

## VI ON THE HYDROZOOON *CAMPANULINA CEYLONENSIS* (BROWNE)

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### I.—THE SYSTEMATIC POSITION AND SYNONYMY OF THE SPECIES.

By N. ANNANDALE.

The medusa of this species was described by Browne<sup>1</sup> in 1905 under the name *Irene ceylonensis*, while the hydroid was discovered by myself<sup>2</sup> in 1906. In a recent paper<sup>3</sup> I have referred the species to the genus *Campanulina*, van Beneden, and this attribution is fully borne out by a detailed examination since made of the living hydranth.

Medusae that agree, so far as structure is concerned, in every respect with Browne's figures and description of *I ceylonensis* have made their appearance in great numbers in a canal of brackish water in Calcutta in July, 1915, the water having, at the place and time at which specimens were taken, a specific gravity of 1.0085 (the reading corrected to a standard temperature of 15°C.), and no great difficulty has been experienced in rearing young colonies of hydroids in a bell jar. The development is rapid. Medusae were placed in the bell-jar, which was filled with water from the canal, on July 5th; on July 7th numerous planulae and single minute hydranths, many of which had attached themselves to the cast skins of Copepods, were found, with intervening stages; while two days later young colonies were observed with a single perfect hydranth and a short rhizome bearing at least two hydranth-buds. The buds had the capitate form of those of *C. acuminata* (Alder) as figured by Hincks.<sup>4</sup> The hydranth figured here was sketched from life on July 10th, by Babu D. N. Bagchi; only the part exerted from the hydrotheca is shown. The column was capable of great elongation, but the tentacles seemed to be less extensile than in the adult and the whole organism was less sensitive.

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<sup>1</sup> In Herdman's *Rep. Ceylon Pearl Fish.*, IV, p. 140, pl. iii, figs. 9-11 (1905).

<sup>2</sup> *Rec. Ind. Mus.*, I, p. 142, fig. 4 (1907).

<sup>3</sup> *Mem. Ind. Mus.*, V, p. 105 (1915).

<sup>4</sup> *Brit. Marine Hydroid Zoophytes*, pl. xxxvii (1868).

This hydranth though immature in several respects, already exhibits the generic characters of that of *Campanulina*, being webbed at the base of the tentacles, which are surrounded by regular circles of nematocysts, and having a short conical hypostome. The hydrothecae of the adult hydroid only differ from those of more robust species of the genus in that each grows on a short stalk that arises directly from an adherent stolon while the gonothecae closely resemble those of *C. repens*, Allman, in outline. Major Lloyd<sup>1</sup> tells me that a short stem bearing a gonotheca as well as a hydranth is sometimes produced and that more than one medusa is often produced in a single gonotheca.

If it is necessary to place the medusa as distinct from the hydroid in a recognized genus, greater difficulty is experienced. It agrees with *Phortis*, McCrady, and differs from *Eirene* and *Tima*, Eschscholtz, in not possessing marginal cirri, but the ten-

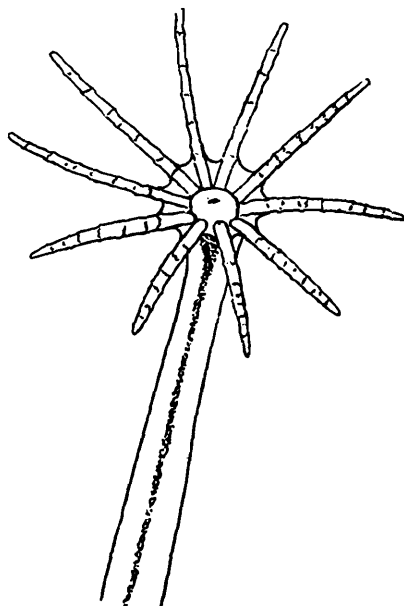


FIG. 1.—Young hydranth of *Campanulina ceylonensis* (highly magnified).

tacles have a narrow longitudinal band of muscle on the velar surface and the gonads are less restricted in position than in most species of *Phortis*, though they do not until very fully ripe extend along the manubrial peduncle as in *Tima*. On the whole, therefore, the medusa may be said to occupy a position intermediate between *Tima* and *Phortis*, but to be nearer the authentic species of the latter, to which it should probably be assigned, as Meyer<sup>2</sup> suggests.

The name *Campanulina* (1847) has priority over *Phortis* (1857) by ten years.

<sup>1</sup> I regret that, as I am about to leave India for some months, I have not been able to read Major Lloyd's paper printed below. He has, however, kindly informed me as to the results of his observations, and shown me his preparations.

<sup>2</sup> *Medusae of the World*, II, p. 309 (1910).

The only species of *Phortis*, that has been traced to its hydroid, if we except "*Irene ceylonensis*," is *P. gibbosa* (McCrary), the life-cycle of which was worked out by Brooks<sup>1</sup> in North America. His description, which is brief and unaccompanied by figures, does not conform to *Campanulina* in that it makes no mention of an operculum to the hydrotheca or of a webbing of the tentacles, but both these points are difficult to detect unless attention is specially directed to them and the general conformation of the colony is not unlike that of the species found in the Gangetic delta.

Some of the medusae from Calcutta lived in captivity for a week, though all of them had apparently shed their gonads at least three days earlier. Those that remained alive at the end of the week were, as was shown by the asymmetrical form of their bells and their feeble and irregular pulsations, in a degenerate condition. They had, moreover, assumed completely the peculiarities regarded by Browne (*op. cit.*, p. 141, pl. iii, figs. 12-16) as diagnostic of his *Irene palkensis*. When the gonads first reach or approach maturity the tentacles alternate with sense-organs round the margin of the bell; the former are capable of great elongation and all are complete in structure; the otocysts are small and each contains a single otolith or sometimes a pair of otoliths. The shedding of the sexual products apparently takes some days. When it commences the gonads do not extend down the manubrial peduncle, but as it proceeds and approaches completion they do so to some extent. Meanwhile considerable changes take place on the margin of the bell. Numerous additional tentacles begin to bud out, but as a rule only the basal bulb is completed and the filamentous part is altogether abortive. At the same time the otocysts increase greatly in size, becoming three or four times as large as hitherto; the otoliths multiply, so that there may be as many as eight in a single sense-organ, and finally the whole structure divides into two otocysts. Details as to the process of division have not yet been worked out either in the cysts or in their contained concretions.

These changes in the tentacles and sense-organs prove that Browne's two species, *Irene ceylonensis* and *Irene palkensis*, are identical or rather that the latter represents merely a degenerating phase of the former.

Before the sexual products are completely shed the upper part of the bell often becomes constricted, the constriction involving not only the jelly but also the upper part of the subumbrellar cavity. The tentacles then degenerate, and finally both they and the sense-organs disappear. The bell shrinks to a half or a third, and finally to about a sixth of its original size and at last ceases to pulsate. The manubrium, however, though also shrunken, still exhibits languid movements, which persist for some days after the complete disappearance of the marginal structures and even

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<sup>1</sup> *Stud. Biol. Lab. Johns Hopkins Univ.*, II, p. 470 (1883).

of the radial canals. Death is thus extremely gradual. All these points are clearly important in considering the systematic position of any medusa that exhibits the slightest signs of degeneracy.

## II.—LIFE HISTORY OF THE HYDROID AND MEDUSA.

By R. E. LLOYD.

In July 1915, Dr. Annandale informed me of the occurrence of the Medusa, *Irene ceylonensis* (Browne), in the brackish water of a canal in the neighbourhood of Calcutta and suggested that I should enquire into its life-history as his own observations on the subject had to be discontinued. He also kindly lent me a stained permanent preparation showing several planulae, some with budding hydroids and stolons. This preparation was made by Mr. F. H. Gravely from material gathered from the bottom of a glass bowl in which a number of the medusae with ripe gonads had been confined for observation.

About the middle of July, the medusae were plentiful throughout the canal so that I was able to obtain a large number, varying in diameter from about 2.5 mm. to 2.5 cm. By the end of the month however none were to be found. No doubt they were killed by the heavy monsoon rain, which greatly diminishes the salinity of the water.

I was unsuccessful in again raising the planulae in captivity but was fortunate in obtaining some colonies of the hydroid growing in the canal attached to stones. Some were kept alive for ten days, affording good opportunity for observation. Several gonosomes were obtained from these colonies. These were stained and mounted in Canada balsam. They show certain stages in the development of the medusa, especially the early and late stages, in a satisfactory manner.

### *The Hydroid Colony.*

The hydroid was defined by Dr. Annandale from material taken in brackish water at Port Canning, but as I had the opportunity of examining the living animal from day to day in the laboratory a few further remarks on its structure will be made.

The hydroid varies considerably in size. Only the larger and older individuals can be discerned by the naked eye. The colony as a whole is much less conspicuous than most hydroid colonies. The stolon seldom divides, so that it is easy to strip off as much as an inch from the substratum without meeting any outgrowths except the hydrothecae. The stolon however does occasionally branch, the growing point dividing in a simple dichotomous manner.

The coenosarc of the stolon has a different appearance from the coenosarc of the hydroid, due principally to the fact that the endoderm cells of the stolon are granular and opaque while those of the hydroid are clear, vacuolated and much larger. The hy-