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# A NEW STAUROMEDUSA, *KISHINOUYEA CORBINI* (SCYPHOZOA, STAUROMEDUSAE) FROM THE TROPICAL WESTERN ATLANTIC

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## ABSTRACT

*Kishinouyea corbini*, new species, is the first stauromedusa reported from the tropical Atlantic and is the sole species of the genus in the Atlantic. It has only been collected from two shallow water areas of Puerto Rico. It is unique in that a number of the tentacles at the arm tip have fused to form a broad pad-like adhesive organ. These anchors attach to the substrate and enable the medusa to flip over by releasing the pedal disc. This somersaulting activity is also used in an unusual form of prey capture whereby shrimp and amphipods are trapped between the oral surface and the substrate.

Although Stauromedusae may be locally abundant, they are rarely observed because of their cryptic coloration and small size. Most species occur subtidally in temperate seas, commonly attached to algae. Tropical forms are extremely uncommon. Only two tropical Pacific forms have been reported. Edmondson (1930) described a new species *Kishinouyea hawaiiensis* from Oahu, apparently from two specimens, and Panikkar (1944) found a *Lucernariopsis* near Ceylon. The only report of a tropical Atlantic stauromedusa was a brief note by Capriles and Martinez (1970) of two specimens of an unidentified species from Puerto Rico. This species, recently rediscovered by the author, is here described, with remarks on its biology.

## MATERIALS AND METHODS

Medusae were collected February and March 1974, by sweeping a dip net through *Thalassia* until an area of about 100 $m^2$ was covered. The net contents were examined in the laboratory under low magnification. All medusae were fixed in 10% formalin, except for four preserved in Zenker's fixative. Histological sections were later made of two specimens. Specimens had been maintained in an aquarium with running sea water for up to 3 weeks. Small shrimp and gammarid amphipods found with the medusae were used as food.

All specimens collected by the author are deposited at the National Museum of Natural History, Washington, D.C.

## *Kishinouyea corbini* new species
Figures 1–2

*Material Examined.*—HOLOTYPE: 12 mm diameter, USNM 57072. PARATYPES: 3, 10–12 mm diameter, USNM 54480; 10, 5–12 mm diameter, USNM 54479; 6, 3–5 mm diameter, USNM 57073; 2, 5 & 8 mm diameter, USNM 54482; 2, 2 & 8 mm diameter, as histological sections, USNM 57074.

*Etymology.*—The species is named after Peter Corbin, of The Laboratory, Plymouth, United Kingdom, who has done considerable work on Atlantic Stauromedusae.

*Diagnosis.*—*Kishinouyea* with erect nodular gonadal lobes on the oral surface, with a broad adhesive pad-like organ on the arm tips and without an axial canal.

*Description.*—Calyx about 15 mm maximum diameter, divided into 4 pairs of arms, resembling a cross which is broadest near its center. Four broadly curved u-shaped perradial notches about twice as deep as the u- or v-shaped interradial

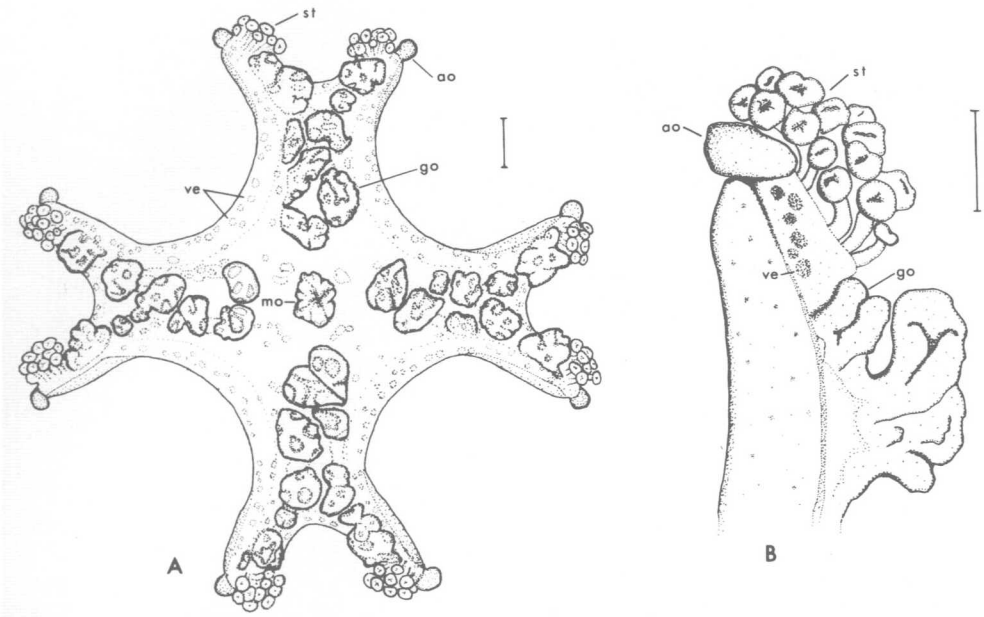


Figure 1. Morphology: A, Oral view of *Kishinouyea corbini*, drawing of photograph from life, bar equals 1 mm; B, Side view of distal portion of arm, bar equals 1 mm. ao. adhesive organ, go. gonad lobe, mo. mouth, st. secondary tentacles, ve. vesicles filled with nematocysts.

notches. Arms each with 6–25 short hollow capitate secondary tentacles on the oral side near the arm tips. Number and size of tentacles increase with increasing calyx size, e.g. 3-mm diameter specimen, 9–11 tentacles; 12-mm specimen, 15–18 tentacles. Tentacles are morphologically alike, although variable in size. The capitate ends of the tentacles are composed of adhesive cells. No cnidoblasts were seen in histological sections. Primary tentacles lacking in large specimens; only a single 3-mm diameter specimen with primary tentacles was seen. These were similar to the secondary tentacles and were located on the calyx margin between two interradial notches.

Two apparently deformed specimens have several tentacles in abnormal locations. At the tip of each arm and lying across it, facing aborally, is a broad adhesive pad-like organ which is the result of fusion of several secondary tentacles. In cross section, the stalk canals of these tentacles are visible and the histology of the adhesive pads resembles that of the tentacle clubs.

Aboral surface is smooth, without ridges or grooves, but is covered with numerous evenly scattered nematocyst warts. The mesoglea of the aboral wall is thick and less transparent than the membranous oral wall. The oral surface is smooth but easily folded. Numerous disc-shaped white spots occur on the oral surface near the gonads, mouth and calyx margin. These are vesicles within the mesoglea which are filled with numerous eurytele nematocysts.

The manubrium is short and cruciform, the lips highly pleated. The pylorus of the coelenteron contains many (about 200) short gastric cirri. The interradial septa extend from the pylorus almost to the margin, allowing the 4 radial pockets to communicate.

Gonads are present in all specimens and are arranged in 8 sinuous adradial bands of closely packed follicles extending from the pyloric region to the tenta-

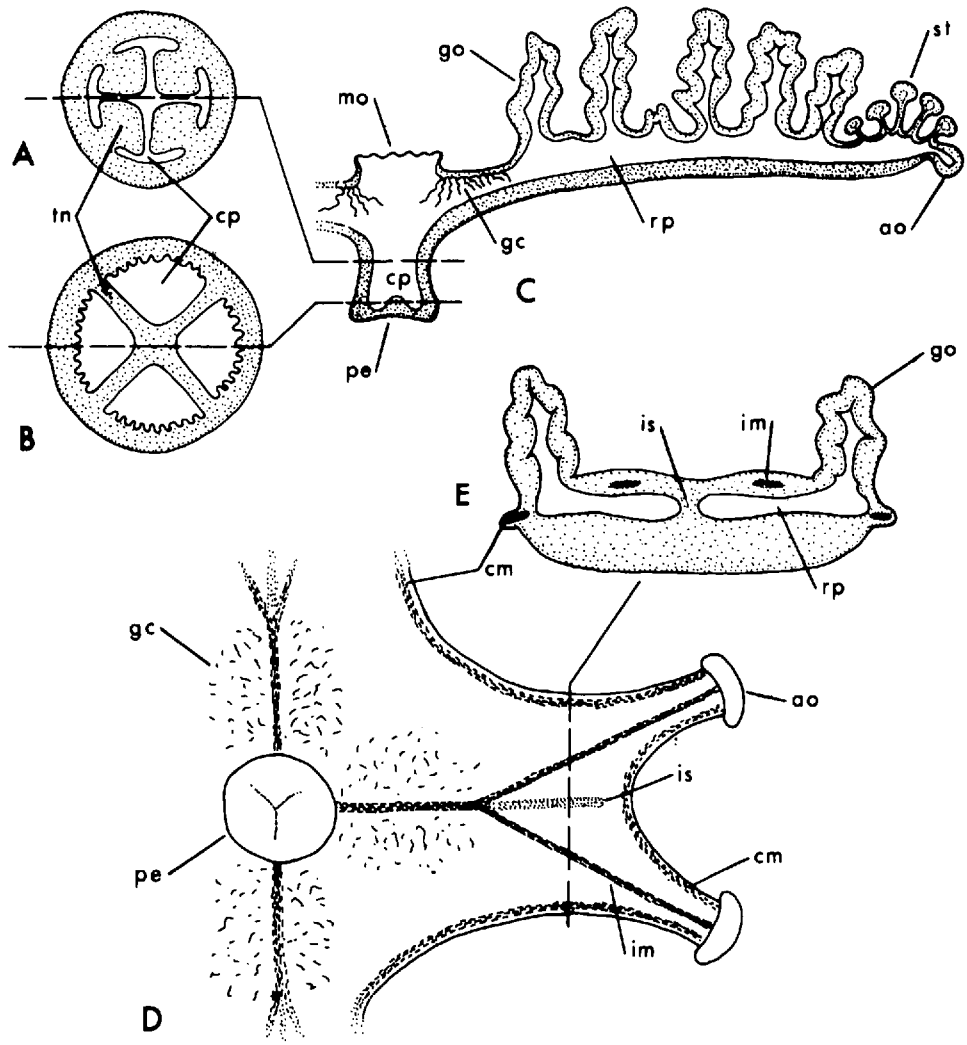


Figure 2. Morphology (schematic, not to scale): A, Cross section of proximal peduncle; B, Cross section of distal peduncle; C, Longitudinal section through mouth, peduncle and arm; D, Aboral view of calyx; E, Cross section through arm pair. ao. adhesive organ, cm. coronal muscle, cp. chamber of peduncle, gc. gastric cirri, go. gonad lobe, im. interradial muscle, is. interradial septum, mo. mouth, pe. peduncle, rp. radial pocket, st. secondary tentacles, tn. taeniole.

cles. Along these genital bands, the oral surface is irregularly folded into a number of asymmetrical, highly convoluted, erect lobes which look like small raisins. The number, size, shape and arrangement of these lobes vary from arm to arm and increase with size of the specimen, e.g. 3-mm specimen, 2–3 lobes/arm; 12-mm specimen, 4–8 lobes/arm.

The well developed coronal muscle is separated into 8 u-shaped segments forming a shelf-like extension along the calyx margin. The 4 y-shaped interradial muscles, also well developed, extend along the interradial septa, bifurcating in the pyloric region and extending to the arm tips.

The non-muscular peduncle is short (about 3 mm high in 12-mm specimens), of small diameter (about 1–2 mm), and terminates in a small swollen adhesive

pedal disc. It contains a single cruciform chamber, the shape of which is due to the large triangular cross section of each of the four taenioles: only basally within the pedal disc does the stalk become 4-chambered, due to the sudden narrowing of the taenioles into thin radii which unite centrally with a small elevation of the internal surface of the disc. A minute central pit is sometimes present exteriorly on the disc, but no canal arises from it.

In life, the coloration is highly variable, but green and reddish brown predominate. The pigmentation is diffuse and, due to the transparency of oral and calyx tissues, internal structures can readily be seen. The gonads are white, except for dark green or reddish brown pigmentation of the ridges of the lobes. The nematocyst-filled vesicles of the oral surface are purely white. Preserved specimens are a translucent white.

*Cnidome.*—(measurements of undischarged capsules from preserved material). Atrichs: 9–10 $\mu$m × 5–6 $\mu$m, in calyx epidermis; euryteles: 9–11 $\mu$m × 7.5–8 $\mu$m, in gastric cirri; euryteles: 11–12 $\mu$m × 8–9 $\mu$m, in vesicles of oral mesoglea.

*Type locality.*—A small *Thalassia*-covered cove, 1.5 km east of La Parguera, on the south coast of Puerto Rico, 17°58'N, 67°02'W.

*Geographic Distribution.*—*Kishinouyea corbini* is known only from the type locality and from Joyuda on the west coast of Puerto Rico, 18°08'N, 67°11'W, where it was collected by Capriles and Martinez (1970).

*Discussion.*—Hitherto the genus *Kishinouyea* Mayer, 1910, has included only two species: *K. nagatensis* (Oka, 1897) from the east and south coasts of Honshu, Japan and Chusan Island of China (Ling, 1939) and *K. hawaiiensis* Edmondson, 1930 from Oahu, Hawaiian Islands. *Kishinouyea corbini,* the only known Atlantic species, differs morphologically from these two species in the presence of erect nodular lobe-like gonads, a terminal adhesive pad-like organ on the arms, and the lack of an axial peduncular canal. Both *K. nagatensis* and *K. hawaiiensis* have flattened gonads arranged in bands of transversely oblong vesicles, both lack terminal adhesive organs on the arms and both have a well-developed axial canal.

Examination of one of the specimens collected by Capriles and Martinez (1970) in the Invertebrate Museum, Department of Marine Sciences, University of Puerto Rico, Mayaguez, showed that their unidentified stauromedusa is, in fact, *Kishinouyea corbini.*

*Biology.*—*Kishinouyea corbini* has been collected from only two localities in Puerto Rico, even though other similar habitats were examined. The author searched the area where Capriles and Martinez (1970) found two stauromedusae, but had no success in finding more specimens there. The site is a small patch reef, about 0.5 m depth, composed of living and dead coral interspersed with *Thalassia. Sargassum* and other benthic algae are attached to the dead coral. Their specimens were found on the *Sargassum* and dead coral. The small cove (100 m across) where *K. corbini* was rediscovered is shallow (0–1 m depth) and the bottom is covered with *Thalassia* and *Syringodium.* Small waves consistently enter the cove, keeping the grasses in constant motion. A search outside the cove on *Thalassia* and *Sargassum* failed to locate any specimens. Along the Oregon coast, where the author has observed stauromedusae for a number of years, they appeared seasonally in the same areas. Otto (1976) found that the planulae of *Haliclystus stejnegeri* and *Haliclystus salpinx* collected from San Juan Island, Washington, settle rapidly; this possibly accounts for their localized distribution.

Although the medusae are small and cryptically pigmented, several specimens were observed *in situ* anchored to *Thalassia* by a pedal disc or by arm tip ad-

hesive organs. In aquaria they were most commonly seen affixed by these organs. The relatively large size of these as compared to the pedal disc, indicates that they are important for attachment. Gwilliam (1950) noted that *Haliclystus salpinx,* which also has large adhesive organs, was often found attached by these structures.

In aquaria, *Kishinouyea corbini* was observed slowly moving about by a somersaulting activity, with one or more of the arm-tip organs adhered to the substrate; the basal disc was then released and by contracting the coronal and radial muscles the medusa flipped over onto its side. This somersaulting activity is also used as a unique means of prey capture. On several occasions, small shrimp of the genus *Hippolyte,* which are abundant in the sea-grass beds with *K. corbini,* touched an arm; the tentacles adhered to the shrimp and the medusa rapidly and forcefully flipped over as described above, trapping the shrimp against the substrate. The medusa remained oral side down, strongly attached to the *Thalassia* blade on which it was resting, until the shrimp was swallowed. Both shrimp and amphipods were also captured by the more conventional method of rapidly contracting the arms, pulling attached prey to the mouth. Apparently nematocysts are not used in prey capture, since none were found on the tentacles or lips. Singla (1976) describes the adhesive-secreting cells of the basal disc of *Haliclystus stejnegeri,* and it is likely that the tentacles and other adhesive organs of stauromedusae have these secretory cells as well.

Prey is engulfed by a combined muscular and ciliary activity of the lips. Due to the elongate nature of the prey, it must be maneuvered until one end can be swallowed. The highly elastic nature of the lips and entire oral surface allows *Kishionouyea corbini* to swallow prey almost as large as its calyx diameter. This may take 30 min or more for large prey.

Due to the transparency of the membranous oral surface, processes taking place during digestion were observed. Within 80 min after ingestion, food particles were seen circulating within the coelenteron. After 5–10 h, the empty carapace of the prey is ejected. The gastric cirri (about 200) are constantly in motion, and when food is present they adhere to it, nearly obscuring it from view.

Because few specimens were collected with food in their coelenteron, it is uncertain what their natural diet consists of, but since *Hippolyte* and gammarids abundantly co-occur with the medusae and were readily eaten in the laboratory, they are probably important prey items. Larson (1978) reviewed the literature concerning the diet of stauromedusae and found that crustaceans were fed upon by nearly all species studied.

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