J. Zool. Soc. India
22 (1 & 2): 147-156; 1970

Some new species of Siphonophora (Coelenterata) from the Indian Ocean

Ruby Daniel
Research Fellow,
Zoological Survey of India, Calcutta

A detailed study of the Siphonophora collected during the International Indian Ocean Expedition (1962-65) has shown the occurrence of 6 new species belonging to the genera *Amphicaryon* Chun, 1888 (I species) *Lensia* Totton, 1932 (4 species) and *Ceratocymba* Chun, 1888 (1 species). These species are described in this paper.

Sub-order CALYCOPHORAE Leuckart, 1854
Family Prayidae Kolliker, 1853
Sub-family Amphicaryoninae Chun, 1888
Genus **Amphicaryon** Chun, 1888

Amphicaryon intermedia n. sp.

(Text-fig. 1a)

Among the Siphonophores sorted from the plankton samples collected from the Arabian Sea by INS KISTNA, there are three examples of the polygastric phase of an Amphicaryoninae which fall, intermediate between *Amphicaryon* Chun (they possess a similar shape, are of same size and general appearance as this genus) and *Maresearsia* Totton (they resemble this genus in possessing two functional nectophores); these three examples are therefore treated as belonging to a new species of *Amphicaryon*, which is hereby named *Amphicaryon intermedia* n. sp.

Material examined.—One polygastric phase from INS KISTNA, Station K 20; Two examples of polygastric phase from INS 'KISTNA' Station no. K 44. All the specimens were taken by Nansen's net in hauls made from 200 metres to the surface.

Type locality.—Arabian Sea.

Description.—Polygastric phase: (Text-fig. 1a): The polygastric phase consists of two functional nectophores. The smaller one of the two is the younger nectophore, but it is not flat and shield-like as in *A. acaule;* it is not embraced by the larger nectophore. Large nectophore (Text-fig. 1a, N2): The dimensions of the larger nectophore are as follows:

Length of the nectophore:	...	...	... 3.85 mm
Breadth „ „ „ :	...	...	... 2.25 „
Length „ „ nectosac :	...	...	... 2.10 „
„ „ „ somatocyst :	...	...	... 1.30 „

It is longer than broad, smooth and lacks ridges. It is rounded on the dorsal side and flat with a shallow hydroecium on the ventral side. The somatocyst is small, thick and curved towards the dorsal side of the nectophore. The nectosac is large, elongated and the ostium is situated slightly below the surface of the nectophore. This gives a funnel-like slope toward the mouth-opening. The radial canals are simple and unbranched.

Smaller nectophore: (Text-fig. 1a, N1): The measurements of the nectophore are as follows:

Length of the nectophore:	...	..	... 3.25 mm
Breadth „ „ „ :	...	...	... 2.75 „
Length „ „ nectosac :	...	...	... 1.00 „
Diameter of ostium :	...	...	... 0.25 „

The nectophore has a smooth exterior, rounded on the dorsal side, and flat with a shallow hydroecium in the middle region of the ventral side. The hydroecium lies in contact with the hydroecium of the larger nectophore. The contracted stem with six gastrozooids are found within this common hydroecium. The nectosac is small, being about 1/3rd the length of the nectosac of the larger nectophore. It has a bulged, rounded appearance. The ostium of the nectosac is very small, measuring 0.25 mm. in diameter, and it is open and round in shape. It is situated well below the level of the outer surface of the nectophore which slopes downwards towards the ostium as in the larger nectophore. The four radial canals are distinct, simple and unbranched. This reduced nectophore is not embraced by the larger nectophore.

Eudoxid phase is unknown.

Remarks.—The genera *Amphicaryon* and *Marescarsia* Totton, 1954, are included in this sub-family, because they possess nectophores of unequal sizes. The present new species, viz., *A. intermedia* n.sp, differs from *A. acaule* Chun, 1888 and *A. peltifera* (Haeckel, 1888) in the presence of a functional nectophore, while both, *A. actule* and *A. peltifera* possess a highly reduced nectophore which is shield-like in shape. *A. intermedia* resembles *A. ernesti* Totton, 1954, in possessing a smaller nectophore which is not embraced by the larger one. However, in *A. ernesti* the proximal half of the four radial canals of the larger nectophore is branched while in the smaller nectophore the dorsal canal is normal, the ventral canal forms reticulations in the ventral wall of the nectosac and the lateral canals are absent. The radial canals of the vestigeal nectophore are simple without branches in *A. acaule*

but occur in the form of a three-pronged structure in *A. peltifera.* In general appearance and in size, the present new species resembles the valid species of the genus *Amphicaryon.*

In possessing two functional nectophores, the new species resembles *Marescarsia,* but the latter species is known to grow to a very large size (20.0 mm in diameter) and the proximal parts of the radial canals are hypertrophied.

Family DIPHYIDAE Quoy and Gaimard, 1827

Subfamily DIPHYNAE MOSER, 1925

Genus **Lensia** Totton, 1932

Lensia roonwali n. sp.

(Text-fig. 1b, c)

Material examined.—One example from RV VITYAZ, Station no. V 5216 (Lat. 2°03'S ; Long. 91°27'E) taken by ichthyological Net in a haul from a depth of 1,000 metres to surface.

Diagnosis.—Anterior nectophore very small, with five slightly twisted ridges ; right ventral ridge incomplete ; dorsal displaced to right. Nectosac large, extending upto tip of nectophore. Somatocyst stalked and minute. Hydroecium very shallow.

Description.—Polygastric phase: Anterior Nectophore: (Text-fig. 1b, c). The specimen measures 3.75 mm. in length, 2.25 mm. in breadth and its somatocyst is 0.33 mm. long. It has five ridges ; of these the dorsal, laterals and the left ventral ridges are complete, extending from apex to base. The right ventral ridge is incomplete, it reaches the base but ends anteriorly near the apex of the nectosac. All these ridges are slightly twisted, therefore the dorsal ridge is displaced towards the right. The nectosac is large, leaving very little mesoglea between the walls of the nectosac and nectophore. The mouth of the nectosac is large, round and wide open. The hydroecium is very shallow (nearly absent). The ventral facet is rounded and slopes upwards. The somatocyst is minute and stalked. There is no basoventral ridge. The stem is contracted. No posterior nectophore is present in the collections.

Remarks.—Of all the thirty valid species, this one resembles *L. campanella* Moser, 1925 in the twisted nature of the ridges. In *L. campanella* the apex of the nectophore is twisted in the preserved condition, the dorsal ridge is vestigeal and the somatocyst is large and globular. In both the forms the mouth-plates are short, the right ventral ridge does not reach the apex and the ventrolateral margin is rounded, but in *L. roonwali* sp. nov., the right ventral ridge does not form the basal ridge at the ventrobasal facet as in *L. campanella.* In general shape, somatocyst and hydroecium, the present new species resembles *L. tmeteori* Leloup, 1934, but in the latter the necto-

phore is blunt and lacks proper ridges. This species is named after Dr. M. L. Roonwal, former Director, Zoological Survey of India, Calcutta.

Lensia panikkari n. sp.
(Text-fig. 1d)

Material examined.—One example from RV VITYAZ, Station no. V 5193 (Lat. 32° 48′ S ; Long. 103° 58′ E) taken in a haul from 1000 metres to surface using Ichthyological Net.

Diagnosis.—Anterior nectophore long, slenderly pyramidal, five prominent faintly crested ridges, laterals not reaching base, somatocyst long, reaching more than half the length of nectosac; hydroecium shallow, conical and occurring below level of ostium.

Description.—Polygastric phase: Anterior Nectophore: (Text-fig. 1d). The anterior nectophore measures 9.7 mm. in length, 4.5 mm. in breadth and has a somatocyst measuring 5.1 mm. in length, and an hydroecium 0.83 mm. in length. It is long and slenderly pyramidal, having five prominent faintly crested ridges. All the ridges meet at the apex. The lateral ridges alone do not reach the base *i.e.*, velar or ostial level. The ventral facet is narrow. The somatocyst is long measuring more than half the length of the nectosac, thin and club-shaped. It lies close against the nectosac. The hydroecium is shallow, occurring below the velar level and is conical in shape. The mouth-plates are prominent, slightly rounded and overlapping. The basoventral ridge is short.

The stem and the posterior nectophores are not present in the collections.

Remarks.—Among the thirty valid species of the genus *Lensia*, the present species resembles *L. leloupi* Totton, 1954 and *L. tottoni* Daniel & Daniel, 1963, in respect of the lateral ridges not reaching the velar level. It differs from these other species in possessing a long somatocyst and a narrow ventral facet. *Lensia panikkari* sp. nov. is probably the same as the *Lensia* sp. indet, described by Totton (1932) from the Great Barrier Reef Expedition Station no. 50, outside Papuan Pass. This species is named after Dr. N. K. Panikkar, Director of the Indian programme of the Indian Ocean Expedition.

Lensia nagabhushanami n. sp.
(Text-fig. 1f)

Material.—One example from INS KISTNA Cruise no. III, Station no. K 26, (Lat. 8°0 'N ; ; Long. 63°7 'E ; on 30.11.1962) by a Nansen Net haul from 200 metres to surface.

Distribution.—Arabian Sea (Indian Ocean).

Diagnosis.—Nectophore with five ridges, laterals not meeting velar edge ; nectosac produced apically into a blunt extension.

Description.—Polygastric phase: Anterior Nectophore: (Text-fig. 1f). It has a length of 8.5 mm. and a breadth of 5.0 mm.; the somatocyst measures 1.7 mm. in length; the nectosac is 7.2 mm. long, and the hydroecium is 0.9 mm. long. It has a pointed tip, bulged middle region and a broad ostium. There are five prominent ridges which reach the apex. Of these, the lateral ridges do not meet the velar edge or ostium. On either side of the ridges on both sides of the nectophore, there are two shallow (vestigeal ridges) depressions or folds (Text-fig. 1 f). The apex of the nectosac is produced into a blunt, narrow extension which reaches up to the tip of the nectophore. It is bulged in the middle region and slightly narrower near the ostium. The ostium is broad. The somatocyst is about $\frac{1}{4}$th the length of the nectosac, stalked and club-shaped. It occurs in close contact with the nectosac which is curved according to the shape of the somatocyst. The hydroecium is conical in shape and the apex lies in close contact with the base of the nectosac. It does not extend beyond the velar level. The ventrobasal ridge is slightly oblique. The mouth-plates are medium-sized with rounded overlapping margins.

Remarks.—Of the thirty valid species belonging to the genus *Lensia*, the present one resembles *L. leloupi* Totton, 1954, *L. tottoni* Daniel & Daniel, 1963 and *L. panikkari* n.sp. in possessing five ridges of which the laterals do not reach the velar edge. The somatocyst of *L. tottoni* and *L. panikkari* are entirely different. This species resembles *L. leloupi* in its somatocyst and hydroecium; but differs from it in the shape of its nectosac which narrows apically into a blunt tube, and in possessing four longitudinal folds. This species is named after Dr. A. K. Nagabhushanam, Zoological Survey of India, Calcutta.

Lensia tiwarii n.sp.

(Text-fig. 1 e)

Material examined.—A single nectophore was taken in a haul at RV VITYAZ Station no. V 5216 from a depth of 1000 metres to surface by the Ichthyological Net.

Type locality.—Lat. 2° 03′ S; Long. 91° 27′E (Indian Ocean).

Description.—Polygastric phase: Anterior Nectophore: (Text-fig. 1e). This specimen has a length of 4.4 mm. and a breadth of 3.4 mm.; the somatocyst measures 1.5 mm. The anterior nectophore has a smooth, rounded appearance. The apex of the nectophore is rounded and the nectosac is also rounded. The nectosac is large and its wall lies close to that of the nectophore, and therefore there is very little mosoglea present between the walls of the nectosac and the nectophore except in the ventrobasal corner; the ventro basal edge is rounded and has a sloping margin. The somatocyst is slender, uniformly thick and has a short stalk; and it arises from the middle of a very shallow hydroecium and is inclined over the nectosac. The ventral side of the hydroecium is on a higher level than the ostium of the nectosac. The mouth-

plates are very small and lie close to the ventral corner of the nectosac. The stem and the posterior nectophores are missing.

Remarks.—Of all the valid species of *Lensia*, this new species *L. tiwarii* n.sp. is close to *L. subtilis* (Chun, 1886) in general appearance but differs from it in the shape and location of the somatocyst and in its peculiar hydroecium This species is named after Dr. K. K. Tiwari of the Zoological Survey of India, Calcutta.

Family ABYLIDAE L. Agassiz, 1862
Subfamily ABYLINAE L. Agassiz, 1862
Genus **Ceratocymba** Chun, 1888

Ceratocymba indica n.sp.
(Text-fig. 1g, h, j)

One complete specimen was taken in a haul from 1000 metres to surface, at Station no. V 5194 by RV VITYAZ, using an Ichthyological Net; type locality: Lat. 32°39′ S, Long. 101°12′ E.

Description.—Polygastric phase: Anterior Nectophore: (Text-fig. 1g, h, j). The nectophore has the following measurements: Length: 26.0 mm; breadth at base: 7.67 mm; breadth at apical prolongation: 1.87 mm; somatocyst: 5.87 mm; hydroecium: 11.3 mm; nectosac: 17.2 mm; length from apex of nectosac to apex of nectophore: 7.3 mm. The anterior nectophore has a broad base and narrows abruptly at the level of the apex of the somatocyst into an extremely long apical prolongation. There are four ridges, two dorsal and two ventral at the apex. The lateral ridges are not sharply oblique; these occur at the middle of the nectophore, at the base; then run alongside the ventral ridges at the apical region and meet the ventral ridges at the level of the apex of the nectosac. The dorsal facet is long, triangular and end in two prominent teeth at the dorsal side of the ostium. The ventral facet is oval in shape, pointed at the base and narrows at the level of the apex of the somatocyst. In the apical region the ventral facet is long and narrow. The basal ends of all the ridges are finely serrated, while they are faintly serrated at the apical prolongation. The somatocyst, hydroecium and the nectosac are arranged parallel to one another. The nectosac is produced into a blunt tube at the apex and terminates in the middle region of the apical prolongation.

Posterior Nectophore: (Text-fig. 1h): This has measurements as given below: Length: 31.3 mm; breadth: 8.0 mm; length of left ventral tooth: 10.87 mm; length of right ventral tooth: 1.0 mm. The posterior nectophore is long and thin. The dorsal ridge is not vestigeal but extends upto half the length of the nectosac and forms a median dorsal tooth at the ostium. The left and right lateral ridges occur from the base of the apophysis to the base of the nectosac and end in broad teeth. Apically these ridges are

connected by a short cross-ridge at the base of the apophysies. The right ventral ridge ends in a much reduced projection and has two small curved teeth at the outer margin. The inner margin is curved and is continuous with the extremely long left ventral tooth. The left ventral ridge ends in this tooth. This tooth is three-faceted, but the edges are not sharply defined, and are not serrated; but faint projections are present at the corners of the facets. There are four large comb teeth on the inner thickened margin of the right ventral hydroecial wing. These are in the form of raised rounded prominences and the tips of these are sharply curved into pointed teeth (Text-fig. 1j). Faint denticulation is present at the basal margin of the right wing, while the denticulations (about 8 in number) are more marked on the left one.

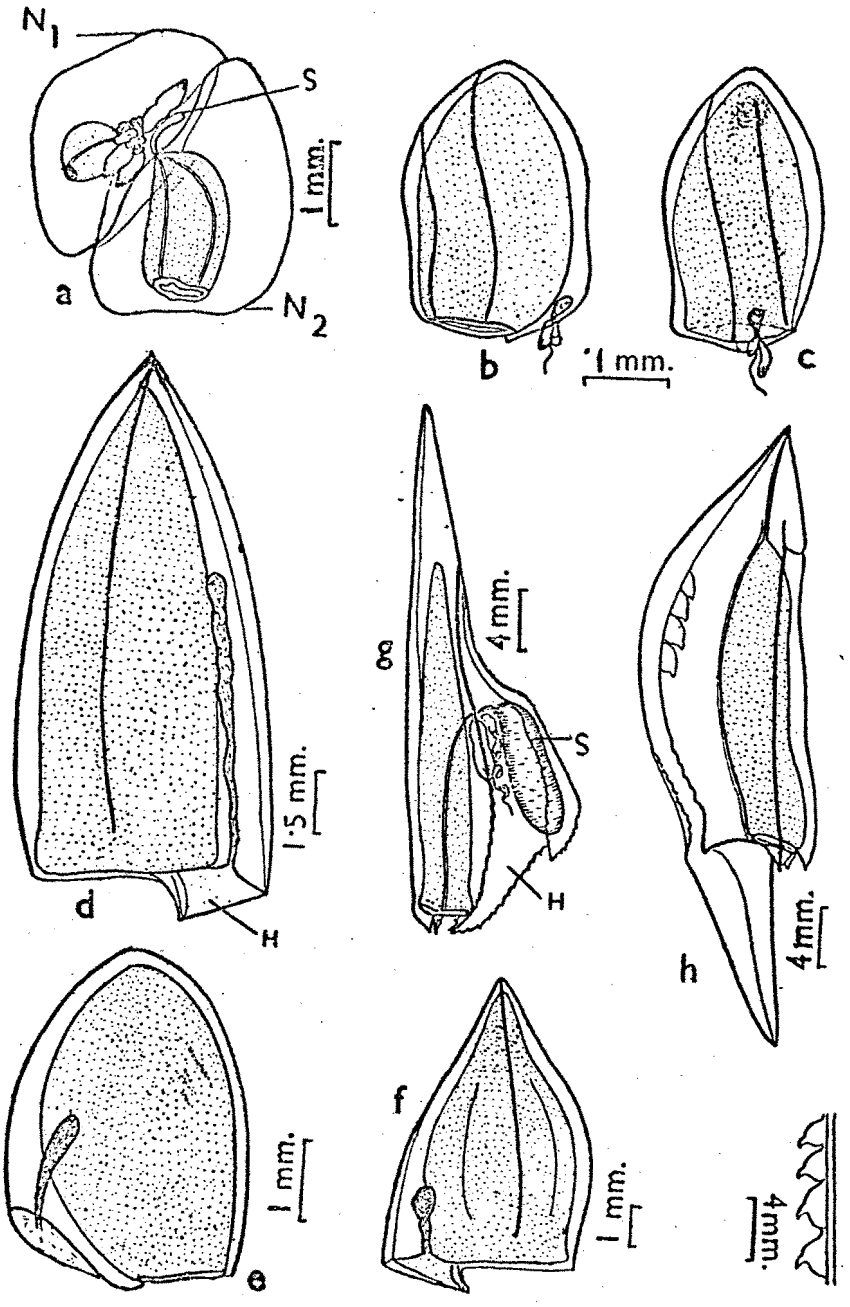
Remarks.—The genus *Ceratocymba* includes four valid species: *C. sagittata* (Quoy. & Gaimard, 1827); *C. leuckarti*, Huxley, 1859; *C. dentata* (Bigelow, 1918), and *C. intermedia* Sears, 1953; the present new species *C. indica* n.sp. is an addition to this list.

The anterior nectophores of *C. leuckarti* and *C. dentata* are not produced into apices as in *C. sagittata* and the present new species *C. indica*. In *C. intermedia* the anterior nectophore is slightly extended apically and the nectosac is about ⅓rd the total height of the nectophore (cf. Sears, 1953, Text-fig. 1c, 22). *C. indica* n.sp. resembles *C. sagittata* in possessing long, triangular dorsal facet, and in the nectosac being extended into a long narrow blunt tube at apex. It differs from it in the shape of the anterior nectophore, the apical prolongation being very narrow, long and not pyramidal; the abruptly narrowing ventral facet at the region of the apex of the somatocyst; the lateral ridges in not being sharply oblique but running alongside the ventrals before joining them; and the apex of the nectosac in terminating far below the tip of the nectophore. The posterior nectophore differs from those of *C. sagittata* in being thinner, with only four combteeth differently shaped, in the right hydroecial wing and the left ventral tooth being 2-3 times as long as in *C. sagittata*.

The measurements of *C. sagittata* and of *C. indica* n.sp. are given below:

Character		*C. indica* n.sp.	*C. sagittata*
ANTERIOR NECTOPHORE:			
Length	:	26.0 mm	22.2 mm
Breadth at base	:	7.67 „	11.47 „
„ „ apical prolongation	:	1.87 „	4.5 „
Somatocyst, length	:	5.87 „	8.0 „
Hydroecium „	:	11.2 „	11.3 „
Nectosac „	:	17.2 „	17.0 „
Length from apex of nectosac to „ „ nectophore	:	7.3 „	3.0 „
POSTERIOR NECTOPHORE:			
Length	:	31.3 „	31.8 „
Breadth	:	8.0 „	12.0 „
Length of left ventral tooth	:	10.87 „	5.8 „
„ „ right „ „		1.0 „	2.0 „

The differences in the measurements of the breadth at apical prolongation, the length from apex of nectosac to apical tip of the anterior nectophore and



TEXT-FIG. 1a.—*Amphicaryon intermedia* n.sp. Polygastric phase; b. *Lensia roonwali* n.sp. Anterior nectophore lateral view; c. *Lensia roonwalii* n.sp. Anterior nectophore ventral view; d. *Lensia panikkari* n.sp. Anterior nectophore lateral view; e. *Lensia tiwarii* n.sp. Anterior nectophore lateral view; f. *Lensia magabhushanami* n.sp. Anterior nectophore—lateral view; g. *Ceratocymba indica* n.sp. Anterior nectophore—lateral view; h. *Ceratocymba indica* n.sp. Posterior nectophore—lateral view; j. *Ceratocymba indica* n.sp. Posterior nectophore—Comb teeth.

H—Hydroecium; N1—Smaller nectophore; N2—Larger nectophore; S—Somatocyst.

the size of the ventral teeth in the posterior nectophore firmly establishes the validity of *C. indica* n.sp.

It is of interest to note that Sears (1953, p. 65) described two kinds of bracts of *C. sagittata*, one with incomplete lateral ridge and the other with complete lateral ridge, and suggested that this variability in the nature of the lateral ridge may indicate the occurrence of more than one species.

The present record of the anterior and posterior nectophores (intact) of *C. indica* confirms the existence of closely allied but distinct species: *C. sagittata* (Quoy & Gaimard. 1827) and *C. indica* n.sp.

ACKNOWLEDGEMENTS

Thanks are due to the Director, Zoological Survey of India, for the facilities given to carry out this work, and grateful acknowledgement is made to the Government of India, Ministry of Education, for the award of a Senior Research Fellowship.

SUMMARY

Six new species of Calycophorae, Siphonophora, are described:

1. *Amphicaryon intermedia* n.sp. differs from other species of *Amphicaryon* in possessing two functional nectophores with four simple radial canals in both the nectosacs.
2. *Lensia roonwali* n.sp. possesses five twisted ridges, the right-ventral ridge not reaching apex, and very small somatocyst and mouth-plates.
3. *Lensia panikkari* n.sp. is characterised by 5 ridges, the laterals not reaching the base as in *L. leloupi*, and long somatocyst which is more than half as long as the nectophore.
4. *Lensia nagabhushanami* n.sp. is similar to that of *L. leloupi* in the lateral ridges not reaching base and short somatocyst but the nectosac is produced to a blunt tube at the apex and four depressions occur on either side of the lateral ridges.
5. *Lensia tiwarii* n.sp. is characterised by the absence of any ridges (or very inconspicuous) with blunt nectophore, short somatocyst inclined over the nectosac and minute mouth plates.
6. *Ceratocymba indica* n.sp. resembles *C. sagittata* in the apically produced nectophore but in *C. indica* the anterior nectophore is not triangular in shape since there is a constriction at level of somatocyst and nectosac reaches the mid-region of the elongated portion of the nectophore. Posterior nectophore differs from that of *C. sagittata* in being narrow, possessing only four comb teeth and left ventral tooth twice as long as in *C. sagittata*.

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