THE FAUNA OF BRACKISH PONDS AT PORT CANNING, LOWER BENGAL.

PART I.—INTRODUCTION AND PRELIMINARY ACCOUNT OF THE FAUNA.

By N. ANNANDALE, *D.Sc., Officiating Superintendent, Indian Museum.*

INTRODUCTION.

The settlement of Port Canning is situated on the Matla river, one of the numerous creeks which run up into the delta of the Ganges, about sixty miles from the open sea. Partly at any rate in connection with the Port Canning Improvement Scheme,[1] which was believed some forty years ago to be about to transform the place into a port rivalling that of Calcutta, a high embankment has been built up along the bank of the estuary, protecting the low-lying land in the neighbourhood from all but exceptional floods. The earth out of which this embankment was formed was apparently dug from a series of pits situated at a short distance, varying up to about a quarter of a mile, from the present edge. These pits are further supplemented by a number of smaller ones immediately behind the embankment, which is repaired with earth dug from the latter when it is injured by an unusually high flood. The original pits vary in size, but all have an area of something approaching half an acre. They are now filled with water and are the ponds dealt with in this paper. Judging from maps in the office of the Port Commissioners, Calcutta, they did not exist in 1855. It is evident from Stoliczka's account,[2] however, that at any rate some of them existed thirty-nine years ago, and he does not say that they had then been dug recently.

The account referred to deals in particular with an Actinian and a Polyzoon taken in the ponds; but it is by no means clear in which pond Stoliczka found his *Sagartia schilleriana*, as there are several ponds "close to the railway station." This point is of importance, because he was only able to find the Actinian in one pond, the position of which he describes in the manner indicated. One factor in the environment of forty years ago, however, has certainly changed; for he gives as one reason why the Actinian was not to be found in the other ponds that the one close to the station alone

---

[1] See Hunter, *A Statistical Account of Bengal*, vol. i, pp. 91—98 (London, 1875).
[2] In *Journ. Asiat. Soc. Bengal*, part ii, 1869. p. 52.

contained logs of wood to which the animal could attach itself, and now these logs are no longer to be found, either in the pond which is nearest to the railway station or in any other in the neighbourhood; they have evidently been removed by human agency or else have rotted away. The bottom of all the ponds now consists of soft mud, which is devoid of any hard substances except an occasional twig, small tree-stump, or brick, and as there are very few trees in the vicinity, twigs are rare and tree-stumps still more so. The bricks are also scarce, being derived from ruined drains and wells, and there are no stones in this part of Bengal. The ponds are all shallow (probably at no point more than ten feet deep when full) but the depth of the mud at their bottom is considerable. It is black beneath the surface, contains a large amount of organic matter and smells foul when disturbed.

The flora of the ponds consists chiefly of filamentous and unicellular algæ; but in some cases two or three species of Phanerogams occur, notably at least two of *Naias*, a duckweed and a true water-lily, the last being rare, the first abundant in some of the ponds.

An important factor in the environment is the nature of the water. I have described the ponds as brackish, but at some time of the year the water may contain the same proportion of soluble salts as the sea, at others it may even be more strongly saline, and again at others it is much more nearly fresh. As a rule the ponds are completely isolated both from one another and from the estuary. During the cold weather they are exposed to evaporation, which becomes intensified during the hot weather. During the rainy season, on the other hand, they become filled up with fresh water and probably often coalesce. They are also liable to be placed in temporary communication with the estuary occasionally, owing to a flood bursting the embankment; but this does not occur by any means every year. When it does happen, it happens owing to the estuary being swollen with fresh water, which is flowing down from up-country; so that the ponds, even under these conditions, are practically cut off from the sea.

Stoliczka, apparently in 1868 or 1869, had the water of the ponds analysed; but he does not say at what time of year his samples were obtained. He found that the proportion of soluble solids was 12·87 per thousand, sea-water containing from 32 to 39 per thousand. Mr. D. Hooper, Curator of the Industrial Section of the Indian Museum, has kindly examined samples taken by myself in December and March last. Two samples came from a pond in which the Hydrozoon *Irene ceylonensis*, as well as the Actinian, was reproducing its species, and in which the plant *Naias* was abundant. A sample taken from this pond at the beginning of December, a few weeks after the end of the rainy season, was found to contain 12·13 per thousand of soluble salts, while another taken on March 17th contained 20·22 per thousand. At the latter date water from the edge of the Matla at Port Canning contained 25·46 per thousand, and that from a second pond near the first

23·16. This second pond had a fauna almost identical with that of the first except in the absence of the Hydrozoon; but its flora was entirely cryptogamic.

I am indebted to Capt. J A. Black, I.M.S., Chemical Examiner to the Government of India, for a more detailed analysis of a sample from the second pond taken on January 6th. It is as follows:—

Chloride of Sodium	13·8	parts per thousand.
,, ,, Magnesium	0·6	,, ,, ,,
Sulphate of Magnesium	0·7	,, ,, ,,
,, ,, Calcium	2·1	,, ,, ,,
Nitrates, etc.	0·3	,, ,, ,,
Total .	17·5	

Stoliczka's analysis was, in detail, as follows:—

" Chloride of Sodium (including Potassium)	9·81
,, ,, Calcium	0·46
,, ,, Magnesium	0·93
Sulphate of Magnesium	1·17
Carbonic acid, etc.	0·50 " ;

the soluble substances being also calculated in parts per 1,000.

Stoliczka noted that the water in the ponds was almost fresh during the rains, and in the tank from which my first sample was taken the water-level had sunk only a short distance below the top of the bank, the dry weather having been of no more than a few weeks' duration. All that can be said, therefore, as regards the salinity of the water in the ponds, is that it varies considerably at different times of the year. The range in variation which the members of the fauna are able to survive, is perhaps more remarkable than what may be regarded in different instances either as the deficiency or the excess of salt in the medium in which they live.

THE FAUNA OF THE PONDS.

I do not propose at present to attempt more than a general description of the fauna of these ponds, with notes on some particularly striking species. Specimens of several important groups are now in the hands of specialists in Europe, whose determinations will make a more detailed discussion of greater value after their researches are complete.

Protozoa.—The most conspicuous representatives of the Protozoa found in the ponds are *Carchesium polypinum* and *Folliculina ampulla*. The latter of these is commonly found in salt water but also occurs in fresh, while the *Carchesium* is commonly an inhabitant of fresh water. In the ponds, *F. ampulla* occurs most frequently in close association with the Hydroid stage of *Irene ceylonensis*. Indeed, so frequently is this the case that I was able in almost all instances to detect the presence of the Hydroid, itself almost

invisible to the naked eye, by the dark spots due to groups of the Protozoon among the branches of its hydrorhiza. The Protozoon also occurs independently in the ponds, but rarely. *Carchesium polypinum* is just as frequently found attached to colonies of the Polyzoon *Victorella pavida*, but is also common apart from this animal.

Many other representatives of the Protozoa were taken in the ponds; they have been submitted, together with other microscopic organisms, to Prof. von Daday, of Buda-Pesth.

Porifera.—It was in the same ponds that my types of *Spongilla lacustris* var. *bengalensis* (1) were taken in the winter of 1905–6, but in that of 1906–7 this form was entirely replaced by another agreeing closely with Bowerbank's description of his *S. cerebellata* (2). Other specimens, taken near Calcutta and in northern Bengal and sent me from the Chilka Lake in Orissa, convince me that the two forms are identical as regards taxonomic position, being no more than temporary phases of *S. alba*, Carter (3), which in its turn may be no more than an Oriental race of the widely distributed *S. lacustris*. This is a point, however, which I hope to discuss more fully on another occasion. All the sponges in the ponds had perished and most had completely disintegrated by the middle of March.

A notable point as regards these Sponges growing in brackish ponds is the number of animals which take temporary or permanent shelter in their canals. Not only do several species of Amphipods common in the ponds use these canals as temporary resting-places, but an Isopod of distinctly marine facies is common in them and is apparently not found elsewhere in the same habitat. Several small Lamellibranch Molluscs (*Corbula*, spp.), young individuals of the Actinian to be described later, a larval Dragon Fly, and several species of Chironomid larvæ were also found in the canals of the Sponge, while a Cirripede (*B. amphitrite*) was taken buried in the substance of one specimen. In my account of *S. lacustris* var. *bengalensis*, I noticed that those specimens of the Sponge which had any definite colour were dark green owing to the presence in them of a filamentous alga. A similar case of apparent symbiosis has been recorded from Celebes by Professor and Mme. Weber (4); but I am now confident that in such cases the alga should be regarded as a parasite of the Sponge. In keeping certain species of freshwater Sponge, *e.g.*, *S. carteri*, alive in an aquarium in Calcutta, one of the difficulties to be contended with is the rapid growth of just such filamentous algæ, which block up the canals and finally kill the organism. In the Port Canning ponds Sponges infested with the alga are evidently in an unhealthy condition and are usually found towards the end of the season.

Cœlenterates.—Besides the form of *Metridium schillerianum* (Stol.) to be described in a subsequent paper of this series, I have only found one Cœlenterate in the ponds, namely the Hydrozoon *Irene ceylonensis* (5); and that only in one pond. The Medusæ were abundant from the end of November till the beginning of January.

At the beginning of December they were not sexually mature; at Christmas G. C. Chatterjee found specimens in which he could detect ova; at the beginning of January only spent individuals, dead or moribund, could be procured, their umbrellas persisting for some days after the sense-organs and gonads had disappeared. At the last date, however, specimens of the Hydroid were taken in which the gonophores still bore gonosomes half developed. A second brood was sexually mature in March. I have already described the Hydrozoon of this species briefly, and hope to do so more fully in the present series; the Medusa was described by Browne from the seas of Ceylon. Both Medusa and Hydroid show a power of resisting unfavourable conditions (especially lack of aëration of the water) remarkable in their order and contrasting markedly with the feeble nature of this power displayed by *Hydra* in India. A large number of the Medusæ lived for over 48 hours in a small corked tube of water in which a single *Hydra* would hardly have survived for an hour.

In the smaller ponds near the embankment I found two other Hydrozoa, one of which appears to be specifically identical with the European *Bimeria vestita*, which has recently been recorded from South America (6), while the other represents a new species of *Syncoryne*. None of these genera have representatives in fresh water, but all belong to the littoral zone.

Mollusca.—Stoliczka (7) stated that most of the Mollusca in the ponds belonged to marine types; but this is putting the matter a little too strongly, for many of the species belong to characteristic lacustrine genera, while others are common in estuaries. Nevill (8) describes *Hydrobia* (*Belgrandia*) *miliacea* as occurring in "brackish-water ponds (at Port Canning), associated with *Valvata* (?) *microscopica*, Nev., new species of *Blythinia*, *Martesia*, *Teredo* (?), *Pharella*, *Theora*, *Stenothyra blanfordiana*, etc." Preston (9) has recently described five new species of *Corbula* and one of *Bithinella* from my own collection, and I have also found an *Ampullaria* and two species of *Melania*. Although several species of *Onchidium* are not uncommon on the banks of the Matla, while at least one occurs in ditches and pools of brackish water as far inland as Calcutta, I have not found any in the Port Canning ponds.

Nematode.—Dr. von Linstow (10) has described a new Nematode of the genus *Oncholaimus* from the ponds. All previously known species of this genus are marine.

Rotifers and Gastrotricha.—The Rotifers have been submitted to Prof. von Daday. In January, 1906, I took among filamentous algæ from the ponds a representative of the Gastrotricha which agrees very closely with Zelinka's (11) figure and description of *Chætonotus schulizei*, which I have also seen in a similar situation in freshwater tanks in Calcutta and Chota Nagpur.

Annelid.—The only Annelid seen was a small Polychæte which burrows in the mud in great numbers.

Polyzoa.—Stoliczka (7) took the Cheilostome *Membranipora bengalensis* in the Port Canning ponds thirty-eight years ago, but

notwithstanding a very diligent search, I have been unable to find it in them now, although it still occurs in the estuary at the same place. The only common form in the ponds at present is a Ctenostome which I take to be specifically identical with the European *Victorella pavida*. The Indian form, however, grows more luxuriantly than the European, and often covers large areas on grass-roots and the like; the zoœcia often arise very close together on the stolon and comparatively seldom produce buds. All the individuals I have seen expanded have had eight tentacles. *Victorella* is essentially a brackish-water form, and even *Membranipora* occurs elsewhere in marshes the water of which contains considerably less salt than that of the sea. Miss L. Thornely has lately identified a species found incrusting a brick in one of the ponds as *Bowerbankia caudata* (Hincks); this species also belongs to a genus common in estuaries.

Crustacea.—Of the higher Crustacea all that I can say at present is that the crabs, which are common among the Sponges in the ponds, belong to the genus *Varuna*, which is generally found in the neighbourhood of estuaries, whence it is liable to be carried out to sea (Alcock, *A Naturalist in Indian Seas*, p. 75). Dr. J. de Man has kindly promised to examine specimens of the Decapods, while the Rev. T. R. R. Stebbing has already reported a new genus of Gammarids (which will be described in a future number of these "Records") among the Amphipods.

Gurney (12) has identified the Daphniid *Ceriodaphnia rigaudi* and Copepod *Cyclops leuckartii*, both freshwater species, among the Entomostraca. To these I can add two species of the marine order Cirripedia. A single specimen of *Balanus* was found deeply buried in the tissues of a *Spongilla* and attached to the grass-root to which the Sponge had also affixed itself, in December, 1906. The specimen was small and distorted, probably owing to the nature of its support, but it could be readily identified with *Balanus amphitrite*, a species common at the mouth of the Ganges and having an extraordinarily wide bathymetric range in the Indian seas, for Gruvel (13) has recently recorded examples of the variety *communis*, with which the Port Canning specimen should perhaps be identified, from a depth of over 1,000 fathoms. In another of the ponds I found a brick to which several specimens of *B. patellaris* were attached. This species is abundant in the Matla, occurring with *B. amphitrite* and *Chthamalus stellatus*.

Insects—G. C. Chatterjee (14) found the larva of the Mosquito *Anopheles rossi* abundant in the ponds at the beginning of December and less so towards the end of the same month. Though somewhat scarce, relatively speaking, they were still to be found at the beginning of January; in March I could only find one individual. At all periods between December and the end of March I took several Dragon Fly [1] larvæ, of which *Ischneura senegalensis*

[1] For observations on Dragon Fly larvæ in brackish water in America see Osburn in the *American Naturalist*, vol. xl, p. 395 (1906).

a common species throughout India, was the most abundant. I also took larvæ of an Ephemerid and of at least two Chironomid flies in December and January; they sheltered themselves indifferently in the canals of Sponges or among the zoœcia of Polyzoa. During the winter months, at any rate, adult insects of a large number of species are abundant in the ponds. Among the Hemipterous genera represented the following may be mentioned: (surface forms) *Gerris*, *Hydrometra*, *Microvelia* and *Mesovelia*; (forms which live below the surface) *Laccotrephes*, *Nectocoris* *Anisops*; the only common genus not so well represented in the ponds as in the freshwater tanks of Calcutta being *Plea*, with the possible addition of *Sphærodema*. Both these genera, however, very frequently rest among the hanging roots of *Pistia stratiotes* (the Water Plantain), which does not occur in the ponds at Port Canning. Most of the aquatic Coleoptera collected were minute forms, and no Gyrinidæ were seen; but a few common species of large size (*e.g.*, *Cybister convexus*) were taken. Several small Tettigids (Orthoptera) were observed swimming on the surface of the ponds—a habit shared by a large number of the members of this family; and in March a Lepidopterous larva (apparently a species of *Nymphula*) is common on *Naias*, making a cylindrical case like that of a Caddis-worm.

Fish.—Specimens of the following Fish were taken in the ponds:—

Symbranchus bengalensis (one young specimen).
Amblypharyngodon microlepis.
Macrones gulio.
Barbus chola.
,, *stigma.*
Nuria danrica.
Haplochilus melanostigma.
,, *panchax.*
Gobius acutipennis.
,, *giuris.*
,, *alcockii.*
Apocryptes lanceolatus.
Ophiocephalus punctatus.
Anabas scandens.
Trichogaster fasciatus.

There are also one or two minute Gobies, which, if they are adult, represent new species. Mr. Hodgart, who collected for the Museum at Port Canning, further reports *Periophthalmus kœlreuteri* and *Boleophthalmus viridis* from the ponds; but although these species are common on the shore of the estuary, I have not seen them in any of the ponds. None of these fish can be called essentially marine; but most of them are commonly found in brackish water in the neighbourhood of estuaries. *Barbus chola* is usually found in fresh water, and so is *Haplochilus panchax*, which in the ponds is less abundant than *H. melanostigma*; I have

recently taken *Gobius alcockii* in a tank at Rajshahi, 150 miles north of Calcutta. Some of the species (*e.g.*, *O. punctatus*) extend inland even as far as mountain tarns in the Himalayas.

Reptiles and Amphibia.—The only Reptile taken in the ponds was the common Water-snake *Tropidonotus piscator*, and the only Amphibians the equally common *Rana cyanophlyctis* and *R. tigrina*. The Indian Toad, *Bufo melanostictus*, is abundant at the edge of the ponds, in which it possibly breeds; Gardiner (15) has recently recorded this species as inhabiting brackish pools in the Maldives. The range in altitude of these Amphibians, and especially of *R. cyanophlyctis* and *B. melanostictus*, shows that they are very adaptable species.

LITERATURE.

1. Annandale, N. "Notes on the Freshwater Fauna of India, No. I" (*Spongilla lacustris* var. *bengalensis*), *Journ. Asiat. Soc. Beng.* (New Ser.), vol. ii, 1906, p. 55.
2. Bowerbank, J S "Monograph of the *Spongillidæ*," *Proc. Zool. Soc.*, 1863, p. 440.
   Carter H. J History, etc., of known species of *Spongilla*," *Ann. Mag. Nat. Hist.* (5), vii, p. 77 (1881).
4. Weber, M. M. and A. "Quelques nouveaux cas de Symbiose," *Ergeb. Nied. Ost-Ind.* vol. i, p. 48 (1890).
5. Annandale, N. "Notes on the Freshwater Fauna of India, No. XI" (the Hydroid of *Irene ceylonensis*), *Journ. Asiat. Soc. Beng.* (New Ser.), vol. iii, 1907, p. 79.
6. Hartlaub, C. "Die Hydroiden der magalhaenischen Region," etc., *Zool. Jahrb*, suppl. vi, p. 534 (1905).
7. Stoliczka, F. 'Anatomy of *Sagartia schilleriana* and *Membranipora Bengalensis*," *Journ. Asiat. Soc. Bengal*, part 2, vol. xxxviii, p. 28 (1869).
8. Nevill, G. "New species of Brackish-water Mollusks," *Journ. Asiat. Soc. Bengal*, part 2, xlix, p. 159 (1880).
9. Preston, H. B. "Diagnoses of new Species of *Corbula*," etc., *Ann. Mag. Nat. Hist.* (7), xix, p. 215 (1907).
10. Linstow, O. von "A new Nematode of the genus *Oncholaimus*," *Rec. Ind. Mus.*, i, p. 45 (1907).
11. Zelinka, C. 'Die Gastrotrichen," *Zeitschr. f. Wiss. Zool.*, xlix, p. 209, 1890.

12. Gurney R. "Some Indian Freshwater Entomostraca," *Journ. Asiat. Soc. Bengal*, 1906, p. 273.

13. Gruvel, A. "Cirrhipèdes Operculés," etc., *Mem. Asiat. Soc. Bengal*, ii, p. 1 (1907).

14. Chatterjee, G. C. "Anopheles larvæ," *Rec. Ind. Mus.*, i, p. 82 (1907).

15. Gardiner, J S. *The Fauna and Geography of the Maldive and Laccadive Archipelagoes*, vol. ii, suppl. ii, p. 1049.