

FISH AND FISHERIES OF THE PATNA STATE, ORISSA.

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(Plates VII—IX.)

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INTRODUCTION.

In March 1946, a party of the Zoological Survey of India, headed by me was deputed to the Patna State, in Orissa to conduct a fish and fisheries survey of the State. The work was undertaken specially at the instance of Rai Bahadur Dr. S. L. Hora, Director of Fisheries, Bengal, who had been requested by the state authorities to advise them on the development of the State Fisheries. As the fauna of this state and the country in its immediate vicinity has not yet received any attention, at the hands of the Systematists, this opportunity was availed of to collect and study as many other types of animals also, as could possibly be done.

The Patna State is situated between 20° 9' and 22° 4' N. and 82° 41' and 83° 40' E. and lies in the valley of the Mahanadi. It consists mostly of an undulating plain broken up by numerous small ranges and isolated

peaks. The average yearly rainfall is between 50 to 60 inches. For details of the physical features, etc., of the state a reference may be made to the following publications :—

Bengal Gazetteers, Feudatory States of Orissa, XIX, pp. 281-303 (Calcutta : 1910).
The Imperial Gazetteer of India, XX, pp. 70-73 (New Edition : 1908).

WATER RESOURCES OF THE STATE.

The water area of the State is about 18,000 acres and there are about 8,000 tanks, *Kathas* and *Mundas*.

The principal river of the state is the Tel river, a tributary of the Mahanadi. Almost the entire state is drained by the tributaries of the Tel, principals of which are the Ang river, Suktel, Lant, Sungad, Rahul, Khadang and Under. The Suktel and Barabait rivers traverse the centre of the State. Subarnrekha, Mayabati, Singodi, Solen, Chilari, Tong, Nimuruti and Luchimi are the other important smaller rivers of the state. Besides these rivers, there are some big streams or *Nallas*, known as *Jores*, in the state.

From the point of pisciculture, the state is particularly lucky in having many tanks, *Kathas* and *Mundas* which may prove useful provided necessary repairs and improvements are carried out. Sometimes, many as three or four tanks or *bundhs* exist in a single village and most of the cultivation fields, specially of paddy, which is the staple crop of the state are also terraced. These tanks are mostly irrigational tanks but with few alterations could probably be used for fish culture also. A very typical tank, in the state (Plate I, fig. 4) is a more or less square enclosure with high embankments, occasionally with a light house like tower, or a stone or a wooden pole in its centre perhaps to indicate water level. In addition to irrigation, these tanks are usually used for other purposes also, such as bathing, washing and taking drinking water for men and animals alike. Their areas vary from half an acre to ten or even more each. The tanks are dug deeper than *Kathas* and *Mundas*; an average depth of a tank being six to twelve feet and that of a *Katha* or *Munda* two to eight feet only.

There are in the state about 19 *Sars* or water reservoirs, which get connected with the rivers in the rainy season. We visited only two of them. There are in addition three very large water reservoirs in the state, known as *Sagars*. Each of these covers an area of more than 100 acres.

There is only one hill stream, with almost a perennial supply of water, at Harishanker, about 2,500 feet above sea level.

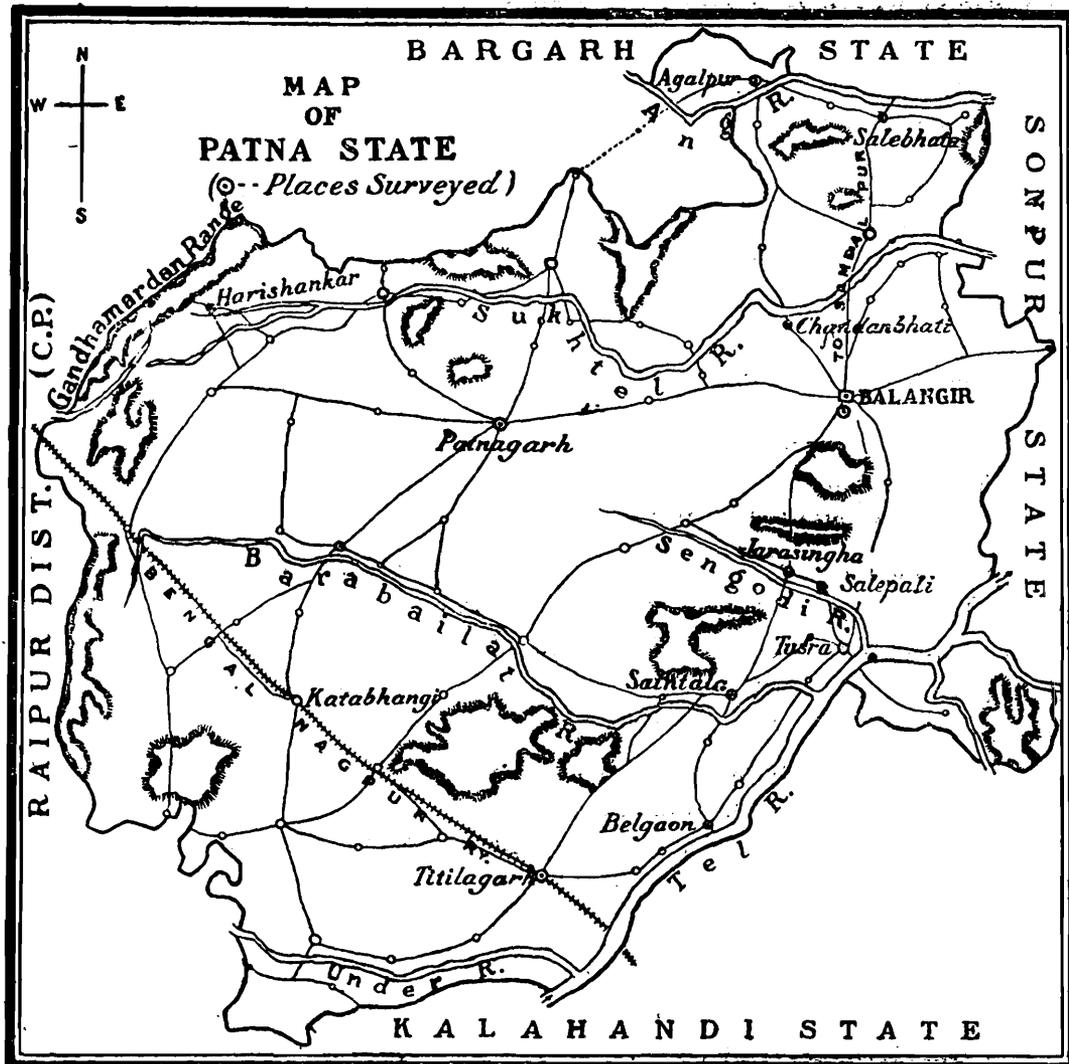
FISH FAUNA OF THE STATE.

A few localities, representing the different types of habitats in the state were selected and surveyed. The localities are shown in the accompanying map (Text-fig. 1) and descriptions of the tanks, etc., that were surveyed and the names of fishes found in them are given below:—

(i) *Salebhata*.—The following water resources were surveyed at this place :—

Jhitri bundh.—(Plate I, fig. 1). This is a small, roadside irrigational tank. The water area is about half an acre and increases in the

rainy season to about two and a half acres. It is a shallow tank and the vegetation consists mostly of *Hydrilla*, *Nymphia*, *Ceratophyllum*



etc. It is manured from the washings of the cattle sheds situated on its south-west bank and is very much silted.

- Ambasis baculis* (Ham.)¹
- Amblypharyngodon mola* (Ham.)
- Barbus (Puntius) sophore* (Ham.)
- Lepidocephalichthys guntea* (Ham.)
- Ophicephalus gachua* Ham.
- Rasbora daniconius* (Ham.)

Dhubel bundh.—This is a large perennial tank, about five feet in depth, with high embankments and over-shadowing trees, particularly on western side. It is full of vegetation, mostly *Nelumbium Pistia*, *Hydrilla* and other weeds. The water is greenish in colour. The tank is heavily silted and netting for fish is difficult. Its water is used for drinking and bathing. It has a large catchment area, mostly covered by paddy fields, the manure of which is probably washed off into this tank. It is also an irrigational tank and is reported to have many cat-fishes. A specimen of *Wallagonia attu*. from this tank was found to harbour an

¹ I am obliged to Dr. K. S. Misra, Assistant Superintendent, Zoological Survey of India for the identification of the fishes of this collection. A paper, dealing with the systematics of these fishes, along with their local names, is being published by him separately.

immature nematode, *Porrocaucum* sp. in its intestine and in its liver, half a dozen specimens, of the trematode fish parasite, *Isoparorchis hypselobagri* (Billet) which is believed to cause often serious fish mortality.¹

Ambassis ranga (Ham.)
Amblypharyngodon mola (Ham.)
Barbus (Puntius) sarana (Ham.)
 " " *sophore* Ham.
Clarias batrachus (L.)
Chela clupeoides (Bl.)
Esomus danricus (Ham.)
Labeo boggut (Sykes)
 " *fimbriatus* (Bl.)
Ophicephalus gachua Ham.
 " *punctatus* Bl.
 " *striatus* Bl.
Rasbora daniconius (Ham.)
Wallagonia attu (Bl. Schn.)

Baijal Sagar.—This has a water area of about one and a half acres and a catchment area of about three to four square miles. The tank is about two and a half to three feet deep, clean and with mostly reed vegetation. It dries up in summer. *Chela clupeoides* was found to be the most abundant fish in this tank.

Purni bundh.—This is a seasonal tank but has so much vegetation that no satisfactory netting of fish is possible.

The fish fauna of the above two tanks was found to consist of the following fishes :—

Ambassis ranga (Ham.)
Amblypharyngodon mola (Ham.)
Barbus (Puntius) sarana (Ham.)
 " " *sophore* Ham.
Chela clupeoides (Bl.)
Esomus danricus (Ham.)
Labeo boggut (Sykes)
 " *fimbriatus* (Bl.)
Lepidocephalichthys guntea (Ham.)
Ophicephalus gachua Ham.
 " *punctatus* Bl.
 " *striatus* Bl.
Rasbora daniconius (Ham.)

The Ang River.—The river Ang is a tributary of the Mahanadi. Vegetation in this river at this place is not very thick and consists of ordinary water weeds, reeds, etc. The nature of the bottom is sandy, there is clay on one bank and the bottom near about muddy; current is slow and water clear; and not deep. The river, just behind the state Inspection Bangalow, was surveyed twice up to the road bridge and the Sar.

Barbus (Puntius) ticto (Ham.)
 " (*Tor*) *khudree*² ? Sykes.
Barilius bendelisis (Ham.)
 " *vagra* (Ham.)
Brachydanio rerio (Ham.)
Labeo boggut (Sykes).
Rasbora daniconius (Ham.)

¹ Chauhan, B. S. *Rec. Ind. Mus.* XLV, pp. 133 and 136 (1947).

² The specimens are too young to be determined with any certainty.

Chandi Sar.—This is a long and deep *Sar*, a blind arm of the river Ang, just by the side of the bridge, on its right side. The place is shady. The bottom of the reservoir is muddy, with rich organic matter. The water is clear and has almost no current.

Ambassis baculis Ham.

„ *ranga* (Ham.)

Barbus (Puntius) ticto Ham.

Gadusia chapra (Ham.)

Xenentodon cancila (Ham.)

(ii) *Agalpur.*—The Ang river at Agalpur, about 11 miles from Salebhata, has a long and deep pool. The nature of the river bed here is sandy and at places rocky. One bank of the river is sandy, with shallow water and the other is high with deep water and is cut through earth. The water is clear, cool and the current slow, vegetation is scanty, except on the bank composed of clay where there are some high reeds and other water plants.

It was hoped that adult specimens of *Barbus (Tor) khudree?* and *Labeo boggut*, many fingerlings of which were seen in shoals at Salebhata, would be found at Agalpur. We however failed to get any adults of these two species. The following fishes were collected:—

Ambassis ranga (Ham.)

Callichrons bimaculatus (Bl.)

Chela boopis Day.

„ *gora* (Ham.)

Cirrhina reba (Ham.)

Danio devario (Ham.)

Gonialosa manmina (Ham.)

Labeo fimbriatus (Bl.)

Mastacembelus pancalus (Ham.)

Mystus bleekeri (Day)

„ *seenghala* (Sykes)

Ophicephalus gachua Ham.

Rasbora daniconius (Ham.)

Rohtee vigorsii Sykes.

(iii) *Balangir.*—This town is the capital of the State. The following tanks were visited here.

The Rajendra Agricultural Farm tanks.—This state agricultural farm has a chain of about five extensive tanks, almost in a continuous line, with a catchment area extending over miles, extending right from down the neighbouring hills: The tanks are surrounded by paddy fields and have something like a natural “lock-system” arrangement of drainage and control of water level. Although all of these tanks are not perennial, probably with a comparatively small investment, they

could be used for fish culture, and specially for rearing and stocking.—

Amblypharyngodon mola (Ham.)
Barbus (Puntius) amphibius (C. V.)
 " " *sarans* (Ham.)
 " " *sophore* Ham.
Chela clupeoides (Bl.)
Labeo boggut (Sykes)
Rasbora daniconius (Ham.)

Naya bundh.—This is comparatively a newly constructed small tank, about 10-12 feet deep, with high embankments and is used both for bathing and washing. The bottom consists of gravel and rocks and there is almost no vegetation. Size of the fishes is also comparatively small, due to lack of sufficient food as pointed out for such tanks by Hora (1943).¹ It is reported that a mortality of fishes in this tank often occurs on a large scale in the hot months of May and June. The water, in this tank was comparatively warm also.

Amblypharyngodon mola (Ham.)
Barbus (Puntius) sophore Ham.
 " " *ticto* Ham.
Chela bacaila (Ham.)
Esomus danricus (Ham.)
Glossogobius giuris (Ham.)
Mastacembelus pancalus (Ham.)

Jubilee tank.—This tank is about six feet deep. It has trees on its western side and has little aquatic vegetation.

Amblypharyngodon mola (Ham.)
Barbus (Puntius) sophore Ham.
Chela bacaila (Ham.)
 " *clupeoides* (Bl.)
Lepidocephalichthys guntea (Ham.)
Mastacembelus pancalus (Ham.)
Ophicephalus punctatus Bl.
Rasbora daniconius (Ham.)

Gait sarobar.—The following fishes were obtained to us from this tank.

Amblypharyngodon mola (Ham.)
Chela clupeoides (Bl.)
Mastacembelus pancalus (Ham.)
Ophicephalus punctatus Bl.
Rasbora daniconius (Ham.)

Maharani sagar.—A collection consisting of the following fishes was made for us from this tank.

Ambassis nama (Ham.)
Barbus (Puntius) sophore Ham.
 " " *ticto* Ham.
Lepidocephalichthys guntea (Ham.)
Mastacembelus armatus (Lac.)
Nandus nandus (Ham.)

Talpali Katha.—This reservoir is located near the Jubilee tank. It dries up completely in summer.

¹Hora, S. L. Tank for Fish-Culture. *Indian Farming* IV (8), p. 389 (1943).

Other fishes found in different tanks at Balangir are.—

Labeo boggut (Sykes)
 „ *fimbriatus* (Bl.)
Notopterus notopterus (Pallas)
Rohtee vigorsii Sykes

(iv) *Chandanbhati*.—This place is situated on the banks of the river Suktel. The river and its *Sar* and some tanks were surveyed here.

The Suktel river.—This river here is deep and its current slow. The bottom is sandy and at places there is silt. The water is not very clear and contains much decaying organic matter. The insect fauna is rich and the vegetation, specially algae growth is considerable.

Barilius bendelisis (Ham.)
Barilius vagra Ham.
Brachydanio rerio (Ham.)
Labeo boggut (Sykes)
Lepidocephalichthys guntea (Ham.)

Dhamna Sar.—This reservoir is a blind arm of the river Suktel. It is deeper than the river, and the water is almost stagnant. The bottom is sandy or muddy. There is thick growth of submerged vegetation.

Amblypharyngodon mola (Ham.)
Barbus (Puntius) ticto Ham.
 „ „ *sophore* Ham.^f
Gadusia chapra (Ham.)
Rohtes cotio var. *cunma* Day.

Nimuhi tank.—This is a clean tank, vegetation is not considerable and the bottom is made of ordinary clay.

Barbus (Puntius) amphibiis (C. V.)
 „ „ *sarana* (Ham.)
 „ „ *sophore* Ham.
 „ „ *ticto* Ham.^g
Chela clupeoides (Bl.)
Glossogobius giuris (Ham.)
Rasbora daniconius (Ham.)

(v) *Patnagarh*.—This place is the old capital of the State. It has a large number of tanks, but most of them are not in good condition. The place is said to be rather malarious. The following water areas were surveyed here.

Bhusagar.—This is a rather deep tank, being about 12 feet in depth, has an area of about four acres, and at the time of our visit, the water was dirty and greenish. It is full of mosquito larvae and is used for bathing and washing. *Glossogobius giuris* was found to be breeding and *Barbus (P.) sophore* was very abundant in this tank.

Amblypharyngodon mola (Ham.)
Barbus (Puntius) sophore Ham.
 „ „ *ticto* Ham.
Glossogobius giuris (Ham.)
Mastacembelus pancalus (Ham.)
Mystus sp.
Notopterus notopterus (Pallas)
Rasbora daniconius (Ham.)

Mena bundh.—This is a deep tank, about three to four acres in area. It has *pucca* ghats, clear water and profuse vegetation. The bottom soil is alluvial. The tank is also used for bathing. *Barbus (P.) ticto* was most abundant here. A large number of frogs were also observed.

Barbus (Puntius) ticto (Ham.)

Glossogobius giuris (Ham.)

Ophicephalus punctatus Bl.

Notopterus notopterus (Pallas)

Rasbora daniconius (Ham.)

Tahsil bundh.—It has an area of about two acres ; water is muddy and there is hardly any aquatic vegetation.

Barbus (Puntius) sophore Ham.

Ophicephalus punctatus Bl.

Rasbora daniconius (Ham.)

Markand bundh.—This is a small tank, with an area of about only half an acre, water is dirty and the tank has little vegetation.

Notopterus notopterus (Pallas)

Rasbora daniconius (Ham.)

Other fishes found in tanks at Patnagarh are.—

Barbus (Puntius) chola Ham.

” ” *conchoniis* Ham.

Esomus danricus (Ham.)

Lepidocephalichthys guntea (Ham.)

The following fishes were noticed to be on sale, in the local market at this place.—

Barbus (Puntius) sophore Ham.

” ” *ticto* Ham.

Glossogobius giuris (Ham.)

Mastacembelus pancalus (Ham.)

Rasbora daniconius (Ham.)

(vi) *Harishanker.*—(Plate I, figs. 2 and 3). This place is at an altitude of about 2,500 feet above sea level and has the advantage of a profuse, perennial water supply from a hill stream ; which ultimately makes up the Suktel river. The water is distinctly alkaline and its temperature was found to be 18°C in the morning and 20°C in the afternoon in the middle of the month of March. The place is said to be very malarious. Collections were made in the hill stream, from the top of the neighbouring hill up to the base, where the village Nandupala is situated. The water is clear and current swift. The bed of the stream is rocky and soil, where present, is light and reddish in colour ; vegetation in the stream consists of a few reeds and shrubs here and there, and the banks are also occasionally shaded with shrubs, trees, etc.

Brachydanio rerio (Ham.)

Danio malabaricus (Jerdon)

Garra mullya (Sykes)

Glyptothorax lonah (Sykes)

Lepidocephalichthys guntea (Ham.)

Nemachilus dayi Hora.

The following fishes were collected from Makritapar which is a deep pool of Katangi Jore, a continuation of the above stream three miles away from the Harishanker Rest House. This stream is shallow, with

bottom usually muddy or sandy. Its water is somewhat warmer and the current is also slower than that of the hill stream.

Barbus (Puntius) chola Ham.
 „ „ *sarana* (Ham.)
 „ „ *ticto* Ham.
Brachydanio rerio (Ham.)
Callichrons bimaculatus (Bl.)
Garra mullya (Sykes)
Lepidocephalichthys guntea (Ham.)
Nemachilus dayi Hora.
Ophicephalus gachua Ham.

(vii) *Jarasingha.*

Budhai bundh.—The water of this tank is dirty and aquatic vegetation consists of small plants and is profuse. Its bottom is muddy. *Rasbora daniconius* was the most abundant species in this tank and was found to have strikingly brilliant colour band.

Amblypharyngodon mola (Ham.)
Barbus (Puntius) sophore Ham.
 „ „ *ticto* Ham.
Rasbora daniconius (Ham.)

(viii) *Salepali.*—Collections were made at this village in the *De Sar* reservoir of the Sungad river. The water in this reservoir is deep cool and clear. There are almost no currents. Its bottom is made of loamy soil. Vegetation is high but spare.

Ambassis baculis (Ham.)
 „ *ranga* (Ham.)
Amblypharyngodon mola (Ham.)
Barbus (Puntius) sophore Ham.
Chela clupeiodes (Bl.)
Danio chrysops (C. V.)
Ophicephalus punctatus Bl.
Rasbora daniconius (Ham.)
Rohtee cotio var. *cunma* Day.
Xenentodon cancila (Ham.)

Danio and *Xenentodon* were the most abundant fishes here.

(ix) *Belgaon.*—This place is situated on the banks of the river Tel (Plate I, fig. 5). The water of this river, though clear, probably contains some minerals and appears to be oily. Collections were made here in Kudal Darh, which is said to be the deepest pool in the state, and is at places 15-20 feet deep. Its water is cool and the bottom sandy; one bank is made up of sand and the other of poor, red soil; vegetation where present, is high and thick and water current is fairly swift.

Fry and fingerlings, specially of *Chela*, were found to abound here.

Ambassis baculis (Ham.)
 „ *ranga* (Ham.)
Aspidoparia morar (Ham.)
Barbus (Puntius) amphibius (C. V.)
 „ „ *chola* Ham.
 „ „ *sarana* (Ham.)
 „ „ *ticto* Ham.
Barilius bendelisis (Ham.)
 „ *barila* Ham.

Brachydanio rerio (Ham.)
Callichrons bimaculatus (Bl.)
Chela boopis Day.
 " *clupeiodes* (Bl.)
 " *gora* (Ham.)
Cirrhinā reba (Ham.)
Clupisoma garua (Ham.)
Erethistes hara (Ham.)
Eutropichthys vacha (Ham.)
Glossogobius giuris (Ham.)
Labeo ariza (Ham.)
 " *boggut* (Sykes)
 " *calbasu* (Ham.)
 " *gonius* (Ham.)
Lepidocephalichthys guntea (Ham.)
Mastacembelus armatus (Loc.)
Mugil corsula (Ham.)
Mystus cavasius (Ham.)
Nemachilus botia var. *aureus* Day.
 " *botia* (Ham.)
Rasbora daniconius (Ham.)
Rita chrysea Day.
Rohtee cotio (Ham.)
 " *vigorssii* Sykes.
Xenentodon cancila (Ham.)

(x) *Titilagarh*.—This small, rapidly growing town with advantages of railway communication has a number of good tanks, like Maharaj Sagar, Nua bundh, Circle bundh, etc., which could perhaps be usefully employed for fish culture.

Trishool bundh.—This is a small tank, about half an acre in area and four feet in depth, situated in the Khazurpara village.

Barbus (Puntius) sophore Ham.
Rasbora daniconius (Ham.)

Nua bundh.—This is a bigger tank about two acres in area, but is full of vegetation. It has the advantage of getting washings from the neighbouring sheds.

Barbus (Puntius) sophore Ham.
Glossogobius giuris (Ham.)
Ophicephalus punctatus Bl.
Rasbora daniconius (Ham.)

Circle bundh.—This is a very clean tank, almost devoid of any vegetation. It is deeper also, about six feet deep.

Amblypharyngodon mola (Ham.)
Barbus (Puntius) conchoniū Ham.
 " " *sophore* Ham.
Glossogobius giuris (Ham.)
Ophicephalus punctatus Bl.

Deo bundh.—This appears to be a deep but dirty tank. It is full of vegetation, especially *Nelumbium*, *Pistia*, etc. and is said to abound in cat-fishes.

Ambassis ranga Ham.
Barbus (Puntius) conchoniū Ham.
 " " *sophore* Ham.
Glossogobius giuris (Ham.)
Mastacembelus pancalus (Ham.)
Nandus nandus (Ham.)
Ophicephalus punctatus Bl.
Rasbora daniconius (Ham.)

Maharaj Sagar.—This is one of the good tanks, with high embankments. Its area is about five acres and depth eight feet. The catchment area is also large.

Barbus (Puntius) sophore Ham.

Nandus nandus (Ham.)

Ophicephalus punctatus Bl.

Rasbora daniconius (Ham.)

Rasbora daniconius was found to be the most abundant fish in this tank.

The following fishes were found on sale in the local market, at this place.

Ambassis ranga (Ham.)

Barbus (Puntius) sophore Ham.

Glossogobius giuris (Ham.)

Nandus nandus (Ham.)

Notopterus notopterus (Ham.)

It was learnt that the state had been purchasing fish fry from Sambalepore for introducing in the tanks all over the state. The fish fauna, as recorded by us here, cannot, therefore be taken as absolutely indigenous to this state. As no experimental and control tanks are maintained, it is difficult to say, which species of fishes were introduced into these different tanks from outside the State.

FISHING IMPLEMENTS USED IN THE STATE.

The various fishing implements, nets, traps, etc. and other special devices used in the state are dealt with in brief below. It will be observed that they are remarkably old and primitive.

NETS.

The different types of nets, met with in the state, have been divided here into five groups—

(a) PLUNGE NETS.—These are light, hand nets operated generally by a single person.

Kural jal.—(Plunge net; Plate I, fig. 6). This net is designed on the model of an umbrella with six wooden ribs loosely tied at the top and carrying the netting at their lower ends. There is a handle at the upper end to operate the net. The netting can be taken out completely and the frame folded like an umbrella. It is evidently, not very useful for catching large fishes.

Tula jal.—(Lifting net; Plate II, figs. 1 and 2). The frame of this net consists of two long and thin bamboo strips crossing each other in the middle and at right angle, with a long bamboo handle attached at the point of crossing. The net is fixed to the four ends of the bamboo strips. This is a large net, a specimen that was measured being 12 feet 10 inches long and 12 feet 6 inches broad. The mesh, as in most of the other nets used in the state, is about half an inch to one inch. The net is lowered in the water and when some fishes, prawns, etc., have been collected into it, the man operating it lifts it out of the water and

collects his catch in a basket that he generally carries on his back. This net very much resembles the *Ilb-jung-thauri* of the Manipuris.¹ Though this net is used during the day also, fishermen of Belgaon and perhaps of Titilagarh side also employ it extensively for night fishing. Forty to fifty of them or even more, stand in pairs, in a row across the river. One man of each pair, operates the net and carries on his back a basket in which the catch is collected, while the other has a *Baingi* over his shoulder. This is a horizontal bar of wood with a basket hanging at each end. In the front basket, is a half earthen pot in which some fuel is kept burning, while in the other basket supply of extra fuel is carried. Fishes are attracted by the light of the fire and are easily caught in the net. Wood of *Sisoo* (*Dalbergia latifolia*) or some such other wood is generally used as fuel, as it is said to contain oil and therefore considered to give a comparatively bright light and also burn for a longer time, while fishing the men keep up moving forward slowly.

Thapi net (*Chingri jal*; Plate III, fig. 3). This is a small, rectangular hand net, designed on the lines of the last one but has no handle. It consists of two thin and elastic bamboo strips, tied down in their middle so as to cross each other at right angles and their four ends carry the netting. Our sample measured about 30 inches in length and 20 inches in width. The size of the mesh is about one third of an inch. This net is used mainly for shrimps and small prawns but is quite effective for fry and small fishes also. It is mostly used in small tanks, pools and perhaps in paddy fields as well.

(b) FIXED NETS.

Fwi jal.—(Fixed or stake net; Plate III, fig. 1). This net is just like the *Sera jal* referred below or any other ordinary drag net of its type. It differs from a common drag net in being smaller in size and in the construction of the upper border, which is formed of small, thin, and hollow pieces of stick, about three to four inches in length, arranged in a continuous chain. This modification makes the operation of the net, as an ordinary drag net, difficult, but renders it perhaps more convenient to handle and also effective in operation, as the sticks serve the purpose of a float. This net is fixed across the stream at night. The size of the mesh varies considerably; it is generally one to three inches. The net is about 20 to 60 feet long and five feet high. It is used in slow running waters, tanks, deep pools, etc.

(c) DRAG NETS.

Khadi jal.—(Plate II, fig. 4.) This net is, perhaps, just a modification of an ordinary drag net, the modifications being that it is narrower, shorter, and is supported by thin transverse wooden sticks. It is very common all over the state, probably on account of its being light and convenient to use. Its length is usually about 80 feet and height 2 feet. It is known as *Khadi Jal*, on account of the local name of the wood, which is used for making its supporting ribs. It is effective for small and shallow waters and can be used only up to two to three feet below the surface of the water. Two men are required to operate this net and generally one or more persons are needed to drive the fishes towards the net.

Sera jal.—This is just an ordinary drag net, common almost all over India. It measures about 30 to 120 feet in length and five to eight feet in height. The size of the mesh is about one and a half inches.

(d) CAST NETS.

Bhaur jal.—This is a typical cast net used all over India. It is circular in shape, with a pull-string in the centre and lead beads all along the margin. Its circumference is about 12 feet, radius six feet and the size of the mesh about a quarter of an inch. In the Patna State, it is specially employed for catching clupeoids, etc.

(e) FRY NETS.

The length of these nets varies from 30 to 60 feet and the height is about five feet. The size of the mesh is about a quarter of an inch.

TRAPS.

Fishermen, in the State, use different types of traps also, mostly made of bamboo. These are generally used in comparatively still waters and can be roughly divided into two groups.

(a) BASKET TRAPS.

The traps included in this group are generally fixed.

Ghani trap.—(Plate II ; fig. 5.) This is a rectangular bamboo basket with a device for allowing the fish to get in and preventing it from escaping easily. There is a hole in one corner, near the bottom and as this is protected on the inside by converging strips of bamboo, fishes can get in easily, but cannot escape. A large door running along the whole height of the trap, in the middle of the front side, is used for taking out the fish. It also serves as an additional trap-gate. Bait, generally consisting of some worms is hung on a string running across, inside the trap. These traps are sometimes used singly but often in groups in one line. One trap that was measured was 25 feet long, 14 feet broad and 23 feet high.

Dhair trap.—(Filter basket ; Plate III, fig. 2.) This trap is also made of bamboo strips. There are three holes on one side and two on the other to allow the fish to get in. The holes, as in the case of *Ghani trap* are provided inside with converging bamboo strips. The outlet for collecting the catch is in one corner on the top. Its length is 77 feet, height 25 feet and width, at the bottom 15 feet. They are used singly or in a row in shallow running waters.

Thapa (Plunge basket ; Plate III, fig. 3). This is just a conical basket, open at both the ends. A person carries it in his hand and if he comes across a fish in the water, he plunges the basket over it, to trap it. If he is successful, the prey is removed out of the basket through the narrow outlet at the top. It is about 22 feet 5 inches high and has a diameter of about 29 inches.

Khaksa, *Putia* and *Chingri Bendas* (Plate II, fig. 6 ; Basket Nos. 1 and 2. *Khaksa Benda* ; 3-6 *Chingri Benda* and 7-8 *Putia Benda*). All

these traps are also rectangular bamboo baskets, made on the model of *Ghani trap* (Plate II, fig. 5), the only difference being in their smaller size and absence of any hole near the bottom. There is similar arrangement for bait and the gate is also identical. It consists of small strips of bamboos fastened together into a mat like structure by three rows of strips; of which the central string is tied down to the top and bottom horizontal supports of the frame of the top in such a way that the middle string acts more or less like a hinge and a fish could get in only but cannot come out again. The distance between the inter-spaces of the bamboo strips of the traps, varies with the size of the game which is sought to be trapped, *Khaksa* (*Ophicephalus*), *Putia* [*Barbus* (*Puntius*) spp.] or *Chingri* (Prawn and Shrimps). Average size of one of these baskets is length nine inches, height nine and a half inches and width five inches. These traps are used only in slow running streams and several of them are used at one time.

Kumna (Back trap; Plate III, fig. 4). This trap consists of two parts, first a piece of straw or bamboo mat folded so as to make a gutter-like channel, leading into the second component, bamboo cone, arranged as shown in the photograph. The whole thing is kept in a flowing stream along the direction of the current. A fish passes along the channel formed by the mat into the cone, and as the space at the farther end of the cone is narrow, it cannot turn back and escape. Its fins are often entangled in the meshes of the trap. The size of the mat is variable, but the cone generally measures about 32 inches in length. This trap is used in somewhat, slow running streams.

(b) FLOATING TRAPS.

The two little fishing devices described below are used in groups at a time either independently or along with the *Dawn*, described below, or *Fui jal*, already referred to.

Floating Sol.—(Plate III, fig. 5, *b*). This trap is made of some light wood, generally pieces of certain climber intertwined, carrying a hook with bait hanging from one end. This floats on water and its increased movements enable a person to detect the catch.

Phas.—(=trap; Plate III, fig. 5, *a*.) This is an elongated, hexagonal cone open at both ends and is made of thin and light branches or strips of certain climbers. There is a ring of a few strips at the narrow end of the cone, carrying a small hook and bait. A fish enters this cone for the bait, and as soon as it swallows the bait and tried to escape the ring closes the narrow end, so that even a small fish cannot easily escape. If a large fish struggles to get out, its fins get entangled or come out of the inter-spaces of the component strips, making its escape almost impossible. This trap also floats on water and like the previous one, is generally used in groups, with floating *sol* or alone. These contrivances are specially used for air breathing fishes, like *Ophicephalus*, *Clarias*, *Heteropusteus*, etc., that come to the surface to take air.

LINES.

(*a*) *Dawn* (Hook and lines). This is a long, cotton cord with about 100-150 hooks, hanging at more or less regular intervals, with bait attached and is used specially for *Ophicephalus* fishing.

(b) *Upher* (Rod and line). This consists of the usual hook, line and a rod as used by anglers everywhere.

FISHING BOATS.

Boats and other crafts appear to be seldom used for fishing in the state. A very primitive type of canoe (Plate III, fig. 6) was seen for the first time in the state, in the river Tel at Belgaon. Four similar boats were subsequently seen at Rigdol village, about four miles from Titilagarh. Their average measurements were : length 11.4 feet, width one foot and depth, on the inside, nine inches. These canoes are dug out from single trunks of *Pipal*, teak or *Sāle* (*Bowtellia serata*) trees, probably prepared by the fishermen themselves and are reported to cost only two or three rupees each. While fishing a canoe is usually manned by two persons, one for paddling and the other for operating a net, generally a lifting net. At the longer end of the canoe where there is a round hole, in which the pole is fixed, when not in use, which is used for paddling, a person sits to paddle it and at the other, the smaller end, the second person operates the net. They also tie two canoes together for fishing purposes.

GENERAL.

The total population of the Patna State is about seven lakhs and the staple food is rice. A vast majority of the population, reported to be about 96 per cent eat or are said to have no objection to eating fish. The communities, which deal in fishes in the state are *Kewat*, *Dhimar*, *Tiyar* and *Gingra* and their population is about 4,500.

There is great demand of fish in the state. At Balangir, the State Fisheries Inspector auctioned a small lot of fingerlings, weighing about a pound, and it fetched nine annas. Similarly a handful of tiny shrimps were sold for six pice and the competition amongst the bidders for both the fish and shrimps was comparatively keen. Fish is also imported into the state from the neighbouring state of Sonapur, on account of scarcity of local fish. Cured, smoked and sun-dried fish, etc., appears to be scarce in the markets all over the state.

The fishing communities of the state appear to be poor and simple folk and their fishing methods and implements are also primitive and crude. Mostly, they use the *Thapi* and *Khadi jals*, which are good only for small, surface feeders. This absence of large nets probably accounts for the absence of most of the familiar bigger varieties of carps, like Catla, Mahaseer, etc., from our list of fishes of the State. During the later part of our tour, we arranged to get large cast and drag nets, from the neighbouring state of Sonapur, but, unfortunately, the local fishermen could not operate them effectively. They do not appear to be familiar with fishing in waters more than a few feet deep and are reluctant to go in even moderately deep waters.

Some of the methods employed by the fishermen are injurious to the development of fisheries. A very common device is the diversion of water courses into blind channels, resulting in the catching and wanton destruction of large quantities of young fishes, fry, etc.

We were also told at Belgaon that the fishing rights in the river Tel, are auctioned by the state every year. This year the rights are said to have been auctioned for Rs. 200 only for the whole year. It is stated that the contractor employs a very large number of people for fishing on particular days and total destruction of fish, irrespective of size, takes place. Fish destruction by poisoning the waters, with fruits, leaves and bark of various jungle trees is also reported.

The fishing rights in the state-owned water reservoirs are leased out every year by public auction, approximately at the rate of rupee one per acre. Fishing in the rivers also is permitted under license and for this purpose the various fishing implements used in the state have been classified and the licence fee fixed for each variety at roughly the following rates :

	Rs.	₹.	P.	
Long nets (including <i>Khadi jal</i>)	7	8	0	per year
Cast nets	2	8	0	„
<i>Thapi</i> net	0	8	0	„
Hooks	1	0	0	„
Lifting nets	1	0	0	„
<i>Thapa</i> nets	0	8	0	„
<i>Benda</i> trap	15	0	0	„
<i>Daun</i> (line)	3	0	0	„

A comprehensive fishing legislation, fixing the size of mesh of the various types of nets and declaring illegal all devices destructive or injurious to fisheries is said to be under preparation by the state authorities.

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