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Opisthobranchian and Lamellarian Gastropods Collected by the "Vema"

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INTRODUCTION

At the request of Dr. Ernst Kirsteuer of the American Museum of Natural History, we have examined the opisthobranch and the lamellarian prosobranch mollusks collected by the R/V "Vema" of the Lamont Geological Observatory, Columbia University, during the years 1958–1961. The collection comprises 19 opisthobranchs, 16 of which could be classified to species level, and one species of *Lamellaria;* species of *Lamellaria* are traditionally studied with the opisthobranchs. Seven of the species were collected in the North Atlantic, in the region between southeastern Greenland and the Newfoundland Bank; 10 species were obtained in the South Atlantic, in the area between Bahia Blanca and the Strait of Magellan; and two were dredged in the east Pacific, from the Peru-Chile trench. The type specimens and some of the non-typological material are deposited in the Department of Living Invertebrates of the American Museum of Natural History.

Mr. Gerald W. Thurmann of the American Museum of Natural History, who sorted the specimens from the dredge samples, also kindly provided us with a copy of the original description and figures of *Triopella incisa* (M. Sars).

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LIST OF GASTROPODS CLASSIFIED IN THE PRESENT PAPER

Subclass Prosobranchia (=Streptoneura)

Order Monotocardia
  Suborder Mesogastropoda (=Taenioglossa)
    Superfamily Lamellariacea
      Family Lamellariidae
        Lamellaria perspicua perspicua (Linné, 1758)

Subclass Euthyneura

Order Cephalaspidea (=Tectibranchia, *sensu stricto*)
    Superfamily Acteonacea
      Family Hydatinidae
        Parvaplustrum tenerum Powell, 1951 (figs. 1–6)
    Superfamily Bullacea
      Family Retusidae
        Retusa sosa, new species (fig. 7)
    Superfamily Scaphandracea
      Family Scaphandridae
        Scaphander sp. (figs. 8, 9)
      Family Cyclichnidae
        Cylichna sp. (figs. 10–12)
    Superfamily Philinacea
      Family Philinidae
        Philine finmarchica M. Sars, 1858 (figs. 13–16)
        Philine lima (Brown, 1825) (fig. 17)
        Philine quadrata (S. Wood, 1839) (figs. 18, 19)
        Philine cf. *gibba* Strebel, 1908 (figs. 20–22)
        Philine thurmanni, new species (figs. 23–28)
        Philine thurmanni chilla, new subspecies (fig. 29)
Order Notaspidea
    Superfamily Pleurobranchacea
      Family Pleurobranchidae (Subfamily Pleurobranchaeinae)
        Pleurobranchaea hedgpethi Abbott, 1952
Order Doridoidea
  Suborder Eudoridacea
    Tribe Cryptobranchia
      Family Doridiidae (Subfamily Thorunninae)
        Rostanga pulchra MacFarland, 1905
      Family Doridiidae (Subfamily Discodoridinae)
        Discodoris pusae Marcus, 1955 (fig. 30)
    Tribe Phanerobranchia
      Family Notodorididae
        Triopella incisa (M. Sars, 1872) (figs. 31–34)
      Family Triophidae
        Holoplocamus papposus Odhner, 1926 (figs. 35–37)
Order Dendronotacea
      Family Tritoniidae
        Tritonia (*Candiella*) *australis* Bergh, 1898

Marionia cucullata (Gould, 1852)
Dendronotus frondosus (Ascanius, 1774)
Family Dotoidae
Doto fragilis umia, new subspecies (figs. 38, 39)

SYSTEMATIC ACCOUNT

Lamellaria perspicua perspicua (Linné, 1758)

Lamellaria perspicua perspicua: MARCUS AND MARCUS, 1967a, pp. 11, 145.

RANGE: In all seas, except the Arctic and Antarctic; intertidal to 1287 meters. Original locality: Mediterranean Sea.

COLLECTING STATIONS: South Atlantic Ocean, between latitudes 40° 32′ and 55° 07′ 12″ S., longitudes 59° 33′ and 69° 53′ 07″ W., February 4, 1958 to February 17, 1962, 24 to 211 meters, a total of 24 specimens (seven males, 17 females).

DESCRIPTIVE NOTES: The largest male is 12 mm. long. The largest female is 15 mm. long, 12 mm. broad, and 8 mm. high. The length of the smallest animal is 3.5 mm. The size is not correlated with the number of radular rows. Our smallest specimen and one 7 mm. long have 60 rows; a 10-mm. specimen has 50, and a 15-mm. specimen has 65. All examined radulae have denticles on each side of the rhachidian cusp, contrary to *L. perspicua mopsicolor* (Eveline Marcus, 1958). The number of these denticles and of those on the lateral teeth is small in small specimens. The denticulation of the rhachidian cusp is symmetrical or slightly asymmetrical. The limbs of the rhachidian tooth are asymmetrical. On the lateral teeth of the adult animals there are four to nine coarse outer denticles and 17–23 fine inner ones. The shape of the mandibles varies; even in the same animal one mandible may be truncated and the other rounded. In the beginning of our examination we noted truncated jaws identical with those from the same region (Bergh, 1894, pl. 10, fig. 14), but later we also found rounded ones. Bergh (p. 224) compared his Patagonian material with the Mediterranean *L. perspicua morelli* (delle Chiaje, 1841), the jaws of which are rounded (Bergh, 1887, pl. R, fig. 10).

Possibly not the mandibles, but the blackish anterior groove of the foot in preserved specimens of *morelli* (Bergh, 1887, pp. 236–237) led Bergh to compare the "Albatross" material with his specimen from Naples, although he did not mention a blackish groove for the specimens from Cape Delgado. Also nine animals of the "Vema" material have a black or gray anterior pedal furrow. As a blackish pedal groove occurs also in *L. perspicua perspicua* (Bergh, 1887, p. 228), the character has no systematic value. Probably delle Chiaje's *Sigaretus morelli* is also *L. perspicua perspicua* (Bergh, 1853, p. 98).

Parvaplustrum tenerum Powell, 1951

Figures 1–6

Parvaplustrum tenerum POWELL, 1951, pp. 180, 195, text fig. M, 96–98, pl. 7, fig. 25.

RANGE: North of Falkland Islands, abundant in latitudes from 47° 06′ to 51° 10′ S., longitudes from 57° 20′ to 62° 38′ W., 104 to 320 meters.

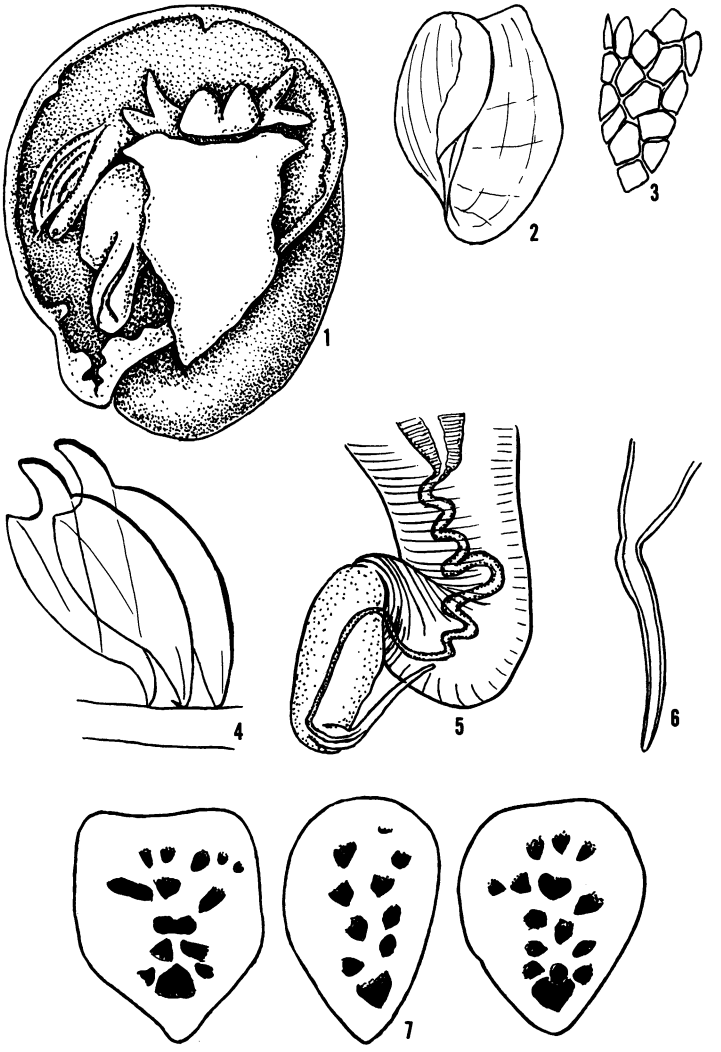
COLLECTING STATIONS: South Atlantic Ocean, V-17-74, latitude 41° 27′ S., longitude 59° 33′ W., May 23, 1961, 71 meters, seven specimens. V-17-75, latitude 41° 41′ S., longitude 59° 19′ W., May 23, 1961, 82 meters, one specimen.

DESCRIPTION: The shell of the animal from the second station is well preserved (fig. 2). The others are fragments. The height of the shell is 2.7 mm., the diameter is 2.0 mm., and the shape is ovate-globose, *Haminoea*-like. It is whitish, without color marks, semitransparent, and fragile. The axial growth lines are stronger than the delicate spiral striations. The spire lies in a concavity of the blunt apex. The aperture is narrow behind, wide in front; its top is higher than the apex. The outer lip is thin, the basal lip is broadly arcuate, and the inner lip bears a narrow callus, not adhering to the concave columella in front.

The head shield is small and deeply incised behind. On each side two extensible appendages extend from a common base and have pointed ends (fig. 1). Eyes and lateral folds are supplied with nerves, i.e., Hancock's organs were not seen, perhaps because of insufficient preservation of the soft parts. The foot is broad in front, the corners are prominent, and the ends are pointed, so that the sole is triangular.

The pallial cavity is widely open, and the ragged edge of the mantle is accompanied by the strip of mantle glands. Behind a short fold, an infrapallial lobe occupies the region where the columellar border and the outer lip meet. No pallial caecum was seen. On the right side the gill hangs as a small triangular flap from the mantle skirt into the mantle cavity; it has about four transverse folds. The rectum with the anus lies under the gill rather far behind. The columellar muscle originates in front of the level of the gill.

Powell's description of the organs of the alimentary system should be emended. There are no gizzard plates, but there are jaw plates (fig. 3) with smooth, polygonal platelets. The length of the jaws is 140 μ, the breadth is 46 μ, and the diameter of the platelets is about 9 μ. The radula comprises about 40 rows with the formula 1.0.1. The tooth (fig. 4) is about 46 μ long. Its base is narrow, and the broad, curved blade ends in a claw-shaped tip. Broad blades occur also in the teeth of *Hydatina* (Bergh, 1901, pl. 20, fig. 42; Marcus and Marcus, 1967a, fig. 9).



FIGS. 1–6. *Parvaplustrum tenerum.* 1. Shell. 2. Ventral view of preserved snail without shell. 3. Labial platelets. 4. Two radular teeth. 5. Penis. 6. Stylet.
FIG. 7. *Retusa sosa,* gizzard plates.

The ovotestis and the hermaphrodite duct with its ampulla lie in the visceral hump, and the male duct is under the floor of the pallial cavity. The ental prostatic looping part passes to the ectal part. This is directed backward on the right side and bulges the floor of the pallial cavity.

The sinuous muscular ejaculatory duct winds through the bulge and through a penial papilla (fig. 5). It opens through a brown cuticular stylet, as much as 500 μ in length, 65 μ in width at its base and 20 μ at the tip (fig. 6). The stylet is torn off or missing in five of the eight specimens.

The male organ agrees with that of *Hydatina* (Bergh, 1901, pl. 20, fig. 44; Risbec, 1951, fig. 10, pn), *Micromelo* (Marcus and Marcus, 1967a, fig. 7H), and *Acteon* (Fretter and Graham, 1954), as there is an inner male duct and external penis, whereas the Diaphanidae (Odhner, 1926a) and evidently also *Ringicula* (Fretter, 1960, fig. 2, p. 544) have the common cephalaspidean type with seminal groove and invaginated atrium.

REMARKS: Powell called *Parvaplustrum tenerum* a tectibranch of uncertain affinity but probably nearest to the Aplustridae, which were placed in the synonymy of the Hydatinidae by Pilsbry (1893–1895, p. 385). We agree with Powell's opinion, although the absence of lateral expansions of the foot gives the animal an aspect widely different from the hydatinidan type. Powell's "prominent bilobed proboscis" is the head shield of our description; his "stomach plates" correspond to our mandibular elements. Therefore, *P. tenerum,* as characterized here, differs less from Thiele's (1931 [1931–1935,] vol. 1, p. 381) diagnosis of the Hydatinidae than from Powell's record. The single lateral tooth with a narrow base, the small gill, and the minute infrapallial lobe are features that separate *P. tenerum* from the Hydatinidae. Added to the fact that the foot has no lateral expansion they could justify the introduction of a new family, as Powell suggested.

In the Cephalaspidea the presence of a naked rhachis is not restricted to the Hydatinidae. It is found, for example, also in the aberrant genera *Colobocephalus* M. Sars, 1870, and *Colpodaspis* M. Sars, 1870. Odhner (1939, p. 9) derived the head shield of these genera from that in *Newnesia antarctica* E. A. Smith (1902, p. 208), the shell of which is similar to that of *Hydatina.* As in the other Diaphanidae, the head shield of *N. antarctica* is not set off from the notum behind. Such a head shield, the absence of mandibular elements, and the anaspidean male organ (Odhner, 1926a, p. 14), show that *P. tenerum* cannot be included in the Diaphanidae, nor can the related families (Fretter and Graham, 1962, p. 638) Acteonidae and Ringiculidae receive *Parvaplustrum,* although the Ringiculidae have the same radula formula.

Retusa sosa, new species

Figure 7

HOLOTYPE: A.M.N.H. No. 146376.

COLLECTING STATION: South Atlantic Ocean, V-17-74, latitude 41° 27′

S., longitude 59° 33′ W., May 23, 1961, 71 meters, two specimens.

DIAGNOSIS: About 2 mm. in length, shell with a sunken spire, fine spiral lines, and no columellar fold. Absence of jaws and radula. Two gizzard plates of equal size, third a little narrower.

DESCRIPTION: The snails are about 2 mm. long; the shells measure 1.6 by 0.8 and 1.4 by 0.8 mm.; both are broken. They are cylindrical, have a sunken spire, the protoconch of which lies far inward, and an aperture narrowed backward. There is no columellar fold. The periostracum is delicate. The spiral sculpture consists of densely set, thin lines, which are common, but not constant (Lemche, 1948, p. 57), in *Retusa* (*Cylichnina*) *umbilicata* (Montagu, 1803).

The head shield with its concavity in front, the long lappets behind, the eyes about in the middle of the head, and the relatively short foot without lateral expansions correspond to what is known of other species of *Retusa*. There are neither jaws nor radula. The gizzard plates are light brown and beset with black tubercles. Two of the three plates are 130 μ long and 100 μ broad, the third is 80 μ broad. The size and the distribution of the denticles are shown in figure 7.

The accumulation of foraminifers in the crop, in front of the gizzard plates, in *R. sosa* corresponds to the figures of Sars (Pilsbry, 1893–1895, pl. 60, fig. 7) and Hurst (1965, fig. 24). Usually these plates are called "masticatory," but evidently they do not crush the prey as they do in *Philine*. The crop of *Retusa* is thin-walled, and the denticles on the gizzard plates work together to form a sieve. Probably only the soft parts of the eaten animals pass through them, whereas the skeletons are retained in the crop and later expelled through the mouth. Lemche (1956, p. 18) and Hurst (1965, p. 336) observed retracting *Retusa* discharging ingested rissoids. It is not known how the digestible substances of the prey are separated from their shells; the salivary glands of *Retusa* are minute (Hurst, *loc. cit*).

The name of the species is the latinized form of the English vernacular expression "soso."

REMARKS: The missing jaws and radula as well as the tuberculated gizzard plates serve to substantiate our classification of the present snails as *Retusa* (Pilsbry, 1893–1895, p. 204; Lemche, 1948, p. 50; Hurst, 1965, p. 336). We do not know any gizzard plates similar to the present ones. We cannot, however, exclude the possibility that empty shells of *Retusa sosa* have been described previously. *Tornatina, Diaphana* (Thiele, 1925, p. 268), and *Cylichna* (Lemche, 1948, p. 54) "are very difficult to distinguish from *Retusa* without knowledge of the soft parts" (Lemche).

As a negative feature, the absence of the radula should be carefully

examined. Thiele (*loc. cit.*) identified *Tornatina canaliculata* (Say, 1826) correctly from the shell, but did not find any radula and therefore transferred this species to *Retusa,* in which it was maintained by Zilch (1959–1960, p. 47). The gizzard plates of *T. canaliculata* (Thiele, 1925, pl. 46, fig. 7) are very similar to those of *Tornatina candei* (d'Orbigny, 1842) (Marcus, 1958, pl. 4, fig. 30), a species with radula (*ibid.,* fig. 29). Because Wells and Wells (1962, fig. 13) found a radula in *canaliculata,* it also belongs in *Tornatina. Retusa obtusa* (Montagu, 1803), the type species of *Retusa* Brown, 1827, has none (Hurst, 1965, pp. 326, 336).

Retusa truncatula (Bruguière, 1789), "indistinguishable from the European species" (Melvill and Standen, 1907, p. 112), has been recorded from the Falkland Islands and Burdwood Bank. Odhner (1926a, p. 3) called *R. truncatula* the only bipolar opisthobranch. It is a boreal species of the eastern Atlantic, southward to Madeira and the Canaries. Its range may suggest an equatorial submergence. The gizzard plates of *R. truncatula* (Pilsbry, 1893–1895, pl. 60, fig. 4; Vayssière, 1928–1934, fig. 6) are quite different from those of *R. sosa,* and the shell of *R. truncatula* has no spiral striation.

Scaphander sp.
Figures 8, 9

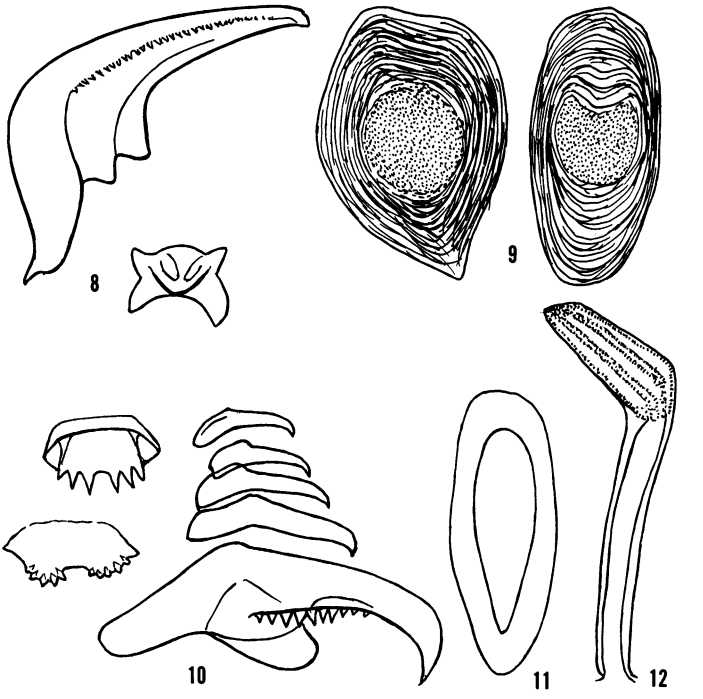
COLLECTING STATION: Peru-Chile trench, off middle Chile, V-17-2, latitude 34° 29′ S., longitude 74° 21′ W., March 13, 1961, 4030 to 4036 meters, one specimen.

DESCRIPTIVE NOTES: The animal is 3 mm. long. The remains of the shell show a non-prominent apex, a callus on the concave columella and the parietal wall, and a spiral sculpture that consists of a catenation. The punctations, the links of the chains, are discontinuous.

In the mantle skirt the big glands of Blochmann, characteristic of *Scaphander* (Perrier and Fischer, 1911, p. 101), are noticeable. The short salivary glands are not attached to the gut (Lacaze-Duthiers, 1898, pl. 27, fig. 2, gs). Jaws are missing. The radula (fig. 8) has 12 rows. The rhachidian tooth, caducous as in the other species of the genus, has a prominent cusp and distinct lateral corners. The grasping edge of the sickle-shaped lateral teeth is denticulated. The dorsal and ventral gizzard plates (fig. 9) are 700 μ long and 500 μ broad; the left one is of the same length, but only 400 μ broad. The disposition of the plates is as described by Fretter (1939, pp. 610–611). The plates are connected by strong bundles of muscle fibers. There were no reproductive organs.

REMARKS: A juvenile specimen of *Scaphander* with only fragments of

a shell cannot be determined to species level. The available pieces of shell are not incompatible with *S. interruptus* Dall (1890, p. 297) from



FIGS. 8, 9. *Scaphander* sp. 8. Radular teeth. 9. Gizzard plates.
FIGS. 10–12. *Cylichna* sp. 10. Half row of radula and a rhachidian tooth in different view. 11. Gizzard plate. 12. Penis.

the east Pacific, which is 10 times larger. The radula and the gizzard plates of that species are not known.

Cylichna sp.

Figures 10–12

COLLECTING STATION: V-17-119, Labrador Sea, latitude 54° 27′ N., longitude 54° 06′ W., 218 meters, September 10, 1961, one specimen.

DESCRIPTIVE NOTES: The animal is about 2.4 mm. long and 1.4 mm. in diameter. The smooth shell is broken. Recognizable are weak growth lines, a hidden spire covered by a callus, and a short columellar callus. Also the head shield is defective. The systematically important inner organs, the radula, stomach plates, and male copulatory organ, are as follows: The radula (fig. 10) has 12 rows; the teeth are 3-4.1.1.1.3-4.

The number of denticles on the sides of the rhachidian tooth varies. The three gizzard plates (fig. 11) are of equal size and shape, with a dark, thick center and light borders; they are 400 μ long, 160 μ broad. The male organ (fig. 12) has an atrium or penial sac, 230 μ long, devoid of a penial papilla, and a prostatic sac with longitudinal folds, 130 μ long, annexed to the atrium at a nearly right angle. It is similar to that of *C. alba* (Brown, 1827) (Lemche, 1956, p. 209, figs. 108, 109), a species with five or six marginal teeth and gizzard plates 1 mm. in length. Also the available shell fragments of the present specimen do not show the structure of *C. alba* (*ibid.*, p. 196, fig. 15).

REMARKS: The small size of the animal at hand and its broken shell make it impossible to identify it with the east American *C. gouldii* (Couthouy, 1839), which has "the spire usually sunk in" (Abbott, 1955, p. 282) and four marginal teeth (Lemche, 1948, p. 42).

Philine finmarchica M. Sars, 1858

Figures 13–16

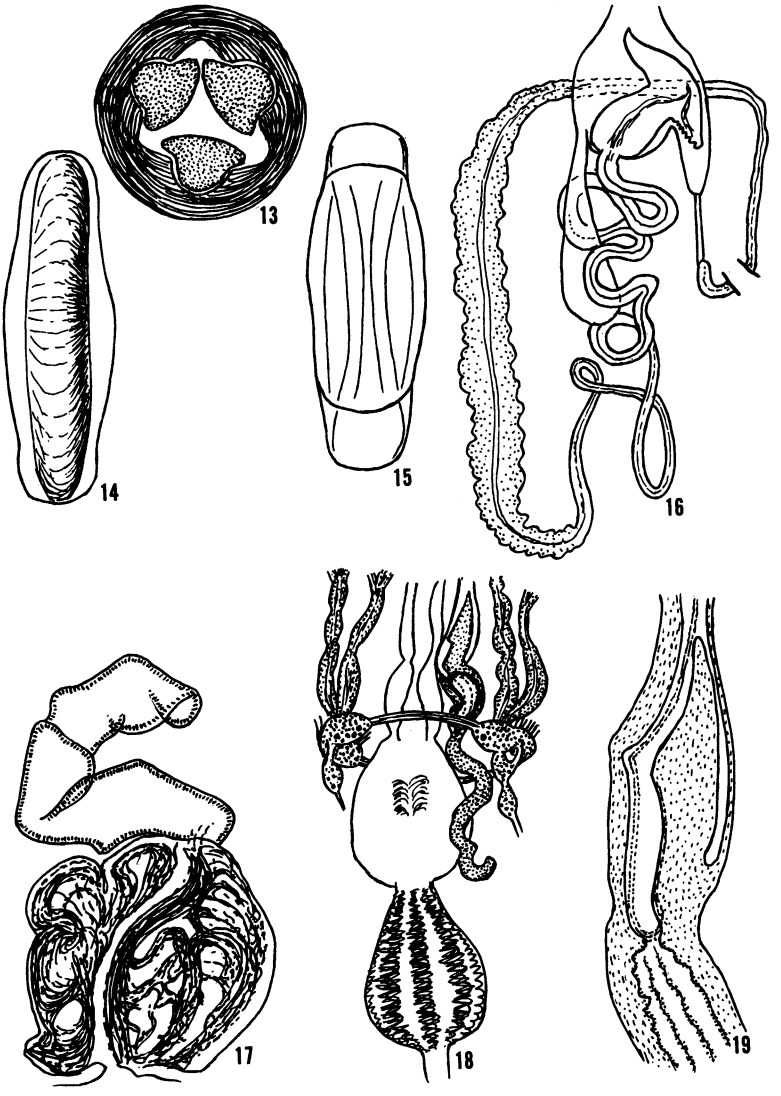
Philine finmarchica: LEMCHE, 1948, pp. 64–65, 66 (discussion), 96 (references).

RANGE: Nova Scotia, Baffin Bay, Greenland, Iceland, Jan Mayen, Spitsbergen, coast of Norway southward to Lofoten, Murman coast, and Kara Sea. In depths from 12 to 2220 meters, but the last record refers only to shell fragments, and also the other records from considerable depths probably refer to dead specimens (Lemche, 1938, p. 13).

COLLECTING STATION: V-17-119, Labrador Sea, latitude 54° 27′ N., longitude 54° 06′ W., 218 meters, September 10, 1961, 13 specimens.

DESCRIPTION: The animals are 1.3 to 10.2 mm. long. The length of the head shield of the largest is 6.2 mm., and the width is 5 mm. Posteriorly it is rounded, straight, or slightly notched. The length of the sole is 6 mm. The parapodia are rather short and thick. The mantle is 7 mm. long, as are the largest of the mostly broken shells. The ratio between the width and length of the shell varies in *P. finmarchica* (Lemche, 1948, figs. 67–72). In the liquid of preservation the shells are transparent; when dry, they are opaque. The growth lines are weak, the spiral lines dense. In the incipient parts of the shell the spiral lines are catenoid, and become simple in the newer parts (Lemche, 1948, p. 66).

The radula has 14 rows, and the long denticles of the lateral tooth are numerous, thin, and pointed. The three gizzard plates, of equal size, are 4 mm. long and 1.3 mm. broad; in small animals they are four times as long as broad. The plates are blunt on both ends. The inner surface (fig. 15) is slightly convex and brown by conchiolin layers; the outer surface (fig. 14) bears a longitudinal crest of light lime. The annular



FIGS. 13–16. *Philine finmarchica.* 13. Transverse section of gizzard. 14. Gizzard plate, outer side. 15. Gizzard plate, inner side. 16. Male copulatory organ.

FIG. 17. *Philine lima,* male copulatory organ.

FIGS. 18, 19. *Philine quadrata.* 18. Anterior part of alimentary tract, with nerve ring and male organ. 19. Penial papilla.

musculature of the gizzard consists of an outer entire layer which surrounds the gizzard, and an interrupted inner one connecting the crests of the plates (fig. 13). The light brown, silky gizzard muscles shine through the skin.

The male organ (fig. 16) is similar to that of *P. aperta* (Pruvot-Fol, 1930), but in that species the penial papilla around the ejaculatory pore is smooth, not verrucose as in *P. finmarchica.* In both species the sinuous, smooth prostatic duct unites with the seminal duct at the fundus of a seminal vesicle. The glandular prostate is thicker in the outer than in the inner part; its convolutions were drawn with an interruption (fig. 16). The fundus of the prostate is attached to the outer wall of the atrium by a strand of conjunctive tissue.

Philine lima (Brown, 1825)
Figure 17

Philine lima: LEMCHE, 1948, pp. 68 (discussion), 93–94 (references).

RANGE: Massachusetts, Newfoundland, Greenland, Iceland, Spitsbergen, Franz Josef Land, northern Norway, White Sea, Kara Sea, in depths from 4 to 800 meters.

COLLECTING STATIONS: V-17-120, west of Strait of Belle Isle, latitude 51° 08′ N., longitude 58° 01′ W., 199–201 meters, September 11, 1961, five specimens. V-17-119, off Labrador, latitude 54° 27′ N., longitude 54° 06′ W., 218 meters, September 10, 1961, one specimen.

DESCRIPTIVE NOTES: The body is brown, the shell white. The sculpture consists of coarse catenoid spiral lines and distinct growth lines. The spire is slightly raised. The head shield is strongly notched posteriorly. The lateral tooth is not serrulated; there are no gizzard plates.

The male atrium (fig. 17) is richly folded; a penial papilla is not developed. The prostate is a short, wide sac, the fundus of which lies free in the body cavity. The largest specimen of the present material is 5 mm. long; the length of the head shield is 2.8 mm., that of the foot is 3 mm., the length of the shell is 4 mm., and the breadth 2.5 mm. The examined radula has 12 rows.

Philine quadrata (S. Wood, 1839)
Figures 18, 19

Philine quadrata: Lemche, 1948, pp. 68 (discussion), 94 (references).

RANGE: From New England to Greenland, Iceland, Norway, Kola Peninsula, the Shetlands, west coast of Europe, Azores, Mediterranean, St. Helena. The vertical range is from 5–6 to 2150 meters, but from great depths probably only shells have been recorded (Lemche, 1938,

p. 12).

COLLECTING STATION: V-16-48, southwest Greenland, latitude 60° 10′ N., longitude 47° 08′ W., 300 meters, August 21, 1960, two specimens.

DESCRIPTIVE NOTES: The length of each animal is 5 mm., the width is 3.5 and 3 mm., and the length of the head shields is 3 mm. A longitudinal furrow divides the head shield. Both shells are broken, but the catenate spiral striae are recognizable.

The frill of the mantle described for *P. aperta* (Linné, 1767) by Brown (1934, p. 183) also occurs in *P. quadrata*. The organs of the buccal region (Hurst, 1965, p. 283, 284, fig. 1) correspond to those of *P. aperta*. Two sensory palps flank the mouth. The buccal cavity is deep and wide. There are 12 radular rows. The lateral tooth bears about 30 serrulations on its inner edge. The outer of the two hamate marginal teeth is weaker than the inner. The thick salivary glands curve around the esophagus. Its dilatation is not a gizzard but contains epithelial ridges (fig. 18).

The male atrium lodges a strong, obliquely truncate penial papilla (fig. 19). The prostate is a thin, sausage-shaped organ, with a free fundus, its wall thrown into some longitudinal folds.

Philine cf. *P. gibba* Strebel, 1908

Figures 20–22

Philine gibba: ODHNER, 1926a, pp. 17–18, figs. 12, 13.

RANGE OF *P. gibba:* South Georgia, 12–310 meters.

COLLECTING STATION: South Atlantic Ocean, V-17-89A, latitude 45° 02′ S., longitude 61° 18′ W., June 11, 1961, 102 meters, one specimen.

DESCRIPTION: The animal is about 8 mm. long; its shell is dissolved. The cephalic shield is round and has no median furrow. The radula (fig. 20) has 12 rows with the formula 2.1.1.1.2; the occurrence of a rhachidian tooth is quite exceptional in *Philine*. The rhachis is broad, and the radular membrane has a median thickening and transverse bands reaching the bases of the lateral teeth. Where the transverse bands cross the median thickening there is a broad plate, about 20 μ long and 20 μ broad, the base of the rhachidian tooth. From the base rises a cusp 70 μ high. It consists of a straight shaft dilated in front with a hammer-shaped, asymmetrical termination directed backward. The quadrangular bases are attached, but some of the cusps dropped off when the radula was straightened. The lateral tooth is 270 μ long; its pointed cusp is only slightly curved. The inner border of the cusp is irregularly denticulated. The marginal teeth are common hooks; the inner is 140 μ, the outer, 100 μ, in length. The three brown gizzard plates (fig. 21) are of equal size, 0.9 mm. long, 0.5 mm. broad, rounded

on both ends, strongly convex on the outer side, flattened on the inner, and without pores.

The male atrium is 1.4 mm. long and separated by a fold from the penial sheath (fig. 22), which is 0.4 mm. long. The length of the prostate is 0.6 mm. This short prostate and the folds of the penis resemble those of *P. alba* Mattox (Marcus and Marcus, 1967b, fig. 28).

REMARKS: The head shield of *P. gibba* is rectangular and furrowed. The rhachidian tooth of *P. gibba* corresponds to the basal plate of the present animal; possibly the cusps had fallen off in Odhner's material. The cusp of the lateral tooth of *P. gibba* is more curved than in our specimen. The gizzard plates of *P. gibba* are very convex on the inner, slightly concave on the outer, side. Odhner compared them with those of *P. fragilis* G. O. Sars, 1878 (= *P. finmarchica* M. Sars, 1858) and *Cylichna.* This similarity is still more pronounced in the animal at hand.

The male organ of *P. gibba* is not known.

Philine thurmanni thurmanni, new species

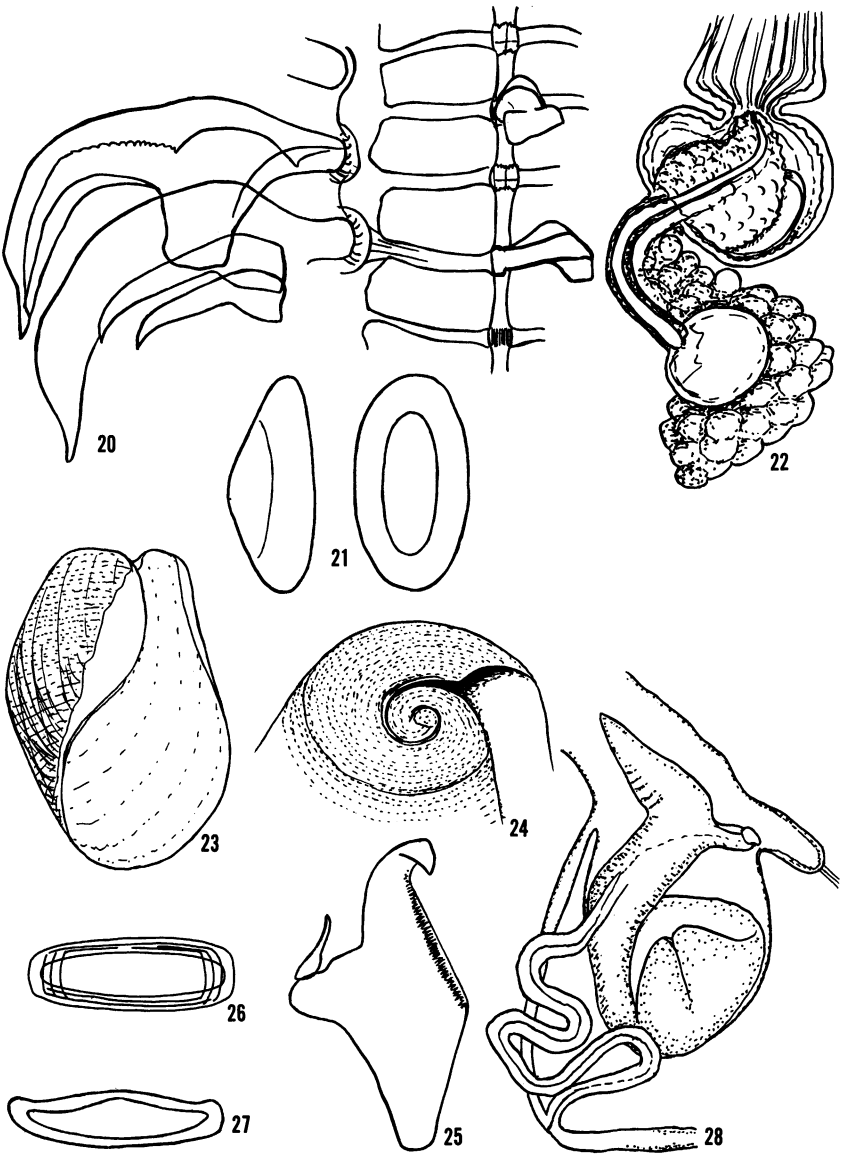
Figures 23–28

HOLOTYPE: A.M.N.H. No. 146377, the largest animal (V-17-97).

COLLECTING STATIONS: South Atlantic Ocean, off Argentina, from latitudes 36° 17′ to 44° 29′ S., from 70 to 676 meters, 58 specimens. V-17-67, latitude 41° 39′ S., longitude 59° 05′ W., 73 meters, May 18, 1961, five specimens. V-17-68, latitude 41° 16′ S., longitude 60° 03′ W., 70 meters, May 18, 1961, four specimens. V-17-74, latitude 41° 27′ S., longitude 59° 33′ W., 71 meters, May 23, 1961, four specimens. V-17-75, latitude 41° 41′ S., longitude 59° 19′ W., 82 meters, May 23, 1961, 41 specimens. V-17-97, latitude 44° 29′ S., longitude 60° 45′ W., 102 meters, June 13, 1961, two specimens. V-18-9, latitude 36° 17′ S., longitude 53° 21′ W., 676–547 meters, February 4, 1962, two specimens.

DIAGNOSIS: Length up to 9.5 mm., with fragile shell, up to 7 mm. long, shell 1.08 to 1.5 times wider than long. Growth lines weak, catenation of the spiral striae distinct in young shells and oldest area of body whorl. Subapical flattening obvious in large shells. Prominence of outer lip over apex varies. Radula with formula 14-16 × 1.1.0.1.1; weak marginal tooth straight. Gizzard with continuous muscle ring and containing three plates of equal size, about three times as long as broad, and with outer crest. Male organ with a muscle mass around base of papilla which is hammer-shaped.

DESCRIPTION: The length of the 58 animals is from 2.0 to 9.5 mm.; the largest is 5 mm. high, 4.8 mm. broad. The measurements of five shells selected at random are, in millimeters: length, 7.0, 6.2, 5.2, 3.7, 2.7;



FIGS. 20–22. *Philine* cf. *gibba*. 20. Radula. 21. Gizzard plates. 22. Male copulatory organ.

FIGS. 23–28. *Philine thurmanni*. 23. Shell. 24. Apex of shell. 25. Radular teeth. 26. Gizzard plate, outer side. 27. Gizzard plate, inner side. 28. Male copulatory organ.

the corresponding width, 5.2, 4.1, 4.0, 3.1, 2.5; the ratio of length to width (1) is: 1.35, 1.5, 1.3, 1.2, 1.08. The growing shells increase in length more than in width. The fragile shell (fig. 23) is white, semi-transparent, and has a shining periostracum and densely set spiral lines. These are furrows with slightly crenulate borders that produce a catenation more distinct in the apical than in the anterior region. The growth lines are weak. A thin callus overlies the columellar border of the body whorl. The apex (fig. 24) is flattened. The shape of the larger shells is more cylindrical, that of the smaller shells rather oval. The greatest breadth lies approximately in the middle. Behind it there is a slight flattening, distinct in shells of 3.5 mm. length and more. The smallest shells have three whorls; the columella is open. In young shells the second whorl has a deep suture, accompanied by irregular crests and hidden by secondary calcification in older ones. The outer lip begins parallel to the suture, then curves in a right angle to the apex and rises over it. The elevation of the outer lip over the apex varies in height. The smooth descending border passes, evenly rounded, to the inner lip.

The soft parts are light brown and sufficiently transparent to show the shell and its sculpture. The round head shield is about half of the length of the shell, but overlaps it in some cases. The head shield is neither furrowed in the midline nor notched behind, and its posterior corners are more or less distinct. As in other species, the head shield has an anterior notch over the mouth, and in the furrow between the head shield and the foot stand two small palps. In large specimens the simple transverse folds of the Hancock's organs and the seminal groove are distinct.

The foot occupies two-thirds of the total length; the epipodia are low. The infrapallial lobe, which expands from the pallial roof with a small fold, is nearly square, a little longer in a transverse than in an antero-posterior direction.

The salivary glands are short, and their surface is nodose. The radula (fig. 25) comprises 14 to 16 rows with the formula 1.1.0.1.1. The lateral tooth bears about 50 denticles. The straight marginal tooth is very weak and easily overlooked, especially in the specimens from the last locality. The brown annular muscles of the gizzard form a continuous ring as in *P. finmarchica*. The three brown plates (figs. 26, 27) are of equal size, about three times as long as broad, and provided with an outer calcareous crest. In three specimens the length of the plates was 3.1, 2.31, and 1.86 mm.; the corresponding width, 1.08, 0.78, and 0.6 mm.

The male copulatory organ (fig. 28) resembles that of *P. aperta* in the hammer-shaped penis papilla and the long, coiled prostate. It differs

from that of *P aperta* in the bulky muscle mass around the base of the papilla and the slender form of the latter, sometimes spoon-shaped on one side and pointed, with basal folds, on the other.

The species is named for Mr. Gerald W. Thurmann, of the American Museum of Natural History.

REMARKS: In the following comparison of the typical subspecies the Atlantic, Mediterranean, South African, and Antarctic species of *Philine* were considered. For the following southeast Pacific subspecies, the species from the southern Indic, east Australia, New Caledonia, and New Zealand were compared. *Philine umbilicata* Murdoch and Suter (1906, p. 279, pl. 21, fig. 2) from the continental shelf of New Zealand is somewhat similar, but its sculpture is inconspicuous, and it cannot be the present species. *Philine amabilis* Verrill, 1880 (Pilsbry, 1895–1896, (p. 25) has a slender, spiniform, marginal tooth as in *P. thurmanni thurmanni,* but its shell is 15 mm. long, 10 mm. broad, and has conspicuous growth lines and simple spiral striae. The two deep-sea species from the Azores, *P. rugulosa* and *P. approximans* Dautzenberg and Fischer (1896, p. 406, pl. 15, figs. 6–9) have certain similarities to *P. t. thurmanni,* especially *P. rugulosa,* but the shell sculpture of both is incompatible with the present species. *Philine desmotis* Watson (1897, p. 236, pl. 19, fig. 5a) from Madeira is a small species with strong catenation.

In the Antarctic *P. alata* Thiele (1912, p. 220) the wing-shaped outer lip overtops the apex, but as a feature of a single shell this character is not necessarily specific (Lemche, 1948, pp. 64–65). The shell of *P. alata* is 15 mm. long, 13 mm. broad, and the apical striae are simple, not catenate. The name *alata* had been used for a species belonging to *Philine* many years before Thiele (Lemche, 1948, pp. 67–68, 95).

Among the well-known species of the genus, *P. catena* (Montagu, 1803) differs least from *P. thurmanni.* The range of that boreal east Atlantic and Mediterranean species extends to the Canaries. The subapical flattening of *P. t. thurmanni* does not occur in *P. catena,* a species with 30 radular rows and an armed male organ (Vayssière, 1885, p. 36, 38).

Philine thurmanni chilla, new subspecies

Figure 29

HOLOTYPE: A.M.N.H. No. 146378, complete animal (V-17-3).

COLLECTING STATIONS: Southeast Pacific Ocean, off middle Chile, south of Juan Fernandez Islands, to south Chile, off Golfo de Peñas, from 152 to 4116 meters, 12 specimens. V-17-2, latitude 34° 29′ S., longitude 74° 21′ W., 4030–4036 meters, March 13, 1961, one specimen. V-17-3, latitude 36° 15′ S., longitude 76° 51′ W., 4030 meters, March

14, 1961, two specimens. V-17-4, latitude 37° 10′ S., longitude 77° 42′ W., 4116 meters, March 15, 1961, one specimen. V-17-11, latitude 43° 25′ S., longitude 75° 05′ W., 152 meters, March 23, 1961, one specimen. V-17-15, latitude 47° 02′ S., longitude 75° 36′ W., 642 meters, March 24, 1961, seven specimens.

DIAGNOSIS: Length of animal up to 3.7 mm., largest shell of which is 3 mm. long. Spiral sculpture variable. Subapical flattening indistinct. Marginal radular tooth absent. Other characters agree with those of Atlantic subspecies.

DESCRIPTION: The length of the 12 animals is from 2 to 3.7 mm.; the shells, which are mostly broken, reach a maximum of 3 mm. (V-17-3). The ratio of length to width (1) is about 1.4. The spiral sculpture varies from chains with quite round links to nearly straight furrows. In the present shells the subapical flattening is inconspicuous as in the small ones of the Atlantic subspecies.

The soft parts are brown in the specimens from the first and the two last localities, and snow-white in the three other animals, perhaps because of different preservation. The radula has the formula 12 × 0.1.0.1.0; the weak marginal tooth of *P. t. thurmanni* is absent; also in the Atlantic subspecies it is often quite inconspicuous. The lateral tooth bears 19 to 27 denticles. The gizzard has the same musculature as the typical subspecies; also the plates of equal size that are three times as long as broad are the same. The male copulatory organ of both subspecies is similar. The muscular bulge around the base of the penial papilla is strong, and the aspect of the hammer-shaped papilla is somewhat variable, but essentially the same as in *P. t. thurmanni*.

REMARKS: Of the species recorded from the neighboring areas none requires special comparison. The distinct catenation, characteristic of young shells, led us once more to the above-mentioned *P. desmotis* Watson, the chains of which have links three times as long as broad, whereas the links are as long as broad in *P. t. chilla*.

Pleurobranchaea hedgpethi Abbott, 1952, juvenile

Pleurobranchaea hedgpethi ABBOTT, 1952, p. 1, pl. 1, figs. 1–8.
Pleurobranchaea hamva MARCUS AND MARCUS, 1957, p. 31, figs. 40–52.
Pleurobranchaea hedgpethi: NIJSSEN-MEYER, 1965, p. 144.
Pleurobranchaea hedgpethi hamva: MARCUS AND MARCUS, 1967a, p. 48 (references).

RANGE: North Carolina; Georgia, 70–95 meters; Florida, Dry Tortugas, 51 meters; Gulf of Mexico, from Port Aransas (original locality of *P. hedgpethi*) to Bay of Campeche; Surinam; Rio de Janeiro; São Paulo (original locality of *P. hamva*).

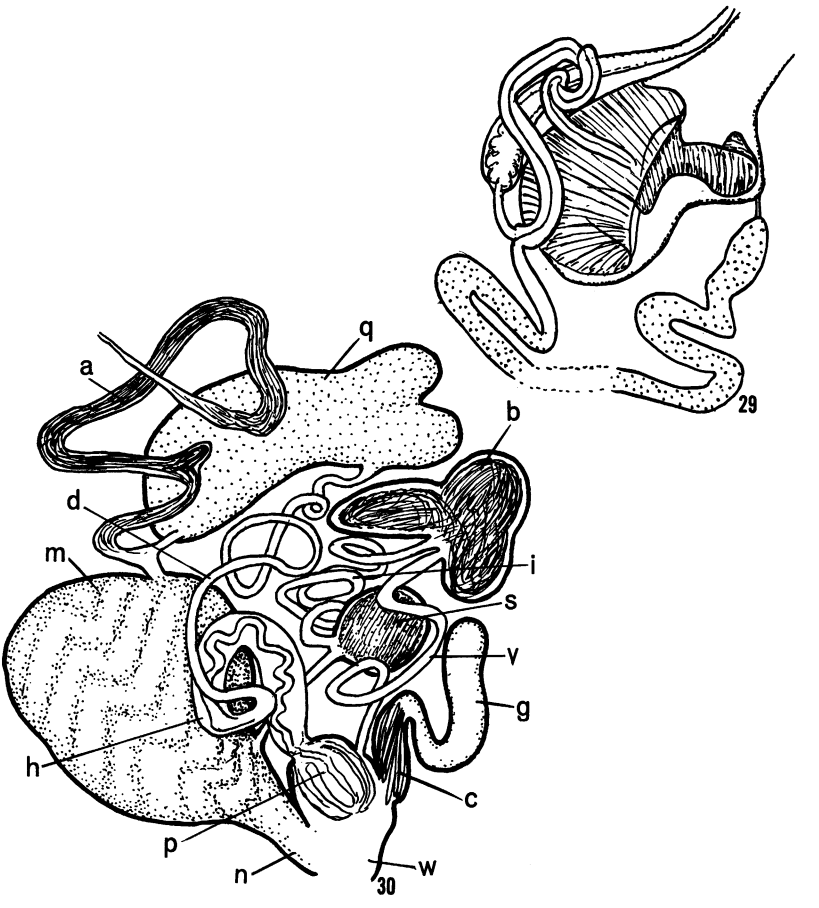


FIG. 29. *Philine thurmanni chilla,* male copulatory organ.

FIG. 30. *Discodoris pusae,* diagram of reproductive organs.

Abbreviations: a, ampulla; b, bursa; c, cuticular spines; d, sperm duct; g, atrial gland; h, muscular sheath; i, insemination duct; m, female gland mass; n, nidamental duct; p, penis; q, prostate; s, spermatocyst; v, vagina; w, atrium.

COLLECTING STATIONS: V-17-70, Argentina, latitude 40° 32′ S., longitude 60° 19′ W., 57 meters, May 18, 1961, 19 specimens. V-17-71, latitude 40° 11′ S., longitude 60° 27′ W., 44 meters, May 18, 1961, seven specimens.

REMARKS: The collecting stations are about 1800 kilometers from the southernmost previous locality, Cananéia, latitude 25° 01′ S. Therefore, our comparison should have been especially extended to the stated dif-

ference between the insemination duct in *P. hedgpethi* (Marcus and Marcus, 1967a, fig. 55C) and the West African *P. gela* (Marcus and Marcus, 1966, fig. 37). All animals at hand, however, are immature, even without genital apertures and the surrounding cutaneous structures. The available characters of the present material do not contrast with those of *P. hedgpethi,* although some are evidently juvenile. Among these we stress a very weak denticulation of the mandibular platelets. The largest specimens, from the second locality, are 20 and 18 mm. long, 6 and 8 mm. broad, and 7 and 6 mm. high. The animals from the first locality are quite young, 3.5 to 7 mm. long. A warty veil, a black net of the notum, a median black stripe on the tail which ends on the spur, and a small pedal gland occur in both lots. Systematic important characters, uniform in the largest animals from both localities are: 20 to 25 branchial plumes, the small outermost five are free from the branchial membrane, and the anus lies over the middle of the gill. The radula consists of 36 to 40 rows and about 50 teeth per half row.

A slug 14 mm. long and 8 mm. broad had, among other food, a 4-cm. polychaete in its gut.

Rostanga pulchra MacFarland, 1905

Rostanga pulchra: Marcus, 1961a, pp. 15, 16 (references), pl. 3, figs. 46–49. MacFarland, 1966, pp. 165–169, pl. 25, fig. 7, pl. 29, figs. 7–10, pl. 35, figs. 1–16.

Range: From the Vancouver Island region to the Gulf of California; south Chile, Chiloé; in shallow water.

Collecting Station: V-17-97, off Camarones Bay, Argentina, latitude 44° 29′ S., longitude 60° 59′ W., 102 meters, June 13, 1961, one specimen.

Descriptive Notes: Although the species is well known, the extension of its horizontal and vertical range needs justification. The specimen is 9 mm. long, 4.2 mm. broad, and 4.5 mm. high. The sole is 6.5 mm. long and 2.8 mm. broad. The color is not preserved, with the exception of some dark spots in the notum. The back is densely set with caryophyllidia. There are 12 unipinnate gills. The two small areas of the labial cuticle bear slightly rough pegs. The radula contains 85 rows of about 90 teeth per half row. The innermost tooth bears as many as seven, generally three to five, denticles. About one-fourth of the length of the outer teeth is split into secondary, spinelike cusps. Their maximum number is six.

Remarks: Although the present occurrence is the first record from the Atlantic, it lies within the temperate antiboreal South American zone which is not interrupted by Cape Horn. The "Vema" collecting station

occurs near the northern limit of the Magellanic Province (Carcelles and Williamson, 1951, p. 226). In the Brazilian *Rostanga byga* Marcus, 1958, known from São Paulo and Pernambuco, the secondary cusps of the marginal teeth comprise almost half the length of the tooth. *Rostanga arbutus* (Angas, 1864), the specific name of which is an invariable noun, differs from *R. pulchra* by having 30 denticles on the innermost tooth.

Discodoris pusae Marcus, 1955

Figure 30

Discodoris pusae Marcus, 1955, pp. 147–151, figs. 151–165. Marcus and Marcus, 1967a, pp. 82–85, figs. 105–107.

Range: Florida; Puerto Rico; São Paulo (original locality).

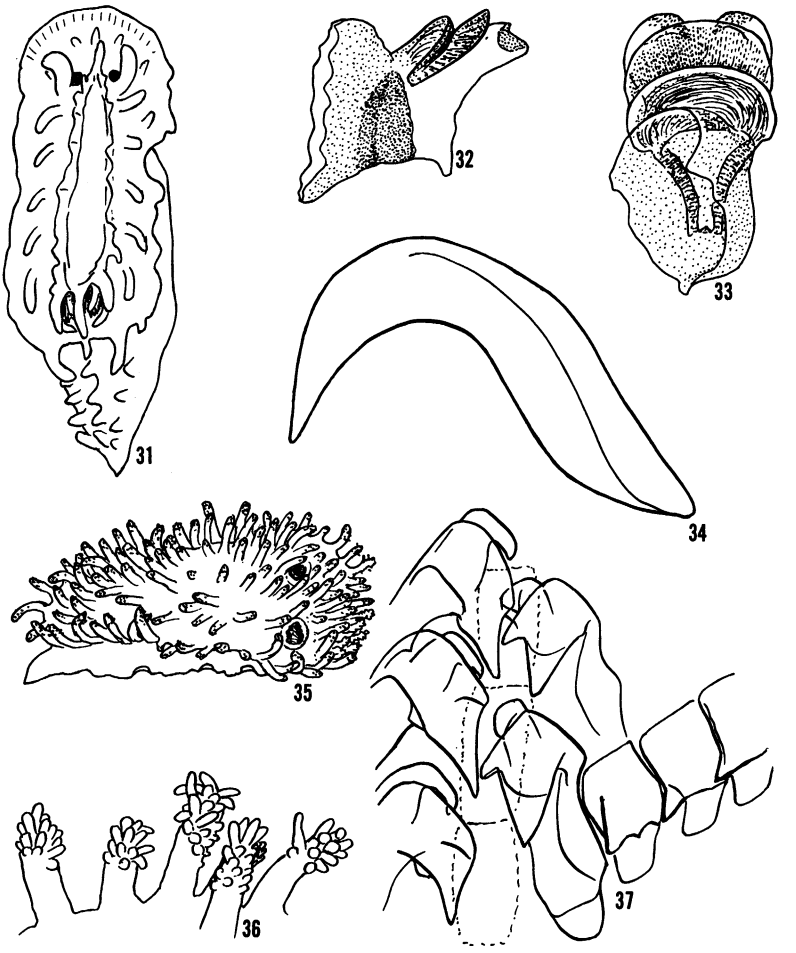
Collecting Station: Argentina, off Bahia Blanca, V-17-69, latitude 40° 56′ S., longitude 60° 10′ W., May 18, 1961, 68 meters, one specimen.

Description: The preserved animal is 13 mm. long, 11.5 mm. broad, and 7 mm. high. There is no pigment preserved; the brownish color with darker viscera shining through has no specific value. The margin of the notum is broad. The back is warty; some of the thin, long spicules, 0.3 mm. and more, project from the cutaneous eminences. The notum contains many voluminous, multicellular, glandular sacs.

The border of the branchial pocket is smooth. The seven gills are bipinnate. The large rhinophores have 16 leaves, not all of which are complete, which is a common occurrence. The tentacles are broad and flat, with blunt tips, not furrowed. The anterior border of the foot is bilabiate and deeply notched in the middle.

The labial armature consists of two fields, each 0.6 mm. long and 1.2 mm. broad. The brown rodlets are indistinctly stratified, 50 to 60 μ high, and 6 to 10 μ in diameter. The radula is 2 mm. long, 1.4 mm. broad, and comprises 21 rows. Each half row contains about 16 marginal lamellae and 25 lateral teeth; the rhachis is naked. The laterals are hook-shaped; the shaft of the innermost tooth is angled under the cusp. The marginal lamellae are thin and so densely apposed to one another that their edges, smooth or serrate, are not recognizable. The blood glands are colorless. The stomach is covered by the digestive gland. The tip of the caecum appears to the left of the pylorus which is dorsal and leads to the longitudinally folded intestine.

The ampulla (fig. 30, a) is tubular. The male duct begins with a massive prostate (q), 4 mm. long and 1 mm. thick in oil of cloves. The following tubular and winding sperm duct (d) is muscular. Its terminal section runs free in a muscular sheath (h). The ejaculatory duct and the



FIGS. 31–34. *Triopella incisa*. 31. Dorsal view of preserved slug. 32. Buccal mass, lateral view. 33. Buccal mass, dorsal view. 34. Radular tooth.

FIGS. 35–37. *Holoplocamus papposus*. 35. Lateral view of preserved slug. 36. Velar papillae. 37. Radula.

penis papilla (p) which project into the genital atrium (w) are strongly contracted, so that they cannot be described in detail.

The pallial oviduct or female gland mass (m) is not yet differentiated into albumen gland and mucous gland. The atrium receives the nidamental duct (n) and the duct of an atrial gland (g). This duct contains several, more than five, cuticular spines (c) in its thickened ectal part.

Between the atrial gland and the penis the thin vagina (v) arises, running to the voluminous reddish spermatheca or bursa (b). Close to the entrance of the vagina the coiled insemination duct (i) goes out from the bursa, reaching first the receptaculum or spermatocyst (s) and then the female gland mass.

REMARKS: Bergh (1891, p. 130) established the genus *Geitodoris* for *Doris complanata* Verrill, 1889, of which he examined one specimen (Bergh, 1894, p. 163). One of the three generic characters, prominent lobules of the anterior pedal border, is not a special structure, as Odhner's figures showed (1926a, pl. 3, figs. 43, 45). Owing to the median notch of the upper lip, its two halves may appear as bulges. The two other characters of *Geitodoris* are the differentiation of the radula into inner hooks and outer lamellae, and the absence of a prostate. There is, however, a tubular, inner, glandular section of the male duct instead of a massive gland. This difference is only a gradual one (Odhner, 1926a, p. 49) because the massive gland is also morphologically a part of the duct. Only in mature animals may one decide whether a prostate gland is lacking or not. In Odhner's system (p. 54) the absence of the prostate motivated the allocation of *Geitodoris* to the Archidoridinae, as different from *Discodoris,* which belongs to the following subfamily.

We applied Odhner's system in 1955, when we described the present species which combines a massive, *Discodoris*-like prostate with a *Geitodoris*-like radula. The similarity of the skin, the radula, and the stomach in *D. pusae* and *G. patagonica* Odhner (1926a, pp. 80–83) is striking. Because of the occurrence of the present specimen only 200 kilometers farther north than the original locality of *G. patagonica,* the problem becomes still more intricate. However, Odhner's much-contracted animals are 20 mm. long, and "there is no prostate in the male branch" (p. 83). Therefore we continue to separate *Discodoris pusae* and *Geitodoris patagonica.* Also in Odhner's *Geitodoris falklandica* (1926a, pp. 83–85), 25 mm. long, strongly contracted, "no special prostate was present." Spines in the duct of the atrial gland were not recorded for *G. patagonica* or for *G. folklandica.*

Triopella incisa (M. Sars, 1872)

Figures 31–34

Triopella incisa: G. O. SARS, 1878, pp. 310, 311, pl. 14, fig. 9, pl. 27, figs. 3a–3d.

RANGE: Coast of Norway from the Lofoten Islands to the Sande Fjord, in depths of from 220 to 550 meters.

COLLECTING STATION: V-16-48, southwestern Greenland, latitude 60° 10′ N., longitude 47° 08′ W., 300 meters, August 21, 1960, one specimen.

DESCRIPTION: The animal is 8 mm. long, 4 mm. broad, 3.5 mm. high,

and rounded in front and pointed behind (fig. 31). It is brownish transparent, with darker viscera shining through the skin. The anterior margin of the notum is ample and projects over the head. In front of the tail the notum is also broad, and its straight border bears several papillae, one of which lies in the midline. Two lateral ridges run between the rhinophores and the gills; in front they form an unpaired median crest; behind they end in three flaps. Under these flaps four cutaneous appendages surround the three small but multipinnate branchiae. The rhinophores are foliate and retractile into pits, the borders of which bear a strong papilla. Smaller papillae occur in front of the anterior crest, to the sides of the lateral ridges, and in three rows on the tail, each of four conical papillae. The lateral notal papillae are about five on each side. The anterior border of the notum shows vestiges of spicules.

The anterior wall of the pharynx, generally called a labial disc, is a wide funnel, the cuticle of which is composed of transparent prisms. The entrance of the pharynx or inner mouth is triangular, broad above, narrow below (fig. 33). The cuticle that lines the walls of this passage is strong and dark yellow. A transverse fold of the dorsal wall forms an unpaired, crescent-shaped plate with concentric structure. Behind this plate there lies a second, still higher one with radiating lines (fig. 32). The cuticle that follows on the ceiling of the pharyngeal cavity forms a right and a left pad of short rodlets; these might be called palatal teeth. The radula is 1.3 mm. long, 0.9 mm. broad, and comprises 18 rows of 24 teeth per half row. The rhachis is naked. On each side of it the teeth are shorter than in the middle of the half row, where they are 0.15 mm. high. All teeth are simple hooks (fig. 34).

REMARKS: The tail of the original material bears an irregularly lobate crest, not three rows of papillae, but this slight difference does not justify a separation of the present slug, although it is the first found outside the Norwegian coast. The size originally was 7 mm. Odhner (1922, p. 23) found slugs up to 12 mm., but that is his only addition to the first description. The species has been mentioned several times, e.g., by Bergh (1883; 1892), Eliot (1910), Fischer (1887), Norman (1893), Odhner (1907; 1939), and Thiele (1931–1935), but without further morphological details.

The original description does not include mention of the jaws. The characters mentioned above serve to demonstrate the close relationship between *Triopella* and *Aegires*. The two unpaired jaw plates of *Triopella* are morphologically not related to typical lateral mandibles. The palatal teeth are similar to those that occur in the Akeridae and Anaspidea. These convergent structures have no phylogenetic significance.

Holoplocamus papposus Odhner, 1926

Figures 35–37

Holoplocamus papposus Odhner, 1926a, pp. 42–45, text figs. 29–32, pl. 1, figs. 18, 19.

Range: Strait of Magellan, Puerto Borja, 18 meters.

Collecting Stations: V-15-102, off the eastern entrance of the Strait of Magellan, latitude 52° 53′ 3″ S., longitude 65° 35′ W., 108 meters, March 5, 1959, one specimen. V-17-69, Argentina, off Bahia Blanca, latitude 40° 56′ S., longitude 60° 10′ W., 68 meters, May 18, 1961, one specimen.

Description: The animals are transparent, 6 mm. long, 3 mm. broad, and 3 mm. high. They are rounded in front and pointed behind, where the tail projects from under the notum. The latter bears papillae that are especially dense along the border. In the northern animal the papillae are much more numerous (fig. 35) than in the southern animal, and also their shape is different. In the southern specimen the papillae are 0.5 mm. long and 0.3 mm. in diameter; in the northern animal, up to 0.8 mm. and 0.2 mm., respectively. The surface of the papillae is rough, and the frontal papillae (fig. 36) have short branched tips, especially in the northern specimen. There are traces of spicules. The under side shows the rounded oral veil flanked by the tentacles which are broadly grooved on their outer side. The oral cavity bears strong longitudinal folds. The rhinophores are retractile into little prominent sheaths. The clubs bear 10 leaves, and the rim of the sheaths is slightly rough. The five to six tripinnate gills lie far behind. The genital aperture is situated at the end of the anterior third of the body, and the anus is at the base of a dorsomedian papilla behind the gills.

The labial cuticle is delicate. The radula (fig. 37) has 45 and 50 rows in the southern and northern animals, respectively. The rhachis bears platelike thickenings without a cusp, more distinct in the northern than in the southern animal. The former has 13, the latter has 14, lateral teeth, the two innermost of which are differentiated in both animals. The first tooth is narrow and has a single hook, and the second tooth is large and bears a principal cusp, an inner denticle, and a minute spur on the outer side. The following 11 or 12 teeth are platelike. Their prominent inner corner decreases outward and disappears in the outermost plates.

The highly concentrated central nervous system corresponds to Odhner's description. The other inner organs, also described by Odhner, were not examined in the material at hand.

Remark: *Holoplocamus* had been allotted to the Polyceridae, but from these the genera with ramose processes have been removed and united

in a separate family, the Triophidae (Odhner, 1941, p. 12).

Tritonia (Candiella) australis Bergh, 1898

Tritonia (Duwaucelia) australis: MARCUS, 1959, pp. 63–66 (references), figs. 144–152.

RANGE: Burdwood Bank, latitude 53° 45′ S., longitude 61° 10′ W.; Falkland Islands; Magellanic area; south Chile, Chiloé; Juan Fernandez. The species ranges from the intertidal zone down to 137–150 meters.

COLLECTING STATION: V-17-70, Argentina, latitude 40° 32′ S., longitude 60° 19′ W., 57 meters, May 18, 1961, one specimen.

REMARKS: The separation of the genera *Duwaucelia* and *Tritonia* has been established by Odhner (1963, p. 51). Of the subgenera of *Tritonia,* only *Tritonidoxa* is well characterized by its flagelliform penis, e.g., in *Tritonidoxa wellsi* Marcus (1961b, fig. 24, b). The genus *Myrella* Odhner (1963, p. 51; new name for *Microlophus* Rochebrune and Mabille, 1889), the notal pores of which are probably openings of cutaneous glands, cannot be maintained (Marcus, 1959, p. 65; Marcus and Marcus, 1967a, p. 101). The body size, the shape of the veil, and the number of its appendages separate the subgenera *Tritonia* and *Candiella,* when full-grown living animals are available, but are sometimes insufficient for preserved specimens of intermediate size (Marcus and Marcus, 1967a, p. 209).

The present animal is small, 10 mm. long, 5 mm. broad, and 4 mm. high. The veil bears six processes on each side; the notum, eight gills. The transparent glands of the back are the most important specific character, already mentioned in the original description (Bergh, 1898, pp. 537, 538, pl. 31, fig. 21). In the specimen at hand the diameter of these glands is 0.1 mm. The anus lies behind the middle of the body, under the third and fourth branchial tuft; the genital apertures are under the second. The radula consists of 42 rows and 39 teeth per half row.

Marionia cucullata (Gould, 1852)

Marionia cucullata: MARCUS AND MARCUS, 1967a, p. 104 (references).

RANGE: Brazil, Rio de Janeiro and Santa Catarina; Argentina, between latitudes 35° and 38° 50′ S.; from intertidal rocks among *Mytilus;* ranging down to 146 meters.

COLLECTING STATION: V-17-70, Argentina, latitude 40° 32′ S., longitude 60° 19′ W., 57 meters, May 18, 1961, one specimen.

REMARKS: The present specimen is small, 20 mm. long, 6 mm. broad,

and 4 mm. high. The border of the notum bears 12 tufts of gills; the front margin of the veil, eight processes on each side. The sheaths of the rhinophores are smooth, and the clubs have about eight tripinnate crests. The solid brown jaws are 5.5 mm. long, 3.5 mm. broad. The radula has 38 rows and 54 teeth per half row. The fine oblique striation of the lateral teeth (Bergh, 1884, p. 51; Odhner, 1926a, p. 40) is distinct. The stomach plates are as shown in Odhner's text figure 68 (1934, p. 297). The right liver is quite separate from the left or main liver. The anterior gut contains anthocodia of alcyonarians.

Dendronotus frondosus (Ascanius, 1774)

Dendronotus frondosus: ODHNER, 1907, pp. 19, 64, 65, pl. 3, fig. 18. LARSEN, 1925, pp. 38–42, text figs. 30–33, pl. 1, fig. 9. ODHNER, 1926b, pp. 17–19, text fig. 13; 1936, pp. 1105–1109, text figs. 3, 4, 39a. MARCUS, 1961a, pp. 34–36 (references), pl. 7, figs. 121–124. MACFARLAND, 1966, pp. 256, 257.

RANGE: Arctic zone; North Atlantic, including western Baltic; North Pacific. Southern limits: France, Arcachon; Massachusetts, Cape Cod; California, Monterey area; middle Japan, Toyama Bay, latitude 36° 42′ N., longitude 137° 13′ E. (Abe, 1964, p. 87). Vertically the species ranges down to 400 meters.

COLLECTING STATION: V-16-65, Newfoundland Bank, latitude 46° 47′ N., longitude 56° 22′ W., 42 meters, September 9, 1960, one specimen.

REMARKS: The present, somewhat damaged animal is 30 mm. long and higher than broad; the sole is contracted. The radula has 42 rows and 11 lateral teeth per half row. The cusp of the median tooth is smooth. The lateral teeth bear up to 10 strong denticles, but these characters are variable (Odhner, 1926b; Marcus, 1961a). The outermost tooth has no cusp. Lemche (1941, p. 24) called the species arctic boreolittoral.

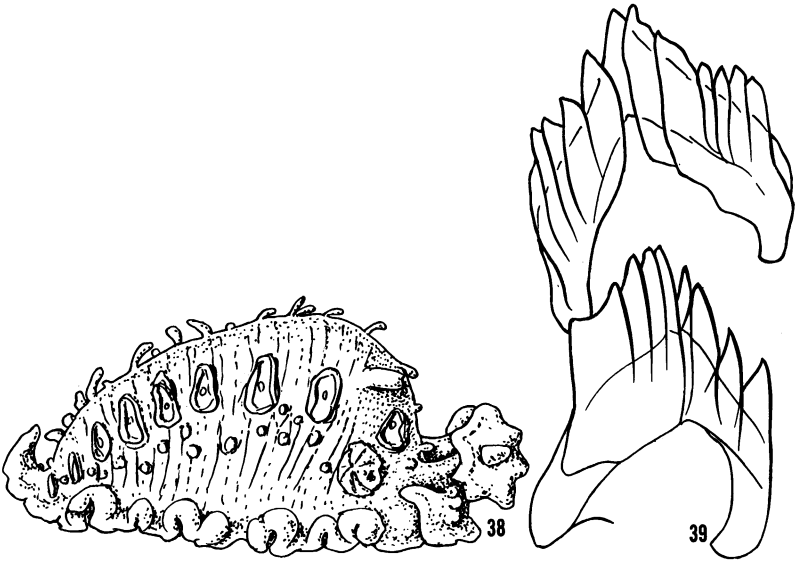
Doto fragilis umia, new subspecies

HOLOTYPE: A.M.N.H. No. 146379.

COLLECTING STATION: V-17-29 RD, southwest Greenland, latitude 60° 27′ N., longitude 48° 31′ W., 366 meters, September 4, 1961, two specimens.

DIAGNOSIS: There are as many as 12 left and 11 right cerata, hence more than in *Doto fragilis fragilis* (Forbes, 1838). Papillae, not tubercles, occur along the dorsal midline.

DESCRIPTION: The animals are about 10 mm. long, 6 mm. high, and 4 mm. broad. One specimen had 12 left and 11 right cerata; the other



FIGS. 38, 39. *Doto fragilis umia*. 38. Lateral view of preserved slug without cerata. 39. Radula.

had 10 and nine, respectively. Only in one specimen are the two small hindmost cerata retained. All the others have fallen off, a common occurrence, hence the specific name, but such is not always the case (Bergh, 1889, p. 696), in *D. fragilis fragilis*. The color is pinkish brown, with lighter dorsomedian papillae and lateral tubercles. Traces of brown granules occur in folds around the insertions of the cerata. The body is thickest in front of the middle and attenuated behind. The border of the foot is frilled, and slightly notched and furrowed in front.

The veil is broadly lobate on the sides; a gibbous ridge extends from the rhinophoral sheath forward. The jagged rim of the wide sheath, with about 10 points, surrounds the contracted, somewhat folded club. One of the present animals has a dorsomedian row of about 18 high papillae; the papillae are quite low in the other. The large, longish cicatrices of the cerata have thick borders around a central pit, the vestige of the hepatic branch, and circular muscle fibers closing the blood spaces. The larger of the remaining cerata bears three circles of five to seven conical tubercles. As this is one of the smallest cerata, these numbers have no systematic value, nor can we indicate the occurrence of the gill, generally absent from the hindmost cerata. Under the row of cerata is a row of clusters of about three light tubercles between every

two scars. The genital aperture lies under the foremost cerata, the anal papilla above them.

The jaws are delicate, and their masticatory process is smooth. The radula consists of 100 teeth, the central cusp of which is not prominent (fig. 39). On its sides there are about five asymmetrical denticles. The posterior sinus of the tooth is a broad triangle. The penis is strongly contracted, so that the sinuous course of the ejaculatory duct cannot be considered a specific character.

The name of this subspecies is derived from "umiak," an open Eskimo boat.

REMARKS: *Doto fragilis umia* has more cerata than any other species of *Doto,* having one more pair than *D. japonica* Odhner (1936, p. 1120; Baba, 1949, p. 171). *Doto fragilis fragilis* has as many as nine pairs, and this character distinguishes it from *D. f. umia.* The papillae in the dorsal midline of *D. f. umia* are "too long to be called tubercles" (Eliot, 1910, p. 125), so differ by degree from the elevations in *D. f. fragilis.* Similar papillae occur in *D. pinnatifida papilligera* Eliot (*loc. cit.*). Also *D. pinnatifida* has as many as nine pairs of cerata, but the black spots, recognizable also in preserved condition, separate *D. pinnatifida* from *D. fragilis.*

Doto fragilis is a boreal species. It occurs on the southern coast of Iceland, where one specimen has been found (Lemche, 1938, p. 16), at the Faroes, the Shetlands, the coast of Norway, along the west coasts of Europe, and in the Mediterranean. Vertically *D. f. fragilis* ranges down to 200 meters.

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