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SOME LARVAL STAGES OF *SERGESTES* SP.

and

***SYNALPHEUS BIUNGUICULATUS* (Stimpson)**

BY

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INTRODUCTION AND HISTORICAL

The present work is a continuation of the programme of larval stages of Red Sea Decapod Crustacea. *Sergestes* larvae are recorded for the first time in the Red Sea. The two stages described are obtained from the plankton. For detailed study of the larvae of the genus *Sergestes*, we refer the reader to Hansen (1924) Menon (1933), and Gurney and Lebour (1940). The larvae described in this manuscript are nearly the same as that of *Sergests armatus*. The armature of the larvae is a good character by which one can easily separate the larvae of this genus from others. The life history of the genus *Sergestes* consists of three protozoecae and two zoeae. It is not certain now that there is a nauplius stage. The genus *Alpheus* is characterised by a long life-cycle. In *Alpheus pacificus* Dana, there are nine larval stages (Gohar & Al-Kholy, 1957). The genus *Synalpheus* has an abbreviated life-cycle. Gurney (1938) described 4 stages in the life-history of *Synalpheus triunguiculatus* (Paulson). The different stages of the genus *Alpheus* are distinguished by ; the spinal formula of telson 7+7, fifth leg rudimentary in the first stage. In second stage spinal formula 8+8, third maxillipede with a very long spine ; uropods traceable. In third stage, spinal formula of telson still 8+8 but uropods well formed with setose exopods ; spine on third maxillipede short ; long spine present on fifth leg ; fifth leg without exopod. The first free larval stage of *Synalpheus biunguiculatus* (Stimpson) is actually the second. The first larval stage is passed through the egg before hatching. The spinal formula, uropods, and fifth leg of the 2nd larval stage is similar to those of the same stage of the genus *Alpheus*. The apical spine of the third maillipede is shorter than in case of *Alpheus*. The third stage of *S. biunguiculatus* has a telson with a spinal formula 6+6. The larval stage of *S. triunguiculatus* described by Gurney (1938), as the first stage is actually a second, second is third and the third is fourth. Gurney himself was cautious in mentioning «This stage (the 2nd) is equivalent to the normal stage III. In view of my observation of the very short duration of stage one in *Alpheus audouini* it seems probable that there is a similar speeding-up of metamorphosis in *S. triunguiculatus* but my attention was not directed to this point on the spot». It is now sure that there is a speeding up of metamorphosis in *S. biunguiculatus* and probably the same with *S. triunguiculatus*.

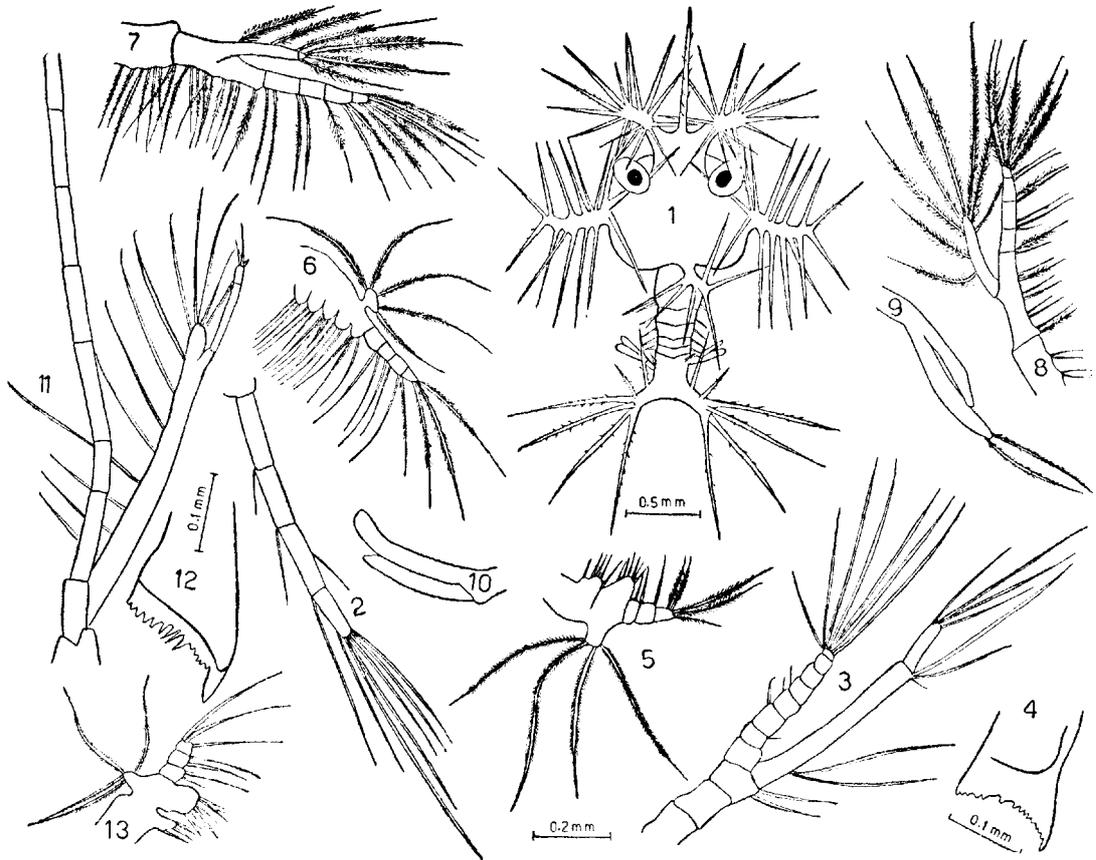
SERGESTES SP.

Protozoecal Stage (Figs. 1—10)

The characters of the larva under investigation show that this is a late protozoecal stage. Unfortunately we have not the whole series of larvae to fix the stages of the present larva. The genus *Solenocera* has a very spiny carapace and the

abdomen and telson of the last zoea are remarkably like those of some *Sergestes*. Spines of *Sergestes* larvae are broad and branched with lateral spinules. Rostrum long, of same length as carapace with lateral and dorsal spinules. Eyes stalked, a pair of supra-orbital processes present, each process produced into about 16 spines with lateral spinules.

Two lateral processes present in middle region of carapace, each process produced into 15 lateral and dorsal spines. Posterior dorsal process at hind region of carapace, this process produced into 6 lateral and dorsal spines. Thoracic segments free from carapace, first and second thoracic segments fused together. Postero-lateral spines found on thoracic segments. Abdomen short and not segmented. Uropods distinguished but not functional. Telson fork wide with 6+6 spines, terminal spines long. Antennule, a mere 4-jointed peduncle with 6 terminal setae, long inner setae present at base of fourth segment, two setae present on 3rd. joint (one outer on middle and one inner on base). At base of second joint an inner seta present. Antennal peduncle 3-segmented, at apex of third segment, 8-jointed exopod and a longer 2-jointed endopod present, terminal segment of endopod produced into 4 long setae, two inner setae + a hair found on base of terminal joint, basal joint of endopod long with 3 inner setae at base, exopod 8-jointed with 7 terminal long setae. Mandibular palp absent, masticatory surface produced into a number of teeth. Maxillular endopod 3-jointed with two plumose setae at apex and inner surface of terminal segment, each of basis and coxa produced into 6 spines, maxillular exopod well represented, with 4 long plumose setae. Maxillar endopod 5-jointed, basal joint (first) produced into 3 inner second 1, 3 rd. 2, 4th. 2 and 5th. 3 apical and one inner plumose setae, scaphognathite produced into 5 long plumose setae, coxa and basis bilobed coxa with 3 +3 and basis 4 +3 long setae. Protopod of first maxillipede 2-jointed, from terminal joint a short exopod and long endopod present ; exopod slender with terminal small segment provided with 6 plumose setae, (one inner, 2 apical and 3 outer) ; endopod 5-segmented with 18 plumose setae + one hair (3 apical and 15 + one hair inner). Inner surface of protopod produced into 12 inner plumose long setae. Exopod of second maxillipede unjointed with 8 long plumose setae (3 apical, 2 inner and 3 outer), endopod 5-jointed with 15 plumose setae (4 apical and 11 inner). Third maxillipede not functional in this stage, endopod longer than exopod and with 2 apical plumose setae, both exopod and endopod unjointed. Biramous rudiments of legs 1—3 distinguished but not functional. Uropods biramous but not setose.



Figs. 1—10 Prorotoczoa of *Sergestes* sp.:

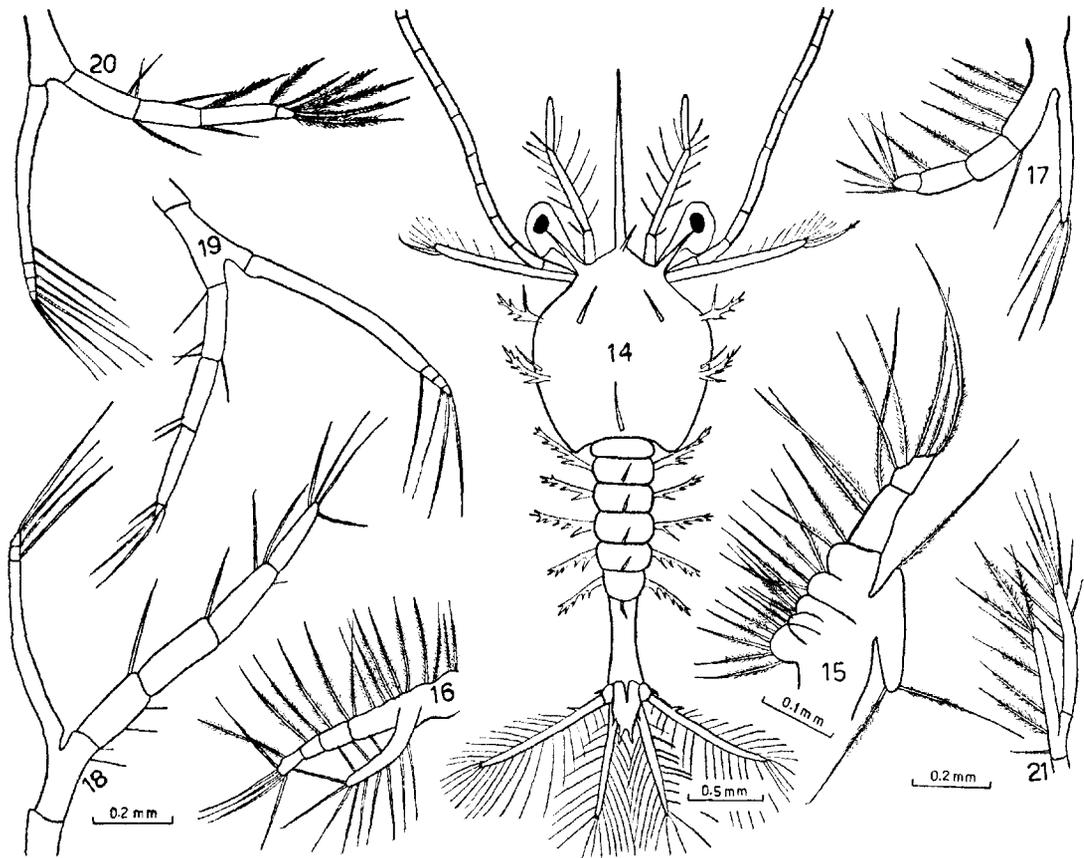
1, whole ; 2, antennule ; 3, antenna ; 4, mandible ; 5, maxillule ; 6, maxilla ; 7, first maxillipede ; 8, second maxillipede ; 9, third maxillipede ; 10, first or second leg.

Figs. 11—13 Mysis Stage :

11, antenna ; 12, mandible ; 13, maxillule.

Mysis Stage (Figs. 11-23)

Rostrum nearly as long as carapace with fine ventral and lateral spinules. Armature of carapace not complicated as in protozoal stage, a pair of supra-orbital and 3 pairs of lateral spines present. Dorsally at base of rostrum, a short spine present behind which are a pair of dorso-lateral and a postero-dorsal spines. Abdominal segments provided with lateral branched spines and dorsal intersegmental shorter ones, sixth abdominal segment longer and more slender than other 5 segments and has a postero-dorsal spine on region between it and telson. Eyes stalked. Antennule 3-jointed with 3 inner aesthetes on terminal segment and all joints provided with 16 outer and inner plumose setae. Antenna biramous, endopod long and jointed, exopod nearly as long as rostrum, tip of exopod bifid and an outer slender 3-jointed flagellum with 3 terminal spines, Mandibular palp absent and masticatory edge strong and toothed. Maxillular exopod produced into 4 long plumose setae, endopod 3-jointed with 7 terminal and inner plumose setae, basis broader and longer than coxa, with 8 and 4 apical setae respectively. Maxillar endopod long, broad and 3-jointed, terminal segment of endopod provided with 5, middle with 3 and has a 1 with 2 long plumose setae, basis and coxa bilobed with 4 + 3 and 3 + 6 plumose setae respectively. Endopod of first maxillipede 4-jointed broader and longer than exopod. Both exopod and endopod produced into long plumose setae. Second maxillipede with 4-jointed endopod, terminal joint with 6 apical, third joint with one inner, 2nd joint with 2 inner and one outer and basal joint with 4 inner plumose setae, exopod slender and shorter than endopod, with 4 apical and inner plumose setae. Endopod of third maxillipede 5-jointed, 5th. joint (terminal) produced into 3 apical and inner setae, 4th joint into 3 outer setae and one inner hair, 2nd. into one outer seta and 3 inner hairs and 1st joint (basal) into one outer hair, exopod shorter and slender with a 1-jointed tip, the 2 joints produced into 4 apical and inner setae. First and second legs nearly similar in structure and size, endopod 5-jointed, terminal joint with 3 apical setae., 4th. joint 3 outer and inner, 3rd. joint one inner, and 2nd. joint 4 outer and inner setae, tip of exopod 3-jointed with 4 apical and inner setae. Third leg with 3-jointed exopod carrying 8 apical and inner setae at its tip, endopod 5-jointed, terminal joint with 5 apical and inner, 4th joint with 3 outer and inner, third joint with 2 outer and inner and 2nd. joint with 2 inner setae. Fourth leg shorter and thinner than third—exopod contrary to preceding legs—longer than endopod and 2-jointed at terminal third carrying 10 outer apical and inner setae, endopod 3-jointed with 4 apical plumose setae. Fifth leg shorter and slender than other legs, exopod 2-jointed and longer than endopod, terminal segment longer than basal and carrying 10 outer, apical and inner plumose setae, endopod unjointed with 8 apical and inner plumose setae. Five pairs of non-setose pleopods present, protopod 2-jointed giving out unjointed exopod and inner short but representing endopod. Uropods well developed, biramous and much setose. Telson with a narrow fork.



Figs. 14—21 Mysis stage of *Sergestes* sp. :

14, whole ; 15, maxilla ; 16, first maxillipede ; 17, second maxillipede ; 18, third maxillipede ;
19, first leg ; 20, third leg ; 21, fifth leg.

Figs. 22—23 Mysis stage of *Sergestes* sp.

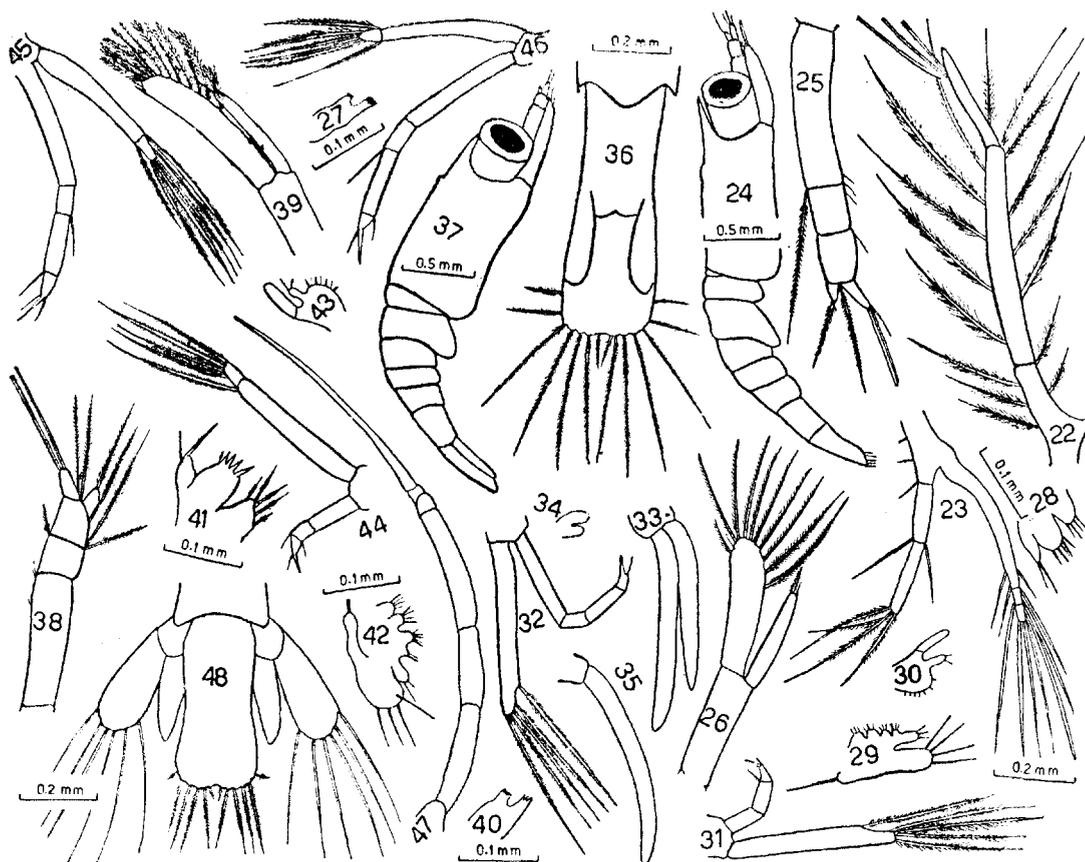
22, antennule ; 23 fourth leg.

*SYNALPHEUS BIUNGUICULATUS***Second Stage (Figs. 24-36)**

First larval stage passed through egg, bases of antennules, eye stalks, appendages and lateral folds of cephalothorax orange yellow with olive tint, deep red chromatophores scattered on cephalothorax and abdominal segments. Sixth abdominal segment and telson transparent. Rostrum short and not serrated. Antennular peduncle 3-jointed from which an outer exopod and an inner endopod made out, exopod longer than endopod and produced into 2 aesthetes and an outer seta, a long plumose seta located in region between exopod and endopod, endopod short with an apical plumose seta, terminal peduncular joint produced into an outer hair, middle joint into an inner basal long plumose seta and 2 outer hairs and basal joint into an outer hair. Antenna provided with an inner unjointed endopod with an apical spine and hair, exopod unjointed apically with 19 terminal and inner setae + an outer seta and a hair. Mandible with its masticatory region produced into a toothed incisor and molar processes. Maxillule simple, endopod with 2 apical setae, basis 5 and coxa 4. Maxillar scaphognathite with 4 apical and one basal setae, endopod provided with 3 apical hairs and produced into an inner lobe carrying 4 apical hairs, coxa of one lobe with 3 apical hairs while basis bilobed with 3 + 3 hairs. First maxillipede short and much reduced, exopod without setae and endopod with 2 apical short hairs. Maxillipede 2 with unsegmented exopod with 5 apical and inner plumose setae, endopod 3-jointed with a terminal spine + a hair. Exopod of 3rd maxillipede same as in 2nd maxillipede, endopod long 4-jointed with terminal spine + a hair. First and 2nd. legs biramous but not setose. Third rudimentary, fourth leg absent, fifth leg uniramous, unjointed and not setose. Abdominal somite 2 produced into large pleura. Traces of uropod distinguished. Telson with 7 + 7 plumose spines, two pairs outer.

Third Stage (Figs. 37-48)

Third stage obtained on the next day after hatching. Colour same as in 2nd stage. Rostrum broad at base. Eyes stalked. Antennule with unjointed exopod and endopod, exopod with 2 terminal aesthetes, two plumose long setae in region between the two flagellae, endopod with terminal plumose seta, terminal joint of antennular peduncle with 3 inner and one outer plumose setae + an outer hair. Antennal scale with 12 terminal and inner plumose setae + a hair, spine on antennal endopod getting longer than in 2nd. stage. Mandible not different from that of 2nd stage. Maxillule as in 2nd. stage but coxa with 5 terminal and basal plumose setae. Scaphognathite same as in 2nd stage, basal lobe of maxillar endopod with



Figs. 24—36, Second Larva of *Synalpheus biunguiculatus* :

24, whole ; 25, antennule ; 26, antenna ; 27, mandible ; 28, maxillule ; 29, maxilla ; 30, first maxillipede ; 31, Second maxillipede ; 32, third maxillipede ; 33, first leg ; 34, third leg ; 35, fifth leg ; 36, telson.

Figs. 37—48, Third Larva of *Synalpheus biunguiculatus* :

37, whole ; 38, antennule ; 39, antenna ; 40, mandible ; 41, maxillule ; 42, maxilla ; 43, first maxillipede ; 44, second maxillipede ; 45, third maxillipede ; 46, first leg ; 47, fifth leg ; 48, telson.

2 apical hairs, two lobes on basis with 5+5 hairs and coxa with 4. First maxillipede not different from that of 2nd stage, exopod not setose. Exopod of 2nd. maxillipede with a terminal joint carrying 5 terminal and inner long plumose setae. Terminal joint of exopod of 3rd maxillipede with 6 outer terminal and inner plumose setae. Legs 1, 2 and 3 fully formed and nearly similar —exopod with a terminal joint carrying 6 plumose setae, endopod 4-jointed with terminal short spine. Fourth leg rudimentary, 5th. leg without exopod and endopod long with an apical long spine. Uropods well differentiated with setose exopod. Telson with 6 +6 plumose spines, one pair outer.

SUMMARY

1. A protozoecal stage and a mysis stage of *Sergestes* obtained from the plankton are studied.
2. Two Stages in the life-history of *Synalpheus biunguiculatus* (Stimpson) hatched in laboratory are described.
3. The first free larval stage of *S. biunguiculatus* is the 2nd. and not the first larva, the first stage being passed through the egg.

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