

XII. NOTES ON FISH FROM INDIA AND PERSIA, WITH DESCRIPTIONS OF NEW SPECIES.

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I.—ON A COLLECTION OF FISHES MADE BY W. T. BLANFORD IN 1872 IN PERSIA AND BALUCHISTAN.

In 1872 Mr. W. T. Blanford accompanied Major St. John in a journey from Gwadar on the shores of the Arabian Sea to Shiraz, Isfahan and Tehran,¹ during which collections of zoological material were made. The reports on the Mammalia, Aves, Reptilia and Amphibia were shortly afterwards published,² but the collections of fish and invertebrata, "being comparatively few in number," have apparently never yet been worked out. The present collection, which is only a part of that which Blanford made, was procured partly in what is now British Baluchistan and partly in Persia proper.

The specimens of *Scaphiodon* are from Baluchistan, some being from a stream near the fort of Gishtigan in the Bampusht highland. Gishtigan is on the Kulushta river which drains south through the Nihing river into the Dashti and so into the Indian Ocean. Other examples of *Scaphiodon* are labelled Baluchistan simply, while still others are from a stream running into the desert at Kalagan at a height of 3,500 feet. The Cyprinodontidæ are all from the vicinity of Shirar, in Southern Persia.

Although collected in 1872 the specimens do not appear to have reached the Indian Museum at Calcutta until 1881, at any rate they were not entered in the register until May of that year. No less than 91 specimens were then entered (Nos. 9341—9431, inclusive); of these 62 have been examined (Nos. 9392—97, 9402—4, 9408—18, 9425—31; 9419—24, 9363—76, 9377—91).

The first 27 specimens had been carefully wrapped up in linen and preserved in spirit and they are now, after thirty-seven years, in a remarkably good state of preservation. The remaining 35 were loose in spirit and, although capable of being identified, were not nearly as well preserved as the others. They consist almost entirely of the new species of *Scaphiodon* except that there are a few

¹ *Eastern Persia: An account of the journeys of the Persian Boundary Commission, 1870-71-72*, vol. i, Geography, p. 18, *et seq.* (London, Macmillan & Co., 1876).

² *Ibid.*, vol. ii, Zoology and Geology, by W. T. Blanford.

Discognathus lamta and one imperfect specimen of *Cyprinodon blanfordii*. All the specimens are Cyprinidæ and belong to the genera *Scaphiodon*, *Cyprinodon* and *Discognathus*. The specimens of *Scaphiodon* differ from those previously described and are here recorded as a new species.

Scaphiodon baluchiorum, sp. nov. (Pl. vi, fig. 1.)

D. 3—9-10, V. 8, A. 8-9, P. 16, C. 10. L.l. 37-39, L.tr. $6\frac{1}{2}$ - $3\frac{1}{2}$.

Length of head $5\frac{1}{2}$ times and height of body $4\frac{1}{2}$ times in total length (including the caudal fin). Snout obtuse, covered with glandular pores. Diameter of eye $3\frac{1}{4}$ times in length of head. Interorbital width $2\frac{1}{3}$ times in length of head. Mouth inferior, upper jaw the longer.

Barbels, a maxillary pair, about half the length of the eye. Dorsal fin commencing slightly before ventrals, its third undivided ray osseous and posteriorly serrated in its lower half. Height of dorsal fin about $\frac{3}{4}$ that of body. Pectoral shorter than head. Well-marked tubercles on rays of anal fin occasionally present (absent in the specimen figured). Caudal forked, upper lobe the longer.

Scales regularly arranged, in this respect differing from *S. irregularis* (Day); on lower surface of body small and rudimentary. Dorsal and lateral scales with fine black dots, especially on lateral surface of body.

Colour (in spirit) greyish above gradually fading to silvery below.

Localities.—Gishtigan (Bampusht); Kalagan, 3,500 feet; Baluchistan.

Cyprinodon blanfordii, sp. nov. (Pl. vi, fig. 3.)

D. 9, V. 5, A. 8, P. 16, C. 24. L.l. 32, L.tr. 13.

Height of body 3.4 times, length of head 3.8 times, in total length inclusive of caudal. Snout obtuse, truncated, mandible directed vertically upwards. Diameter of eye twice length of snout and one-third length of head. Interorbital space slightly wider than diameter of eye.

Origin of dorsal fin much further from tip of snout than from root of caudal. First anal ray below fourth dorsal.

Colour.—Body dark brown above fading to pale yellow below. Fins colourless. Operculum and head below eyes with minute black spots. A series of black spots more or less longitudinally arranged along sides of body, with a larger lozenge-shaped spot near root of tail. In these specimens, which have been in spirit for over 30 years (although to some extent protected from the light, owing to their being wrapped up in linen), the colour must necessarily have changed considerably.

Locality.—East of Shiraz, South Persia (Reg. Nos. 9416—18).

This species somewhat resembles *Cyprinodon punctatus*,¹ a form identical with the *Lebias punctatus* of Heckel² which was recorded from Nemek-Deria, a salt-water lake near Shiraz. The number of rays in the dorsal and anal fins, the number of lateral line scales and in particular the number of lateral transverse rows of scales differentiate *C. blanfordii* from *C. punctatus*.

Cyprinodon persicus, sp. nov. (Pl. vi, fig. 4.)

D. 9, V. 4, A. 9, P. 15, C. 27. L.l. 29, L.tr. 14.

Height of body 3.5 times, length of head 3.7 times, in total length inclusive of caudal.

Body elevated and compressed. Snout obtuse, mandible directed upwards. Diameter of eye $1\frac{2}{3}$ length of snout and $2\frac{1}{5}$ in length of head. Interorbital space broad, not less than one and a half times diameter of eye. Origin of dorsal much nearer to root of caudal than to eye and situated considerably behind the vertical from the root of the ventral, which is half-way between the tip of the snout and the base of the caudal.

Colour (in spirit).—The head and body are both light brown in colour. Along the body there is a number (10) of vertical white stripes, running from the ventral surface to just below the dorsal margin. The operculum is unspotted. The dorsal fin is blackish except at the margin and base, both of which are whitish. The other fins are pale yellow. In one of the two specimens there is a pale band running across the snout between the eyes.

Locality.—Spring on the edge of Shiraz Lake, Southern Persia (Reg. Nos. 9403-4).

This species comes near *Cyprinodon sophia*³ (*Lebias sophia* of Heckel), but differs from it in the number of fin rays and lateral line scales. The lateral transverse row is 7 in *C. sophia*, whereas in *C. persicus* it is 14. The origin of the dorsal fin is also markedly different in the two species; in *C. sophia* it is midway between the root of the caudal and the eye, whereas in *C. persicus* it is much nearer the former.

Cyprinodon pluristriatus, sp. nov. (Pl. vi, fig. 5.)

D. 11, V. 6, A. 12, P. 15, C. 28. L.l. 29-31, L.tr. 14.

Height of body 3.5 times in length of head and 4 in total length inclusive of caudal.

Body elevated and compressed, snout obtuse. Diameter of eye nearly equal to length of snout. Interorbital space about $1\frac{2}{3}$ diameter of eye. Origin of dorsal much nearer to root of caudal than to eye.

¹ See Günther's Catalogue, vol. vi, p. 305.

² In *Russegger, Reisen*, ii, 3, p. 268, taf. 22, fig. 3 (quotation taken from Günther).

³ See Günther's Cat., vol. vi, p. 304.

Colour (in spirit).—The head and body are of a dark brown colour. Along the sides of the body there is a number of vertical white stripes, running from the ventral surface to just below the dorsal. The number is greater than in *C. persicus*, being from 14 to 16. The operculum has a number of small brownish spots irregularly arranged. The fins are yellowish brown and, except the pectoral and pelvic, are white-edged. The lower edge of the pectoral is tinged with black.

Locality.—East of Shiraz, stream running to Fussa, Southern Persia, 5,000 feet (Reg. Nos. 9408—12).

This species is allied to the previous one, *C. persicus*, but is readily distinguished by the greater number of vertical white bands. In *C. pluristriatus* these bands are appreciably narrower than in *C. persicus*. The fin ray formula also differs in the two species.

BIBLIOGRAPHY OF WORKS RELATING TO PERSIAN AND BALUCHISTAN INLAND FISH.

- Cuvier et Valenciennes .. *Histoire naturelle des poissons*, 1844, vols viii, xiv, xvi.
- Fillippi, F. de .. "Nuove specie di Animali raccolte in un viaggio in Persia," *Arch. per la Zool.*, ii, 1863.
- Fillippi, F. de .. *Note di un Viaggio in Persia*, Milan, 1865.
Gives list of vertebrata, including twenty-two fishes, of which ten are described as new species, namely, *Gobius macrobus*, *Systomus alpinus*, *Barbus cyri*, *Barbus miliaris*, *Abramis microlepis*, *Squalius turcicus*, *Telestes leucoides*, *Alburnus eichwaldii*, *Alburnus doriae* and *Acanthopsis aurata*.
- Some of these fish are not Persian in the sense that they were found within the boundaries of Persia as at present constituted.
- Güldenstadt .. "Cyprinus capoeta et Cyprinus mussa," *Nov. Comm. Petropol.*, xvii, 1773, p. 507, pls. viii, ix.
- Günther, A. .. *British Museum Catalogue of Fishes*, vols. iii, v, vi, vii, 1868.
- Günther, A. .. *Zoology of the Afghan Delimitation Commission*, second series, vol. v, 1887, Fishes.

Describes a new species of *Cirrhina*, *C. afghana*, which occurs in N. Baluchistan, also a new species of *Schizothorax*, *S. rawlinsii*, from Bard,

Province of Khorassan, Persia. Also *Nemachilus kessleri* from Nushki, N. Baluchistan.

- Heckel, J. "Ichthyologie," *Russegger, Reisen in Europa, Asien und Afrika*, 1841-43, vols. i and ii, Stuttgart, 1843. (I have not been able to see this work but all the fish appear to be mentioned in Günther's Catalogue.)

Describes (amongst others) *Cyprinodon sophiæ*, *Cyprinodon punctatus*, *Barbus barbatus*, *Cobitis persa*, *Acanthopsis linea*.

- Kessler, K. *Mém. Soc. Nat. St. Petersburg*, t. vii.
Keyserling, Graf E. "Neue Cypriniden aus Persien," *Zeitschrift ges. Naturwiss.*, Berlin, xvii (1861).

Describes the following as new species:—*Barbus microlepis*, *Scaphiodon chebisiensis*, *Scaphiodon rostratus*, *Scaphiodon gracilis*, *Scaphiodon heratensis*, *Scaphiodon asmussi*, *Alburnus maculatus*, *Bungia nigrescens*, *Squalius latus*. All these species are figured. *Scaphiodon macrolepis*, Heck., and *Discognathus variabilis*, Heck., are also recorded. Contains also a table for the determination of the species of *Scaphiodon*.

- Ménétriés, E. *Catalogue Raisonné des Objets de Zoologie recueillis dans un voyage au Caucase et jusqu'aux frontières actuelles de la Perse*, St. Petersburg. Imprimerie de l'Académie Impériale des Sciences, 1832.

Enumerates 38 species of fish, most if not all of which are outside the confines of Persia.

- Nikolski, A. M. "Reptiles, Amphibiés et Poissons, recueillis pendant le voyage de M. N. A. Zaroudny en 1898 dans la Perse," *Ann. du Mus. Zool. de l'Acad. Imp. des Sciences de St. Petersbourg*, tome iv, 1899, p. 375.

Records following species from Persia:—*Ophiocephalus gachua*, *Cyprinodon dispar*, *Capoeta amir*, *Schizothorax poelzami*, *Schizothorax zaroudnyi*, *Cirrhitina afghana*, *Discognathus lamta*, *Discognathus variabilis*.

Also describes as new *Barbus bampurensis* from Bampur River, *Cyprinion kirmanense* from Schur-Ab in Kirman, *Nemachilus bampurensis* from Barman and *Nemachilus sargadensis* from Sargado. None of these are figured.

Sauvage . . . "Notice sur la faune ichthyologique de l'ouest de l'Asie et plus particulièrement sur les Poissons recueillis par M. Chantre pendant son voyage dans cette region," *Nouvelles Archives du Muséum*, 2e serie, t. vii, 1884.

Gives a list of fishes recorded from Western Asia.

Steindachner, F. . . "Ichthyologische Mittheilungen" (vii), *Verh. zool.-bot. Ges. Wien*, 1864, pp. 223—234.

Unites *Scaphiodon capoeta* and *S. socialis* of Heckel into one species under the former name.

II.—FISHES FROM PARESNATH HILL, W. BENGAL.

Five species of fish were collected at Paresnath Hill by Dr. Annandale and myself in April 1909. They were obtained from a stream known as Sita Nullah at a height of 2,150 feet.

The specimens belong to three families, viz.—

SILURIDÆ.

Glyptosternum saisii, sp. nov.

CYPRINIDÆ.

COBITIDINÆ.

Nemachilus savona.

CYPRININÆ.

Discognathus lamta.

Danio dangila.

OPHIOCEPHALIDÆ.

Ophiocephalus gachua.

Glyptosternum saisii, sp. nov. (Pl. vi, fig. 6.)

D. 1-6, V. 6, A. 10, P. 1-7, C. 14.

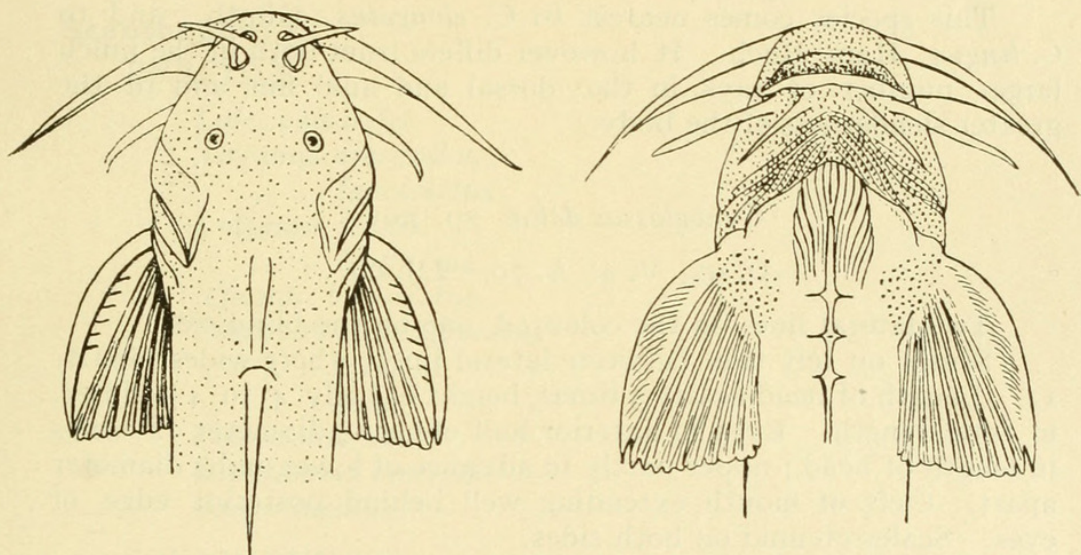
Length of head $4\frac{1}{2}$ times, of caudal $6\frac{3}{4}$ times, height of body $6\frac{1}{2}$ times, in total length. Eyes approximately in mid length of

head, width of interorbital space $3\frac{1}{2}$ times in length of head. Upper jaw the longer, the width of the gape of the mouth $2\frac{1}{3}$ times in the length of the head. Lips slightly fringed.

The maxillary barbels extend to just beyond the base of the pectoral fins, the nasals reach about three-quarters of the way to the orbit, the outer mandibular to the base of the pectoral and the inner to the gill opening. Teeth in the jaws villiform, palate edentulous.

Dorsal fins as high as body. Bases of adipose and first dorsal fins approximately equal, pectoral extending half-way to ventral. Pectoral spine flattened, strong, and coarsely serrated internally. Skin covering under surface of pectoral and ventral spines plicated.

Colour.—Greyish black all over except ventral thoracic and



Glyptosternum saisii, sp. nov., $\times 2$.

abdominal regions which are whitish. Fin membranes white, rays and spines black. Caudal fin with black spots. Caudal peduncle twice as long as high.

This species approaches *G. pectinopterum*, McClelland, a form which occurs in the Himalayas, throughout the Punjab, and at Kangra, Simla and Darjiling, but differs from it in the head being longer than broad, and in the adhesive apparatus being much longer than wide. The relative body proportions are also markedly different.

III.—TWO NEW SPECIES OF *Cynoglossus* FROM THE SUNDERBUNS.

While engaged in an enquiry into the fishery resources of the Sunderbuns, trawling was tried in several of the creeks. On the 25th August 1909, when fishing with the shrimp trawl off Morelganj

(in the district of Khulna) in 10 fathoms water, two species of *Cynoglossus* were obtained which are here described as new.

Cynoglossus acinaces, sp. nov.

D. 168-182, V. 5, A. 120-125, C. 12. L.1. 129-133.

Two lateral lines on coloured side, one on blind side. Scales between lateral lines on left side, where widest apart, 13. Length of head $5\frac{1}{4}$ times, height of body 7 times, in total length. Eyes in middle of head; diameter 16 to 17 times in length of head; upper slightly in advance of lower and about $\frac{1}{2}$ diameter apart. Cleft of mouth extending well behind posterior edge of eyes. Scales markedly ctenoid on coloured side, cycloid on uncoloured side.

Colour.—Pale greyish white.

This species comes nearest to *C. elongatus*, Günth., and to *C. lingua*, Ham. Buch. It however differs from both in the much larger number of rays in the dorsal and anal fins and in the greater slenderness of the body.

Cynoglossus deltae sp. nov.

D. 95, V. 4, A. 70. L.1. 90.

Two lateral lines on the coloured, one on the blind side.

Scales on left side between lateral lines, where widest apart, 12. Length of head nearly 5 times, height of body 4 to 4.3 times, in total length. Eyes in anterior half of head; diameter 22 times in length of head; upper partly in advance of lower and a diameter apart. Cleft of mouth extending well behind posterior edge of eyes. Scales ctenoid on both sides.

Colour.—Pale yellow.

This species comes nearest to *C. lida*, Bleek., and *C. bengalensis*, Bleek. It differs from the latter in that its ventral fin is separate from the anal, and in its body being somewhat more slender. From *C. lida* it is differentiated by the smaller number of rays in the dorsal and anal fins.

IV.—ON A COLLECTION OF FISH FROM KARACHI, WITH A DESCRIPTION OF TWO NEW PLEURONECTIDS.

This collection of fish was obtained by purchase from Karachi in 1908 (February to May). Most of the specimens were bought in the markets, but in a few instances inedible species were collected from the fishermen. For the most part the collection consists of common species. The Pleuronectidæ comprise two forms which are here described as new. The arrangement adopted is that of Day as being the most convenient for reference. All the fish were Teleosteans.

Physostomi.**SILURIDÆ.**

Arius dussumieri.

CLUPEIDÆ.

Clupea brachysoma.

„ *liie.*

„ *longiceps.*

„ *sindensis.*

Chatoessus nasus.

„ *chacunda.*

Chanos salmonesus.

SCOMBRESOCIDÆ.

Belone strongylura.

Acanthopterygii.**PERCIDÆ.**

Lates calcarifer.

Serranus diacanthus.

„ *lanceolatus.*

Lutjanus johnii.

„ *lioglossus.*

Apogon bifasciatus.

Therapon quadrilineatus.

„ *jarbua.*

„ *puta.*

Pristipoma hasta.

Diagramma cinctum.

Gerres lucidus.

SQUAMIPINNES.

Scatophagus argus.

Drepane punctata.

SPARIDÆ.

Pagrus spinifer.

Chrysophrys berda.

„ *datnia.*

„ *sarba.*

TEUTHIDÆ.

Teuthis oramin.

POLYNEMIDÆ.

Polynemus tetradactylus.

SCIÆNIDÆ.

Otolithus ruber.

Sciæna belengeri.

„ *cuja.*

CARANGIDÆ.

- Caranx gallus.*
,, *hippos.*
,, *rotteri.*
,, *sansun.*
Chorinemus moadetta.
,, *toloo.*
Trachynotus ovatus.
Equula brevirostris.
,, *fasciata.*
,, *insidiatrix.*

SCOMBRIDÆ.

- Cybium commersoni.*
Eiacate nigra.

TRACHINIDÆ.

- Sillago sihama.*

BATRACHIDÆ.

- Batrachus grunniens.*

COTTIDÆ.

- Platycephalus insidiator.*

GOBIIDÆ.

- Periophthalmus koelreuteri.*

SPHYRÆNIDÆ.

- Sphyræna jello.*

MUGILIDÆ.

- Mugil carinatus.*
,, *cunnesius.*
,, *kelaartii.*
,, *klunzingeri.*

GLYPHIDODONTIDÆ.

- Pomacentrus sindensis.*

Anacanthini —

PLEURONECTIDÆ.

- Synaptura orientalis.*
Pseudorhombus arsius.
Cynoglossus puncticeps (?).¹
Solea sindensis, sp. nov.
Plagusia obscura, sp. nov.

¹ The specimen is somewhat damaged and has not the markings of *puncticeps*, but the colour has possibly been dissolved out in spirit.

Solea sindensis, sp. nov.

D. 70, V. 4, P. 8, A. 50. L.1. 120.

Length of head 6 times, height of body 2.8 times, in total length, inclusive of caudal fin. Eyes about $\frac{1}{2}$ diameter apart; diameter $4\frac{3}{4}$ times in length of head; lower eye $1\frac{1}{4}$ diameters from end of snout. Nasal opening on coloured side immediately in front of lower eye, not situated on a papilla; that on blind side circular.

Scales ctenoid on both sides of body. Pectoral fin on coloured side with a black blotch on its outer third. Numerous short tentacles on anterior portion of head on blind side.

Colour.—Dark brown on coloured side with dark spots scattered over head, body and fins.

The genus *Solea* has, so far as I am aware, only once been recorded from the north-eastern part of the Arabian Sea. A specimen was obtained by the "Investigator" off the Kattiawar coast at a depth of 82 fathoms. This specimen is referred to a species described as *Solea umbralitis* by Alcock,¹ but is figured in the same paper and also in the *Illustrations of the Zoology of the Investigator*² as *Solea umbratilis*. The first name is so obviously due to a printer's error that one naturally refers to the species as *umbratilis*.

The species described above was obtained from Karachi market and is therefore certainly a shallow water form; it comes nearest to *S. ovata*, whereas *S. umbratilis* is a deep-sea form.

Synopsis of the Indian species of Solea.

- A. Both pectorals present.
 - a. Height of body less than 3 in total length.
 - (1) Height of body $2\frac{3}{4}$ in total length.
D. 70. L.1. 120 *S. sindensis*.
 - (2) Height of body $2\frac{1}{4}$ in total length.
D. 60-66. L.1. 110 *S. ovata*.
 - b. Height of body 3 or more in total length.
 - (1) Long tubular nostril. Body irregularly banded *S. heterorhina*.
 - (2) Short tubular nostril. Body with black blotches *S. elongata*.
- B. Pectoral wanting on left (blind) side .. *S. indica*.
- C. No pectorals.
 - a. Less than 85 rays in dorsal fin.
 - (1) D. 70, A. 50. Numerous large black blotches on coloured side .. *S. umbratilis*.
 - (2) D. 77, A. 54. Coloured side very dark olive. *S. cyanea*.

¹ *Journ. As. Soc. Beng.*, vol. lxiii, pt. 2, 1894, p. 131, pl. vii, fig. 3.² *Fishes*, pl. xv, fig. 4.

b. More than 85 rays in dorsal fin.

D. 98. Complicated ocelli on coloured surface *S. oculus*.

Plagusia obscura, sp. nov.

D. 94, V. 4, A. 80, C. 8. L.1. 112.

Length of head $4\frac{1}{2}$ times, height of body 4 times, in total length, inclusive of the caudal. Eyes, 9 diameters in length of head, one diameter apart. Lips fringed. Nostril on coloured side small, that on blind side tubular and well developed. Two lateral lines on the coloured side separated where widest apart by 16 rows of scales. Scales ctenoid on both sides.

Colour dark brown, much darker than in *C. bilineata*. Each scale lightest in centre.

Length of specimen 15.9 cm.

This species differs from *P. marmorata* in the smaller number of dorsal and anal fin rays and the body coloration, while from *P. bilineata* it is distinguished by the number of scales between the lateral lines on the coloured side and by the proportion of the body height to the length.

Synopsis of the Indian species of Plagusia.

- A. Two lateral lines on coloured side separated by 16 or 17 rows of scales.
 - a. D. 99-106, A. 75-86. Body marbled *P. marmorata*.
 - b. D. 94, A. 80. Body not marbled .. *P. obscura*.
- B. Two lateral lines on coloured side separated by 13 or 14 rows of scales.
 - D. 96-102, A. 70-74. *P. bilineata*.

V.—A LIST OF FISHES FROM LAKE CHILKA, TOGETHER WITH A DESCRIPTION OF A NEW SPECIES OF *Gobius*.

The following list comprises two collections, one made by Mr. Hodgart, Museum collector, in the neighbourhood of Gopkuda Island in August 1907; the other by myself near Satpara in December 1908.

Satpara lies at the landward extremity of the narrow channel which connects Lake Chilka with the sea, whereas Gopkuda is far removed from the entrance.

On the way to the Lake (December 8th, 1908) three specimens of fish were purchased in the bazaar at Balgaon (B. N. Railway). These were identified as—

NOTOPTERIDÆ.

Notopterus kapirot.

GOBIIDÆ.

Gobius striatus.

OPHIOCEPHALIDÆ.

Ophiocephalus striatus.

In the following list of the lake fish the letter G indicates that the fish was caught near Gopkuda Island, while S indicates Satpara.

Elasmobranchii.

CARCHARIIDÆ.

Carcharias melanopterus. S.

MYLIOBATIDÆ.

Aetobatis flagellum. S.**Physostomi.**

SILURIDÆ.

Macrones vittatus. S.*Osteogeniosus militaris.* S.

CYPRINIDÆ.

Barbus amphibius. G.

CLUPEIDÆ.

Clupea lile. G.*Chatoessus nasus.* G. S.*Elops saurus.* G. S.*Engraulis mystax.* G.,, *malabaricus.* S.

SCOMBRESOCIDÆ.

Belone strongylura. S.*Hemirhamphus limbatus.* S.

CYPRINODONTIDÆ.

Haplochilus panchax. G.,, *melanostigma.* G.**Acanthopterygii.**

PERCIDÆ.

Gerres lucidus. S.*Pristipoma hasta.* S.*Therapon jarbua.* S.,, *puta.* S.

SPARIDÆ.

Chrysophrys berda. G. S.,, *sarba.* G. S.

POLYNEMIDÆ.

- Polynemus tetradactylus.* G. S.
 „ *plebeius.* S.

SCIÆNIDÆ.

- Umbrina macroptera.* S
 „ *russellii.* G.
Sciæna albida. G.

CARANGIDÆ.

- Equula blochii.* S.
 „ *edentula.* G. S.
Caranx ire. G.
 „ *djedaba.* S.
Gazza æquiliiformis. S.
Psettus argenteus. S.

TRACHINIDÆ.

- Sillago sihama.* S.

GOBIIDÆ.

- Gobius chilkenis*, sp. nov. G.

MUGILIDÆ.

- Mugil klunzingeri.* S.
 „ *oeur.* G. S.
 „ *olivaceus.* G.
 „ *seheli.* S.

Plectognathi.

SCLERODERMI.

- Triacanthus brevirostris.* G. S.

At Gopkuda purely freshwater species such as *Barbus amphibius*, *Haplochilus panchax* and *H. melanostigma* occur. These are not represented at Satpara.

In March 1909 trawling was carried on on the Bengal Government vessel the "Golden Crown" off the entrance to Lake Chilka in depths of about 27 fathoms on a muddy bottom.

On comparing the fish obtained in these hauls with those from the lake, one finds that there are four species common to the three lists, namely *Chatoessus nasus*, *Chrysophrys berda*, *Equula edentula* and *Triacanthus brevirostris*; while there are five other species found both in the sea off the lake entrance and at Satpara, but not at Gopkuda Island. These are *Umbrina macroptera*, *Caranx djedaba*, *Polynemus plebeius*, *Therapon jarbua* and *Pristipoma hasta*.

It is certainly rather curious that while purely marine forms were obtained together with freshwater species from Gopkuda, typical estuarine types such as *Osteogeniosus militaris* should not have been found there.

Several female specimens of *Haplochilus melanostigma* were obtained which were carrying a mass of eggs attached to the abdomen (see pl. vi, fig. 7). The average number of eggs so attached is from 30 to 36. These are affixed by a number of slender filamentous processes given off from a central ligament which protrudes from the external genital opening. Each egg is about a centimetre in diameter and the shell, which is quite distinct from the egg proper, has on its external surface a number of minute processes (see fig. 7a).

Gobius chilensis, sp. nov. (Pl. vi, fig. 2.)

D. 1-5—1-7, P. 14, V. 1-4, A. 8, C. 28.

Length of head 6 times, of caudal fin $4\frac{1}{5}$ times, height of body $5\frac{1}{4}$ times, in total length. Eye-diameter equal in length to snout and interorbital space and $3\frac{1}{2}$ times in length of head.

Interorbital space slightly concave. Width of head $\frac{3}{4}$ of length, height also $\frac{3}{4}$ of length. Upper jaw the longer, cleft of mouth extending to middle of orbit. No canine teeth. Preopercle minutely serrated.

Spines in first dorsal fin variable. Posterior extension of 2nd dorsal and anal ray very variable, in some instances reaching nearly to origin of caudal. Caudal rounded.

Colour pale yellow, margins of scales black. Dorsal and caudal spotted in bands. Pectoral colourless. Ventral sometimes colourless, sometimes with black rays. Anal colourless, but membrane with minute black spots.

Locality.—Lake Chilka, Gopkuda Island.

This species comes near *G. giuris*, but differs in that the lower jaw does not project and in that the snout is not elongate. The posterior extension of the ventral is also much more marked in *G. giuris*. There are twelve specimens in the collection and their measurement in millimetres from the tip of the snout to the extremity of the tail is respectively 44, 42, 42, 41, 40, 39, 36, 32, 25, 21, 21 and 19.

VI.—SOME FISH FROM UPPER BURMA.

Two collections of Burmese fish have recently been added to the Indian Museum; one was purchased by Dr. Annandale in the market at Mandalay (March 1908), while the other was obtained by Mr. J. Coggin Brown of the Geological Survey of India at Bhamo, Upper Burma, in January 1909. Some of the specimens in the latter collection were obtained from a tank (T), others from the Irrawaddy River (R).

TELEOSTEI.

Physostomi.

SILURIDÆ.

Callichrous pabo. Mandalay.

Macrones cavasius. Mandalay.

Macrones bleekeri var. *burmanicus*. Bhamo (T)
Saccobranchus fossilis. Bhamo (T).

CYPRINIDÆ.

Rohtee belangeri. Mandalay.
Cirrhitina mrigala. Mandalay.
Nuria danrica var. *alta*. Mandalay. Bhamo (R).
Rasbora daniconius. Bhamo (R).
Barbus tetrarupagus. Bhamo (R).

COBITIDINÆ.

Lepadocephalichthys guntea. Mandalay.

CLUPEIDÆ.

Clupea variegata. Mandalay.

NOTOPTERIDÆ.

Notopterus kapirot. Mandalay.

Acanthopterygii.

PERCIDÆ.

Ambassis baculis. Mandalay.
 „ *ranga*. Bhamo (R).

RHYNCHOBDELLIDÆ.

Mastacembelus zebrinus. Mandalay.

OPHIOCEPHALIDÆ.

Ophiocephalus marulius. Mandalay.
 „ *punctatus*. Bhamo (T).

LABYRINTHICI.

Anabas scandens. Bhamo (T).

Of the above *Barbus tetrarupagus* and *Lepadocephalichthys guntea* have not previously been recorded from Burma though their distribution in India is wide.

VII.—THE SPAWNING OF THE HILSA.

During 1909 I was able to examine Hilsa (*Clupea ilisha*) at various places in the province of Bengal. Unfortunately, through circumstances over which I had no control, the investigation into the spawning habits of this fish was suspended at a time when it seemed probable that its spawning grounds would be located. The results of the investigation are appended here for the benefit of anyone who may care to follow up the question.

There can be no doubt whatever that the Hilsa, like the American and European “Shad” (*Clupea sapidissima* and *C. alosa* and *finta*), is an anadromous fish, that is, it ascends the rivers from the sea in order to spawn. The spawning places and habits of the

American Shad (*C. sapidissima*) are now well known¹ and artificial hatching of this fish is extensively practised in the United States. Nothing is known of the details of the spawning of the European Shad (*C. alosa* and *finta*)² or the Indian Hilsa. Recently the ripe eggs of the Hilsa have been obtained in the Madras Presidency by Mr. Wilson of the Madras Fisheries, but so far as one can ascertain they were not obtained on the natural spawning grounds, but at a weir which dammed up the stream and so prevented the upward migration of the fish. The diameter of the eggs is not given.

In Bengal it appears that the Hilsa move up the rivers in the rains and down towards the sea on their return journey from December to February. Spent Hilsa are abundant in Lake Chilka in December. Since they are full of roe in the rains and spent from December to February, it follows they must have deposited their spawn in the rivers.

Adult fish were examined between the middle of June and the 8th October. From the 17th to 21st June specimens were obtained in the Calcutta markets and examined in the Museum. These fish were from Sara Ghat (in the province of Eastern Bengal and Assam). The males even at this period of the year had ripe spermatozoa but no female was obtained either ripe or spent. Eggs from the females were examined in normal salt solution and the diameter of the eggs was found to be 0.5 mm.

Subsequently visits were paid to Sara Ghat, Rajmahal, Khulna, Bagherhat, Monghyr and Kooshtea in the order named and live fish were examined and search made as far as practicable, with a fine-meshed net, along the banks of the river for the fry of the Hilsa.

In the following table the diameter of the eggs, and the condition of the reproductive organs of the males at each of the above-mentioned places is shown:—

Place.	Date.	Average diameter of eggs in mm.	Condition of testes.
Sara Ghat ..	June 25 ..	0.66	..
Rajmahal ..	July 5—7 ..	0.6	Ripe.
Hooghly at Calcutta ..	Aug. 20 ..	0.4	..
Khulna ..	Aug. 23 ..	0.59	..
Bagherhat ..	Aug. 25	Immature.
Monghyr ..	Sep. 22—25 ..	0.68	Ripe.
Kooshtea ..	Oct. 7—8 ..	0.68	Ripe

¹ See J. A. Ryder, *Rep. U. S. Fish Comm.* for 1885, No. 13, pp. 523—533, pls. xiv—xxii, 1887.

² But see P. P. C. Hoek, *Tijdschrift d. Nederlandsche Dierkund. Vereeniging.*, Leiden, 1888, Supplem. deel ii, pp. 313—17, taf. vi, figs. 6—8 (young stages of *C. alosa*), and E. Ehrenbaum, *Wissenschaft. Meeresuntersuch. Anst. Helg.*, Bd. i, S. 54—63, taf. ii, figs. 9—15, 1894. P. P. C. Hoek, *Verlag v. d. staat. d. niederlandische Zeevischerijen* over 1896. Bijlage v. Rapport over het visschen met Ankerkuilen bes. p. 290, ff., pls. ii—iv (young of *C. alosa* and *C. finta*).

A few females purchased in Calcutta on September 14th and alleged to be from Goalundo had eggs of the average diameter of 0.58 mm. At Monghyr a spent female was obtained on September 23rd. In the ovary of this fish were a few large dead eggs which had escaped extrusion in the spawning act. These eggs measured 0.9 mm.¹ (The egg diameter of the American Shad after extrusion is given as $\frac{1}{14}$ of an inch, approximately 1.8 mm.) The egg membrane in all probability expands in contact with water, so the egg of *Clupea ilisha* may approximate in diameter to that of the American Shad.

At Rajmahal a careful search was made along the banks of the Ganges for Hilsa fry but none were obtained. The young of the following species were identified:—*Wallago attu*, *Mugil corsula*, *Pseudeutropius garua* and *Haplochilus melanostigma*.

At Monghyr a quantity of undersized fish was obtained from the market and identified. The following species were present:—*Gobius giuris*, *Engraulis telara*, *Barbus sarana*, *Rohtee cotio*, *Silundia gangetica*, *Ailia coila*, *Wallago attu*, *Macrones cavasius*, *Pangasius buechanani*, *Bagarius yarrellii*, *Macrones aor*, *Sciænoides pama* and *Clupea chapra*. A single specimen of the Hilsa (*Clupea ilisha*) 6 cm. long was obtained. It would appear that the Hilsa spawns in the Ganges somewhere above Monghyr and careful investigation should be carried on during September and October in suitable localities above that place.

VIII.—PARENTAL CARE IN SILURIDÆ.

During the prosecution of the Bengal Government's enquiries into the fishery resources of the Sunderbuns two instances of parental care in Siluridæ were met with. On August 22nd shrimp-trawling was tried in the Culputto River (to the eastward of Kaliganj, District of Khulna), and in one of the hauls a specimen of *Arius jatius* was obtained with the young inside the parent's mouth. On examination, this fish, which turned out to be an adult male, had four young fish thus sheltering.

Subsequently when fishing with drift nets off Fraserganj (to the eastward of Saugor Island) near the sea face, an interesting series of the developing eggs of *Osteogobius militaris* were obtained. These fish, which were also males, were taken on the night of November 12th, and my attention was first drawn to them owing to their ejecting their eggs when liberated from the meshes of the net. Subsequently three individuals were obtained with the eggs *in situ*. These eggs, which are of the size of marbles, showed a series from the first stages of development to those in which the young is well marked off from the yolk. A series has been mounted for exhibition in the public galleries of the Museum.

¹ For an account of the growth of the intraovarian ova and the appearance of the spent ovary in Teleostei see J. T. Cunningham, "On the Histology of the Ovary and of the Ovarian Ova in certain Marine Fishes," *Quart. Journ. Mic. Science*, vol. xl, 1897-98, pp. 101-163, pls. 2-4.



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