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# *NECTOCARMEN ANTONIOI*, A NEW PRAYINAE, CALYCOPHORAE, SIPHONOPHORA FROM CALIFORNIA

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*Abstract.*—*Nectocarmen antonioi* n. gen., n. sp. was found 13 April 1981 at 33°36.7'N, 118°18.4'W, off California, at a depth of less than 70 m. The siphonophore was complete, with nectophores, gastrozooids, tentacles, palpons, tentilla, bracts, and gonophores. It differs from other genera (*Rosacea, Nectodroma* or *Praya, Prayoides, Lilyopsis, Desmophyes, Stephanophyes*) in the subfamily Prayinae in the characteristics of its nectophores, bracts, and gonophores, but constitutes a morphological link among them.

## *Nectocarmen*, new genus

*Diagnosis.*—A member of the subfamily Prayinae, which includes the genera *Rosacea* (2 species), *Nectodroma* or *Praya* (2 species), *Lilyopsis* (2 species), and *Prayoides, Desmophyes,* and *Stephanophyes* (1 species each). The principal characteristics of these genera and of *Nectocarmen* are given in Table 1.

*Type-species.*—*Nectocarmen antonioi,* new species.

*Etymology.*—*Necto* ("swimming," Greek) + *Carmen,* my mother's name (Latin for poetry, song, and garden).

## *Nectocarmen antonioi*, new species

Figs. 1–5

*Material.*—Off California, San Pedro Channel, 33°36.7'N, 118°18.4'W, R/V *David Starr Jordan* sta 88.3 *33,* cruise 8104, 13 April 1981, vertical tow from about 70 m to surface: Holotype, complete colony, USNM 60895; paratype, eudoxids, USNM 60896.

*Etymology.*—Named for my father, Antonio.

*Description.*—The subfamily Prayinae of the suborder Calycophorae are large prayids with pulsating nectophores and a heavy stem. The bracts are composed of a large amount of mesoglea, which aids the flotation of the whole animal. Prayids lack the apical gas-filled float of the Physonectidae, and are propelled by the nectophores at the upper part of the stem, which also supports the large bracts, gastrozooids, palpons, tentacles, tentilla, and gonophores.

The holotype is based on a polygastric specimen with a pair of small nectophores at the top of the stem, and well-developed eudoxids hanging from the stem, along with bracts, gastrozooids, tentacles, palpons, tentilla, gonophores, and free cormidia. The details of the siphonophore observed have been carefully reproduced, and the whole animal represented in detail in Fig. 1. Drawings give a more reliable representation of specimens than photographs.

Polygastric phase: In the polygastric phase, *Nectocarmen antonioi* exhibits 2 transparent kidney-shaped cylindrical nectophores, one slightly larger than the

Table 1.—Principal differential characteristics of the genera in the subfamily Prayinae, and the new genus.

| Genera character | *Rosacea* Bigelow, 1911 | *Praya* Quoy & Gaimard, 1833 = *Nectodroma* Bigelow, 1911 | *Prayoides* Leloup, 1934 | *Lilyopsis* Chun, 1885 | *Desmophyes* Haeckel, 1888 | *Stephanophyes* Chun, 1888 | *Nectocarmen* n. gen. |
|---|---|---|---|---|---|---|---|
| Nectophores | Large flat smooth cylinders. Large hydroecium. | Round large pair with multi-form (branched) radial subumbral canals. Large hydroecium. | Round large pair, deep hydroecium. | 3 equal size wedge-shaped. | Biserial lateral view wedge-shaped soft and transparent. | Distributed in corona. | Soft, transparent kidney shape. Hydroecium small deep groove. |
| Somatocyst | Does not lie as a free canal in mesoglea, but forms the pallial canal on dorsal wall of hydroecium. | Branched system of canals. | Unbranched short upper branch, or short descent branch and a short thick upper one. | Simple thin tube, lying obliquely in mesoglea. | Simple club ended, lying obliquely in mesoglea. | Complex asymmetrically rebranching up to ten times. Tips of branchlets pigmented. | Single, pear-shaped, lying vertically in mesoglea. |
| Nectosac | Small, about 1/4 of length of nectophore. Sinuous meandering lateral canals. | Small, ¼–½ of length of nectophore. Canals multi-branched or in network. | Short, branched canals, up to 15 branches. | Large, with meandering radial canals. Ostial tubercles or pigmented spots. | Small. Lateral radial canals straight. Ring of minute pigment flecks and tubercles around the ostium. | Occupying great part of nectophore. Ostium nearly parallel with long axis. Some small red tubercles on ventral side of ostium. | Large, occupying most of nectophore. Anterior and posterior canals straight, lateral canals reach up close to top of nectosac bending down to ring canal. No tubercles or pigmented spots on ostium. |

Table 1.—Continued.

| Genera character | *Rosacea* Bigelow, 1911 | *Praya* Quoy & Gaimard, 1833 = *Nectodroma* Bigelow, 1911 | *Prayoides* Leloup, 1934 | *Lilyopsis* Chun, 1885 | *Desmophyes* Haeckel, 1888 | *Stephanophyes* Chun, 1888 | *Nectocarmen* n. gen. |
|---|---|---|---|---|---|---|---|
| Bract | Oval, with central organ. Left and right hydroecian canal of different size (one less than ¼ of other) Dorsal bracteal canal short, extends to anterior part. Ventral bracteal canal short. | Flattened semicircular. No median central organ. Dorsal bracteal canal recurved. Ventral bracteal canal long. Both bracteal canals may have small branches. Hydroecial canals of almost equal length. | | 6 bracteal canals. No central organ. | Kidney shape, round above. With median pear-shaped vesicle (central organ). 4 main bracteal canals. | Bracteal canal system similar to previous genera. | Transparent, oval, flat. Bracteal canals almost straight. One hydroecial canal larger and more curved than the other. |
| Gonophore | Well-developed medusoids. No asexual eudoxid nectophore. | Medusoids with well developed radial and ring canals. ♀ larger than ♂. Pedicular canal trifid branched. Female with 4–6 large ova. | | Large asexual eudoxid nectophores. Radial canals in 2 pairs from pedicular canal. Unisexual gonophores with reduced umbrella. Females and males on same stem. | Large asexual eudoxid nectophores, and groups of unisexual reduced gonophores. Eudoxids of both sexes on same stem. | Large asexual eudoxid nectophores, with meandering canals. The 4 radial canals do not branch together from pedicel. Small red tubercles. Bunch of reduced medusoid gonophores, canals in zigzag branching laterally. 2–3 female alternating with 2–3 male cormidia. | No asexual eudoxid nectophores. Gonophores laterally flat hemispheres, with 4 straight radial canals together from pedicel to ring canal. Pedicular canal trifid branched. Ovaries with small ova. No tubercles or pigmented spots on edge of umbrella. |


Fig. 1. *Nectocarmen antonioi*, complete specimen, about 200 mm long.

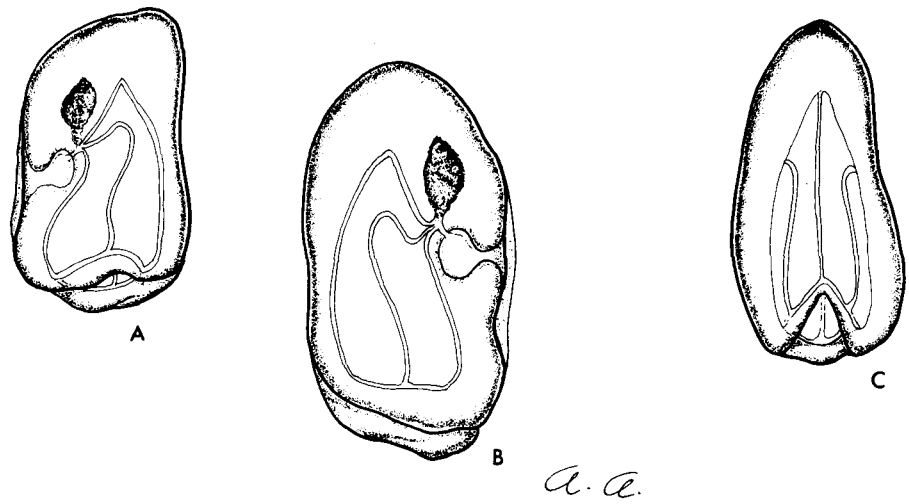


Fig. 2. Pair of nectophores of *Nectocarmen antonioi* (3–4 mm long): A, Small nectophore; B, Large nectophore; C, Dorsal view of either nectophore. Hydroecium, nectosac, radial and circular canals, and somatocyst can easily be observed.

other, with a large nectosac reaching nearly to the top of the nectophore. The nectophores are 3–4 mm long and about 2.5 mm wide. The hydroecium is only ⅓ the width of the nectophore, and does not run its entire length; it forms a deep groove, with rounded lobes (superior and inferior) closing the entrance, and this whole structure is covered by the flaps of the nectophore walls.

The pair of nectophores are bound together by the hydroecium, embracing each other by this structure (Fig. 2).

The nectosac is large, similar to that of *Stephanophyes superba* Chun, 1885 (1891) but with differences in the hydroecium, somatocyst, and radial canals. The pallial canal extends slightly up the nectosac, forming the radial canals. The anterior and posterior radial canals are straight, and the lateral canals bend upward to a position close to the top of the nectosac, then turn straight down to the ring or circular canal. The velar end of the nectosac, the ostium, is large, extending upward at the dorsal side. No ring of minute pigment flecks or tubercles is observed on the ostium.

The somatcyst is pear-shaped, and lies vertically in the mesoglea, extending slightly above the top of the nectosac.

Gastrozooids retain the larval tentacle, modified to form a series of tentilla. The base of the gastrozooids is enlarged into the nematocyst-producing area, the basigaster.

Palpons of reduced gastrozooids, with simple tentacles or palpacles, serve as feelers or testers.

The tentilla, with the subterminal battery of nematocysts, are spirally twisted filaments, with cnidobands (sabre-shaped nematocysts) forming the chief part of the stinging organs.

Gastrozooids, tentacles, palpons and tentilla lie under the bracts, and are shown in Fig. 1, and in detail in Fig. 3.

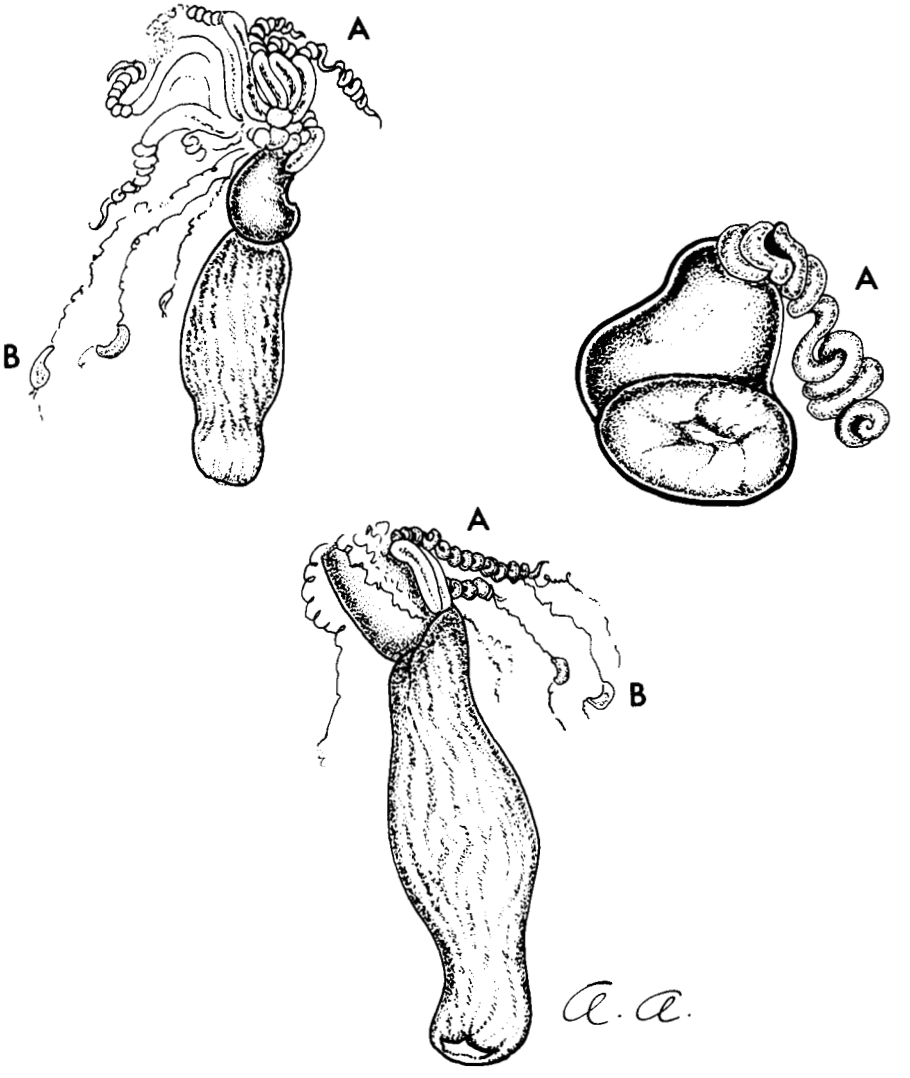


Fig. 3. Gastrozooids of *Nectocarmen antonioi* (2–3 mm long): A, Tentacles; B, Tentilla.

Eudoxid phase: The eudoxid phase has no asexual nectophore.

The bracts, which reach a maximum length of 10–12 mm, are oval, kidney-shaped, laterally flattened masses of mesoglea, the inferior part of which is concave and the upper part convex. They are divided into 2 lobes, with a third lobe on the concave distal side forming part of the hydroecial cavity of the bract. Unlike *Desmophyes,* no central organ (pear-shaped vesicle) is present at the junction of the main bracteal canals.

The bracts contain 4 large canals. The dorsal bracteal canal, which is slightly curved, ends in an ampullar dilatation, as does the nearly straight ventral bracteal canal; left and right hydroecial canals also end in ampullar dilatations. The right

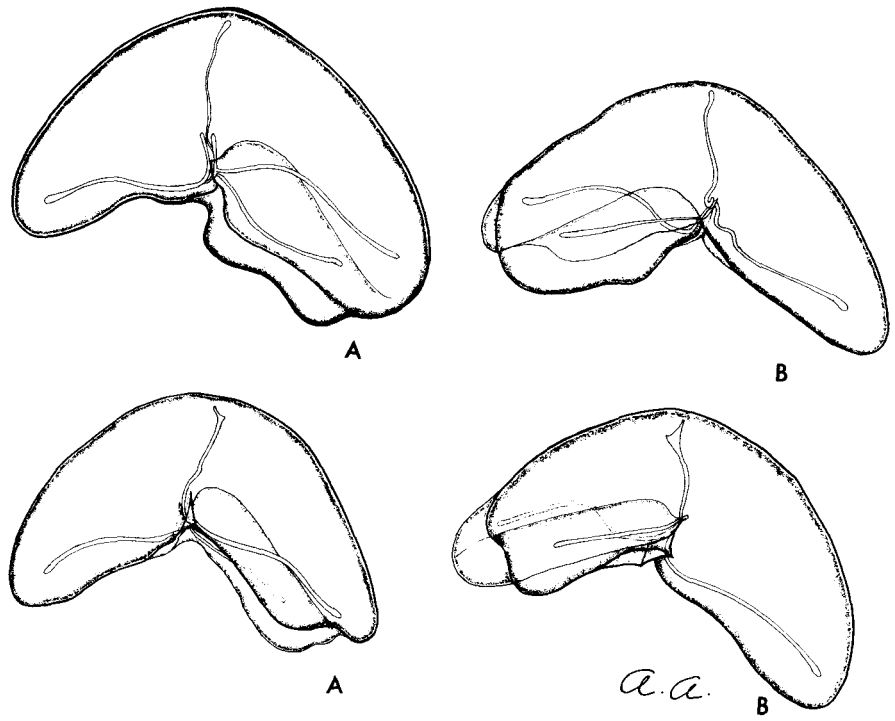


Fig. 4. Bracts of *Nectocarmen antonioi* (10–12 mm longest axis): A, Lateral right view of two bracts; B, Lateral left view of two bracts.

hydroecial canal is longer than the left. The former curves upwards and then extends down, and the latter bends down and then up. Usually, the left canal is straighter than the right. Neither the bracteal nor the hydroecial canals branch into small branchlets or spurs (Fig. 4).

The bracts, with gastrozooids, tentacles, palpons, tentilla and gonophores, may detach from the stem and swim freely in the ocean.

The sexual gonophores are large and hemispherical in shape, laterally flattened, retaining the medusoid characteristics, but without marginal tentacles. Female and male gonads occupy the mouthless manubrium. The gonophores pulsate intermittently, and are capable of propelling the cormidia in the water.

The gonophores are budded at the stem, below the base of the gastrozooids. They are, as explained, large bells, laterally compressed, with 4 straight radial canals ending at the ring canal. The bells hang from the bract by the pedicular canal, and the four radial canals run from the pedicel to the circular canal. Near the top of the umbrella, the pedicel has trifid branches embedded in the mesoglea, as is seen in *Nectodroma (Praya) reticulata* (Bigelow, 1931). The large, pear-shaped vesicles inside are the female gonads, containing numerous small ova. Male gonads are small, pointed, sausage-shaped vesicles (Fig. 5).

Male and female eudoxids may be found on the same stem.

It is probable that each cormidium includes either male or female gonophores, providing a sexual separation when male cormidia and female cormidia swim

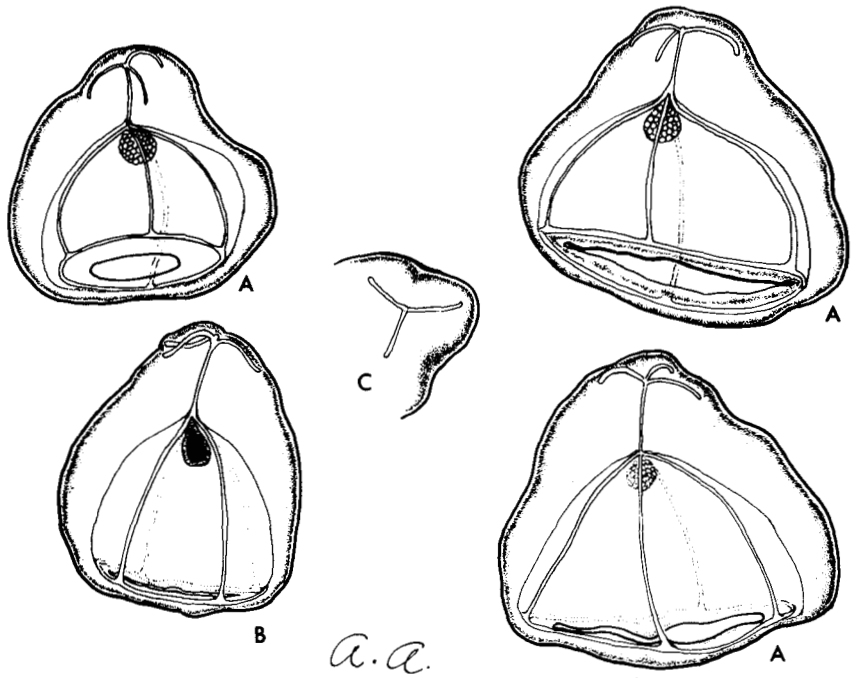


Fig. 5. Gonophores of *Nectocarmen antonioi* (3–4 mm high): A, Female gonophores; B, Male gonophore; C, Upper view of gonophore to show the trifid branching pedicel.

freely in the ocean. Some of the cormidia were detached, but obviously belonged to the same whole animal.

The nectophores, bracts, and gonophores are transparent; gastrozooids, palpons, and tentacles range in color from bright reddish to faded pink or rose.

The nectophores function in propulsion; the bracts are composed of enlarged masses of mesoglea and act as protection for gastrozooids and gonozoids or gonophores, as well as contributing to the buoyancy of the animal. The stem contracts and expands, and the gonophores also perform active pulsations, contributing to the propulsion of the siphonophores; by spreading the stem into loops they also amplify the potential field of the tentacles and the fishing predatory capacity of the siphonophore.

*Discussion.*—The principal differential characteristics of the genera in the subfamily Prayinae are presented in Table 1, together with those for *Nectocarmen* n. gen.

The general shape of the nectophores is similar to that of the other genera in the subfamily, especially *Rosacea* Bigelow, 1911, and *Desmophyes* Haeckel, 1888, also described by Kawamura (1915). However, the hydroecium is smaller than that of *Rosacea*, or *Desmophyes*, and similar to that of *Stephanophyes*. The nectosac is large, as in *Stephanophyes* and *Lilyopsis* (Alvariño 1981; Chun 1885, 1891), but the radial canals do not display the meandering pattern observed in *Stephanophyes* and *Lilyopsis*. The somatocyst of *Nectocarmen* is different from that of other Prayinae genera, including *Prayoides intermedia* Leloup, 1934.

The bracts resemble in general outline those of *Nectodroma (Praya)*, but differ in the detail of the shape and pattern of the canals, as can be observed by comparing present illustrations with those by Alvariño (1981), Bigelow (1911), and Totton and Bargmann (1965). Bracts in *Nectocarmen antonioi* do not have the vesicular organ of *Desmophyes*.

The eudoxids of the new siphonophore do not have the large asexual eudoxid nectophore that is found in *Lilyopsis, Desmophyes,* and *Stephanophyes*. The gonophores are similar to those of *Nectodroma (Praya)*; however, sexual nectophores are pear-shaped in *Nectodroma,* and hemispherical in *Nectocarmen*. Both *Nectodroma (Praya)* and *Nectocarmen* present the trifid branched pedicular canal, but the gonads of the former include 4–6 large ova (Bigelow 1931), while in the latter the ova are small and numerous. In *Nectocarmen* the four radial canals of the gonophore converge at the pedicel, and run straight to the circular canal, characteristics different from the other genera in the subfamily, though similar to *Nectodroma (Praya)*. No tubercles or pigmented spots appear on the margin of the gonophoral umbrella, whereas in the other species of the subfamily those structures are present.

Species of the following Prayinae have been observed in California waters (Alvariño 1967, 1971): *Nectodroma dubia* (Quoy and Gaimard, 1833), *N. reticulata* (Bigelow, 1911), *Rosacea plicata* Bigelow, 1911. Bigelow and Leslie (1930) reported *N. reticulata* from Monterey, but Totton and Bargmann (1965) indicate it was probably *N. dubia*.

There is a peculiar phenomenon common to Siphonophorae and Medusae, in that most of the species present an erratic distribution (Alvariño 1977, 1981; Sears 1953). Sears (1953:11) says: "There appears to be a tendency among coelenterates for a seemingly good species to appear in a particular locality, often in considerable numbers, and after a time to disappear, never to be seen again." This must be related to the peculiarity in patchiness and irregular aggregational distribution characteristics of siphonophores and other coelenterate populations, and the ineffectiveness of the plankton sampling gear in capturing these organisms (Biggs, Bidigare, and Smith 1981; Hamner *et al.* 1975). Because of their swimming behavior and speed, and their life cycle characteristics, siphonophores are capable of avoiding capture by plankton nets (Biggs 1977).

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