

A key to the species of *Anelassorhynchus* (Echiura) with a description of a new species from the east coast of southern Africa

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A new echiurid species of the genus *Anelassorhynchus* Annandale 1922, collected from Isipingo Beach along the Natal coast (Republic of South Africa) is described. Although the genus is widely distributed and numerous species have been recorded from the Indian and Pacific Oceans, only two species, *A. indivisus* (Sluiter 1900) and *A. moebii* (Greeff 1879), are currently known from the southern African region. The new species, *A. gangae* sp. nov., appears to be related to *A. porcellus* Fisher 1948 and to *A. adalaidensis* Edmonds 1960. It differs from these two species mainly in the nature of the integument and in the arrangement of the dermal papillae. A key for the identification of all the species in the genus is provided.

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'n Nuwe spesie van die Echiura-genus, *Anelassorhynchus* Annandale 1922, wat by Isipingostrand langs die Natalse kus versamel is, word beskryf. Hoewel die genus wydverspreid voorkom en baie Indiese- sowel as Stille Oseaan-spesies opgeteken is, is tans net twee spesies, *A. indivisus* (Sluiter 1900) en *A. moebii* (Greeff 1879), in die Suider-Afrikaanse gebied bekend. Dit lyk of die nuwe spesie, *A. gangae*, verwant is aan *A. porcellus* Fisher 1948 en *A. adalaidensis* Edmonds 1960. Dit verskil van hierdie twee spesies hoofsaaklik t.o.v. die aard van die huid en die rangskikking van die huidpapille. 'n Sleutel vir die identifisering van al die spesies in die genus word voorsien.

S.-Afr. Tydskr. Dierk. 1984, 19: 16–21

The echiurid fauna of southern Africa is at present confined to four genera: *Thalassema*, *Ochetostoma*, *Echiurus* and *Anelassorhynchus*. Three species of *Thalassema*, six of *Ochetostoma* and only one of *Echiurus* have been recorded from southern African waters while the genus *Anelassorhynchus* is represented by two species, *A. indivisus* and *A. moebii*. *A. indivisus*, originally described as *T. indivisum* by Sluiter (1900), from off the coast of Spain was also recorded by Stephen & Cutler (1969) from off the Natal coast in waters 47 to 57 m deep. *A. moebii* (Greeff 1879), originally known from Mauritius, has been recorded from three other localities in the Indian Ocean. The latter species was also collected by von Weber in the vicinity of Durban (Sluiter 1898).

Sixteen species have so far been assigned to the genus *Anelassorhynchus*, but the specimens on hand are not referable to any of the known species. In the present paper, *A. gangae* is described and compared with other related species in the genus.

Anelassorhynchus Annandale 1922

Generic diagnosis

Longitudinal and inner oblique layers of muscle not grouped into bands or fascicles. Posterior setae absent. Gonostomal lips elongate and spirally coiled.

Type species: *Anelassorhynchus gangae* sp. nov.

Remarks

Prior to 1922, the genus *Thalassema* comprised echiurans where the longitudinal and inner oblique layers of muscle were continuous and not grouped into bands or fascicles. The genus *Anelassorhynchus* was erected by Annandale (1922) to contain two estuarine species which possessed gill-like outgrowths on the proboscis (Stephen & Edmonds 1972). Fisher (1946) considered these gill-like processes to be adaptations to an unusual environment and therefore an unsatisfactory character on which to base the genus. He proposed that the condition of the gonostomal lips should be the main distinguishing character. This is a reliable taxonomic character in differentiating these two closely related genera.

Distribution of *Anelassorhynchus*

The genus is widely distributed and numerous species have been recorded from several localities in the Indian and Pacific Oceans. The majority of the species are confined to shallow waters of the intertidal zone but a few have been reported from the abyssal regions of the ocean. In their monograph, Stephen & Edmonds (1972) give the range of distribution of each species.

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Key to the species of the genus *Anelassorhynchus*

The key for the species *Anelassorhynchus*, provided by Stephen & Edmonds (1972) and Datta Gupta (1974) has been modified in order to accommodate *A. gangae*. No attempt has been made to synonymize any of the species. In this key other, less rigorous characters have also been included to assist in the identification of single individuals.

1 Gonoducts one pair	2
– Gonoducts more than one pair	3
2 Trunk up to 230 mm in length, body wall slightly translucent. Interbasal muscle present	<i>A. abyssalis</i> Fisher, 1949
– Trunk up to 14 mm in length, body wall thin and transparent. Interbasal muscle absent	<i>A. indivisus</i> (Sluiter, 1900)
3 Gonoducts two pairs	4
– Gonoducts three pairs or more	12
4 Numerous minute spinelets in place of each seta	<i>A. chaetiferus</i> Datta Gupta, Menon & Johnson, 1963
– Two ventral setae	5
5 Proboscis reduced to a small collar about one-nineteenth the body length	<i>A. microrhynchus</i> (Prashad, 1919)
– Proboscis well developed, at least one-fifth body length	6
6 Margin of proboscis with outgrowths	7
– Margin of proboscis without outgrowths	8
7 Proximal margin of proboscis with dendritic outgrowths and distal margin serrated	<i>A. dendrorhynchus</i> (Annandale & Kemp, 1915)
– Proximal margin of proboscis with two rows of gill-like outgrowths, distal margin of proboscis smooth	<i>A. branchiorhynchus</i> (Annandale & Kemp, 1915)
8 Proboscis from one-quarter to one-fifth the length of the trunk. Anal vesicles short	<i>A. sabinus</i> (Lanchester, 1905)
– Proboscis half or more than half the trunk length. Anal vesicles long	9
9 Trunk papillae arranged in groups. Anal vesicles with few scattered funnels. Proboscis non-deciduous	<i>A. gangae</i> sp. nov.
– Trunk papillae not arranged in groups. Anal vesicles with numerous funnels. Proboscis deciduous	10
10 Integument thin and transparent	<i>A. semoni</i> (Fischer, 1896)
– Integument thick and opaque	11
11 Trunk rich dark green	<i>A. adelaidensis</i> Edmonds, 1960
– Trunk sandy grey	<i>A. porcellus</i> Fisher, 1948
12 Proboscis anteriorly bilobed	13
– Proboscis not bilobed	14
13 Gonoducts located posterior to the ventral setae without any tendency to cluster	<i>A. lobarhynchus</i> Datta Gupta & Menon, 1965
– Gonoducts located anterior as well as posterior to ventral setae with a tendency to cluster	<i>A. fisheri</i> Datta Gupta, 1974
14 Three pairs of gonoducts, first pair anterior to the ventral setae	15
– Three pairs of gonoducts located posterior to the ventral setae	16
15 Anterior extremity of anal vesicles attached to body wall by slender muscle. Body uniformly covered with small, closely arranged papillae	<i>A. inanensis</i> (Ikeda, 1904)
– Anterior extremity of anal vesicles not attached to body wall. Papillae irregularly scattered over body and often arranged in clumps	<i>A. moebii</i> (Greeff, 1879)
16 Anal vesicles with ciliated funnels set on small stalks. Trunk covered with dark green papillae closely crowded at the extremities. No ring vessel	<i>A. mucosus</i> (Ikeda, 1904)
– Anal vesicles without ciliated funnels. Papillae scattered over whole surface of trunk but posteriorly larger and more numerous and arranged in regular rows. Ring vessel unknown	<i>A. vegrandis</i> (Lampert, 1883).

***Anelassorhynchus gangae* sp. nov.**

Present record. Isipingo Beach (29°05'S/30°56'E), Natal coast, approximately 15 km south of Durban (Type locality).

Holotype. Sexually mature female, in the Natal Museum, Pietermaritzburg, Republic of South Africa No 2670, collected by Mr K.S. Ganga, 26 March 1982.

Paratype. One sexually mature male, in the Natal Museum, collected by the author, 27 April 1983. Museum number same as for holotype.

Habitat. Both specimens were found in a rocky tunnel in the intertidal zone, close to the high water mark. Numerous specimens of *O. caudex* were also found in the same habitat. The holotype occurred between two slabs of sandstone in the wall of the tunnel while the paratype was discovered under a slab of rock in relatively muddy sand.

Description**Size**

Measurements were taken after the specimens were narcotized with magnesium sulphate and preserved in formalin. In the holotype, the proboscis which is 53 mm long slightly exceeds half the length of the trunk. The trunk length is 90 mm and its greatest diameter is 23 mm. In the paratype the trunk is 100 mm in length and its greatest diameter is 21 mm. The pro-

boscis, which was detached during narcotization, measures less than half the length of the trunk. The size of these animals, however, varies depending on their state of contraction at fixation.

Colour in life

The trunk is uniformly grey in both specimens but the colour of the proboscis differs slightly. In the holotype the proboscis is white in colour but in the paratype it is pale yellow. The proboscis of both specimens is edged with light brown. A dark red line, probably the ventral blood vessel, is visible along the mid-ventral surface of the trunk. In formalin preserved specimens, the colour of the trunk changes to brown.

External features

Proboscis. The proboscis (Figure 1), which is fleshy and non-deciduous, is of uniform width throughout its length with a shallow ventral depression or groove leading to the mouth. In preserved specimens, the lateral edges tend to curl inwards to form a tubular structure. The lateral margins fuse at the base to form a narrow lower lip. The two lateral nerves of the proboscis are visible from the ventral surface.

Trunk. The trunk is cylindrical or sausage-shaped and more or less of uniform diameter throughout its length (Figure 1). The papillae are minute and barely visible to the unaided eye.

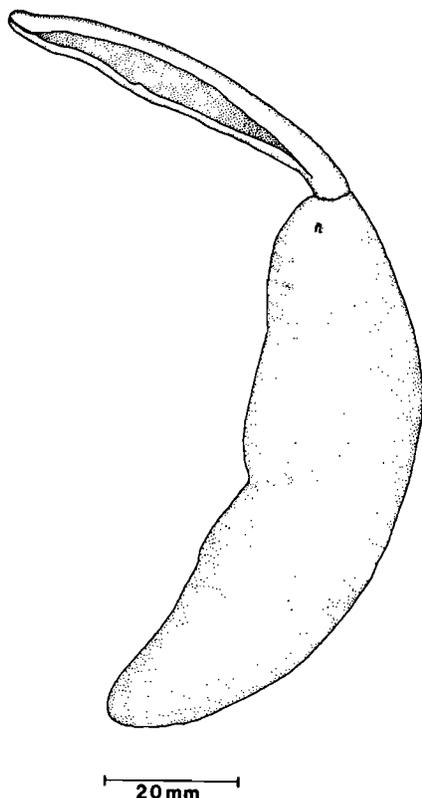


Figure 1 Ventral aspect of *A. gangae*.

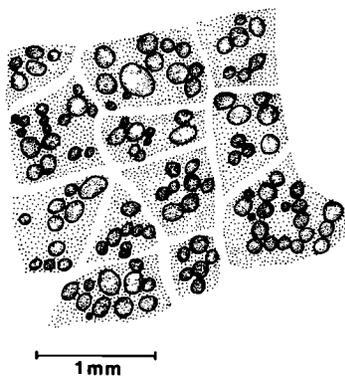


Figure 2 A part of the integument from the midventral surface of the trunk showing the arrangement of the papillae.

Under the dissecting microscope, however, these papillae are densely arranged over the entire surface of the integument. A noticeable feature is that the rounded papillae are arranged in groups of various shapes and sizes, separated by narrow interspaces (Figure 2). The size of the papillae, however, varies within a group. Under certain states of contraction, the narrow, irregularly arranged interspaces separating groups of papillae are visible to the unaided eye. A white mucous cap encased the posterior extremity of the trunk after preservation in formalin.

Setae (Figures 3a & b). The two yellowish-brown ventral setae are situated about 5 mm posterior to the junction of the proboscis and trunk. Two pairs of genital pores are located behind the setae. The setae are cylindrical hook-like structures about 3 mm in length. When dissected out, each seta consists of a long straight shaft with a curved terminal end. The much narrower distal third of the shaft is yellowish-brown in colour while the proximal two-thirds is dark brown. More or less equidistant concentric rings are present over the entire surface of the

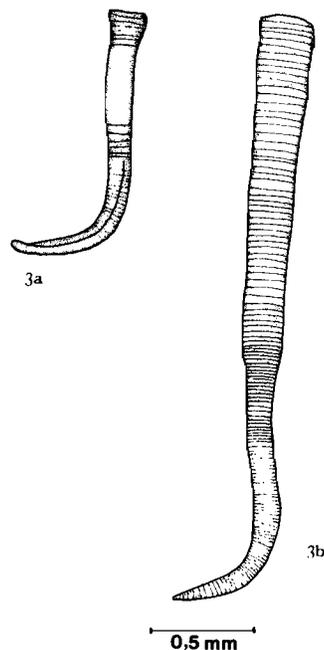


Figure 3 (a) The right non-functional (replacement) seta. (b) The right functional seta.

shaft. As in other related species, the setae are invested in connective tissue and located in cone-shaped setal sacs, supported by a number of radiating muscle strands. There is no inter-basal muscle.

In the holotype, a second, much smaller, replacement seta is present in close association with the right functional one. The curved distal end of the non-functional seta is slightly flattened and the concentric markings are not very pronounced. In the paratype, however, the non-functional seta is on the left.

Internal anatomy

Alimentary canal. The alimentary canal is extremely long and is attached to the body wall at several points along its length by numerous thin mesenteric strands.

The mouth is situated at the extreme anterior end of the trunk at the base of the proboscis, which surrounds the aperture to form a funnel. The mouth leads into a spacious muscular pharynx which is attached anteriorly by a number of radiating strands of mesentery (Figure 4).

The oesophagus is of uniform diameter and opens into a somewhat dilated, oval crop (Figure 4) which appears white in colour. A thin sheet of transparent ventral mesentery attaches the oesophagus to the body wall. Externally, the crop can be clearly distinguished from the adjoining oesophagus and intestine by its shiny appearance. The characteristic ring vessel is located at the posterior end of the crop.

A noticeable feature is the presence of extremely long and thin mesenteric strands which extend anteriorly to fasten the crop and adjoining intestine to the body wall (Figure 4).

After the ring vessel, the intestine forms a loop and then pursues a complicated course through the body cavity, forming several ascending and descending limbs. The intestine can be divided into the presiphonal, siphonal and postsiphonal regions. The presiphonal region of the intestine is long and is marked by the presence of a ciliated groove. This groove commences soon after the first loop of the intestine and then merges with the intestinal siphon. In the region of the intestinal siphon, the intestine is of much bigger diameter with extremely thin walls. The postsiphonal intestine is a long and narrow tube

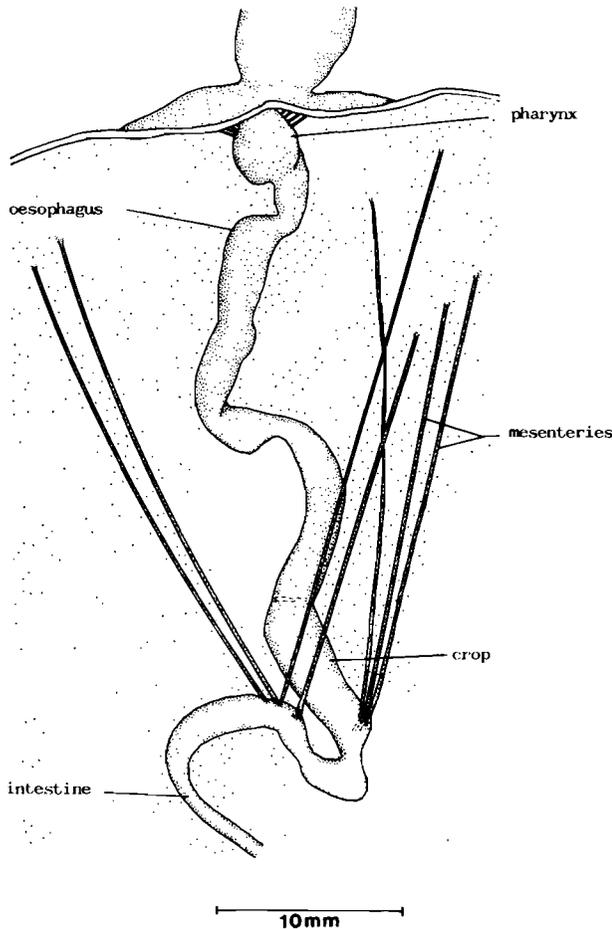


Figure 4 Anterior end of the alimentary canal illustrating the elongate mesenteric strands.

which is compactly filled with fine sand grains, small shell fragments and other miscellaneous hard debris. The intestinal contents are not in the form of pellets. Posteriorly, the intestine leads into the rectum, which is a straight tube of much bigger diameter. A rectal caecum is absent in this species.

Anal vesicles (Figure 5). The paired, blind-ending anal vesicles open posteriorly into the rectum. They are highly distensible tubes with extremely thin walls. Proximally, these vesicles are fastened to the body wall by numerous fine strands of mesentery but distally they are free and loosely interweave through the coils of the alimentary canal. In the holotype, the vesicles are almost as long as the trunk. They are somewhat distended in the anterior two-thirds, thereafter they narrow considerably but dilate once again before opening into the rectum. In the paratype, however, they are much longer, about one and a half times the trunk length. They are narrow distally but also become dilated before opening into the rectum. Minute, unstalked ciliated funnels are very sparsely distributed over the surface of the vesicles.

Gonoducts (Figure 6). Two pairs of elongate, tubular gonoducts are located in the anterior part of the body cavity on either side of the ventral nerve cord; the posterior pair being much the larger. Both the pairs are located posterior to the ventral setae. The gonoducts of both specimens are considerably distended due to the presence of gametes. In the holotype, the terminal ends of the gonoducts are pointed and strongly curved but in the paratype they are rounded and smooth. The second pair of gonoducts in the paratype has a few constricted and dilated portions. These different shapes

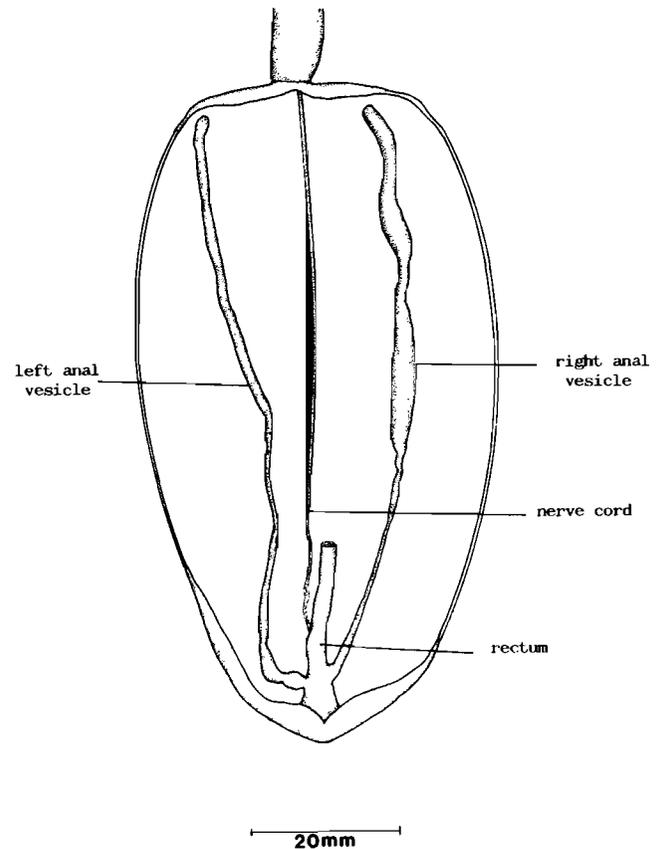


Figure 5 Dorsal dissection of the trunk showing the anal vesicles.

of the gonoducts are probably due to the different degrees of inflation caused by the storing of sexual cells within them. The paired gonostomal lips are elongate and spirally coiled. These longitudinally grooved gonostomal lips unite proximally to form a short, common duct which opens into the base of the gonoduct. In the holotype, the right anterior gonoduct possesses a single gonostomal lip.

Blood system (Figure 7). The characteristic ring vessel surrounds the posterior end of the crop. The conspicuous dorsal vessel, which arises from the ring vessel, continues anteriorly, dorsal to the foregut. In the region of the pharynx it gives off a branch to the body wall before entering the proboscis. Two elongate neuro-intestinal vessels also arise from the ring vessel and pass anteroventrally. Both these vessels remain separate from each other for a considerable part of their length but unite to form a single vessel before opening into the ventral vessel.

Remarks

The separation of species in this genus is based mainly on the following features: the number as well as the position of the gonoducts in relation to the ventral setae, the nature of the body wall, the shape and arrangement of the dermal papillae, the structure of the proboscis, the presence or absence of ciliated funnels on the anal vesicles, an interbasal muscle, the neuro-intestinal vessel and the rectal diverticulum.

Distinctive features of the present species include the characteristic shape and arrangement of the dermal papillae, the nature of the integument and the presence of unusually long mesenteric strands which attach the crop and adjoining intestine to the anterior part of the body wall.

Of the 16 described species, the following eight possess two pairs of gonoducts: *A. adelaidensis* Edmonds 1960, *A. bran-*

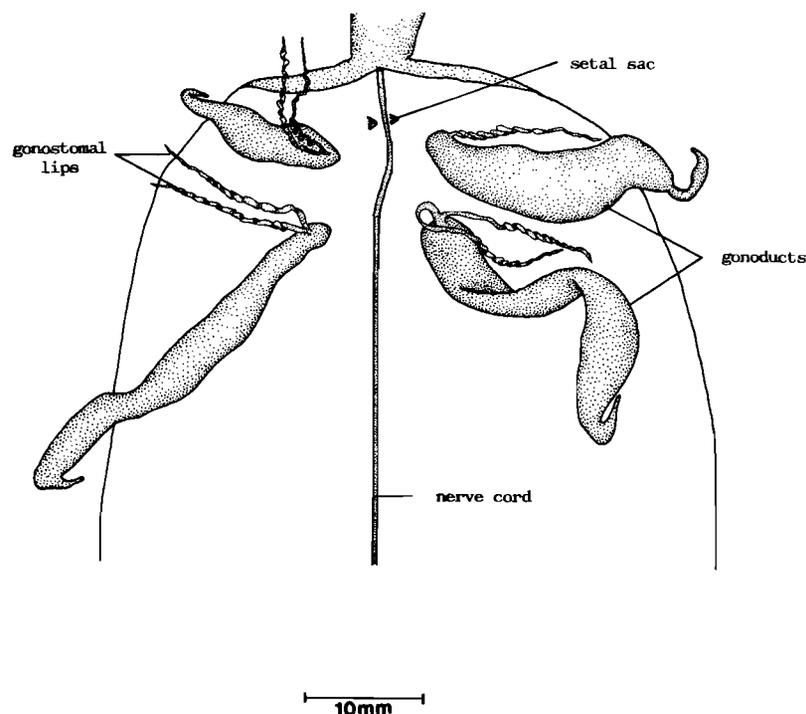


Figure 6 Anterior end of the trunk cavity illustrating the gonoducts.

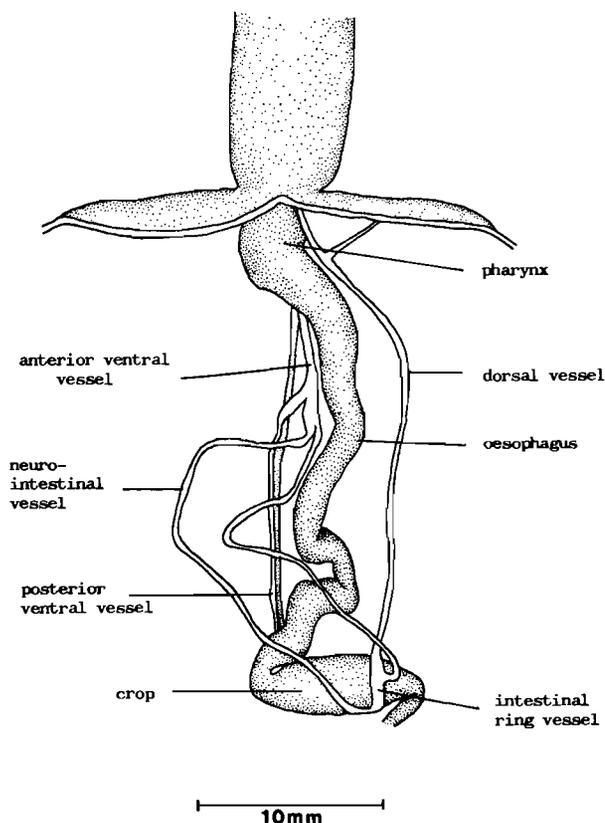


Figure 7 Anterior end of alimentary canal showing blood vessels.

chiorhynchus (Annandale & Kemp 1915), *A. chaetiferus* Datta Gupta, Menon & Johnson 1963, *A. dendrorhynchus* (Annandale & Kemp 1915), *A. microrhynchus* (Prashad 1919), *A. porcellus* Fisher 1948, *A. sabinus* (Lanchester 1905) and *A. semoni* (Fischer 1896).

Both *A. branchiorhynchus* and *A. dendrorhynchus* possess dendritic outgrowths on the proboscis (Stephen & Edmonds 1972) and hence are distinct from *A. gangae* and the other

species in the genus.

The species *A. chaetiferus* differs from all other known echiurids by possessing muscle pads in which eight spinelets are embedded (Datta Gupta *et al.* 1963). Another unusual feature in this species is that there is no typical demarcation between the proboscis and the trunk.

A. microrhynchus is based on a single specimen from India described as *Thalassema microrhynchus* by Prashad (1919a). An important feature that distinguishes it from *A. gangae* is that the proboscis is reduced to a small collar about one-nineteenth of the body length (Prashad 1919a). Furthermore, the presence of two rows of ciliated funnels on the surface of the anterior half of the anal vesicles in *A. microrhynchus* also tends to separate these two species.

The species *A. sabinus* has been described rather briefly by Lanchester (1905) from five specimens. He mentions that the animals are small with a total length of 10 mm and the proboscis is one-fifth the body length. In addition to the marked difference in size, *A. sabinus* also differs from *A. gangae* in possessing an integument that is rather thin and transparent. Both Prashad (1919b) and Sato (1939) state that the anal vesicles are short in *A. sabinus*; Prashad's figure also shows a well-developed caecum.

In the species *A. semoni* the integument is thin and transparent (Fischer 1896). The papillae are of uniform size and are very closely arranged at the posterior end of the body. The anal vesicles are more than half the length of the trunk. According to Fischer (1896) the right gonoduct opens in front of the setae, the rest behind. Wharton (1913) reports two specimens with a trunk length of 70 mm and a proboscis about three-quarters as long as the trunk. Both his specimens possessed two pairs of gonoducts, one pair in front of and the other behind the setae. Wesenberg-Lund (1959) also mentions that the papillae are more densely crowded round the posterior end of the trunk. In two of the specimens that were dissected, both the pairs of gonoducts were post-setal in position. Hence there is considerable variation in the position of the gonoducts in this species. The most important differences between *A.*

Table 1 Comparison of *A. gangae*, *A. porcellus* and *A. adelaidensis*

	<i>A. gangae</i>	<i>A. porcellus</i>	<i>A. adelaidensis</i>
Size	length of trunk up to 100 mm; proboscis : trunk is 1:2	length of trunk up to 70 mm; proboscis : trunk is 1:2	length of trunk up to 100 mm; proboscis : trunk is 1:2,5
Colour (living specimen)	proboscis white to pale yellow with light brown margins; trunk uniform grey	trunk sandy-grey	groove or trough of proboscis light green; trunk rich dark green
Proboscis	non-deciduous	deciduous	deciduous
Shape	trunk sausage-shaped; proboscis of uniform diameter	trunk plump and sac-like; proboscis tapers slightly anteriorly	trunk cylindrical; proboscis tapers anteriorly, margin not frilled
Papillae	minute, arranged in groups of various shapes and sizes distributed uniformly over entire surface of trunk; groups of papillae separated by narrow interspaces	numerous, flat, largest on anterior and posterior surfaces of trunk, transversely aligned	numerous, small, flat; not arranged in groups
Body wall	thick and opaque	thick in large specimens; slightly translucent in smaller ones; skin close- ly wrinkled transversely	skin wrinkled
Anal vesicles	almost as long as or longer than trunk with few scattered funnels.	long, slender; brown in colour with numerous small unstalked funnels	long, slender; brown in colour with numerous minute brown funnels

semoni and *A. gangae* lie in the nature of the integument and in the arrangement of the dermal papillae.

The two species most nearly related to *A. gangae* seem to be *A. porcellus* and *A. adelaidensis*. The characteristic features of these three species are summarized in Table 1. Fisher's original description of *A. porcellus* (1948) is based on a number of specimens collected from several localities in Hawaii. This species was redescribed by Edmonds (1960) from 12 specimens collected from the Heron Islands, Queensland. The description of *A. adelaidensis* by Edmonds (1960) is based on eight specimens from South Australia. The differences which distinguish *A. gangae* from *A. porcellus* and *A. adelaidensis* mainly concern the nature of the body walls, the shape and distribution of the dermal papillae and the arrangement of the funnels on the anal vesicles. Other differences of lesser significance are the relative sizes of the specimens, the nature of the proboscides and the form and colouration of the trunk of living specimens.

Further material should give a better understanding of the variation within *A. gangae* as well as determining whether the shape and distribution of the dermal papillae are of a distinctly different type from those reported for *A. porcellus* and *A. adelaidensis*.

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