NEW ZEALAND COELENTERATES
Ctenophores from Cook Strait

by

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ABSTRACT

The paper describes Ctenophores of the Orders Cydippida, Lobata, and Cestida from the waters of Cook Strait, New Zealand. Three new species are described and figured. *Pleurobrachia helicoides* n. sp. has a cylindrical body; comb rows extending nearly the whole length of the body; paragastric canals as wide as the stomodeum; tentilla tightly coiled into a barrel-shaped orange-pink helix: *Bolinopsis paragaster* n. sp. has unique branched paragastric canals which unite with the subventral meridional canals on the margin of the oral lobe; double tentacle bases; *Lesueuria pinnata* n. sp. has four fin-like flaps, marginally papillose, beside the subventral meridional bands of swimming plates; oral lobes about ¼ the total body length. *Bolinopsis*, *Lesueuria*, *Leucothea* and *Cestum* are recorded from New Zealand waters for the first time.

The Ctenophores described in the present paper were collected by Mr. Kaberry, now of the Marine Department, Wellington, in the course of his postgraduate researches in the Department of Zoology at this College. They can be said to be fairly representative of the species found in New Zealand waters for the year July 1934 to July 1935. This season was exceptionally warm and calm in Wellington, and the absence of wind was important in the collection of delicate forms. Collections were made from Island Bay, a suburb of Wellington, bordering Cook Strait. Cook Strait forms a natural wind funnel between the North and South Islands of New Zealand and is on the line of the Subantarctic Convergence, and receives water from the East Australian Current and Southern Ocean Current during the summer months. These factors may have some effect on the abnormal distribution of typically warm water forms such as *Cestum veneris*. The authors wish to thank Prof. L. R. Richardson for his helpful advice with this paper.

Order CYDIPPIDA

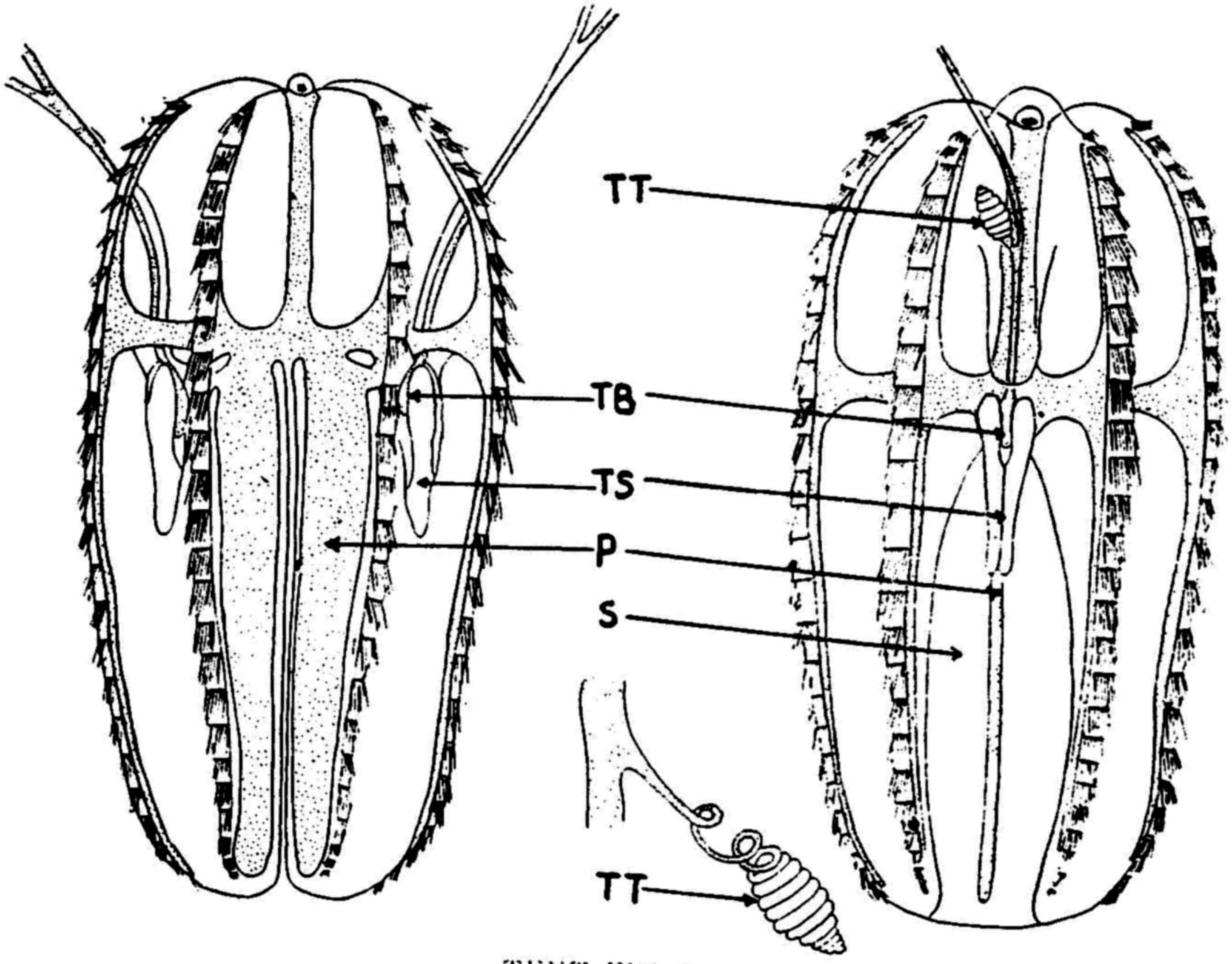
Pleurobrachia pileus (O. F. Muller).

This species has been recorded from New Zealand waters by Moser (1909) and Ralph (1949) and the present study only places on record that the New

Zealand specimens of *P. pileus* are efficient fish catchers. On several occasions larval fish observed when the net was taken on board were missing when the haul was later examined. Once *P. pileus* was seen to come in contact with a larval fish as large as itself. The fish seemed to die immediately and in approximately an hour was within the stomodeum. The economic importance of this habit has been emphasized elsewhere. (Bigelow, 1924.)

Pleurobrachia helicoides sp. nov. Text Fig. 1.

Specific Description: Body of living specimen cylindrical, with long comb rows extending from the aboral pole to nearly the oral pole; meridional canals slightly greater in length than the comb rows broad paragastric canals, nearly as wide as the stomodeum; tentilla, tightly coiled into a barrel-shaped helix, orange-pink in colour.



TEXT FIG. 1.

Pleurobrachia helicoides n.sp. P, paragastric canal; TB, tentacle base; TS, tentacle sheath; TT, coiled helix of tentilla; S, stomodeum.

Specimens were taken on two occasions—July 22nd and 23rd 1935. They were very active swimmers and intolerant to any irritation. The specimen described below

was 11 mm. long, approximately cylindrical, with blunt oral and aboral ends. The eight bands of swimming plates almost cover the eight meridional canals and extend from the aboral pole to nearly the mouth rim. A faint pink colour can be distinguished underneath the comb rows. The two long contractile tentacles are based in the usual position for *Pleurobrachia*—midway between the outer body wall and the funnel axis. The tentacles give rise at long intervals to lateral filaments tightly coiled into barrel-shaped helicles which are orange-pink in colour. To the naked eye the tentacle resembles the fishing thread of a young *Physophora*. The helicles were not seen to uncoil. The bottom of the tentacle sheath is filled with liquid of refractive index similar to the oil bubble in a fish egg. The apical sense organ when first examined in the living animal is prominent, projecting above the polar surface, but as the specimens become fatigued it sinks into a pit and the surrounding tissue between the swimming plates swells upward to form the walls of the pit. The funnel tube is nearly one-third the length of the body, and of constant diameter. The paragastric canals are greatly flattened and very wide, as wide as the stomodeum. No genital products are visible in the meridional canals.

DISCUSSION

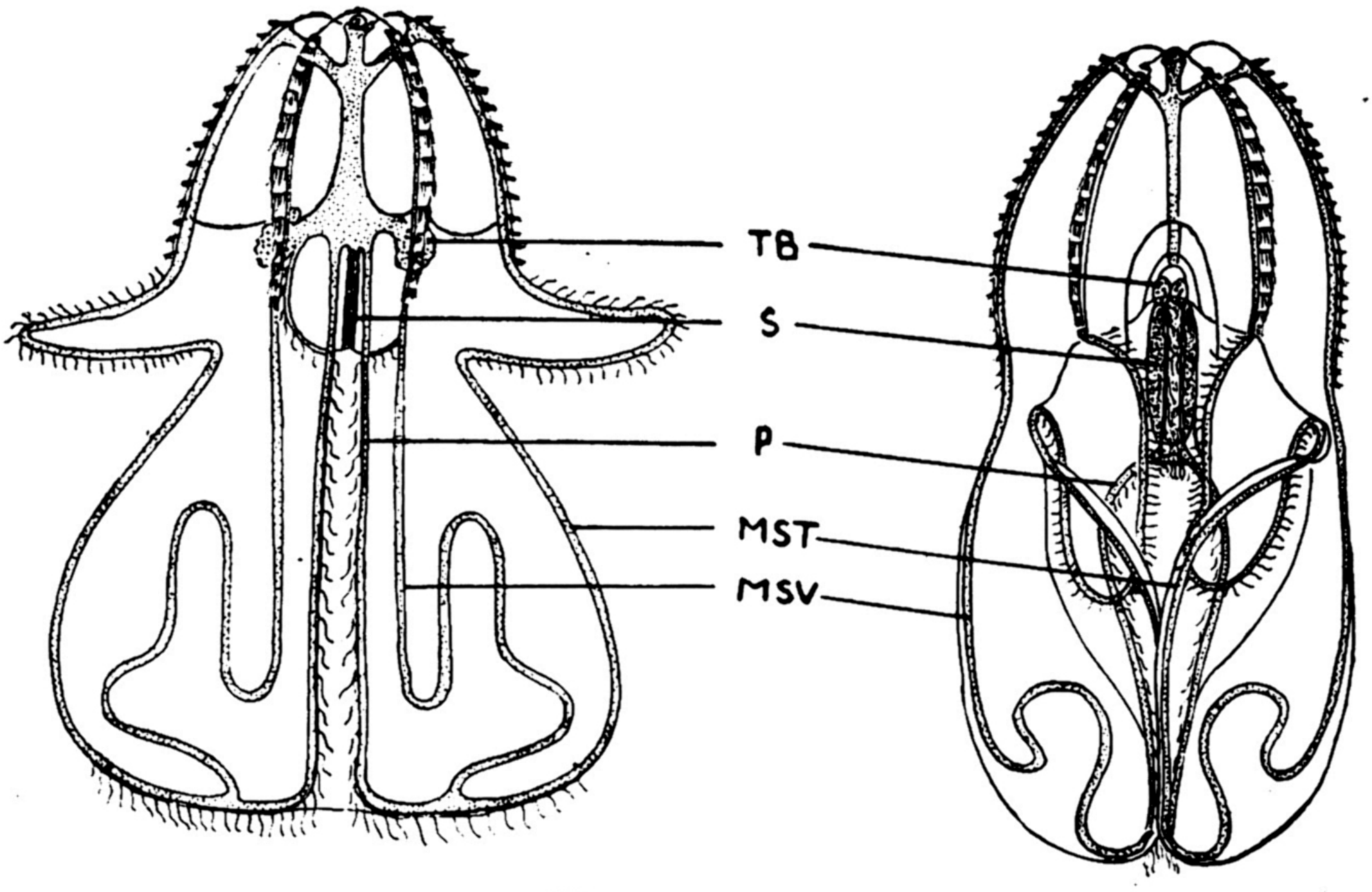
The very broad paragastric canals distinguish *P. helicoides* from all known species of *Pleurobrachia*. They can further be distinguished by body shape, pigmentation, etc. Firstly they are distinguished from *P. pileus* O. F. Muller 1776 by their cylindrical body shape, long comb rows and by their colour—pale pink underneath the comb rows and orange-pink tentilla; from *P. bachei* A. Agassiz 1865 and *P. globosa* Moser 1909 by the difference in position of the junction of the adradial canals with the meridional canals; from *P. pigmentata* and *P. striata* Moser 1909 by the absence of pigmented "paddle plates" and from *P. crinata* Moser 1909 and *P. australis* (Benham) 1907 (Syn. *Euplokamis australis* Benham 1907) by the absence of a funnel-shaped collar round the mouth. The general body shape, comb rows, and canal system of *P. helicoides* is similar to *P. australis* and both species have been taken from Cook Strait, but not at the same time. The weight of evidence is such that despite the general similarity in appearance and canal structure *P. helicoides* does not fall within the specific description of *P. australis* as given by Benham. The broad paragastric canals, tightly coiled tentilla, the presence of colour, and the lack of a funnel-shaped collar round the mouth distinguish *P. helicoides* from *P. australis*. Nevertheless it must be borne in mind that only a few specimens of each species have been examined and it would not be surprising to find in a genus where wide variation in form, colour, and even canal structure is permissible within a species that examination of a large number of specimens would yield sufficient evidence for the specific description of *P. australis* to be widened to include those forms at present distinguished as *P. helicoides*. *P. helicoides* may be in fact only a seasonal variant.

Order LOBATA

Bolinopsis paragaster sp. nov. Text Fig II and III.

Specific Description: Oral lappets large, three-fifths the total length of the body; four short auricles about one-half the size of the oral lappets; paragastric canals unique, giving rise to two branches which traverse the inner surface of each oral lobe, then travel along the lower margin of the lobe till they join the meridional subventral canal of their respective sides; stomodeum short, and coloured with deep red-brown pigment; the funnel tube is long; and the tentacle bases are double.

The generic name *Bolinopsis* is used in this paper in the "sens emend.," of Mayer (1912). Specimens up to 50 mm. long were taken. As is usual with *Bolinopsis* they were extremely delicate in texture, the least current being sufficient to tear them to pieces. When swimming the specimens always kept the funnel axis vertical using the swimming plates and feeble movements of the oral lobes for locomotion. Specimens were taken during late Autumn (March and April) when they often formed a major part of the pelagic fauna.

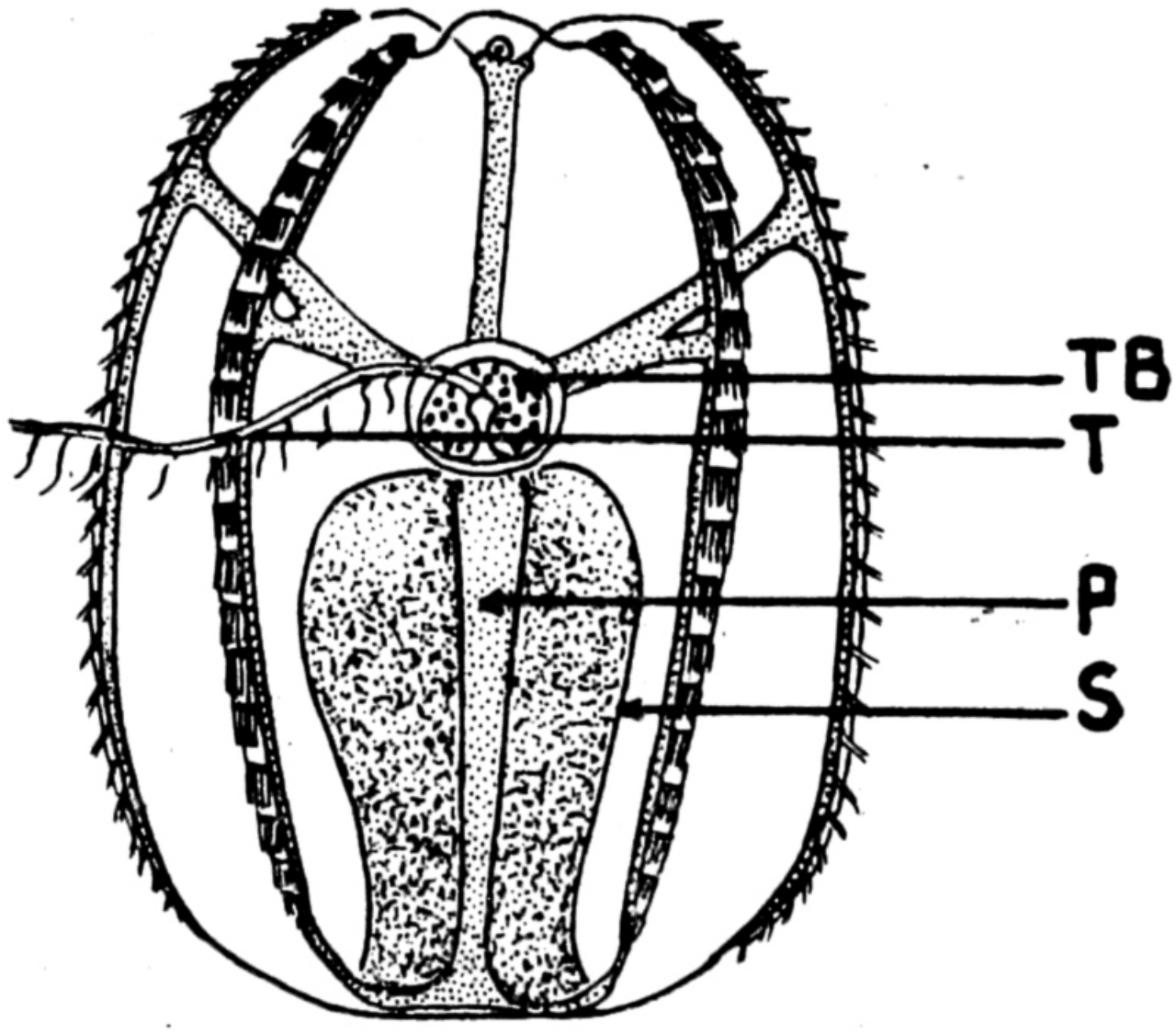


TEXT FIG. II.

Bolinopsis paragaster n.sp. MST, meridional subtentacular canal; MSV, meridional subventral canal; TB, tentacle base; S, stomodeum.

The species is described from a living specimen measuring 25 mm. in length (in the stomach axis) from the apical sense organ to the tip of the oral lobes. The two large oral lobes are about three-fifths the total length of the expanded

animal, and there are four short auricles with cilary combs on the margin. The sense organ is sunken in a small pit. The subventral meridional canals traverse the oral lobes of their respective sides as two parallel canals till nearly the abapical margin where they diverge, wind slighty in the oral lobe and then join a branch of the paragastric canal on the margin of the lobe. From this junction with the paragastric canals on the margin of the lobe, the meridional subventral canals continued to border the margin of their respective sides of the lobe until they meet and join with the meridional subtentacular canal of that side. The paragastric



TEXT FIG. III.

Juvenile *Bolinopsis paragaster* n.sp. T, tentacle; P, paragastric canal; TB, tentacle base; S, stomodeum.

canals are unique. They give rise to two branches which traverse the inner surface of each oral lobe travelling along the margin of the lobe till they join the meridional subventral canal as described above. All the canals, but especialy the paragastric canals and the tentacular canals contain many tiny globules, more so than in other ctenophores. Many of these globules are coloured light red. The stomodeum is short, compressed in the stomodeal axis, and coloured with a deep red-brown pigment. Except for this deep red-brown pigment of the stomodeum and the light red globules in the canals the specimens are transparent and colourless. The funnel tube is long, and from its oral end two thick branches pass to the tentacle bases. The tentacle bases are enclosed in remnants of a tentacle sheath, and are unusual in that they are double in all specimens examined, *i.e.*, there is a pair of tentacle bases on each side of the animal. Arising from this double tentacle base is a single tentacle which follows the contour of the margin of the mouth to the inner side of the two parallel branches of the paragastric canal and then follows these canals closely until just past their junction with the meridional subventral canals. Throughout their course they give rise to numerous contractile filaments.

The auricles hang down well below the mouth.

Several specimens were taken during hauls that we consider are juvenile *B. paragaster*. They showed similar localized pigment in the stomodeum, globular bodies in the paragastric canals and the tentacle bases were double. The largest specimen is 6 mm. in length and differs from the adult in possessing long rows of swimming plates and long meridional canals, tentacles based in definite sheaths and non-branching paragastric canals. No oral lobes are present and the subventral meridional canals end blindly. The meridional subtentacular canals join the paragastric canals of their respective sides. The stomodeum is flattened in the plane of the polar plate. A two-millimetre specimen had large swimming plates and the meridional canals ended blindly. The tentacles were similar to the 6 mm. specimen.

DISCUSSION

B. paragaster can be distinguished from *B. infundibulum* (L. Agassiz) Mayer 1912 the type species, by its longer oral lobes, shorter comb rows, less deeply sunken sense organ and by the simple windings of the subventral meridional canals in the oral lobes; from *B. vitrea* (L. Agassiz) Mayer 1912 by possessing subventral comb rows only slightly longer than the subtentacular rows, whereas *B. vitrea* has the subventral rows about twice as long as the subtentacular; from *B. elegans* Mertens 1833 by the lack of body papillae, and from *B. mikado* Moser 1907, 1908 by the very much shorter subventral comb rows which are less than half the length of those displayed by *B. mikado*, which extend from the apical pole to nearly the lower border of the oral lobe. In *B. paragaster* the subventral rows do not extend beyond the level of the mouth. Further, the sense organ of *B. mikado* is far more deeply sunken than in *B. paragaster*. *B. paragaster* shows some similarity to *B. ovalis* Bigelow 1904 which has proportionally longer lobes than most other species of the genus. Bigelow (1912) considers, however, that *B. ovalis* and *B. hydactina* Chun 1880 are varieties of *B. vitrea* so that the same character that separates *B. vitrea* from *B. paragaster*, namely the difference in length of the subventral comb rows, will also distinguish *B. ovalis* and *B. hydactina* from *B. paragaster*. *B. chuni* described by von Lendenfeld (1884) from South Australian waters can be distinguished from *B. paragaster* by the extraordinary thickness of its oral lobes, and by the fact that the paragastric canals lie at some distance from the stomach. In addition to the characters outlined above *B. paragaster* possesses several unique features that distinguish it from all the known species of the genus, viz.: double tentacle bases; branched paragastric canals that join the meridional subventral canals on the lower margin of the oral lobe and a short densely pigmented stomodeum and relatively long infundibulum. Unfortunately, the juvenile specimens do not throw any light on the manner in which the branched paragastric canals arise, as in both specimens no oral lobes are present and the normal non-branched condition of the canals is displayed. Double tentacle bases however seem to be characteristic of the species in the juvenile stage of development, and should assist in making possible early recognition of the species.

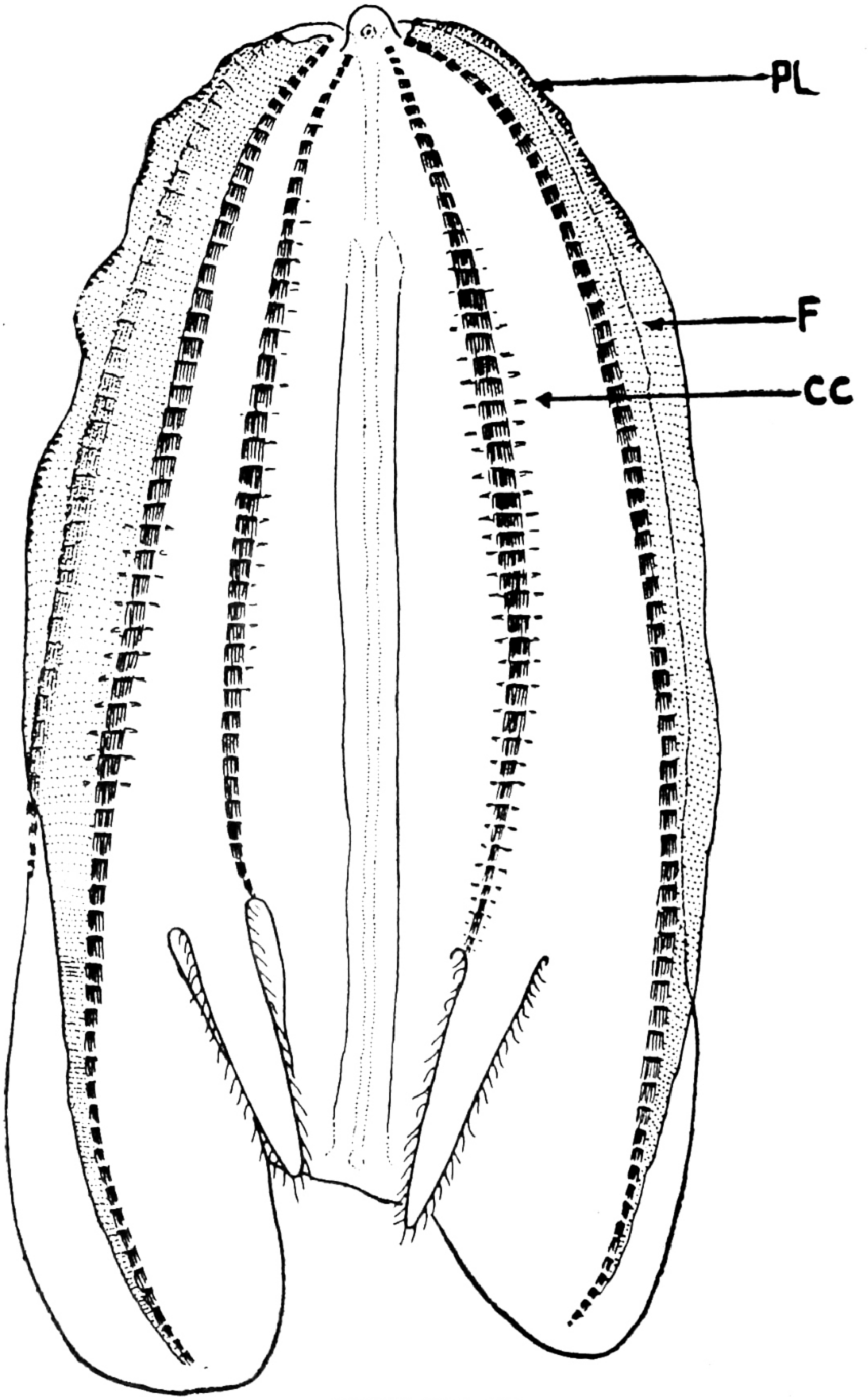
Lesueuria pinnata sp. nov. Text Fig. IV.

Specific Description: Four, papillated, fin-like flaps, are situated beside the meridional subventral bands of swimming plates and what appear to be short transverse canals are found below each swimming plate; oral lobes about one-quarter the total length of the animal and the auricles slightly shorter than the oral lobes; peripheral canal system at present unknown.

This species is common during calm weather in autumn but is very difficult to capture on account of its size and delicate nature, while an hour or so of confinement is sufficient to start disintegration. The description of this species is taken from the preserved specimen and observations on several living specimens. The average size of specimens was 160 to 200 mm. long and the largest was 290 mm. The stomodeum of the species is long and the infundibulum short. The meridional canals unfortunately are not distinct. In cross section the body is dumb-bell shaped, with the stomodeum corresponding in position to the handle of the dumb-bell. In general outline the body is long and considerably flattened in the tentacular axis, which has a deep wide groove running from the oral toward the aboral end and disappearing in the region of the funnel tube. There are two oral lobes of very delicate texture about one-quarter the total length of the body. The four auricles are straight and ribbon-like and somewhat shorter than the oral lobes. The stomodeal axis is 60 mm. in width and the distance between the meridional subventral and meridional subtentacular canals of opposite sides is 20 mm. Aborally, the end is bluntly pointed, and the subtentacular comb rows commence from the inner sides of two gelatinous projections that form a groove in which the sense organ is situated. Otherwise the rows of swimming plates are of the general lobate type with the individual plates very wide and short. What appear to be short transverse canals pass through the base of each comb plate. Gelatinous dark-coloured, fin-like flaps are situated beside the meridional subventral bands of swimming plates. Along the outer margin of these fin-like flaps is a row of tiny papillae each with a projecting centre. In the preserved specimens these could be traced to the margin of the oral lobe but this is difficult in the living specimens as the papillae are unpigmented in this region. Aborally, they are pigmented and show as a thin dark line. The centres of the papillae however are devoid of pigment. The rest of the animal is unpigmented and slightly opaque.

DISCUSSION

It is with hesitation that we revive the genus *Lesueuria* Milne-Edwards, 1841, to receive these New Zealand specimens of the O. Lobata, for Mortensen (1912) unhesitatingly concluded that *Lesueuria* is nothing else than a regenerating *Bolina* (Syn. *Bolinopsis* Mayer 1912). All the present specimens fall within the generic description of *Lesueuria* as defined by Mayer (1912). "Lobatae with rudimentary oral lappets and with long, ribbon-shaped auricles. The peripheral gastrovascular system is simple, without complex windings." At present we see no adequate reason



TEXT FIG. IV.

Lesueuria pinnata n.sp. Drawing reconstructed from a photograph. F, fin-like flap beside subventral row of swimming plates; CC, canal-like structures below each comb plate; PL, papillose margin of flap.

for concluding that our specimens are regenerating from a damaged condition, so that the characters displayed by the New Zealand specimens, *i.e.*, small oral lappets and long ribbon-shaped auricles properly assign them to the genus *Lesueuria* and not *Bolinopsis*. *Lesueuria* and *Bolinopsis* have been taken on the same day and can readily be distinguished one from the other. The oral lobes of the present specimens of *Lesueuria* are about one-quarter the total length of the body, whereas in *Bolinopsis*, the lobes are usually nearly two-thirds the total body length. The type species is *L. vitrea* Milne-Edwards 1841, of the Mediterranean. *L. hyboptera* "the so-called American species is more nearly rectangular in outline than the oval-shaped *L. vitrea*. In *L. hyboptera* the body is wider both above and below than it is in the middle, thus giving the appearance of a laterally flattened hour glass." (Mayer 1912.) The body shape of *L. pinnata* is more like *L. hyboptera* than *L. vitrea* but the oral lobes are longer than in either of these species. *L. pinnata* can further be distinguished from *L. vitrea* and *L. hyboptera* by the presence of four, fin-like, marginally papillose, flaps alongside the meridional subventral bands of swimming plates and by what appear to be small transverse canals below each of the comb plates.

Leucothea multicornis (Eschscholtz) 1825 (Syn. *Eucharis multicornis* Eschscholtz 1825)

This species observed in autumn during very calm weather was one of the most delicate ctenophores taken, and extremely difficult to handle, as it extruded great quantities of slime when captured. Any slight movement of the boat always tore the specimens to pieces so that only fragments ever reached the laboratory. Specimens average between 150 mm. and 200 mm. but specimens larger than 200 mm. have been taken. Specimens smaller than 150 mm. were seldom encountered. The oral lobes are very large and once were seen spread on the surface of the water as figured by Chun (1880). The auricles are very long with cilia on one side only. The body surface is papillated, each being about 10 mm. long and bearing a cap of large globular cells. These papillae are mobile and extensible. They respond to tactile stimuli bending to touch if possible the stimulating object. The individual plates of the comb rows are large. All specimens examined were in part damaged. The canal system and tentacle structure were difficult to determine accurately. Sufficient evidence was obtained however for us to be sure that the New Zealand specimens are correctly assigned to *L. multicornis*.

Order CESTIDA

Cestum veneris Lesueur, 1813.

On five occasions during prolonged calm weather, specimens of this ctenophore were seen. Specimens were taken on March 9th from water 15.5°C. and on May 13th from water 12.25°C. and on this later date the species was plentiful.

almost sufficient to be called a swarm. They were mostly between 100 and 200 mm. long. The specimens taken were sketched in the living condition and were found on comparison with figures given by Mayer (1912) and Chun (1880) to be identical with *C. veneris*. All specimens were colourless and were smaller than those recorded by Mayer. The largest New Zealand specimen taken was about 350 mm. long and the smallest 10 mm., whereas Mayer records a size range between 800 and 1500 mm.

DISCUSSION

Cestum is predominantly a warm water ctenophore, (Mayer, 1912) although it has been recorded from the White Sea (Wagner, 1885). Mayer and Mortensen (1912) consider that the specimens described by Wagner were swept northward along the Norwegian coast by the Gulf Stream Drift. The South Equatorial current may have been responsible for the presence of *C. veneris* in New Zealand waters, but it has no reputation like the Gulf Stream in this respect. Moreover in latitude 41° S., a water temperature of 12.25°C. does not indicate a warm current. We suggest that they have not been reported from the temperate regions for two reasons, viz: the necessary calm periods with brilliant sunshine for collection are not of sufficient duration; and secondly, that *C. veneris* is not readily netted but must be sighted and then collected by a method of dipping.

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