

# An undescribed lobate ctenophore, *Lobatolampea tetragona* gen. nov. & spec. nov., representing a new family, from Japan

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*Lobatolampea tetragona* gen. nov. & spec. nov. was collected from coastal waters of Ise Bay, near Toba, Pacific coast of middle Japan. It assumes a medusoid bell-shape when floating, but is nearly disc-shaped when resting on the bottom. It is characterized by four C-shaped gonads present on the distal part of the subpharyngeal meridional canals, beyond the oral end of the comb rows. "Primitive" oral lobes are also formed and ctenes are found at the site of the presumptive auricles. The morphology of this species differs from any previously described larval or adult form, and is intermediate between the orders Cydippida and Lobata. The larvae are of the cydippid type.

## Introduction

Two specimens of a strange, hitherto undescribed ctenophore were collected, together with other near-shore zooplankters, along the shore of Ise Bay, Toba, Pacific coast of middle Japan. Observations in the laboratory showed these ctenophores to vary in shape from medusoid when floating to roughly discoid when resting on the bottom. The larger specimen, measuring about 20 mm across, was observed, photographed and drawn while fresh. This specimen, designated as the holotype, served mainly for the description of the new species. After 41 days the specimen died, and before it could be preserved it had disintegrated. A colour photograph of the living specimen in the discoid, prostrate condition, taken from above (fig.1), clearly shows the structure of the gastrovascular canal system, the secondary tentacular apparatus, and the C-shaped gonads in the distal portion of the four subpharyngeal meridional canals. These canals extend beyond the oral end of the comb rows. The gonads were mature, with eggs in various developmental stages. In addition cydippid larvae were found in the meridional canals.

In the second, slightly smaller specimen, the gonads were spent already. Fifteen days after collecting, this specimen was preserved in a solution of 3.7% formaldehyde in sea-water. However, upon doing so, it shrank to an amorphous whitish mass, so that all that remained recognizable were some comb plates and the aboral portion, inclusive of the sensory organ and the infundibulum. These remains are deposited in the collection of the Toba Aquarium as the paratype.

The specimens of the new species show a morphological structure intermediate between the orders Cydippida and Lobata. The gastrovascular canal system resembles almost exactly that of the Cydippida, whereas the structure of the oral lobes (though in a "primitive" stage of development), and the presence of ctenes, the precursory structures of the auricles, are typical of the Lobata.

The presence in the two specimens of well developed gonads on the four subpha-

ryngeal meridional canals represents a significant (though not unique) feature of the larval stage of the Lobata, known as dissogony. The presence of ctenes is described by Chun (1880) from a medusoid larva of *Leucothea multicornis* of about the same size as the present specimens. Therefore, it was important in the present study to make detailed comparisons between the present specimens and the larval as well as adult forms of previously known ctenophores. Thus, the author's efforts were especially concentrated on proving that the present specimens do not represent a larval form of any known species, as discussed below. Results of the comparisons, together with some other features seemingly unique to the present specimens led the author to the conclusion that these specimens represent a new species, to be accommodated in a new genus and family. Possibly it should even be placed in a new order intermediate between Cidippida and Lobata.

### Descriptive part

#### **Lobatolampeidae fam. nov.**

(The characters of the family are incorporated in the genus diagnosis)

#### *Lobatolampea* gen. nov. (figs 1-3)

Diagnosis.— Tentaculate lobate ctenophores with medusa-shaped body compressed along the oral-aboral axis. Comb rows short. Oral lobes without auricles but with ctenes at site of presumptive auricles. Subpharyngeal meridional canals short, ending blind orally and containing C-shaped gonads in the distal portion. Short per-radial canals and blind paragastric canals present. Secondary tentacles with lateral filaments.

#### *Lobatolampea tetragona* spec. nov.

(figs 1-3)

Material (cf. introduction).— Holotype (cf. figs 1-3), no longer extant (Japan, Pacific coast of Honshu, Ise Bay, Toba, 3.v.1992, water temperature 15.3°C, leg. Takushi Horita). Paratype, kept in the collection of the Toba Aquarium laboratory, Toba, Japan (same data, except 14.vi.1992, water temperature 19.9°C).

Description (mainly based on lost holotype).— The specimen resembled a thalassocalycid medusa when floating (fig. 3), but was roughly disc-shaped when resting on the bottom (fig. 3). Body flattened along the oral-aboral axis, with the aboral part somewhat domed. Prominences, keels and papillae lacking in the aboral region around the sensory organ. Polar plates of moderate length. Tentacular plane slightly narrower than pharyngeal plane, measuring 21.3 × 23.1 mm in width. Comb-rows short, extending to level of tentacle bulbs; subtentacular rows slightly shorter than subpharyngeal rows, running to very near tentacular plane, whereas subpharyngeal comb-rows each extending roughly to centre of its respective quadrant. Number of comb plates 16 per row. Oral margin markedly incurved to form an Omega-shaped cleft at each end of the tentacular plane, up to halfway up the bell. Oral periphery fringed wholly with a broad, thin, and transparent velar membrane, hanging down when floating.

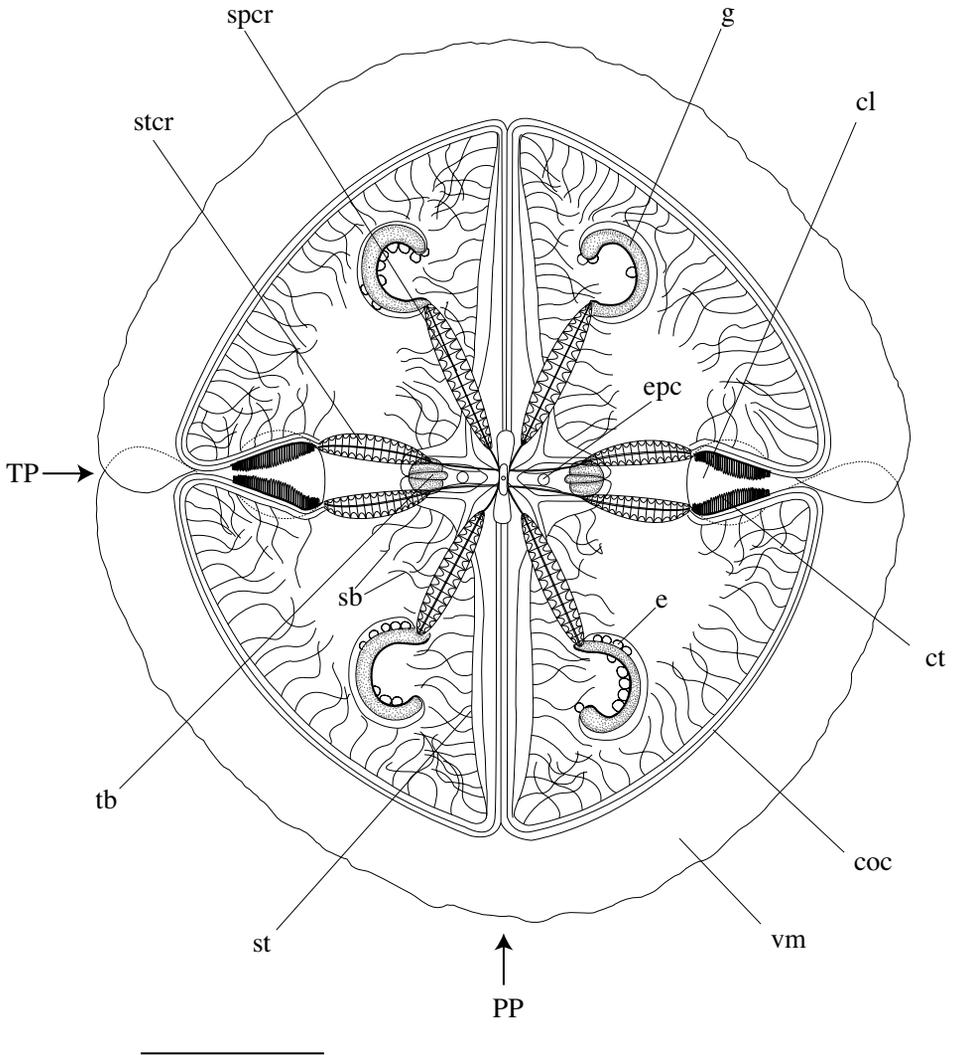


Fig. 1. *Lobatolampea tetragona* gen. nov. & spec. nov., schematic line drawing of the holotype. Aboral view of animal resting on substrate (see also fig. 3B). Secondary tentacular system visible through the transparent body.

Explanation of abbreviations: cl = cleft at the base of oral lobe; coc = circumoral canal; ct = ctene at the site of presumptive auricle; e = liberated egg; epc = entrance to paragastric canal; g = gonad; sb = side branches of tentacular stem; sPCR = subpharyngeal comb row; st = stem of secondary tentacular system; stcr = subtentacular comb row; tb = tentacular bulb; vm = velar membrane; PP = pharyngeal plane; TP = tentacular plane. Scale bar: 5 mm.

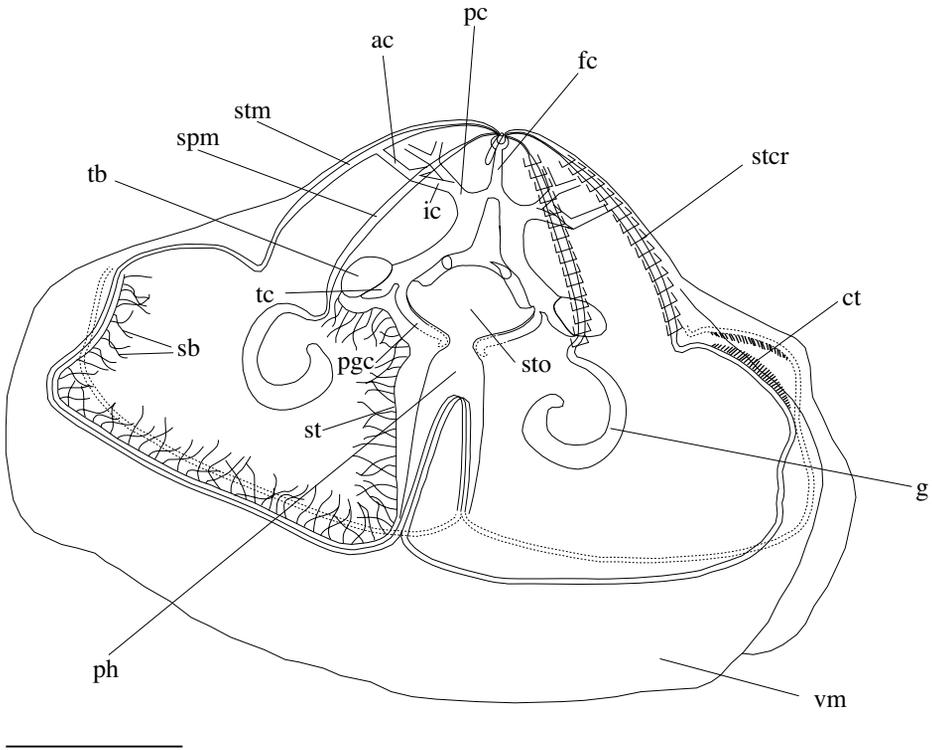


Fig. 2. *Lobatolampea tetragona* gen. nov. & spec. nov. Semi-diagrammatic view from lateral side roughly along the pharyngeal plane (see fig. 3A).

Explanation of abbreviations: ac = adradial canal; fc = funnel canal; ic = interradiial canal; pc = perradial canal; pgc = paragastric canal; ph = pharynx (functional part); spm = subpharyngeal meridional canal; sto = stomach; stm = subtentacular meridional canal; tc = tentacular canal. For explanation of other abbreviations, see the caption of fig. 1. Scale bar: 5 mm.

Very short perradial canals and blind paragastric canals present as in *Cydippida*. Interradiial canals and bifid tentacular canals distinct. Adradial canals join respective meridional canals at the level of aboral one-fifth of the comb-rows. Subpharyngeal meridional canals end blind orally, and bear gonads in the distal portion beyond the oral end of each comb-row, situated near interradiial axis. Subtentacular meridional canals in each quadrant aligned almost along tentacular plane and extending along the margin of the simple oral lobe. After meeting at the middle of the lobe margin in the pharyngeal plane, both canals run together along the pharyngeal axis on the vestibular wall over the pharynx and extend to the central entrance region of the folded portion of the pharynx; connected respectively to partner extension of neighbouring subtentacular meridional canal on opposite side of tentacular plane. Thus, the circumoral canal is formed. It is accompanied by the ciliated groove along its whole length and with the secondary tentacles along the periphery of the oral lobes.

Four remarkable, well developed C-shaped gonads are present, one each, in the distal part of each of the four subpharyngeal meridional canals, beyond the oral edge of the comb rows. Subtentacular meridional canals sterile.

Primary tentacles reduced, represented only by conspicuously pigmented bulbous bases, approximately at level of distal end of subtentacular row of comb-plates (about the level of aboral one-fourth of bell height); tentacle sheath vestigial. A pair of stout tentacular stems of the secondary tentacular system issuing from each tentacle base; each stem running towards pharyngeal plane and subsequently turning along this plane towards a peripheral notch at the middle of each oral lobe. Stems extend along the periphery of the oral lobes, on the interior surface, to entrance of cleft in tentacular axis. Many side-branches issued from this stem in each quadrant. In life, side-branches actively extended or contracted and entangled near the proximal portion; however, they were gradually torn off and later only a small number of short ones remained.

Colour.— The whole body is transparent, but the testicular side of the gonads and the tentacle bulbs are golden in colour. The ovarian side of the gonads, the base of the ctenes at the site of presumed auricles and the upper part of the infundibulum are conspicuously red.

Remarks.— Food particles caught by the tentacles were carried along the ciliated groove. Even food obtained near the tentacular plane was sent along the lobe periphery onto the pharyngeal plane, and subsequently to the pharynx.

Embryos in various stages of cleavage were observed in the gonads of the holotype. The specimen continued to release cydippid larvae intermittently for a few days after capture. In the other specimen, gonads were emptied by release of germ cells. Larvae were pear-shaped when just released, but changed to nearly spherical within 24 hours, and gradually elongated. After about two weeks the mouth of the larvae began to spread and the tentacular sheath opened on the bell at the level of the infundibulum. Tentacles, furnished with side-branches, measured more than three times body length in early stages, but gradually shortened to nearly body length after two weeks. Further rearing of larvae failed at this point.

Discussion.— Another remarkable feature of *Lobatolampea tetragona* spec. nov., in addition to the four C-shaped gonads, is its medusa-like bell shape when floating, changing to nearly disc-shape when resting on the substrate. The animal is provided with "primitive" oral lobes (figs 1, 3B), and has no primary tentacles. The existence of ctenes at the site of the presumptive auricles as in Lobata is noteworthy. Internally, the gastrovascular canal system resembles closely that of Cydippida, except for the subtentacular meridional canals extending to form the circumoral canal. These features indicate a position of *L. tetragona* intermediate between Cydippida and Lobata.

*Lobatolampea tetragona* superficially resembles Ganeshida, in which, however, the body is compressed along the tentacular axis, the tentacle sheaths open on the oral margin, the perradial canals are missing, the interradial canals arise directly from the infundibulum and lead to the aboral end of the meridional canals, and the subpharyngeal canals are connected to the circumoral canal. These features are clearly different from those in the present species.

In Thalassocalycida and Lobata, four medusoid forms are depicted by the following authors: Chun, 1880; Moser, 1910; Dawydoff, 1948; and Madin & Harbison, 1978. *Thalassocalyce inconstans*, described by Madin & Harbison (1978) as an adult medusoid ctenophore, is about twice as large as *L. tetragona* spec. nov., and bears the tentacles located near the mouth as in Lobata. Neither oral lobes, nor ctenes are present at the

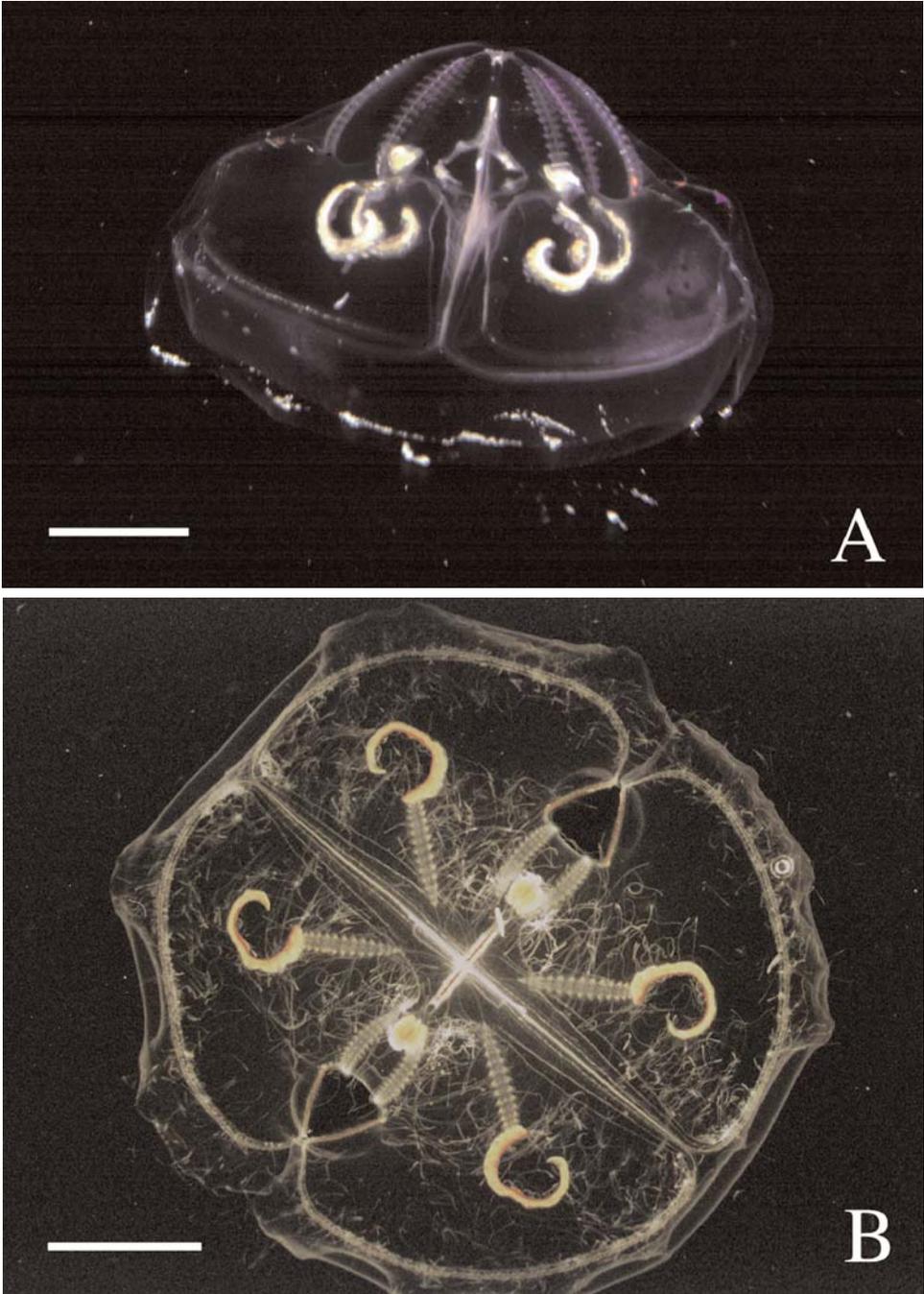


Fig. 3. *Lobatolampea tetragona* gen nov. & spec. nov., holotype. Fig. 3A. Floating animal in lateral view roughly along the pharyngeal plane (cf. fig. 2). Fig. 3B. Animal resting on the substratum seen from above (cf. fig. 1). Scale bars 5 mm.

site of the auricles. In addition the gastrovascular canals show a complicated configuration. These features are quite different from those seen in *L. tetragona*. The medusoid stage of *Leucothea multicornis* (Chun, 1880) has ctenes at the site of the auricles, but it has a much more complex gastrovascular canal system than has *L. tetragona*. *Cryptolobata primitiva* described by Moser (1910), a possible larval lobatean form, and a larva of *Ocyropsis* spec. reported by Dawydoff (1948), are also medusoid in shape. In the former nominal species, the course of the gastrovascular canal is quite different from that in *L. tetragona*. In the latter it has a manubrium-shaped peduncle, though neither tentacle nor tentacle sheath exists in its cydippid larval stage (Dawydoff, 1948; and personal observation). These features are different from those in *L. tetragona*, though Dawydoff mentioned nothing about gastrovascular canals and gonads in the medusoid larva.

The presence of four gonads on the subpharyngeal meridional canal also has been recorded in *Savangia* (only testis), and in *Thalassocalyce* (Harbison & Madin, 1982) the gonads are formed on the subtentacular meridional canals instead of on the subpharyngeal meridional canals. The formation of gonads in the subpharyngeal meridional canals is usually seen only early in reproduction, in dissogony. Therefore, it might be possible to consider the existence of four gonads in the present species as a neotenus character. The presence of typical lobatean characters in *L. tetragona* (though rudimentary developed), such as "primitive" oral lobes and ctenes at the presumptive site of the auricles, might indicate that it is an undescribed larval form of a lobatean ctenophore. In Lobata, however, the characteristic lobe formation appears early in development and metamorphosis takes place at a body size much smaller than in *L. tetragona*. In *Bolinopsis vitrea* L. Agassiz, 1860 and *Mnemiopsis leidyi* A. Agassiz, 1865, oral lobes and auricles appear in larvae of 7-10 mm body length (Mayer, 1912). As mentioned previously, *L. tetragona* is quite different from any medusoid larval form described so far; and the two available specimens did not show any sign of morphogenesis during rearing in the laboratory for 15 and 41 days, respectively (see introduction). Therefore, the author considers the present specimens to represent an adult form of a previously unknown species, genus and family.

Although it is difficult to deduce the adequate generic and family criteria from the diagnosis of the new species, the author wishes to establish a new monotypic genus *Lobatolampea* and a new family Lobatolampeidae, tentatively, to hold the present new form. However, the author wants to refrain himself from establishing a new order, pending further studies on variation and morphogenesis of features defining higher taxa of Ctenophora.

Etymology.— The generic and family names express that the new species is provided with oral lobes (though in the "primitive" state) as in Lobata, while the body shape is freely changeable as in *Lampea* (Cydippida). The specific name refers to the four conspicuous gonads.

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