

## Redescription of *Antipathes panamensis* Verrill (Coelenterata, Antipatharia)<sup>1</sup>

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IN 1869, A. E. Verrill described a new species of antipatharian from the Pearl Islands, Gulf of Panama. This species, which he named *Antipathes panamensis*, was based on a specimen collected by pearl divers for F. H. Bradley, collector of natural history specimens for the "Museum of Yale College." Since its original discovery, the species apparently has never been found or reported on again until about 5 years ago when marine biologists from the Smithsonian Tropical Research Institute (S.T.R.I.) found an extensive stand of black coral in the shallow waters (10-12 m) surrounding Isla Taboguilla.

Because Verrill's original description of *Antipathes panamensis* is rather brief and incomplete, exact identification of the S.T.R.I. material could not be made without comparison with the type, of which there are only four small fragments remaining. To insure more reliable identifications of this species in the future and to allow for a more valid comparison of this species with very similar ones occurring in the Indo-Pacific, I am presenting the following redescription of the species.

*Antipathes panamensis* Verrill, 1869

*Antipathes panamensis* Verrill, 1869: 499.

[*Antipathes*] *panamensis*, Brook, 1889: 167.

### Type Material Examined

Four branches, considered to be fragments of the type specimen; Pearl Islands, Panama, 6-8 fm (11-15 m), F. H. Bradley, 1866 (Yale Peabody Museum, no. 8671 b). The specimens were originally preserved dry but in December 1971 they were moistened with  $\text{Ca}_{10}(\text{OH})_2(\text{PO}_4)_6$  and then transferred to 70 percent alcohol.

### Additional Material

Three specimens in the collections of the Rosenstiel School of Marine and Atmospheric Sciences, University of Miami; Isla Taboguilla, Panama, 50 ft (17 m), C. Birkeland, 20 September 1971. Three specimens, Bona Island, Panama, 40-50 ft (13-17 m), W. Goldberg, December 1972.

### Diagnosis

Colony branched, usually in a thick, multi-layered plane; irregularly and complexly pinnulate. Primary pinnules (about 0.3 mm in diameter, excluding spines) unequal and arranged bilaterally and alternately in two lateral or anterolateral rows; generally 4-6 mm long and 1.5-2.0 mm apart in the same row. Distal angle of primary pinnules and branches  $45^\circ$ - $60^\circ$ ; angle between the planes containing the two rows of primary pinnules  $160^\circ$ - $180^\circ$ . Secondary pinnules (about 0.2 mm in diameter) present on the anterior side of the primary pinnules, uniserial near the base of the primary, but forming two bilateral rows on the more distal parts of the larger primaries.

Spines variable in size and shape, generally conical or horn-shaped (Figure 1a), curved upward near the apex, occasionally flattened on their outer side, polypar spines 0.10-0.16 mm high, abpolypars equal or slightly smaller than polypars. Spines on the pinnules arranged in 7-9 longitudinal rows with 7-8 spines/mm in each row; spines on the branches arranged irregularly.

Polyyps small, 0.5-0.7 mm long (transverse diameter) and arranged in a single series with 10-12 individuals/cm. Polyyps with 10 septa.

### Description of the Type

The type specimen was described by Verrill (1869) as being 13 inches high and 10 inches

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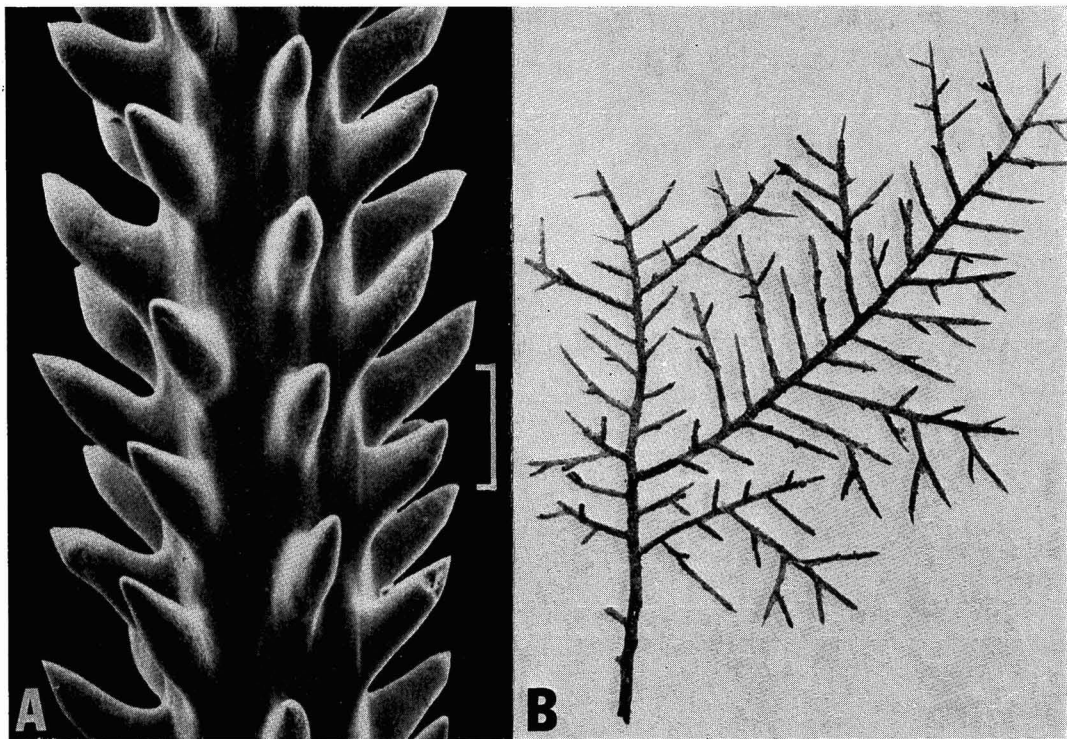


FIGURE 1. *A*, photomicrograph of the axial spines on the type specimen of *Antipathes panamensis* (scale, 0.1 mm); *B*, corallum of one of the specimens considered to be a fragment of the type (height, 3.2 cm).

wide with a trunk diameter of 0.5 inches. This specimen was not found in either the Yale Peabody Museum or in the United States National Museum; however, in the Peabody collections, four small fragments of an antipatharian, the largest of which is only slightly more than 7 cm (3 inches) high, were found which, although not labelled as types, have the same locality and date as the type. These are treated here as being branches of the larger colony, the fate of which is unknown. Polyps are not present on any of these fragments.

The first of the four specimens is branched almost entirely in one plane (Figure 1*b*). It is 3.2 cm high and about 3 cm wide and its largest branch is 0.6 mm in diameter. The primary pinnules are placed in two anterolateral rows (internal angle  $160^{\circ}$ – $180^{\circ}$ ) and alternate along the length of the branch. In each row the pinnules are most often spaced 1.5–2.0 mm apart, and each pinnule is inclined distally at an angle of  $45^{\circ}$ – $60^{\circ}$  with the branch from which it

arises. The basal diameter of most primary pinnules ranges from 0.35–0.45 mm (including spines). The length of the primaries varies considerably, but most are 4–6 mm long and possess two or three subpinnules. The first subpinnules (secondary pinnules) appear at a point 1–4 mm from the base of the primary pinnule, and they lie in a plane which is perpendicular to the plane containing the primary pinnules and the branch. They are also inclined distally at an angle of  $45^{\circ}$ – $60^{\circ}$ . The more distal subpinnules are spaced about 1.5 mm apart and are more laterally located on the primary pinnules. Sometimes they occur on the same side as the lower subpinnules but in other places they form an alternating series. At a size of 8–9 mm most of the primary pinnules develop into distinctly pinnate branches; there are, however, some of the same size which possess only a unilateral series of subpinnules.

Where a primary pinnule develops into a pinnate branch, the angle formed by the two

rows of subpinnules ranges from  $75^{\circ}$ – $90^{\circ}$  near the base of the branch, then widens to about  $140^{\circ}$  between the next few pairs of more distal subpinnules and then finally increases to  $160^{\circ}$ – $180^{\circ}$ .

The three other fragments of the type of *Antipathes panamensis* differ in only minor points from the specimen described above. In one of these specimens (height 5.4 cm, diameter of largest branch 1.2 mm) there is some overlapping of neighboring branches and pinnules. The pinnules, for the most part, are alternately arranged in two lateral rows, with the distance between adjacent pinnules in each row varying from 1.0–4.0 mm.

The third specimen consists of three branches aligned end to end in the same direction. Its combined length is 8.3 cm. The entire corallum, except for two small branches, tends to lie in a single plane. The primary pinnules are spaced 2.0–2.5 mm apart in each lateral row and most have a distal angle of inclination of  $60^{\circ}$ – $75^{\circ}$ . Primary pinnules less than 4 mm long rarely possess subpinnules.

The last fragment of the type consists of a small, 2.5-cm-long branch, which has a number of smaller branches coming off near its distal end, and which itself arises from a short stub of a branch that is only 1.5 cm long and about 0.7 mm in diameter. This specimen indicates that the branching of the corallum can, at times, be quite irregular.

Although the spines show considerable variation in form, they tend to retain certain characteristic features. They are basically conical (Figure 1a), but may curve distally to become horn-shaped. On some areas of the axis the lower part of the distal edge of the spines is flattened, thus giving the spines a more bladelike or rectangular appearance in profile. The spines tend to be swollen and enlarged a short distance from the tips of the pinnules but decrease rapidly in size near the tips. They are more acicular on the larger branches and are often larger on one side of the axis, which probably corresponds to the polyp-side of the pinnule. The larger spines, which are usually not more than 0.16 mm high, occasionally can be seen to be finely papillose on the distal half of their surface. On the pinnules there are eight or nine longitudinal rows of spines with 7–8 spines/mm in each row. On the larger pinnules and on the

branches the number of rows increases but the linear arrangement becomes less distinct. On a branch 1.2 mm in diameter, about 25 spines can be counted around the circumference of the axis at any particular point.

#### Remarks

An examination of the S.T.R.I. specimens which were collected near the type locality and which unquestionably can be referred to this species, reveals the fact that the corallum, although not branched in a single plane, nevertheless takes on a flabellate shape (Figure 2) and can grow to a rather large size. The largest specimen examined is more than 60 cm tall, 30 cm wide, and about 10 cm thick. Another colony is 33 cm high, 27 cm wide, and about 8 cm thick, and a third is 23 cm high, 28 cm wide, and 7 cm thick. The stems of the latter two colonies are 5 mm and 2.3 mm in diameter, respectively, while that of the largest colony is about 9 mm in diameter. In all three cases, branches arise from very near the basal plate, and the length of several of these major branches is more than half the height of the entire corallum.

The formation of the pinnules and subpinnules is similar to that described for the type specimens, but in some parts of the colonies it is much more irregular. In one specimen there is a general tendency for the subpinnules on the front and back of the colony to point inward toward the center of the corallum. The primary pinnules are spaced from 2.0–2.5 mm apart in each lateral row and, on the average, every fourth or fifth pinnule develops into a pinnulated branch. The primary pinnules are either simple or they possess one or two (sometimes as many as five) simple subpinnules (Figure 3a). These are placed on one side and usually at a right angle with the plane of the primaries but are inclined distally at an angle of about  $45^{\circ}$ . Primary pinnules with more than five subpinnules usually develop into pinnulated branches.

The spines show the same range of variation as do those on the fragments of the type, but they are more often simply conical and curved upward. On the larger pinnules and branches they become narrower and more needlelike; however, even on the largest branches the polypar spines do not exceed 0.16 mm in length.

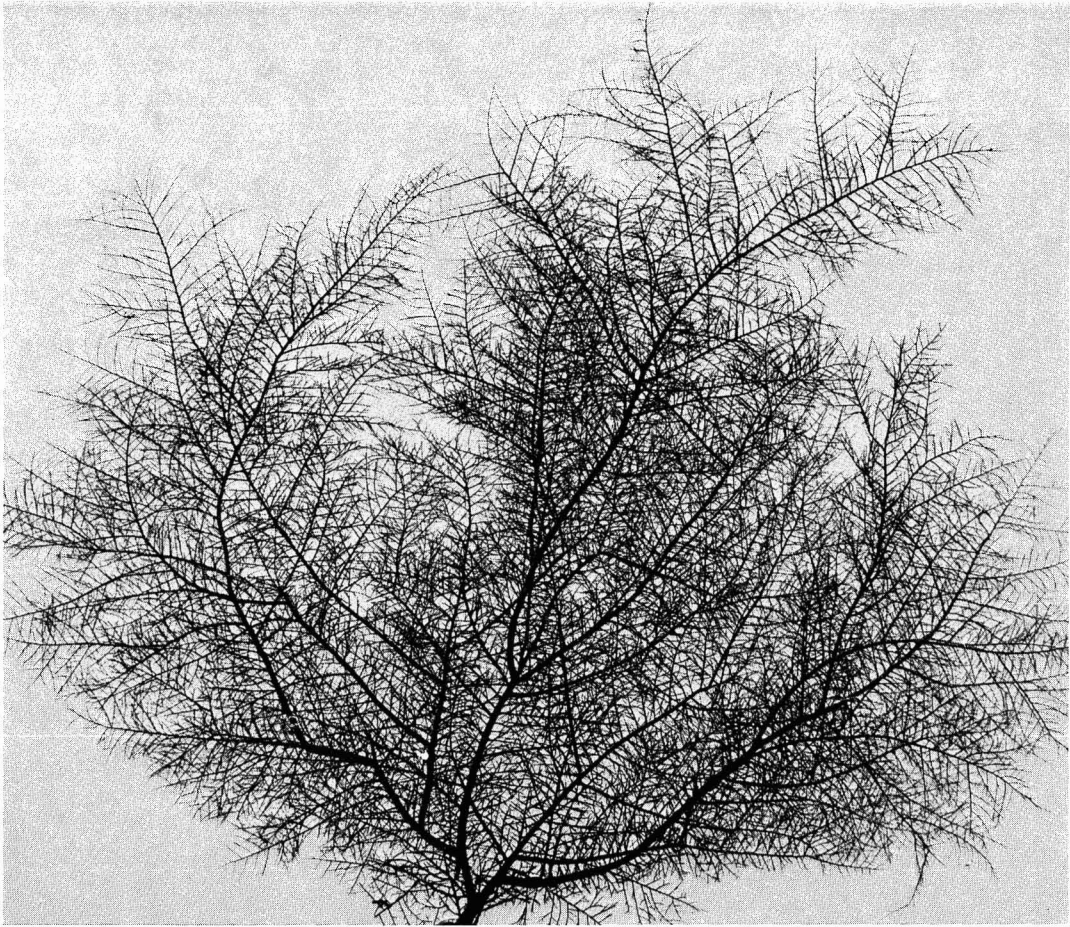


FIGURE 2. Corallum of a specimen of *Antipathes panamensis* collected off Isla Taboguilla, Gulf of Panama (height approximately 23 cm).

On all the colonies there are usually 7–8 spines/mm in each longitudinal row and only rarely are there as many as 10/mm.

The polyps (Figure 3*b*) are small and slightly elongated in the direction of the transverse axis. The sagittal tentacles occur rather far down on the sides of the polyps and often appear farther away from the oral cone than do the laterals. The oral cone is very prominent and raised up about 0.2 mm over the peristome. The mouth is often slitlike and sagittally elongated. The tentacles are about 0.3 mm long, and the sagittals and laterals are about equal in size.

The polyps are usually in a single row (10–12/cm) on the side of the pinnules on which the subpinnules develop. The arrangement

becomes much less regular on the branches where polyps may also occur on the opposite side of the axis. On the pinnules the polyps are 0.7 mm long (transverse length), but on the larger branches they are slightly smaller.

#### *Comparisons*

*Antipathes panamensis* Verrill belongs to the group of species that Brook (1889: 166) called the “Antipathidae Myriophylloides.” These species are united on the basis of similarities in the spines and in the mode of formation and arrangement of the pinnules and subpinnules. According to Brook’s descriptions, three species included in this group appear to be very



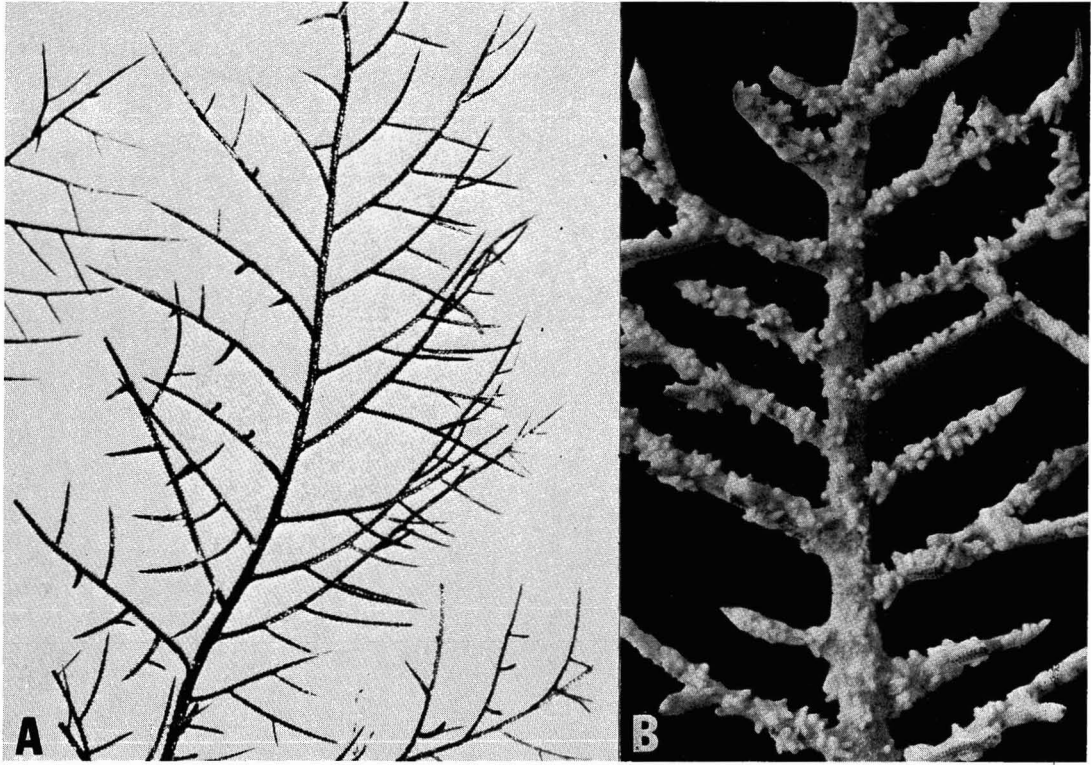


FIGURE 3. *A*, a portion of the corallum of a specimen of *Antipathes panamensis* from off Isla Taboquilla, showing the arrangement of the pinnules and subpinnules; *B*, a preserved specimen collected off Isla Taboquilla showing the relative size and arrangement of the polyps.

similar to *A. panamensis*; these are *A. ulex* Ellis & Solander, *A. japonica* Brook, and *A. spinosa* (Carter). The last mentioned species, however, apparently is more densely branched than is *panamensis* and has smaller and more isolated spines. Although there is an insufficient amount of information to separate easily *japonica* from *ulex*, Brook's descriptions suggest that *japonica* is more regularly pinnate and has more strongly curved spines. The illustrations given by Brook (1889: pl. 11, fig. 25) for the spines of *japonica* are very much like those of *panamensis*, but the illustrations of the pattern of branching, as given by Silberfeld (1909: pl. 2, fig. 3) indicate that the pinnules are thicker and much more inclined distally than are those in *panamensis*. It is evident that the two species are closely related but, until *A. japonica* is more clearly defined, they cannot be considered to be identical.

#### Ecological Notes

*Antipathes panamensis* and another species, tentatively identified as *Antipathes ericoides* Pallas, appear to be important components of shallow-water (10–25 m) rocky bottom communities of the tropical eastern Pacific (C. Birkeland, personal communication). The coral skeletons provide a substrate for the attachment of sessile organisms such as the oyster *Pteria sterna*, and the crowded branches provide a refuge for small invertebrates and fish. In the case of *A. ericoides*, the protection afforded by the branches allows the normally cryptic under-rock fauna to occur on upper surfaces.

#### Geographic Distribution

This species is known only from the type locality, Gulf of Panama, and from the Galápagos Islands (G. Wellington and C. Birkeland, personal communication).

*Bathymetric Range*

Although commonly occurring with *Antipathes ericoides* at depths of 10–25 m, *Antipathes panamensis* is found more frequently in the upper parts of this range. *Antipathes ericoides*, however, tends to be the more abundant of the two species, and in some localities it forms rather dense stands (C. Birkeland, personal communication).

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