

**SYNESTIUS CALIGINUS STEENSTRUP & LUTKEN, A COPEPOD
PARASITE OF THE GREY POMFRET**

*By C. P. GNANAMUTHU, M.A., D.Sc., F.Z.S., Director, University Zoology
Laboratory, Madras.*

The genus *Synestius* with the genotype, *S. caliginus* was established in 1861 by Steenstrup and Lutken on the basis of females found on the gills of grey pomfrets (*Stromateus niger*) from South India. Except for Heller's (1868) record of the species occurring on the gills of *Stromateus argenteus* from the Indian Ocean, there has been no subsequent record or description and the male has remained unknown. The author of the present paper, collected over sixty-five mature females, eight immature females, fifteen mature males and four chalimi from fifteen pomfrets. The male is described here for the first time. A full account of the female (the holotype) is also given in this paper as the sketches and description given by Steenstrup and Lutken are incomplete and out of date.

The author thanks Prof. T. L. Tuxen of Copenhagen University for Steenstrup and Lutken's monograph and Miss H. Dalsgaard for translating relevant passages.

THE FEMALE.

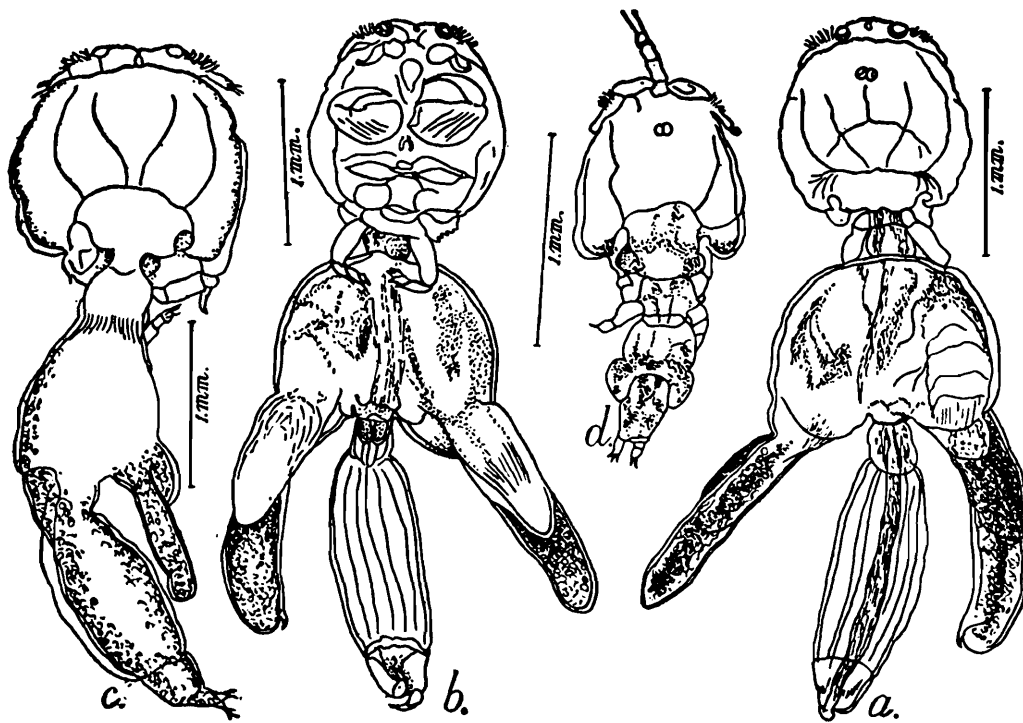
All the parasites were found buried head foremost between the bristles which form a brush-like pad on the roof of the buccal cavity and not one was found on the gills.

Size.—The mature forms were nearly of the same size. Total length of the largest was 4.3 mm.; the cephalothorax 1.2 mm.; the genital segment 1 mm.; the abdomen 1.4 mm.

External appearance.—The general appearance is caligine. The cephalothorax is of a circular form, with the nearly straight hind margin broken by two deep notches, so that the central part forms about a third of the entire breadth. This hind edge of the carapace extends over the fourth segment to some extent and makes the waist appear shorter than in the male when viewed from the dorsal side. The carapace is marked by the caligine pattern of grooves and a double median pinkish eye. The frontal area is delimited by a well-defined transverse groove. The lunules are small, shallow. The cephalothorax is markedly convex above and concave below. The cephalothorax is followed by a waist which is only 0.3 mm. broad. This waist is formed partly by the fourth free segment but mainly by a constricted anterior extension of the broad genital segment. The genital segment proper is 1.4 mm. broad and 1 mm. long. All its sides except the posterior are convex. The two posterior corners are prolonged ventrally to bear two pairs of processes or laminae. Of the two laminae on each side, one is dorsal, cylindrical and long while the other is more ventral, flat, shorter and broader. The broad, flat proximal end of the lamina is so obliquely attached that ventrally the attachment extends more forward.

The abdomen is attached to the dorsal edge of the posterior side of the genital segment. Just ventral to its attachment there are two narrow transverse folds of the skin between which are located the orifices through which the eggs descend into the sacs immediately behind. The vulvae are situated more medially. Two circular spermatophores are usually seen attached to the ventral skin fold close to the vulvae.

The abdomen is cigar-shaped, 1.8 mm. long, being longer than the genital segment. It is two-segmented, the anterior segment is 1.5 mm., and the posterior, 0.3 mm. long. A constriction in the anterior third of the first segment helps to twist the abdomen from its position in a dorsal direction making room for the coils of the stout egg strings. The terminal segment bears two anal laminae. Each lamina is elliptical and carries four plumose spines of which the outer most is shorter than the other three, and the inner second is the longest. The eggs are large, biconvex and circular being 0.22 mm. in diameter and 0.12 mm. in thickness.



TEXT-FIG. 1.—*Synestius caliginus* Steenstrup and Lutken.

a. Dorsal view of female; b. Ventral view of female; c. Dorsal view of immature female; d. Dorsal view of chalimus female.

The shape and size of the genital segment characteristic of the adult female is attained during maturity as has been noted by the author in other caligines. In the immature form, the genital segment is much narrower in front than behind and the neck-like constriction, so conspicuous in the adult female, is not differentiated and the general outline of the genital segment resembles that of the male more than that of the mature female (the cephalothorax is proportionately much larger than in the adult) and the posterior laminae are much shorter.

Appendages.—The first antenna is two-jointed. The base is stout and bears a dorsal row of about twelve plumose setae and a ventral

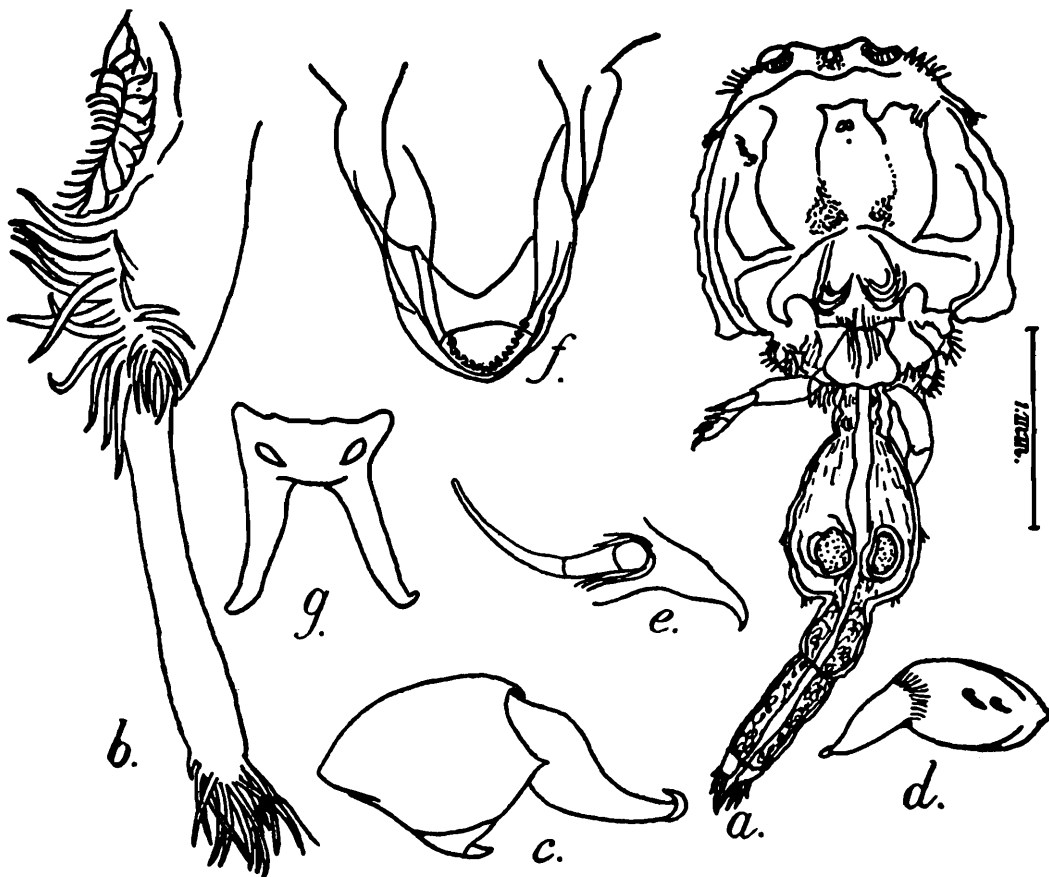
row of as many shorter spiny setae. The lunules are small, shallow. The adhesion appears mainly due to the sucker action of the cephalothorax. The distal segment is more than twice the length of the basal. It is club-shaped and bears twelve spines at the free tip. The second antenna is three-jointed. The proximal joint is long and conical. The second joint is large and stout. A long thick claw forms the distal joint. The mouth tube is broad and conical. Through the anteriorly directed mouth opening, the scythe-shaped, finely-toothed mandibles can be seen. The first maxilla is a simple, short, thick, curved spine situated close to the outer margin of the carapace. On its stout cylindrical base are two aborted setae. The second maxilla is a long sharp spine to the broad base of which is attached a long jointed palp. The first maxillipede is a long, slender, two-jointed appendage. The proximal joint is shorter than the distal which folds like the blade of a pocket-knife and ends in three long claws. The second maxillipede is stout, muscular and two-jointed. The basal joint is large and swollen and bears the distal, long, sharp, curved claw. The furca is of two short, slightly divergent, blunt-tipped rami.

The first leg is uniramous. The protopod is short and bears a jointed spine on the hinder aspect of the distal edge. The exopod is two-jointed. The first joint is long and has its posterior border densely fringed with bristles and bears a short spine on the outer corner of the distal edge. The second joint is of the typical 'hand' form bearing three long spines distally, one on the corner and three plumose setae on the posterior edge. The second leg is biramous. The basipod is two-jointed, consisting of a short base with a plumose seta and a longer, stouter second joint. The exopod is composed of three unequal joints. The first is long and bears a plumose spine. The second is short and bears two plumose spines and a long plumose seta; and the third flattened distal joint bears two spines and six plumose setae. The endopod is three-jointed. The first joint bears a plumose seta on its inner edge and a short curved spine on its distal edge. The second joint bears two plumose setae while the third bears six. The third leg is biramous. The protopod is foliaceous and bears a plumose seta as in all caligines. The exopod is three-jointed. The proximal joint is extremely short and bears a large, stout, curved spine. The second joint is fringed with hairs on its outer edge and bears a large plumose seta on its inner edge; and the distal joint bears three spines on its distal outer corner and four plumose setae on the free margin. The endopod is two-articled. The first is short and bears a plumose seta on its inner side while the larger, flat, circular, distal joint bears six plumose setae. The fourth leg is uniramous. The basipod is long cylindrical and stout and the exopod is three-jointed. The outer distal corners of the first two joints end in sharp curved spines while the distal edge of the last segment bears a very short spine on its inner corner and three longer spines increasing in length from the outer to the inner corner. The fifth and sixth are represented by clusters of four and three spines, seen on the ventral surface of immature forms, with no egg-sacs and long posterior processes to obscure them.

THE MALE.

Of the fifteen males collected, twelve were taken from nine small pomfrets and only three were from six larger fish. It is probable that both sexes first enter the young fish and that the males disappear when the fish grow larger, leaving the longer-lived females. All the males were found, contiguous to the females.

Size.—The males are 3—3.5 mm. long. In a male 3.5 mm. long, the cephalothorax was 1.4 mm., the free segment 0.3 mm., the genital segment 1 mm. and the abdomen 0.84 mm.



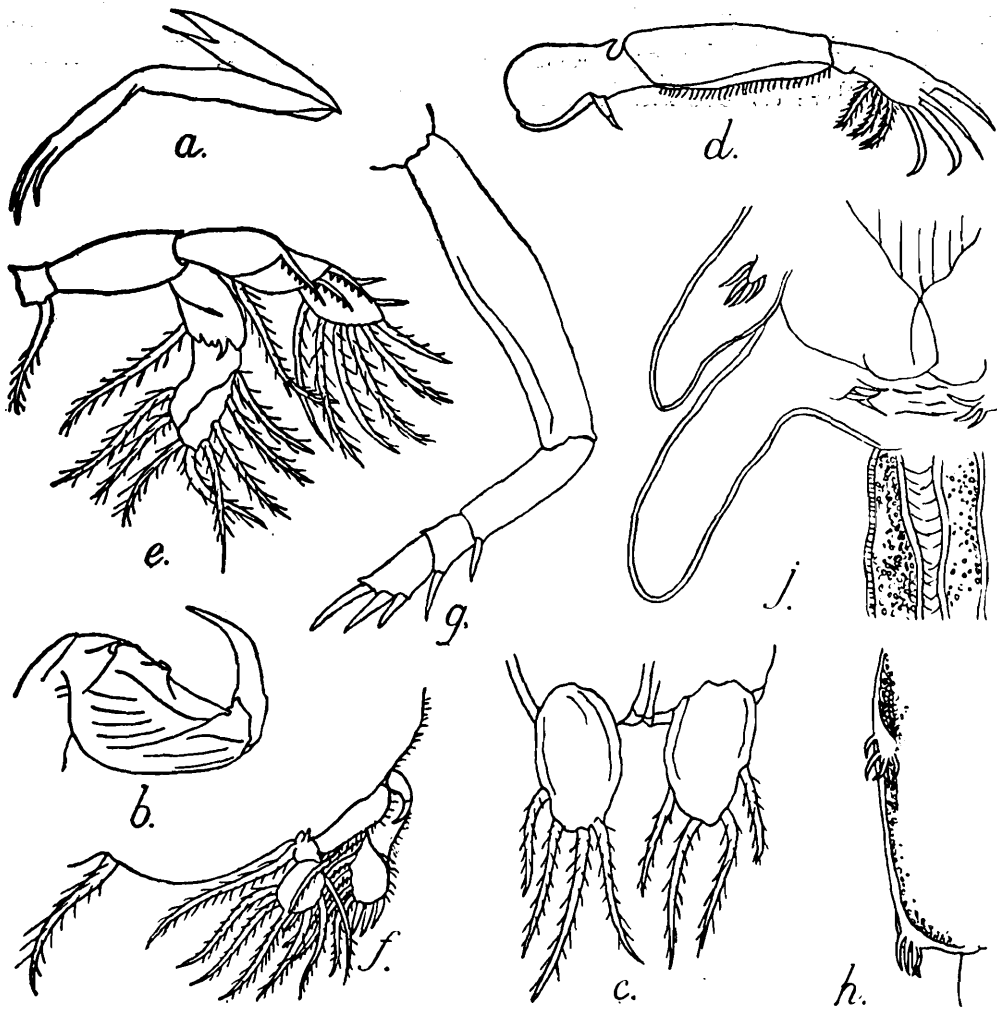
TEXT-FIG. 2.—*Synestius caliginus* Steenstrup and Lutken.

a. Dorsal view of a male; b. First antenna in dorsal view; c. Second antenna; d. First maxilla; e. Second maxilla; f. Mouth tube; g. Furca.

The cephalothorax is nearly circular but has a truncated straight hind border so that the length is slightly less than the breadth (1.5 mm.). The cephalothorax strongly resembles that of the immature female both in its being larger than that of the adult female and in the truncated appearance of the hind margin. The groove marking off the frontal plate, the notches on the hind border, the lunules, the median eye and the markings of the carapace are as in the female. But the posterior margin of the cephalothorax does not extend over the free segment which therefore gives the body the appearance of a longer waist than in the female. The free segment is more clearly defined, rhomboid in form, the front edge being half the breadth of the hind edge. The genital segment is like a flat-bottomed conical flask, the neck being half the width of the base and the two sides convex, the maximum width (0.65 mm.) being about a third of the length from the hind margin. The neck of the genital segment is about a fifth of the length and being

narrower than the free segment, adds to the slender appearance of the male. The abdomen is nearly as long as the genital segment. It is two-segmented as in the female but the first segment is shorter than the second. The anal laminae are as in the female.

Appendages.—Except for the first antennae and the second antennae being larger proportionately, the appendages are exactly alike in both size and structure, the resemblance being obvious even in the number of setae of the first antenna and the swimming feet. The fifth and the sixth legs, however, are noteworthy. At about a third of the length from the hind margin, where the genital segment is broadest is seen a tuft of five long curved bristles, the vestiges of the fifth leg, and further down at the posterior corner of the genital segment is a cluster of four spines representing the sixth leg.



TEXT-FIG. 3.—*Synestius caliginus* Steenstrup and Lutken.

a. First maxillipede ; b. Second maxillipede ; c. Anal laminae ; d. First swimming leg ; e. Second leg ; f. Third leg ; g. Fourth leg ; h. Vestiges of the fifth and sixth legs ; j. Vestiges of the fifth and sixth legs of female.

REMARKS.

Apart from the circumstantial evidence of all the males being found close to the females on the same part of the body of the same host fish, the close correspondence of structure between the two sexes and the spermatophores seen within the male being of the same form as those

found deposited on the females show that the males and the females belong to the same species *Synestius caliginus*. The possession of two pairs of laminate processes on the larger swollen genital segment of the female, has been defined as the chief characteristic feature of the genus *Synestius*. In view of the absence of these processes in the male now presented, the generic diagnosis originally given by Steenstrup and Lutken, must be modified to include a statement of the sex difference. The description of the male, given here for the first time, completes the species diagnosis.

REFERENCES.

HELLER, C., 1868.—*Reise der Novara*, II, Abt. III, pp. 175 ; 179.

STEENSTRUP & LUTKEN, 1861.—*Bidrag Til Kundskab om det aabne Havs snt ltekrebs og Lerneer-Kongelige Danske Videnskavernes selskabs Skrifter 5te Raekke* Copenhagen.