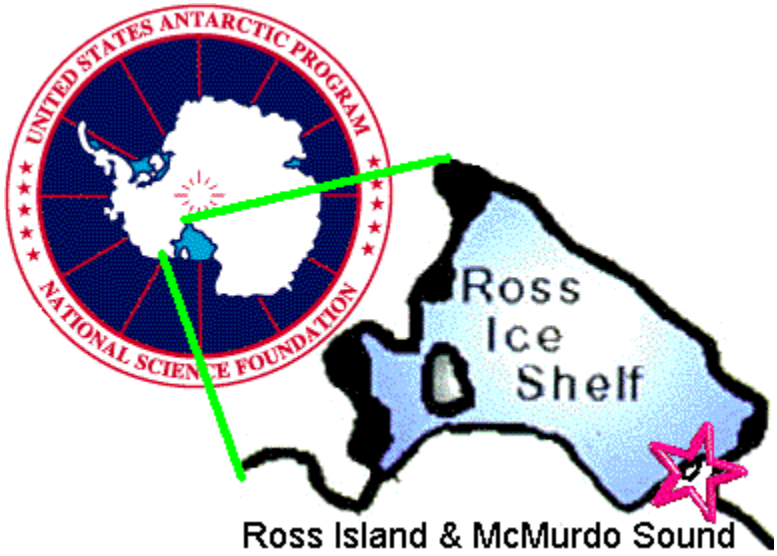
UNDERWATER FIELD GUIDE TO ROSS ISLAND & MCMURDO SOUND, ANTARCTICA, VOLUME 4: ECHINODERMATA
seastars, urchins, brittle stars, sea cucumbers, crinoids

Peter Brueggeman

Photographs: Isidro Bosch, Peter Brueggeman, Rod Budd/Antarctica New Zealand, Kathleen Conlan/Canadian Museum of Nature, Paul Cziko, Paul Dayton, Shawn Harper, Henry Kaiser/NSF, 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 aims to facilitate underwater/topside field identification from visual characters. Most organisms were identified from photographs with no specimen collection, so there can be uncertainty with these identifications.

Keywords; Antarctic, Antarctica, field guide, marine, Ross Island, McMurdo Sound, echinodermata, echinoderm, seastar, starfish, sea urchin, brittle star, sea cucumber, crinoid

seastar *Acodontaster conspicuus*

seastar *Acodontaster hodgsoni*

seastar *Cuenotaster involutus*

seastar *Diplasterias brucei*

seastar *Lophaster gaini*

seastar *Macroptychaster accrescens*

astropectinid sea star, probably *Macroptychaster accrescens* or *Leptychaster* sp.

seastar *Notasterias armata*

seastar *Odontaster* spp.

seastar *Odontaster validus*

seastar *Perknaster aurorae*

seastar *Perknaster fuscus*

seastar *Glabraster antarctica*

seastar *Psilaster charcoti*

possibly the seastar *Pteraster affinis*

heart urchin *Abatus* sp.

pencil urchin *Ctenocidaris perrieri*

sea urchin *Sterechinus neumayeri*

brittle star *Astrotoma agassizii*

brittle star *Ophiacantha antarctica*

brittle star *Ophionotus victoriae*

brittle star *Ophioplinthus* sp., probably *Ophioplinthus gelida*

brittle star *Ophiosparte gigas*

sea cucumber *Staurocucumis liouvillei*

sea cucumber *Staurocucumis turqueti*

sea cucumber *Bathyplotes bongraini*

sea cucumber *Cucumaria* spp.

sea cucumber *Echinopsolus acanthocola*

sea cucumber *Heterocucumis steineni*

sea cucumber, group Aspidochirotida

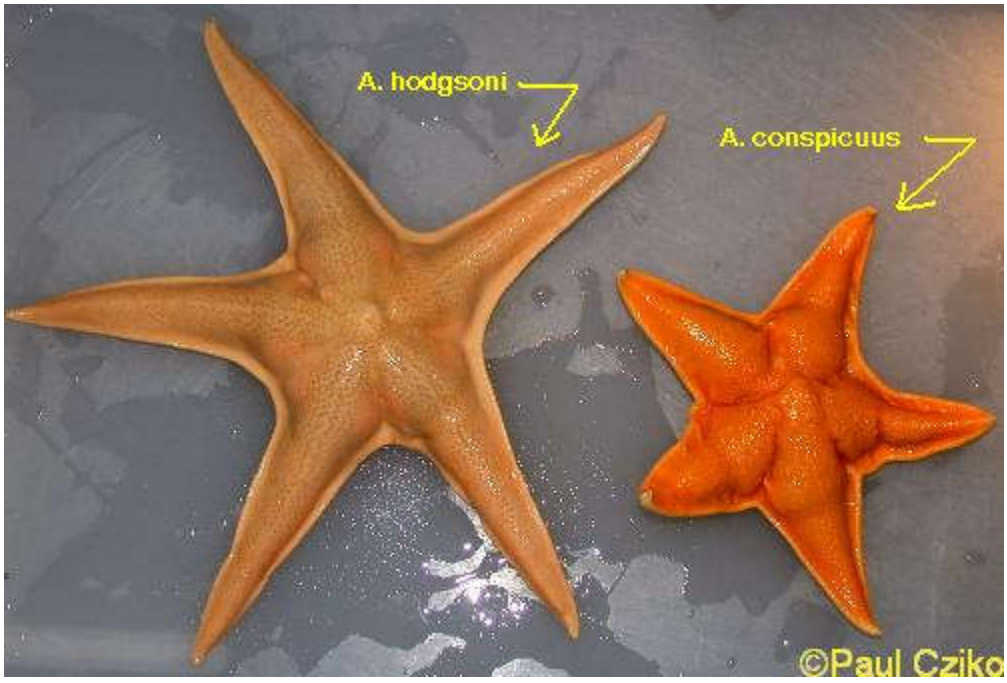
crinoid *Promachocrinus kerguelensis*

Seastar ID advisors included John H. Dearborn

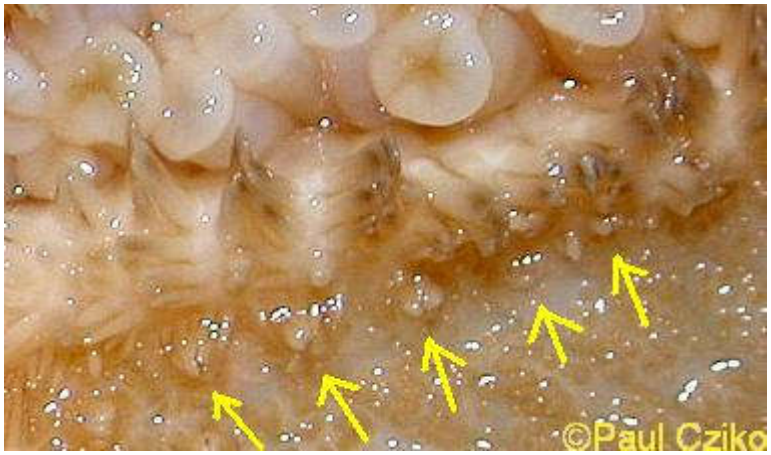
November 2021: Taxonomic names checked in Zoological Record and World Register of Marine Species

seastar *Acodontaster conspicuus*

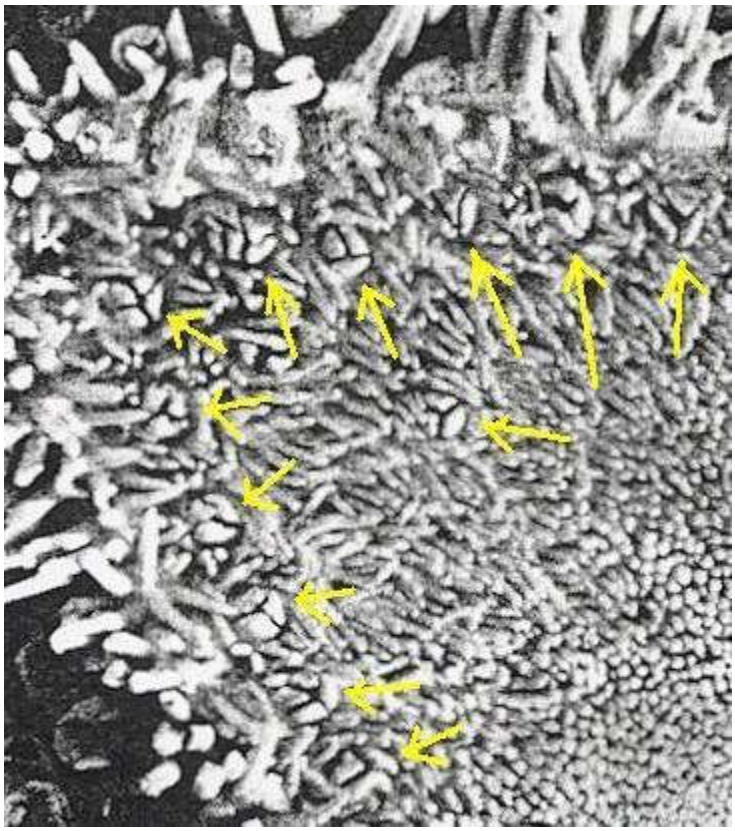
Acodontaster conspicuus is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia Island, Bouvet Island, and Falkland Islands between 0 and 761+ meters depth [3,5,6,7,8]. *A. conspicuus* has been collected at sizes up to fourteen centimeters in radius from its center to the tip of an arm [4,6].



The color of *Acodontaster conspicuus* (shown on the right compared to *A. hodgsoni* on the left) has been recorded as pink, orange, pale orange, brown, and brownish yellow and it may be yellowish towards the edges [4,6]. *A. conspicuus* has a flattened disc with arms wide at their base and narrowing quickly with a thin edge [6].

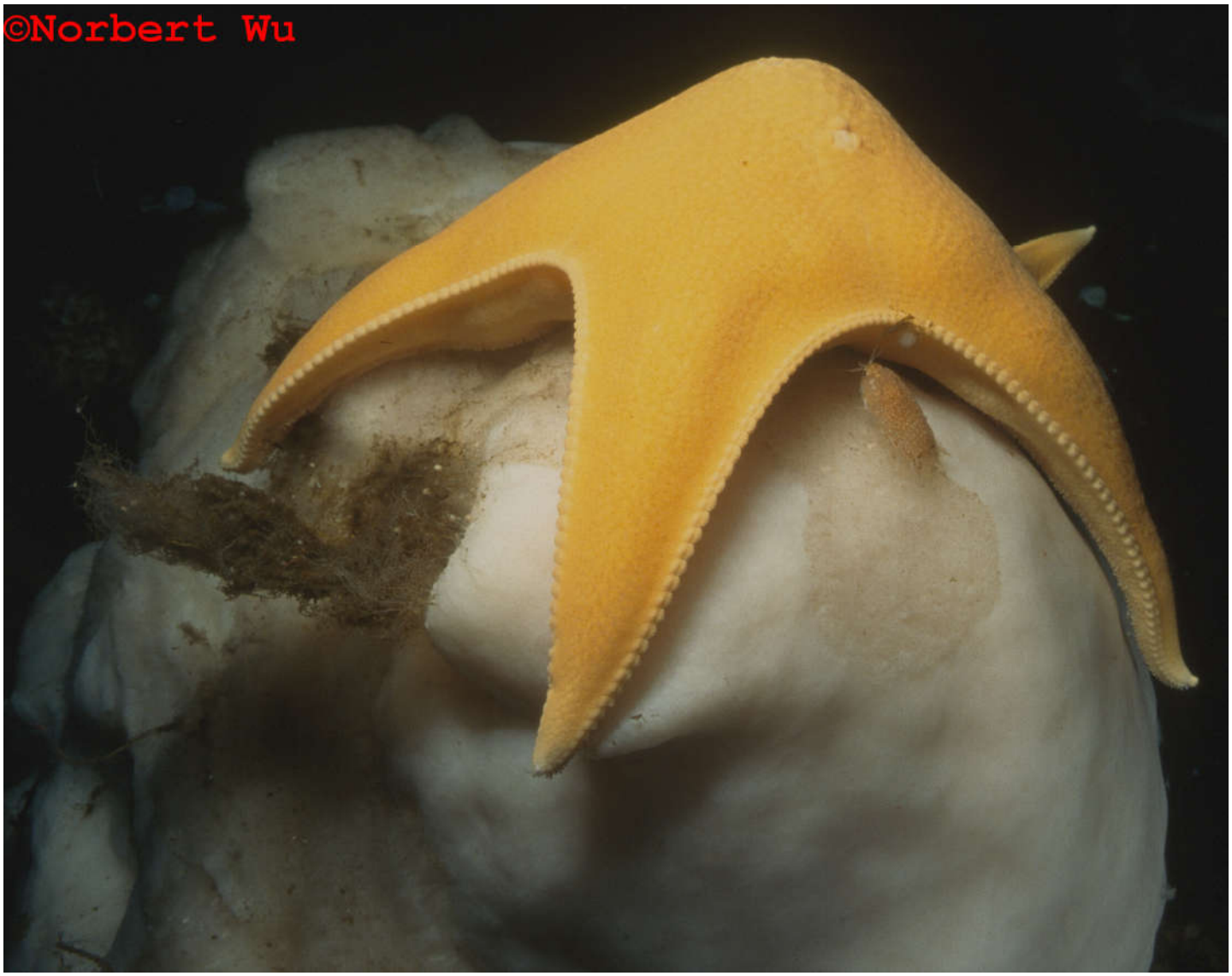


One way to distinguish *Acodontaster conspicuus* from the other Ross Sea *Acodontaster* species is by the presence of pincer-like pedicellariae on the underside of *A. conspicuus* [4].



A preserved specimen of *Acodontaster conspicuus* shows the pincer-like pedicellariae with greater clarity [4].

Pedicellaria keep the seastar's body surface clear of encrusting organisms by pinching or cutting their settling larvae.



Showing an *Acodontaster* sp. here, *Acodontaster conspicuus* is a predator of rossellid sponges and the sponges *Homaxinella balfourensis*, *Anoxycalyx (Scolymastra) joubini* (shown here), *Antarctotetilla leptoderma*, *Haliclona scotti*, *Mycale (Oxymycale) acerata*, and *Kirkpatrickia variolosa* [1,2]. Observations suggest that a single *A. conspicuus* does not stay long on the sponge *Anoxycalyx (Scolymastra) joubini* but several accumulate, do not leave, and consume enough of the sponge to kill it [2]. In this image, see the isopod standing alongside *Acodontaster* sp. Some isopods shelter in sponges so it's possible that this isopod is inspecting a predatory visitor dining on its home.

Here’s a gang attack on an *Acodontaster* sp. by the predatory seastar *Odontaster validus*. Predators of *Acodontaster conspicuus* include the seastar *Odontaster validus* (shown here), the nemertean proboscis worm *Parborlasia corrugatus* (in foreground), and the anemone *Urticinopsis antarcticus* [2,3]. *Acodontaster conspicuus* would reach population densities destroying the sponge community if not kept in check by *Odontaster validus* which preys upon the larvae, young and adult *A. conspicuus* [2]. A single *Odontaster validus* climbs up onto an *Acodontaster conspicuus* armray, everts its stomach, and digests a hole into it. An attack by a single *Odontaster validus* isn't fatal but nearby *O. validus* probably respond to the release of *Acodontaster conspicuus* coelomic fluid and join the attack [2].

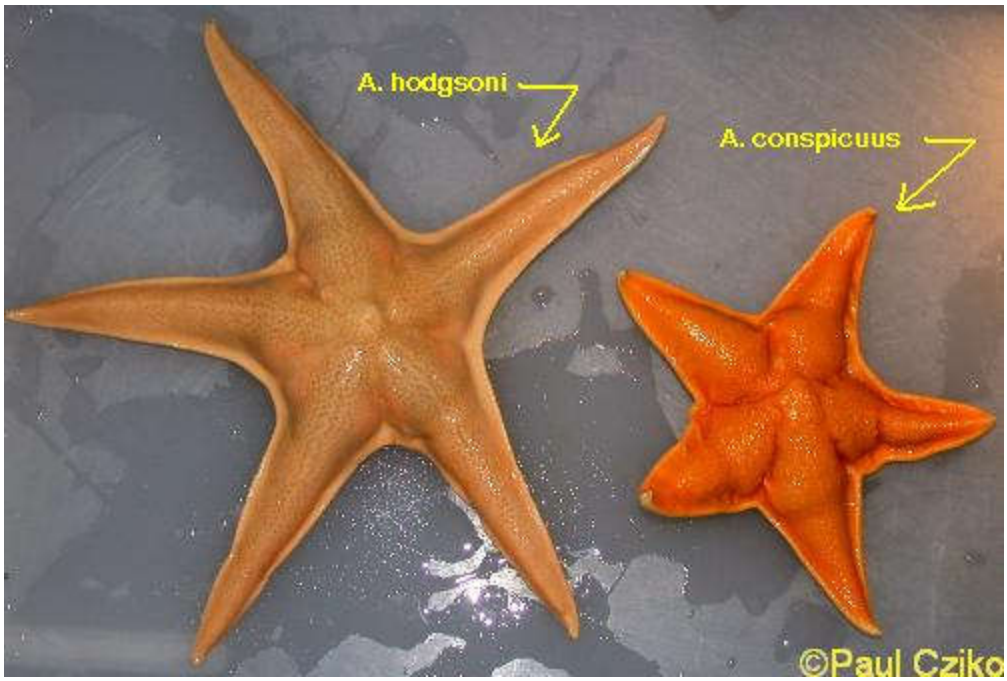
Showing an *Acodontaster* sp. here, a gang attack eventually slows the larger *Acodontaster conspicuus* seastar's movement, more *Odontaster validus* join the attack, and the large nemertean proboscis worm *Parborlasia corrugatus* joins in as well. *A. conspicuus* seastars can become completely buried under high piles of attacking *Odontaster validus* seastars and *Parborlasia corrugatus* worms [2].

References: 1: Science 245:1484-1486, 1989; **2:** Ecological Monographs 44(1):105-128, 1974 (P. Dayton, personal communication, 2015: *Haliclona dancoi* observations are corrected to *H. scotti*; *Rossella racovitzae* observations are corrected to *R. podagrosa*); **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.293-326; **4:** The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **5:** Polar Biology 20(4):229-247, 1998; **6:** Equinodermos Antarticos. II. Asteroideos. 5. Asteroideos de la Extremidad Norte de la Peninsula Antartica. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia (aka Ciencias Zoologicas) 9(10):211-281 and plates, 1970; **7:** U.S. National Museum of Natural History, Dept of Zoology, Invertebrate Zoology, Invertebrate Zoology Collections database; **8:** Amazing Antarctic asteroids: a guide to the starfish of the Ross Sea. Kate Neill et al. NIWA, New Zealand, Version 1, 2016 https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/amazing-antarctic-asteroids

seastar *Acodontaster hodgsoni*

Acodontaster hodgsoni is found throughout Antarctica, the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia Island, Bouvet Island, Crozet Islands, Heard Island, Kerguelen Islands, Prince Edward Islands, between 4 and 540 meters depth [2,3,4,5,6,7].

Acodontaster hodgsoni has been collected at sizes up to twenty centimeters in radius from its center to the tip of an arm [2].



Acodontaster hodgsoni is shown on the left compared to *A. conspicuus* on the right.

Acodontaster hodgsoni is a predator of the sponges *Haliclona scotti*, *Calyx shackletoni*, rossellid sponges, and *Hemigellius fimbriatus* [1].

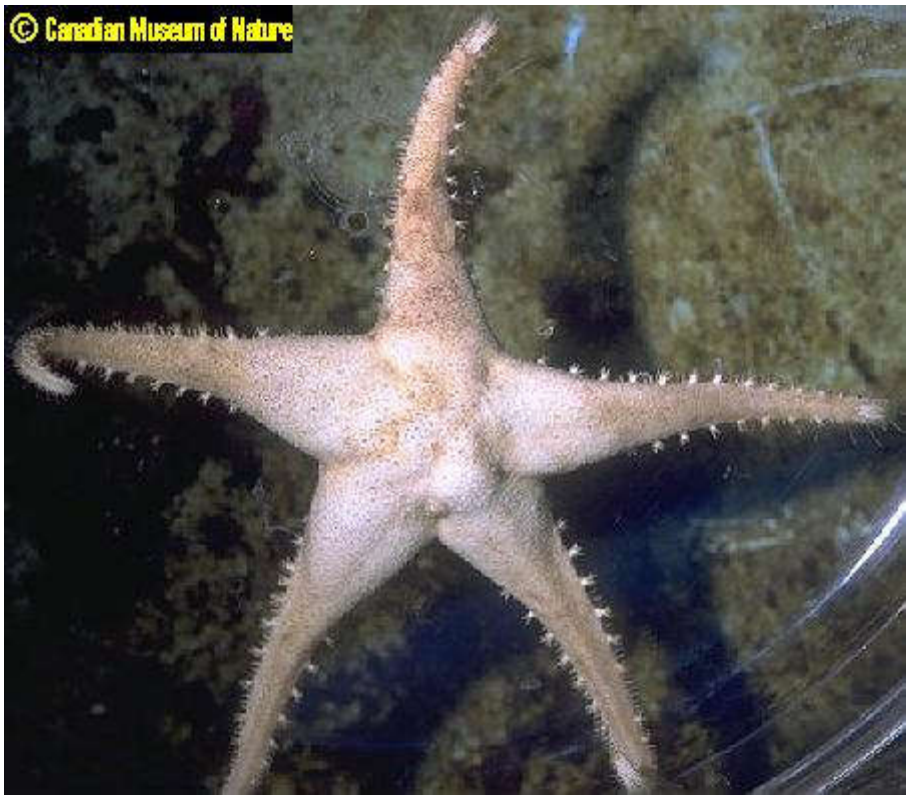
As shown here, *Acodontaster hodgsoni* lacks the pincer-like pedicellariae alongside its underside spines, which are present on *A. conspicuus* [2].

Predators of *Acodontaster hodgsoni* include the seastar *Odontaster validus*, the nemertean worm *Parborlasia corrugatus*, and the anemone *Urticinopsis antarcticus* [1]. Here's a gang attack on an *Acodontaster* sp. by the seastar *Odontaster validus* with the nemertean proboscis worm *Parborlasia corrugatus* in the foreground.

Showing an *Acodontaster* sp. here, a gang attack eventually slows the larger *Acodontaster* seastar's movement, more *Odontaster validus* join the attack, and the large nemertean proboscis worm *Parborlasia corrugatus* will join in the feeding as well.

References: 1: Ecological Monographs 44(1):105-128, 1974 (P. Dayton, personal communication, 2015: *Haliclona dancoi* observations are corrected to *H. scotti*; *Gellius tenella* corrected to *Hemigellius fimbriatus*; *Rossella racovitzae* observations are corrected to *R. podagrosa*); **2:** The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **3:** Bulletin de l'Institut Royal des Sciences Naturelles de Belgique. Biologie 63:175-184, 1993; **4:** Discovery Reports 20:115, 1941; **5:** U.S. National Museum of Natural History, Dept of Zoology, Invertebrate Zoology, Invertebrate Zoology Collections database; **6:** Polar Biology 38:799-813, 2015; **7:** Amazing Antarctic asteroids: a guide to the starfish of the Ross Sea. Kate Neill et al. NIWA, New Zealand, Version 1, 2016 https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/amazing-antarctic-asteroids

seastar *Cuenotaster involutus*



Cuenotaster involutus is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Georgia Island, Shag Rocks, and Bouvet Island from 0 to 794 meters depth [1,2,4,5,6,7]. The disc of *C. involutus* may be flat or slightly convex and is depressed between arms [3]. The arms of *Cuenotaster involutus* are long, slender, flexible, convex-surfaced, and blunt-tipped and may sometimes be coiled ventrally [3,4].

Cuenotaster involutus has been collected at sizes up eleven centimeters in radius from its center to the tip of an arm [2,3,5].

The color of *Cuenotaster involutus* includes pink-brick, grey-brown, yellowish brown, white, greenish gray, and gray white [2,3,4,5].

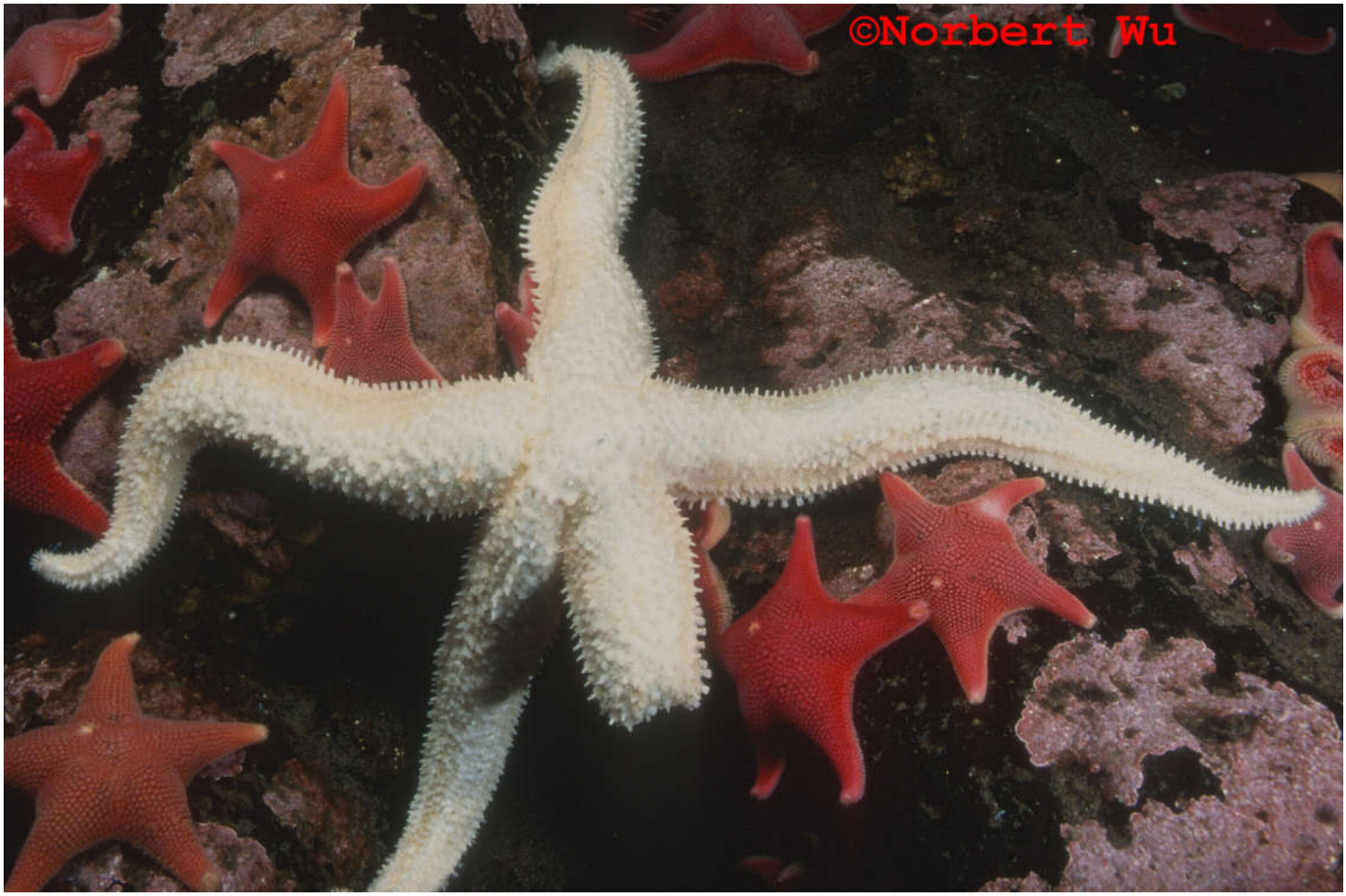
Closer view of the distinctive and unmistakeable bristling, well-spaced rosette-like paxillae along the disc and arms of *Cuenotaster involutus* [3,4,5].

Cuenotaster involutus may be both an active predator and a scavenger [1].

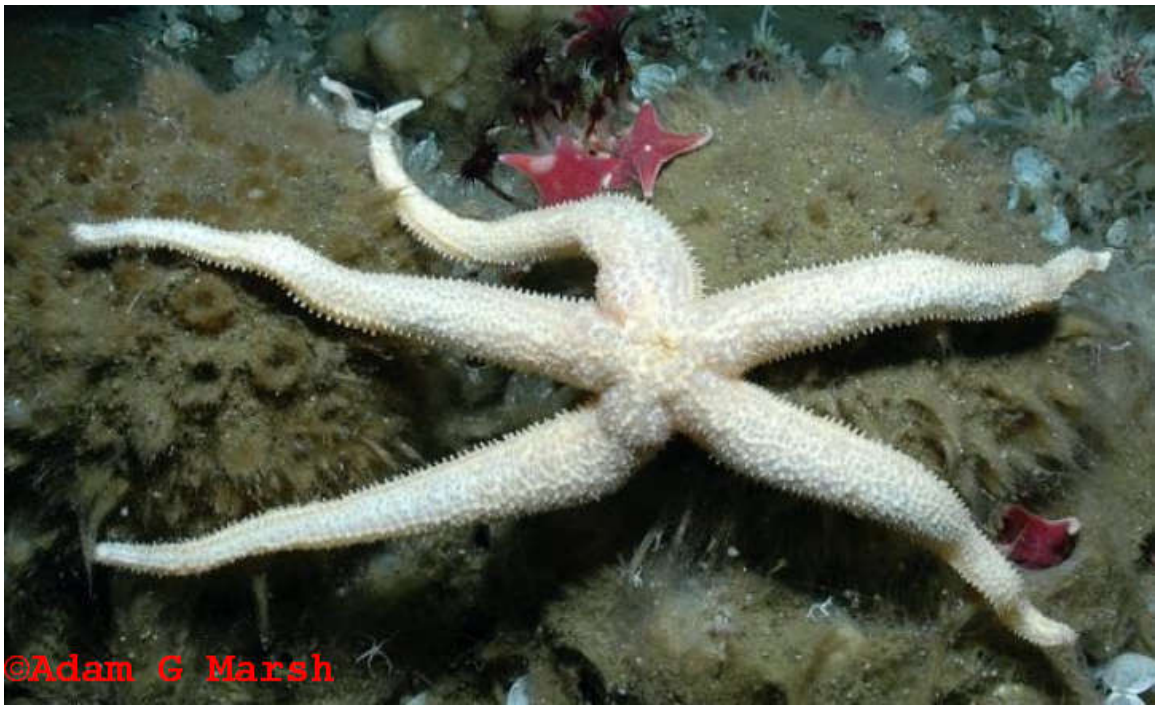
References: 1: Adaptations within Antarctic Ecosystems: Proceedings of the Third SCAR Symposium on Antarctic Biology. George A. Llano, ed. Washington: Smithsonian Institution; Houston, Tex.: distributed by Gulf Pub. Co., 1977. pp.293-326; **2:** Fauna der Antarktis. J Sieg & JW Wagele, eds. Berlin: P. Parey, 1990; **3:** The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **4:** Discovery Reports 20:69-306 and plates, 1940; **5:** Equinodermos Antarticos. II. Asteroideos. 5. Asteroideos de la Extremidad Norte de la Peninsula Antartica. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia (aka Ciencias Zoologicas) 9(10):211-281 and plates, 1970; **6:** Polar Biology 38:799-813, 2015; **7:** Amazing Antarctic asteroids: a guide to the starfish of the Ross Sea. Kate Neill et al. NIWA, New Zealand, Version 1, 2016
https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/amazing-antarctic-asteroids

seastar *Diplasterias brucei*

Diplasterias brucei is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia Island (six-rayed forma), Tierra del Fuego, Crozet Islands, Heard Island, Marion and Prince Edward Islands, from 0 to 752 meters depth [3,6,7,8,9,10,11,12].



Diplasterias brucei color can be light blue-green on top with white spines and a whitish border to the disc and arms with the arm tips blood-red; other recorded colors are pale grey to blue-grey, pale orange or pale blue-grey with a red eye spot at each arm tip, light brown, creamy white with red blotches [7,10].



The disc of *Diplasterias brucei* is small and convex; its arms taper gradually to blunt tips [7]. *Diplasterias brucei* has been collected at sizes up to 23.7 centimeters in radius from its center to the tip of an arm [6,7,10].

These are juvenile *Diplasterias brucei*.

As shown here, *Diplasterias brucei* specializes on molluscan prey; it is a significant predator of the bivalve mollusc *Limatula hodgsoni* which can comprise almost all of its diet [2,3]. *Diplasterias brucei* also eats the muricid gastropod *Trophonella longstaffi*, and is a scavenger on dead material [2,3].

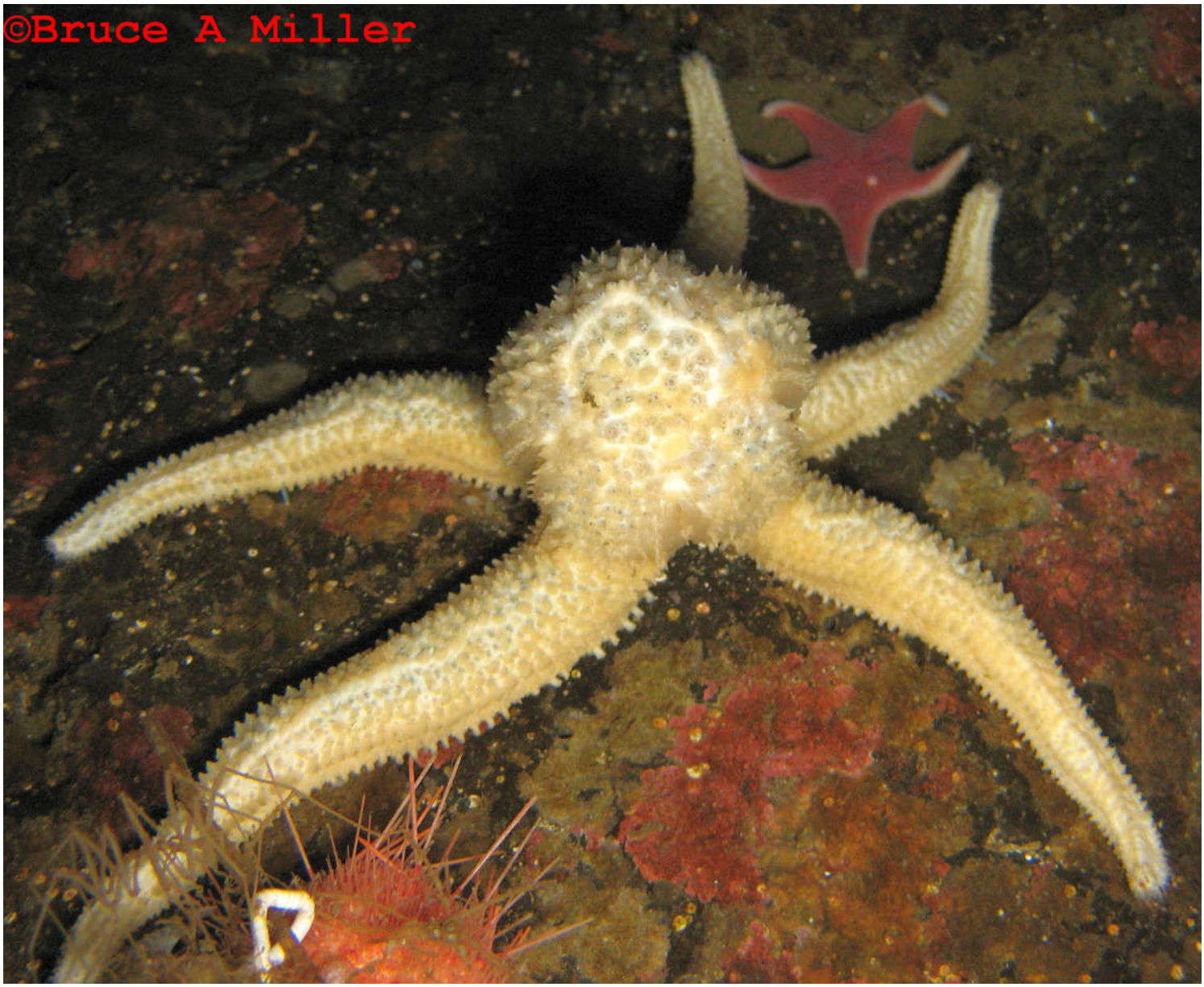
Diplasterias brucei is a prey item for the anemone *Urticinopsis antarctica* [2].

Here is *Diplasterias brucei* on anchor ice.

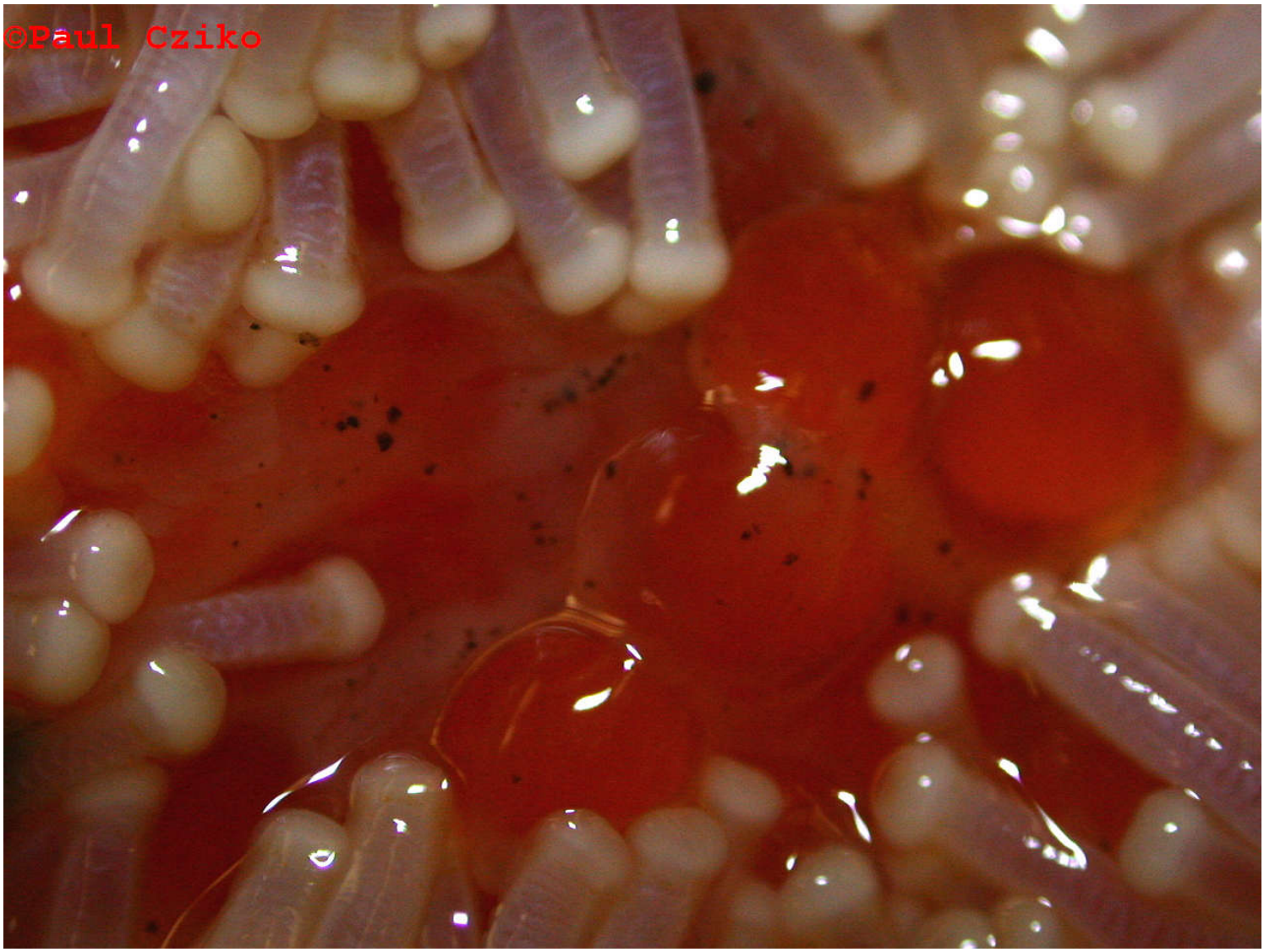
Here *Diplasterias brucei* is humped up and brooding its young in a pocket formed by the underside of its body [1]. Ripe females have been observed year round [5].

Closer view of the eggs being brooded by *Diplasterias brucei*, as seen from its underside, the ventral side of the seastar.

Brood protection occurs quite commonly among Antarctic marine invertebrates [4].



This *Diplasterias brucei* is humped up and brooding its young.



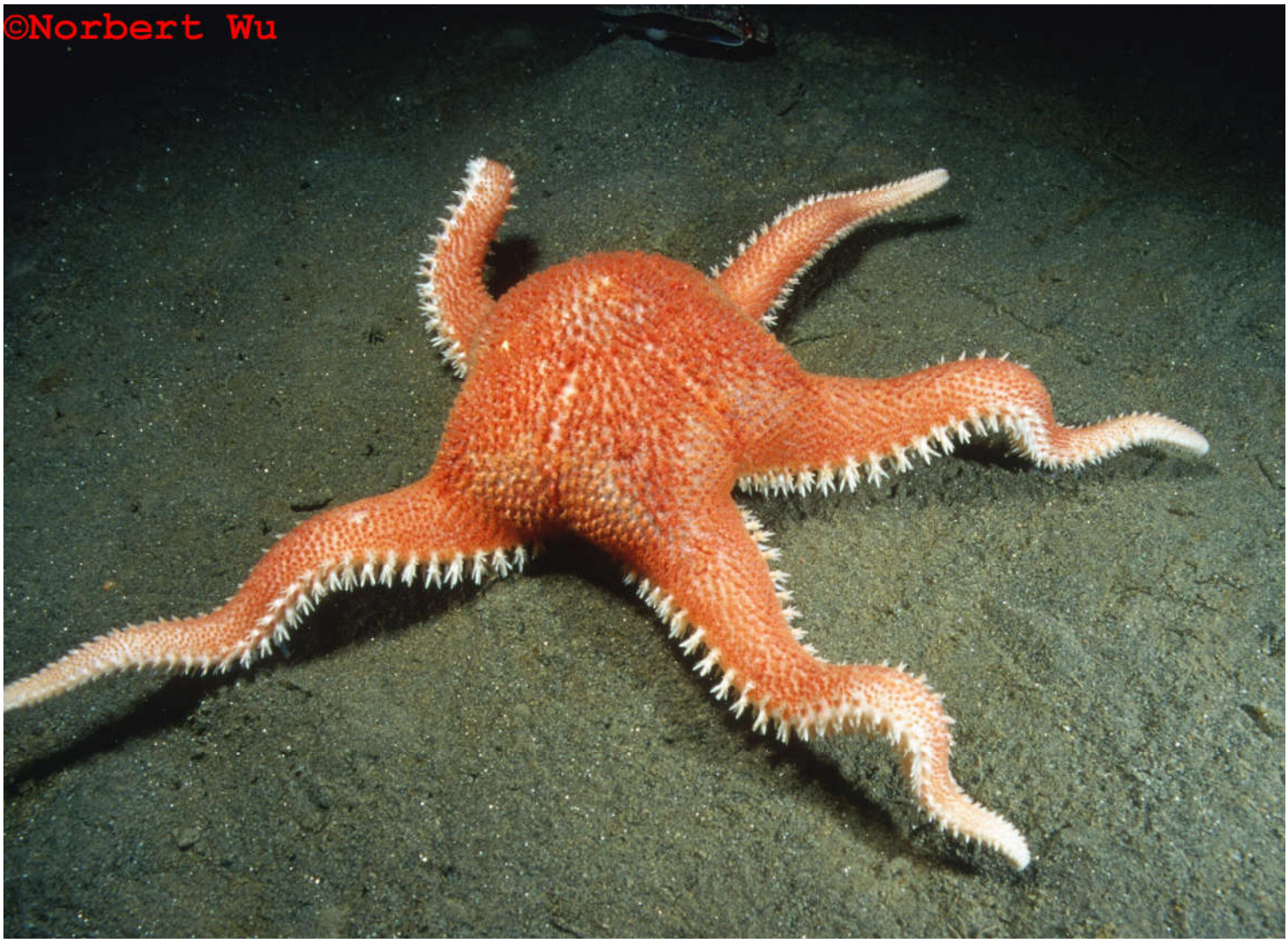
Yolky eggs of *Diplasterias brucei*.

Brood protection helps larvae avoid the stresses of the environment and predation [4]. Brooding helps larvae avoid the dangers of being eaten if the larvae were planktonic in a strong seasonal planktonic cycle as seen in Antarctic waters [4].

References: 1: Ecological Monographs 44(1):105-128, 1974; **2:** Antarctic Ecology, Volume 1. MW Holdgate, ed. NY: Academic Press, 1970. pp.244-258; **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.293-326; **4:** 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.135-157; **5:** Marine Biology 104: 41-46, 1990; **6:** Fauna der Antarktis. J Sieg & JW Wagele, eds. Berlin: P. Parey, 1990; **7:** The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **8:** AM Clark. B.A.N.Z. Antarctic Research Expedition 1929-1931. Reports, Series B (Zoology and Botany) Volume 9, Asteroidea. Adelaide: BANZAR Expedition Committee, 1962; **9:** Discovery Reports 20:69-306 and plates, 1940; **10:** Equinodermos Antarticos. II. Asteroideos. 5. Asteroideos de la Extremidad Norte de la Peninsula Antartica. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia (aka Ciencias Zoologicas) 9(10):211-281 and plates, 1970; **11:** Polar Biology 41:2423-2433, 2018; **12:** Amazing Antarctic asteroids: a guide to the starfish of the Ross Sea. Kate Neill et al. NIWA, New Zealand, Version 1, 2016 https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/amazing-antarctic-asteroids

seastar *Lophaster gaini*

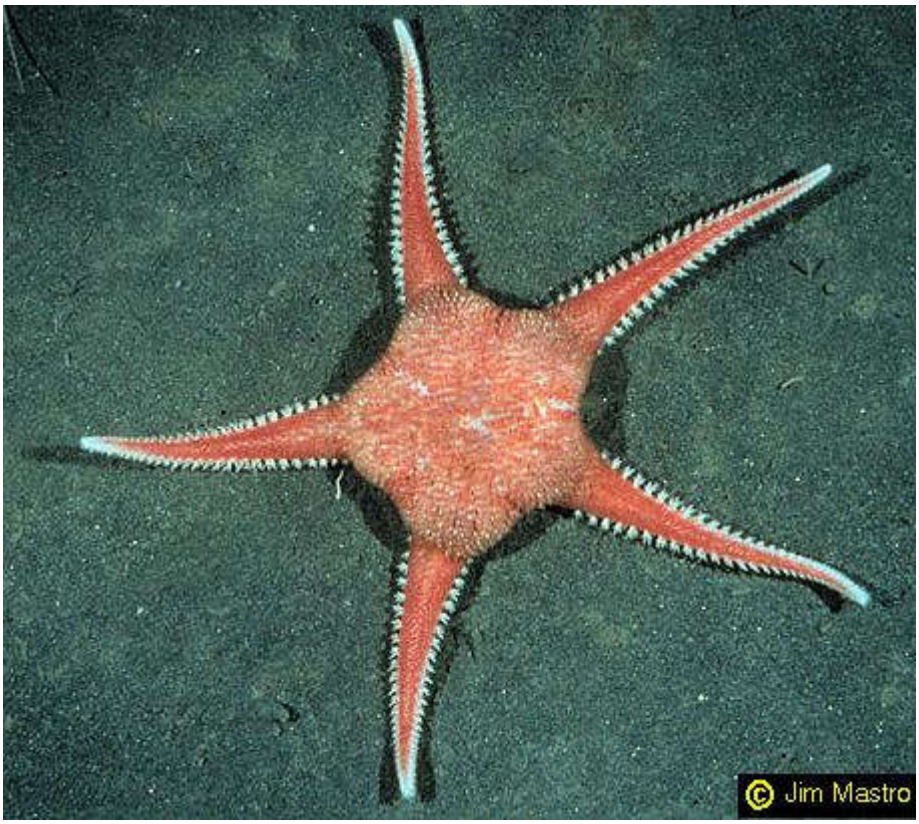
Lophaster gaini is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, and Adelaide Island, at depths from 23 to 578 meters [1,3,6]. *Lophaster gaini* has been collected at sizes up to 17.5 centimeters in radius from its center to the tip of an arm [1].



Lophaster gaini has a broad disc which is slightly concave in the center; its arms are broad at the base and taper evenly to blunt tips protected by small square plates [1].

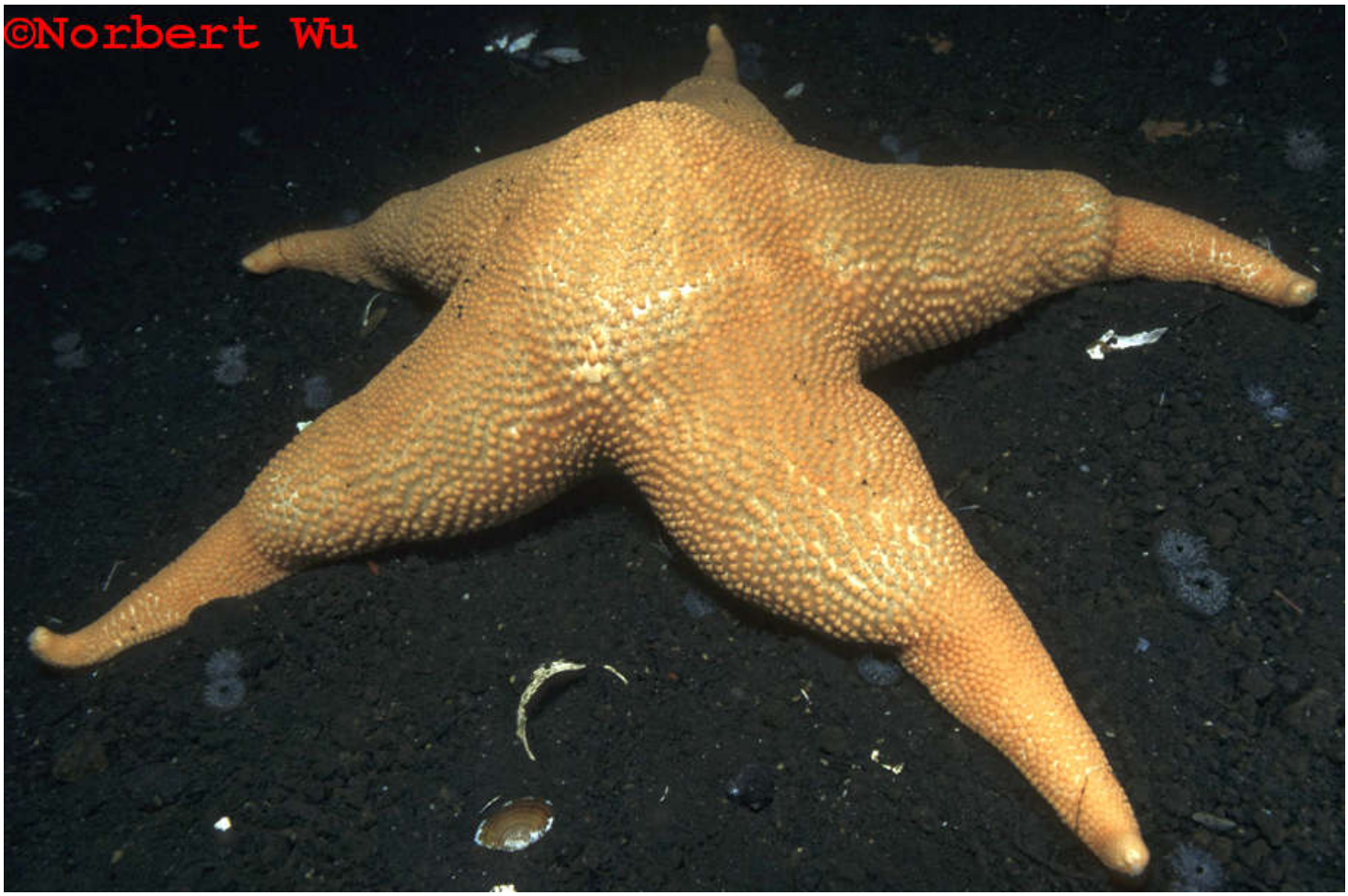
The dorsal (abactinal) color of *Lophaster gaini* may be red to orange to light bluish purple or slightly purple [1,2,5].

One prey item of *Lophaster gaini* is the Antarctic scallop *Adamussium colbecki* [4].



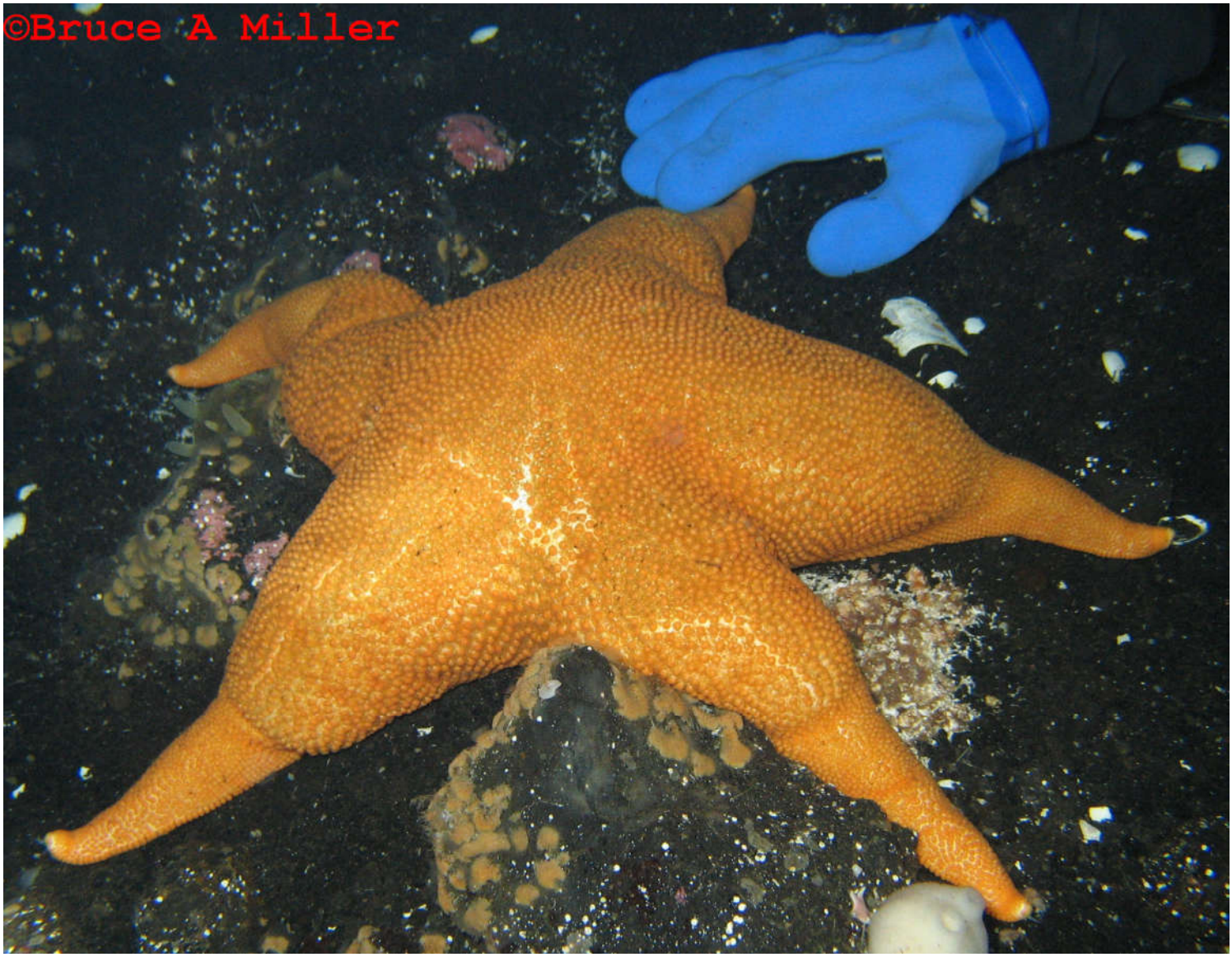
References: 1: The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **2:** Isidro Bosch, 1999, personal communication; **3:** Jim Mastro, personal communication, 1999 (New Harbor, 23 meters); **4:** Ecology of the Circumpolar Antarctic Scallop, Adamussium colbecki (Smith, 1902). Paul Arthur Berkman. Ph. D. Dissertation, University of Rhode Island, 1988; **5:** Echinodermes (Asteries, Ophiures et Echinides). R Koehler. Deuxieme Expedition Antarctique Francaise (1908-1910) commandee par le Dr Jean Charcot. Sciences Naturelles. Documents Scientifiques. Paris: Masson et Cie, 1912; **6:** Amazing Antarctic asteroids: a guide to the starfish of the Ross Sea. Kate Neill et al. NIWA, New Zealand, Version 1, 2016 https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/amazing-antarctic-asteroids

seastar *Macroptychaster accrescens*

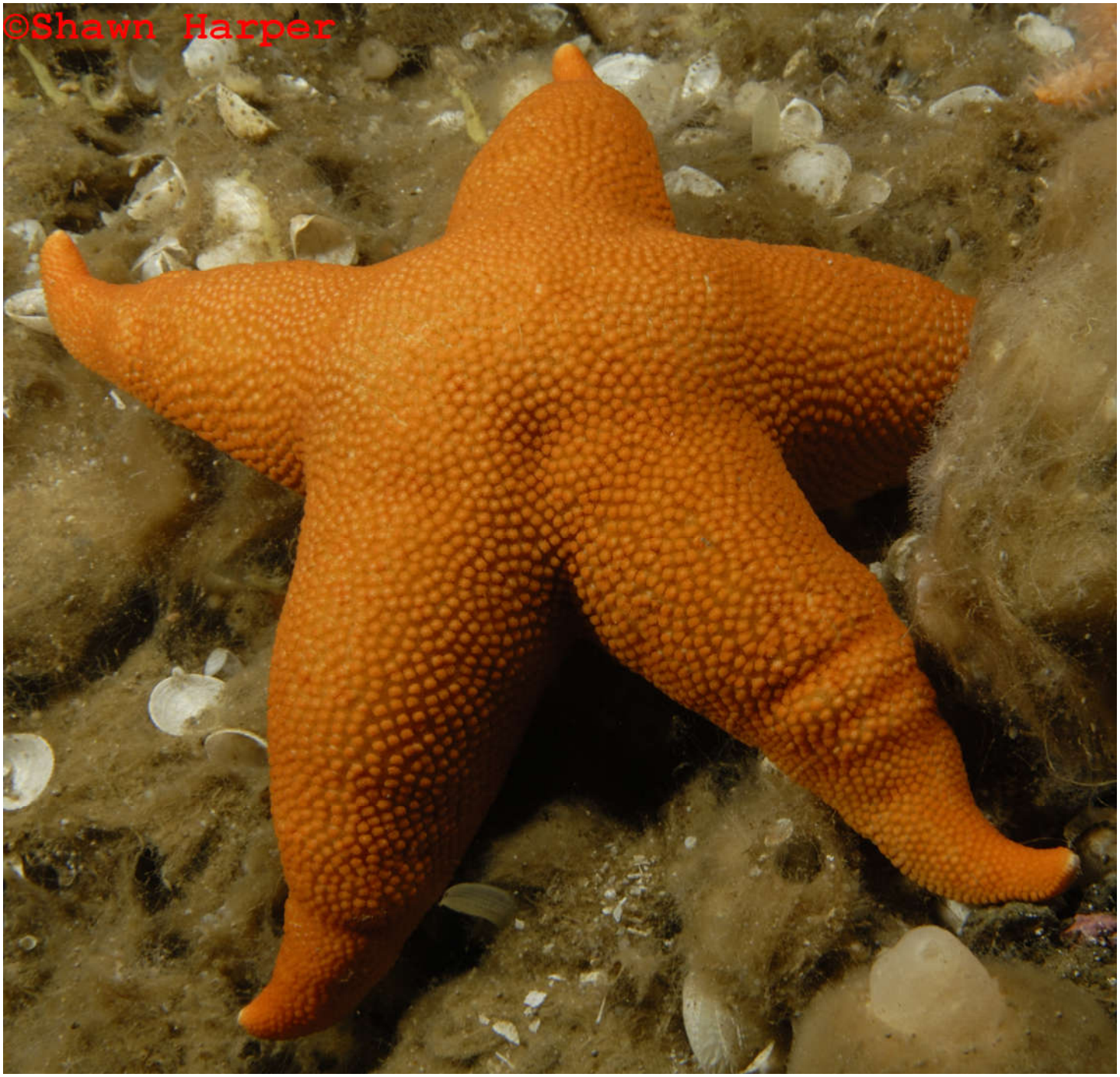


Macroptychaster accrescens is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Georgia Island, and Bouvet Island at depths from zero to 655 meters [1,2,4,5,6,7].

Macroptychaster accrescens color has been recorded as orange with darker brown transverse bands across the arms and brown markings on the central disc [1].



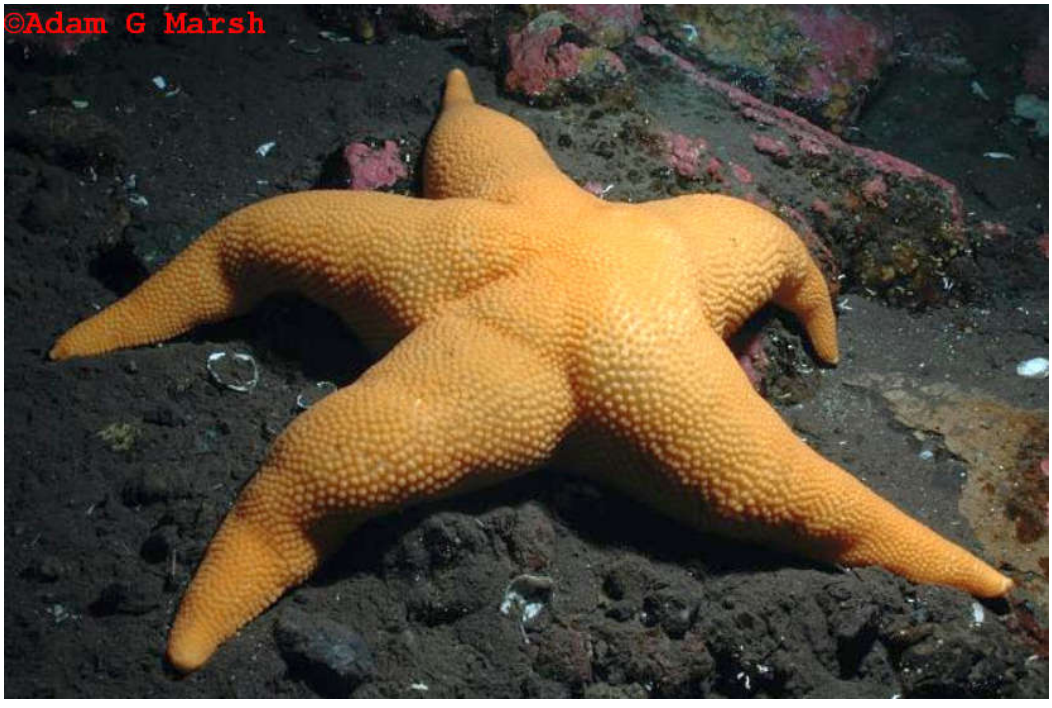
Macroptychaster accrescens has been collected at sizes up to 26 centimeters in radius from its center to the tip of an arm [1].



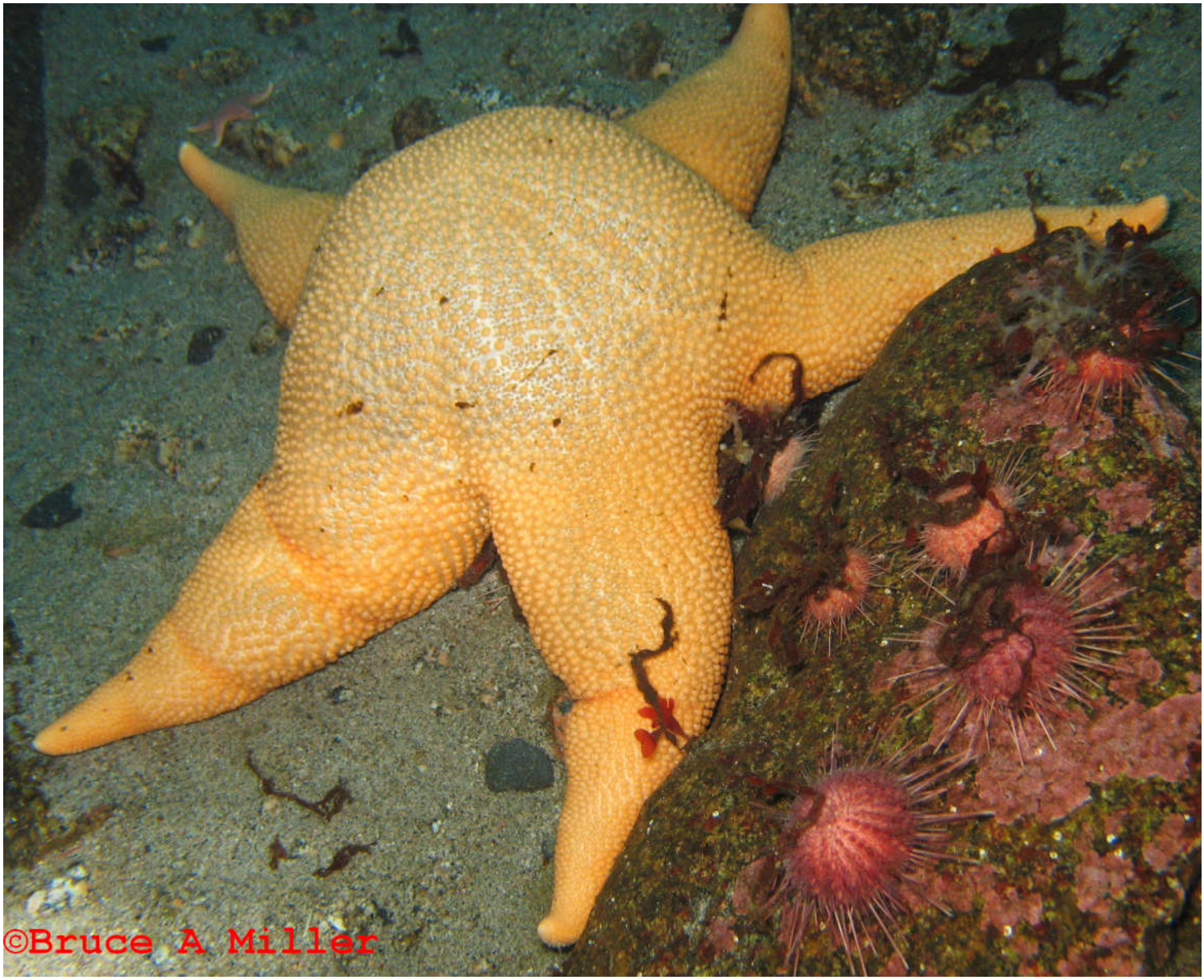
Like other seastars in the Astropectinidae, *Macroptychaster accrescens* lacks sucking discs on its tube feet indicating a preference for soft or muddy environments [1].

Macroptychaster accrescens is a predator of the seastar *Odontaster validus*, the sea urchin *Sterechinus neumayeri*, gastropod molluscs, bivalves, and brittle stars [3,4].

Females of *Macroptychaster accrescens* are presumed to spawn their eggs by broadcasting them into the water where they develop into non- feeding larvae [2]. This pelagic (open ocean) non-feeding larval development is common among McMurdo Sound seastars [2]. Their larvae develop on stored yolk (lecithotrophic) which is probably an adaptation to low food levels [2]. Seastars in temperate and tropical shallow waters typically have feeding larvae [2].



Macroptychaster accrescens is uncommonly seen [4].


©Bruce A Miller


©Adam G Marsh

References: 1: The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **2:** Marine Biology 104:41-46, 1990; **3:** Ecological Monographs 44(1):105-128, 1974; **4:** 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.293-326; **5:** Equinodermos Antarticos. II. Asteroideos. 5. Asteroideos de la Extremidad Norte de la Peninsula Antartica. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia (aka Ciencias Zoologicas) 9(10):211-281 and plates, 1970; **6:** Amazing Antarctic asteroids: a guide to the starfish of the Ross Sea. Kate Neill et al. NIWA, New Zealand, Version 1, 2016 https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/amazing-antarctic-asteroids; **7:** Polish Polar Research 18(2):107-117, 1997

astropectinid sea star, probably *Macroptychaster accrescens* or *Leptychaster* sp.

These sea stars get very large and massive; this animal is probably a juvenile or young adult [1]. Several characters place it in the *Leptychaster* - *Leptoptychaster* - *Macroptychaster* complex which isn't taxonomically well-defined; the species in these genera are fairly common on the Antarctic Shelf, but variable in their morphology [1].

References: 1: John H. Dearborn, personal communication, 1999

seastar *Notasterias armata*

Notasterias armata is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, Bouvet Island, and Kerguelen Islands, from 15 to 752 meters depth [1,2,7,8].

The color of *Notasterias armata* can be orange, creamy white, red, and mottled red with creamy areas [2,3]. *Notasterias armata* has been collected at sizes up to thirteen centimeters in radius from its center to the tip of an arm [2,3]. The disc of *Notasterias armata* is small and its arms taper to blunt tips [2].

The diet of *Notasterias armata* includes the Antarctic scallop *Adamussium colbecki* (shown here) as well as the bivalve *Limatula hodgsoni* [1,6].

Notasterias armata broods its young in a brooding posture with a strongly convex disc and supporting itself on bent arms [2]. Ripe females have been observed from August to February [5]. Brood protection occurs quite commonly among Antarctic marine invertebrates [4]. Brood protection helps larvae avoid the stresses of the environment and predation [4]. Brooding helps larvae avoid the dangers of being eaten if the larvae were planktonic in a strong seasonal planktonic cycle as seen in Antarctic waters [4].

References: 1: 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.293-326; **2:** The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **3:** Fauna der Antarktis. J Sieg & JW Wagele, eds. Berlin: P. Parey, 1990; **4:** 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.135-157; **5:** Marine Biology 104: 41-46, 1990; **6:** Ecology of the Circumpolar Antarctic Scallop, Adamussium colbecki (Smith, 1902). Paul Arthur Berkman. Ph. D. Dissertation, University of Rhode Island, 1988; **7:** Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut 89:239- 259, 1992; **8:** Amazing Antarctic asteroids: a guide to the starfish of the Ross Sea. Kate Neill et al. NIWA, New Zealand, Version 1, 2016
https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/amazing-antarctic-asteroids

seastar *Odontaster* spp.

In the Ross Sea, an *Odontaster* seastar with yellow coloration can be *Odontaster roseus*, *O. pearsei*, *O. validus*, or *O. meridionalis* [2,7,11,13,17,21].

Odontaster roseus can be yellow, rosy, drab red, or tan [13.17].

Odontaster pearsei can be yellow or orange to tan [13,17].

Odontaster validus varies widely in color and can be orange-yellow colored in addition to its characteristic dark pink/red color [17]. Colors of *O. validus* include dark brown, purple, purple-red, orange, orange-yellow, red-orange, red, brick red, dark carmine, and pink [17,18,19,20].

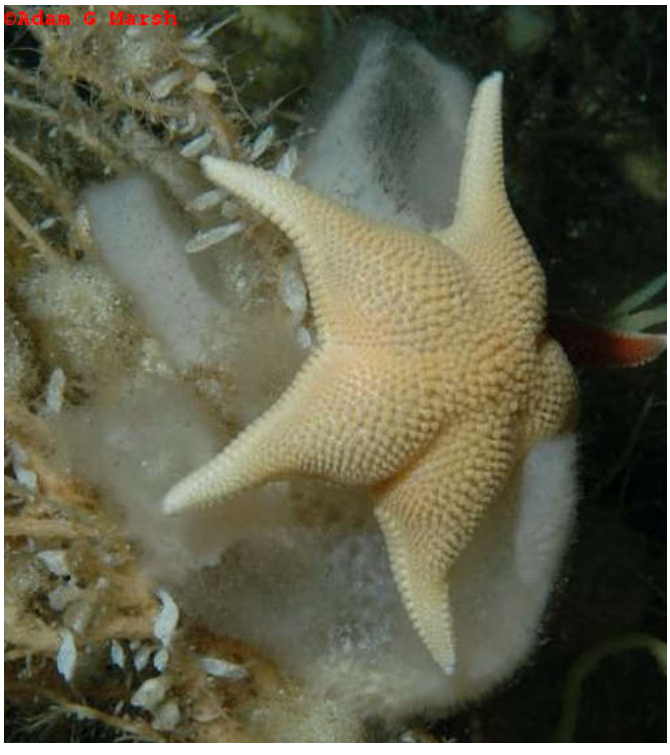
Odontaster meridionalis color is variable and includes yellow-white, dirty yellow, orange yellow, bright orange, pale brown, and a grey center grading to white at arm tips [2,7]. *O. meridionalis* is generally pale brown or yellowish white on the dorsal surface and lighter on the ventral surface [11].

Odontaster roseus and *Odontaster pearsei* have been found in the Antarctic Peninsula and Terra Nova Bay [13.17]. A classification key for *Odontaster* species was published in 2010 [13]. *Odontaster roseus*, *O. pearsei*, and *O. validus* can be differentiated by the number of spines on abactinal plates and their length, and the marginal plates and spines, in addition to genetic sequences [17].

Odontaster meridionalis is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Sandwich Islands, South Georgia Island, Shag Rocks, Straits of Magellan, Tierra del Fuego, Bouvet Island, Marion and Prince Edward Islands, Kerguelen Islands, Crozet Islands, and Heard Island, from 0 to 647 meters depth [1,2,5,6,7,8,9,10,12,14,15,16]. Genetic study points to *O. meridionalis* in Kerguelen Islands and *O. pencillatus* in South America being a single species occurring in both regions [21].

Odontaster meridionalis has been collected at sizes up to nine centimeters in radius from its center to the tip of an arm [2]. *O. meridionalis* has a flattened disc with its arms narrowing down on the latter half of their length [8]. *O. meridionalis* is an important predator of the sponge *Homaxinella balfourensis* and also eats rossellid sponges and the sponges *Haliclona scotti*, *Mycale (Oxymycale) acerata*, *Polymastia invaginata*, *Hemigellius fimbriatus*, *Isodictya setifera* (above and at left), and *Pachychalina pedunculata* [3,4]. *O. meridionalis* is preyed upon by the anemone *Urticinopsis antarcticus* and the seastar *Macroptychaster accrescens* [5]. Female *O. meridionalis* spawn their eggs by broadcasting them into the water where they develop into feeding larvae [1]. This differs from the more common tendency of McMurdo Sound seastars to have pelagic (open ocean) non-feeding larval development [1].


©Peter Brueggeman

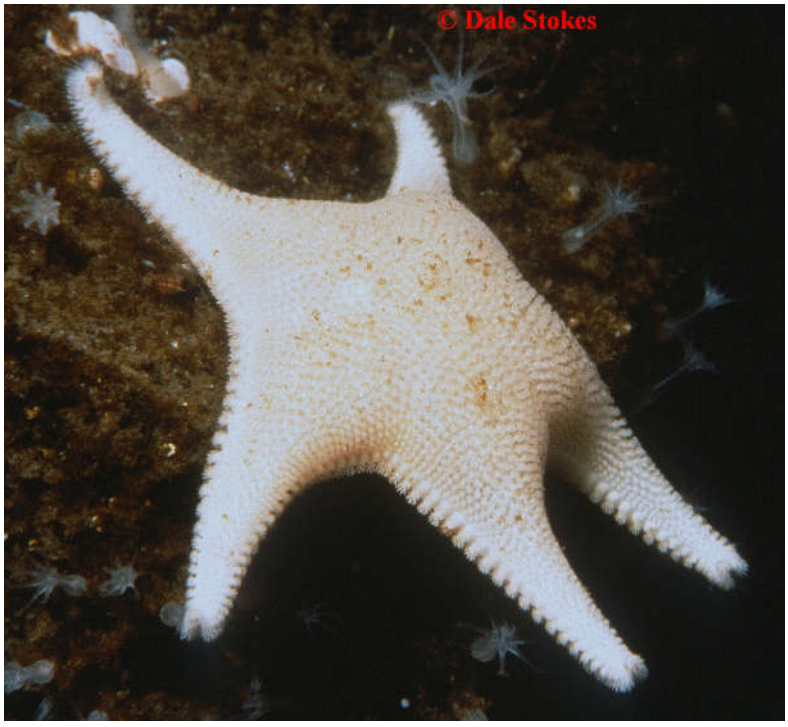

©Adam G Marsh


©Adam G Marsh


©Norbert Wu


©Adam G Marsh

Above and below, a yellow *Odontaster* eating the bush sponge *Homaxinella balfourensis*.



A yellow *Odontaster* eating the sponge *Isodictya setifera*.

References: 1: Marine Biology 104:41-46, 1990; **2:** The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **3:** Science 245:1484-1486, 1989; **4:** Ecological Monographs 44(1):105-128, 1974 (P. Dayton, personal communication, 2015: *Haliclona dancoi* observations are corrected to *H. scotti*; *Gellius tenella* corrected to *Hemigellius fimbriatus*; *Rossella racovitzae* observations are corrected to *R. podagrosa*); **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.293-326; **6:** AM Clark. B.A.N.Z. Antarctic Research Expedition 1929-1931. Reports, Series B (Zoology and Botany) Volume 9, Asteroidea. Adelaide: BANZAR Expedition Committee, 1962; **7:** Discovery Reports 20:69-306 and plates, 1940; **8:** Equinodermos Antarticos. II. Asteroideos. 5. Asteroideos de la Extremidad Norte de la Peninsula Antartica. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia (aka Ciencias Zoologicas) 9(10):211-281 and plates, 1970; **9:** South African Journal of Antarctic Research 23(1-2):37- 70, 1993; **10:** Scientia Marina 63(Supplement 1):433-438, 1999; **11:** John Dearborn, personal communication, 2001; **12:** Revista Ciencia y Tecnología del Mar 29(1):91-102, 2006; **13:** Integrative and Comparative Biology 50(6):981-992, 2010; **14:** Polar Biology 38:799-813, 2015; **15:** Polar Biology 41:2423-2433, 2018; **16:** Amazing Antarctic asteroids: a guide to the starfish of the Ross Sea. Kate Neill et al. NIWA, New Zealand, Version 1, 2016 https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/amazing-antarctic-asteroids **17:** Diversity 14:457, 2022. https://doi.org/10.3390/d14060457 ; **18:** The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **19:** Discovery Reports 20:69-306 and plates, 1940; **20:** Equinodermos Antarticos. II. Asteroideos. 5. Asteroideos de la Extremidad Norte de la Peninsula Antartica. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia (aka Ciencias Zoologicas) 9(10):211-281 and plates, 1970; **21:** Diversity 15:1129, 2023. https://doi.org/10.3390/d15111129

seastar *Odontaster validus*

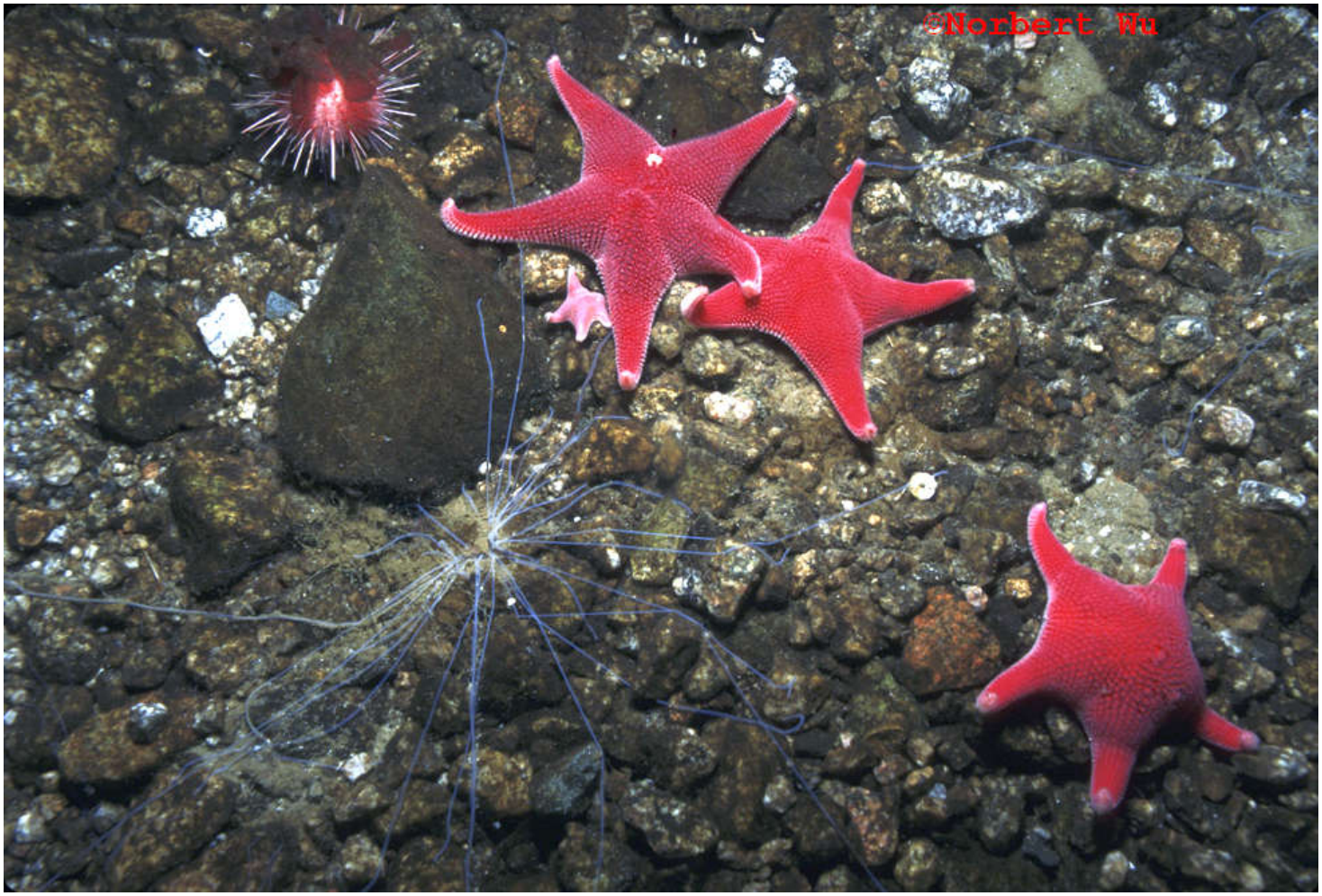
Odontaster validus is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia Island, Shag Rocks, Chile, Falkland Islands, Bouvet Island, Marion and Prince Edward Islands, Heard Island, and Crozet Islands, at depths from 0 to 914 meters [7,10,11,12,14,20].

Reported distribution beyond Antarctica is not supported by mitochondrial DNA data, which shows *Odontaster validus* to be geographically isolated to Antarctic and subantarctic waters [21].

Odontaster validus has a broad disc and short arms tapering to blunt tips [7]. *O. validus* varies in color including dark brown, purple, purple-red, orange, orange-yellow, red-orange, red, brick red, dark carmine, and pink; it may have light colored arm tips [7,11,14,22].

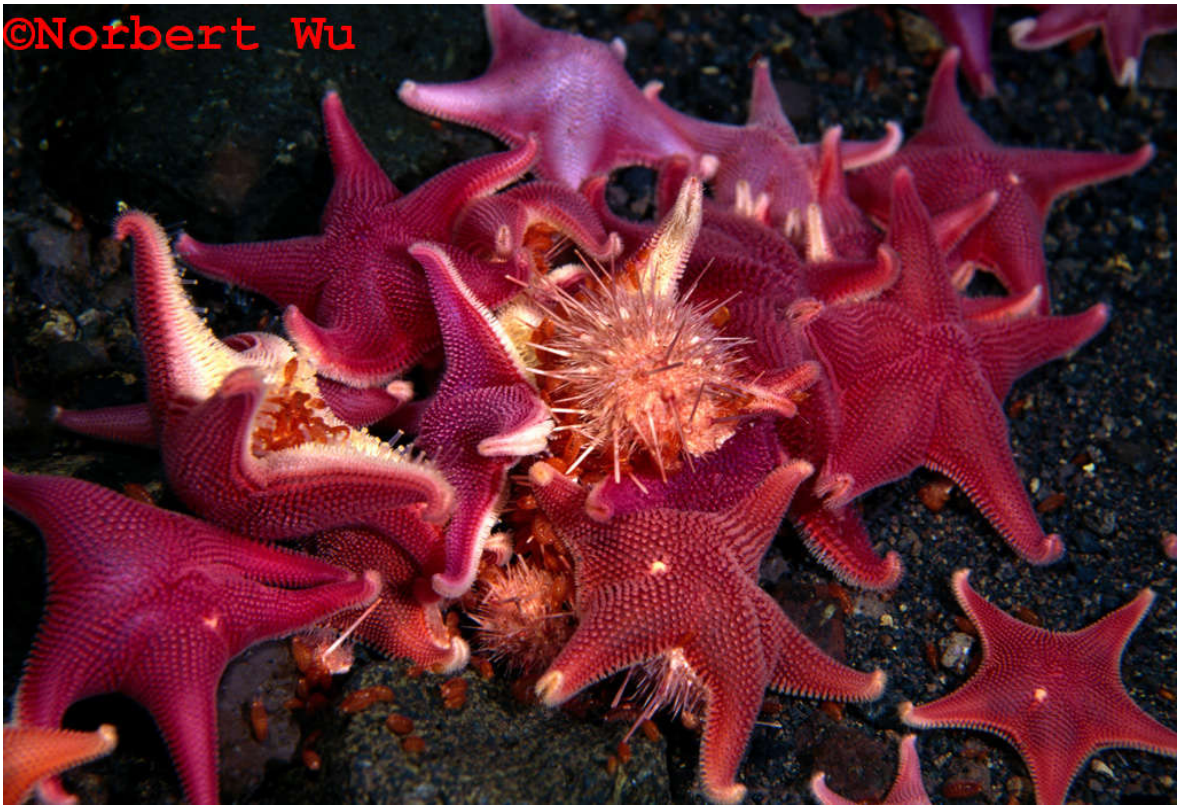
Odontaster validus is usually bright to dull red on the dorsal (abactinal) surface, and yellowish white to pale pink on the ventral (actinal) surface [16]. However *O. validus* can be orange-yellow colored on its dorsal surface in addition to its characteristic dark pink/red color, thus confounding visual identification by color for this species [22]. *Odontaster validus*, *O. roseus*, and *O. pearsei* can be differentiated by the number of spines on abactinal plates and their length, and the marginal plates and spines, in addition to genetic sequences [22].

Odontaster validus has a characteristic position with its arm tips slightly raised [7].



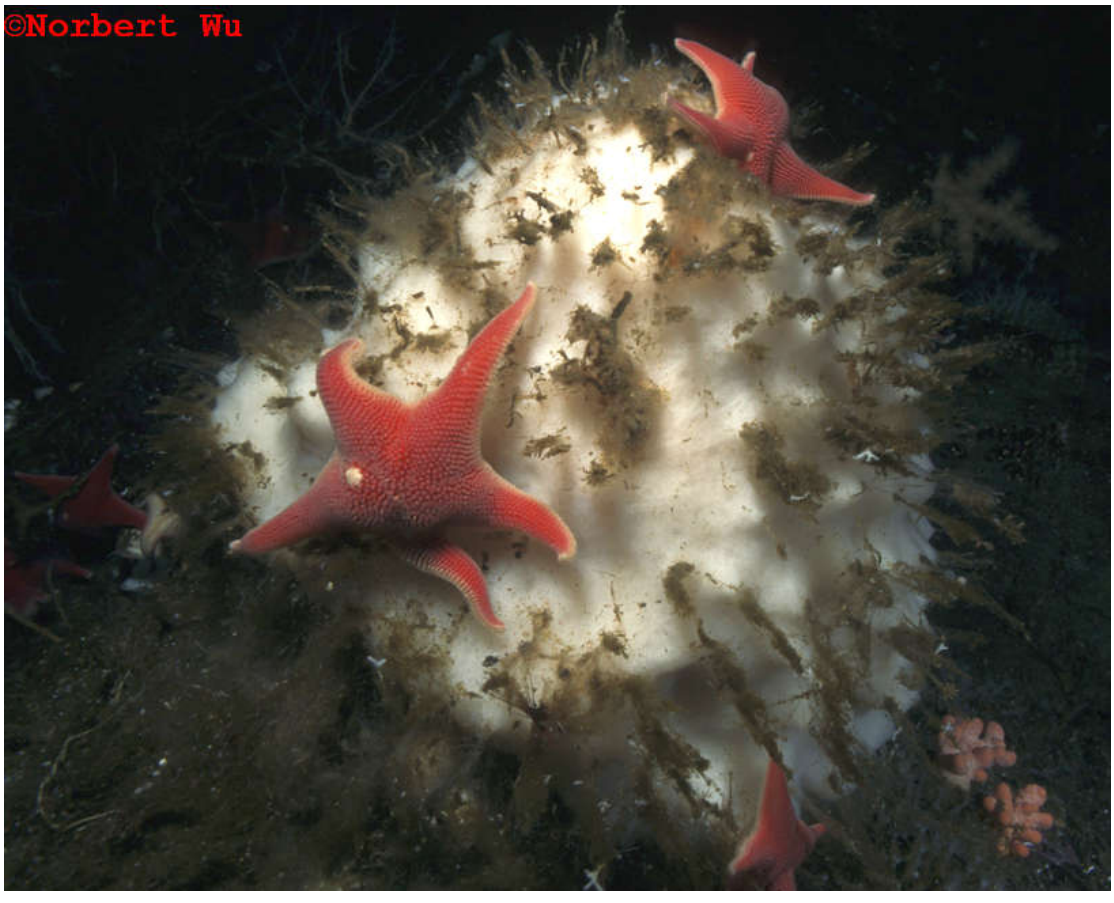
Odontaster validus has been collected at sizes up to seven centimeters in radius from center to arm tip [7,11].

Here's a juvenile and adult of *Odontaster validus*. Size-frequency distribution of *O. validus* can vary with location and is a reflection of the general level of productivity of a habitat: at McMurdo Station, their size and number decrease with depth; at Cape Evans, they are more numerous and generally smaller; and, at East Cape Armitage, they are less numerous and very small [3]. *O. validus* is slow growing; well-fed individuals need about nine years to reach thirty grams wet weight which is near the mean size of shallow-water individuals at McMurdo Station [3]. Based on its growth rate, collected sizes, and knowledge from other seastars, *O. validus* may live beyond one hundred years of age, with very low turnover in a population [17].

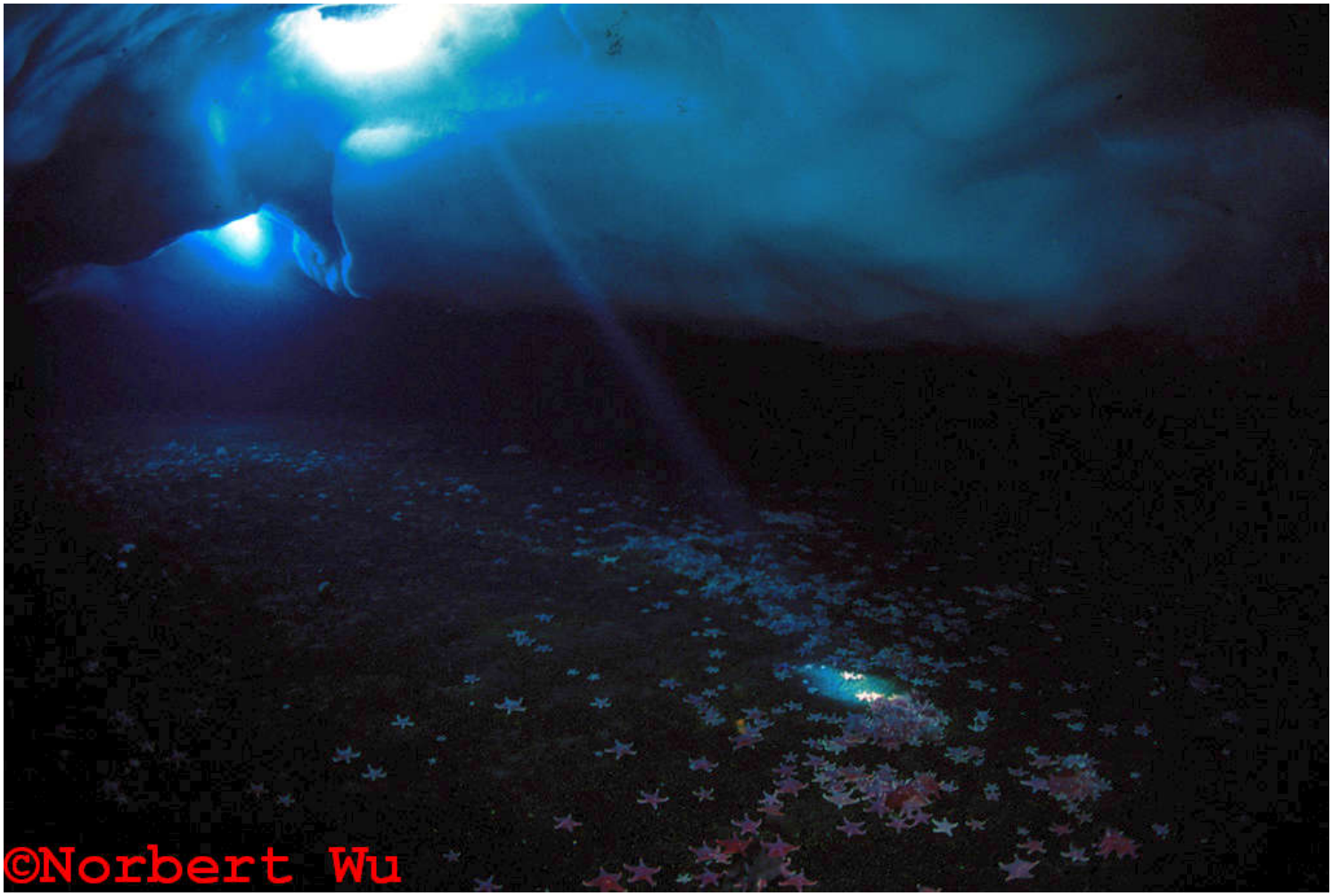


Here *Odontaster validus* is ganging up and eating the sea urchin *Sterechinus neumayeri*; little red amphipods are stealing food in the process. *O. validus* appears voracious to the diver, being very numerous in some areas and piled up in feeding groups; one study found that almost 50% of *O. validus* in the study area were engaged in feeding with their everted stomach [13].

Odontaster validus is omnivorous, capable of filter-feeding and eating a varied diet: detritus, small crustaceans including amphipods and the isopod *Glyptonotus antarcticus*, seastars, molluscs (scallop *Adamussium colbecki*, gastropods, bivalves *Laternula elliptica* and *Limatula hodgsoni*), hydroids (including *Hydrodendron arboreum*), bryozoans, sponges (rossellid sponges, *Homaxinella balfourensis* [shown above], *Scolymastra joubini*, *Tetilla leptoderma*) , ostracods, sea urchin *Sterechinus neumayeri*, polychaete worms, carrion (dead Weddell seals), feces (Weddell seals), diatoms, and algae [shown above] [5,8,9,13,15].



Above, *Odontaster validus* seastars feeding on a dead Weddell seal pup. *O. validus* has been observed feeding on the detrital film on the surface of the sponge *Cinachyra antarctica* [at left] [13].



Odontaster validus seastars piled up feeding on Weddell seal feces under ice holes used by Weddell seals to enter and exit the water through the thick sea ice.

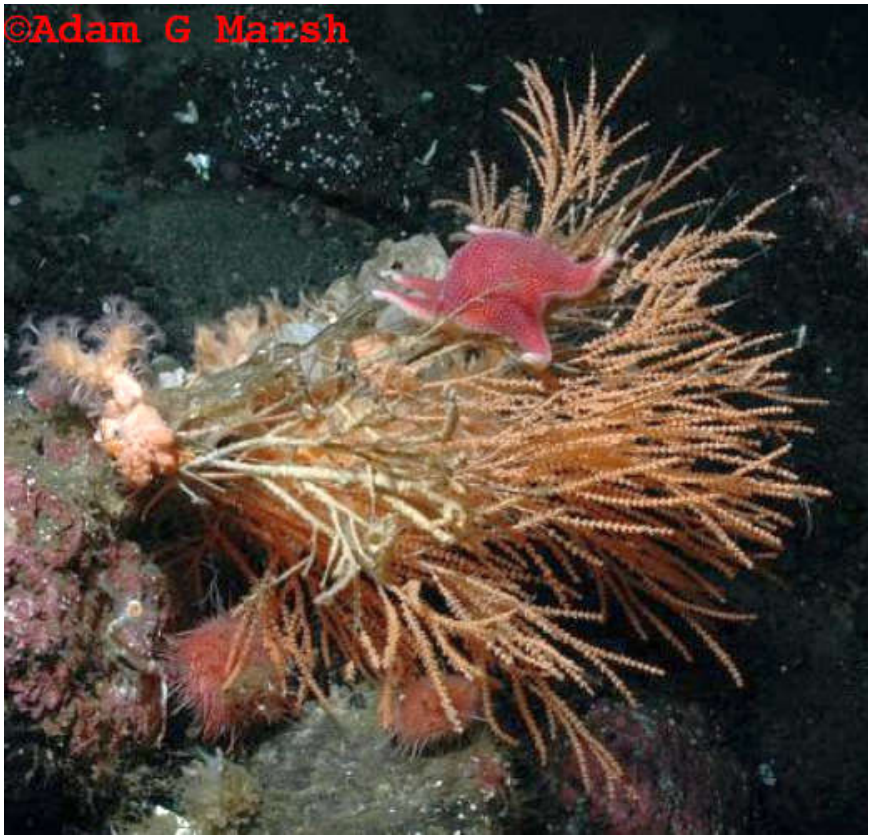
Odontaster validus is a prey item of the seastar *Macroptychaster accrescens* [5] and of the anemone *Urticinopsis antarcticus* (shown at left) [6].

Odontaster validus broadcast-spawns larvae which feed on bacteria and algae and have a low metabolic rate (which predicts long-term larval survival); larvae of a comparable temperate seastar eat only algae and have a higher metabolic rate [1,2].

The seastars *Odontaster validus* and *Acodontaster conspicuus* are the two greatest predators on McMurdo sponges [5]. *Odontaster validus* is a foundation species in the McMurdo sponge-dominated benthic ecosystem and is the keystone to the interaction between the rossellid sponges and one of their primary predators, the large Antarctic seastar *Acodontaster conspicuus* [4]. *A. conspicuus* would reach population densities destroying the sponge community if not kept in check by *O. validus* which preys upon its larvae, young and adults [5]. Here's a gang attack on *Acodontaster* sp. A single *O. validus* climbs up onto an *Acodontaster conspicuus* ray, everts its stomach, and digests a hole into it. An attack by a single *O. validus* isn't fatal but nearby *O. validus* probably respond to the release of coelomic fluid from *A. conspicuus* and join the attack [5].

Showing an *Acodontaster* sp. seastar here, eventually the larger *Acodontaster conspicuus* seastar's movement is slowed, and more *Odontaster validus* seastars attack. *Acodontaster conspicuus* seastars can become completely buried under high piles of attacking *Odontaster validus* seastars and *Parborlasia corrugatus* worms [5].

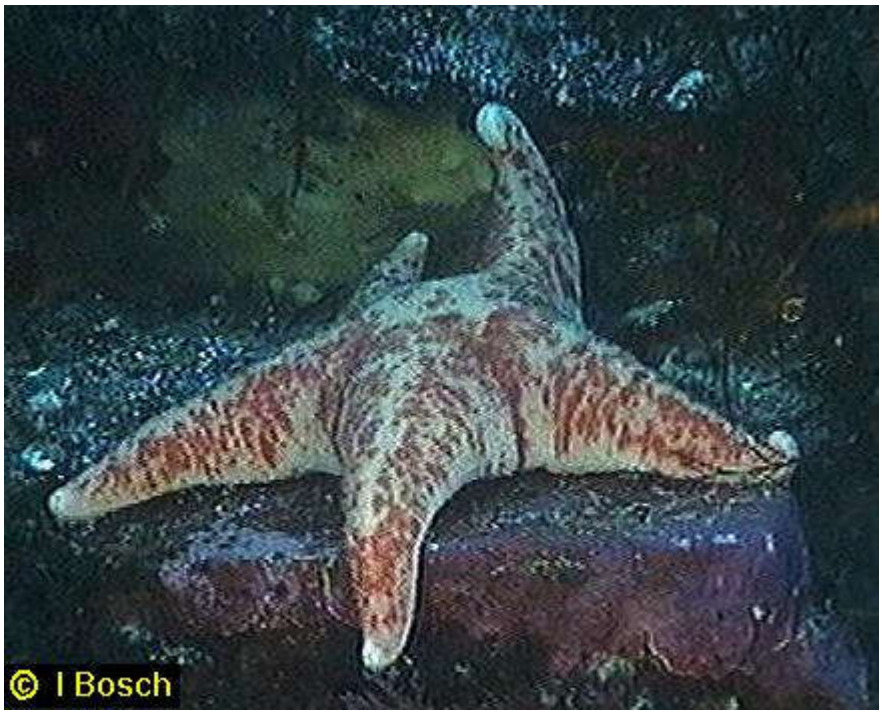
Odontaster validus seastars attack an urchin.



Odontaster validus seastar eating a gorgonian. *Odontaster validus* is the most abundant seastar in the shallow shelf waters of Antarctica and is most abundant from 15 to 200 meters [9].

TAXONOMIC NOTE: A classification key for *Odontaster* species was published in 2010 [18]. Three closely related species in *Odontaster* have been identified by molecular barcoding (*O. validus*, *O. roseus*, and *O. pearsei*), but morphological variation in a single population of *Odontaster validus* from one locality covers the whole range of that reported for *O. roseus*, and overlaps that of *O. pearsei* [18,19,21]. *Odontaster roseus*, *O. pearsei*, and *O. validus* can be differentiated by the number of spines on abactinal plates and their length, and the marginal plates and spines, in addition to genetic sequences [22].

References: 1: Antarctic Journal of the United States 26(5):170-172, 1991; **2:** Antarctic Journal of the United States 26(5):163-165, 1991; **3:** Marine Biology 99(2):235-246, 1988; **4:** Colloquium on Conservation Problems in Antarctica, Sept. 10-12, 1971, Blacksburg, VA, Proceedings. BC Parker, ed. Lawrence, Kansas, Allen Press, 1972. pp.81-96; **5:** Ecological Monographs 44(1):105-128, 1974 (Paul Dayton, personal communication, 2015: *Rossella racovitzae* observations are corrected to *R. podagrosa)*; **6:** Antarctic Ecology, Volume 1. MW Holdgate, ed. NY: Academic Press, 1970. pp244-258; **7:** The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **8:** Science 245:1484- 1486, 1989; **9:** Adaptations within Antarctic Ecosystems: Proceedings of the Third SCAR Symposium on Antarctic Biology. GA Llano, ed. Washington: Smithsonian Institution; Houston, Tex.: distributed by Gulf Pub. Co., 1977. pp.293-326; **10:** AM Clark. BANZ Antarctic Research Expedition 1929-1931. Reports, Series B (Zoology and Botany) Volume 9, Asteroidea. Adelaide: BANZAR Expedition Committee, 1962; **11:** Discovery Reports 20:69-306 and plates, 1940; **12:** South African Journal of Antarctic Research 23(1-2):37-70, 1993; **13:** New Zealand Antarctic Record 9(2):34-52, 1989; **14:** Equinodermos Antarticos. II. Asteroideos. 5. Asteroideos de la Extremidad Norte de la Peninsula Antartica. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia (aka Ciencias Zoologicas) 9(10):211-281 and plates, 1970; **15:** Antarctic Science 12(1):64-68, 2000; **16:** John Dearborn, personal communication, 2001; **17:** Australian Natural History 16(7):234-238, 1969; **18:** Integrative and Comparative Biology 50(6):981-992, 2010; **19:** Polar Biology 41:2159-2165, 2018; **20:** Amazing Antarctic asteroids: a guide to the starfish of the Ross Sea. Kate Neill et al. NIWA, New Zealand, Version 1, 2016 https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/amazing-antarctic-asteroids; **21:** Polar Biology 34(4):575–586, 2011; **22:** Diversity 14:457, 2022. https://doi.org/10.3390/d14060457

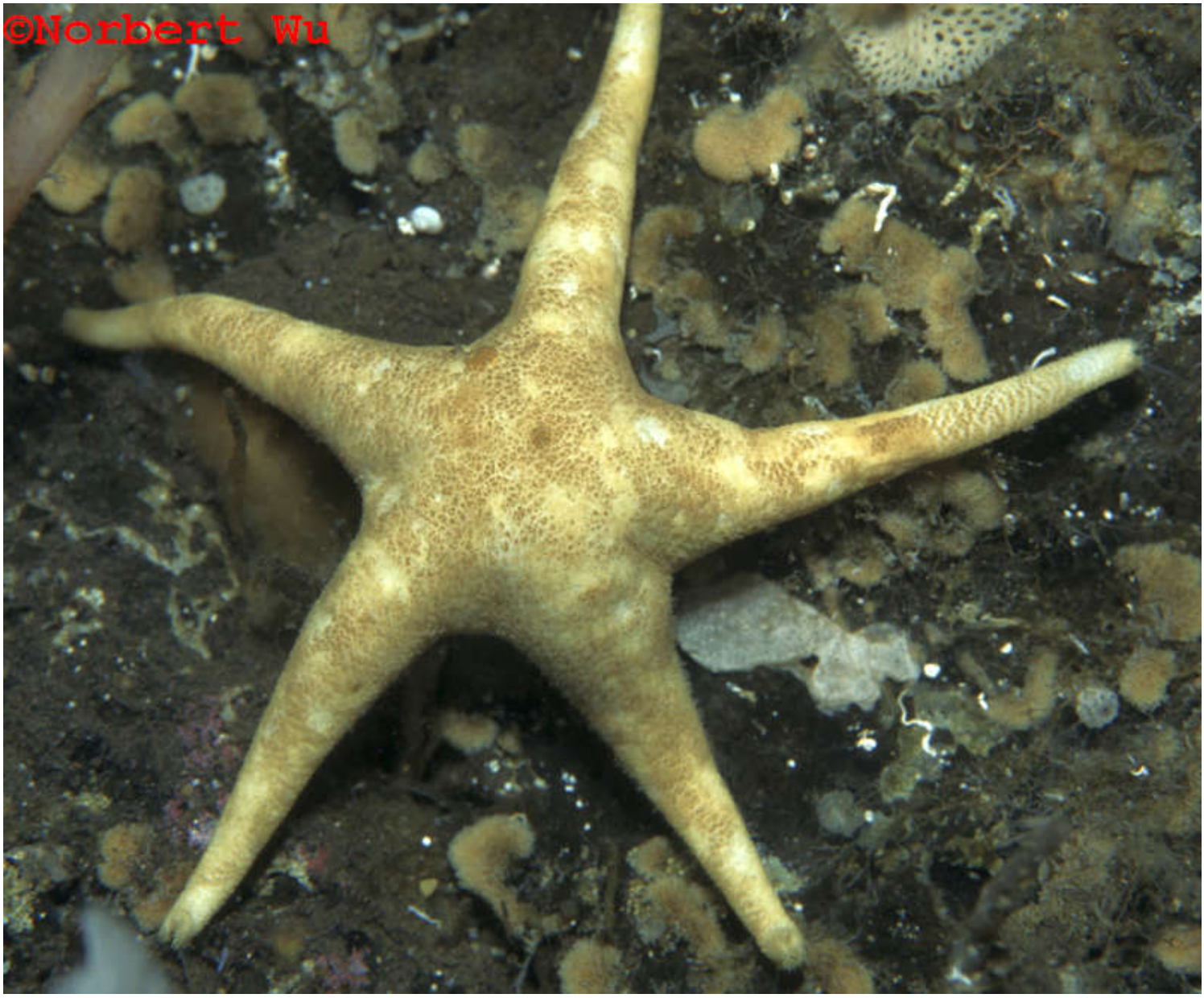


seastar *Perknaster aurorae*

Perknaster aurorae is found in the Antarctic Peninsula, South Shetland Islands, South Sandwich Islands, South Georgia Island, and Shag Rocks, and probably throughout Antarctica, from 18 to 310 meters depth [1,4,5]. *P. aurorae* has a large convex disc and long arms that are wide at the base [1]. *P. aurorae* has been collected at sizes up to fourteen centimeters in radius from its center to the tip of an arm [1,3]. The dorsal color of *P. aurorae* ranges from brick with dark red markings to beige with brick bands along the arms and on the disc; the ventral color is pale yellow, with dark red interradial bands that reach the oral region [1,2].

References: 1: Equinodermos Antarticos. II. Asteroideos. 5. Asteroideos de la Extremidad Norte de la Peninsula Antartica. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia (aka Ciencias Zoologicas) 9(10):211-281 and plates, 1970; **2:** Isidro Bosch, personal communication, 1999; **3:** AM Clark. B.A.N.Z. Antarctic Research Expedition 1929-1931. Reports, Series B (Zoology and Botany) Volume 9, Asteroidea. Adelaide: BANZAR Expedition Committee, 1962; **4:** Discovery Reports 20:69-306 and plates, 1940; **5:** Tethys 6(3):631-653, 1974

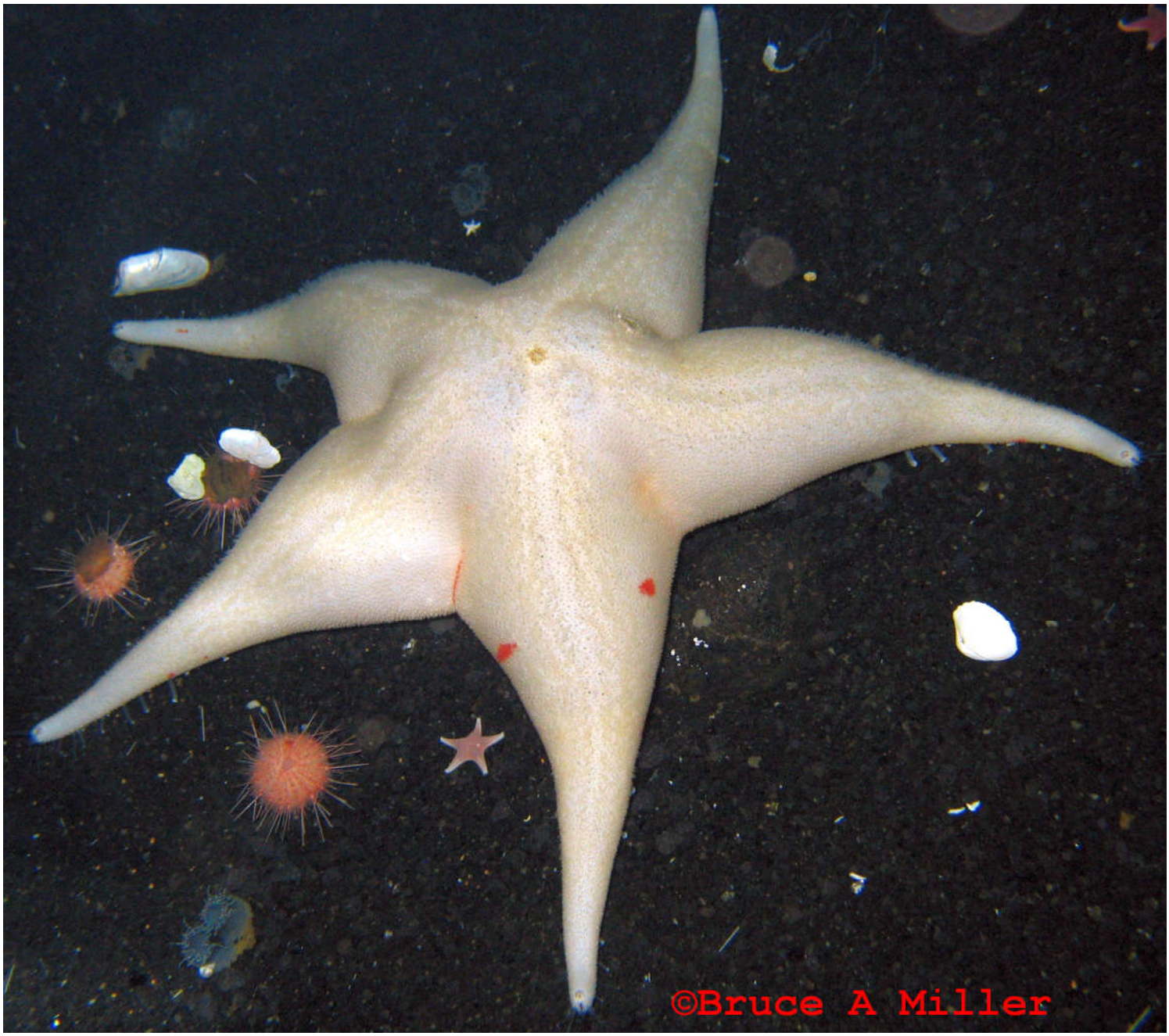
seastar *Perknaster fuscus*



Perknaster fuscus is found throughout Antarctica south of sixty degrees, in depths of 0 to 457 meters [5,8].

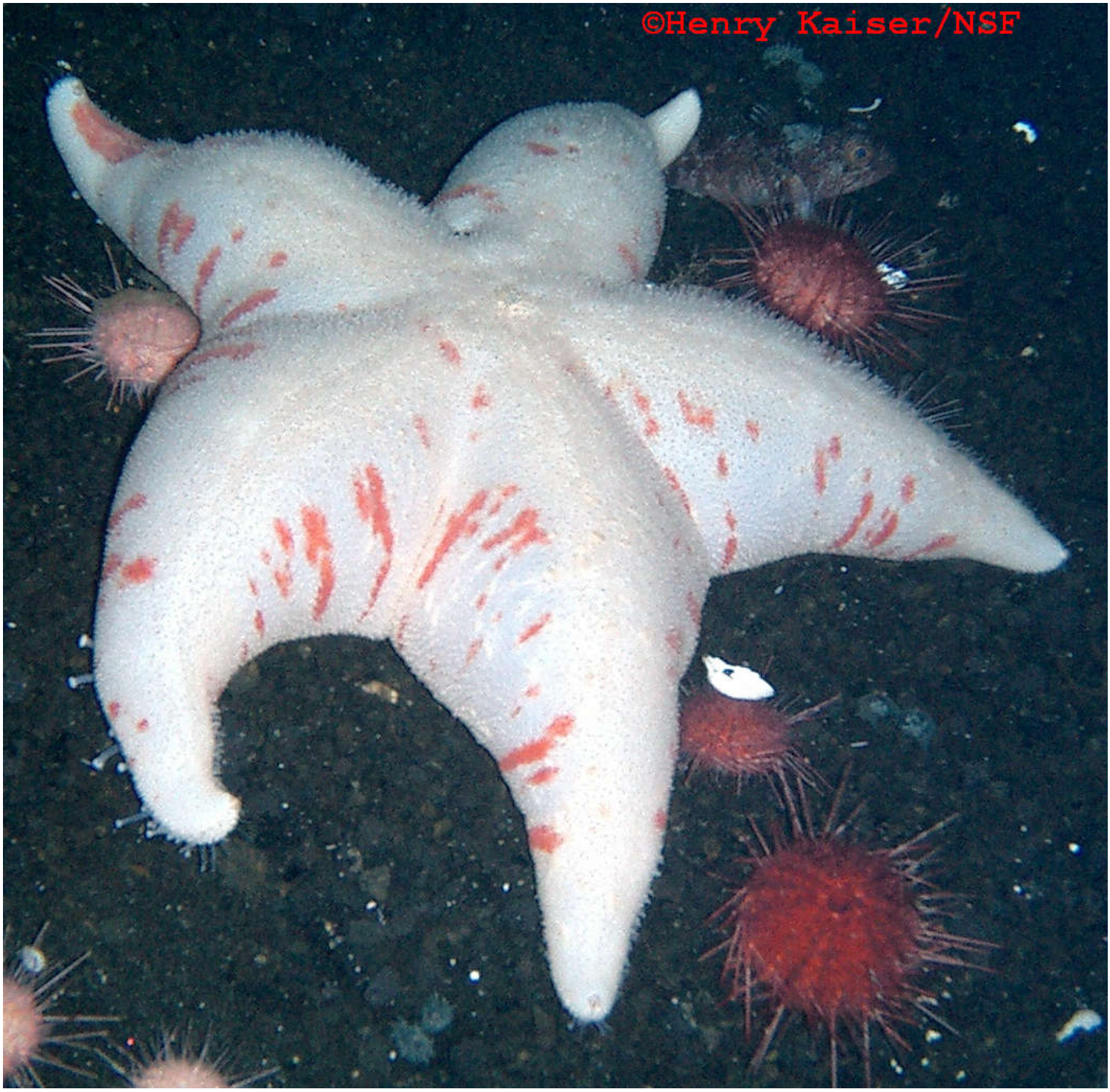
The color of *Perknaster fuscus* ranges from shades of red with darker spots or stripes to a yellow or light orange background with red markings [7].

P. fuscus has a color morph at Turtle Rock due to its diet of urchins and *Odontaster validus* [6].

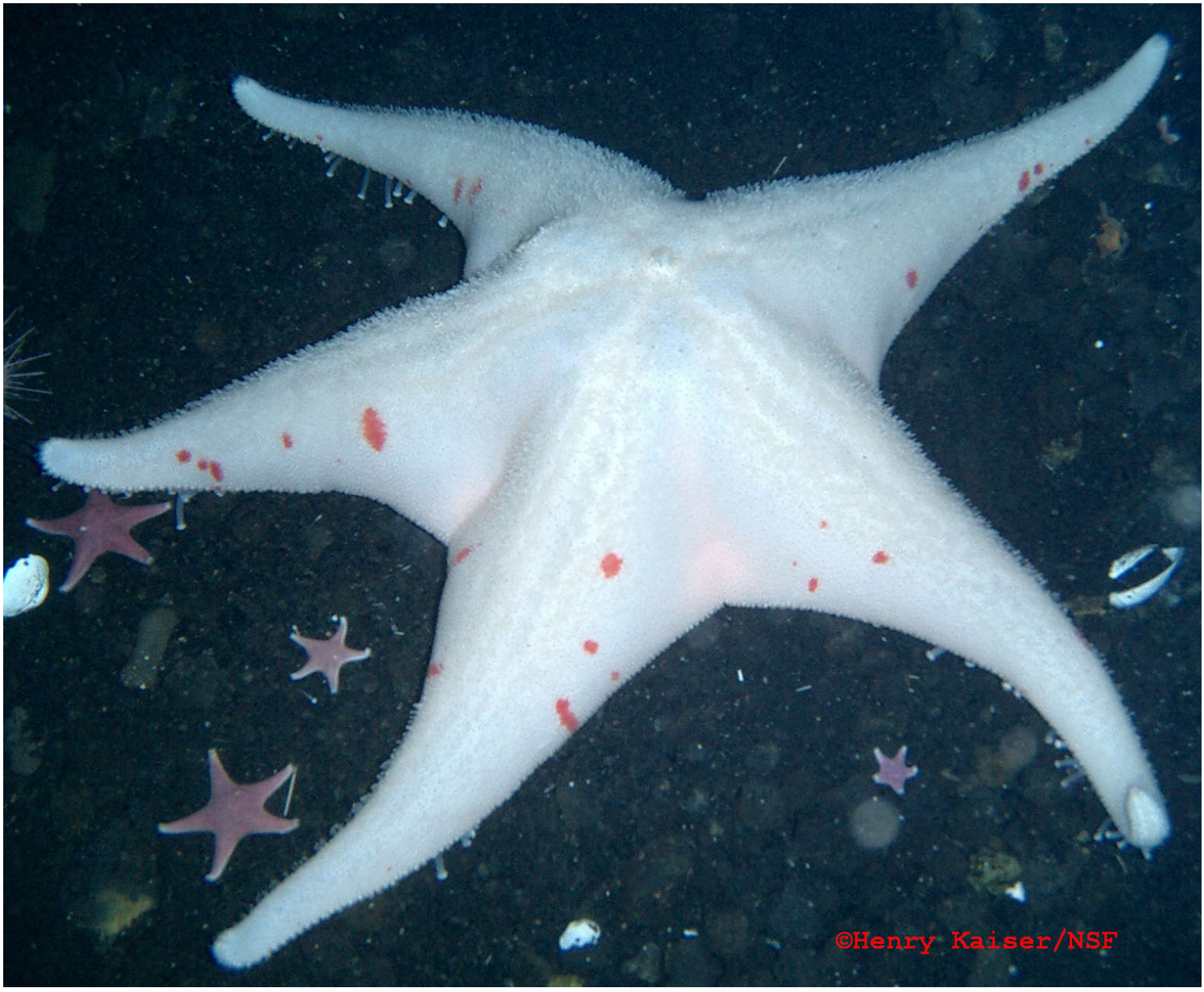


Perknaster fuscus has been collected at sizes up to fourteen centimeters in radius from its center to the tip of an arm [7].

A small *Perknaster fuscus* is shown here, with a radius of four centimeters [10].


©Henry Kaiser/NSF


©Henry Kaiser/NSF


©Henry Kaiser/NSF

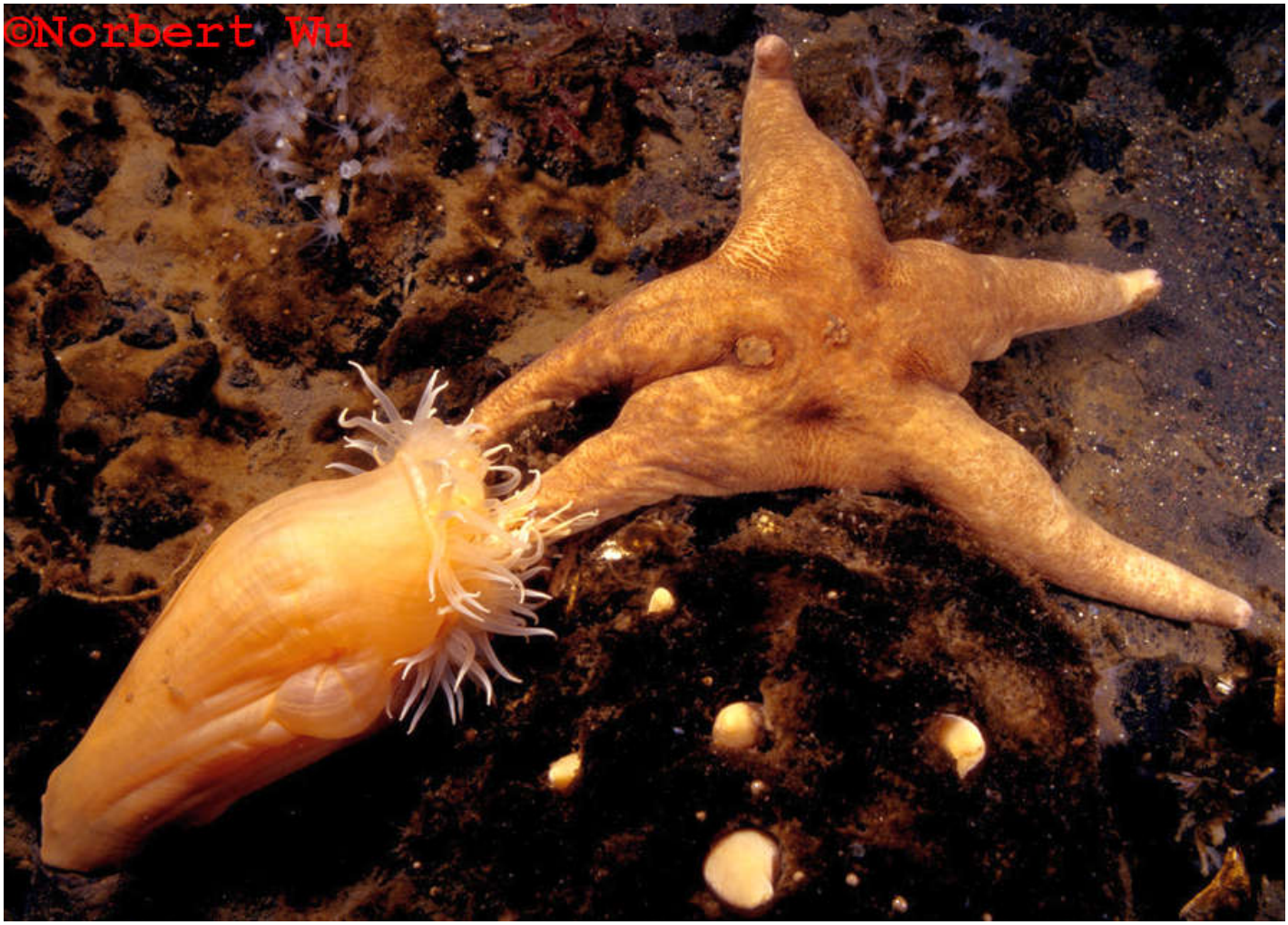
Juvenile *Perknaster fuscus* are important predators of the sponge *Homaxinella balfourensis* (shown here) and also eat the sponges *Tetilla leptoderma*, *Haliclona scotti*, *Mycale (Oxymycale) acerata*, *Polymastia invaginata*, and *Kirkpatrickia variolosa* [1,2].

Here the sea urchin *Sterechinus neumayeri* is crawling across an adult *Perknaster fuscus*. Adult *Perknaster fuscus* are food-specific predators of the sponges *Tetilla leptoderma*, *Anoxycalyx (Scolymastra) joubini*, and *Mycale (Oxymycale) acerata* [2,3].

Below three *Odontaster validus* seastars is a juvenile *Perknaster fuscus* eating the bush sponge *Homaxinella balfourensis*.

Perknaster fuscus can be an opportunistic scavenger on dead material [5]. Here *P. fuscus* is scavenging on something with the proboscis worm *Parborlasia corrugatus*.

A juvenile *Perknaster fuscus* eating the bush sponge *Homaxinella balfourensis*.



Perknaster fuscus is eaten by the anemone *Urticinopsis antarcticus* [4]. *P. fuscus* appears to be chemically defended from most predators [9].

About the *Perknaster* seastar in the above photo, Paul Dayton said “I mentioned a white (*Perknaster*) eating *O. validus* (seastar) and urchins at Turtle Rock and points north ... I transplanted them to see if they would switch prey. Here is a photo ...that is proof that the white with pink patches did switch and eat *Mycale*...." [12].

TAXONOMIC NOTE: World Register of Marine Species lists a *Perknaster fuscus antarcticus* subspecies as an alternate representation (an accepted name though slightly less preferred) of *Perknaster fuscus*, stating "maintained as subspecies of *Perknaster fuscus* Sladen, 1889 by Bernasconi (1967) without reference to A.M. Clark (1962)" [11].

References: 1: Science 245:1484-1486, 1989; **2:** Ecological Monographs 44(1):105-128, 1974 (P. Dayton, personal communication, 2015: *Haliclona dancoi* observations are corrected to *H. scotti*); **3:** Biologie des Spongiaires, Sponge Biology. C Levi and N Boury-Esnault, eds. Colloques Internationaux du Centre National de la Recherche Scientifique Number 291. Paris: Centre National de la Recherche Scientifique, 1979. pp.271-282; **4:** Antarctic Ecology, Volume 1. MW Holdgate, ed. NY: Academic Press, 1970. pp244-258; **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.293-326; **6:** P Dayton, personal communication, 1998; **7:** The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **8:** Tethys 6(3):631-653, 1974; **9:** Antarctic Ecosystems: Models for Wider Ecological Understanding. W Davison, C Howard-Williams, P Broady, eds. Christchurch, NZ: New Zealand Natural Sciences, 2000. pp. 158-164; **10:** Paul Cziko, personal communication, 2004; **11:** Mah, C.L. (2023). World Asteroidea Database. Perknaster fuscus antarcticus (Koehler, 1906). Accessed through: World Register of Marine Species at: https://www.marinespecies.org/aphia.php?p=taxdetails&id=172754 on 2023-10-27; **12:** Paul Dayton, personal communication, 2023

seastar *Glabraster antarctica*

Glabraster antarctica is found in Antarctica and South Shetland Islands, South Sandwich Islands, South Georgia Island, Shag Rocks, Bouvet Island, Burdwood Bank, Falkland Islands, Chile, Uruguay, Argentina, Crozet Islands, Kerguelen Islands, Marion and Prince Edward Islands, Marquarie Island, and Heard Island, from 0 to 3,200 meters depth [3,4,6,8,9,10,13,14,15,16,17]. *G. antarctica* has been collected at sizes up to 9.7 centimeters in radius from its center to the tip of an arm [5,9,14].

Glabraster antarctica varies in coloration as shown here. The color of *G. antarctica* can include off white, deep scarlet, pink, red purple, brick red, reddish orange, dark orange, bluish white, purplish white, bluish-grey, yellowish white, grey, pale orange, pale red and has also been described as various tints of dark red [6,8,9,10,13,15].

Glabraster antarctica is a ciliary-mucous feeder consuming the small organisms, diatoms, and detritus that shower down on its back by passing them along to its mouth [1,2].

Glabraster antarctica occasionally is an active predator on larger prey and is a scavenger [2].

Glabraster antarctica is a morphologically variable species with morphotypes that are not genetically distinct [18]. The Antarctic Peninsula morphotype is small, with strong abactinal spination, while the large Scotia Arc morphotype lacks abactinal spines [18]. The Magellanic morphotype is bright red-orange with distinct abactinal spination [18].

Here is a spiny form of *Glabraster antarctica* [7,10]. Adult *Glabraster antarctica* have well developed dorsal spines or tubercles [1,2,4,9,10]. However this distinction is not so distinct in some specimens [4,6].

Taxonomic Note: *Porania antarctica* assigned to *Glabraster* genus, and subspecies *glabra* was synonymized [11,13].

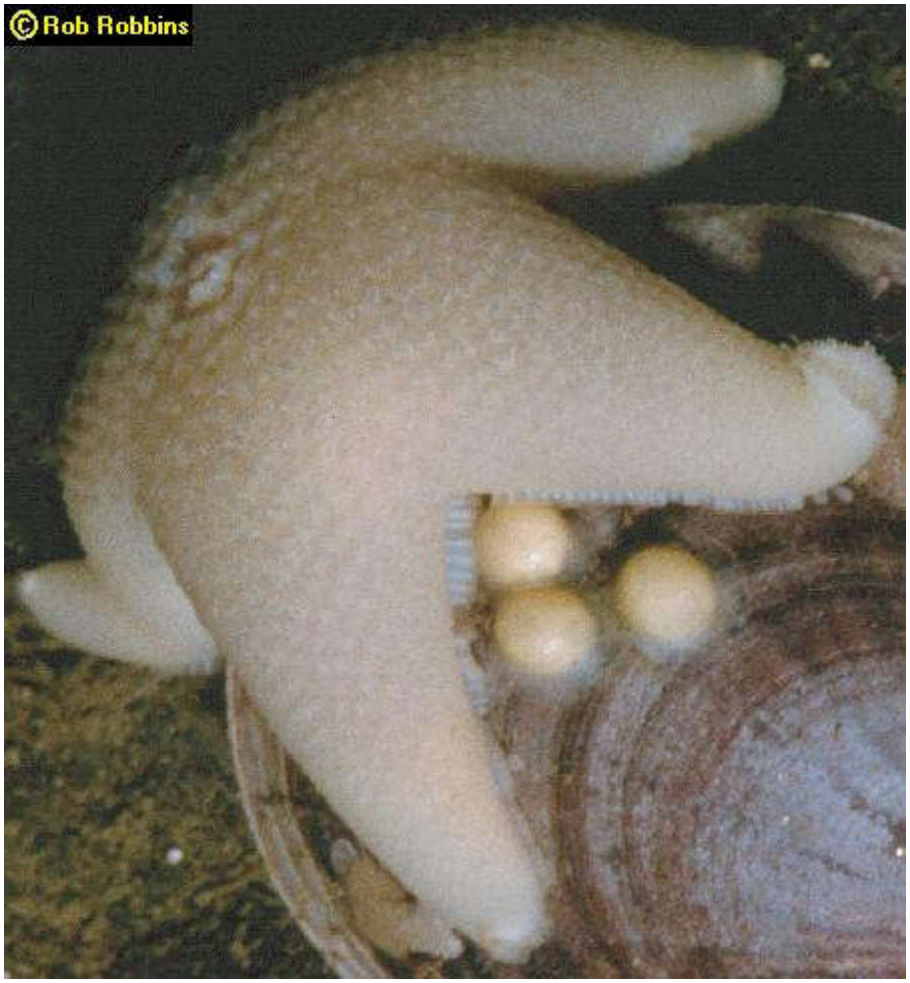
References: 1: The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **2:** Adaptations within Antarctic Ecosystems: Proceedings of the Third SCAR Symposium on Antarctic Biology. George A. Llano, ed. Washington: Smithsonian Institution; Houston, Tex. : distributed by Gulf Pub. Co., 1977. pp.293-326; **3:** Los Equinodermos Colectados por el "Walther Herwig" en el Atlantico Sudoeste. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Hidrobiologia 3(3):287-334 and plates, 1973; **4:** AM Clark. B.A.N.Z. Antarctic Research Expedition 1929-1931. Reports, Series B (Zoology and Botany) Volume 9, Asteroidea. Adelaide: BANZAR Expedition Committee, 1962; **5:** Biological Bulletin 177(1):77-82, 1989; **6:** Discovery Reports 20:69-306 and plates, 1940; **7:** Isidro Bosch, personal communication, 1999; **8:** South African Journal of Antarctic Research 23(1-2):37-70, 1993; **9:** Asteroidea with a Survey of the Asteroidea of the Chilean Shelf. FJ Madsen. Lunds Universitets Arsskrift. Ny Foljd, Avd. 2. Bd 52. Nr 2. Kungliga Fysiografiska Sallskapet Handlingar. Ny Foljd, Bd 67, Nr 2. Reports of the Lund University Chile Expedition 1948-49. Number 24. Lund: CWK Gleerup, 1956; **10:** Memoirs of Museum Victoria 57(2):167-223, 1998; **11:** AM Clark & ME Downey. Starfishes of the Atlantic. Chapman & Hall Identification Guides, 3. London: Chapman & Hall 1992;

12: W. Percy Sladen. Zoology Part 51. Report on the Asteroidea (Starfish) collected by H.M.S. Challenger during the years 1873-1876. Report on the Scientific Results of the Voyage of HMS Challenger during the Years 1873-76. Zoology, Vol 30, Text. London, HMSO: 1889. pp 360-362; **13:** Zootaxa 3795(3): 327-372, 2014; **14:** Fauna der Antarktis. J Sieg & JW Wagele, eds. Berlin: P Parey, 1990; **15:** Equinodermos Antarticos. II. Asteroideos. 5. Asteroideos de la Extremidad Norte de la Peninsula Antartica. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia (aka Ciencias Zoologicas) 9(10):211-281 and plates, 1970; **16:** Polar Biology 41:2423-2433, 2018; **17:** Amazing Antarctic asteroids: a guide to the starfish of the Ross Sea. Kate Neill et al. NIWA, New Zealand, Version 1, 2016 https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/amazing-antarctic-asteroids; **18:** Ecology and Evolution 8(21):10621-10633, 2018

seastar *Psilaster charcoti*

Psilaster charcoti is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia Island, Bouvet Island, Crozet Islands, Macquarie Island, Argentina, and Chile, from 10 to 3,900 meters depth [1,3,4,5,6,7]. The dorsal surface of *P. charcoti* is slightly convex; its arms are wide at the base, have steeply vertical sides, and taper evenly from its broad disc to the sharp arm tips [1,4]. *P. charcoti* has a central anus, long slender tube feet without distinct sucking discs, and its oval madreporite is between arms and nearer the edge than center [1]. The lack of distinct suckers on the tube feet of *P. charcoti* indicates a preference for a muddy environment [1]. *P. charcoti* has been collected at sizes up to sixteen centimeters in radius from its center to the tip of an arm [2,4]. The color of *P. charcoti* is reddish brown, brown-yellow, light tan, bright or pale pink, purplish, or violet and its edges may be lighter; young may be pale yellow [1,4,6]. *Psilaster charcoti* has been collected with its stomach filled with mud, fecal material, the remains of a polychaete worm, and pieces of a colonial ascidian; it has also been captured with hooks baited with fish chunks [3]. Thus *P. charcoti* is an active predator on some invertebrates and ingests mud to eat organisms therein; it also scavenges on feces and dead organisms [3]. *P. charcoti* is noted as being slimy, suggesting ciliary-mucus feeding [3].

References: 1: The Fauna of the Ross Sea, Part 3, Asteroidea. HES Clark. New Zealand Department of Scientific and Industrial Research Bulletin 151, New Zealand Oceanographic Institute Memoir 21, 1963; **2:** Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Biologie 63:175-184, 1993; **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.293-326; **4:** Equinodermos Antarticos. II. Asteroideos. 5. Asteroideos de la Extremidad Norte de la Peninsula Antartica. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia (aka Ciencias Zoologicas) 9(10):211-281 and plates, 1970; **5:** Tethys 6(3):631-653, 1974; **6:** Memoirs of Museum Victoria 57(2):167-223, 1998; **7:** Amazing Antarctic asteroids: a guide to the starfish of the Ross Sea. Kate Neill et al. NIWA, New Zealand, Version 1, 2016 https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/amazing-antarctic-asteroids



possibly the seastar *Pteraster affinis*

This seastar was photographed at New Harbor at about twelve meters depth [2].

Taxonomic Note: *Pteraster affinis* reported by AM Clark [1]. John Pearse said this photo looked like the *aculeatus* subspecies [3]. That subspecies has been synonymized into the *affinis* parent species [4]. Genetic analysis suggests that *Pteraster affinis* should have several species [5]. An identification key to the Southern Ocean Pterasteridae is at http://pterasteridae-so.identificationkey.org/mkey.html [accessed 10 November, 2021].

References: 1: AM Clark. B.A.N.Z. Antarctic Research Expedition 1929-1931. Reports, Series B (Zoology and Botany) Volume 9, Asteroidea. Adelaide: BANZAR Expedition Committee, 1962; **2:** Rob Robbins, personal communication, 2000; **3:** John Pearse, personal communication, 2000; **4:** Mah, C. (2014). Pteraster affinis Smith, 1876. In: Mah, C.L. (2014) World Asteroidea database. Accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p=taxdetails&id=172780 on 2014-09-03; **5:** Zoological Journal of the Linnean Society 192(1):105-116, 2021

heart urchin *Abatus* sp.

Species of *Abatus* urchins reported in the McMurdo Sound area are *ingens*, *nimrodi*, and *shackletoni* [15]. Species of *Abatus* urchins reported in Terra Nova Bay of the Ross Sea are *ingens*, *nimrodi*, *shackletoni*, *agassizii*, *cavernosus*, *cordatus*, *curvidens*, and *elongatus* [16].

Urchins of the genus *Abatus* are characterized by what's called a peripetalous fasciole in adult urchin tests (shells); this is a different-looking band of fine densely-packed spines circum-navigating the top of the test (see it below this red line) [15].

A live *Abatus* urchin showing its peripetalous fasciole, a band of fine densely-packed spines circum-navigating the top.

Heart urchins are deposit feeders, using their oral tube feet to gather up detritus [13]. Heart urchins have a dense coat of spines which keeps sediment away from the urchin's surface, thus maintaining a water-filled surrounding space that the urchin uses for respiration while buried [13].

An *Abatus* sp. urchin.

An *Abatus* sp. urchin.

An *Abatus* sp. urchin.

Abatus shackletoni is found throughout Antarctica and the Antarctic Peninsula from 8 to 631 meters depth [1,2,3,4,9,10,12,14,15]. Near Cape Evans, *Abatus shackletoni* occurs in loose gravel and cobble habitats [1]. At Rocher Jacobsen in the Pointe Géologie Archipelago of Terre Adélie, *Abatus shackletoni* individuals live completely buried in the silty sediment [14]. The shell (test) length of *Abatus shackletoni* can be up to 6.7 centimeters in length, with a typical size being four centimeters [6,11,15]. The test of *Abatus shackletoni* is more or less ovoid, about as long as it is broad, has a regular peripetalous fasciole, and may or may not have a faint notch at the anterior end [4,5,9,10,15]. The color of *Abatus shackletoni* is brown to grayish-purple [15].

Abatus (Pseudabatus) nimrodi is found in eastern Antarctica from 2 to 716 meters depth [1,4,5,6,9,14]. *Abatus (Pseudabatus) nimrodi* can be found partly or completely burrowed into muddy or silty sediment [7,14]. *Abatus (Pseudabatus) nimrodi* is common along the western oligotrophic side of McMurdo Sound including New Harbor; it can be found buried just below the surface of fine, silty sediment at New Harbor [1,6,9]. The shell (test) length of *Abatus (Pseudabatus) nimrodi* can be up to six centimeters with an average size of 3 - 4 centimeters [15]. The brood pouches of *Abatus (Pseudabatus) nimrodi* are widely separated from the apical system at the top of the test (shell) [15]. The color of *Abatus (Pseudabatus) nimrodi* is dark brown to nearly black [4,15].

Abatus ingens has been found along the Antarctic coast from 20 to 761 meters depth, and is very large, up to six to seven centimeters in length [15]. *Abatus ingens* has a triangular-looking ambitus at its posterior end, has a sinuous-looking peripetalous fasciole, and is very dark, almost black, including its spines [15].

An *Abatus* sp. urchin.

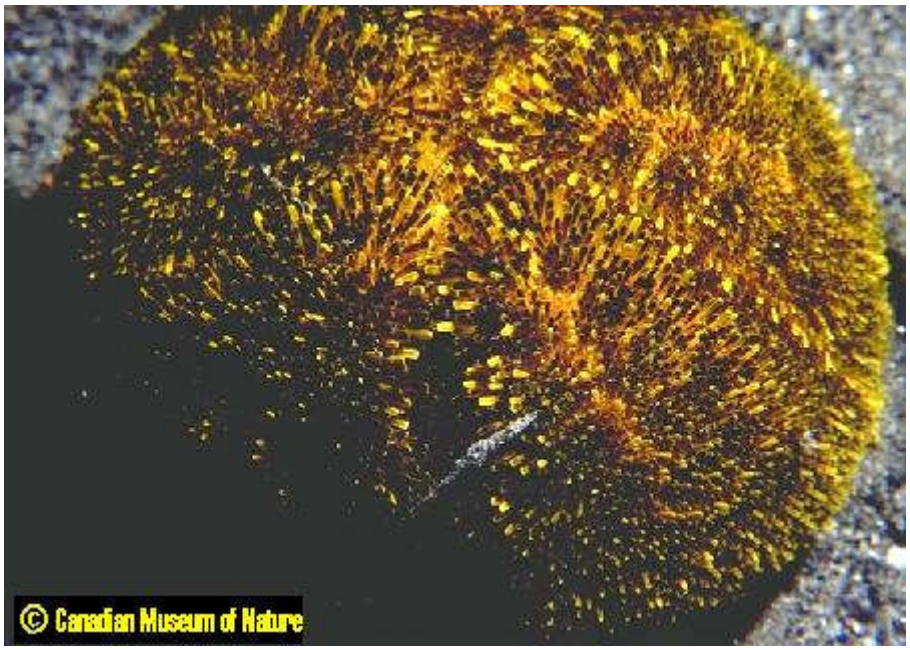
Here's a look at the four brood pouches on an *Abatus* test (shell).

Abatus shackletoni broods an average of 22 yolk-feeding embryos and juveniles in each of four depressed elongated brood pouches on the urchin's dorsal (aboral) surface; *Abatus (Pseudabatus) nimrodi* broods an average of eighteen [1,6].

Here, *Abatus* embryos and juveniles are pulled out of their brood pouches for illustration. Development of embryos within the brood pouch takes at least eight months [6]. Eggs are released into the brood pouches and fertilized there throughout most or all of the year [6]. From August to January, 71-100% of *Abatus shackletoni* females are brooding embryos [6]. From November to January, 60-84% of *Abatus (Pseudabatus) nimrodi* females are brooding embryos [6].

Two types of spines form a protective arch over the *Abatus* brood pouch [1,6]. *Abatus (Pseudabatus) nimrodi* juveniles are spine-covered in later stages of development in the brood pouch and are larger in size relative to the juveniles of *Abatus shackletoni* [1,6].

The production of large, robust *Abatus (Pseudabatus) nimrodi* juveniles may increase their survival for escaping the predatory brittle stars which occur in their environment; these brittle stars are not abundant where *Abatus shackletoni* is found [6].



An *Abatus* sp. urchin

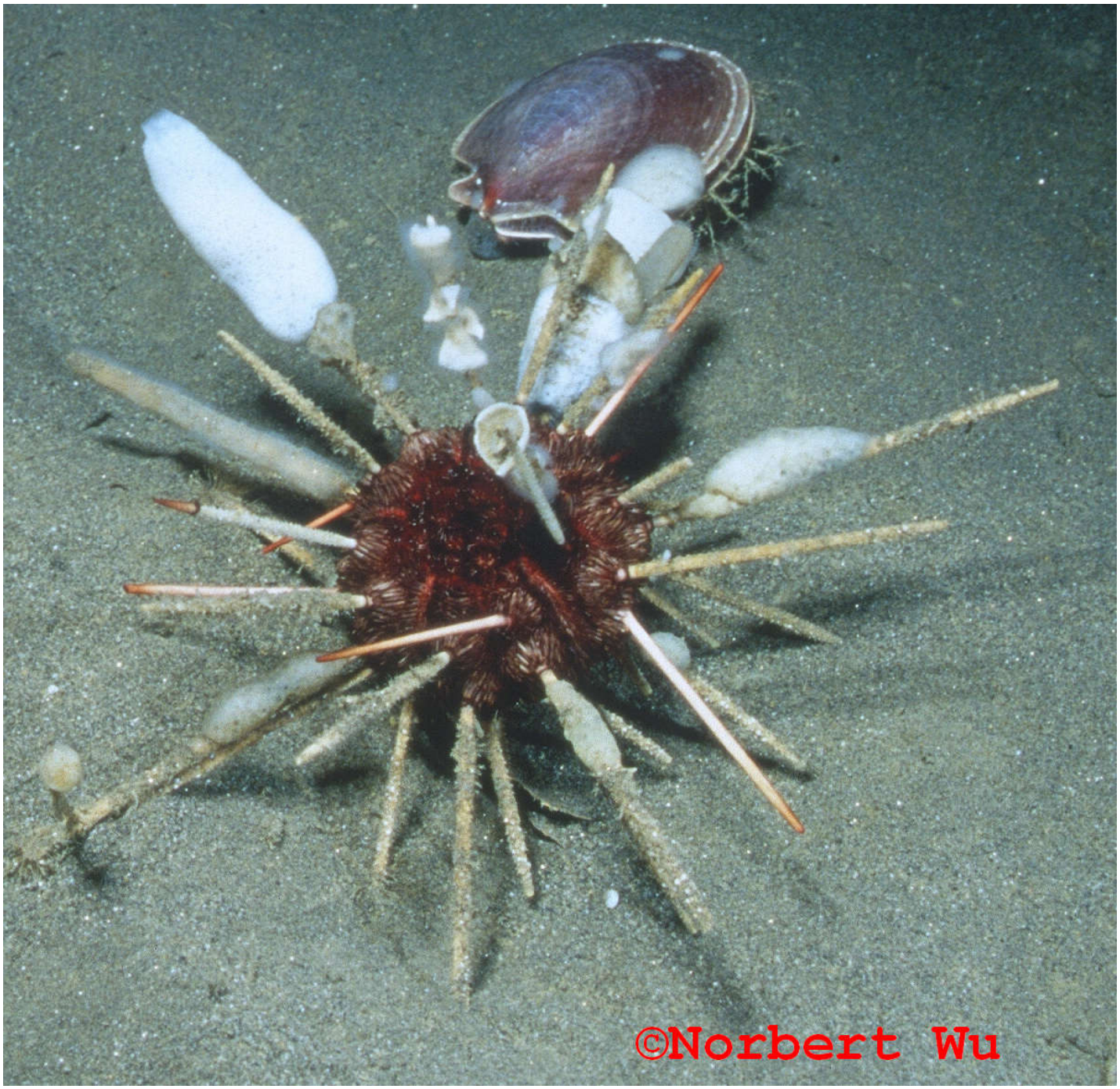
The diversity of Antarctic sea urchins with its prevalence of brooding (thirty-nine of sixty Antarctic and subantarctic species -- 65%) may be a process of species-level selection via extinction and speciation rates related to pelagic or protected development of their young [7,8].

Taxonomic Note: Genetic analysis showed *Abatus koehleri* to be *A. shackletoni* [16]. *Abatus ingens*, *nimrodi*, *shackletoni*, *agassizii*, *cavernosus*, *cordatus*, *curvidens*, and *elongatus* were reverse described after genetic analyses [16].

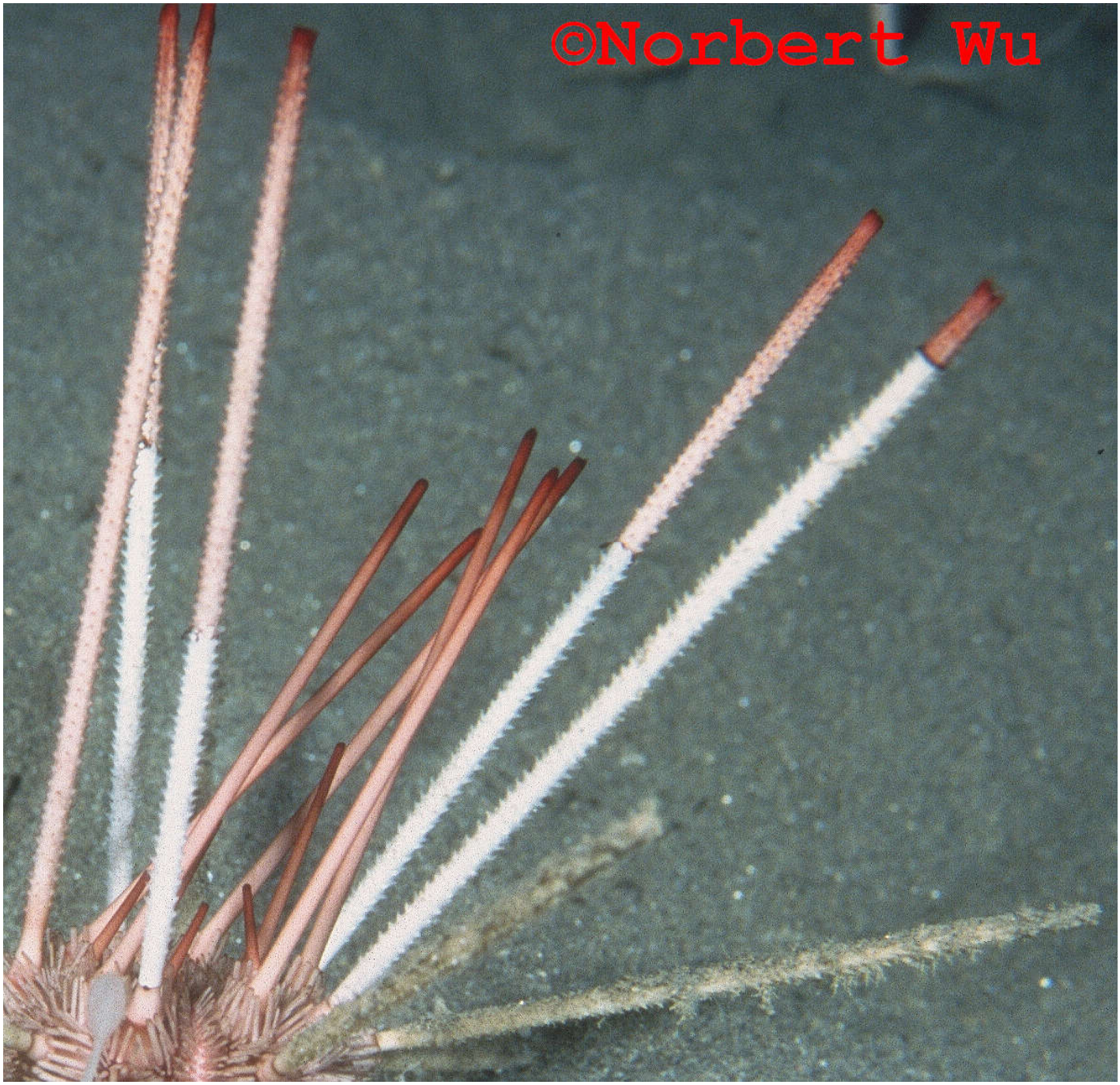
References: 1: Journal of Morphology 216(1):79-93, 1993; **2:** Symposium on Antarctic Oceanography. Santiago, Chile 13-16 September 1966. Published by Scott Polar Research Institute for Scientific Committee on Antarctic Research. Cambridge, Printed by W. Heffer, 1966. p.162; **3:** R Koehler. Echinodermata Echinoidea. Australasian Antarctic Expedition 1911-1914. Scientific Reports. Series C, Zoology and Botany. Vol 8 Part 3. Sydney: David Harold Paisley, Government Printer, 1926; **4:** A Monograph of the Echinoidea. Volume 2, Spatangoida. 2. Amphisternata. 2. Spatangidae, Loveniidae, Pericosmidae, Schizasteridae, Brissidae. T Mortensen. Copenhagen: CA Reitzel, 1951. pp.249-263; **5:** Hawaiian and Other Pacific Echini. The Spatangina. HL Clark. Memoirs of the Museum of Comparative Zoology at Harvard College. Volume 46 Number 2. Cambridge: Museum of Comparative Zoology at Harvard College, 1917. pp. 174-177; **6:** Invertebrate Reproduction and Development 17(3):181-191, 1990; **7:** Vie et Milieu 47(4):381-387, 1997; **8:** Evolution 50(2):820-830, 1996; **9:** Echinoderms Through Time: Proceedings of the Eighth International Echinoderm Conference, Dijon, France, 6-10 September 1993. B David et al, eds. Rotterdam; Brookfield, Vt.: Balkema, 1994. pp.749-756; **10:** Equinodermos Antarticos. I. Equinoideos. 1. Equinoideos de Shetland del Sur y Archipielago Melchior. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia 9(9):197-210 and plates, 1969; **11:** Biogeografia de la Peninsula Antartica, Archipielagos y Mares Adyacentes. N Bellisio & A Tomo. Buenos Aires: Servicio de Hidrografia Naval, 1974; **12:** 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; **13:** www.nhm.ac.uk/palaeontology/echinoids/; **14:** Polar Biology 27(3):177-182, 2004; **15:** Antarctic Echinoidea. B David, T Chone, R Mooi & C De Ridder. Ruggell, Liechtenstein: ARG Gantner, 2005; **16:** Diversity 15: 875, 2023 https://doi.org/10.3390/d15070875

pencil urchin *Ctenocidaris perrieri*

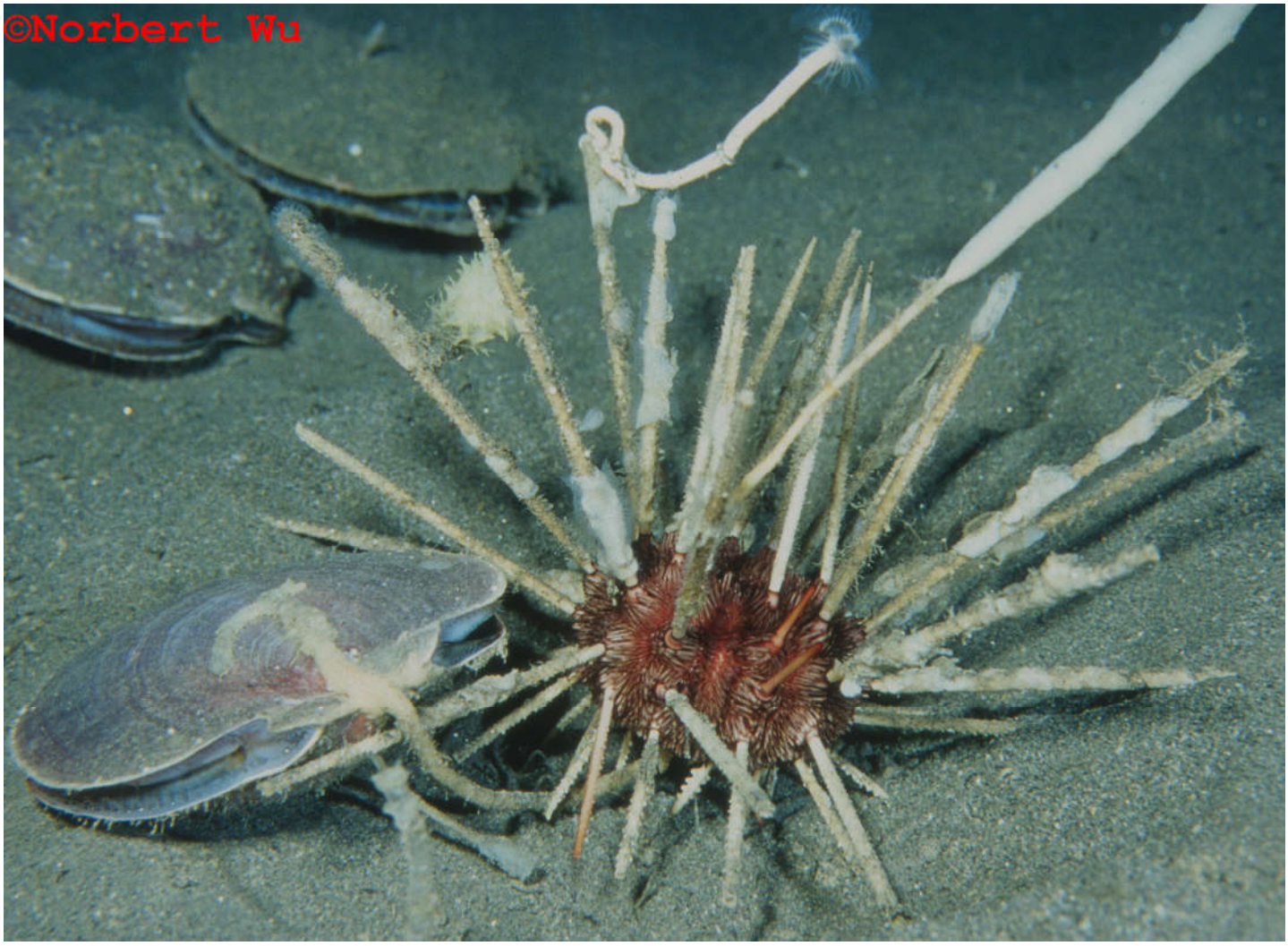
Ctenocidaris perrieri is found in Antarctica and the Antarctic Peninsula, Kerguelen Island, Crozet Island, and Heard Island from 6 to 602 meters depth [1,2,5,6,7].

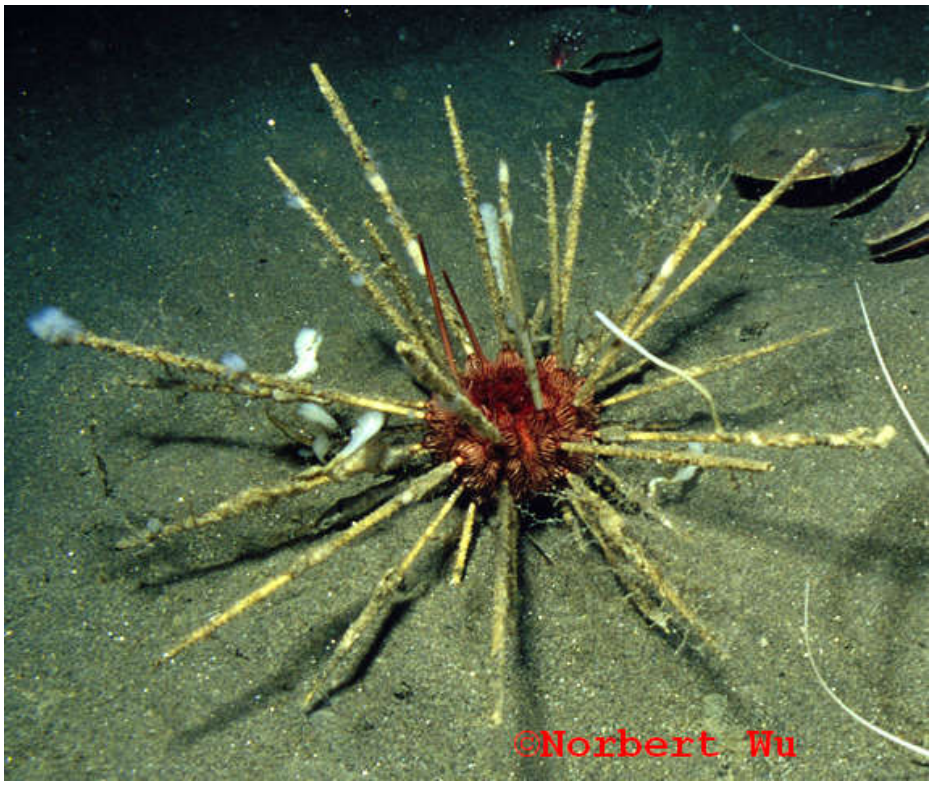


The test (shell) of *Ctenocidaris perrieri* has been measured at sizes up to 6.7 centimeters and is purple or purple-brown in color [7,8,9].



Ctenocidaris perrieri has long, slender, coarsely thorny primary spines measured at lengths up to 8.5 centimeters and covered with a thick, spongy coat of hairs [2].



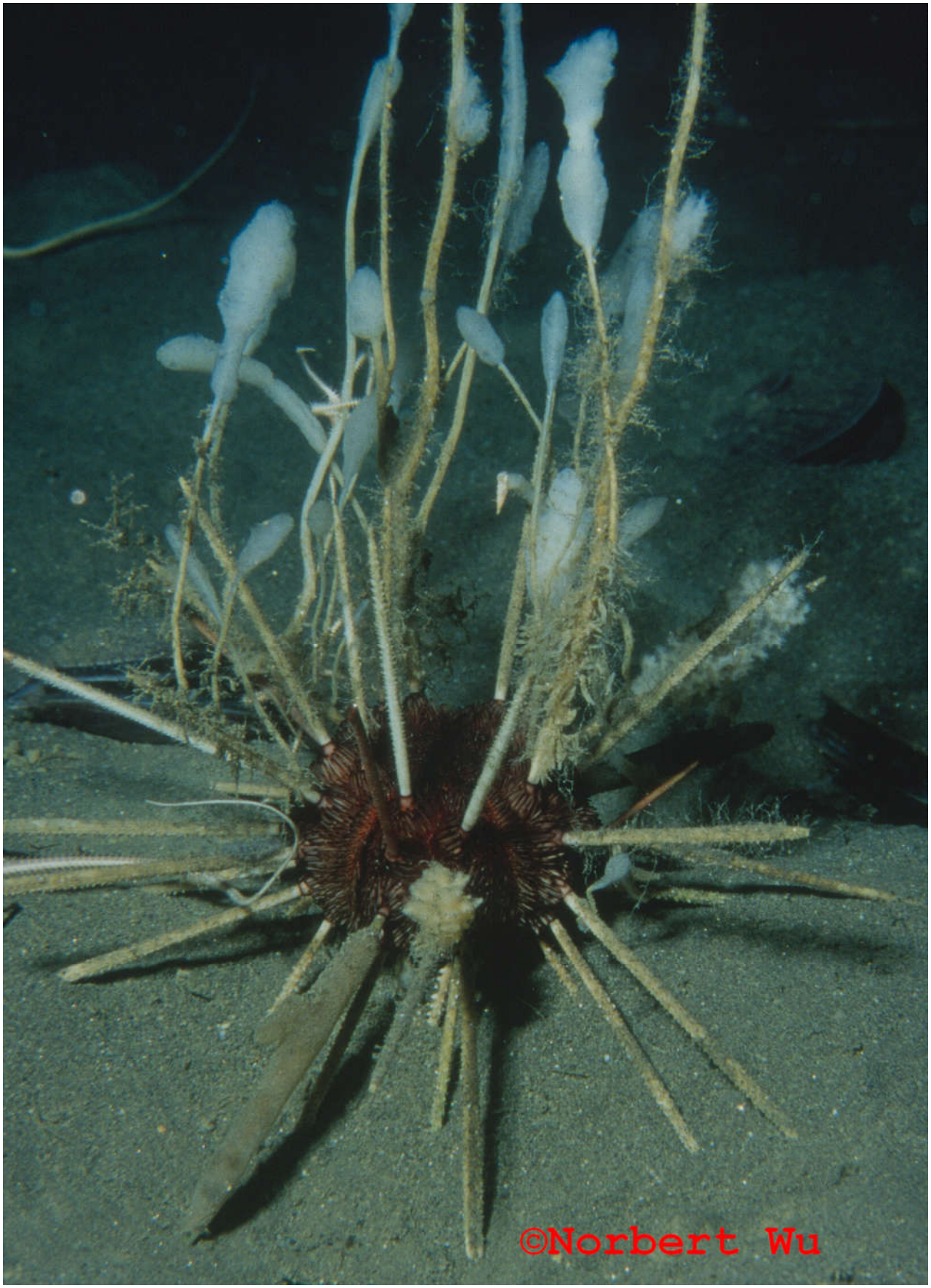


The primary spines of *Ctenocidaris perrieri* are typically twice as long as the horizontal diameter of the test (shell) [2].

Eleven sponge species were found to grow on the spines of *Ctenocidaris perrieri*, with the most common being *Homaxinella balfourensis, Isodictya erinacea, Iophon unicorne*, and *Haliclona (Rhizoniera) dancoi*; the urchins increase the dispersal of the sponges by being "islands" of suitable habitat [10].

Ctenocidaris perrieri broods its embryos and juveniles in the region surrounding its mouth (the peristome) [3,8].

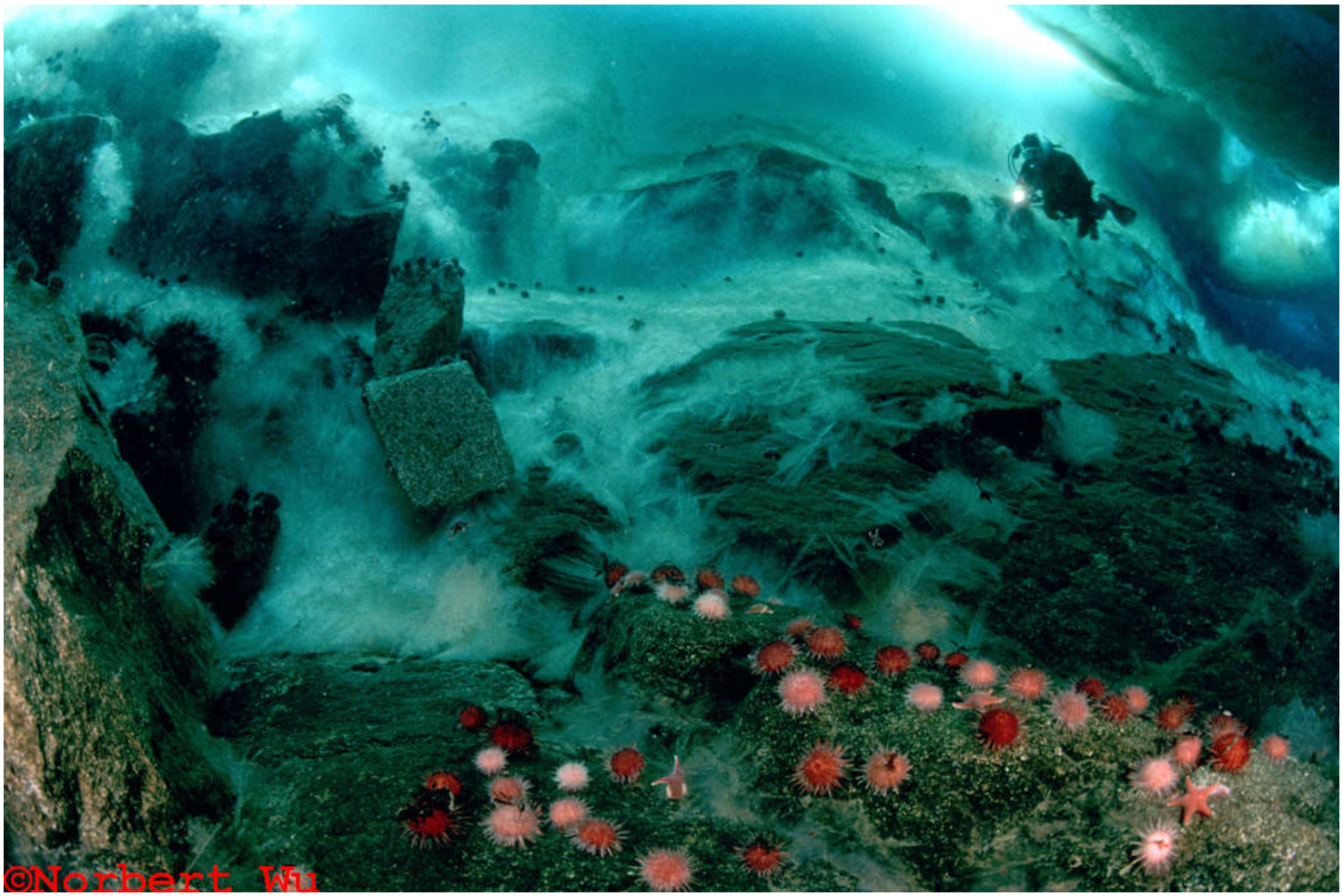
The diversity of Antarctic sea urchins with its prevalence of brooding (thirty-nine of sixty Antarctic and subantarctic species -- 65%) may be a process of species-level selection via extinction and speciation rates related to pelagic or protected development of their young [3,4].



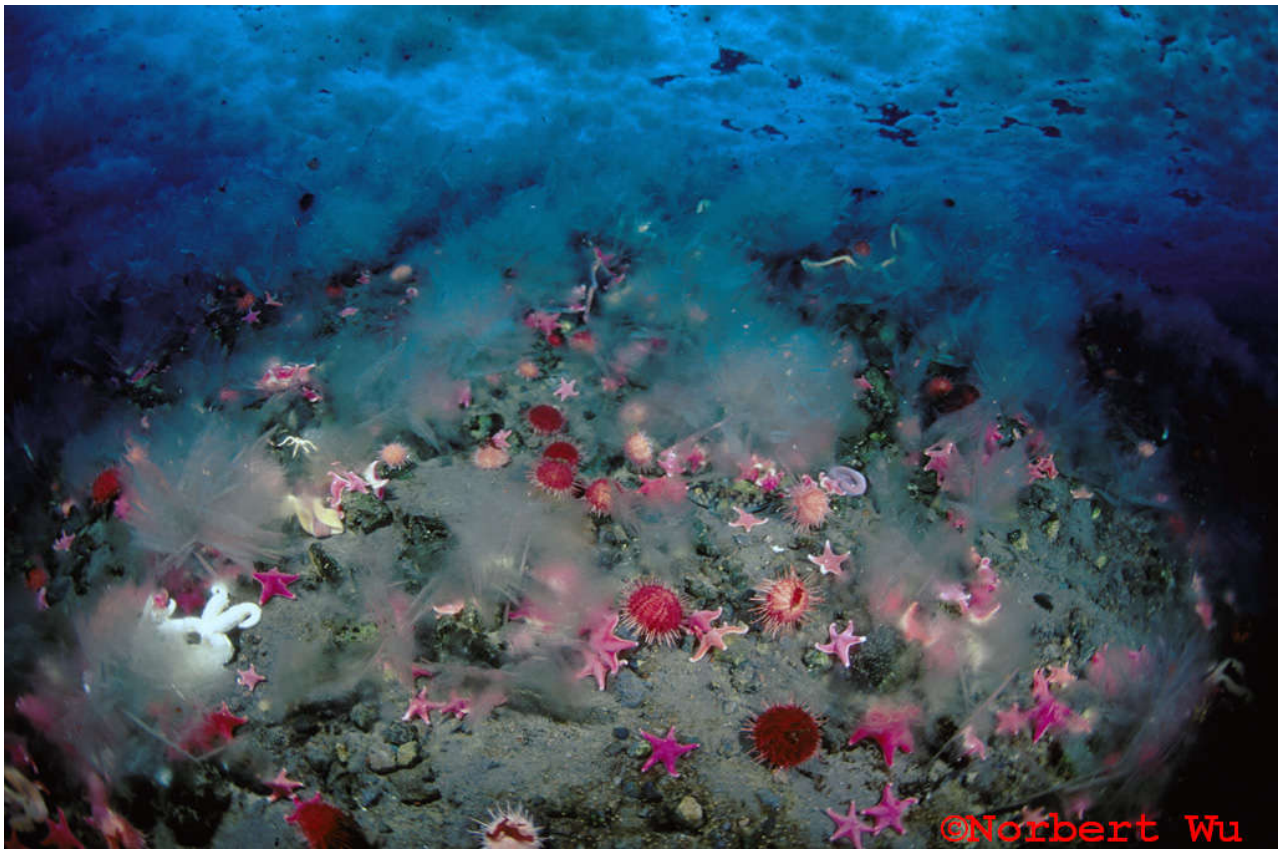
References: 1: Bulletin du Museum National d'Histoire Naturelle, Section A, Zoologie, Biologie, et Ecologie Animales 14(2):405-441, 1992; **2:** A Monograph of the Echinoidea. Volume 1, Cidaroidea. T Mortensen. Copenhagen: CA Reitzel, 1928. pp123-124; **3:** Evolution 50(2):820-830, 1996; **4:** Vie et Milieu 47(4):381-387, 1997; **5:** NZOI Records (New Zealand Oceanographic Institute) 3(1):1-6, 1976; **6:** Jim Mastro, personal communication, 1999 [6 meters at Explorer's Cove in New Harbor]; **7:** Equinodermos Antarticos. I. Equinoideos. 1. Equinoideos de Shetland del Sur y Archipielago Melchior. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia 9(9):197-210 and plates, 1969; **8:** T Mortensen. B.A.N.Z. Antarctic Research Expedition 1929-1931. Reports, Series B (Zoology and Botany) Volume 4, Part 10 Echinoidea. pp. 287-310 plus plates. Adelaide: BANZAR Expedition Committee, 1950; **9:** Echinodermes (Asteries, Ophiures et Echinides). R Koehler. Deuxieme Expedition Antarctique Francaise (1908-1910) commandee par le Dr Jean Charcot. Sciences Naturelles. Documents Scientifiques. Paris: Masson et Cie, 1912; **10:** Polar Biology 32(7):1067-1076, 2009

sea urchin *Sterechinus neumayeri*

Sterechinus neumayeri is found in Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia Island, South Patagonia Island, Prince Edward Island, Marion Island, Crozet Island, and Kerguelen Island at depths from 5 to 640 meters [8,9,10].



Sterechinus neumayeri is abundant in shallow waters of McMurdo Sound at depths less than fifteen meters and plays a major role in McMurdo Sound's benthic ecosystem.

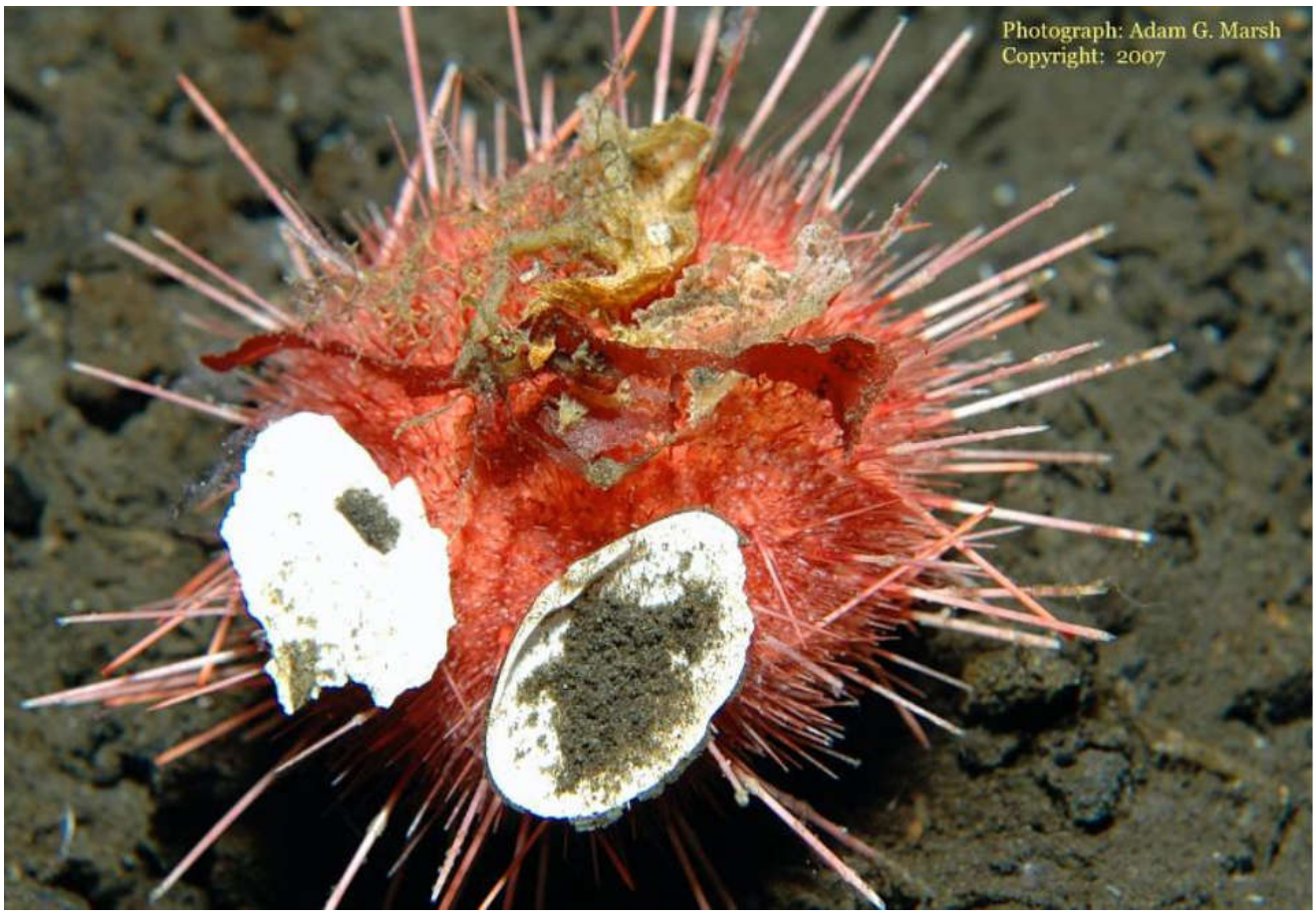


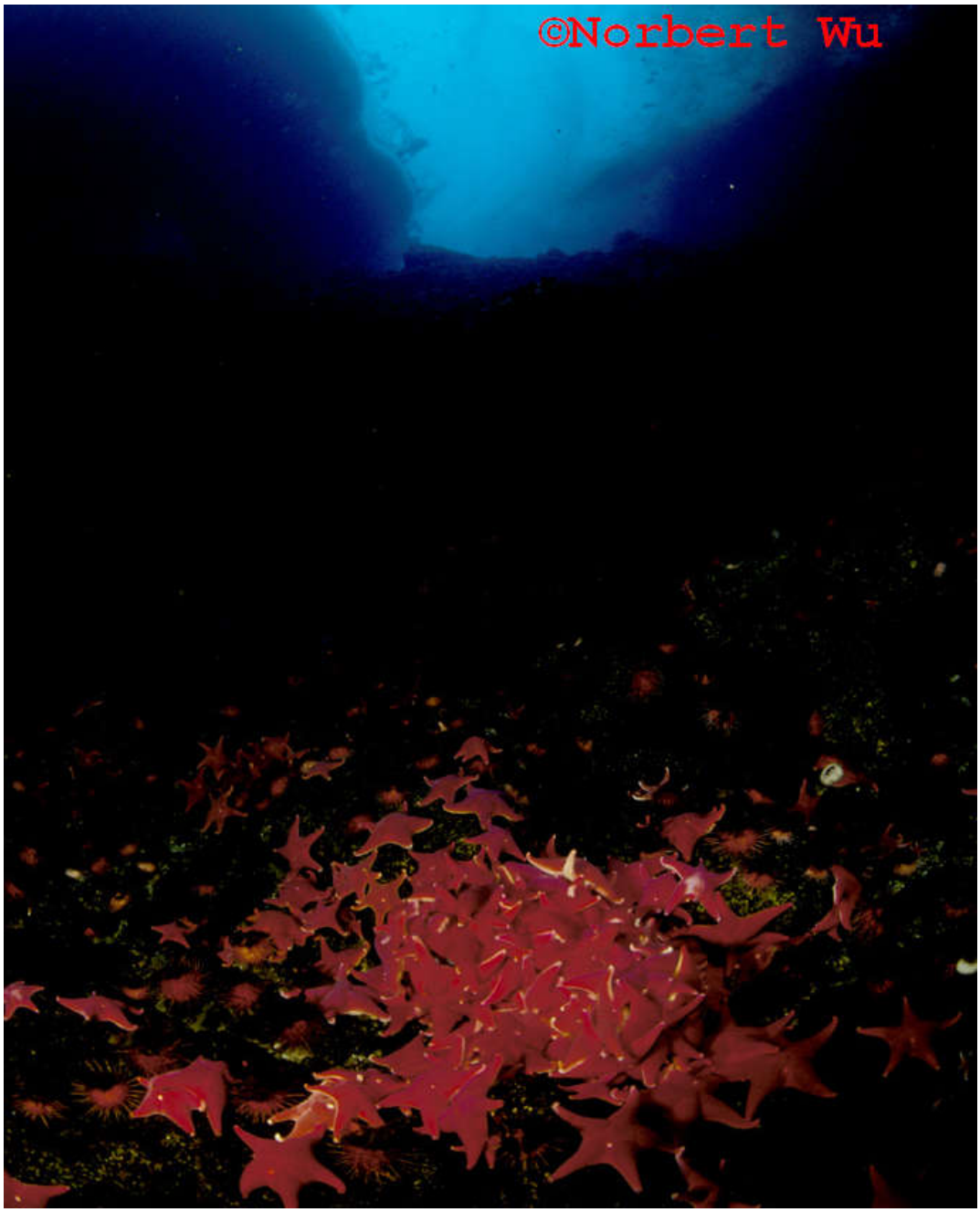
The color of the test (shell) and spines of *Sterechinus neumayeri* is variable, from greenish- olive to dark purplish/violet or whitish; the test is more generally greenish-olive or green-gray [8,9,10]. It is slow growing, reaching a maximum diameter of seven centimeters at forty years of age [1].

The bare test (shell) of the genus *Sterechinus* is distinguished by a large periproct within its ring of apical plates, distinctly darker lines formed by tube feet in the pore zones, and denser distribution of tubercules on the oral side than the aboral side [19]

Largely herbivorous, half of the diet of *Sterechinus neumayeri* is algae; it also eats diatoms, foraminiferans, sponges, bryozoans, hydrozoans, polychaetes including *Spirorbis* sp., and amphipods [4,18].

Above, *Sterechinus neumayeri* and the seastar *Odontaster validus* cruise the shallow bottom foraging for food around the crystalline anchor ice.



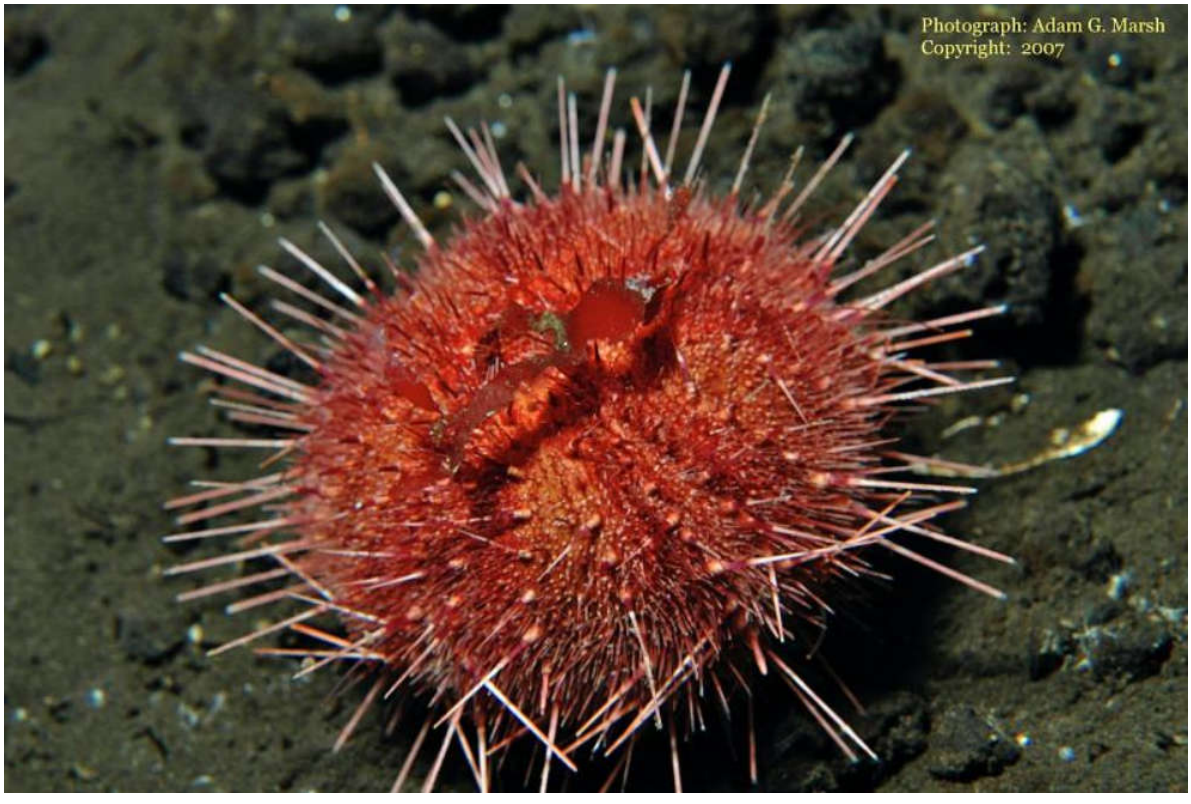


Weddell seal feces are a food item for *Sterechinus neumayeri* in shallow water, which can be observed piled up on feces along with the seastar *Odontaster validus*. The gut content of *S. neumayeri* is filled with seal feces at locations where this occurs [5].

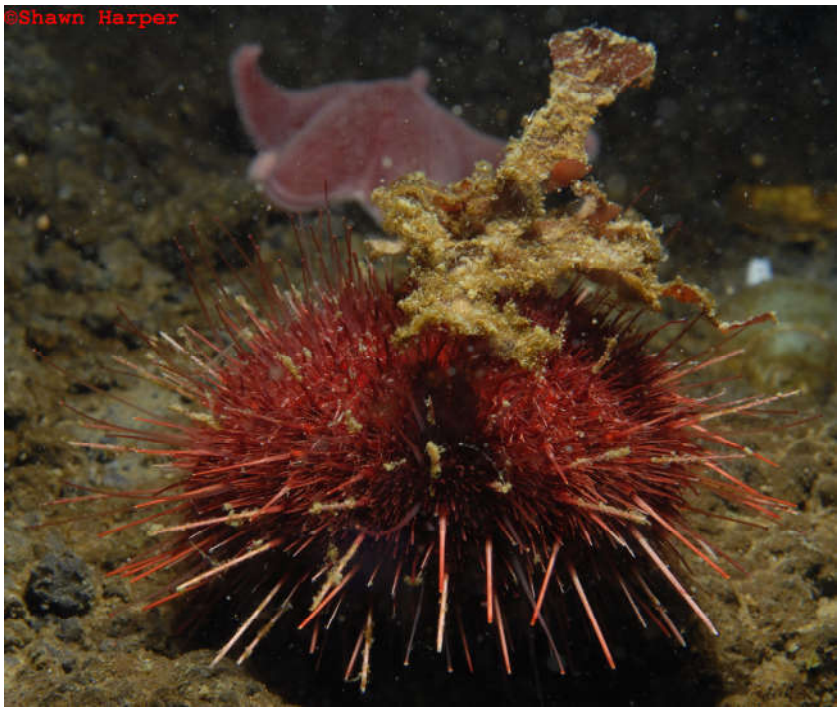
Sterechinus neumayeri has been observed feeding on the detrital film on the surface of the sponge *Cinachyra antarctica* [13].

Like many other urchins, *Sterechinus neumayeri* attaches bits of shell and debris to itself. The shells and debris often have stinging hydroids on them (see the whitish polyps on top left of the urchin). If an anemone like *Urticinopsis antarcticus* touches the urchin's hydroids, it releases the urchin. If the urchin is aware of the anemone's tentacles, the urchin releases its protective camouflage and escapes the anemone's grasp. If this camouflage isn't present on the urchin, the anemone captures and eats the urchin [3].

Predators of the urchin *Sterechinus neumayeri* include the anemones *Urticinopsis antarcticus* and *Isotealia antarctica*, the octopus *Pareledone* sp., the fish *Trematomus bernacchii*, the seastars *Macroptychaster accrescens* and *Odontaster validus* [shown here], and the brittle star *Ophiosparte gigas* [6,7,11,12,14,16].

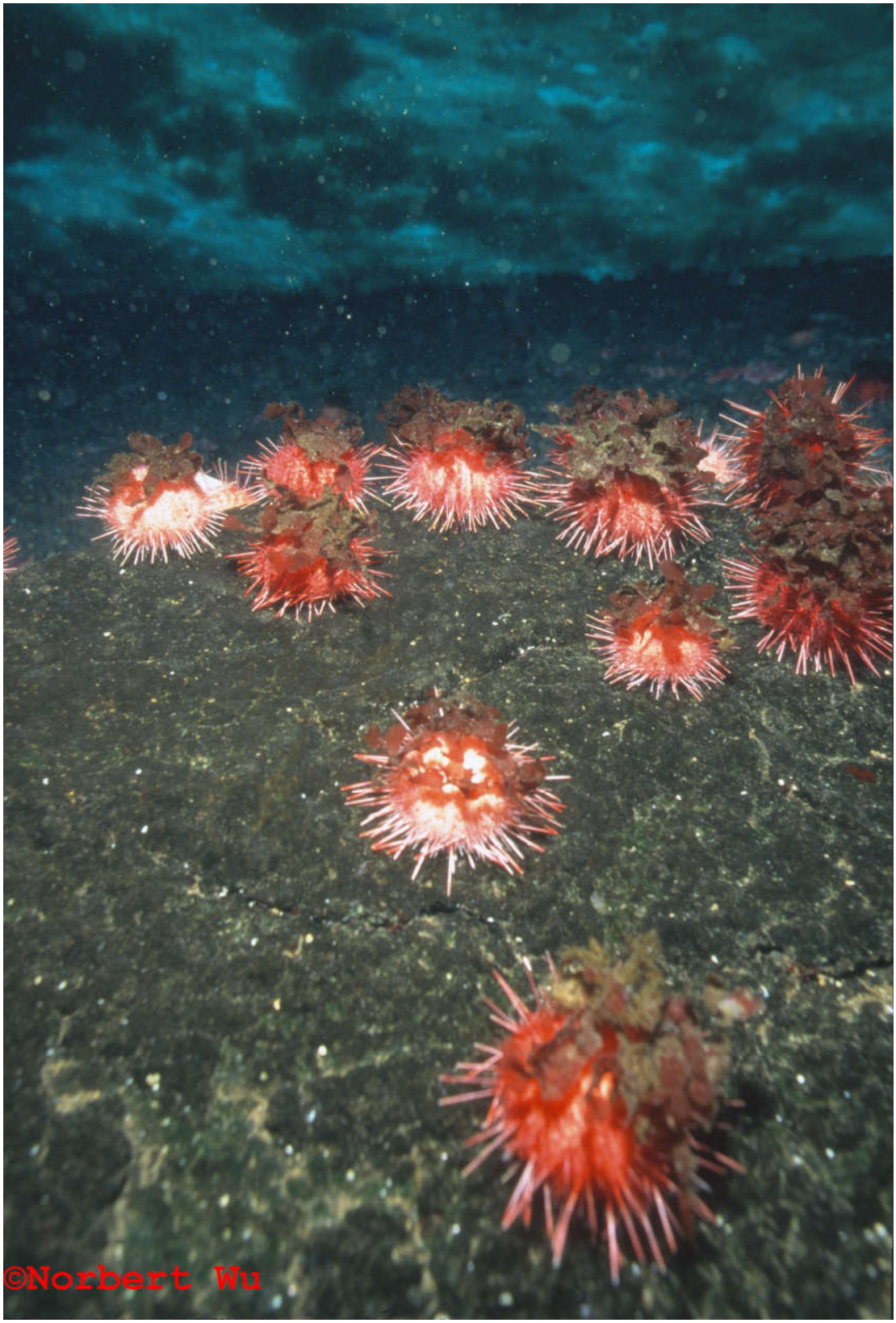


Sterechinus neumayeri attaches pieces of algae like *Phyllophora antarctica* and *Iridaea cordata* to itself as protection against the anemone *Isotealia antarctica* [14].



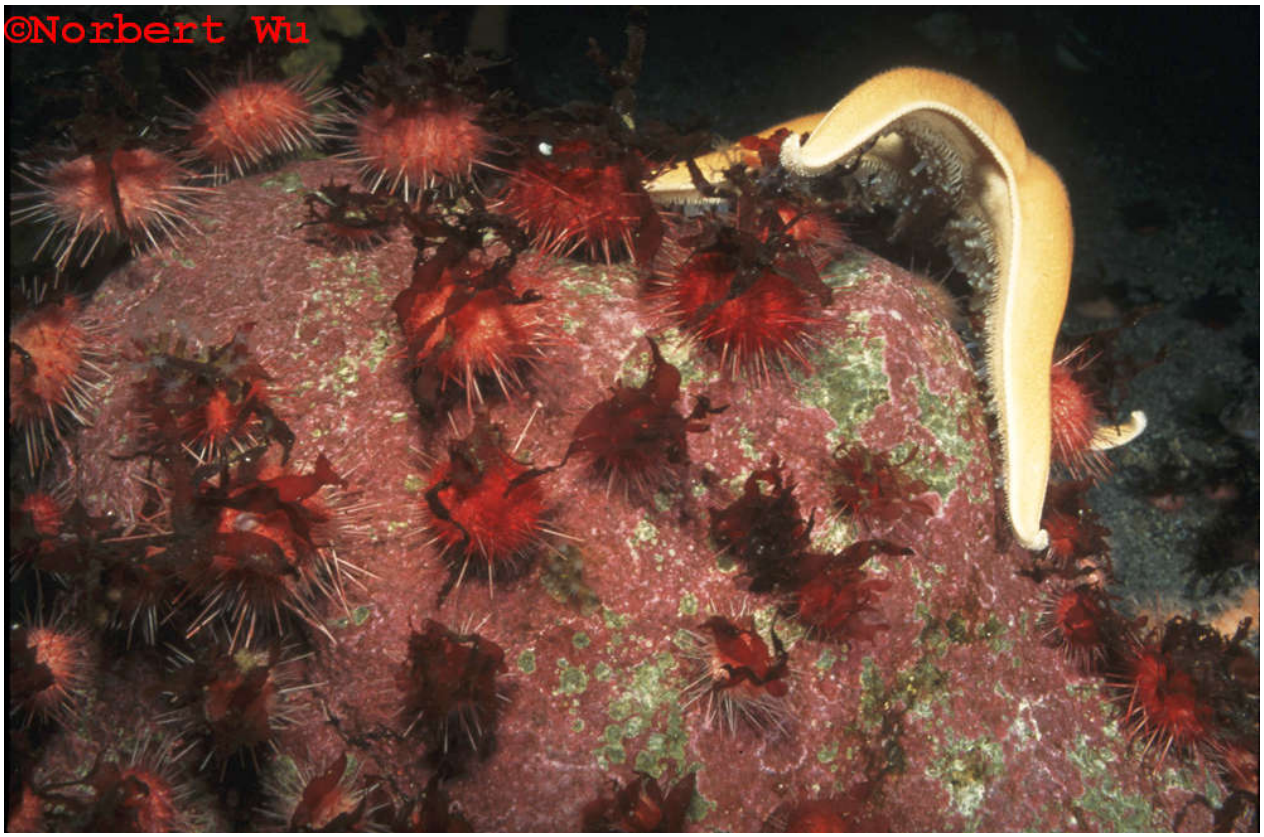
Both algae manufacture unpalatable defensive chemicals to avoid getting eaten by *Sterechinus. neumayeri*, yet the urchin attaches algal pieces to itself as a detachable shield to shed when the anemone's tentacles grab onto the attached algae [14,15].

The Antarctic scallop *Adamussium colbecki* may be colonized on either shell by small hydroids *Hydractinia angusta* [17]. *H. angusta* hydroids eat tube feet and pedicellariae of sea urchins including *Sterechinus neumayeri*, which graze on the algal film growing on the surface of the scallop's shell but is not a predator of the scallop [17]. *Adamussium colbecki* shells are very thin, and such urchin grazing may damage the shell; thus the hydroids act in defense of the scallop [17].

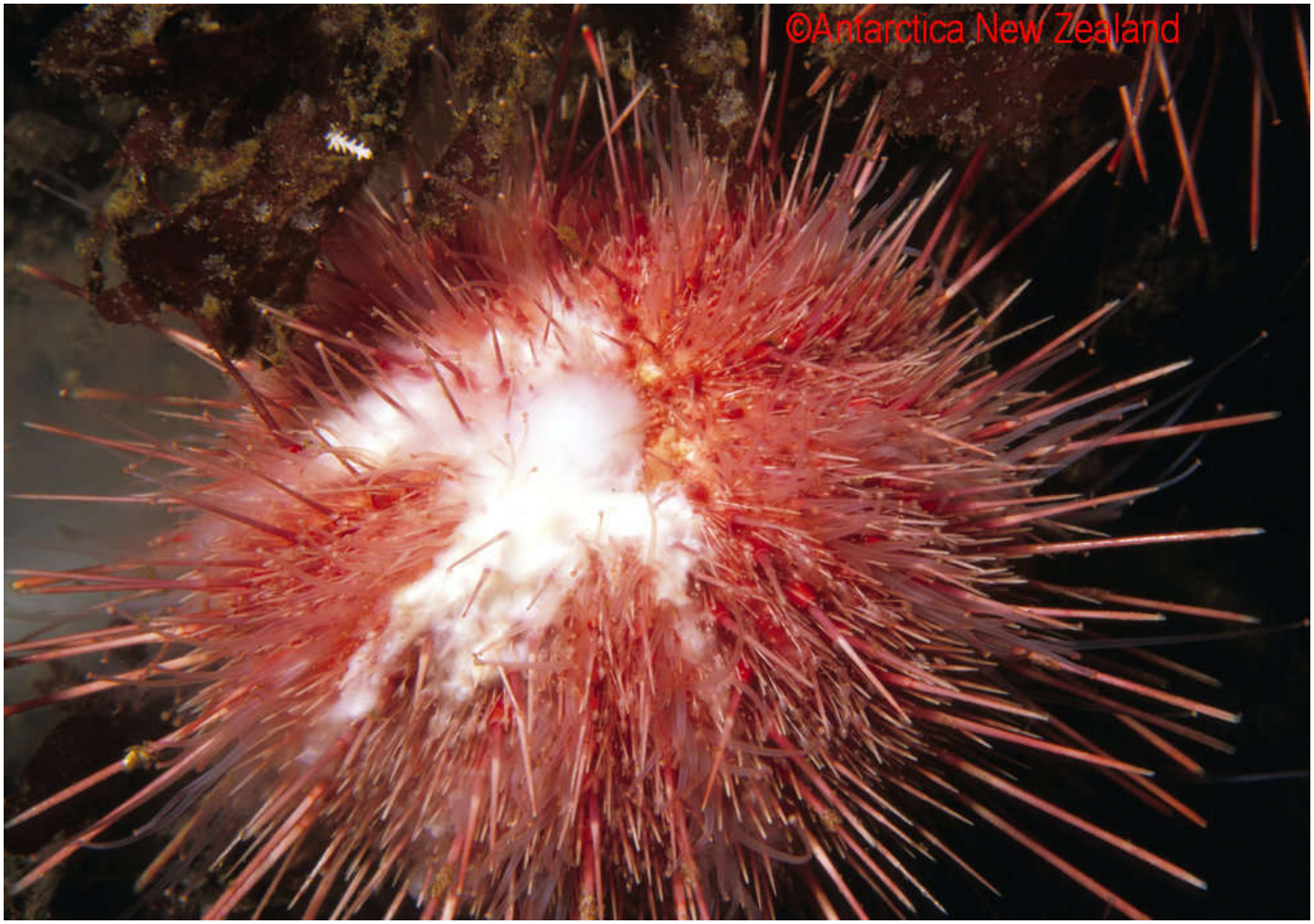


At some sites where these algae occur with *Sterechinus neumayeri*, 96.5% of the urchins were using *Phyllophora antarctica* for 90% or more of their cover [14]. This is a mutually beneficial relationship between *S. neumayeri* and the algae [14].

The urchins move fertile drift algae throughout sunlit waters, thereby keeping drift algae in the reproductive area with other attached and drift algae; the urchins also extend the vertical and horizontal range of the algae and facilitate recolonization after ice scouring of the bottom or when conditions allow growth of attached plants at greater depths [14].



Sterechinus neumayeri spawning is timed so that its feeding larvae are in the plankton during the short summer peak of phytoplankton abundance [2].



Spawning *Sterechinus neumayeri*

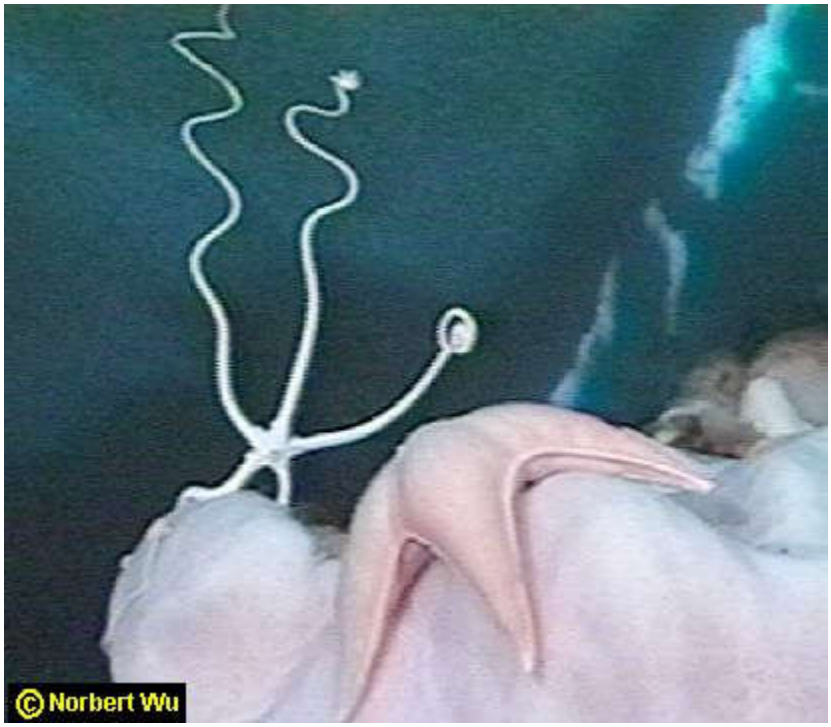
Spawning *Sterechinus neumayeri*

References: 1: Marine Biology 124(2):279-292, 1995; **2:** Biological Bulletin 173(1):126-135, 1987; **3:** Antarctic Ecology, Volume 1. MW Holdgate, ed. NY: Academic Press, 1970. pp.244-258; **4:** Antarctic Journal of the United States 11(1):24-26, 1976; **5:** Biological Bulletin 130(3):387-401, 1966; **6:** Polar Biology 13(5):347-354, 1993; **7:** Ecological Monographs 44(1):105-128, 1974; **8:** A Monograph of the Echinoidea. Volume 3, Part 3. Camarodonta 2. Echinidae, Strongylocentrotidae, Parasaleniidae, Echinometridae. T Mortensen. Copenhagen: CA Reitzel, 1943. pp.106-108; **9:** Bulletin du Museum National d'Histoire Naturelle, Section A, Zoologie, Biologie, et Ecologie Animales 14(2):405-441, 1992; **10:** Equinodermos Antarticos. I. Equinoideos. 1. Equinoideos de Shetland del Sur y Archipielago Melchior. I Bernasconi. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Zoologia 9(9):197-210 and plates, 1969; **11:** Bulletin de l'Institut Oceanographique 66(1368), 1966; **12:** Adaptations within Antarctic Ecosystems: Proceedings of the Third SCAR Symposium on Antarctic Biology. GA Llano, ed. Washington: Smithsonian Institution; Houston, TX : distributed by Gulf Pub. Co., 1977. pp.293-326; **13:** New Zealand Antarctic Record 9(2):34-52, 1989; **14:** Marine Ecology Progress Series 183:105-114, 1999; **15:** Journal of Phycology 34(1):53-59, 1998; **16:** Polar Biology 16(5):309-320, 1996; **17:** Polar Biology 23(7):488-494, 2000; **18:** Polar Biology 26(2):99-104, 2003; **19:** Sea Urchins, a Guide to Worldwide Shallow Water Species. H Schultz. Hemdingen, Germany: Heinke & Peter Schultz Partner Scientific Publications, 2006

brittle star *Astrotoma agassizii*

Astrotoma agassizii occurs throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Georgia Island, Shag Rocks, Falkland Islands, Burdwood Bank, and southern Chile and Argentina, in depths from 55 to 1,335 meters [1,2,3,4,8,9].

Astrotoma agassizii is creamy white in color [2]. The central disk of *A. agassizii* can reach a diameter of six centimeters [2,6]. From its growth rings, maximum age of *A. agassizii* is estimated to be 91 years [7]. *A. agassizii* bears live young and is hermaphrodite [3].



The unbranched arms of *Astrotoma agassizii* are stout, tapering, and flexible, reaching a length of seventy centimeters [2,6].

Astrotoma agassizii is usually found on sponges (as shown here on *Anoxycalyx (Scolymastra) joubini*), corals, and other organisms on which it can climb to be more advantageously placed to feed on prey drifting by [1,2]. The stomach of *A. agassizii* contains diatoms, phytoplankton, foraminiferans, chaetognaths, bryozoans, polychaetes, holothurians, ascidians, and primarily crustaceans (including mysids, copepods particularly *Euchaeta antarctica* and *Calanoides acutus*, euphausiids, and amphipods, ostracods), indicating that it feeds on plankton, catching them with its flexible long arms, which are armed with hooks and spines to increase catch efficiency [1,2,5,6,7]. One or two arms cling to the perch, while the others extend to feed [6]. The arms of *A. agassizii* can be looped and twisted, increasing its efficiency at contacting prey [1]. Prey caught by the arm tips of *A. agassizii* are rolled up into coils and passed to the mouth [1].

Taxonomic Note: *Astrotoma agassizii* is a species complex; Clade I is distributed across the Antarctic continental shelf and South Georgia and is genetically discrete with dispersing pelagic larva [10].

References: 1: Adaptations within Antarctic Ecosystems, Proceedings of the Third SCAR Symposium on Antarctic Biology. GA Llano, ed. Washington, DC: Smithsonian Institution, 1977. pp.293-326; **2:** The Fauna of the Ross Sea, Part 1, Ophiuroidea. HB Fell. New Zealand Department of Scientific and Industrial Research Bulletin 142, New Zealand Oceanographic Institute Memoir 18, 1961; **3:** Physis 25(69):2-5, 1965; **4:** US National Museum Polar Invertebrate Catalog at www.nmnh.si.edu/iz/usap/usapdb.html; **5:** Journal of Plankton Research 11(6):1315-1320, 1989; **6:** Antarctic Research Series 44:1-28, 1986. Biology of the Antarctic Seas, Volume 17. Washington: American Geophysical Union, 1986; **7:** Berichte zur Polarforschung 194, 1996; **8:** Boletim do Instituto Oceanografico (Sao Paulo) 32(1):33-54, 1983; **9:** Polar Biology 38:799-813, 2015; **10:** Heredity 123:622-633, 2019

brittle star *Ophiacantha antarctica*

Ophiacantha antarctica is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Georgia Island, Bouvet Island, and the Antarctic Ocean south of the polar circle in depths from 20 to 3,398 meters [1,2,4,5,6,7].

The color of *Ophiacantha antarctica* is variable including disc colors of bluish-grey, grey, reddish, and purple and arm colors of orange, straw, and pinkish [2,3].

The pentagonal central disc of *Ophiacantha antarctica* is up to 1.3 centimeters in diameter with indentations on the sides between arms [2,4]. The slender, fragile arms of *O. antarctica* are up to nine centimeters in length [2,4].

Ophiacantha antarctica is generally found up on the substrate (rocks, sponges, sessile cnidarians, etc.) [1,3].

Ophiacantha antarctica is an active forager and its diet includes diatoms, foraminifera, copepods, and other microzooplankton [1].

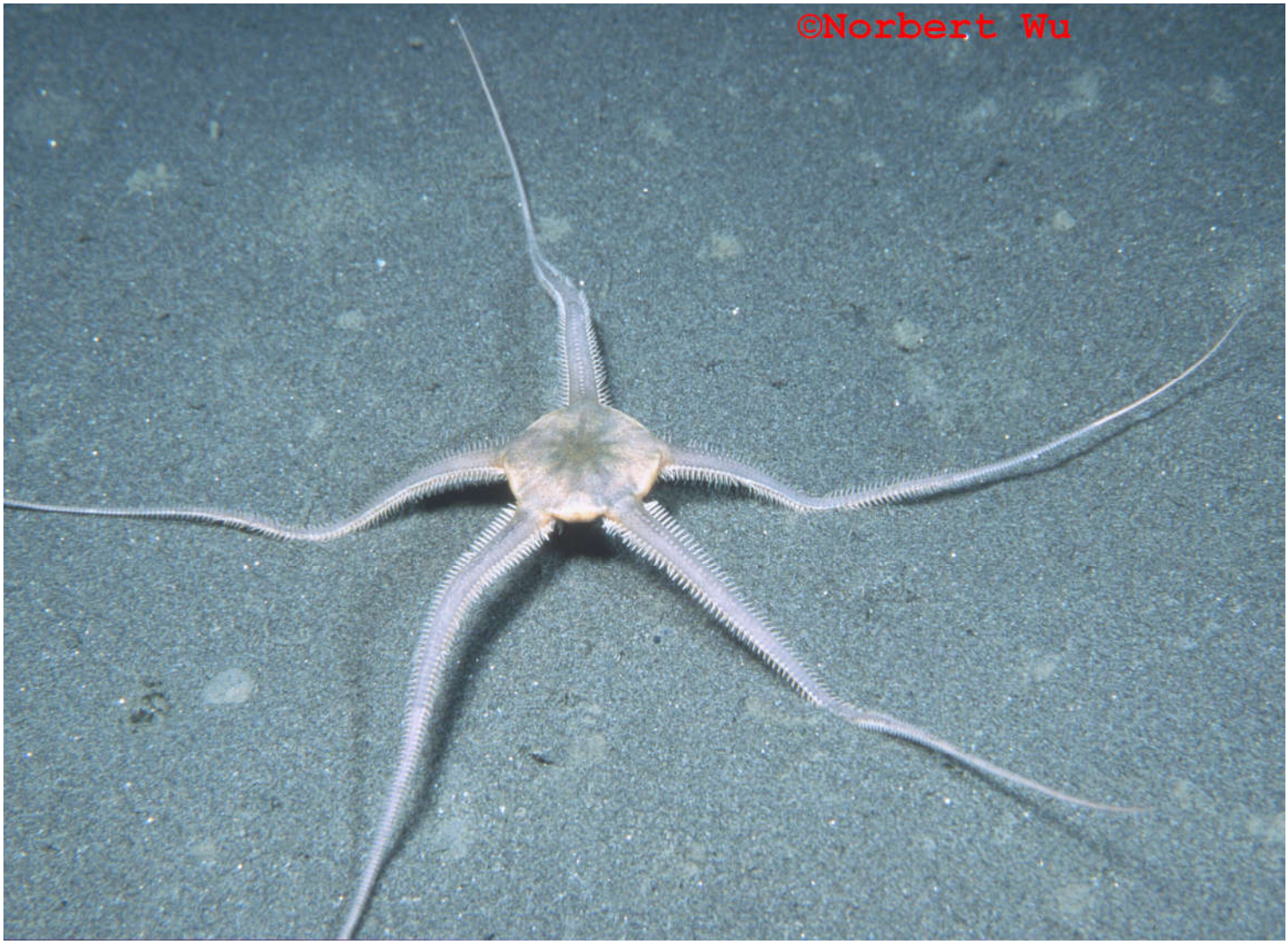
Its flexible arms, long erect and thin arm spines, and climbing ability suggests that *Ophiacantha Antarctica* feeds by manipulating its arms and arm spines to capture its food on or near the bottom [1].

Ophiacantha antarctica is the most abundant and widely distributed echinoderm in the Ross Sea, playing an important role in the benthic biological balance [2].

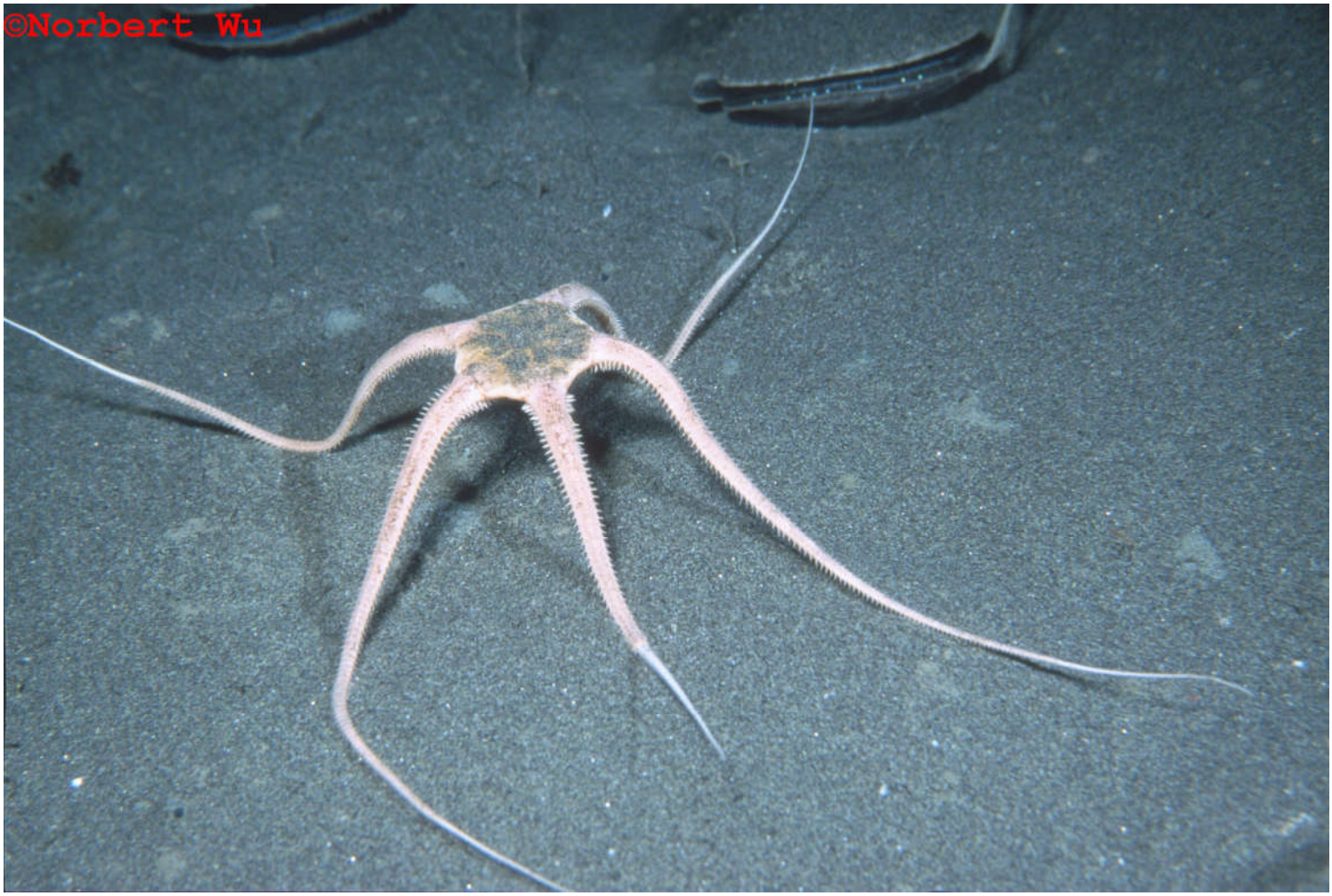
References: 1: Adaptations within Antarctic Ecosystems: Proceedings of the Third SCAR Symposium on Antarctic Biology. George A. Llano, ed. Washington: Smithsonian Institution; Houston, Tex.: distributed by Gulf Pub. Co., 1977. pp.293-326; **2:** The Fauna of the Ross Sea, Part 1, Ophiuroidea. HB Fell. New Zealand Department of Scientific and Industrial Research Bulletin 142, New Zealand Oceanographic Institute Memoir 18, 1961; **3:** John Dearborn, personal communication, 1999; **4:** Equinodermos Antarticos. III. Ofiuroideos. 1. Ofiuroidoes del Extremo Norte de la Peninsula Antartica. I Bernasconi and MM D'Agostino. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Hidrobiologia 4(2):81-133 and plates, 1974; **5:** Tethys 6(3):631-653, 1974; **6:** Polar Biology 26(11):691-699, 2003; **7:** Polar Biology 38:799-813, 2015

brittle star *Ophionotus victoriae*

Ophionotus victoriae occurs throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Sandwich Islands, South Georgia Island, and Bouvet Island in depths from 5 to 1,266 meters [3,4,5,6].

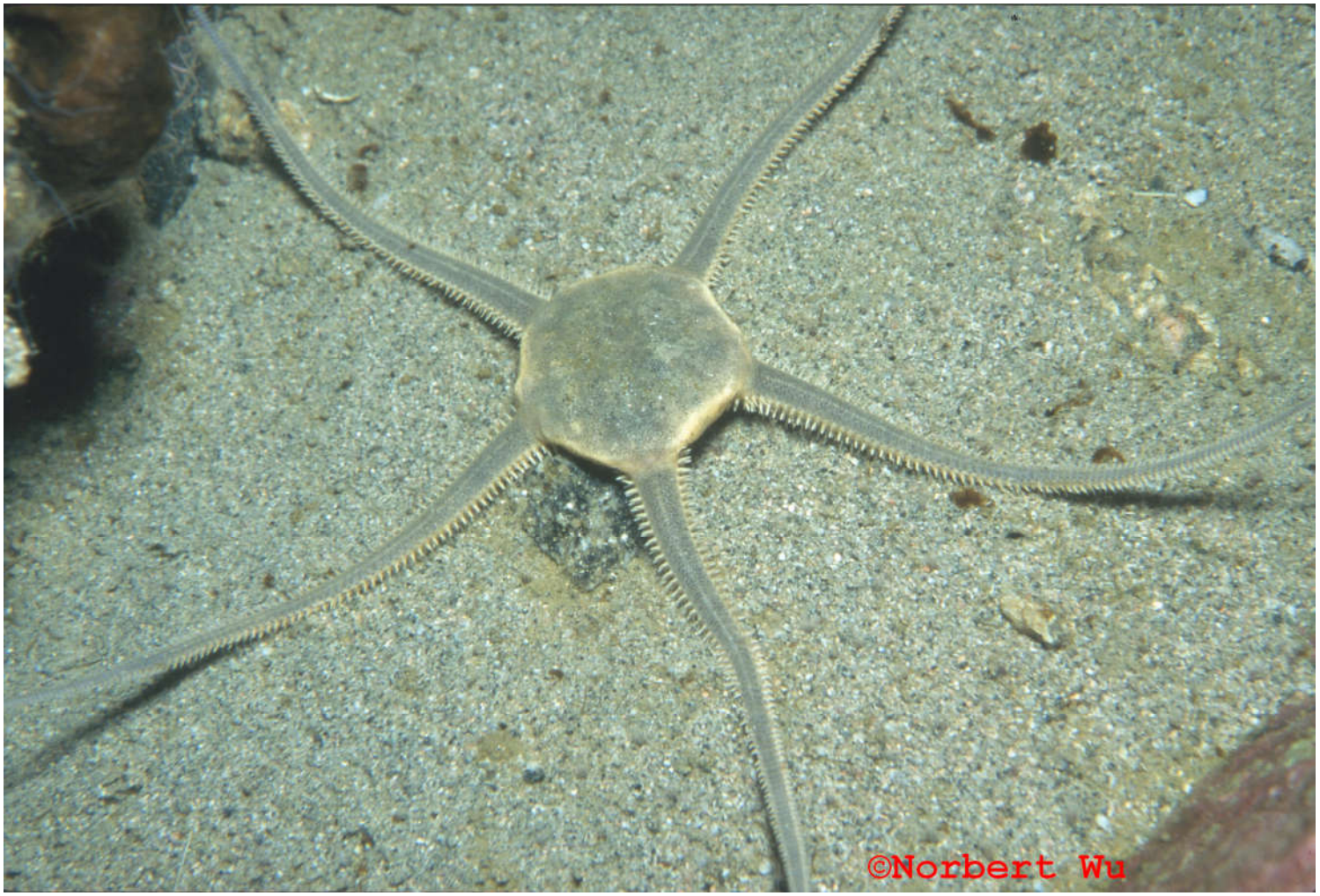


The arms of *Ophionotus victoriae* are short, flattened, robust, and depressed, taper rapidly, and can reach a length of nine centimeters [3].

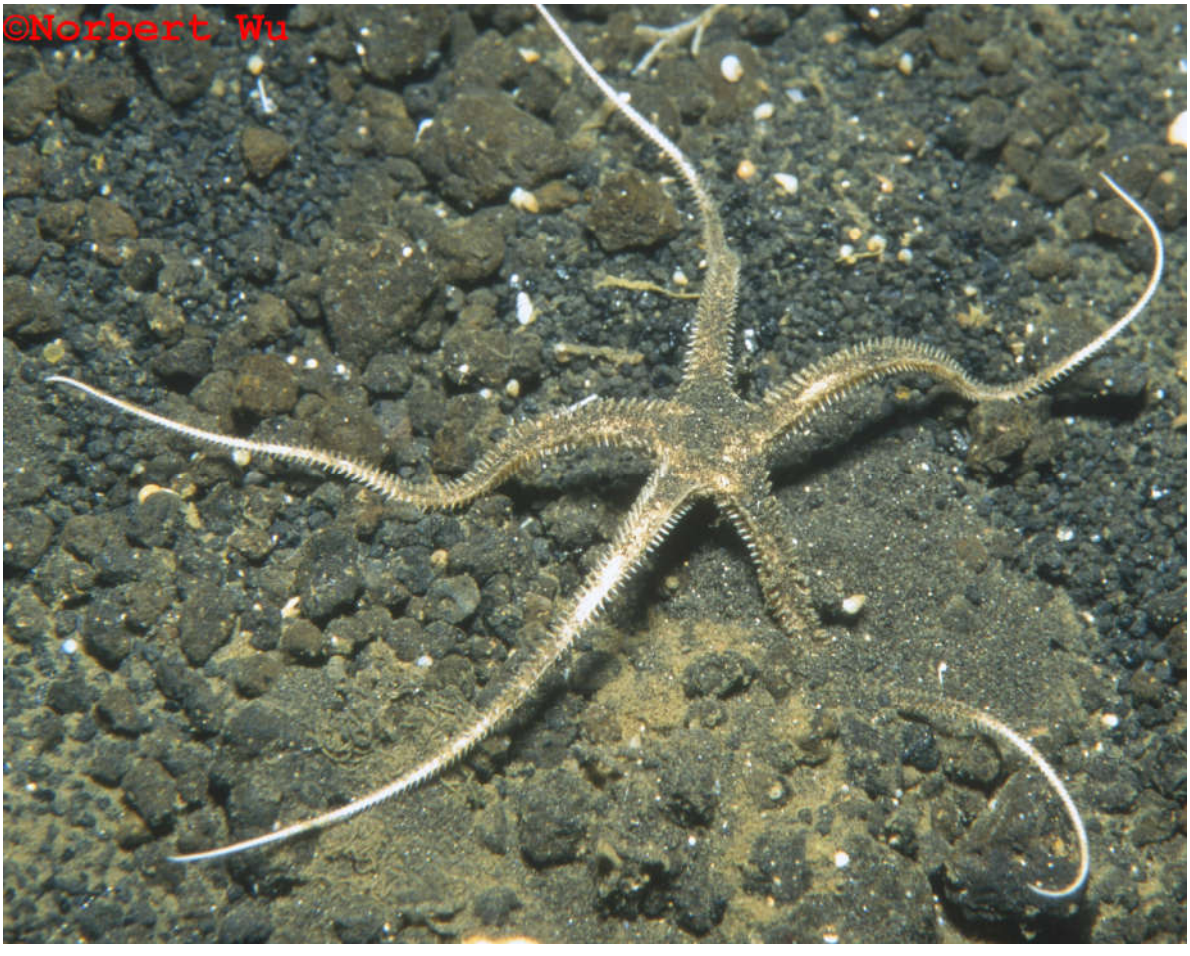


Ophionotus victoriae uses its two leading arms in a typical brittle star rowing fashion as it moves on the seafloor searching for food [2].

The central disk of *Ophionotus victoriae* is large, flat and circular and can reach a diameter of four centimeters [3].

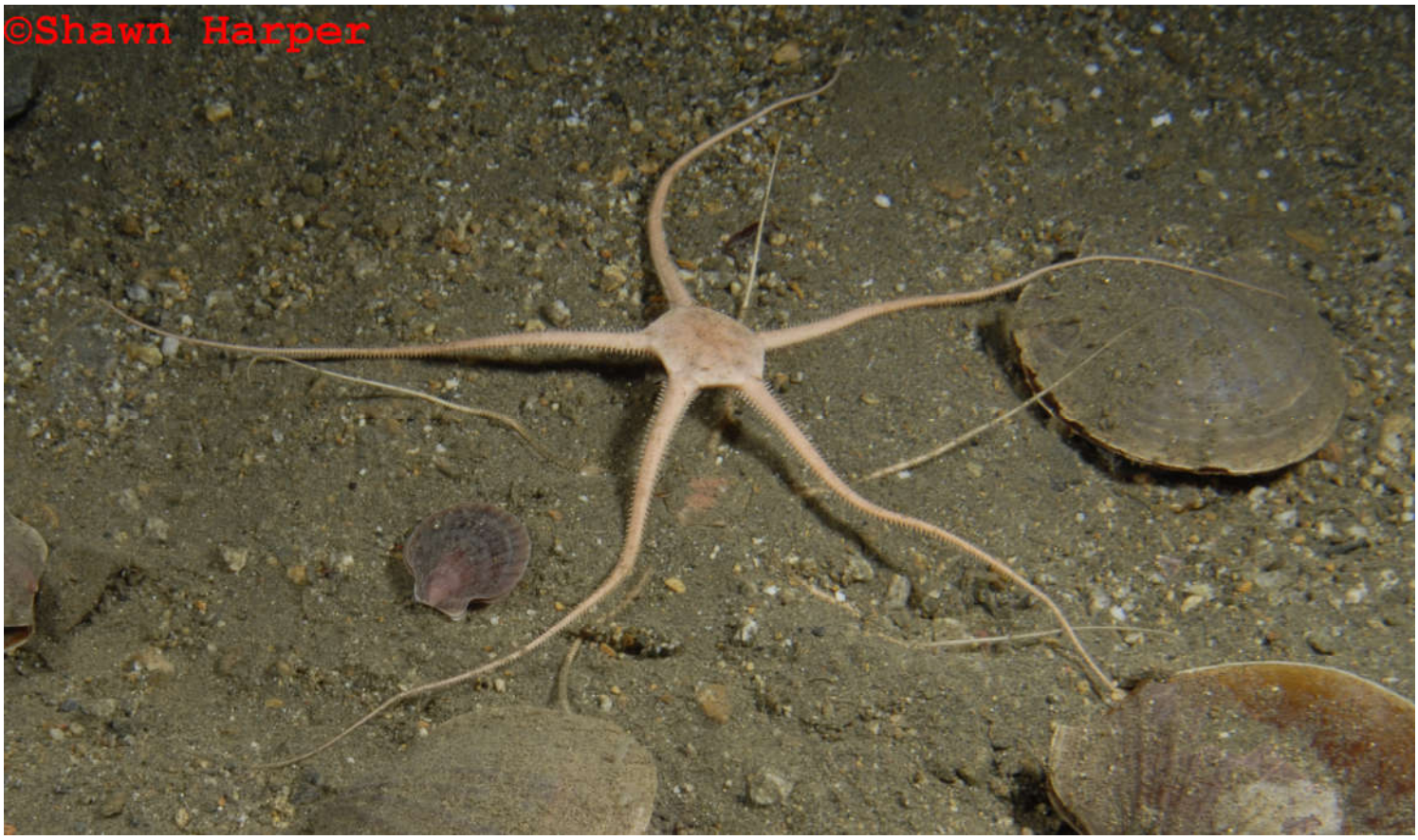


Ophionotus victoriae is variable in color, including brown, red-brown, brick-red, yellowish-pink, bluish grey, grey, white, brownish- violet with darker patches, grey with radial fawn streaks, and brownish-grey; pinkish-fawn banded arms have been observed [3,5].



The maximum age of *Ophionotus victoriae* has been estimated at 22 years [9].

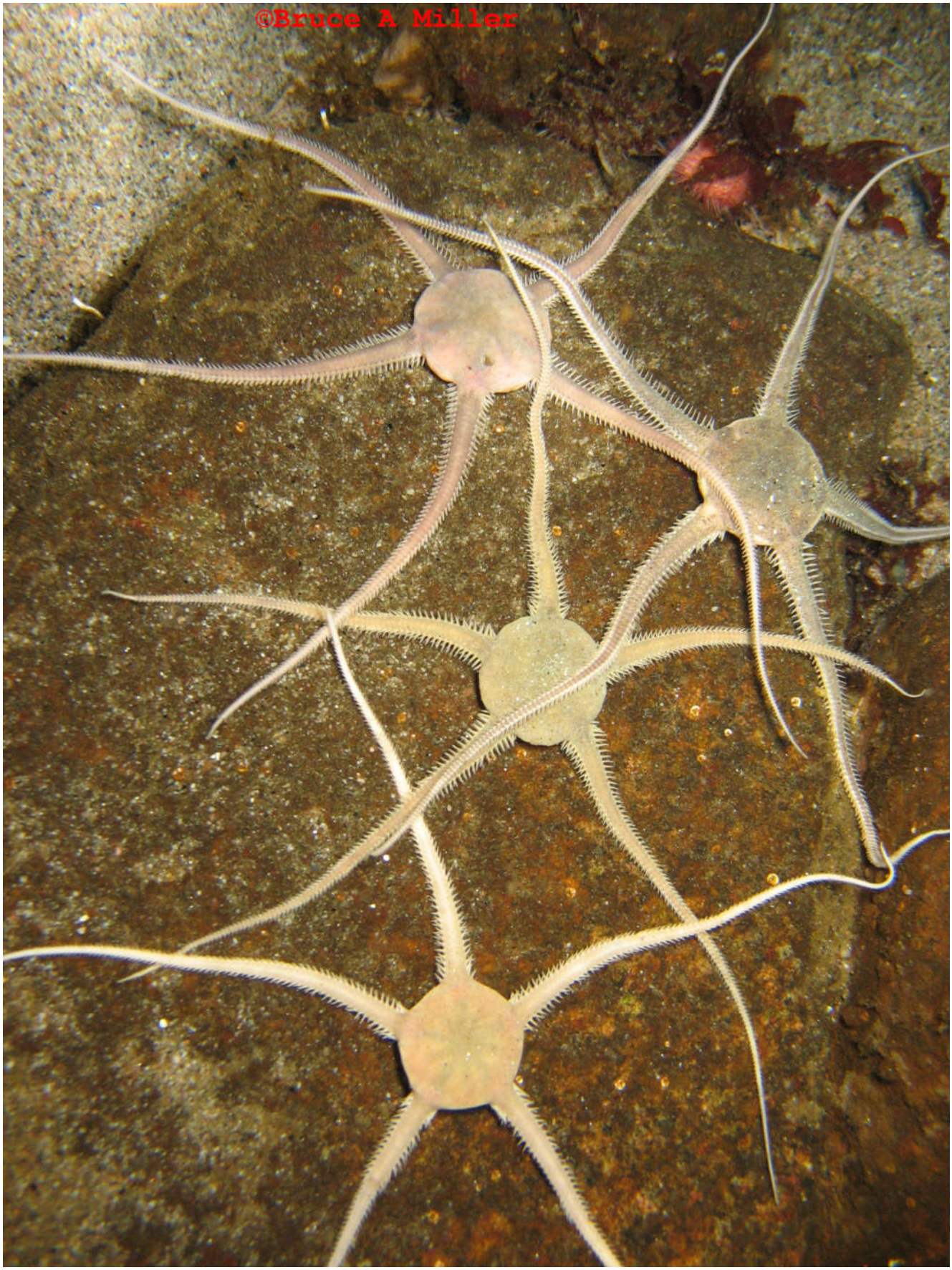
*Ophionotus victoriae*is a broadcast spawner [10].



Ophionotus victoriae is an opportunistic predator and also a scavenger and detrital feeder [2]. *O. victoriae* has a varied diet including seal feces, diatoms, foraminiferans, tunicates/ascidians, sponges, hydroids, bryozoans, polychaetes, bivalve molluscs, crustaceans (euphausiid krill, copepods, amphipods, mysids), sea urchins, and brittle stars [1,2,9].

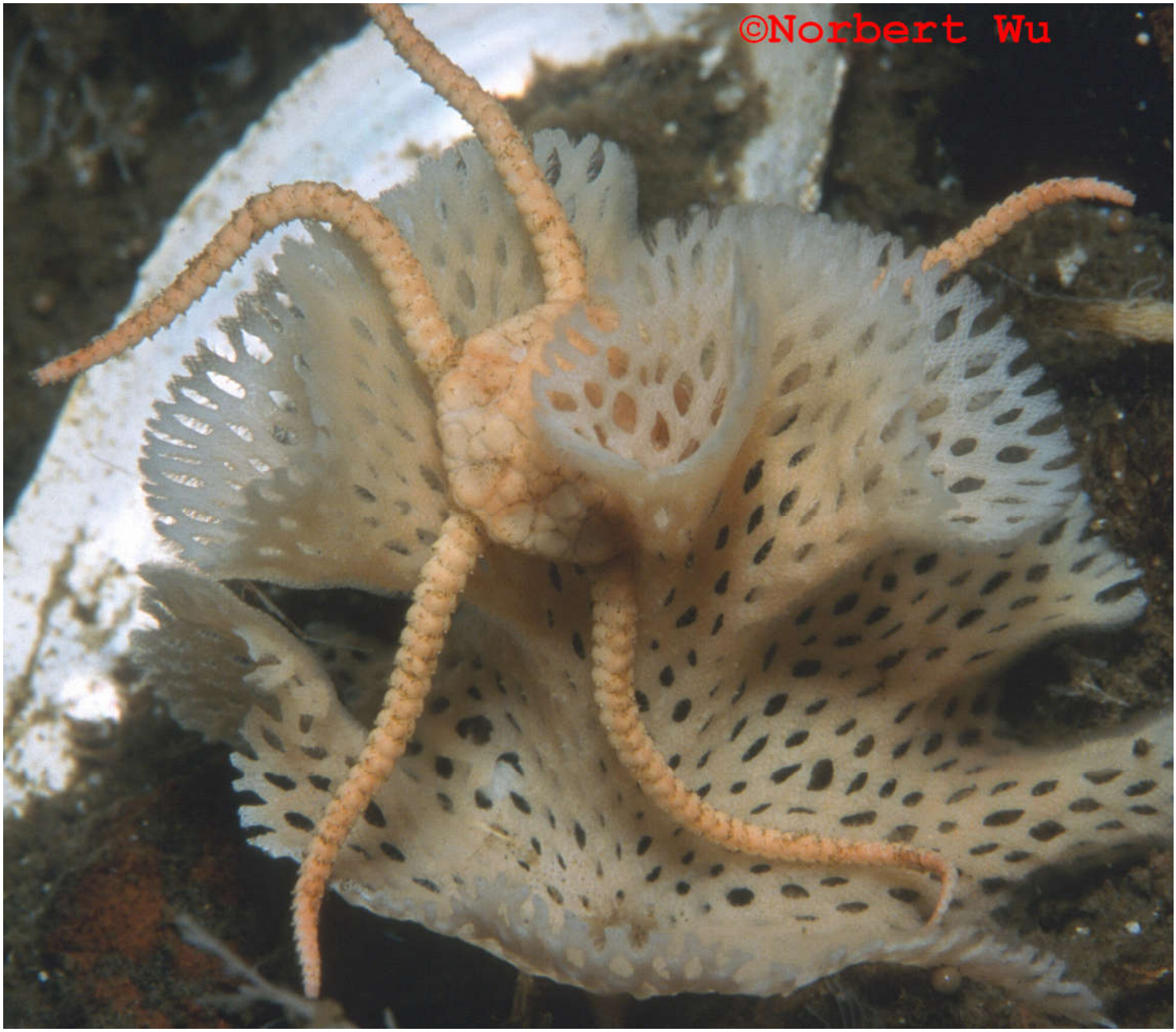
Ophionotus victoriae is a significant predator of brittle stars including its own species (cannibalism), which mostly involves adults eating juveniles [2].

Predators of *Ophionotus victoriae* include fish and the larger brittle star *Ophiosparte gigas* [2,7]. *Ophionotus victoriae* has been observed to respond to contact by the larger brittle star *Ophiosparte gigas* by quickly fleeing [7,8]. If successful in capture, *Ophiosparte gigas* holds the disc of *Ophionotus victoriae* under its own and clips off arms to ingest [7].



References: 1: Polar Biology 3(3):127-139, 1984; **2:** Adaptations within Antarctic Ecosystems, Proceedings of the Third SCAR Symposium on Antarctic Biology. GA Llano, ed. Washington, DC: Smithsonian Institution, 1977. pp.293-326; **3:** The Fauna of the Ross Sea, Part 1, Ophiuroidea. HB Fell. New Zealand Department of Scientific and Industrial Research Bulletin 142, New Zealand Oceanographic Institute Memoir 18, 1961; **4:** Fauna der Antarktis. J Sieg & JW Wagele, eds. Berlin: P. Parey, 1990; **5:** AFJ Madsen. B.A.N.Z. Antarctic Research Expedition 1929-1931. Reports, Series B (Zoology and Botany) Volume 9, Part 3, Ophiuroidea. Adelaide: BANZAR Expedition Committee, 1967; **5:** Equinodermos Antarticos. III. Ofiuroideos. 1. Ofiuroidoes del Extremo Norte de la Peninsula Antartica. I Bernasconi and MM D'Agostino. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Hidrobiologia 4(2):81-133 and plates, 1974; **6:** Echinodermata from the Palmer Archipelago, South Shetlands, South Georgia and the Bouvet Island... . JA Grieg. Oslo: I Kommisjon Hos Dybwad, 1929. Scientific Results of the Norwegian Antarctic expeditions, 1927-1928 and 1928-1929 No. 2. Norske Videnskaps-Akademi i Oslo No. 2; **7:** Polar Biology 16(5):309-320, 1996; **8:** Norbert Wu, personal communication, 1999; **9:** Okologie und Populationsdynamik Antarktischer Ophiuroiden (Echinodermata), Ecology and Population Dynamics of Antarctic Ophiuroids (Echinodermata). C Dahm. Berichte zur Polarforschung, Reports on Polar Research 194, 1996; **10:** Molecular Ecology 32(13):3382-3402, DOI: 10.1111/mec.16951

brittle star *Ophioplinthus* sp., probably *Ophioplinthus gelida*



Shown here on a lacy bryozoan, this *Ophioplinthus* sp. is probably *Ophioplinthus gelida* which is the most common member of the genus in McMurdo Sound [3]. Dorsal photos are inadequate for distinguishing *O. gelida* from other species [3]. *Ophioplinthus gelida* is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Sandwich Islands, and Bouvet Island in depths from 40 to 2,725 meters [2,4,5,6,8,11].

The pentagonal or rounded-pentagonal disc of *Ophioplinthus gelida* is flattened and up to 2 centimeters in diameter [2]. The arms of *O. gelida* are long and tapering and reach a length of six centimeters [2,6]. *O. gelida* is colored orange-brown or yellowish-brown [2].

Ophioplinthus gelida captures prey or feeds by moving surface sediments into small mounds which are partially or completely engulfed; this feeding behavior gathers small organisms as well as eggs and fecal material [1]. *O. gelida* feeds on diatoms, silicoflagellates, bryozoans, tunicates/ascidians, foraminifera, polychaetes, gastropods, polychaetes, sponges, bivalve molluscs, amphipods, and euphausiid krill [1,9].

Predators of *Ophioplinthus gelida* include the brittle star *Ophiosparte gigas* [7]. The maximum age of *O. gelida* has been estimated at 33 years [9].

Some *Ophioplinthus* species may be parasitized by an epizoic sponge *Iophon radiatum* [2]. *I. radiatum* is dark brown, obscures the brittle star's true color, and grows on the disc and arm bases of *Ophioplinthus* [2]. Presence of *I. radiatus* is not definitive for identifying *O. gelida*; some *O. gelida* lack it and other species of *Ophioplinthus* have it [2,3,5].

Taxonomic Note: *Ophiurolepis* genus was synonymized into *Ophioplinthus* [10].

References: 1: 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.293-326; **2:** The Fauna of the Ross Sea, Part 1, Ophiuroidea. HB Fell. New Zealand Department of Scientific and Industrial Research Bulletin 142, New Zealand Oceanographic Institute Memoir 18, 1961; **3:** John Dearborn, personal communication, 1999; **4:** Fauna der Antarktis. J Sieg & JW Wagele, eds. Berlin: P. Parey, 1990; **5:** AFJ Madsen. B.A.N.Z. Antarctic Research Expedition 1929-1931. Reports, Series B (Zoology and Botany) Volume 9, Part 3, Ophiuroidea. Adelaide: BANZAR Expedition Committee, 1967; **6:** Equinodermos Antarticos. III. Ofiuroideos. 1. Ofiuroidoes del Extremo Norte de la Peninsula Antartica. I Bernasconi and MM D'Agostino. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Hidrobiologia 4(2):81-133 and plates, 1974; **7:** Polar Biology 16(5):309-320, 1996; **8:** Tethys 6(3):631-653, 1974; **9:** Okologie und Populationsdynamik Antarktischer Ophiuroiden (Echinodermata), Ecology and Population Dynamics of Antarctic Ophiuroids (Echinodermata). C Dahm. Berichte zur Polarforschung, Reports on Polar Research 194, 1996; **10:** Marine Biology Research 4(1-2):76-111, 2008; **11:** Polar Biology 38:799-813, 2015

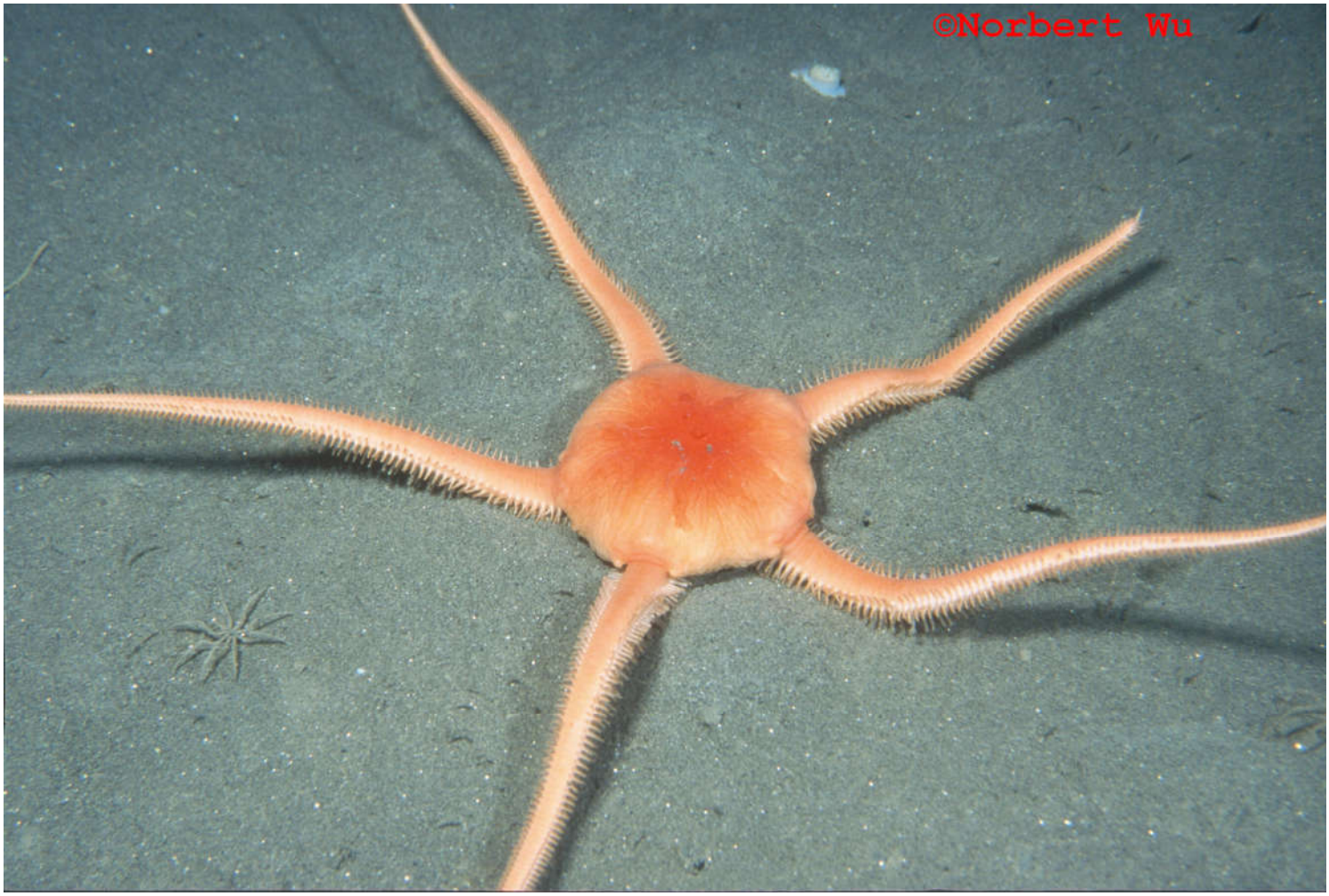
brittle star *Ophiosparte gigas*

Ophiosparte gigas is found throughout Antarctica and the Antarctic Peninsula at depths from 8 to 1,200 meters [1,2,3,4,5].

The disc of *Ophiosparte gigas* is thick, mucus-covered, convex, and up to seven centimeters in diameter; its large disc relative to the arms makes it easy to recognize [1,4,5]. The arms of *Ophiosparte gigas* have spatulate arm spines, conical tube feet, and are up to seventeen centimeters long [1,4,5].

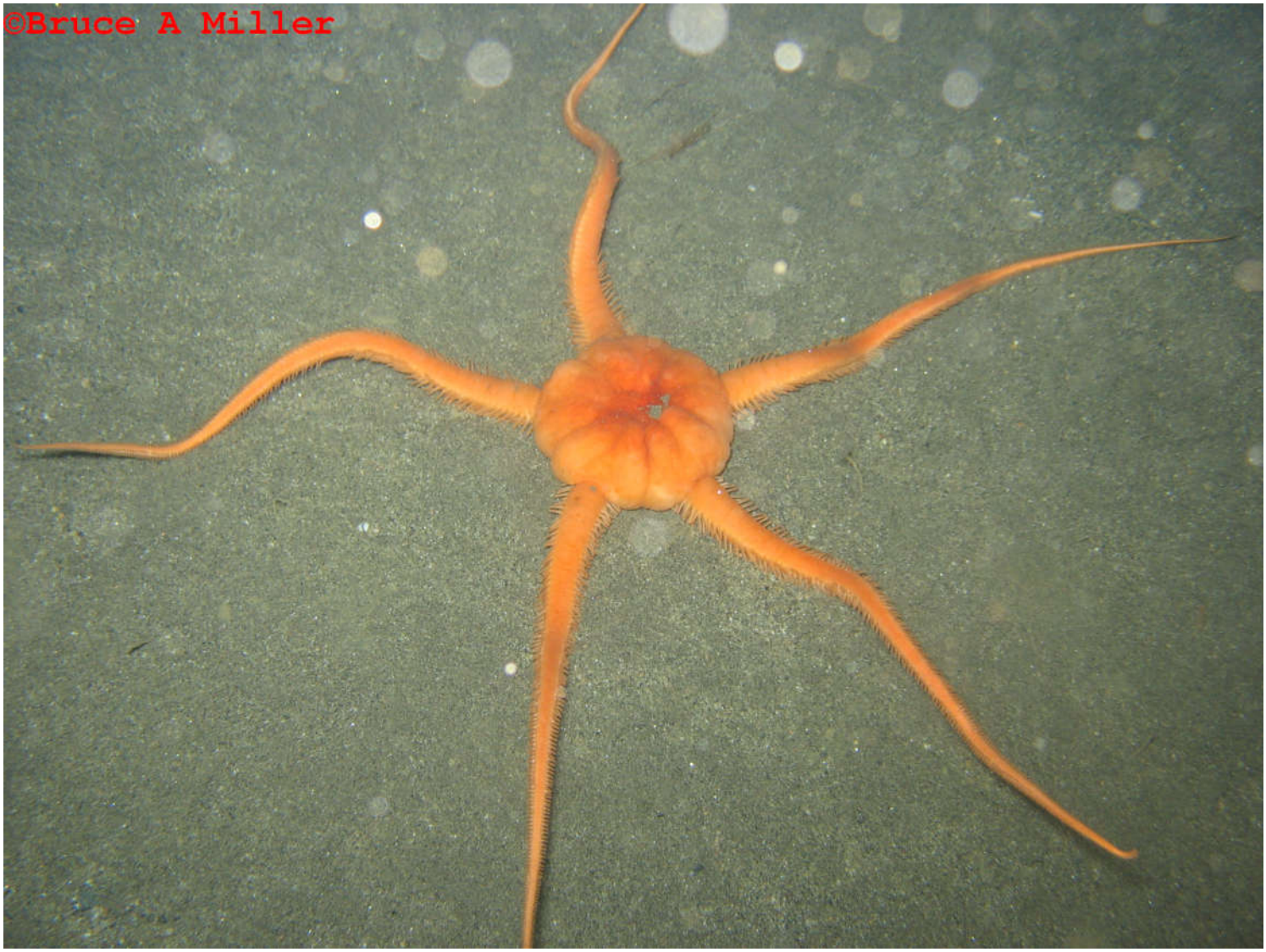
Ophiosparte gigas is colored pink, deep pink, pinkish orange, deep reddish, purplish brown, or brick red [1,4,5].

Ophiosparte gigas lives on soft substrate; its movement is made more efficient by its paddle-like arm spines and stilt-like tube feet [1].



Ophiosparte gigas is an active benthic predator on large prey, primarily brittle stars (including its own species, *Ophiurolepis gelida*, *Ophionotus victoriae*, *Ophiacantha* sp., *Ophiocten* sp.), bivalves (including *Adamussium colbecki*, *Aequiyoldia eightsii*, *Yoldiella sabrina*), polychaete worms, crustaceans, and sponges [2,5]. *O. gigas* also preys on diatoms, algae, foraminifera, hydroids, nematodes, gastropods (including *Nacella concinna*), sea spiders, ostracods, mysids,

amphipods, isopods, euphausiids (including *Euphausia crystallorophias*, *Euphausia superba*), the shrimp *Chorismus antarcticus*, bryozoans, cheilostomes, the crinoid *Promachocrinus kerguelensis*, seastars, and sea urchins (including *Sterechinus neumayeri*) [5].



The brittle star *Ophionotus victoriae* has been observed to respond to *Ophiosparte gigas* contact by quickly fleeing [5,6]. If successful in capture, *Ophiosparte gigas* holds the disc of *Ophionotus victoriae* under its own and clips off arms to ingest [5].

Ophiosparte gigas is also a scavenger [2,5].

References: 1: The Fauna of the Ross Sea, Part 1, Ophiuroidea. HB Fell. New Zealand Department of Scientific and Industrial Research Bulletin 142, New Zealand Oceanographic Institute Memoir 18, 1961; **2:** 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.293-326; **3:** Jim Mastro, personal communication, 1999 [10 meters at Explorer's Cove in New Harbor]; **4:** Equinodermos Antarticos. III. Ofiuroideos. 1. Ofiuroidoes del Extremo Norte de la Peninsula Antartica. I Bernasconi and MM D'Agostino. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigacion de las Ciencias Naturales. Hidrobiologia 4(2):81-133 and plates, 1974; **5:** Polar Biology 16(5):309-320, 1996; **6:** Norbert Wu, personal communication, 1999

sea cucumber *Staurocucumis liouvillei*

Staurocucumis liouvillei has been collected in Antarctica and the Antarctic Peninsula and Bouvet Island, Heard Island and South Georgia Island from 60 to 791 meters depth [2,3,5]. *S. liouvillei* has been collected at sizes up to eight centimeters long [1,5].

Staurocucumis liouvillei lives attached to sponges, gorgonians (as shown here), and large stones [4].

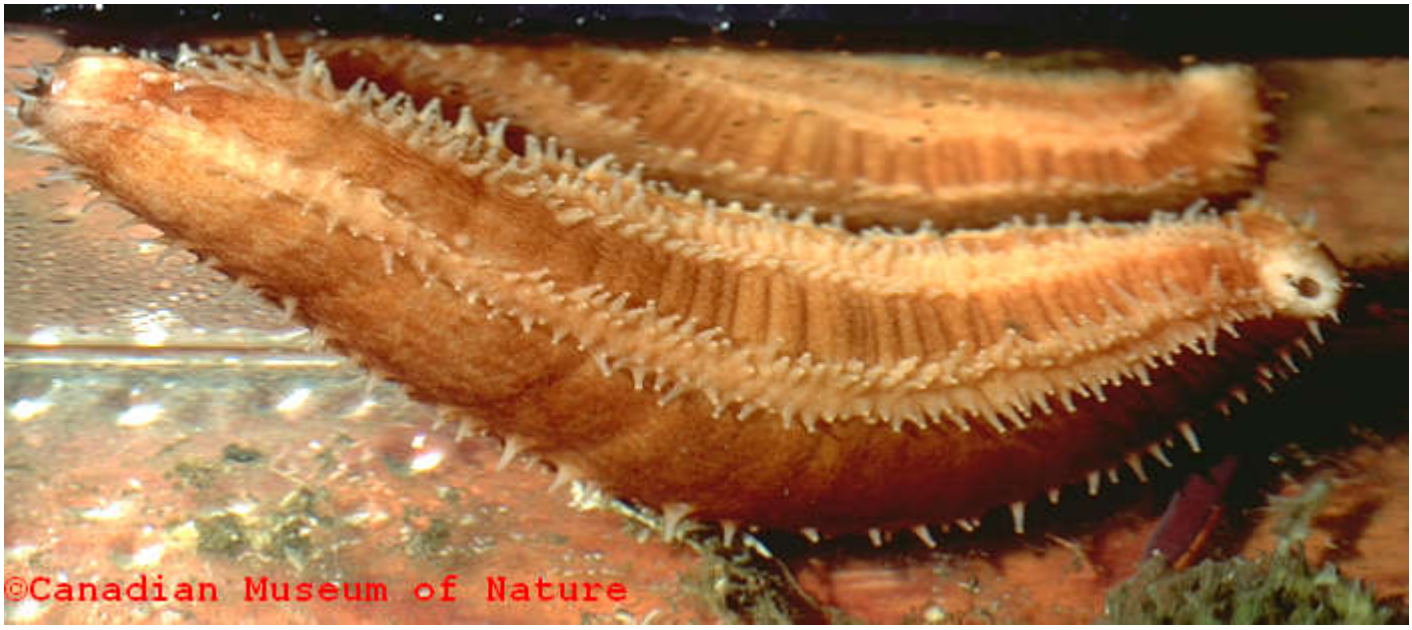
Taxonomic Note: In earlier literature, it may appear under the genera *Cucumaria* or *Abyssocucumis* [1,3,5].

Staurocucumis liouvillei is a species complex comprising several discrete species [6].

References: 1: S Ekman. Holothurien. Further Zoological Results of the Swedish Antarctic Expedition 1901-1903. Volume 1, Number 6. Stockholm: PA Norstedt & Soner, 1925; **2:** Berichte zur Polarforschung 41:1-87, 1988; **3:** Tethys 5(4):601-610, 1974; **4:** Polar Biology 11(3):145-155, 1991; **5:** Memoirs of Museum Victoria 59(2):297–325, 2002; **6:** Polish Polar Research 34(1):67-86, 2013

sea cucumber *Staurocucumis turqueti*

Staurocucumis turqueti is found in Antarctica and the Antarctic Peninsula and South Orkney Islands from 10 to 385 meters depth [2,4,5,8]. *S.turqueti* has been collected at lengths up to thirty centimeters [2].



Staurocucumis turqueti is chestnut or brown colored [1,2].

Staurocucumis turqueti is a suspension feeder and has been observed on the sediment surface holding the anterior half of its body vertically up in the water to suspension feed [6]. *S. turqueti* has been observed attached to sponges [6].

Taxonomic Note: Appears under other genera in the older literature including *Abyssocucumis*, *Cucumaria* and *Ekmocucumis* [2,3,4,7]. *Staurocucumis grandis* is a synonym of *S. turqueti* [9].

References: 1: C Vaney. Holothuries. Expedition Antarctique Francaise (1903-1905). Paris: Masson et Cie, 1906; **2:** S Ekman. Holothurien. Further Zoological Results of the Swedish Antarctic Expedition 1901-1903. Volume 1, Number 6. Stockholm: PA Norstedt & Soner, 1925; **3:** Julian Gutt, personal communication, 1999; **4:** Tethys 5(4):601-610, 1974; **5:** Berichte zur Polarforschung 41:1-87, 1988; **6:** Polar Biology 11(3):145-155, 1991; **7:** Memoirs of Museum Victoria 59(2):297–325, 2002; **8:** Polar Biology 38:799-813, 2015; **9:** Zootaxa 2016(1):1-16, 2009

sea cucumber *Bathyplotes bongraini*

Bathyplotes bongraini is found throughout Antarctica and the Antarctic Peninsula and Bouvet Island at depths from 4.5 to 768 meters [1,3,4,5,6,7,8]. *B. bongraini* has been collected at lengths up to 26 centimeters [1,6]. *B. bongraini* is usually colored dark pink with a distinct dark brown cross-band, two to three centimeters wide, slightly behind the middle of the body [1].

The dorsal conical papillae of *Bathyplotes bongraini* are 1-5 millimeters high [1].

B. bongraini is a sediment feeder [2]. The mouth of *B. bongraini* is turned down (ventrally) and its anus is subdorsal [1].

Taxonomic Note: Older species name was *fuscivinculum* [6].

References: 1: Zoologica Scripta 19(1):119-127, 1990; **2:** Polar Biology 11(3):145-155, 1991; **3:** Jim Mastro, personal communication (New Harbor 21 & 28 meters [photo]; Hutton Cliffs 4.5 meters), 1999; **4:** Peter Brueggeman, personal communication (New Harbor 26 meters), 1999; **5:** Polar Biology 20(4):229-247, 1998; **6:** Memoirs of Museum Victoria 59(2):297–325, 2002; **7:** Polar Biology 29(2):83-96, 2006; **8:** Polar Biology 38:799-813, 2015

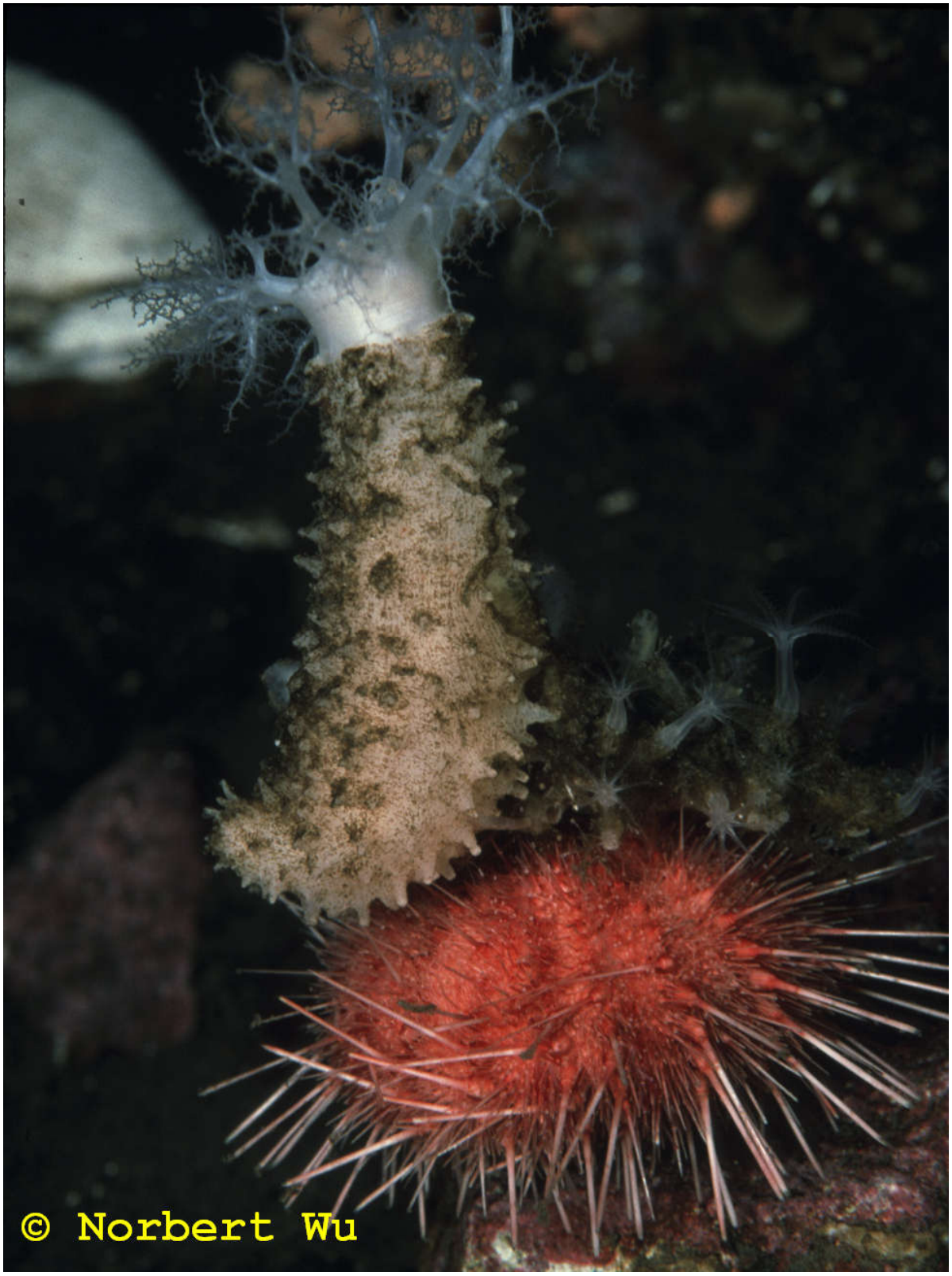
sea cucumber *Cucumaria* spp.

These *Cucumaria* spp. sea cucumbers are impossible to identify to the species level from this photo [1]. Even with specimens on hand, identification is difficult; the literature of this group is confusing, and they have been referred to as *Cucumaria georgiana*-group [1,2].

Cucumaria spp. has been observed attached to sea urchins, branched bryozoans, and hydroid stalks [2]. Here *Cucumaria* spp. sea cucumber is perched on algae *Phyllophora antarctica* on top of the sea urchin *Sterechinus neumayeri*.

References: 1: Julian Gutt, personal communication, 1999; **2:** Polar Biology 11(3):145-155, 1991

sea cucumber *Echinopsolus acanthocola*



Echinopsolus acanthocola has been collected in the Weddell Sea and Bouvet Island at depths from 177 to 650 meters [1,4,5,7]. Here it is photographed at scuba diving depth in McMurdo Sound. *E. acanthocola* has scattered peaked cone-shaped processes on its body wall and its color is rose to brownish-red [1,6].

Echinopsolus acanthocola is a suspension feeder and has a narrow sole delimited by tube feet, which restricts it to using narrow, rod-like structures as substrate; it has been collected attached to sea urchin spines [2,6]. Here *E. acanthocola* is attached to the sea urchin *Sterechinus neumayeri* and it has been collected attached to the pencil urchin *Ctenocidaris perrieri* [3].

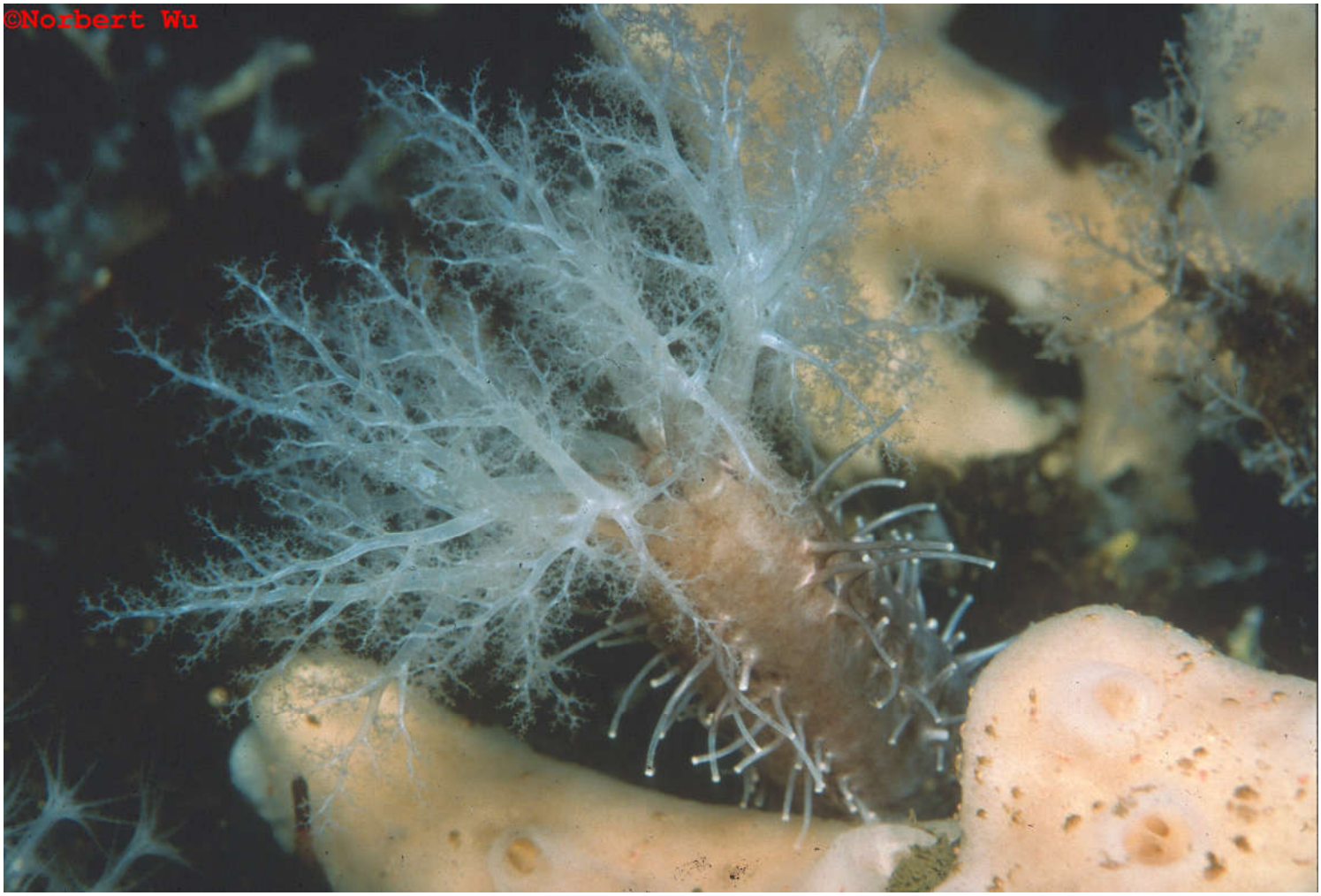
Echinopsolus acanthocola has been collected at lengths up to 2.3 centimeters long [1].

The species name *acanthocola* is composed of *Colere* (meaning "to inhabit") and *Acantha* (meaning "spine, thorn") to indicate that this sea cucumber species is well adapted to live on sea urchin spines and similar structures [1].

References: 1: Zoologica Scripta 19(1): 101-117, 1990; **2:** Polar Biology 11(3):145-155, 1991; **3:** Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Biologie 62:179-191, 1992; **4:** Polar Biology 29(2):106-113, 2006; **5:** Polar Biology 38:799-813, 2015; **6:** Zootaxa 3841(4):573-591, 2014; **7:** Zootaxa 2196:1-18, 2009

sea cucumber *Heterocucumis steineni*

Heterocucumis steineni is found in Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Georgia Island, Falkland Islands, and Burdwood Bank from 0 to 1,200 meters depth [2,3,5]. *H. steineni* is beige to chestnut brown, can be almost white or white and brown in one specimen, and has dark spots between tentacles [1,5,6]. *H. steineni* is up to fifteen centimeters long [2].



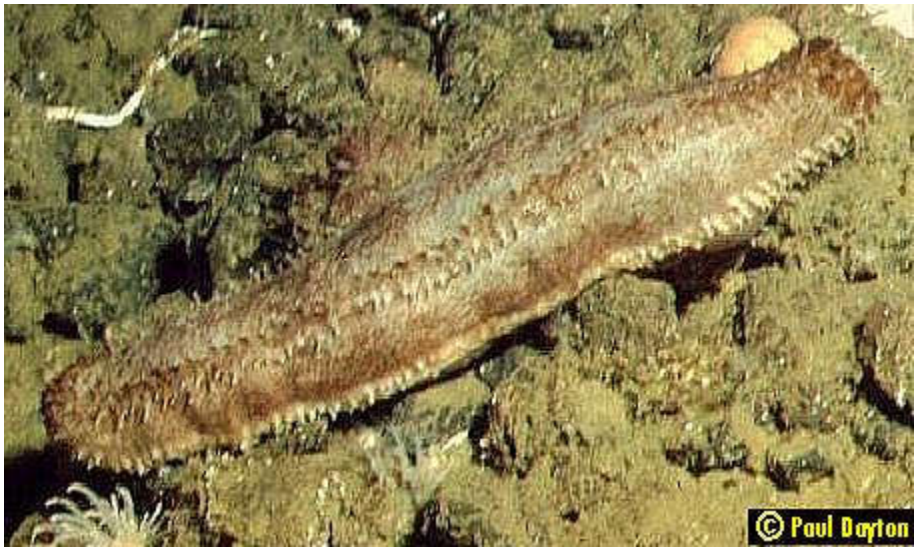
Heterocucumis steineni may attach to other organisms like hydroids and fan-shaped bryozoans or it may live with the lower half of its body in sediment [4,7]. This facultative lifestyle may explain why its posterior feet are wart-like and its anterior feet are exceptionally long, up to five millimeters [4,7].

Heterocucumis steineni is a suspension feeder [4,7].

Heterocucumis steineni is one of the most widely spread Dendrochirotida sea cucumbers in the Weddell Sea [4].

Taxonomic Note: In earlier literature, appears under different genera including *Cucumaria*, *Ekmocucumis*, and *Heterocucumis* [8].

References: 1: C Vaney. Holothuries. Expedition Antarctique Francaise (1903-1905). Paris: Masson et Cie, 1906; **2:** S Ekman. Holothurien. Further Zoological Results of the Swedish Antarctic Expedition 1901-1903. Volume 1, Number 6. Stockholm: PA Norstedt & Soner, 1925; **3:** Berichte zur Polarforschung 41:1-87, 1988; **4:** Polar Biology 11(3):145-155, 1991; **5:** Fauna der Antarktis. J Sieg, JW Wagele, eds. Berlin: P Parey, 1990; **6:** Julian Gutt, personal communication, 2000; **7:** Polar Biology 11(8):533-544, 1992; **8:** Memoirs of Museum Victoria 59(2):297–325, 2002; **9:** Polar Biology 38:799-813, 2015



sea cucumber, group Aspidochirotida

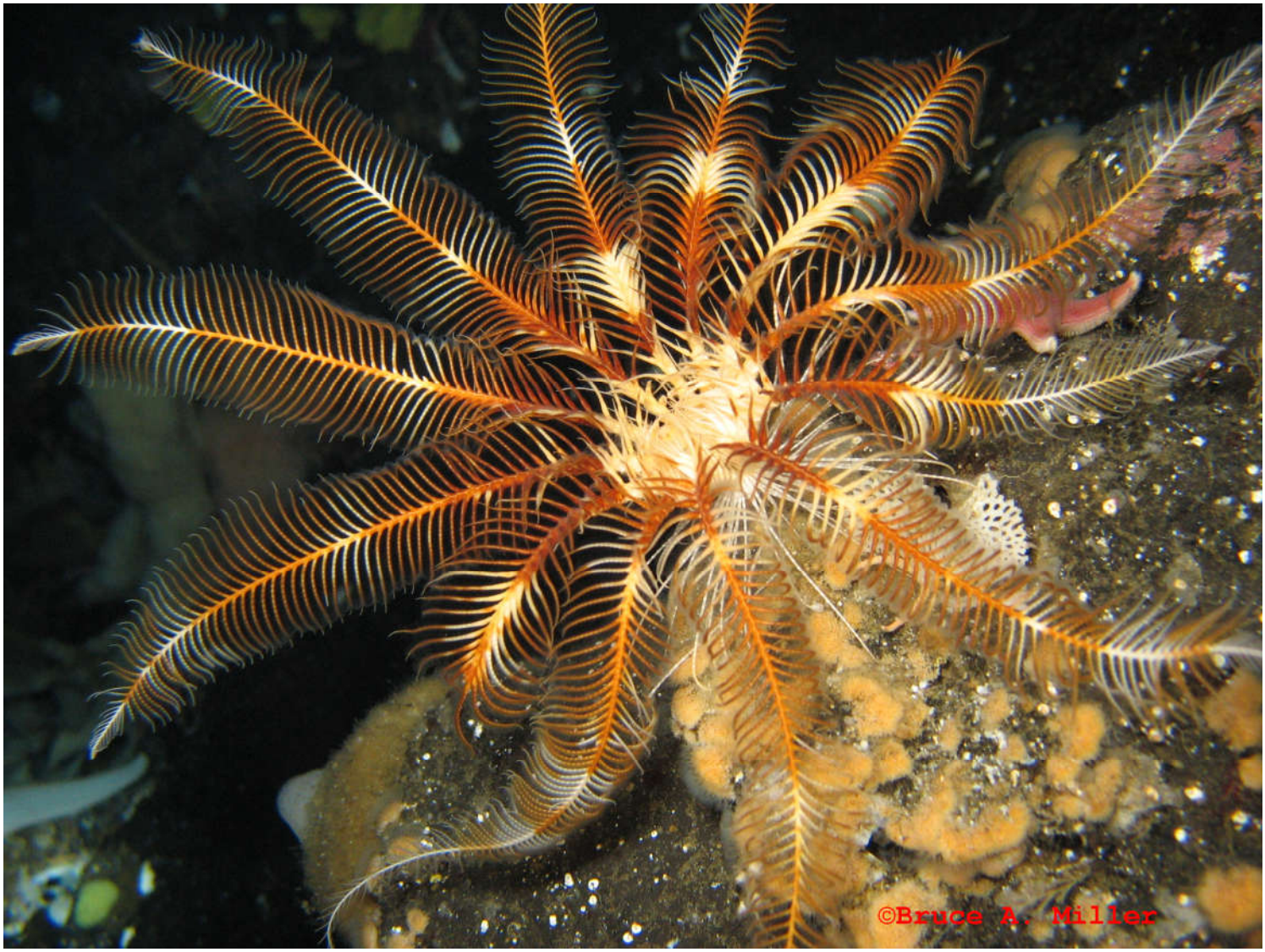
Taxonomic Note: Not *Staurocucumis turqueti* [1].

References: 1: Julian Gutt, personal communication, 2000

crinoid *Promachocrinus kerguelensis*

Promachocrinus kerguelensis is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Georgia Island, Bouvet Island, Kerguelen Island, and Heard Island, from 10 to 2,100 meters depth [3,4,6,9]. *P. kerguelensis* is also found in the Strait of Magellan, and between Australia/New Zealand and the Antarctic continent [3,4,7].

Promachocrinus kerguelensis has ten biradiate rays (20 arms), is the most widely distributed and abundant crinoid in Antarctica and subantarctic islands, is the largest comatulid (unstalked) crinoid in southern latitudes and is the only 20-armed comulatid crinoid in high southern latitudes [3,4,9].



Promachocrinus kerguelensis can be solid colored or banded; its color ranges from ivory to buff with light to dark brown pinnules and if banded, the bands can be dark to reddish brown [3,4]. Individuals from the Ross Sea may be more uniform in color; solid color and banded specimens can occur in the same population [4].

The arms of *Promachocrinus kerguelensis* are edged with feathery pinnules containing sensory tube feet and reproductive organs. The arms are used to trap drifting plankton and they have grooves down which food particles are carried by hair-like cilia to the upward-facing mouth. Its different feeding postures (a filtration fan, a radial posture with its pinnules in one plane, and a collecting bowl) are suggested as a response to ocean currents [3].

Promachocrinus kerguelensis produces large numbers of buoyant eggs which spawn into the plankton in November and December in McMurdo Sound; it doesn't brood eggs in its arms as do some Antarctic crinoids [1]. Settlement of its free-floating larvae occurs 2 to 3 months later when the seasonal Antarctic plankton bloom is high and offers a rich food source [1].

Promachocrinus kerguelensis (and other comatulid crinoids) cling and move by walking on specialized curved structures called cirri (seen at lower left). *P. kerguelensis* clings to sponges, worm tubes, gorgonians, and rocks as well as mud and gravel [2,3]. This gives *P. kerguelensis* a high perch above the seafloor which may protect it from fish nibbling on its extended arms [2].

Promachocrinus kerguelensis is not toxic to fish, but there are no Antarctic fish living in the water above the seafloor to nibble at its arms [2]. The predatory brittle star *Ophiosparte gigas* has been found to have *P. kerguelensis* in its gut contents [5].

Taxonomic Note: Genetic analysis shows that *Promachocrinus kerguelensis* may be comprised of two cryptic species [8].

References: 1: Marine Biology 96(3):375-383, 1987; **2:** Polar Biology 9(7):461-465, 1989; **3:** Biology of the Antarctic Seas XIII. Louis S. Kornicker, ed. Antarctic Research Series Volume 38. Washington, DC: American Geophysical Union, 1983. pp.1-60; **4:** Comatulid Crinoids from R/V Eltanin Cruises in the Southern Oceans. Janis A. Speel. University Of Maine PhD dissertation. 1976; **5:** Polar Biology 16(5):309-320, 1996; **6:** Tethys 6(3):631-653, 1974; **7:** Revista Ciencia y Tecnología del Mar 29(1):91-102, 2006; **8:** Molecular Ecology 21(10):2502-2518, 2012; **9:** Diversity 15: 875, 2023 https://doi.org/10.3390/d15070875