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Rosacea flaccida n. sp., a new species of siphonophore (Calycophorae Prayinae) from the North Atlantic Ocean

D. C. BIGGS, P. R. PUGH & C. CARRÉ

ABSTRACT

Rosacea flaccida, a new prayine siphonophore, is described from specimens collected by SCUBA divers in the upper 30m of the subtropical and temperate North Atlantic Ocean. The new species has stoutly cylindrical, flaccid nectophores and delicate flattened bracts. The nectophores are morphologically similar to those of *R. plicata sensu* Bigelow, 1911 and *R. cymbiformis* (delle Chiaje, 1822) having a deep hydroecial groove and meandering lateral radial canals in the nectosac. In one of the nectophores there is a slight dorsal prolongation of the somatocyst at its apical end into the mesoglea. The eudoxid bracts are distinctive, being flattened dorsoventrally and divided, on the proximal side of the stem, into two lobes which are twisted at an angle of approximately 90° to the lobe on the distal side. Right and left longitudinal bracteal canals are well developed. The origin of the dorsal bracteal canal from the right longitudinal canal differs from that in the other *Rosacea* species but resembles the configuration found in the bracts of species of the genus *Praya*.

INTRODUCTION

Living specimens of a new siphonophore species of the genus *Rosacea sensu* Bigelow, 1911 were collected by SCUBA divers in the northern Sargasso Sea and the western North Atlantic Ocean Continental Slope Water. The surface temperature and salinity at collection sites ranged from 19.6-26.8°C and 35.3-36.6‰ respectively (Table 1). *In situ* observations were made of the swimming and fishing behaviour of the animals, while five complete specimens were collected in hand-held jars. The species has been designated *Rosacea flaccida* n. sp. because it has delicate, flaccid nectophores and bracts.

Table 1. Stations where *R. flaccida* was collected.

| Date | Cruise | Position | Surface Temperature | Surface Salinity |
|-------------|------------|-----------------|---------------------|------------------|
| 5 Jun 1975 | CHAIN-122 | 29°30'N 58°27'W | 25.1°C | 36.6‰ |
| 28 Nov 1975 | KNORR-53 | 38°55'N 67°46'W | 19.6°C | 35.6‰ |
| 28 Nov 1975 | KNORR-53 | 38°55'N 67°58'W | 21.2°C | 35.3‰ |
| 28 Jul 1976 | OCEANUS-11 | 37°00'N 65°00'W | 26.8°C | — |
| 29 Aug 1976 | KNORR-58 | 38°57'N 72°21'W | 23.7°C | — |

ABBREVIATIONS USED IN PLATES AND FIGURES

- br bract
- c.d. bracteal canal, dorsal
- c.h.l. bracteal canal, left hydroecial
- c.h.r. bracteal canal, right hydroecial
- c.l.l. bracteal canal, left longitudinal
- c.l.r. bracteal canal, right longitudinal
- c.v. bracteal canal, ventral
- aS₁ apical prolongation of S₁
- ga gastrozoid
- go ♀ gonophore, female
- go ♂ gonophore, male
- h hydroecial groove
- m.l. muscular lamellae (attach nectophores to stem)
- N₁ definitive nectophore one
- N₂ definitive nectophore two
- ns nectosac
- os ostium
- p.c. pedicular canal of nectophore
- r.c. radial canal of nectophore
- S₁ somatocyst of N₁
- S₂ somatocyst of N₂

DESCRIPTION

Classification: Prayinae Chun, 1897.
Rosacea sensu Bigelow, 1911
***Rosacea flaccida* n. sp.**

Holotype: Specimen collected by SCUBA divers on 28th November 1975; preserved in 4% formalin buffered with sodium borate. Presented to the Zoölogisch Museum, Amsterdam, reg. no. ZMA COEL. 7855.

Paratypes: A paratype has been placed with the U.S. National Museum of Natural History (specimen collected 28 July 1976) and each author has retained one of the remaining specimens.

Type locality: 0-30 m, northern Sargasso Sea (38°55'N, 67°58'W).

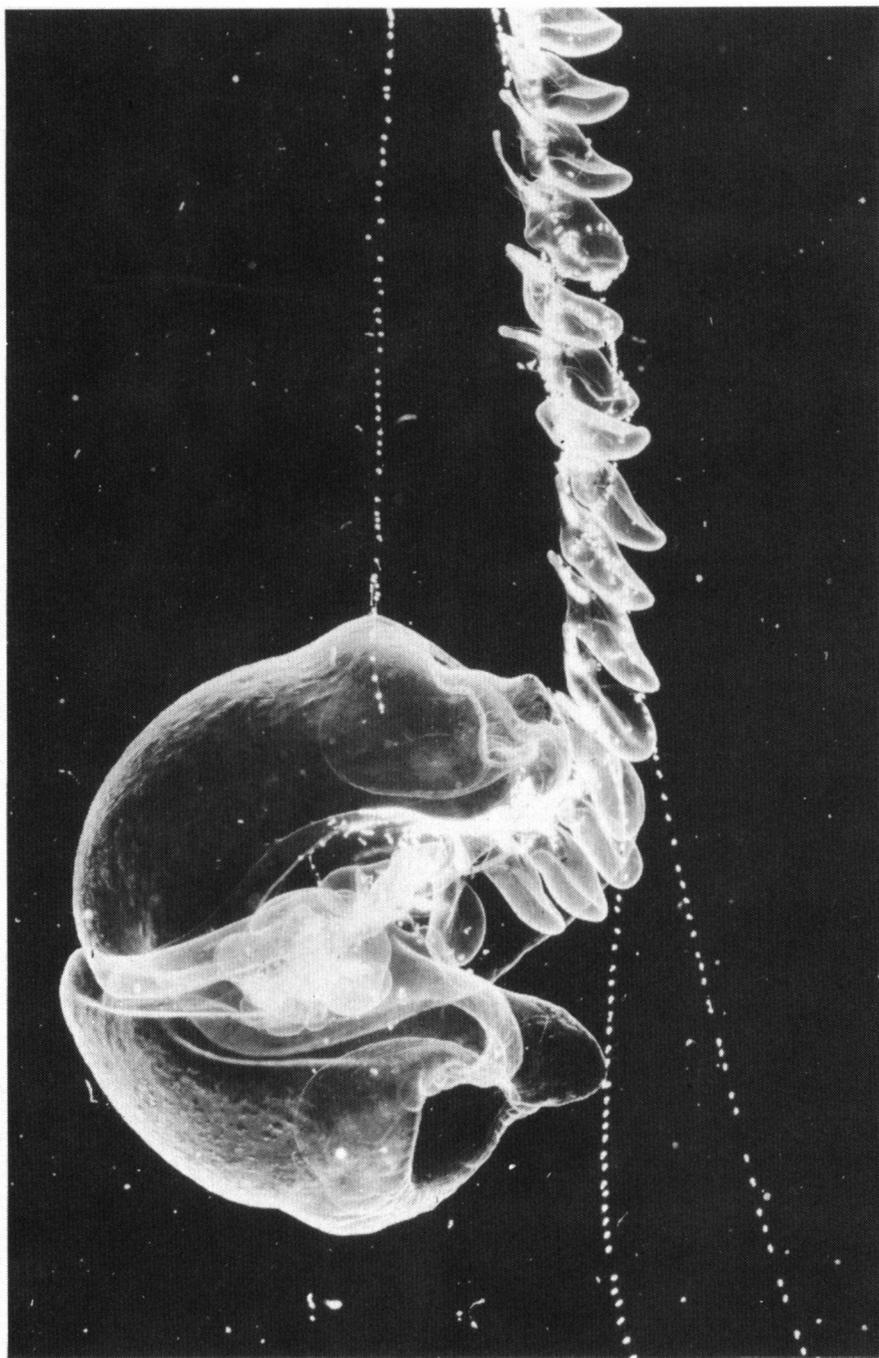


Plate I. *Rosacea flaccida* n. sp., living colony with stem partially extended in fishing posture

(photo by L. P. Madin).

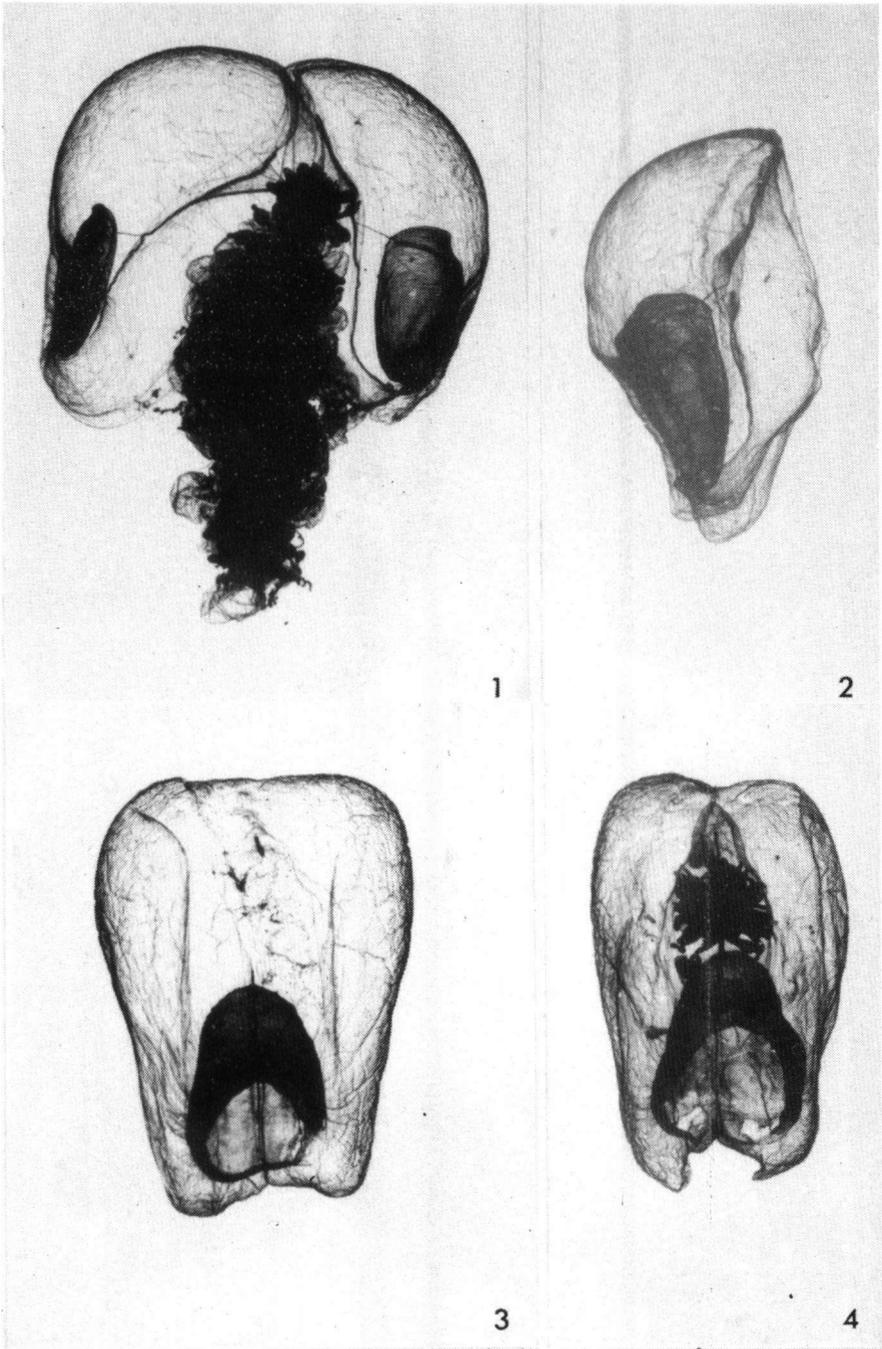


Plate II. *Rosacea flaccida* n. sp. 1. Colony in lateral view; 2. Nectophore N_2 , lateral view; 3. Nectophore N_1 , ventral view; 4. Nectophore N_2 , ventral view.

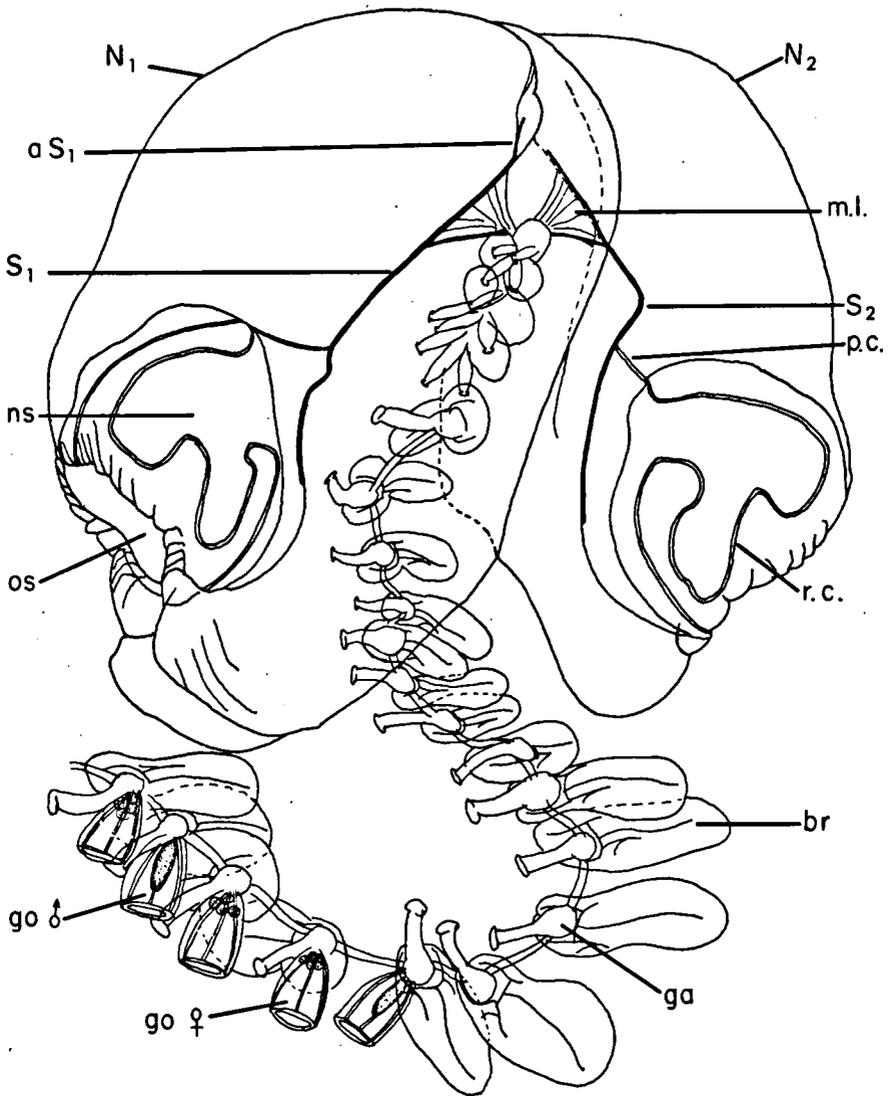


Fig. 1. *Rosacea flaccida* n. sp., colony in lateral view (from a photograph of a living specimen).

A. Nectophores (Fig. 1, Plates I & II)

There are two definitive nectophores (N_1 and N_2) apposed at the anterior end of a long, highly-contractile stem. Both are rounded, stoutly cylindrical and have no pronounced ridges. Small, rounded papillae, 0.2-0.3 mm in diameter, are present on their exumbrellar surfaces in the living specimens but these are not usually seen after preservation. The nectophores measure 2-3 cm in length, with N_1 being 1-3 mm longer and broader than N_2 . The hydroecium of N_1 is a broad, deep gutter extending the entire length of the

ventral surface of the nectophore. Its width is roughly comparable with that of the nectosac (Pl. II, 3). In contrast, the hydroecium of N_2 is narrower, about two-thirds the width of the nectosac. It is further constricted at its apical end and is of uneven depth, having a shallow conical depression midway along its length (Fig. 1, Pl. II, 2 & 3).

The somatocyst, which follows the dorsal surface of the hydroecium, is unbranched in both nectophores, and extends basally below the origin of the pedicular canal. There are no terminal swellings. The apical part of the somatocyst of N_1 extends dorsally for 0.5-1 mm into a pocket of mesoglea (Fig. 1).

The nectosacs of the living specimens occupy about one-third of the overall length of each nectophore, their ostia opening on the dorso-basal surface. In the relaxed state, the nectosacs were almost hemispherical in shape but contractions of the ostial musculature could compress them to shallow, slipper-like cavities. The lateral radial canals of the nectosacs take broad, W-shaped meandering courses.

B. *Siphosome*

There are between 30 and 70 stem groups in our specimens of *R. flaccida*. The tentilla are bright yellow in the live specimens, and the tentacles, together with the gastrozooids, are very similar in gross morphology to those of the well known species, *Rosacea cymbiformis*. The structure of the tentillum is typical of the calyphoran siphonophores and in particular the prayine species (Carré, 1969a, b). Each tentillum contains four categories of nematocysts whose positioning is always more or less the same. However their number and size vary from species to species (see Table 2). There are

Table 2. The categories of nematocysts found in the species of *Rosacea* and *Desmophyes*. Size and number per tentillum.

| Nematocyst type | Microbasic Mastigophore | Anisorhiza | Desmoneme (two types) | Rhopaloneme |
|------------------------|--------------------------|-------------|-----------------------------|--------------|
| <i>R. flaccida</i> | ca. 30 75 × 8μm | 30 × 5μm | 7.5 × 7μm 10 × 8μm | 15 × 3μm |
| <i>R. cymbiformis</i> | ca. 30 75 × 8.5μm | 37 × 6.5μm | 14.5 × 10μm 12.5 × 8.5μm | 13.5 × 3.5μm |
| <i>R. plicata</i> | ca. 36 120 × 10μm | 50 × 9μm | 9 × 9μm 18 × 12.5μm | 30 × 5.5μm |
| <i>R. villafrancae</i> | ca. 6 *) 32.5 × 8.5μm | 20μm long | 5 × 3.5μm | 7.5 × 1.5μm |
| <i>D. annectens</i> | 140 × 9.5μm | 37.5μm long | 13.5 × 10μm | 12.5 × 4.5μm |

*) No mastigophores, but euryteles present.

about thirty large, penetrant nematocysts (mastigophores) in the cnidoband of each tentillum, together with many smaller anisorhizas and desmonemes (Plate III, 5). In the terminal filament, pairs of rhopalonemes alternate with desmonemes (Plate III, 6).

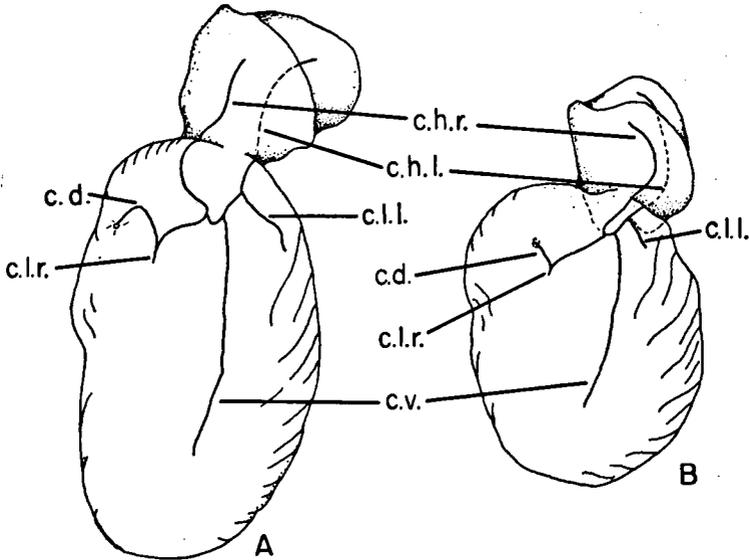


Fig. 2. *Rosacea flaccida* n. sp., camera lucida drawings of preserved bracts (A = Mature; B = Juvenile).

1. Bracts (Fig. 2; Pl. III 1-2)

The bracts of *R. flaccida* are sufficiently distinctive that the eudoxids are unlikely to be confused with any other prayine siphonophore. Unlike the bracts of the other *Rosacea* species, those of *R. flaccida* are not globular but are strongly flattened dorso-ventrally. Bracts towards the posterior*) end of the stem range from 6-10 mm in length, and are two or three times longer than broad. Each bract is divided on the side proximal to the stem into two lobes which are twisted approximately through 90° relative to the lobe on the distal side. The dorsal bract canal arises from the right longitudinal canal and extends to the dorsal surface of the bract. The ventral bract canal terminates about 0.5 mm short of the bract surface.

2. Gonophores (Pl. III, 3-4)

All of our specimens bore buds of both male and female gonophores. The gonophores are simple, rounded, with only slightly thickened walls and without wing-like expansions and thus contrast with those of *R. cymbiformis*.

*) The terminology for the orientation of the siphonophores follows the conventions of Bigelow and Sears (1937).

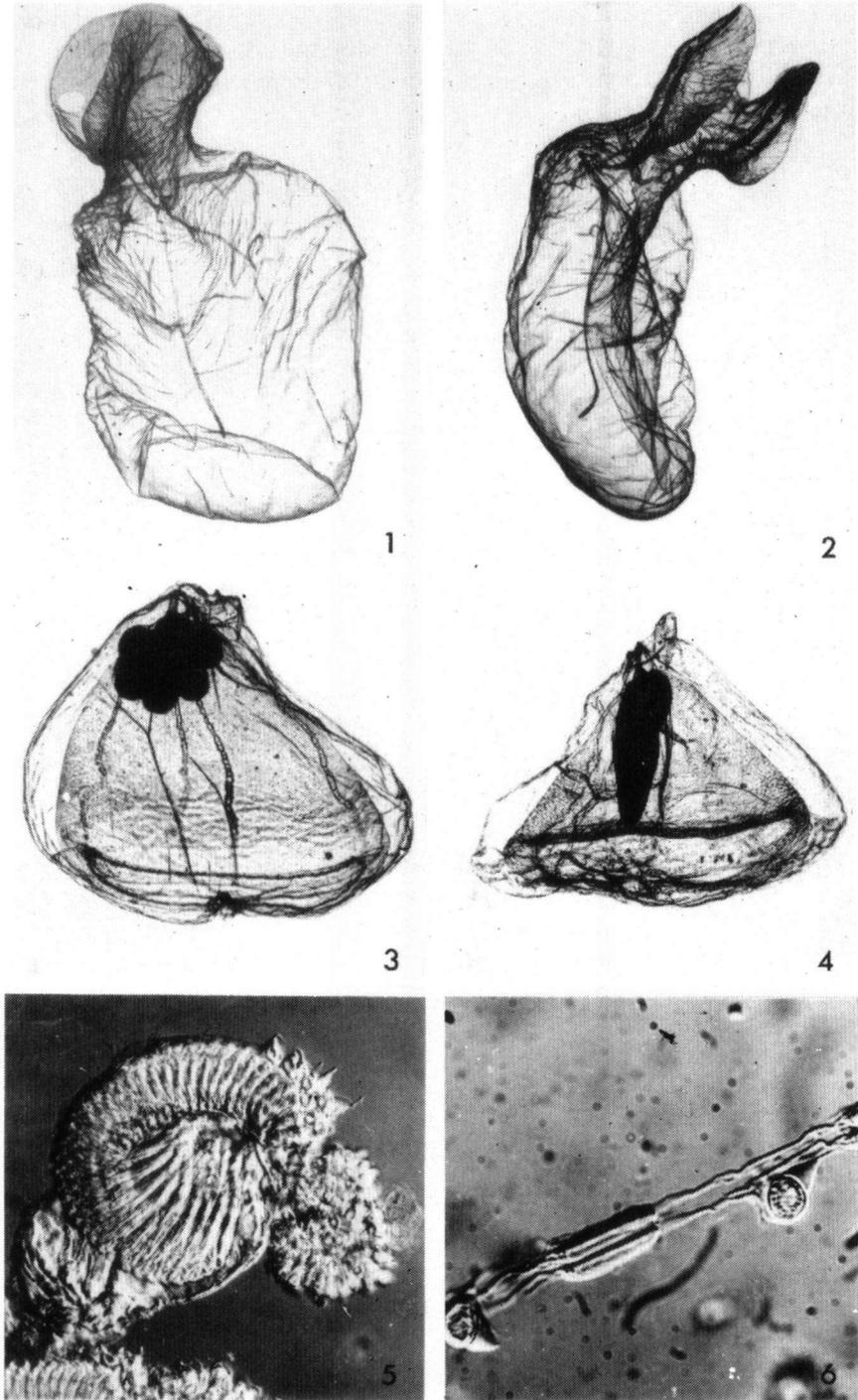


Plate III. *Rosacea flaccida* n. sp., components of stem groups. 1. Bract, ventral view; 2. Bract, lateral view; 3. Gonophore, female; 4. Gonophore, male; 5. Preserved tentillum, lateral view, showing the prominent penetrant nematocysts of the cnidoband; the terminal filament is contracted; 6. A portion of the terminal filament of the tentillum, stretched, to show the alternation of two rhopalonemes with each desmoneme.

The more posterior cormidia contained a single well-developed gonophore, measuring 2.0×2.5 mm. The spadix of a male gonophore measured 2.5-3 mm in length, while female gonophores bore up to eight eggs, each being 0.12-0.14 mm in diameter. The radial canals in the umbrella of both types of gonophore ran straight from the pedicular canal to the ring canal.

C. Notes on Fishing and Swimming Behaviour

The stem of *Rosacea flaccida* is highly contractile but can relax to a length of 30-70 cm in a drifting, "long-line" configuration (Plate I). In this fishing posture each individual tentacle may contract and relax once or twice a minute, but the whole animal remains relaxed for up to three or four minutes. When the animals were prodded by a diver the stem and tentacles would contract into a stream-lined configuration, but not all the cormidia could be withdrawn into the hydroecia. Swimming speeds (see Biggs, 1977) were estimated to be less than 2 cm sec⁻¹, on average.

DISCUSSION

Bigelow (1911b), in his generally excellent monograph on the Siphonophorae, remarked that the synonymy of the subfamily Prayinae was extremely confused considering that only seven species could justify recognition. Unfortunately his attempts to rectify the situation were not completely successful, and, in the case of the genus *Rosacea*, resulted in further confusion. Bigelow (1911a) described some nectophores, and cormidial fragments, taken from the Bay of Biscay, under the name *R. plicata* Quoy & Gaimard, 1827, and mentioned that the somatocysts in the nectophores were dilated at their apical ends, although the dilations were sometimes obscured due to the contraction of the preserved material. Such a terminal dilation of the somatocyst is clearly seen in the original illustration of *R. plicata* by Quoy and Gaimard.

Bigelow (1911b) compared these Biscayan specimens with others taken in the eastern Pacific Ocean, enlarging his description of the somatocyst of the former specimens by stating that their upper ends turned dorsally away from the dorsal surface of the hydroecium and that their terminal regions were slightly thickened, sometimes forming definite egg-shaped dilations. In the Pacific Ocean specimens, however, he found neither a dorsal extension of the somatocyst nor any terminal dilations, but considered that their presence in the Biscayan specimens was so variable that the differences between all the specimens represented only intraspecific variation. Unfortunately the Biscayan specimens were not illustrated, for it is the clear illustrations and description of the "Albatross" specimens from the eastern Pacific Ocean which have subsequently been adopted as the basis for the identification of material under the name *R. plicata sensu* Bigelow. It is apparent now that this

latter species is, however, clearly different from that described by Quoy and Gaimard (1827).

Thus, as Totton (1965) discussed in his Synopsis of the Siphonophora, since 1911 the generic name *Rosacea* commonly has been used, not in the original sense of Quoy and Gaimard (1827) for specimens with a dorsal extension and terminal dilation of the somatocyst, but for another, presently better known species. Totton placed *R. plicata* Quoy and Gaimard, 1827, and its various synonyms, under *Desmophyes annectens* Haeckel, 1888, but recognised that the strict application of the law of priority would necessitate the use of *Rosacea* for *Desmophyes* and the erection of a new genus for *R. cymbiformis* and *R. plicata sensu* Bigelow. However, since the genus *Rosacea sensu* Bigelow had been in common usage for over half a century, Totton retained it and designated *R. plicata sensu* Bigelow as its type species. In naming our new species of prayine siphonophore as *R. flaccida* we have continued Totton's convention and further recognize that *D. annectens* is a likely synonym of *R. plicata* Quoy & Gaimard, 1827. A re-examination of Bigelow's (1911a) Biscayan material may be of interest as both *R. plicata sensu* Bigelow and *D. annectens*, together with another species, *Prayoides intermedia* Leloup, 1934 which also has a dorsal extension to the somatocyst, are present in the Bay of Biscay (P. R. Pugh, unpublished data).

Nectophores of *R. flaccida* closely resemble those of *R. cymbiformis* but, in general, are 5-15 mm longer and noticeably less turgid than specimens of the latter species collected by divers in the same localities. However, the specimens of *R. cymbiformis* found in the Mediterranean are larger, up to 6 cm in length, which is twice the size of *R. flaccida*. In *R. plicata sensu* Bigelow, the hydroecium of N_2 is conical in shape, but it is much deeper and shorter than that of *R. flaccida* (see Bigelow, 1911a, p. 343, and Bigelow and Sears, 1937, pp. 11-13 for descriptions of *R. plicata*). The apical prolongation of the somatocyst of N_1 , which we have noted for *R. flaccida*, has not been described for *R. cymbiformis*, nor is it present in our Sargasso Sea specimens of *R. cymbiformis*. Similarly, N_1 of *R. plicata sensu* Bigelow lacks an apical prolongation of the somatocyst, although Bigelow (1911a) described terminal enlargements of the somatocyst in some of his Atlantic specimens of *R. plicata*, as discussed above.

The nectophores of *R. villafrancae* Carré, 1969 possibly have closer affinities with *D. annectens* than with either of the two previously discussed species of the genus *Rosacea sensu* Bigelow or with *R. flaccida*. In *R. villafrancae*, the somatocyst in both N_1 and N_2 bends dorsally at its apical end and extends far into the mesoglea. The nectosacs are large in relation to the overall size of the nectophores (i.e. they extend about $\frac{1}{2}$ the length of N_1 and $\frac{1}{2}$ the length of N_2) and have straight lateral, radial canals; the hydroecium is shallow in N_2 but rather deeper in N_1 .

The eudoxid bracts of *R. flaccida* are strikingly different from those of *R. cymbiformis*, *R. plicata sensu* Bigelow, and *R. villafrancae*, being dorso-

ventrally flattened in the former species whereas in the latter three species they are globular. Moreover, the longitudinal canals of *R. flaccida* are more than short "spurs" (cf. *R. cymbiformis* and *R. plicata*) and the dorsal bracteal canal originates from the right longitudinal canal. In *R. plicata sensu* Bigelow and *R. villafrancae* the dorsal bracteal canal arises from the right hydroecial canal, while in *R. cymbiformis* it arises from the combined right hydroecial-longitudinal canal before this divides into separate hydroecial and longitudinal components. The bracteal canal configuration of *R. flaccida* is, in fact, reminiscent of the arrangement in species of the genus *Praya* Quoy & Gaimard, 1827.

DIAGNOSIS OF *ROSACEA FLACCIDA* n. sp.

Prayine siphonophore of the genus *Rosacea*. Stem highly contractile with 30-70 stem groups or cormidia. There is a pair of nectophores at the apical end of the stem which are flaccid but stoutly cylindrical, measuring 2-3 cm in length. The hydroecium of each nectophore is a deep gutter which extends almost the entire length of the ventral surface. The somatocyst is simple and unbranched but in one nectophore (N_1) has a short apical extension into a pocket of mesoglea. The eudoxid bracts are long and thin and flattened dorso-ventrally. Bracts are divided into two lobes on the side proximal to the stem, and these are twisted at an angle of approximately 90° relative to the rest of the bract. The dorsal bracteal canal arises from the right longitudinal canal.

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D. C. BIGGS
Marine Science Research Center,
State University of New York,
Stony Brook, N.Y. 11794, U.S.A.

P. R. PUGH
Institute of Oceanographic Sciences
Brook Road, Wormley, Godalming
Surrey, GU8 5UB, England

C. CARRÉ
Station Marine
06230 Villefranche-sur-Mer, France