

## TWO NEW SPECIES OF COPEPODS OF THE GENUS *PENICULUS* PARASITIC ON MADRAS FISHES.

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### INTRODUCTION.

Lernaeid copepods parasitic on Indian fishes are little known. Of the several genera *Peniculus* was first recorded from Asia by Yamaguti (1939) when he described *Peniculus ostraciontis*. The present author (1951c) added three more species, *P. trichiuri*, *P. theraponi* and *P. sciaena* found parasitic on Madras fishes. In the present paper full descriptions of two more new species, parasitic on the mackerel, *Scomber microlepidotus*, and the pomfret *Stromateus niger*, are given. A study of the structure of the proboscis, as well as the mandibles and maxillae contained within it, not made before in any other species of the genus, was possible in the present forms. In the light of the occurrence of these three pairs of mouth appendages, the enumeration of the cephalothoracic appendages followed by all the previous authors, had to be revised.

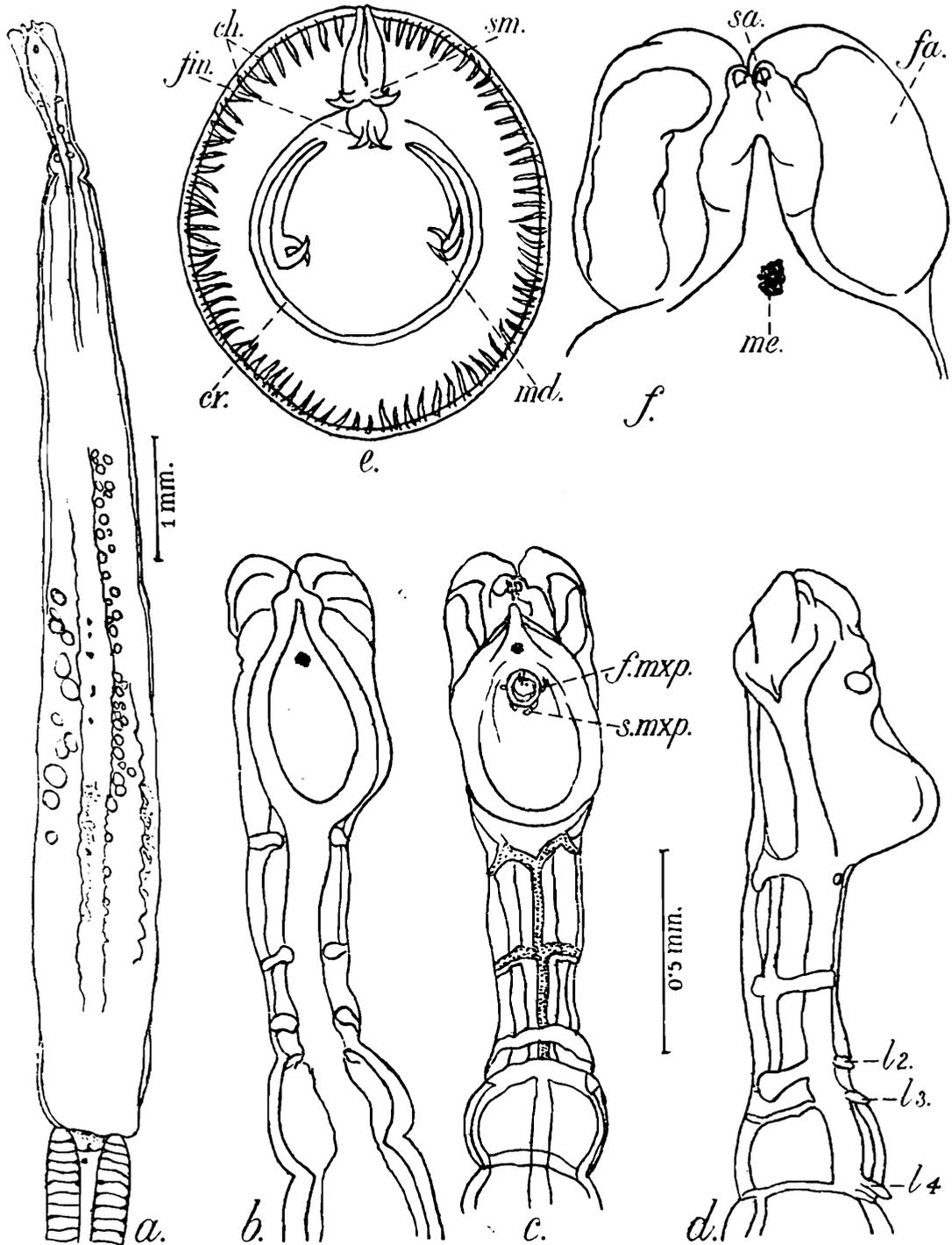
### ***Peniculus stromatei*, sp. nov.**

*Locality and type specimens.*—Eight females were collected from three small sized *Stromateus niger* caught at Madras, in August 1950. The parasites were attached to the fin rays of the dorsal or caudal fins. All were mature adults, more or less of the same size and bore eggs. One of these on which this description is mostly based, will be lodged in the Indian Museum, Calcutta as the type specimen. The paratypes are in the author's collection.

*Description.*—The long cylindrical body (text-fig. 1a), exclusive of the egg strings measures 9.32 mm. The trunk is 8 mm. long and 1.06 mm. wide. The egg strings are longer than the body. In several specimens they were broken.

The cephalothorax is cylindrical with a large posterior heel-like prominence on the ventral side (text-fig. 1d). In front of the deep projection lies the small mouth cone. The forwardly directed antennae extend far beyond the frontal margin (text-fig. 1f, *sa* & *fa*). A median eye (text-fig. 1f, *me*) is noticeable anterior to the region of the mouth. The cephalothorax or head is followed by the four free thoracic segments which, being narrower by nearly half of its width, form the 'neck' of the parasite (text-fig. 1b, *c* & *d*). The fourth segment, however, becomes as broad as the head and is followed by a trunk which is nearly thrice its width. Of the four free thoracic segments the third is the shorter. If the cephalothorax is 20 units long, the four segments are 8, 5, 1 and 6 units in length. The chitinous bars supporting the neck and head form a pattern not very different from that of *P. theraponi*. The trunk which starts from a constriction behind the fourth thoracic segment, gradually widens to 1.06 mm. about three-fourth, of its length

This maximum thickness of the body is an eighth of the total length of the trunk. Posteriorly the trunk is marked by a ventral groove which ends between the genital apertures. Dorsal and posterior to these apertures, the very short abdominal region of the trunk bears two rounded prominences. These, under high magnification, show three stumps of anal setae. The egg strings are 0.24 mm. in diameter.



TEXT-FIG. 1.—*Peniculus stromatei*, sp. nov.

a. Entire specimen with egg strings; b. Anterior region of body, dorsal view; c. Ventral and, d. lateral views of the same; e. Proboscis, oral view; f. Anterior extremity, ventral view.

Lettering: *ch.*, chitinous hairs; *cr.*, chitinous ring; *fa.*, First antenna; *fm.*, first maxilla, *f. mxp.*, first maxilliped; *l<sub>2</sub>*, *l<sub>3</sub>* and *l<sub>4</sub>*, second, third and fourth legs; *md.*, mandible; *me.*, median eye; *sa.*, second antenna; *sm.*, second maxilla; *s. mxp.*, second maxilliped.

The antennae are directed forwards beyond the frontal margin. Medially they hold on to a fin ray of the host. The first antennae (text-fig. 1f, *fa*) are large, indistinctly three-jointed. The basal segment is prominent ventrally while the terminal two joints taper and are curved inwards. Between the two first antennae and ventral to them lie the second antennae (text-fig. 1f, *sa*). These are smaller and placed close to each other. The basal joint is larger, cylindrical, with the terminal claw folding down on a lobe of the inner margin of the base. The small mouth cone or proboscis is seen on the anterior side of the very large ventral prominence. When brushed clean, dehydrated and cleared, the structure of the proboscis and the appendages within, can be seen through the distal opening (text-fig. 1e). The mouth tube is supported by chitinous rings (text-fig. 1e, *cr.*) and has a fringe of long hairs on its distal rim (text-fig. 1e, *ch.*). As has been described by the author (1951c) in the species of *Lernaenicus*, three pairs of appendages can be seen. These appendages, the mandibles and the maxillae appear to be attached at different levels within the tube and have their distal tips directed backwards. The mandibles lie deepest (text-fig. 1e, *md.*). Each consists of a long narrow base bearing two sharp, claw-like teeth turned inwards from the sides of the proboscis tube. The first maxilla (text-fig. 1e, *fm.*) consists of two slender hooks crossing each other, attached to a base in front. The second maxilla (text-fig. 1e, *sm.*) is most superficial. The long base attached to the anterior edge of the proboscis, is directed backwards to bear two powerful claws. This succession of the appendages with the second maxilla in front and the mandible behind, found in all the specimens examined, is a reversal of the usual arrangement and may be due to the rotation of the proboscis tube as a whole or a feature of the formation of the tubular-mouth cone through a forward folding of the region behind the mandibles. On either side of the proboscis can be seen two pairs of appendages. The first maxillipedes (text-fig. 1c, *f. mxp.*) are short three-jointed tapering appendages attached to the sides of the proboscis. The second maxillipedes (text-fig. 1c, *s. mxp.*) are longer four-jointed appendages found on the posterior side of the proboscis. Of the four swimming legs, none were found complete. Stumps of the legs broken off legs persisted.

*Remarks.*—The present form differs from the three species listed by Wilson (1917) and the six species established since viz., *P. ostraciontis* Yamaguti (1939), *P. elegans* Leigh Sharpe, (1934) and *P. communis* Leigh Sharpe (1934) as well as the three species described by the author. This difference is seen in the trunk being eight times longer than wide, the width of the trunk being thrice as much as that of the fourth thoracic segment, and the trunk being over six times longer than the head and neck. It can be easily distinguished from *P. theraponi*, which it approximates in the breadth and length of trunk, by the narrower fourth thoracic segment and longer front part of body, thinner egg strings and the conspicuous cushion-like swelling on the ventral side of the cephalothorax. Hence the present form is described as a new species, *Peniculus stromatei* which can be defined as follows. "Trunk eight times longer than wide, fourth thoracic segment one-third as wide as trunk, proboscis

inconspicuous, the cephalothorax marked by prominent posterior ventral swelling, head and neck one sixth the length of the trunk and head three-fourths the length of the neck. Abdomen is a short stout swelling and the egg strings are thin."

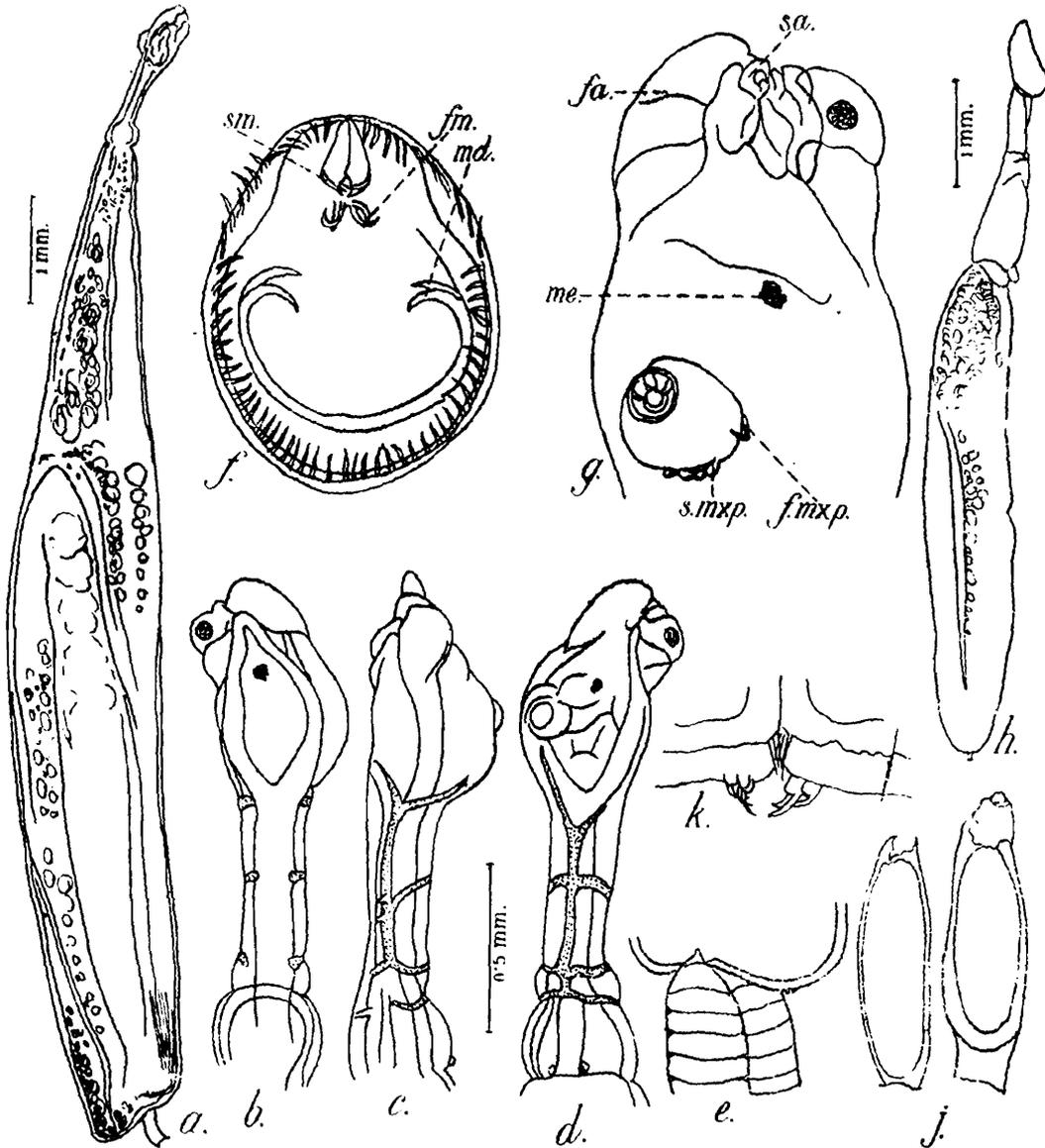
**Peniculus scomberi**, sp. nov.

*Locality and type specimen.*—Fifteen females were collected from two specimens of *Scomber microlepidotus* caught in August 1950. The parasites were attached to the fin rays of the median fins. Except two immature forms the rest bore long egg strings and were of nearly the same size. One measuring 11 mm. long served as type specimen and will be lodged in the Indian Museum, Calcutta. The paratypes are in the collection of the author.

*Description.*—The parasite (text-fig. 2a) was ivory white when fresh and is of the same colour in formalin. The cephalothorax is pyriform being broad behind and narrower in front. While the narrower anterior region, especially in the region of the antennae, appears excavated ventrally (text-fig. 2d) to hold the fin ray of the host, the hind part appears swollen and spherical, without the prominent heel-shaped protuberance found in the previous species. The region of the antennae was deeply buried in the skin of the host and the parasite was more difficult to remove. This firmer fixation, probably necessitated by the hosts being stronger swimmers, results in the axis of the cephalothorax being twisted. The antennae in front, and the conspicuous proboscis behind, appear displaced in opposite directions. A median dark eye-spot occurs about the middle of the dorsal side (text-fig. 2g, me.). The neck which follows the cephalothorax is about half its thickness. The first three free thoracic segments (text-fig. 2b, c and d) forming the neck are uniformly cylindrical and of more or less the same width while the fourth segment expands to twice their width, but constricts slightly before leading into the trunk behind. The neck is longer than the cephalothorax. If the head or cephalothorax were 54 units long the four segments of the neck are 20, 20, 8 and 21 units in length. The trunk, which is separated from the last or fourth segment of the neck by a slight constriction, widens to nearly four and a half times the breadth of that segment. In fact the 9.53 mm. long trunk is nearly six and half times its width which is 1.48 mm. Posteriorly the abdomen forms a (text-fig. 2e) slight prominence (more marked in the immature forms) and also shows three setae placed on either side of its hind tip. Egg strings are 0.33 mm. in diameter.

The first antenna (text-fig. 2f and g; fa.) is large, slightly flattened dorso-ventrally, indistinctly three-jointed. The end joint is pointed and curved inwards. Therefore its outer margin is convex. The second antennae (text-fig. 2f and g; sa.) are shorter and more cylindrical. Its basal joint is large and lobed, while its distal segment is a stout hook, working against a lobe of the base. The proboscis (text-fig. 2f) is a conspicuous flask-shaped body with a small, nearly circular, distal opening at the posterior base. At the sides of the spherical prominence are the maxillipedes. Visible, through the opening are the mandibles

(Text-fig. 2*f*, *md.*.) and maxillae (Text-fig. 2*f*, *fm.* and *sm.*). Though slightly differing in form from those of *P. stromatei*, these appendages resemble a great deal and are arranged in the same order. The first maxillipedes (Text-fig. 2*g*, *f. mxp.*) appear smaller, more slender, pointed and three-jointed while the second maxillipedes (Text-fig. 2*g*, *s. mxp.*) are larger and four-jointed. Of the four swimming legs, there were no traces in the adult. But in a young form, the protopods of the second, third and fourth legs were found as long, elliptical structures, bearing two distal claws and a tubercular vestige of the rest of the limb.



TEXT-FIG. 2.—*Peniculus scomberi*, sp. nov.

a. Entire specimen; b., c. and d. Dorsal, Lateral and Ventral view of anterior region of body; e. Abdomen; f. Proboscis, oral view; g. Head, ventral view; h. An immature specimen; j. Vestiges of legs; k. Anal setae.

Lettering as in Text-fig. 1.

*Remarks.*—Following Wilson's key for the genus, we find that because the trunk being six and a half times longer than broad, and the width of the fourth segment being four and half times the width of the trunk, this form can be marked as different from those established before and also from *P. stromatei* described in this paper. As the cephalothorax is

uniformly swollen, the head appears broader, while in *P. stromatei*, the heel-like prominence gives its head greater depth. In view of these differences, the present form is treated as belonging to a new species *Peniculus scomberi* which can be defined as follows:—The trunk is six and a half times longer than broad. It is five times broader than the fourth segment; the cephalothorax is uniformly swollen behind, slightly twisted and asymmetrical. The proboscis is conspicuous.

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