ON A COLLECTION OF INDIAN CEPHALOCHORDATES, WITH NOTES ON THE SPECIES FROM THE INDIAN WATERS IN THE INDIAN MUSEUM, CALCUTTA.

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Dr. F. H. Gravely, Superintendent, Government Museum, Madras, sometime back sent me a small collection of Cephalochordates for identification. The collction is not very large, but is of special interest in that some of the species represented in it have not been adequately described so far. The specimens are mainly from the collections made by " Lady Goschen "—the trawler of the Madras Fisheries Department, but there are also two tubes containing well-preserved material of the interesting species, *Branchiostoma indicum* (Willey) from Madras. In the following account I have also included short notes on the species from Indian waters in the Indian Museum collection.

The literature on the Indian Cephalochordates is not very extensive. The earliest account of a species of the genus *Branchiostoma* from the area is that of Gray[1], who described a species from Borneo under the name *Amphioxus belcheri*. Thurston recorded that the species had been dredged some 30 miles south of Madras in 1887-88[2]. Forster-Cooper[3] also recorded it from Madras, from off " Seven Pagoda, Mahabili " and according to Tattersall[4], who considered it to be a variety of *B. lanceolatum*, the species was collected from Singapore by Bedford and from Ceylon by Herdman.

Andrews[5] doubtfully recorded *B. lanceolatum* from Ceylon and Tattersall[6] after a careful review of the literature recorded the same species from various localities round the same Island. Franz[7], however, considered the specimens from round Ceylon to be distinct and described this form under the name *B. haeckelli*.

Willey[8] described an interesting species from the Black Pagoda, Orissa Coast, under the name *Dolichorhynchus indicus*. Tattersall considered the subgenus *Dolichorhynchus* superfluous and referred the species *indicum* to the genus *Branchiostoma* ; he redescribed the species and recorded specimens of it from round Ceylon.

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[1] Gray, J. E., *Proc. Zool. Soc. London*, p. 35 (1847).
[2] Thurston, E., *Bull. Madras Govt. Mus.*, I, p. 26 (1980).
[3] Forster-Cooper, C., *The Fauna and Geography of the Maldive and Laccadive Archipelagoes*, I, p. 359 (1903).
[4] Tattersall, W. M., *Ceylon Pearl Oyster Rept.*, I, p. 212 (1903).
[5] Andrews, E. A., *Studies Biol. Lab. Johns Hopkins Univ.*, V, p. 238 (1893).
[6] Tattersall, W. M., *Op. cit.*, p. 210.
[7] Franz, V., *Jenais. Zeitschr. Naturwissen*, LVIII, p. 403, text-fig. 18 (1922).
[8] Willey, A., *Quart. Journ. Microsc. Sci.*, XLIV, pp. 269-71, figs. 1, 2 (1901). The author in this paper unfortunately uses the new name *Dolicorhynchus* both in a generic and subgeneric sense.

In addition to the neotenic form *Branchiostoma pelagicum* Günther, which was later separated by Goldschmidt[1] under the generic name *Amphioxides*, Tattersall[2] doubtfully referred a specimen from round Ceylon to Cooper's species, *B. californiense*. Franz[3], however, was of opinion that this record is probably to be referred to *B. elongatum* (Sundevall), of which the Ceylon form and the Cape species, *B. capense* (Gilchrist), are probably geographical varieties. In the Madras Museum collection, there are a number of specimens which agree with Tattersall's description, and as they differ from the true *B. elongatum*, I propose separating these under the name *B. gravelyi*.

Of the genus *Asymmetron* E. A. Andrews, *A. cultellus* (Peters), *A. cingalense* (Kirkaldy), *A. maldivense* (Forster Cooper), *A. agassizi* (Parker), *A. parvum* (Parker), *A. lucayum* Andrews and *A. orientale* (Parker) have been recorded from the Indian waters by various authors. For full literature regarding these species reference may be made to the works of Tattersall[4], Forster Cooper and Franz.

In reference to the nomenclature of the genera I have followed the masterly memoirs of Franz, and it is not necessary, therefore, to discuss the controversial questions of the genera and their nomenclature.

In the collections before me the following species are represented :—

1. *Branchiostoma belcheri* (Gray).
2. *Branchiostoma indicum* (Willey).
3. *Branchiostoma gravelyi*, sp. nov.
4. *Asymmetron cingalense* (Kirkaldy).

Genus **Branchiostoma** Costa.

Branchiostoma belcheri (Gray).

1847. *Amphioxus belcheri*, Gray, *Proc. Zool. Soc. London*, p. 35.
1889. *Branchiostoma belcheri*, Günther, "*Challenger*" *Reports*, XXXI, *Pelagic Fishes*, p. 43.
1890. *Branchiostoma belcheri*, Thurston, *Bull. Madras Govt. Mus.*, I, p. 26.
1895. *Branchiostoma* (*Amphioxus*) *belcheri*, Kirkaldy, *Quart. Journ. Microsc. Sci.*, XXXVII, p. 313, pl. xxxv, fig. 8.
1901. *Branchiostoma nakagawae*, Jordan & Snyder, *Proc., U. S. Nat. Mus.*, XXIII, p. 726.
1903. *Branchiostoma lanceolatum* var. *belcheri*, Tattersall, *Trans. Liverpool Biol. Soc.*, XVII, p. 299.
1903. *Branchiostoma lanceolatum* var. *belcheri*, Tattersall, *Ceylon Pearl Oyster Rept.*, I, p. 212, pl. i, fig. 3.
1913. *Branchiostoma belcheri*, Jordan, Tanaka & Snyder, *Journ. Coll. Sci. Tokyo.*, XXXIII, p. 4.
1922. *Branchiostoma belcheri*, Franz, *Jenais. Zeitschr. Naturwissen.*, LVIII, p. 391, text-figs. 8-13.
1927. *Branchiostoma belcheri*, Franz, *Ergebn. Anat. Entwickelung.*, XXVII, p. 482.

B. belcheri originally described from Borneo is widely distributed in the Indo-Pacific. It has been recorded from the east coast of Africa,

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[1] Goldschmidt, R., *Biol. Centralbl.*, XXV, pp. 235-40 (1905).
[2] Tattersall, W. M., *op. cit.*, p. 216.
[3] Franz, V., *op. cit.*, p. 406 ; see also Franz, V., *Ergebn. Anat. Entwickelung*, XXVII, p. 483 (1927).
[4] Tattersall, W. M., *Trans. Liverpool Biol. Soc.*, XVII, pp. 269-302 (1903).

Ceylon, Borneo, Philippines, the Prince of Wales Islands, Torres Straits, China and Japan..

Thurston remarked that the species had also been dredged earlier some 30 miles south of Madras, while Tattersall recorded it from Ceylon as a variety of *B. lanceolatum* (Pallas).

In the Madras Museum collection before me the species is represented by two series of specimens from :—

1. Tholayiram par, 10-16 fathoms, 28. iii. 28. 4 specimens.
2. Off Coilpatam, S. W. and W. of Tuticorin, 7-10 fathoms, 30. iii. 28—1. iv. 28.

The specimens are mostly immature and rather poorly preserved, but agree with the descriptions of Kirkaldy, Tattersall and Franz.

The largest specimen from off Coilapatam is 45 mm. and the youngest about 20 mm. long. In the larger specimens traces of gonads are to be seen, and in one specimen 27 and 25 on the right and left sides respectively were counted. The myotome formula is 37, 17, 10.

The Tholayiram par specimens vary from 30-35 mm. in length, and in one specimen 27 gonads on the right and 25 on the left side could be seen. The myotome formula is 37, 17, 9-10.

In the Indian Museum collection the species is represented by 11 specimens collected by the Surgeon Naturalist on the R. I. M. S. " Investigator " in the Mergui Archipelago, 16-20 fathoms. The largest specimen is 52 mm. long, and the myotome formula varies as 37-38, 17-18, 9-10. The gonads are developed in some specimens, but their exact numbers cannot be counted.

Branchiostoma indicum (Willey).

1901. *Dolichorhynchus indicus*, Willey, *Quart. Journ. Microsc. Sci.*, XLIV, p. 269, figs. 1, 2.
1903. *Branchiostoma indicum*, Tattersall, *Trans. Liverpool Biol. Soc.*, XVII, p. 300.
1903. *Branchiostoma indicum*, Tattersall, *Ceylon Pearl Oyster Rept.*, I, p. 215, pl. i, figs. 11-13.
1922. *Branchiostoma indicum*, Franz, *Jenais. Zeitschr. Naturwissen.*, LVIII, p. 410.
1927. *Branchiostoma indicum*, Franz, *Ergebn. Anat. Entwickelung*, XXVII, p. 483.

Of *B. indicum* I have examined the 4 badly preserved types and a mounted slide in the collection of the Indian Museum and a large series of fresh specimens from off Madras kindly sent to me by Dr. R. Gopala Iyer of the Madras University. In addition I have also examined a few old specimens from Madras in the Indian Museum collection and two series of specimens marked " ? Madras " in the collection from the Madras Museum. In view of this extensive material I give below a few notes on the species and a good figure showing its main characters.

The specimens vary from white to pink or even brown in colour and the largest is 27 mm. long and about 3 mm. in maximum width. The

myotome formula (text-fig. 1) generally is 41, 14, 14, but in 3 specimens 42-43 preatrial and in 2 specimens 15 postanal myotomes were found. The myotomes in the anterior third of the animal are comparatively narrow as the main part of the body is occupied by the very broad pharynx.

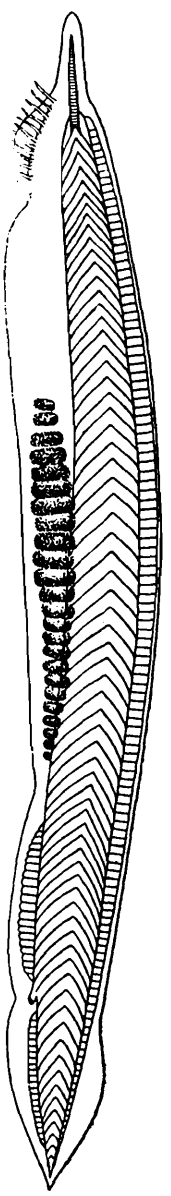

Fig. 1.—*Branchiostoma indicum* (Willey). Lateral view. ×6.

All the specimens show distinct preoral lobes, but their proportionate length agrees in general with Tattersall's figure rather than Willey's.

The rostrum is comparatively long, about as long as the first five myotomes, and appears as a somewhat narrow, tubular structure.

The dorsal fin is low and of an even height; it ends slightly in front of the first myotome anteriorly and slightly behind to the anus posteriorly.

The ventral fin has the usual fin chambers which also extend postanally. The caudal fin is relatively broad and almost pointed posteriorly; the infra-caudal lobe is slightly less deep than the supra-caudal, but is longer, extending very slightly beyond the anus.

The metapleural folds terminate symmetrically on either side of the ventral fin behind the V-shaped atripore (text-fig. 2).

The oral cirri are moderately long, about 40 in number, and are provided with distinct sense papillae.

The notochord extends into the long rostrum as a thin tube, but does not extend to the tip.

The neural tube projects slightly in front of the dorsal fin chambers, but stops short of the anterior termination of the dorsal fin.

There is no eye-spot.

The number of gonads varies from 25-27 on the right side to 22-24 on the left in both male and female specimens.

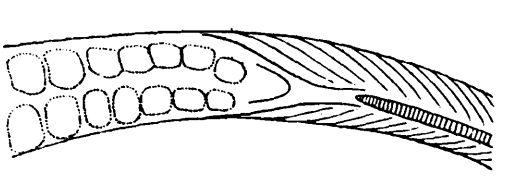

Fig. 2.—*Branchiostoma indicum* (Willey). Ventral view showing the symmetrical termination of the metapleural folds. ×6.

From the above description it is clear that all the specimens from off Madras are to be referred to Willey's species, *B. indicum*.

Branchiostoma gravelyi, sp. nov.

1903. ? *Branchiostoma californiense,* Tattersall, (*nec* J. G. Cooper), *Ceylon Pearl Oyster Rept.*, I, p. 216, pl. i, figs. 14, 15.
1922. *Branchiostoma elongatum,* Franz (in part), *Jenais. Zeitschr. Naturwissen.*, LVIII, p. 405.
1927. *Branchiostoma elongatum,* Franz (in part), *Ergebn. Anat. Entwickelung.*, XXVII, p. 483.

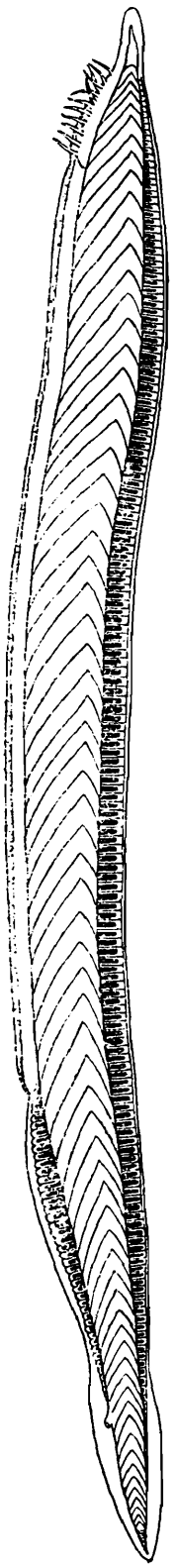

FIG. 3.—*Branchiostoma gravelyi,* sp. nov. Lateral view. ×*ca.* 5.

Tattersall referred with some doubt a specimen from the Cheval District, Ceylon, to Cooper's species *Branchiostoma californiense,* and remarked that the Ceylon specimen " differs but very slightly from either *B. californiense* or *B. capense* " Franz considered *B. capense* to be probably a " geographische Varietät " of *B. elongatum* (Sundevall), but considered *B. californiense* as distinct. He also doubtfully referred Tattersall's *B. californiense* from Ceylon to *B. elongatum* (Sundevall), even though he gave the distribution of this species as " Westküste Südamerikas "

The rostral fin (text-fig. 3) is almost continuous with or separated by a shallow notch from the dorsal and is only slightly produced into a snout-like structure. The dorsal fin is low and has a continuous series of fine rays. The caudal fin is a little higher than the dorsal and ventral fins ; the infra-caudal lobe is slightly longer and deeper. The ventral fin is very long, and has a series of double fin rays throughout its entire length, but the fin chambers do not extend postanally. The metapleural folds terminate symmetrically.

The oral cirri are moderately long, about 30 in number, and bear well-marked, almost triangular, sense-papillae. The " Räderorgan " agrees with Tattersall's description.

The notochord extends far in front of the anteriormost myotome and slightly beyond the last myotome. The nervous system projects anteriorly to almost the beginning of the rostral fin. There is no eye-spot.

All the specimens are apparently immature as no gonads can be seen.

The measurements and myotome formula of 4 specimens are as follows :—

Length 44 mm. Myotomes 41—18—10=69.
Length 41 mm. Myotomes 40—18—10=68.
Length 36 mm. Myotomes 40—18—10=68.
Length 23 mm. Myotomes 40—18—10=68.

This form, as the above description shows, agrees very closely with Tattersall's single specimen from Ceylon which he recorded doubtfully as *B. californiense*, but differs in myotome formula and the absence of the eye-spot. I am inclined to consider the differences as of little value and believe that the specimens before me are conspecific with Tattersall's form. They, however, differ materially from *B. californiense* and *B. elongatum*, and I propose to separate them under the name *B. gravelyi*, sp. nov. with the following diagnosis :—

Myotomes 68-69, with the general formula 40—18—10. Rostral fin rather low, only slightly or not marked off from the dorsal. Caudal fin beginning about 2 myotomes in front of the anus dorsally and extending ventrally about 5 myotomes beyond it. Posterior end distinctly pointed. Ventral fin chambers not extending postanally. Preoral tentacles moderately large with distinct, triangular sense papillae. Length up to 44 mm.

Distribution.—About a dozen specimens of this species were dredged from off Coilapatam, S. W.×W. of Tuticorin on 30. iii. 28 by the Madras Fisheries Trawler " Lady Goschen "

Holotype.—F 11675, *Zoological Survey of India, Indian Museum, Calcutta.*

Remarks.—*B. gravelyi* is allied to *B. elongatum*, but differs in its myotome formula, form and extension of the fins, and the entire absence of the eyes.

Genus **Asymmetron** Andrews.

Asymmetron cingalense (Kirkaldy).

1895. *Amphioxus (Heteropleuron) cingalense*, Kirkaldy, *Quart. Journ. Microsc. Sci.*, XXXVII, p. 315, pl. xxxv, fig. 7.
1903. *Asymmetron cingalense*, Tattersall, *Trans. Liverpool Biol. Soc.*, XVII, p. 301.
1903. *Asymmetron cingalense*, Tattersall, *Ceylon Pearl Oyster Rept.*, I, p. 217.
1922. *Asymmetron cingalense*, Franz, *Jenais. Zeitschr. Naturwissen.*, LVII, p. 425.
1927. *Asymmetron cingalense*, Franz, *Ergebn. Anat. Entwickelung.*, XXVII, p. 484.

A. cingalense is represented in the collection before me by 7 specimens dredged from Tholayiram par, 10-16 fathoms, on 28. iii. 1928.

The specimens vary from 21-27 mm. in length and the myotome formula is 8-9, 15-16, 26-37. In one specimen, a male, 15 gonads were present on the right side. In other repsects the specimens agree very closely with the descriptions of Kirkaldy and Tattersall.