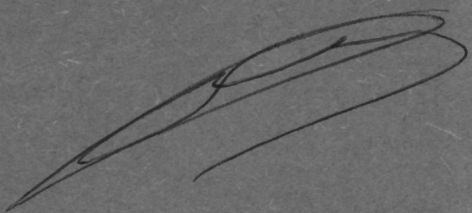


145364

Dr. G. Leleup, ~~1991~~

hommage de l'auteur

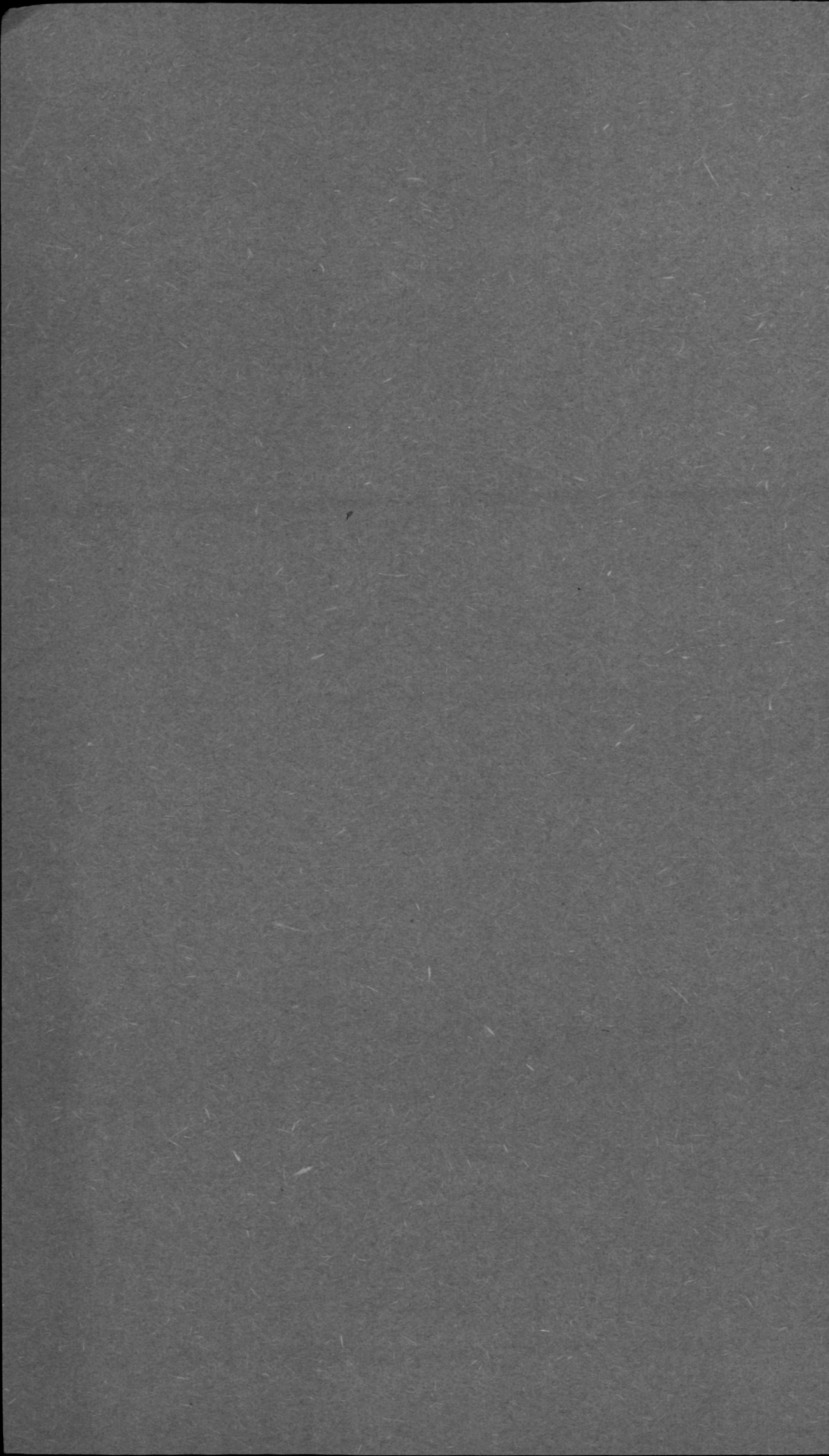
P. L. Kramp
Medusae of Vietnam



Instituut voor Zeevisserijonderzoek
Instituut voor de Wetenschap van de Vis
Prinses Elisabethlaan 67
2001 Brechtse - Belgica - Tel. 059 4 1 1 1

Reprinted from

Vidensk. Medd. fra Dansk naturh. Foren., bd. 124, 1962



MEDUSAE OF VIETNAM

By P. L. KRAMP

(Zoological Museum, Copenhagen)

Introduction.

A large collection of medusae from the coasts of Vietnam was forwarded to me by Dr. G. RANSON, Musée d'histoire naturelle, Paris. It was procured by the Institut Océanographique of Vietnam during the period 1915-1943, partly on several cruises by the vessel "De Lanessan" off various parts of the coasts, and partly by series of hauls with plankton nets at all seasons immediately outside the marine laboratory of Cauda, near Nhatrang on the east coast of Vietnam. In the lists of material of each species, as given in the present paper, the samples from these regular investigations are marked by a **P**. Other samples are listed in accordance with the inscriptions on the labels such as I received them, with addition of such data which it has been possible to obtain.

The collection contains 63 species of medusae, two of which are described as new species. Particularly many of the specimens are in young stages of development. The paper, as here presented, is predominantly systematic, with morphological remarks and taxonomic discussions. A new genus is erected for the Anthomedusa *Sarsia brevia* Uchida; Indo-Pacific forms of *Leuckartiara* and *Phialidium* are discussed, and new definitions of the genera *Staurodiscus* and *Toxorchis* are introduced. A peculiar polypoid structure developed at the base of the stomach of *Proboscidactyla ornata* is described. In some concluding remarks it is demonstrated that the fauna of medusae is almost entirely of local origin.

I am greatly indebted to Dr. RANSON, because he has placed this very interesting collection at my disposal.

ANTHOMEDUSAE.

Dipurena ophiogaster Haeckel.

Material: Nhatrang:

- P. 35, 30.I.36, 1 specimen, 3 mm high, with three gonads.
- P. 153, 5.V.38, 2 specimens, 2-3 mm high, with three gonads.
- P. 155, 19.V.38, 1 specimen, 1 mm high, with one gonad.
- P. 158, 20.IV.36, 1 specimen, 1.5 mm high.
- P. 163, 25.V.36, 1 specimen, with two gonads.
- P. 274, 18.VII.38, 2 specimens, 1-1.8 mm high, with one gonad.
- P. 283A, 19.IX.38, 1 specimen, 1.5 mm high, with one gonad.
- P. 308, 13.III.39, 2 specimens, 1.5-2 mm high, with three gonads.
- P. 322D, 19.VI.39, 1 specimen, 2.5 mm high, with two gonads.
- P. 326, 17.VII.39, 1 specimen, 2 mm high, with two gonads.
- P. 390, 14.X.40, 1 specimen.
- P. 404, 20.I.41, 1 specimen, 1.5 mm high, with two gonads.
- P. 412C, 17.III.41, 1 specimen, 2 mm high, with two gonads.
- P. 499, 14.XII.42, 1 specimen, 2 mm high, with one gonad.

As will be seen from the above list this species was taken at various seasons; only small specimens were found (the medusa may attain a size of 5 mm in height), and in some of them only one gonad was developed. Structural details, however, show that they belong to the same species as the specimens with 2-3 well separated gonads.

Further distribution: Ceylon; southern Japan; Palao Islands in the western tropical Pacific; west coast of Mexico; north-western Europe; Mediterranean Sea.

Genus *Euphysomma* n. g.

Tubulariid medusae without exumbrellar nematocyst tracks; with broad stomach surrounded by a ring-like gonad circular in transverse section; mouth rim simple, studded with nematocysts; with four hollow, perradial marginal tentacles provided with abaxial clusters of nematocysts; without ocelli.

Type-species: *Euphysomma brevia* (Uchida, 1947).

Euphysomma brevia (Uchida).

Sarsia brevia Uchida 1947 p. 299, fig. 1.

Sarsia brevia Kramp 1955 p. 246.

Material: Nhatrang, 19.V.1938 and 29.VI.1936.

This species was described by UCHIDA (1947) as *Sarsia brevia*; two small specimens, 0.7 mm high and 0.8 mm in diameter, were found at the Palao Islands in the western tropical Pacific. In a previous paper (KRAMP 1955) I have expressed the opinion that the species should probably be removed from *Sarsia* and transferred to the family Tubulariidae, and having had the opportunity to study some specimens from Nhatrang, I may now confirm this apprehension. On the other hand, it cannot be included in any of the genera of Tubulariidae known up to now, but represents a new genus for which I propose the name *Euphysomma*.

The species, *E. brevia*, resembles *Ectopleura dumortieri* (van Beneden) and *minerva* Mayer in the possession of an abaxial row of prominent clusters of nematocysts on the tentacles, but it is devoid of the eight longitudinal rows of nematocysts on the exumbrella, which is characteristic of the genus *Ectopleura*. It also bears some resemblance to the West-African medusa *Euphysilla pyramidata* Kramp in which, however, the clusters of nematocysts on the tentacles are adaxial in position, and in which the stomach is quadrate in transverse section.

The three specimens of *Euphysomma brevia* collected at Nhatrang are 1.0 mm in diameter; one of them (29th June 1936), corresponds exactly with fig. 1 in UCHIDA's paper. The two other specimens (19th May 1938) differ from the original description in having a short and narrow proximal

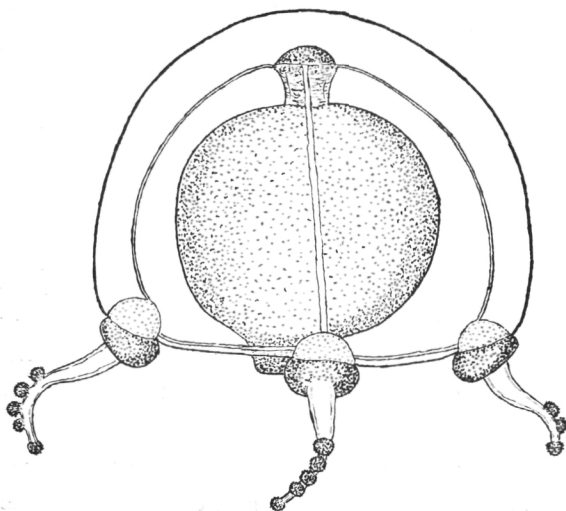


Fig. 1. *Euphysomma brevia* (Uchida), specimen from Nhatrang.

portion of the manubrium free of gonads and a low apical chamber (fig. 1). The number of abaxial clusters of nematocysts on the tentacles varies from two to four, besides a terminal cluster.

Hybocodon forbesi Mayer.

Hybocodon forbesi Mayer 1894 p. 236, Pl. I fig. 1.

Hybocodon forbesi Mayer 1910 p. 42, Pl. I fig. 8, Pl. II fig. 3.

Hybocodon forbesi Uchida 1927a p. 193, fig. 30.

Hybocodon sp. Menon 1932 p. 5, Pl. I fig. 1.

Hybocodon sp. Nair 1951 p. 50, Pl. I fig. 1.

Hybocodon forbesi Ganapati & Nagabhushanam 1958 pp. 92, 94.

Hybocodon forbesi Yamazi 1958 p. 135.

Hybocodon forbesi Kramp 1959a pp. 87, 231, 270, fig. 36.

Material: Nhatrang:

P. 205, 15.III.37, 1 specimen.

P. 210, 20.IV.37, 1 specimen.

Both specimens are about 1 mm in height of umbrella; they are well preserved, and I may confirm that the exumbrella is without nematocyst tracks. On this account it seems uncertain whether this species actually does belong to the genus *Hybocodon*.

The specimen from 15th March corresponds exactly to the figures given by UCHIDA, 1927a fig. 30, and MAYER, 1910 Pl. I fig. 8, but not to MAYER's Pl. II fig. 3. The tentacle has a small pointed projection on the terminal swelling as shown in these figures, but in the specimen from 20th April this tenon-like projection is absent.

Further distribution: Southern Japan; India; Florida and the Bahamas in the western tropical Atlantic.

Euphysora bigelowi Maas.

Material:

P. 228, Nhatrang, 16.IX.35, 1 specimen.

Stat. 873, Nam-Yit, 25.IV.36, 1 specimen.

Both specimens are 2.2 mm high. In the specimen from Nhatrang (P. 228) the principal tentacle is provided with six well-developed clusters of nematocysts and one young proximal cluster; the tentacle opposite the principal tentacle is somewhat smaller than the two lateral which are of equal size. In the specimen from Nam-Yit (St. 873) the tentacle opposite the principal tentacle is larger than the two lateral.

Further distribution: Tropical parts of the Indian Ocean and the western Pacific; North-East Australia; Chile.

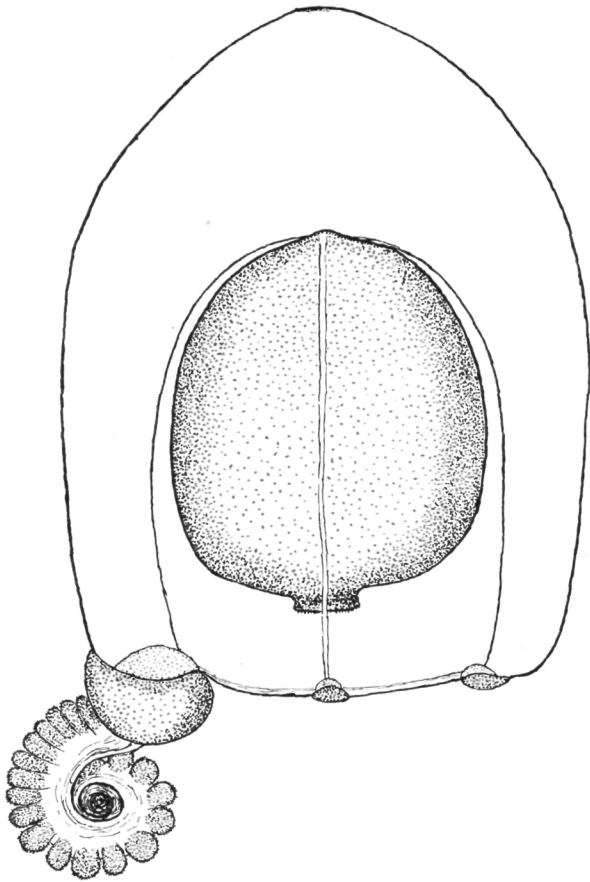


Fig. 2. *Euphysora abaxialis* n. sp., Nhatrang 16.I.1939, holotype.

Euphysora abaxialis n. sp.

Material: Nhatrang:

P. 155, 19.V.38, 2 specimens.

P. 300A, 16.I.39, 2 specimens.

P. 395 F, 19.II.40, 1 specimen.

Description (figs. 2–4): Up to 3 mm high and 2.4 mm wide, umbrella dome-shaped with slightly conical apex terminating in a patch of small papillae; jelly thick, especially in apical part; no apical canal, but a low apical chamber, which is distinct in small specimens (fig. 3) but almost obliterated in specimens of greater size (fig. 2). Stomach covered by the gonad in its whole extent, almost entirely filling the subumbrellar cavity; a small, simple, circular mouth studded with nematocysts. Four radial

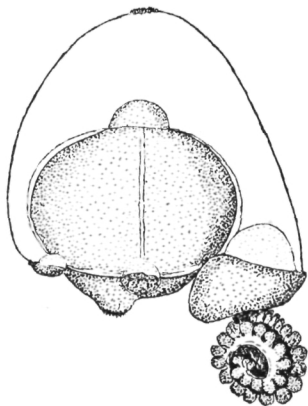


Fig. 3. *Euphysora abaxialis* n. sp., a small specimen from Nhatrang, 19.V.1938.

canals and ring canal very narrow. Umbrella margin with one long tentacle mounted on a very large and broad basal bulb with a faintly indicated abaxial spur grasping around the umbrella margin; the three other per-radial marginal bulbs are small and quite rudimentary, without any indication of tentacles. The bulb opposite the tentacle is slightly larger than the two lateral bulbs. No ocelli.

In all the specimens from Nhatrang the tentacle is more or less tightly helically coiled, but I have seen a specimen, collected by the Danish "Galathea" Expedition in the Strait of Malacca, in which the tentacle is extended, though somewhat twisted (fig. 4). The tentacle is long and in its entire length provided with prominent clusters of nematocysts in one row along the abaxial side; the clusters are densely set and fairly broad in the proximal portion of the tentacle, narrower and more elevated, almost spherical, at some distance from the base and further outwards. When the tentacle is densely coiled as in the specimens from Nhatrang, the nematocyst clusters are close together in its entire length, but as seen from fig. 4 they are well separated in the distal portion of the extended tentacle.

Remarks on the specimens: 1). 19th May 1938 (P. 155), two specimens, one strongly contracted, the other (fig. 3) 1.5 mm high, with a fairly high, bluntly conical apical projection with a distinct patch of small papillae; the stomach with the gonad occupies the whole subumbrella cavity and extends slightly beyond the velar opening; the tentacle bulb is extraordinarily large. — 2). 16th Jan. 1939 (P. 300 A), two large specimens, about 3 mm high, umbrella more regularly dome-shaped than in the smaller specimens, the apical patch of papillae hardly discernible; the



Fig. 4. *Euphysora abaxialis* n. sp., extended tentacle of a specimen from the Strait of Malacca, "Galathea" stat. 325.

stomach does not quite reach to the velar opening. — 3). 19th Febr. 1940 (P. 395 F), one specimen, 1 mm high, the conical apex somewhat more pointed than in the specimen of March 1936, the apical patch of papillae distinct; the stomach somewhat mutilated.

One of the large specimens from 16th Jan. 1939 is selected as the holotype.

In several structural details this species resembles *Euphysora bigelowi* Maas, a.o. in the possession of an apical patch of papillae and in the nematocyst clusters of the principal tentacle being arranged in one row. In *E. bigelowi*, however, the row of nematocyst clusters is adaxial, not abaxial as in the present species, and in *E. bigelowi* each of the three other marginal bulbs carries a short, but distinct, pointed tentacle, whereas in *E. abaxialis* the bulbs are quite rudimentary; moreover the tentacle bulb in *E. abaxialis* is very much larger than in *E. bigelowi*. I have looked through an extensive collection of *E. bigelowi*, small as well as fully developed specimens, and I have failed to find a single specimen which might be designated as a transitory form between the two species.

There are two other species of *Euphysora* in which the three marginal bulbs are devoid of any trace of tentacles. *E. gigantea* Kramp (1957) is a large, globular medusa with a long tentacle carrying bifurcated lateral branches; it occurs in deep water in antarctic seas. *E. normani* Browne

(1916) is a small medusa, in which the tentacle has three abaxial clusters of nematocysts and a terminal knob; its radial canals and ring canal are remarkably broad, and it has a large, conical apical chamber; it was found near the Chagos Islands in the Indian Ocean.

Zanclaea costata Gegenbaur.

Material: Nhatrang, P. 210, 20. IV. 37, one small, crumpled specimen, 1 mm high and wide, with four tentacles.

Further distribution: Red Sea; Gulf of Siam; Nicobars and Malayan Archipelago; Palao Islands; China; Japan; Pacific coast of Mexico; West Indies, Florida and New England; west coast of Africa; Mediterranean and Adriatic Seas; north-western Europe.

Cytaeis tetrastyla Eschscholtz.

Material:

L. 3. Between Chutt and Nhatrang, 19.VIII.26, at night, 2 specimens.

Nhatrang:

P. 112, 28.V.35, 1 specimen.

P. 168, 29.VI.36, 1 specimen.

P. 177, IX.36, 1 specimen.

P. 375 F, 17.VI.40, 3 specimens.

P. 388 C, 23.IX.40, 1 specimen.

P. 388 F, 23.IX.40, 20 specimens.

All the specimens are small, 1–2 mm in height.

Further distribution: Generally distributed in tropical and subtropical seas, partly oceanic.

Podocoryne apicata Kramp.

Podocoryne apicata Kramp 1959b p. 228, fig. 5.

Material:

Stat. 81, off Hon-Cha-La, 20.IX.25, 13°21'30" N, 109°23'20" E, 1 specimen.

P. 165, Nhatrang, 8.VI.36, 1 specimen.

P. 372, Nhatrang, 27.V.40, 1 specimen.

Both specimens are about 1 mm in height of umbrella, with well developed gonads and with four very small oral tentacles. In the specimen from Stat. 81 the apex of the umbrella is depressed, and the stomach peduncle indistinct; there are four long tentacles all alike, and no indication of other tentacles developing. In the specimen from 27th May 1940 (P. 372) the umbrella margin is mutilated, but the manubrium is in good condition, with a distinct peduncle. The specimen of 8.VI.36 (P. 165) is

in good condition. By direct comparison with the original specimens recently described by me (KRAMP 1959*b*) I feel sure that the present specimens belong to the same species.

Further distribution: Malacca; Gulf of Siam.

Amphinema dinema (Péron & Lesueur).

Material: Nhatrang:

P. 104, 1.IV.35, 1 specimen.

P. 213, 10.V.37, 1 specimen.

Both specimens are small, about 1 mm in height and in good condition. In the specimen from April 1935 the two tentacles are of unequal size, one very large, the other small.

Further distribution: North-eastern Australia; India; Gulf of Guinea; Mediterranean Sea; western Europe; North America from Cape Cod to Florida.

Halitiara formosa Fewkes.

Material:

Octant stat. 10, date unknown.

P. 148, 31.III.38, 1 specimen.

This species may attain a size of 3 mm in height; the present two specimens are small, that of March 1938 is 0.8 mm high, well preserved and typical in shape, the exumbrella densely covered by small, round groups of nematocysts. The specimen marked Octant St. 10 is slightly larger, 1 mm high and wide, the apical projection is obliterated, but the four large and several very small tentacles are retained, and the gonads are well developed.

Further distribution: Japan; Fiji Islands; Philippines and Malayan Archipelago; India; Florida and the Bahamas in the western tropical Atlantic.

Merga violacea (Agassiz & Mayer).

Material:

Stat. 813, anchorage in Saracene Bay, Gulf of Siam, 1.IV.35, 4 specimens.

P. 168, Nhatrang, 29.VI.36, 2 specimens.

P. 213, Nhatrang, 10.V.37, 3 specimens.

A count of the marginal organs in specimens of different sizes shows that development of young marginal bulbs into tentacles proceeds very irregularly, as seen from the following table.

Diameter, mm	Number of well developed tentacles	Number of young marginal bulbs
0.9.....	3	6
1.5.....	3	4
2.0.....	7	7
2.0.....	7	8
2.1.....	3	14
2.5.....	9	9
2.9.....	8	10
3.0.....	5	11

Further distribution: India; Nicobar Islands; north-eastern Australia; Fiji Islands; Pacific coast of Mexico; Mediterranean Sea; Florida and the Bahamas in the western tropical Atlantic.

Leuckartiara octona (Fleming).

Material:

L. 3. Between Chutt and Nhatrang, 19.VIII.26, at night, 2 specimens.

No. 23. Gulf of Cauda, 23.VI.27, 2 specimens.

Nhatrang:

P. 128, 16.IX.35, 1 specimen.

P. 218, 14.VI.37, 1 specimen.

P. 228, 23.VIII.37, 1 specimen.

P. 326D, 17.VII.39, 1 specimen.

P. 437D, 15.IX.41, 1 specimen.

Specimens of this widely distributed species from Indo-Pacific waters have sometimes given occasion to doubtful or erroneous identification; it has been confounded particularly with *Neoturris papua* (Lesson). HARTLAUB (1913) has discussed these questions. In pp. 294-295 he states that *Turris oceanica* Agassiz & Mayer, 1902, which was described from California, and the specimens identified as *Tiara papua* by MAAS, 1905, from the Malayan Archipelago, by MAAS, 1909, from Japan, and by BIGELOW, 1909, from the eastern tropical Pacific, probably belonged to *Leuckartiara octona*. Later on in the same paper, p. 335, HARTLAUB is somewhat more reticent, to the effect that *Tiara oceanica* Agassiz & Mayer, 1902, and *Tiara papua*, Maas 1905 and 1909 and Bigelow 1909 may be identical with *Tiara intermedia* Browne, 1902, from the Falkland Islands, all of them to be referred to the genus *Leuckartiara* and named *L. intermedia*. According to BROWNE & KRAMP, 1939, however, the Falkland

medusa is a separate species belonging to the genus *Halitholus*. BIGELOW, 1919 p. 282, admits that the specimens identified as *Tiara papua* by MAAS and himself, belong to *Leuckartiara octona*, and examination of the present specimens from Vietnam has enabled me to verify that statement. A specimen recorded from Amboina by MAAS, 1906 p. 88 under the name of *Tiara papua* may likewise belong to *L. octona*, but the description is rather incomplete for a final decision.

The proper name of *Tiara papua* is *Neoturris papua*. Its morphology has been treated at some length by RANSON (1929, pp. 209-215); it is characterized by a number of longitudinal pigmented ridges on the exumbrella, each containing an endodermal canal.

There are two medusae, which bear a considerable resemblance to the specimens of *Leuckartiara octona* from Vietnam examined by me, viz. *L. gardineri* Browne, 1916 from the Amirante Islands in the Indian Ocean, and *L. zacaе* Bigelow, 1940 from the Pacific coast of Panama; both have similar canals in the exumbrella as *Neoturris papua*, and BIGELOW is inclined to think that *L. zacaе* is the fully developed stage of *L. gardineri*. Another Pacific species resembling *L. octona* is *Leuckartiara hoepplii* Hsu (1928) in which, however, each of the rudimentary marginal bulbs is provided with a median cirrus; it was found near Amoy in China. I have recently been able to examine a young specimen of this species (KRAMP 1959b p. 235) and am able to state that the cirri are quite distinguishable even in such small specimens.

There is a considerable variation in the rate of development of the tentacles and the configuration of the gonads in *L. octona*, which may partly account for the rather frequent uncertainty with regard to the identification of Indo-Pacific specimens. It may be worth while, therefore, to add some remarks on the present specimens from Vietnam. All of them are small, up to 3 mm in diameter and 5 mm in height. The gonads, which are adradial in position, are transversally folded, each with up to three or four folds, interradially connected by a narrow bridge across the proximal part of the stomach (in well developed specimens, sometimes also in younger stages, the bridge is situated further down). The margins of the radial canals and ring canal are smooth. The apical projection of the umbrella is variable, fairly high in some specimens, preferably when well preserved. There is no apical canal and no apical chamber. There is an ocellus on the basal bulb of each of the well developed tentacles as well as on the small, club-shaped rudimentary bulbs. The smallest specimen, 2 mm wide and high (no. 23, 23.VI.27) is very similar to the figure of "*Tiara papua*" given by BIGELOW, 1909 Pl. 42, figs. 2-4, except that it

has only four tentacles and four, interradial rudimentary bulbs. The number of small, club-shaped bulbs between successive tentacles is never more than three, most frequently only one, as seen from the following enumeration:

Sample	Diam. mm	Height mm	Number of tentacles	Bulbs between successive tentacles
No. 23	2	2	4	1
L. 3	2	4	6	1-2
P. 437D	2	3	8	1-2
P. 218	2.2	3.5	8	1-2
P. 128	2.5	2.5	8	1
No. 23	3	4	8	1-3
L. 3	3	5	10	1
P. 326D	3.5	3.5	8	1

Further distribution: India; Malayan Archipelago; north-eastern Australia; Philippines; Low Archipelago; China; Japan; eastern Pacific from Chile to Vancouver; west coast of Africa; Mediterranean; European coasts from Portugal to Norway and Iceland; North America from Florida to Labrador.

Niobia dendrotentaculata Mayer.

Niobia dendrotentaculata Mayer 1900 p. 36, Pl. 42 figs. 141-143, Pl. 43 fig. 144.

Niobia dendrotentaculata Mayer 1910 p. 187, Pl. 19 figs. 1-5.

Material: Nhatrang:

P. 151, 2.III.36, 4 specimens.

P. 154, 12.V.38, 6 specimens.

P. 155, 19.V.38, 1 specimen.

P. 206, 22.III.37, 40 specimens.

P. 210, 20.IV.37, 3 specimens.

The peculiar asexual propagation by transformation of the tentacle bulbs into new, free-swimming medusae and the development of the buds before and after liberation are fully described by MAYER in the two papers quoted above. The shape of the newly detached specimens is very variable as seen from the examples given in fig. 5.

Further distribution: Trivandrum coast, India (NAIR 1951); Florida and between Cape May and Chesapeake Bay on the east coast of North America. The species has once before been recorded from Vietnam (DAWYDOFF 1936).



Fig. 5. *Niobia dendrotentaculata* Mayer, outlines of newly liberated specimens, all drawn to the same scale.

LEPTOMEDUSAE.

Laodicea indica Browne.

Laodicea indica Browne 1905 p. 136, Pl. I fig. 5, Pl. IV figs. 7-11.

Laodicea fijiana var. *indica* Maas 1905 p. 25, Pl. II figs. 14, 15, Pl. V figs. 32-35.

Laodicea fijiana Maas 1906 p. 89.

Laodicea maasi Browne 1907 p. 266.

Laodicea maasi Vanhöffen 1911 p. 221, fig. 14.

Laodicea fijiana Mayer 1915 p. 200.

Laodicea undulata var. *indica* Nair 1951 p. 59.

Laodicea indica Kramp 1953 p. 268.

Laodicea indica Kramp 1958 p. 343.

Material:

No. 18. Anchorage of Cauda, 4.VIII.26, 16 specimens.

No. 19. Bich-Dam (Nhatrang), 6.VIII.29, 1 specimen.

No. 23. Gulf of Cauda, 23.VI.27, 1 specimen.

No. 27. Cauda, 20.VIII.29, 1 specimen.

Nhatrang:

P. 112, 28.V.35, 2 specimens.

P. 131, 1 specimen.

P. 154, 12.V.38, 1 specimen.

P. 208, 6.IV.37, 3 specimens.

P. 213, 10.V.37, 2 specimens.

- P. 132A, 20.IX.37, 2 specimens.
 P. 278F, 16.VIII.38, 1 specimen.
 P. 311, 3.IV.39, 1 specimen.
 P. 326E, 17.VII.39, 1 specimen.
 P. 421, 19.V.41, 1 specimen.
 P. 430, 29.VII.41, 1 specimen.

Up to the present time the identity of *Laodicea indica* Browne, 1905, and *L. maasi* Browne, 1907, has not been finally proved, though it has been presumed as a probability. The present specimens, most of which are well preserved, put the question beyond doubt.

The name *L. maasi* was given by BROWNE (1907) to the Malayan medusa described by MAAS (1905), in which abaxial spurs were present at the base of the tentacles, whereas no marginal cirri were observed; the original specimens from Ceylon of *L. indica* Browne had cirri but no abaxial spurs. In my paper of 1953 it was pointed out that there was a possibility that the cirri had been lost in MAAS' specimens, and also that spurs had actually been present in *L. indica*, though BROWNE failed to observe them. Careful examination of the present specimens from Vietnam shows that abaxial spurs are present at the base of young tentacles, but they are very small and easily overlooked, and far from being so conspicuous as in the Atlantic species *L. undulata*, and in spite of the good state of preservation most of the cirri had been lost, but some few were retained in scattered positions. This confirms the supposition that the two species are identical.

The pigmentation of the characteristic adaxial ocelli at the base of some of the tentacles has entirely faded away in almost all the specimens, but in the specimen from the Gulf of Cauda, 23' June 1927 (no. 23) the ocelli are quite distinct; as a rule there is an ocellus on every third of the tentacles, but occasionally there are three tentacles, or only one, devoid of ocelli between two in which the ocellus is present.

In the sample of particularly well preserved specimens from the anchorage of Cauda, 4' August 1926 (no. 18) I have counted the tentacles as follows:

Diam., mm	7	9	10	11	12
Approximate number of tentacles	100	120-160	120-160	170-188	160-180

L. indica was found at the coasts of Vietnam between the months of March and September:

Month	III	IV	V	VI	VII	VIII	IX
Diam., mm. .	1-2.5	2-4	1-7	7	6-12	7-13	1-1.5

In March to May only small specimens were taken, and specimens of larger size, 12–13 mm in diameter, were found only in July and August. At the Great Barrier Reef in north-eastern Australia young specimens were found at all seasons, but specimens more than 8 mm wide were only taken during the southern summer, from October to February (KRAMP 1953 p. 270).

Further distribution: Gulf of Aden; Trivandrum coast, India; Ceylon; the Nicobars; several localities in the Malayan Archipelago; Torres Straits; N.E. Australia.

Staurodiscus vietnamensis n. sp.

Material:

De Lanessan no. 23. Gulf of Cauda, 23.VI.27, 1 specimen.

Description (figs. 6a, b): The specimen is mutilated, but all details are retained, enough to allow a description. The gastro-vascular system and the umbrella margin with the ring canal and the marginal organs are detached from the gelatinous disk of the umbrella which is 13 mm in diameter, about 5 mm high and fairly thick; near its margin traces of the terminal ends of 18–20 canals may be discerned. The stomach is quadratic, with four large, folded lips. There are four radial canals proceeding straight out to the four perradial points of the umbrella margin; outside the corners of the stomach each of the radial canals gives rise to two pairs of lateral

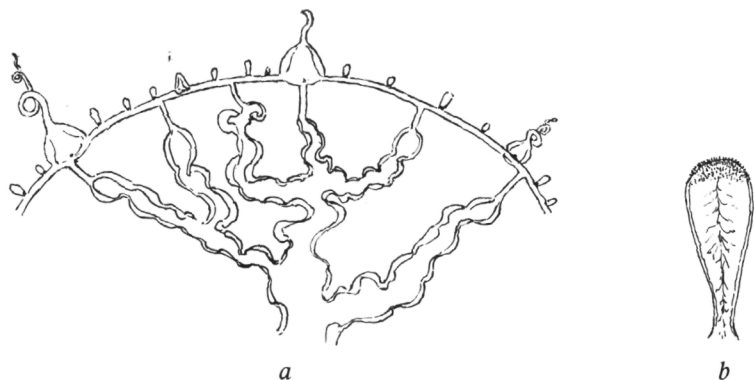


Fig. 6. *Staurodiscus vietnamensis* n. sp. a, reconstruction of one quadrant of the medusa; b, cordylus with nematocysts.

branches more or less opposite each other, some of the proximal branches with a secondary lateral branch. It has not been possible to determine the course of all the canals, but the one represented in fig. 6 may be regarded as typical. The gonads form continuous, irregularly folded bands along the main radial canals and their branches from their points of origin almost to the umbrella margin; the distal ends of the canals are free of gonads and communicate with the ring canal. These terminal ends of the branches are very difficult to see in the present state of preservation, but by means of shifting intensity and direction of light from a lamp they may be discerned with certainty; their exact number could not be determined but amounts to at least eighteen.

The detached umbrella margin is fully retained showing a narrow ring canal and 12 tentacles fully developed, though of somewhat different sizes, and 4 young bulbs. The tentacle bulbs are broadly triangular, without a basal spur, the tentacles are hollow, long, gradually tapering in thickness, spirally coiled, with scattered nematocysts throughout their length. The four perradial tentacles are opposite the principal radial canals, but the other tentacles are not necessarily situated off the terminal end of a canal. There are about 48 cordyli of somewhat different sizes, typically club-shaped with a narrow base and with a distal cap of numerous nematocysts. There is a black, adaxial ocellus at the base of each tentacle and cordylus. No marginal cirri.

Discussion of the genera *Staurodiscus* Haeckel and *Toxorchis* Haeckel. — Laodiceidae with branched radial canals are generally referred to two genera: *Staurodiscus*, in which the lateral branches of the canals end blindly, and *Toxorchis*, in which the lateral branches communicate with the ring canal. Several species are described within both genera. All of them seem to be rare and have been recorded only on few occasions.

In MAYER's monograph (1910) the genus *Toxorchis* comprises three species: *T. arcuatus* Haeckel (which is the type species), *T. thalassina* (Péron & Lesueur), and *T. kellneri* n. sp. In a recent paper (KRAMP 1959 a) I have also referred *Dipleurosoma brooksi* Mayer and, with some reservation, *Cuvieria huxleyi* (*Berenice huxleyi*) to *Toxorchis* and described a new species *T. polynema*. On the other hand, in some of the species which up to now have been included in the genus *Staurodiscus* the branches of the canals may prove to be extended to the ring canal, so that these species ought to be referred to *Toxorchis*, if the distinction between the two genera be maintained in the conventional way.

It is my intention, however, to define the two genera in an entirely new meaning which will be motivated below.

The type species of *Staurodiscus* is *S. tetrastaurus* Haeckel (1879 p. 145, Pl. 9 figs. 1-3) which has a rather extensive distribution. It was originally described from the Canary Islands as being 4-6 mm wide, with four radial canals, each with one pair of lateral branches opposite each other and issuing at right angles from the middle portion of the main canal, with gonads on the distal portions of the canals and their branches, with 8-16 tentacles and 48 cordyli. In *S. heterosceles* Haeckel (1879 p. 146), likewise from the Canary Islands, which most probably is the same species, the two lateral branches of the radial canals are not opposite each other, there are usually 16 tentacles, but sometimes 8 or 32, and 40-80 cordyli; the diameter is 6-8 mm; it was accordingly in a somewhat more advanced stage of development. It has not been recorded since it was described by HAECKEL.

S. tetrastaurus was found again by MAYER (1900 p. 46, Pl. 18 fig. 47, Pl. 19 figs. 48, 49) at Tortugas, Florida; his specimens were up to 4.5 mm wide, with 8 tentacles and up to 24 cordyli, very similar to HAECKEL'S original specimens with the exception that the gonads were continuous along the lateral branches and the distal portion of the radial canals, and the lateral branches were somewhat bent outwardly showing a tendency to approach the ring canal. MAYER also described some young stages.

MENON (1932 p. 14, Pl. II figs. 14, 19) found two young specimens at Madras, India; they were 5 mm wide, the radial canals with one pair of lateral branches opposite each other, one of the specimens with four, the other with eight tentacles. Four specimens from the Trivandrum coast in south-western India, described by NAIR (1951 p. 60) were in similar stages, and I have seen a very young specimen from Singapore, 2 mm wide, with four large perradial tentacles, four interradial young tentacles, and eight adradial cordyli, the gonads continuous on the three branches of the radial canals. The species is also recorded from the Vizagapatam coast in north-eastern India by GANAPATI & NAGHABHUSHANAM (1958 pp. 92, 94). We thus have a complete series of developmental stages of *S. tetrastaurus* up to 6 mm in diameter (or 8 mm if *S. heterosceles* is regarded as the same species), but none of larger size.

Two other species of *Staurodiscus* have been described, both of them larger than *S. tetrastaurus*. *S. nigricans* Agassiz & Mayer (1899 p. 164, Pl. 4 figs. 11, 12) from the Fiji Islands was 14 mm in diameter, with 12 tentacles and 84 cordyli; the two opposite branches of the radial canals were extended to join the ring canal. In 1910 (p. 221) MAYER erroneously

identified this species with *Cannota dodecantha* Haeckel. I provisionally retain it as a separate species, but it may possibly be an advanced stage of *S. tetrastaurus* in which the branches of the radial canals have accomplished the growth towards the ring canal; a like tendency is indicated in some of the specimens of *S. tetrastaurus* previously described. According to the conventional definition of the two genera it should be referred to *Toxorchis*.

A more complicated structure is found in *Staurodiscus gotoi* (*Staurodiscoides gotoi* Uchida, 1927b pp. 165–168, figs. 1, 2). A single specimen was obtained at Shimizu Bay, Japan. It was 25 mm wide and 20 mm high, with four radial canals, each with about three pairs of lateral branches, not exactly opposite each other, with occasional short, secondary diverticula. The gonads are continuous, folded bands along the radial canals and their branches. All the principal lateral branches are extended almost to the umbrella margin, but it is stated in the description that "there is no open connection with the circular canal". As seen in the figures each branch terminates in a prolongation free of gonads directed towards the ring canal. There are four large perradial tentacles, two of which are larger than the others, and four smaller interradial tentacles. Ocelli were not observed on the tentacle bulbs, but there was an adaxial ocellus on each of the 88 cordyli.

The description of *S. gotoi* has been quoted at some length because in several features it bears a considerable resemblance to the present specimen from Nhatrang described above. Apart from the different number of tentacles the only distinguishing character of some importance seems to be the extension of the terminal ends of the canal branches. According to the description of *S. gotoi* they do not communicate with the ring canal. As stated above, however, the communication between the branched canals and the ring canal in *S. vietnamensis* were very difficult to discern except by careful examination in light of varying intensity and direction. I was inclined to think that the short prolongations beyond the gonadial parts of the canals in *S. gotoi*, as figured by UCHIDA, have actually been extended right out to the ring canal in a similar indistinct way as in the Nhatrang specimen. Professor UCHIDA, however, has kindly reexamined the type specimen and informed me in a letter that the branches of the canals actually end blindly at a short distance from the ring canal.

The possibility cannot be excluded that *Staurodiscus nigricans*, *gotoi*, and *vietnamensis* may prove merely to be further developmental stages of *S. tetrastaurus*, but as long as only one specimen of each of these species has been observed, it seems more secure to keep them apart as independent species.

In all these species the four primary radial canals proceed straight out to the ring canal giving rise to lateral branches on both sides. The same applies to the medusa from the Bahama Islands described by MAYER (1910 p. 227, fig. 118a) as *Dipleurosoma brooksi*; it has eight radial canals four of which are provided with one pair of lateral branches; owing to the presence of marginal clubs it must be referred to the Laodiceidae. Somewhat more doubtful is the position of *Cuvieria huxleyi* Haeckel (1879 p. 154, Pl. 9 fig. 4), in which the canals are branched repeatedly, so that about 70 terminal branches reach the ring canal, and gonads are only found on the terminal branches. Numerous marginal clubs are said to be present between the 16 long tentacles; it was found off the Azores in the Atlantic Ocean. It is, however, so much like *Cuvieria carisochroma* Péron, which has numerous tentacles but no marginal clubs, that one is tempted to presume that the "clubs" in *C. huxleyi* are merely the basal bulbs of tentacles which have been lost.

All the species enumerated above are evidently closely related, and I regard them as belonging to one genus, *Staurodiscus*, whether the lateral branches of the radial canals communicate with the ring canal or not. Accordingly the genus *Staurodiscus* may be characterized as Laodiceidae in which the radial canals give rise to lateral branches.

In contradistinction to *Staurodiscus* the genus *Toxorchis* is characterized as Laodiceidae in which some or all of the radial canals are bifurcated or dichotomously branched. The type-species, *Toxorchis arcuatus* Haeckel (1879 p. 157, Pl. 9 figs. 6-8) has six radial canals which are bifurcated once at their middle points; it was found at the Canary Islands. *T. kellneri* Mayer (1910 p. 229, Pl. 28 figs. 1, 2) has eight radial canals, most of them bifurcated near the eight corners of the stomach; it occurs in the Gulf of Maine and at Tortugas, Florida. *T. polynema* Kramp (1959a p. 34, Pl. I fig. 13, Pl. II fig. 4) has four groups of radial canals, each bifurcating twice inside the cruciform base of the stomach, 16 canals leaving the stomach; it is recorded from Angola in West Africa and from the Nicobar Islands in the Indian Ocean. The most highly differentiated species is *T. thalassina* (Péron & Lesueur, 1809 p. 327, as *Berenix thalassina*) from New Guinea and North Australia; it was 50 mm in diameter, with six wide radial canals branching dichotomously three or four times, about 100 branches reaching the ring canal. In none of these species the primary radial canals proceed directly to the ring canal (except when one or two canals in *T. kellneri* are undivided); the branching is thoroughly dichotomous, fundamentally different from the mode of branching in *Staurodiscus*, where the branches are lateral outgrowths

from the radial canals. This difference seems to me of much greater importance for distinguishing between the two genera than the former distinction which is according to whether the branches communicate with the ring canal or not.

Obelia sp.

Material: Nhatrang:

- P. 112, 28.V.35, 1 specimen.
 P. 113, 3.IV.35, 2 specimens.
 P. 118, 2.IX.35, 6 specimens.
 P. 131, 3.XII.35, 1 specimen.
 P. 137, 18.XI.35, fragments.
 P. 153, 5.V.38, 1 specimen.
 P. 165, 8.VI.36, 3 specimens.
 P. 213, 10.V.37, 1 specimen.
 P. 323, 26.VI.39, 1 specimen.
 P. 380, 23.VII.40, 1 specimen.

Apparently the specimens all belong to one species. Two very small specimens, 0.3–0.5 mm in diameter, have 11–22 tentacles and tiny gonads in the middle of the radial canals. In a specimen 0.7 mm wide, with about 35 tentacles, the gonads are already fairly large, spherical; in specimens 0.9–1.3 mm in diameter the number of tentacles varies between 40 and 64, average 53, the greatest number, 64 tentacles, being found in three specimens 1.0–1.3 mm wide. In all the specimens more than 0.9 mm wide the gonads are large, spherical and with few exceptions situated in the middle points of the radial canals, in two specimens somewhat nearer to the margin than to the stomach.

Phialidium hemisphaericum (L.).

Material: Nhatrang:

Label	Date	Number of specimens	Label	Date	Number of specimens
L. 3	19.VIII.26	2	P. 154	12.V.38	1
P. 112	28.V.35	65	P. 155	19.V.38	11
P. 117	26.VIII.37	1	P. 165	8.VI.36	38
P. 118	2.IX.37	1	P. 168	29.VI.36	6
P. 122	30.IX.37	1	P. 177	20.X.38	1
P. 123	7.X.37	1	P. 198	16.III.39	3
P. 131	3.XII.34	1	P. 205	15.III.37	3
P. 135	4.XI.35	1	P. 206	22.III.37	2
P. 137	18.XI.35	2	P. 208	6.IV.37	1
P. 153	5.V.38	8	P. 213	10.V.37	24

Label	Date	Number of specimens	Label	Date	Number of specimens
P. 227	17.VIII.37	1	P. 311	3.IV.39	1
P. 232	20.IX.37	1	P. 322D	19.VI.39	1
P. 273	11.VII.38	16	P. 323	26.VI.39	4
P. 273 A	11.VII.38	4	P. 353C	15.I.40	2
P. 274	18.VII.38	4	P. 370	24.V.40	1
P. 276	1.VIII.38	1	P. 372	27.V.40	2
P. 295	12.XII.38	1	P. 383	12.VIII.40	2
P. 295 B	12.XII.38	1	P. 412C	17.III.41	2
P. 295 D	12.XII.38	3	P. 508A	15.II.43	2
P. 295 E	12.XII.38	5	P. 513A	22.III.43	5
P. 308	13.III.39	150			

A careful examination of these numerous specimens, plus several others from a number of localities between India and the Philippine Islands, has convinced me that they belong to the common Atlantic species *Phialidium hemisphaericum*. Specimens from the north-eastern coast of Australia previously examined by me (KRAMP 1953 p. 271) were likewise indistinguishable from *P. hemisphaericum*; the corresponding hydroid, *Campanularia johnstoni* is recorded from the Malayan Archipelago and New Zealand. The genus *Phialidium* certainly needs a revision, and some of the species are more or less doubtful, partly owing to their considerable variation, although provisionally we must retain most of the 22 species described. In European waters *P. hemisphaericum* is subject to considerable variability; in the present collection from Nhatrang the variation is less pronounced and will be discussed below.

The vast majority of the specimens are small, less than 5 mm in diameter, but many of them have mature gonads, indicating that they are not juvenile stages. They agree perfectly with the summer-form of *P. hemisphaericum* in North European waters, small specimens with rarely more than 16 tentacles and with broadly oval gonads near the distal end of the radial canals. In European waters specimens hatched in the autumn or late summer frequently continue growth and development into the cold season and attain larger size, a greater number of tentacles, and elongated gonads. Apparently such specimens rarely appear in tropical seas; among the numerous specimens from Nhatrang only one was found with more than 17 tentacles, and in most of the specimens more than 2.5 mm wide the number of tentacles is 16.

The number of fully developed tentacles in proportion to the diameter of the umbrella is seen from the following table; a few young bulbs may

be present between the fully developed tentacles, especially in very small specimens, but when the number of tentacles reach of figure of 16, there are usually no more young bulbs to increase the number.

Diam., mm	Number of tentacles	
	width of variation	average
1-2	7-16	12
2-2.5.....	8-17	14
2.5-3.....	12-17	15.5
3-4	14-17	16
4-5	16	16

Very small specimens, less than 1 mm wide, may have 7 or 8 tentacles, but frequently 12.

Gonads appear in very small specimens as tiny dots in the middle of the radial canals, but they are soon displaced outwards towards the bell margin, and in the majority of the specimens examined the gonads are broadly oval or nearly spherical and are situated near the distal ends of the radial canals. Such well developed, distal gonads are frequently seen even in specimens only 2 mm in diameter. Occasionally the gonads increase in size and attain their broadly oval or spherical shape before they have been displaced towards the distal portions of the radial canals, but such well developed gonads situated near the middle points of the canals are only seen in specimens less than 2.5 mm wide. In a few of the larger specimens, 3-5 mm wide, the gonads are cylindrical, occupying the distal one-third of the radial canals.

A few instances of particularly elongated gonads are observed. In five specimens, 2, 2, 2.5, 3 and 4 mm wide, the gonads occupy the distal half or even three-fourths of the radial canals, and in one specimen, 4 mm wide, almost the entire length of the radial canals. None of these specimens have more than 16 or 17 tentacles, and apart from the elongated shape of the gonads they differ in no way from the other specimens of the collection. Two specimens should be specially mentioned. One of them is 6 mm wide; it has 16 fully developed tentacles and 8 young bulbs, and the gonads are linear, situated along the middle portion of the radial canals; the other is the largest specimen observed, being 7.5 mm in diameter, with 26 tentacles, gonads along the distal three-fourth of the radial canals. They undoubtedly belong to the same species as all the others and may be regarded as particularly advanced stages of development.

Specimens of *Phialidium* with five or six radial canals have sometimes been described as proper species: *Pseudoclytia pentata* Mayer, *Pseudoclytia gardineri*, *Pseudoclytia pentata* forma *hexaradiata* Thiel. Most probably

all of them are abnormal specimens of four-radiated species of *Phialidium*, this being confirmed by examination of the present collection, where such forms are richly represented. Among the 65 specimens collected on May 28th 1935 (P. 112) no less than 45 have five radial canals, and other five-radiated specimens were found in the following samples: P. 153 (3 specimens), P. 155 (3), P. 165 (8), P. 168 (1), P. 213 (7), and P. 513A (5 specimens). One of the five-radiated specimens from P. 155 is 3 mm in diameter and has 14 tentacles and 6 young bulbs with oval gonads near the middle points of the radial canals. All the other specimens are less than 2 mm wide, with 7-16 tentacles and a few young bulbs with tiny gonads in the middle of the radial canals. The five radial canals are not always equidistant. Apart from the aberrant number of radial canals these specimens resemble in every regard the four-radiated specimens of *Phialidium hemisphaericum* in the same samples. Two specimens with 6 radial canals (not equidistant) were found in the samples P. 123 and P. 177; both of them are 5 mm wide, one has 16 tentacles and about 12 young bulbs. In the other there are 24 tentacles and no young bulbs, the gonads short, near the distal ends of the radial canals.

One six-radiated specimen must be specially mentioned owing to its comparatively large number of tentacles. It is labelled P. 122 and is 4 mm wide; besides the 6 periradial tentacles the numbers of tentacles, young bulbs and marginal vesicles in the six sextants are as follows:

fully developed tentacles	young bulbs	marginal vesicles	thus the total numbers are:
2	3	4	21 tentacles, 18 young
3	4	4	bulbs, and 22 marginal
3	4	4	vesicles.
3	4	4	
2	2	3	
2	1	3	

Further distribution of *Phialidium hemisphaericum*: North-eastern Australia; Malayan Archipelago; India; west coast of Africa; Mediterranean; European coasts from Portugal to northern Norway; Iceland.

Phialidium malayense Kramp.

Phialidium pacificum Maas 1906 p. 91, Pl. 2 fig. 7.

— — Mayer 1915 p. 201, Pl. 2 fig. 3.

— *malayense* Kramp 1961 p. 170.

Material:

P. 198, Nhatrang, 16.III.39, 1 specimen.

The specimen is very like the medusa from Amboina, which was described and figured by MAAS, 1906, and by him erroneously referred to *Oceania pacifica* Agassiz & Mayer, 1899, from the Fiji Islands. It was most probably the same species which was found to be fairly common in Torres Straits, Australia, and described and figured by MAYER, 1915. It is also recorded as *P. pacificum* from China (CHIU 1954 p. 55).

The present specimen is 3.5 mm in diameter and has 24 fully developed tentacles, no young marginal bulbs and one or two marginal vesicles between successive tentacles. The tentacle bulbs are remarkably broad as in the specimen figured by MAAS; the broad stomach, cross-shaped at its base, and the fairly large, out-turned mouth lips likewise agree with MAAS's drawing. The gonads are short and oval, placed somewhat nearer to the ring canal than in the specimen from Amboina; in the specimen figured by MAYER the gonads are somewhat more elongated. The specimens examined by MAAS and MAYER were somewhat larger than the present specimen, being up to 5 mm wide, with 32–43 tentacles. According to MAAS the number of marginal vesicles between successive tentacles was variable—one, two or none in each space; in the largest specimen examined by MAYER there were only 26 marginal vesicles between the 43 tentacles, but in young specimens there were more marginal vesicles than tentacles.

This species seems to me so well characterized that it can safely be retained as valid. At any rate, the present specimen is quite distinct from the numerous other specimens of *Phialidium* collected at Nhatrang and mentioned above as *Phialidium hemisphaericum*, and I do not hesitate to refer it to the same species as the medusae from Amboina and Torres Straits mentioned by MAAS and MAYER under the name *P. pacificum*; the name, however, had to be changed, because the species cannot with any degree of probability be identified with *Phialidium pacificum* (Agassiz & Mayer).

Further distribution: Amboina; Torres Straits; China.

Phialidium simplex Browne.

Phialidium simplex Browne 1902 p. 282.

— — Browne & Kramp 1939 p. 299, Pl. 17 figs. 5–9.

Material:

Indochina; no date; labelled No. 4, 1 specimen.

The specimen is somewhat mutilated, 12 mm in diameter; the stomach has disappeared leaving only the cruciform base. The gonads are linear,

extending along the distal two thirds of the radial canals, though not quite to the ring canal. The tentacles cannot be counted, apparently there have been somewhat more than 100; they have the same appearance as in *Phialidium simplex*, and as in that species the marginal vesicles alternate with the tentacles.

Further distribution: North-eastern Australia; South Africa; Brazil; Falkland Islands.

Phialella quadrata (Forbes).

Material: Nhatrang:

P. 214, 17.V.37, 2 specimens.

P. 228, 23.VIII.37, 1 specimen.

The specimens are 1.5–2 mm wide, with 20–24 tentacles.

Further distribution: New Zealand; West Africa; north-western Europe.

Cirrholovenia polynema Kramp.

Cirrholovenia polynema Kramp 1959*b* p. 243, fig. 17*a, b*.

Material: Nhatrang:

P. 317F, 15.V.39, 1 specimen.

The specimen is not fully developed, being 3.5 mm in diameter, with only 8 tentacles and 8 young tentacle bulbs, and numerous marginal cirri between the tentacles and bulbs.

Further distribution: Strait of Malacca; Gulf of Siam; Philippines; Bali; Solomon Islands.

Eucheilota menoni Kramp.

Eucheilota sp. II. Menon 1932 p. 17, Pl. 1 fig. 9.

Eucheilota menoni Kramp 1959*b* p. 248, fig. 14*a, b*.

Material: Nhatrang:

P. 164, 2.VI.36, 3 specimens.

P. 165, 8.VI.36, 3 specimens.

P. 166, 4.VIII.38, 2 specimens.

This little medusa may be up to 2.5 mm in diameter and at that size has four large perradial tentacles, four large interradial bulbs, and 16 very small rudimentary bulbs. The present specimens are younger stages, very like the drawing by MENON (Pl. 1 fig. 9). One specimen is 1.5 mm wide, with four perradial tentacles on large bulbs, each with two (or

perhaps three) pairs of lateral cirri, four very small interradial and eight quite minute adradial bulbs, all without cirri. Most of the specimens are 1 mm or slightly less in diameter, with four tentacles usually having only one pair of cirri, and in each quadrant one (with rare exceptions three) minute bulbs without cirri. These specimens are about as high as wide, and have large, globular gonads near the distal end of the radial canals. One particularly small specimen, 0.5 mm wide, has only two fully developed tentacles, situated opposite each other on large bulbs; the two other periradial bulbs are somewhat smaller and carry no tentacles; each of the four periradial bulbs has one pair of cirri; four minute interradial bulbs are only just discernable. In this specimen the gonads have not yet appeared.

Further distribution: Madras, India; Nicobar Islands; Strait of Malacca; Philippines; Java Sea.

Eucheilota tropica Kramp.

Eucheilota sp. I. Menon 1932 p. 17, Pl. 1 fig. 6.

Eucheilota tropica Kramp 1959b p. 247, fig. 13.

Material: Nhatrang:

P. 102, 18.III.35, 1 specimen.

P. 118, 2.IX.37, 2 specimens.

P. 165, 8.VI.36, 1 specimen.

P. 273A, 11.VII.38, 1 specimen.

This species is distinguished from *E. menoni* by the gonads being elongated and extending along almost the entire length of the radial canals, and by the marginal bulbs all being provided with lateral cirri; it may be up to 4 mm wide.

One of the specimens in the present collection is 2.5 mm wide, and it is the only one in which the gonads have appeared as tender bands along the median parts of the radial canals; it has four fully developed, periradial tentacles, four large interradial and eight small adradial bulbs. In two other specimens, about 2 mm wide, small tentacles are developed on some of the interradial bulbs. There is also a specimen 1.5 mm wide, in which the eight adradial bulbs are very small, most of them still without cirri, but two of them have one cirrus each. The youngest specimen (P. 102) has no adradial bulbs, and the four interradial bulbs are very small, all with one pair of cirri; this specimen is exactly like MENON'S figure of "*Eucheilota* sp. I" (Pl. 1 fig. 6).

Further distribution: Madras in India; Nicobar Islands; Philippines.

Eucheilota paradoxica Mayer.

Material: Nhatrang:

P. 213, 10.V.37, 8 specimens.

This species is remarkable for the development of medusa buds on the gonads.

Further distribution: Japan; Bali; Strait of Malacca; Florida and the Bahamas off the Atlantic coast of North America.

Eucheilota ventricularis McCrady.

Material: Nhatrang:

P. 228, 23.VIII.37, 1 specimen.

The specimen is 3 mm wide, 2.5 mm in height, with thick jelly. The stomach is small; tender, elongated gonads are seen in the middle parts of the radial canals. There are 8 fully developed tentacles, each with one pair of lateral cirri, and in each quadrant 3 or 5 young bulbs of different sizes, some of them very small; the largest of the young bulbs have a pair of cirri. Only a few of the marginal vesicles can be seen; apparently there have been more than eight.

Further distribution: Originally described from the southern parts of the east coast of North America, but also recorded from Brazil and from the west coast of Africa. Records from the Red Sea and the Cagos Islands in the Indian Ocean have been considered doubtful, but young specimens from the Strait of Malacca, the Gulf of Siam, and the Solomon Islands most probably belong to this species (KRAMP 1959 *b* p. 244). The accuracy of these records seems to be confirmed by the occurrence of a medusa in Vietnam which cannot with any degree of probability be referred to any other known species of *Eucheilota*.

Lovenella sp.

Material:

"Octant St. 10", date unknown, 1 specimen.

Nhatrang, P. 205, 15.III.37, 2 specimens.

The specimens are more or less mutilated, and cannot with certainty be referred to any known species. The two specimens from P. 205 are 2 mm in diameter one of them has five radial canals. There are 6 or 8 fully developed tentacles, each with 1-3 pairs of lateral cirri, and 10 or 8 young bulbs of different sizes, some of them with one or two pairs of cirri. In one of the specimens about 20 marginal vesicles may be counted. Tender, elongated gonads are seen in the middle portions of the radial canals. The third specimen (Octant St. 10) is 3.5 mm wide, with 16 ten-

tacles and about 16 young bulbs; cirri have been present, but their number cannot be ascertained; the gonads have been lost.

Phialucium carolinae (Mayer).

Oceania carolinae Mayer 1900 p. 7, Pl. 3 fig. 9, Pl. 4 figs. 10, 11.

Phialucium carolinae Maas 1905 p. 38.

Phialucium carolinae Kramp 1953 p. 276, figs. 2, 3.

Material:

Indochina, no. 4, without date, 17 specimens.

"Krempf 1833", no date, 3 specimens.

De Lanessan no. 18, Courreau de Cauda, 4.VIII.26, 1 specimen.

— no. 26, Port Dayot, 13.IX.29, 1 specimen.

— no. 27, Cauda (Nhattrang), 20.VIII.29, 1 specimen.

Nhattrang:

P. 27, 4.VI.25, 2 specimens.

P. 126, 28.X.37, 1 specimen.

P. 155, 19.V.38, 1 specimen.

P. 166, 4.VIII.38, 1 specimen.

P. 190, 19.I.39, 1 specimen.

P. 213, 10.V.37, 3 specimens.

P. 216, 31.V.37, 1 specimen.

P. 330, 16.VIII.39, fragments.

P. 331, 21.VIII.39, 1 specimen.

P. 507, 8.II.43, 1 specimen.

The species of *Phialucium* have been greatly confused; a revision was carried out by me some years ago (KRAMP 1953). The number of radial canals is usually four, but sometimes 5, 6 or even 7.

Most of the specimens in the present collection are in fairly good condition. There are four very young specimens, 1.2–2.0 mm wide; they have 4 fully developed, perradial tentacles and in each quadrant 3 young bulbs, the median one being larger than the two others. In the youngest specimen, 1.2 mm wide, there are only two marginal vesicles in each quadrant, in the others eight. Gonads are not seen in any of these small specimens.

In normal specimens with four radial canals the fully developed tentacles have been counted as follows:

Diam., mm	4.5	5.5	7	8	8	9	9	9.5	10
Number of tentacles. . . .	5	10	12	11	13	11	12	15	20

In specimens with more than four radial canals I have counted

radial canals	5	5	5	7
diam., mm	6	7	10	12
tentacles	13	28	30	36

In the sample, labelled no. 4, without date, most of the specimens are more or less abnormal, and unfortunately, as they are also mutilated, the tentacles cannot be counted. There are 6 normal specimens, 9–13 mm wide, with four radial canals; one has 5 radial canals while another has 6; both are 10 mm in diameter. Moreover there are 9 specimens, in which the gonads have a peculiar appearance; the medusae are about 7–15 mm in diameter, and as far as the marginal organs are concerned they agree completely with *P. carolinae*, but their gonads are moniliform! The gonads extend from a little way inside the middle of the radial canals outwards towards the umbrella margin, and by one or more, up to four deep constrictions they are divided into a corresponding number of small globular protuberances at some distance from each other, connected by low bridges of gonadial structure. I have never seen anything like that before, and it is remarkable that such an aberrant feature occurs in so many specimens within one sample.

Further distribution: *Phialucium carolinae* is widely distributed and very common in Indo-West-Pacific coastal waters from southern China to the Philippines, the Malayan Archipelago and India; also in north-eastern Australia. It was originally described from South Carolina and Florida in North America.

Phialucium multitentaculatum Menon.

Phialucium multitentaculata Menon 1932 p. 16, Pl. 2 figs. 15, 16.

Material:

Stat. 805, Fort Bayard (Gulf of Tonkin), 5.X.34, 2 specimens.

One of the specimens, 13 mm wide, is incomplete; the other specimen is 14 mm in diameter, with a thick and soft jelly; the stomach is small, 1.5 mm broad; the gonads are long, extending from a short distance beyond the stomach almost to the umbrella margin. In one of the quadrants all the marginal organs are retained; there are 8 tentacles, so that the total number of tentacles in the specimen may be estimated as 32; between successive tentacles there are 3–4 or 5 very small rudimentary bulbs, low, conical and all alike (in contradistinction to *P. carolinae*) and provided with an excretory papilla. Where marginal vesicles can be seen, they alternate with the tentacles and rudimentary bulbs.

Further distribution: This is the first time this species has been recorded since it was described from Madras in India.

Octophialucium indicum Kramp.

Octophialucium indicum Kramp 1958 p. 347, fig. 2a, b.

Material:

- Cauda (Nhatrang), 19.V.26, 2 specimens.
 De Lanessan, no. 18, Courreau de Cauda, 4.VIII.26, 1 specimen.
 De Lanessan, no. 7, off Bangoi, 1.VIII.27, about 600 specimens.
 Cauda (Nhatrang), 11.X.29, 17 specimens.
 Stat. 805, Fort Bayard (Gulf of Tonkin), 5.X.34, 1 specimen.
 Stat. 813, anchorage in Saracene Bay, Gulf of Siam, 1.IV.35, 1 specimen.

This is one among several species which have been recorded in the literature under the name *Octocanna polynema* Haeckel. On a previous occasion (KRAMP 1955 p. 258) I have shown that the genus *Octocanna* as well as the two species referred to it, *octonema* and *polynema* Haeckel, must be regarded as obsolete, and I introduced a new name, *Octophialucium* to comprise Phialuciidae with normally eight radial canals. Six species have been described, most of them under the generic name *Octocanna*. A revision of the species was attempted by me in the paper quoted above and further elucidated in another paper (KRAMP 1958 p. 348), in which the species *O. indicum* was erected to comprise several records of "*Octocanna polynema*" from India and China as well as a collection of numerous specimens from Burma and the Mergui Archipelago examined by myself.

The numerous specimens in the present collection vary in size from 10 to 17 mm in diameter; the majority of them have 8 radial canals, but a few have 7, and one specimen was found with 11 radial canals.

Further distribution: India, Burma and southern China.

Eirene ceylonensis Browne.

Material:

- Indochina, No. 4, without date, 1 specimen.
 Nhatrang, "Krempf 1833", 1 specimen.
 De Lanessan, no. 10, Gulf of Camranh, 15.X.28, 1 specimen.
 De Lanessan, no. 23, Gulf of Cauda, 23.VI.27, 4 specimens.
 Nhatrang:
 P. 100, 29.IV.37, 1 specimen.
 P. 129, 18.XI.37, 1 specimen.
 P. 155, 19.V.38, 1 specimen.
 P. 165, 8.VI.36, 2 young specimens.
 P. 166, 4.VIII.38, 15 specimens.
 P. 176, 25.VIII.36, 1 specimen.
 P. 208, 6.IV.37, 1 specimen.
 P. 216E, 31.V.37, fragments.
 P. 218, 14.VI.37, 3 specimens.

- P. 255F, 7.III.38, 1 specimen.
 P. 376, 17.IX.42, 8 specimens.
 P. 380, 23.VII.40, 1 specimen.

This well known Indo-West-Pacific species was taken on several occasions and at different seasons, but never in great numbers. The two young specimens from P. 165 are 0.8–1.1 mm wide; they have a tiny stom:achal peduncle, the stomach is fairly large, the mouth with large lips directed outwards, still with smooth edges; no gonads; the number of tentacles + developing bulbs is 13 in the smallest specimen, 20 in the specimen 1.1 mm wide. Presumably these two young specimens belong to *E. ceylonensis*.

The other specimens vary in size between 5 and 15 mm in diameter. When possible tentacles were counted giving the following results:

Diam., mm . . .	5	6	8	8	9	10	11	13	13
tentacles.	48	50	48	80	107	85	78	81	119

Further distribution: Generally distributed in the coastal waters of southern China, north-eastern Australia, the Philippines, the Malayan Archipelago, the Nicobar and Mergui Islands, Burma, and India.

Eirene kambara Agassiz & Mayer.

- Eirene kambara* Agassiz & Mayer 1899 p. 169, Pl. 8 fig. 29.
Phortis kambara Mayer 1910 p. 309.

Material:

Nhatrang, P. 166, 4.VIII.38, 2 specimens.

The two specimens are young stages, 1.5–2 mm wide, with 14–17 tentacles.

Further distribution: Fiji Islands; Great Barrier Reef, Australia.

Eirene palkensis Browne.

- Irene palkensis* Browne 1905 p. 141, Pl. 3 figs. 12–16.
Phortis palkensis Mayer 1910 p. 309.

Material:

- De Lanessan, no. 15, Cauda (Nhatrang), 19.VI.25, 3 specimens.
 De Lanessan, no. 7, off Banghoi, 1.VIII.27, 10 specimens.
 De Lanessan, no. 27, Cauda (Nhatrang), 20.VIII.29, 1 specimen.
 De Lanessan, no. 1, Cauda (Nhatrang), 11.X.29, 1 specimen.
 De Lanessan, Stat. 813, anchorage in Saracene Bay (Gulf of Siam), 1.IV.35, 12 specimens.
 P. 100, Nhatrang, 29.IV.37, 2 specimens.

Tentacles have been counted as follows:

Diam., mm	Tentacles	Diam., mm	Tentacles
5.....	8-16	11.....	36-45
6.....	15-20	13.....	40-42
8.....	18-22	15.....	60
9.....	24-48	20.....	49
10.....	21-26	24.....	40

It is characteristic of this species that the gonads are extended from the base of the peduncle to near the umbrella margin; in one of the present specimens, 20 mm wide, the gonads are continued a short way down on the basal part of the peduncle.

Further distribution: southern China; Great Barrier Reef, Australia; Nicobar Islands and Mergui Archipelago; Ceylon; Port Natal in South Africa.

Eirene menoni Kramp.

Irene ceylonensis Annandale 1907 p. 79, Pl. 2 fig. 5.

Phortis sp. Menon 1932 p. 18.

Phortis lactea Ling 1937, p. 357, figs. 9, 10.

Eirene menoni Kramp 1953 p. 286, Pl. 2 fig. 6.

Material: Nhatrang:

- P. 35, 30.I.36, 1 specimen.
- P. 100, 29.IV.37, 1 specimen.
- P. 101, 11.III.35, 2 specimens.
- P. 107, 17.VI.37, 3 specimens.
- P. 148, 31.III.38, 1 specimen.
- P. 153, 5.V.38, 5 specimens.
- P. 154, 12.V.38, 6 specimens.
- P. 155, 19.V.38, 20 specimens.
- P. 165, 8.VI.36, 9 specimens.
- P. 168, 29.VI.36, 2 specimens.
- P. 198, 16.III.39, 9 specimens.
- P. 200, 8.II.37, 2 specimens.
- P. 228, 23.VIII.37, 1 specimen.
- P. 247F, 22.II.40, 1 specimen.
- P. 249, 7.III.40, 1 specimen.
- P. 250, 31.I.38, 9 specimens.
- P. 251, 7.II.38, 1 specimen.
- P. 398, 10.XII.40, 1 specimen.
- P. 400A, 23.XII.40, 1 specimen.
- P. 408, 17.II.41, 1 specimen.

Some of the specimens are young stages, 1.5–2.5 mm wide, connected with larger specimens by even transitions, so that their identification may be regarded as reliable. They have a tiny stomachal peduncle; the gonads make their first appearance in the middle of the radial canals when the umbrella is 2 mm wide. One of the youngest specimens, 1.5 mm wide, has only 8 tentacles and 8 young bulbs, but in others of about the same size some of the young bulbs have developed into tentacles, some new young bulbs appearing; in a specimen 2.1 mm wide there are 12 tentacles and 12 young bulbs of different sizes.

Fully developed tentacles have been counted in specimens of different sizes as follows:

Diam. mm	Fully developed tentacles	Diam. mm	Fully developed tentacles
1.5	8–17	7.....	28–37
2.0	12–20	8.....	26–33
3	23–28	9.....	31
4	22	10.....	30–35
5	25–40	11.....	—
6	27–34	12.....	32

In adult specimens, which rarely exceed 12 mm in diameter, the number of tentacles may amount to 48.

Further distribution: China; Great Barrier Reef, Australia; the coasts of India.

Eirene hexanemalis (Goette).

Syn. *Irenopsis hexanemalis*.

Material:

Indochina, no date, 2 specimens.

De Lanessan, no. 17, Iles des pêcheurs, Febr. 1926, 6 specimens.

De Lanessan, Cauda (Nhatrang), 18.VI.26, 1 specimen.

De Lanessan, no. 7, off Banghoi, 1.VIII.27, 9 specimens.

De Lanessan, no. 25, north of Hon Chala, 13.IX.29, 3 specimens.

Cauda (Nhatrang), no. 1, 11.X.29, 1 specimen.

Stat. 801, near Cacba, Gulf of Tonkin, 23.IX.34, 1 specimen.

Stat. 805, Fort Bayard, Gulf of Tonkin, 5.X.34, 2 specimens.

Nhatrang:

P. 27, 4.VI.25, 5 specimens.

P. 71, 8.X.36, 1 specimen.

P. 126, 28.X.37, 1 specimen.

P. 177, 20.X.38, 4 specimens.

P. 326, 17.VII.39, 5 specimens.

Among 39 specimens examined one was found with 7 radial canals, all the others having the normal number of 6.

Further distribution: Generally distributed and very common in Indo-West-Pacific waters from Japan and southern China to Zanzibar in East Africa.

Helgicirrha malayensis (Stiasny).

Eirene malayensis Stiasny 1928 p. 210, fig. 1.

Eirene madrasensis Menon 1932 p. 20, Pl. 3 fig. 24.

Material:

Stat. 4, Octant, Chevey, no date, 3 specimens.

No. 13, Stat. 801, near Cachba, Gulf of Tonkin, 23.IX.34, 1 specimen.

Nhatrang, P. 126, 28.X.37, 1 specimen.

Nhatrang, P. 478A, 20.VII.42, 1 specimen.

The specimen from P. 478A is 8 mm wide with about 30 tentacles and a few young bulbs. The specimen from Stat. 801, which is 13 mm wide, has about 80 fully developed tentacles and about 50 young bulbs. In the specimen from P. 126, which is somewhat mutilated, about 23 mm in diameter, long and narrow gonads extend from the umbrella margin inwards and slightly down the basal part of the peduncle. The specimens from Stat. 4 cannot be measured.

Further distribution: southern China; Great Barrier Reef, Australia; Java Sea; Nicobar Islands and Mergui Archipelago; the coasts of India.

?*Helgicirrha danduensis* (Bigelow).

Eirene danduensis Bigelow 1904, p. 254, Pl. 1 fig. 5, Pl. 2 fig. 6.

Material: Nhatrang:

P. 165, 8.VI.36, 1 specimen.

P. 214, 17.V.37, 2 specimens.

It is with some hesitation that these young specimens are referred to *Helgicirrha danduensis*, which is a comparatively large medusa, up to 25 mm in diameter. The specimens from P. 214 are 3-5 mm wide with a fairly thick jelly and a short, cylindrical stomachal peduncle; the stomach is elongated, though not remarkably long as in the few specimens which have been observed; gonads have not yet appeared. There are about 16 tentacles, apparently without excretory papillae, and a few young bulbs; the perradial tentacles do not differ in length from the others.

The specimen from P. 165 is a juvenile stage, only 1 mm wide; the umbrella is quite flat, the peduncle short and narrow, with a conical

base; the stomach is long and cylindrical, longer than the peduncle, and four oral lips are slightly indicated. No gonads. There are four very large perradial tentacles, as long as or somewhat longer than the diameter of the umbrella; the tentacles are gradually tapering from the conical basal bulbs, which are provided with one or two pairs of lateral cirri. In each quadrant there are 5 or 6 young bulbs (developing tentacles), the median (interradial) one a little larger than the others, the adradial a little larger than the eradial, almost all of them with cirri, one or a pair. The young bulbs are densely crowded on the umbrella margin, and marginal vesicles cannot be seen. The cirri are typical spiral cirri with a distal knob of nematocysts. It is mainly owing to the great size of the perradial tentacles that I am inclined to think that this tiny specimen belongs to *Helgicirrho danduensis*.

Distribution of *Helgicirrho danduensis*: Nicobar and Maldive Islands.

Eutima levuka (Agassiz & Mayer).

Eutimeta levuka Agassiz & Mayer 1899, p. 163, Pl. 9 figs. 30, 31.

Material:

- De Lanessan, no. 15, Cauda (Nhatrang), 19.VI.25, 39 specimens.
- De Lanessan, no. 3, Gulf of Nhatrang, 19.VIII.26, 1 specimen.
- De Lanessan, no. 7, off Banghoi, 1.VIII.27, 9 specimens.
- De Lanessan, no. 27, Cauda (Nhatrang), 20.VIII.29, 1 specimen.
- Stat. 813, anchorage in Saracene Bay (Gulf of Siam), 1.IV.35, 3 specimens.
- Stat. 848, anchorage of Ile Money (Paracels), 20.V.35, 3 specimens.

Nhatrang:

- P. 168, 29.VI.36, 1 specimen.
- P. 177, 20.X.38, 2 specimens.
- P. 213, 10.V.37, 1 specimen.
- P. 326, 17.VII.39, 11 specimens.
- P. 326D, 17.VII.39, 2 specimens.
- P. 326E, 17.VII.39, 1 specimen.
- P. 331, 21.VIII.39, 1 specimen.

The specimens vary in size between 2 and 15 mm in diameter; the development of the gonads on the peduncle seems to proceed rather slowly; in a specimen 9.5 mm wide they are still rather tender, in the middle portion of the peduncle. In specimens 10–15 mm in diameter the gonads are well developed, situated somewhat above the middle portion of the peduncle.

Further distribution: Fiji Islands; southern China; North-East Australia; Philippines; Malayan Archipelago; Maldive Islands.

Eutima orientalis (Browne).

Octorchis orientalis Browne 1905 p. 139, Pl. 3 fig. 4.

Material: Nhatrang:

- P. 146, 17.III.38, 5 specimens.
 P. 153, 5.V.38, 1 specimen.
 P. 200, 8.II.37, 2 specimens.
 P. 253C, 21.II.38, 1 specimen.
 P. 295B, 12.XII.38, 1 specimen.
 P. 295E, 12.XII.38, 1 specimen.
 P. 353G, 15.I.40, fragments.
 P. 388C, 23.IX.40, 1 specimen.
 P. 421, 19.V.41, 1 specimen.

The specimens are 2-6 mm in diameter. Marginal warts have been counted as follows:

Diam., mm	2.5	3	5	6
Marginal warts	27	25	22	c. 50

Further distribution: Nicobar Islands and the coasts of India.

Aequorea macrodactyla (Brandt).

Material:

No. 1, Cauda (Nhatrang), 11.X.29, 12 specimens.

Measurements:

Diam. of umbrella, mm	12	16	17	18	19	22	22	24	24	26	27	30
Diam. of stomach, mm..	8	11	12	10	11	15	15	14	14	17	15	19
Number of tentacles ...	16	11	12	?	c.16	c.10	?	17	?	13	7	c.24
Number of radial canals (approximate)	60	46	48	?	50	48	?	42	70	60	47	70

In all the specimens the tentacle bulbs have the broad shape with a distinct abaxial keel and the prominent excretory papilla characteristic of this species.

Further distribution: Widely distributed in the Pacific and Indian Oceans from America to East Africa and in the southern Atlantic.

Aequorea pensilis (Eschscholtz).

Material:

- "Krempf 1832", Nhatrang, 7 specimens.
 De Lanessan, no. 13, Vung-Ro Bay, 17.VI.27, 8 specimens.
 De Lanessan, no. 9, between the pyramide and the island Tré, 20.VII.28, 1 specimen.
 De Lanessan, no. 19, Nhatrang, 6.VIII.29, 1 specimen.
 De Lanessan, no. 27, Cauda (Nhatrang), 20.VIII.29, 3 specimens.
 De Lanessan, no. 1, Cauda (Nhatrang), 11.X.29, 2 specimens.
 Nhatrang, P. 252B, 14.II.38, fragments.

Measurements:

Diam. of umbrella, mm	12	17	19	20	22	22	22	23
Diam. of stomach, mm	6	8	11	12	17	15	10	15
Number of tentacles	6	7	c. 8	9	?	13	13	8
Number of radial canals (approximate)	29	40	57	60	?	57	59	56
Diam. of umbrella, mm	25	26	27	42	47	49	57	75
Diam. of stomach, mm	14	19	13	20	28	31	40	52
Number of tentacles	?	?	10	12	18	c. 13	c. 16	14
Number of radial canals (approximate)	60	?	49	120	170	160	180	200

In the sample from De Lanessan, no. 13 some of the specimens are in the interesting stage of development, where some of the radial canals have recently been formed and are still much narrower than the others and devoid of gonads; this applies to about every second radial canal in three specimens: diam. 17 mm with 40 radial canals, diam. 19 mm with 57 radial canals, diam. 22 mm with 59 radial canals. In two specimens of the same sample a few of the canals are without gonads: diam. 12 mm with 29 radial canals, diam. 20 mm with 60 radial canals. Such specimens are not seen in any of the other samples in the present collection, but I have seen the same phenomenon in specimens from other localities.

Apart from the numbers of tentacles and radial canals this species is distinguished from *Ae. macrodactyla* by the shape of the tentacle bulbs, which have long lateral extensions, no abaxial keel, and no prominent excretory papillae, only excretory pores.

Further distribution: Widely distributed in the tropical parts of the Pacific and Indian oceans; records from the Atlantic are doubtful.

Aequorea globosa Eschscholtz.

Material:

- De Lanessan, no. 16, Nhatrang, June 1925, 4 specimens.
 De Lanessan, no. 9, between the pyramid and the island Tré, 20.VII.28, 1 specimen.
 De Lanessan, no. 19, Nhatrang, 6.VIII.29, 2 specimens.
 De Lanessan, no. 27, Cauda (Nhatrang), 20.VIII.29, 1 specimen.
 De Lanessan, no. 1, Cauda (Nhatrang), 11.X.29, 7 specimens.

Measurements:

Diam. of umbrella, mm	10	12	13	13	13	15	17
Diam. of stomach, mm	5	7	6	7	7	8	10
Number of tentacles	26	c. 30	c. 33	41	?	28	c. 36
Number of radial canals	27	35	29	29	44	32	43

The thick apical jelly and highly vaulted shape of the umbrella is seen in the younger specimens. In fully developed specimens of this species the gonads occupy almost the entire length of the radial canals; in younger stages with somewhat shorter gonads these are adjacent to the stomach, in contradistinction to *Ae. australis*, in which the gonads are only half as long as the radial canals and situated nearer to the umbrella margin than to the stomach. Moreover the tentacle bulbs of *Ae. globosa* have no excretory papillae. I have previously compared these species (KRAMP 1953 p. 293), and the present collection confirms my former statement that they are two distinct species.

Further distribution: ESCHSCHOLTZ described *Ae. globosa* from the tropical Pacific, near the equator; later on it has been recorded from the Banda Sea (MAAS 1905) and the Java Sea (STIASNY 1928) in the Malayan Archipelago; now also found off the coasts of Vietnam.

LIMNOMEDUSAE.

Gonionemus vertens A. Agassiz.

Synonyms: *G. murbachi* Mayer, *G. agassizi* Murbach & Shearer, *G. depressus* Goto, *G. oshoro* Uchida.

Material:

Nhatrang, P. 177A, 20.X.38, 1 specimen.

This is a young specimen, only 4 mm wide, with 58 tentacles; there are four small, somewhat folded male gonads in the middle parts of the four radial canals.

Further distribution: This strictly littoral medusa was originally described from both sides of North America, but it also occurs at the coasts of Japan and China. During the last decennia it has been found in an increasing number of European localities, mainly in northern temperate seas, which is probably owing to transportation with ships of the polypoid stage; it is quite exceptional that it may now be recorded from a tropical coast.

Proboscidactyla ornata (McCrary).

Synonyms: *Willisia ornata* McCrary, *Willia gemmifera* Fewkes, *Proboscidactyla varians* Browne, *P. tropica* Browne, *P. flavicirrata* var. *stonifera* Maas, *Misakia typica* Uchida.

Material:

"Octant 10", no date, 12 specimens.

De Lanessan 27, Cauda (Nhatrang), 20.VIII.29, 6 specimens.

Nhatrang:

- P. 117, 26.VIII.37, 1 specimen.
 P. 131, 3.XII.37, 1 specimen.
 P. 133, 22.X.35, 1 specimen.
 P. 137, 18.XI.35, 1 specimen.
 P. 153, 15.V.38, 1 specimen.
 P. 165, 8.VI.36, 2 specimens.
 P. 175, 18.VIII.36, 2 specimens.
 P. 176, 25.VIII.36, 3 specimens.
 P. 177, 20.X.38, 3 specimens.
 P. 183, 1.XII.38, 1 specimen.
 P. 214, 17.V.37, 2 specimens.
 P. 232, 20.IX.37, 4 specimens.
 P. 232A, 20.IX.37, 1 specimen.
 P. 283, 19.IX.38, 1 specimen.
 P. 308, 13.III.39, 6 specimens.
 P. 377, 1.VII.40, 1 specimen.

Specimens 0.5–2.5 mm wide were found; in very small specimens, up to 1 mm wide, there are usually only 4 tentacles and sometimes also 4 young tentacle bulbs, and in most of the specimens 1–2 mm wide there are 8 tentacles, but in a few specimens 2–2.2 mm wide 11, 15 and 16 were counted.

In about half the number of specimens examined mature gonads are present, and they have no medusa buds; most of the specimens with mature gonads are about 2 mm wide, but well developed gonads were also found in a few specimens only 1 mm wide. Medusa buds were found in specimens of all sizes, partly in the corners of the stomach and partly in the forkings of the radial canals. I have previously stated that the position of the medusa buds is of no systematical importance and does not justify a division into varieties or even species.

Some specimens need further consideration. One small specimen, hardly 1 mm wide, has four perradial tentacles, and in each of the interradial spaces there is a small, oval exumbrellar patch of nematocysts, but no tentacle bulb; it has already well developed gonads and no medusa buds. Two specimens (P. 214), 2.0 and 2.2 mm wide, have respectively 15 and 16 tentacles; the oral lips are much folded, the stomach large and mounted upon a low and broad gelatinous peduncle; the gonads (female) are mature and are extended from the corners of the stomach upwards on the peduncle almost to its base, but not further out on the radial canals.

A very peculiar structure is seen in a specimen from Nhatrang, July 20th 1929: it is a well developed polyp situated at the base of the stomach of the medusa! (fig. 7).

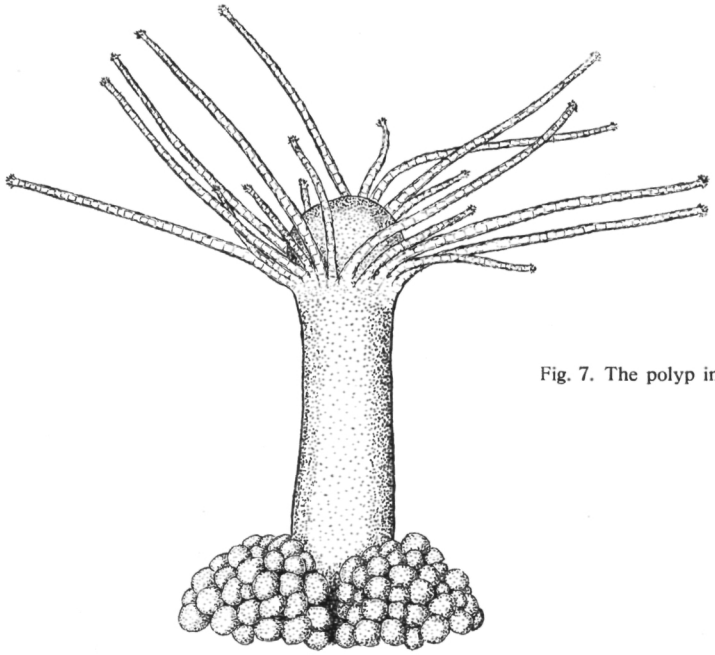


Fig. 7. The polyp in situ.

Figs. 7-9. Polyp situated at the base of the stomach of *Proboscidactyla ornata*, Nhatrang 20.VII.1929.

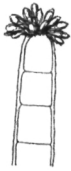


Fig. 8. Terminal end of a tentacle.

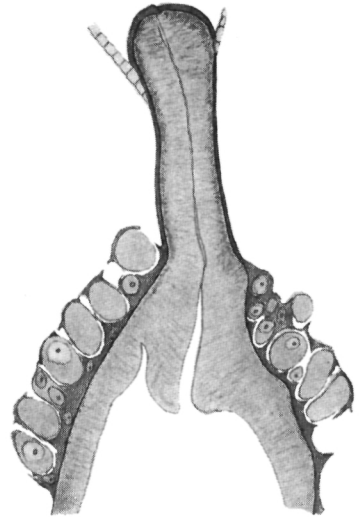


Fig. 9. Longitudinal section of the polyp and adjacent part of the stomach of the medusa.

The medusa is 2 mm wide and has eight tentacles and mature eggs in its gonads. The polyp has a smooth, cylindrical body and a dome-shaped proboscis surrounded by a whorl of tentacles; there are 18 tentacles, ten of them about as long as the height of the body, the others about half as long but not exactly of equal length. The tentacles are slender, rather stiff, and contain a single row of cylindrical endoderm cells (fig. 8); nematocysts are restricted to the terminal ends of the tentacles forming a small tuft, not a spherical knob as in true capitate tentacles.

This polyp is so unlike the other polypoid structures known within the Proboscidactylidae, that one might hesitate to regard it as belonging to the medusa on which it is situated. As a matter of fact, however, the polyp is an outgrowth from the interradial stomach wall of the medusa. Sections show (fig. 9) that the tissues of the medusan stomach (ectoderm as well as endoderm and supporting lamella) are continuing directly and without interruption into the corresponding tissues of the polyp, indicating that the polyp is an asexual offspring of the medusa and not a foreign polypoid creature which has attached itself to its stomach wall. The polyp has a narrow digestive cavity and a tiny mouth opening.

We know the developmental cycle of two species of *Proboscidactyla*. It has long been known in *P. stellata*, and UCHIDA & OKUDA (1941) have found that it is the same in *P. flavicirrata*; presumably the present species, *P. ornata*, behaves in a similar manner.

The eggs of the medusa give rise to colonial hydroid polyps with two kinds of individuals, nutritive polyps (gastrozooids) and blastostyles. The blastostyles, on which a new generation of medusae is produced, are without tentacles and mouth and have a small terminal knob armoured with nematocysts. The gastrozooids have a bilaterally symmetrical, head-like lobe with a mouth opening on one side; above and on the opposite side of the mouth is a cluster of nematocysts. Below the narrowed neck of the head-like lobe there are two large tentacles close together. In the polyps of *P. flavicirrata* the authors observed a few gastropods with three tentacles and in one individual even seven. These tentacles have a single row of endoderm cells, they are tapering in width from the base towards the tip and devoid of nematocysts; there is no terminal tuft as in the tentacles of the polyp described above. This description applies to the hydroid polyp generally known as *Lar*.

Besides this metagenetic developmental cycle, asexual reproduction occurs in the medusa of *Proboscidactyla ornata*, where medusa buds are produced, either at the base of the stomach or on the forkings of the radial canals. However, the medusa buds do not rise directly from the

tissues of the radial canals but from blastostyles, i. e. from polypoid structures, very similar to the blastostyles of the hydroid colonies. This was observed already by HUXLEY (1877) and subsequently reported by several other authors. Polypoid structures on the medusae of *P. ornata* are, accordingly, well known, but a fully developed polyp, a hydranth with a whorl of tentacles like that found in the medusa from Nhatrang mentioned above, has not formerly been observed. It is situated in a position where a medusiferous blastostyle might conceivably have been developed, and it may be interpreted as the outcome of a kind of heteromorphosis, where a polypoid outgrowth has been transformed from the ordinary shape and structure (a blastostyle), to an extraordinary form, a fully developed hydranth with mouth and tentacles. The most peculiar oddity is, however, that it is entirely different from the hydranths of the hydroid colony derived from the eggs of the medusa, the "Lar". It is true, admittedly, that the hydroid of *P. ornata* is not known, but there is no reason to believe that it should be fundamentally different from the *Lar* of the other species.

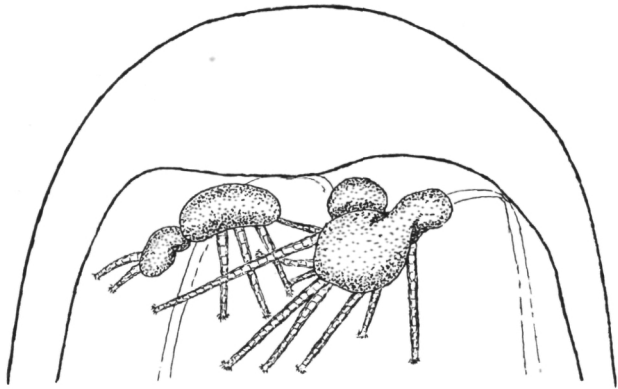


Fig. 10. Apical part of medusa of *Proboscoidactyla ornata*, Nhatrang 20.VII.1929, with polypoid tentacles issuing from regenerated parts of the stomach of the medusa.

In another specimen of *Proboscoidactyla ornata* from the same sample (Nhatrang, 20.VII.1929) polypoid structures of the same nature as the polyp described above seems to have been present, but are in a degenerate state (fig. 10). The stomach of the medusa has been destroyed and is reduced to three isolated lumps, irregularly lobed, and directly issuing from each of these are a number of tentacles (3-8) of exactly the same shape and structure as the tentacles of the well developed polyp which

was found on the stomach of the medusa mentioned above. One of the three lumps communicates with the radial canals on the subumbrella. Presumably well developed polyps have originally been present on the stomach wall of the medusa; the stomach and the polyps were destroyed but partially regenerated in a peculiar manner, polypoid tentacles being developed on the remains of the stomachal structures.

Heteromorphosis is a well known phenomenon in colonial hydroids, where a bud, ordinarily destined for a certain function, develops into something else. A hydranth bud may become a stolon, a gonangium may appear in an unusual position on the colony, the terminal end of a stolon may rise from the substratum and become a hydranth, a hydranth may be developed from the proximal end of a broken stem by reversal of polarity, isolated tentacles may appear below an injured portion of the stem; such irregularities are usually due to altered external circumstances. Peculiar irregularities are also frequently observed in medusae, and the case described above, where tentacles issue from degenerative portions of a medusan stomach, may possibly be explained in a similar way.

Further distribution of *Proboscidactyla ornata*: Circum-global in warm coastal waters.

Proboscidactyla flavicirrata Brandt.

Material:

Nhatrang, P. 214, 17.V.37, 1 specimen.

The specimen is about 5 mm wide, somewhat crumpled. There is no indication of a stomachal peduncle, the gonads (female) are well developed folded bands on both sides of the four primary radial canals outside the corners of the stomach and extending far out towards the umbrella margin, leaving a fairly narrow external zone for the branching portions of the radial canals. There are about 64 tentacles, densely crowded.

Further distribution: Pacific coast of North America from Vancouver Island to California; Kamchatka, Japan and China. This species thus has a predominantly northern distribution in the Pacific, which may account for its scarcity on the coast of Vietnam.

TRACHYMEDUSAE.

Liriope tetraphylla (Chamisso & Eysenhardt).

Material:

Nhatrang, no. 16, June 1925, 3 specimens.

Cauda (Nhatrang), no. 14, 3.VIII.26, 1 specimen.

Cauda (Nhatrang), no. 22, 10.VII.29, 1 specimen.

Bich-Dam (Nhatrang), no. 19, 6.VIII.29, 16 specimens.

Port Dayot, no. 26, 20.VIII.29, 1 specimen.

Cauda (Nhatrang), no. 27, 20.VIII.29, 1 specimen.

Stat. 801, near Cac-ba, Gulf of Tonkin, 23.IX.34, 1 specimen.

Stat. 813, anchorage of Saracene Bay, Gulf of Siam, 1.IV.35, 4 specimens.

Stat. 870, anchorage at l'itu-Aba, 23.IV.36, 4 specimens.

Nhatrang:

Label P.	Date	Number of specimens	Label P.	Date	Number of specimens
105	3.VI.37	1	213	10.V.37	6
109	6.V.35	1	227	17.VIII.37	2
112	28.V.35	3	232	20.IX.37	9
117	26.VIII.37	1	232 A	20.IX.37	12
128	16.IX.35	21	232 B	20.IX.37	13
133	22.X.35	15	232 E	20.IX.37	1
135	4.XI.35	4	232 F	20.IX.37	1
137	18.XI.35	3	233	27.IX.37	3
153	5.V.38	1	238	8.XI.37	1
154	12.V.38	3	252	14.II.38	1
163	25.V.36	12	255 F	7.III.38	1
165	8.VI.36	3	273 A	11.VII.38	5
166	4.VIII.38	4	273 B	11.VII.38	1
167	22.VI.36	12	273 I	11.VII.38	1
168	29.VI.36	15	286	10.X.38	6
173	5.VIII.36	1	287 F	17.X.38	1
177	20.X.38	1	290	7.XI.38	4
183	1.XII.38	35	296	19.XII.38	2
185	27.X.36	5	302	30.I.39	1
190	19.I.39	150	303		1
191	7.XII.36	1	308	13.III.39	3
193	9.II.39	4	309	20.III.39	2
198	16.III.39	1	311	3.IV.39	1
201	15.II.37	2	317 F	15.V.39	1
204	9.III.37	1	353 A	15.I.40	c. 40
205	15.III.37	3	353 B	15.I.40	5
206	22.III.37	1	375 A	17.VI.40	1
207	30.III.37	1	377	1.VII.40	1
209	13.IV.37	1	380	23.VII.40	3
210	20.IV.37	1	383	12.VIII.40	1

Label P.	Date	Number of specimens	Label P.	Date	Number of specimens
388	23.IX.40	2	400	23.XII.40	1
388C	23.IX.40	3	408	17.II.41	1
388F	23.IX.40	23	408A	17.II.41	1
395	19.II.40	2	412C	17.III.41	1
395C	19.II.40	1	507	8.II.43	1
397	2.XII.40	1	513A	22.III.43	1

In most of these numerous hauls only a few specimens were taken; the few hauls, where the nets contained more than 10 specimens, were taken in the months May, June, August, September, October and December. An exceptionally large catch was that of January 1939 (P. 190), when about 150 specimens were taken in a single haul. Altogether this species was taken in about equal numbers at all seasons. As to the sizes of the specimens the catches in November and December contained only small specimens, 1–2.5 mm wide, but apart from this, which may be quite accidental, specimens of all sizes, from 0.5 to 7 or 9 mm, occurred every month; a few particularly large specimens, 14 and 20 mm in diameter, were found in August. Apparently the occurrence of this medusa at the coasts of Vietnam is independent of the seasons.

Further distribution: Generally distributed in the warm parts of all the oceans.

Petasiella asymmetrica Uchida.

Petasiella asymmetrica Uchida 1947 p. 311, textfigs. 10, 11.

Petasiella asymmetrica Kramp 1959b p. 256.

Material: Nhatrang:

P. 165, 8.VI.36, 1 specimen.

P. 395C, 19.XI.40, 1 specimen.

The specimen from P. 395C is somewhat mutilated, about 2 mm in diameter. The specimen from P. 165 is in good condition, 1.2 mm wide, 1.0 mm high; it has four spherical gonads with large eggs, close to the ring canal. There are 40 tentacles, and a peculiarity is observed in the position of the perradial tentacles. In each perradius one tentacle is situated on the margin of the umbrella, whereas another of the same size and structure issues from the exumbrella at a short distance above the marginal one, connected with the ring canal by a thin string of endoderm; accordingly there are eight perradial tentacles in the four perradii in this medusa. This peculiar position of the perradial tentacles is not mentioned in

UCHIDA's description of the species, but it seems to have been present in the specimen shown in his fig. 10c.

The arrangement of the other tentacles agrees with that described by UCHIDA. Apart from the perradial tentacles mentioned above, there are eight tentacles in each quadrant, all situated on the umbrella margin and grouped on both sides of the single statocyst with five to the right and three to the left, and in each group the youngest tentacles are nearest to the statocyst.

Further distribution: Palao Islands; Philippines; Bali; Malacca; Nicobar Islands.

Rhopalonema velatum Gegenbaur.

Material: Nhatrang:

- P. 122, 30.IX.37, 1 specimen.
- P. 123, 7.X.37, 1 specimen.
- P. 205, 15.III.37, 2 specimens.
- P. 228, 23.VIII.37, 1 specimen.
- P. 228 F, 23.VIII.37, 2 specimens.
- P. 276, 1.VIII.38, 1 specimen.
- P. 278 F, 16.VIII.38, 4 specimens.
- P. 349, 18.XII.39, 1 specimen.

In most collections from warm waters this species occurs in company with *Liriope tetraphylla* and in similar numbers. It is remarkable, therefore, that so few specimens were found in the present collection, and that most of them are small; the specimen from P. 228 is 6 mm wide, the specimen from P. 349 is 5 mm, the others 1.5–4 mm.

Further distribution: Generally distributed in the warm parts of all the oceans.

Amphogona apsteini (Vanhöffen).

Pantachogon apsteini Vanhöffen 1902 p. 65, Pl. 10 fig. 18, Pl. 11 fig. 28.

Amphogona apsteini Browne 1905 p. 740, Pl. 54 fig. 5, P. 56 figs. 10–15.

Material: Nhatrang:

- P. 123, 7.X.37, 1 specimen.
- P. 126, 28.X.37, 1 specimen.
- P. 165, 8.VI.36, 7 specimens.
- P. 166, 4.VIII.38, 2 specimens.
- P. 168, 29.VI.36, 2 specimens.
- P. 228, 23.VIII.37, 1 specimen.
- P. 228 F, 23.VIII.37, 1 specimen.
- P. 232 E, 20.IX.37, 1 specimen.
- P. 236 A, 18.X.37, 3 specimens.

- P. 273 A, 11.VII.38, 6 specimens.
 P. 273 I, 11.VII.38, 12 specimens.
 P. 274, 18.VII.38, 4 specimens.
 P. 276, 1.VIII.38, 5 specimens.
 P. 278 F, 16.VIII.38, 3 specimens.
 P. 311, 3.IV.39, 1 specimen.
 P. 349, 18.XII.39, 1 specimen.
 P. 370 F, 17.IX.42, 1 specimen.
 P. 372, 27.V.40, 3 specimens.
 P. 375 A, 17.VI.40, 4 specimens.
 P. 375 F, 17.VI.40, 1 specimen.
 P. 388 A, 23.IX.40, 2 specimens.
 P. 388 F, 23.IX.40, 14 specimens.
 P. 421, 19.V.41, 2 specimens.
 P. 437 D, 15.IX.41, fragments.

The specimens vary in size from 0.8 to 4.5 mm in diameter; there are many small specimens, less than 1.5 mm wide, and it is remarkable that small, spherical gonads are present in all these young stages.

Further distribution: Pacific coast of Mexico; Galapagos Islands; Japan; Palao Islands in the Pacific; Sumatra; north-eastern Australia; several groups of islands in the Indian Ocean; north-western India; Gulf of Guinea on the west coast of Africa.

Aglaura hemistoma Péron & Lesueur.

Material: Nhatrang:

- P. 123, 7.X.37, 2 specimens.
 P. 133, 22.X.35, 1 specimen.
 P. 135, 4.XI.35, 9 specimens.
 P. 141, 10.II.38, 6 specimens.
 P. 144, 7.I.36, 2 specimens.
 P. 148, 31.III.38, 2 specimens.
 P. 156, 6.IV.36, 2 specimens.
 P. 165, 8.VI.36, 1 specimen.
 P. 167, 22.VI.36, 1 specimen.
 P. 183, 1.XII.38, 1 specimen.
 P. 216, 31.V.37, 1 specimen.
 P. 232, 20.IX.37, 1 specimen.
 P. 232 F, 20.IX.37, 1 specimen.
 P. 236 B, 18.X.37, 2 specimens.
 P. 255 F, 7.III.38, 3 specimens.
 P. 259 A, 4.IV.38, 2 specimens.
 P. 260, 11.IV.38, 7 specimens.
 P. 273 A, 11.VII.38, 3 specimens.
 P. 281, 5.IX.38, 2 specimens.
 P. 295, 12.XII.38, 2 specimens.

- P. 372, 27.V.40, 2 specimens.
 P. 376, 24.VI.40, 1 specimen.
 P. 377, 1.VII.40, 3 specimens.
 P. 379D, 15.VII.40, 1 specimen.
 P. 388 F, 23.IX.40, 3 specimens.
 P. 395, 19.XI.40, 2 specimens.
 P. 395C, 19.XI.40, 1 specimen.
 P. 395 F, 19.XI.40, 2 specimens.
 P. 399, 19.XII.40, 1 specimen.
 P. 404, 20.I.41, 1 specimen.
 P. 437D, 15.IX.41, 2 specimens.

This common medusa occurs off the coast of Nhatrang at all seasons.

Further distribution: Generally distributed in the warm and temperate parts of all the oceans.

NARCOMEDUSAE.

Solmundella bitentaculata (Quoy & Gaimard).

Material:

- No. 4, Indochina, no date, 6 specimens.
 De Lanessan, no. 15, Cauda (Nhatrang), 19.VI.25, 2 specimens.
 — — no. 16, Nhatrang, June 1925, 2 specimens.
 — — no. 17, Iles des Pêcheurs, Febr. 1926, c. 50 specimens.
 — — no. 23, Cauda (Nhatrang), 23.VI.27, 2 specimens.
 — — no. 20, Cauda (Nhatrang), 30.V.29, 7 specimens.
 — — no. 21, Cauda (Nhatrang), 21.VI.29, 32 specimens.
 — — no. 22, Cauda (Nhatrang), 10.VII.29, 8 specimens.
 — — no. 19, Nhatrang, 6.VIII.29, c. 55 specimens.
 — — no. 27, Cauda (Nhatrang), 20.VIII.29, 9 specimens.

Nhatrang:

Label P.	Date	Number of specimens	Label P.	Date	Number of specimens
118	2.IX.37	5	260	11.IV.38	1
133	23.X.35	2	292 E	21.XI.38	1
135	4.XI.35	1	292 F	21.XI.38	1
144	7.I.36	1	292 I	21.XI.38	1
165	8.VI.36	2	294	5.XII.38	11
166	4.VIII.38	2	295 E	12.XII.38	1
190	30.XI.36	14	318	22.V.39	1
193	9.II.39	2	349D		1
201	15.II.37	1	353G	15.I.40	2
232B	20.IX.37	2	375 F	17.VI.40	2
232 F	20.IX.37	1	499	14.XII.42	1
251	7.II.38	1			

This species was taken at all seasons. In January, April, September and October only small specimens were found, which most probably was accidental. Adult specimens, 7–10 mm in diameter, were found in all other months of the year, in particularly great numbers in February 1926, and in June and August 1929.

Further distribution: Widely distributed in all the great oceans, particularly common in the southern hemisphere.

Solmaris rhodoloma (Brandt).

Material:

No. 4, Indochina, no date, 150 specimens.

De Lanessan, no. 3, Cauda (Nhatrang), 3.IX.34, 2 specimens.

— — no. 13, Gulf of Vung-Ro, 17.VI.27, 1 specimen.

— — Stat. 813, anchorage in Saracene Bay (Gulf of Siam), 1.IV.35, 1 spec.

Nhatrang:

P. 133, 22.X.35, 1 specimen.

P. 273I, 11.VII.38, c. 20 specimens.

P. 349, 18.XII.39, 6 specimens.

P. 388A, 23.IX.40, 2 specimens.

P. 388F, 23.IX.40, 3 specimens.

P. 483, 24.VIII.42, c. 325 specimens.

P. 508A, 15.II.43, 3 specimens.

Some of the specimens are very small, 1.2–2 mm wide, and may have 12–16 tentacles and marginal lappets; they were taken at any season between February and December. Specimens 4 mm wide have 24–28 tentacles and lappets. Most of the larger specimens, 5–6 mm in diameter, have 32 tentacles and marginal lappets, which is the normal number in adult specimens of this little medusa; its maximum size is 7 mm.

Further distribution: Japan; Marchesas Islands; Australia; originally described from Chile (BRANDT 1838).

As a rule only a few specimens were taken in the nets at Nhatrang, but on August 24th, 1942 an enormous number suddenly appeared, specimens of all sizes from 1.8 to 5 mm wide. A similar occurrence was observed at the Great Barrier Reef in Australia where, during regular investigations throughout the period of a year, this medusa occurred only on one occasion, and then suddenly in great abundance (KRAMP 1953 p. 302).

Cunina octonaria McCrady.

Material: Nhatrang:

P. 131, 3.XII.37, 1 specimen.

P. 141, 10.II.38, 1 specimen.

P. 155, 16.V.38, one actinula.

P. 198, 16.III.39, 3 specimens.

P. 290, 7.XI.38, 2 specimens.

P. 388F, 23.IX.40, 1 specimen.

The specimen from P. 155 is in the actinula stage, lens-shaped with a short mouth tube and with four tentacles about as long as the diameter of the disk placed crosswise, and also tiny vestiges of two more tentacles developing opposite each other from the disk.

Further distribution: Widely distributed in the warm parts of all the oceans.

Cunina peregrina Bigelow.

Cunina peregrina Bigelow 1909 p. 59, Pl. 1 fig. 6, Pl. 15 figs. 1, 2, Pl. 28 figs. 1-7, Pl. 45 fig. 8.

Cunina peregrina Kramp 1955 p. 282.

Cunina peregrina Kramp 1957 pp. 81, 84.

Material:

Nhatrang, P. 141, 10.II.38, 21 specimens.

The specimens are all in young stages, 1-2 mm wide, with 10-13 tentacles and marginal lappets, most of them having twelve. The gastric pouches are still fairly narrow, somewhat narrower in their proximal than in their distal part. There are usually three statocysts on each of the marginal lappets. Some of the specimens have medusa buds in their stomachs.

Further distribution: This is mainly an Atlantic warm-water species, but it was originally described from the eastern Pacific, off Ecuador and Colombia, and is also recorded from east of Africa and from near Chagos Islands in the Indian Ocean.

SCYPHOMEDUSAE.

Fam. *Carybdeidae*.

Four species of Carybdeidae are represented in the present collection. Only small specimens were found, in which many of the specific characters are not yet distinctly developed. The Indo-Pacific species may, however, be distinguished by means of the configurations of the covering membranes of the sensory niches, which are very characteristic and easily recognizable even in such young individuals, in some of the larger specimens being confirmed by other features. In *Tamoya gargantua* the niches are bounded above and below by a rounded covering scale. In *Carybdea alata* they are



Fig. 11. Sensory niches of *Carybdea sivickisi*, showing different states of contraction of the orifice in the covering membrane.

enclosed by a pair of covering scales below and one above. In *Carybdea rastoni* there is a well developed flap-like scale above, but the entry is open below. In *Carybdea sivickisi*, which is richly represented in the collection, the covering membrane of the niches is not divided into scale-like flaps, but in its lower part there is an orifice which may attain somewhat different shapes according to the state of contraction (see fig. 11); it is always a longitudinal fissure with smooth edges, the lower edge somewhat protruding like a spout, and frequently the fissure is quite narrow with more or less bulging sides, but sometimes it is regularly oval or pear-shaped. In any case the covering membrane in this species is entirely different from that in the other species. *C. sivickisi* is also distinguished from *C. alata* by the presence of nematocyst warts on the exumbrella. It is a small species, no more than 12 mm in height, and mature gonads may be found at a bell height of only 6 mm.

Carybdea alata Reynaud.

Carybdea alata Reynaud 1830 p. 95, Pl. 33 fig. 1.

Carybdea pyramis Haeckel 1880 p. 440, Pl. 25 figs. 5-8.

Carybdea moseri Mayer 1906 p. 1135, Pl. 1 figs. 2-2c.

Carybdea grandis Agassiz & Mayer 1902 p. 153, Pl. 6 figs. 26-31.

Material: Nhatrang:

P. 224B, 26.VII.37, 1 specimen, perhaps 5.

P. 229B, 30.VIII.37, 2 specimens.

The specimens from P. 229 are 11-13 mm high; one of the specimens from P. 224 is 6 mm high, and there are also four very small specimens, about 3 mm, the identification of which is uncertain. The species may grow to a height of 80 mm, var. *grandis* even to 230 mm.

Further distribution: Widely distributed in the warm parts of the Pacific, Indian and Atlantic oceans.

Carybdea rastoni Haacke.

Carybdea rastonii Haacke 1886 p. 554.

Carybdea mora Kishinouye 1910 p. 6, Pl. 1 figs. 7-9.

Carybdea rastonii Mayer 1910 pp. 508, 726.

Carybdea rastonii Uchida 1929 p. 157, Pl. 3 fig. 7, textfigs. 60-80.

Material:

De Lanessan, no. 13, Gulf of Vung-Ro, 17.VI.27, 1 specimen.

P. 313, 12.VI.41, 1 specimen.

The specimen from Gulf of Vung-Ro is 12 mm high and quite typical; the specimen from P. 313 is only 4 mm high. The species may become 34 mm high.

Further distribution: Western Pacific from Japan and the Philippines to the Malayan Archipelago and southern Australia.

Carybdea sivickisi Stiasny.

Carybdea sivickisi Stiasny 1926 p. 240, figs. 1-4.

Material:

De Lanessan, no. 2, 6 specimens.

— — no. 9, Cauda, 20.VII.28, 23 specimens.

Stat. 873, anchorage of Nam-Yit, 25.IV.36, 4 specimens.

Nhatrang:

P. 47, 22.VII.25, 9 specimens.

P. 98, 15.IV.37, 2 specimens.

P. 147, 24.III.38, 1 specimen.

P. 160, 23.VI.38, 1 specimen.

P. 217, 7.VI.37, 14 specimens.

P. 305, 17.IV.41, 1 specimen.

P. 312, 5.VI.41, 1 specimen.

P. 322, 18...41, 15 specimens.

P. 375A, 17.VI.40, 1 specimen.

P. 376B, 17.IX.42, 1 specimen.

or 24.VI.40.

Most of the specimens are small, less than 3 mm in height, some few up to 7 or 8 mm. The species may become 10 or 12 mm high. This is the first time that this species has been recorded, since it was described by STIASNY, and I have nothing to add to his description, with the exception of the above remarks on the variation of the fissure in the covering membrane of the sensory niches.

Further distribution: Philippines.

Tamoya gargantua Haeckel.

- Tamoya gargantua* Haeckel 1880 p. 444.
Tamoya bursaria Maas 1903 p. 4.
Tamoya virulenta Kishinouye 1910 p. 7, Pl. 1 fig. 10.
Tamoya alata (= *T. bursaria*), Stiasny 1929 p. 196.
Tamoya gargantua Bigelow 1938 p. 151.

Material:

- De Lanessan, no. 21, Cauda (Nhatrang), 21.VI.29, 1 specimen.
 — — no. 23, Gulf of Cauda, 23.VI.27, 1 specimen.
 — — no. 24, Gulf of Nhatrang, 19.VII.28, 5 specimens.

Nhatrang:

- P. 217, 7.VI.37, 1 specimen.
 P. 215 A, 24.V.37, 1 specimen.
 P. 224 B, 15.IX.39, 2 specimens.
 P. 225, 21.IX.39, 1 specimen.
 P. 326 B, 17.VII.39, 3 specimens.

All the specimens are small, 5–17 mm in height. The species may grow to a considerable size, up to 220 mm high. The specific name has been discussed by BIGELOW (1938) and KRAMP (1956).

Further distribution: Widely distributed in the coastal waters of the warm parts of the western Pacific from Japan to Australia and the Malayan Archipelago, and in the Indian Ocean westwards to the Iranian Gulf and the Red Sea.

Nausithoë punctata Kölliker.

Material: Nhatrang:

- De Lanessan, no. 23, 23.VI.27, 42 specimens.
 P. 101, 11.III.35, 2 specimens.
 P. 308 I, 13.III.39 } 60 specimens.
 P. 317 I, 15.V.39 }
 P. 372, 27.V.40, 2 specimens.
 P. 388 F, 23.IX.40, 2 specimens.

Some of the specimens are very small, 1.5–2 mm wide, but in the samples from P. 308, 317 and from no. 23, 23.VI.27, most of the numerous specimens are 3–5 mm wide and have mature gonads.

Further distribution: Common in the coastal waters of all tropical and warm seas.

Pelagia noctiluca (Forskål).

Material:

- De Lanessan, no. 18, Cauda, (Nhatrang), 4.VIII.26, 95 specimens.
 — — no. 15, — — 19.VI.26, 2 specimens.
 — — no. 21, — — 21.VI.29, 40 specimens.

De Lanessan, no. 19, Bich-Dam (Nhatrang), 6.VIII.29, 2 specimens.
 — — no. 27, Cauda (Nhatrang), 20.VIII.29, 68 specimens.
 P. 184, Nhatrang, 20.X.36, 1 specimen.

All the specimens are small, 4–10 mm in diameter.

Further distribution: Common in the coastal waters in the tropical and warm parts of all the oceans.

Chrysaora sp.

Material: Cauda (Nhatrang), 11.X.29, 1 specimen.

This is a young and immature specimen, 40 mm in diameter; there is one very large and two very small tentacles in each octant; the mouth arms are 70–80 mm long; gonads are not developed; the umbrella is colourless. It seems probable that this young medusa belongs to *Chrysaora quinquecirrha* (Desor), which is widely distributed in the warm parts of the Atlantic and Indian oceans and the western Pacific, but the determination is uncertain.

Aurelia solida Browne.

Aurelia solida Browne 1905 p. 960, Pl. 94 figs. 1, 2.

Material:

De Lanessan, no. 7, off Bangoi, 1.VIII.27, fragments of two or three specimens.

Further distribution: Maldive Islands and the coasts of India; also recorded from the eastern tropical parts of the Atlantic.

Netrostoma coerulescens Maas.

Netrostoma coerulescens Maas 1903 p. 35, Pl. 5 figs. 37, 46, Pl. 11 figs. 97, 103, Pl. 12 fig. 109.

Cephea octostyla var. *coerulescens* Mayer 1910 p. 653.

Netrostoma coerulescens Stiasny 1921 p. 77, Pl. 1 fig. 2, Pl. 3 figs. 19, 20, textfigs. 3, 4

Material: De Lanessan, Gulf of Nhatrang, 19.VII.28, 2 specimens.

The specimens are in fairly good condition, 40 and 42 mm in diameter. The configuration and branching of the canals is typical and well in accordance with the figures by STIASNY (1921). The gelatinous warts on the central portion of the exumbrella are smooth and much flattened.

Further distribution: Japan; the Philippines; Australia; Malayan Archipelago; Indochina; the coasts of India; Maldive Islands; Arabian Sea.

Acromitus hardenbergi Stiasny.

Acromitus hardenbergi Stiasny 1934 pp. 1-7, figs. 1-5.

Material: De Lanessan, off Bangoi, I.VIII.27, 1 specimen.

The specimen is 60 mm in diameter and in good condition. The finely granulated, almost smooth exumbrella, the richly branched anastomosing network of the canals, and the absence of long, thread-like endings of the mouth arms show that the specimen must belong to *A. hardenbergi*, which has been well and thoroughly described by STIASNY.

Further distribution: Borneo.

Composition of the fauna.

The collections derived from the regular investigations during the period 1925-1943 comprise 63 species of medusae. Two of them (*Euphysora abaxialis* and *Staurodiscus vietnamensis*) are described as new species; four have not been identified with certainty (*Obelia* sp., *Lovenella* sp., *Helgicirra* ? *danduensis* and *Chrysaora* sp.). These species are excluded from the following discussion. A list of all the species is given in Table I, with information of their distribution in neighbouring geographical areas: China and/or Japan, the Philippines and neighbouring islands (including the Palao Islands), the Malayan Archipelago, and the Indian Ocean. Three species (*Phialidium simplex*, *Phialella quadrata* and *Eirene kambara*) have not yet been found in any of these areas, but are known either from Australia or New Zealand or from the Fiji Islands. Among the remaining 54 species 36 are known from China or Japan (or both), 31 from the Philippines etc., 36 from the Malayan Archipelago, 42 from the Indian Ocean. The majority of the species thus are more or less generally distributed in the Indo-West-Pacific region, and the Vietnamese fauna of medusae cannot be designated as characteristic of this area.

A numerical analysis of the composition of the fauna is given in Table II. It should be emphasized, however, that several of the species may actually occur in areas, where they have not yet been found; it is evident, e. g., that species which are known from China or Japan and from the Indian Ocean as well, must be presumed also to occur in parts of the Malayan Archipelago, even if they have not yet been found there.

Table I. List of medusae collected at the coasts of Vietnam 1925-1943.

Species	Distribution in neighbouring areas				Species	Distribution in neighbouring areas				Species	Distribution in neighbouring areas			
	China, Japan	Philippines etc.	Malayan Archipelago	Indian Ocean		China, Japan	Philippines etc.	Malayan Archipelago	Indian Ocean		China, Japan	Philippines etc.	Malayan Archipelago	Indian Ocean
<i>Dipurena ophiogaster</i> . . .	×	×	..	×	<i>Cirrholovenia polynema</i> .	..	×	×	..	<i>Proboscidactyla ornata</i> . .	×	×	×	×
<i>Euphysomma brevia</i>	×	<i>Eucheilota menoni</i> . . . . .	..	×	×	×	— <i>flavicirrata</i> . . . . .	×	..	..	..
<i>Hybocodon forbesi</i>	×	×	— <i>tropica</i> . . . . .	..	×	..	×	<i>Liriope tetraphylla</i>	×	×	×	×
<i>Euphysora bigelowi</i>	×	×	×	×	— <i>paradoxa</i>	×	..	×	..	<i>Petasiella asymmetrica</i> . .	..	×	×	×
— <i>abaxialis</i> n. sp.	— <i>ventricularis</i> . . . . .	..	..	×	×	<i>Rhopalonema velatum</i> . .	×	×	×	×
<i>Zanclaea costata</i>	×	×	×	×	<i>Lovenella</i> sp. . . . .	..	..	..	..	<i>Amphogona apsteini</i>	×	×	×	×
<i>Cytaeis tetrastyla</i>	×	×	×	×	<i>Phialucium carolinae</i> . . .	×	×	×	×	<i>Aglaura hemistoma</i>	×	×	×	×
<i>Podocoryne apicata</i>	×	..	— <i>multitentaculatum</i> . .	..	..	..	×	<i>Solmundella bitentaculata</i>	×	×	×	×
<i>Amphinema dinema</i>	×	<i>Octophialucium indicum</i> . .	×	..	..	×	<i>Solmaris rhodoloma</i> . . . . .	×	..	..	..
<i>Halitiara formosa</i>	×	×	×	×	<i>Eirene ceylonensis</i>	×	×	×	×	<i>Cunina octonaria</i>	×	×	×	×
<i>Merga violacea</i>	×	— <i>kambara</i> . . . . .	..	..	..	..	— <i>peregrina</i> . . . . .	×	..	..	×
<i>Leuckartiara octona</i>	×	×	×	×	— <i>palkensis</i> . . . . .	×	..	..	×	<i>Carybdea alata</i>	×	×	×	×
<i>Niobia dendrotentaculata</i>	×	— <i>menoni</i> . . . . .	×	..	..	×	— <i>rastoni</i>	×	×	×	..
<i>Laodicea indica</i>	×	×	— <i>hexanemalis</i>	×	×	×	×	— <i>sivickisi</i> . . . . .	..	×	..	..
<i>Staurodiscus vietnamiensis</i> n. sp.	<i>Helgicirrha malayensis</i> . .	×	..	×	×	<i>Tamoya gargantua</i>	×	×	×	×
<i>Obelia</i> sp.	?— <i>danduensis</i> . . . . .	..	..	..	?	<i>Nausithoë punctata</i>	×	×	×	×
<i>Phialidium hemisphaericum</i>	×	×	<i>Eutima levuka</i>	×	×	×	×	<i>Pelagia noctiluca</i>	×	×	×	×
<i>Phialidium malayense</i> . .	×	..	×	..	— <i>orientalis</i> . . . . .	..	..	..	×	<i>Chrysaora</i> sp. . . . .	..	..	..	..
— <i>simplex</i>	<i>Aequorea macrodactyla</i> . .	×	×	×	×	<i>Aurelia solida</i> . . . . .	..	..	..	×
<i>Phialella quadrata</i>	— <i>pensilis</i>	×	×	×	×	<i>Netrostoma coerulescens</i> . .	×	×	×	×
					— <i>globosa</i> . . . . .	..	..	×	..	<i>Acromitus hardenbergi</i> . .	..	..	×	..
					<i>Gonionemus vertens</i> . . . . .	×	..	..	..		

Table II. Numerical composition of the fauna of medusae at the coasts of Vietnam.

China/Japan . . . .	×	×	×	×	×	×	×	..	..	..	..	..	..	..
Philippines etc...	×	×	×	..	..	..	..	×	×	×	×	..	..	..
Malayan														
Archipelago . . . .	×	×	..	×	×	..	..	..	×	×	..	×	×	..
Indian Ocean . . . .	×	..	×	..	×	×	..	..	..	×	×	..	×	×
Number of species	23	1	1	2	1	5	3	2	1	2	1	3	3	6

It might be of particular interest to examine, whether the composition of the fauna is different at different seasons, perhaps showing some relation to the prevailing sea currents.

It may first be pointed out that all of the species collected are predominantly epipelagic, belonging to the upper water layers; no bathypelagic medusae were found which might indicate an upwelling of water from the deep-sea towards the coast.

The currents along the east coast of Vietnam are mainly dependent on the monsoons blowing from the S.W. in summer, May to September, from the N.E. in winter, November to March; in April and November the winds may be irregular. At the coast of Vietnam we might expect, therefore, to find a predominance of species with a southern distribution during the season of the S.W. monsoon and a predominance of northern species during the season of the N.E. monsoon.

In the discussion we may disregard the two species, *Euphysomma brevia* and *Carybdea sivicksi*, which have only been recorded from the Philippines or the Palao Islands. The three species which, in Table II, are listed as occurring at China/Japan, but neither in the Malayan Archipelago nor in the Indian Ocean, are as follows: *Gonionemus vertens*, the occurrence of which at Vietnam is most probably due to transportation by ships; *Proboscidactyla flavicirrata* which is a decidedly northern species, was taken near Nhatrang only once, and that was in May; *Solmaris rhodoloma* was taken in February, July, August, September and November, usually only a few specimens, but on one occasion it suddenly appeared in great numbers, and that was in August at the height of the season of the S.W. monsoon!

An enumeration of the 16 Indo-Malayan species which are not recorded from the China/Japan region (the last six columns in Table II) gives the following results:

Month	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	X*
Number of species	2	2	1	1	4	(6)	9	8	2	7	4	(3)
Total number of species	5					16						

*) In the calculation of the total number of species found at each of the two seasons, the N.E. monsoon and the S.W. monsoon, the months of April and October are disregarded.

Accordingly the majority of the species belonging to this group occurred at Vietnam mainly during the season of the S.W. monsoon. With the exception of the Trachymedusa *Petasiella asymmetrica* all of them are meropelagic species.

For comparison I have carried out a corresponding enumeration of the species which occur in the China/Japan region as well as in the Malayan Archipelago and/or in the Indian Ocean, with the following results (meropelagic species only):

Month	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	X
Number of species	1	3	3	4	8	(8)	11	13	11	13	11	(12)
Total number of species	11					21						

The occurrence at Vietnam of these species, which are almost generally distributed in the surrounding areas, north as well as south of Vietnam, might be expected to be independent of the directions of the currents. Nevertheless several more species were taken during the season of the S.W. monsoon than during the season of the N.E. monsoon, though the difference was not so conspicuous as among the "southern" (Indo-Malayan) species mentioned above. The difference in the seasonal occurrence of the "southern" species may, therefore, not be due to the northward direction of the current during the summer months, when a greater number of species were found, as pointed out above. Presumably the local production of both groups of species has been more active during the summer than during the winter, though many of the species were actually found at all seasons. To a lesser degree the difference between the numbers of species of both groups at the two seasons may be due to a somewhat greater activity of collecting in summer than in winter. The total number of samples containing medusae were about 130 between May and September, about 90 between November and March. As might be expected the oceanic,

holopelagic Trachymedusae and Narcomedusae, which are generally distributed in the warm parts of the oceans, occurred at the coasts of Vietnam at all seasons.

According to the above considerations we may state that the fauna of medusae at the coasts of Vietnam is an indigenous fauna, almost entirely of local origin; immigration from other regions is of very inconsiderable importance. This is also confirmed by the fact that numerous of the specimens in the collection are in young stages of development.

Appendix.

During a stay at Nhatrang in 1959 Dr. J. KNUDSEN (Zoological Museum, Copenhagen) has collected the following medusae in the Bay of Nhatrang: *Carybdea sivickisi* Stiasny, 15.X.59, one young specimen, 2 mm in diameter.

Aurelia spp., 27.VII, 4.IX, 8.X, and 28.X.59, several large specimens. These will be further mentioned in a forthcoming paper in comparison with material from other localities in Indo-Pacific waters.

Cassiopea andromeda (Forskål), 6.X.59, one specimen, 92 mm in diameter.

Catostylus townsendi Mayer, 27.VIII.59, one specimen.

Netrostoma coerulescens Maas, 13–16.X.59, 7 specimens, 125–140 mm in diameter.

Mastigias papua (Lesson), Sept. 1959, 2 specimens, 58–72 mm in diameter.

References.

- AGASSIZ, A., & MAYER, A. G., 1899. Acalephs from the Fiji Islands. — Bull. Mus. Comp. Zoöl. Harvard, Vol. 32, No. 9, pp. 157–89, Pls. 1–17.
- 1902. Medusae. Rep. Sci. Res. Exped. Tropical Pacific. U.S. Fish. Comm. St. Albatross, 1899–1900. III. — Mem. Mus. Comp. Zoöl. Harv., Vol. 26, No. 3, pp. 139–76, Pls. 1–3, 1 text-fig., 1 map.
- ANNANDALE, N., 1907. Notes on the freshwater-fauna of India, No. XI. Preliminary note on the occurrence of a medusa (*Irene ceylonensis*, Browne) in a brackish pool in the Ganges Delta, and on the hydroid stage of the species. — J. Asiat. Soc. Beng., N.S. Vol. 3, No. 2, pp. 79–81, Pl. 11.
- BIGELOW, H. B., 1904. Medusae from the Maldive Islands. — Bull. Mus. comp. Zoöl. Harv., Vol. 39, No. 9, pp. 245–69.
- 1909. Rep. Sci. Res. Exped. Eastern Tropical Pacific U.S. Fish. Comm. "St. Albatross" 1904–1905. XVI. Medusae. — Mem. Mus. Comp. Zoöl. Harv., Vol. 37, pp. 1–243, Pls. 1–48.

- BIGELOW, H. B., 1919. Hydromedusae, Siphonophores and Ctenophores of the "Albatross" Philippine Expedition. Contribution to the biology of the Philippine Archipelago and adjacent regions. — U.S. nat. Mus., Bull. 100, Vol. 1, pt. 5, pp. 279–362, Pls. 39–43.
- 1938. Plankton of the Bermuda Oceanographic Expedition. VIII. Medusae taken during the years 1929 and 1930. — Zoologica, N.Y., Vol. 23, pp. 99–189, text-figs. 1–23.
- 1940. Medusae of the Templeton Crocker and Eastern Pacific Zaca Expeditions, 1936–1938. — Zoologica, N.Y., Vol. 25, pp. 281–321, text-figs. 1–20.
- BRANDT, J. F., 1838. Ausführliche Beschreibung der von C. H. Mertens auf seiner Weltumsegelung beobachteten Schirmquallen. — Mém. Acad. Imp. Sc. St.-Petersb. Sci. Nat., sér. 6, Vol. 2, pp. 237–411.
- BROWNE, E. T., 1902. A preliminary report on hydromedusae from the Falkland Islands. — Ann. Mag. Nat. Hist., Ser. 7, Vol. 9, pp. 272–84.
- 1905. Report on the medusae collected by Professor Herdman at Ceylon, in 1902. — Rep. Pearl Fish. Manaar, Pt. IV, Supplementary Report, No. 27, pp. 131–66, Pls. 1–4.
- 1907. A revision of the medusae belonging to the family Laodiceidae. — Ann. Mag. nat. Hist., Ser. 7, Vol. 20, pp. 457–80.
- 1916. Medusae from the Indian Ocean. — Trans. Linn. Soc. Lond. (Zool.), Vol. 17, pp. 169–210, Pl. 39.
- and KRAMP, P. L., 1939. Hydromedusae from the Falkland Islands. — "Discovery" Rep., Vol. 18, pp. 265–322, Pls. 14–19, text-figs.
- CHIU, S. T., 1954. Studies on the medusa fauna of south-eastern China Coast, with notes on their geographical distribution. — Acta zool. Sinica, Vol. 6 (1), pp. 49–57. (In Chinese).
- DAWYDOFF, C., 1936. Observations sur la faune pélagique des eaux indochines de la mer de Chine méridionale. — Bull. Soc. zool. Fr., Tome 61, pp. 461–84.
- GANAPATI, P. N. & R. NAGABHUSHANAM, 1958. Seasonal distribution of the Hydromedusae off the Visakhapatnam coast. — Mem. Oceanogr. Andhra Univ., Ser. 62, Vol. 2, pp. 91–9.
- HAACKE, W., 1886. Über die Ontogenie der Cubomedusen. — Zool. Anz., Bd. 9, pp. 554–5.
- HAECKEL, E., 1879. Das System der Medusen. Erster Theil einer Monographie der Medusen. 360 pp. 20 pls.; Jena 1879.
- 1880. System der Acraspeden. Zweite Hälfte des System der Medusen, pp. 361–372, 20 Pls.; Jena 1880.
- HARTLAUB, C., 1913. Craspedote Medusen. Teil I, Lief. 3, Tiaridae. Nord. Plankt., Lief. 17, XII, pp. 237–363, figs. 200–311.
- HSU, H. F., 1928. A new species of hydromedusae. — Contr. biol. Lab. Sci. Soc. Nanking, Ser. B, Vol. 4, No. 3, pp. 1–7, 4 text-figs.
- KISHINOUE, K., 1910. Some medusae of Japanese waters. — J. Coll. Sci. Tokyo, Vol. 27, art. 9, pp. 1–35, 5 pls.
- KRAMP, P. L., 1953. Hydromedusae. — Sci. Rep. Gr. Barrier Reef. Exped., Vol. 6, No. 4, pp. 259–322, text-figs. 1–9, Pls. I, II.
- 1955. The medusae of the tropical west coast of Africa. — Atlantide Rep., No. 3, pp. 239–324.

- KRAMP, P. L., 1956. Medusae collected in the Eastern Tropical Pacific by Cyril Crossland in 1924-1925. — Vidensk. Medd. dansk naturh. Foren. Kbh., Bd. **118**, pp. 1-6, 1 text-fig.
- 1957. Hydromedusae of the Discovery Collections. "Discovery" Rep., Vol. **29**, pp. 1-128, text-figs. 1-19, Pl. i-vii.
- 1958. Hydromedusae in the Indian Museum. — Rec. Indian Mus., Vol. **53**, pp. 339-76, text-figs. 1-5.
- 1959a. The Hydromedusae of the Atlantic Ocean and adjacent waters. — Dana Rep., No. **46**, pp. 1-283, 2 pls., 335 text-figs.
- 1959b. Some new and little-known Indo-Pacific medusae. — Vidensk. Medd. dansk naturh. Foren. Kbh., Bd. **121**, pp. 223-59, 19 text-figs.
- 1961. Synopsis of the Medusae of the World. — Journ. Mar. Biol. Ass. Vol. **40**, pp. 1-468.
- LING, S. W., 1937. Studies on Chinese Hydrozoa. I. On some Hydromedusae from the Chekiang coast. — Peking nat. Hist. Bull., Vol. **2**, No. 4, pp. 351-65, 21 text-figs.
- MAAS, O. 1903. Die Scyphomedusen der Siboga Expedition. — Siboga Exped., Monogr. II, livr. X, 91 pp., 12 pls.
- 1905. Die Craspedoten Medusen der Siboga Expedition. — Siboga Exped., Monogr. X, 85 pp., Pls. 1-14.
- 1906. Méduses d'Amboine. — Rev. suisse Zool., Tome **14**, pp. 81-107, Pls. 2, 3.
- 1909. Japanische Medusen. — Abh. bayer. Akad. Wiss., math.-physik. Cl., Suppl., Bd. **1**, Abh. 8, pp. 1-52, Pls. 1-3.
- MAYER, A. G., 1894. An account of some medusae obtained in the Bahamas. — Bull. Mus. comp. Zool. Harv., Vol. **25**, No. 11, pp. 235-42.
- 1900. Some Medusae from the Tortugas, Florida. — Ibid., Vol. **37**, No. 2, pp. 13-82, Pls. 1-44.
- 1906. Medusae of the Hawaiian Islands collected by the steamer "Albatross" in 1902. — Bull. U.S. Fish. Comm. for 1903, Vol. **23**, Pt. 3, pp. 1131-43, Pls. 1-3.
- 1910. Medusae of the World. Hydromedusae, Vols. I, II, pp. 1-498, Pls. 1-55. Scyphomedusae, Vol. III, pp. 499-735, Pls. 56-76. Washington.
- 1915. Medusae of the Philippines and of Torres Straits. Being a report on the Scyphomedusae collected by the U.S. Fisheries Bureau steamer "Albatross" in the Philippine Islands and Malay Archipelago, 1907-1910, and upon the medusae collected by the expedition of the Carnegie Institution of Washington to Torres Straits, Australia, in 1913. — Pap. Tortugas Lab., Vol. **8**, pp. 157-202, Pls. 1-3.
- MENON, M. G. K., 1932. The Hydromedusae of Madras. — Bull. Madras Govt. Mus., N.S., Nat. Hist. Sect., Vol. **3**, No. 2, pp. 1-32, 3 pls.
- NAIR, K. K., 1951. Medusae of the Trivandrum Coast. Part I. Systematics. — Bull. Res. Inst. Univ. Travancore, Ser. C, Nat. Sci. Vol. **2**, Pt. 1, pp. 47-75, 1 pl.
- PÉRON, F. & C. A. LESUEUR, 1809. Histoire générale et particulière de tous les animaux qui composent la famille des Méduses. — Ann. Mus. Hist. nat., Vol. **14**, pp. 312-66.
- RANSON, G., 1929. Observations morphologiques et systématiques sur une Anthoméduse, *Neoturris papua* (Lesson 1843). — Bull. Mus. Hist. nat., Paris, Sér. 2, Tome **1**, pp. 209-15, 1 text-fig.
- REYNAUD, R. M., 1830. In: Lesson's *Centurie Zoologique*.

- STIASNY, G., 1921. Studien über Rhizostomeen. — *Capita Zool.*, Deel 1 (2), pp. viii + 179, 5 pls., text-figs.
- 1926. Über einige Scyphomedusen von Puerto Galera, Mindoro (Philippinen). — *Zool. Meded.*, Deel 9, pp. 239–48.
- 1928. Hydromedusen aus der Java-See. — *Ibid.*, Deel II, pp. 206–26.
- 1929. Ueber einige Scyphomedusen aus dem Zoologischen Museum in Amsterdam. — *Ibid.*, Deel 12, pp. 195–215, 15 text-figs.
- 1934. *Acromitus hardenbergi* nov. spec., eine neue Rhizostome Meduse aus dem Malayischen Archipel. — *Ibid.*, Deel 17, pp. 1–7, 5 text-figs.
- UCHIDA, T., 1927*a*. Studies on Japanese Hydromedusae. I. Anthomedusae. — *J. Fac. Sci. Tokyo Univ.*, Vol. 1, pp. 145–241, text-figs. 1–47, Pls. 10–11.
- 1927*b*. Description of a new Leptomedusa, *Stauroidiscoides gotoi*. — *Jap. J. Zool.*, Vol. 1, pp. 165–8, 2 text-figs.
- 1929. Studies on the Stauromedusae and Cubomedusae, with special reference to their metamorphosis. — *Ibid.*, Vol. 2, pp. 103–92, 88 text-figs., 3 pls.
- 1947. Some medusae from the central Pacific. — *J. Fac. Sci. Hokkaido Univ.*, Ser. 6, *Zool.*, Vol. 9, pp. 297–319, text-figs. 1–13.
- VANHÖFFEN, E., 1902. Die Acraspeden Medusen der deutschen Tiefsee-Expedition 1898–1899. Die Craspedoten Medusen der deutschen Tiefsee-Expedition 1898–1899. I. Trachymedusen. — *Wiss. Ergebn. "Valdivia"*, Bd. 3, pp. 1–52, 55–86, Pls. 1–12.
- 1911. Die Anthomedusen und Leptomedusen der Deutschen Tiefsee-Expedition 1898–1899. — *Ibid.*, Bd. 19, Heft 5, pp. 191–233, text-figs. 1–21, 1 pl.
- YAMAZI, I., 1958. Preliminary check-list of plankton organisms found in Tanabe Bay and its environs. — *Publ. Seto mar. biol. Lab.*, Vol. 7, No. 1, pp. 111–63.
-
-

BRANDLING A/S, NBR