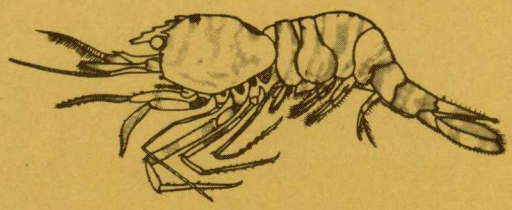
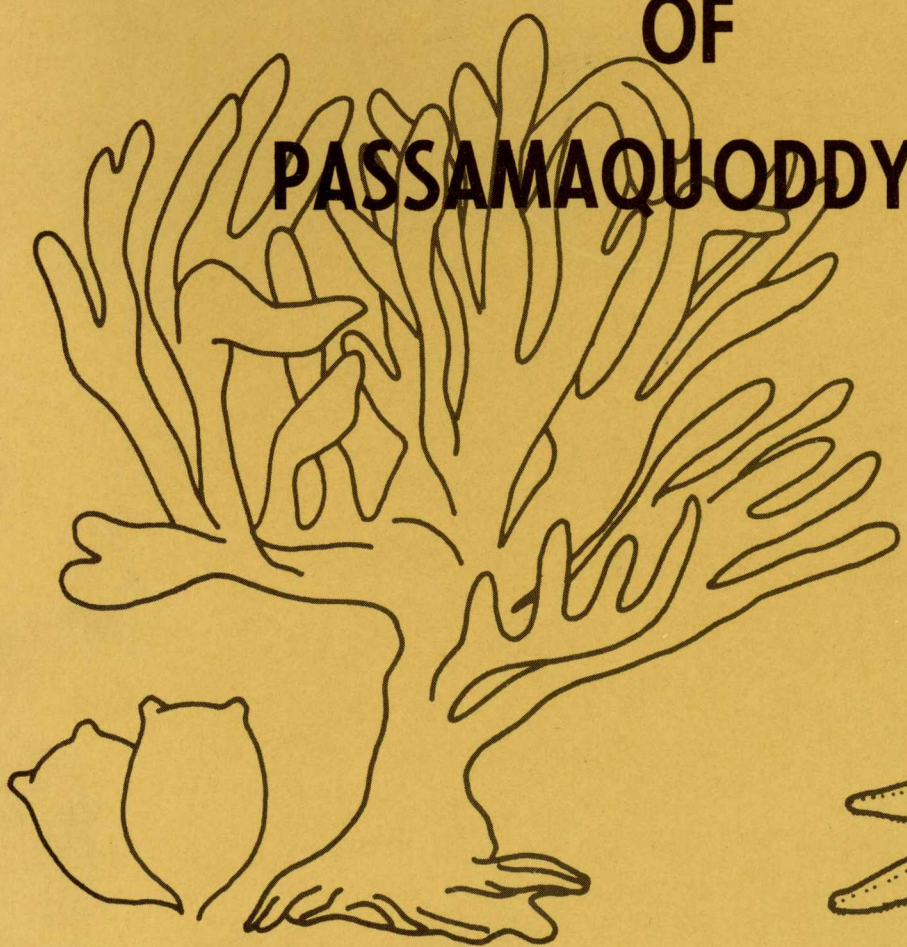
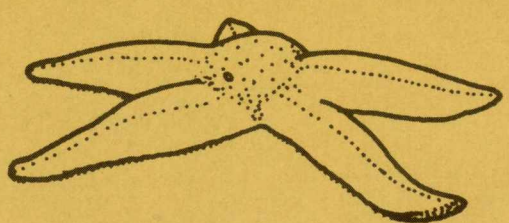


A PRELIMINARY GUIDE TO THE LITTORAL AND SUBLITTORAL MARINE INVERTEBRATES OF PASSAMAQUODDY BAY





A PRELIMINARY GUIDE TO THE LITTORAL AND SUBLITTORAL MARINE INVERTEBRATES OF PASSAMAQUODDY BAY

by

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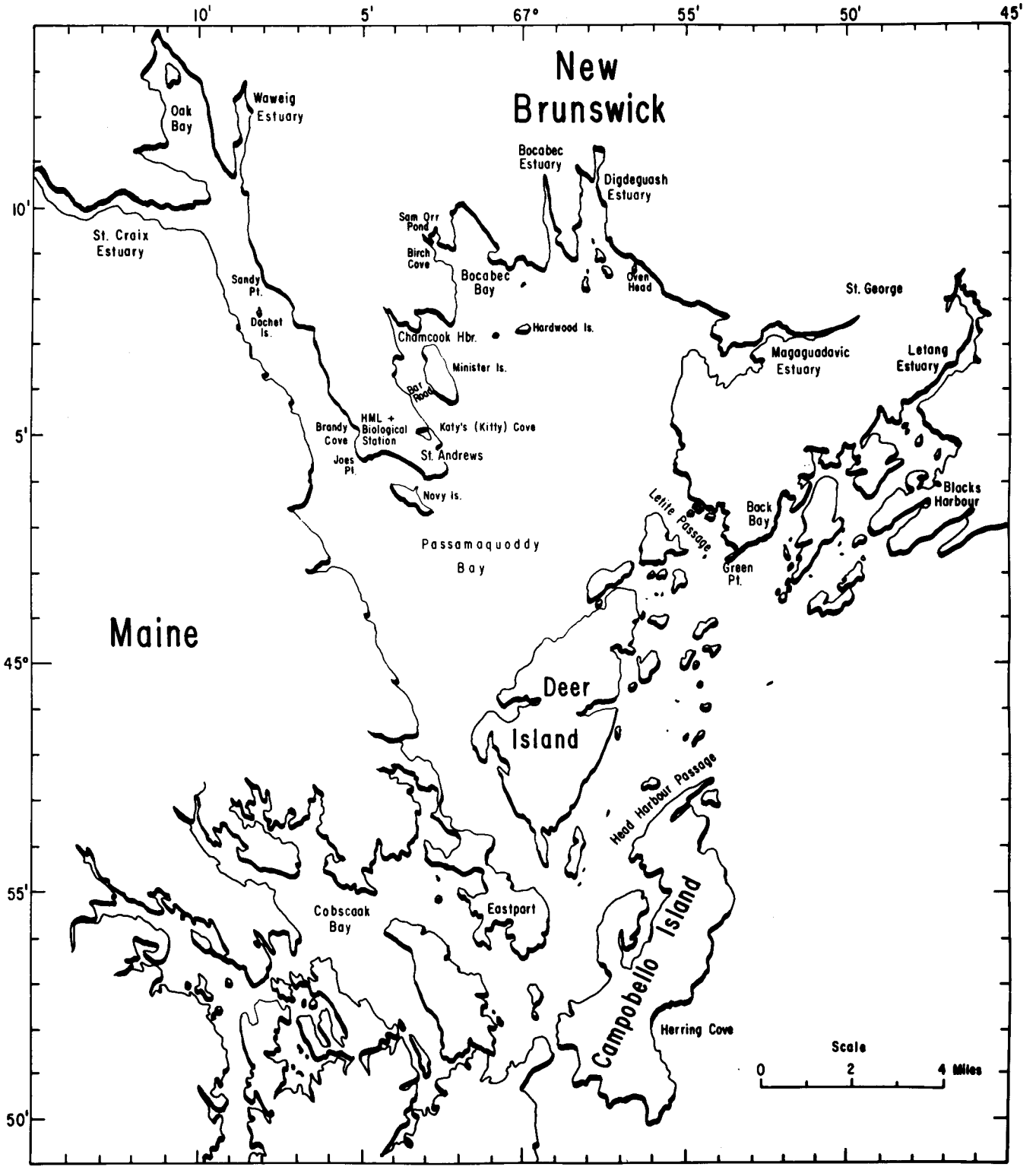


Figure 1. Map of Passamaquoddy Bay, New Brunswick-Maine, showing locations mentioned in the text.

Figure 2. Bathymetric map of Passamaquoddy Bay and nearby waters.

INTRODUCTION

This guide was drawn up from the collections of the Identification Center of the Environment Canada Biological Station, St. Andrews, N. B. together with relevant literature records.

The Center maintains a collection and a locality index. This material is derived from studies made by the staff of the Biological Station and by visiting professors and students of the Huntsman Marine Laboratory. It provides a service to these groups and to the scientific and lay communities in making identifications of limited collections.

The guide is intended to be a working document. It will be improved only by input from the users, so please

1. Let the Director of the Biological Station know about errors and omissions
2. Deposit properly identified specimens and reliable fauna lists with the Center so that others can benefit from your expertise - the guide is primarily based on specimens lodged in the collection.

A precise definition of the geographical area and habitat range covered would be impossible. Basically, the guide should enable identifications of the common intertidal invertebrates and those obtained from dredgings. Microscopic forms and parasites are not included, nor are vertebrates. Fish and parasitic forms will be covered in a future guide, currently in preparation. While the collections on which this is based are drawn primarily from the area around St. Andrews, New Brunswick, the guide could probably be used to advantage on at least the Atlantic coasts of the three Maritime Provinces and the State of Maine.

ACKNOWLEDGMENTS

J. M. Anderson, former Director of the Biological Station, provided funds for the Senior Editor to reorganize the old St. Andrews Biological Station museum collection, using HML laboratory space. H. Gow assisted with that phase of the work. The station then established the Id. Center and E. I. Lord has looked after the collection since then. This guide was initiated as the major project of the Id. Center.

Special advice and use of published illustrations were obtained from the following:

Cnidaria: A. Voss

Platyhelminthes: I. Ball

Polychaeta: T. Lacalli

Oligochaeta: D. G. Cook

Mollusca: R. D. Turner, W. Baranowski and J. M. Reinhart

Cumacea: S. Corey

Isopoda: F. Rafi

Amphipoda: E. L. Bousfield

Caprellidae: D. R. Laubitz

The drawings were done by J. Andrews, L. Linkletter, A. Johnston and M. Thinh (R.O.M. - Platyhelminthes). Approximately half of the drawings are originals, the remainder are redrawn and adapted from the illustrations of authors listed in the bibliography.

T. Lacalli, I. Ball and M. Owen critically read the manuscript.

Finally, we are grateful to B. J. McCullough for her cheerful cooperation in the typing of this manuscript.

I. THE PARAZOA

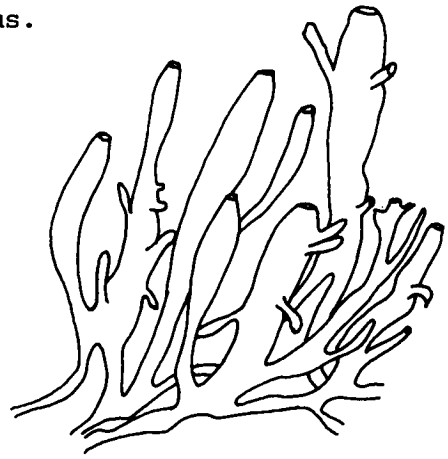
PORIFERA: The Sponges

Adult sponges are attached to solid objects, and they do not draw away when touched, though the many openings leading into the central space may close when disturbed. They may form encrusting colonies or more upright lobed masses, often brightly coloured. The body is supported mechanically by a variety of spicules, sometimes with fibrous material. The bath sponge is the fibrous skeleton of a dead sponge, which is a warm-water species lacking spicules.

CLASS CALCAREA

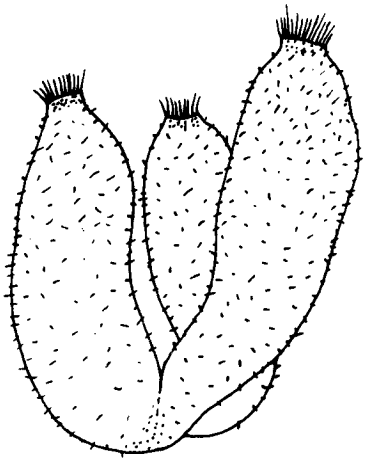
Solitary or branching assemblages of little vase-like individuals with single exhalent openings. Spicules all calcareous.

Leucosolenia botryoides (Fleming), the colonies have tubular individuals up to 20 mm high by 1.5 mm in diameter. They rise from a base which may be a simple stolon or a network. The pores are microscopic. The color is dingy white. Found between 18-117 meters.



X4

Scypha ciliata Fabricius, may be solitary or in clusters, with the unbranched vaselike individuals up to 12 mm high by 3 mm in diameter. The osculum is surrounded by a fringe of spicules. This fragile sponge is a dull brown color. Found intertidally to 102 meters. It is sold commercially as *Grantia*.

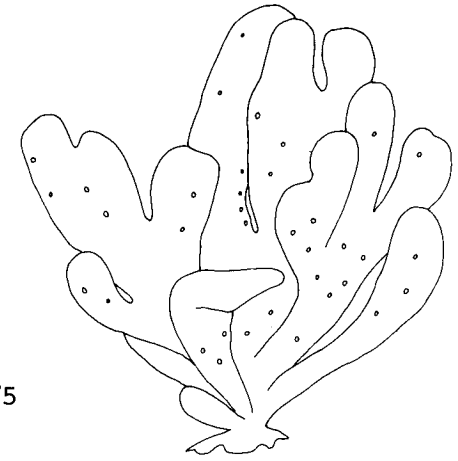


X5

CLASS DESMOSPONGIA

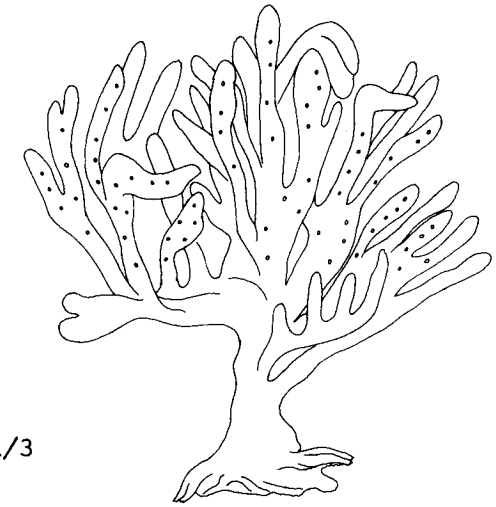
Various larger sponges, spicules siliceous.

Isodictya deichmannae (deLaubenfels), up to 30 cm, consists of a short stalk which gives rise to many upright, flattened branches, about 10 mm thick, and 30-40 mm wide. The surface is minutely lumpy with small oscules with raised rims, on the branches. The color is brown, black or yellowish-red. Subtidally to 40 meters.



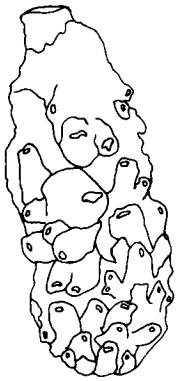
X1/5

Haliclona oculata (Linnaeus), the "Finger Sponge", up to 20 cm, consists of a short stalk which gives rise to many upright fingerlike branches which fork and divide. In cross-section the branches are oval or slightly flattened. The surface is minutely lumpy with minute oscules, without raised rims, on the branches. The color is yellowish or dull lavender. Intertidally to 140 meters.



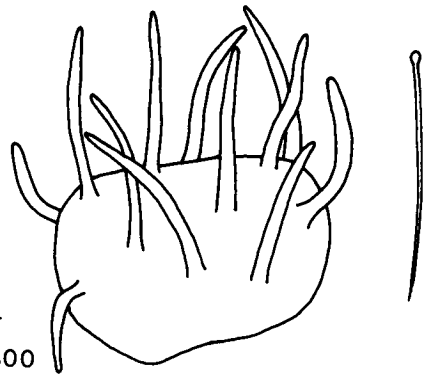
X1/3

Halichondria panicea (Pallas), the "Bread Crumb Sponge", has a variable shape, usually less than 1 cm thick but spreads laterally indefinitely. The surface is soft and smooth with shallow undulations and conspicuously raised oscules. The most common color is olive-green, but it may be grey, yellow or orange. Common intertidally to 90 meters growing on the underside of overhanging rock ledges.



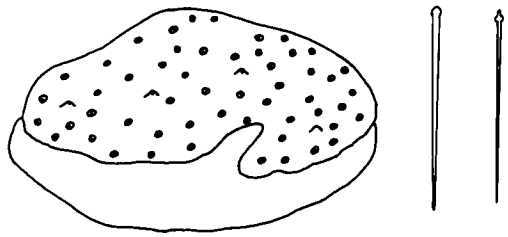
X6

Polymastia robusta (Bowerbank), up to 50 mm, is subspherical with long, slender, fingerlike projections. The surface is smooth with minute oscules. The color is yellow, grey or orange-red. Subtidally to 45 meters encrusting stones and shells.



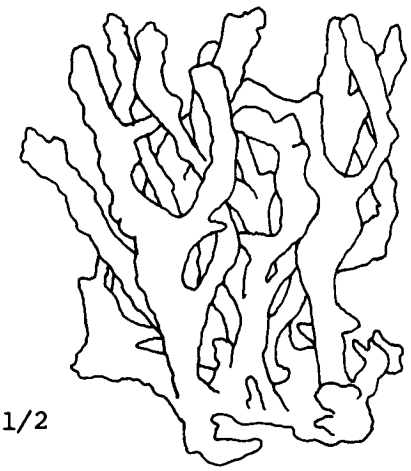
colony X1
spicule X300

Cliona celata Grant, the "Sulfur or Common Boring Sponge" has a variable shape, up to 200 mm wide; it excavates tunnels in calcareous material. The surface is soft with minute rounded papillae. The color is yellowish. It has a very unpleasant odor and is found intertidally to 40 meters.



colony X1
spicule X300

Microciona prolifera (Ellis and Solander), the "Redbeard Sponge", up to 15 cm, is encrusting when young but as it grows it rises into irregular branches ultimately producing a complexly branched sponge. The branches, 2-5 mm in diameter, are more or less flattened with abundant oscules scattered over the surface. The color is bright red to orange-brown. Found intertidally to 30 meters encrusting stones, shells and on wharf pilings.



X1/2

II. THE RADIATE METAZOA

CNIDARIA: The Hydroids, Jellyfish and Anemones

This phylum is characterized by all members having nematocysts, which are stinging cells used for the capture of prey. The nematocysts are usually carried on tentacles. These animals usually exhibit radial symmetry. The body can be jellylike, muscular or have a calcareous exoskeleton and has central water-filled space which is used in conjunction with the muscles of the two body layers and the secreted mesoglea between them, to maintain body shape and permit movement. The same space is used as a digestive cavity.

The hydroids may be solitary but are more often found as branched colonies attached to solid objects including the larger algae. They often superficially resemble plants. The hydroids often produce medusae, which resemble tiny jellyfish.

The sea anemones are much larger single polyps, again found attached to the substrate, but the true jellyfish is a large swimming form.

From a very simple basic plan the group has evolved an exceedingly wide diversity of forms.

The burrowing anemone *(Edwardsia)* may be mistaken for a worm or perhaps for the burrowing holothurians (compare *Molpadia, Chiridota).*

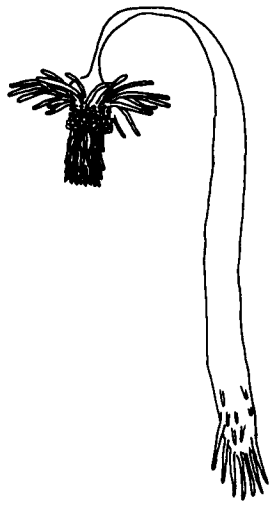
CLASS HYDROZOA: The Hydroids

While the solitary *Hydra* may be familiar, the colonial *Obelia* is more typical of the forms encountered on the seashore. The athecate forms are those in which the outer covering of the "branches and roots" does not cover the naked "animal" at the end of the "branch". The thecate forms have this outer covering extended so that the "animal" can withdraw into a protective cup, as in *Obelia.*

Do not confuse these colonies with the Ectoprocta (q.v.).

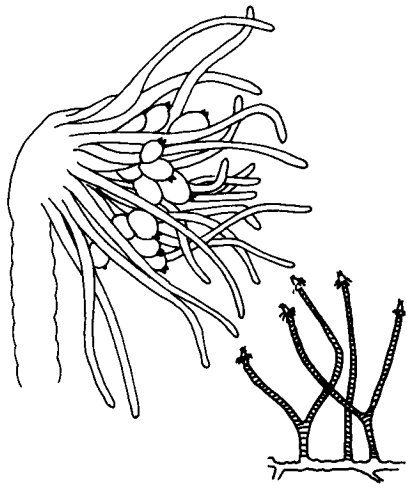
ORDER ATHECATA

Corymorpha pendula Agassiz, is a solitary form, up to 100 mm, with the stem which is slender at the top, gradually becoming bulbous or club-shaped at the base. It is not annulated. The pink hydranths have a proximal whorl of 30 long, filiform tentacles and several distal whorls of short, filiform tentacles. The gonophores, just distal to the proximal tentacles, are oval with a single large and 3 rudimentary tentacles. On muddy bottoms from just below low water to 90 meters.



X1

Tubularia larynx Ellis and Solander, is the smallest (20-50 mm) of the 3 common *Tubularia* of this region. The colonies are branched with the stems extensively annulated and the hydranths, which are bright pink, have 2 distinct whorls of filiform tentacles, each whorl having approximately 20 tentacles. The gonophores have radial canals and apical processes which are conical. Subtidally on rocks and pilings to 45 meters.



X15

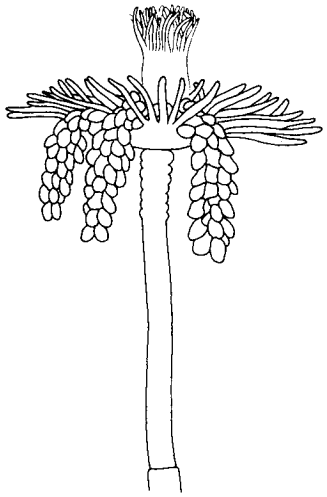
colony X1

Tubularia crocea (Agassiz), the colony is a cluster of long stems (75-125 mm) not annulated, which are unbranched or sparsely branched. The hydranths are rose-colored with 2 distinct whorls of filiform tentacles, each having 20-24 tentacles. The gonophores are without radial canals and with the apical processes laterally compressed. Subtidally to 55 meters on pilings and sometimes in brackish water.

X15

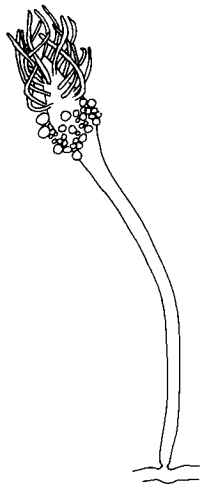
colony X1/4

Tubularia couthouyi (Agassiz), the colonies are clusters of unbranched stems up to 150 mm tall, the stems are annulated only at intervals. The hydranths are scarlet in color, with 30-40 long proximal filiform tentacles and around 50 shorter and smaller distal filiform tentacles. The gonophores have radial canals but are without apical processes. Subtidally to 120 meters and is generally not found alive in summer.



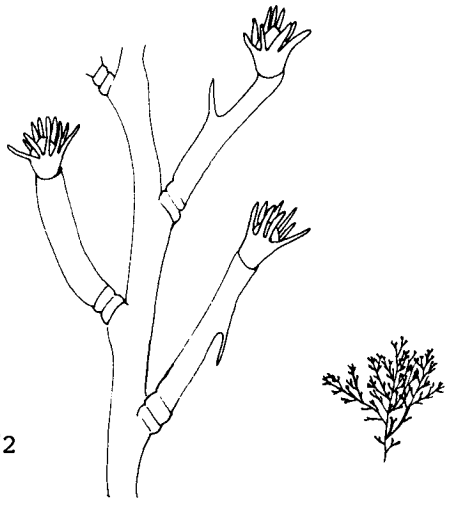
X2

Clava leptostyla (Agassiz), the zooids are usually about 10 mm in height and have pink hydranths with filiform tentacles only. The tentacles which number between 20-30 are scattered on the hydranth with the sporosacs clustered below. They are pink, the females having bluish gonophores clustered below the tentacles in summer. Most commonly in small clusters on *Ascophyllum* and *Fucus* in the low intertidal region.



X10

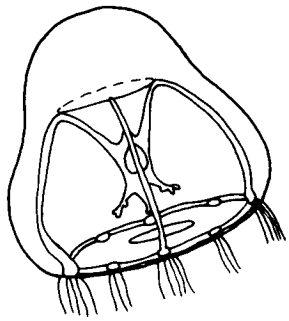
Bougainvillia carolinensis (McCrady), an irregularly branched colonial hydroid, up to 300 mm high, with long stems fascicled proximally, and having branches annulated at the base. The gonophores are scattered over the stems and branches. The color is brownish-red. Commonly found intertidally and in shallow water on docks, pilings, etc.



X15

colony X1/2

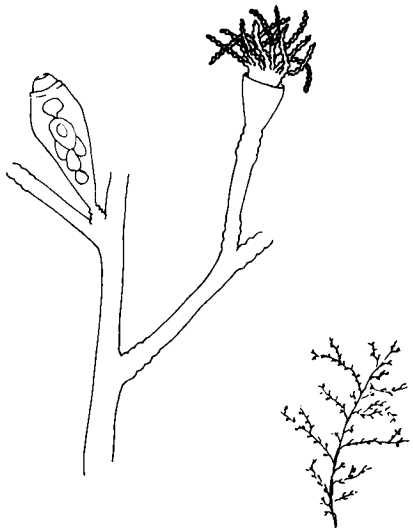
Rathkea octopunctata (Sars) has only the medusa stage known, which is bell-shaped, 3-4 mm high, with a short 4-sided stomach, on a conical peduncle, the mouth has 4 lips, each with a pair of oral tentacles. It has 4 well developed radial canals and 8 clusters of marginal tentacles, with 3-5 in each perradial and 3 in each interradial group. Subtidally in the spring and early summer.



X10

ORDER THECATA

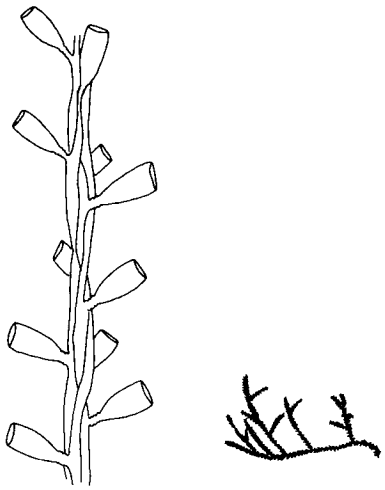
Obelia sp. The numerous species belonging to this genus have a regularly branched stem which may be simple or fascicled. They have a flowerlike hydranth which has an inner diaphragm or annular thickening at its base, but lacks an operculum; also gonangia which are not ringed, arising from the axils of the branches. The medusae, which are set free, have 8 or more marginal tentacles with 8 sense organs, or lithocysts, situated between the bases of the tentacles. Very common on *Zostera*, *Laminaria*, floats, piles, etc.



X20

colony X1

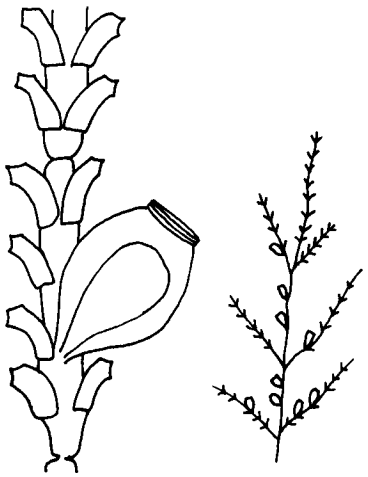
Lafoea fruticosa (Sars), the mature stem is fascicled, with many large regularly arranged branches, sometimes all on one side of the stem. The pedicels are relatively long, with 3 or 4 twists, passing out at a 45° angle to the stem. The hydrotheca is large and tubular with no teeth on margin, no diaphragm and it is open at the top, no operculum. The gonangia are gathered in masses (coppinia) with small, irregular facets and tubes that are very long and thin. The colony reaches a height of 50 mm. Found from 5-957 meters.



X10

colony X1

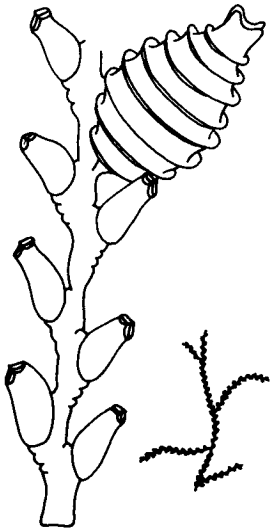
Sertularia pumila (Linnaeus), the colony may reach a height of 50 mm; the main stem is divided into irregular internodes but the branches are usually strictly opposite, given off at a wide angle. The hydrotheca, opposite or subopposite, lacks stems and is closely appressed to the stem or branch, the margin has 2 teeth and the operculum is made up of 2 flaps. The gonangia are obovate, smooth or very slightly rugose, with a narrow collar and wide aperture. Common on intertidal brown algae in protected waters to 55 meters.



X10

colony X2

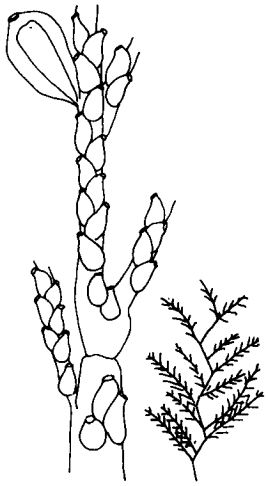
Sertularella polyzonias (Linnaeus), the colonies of this species are 50-150 mm in height, the stem is not fascicled and branches irregularly. The hydrothecae, which are relatively large and urn shaped are alternate with one hydrotheca per internode, they have 4 teeth and the operculum has 4 flaps. The gonangia are large and oval with 4 distinct stout spines or teeth on the margin; the surface is strongly rugose. Commonly found subtidally to 274 meters on stones, shells and seaweed.



X12

colony X1/2

Hydrallmania falcata (Linnaeus), the colony may reach a height of 300 mm; the main stem is divided into regular internodes with short primary branches which are pinnately branched. The tubular hydrothecae are arranged in a row on one side of the branches, with the distal portions turned alternately to right and left, there are 5 or 6 per internode. The gonangia are oval, smooth or slightly ridged, with tubular necks. A common subtidal species.

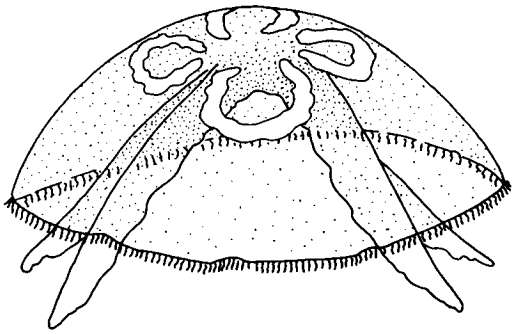


X5

colony X1/4

CLASS SCYPHOZOA: The Jellyfish

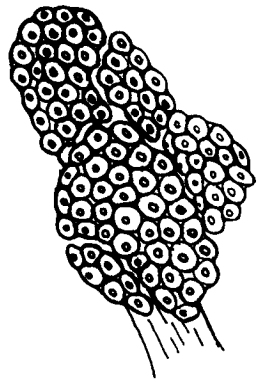
Aurelia aurita (Linnaeus), is the "Common White Jellyfish" or "Moon Jelly"; the disc is flat, between 150-250 mm in diameter and is completely surrounded by numerous short, fringelike tentacles, alternating with the same number of tiny lappets. The color is translucent milky white or light yellow-brown. The 4-sided mouth opening is extended perradially into 4 tapering sinuous mouth-arms, and the 4 horseshoe shaped gonads, pale pink in the male and white in the female are situated interradially between the mouth-arms. Often found stranded on the beach, otherwise pelagic in habit.



X1/4

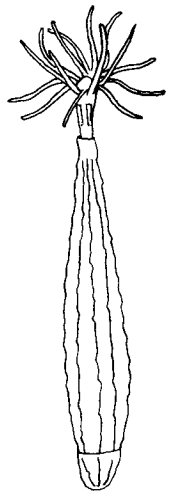
CLASS ANTHOZOA: The Anemones and Soft Corals

Gersemia rubiformis (Pallas), a "Soft Coral", is a colonial anthozoan with a skeleton of calcareous spicules. It is branched into stout, blunt lobes in the form of short cylinders terminating in circular oral discs of 8 pinnate tentacles. The main stem, covered by red spicules is especially characteristic and its branches are often club-shaped with clusters of polyps. The colony is firmly attached to hard substratum and is found from the intertidal zone to 90 meters.



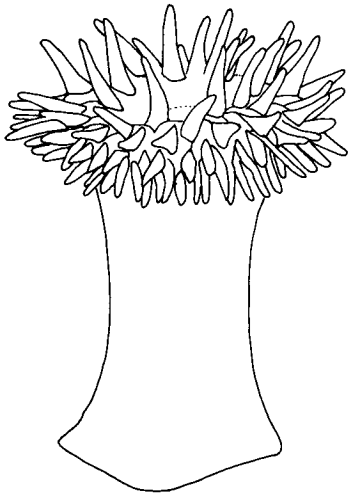
X1

Edwardsia elegans (Verrill), this species is from 35-150 mm long and 20 mm in diameter. It normally has 16 slender and very mobile tentacles. The middle portion of the body has 8 longitudinal grooves and is covered by a rough brown cuticle to which sand adheres. The disc is cone shaped and striped with 8 reddish or purplish-brown lines separating the 8 labial lobes; the tentacles are yellowish to pale flesh color. Intertidally under stones and burrowing in sand, gravel or mud with only the tentacles exposed.



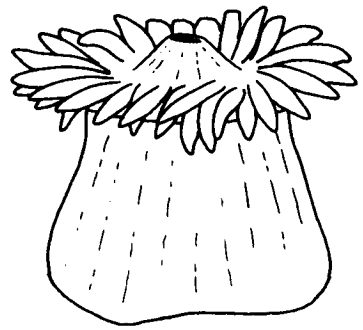
X1

Tealia felina (Linnaeus), the "Dahlia Anemone", 120 mm high by 50 mm wide, has fully contractile tentacles in 5 cycles (10-10-20-40-80) that can extend well beyond the top of the column. The column, which has a wide base and strongly developed sphincter, is covered in grey, sticky warts to which pieces of shell and gravel adhere. The column is streaked or blotched and is generally greenish in shallow water and reddish in deeper water; the tentacles are banded. On the middle or lower shore in shaded pools and cracks in rocks, and under *Laminaria* and stones.



X1/2

Bunodactis stella (Verrill), the "Gem Anemone", 50 mm wide and 35 mm high, has between 48-96 tentacles in 4 or 5 cycles. The sphincter is less developed than in *Tealia*. It has wartlike elevations in longitudinal rows. The color ranges from pale pinkish or greenish to dark green. In tidepools, sometimes partially buried in the sand.

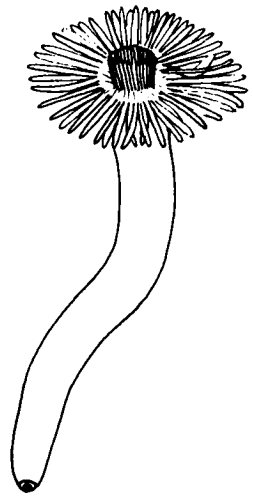


X2

Metridium senile (Linnaeus), the "Plumose Anemone", 75 mm wide and 100 mm high, has numerous (ca. 1000) short, slender tentacles which give a feathery appearance. It has a well developed sphincter and the disc is very wide and deeply lobed into about 6 or 8 curving sections. The coloration is pale brown, orange, salmon pink, cream or white. It attaches to hard surfaces on the lower shore, on rock overhangs, clefts, under stones and on pier piles.

X1

Cerianthus borealis Verrill, a wormlike anthozoan, is characterized by its large size being 180-230 mm long, 50 mm wide and having an expanded tentacle diameter of 140 mm. In a relaxed state it is elongate tapering basally and has a rounded aboral end. At the oral end is an oral disc bearing 2 sets of simple, slender tentacles, an outer marginal set and a shorter inner oral set. It constructs a rough thick tube of mud and mucus up to 600 mm. The body is brown to grey with a pale yellow-brown disc and is found from 45-480 meters.

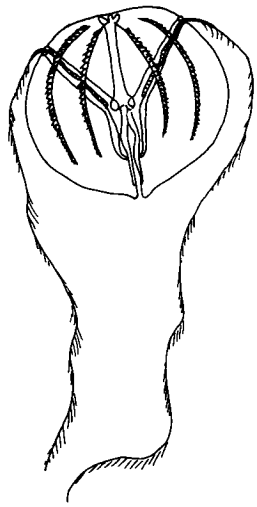


X1/3

CTENOPHORA: The Comb Jellies

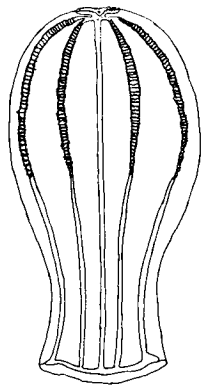
These are fragile, jellylike, transparent animals using 8 rows of comblike arrays of cilia for locomotion. They are without nematocysts and lack organ systems. Habit is planktonic.

Pleurobrachia pileus (Fabricius), has a more or less globular, egg-shaped body, about 20 mm in length and 15 mm wide. It has 2 long tentacles, with many side branches, arising from deep sheaths into which they may be withdrawn. It is distributed in all seas and may be found in tidepools at low tide.



X1

Beroë cucumis Fabricius, a larger thimble-like species without tentacles or lobes. 35-115 mm tall. Young are sac-like and often found in estuaries. When in motion, cilia bands create a rainbow effect of color.



X1

III. THE ACOELOMATE BILATERIA

PLATYHELMINTHES: The Flatworms

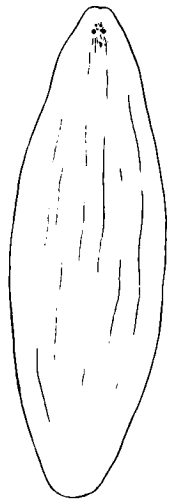
In general, flatworms are well named as they are usually flattened worms that creep about. They have no coelom or other body cavity, and they locomote by means of cilia or by a muscular shrugging motion.

CLASS TURBELLARIA

The smaller forms (Acoela, Rhabdocoela) are ignored, as are the parasitic forms (Classes Trematoda, Cestoda), which will be treated separately. The form of the intestine serves as the simplest means of separating the orders.

ORDER ALLOEOCOELA

Plagiostomum album Hyman, has a white, plump, cylindrical body about 4 mm long, and is often found on algae and under stones in the intertidal zone, where it resembles a chalky white lump until disturbed. It has two pairs of eyes that are almost obscured by a patch of pigment, and the body has a very fine pigment reticulum.



X15

ORDER TRICLADIDA

Procerodes littoralis (Ström), has an elongate oval body, narrowest anteriorly, and is up to 8 mm long. It has well developed tentacles and 2 eyes set in white streaks. Usually dark in color, some shade of brown. Very active, frequently waving its head while gliding, and often it 'lopes' along. A common species, it is found on gravelly bottoms, under stones, and on algae from the lower intertidal zone to several meters, and is very characteristic where fresh water enters the sea.

X10

Foviella affinis (Oersted), has a plump elongate body with parallel margins and is up to 12 mm long. It has two eyes and the head tends to a triangular shape. The color is usually some shade of brown with a distinct yellowish or greenish hue, and occasionally forms with a longitudinal stripe may be found. This species is not very active and may be found in small numbers under large rocks, embedded in the mud, in the intertidal zone.

X5

Uteriporus vulgaris Bergendal, is a delicate slender species, up to 7 mm long. The head is rounded and there are 2 close-set eyes. Always pale in appearance, the color may be milky-white, yellowish-orange, or brown. There are two genital pores, as well as the pharyngeal pore, on the ventral surface. Although never numerous, the species may be found under rocks in the intertidal zone.

X10

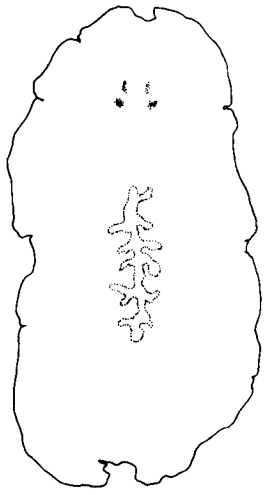
Monocelis sp., is a slender and very active worm about 5 mm long. The anterior end is narrow and has a single eye, or pigment spot, in front of a circular statocyst. The posterior end is spatulate or triangular. The pharynx and mouth are in the middle of the body and the copulatory organs are posterior. Usually some shade of brown with or without longitudinal stripes. Found under rocks and among algae in the intertidal zone.

X15

ORDER POLYCLADIDA

Notoplana atomata (Müller), has an elongate oval body, often crenate, up to 20 mm long. When gliding normally the head is generally broader than the rest of the body. It has no tentacles and there are four eye clusters. The ruffled pharynx lies in the middle of the body. The color is various shades of brown. Commonly found under stones, on algae, and in tidepools, from the intertidal zone to 90 meters.

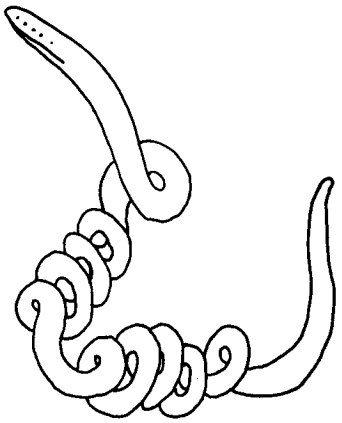
X3



RHYNCHOCOELA (NEMERTEA): The Boot Lace Worms

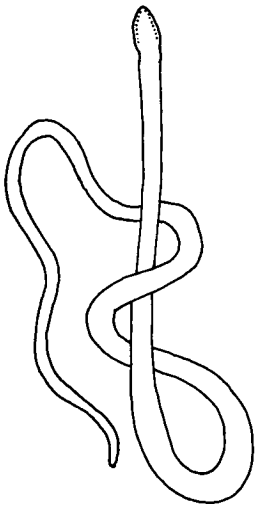
These worms are elongate, unsegmented worms without a body cavity. They are superficially like elongate flatworms. They are capable of an amazing degree of contraction and extension. Often brown, red or black and somewhat rubbery, one of them is broader and is often a light creamy color. The latter *(Cerebratulus)* is often cut in pieces when digging in mud, and the isolated sections are hard to recognize.

Lineus socialis (Leidy), is a common, often gregarious worm with a long, up to 150 mm, slender body with no caudal cirrus. The head region is narrow with long cephalic grooves and 2-8 pairs of small ocelli grouped in rows on either side. The body contracts by coiling into a spiral. The color is brownish, darker on the dorsal surface and on the head. Intertidally under stones, in crevices and among mussels.

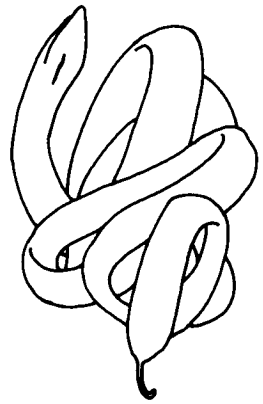


X1

Lineus ruber (Müller), is a common worm with a long, up to 150 mm, moderately slender body with no caudal cirrus. The head region is slightly wider than *L. socialis*, with shorter cephalic grooves, it has 3-8 pairs of ocelli on each side. The body contracts by shortening and thickening, not by coiling into a spiral. The color varies from red to greenish-black. Intertidally under stones and among shells.

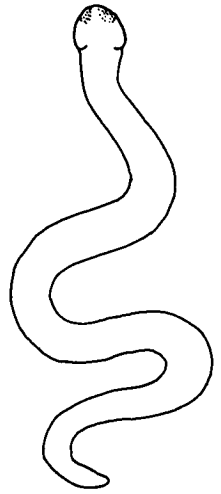


Cerebratulus lacteus (Leidy), is the largest Eastern Atlantic nemertean, up to 120 cm long. The body is firm, long and ribbonlike, much flattened in the intestinal region with thin lateral margins well adapted for swimming. It has a caudal cirrus which is easily broken off in handling. The head region has longitudinal cephalic grooves, no ocelli and a large slotlike mouth. The body is less contractile than in other genera. The color varies from cream to light red. Intertidally under stones, and in mud and sandy mud near low water.



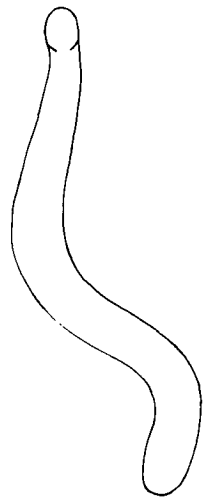
X1

Amphiporus frontalis Verrill, has a long, up to 120 mm, stout body tapering slightly to a bluntly rounded posterior end. The head region is broad, more or less triangular, with 2 pairs of shallow, oblique grooves and 6-10 pairs of rather large ocelli in an irregular double row on each side. The color varies from white to pale grey or yellowish. Near low water.



X1/3

Amphiporus groenlandicus Oersted, up to 80 mm long, has a stout body with the ends rounded. The head region is without ocelli, has transverse cephalic grooves, but is not demarcated from the body. The color is dark brown dorsally and lighter ventrally. Found subtidally to 450 meters.



X1

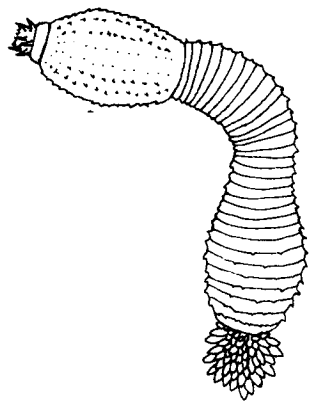
IV. THE MINOR PHYLA

The Aschelminthes are largely neglected here, as in many other guides to non-parasitic organisms. The Acanthocephala are all parasites, as are many of the Nematoda. No attempt has been made to identify free-living Nematoda, or the microscopic Rotifera, the Gastrotricha of the sandy shores, or the Kinorhyncha of shallow water muds. The marine Nematomorpha parasitize crabs as juveniles. The Entoprocts (formerly united with Ectoprocts as the Bryozoa or moss animals) are also pseudocoelomate, but the local fauna is unknown.

MINOR COELOMATES

The Priapulida have been classified both as pseudocoelomates and as coelomates. They are recognizable instantly when alive because of the large spiny proboscis. The spiny oral region and collar are usually invaginated within the proboscis.

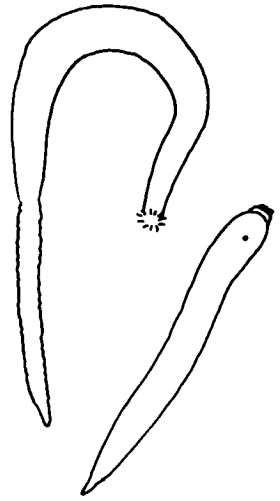
Priapulus caudatus (Lamarck), up to 80 mm, usually around 25 mm, has a stout wormlike body divided into a bulbous proboscis with 25 longitudinal rows of small, spiny papillae and a trunk which is superficially segmented with about 30-40 rings with scattered papillae and ends in a central caudal appendage covered by hollow papillae. The proboscis is whitish, the trunk flesh-colored, yellow or brown and the caudal appendage yellow. Buried in mud or muddy gravel subtidally to 500 meters.



X2

The Sipuncula (mud worms) are unsegmented, and clearly distinguishable from Priapulus. Do not confuse with the burrowing anemone or holothurian *(Edwardsia, Chiridota)* or with the molluscan solenogaster *(Crystallophrisson)*.

Phascolosoma gouldii (Pourtales), the "Mud Worm", up to 30 cm, has a continually expanding and contracting body. When relaxed, a long proboscis extends anteriorly, with the mouth surrounded by a circlet of tentacles. The anus is on the dorsal surface near the base of the proboscis. The color is from dull white to light brown. Burrowing in patches of muddy sand near low water mark to 30 meters.

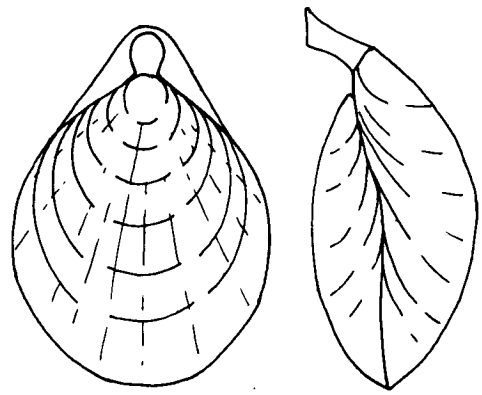


X1/10

The Echiura *(Echiurus echiurus* the only likely species), a small group of annelid - like but unsegmented worms, are not treated here, nor are the Tardigrada (water bears) that are microscopic and are found between sand grains. The segmented Onychophora are terrestrial, the Pentastoma are parasitic.

The Brachiopoda (lamp shells) belong to the interesting lophophorate phyla. Superficially the animal resembles a clam, but even the quickest second look will reveal the difference, especially if examined alive, when the crown of ciliated tentacles (= lophophore) will be seen.

Terebratulina septentrionalis (Couthouy), a "Lamp Shell", is a solitary, bivalve animal that grows up to 32 mm. The thin and semi-transparent shell is broadly oval in shape and has up to 240 radial ribs and fine growth lines. It attaches by its peduncle to solid surfaces and such things as algal stems and worm tubes. This yellowish-white shell is found from the lower intertidal zone to 3475 meters.

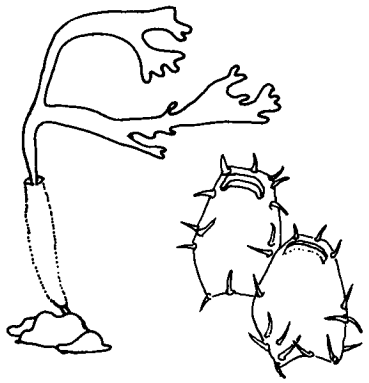


X1

ECTOPROCTA (BRYOZOA): The Moss Animals

The Ectoprocta (Bryozoa) are also lophophorates, often resembling hydrozoan cnidarians. Again, when alive they demonstrate the cilial activity of the lophophore.

Flustrellidra hispida (Fabricius), the brown or reddish-brown colony forms a gelatinous or rubbery crust, sometimes elevated into lobes. The uncalcified spiny, oval or hexagonal zooids are squat and opaque, having large tentacles and a slitlike orifice with 2 lips. Stolon or stolonlike extensions of zooids are absent as are true ovicells, but gonozoids may occur. In tidepools on the middle or lower shore encrusting algae.



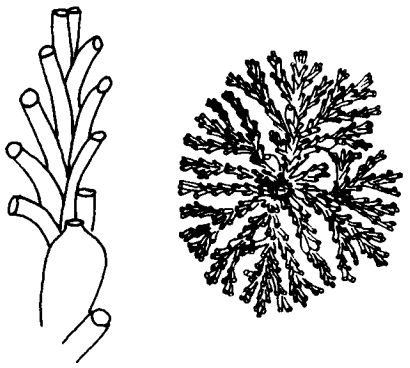
colony X1/10

zooid X20

Bowerbankia gracilis Leidy, this is a creeping colony of tangled grey masses of stolons and uncalcified zooids. The colorless zooids which are tubular, with the distal end squared, arise directly from the stolon either singly or in clusters. All zooids have a strong gizzard and some have a caudate process. There are 8 tentacles arranged in a circle and an operculum of spines. At low water on pilings, stones and algae, it also occurs in brackish waters.

X1

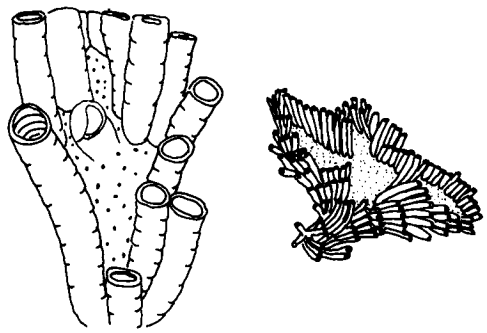
Crisia eburnea (Linnaeus), the erect, ivory-white, bushy colony, from 10-30 mm in height, has 2 semi-alternate rows of cylindrical, well-calcified zooids curved outward. The distal ends of the zooids are free, with an elliptical orifice and no operculum, the rest may be free or immersed in a common zoarial crust. The ovicells are large and pear-shaped, densely pitted with pores. On the lower shore to 145 meters on algae, exp. *Chondrus*.



X20

colony X1

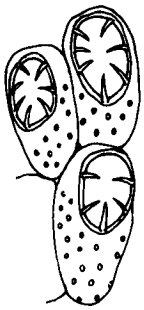
Tubulipora liliacea (Pallas), the colony either white or purple, about 10 mm in height, is fan-shaped when young, becoming nodular or rounded when older. The well-calcified, tubular zooids are fused along their entire length and have closely adjoined rounded orifices and no operculum. There are many ovicells present. On the lower shore and in tidepools attached to algae, eelgrass, shells and stems of hydroids.



X60

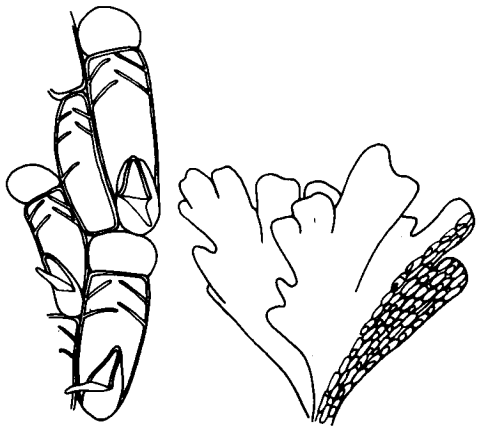
colony X2

Electra pilosa (Linnaeus), the encrusting colony, up to 300 mm, has oblong zooids with the frontal wall partly calcified. The membranous area is usually oval surrounded by a high border from which project 7-12 curved spines, the basal spine may be greatly elongated. Ovicularia and ovicells are absent. It is found encrusting algae, stones and shells from low water to 100 meters.



zooid X20

Dendrobeania murrayana (Johnston), the typical form has erect or somewhat recumbent, broad frondlike branches reaching 40 mm high. It consists of very weakly calcified, multiserial tubular zooids having frontal orifices with well-developed spines, the distal pair erect and the lateral ones curving over the large opersis. It has large, subglobular ovicells marked by radiating lines. From low water attached to shells and stones.



X35

colony X2

V. UNSEGMENTED COELOMATES

MOLLUSCA: Chitons, Snails, Limpets, Clams, Cockles, Sea Slugs, Shipworm, Tusk Shell, Squids and Octopus

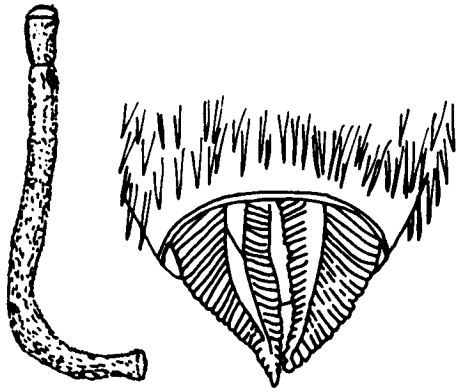
Although there is an academic controversy about the possibility of segmentation having once been present (and still being present in a single species), the student can readily distinguish molluscs from the annelids and arthropods that are obviously segmented.

The various major groups are fairly easy to recognize:

1. Aplacophora - shell-less, wormlike but with calcareous spicules. The slitlike mouth is subterminal at the anterior end, and a pair of short, exposed feathery gills lie at the posterior end. Only one species recorded locally.
2. Amphineura-Polyplacophora - the chitons. The shell consists of 8 valves, clearly visible in the 3 species described below.
3. Gastropoda - the single-shelled snails and the shell-less sea slugs. A key to the commoner shelled forms is followed by a brief description of 4 common sea slugs. Some polychaetes live in limy tubes that might be mistaken for shells.
4. Pelecypoda - the bivalves. These animals have a "left and right" shell in two halves, though this sometimes appears to be "top and bottom" shells as in oysters and scallops. The fleshy shipworm belongs here, as do clams and razor shells.
5. Scaphopoda - the tusk shell. The single shell is a tapered curved shell with an opening at each end. Do not confuse it with worm tubes, which are made of particles glued together if they are of this shape.
6. Cephalopoda - the octopus and the squid. Only two squids are rated here, and a single small octopus.

CLASS APLACOPHORA: The Solenogaster

The single species found in Brandy Cove in a dredge sample is *Crystallophrisson nitidulum* (Loven). The body is covered in calcareous spicules, the mouth is subanterior, the 2 feathery gills are posterior. 12-80 mm.



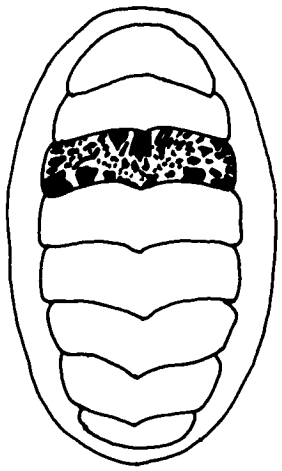
X1

gills X20

CLASS AMPHINEURA

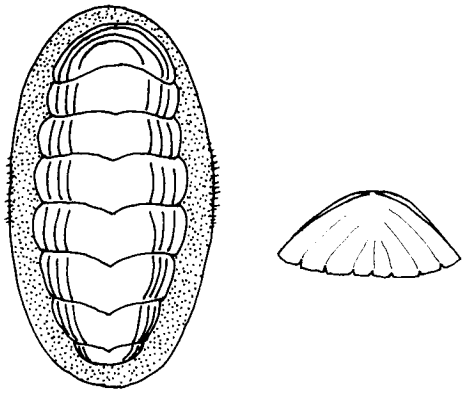
Subclass Polyplacophora: The Chitons

Tonicella marmorea (Fabricius), the "Mottled Red Chiton", up to 40 mm long, is oval to oblong in shape with rather acutely angular valves each bearing a slight projection at the rear. The valves are apparently smooth, but microscopically granular; the posterior valve has 8-9 slits. The valves are buff-colored, marked with dark red and rosy pink inside. The banded girdle is leathery and has no scales or bristles. On stones and shells from the intertidal zone to 90 meters.



X2

Ischnochiton ruber (Linnaeus), the "Northern Red Chiton", up to 25 mm, is elongate-oval in shape with moderately elevated rounded valves. The valves are smooth except for growth lines; the front slope of the head is convex. The posterior valve has 7-11 slits. The valves are buff-colored with reddish marblings, internally colored bright pink. The reddish-brown girdle is covered with minute, elongate, nonoverlapping scales and has minute spines around the outer margin. On rocky shores from the lower intertidal to 145 meters.



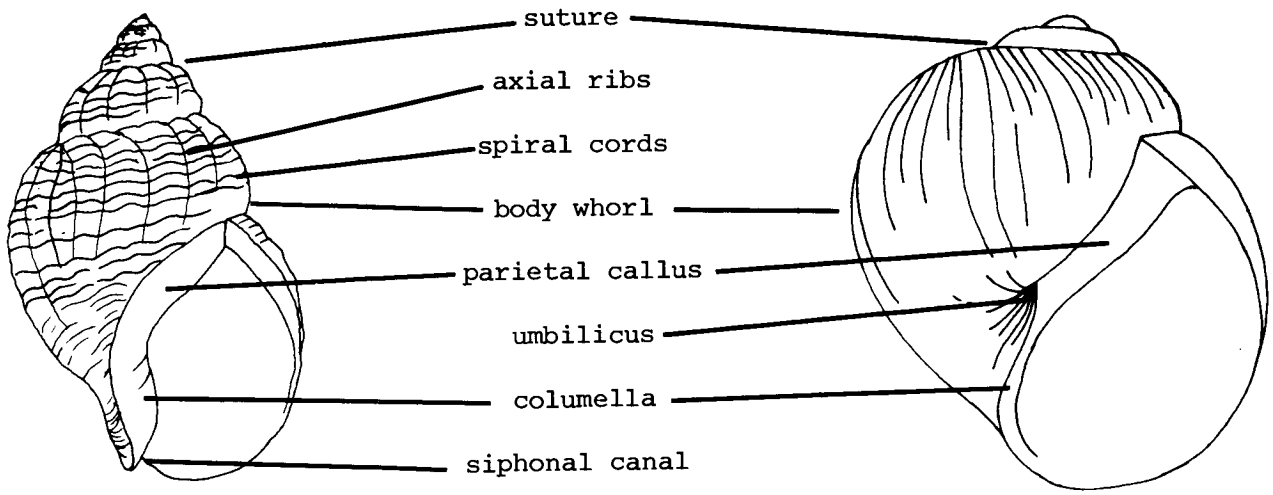
X2

posterior valve X5

Ischnochiton alba (Linnaeus), the "White Chiton", up to 15 mm, is oblong in shape with moderately elevated valves weakly marked with growth lines giving a microscopic sandpaper effect. The front slope of the head valve is straight to slightly concave; the posterior valve (shown) has 12-13 slits. In life the color is bluish-black, but this rubs off easily, leaving the valves whitish, internally the valves are white. The girdle is covered with minute, elongate nonoverlapping scales and has a smooth margin with no spines. On stones and shells from low water to 90 meters.

X10

POSTERIOR



ANTERIOR

Buccinum undatum

Lunatia heros

PRINCIPAL PARTS OF GASTROPODS

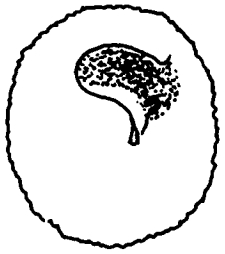
CLASS GASTROPODA: 1. Shelled forms

1. Shell spirally coiled - 5
1. Shell flattened, not spirally coiled - - - - - - - - - - - - - - - - 2

2. Shell with internal cup or shelf - - - - - - - - - - - - - - - - - - 3
2. Shell without internal cup or shelf - - - - - - - - - - - - - - - - - 4

3.(2) Shell with internal cup ..... *Crucibulum striatum* (Say)

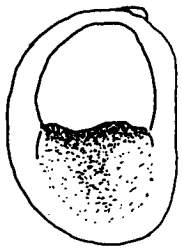
The "Cup and Saucer" Limpet is a small, up to 25 mm long, circular shell, fairly solid in structure. It has a slightly twisted apex near the center and a cup-shaped process inside. The color is pinkish-white streaked with brown. From low water to 345 meters.



X1

3.(2) Shell with internal shelf ..... *Crepidula fornicata* Linnaeus

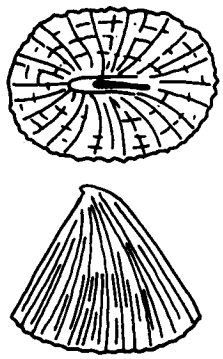
The "Slipper Limpet" or "Quarter-deck" is a rather large, up to 50 mm long, moderately to strongly convex shell. It has a prominent apex turned to one side, but not separate from the shell body, and a wide, slightly concave shelf inside. The color is from grey-white to tan, often with streaks and blotches of red brown, and white or buff inside. A common intertidal species found on rocks and shells.



X1/2

4.(2) Shell with dorsal slitlike perforation ..... *Puncturella noachina* (Linnaeus)

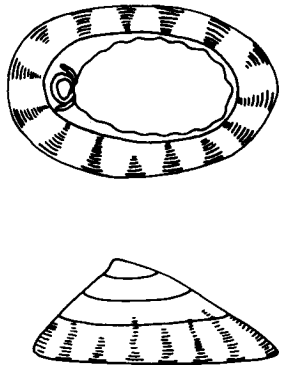
This small "Keyhole Limpet", up to 15 mm long, has a conical, laterally compressed shell with 21-26 smooth ribs and an elliptical base with a crenulated margin. It has a dorsal perforation just anterior to the sharply pointed apex which is internally bordered by a U-shaped funnel. It is white to brownish and internally glossy. Under rocks intertidally to 90 meters.



X2

4.(2) Shell without dorsal perforation ..... *Acmaea testudinalis* (Müller)

The "Atlantic Plate Limpet", up to 48 mm long, is tent-shaped and rather elongate, with sculpture of fine radial threads and concentric growth lines, and an apex anterior to center. The exterior is greyish with axial bars of brown and the interior is bluish, with a brownish apex and the margin of brown bars. It is found clinging to rocks in the intertidal zone.



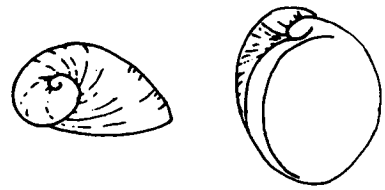
X2/3

5.(1) Shell auriform (flattened), thin; without operculum - - - - - - - 6

5.(1) Shell variously shaped, not auriform; with operculum - - - - - - 7

6.(5) Shell smooth, periostracum thin, columella broad .... *Velutina undata*
Brown

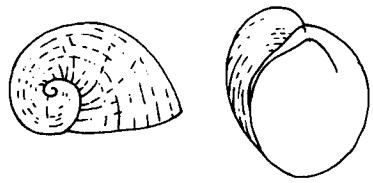
The "Striped Velvet Shell", up to 15 mm long, has a smooth thin, translucent shell covered by a thin, yellowish-white periostracum; the columella is broad, flattened and slightly channeled. From 5-55 meters.



X2

6.(5) Shell with fine spiral striae, periostracum thick, columella narrow ..... *Velutina laevigata*
(Linnaeus)

The "Velvet Shell", up to 20 mm long, has a thin, transparent shell with fine spiral striae which is covered by a thick pinkish-brown periostracum and fine spiral striae; the columella is narrow and not channeled. From low water to 90 meters.



X1

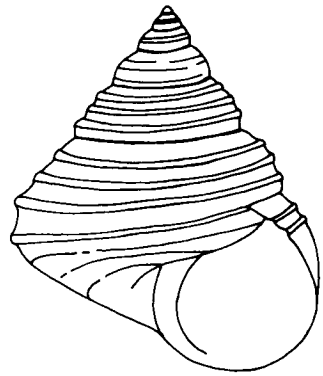
7.(5) Shell pearly - 8

7.(5) Shell not pearly - 10

8.(7) Shell with an umbilicus or central pit or hollow at the base of the columella - 9

8.(7) Shell without an umbilicus ..... *Calliostoma occidentale* (Mighels & Adams)

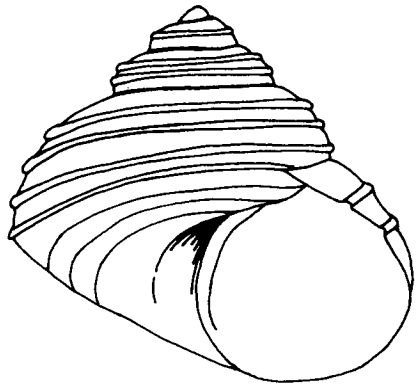
The "Pearly Top Shell" is 17 mm long and equally wide; the shell is thin, acutely pointed, and has a flattened base. It has 6 convex whorls with 3-5 strong cords above the periphery and 9-12 below. The cords are slightly beaded on early whorls, smooth on the body whorl. The outer lip is fragile and made wavy by terminating ridges, the operculum is multispiral. The color is ivory to pearly white with an iridescent aperture. Common from 18-670 meters.



X3

9.(8) Umbilicus margined by strong cord ..... *Margarites costalis* (Gould)

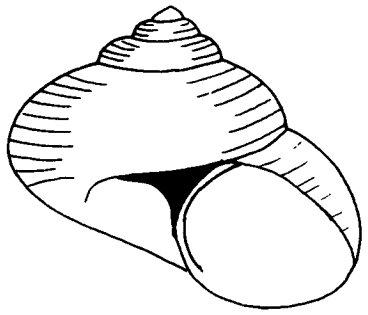
The "Northern Rosy Margarite", up to 25 mm long and a little wider, has 5 evenly and well-rounded whorls, with strong spiral cords usually interspaced with finer cords above the periphery, and finer cords on the base. Occasional specimens have axial costae on the upper whorls giving a beaded appearance. The angle of the spire is about 90°. The umbilicus is narrow and deep and the columella and outer lip are thin and sharp, the latter finely crenulate. The color is rosy to greyish-white with a pearly rose appearance. Common from low water to 115 meters.



X2

9.(8) Umbilicus not margined by strong cord ..... *Margarites groenlandicus* (Gmelin)

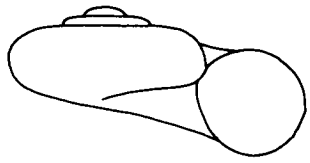
The "Greenland Margarite", up to 12 mm long and 20 mm wide, has 4 or 5 whorls somewhat flattened above, with spiral cords closely spaced, of about equal size above the periphery and finer below. Axial sculpture is lacking or is present as undulations at the sutures only. The angle of the spire is about 110°. The umbilicus is wide and deep, the columella and outer lip are very thin. The color is white to brownish with a pearly aperture. Common from low water to 275 meters.



X3

10.(7) Shell discoid (whorls coiled in one plane) ... *Skeneopsis planorbis* (Fabricius)

A minute species, diameter up to 2 mm, with a very low spire. The shell is smooth with 4 rather flatly coiled whorls with well defined sutures, and relatively wide and deep umbilicus. The operculum is multispiral. It is horn colored. Found living intertidally on sponges, corals, shells, and seaweeds (esp. *Enteromorpha*).



X20

10.(7) Shell variously shaped, not discoid - - - - - - - - - - - - - - - 11

11.(10) Shell without siphonal canal - - - - - - - - - - - - - - - - - - 12

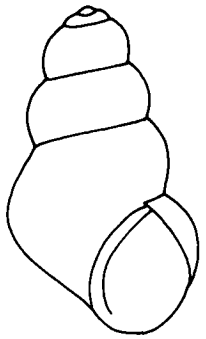
11.(10) Shell with siphonal canal - 19

12.(11) Shell turbinate; length of aperture less than ½ total length of shell - 13

12.(11) Shell globose to turbinate; length of aperture ½ or more than total length of shell - 14

13.(12) Shell smooth ..... *Hydrobia minuta* (Totten)

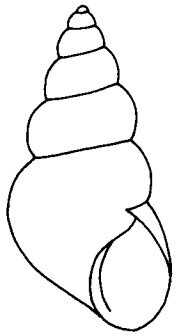
A small species, about 3.5 mm long, with a thin, semi-transparent shell having 4-5½ whorls which are usually eroded. The spire angle is about 38°. It has a slitlike umbilicus and a smooth columella. The color is shiny light yellowish brown. Usually found in salt marshes or mudflats of bays and estuaries.



X15

13.(12) Shell sculptured ..... *Onoba (Cingula) aculeus* (Gould)

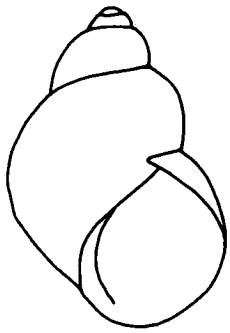
A small species, about 3.5 mm long, with spire well elevated. It has 5-6 rounded whorls, with sutures well impressed. Spiral sculpture of 30 or more fine incised lines on body whorl, occasional specimens with weak axial ribs at suture. The spire angle is 22-35°. It has an ovate aperture with a slightly flaring lip, a smooth columella, but no umbilicus. The color is light to rusty brown. Found in shallow water.



X15

14.(12) Shell turbinate; thin smooth shell with groove in inner lip extending into slitlike umbilicus ..... *Lacuna vincta* (Montagu)

The turbinate shell is about 13 mm long with 5 stout whorls separated by moderately deep sutures. It is a fairly thin, but strong translucent shell with microscopic spiral lines. The aperture which is ½ length of shell is semilunar with the outer lip thin and sharp. The color is dark purplish-brown, sometimes banded with white. Found from low water to 45 meters.



X3

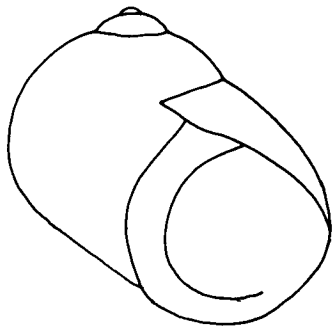
14.(12) Shell globose; umbilicus if present not slitlike - - - - - - - 15

15.(14) Umbilicus absent; columellar area and inner portion of inner lip broad, flattened and rounding into outer lip (Periwinkles) - 16

15.(14) Umbilicus deep and round; columellar area and inner portion of inner lip not broadened (Moon Shells) - - - - - - - - - - - 18

16.(15) Shell globular, spire depressed ..... *Littorina obtusata* (Linnaeus)

The "Northern Yellow Periwinkle" is as wide as it is high, up to 13 mm, the shell is smooth and shiny with 5-6 whorls with the spire slightly depressed. The color is a uniform brownish yellow, occasionally dark brown and sometimes banded. The columella is whitish. It is a common lower intertidal species associated with fucoid seaweeds.

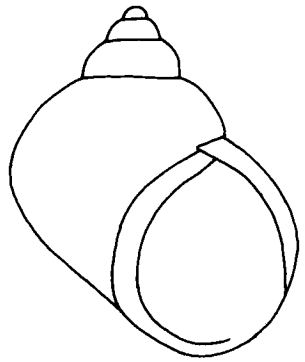


X3

16.(15) Shell trochoid, spire slightly elevated - - - - - - - - - - - 17

17.(16) Outer lip meeting body whorl at an angle below the periphery ..... *Littorina saxatilis* (Olivi)

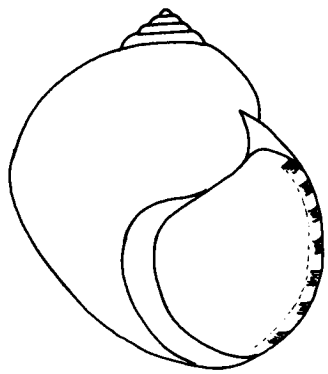
The "Rough Periwinkle" is up to 18 mm long. It has 6-8 convex whorls with well developed sutures and the spire elevated. The ovate shell is grey to dark brown, sometimes mottled with yellow, brown or black. The interior of the aperture and columella is light to dark brown. Found on the higher intertidal zone.



X2

17.(16) Outer lip sloping smoothly into body whorl at or just above the periphery ..... *Littorina littorea* (Linnaeus)

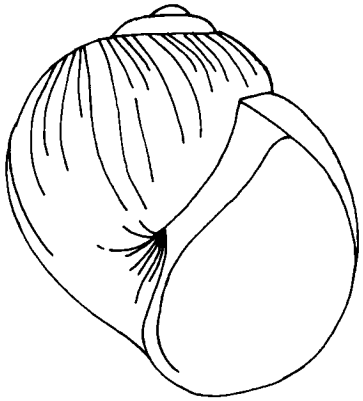
The "Common Periwinkle" is the largest and most abundant periwinkle in this area, up to 42 mm long. It has 5-7 flat-sided whorls with the spire slightly elevated. The solid ovate shell, grey to brownish-grey is spirally banded with dark lines. The columella and inner edge of the aperture is whitish and the outer lip is black. The young are usually black with raised threads. Found at all tide levels on rocky shores.



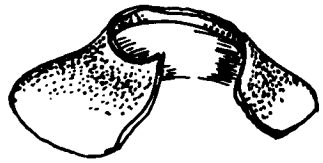
X1.5

18.(15) Parietal callus uniformly thin; outer lip meeting the body whorl at sharp angle ..... *Lunatia heros* (Say)

The "Common Northern Moon-Shell" is a globular shell up to 120 mm long, with a relatively small, deep, round umbilicus and only slightly covered by a thickening of the columellar wall. It has 5-6 convex whorls, sometimes flattened at the top. The aperture is large and oval; the operculum is horny. The color is dirty-white to brownish-grey with a thin, light yellow periostracum. The aperture is glossy, whitish or with tan or purplish brown stains. A very common intertidal species on sand and mud bottoms.



The egg case or "collar" is a wide, circular ribbon of sand, with tiny gelatinous egg capsules embedded in it.

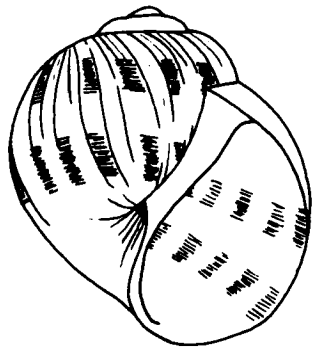


X1

eggs X1/2

18.(15) Parietal callus thickened posteriorly at junction of outer lip and body whorl; outer lip meeting body whorl at moderate angle ..... *Lunatia triseriata* (Say)

The "Spotted Northern Moon-Shell" is less than 35 mm long, the shell is very similar to a small *Lunatia heros*. It has 5 whorls, the last whorl usually has 3 spiral bands of 12-14 bluish or reddish-brown, squarish spots. From mid-tide to 120 meters on sand.

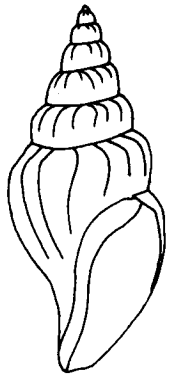


The egg collar is similar to that of *L. heros*.

X2

19.(11) With anal canal or sinus, may be obscure; axial ribs sinuous ..... *Oenopota (Lora) elegans* (Müller)

This species, up to 21 mm long, has 7-8 whorls, slightly angled at the shoulder. There are 18-24 round axial ribs, which may be low to rather high, extending onto the base. The ribs are crossed by prominent spiral cords, except on shoulder. The shallow anal sinus is not distinct. The spire angle is 35° or less. The color is from white to light brown. Found in relatively deep water.



X3

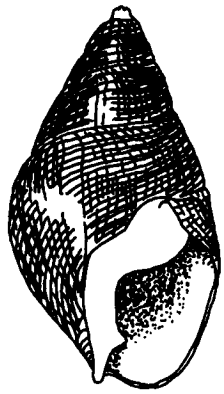
19.(11) Without anal canal or sinus - - - - - - - - - - - - - - - - - - - 20

20.(19) Columella with 2-5 folds; siphonal canal and body whorl separated by a groove - 21

20.(19) Columella smooth - 22

21.(20) Shell dark, often eroded; axial and spiral sculpture of fine ribs, weakly beaded; 5 whorls ..... *Nassarius obsoletus* (Say)

The "Mud Dog Whelk", up to 25 mm long, has 5 whorls sculptured with numerous fine axial ribs and spiral threads giving a weakly beaded appearance; the apex is usually eroded. The color is dark reddish-brown to black, occasional specimens with a single tan spiral band. In adults the thick parietal callus is purple-brown to grey. In shallow water and is common in Sam Orr Pond.



X2

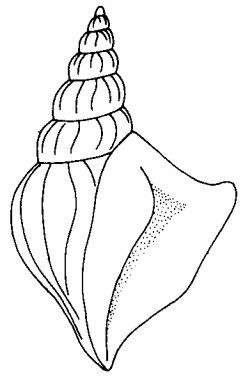
21.(20) Shell whitish; axial and spiral sculpture of equal strength giving strong beaded appearance; 8-9 whorls .. *Nassarius trivittatus* (Say)

The "New England Dog Whelk", up to 25 mm long, has 8-9 whorls with a pronounced shoulder, covered with strong beads in 20-30 axial rows and 4-5 spiral rows; the apex is acute (45° angle). The color is cream to greyish-tan, sometimes banded with brown. The thin parietal callus is white. On sand in shallow water to 90 meters.

X2

22.(20) Outer lip greatly expanded to form "wing" (missing in young specimens, up to 59 mm)..... *Aporrhais occidentalis*

The "American Pelican's Foot", up to 64 mm long has 8 well-rounded whorls with 14-25 curved axial ribs crossed by fine spiral striae. Adults have the outer lip greatly expanded to form a 'wing', this is not so in young specimens. The color is ashen-grey to yellowish-white the periostracum is tan. Found between 4 and 365 meters.

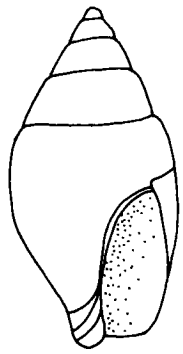


X1

22.(20) Outer lip not greatly expanded - - - - - - - - - - - - - - - - 23

23.(22) Small fusiform shell; narrow oval aperture; spiral sculpture on base only; up to 5 mm ..... *Mitrella lunata* (Say)

The "Lunar Dove Shell" up to 5 mm, is rather stoutly fusiform, with 6 whorls and the base having fine, incised spiral lines. The aperture is constricted, slightly sinuate and the outer thickened lip of adults has 4 small teeth on the inside. The spire angle is about 40°. The smooth glossy shell is translucent-grey to brownish and marked with fine, axial zigzag brown to yellow stripes. Very common lower intertidal species.

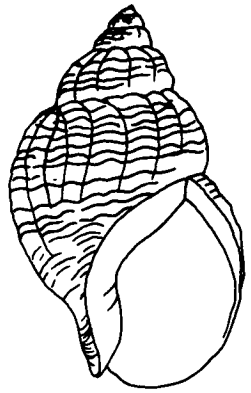


X9

23.(22) Not as above; larger than 20 mm - - - - - - - - - - - - - - - - 24

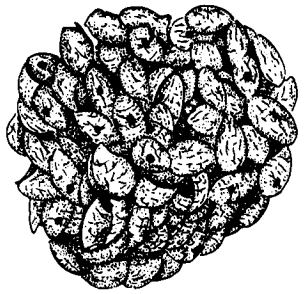
24.(23) Shell solid; strong axial sculpture, fine spiral ribs; columella slightly twisted ..... *Buccinum undatum* Linnaeus

The "Waved or Edible Whelk", up to 110 mm long, has 7-8 convex whorls with 9-18 strong to weak axial ribs extending to whorl periphery and 6-10 fine spiral threads interspersed with weaker threads. Outer lip is sinuate and somewhat flaring. The shell is solid, chalky grey to yellowish, with a moderately thick, grey to greenish-brown periostracum. Intertidally to 30 meters.



The eggs are laid in fist-size clusters of overlapping yellowish capsules resembling corn kernels.

X1/2

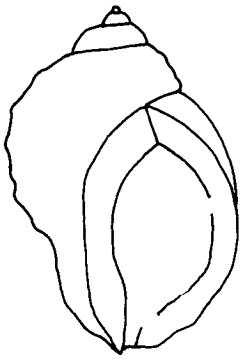


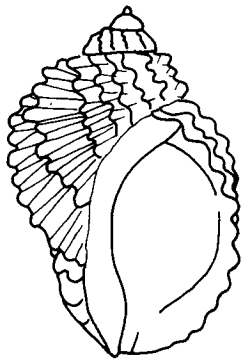
eggs X1/2

24.(23) Not as above - 25

25.(24) Siphonal canal short and broad, not constricted; shell solid with thickened lip; spiral sculpture of rounded ridges, sometimes with overlapping scales ..... *Thais lapillus* (Linnaeus)

The "Atlantic Dogwinkle" up to 46 mm, has a thick, solid shell with 5 whorls, a sloping shoulder, a short spire, and a bluntly pointed apex. It is usually roughly sculptured with round spiral ridges. The length of the oval aperture is more than ½ the length of the entire shell; the arched lip and the parietal callus are thickened in adults. The siphonal canal is very short and open. The color is variable, usually greyish but may be brownish, orange, purple or yellowish, uniform or banded. Common from below mid-tide to 4 meters under rockweed.





The variety *Thais lapillus imbricatus* Lamarck, is covered with small overlapping, shingle-like scales.

The eggs are deposited in spindle-shaped capsules, 1-3 mm high, laid in groups on the underside of rocks near low water level.

X1

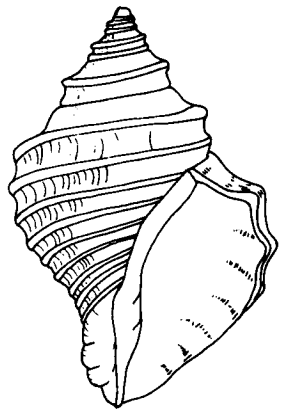
X1

egg case X2

25.(24) Siphonal canal long and thin, constricted; lip not thickened - - - 26

26.(25) Heavy shell; 7-10 prominent spiral cords; body whorl much larger than penultimate whorl ..... *Neptunea decemcostata* (Say)

The "Ten-Ridged Whelk", up to 140 mm, has a heavy, solid shell with 9 whorls, the body whorl is large, shouldered and has 7-10 prominent raised brown spiral cords, there are 2-3 on the upper whorls. The space between the cords is smooth or with fine incised spiral lines. The color is greyish-white with reddish-brown cords, white aperture within, and the darker cords faintly showing through. From low water to 90 meters.

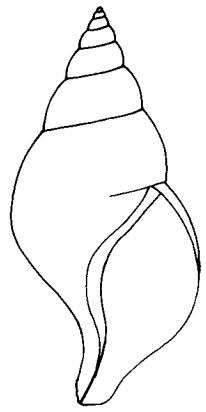


X1

26.(25) Lighter shell; without prominent spiral cords; body whorl not much larger than penultimate whorl - - - - - - - - - - - - 27

27.(26) Whorls flat-sided, sutures not impressed; periostracum heavy, reddish-brown and not ciliated ..... *Colus stimpsoni* (Mörch)

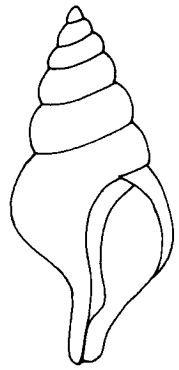
"Stimpson's Whelk", up to 125 mm, is spindle-shaped with 8 flat-sided whorls. The sculpture is of fine, barely visible, spiral incised lines, about 20 or less between the lip and suture. The aperture is oval, white inside, the siphonal canal is moderately long, open and inclined to turn backwards. The color is chalky-white. From 2-730 meters.



X1/2

27.(26) Whorls convex, sutures impressed; periostracum grey to olive-brown, ciliated and dull ..... *Colus pygmaeus* (Gould)

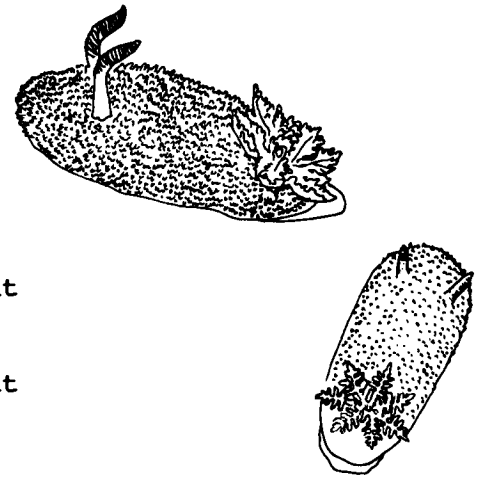
The "Pygmy Whelk", up to 25 mm, has a more delicate shell than *C. stimpsoni*, it is fusiform with 7-8 convex whorls. The sculpture is of fine spiral cords, somewhat varying in width, about 12 between lip and suture. The aperture is oval, with a rather short siphonal canal and the columella is strongly twisted. The color is chalky-white Found from 2-1100 meters.



X2

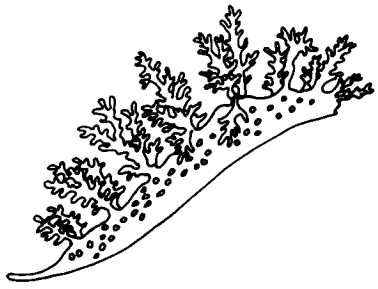
CLASS GASTROPODA: 2. Sea Slugs

Acanthodoris pilosa Abildgaard, the "Pilose Doris", up to 35 mm, has one pair of tentacles termed 'rhinophores' just back from the anterior end. The dorsal surface is thickly covered with numerous, soft, slender, conical papillae or 'cerata' of almost uniform size, which give it a hairy appearance. It has a circle of 7-9 tripinnate, transparent branchial plumes about the anus, which is mid-dorsal on the posterior half of the body. The color is variable, semi-transparent from white to brown. Moderately common under rocks at low tide.



X2

Dendronotus frondosus Ascanius, the "Frond Eolis", up to 80 mm, has a sluglike body which is rather flattened, elongate and tapering posteriorly. The retractile rhinophores have 5-6 large leaves, interspersed with about 15 smaller appendages, instead of tentacles, extending forward. It has 2 rows (7 pairs) of translucent, branching treelike cerate rising from the raised and tuberculated dorsal surface. It is without a circlet of branchial plumes surrounding the anus. The color is whitish mottled with reddish brown markings. It is found in tidepools crawling over rocks, algae and hydroids, esp. *Tubularia*, to 110 meters.

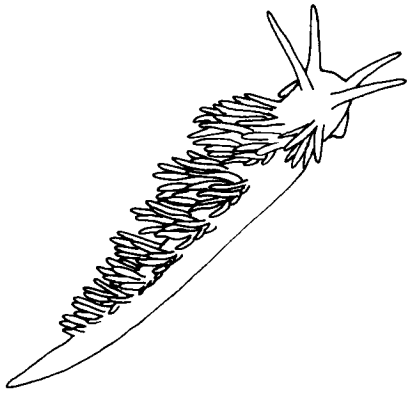


X2

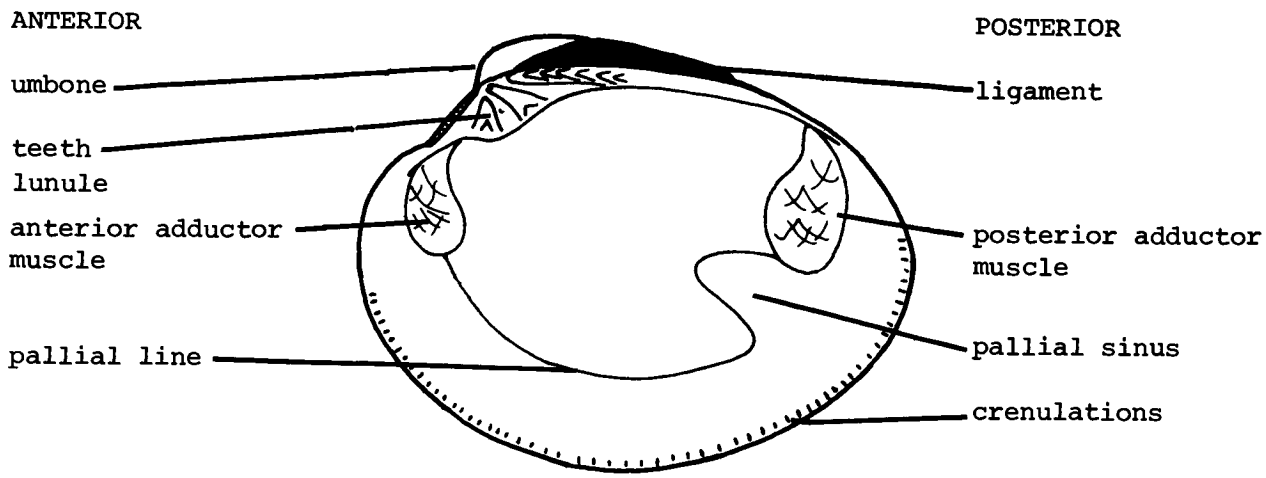
Aeolidia papillosa (Linnaeus), the "Papillose Eolis", up to 100 mm, has a broad, ovate body which is somewhat depressed. It has a pair of tentacles as well as a pair of smooth or slightly wrinkled non-retractile ehinophores. The dorsal surface is covered with numerous (about 400 on each side) simple unbranched cerata arranged in transverse rows on either side of the median line. It is without a circlet of branchial plumes surrounding the anus. The color is variable; brown, grey or yellowish always freckled with white, purple or green. It is found in tidepools and among algae and hydroids down to 365 meters.

X1

Coryphella rufibranchialis (Johnston), the "Red-fingered Eolis", up to 25 mm long, has a slender, tapering body with 2 pairs of tentacles. The dorsal surface is covered with 6 or 7 clusters of slender, unbranched cerata, each cluster consists of 2-6 rows of 4 cerata per row. The body color is translucent white with the cerata bright red having the tip encircled with an opaque-white ring. Found intertidally to 200 meters among hydroids.

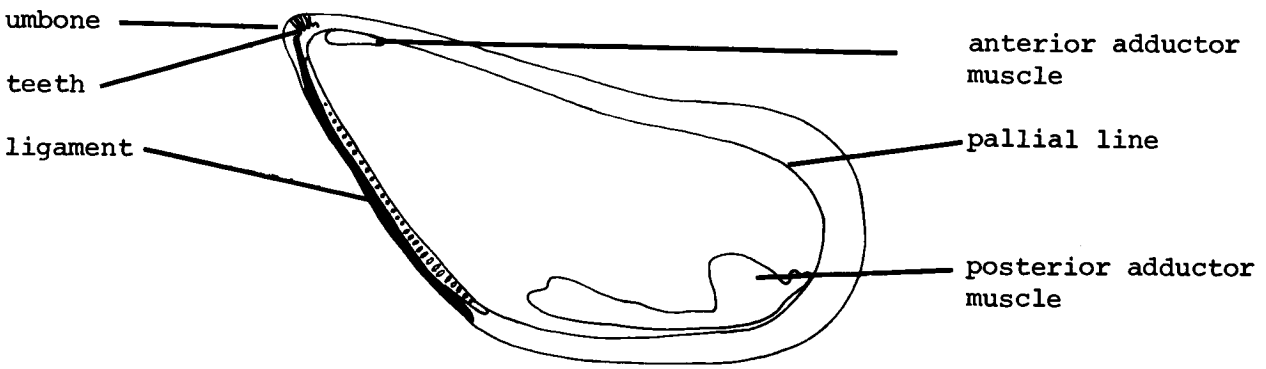


X2



Mercenaria mercenaria

(right valve)



Mytilus edulis

(left valve)

PRINCIPAL PARTS OF PELECYPODS

CLASS PELECYPODA: The Bivalves

1. With 1 large adductor muscle (scallops and thin shelled jingles) - - 2

1. With 2 distinctly unequal adductor muscles (mussels, razor clam and shipworm) - 5

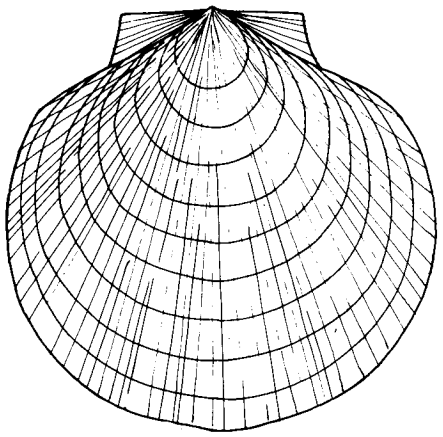
1. With 2 approximately equal adductor muscles (clams, "quahaugs", nut shells, cockles, etc.) -11

2.(1) Hinge with distinct 'ears' or 'wings' - - - - - - - - - - - - - - - - 3

2.(1) Not so; lower valve with slotlike hole - - - - - - - - - - - - - - - - 4

3.(2) With numerous fine, threadlike ribs; hinge 'wings' about equal ..... *Placopecten magellanicus* (Gmelin)

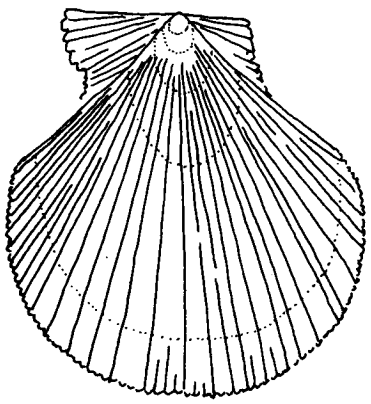
The "Sea or Giant Scallop", up to 200 mm, has large, almost circular valves. The upper valve is somewhat convex, the lower one practically flat. The exterior is rough with fine ribs and grooves crossed by concentric lines of growth. The upper valve is pinkish or reddish-brown, sometimes rayed with white or brown, the lower valve is pinkish-white. The interior is glossy white with a conspicuous central muscle scar. On sand and gravel bottoms from low water to 165 meters.



X1/4

3.(2) With about 50 moderately coarse ribs; hinge 'wings' distinctly unequal ..... *Chlamys islandicus* (Müller)

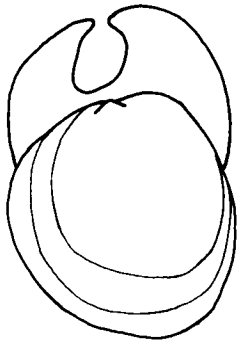
The "Iceland Scallop", up to 100 mm, has oval valves with the upper one slightly more convex than the lower one. There are about 50 coarse irregular ribs of more or less scaly texture which split into 2, near the margins. The valves are dirty grey to cream, they may be tinged with purple, red, orange or pink both inside and out. It is common in cold water areas from low water to more than 310 meters.



X1/2

4.(2) Umbone eccentric, concealed; valves smooth, thin but strong ..... *Anomia simplex* d'Orbigny

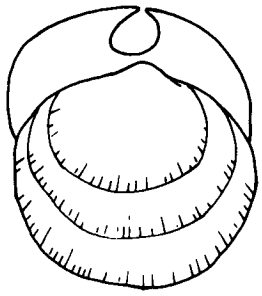
The "Smooth Jingle Shell", up to 50 mm, has irregularly oval, smoothish, thin but strong valves. The upper or free one is usually quite convex with minute scales and undulating or jagged margin. The lower valve is flattish with an oval hole near the apex. The color is either translucent-yellow or dull orange with a silvery sheen. From low water to 165 meters attached to stones, shells, logs and wharves.



X1

4.(2) Umbone central, not concealed; valves rough, often with small prickles ..... *Anomia aculeata* Gmelin

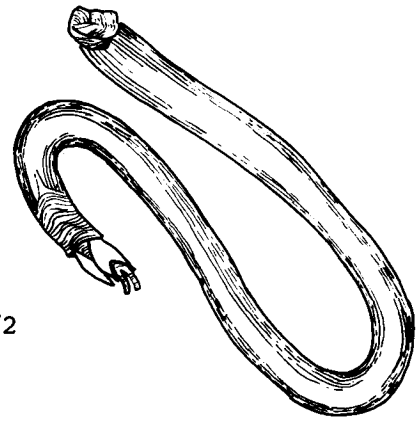
The "Prickle Jingle Shell", up to 20 mm, has moderately fragile, irregularly rounded valves. The upper one is slightly convex and rough, usually covered with prickly scales. The lower valve is thin and fragile, with a small circular hole near the apex. The color is drab opaque whitish-tan. It is more common than *A. simplex*; found from low water to 145 meters attached to shells and stones.



X2

5.(1) Wormlike, elongate; boring in timber ..... *Teredo navalis* Linnaeus

The "Common Shipworm" is a destructive wood borer, it has small globular valves about 3 mm long. Most of the animal lives in a shelly tube that may be 150-300 mm long when fully grown. It has a pair of paddle-shaped calcareous structures called 'pallets' at the extreme rear, used to close the burrow.

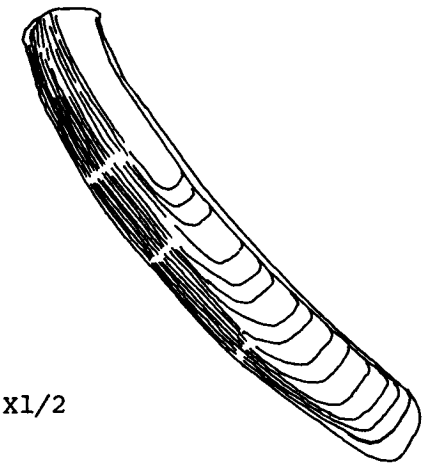


X1/2

5.(1) Not as above, not wormlike - 6

6.(5) Length 6 times the height ..... *Ensis directus* (Conrad)

The "Common Razor Clam", up to 250 mm, has thin, elongate, slightly curving, gaping valves with the dorsal and ventral margins parallel. The surface is smooth except for concentric lines of growth. The color is white with a smooth, shiny olive green periostracum. On sandy bottoms between tide marks to 75 meters, standing upright in the sand.

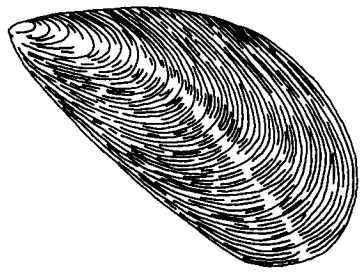


X1/2

6.(5) Not as above, length much less than 6 times the height - - - - - - 7

7.(6) Umbone at anterior tip of each valve; interior slightly pearly blue-white with a purple-blue border ..... *Mytilus edulis* Linnaeus

The "Blue or Edible Mussel", up to 80 mm, has wedge-shaped valves, the anterior margin is generally straight, and the posterior margin broadly rounded. There is no sculpture other than coarse growth lines. The color is blue-black with a varnishlike periostracum. Younger specimens are usually brighter and may be greenish, brownish or even banded or rayed. A very abundant intertidal species on sand, gravel, pilings, wharves, etc. attached by strong byssal threads.

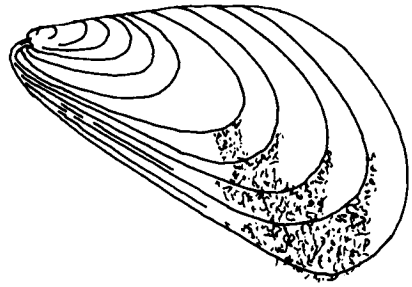


X1

7.(6) Umbone near, but not at anterior tip of valve - - - - - - - - - - - - 8

8.(7) Without radial sculpture; thick black-brown periostracum ..... *Modiolus modiolus* (Linnaeus)

The "Red or Horse Mussel", up to 155 mm, has wedge-shaped valves which are swollen near the umbone. The valves are heavy with a thick, coarse, black-brown to reddish-brown periostracum which in dried specimens flake off to reveal a mauve-white chalky shell. The interior is pearly. A common shallow water species on rocks and in sand and gravel.

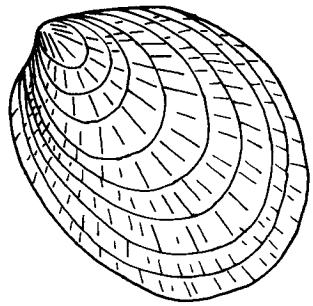


X1/2

8.(7) With radial sculpture, at least in part; thin periostracum - - - - - 9

9.(8) Radial ribbing on entire surface of valves .... *Crenella glandula* (Totten)

The "Glandular Bean Mussel", up to 15 mm, has highly arched, oval valves, somewhat truncate anteriorly and rounded posteriorly. The surface bears fine, numerous, distinct radiating lines crossed by even finer concentric lines; the inner edge of the margin is crenulated. The color is yellowish-brown, pearly inside. It is characterized by its habit of nest building, and is found among algal holdfasts on stony and muddy bottoms from low water to 110 meters.

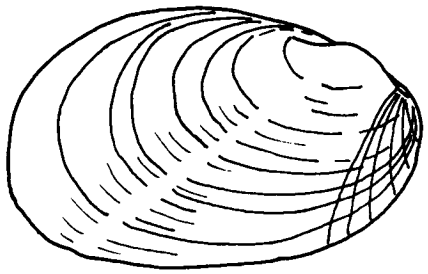


X3

9.(8) Radial ribbing on anterior and posterior parts of valves only - - - - 10

10.(9) Valves inflated strong radial depression in central region; anterior region with 5-8 fairly conspicuous radial ribs .... *Musculus discors* (Linnaeus)

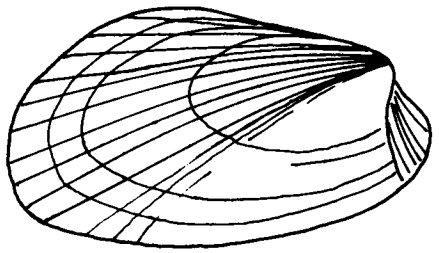
The "Discordant Mussel", up to 30 mm, has oblong-oval valves, the anterior region with 5-8 strong, and the posterior with a few weak radial ribs; the central region smooth except for irregular lines of growth. The periostracum is shiny, either dark black-brown or light brown, pearly inside. Moderately common under stones from low water to 550 meters.



X2

10.(9) Valves more compressed; no pronounced radial depression; posterior and anterior regions with numerous radial riblets ... *Musculus niger* (Gray)

The "Little Black Mussel", up to 60 mm, has thin oblong-oval valves, the central region has microscopic wavy threads and pimples. The color is from yellowish-brown to black with the interior often pinkish. Common intertidally to 110 meters.



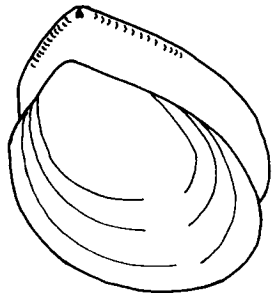
X2

11.(1) With 2 rows of many small uniform hinge teeth separated by umbone - 12

11.(1) Not as above, teeth not in 2 long rows - - - - - - - - - - - - - - 15

12.(11) Valves not much or not at all longer than high ... *Nucula proxima* Say

The "Atlantic Nut Shell", up to 10 mm, has smooth triangular valves with a strongly arched hinge line with 12 teeth anterior to the umbones and 18 posterior to them. The lower margin is minutely crenulated. The color is white, with a thin olive-green to greyish-green periostracum. Common in sandy mud from low water to 55 meters.

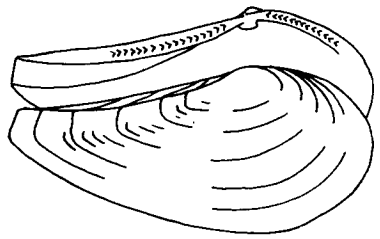


X4

12.(11) Valves elongate - 13

13.(12) Valves elongate; posterior end tapered ..... *Nuculana tenuisulcata* (Couthouy)

The "Thin Nut Shell", up to 25 mm, has thin, elongate valves with the posterior end double the length of the anterior and narrowed to a truncate tip. The surface has strong, concentric, closely spaced growth lines. The hinge has 12-14 anterior and 16-18 posterior teeth. The color is white, with a thin yellowish-brown periostracum. In mud from low water to 275 meters.

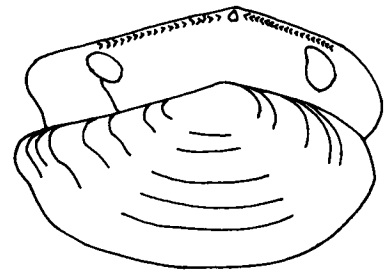


X2

13.(12) Valves ovate or somewhat quadrangular; posterior end very slightly tapered - 14

14.(13) Valves delicate; teeth extend almost to the outer edge of posterior muscle scar, and to the outer edge of anterior muscle scar ..... *Yoldia sapotilla* (Gould)

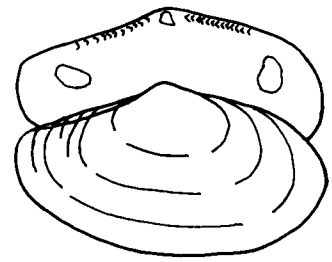
The "Short Yoldia", up to 40 mm, has thin, smooth, somewhat elongate oval valves. The anterior end is regularly rounded and the posterior end narrowed with a slight dip on the postero-ventral margin. The umbone is slightly anterior of center with 18-20 or more teeth on each side. The color is white with a yellowish-green periostracum, and a white interior. It is more common than *Y. myalis*; found from low water to 185 meters.



X2

14.(13) Valves shorter; teeth extend only to the inner edge of muscle scars ..... *Yoldia myalis* (Couthouy)

The "Oval Yoldia", up to 30 mm, has smooth, elongate oval valves. Both ends are slightly rounded, the posterior one is somewhat narrower. The umbone is slightly posterior of center, and has 10-15 teeth on each side. The color is white with a yellowish-brown periostracum, and a white interior. On sandy-mud from low water to 145 meters.



X2

15.(11) Valves marked externally with clearly defined radial ribbing - - - 16

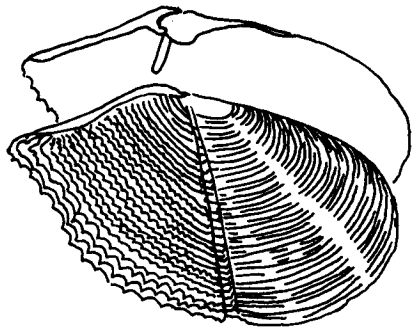
15.(11) Not so, valves smooth or concentrically ribbed, radial ribbing, if present, obscure or confined to ends of valves - 20

16.(15) Valves elongate; typical clamlike bivalves - - - - - - - - - - 17

16.(15) Valves not much or not at all longer than high - - - - - - - - 18

17.(16) Valves sturdy with radial indented line which divides them into 2 distinct regions ..... *Zirfaea crispata* (Linnaeus)

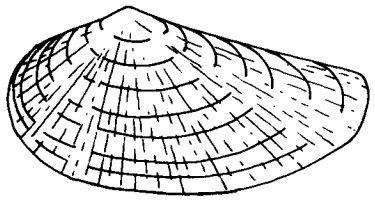
The "Great Piddock", up to 50 mm long and half as high, has widely gaping valves divided into 2 regions by a radial, indented line running from the umbone to the middle of the ventral margin. The rounded posterior region has coarse irregular growth lines, the somewhat pointed anterior region has scaly growth lines and a serrated margin. The color is greyish-white. Burrowing in soft rock, clay or sand from low water to 75 meters.



X1

17.(16) Not so; valves fragile, often with adherent sand grains ..... *Lyonsia hyalina* (Conrad)

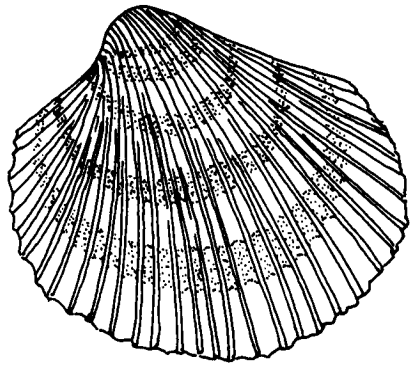
The "Glassy Lyonsia", up to 20 mm, has thin, fragile, elongate-oval valves tapering and becoming compressed posteriorly. The valves have fine radial lines and concentric wrinkles, often with adherent sand grains. The color is translucent, pearly white especially interiorly. On sand or sandy-mud from low water to 60 meters.



X4

18.(16) Ribs 32 or more; valves slightly longer than high; radial ribs sharp-edged ..... *Clinocardium ciliatum* (Fabricius)

The "Iceland Cockle", up to 65 mm, is a common, large fringe-ribbed cockle with 32-38 spiny, radial ribs and coarse concentric growth lines. The prominent rounded umbones are turned inward and nearly meeting. The yellowish-brown periostracum is stiff and fringelike. The color is dull white with a yellow or white interior. From low water to 185 meters.

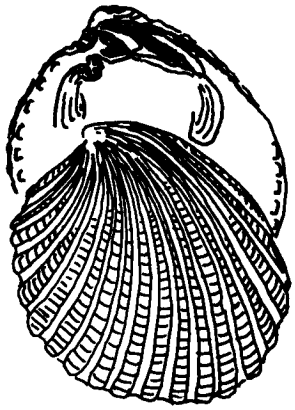


X1

18.(16) Ribs usually fewer - 19

19.(18) Valves strong, with thick periostracum; ribs about 20, weakly beaded ..... *Venericardia borealis* (Conrad)

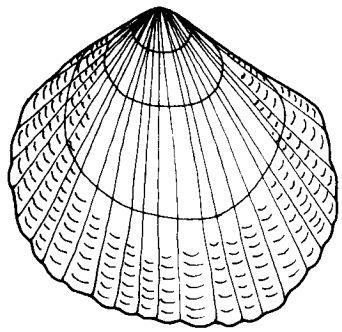
The "Northern Heart Shell", up to 38 mm, has strong subglobular valves with 20 rounded rough ribs, wider than the spaces between them, running in a curved fan from the umbone to the margin. It has 2 strong hinge teeth and an erect tooth posteriorly. The umbones are elevated and turned forward. The color is greyish-white with a thick, shaggy, brownish periostracum. Under stones, from low water to 460 meters.



X2

19.(18) Valves thin, with thin periostracum; ribs about 22-28, delicately scaled ..... *Cerastoderma pinnulatum* (Conrad)

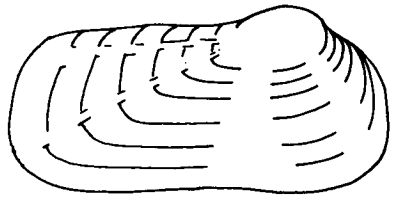
The "Little Cockle", up to 13 mm, has thin subcircular valves with 22-28 wide flat ribs, each with a series of scales, which are lacking on the central portion of the valves. It has 1 or 2 cardinal teeth and 2 lateral teeth on each valve, and saw-toothed margins. The umbones are prominent and centrally placed. The color is creamy-white with irregular brown markings; interior glossy white. On gravelly bottoms from low water to 110 meters.



X4

20.(15) Valves elongate, usually twice as long as high, with the dorsal and ventral margins usually parallel; umbone about 1/3 back from the anterior end; with a weak to fairly strong radial rib at the posterior end ..... *Hiatella arctica* (Linnaeus)

The "Arctic Saxicave", up to 50 mm, has an irregular shaped shell due to the nesting and burrowing habits. The young are rather evenly elongate, the adults may be oblong, oval, or twisted and misshapen, but with dorsal and ventral margins parallel. There are 2 faint radial ribs, which are scaled in young specimens, on the posterior end. The color is white with a thin, grey-brown periostracum. Common under rocks, among mussels, or in excavations in sand, mud, clay, soft rocks, and algal holdfasts, from low water to 185 meters.



X1

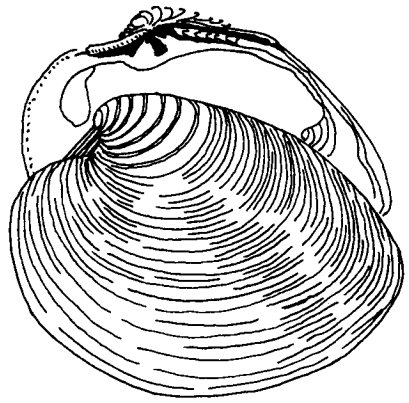
20.(15) Not so - 21

21.(20) Valves with strong concentric sculpture especially near the umbones - 22

21.(20) Valves with no sculpture apart from irregular growth lines - - - 24

22.(21) Pallial line with sinus; interior with purple stain ..... *Mercenaria mercenaria* (Linnaeus)

The "Northern Quahaug", up to 130 mm, has thick, solid, rather well-inflated valves. The surface bears numerous concentric lines most conspicuous near the umbones. The umbones are placed far forward, thus the anterior end is short, while the posterior end is developed into a broad oval sweep. The ventral margin is crenulated. The color is dull greyish-white, while the interior is whitish with a dark violet border. In Sam Orr Pond only.



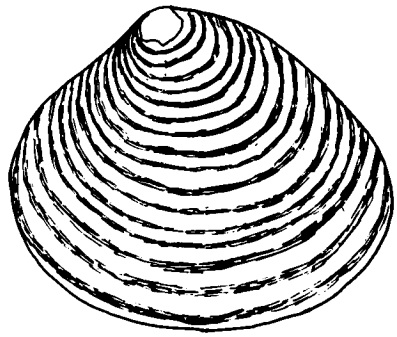
X1/2

22.(21) Pallial line without sinus; interior without purple stain ..... *Astarte* - - - - - - - 23

The identification of *Astarte* spp. is difficult; the keys of different authorities do not always agree.

23.(22) Valves elliptical; posterior end broadly rounded; sculpture 30-40 concentric ridges ..... *Astarte subaequilatera* Sowerby

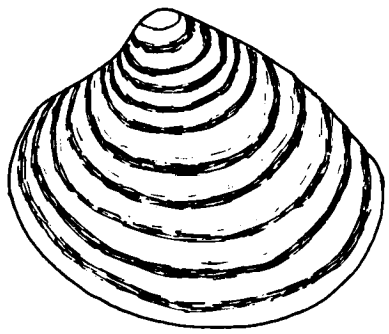
The "Lentil Astarte", up to 38 mm, has elliptical robust valves with the anterior slope a bit concave and the posterior end broadly rounded. The centrally situated umbones are turned slightly forward and often eroded. The thick periostracum is yellowish-brown; the interior is white. In shallow water.



X2

23.(22) Valves less elliptical; posterior end rather straight; sculpture 10-20 strong concentric ridges ..... *Astarte undata* Gould

The "Waved Astarte", up to 32 mm, has slightly triangular, robust valves, with the posterior slope rather straight. The centrally situated umbones are elevated and pointed, curving inward until they meet the hinge. The thick periostracum is reddish-brown; the interior is white. It is more common than *A. subaequilatera*, found on muddy bottoms from 7-190 meters.



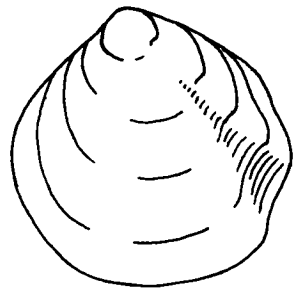
X2

24.(21) Valves in contact along entire margin when closed - - - - - - - - - - - 25

24.(21) Valves slightly or widely gaping when closed - - - - - - - - - - - - - 28

25.(24) Valves circular, small around 6 mm in length, with a groove posteriorly; without hinge teeth; without pallial sinus; white ..... *Thyasira gouldii* (Philippi)

The "Gould's Cleft Clam", up to 6.4 mm, has fragile valves with umbones slightly anterior. It has a groove running posteriorly from the umbone. The color is white with a thin yellowish periostracum. From below low water mark to 110 meters.

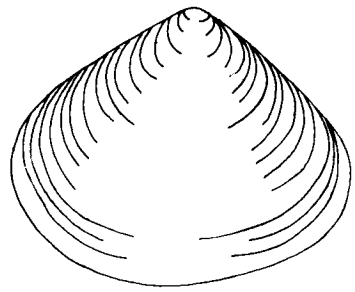


X8

25.(24) Not as above, no grooves posteriorly - - - - - - - - - - - - - - - - - - 26

26.(25) Valves under 5 mm in length; with pallial sinus pointing toward umbone; white to greyish-tinted purple ..... *Gemma gemma* (Totten)

The "Gem Shell", up to 5 mm, has thin, subglobular, shiny valves with central umbones, large faintly impressed lunules and a smooth surface. The color is white to greyish with purple over the umbones and posterior areas, the interior is white. In shallow bays, estuaries, salt marshes and ponds.

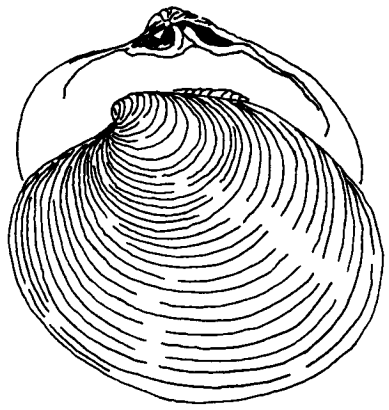


X10

26.(25) Not so; valves over 5 mm in length - - - - - - - - - - - - - - - - - - 27

27.(26) Pallial line without sinus; lunules absent; periostracum shiny dark brown or black ..... *Arctica islandica* (Linnaeus)

The "Black Quahaug or Ocean Clam", up to 138 mm, has thick, heavy valves about as high as long. The surface bears irregular, finely incised growth lines only. The umbones are elevated and turned forward and inward, almost meeting. The ventral edge is not crenulated. The color is white with a yellowish-brown periostracum in young and brown or black in older specimens. The interior is white. On mud bottoms from low water to 165 meters.



X1/2

27.(26) Pallial line with sinus; with heart-shaped lunules; color dull white ..... *Pitar morrhuana* (Linsley)

The "False Quahaug", up to 50 mm, has relatively thin valves, distinctly longer than high, but more or less ovoid. The surface bears irregular, incised growth lines only. The interior has no crenulations, but has a moderately deep V-shaped pallial sinus. The color is dull white to grey, the interior is white. From low water to 45 meters.

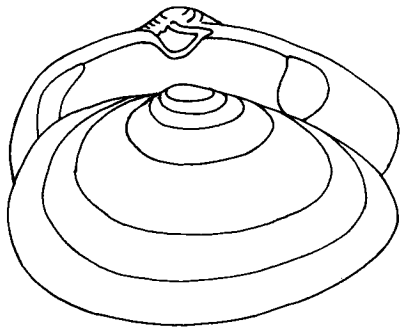
X1

28.(24) Hinge with a large projecting tooth in one valve and socket in the other - 29

28.(24) Hinge of both valves more or less similar - - - - - - - - - - - - - 30

29.(28) Posterior rounded, somewhat pointed; pallial sinus V-shaped ..... *Mya arenaria* Linnaeus

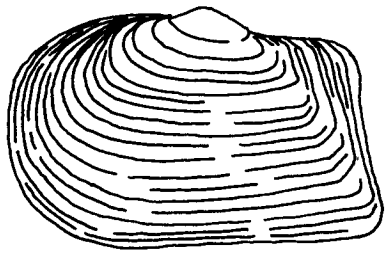
The "Soft-shelled Clam", up to 100 mm, has thin, elliptical, gaping valves with the anterior end rounded, and the posterior end somewhat pointed. The left valve has a long, spoon-shaped chondrophore projecting below the upturned umbone, the right valve has a corresponding receptacle. The color is dull grey to chalky white with a thin greyish periostracum. Burrowing in sand, mud or gravel intertidally to 75 meters.



X1

29.(28) Posterior abruptly truncate; pallial sinus U-shaped ..... *Mya truncata* Linnaeus

The "Truncate Soft-shelled Clam", up to 75 mm, has thick oblong, widely gaping valves, with the anterior end rounded, and the posterior end abruptly truncated and slightly flaring. The left valve has a chondrophore, less prominent than *M. arenaria*, and the right valve has the receptacle. The color is dingy white with a tough yellowish-brown periostracum. From low water to 75 meters.



X1

30.(29) Umbone at the posterior third of the valves; ligament completely or largely internal, with prominent chondrophore ..... *Mesodesma arctatum* Conrad

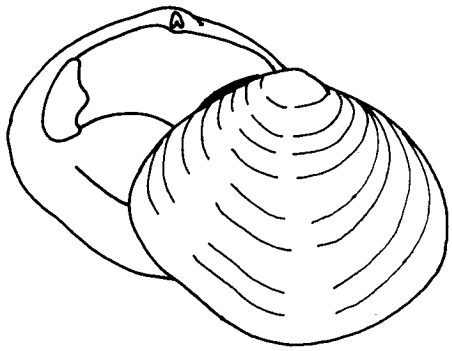
The "Arctic Wedge Clam", up to 40 mm, has thick, strong, wedge-shaped valves with a short posterior end and the anterior end slightly narrowed and regularly rounded. The left valve has a long anterior and posterior lateral tooth, with comblike teeth on both sides. The muscle scars and U-shaped pallial sinus are strongly delineated. The color is white with a shiny, yellowish periostracum and white interior. On sand from low water to 90 meters.

X2

30.(29) Umbone is central or nearly so - 31

31.(30) Ligament external; hinge without lateral teeth; up to 25 mm ..... *Macoma balthica* (Linnaeus)

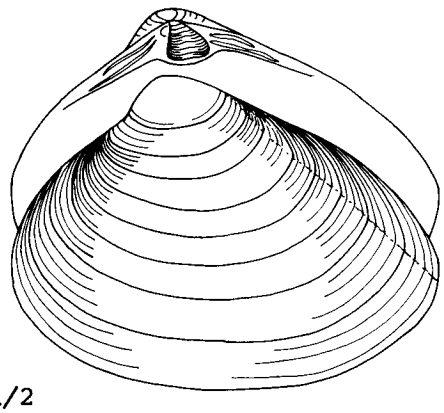
The "Little Macoma", up to 25 mm, has moderately thin valves with an ovate outline and the posterior somewhat constricted. The large pallial sinus more extensive in the right valve is fused along the lower border with pallial line. The color is chalky white to pinkish-white with an olive-brown periostracum, which is usually lacking on the upper parts, and a pinkish-white interior. Abundant in muddy coves, bays, and estuaries from mid-tide level to 20 meters.



X2

31.(30) Ligament internal; lateral teeth are thin, long and transversly striated; up to 150 mm ..... *Spisula solidissima* (Dillwyn)

The "Surf or Bar Clam", up to 150 mm, has strong, roughly triangular, smooth valves with a prominent spoon-shaped chondrophore in the left valve. The color is white covered by a shiny yellowish-brown periostracum and a white interior. It generally occurs within 20 mm of the sediment surface, from low water to 75 meters, on exposed ocean beaches.

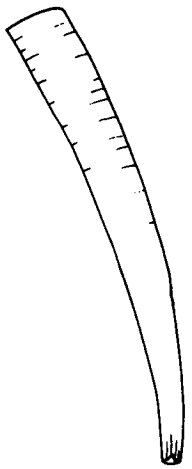


X1/2

CLASS SCAPHOPODA: The Tusk Shell

Dentalium entale (Linnaeus), the "Common Tooth Shell", up to 50 mm, is very moderately curved with the tips usually eroded. The sculpture is feebly developed, with a few longitudinal wrinkles on the posterior quarter. The anterior margin is jagged and the posterior opening is oblique and notched on the convex side. It is ivory-white in color. From 15-3000 meters.

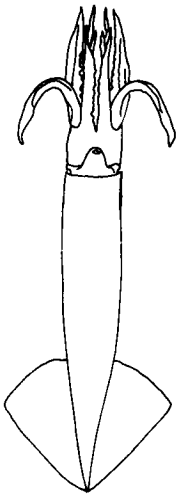
X2



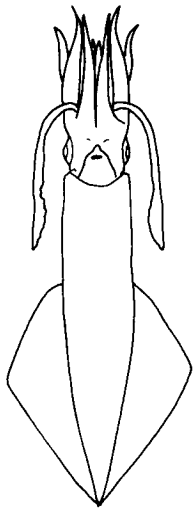
CLASS CEPHALOPODA: The Squids and Octopus

Illex illecebrosus (Lesueur), the "Northern or Short-finned Squid", up to 45 cm, has a head as broad as the mantle, free eyelids and 10 arms, the 2 longer, tentacular arms have 8 rows of small suckers. The fins reach about 1/3 the length of the mantle. The color varies from pale bluish-white to red or dark blue due to the large number of pigment cells. It swims in schools from the surface to 440 meters, in the summer it is close to shore.

X1/5

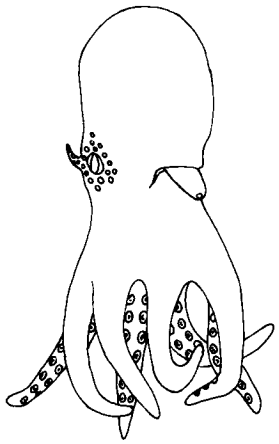


Loligo pealei (Lesueur), the "Long-finned Squid", up to 60 cm, has a head slightly narrower than the mantle, no eyelids, and 10 arms, the 2 longer, tentacular arms have 4 rows of small suckers. The fins reach ½ or more the length of the mantle. The color is translucent grey with obvious pigment cells, which are mostly red and black. It swims in schools from the surface to 80 meters, at times close to shore.

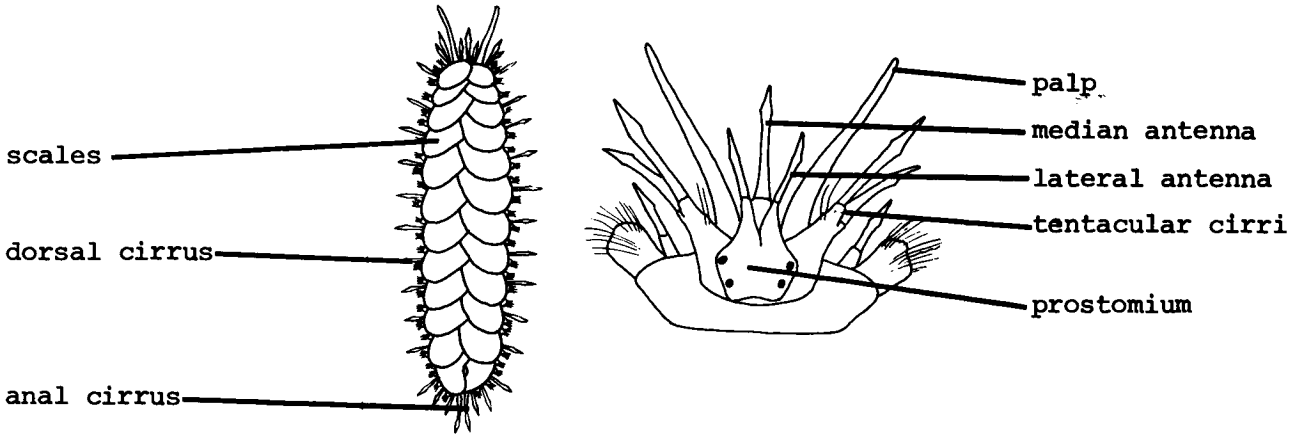


X1/10

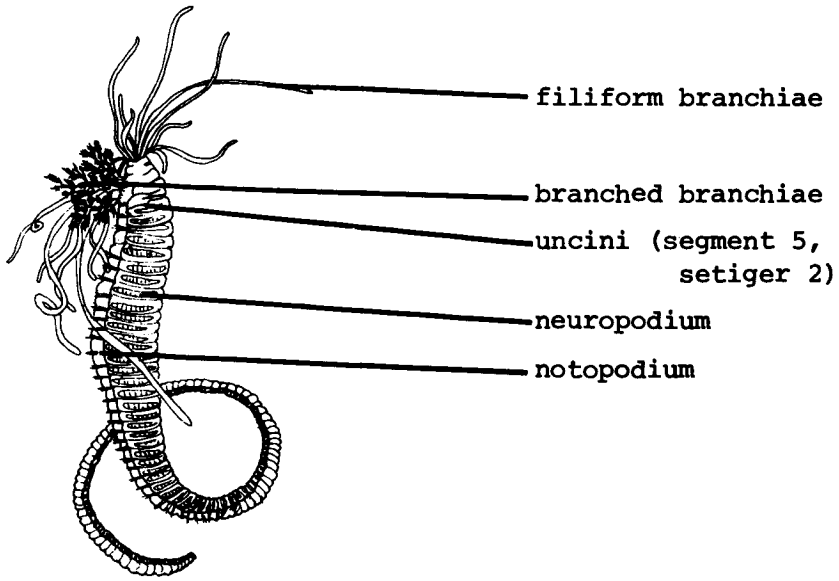
The little octopus recorded in this area is *Bathypolypus arcticus* Prosch. The little warty horns above the eyes are characteristic. From 50-1500 meters.



X1

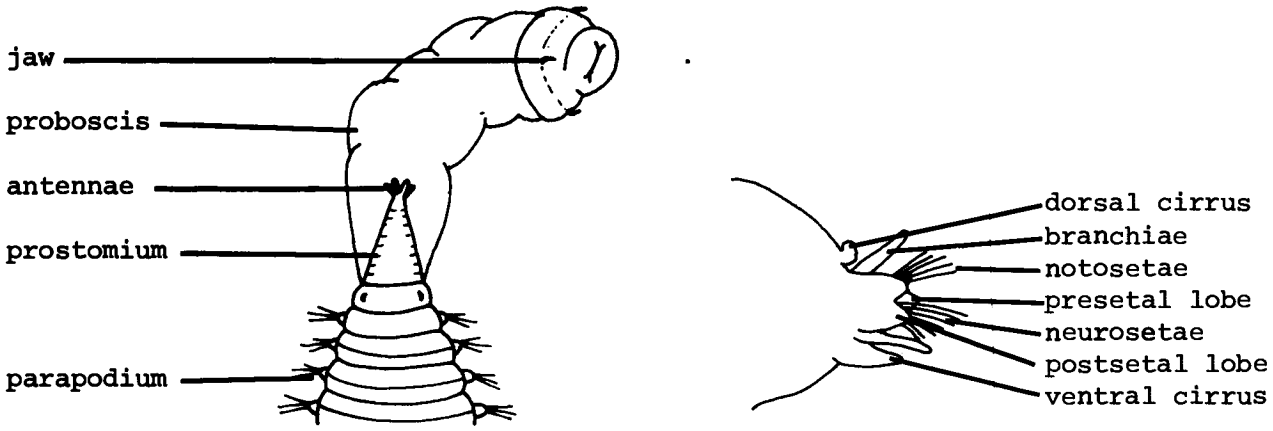


Lepidonotus squamatus



Amphitrite johnstoni

PRINCIPAL PARTS OF POLYCHAETES



Glycera dibranchiata

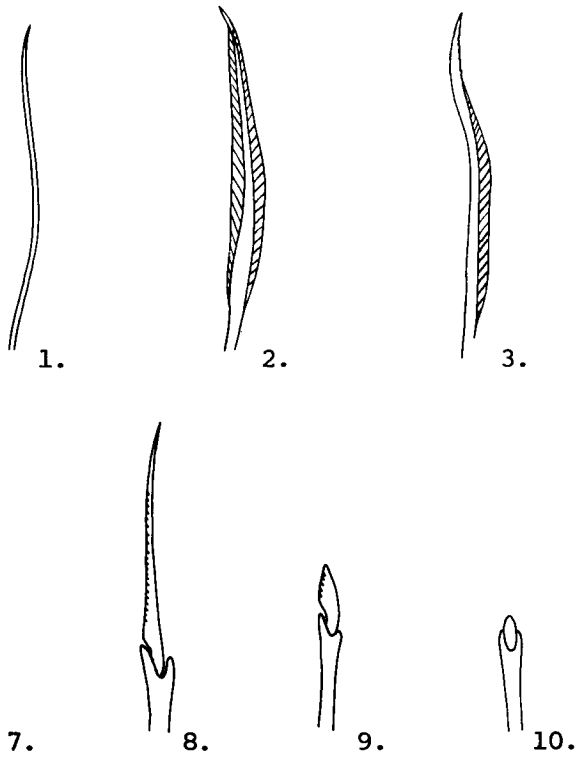
Common Types of Setae

1. Capillary
2. Limbate
3. Falcate

4-6. Crochets

7-8. Compound spinigers

9-10. Compound falcigers



VI. SEGMENTED COELOMATES

ANNELIDA: The Segmented Worms

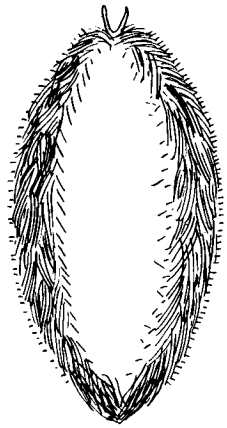
These worms are clearly segmented, unlike the many other forms in phyla as diverse as anemones to sea cucumbers, that have become wormlike once having adopted the mud-burrowing habit. The parapodia on most polychaetes, together with the various palps and cirri around the mouth, and the more or less prominent eyes on many species, distinguish them from the anatomically simpler oligochaetes. The latter are relatively small, have fewer setae (up to a dozen in each of four bundles per segment) and lack eyes in all but a few species of Naididae. The oligochaetes are hermaphrodites and have complex reproductive ducts, the polychaetes have separate sexes and gonads, but no complex copulatory equipment (as always there are exceptions to most rules). The Capitellidae (Polychaeta) resemble oligochaetes, and even have genital setae, but the setae of polychaetes are hooded and are even jointed; whereas those of oligochaetes may be bifid or pectinate. Oligochaetes may have hairlike setae in dorsal bundles, but they are not hooded or sheathed.

CLASS POLYCHAETA: The Bristle Worms

1. Dorsal surface more or less completely covered by scales (elytra) - 2
1. Dorsal surface not covered by scales - - - - - - - - - - - - - - - 7

2.(1) Scales obscured by a feltlike covering ..... *Aphrodita hastata* Moore

The "Sea Mouse" is up to 15 cm long and 7.5 cm wide, with a convex back covered by dense, greyish, feltlike matting which completely covers the 15 pairs of large, smooth scales. On mud bottoms from 1 to 2000 meters.

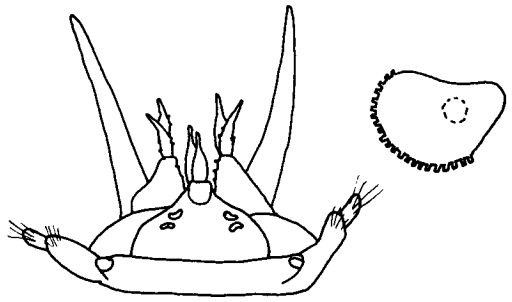


X1/2

2.(1) Scales not concealed - 3

3.(2) Scales on all segments of posterior region; without filiform dorsal cirri; prostomium suboval or subglobular ... *Pholoe minuta* (Fabricius)

This small, fragile creeping form is up to 2.5 cm long by 4 mm wide, having a variable number (approx. 40) of smooth scales with a posterior fringe of papillae. The scales cover the dorsum except for a narrow mid-dorsal line. The small prostomium has 2 pairs of eyes, a short median antenna, a pair of palps and 2 pairs of tentacular cirri. It varies in color from yellowish brown to pale pink mottled with brown and is found intertidally to 2500 meters under rocks, in crevices, among mussels, etc.



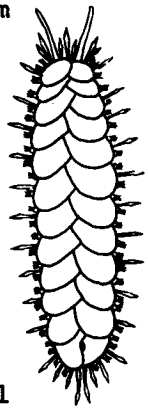
head X8

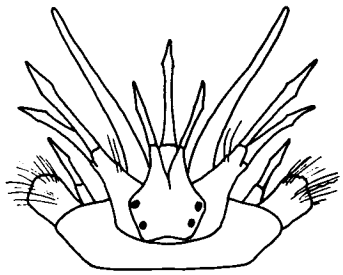
scale X10

3.(2) Scales not on all segments of posterior region; filiform dorsal cirri on segments without scales; prostomium bilobed - - - - - - - - 4

4.(3) Scales 12 pairs, dark brown, the posterior pair notched medially; lateral antennae inserted on cephalic peaks of prostomium ..... *Lepidonotus squamatus* (Linnaeus)

A common fouling species which is up to 5 cm long and 1.5 cm wide. It has 12 pairs of firmly attached scales covered with many small, dark brown or black tubercles and a lateral fringe of papillae. It has a bilobed prostomium with 2 pairs of eyes. It is found from the intertidal zone to 2800 meters clinging to the undersides of stones, piles, shells, etc.



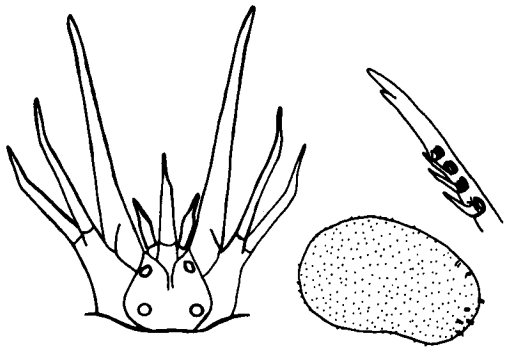


body X1
head X6

4.(3) Scales 15 pairs, lighter color, the posterior pair not notched; lateral antennae inserted ventral to cephalic peaks - - - - - - - - - 5

5.(4) Anterior pair of eyes anteroventral, not visible dorsally except through translucent prostomium ..... *Harmothoe imbricata* (Linnaeus)

Up to 6.5 cm long by 1.9 cm wide with 15 pairs of mottled greyish-brown scales (which may fall off when handled), covered with conical microtubercles. It is found on all types of bottoms from the intertidal zone to 4000 meters, clinging to rough surfaces of stones, hydroids, barnacles, etc. It is by far the most common *Harmothoe* species of the region.

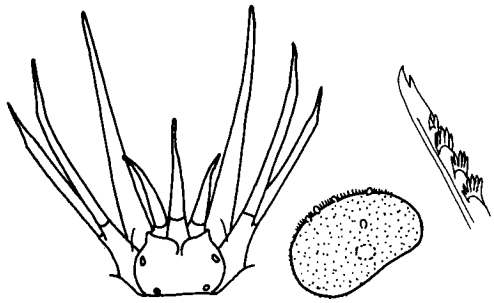


head X6
scale X5

5.(4) Anterior pair of eyes anterodorsal, visible dorsally - - - - - - - - - 6

6.(5) Scales with microtubercles only, or with additional soft globular macrotubercles; neurosetae with secondary tooth near tip ..... *Harmothoe extenuata* (Grube)

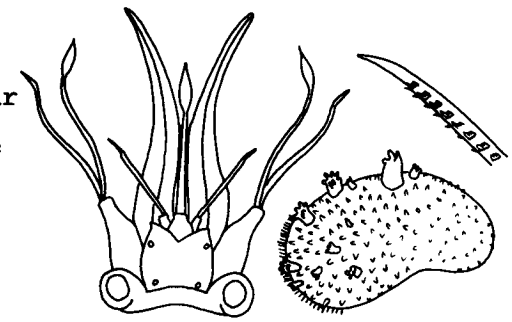
Up to 7.5 cm long and 2 cm wide, having 15 pairs of scales covered with conical microtubercles, few oval macrotubercles and a lateral fringe of papillae. It is found intertidally to 1000 meters under rocks, on piles, mussels, tunicates and algae on all types of bottoms. It is a more robust worm than *H. imbricata*.



head X1
scale X4

6.(5) Scales with microtubercles plus variously shaped branched macrotubercles; neurosetae without secondary tooth ... *Harmothoe oerstedi* (Malmgren)

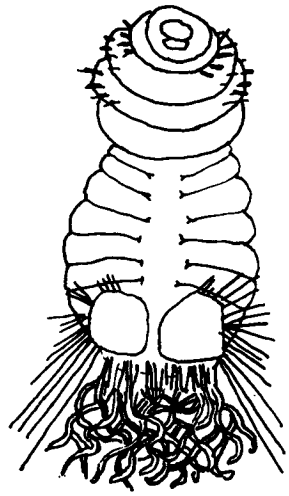
Up to 8 cm long and 3 cm wide, has 15 pairs of scales mottled grey and brown, covered with numerous microtubercles, nodular to spiny macrotubercles and a lateral fringe of papillae. From low water to 1000 meters on rocks, shells and algae on all types of bottoms.



head X1
scale X6

7.(1) Body grublike; posterior part of body with 2 large horny sternal plates from edges of which protrude long stiff setae and coiled branchiae posteriorly ..... *Sternaspis scutata* (Ranzani)

Up to 3 cm long by 1.4 cm wide and has a body divided into 3 regions. The anterior region, which may be retracted into the more posterior segments, has 7 segments, the first 3 having a semicircle of strong, yellow setae on either side. The middle region has 6 well defined segments increasing in size and the posterior region has 2 flat, horny plates. The body is dull grey. Found subtidally on muddy bottoms.



X2

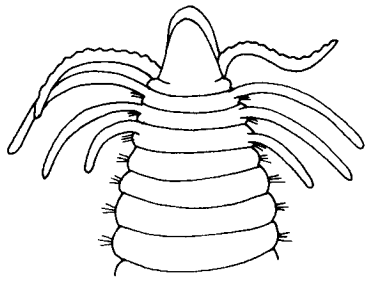
7.(1) Not as above - 8

8.(7) Anterior end with 1 pair of large grooved tentacular palps posterior to prostomium; 3 to many pairs of simple, long filiform branchiae on sides of body - 9

8.(7) Not as above -11

9.(8) Small number of branchiae, 3-8 pairs, on the anterior segments ..... *Dodecaceria concharum* Oersted

Up to 6 cm long by 3 mm wide with from 40 to 80 segments. The body is thick, often flattened and widened posteriorly with a pair of thick, grooved tentacular cirri on the prostomium. There are 3 to 8 pairs of branchiae decreasing in length from the prostomium. It ranges in color from dark green to black and is usually found in old shells from 36 to 54 meters.

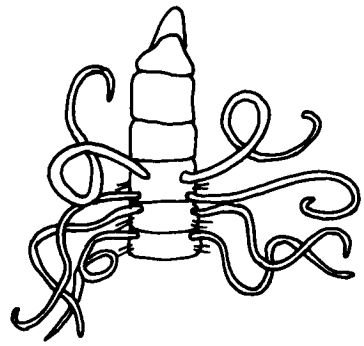


X2

9.(8) Numerous branchiae, along most of body - - - - - - - - - - - - - - - - -10

10.(9) Setae all capillary types ..... *Tharyx acutus*
Webster and Benedict

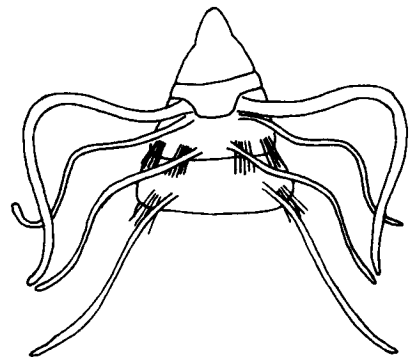
Up to 15 mm long by 7 mm wide with an elongate body and pointed prostomium. On the first setiger is a pair of thick, deeply grooved palps and the first pair of long cirriform branchiae. Similar branchiae are found along most segments of the body and these are shorter on more posterior segments. It is found from 10-20 meters.



X2

10.(9) Setae, capillary types plus crochets encircling the body in posterior region ..... *Chaetozone setosa*
Malmgren

Up to 25 mm long and 2 mm wide with from 70 to 90 segments. The body is elongate, fusiform in outline with branchiae along the entire surface which decrease in length posteriorly. The prostomium is conical and pointed with very long and grooved tentacular cirri. The setae are of the capillary and crochet types, the crochets almost encircling the body posteriorly. It is grey to brown in color. Found from low water to 2600 meters.



X20

11.(8) Branchiae directed dorsally over all or part of the dorsal surface; parapodia biramous with simple setae and crochets; no tentacular cirri; no frontal antennae, median antenna present or absent - 12

11.(8) Not as above - 17

12.(11) Anterior end with long, stout, coiled tentacular palps (may be missing); prostomium small, elongate, 0-4 eyes; pygidium with anal cup or cirri; branchiae straplike or pinnate; segment 5 may be modified - 13

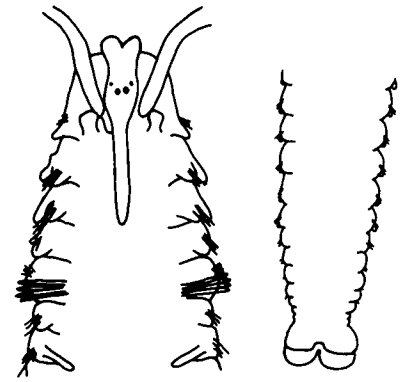
12.(11) Not as above, palps absent - 16

13.(12) Setiger 5 specialized with stout setae visible through body wall; anterior segments without branchiae; pygidium with anal cup - 14

13.(12) Setiger 5 not specialized; pygidium with anal cirri - - - - - - - - 15

14.(13) Pygidium with 4 subequal lobes; modified spines of setiger 5 bifid, or with bushy tufts between the teeth ... *Polydora quadrilobata* Jacobi

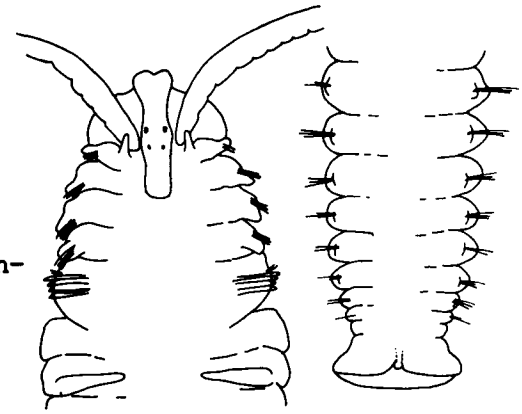
Up to 1.5 cm long with 70 segments. The prostomium, with 4 to 6 eyes, is distinctly bifid and has an indistinct caruncle. Setiger 1 has capillary notosetae and neurosetae. The branchiae begin on setiger 7 and are absent on the posterior end. The tubes are very small, being made of fine silt and stand erect. It is found intertidally in sandy mud often among the larger *Clymenella* tubes.



X20

14.(13) Pygidium cup-shaped with a distinct dorsal notch; modified spines of setiger 5 with lateral sheaths or flanges ... *Polydora websteri* Hartman

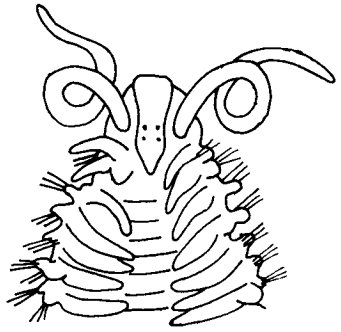
Up to 2 cm long with 105 segments. The prostomium, with 0-4 weakly developed eyes, is distinctly bifid and has an indistinct caruncle. Setiger 1 has only capillary neurosetae and elevated notopodial lobes. The branchiae begin on setiger 7 and are absent on the posterior end. It is an inconspicuous annelid often commensal on marine molluscs and accumulates mud on the shell margin which it lives in and over which the mollusc secretes a limey shell to produce a blister. In shallow depths.



X20

15.(13) With numerous, simple, straplike branchiae .... *Spio filicornis* (Müller)

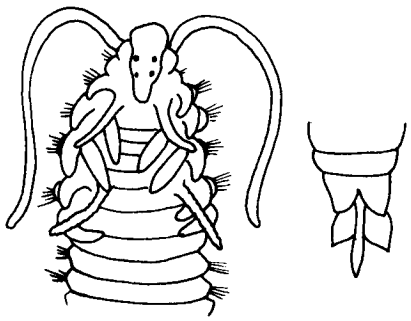
Up to 3 cm long with a prostomium with 4 eyes that is broadly rounded in front and extends posteriorly as a narrow caruncle. It has a small median antenna inserted between the palps. The simple branchiae are on all segments. The ringlike pygidium ends in 4 tapering cirri. The thick, sandy tube stands vertically and is found intertidally to 400 meters.



X20

15.(13) With 4 pairs branchiae, first and last pair pinnate ..... *Prionospio steenstrupi* Malmgren

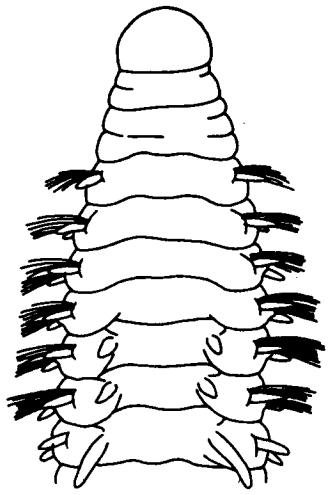
Up to 3 cm long with 100 segments. The prostomium has 4 eyes, is rounded anteriorly and narrows posteriorly with no median antennae. The branchiae begin on setiger 2 and extend for 4 setigers. The pygidium has a single dorsal cirrus and a pair of shorter lateral cirri. Common in mud from low water to 400 meters.



X20

16.(12) Median antenna absent; body weakly divided into short, slightly flattened anterior region, and long posterior region with parapodia and fingerlike branchiae; pygidium with 4 short, cylindrical anal cirri ..... *Naineris quadricuspida* (Fabricius)

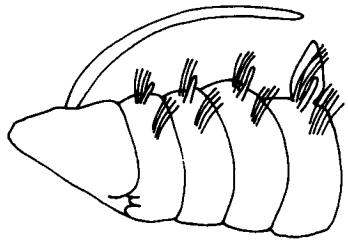
Up to 8 cm long by 3 mm wide with about 130 segments. The prostomium is oval with a pair of minute eyes near the posterior border. The branchiae begin on setiger 4-6, and are short and triangular anteriorly becoming broad and pointed posteriorly. The color is generally brownish but may be yellow in the summer due to the presence of eggs. Common in tidepools, under rocks and among shells from the intertidal zone to 2000 meters.



X20

16.(12) Median antenna present; 9-10 pairs branchiae begin on setiger 4; pygidium with 3 short, slender anal cirri ... *Aricidea quadrilobata* Webster and Benedict

This small, uncommon worm is up to 6 mm long by 0.6 mm wide and has 100 segments. The prostomium is rounded anteriorly and has a single median antenna. The 9-10 branchiae begin on setiger 4 and have broad bases tapering abruptly to a point. The main body is light green with glistening white setae and green branchiae with red centers. Found in soft mud and sandy mud in mucus tubes from low water to 60 meters.



X30

17.(11) Prostomium more or less concealed by feathery tentacles, by chitinous golden setae or paleae, by long filamentous outgrowths, which may continue along sides of body or, by setae directed forward sometimes forming a cephalic cage - - - - - - - - - - - - - - 18

17.(11) Prostomium generally visible - 37

18.(17) Anterior end bearing pinnate or featherylike tentacles forming a branchial plume - 19

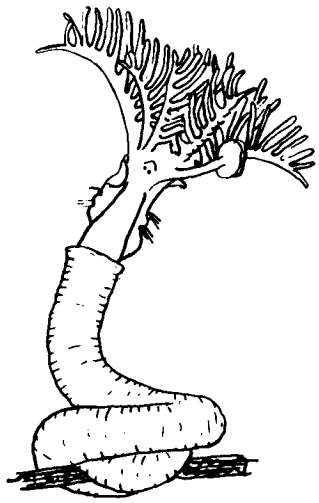
18.(17) Anterior end without branchial plume - - - - - - - - - - - - - - - 25

19.(18) Tube calcareous, irregular in form (spirally coiled in *Spirorbis*); one of the tentacles modified to form a pluglike stalked operculum; usually with thoracic membrane - - - - - - - - - - - - - - 20

19.(18) Tubes not calcareous, may be horny, mucoid or membranous, without operculum or thoracic membrane - - - - - - - - - - - - - - - 21

20.(19) Shell coiled dextrally; tube smooth, white; subtidal ..... *Spirorbis spirillum* (Linnaeus)

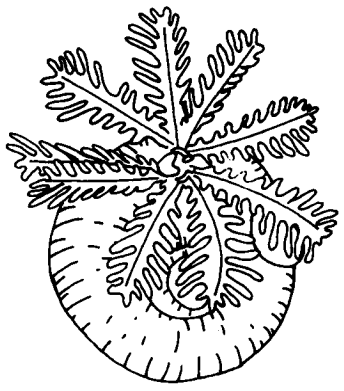
It has a flat, dextrally coiled calcareous tube which is from 1-3 mm in diameter. The tube is white, shiny, smooth and coiled about 3½ times. It has 9 branchiae which also act as feeding structures and a vase-shaped operculum. It broods its eggs and embryos within the tube. It is found in deep water with the tube firmly attached to hydroids, algae fronds, stones and carapaces of crustaceans.



X10

20.(19) Shell coiled sinistrally; tube smooth to rugose, white; intertidally ..... *Spirorbis borealis* Daudin

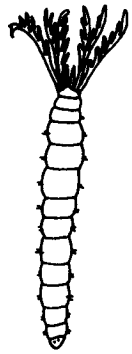
It has a flat, sinistrally coiled calcareous tube which is from 2-3 mm in diameter. The tube is rough, dull, pasty-white and coiled 2-4 times around a deep umbilicus. It has 9 branchiae which also act as feeding structures and a funnel shaped operculum. It broods its eggs and embryos within the tube. Common intertidally where the tubes are cemented to rocks and algae.



X10

21.(19) Minute species, body 10-12 segments; 2 eyes on first segment and pygidium; collarette poorly developed, represented by a ventral spatulate lip; no palmar membrane ..... *Fabricia sabella* (Ehrenberg)

This tiny worm is up to 3 mm long and 0.25 mm wide and has only 10-12 segments, of which 8 are thoracic. There are 3 branchial filaments per branchial lobe with no uniting or palmar membrane or eyes on the filaments. The collar is poorly developed, represented by a ventral lobe only. The pygidium has a pair of eyespots. The soft mucus tube is embedded in sand or mud. Intertidally to 450 meters.

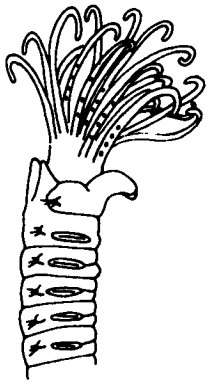


X20

21.(19) Larger species, body more than 12 segments; with palmar membrane - 22

22.(21) Branchial filaments with eyes; united at base only by poorly developed palmar membrane; 4-lobed collarette ..... *Potamilla reniformis* (Leuckart)

Up to 10 cm long by 2 mm wide with 5-15 (usually 10) branchial filaments per branchial lobe. On some of the filaments are from 0-8 large, dark, compound eyes in a row. The collar is 4-lobed with a mid-dorsal depression, a mid-ventral slit and a deep notch dorsolaterally. The pygidium has a pair of bulbous lobes with eye-spots. The horny, translucent tube is leathery and covered with sand or mud with the free end usually flattened. From low water to 625 meters.

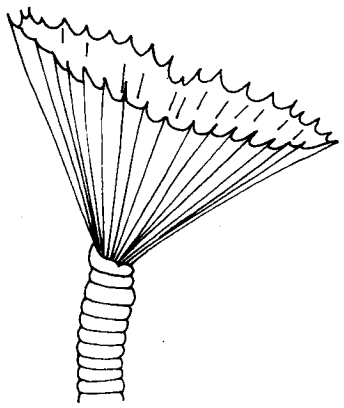


X5

22.(21) Branchial filaments without eyes; palmar membrane well developed - 23

23.(22) Collarette poorly developed, represented by a triangular ventral lobe ..... *Myxicola infundibulum* (Montagu)

It is up to 20 cm long and 3 cm wide and has 20-40 branchial filaments united for most of their length by a palmar membrane to form a branchial crown which when disturbed is pulled back within the tube by a single, very rapid muscular contraction of the body. There is a mid-dorsal groove on the first 8-10 segments. The thick, gelatinous, transparent tube is elastic and is buried in sand. The worm is a uniform dark green or brown Found from low water to 550 meters.

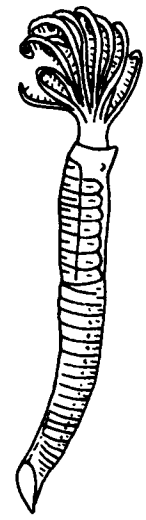


X1/2

23.(22) Collarette well developed - 24

24.(23) Collarette notched mid-dorsally and small mid-ventral slit; posterior with ventral suckerlike disc ..... *Euchone rubrocincta* (Sars)

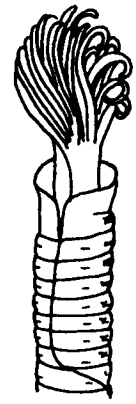
This inconspicuous worm is up to 25 mm long by 5 mm wide. It has branchial filaments united by at least one-half their length by a palmar membrane. The well-developed collar is 2 lobed, with a mid-dorsal notch and a small mid-ventral slit. There are 8 thoracic setigers. The posterior 9 or 10 segments have a large vertral groove-like depression with flared sides. The membranous tube is covered with sand, mud or pebbles. Found in shallow water.



X3

24.(23) Collarette with mid-dorsal slit only; posterior without ventral suckerlike disc ..... *Chone infundibuliformis* Kröyer

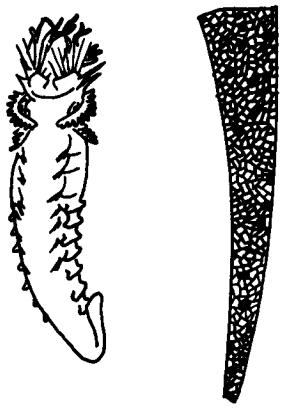
This inconspicuous worm is up to 12 cm long and 6 mm wide. It has 10-36 (usually 15) branchial filaments united at the base for more than one-half their length by a palmar membrane. The well-developed collar has a mid-dorsal slit only and is entire ventrally. There are 8 thoracic setigers. The pygidium has a rounded, bulbous dorsal valve, without a suckerlike disc. The membranous tube is encrusted with sand, mud or pebbles. Found from low water to 3500 meters.



X2

25.(18) Anterior end decidedly truncate with 2 comblike series of golden setae or paleae forming an operculum; conical, slightly arched tube made of a single layer of sand grains, open at both ends ..... *Pectinaria granulata* (Linnaeus)

Up to 5.2 cm long with a short conical body and an indistinct prostomium fused with the buccal segment forming a truncate anterior end. There are golden, shiny paleae, red gills and 2 pairs of tentacular cirri. It forms a beautifully arched conical tube of a single layer of coarse sand grains cemented together. Found intertidally in tidepools, under rocks and in mussel beds to 50 meters.



Xl

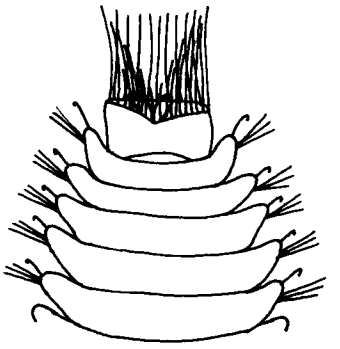
25.(18) Anterior end without 2 comblike series of paleae forming an operculum; tube otherwise - 26

26.(25) Anterior end usually with elongate setae surrounding the head region forming a cephalic cage; body papillated, not regionated, may be encased in thick mucous mantle - - - - - - - - - - - - - - - 27

26.(25) Anterior end not as above, but with long filamentous (threadlike) outgrowths, body regionated, without papillae; tube membranous - 29

27.(26) Body covered by a thick mucous mantle; neurosetae, compound, stout, dark-tipped hooks ..... *Flabelligera affinis* (Sars)

Up to 13 cm with about 70 segments. The body is rounded, attenuated slightly anteriorly and more so posteriorly with a thick transparent mantle of mucus which may be covered with mud on the outside. The body is covered with numerous, long papillae which are embedded in the mucus. The setae of the first 4 segments are directed forward to form a cage. The prostomium has 8 blunt, unequal branchiae plus 2 thicker tentacles. Found from the intertidal zone to 40 meters.



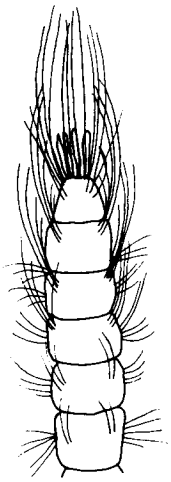
X3

27.(26) Body not covered by a thick mucous mantle; neurosetae simple - 28

28.(27) Both neurosetae and notosetae long, capillary; branchiae of 2 kinds, one filiform, the other wider and flattened ..... *Diplocirrus hirsutus* (Hansen)

25 mm long by 2 mm wide with a body covered with papillae which are remarkably long. The setae of the first 2 setigers are projected anteriorly forming a cephalic cage. It is pale greenish in color and found in shallow water.

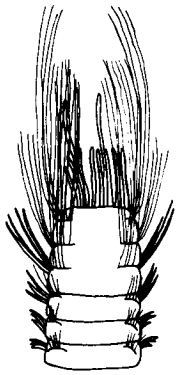
X10



28.(27) Neurosetae hooked, not capillary; branchiae, all filiform ..... *Pherusa plumosa* (Müller)

Up to 13 cm long with 60-90 segments. The body is rounded, having 2 large palps and 8-10 oral, fingerlike branchiae. The body is covered with elongated cylindrical or capitate papillae, agglutinated with sand and mud. The long capillary setae of the first 3 segments are directed forwards to form the cage and the hooked neurosetae begin on segment 4. It is grey or brown and is found from 16 to 20 meters.

X4

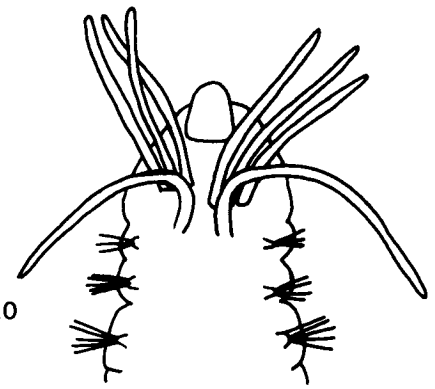


29.(26) Anterior end with or without 2 rows of conspicuous paleae, usually 4 pairs of filiform branchiae, short tentacular filaments retractile so prostomium often visible - - - - - - - - - - - - - - - 30

29.(26) Anterior end without paleae, branchiae dorsal or absent, with numerous long tentacular filaments non-retractile, prostomium not visible - 32

30.(29) Without paleae; thoracic uncini with 5 teeth; anal cirri 2 ..... *Asabellides oculata* (Webster)

Up to 2 cm long with 14 thoracic segments and 13 abdominal segments. The tentacles are pinnate and there are 2 anal cirri. It is transparent but appears red because of blood. From 4 to 16 meters. It is similar in appearance to *Ampharete* sp.

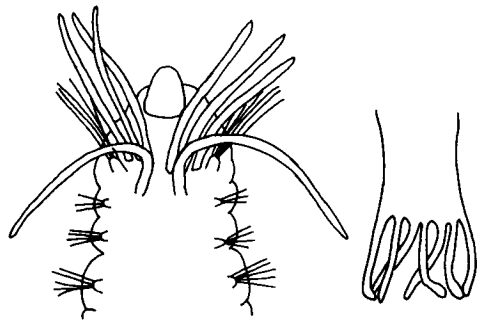


X10

30.(29) With paleae; thoracic uncini with 6-10 teeth; anal cirri 2 or numerous - 31

31.(30) Paleae slender, tapering gradually; neuropodial cirri prominent; anal cirri numerous; thoracic uncini with 8-10 teeth ..... *Ampharete acutifrons* (Grube)

Up to 2 cm long with 14 thoracic segments and 12 abdominal segments with prominent neuropodial cirri. The tentacles are pinnate and there are 10-14 anal cirri. The tubes are membranous with compact mud. The body is transparent but appears reddish or greenish because of the blood and guts. From just below low water to 2500 meters.



X10

31.(30) Paleae tapering rather abruptly; neuropodial cirri inconspicuous; anal cirri 2; thoracic uncini with 6-8 teeth ... *Ampharete arctica* Malmgren

Up to 4.5 cm long with 14 thoracic segments and 12-13 abdominal segments with inconspicuous neuropodial cirri. The tentacles are pinnate and there are 2 anal cirri. The tube is compospd of stiff, smooth, compact mud is thicker than in *A. acutifrons*. The body is transparent but appears reddish or greenish because of the body contents. From shallow to deep water.

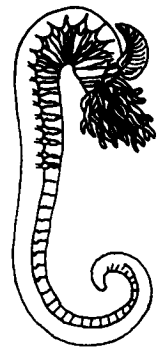
X5

32.(29) With 1-3 pairs branchiae on anterior segments - - - - - - - - - - - 33

32.(29) Without branchiae on anterior segments - - - - - - - - - - - - - - - 36

33.(32) Single large branchia formed of trunk and 4 pectinate lobes; ventral plates absent; thoracic setigers 18 ... *Terebellides stroemi* Sars

Up to 8 cm long by 8 mm wide with 60 segments. The single, large branchia is on segment 3. Setae are found on 50-56 segments. There is no cephalic ridge or eyespots. The uncini begin on setiger 6 (segment 8). The tube is sandy or muddy and the animal is found from 20 to 200 meters on a muddy bottom.

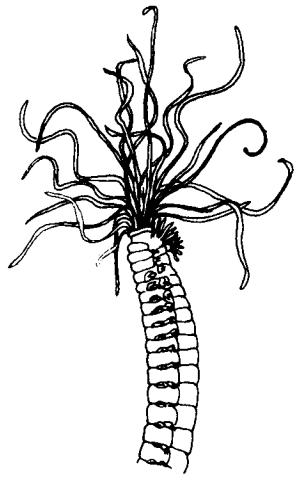


X1

33.(32) More than 1 branchia; ventral plates present - - - - - - - - - - - 34

34.(33) With 2 pairs of compound unbranched filiform branchiae ..... *Thelepus cincinnatus* (Fabricius)

Up to 20 cm long by 1 cm wide with 100 segments. The 2 pairs of unbranched branchiae are on segments 2 and 3. Setae are found on 30-40 segments. The cephalic ridge has numerous eyespots. The uncini begin on setiger 3 (segment 5). The tentacles are orange to flesh color with red dots and the body is pale red with numerous small glandular warts on the dorsal surface. The tube is membranous. Found intertidally to 1300 meters.

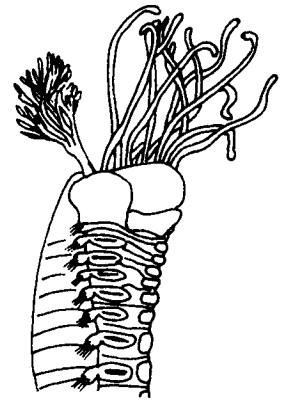


X1/2

34.(33) With 1 or 3 pairs branched branchiae - - - - - - - - - - - - - - - - 35

35.(34) With 1 pair branched branchiae; 16 setigerous segments ..... *Pista maculata* (Dalyell)

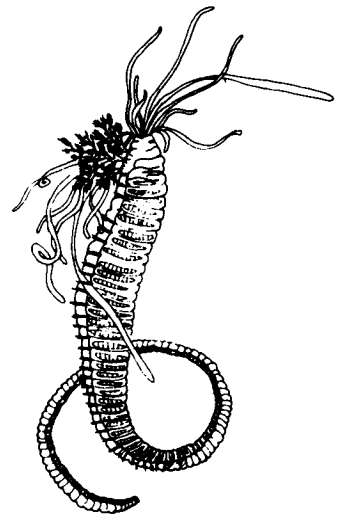
Up to 15 cm long by 5 mm wide. The single pair of treelike branchiae are on segment 2. Setae are found on 16 segments. The cephalic ridge has numerous eyespots. The uncini begin on setiger 2 (segment 5). The tube is membranous with small pebbles and debris. Found in shallow water to 250 meters.



X4

35.(34) With 3 pairs branched branchiae; 24-25 setigerous segments ..... *Amphitrite johnstoni* Malmgren

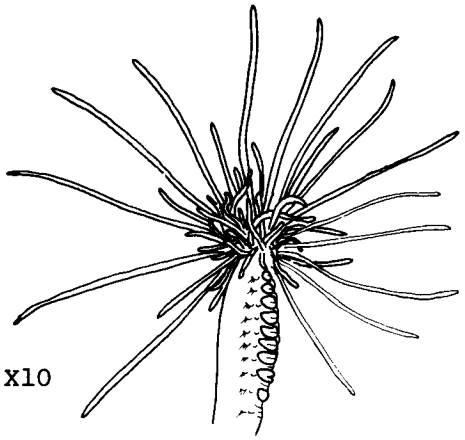
Up to 20 cm long with 90-100 segments; The 3 pairs of treelike branchiae are on segments 2-4. Setae are found on 24-25 segments. The cephalic ridge has no eyespots. The uncini begin on setiger 2 (segment 5). The tube is made of mud and sand. It is the largest and most conspicuous terebellid in this region and is usually found intertidally in mud, under rocks or in mussel beds.



X1/2

36.(32) 18-25 setigerous segments ..... *Polycirrus eximius* (Leidy)

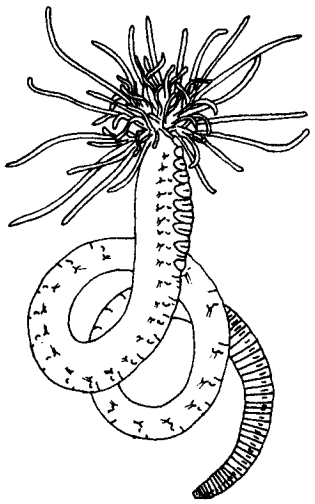
Up to 2.5 cm with very extensive tentacles. The prostomium is a great shovel-like lobe but is not usually seen. There are setae on 18-25 segments. The uncini begin on setiger 7. It constructs no tubes and can be found among decaying shell fragments. It is bright red and found from the intertidal zone to 16 meters.



X10

36.(32) 24-32 setigerous segments ..... *Polycirrus phosphoreus* Verrill

Up to 8 cm long and has a prostomium with a large folded tentacular membrane bearing a great mass of tentacular filaments, both large and small, capable of great extension and contraction. There are no eyespots and the setae are on 24-32 segments. The uncini begin on setiger 9. The body is phosphorescent and lemon-yellow in color. From the intertidal zone to 90 meters.



X2

37.(17) Prostomium with antennae, may be minute; anal cirri present; jaws present or absent; palps present or absent; tentacular cirri present or absent - 38

37.(17) Prostomium without antennae; anal cirri present or absent; jaws absent; palps absent; tentacular cirri absent - - - - - - - - 60

38.(37) Prostomium with 2-5 antennae, 1-4 pairs tentacular cirri, with or without palps - 39

38.(37) Prostomium with 4 minute antennae, with 0 or 2 pairs *(Nephtys)* tentacular cirri, without palps - - - - - - - - - - - - 53

39.(38) Parapodia uniramous with dorsal and ventral cirri flattened, leaflike or globular, setae compound; prostomium with 2 eyes, 4-5 antennae, 2-4 pairs tentacular cirri, and no palps; proboscis without jaws - 40

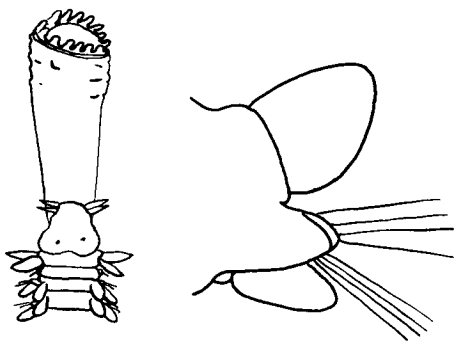
39.(38) Parapodia uni- or biramous, dorsal and ventral cirri, if present, not as above, prostomium with 4-6 eyes, 2-3 antennae; 1, 2 or 4 pairs tentacular cirri and 2 palps; proboscis armed - 47

40.(39) Tentacular cirri 2 or 3 pairs - - - - - - - - - - - - - - - - - 41

40.(39) Tentacular cirri 4 unequal pairs - - - - - - - - - - - - - - - - 42

41.(40) Tentacular cirri 2 pairs; prostomium subtriangular, with occipital tubercle ..... *Eteone longa* (Fabricius)

Up to 16 cm long and 5 mm wide, up to 200 segments. The body is long and delicate with 4 short frontal antennae and no median antenna. It has 2 pairs of filiform tentacular cirri, small nearly symmetrical dorsal cirri, small elongate-oval ventral cirri and 2 short, spherical anal cirri. The color is whitish-grey with scattered green or brown specks. Found from high intertidal to 1850 meters in sand, muddy sand and gravel.

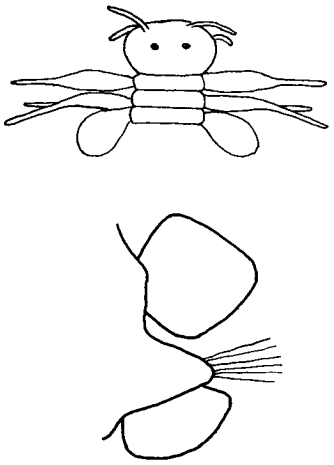


head X3

parapodia X18

41.(40) Tentacular cirri 3 pairs; prostomium suboval, without occipital tubercle ..... *Mystides borealis* Theel

Up to 16 mm long and 0.8 mm wide, up to 75 segments. The small body is linear having a suboval prostomium with 4 filiform frontal antennae and no median antenna. On the first 2 segments are 3 pairs of basally enlarged tentacular cirri. There are dorsal and ventral cirri which are small, oval and flattened and 2 oval, thick and flattened anal cirri. The color is yellowish-brown or greenish-yellow with dark cirri. From low water to 425 meters on sand, muddy sand, stones, rocks and shells.



head X10

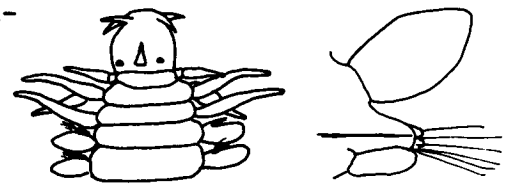
parapodia X20

42.(40) Median antenna present - 43

42.(40) Median antenna absent - 44

43.(42) Median antenna short; dorsal cirri, short, oval-obtuse ..... *Eulalia bilineata* (Johnston)

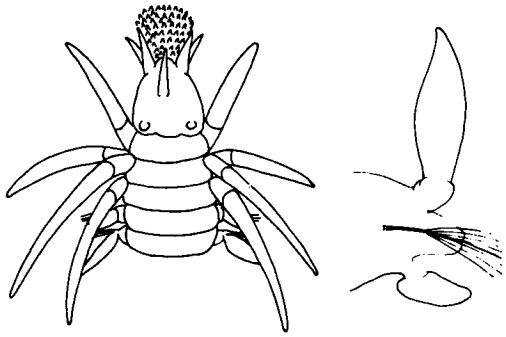
Up to 10 cm long by 2 mm wide, up to 150 segments. The body is linear with a prostomium having 4 subequal frontal antennae, a very small median one, 4 pairs of cylindrical fusiform tentacular cirri of which the upper 2 pair are the longest, extending to setiger 5 and two anal cirri. The color is greyish with dark green or brown bands (which are not always obvious) on each side and dark spots on the bases of the parapodia. Intertidally to 2500 meters among rocks, algae, bryozoans and hydroids.



head X10
parapodia X40

43.(42) Median antenna longer; dorsal cirri, elongate-lanceolate ..... *Eulalia viridis* (Linnaeus)

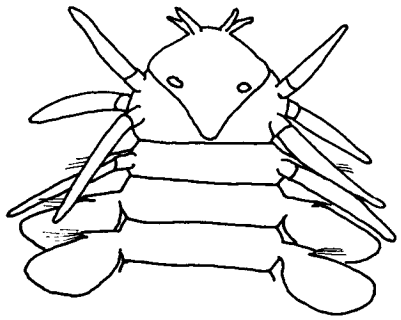
Up to 15 cm long by 3 mm wide, up to 200 segments. The prostomium is similar to *E. bilineata* except that the median antenna is subequal to the frontal antennae and the upper 2 pair of the tentacular cirri are the longest, extending to setigers 10-12 and 2 anal cirri. The color is pale to dark green with or without brown spots on the dorsal cirri. Intertidally to 250 meters in sand, mud or gravel among shells, algae and tunicates.



head X7
parapodia X21

44.(42) Prostomium suboval with distinct posterior extension ..... *Paranaitis speciosa* (Webster)

Up to 18 mm long by 3 mm wide, up to 55 segments. The suboval prostomium has a distinct posterior extension, 4 frontal antennae and no median antenna. The body has 4 pairs of tentacular cirri, the upper 2 pairs are longest and extend to setiger 4. There are large overlapping broad dorsal cirri, elongate-oval ventral cirri and oblong-oval anal cirri. The color is white or greenish with segments 9 and 10 red and all segments after 10 have transverse bands of red. From low water to 200 meters in sand and mud.

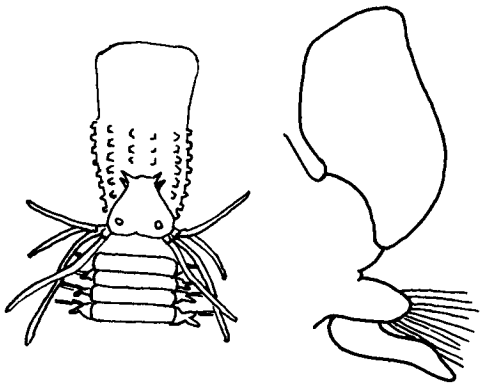


X15

44.(42) Prostomium subtriangular with a distinct posterior notch - - - - - - 45

45.(44) Ventral cirri lanceolate, pointed ..... *Phyllodoce mucosa* Oersted

Up to 15 cm long by 3 mm wide, up to 200 segments. The long, slender body has a prostomium with a proboscis having basally 12 longitudinal rows of 8-12 papillae, 4 short antennae and 2 eyes. There is a pair of cylindrical, tapering anal cirri. The color is a transparent whitish with a mid-dorsal band of brown spots and yellow spots at the base of the parapodia as well as dorsal cirri with central brown spots. It is found intertidally to 475 meters in muddy sand and gravel, on rocks and shells.



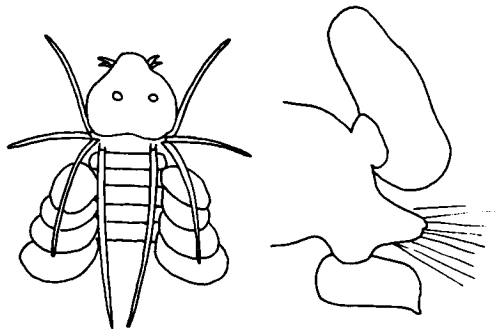
head X6

parapodia X40

45.(44) Ventral cirri not lanceolate, pointed - - - - - - - - - - - - - - - - - 46

46.(45) Ventral cirri oval, with ventral acuminate tip ..... *Phyllodoce groenlandica* Oersted

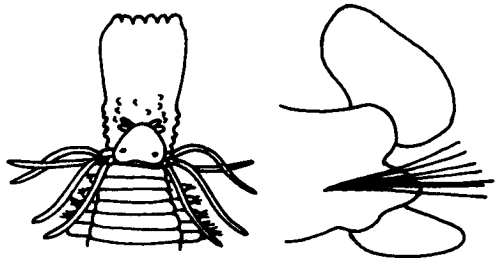
This large worm is up to 45 cm long by 9 mm wide and up to 700 segments. It is similar to *P. mucosa*. The rows on the proboscis have 10-20 papillae. The body has large suboval dorsal cirri. The color is greenish with irregular brown markings and tan to dark brown cirri. From low water to 1600 meters in sand, holdfasts of algae and on pilings.



head X4
parapodia X10

46.(45) Ventral cirri oval, without ventral acuminate tip ..... *Phyllodoce maculata* (Linnaeus)

This big, colorful worm is up to 20 cm long by 3 mm wide and can have up to 250 segments. It is similar to *P. mucosa*. The 12 rows on the proboscis have 6-8 papillae. The color is yellowish-green with 3 brownish bands, 1 mid-dorsally and 2 dorsolaterally. The dorsal cirri are spotted. Intertidally to 180 meters in tidepools, on algae, hydroids and shells on muddy bottoms.



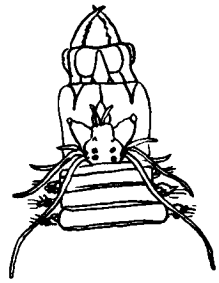
head X6
parapodia X15

47.(39) Biramous parapodia with extra tonguelike or conical lobes called ligules; prostomium with 4 eyes, 2 frontal antennae, a pair of 2-jointed palps and 4 pairs of tentacular cirri; proboscis with a pair of dark, toothed jaws and small denticles on the sides - 48

47.(39) Uniramous parapodia without ligules; prostomium with 4 eyes, sometimes with an additional minute anterior pair, 3 antennae, 1 pair of palps (may be reduced and fused) and 1-2 pairs of tentacular cirri; proboscis armed or not with 1 to several chitinous teeth - 49

48.(47) 3 notopodial ligules, upper ligules broadly triangular, largest; dorsal and ventral cirri shorter than ligules; notopodia with spinigerous setae only ..... *Nereis virens* Sars

The "Clam or Sand Worm", is a very large and common worm, up to 90 cm long, with more than 200 segments. It has a wrinkled integument, 4 pairs of slender, tapering tentacular cirri, the longest reaching to setigers 3-9. The color is usually dark green-brown with bright orange parapodia. It is used by fishermen for bait and can be found on all types of bottom, especially on sand or mud from high water to 160 meters.

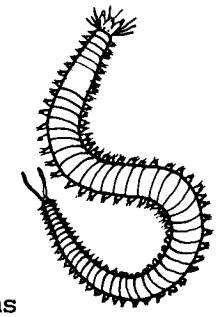


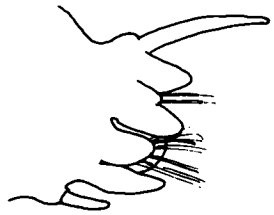
head X1

parapodia X3

48.(47) 2 notopodial ligules, ligules short, thick, evenly rounded; dorsal and ventral cirri longer than ligules; notopodia with spinigerous setae, falcigerous setae ..... *Nereis pelagica* Linnaeus

It is similar to *N. virens* but smaller, being up to 15.5 cm long with up to 100 segments. It has a smooth integument, 4 pairs of short tentacular cirri, the longest reaching setiger 2. Its parapodia are rather blunt. The color is usually uniformly brownish-grey, but may be reddish-brown to green. Found on all types of bottoms from the lower half of the intertidal zone to 1200 meters.



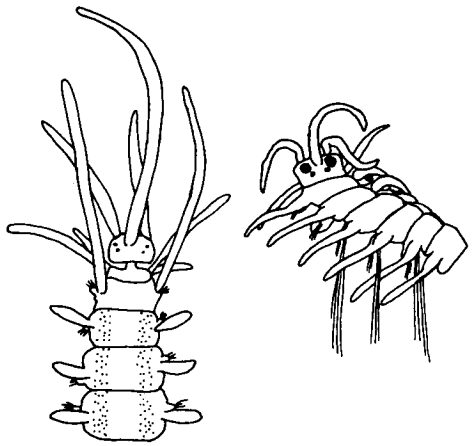


body X1/2

parapodia X5

49.(47) Ventral cirri absent; palps poorly developed, fused; antennae and dorsal cirri smooth ..... *Autolytus* sp.

The different species have bodies which are thin and elongate. The proboscis tends to be rather long with a chitinous lining and a crown of teeth. There are 4 eyes in trapezoidal arrangement. All species are known in 2 forms, benthic (stem forms, right) and swimming (gamete bearing forms, left) which are budded off as stolons from the benthic stage. The two forms may be substantially different in appearance, and in the swimming stages, the male and female stolons may be rather different in appearance.



X5

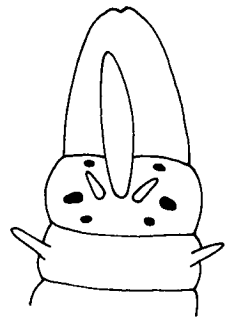
49.(47) Ventral cirri present; palps well developed; antennae and dorsal cirri smooth or annulated - 50

50.(49) Small forms, less than 10 mm long; palps appear fused for entire length; 1 pair tentacular cirri, rudimentary; segments less than 50; dorsal cirri smooth - 51

50.(49) Larger forms; palps fused on basal third or less; 2 pair tentacular cirri, segments more than 50; dorsal cirri smooth or annulated - 52

51.(50) Median antenna longest; anterior parapodia with all setae compound with short appendages ..... *Exogone hebes* (Webster and Benedict)

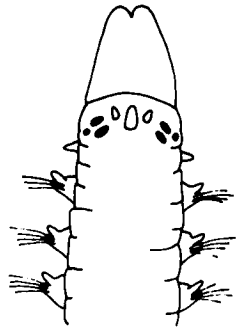
Up to 10 mm long and 30-45 segments. It is threadlike and transparent with rather small parapodia and cirri. The prostomium has 4 large eyes and usually a small pair near the base of the palps. There are no dorsal cirri on setiger 2 and all setae are compound. The tentacular cirri are rudimentary, smaller than dorsal cirri. The young are often found attached externally to the female's back and carried around. From the intertidal zone to 150 meters.



X20

51.(50) Antennae short, subequal; anterior parapodia with 3 kinds of setae; simple, curved upper ones, compound spinigers and compound falcigers ..... *Exogone verugera* (Claparède)

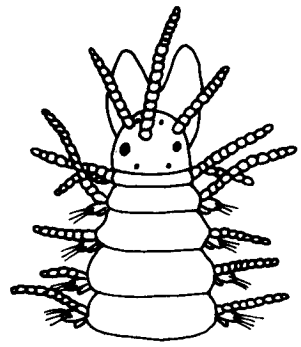
Identical to *E. hebes* except for the fact that the median antenna and the tentacular cirri are about the same size. It may have dorsal cirri on setiger 2. It also lacks the pair of small eyes near the base of the palps.



X20

52.(50) Antennae and dorsal cirri distinctly annulated over entire length; palps fused at base only; proboscis with smooth chitinous rim ..... *Syllis cornuta* Rathke

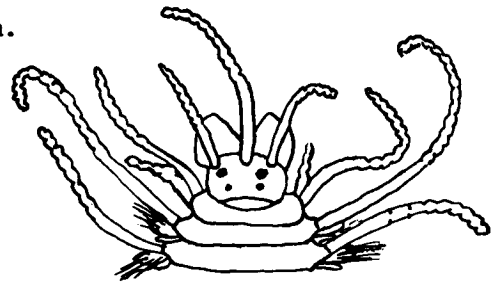
Up to 4.5 cm long, has a prostomium with 4 eyes. The ventral cirri are digitiform, about the length of the parapodial lobes, and the dorsal cirri are rather long, having 11-40 articles. It is usually white in color and found in sand, mud and stones among shells and sponges from low water to 2800 meters.



X10

52.(50) Antennae and dorsal cirri smooth or indistinctly annulated anteriorly; palps fused on basal third; proboscis with finely denticled chitinous rim ..... *Eusyllis blomstrandi* Malmgren

Up to 3.2 cm long, has a prostomium with 4 eyes. It has a distinct nuchal fold covering the posterior part of the prostomium. The ventral cirri are oval, about the same length as parapodial lobes, and the dorsal cirri in the median and posterior region are shorter than the body width. It tends to be a pale orange color and is found in sand, mud and gravel with shells, hydroids and bryozoans from low water to 850 meters.



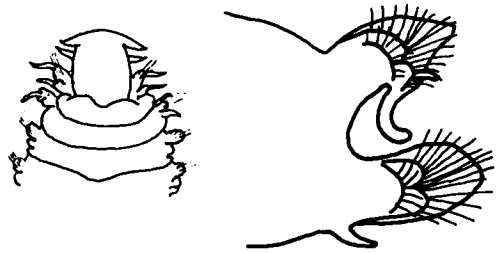
X15

53.(38) Prostomium subquadrate, with 2 pairs minute antennae, 1 pair at front corners, 1 pair concealed at sides; proboscis with a circle of papillae terminally; parapodia with lamellae; single anal cirrus - 54

53.(38) Prostomium conical and annulated ending in 4 minute antennae arranged in a cross; proboscis has 1 or 2 pairs of black hooked jaws terminally; parapodia small, without lamellae; 2 anal cirri - 56

54.(53) Parapodia with posterior lamellae large, oval; proboscis without dorsal papilla ..... *Nephtys caeca* (Fabricius)

Up to 25 cm long by 1.5 cm wide, has 150 segments. The parapodia have rudimentary anterior lamellae and long, oval posterior lamellae. The acicular lobes are bilobed to round with the preacicular setae being short and barred and the postacicular setae being long, yellow and finely spinous. The branchiae extend to near the posterior end. The body is white with tan iridescence; found on most bottoms from the intertidal zone to 600 meters.



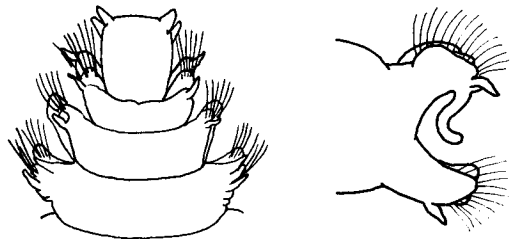
head X2

parapodia X20

54.(53) Parapodia with posterior lamellae small; proboscis with unpaired mid-dorsal papilla - 54

55. (54) Parapodia with anterior and posterior lamellae about equal in size; setae dark ..... *Nephtys incisa* Malmgren

Up to 15 cm long by 1.5 cm wide, has 75 segments. The parapodia have both the anterior and posterior lamellae equally developed. The acicular lobes are conical with the preacicular setae being short, dark brown and barred and the postacicular setae being short, deep yellow and minutely serrated. The branchiae are absent from the last 12 segments. The body is white, or sometimes pink with eggs. It is the most abundant nephtyid, found from low water to 1750 meters.

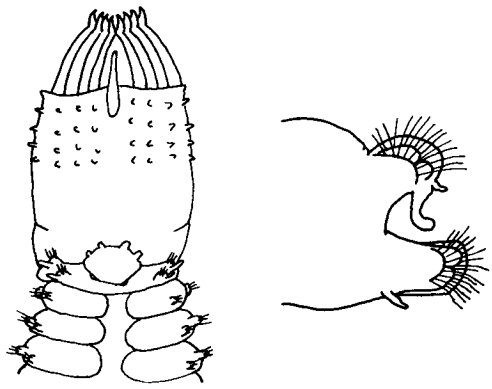


head X4

parapodia X4

55. (54) Parapodia with anterior lamellae rudimentary; setae light ..... *Nephtys ciliata* (Müller)

Up to 30 cm long by 1.3 cm wide, has 140 segments. The parapodia have rudimentary anterior lamellae and the posterior lamellae short, about the same length as the slightly bilobed acicular lobes. The preacicular setae are short, fine and barred, while the postacicular setae are long and light colored. The branchiae are rudimentary on the last 20-30 segments. The body is light brown with brown iridescence; found on sand, mud or gravel mud from low water to 925 meters.



head X2

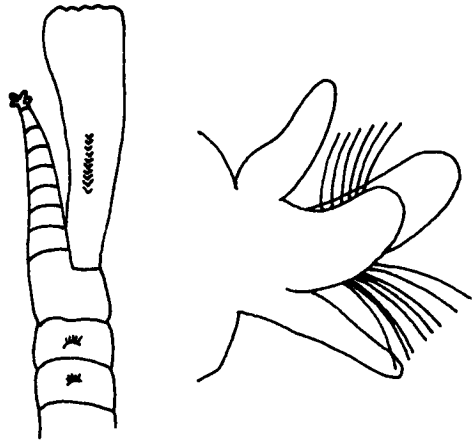
parapodia X3

56.(53) Anterior parapodia uniramous, posterior parapodia biramous; segments uniannulate; proboscis with 1 pair of dentate jaws - 57

56.(53) Parapodia all similar, either all uni- or all biramous; segments bi- or triannulate; proboscis with 4 strong jaws; body very muscular - 58

57.(56) Proboscis with 7-11 chevrons; anterior region uniramous parapodia with digitiform presetal lobe longer than postsetal lobe ..... *Goniada maculata* Oersted

Up to 10 cm long, about 200 segments. The anterior region, with uniramous parapodia has 38-40 segments. The posterior region has biramous parapodia with the notopodial lobes having conical presetal lobes and lacking postsetal lobes. The neuropodial lobes have bilobed presetal lobes with conical tips and shorter, rounded postsetal lobes. The body is transparent-green Found on sand, mud and gravelly sand from low water to 2400 meters.

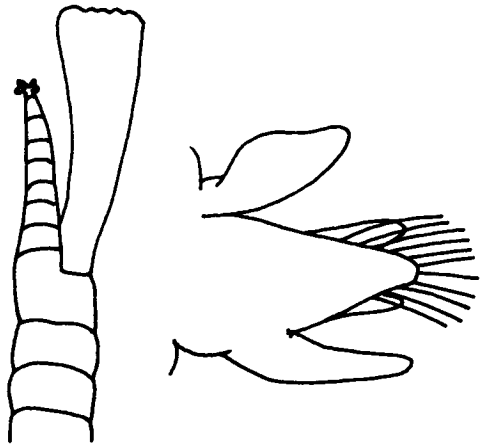


head X10

parapodia X20

57.(56) Proboscis without chevrons; anterior region uniramous parapodia with bilobed presetal lobes shorter than postsetal lobes ..... *Ophioglycera gigantea* Verrill

Up to 76 cm long, about 300 segments. The anterior region, with uniramous parapodia, has 56-64 segments. The posterior region has biramous parapodia with the notopodial lobes having triangular presetal lobes. The neuropodial lobes have bilobed presetal lobes with pointed tips and rounded postsetal lobes with narrowed triangular tips. The body is iridescent dark blue with bright red parapodia. Found in mud, intertidally to 50 meters.

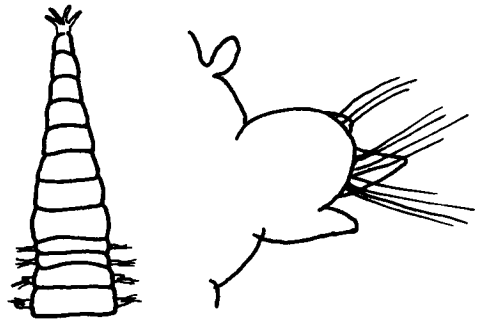


head X3

parapodia X10

58.(56) Parapodia with 1 postsetal and 2 presetal lobes; small, globular dorsal cirri well above parapodia; no branchiae ..... *Glycera capitata* Oersted

Up to 15 cm long by 8 mm wide with 150 segments which are usually triannulate. The parapodia have 2 conical presetal lobes, the lower one much longer and a single, short, rounded postsetal lobe. It has no branchiae. It is not common but is found in sand, mud and muddy gravel from low water to 3800 meters.



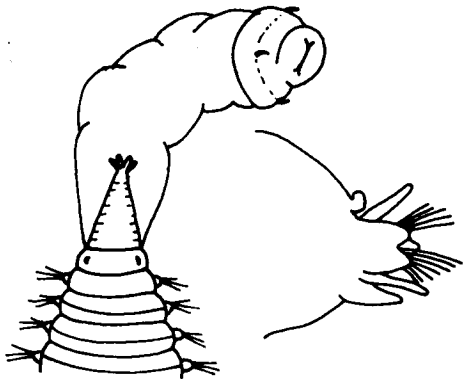
head X2

parapodia X20

58.(56) Parapodia with 2 postsetal and 2 presetal lobes; globular dorsal cirri at base of parapodia; with branchiae - - - - - - - - - - 59

59.(58) Parapodia with 2 digitiform branchiae, above and below the setal lobe ..... *Glycera dibranchiata* Ehlers

The "Blood Worm" is up to 37 cm long by 1.1 cm wide and has 300 biannulate segments. The parapodia have 2 sharply conical, presetal lobes and 2 shorter, bluntly conical postsetal lobes. The digitiform branchiae are not retractile. It is pale pink or purplish with large black teeth. It is very common on intertidal mud flats and is found to 440 meters. It is often used as fish bait.

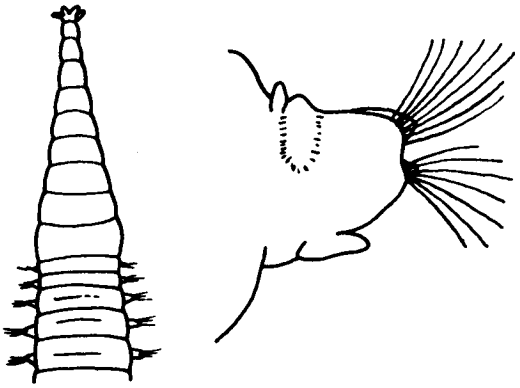


head X2

parapodia X10

59.(58) Parapodia with blisterlike branchiae on dorsal surface ..... *Glycera robusta* Ehlers

Up to 80 cm long by 2.2 cm wide with numerous biannulate segments. The parapodia have 2 conical, presetal lobes and 2 low, slightly conical postsetal lobes with only a slight notch between them. The branchiae are blisterlike and retractile. This uncommon deep burrower can be found in sand and sandy mud from low intertidal to 400 meters.



head X1

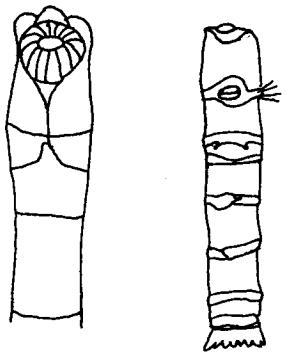
parapodia X10

60.(37) Body truncate at both ends; some segments much longer than wide; funnel-shaped pygidium with ring of cirri around edge - - - - - - - - 61

60.(37) Not as above, segments not longer than wide, pygidium not funnel-shaped - 63

61.(60) Pygidium funnel with 20-38 subequal papillae and 1 longer ventral one; setigerous segments 19, 4-5 non-setigerous segments ..... *Praxillella praetermissa* (Malmgren)

Up to 4.5 cm long, has a proboscis equipped with kidney-shaped papillae instead of conical ones and has no collarette. It has 19 setae bearing segments followed by 4 without. The anus is terminal, in the center of a funnellike pygidium, with papillae around the margin of the funnel. The body has brownish and red bands and is found in tubes of clay, sand and small bits of rock, from low water to 2225 meters.

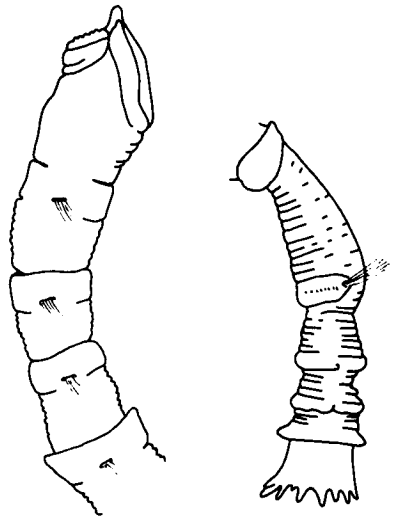


X10

61.(60) Pygidium funnel with subequal papillae but without longer ventral one; setigerous segments 18-42, 1-3 non-setigerous segments - 62

62.(61) With membranous collarette on 4th setigerous segments; setigerous segments 18; lacks ventral spot on pygidium ... *Clymenella torquata* (Leidy)

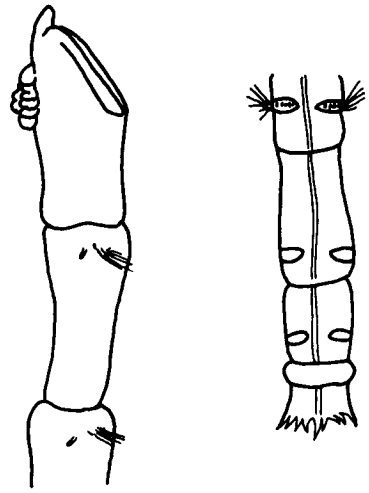
Up to 16 cm long has a head with a well developed brim or ridge. The anterior side of setiger 4 has a deep membranous collarette. The pygidial funnel is bordered with papillae and contains a projecting anal cone. It is pale red with bright red bands around the segments. It constructs round, long, straight tubes of sand and mucus and is especially common in this region in sheltered coves from low water to 120 meters.



X3

62.(61) Without membranous collarette on 4th setigerous segment; setigerous segments 19-42; with ventral spot on pygidium ..... *Clymenella zonalis* (Verrill)

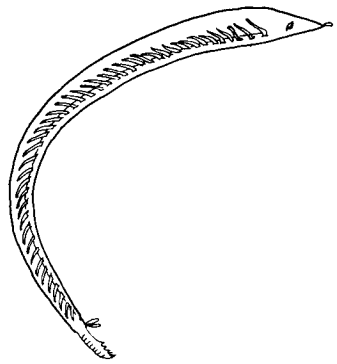
It is up to 6 cm long and is similar to *C. torquata* except that it has a ventral spot on the pygidium and lacks the membranous collarette. It is light orange-yellow with bands and spots of red and is found from 7 to 37 meters.



X9

63.(60) Body lanceolate, with a conspicuous central gutter extending length of body; parapodia reduced to bundles of setae ..... *Ammotrypane aulogaster* Rathke

Up to 7.5 cm long, about 50 segments. It has a smooth, slender, muscular body which is pointed at both ends, and a fleshy dorsal ridge with a mid-ventral groove running the length of the body. The pygidium is spoon shaped, opened ventrally, with the margins having slender papillae and the base with 3 longer cirri. The color is grey. Found in mud from low water to 250 meters.



Xl

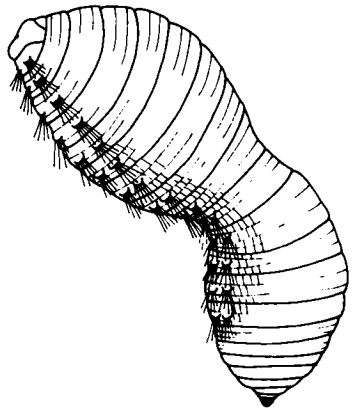
63.(60) Not as above; without ventral gutter - - - - - - - - - - - - - - - - 64

64.(63) Body fat, grublike with a narrow posterior end; segments annualted; branchiae 4 pairs on anterior segments - - - - - - - - 65

64.(63) Not as above, not grublike; branchiae present or absent not 4 pairs - 66

65.(64) Body short and fusiform; prostomium bilobed ..... *Polyphysia crassa* (Oersted)

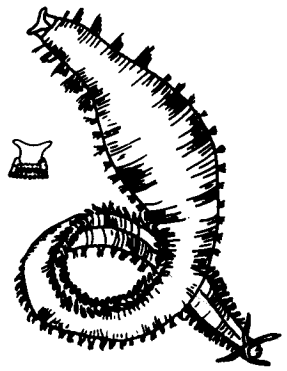
Up to 4 cm long by 1.5 cm wide and has a grublike body. The segments are bi- or triannulated and the parapodia are reduced to small papillae lacking dorsal and ventral cirri. There are 4 pairs of branchiae on setigers 2-5, the first being the smallest. The pygidium is without anal cirri. In mud or sand from 40 to 1500 meters.



X2

65.(64) Body inflated anteriorly; prostomium t-shaped .... *Scalibregma inflatum* Rathke

Up to 10 cm long with 60 segments. The body is divided into an anterior region lacking dorsal and ventral cirri and a posterior region with both. The segments have 4 annuli each. There are 4 pairs of short, tufted branchiae on setigers 2-5. The pygidium has 4-7 filiform anal cirri on ventral side. The color is orange-yellow. Found from low water to 2600 meters.



X1

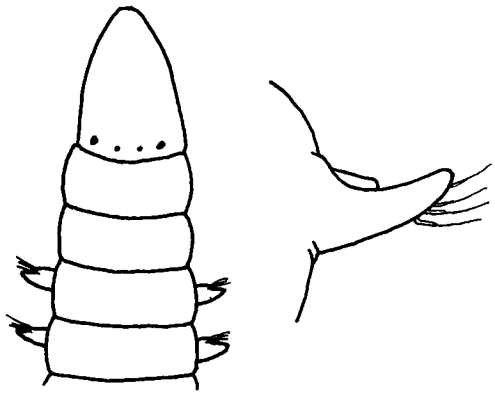
66.(64) Body cylindrical, parapodia small, uniramous; proboscis only slightly eversible, armed with dark chitinous jaws - - - - - - - - 67

66.(64) Not as above, parapodia biramous or reduced; proboscis without jaws - 69

67.(66) Without eyes; parapodia with simple limbate setae and hooked setae; acicula black - 68

67.(66) With 4 eyes on posterior border of prostomium, may be obscure; parapodia with simple limbate setae only; acicula yellow ..... *Arabella iricolor* (Montagu)

The "Opal Worm" is up to 60 cm long and has about 500 segments. The prostomium is bluntly conical with 4 eyes in a transverse line on the posterodorsal margin. It has small parapodia with short, rounded presetal lobes and longer, digitiform postsetal lobes. The body is orange and very iridescent. It secretes a thick coat of mucus and is common in sand and muddy sand, under rocks, among mussels, etc. from the intertidal zone to 90 meters.

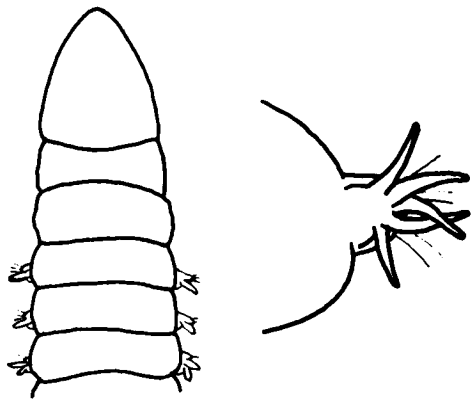


head X3

parapodia X12

68.(67) Some parapodia with palmately branched branchiae ..... *Ninoe nigripes* Verrill

This long, slender worm is up to 10 cm long by 4 mm wide and has 150 segments. The prostomium is conical with a posterior median notch. The parapodia have short, rounded presetal lobes and digitiform postsetal lobes in the anterior region diminishing in size posteriorly. There are small red branchiae on the anterior parapodia. It is pink to red in color and can be bright orange with eggs. It is found on mud and sand from low water to 1200 meters.

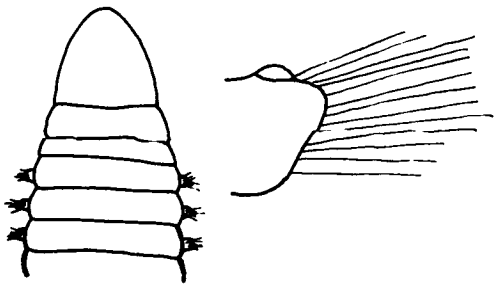


head X5

parapodia X10

68.(67) Parapodia without palmately branched branchiae ..... *Lumbrineris fragilis* (Müller)

Up to 38 cm long with 340 segments. The prostomium is short and conical. The parapodia have short, rounded presetal lobes and longer diagonally truncated postsetal lobes becoming digitiform posteriorly. It lacks branchiae entirely and is pale cream to tan with bands of white dots on each segment and dark setae. It is found in mud, muddy sand and gravelly mud intertidally to 3500 meters.

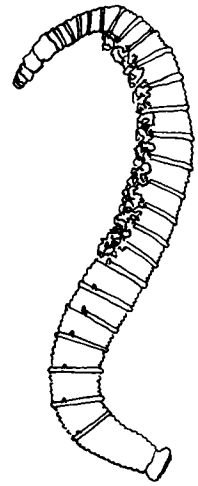


head X4

parapodia X8

69.(66) Body large, stout, 12-13 pairs conspicuous tufted branchiae on middle of body; "Lugworm" ..... *Arenicola marina* (Linnaeus)

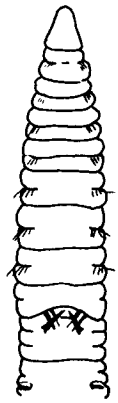
Up to 20 cm long with a stout, cylindrical body consisting of a small, blunt, 3-lobed prostomium. There are 19 setigerous segments with the first of the 13 bushy branchiae on the 7th segment and a posterior region lacking branchiae. It is dirty looking, from grey to greenish grey. Found burrowing in sand or gravel from the lower intertidal zone to 40 meters.



X1/2

69.(66) Body small, slender, tapering at both ends; no branchiae ..... *Capitella capitata* (Fabricius)

Up to 10 cm long with a slender, elongate body consisting of a distinct conical prostomium, a slightly bulging thorax having 9 setigerous segments and a long, slender abdomen with a variable number of segments. In males setigers 8 and 9 are modified with special genital hooks. The anterior end is red-pink becoming more yellowish posteriorly. It is found in sand, mud or gravel in estuarine and marine habitats from low water to 1000 meters.

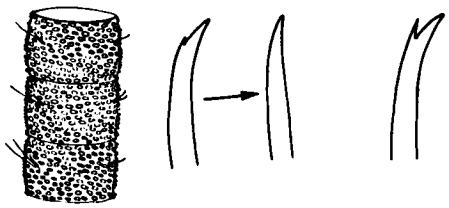


X1

CLASS OLIGOCHAETA: The Aquatic Earthworms

FAMILY TUBIFICIDAE

Peloscolex benedeni (Uedkem) is from 35 to 55 mm long and contains 75 to 100 segments. The body wall is generally thin, imparting a fragile appearance to the worm and is distinctly papillate, often with accumulations of foreign particles in ridges of the epidermis. Dorsal crochets are bifid or single-pointed, and the setae of the ventral bundles are bifid with the upper tooth shorter than the lower. The spermathecal pores are on segment 10. The worms are usually red. Found in the intertidal zone to a depth of 9 fathoms.

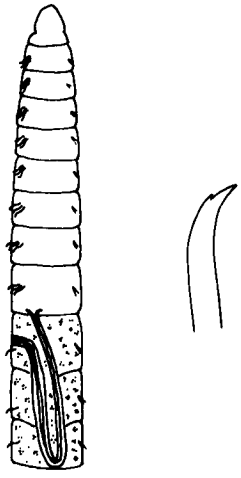


body section X10

crochets X200

seta X200

Clitellio arenarius (Müller) is 20 to 65 mm long, 0.5 to 0.8 mm in diameter and contains 64 to 120 segments. The body wall is smooth being rarely encrusted with foreign particles. Setae are bifid with upper tooth small, rudimentary or absent. The atria is very long and cylindrical. The spermathecal pores are on segment 10. The worms are usually red. Found in the intertidal zone in sand and gravel, often under stones.

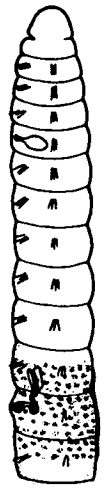


body X20

seta X200

FAMILY ENCHYTRAEIDAE

Enchytraeus albidus Henle, up to 3.5 cm long by 1 mm in diameter and contains 46 to 65 segments. The body wall is generally thick giving a rigid appearance and there is a prominent bulge or clitellum beginning on segment 11. All setae have simple pointed or rounded ends and the setae of the dorsal and ventral bundles are similar. The spermathecal pores are on segment 5. The worms are white or pink. Found living in decaying seaweed or under stones near the high tide line.



X10

There are a surprising number of marine oligochaetes, many of which will be found in this region. The most recent key is that of D. G. Cook and R. O. Brinkhurst, Marine Flora and Fauna of the N.E.U.S. NOAA Tech. Rep. NMFS Circ. 374. 1973.

ARTHROPODA: Sea Spiders, Barnacles, Cumaceans, Isopods, Beach Fleas, Caprellids, Mysids, Krill, Shrimp, Lobster, Hermit Crabs, and True Crabs

This phylum (or superphylum) consists of the segmented coelomates with jointed external skeletons and limbs. The Chelicerata includes the horseshoe crab (that does not occur in our area) and the Arachnida (non-marine) plus the Pycnogonida or sea spiders. These odd creatures seem to be all legs and no body.

The insects and myriapods are terrestrial, with a few marine water striders and chironomid midges.

The Crustacea are the predominantly aquatic segment of the Arthropoda, and many are marine. This large group can be roughly divided as follows:

Cephalocarida, Mystacocarida - microscopic - not treated

Branchiura - fish lice - parasitic - " "

Branchiopoda - microscopic, freshwater or hypersaline (brine shrimps) - " "

Ostracoda - microscopic - " "

Copepoda - " - " "

Cirripedia - Barnacles - the adults attached and enclosed in a calcareous shell of discrete plates.

Malacostraca - all other crustacea, the following groups are represented:

Superorder Peracarida - carapace absent or leaving at least 4 thoracic segments free.

Cumacea - inflated carapace covering 3-4 thoracic segments, abdomen narrow, reflected over carapace in life, thin. No tail fan.

Isopoda - No carapace, flattened dorso-ventrally.

Amphipoda - No carapace, laterally flattened.

Mysidacea - transparent carapace over most of thorax, eyes stalked (in species here).

Superorder Eucarida - all thoracic segments covered by and attached to carapace.

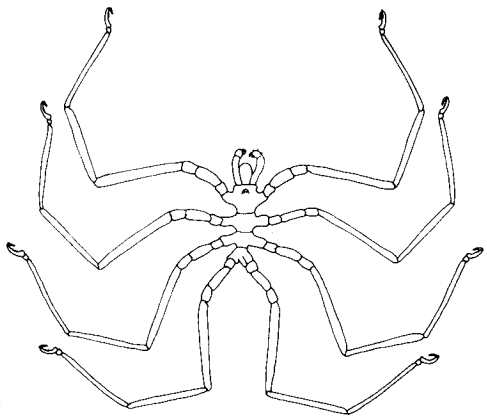
Euphausiacea - krill. The carapace is not developed latero-ventrally and so the gills are exposed.

Decapoda - the carapace encloses the gills in a branchial cavity (shrimps, crabs, lobsters).

SUBPHYLUM PYCNOGONIDA

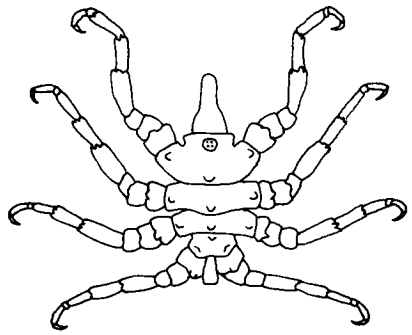
CLASS PANTOPODA: The Sea Spiders

Phoxichilidium femoratum (Rathke), up to 4 mm, has a slender body with the lateral processes well separated and slender legs with auxiliary claws on the dactyls. The conical ocular tubercle is prominent with the anterior eyes larger than the posterior. The stout proboscis, directed obliquely downward, is rounded at the end and 2/3 the length of the body. The slender chelifores are longer than the proboscis. The palps are lacking. The color is purple, grey or brown. It is found on hydroids, esp. *Tubularia*, ascidians and under stones from low water to 90 meters.



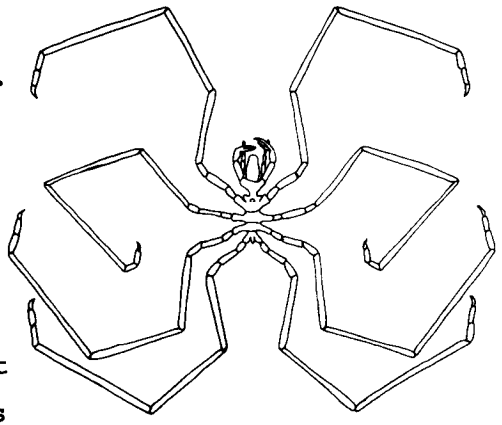
X5

Pycnogonum littorale (Ström), up to 18 mm, has a broad, heavy body with the lateral processes crowded, barely separated, and short, very powerful legs. It has very small black eyes which are widely separated. The proboscis is conical with the outer part becoming slender and cylindrical. Chelifores, palps and auxiliary claws are lacking. It has a conical tubercle on each lateral process. The color is light yellowish-brown to dark reddish brown. It is found under stones, on sea anemones and hydroids from low water to 820 meters.



X2

Nymphon stromi Kröyer, up to 15 mm, has a somewhat thickened body with the lateral processes separated and long slender legs with auxiliary claws. The ocular tubercle is low and rounded with distinct ovate eyes. The proboscis, directed forward, is large and cylindrical. The chelifores are more strongly developed than the 5-jointed palps, which are twice as long as the proboscis. The color is salmon-yellow with the legs having reddish rings. It is found on all bottoms, most common on muddy bottoms from 11-960 meters.



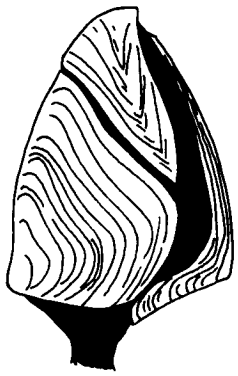
X1

SUBPHYLUM MANDIBULATA

CLASS CRUSTACEA

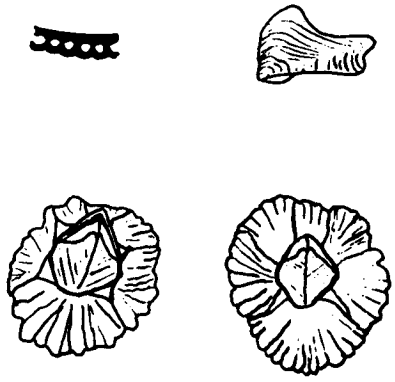
SUBCLASS CIRRIPEDIA: The Barnacles

Lepas fascicularis (Ellis and Solander), this "Goose Barnacle", up to 40 mm, is a pelagic form, with thin, papery valves, an angular, bent carina, a prominent umbone, a short stalk and an expanded basal disk. It occurs in bunches, attached to seaweeds and other floating objects.



X2

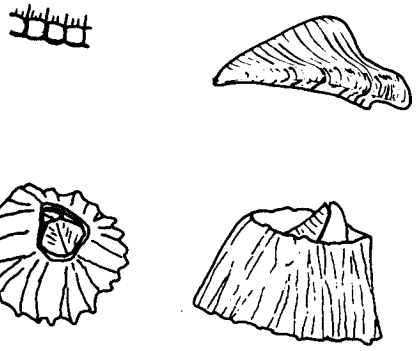
Balanus balanoides (Linnaeus), up to 30 mm in diameter, has a membranous basis; it varies in form from a rather solid, low cone with ribbed or folded walls, to a more fragile lengthened form which is smoother. The broad scuta have a callus below the articulate ridge; the narrower terga, with short spurs, are rounded distally. The plate walls are tubiferous but rather solid when viewed from the base, the inner surface is smoothish, not ribbed. It is abundant on rocks, wood and shells in the intertidal zone.



whole animal X1

terga X2

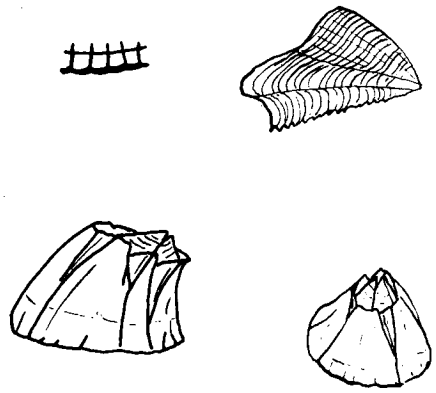
Balanus balanus (Linnaeus), up to 50 mm in diameter, has a thin, but solid, calcareous basis. The parietes usually have 2-4 strong longitudinal ribs, the radii are wide and smooth. The scuta are finely grooved longitudinally and have prominent growth ridges; the terga are much narrower than the scuta, have the points projecting well above and have wide, long spurs. The plate walls are tubiferous with the number of supporting ridges exceeding the number of main partitions. It is found on shells and stones from the lower intertidal to 165 meters.



whole animal X1/2

terga X2

Balanus crenatus Bruguière, up to 30 mm in diameter, a solid, calcareous basis with the surface marked by fine radiating furrows giving a crenulated edge. When the barnacle is removed from rock, the basis may remain. The parietes are usually irregular folded longitudinally; the radii are generally narrow. The scuta are not longitudinally grooved but have fine growth lines and are usually covered by disintegrating membrane; the terga are rather small with short spurs. The plate walls are tubiferous with the partitions extending inside the shell as supporting inner ribs. It is found on overhanging rocks, stones and shells from low water to 90 meters.



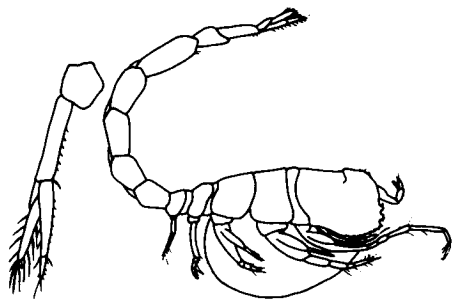
whole animal X1

terga X4

SUBCLASS MALACOSTRACA (Peracarida)

ORDER CUMACEA: The Cumacean Shrimp

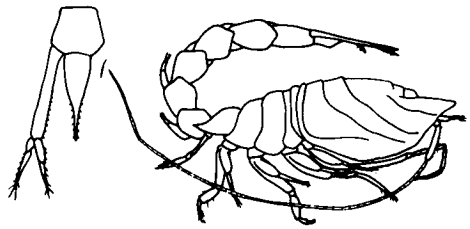
Eudorella truncatula (Bate), up to 5 mm, has a smooth anteriorly truncate carapace with 1 dorsal fold, the antero-lateral margin in females has 2 toothed prominences having a narrow sinus between them, males lack the prominences, but have 3 or 4 small teeth below. The peduncles of the uropods have spinules on the distal 2/3 of the inner edges; the 2-segmented inner rami are longer than the outer rami. It lacks a telson. Found subtidally to 100 meters.



whole animal X15

telson X30

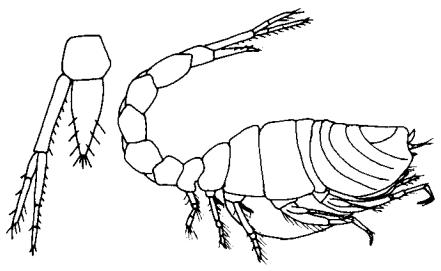
Oxyurostylis smithi Calman, up to 7 mm, has a small pseudorostrum with 3 oblique ridges; on the dorsal surface are 2 tranverse ridges, the female also has 2 fainter ones behind these. The peduncles of the uropods have spines on the distal half of the inner edge. The 3-segmented inner rami are slightly longer than the outer rami. The telson apex is upturned without apical spines. Found intertidally to 10 meters.



whole animal X10

telson X20

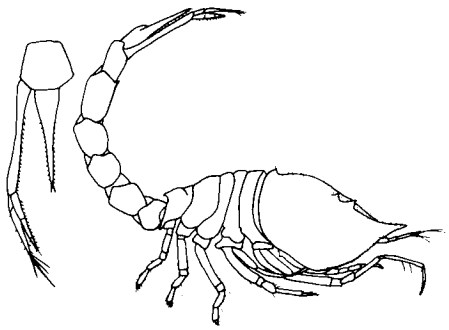
Lamprops quadriplicata S.I. Smith, up to 10 mm, has a carapace with a small pseudorostrum with 4 distinct nearly parallel ridges on each side. The antero-lateral corners are obtuse. The peduncles of the uropods have spines on the inner edges; the 3-segmented inner rami are longer than the outer rami. The telson apex is not upturned and has 5 apical spines. Found intertidally to 150 meters.



whole animal X8

telson X15

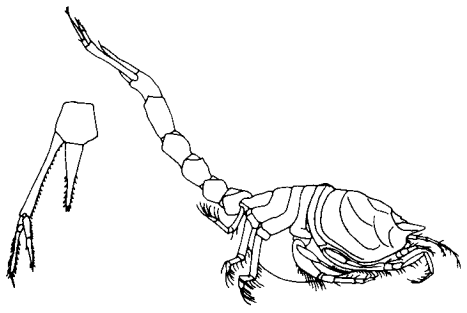
Diastylis quadrispinosa Sars, up to 11 mm, has a carapace covered with minute bristles, lacks ridges but has 4 large spines on the dorsal surface. The peduncles of the uropods have spines on the distal 2/3 of the inner edges; the 3-segmented inner rami are shorter than the outer rami. The telson apex is not upturned and has 2 apical spines. Found intertidally to 400 meters.



whole animal X7

telson X12

Diastylis sculpta Sars, up to 10 mm, has a carapace with a distinct pseudorostrum, 4 oblique lateral ridges, teeth on the antero-lateral margin, and no dorsal spines. The peduncles of the uropods have spines along the entire inner edge; the 2-segmented inner rami are shorter than the outer rami. The telson apex is not upturned and has 2 apical spines. Found intertidally to 400 meters.



whole animal X8

telson X12

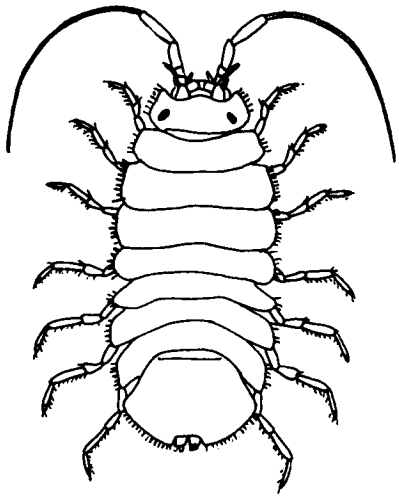
ORDER ISOPODA: The Isopods

1. Uropods lateral - 2

1. Uropods folded under ventral surface - - - - - - - - - - - - - - - - - - 3

1. Uropods terminal ..... *Jaera marina* (Fabricius)

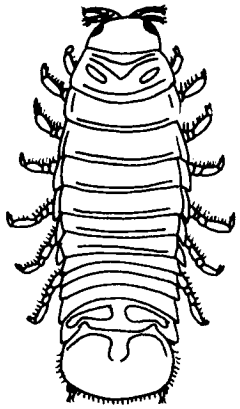
Up to 7 mm, has ambulatory legs, a broad head with the anterior margin excavated on either side of the medial lobe, and small, oval, dorsally situated eyes. Antennae 2 reach to the posterior margin of the 5th thoracic segment. The lateral margins of the body are straight with the posterolateral margins rounded. The abdomen is a single segment while the telson is broad and deep with a small excavation for the receptacle of the minute uropods. Found in the tidal region.



X7

2.(1) Uropods small, outer rami hooklike; antennae 2 slightly longer than antennae 1 ..... *Limnoria lignorum* (Rathke)

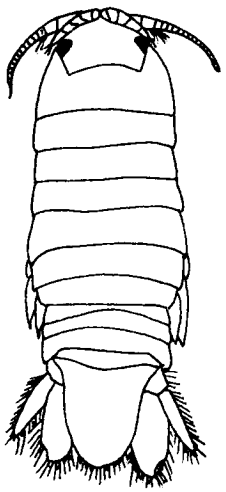
The "Gribble", up to 3 mm, has ambulatory legs and small eyes situated at the side of the head. Antennae 2 are slightly longer than antennae 1. The abdomen is 6 segmented followed by a broad telson with short setae. The uropods are small with the outer clawlike rami much smaller than the inner rami. It is found in most submerged pieces of wood.



X17

2.(1) Uropods large, both rami flattened; antennae 2 over twice as long as antennae 1 ..... *Cirolana polita* (Stimpson)

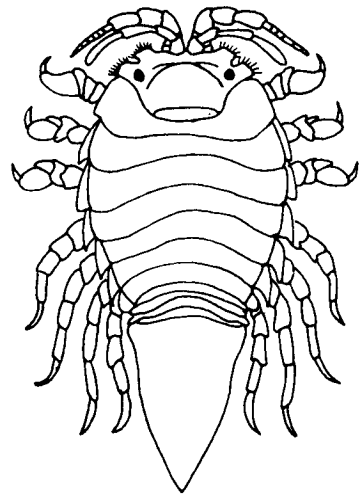
Up to 20 mm, has 3 pairs of prehensile legs followed by 4 pairs of ambulatory legs and small square eyes situated in the anterio-lateral angles of the head. Antennae 2 extend to the middle of the 1st thoracic segment. The abdomen is 6-segmented followed by a triangular telson with a crenulated apex. The large uropods have pointed outer rami and inner rami with a notch on the exterior margins. Found subtidally to 600 meters.



X4

3.(1) Eyes dorsal; sides of head notched ..... *Chiridotea coeca* (Say)

Up to 15 mm, has 3 pairs of subchelate legs followed by 4 pairs of ambulatory legs. The head has notched anterolateral lobes with the dorsal eyes at the base of the posterior lobes. Antennae 2 are slightly longer than antenna 1, reaching the anterior margin of the 1st thoracic segment. The body is short and broad with the abdomen 4-segmented and the telson tapering to a point. Found in the subtidal region.



X5

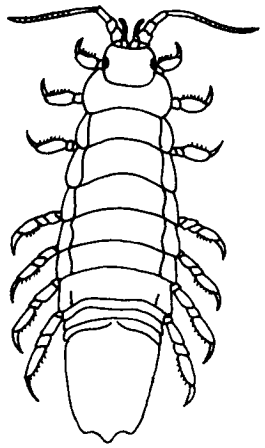
3.(1) Eyes lateral; sides of head entire - 4

4.(3) Antennae 2, flagellum multisegmented; without antero-lateral lobes on the head - 5

4.(3) Antennae 2 without a multisegmented flagellum; with anterolateral lobes on the head - 6

5.(4) Telson tapering to a tridentate apical border ... *Idotea balthica* (Pallas)

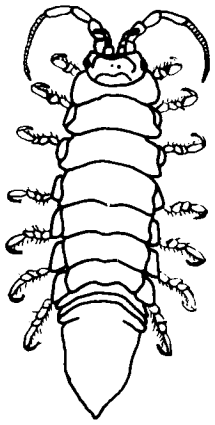
Up to 30 mm, has all legs more or less similar in structure, a head which is slightly excavated in front and round, lateral eyes. Antennae 2 have well developed flagellum which extend to the middle of the 3rd thoracic segment. The lateral margins of the body are continuous without noticable breaks between the peraeonal segments. The abdomen is 3-segmented. Found subtidally to 200 meters.



X2

5.(4) Telson tapering to a point ..... *Idotea phosphorea* Harger

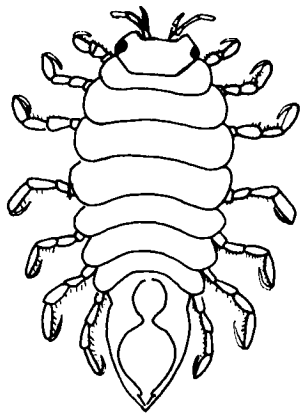
Up to 20 mm, has all legs more or less similar in structure, a head which is slightly excavated in front and round, lateral eyes. Antennae 2 have well developed flagellum which extend to the posterior margin of the 3rd thoracic segment. The lateral margins of the body are broken by laterally produced epimeres, especially paraeonal segments V, VI, VII. The abdomen is 3-segmented. Found from 1 to 60 meters.



X3

6.(4) Lateral margins of the thorax rounded ..... *Edotea triloba* (Say)

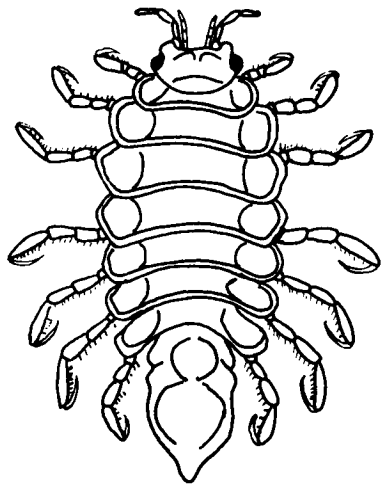
Up to 7 mm, has prehensile legs, and a head with dorsolateral eyes. Antennae 2 reach to the middle of the 4th article of antennae 1. The lateral incisions at the base of the terminal segment of the body are shallow and the lateral margins of the thorax have 2 longitudinal rows of low tubercles extending the entire length. The abdomen is a single segment. The telson tapers to a point. Found in the subtidal region.



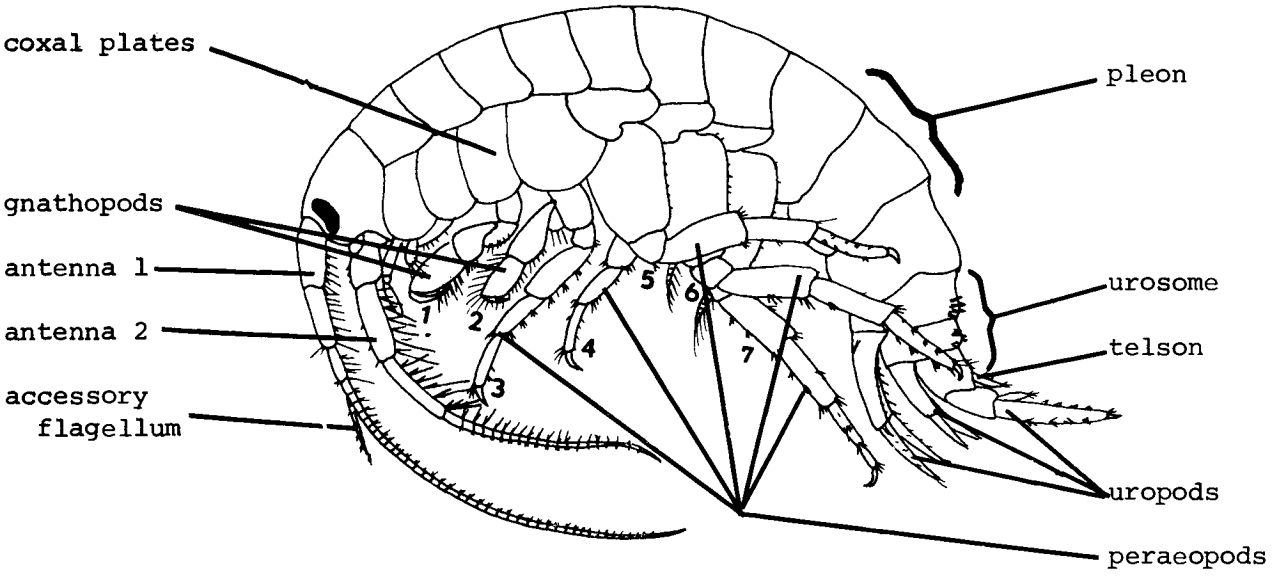
X10

6.(4) Lateral margins of the thorax straight ..... *Edotea montosa* (Stimpson)

Up to 9 mm, has prehensile legs, and a head with dorsolateral eyes. Antennae 2 do not quite extend to the end of the 3rd article of antennae 1. The lateral incisions at the base of the terminal segment of the body are deep, and there are no tubercles on the lateral portions of the thorax. The abdomen is a single segment. The telson tapers to a point. Found subtidally.



X10



Marinogammarus obtusatus

PRINCIPAL PARTS OF AN AMPHIPODS

ORDER AMPHIPODA : The Beach Fleas and Caprellids

1. Abdomen rudimentary; body cylindrical; coxal plates vestigial or lacking -16

1. Abdomen well developed; body usually laterally compressed with ventrally directed coxal plates - - - - - - - - - - - - - - - - - 2

2.(1) Antenna 1 distinctly shorter than antenna 2 - - - - - - - - - - - - - 3

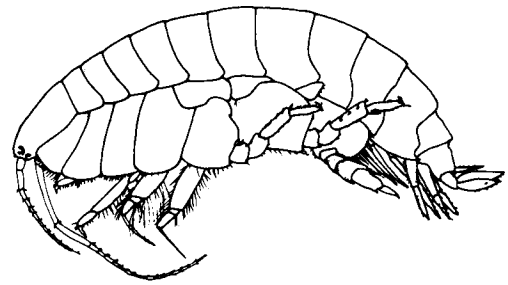
2.(1) Antenna 1 longer or about equal to antenna 2 - - - - - - - - - - - - - 6

3.(2) Eyes, 2 pairs; urosome segments 2 and 3 fused - - - - - - - - - - - - 4

3.(2) Eyes, 1 pair; urosome segments 2 and 3 not fused - - - - - - - - - - - 5

4.(3) Peraeopod 7, 3rd article shorter than 4th; pleon side plate 3 with a large tooth at the posterior corner .... *Ampelisca macrocephala* Liljeborg

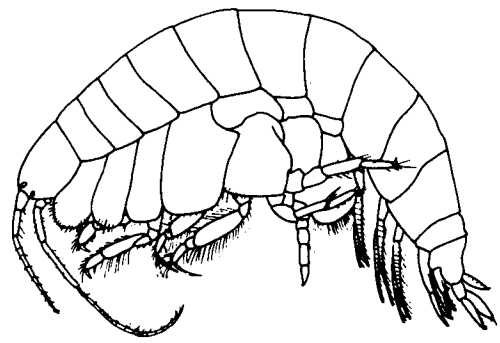
Up to 20 mm, has a compressed body with elongate dactyls on peraeopods 3 and 4, and lacking an accessory flagellum. Uropod 1 is slightly shorter than uropod 2; uropod 2 has a long, stout, grooved spine near the tip of the outer ramus. It constructs tubes among eelgrass on sand and mud bottoms from the intertidal zone to 240 meters.



X3

4.(3) Peraeopod 7, 3rd article longer than 4th; pleon side plate 3 is slightly rounded at posterior corner ..... *Ampelisca abdita* Mills

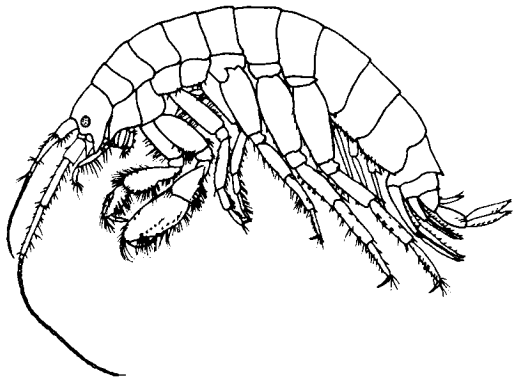
Up to 8 mm, has a compressed body, with elongate dactyls on peraeopods 3 and 4 and lacking accessory flagellum. Uropod 1 is slightly longer than uropod 2, which does not have a spine on its outer ramus. It is found in salt marshes as well as marine habitats on fine sand and silty sand from the intertidal zone to 55 meters.



X10

5.(3) Uropod 3 large, biramous, margins spinose; inferior angle of head strongly produced anteriorly ..... *Casco bigelowi* (Blake)

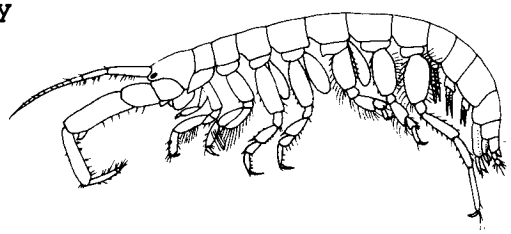
Up to 25 mm, has a compressed body with a 2-segmented accessory flagellum. Coxal plates 1 and 2 are distinctly deeper than 3 and 4. Peraeopods 5-7 have the dactyls directed anteriorly. Urosome segment 1 has a mid-dorsal tooth, while both urosome segments 2 and 3 have a pair of mid-dorsal spines. The telson is deeply cleft. It is found on muddy and stony bottoms from low water to 45 meters.



X2

5.(3) Uropod 3, small, uniramous, armed with setae only; inferior angle of head not produced ..... *Corophium volutator* (Pallas)

Up to 6 mm, has a depressed body, lacking an accessory flagellum and with antenna 2 very large and stouter than antenna 1. The coxal plates are small and separate. Peraeopods 5 and 6 have the dactyls directed posteriorly. The urosome is smooth dorsally. The small, broad telson is not cleft. It constructs tubes intertidally in mudflats of estuaries.



X10

6.(2) Accessory flagellum lacking - 15

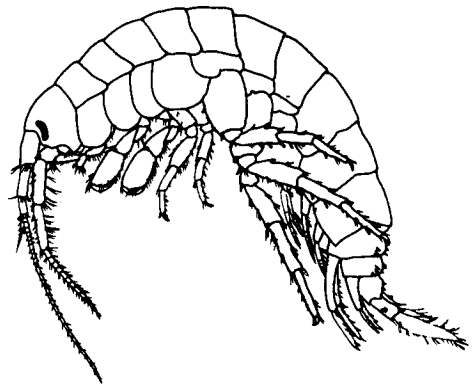
6.(2) Accessory flagellum present - 7

7.(6) Uropod 3, inner ramus less than ½ outer ramus - - - - - - - - - - - - 8

7.(6) Uropod 3, inner ramus more than ½ outer ramus - - - - - - - - - - - - 9

8.(7) Antenna 1, peduncle segment 1, posterior margin with 1 or 0 setal groups; gnathopod 1 smaller than gnathopod 2; uropod 3, inner ramus 1/3 outer ramus ..... *Marinogammarus finmarchicus* Dahl

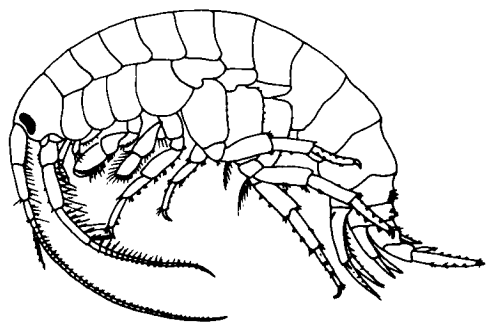
Up to 24 mm, has a compressed body with antenna 1 distinctly longer than antenna 2 and gnathopod 1 smaller than gnathopod 2. The posterior margin of the basis of peraeopod 6 has a free distal lobe. Pleon side plate 3 has an acute hind corner, only slightly produced, with a single seta on the posterior margin. The outer ramus of uropod 3 is broad, foliaceous and 1-segmented. It is found in tidepools at high water mark, also in salt marshes.



X3

8.(7) Antenna 1, peduncle segment 1, posterior margin with 4 or 5 setal groups; gnathopod 1 larger than gnathopod 2; uropod 3, inner ramus less than 1/4 outer ramus ..... *Marinogammarus obtusatus* Dahl

Up to 18 mm, has a compressed body with antenna 1 slightly longer than antenna 2 and gnathopod 1 larger than gnathopod 2. The posterior margin of the basis of peraeopod 6 has a free distal lobe. Pleon side plate 3 has an obtuse hind corner with a weakly setose posterior margin. The outer ramus of uropod 3 is narrow, subcylindrical with a distinct terminal segment. It is found in tidepools in the lower intertidal zone, also in salt marshes.



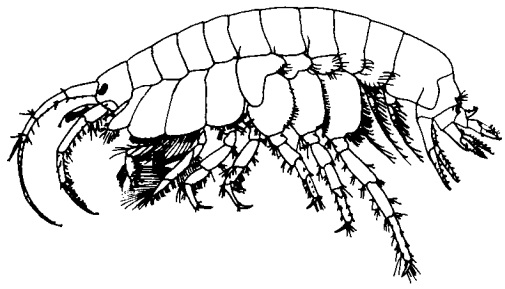
X3

9.(7) Gnathopod 1 distinctly larger than gnathopod 2; telson entire - - - - 10

9.(7) Gnathopod 1 smaller or about equal to gnathopod 2; telson cleft - - - 11

10.(9) Coxal plates 1-4 moderately deep, setose ventrally; peraeopods 5-7, bases broadly expanded ..... *Leptocheirus pinguis* (Stimpson)

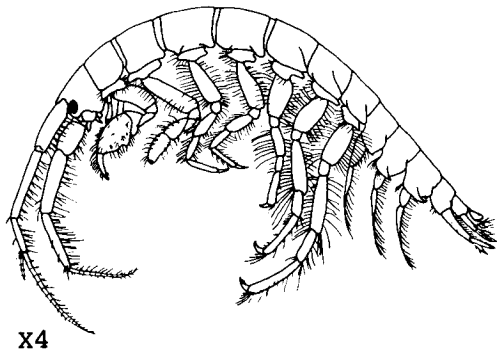
Up to 17 mm, has a compressed body with a 5-7 segmented accessory flagellum. The eyes are black and subreniform. Urosome segments 1 and 2 have paired dorsolateral cusps with setae and spines. Uropod 3 is biramous and the telson is broader than long with the apex rounded and the posterior corners acutely produced. It is found on sandy mud from low water to 230 meters.



X3

10.(9) Coxal plates 1-4 very shallow with indented borders; peraeopods 5-7 bases expanded ..... *Unciola irrorata* Say

Up to 13 mm, has a narrow depressed body with a 5-segmented accessory flagellum. The eyes are black and oval. The urosome is dorsally smooth. Uropod 3 is uniramous and the telson is rounded, slightly longer than broad. It is found from low water to 55 meters in tubes of other organisms.



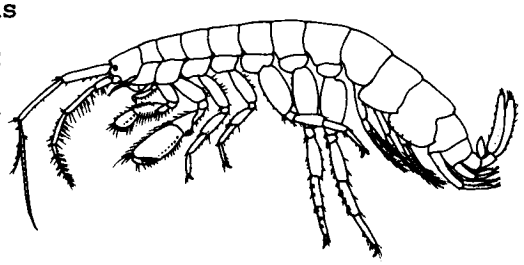
X4

11.(9) Eyes round or lacking; urosome segments smooth, without clusters of spines dorsally - 12

11.(9) Eyes reniform; urosome segments with clusters of spines dorsally - 13

12.(11) Eyes round; accessory flagellum 6-segmented; peraeopods 5-7, basis length twice width ..... *Maera danae* Stimpson

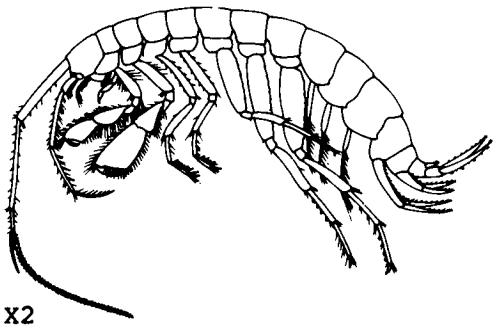
Up to 22 mm, has a slender, elongate compressed body with antenna 2 more than half as long as antenna 1. Segment 6 of gnathopod 2 has a short blunt tooth at the posterodistal angle. The broad telson is longer than the peduncle of uropod 3. On muddy and sandy bottoms along rocky shores from low water to 45 meters.



X3

12.(11) Eyes lacking; accessory flagellum 7-segmented; peraeopods 5-7, basis length 3 times width ..... *Maera loveni* (Bruzel)

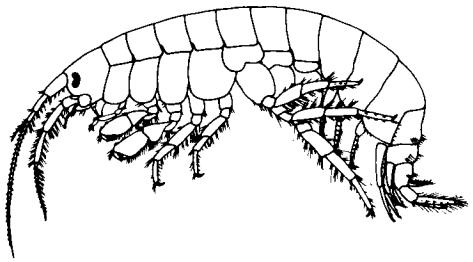
Up to 25 mm, has a slender, elongate compressed body with antenna 2 half as long as antenna 1. Segment 6 of gnathopod 2 has a long, slender spine at the posterodistal angle. The small telson extends to the end of the peduncle of uropod 3. On muddy and sandy bottoms from low water mark.



X2

13.(11) Eyes reniform, with anterior middle notch; peraeopod 6 posterodistal margin forming a distinct free lobe lacking spines ..... *Gammarus duebeni* Liljeborg

Up to 23 mm, has a compressed body with the head having a transversely truncated upper angle. The 1st peduncle segment of antenna 1 has 3-4 clusters of setae on the posterior margin; the accessory flagellum has 6 segments. Pleon side plate 3 has a slightly produced, acute hind corner, and 5 setae on the posterior margin. Urosome segments are not distinctly humped. Brackish pools on rocky shores above high water and subtidally in estuaries.

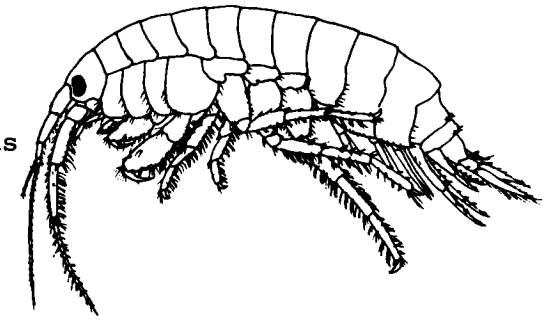


X3

13.(11) Eyes reniform, without notch; peraeopod 6 posterodistal margin lacking free lobe, with spines - - - - - - - - - - - - - - - - 14

14.(13) Coxal plate 1, anteroventral angle with 4-6 relatively long setae; peraeopod 7 posterior margin with numerous long setae ..... *Gammarus tigrinus* Sexton

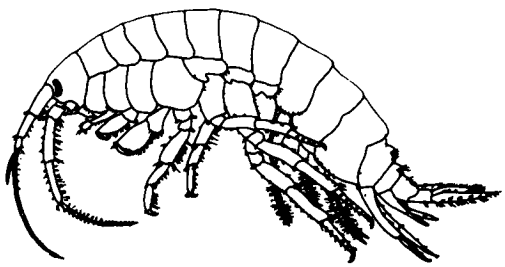
Up to 14 mm, has a compressed body with the head having an acute, slightly notched upper angle. The 1st peduncle segment of antenna 1 has 1-2 clusters of setae on the posterior margin; the accessory flagellum has 3-5 segments. Pleon side plate 3 has a slightly produced, acute hind corner, and a lightly setose posterior margin. Urosome segments are not distinctly humped. Body is distinctly banded with "tiger" stripes. Upper regions of estuaries and intertidally on rocky shores in stream outflows.



X5

14.(13) Coxal plate 1 anteroventral angle with 2-4 relatively short setae; peraeopod 7 posterior margin with 10 short setae ..... *Gammarus oceanicus* Segerstråle

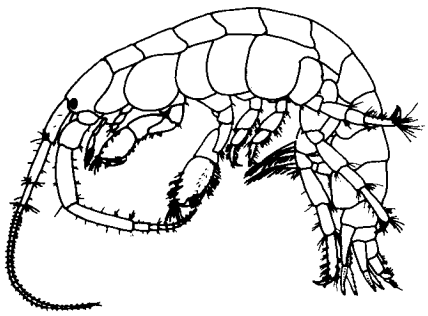
Up to 22 mm, has a compressed body with the head having an acute, upper angle. The 1st peduncular segment of antenna 1 has 2 central clusters of setae on the posterior margin; the accessory flagellum has 6-10 segments. Pleon side plate 3 has a produced, acute hind corner with a single seta on the posterior margin. Urosome segments 1 and 2 are distinctly humped dorsally. Common under stones, among algae and in tidepools from the intertidal zone to 25 meters.



X3

15.(6) Eyes small, oval; uropod 3, rami shorter than peduncle, outer ramus with 2 hooked spines near the apex .... *Ampithoe rubricata* (Montagu)

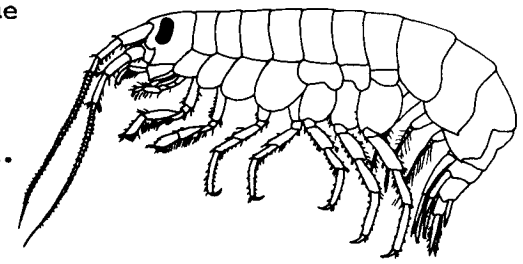
Up to 20 mm, has a slightly depressed body with a shallow, convex inferior antennal sinus. The coxal plates are relatively large, lacking setae; coxal plate 1 is directed anteriorly and coxal plate 2 is larger than either 1 or 3. The telson is entire with a pair of small dorsolateral cusps. Along rocky coasts building nests in mussel beds and among algae.



X3

15.(6) Eyes large, broad reniform; uropod 3, rami longer than peduncle, outer ramus lacking hooked spines at apex ..... *Pontogeneia inermis* (Kröyer)

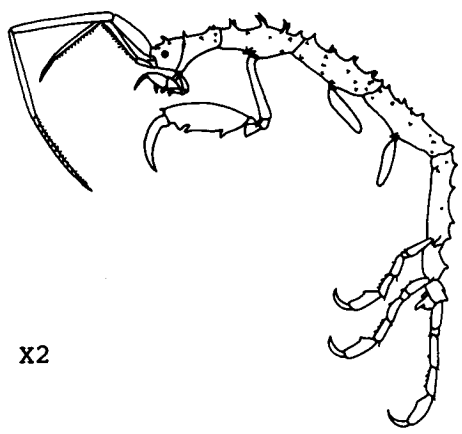
Up to 12 mm, has a compressed body with a sharply incised inferior antennal sinus. The coxal plates are relatively small, lacking setae. The telson is longer than broad and cleft about 2/3 with the lobes being unarmed. Clinging to seaweeds from low intertidal to 10 meters.



X5

16.(1) Antenna 2, swimming setae absent; mandibular palp 3-segmented; abdomen with 2 pairs of appendages and 1 pair of lobes ..... *Aeginina longicornis* (Kröyer)

Up to 50 mm, has a smooth to very spiny body with 1 pair of dorsal head spines and lateral spines over gnathopod 2 insertions usually present. Antenna 2 is shorter than the peduncle of antenna 1. The cephalon is separated from pereonite by a suture. Most common intertidally to 2258 meters.

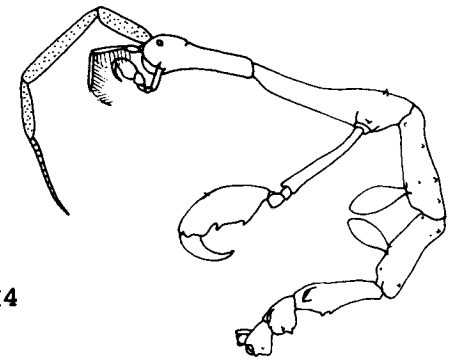


X2

16.(1) Antenna 2 with swimming setae; mandibular palp absent; abdomen of male with 1 pair of appendages and 1 pair of lobes, female with 1 pair of lobes - - - - - - - - - - - - - - - - - 17

17.(16) Pereonites 1-4 usually smooth, spines, when present, always paired ..... *Caprella linearis* (Linnaeus)

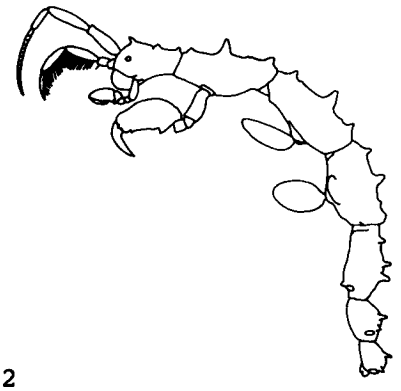
Up to 22 mm, has a smooth body with spines in pairs. The basis of gnathopod 2 is relatively long, the ratio of the total length of the body to the length of the basis is less than 13:1. Intertidally to 185 meters among algae, sponges and hydroids.



X4

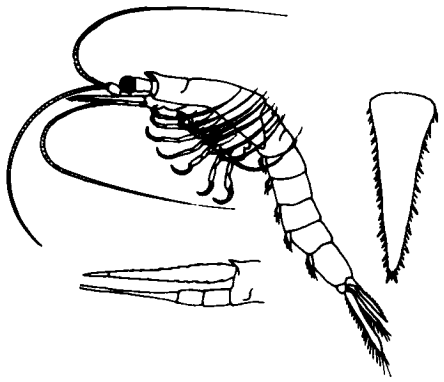
17.(16) Pereonites 1-4 usually spinose, spines always single ..... *Caprella septentrionalis* Kröyer

Up to 30 mm, has an extremely variable body spination with at least 1 large spine on the head. The basis of gnathopod 2 is shorter than *C. linearis*, the ratio of the total length of the body to the length of the basis is greater than 13:1. Intertidally to 915 meters among algae, sponges and hydroids.



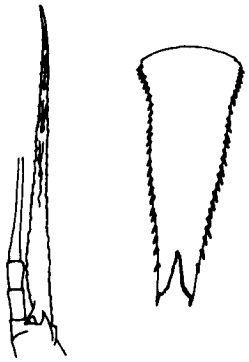
X2

ORDER MYSIDACEA: The Mysids



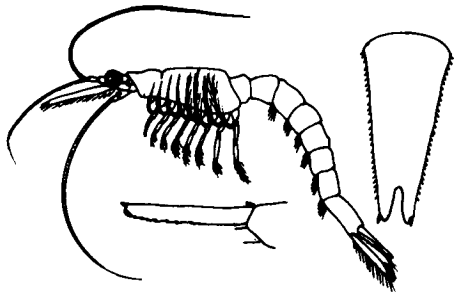
Neomysis americana (S.I. Smith), up to 15 mm, has acutely pointed antennal scales which are 10 times as long as broad with setae on both margins. The telson is triangular in shape, about 2 1/2 times as long as broad with a narrowly truncate apex armed with 2 pairs of spines, the outer pair 3 times as long as the inner pair. The lateral margins are armed with about 40 spines. Found among seaweeds intertidally to 195 meters.

body X3
antennal scale X6
telson X10



Mysis stenolepis S.I. Smith, up to 30 mm, has acutely pointed antennal scales which are 12 times as long as broad with setae on both margins. The lateral margins of the telson are armed with about 25 spines extending posteriorly to the cleft. The body is translucent with star-shaped dark pigment spots. Found among seaweeds in the intertidal and shallow waters.

antennal scale X6
telson X8



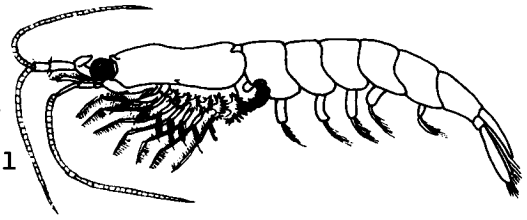
Praunus flexuosus (Müller), up to 28 mm, has truncated antennal scales which are 7-8 times as long as broad with setae on the inner margin only; the outer margin terminates in an articulated spine. The lateral margins of the telson are armed with 21-27 spines extending beyond the cleft. Found in shallow water among seaweeds, also in brackish areas.

body X2
antennal scale X3
telson X10

SUBCLASS MALACOSTRACA (Eucarida)

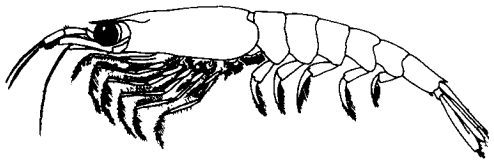
ORDER EUPHAUSIACEA: The Krill Shrimp

Meganyctiphanes norvegica (M. Sars), the "Large Krill", up to 40 mm, has a reflexed leaflet on the peduncle of antenna 1. The carapace, lacking a rostrum, has a well defined denticle on the lateral margin slightly behind the middle. The last abdominal segment lacks a mid-dorsal spine. It is found from the surface to 275 meters.



X2

Thysanoessa inermis (Kröyer), the "Small Krill", up to 30 mm, lacks the reflexed leaflet on the peduncle of antenna 1. The carapace has a narrow lanceolate rostrum reaching the end of the 1st antennular segment, but lacks the denticle on the lateral margin. The last abdominal segment has a well defined mid-dorsal spine. It is found from the surface to 185 meters.

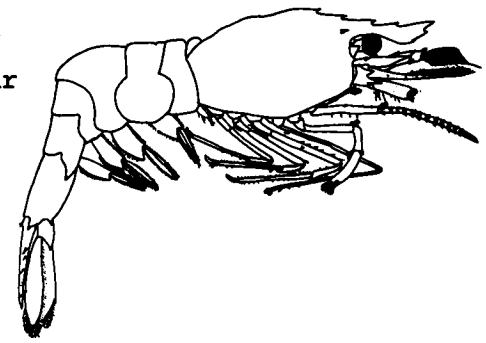


X2

ORDER DECAPODA

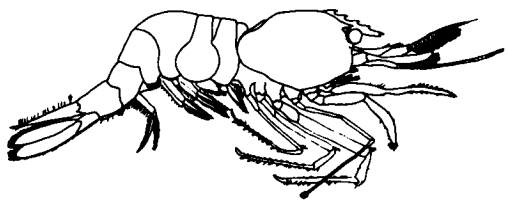
INFRAORDER CARIDEA: The Shrimp

Lebbeus polaris (Sabine), up to 50 mm, has a slightly upturned rostrum as long as the antennular peduncle, with 2-3 spines dorsally and 2-3 spines ventrally. The carapace has 2 dorsal spines and 1 supraorbital spine on each side, at the base of the rostrum. It has scattered orange-red, minute dots over the carapace and abdomen. 5-520 meters.



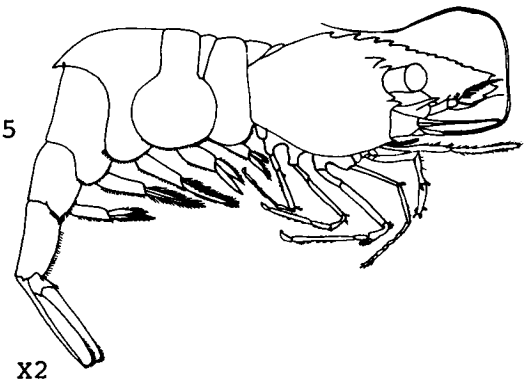
X2

Lebbeus zebra (Leim), up to 48 mm, has a short rostrum, the tip not exceeding the proximal article of the antennular peduncle, with 4-5 spines dorsally and 1 ventrally. The carapace has 2 spines dorsally and 1 pair of supraorbital spines. It is banded by brownish-red to orange stripes which run dorsoventrally. Low water to 25 meters.



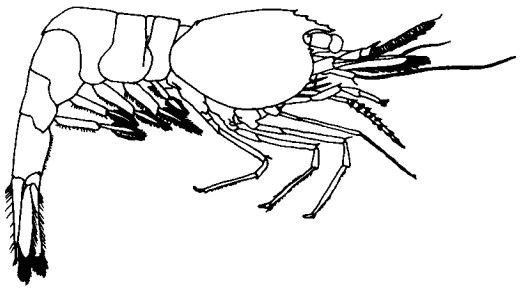
X1

Spirontocaris spinus (Sowerby), up to 59 mm, has a moderately long rostrum with a variable number of dorsal spines, 9-33, usually 18-20 and 2-5 ventrally. The carapace has 4-6 dorsal spines and 2 pairs of supraorbital spines. It is translucent and thickly mottled with bright red, brownish-red and white. 9-465 meters.



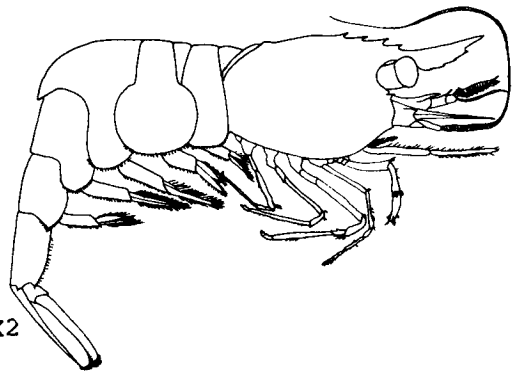
X2

Eualus pusiolus (Kröyer), up to 28 mm, has a short rostrum, the tip not exceeding the distal edge of eye, with 1-2 spines dorsally and no spines ventrally. The carapace has 1-2 dorsal spines and is lacking supraorbital spines. It has a few red to orange-red spots scattered over a whitish background. Low water to 290 meters.



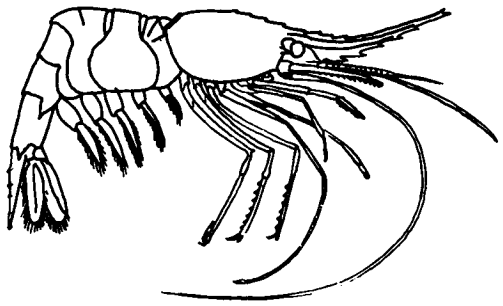
X2

Eualus fabricii Kröyer, up to 53 mm, has a long rostrum with 1-2 spines dorsally and 2-4 spines ventrally. The carapace has 2-3 dorsal spines and is lacking supraorbital spines. It has bright red spots over a whitish background. Low water to 230 meters.



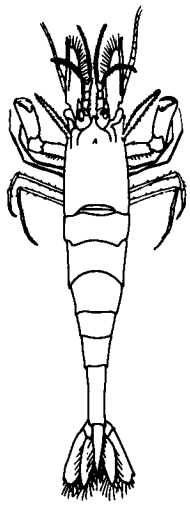
X2

Pandalus montagui Leach, up to 95 mm, has a long, slender, slightly upturned rostrum with a bifid tip; and 10-12 spines dorsally on the posterior half of the rostrum and the anterior half of the carapace, and 5-7 spines ventrally. Supraorbital spines are lacking. The second pair of legs are chelate, carpus of the right leg has 20 segments. Low water to 790 meters.



X1

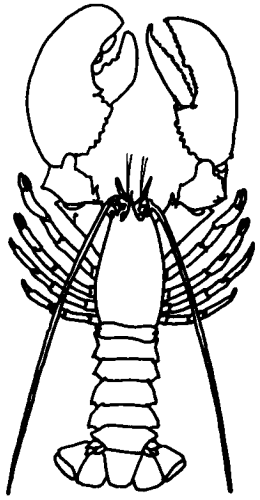
Crangon septemspinosa Say, up to 100 mm, has a very short, more or less horizontally flattened rostrum. The carapace is smooth, lacking supra-orbital spines but with 1 spine on the midline slightly behind the rostrum and 1 on each branchia. The first pair of legs is subchelate with a movable spine; the second pair of legs is chelate with the carpus having 1 segment. On sandy bottoms from low water to 90 meters.



X1

INFRAORDER ASTACIDEA: The Lobster

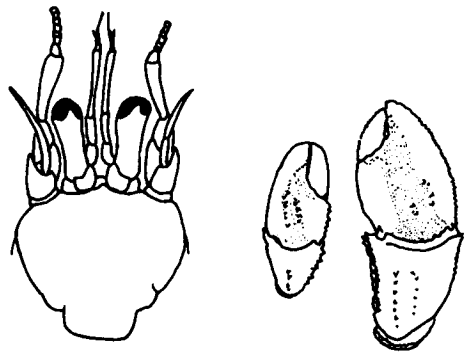
Homarus americanus Milne-Edwards, up to 60 cm, usually around 20 cm, has the first pair of legs very large, developed as pinching and crushing claws. The common color is dark green with yellow or orange on the ventral side. It is found from low water to the edge of the continental shelf.



X1/5

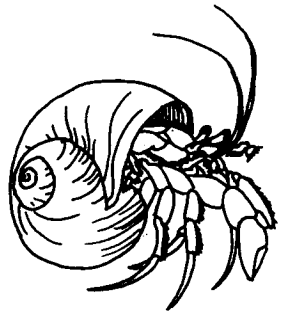
INFRAORDER ANOMURA: The Hermit Crabs

Pagurus acadianus Benedict, up to 160 mm, does not have pubescent claws. The right claw is strongly sculptured with ridges and tubercles. The left claw has a horizontal upper surface which is not divided by a ridge; in cross-section it is oblong. The color is red-orange along upper surface of the claws and the 3 ambulatory legs. Low water to 485 meters.

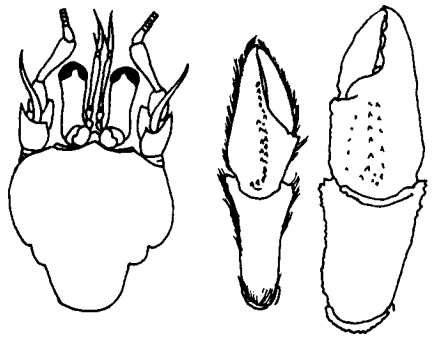


X2

whole animal X1/4



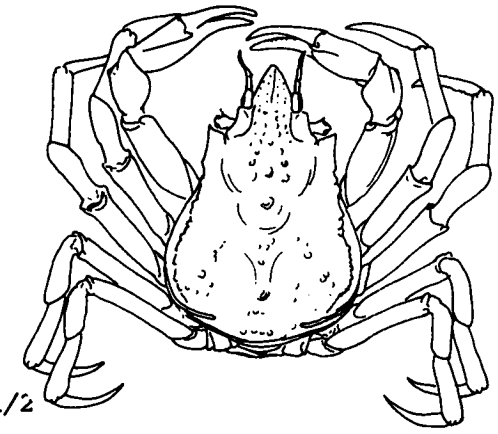
Pagurus pubescens Kröyer, up to 75 mm, has pubescent claws. The right claw is moderately sculptured with ridges and tubercles. The left claw has the upper surface divided into 2 facets by a ridge of spines; in cross-section it is triangular. The color is yellowish. Low water to 275 meters.



X2

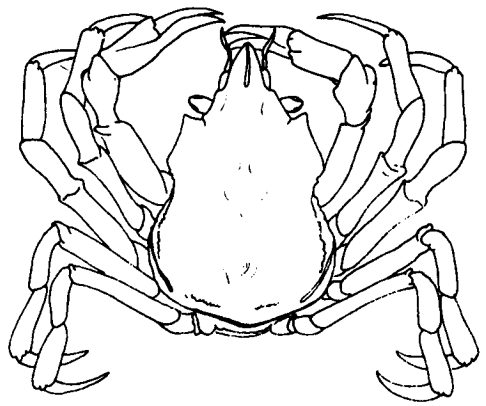
INFRAORDER BRACHYURA: The True Crabs

Hyas araneus (Linnaeus), up to 110 mm, has a subtriangular carapace covered with tubercles. The region below the post-ocular tooth is not dilated. The first pair of legs are not larger than the other legs but end in claws. The color is dull purplish-red. On rocky shores to 500 meters.



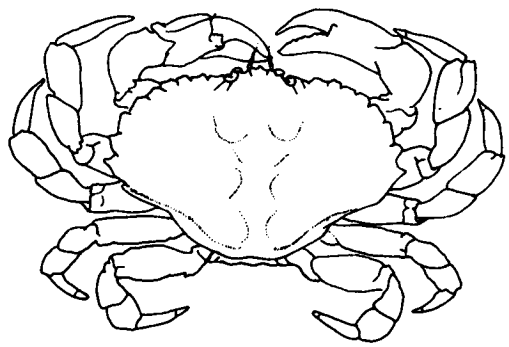
X1/2

Hyas coarctatus Leach, the "Toad Crab", up to 50 mm, has a carapace covered with tubercles. The region below the post-ocular tooth is dilated. The legs are similar to *H. araneus* as is the color. Among rocks from low water to 1660 meters.



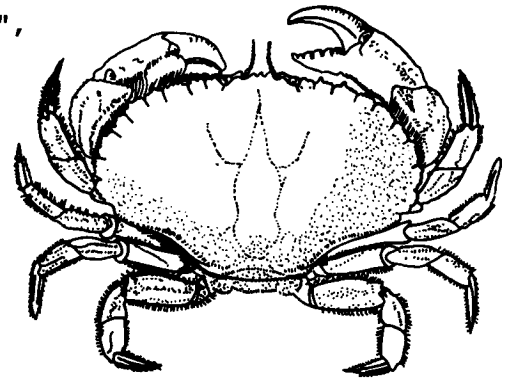
X1

Cancer irroratus Say, the "Common Rock Crab", up to 150 mm wide, has a finely granular, convex carapace with 9 anterolateral and 2 posterolateral teeth, the margin of these teeth is entire. The first pair of legs is short, stout and terminate in claws, which are granular but not denticle. The base color is yellow overlaid by numerous purplish spots. Found under rocks and on sandy bottoms from low water to 185 meters.



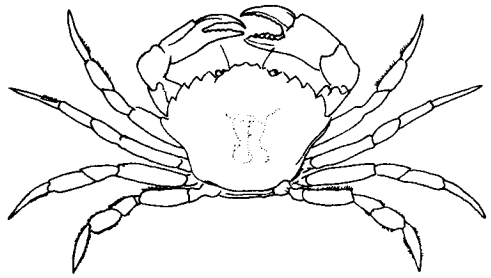
X1/5

Cancer borealis Stimpson, the "Jonah Crab", up to 150 mm wide, has a coarsely granular, convex carapace, with 9 anterolateral and 2 posterolateral teeth, the margin of these teeth is denticulated. The first pair of claws is short, much broader and more powerful than *C. irroratus*, with the claws denticulate. The base color is brick red overlaid by purplish spots. On rocky shores to 730 meters.



X1/5

Carcinus maenas (Linnaeus), the "Green Crab", up to 80 mm wide, has a granular carapace with 5 very prominent sharp anterolateral teeth. The first pair of legs is stout and terminate in claws. The last pair of legs is flattened with pointed tips. The color varies from greenish-black to orange with numerous yellowish spots. A common shore crab found intertidally to several meters.



X1/2

VII. THE DEUTEROSTOMES

Most of the foregoing phyla, and at least the huge Annelid - Arthropod - Mollusc Platyhelminthes assemblage, can be referred to as Protostomes, and while this distinction is useful in theory, the characteristics of these two groups are displayed during development rather than as adults. Any good invertebrate text will explain this division. The Echinodermata and Chordata, together with some smaller phyla, make up the deuterostomes.

ECHINODERMATA: Sea Cucumbers, Urchin, Sand Dollar, Starfish, and Brittle Stars

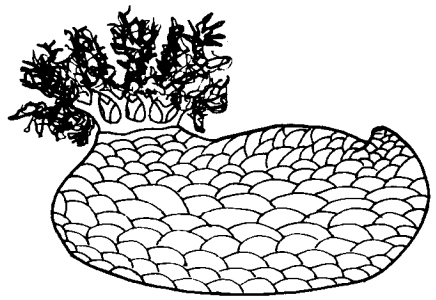
This entirely marine phylum is made up of animals quite easily recognizable as members, with the possible exception of the thin-walled wormlike burrowing sea cucumber *(Chiridota)*. They are radially symmetrical even though they start life as bilaterally symmetrical larvae, and some have become almost bilaterally symmetrical again as adults (heart urchins). The symmetry is basically 5-rayed. The skeleton is internal, but the living tissue on the outside of it is thin so that it appears external. When present it consists of calcareous plates. There is a water-vascular system that functions as a hydrostatic skeleton for the tube feet, the numerous suckerlike feet that are often used for locomotion.

The phylum is divided into:

1. The Holothuroidea - sea cucumbers, with elongate leathery bodies that move sluggishly. The mouth is surrounded by tentacles that may be fingerlike or branched. Unlike the other groups, the oral-aboral axis is commonly parallel to the substrate, not vertical to it. The tube feet are less obvious than in the urchins and starfish.
2. Echinoidea - The common sea urchin and its flattened relative, the sand dollar.
3. Stelleroidea - the starfish (Asteroidea) in which the arms meet the disc on a broad base, the skeleton consists of isolated calcareous bodies or is absent, the brittle stars (Ophiuroidea) with their flexible arms on a central circular disc, the skeleton well formed and obvious. *Gorgonocephalus* (the basket star) has branched arms.

CLASS HOLOTHUROIDEA: The Sea Cucumbers

Psolus fabricii (Duben and Koren), the "Scarlet Psolus" or "Sea Orange", up to 10 cm, has overlapping scales on the dorsal and lateral sides, the ventral side is flattened with a distinct sole bearing rows of tube feet. On the dorsal surface the oral opening is raised and bears 10 finely branched tentacles, the anal projection is only slightly elevated. The color is bright orange-red. Low water to 165 meters.

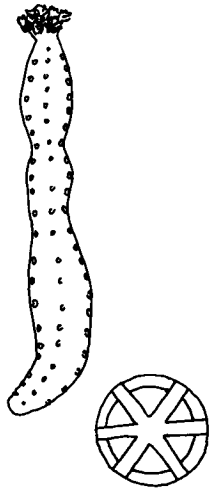


X1

Cumcumaria frondosa (Gunnerus), the "Large Northern Sea-cucumber", up to 30 cm in length, has a thick-walled cylindrical body with completely retractile tube feet arranged in 5 ambulacral rows. It has a simple esophageal ring having 10 branching tentacles. The color of adults is brownish-pink or purple with bright orange-red tentacles; the juveniles are lighter colored. Intertidally under rocks to 460 meters.

X1/4

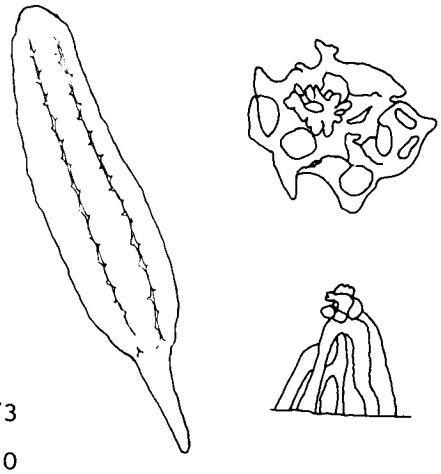
Chiridota laevis (Fabricius), the "Tufted Synapta", about 15 cm long, has a cylindrical worm-like body with a thin, semi-transparent body wall and no tube feet. Usually twelve tentacles form a circle about the mouth. Dermal skeletal elements or deposits are 6-spoked wheel shaped, 0.08 to 0.10 mm in diameter concentrated in a few large papillae. Body is white to pinkish. Intertidal zone to 80 meters.



whole animal X1/3

deposit X150

Molpadia oolitica (Pourtalès), up to 150 mm, has a fusiform body, with a tapering tail about 1/8 total length. The body wall is leathery, opaque with no tube feet. It has 15 tentacles, each with 2 digits, and a terminal anal opening surrounded by minute papillae. Deposits present near the tail are of irregular tables and brown elliptical bodies. The color is grey to reddish-brown. 20-1100 meters.

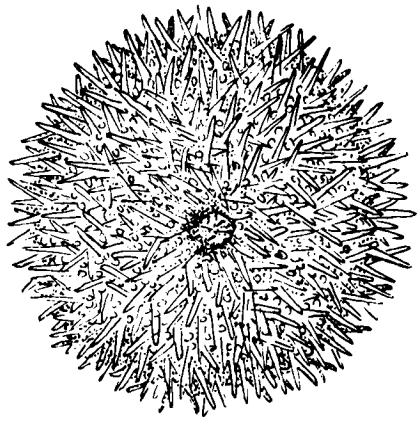


whole animal X1/3

deposits X150

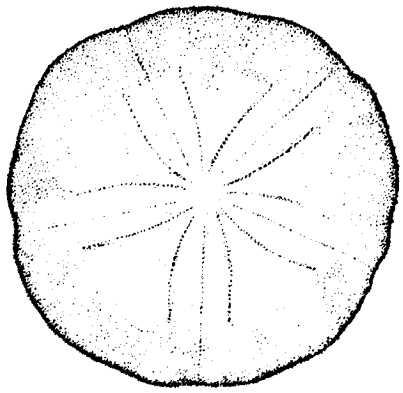
CLASS ECHINOIDEA: The Sea Urchin and Sand Dollar

Strongylocentrotus droebachiensis (Müller), the "Green Sea-Urchin" up to 80 mm in diameter, 45 mm high, has a radially symmetrical, globular test. The test is covered with numerous prominent spines of various lengths which are pointed but not sharp, the longest usually less than 1/3 the diameter of test. The color is dark green to green-white, sometimes tinged with purple or red on the oral surface. It is a very common species found from the intertidal zone to 1170 meters, usually in protected rocky regions.



X1

Echinarachnius parma (Lamarck), the "Common Sand Dollar", up to 78 mm in diameter, has a flat, disclike test. The test is covered with minute hair-like spines. The color is purplish to reddish brown while the bare tests are whitish. On sandy bottoms from the intertidal zone to 1625 meters.

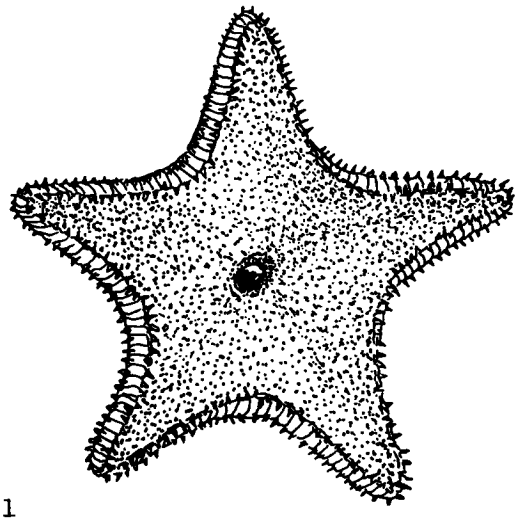


X1

CLASS STELLEROIDEA

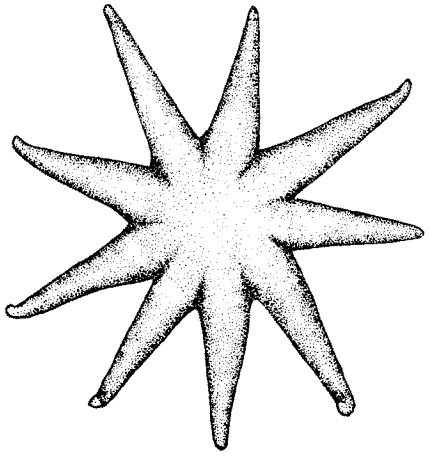
SUBCLASS ASTEROIDEA: The Starfish

Ctenodiscus crispatus (Retzius), the "Mud Star", up to 10 cm, has 5 stiff, broad-based arms having 2 rows of tube feet and an elevated cone in center of disc. The aboral surface is covered with low paxillae with spines which are short, clavate and skin-covered. It has well developed marginal plates covered with a thin soft skin forming a distinctly sided margin separating oral or aboral regions. The color is yellowish. In soft mud from 7-1675 meters.



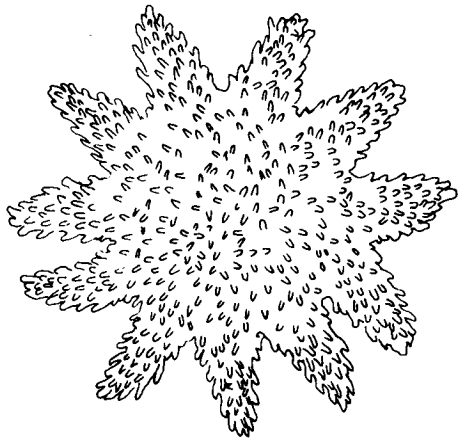
X1

Solaster endeca (Linnaeus), the "Purple Sunstar", up to 45 cm and arm radius of 20 cm, has 9-11 arms. The disc is large with fairly long round arms having 2 rows of tube feet. The aboral surface is covered with numerous, small, close-set paxillae with short columns and circlets of short spines. The color is purplish-red to orange with golden marginal paxillae and a conspicuous light yellow madreporite. On rocky or hard bottoms from the intertidal zone to 250 meters.



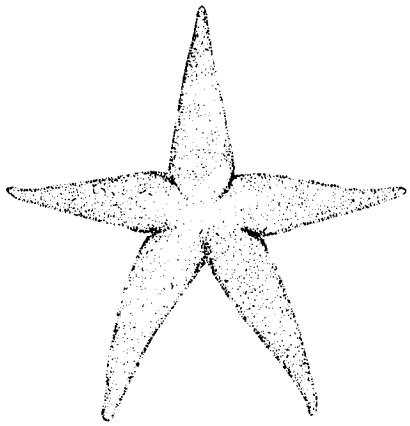
X1/4

Solaster papposus (Linnaeus), the "Common or Spiny Sunstar", up to 35 cm and arm radius of 17 cm, has 10-12 arms. The disc is large with rounded arms having 2 rows of tube feet. While the marginal paxillae form a single series and stand out stiffly around the arms, the other paxillae are large, crowned with cylindrical clusters of spines giving a circular bristling appearance. The color is bright and variable, usually scarlet to orange and whitish on the oral surface. Low water mark to 295 meters.



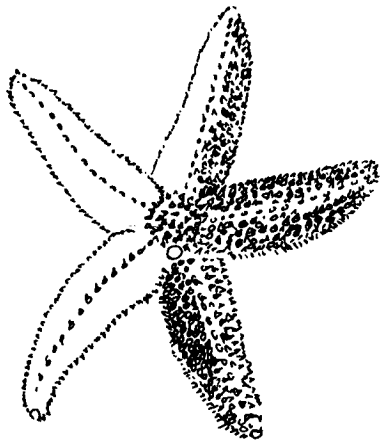
X1/5

Henricia sanguinolenta (Müller), the "Blood Starfish", up to 35 cm, has 5 arms with 2 rows of tube feet. The disc is small with slender, sub-cylindrical arms, which may be swollen basally and/or upturned at the tips. The aboral surface is covered by a network of plates upon which are numerous minute paxillalike spinules. The color is purple, orange or red with a small, light madreporite. Low water mark to 1225 meters.



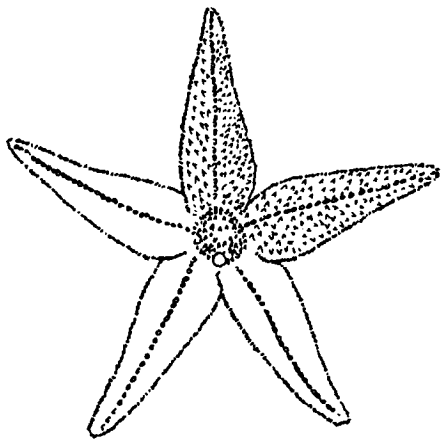
X1/5

Asterias forbesii (Desor), the "Common Starfish", of diameter up to 28 cm and arm radius 13 cm, usually has 5 arms. The disc is often domelike with radiating arms which are usually stout and blunt with 4 rows of tube feet. A firm skeleton is formed of strong interlocking plates which each bear a single, blunt, prominent spine encircled by a cluster of smaller spines. The color is dark green with spines tipped with yellow and a white to orange madreporite. Intertidal zone to 45 meters.



X1/4

Asterias vulgaris (Verrill), the "Purple Starfish", with diameter up to 45 cm and arm radius of 20 cm, generally has 5 arms. The disc is large and often rises to an arched dome with arms that are flattened and slightly pointed containing 4 rows of tube feet. Blunt spines from 1 to 4 mm rise from all surfaces but are especially prominent on the oral surface. The skeleton is rather soft because of the widely meshed plates of the aboral surface. The color varies from whitish-orange to orange with purple, occasionally green, and the madreporite is white to yellow. More common than *A. forbesii*, found from the intertidal zone to 595 meters.

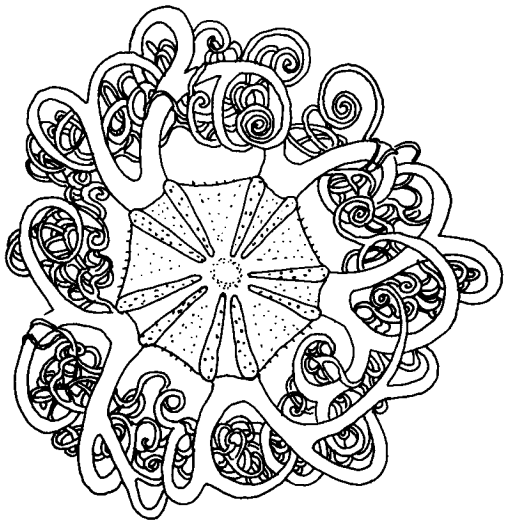


X1/5

CLASS STELLAROIDEA

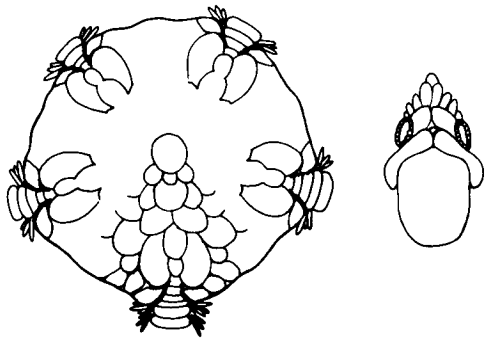
SUBCLASS OPHIUROIDEA: The Brittle Stars

Gorgonocephalus arcticus (Leach), the "Basket Star", disc diameter to 10 cm, arm length to 35 cm, has 5 tentaclelike arms branching out from the disc forming repeated V-shaped divisions. The disc is covered by naked skin, granules or short spines while the arms have spines directed downwards in the form of hooks. Individuals of this species are often found grouped together in entangled masses. The color varies from brown to cream-orange. Intertidal zone to 1370 meters.



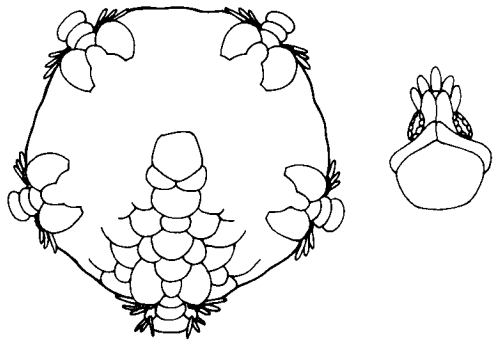
X1/4

Ophiura sarsi (Lutken), disc diameter up to 40 mm, arm length of 150 mm, has 5 unbranched arms with 3 pairs of diagonally extended arm-spines on each segment. At the base of the arms on the aboral side of the disc is a distinct notch bordered by well developed combs of papillae. The jaws have oral shields which are longer than wide, and 4-6 pairs of mouth papillae. The color is fairly uniform purple red. 9-3000 meters.



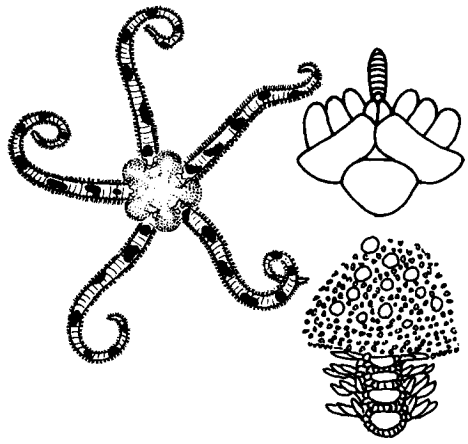
disc X1
oral shield X3

Ophiura robusta (Ayres), disc diameter up to 10 mm, arm length to 35 mm, has 5 unbranched arms with 3 pairs of arm-spines on each segment. At the base of the arms on the aboral side of the disc is a slight notch bordered by poorly developed combs of papillae. The jaws have oral shields which are wider than long, and 3-4 pairs of mouth papillae. The color is variable, generally grey mottled with brown, red or black, the arms are usually banded. Low water to 915 meters.



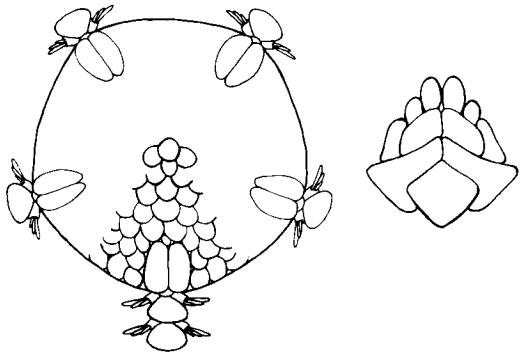
disc X4
oral shield X10

Ophiopholis aculeata (Linneaus), the "Daisy Brittlestar", disc diameter to 20 mm, arm length to 80 mm, has 5 unbranched arms with 5 or 6 pairs of prominent erect arm spines on each segment. The disc is partially covered with spinelike granules, but the radial and central circular plates are bare giving the disc an ornate appearance. The dorsal arm plates are oval and surrounded by a single series of small plates. The jaws have elliptical oral shields, much wider than long, and 3 or 4 pairs of mouth papillae. The color is extremely variable with disc and arms often in contrasting colors, the arms are frequently banded in red. Intertidal zone to 1830 meters.



whole animal X1/2
oral shield X6
disc section X2 1/2

Amphiopholis squamata (Delle Chiaje), the "Long Armed Snake Star", disc diameter to 5 mm, arm length of 20 mm, has 5 unbranched arms with 3 or 4 pairs of prominent, appressed arm-spines on each segment. The disc is covered with small scales, but the radial plates are conspicuous. The dorsal arm plates are triangular and are not surrounded by a series of small plates. The jaws have oral shields, slightly wider than long, rounded without, but pointed within, and 2 pairs of oral papillae. The color is brownish or grey, mottled with white. Rocky or shelly bottoms from the intertidal zone to 640 meters.



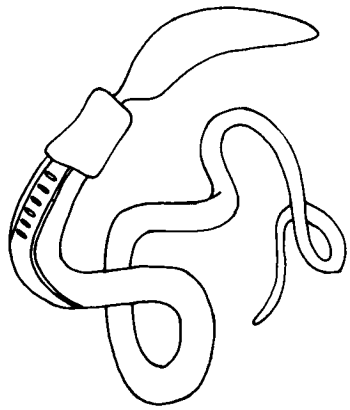
disc X8
oral shield X20

VIII. MINOR DEUTEROSTOMES AND CHORDATA

The Chaetognatha (arrow worms) are typically planktonic and are not treated here, nor are the beardworms (Pogonophora) which are deep water forms. The acorn worm (Saccoglossus) is the sole and distinctive representative of the Hemichordata. The more familiar Chordata are the vertebrates, the subject of a separate guide, but the Urochordata, consisting of the sea squirts, sea potato and sea peach and allies, can be recognized by the two siphons, multiplied in the colonial forms. The Thaliacea and Larvacea are pelagic or planktonic.

CLASS ENTEROPNEUSTA: The Acorn Worm

Saccoglossus kowalewskyi (Agassiz), the "Acorn Worm", up to 150 mm, has a cylindrical flaccid body composed of an elongate, whitish proboscis, an orange collar and yellow to brownish trunk bearing a longitudinal row of gillslits at each side of a mid-dorsal ridge just posterior to the collar. It is generally found in a 2-holed mucus-lined burrow on exposed mud flats, the ropelike castings often dot the mudflats.



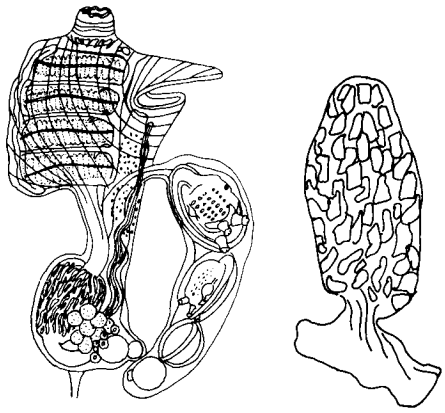
X1

CHORDATA: The Invertebrate Chordates - Tunicates

SUBPHYLUM UROCHORDATA

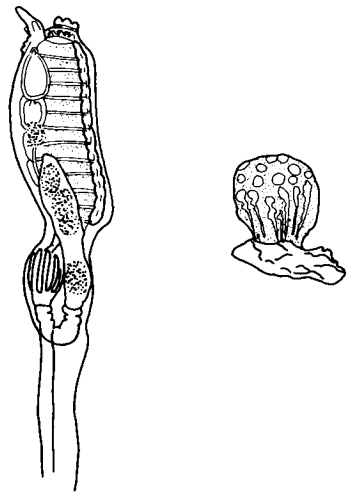
CLASS ASCIDIACEA: The Sessile Tunicates

Distaplia clavata (Sars), this colonial ascidian can grow to be 30 mm while the individual zooids have a diameter of from 3.4-5.0 mm. The typical form of the colony is clavate, narrowly capitate or flattened encrusting forms (most common in this area). Sometimes there may be more than one head arising from a common expanded base. Although superficially similar to *Amaroucium glabrum*, the test is generally less firm. These sessile ascidians vary from a white to a yellowish color. Found from 37-60 meters.



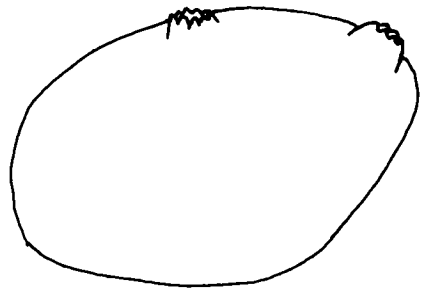
zooid X12
colony X1

Amaroucium glabrum Verrill, this compound ascidian may reach 80 mm, but the individual zooids are approximately 2.5 mm. The colony forms one to several rather flat-topped heads, 10-20 mm high, usually with abrupt sides and short, narrow peduncles. The surface is smooth, without spicules. The test has the consistency of a firm gelatine. The ascidian is translucent varying from a bluish-grey to a yellow-brown. Found from the intertidal zone to 210 meters.



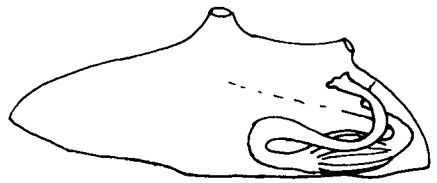
zooid X15
colony X1

Ascidia callosa Stimpson, this simple ascidian is about 60 mm by 30 mm, and has a smooth, firm and cartilagelike covering. The body is flattened ovate and attached on the left side. The prominent siphons are usually separated by 1/3 the body length, normally having 8 branchial lobes and 6 atrial lobes. The test is translucent varying from dull olive to brown or grey and often encrusted with foreign material. Intertidal zone to 135 meters.



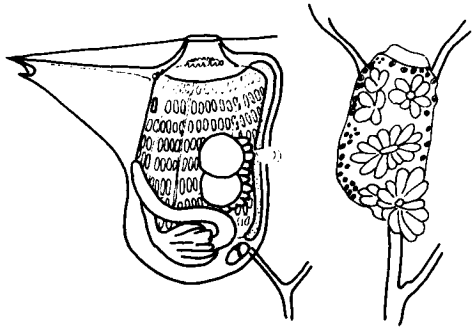
X2

Dendrodoa carnea (Agassiz), this simple ascidian which is from 8-12 mm in diameter has a smooth test with minute wrinkles. The body is a depressed cone or dome shape and is attached to the substratum by its whole lower surface including the expanded margins. The atrial and branchial siphons are similar being 4-lobed or squarish and in some the lobes may be partially fused. It varies in color from a pink to a bright red. Intertidal zone to 65 meters attached to stones, shells, wharf piles, etc.



X6

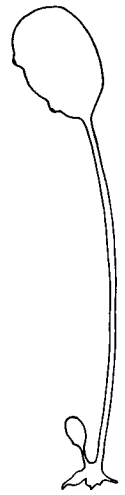
Botryllus schlosseri (Pallas), forms colonies of gelatinous encrustations sometimes 100 mm across. Often groups of about 5 zooids have a common central excurrent aperture with peripheral incurrent apertures. The zooids are only 1.75 mm long and are conspicuously marked with white and bright yellow. The purplish or black colonies are often found in flat sheets or lobes on seaweeds, piles, boats, etc, from the intertidal zone to 15 meters.



zooid X20

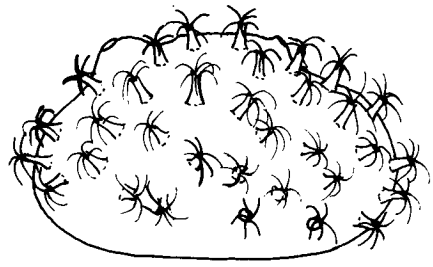
colony X1/10

Boltenia ovifera (Linnaeus), the "Sea Potato", is a sessile tunicate which is about 90 mm long on a 200 mm stem. The body is oval shaped, either smooth, wrinkled or encrusted and mounted at the top of a long stalk. Both siphons are similar, being 4-lobed or squarish, and in some the lobes are fused. The body varies in color from white, through yellow, pink or red particularly about the siphons. Low water to 450 meters.



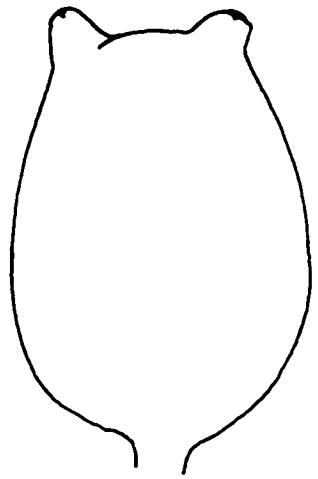
X1/4

Boltenia echinata (Linnaeus) is a sessile tunicate which varies from 15-25 mm in length. The body is globose but not stalked with the test covered with yellow spiny bristles making the tunicate resemble a cactus. Both siphons are similar being 4-lobed giving a squarish appearance if not fused. The tunicate varies from a light pink to a deep salmon, particularly about the siphons. Intertidal zone to 270 meters.



X2

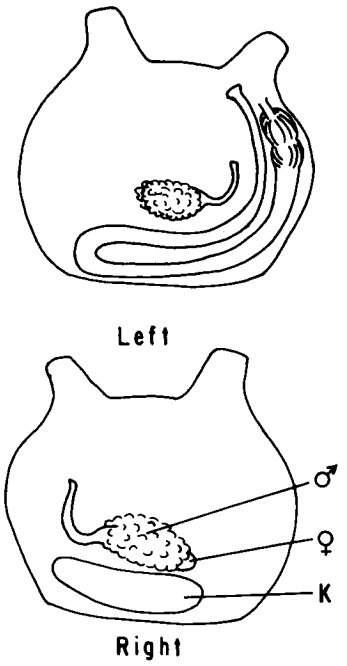
Halocynthia pyriformis (Rathke), the "Sea Peach", is a simple ascidian with a body about 75 mm high by 30 mm wide. The body is globose or elliptical attached to a narrow base. The test surface is velvety looking but rough to the touch like sandpaper. Both siphons are generally 4-lobed, but the atrial lobes may be fused. It varies from a light peach to an orange-red color. Intertidal zone to 175 meters.



X1

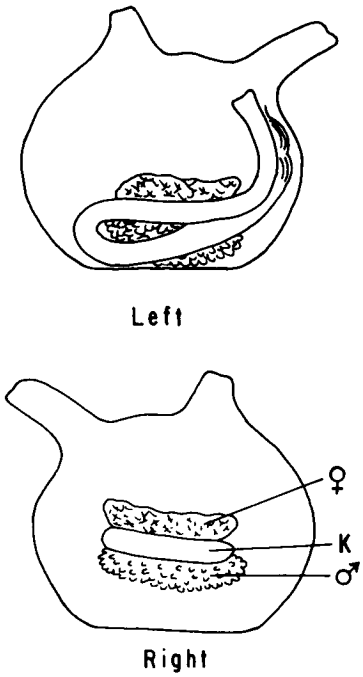
Molgula citrina Alder and Hancock. This simple ascidian, up to 16 mm high, is frequently encrusted with foreign material. The siphons are located anteriorly, normally have 6 branchial and 4 atrial lobes. Internally, the ovary is prolonged into a long slender, tubular oviduct. The testes are in masses lying against the free surface of the ovary and against the inner surface of the mantle. The left gonad is dorsal to the horizontal part of the intestinal loop and the right gonad is just dorsal to the kidney. The species is usually dull olive or brownish. Found intertidally to 160 meters.

X4



Molgula retortiformis Verrill. This simple ascidian, up to 75 mm high, outwardly is very similar to *M. citrina*, but internally is quite different. The ovary has no, or very short, oviduct and the testes and ovaries are completely separated from each other. On the left side the testis lies against the inner side of the lower branch of the intestinal loop, visible in the open portion and beyond ventral border of the loop. The left ovary lies outside the intestinal loop along the middle part and dorsal to the upper branch of the loop. On the right side the testis lies ventral to the kidney, the ovary lies along the dorsal border of the kidney. Found from the intertidal zone to 170 meters.

X1/2



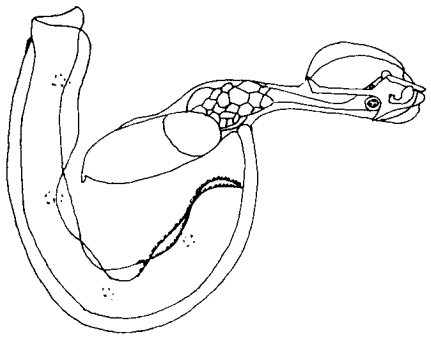
CLASS THALIACEA: The Pelagic Tunicate

Salpa fusiformis Cuvier, exists in both the solitary and aggregate state. In the latter case, the individual zooids are distinctly different from the solitary form. The body surface varies from smooth to rough with minute points, and the ring-shaped muscle bands are very consipcuous. The solitary form is shaped like a flattened cylinder with 9 muscle bands and is 40 to 80 mm long while the aggregate form is elliptical with 6 muscle bands and forms straight chains which are from 14 to 80 mm long.

X1

CLASS LARVACEA: The Pelagic Tunicate

Fritillaria borealis Lohmann, is a small, planktonic, solitary form about which there is little information. The trunk is 1.3 mm long and is narrow. The tail, which is attached ventrally to the body and 3-4 times its length, has a long bifurcated fin.



X40

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