Mollusca – Gastropoda – Opisthobranchia: nudibranchs, pteropods

UNDERWATER FIELD GUIDE TO ROSS ISLAND & MCMURDO SOUND, ANTARCTICA

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Photographs: Peter Brueggeman, Canadian Museum of Nature (Kathleen Conlan), Shawn Harper, Luke Hunt, Bruce A Miller, Rob Robbins, and Norbert Wu

The National Science Foundation's Office of Polar Programs sponsored Norbert Wu on an Artist's and Writer's Grant project, in which Peter Brueggeman participated. One outcome from Wu's endeavor is this Field Guide, which builds upon principal photography by Norbert Wu, with photos from other photographers, who are credited on their photographs and above. This Field Guide is intended to facilitate underwater/topside field identification from visual characters. Organisms were identified from photographs with no specimen collection, and there can be some uncertainty in identifications solely from photographs.

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June 2019: Taxonomic names checked in Zoological Record and World Register of Marine Species
**dorid nudibranch *Bathydoris hodgsoni***

*Bathydoris hodgsoni* is found in Antarctica, South Orkney Islands, and South Sandwich Islands, from 15 to 2,757 meters depth [1,2,3,4,5,6]. *Bathydoris hodgsoni* is up to twenty centimeters in length [2]. The color of *Bathydoris hodgsoni* can be dirty white to reddish or brownish; collected specimens have been found with more papillae than reported in the descriptive literature [1,2]. Prey items found in its stomach include sponge, crinoids, gorgonarians, alcyonarians, bryozoans, seastars, and bivalves [2].

Doris kerguelenensis is found in Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Georgia Island, Falkland Islands, Shag Rock, Bouvet Island, Kerguelen Island, Macquarie Island, New Caledonia, Heard Island, southern Chile, southern Argentina, and near Rio de Janeiro, Brazil at depths from 0 to 1,550 meters \[1,2,4,5,10,12,13\]. The collection off Rio de Janeiro, Brazil at 740 meters depth with a water temperature of 5 degrees Celsius illustrates how Antarctic bottom water extends to the Equator at great depth \[5\].
The body of *Doris kerguelenensis* can be over twelve centimeters in length, and can be white, pale or bright yellow, with the gills and rhinophores often slightly darker [1,4,9]. Some white *Doris kerguelenensis* have white pigment on the gills [1].

*Doris kerguelenensis* is covered with tubercles of different size and form [1,4,9].
*Doris kerguelenensis* feeds on *Polymastia invaginata* (shown here), rossellid sponges, *Anoxycalyx (Scolymastra) joubini*, *Antarctotetilla leptoderma*, *Haliclona scotti*, *Mycale (Oxymycale) acerata*, *Hemigellius fimbriatus*, *Calyx shackletoni*, *Isodictya setifera*, *Ectyodoryx cf. ramilobosa*, and *Dendrilla antarctica* [2,3,4,6,7,8].
Taxonomic Note: The genus Austrodoris is a synonym for Doris [11]. Austrodoris macmurdensis is a synonym for Doris kerguelenensis [1].

Doto antarctica has been found in Antarctica, South Shetland Islands, and Bouvet Island, from 21 to 500 meters depth [1,2,3,4,6,7].

Doto antarctica has been described as pale yellowish-white, pale brown, or yellowish-brown, with the color intensified in the cerata [1,2,6]. Doto antarctica has 6 pairs of cerata with 4-5 circlets of tubercles on each cerata, with each tubercle having white spots [1,2,6]. Cerata pairs are progressively smaller towards the tail [6].

Doto antarctica is up to eleven millimeters in length [1,6].

Some Doto Antarctica were found laying egg masses on hydrozoans of the genera Oswaldella and Antarctoscyphus [7].
Several *Doto antarctica* are shown here on the hydroid *Hydrodendron arboreum*, on which *Doto antarctica* feeds in addition to other hydroids [5,6].

**References:**

aeolid nudibranch *Notaeolidia depressa*

*Notaeolidia depressa* has been recorded in Antarctica and the Antarctic Peninsula, South Shetland Islands, South Sandwich Islands, and Bouvet Island, from depths of 0 to 527 meters [1,2,3]. The body of *Notaeolidia depressa* is translucent white, and its brown or red digestive gland shows through the body wall and cerata [1]. *Notaeolidia depressa* has been recorded at lengths up to 6.5 centimeters in fixed specimens [1].

*Notaeolidia depressa* has one to two longitudinal rows of cerata numbering about one hundred with the larger cerata of being innermost (*Notaeolidia gigas* has at least 3 rows of cerata) [1]. *Notaeolidia depressa* has white pigment on cerata tips, rhinophores and foot margin and sometimes the oral tentacles [1]. The genus *Notaeolidia* is known only from Antarctica [1].

**Taxonomic Note:** *Notaeolidia rufopicta, N. robsoni, N. subgigas* (Odhner, 1944), *N. alutacea*, and *N. flava* were synonymized under *Notaeolidia depressa* [1].

aeolid nudibranch *Cuthona crinita*

*Cuthona crinita* has been found at Arrival Heights in McMurdo Sound and Queen Mary Land in Antarctica [1].

Specimens of *Cuthona crinita* are up to 45 millimeters long [1].
The background color of *Cuthona crinita* is opaque light grey, with barely visible digestive and reproductive organs [1].
Rhinophores and oral tentacles of *Cuthona crinita* are light grey covered with densely arranged small opaque white spots [1].
Cerata of *Cuthona crinita* are semi-translucent covered one-third at their end with densely arranged white spots, and digestive gland branches are visible in the cerata as greyish-brown tubes [1].
Eggs of *Cuthona crinita*. 
Taxonomic Note: Originally this nudibranch was identified from Norbert Wu photographs for this field guide as *Notaeolida gigas* by helpful experts familiar with Antarctic Peninsula nudibranch species, with *N. gigas* being only reported from the Antarctic Peninsula. Subsequently a specimen from McMurdo Sound was identified as *Cuthona crinita* [1].

aeolid nudibranch, probably *Notaeolidia schmekelae*

This large opisthobranch (about ten centimeters long) is probably *Notaeolidia schmekelae*, but without a genital dissection, a big *Notaeolidia gigas* cannot be excluded [1]. Typical for *Notaeolidia schmekelae* is large size with only few rather short cerata, and compared to other *Notaeolidia* species, the rather short oral tentacles [1].

*Notaeolidia schmekelae* is found in the Weddell Sea, at depths from 200 to 481 meters [2]. *N. schmekelae* ranges in length between 4 and 13.5 centimeters, and its body, oral tentacles, and cerata are milky white [2]. *N. schmekelae* lacks a penis; the vas deferens runs into a flaplike structure on its right side, which seems to be part of the genital papilla [1]. Cerata are arranged in two to four longitudinal rows [2]. The rhinophores of *Notaeolidia schmekelae* have a tint of yellow; the cerata tips and oral tentacles have white pigment [2]. A brown digestive gland shows through the skin of the cerata of *Notaeolidia schmekelae* but is less visible in the body [2].

*Notaeolidia gigas* is found in the Antarctic Peninsula and Scotia Arc, at depths from 0 to 50 meters [3]. *Notaeolidia gigas* is up to 6 centimeters in length [2].
tritoniid nudibranch *Tritonia challengeriana*

*Tritonia challengeriana* is found in Antarctica and the Antarctic Peninsula, South Shetland Islands, South Georgia Island, Falkland Islands, Bouvet Island, and southern Chile and Argentina, at depths...
from 1 to 600 meters [1,2,3,4,5,6,7]. Above, *Tritonia challengeriana* is perched on the soft coral *Alcyonium antarcticum*. The two white spots on the right side of the body are the genital (upper) and anal (lower) openings [2].

In one study, *Tritonia challengeriana* was studied at depths from 5 to 36 meters and was most abundant around 7 meters in red algae communities [1]. Specimens of *Tritonia challengeriana* have been recorded at lengths up to 6.5 centimeters [2,4].
The color of *Tritonia challengeriana* is milky white to transparent with no opaque white pigment in the body, sometimes yellowish to pinkish to orange to brownish, with yellowish or rose colored viscera shining through the body wall \(2,6\).
Opaque white pigment is present on the gills, notal margin, rhinophore tips and sheath margins, velar tentacles, and papillae of the oral veil of *Tritonia challengeriana* [2]. Small white stripes radiate across the notum from the bases of gills, and gills number up to 30 [2,6].
The oral veil of *Tritonia challengeriana* has 10-18 digitiform processes with the outermost ones grooved [6]. Zooids of *Cephalodiscus* were observed in the digestive tract of one specimen of *Tritonia challengeriana* [2]. *Cephalodiscus* is a worm-like invertebrate (pterobranch hemichordate) living in secreted tubes organized into a colonial structure.

**Taxonomic Note:** *Tritonia antarctica* was synonymized into *Tritonia challengeriana* in 2004 [2,4]. Later work suggests that the *T. antarctica* of the Southern Ocean may be a separate species from the Magellanic *T. challengeriana* [8].

Tritoniella bellii is found in Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Georgia Island, Shag Rock, and Kerguelen Island at depths from 7 to 699 meters [1,6,7,8,9].
Tritoniella bellii has a longitudinal ridge along its back and can be up to eight centimeters in length [1].
Tritoniella bellii can have two morphological types: (1) tubercle-covered body with a yellow to orange color and a ridged margin; found predominately along the Antarctic Peninsula; (2) milky-white to transparent body with few tubercles and a serrated margin sometimes with small finger-shaped processes; prevails in the Weddell Sea and Signy Island (South Orkney Islands) [1]. Both morphs can be found elsewhere in Antarctica [1].
A study noted that *Tritoniella belli* feeds primarily on the stoloniferan soft coral *Clavularia frankliniana*, occasionally eats hydroids and anemones, and probably eats tunicates on which its eggs can be found [2,3,5]. *Tritoniella belli* has been observed feeding on the octocoral *Ascolepis* sp [6].
One study found *Tritoniella belli* primarily on bare rock surfaces or upon the hydroid *Hydrodendron arboreum*, with smaller numbers of *Tritoniella belli* found on the bush sponge *Homaxinella balfourensis* and the soft corals *Alcyonium antarcticum* (shown here) and *Clavularia frankliniana* [7]. This suggests that *Tritoniella belli* is feeding on these organisms and also on growth on rock surfaces; gut contents include benthic diatoms [7].
Egg ribbons of *Tritoniella belli* have been observed on bare rock surfaces, on the hydroid *Hydrodendron arboreum*, and on the bush sponge *Homaxinella balfourensis* [7].
Here *Tritoniella belli* is crawling across the predatory seastar *Odontaster validus*. *Tritoniella belli* mantle tissue is noxious to several seastars, the sea urchin *Stereocinus neumayeri*, and two species of fish [4]. *Odontaster validus* shows feeding deterrence to *Tritoniella belli* mantle tissue and to chimyl alcohol [3]. *Tritoniella belli* probably defends itself chemically against predators using chimyl alcohol that it obtains from the soft coral *Clavularia frankliniana*. Exracts of *Tritoniella belli* and the soft coral *Clavularia frankliniana* have chimyl alcohol in common.

**References:**
Unidentified cryptic nudibranch on *Zyzzyzus parvula* hydroid

This photo shows its rather cryptic appearance on the thecate hydroid *Zyzzyzus parvula*. 
Unidentified cryptic nudibranch on *Corymorpha* sp. hydroid

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A closer view of the cryptic nudibranch… those are its cerata sticking up behind the hypostome and its oral tentacles.
Unidentified nudibranchs
notaspidean opisthobranch *Bathyberthella antarctica*

*Bathyberthella antarctica* is found throughout Antarctica and the Antarctic Peninsula, South Shetland Islands, South Orkney Islands, South Sandwich Islands, South Georgia Island, and Bouvet Island at depths from 120 to 2,080 meters [1,2,3,5,6,7,8]. *Bathyberthella antarctica* has an oval body with a prominent gill on the right side and an internal large oval uncalcified shell covering the visceral mass [1,4].

The mantle/notum of *Bathyberthella antarctica* can be unpigmented or scattered with grey blotches and adults are opaque white, creamy-grey, or dirty white, often with black pigment in depressions [2,4]. The mantle/notal surface of *Bathyberthella antarctica* is smooth or with small groups of low pustules [2].
The foot of *Bathyberthella antarctica* is large and thick with the front margin divided into upper and lower lips [2,4].

*Bathyberthella antarctica* can be up to seventeen centimeters long [2].

*Bathyberthella antarctica* has acid secreting epidural glands providing all-over protection against predators and parasites, which is useful since an external shell is lacking [9].

sea butterfly or pteropod *Clione antarctica*

*Clione antarctica* is found throughout Antarctic and subantarctic waters and can be found northward to about 36 degrees in some areas [5,8].

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*Clione antarctica* is found throughout Antarctic and subantarctic waters and can be found northward to about 36 degrees in some areas [5,8].
In McMurdo Sound, *Clione antarctica* is commonly found near the undersurface of the sea ice and is sparse in water deeper than twenty meters [5].

Localized population density down to twenty meters depth may be as high as 300 per cubic meter [7].

*Clione antarctica* has been observed in breeding swarms in shallow water down to six meters depth, with an average of 7.9 pteropods per cubic meter [12].
*Clione antarctica* is a free-swimming shell-less pteropod mollusc up to 4.2 centimeters long [5]. *Clione antarctica* swims with less than two wing strokes per second and orients itself head up [5].

*Clione antarctica* deposits a free-floating, gelatinous egg mass, with spawning taking place from November through January [5].

In Antarctic waters, *Clione antarctica* eats a planktonic shelled pteropod mollusc *Limacina helicina antarctica* which it extracts from its shell; further north, it feeds on *Limacina retroversa* as well [5].

The medusa *Diplulmaris antarctica* eats *Clione antarctica*, as does the sea spider *Colossendeis megalonyx* [2,3,11].

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A hyperiid amphipod *Hyperiella dilatata* grabs *Clione antarctica* from the water and holds it to itself as a chemical defense against predation [1,4,7].

Predatory fish won't eat the amphipod / *Clione antarctica* combination or *Clione antarctica* itself which has a chemical, pteroenone, which deters feeding [1,4,6,7].

The *Limacina helicina antarctica* prey species of *Clione antarctica* doesn't have pteroenone so it appears that *Clione antarctica* synthesizes it as part of its metabolic processes [6,7].
**Taxonomic Note:** In 1976, van der Spoel arranged *Clione antarctica* as the subspecies *Clione limacina antarctica* [9]. In 1990, it was reestablished by Gilmer & Lalli as a separate species to *Clione antarctica* [5]. In June 2019, MolluscaBase and World Register of Marine Species list it as *Clione limacina antarctica* citing van der Spoel 1976, with no mention of the later publication of Gilmer & Lalli 1990, so the later published name *Clione antarctica* is used in this field guide in accordance with zoological nomenclature practice [10].

shelled pteropod *Limacina helicina antarctica*

*Limacina helicina antarctica* is most abundant in Antarctic waters between Antarctica and the Antarctic Convergence (aka Antarctic Polar Front) and is less common in subantarctic waters of the Antarctic Circumpolar Current (aka West Wind Drift); its northern limit is coincident with the Subtropical Convergence [2,7].

*Limicina helicina antarctica* has also been found north to 10°S in the Brazil Current and at 30°S near South Africa [2].

*Limacina helicina antarctica* is a notable component of the McMurdo zooplankon [9].
**Limacina helicina antarctica** filter feeds on phytoplankon [9]. The carnivorous pteropod *Clione antarctica* eats *Limacina helicina antarctica* which it extracts from its shell [3,8,9]. Other predators include medusas (*Diplulmaris antarctica*, *Solmundella bitentaculata*) and nototheniid fish (*Trematomus borchgrevinki*, *T. bernacchii*, *T. hansonii*, *T. pennellii*) [4,5,6,8,10,11].

**Taxonomic Note:** *Limacina helicina antarctica* has two formas, *antarctica* and *rangii* [1]. The two formas are distinct in range and characters, but there are intermediates between the two formas, and the intermediates are only found between the areas of both formas [1]. Arctic and Antarctic populations of *Limacina helicina* are genetically distinct at a species level, so *Limacina helicina antarctica* should have a separate species and not be a subspecies of a bipolar species name [12]. As of June 2019, no reassignment of *Limacina helicina antarctica* to a new species seems to have been published. In June 2019, MolluscaBase said *Limacina helicina antarctica* was unaccepted, referring to an accepted name *Limacina rangii* with no publication reference supporting that reassignment [13]. Due to lack of published reassignment, *Limacina rangii* is not used in this field guide in accordance with zoological nomenclature practice [13].