MARY SEARS

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1. Siphonophores from the Marshall Islands

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NOTES ON SIPHONOPHORES

1. Siphonophores from the Marshall Islands

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ABSTRACT

The CROSSROADS plankton collection extends the range of about 30 siphonophores to the Marshall Islands, but only one third of these was taken in the lagoons. Of the species recorded, *Galetta bigelowi* is new, *Lensia grimaldii* was taken in the Pacific for the first time, and *Diphyes chamissonis*, which is restricted to the Indo-Pacific region, was taken in quantity in Rongelap Lagoon, as it had been in the Great Barrier Reef Lagoon. The significance of this habitat in limiting the distribution of *D. chamissonis* is not apparent.

The siphonophores formed a small fraction of the zooplankton in the area. Comparison with rough estimates of the population of the Mediterranean and of the Great Barrier Reef Lagoon suggests that this sparsity is not uncommon. On the other hand, some evidence of swarming is afforded.

Galetta bigelowi n. sp. is described and figured.

Introduction. During the spring and summer of 1946 some plankton collections were made in the Marshall Islands area as part of the oceanographic program for Operation CROSSROADS[2] (Barnes,

[1] Contribution No. 481 from the Woods Hole Oceanographic Institution.

[2] For convenience, the tests at Bikini in 1946 under the joint auspices of the U. S. Army and Navy, which included an oceanographic survey in the Marshall Islands area during the spring and summer months, is referred to as Operation CROSSROADS. Observations were taken in the vicinity of Eniwetok, Rongelap, and Rongerik atolls, as well as in the vicinity of Bikini Atoll.

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Bumpus, and Lyman, 1948; Ford, 1949; Johnson, 1949; LaFond, 1949; Sargent and Austin, 1949; von Arx, 1948). I am indebted to Dr. Martin W. Johnson of the Scripps Institution of Oceanography for the opportunity to examine the siphonophores in the material he collected.

Insofar as I can ascertain, this is the first published record of any extensive or systematic collection of siphonophores from this particular area. Agassiz and Mayer (1902: 166) mention having drawn a specimen of *Abylopsis tetragona* (as *Abyla huxleyi* Haeckel) that was "obtained near Rongelap Atoll, Marshall Islands," but Agassiz made no regular plankton hauls after leaving the Society Islands (Agassiz and Mayer, 1902: 139, pl. 14). The CARNEGIE, on her last cruise, passed somewhat to the east and north of the Marshall Islands. From the plankton taken along that portion of her route, Totton lists a number of the new species which he described recently (Totton, 1941), but as yet he has not published a complete enumeration of the species from that region. The SHINTOKU MARU (Schott, 1935), on return voyages from Australia to Japan in the early 1930's, passed to the south and west of the Marshall Islands, but I have been unable to locate a report on siphonophores resulting from these traverses.

Geographical Considerations. The CROSSROADS collection is interesting in that it extends the range of about 30 siphonophore species to this area (Table I). However, inasmuch as the collection of siphonophores was incidental to other work, it is improbable that an adequate census of this group was made, since many species are now known to live in some numbers at considerable depths[3] (Bigelow and Sears, 1937). In this connection, it is noteworthy that only about one-third of the species recorded were actually taken within the shallower waters of the lagoons, despite the fact that four times as many tows were made there as in the waters outside the atolls (Table I). This suggests that many of the species taken outside were "strays" from greater depths, especially as they were not taken regularly (Table I) or in any quantity. On the other hand, of the five species prevalent (but seldom numerous) in the lagoons, four (*Abylopsis eschscholtzii* Huxley, *Bassia bassensis* Quoy and Gaimard, *Diphyes chamissonis* Huxley, and *Lensia subtilis* Chun) have previously been known to inhabit the warmer surface waters (Leloup and Hentschel, 1935; Russell and Colman, 1935; Bigelow and Sears, 1937). Although the fifth (*Chelophyes contorta* Lens and Van Riemsdijk) is still rela-

[3] Only the surface layers down to about 60 meters were sampled by using a plankton sampler (Clarke and Bumpus, 1940) or small nets, 10 in., and 30, 40 and 70 cm. in diameter, made of No. 2, 8, 10 or 20 bolting silk (Johnson, personal communication).

TABLE I. Number of Stations (with Approximate Locality) Where Various Species of Siphonophores Were Taken During Operation CROSSROADS

Species	*Bikini Atoll* Inside lagoon	*Bikini Atoll* Outside lagoon	*Rongelap Atoll* Inside lagoon	*Rongerik Atoll* Inside lagoon	*Rongerik Atoll* Outside lagoon	*Eniwetok Atoll* Inside lagoon	*Eniwetok Atoll* Outside lagoon	*Destroyer hauls between 2° 15′ S. & 9° 00′ N. and 166° 39′ E. and 168° E.*
Abyla leuckartii	—	1	—	—	—	—	—	—
Abyla trigona	—	3	—	—	1	—	—	—
Abylopsis eschscholtzii	10+1?*	47+1?	11	2	1	—	1	5
Abylopsis tetragona	—	18	2	—	—	—	1	1
Agalma okeni	1?	6+1?	—	—	1	—	1	2
Agalmid	4+1?	2	2	—	—	—	—	1
Bassia bassensis	19	42+1?	11	3	1	—	1	2
Chelophyes appendiculata	—	7	1	—	1	—	—	—
Chelophyes contorta	33+1?	40+1?	21	3	1	1	2	2
Dimophyes arctica	—	4	—	—	—	—	—	—
Diphyes bojani	3	20	5+1?	2	1	—	—	3
Diphyes chamissonis	15+19?	22+16?	42	2+2?	1	2?	—	5+2?
Diphyes dispar	3	20	2	—	—	—	1	6
Enneagonum hyalinum	—	1?	—	—	—	—	—	—
Eudoxoides mitra	—	6+3?	—	—	—	—	—	—
Eudoxoides spiralis	—	1	1	—	—	—	—	—
Galetta australis	—	6+1?	—	—	—	—	—	1
Galetta chuni	1	2+3?	2	—	—	—	—	1
Galetta bigelowi NOV	—	2	—	—	1	—	—	—
Lensia campanella	—	6	—	—	1	—	—	—
Lensia conoidea	4+3?	6+5?	3+3?	—	—	—	1?	1+1?
Lensia cossack	—	4+2?	—	—	1	—	—	—
Lensia fowleri	—	2	—	—	—	—	—	—
Lensia grimaldii	—	1	—	—	—	—	—	—
Lensia hotspur	—	—	—	—	1	—	—	—
Lensia multicristata	—	2+2?	—	—	—	—	—	—
Lensia subtilis	10	14+1?	4	1	1	—	—	4
Lensia subtiloides	—	6	—	—	1	—	—	—
Lensia sp.?	—	4	—	—	—	—	1	—
Rosacea plicata	—	1	—	—	—	—	—	—
Sulculeolaria monoica	—	3	—	—	—	—	—	—
Sulculeolaria quadridentata	—	1	—	—	—	—	—	—
No. of stations where siphonophores were taken	54	58	42	6	1	2	2	11
No. of stations where plankton tows were taken	210	74	80	19	1	27	3	?

* Since the preservation of the siphonophores was not always sufficiently good to identify positively the various species, a question mark in the above table indicates some uncertainty in identification.

tively unfamiliar, preliminary examination of several DANA stations in the Pacific suggests that this species will also prove to be an inhabitant of the warmer superficial layers.

Of these five species, *Diphyes chamissonis* is unique in that it is the only siphonophore restricted to the Indo-Pacific region. Thus, judging from earlier accounts, it is scarce in the Indian Ocean (Browne, 1926); it is fairly common in the Malay Archipelago (Lens and Van Riemsdijk, 1908), in the Philippines (Bigelow, 1919) and off the east coast of Australia (Huxley, 1858; Russell and Colman, 1935), where it may be the most common and most abundant siphonophore (Table II); it has been recorded to the north (Bigelow, 1913; Kawamura, 1915) but not from the eastern Pacific (Bigelow, 1911). While the present records thus extend eastward the area outlined above, they do not delimit its chief centers of abundance.

Perhaps it is more than a coincidence that the only two reports of *Diphyes chamissonis* in any great quantities are from lagoons, i. e., Rongelap lagoon and the Great Barrier Reef lagoon where it was also the most prevalent of the siphonophores and the second most abundant (Russell and Colman, 1935: 262). However, factors which may limit the distribution or abundance of this or any other siphonophore species in other areas, such as salinity, temperature, currents, and bottom topography (Russell and Colman, 1935; Leloup and Hentschel, 1935; Bigelow and Sears, 1937), are not apparent in analyzing the distribution of the various species in this area; this may be due in part to the small number of individuals taken in any particular tow and possibly because the collection was made over such a short period of time. Thus it will be necessary to await the analysis of other collections before we can determine whether *Diphyes chamissonis* is restricted to the Indo-Pacific because it propagates chiefly in shallow lagoon waters, or whether its dispersal to other areas is limited by temperature, currents, or some other factor.

Of the other species (Table I), none of which was taken in quantity in the Marshall Islands area, four species[4] are among the most common and most numerous in collections made in all oceans; 17 species[5] are

[4] *Abylopsis eschscholtzii* Huxley, *A. tetragona* Otto, *Bassia bassensis* Quoy and Gaimard, and *Chelophyes appendiculata* Eschscholtz.

[5] *Abyla leuckartii* Huxley, *A. trigona* Quoy and Gaimard, *Agalma okeni* Eschscholtz, *Chelophyes contorta* Lens and Van Riemsdijk, *Dimophyes arctica* Chun, *Diphyes bojani* Chun, *D. dispar* Chamisso and Eysenhardt, *Enneagonum hyalinum* Quoy and Gaimard, *Eudoxoides mitra* Huxley, *E. spiralis*, Bigelow, *Galetta australis* Quoy and Gaimard, *G. chuni* Lens and Van Riemsdijk, *Lensia subtilis* Chun, *L. subtiloides* Lens and Van Riemsdijk, *Rosacea plicata* Quoy and Gaimard, *Sulculeolaria monoica* Chun, and *S. quadridentata* Quoy and Gaimard.

TABLE II. Dominant Siphonophores in Various Pacific Ocean Areas

Locality	*Species*	*Remarks*
Marquesas Islands	*Diphyes dispar* Chamisso & Eysenhardt (as *Diphyopsis angustata* and *Ersaea angustata*)	"In the tropical regions of the Pacific—commonest of all Siphonophorae" (Agassiz & Mayer, 1902: 162).
	Chelophyes appendiculata Eschscholtz (as *Diphyopsis appendiculata* and *Ersaea appendiculata*)	"Abundant throughout tropical regions of Pacific" (Agassiz & Mayer, 1902: 160).
Fiji Islands	*Diphyes dispar* Chamisso & Eysenhardt (as *Diphyopsis angustata*)	"Common among the Fiji Islands" (Agassiz & Mayer, 1899: 180).
Eastern Tropical Pacific	*Abylopsis tetragona* Otto	"Five of the commoner" species (Bigelow, 1911: 358).
	Bassia bassensis Quoy & Gaimard	
	Chelophyes appendiculata Eschscholtz (as *Diphyes appendiculata*)	
	Diphyes bojani Chun	
	Eudoxoides mitra Huxley (as *Diphyopsis mitra*)	
Great Barrier Reef	*Diphyes chamissonis* Huxley	"Only really abundant sipnonophores in the barrier reef lagoon" (Russell & Colman, 1935: 256).
	Lensia subtiloides Lens & Van Riemsdijk	
Bass Straits	*Chelophyes appendiculata* Eschscholtz (as *Diphyes appendiculata*)	"Particularly abundant" (Huxley, 1858: 35).
	Bassia bassensis Quoy & Gaimard (as *Sphenoides australis*)	"Abounded" (Huxley, 1858: 62).
South of Tasmania	*Bassia bassensis* Quoy & Gaimard (as *Abyla bassensis*)	"Great abundance" (Huxley, 1858: 46).
East coast of Australia and in Louisiade Archipelago	*Diphyes chamissonis* Huxley	"Took . . . repeatedly" (Huxley, 1858: 36).
Philippines	*Diphyes chamissonis* Huxley	67 superior nectophores;
	Diphyes dispar Chamisso & Eysenhardt	149 nectophores;
	Galetta australis Quoy & Gaimard (as *Galeolaria australis*)	282 nectophores;
	Abylopsis tetragona Otto	87 colonies. (Bigelow, 1919).
Northwest Pacific	*Galetta australis* Quoy & Gaimard (as *Galeolaria australis*)	111 superior nectophores;
	Dimophyes arctica Chun (as *Diphyes arctica*)	74 superior nectophores. (Bigelow, 1913).
Malay Archipelago	*Abylopsis tetragona* Otto (as *Abyla pentagona* and *Aglaisma cuboides*)	169 colonies (or parts thereof), 30 stations;
	Abylopsis eschscholtzii Huxley (as *Abyla quincunx* and *Aglaismoides eschscholtzii*)	138 colonies (or parts thereof), 28 stations;
	Chelophyes contorta Lens & Van Riemsdijk (as *Diphyes contorta*)	296 specimens, 36 stations;
	Diphyes chamissonis Huxley (as *Diphyopsis weberi*)	272 specimens, 20 stations. (Lens & Van Riemsdijk, 1908).

nearly as widespread, but less numerous; three species[6] are found rather more regularly and in greater abundance wherever the deeper layers have been sampled; and three small species,[7] all described within the past 25 years, will probably prove to be widespread.[8] [9]

The only species apparently reported for the first time from the Pacific are *Lensia grimaldii* Leloup, originally described from the vicinity of the Azores (Leloup, 1933) and *Galetta bigelowi* n. sp. (see description on p. 10).

Abundance. Only one species, *Diphyes chamissonis*, occurred in sufficient quantity in the tows to warrant comparison with the general abundance of other plankton constituents in the Marshall Island area and with the numbers of siphonophores in other seas. Actually, an active center of reproduction in Rongelap lagoon at the time of the mid-June survey (Table III) appears to have been responsible for the

TABLE III. Abundance of *Diphyes chamissonis* in Various Parts of the Marshall Islands. Most Tows Were Roughly of Twenty Minute Duration Except Those from the Destroyer Which Averaged One Hour. Numbers Are Unadjusted for Type of Net or Duration of Haul

	Colonies		*Eudoxids*		*No. of tows taking D. chamissonis.*	
	Av.	*Max.*	*Av.*	*Max.*	*All types of gear*	*Clarke-Bumpus Sampler*
Bikini Atoll						
Inside	1	1	2	15	34	28
Outside	1	1	3	12	38	32
Rongelap Atoll						
Inside	82	527	114	842	42	28
Rongerik Atoll						
Inside	0	0	3	5	4	2
Outside	0	0	21	21	1	0
Eniwetok Atoll						
Inside	0	0	2	3	2	2
Destroyer haul	1	1	7	33	7	0

abundance of *D. chamissonis*, since both nectophores and free eudoxids were taken there ranging from a few millimeters to nearly a centimeter.

At one station in the central portion of Bikini lagoon, Johnson (1949: 240, fig. 8) found an average of 66 copepods per cubic meter of water and as many as 255 specimens of *Undinula vulgaris*, the most

[6] *Lensia conoidea* Keferstein and Ehlers, *L. fowleri* Bigelow, and *L. multicristata* Moser.

[7] *L. campanella* Moser, *L. grimaldii* Leloup, and *L. hotspur* Totton.

[8] Totton (personal communication) has found them in some numbers in the Discovery material, while I have found them among the Dana siphonophores from the Pacific.

[9] See Bigelow and Sears (1937) for a discussion of this, as well as for references to earlier work.

abundant copepod. In contrast, not more than one specimen of either generation of *D. chamissonis* per cubic meter of water was taken at any one station there. Furthermore, this species was present in only 16% of the tows in that lagoon. Even the richest tow of *D. chamissonis*, made with a Clarke-Bumpus sampler in Rongelap lagoon, yielded only half as many specimens (29 eudoxids per cubic meter of water) as the *average* copepod catch and only about one-tenth as many as the *biggest* catch of *Undinula vulgaris* in Bikini lagoon, supposing such a comparison to be permissible. At best, then, siphonophores formed only a very small fraction of the total larger zooplankton[10] population at the time of the CROSSROADS survey.

In short, we must come to the conclusion that, insofar as we may estimate the general abundance of siphonophores, they are distinctly scarce when compared with other constituents of the plankton, particularly in an area (Marshall Islands) where the plankton as a whole is definitely scarce (Johnson, 1949: 239). Furthermore, this situation appears to be similar to that in the Great Barrier Reef lagoon (Russell and Colman, 1935: 254) where the siphonophores (taken in the coarse silk net) proved to be 0.3 to 4.8% of the total number of animals caught. It is to be suspected that future examination of more or less quantitative hauls of the plankton as a whole from elsewhere will further substantiate this conclusion. There is a suggestion of this in the catches made with stramin nets[11] in the Mediterranean and adjacent parts of the Atlantic, where a rough total of 264,920 euphausids (Ruud, 1936: List of Material), 40,000 hyperiid amphipods (Stephensen, 1925: 227), and 95,000 siphonophores (Bigelow and Sears, 1937: 3) were taken by the THOR. No figure can be given for the other groups, the figures not being readily obtainable from the published reports, or for the copepods, for which a report is lacking.

Unfortunately, since no indication is given of the speed of towing or the volume of water strained when samples were taken in the Great Barrier Reef lagoon (Russell and Colman, 1931), it is impossible to compute the numbers per cubic meter of water for comparison with the figures obtained in the Marshall Island area. Thus, the only previous report expressing the abundance of siphonophores in terms

[10] The unicellular zooplankton discussed in Johnson's (1949) paper has not been considered in this connection, since these forms are not generally taken in the same nets used in capturing siphonophores.

[11] Catches made with stramin nets contain proportionately higher numbers of siphonophores than those taken with silk nets (Russell and Colman, 1935), presumably because many of the smaller copepods slip through the relatively large meshes.

which can be made at all comparable to those taken on Operation CROSSROADS is the one based on the THOR collection (Bigelow and Sears, 1937). It is questionable, of course, whether one is justified in comparing catches taken with Petersen's Young-Fish Trawl, the net used chiefly in making the THOR tows, with those taken by the Clarke-Bumpus Plankton Samplers, used on Operation CROSSROADS. Admittedly the estimates for the abundance of the THOR siphonophores were rough approximations (Bigelow and Sears, 1937: 68–69), while the volume of water flowing through the sampler is known and hence the number of organisms in a given body of water can be calculated rather accurately. Despite the great difference in nets, it is interesting to note, at least in the absence of more comparable data, that the richest haul of any single species (*Diphyes chamissonis*) in Rongelap lagoon was apparently about five times as great as the richest taken by the THOR (*Bassia bassensis*) in the Atlantic (Table IV). This is quite astonishing in view of the fact that the lagoon

TABLE IV. COMPARISON OF MAXIMAL CATCHES IN THE MARSHALL ISLANDS AND IN THE ATLANTIC

	Marshall Islands Diphyes chamissonis (eudoxids)		*Atlantic Bassia bassensis (colonies)*
	Clarke-Bumpus‡ sampler, No. 2 silk	*40 cm. net, No. 8 silk*	*Young-Fish Trawl*
Actual catch	411	842	—
No. specimens per m³ water	29	32*	6†
Volume (m³) of water per specimen	.03	.03	.18

‡ Dr. Johnson (personal communication) informs me that the sampler actually strained 10,667 liters of water.

* Based on the assumptions (1) that No. 8 bolting silk will filter about three quarters of the amount of No. 2 silk (from comparisons with plankton samplers) and (2) that the amount filtered is increased in direct proportion to the area of the net opening (about 240 cm² for the plankton sampler; 1,257 cm² for the 40 cm. net).

† The most abundant catch of a single species of siphonophores taken by the THOR (Bigelow and Sears, 1937: 139).

waters in the Marshalls were seemingly not an especially favorable environment for siphonophores, as mentioned above (see Table I); however, perhaps it lends support to the idea that this particular species is indigenous to shallow lagoon waters, as suggested previously.

It is a generally recognized fact that plankton organisms are not regularly dispersed in a given body of water but occur in more or less dense swarms. Patches of plankton organisms are observed frequently at the sea surface in such density that they discolor the water, i. e., "red water" (dinoflagellates),[12] "red feed" (*Calanus finmarchicus*[13] or various euphausids), or swarms of Cyanea which occasionally form a thick "soup" off the New England Coast. In contrast to these dense masses, Stephensen (1925: 234) speaks of "shoals" of amphipods, when more than 100 specimens of a species were taken in a 30 minute tow (i. e., about 1 specimen per 3 cubic meters of water).

Other than the marked differences in the numbers caught from station to station, no evidence for the patchiness of siphonophores has been described previously. This is chiefly due to the fact that the older tow nets with their wide mouths, hauled long distances through the water, strained so much water that the catch represented the average rather than the actual condition prevailing over a considerable area—perhaps several miles. The rather limited amount of water strained through the small opening of a plankton sampler apparently affords a means of ascertaining more accurately the actual density of rather small patches and conversely the sparsity elsewhere.

In general, siphonophores occurred in 78% of the tows outside the lagoons and in 30% of those inside. This shows at once that the siphonophores were not evenly distributed throughout the water masses. An even stronger indication results from an examination of the distribution of *D. chamissonis* in Rongelap lagoon, where it was most abundant. Not only did it occur in only 53% of the tows, but in some of these catches it occurred in considerably greater numbers than in others. Obviously, then, this species tends to swarm. Such shoals (maximum of 29 to 32 eudoxids per cubic meter of water, Table IV) are not dense in comparison with the patches[14] of planktonic organisms frequently seen at the surface, but they are considerably denser than Stephensen's (1925) estimates for amphipods.

Systematic Considerations. Since so many of our specimens were

[12] Davis (1948), for example, reports 60,000,000 per liter in the Gulf of Mexico.

[13] Bigelow (1922; 1926: 205) reports upwards of 2.5 million large *Calanus finmarchicus* in what I judge to be a vertical meter net tow from 40–0 meters, which means perhaps upwards of 83 thousand per cubic meter of water.

[14] Recent work on the "scattering layer" (Hersey and Moore, 1948; Johnson, 1948) suggests a concentration of the larger zooplankton organisms (at depths of from 50 to 250 fms.) because of its diurnal vertical migration. This is similar to that observed in shallower areas by earlier workers (Russell, 1936; Clarke, 1934), although no indication is given of the numerical abundance of these organisms. However, the sort of patchiness referred to above has not been considered. Actually, a practical device (or devices) for sampling shoals of organisms of this sort from known levels or from a particular water mass has not yet been devised, but in time this should be possible, especially with the aid of the refined techniques used in delimiting water masses while working in the field (Ford, 1947).

small and not too well preserved, nothing can be added to what is already known, either morphologically or systematically, with the exception of three small (3–4 mm.) superior nectophores which apparently belong to a new species.

Galetta, Stechow 1921

Three rather poorly preserved superior nectophores, taken in separate tows near Rongerik and Bikini atolls, can be definitely referred to the genus Galetta, even in the absence of stems with permanently attached cormidia or of inferior nectophores with looped lateral canals. The nectophores are well rounded without any trace of ridges, the hydroecium is shallow and not clearly defined, and there are no basal teeth surrounding the opening of the nectosac. Commissural canals were not observed, but sufficient evidence has now accumulated to show that this is no longer a reliable character for distinguishing the superior nectophores in this genus from other calycophorids (Bigelow and Sears, 1937: 34, 36).

Galetta bigelowi n. sp.

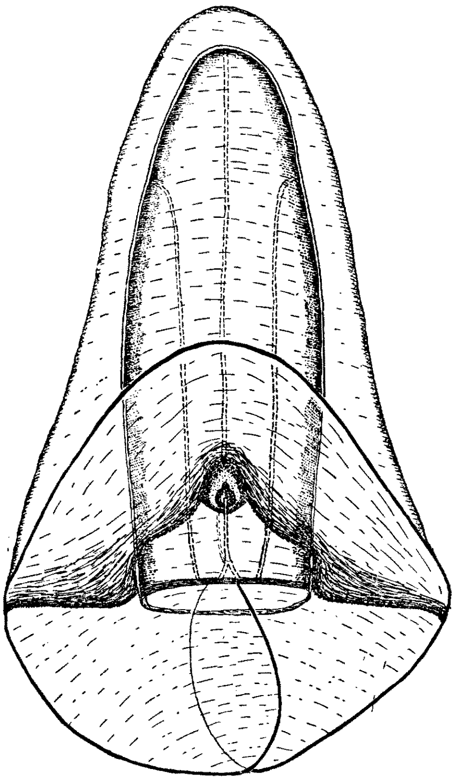
Figures 1 and 2

1 superior nectophore (type), CROSSROADS Plankton Station No. 270; 1 superior nectophore, CROSSROADS Plankton Station No. 300; 1 superior nectophore, CROSSROADS Plankton Station No. 408. (These specimens have been deposited in the U. S. National Museum.)

The three specimens listed above are so different in general appearance from all other members of the Galettinae that, despite poor preservation, it was at once apparent that they belonged to a rare or unknown species. To begin with, the general outline of the nectophore is definitely conical in dorsal and ventral views (Fig. 1) rather than tubular as in most species belonging to the genus. Viewed ventrally, the oblique ventral base, together with the two extraordinarily wide ventral lamellae (Fig. 1),[15] forms an almost complete circle, which, at least in much contracted preserved specimens, tends to surround the opening of the nectosac. Furthermore, in contrast to other species of Galetta, the oblique surface thus formed equals about one half the total height of the nectophore (including the lamellae). The lamellae, however, are not proportionately longer than in other members of the genus, although they are twice as wide. The hydroecium is a shallow indentation (Fig. 1). Just above it and projecting out into this depression is a minute somatocyst whose main axis in

[15] It is believed that an apparent variation in the size of the ventral lamellae of one specimen was due to distortion and shrinkage in preservation.

the crushed specimens at hand appears to be almost at right angles to the nectosac (Fig. 2). The shape of the somatocyst (Fig. 2) appears to be characteristic. The musculature of the nectosac resembles that seen in other members of the genus. There is no trace of the stem or other structures on any of the specimens.



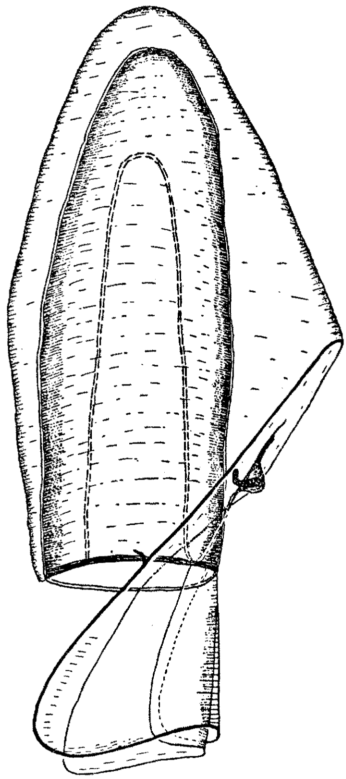


Figure 1. *Galetta bigelowi* n. sp. Ventral view of superior nectophore, somewhat restored, from the specimen taken in CROSSROADS Plankton Station No. 270.
Figure 2. *Galetta bigelowi* n. sp. Lateral view of superior nectophore, restored and somewhat diagrammatic, from the specimen taken in CROSSROADS Plankton Station No. 270.

The canal system in the genus Galetta appears to be extremely variable even among individuals of the same species. Although not definitely proven, it begins to look as if the younger individuals are apt to have canals of the *Diphyes* type which, as they grow older, develop the commissural canals usually considered as characteristic of the Galettinae (Browne, 1926: 68; Totton, 1932: 344; Bigelow and Sears, 1937: 36). The three specimens at hand, all small, lack these. In addition, this species is unique in that the ventral canal splits into two short branches before entering the ring canal. At the point where the canal splits, the short pedicular canal enters from the stem and somatocyst. This appears to be fairly characteristic, if these three specimens can be taken as typical. Nevertheless, it should be borne in mind that there is considerable variability in *G. australis*, in this region. In the latter species, the lateral canals may enter the ring canal directly, they may enter the ring canal at the point of entrance of the ventral canal, or they may enter the ventral canal some distance above the ring canal (Bigelow and Sears, 1937: 36). The pedicular canal seems to have been overlooked in a number of instances, but re-examination of well preserved ALBATROSS and ARCTURUS specimens of *G. australis* in the collection of the Museum of Comparative Zoology, together with drawings of *G. chuni* (Lens and Van Riemsdijk, 1908: pl. 9, fig. 78), of *Sulculeolaria quadridentata* (Bigelow, 1918: pl. 8, fig. 1), of *S. quadrivalvis* (Bigelow, 1931: figs. 195, 197), plus descriptions of the canal system (Browne, 1926), all seem to indicate that this canal enters the ring canal directly at the same point as the ventral canal or may enter the ventral canal just above the ring canal (Browne, 1926: 68). Whether a similar range of variation will be found in the present species, when more specimens are available, remains to be seen. Actually, in the three specimens in the CROSSROADS collection, none of which are very well preserved, the only variation seems to be in the relative height of the lateral canals. In one specimen they reach nearly to the apex, but in the other two they extend only about three quarters of the distance between the opening of the nectosac and the apex.

Two characteristics of the superior nectophores, i. e., the extraordinarily wide ventral lamellae and the peculiar shape of the somatocyst (Figs. 1 and 2), distinguish the present species from the other recognized members of the genus Galetta, namely *G. australis* Quoy and Gaimard (genotype), *G. chuni* Lens and Van Riemsdijk, and *G. meteori* Leloup.[16] Furthermore, I believe that the three specimens at hand cannot be referred to the questionable species, *G. turgida* Gegenbaur (1854), because they do not have the unique characters usually attributed to *turgida* (i. e., the single rounded ventral lamella and the absence of a somatocyst); in addition, they do not have the ridges on

[16] Totton (1932: 34) also lists *biloba* among the species of this genus, but Bigelow (1918: 419; 1931: 564) as well as Moser (1913, 1925) have relegated Sars species, *biloba*, to the synonymy of *G. australis* Quoy and Gaimard. Leloup's (1934) specimens of *meteori* were all so small that they may eventually prove to be the young of *australis* (Bigelow and Sears, 1937: 34).

the superior nectophores that he described. Therefore, they seem to belong to a new species, *Galetta bigelowi*, which is named for Professor Henry B. Bigelow in appreciation of the years I had the privilege to work with him.

For some time there has been considerable doubt as to whether Gegenbaur's (1854) *Diphyes turgida* could be definitely associated with any siphonophore found in recent years (Bigelow and Sears, 1937: 33), because his description of the anterior nectophore as having "eine dünne, abgerundete Lamella" (Gegenbaur, 1854: 443) distinguishes it from all other known siphonophores. Later, in the same paper, Gegenbaur (1854: 454) repeats his description of this character by saying "an der Mündung des vordern, so wie an jener des hintern Schwimmstücks eine vorstehende abgerundete Lamella." *D. turgida* was also described as lacking a somatocyst by both Gegenbaur (1854) and Sars (1859), although Chun (1885) figures one on a young superior nectophore, which lacks other distinguishing characters. In studying one of our specimens, the only one in which the overlapping ventral lamellae were undamaged, a first inspection revealed what appeared to be but a single undivided lamella. However, on closer examination two overlapping lamellae (Fig. 1) were actually found. Likewise, without using quite a high power of the microscope, the somatocyst would not have been obvious. Hence, both characters which make the species under consideration unique ~~among siphonophores~~ are such that they could have been overlooked easily. However, Gegenbaur's powers of observation and description have proven so accurate in most instances that it is hard to believe he erred on this occasion. Because his figure (1854: pl. 23, fig. 1) resembles, on a smaller scale, that of *G. australis* as drawn by Bigelow (1911: pl. 6, figs. 1, 3), it would seem that he probably had described damaged specimens of *G. australis* and that *G. turgida* should become a synonym of *G. australis*, as suggested tentatively by Bigelow (1911: 234, 238). This would appear reasonable, for *G. australis* is an extremely fragile species and is usually badly damaged in most plankton samples; in such cases the somatocyst is often destroyed completely (Bigelow and Sears, 1937: 36). Unfortunately, this solution does not seem possible in view of the fact that Gegenbaur (1854: 442) definitely states that the superior nectophore is "einem vierseitigen Körper, der nach vorn pyramidal sich zuspitzt."

The only recent author who figures a specimen believed to be *G. turgida* is Candeias (1929: 272–273, fig. 2). He suggests that his specimen is Gegenbaur's species owing to the very small somatocyst, but the figure otherwise resembles closely his drawing of *G. australis*. However, within the last few years, study of a considerable series has shown that the somatocyst in *Galetta australis* (Bigelow and Sears, 1937: 36, fig. 26) may be quite variable in size (and may even be absent in preserved specimens). It now appears likely that Candeias' specimen actually may have been *G. australis* rather than *G. turgida*, as he suggested.

Totton (1932) reports *turgida* from the Great Barrier Reef, but without either figures or description. He also writes me that my description of the CROSSROADS specimens "sounds like a species with relatively large lamellae—identified tentatively with *Galetta turgida*" (Totton's letter dated 2 March 1949). This suggests that Totton's species may be the same as the one described above and here called *G. bigelowi*.

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