

THYSANOTE APPENDICULATA (STEENSTRUP AND LUTKEN),
A LERNAEPOPODID, SARASITIC ON THE GILLS OF THE
GREY POMFRET

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Steenstrup and Lutken established the species *Brachiella appendiculata* in 1861 on the basis of the males and females they collected from the gills of *Stromateus (paru) niger* from South India. In 1898, Bassett-Smith found these parasites on the same host in Bombay, but not having access to the original account, described the parasites as *Brachiella appendiculosa* sp. n. In 1915, Wilson transferred the species to the new genus *Thysanote*. Kirtisinghe obtained, in 1937, two females alone from *Stromateus fiotola* Bloch in Ceylon. The descriptions given by Steenstrup and Lutken, as well as by Bassett-Smith, are very meagre while Kirtisinghe's account of the female is unsatisfactory and not free from errors. In the present paper a complete account of the male is given for the first time together with a full description of the female.

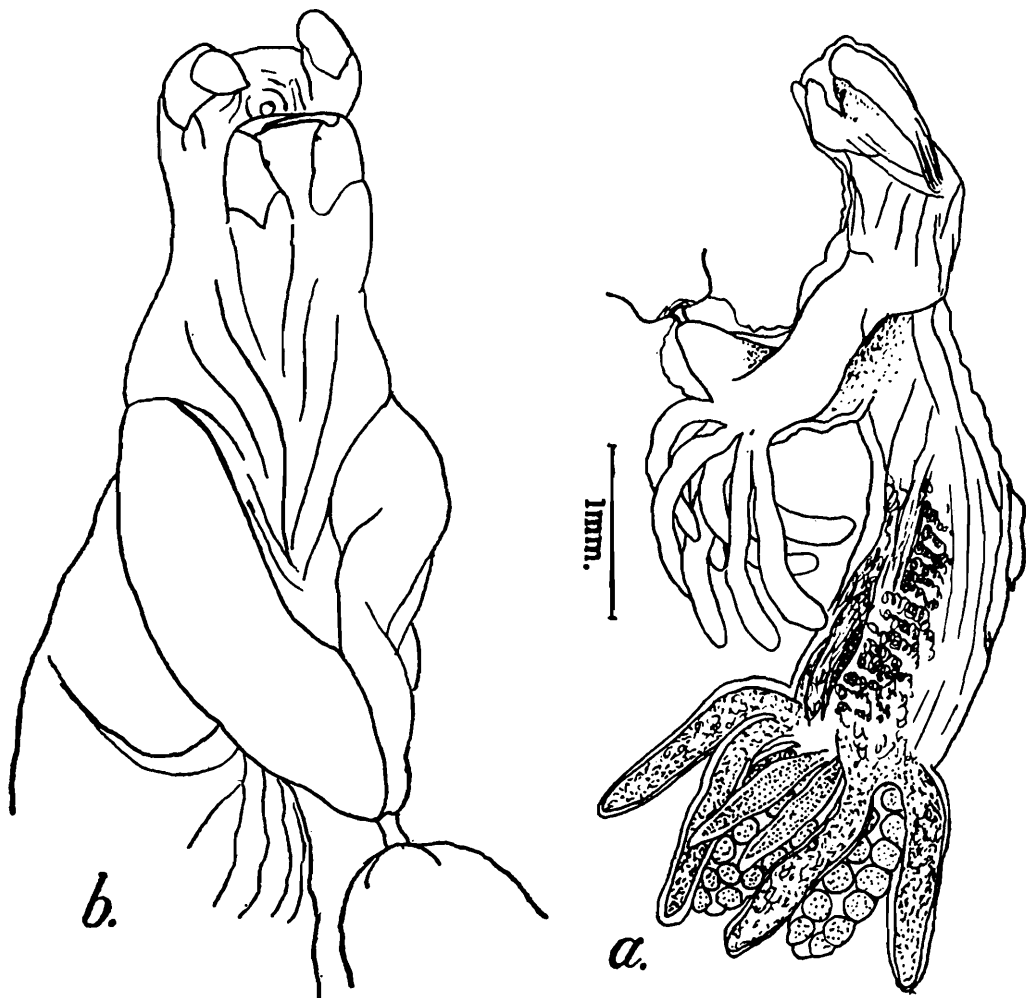
Host and Records.—Eighteen parasites were collected from twenty grey pomfrets (*Stromateus niger*) during August to October. Some of the fishes had two parasites, many had one each while others had none. These parasites were found attached to the gill arches or to the posterior corners of the branchial cavity. Of these only two had males attached to them.

THE FEMALE. (Text-figs. 1 and 2 and Text-fig. 3a and b).

Size.—As shown in the table, the females varied in size. Measured without the egg-strings and posterior processes, they ranged from 3.04 to 5.6 mm. in length. This size variation was not correlated with the size of the host fish. In a form 4.8 mm. long, the head measured 1.2 mm. the neck upto the second maxilla 0.6 mm. and the rest of the body 3.08 mm. At the posterior margin of the trunk where the body is broadest, it measures 1.4 mm. The fimbriate processes of the arm are 2 mm. long while the posterior processes and the anal laminae measure 1.6 mm. and 1 mm. respectively.

The oval trunk tapers anteriorly to bear the second maxillae. The short neck beyond the arms bears a head 1.2 mm. long. The head is well marked from the neck by a constriction as well as by a thin carapace. This shield has a truncated frontal margin and a hind margin with rounded corners. Anteriorly it is much broader than behind, the lateral corners folding down on each side over the base of the second antennae. The gulf between the upper and lower parts of the head appears reduced by the thick second antennae extending forwards and downwards on either side of the head.

The arms are free upto the tips where they hold the very short manubrium bearing the bulla. Though this bulla is attached at right angles to the surface of the gill arch of the fish, the head and neck are turned laterally towards the surface owing to a 90° twist of the arms, and through another similar bend in the front part of the trunk itself, the ventral surface of the genital region is turned away from the gill surface. The trunk is not only broad behind and narrow in front but also thick posteriorly, becoming thinner anteriorly. The trunk is faintly marked by two grooves giving the appearance of its being three-segmented.

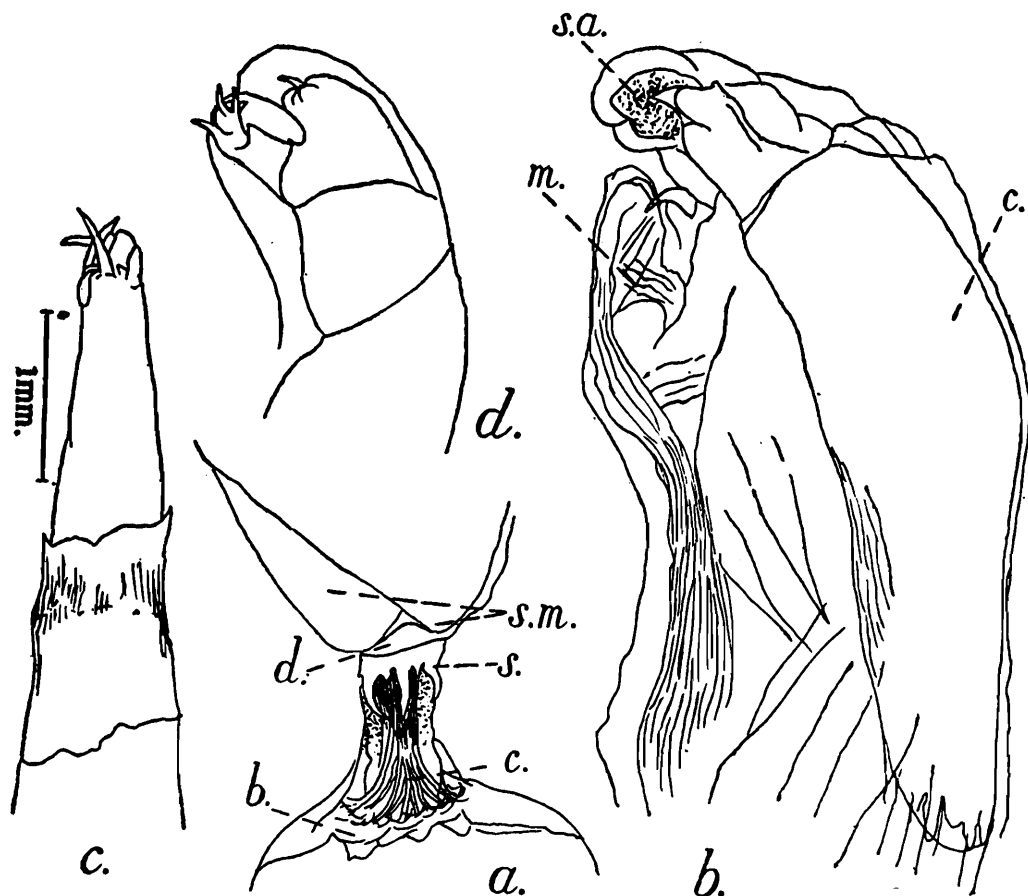


TEXT-FIG. 1.—*Thysanote appendiculata* (Steenstrup and Lutken), Female.
a. Lateral view ; b. Oral view.

The fimbriate processes characteristic of the genus are cylindrical, unbranched, and twelve in number. Four pairs of processes are attached to the lower side of the arms where they curve away from the trunk and two pairs are attached ventral to the egg sacs, just below the anal laminae. These laminae can be easily distinguished from the posterior processes by their being cigar-shaped, their being shorter, their more or less fixed length, their more medial and dorsal insertion and by the presence of aborted setae. The four posterior processes which are clustered together with the anal laminae can be further distinguished by their forking from two extensions of the posterolateral corners of the trunk. The egg sacs appear attached more dorsal to the anal laminae. They are very variable in size and reach even a length of 4.8 mm. with 3 to 40 eggs in

each of the 8 to 12 rows. In forms with short egg strings, the eggs appear packed in fewer rows.

The Appendages.—The first antenna (text-fig. 2c) is three-jointed, small and directed forwards. The distal joint which is slender and tapering is longer than the other two joints and bears three slender spines and four tubercles. The second antenna (text-fig. 2d) is very large being long and stout. It projects straight beyond the frontal end and curves medially and downward on either side of the mouth tube. In this sweep of the second antenna the small first antenna is pressed against the mouth tube and is usually hidden from view. The second antenna is biramous, the two-jointed protopod being far longer than the rami. The exopod is two-jointed. The distal joint bears a short



TEXT-FIG. 2.—*Thysanote appendiculata* (Steenstrup and Lutken), female.

a. Attachment of the host; b. Side view of head; c. First antenna; d. Second antenna.

c., carapace; m., maxillipede; s. a., second antenna.

stout spine half way up its length as well as three spines and a sharp pointed lobe distally. The endopod is large and laminate. The tip shows papillose lobes arranged round a small tentacular process. The mouth cone has a large number of spiny papillae on its distal part fringing the circular downwardly directed mouth. Through the mouth, and the transparent wall of the tube, the long blades of the mandibles bearing six teeth can be seen. The first maxilla (text-fig. 3a, f. m.) is tripartite, the distal joints of the dactylose lobes are pointed and bent at an angle, and the bases swollen. The palp is much shorter.

but inflated and bears two spines divergently. The maxillipedes (text-fig. 3b) appear a little smaller in size compared with the second antennae. They are two-jointed and are directed forward below the mouth cone. A two-jointed short spine is borne on the first joint while a long stout curved claw is attached distally to the second joint. At the base of this claw a slender short accessory spine also can be distinguished. The primary spines of the two maxillipedes work against each other and are usually found overlapping one another. The second maxillae are short and stout and taper distally as they curve towards each other to unite their tips. A disc within this fused part of the arms bears a thick manubrium in its centre, reinforced by a circlet of four long spines from the disc supporting its base. The two canals from the maxillae run up through the manubrium, branch repeatedly as they extend into the bulla so that the truncated edge of the bulla appears fimbriate owing to the nearly ten branches of the canals.

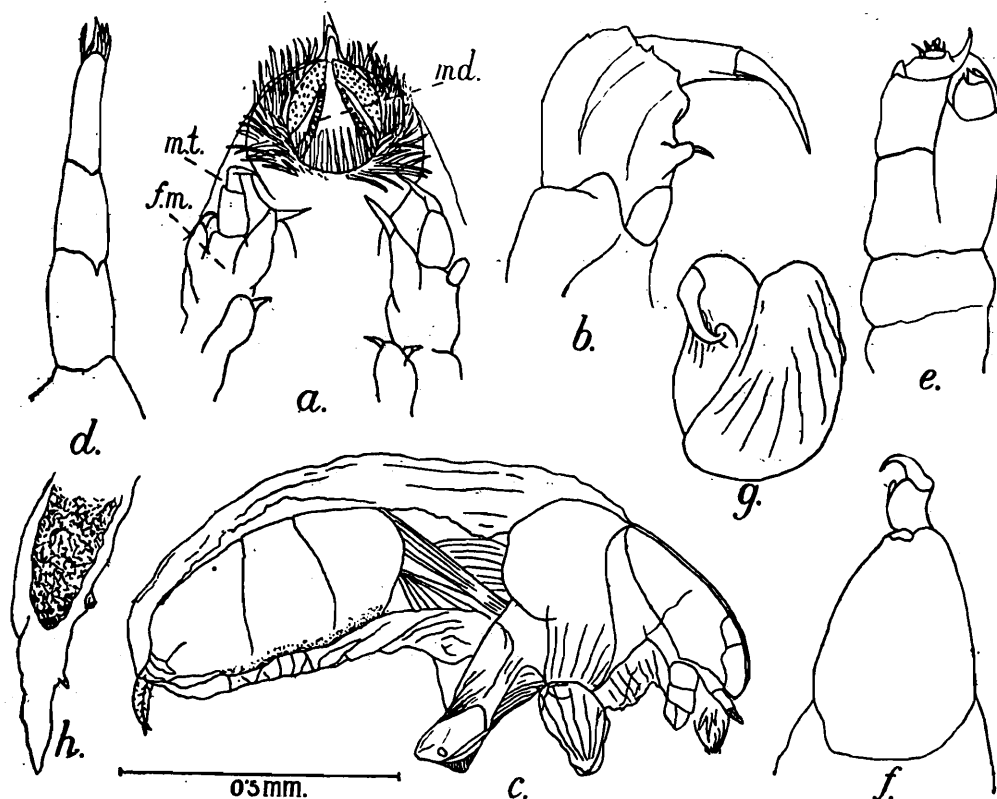
THE MALE. (Text-fig. 3c-h).

Ten males were collected from ten females. The males were usually found clinging to the ventral side of the trunk of the female between and behind the arms sheltered by the processes hanging down from each arm, but they were also found on the dorsal side of the trunk and the posterior processes. The wide and unbroken range in the sizes of the females with eggs, shown in the table below, suggests growth even after maturity. On the other hand, the sizes of the males, attached to both small and large females being nearly the same, indicate that the male undergoes no alteration in size after attachment to females. While the lengths of nine males range between a narrow margin of 0.84 mm. and 1.04 mm., the tenth reaching a length of 1.32 mm. suggests the probability of there being "high" and "low" forms such as Sewell found among free-living forms.

	Female.	Male.		Female.	Male.
1	3.0 mm.	0.88 mm.	6	4.7 mm.	0.96 mm.
2	3.5 mm.	0.84 mm.	7	4.7 mm.	0.88 mm.
3	3.6 mm.	1.00 mm.	8	5.0 mm.	1.00 mm.
4	4.0 mm.	0.84 mm.	9	5.6 mm.	1.00 mm.
5	4.6 mm.	1.04 mm.	10	5.1 mm.	1.32 mm.

Beneath the loose transparent cuticle can be seen the arc-like body constricted in the middle (text-fig. 3c), with the tapering cephalothorax in front and the stout conical trunk behind ending in a pair of anal laminae. The head is marked by a carapace of very thin membranous texture and the forwardly directed antennae, mouth tube and first maxilla. The maxillipedes which serve as the main organs by which the male attaches itself to the female are found behind the second

maxillae in the middle of the body. The anal laminae which are cylindrical, acute tipped, and bear a few aborted setae, probably aid in supporting the body in the rear. The part of the body where the second maxillae are attached is well marked by grooves. The trunk appears divided by two faint grooves into three segments.



TEXT-FIG. 3.—*Thysanote appendiculata* (Steenstrup and Lutken).

a. Mouth parts of female; b. Maxillipede of female; c. Lateral view, male; d. First antenna, male; e. Second antenna, male; f. Second maxilla, male; g. Both maxillipedes, male; h. single anal lamina, male; j. m., first maxilla; md., mandible; m. t., mouth tube.

The Appendages.—The first antenna (text-fig. 3d) is uniramous and appears four-articled tapering to a pointed distal extremity. The two basal segments representing the protopod are much stouter while the terminal segment bears six pointed spines of which the central appears stouter than the rest. The second antenna (text-fig. 3e) is biramous. The two protopod joints are short and stout. The endopod is two-jointed, the distal joint is laminate, having its rounded tip marked by imbricated lobes. The exopod is three-jointed, the distal segment being a robust sickle-shaped claw, the base of which is a swollen pad of nearly seven short spines, and the large proximal joint being provided with a spine on its inner distal edge and two spiniferous pads. The mandibles are long narrow blades with the slightly expanded distal tips being finely toothed. The first maxilla is biramous. The palp is conical single jointed and bears a long spine. The endopod is tripartite. Of the lobes which are long, dactylose and sharp tipped, two are longer than the third. The second maxilla (text-fig. 3f) is three-jointed. The basal joint is stout conical and muscular. To its tapered outer end is articulated a cushion-like joint bearing a pad on to which folds the tip of a sickle-shaped claw. Such a chelate termination helps to hold the

skin of the female between. The maxillipede (text-fig. 3*h*) is two-jointed. The basal joint is stout long and muscular, and twisted, so that the curved distal claw works against a pad on its posterior aspect. This twist of the maxillipede enables the male to have a pinch hold of even an oblique surface of the female's body.

Remarks.—The details of the structure of the male presented here for the first time, support Wilson's transfer of *Brachiella appendiculata* Steenstrup and Lutken to the genus *Thysanote*.

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