A new species of platyctenean ctenophore, *Lyrocteis flavopallidus* sp. nov., from McMurdo Sound, Antarctica

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Received June 9, 1971

ROBILLIARD, G. A., and P. K. DAYTON. 1972. A new species of platyctenean ctenophore, *Lyrocteis flavopallidus* sp. nov., from McMurdo Sound, Antarctica. Can. J. Zool. **50**: 47–52.

Lyrocteis flavopallidus sp. nov., a large (up to 110 mm tall) platyctenean ctenophore from the Antarctic, is described on the basis of the external morphology. The pale straw-yellow color, lack of ridges and frills on the body and arms, presence of small papillae on the body, and geographical location are considered sufficient to distinguish *L. flavopallidus* from *L. imperatoris* Komai, 1941, the only other species in the genus. The systematic placement of *L. flavopallidus* is somewhat uncertain because neither the anatomy of the reproductive system nor the larval development is known; the species may represent a new genus and possibly a new family.

Lyrocteis flavopallidus is sedentary and usually found atop sponges or other elevated surfaces. However, it is able to move at least 1 to 2 m per day possibly to attain a more advantageous feeding position. Food items are captured by the sticky tentacles and transferred to the mouth.

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On décrit ici la morphologie externe de ***Lyrocteis flavopallidus*** sp. nov., cténophore platycténide de grande taille (jusqu'à 110 mm) de l'Antarctique. La coloration jaunâtre, l'absence d'arêtes et de franges sur le corps et les bras, la présence de papilles minuscules sur le corps et enfin la situation géographique de cet animal en font une espèce distincte de *L. imperatoris* Komai, 1941, seule autre espèce du genre. La position systématique de *L. flavopallidus* demeure incertaine car l'anatomie de son système reproducteur de même que son développement larvaire sont encore inconnus; peut-être s'agit-il d'un autre genre ou même d'une autre famille.

Lyrocteis flavopallidus est un animal sédentaire se rencontrant ordinairement sur des éponges ou sur toute autre surface surélevée. Il peut cependant ramper d'au moins 1–2 m par jour, probablement pour atteindre une meilleure source de nourriture. Des tentacules visqueux lui servent à attraper des particules de nourriture qu'il porte ensuite à sa bouche.

Introduction

Platyctenean ctenophores are usually considered to be tropical and subtropical animals (Hyman 1940). The only polar species described so far is *Tjalfiella tristoma* Mortensen; this was collected in Umanak Fjord (lat. 70°53′N, long. 54°03′W) where water temperature was 1.05°C (Mortensen 1910, 1912). Most platyctenids are small, usually less than 3 cm in the longest dimension. Many are commensal in a specific situation such as among colonies of bryozoans, anthozoans, hydroids, tunicates, and the spines of echinoids (Gordon 1969; Matthews and Townsley 1964; Rankin 1956). Although the systematics of the seven genera in the order is reasonably well known (Komai 1942; Rankin 1956; and references therein), there is a dearth of knowledge of their natural history.

In this paper, we describe a new species of a platyctenean ctenophore collected in McMurdo Sound, Antarctica, during the austral springs of 1967 and 1968. Although it is similar in some respects to *Lyrocteis imperatoris* Komai, 1941, which is found in Sagami Bay, Japan, we feel that it is sufficiently different to warrant description as a new species. Until well-preserved specimens are obtained and studied critically, we tentatively assign the animal to the genus *Lyrocteis*. Komai (personal communication) suggests that, because of the brooding behavior, this new species may well represent a new genus and possibly a new family which should stand beside the Lyroctenidae and Tjalfiellidae.

FAMILY Lyroctenidae

GENUS *Lyrocteis*

Komai, T. 1941. Proc. Imp. Acad. Tokyo, **17**: 216–220.

Komai, T. 1942. Mem. Coll. Sci. Kyoto Univ. Ser. B, **17**(1): 1–36.

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Synopsis of the genus (those characters preceded by an asterisk were not studied in *L. flavopallidus*): sedentary; size large (50–150 mm tall); body lyre-shaped; compressed in the plane of the arms and circumscribed by a deep marginal furrow; beautifully colored; ctenes absent in the adult; tentacles branched on one side only, the branches simple; tentacle sheath opens in marginal furrow at tip of arm; meridional canals well developed; *peripheral canals form a network; *gonads develop in numerous diverticula of meridional canals; *each testis with a duct to the exterior; viviparous; *cydippid embryo develops in brood chamber formed at the end of the ovarian diverticulum.

Lyrocteis flavopallidus sp. nov.

The description is based on seven animals, all that we saw and six of which we collected, from Hut Point Peninsula and Cape Armitage near McMurdo Station, Antarctica. Because of the fragile nature of these animals, we collected them underwater in bottles and brought them to the surface for study. We attempted to relax one animal in isotonic magnesium chloride and another by slow infusion of ethanol over a 48-h period. We also quick-froze two animals at −40°C, covered the ice with 10% formalin, and allowed the ice to melt while the formalin slowly diffused through the ctenophore. These four animals were placed in either 70% ethanol or 5% formalin but in all cases they collapsed into amorphous masses. Finally, two animals were quick-frozen at −40°C, fixed in Bouin's solution as above for formalin, and embedded in paraffin blocks using standard histological techniques and considerable care.

These embedded but unsectioned specimens, deposited in the United States National Museum, are the holotype (USNM 52717) and paratype (USNM 52718). The type locality is Hut Point Peninsula, Ross Island, Antarctica (lat. 77°50′-50″S, long. 166°37′25″E).

The species name refers to the pale yellow color of the animals.

External Morphology

Lyrocteis flavopallidus closely resembles *L. imperatoris* in size and general morphology; the largest animal found was 110 mm tall, but most were 50–90 mm tall (Fig. 1, Table 1). The saddle-shaped trunk, slightly compressed in the plane of the "arms," is somewhat wider than tall (Figs. 1, 2). ("Arms" is used as convenient description of the vertical prolongations of the body (see Komai 1942).) The aborally extended arms, nearly circular in cross section, taper slightly to a bluntly rounded tip. Usually they are the same diameter throughout their length although occasionally they may bulge slightly in the middle third. The shape is plastic and can vary considerably in a single individual through time. The arms may diverge up to 45° from the vertical axis of the body.

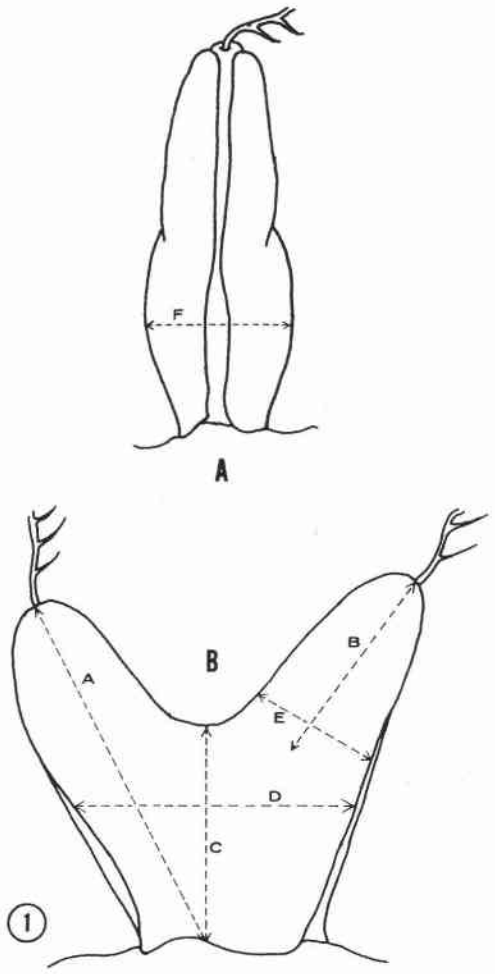

FIG. 1. Diagram of *Lyrocteis* showing the measurements referred to in Table 1 and in the text. (A) Side view; (B) lateral view: A, total length; B, length of arm; C, length of trunk; D, width of trunk; E, width of arm; F, thickness of trunk.

Lyrocteis flavopallidus is very soft and fragile, and any rough handling resulted in the epidermis being sloughed off or the body becoming tattered. Considerable quantities of mucus may be secreted, especially when the animal is disturbed. The epidermis overall is relatively smooth or only slightly wrinkled. Numerous small conical to subconical papillae, 1–3 mm tall, may be present on the sides of the trunk, between the arms, and on the proximal half of the arms. Occasionally the apex of the papilla bears a small, nipple-like projection. The papillae are lighter in color than the rest of the body and they appear full of clear, colorless fluid. The papillae may be extended and contracted relatively quickly. They are usually extended when the animal is irritated or disturbed but when the animal is observed in the field, the papillae are usually contracted. Whether or not these papillae are analogous to the beautifully colored tubercles on *L. imperatoris* is not known, but it seems likely that those of *L. imperatoris* are more or less permanent structures while the papillae of *L. flavopallidus* are more transitory in nature.

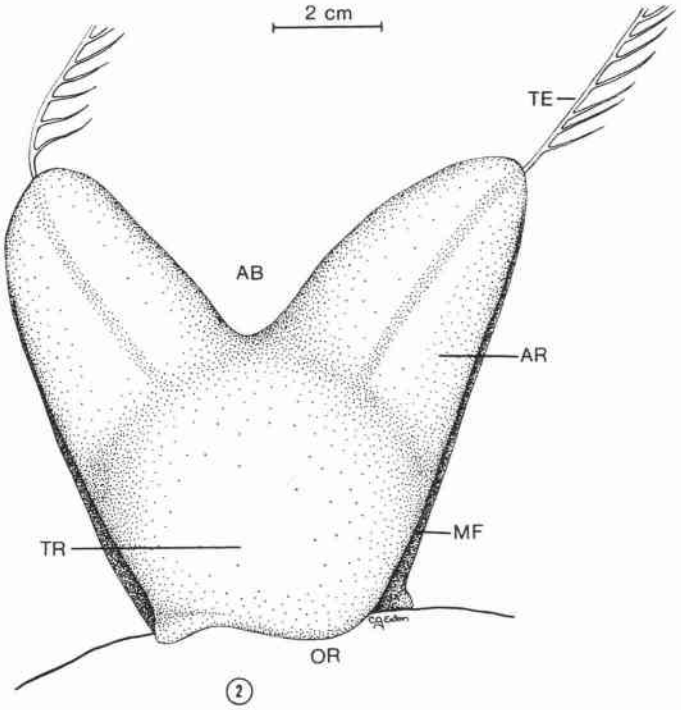

FIG. 2. Lateral view of *Lyrocteis flavopallidus* sp. nov. AB, aboral surface; AR, arm; MF, marginal furrow; OR, oral surface; TE, tentacle; TR, trunk.

TABLE 1

Measurements, in millimeters, of four specimens of *Lyrocteis flavopallidus* sp. nov.

Specimen	Total length from tip of arm to base of trunk	Length of arm	Length of trunk	Width of trunk	Width of arm	Thickness of trunk
1	110	50	55	70	30	45
2	52	—	—	45	—	33
3 (holotype)	93	55	48	60	33	36
4 (paratype)	90	44	—	47	24	—

NOTE: All measurements represent the maximum dimension of the character. See Fig. 1 for orientation of measurements.

In *L. imperatoris*, the arm bears four longitudinal ridges on either side: these run parallel to the outside margin of the arm and extend from the end of the arm to the oral half of the trunk (Komai 1942). Komai (p. 9) stated that "It is evident that the fringes are homologous with the dorsal papillae found in many species of *Coeloplana*, and they function as respiratory organs." However, no fringes are seen on the arms of *L. flavopallidus*. Also absent from *L. flavopallidus* is the extensive frilling on the outer edge of the marginal furrows and the skirt of the trunk seen in *L. imperatoris*.

There is a complex anastomosing network of channels visible just below the epidermis of the body and arms but especially prominent at the edges of the marginal furrow. As no dissections were made, it is not known whether these channels are part of the genital system, the gastrovascular system, or both. Under the epidermis of one animal collected December 3, 1968, we saw some white, irregularly shaped, but basically tubular structures about 1–3 mm long.

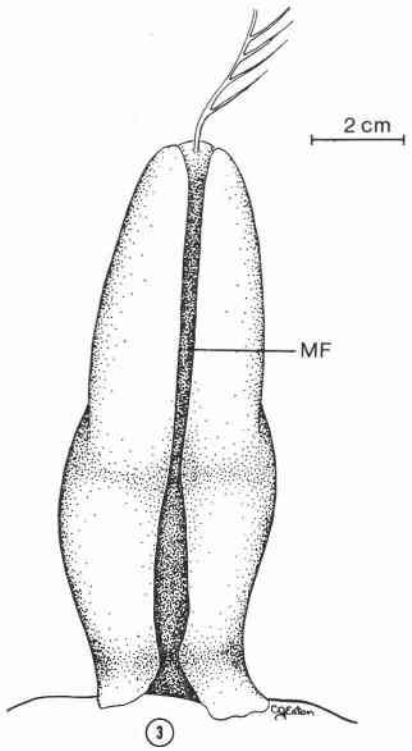

FIG. 3. Side view of *Lyrocteis flavopallidus* sp. nov. MF, marginal furrow.

These were restricted to the upper half of the trunk and seemed to be relatively firm.

No ctene rows were present in the adults. The apical organ is in the midline at the bottom of the "saddle" of the body and is marked externally only by a slight indentation.

A marginal furrow runs from the apex of each arm (marked by the opening to the tentacle sheath) down the lateral border of the arm, and then along the oral surface to join its opposite member at the mouth (Fig. 3). This furrow is about one-fourth to one-third as deep as the arm is wide. The outer edges of the furrow can either be folded together, thus effectively concealing the furrow, or be far apart, revealing it. At the oral end, the smooth floor of the furrow is thrown into a series of low, longitudinal rugosities which continue into the mouth area.

On either side of the mouth and oriented in the plane of the arms, there is a thin, oblong flap. These flaps overlap, thus covering the mouth. When the flaps are folded back, soft billowy folds, one on either side of the mouth and oriented at right angles to the furrows, are revealed. The mouth lies between them. The exact structure and function of these folds was not determined but they may be analogous to the sensory papillae and pharyngeal folds described by Komai (1942). In the furrow just lateral to the mouth region on either side, there is a small blind pouch, the function of which is not known.

Tentacles

The main tentacles bear numerous, evenly spaced, long, filamentous branches; however, the branches are restricted to one side of the tentacle. The branches are longest near the body and become shorter distally. They are notably adhesive which suggests that they have colloblasts. Both the tentacles and the branches are extensible. In one specimen observed in the field, the tentacles were 70 cm long and it is possible that they could have been extended even further. Normally, they were extended about 15–30 cm. On the other hand, the tentacles can be completely retracted into the sheath. The tentacle sheath extends from the apex to the base of the arm.

Color

Lyrocteis flavopallidus is a pale straw-yellow color. Within the species, there is some variation in the shade and intensity of the color but the

color is almost uniform in any individual. Along the edge of the marginal furrow, the pigment appears more concentrated. As mentioned above, the papillae are pale and transparent. The tentacles are white and appear through the otherwise translucent body as opaque white lines in the tentacle sheaths. The lining of the marginal furrow and the oral region is translucent white. In contrast to the uniformity of color in *L. flavopallidus*, all the specimens of *L. imperatoris* which Komai (1942) examined were translucent and beautifully colored—venetian pink, picric yellow, milky white, or mustard yellow, with green on the trunk margin, orange or apricot over the genital tracks, and many with carmine tubercles.

Reproduction

The structure and location of the genital system was not determined for this species although we assume that it is similar to that described for *L. imperatoris* by Komai (1942). One animal collected December 3, 1968, released two large eggs from the oral region, possibly through the mouth, after it had been in a dish in the laboratory for one hour. The eggs were 4 mm in diameter with a clear jelly coat about 0.5 mm thick around each. One pole was filled with a jelly-like substance with a few small "bubbles" in it while the yolky part was concentrated at the opposite pole.

A specimen collected in 1967 produced three young resembling cydippid larvae except that we saw no ctene rows. However, the larvae were not examined microscopically so we cannot be sure of the complete lack of ctenes. These larvae appeared to come from the ventral part of the marginal furrow but the exact outlet is not known. Komai (1942) found that the larvae of *L. imperatoris* penetrate the body wall overlying the brood chambers and escape, leaving holes on the outer surface of the adult. The brood chamber of *L. imperatoris* is an expansion of the many ovarian diverticula which lie along the meridional canal. It remains to be seen if this same condition obtains in *L. flavopallidus*. The method of release of the larvae may be an important difference and sufficient to warrant establishing a new genus and perhaps even a higher taxon (Komai, personal communication).

Ecology and Behavior

The animals were found at a depth of 36 to 55 m just north of Hut Point (five specimens) and just south of McMurdo Station toward Cape Armitage (two specimens). Most of the specimens

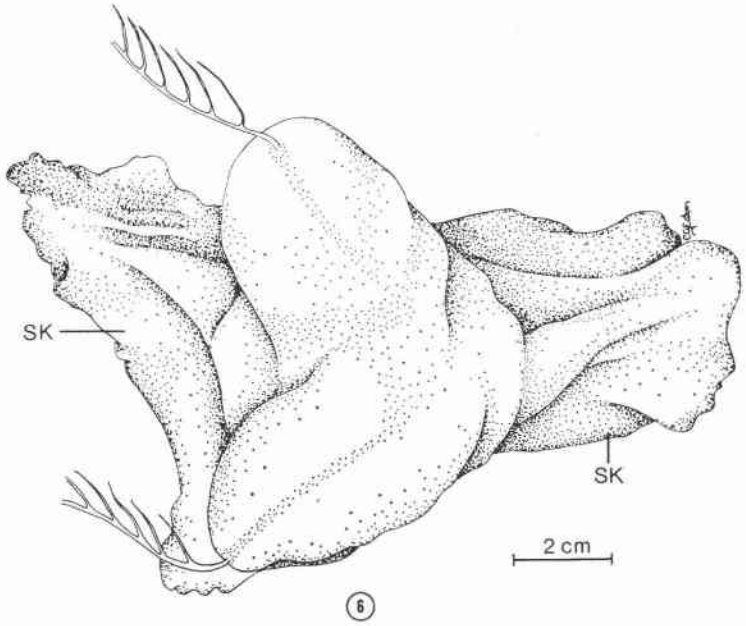

FIG. 6. Aboral view of *Lyrocteis flavopallidus* sp. nov. Note the skirt (SK) upon which the animal glides over the substratum.

were found on elevated surfaces, usually sponges such as *Rosella racovitzae* and *Tetilla leptoderma* (Fig. 4). As a rule, the animals moved less than 2–3 cm over long periods of time (up to 2–4 days). One animal, located upon a sponge (*Tetilla leptoderma*) and elevated about 15 cm above the bottom, moved 35 cm in a 12-h period to a steel rod we used as a marker, and then crawled up this rod to a point about 30 cm above the bottom (Fig. 5). The rod was downcurrent from the ctenophore and on at least one occasion, we saw its tentacles touch the rod. Another *Lyrocteis flavopallidus* was sitting on some sponge debris carried by an urchin, *Sterechinus neumayeri*, but within 3 days (probably less), it moved from the urchin to another steel rod we used to mark the ctenophore's position, a distance of 35 cm, and crawled up the rod to a point 30 cm above the bottom.

We suggest that *L. flavopallidus* somehow recognized these rods as better places to be and moved over to them. Many of the macroinvertebrates in this depth zone are filter feeders (Dayton *et al.* 1970), so it is probably to any individual animal's advantage to elevate itself above the others thus obtaining first chance to filter the food organisms out of the water. We have observed this same behavior in one species of holothurian.

The base of the trunk around the oral area can be expanded laterally into what Komai (1942) called the skirt, the edge of which is irregular in outline (Fig. 6). In the laboratory, the ctenophore was able to glide slowly around the aquarium by extending the skirt in one direction, attaching the leading edge, and pulling the rest of the body up to it. The skirt rarely broke contact with the surface. It is also possible that cilia, of which there are many on the oral surface, are instrumental in movement of the ctenophore.

The body and the arms usually bend in the same direction as the current flows. Occasionally an arm may bend into the current, but in any case, the tentacles stream with the current. When we stirred up detritus such that it floated past the tentacles, the lateral branches became active and picked up small bits of detritus. Then the tentacle was rapidly retracted, the whole process taking only a few seconds. Although we could not see what happened to the food, it seems likely that it was either scraped off at the tip of the tentacle sheath and moved down the marginal furrow to the mouth by ciliary action, or that it was carried to the mouth directly by the tentacles and scraped off there. Both methods are used by *Vallicula multiformis* Rankin, the former being involved in feeding on small particles and the latter when the prey is larger (Rankin 1956).

We have no information on longevity, growth rates, distribution, length of larval life, etc. Hopefully, more animals will be found in the future and a more critical study of the anatomy can be carried out to firmly establish the systematic status of this species as well as elucidate more of the natural history.

Acknowledgments

We are grateful to Charles P. Galt for his patience and care in embedding the type specimens, to Drs. Taku Komai, Cadet Hand, and Mr. Dennis Gordon for valuable advice concerning the systematics of the species, and to Drs. Alan J. Kohn, Eugene Kozloff, and Robert T. Paine for reading the manuscript. Mrs. Cathy Eaton prepared Figs. 2, 3, and 6.

The support of the National Science Foundation Grant (GB 6518X and GB 20978) and the National Science Foundation Grant (GA 1187) to Dr. Robert T. Paine is gratefully acknowledged. The junior author acknowledges the support of the National Science Foundation Grant (GA 30877) during preparation of the manuscript.

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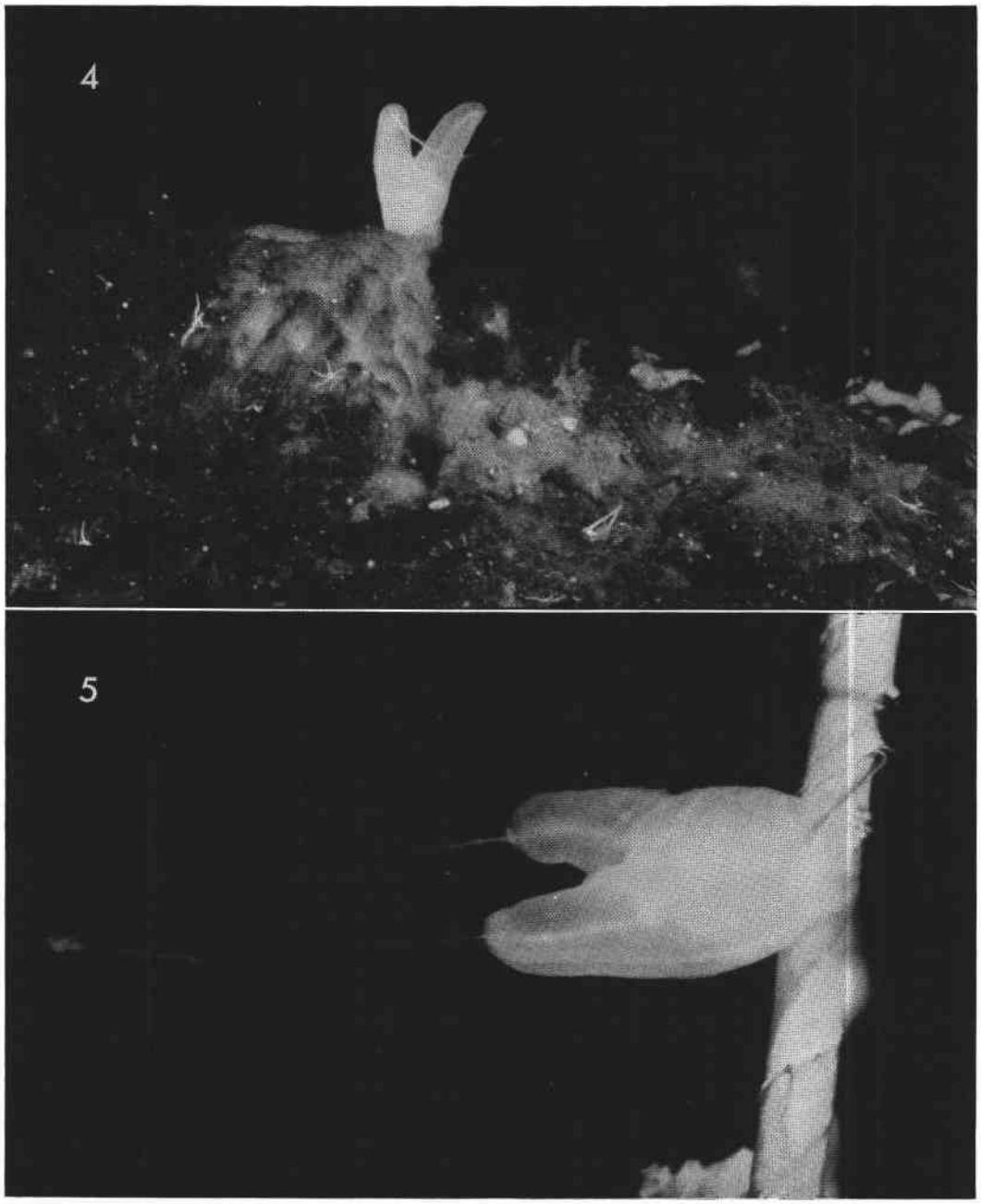

FIG. 4. *Lyrocteis flavopallidus* sp. nov. on a sponge, *Rosella racovitzae*, at 50 m at Hut Point, Antarctica. $\frac{1}{4}\times$.

FIG. 5. *Lyrocteis flavopallidus* sp. nov. on a steel rod wrapped with tape at 45 m at Hut Point, Antarctica. See text for explanation. $\frac{1}{2}\times$.