

**BOMOLOCHUS ACUTA N.SP., A COPEPOD  
PARASITIC ON THE GILLS OF  
DUSSUMIERIA ACUTA**

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A SINGLE mature female specimen of this Ergasilid parasite was found attached to the gills of the Madras Rainbow Sardine *Dussumieria acuta*. A full description is given here since our knowledge of copepods parasitic on Indian fishes is very scanty as indicated in a previous paper (6) and since the Ergasilidæ which are not far removed from the free living forms consist of only a few genera and species and the earlier descriptions are far from accurate. The parasite measures 2.72 mm. long and 0.75 mm. across the cephalothorax, the widest part of the body. The cylindrical egg sacs, 1.32 mm. long, form a conspicuous feature. Behind the semicircular broad cephalothorax the rest of the thoracic segments succeed in decreasing width and end in a narrow abdomen lying between the two long egg sacs. The cephalothoracic shield or carapace is not merely convex above, concave below, but has an edge fringed by a softer thinner extension of the ventral plate, helping the adhesion of the parasite by suction. This is facilitated further by a deeper caving in of the ventral surface brought about by the folding dorsalwards and forwards of the cephalon just behind the maxillipedes and in front of the first swimming leg of the thorax. As a result, the cephalothorax serves as a large sucker bounded in front by the frontal area, on the sides by the thick edge of the carapace and behind by the first swimming legs. The cephalothorax is semicircular in outline with the straight posterior side 0.75 mm. wide, fused to the first free thoracic segment along the whole width. Anteriorly the frontal region is marked by a deep median notch to the bottom of which is attached a frontal plate. This elliptical plate is folded transversely in the middle in such a way that the front half hangs down. The anterior (*i.e.*, the lower) margin bears two processes with swollen bases and acuminate tips. The dorsal convex surface of the carapace is marked by a median furrow starting close to the hind border of the cephalothorax. As it runs forwards, the furrow widens into a valley flanked by two ridges which end in two conspicuous prominences one on either side

of the median notch containing the frontal plate. In the anterior region of the valley just behind the frontal lobe is located the median eye which recalls strongly the median eye of free living copepods. It is of three parts, two lateral and one anterior and median. In the vicinity of the eye, the carapace is marked by several denticles of varied size and form.

*Appendages.*—The cephalothorax bears the six appendages of the cephalon and that of the first thoracic segment fused with the head. As

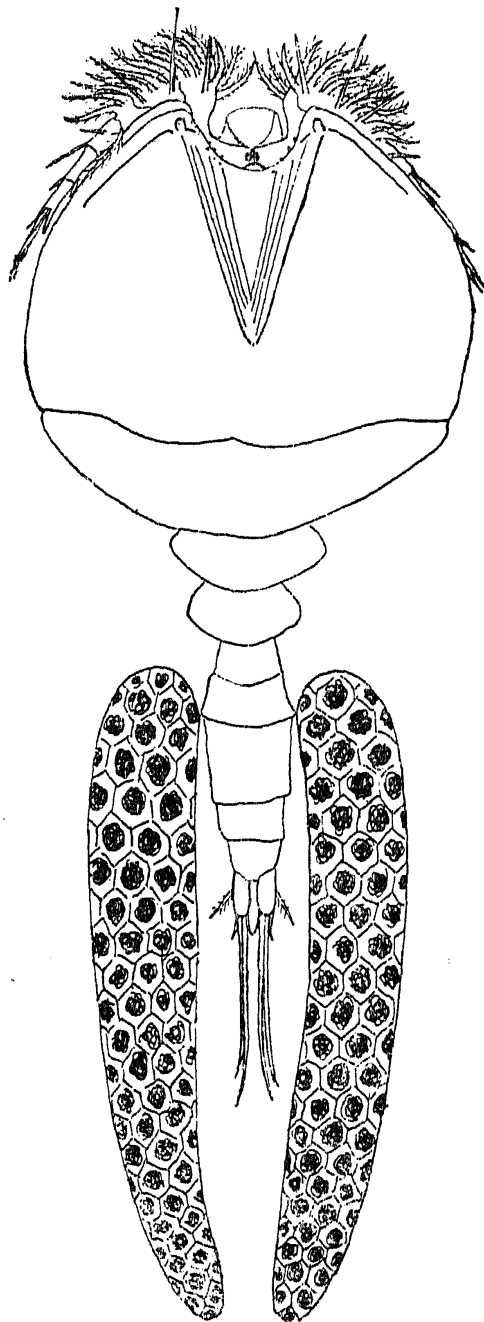


FIG. 1. *Bomolochus acuta* n. sp. Dorsal view of female  $\times 63$ . (Shown without thoracic appendages).

there are many errors in the earlier descriptions of Bassett Smith, Scott, Brian and others, occasioned by defective observation and interpretation of

these appendages, the author of the present paper has adhered to Wilson's descriptions. The first antennæ are large and setose. Each consists of seven segments of which four form the proximal half and three form the distal part of the appendage. The first or basal joint widens anteriorly and bears two plumose setæ, the second joint, which is more dorsal, is bent outwards in such a way that the antennæ projects laterally sweeping round the

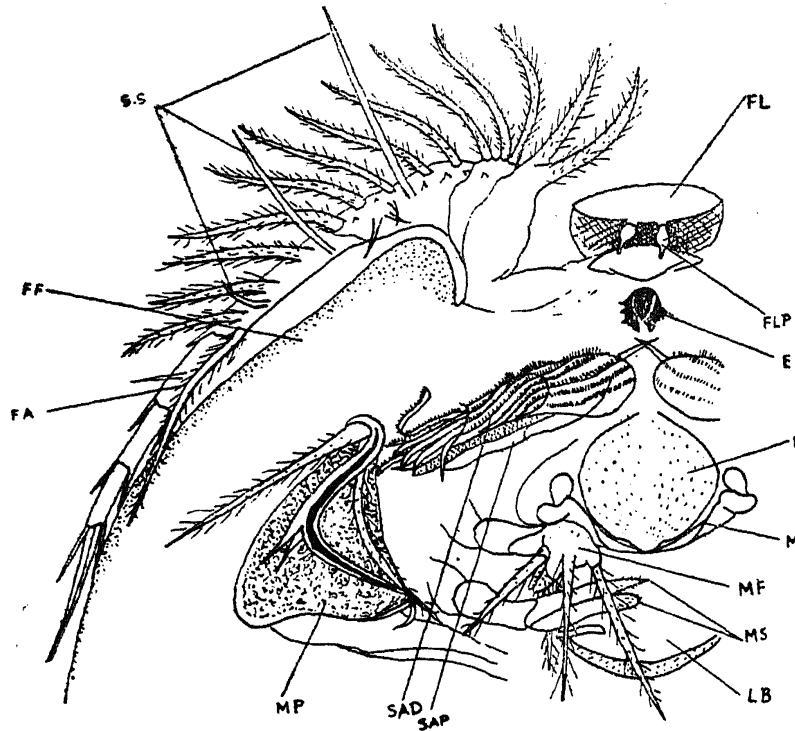


FIG. 2. *Bomolochus acuta* n. sp. Ventral view of head appendages  $\times 150$ .

<i>E.</i>	Median eye.	<i>M.</i>	Mandible.
<i>F.E.</i>	Flexible flange of ventral plate.	<i>M.F.</i>	First maxilla.
<i>F.A.</i>	First antenna.	<i>M.P.</i>	Maxillipede.
<i>F.L.</i>	Frontal lobe.	<i>M.S.</i>	Second maxilla.
<i>F.L.P.</i>	Frontal lobe processes.	<i>S.A.D.</i>	Second antenna distal part.
<i>L.</i>	Labrum.	<i>S.A.P.</i>	Second antenna promimal part.
<i>L.B.</i>	Labium.	<i>S.S.</i>	Sensory spines.

anterior margin of the carapace. This joint, as well as the third and fourth joints, bear three simple sensory spines of varying lengths as well as eleven long plumose setæ on the anterior aspect of the appendage. Each plumose seta projects forwards and curves outwards to its sharp tip. In addition to these the fourth segment bears posteriorly on its outer edge, a long plumose seta. The fifth, sixth and seventh joints form the more slender, less armed distal part of the antenna. Each joint is of a tapering form and bears on its outer edge two short horizontal spines. The terminal joint bears two long setæ set close together. *The second antenna* is of two halves hinged and folded. The proximal two jointed part is attached behind the

base of the first antenna and is directed inwards so that the distal part is folded outwards. This part also consists of two joints of which one forms the bend or hinge. It is swollen, rounded and bears a short slender spine directed obliquely forwards and inwards. The fourth joint consists of a short cylindrical body to which a number of slender strips and about five long setæ hooked at their distal sharp tips are attached. These slender chitinous strips which are fused spiral-wise on the joint bear numerous teeth

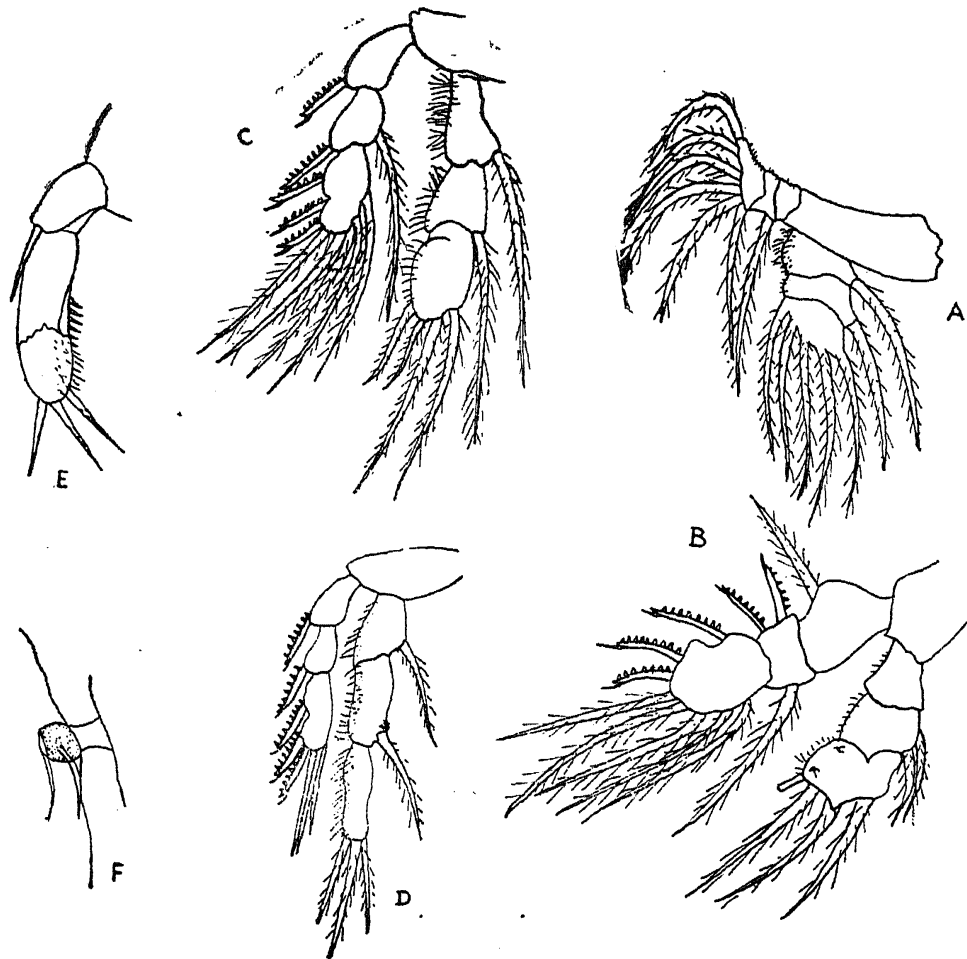


FIG. 3. *Bomolochus acuta* n. sp. Thoracic appendages (not drawn to scale).

- |                    |                               |
|--------------------|-------------------------------|
| A. First thoracic  | D. Fourth thoracic            |
| B. Second thoracic | E. Fifth thoracic             |
| C. Third thoracic  | F. Sixth thoracic (vestigial) |

closely packed together and provide rough surfaces which help adhesion. Between the rounded inner ends of the second antennæ, the obovate labrum is attached. On either side of this upper lip in front of the labium are arranged three appendages on each side. Of these the mandibles are most anterior and closest to the labrum. It consists of a basal joint bent backwards, a middle joint with two rounded articular knobs at the base, as well as a distal cylindrical tapering portion. There is no palp and the terminal

joint is destitute of setæ. *The first maxillæ* are three jointed; a stout cylindrical muscular portion directed inwards, is followed by a similar second joint. The third part is bulbous and bears four long stiff plumose setæ directed backwards in different directions as well as a short setose palp-like body. *The second maxilla* consists of a two articulated basal part and a bipartite distal part. The two rami are directed medially. One of these is sharp pointed while the other is blunt tipped, both being setose. *The maxillipedes* are three jointed. The basal joint is attached to the ventral surface of head behind the second maxillæ but is turned outside mouth parts in such a way that the rest of the appendage appears not only outside but also anterior to the other mouth parts. The second joint is roughly triangular in form, the inner proximal corner of which bears a slender sharp claw. The third joint is formed by a sigmoid curved stout claw directed backwards. This claw bears two sharp teeth at its second bend and ends in a sharp point. To the base of the claw are attached two plumose setæ one directed outwards and the other inwards.

*Thoracic appendages.*—The first are flattened and biramous. The basal joint is long. The exopod is three jointed and bears seven long plumose setæ; one on the second and six on the last joint. The endopod is also three jointed, the first and second joints bear one plumose seta each, while the third bears five plumose setæ. The second, third and fourth pairs of swimming feet also are biramous but are less flattened. In each leg the basal joint is single and supports both the exopod and endopod. The endopods are clearly three jointed while the exopods are really four jointed but, owing to the fusion of the last two joints, appear three articulated. The joints are covered with hairs and bear a number of spines and setæ which are distributed as follows:—

II Endopod 0-1, 2-2, 1-3; II Exopod 0-1, 2-1, 3-6; III Endopod 0-1, 0-1, 2-2; III Exopod 1-0, 1-1, 3-5; IV Endopod 0-1, 0-1, 2-1; IV Exopod 1-0, 1-0, 3-3.

The fifth leg differs from the foregoing four in being uniramous as in all Ergasilids. They are smaller but are clearly three jointed. A well marked basal joint bears a long slender spine at its outer distal margin. The second joint is twice as long and bears a number of teeth on its inner aspect and the third joint is short, rounded, setose and bears three spines at its distal tip. The sixth leg is vestigial, consisting of a papilla and two slender spines.

Of the six thoracic segments the first has fused with the head to form the cephalothorax, the remaining five being distinct and free. The first of these is as broad as the cephalothorax but has a markedly convex hinder border

so that the next segment which is a third in width is articulated to its narrow posterior hump. The third segment resembles the second in being ellipsoidal but smaller being only two-thirds in width. The fourth segment is much narrower, being only half the breadth of the third. But its posterior edge being wider leads up to the slightly wider, genital segment. To the sides of this segment are attached the two long cigar-shaped egg sacs 1.32 mm. in length. These egg sacs are broadest at the anterior end being 0.17 mm. and taper posteriorly to a blunt point. Each egg sac contains about six to seven longitudinal rows of eggs, each row consisting of eighteen to twenty eggs.

*The abdomen*:—is three segmented and is of such a tapering form that the third segment narrows to nearly half the width of the first. Two anal laminae, each bearing a short slender plumose seta on the outer side and a couple of spines on its distal margin are attached to the last segment. To the tip of each lamina are attached two long plumose setae as long as the abdomen and anal laminae put together. Of the two, the inner is slightly longer.

*Systematic position*.—This parasite clearly belongs to the genus *Bomolochus* (of the sub-family Bomolochinae) since all the thoracic segments except the first are distinct and freely movable and the basal joints of the first antennae are enlarged, flattened and densely armed. According to Wilson's artificial key, the maxillipedes being turned forward outside the other mouth parts, appears to be significant. The terminal claw on maxillipedes being sigmoid in shape and bearing two more teeth, the exopod of the first swimming leg having three joints of which the two terminal joints bearing plumose setae and the free thoracic segments being of decreasing width, emphasise the resemblance to *B. exilipes* n. sp. Wilson. The present form, however, differs from this species in having only two plumose setae (and not three) on the maxillipedes; the first maxilla having four plumose setae (and not three); the first antenna being indistinctly segmented into seven and reaching far beyond the lateral margins; and the second antenna having shorter claws on its inner elbow. A comparison with forms hitherto recorded from the Indo-tropical area is made difficult owing to the incorrect descriptions and inaccurate sketches given by earlier authors. Of the species recorded from the Indo-tropical waters, the following eight species have been compared:—(1) *B. gracilis* found on *Zygæna malleus* Java (Heller, 1865), (2) *B. tetodontis* found on *Tetrodon oblongus* Bombay (Bassett Smith, 1898), (3) *B. chætoessi* found on *Chetossus* sp. East Indies (Kroyer, 1863), (5) *B. unicirrus* found on *Amphisile scutata* Ceylon (Brian, 1902), (6) *B. megaceros* found on *Stromateus cinereus* Bombay, Colombo and on *Caranx djedaba*

Aden (Bassett Smith, 1898 and Heller, 1865), (7) *B. tricerus* found on *Stromateus cinereus* Bombay (Bassett Smith, 1898), (8) *B. denticulatus* found on *Sphyræna jello* and *Hemirhampus far*. Of these two have been included by Wilson in a new genus *Irodes* the next three species have been removed to the new genus *Artocolax* (Wilson). The remaining three species differ from the present species in the following features. *B. denticulatus* differs in having the second free thoracic segment globose, longer than the first and bending the body at regular right angles; second antennæ having three terminal spines; the exopod of first leg being two jointed; the body being 3-4 mm. long; the egg sacs being as long as the whole animal and the frontal plate being semilunar, bearing two pedicles. *B. megaceros* is distinguished from the present species in being 4 mm. long; the first antenna having thirteen plumose setæ and three spines; the second antennæ bearing four spines; the sigmoid claw of the maxillipede bearing a single tooth; the second free thoracic segment being as broad as the first free thoracic segment; and in the number and distribution of the denticulate spines, simple spines and plumose setæ. *B. tricerus* differs from the present form in possessing a very long pointed rostrum (not shown in figure); first swimming leg having a single jointed exopod bearing five plumose setæ and an endopod consisting of two joints; the second, third and fourth thoracic legs having no denticulate setæ and the anal lamina bearing a single strong bristle, two short lateral hairs, and a minute hair on outer border.

The present species can be distinguished from others in the following features. All free segments of the thorax except the first being distinct and uniform; a folded rostral plate bearing two processes; the first antenna having seven joints; the maxillipede bearing a sigmoid claw with two teeth and two plumose setæ; the exopod of second, third and fourth legs bearing denticulate spines, the exopod of first swimming leg being three jointed; the second antenna bearing five hooked spines; Hence the present species is described as a new species *Bomolochus acuta*. The type form will be lodged in the Indian Museum, Benares.

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