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SOME PHILIPPINE SCYPHOMEDUSÆ, INCLUDING TWO NEW GENERA, FIVE NEW SPECIES, AND ONE NEW VARIETY

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Sixteen text figures

The Scyphomedusæ described in this paper are in the museum of the zoölogical department of the University of the Philippines. Many of them were collected on the joint scientific expeditions of the University of the Philippines and the Bureau of Science, while others were collected at various times by members of the zoölogical department. They are not the result of a systematic collection of Philippine Scyphomedusæ which, judging from the percentage of new species in the Philippine collections of the United States Bureau of Fisheries steamer *Albatross*[1] and in the present collection, should produce many new and interesting forms.

The collection includes medusæ of 12 species in 11 genera, and 1 doubtful immature form. All but three are new to the Philippines, and 2 genera, 5 species, and 1 variety are new to science. A list of the genera and species follows. Those starred are reported from the Philippines for the first time. The new genera and species are indicated by black-faced type.

1. *Chiropsalmus quadrigatus* Haeckel.
*2. *Dactylometra quinquecirrha* L. Agassiz, "*Chrysaora* stage."
3. *Aurellia labiata* Chamisso and Eysenhardt.
*4. *Cassiopea polypoides* Keller var. culionensis var. nov.
*5. *Cassiopea* medusa sp. nov.
*6. *Cephea cephea* (Forskål) Mayer.
7. *Catostylus purpurus* Mayer.
*8. *Mastigias papua* L. Agassiz.
*9. **Acromitus maculosus** gen. et sp. nov.
*10. *Lobonema* **mayeri** sp. nov.
*11. **Lobonemoides gracilis** gen. et sp. nov.
*12. *Rhopilema* **visayana** sp. nov.
13. *Cassiopea polypoides* Keller (?).

[1] Mayer, A. G., Medusae of the World, *Pub. Carnegie Inst. Wash.* (1910), No. 109, 3.

It will be noted that 8 of the species reported, including all the new forms, belong to the suborder Rhizostomæ. This essentially tropical suborder seems to include the greater part of the Philippine forms as 16 of the 29 species and varieties reported from the Islands belong to that group. There are undoubtedly many medusæ new to science and others as yet unreported from the Philippines to be found in the waters of the Archipelago. While on launch trips, during May and June, 1913, along the coast of Palawan and the islands between Palawan and Culion, I saw many medusæ not found in this collection. Most of them were Rhizostomæ, but at least three species of Pelagidæ were common. Large Beroe-like ctenophores were also very numerous, but attempts to preserve them were unsuccessful.

While I have attempted to give a fairly complete description of new species and a sufficiently complete description of old species for diagnostic purposes, I have not attempted detailed anatomical discussions. In the diagnosis of old species, and in matters of general classification, I have followed very closely Mayer's monumental work, The Medusae of the World. Full synonymies of previously described species will be found in that work.

Mayer describes 20 species and varieties of Scyphomedusæ which have been reported from the Philippines. The fact that all but one of these were reported for the first time from the *Albatross* collection made during the years 1908 to 1910 shows how little attention has been paid to the collecting of Scyphomedusæ in Philippine waters. The present paper adds 9 species and varieties, making a total of 29 species and varieties of Scyphomedusæ from the Philippines. A list of these, with localities when known, follows.

1. *Carybdea rastonii* Haacke, Luzon and Mindoro [Mayer, 1910].
2. *Carybdea alata* Reynaud var. *moseri* Mayer=*Charybdea philippina* Haeckel [Semper, 1860].
3. *Chiropsalmus quadrigatus* Haeckel, common [Mayer, 1910] [Light, 1914].
4. *Periphylla hyacinthina* Steenstrup forma *dodecabostrycha* (Haeckel) Mayer [Mayer, 1910].
5. *Linuche aquila* (Haeckel) Mayer, Mactan [Mayer, 1910].
6. *Atolla bairdii* Fewkes forma *valdiviæ* Vanhöffen, Albatross station 5202 [Mayer, 1910].
7. *Atolla wyvillei* Haeckel, Albatross station 5201 [Mayer, 1910].
8. *Pelagia panopyra* Péron and Lesueur var. *placenta* (Haeckel) Mayer [Mayer, 1910].
9. *Dactylometra quinquecirrha* L. Agassiz, "*Chrysaora* stage," Manila Bay [Light, 1914].
10. *Sanderia malayensis* Goette, Sulu Sea [Mayer, 1910].

11. *Discomedusa philippina* Mayer, Catingan Bay [Mayer, 1910].
12. *Aurellia labiata* Chamisso and Eysenhardt, Masbate [Mayer, 1910], Palawan and Manila Bay [Light, 1914].
13. *Cassiopea polypoides* Keller var. *culionensis* Light, Culion Bay, Culion [Light, 1914].
14. *Cassiopea medusa* Light, Culion Bay, Culion [Light, 1914].
15. *Cassiopea ornata* Haeckel, Simaluc Islands, Subic Bay, Luzon and Samar [Mayer, 1910].
16. *Cephea cephea* (Forskål) Mayer, Mariveles [Light, 1914].
17. *Cephea octostyla* L. Agassiz, Jolo [Mayer, 1910].
18. *Catostylus purpurus* Mayer, Manila Bay [Mayer, 1910] [Light, 1914].
19. *Lychnorhiza bartschi* Mayer, Jolo [Mayer, 1910].
20. *Mastigias papua* L. Agassiz, Mindoro and Palawan [Light, 1914].
21. *Mastigias ocellata* Haeckel [Mayer, 1910].
22. *Versura maasi* Mayer, Bohol [Mayer, 1910].
23. *Lobonema smithii* Mayer, Manila Bay [Mayer, 1910].
24. *Lobonema mayeri* Light, Malampaya Sound, Palawan and Manila Bay [Light, 1914].
25. *Lobonemoides gracilis* Light, Palawan [Light, 1914].
26. *Acromitus maculosus* Light, Palawan [Light, 1914].
27. *Thysanostoma thysanura* Haeckel, Mindanao and Mindoro [Mayer, 1910].
28. *Lorifera flagellata* (Haeckel) Mayer, Albatross station D. 5226 [Mayer, 1910.]
29. *Rhopilema visayana* Light, Palawan [Light, 1914].

IMMATURE FORM

Cassiopea polypoides Keller (?), Port Galera Bay, Mindoro [Light, 1914].

Order CARYBDEIDÆ

Genus CHIROPSALMUS L. Agassiz, 1862

Chiropsalmus quadrigatus Haeckel.

The bell is dome shaped and 4-sided, with an evenly rounded aboral surface. Four laterally flattened, hand-shaped, interradial pedalia arise from the sides of the bell a short distance above the velar margin. Each bears from 5 to 9, typically 7, finger-shaped projections, each of which gives rise to a very long, slender, flexible, hollow tentacle banded with nematocysts. There are 4 perradial sense clubs in covered notches in the sides of the bell, a little above the level of origin of the pedalia. A distinct velarium supported by a bracketlike, perradial frenulæ stretches partly across the mouth of the bell cavity. The central stomach is short and wide, with 4 lanceolate lips with simple margins. From each of the flattened perradial sides of the stomach arises a pair of gastric saccules which project downward into the bell cavity. Each sacculé is laterally flattened and cockscomb shaped with an irregularly notched margin.

This distinguishes the medusa from *C. quadrumanus*, the most nearly related form, which has finger-shaped saccules.

This medusa was very abundant in Taytay Bay, Palawan, and in Culion Bay, Culion, in May and June, 1913. Numerous specimens were obtained, including many immature forms. They agree exactly with Mayer's description of specimens collected in Philippine waters by the *Albatross*. Much larger specimens were seen than any as yet reported, some in Culion reaching a diameter of at least 200 mm. There are 7 tentacles to each pedalium in by far the greater number of specimens, and these tentacles show in life narrow, lavender bands of nematocysts. The tentacles are very long, slender, and flexible, reaching a length of 1.5 meters or more. They are very delicate, and usually break off and remain attached to the clothing or the body when encountered in the water.

The sting of this medusa is very dangerous. One of the women in the party of the expedition to Palawan, who was stung while in bathing, was very seriously ill. I have described the symptoms more in detail in another place.[2] Swelling and inflammation began almost immediately in the areas which came in contact with the tentacles, and later blisters formed along the lines marked by contact with the tentacles. The lower limbs became swollen, the heart action was impaired, respiratory spasms and nervous twitchings of the muscles ensued, and the patient experienced intense general pain. The natives of Palawan reported a number of deaths caused by the sting of this medusa.

Mayer reports this medusa in the *Albatross* collection from Masbate, Luzon, and Mindanao, and I have found it plentiful in Culion and Palawan, from which it may be seen that it has a wide range in the Philippines.

Family PELAGIDÆ

Genus DACTYLOMETRA L. Agassiz, 1862

Dactylometra quinquecirrha L. Agassiz, *"Chrysaora* stage."

At certain seasons of the year, particularly in October and November, this medusa is found in large numbers in Manila Bay where it is a menace to bathers and fishermen who hold it in great fear. While all the specimens which I have seen have shown only 24 tentacles and 32 marginal lappets and many of them are apparently sexually mature, this medusa agrees so closely in every other respect with *D. quinquecirrha* that I have considered it as the *"Chrysaora* stage" of that species,

[2] *This Journal, Sec. B* (1914), 9, 291.

corresponding to the similar *"Chrysaora* stage" of the species found in the bays of the Atlantic Coast of the United States.

The flatly rounded bell is from 70 to 100 mm. in diameter. There are 24 marginal tentacles of about equal length. In life, these reach a maximum length of almost a meter. In preserved specimens, they are seldom perfect and are much contracted, not usually exceeding a length of twice the bell diameter. There are 32 bluntly rounded marginal lappets, and the 2 next the sense organs in each octant are usually about one-half as wide as the 2 between the tentacles. The sense organs are marked by shallow notches in the margin. They are covered above by a shelf of tissue nearly twice as wide as the length of the sense club. Below they are exposed, but lie in deep narrow furrows. The mouth arms are complexly folded, presenting along their edges regular pairs of extended points. They are from two to three times as long as the bell radius in preserved specimens and many times as long in life. The umbrella is transparent white, and is covered on the exumbrellar surface with tiny, semiopaque, white spots. The 16 stomach pouches are semiopaque, the dividing membranes entirely transparent, and the exumbrellar radial muscle strands opaque white. The gonads are light yellow, light brown, or yellow with a lavender tinge, the inner edges of the oral palps are light transparent pink to light lavender brown, and the tentacles are opaque white.

This medusa is known to be very dangerous. The natives call it *fosforo* ("match" in Spanish). This name is used by the fishermen, because the long oral arms suggest the stick and the bell the head of a match. I have heard of several cases of severe poisoning from this medusa both among natives and Americans. The native remedy is sugar solution taken internally and external applications of vinegar.

Old [3] has reported a number of cases of poisoning from jellyfish in which there was a definite symptom complex differing from that in the case of poisoning by *Chiropsalmus quadrigatus* already mentioned. Mayer [4] cites Doctor Smith [5] as considering that these cases of poisoning were due to the sting of *Lobonema smithii* Mayer. It seems more probable that they were due to *Dactylometra*, since it is so common in the bay and is the form commonly considered to be poisonous by the natives, especially the fishermen. I have not seen *L. smithii*, but the

[3] *This Journal, Sec. B* (1908), 3, 329.
[4] *Pub. Carnegie Inst. Wash.* (1910), No. 109, 3, 690–691.
[5] Dr. Hugh M. Smith, deputy United States fish commissioner.

sting of *L. mayeri* sp. nov., a closely related form, while unpleasant is not dangerous. I hope to be able to report more fully on this matter in the future.

Order SEMÆOSTOMEÆ

Genus AURELLIA Péron and Lesueur, 1809

Aurellia labiata Chamisso and Eysenhardt.

The margin is divided into 16 velar lobes. The bell margin projects downward from the subumbrellar side as a velumlike membrane, forming a fold between each 2 sense organs. The tentacles and marginal lappets have moved a considerable distance up the sides of the exumbrella. The subgenital ostia are very small.

This seems to be a rather widely distributed form in Philippine waters, as Mayer reports it from Masbate from specimens in the *Albatross* collection and we have specimens from Taytay, Palawan, and Manila Bay. We have 4 specimens in our collection, 2 collected by Dr. R. P. Cowles in Taytay, Palawan, and 2 from Pasay Beach, Manila Bay. They all show the 16 notches in the bell margin, the velumlike subumbrellar membrane marking the true margin, and the very small subgenital ostia which characterize *A. labiata*, so I have considered them as belonging to that species in spite of rather marked individual differences and differences in proportion as compared with other specimens whose measurements are given by Mayer.

The smallest specimen (D in the table) is relaxed, flabby, and without definite shape. The bell is only 10 mm. thick at the base of the mouth arms, and the whole medusa has the appearance of having completely relaxed in death. The marginal tentacles are very slender and flexible, and are from 12 to 15 mm. in length.

In another specimen (B in the table), the bell thickness at the base of the mouth arms is 25 mm. The material of the umbrella has a very solid, stiff consistency, and is thick up to the tentacle zone. It appears to be in a state of contraction, and nearly all the marginal tentacles are tightly contracted. The velumlike margin is here represented only by a very slight fold which has the appearance of a line connecting the sense organs. The thick bell with a solid consistency and the rounded genital pouches and small ostia give it a resemblance to *A. solida* Browne. Owing to the condition of the specimen, it was impossible to determine the arrangement of the sense organs, but the 16 velar lobes show that the medusa is *A. labiata*.

Measurements of Aurellia labiata.

Specimen.	Diameter of the umbrella.	Diameter across the zone of gonads.	Length of each mouth arm.
	mm.	*mm.*	*mm.*
A	225	107	100
B	167	86	71
C	150	65	----------
D	145	50	55

Order RHIZOSTOMÆ

RHIZOSTOMATA PINNATA Vanhöffen

Genus CASSIOPEA Péron and Lesueur, 1809

Cassiopea polypoides Keller var. **culionensis** var. nov. (fig. 1).

Type.—No. C. 2420, zoölogical collection, University of the Philippines.

The disk is flat, from 120 to 150 mm. in diameter, with a broad, shallow sucker cavity and a central thickened area. The thickened outer margin of the sucker cavity is from 15 to 20 mm. from the margin of the bell, and the diameter of the sucker is about two-thirds of the bell diameter. The margin is thin and divided into from 16 to 20 parameres by as many sense organs. There are twice as many radial canals as sense organs, and there is no ring canal. Each paramere has 5 blunt marginal lappets, the lappet in the center of each paramere being the largest, the 2 ocular lappets being about one-half as wide as the 2 on each side of this central lappet. The sense organs show no pigment spot. The mouth arms are from 1.25 to 1.5 as long as the bell radius, and project considerably beyond the bell margin. They are cylindrical or somewhat dorsally flattened in their proximal portions and higher than broad in their distal portions. The arms give rise in their proximal portion to about 3 pairs of short, alternately arranged lateral branches beyond which the arm divides to form from 3 to 5 long branches which may in turn subdivide. There are numerous, small, berrylike vesicles between the mouths over the entire surface of the arms. In most specimens, there is a central flattened appendage in the center of the arm disk

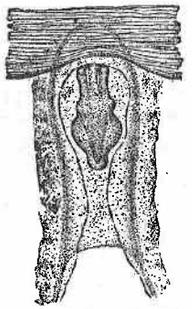

FIG. 1. *Cassiopea polypoides* Keller var. *culionensis* var nov., a sense organ from the subumbrellar side. Much enlarged.

surrounded by a whorl of smaller similar appendages. This central appendage reaches a length of 30 mm. and a width of 40 mm. The arms may have toward their distal ends a number of ribbonlike or leaflike appendages, reaching a length of 20 mm. and a width of from 8 to 15 mm. Of the 27 specimens in the collection, 10 have the large central appendage and a whorl surrounding it, 11 have a large central appendage without a surrounding whorl, 3 have no enlarged appendage, and 3 have enlarged appendages on the arms but none in the center of the disk.

The central stomach is circular in outline, and is encroached on from below by the 4 gonads. Twice as many radial canals as sense organs originate from it and extend to the margin, giving off branches which form a very complex network of anastomosing vessels. The rhopalar canals increase in size toward the margin, while the interrhopalar canals become small distally.

In preserved specimens the umbrella is light olive green. On close examination dull white bands may be seen running to each sense organ. The mouth arms usually exhibit 3 color zones: A central circular area which is yellow, a zone composed of the portions of the arms projecting beyond the disk which is also yellow, and between these zones a zone of green. The appendages are opaque white, and contain a network of canals, giving them a leaflike appearance. The color of the live medusa is very similar to that of the preserved specimens.

Measurements and numbers of sense organs and of marginal lappets to a paramere of 14 specimens from Culion.

Specimen No.	Diameter of the bell.	Diameter of the arm disk.	Length of the mouth arms (from the center of the arm disk).	Sense organs.	Marginal lappets to a paramere.
	mm.	*mm.*	*mm.*		
1	121	50	95	20	5
2	129	58.5	89	20	5
3	120	55	90	16	5
4	128	58	99.5	20	5
5	145	57	104	19	5
6	130	58	112	17	5
7	130	60	99	20	5
8	143	50	102	19	5
9	151	79	145	17	5
10	145	62	120	17	5
11	145	63	114	16	5
12	154	68.5	176	19	5
13	118	60	95	18	5
14	150	60	120	16	5

The museum has 27 specimens of this new variety of *C. polypoides* collected by Dr. L. E. Griffin and Mr. L. D. Wharton in Culion Bay, in October, 1911. They were present in great numbers in the bottom of a boat slip near the Leper Colony pier. I found them in the same place in May, 1913, and Dr. Ernest Clements, the superintendent of the Leper Colony, tells me that they are nearly always to be found there. This boat slip is from 1 to 2 meters deep, is protected from storms, and has a sandy bottom; it seems to be an ideal habitat for the medusæ. They were all found lying with the exumbrellar surface downward and looked, as Keller[6] has remarked of *C. polypoides* forma typica in the Red Sea, extraordinarily like some large sea anemone. They are able to retain their hold firmly by means of the sucker cavity. Indeed, when the preserved specimens are placed with the exumbrella down in a glass dish, it is practically impossible to turn them over by lifting on the arms and arm disk. The living medusæ on being turned over immediately begin to pulsate. At each contraction, the arms of one side are pulled farther in and bent upward thus lifting the disk on that side. A final pulsation causes it to fall over on the exumbrellar surface, the pulsations cease, and the arms and margin are slowly adjusted.

This medusa resembles *C. polypoides* forma typica in general appearance, in the number of lappets to a paramere, in the length and branching of the mouth arms, in the canal system, and to some extent in the coloring. While it differs in some particulars, such as in the shape of the central stomach and the lack of pigmentation in the sense organs, I do not consider these differences sufficient to warrant the making of a new species in a genus which contains so many intergrading forms, and so I have considered it as a new variety of *C. polypoides* to which I have given the name *culionensis* as Culion seems to be a constant habitat of the medusa.

In coloration of the bell and in the arrangement of the appendages of the mouth arms, this form approaches most nearly to Keller's color variety "rosæ."

Cassiopea polypoides Keller (?).

One immature medusa collected in Port Galera Bay in May, 1912, differs from *C. polypoides* var. *culionensis* in having pigmented eyespots, in that the arms do not project beyond the bell margin, and in the arrangement of the appendages

[6] *Zeitschr. f. wiss. Zool.* (1883), **38**, 634.

of the mouth arms. It has besides the berrylike vesicles a small central appendage, surrounded by a double whorl of 8 appendages, 2 in the axil between each two arms supported by the same interostial pillar. The appendages of the inner whorl are smaller than those of the outer whorl. Near the distal end of each arm is a large ribbonlike appendage reaching a length of 15 mm. and a width of 4 mm., which is surrounded by a number of similar but smaller appendages. Besides these, there are scattered among the mouths a number of small leaflike appendages.

The entire medusa is, in formalin, a dull grayish white.

Measurements of the specimen in millimeters: Diameter of the bell, 55; diameter of the arm disk, 25; length of the mouth arms (measured from the center of the disk), 26. Number of sense organs, 17; number of lappets to a paramere, 5.

While this is probably an immature individual of *C. polypoides* forma typica, it is impossible to place it definitely, so I have indicated it as a doubtful immature example of that species.

Cassiopea medusa sp. nov. (figs. 2 and 3).

Type.—C. 2421, zoölogical collection, University of the Philippines, from Culion Bay, Culion.

The disk is flat with a broad, shallow sucking surface bounded externally by a circular raised area and having a broad thickened central disk. The disk measures 260 mm. in diameter, the sucking surface 180 mm., and the raised central disk 115 mm. The raised margin of the sucking surface is 15 mm. wide, and its outer edge is 25 mm. from the bell margin.

There are 17 sense organs, and each paramere contains 7 irregular, very blunt marginal lappets which are often more distinct as spaces between grooves in the exumbrella than as actual lappets in the very thin and nearly smooth margin. The sense organs are very small, slender clubs hidden in deep clefts. They are covered above by a shelf of exumbrellar tissue, but they are quite distinct from the subumbrellar side. They are without pigmented eyespots. The 8 large mouth arms arise from an 8-sided arm disk 114 mm. in diameter. They are 170 mm. in length, send off numerous small lateral branches in their proximal portion, and divide distally into 3 main branches, which are again subdivided. The mouths and branches are much more scattered than in *C. polypoides*, and arising in the axils of the branches and between the mouths from the center of the disk to the distal ends of the branches are hundreds of transparent appendages. These appendages are of two types

which graduate into one another—a small, inconspicuous, ribbonlike form and a large, very flexible form, cylindrical at the base, flattened toward the outer end, and containing a broad central canal. These reach a length of 110 mm. and a diameter of 7.5 mm., giving the animal an appearance remarkably suggestive of the classical Medusa, hence the specific name. The canal system consists, as usual in the genus, of an equal number of ocular and interocular canals. The former run to the sense organs at the margin, while the latter break up into branches some distance inside, which anastomose with those from the ocular canals to form a network of canals running out to the margin. The subgenital ostia are small and considerably longer than broad as opposed to *C. polypoides*.

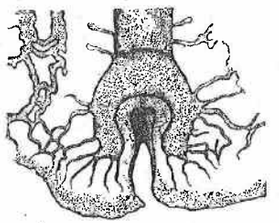

FIG. 2. *Cassiopea medusa* sp. nov., a sense organ and the adjacent canal system from the subumbrellar side. Very much enlarged.

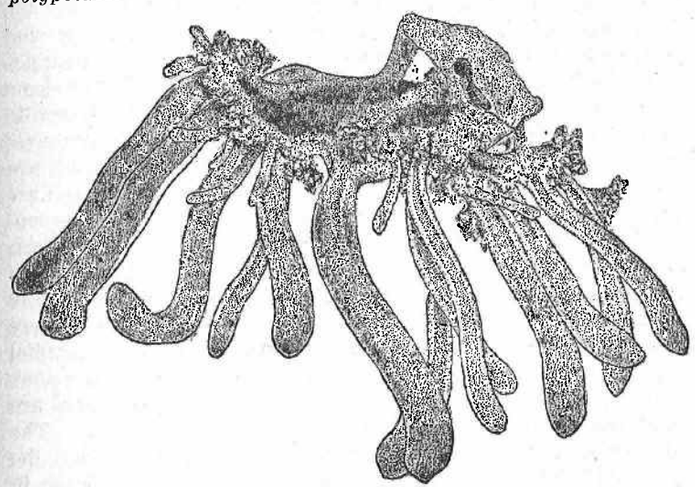

FIG. 3. *Cassiopea medusa*, a portion of a mouth arm, showing the scattered mouths and the very typical appendages. × 1.

In the preserved specimen the disk is opaque white with a slight grayish or greenish tinge. The mouths are light yellow, the arms and appendages are transparent white, and the canals are outlined in semiopaque white.

This very interesting and distinctly new *Cassiopea* is represented by a single specimen collected by Dr. L. E. Griffin and Mr. L. D. Wharton in Culion Bay, where it was found with *C. polypoides* var. *culionensis*. It is most nearly related to *C. polypoides* and *C. xamachana*, but it is differentiated from them as from all other species by the numerous very large appendages, by its very large size, and by the combination in one medusa of the following characteristics: 7 lappets to a paramere, mouth arms longer than the bell radius, and an unpigmented sense organ.

Owing to the extreme fragility of the specimen, it is impossible to make as complete a description as might be desired.

RHIZOSTOMATA DICHOTOMA Vanhöffen

Genus CEPHEA Péron and Lesueur, 1809

Cephea cephea (Forskål) Mayer.

I have a single worn specimen of this widely distributed species collected at Mariveles, Manila Bay, in January, 1912. It is undoubtedly a form of *Cephea cephea* as shown by the deep clefts of the sense organs and the high, heavily warted central dome. The bell diameter is 220 mm., and the distance from the lower surface of the arm disk to the top of the dome is 120 mm. The 8 mouth arms arise in 4 pairs. Each arm is shorter than the bell radius, and shows decided lateral compression in the proximal portion. The two outer branches are considerably stouter than the inner branches. The mouths are borne only on the faces of the main branches and their subbranches. Scattered among the mouth arms are numerous short, ribbonlike, narrow appendages which when contracted have a berrylike appearance. These reach a maximum length of 40 mm., most of them being from 10 to 20 mm. in length. There is a very conspicuous set of folded ridges containing the radial muscles and extending from the arm disk to the ring canal, which is about 50 mm. from the margin. On these ridges are numerous very small, flexible, cone-shaped projections. The circular muscles which are also distinct folds lying between the ring canal and the margin are interrupted, partially at least, in the rhopalar radii. The canal system agrees with that given by Mayer for *Cephea cephea*, except that the ocular canals are considerably wider, in their distal portion at least, than are the interocular canals. The subgenital ostia are small, half-moon shaped, convex below, and concave above.

The central dome of the exumbrella is 80 mm. high and about 70 mm. in diameter. It is covered at the bottom with small granular warts. Toward the top, these increase in size, reaching at the apex a length of 18 mm. and a diameter of 14 mm. They are irregular, and may be slender and pointed or irregular and massive.

The margin is not in a good state of preservation, but there are evidently 8 sense organs, which lie in deep notches, and about 80 marginal lappets—8 velar and 2 ocular between each two sense organs. The lappets show very plainly as thickenings of the gelatinous material, but are not distinct at the edge where they are joined by a web. The dome is transparent rosy pink, shading to light blue at the apex.

RHIZOSTOMATA TRIPTERA Vanhöffen sensu Maas

Genus CATOSTYLUS L. Agassiz, 1862

Catostylus purpurus Mayer.

The disk is somewhat flatter than a hemisphere in preserved specimens, but more convex than a hemisphere in life. The exumbrella is smooth. The 8 rhopalia are flanked by short, narrow, bluntly rounded lappets. In each octant there are 4 cleft and 2 simple velar lappets; in all, 10 velar terminal lappets to an octant. In the whole bell there are 96 marginal lappets, 16 rhopalar, and 80 velar terminal lappets. In any octant the velar lappets are arranged as follows: One cleft lappet, 1 simple lappet, 2 cleft lappets, 1 simple lappet, and 1 cleft lappet.

The arm disk at the base is about half as wide as the bell diameter, and is much smaller at the level of origin of the mouth arms. The long, narrow genital ostia are nearly as wide as the interostial pillars. They are constricted by a thick, wide median projection which extends from the arm disk. A long finger-shaped or swollen papilla is seen on the subumbrellar surface. It arises on the outer margin of the ostia in the line of the rhopalar canal. The subgenital porticus is unitary and cruciform.

The mouth arms are from 0.75 to 1.25 as long as the bell radius, and the mouths extend to the extreme tip of each arm. In living specimens, particularly those that are immature, a considerable part of the mouth arms is covered by edges of the bell. In preserved specimens the bell is flattened and the edges are turned in, leaving the mouth arms exposed.

The circular muscles extend uninterruptedly from the arm disk to the margin, being most prominent between the circular canal and the margin.

Sixteen radial canals, 8 of which are rhopalar and 8 adradial, leave the cruciform central stomach. The ocular canals extend past the ring canal to the sense organs, while the adradial canals end in the ring canal. The fine-meshed network of canals outside the ring canal extends to the margin. The coarser inner network is always connected with the adradial canals, seldom with the ocular canals, and never with the stomach.

The sense organs have in life brilliant silver spots which fade in preserved specimens. The size of these ocelli is in inverse ratio to the size of the medusa.

The medusa is deep purplish brown in life, and fades to dull brown in formalin.

This is the commonest medusa of Manila Bay. During the months of November and December it is especially abundant on the beach at Pasay just outside of Manila. The fishermen say that these jellyfish are blown in by southwest winds which prevail during these months. The largest specimen in the collection measures 105 mm. in bell diameter, but I have seen many considerably larger specimens. Mayer reports this species as living on the bottom in shallow water. I hardly think this is the case, as they are always to be seen on or near the surface in shallow water along the beach and in the esteros (brackish water canals), where they sometimes occur in countless numbers. The immature medusæ vary considerably. Some are transparent white, and resemble in general appearance the immature forms of *Acromitus maculosus* gen. et sp. nov. which is described later in this paper. The chief and most apparent difference is, of course, the absence of appendages of any kind on the mouth arms of *Catostylus*. Others resemble in general form the mature medusæ, but have such striking differences that I have thought it worth while to give a short description of one of them.

Catostylus purpurus Mayer, immature form.

The bell, which measures 27 mm. in diameter, is more convex than a hemisphere when relaxed and much more so in contraction. The margin in life hangs down below the short mouth arms, but in formalin is curved inward exposing the mouth arms. There are 8 prominent rhopalia, which in life have a bright silvery color. The exumbrellar sensory pit is broad and shallow and dendritically grooved. The ocular lappets are roundly pointed and longer than the velar lappets. There are typically 10, sharply pointed, narrow, velar lappets between each 2 ocular lappets arranged as in the adult medusa.

The subgenital ostia are irregular in size and from once

to twice as wide as the interostial pillars. The genital porticus is unitary and cruciform. The circular muscles extend uninterrupted from the outer end of the arm disk to the margin.

The arms are 6 mm. long. Each has a swollen area near the base, culminating on the outside in a laterally projecting point beyond which the arms are decidedly narrowed. The mouths are on the lower and inner surfaces of the three branched arms.

In life, the medusa is deep, rich plum; in formalin, it is purplish brown.

This immature form was collected from a seine at Pasay Beach, Manila Bay, October, 1913. It is particularly interesting, because of the presence under the edge of the margin of several small cyclopslike crustacea, evidently leading a commensal existence. Four of these crustaceans were found, each lying just below a sense organ and along the line of a rhopalar canal, the head end lying innermost. They were all females with well-developed egg sacks, and were difficult to make out in position as they have many minute brown pigment spots scattered over the body, giving them the same general color as the medusa.

I have since found that these crustacea are to be found in great numbers on living specimens whether mature or immature and are not confined to any one region of the medusa.

Genus MASTIGIAS L. Agassiz, 1862

Mastigias papua L. Agassiz.

There are 3 immature and 2 mature specimens of this medusa in the collection from Port Galera Bay, Mindoro, collected during May and June, 1912. I saw many small specimens in Taytay Bay, Palawan, in May, 1913.

These forms differ somewhat from the typical *M. papua*, and while these differences coincide to some extent with those noted in *M. papua* var. *sibogæ* Maas they differ to about the same extent. They seem to be intermediate in form between *M. papua* var. *sibogæ* and *M. papua* forma typica, and the specimens differ among themselves as to coloration, length of filaments, etc. These facts lead me to believe, as Mayer says, that there are numerous very closely related or even intergrading forms in this genus. It would be interesting to compare large series of these medusæ from localities joining two rather widely separated habitats, say Japan and Papua, getting series from Japan, Formosa, Luzon, Mindanao, Jolo, Amboina, and Papua. I have no doubt that the individuals of such a series would so inter-

grade as to make it necessary to consider them as local forms of a single very variable species.

The largest specimen in the collection measures 60 mm. in bell diameter, and the arm disk is 33 mm. in diameter. The arms measure 35 mm. in length from the center of the arm disk, and project only slightly beyond the edge of the disk. There are 8 rhopalia, with large, cup-shaped, pigmented ocelli and long, pointed, ocular lappets. Between each 2 sense organs are 9 rounded or bluntly pointed velar lappets. The subgenital ostia are three times as wide as the interostial pillars. There are 7 anastomosing interocular canals in each octant. The rounded clubs are scattered on the mouth arms, and the terminal appendages which are somewhat less in length than the bell diameter are distinctly 3-sided and show a network of internal canals. The general color in life is light greenish blue, shading into light brown, purple, or olive green. The exumbrella is covered, particularly in the mature medusa, with prominent white spots. Those above the ring canal are double-headed or dumb-bell shaped. The rhopalar canals are outlined by a broad violet or deep blue band. The arm clubs are violet or blue at the tip and base with intermediate zones of olive green, gray, and white. In preserved specimens the colors fade with the exception of the violet band on the circular canal, which is not present in some immature medusæ, and the violet bases of the terminal appendages.

Genus **ACROMITUS** novum [1]

Generic characters.—*Rhizostomata triptera* with scattered filaments and axial, terminal, filamentous appendages on the oral arms. The cruciform stomach gives rise to 16 radial canals, 8 of which are rhopalar and 8 adradial and interrhopalar. The rhopalar canals extend beyond the ring canal to the margin, while the adradial canals end in the ring canal. Externally, the ring canal sends off many small canals which anastomose and form a network between the ring canal and the margin. Internally, it gives off several larger canals on each side of each rhopalar canal which anastomose and join the rhopalar canals. The exumbrellar sensory pits show radiating furrows. The subgenital porticus is unitary and cruciform. The circular muscle is partially interrupted in the rhopalar radii.

The type species is *A. maculosus* sp. nov. from Taytay Bay, Palawan.

[1] ἄκρος, at the point, terminally; μίτος, a thread.

The genus *Acromitus* is most closely related to *Catostylus* on one hand and less closely to *Lychnorhiza* and *Crambione* on the other. It resembles *Catostylus* in its canal system, the

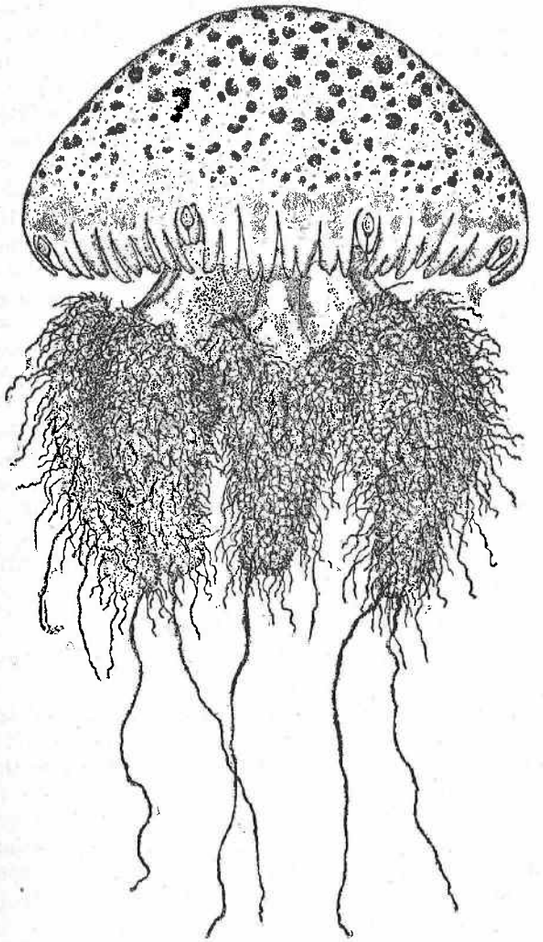

FIG. 4. *Acromitus maculosus* gen. et sp. nov., lateral view of the medusa. × 8/9.

shape and structure of its mouth arms, and in the presence of furrows in the sensory pit, but differs from it in having filaments and an axial terminal appendage on each mouth arm.

While resembling *Lychnorhiza* and *Crambione* to some extent in its canal system, in having filaments on the mouth arms and in the presence of radiating furrows in the sensory pits, it differs from them in having an axial terminal appendage, in that the internal branches of the ring canal join the rhopalar canals, and in that the circular muscles are interrupted, partially at least, in the rhopalar radii. It differs from *Mastigias* in that the exumbrella sensory pit is furrowed, in that the interocular canals are regular in number (8) and in position and do not anastomose, running directly from the central stomach to the ring canal, and in that the axial terminal appendages of the mouth arms are long, slender filaments and not clubs. It differs from *Pseudorhiza* in having slender terminal appendages, in the presence of filaments on the mouth arms, in that the sensory pits are furrowed, and in the absence of a central mouth. It differs from *Phyllorhiza* in having axial terminal appendages and in that the inner branches of the ring canal do not reach the stomach. It differs from *Versura* in that the interradial canals are separate and in the presence of a definite ring canal. It differs from *Lobonema* most strikingly in the small size of the marginal lappets and in the absence of windowlike apertures in the oral arms. It differs from *Lobonemoides* gen. nov. in that there are not more than 8 rhopalia, in that the interocular canals do not extend to the margin, and in that the axial, terminal appendages of the mouth arms are filamentous.

Acromitus maculosus sp. nov. (figs. 4, 5, and 6).

Type.—No. C. 2081, zoölogical collection, University of the Philippines.

The bell reaches a width of 90 mm. or more, and is hemispherical or somewhat flatter than a hemisphere. It has a solid consistency, being thick in the central region and thin outside the ring canal. The surface of the exumbrella is covered with minute, bluntly cone-shaped projections. There are 8 rhopalia, each with a pigmented area and a deep, triangular, grooved, exumbrellar sensory pit. The marginal lappets are typically 80 in number—8 pointed velar lappets in 4 pairs and 2 narrow pointed ocular lappets being present in each octant. The grooves between the pairs of velar lappets are deep, and extend some distance up on the exumbrellar surface. The arm disk is about 1.2 or 1.25 of the bell radius. The genital ostia are from 1.3 to 1.5 as wide as the column between them. They have a regular but sinuous outline, and are partially closed by

a median flaplike projection from the outer margin. The subgenital porticus is cruciform and unitary.

The mouth arms vary in length from 1.3 to twice the bell radius. The proximal area, in the adult, is about 0.25 of the arm length and considerably more in the immature medusa. It is narrow and unbranched, and bears mouths only on its inner side where they extend to the center of the arm disk. The distal portion has the shape of a 3-cornered pyramid, the branches of the wings of the mouth arms extending alternately in opposite directions. The mouths are found only on the outer surfaces of the secondary branches of the three main divisions of the mouth arms, but these branches are so elongated laterally as to cover the bare spaces between the branches and present in all directions a surface composed of fringed mouth openings interspersed with filaments. The capitate tentacles fringing the mouths are very numerous and heavily loaded with nematocysts. The filaments are covered with large nematocyst warts, giving them a knobbed and knotted appearance. The filamentous axial terminal appendages are about as long as the mouth arms and very flexible. They contain a central canal, and are covered with nematocyst warts considerably smaller than those of the other filaments. The central ducts of the mouth arms join in pairs before passing into the stomach, the ducts of the two arms arising from a common interostial pillar uniting. Each of these 4 main ducts enters the outer end of a stomach pouch. The main duct of each mouth arm gives off about 6 small branches to the mouths of the upper portion of the mouth arm. At the point of origin of the two outer arm branches it gives off 3 main branches, one to each arm branch, and continues beyond that point to the tip of the mouth arm as a small central canal giving off a few small branches to each of the three arm branches and is continued as the central canal of the terminal filament. The canals to the two outer arm branches are broad and bifurcated near their outer ends.

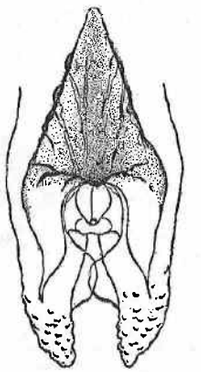

FIG. 5. *Acromitus maculosus*, an exumbrellar view of a sense organ; diagrammatic. Much enlarged.

The stomach is cruciform in shape, the 4 lobes tapering somewhat toward the outer ends. From the outer extremity of each lobe there are given off 3 radial canals, a central rhopalar canal and an ardradial canal on either side arising from the outer

edge of the end of the lobe. In the cleft between each two lobes, a rhopalar canal is given off. So, of the 8 rhopalar canals, the 4 perradial canals—since they arise from the ends of the stomach lobes—are short and the 4 interradial canals—since they arise between the stomach lobes—are long. The 8 rhopalar canals extend straight to the sense organs, while the 8 interocular canals end in the circular canal. The area of the bell between the circular canal and the margin is filled with a network of anastomosing canals, taking their origin from the outer surface of the ring canal and intercommunicating with the branches of the rhopalar canals. Arising from the inner surface of the circular canal on each side of each ocular canal is a series of anastomosing canals usually 3 in number, which joins the ocular canals by a common lateral branch. This canal network has, typically, no connection with the interocular canals

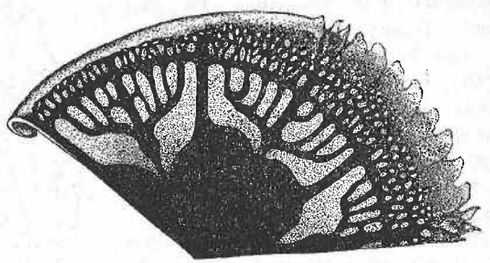

FIG. 6. *Acromitus maculosus*, an exumbrellar view of a portion of the bell, showing the canal system as seen when injected; somewhat diagrammatic.

which run directly from the stomach to the ring canal without branching or anastomosis.

There is a wide band of circular muscles covering the space between the margin and a line a little external to the level of the ends of the stomach pouches. The part of the muscle band lying within the ring canal is interrupted in the 8 rhopalar radii, while that outside the ring canal is only partially interrupted.

The whole medusa is pale blue in life, the color being deepest along the radial canals and oral arms. The exumbrella is covered with circular, ring-shaped, solid, elongated, or irregular spots. In life, these are iridescent purplish black to dark brown. In specimens preserved in formalin, the blue fades to slightly opaque white with a faint bluish tinge and the spots fade to bronze brown and finally dissappear.

These medusæ were common in the shallow water along the beach at Taytay, Palawan, in April and May, 1913. Great numbers of immature forms were present the second week in May. They first appeared after a very severe wind storm of several days' duration, but were never noted in the deeper waters of the bay.

Measurements of the type specimen in the collection of the zoölogical department of the University of the Philippines, No. C. 2081.

	mm.
Bell diameter	90
Length of the mouth arms	60
Length of the bare proximal portion of the mouth arm	15
Diameter of the arm disk	50
Width of the inturned portion of the exumbrella	15
Diameter of the largest exumbrellar spots	5
Width of the subgenital ostia	20
Width of the interostial pillars	15

Numerous specimens of the different stages of this medusa were collected at Taytay, Palawan, in the summer of 1913 by Dr. R. P. Cowles and myself while on the joint scientific expedition of the University of the Philippines and the Bureau of Science. During the time in which they were numerous in the vicinity of Taytay, I visited neighboring islands and other parts of Palawan, but was unable to find the medusa.

Among the numerous immature specimens, some variations and abnormalities are to be noted. The time at which the spots appear on the umbrella seems to vary. Some specimens whose umbrella is but 15 mm. in diameter show distinct spots, while others which have reached a diameter of 40 mm. show no markings at all. In the immature forms, the spots are arranged in more or less circular groups of 4 or 5 which coalesce to form the large spots of the adult form. The proximal portion of the mouth arms is more prominent, and makes up a larger portion of the arms of the immature medusa. The canal system of the bell seems the same in mature and immature specimens, but the side branches of the upper portion of the main canals of the mouth arms are conspicuous in the immature forms. The canal pattern is strikingly brought out by injecting pure Delafield's hæmatoxylin through an opening in the center of the exumbrella. The only notable variation is that in a very few cases the inner canal network is connected to the adradial canals as well as to the interradial and perradial canals. This

connection is very slight, and is by no means common. One specimen has 5 stomach lobes, 5 gonad lobes, 9 mouth arms, 18 radial canals—10 of them rhopalar and 8 adradial—and 96 marginal lappets. There are 9 rhopalia present, and as the margin is gone at the end of another rhopalar canal we may say there are 10 rhopalia, so it is as if a new area equivalent to a quadrant has been developed in this specimen to correspond to the extra stomach lobe, lacking, however, two adradial canals. In another specimen there are 18 canals, but 5 of them—3 adradial and 2 rhopalar—arise from a single enlarged stomach pouch. Another specimen has 10 mouth arms, 4 of them developing from a single interostial pillar, but the canal system is of the normal type. At first glance, the canal system of the bell of this species appears to be very similar to that of *Catostylus purpurus* Mayer, to which it is undoubtedly closely related. But in the injected specimens of *C. purpurus* it can be seen that the internal network of canals from the ring canal is connected most conspicuously with the adradial canals, while in *A. maculosus* it is connected with the rhopalar canals and typically not at all with the adradial canals.

I have given the species the name *maculosus*, as the spots on the umbrella constitute one of its most striking specific characters.

Genus **LOBONEMA** Mayer, 1910, emended

Generic characters.—*Rhizostomata triptera*, in which the velar lappets are greatly extended, tapering to pointed ends. The mouth arms show numerous filaments, and the mouth-arm membranes are perforated by windowlike openings. There are from 8 to 16 rhopalia, twice as many radial canals as rhopalia, and a ring canal which gives off an anastomosing network of vessels on both its inner and outer sides. The inner network does not connect with the stomach. All of the radial canals extend beyond the ring canal, the ocular canals always to the sense organs. The subumbrella shows a well-developed system of ring muscles extending from the mouth-arm disk to the margin, interrupted partially or not at all by the radial canals. There are numerous prominent tapering papillæ upon the exumbrella. There is an exumbrellar sensory pit above each rhopalium, whose floor is covered with radiating dendritic furrows.

This is Mayer's original definition emended so as to include *Lobonema mayeri* sp. nov.

Lobonema mayeri [8] sp. nov. (figs. 7, 8, and 9).

Type.—No. C. 2424, zoölogical collection, University of the Philippines.

During the middle and latter part of May, Malampaya Sound on the west coast of Palawan contained great numbers of this very beautiful and interesting medusa. Two specimens were

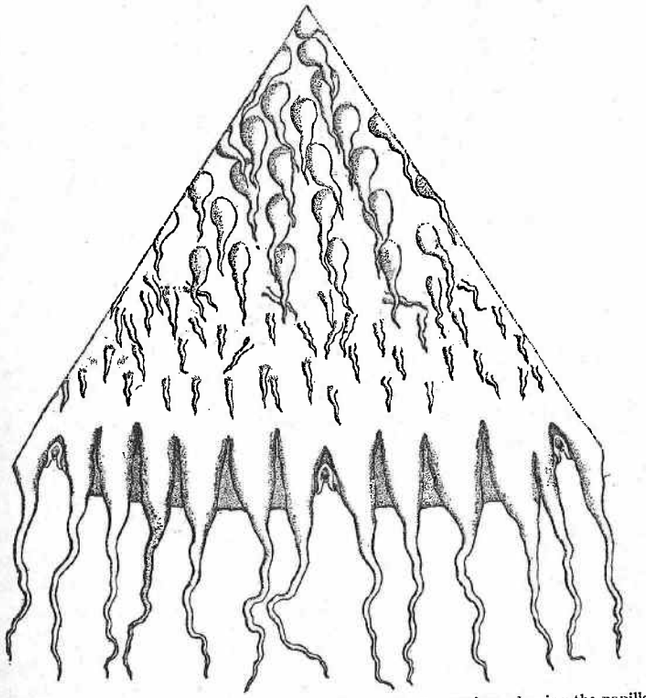

FIG. 7. *Lobonema mayeri* sp. nov., a quadrant of the exumbrellar surface, showing the papillæ, sense organs, and tentaclelike marginal lappets. × ½.

taken in as perfect a condition as was possible in the case of forms with such long and fragile arm filaments.

The bell is much flatter than a hemisphere both in preserved and living specimens. The portion of the bell beyond the ring

[8] I have named this species in honor of Dr. A. G. Mayer without whose Medusae of the World the completion of this report would have been extremely difficult if not impossible and who (1910) described the genus *Lobonema* and the only other known species, *L. smithii* Mayer.

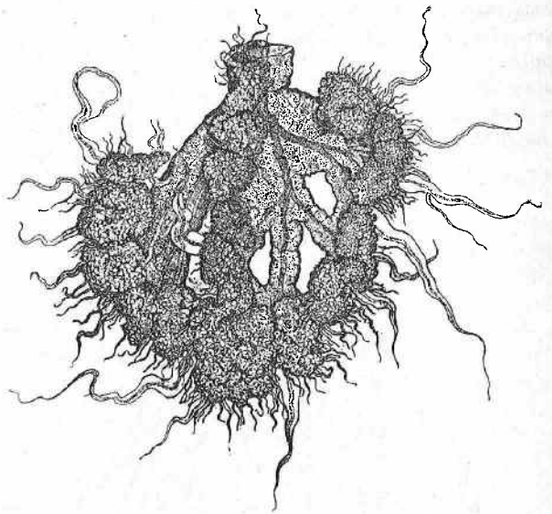

FIG. 8. *Lobonema mayeri*, a mouth arm, showing the appendages, the windowlike openings, and the irregular arrangement of the ducts; somewhat diagrammatic. × ⅓.

canal, which is a considerable distance from the margin, is very thin, and hangs down as a sort of fringe when floating. The bell is from 340 to 500 mm. in diameter measured from a sense club to the one 180° from it. Medusae having a diameter of at least 500 mm. and probably much more were very numerous. The subumbrella is covered with very flexible tapering papillæ, increasing in size and number toward the center of the exumbrella where they reach a length of 60 mm. and a basal diameter of 15 mm. Those in the center of preserved specimens are stiff and solid at the base, but their tips like the entire papillæ toward the outer position of the exumbrella are very soft, shrunken, and without rigidity. In life, they are all conical and flexible, waving about in the currents of water. Toward the center of the exumbrella, the rather broad bases of these papillæ cover the entire surface.

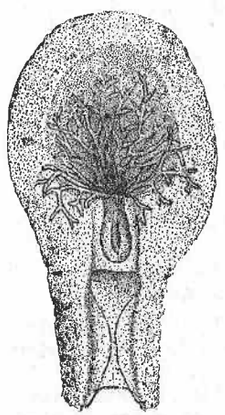

FIG. 9. *Lobonema mayeri*, a sense organ from the exumbrellar side. Much enlarged.

The 12 to 16 rhopalia are very short

with broad swollen ends, and are covered above and below by shelves of tissue, the exumbrellar shelf being very short and the subumbrellar much larger. No pigment spots are present. The exumbrellar sensory pit it small, rather deep below, and dendritically grooved. It lies in the surface of an oval, papillalike, raised area. The ocular lappets are short, plump, and closely approximated, being 4 mm. in length from the base of the exumbrellar sensory pit to the tip and 3 mm. in diameter. There are from 70 to 80 complete marginal lappets, from 3 to 6 in a paramere. Some of the lappets show a distal bifurcation. The lappets are elongated, tentaclelike, tapering to a point. They reach a length of 200 mm., measured from the inner end of the cleft, are very slender and flexible distally, and have the appearance of true tentacles. For about 25 mm. of their inner length they are joined by a web. They are concave below and convex above, with thin edges. They contain a number of large longitudinal canals joined by small lateral branches, and no muscle fibers could be detected in stained sections. The velar grooves of the exumbrella are about 25 mm. and the ocular grooves are about 12 mm. long. The rhopalar clefts are V-shaped rather than Y-shaped as in *L. smithii*. From 24 to 32 radial canals, half of them rhopalar and half interrhopalar, leave the central stomach. There are always half as many sense organs as canals. The ocular canals extend to the sense organs in the margin, but the interocular canals while extending for some distance beyond the ring canal are lost in the network of anastomosing canals before reaching the margin, differing in this character from *L. smithii*. This is well shown by injecting one of these canals with Delafield's hæmatoxylin. There is a distinct ring canal about 45 mm. inward from the sense club zone giving off an anastomosing system of canals internally and externally, which connects with both the ocular and interocular canals but not with the central stomach.

The bell between the arm disk and the ring canal is from 25 to 30 mm. in thickness, while from the ring canal to the margin it is not thicker than 10 mm. The thickest point is at the level of the ring canal, where there is a circular swollen subumbrellar area over which the radial canals curve to meet the ring canal whose greatest breadth is at right angles to the plane of the subumbrella. At this point, just before it joins the ring canal, there is a bulbous enlargement of each ocular canal.

There is no radial muscle. The circular muscles form a series of circular folds between the arm disk and the zone of the sense organs. That part of the muscle band which lies within

the ring canal is completely interrupted in the ocular radii and thinned in the interocular, while that portion lying outside the ring canal is thinned in the ocular radii and only slightly so in the interocular radii.

The arm disk is two-thirds as wide as the bell radius, very thin in the center, and swollen and rounded along the outer edge. The subgenital ostia are compressed, are twice as wide as the interostial pillars, and have a small papillalike projection in the center of their subumbrellar lip. The subgenital porticus is unitary. The gonads are in the form of long lines in the thin reduplicated and folded wall of the stomach. On each side of these lines of reproductive organs are lines of blunt gastral filaments. These reduplicated membranes are inflated and pushed out through the subgenital ostia in the two specimens in the collection. Each of the interostial pillars contains a slitlike false ostium about two-thirds as wide as the pillar. One specimen examined had a large cone-shaped papilla on the upper margin of this false ostium, while others did not.

The supporting membranes of the 3 main branches of the mouth arms are pierced by windowlike openings. Typically, there seem to be 2 in the membrane of each wing, but the weakened arm membranes have broken down in most of the arms. In no arm are there more than 2 in each wing, in some none at all, and in others the branch is only attached by its upper edge, the membrane between the openings having given away. The mouth arms are equally spaced, the two arms arising from the same interostial pillar being widely separated, the base of each extending partly over the adjacent subgenital ostium. The proximal portion of each arm is about one-half the length of the 3-winged distal portion. The fringed mouths extend on the inner surface to the center of the arm disk. Scattered among the mouths are very numerous filaments. Those of the central disk and the proximal portion of the arms are slender, threadlike filaments. Toward the distal portion they increase in length and become spindle-shaped, circular in cross section, and tapering to a long threadlike portion. The larger filaments contain an axial canal, and reach a maximum length of 200 mm. and a diameter of 10 mm.

In life, the medusa has an exquisite color scheme of purple, violet, and rose pink. The gonads are, as a rule, pink, the general color is violet, and the fringe of tentaclelike marginal lappets purple. These colors vary considerably in intensity and arrangement. In formalian, the entire medusa is milky gray and the gonads and mouth fringes are yellow.

These medusæ with their numerous tentaclelike velar lappets, their exumbrellar papillæ, and their arm appendages—all of which are very long, slender, and flexible and all of which are colored some shade between rose pink and purple—present a most striking and beautiful appearance, and as they are found on or near the surface are most conspicuous objects.

Numbers of young fish of the genus *Caranx* were found living in the mass of filaments and mouth arms.

L. mayeri differs from *L. smithii* in that it has from 12 to 16 rhopalia instead of 8, in that the circular muscle is completely interrupted in the ocular radii, in that it has a false ostium in each interostial pillar, and in that the interocular canals do not reach the bell margin.

I have handled this medusa and have seen and experienced the results of the sting which are very similar to those of a nettle sting and are not at all serious. This is surprising in view of the statements of Dr. H. M. Smith as given by Mayer with regard to the closely related *L. smithii* Mayer.[9] It seems to me much more probable that the cases of poisoning reported by Old[10] were due, as I have said before, to the *"Chrysaora* stage" of *Dactylometra quinquecirrha* which is common in the harbor. The Filipinos state that the latter form is very poisonous, and a number of instances are known in which it has caused severe symptoms of poisoning.

I append a table of comparative measurements and the number of rhopalia and lappets to a paramere of the two specimens of *L. mayeri* in the collection.

Measurements of Lobonema mayeri sp. nov.

	Specimen A.	Specimen B.
Bell diameter.....millimeters..	350	340
Arm disk, diameter.....do....	125	110
Maximum length of the velar lappets.....do....	180	200
Number of rhopalia.....	12	16
Number of velar lappets.....	[a]3–6	[b]3–4
Width of the subgenital ostia.....millimeters..	[c]75	[c]70
Width of the interostial pillars.....do....	32	33
Width of the pillar cavity (false ostium).....do....	25	22
Length of the mouth arms from the center of the arm disk.....do....	180	180

[a] 6 in 4 parameres, 5 in 2, 4 in 5, and 3 in 1.
[b] 4 in 13 parameres and 3 in 3.
[c] More than twice the width of the pillar.

[9] *Pub. Carnegie Inst. Wash.* (1910), No. 109, 3, 690.
[10] *This Journal, Sec. B* (1908), 3, 329.

Genus **LOBONEMOIDES** novum

Generic characters.—*Lobonema*-like *Rhizostomata triptera* in which the marginal lappets are pointed but not greatly extended. The mouth-arm membranes are not perforated by windowlike openings. There are more than 8 rhopalia, twice as many radial canals as sense organs all extending to the margin, and a ring canal. The ring canal gives off externally a network of anastomosing canals, extending to the margin, and internally a series of anastomosing canals on each side of each rhopalar canal, which do not reach the stomach and are connected with the rhopalar canals but not the interrhopalar canals. The exumbrellar sensory pits are furrowed with radiating dendritic grooves. Each mouth arm bears numerous small scattered appendages and one large terminal spindle-shaped appendage, all of which taper to filamentous outer ends.

The type species is *L. gracilis* sp. nov. from Taytay, Palawan.

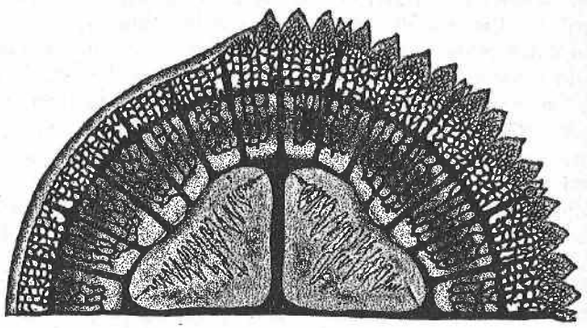

FIG. 10. *Lobonemoides gracilis*, an exumbrellar view of half the bell, showing the canal system, the marginal lappets, etc. × 1.

Lobonemoides gracilis sp. nov. (figs. 10, 11, 12, and 13).

Type.—No. C. 2422, zoölogical collection, University of the Philippines.

The bell is flat, 50 to 85 mm. in diameter, and very transparent. The stomach and canals are semiopaque white and the gonads opaque white. That part of the bell which lies outside the ring canal is very thin and flexible, while the central portion is rather thick and stiff. This outer thin region is about 17 mm. wide in the type specimen. The bell is 7 mm. thick outside the ring canal, 14 mm. high through the outer edge of the arm disk, and 10 mm. high through the center of the arm disk. There are a few scattered papillæ on the exumbrella,

increasing in size toward the center. They are small, slender, and flexible, and reach a length of 2 mm. and a basal diameter of 0.5 mm. In preserved specimens they lie flat on the disk.

There are 14 rhopalia and twice as many radial canals, all extending to the margin. The sense organs are very short, thick clubs lying at right angles to the plane of the bell with the swollen end toward the exumbrellar surface. Between each pair of sense organs, there are 6 marginal lappets—4 large pointed triangular velar lappets between 2 small pointed ocular lappets. The rhopalar canals are somewhat larger than the interrhopalar canals, and divide distally to form a U-shaped sinus in the upper part of the ocular lappets. In the curve

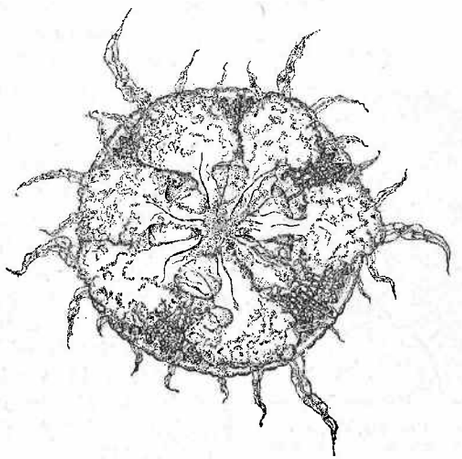

FIG. 11. *Lobonemoides gracilis* gen. et sp. nov., ventral view of the medusa. × ½. Two of the mouth arms of this specimen are aborted.

between the limbs of this sinus lies the sense organ. The exumbrellar sensory pit is dendritically grooved. The ring canal lies at the outer edge of the swollen central region of the bell, and its greatest breadth is at right angles to the plane of the umbrella. The radial canals curve over this swollen area to the ring canal, which gives off externally and internally a set of anastomosing canals. The external network is connected in a number of places with both the ocular and interocular canals, and it approaches the latter more closely and is joined to it in a greater number of places. Internally, a network of 3 or 4 anastomosing canals is given off by the ring canal on each side of each ocular canal to which it is joined in 2 or 3

places. The interocular canals internal to the ring canal are broader than the ocular canals, and show a sinuslike broadening where they join the ring canal. Beyond the ring canal the interocular canals are small and are closely surrounded by the network of anastomosing canals, while the ocular canals maintain a uniform size to the margin and have on either side just outside the ring canal a small area free from the anastomosing canals.

The arm disk is 50 mm. in diameter, swollen in the zone of origin of the arms, and thin in the center of the disk. The subgenital ostia are 18 mm. in width and 4 mm. high, with a concave upper and swollen convex lower lip. The interostial pillars are 9 mm. wide. The subgenital porticus is unitary and square. Each gonad lies in a complex series of folds in the floor of the stomach. The folds are longest in the center and shortest at the ends, where at the level of the center of the interostial pillars the gonads are separated from one another by a very short space. Thus the outer edges of the gonads outline a square area, the corners of which coincide with the centers of the interostial pillars. The bases of the pillars are rounded, and the edge of the portion of the arm disk between them is straight, so the arm disk may be considered 8-sided—rounded and straight faces alternating with one another—or more exactly 4-sided, each corner being rounded. The outline of the stomach is square, but the invaginated gonads have so encroached on it as to leave only a narrow cruciform cavity whose outer ends are joined by a marginal sinus from which the radial canals originate.

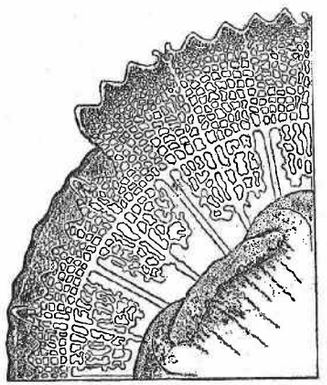

FIG. 12. *Lobonemoides gracilis*, a diagrammatic representation of a quadrant of the bell from the subumbrellar side, showing the subgenital ostium, canals, etc. × 1.

The arms are about equally spaced. The two arms on a common interostial pillar are widely separated, so that the base of each arm lies over the outer one-third of a gonad. The arm disk at the base is a little wider than the bell radius, while at the point of origin of the arms it is only five-ninths as wide as the bell radius. The arms are 50 mm. long from

the center of the disk, and so a little longer than the bell radius. They are very flexible. The inner wings bear mouths to the center of the disk. The distal 3-winged portion of the arm is about one-half the total length of the arm. The branches are slender and delicate, and the fringed mouths are not crowded, except toward the tip of the arms. At the center of the disk is a slender filament, and around this a whorl of similar filaments, one in the axil between each pair of arms arising from a common interostial pillar. Scattered among the mouths are a few similar but smaller filaments. At the end of each mouth

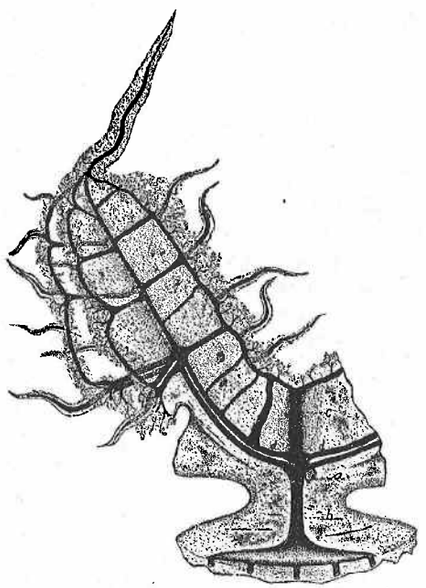

FIG. 13. *Lobonemoides gracilis*, lateral view of one mouth arm and an interostial pillar, showing the ducts as seen in an injected specimen; diagrammatic. × 1.

arm there is a large spindle-shaped appendage tapering to a filamentous distal end and having a central canal. Scattered on the distal ends of the arms are a few similar but smaller appendages. The terminal appendages reach a length of 45 mm. and a maximum diameter of 6 mm.

Each of the very narrow, interradial limbs of the stomach receives two ducts from the mouth arms, one (fig. 13, *a*,) at a point about one-third of the distance from its outer end to the center and the other (fig. 13, *b*) at the outer end. These

two ducts originate from the point of junction of three main ducts in the mouth arms. The central one (fig. 13, *c*) is formed by the union of the ducts, which run along the outer edge of the inner wing of the two arms supported by a common pillar and give off smaller ducts to the branches of their inner wings. This union occurs not far from the disk center in the axil between two mouth arms supported on the same interradial pillar. The other two (fig. 13, *d*) are the main central ducts from the same two mouth arms. Each of those two main ducts divides at the point of origin of the two outer arm wings into 3 main branches, the two larger of which run to each of the outer arm wings and join the ducts running along the outer surfaces of these wings. These and the main ducts of the arms are often double (fig. 13). The smaller one runs through the center of the arm, giving off branches to the outer ducts of the 3 wings till at the tip of the arm it and the outer ducts of the 3 wings are joined. The main duct of each arm sends off in its proximal portion one large connecting branch and numerous smaller connecting branches to the outer duct of the inner mouth arm.

The medusa is transparent white, and the gonads are yellow.

There are 3 specimens of this new and interesting medusa collected by Dr. R. P. Cowles along the beach at Taytay, Palawan. Measurements of them are given in the following table.

Measurements of Lobonemoides gracilis sp. nov.

Specimen.	Bell diameter.	Arm-disk diameter.	Length of the mouth arms.	Width of the subgenital ostia.	Width of the interostial pillars.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*
Type C. 2422	85	50	50	18	10
Cotype A	70	44	44	16	8
Cotype B	47	34	30	12	5

This is a very puzzling form to place systematically. It may possibly be a growth form of *Lobonema mayeri* or some other species of that genus, for in many ways it resembles these medusæ, but it lacks the two main generic characters of *Lobonema*, the tentaclelike marginal lappets and the perforated arm membranes. Further, it was collected on the east coast of Palawan, whereas *L. mayeri* was found only on the west coast. The gonads of *Lobonemoides gracilis* are well developed although not fully mature, and its sense organs and the arrangement of the canals of the mouth arms are different from those of *L. mayeri*.

For these reasons, I have decided to consider it as a mature form which necessitates the formation of the new genus to which I have given the name *Lobonemoides*, because of its resemblance in certain characters to Mayer's genus *Lobonema*.

The classification of a form such as this brings in question the purpose of systematic work. As I see it, the function of such work is to bring before scientific workers the forms of life in such a way as to make possible their differentiation and consequently to allow of their being placed in a general system and used as a basis for scientific inductions. The binomial system of nomenclature has been adopted as the most practical method of accomplishing this end. The placing of scientific data before the world is the essential part of such a work. The mere introducing into the literature of the group of a new generic or specific name is the smallest part and should be but a means to an end. It seems to me, therefore, that the possibility that these names may in the future become synonyms should not prevent the worker from accomplishing this purpose. For example, I might have described the above species as a doubtful, immature form of *L. mayeri*. But this denies a place in the classification and nomenclature of the group to a very interesting medusa form, which in so far as present data is concerned is a new species of a new genus and concerning which there may be no more data for years. It practically buries it from all but a very few workers; whereas, if it be given a generic and specific name it receives a place in the nomenclature of the group and is thus brought to the attention of all workers, and the question as to whether it is a mature form or not will, no doubt, be sooner settled and the medusa put in its proper place. If it be a growth form, the name which I give it will become a synonym and be discarded, but it will have accomplished the purpose for which it was given.

RHIZOSTOMATA LORIFERA Vanhöffen

Genus **RHOPILEMA** Haeckel, 1880

Rhopilema visayana sp. nov. (figs. 14, 15, and 16).

Type.—No. C. 2423, zoölogical collection, University of the Philippines. From Taytay Bay, Palawan.

The bell is from 200 to 400 mm. in diameter, and is hemispherical or more convex than a hemisphere. The central portion which forms the upper wall of the stomach is thick and stiff, while the remainder is very thin and flexible. The exumbrella is covered with numerous small, pointed, spinelike projections.

FIG. 14. *Rhopilema visayana* sp. nov., an exumbrellar view of a sense organ, showing the adjacent canals as seen in an injected specimen. Enlarged.

These are about 0.5 mm. in basal diameter and 0.75 mm. high. They are scattered over the surface, are about 2 mm. apart at the margin, and increase in number toward the apex, where they are only about 0.5 mm. apart. Scattered among these on the sides of the exumbrella are a few low, flatly rounded papillæ about 1.5 mm. in diameter and 0.5 mm. in height.

Each of the 8 rhopalia shows a distinct, brown, pigmented area. There are typically 8 thin, rounded, velar lappets in each octant. The free outer ends and the deep irregular grooves between them are free from the projections found on the rest of the exumbrella. The width of these lappets is variable, and their outer ends sometimes show bifurcation.

The canal system is very similar to that of *R. hispidum* Maas, the 16 radial canals extending to the margin. Each adradial canal shows a sinuslike swelling at the point of origin of its innermost and largest branch. The radial

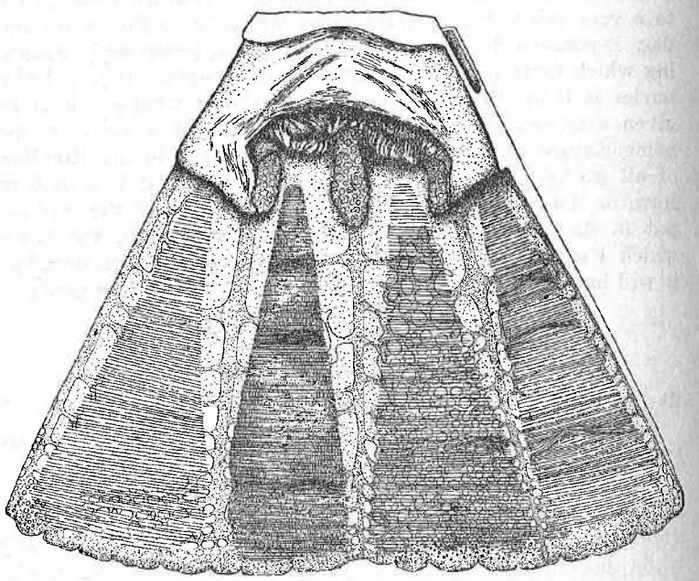

FIG. 15. *Rhopilema visayana*, subumbrellar view of a quadrant, showing the canal system, the radial muscles, and the subgenital ostium with the three papillæ. × ½.

canals divide the radial muscle into triangular areas which are widely separated proximally.

The genital ostia are as wide as the interostial pillars, and are partly closed by 1 large median papilla and 2 smaller, lateral, elongated, roughened, wartlike papillæ, each lying in the line of a radial canal. The partitions between the 4 genital cavities are narrow but complete.

The arm disk is supported by 4 broad, flat pillars. The distance from the base of one of these to the base of the one opposite it is 170 mm. The united arms arise from the center of the arm disk, and are only 60 mm. in diameter where they leave

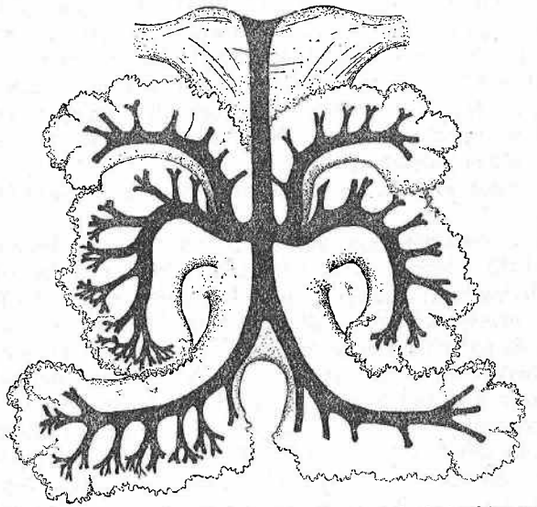

FIG. 16. *Rhopilema visayana*, a diagram of the arrangement of the ducts of two mouth arms supported by a common pillar and of their scapulets. × ½.

the disk. The mouth arms, measured from the outer surface of the arm disk, are 190 mm. in length. They are united proximally for more than two-thirds of this distance, the distal free portion measuring 75 mm. When the arms are spread out, the specimen is 200 mm. from the tip of one arm to the tip of the arm 180° from it, the central united portion being 50 mm. across at this point. The 3-winged portion of the arm makes up less than one-half of the free distal portion of the arm. Each of the two outer wings bears a dichotomously divided branch near its origin, and is divided distally into 4 flattened, tapering, nearly naked branches. Scattered among the mouths are appendages of three types: Long, flexible, somewhat flattened, filamentous append-

ages; shorter, flattened, ribbonlike appendages; and pointed, spindle-shaped or wedge-shaped appendages, the largest of which is usually terminal.

The scapulets are about 65 mm. long and 45 mm. wide at the base, their upper and outer surfaces bearing numerous mouths, among which are many long, filamentous appendages. The scapulets are branched along either side, and are deeply bifurcated at the outer end.

Each interostial pillar contains a main duct which enters the outer end of one of the 4 stomach lobes and is formed by the union of the main ducts of the 2 mouth arms arising from the same pillar. The main ducts of the 2 arms unite somewhat beyond the scapulets, and the main duct formed by their union receives on each side a duct formed by the union of the ducts of the two scapulets of that side. The main duct of each mouth arm receives a number of smaller ducts from the inner surface of the mouth arm and a very large duct from each of the 3 outer wings of the distal portion of the arm.

The color in both preserved and living specimens is opaque white.

This medusa was very common in Taytay Bay, Palawan, during May, 1913. Nearly every specimen examined contained one or more living individuals of a species of a crab, *Charibdis* (*Goniosemus*) *crucifera* (Fabr.) M. Edwards. These crabs were considerably paler than is typical for the species, which would seem to indicate a somewhat extensive residence within the medusa. I have also seen the medusa accompanied by large numbers of small fish apparently belonging to the genus *Caranx*. In some instances, these fish were seen to be eating the medusa, but in all such cases the medusa was dead. When the medusa was alive, they seemed to maintain a commensal relation. The fish would be seen playing about among the mouth arms and appendages and on being alarmed would disappear under the edge of the bell, between the arms or in the subgenital porticus. A similar condition was found in the case of *Lobonema mayeri*. I am told that *R. visayana* which is closely related to the common edible medusa of Japan, *R. esculenta* Kishinouye, is used for food by the inhabitants of the east coast of Leyte where it is preserved in vinegar. As it is apparently a common form in the Visayas (hence the name), there is no reason why it should not form a staple article of food.

It is very closely related to *R. hispidum* Maas, but differs from it in having a distinct pigmental area in the sense organ, in having its mouth arms united for more than two-thirds of their length, and in having 3 wartlike papillæ in the mouth of the subgenital ostia.

ILLUSTRATIONS

(Drawings by Santos, Fajardo, and Peñya)

TEXT FIGURES

FIG. 1. *Cassiopea polypoides* Keller var. *culionensis* var. nov., a sense organ from the subumbrellar side. Much enlarged.

2. *Cassiopea medusa* sp. nov., a sense organ and the adjacent canal system from the subumbrellar side. Very much enlarged.
3. *Cassiopea medusa*, a portion of a mouth arm, showing the scattered mouths and the very typical appendages. × 1.
4. *Acromitus maculosus* gen. et sp. nov., lateral view of the medusa. × 8/9.
5. *Acromitus maculosus*, an exumbrellar view of a sense organ; diagrammatic. Much enlarged.
6. *Acromitus maculosus*, an exumbrellar view of a portion of the bell, showing the canal system as seen when injected; somewhat diagrammatic.
7. *Lobonema mayeri* sp. nov., a quadrant of the exumbrellar surface, showing the papillæ, sense organs, and tentaclelike marginal lappets. × 1/2.
8. *Lobonema mayeri*, a mouth arm, showing the appendages, the windowlike openings, and the irregular arrangement of the ducts; somewhat diagrammatic. × 1/3.
9. *Lobonema mayeri*, a sense organ from the exumbrellar side. Much enlarged.
10. *Lobonemoides gracilis*, an exumbrellar view of half the bell, showing the canal system, the marginal lappets, etc. × 1.
11. *Lobonemoides gracilis* gen. et sp. nov., ventral view of the medusa. × 1/2. Two of the mouth arms of this specimen are aborted.
12. *Lobonemoides gracilis*, a diagrammatic representation of a quadrant of the bell from the subumbrellar side, showing the subgenital ostium, canals, etc. × 1.
13. *Lobonemoides gracilis*, lateral view of one mouth arm and an interostial pillar, showing the ducts as seen in an injected specimen; diagrammatic. × 1.
14. *Rhopilema visayana* sp. nov., an exumbrellar view of a sense organ, showing the adjacent canals as seen in an injected specimen. Enlarged.
15. *Rhopilema visayana*, subumbrellar view of a quadrant, showing the canal system, the radial muscles, and the subgenital ostium with the three papillæ. × 1/2.
16. *Rhopilema visayana*, a diagram of the arrangement of the ducts of two mouth arms supported by a common pillar and of their scapulets. × 1/2.