

STUDIES ON INDIAN COPEPODS — 13. BRIEF NOTES ON THE  
ASTEROCHERID COPEPODS OBTAINED FROM THE SOUTH EAST  
COAST OF INDIA WITH DESCRIPTION OF *INDOMYZON QASIMI*  
N. GEN., N. SP. AND A DISCUSSION ON THE FAMILY  
ASTEROCHERIDAE

BY

A. N. P. UMMERKUTTY

Central Marine Fisheries Research Institute, Mandapam Camp, India <sup>1)</sup>

During the course of a study on the littoral and planktonic copepods of the south east coast of India several species belonging to Asterocheridae (Cyclopoida, Copepoda) were gathered, mostly in association with other invertebrates and weeds. The present communication intends to give brief accounts of these species and includes the description of *Indomyzon qasimi* n. gen., n. sp. *Indomyzon* shares many structural similarities with *Cletopontius* Thompson & Scott. Though there is little doubt that they are both asterocherids, these two genera together exhibit a pattern of ornamentation of the swimming legs different from other asterocherids. It is proposed, therefore, to split up the family Asterocheridae Giesbrecht (sens. str.) into two subfamilies: Cletopontiinae nov. to include *Cletopontius* and *Indomyzon* and Asterocherinae to contain the remaining genera. In the following pages species that are already described by earlier workers are merely listed, reporting points of special interest. Two species recently collected and belonging to the genus *Asterocheres* Boeck seem to be new to science and are described without, however, suggesting names since each species is represented by a single female specimen.

***Asterocheres major* Thompson & Scott, 1903**

Thompson & Scott, 1903: 287, pl. 18 figs. 21-28.

Several specimens of both sexes were obtained from sponge washings from the Gulf of Mannar on the south east coast of India on 14 October 1960. Thompson & Scott (1903) have given excellent diagrams of the cephalosomal appendages and the fourth and fifth legs of the adult female as well as the urosome and the antennule of the adult male. The siphon is very broad and short, pyriform in shape and extending only to the insertions of the maxillipeds. The ornamentation of the swimming legs is presented below:

<sup>1)</sup> Present address: Zoological Survey of India, Calcutta 13, India.

	Protopod						Endopod						Exopod					
	1		2		1		2		3		1		2		3			
	si	se	si	se	si	se	si	se	si	st	se	si	se	si	se	si	st	se
P1	I	0	I	1	1	0	2	0	3	2	1	1	I	1	I	2	2	III
P2	I	0	0	1	1	0	2	0	3	I+1	1	1	I	1	I	4	I	III
P3	I	0	0	1	1	0	2	0	3	I+1	1	1	I	1	I	4	I	III
P4	0	0	0	1	1	0	2	0	2	II+1	1	1	I	1	I	4	I	III

The spine on the proximal segment of the first exopod is rather short, hardly reaching the middle of the segment. The spine on this latter segment suggests bifurcation because of the presence of a small outgrowth at its base. The basal protopod segment of the first leg carries a spine. The female is 1.15 mm, the male 1.05 mm long. This is the first record of the species after the original publication by Thompson & Scott.

#### ***Asterocheres minor* Thompson & Scott, 1903**

Thompson & Scott, 1903: 288, pl. 18 figs. 29-31.

Several specimens of both sexes were gathered from washings of sponges from the Gulf of Mannar, along with the preceding species. The present species is very close to the preceding one in structural details, including the ornamentation of the swimming legs. "The distinguishing characters of this species are the differences in the proportional lengths of the abdominal joints and furca, the latter being about half the length of the last abdominal joint" (Thompson & Scott, 1903). Since these features as well as the size range are constant in all the specimens examined, I agree with Thompson & Scott in extending specific validities to these two forms. The female is 0.83 mm, the male 0.71 mm long. This is the first record of this species after its original description.

#### ***Asterocheres mannarensis* Thompson & Scott, 1903**

Thompson & Scott, 1903: 287, pl. 19 figs. 11-20; Sewell, 1949: 50-51.

Three female specimens of this copepod were obtained from washings of sponges from the Gulf of Mannar on 14 October 1960. The present material agrees fully with the descriptions given by earlier workers. The ornamentation of the swimming legs is, however, presented here, distinguishing between the spines and setae.

	Protopod						Endopod						Exopod					
	1		2		1		2		3		1		2		3			
	si	se	si	se	si	se	si	se	si	st	se	si	se	si	se	si	st	se
P1	1	0	1	0	1	0	2	0	3	2	1	1	I	1	I	2	2	III
P2	1	0	0	2	1	0	2	0	3	I+1	1	1	I	1	I	4	1	III
P3	1	0	0	1	1	0	2	0	3	I+1	1	1	I	1	I	4	1	III
P4	1	0	0	1	1	0	2	0	2	2	1	1	I	1	I	4	1	III

The size of the female is 0.70 mm. This species has been recorded from the Gulf of Mannar and the Malay Archipelago.

***Asterocheres dentatus* Giesbrecht, 1897**

Giesbrecht, 1897: 9.

This species has already been reported from the present geographical area by Thompson & Scott (1903). The present collection comprises several specimens of both sexes; it was obtained from weed washings from the Gulf of Mannar on 18 July 1960. The females are 0.53-0.63 mm, the males 0.45-0.50 mm long.

***Asterocheres orientalis* Sewell, 1949**

Sewell, 1949: 51-53, fig. 9.

Several male and female specimens of this species were procured from washings of weeds from the Gulf of Mannar on 3 December 1960. Sewell has rendered a detailed description of the female. The male will shortly be described by the author (Ummerkutty, in press b). The female is 0.68 mm, the male 0.61 mm long. The species has been reported from the Gulf of Mannar and the Malay Archipelago.

***Asterocheres indicus* Sewell, 1949**

Sewell, 1949: 53-56, fig. 10.

Seven female specimens of this species were gathered from weed washings from the Gulf of Mannar on 15 December 1960. Some minor points of difference are noticed between the Malay material and present specimens. The segments nine and ten of the antennule are incompletely divided in the Malay specimens while they are fully separate in the present material. Sewell showed only two terminal setae in the fifth leg. In the present case three setae are distinctly seen. In addition, a pair of rather strong setae is present on the ventral side of the genital segment, guarding the genital apertures. In all other characters there is complete agreement between the present material and the earlier description. The size of the female is 0.61 mm. This species is here for the first time reported from outside of its type locality.

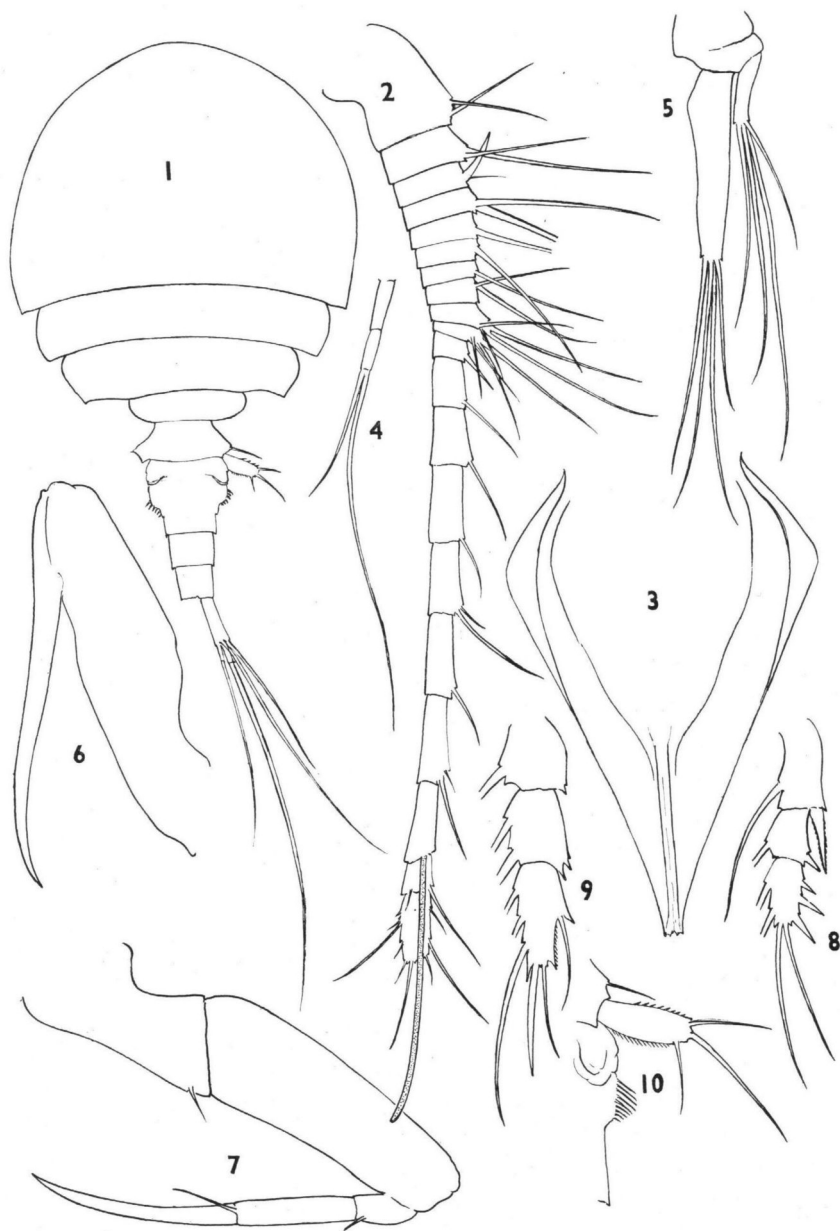
***Asterocheres complexus* Stock, 1960**

Stock, 1960: 222-224, fig. 3a-e.

Several female specimens of this species were taken from weed washings from the Gulf of Mannar on 29 September 1960. This species is very easily recognised by the angular nature of the postero-lateral corners of the prosomal segments. The first prosomal segment is distinctly wider than long. The length and width of the genital segment are more or less equal. The lateral margins of this segment are broken by indentations, and are lined with spinules and bristles. The last abdominal segment is a little longer than the caudal rami. The distal segment of the fifth leg carries three apical setae, the central of which is very small. The size of the female is 0.68 mm. The species has been reported from the Gulf of Naples (Giesbrecht, 1899, under the name of *A. boeckii*), Banyuls (Stock, 1960), and the Gulf of Mannar (Ummerkutty, in press, under the name of *A. latum*).

**Asterocheres sp. (1)**

A single female specimen of this copepod was gathered from mud-covered coral stone washings from the Gulf of Mannar on the south east coast of India on 16 August 1960.



Figs. 1-10. *Asterocheres* sp. (1), female. 1, dorsal view; 2, antennule; 3, siphon; 4, mandibular palp; 5, maxillule; 6, maxilla; 7, maxilliped; 8, first exopod; 9, third endopod; 10, fifth leg.

The body (fig. 1) is more or less oval with prosome and urosome clearly marked, the former is very conspicuous, being much wider and longer than the latter. The first prosomal segment is the largest and widest of the body segments. The second and third segments diminish both in length and width posteriorly. All these segments end posteriorly in angular corners. The fourth prosomal segment is very small, just half as long and as wide as the preceding segment. The urosome consists of four segments, the fifth leg-bearing segment, the genital segment and two abdominal segments. They gradually decrease in breadth posteriorly. The genital segment is the longest of the urosomal segments, while the other segments are subequal and much shorter than the genital segment. At the junction of the proximal and distal halves of the genital segment there are tufts of hairs on either lateral side. The caudal ramus is much longer than the last abdominal segment and is slightly broader posteriorly. Each ramus bears five setae, the medial seta being much longer than the entire urosome. As usual, two caudal setae are jointed at the base. The relative lengths of the urosomal segments and the caudal ramus are given below:

$$17.8 \quad 32.2 \quad 14.5 \quad 13.3 \quad 22.2 = 100$$

The relative lengths of the prosome and urosome are 40 : 60. The prosome is slightly longer than wide.

The antennule (fig. 2) is 20-segmented and is divided into a proximal wide and a distal narrow region, composed of nine and eleven segments respectively. There is an aesthetask on the eighteenth segment, while setae are borne on all segments. The antennular segments have the following proportionate lengths:

1	2	3	4	5	6	7	8	9	10	11
11.3	3.6	3.3	2.4	2.4	2.3	1.8	2.3	2.0	1.6	2.1
12	13	14	15	16	17	18	19	20		
5.2	6.0	8.4	7.5	9.0	9.2	8.4	3.4	7.8	= 100	

The antenna is 4-segmented, the second segment, bearing a rudimentary endopod, is spherical in shape and carries a single apical seta. The third segment is the longest, it is about as long as the first and second segments combined. The last segment is the smallest and bears two apical spines, one of which is about half as long as the entire antenna. The siphon (fig. 3) is very stout and short. Its wider proximal region narrows down to the posterior tip which is trilobed. The mandible (fig. 4) consists of a masticatory blade and a biarticulate palp. The latter is only one-fifth as long as the blade and bears two apical setae of unequal length. The combined length of the palp and its longer seta is equal to that of the blade. The maxillule (fig. 5) is bilobed, both lobes being borne on a partially divided protopod. The two lobes are very unequal in size and each bears apical setae of varying lengths. The maxilla (fig. 6) which is composed of a very small proximal and a large distal segment carries a long tapering claw on the apex. The maxilliped (fig. 7) is 4-segmented, the distal two segments being much smaller and held at

an angle to the axis of the two proximal segments. The fourth segment bears a long tapering claw and a small seta on its apex. The first and third segments of the maxilliped each bear a small seta in the distal part. The second segment is devoid of any accessory structures.

The four pairs of swimming legs are biramous (figs. 8, 9) each ramus being trimerous. The first legs are the smallest while the other legs are more or less of equal size. The ornamentation of the swimming legs is presented below:

	Protopod						Endopod						Exopod					
	1		2		1		2		3		1		2		3			
	si	se	si	se	si	se	si	se	si	st	se	si	se	si	se	si	st	se
P1	1	0	1	I	1	0	2	0	3	2	1	1	I	1	I	2	2	III
P2	1	0	0	1	1	0	2	0	3	2	1	1	I	1	I	4	I	III
P3	1	0	0	1	1	0	2	0	3	I+1	1	1	I	1	I	4	I	III
P4	0	0	0	1	1	0	2	0	2	I+1	1	1	I	1	I	4	I	III

In the fifth leg (fig. 10) the proximal segment is indicated by the presence of a single seta. The distal segment is rather rectangular, bearing three apical setae. There are bristles on both margins of the distal segment. The female is 1.27 mm long.

*Asterocheres lilljeborgi* Boeck comes closer to the present species than any other known member of the genus. However, a description is given above because the present species differs from all known forms in a few important details: (i) The caudal ramus is much longer than the last abdominal segment. Sars (1915) in his definition of the genus mentioned that the caudal rami are comparatively short, and a study of the forms that have been described after his "Account" reveals that the last urosomal segment always exceeds the caudal ramus in length. (ii) The length-width ratio of the ramus itself is still more striking. While in all recorded species the caudal rami are hardly more than twice as long as broad, in the present case the length-width ratio is 3.5 : 1.0. (iii) The proportionate sizes of prosome and urosome are 63 : 37. This is different from what has been described for all earlier species where the prosome is found to be generally twice as long as the urosome. (iv) The proportionate lengths of the antennular segments and the ornamentation of the swimming legs are as given in the text. It is likely that the present species is an undescribed form.

#### *Asterocheres* sp. (2)

A single female specimen of this copepod was obtained from washings of the starfish, *Pentaceros bedemanni* (Lütken) from the Gulf of Mannar on 22 December 1960.

The shape of the body is peculiar for an asterocherid (fig. 11). The prosome is squarish, 4-segmented and one and a half times longer than the urosome. The first segment constitutes three-fourth of the entire prosome and is clearly broader

than long. The next three segments abruptly diminish both in length and in width. The urosome is 4-segmented and much narrower than the prosome. The first segment, carrying the fifth pair of legs is very short. The genital segment is long and is divided into three regions of equal length; the proximal region is the widest and carries the genital apertures on its ventral side; the middle region is less broad, but is clearly marked off by sharp angular corners, and it carries a few hairs on its distal margins; the distalmost region is the narrowest and tapers posteriorly. The abdominal segments are of about equal dimensions and are columnar. The caudal rami are longer than the last abdominal segment and three times as long as broad. Both the inner and outer margins of the ramus are straight; there are five caudal setae, two of these being jointed at the base. The antennule (fig. 13) is 20-segmented and stoutly built. There is an aesthetask on the eighteenth segment. The antennular segments have the following relative lengths:

1	2	3	4	5	6	7	8	9	10	11
13.0	4.0	4.0	3.0	3.5	3.5	3.0	4.0	5.0	3.0	4.0
12	13	14	15	16	17	18	19	20		
5.0	5.0	5.0	6.5	6.0	6.5	5.5	4.0	6.5	= 100	

The other cephalosomal appendages (fig. 14) are typically asterocherid. The antenna is 5-segmented with a vestigial exopod on the second segment. The siphon is very stout and short, hardly reaching the base of the maxilla. The mandible has a well developed, 2-segmented palp and a long, narrow masticatory blade. In the maxillule the size difference between the two lobes is rather small. The maxilla has its terminal claw longer than the basal segment. The maxilliped is 5-segmented with a strong claw.

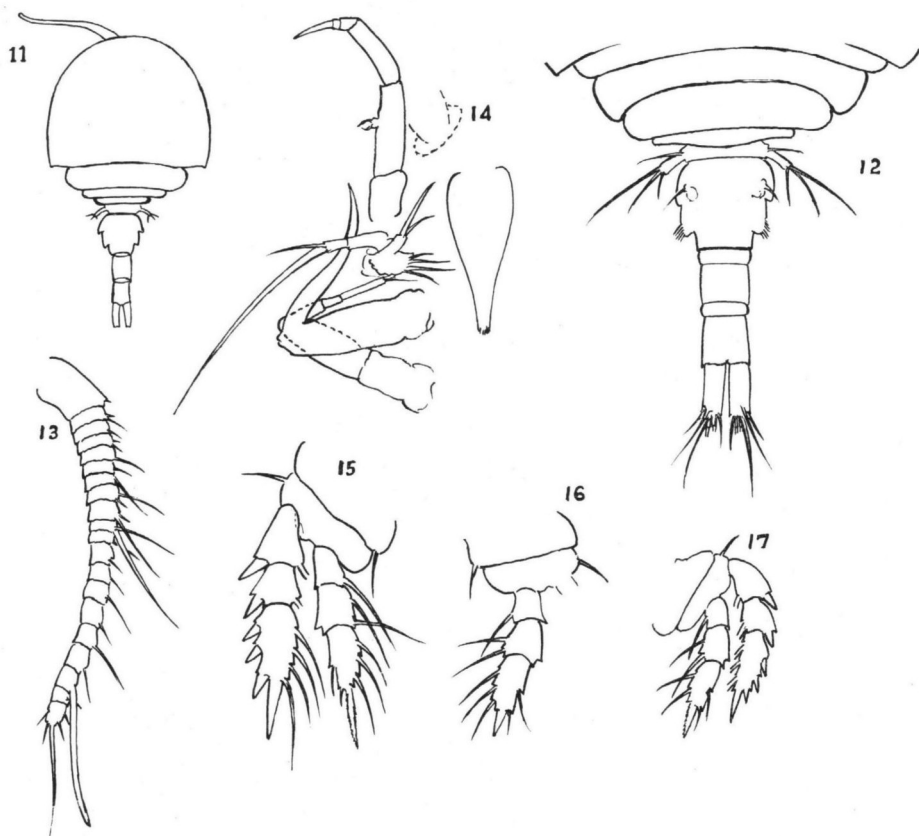
The four pairs of swimming legs (figs. 15-17) are biramous, the rami being 3-segmented. The ornamentation of the swimming legs is presented below:

	Protopod				Endopod						Exopod							
	1		2		1		2		3		1		2		3			
	si	se	si	se	si	se	si	se	si	st	se	si	se	si	se	si	st	se
P1	1	0	1	1	1	0	2	0	3	2	1	1	I	1	I	2	2	III
P2	1	0	0	1	1	0	2	0	3	2	1	1	I	1	I	4	I	III
P3	1	0	0	1	1	0	2	0	3	I+1	1	1	I	1	I	4	I	III
P4	0	0	0	1	1	0	2	0	2	I+1	1	1	I	1	I	3	I	III

The segments of the legs are stout and the lateral spines of the exopods are beautifully spindle-shaped with dentate margins. The fifth leg is normal. The proximal segment is represented by a seta on the outer lateral margin. The distal segment is well developed with a narrow proximal area and a broad distal area, the latter carrying three unequal terminal setae. The size of the female is 0.61 mm.

The species dealt with above appears to be new to science. The following are the characteristic features of this species: (i) The first prosomal segment is one and one-quarter times broader than long. The anterior end is smoothly rounded

while the posterior end is rather straight. The next three prosomal segments together are only about one-fourth of the first segment, the segments gracefully diminishing both in length and width posteriorly. (ii) In the urosome the genital segment is very short, forming a narrow strip between the last prosomal segment and the fifth leg-bearing segment. The genital segment is characteristically divided into three equal parts: (1) the proximal part is the widest and encloses the genital apertures; (2) the middle part is a little less wide, but distinctly marked off by angular corners, the posterior half of lateral margins of this middle part carries four stout spinules on each side; (3) the distal part is the narrowest and does not



Figs. 11-17. *Asterocheres* sp. (2), female. 11, dorsal view; 12, part of prosome and urosome ventral view; 13, antennule; 14, cephalosomal appendages in situ; 15, second leg; 16, third leg; 17, fourth leg.

carry any appendage. The next urosomal segments are more or less of equal size and rather squarish. Each caudal ramus is two and a half times longer than wide. (iii) The antennule is 20-segmented. (iv) The setal formula of the swimming legs is as represented earlier. One notable feature about the legs is the stout, rounded nature of the exopodal spines. Even the spine on the first segment of the exopod which in other species of the genus exceeds the length of the second segment of



the same leg, is spindle-shaped in the present case, with a smooth terminal end. The fifth leg is rectangular with little difference in width between the proximal and distal halves. There are three long setae on the terminal segment. (v) There is a high degree of calcification not only in the segments of the antennule but also in other appendages as well as along the margins of various segments of the body. (vi) The species lives in association with the starfish, *Pentaceros hedemanni* (Lütken).

#### **Scottocheres latus** Nicholls, 1944

Nicholls, 1944: 18-20, fig. 7.

Few female specimens of this copepod were obtained from washings of weeds from the inshore waters of the Gulf of Mannar on 19 September 1960. The size of the female is 0.98 mm. There is close agreement between the description rendered by Nicholls and the present material. It may be mentioned here that two other species of the genus have already been reported from the present geographical area by Thompson & Scott (1903). This is the first time that *S. latus* Nicholls is recorded outside its type locality.

#### **Dermatomyzon nigripes** (Brady, 1880)

Sars, 1915: 95-97, pls. 59, 60.

Two female specimens of this copepod occurred among sponge washings from the Gulf of Mannar on 14 October 1960. The present material corresponds with the descriptions of earlier workers; a few minor variations noticed are dealt with in another paper (Ummerkutty, in press a). This is the first record of this species from the Indian waters. It has formerly been reported from the British Islands, the Gulf of Naples, Spitzbergen and the Norwegian coast.

#### **Asteropontius typicus** Thompson & Scott, 1903

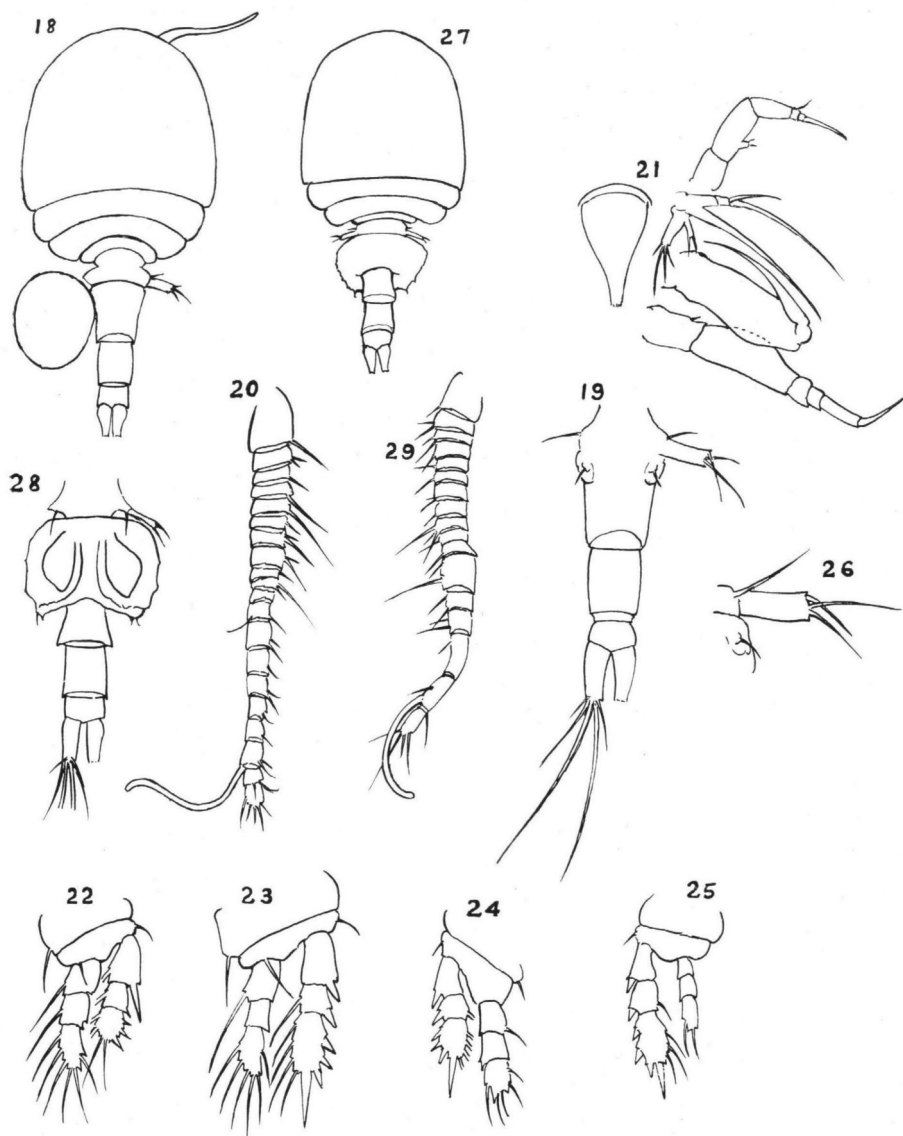
Thompson & Scott, 1903: 288-289, pl. 19 figs. 1-10.

Three female specimens of this copepod occurred in washings of weeds from the Gulf of Mannar on 1 November 1960. The specimens examined by Thompson & Scott were much larger, measuring 0.96 mm. As those specimens were reported from the same geographical area as mine, it is obvious that some variation in the size of the body exists in this species. In general appearance the species shows a great resemblance to *Asterocheres mannarensis* Thompson & Scott. However, it is easily distinguishable from the latter species by the difference in the relative lengths of the urosomal segments as well as by the generic distinctions. The size of the female is 0.7 mm.

#### **Asteropontius littoralis** Ummerkutty, 1961

Ummerkutty, 1961: 22-34, pl. 1.

Several female specimens of this species were taken from washings of weeds from the Gulf of Mannar on 13 July 1960. The size of the female is 1.2 mm. So far this species has not been reported from outside its type locality.



Figs. 18-29. *Indomyzon qasimi* n. gen., n. sp. 18-26, female; 27-29, male. 18, dorsal view; 19, urosome with fifth leg; 20, antennule; 21, cephalosomal appendages in situ; 22, first leg; 23, second leg; 24, third leg; 25, fourth leg; 26, fifth leg with spines on the genital segment; 27, dorsal view; 28, urosome ventral view; 29, antennule.

#### • *Asteropontius sewelli* Ummerkutty

Ummerkutty, 1961: 25-27, pl. 2.

Besides the type specimens no further examples of this copepod were obtained. The size of the female is 1.1 mm.

**Indomyzon n. gen.**

Body cyclopoid. Cephalosome fused with first pedigerous segment to form cephalothorax. Urosome 4-segmented in female, 5-segmented in male; caudal rami swollen in proximal region; caudal setae not segmented. Antennule 20-segmented in female, 17-segmented and geniculate in male. Mandibular palp 1-segmented. Siphon very short and broad. Other mouth parts typically asterocherid. Setae and spines of swimming legs greatly reduced. Second endopod segment of first leg with one seta; corresponding segment of other legs without any seta. Fourth endopod fragile, setation highly reduced. Fifth leg with a single segment, bearing three unequal apical setae.

Type species: *Indomyzon qasimi* n. sp.

**Indomyzon qasimi n. sp.**

Ten females (one of them carrying egg sacs) and eight males of this species were gathered from washings of the starfish, *Pentaceros bedemanni* (Lütken) from the Gulf of Mannar off Mandapam on 24 October 1960. One holotype female, one allotype male and six paratypes (three females and three males) are deposited in the Reference Collection Museum of the Central Marine Fisheries Research Institute, Mandapam Camp, and bear the registered numbers J. 754/23, J. 755/23 and J. 756/23 respectively.

Female. — The animal is very easily recognised by the rather rectangular shape of the prosome (fig. 18). The latter is equal in length to the urosome (fig. 19). The second, third, and fourth segments of the urosome diminish both in length and width posteriorly. The first urosomal segment is moderately developed and carries the fifth pair of legs. The genital segment is quite large, as long as the combined size of the second and third segments. It is broader in its anterior half and bears a seta ventrally near the genital aperture. The anterior and posterior halves of the genital segment merge smoothly with each other. There are no setae at their junction. The third urosomal segment is double the size of the fourth, but both segments are of about the same width. The caudal rami are peculiarly shaped; while the inner margin of the ramus is straight, the proximal half of the outer margin is bulged. At the posterior margin five setae are borne, none of them being jointed at base. The caudal ramus is longer than the last abdominal segment and is almost twice as long as wide.

The antennule (fig. 20) is strong with a high degree of calcification along the margins of the segments. There is a fairly long aesthetask on the eighteenth segment. The relative lengths of the segments are as follows:

1	2	3	4	5	6	7	8	9	10	11
12.7	5.0	3.6	3.6	4.5	3.2	4.5	5.0	2.7	2.7	3.2
12	13	14	15	16	17	18	19	20		
5.0	6.4	6.4	5.5	4.5	5.5	6.0	4.5	5.5	= 100	

The antenna (fig. 21) is 5-segmented, the second segment carries a rudimentary exopod with two terminal setae. The penultimate segment bears two marginal setae while the last segment has two terminal setae. The siphon is very short, hardly reaching the point of origin of maxillipeds. It is broad in its proximal half gradually narrowing down to the distal end. The mandibular palp is uni-articulate with terminal setae of unequal length. The masticatory blade tapers to a fine point, and is four times longer than the palp. The maxillule is small and bilobular. Both lobes carry apical setae, and the size difference between the two lobes is negligible. The maxilla is apparently 1-segmented with its terminal claw almost as long as the segment. The latter is very short and strong. The maxilliped is 5-segmented; the second segment is the longest and is only a little shorter than the combined lengths of the other segments; the first and fourth segments each have a solitary seta in the distal angle, while the last segment has an apical seta and a claw. The latter is very fragile and just as long as the terminal segment.

The four pairs of swimming legs (figs. 22-25) are biramous, each ramus being composed of three segments. However, the setae and spines on the different segments are highly reduced. The most notable features of the legs are the complete absence of setae on the second endopod segment of the second, third and fourth legs, the presence of only one inner seta on the first and second segments of the first endopods and the first segment of the second and third endopods and the highly reduced nature of the fourth endopods. The ornamentation of swimming legs is given below:

	Protopod				Endopod						Exopod					
	1		2		1		2		3		1		2		3	
	si	se	si	se	si	se	si	se	si	st	se	si	se	si	st	se
P1	1	0	1	1	1	0	1	0	3	2	1	1	I	1	I	3
P2	1	0	1	1	1	0	0	0	3	2	1	0	I	1	I	4
P3	1	0	0	1	1	0	0	0	2	2	1	0	I	1	I	4
P4	0	0	0	1	0	0	0	0	0	1	1	0	I	1	I	3

The proximal segment of the fifth leg (fig. 26) is fused with the body of the animal and is indicated by the presence of a seta. The distal segment is well developed, rectangular in shape with three apical setae of unequal length. It reaches beyond one third of the genital segment. The size of the female is 0.62 mm.

Male. — In appearance the male (fig. 27) is very similar to the female. However, the urosome (fig. 28) is clearly 5-segmented, and the genital segment is very much broadened, carrying at its postero-lateral angles the sixth pair of legs; each sixth leg consists of two unequal setae borne on a prominence. It is as long as the next two abdominal segments together. The caudal rami are very slender, similar to those of the female. The proportionate lengths of prosome and urosome are identical to those of the female. The antennule (fig. 29) is 17-segmented and geniculate. The sixteenth segment bears an aesthetask which is as long as the last

three antennular segments. The tenth segment, as it does in female, bears a great number of setae. The relative lengths of the antennular segments are given below:

1	2	3	4	5	6	7	8	9	10	11
7.0	4.5	4.5	3.0	4.0	3.5	4.5	5.0	4.5	2.0	4.5
12	13	14	15	16	17					
10.0	5.0	6.5	12.0	11.0	8.5	= 100				

The other cephalosomal appendages and swimming legs are exactly similar to those of the female. The fifth legs, are, however, much smaller and narrower. The size of the male is 0.57 mm.

Discussion. — Sewell (1949) has discussed the arrangement of setae and spines of the swimming legs and has given a series of ornamentation formulas for the different genera included in the family Asterocheridae. He observed that throughout the family there is a tendency towards the reduction of the total number of setae and spines. In most of the genera the reduction of spines and setae has taken place in the exopod and endopod segments of the fourth leg, while the third leg also has been affected in some cases like in *Rhyncomyzon*, *Dermatomyzon* and *Collocheres*. There has been little reduction in the number of setae and spines in the first and second legs except in *Asteropontius* where the situation is as follows:

	endopod			exopod			
	1	2	3	1	2	3	
P1	1 0	2 0	3 2 1	1 I	1 I	3 I	III or II
P2	1 0	2 0	3 I+1 1	1 I	1 I	4 I	III
			or				
			3 2 1				

The genus *Indomyzon* is unique in that the reduction of setae and spines has proceeded to an extreme case, affecting both exopods and endopods of all pairs of legs to a greater degree than is found in other asterocherid genera. Further, the fourth endopod is much smaller and is fragile as compared with the exopod of the same leg as well as with the rami of other legs.

Attention may be drawn here to some very interesting genera which were discovered about sixty years ago by Thompson & Scott from the Ceylon side of the Gulf of Mannar. Besides *Asteropontius* in which we have already seen a greater reduction in the number of setae and spines of the swimming legs, they also described four other siphonostome genera, viz., *Stephopontius*, *Doropontius*, *Cleto-pontius* and *Lepeopsyllus*. The systematic position of the first genus is discussed in a forthcoming paper by the present author. The last genus has recently been placed in the family Entomolepidae by Eiselt (1959). Of the remaining two genera, *Doropontius* has been correctly placed by Wilson (1932) in the Asterocheridae. *Cleto-pontius* has been included in the Dyspontiidae by Nicholls (1944) who obviously followed Wilson (1932) in this respect. Both authors appear to have been misled by the nature of the fourth swimming leg which completely lacks the endopod,

thus displaying superficial resemblance to some dyspontiid genera. The real systematic position of this genus however, has clearly been indicated by its authors who observed: "The characters of this genus do not agree in all respects with any of the known subfamilies of the Asterocheridae, and a new subfamily may, therefore, be required for its reception" (Thompson & Scott, 1903: 292). They were apparently referring to the family as conceived by Giesbrecht with subfamilies Asterocherinae, Dyspontiinae and Cancerillinae contained therein. These subfamilies were later upgraded, and in some cases split up, into more than one family by Sars (1913-18). A study of various appendages of *Cletopontius*, however, shows that this genus cannot, with certainty, be accommodated into any of the families proposed and defined by Sars, nor to those that have since then been added. In the structure of the antennule, antenna, mandible, maxillule, maxilla, maxilliped and first swimming legs, this copepod is a typical asterocherid. The second swimming leg and the siphon are not described by Thompson & Scott. The structure of the third swimming legs comes nearer to that of *Indomyzon* with the following formula:

	protopod			endopod			exopod		
P3	0	0	0 0	1	0	1 0	3	1 1	1 1 I III

In the fourth leg, as stated, the endopod is absent. The ornamentation of that leg is as follows:

P4	0	0	0 0	Absent	0	I	1	I	2	I I
----	---	---	-----	--------	---	---	---	---	---	-----

The fifth legs are clearly 2-segmented, and the body is flat and ovoid with a very short urosome.

*Cletopontius* is discussed in detail because it is felt that the discovery of the new genus *Indomyzon* throws more light on the systematic position of the former genus. Both are asterocherids with a greater tendency to reduction of setae and spines of the swimming legs. In *Indomyzon* the fourth leg is fragile with the first two segments devoid of setae and spines and with only one seta and one spine on the terminal segment. In *Cletopontius* the endopod is entirely absent. The first and second segments of the fourth exopod are similar in both cases. The terminal segment of the fourth exopod has two setae and spines in *Cletopontius* while there are three setae and four spines on that segment in *Indomyzon*. Finally in both genera the second segment of the third endopod carries only one seta, a character not met with in any other asterocherids, all of which possess two setae on the second endopod segment of the first three pairs of legs.

Eiselt (1961) has recently recognised that *Cletopontius* is an asterocherid, but did not indicate its correct position. The similarities shared by *Cletopontius* and *Indomyzon* and the differences that exist between these two genera on the one hand and the remaining asterocherids on the other, seem to support the division of the family Asterocheridae Giesbrecht into the following two sub-families:

Family Asterocheridae Giesbrecht (sens. str.)

Subfamily Asterocherinae. — All four pairs of legs are biramous, the rami being 3-segmented. The second endopod segment is provided with two inner setae in the first three pairs of legs and one or two setae in the fourth pair of legs.

Subfamily Cletopontiinae nov. — The first three pairs of legs are biramous, the rami being 3-segmented; in the fourth leg the endopod is present or absent; when present, setae and spines are reduced. The second endopod segment is armed with one or two setae in the first and second legs and with one or no seta in the third and fourth legs.

#### ACKNOWLEDGEMENTS

My grateful thanks are due to Dr. S. Jones, Director, Central Marine Fisheries Research Institute, Mandapam Camp, for his guidance and encouragement during the period of this investigation; to Dr. S. Z. Qasim, Chief Scientist, International Biological Programme, Ernakulam for his keen interest in the work, constructive criticisms and many helpful suggestions; and to Dr. A. G. Nicholls, C.S.I.R.O., Tasmania, Australia for kindly going through the systematic part of these studies on the Indian Copepods.

#### RÉSUMÉ

Les Copépodes asterocherides suivants sont signalés de la côte sud-est de l'Inde: *Asterocheres major*, *A. minor*, *A. mannarensis*, *A. dentatus*, *A. orientalis*, *A. indicus*, *A. complexus*, *Scottocheres latus*, *Dermatomyzon nigripes*, *Asteropontius typicus*, *A. littoralis* and *A. sewelli*.

En outre sont décrits en détail deux espèces non-nommées du genre *Asterocheres*, et *Indomyzon qasimi* n. gen., n. sp. A la lumière de la découverte de ce dernier genre, l'auteur suggère que la famille des Asterocheridae Giesbrecht (sens. str.) soit divisée en deux sous-familles: Cletopontiinae incluant *Cletopontius* Thompson & Scott et *Indomyzon* n. gen., et Asterocherinae incluant les autres genres d'Asterocheridés.

#### REFERENCES

- BRADY, G. S., 1880. A monograph of the British free and semi-parasitic Copepoda, **3**: 1-83. (Ray Society, London).
- EISELT, J., 1959. *Entomolepis adriae* n. sp., ein Beitrag zur Kenntnis der kaum bekannten Gattungen siphonostomer Cyclopiden: *Entomolepis*, *Lepeopsyllus* und *Parmulodes* (Copepoda, Crust.). Sitz. Ber. Österr. Akad. Wiss., math.-naturw. Kl., (1) **168** (7): 643-660.
- , 1962. Neubeschreibungen und Revision siphonostomer Cyclopoiden (Copepoda, Crust.) von der südlichen Hemisphäre nebst Bemerkungen über die Familie Artotrogidae Brady, 1880. Sitz. Ber. Österr. Akad. Wiss., math.-naturw. Kl., (1) **170** (7-10): 315-366.
- GIESBRECHT, W., 1897. Notizen zur Systematik der Copepoden. Zool. Anz., **20**: 253-255.
- NICHOLLS, A. G., 1944. Littoral Copepoda from south Australia (II). Calanoida, Cyclopoida, Notodelphyoida, Monstrilloida and Caligoida. Rec. S. Austr. Mus., **8** (1): 1-62.
- SARS, G. O., 1913-1918. Copepoda Cyclopoida. An account of the Crustacea of Norway, **6**: i-xiii, 1-225. (Bergen).
- SEWELL, R. B. S., 1949. The littoral and semiparasitic Cyclopoda Monstrilloida and Notodelphyoida. Sci. Rep. John Murray Exped., **9** (2): 17-199.
- STOCK, J. H., 1960. Sur quelques Copépodes associés aux Invertébrés des côtes du Roussillon. Crustaceana, **1** (3): 218-257.
- THOMPSON, I. C. & A. SCOTT, 1903. Report on the Copepoda collected by Prof. Herdman at Ceylon in 1902. Rep. Ceylon Pearl Oyster Fish., **1**: 227-307.
- UMMERKUTTY, A. N. P., 1961. Studies on Indian Copepods, 5. On eleven new species of marine cyclopoid copepods from the south east coast of India. J. mar. biol. Ass. India, **3**: 19-69.

- , in press, *a*. Studies on Indian Copepods, 9. Brief notes on copepods newly recorded from Indian waters.
- , in press, *b*. Studies on Indian Copepods, 11. Short accounts on the undescribed males of six species of copepods.
- WILSON, C. B., 1932. The Copepoda of the Woods Hole region, Massachusetts. Bull. U.S. nation. Mus., **158**: i-xix, 1-635.