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D. C. Biggs and G. R. Harbison

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THE SIPHONOPHORE *BATHYPHYSA SIBOGAE* LENS AND VAN RIEMSDIJK, 1908, IN THE SARGASSO SEA, WITH NOTES ON ITS NATURAL HISTORY

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ABSTRACT

Eleven specimens of *Bathyphysa sibogae* Lens and van Riemsdijk, 1908 (Siphonophorae: Cystonectae) were collected by SCUBA divers in the upper 30 m of the Sargasso Sea. The appearance and behavior of the living animal are described for the first time. The larger gastrozooids are attached to the stem by pedicles, and their tentacles have tricornate tentilla. The hyperiid amphipod, *Schizoscelus ornatus* Claus, 1879 seems to be preferentially associated with this siphonophore.

Bathyphysa sibogae Lens and van Riemsdijk, 1908 (Siphonophorae: Cystonectae) is known only from two specimens found in preserved collections of the SIBOGA Expedition (Lens and van Riemsdijk, 1908). Both came from trawls to 2080 m deep near the Celebes Islands. This paper reports the occurrence of *B. sibogae* in the Western North Atlantic Ocean.

We observed and collected 11 specimens of *B. sibogae* while SCUBA diving in the upper 30 m of the western Sargasso Sea during R/V ATLANTIS-II Cruises 84 and 85 (Table 1). Since this siphonophore is considered a rare species, we will describe its morphology and provide some information on aspects of its natural history.

Description of the Species

The most prominent features of a colony of *B. sibogae* are the pneumatophore (apical gas-filled float) and series of gastrozooids (feeding polyps) which are arranged along one side of the highly contractile stem (Fig. 1). The living colony appears colorless except for a cap of red-violet pigment around the apical pore of the pneumatophore. The pneumatophore is bluntly fusiform in shape and while alive measured 4.0×1.0 mm. Small hypocystic villae are located at the base of the reflective gas-filled pneumatosaccus. The small gastrozooids are transparent, while large gastrozooids have opaque patches of nematocysts in the ectoderm.

Several forms of gastrozooids occur along the stem. Gastrozooids closest to the apical float are flattened dorso-ventrally and have ptera (lateral aliform ridges which distinguish the genus *Bathyphysa* from *Rhizophysa*). Gastrozooids #18-22 also have ptera, but each has a small basal tentacle bud as well. The tentacle is more pronounced in gastrozooids #23-25, and ptera are absent. Gastrozooids #23-25 are each attached to the stem by pedicles.

The specimens we observed and collected are much smaller than the two described by Lens and van Riemsdijk (1908). In 4% formalin buffered with sodium borate, the colony illustrated in Figure 1 is only 25 mm long. The remainder of the stem (not illustrated in Fig. 1) is complexly contracted and has six gastrozooids with well-developed tentacles and pedicles. The largest gastrozooids are 5-10 mm long and are attached to the stem by pedicles 3 mm long (Fig. 2). Each of these large gastrozooids has a tentacle with 35-40 tentilla. The tentacles produce a sharp stinging sensation when touched. The largest tentilla (those most distal) are segmented and measure about 0.1 mm in diameter. They are faint pink in color and each ends in a swelling 0.2-0.3 mm long with two lateral projections (Fig. 3). A smaller terminal projection represents the developing central filament (Lens and van Riemsdijk, 1908, Fig. 164).

Gonodendra are located midway along the

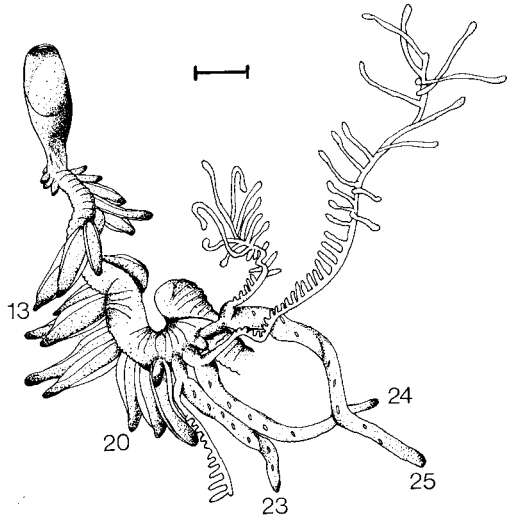

Figure 1. Upper part of a colony of *Bathyphysa sibogae* from the Sargasso Sea, showing the pneumatophore at the apical end of the colony, the first 25 gastrozooids and the tentacles of gastrozooids 23, 24, and 25. Gastrozooids 13, 20, 23, 24, and 25 are numbered in the figure. Pedicles are visible at the bases of gastrozooids 23, 24, and 25. Scale line 1 mm.

stem between two gastrozooids and their early developmental stages closely resemble those of *B. conifera* (Leloup, 1936, Fig. 6). The largest gonodendrum from the animals we collected measured 1.3 × 0.8 mm (including gonostyle) and bore 14 colorless lateral buds. Each bud was a grapelike swelling which measured about 0.3 × 0.1 mm (Fig. 4). The lack of differentiation of the gonophore buds and the small size of the animals we collected both suggest that all were juvenile, sexually-immature colonies.

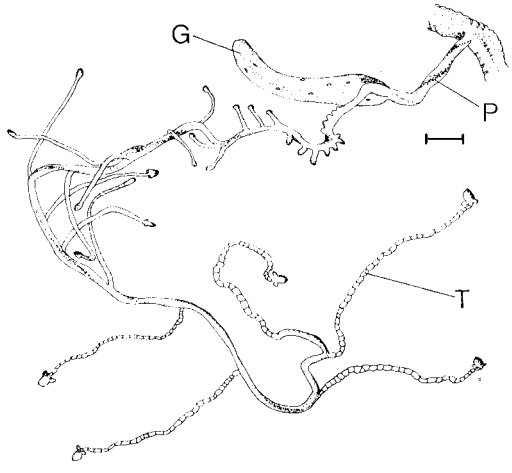

Figure 2. Older gastrozooid (G) of *Bathyphysa sibogae*, showing pedicle (P) and form of the tentilla (T). Scale line 1 mm.

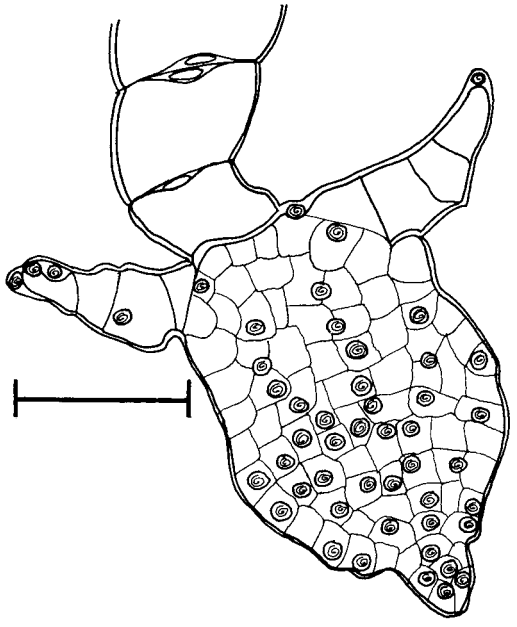

Figure 3. Tentillum of *Bathyphysa sibogae*, showing the arrangement of the nematocysts. Scale line 0.1 mm.

Notes on the Natural History of *B. SIBOGAE*

An undisturbed living colony of *B. sibogae* hangs vertically in the water with the stem often extending more than 300 mm below the pneumatophore. In this fishing posture, the longer tentacles may trail an additional 60 mm and the pedicles may extend up to 10-15 mm in length. The colony can contract to about one-tenth of its extended length through a series of longitudinal contractions of stem and tentacles which cause the stem to spiral dextrally.

Bathyphysa sibogae does not swim by contraction of the ptera of younger gastro-

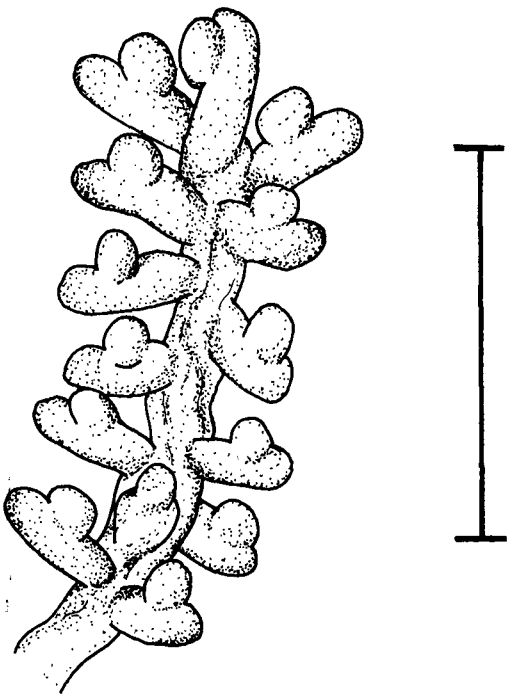

Figure 4. Developing gonodendrum of *Bathyphysa sibogae*. Scale line 1 mm.

zooids, as suggested by Lens and van Riemsdijk (1908). It can only writhe about in the water by repeated contraction and relaxation of the stem as does *Rhizophysa filiformis* Forskal, 1775 (Totton, 1965). Gastrozooids with ptera are no more prehensile than the larger, tentaculate gastrozooids, which is contrary to Fewkes' (1884) suggestion. Our observations of living colonies of *B. sibogae* suggest that the ptera may function primarily to retard the sinking of the colony. In colonies of *B. sibogae* extending in fishing posture, the smaller gastrozooids are oriented at right angles to the stem.

The hyperiid amphipod, *Schizoscelus ornatus* Claus, 1879 seems to be preferentially associated with *B. sibogae* (Table 1). Of the eleven colonies of *B. sibogae* we collected, five had *S. ornatus* associated with them, and one had a mature *Thyropus edwardsii* (Claus, 1879). The rest had no amphipods. We have collected *S. ornatus* only with *B. sibogae*, while we have found *T. edwardsii* with other species of siphonophores.

Table 1. Stations where *Bathyphysa sibogae* was collected

Date	Time	Position	Surface Temp.	Numbers of *B. sibogae*	Number and Kind of Associated Amphipods
15 August 1974	1000	28°31′N, 67°38′W	28.8°C	1	1 *Schizoscelus ornatus* (4.3 mm female)
				3	no amphipods
	1540	29°10′N, 67°41′W	28.8°C	1	1 *Schizoscelus ornatus* (5.4 mm mature female)
				1	1 *Schizoscelus ornatus* (4.7 mm female)
16 August 1974	1100	31°40′N, 67°43′W	28.8°C	1	1 *Thyropus edwardsii* (6.2 mm mature male)
	1515	31°41′N, 67°43′W	28.8°C	1	4 *Schizoscelus ornatus* (4.3 mm mature male) (3.5 mm male) (3.4 mm male) (4.4 mm female)
				1	no amphipods
3 October 1974	1600	28°31′N, 62°30′W	27.7°C	1	no amphipods
4 October 1974	1700	29°37′N, 63°45′W	27.7°C	1	1 *Schizoscelus ornatus* (3.5 mm female)

Our field and aquarium observations indicate that *S. ornatus* moves about freely on the pneumatophore and the smaller gastrozooids but avoids the gastrozooids with tentacles. If the amphipod's freedom of movement is restricted, as when it is enclosed in a jar with its host, it can be captured and quickly ingested.

Discussion

Both of Lens and van Riemsdijk's type specimens of *B. sibogae* were badly fragmented. The smaller of the two apparently had no gastrozooids with mature tentilla (Lens and van Riemsdijk, 1908, Fig. 148), suggesting that it may have been the apical part of a much larger colony. Only two gastrozooids with tentacles remained on the stem of the second, but these seemed to be attached by long filamentous pedicles (Lens and van Riemsdijk, 1908, Fig. 160).

Leloup (1936) was unable to discern the presence of pedicles when he reexamined the type material. He published a figure of an isolated gastrozooid from *B. sibogae* and identified the basal filament as a tentacle (Leloup, 1936, Fig. 9). Accordingly, Leloup abandoned previous classification schemes based on the presence or absence of pedicles and grouped all previously described Cystonectae material with ptera and simple tentacles as *Bathyphysa conifera* (Leloup, 1936). Leloup retained *B. sibogae* as a second distinct species because it had tentilla.

Our specimens clearly have pedicles, and suggest that Leloup's synonomy may not be appropriate. If other species of *Bathyphysa* exist (e.g., *B. abyssorum* Studer, 1878; *B. japonica* Kawamura, 1954), *B. sibogae* may be distinguished by two anatomical features: (1) The tentacles have tentilla (terminating in an ampulla and two lateral filaments); (2) Pedicles are present at the basal end of the larger gastrozooids.

The different morphological forms of gastrozooids which occur sequentially along the stem of *B. sibogae* probably represent stages in gastrozooid development. During growth of Cystonectae siphonophores, gastrozooids produced in the budding region at the base of the pneumatophore become progressively situated towards the posterior part of the stem. Gastrozooids with ptera are found adjacent to this budding zone. These are probably juvenile gastrozooids unable to capture and ingest prey. Later, they develop by differential growth into the larger pediculate, tentaculate gastrozooids. Gastrozooids #18-23 (Fig. 1) represent stages in this transformation process. Shortly after the formation of a tentacle bud (gastrozooids #18-22), the basal region of the gastrozooid seems to elongate and differentiate into the pedicle. The ptera disappear and simultaneously the tentacle and pedicle become well-developed (gastrozooids #23-25).

Siphonophores of the genus *Bathyphysa* have been considered to be deep-living organisms, since most specimens collected came from deep trawls or were removed from hydrowire or cable being retrieved from casts deeper than 1000 m (Leloup, 1936; Totton, 1965). Records of *B. conifera* from the Atlantic Ocean have a distributional range extending from at least 47°53′N to 24°24′S (Leloup, 1936). *Bathyphysa* has also been collected from the equatorial Pacific Ocean (Lens and van Riemsdijk, 1908) and off the east coast of Japan (Kawamura, 1954). However, many specimens of each of the three other genera of Cystonectae siphonophores (Totton, 1965) have been obtained from surface tows. Both *Physalia* and *Epibulia* float on the surface (Alvarino, 1972), while *Rhizophysa* is frequently present in the epipelagic zone (Bigelow and Sears, 1937; Pugh, 1974).

The fact that we have collected 11 specimens of *B. sibogae* implies that this species is not rare and may even be abundant in the upper water layers. Though it is difficult to understand why *B. sibogae* has not been reported since its original description, it is perhaps significant that all Cystonectae siphonophores of the Family Rhizophysidae adhere to fabric. Since they are delicate and easily fragmented as well, most specimens

captured in plankton nets probably never reach the cod-end in recognizable condition.

The specimen of *B. sibogae* described in this paper has been placed in the Museum of Comparative Zoology at Harvard University.

Acknowlegments

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Address: *Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543.*