



# A survey of selected polychaete families and their feeding mechanisms

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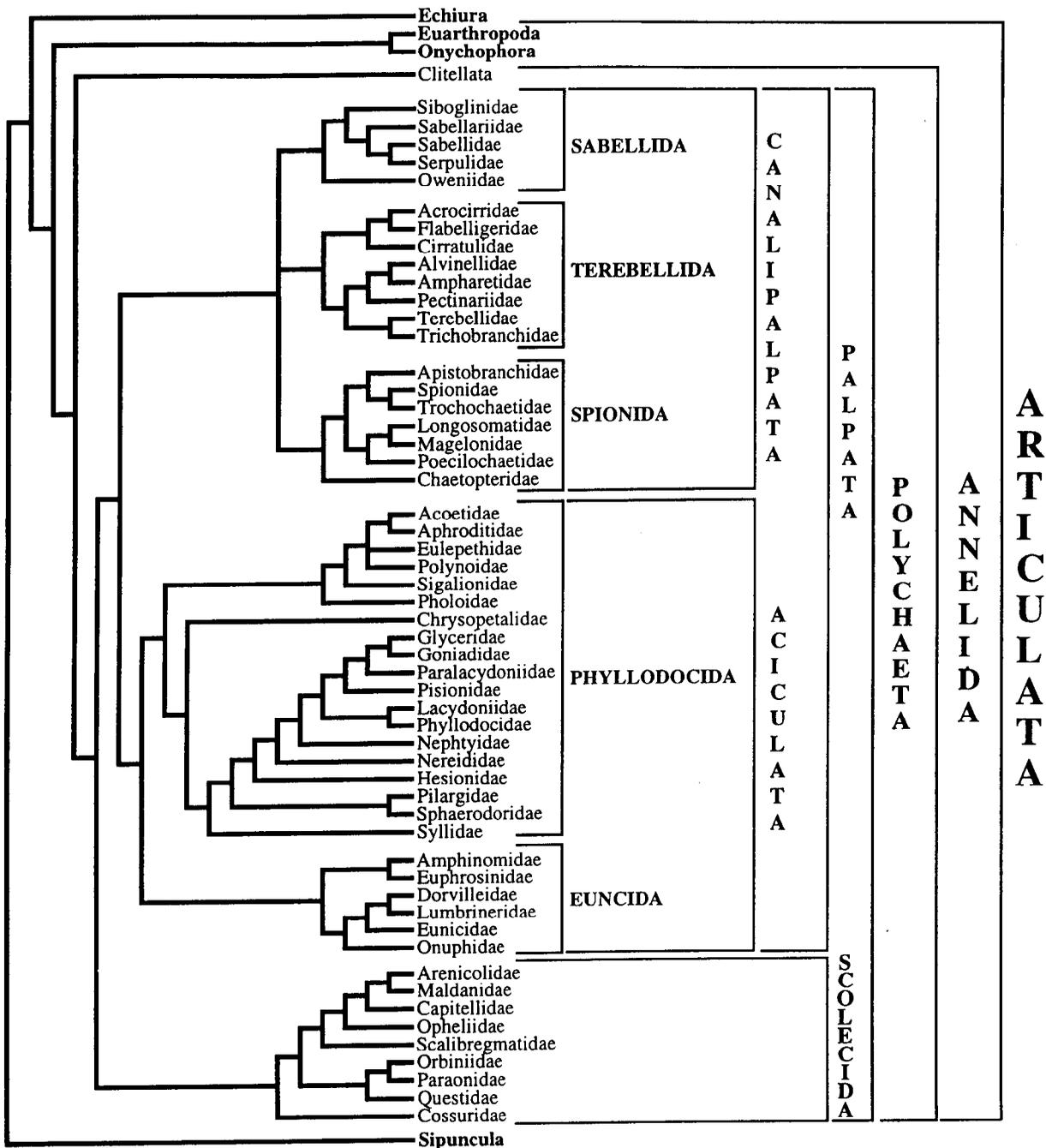
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We will here survey the major families of the Polychaeta in the context of a classification developed by Dales (1961) on the basis of the structure of the stomodaeum and will include later work by Rouse and Fauchald (1997). Dales' work has been severely criticized by Orrhage (1973) who has shown that the form of the stomodaeum is not as constant within the family as Dales suggested. In the Maldanidae, for instance, some species have the axial and others the ventral proboscis. Nevertheless, the classification has been found useful and was largely retained by Fauchald (1977). A new, phylogenetically based classification has been developed by Rouse (a former University of Queensland student) and Fauchald (Rouse and Fauchald, 1997), both working at the Smithsonian Institution, Washington. In the latter work, most orders recognized by Dales are retained, a new higher classification of polychaetes is given and major changes, such as inclusion of the Pogonophora in the Polychaeta are made.

Despite some reservations as to phylogenetic utility of the types of stomodaeum, we will follow the arrangement of Dales as a means of examining methods of feeding in the Polychaeta while studying the taxonomy of the group. The account will be largely restricted to selected species from Queensland and northern New South Wales, Australia.

In the system of [Rouse and Fauchald \(1997\)](#), the Polychaeta are divided into two groups, the **Palpata** (with palps) and the **Scolecida** (lacking palps). The Palpata are in turn divided into the **Canalipalpata** (with grooved palps) and the **Aciculata** (with one or more rods, the aciculae, supporting the parapodia). The **Scolecida** have no further subdivisions above the level of families. The **Canalipalpata** are further subdivided into the **Sabellida**, **Terebellida** and **Spionida**. The **Aciculata** contain the **Phyllodocida** and the **Eunicida**. These subdivisions conform closely to the orders with those names recognized by Dales (1961).



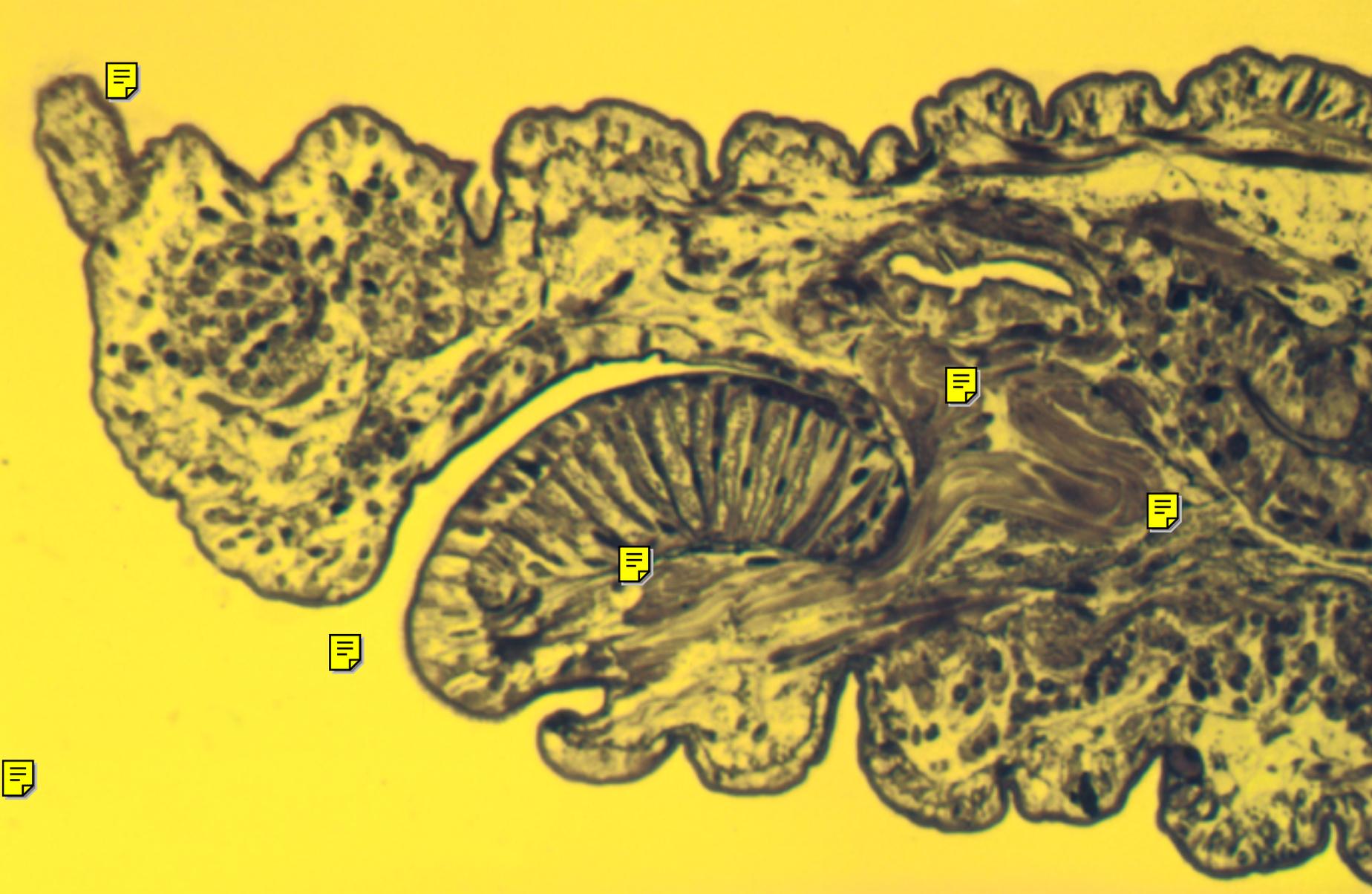
Classification of Rouse and Fauchald (1997).

However, the relationships between the groups of families which they represent are sometimes radically different from those suggested by Dales.

## VENTRAL PROBOSCIS MODIFIED FOR PREDATION

### **Aciculata: Eunicida**

In this group Rouse and Fauchald (1997) place the families \*Amphinomidae, Euphrosinidae, \*Dorvilleidae, Lumbrineridae, \*Eunicidae and \*Onuphidae. We will refer to members of the asterisked families. Dales (1961) considered that such modification occurred in the ancestry of the Amphinomidae and Eunicidae as well as the isolated genus *Magelona*. A buccal bulb, with retractor and protractor muscles, is well exemplified by *Questa ersei* (family Questidae), which is, however, placed in the Scolecida in the classification of Rouse and Fauchald (1997).



## Amphinomidae

Amphinomids (e.g. *Eurythoe*, *Chloeia*) have a ventral proboscis which consists of a muscular cushion armed with rasping cuticular folds which is situated in the floor of the stomodaeum and is protrusible making up a "buccal bulb". They are peculiar in having a ventral **mouth** as drawn here for *Eurythoe* and seen in a live specimen of *Chloeia* (it is also ventral in some eunicids but is not, as in amphinomids, circumscribed by several segments). They usually have a dorsal cushion like protuberance, at the posterior end of the prostomium, termed a **caruncle**.

Amphinomids are often "browsers", commonly feeding by rasping sponges off rocks, the most specialized ones more or less parasitic on sponges but *Chloeia* is an active scavenger.

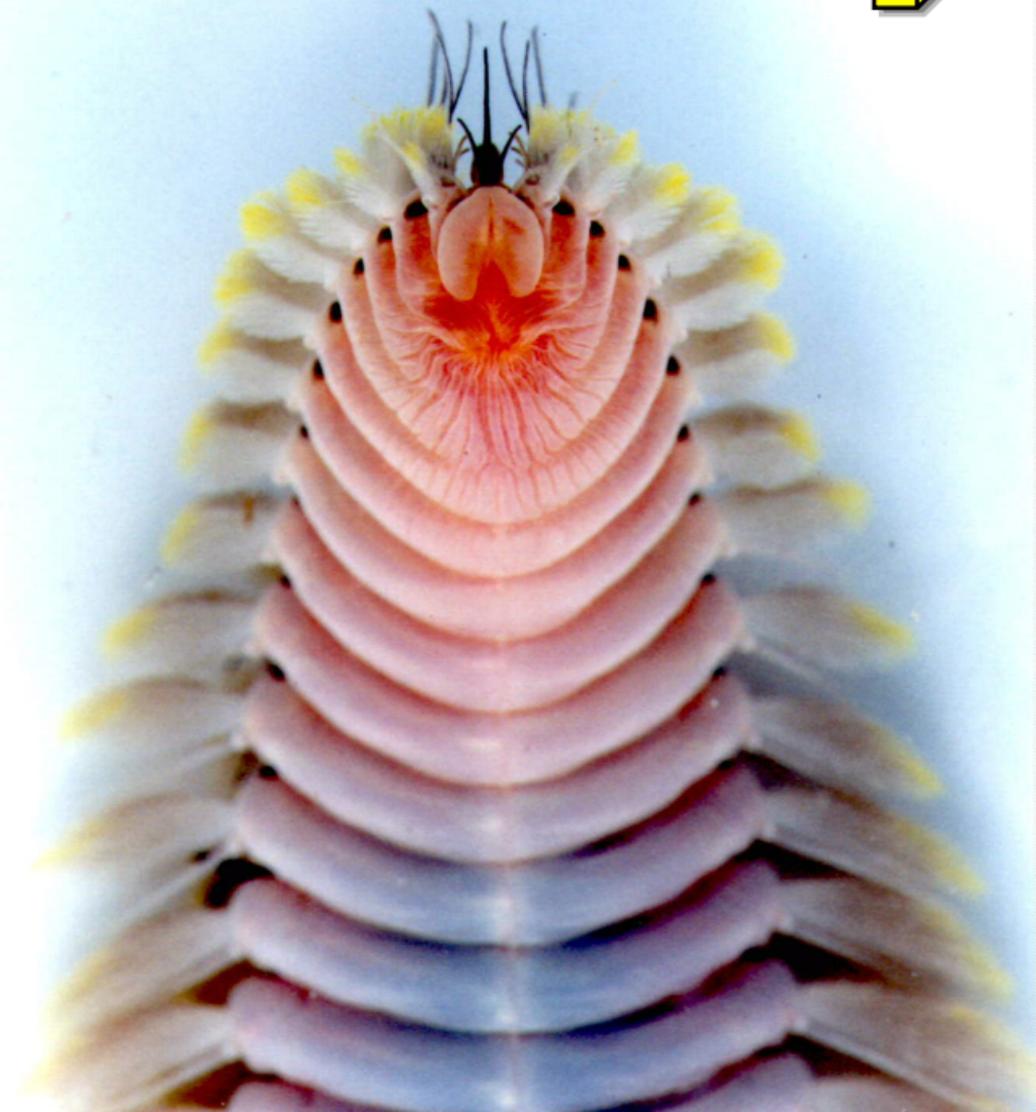
In amphinomids, as seen in longitudinal section in *Eurythoe*, a large elongated proboscis leads to the much folded intestine.

The dorsal wall of the stomodaeum is relatively thin but contains particularly well-developed longitudinal muscle fibres.









The ventral side of the stomodaeum raised into elaborate inverted U-shaped cushion made up of vertical lamellae. In front of it are vascularized lips.

The internal lamellar cushion is muscular and the vertical or more or less transverse edges of the lamellae have a thickened cuticle, the whole organ forming a rasping apparatus (compare the radula of molluscs).

The pharynx (proboscis) is protrusible. Protractors are attached to a split buccal ring and extend from the ventral side to the body wall.

Retractors extend backwards from the hinder end of this rasping organ.

## **Laboratory notes**

### ***Eurythoe***

Often very common under stones on the shore. In life it is pink with conspicuous white setae which detach readily and cause severe irritation, forming a protective mechanism. Note long body; mouth circumscribed by

several segments. Caruncle long with a thick, sinuous median ridge. Branchiae much subdivided (dendritic). Dorsal cirri single. Eyes present. Revise **dorsal** and **ventral** views. The specimen shown had defaecated the sand grains in the **photograph**.

### ***Chloeia***

A very active scavenger and carnivore, not uncommonly caught on baited fishing hooks. Note body ovate, ventral mouth circumscribed by several segments, **caruncle** large, much longer than wide, with indistinct lateral folds. Branchiae not dendritic but **pennate** (feather-like). Dorsal cirri single. Eyes present. Large **bilobed palp** ventrally anterior to the mouth.

Family **Eunicidae and related families** (e.g. *Eunice*, *Marphysa*, *Australonuphis*, *Diopatra*).

The Eunicidae and the closely related Onuphidae include **errant** and **sedentary** species, indicating the non-phylogenetic nature of classification of polychaetes into Errantia and Sedentaria. **Proboscis** entirely ventral; when well-developed projects backwards under the oesophagus as a muscular sac. It may therefore be termed the 'ventral diverticular type'.

This develops as a ventral pocket of the stomodaeum of the early larva. The mouth is terminal.

The proboscis has protractor and retractor muscles attached to it.

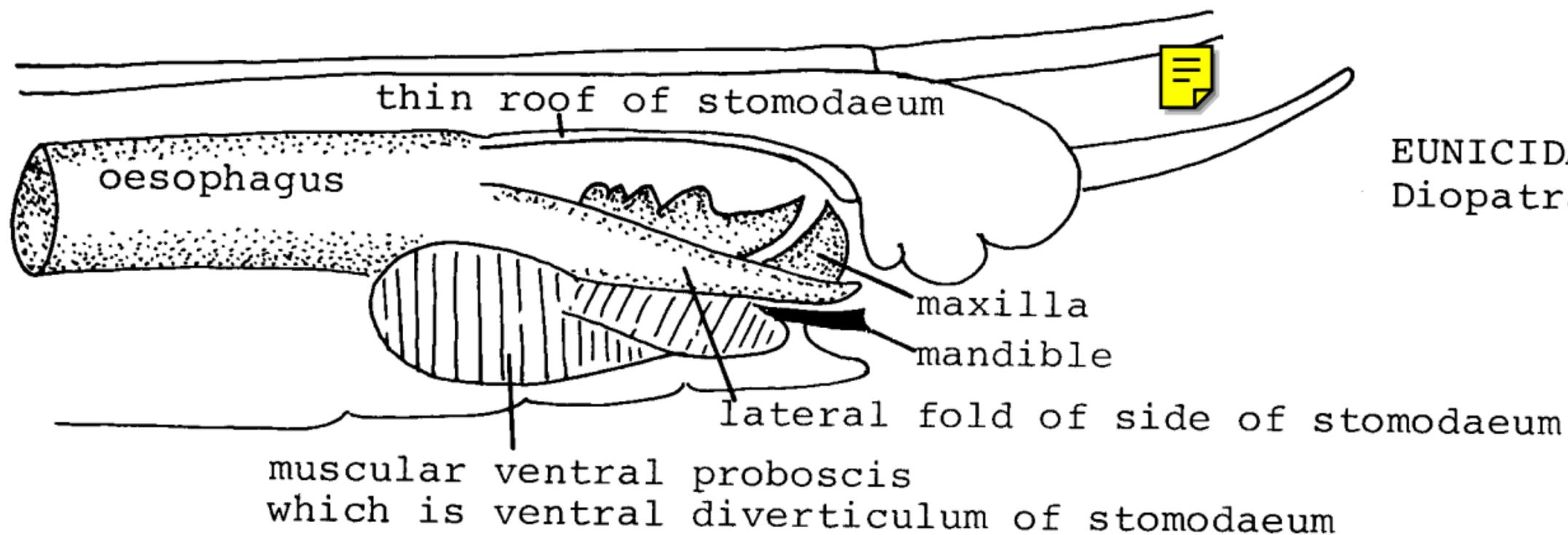
A **jaw** apparatus present; this consists of a dorsal series (maxillae) of which the larger, at least, are joined in the midline to the other side.

Ventral jaws on the floor of proboscis are known as mandibles.

The maxillae are hardened and specialized parts of the edges of lateral folds projecting into the cavity of proboscis.







EUNICIDAE  
Diopatra



The maxillary apparatus is constantly renewed. The chief variation is in the dental armature although the extent of the musculature also varies.

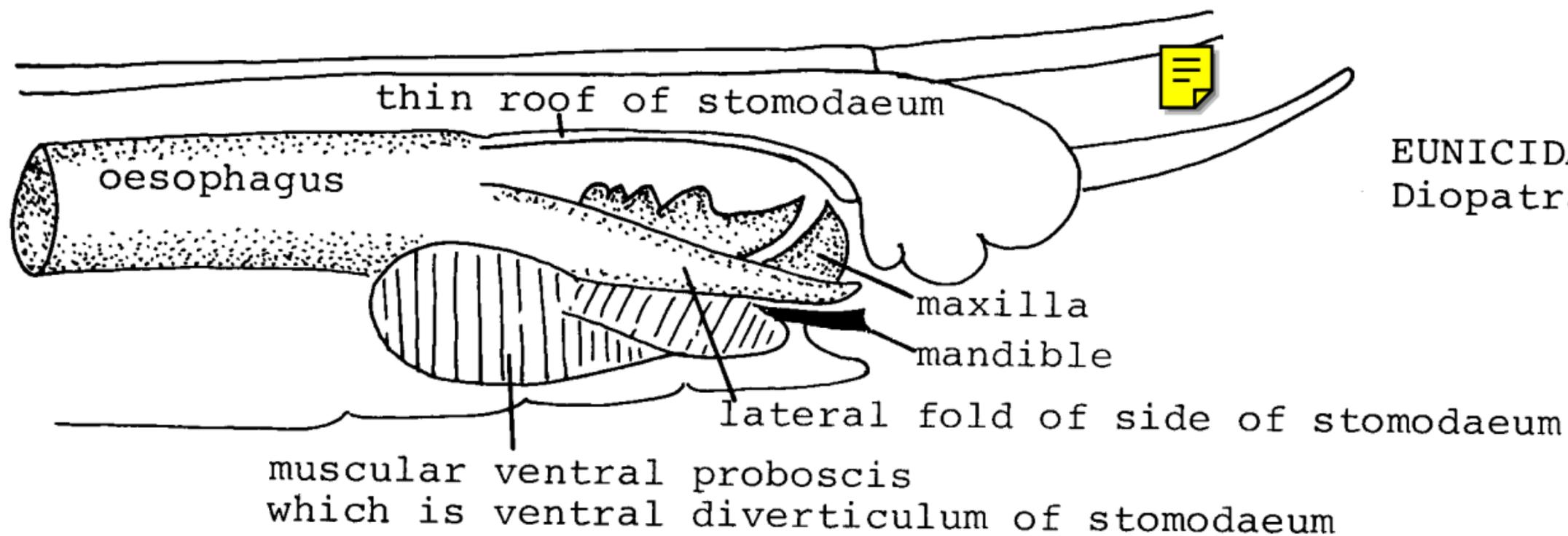
The length of the proboscis very variable and reflects the length of the maxillary carriers or basal plates to which the main muscles are attached.

The buccal organ is reduced, though still large, in the onuphid *Diopatra* a tube dweller with a relatively small (though still considerable) globular proboscis.

## **Laboratory notes**

### Family **Eunicidae**

Very elongated errant, burrowing and tubicolous polychaetes. Prostomium lacking appendages or with 1 to 5 antennae. Sometimes with a pair of tentacular cirri on segment 2. Parapodia uniramous, the notopodium being represented by a gill and a dorsal cirrus. Sometimes the dorsal acicula is



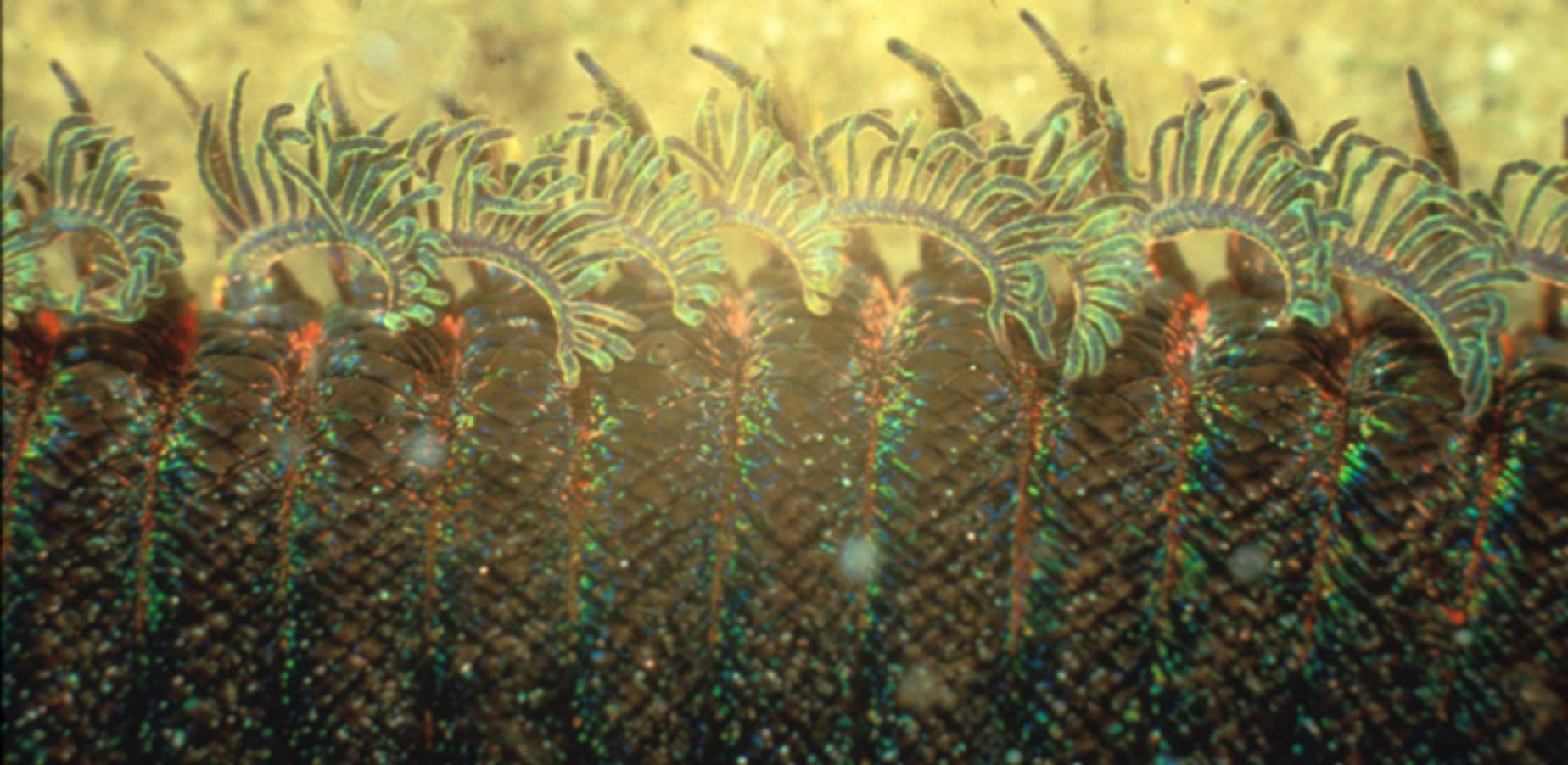
present (in addition to the ventral), giving the sesquiramous condition (i.e. one and half rami). Setae simple or composite. Proboscis when well developed extending backwards as a muscular sac under the oesophagus and armed with dorsal 'maxillae' and ventral 'mandibles'.

### *Eunice*

A large (up to 3 feet) active swimming and crawling carnivore, with lateral parapodia, neuropodium with setae, notopodium reduced to a muscular cirrus, dorsal cirrus as a pectinate gill; head with two eyes, five prostomial antennae, achaetous peristomium, a pair of dorsal tentacular cirri on first trunk segment. As in many other polychaetes, the dorsal cirri may be associated with [gills](#).

### *Marphysa*

Differs from *Eunice* in lacking peristomial cirri. Note bilobed prostomium, bearing 5 simple antennae and 2 small, black eyes. Ventral cirri obtuse



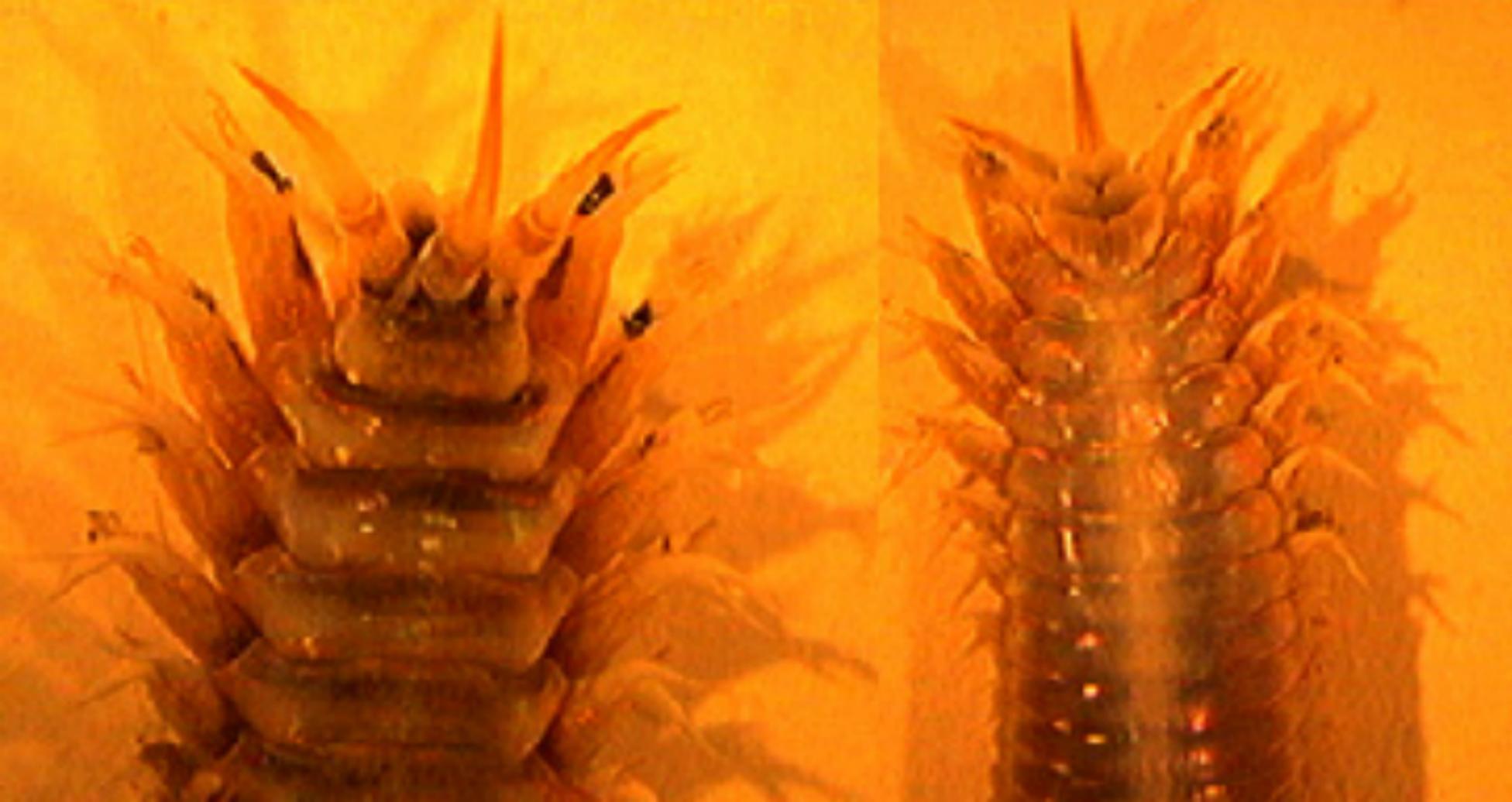
tubercles, dorsal cirri simple. Gills beginning towards the 16 to 30th segment, at first simple, more posteriorly with 4-7 filaments.

## Family **Onuphidae**

2 small antennae anteriorly and usually 5 larger antennae more posteriorly on the prostomium. Notopodium again represented by dorsal cirrus and branchiae but often supported by acicula.

### *Australonuphis*

*Australonuphis teres*, the Australian Beach Worm, is a carnivore and scavenger and one of the largest annelids, reaching more than a metre in length with hundreds of segments. The head and first few segments are of typical errant form but from about trunk segment 6 posteriorly the parapodia are dorsolateral and leave between them a middorsal channel along which a respiratory and cleansing water current flows, these segments remaining in the burrow in the sand when the anterior segments are protruded for feeding.





Examine dorsal view of head with two small and three large antennae; two bulbous ventral palps; anterior parapodia with unbranched dorsal cirrus; other parapodia with **pectinate gills**. Large, black eye spots on the more anterior parapodia.

Also examine head divided in half longitudinally to reveal the dorsal maxillae, ventral mandibles and the muscular ventral proboscis of the diverticular type.

### ***Diopatra***

A greatly modified eunicid adapted to life in a **tube** composed of shell fragments cemented by a fibrous organic secretion. Ventral proboscis relatively reduced, globular though still considerable. Dorsal cirri digitate; gills enlarged relative to those of *Australonuphis* and spiral. Frontal antennae short and conical; tentacular cirri present.



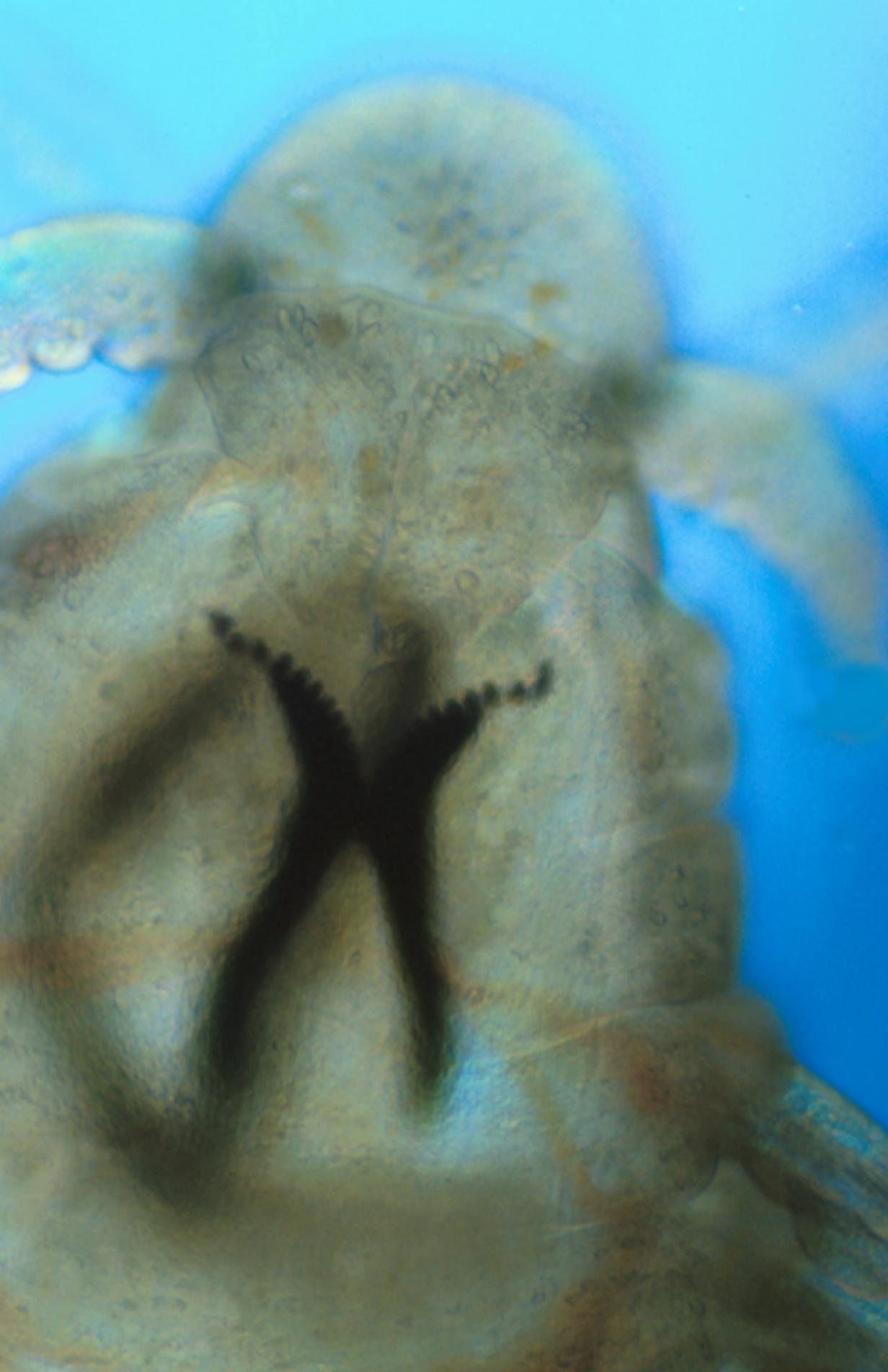
## Family **Dorvillaeidae**

These minute polychaetes show their relationship with eunicids in possessing **maxillae and mandibles**.

### **BUCCAL ORGAN RETAINED AS A SORTING LIP (DEPOSIT FEEDING)**

The Terebellida of Dales have been expanded by **Rouse and Fauchald (1997)** and contain the Acrocirridae, Flabelligeridae, \*Cirratulidae, Alvinellidae, Ampharetidae, \*Pectinariidae, \*Terebellidae and Trichobranchidae. They fall in their **Canalipalpata: Terebellida**.

Dales recognized, in the families Cirratulidae, Ampharetidae, Pectinariidae and Terebellidae, forms with a modified buccal organ retained for deposit feeding.



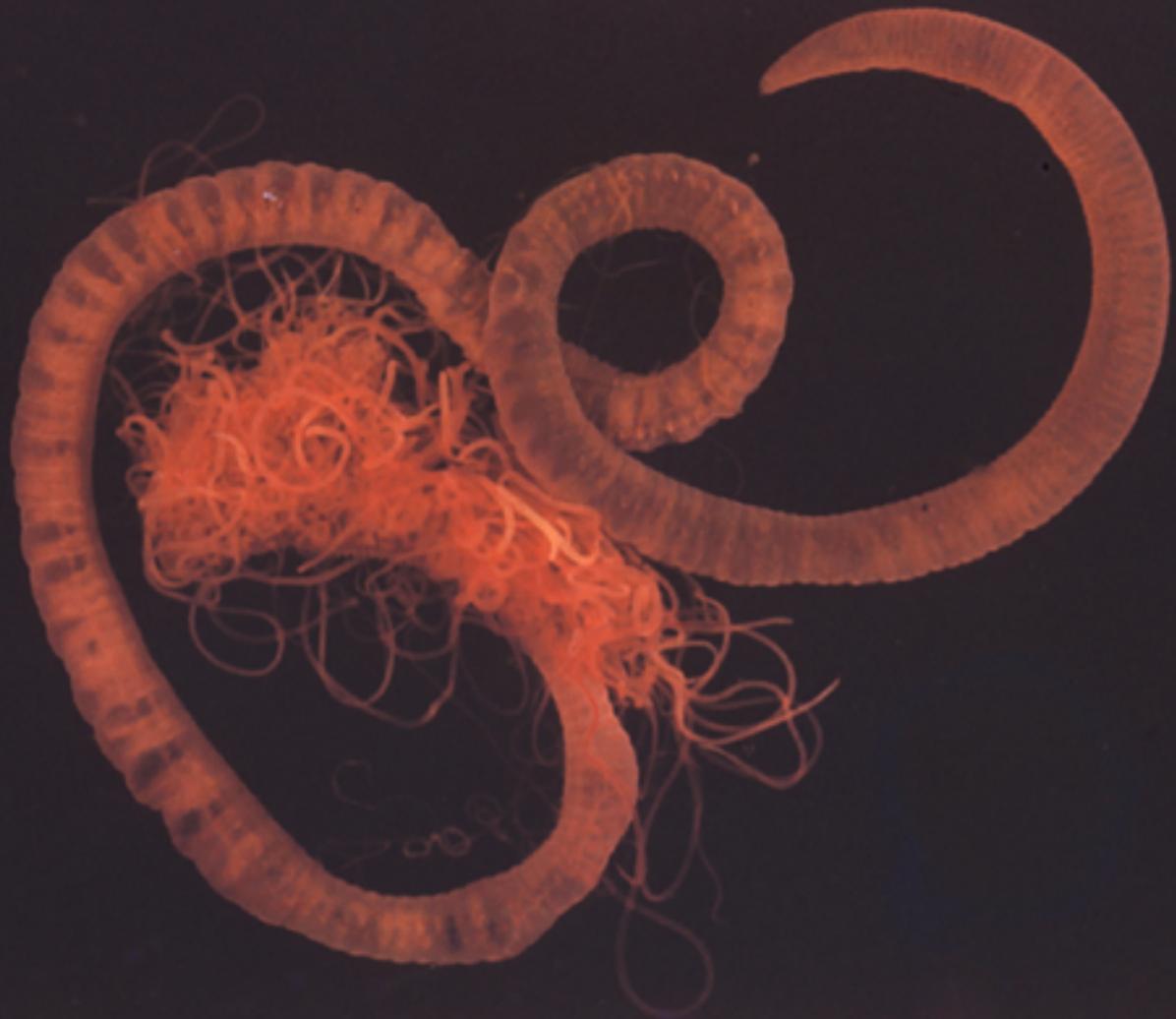
The protrusible ventral tongue of the **Cirratulidae** (distinguished by lateral tentacles), for instance, is little modified relative to a buccal bulb.

Modification as a **sorting lip** is well exemplified by the Terebellidae. Tentacles in terebellids cannot be fully retracted into the mouth; they are usually grooved (hence Canalipalpata) and are used in selective deposit feeding on the substrate (sorting by the modified buccal bulb) or capture particles from the water.

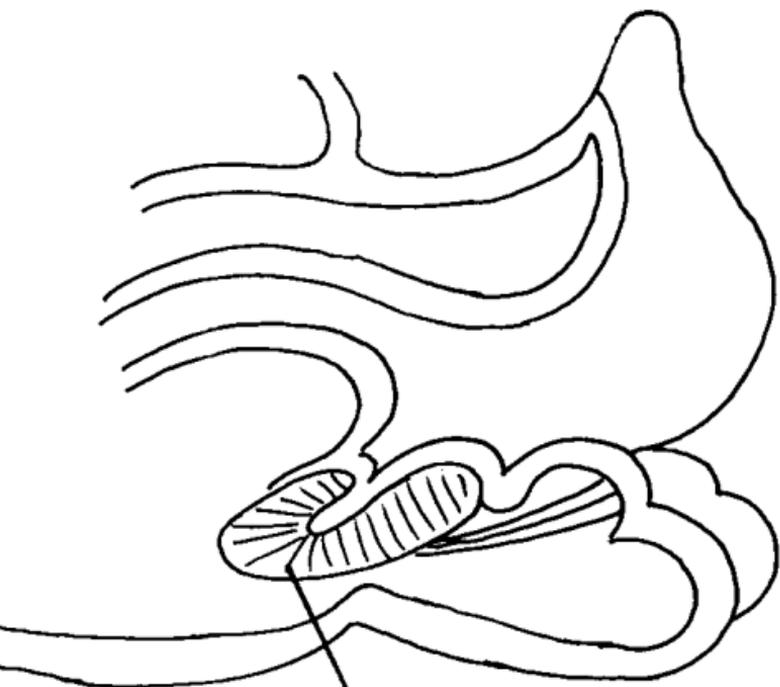
The Terebellida typically have **mixonephridia** throughout the body.

## **Laboratory notes**

Family **Terebellidae**. Sedentary polychaetes with a mucous, membranous or **sandy tube**. Thorax with notopodia and neuropodia; dorsal capillary setae

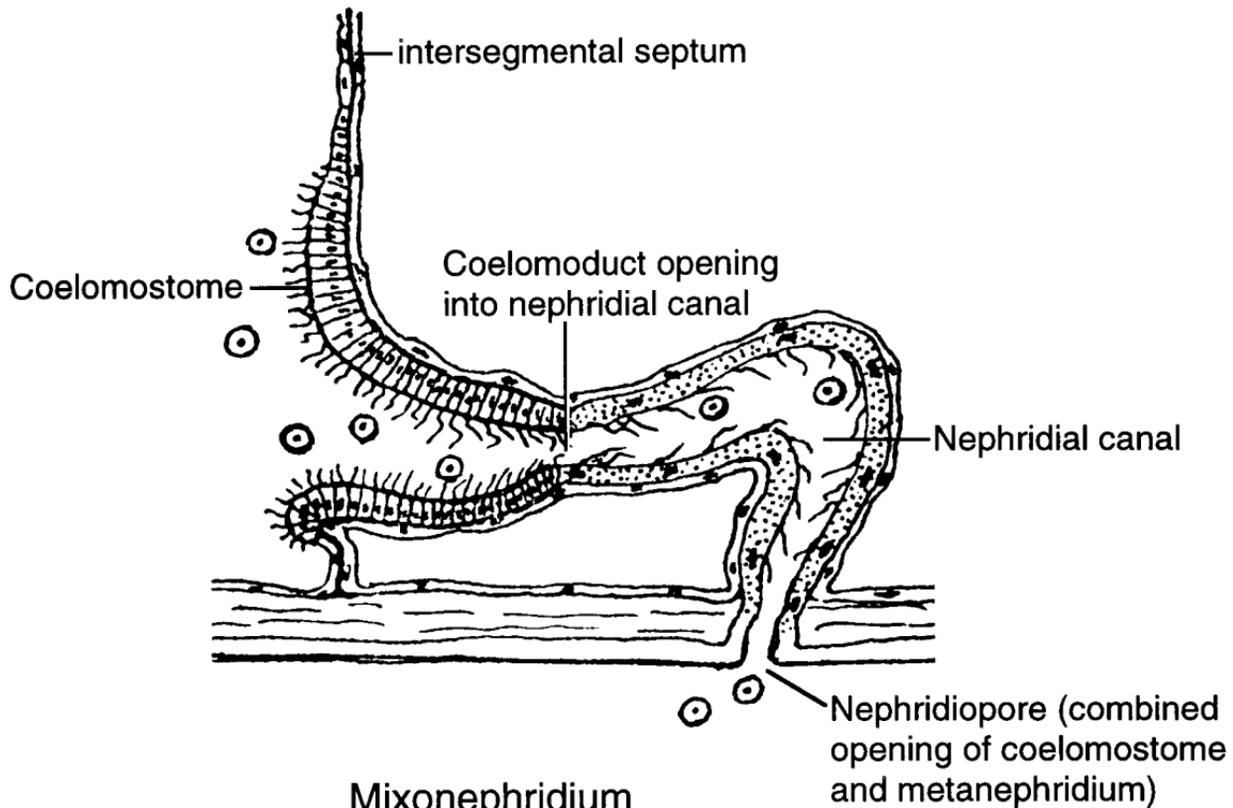


TEREBELLIDAE - Terebella



Buccal bulb

(from Dales)



Mixonephridium  
(after Goodrich, 1945)



and ventral **uncini** (biramous); abdomen with only neuropodia, bearing uncini (uniramous). Prostomium reduced but bearing numerous elongated ciliated feeding tentacles. 1, 2, or (commonly) 3 pairs of branchial plumes (gills) on the first segments (sometimes absent). Peristomium without appendages.

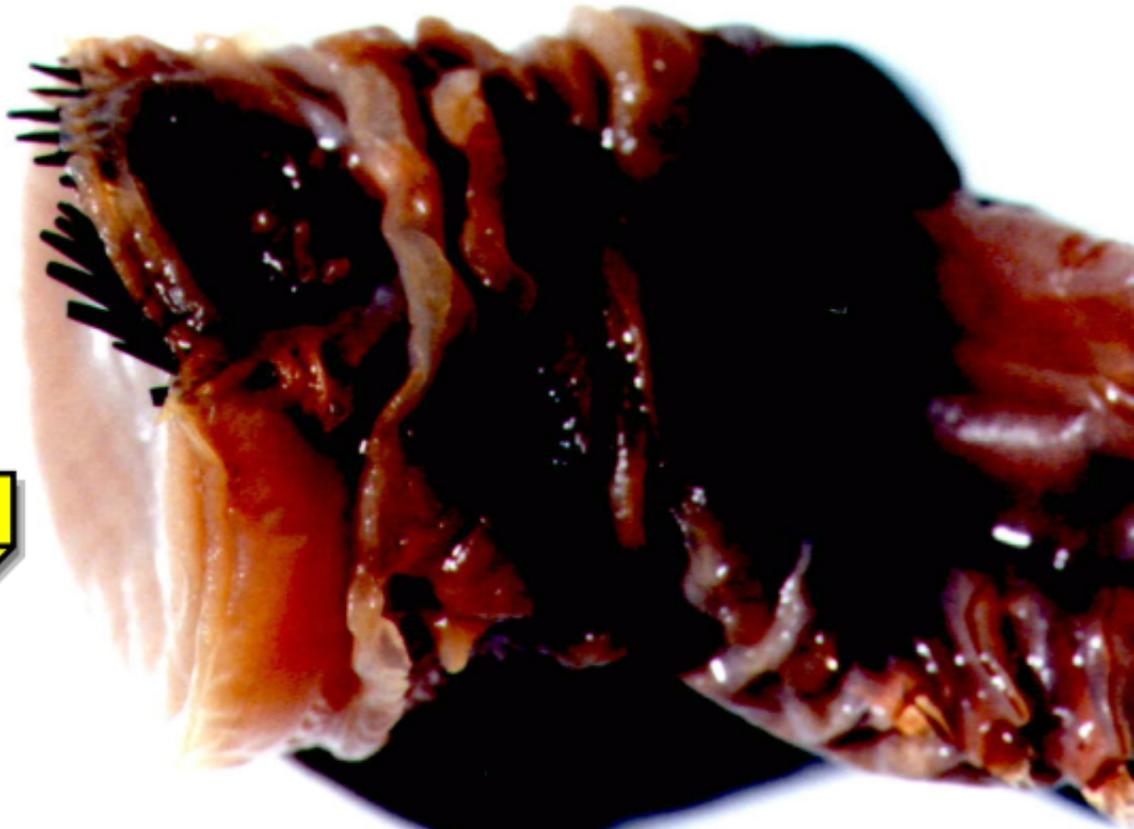
***Reteterebella queenslandia***. Well exemplifies the 3 pairs of branchial plumes and long tentacles which often extend, on Heron Island, over an area of a metre square on the reef flat, the worm being concealed under coral heads or rubble.

Family **Pectinariidae** (Amphictenidae)

Sedentary worms. Very readily identified by the striking glossy metallic-looking paleal setae and the gently curved, tapering, tusk-shaped exquisitely formed sandy tube, open at both ends. Body short, with three parts: (1)







thoracic, comprising the first three setigerous segments, which lack the neuropodium, and the anterior gill-bearing segments, (2) abdominal, biramous segments with dorsal setae and ventral uncini, (3) caudal, a leaf-like region with segments a setigerous and vestigial except the first. Prostomium indistinct, but covered by numerous prehensile, ciliated feeding tentacles. Two bundles of enlarged forwardly directed setae form an operculum. *Pectinaria* burrows in sand using anterior setae while remaining in tube.

## **BUCCAL ORGAN LOST (FILTER FEEDERS)**

### **Canalipalpata: Sabellida**

Among the most modified of all polychaetes are the families Sabellidae (e.g. *Sabellastarte australis*) and Serpulidae (e.g. *Galeolaria*) which were united by Dales in the order Sabellida. Rouse and Fauchald add

to these the Sabellariidae and, notably, the Siboglinidae (Pogonophora, once regarded as a separate, deuterostome phylum).

Sabellida are typically true filter feeders using only ciliated prostomial plumes.

They have a single pair of anterior metanephridia opening by a single median dorsal pore

### Family **Sabellidae**

Sabellids have a mud and mucous tube. This tube and the crown of tentacles are well exemplified by *Sabellastarte australis*.

The thorax has dorsal capillary setae (notosetae) and ventral uncini (neurosetae).



The abdomen has the reverse situation, with dorsal uncini and ventral capillary setae.

They are true filter feeders. A crown of ciliated pinnate tentacles (radioles) is developed from prostomium. It often forms two half circles, opposed to form a funnel when expanded beyond tube. Beating of cilia on the **pinnules** produces a current of water that flows through radioles into funnel and then flows upwards and out. Particles are trapped on the pinnules and are driven by cilia into a ciliated groove running the length of each radiole.

At the base of the radioles there is a complex sorting mechanism. The largest particles are rejected and fine material is carried by ciliated tracts into the mouth. Medium sized particles may be used for tube construction.



A large introduced *Sabella* is now a major problem in Port Phillip Bay.

### **Laboratory notes**

Sabellids are sedentary worms with a tube made of various materials but never calcareous. The 'trunk' is divided into thorax and abdomen; the thoracic region having dorsal capillary notosetae and ventral uncini; the abdomen having dorsal uncini and ventral capillary setae. The prostomium is more or less distinctly trilobed. The tentacles are filiform, simple or pinnate, and are said to be retractile into the mouth. They are true filter feeders, using only the ciliated prostomial tentacles for directing food particles in suspension to the mouth. The proboscis has been lost. They have a single pair of anterior mixonephridia opening by a single median dorsal pore.

*Sabellastarte*. One of our biggest native ‘feather duster worms’. Observe a living demonstration specimen in its tube.

## Family **Serpulidae**

Serpulids have a basically similar mode of feeding to that of sabellids.

The family is distinguished from the Sabellidae in having the right dorsal filament modified as an operculum; having a thoracic membrane (dorsolateral frills) and a calcareous tube.

The setae are arranged as in sabellids. The thorax has 7 setigerous segments, with dorsal capillary notosetae, and ventral uncini.

The abdomen has a variable number of segments. There are ventral capillary neurosetae and dorsal uncini. The animal commonly lies on its back but in ‘colonial’ species orientation is variable.



## Laboratory notes

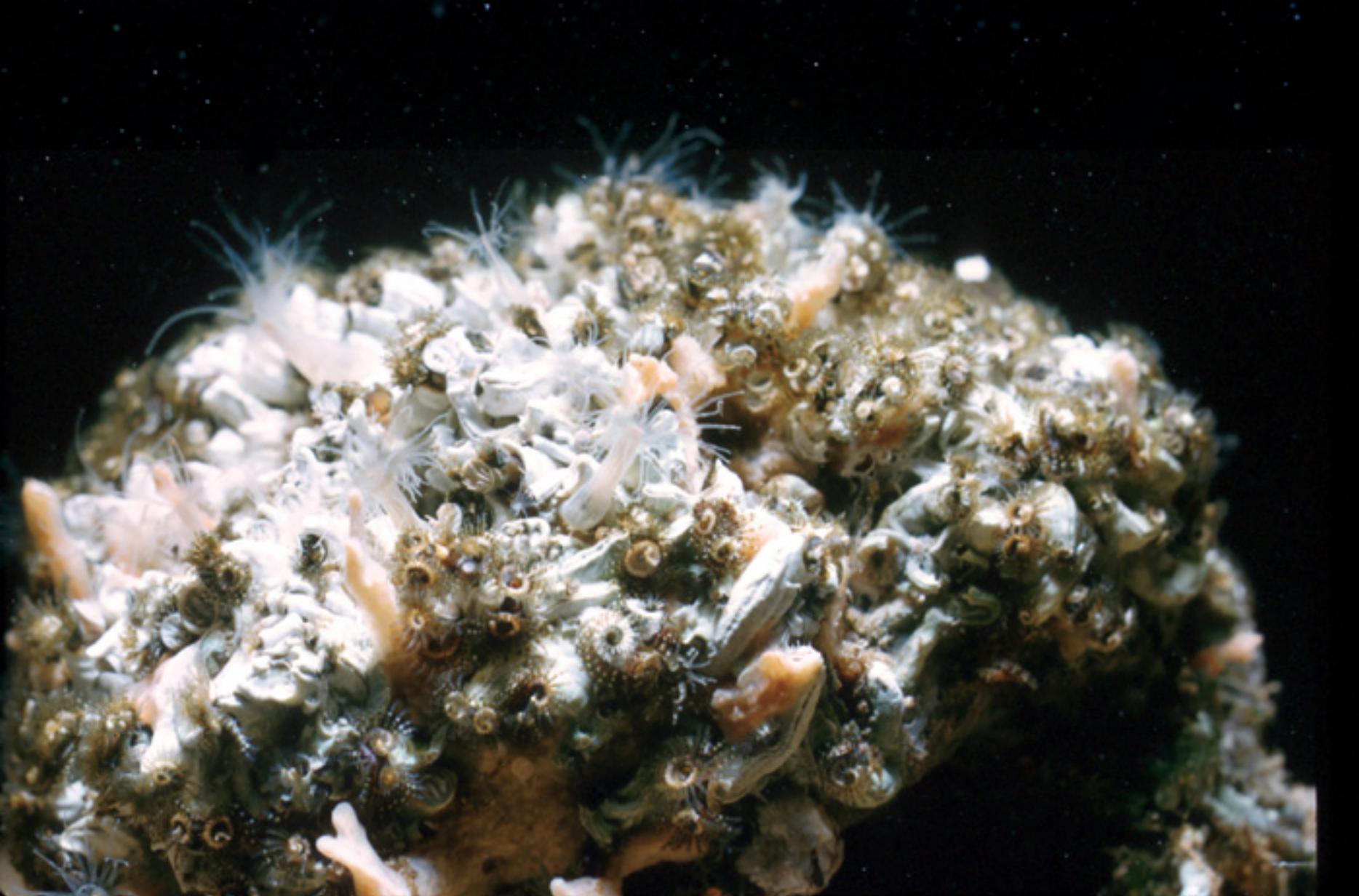
Serpulids are distinguished from the Sabellidae by the possession of an operculum, a thoracic membrane (rarely absent) and a calcareous tube.

### *Galeolaria*

An extremely abundant Australian worm, the white **calcareous tubes** of which forms a distinct midlittoral band on rocky shores throughout New South Wales and southern Queensland. A *Galeolaria caespitosa* ‘**clump**’ is home to a considerable diversity of fauna; here some small coelenterates (Sea anemones - Actiniaria) are visible among the tubes. It is highly specialized for ciliary feeding and for life in its calcareous tube attached to the substrate.

Examine *Galeolaria* tubes containing the living animals. Note how the animals can contract completely into their tubes, closing the entrance by the





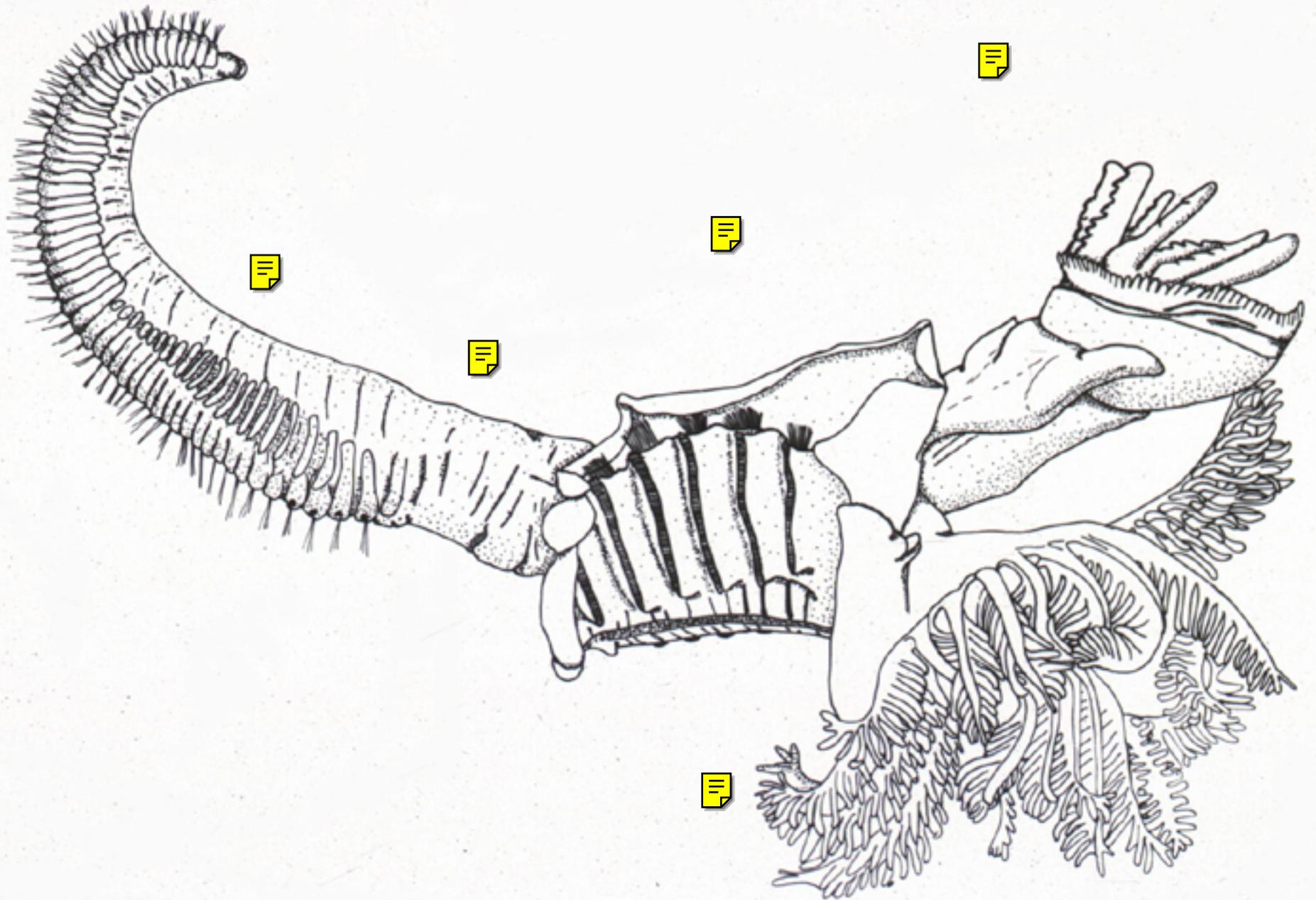
peculiarly ornamented **operculum** (differing in numbers of ‘teeth’ between the two sexes), or partially emerge, exposing a crown of tentacles.

Break open the tubes and extract the animals. Observe males: smaller, black, with a white abdomen filled with sperm; females; larger, with a bright orange abdomen filled with eggs. Make careful investigations of the anatomy, noting the following regions: head, thorax, asetigerous region and abdomen.

Recognize in the specimens and accompanying drawings the following features. Observe the very informative **lateral** view; also **dorsal** and **ventral** views.

**Head.** Prostomium vestigial but bearing a **crown of filaments** developed from the prostomial palps. Each filament (‘radiole’) a stiff pinnate structure, each element of which has a ciliated groove. Cilia create food-bearing water







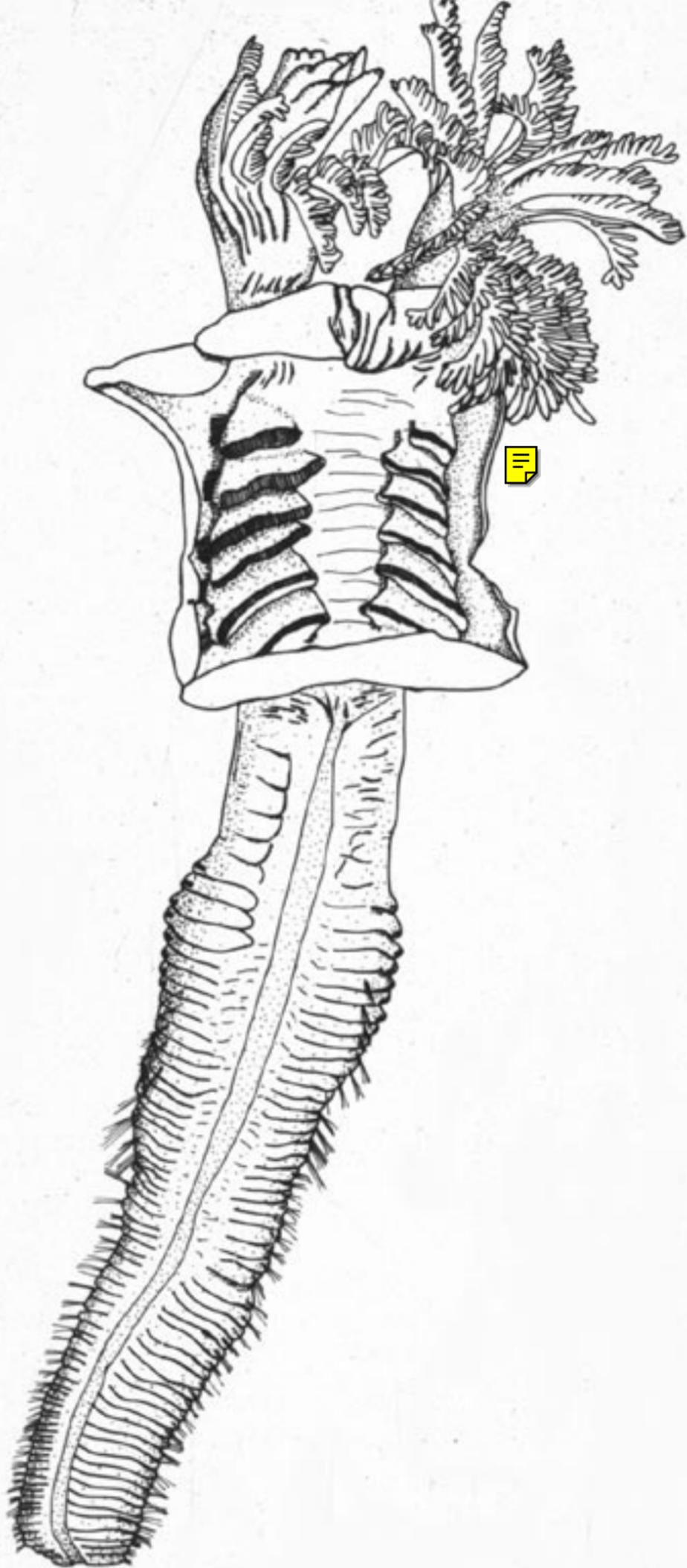


current. (Observe the currents by pipetting carmine particles into the water near the crown). **Operculum** at end of peduncle, believed to represent a modified right *dorsal* radiole.

A ciliated **groove** on the dorsal face of the operculum connects with a groove along the body which turns ventrally on the posterior part of the asetigerous region and is ventral on the abdomen; this carries faeces, urine and gametes out of tube. Dorsal tentacles of the prostomium are reduced, represented by 6 to 8 small filaments surrounding the buccal cavity (often absent). The peristomium is asetigerous, enlarged as ventrolateral 'collar' which secretes the tube and is probably respiratory. The collar is fused with pair of dorsolateral frills, the 'thoracic membrane', which extends back on the sides of thorax.

**Thorax.** Seven setigerous segments. Dorsally no longer segmented. Note the two sides of thoracic membrane uniting posteriorly as a flap extending over





the anterior part of the asetigerous region. Setae: ventral uncini, on neuropodium, and dorsal capillary setae on notopodium. Thoracic membrane **unites ventrally**. The animal often lies on its back.

**Asetigerous region.** Immediately behind the thorax. No external segmentation or setae.

**Abdomen.** Variable number of segments. Setae: ventral capillary setae, on neuropodium, and dorsal uncini on notopodium. Size and colour difference between sexes.

The calcareous tube of the type-species, *Serpula vermicularis*, is often covered by bryozoans.

Some serpulids, by virtue of their dense populations and calcareous tubes, are pests. They may block lock-gates and fowl dock piles. *Hydroides norvegica* has a delicate tube but seriously fowls the undersides of boats.





## AXIAL PROBOSCIS

Forms with an axial proboscis, recognized by Dales (1961), comprise, as he was aware, a polyphyletic group. They belong to all three divisions of the Polychaeta: the Scolecida, Spionida and Aciculata in the system of [Rouse and Fauchald \(1997\)](#).

The axial proboscis is generally a *symmetrically* developed structure which is axial in that it is a muscular specialization of the anterior region of the alimentary canal (stomodaeum).

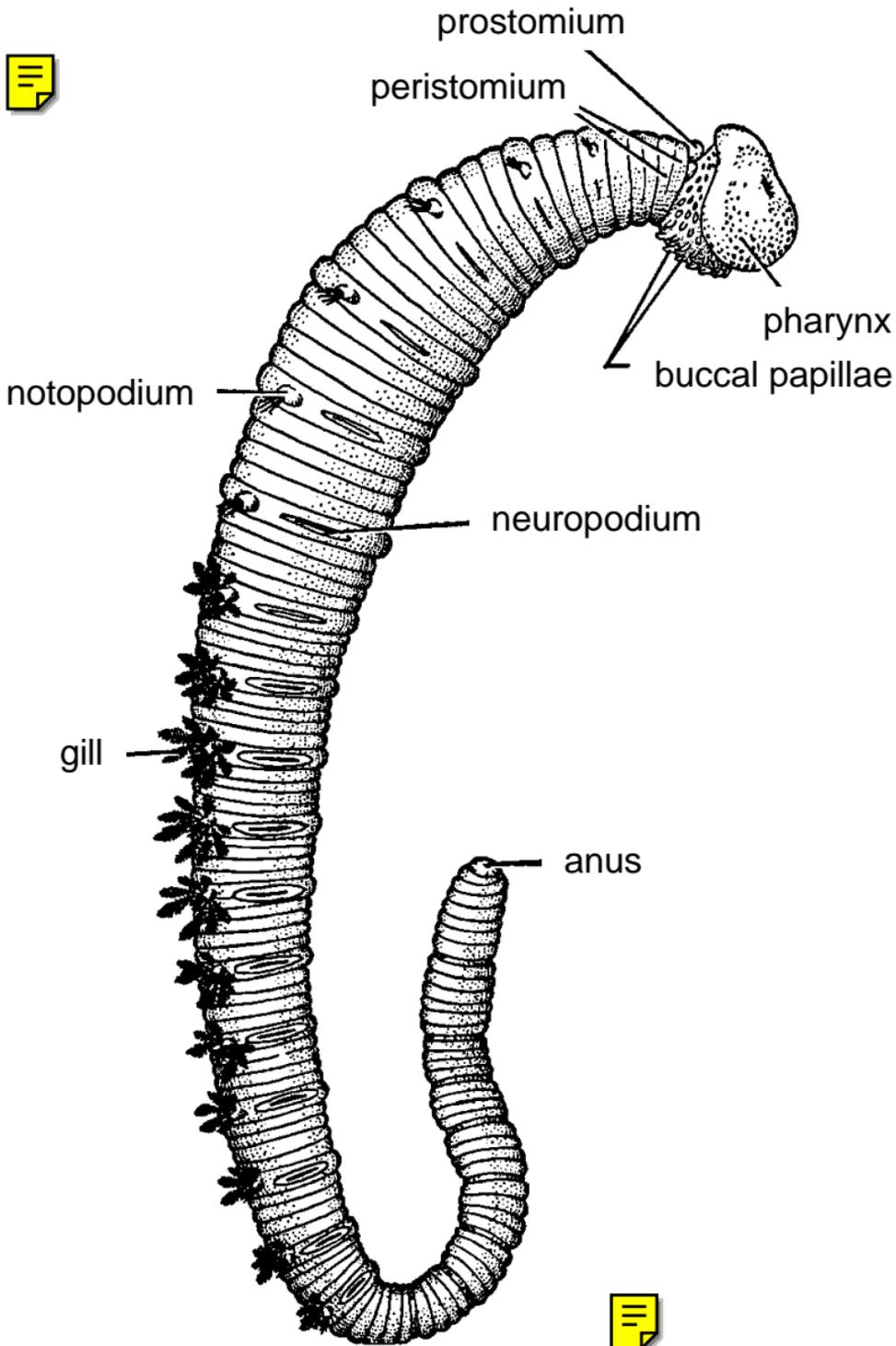
It is frequently armed on its inner wall with jaws which are exposed when the proboscis is extruded. In the latter case the posterior region of the proboscis is very muscular and is termed the pharynx. A muscular pharynx may be present without jaws, as in *Phyllodoce*.

## Simple Axial proboscis

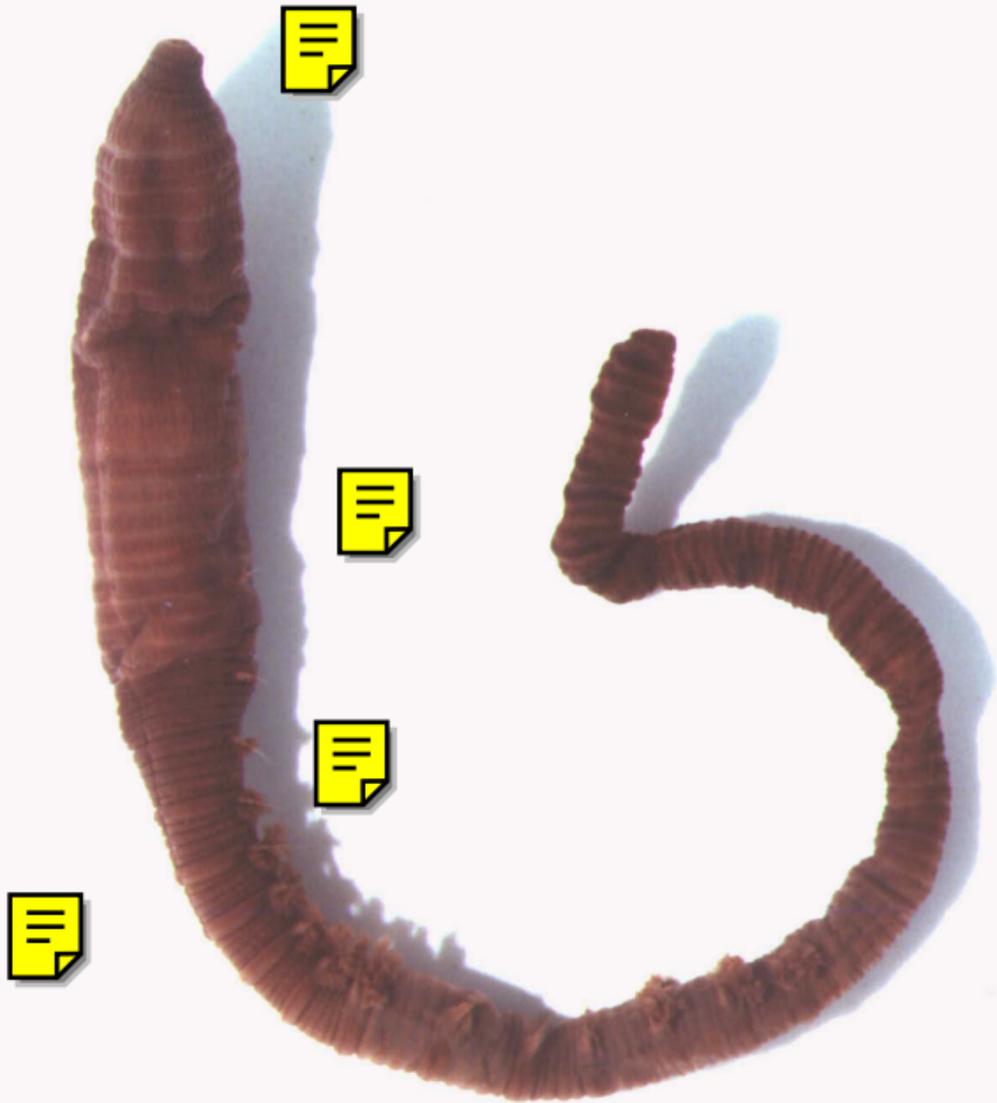
Here there is no muscular pharynx at the hind end of the buccal tube. There are two main feeding types: the sand and mud eaters and the suspension feeders. This form of the proboscis gives a polyphyletic grouping according to the phylogeny of [Rouse and Fauchald \(1997\)](#), consisting of Scolecida and Spionida.

### Sand and mud eaters

These comprise the order **Capitellida** of Dales, including the families Capitellidae, \*Arenicolidae and \*Maldanidae, etc. They lie in the **Scolecida** of [Rouse and Fauchald \(1997\)](#), which, in addition to these three families, contains the Opheliidae, Scalibregmatidae, Orbiniidae, Paraonidae, \*Questidae (pleisomorphically retaining a ventral proboscis), and Cossuridae.



*Arenicola* (After Brown)

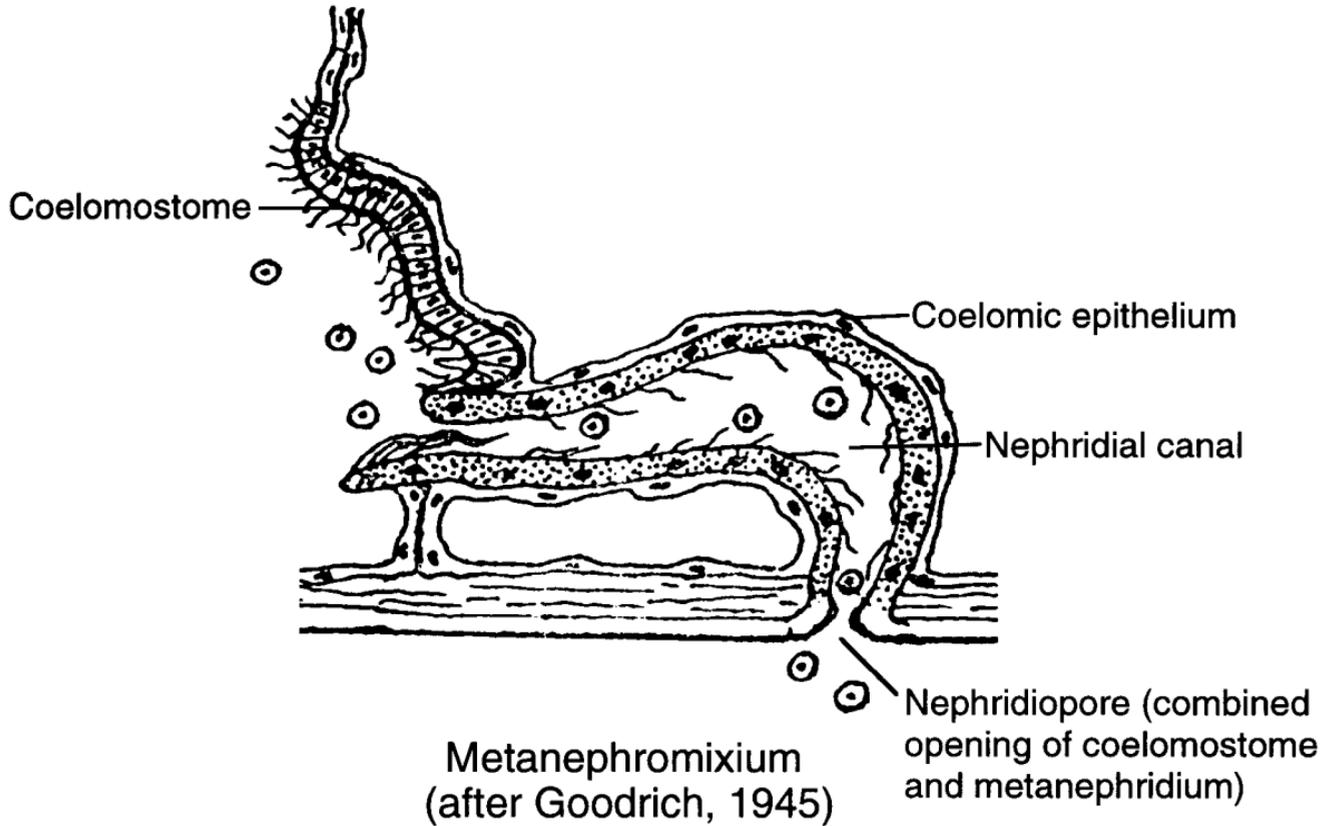


A familiar example is *Arenicola*. This is not a Queensland genus but is the well-studied British ‘lugworm’. Here the proboscis is of importance in burrowing and though papillate is unarmed. As usual in polychaetes, the proboscis is housed in an anterior aseptate chamber but here the most anterior septum is especially important because in the Arenicolidae, at least, it contributes the retractor muscle. It is protruded by coelomic pressure.

Nephridia: *Arenicola* has **mixonephridia**; Capitellidae are exceptional (with some nereidids) in retaining separate metanephridia and complete coelomoducts.

### **Suspension feeders**

These are the Spionida of Dales and include the family Spionidae, \*Chaetopteridae (e.g. *Chaetopterus*) and \*Sabellariidae (e.g. *Idanthyrus*). The group is recognized by Rouse and Fauchald (1997) for the families



Spionidae, \*Chaetopteridae, Magelonidae, Apistobranchidae, Trochochaetidae, Longosomatidae, and Poecilochaetidae. They remove the Sabellariidae to the Sabellida, a controversial placement.

In the Spionidae there is reduction of the proboscis and elaboration of feeding tentacles, while in the Chaetopteridae, with the utilization of the dorsal respiratory current for filter feeding, by means of a mucus 'bag', the tentacles are greatly reduced. The stomodaeum of the Chaetopteridae is a simple tube with no vestige of a proboscis.

Relationships of Sabellariidae (sand-mason worms, e.g. *Idanthyrsus*) are very controversial. Placed by Hatschek (1893) with sabellids and serpulids. Fitzhugh (1989). found the Sabellida, *sensu strictu*, to be monophyletic and the sister group to the sand-mason worms, the Sabellariidae, the supposed synapomorphy for the clade being the presence of setal inversion between thoracic and abdominal regions. The prostomial

appendages of the groups have also been found to be homologous (Orrhage 1980).

Dales (1961) argued for descent of sabellariids and chaetopterids from a spionid stock on the grounds that:

1. The early larvae of sabellariids are practically identical with those of spionids.
2. Anterior feeding tentacles of larva are retained into the adult as in spionids but show progressive reduction in different genera with increasing elaboration of secondary feeding tentacles on the ventral face of the opercular stem.
3. Uncini of sabellariids are similar to those of chaetopterids.

4. As in spionids, there is a dorsal ciliary respiratory current and long notopodial gills arched over back.

Some supposed similarities with Sabellidae were not confirmed by Dales, *viz.*

(a) a dorsal median excretory pore was not seen and

(b) reversal of notosetae and neurosetae between the thorax and abdomen was considered, with justification, different from the reversal of setae in Sabellida.

Possibly sabellariids are nearer sabellids but their position is still uncertain. Sabellariids also show notable similarities to pectinariids in the Terebellida and were placed in the latter order by Fauchald (1977).

### *Idanthyrus*

Observe a live specimen in its tube of sand, shell fragments etc. The fused tubes form considerable **clumps** or even small reefs. The animals extend their **feeding tentacles** into the surrounding water. Remove one from its tube and examine it in a Petri dish. Revise **dorsal**, **ventral** and **lateral** views.

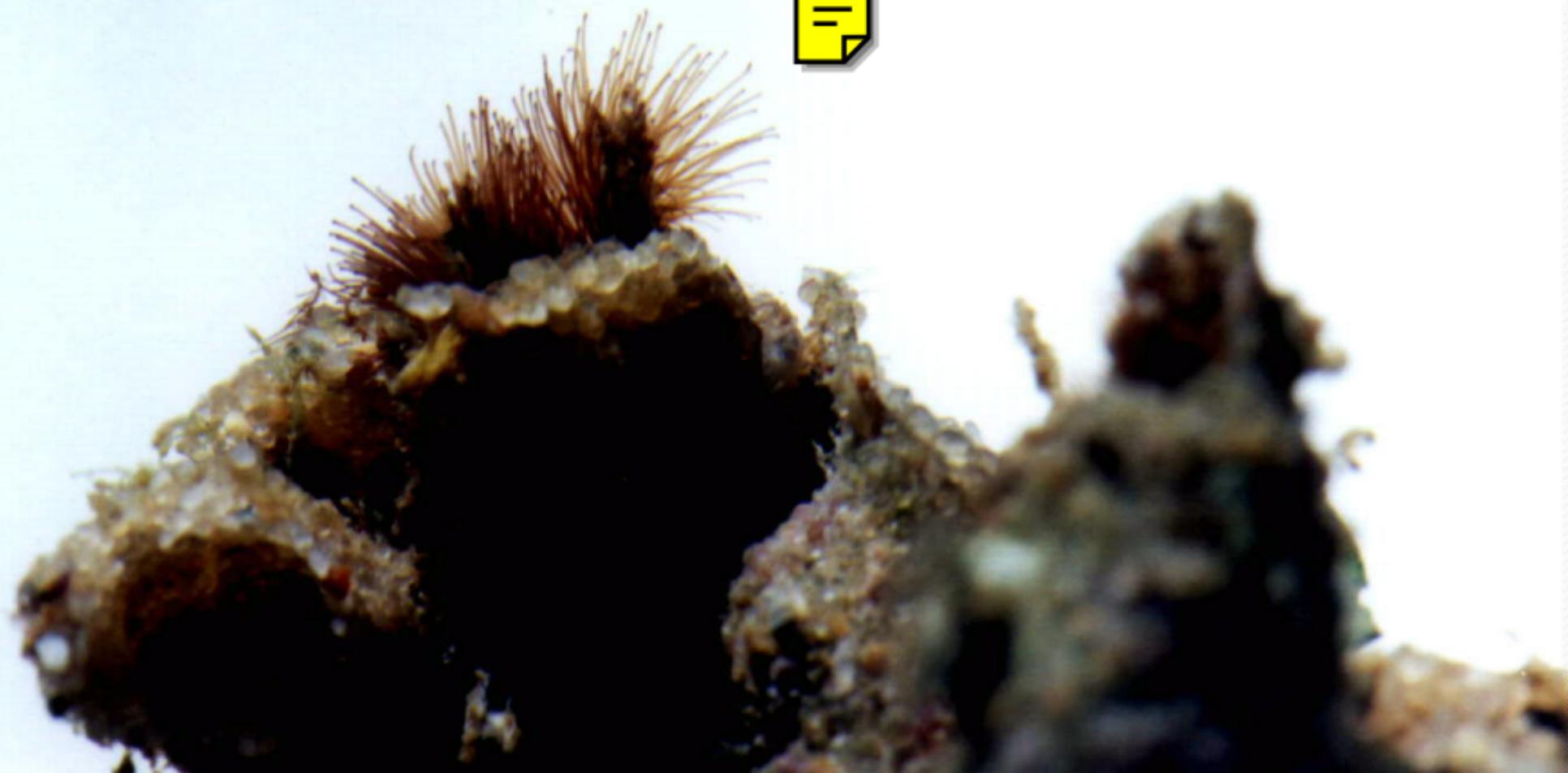
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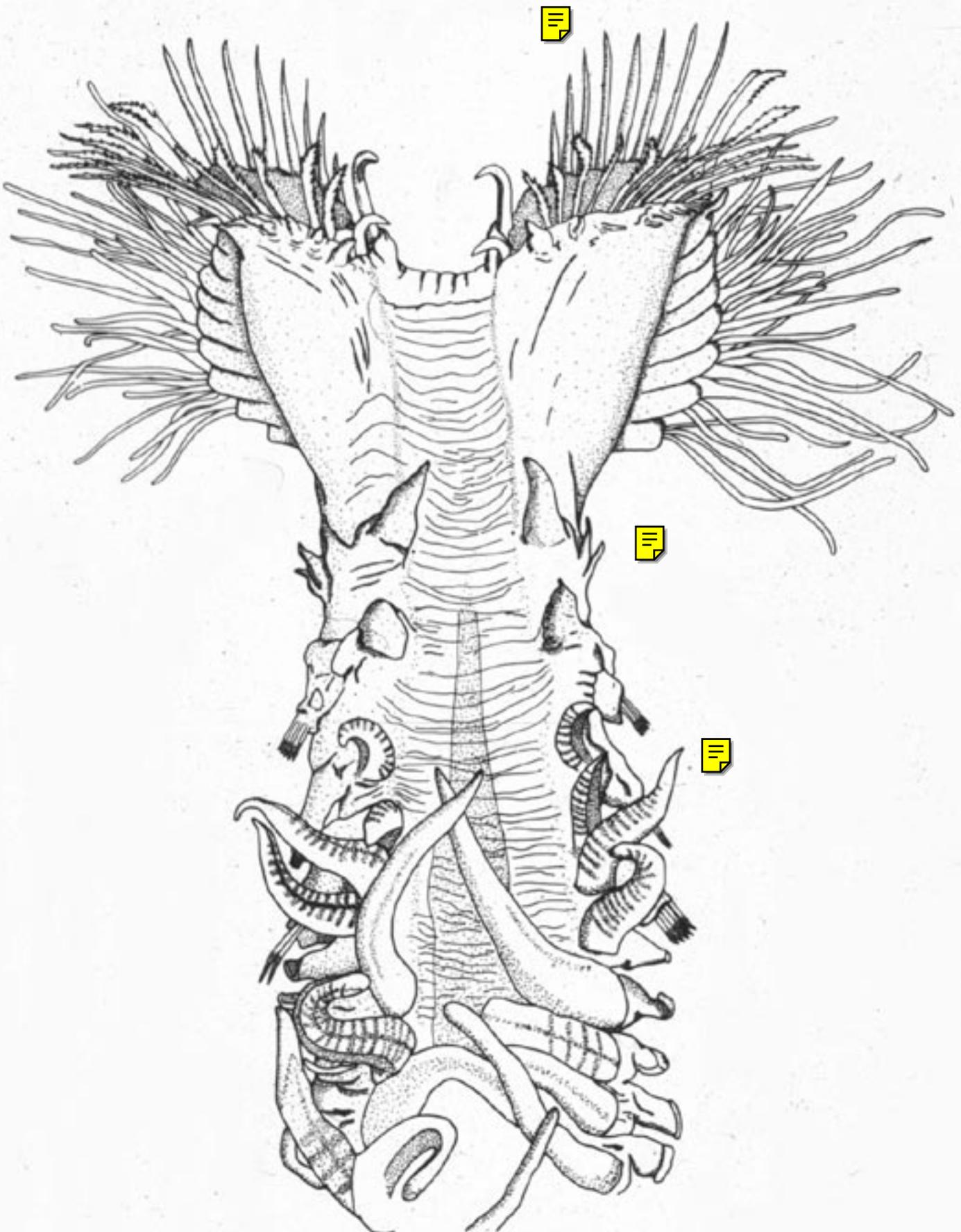
Large **opercular lobes** turned forwards and fused dorsally bearing two distinct rows of large setae, the internal (ventral) and external (dorsal) **paleae**. Some of these coarsely serrate or denticulate. Each row ending medianly with a large **hook**.

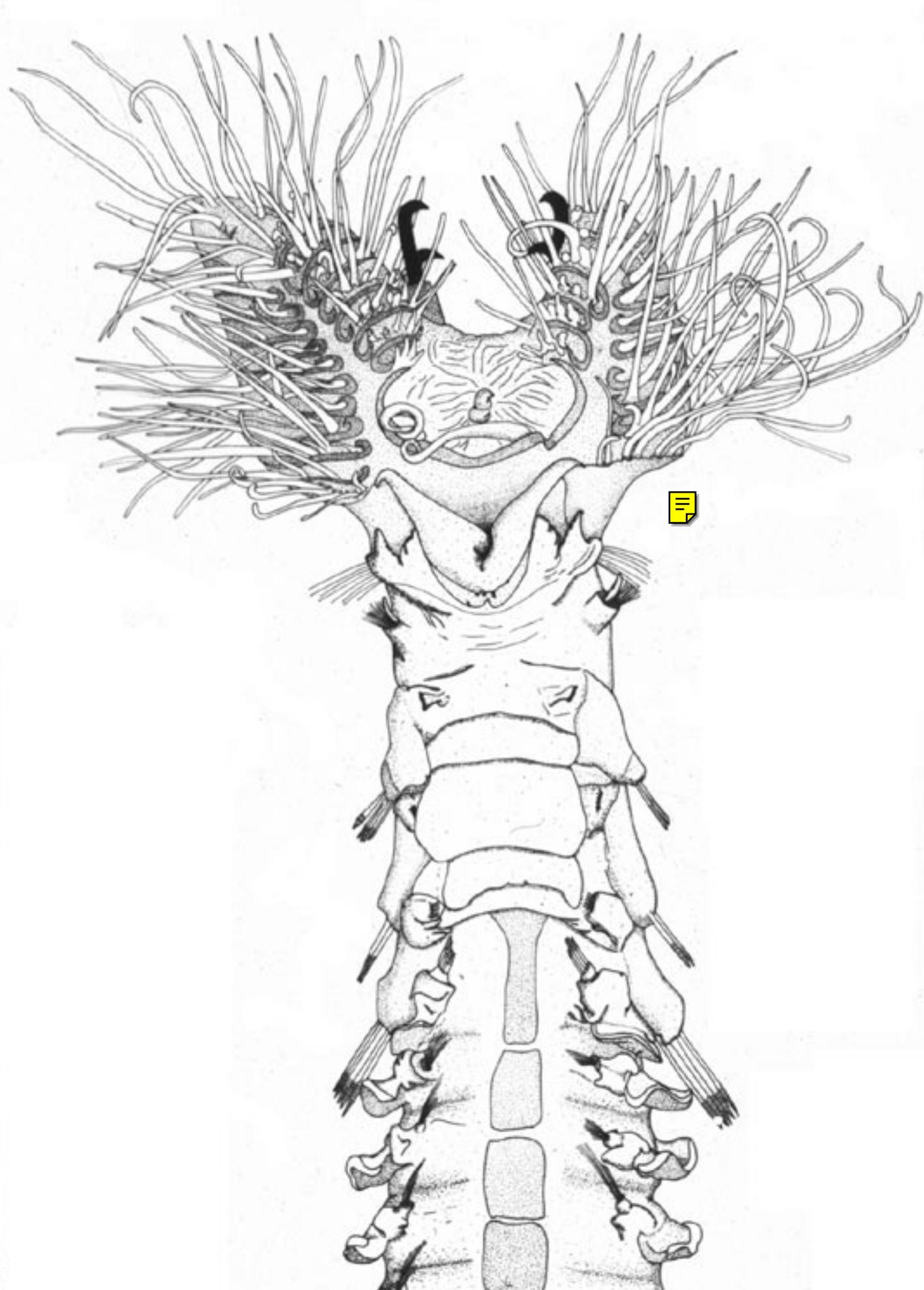
**Uniramous region**, with **two segments**, behind the operculum. Each with a dorsal cirrus and ventral capillary setae.

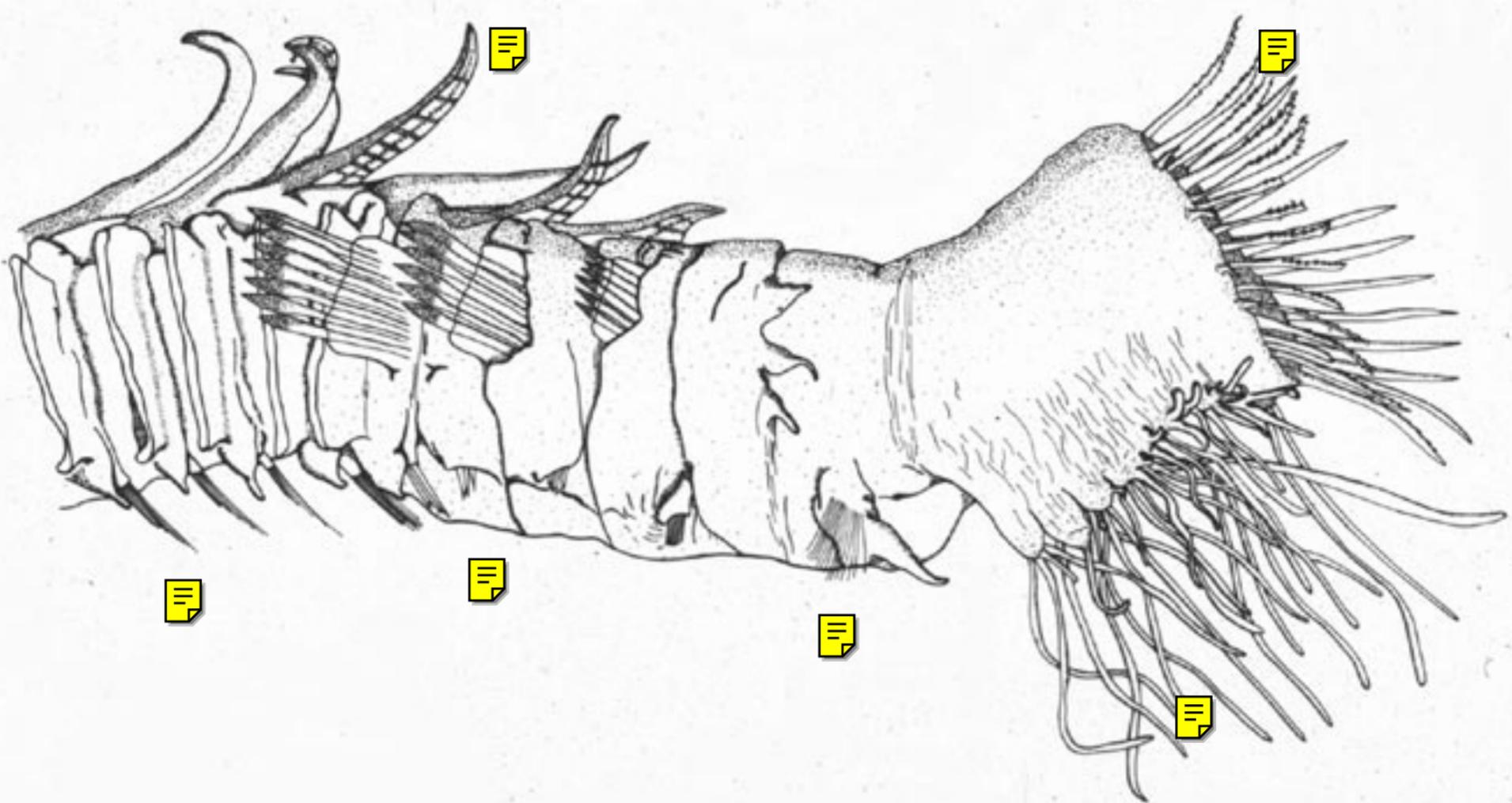










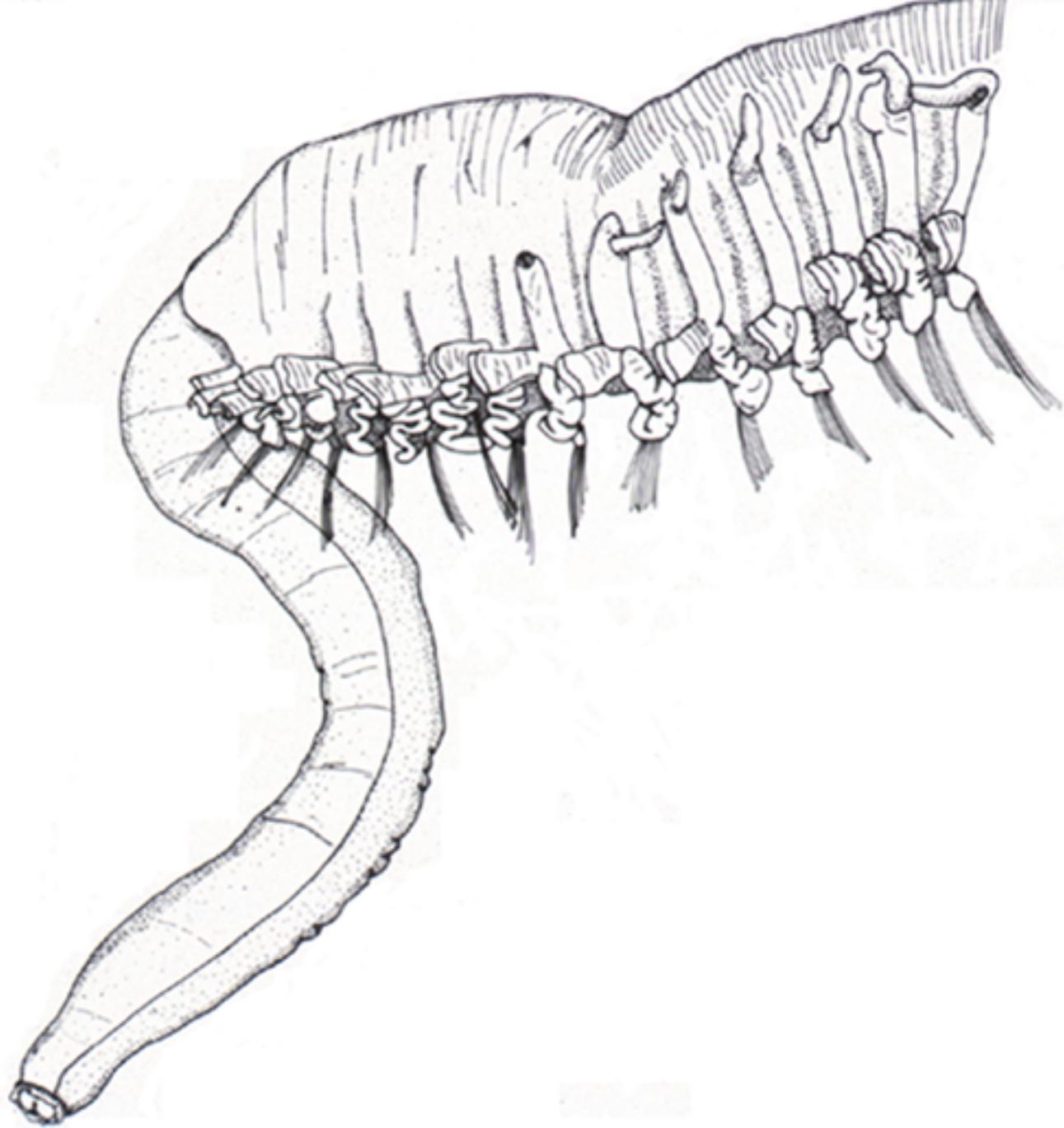


**Parathoracic region**, with 3 segments which have longer dorsal cirri, very large oar-shaped notopodial setae, and ventral capillary neuropodial setae.

**Trunk region**. Long, with increasingly long dorsal cirri between which respiratory current is maintained; with vertically elongate, ridge like **notopodia** bearing uncini and small neuropodia with capillary setae.

**Asetous, apodous region**. With no parapodia or setae. Ending in the anus and in life held ventrally with the anus anterior.

Note also the **ventral view** showing: between the opercular lobes, a median cirrus on the prostomium and behind the cirrus two tortuous palps; behind these the mouth flanked by a large diagonal lip on each side. On the ventral face of the opercular lobes numerous **feeding tentacles**.



Behind the opercular lobes note the segmental regions and setation as noted in the account of the dorsal view.

### *Chaetopterus*

Lives in U-shaped parchment tube (actually raised cuticle) about 25 cm long, buried in mud with the ends in water, a small 'chimney' protruding above the mud at each end. It can be observed by transfer to a glass tube where **lateral** and **dorsal** views are informative.

Notopodia of segment 12 are extremely long (**aliform** or wing-like). Their epithelium is ciliated and mucus-secreting.

Parapodia on 14-16 are fan-like. Each pair forms a piston ring fitting against the cylindrical walls of tube. Beating of the fans (60 beats/minute) produces a current through the tube from the anterior end. The aliform notopodia are splayed and a sheet of mucus like a net is secreted between them. It is continuously secreted to form a mucus bag, at 1 mm/sec. The end of the bag is grasped by a ciliated cup middorsal in segment 13. This







cupule (seen here in dorsal view, though the bag is not visible) rolls up the end of the bag. Almost all incoming water is filtered through this bag; detritus and plankton are retained.

Large objects brought into tube are detected by peristomial cilia and shunted to either side; the aliform notopodia are then raised to let the large objects pass, thus avoiding damage to the bag. The mucus bag is continually rolled up by the cupule. When the ball (bolus) reaches a certain size it is cut loose from the notopodia. The cupule then places the bolus on the ciliated mid-dorsal groove which carries it forward to mouth. The food ball averaged 3 mm diameter in an 18 cm (6 to 8 inch) specimen.

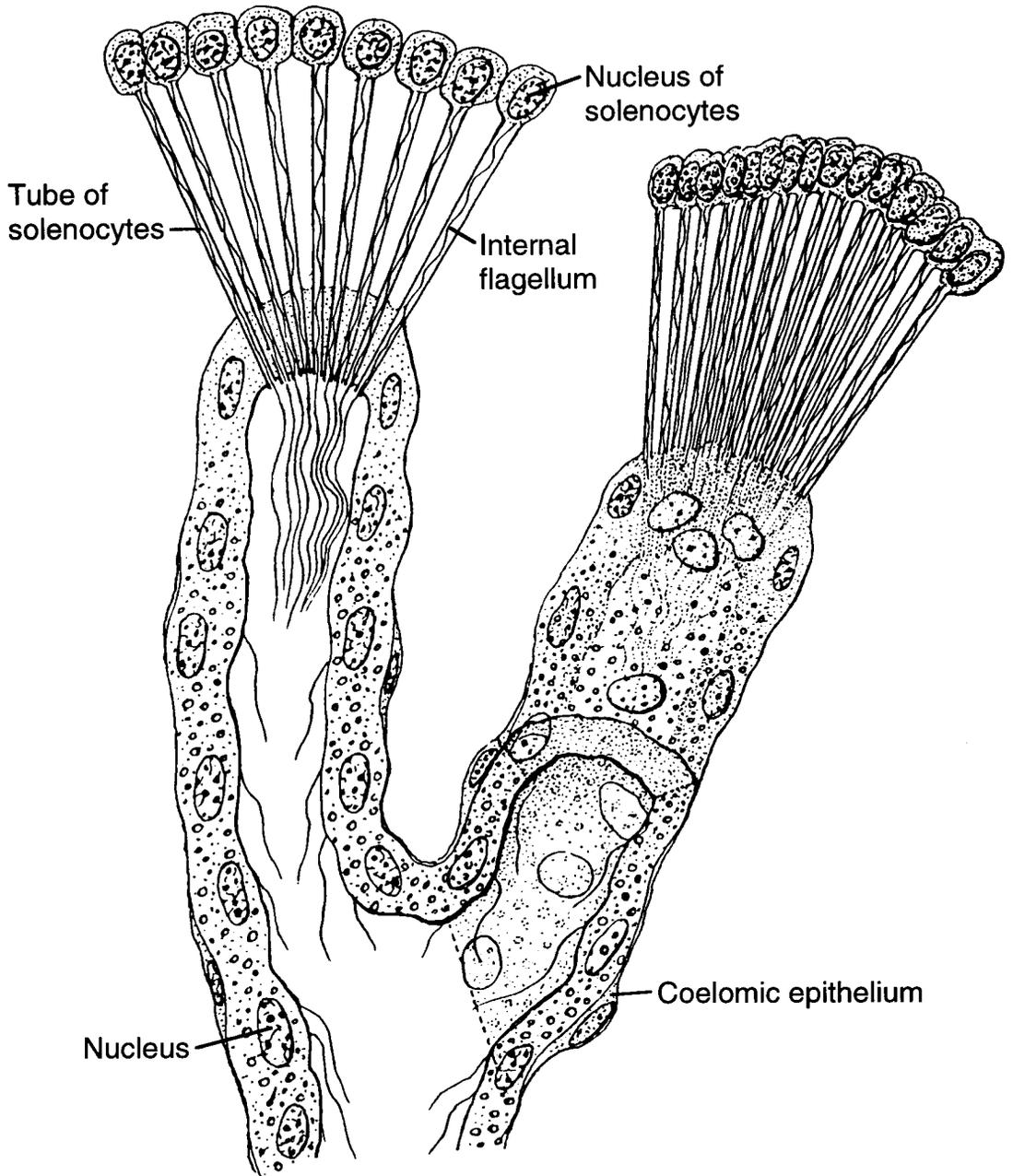
### **Axial proboscis with muscular pharynx**

The axial proboscis with muscular pharynx is a development for predation and scavenging and characterizes the order Phyllodocida of Dales, also recognized by Rouse and Fauchald (1997). Three groupings on

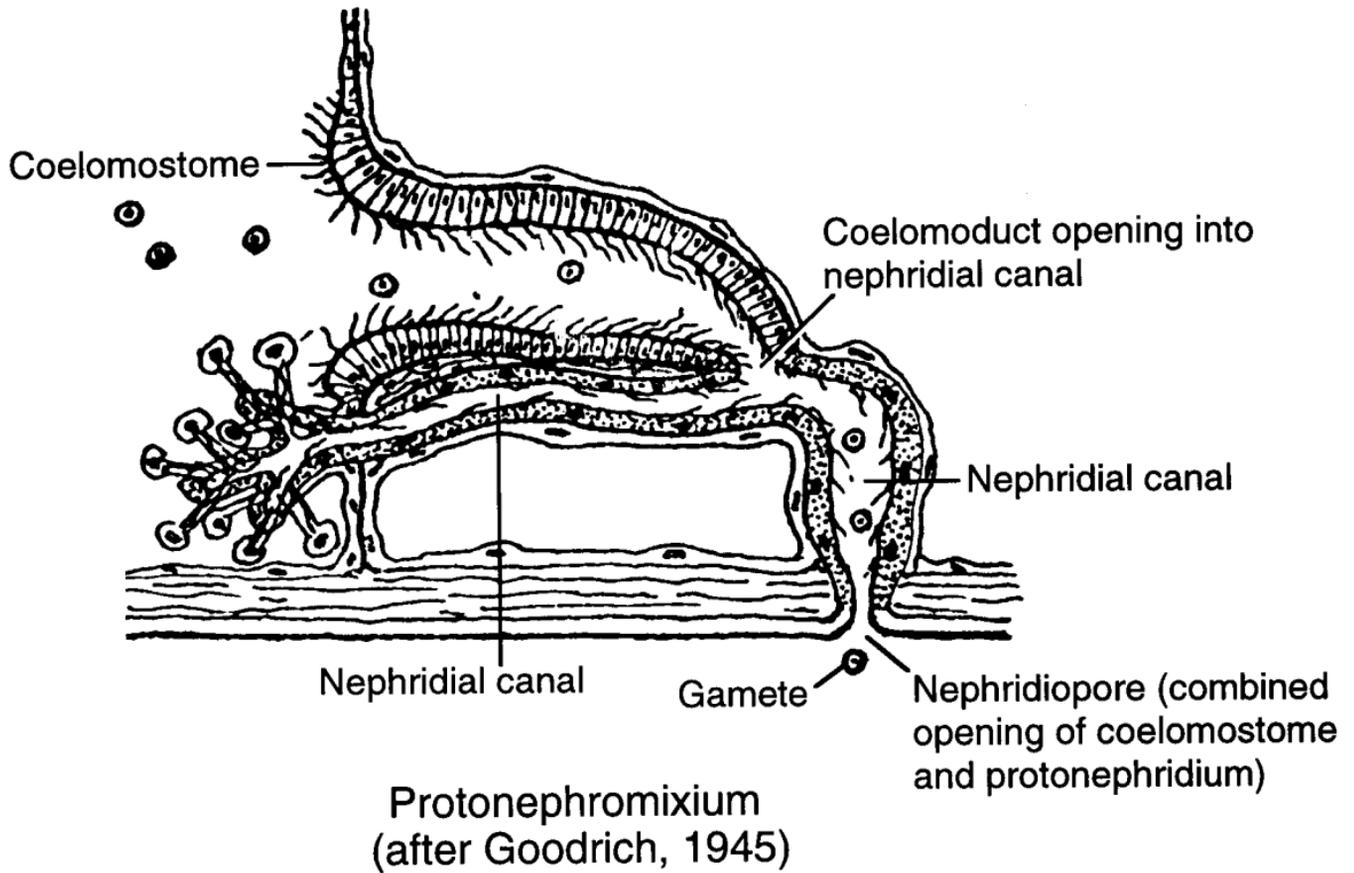
the basis of nephridia are supported on other grounds: those with (1) **protonephridia** or **protonephromixia** (e.g. Phyllodocidae, Alciopidae, Tomopteridae, Glyceridae, Goniadidae and Nephtyidae); (2) **Mixonephridia** (Aphroditidae, Polynoidae and Chrysopetalidae) and (3) **Metanephridia** or **metanephromixia** (Nereididae and Syllidae).

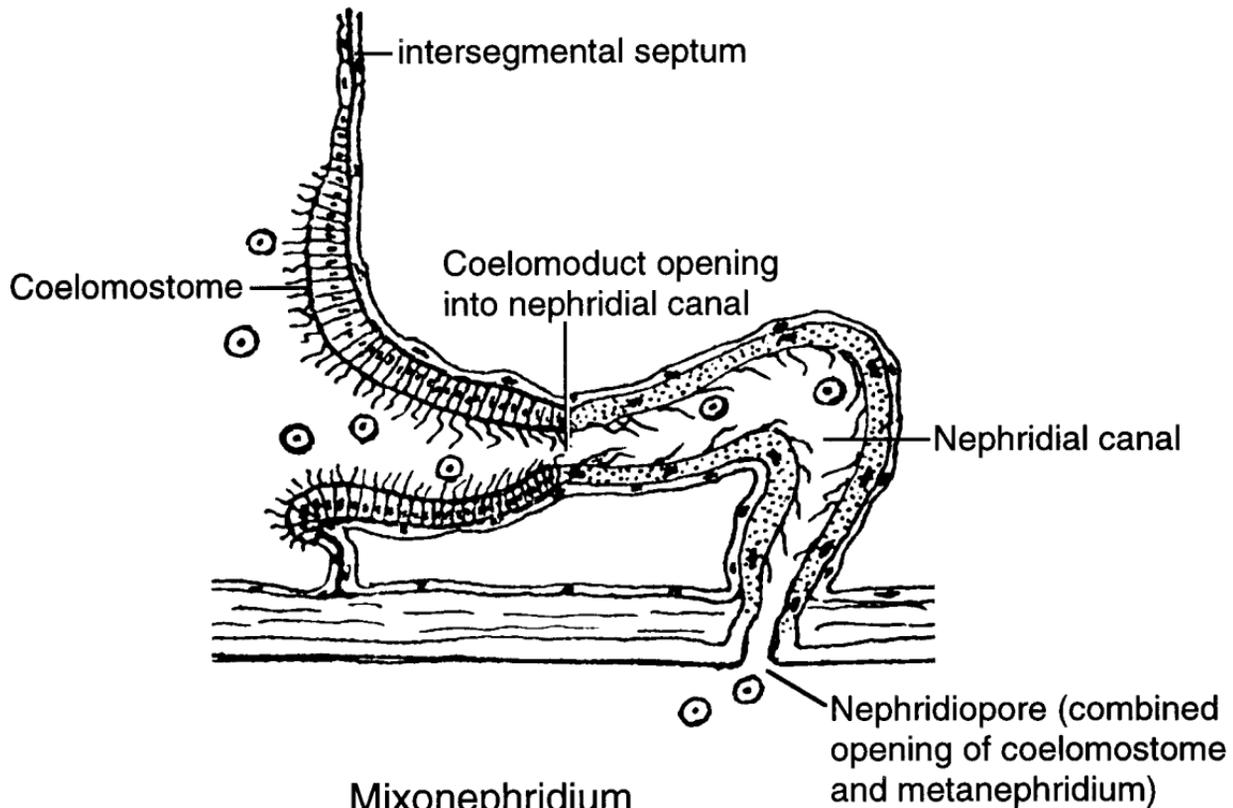
The Phyllodocida is a large group containing, in the classification of [Rouse and Fauchald \(1997\)](#), the Acoetidae, \*Aphroditidae, Eulepethidae, \*Polynoidae, Chrysopetalidae, \*Glyceridae, Goniadidae, Paralacyoniidae, Pisionidae, Lactdoniidae, \*Phyllodocidae, Nephtyidae, \*Nereididae, Hesionidae, Pilargidae, Sphaerodoridae, and \*Syllidae, of which those asterisked are dealt with here.

The division of the stomodaeum into anterior buccal tube and posterior muscular pharynx is well exemplified by a [syllid](#).

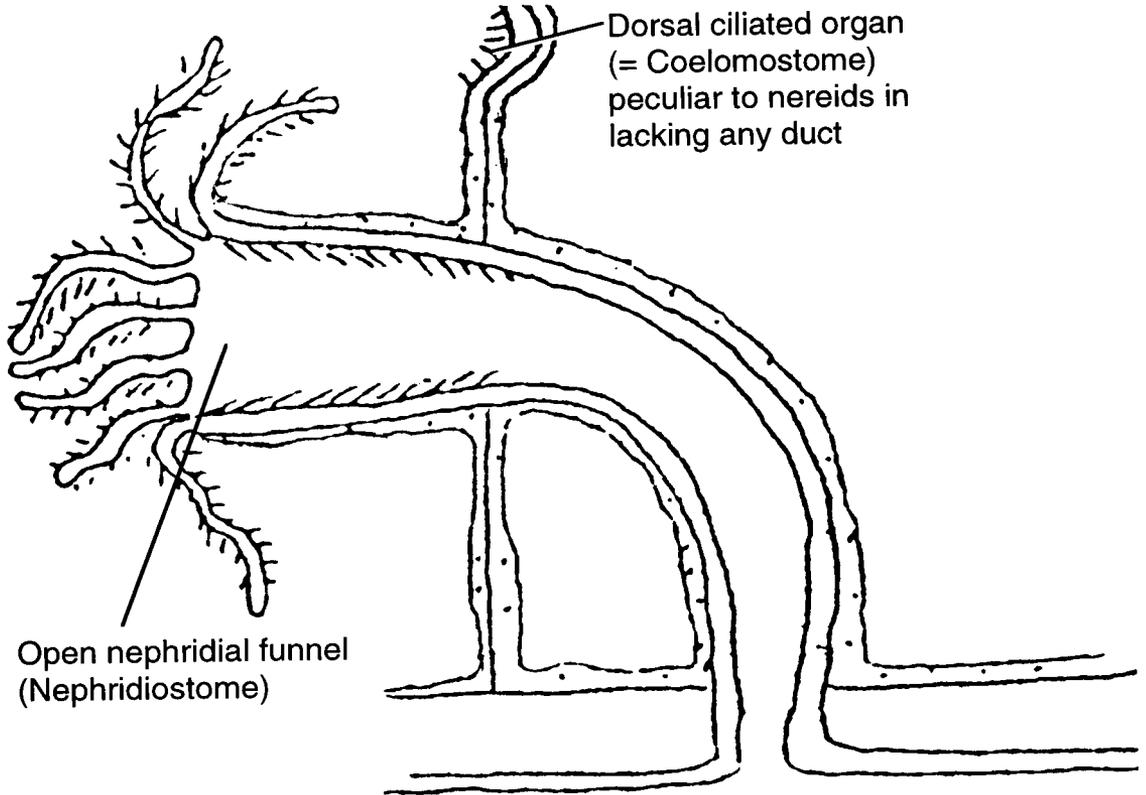


*Phyllodoce* protonephridium  
(after Goodrich, 1945)





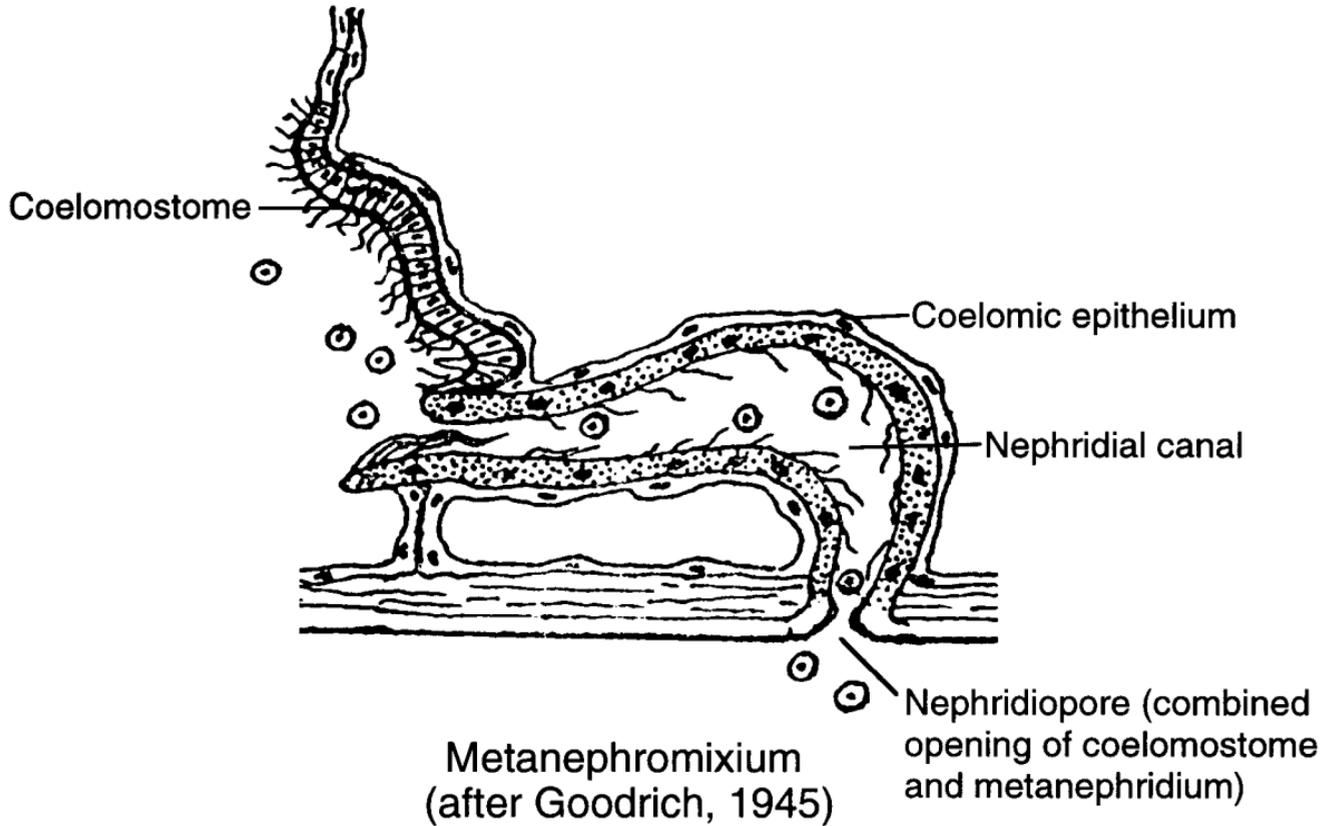
Mixonephridium  
(after Goodrich, 1945)



Dorsal ciliated organ  
(= Coelomostome)  
peculiar to nereids in  
lacking any duct

Open nephridial funnel  
(Nephridiostome)

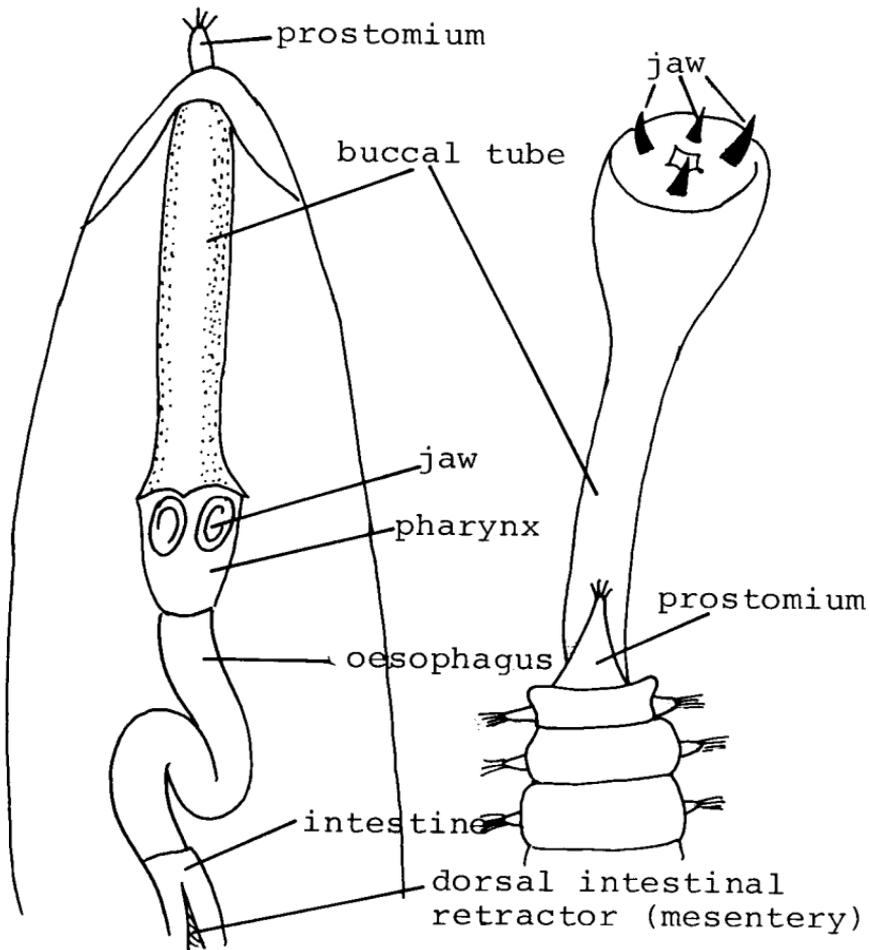
Nereidid metanephridium  
(based on Goodrich, 1945)





The proboscis in (1) phyllodocids, glycerids, nephthyids and (2) aphroditids and polynoids, is similar in having a long cylindrical crushing and, in at least some cases, sucking pharynx made up of concentric lamellae of circular or radial muscle. Strong paired retractor muscles connected to the body wall are not developed; in spite of the extreme length of pharynx, and retraction is effected by longitudinal muscles of oesophagus and buccal tube or by muscles extending on to intestine. Radial muscles to the body wall where present are probably developed from septa.

Intestinal retractors of glycerids are median and have presumably been derived from the dorsal mesentery. [*Phyllodoce* is similar but has no jaws]. In *Glycera* the muscular pharynx lies at the level of segment 23 but can be everted, to expose the four jaws, without the aid of paired protractor or retractor muscles.

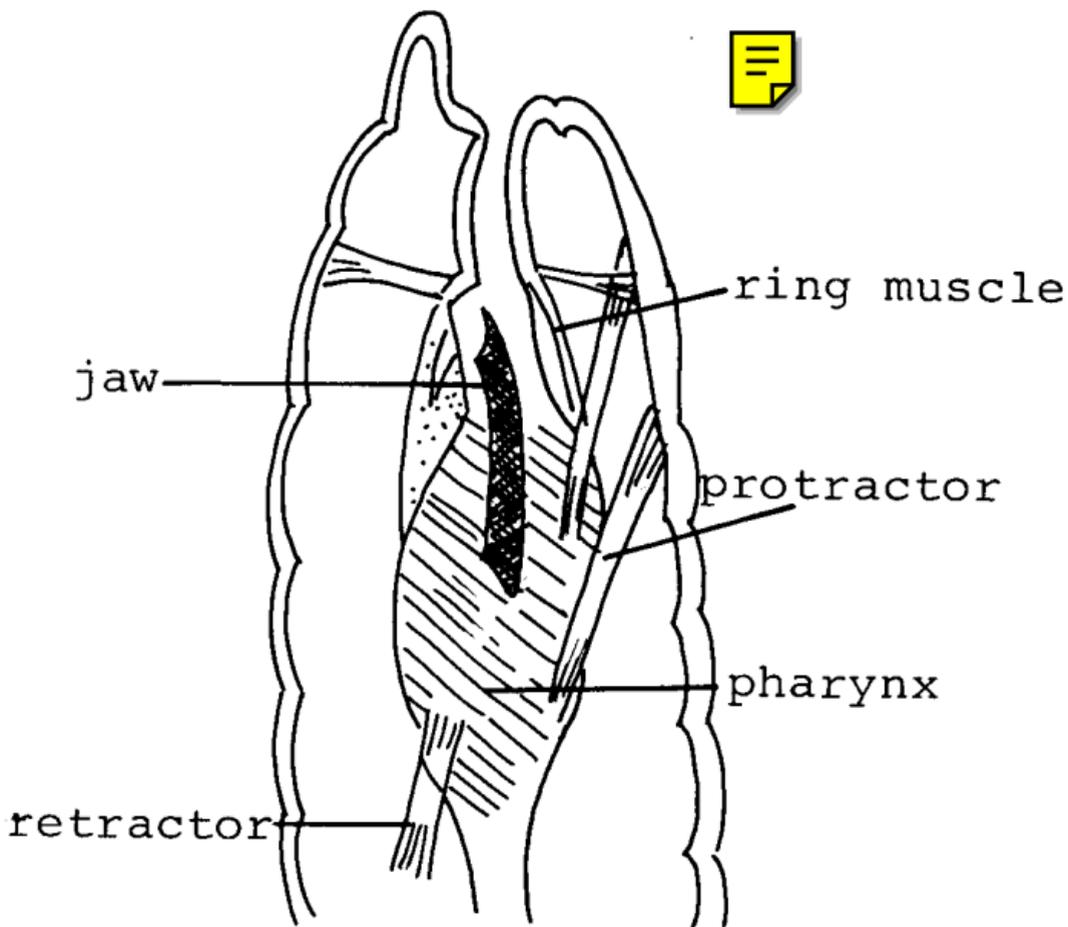


Nereidids and syllids (3) with metanephridia or metanephromixia, on the other hand, have strong protractor and retractor muscles which are paired and are inserted on the pharynx; the more anterior motor muscles arise from the ventrolateral or dorsolateral muscles of the body wall.

## Laboratory notes

### Family Phyllodoceidae

Body long and slender; segments very numerous. Prostomium well developed; 2 eyes; 4 to 5 antennae; 2 to 4 pairs of tentacular cirri. Long muscular axial proboscis; unarmed but with numerous papillae. Parapodia uniramous, with foliaceous dorsal and ventral cirri. Setae composite.



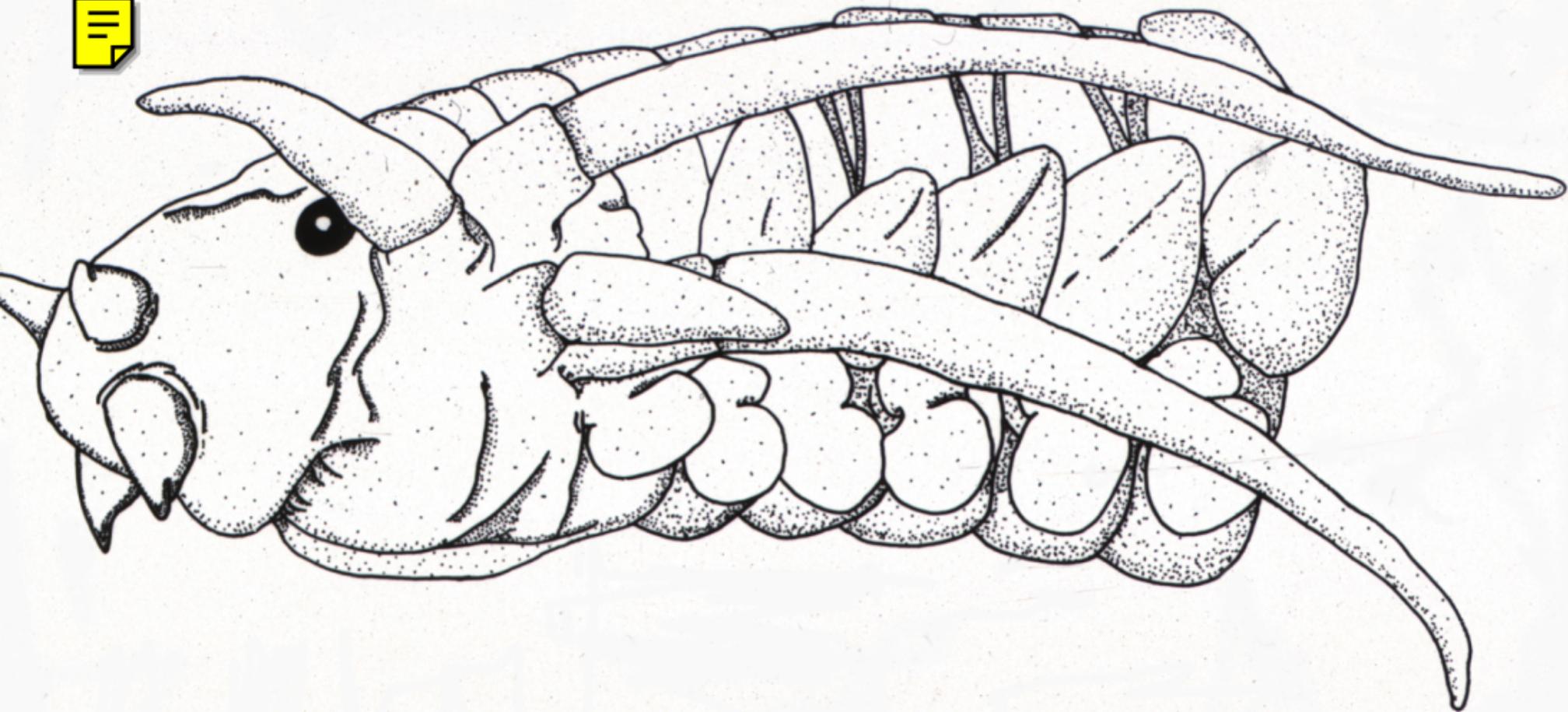
## *Phyllodoce*

Exceedingly common on estuarine mudflats in Queensland. Though a sand crawler which can also burrow, the family as a whole is specialized for a pelagic life. Observe living specimens **feeding** and watch for eversion of the proboscis; this may be facilitated by feeding with a portion of another worm or by placing the animal in a hypotonic medium (fresh water).

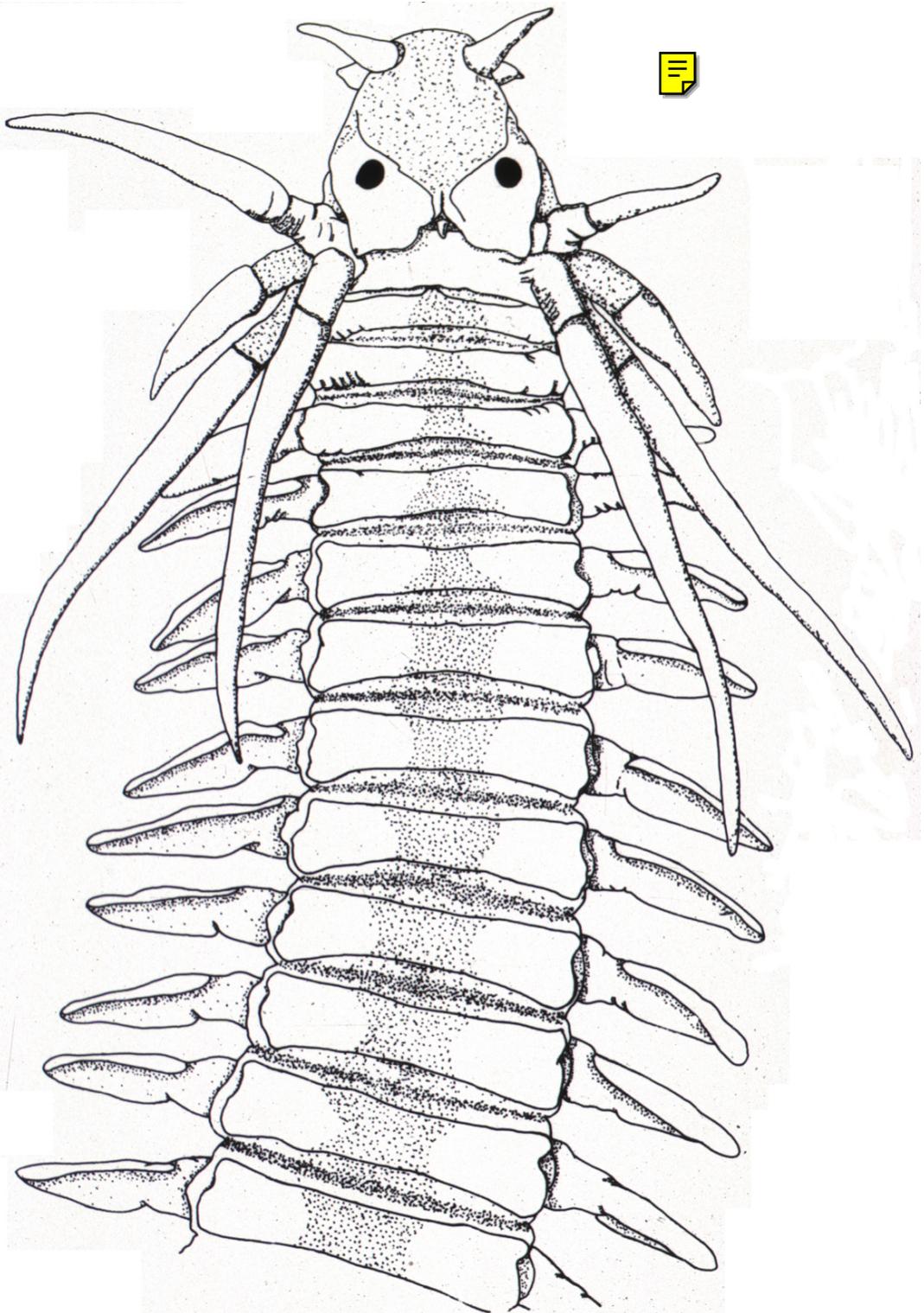
Revise **dorsal**, **lateral** and **ventral** views.

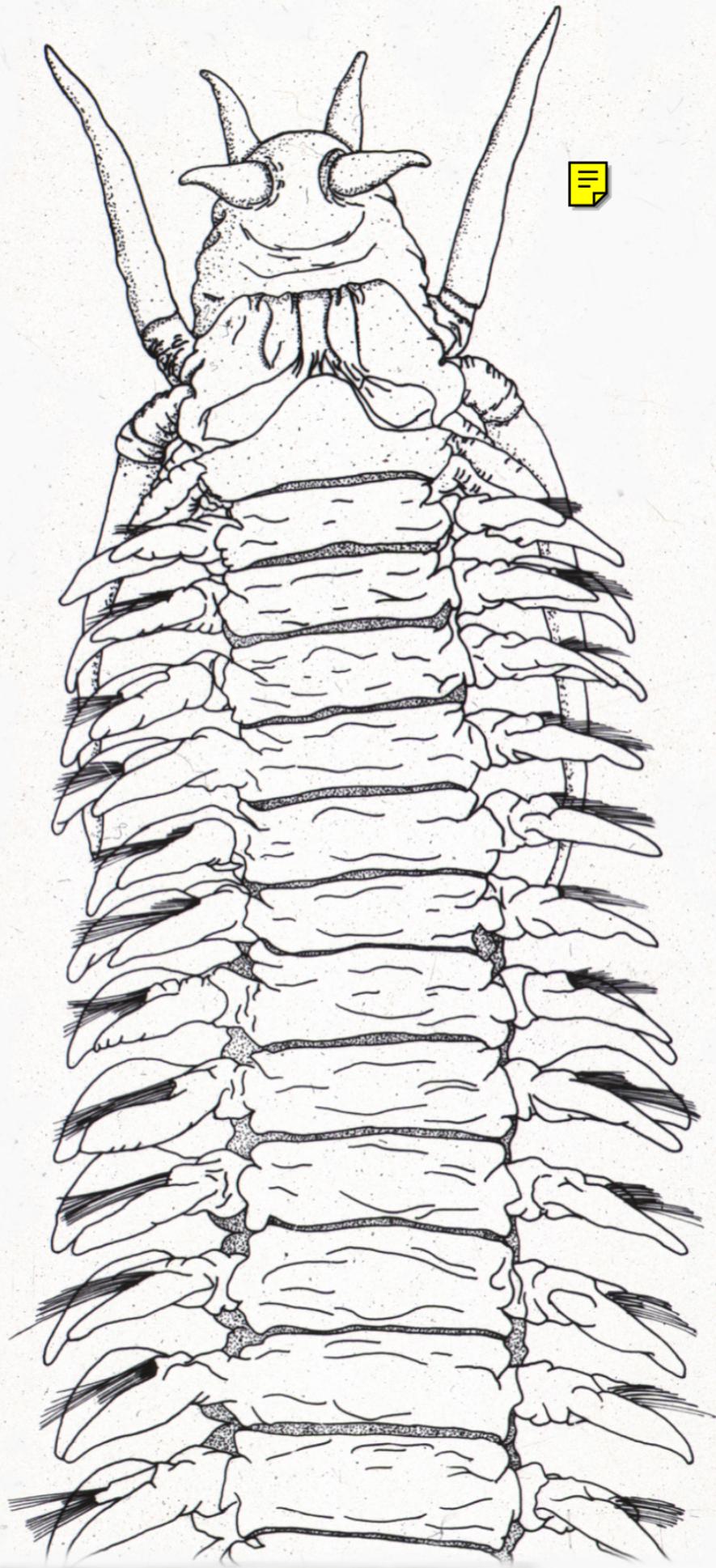
Although the **proboscis** is of the type with a muscular pharynx, the latter is exceptional in being **unarmed** (lacking jaws).

Note the **prostomium** with a pair of dorsal eyes and 4 small simple antennae (the ventral pair might be termed palps); 4 pairs of tentacular cirri on the peristomium. Remaining, general, segments **uniramous**, each with foliaceous













dorsal and ventral cirrus, the dorsal very large, and capillary neurosetae only.

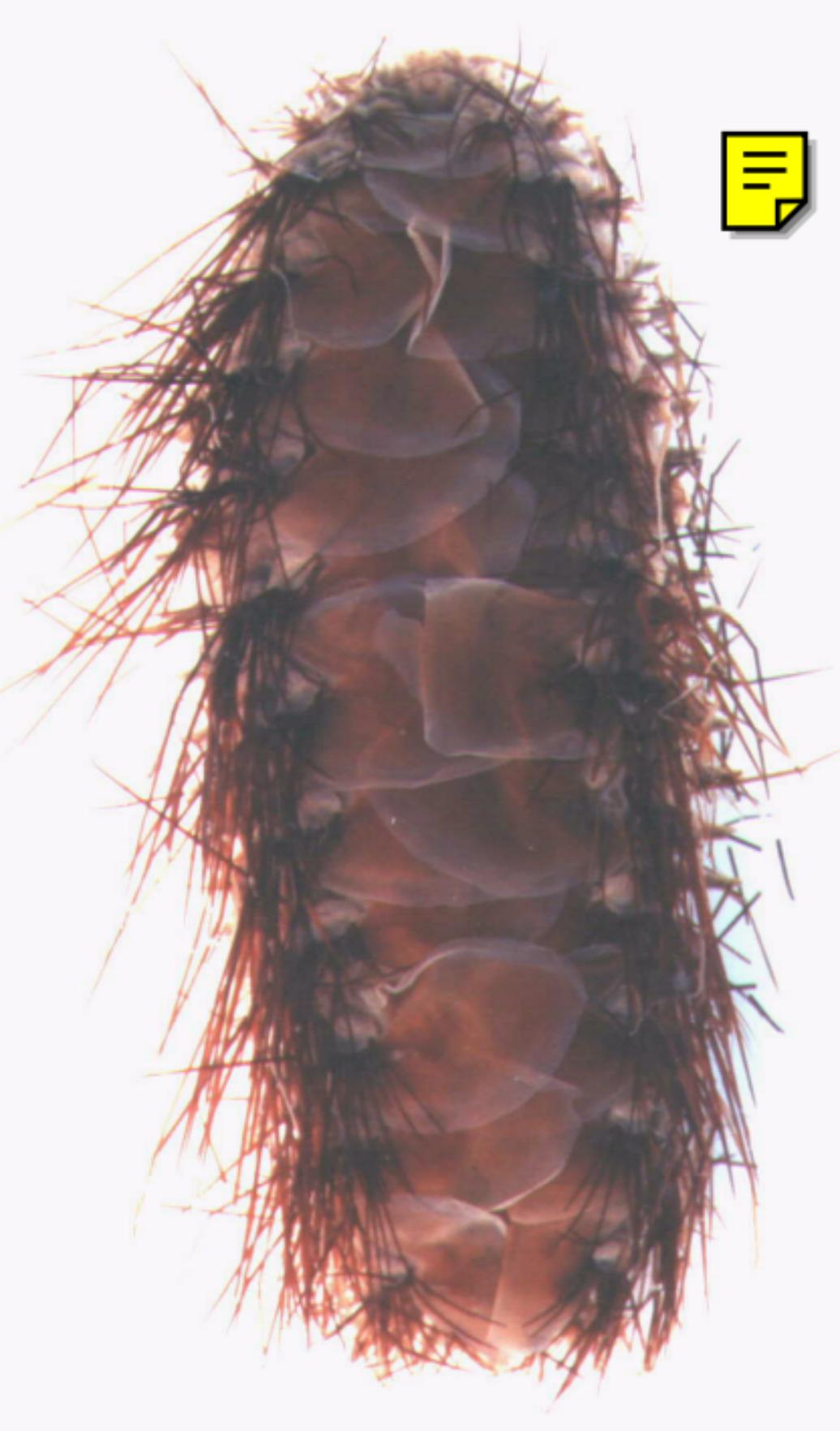
(2) With **mixonephridia**

### Family **Aphroditidae**

‘Errantia’ with flattened or vermiform body. 1 to 3 antennae, 2 elongate palps; 2 pairs of tentacular cirri. Parapodia biramous or sesquiramous. With an alternation of elytra and dorsal cirri which is more or less regular. Dorsal setae simple, ventral setae simple or composite.

#### ***Aphrodite***

The Sea Mouse. This is very similar to *Lepidonotus* but is larger and shows unique specializations for burrowing in mud. The notopodial setae are exceedingly numerous and form a continuous ‘felt’ over the dorsal surface



of the animal, maintaining a mud-free channel in which the elytra lie and along which a respiratory water current is passed. The name *Aphrodite* refers to the iridescence of the lateral setae. This is a Queensland relative.

## Family **Polynoidae**

### *Lepidonotus*

Found under stones on muddy bottoms. Morphology much as for the Aphroditidae; with 3 antennae and 2 palps; peristomium setigerous, but the dorsal and uniramous ventral cirrus of each side are turned forwards to function as sensory tentacular cirri. On the trunk segments the dorsal cirri are alternately filiform and flattened (as an elytron) on each side. The elytra are numerous in this genus. They overlap and cover the dorsal surface. They are protective, generally pigmented and often give a cryptic coloration, are respiratory, and in the female form a brood pouch for the developing eggs.



(3) With **metanephridia**

Family **Nereididae**

Errant polychaetes with vermiform body, 2 antennae, 2 ovoid, 2-jointed palps. 4 eyes. 4 pairs of tentacular cirri. Axial proboscis with muscular pharynx armed with two horny jaws and conical paragnaths. Parapodia almost always biramous. A cirrus and two or three lobes on each ramus. Setae composite. Possessing an epitokous *Heteronereis* stage.

### ***Australonereis***

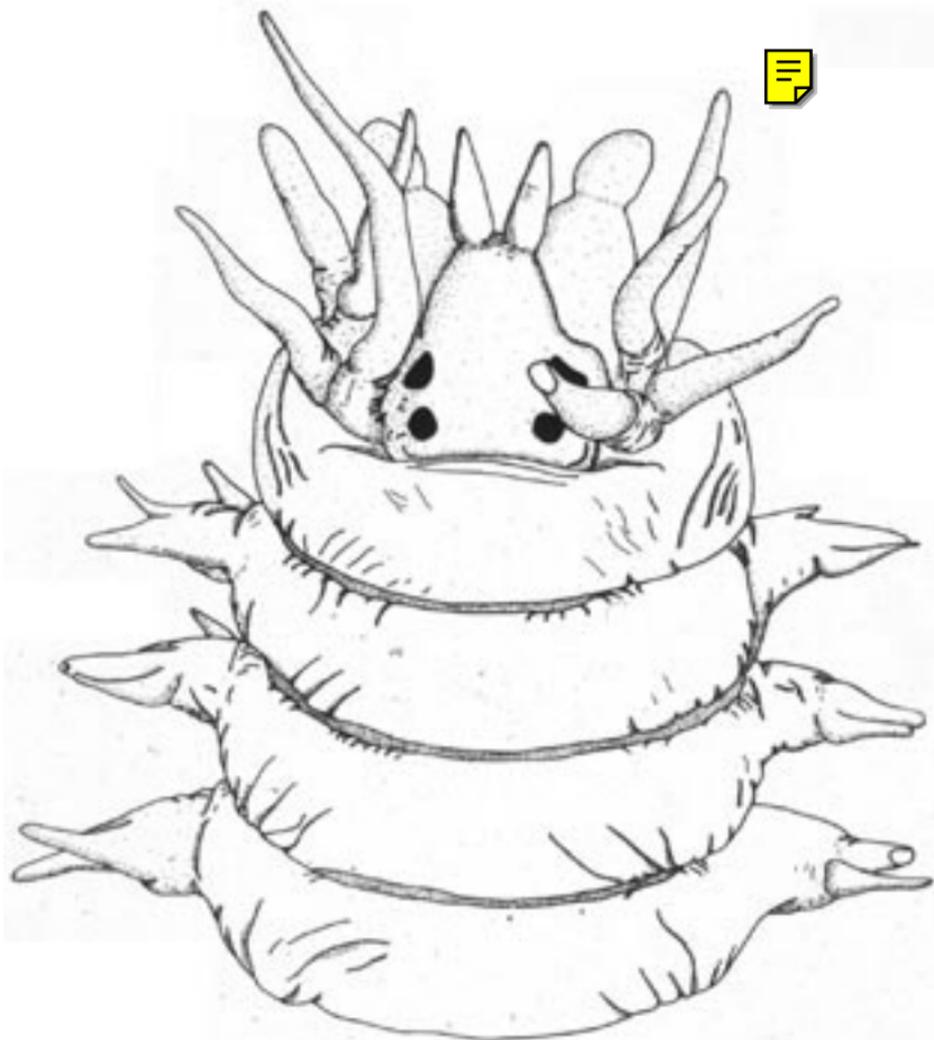
A very common polychaete of the Queensland littoral zone. In this or other nereidid note typically errant form. Capable of swimming and crawling but also burrowing in sand in which it constructs a definite sandy tube which can often be seen protruding above the substrate. Examine nereidid material

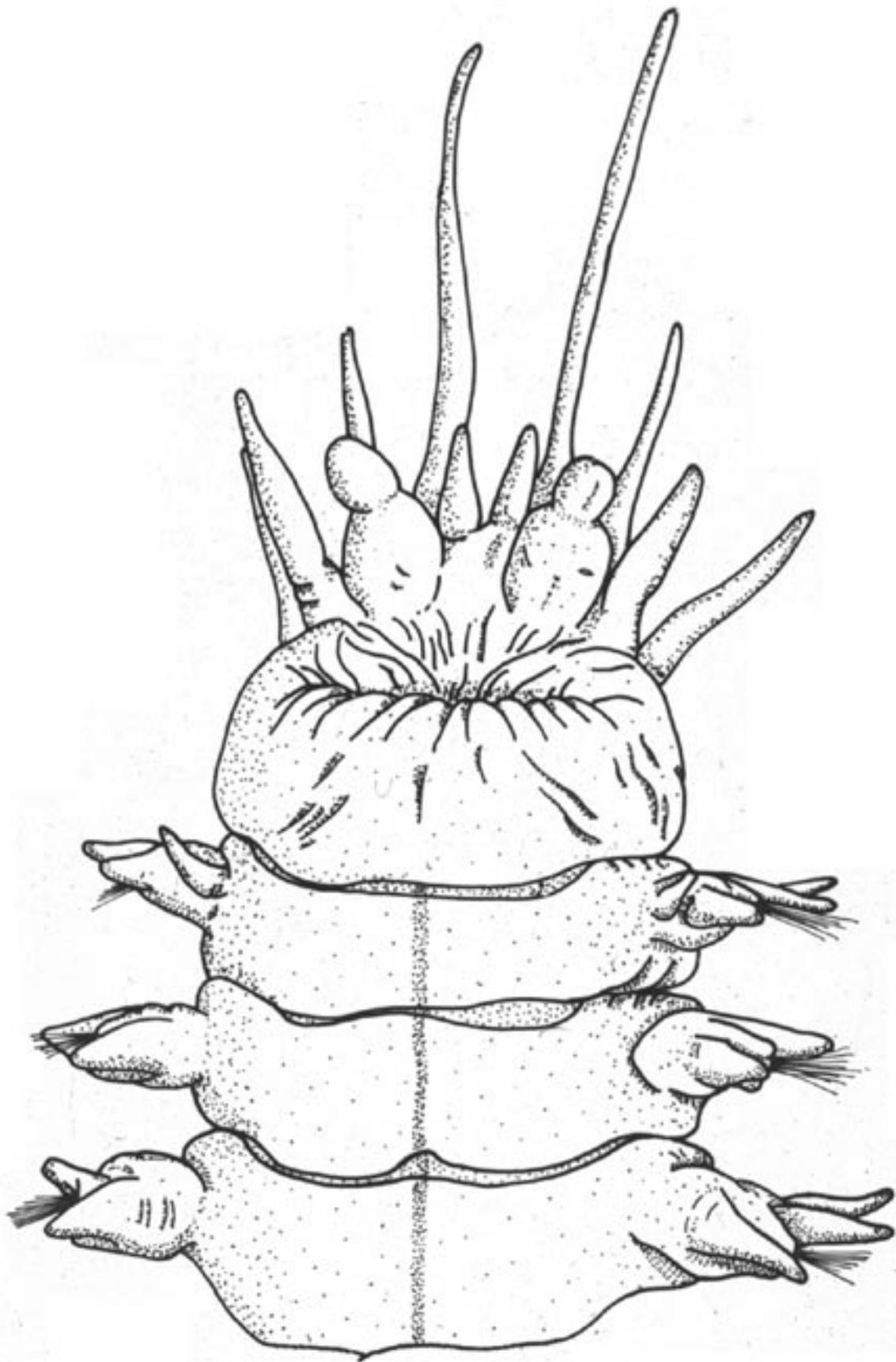


provided. Note **dorsal** and **ventral** views of the anterior region, with and without eversion of the **pharynx**. Note the formidable jaws on the inner wall of the far posterior pharynx **before eversion**.

Anterior triangular prostomium with 2 pairs of eyes, 2 dorsal antennae. On the peristomium, lateral sensory tentacular cirri. Examine specimens with and without extrusion of the large muscular axial proboscis. Proboscis with jaws and paragnaths; all trunk segments similar and bearing each a pair of two-lobed, well developed parapodia. The **jaws** are exposed when the pharynx is everted.

Examine a **nereidid parapodium** as revision of, albeit variable, parapodial structure: the dorsal (notopodial) and ventral (neuropodial) bundles of setae each emerging from a setal sac supported by a strong central rod, the acicula (plural aciculae), the flattened form of the parapodia which are of importance in respiration, and the small dorsal and ventral sensory and respiratory cirri.











## Family **Syllidae**

Mostly small. Prostomium distinct. 4 eyes. 2 palps. 3 antennae. 2 pairs of cirri on the peristomium which always lacks setae. Barrel shaped axial pharynx preceded by chitinized chamber bearing 1 or more teeth. Parapodia uniramous, often with a dorsal and ventral cirrus. Setae usually compound. 2 anal cirri. Have metanephridia and **metanephromixia**.

### *Eusyllis*

From local rocky shores. Note prostomium with 4 eyes and 3 antennae which, though not articulated, are somewhat annulated as common in syllids. Anterior border of pharynx chitinous and with a single large dorsal tooth. Some syllids are brilliantly bioluminescent.

Note the large muscular pharynx and buccal tube of two syllids: [1](#) & [2](#).

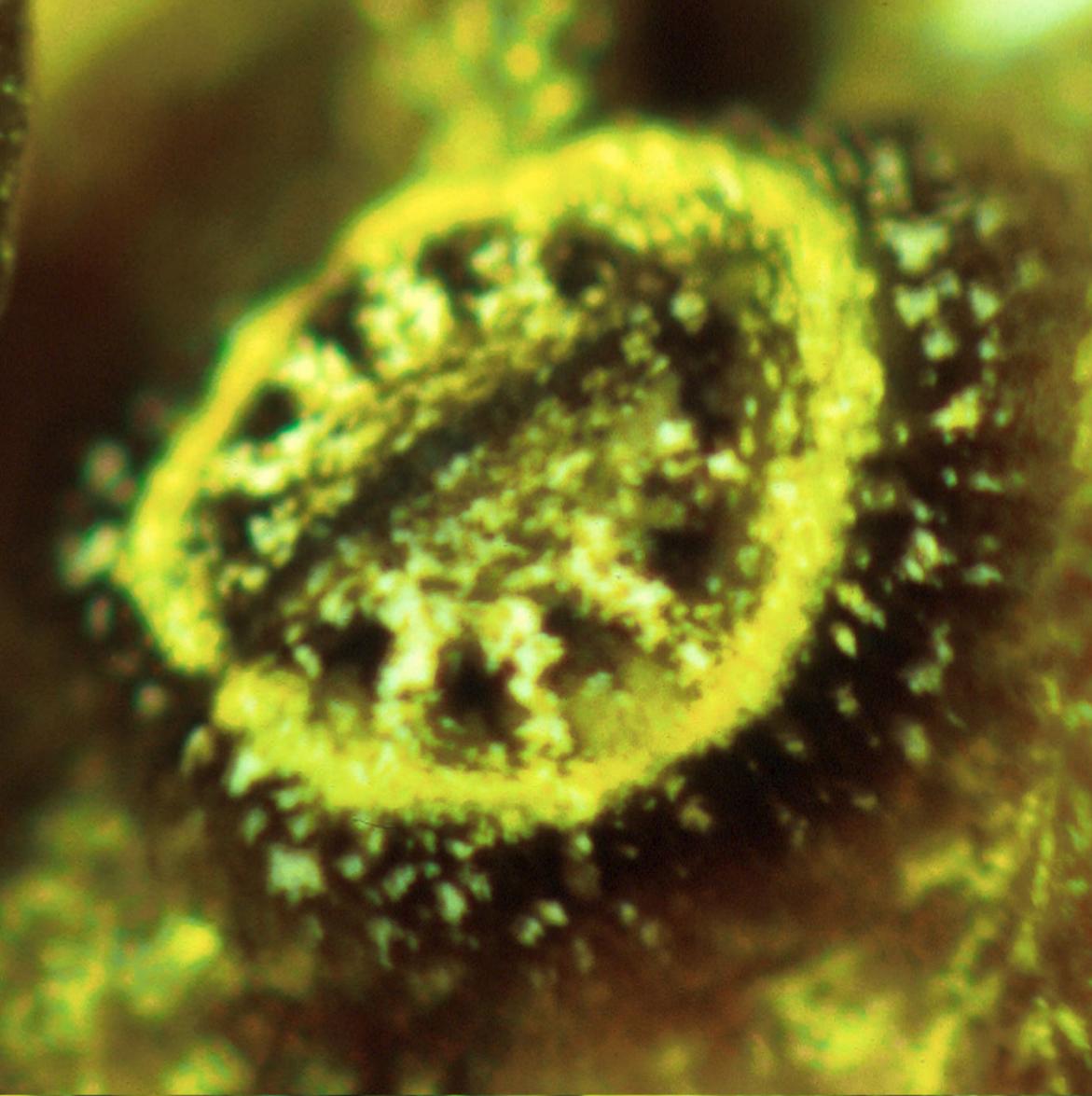




## **Myzostomida**

Myzostomes are obligate commensals or parasites of echinoderms, usually crinoids. They have been regarded as platyhelminths or even as tardigrades. Because they have an eversible pharynx like that of phyllodocids and have acicula, Rouse and Fauchald (1997) have placed the myzostomes in the Polychaeta, and specifically in the Phyllodocida.

Myzostomes mimic the colour patterns of the host crinoid, clearly as a result of selection for individuals less visible to predators. Here a [greenish species](#) and a [reddish species](#) mimic the colour patterns of their respective host crinoids on Heron Island, Great Barrier Reef.





## ACKNOWLEDGEMENTS

All line drawings are by Bruce Barnes, excepting labelled sketches of pharyngeal types by the author.

Colour photographs are by the author or were donated to the author by Dr. Isobel Bennett, Mr. Justice Myers, Owen Kelly and Tom Gorringe. They may not be reproduced without the permission of the author.

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