

ANATOMICAL DETAILS OF TWO FISH LEECHES FROM THE PULICAT LAKE, SOUTH INDIA

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ABSTRACT

Anatomical details of the fish leeches, *Pterobdella amara* Kaburaki, 1921 and additional information on *Zeylanicobdella arugamensis* de Silva, 1963 are presented.

INTRODUCTION

LEECHES parasitic on estuarine fish from India are known earlier only from the Chilka Lake through the reports of Harding (1920) and Kaburaki (1921), subsequent to which Jayadev Babu (1967) has reported two species of leeches *Zeylanicobdella arugamensis* de Silva, 1963 infesting the canine cat-fish eel, *Plotosus canius* and *Pterobdella amara* Kaburaki, 1921 parasitic on the sting ray, *Trygon sephen* from the Pulicat Lake. The former leech *Z. arugamensis* has been reported originally from Sri Lanka and subsequently from Malay peninsula and is now reported for the first time from India. *P. amara* is so far known exclusively from India and the present report is a new record for the Pulicat Lake. Anatomical details of *P. amara* and a redefinition of the genus *Pterobdella* and comparison with the closely allied genera and species are also included in this paper. Whereas *P. amara* is found to infest the same hosts both in the Chilka and Pulicat Lakes, *Z. arugamensis* seems to exhibit a wide range of host distribution. The present host, *Plotosus canius* from Pulicat Lake is a new host record for this species of leech.

Pulicat Lake (lat. 13°24'N to 13°47'N; long. 80°02'E to 80°16'E) is the second largest brackishwater body in India, with an approximate area of about 178 sq. miles. At its southern end, it opens into the Bay of Bengal and the Buckingham Canal and three other small monsoonal rivers flow through the lake at various points, rendering the lake brackish.

As per earlier records of Chacko *et al.* (1953), Rao and Rao (1971) and Selvanathan and Kaliyamurthy (1973), nearly 147 species of fish, including about 50 species of food fishes are known to occur in this lake and therefore this lake has been a major fishing centre on the east coast of India, since ancient times.

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FAMILY : PISCICOLIDAE

Zeylanicobdella arugamensis De Silva, 1963 (Fig. 1 a, b, c)

De Silva (1963) reported a number of brackishwater leeches found ectoparasitic on fishes, *Tachysurus maculatus* (Thunberg), *Macrones gilio* (Hamilton Buchanan) and *Tilapia mossambica* (Peters) from Arugam Kalapu, Eastern Province, Sri Lanka and a single specimen from the spotted bat-fish *Drepane punctata* (Linnaeus) from the Puttalam lagoon near

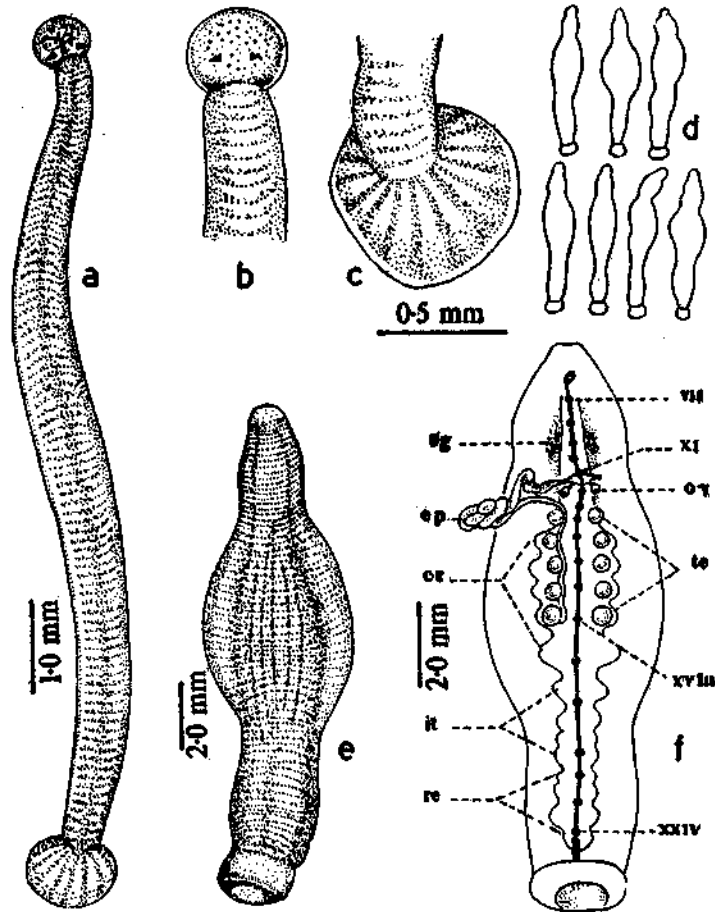


Fig. 1 a-c. *Zeylanicobdella arugamensis*: a. entire animal-dorsal view, b. anterior sucker; c. posterior sucker; d-f. *Pterobdella amara*: d. showing different body shapes; e. entire animal-dorsal view and f. VII, XI, XVIII, XXIV segments indicated by nerve ganglia. cr: crop caeca; ep: epididymis; it: intestine; ov: ovary; re: rectum; sg: salivary gland and te: testes.

Kalpitiya, Sri Lanka. Subsequently, de Silva and Fernando (1965) collected three specimens of the same species from *Hippocampus kuda* Bleeker and four more specimens from a marine eel from the Malay Peninsula, off

Singapore. Since these specimens from Malaya are found to be slightly different from Sri Lanka forms, with regard to the presence of radially arranged bands of the posterior sucker and transverse bands on the body, they were considered as belonging to a new variety *radiata*. Jayadev Babu (1967) recorded them for the first time from Pulicat Lake in India, and this is suggestive of their wide geographic distribution, in countries adjacent to Bay of Bengal.

Material: Forty two specimens of *Zeylanicobdella arugamensis* ranging between 3.0 mm to 10.0 mm in length were recovered from nine specimens of *Plotosus canius* Hamilton Buchanan, caught from the Pulicat Lake.

The leeches were found mostly attached to the chin, ventral to operculum, and at the sides of the head of the host-fish. Some were found on the sides of the body, also near the pectoral fins and some were attached even to the palate of the fish.

Colouration: Live specimens are deep olive green in colour. A number of dark spots, without any definite pattern are noticeable on the dorsal surface of the body. Posterior sucker in some cases shows radial bands of lightbrown pigmentation. This deep olive-green colour of the leech however fades away in the preservative, 70% alcohol.

Measurements (of one of the specimens measuring 5.5 mm in total length) :

	in mm
Total length (including suckers) ...	5.5
Length of neck (including anterior sucker) ...	1.5
Length of abdomen (including posterior sucker) ...	3.5
Diameter of anterior sucker ...	0.3
Diameter of posterior sucker ...	0.7
Width of neck ...	0.4
Width of abdomen ...	0.5

Host: The earlier host records for this leech are *Tachysurus maculatus* (Thunberg), *Macrones gulio* (Hamilton Buchanan), *Tilapia mossambica* (Peters), *Glossogobius giuris* (Hamilton Buchanan) and *Drepane punctata* (Cuv. and Val.) from Sri Lanka and *Hippocampus kuda* Bleeker, and an unidentified marine eel from the Malay Peninsula, off Singapore. Although these hosts are common in the Pulicat Lake, it is interesting that this leech has been found parasitic only on *Plotosus canius*. This is however a new host record for this fish leech.

Discussion: The present collection of forty two leeches includes two varieties of specimens, one with irregularly distributed dark brown spots on the anterior sucker and radially arranged pigment bands on the posterior sucker (Fig. 1c) as in the specimens collected by de Silva and Fernando (1965) from Malaya and the other devoid of these colour patterns. The latter variety of specimens resemble *Zeylanicobdella arugamensis* de Silva originally reported from Sri Lanka. It is interesting therefore, that both these Sri Lanka and Malaysian forms coexist in Indian waters. In the present collection however, the radial bands are not so very pronounced as in

the Malaysian variety *radiata*. Also, the transverse bands on the abdomen of the var. *radiata* are lacking in the specimens from the present collection. These two characters viz., the presence of radial bands on the posterior sucker (Fig. 1c) and the absence of transverse bands in the abdominal region place this group of Pulicat specimens intermediate between the Sri Lanka and Malaysian forms. In having no transverse bands on the abdomen, the present specimens resemble the original type *Zeylanicobdella arugamensis* from Sri Lanka; and in having radial bands on the posterior sucker and irregularly distributed dark brown spots on the anterior sucker, they resemble the Malaysian variety *radiata*. These differences in pigmentation may be probably due to parasite-host and geographic distribution and hence of no significant taxonomic value. Leeches from the more saline water hosts seem to have deeper pigment patterns.

***Pterobdella amara* Kaburaki, 1921 (Fig. 1d, e, f)**

Piscicolid leeches with the characteristic lateral finlike extensions of the body are illustrated by three genera, *Pterobdella* Kaburaki, 1921; *Phyllobdella* Moore, 1939 and *Pterobdellina* Bennike and Brunn, 1939. These three genera include four species, (1) *Pterobdella amara* Kaburaki (1921) collected from the Chilka Lake in India, (2) *Phyllobdella maculata* Moore (1939) collected from the Lake Tanganyika in Africa, (3) *Pterobdellina jenseni* Bennike and Brunn (1939) collected from the deep waters around the Faroes Islands in the North Atlantic and (4) *Pterobdellina australis* Epstein (1970) collected from the coast of Argentina in South America.

The genus *Pterobdellina* was originally established by Bennike and Brunn (1939) as a subgenus *Pterobdella*. Subsequently, Knight-Jones (1962) and Soos (1965) elevated it to the status of a genus.

Excepting for the detailed anatomy of *Phyllobdella maculata* all the other three species of this peculiar group of fish-leeches are known only from very cursory descriptions of their anatomical details.

Pterobdella amara was originally described but incompletely by Kaburaki (1921) and the same description and illustrations were copied by Harding (1927) in his *Fauna of British India*. Kaburaki (1921) mistook the front end of the leech to be the hind end!

The present collections of a large number of live specimens of *Pterobdella amara* Kaburaki were preliminarily announced by Jayadev Babu (1967), as the first record of this leech from the Pulicat Lake and as the second record for India, after the original report of Kaburaki (1921). Details of external morphology and internal anatomy along with some interesting observations on live specimens are given here for the first time. Based on these detailed studies the original generic concept proposed by Kaburaki (1921) is suitably emended.

Occurrence: Twentynine specimens of this leech were collected alive, out of the many more noticed, as the host-fish was being hurriedly carried away by the people who had bought it. The leeches were picked out (on 11th March, 1967) from the margins of the mouth, folds of the lips and the base of the teeth of a large single host, *Trygon sephen* Fosskál with a

wide disc of about 1400 mm diameter. The fish was caught in the vicinity of the Pulicat Lake-mouth on the previous night and was dead in the fishing boat by morning. It was landed at the Pulicat village only by the following noon. Eventhough the host was dead for nearly 12 hours, it was astonishing to see the leeches still alive on the host. They looked pale and were wriggling about like large-sized dipteran maggots, within the mouth of the host. They were not found in any other parts of the host body. Normally parasitic leeches crawl away from the dead or live fish hosts soon after they are landed. But these leeches were still found clinging to the host in its rather moist and oozing mouth that was wide open.

External features: The leeches are about 20 mm in total length, 4 to 5 times longer than their greatest width. Measurements in millimetres of six preserved specimens are given below:

Total length	Greatest width	Length upto genital pore	Anterior length	Sucker width (Anterior)	Posterior length	Sucker width (Posterior)
12.96	3.2	5.36	0.96	0.88	1.68	1.68
15.20	3.28	4.16	0.64	0.88	1.60	1.84
16.83	3.20	3.04	0.80	0.88	2.00	1.68
15.92	3.36	2.40	0.64	0.88	1.60	1.68
14.56	3.76	3.60	1.04	1.20	2.00	1.84
14.32	3.04	2.24	0.88	0.80	1.60	1.68

These specimens obtained from the Pulicat Lake are larger than those originally collected by Kaburaki (1921) from the Chilka Lake, which measured only 10 to 12 mm in total length.

Phyllobdella maculata is about 1½ times longer than its width. Both *Pterobdellina jenseni* and *Pterobdellina australis* are about 7 to 8 times longer than their width.

Posterior sucker of *Pterobdella amara* is twice wider than the anterior, but it is only half the width of the anterior abdominal region which is the widest part of the body.

Shape: Posterior half of the neck (trachelosome) and anterior half of the abdomen (urosome) are rather flattened dorsoventrally and are oval in cross section, but the posterior part of the abdomen is cylindrical.

Colour: In live condition, these leeches are pale with pink streaks on the abdomen whereas in the alcohol, they take a light uniform grey colour. The posterior part of the abdomen is rather brownish grey; this might be due to the distended gut gorged with blood.

Observations in live condition: The leeches are notorious for their tremendous grip by their posterior sucker on the body of the host. They are so firmly anchored to the flat teeth of the ray, that when pulled out forcibly with a forceps, one or two teeth of the host also got extracted. Dislodging these leeches from the host is difficult. Their body is extremely slippery and in contracted condition it assumes the shape of a nodule. It is difficult to get a grip even with a good forceps.

In the softer parts of the mouth and lips of the ray, where the leeches secure a firm attachment by their posterior sucker, a small circular

scar is left behind when the leech is removed. *Phyllobdella maculata* also is supposed to leave "deep circular scars bounded by somewhat raised rim, which had evidently grown over the margins of the attached posterior sucker".

The dislodged leeches continued to survive in brackishwater contained in glass vials even for about four hours. In live condition they were found to be firmly attached to the sides of the glass vials, by their posterior suckers and were noticed to be rather sluggish, unlike other piscicolids like *Piscicola* which are known to be fairly active. Occasionally, the leeches exhibited body movements showing that they are extremely extensile to about twice their length in contraction. In live specimens the posterior part of the neck (trachelosome) and the anterior half of the abdomen (urosome) get flattened side-ways as wing-like expansions of the body so characteristic of this species of leech. However it was noticed that such wing-like structures are not permanent folds existing at the sides of the body. They are only temporary expansions of variable degree and therefore, of variable appearances in live or preserved condition (Fig.1 d). When the leeches were transferred to freshwater, they relaxed and died as if under a narcotic.

Annulation : The body of the leech is smooth, without any segmental constrictions or even segmental papillae externally, so that delimitation of segments is rather difficult. However it could be made out with some difficulty, that every complete segment is composed of about seven clear annuli, each of which shows a further indistinct sub-division, thereby the number of annuli for a segment can be estimated to be about 14.

Sensillae and eyes : Segmental or annular sensillae are non-existent; but a pair of dark crescent-like eye patches are seen in live specimens, especially in the younger forms. These patches are however lost when the specimens are transferred to the preservative. The crescent-like patches are located wide apart on the anterior sucker, at its junction with the neck and directed forwards. Larger or older specimens do not clearly show these eye patches.

According to Kaburaki (1921) and Harding (1927), this species is believed to be devoid of eyes. Hence, in the light of the present finding of the eyes in the specimens, the generic diagnosis needs suitable emendation.

Suckers : Anterior sucker is eccentrically connected to the neck, a little posterior to its centre. There are no papillae anywhere on the dorsum of the anterior sucker, not even at its rim as noticed in *P. jenseni*. In the preservative, both the anterior and posterior suckers get the characteristic cupiliform shape, but in live forms they are rather flat and open. Mouth is a small triangular opening, the apex of which is directed forwards. It is situated at the centre of the anterior sucker. In none of the specimens under study the proboscis is seen to project out of the mouth.

Posterior sucker is also eccentrically connected to the abdomen at a point little anterior to the centre of the sucker. There are no radiating rays or papillae on the lower or upper surface of the posterior sucker. The connection of the posterior sucker to the abdomen is marked by a clear groove or furrow. The posterior sucker is rather fleshy.

Genital opening : Between the neck and the abdomen, there is a clear constriction of the body devoid of wing-like expansions. In the contracted condition, one or two annuli of the abdomen get folded like a 'prepuce' as seen in the piscicolid genus *Branchellion*. There is only one large genital sinus situated in the ventromedian line just in front of the 'preputial fold'. It is a transversely elongated opening into which the male and female genital ducts open independently (described in detail under the reproductive system).

Anus : This is a transverse slit located in the inter-annular region, about four annuli in front of the groove separating the abdomen from the posterior sucker. Nephridial openings could not be located.

Nervous system : (Fig. 1 f) Apart from the small nerve ring and the composite caudal ganglion, there are 18 other free ganglia from ganglion VII to ganglion XXIV. Caudal ganglion is composed of four ganglionic sub-divisions. Ventral nerve cord passes over the common genital atrium between the free ganglia XI and XII.

Alimentary canal : (Fig. 1 f) There is a cluster of unicellular salivary glands on either side of the alimentary canal in the anterior part of the neck. Crop has five pairs of large obtuse caeca, but there are no postcaeca at all, as in *Pterobdellina jenseni*, *P. australis*, *Phyllobdella maculata*. Intestine and rectum have each four pairs of blunt lobe like caeca, less prominent than those of the crop. Rectal caeca are more prominent than those illustrated by Kaburaki (1921) and Harding (1927).

Reproductive system : (Fig. 1 f) There are five pairs of spherical testes located between the segments XIV/XV to XVIII/XIX. Epididymis is much more elaborate than was originally described by Kaburaki (1921) and Harding (1927). It is a long variably enlarged duct, folded on itself and the two limbs of the fold are characteristically twisted round one another and they narrow down before opening into the common genital atrium from either sides, located between the free ganglia XI and XII. The twisted part of the epididymis is enveloped by some kind of glandular tissue, perhaps the prostate gland. The two distal ducts of the epididymis do not seem to join, nor do they open into the genital atrium from the front, as illustrated by Kaburaki (1921) and Harding (1927).

Ovaries are short and club shaped and are located in segments XII and XIII. They narrow down in front and open into the same common genital atrium postero-laterally, but independently, a little behind the ducts of the epididymis, each by a short oviduct. The oviducts do not join with one another as shown in the original illustration by Kaburaki (1921) and Harding (1927).

The common genital atrium is a large transversely elongated simple chamber without any cornua, not correctly sketched in the original diagram by Kaburaki (1921) and Harding (1927).

Geographic and host distribution : The genus *Pterobdella* is restricted in its geographic distribution to the brackish waters of India only, just as the genus *Phyllobdella* is confined to the freshwaters of Africa. The deep sea genus *Pterobdellina* on the other hand, seems to be bipolar in its geographic

distribution as pointed out by Epstein (1970). *Pterobdella* is more a shallow water leech, almost like *Phyllobdella* in contra-distinction, to *Pterobdellina* which is deep-sea form. *Pterobdella* seems to be host specific, being confined to the rays of the genus *Trygon*, more particularly to the species *T. sephen* Forsskål, common in any brackishwater body of India. This fish-leech is more commonly seen infesting the lips and gums of *T. sephen*.

Emended generic diagnosis: Brackishwater fish-leeches, about 20 mm long, host specific to species of *Trygon*. Posterior half of the trachelosome and anterior half of the urosome, expansible laterally as temporary fin-like folds; genital pores opening into a common genital sinus between segments XI and XII. Oral sucker without marginal papillae, but with a pair of vestigial eyes in adults but better noticed in younger forms; five pairs of crop (stomach) caeca, four pairs of intestinal and four pairs of rectal caeca, all simple and lobe-like; five pairs of testes with convoluted epididymis, opening independently into the common genital atrium, as do the two oviducts.

DISCUSSION

In view of the anatomical details given for the first time here based on an elaborate study of a large and live collection of this rather rare fish-leech and in view of the fact that this fish-leech occurs more commonly in the brackishwaters of India, an emendation of the generic concept is of importance, so that one could compare such a revised diagnosis with the earlier diagnoses provided by Kaburaki (1921), Harding (1927), Knight-Jones (1962) and Soos (1965), which are the only available sources of information on this genus of fish-leech.

The genus *Pterobdella* with its unique species *amara* is comparable within the fish-leeches with only two other genera, viz., the genus *Phyllobdella* with a unique species, *maculata* and with the genus *Pterobdellina* with two species, *jenseni* and *australis*. With regard to the shape and size of the body and the extension of the fin-like lateral folds, this genus *Pterobdella* differs from both the other genera. However, this brackish water genus seems to resemble more closely the fresh-water genus *Phyllobdella* of Africa, rather than the marine genus *Pterobdellina*, which is bipolar in its distribution. Vestigial eyes and the common genital sinus are common to both the genera *Pterobdella* and *Phyllobdella*. Crop and intestinal caeca are more or less the same in all the three genera but rectal caeca are more conspicuous in the present genus, *Pterobdella*. Atrium is simple in *Pterobdella*, without the cornua seen in *Phyllobdella*.

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