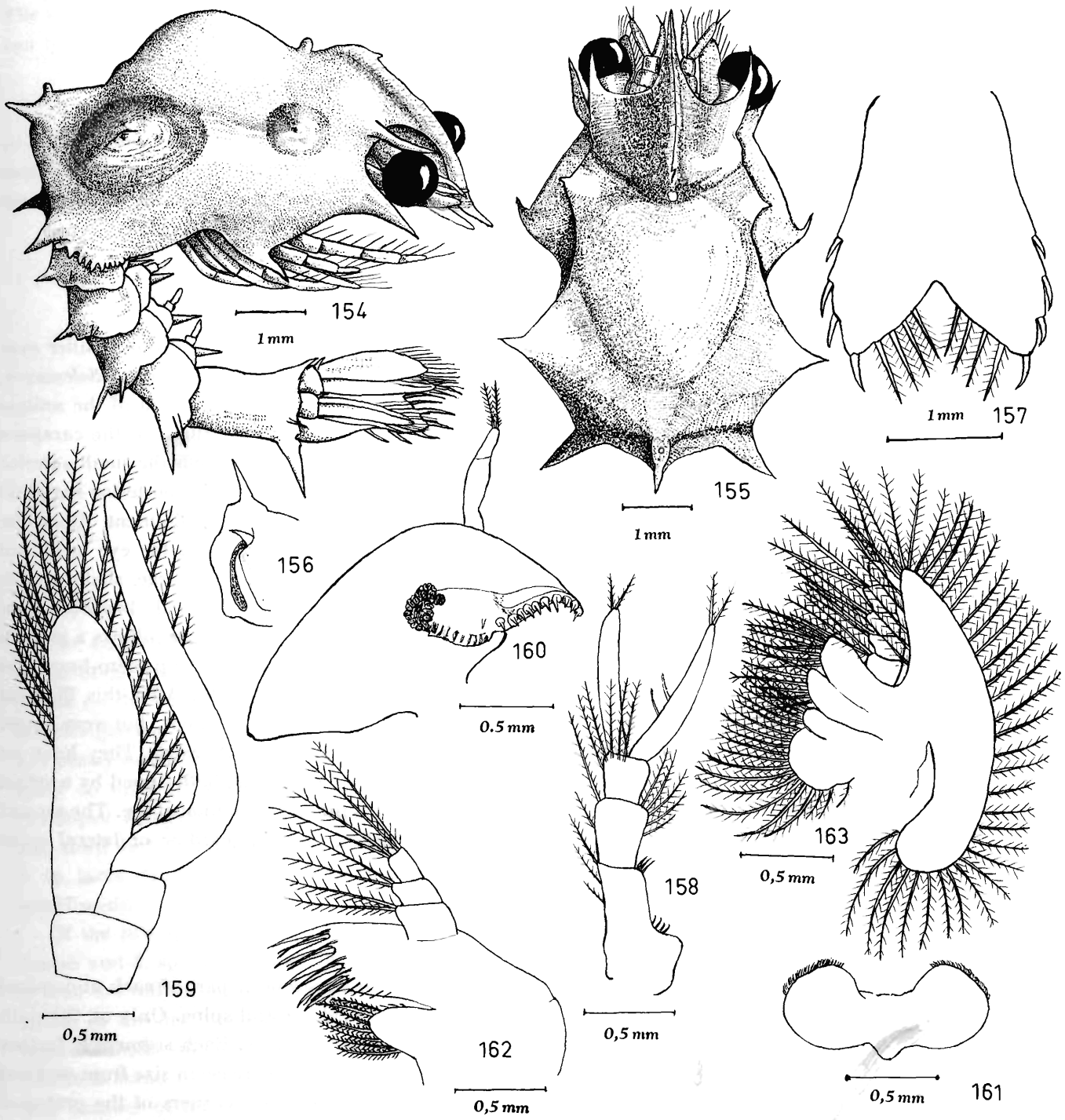
Telson.

The telson is different from that of the other larvae here described, more flattened and much wider, with an open, not very deep, furcal incision, which makes the furcal branches short and leaf-shaped. Inside the furcal cleft are four plumose setae on each side, and one short spine is tipping each branch. Three equally long spines are placed with about equal intervals along the distal half of the lateral margin with the proximal one off the bottom of the furcal cleft.

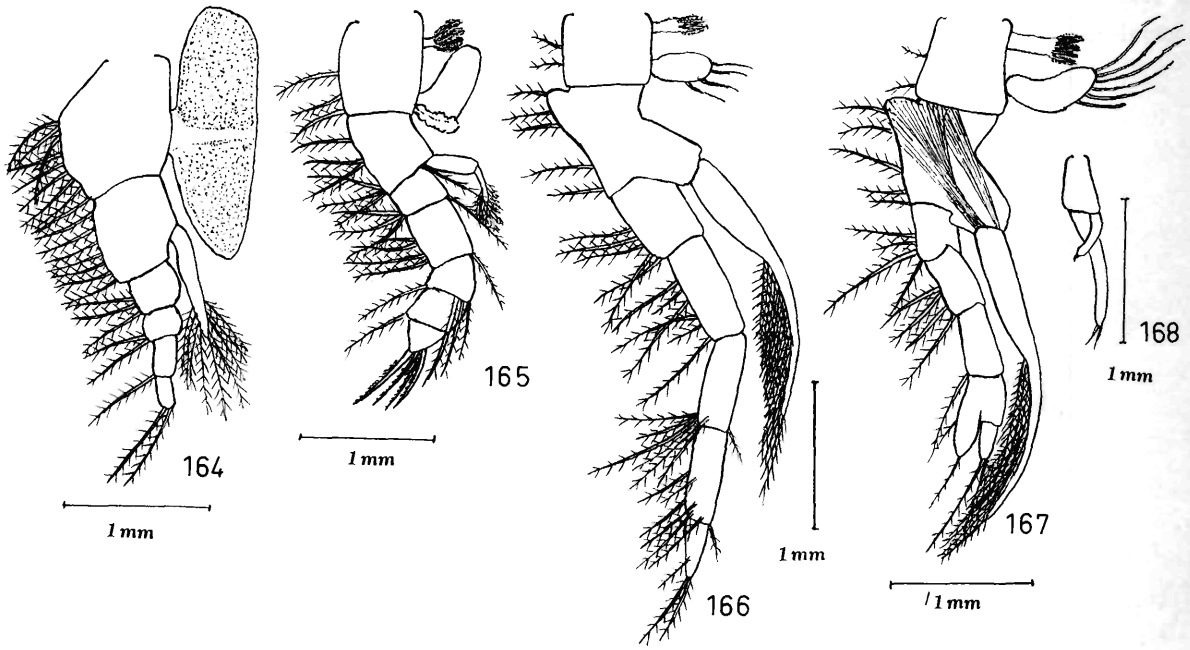


Figs. 154–163. *Solenocera* sp. larva *nodulosa*. Second Mysis. Fig. 154, larva from lateral. — Fig. 155, larva from dorsal. — Fig. 156, first abdominal segment with lateral process. — Fig. 157, telson. — Fig. 158, first antenna. — Fig. 159, second antenna. — Fig. 160, mandible. — Fig. 161, labium. — Fig. 162, first maxilla. — Fig. 163, second maxilla.

Appendages.

The first antenna has a three-jointed protopod with the basal joint about as long as the two following joints together. No statocyst is developed, but the process and the concavity for its future incavation are present with short hairs where the opening is going to be. Stiff setae are placed along both sides of the protopod. The last joint is tipped with two relatively short, still unjointed flagella, the lateral one has a few olfactory hairs along its inner margin. Both flagella are tipped with two short setae.

The second antenna has a short protopod and an antennal scale with setae on the whole medial and distal margins and half way down the lateral margin. The disto-lateral spine is not yet developed. The absence of this spine and the setae halfway down the lateral margin of the antennal scale are unusual features. The endopod consists of one short joint and one longer, unjointed flagellum.



Figs. 164–168. *Solenocera* sp. larva *nodulosa*. Second Mysis. Figs. 164–166, first, second and third maxillipedes. — Fig. 167, first pereiopod. — Fig. 168, first pleopod.

The labium is stout and square. The labrum consists to each side of an arm and a plate, so that the latter can be moved below or laterally of the mouth and up to the labium and the mandible.

The mandible is very large with strong muscles. The incisor part of the corpus mandibulae is well developed with about ten pointed teeth in a line followed by a large pars molaris forming an actual chewing-lobe. The mandible has a two-jointed palp of which the proximal joint is by far the longest and rather swollen. The distal joint is short, much more delicate and tipped with two short setae.

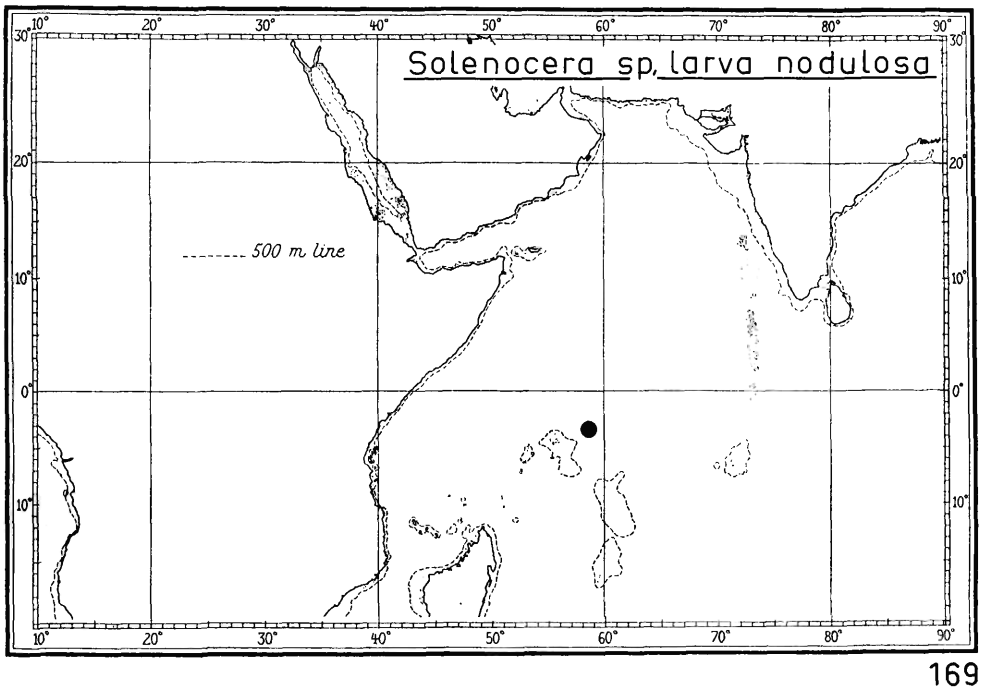
The first maxilla is of the strong carnivorous type with a mandibular basi-endite with teeth placed in two lines and behind these a line of stiff setae, which continues along the free margin of the posterior part of the lobe. The coxa-endite is much smaller and has stiff, plumose setae to brush up against the teeth of the basi-endite. The endopod is of the usual three-jointed type.

The second maxilla has four well-shaped endital lobes on the protopod, a five-jointed endopod and a large exopod with one long anterior and one long posterior lobe, the latter is very large. On the endites and the exopod is a dense brim of plumose setae, and the endopod has the usual two plumose setae on each joint.

The first maxillipede has the usual two-jointed protopod developed into a high bar with many setae on the medial margin. On the coxa is one very large mastigobranchia with an anterior and a posterior lobe. The endopod is small and four-jointed. The exopod is very small and not of any use as a swimmeret.

The second maxillipede has also a strong two-jointed protopod, however, not nearly as high as that

of the first maxillipede. On the coxa is placed both a mastigobranchia and a podobranchia. The mastigobranchia is divided into two parts, a distal lobose and a proximal leaf-shaped section. The following appendages have only the leaf-shaped section of the mastigobranchia, but on each of them extends from the distal margin of the gill a group of long, thin and hairy setae. The podobranchiae are also different from those in the other species by missing a stem running through the whole gill, they consist of a short, thick peduncle from which extends a line of short gill-filaments. This special type of mastigobranchiae and podobranchiae is remarkable and very characteristic, and is among the here or elsewhere described larvae of *Solenocera* only known for *S.* sp. larva *sumatransis* and *S.* sp. larva *nodulosa*. I think this gill-development must be a



169

Fig. 169. Map of distribution.

generic character which separates these two species from the rest and unites them in one group. When more *Solenocera* larvae are known it may turn out to be a much more common feature than the present knowledge suggests. The endopod is five-jointed, and the last three joints form a sort of hook as the second and third endopodial joints are very movably connected so that the three distal joints can be bent towards the proximal joints. The exopod of the limb is very small and rudimentary, just hanging as a small appendix to the limb.

The third maxillipede has a two-jointed protopod. The coxa has a mastigobranchia furnished with long, hairy setae at its distal margin and proximally of it a podobranchia. The third maxillipede and all the following thoracopods have a basis with a characteristic lobe from its basal medial corner. This lobe serves as a fastening for the swimming muscles of the exopod which are extraordinarily well developed in this species. In spite of its clumsy and bulbous carapace this larva must be a very good swimmer because the exopods, their swimming setae and adductor muscles are very strongly developed. The endopod of the third maxillipede is five-jointed as common for this appendage. The following three thoracopods have each a chela on the five-jointed endopod, but the chela has still long setae and is not yet in proper function. The fourth and fifth pairs are without chelae. The first four thoracopods are furnished with a mastigobranchia and with the podobranchia of the type for the species as described above. The fifth thoracopod has no gills.

The pleopods are short with an unjointed protopod, and an unjointed exopod and endopod, the two latter are tipped with embryonic setae. The exopods are much longer than the endopods. This difference in length is strongest for the first pleopod and descreases gradually backwards so that on the fifth pleopod the lengths of the two branches are nearly equal.

Dimensions:

Total length 14 mm; length of carapace 6 mm; width of same 4 mm; length of rostrum 2 mm; length of abdomen 5 mm.

Distribution and Remarks.

Fig. 169.

This species was found by "Dana" on a single station a little north of the Seychelles in the Indian Ocean. It is a most remarkable animal with its six large, conical bulbs on the carapace and the flattened leaf-shaped telson. Also the limbs differ a little from those of most of the other species. The mandible is very large with single, very pointed, conical teeth in the incisor part. The mastigobranchia of the first maxillipede is extremely large like in the later stages of *S.* sp. larva *sumatransis*; from the third maxillipede to the fourth thoracopod the mastigobranchiae have long, flexible hairs. The podobranchiae, when present, have a short shaft from which extends a line of gill filaments. The same type of gills is also found in *S.* sp. larva *sumatransis*, but in no other of the investigated species.

Solenocera sp. larva *elongata*

Figs. 65, 170–180.

Localities.

Protozoea III.

"Terra Nova" St. 43. 22°06′ S–39°40′ W. Surface. 3.5.1913. B.M. 2 spec.

Description.

Protozoea III.

Figs. 170–180.

Carapace.

Formula: 2. 3. 5. 7. 10. 11*. 12. 13*. 15. 16*. 18. 19. 22. 23. 24. 25. 28. 29. 30.

This is the smallest of the species described in this paper with a total length, including rostrum, of 3 mm. The carapace is slightly longer than wide or the length and width are the same. Usually in the third Protozoea it is wider than long. This is the more remarkable as there either is no rostral plate or the rostral plate is only a very narrow ledge in front of the carapace, hardly to be termed a plate. The dorsal organs are unusually well-developed and the anterior one is a very long, cylindrical tube a little wider at the end than at the base. The name *elongata* is partly referring to the length of this organ. Also the rostrum is very long, 0.8 mm, compared with the rest of the body, and strongly barbed like all the spines of the carapace, as also in the following species described, *Solenocera* sp. larva *barbata*, which it resembles also in many other aspects, one could say that these two species although their localities are wide apart together form a group judged from the Protozoea only. The pair of supra-orbital spines is very large reaching forward about to the same line as the tips of the rostrum and the first antenna. The rostrum is nearly twice as long as the supra-orbital spines, but these are more straightly pointing forward, whereas the rostrum is strongly bent ventrally. The antennal process is placed behind the supra-orbital spines, and is rather short and tipped with long, filamental teeth, in the following stage it will be replaced by the antennal spine. About midway, still at the margin of the carapace, are two branchiostegal processes, rather dominant and long, both with a toothed marginal brim. In front of the anterior process, two filamental teeth are placed directly on the margin of the carapace. On the postero-lateral corner is a pair of process-like spines, the latero-posterior marginal spines, these are long, pointed and barbed mainly at their lateral side. This and the first Mysis of *S. muelleri* are the only species of the known *Solenocera* larvae with a spine in this place. Therefore, this spine can—as long as future research does not reveal its presence in other species—be considered as characteristic for these two species.

Above the latero-posterior marginal spine is a comb-shaped postero-branchial groove spine still extending from the margin, and from the base of the spine the branchio-cardiac groove runs forward for the posterior third of its length or a little less. In the comb of the postero-branchial groove spine the main part of the teeth are placed along the dorso-anterior margin and only a few at the ventro-posterior margin. Finally posteriorly on both sides of the medial line of the carapace a pair of medio-posterior marginal spines extends from its margin. These are, as always when present in the third Protozoea, tipped with long filamental teeth, but in this species these teeth are placed along the lateral side of the spine.

Inside the margin are several barbed spines. An unpaired epicardiac or dorsal spine, placed midway between the two dorsal organs, is present. Behind this spine are the following paired spines placed symmetrically to the longitudinal mid-line. Two spines on each side extending from the branchio-cardiac groove, named branchio-cardiac spines, or lateral spines, because of a possible homology between the dorsal spine and the lateral spines in the *Solenocera* and in the Zoea of the Brachyura, only the lateral spine in the Brachyura has been multiplied in number in the *Solenocera*. Behind the anterior dorsal organ are the pre-hepatic spines, postero-laterally of them the latero-hepatic spines, and finally the post-antennal spine between the latero-hepatic spines and the antennal process. The already mentioned filamental teeth include the teeth on the antennal process, the only two supra-antennal teeth placed immediately in front of the anterior branchiostegal process, further the teeth on these processes, the teeth on the latero-posterior marginal spine, the postero-branchial teeth, and the teeth on the medio-posterior marginal spines.

Abdomen.

Formula, segments I–V: 1. 2., segment VI: 1. 2. 4.

Of the usual six segments number six is twice as long as any of the others. Each of the first five segments has a long curved dorsal spine which increases in size backwards for each segment. All six segments have a pair of long backwards curved lateral spines, also these spines increase in size posteriorly. Only on the sixth segment is also a pair of shorter ventro-lateral spines.

Telson.

The furca is very open, about 145°, with a convex arch at the bottom of the cleft. The plumose setae are eight on each branch, four on the inner margin, two at the distal end, and two on the lateral side close to the tip of the branch.

Appendages.

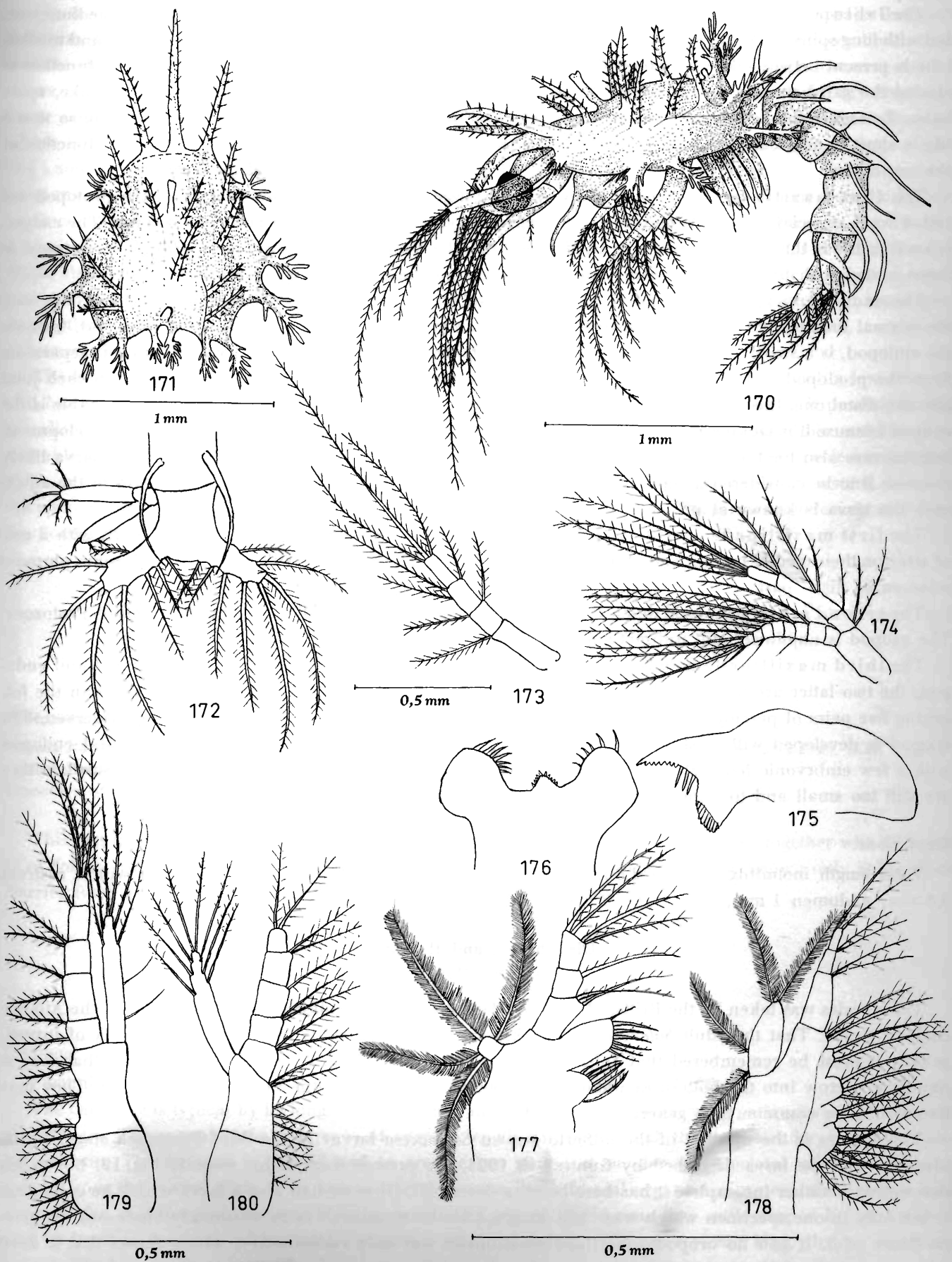
The first antenna consists of the usual four joints in this stage, the basal joint is the largest. The setae are unusually long and flexible especially the most distal one, and their numbers are on the lateral side 1, 1, 2, and 3 at the tip, on the medial side 0, 1, 1.

The second antenna is also furnished with long and flexible plumose setae. The protopod is unjointed. The endopod consists of three joints, but judging from the setae and their placement—two setae extending from a little bulb halfway up the joint—the second joint is coalesced from two joints. The last joint is as usual tipped with five setae, only these setae are unusually long and slender. The exopod is divided into many small joints and provided with long and flexible swimming setae.

The labrum or upper lip is very large and as in the other *Solenocera* species shaped like a hollow, semiglobular cup. Whereas the other species have a short spine or none anteriorly on the ventral side, this species has here a long S-curved spine (Fig. 170), reaching down in front of the area of the mouth appendages.

The mandible is weak, but with a clear separation between the incisor and molar parts; the molar part has already a distinct chewing pad. Between the two parts are placed three long and movable teeth. As always in this stage no palp is yet developed.

Figs. 170–180. *Solenocera* sp. larva *elongata*. Third Protozoea. Fig. 170, larva from lateral with characteristic shape of labium with its large spine. — Fig. 171, carapace from dorsal. — Fig. 172, telson. — Fig. 173, first antenna. — Fig. 174, second antenna. — Fig. 175, mandible. — Fig. 176, labium. — Fig. 177, first maxilla. — Fig. 178, second maxilla. — Figs. 179–180, first and second maxillipedes.


171
1 mm
170
1 mm
172
173
0,5 mm
174
175
176
177
178
179
180
0,5 mm
0,5 mm

The labium or lower lip is also characteristic for this species. Its two lateral lobes are of medium size, but with long spiny comb-hairs on the inner margin. Further, only observed in this species, a third and median lobe is present between the two lateral lobes, this third lobe is very short and small, but it does function in closing the gab between the two lateral lobes, because its surface is covered with short papilla-like, spiny hairs. To secure the co-operation of all three lobes the basal part of the labium is relatively long so that it like a short handle can bring the three lobes together in the wanted position for supporting the function of the mandibles.

The first maxilla has the typical shape for this stage, only the two endite lobes on the protopod are rather weak especially the coxa-endite, and the setae on both endites are short and not yet spiny. The exopod is small (this is the last stage where it exists) and has the usual four very plumose setae. The endopod is three-jointed with two, one and four setae on the 1st, 2nd, and 3rd joints, respectively.

The second maxilla is a slender appendage with no clear division between coxa and basis, but with the normal four endital lobes, two belonging to coxa and two to basis. At the tip of the protopod, towards the endopod, is a small lobe with two setae, this may be the first endopodial joint without a clear separation from the prodopod in this stage. The endopod is only three-jointed and with only two setae on each joint also the distal one, this is a reduced stage for this branch in a third Protozoea. But more remarkable is the exopod because it is lacking the posterior directing lobe (Fig. 178). If this is not only a retarded development, but the case also for the following stages, it is together with the other diverging features in the larva likely to cause it to be considered a separate genus, the more so as these features surely will remain in the adult; only the larva is known at present. The exopod carries four plumose setae.

The first maxillipede consists of a two-jointed protopod and a five-jointed endopod, both with a row of setae on their medial margin and at the tip of the endopod. The exopod is still weak and with some plumose setae on its distal part.

The second maxillipede is much like the first one, only a little smaller as usual in the third Protozoea. The exopod is unjointed, still unfunctioning.

The third maxillipede is only a small bifurcate rudiment with unjointed protopod, exopod and endopod, the two latter are tipped with short, embryonic bristles, and the limb is not much larger than the following five pairs of pereiopods hanging down from the thorax as brushes. Pleopods were not observed. The uropod is developed with a short, unjointed protopod and a fleshy, sausage-shaped exopod and endopod with a few embryonic hairs at the tip. Although the uropods are placed at the side of the telson plate they are still too small and too undeveloped to be a functional part in the tail-fan.

Dimensions:

Total length including rostrum 2.8 mm, carapace 0.9 mm long and about the same in width, rostrum 0.8 mm, abdomen 1 mm.

Distribution and Remarks.

Fig. 65.

This species was taken by the British Antarctic "Terra Nova" expedition 1910 at station 43 off the Atlantic coast of Brazil. That the adult *Solenocera* is not known from this locality is possibly due to lack of investigation; it must be remembered that *Solenocera* never has been found in large numbers,* and that they at day time burrow into the bottom in water of 300–800 m, where very little investigation is done. They may be much more common than generally assumed.

This species is the smallest of the hitherto known *Solenocera* larvae in the third Protozoea stage, and is identical with the larva described by GURNEY in 1924, the present stage is his stage II Fig. 12, but as his description is rather incomplete it has here been re-described. GURNEY had also a larva which he calls stage I, but only in one specimen which was "too distorted for its structure" to be accurately made out, he gives no figure of it. It had no uropods, the third maxillipede was only rudimentary, which shows that it must

* After this paper has gone to press its author has located an area in the Mediterranean, near Naples with large quantities of *Solenocera membranacea.*

be the second Protozoea, if it is the same species as suggested by GURNEY, but against this speaks GURNEY's following remark "it is important to note that there is a pair of large spines on either side between the rostrum and the supra-ocular pair. These spines are branched like those of Sergestids and are lost at the next moult." There is only one *Solenocera*, *S. membranacea*, for which we know the second Protozoea or any *Solenocera* larva younger than the third Protozoea. In *Solenocera membranacea* are no such branched spines or spines which later are lost. On the contrary the numbers of spines remain the same or increase in later stages. We know of no *Solenocera* larva with branched spines, these are only known in Sergestids. So this problem must remain unsolved until more material is collected as unfortunately GURNEY's specimen seems to be lost.

GURNEY mentions in the same paper a third larva, which he calls stage III and figures in Fig. 13. It is a Mysis larva of the same species as the one in Fig. 12, and its length of 4.3 mm indicates that it is the first Mysis stage, but the development of the appendages and especially the uropods and the number of spines and hairs on the carapace, point to the second Mysis stage. As GURNEY, however, gives an incomplete description this can not be decided with certainty until another specimen can be examined, as also the existence of this specimen has not been possible to trace.

The larva of this species is of morphological interest. It is adapted to tropical waters with a low viscosity and has long spines and very long and delicate setae. With the median lobe on its labium it possibly is able to collect detritus, this is also indicated by the well-developed molar part of the mandible and the three movable teeth between the molar and incisor parts. Further this species has a larger latero-posterior marginal spine, a spine which hitherto only is known in the *S. muelleri* larva, also from Brasilian waters, but here the spine is only a small, vestigial process except in the first Mysis and in *S.* sp. larva *aequatorialis* also from the South Atlantic, but from the African side.

Solenocera sp. larva *barbata*

Figs. 181–192.

Localities.

Protozoea III.

"Great Barrier Reef" Exped. St. 46. 14°32′ S–145°32′ E. Inside Cooks Passage. Depth 33 m. 28.2.1925. B.M. 1 spec.
"Great Barrier Reef" Exped.: "Great Barrier Reef." (no further data) B.M. 3 spec.
Discovery St. 276. 5°54′00″ S–11°19′00″ S. 110–0 m, 5.8.1927 B.M. 1 spec.?

This last locality is given with a question mark. The specimen was found in a tube together with 17 Mysis II of *Solenocera membranacea* subsp. *capensis*. It is very unlikely for a species to be known only at the Great Barrier Reef Australia and at the Atlantic coast of Loanda, W. Africa.

Description.

Protozoea III.

Figs. 181–191.

Carapace.

Formula: 1. 2. 3. (4). 7. 10. 11*. 12. 13*. 15. 16*. 18. 20. 24. 25. 26. 27. 29. 30.

The carapace is typical by its long, barbed spines and the very large lateral wing partly covering the mouth appendages. The rostral plate is narrow, of average length and tipped with the long, slender, ventrally curving rostrum. The rostrum is barbed and so are the two long and slender supra-orbital spines, which also extend from the rostral plate at its antero-lateral corners. Both frontal organs are present, the anterior is of average size, but the posterior one is rather small and placed like a cone in a sattle-shaped bridge between and in front of the basis of the medio-posterior marginal spines. These are rather long, slender and have long, toothed filaments at their tips. The antennal spine is not yet present, but in its stead is a long lobe which not only is toothed as usually at the tip, but also furnished along the whole frontal margin forward to the

root of the antennal plate with long pointed, filamental teeth. Two of the branchiostegal spines are present, also not yet as proper spines, but as filamental lobes with teeth on their margins. The teeth do not extend posteriorly to the lobes as usually, but begin only on the carapace margin a little in front of the first lobe, and no teeth are found in the space between the two lobes. From the second lobe and back to the postero-branchial groove spine the margin of the carapace has a line of long, curved branchio-lateral spines which is characteristic for this species and not found in any other species dealt with in this or earlier papers. When other species have toothed spines in this place the spines are all in the shape of short, rounded teeth. The postero-branchial groove spine is long, slender and furnished with spine-shaped teeth on both sides so that the branchio-lateral teeth continue directly into the series of teeth of the postero-branchial groove spine. On the surface of the carapace inside the margin behind the anterior dorsal organ can be seen the beginning of a cervical groove. The dorsal or epi-cardiac spine is placed in the medial line midway between the two dorsal organs, it is barbed as all the other spines. Behind the antennal lobes, a little towards the mid-line of the carapace, is a pair of post-antennal spines, and a little farther back nearer the mid-line and the anterior dorsal organ is a pair of pre-hepatic spines. Postero-laterally of these are the supra-hepatic spines.

Abdomen.

Formula, segments I–V: 1. 2. 4., segment VI: 2. 4.

Of the six segments the last one is 2–3 times as long as any of the other segments. Each of the first five segments bears a dorsal spine, which on the first two segments is straight and extended at a right angle from the segment, but on segments three to five backwards curved. The dorsal spine of the second segment is very stout and larger than the other spines. The sixth segment is without a dorsal spine. All six segments have a pair of long lateral spines. These are all slender and, like the dorsal spines, barbed at their tips. A pair of ventro-lateral spines are present on all the abdominal segments, but they are very short except on the sixth segment where they extend ventro-laterally of the uropods.

Telson.

The telson-plate is shorter with a more closed furca than in the preceding species. The cleft of the furca is about 115° and has a small convex lobe at the bottom. Each branch of the furca is furnished with eight plumose setae. Four of these setae are placed on the median or inner margin of the branch, these four setae are decreasing in size towards the bottom of the cleft. The two longest of the eight setae are placed at the tip, and two other, a little shorter, laterally on the exterior side of the branch.

Appendages.

The first antenna is divided into the four joints as usual for the third Protozoea and with 1, 1, 2, 2 setae on the medial side and 0, 1, 1, 2 on the lateral side. The setae on the tip of the distal joint are placed in two groups.

The second antenna is also typical for the third Protozoea with its unjointed protopod. The exopod is also still unsegmented and provided with its swimming setae at the tip and along the more distal part of the medial margin. The endopod is also unjointed, but the setae on its medial margin indicate a division into four joints, as far as they are being placed in three pairs along the margin; five long setae are present at the tip.

The eye balls with the ocelli are of a globular shape, and the eye-stalk or base of the eye is a long cylinder with an only small ocular papilla.

The upper lip is semiglobular.

The mandible is rather small for the stage with a not yet clear division between incisor and molar parts in so far as the proper molar teeth are not yet developed on the molar part, which at this stage still is furn-

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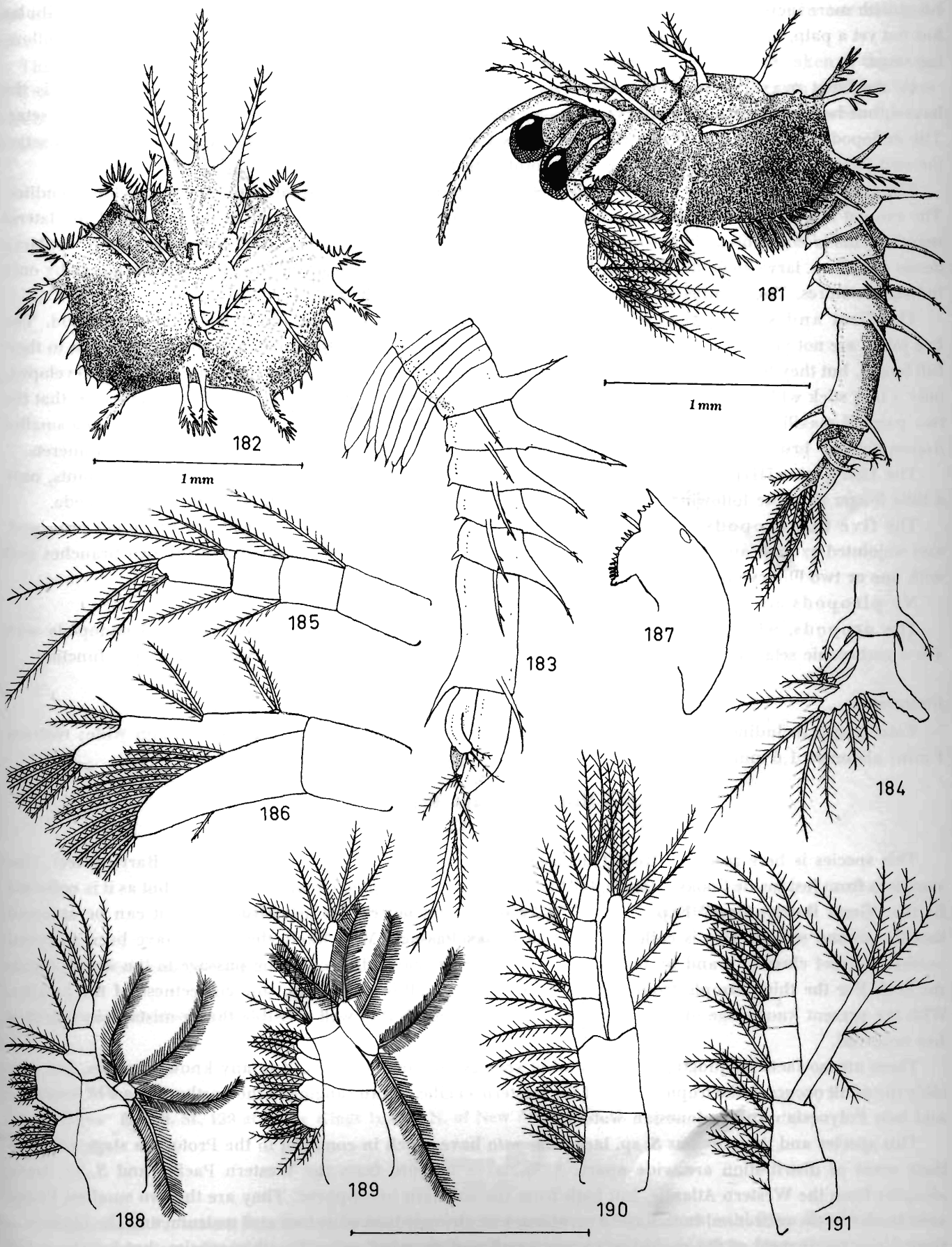
Figs. 181–191. *Solenocera* sp. larva *barbata*. Third Protozoea. Fig. 181, larva from lateral. — Fig. 182, carapace from dorsal. — Fig. 183, free thorax segments, abdomen and telson, all from lateral. — Fig. 184, last part of sixth abdominal segment with uropod and telson. — Fig. 185, first antenna. — Fig. 186, second antenna. — Fig. 187, mandible. — Fig. 188, first maxilla. — Fig. 189, second maxilla. — Figs. 190–191, first and second maxillipedes.


181
1 mm
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1 mm
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184
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0,5 mm

ished with more incisor-shaped teeth. Between the two parts is a single stalked tooth. The corpus mandibulae has not yet a palp, but a small impression can be seen on its surface where the palp will appear in the following stage.

Of the first maxilla the protopod is two-jointed with a coxa-endite and basi-endite, the latter is the largest, but both show a clearly embryonic stage. The exopod is vestigial, but has still all four plumose setae. The endopod is divided into the usual three joints for this larval stage. The proximal joint with two setae, the mid-joint with a single seta and the distal joint with four terminal setae.

The second maxilla has a two-jointed protopod, each joint has two small yet not well developed endites. The exopod is a small lobe with five, plumose setae: two on each end, and one at the middle of the lateral margin. This is the same as in *Solenocera membranacea* in the third Protozoa, but one more than *S.* sp. larva *danae* and *S.* sp. larva *elongata*. The endopod is long, slender and seems to be divided into five joints by only indistinct sutures. The number of the setae of the endopod are 3, 2, 2, 2, 3.

The first and second maxillipedes have a two-jointed protopod and a five-jointed endopod. The five joints are not yet very clearly seen on the second maxillipede, and the joints are not yet stretched to their full length, but they have already many marginal setae. The exopods of the two limbs are even less developed, only a thin stick with a few, not yet functioning, swimming setae. It is clear, especially in this species, that the two pairs of maxillipedes have not yet taken on any of their proper functions. The endopod can to a smaller degree help by brushing the food to the mouth, but the exopods are not yet much worth as swimmerets.

The third maxillipede is only a small, rudimentary, two-branched limb without separate joints, only a little longer than the following thoracopods, see Fig. 183 where the first limb is the third maxillipede.

The five thoracopods are only very rudimentary as usual in this stage, with an unjointed protopod, and unjointed exopod and endopod, often without sutures between the protopod and the two branches and with one or two embryonic setae at the tip of the branches.

No pleopods are visible in this stage except the sixth pair.

The uropods, which consist of a short unjointed protopod and lobe-like exopods and endopods with a few embryonic setae at their tips, are placed at the side of the telson, but are still without any function.

Dimensions:

Total length including rostrum 4 mm; carapace without rostrum 1 mm long and 1.2 mm wide; rostrum 1 mm; abdomen 1,6 mm.

Distribution and Remarks.

Fig. 192.

This species is here recorded from Queensland in Eastern Australia, inside the Great Barrier Reef. One sample is from just inside Cooks Passage, for the other one is only stated Great Barrier Reef, but as it is collected by the "Great Barrier Reef" Expedition 1928–29 which did not collect in a wider area, it can be assumed that the second sample also is collected close to Cooks Passage. Most likely the larvae have been spawned outside the reef close to it and by the tide or other currents carried through the passage to the waters inside the reef. For the third sample from W. Africa one may be allowed to doubt the correctness of the locality. With the present knowledge of the species and the distribution it is well possible that a mistake in labelling has occurred.

There are no facts for judging to which adult species the larva belongs, if to any known species, but possibly the adult occurs in the tropical part of the western Pacific Ocean ranging to the northern coast of Australia and into Polynesian and Indonesian waters.

This species and the previous *S.* sp. larva *elongata* have much in common in the Protozoea stage although their areas of distribution are wide apart: *S.* sp. larva *barbata* from the Western Pacific and *S.* sp. larva *elongata* from the Western Atlantic, but both from the southern hemisphere. They are the two smallest Protozoea larvae in the collection, both have a carapace with strongly barbed spines and rostrum, and the filamental teeth along the margin of the carapace are not small and rounded as in the other species, but long, pointed

and awl-like. They have both like the following species two branchiostegal spines. It would be interesting to learn whether the Mysis stage will change the number up or down.

This larva seems to have much resemblance to FRITZ MÜLLER's larva Fig. 18 from 1863 taken at the coast of Brazil, but the telson in the two species MÜLLER's and *S.* sp. larva. *barbata* are of quite different types which should exclude that they belong to one and the same species, also the great distance between the two localities makes this unlikely.

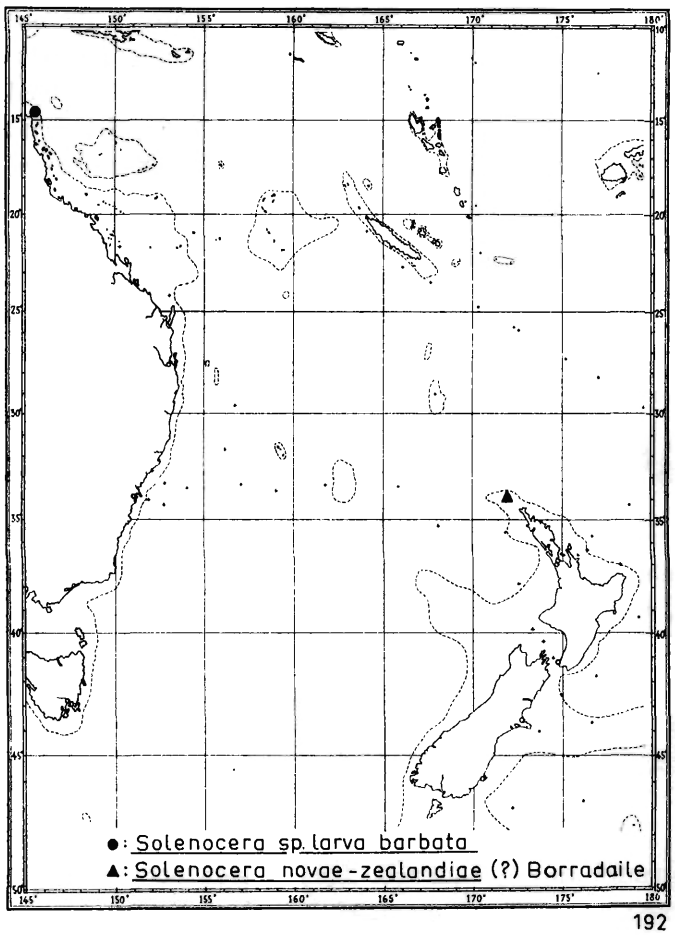

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Fig. 192. Map of distribution.

Solenocera novae-zealandiae (?), BORRADAILE.

Figs. 192–204.

Solenocera novae-zealandiae BORRADAILE 1916, pp. 79–80, Fig. 1.

Larvae:

Solenocera novae-zealandiae(?) GURNEY 1924, pp. 76–77, Figs. 14, 15.

Localities.

Protozoea III.

"Terra Nova" Exped. St. 129 at Three Kings Islands N. of New Zealand. B.M. 1 spec.

Protozoea III.

Figs. 193–204.

A single third Protozoea in a bad state of conservation was observed in the material from British Museum. Due to the poor state of preservation the figure of the whole larva (Fig. 193) is taken from GURNEY's figure.

Description.

Carapace.

Formula: 2. 3. 7. 10. 11. 12. 13*. 16*. 18. 20. 24. 26. 27. 30.

This small Protozoea has a short, squarish carapace, a little wider than long and not nearly covering the thorax. The rostrum is long and slender and as usual in this stage without teeth. The eye-stalks are long; above them are the supra-orbital spines. The antennal spines are only a broad process with filamental teeth. Farther back on the margin are two branchiostegal processes of which the anterior is short and rounded, the posterior elongate and curved backwards, both are lined with filamental teeth. A little behind the posterior one the filamental teeth start again along the margin. These branchio-lateral teeth, continue until the postero-branchial groove spines which also are covered with filamental teeth; between this last pair of spines is an unpaired, rather wide medio-posterior marginal spine. The spine itself is very short, but its broad tip is covered with filamental teeth.

On the inner surface of the carapace are an anterior and a posterior dorsal organ, both relatively small. Between these organs and in the medial line are the dorsal or epi-cardiac spine and between this and the anterior dorsal organ the pair of pre-hepatic spines, one on each side. No more spines are found on the carapace of the first Protozoea. The thorax is divided into its segments, but these are not yet all covered by the carapace.

Abdomen.

Formula, segments I–V: 1. 2., segment VI: 1. 4.

All six segments are developed each with one dorsal and one lateral spine, except for the last segment where the lateral spine is substituted by a pair of ventro-lateral spines. The lateral spines are large, nearly as large as the dorsal spine, and make only a small angle of about 30° with this spine.

Telson.

The furca is wide open and has only seven setae on each branch, the normal is eight setae, one is missing on the lateral margin.

Appendages.

The first antenna is slender and four-jointed. The division between the second and third joint is not so strongly developed as the rest, and no setae are attached to the 2nd joint, but only to the latero-distal corners of joints one and three. The last joint has three terminal setae.

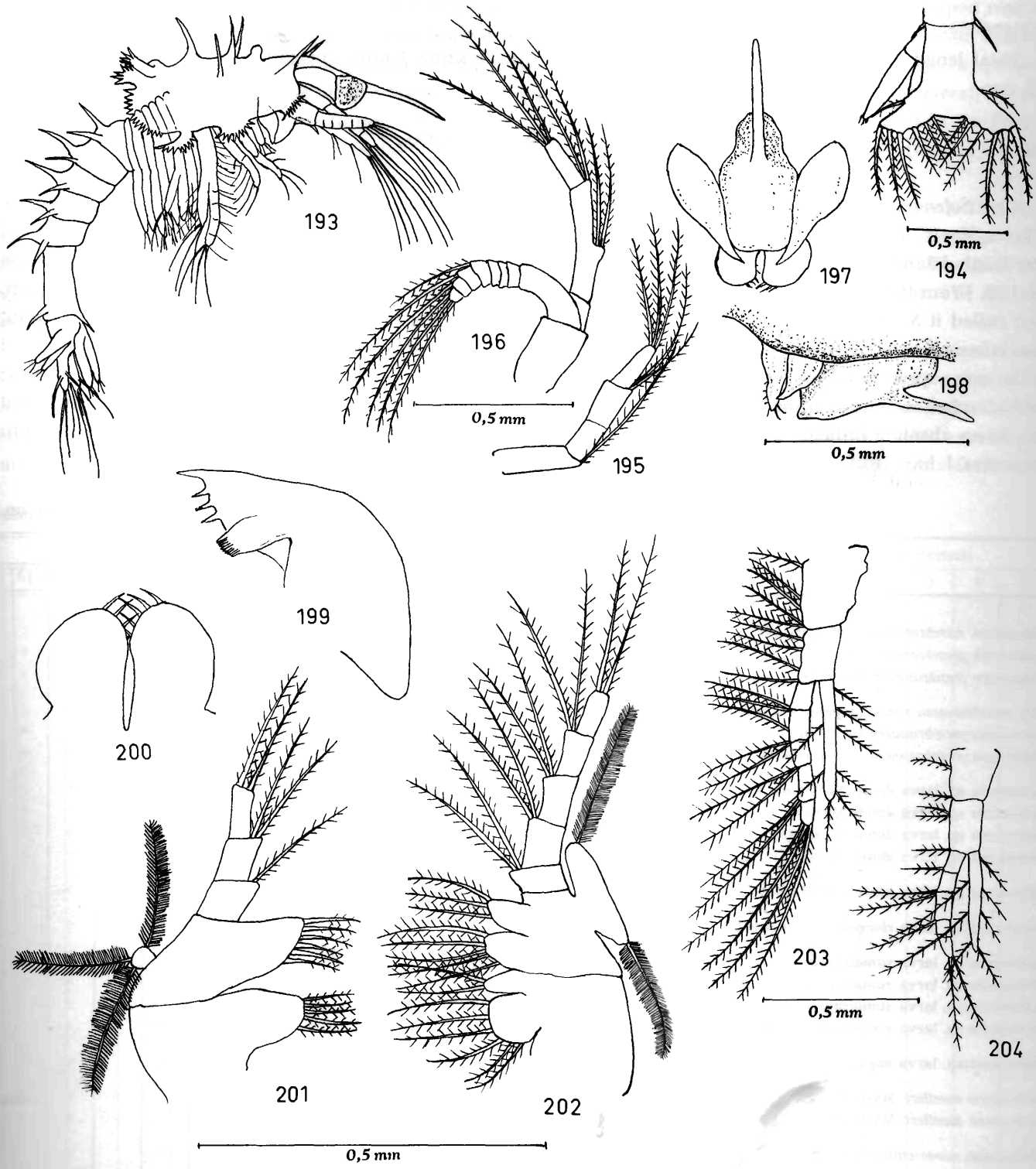
The second antenna has an unjointed protopod and a several-jointed exopod with long swimming setae at the distal end. The endopod is three-jointed with a short first joint and a long second joint, the latter has a notch midway on the lateral side with two setae, which indicates a coalescence of two joints. This joint is also twice as long as the following joint, which is tipped with three setae.

The labrum is large and with a spine on its surface, the spine is a little curved and points forward. A similar spine on the labium was also found in the third Protozoea of *Solenocera* sp. larva *elongata*, only here it was much longer and S-shaped. But there is a great distance between their localities: *elongata* from the coast of Brazil and the other from north of New Zealand.

The mandibles are stout and strongly bent, with three pointed teeth in the incisor part, one larger corner tooth and a strongly developed molar lobe. The labium or lower lip is relatively short and split right to the base.

The first maxilla is normal with two lobes of about equal sizes, a three-jointed endopod and a small exopod with three plumose setae. Also the second maxilla is as typical for the stage. The four endites are of nearly equal sizes, only the most proximal is a little larger than the rest. The endopod is five-jointed and the exopod is still fleshy with an anterior and a posterior lobe each tipped with a single seta; there may have been more setae as one or two setae may have been lost due to the preservation.

The first and second maxillipedes are not yet swimmerets, the first is sooner functioning as a mouth appendage with many catching setae on its medial margin. The protopod is two-jointed, the endopod five-jointed in the first maxillipede and only four-jointed in the second maxillipede. The exopod is short and unjointed and still without proper swimming setae. No gills or gillbuds were yet seen on the protopod.



Figs. 193–204. *Solenocera novae-zealandiae?* Third Protozoea. Fig. 193, larva from lateral (drawn after GUERNEY's figure). — Fig. 194, telson. — Fig. 195, first antenna. — Fig. 196, second antenna. — Fig. 197, labrum. — Fig. 198, same from lateral. — Fig. 199, mandible. — Fig. 200, labium. — Fig. 201, first maxilla. — Fig. 202, second maxilla. — Figs. 203–204, first and second maxillipedes.

The third maxillidepe and the five pairs of thoracopods are only in a rudimentary state consisting of an unjointed protopod with exopod and endopod, the last two branches are tipped with a few embryonic setae; these limbs have not yet reached a functional size.

Of the pleopods there are only the uropods which are small, not quite reaching the tip of the telson furca and unfunctioning.

Dimensions:

Total length 4 mm; length of carapace 1 mm, width of same 1 mm; rostrum length 0,8 mm; abdomen 1,5 mm.

Distribution and Remarks.

Fig. 192.

This *Solenocera* larva was described by GURNEY in 1924, but not in detail. He had his material from the "Terra Nova" Expedition Station 93, 120, and 129, around the Three Kings' Islands at the northern tip of the North Island of New Zealand. The one specimen available for this description is from that expedition St. 129. From the same expedition BORRADAILE described a new species of *Solenocera* on an adult specimen, and called it *S. novae-zealandiae.* There was only a single specimen, a male, of *Solenocera* in his collection, also taken close to the position where the larvae were taken. This caused GURNEY to suggest that they belonged to the same species and he therefore gave the larvae the name of the adult. The adult has the following spines: orbital spine, antennal spine, post-antennal spine and hepatic spine. The larva has only the two first, but this is no absolute indication that more may not develop in later stages. Thus, not being able to decide pro or contra I have followed GURNEY and for the present kept the name.

Placement of Spines and Filaments on Carap

	Carapace														
	1	2	3	4	5	6	7	8	9	10	11	11*	12	13	13*
Solenocera membranacea Protozoea III	+	+	+		+		+			+	+		+		+
Solenocera membranacea Mysis I	+	+	+	(+)	+	(+)	+	+	+	+	+		+	+	
Solenocera menbranacea Mysis II	+	+	+	+	+	+	+	+	+	+	+		+	+	
Sol. membranacea subsp. *capens.* Protozoea III	+	+	+		+		+			+	+		+		+
Solenocera membranacea subsp. *capens.* Mysis I	+	+	+	(+)	+	(+)	+	+	+	+	+		+	+	
Solenocera membranacea subsp. *capens.* Mysis II	+	+	+	+	+	+	+	+	+	+	+		+	+	
Solenocera sp. larva *danae* Protozoea III		+	+	+			+					+	+		
Solenocera sp. larva *danae* Mysis I		+	+	+			+		+				+	+	
Solenocera sp. larva *danae* Mysis II		+	+	+			+		+				+	+	
Solenocera sp. larva *danae* Mysis III		+	(+)	+			+		+				+	+	
Solenocera sp. larva *barbata* Protozoea III	+	+	+	(+)			+			+		+	+		+
Solenocera sp. larva *elongata* Protozoea III		+	+		+		+			+		+	+		+
Solenocera sp. larva *sumatransis* Mysis I	(+)	+	+		(+)		+	+	+	+	+		+	+	
Solenocera sp. larva *sumatransis* Mysis II		+	+	(+)	(+)		+	+	+	+	+		+	+	
Solenocera sp. larva *sumatransis* Mysis III		+	+	(+)	+		+	+	+	+	(+)		+	+	
Solenocera sp. larva *sumatransis* Mysis IV		+	+	(+)	(+)		+	+	+	+	(+)		+	+	
Solenocera sp. larva *aequatorialis* Mysis II		+	+	+	+	+	+	+	+	+	+		+	+	
Solenocera muelleri Mysis I	+	+	+	+	+		+	+	+	+		+	+	+	
Solenocera muelleri Mysis II	+	+	+	+	+		+	+	+	+	+		+	+	
Solenocera novae-zealandiae Protozoea III		+	+				+			+	+		+		+
Solenocera sp. larva *nodulosa* Mysis II		+	+	+		+	+		+		+		+	+	

Numbers in second line refers to numbers on Figs. 1 and 2. A bracket around the + for the section on carapace means that the organ in ques
dominal segment. An asterisk after the number indicates that the organ is furnished with a toothed filament.

Relation between the Species of Solenocera.

The material is still too small for defining the relation between the different species based on the larvae. Only some suggestions can be made. We first have the group which may be called the *membranacea* group to which belong *S. membranacea*, *S. membranacea* subsp. *capensis*, and *Solenocera muelleri*, the last possibly the larva of *S. vioscai*. These have all in the Mysis a long rostrum with two dorsal teeth, a well-shaped rostral plate, three branchiostegal spines, a branchio-cardiac groove with lateral spines, medio-posterior spines, latero-hepatic spines and pre-hepatic spines besides the spines of the larvae of most other *Solenocera* species. They have in their second Mysis all five types of spines on the abdominal segment, viz: dorsal, lateral, dorso-lateral, ventro-lateral and ventral spines. The ventral spine is apart from this group only found in the Protozoea of *S.* sp. larva *sumatransis*, not in later stages, and in *S.* sp. larva *nodulosa*. They are carnivorous and all Atlantic forms from both sides of this ocean.

Partly alone, a little separated from the rest stands *S.* sp. larva *nodulosa* and *S. crenatus* (BATE). The first species is the most carnivorous of all the larvae to judge from its mouth appendages. It has developed six most characteristic cones on the carapace, two dorsal and two on each side of the carapace. The gills are different from the others by their finger-shaped form; the telson plate is very wide and flattened. The species is from the Indian Ocean at the Seychelles.

Nearest *S.* sp. larva *nodulosa* stands another species also from the Indian Ocean *S.* sp. larva *sumatransis* from near the North Western point of Sumatra towards the Nicobares. They are both together with *S.* sp. larva *danae* the most carnivorous of the larvae. The gills of *S.* sp. larva *sumatransis* are of an intermediate shape between *S.* sp. larva *nodulosa* and the rest by in a way also being finger-shaped, but with an oblique arrangement of the fingers which are slanting toward the proximal part of the gill where the fingers are longer

apace **and Abdomen of *Solenocera* larva.**

Carapace																	Abdomen				
14	15	16	16*	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5
	+	+		+	+	+	+			+	+	+	+	+		+	+		+	+			
	+	+		+	+	+	+			+	+		+	+			+		+	+	+	(+)	+
	+	+		+	+	+	+			+	+			+					+	+	+	(+)	+
	+	+		+	+	+	+			+	+	+	+	+		+	+		+	+			
	+	+		+	+	+	+			+	+		+	+			+		+	+	+	(+)	+
	+	+		+	+	+	+			+	+			+					+	+	+	(+)	+
	+				+	+					+	+	+	+			+		+	+			
	+	+			+	+					+			+				+	+	+			
	+	+			+	(+)					+			(+)				(+)	+	+			
	(+)	+			+	(+)					+								+	+			
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	+			+	+		+				+	+	+	+	+	+	+		+	+	+	(+)	+
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+		+			+	(+)			(+)	+	+			+		(+)	(+)		+	+	+	+	+
+			+																				
	+	+								+	+			+					+	+		(+)	+

question was only vestigial. A bracket around the + for the abdomen indicates that for this section the spine in question is only present on the sixth ab-

and branched. Further both species have hairs on the mastigobranchiae. The exopods on the first and second maxillipedes are very small. The exopods on the following thoracopods are extraordinarly large, especially in *S.* sp. larva *nodulosa* where coxa has developed an extra process for the fastening of the very strong adductor muscles of the exopod. *S.* sp. larva *nodulosa* is the only known species without a dorsal spine on the carapace. *S.* sp. larva *nodulosa* has a single branchiostegal spine, *S.* sp. larva *sumatransis* is lacking this spine, but has developed strong branchiostegal lobes.

Solenocera sp. larva *danae* also from the Indian Ocean is very characteristic with its extremely long posterobranchial groove spines which are well developed already in the third Protozoea, but become larger and larger with each moulting and in the last known instar, the third Mysis, they reach backwards behind the abdomen. This species, together with *S.* sp. larva *sumatransis*, both from the Indian Ocean, are the only two species for which we know with certainty that they have more than two Mysis stages. Of *S.* sp. larva *sumatransis* are here described four Mysis stages, and they may even be followed by still more Mysis stages. *S.* sp. larva *barbata* and *S.* sp. larva *elongata*, for both of which only the third Protozoea is known, have two branchiostegal spines and all the spines of the carapace are strongly barbed. But they have also other features of the carapace in common viz. a dorsal spine, paired medio-posterior marginal spines, post-antennal spine, pre-hepatic spine and very slender dorsal spines. Both have further lateral spines on the abdomen. They are not strongly carnivorous, but sooner feaders of detritus or of smaller plankton organisms.

Near these two species stands *S. novae-zealandiae* which has no barbed spines, but like *S.* sp. larva *elongata* a spine on the labrum; it seems also in several other, minor, points near to these two species.

More aside stands *S.* sp. larva *aequatorialis*, but with certain relations to the first group, *S. membranacea*.

Although the number of known larval species described is rather limited the following grouping of them is ventured:

I. The Atlantic group.

a. *Solenocera membranacea*
— — subsp. *capensis*.
— *muelleri*
b. *Solenocera* sp. larva *aequatorialis*.
c. *Solenocera (Platysacus) crenatus* (BATE) 1888.

In this group we find the largest number of spines placed on a more or less haired carapace. All species are from the Atlantic Ocean but from both sides. The three first (a) are very closely related so it can be discussed whether they are to be looked upon as separate species or only as geographical subspecies of one and the same species. Close to them stands *S.* sp. larva *aequatorialis* (b) and *Solenocera crenatus* (BATE) (c), both from the aequatorial region of the Atlantic Ocean.

II. The Indian Ocean group.

a. *Solenocera* sp. larva *nodulosa*
— — — *sumatransis*
b. *Solenocera* sp. larva *danae*.

These are all three from the Indian Ocean. From the development of their mouth appendages, they are the most carnivorous of the *Solenocera* larvae, and in the two last species we have more than two Mysis stages. In the present paper are described four Mysis stages in *S.* sp. larva *sumatransis* and three Mysis stages in *S.* sp. larva *danae*. Of *S.* sp. larva *nodulosa* the material only includes a single specimen in the second Mysis stage, so nothing definitely can be stated as to number of Mysis stages, but because the specimen is very larval in several features, e.g., the mandibular palp and the pleopods, it is certain that also here at least one more Mysis stage must follow before reaching the post-larva.

In *S.* sp. larva *nodulosa* and in *S.* sp. larva *sumatransis* the gill filaments extend from a stalk in a finger-shaped arrangement, but in *S.* sp. larva *danae* the gill-filaments are arranged as in the *membranacea* group with a main stem and the filaments extending dicotomally along the sides of the stem.

III. The Austral-Asian group.

a. *Solenocera* sp. larva *barbata.*

— — — *elongata.*

b. *Solenocera novae-zealandiae*?

The two first are only known in the third Protozoea stage in which they have strongly barbed spines on the carapace and long, delicate dorsal and lateral spines on the abdomen. Their mouth parts seem more adequate for a food of detrius and smaller plankton organisms than for a strongly carnivorous life. Close to them stands *S. novae-zealandiae*? BORRADAILE, however, without barbed spines on the carapace.

CERATASPIS AND CERATASPIDES

History.

The genera *Cerataspis* and *Cerataspides* include some large oceanic larvae of which we at present know three different species: *Cerataspis monstrosa, C. petiti,* and *Cerataspides longiremis,* all the rest so far described are synonyms to one or the other of these three species. The first description is by GRAY in 1828 in his album of "New and unfigured animals". He gives a short description of and figures a crustacea under the Schizopoda family Nebalidae, which was found in the stomach of a dolphin off the coast of Brazil. The crustacea was named *Cerataspis monstrosa* referring to its unusual appearance. – In 1837 *Cerataspis monstrosa* was again figured by H. MILNE-EDWARDS in CUVIER's Règne Animal as *Cryptopus defrancei,* and by QUOY 1839 under the name *Lepsia tuberculosa.* In 1889 a *Cerataspis* was described, this time by SPENCE BATE and given the name *Ophthalmeryon transitionalis* and was referred to the Brachyura. The specimen was also from the stomach of a dolphin, caught at the British Islands, it was badly damaged and in a dried state when received by BATE. This possibly caused some differences in the appearance of the sculpture of the carapace from the previous records of *Cerataspis monstrosa,* to which it probably belongs. There is, however, a slight possibility that it represents a fourth species, only recorded this single time and not since. This view was held by BONNIER (1899, p. 48) who listed it as a *Cerataspis transitionalis.* By a peculiar mistake BOUVIER (1917, p. 31) refers it to *Cerataspis longiremis. Cerataspis monstrosa* was again described and more detailed by DOHRN (1871, pp. 362–66, Figs. 33–34).

The next species *Cerataspis petiti* was first described by GUERIN in 1844 p. 18 in his Iconographie du Règne Animal du Cuvier. Two specimens were taken from the stomach of a dolphin caught in the Indian Ocean. Unfortunately I have not been able to obtain access to the text of this book, but in the plates, Pl. 23, Fig. 3. *Cerataspis monstrosa* is figured. In 1892 *Cerataspis petiti* was again described, but not figured, by A. GIORD and J. BONNIER on the two specimens from the Indian Ocean.

The third species *Cerataspides longiremis* was first described by DOHRN (1871, pp. 366–372, Figs. 35–47) and later by BOAS 1880, and PESTA (1916, p. 80, Fig. 14) figures a new specimen under Decapod larva (Mysis stage). In 1899 BONNIER suggested the generic name of *Cerataspides* for this species to separate it from the two others. In 1888 p. 323 it was described by BATE under the name *Peteinura gubernata.*

BOAS 1880 (pp. 42–47) considers *Cerataspis* as larval forms belonging to the Penaeidae. He gives full reason for this, and his view has been accepted by all following authors.

GIARD and BONNIER (1892) refer *Cerataspis* to Penaeids and suggest that the genus holds a position to the other Penaeids similar to that which the Brachyura hold to the Macrura. They further suppose that the Protozoea larva described by DOHRN (1871, p. 377) and by CLAUS (1876, p. 17) may be the Protozoea of *Cerataspis.* BOUVIER (1908) finds that the peculiar shape of *Cerataspis* with a tuberculous thorax and a small, reduced abdomen is caused by a long, pelagic life of the larva. He mentions that the small abdomen may have caused GIARD and BONNIER to find a resemblance to the Brachyura and concludes that *Cerataspis* most likely is a larva of *Aristeomorpha* or at least belongs to the subfamily Aristeidae.

BURKENROAD (1936 p. 85) declares without reference to previous investigators and without any further explanation that *Cerataspis monstrosa* GRAY is the larval form of *Aristeomorpha foliacea* (RISSO), that *Cerataspis petiti*, GUERIN, is the Mysis stage of *Aristeomorpha wood-masoni* CALMAN, and that *Cerataspis longiremus* DOHRN is the Mysis stage of *Plesiopenaeus*, concluding: "If the present allocations are confirmed *Aristeomorpha* is a synonym of *Cerataspis* and *A. wood-masoni* of *C. petiti*". However, in 1956 Mme HELDT described the larval development of *Aristeomorpha foliacea* which was of the normal Penaeid type and with no closer resemblance to *Cerataspis*.

Description.

Carapace.

Both in *Cerataspis* and in *Cerataspides* the carapace is provided with various spines, bulbs and tubercles as floats for supporting their pelagic life in the oceans, mainly over great depths of more than 2000 m.

Both genera are furnished with dorsal tubercles on the carapace. *Cerataspis* has four pairs of large tubercles placed dorsally in a longitudinal line on each side of the mid-line from just behind the cephalic groove to the posterior margin of the carapace. In *Cerataspides* only the anterior pair of tubercles are developed. Further both genera have on each side of the carapace a large oval swelling. In *Cerataspis* the swelling is of rather large dimensions, with a velvet surface of different patterns in the two known species, in *Cerataspides* the swelling is still considerable, in comparison with the size of the individuals, although less dominant (in comparative size).

In *Cerataspis* the carapace further has two pairs of very characteristic spines developed into large, curved horns (which also are supporting the buoyancy of the larva) these are both placed anteriorly representing the dorsally pointing post-orbital spines and the ventrally pointing pterygostomian spines. These spines are both missing in *Cerataspides* which instead has several more, but minor, spines of which the supra-orbital, the post-antennal, one of the hepatic, and the ventro-cardiac spines are the largest. All these four spines are paired with one on each side. An additional number of still smaller spines are present on the carapace. The rostrum is in *Cerataspis* short, smooth and bent ventrally, whereas it is long, spiny, straight and forwards pointing in *Cerataspides*. In both genera the carapace extends latero-posteriorly in a pair of alae which are largest in *Cerataspis*, and both genera have an anterior and a posterior dorsal organ like those in *Solenocera*. The margin of the carapace is smooth in both genera in difference to what is the case in *Solenocera*.

Abdomen and Telson.

The six-segmented abdomen is short in *Cerataspis* and bent in underneath the thorax. It has lateral pleura on the first five segments, but no spines except one ventral spine on the sixth segment. In *Cerataspides* all the segments have spines, both dorsal, ventral and lateral spines, and the sixth segment is enormously elongated, being longer than the whole thorax.

The telson is of the general penaeid shape in both genera with a furcal cleft and three lateral spines on each side. In *Cerataspis* the older stages have two longitudinal keels on the dorsal side of the telson running from the root of the telson to the first lateral spine. *Cerataspis* has six setae on each side of the furcal cleft. *Cerataspides* has no keels, and as many as seven setae on each side inside the furcal cleft.

Appendages.

First Antenna.

In *Cerataspis* the first antenna has a three-jointed peduncle throughout the five Mysis stages, with a statocyst starting to develop in the basal joint. The two flagella are of equal lengths in the first Mysis. The olfactory, lateral one grows a little thicker in the following stages but remains otherwise the same, whereas the medial one grows in length for each stage adding more and more rings to the already existing ones.

In *Cerataspides* both the first and the second antennae are much elongated. The first antenna is to begin with tipped with a brush of setae, and when the two flagella appear in the first Mysis the medial one is very short and unjointed. The lateral and olfactory flagellum is jointed already in this stage with a large basal joint and some small distal joints. In the following stages the lateral flagellum develops most rapidly and when reaching the fifth Mysis we have a very characteristic flagellum with two sections (Fig. 331): a basal thick and olfactory part and a long and slender distal part. A large hook-shaped spine, which not is the later statocyst spine, is already present in the first Mysis placed far up the stem, but of the statocyst nothing is present before in the fourth Mysis.

Second Antenna.

The second antenna has in *Cerataspis* already in the first Mysis a short, annulated, endopodial flagellum and the beginning of an antennal scale. The antennal scale enlarges with each stage, and so does the endopodial flagellum, which in the fifth Mysis is longer than the thorax. It is characteristic that the spine of the antennal scale is missing in *C. monstrosa* and is vestigial in *C. petiti* but large in *Cerataspides.*

In *Cerataspides* the second antenna has throughout the Mysis stages a large lateral spine on the antennal scale and an endopodial flagellum which does not become nearly as elongate as in *Cerataspis.* The distal margin of the antennal scale is rounded in *Cerataspis,* but nearly square-cut in *Cerataspides.*

Eye.

The eyes are large and stalky in both genera.

Labrum.

The labrum is both in *Cerataspis* and *Cerataspides* a large, semiglobular body, and the labium is provided with the usual two lobes.

Mandible.

The mandible is large in both genera with a single tooth in the incisor part and a small molar part which is smaller in *Cerataspides* than in *Cerataspis.* Both parts have a cutting ridge from the single incisor tooth to the molar part. This ridge is more curved in *Cerataspis* and nearly straight in *Cerataspides.* Both genera have a three-jointed palp which develops more and more setae with each ecdycis; the three joints must be looked upon as a primitive character.

Maxillae.

The first maxilla is non-characteristic. The endopodial palp is small and the protopod has a basiendite with toothshaped setae and a smaller coxa-endite with more bushy setae.

The second maxilla is also ordinarily built, only in the fifth Mysis of *Cerataspides* the lateral margin of the endopod is provided with a series of setae which is very characteristic and unusual.

Maxillipedes.

The first maxillipede is much alike in both genera. The protopod is large and only partly divided, only in later stages of *Cerataspides* it develops an extra series of setae on the lateral side behind the marginal setae. The endopod is always five-jointed, and the exopod has at its base a lateral setal lobe which is bent in over the endopod so that the originally laterally pointing setae point in a medial direction. This lobe appears later in the development, but attains a larger size, in *Cerataspides* than in *Cerataspis.* The first maxillipede bears in both genera a large double mastigobranchia and a small arthrobranchia.

The second and third maxillipedes are both very setose catching legs, which especially in *Cerataspides* develop several lines of long, stiff setae almost all pointing medially. The gills are one mastigobranchia, one podobranchia, one arthrobranchia and two pleurobranchiae, in *Cerataspides* I could only find one pleurobranchia on the second maxillipede. Here it is interesting to note that in the younger stages the podo-

branchia starts as a branch from the mastigobranchia, but later it separates from this and moves a little higher up on the coxa. The exopods from the second maxillipede and backwards are all strong swimmerets in both genera throughout the Mysis stages.

Pereiopods.

The three first pereiopods develop in *Cerataspis* already from the first Mysis a beginning chela. In *Cerataspides* this chela is less developed in the fifth Mysis than in the first Mysis of *Cerataspis*. Instead *Cerataspides* develops far more long, stiff setae on both endopod and protopod than any of the stages of *Cerataspis*. The gills on pereiopods one to four are the same as on the third maxillipede.

The fourth and fifth pereiopods never develop chelae, and they grow to their maximal length much later than the three first pairs. In *Cerataspis* they never reach a length comparative with that of the three anterior ones, and in *Cerataspides* they first reach such a length in the fifth Mysis. As already mentioned the exopodial swimmerets are very strongly developed on all pereiopods in the Mysis stages. The fifth pereiopod has only a single pleurobranchia and no other gills.

Pleopods.

The pleopods develop later than the pereiopods. In the first Mysis they are only small limb-buds. In *Cerataspis* they all become bifurcate in the second Mysis, but in *Cerataspides* the last three pairs only reach this stage with the fourth Mysis. The two first pairs develop first a small endopodial branch in the fifth Mysis.

Gills.

In Boas' description of the gills (1880) he made no distinction between the arthrobranchiae and the pleurobranchiae. Further the podobranchia was by Boas described as a gill branch from the epipod here called the mastigobranchia. I have also seen how the later podobranchia first starts as a gill-branch from the mastigobranchia, and in later stages of the larvae it separates from this and grows out independently from the coxa itself. To indicate the difference of this I have in the formulae placed the number of podobranchiae inside a bracket when the gill still is a side-branch from the epipod or mastigobranchia. The number without a bracket indicates that the gill extends from the coxa itself separated from the mastigobranchia. Further from the localities given by Boas it can be stated that his *Cerataspis monstrosa* was a second Mysis and his *Cerataspides longiremus* a third Mysis stage.* In *Cerataspides* I found no podobranchia in the second Mysis, in the third Mysis the material did not allow a clear counting of the gills, but in the fourth Mysis the podobranchiae were found independent from the mastigobranchiae on maxillipede two to pereiopod one and attached onto the mastigobranchia on pereiopod two and three, which indicates as mentioned by Boas that the three free podobranchiae in the fourth Mysis were attached to the mastigobranchiae in the third Mysis.

Uropods.

The uropods are normally built in *Cerataspis* and fairly well developed already in the first Mysis. In *Cerataspides* they are also developed already in the first Mysis, the endopod is normally developed, but the exopod is shaped into an enormous long band or float about twice the total length of the whole larva.

Larval Stages

Mysis I.

This stage is the youngest known stage in both genera and can be recognized not only by its size but also by its unjointed flagella of the first antenna in *Cerataspis* and by the unjointed medial flagellum and the lateral flagellum with a large basal joint and a few small distal joints in *Cerataspides*. Further in *Cerataspides* the first Mysis has four joints in the peduncle of the first antenna. The flagellum of the second antenna is in

* The author has examined both Boas' specimens.