ON THREE NEW SPECIES OF ASTEROCHERID COPEPODS, WITH A REDESCRIPTION OF INDOMYZON QUASIMI UMMERKUTTY

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(With 63 Text-figures)

INTRODUCTION

Family Asterocheridae contains about 24 vaild genera differing mainly in the segmentation of the urosome, the first antenna and the peraeopods. Several attempts have been made to study the family as a whole (Sewell, 1949; Ummerkutty, 1966 and Stock, 1965, 1975) but a thorough revision of the family is yet to be undertaken. As the family is somewhat heterogeneous one often finds difficulty in assigning a species to its proper genus.

I am describing below two new species of Asterocheres Boeck, 1859, and one new species of Asteropontius Thompson & Scott, 1903. A detailed description of Indomyzon quasimi Ummerkutty, 1966, is also included, as the original and only description of this species available, is not detailed and my material shows some difference from that of Ummerkutty.

The holotypes and allotypes will be deposited in the Indian Museum, Calcutta.

Description of Species

Asterocheres stocki sp. nov.

(Text-figs. 1-19)

Material: Two females and two males from the coral, Porites (Synaraea) convexa (Dana), examined at Chetlat Island, Lakshadweep, Arabian Sea.

Female: Prosome disproportionately large and urosome small, producing a very characteristic shape. Ratio of length of prosome to that of urosome 2.3: 1. Total length 0.67 mm, maximum width 0.44 mm. Cephalosome fused with first pedigerous segment, the line of fusion faintly indicated. Cephalothorax a broad-based triangle, posterolaterally projecting. Second pedigerous segment clearly narrower than cephalothorax, third still narrower and shorter. Fourth pedigerous segment relatively very narrow and overlapping a major part of the fifth segment. Ratio of length to width of prosome 1.1:1. Fifth



Text-figs. 1-11. Asterocheres stocki sp. nov., 1. female, dorsal view (b); 2. caudal ramus (g); 3. first antenna (e); 4. second antenna (f); 5. mandible (f); 6. first maxilla (f); 7. second maxilla (f); 8. maxilliped (f); 9. leg 1 (f); 10. leg 2 (e); 11. leg 3 (e).

leg-bearing segment proximally narrow, 64 μ m broad, distally drawn out to give attachment to the legs and consequently much broader than long, 60×124 μ m. Genital segment broader than long, 84×103 μ m, proximally broad and regularly narrowing backwards, median part of lateral borders with a pencil of stiff hairs. Post-genital segments two, first broader than second and the latter longer, measuring 32 x 64 μ m and 36×52 μ m respectively. Caudal ramus broader than long, 20×24 μ m, each with six setae, two of the distal setae long and stout. Posterolateral angles of genital and post-genital segments telescope. Lateral borders of genital and post-genital segments telescope. Lateral borders of genital and post-genital segments and caudal rami spiny.

Oral siphon very long and slender, reaching the hind border of the fifth leg-bearing segment.

First antenna twenty-segmented and moderately narrowing distalwards. First segment fairly stout, segments two to nine relatively short, last three segments perceptibly narrowed; penultimate segment with an aesthete. Length of segments 27, 10, 8, 8, 7, 7, 8, 10, 8, 13, 19, 24, 21, 21, 21, 21, 26, 14, 14, and 10 μ m: setation 1, 2, 1, 2, 2, 2, 1, 2, 3, 1, 1, 1, 1, 1, 1, 1, 2, 0, 1 and 4 respectively.

Second antenna four-segmented, basis as long as first endopod segment but slightly stouter, with a proximal spine. Exopod onesegmented, with one inner and two distal setae. First segment of endopod with a proximal and a distal short spine, second segment short, triangular and underriding third, with an inner distal seta, third segment with an outer seta and long apical spine.

Mandible with slender stylet, distally narrowed and smooth; palp one-segmented and moderately long, with two unequal setae.

First maxilla with highly dissimilar rami, outer lobe small, with three setae, inner lobe basally swollen and narrowing distalwards, with four apical setae, distal half of outer border spinulose.

Second maxilla uncinate, basal segment stout, with three distal spines; second segment long and claw-like, moderately stout and apically curved.

Maxilliped six-segmented, basal segment short, with two setae and a row of tubercles; second segment long and stout, gradually narrowing distalwards, with one inner spine and two outer distal spinules; segments three and four short, the former with an outer spine, partitions indistinct; fifth segment longer, with inner spine; sixth segment a strong stout claw. Legs one to four subsimilar, with three-segmented rami. First leg relatively short, basal segment of exopod with a relatively stout claw. Endopod of fourth leg rather slender. Basal segment of fifth leg with a stout outer distal seta. Distal segment oblong, externally spinulose and internally spiny, distal part with three setae.

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Male: Prosome perfectly ovate, without even a trace of the septum demarcating the first pedigerous segment. Urosome of moderate size. Ratio of length of prosome to that of urosome 1.7:1. Ratio of length to width of prosome 1.2:1. Total length of body 0.43 mm, maximum width 0.24 mm. Cephalothorax about one and a half times as long as the rest of the prosome. Pedigerous segments two to four regularly narrowing backwards, second and third subequal in length, fourth narrow and transversely oblong, overlapping the fifth leg-bearing segment and a part of the genital segment. Fifth leg-bearing segment very short. Genital segment enlarged, $112 \times 87 \ \mu m$, postero-laterally increasing in length, 13×46 , 13×44 and $21 \times 44 \ \mu m$, first two segments subsimilar, third longer ; all postero-laterally slightly produced. Lateral borders of genital and post-genital segments spiny. Caudal ramus clearly broader than long, $15 \times 9 \ \mu m$, with a few lateral spines.

Oral siphon relatively short, only slightly overreaching the middle of the cephalothorax.

Second antenna more slender than in female, second segement externally spiny, fourth segment with two long setae, claw very long. Exopod with three short setae.

Maxilliped six-segmented, more slender than in female, first and second segments with an inner spine, fourth and fifth with an inner distal spine, claw long and moderately curved, its inner distal part spinulose.

Third endopod segment of leg two distally produced into three long processes as illustrated, with five setae.



Text-figs. 12-27. Asterocheres stocki sp. nov., 12. leg 4 (e); 13. leg 5 (g); 14. male, dorsal view (c); 15. caudal ramus (h); 16. second antenna (g); 17. maxilliped (f); 18. last segment of endopod of leg 2 (f); 19. leg 5 (h). Asterocheres longisetosus sp. nov., 20. female, dorsal view (a); 21. caudal ramus (e); 22. first antenna (f); 23. second antenna (f); 24. mandible (f); 25. first maxilla (f); 26. second maxilla (f); 27. maxilliped (f).

Seta on basal segment of fifth leg overreaching the free segment, latter roughly rectangular, with a very short process and two long apical setae.

Remarks: Among the several species of Asterocheres, A. stimulans Giesbrecht, 1897, A. siphonatus Giesbrecht, 1897, and A. proboscidens Stock, 1966a, form a group, distinct from the rest, in having a long slender oral siphon. A. stocki clearly belongs to this group.

In A. stimulans the siphon extends only to the base of the third legs; but according to G. O. Sars, 1918, to the middle of the genital segment. In A. stocki it extends upto the base of the fifth legs. In A. proboscidens the siphon over-reaches the caudal rami. A. stocki hence occupies a position between A. stimulans and A. proboscidens.

A. stocki can be distinguished from A. siphonatus by the spiny post-genital segments, relatively shorter genital segment, by the shape of the exopod of the second antenna and by the length of the mandibular palp.

Stock's, 1966, observation that this group of species possesses an one-segmented mandibular palp and lacks an inner seta on the coxal segment of the fourth leg holds good in the case of A. stocki.

This species is named to honour Professor J. H. Stock who has done excellent work on Asterocheridae.

Asterocheres longisetosus sp. nov.

(Text-figs. 20-32)

Material: Five females from the coral, Porites (Synaraea) convexa (Dana), examined at Chetlat Island, Laskshadweep, Arabian Sea.

Female: Prosome ovate, relatively much larger than urosome. Total length 0.84 mm, maximum width 0.53 mm. Cephalosome completely fused with the first pedigerous segment. Cephalothorax longer than the rest of the prosome and postero-laterally projecting. Second pedigerous segment demarcated from cephalothorax by small but distinct lateral gaps. Third pedigerous segment narrower than second and slightly longer; fourth segment relatively small, overlapping fifth and part of the genital segments. Fifth leg-bearing segment very short, $32 \times 132 \ \mu$ m. Genital segment pyriform, moderately enlarged and narrowing backwards, $120 \times 132 \ \mu$ m, lateral borders medially hairy. Post-genital segments together slightly shorter than genital segment, measuring 38×82 and $44 \times 75 \ \mu$ m, second post-genital segment laterally spiny. Caudal ramus much broader than long, $19 \times 32 \ \mu$ m, with six setae, two of the distal setae very long. Rostrum proximally broad, suddenly constricted in the middle and apically slightly widened, distal border subtruncate. Oral siphon elongated, long and fairly broad, only gradually narrowing, apex trilobed.



Text-figs. 28-39. Asterocheres longicetosus sp. nov., 28. leg 1 (f); 29. leg 2 (f); 30. leg 3 (f); 31. leg 4 (f); 32. leg 5 (h). Asteropontius laccadivensis sp. nov., 33. female, dorsal view (a); 34. first antenna (e); 35. second antenna (d); 36. mandible (f); 37. first maxilla (g); 38. second maxilla (e); 39. maxilliped (e).

First antenna twenty-segmented and regularly narrowing distalwards, segments two to ten relatively short and well armed with strong setae; beyond the tenth segment the appendage suddenly narrowed. Apical segment with a long aesthete. Length of segments 15, 10, 7, 7, 7, 8, 8, 7, 10, 13, 21, 20, 20, 18, 18, 22, 21, 10, 10 and 8 μ m; armature 1, 2, 2, 2, 3, 3, 1, 2, 6, 5, 4, 2, 1, 1, 2, 2, 3, 2, and 2 respectively.

Second antenna four-segmented and slender; first segment stout, second slightly narrower than first and spiny. Exopod very small, with two setae. Third segment short and triangular, underriding fourth and with a short spine, fourth segment a long claw with swollen base carrying an inner spine and outer spinules or hairs.

Mandibular stylet long, fairly stout and apically drawn out; palp short and one-segmented, with three setae.

Inner lobe of first maxilla twice as long and as broad as the outer, with three apical setae, inner border spinulose, outer lobe with three long setae.

Second maxilla uncinate, basal segment fairly stout, distal a stout claw, longer than basal segment, and with two median and one distal spinules.

Maxilliped six-segmented; basal segment with an inner spine, second segment long and stout, third, fourth and fifth segments poorly demarcated, fourth and fifth with an inner seta, sixth segment a well developed claw.

Legs one to four with three-segmented rami. First leg relatively short, its basis produced at the inner distal part into a conspicuous lobe. Rami of third leg more slender than those of second. Endopod of fourth leg clearly shorter than exopod. Free segment of fifth leg only slightly longer than broad, with two long setae and two very short spines, basal segment with an unusually long seta.

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P1 exp. I-1; I-1; III, 4
end. 0-1; 0-2; 1, 5
P2 exp. I-1; I-1; III, I, 4
end. 0-1; 0-2; 1, 5
P3 exp. I-1; I-1; III, I, 4
end. 0-1; 0-2; 1, 5
P4 exp. I-1; I-1; III, I, 3
end. 0-1; 0-2; 2, I, 2
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Remarks: A. longisetosus shows some resemblance to A. scutatus Stock, 1966 and A. ovalis Sewell, 1949, collected from the Red Sea and Arabian Sea respectively, both localities close to that of *A. longisetosus*. However *A. scutatus* has a relatively broader genital segment and longer fifth legs.

A. cvalis resembles A. longisetosus in many characters but its female is unknown. On the other hand my collection includes only females. The male of A. ovalis has a fourteen-segmented first antenna (twentysegmented in A. longisetosus). The absence of a process on the second exopod segment of legs one and three, the slender nature of the rami of the third leg and the presence of a plumose inner seta on the coxa of the fourth leg are characters common to these three species. There is also some similarity in the second antenna, mandible and first maxilla.

The shape of the fifth leg, particularly the long seta associated with it and the presence of a prominent lobe on the basis of the first leg easily distinguish *A. longisetosus* from the rest.

The trivial name refers to the long setae on the fifth leg which is a unique character.

Asteropontius laccadivensis sp. nov.

(Text-figs. 33-50)

Material: Nine females and twenty two males from Acropora formosa (Dana) examined at Agatti Island, Lakshadweep, Arabian Sea.

Female: Prosome comparatively broad and large, urosome slender and elongated, the ratio of their lengths 2:1. Total length of body 1.04 mm, maximum width 0.57 mm. Cephalosome a perfect semicircle with evenly curved borders, fully fused with the first pedigerous segment. The line of fusion between these just indicated laterally and the cephalothorax suddenly narrowed beyond and postero-laterally forming small triangular lobes. Second pedigerous segment clearly narrower than cephalothorax, much longer than the succeeding ones, laterally rounded and with faint indication of epimeral lobes. Third pedigerous segment postero-laterally angular, with small epimeral lobes. Fourth pedigerous segment overlapped by third and laterally curving forwards. Fifth leg-bearing segment drawn outwards and hence much broader than long, $82 \times 170 \,\mu m$. Genital segment longer than broad, $151 \times 138 \ \mu m$, anteriorly forming a pair of rounded lateral lobes and suddenly constricted beyond, the middle of the lateral borders hairy. Post-genital segments two, subequal in length, second segment widening distalwards, both segments laterally spiny, measuring 63×82 and 69×95 μ m respectively. Caudal ramus broader than long, 31×34 μ m, with six setae, one of the distal setae very long and basally swollen.



Text-figs. 40-52. Asteropontius laccadivensis sp. nov., 40. leg 1 (e); 41. leg 2 (e);
42. leg 3 (e); 43. leg 4 (e); 44. leg 5 (f); 45. male, dorsal view
(b); 46. urosome (dorsal) (d); 47. first antenna (e); 48. maxilliped (e); 49. third segment of exopod of leg 1 (e); 50. third segment of endopod of leg 3 (e). Indomyzon guasimi Ummerkutty, 51. female, dorsal view (a); 52. first antenna (g).

First antenna nineteen-segmented, proximal half fairly broad and distal relatively slender; first segment longest, second to nineth short, tenth to seventeenth subequal in length, penultimate segment with a stout aesthete. The length of the segments 72, 16, 22, 14, 11, 11, 10, 11, 12, 22, 27, 22, 26, 24, 21, 24, 22, 32 and 40 μ m and armature 1, 2, 1, 2, 2, 1, 1, 2, 3, 1, 3, 2, 1, 1, 1, 1, 3 and 8 setae respectively.

Second antenna 238 μ m long. Coxal segment short, basis rather stout bearing on its outer distal part a small exopodal lobe carrying three setae; endopod apparently three-segmented, ending in a long slender slightly curved claw, third segment externally hairy and with an inner distal seta.

Oral siphon conical, as long as broad and just reaching the base of the maillipeds.

Mandibular stylet fairly stout, regularly narrowing and apically expanded into a transverse dentate blade, palp very short and onesegmented with a long stout seta, the whole appearing as a single long seta; nearly as long as the stylet.

Inner lobe of first maxilla about twice as broad and three times as long as the outer, each lobe armed with three long setae.

Second maxilla two-segmented and uncinate, second segment longer than first and basally rather swollen, reclining against the basal segment.

Maxilliped six-segmented, first two segments subequal in size, second with a long outer distal process, third, fourth and fifth with an inner seta, sixth segment a long strong claw.

Legs one to four with three-segmented rami. Third leg largest. Outer border of exopod segments spiny and that of endopod segments hairy. Basal exopod segment of first leg with a flanged claw instead of the usual spiny one, third exopod segment lacking the long partly hairy and partly spiny claw. Basal segment of fifth leg stout, with a long seta, distal segment oblong, with one small and two stout setae; its distal border produced into two low processes.

P1	exp.	I-1;	I-1;	III, 4
	end.	0-1:	0-2:	1, 5
P2	exp.	I-1;	I-1;	III, I, 4
	end.	0-1;	0-2;	1, 5
P3	exp.	I-1;	I-1;	III, I, 4
	end.	0-1;	0-2;	1, 5
P4	exp.	I-1;	I-1;	III, I, 4
	end.	0-1:	0-2;	1, 1, I. 2

Male: General shape of body very much like like that of female. Cephalothorax postero-laterally less projecting. First pedigerous segment relatively longer and the fourth shorter. The overall shape of the post-cephalothoracic part of the prosome different from that of female. Fifth leg-bearing segment relatively narrower. Genital segment roughly squarish, $116 \times 104 \ \mu$ m, postero-laterally produced into triangular lobes carrying the sixth legs. Post-genital segments three, middle segment slightly longer than the others, measuring 44×64 , $48 \times 60 \ \mu$ m respectively. Caudal ramus as in female, $24 \times 24 \ \mu$ m. with six setae. Total length of body 0.77 mm; maximum width 0.3 mm. The ratio of length of prosome to that of urosome 1.7:1; ratio of length to width of prosome 1.3:1.

First antenna stouter but shorter than that of female, only sixteensegmented, penultimate segment with a stout aesthete. Other cephalic appedages as in female.

Maxilliped six-segmented, first segment relatively longer; second distally produced over the third, its inner proximal part with a projecting lobe and inner border beyond this lobe spiny; third and fifth segments with a seta, claw slightly longer than in the female.

Legs one to four generally as in female but the third exopod segment of leg one and the third endopod segment of leg three different from the corresponding segments in the female as shown in the figure. Fifth leg relatively short, with two highly unequal apical setae. Sixth leg represented by a short and a long setae placed postero-laterally on the genital segment.

Remarks: A. laccadivensis differs from A. coralliphilus Stock, 1966a, in its longer and more rounded cephalothorax, in the number of setae on the first maxilla, and in the shape of the cephalothorax and first pedigerous segment of the male.

Compared with A. laccadivensis, A. parvipalpus Stock, 1975, has a much broader cephalothorax, a longer exopod on the second antenna, a minute seta representing the mandibular palp, differently setose first maxilla and a differently shaped male.

A. ungellatus Stock, 1975, differs from A. laccadivensis in the shape of the cephalothorax, in the very small mandibular palp, in the shape of the exopod of the second antenna and in the setation of the first maxilla.

A. longipalpus Stock, 1975, is closest to A. laccadivensis, but the general shape of the body, the nature of the mandibular palp and the

slender distal segment of the second maxilla distinguish it from A. laccadivensis.

A. laccadivensis differs from A. typicus Thompson & Scott, 1903, mainly in the shape of the body. According to the key provided by Stock (1966a) these two species have III, I, 4 armature for the distal segment of the exopod of the fourth leg and 2, I, 2 armature for the third segment of the endopod.

The males of *A. typicus* and *A. longipalpus* are unknown. in all the others the second segment of the maxilliped of the male has an identical swelling. It is likely that this may prove to be a character which distinguishes *Asteropontius* from *Asterocheres*.

The specific name alludes to the place of collection.

Indomyzon quasimi Ummerkutty

(Text-figs. 51-63)

Indomyzon quasimi Ummerkutty, 1966, p. 27, figs. 18-29.

Material : Four females from the sponge Sigmadocia pumila (Lendenfeld) examined at Rameswaram Island, Gulf of Mannar, Bay of Bengal.

Female: Prosome broad and subcircular; urosome long and slender; the ratio of their lengths 1.2:1. Total length of animal 1.02 mm, maximum width 0.49 mm. First pedigerous segment fused with cephalosome, the line of fusion indicated laterally. Cephalothorax anteriorly evenly rounded and postero-laterally forming large blunt lobes projecting beyond the second pedigerous segment; second pedigerous segment narrower than cephalothorax and demarcated from the latter by well marked lateral incisions; epimeral lobes posteriorly angular. Third pedigerous segment with large rounded epimeral lobes. Fourth segment small, highly arched and sunk into the third segment, epimeral lobes indistinct and angular. Fifth leg-bearing segment much narrower than fourth, bulging postero-laterally. Genital segment not much swollen, basally somewhat enlarged and narrowing distalwards, longer than broad, $170 \times 126 \,\mu$ m. Post-genital segments two, first very long and second very short, both widening backwards; first, like the genital segment, with sharp postero-lateral corners. Caudal ramus elongated, longer than the second post-genital segment, $76 \times 57 \mu m$, basally swollen and distally subtruncate, two of the distal setae fairly long.

First antenna moderately stout and steadily narrowing distalwards, nineteen-segmented; length of segments 18, 11, 6, 5, 8, 5, 7, 6, 9, 8, 9, 11, 8, 11, 11, 13, 12 and 11 μ m; setation 0, 0, 0, 2, 2, 0, 1, 0, 3, 1, 1,

0, 1, 1, 1, 1, 1, and 3 respectively; seventeenth segment with a long aesthete.

Basal segment of second antenna very short, second segment stout, third only slightly shorter and narrower than second, with a strong distal spine, fourth segment short and underriding fifth, latter with swollen base and drawn out into a short but strong claw. Exopod very small and one-segmented, with three setae.



Text-figs. 58-63. Indomyzon quasimi Ummerkutty, 59. second antenna (g); 54. oral siphon (f); 55. mandible (g); 56. first maxilla (g); 57. second maxilla (g); 58. maxilliped (g); 59. leg 1 (g); 60. leg 2 (g); 61. leg 3 (g); 62. leg 4 (g); 63. leg 5 (p).

Oral siphon short but broad, its basal half roughly squarish, distal steadily narrowing and reaching the base of the maxillipeds.

Mandibular stylet apically drawn out and smooth, palp one-segmented and fairly long, with two pectinate setae, as long as the segment.

Outer lobe of first maxilla short, with three apical setae, inner two and a half times as long as outer and characteristically curved, proximally narrow, with four long apical setae.

Second maxilla uncinate, second segment a stout long claw with proximal inner spinules.

Maxilliped six-segmented; basal segment with two spines, second segment stout, with spiny inner and hairy outer borders, segments three to five with a seta, sixth segment a short, stout, straight claw with spiny borders.

Legs one to four with three-segmented rami; claw on first segment of exopod of first leg long, reaching beyond the second segment. Endopod of legs one to four successively decreasing in length in relation to the exopods. Basal segment of fifth leg with a long seta, distal segment elliptic, with three setae.

P1	exp.	I-1;	I-1;	II, I, 4
	end.	0-1;	0-1;	1, 2, 3
P2	exp.	I-0;	I-1;	III, I, 4
	end.	0-1;	0-0;	1, 3, 2
P3	exp.	I-0;	I-1;	III, I, 4
	end.	0-1;	0-0;	1, 2, 2
P4	exp.	I-0;	I-1;	III, I, 3
	end.	.0-0;	0-0;	2

Remarks: Ummerkutty's illustration of the whole animal is essentially correct but he has not shown the epimeral lobes of the free pedigerous segments. The first post-genital segment is narrower basally than shown by Ummerkutty. The illustration showing the oral siphon and cephalic appendages provided by Ummerkutty does not allow a detailed comparison. The legs do not show any difference worth pointing out. I have provided whatever details could be observed. The free segment of the fifth leg is quite different from what Ummerkutty has shown.

Distribution : Gulf of Mannar.

Summary

Detailed illustrated descriptions of Asterocheres stocki sp. nov., Asterocheres longisetosus sp. nov., Asteropontius laccadivensis sp. nov. and Indomyzon quasimi Ummerkutty are presented.

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References

- BOECK, A. 1859. Tvende nye parasitiske krebsdyr, Artotrogus orbicularis og Asterocheres lilljeborgii. Forh. Vidensk Selsk. Krist. 171-182.
- GIESBRECHT, W. 1897. System der Ascomyzontiden, einer semiparasitischen Copepoden Familie. Zool. Anz., 20: 9-14, 17-24.
- SARS, G. O. 1918. Copepoda Cyclopoida. An account of the Crustacea of Norway with short descriptions and figures of all the species. 6 : 173-225.
- Sewell, R. B. S. 1949. The littoral and semi-parasitic Cyclopoida, the Monstrilloida and Notodelphyoida. Scient. Rep. John Murray Exped., 9 (2): 17-199.
- STOCK, J. H. 1965. Copepods Associes Aux Invertebres Des cotes Du Roussillon V. Cyclopoides siphonostomes spongicoles Rares Et Nouveaux. Vie Milieu., 16: 295-324.
- STOCK, J. H. 1965. Copepoda Associated with Invertebrates from the gulf of Aquaba. Proc. K. ned. Akad. Wet. Amsterdam ser. c, 69 (2): 204-210.
- Stock, J. H. 1966a. Cyclopoida siphonostomata from Mauritius (Crustacea : Copepoda). Beaufortia, 13 (159) : 145-194.
- STOCK, J. H. 1975. Peltomyzon rostratum n. gen., n. sp. A Siphonostome Cyclopoid Copepod Associated with the West Indian Coral Monastraca. Bull. Zool. Mus. Univ. Amsterdam, 4: (14) 111-117.
- THOMPSON, I. C. & SCOTT, A. 1903. Report on the Copepoda collected by professor Herdman, at Ceylon, in 1902. Rep. Ceylon Pearl Oyster Fish., 7: 227-301.
- UMMERKUTTY, A. N. P. 1966. Studies on Indian Copepods. 13. Brief Notes on the Asterocherid copepods from the South East coast of India with Description of *Indomyzon quasimi* n. gen. n. sp. and a Discussion on the Family Asterocheridae. *Crustaceana*, 2 (1): 17-32.