctic Research, 2020

lysianassoid amphipod *Orchomenella pinguides*

Orchomenella pinguides is found throughout Antarctica and South Shetland Islands, South Orkney Islands, and South Georgia Island, from 0 to 800 meters depth [2,7]. *O. pinguides* is a dominant benthic amphipod in McMurdo Sound and is commonly found on shallow water benches under ten meters depth [1]. *O. pinguides* has been collected at lengths up to 1.3 centimeter [3,7].

Orchomenella pinguides eats dead animals (including Weddell seals and grounded medusa), fecal matter, sedimenting plankton, and invertebrate prey, especially planktonic copepods that impact the bottom during winter [1,9]. *O. pinguides* is a much less aggressive and voracious swarming feeder compared to *A. plebs* [1]. Its predators include octopus and the fish *Trematomus bernacchii* [4,8].

Taxonomic Note: Genus revised from *Orchomene* to *Orchomenella (Orchomenopsis)*, and then *Orchomenella (Orchomenella)* [5,6,10].

References: 1: Polar Biology 6(3):171-177, 1986; **2:** Catalogue of the Marine Gammaridean Amphipoda of the Southern Ocean. JK Lowry, S Bullock. Wellington : Royal Society of New Zealand, 1976. Royal Society of New Zealand Bulletin 16; **3:** Adaptations within Antarctic Ecosystems : Proceedings of the Third SCAR Symposium on Antarctic Biology. George A. Llano, ed. Washington : Smithsonian Institution ; Houston, Tex. : distributed by Gulf Pub. Co., 1977. pp.327-334; **4:** Polar Biology 13:291-296, 1993; **5:** Contribution to the Marine Biodiversity Inventory. A Checklist of the Amphipoda (Crustacea) of the Southern Ocean. C De Broyer, K Jazdzewski. Documents de Travail de l'Institut Royal des Sciences Naturelles de Belgique, Number 73 = Studiedocumenten van het Koninklijk Belgisch Instituut voor Natuurwetenschappen, Number 73. Bruxelles, 1993. ANT'PHIPODA www.natuurwetenschappen.be/amphi/ ; **6:** Annales de la Societe Royale Zoologique de Belgique 114 (Supplement 1): 197-198, 1984; **7:** Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut 83:117-130, 1986; **8:** Biodiversity, Molecular Phylogeny and Trophodynamics of Amphipod Crustaceans in the Antarctic Deep- sea. C De Broyer et al. IN: ANDEEP, Cruise Report ANT- XIX/3 and ANT-XIX/4 (ANDEEP I and II), ANtarctic Benthic DEEP-sea Biodiversity (ANDEEP): Colonisation History and Recent Community Patterns. Zoological Institute and Zoological Museum, University of Hamburg, Germany. pp. 43-46. http://www.biologie.uni-hamburg.de/zim/niedere2/cruise_report.pdf; **9:** Polar Biology 24:657-662, 2001; **10:** Bulletin de l'Institut royal des Sciences naturelles de Belgique, Biologie 77, suppl. 1: 1-325, 2007

lysianassoid amphipod *Orchomenella franklini*

Orchomenella franklini is found in Antarctica and subantarctic islands [1]. *O. franklini* is sized up to 7.5 mm for males and 9 mm for females, and has been found to reach extremely high densities of >41,000 per square meter [4]. *O. franklini* is present in the diet of fish [6].

Taxonomic Note: Genus revised from *Orchomene* to *Orchomenella (Orchomenopsis)*, and then *Orchomenella (Orchomenella)* [1,2,3].

References: 1: Contribution to the Marine Biodiversity Inventory. A Checklist of the Amphipoda (Crustacea) of the Southern Ocean. C De Broyer, K Jazdzewski. Documents de Travail de l'Institut Royal des Sciences Naturelles de Belgique, Number 73 = Studiedocumenten van het Koninklijk Belgisch Instituut voor Natuurwetenschappen, Number 73. Bruxelles, 1993. ANT'PHIPODA www.natuurwetenschappen.be/amphi/ ; **2:** Annales de la Societe Royale Zoologique de Belgique 114 (Supplement 1): 197-198, 1984; **3:** Bulletin de l'Institut royal des Sciences naturelles de Belgique, Biologie 77, suppl. 1: 1-325, 2007; **4:** Marine Ecology Progress Series 502:169-183, 2014**; 5:** Polar Biology 36:155–167, 2013; **6:** Xavier, J. C. et al. Crustacean guide for predator studies in the Southern Ocean. Cambridge, UK.: Scientific Committee on Antarctic Research, 2020

lysianassoid amphipod

Female with young in brood pouch, collected from the volcano sponge *Anoxycalyx (Scolymastra) joubini* [1]. Predators of Antarctic benthic amphipods include fish and squid [3].

Among malacostracan crustaceans, amphipods are the most abundant and diverse group in benthic Antarctica [2].

References: 1: Kathleen Conlan, personal communication, 1999; **2:** Polar Biology 11(1):73-79, 1990; **3:** Checklist of the Amphipods of the Sothern Ocean. C. De Broyer, K. Jazdzewski. ANT'PHIPODA www.natuurwetenschappen.be/amphi/

oedicerotid amphipod *Monoculodes curtipediculus*

Monoculodes curtipediculus has been collected around the McMurdo Station seawater intake jetty, the Station sewer outfall, and Cinder Cones, at 20-23 meters depth [3]. *Monoculodes curtipediculus* has been collected in Admiralty Bay of King George Island in the South Shetland Islands, 20-23 meters depth [4].

An adult female is shown here, and a female has been collected up to 7.1 millimeters in length [1,3].

Here an adult male *Monoculodes curtipediculus* is above an adult female [1].

Among malacostracan crustaceans, amphipods are the most abundant and diverse group in benthic Antarctica [2].

References: 1: Kathleen Conlan, personal communication, 1999; **2:** Polar Biology 11(1):73-79, 1990; **3:** Crustaceana 76(1):49-63, 2003; **4:** Oceanological and Hydrobiological Studies 40(1):1-10, 2011

pagetinid amphipod, probably *Pagetina antarctica*

Pagetina antarctica has been collected from the Antarctic Peninsula, South Shetland Islands, South Georgia Island, and Kerguelen Island from 1 to 270 meters depth [1,2].

Predators of Antarctic benthic amphipods include fish and squid [2].

References: 1: Sarsia 66(3):213-215, 1981; **2:** Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut 78:179- 196, 1981; **3:** Checklist of the Amphipods of the Sothern Ocean. C. De Broyer, K. Jazdzewski. ANT'PHIPODA www.natuurwetenschappen.be/amphi/

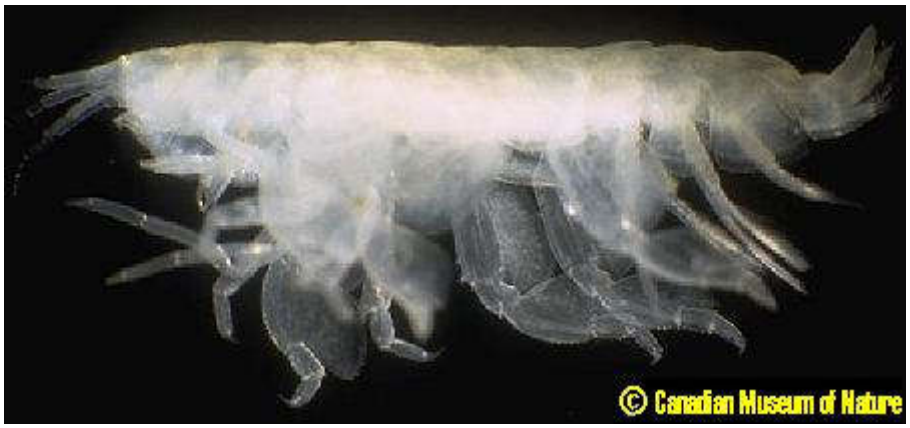
phoxocephalid amphipod *Heterophoxus videns*

Heterophoxus videns is found in Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Georgia Island, Falkland Islands, Chile, Brazil, and Argentina at depths from 2 to 457 meters [2,4,5,8,9]. *H. videns* has been collected at lengths up to one centimeter [6,9]. The family Phoxocephalidae is gammaridean amphipods with their head produced into a hood-like rostrum overhanging the antennae, a well-developed accessory flagellum on the first antennae, and pereopods armed with spines and setae for burrowing into soft bottom sediments [2]. A terminal stage male is shown here [3]. At twenty meters depth at McMurdo jetty, a density of 6,367 *H. videns* per square meter was observed; it is less abundant in the shallower anchor ice zone [1].

Heterophoxus videns is a motile deposit feeder and predator, living buried just below the sediment surface and rarely emerging [1]. *H. videns* eats polychaete worms (including *Spiophanes tcherniai*, *Tharyx* sp., *Haploscoloplos kerguelensis*, maldanids or oweniids), nematodes, copepods, ostracods (including *Philomedes* sp.), sponges, and diatoms [1,7]. *H. videns* is a dominant species in the McMurdo jetty soft-bottom macrofaunal community and is a foundation species for the ecological community there, regulating species composition and population size (age) structure by preying on small species and small individuals of large species [1]. *H. videns* is eaten by fish, including *Trematomus* fish which are hunt-and-peck predators [1,9]. A pre-terminal stage male is shown here [3].

Taxonomic Note: An identification key to species of *Heterphoxus* of the world was published in 2020 [10].

References: 1: Ophelia 24(3):155-175, 1985; **2:** The Amphipod Family Phoxocephalidae in the Eastern Pacific Ocean, with Analyses of Other Species and Notes for a Revision of the Family. JL Barnard. Allan Hancock Pacific Expeditions Volume 18, Number 3. Los Angeles: University of Southern California Press, 1960; **3:** Kathleen Conlan, personal communication, 1999; **4:** Catalogue of the Marine Gammaridean Amphipoda of the Southern Ocean. JK Lowry, S Bullock. Wellington: Royal Society of New Zealand, 1976. Royal Society of New Zealand Bulletin 16; **5:** The Crustacea Amphipoda of Signy Island, South Orkney Islands. MH Thurston. British Antarctic Survey Scientific Reports, Number 71, 1972; **6:** Adaptations within Antarctic Ecosystems : Proceedings of the Third SCAR Symposium on Antarctic Biology. George A. Llano, ed. Washington: Smithsonian Institution ; Houston, Tex.: distributed by Gulf Pub. Co., 1977. pp. 327-334; **7:** Polar Biology 24(9):657-662, 2001; **8:** Marine Benthic Fauna of Chilean Patagonia. V Haussermann, G Forsterra. Puerto Montt, Chile: Nature in Focus, 2009. p. 711; **9:** Xavier, J. C. et al. Crustacean guide for predator studies in the Southern Ocean. Cambridge, UK.: Scientific Committee on Antarctic Research, 2020; **10:** European Journal of Taxonomy 592:1-16, 2020. https://doi.org/10.5852/ejt.2020.592



sebid amphipod *Seba antarctica*

Seba antarctica is found in Antarctica and South Georgia Island and Bouvet Island at depths from 5 to 399 meters [3,4,7,8]. *S. antarctica* has been collected at lengths up to seven millimeters [5].

Both of these photos are males collected from the volcano sponge *Anoxycalyx (Scolymastra) joubini* [1]. *Seba antarctica* shows a high preference for living in sponges, but not exclusively so, having also been recorded on ascidians [7]. *S. antarctica* is an ectoparasite on sponges, both eating the sponge and using it for shelter from predators [7]. Predators of *Seba antarctica* include the fish *Trematomus bernacchii* [6]. Among malacostracan crustaceans, amphipods are the most abundant and diverse group in benthic Antarctica [2].

References: 1: Kathleen Conlan, personal communication, 1999; **2:** Polar Biology 11(1):73-79, 1990; **3:** Catalogue of the Marine Gammaridean Amphipoda of the Southern Ocean. JK Lowry, S Bullock. Wellington : Royal Society of New Zealand, 1976. Royal Society of New Zealand Bulletin 16; **4:** Amphipoda from the Southern Ocean: Families Colomastigidae, Dexaminidae, Leucothoidae, Liljeborgiidae, and Sebidae. H Holman and L Watling. Biology of the Antarctic Seas 13. Antarctic Research Series 38(Paper 4):215-262, 1983; **5:** Adaptations within Antarctic Ecosystems : Proceedings of the Third SCAR Symposium on Antarctic Biology. George A. Llano, ed. Washington : Smithsonian Institution ; Houston, Tex. : distributed by Gulf Pub. Co., 1977. pp. 327- 334; **6:** Polar Biology 27(11):721-728, 2004; **7:** Polar Biology 24:744-753, 2001; **8:** Polar Biology 29(2):83-96, 2006

stenothoid amphipod *Torometopa antarctica*

Torometopa antarctica has been reported from Ross Island and the South Shetland Islands and Bouvet Island at depths down to 391 meters [1,4,8]. *T. antarctica* has been collected at lengths up to seven millimeters [5].

Predators of Antarctic benthic amphipods include fish and squid [6].

Among malacostracan crustaceans, amphipods are the most abundant and diverse group in benthic Antarctica [3].

Taxonomic Note: Name changed from *Proboloides antarcticus* to *Torometopa antarctica* in 1987 [2] and from *Proboloides antarcticus* to *Metopoides antarcticus* in 1990 [4]. Affirmed as *Torometopa antarctica* in 1993 [7]

References: 1: Catalogue of the Marine Gammaridean Amphipoda of the Southern Ocean. JK Lowry, S Bullock. Wellington : Royal Society of New Zealand, 1976. Royal Society of New Zealand Bulletin 16; **2:** Proceedings of the Biological Society of Washington 100(4):856-875, 1987; **3:** Polar Biology 11(1):73-79, 1990; **4:** Mitteilungen aus dem Zoologischen Museum in Berlin 66(1):3- 39, 1990; **5:** Adaptations within Antarctic Ecosystems : Proceedings of the Third SCAR Symposium on Antarctic Biology. George A. Llano, ed. Washington : Smithsonian Institution ; Houston, Tex. : distributed by Gulf Pub. Co., 1977. pp. 327- 334; **6:** Checklist of the Amphipods of the Sothern Ocean. C. De Broyer, K. Jazdzewski. ANT'PHIPODA http://www.natuurwetenschappen.be/amphi/ ; **7:** Contribution to the Marine Biodiversity Inventory. A Checklist of the Amphipoda (Crustacea) of the Southern Ocean. C De Broyer, K Jazdzewski. Documents de Travail de l'Institut Royal des Sciences Naturelles de Belgique, Number 73 = Studiedocumenten van het Koninklijk Belgisch Instituut voor Natuurwetenschappen, Number 73. Bruxelles, 1993; **8:** Polar Biology 29(2):83-96, 2006

stenothoid amphipod, probably *Metopoides* sp.

This is a female collected from the volcano sponge *Anoxycalyx (Scolymastra) joubini* [1].

Predators of Antarctic benthic amphipods include fish and squid [3].

Among malacostracan crustaceans, amphipods are the most abundant and diverse group in benthic Antarctica [2].

References: 1: Kathleen Conlan, personal communication, 1999; **2:** Polar Biology 11(1):73-79, 1990; **3:** Checklist of the Amphipods of the Sothern Ocean. C. De Broyer, K. Jazdzewski. ANT'PHIPODA www.natuurwetenschappen.be/amphi/

stenothoid amphipod, probably *Scaphodactylus* sp. n. 4

Looks like *Scaphodactylus* sp. n. 4 [1].

References: 1: Rauschert Martin & Wolf Arntz. Antarctic Macrobenthos, a field guide to the invertebrates living at the Antarctic seafloor. Wurster Nordseekueste, Germany: Arntz & Rauschert Selbstverlag, 2015, p.79

Arcturid isopod, possibly *Antarcturus furcatus*

Looks like *Antarcturus furcatus* [6] but there are several similar species so close examination is necessary [1,2,5]. Antarctic isopods have at least 346 species, with 302 of those are endemic to Antarctica (native or peculiar to Antarctica) [3].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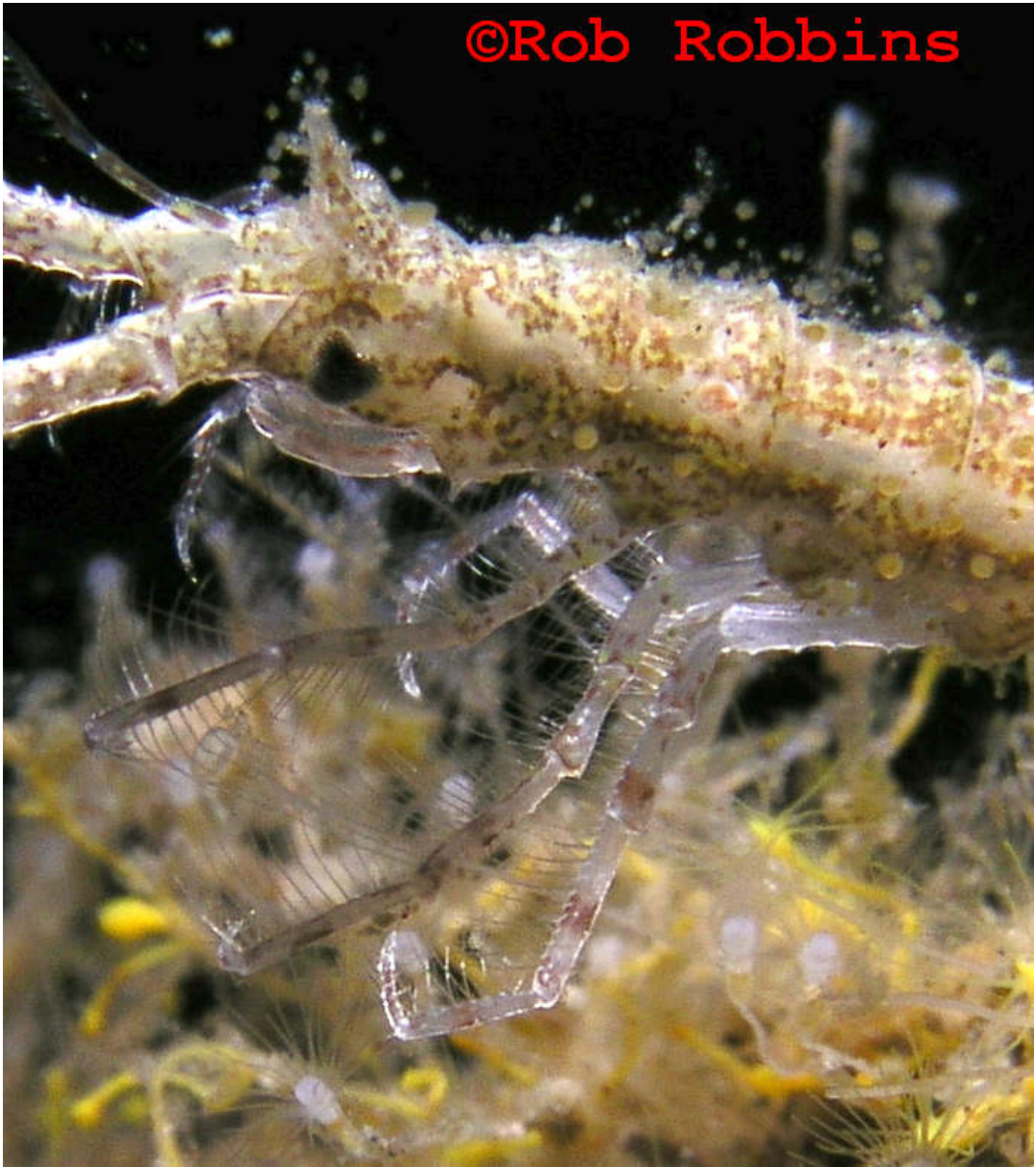
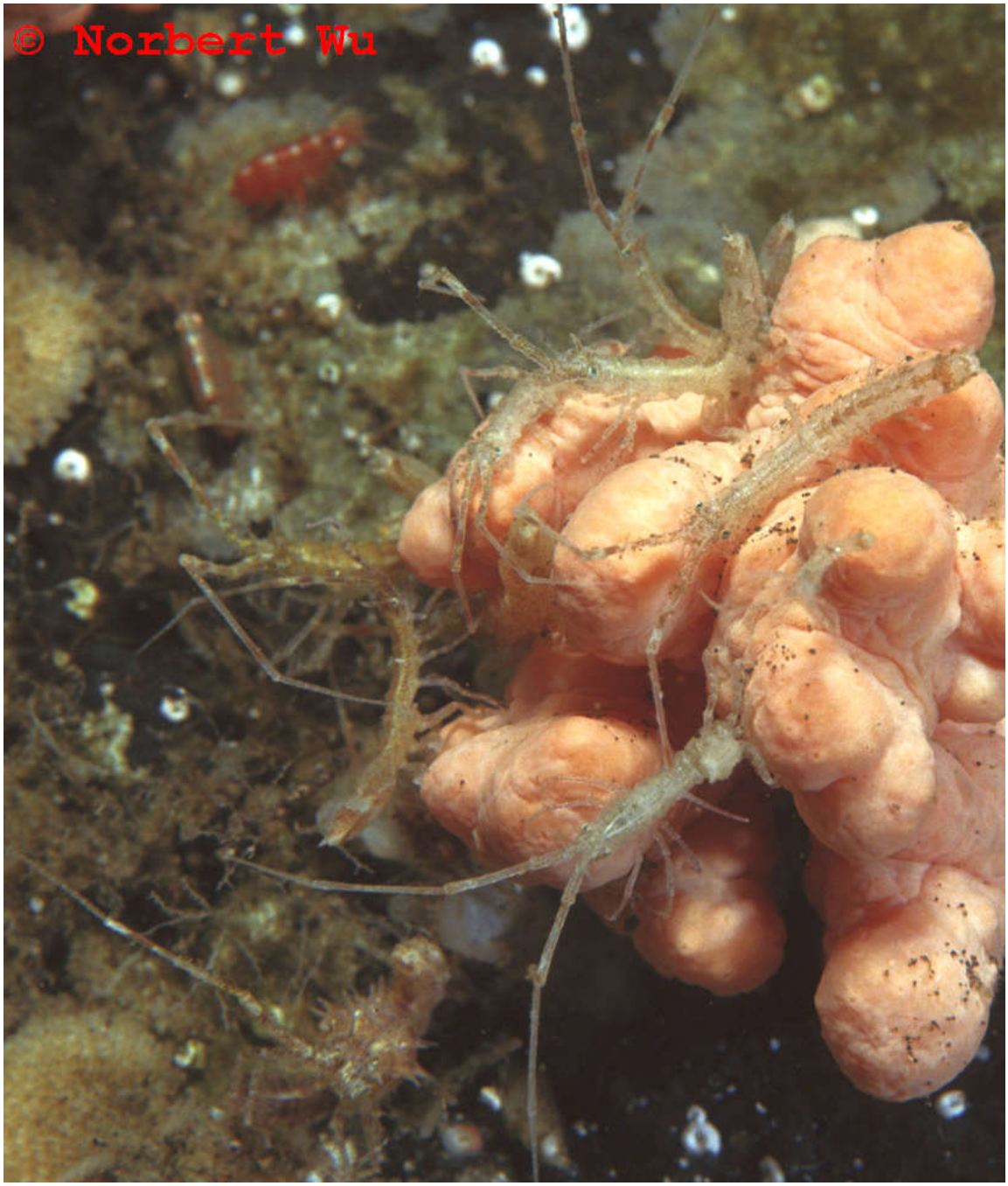


Arcturid isopods usually have a passive filtration feeding mechanism using the setal combs of their anterior pereopods (front legs) [1]. More primitive genera of Arcturid isopods lack these setal combs on their anterior pereopods (front legs) and eat detritus [1].



Arcturid isopods cling to the bottom with some of their posterior pereopods (rear legs) while holding their anterior segments and pereopods up into the water for passive filter-feeding [1].

The bush sponge *Homaxinella balfourensis* almost always has arcturid isopods perched on it [4].

Only one Antarctic isopod is bipolar, being found in the Arctic as well as Antarctic [3].

References: 1: Antarctic Isopoda Valvifera. JW Wagele. Koenigstein ; Champaign, Ill. : Koeltz Scientific Books, 1991; **2:** Antarctic Valviferans (Crustacea, Isopoda, Valvifera) : New Genera, New Species, and Redescriptions. A Brandt. Leiden ; New York : E.J. Brill, 1990; **3:** Berichte zur Polarforschung 98: 201-240, 1991; **4:** Rob Robbins, personal communication, 1999; **5**: Rauschert, Martin & Wolf Arntz. Antarctic Macrobenthos, a field guide to the invertebrates living at the Antarctic seafloor. Wurster Nordseekueste, Germany: Arntz & Rauschert Selbstverlag, 2015, p.87; **6:** Zoologica Scripta 17(2):195-211, 1988

Arcturid isopod, possibly *Chaetarcturus longispinosus*

Looks like *Chaetarcturus longispinosus* [1]. *Chaetarcturus longispinosus* was first reported from the South Shetland Islands [2].

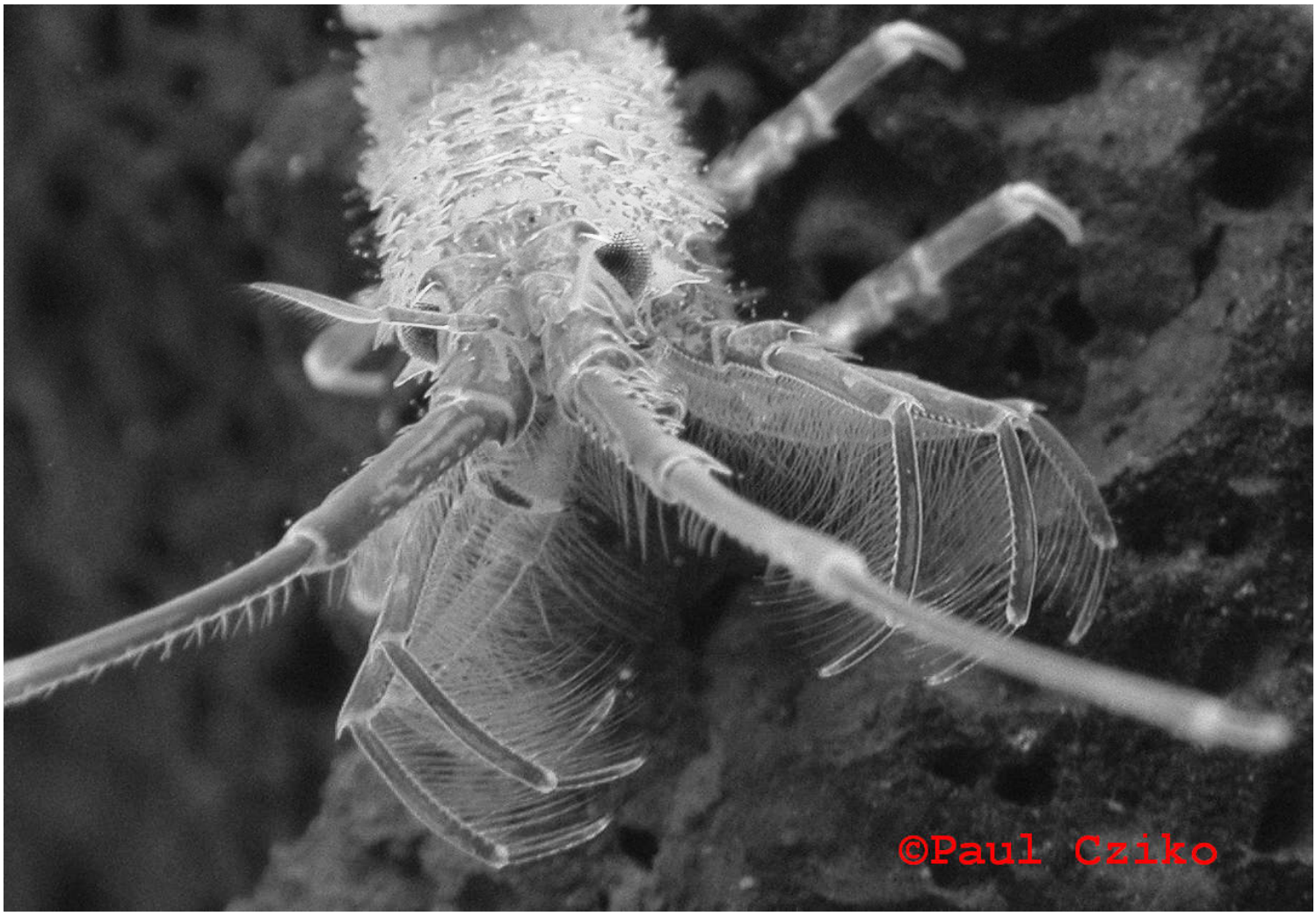
References: 1: Rauschert, Martin & Wolf Arntz. Antarctic Macrobenthos, a field guide to the invertebrates living at the Antarctic seafloor. Wurster Nordseekueste, Germany: Arntz & Rauschert Selbstverlag, 2015, p.87; **2:** Ophelia 46(1):11-34, 1997

Arcturid isopods on sea spider

Here are several arcturid isopods perched on a sea spider, going along for the ride. Why would an isopod joyride on a sea spider?

Arcturid isopods cling to something, like the sea spider leg shown here, using some of their posterior pereopods (rear legs) while holding their anterior segments and pereopods up into the water for passive filter-feeding [1].

Perching on a moving object like a sea spider affords the isopod better access to its prey in the water column as the sea spider walks along the seafloor, covering a wide area. This affords the isopod far better access to food than if the isopod was attached to an immobile object and waiting for its prey to wander by one spot.



Arcturid valviferan isopods have a passive filtration feeding mechanism using the setal combs of their anterior pereopods, seen here [1]. More primitive genera of Arcturidae lack these setal combs on their anterior pereopods and are detritivorous [1].

Antarctic isopods have a variety of deepwater and continental shelf ecological niches including parasites of fish and other isopods and free-living predators of amphipods, polychaetes, and other invertebrates [3]. Antarctic isopods have at least 346 species and 302 of those are endemic to Antarctica (native or peculiar to Antarctica) [3]. Some Antarctic isopods occur in both Antarctica and South Africa, Australia, or South America [3]. Only one Antarctic isopod is bipolar (found in the Arctic as well as Antarctic) [3].

References: 1: Antarctic Isopoda Valvifera. JW Wagele. Koenigstein ; Champaign, Ill. : Koeltz Scientific Books, 1991; **2:** Antarctic Valviferans (Crustacea, Isopoda, Valvifera) : New Genera, New Species, and Redescriptions. A Brandt. Leiden ; New York : E.J. Brill, 1990; **3:** Berichte zur Polarforschung 98: 201-240, 1991; **4:** Rob Robbins, personal communication, 1999

giant Antarctic isopod *Glyptonotus antarcticus*

Glyptonotus antarcticus is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, and South Georgia Island from intertidal to 790 meters depth [6,7]. *G. antarcticus* is up to twenty centimeters in length and seventy grams in weight [8]. The color of *G. antarcticus* varies but generally is olive-brown, with its appendages less dark and yellowish; keels, segment margins, and coxal plate margins are lighter with a red-brown tint [6].

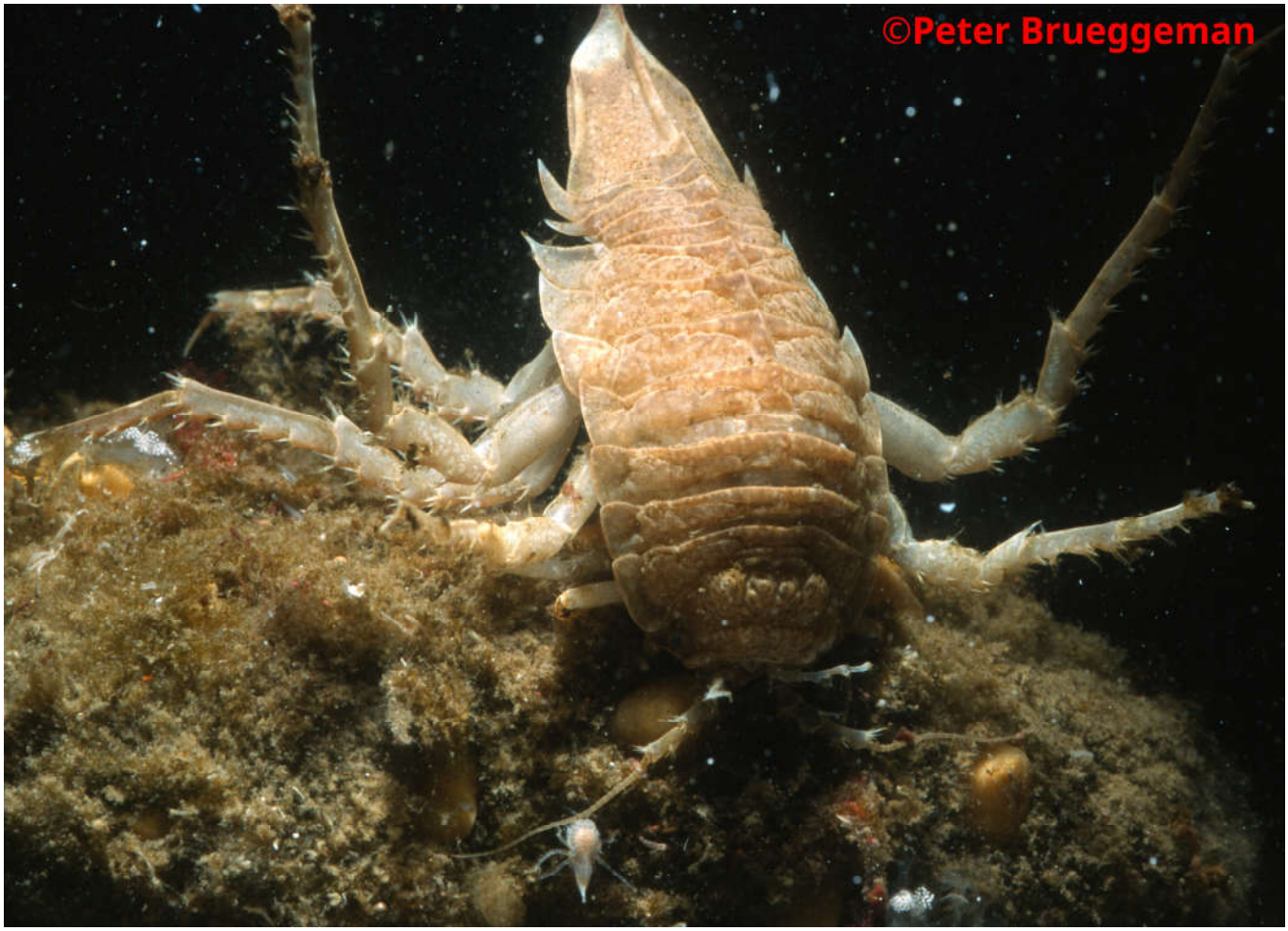
Glyptonotus antarcticus is an omnivore and eats what it finds, including brittle seastars, gastropod molluscs, isopods (including small ones of its own species -- cannibalism), sea urchins, pelecypods, carrion, krill, and polychaete worms (including *Flabegraviera mundata*); food availability is more important than food type [3,6,7,9].

Its large, powerful mouth parts enable *Glyptonotus antarcticus* to dine on hard animals like brittle seastars and sea urchins [3].

As a large benthic predator and scavenger, its ecological role is analogous to that of crabs and lobsters in temperate waters.

Here *Glyptonotus antarcticus* is poking around in the newly formed anchor ice in shallow water under the McMurdo sea ice with the seastar *Odontaster validus* alongside.

The body cuticle of *Glyptonotus antarcticus* has microstructures discouraging settlement by foraminifera and larval stages of sessile organisms [1].



There is a newly-released juvenile *Glyptonotus antarcticus* isopod just below the parent's antenna. *Glyptonotus antarcticus* has a non-seasonal breeding cycle, and young are released throughout the year [6]. Eggs are found in the marsupia of female *G. antarcticus* longer than 75 mm, and females usually die after releasing their brood, but a few may moult and breed again [6,11].

Glyptonotus antarcticus incubates and raises its young in a brood pouch (marsupium) as an adaptation to slow development in such cold and adverse conditions [5,6]. Here are pre-emergent young taken from the brood pouch, with their yolk still attached. The developing young ingest non-viable eggs (adelphophagy) and maternal secretions [5].

A closer view of a newly-released juvenile *Glyptonotus antarcticus* on the tubular sponge *Sphaerotylus antarcticus*.

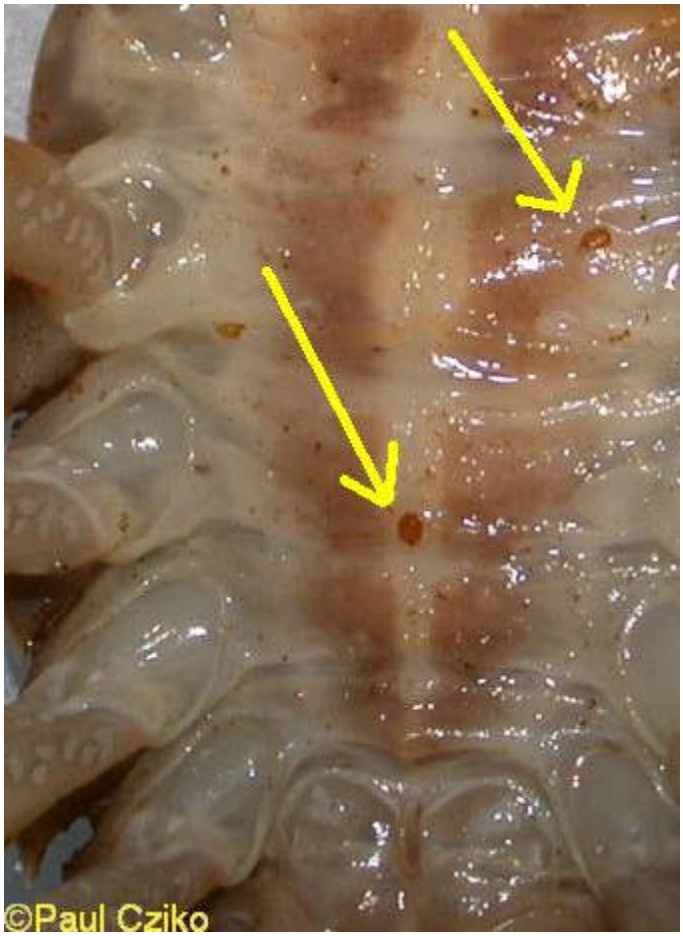
Glyptonotus antarcticus lives five to eight years, and the interval between moults is 100 - 730 days [6].

The armored spiny body of *Glyptonotus antarcticus* protects it well when it's fully grown; small ones are prey items though. Its predators are notothenid fish (*Notothenia neglecta* [2] and *Trematomus bernacchii* [3]) and the octopus *Pareledone* sp. [4].

Glyptonotus antarcticus is nocturnal with a diurnal activity pattern; during the day, it seeks shelter under stones and algae and, at night, it hunts for food [6].

Glyptonotus antarcticus must be fed at least twice a week to stay healthy [6].

A newly-released juvenile *Glyptonotus antarcticus*



The piscicolid leech eggs *Glyptonotobdella antarctica* is known to move between the giant Antarctic isopod *Glyptonotus antarcticus*, *Sterechinus* sea urchins, and some species of the octopus *Pareledone* [10].

As shown here, egg cocoons of this leech can be found on the ventral (under) side of the giant Antarctic isopod *Glyptonotus antarcticus* [10].

A closer view of a leech egg cocoon on *Glyptonotus antarcticus*.

Most likely the leech *Glyptonotobdella antarctica* moves between different hosts and their potential prey [10].

Taxonomic Note: *Glyptonotus antarcticus* may have **cryptic, but reproductively isolated species, and thus not be a single species [12]. Genetic analysis suggests four species, with the originally described** *Glyptonotus antarcticus* occurring in the Antarctic Peninsula and South Shetland Islands, with two species occurring in the Eastern Weddell Sea, and one species occurring in the Ross Sea [12].

References: 1: Zoomorphologie, 94(2):209-216, 1980; **2:** Antarctic Science 2(3):207-213, 1990; **3:** Royal Society of New Zealand, Transactions, Zoology, 8(15):163-168, 1967; **4:** Polar Biology 13(5):347-354, 1993; **5:** Polar Biology 13(3):145-149, 1993; **6:** Antarctic Isopoda Valvifera. JW Wagele. Koenigstein ; Champaign, Ill. : Koeltz Scientific Books, 1991; **7:** Antarctic Valviferans (Crustacea, Isopoda, Valvifera) : New Genera, New Species, and Redescriptions. A Brandt. Leiden ; New York : EJ Brill, 1990; **8:** Ninth European Marine Biology Symposium. H Barnes, ed. Aberdeen : Aberdeen University Press, 1975. pp 707-724; **9:** Peter Brueggeman, personal communication (observed *G. antarcticus* attacking and eating *Flabegraviera mundata* on time-lapsed video), 1999; **10:** Polar Biology 13(5):347-354, 1993; **11:** Polar Bioscience 19:29-42, 2006; **12:** Scientia Marina 69(Supplement 2):175-181, 2005

flabelliferan isopod *Natatolana* sp. or *Aega* sp.

From the suborder Flabellifera, this isopod is either *Natatolana* sp. (Family Cirolanidae) or *Aega* sp. (Family Aegidae) [1]. The genus is identified from the isopod's first, second, and third pereopods (thoracic appendages) on its ventral side which aren't visible in this photo [1,4,5]. This isopod was about the size of a sowbug or pillbug -- about one centimeter [2].

Antarctic isopods have at least 346 known species and 302 of those are endemic to Antarctica (native or peculiar to Antarctica) [3]. Some Antarctic isopods occur in both Antarctica and South Africa, Australia, or South America [3]. Only one Antarctic isopod is bipolar (found in the Arctic as well as Antarctic) [3].

Here a flabelliferan isopod *Natatolana* sp. or *Aega* sp. is perched on the lip of a *Haliclona* sponge. The isopod is probably living in a commensal relationship with the sponge. The isopod benefits from the shelter of the sponge and the sponge is not harmed by the presence of the isopod.

Antarctic isopods have a variety of deepwater and continental shelf ecological niches including parasites of fish and other isopods and free-living predators of amphipods, polychaetes, and other invertebrates [3].

Natatolana spp. isopods feed on carrion [6].

References: 1: Angelika Brandt, personal communication, 1998; **2:** Norbert Wu, personal communication, 1998; **3:** Berichte zur Polarforschung 98: 201-240, 1991; **4:** A Brandt. Antarctic Serolidae and Cirolanidae (Crustacea, Isopoda) : New Genera, New Species, and Redescriptions. Koenigstein : Koeltz Scientific Books, 1988; **5:** Biological Reports of the Soviet Antarctic Expedition, 1955-1958. Chief editor: EP Pavlovskii. Edited by AP Andriyashev & PV Ushakov. Volume 3. Jerusalem : Program for Scientific Translations, 1966. pp 220-389; **6:** Oceanografia in Antartide, Oceanografia en Antartica. VA Gallardo, O Ferretti, HI Moyano, eds. Concepcion, Chile : Universidad de Concepcion, 1992. pp 417-420

gnathiid isopod *Caecognathia calva*

Caecognathia calva is found throughout Antarctica and the Antarctic Peninsula from intertidal to 661 meters depth [1]. *C. calva* is a fish parasite whose larval stages suck blood or lymph; they can be spotted attached to the heads of benthic fish [1]. Adult *C. calva* do not feed and can be up to six millimeters long [1]. This is a male shown here with its mandibles. Mature *C. calva* males fight for dominance leading to death; the stronger male bites off the legs of the weaker male [1].

An adult *Caecognathia calva*.

Adult *C. calva* can be found on hexactinellid sponges (look for *Rossella* spp. or *Anoxycalyx (Scolymastra) joubini*) with a single male close to the oscular opening, accompanied by a harem of several breeding females and also some juveniles [1]. On the sponge *Rossella racovitzae*, *C. calva* can be found in the Budding Type morph and not in the Large Type morph [2].

Here's a juvenile *Caecognathia calva*

Larval *C. calva* are released between February and May and search for a benthic fish [1]. *C. calva* has three larval stages; each stage sucks fish blood once, and then rests in a hidden place for up to two years [1]. Finally the third larval stage of *C. calva* enters a hexactinellid sponge after feeding, where it moults into a mature female or immature male [1].

Taxonomic Note: *Gnathia calva* was assigned to the *Caecognathia* genus in 1994 [3].

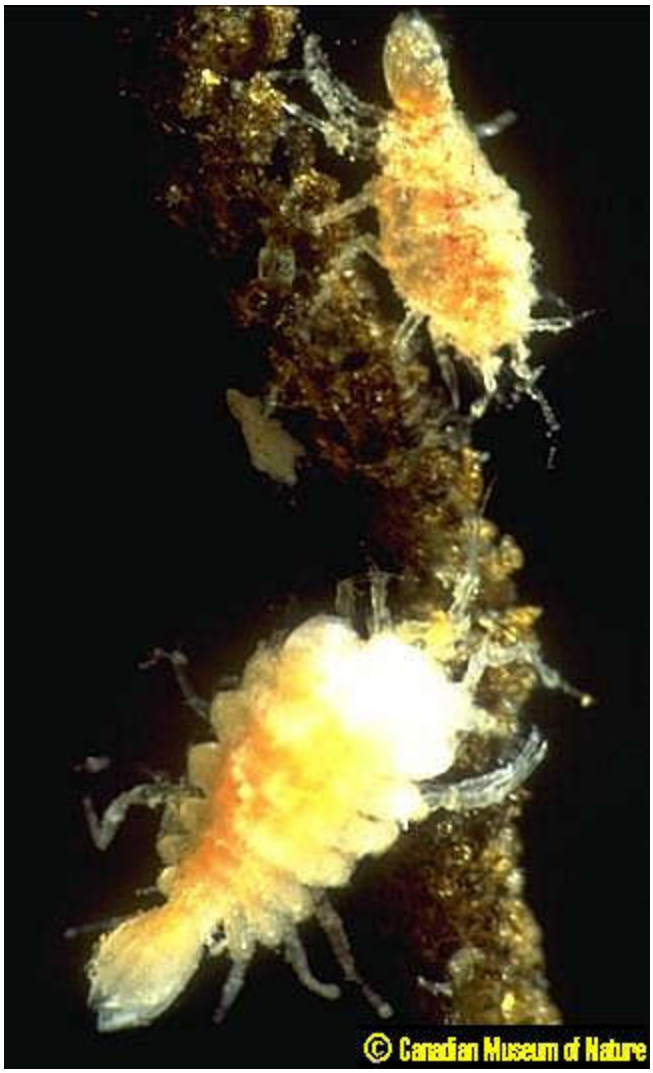
References: 1: Polar Biology 8(4):287-291, 1988; **2:** Verhandlungen Deutsche Zoologische Gesellschaft 85(2):271-276, 1992; **3:** Memoirs of the Museum of Victoria 54(2):271-397, 1994

munnid isopod *Munna* sp.

Munna isopods look like small spiders with long legs that can be 1.5 times longer than the body [1].

Antarctic isopods have a variety of deepwater and continental shelf ecological niches including parasites of fish and other isopods and free-living predators of amphipods, polychaetes, and other invertebrates [2]. Antarctic isopods have at least 346 species and 302 of those are endemic to Antarctica (native or peculiar to Antarctica) [2]. Some Antarctic isopods occur in both Antarctica and South Africa, Australia, or South America [2]. Only one Antarctic isopod is bipolar (found in the Arctic as well as Antarctic) [2].

References: 1: Bulletin du Museum National d'Histoire Naturelle. Section A. Zoologie Biologie et Ecologie Animales 16(1):111-201, 1994; **2:** Berichte zur Polarforschung 98: 201-240, 1991



pleurogoniid isopod *Austrosignum glaciale*

Austrosignum glaciale is found in Antarctica, South Shetland Islands, South Georgia Island, and southern Chile at depths from 0 to 385 meters [1,2,3,4,6,8].

In this photo, the female is above the male. *A. glaciale* is a dominant species in the McMurdo jetty soft-bottom macrofaunal community [7]. *A. glaciale* is found on exposed polychaete tubes or plowing through surface sediments [7]. A study examined the gut contents of *A. glaciale* and found diatoms and amorphous organic material [7]. Its predators include the fish *Trematomus bernacchii* and *Trematomus hansoni* [7].

Pleurogoniid isopods have most of their species in polar or boreal waters with their highest diversity in Antarctica [5]. Deep sea and northern pleurogoniid isopods are derived from genera occurring in Antarctica [5]. This Antarctic center of diversity for pleurogoniid isopods may be due to a narrow range of adaptability to temperature changes [5].

Taxonomic Note: *Austrosignum glaciale* was synonymized with *A. grande*; later both species were placed in *A. glaciale* [1,4].

References: 1: Fauna i Raspredelenie Rakoobraznykh Notalnykh i Antarkticheskikh Vod (Fauna and Distribution of Crustacea from Notal and Antarctic Waters). AI Kafanov, ed. Vladivostok: Akademiya Nauk SSSR, DVNTS, 1982. pp.73-105; **2:** Tethys 5(4):561-600, 1974 (*A. glaciale*); **3:** Systematics and Biology of Bathyal and Abyssal Isopoda Asellota. T Wolff. Galathea Report, Volume 6. Scientific Results of the Danish Deep-Sea Expedition Round the World 1950-52. Copenhagen: Danish Science Press, 1962. p. 255 (*A. grande*) and p. 256 (*A. glaciale*); **4:** Zootaxa 1515:1-29, 2007; **5:** Gunneria 35:1-128, 1980 ; **6:** The Zoogeography, Ecology, and Systematics of the Chilean Marine Isopods. RJ Menzies. Lunds Universitets Arsskrift. Ny Foljd, Avd. 2. Bd 57. Nr 11. Kungliga Fysiografiska Sallskapet Handlingar. Ny Foljd, Bd 72, Nr 11. Reports of the Lund University Chile Expedition 1948-49. Number 42. Lund: CWK Gleerup, 1962; **7:** Ophelia 24(3):155-175, 1985 ; **8:** Polar Biology 28(1):1-14, 2004

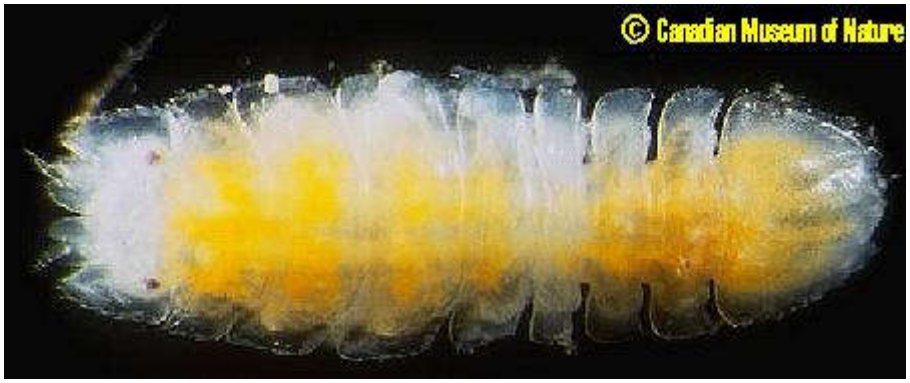
serolid isopod *Ceratoserolis meridionalis*

Ceratoserolis meridionalis is found throughout Antarctica and the Antarctic Peninsula and South Shetland Islands, at depths from 730 to 2,759 meters [2,6,7,8,9]. *C. meridionalis* has been collected at lengths of 6.67 centimeters, plus a caudal spiny tail of 2.67 centimeters length, and a width of 5.18 centimeters [6,7]. Compared to the two other members of its genus, *C. meridionalis* has a characteristic long caudal serrated protrusion (its "tail") [1,6].

Serolid isopods live on sand and mud and are able to burrow into sand [1]. This serolid isopod illustrates how body size can be increased by flattening to occupy more two-dimensional space; flattening helps an organism minimize sinking into a fine-grained soft bottom on which it may live [4]. The eyes of serolid isopods have a large vision field, seeing their surroundings without moving their heads [3]. The second antennae of serolid isopods have brushes used to push sand on the body and to clean the dorsal surface when crawling [3]. Serolid isopods have a concavity under their body which remains sand-free and used to stream water, exiting from a funnel forming at its tail [3]. Serolid isopods are predators and scavengers, feeding on polychaete worms and crustaceans [1,3].

Taxonomic Note: Genus was previously *Serolis* [1,5,6].

References: 1: Antarctic Serolidae and Cirolanidae (Crustacea, Isopoda) : New Genera, New Species, and Redescriptions. A. Brandt. Koenigstein : Koeltz Scientific Books, 1988; **2:** Jim Mastro, personal communication, collected at 730 meters in McMurdo Sound, 1999; **3:** Antarctic Isopoda Valvifera. JW Wagele. Koenigstein ; Champaign, Ill. : Koeltz Scientific Books, 1991; **4:** The Environment of the Deep Sea, Rubey Volume II. WG Ernst & JG Morin, eds. Englewood Cliffs, NJ : Prentice-Hall, 1982. pp. 324-356; **5:** Polar Biology 6:127-137, 1986; **6:** Science Reports of Yokohama National University. Sec. II 38:1-21, 1991; **7:** Biological reports of the Soviet Antarctic Expedition, 1955-1958 (Rezultaty biologicheskikh issledovanii Sovetskoi antarkticheskoi ekspeditsii, 1955-1958) EP Pavlovskii, chief ed. Volume 3: AP Andriyashev and PV Ushakov, eds. Jerusalem : IPST Press for Israel Program for Scientific Translations, 1968. on page 243; **8:** Berichte zur Polarforschung 98, 1991, 240 pp.; **9:** Polar Biology 28(1):1-14, 2004



stenetriid isopod, family Stenetriidae

Stenetriid isopods are asellotes with a flattened body, short antennulae, and dorsal eyes [1].

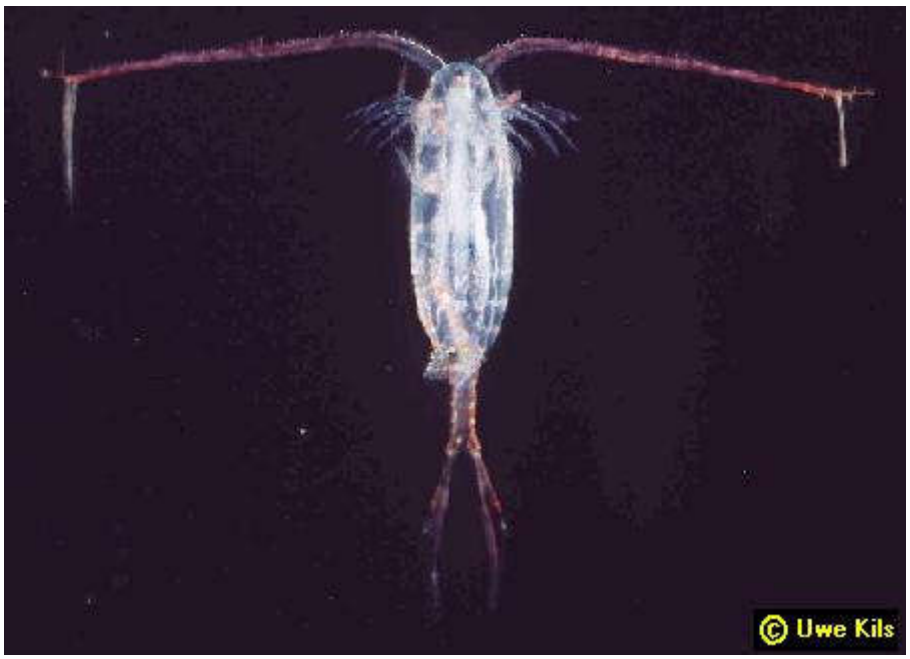
This is a female isopod bearing eggs.

References: 1: Records of the Australian Museum 47(1):39-82, 1995

calanoid copepod

This calanoid copepod is carrying eggs.

Copepods are ecologically important in the ocean food chain, feeding on diatoms and other plankton and, as the largest biomass in the oceans, being food for zooplankton, fish, seabirds, and whales. Most copepods species are free-living in the ocean, found from the surface to great depths.



The long, feathered antennae of calanoid copepods facilitate their drifting in the ocean. Copepod fecal pellets contribute to the marine snow, bringing nutrients and minerals from surface waters to the deep sea.

parasitic copepod, possibly *Eubrachiella antarctica*

A common parasitic copepod on Antarctic fish is *Eubrachiella antarctica* [6,7,8]

Parasitic copepods like these on the tail fin of the Antarctic cod *Dissostichus mawsoni* are free-swimming as juveniles [1,2].

Females find a host, attach, and are stationary for life, diverting their energy to reproduction; males move or swim around to find females to reproduce [1,2].

Eubrachiella antarctica pygmy males attach to the female *E. antarctica* near its genital porus [7] This female parasitic copepod is burrowed into the skin, sucking blood and fluids or grinding away at flesh [1,3]. The female stores the male's sperm and fertilizes its eggs as it expels them into chitinous sausage-like ovisacs [3,4]. The ovisacs gradually lengthen as eggs are expelled [4].

In adapting to their parasitic lifestyle, these copepods have changed substantially from non-parasitic copepods in order to secure a hold on the host and increase their reproductive activity [5]. Parasitic copepods developed various grasping mechanisms like antennae or body outgrowths to hold on or embed themselves into hosts [5].

Parasitic copepods can be relatively benign or life-threatening for a fish, depending on the number of parasites, the organ system affected (fins, skin, gills, internal organs), the age of the fish, environmental conditions, and other factors [3].

References: 1: Copepod Parasites of Marine Fishes. NK Pillai. Calcutta : Zoological Survey of India, 1985; **2:** Parasitic Copepoda of British Fishes. Z Kabata. London : Ray Society, 1979; **3:** Parasitic Copepodes on the Fishes of the USSR = Paraziticheskie Veslonogie Ryb SSSR. AP Markewitch. New Delhi : Published for the Smithsonian Institution and the National Science Foundation by the Indian National Scientific Documentation Centre ; Springfield, VA : available from the National Technical Information Service, 1976; **4:** British Parasitic Copepoda. T Scott & A Scott. London : Ray Society, 1913; **5:** Copepods Parasitic on Fishes. Z Kabata. Synopses of the British Fauna (New Series) No. 47. Oegstgeest, Netherlands : Universal Book Services/Dr W Backhuys, 1992; **6:** Proceedings of the NIPR Symposium on Polar Biology 9:169-177, 1996; **7:** Archiv fuer Fischereiwissenschaft 28(2/3):149-156, 1977; **8:** Meeresforschung 28(2-3): 146-156, 1980

ice krill *Euphausia crystallorophias*

Euphausia crystallorophias is found throughout Antarctica and the Antarctic Peninsula from the surface down to usually 300 to 650 meters depth and has been recorded near 4,000 meters depth [1,5]. *E. crystallorophias* reaches a maximum length of 3.4 centimeters, with females slightly larger than males [1,2,5]. *E. crystallorophias* is a swarming species and an important food source for coastal predators, eaten by minke whales, seals, penguins, birds, and fish (particularly *Pleuragramma antarctica*) [1,4,5,6,7]. *E. crystallorophias* replaces *E. superba* in dominance in regions of pack and floating ice and the pelagic shelf community [1,4,5,6]. *E. crystallorophias* may be the major single pelagic consumer of phytoplankton on the Antarctic shelf [4]. *E. crystallorophias* undertakes a vertical diel migration and breeds from the end of December to February under the ice [1]. Coastal polynas are areas of enhanced spawning and grazing for *E. crystallorophias* [4].

E. crystallorophias was first described from specimens collected through holes cut in the ice by Scott's Discovery Expedtion [3].

Euphausiids are small translucent shrimp-like crustaceans commonly known as krill; seven species belonging to two genera *Euphausia* and *Thysanoessa* occur in the Southern Ocean [1,2]. The genus name *Euphausia* refers to the luminescence produced by large light organs (photophores) [2]. An Antarctic midwater trawling fishery based on *Euphausia superba* catches krill for human and domestic animal consumption [1]. *E. crystallorophias* is similar to *E. superba* but has a longer rostrum, larger eyes, a shorter mandibular palp, and is shorter in overall length [5].

References: 1: FAO Species Identification Sheets for Fishery Purposes : Southern Ocean (Fishing Areas 48, 58 and 88) (CCAMLR Convention Area) / W Fischer & JC Hureau, eds. Rome : Food and Agriculture Organization of the United Nations, 1985; **2:** A Practical Guide to the Euphausiids of the World. A de C Baker, BP Boden & E Brinton. London : Natural History Museum Publications, 1990; **3:** Annals and Magazine of Natural History 17(Seventh Series):1-11, 1906; **4:** Antarctic Communities: Species, Structure, and Survival. B Battaglia, J Valencia, and DWH Walton, eds. Cambridge: Cambridge University Press, 1997; **5:** A Guide to the Euphausiacea of the Southern Ocean. JM Kirkwood. ANARE Research Notes 1 (Australian National Antarctic Research Expedition). Kingston, Tasmania, Australia: Australia Dept of Science and Technology, Antarctic Division, 1984; **6:** Polar Biology 8(5):327-331, 1988; **7:** Xavier, J. C. et al. Crustacean guide for predator studies in the Southern Ocean. Cambridge, UK.: Scientific Committee on Antarctic Research, 2020

Antarctic krill *Euphausia superba*

Euphausia superba is found around Antarctica between the continent and the Polar Front within the upper 100 meters of depth [1]. *E. superba* reaches a maximum length of five centimeters [1]. This photo is an adult male in the typical oblique hovering position with its pleopods beating [4]. *E. superba* is a swarming species and an important food source for baleen whales including minke whales, seals, fish (particularly *Notothenia neglecta*, *Electrona antarctica*, *Cygnodraco mawsoni*, *Champsocephalus gunnari*), penguins and birds, and cephalopods [1,6]. *E. crystallorophias* replaces *E. superba* in dominance in regions of pack and floating ice and the pelagic shelf community [1]. *E. superba* spawns during late spring and summer, peaking from early January to mid-February [1]. *E. superba* lives two years with recent research suggesting seven years [1]. *E. superba* feeds preferentially on phytoplankton and is a dominant herbivore in the food web [1]. *E. superba* feeds on planktonic and ice-attached diatoms, dinoflagellates, silicoflagellates, tintinnids, foraminiferans, radiolarians, heliozoans, *Calanus/Calanoides* copepods, invertebrate eggs, siphonophores, its own species, other zooplankton [1,5].

Euphausiids are small translucent shrimp-like crustaceans commonly known as krill; seven species belonging to two genera *Euphausia* and *Thysanoessa* occur in the Southern Ocean [1,2]. The genus name *Euphausia* refers to the luminescence produced by large light organs (photophores) [2]. An Antarctic midwater trawling fishery based on *Euphausia superba* catches krill for human and domestic animal consumption [1]. *E. crystallorophias* is similar to *E. superba* but has a longer rostrum, larger eyes, a shorter mandibular palp, and is shorter in overall length [3].

References: 1: FAO Species Identification Sheets for Fishery Purposes : Southern Ocean (Fishing Areas 48, 58 and 88) (CCAMLR Convention Area) / W Fischer & JC Hureau, eds. Rome : Food and Agriculture Organization of the United Nations, 1985; **2:** A Practical Guide to the Euphausiids of the World. A de C Baker, BP Boden & E Brinton. London : Natural History Museum Publications, 1990; **3:** A Guide to the Euphausiacea of the Southern Ocean. JM Kirkwood. ANARE Research Notes 1 (Australian National Antarctic Research Expedition). Kingston, Tasmania, Australia: Australia Dept of Science and Technology, Antarctic Division, 1984; **4:** www.ecoscope.com/krill ; **5:** Polar Biology 13(6):389-397, 1993; **6:** Xavier, J. C. et al. Crustacean guide for predator studies in the Southern Ocean. Cambridge, UK.: Scientific Committee on Antarctic Research, 2020

myodocopid ostracod (order Myodocopida)

The carapace of myodocopid ostracods is less strongly calcified than other ostracods; it consists of two valves hinged dorsally with the body of the ostracod suspended from the dorsal margins of those valves [1]. Benthic myodocopid ostracods are usually found at the sediment surface, within the top centimeter of sediment, or swimming near the bottom [1].

One project identified 140 species and 49 genera of ostrocods collected by epibenthic sledge from 89 to 6,224 meters depth in the Atlantic Sector of the Southern Ocean [3].

Ostracods are also called mussel shrimp or seed shrimp. Mussel shrimp differ from most crustaceans in having a very short trunk without external segmentation; nearly all of its body is encased in a hard covering. Most ostracods live on or near the bottom, feeding on microorganisms and organic debris or preying on small invertebrates.

References: 1: Antarctic and Subantarctic Myodocopina (Ostracoda). LS Kornicker. Synopses of the Antarctic Benthos Volume 5. Koenigstein, Germany ; Champaign, Ill. : Koeltz Scientific Books, 1993; **2:** Ophelia 24(3):155-175, 1985; **3:** Zoological Journal of the Linnean Society XX:1-30, 2021 https://doi.org/10.1093/zoolinnean/zlab078

podocopid ostracod (order Podocopida)

Ostracods are also called mussel shrimp or seed shrimp.

Mussel shrimp differ from most crustaceans in having a very short trunk without external segmentation; nearly all of its body is encased in a hard covering.

Most ostracods live on or near the bottom, feeding on microorganisms and organic debris or preying on small invertebrates. Predators of McMurdo podocopid ostracods include the fish *Trematomus bernacchii* [2].

One project identified 140 species and 49 genera of ostrocods collected by epibenthic sledge from 89 to 6,224 meters depth in the Atlantic Sector of the Southern Ocean [3].

References: 1: Antarktische und Subantarktische Podocopa (Ostracoda). G Hartmann. Synopses of the Antarctic Benthos Volume 7. Koenigstein : Koeltz Scientific Books, 1997; **2:** Polar Biology 13:291-296, 1993; **3:** Zoological Journal of the Linnean Society XX:1-30, 2021 https://doi.org/10.1093/zoolinnean/zlab078

mysid

Mysids are small, shrimp-like crustaceans, known as "opossum shrimp" due to a brood pouch in mature females. Most Antarctic mysids are hyperbenthic, living above the bottom [1]. There are 37 mysid species in the Antarctic region, with nineteen being endemic [1]. Depending on the species, mysids may feed on small particles collected by grooming their body surface, capture zooplankton, or scavenge. Mysids may be found in large swarms and are an important part of many fish diets. Antarctic mysid predators include brittle stars (Astrotoma agassizii), fish (dragonfish *Cygnodraco mawsoni*; mackerel icefish *Champsocephalus gunnari*; Antarctic cod *Dissostichus mawsoni*; spiny plunderfishes of the family Harpagiferidae), birds (blackbellied storm petrel *Fregetta tropica*; Wilson's storm petrel *Oceanites oceanicus*), and the crabeater seal *Lobodon carcinophaga* [2,3,4,5,6,7,8,9].

References: 1: Antarctic Science 10(1):3-11, 1998; **2:** Antarctic Science 10(1):55-61, 1998; **3:** Polar Biology 19(5):354- 357, 1998; **4:** Marine Ecology Progress Series 108(1-2):43-57, 1994; **5:** Journal of Zoology 216(1):83-102, 1988; **6:** Polar Biology 6(1):43-45, 1986; **7:** Biology of the Antarctic Seas XVII. Washington DC : American Geophysical Union, 1986. pp.1-28. Antarctic Research Series, volume 44; **8:** Antarctic Nutrient Cycles and Food Webs. Proceedings of the 4th SCAR Symposium on Antarctic Biology, September 1983. WR Siegfried, PR Condy, and RM Laws, eds. Berlin : Springer-Verlag, 1985. pp.430-436; **9:** Copeia 3:686- 693, 1981

tanaid *Nototanais dimorphus*

Nototanais dimorphus is found in Antarctica and the Antarctic Peninsula, Kerguelen Island, Marion and Prince Edward Islands, Macquarie Island, and southern tip of South America, from 2 to 585 meters depth [1,2,4,5,6,7,10]. *N. dimorphus* is a dominant species in the McMurdo jetty soft-bottom macrofaunal community and is a foundation species for the ecological community there, regulating species composition and population size (age) structure by preying on small species and small individuals of large species [8,10]. *Nototanais dimorphus* transforms from female to male, and the genders are differentiated by the shape of their cheliped – the pincer-like claw leg [1]. In this photo, the male is above the female [3,10].

Nototanais dimorphus lives in a tube, and is located in or near its tube [8]. Its gut contents include diatoms, bacteria, and amorphous organic material [8,9].

The predators of *Nototanais dimorphus* include the anemone *Edwardsia meridionalis* and the fish *Trematomus bernacchii* and *Trematomus hansoni* [8].

The tanaid's upper body (thorax) has seven pairs of walking legs, the first of which has a large pincer-like claw for clasping and the second specialized for burrowing. The tanaid's abdomen has five pairs of swimming limbs and a pair of posterior appendages. Tanaids live on or in soft sediments, and feed on organic detritus and plankton. The female carries eggs and developing young in a brood pouch on its underside.

References: 1: Journal of Crustacean Biology 4(2):298-306, 1984; **2:** Mitteilungen aus dem Zoologischen Museum in Berlin 56(1):45-71, 1980; **3:** Kathleen Conlan, personal communication, 1999; **4:** Journal of the Royal Society of New Zealand 13(4):279-294, 1983; **5:** South African Journal of Antarctic Research 21(1):3-44, 1991; **6:** A Survey of the Marine Fauna in Shallow Coastal Waters of the Vestfold Hills and Rauer Islands, Antarctica. MJ Tucker & HR Burton. ANARE Research Notes 55, 1987; **7:** Tethys 6(3):631-653, 1974; **8:** Ophelia 24(3):155-175, 1985; **9:** Antarctic Science 14(1):3-10, 2002; **10:** Polar Biology 38:1623-1629, 2015

acorn barnacle *Bathylasma corolliforme*

The acorn barnacle *Bathylasma corolliforme* is found throughout Antarctica and the Antarctic Peninsula, South Sandwich Islands, Scotia Bank off South Georgia Island, and Kerguelen Islands from 6 to 1,500 meters depth [1,2,4,5,6].

Bathylasma corolliforme is not typically known to live at depths of less than one hundred meters in Antarctica; here it was photographed at Cape Armitage at six meters depth and it has been observed near Cape Evans at 24 meters depth [1,2].

The presence of *Bathylasma corolliforme* may be linked to the presence of currents sufficiently strong to bring food into its grasp and thus ensure survival [1].

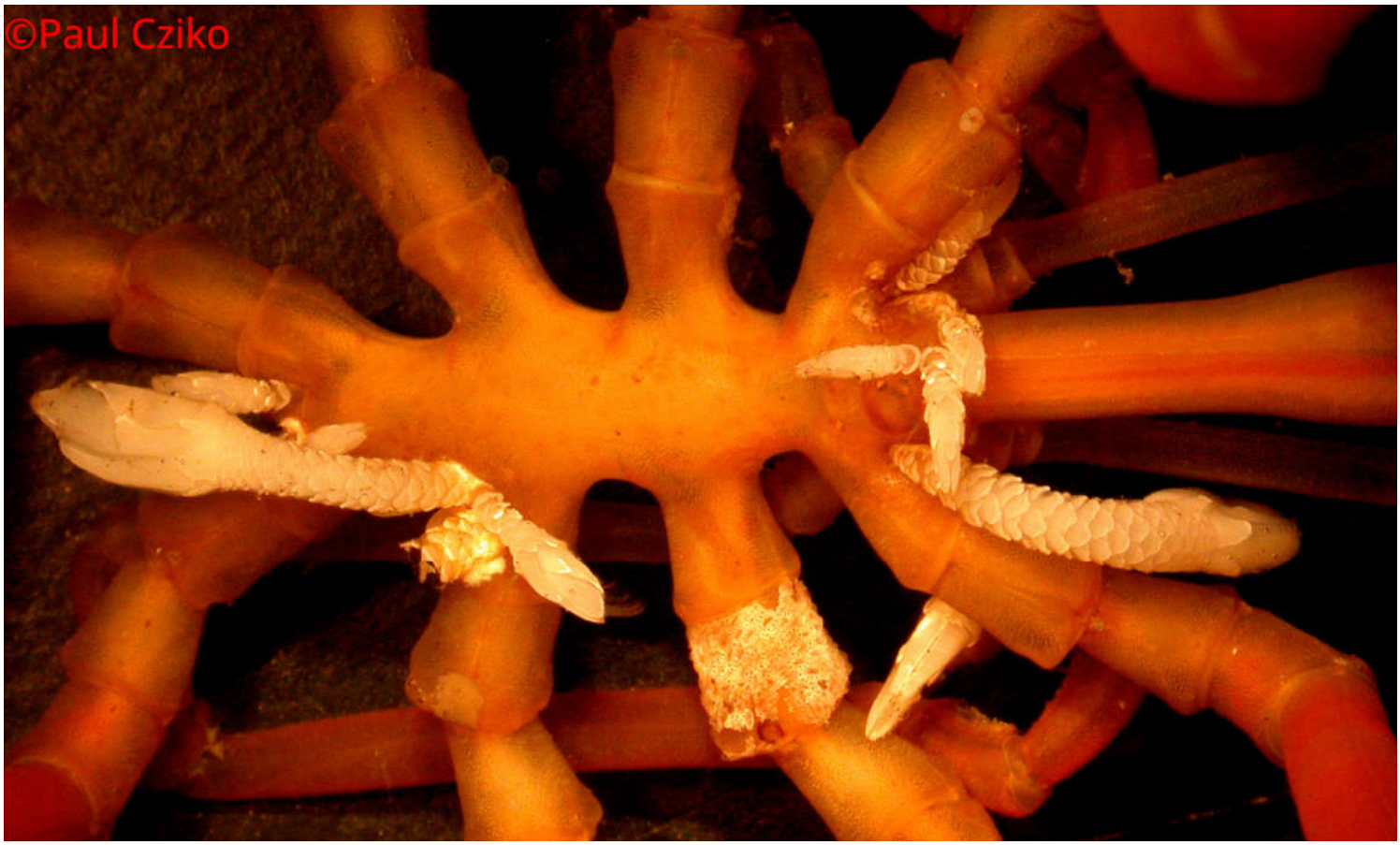
In these photos, *Bathylasma corolliforme* doesn't have complemental males on or near its top opercular plates; small-sized male barnacles are found attached to larger hermaphroditic individuals to facilitate reproduction [1,3].

References: 1: Journal of Biogeography 9:95-109, 1982; **2:** Rob Robbins, personal communication, 2005; **3:** William A Newman, personal communication, 2005; **4:** Revision of the balanomorph barnacles; including a catalog of the species. WA Newman & A Ross.San Diego Society of Natural History Memoir 9, 1976; **5:** Antarctic Cirripedia; monographic account based on specimens collected chiefly under the United States Antarctic research program, 1962-1965. WA Newman & A Ross. Washington DC: American Geophysical Union, 1971; **6:** Crustacea Cirripedia Thoracica: Chionelasmatoidea and Pachylasmatoidea (Balanomorpha) of New Caledonia, Vanuatu and Wallis and Futuna Islands, with a review of all Currently Assigned Taxa. D. Jones. IN: A. Crosnier, ed. Resultats des Campagnes MUSORSTOM, Volume 21. Memoires du Museum National d'Histoire Naturelle 184:141-283, 2000

stalked barnacle, possibly *Litoscalpellum aurorae*

Looks like *Litoscalpellum aurorae* illustrated in Rauschert and Arntz' Antarctic Macrobenthos [1].

Barnacles that are possibly *Litoscalpellum aurorae*, attached to a pycnogonid sea spider.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Pedunculate barnacles of the family Scalpellidae exhibit all three sexual systems (hermaphroditism, androdioecism, dioecism) [2].


©Steve Rupp/NSF

References: 1: Rauschert Martin & Wolf Arntz. Antarctic Macrobenthos, a field guide to the invertebrates living at the Antarctic seafloor. Wurster Nordseekueste, Germany: Arntz & Rauschert Selbstverlag, 2015, p.57; **2:** Marine Biology 149(4):829–844, 2006

stalked barnacle, probably *Weltnerium bouvieri*

Weltnerium bouvieri has been collected from Antarctica and the South Orkney Islands and South Georgia Island, from 18 to 920 meters depth [1,5]. This specimen was collected from Cinder Cones at about 18 meters depth [4]. The capitular plates of *W. bouvieri* are separated by narrow, translucent, chitonous spaces [1]. *W. bouvieri* has been collected up to 15 millimeters total height, and has been found attached to hydroids and bryozoans [1,5].

Stalked or lepadiform barnacle species vastly outnumber stalkless or balaniform barnacle species in Antarctica (32 to 1) [1,2]. The greater number of stalked species in Antarctica may be due to the lack of littoral fauna (in which stalkless barnacles are well represented) and also due to periods of heavy glaciation in geologic history which impacts stalkless barnacles heavily since they tend to live in shallow water [1,2].

After their larval stage, barnacles are sedentary organisms, secreting calcareous plates which they open and close to extend and retract appendages to filter feed.

Taxonomic Note: Genus was changed from *Arcoscalpellum* to *Weltnerium* [3]. *Weltnerium weltneri* is a junior synonym of *W. bouvieri* [5].

References: 1: Antarctic Cirripedia, Monographic Account Based on Specimens Collected Chiefly Under the United States Antarctic Research Program, 1962-1965. WA Newman & A Ross. Washington DC : American Geophysical Union, 1971; **2:** Advances in Marine Biology 10:1-216, 1972; **3:** Zoologicheskii Zhurnal 57(9):1343-1352, 1978; **4:** Kathleen Conlan, personal communication, 1999; **5:** Zoosystema 24(2): 309-345, 2002

shrimp *Chorismus antarcticus*

Chorismus antarcticus is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Georgia Island, Falkland Islands, Chile, and Marion and Prince Edward Islands, from 9 to 1,450 meters depth [3,4,5,8,9,14,15,16].

In the Ross Sea, *Chorismus antarcticus* is found on the continental shelf and upper slopes [13].

Chorismus antarcticus can be up to ten centimeters long with the rostrum as long as the carapace [5]. Carapace length of *C. antarcticus* can be over two centimeters (from eyestalk base to central dorsal carapace edge) [1].

Chorismus antarcticus reaches a likely age of ten years in the Weddell Sea [1]. *C. antarcticus* is a hermaphrodite and undergoes a sex transition from male to female during its the fourth year of life [1,2,6].

Chorismus antarcticus adults are carnivorous and feed on moving prey like amphipods [1].

Predators of *Chorismus antarcticus* include fish (including *Trematomus hansoni*, *Trematomus bernacchii* and *Trematomus loennbergii*), the Weddell seal, penguins, black bellied storm petrels, and the brittle star *Ophiosparte gigas* [7,10,11,12,16].

Due to slow growth, low mortality rate, and low average abundance, *Chorismus antarcticus* has little potential for commercial fishing; commercial bottom trawling would over-exploit the stock and destroy its sponge community habitat [1].

Shrimp have a semitransparent body flattened from side to side with a flexible abdomen and a fan-shaped tail. Shrimp use their appendages for swimming, swimming backward rapidly by flexing their abdomen and tail. Shrimp usually eat phytoplankton and zooplankton; some feed on dead animals.

References: 1: Journal of Experimental Marine Biology and Ecology 174:261-275, 1993; **2:** Polar Biology 17(4):384-388, 1997; **3:** Proceedings of the NIPR Symposium on Polar Biology 9:179-206, 1996; **4:** Instituto Antartico Chileno. Serie Cientifica 4(1):89-94, 1976; **5:** Fauna der Antarktis. J Sieg & JW Wagele, eds. Berlin : P. Parey, 1990; **6:** Adaptations within Antarctic Ecosystems, Proceedings of the Third SCAR Symposium on Antarctic Biology. GA Llano, ed. Washington, DC : Smithsonian Institution, 1977. pp.335-342; **7:** Journal of Mammalogy 46(1):37-43, 1965; **8:** South African Journal of Antarctic Research 21(1):3- 44, 1991; **9:** A Survey of the Marine Fauna in Shallow Coastal Waters of the Vestfold Hills and Rauer Islands, Antarctica. MJ Tucker & HR Burton. ANARE Research Notes 55, 1987; **10:** Polar Biology 16(5):309-320, 1996; **11:** Polar Biology 17(1):62-68, 1997; **12:** Polar Biology 27(11):721-728, 2004; **13**: PLoS ONE 9(7):e103195. doi:10.1371/journal.pone.0103195, 2014; **14:** Scientia Marina 69(Supplement 2):183-193, 2005; **15:** Biogeographic Atlas of the Southern Ocean. Claude de Broyer and Philippe Koubbi, chief editors. Cambridge, UK: Scientific Committee on Antarctic Research, 2014; **16:** Xavier, J. C. et al. Crustacean guide for predator studies in the Southern Ocean. Cambridge, UK.: Scientific Committee on Antarctic Research, 2020

shrimp *Notocrangon antarcticus*

Notocrangon antarcticus is found throughout Antarctica and the Antarctic Peninsula and South Shetland Islands, South Orkney Islands, and South Georgia Island, at depths down to 2,350 meters [2,3].

In the Ross Sea, *Notocrangon antarcticus* is found on the continental shelf and upper slopes [1].

Predators of *Notocrangon antarcticus* include fish, gentoo penguins, grey-headed albatrosses, white-chinned petrels and Weddell seals [4].

References: 1: PLoS ONE 9(7):e103195. doi:10.1371/journal.pone.0103195, 2014; **2:** Scientia Marina 69(Supplement 2):183-193, 2005; **3:** Biogeographic Atlas of the Southern Ocean. Claude de Broyer and Philippe Koubbi, chief editors. Cambridge, UK: Scientific Committee on Antarctic Research, 2014; **4:** Xavier, J. C. et al. Crustacean guide for predator studies in the Southern Ocean. Cambridge, UK.: Scientific Committee on Antarctic Research, 2020