

scarcely as broad as the head across the eyes, broader than long, the widest part a little in front of the middle, obliquely narrowed in front, much narrowed behind, with two longitudinal ridges on the disk, which meet in the middle and at the front margin; the sides finely crenulate; strongly and closely punctured, which gives it a dull appearance as compared with the elytra. Elytra at the base broader than the thorax, and about three times as long, considerably broader near the middle, and then narrowed towards the apex, which is about as broad as the base; strongly punctate-striate, the surface rather undulating; there is a strong transverse impression on the disk near the middle. Legs rather long and slender; tibiæ pitchy. Length  $2\frac{3}{4}$  millims.

*Hab.* Cape of Good Hope.

Geographical Distribution of Indian Freshwater Fishes.—  
Part III. Conclusion. By FRANCIS DAY, Esq., F.L.S. &c.

[Read December 5, 1878.]

IN the pages of the Journal of this Society I have given an analysis of the distribution of the Acanthopterygian<sup>1</sup> and Siluroid<sup>2</sup> freshwater fishes of India, Ceylon, and Burma; and I now propose completing my inquiry by examining into what obtains in the families SCOMBRESOCIDÆ, CYPRINODONTIDÆ, CYPRINIDÆ, NOTOPTERIDÆ, and SYMBRANCHIDÆ.

Family SCOMBRESOCIDÆ.

One freshwater form is found amongst the Indian genera.

1. BELONE<sup>3</sup>, *Cuvier*. Tropical and temperate seas; some species inhabiting fresh waters.

Genus BELONE.

1. B. CANCELIA<sup>4</sup>, *Ham. Buch.* Sind, India, Ceylon, and Burma.

<sup>1</sup> Journal Linn. Soc. Zool. vol. xiii. p. 138.

<sup>2</sup> *L. c.* p. 338.

<sup>3</sup> Includes:—*Mastacembelus* (Klein), Bleeker; *Rhamphistoma*, Raff.; *Tylosurus*, Cocco; *Potamorhaphis*, Günther.

<sup>4</sup> Includes *Belone Grayii*, Sykes.



## Family CYPRINODONTIDÆ.

Two genera of this family have representatives in India, as follows:—

1. CYPRINODON<sup>1</sup>, *Lacépède*. This genus is distributed through Southern Europe, North Africa, Syria, Persia, along the shores of the Red Sea, and is also found in Cutch<sup>2</sup>.

2. HAPLOCHILUS<sup>3</sup>, *McClelland*. India to the Malay archipelago and beyond, tropical Africa, Madagascar, and islands of the Indian Ocean. Also temperate and tropical America.

These small fishes as found in India are mostly inhabitants of waters within the influence of tides or along the deltas of large rivers; some, however, reside in streams on hills, as the western Ghauts and Sind hills.

The distribution of the species is as follows:—

## Genus CYPRINODON.

1. C. DISPAR<sup>4</sup>, *Rüppell*. Abyssinia, Palestine, shores of the Red Sea, Cutch.

## Genus HAPLOCHILUS.

1. H. MELASTIGMA<sup>5</sup>, *McClelland*. From the Wynaad on the western coast of India, up the Coromandel coast to Orissa, Lower Bengal, and Burma.

2. H. RUBROSTIGMA<sup>6</sup>, *Jerdon*. Malabar coast of India and southern portions of the Coromandel coast.

<sup>1</sup> Includes:—*Lebias*, Cuvier; *Aphanius*, Nardo; *Micromugil*, Gulia.

<sup>2</sup> In considering Cutch as India, I must remark that it at one time must have been west of the river Indus, which river, as observed by Balfour (*Cyclopædia of India*), "flows through the three parts (districts of Sind), and at some comparatively recent time it has changed its bed; but the old bed still exists under the name of Nara, and its course has been surveyed from the ruins of Alor to the Run of Cutch. From Alor to Jakrao, a distance of 100 miles, its direction is nearly due south. It there divides into several channels, each bearing a separate name. The most easterly channel, which retains the name of Nara, runs to the south-east by Kipra and Umrkot, near which it turns to the south-west by Wanga Bazar and Romaka Bazar, and is there lost in the great Run of Cutch."

<sup>3</sup> Includes:—*Aplocheilus*, *McClelland*; *Panchax*, Cuv. & Val.; *Zygonectes*, Agassiz; *Micristius*, Gill.

<sup>4</sup> Includes:—*Cyprinodon lunatus*, Cuv. & Val.; *C. hammonia*, Richardson; *C. Stoliczkanus*, Day.

<sup>5</sup> Includes:—*Aplocheilus McClellandi*, Bleeker; *Aplocheilus carnaticus*, Jerdon; *Panchax cyanophthalmus*, Blyth; *Haplochilus argenteus*, Day.

<sup>6</sup> Perhaps includes *Aplocheilus affinis*, Jerdon.



3. *H. LINEATUS*<sup>1</sup>, *Cuv. & Val.* Western Ghauts and Malabar coast to Ceylon.

4. *H. PANCHAX*<sup>2</sup>, *Ham. Buch.* Orissa, Lower Bengal, Burma, Siam, Andaman Islands to the Malay archipelago.

Amongst the CYPRINIDÆ we know of thirty-five genera represented in the fresh waters of India, Burma, and Ceylon; of these, twenty-six belong to the true Carps (*Cyprinina*), and nine to the Loaches (*Cobitidina*).

Of the *Cyprinina*, or true Carps, including the *Homalopterina*, we find the following:—

1. *HOMALOPTERA*<sup>3</sup>, *v. Hasselt.* This genus is distributed through some of the hilly districts of the Himalayas, also the western Ghauts and Neilgherries in the Madras Presidency; and examples are likewise found in Java and Sumatra.

2. *PSILORHYNCHUS*, *M'Clelland.* Hill-streams and rivers in Bengal and Assam.

3. *DISCOGNATHUS*<sup>4</sup>, *Heckel.* Rivers, more especially mountain-streams, of Asia and Abyssinia, extending throughout India, Ceylon, and the Tenasserim provinces.

The next and four succeeding genera consist of a division of Carps which are strictly residents of hilly regions of the Himalayas, but some descend to the plains.

4. *OREINUS*, *M'Clelland.* This genus extends from the Helmund river and Jellalabad in Afghanistan, along the Himalayan and contiguous ranges of mountains to at least the confines of China. They only descend a short distance into the rivers of the plains, and are absent from the level plateaux on the summit of those mountains.

5. *SCHIZOPYGOPSIS*, *Steindachner.* Cold regions of the Himalayas about the head-waters of the Indus, Tibet, and Eastern Turkestan, where the rivers are snow-fed. In short, the *Schizothoracina* (if we exclude the Himalayan *Oreinus*) are confined to cold regions, or at least to localities possessing snow-fed rivers, many

<sup>1</sup> Includes *Aplocheilus vittatus*, Jerdon.

<sup>2</sup> Includes:—*Aplocheilus chrysostigmus*, M'Clelland; *Panchax Buchanani* and *Kuhlii*, Cuv. & Val.; *P. melanopterus*, Bleeker.

<sup>3</sup> Includes:—*Balitora*, Gray; *Platycaea*, pt., M'Clelland; *Octonema*, Martens.

<sup>4</sup> Includes:—*Garra*, Hamilton Buchanan; *Platycaea*, pt., M'Clelland; *Discognathichthys* and *Lissorhynchus*, Bleeker; *Mayoa*, Day.



of which rivers terminate in lakes which have no communication with any sea.

6. *SCHIZOTHORAX*, *Heckel*. A Himalayan genus extending to Afghanistan and Turkestan.

7. *PTYCOBARBUS*, *Steindachner*. Himalayas as head-waters of the Indus ; also Tibet and Kashgar.

8. *DIPTYCHUS*, *Steindachner*. Upper Himalayan region, as Nepaul and Tibet to Yarkand.

9. *LABEO*<sup>1</sup>, *Cuvier*. This genus is spread from tropical Africa and Syria throughout the fresh waters of India, Ceylon, and Burma, to the Malay archipelago and beyond.

10. *OSTEOCHILUS*, *Günther*. Burma and the Malay archipelago.

11. *DANGILA*, *Cuvier & Valenciennes*. Burma to the Malay archipelago.

12. *CIRRHINA*<sup>2</sup>, *Cuvier & Valenciennes*. From Beloochistan, Sind, and India, through Burma to the Malay archipelago.

13. *SEMILOTUS*, *Bleeker*. Assam and Chittagong hill-ranges to Burma.

14. *SCAPHIODON*<sup>3</sup>, *Heckel*. This genus is closely allied to the last, but its dorsal fin is of less extent. Rivers of Syria and Western Asia, extending to those of Sind and the Punjab ; also along the western Ghauts as far south as the Neilgherry hills and rivers along their bases.

15. *CATLA*<sup>4</sup>, *Cuvier & Valenciennes*. Sind and the Punjab, N.W. Provinces, the Deccan, throughout Bengal, Assam, Burma, and Siam, but appears to be absent from Southern India below the Kistna river.

16. *THYNNICHTHYS*<sup>5</sup>, *Bleeker*. Throughout the Kistna and Godavery rivers in India from the Deccan to their terminations ; also the Malay archipelago.

<sup>1</sup> *Bangana*, pt., Ham. Buch. ; *Rohita*, pt., Cuv. & Val. ; *Tylognathus*, Heckel ; *Nandina*, Gray ; *Hypselobarbus*, *Diplocheilus*, *Diplocheilichthys*, *Labocheilus*, *Rohitichthys*, *Morulius*, *Schismatorhynchus*, and *Gobionichthys*, Bleeker ; *Gobio-barbus*, Dybowski.

<sup>2</sup> *Bangana*, pt., Ham. Buch. ; *Dangila*, pt., Cuv. & Val. ; *Crossochilus*, pt., Günther.

<sup>3</sup> *Capoëta* (Cuv. & Val.), Günther.

<sup>4</sup> *Gibelion*, Heckel ; *Hypselobarbus*, Bleeker.

<sup>5</sup> *Mola*, pt., Blyth.



17. *AMBLYPHARYNGODON*<sup>1</sup>, *Bleeker*. From Sind, throughout the plains of India, Ceylon, and Burma.

18. *BARBUS*<sup>2</sup>, *Cuv. & Val.* This most extensive genus is found distributed throughout Europe, Asia, and Africa, about seventy species existing in India, Ceylon, and Burma.

19. *NURIA*<sup>3</sup>, *Cuv. & Val.* Continent of India, Ceylon, Burma, and the Nicobars.

20. *RASBORA*<sup>4</sup>, *Bleeker*. Africa, Sind, continent of India, Ceylon, Burma, to the Malay archipelago.

21. *ASPIDOPARIA*<sup>5</sup> (*Heckel*), *Bleeker*. Sind, India (except south of the Kistna), Assam, and Burma.

22. *ROHTEE*<sup>6</sup>, *Sykes*. Sind, continent of India and Burma.

23. *BARILIUS*<sup>7</sup>, *Hamilton Buchanan*. From the Nile and East Africa; also Afghanistan; throughout Sind, India, Ceylon, Assam, and Burma, extending to the Malay archipelago.

24. *DANIO*<sup>8</sup>, *Hamilton Buchanan*. Sind, throughout India, Ceylon, Assam, and Burma.

25. *PERILAMPUS*<sup>9</sup>, *M'Clelland*. Sind, throughout India, Ceylon, Assam, and Burma.

26. *CHELA*<sup>10</sup>, *Hamilton Buchanan*. Sind, throughout India, Assam, and Burma, to the Malay archipelago.

Of the second division of Indian Carps, the *Cobitidina* or Loaches, we have examples of the following genera.

<sup>1</sup> Includes:—*Mola*, Heckel; *Brachygramma*, Day.

<sup>2</sup> Includes:—*Puntius*, pt., Ham. Buch.; *Labeobarbus*, *Varicorhinus*, pt., Rüppell; *Systomus*, pt., M'Clelland; *Capoëta*, sp., Cuv. & Val.; *Pseudobarbus*, Bietz.; *Luciobarbus*, Heckel; *Cheilobarbus*, sp., Smith; *Balantiocheilus*, *Hemibarbus*, *Cyclocheilichthys*, *Siaja*, *Anematichthys*, *Hypselobarbus*, *Gonoproktopterus*, *Gnathopogon*, *Hampala*, sp., Bleeker; *Enteromius*, sp., Cope.

<sup>3</sup> Includes *Esomus*, Swainson.

<sup>4</sup> Includes *Megarashbora*, Günther.

<sup>5</sup> Includes *Morara*, Bleeker.

<sup>6</sup> Includes:—*Osteobrama*, Heckel; *Smiliogaster*, Bleeker.

<sup>7</sup> Includes:—*Opsarius*, sp., M'Clelland; *Pachystomus*, Heckel; *Chedrus*, Swainson; *Schacra*, Bleeker; *Opsaridium*, Peters; *Pteropsarion* and *Bola* (not H. B.), Günther.

<sup>8</sup> Includes:—*Perilampus*, sp., M'Clelland; *Paradanio* and *Devario*, Bleeker.

<sup>9</sup> Includes:—*Chela*, Swainson; *Laubuca*, Bleeker; *Cachius* and *Eustira*, Günther.

<sup>10</sup> Includes:—*Oxygaster*, v. Hass.; *Salmophasia*, Swainson; *Macrochirichthys* and *Paralaubuca*, Bleeker.



27. *BOTIA*<sup>1</sup>, *Gray*. Sind hills, delta of the Ganges, the Himalayas, Assam, Burma to the Malay archipelago.

28. *ACANTHOPSIS*<sup>2</sup>, *v. Hasselt*. Burma to the Malay archipelago.

29. *SOMILEPTES* (*Swainson*), *Bleeker*. From Orissa and Bengal to Assam.

30. *LEPIDOCEPHALICHTHYS*<sup>3</sup>, *Bleeker*. India, Ceylon, and Burma, to the Malay archipelago.

31. *ACANTHOPHTHALMUS*<sup>4</sup>, *v. Hasselt*. North-east Bengal, Assam, and Burma.

32. *APUA*, *Blyth*. Pegu in British Burma.

33. *JERDONIA*, *Day*. Madras.

34. *NEMACHEILICHTHYS*, *Day*. Deccan.

35. *NEMACHEILUS*<sup>5</sup>, *v. Hasselt*. Europe, Western Asia, Turkestan, throughout India, Assam, Ceylon, and Burma, to the Malay archipelago. It is remarkable that those from the upper parts of the Himalayas and Western Turkestan are destitute of scales.

Examining the foregoing genera composing the Carps of India, we find 14 reach the Malay archipelago, 5 Africa, 4 of which are identical with genera extending to the Malay archipelago; while 5 are restricted to the colder regions of the Himalayas, extending to Turkestan.

I will now follow out the distribution of each species which are included in the foregoing genera.

### Subfamily CYPRININA.

#### Genus HOMALOPTERA.

1. *H. BRUCEI*<sup>6</sup>, *Gray*. Himalayas from round Darjeeling through Boutan, Assam, and the Khasia hills: also the Wynaad and Bowany rivers in Madras.

<sup>1</sup> Includes:—*Hymenophysa* and *Schistura*, M'Clelland; *Diacanthus*, Swainson; *Syncrossus*, Blyth.

<sup>2</sup> Includes *Prostheacanthus*, Blyth.

<sup>3</sup> Includes:—*Platacanthus*, Day; *Misgurnus*, sp., Günther.

<sup>4</sup> Includes *Pangio*, Blyth.

<sup>5</sup> Includes:—*Acoura* and *Acourus*, Swainson; *Acanthocobitis*, Peters; *Oreias*, Sauvage; *Diplophysa*, Kessler.

<sup>6</sup> Includes *Platycara australis*, Jerdon.



2. *H. MACULATA*<sup>1</sup>, *Gray*. Himalayas, also the Wynaad and Bowany rivers in Madras.

3. *H. BILINEATA*<sup>2</sup>, *Blyth*. Tenasserim Provinces.

#### Genus PSILORHYNCHUS.

1. *P. BALITORA*<sup>3</sup>, *Ham. Buch.* Hill-streams and rapids in Northern Bengal and Assam.

#### Genus DISCOGNATHUS.

1. *D. LAMTA*<sup>4</sup>, *Ham. Buch.* From Syria throughout India and Ceylon to the Tenasserim Provinces; also Aden and Abyssinia.

2. *D. JERDONI*, *Day*. Wynaad and Neilgherry hill-streams and rivers at their bases.

3. *D. MODESTUS*, *Day*. Probably Northern India or Assam.

#### Genus OREINUS.

1. *O. SINUATUS*<sup>5</sup>, *Heckel*. From Afghanistan along the Himalayas.

2. *O. RICHARDSONII*<sup>6</sup>, *Gray*. Himalayas.

3. *O. PLAGIOSTOMUS*<sup>7</sup>, *Heckel*. Himalayas.

#### Genus SCHIZOPYGOPSIS.

1. *S. STOLICZKÆ*, *Steindachner*. Himalayas to the Yarkand and Oxus rivers.

#### Genus SCHIZOTHORAX.

1. *S. PROGASTUS*<sup>8</sup>, *M'Clelland*. Himalayas.

2. *S. ESOCINUS*, *Heckel*. Himalayas.

<sup>1</sup> Includes *Platycaea anisura*, M'Clelland.

<sup>2</sup> Perhaps identical with *Cyprinus sucatio*, Ham. Buch., from rivers of Northern Bengal.

<sup>3</sup> Includes *Psilorhynchus variegatus*, M'Clelland.

<sup>4</sup> Includes:—*Cyprinus gotyla*, Gray; *Gonorhynchus rupeculus*, *bimaculatus*, *brachypterus*, and *caudatus*, M'Clelland; *Chondrostoma mullya*, Sykes; *Platycaea nasuta*, and ? *lissorhynchus*, M'Clelland; *Discognathus rufus*, *obtusus*, *crenulatus*, and *fusiformis*, Heckel; *Platycaea notata*, Blyth; *Gonorhynchus M'Clellandi* and *stenorhynchus*, Jerdon; *Garra ceylonensis*, Bleeker; *G. malabarica* and *alta*, Day; *Discognathus macrochir*, Günther.

<sup>5</sup> Includes *Oreinus maculatus*, M'Clelland.

<sup>6</sup> Includes:—*Oreinus guttatus* and *Gonorhynchus petrophilus*, M'Clelland; *Oreinus maculatus*, Günther.

<sup>7</sup> Includes *Capoëta micracanthus*, Günther.

<sup>8</sup> Includes *Oreinus Hodgsonii*, Günther.



## Genus PTYCOBARBUS.

1. *P. CONIROSTRIS*, *Steindachner*. Himalayas.

## Genus DIPTYCHUS.

1. *D. MACULATUS*<sup>1</sup>, *Steindachner*. Himalayas and affluents of Yarkand river.

## Genus LABEO.

1. *L. NANDINA*<sup>2</sup>, *Ham. Buch.* Bengal, Assam, and Burma.
2. *L. FIMBRIATUS*<sup>3</sup>, *Bloch.* Sind, Punjab, Deccan, N.E. Bengal, Orissa to Southern India, but not Malabar.
3. *L. NIGRESCENS*, *Day.* Malabar coast.
4. *L. CALBASU*<sup>4</sup>, *Ham. Buch.* Throughout Sind, the Punjab, India, and Burma.
5. *L. STOLICZKÆ*<sup>5</sup>, *Steindachner.* Irrawaddi and Salween rivers in Burma.
6. *L. GONIUS*<sup>6</sup>, *Ham. Buch.* Sind, and from the Punjab, throughout India (except south of the river Kistna), Assam, and Burma.
7. *L. DUSSUMIERI*<sup>7</sup>, *Cuv. & Val.* Rivers along the western coast of India and Ceylon.
8. *L. ROHITA*<sup>8</sup>, *Ham. Buch.* From Sind and the Punjab throughout India (except south of the Kistna and the Malabar coast), Assam and Burma.
9. *L. PORCELLUS*, *Heckel.* Poona and Bombay.
10. *L. POTAIL*, *Sykes.* Deccan.
11. *L. KONTIUS*<sup>9</sup>, *Jerdon.* Southern India.
12. *L. CÆRULEUS*, *Day.* River at base of Beloochistan hills in Sind.

<sup>1</sup> Includes ? *D. Sewerzowi*, Kessler.

<sup>2</sup> Includes *Cirrhinus macronotus*, M'Clelland.

<sup>3</sup> Includes :—*Cyprinus nancar*, Ham. Buch. ; *Rohita Leschenaultii*, Cuv. & Val. ; *Varicorhinus bobree*, Sykes.

<sup>4</sup> Includes :—*Cirrhina micropogon*, Val. ; *Rohita Belangeri* and *Reynauldi*, Cuv. & Val. ; *Labeo velatus*, Val. ; *Cirrhinus affinis*, Jerdon.

<sup>5</sup> Perhaps identical with *Labeo Reynauldi*, Cuv. & Val.

<sup>6</sup> Includes :—*Cyprinus curchius*, *cursa*, and *cursis*, Ham. Buch. ; *Labeo microlepidotus*, Cuv. & Val.

<sup>7</sup> Includes *Rohita Rouxii*, Cuv. & Val.

<sup>8</sup> Includes :—*Rohita Buchanani* and *Duvaucelii*, also *Labeo fimbriatus* and *Dussumieri*, Cuv. & Val.

<sup>9</sup> Includes *Cirrhinus rubro-punctatus*, Jerdon.



13. *L. DIPLOSTOMUS*<sup>1</sup>, *Heckel*. Along the hills of Sind and the Himalayas, including the rivers at their bases.

14. *L. DYOCHEILUS*<sup>2</sup>, *M'Clelland*. Sind hills, Himalayas to Assam.

15. *L. PANGUSIA*, *Ham. Buch.* Sind, the Himalayas, delta of the Ganges, Deccan, Cachar, and Assam.

16. *L. ANGRA*<sup>3</sup>, *Ham. Buch.* Orissa, Bengal, and Assam.

17. *L. BATA*<sup>4</sup>, *Ham. Buch.* Lower Bengal and Assam, extending as far south as the river Kistna.

18. *L. MICROPTHALMUS*<sup>5</sup>, *Day*. Himalayas.

19. *L. BOGGUT*<sup>6</sup>, *Sykes*. From the Punjab throughout India (except Sind, the western coast, and Assam).

20. *L. BOGA*<sup>7</sup>, *Ham. Buch.* Rivers of Gangetic Provinces, Madras, and Burma.

21. *L. NUKTA*, *Sykes*. The Deccan.

22. *L. NIGRIPINNIS*, *Day*. Sind hills and rivers along their bases.

23. *L. SINDENSIS*, *Day*. Sind, the Punjab, and the Deccan.

24. *L. ARIZA*<sup>8</sup>, *Ham. Buch.* Western Ghauts of Madras and rivers near their bases.

25. *L. KAWRUS*, *Sykes*. Deccan.

The foregoing 25 species are thus distributed:—3 Sind and Himalayas, one of which species extends to Assam; 2 Sind; 1 Sind, Punjab, and Deccan; 1 Sind, India (except the south), and Assam; 1 Sind and India, except Malabar; 2 Sind, India (except Malabar), and Burma; 1 delta of Ganges; 2 Lower Bengal, Orissa, and Assam; 1 delta of Ganges and Brahmapootra to

<sup>1</sup> Includes:—(? *Cyprinus dero*, *Ham. Buch.*); *Cyprinus falcata*, *Gray*; *Gobio malacostomus* and *ricnorhynchus*, *M'Clelland*; *Tylognathus Valenciennesii*, *Heckel*.

<sup>2</sup> Includes:—(? *Gobio bicolor*, *M'Clelland*); *Labeo falcatus*, *Günther*.

<sup>3</sup> Includes:—(? *Cyprinus morala*, *pausius*, and *musiha*, *Ham. Buch.*); *Cyprinus Hamiltonii*, *Gray*; *Gobio boga*, *Bleeker*.

<sup>4</sup> Includes:—*Cyprinus acra* and *cura*, *Ham. Buch.*; *Gobio lissorhynchus* and *anisurus*, *M'Clelland*.

<sup>5</sup> Includes *Labeo diplostomus*, *Beavan*.

<sup>6</sup> Includes *Tylognathus striolatus*, *Günther*.

<sup>7</sup> Includes:—? *Cyprinus falcatus*, *Bloch*, and *Chondrostoma semivelatus*, *Cuv. & Val.*

<sup>8</sup> Includes *Gobio Hamiltonii* and *Bovianus*, *Jerdon*.



Burma; 1 delta of Ganges, Madras, and Burma; 1 Burma; 4 Deccan and Bombay; 2 Malabar and western Ghauts; 1 Malabar and Ceylon; 1 South India; 1 Burma.

#### Genus OSTEOCHILUS.

1. *O. CHALYBEATUS*<sup>1</sup>, *Cuv. & Val.* Burma.
2. *O. NEILLI*, *Day.* Burma.
3. *O. CEPHALUS*, *Cuv. & Val.* Pegu in Burma.

#### Genus DANGILA.

1. *D. BURMANICA*, *Day.* Moulmein and Tavoy.
2. *D. BERDMOREI*, *Blyth.* Tenasserim Provinces.

#### Genus CIRRHINA.

1. *C. CIRRHOSA*<sup>2</sup>, *Bloch.* From the Godavery and Kistna, throughout Southern India.
2. *C. MRIGALA*<sup>3</sup>, *Ham. Buch.* Sind and the Punjab, throughout India, except its southern portion, also Burma.
3. *C. LATIA*<sup>4</sup>, *Ham. Buch.* Sind and the Punjab, throughout India, except its southern portion, also along the Himalayas.
4. *C. REBA*<sup>5</sup>, *Ham. Buch.* Throughout India and Assam.
5. *C. FULUNGEE*, *Sykes.* Deccan.

#### Genus SEMIPLLOTUS.

1. *S. MODESTUS*, *Day.* Hill-ranges above Akyab.
2. *S. MACCLELLANDI*, *Bleeker.* Rivers in Assam as low as Goalpara; also found in Burma.

<sup>1</sup> Includes *Rohita lineata*, *Cuv. & Val.*

<sup>2</sup> Includes:—*Dangila Leschenaultii* and *Cirrhina Blochii*, *Cuv. & Val.*; *Cirrhinus Cuvierii*, *Jerdon*; *Cirrhina macrops*, *Steindachner*.

<sup>3</sup> Includes:—*Cirrhina rubripinnis* and *plumbea*, *Cuv. & Val.*; *Mrigala Buchananii*, *Bleeker*.

<sup>4</sup> Includes:—*Cyprinus gohama* (and ? *C. sada*), *Ham. Buch.*; *Barbus diplochilus* and *Tylognathus barbatulus*, *Heckel*; *Gonorhynchus fimbriatus*, *macrosumus* and *brevis*, *M'Clelland*; *Chondrostoma wattanah*, *Sykes*; *Crossochilus rostratus*, *Günther*.

<sup>5</sup> Includes:—*Gobio isurus* and *limnophilus*, *M'Clelland*; *Chondrostoma gangeticum* and *Cirrhina Dussumieri*, *Cuv. & Val.*; *Cirrhina bengalensis*, *Bleeker*; *Cirrhina rewah*, *Steindachner*.



## Genus SCAPHIODON.

1. *S. WATSONI*, Day. Sind hills and the Punjab.
2. *S. IRREGULARIS*, Day. Sind hills.
3. *S. THOMASSI*, Day. South Canara.
4. *S. NASHII*, Day. Coorg, South Canara and the Wynaad.
5. *S. BREVIDORSALIS*, Day. Rivers at base of Neilgherry hills.

Of the foregoing 5 species, 1 is restricted to Sind, 1 to Sind and the Punjab, 1 to South Canara, 1 to the western Ghauts, and 1 to the rivers at the base of the Neilgherry hills.

## Genus CATLA.

1. *C. BUCHANANI*<sup>1</sup>, Cuv. & Val. Sind, the Punjab, India except its southern portion, Assam, Burma, and Siam.

## Genus THYNNICHTHYS.

1. *T. SANDKHOL*<sup>2</sup>, Sykes. Godavery and Kistna rivers and adjacent pieces of water.

## Genus AMBLYPHARYNGODON.

1. *A. ATKINSONII*<sup>3</sup>, Blyth. Burma.
2. *A. MOLA*<sup>4</sup>, Ham. Buch. From Sind, throughout India (except the Malabar coast), Assam, and Burma.
3. *A. MICROLEPIS*<sup>5</sup>, Bleeker. From the Hooghly through Orissa, and down the Coromandel coast as far south as Madras.
4. *A. MELETTINUS*<sup>6</sup>, Cuv. & Val. Malabar coast and Southern India to Madras; also Ceylon.

Of the foregoing 4 species, 1 extends from Sind throughout India (except the Malabar coast) to Assam and Burma; 1 from Lower Bengal down the Coromandel coast to Madras; 1 the Malabar coast, Ceylon, and up the Coromandel coast to Madras; 1 Burma. Thus every portion of the plains of India and Burma

<sup>1</sup> Includes *Cyprinus abramioides*, Sykes.

<sup>2</sup> Includes *Thynnichthys cochiniensis*, Günther.

<sup>3</sup> Includes probably *Leuciscus harengula*, Cuv. & Val.

<sup>4</sup> Includes :—(? *Leuciscus chitul*, Sykes); *Mola Buchanani*, Blyth; (? *Rhodeus macrocephalus*, Jerdon).

<sup>5</sup> Includes :—(*Leuciscus pellucidus*, McClelland); *Amblypharyngodon pellucidus*, Günther.

<sup>6</sup> Includes :—*Rhodeus indicus*, Jerdon; *Amblypharyngodon Jerdoni*, Day.



is seen to possess one or other species of this genus. At several points of junction we perceive two forms which are as distinct from one another as they are when at their greatest distance apart.

### Genus BARBUS.

#### (a) *With 4 barbels.* (BARBODES.)

1. *B. CHAGUNIO*<sup>1</sup>, *Ham. Buch.* From the Punjab, through the Gangetic valley to Lower Bengal and Orissa, also Assam.
2. *B. CLAVATUS*, *M'Clelland.* Base of Himalayas, near Sikhim.
3. *B. SARANA*<sup>2</sup>, *Ham. Buch.* Throughout the plains of Sind, India, Assam, and Burma.
4. *B. CHRYSOPOMA*<sup>3</sup>, *Cuv. & Val.* Throughout the plains of Cutch and India; also from the Himalayas, near Darjeeling.
5. *B. PINNAURATUS*<sup>4</sup>, *Day.* Western coast of India to Ceylon and up the Coromandel coast certainly as high as Coconada.
6. *B. PLEUROTÆNIA*, *Bleeker.* Ceylon.
7. *B. GONIOSOMA*, *Bleeker.* Mergui and Sumatra.
8. *B. ROSEIPINNIS*, *Cuv. & Val.* Pondicherry.
9. *B. DUBIUS*, *Day.* Bowany River, at base of Neilgherry hills.
10. *B. MICROPOGON*<sup>5</sup>, *Cuv. & Val.* Malabar coast and western Ghauts, also Mysore.
11. *B. CHILINOIDES*<sup>6</sup>, *M'Clelland.* Himalayas, extending as far east as Assam, and descending into the Ganges.
12. *B. CARNATICUS*, *Jerdon.* Rivers along the bases of the western Ghauts and Neilgherry hills.
13. *B. HEXAGONOLEPIS*, *M'Clelland.* Assam.
14. *B. DUKAI*, *Day.* Teesta River, Darjeeling.

<sup>1</sup> Includes:—*Barbus spilopholus* and *sarana* (not H. B.), M'Clelland; *Barbus Beavani*, Günther.

<sup>2</sup> Includes:—*Cyprinus kunnamoo*, *kakoo*, and *kadoon*, Russell; *Barbus deliciosus*, *Systemus immaculatus* and *chrysostomus*, M'Clelland; *B. gardinodes* and *Duvaucelli*, *Cyprinus M'Clellandi*, Cuv. & Val.; *Barbus caudimarginatus*, Blyth; *B. Russellii*, Günther.

<sup>3</sup> Probably identical with *Barbus Polydori*, Bleeker.

<sup>4</sup> Includes:—(? *Barbus nasutus* and *subnasutus*, Cuv. & Val.); *Puntius chrysopoma* (not C. & V.), Bleeker; *Barbus spilurus*, Günther.

<sup>5</sup> Includes *Barbus gracilis* and *mysorensis*, Jerdon; *B. conirostris*, Günther.

<sup>6</sup> Includes:—*Labeobarbus mosal* (not H. B.), Steindachner; *Barbus micropogon* (not C. & V.), Günther; *B. himalayanus*, Day.



15. *B. TOR*<sup>1</sup>, *Ham. Buch.* Throughout Sind, India, and Assam, but most abundant and largest in size near mountain-streams.

16. *B. HEXASTICHUS*, *M'Clelland.* Rivers on and around the Himalayas.

17. *B. BOVANICUS*, *Day.* Bowany River, at base of Neilgherry hills.

18. *B. SOPHORE*, *Ham. Buch.* Assam and Khasia hills.

19. *B. STRACHEYI*, *Day.* Akyab and Moulmein.

20. *B. CURMUCA*<sup>2</sup>, *Ham. Buch.* Western Ghauts of India.

21. *B. LITHOPIDOS*, *Day.* South Canara.

22. *B. THOMASSI*, *Day.* South Canara.

23. *B. SPINULOSUS*, *M'Clelland.* Sikhim.

24. *B. PULCHELLUS*, *Day.* South Canara.

25. *B. DOBSONI*, *Day.* Deccan.

26. *B. JERDONI*, *Day.* South Canara.

27. *B. WYNAADENSIS*, *Day.* Wynaad.

28. *B. STEPHENSONII*, *Day.* Hills near Akyab.

29. *B. NEILLI*<sup>3</sup>, *Day.* Tamboodra river at Kurnool.

30. *B. MALABARICUS*, *Jerdon.* Western Ghauts of India, extending as far south as Courtallum.

31. *B. INNOMINATUS*<sup>4</sup>, *Day.* Ceylon.

32. *B. COMPRESSUS*, *Day.* Cashmere?

33. *B. BLYTHII*<sup>5</sup>, *Day.* Tenasserim.

34. *B. MELANAMPYX*<sup>6</sup>, *Day.* From the Wynaad down the western Ghauts of India and rivers along their bases.

(b) *With 2 barbels.* (CAPOËTA.)

35. *B. MACROLEPIDOTUS*, *Cuv. & Val.* Tavoy to the Malay archipelago.

<sup>1</sup> Includes:—*Cyprinus mosal* and (? *putitora*), *Ham. Buch.*; *Labeobarbus microlepis*, *Heckel*; *Barbus progeneius*, *megalepis*, and *macrocephalus*, *M'Clelland*; *B. mussulah*, *Sykes*; *B. Hamiltonii*, *Jerdon*.

<sup>2</sup> Includes *Gobio canarensis*, *Jerdon*.

<sup>3</sup> Perhaps includes *Barbus khudree*, *Sykes*.

<sup>4</sup> Includes *Leuciscus binotatus*, *Blyth* (not *K. & v. Hass.*).

<sup>5</sup> Includes *Capoëta macrolepidota*, *Blyth* (not *C. & V.*).

<sup>6</sup> Includes:—*Cirrhinus fasciatus*, *Jerdon* (not *Bleeker*); *Barbus Grayi*, *Day*; *B. arulius*, *Günther* (not *Jerdon*).



36. *B. CHOLA*<sup>1</sup>, *Ham. Buch.* Throughout India, Assam, and Burma, as far as Mergui.
37. *B. PARRAH*, *Day.* Malabar, Mysore, and Madras.
38. *B. BURMANICUS*, *Day.* Mergui in Burma.
39. *B. TETRARUPUGUS*<sup>2</sup>, *M'Clelland.* Sind, India (except south of the Kistna), and Assam.
40. *B. DORSALIS*<sup>3</sup>, *Jerdon.* Southern India south of the Deccan and Ceylon.
41. *B. KOLUS*<sup>4</sup>, *Sykes.* Central provinces, Deccan, and throughout the Kistna, Tamboodra, and Godavery rivers.
42. *B. DENISONII*, *Day.* Travancore hill-ranges.
43. *B. MELANOSTIGMA*<sup>5</sup>, *Day.* Wynaad and Neilgherry hills, and rivers at their bases.
44. *B. ARENATUS*, *Day.* Madras.
45. *B. PUCKELLI*, *Day.* Mysore.
46. *B. AMPHIBIUS*<sup>6</sup>, *Cuv. & Val.* Central India and the Deccan ; the Western coast of India from Bombay to Cape Comorin and up the Eastern so far as Orissa.
47. *B. ARULIUS*<sup>7</sup>, *Jerdon.* Wynaad and Neilgherry hills and western Ghauts as far south as Travancore ; also rivers along their bases.
48. *B. MAHECOLA*<sup>8</sup>, *Cuv. & Val.* From Canara down the western coast, also Ceylon ; likewise along the lower part of the Coromandel coast.

(c) *Without barbels.* (PUNTIUS.)

49. *B. APOGON*<sup>9</sup>, *Cuv. & Val.* Burma to the Malay archipelago.

<sup>1</sup> Includes:—*Systomus immaculatus*, Blyth ; *Puntius perlee*, Day ; *Barbus liacanthus*, pt., *sophoroides*, and *thermalis* (not C. & V.), Günther.

<sup>2</sup> Probably includes *Cyprinus titius* and *tictis*, Ham. Buch.

<sup>3</sup> Includes:—(? *Systomus tristis*, Jerdon) ; *Barbus tetraspilus* and *Layardi*, Günther.

<sup>4</sup> Includes *Barbus Guentheri*, Day.

<sup>5</sup> Includes *Systomus carnaticus*, Jerdon.

<sup>6</sup> Includes *Puntius Hamiltonii*, Day.

<sup>7</sup> Includes *Systomus rubrotinctus*, Jerdon.

<sup>8</sup> Includes *Barbus filamentosus*, Günther (not C. & V.).

<sup>9</sup> Includes:—*Systomus apogonoides*, Bleeker ; *S. macularius*, Blyth.



50. *B. AMBASSIS*, *Day*. Assam, Lower Bengal, along the Coromandel coast to Madras.

51. *B. CONCHONIUS*<sup>1</sup>, *Ham. Buch.* Punjab, the Deccan, deltas of the Ganges and Brahmapootra.

52. *B. TICTO*<sup>2</sup>, *Ham. Buch.* Sind, and throughout India and Ceylon.

53. *B. STOLICZKANUS*<sup>3</sup>, *Day*. Eastern Burma.

54. *B. PUNCTATUS*<sup>4</sup>, *Day*. Malabar and Coromandel coast.

55. *B. GELIUS*<sup>5</sup>, *Ham. Buch.* Ganjam, Orissa, Lower Bengal, and Assam.

56. *B. PHUTUNIO*<sup>6</sup>, *Ham. Buch.* Ganjam, Orissa, Bengal, and Burma.

57. *B. CUMINGII*<sup>7</sup>, *Günther*. Ceylon.

58. *B. NIGROFASCIATUS*, *Günther*. Southern Ceylon.

59. *B. GUGANIO*, *Ham. Buch.* Gangetic provinces and Assam.

60. *B. STIGMA*<sup>8</sup>, *Cuv. & Val.* Sind, throughout India, Assam, and Burma.

61. *B. CHRYSOPTERUS*, *M'Clelland*. Sind, delta of Ganges, Assam.

62. *B. THERMALIS*, *Cuv. & Val.* Ceylon.

63. *B. TERIO*<sup>9</sup>, *Ham. Buch.* Delta of the Ganges from the Punjab to Lower Bengal, also Orissa.

64. *B. PUNJAUBENSIS*, *Day*. Punjab and Sind.

65. *B. UNIMACULATUS*, *Blyth*. Burma.

66. *B. WAAGENI*, *Day*. Punjab.

67. *B. COSUATIS*<sup>10</sup>, *Ham. Buch.* Delta of the Ganges, Central India, the Deccan, and from Bombay down the western coast to Cottayam.

<sup>1</sup> Includes *Systemus pyrrhopterus*, M'Clelland.

<sup>2</sup> Includes *Systemus tripunctatus*, Jerdon.

<sup>3</sup> Includes *Barbus M'Clellandi*, Day (not Cuv. & Val.).

<sup>4</sup> Includes *Systemus conchoni*, Jerdon (not H. B.).

<sup>5</sup> Includes *Cyprinus canius*, Ham. Buch.

<sup>6</sup> Includes *Systemus leptosomus*, M'Clelland.

<sup>7</sup> Includes *Puntius phutunio*, Bleeker (not H. B.).

<sup>8</sup> Includes :—*Cyprinus sophore*, pt., Ham. Buch. ; *Systemus sophore*, M'Clelland ; *Leuciscus Duvaucelii* and *sulphureus*, Cuv. & Val. ; *Puntius modestus*, Kner.

<sup>9</sup> Includes *Systemus gibbosus*, M'Clelland.

<sup>10</sup> Includes :—*Systemus malacopterus*, M'Clelland ; *Rohtee pangut*, Sykes.



68. *B. VITTATUS*<sup>1</sup>, *Day*. Cutch, Southern India, Malabar coast, and Ceylon.

69. *B. FILAMENTOSUS*<sup>2</sup>, *Cuv. & Val.* Canara, Malabar coast, and Southern India.

70. *B. PUNTIO*, *Ham. Buch.* Bengal and British Burma.

Amongst the foregoing 70 species of *Barbus*, we find 6 restricted to the Himalayas and rivers near their bases; 10 to the Gangetic delta and Assam, or Orissa, some likewise being found in Sind; 2 restricted to Sind and the Punjab; 2 to Assam; 5 extend from Bengal, or Assam to Burma; 6 local to Burma; 3 Burma and the Malay archipelago; 2 throughout India; 1 from Central to South India; 1 Lower Bengal down the Coromandel coast to Madras; 3 Deccan; 6 Mysore and Southern India; 11 Western coast and Ghauts; 4 Western coast and South India; 3 Western coast, South India, and Ceylon; 5 Ceylon. Thus we find 2 species generally distributed; 25 found in the deltas of the Indus, Ganges, or Brahmaputra, of which 5 extend to Burma; 9 more are found in Burma; 1 species from Bengal to Madras; 10 from Central and Southern India; 18 from the Western coast, some of which are likewise found in Southern India and 3 in Ceylon, whilst 5 are peculiar to that island. Out of 14 of the above species found in Burma, 3 (none of which are found in India) extend to the Malay archipelago.

#### Genus NURIA.

1. *N. DANRICA*<sup>3</sup>, *Ham. Buch.* India, Ceylon, Burma, and the Nicobars.

#### Genus RASBORA.

1. *R. ELANGA*<sup>4</sup>, *Ham. Buch.* Gangetic delta, Assam, and Burma.

2. *R. DANICONIUS*<sup>5</sup>, *Bleeker.* West coast of Africa, continent of India, Ceylon to the Malay archipelago.

3. *R. BUCHANANI*<sup>6</sup>, *Bleeker.* Continent of India, Assam, and Burma to Pinang.

<sup>1</sup> Includes *Puntius sophore*, Kner.

<sup>2</sup> Includes *Systemus assimilis* and *madraspatensis*, Jerdon.

<sup>3</sup> Includes:—*Cyprinus sutiha* and *jogia*, *Ham. Buch.*; *Perilampus recurvirostris*, *macrurus* and *thermophilus*, *M'Clelland*; *Esomus vittatus*, *Swainson*; *Nuria alta*, *Blyth*; *Esomus malabaricus* and *madraspatensis*, *Day*.

<sup>4</sup> Includes *Leuciscus dystomus*, *M'Clelland*.

<sup>5</sup> Includes:—*Cyprinus anjana*, *Ham. Buch.*; *Leuciscus rasbora* and *lateralis*, *M'Clelland*; *L. dandia*, *Cuv. & Val.*; *L. malabaricus*, *Caverii*, and *flavus*, *Jerdon*; *Rasbora woolaree* and *neilgherriensis*, *Day*.

<sup>6</sup> Includes:—*Cyprinus rasbora*, *Ham. Buch.*; *Leuciscus presbyter*, *Cuv. & Val.*; *L. xanthogramme* and *microcephalus*, *Jerdon*.



In the 3 species of this genus, we find 1 extends from the Gangetic delta to Assam and Burma; 1 from Africa, through India and Ceylon, to the Malay archipelago; 1 throughout India to Pinang. The last two with such a wide distribution are subject to considerable local variation; the first, with a less extended range, is less variable.

#### Genus ASPIDOPARIA.

1. *A. MORAR*<sup>1</sup>, *Ham. Buch.* Sind, India, except the western coast and its southern portion (south of the Kistna), Assam, and Burma.

2. *A. JAYA*<sup>2</sup>, *Ham. Buch.* Gangetic delta and Assam.

The two species forming this genus are not found along the western coast or Southern India; one extends to Burma.

#### Genus ROHTEE.

1. *R. BAKERI*, *Day.* Travancore.

2. *R. NEILLI*, *Day.* Bowany River, at base of Neilgherry hills.

3. *R. COTIO*<sup>3</sup>, *Ham. Buch.* Sind, throughout India (except the western coast and south of the Kistna), Assam, Burma.

4. *R. VIGORSII*<sup>4</sup>, *Sykes.* Deccan, Kistna and Godavery rivers.

5. *R. BELANGERI*<sup>5</sup>, *Cuv. & Val.* Godavery river and Burma.

6. *R. OGILBII*, *Sykes.* Deccan, Kistna and Godavery rivers.

Of the foregoing 6 species, 2 are restricted to the south portion of the western Ghauts; 2 to the Deccan and rivers going from thence to the Coromandel coast; 1 the Godavery River and Burma; 1 throughout India (except its southern portion), Assam, and Burma.

#### Genus BARILIUS.

1. *B. VAGRA*<sup>6</sup>, *Ham. Buch.* Deltas of Indus, Ganges, and Brahmaputra; also rivers on the hills in their vicinity.

<sup>1</sup> Includes *Aspidoparia sardina*, Heckel.

<sup>2</sup> Includes *Leuciscus margarodes*, M'Clelland.

<sup>3</sup> Includes:—*Abramis cotis*, M'Clelland; *A. gangeticus*, Swainson; *Leuciscus Duvaucelii* and *Alfredianus*, Cuv. & Val.

<sup>4</sup> Includes *Osteobrama rapax* and *cotio*, Günther.

<sup>5</sup> Includes *Systomus microlepis*, Blyth.

<sup>6</sup> Includes:—*Opsarius isocheilus*, and (? *piscatorius*), M'Clelland; *Barilius alburnus*, Günther; *B. Bleekeri*, Day.



2. *B. MODESTUS*<sup>1</sup>, *Day*. River Indus and its tributaries.
3. *B. RADIOLATUS*, *Günther*. Central India.
4. *B. SCHACRA*<sup>2</sup>, *Ham. Buch*. Gangetic delta and Assam.
5. *B. BENDELISIS*<sup>3</sup>, *Ham. Buch*. India, both in the hills and plains (except Sind and the Malabar coast), also Ceylon.
6. *B. BARILA*<sup>4</sup>, *Ham. Buch*. Gangetic delta, Central Provinces, Orissa, and Lower Assam.
7. *B. BAKERI*, *Day*. Travancore hills.
8. *B. GATENSIS*<sup>5</sup>, *Cuv. & Val*. Western Ghauts and Neilgherry hills.
9. *B. CANARENSIS*<sup>6</sup>, *Jerdon*. Western coast.
10. *B. BARNA*<sup>7</sup>, *Ham. Buch*. Deltas of Ganges and Brahmaputra, also Orissa.
11. *B. GUTTATUS*, *Day*. Delta of Irrawaddi from Mandalay to Prome.
12. *B. TILEO*<sup>8</sup>, *Ham. Buch*. Bengal and Assam.
13. *B. EVEZARDI*, *Day*. Poona in the Deccan.
14. *B. BOLA*<sup>9</sup>, *Ham. Buch*. Delta of Ganges and Brahmaputra, Orissa and Burma.

Of the 14 species of this genus, 5 are found in the deltas of the Ganges and Brahmaputra, 2 of which extend to Central India and Orissa; 1 is restricted to Central India; 1 to the Deccan; 1 throughout India and Ceylon (except Sind and the Malabar coast); 1 to the Indus and its tributaries; 3 to the western

<sup>1</sup> *Opsarius bicirrhatus*, M'Clelland, may be this species.

<sup>2</sup> Includes *Opsarius cirrhatus*, M'Clelland.

<sup>3</sup> Includes:—*Cyprinus coeca*, *chedra*, and *tila*, Ham. Buch.; *Leuciscus branchiatus*, and *elingulatus*, M'Clelland; *Cyprinus apiatus*, Val.; *Chedrus Grayi*, Swainson; *Leuciscus rubripes* and *Opsarius dualis*, Jerdon.

<sup>4</sup> Includes:—*Cyprinus chedrio*, Ham. Buch.; *Opsarius anisocheilus*, M'Clelland; *Barilius morarensis*, Günther.

<sup>5</sup> Includes *Barilius rugosus*, Day.

<sup>6</sup> Includes *Opsarius malabaricus*, Jerdon.

<sup>7</sup> Includes:—*Opsarius fasciatus*, *latipinnatus*, and *acanthopterus*, M'Clelland; *Barilius papillatus*, Day.

<sup>8</sup> Includes *Opsarius maculatus* and *brachialis*, M'Clelland.

<sup>9</sup> Includes:—*Cyprinus goha*, Ham. Buch.; *Opsarius gracilis* and *megastomus*, M'Clelland; *Leuciscus salmoides*, Blyth.



Ghauts; 1 to the deltas of the Ganges and Brahmaputra extending eastwards to Burma; and 1 to Burma. The fishes of this genus prefer rapid streams, and are frequently found ascending rivers of the hills.

#### Genus DANIO.

1. *D. DEVARIO*<sup>1</sup>, *Ham. Buch.* Deltas of rivers Indus, Ganges, and Brahmaputra; also Deccan.
2. *D. SPINOSUS*, *Day.* Burma.
3. *D. MALABARICUS*<sup>2</sup>, *Jerdon.* Western coast of India and Ceylon.
4. *D. ÆQUIPINNATUS*<sup>3</sup>, *M'Clelland.* Himalayas and rivers at their bases, Deccan, Assam, and Tenasserim.
5. *D. DANGILA*<sup>4</sup>, *Ham. Buch.* Delta of Ganges, Himalayas, hills above Akyab.
6. *D. CHRYSOPS*, *Cuv. & Val.* Bengal.
7. *D. NEILGHERRIENSIS*, *Day.* Neilgherry hills.
8. *D. RERIO*<sup>5</sup>, *Ham. Buch.* Lower Bengal, as far south as Malipatam.
9. *D. ALBOLINEATA*<sup>6</sup>, *Blyth.* Moulmein in Burma.
10. *D. NIGROFASCIATUS*, *Day.* Burma.

Of the 10 species of *Danio*, 1 is found in the deltas of the Indus, Ganges, and Brahmaputra; 2 along the Himalayas, Deccan, deltas of Ganges and Brahmaputra to Burma; 2 in Bengal; 2 along the western coast, one of which extends to Ceylon; 3 in Burma.

#### Genus PERILAMPUS.

1. *P. ATPAR*<sup>7</sup>, *Ham. Buch.* Sind, India generally, and Burma.

<sup>1</sup> Includes:—*Perilampus osteographus*, M'Clelland; *Devario M'Clellandi* and *cyanotenia*, Bleeker.

<sup>2</sup> Includes:—(? *Chela alburna*, Heckel); *Perilampus canarensis* and *myso-ricus*, Jerdon; *Danio micronema* and *lineolatus*, Bleeker; *Paradanio aurolineatus*, Day.

<sup>3</sup> Includes *Leuciscus lineolatus* and *Perilampus affinis*, Blyth.

<sup>4</sup> Includes *Perilampus reticulatus*, M'Clelland.

<sup>5</sup> Includes:—*Cyprinus chapalio*, Ham. Buch.; *Perilampus striatus*, M'Clelland; *Danio lineatus*, Day.

<sup>6</sup> Includes *Danio Stoliczkae*, Day.

<sup>7</sup> Includes:—*Cyprinus cachijs*, Ham. Buch.; *Perilampus psilopteromus*, M'Clelland; *Chela anastoma*, M'Clelland; *Perilampus macropodus*, Jerdon; *Paradanio elegans*, Day.



2. *P. LAUBUCA*<sup>1</sup>, *Ham. Buch.* India (except its southern portion), Assam, and Burma.

3. *P. CEYLONENSIS*, *Günther.* Ceylon.

1 species found in Sind and throughout India and Burma ; 1 in India (except the southern portion) ; and 1 in Ceylon.

#### Genus CHELA.

1. *C. GORA*<sup>2</sup>, *Ham. Buch.* Deltas of Indus, Ganges, and Brahmaputra, also Orissa.

2. *C. SLADONI*, *Day.* Irrawaddi river.

3. *C. SARDINELLA*, *Cuv. & Val.* Burma.

4. *C. UNTRAHI*, *Day.* Coromandel coast of India from Orissa to the Cauvery.

5. *C. ARGENTEA*<sup>3</sup>, *Day.* Rivers in Mysore and Southern India.

6. *C. PUNJABENSIS*, *Day.* River Indus and its tributaries.

7. *C. PHULO*<sup>4</sup>, *Ham. Buch.* India (except its southern portion and western coast) ; also Assam.

8. *C. BOOPIS*<sup>5</sup>, *Day.* Western coast.

9. *C. CLUPEOIDES*<sup>6</sup>, *Bloch.* Cutch, Central and Southern India (not Malabar), Burma.

10. *C. BACAILA*<sup>7</sup>, *Ham. Buch.* India, except Malabar, Mysore, and Madras ; also Burma.

Of the foregoing 10 species, 2 are extended throughout India and Assam (except Malabar and South India), one of which reaches Burma ; 1 from Cutch through Central and Southern India (except Malabar) to Burma ; 1 through the deltas of the Indus, Ganges, and Brahmaputra, also Orissa ; 1 to the Indus ; 1 to the Coromandel coast and Southern India ; 1 to Mysore and Madras ; 1 to the Western coast ; 2 to Burma.

<sup>1</sup> Includes :—(? *Cyprinus dancena*, *Ham. Buch.*) ; *Perilampus guttatus* and ? *perseus*, M'Clelland ; *P. fulvescens*, Blyth ; *Laubuca guttata*, Bleeker.

<sup>2</sup> Includes *Opsarius pholicephalus*, M'Clelland.

<sup>3</sup> Includes :—*Leuciscus acinaces*, *Cuv. & Val.*, pt. ; (? *Pelecus diffusus*, *Jerdon*).

<sup>4</sup> Includes :—*Opsarius albulus*, M'Clelland ; *Chela Owenii*, Sykes.

<sup>5</sup> This may be *Leuciscus acinaces*, pt., *Cuv. & Val.*

<sup>6</sup> Includes :—*Clupea cyprinoides*, *Bloch* ; *Chela balookee* and ? *teekaree*, Sykes ; *Leuciscus dussumieri*, *Cuv. & Val.* ; *Pelecus affinis*, *Jerdon*.

<sup>7</sup> Includes :—*Opsarius leucerus*, M'Clelland ; *Leuciscus cultellus*, *Cuv. & Val.* ; *Salmophasia oblonga*, Swainson.



## Subfamily COBITIDINA.

## Genus BOTIA.

1. *B. NEBULOSA*, *Blyth*. Darjeeling.
2. *B. DARIO*<sup>1</sup>, *Ham. Buch.* Delta of Ganges and Brahmaputra.
3. *B. GETO*<sup>2</sup>, *Ham. Buch.* Delta of Indus, Ganges, and Brahmaputra; also contiguous districts.
4. *B. ALMORHÆ*, *Blyth*. Himalayas.
5. *B. BERDMOREI*, *Blyth*. Delta of Irrawaddi river; also Tenasserim.
6. *B. HISTRIONICA*, *Blyth*. Pegu.

Species of this genus appear to thrive best on or near to hills; 1 is distributed through the deltas of the Indus, Ganges, and Brahmaputra, 1 through the deltas of the two latter rivers and contiguous districts; 2 restricted to the Himalayas; and 2 to Burma.

## Genus ACANTHOPSIS.

1. *A. CHOIROBRHYNCHUS*<sup>3</sup>, *Bleeker*. Burma to the Malay archipelago.

## Genus SOMILEPTES.

1. *S. GONGOTA*<sup>4</sup>, *Ham. Buch.* Himalayas, Assam, and Lower Bengal.

## Genus LEPTOCEPHALICHTHYS.

1. *L. GUNTEA*<sup>5</sup>, *Ham. Buch.* Himalayas, India generally (except its southern portion and western coast).
2. *L. THERMALIS*<sup>6</sup>, *Cuv. & Val.* Southern India, Malabar coast, and Ceylon.

<sup>1</sup> Includes *Diacantha flavicauda*, Swainson.

<sup>2</sup> Includes:—*Diacantha zebra*, Swainson; *Botia rostrata*, Günther.

<sup>3</sup> Includes *Protheacanthus spectabilis*, Blyth.

<sup>4</sup> Includes:—*Cobitis cucura*, Ham. Buch.; *C. oculata*, M'Clelland; (? *C. amnicola*, Cuv. & Val.); *Canthophrys albescens* and *Somileptes bispinosa*, Swainson.

<sup>5</sup> Includes:—*Cobitis balgara*, Ham. Buch.; (? *C. phoxocheila*, M'Clelland); *Schistura aculeata*, M'Clelland; *Cobitis maya*, Sykes; *Canthophrys vittatus* and *olivaceus*, Swainson; *Misgurnus lateralis*, Günther.

<sup>6</sup> Includes:—*Cobitis carnaticus*, *mysorensis*, and ? *rubripinnis*, Jerdon; *Platacanthus agrensis*, Day.



3. *L. BERDMOREI*<sup>1</sup>, *Blyth*. Moulmein in Burma.

The 3 species of this genus have a local distribution; 1 extending from the Himalayas as far as Southern India; 1 Southern India, Malabar, and Ceylon; and 1 Eastern Burma.

## Genus ACANTHOPHTHALMUS.

1. *A. PANGIA*<sup>2</sup>, *Ham. Buch.* North-east Bengal and northern portions of British and Upper Burma.

## Genus APUA.

1. *A. FUSCA*, *Blyth*. Pegu.

## Genus JERDONIA.

1. *J. MACULATA*, *Day*. Madras.

## Genus NEMACHEILICTHYS.

1. *N. RÜPPELLI*, *Sykes*. Deccan.

## Genus NEMACHEILUS.

1. *N. EVEZARDI*, *Day*. Poona in the Deccan.

2. *N. PAVONACEUS*<sup>3</sup>, *M'Clelland*. Assam.

3. *N. RUBIDIPINNIS*<sup>4</sup>, *Blyth*. Tenasserim.

4. *N. BOTIA*<sup>5</sup>, *Ham. Buch.* From Sind, throughout India (except its southern portion and Malabar coast).

5. *N. MONOCEROS*, *M'Clelland*. Assam.

6. *N. PULCHELLUS*, *Day*. Bowany River, at base of Neilgherry hills.

7. *N. SINUATUS*, *Day*. Western Ghauts.

8. *N. GUENTHERI*, *Day*. Rivers along slopes and base of Neilgherry hills.

9. *N. SEMIARMATUS*, *Day*. Rivers along slopes and base of Neilgherry hills.

10. *N. CORICA*<sup>6</sup>, *Ham. Buch.* Delta of Ganges and Brahmaputra.

<sup>1</sup> Includes *Acanthopsis micropogon*, *Blyth*.

<sup>2</sup> Includes:—*Cobitis cinnamomea*, *M'Clelland*; *Canthophrys rubiginosus*, *Swainson*.

<sup>3</sup> Includes *Acanthocobitis longipinnis*, *Peters*.

<sup>4</sup> Includes *Cobitis semizonata*, *Blyth*.

<sup>5</sup> Includes:—*Cobitis bilturio*, *Ham. Buch.*; *C. bimacronata*, *ocellata*, and *scaturigina*, *M'Clelland*; *C. moreh*, *Sykes*; *Somileptes unispina*, *Swainson*; *Nemacheilus aureus*, *Day*.

<sup>6</sup> Includes:—*Schistura punctata*, *M'Clelland*; *Acoura cinerea*, *Swainson*.



11. *N. RUPICOLA*<sup>1</sup>, *M'Clelland*. Himalayas.
12. *N. MONTANUS*, *M'Clelland*. Himalayas.
13. *N. STRIATUS*, *Day*. Western Ghauts.
14. *N. MULTIFASCIATUS*<sup>2</sup>, *Day*. Himalayas and Assam.
15. *N. DENISONII*<sup>3</sup>, *Day*. Mysore, Deccan, and western Ghauts.
16. *N. NOTOSTIGMA*, *Bleeker*. Ceylon.
17. *N. ZONALTERNANS*, *Blyth*. Tenasserim provinces.
18. *N. LADACENSIS*, *Günther*. Tibet.
19. *N. ZONATUS*<sup>4</sup>, *M'Clelland*. From the Punjab, throughout the N.W. Provinces, Bengal, Assam, and Orissa.
20. *N. CINCTICAUDA*, *Blyth*. Burma.
21. *N. TRIANGULARIS*, *Day*. Travancore hills.
22. *N. SAVONA*<sup>5</sup>, *Ham. Buch*. N.W. Provinces and Bengal.
23. *N. BEAVANI*<sup>6</sup>, *Günther*. From Orissa to Mysore and South India.
24. *N. SPILOPTERUS*, *Cuv. & Val*. Himalayas, Assam, Cochin China.
25. *N. MARMORATUS*<sup>7</sup>, *Heckel*. Cashmere Lake.
26. *N. STOLICZKÆ*<sup>8</sup>, *Steindachner*. Himalayas and Yarkand.
27. *N. BUTANENSIS*, *M'Clelland*. Boutan, in the Himalayas.
28. *N. GRACILIS*, *Day*. Head-waters of Indus in the Himalayas.
29. *N. TURIO*<sup>9</sup>, *Ham. Buch*. Assam.

Of the 29 species of *Nemacheilus*, 8 are found in the Himalayas, one of which extends to Yarkand and another to Assam ; 1 extends to the Himalayas, Assam, and Cochin China ; 2 to Sind and India

<sup>1</sup> Perhaps includes *Cobitis microps*, Steindachner.

<sup>2</sup> Includes :—(? *Schistura subfusca*, M'Clelland) ; *Nemacheilus montanus*, Günther (not M'Clelland).

<sup>3</sup> Includes *Cobitis montanus*, Jerdon (not M'Clelland).

<sup>4</sup> Includes *Nemacheilus mugah*, Day.

<sup>5</sup> Includes *Acoura obscura*, Swainson.

<sup>6</sup> Includes *N. chryseus*, Day.

<sup>7</sup> Includes *Cobitis vittata*, Heckel.

<sup>8</sup> Includes :—*Cobitis tenuicauda*, Steindachner ; *C. Griffithii*, Günther.

<sup>9</sup> Includes :—*Cobitis gibbosa*, M'Clelland ; *C. arenata*, Val. ; *Acoura argentata*, Swainson.



(except its southern portion and Malabar coast); 2 to the delta of the Ganges, one of which extends to Assam; 3 Assam; 1 Orissa and Southern India; 1 Poona; 7 Western Ghats and rivers along their bases; 1 Ceylon; 3 Burma.

Although these fish are common enough in the waters of the plains, they are still more numerous in those of the hills.

### Family CLUPEIDÆ.

Members of this family are found in the fresh waters of India, but they can only be considered accidental residents there. Some, as the hilsa (*Clupea ilisha*), are anadromous, and only ascend the rivers to deposit their ova. Others which are more constant residents are few in number, and probably descendants of some whose progenitors have had their return to the sea cut off, and have thus become freshwater forms.

### Family NOTOPTERIDÆ.

#### Genus NOTOPTERUS.

1. *N. KAPIRAT*<sup>1</sup>, *Lacépède*. Throughout the fresh waters of the plains of India to the Malay archipelago.

2. *N. CHITALA*<sup>2</sup>, *Ham. Buch.* Sind, Lower Bengal and Assam, Burma and Siam to the Malay archipelago.

This genus is also represented in Africa.

### Family SYMBRANCHIDÆ.

Three genera have representatives in India.

1. *AMPHIPNOUS*<sup>3</sup>, *Müller*. India and Burma.

2. *MONOPTERUS*<sup>4</sup>, *Lacépède*. Burma, Malay archipelago, and China.

3. *SYMBRANCHUS*<sup>5</sup>, *Bloch*. India to the Malay archipelago.

The following are the species belonging to this family.

<sup>1</sup> Includes:—*Gymnotus notopterus*, Pallas; *Clupea sinura*, Bl. Schn.; *Mystus badjee*, Sykes; *Notopterus Pallasii* and *N. bontianus*, Cuv. & Val.

<sup>2</sup> Includes:—*Notopterus ornatus*, Gray; *N. Buchananii*, Cuv. & Val.; *N. hypselosoma* and *N. lopis*, Bleeker.

<sup>3</sup> Includes *Pneumabranhus*, pt., M'Clelland.

<sup>4</sup> Includes:—*Fluta*, Bl. Schn.; *Ophicardia*, M'Clelland; *Apterigia*, Basilewski.

<sup>5</sup> Includes:—*Unibranchapertura*, Lacép.; *Pneumabranhus*, pt., and *Ophisteron*, M'Clell.; *Tetrabranhus*, Bleeker.



## Genus AMPHIPNOUS.

1. *A. CUCHIA*<sup>1</sup>, *Ham. Buch.* Punjab, throughout Bengal and Orissa, through Assam to Burma.

## Genus MONOPTERUS.

1. *M. JAVANENSIS*<sup>2</sup>, *Lacép.* Burma, Malay archipelago, and China.

## Genus SYMBRANCHUS.

1. *S. BENGALENSIS*<sup>3</sup>, *McClelland.* India to the Malay archipelago, and the Philippines.

The foregoing freshwater fishes alluded to as existing in India and Burma belong to sixteen families<sup>4</sup>, which are distributed as follows:—

Sciænidae, Gobiidae, Rhynchobdellidae, Mugilidae, Siluridae, Scombresocidae, Cyprinodontidae, Cyprinidae, Murænidae, all of which have representatives in the Palæarctic, African, and Oriental regions. Percidae group *Apogonina*, Labyrinthici, Notopteridae, which belong to the African and Oriental regions. Nandidae group *Nandina*, Ophiocephalidae<sup>5</sup>, Symbranchidae, and Chromides, all of which are restricted to the Oriental region except the last, which has a representative in Madagascar.

By giving every genus and species and adding their synonyms in the form of notes, all question as to what are included in these papers must be set at rest. Some authors may consider that I

<sup>1</sup> Includes:—*Ophichthys punctatus*, Swainson; *Pneumabranchnus striatus*, *leprosus*, and *albinus*, McClelland.

<sup>2</sup> Includes:—*Unibranchapertura lævis*, Lacép.; *Symbranchus eurychasma*, Bleeker; *Ophicardia Phayriana*, McClelland; *Symbranchus grammicus*, Cantor; *Monopterus cinereus*, *xanthognathus*, *marmoratus*, and *helvolus*, Richardson; *Apterigia saccogularis*, *nigromaculata*, and *immaculata*, Basilewski.

<sup>3</sup> Includes:—*Symbranchus immaculatus*, Cantor; *Tetrabranchnus microphthalmus*, Bleeker.

<sup>4</sup> Mr. W. T. Blanford, in his excellent paper on "The African Element in the Fauna of India," in the 'Ann. & Mag. of Nat. Hist.' Oct. 1876, observes of the zoological productions of India:—"I have long been convinced that many of the usual generic groups are artificial; and some are even founded upon geographical distribution—forms which inhabit Africa being placed in a different genus from those which inhabit India on account of a difference in the locality, and not of a difference in structure." However well such a remark may apply to the other branches of zoology, I do not think it is correct as regards ichthyology.

<sup>5</sup> I have obtained *Ophiocephalus gachua* from Beloochistan; it has likewise been taken in Afghanistan, or localities within the Palæarctic region.



have unduly multiplied some species, considering local varieties as more appropriate ; by referring to those enumerated it will be easy to erase those objected to. Others, I know, think that some which I have placed as synonyms should be given as species. Anyhow, by following out every form as I have done, I have tried to obviate one of Mr. Blanford's objections, that "with only the facts procurable from museum catalogues and other published works, I know from experience that it is impossible to ascertain correctly the details of distribution ; the numerous errors committed by the older naturalists, by whom the term India was used in the very loosest and vaguest sense, have but rarely been eliminated ; and it is constantly the practice in monographs and catalogues to quote species and genera as found in two localities—the old and erroneous one, and the real locality subsequently discovered" (Ann. & Mag. Nat. Hist. 1876, xviii. p. 278).

The fishes I have enumerated belong to 87 genera, thus distributed :—

No. of genera in India.	Also in the Malay archipelago and Africa.	In Malay archipelago.	In Africa.
19 Acanthopterygii .....	4 <sup>1</sup>	10	0
26 Siluridæ .....	1 <sup>2</sup>	10	0
1 Scombresocidæ .....	1 <sup>3</sup>	0	0
2 Cyprinodontidæ .....	1	0	1 <sup>4</sup>
35 Cyprinidæ .....	4 <sup>5</sup>	10 <sup>6</sup>	1 <sup>3</sup>
1 Notopteridæ .....	1	0	0
3 Symbranchidæ .....	0	2	0
87	12	32	2

It appears that out of 87<sup>7</sup> genera, 2 only are restricted to Africa (not being Malayan), both being likewise Palæarctic ; 32 extend to the islands of the Malay archipelago ; 12 are common to both the African and Malayan regions, out of which 6 are likewise Palæarctic.

<sup>1</sup> 2 are also Palæarctic ; the other two, *Periophthalmus* and *Eleotris*, have marine representatives also.

<sup>2</sup> and <sup>3</sup> Also Palæarctic.

<sup>4</sup> *Cyprinodon* also Palæarctic ; *Haplochilus* not so.

<sup>5</sup> *Barilius* has been taken at Candahar ; *Rasbora* is not known to be Palæarctic, the remaining two are.

<sup>6</sup> Out of these 10 genera, 3 are Burmese, not belonging to the Hindustan sub-region.

<sup>7</sup> Genus *Etroplus* will be considered separately.



If we tabulate the 369 Indian freshwater *species* in the same manner, they will be found thus distributed:—

No. of species in India.	Also in the Malay archipelago and Africa.	In Malay archipelago.	In Africa .
47 Acanthopterygii .....	2	9 <sup>2</sup>	0
85 Siluridæ .....	0	6	0
1 Scombresocidæ .....	0	0	0
5 Cyprinodontidæ .....	0	1	1 <sup>4</sup>
226 Cyprinidæ .....	0 <sup>1</sup>	7 <sup>3</sup>	1 <sup>5</sup>
2 Notopteridæ .....	0	2	0
3 Symbranchidæ .....	0	2	0
369	2	27	2

Leaving out the question of the original home of the first parents of these fishes, we may inquire, *what element is now most apparent amongst the Indian freshwater fishes, the African or Malayan?* A single glance at the Tables will show that the Malayan element is most developed. In short, we are unable to ascertain one single *genus* which is solely African and Indian, as all the African forms which extend to India are either likewise present in the Palæarctic region, or else in the Malay archipelago, or in both.

If we turn to the distribution of the species, we obtain the same results. Out of 369 Indian or Burmese forms, 2 are likewise African (not Malayan), but they are also Palæarctic; 27 are common to India (including Burma) and the Malay archipelago; 2 to both Africa, India, and the Malay archipelago.

*How has the African element entered India proper*<sup>6</sup>? I exclude

<sup>1</sup> *Discognathus* is also Palæarctic.

<sup>2</sup> *Pristolepis fasciatus* is Burmese, and not found in the Hindustan sub-region.

<sup>3</sup> Out of these 7 species, 5 are found in Burma, but not in the Hindustan subregion.

<sup>4</sup> and <sup>5</sup> Both Palæarctic forms.

<sup>6</sup> Mr. Blanford considers there is evidence that in Northern and Central India the fauna in the later Tertiary times was more allied to that now existing in Africa than it is now—that this is shown by the presence of *Hippopotamus*, *Camelopardalis*, *Loxodon*, and a number of antilopine forms in the Pliocene fossil fauna of the Sevaliks &c.,—and states his belief that the Vertebrata had been in connexion with Africa:—*first*, forms common to the Oriental and Ethiopian regions, the bulk of the present Indian fauna; *secondly*, forms common to the Ethiopian region and India, but not extending to the eastward of the Bay of Bengal, nor represented in S.W. Asia now lying in the direct line between India and Africa; *thirdly*, species with Ethiopian affinities, which may have wandered into India from Arabia and Baluchistan.



from this consideration whether at some earlier period of the world's history a migration of fishes occurred from the north, and as they travelled south some found their way into Africa, others into India; while as their distance from their base increased, and due to climatic and other disturbing causes, they became modified as we now find them. Although all the genera of fishes which I have alluded to as common to Africa and India are freshwater, some are commonly residents within tidal influence. I will therefore subdivide the 14 genera into (1) strictly freshwater forms, and (2) those which contain some representatives which reside in the sea.

Genera.		Ethiopian subregion.	Mediterraneo-Persic subregion.
Some marine forms.	Strictly freshwater.		
	Mastacembelus .....	W. Africa.	Present.
	Gobius .....	All.	"
	Clarias .....	All.	"
	Discognathus .....	E. Africa.	"
	Labeo .....	All.	"
	Barbus .....	All.	"
	Barilius .....	E. Africa.	"
	Rasbora .....	E. Africa.	Absent.
	Notopterus .....	W. Africa <sup>1</sup> .	"
	Periophthalmus } Eleotris } .....	E. & W. & } S. Africa. }	"
	Belone .....	All.	Present.
	Cyprinodon .....	E.	"
	Haplochilus .....	E.	Absent.

It would thus appear that the irruption of the majority of the freshwater forms common to Africa and India must have been by way of the Mediterraneo-Persic subregion.

We have now to consider what freshwater fishes are found in the various subregions of the *Oriental region*, and which are peculiar to each. I propose taking Mr. Wallace's subdivisions, having the deltas of the Ganges, Indus, and the Brahmaputra as the boundaries of the *Hindustan subregion* on the N.W., N., and N.E., while on the S.W. it extends to the Ceylonese subregion. The *Ceylonese subregion* commences on the western coast below Goa, and includes Canara and Malabar with the western Ghauts to Ceylon; passing along the Neilgherries, its fish fauna in Mysore joins with that of the Hindustan subregion; while in the Carnatic it extends in like manner as high as the river Kistna. Out

<sup>1</sup> This Malayan element in West Africa corresponds with what has been observed in mammals and birds.



of 73<sup>1</sup> genera present in the Hindustan and Ceylonese subregions, we find them thus distributed<sup>2</sup> :—

73 genera, where distributed.	Acanthopterygii.	Siluridæ.	Scombresocidæ.	Cyprinodontidæ.	Cyprinidæ.	Notopteridæ.	Symbranchidæ.
Hindustan, Ceylon, Burmah to Malay archipelago .....	9	8	1	1	10	1	3
Hindustan and Ceylon subregions... ..	1	0	0	0	1	0	0
"                    "                    to							
Burma or beyond.....	1	1	0	0	6	0	0
Hindustan subregion .....	0	4	0	1	2	0	0
"                    "                    to Burma or							
beyond .....	4	7	0	0	5	0	0
Ceylonese subregion.....	1	0	0	0	1	0	0
"                    "                    to Burma or							
beyond .....	4	1	0	0	0	0	0

Out of the foregoing 73 genera of freshwater fishes which are found in the Hindustan and Ceylonese subregions, no less than 62 extend to Burma or the Malay archipelago, or to both; whereas only 15 are common to the Palæarctic region. Thus we not only observe the comparatively small amount of the Ethiopian element in the Indian fish-fauna, but also find that (excluding the Himalayan forms) the ichthyology of India and Ceylon is far less Palæarctic than it is Malayan.

The Oriental genera (excluding the Himalayan) which are distributed more or less through its subregions of Hindustan, Ceylon, Burma and Siam, and the Malay archipelago, but possess neither Ethiopian nor Palæarctic representatives, are as follows :—

1. *Nandus*, 2. *Pristolepis*, 3. *Sicydium*, 4. *Ophiocephalus*, 5. *Channa*, 6. *Anabas*, 7. *Polyacanthus*, 8. *Osphromenus*, 9. *Liocassis*, 10. *Pangasius*, 11. *Pseudeutropius*, 12. *Callichrous*, 13. *Wallago*, 14. *Chaca*, 15. *Bagarius*, 16. *Glyptosternum*, 17. *Homaloptera*, 18. *Cirrhina*,

<sup>1</sup> The Burmese and Himalayan genera which are not common to Hindustan are omitted.

<sup>2</sup> It is to be regretted that, with the exception of some portions of the Himalayas and the western Ghauts of India, the hill-ranges scattered over Hindustan have not had their fishes sufficiently collected. H. D. Thomas, Esq., of the Madras Civil Service, has lately sent me a collection made on the Sheverry hills in Madras; and they are identical with those of the neighbouring plains.



19. *Thynnichthys*, 20. *Chela*, 21. *Botia*, 22. *Acanthopsis*, 23. *Lepidocephalichthys*, 24. *Amphipnous*, 25. *Symbranchus*, and 26. *Monopterus*.

Among those genera which are restricted to the *Hindustan subregion* we have :—1. *Ailia*, 2. *Ailichthys*, 3. *Sisor*, 4. *Nangra*, 5. *Psilrhynchus*, and 6. *Somileptes*, all being found in the deltas of the rivers Indus, Ganges, and Bramaputra, or their affluents. Restricted to the *Ceylonese subregion* we have 1. *Etroplus*, 2. *Jerdonia*. The following are found in the *Ceylonese and Hindustan subregions, also in Burma* :—1. *Badis*, 2. *Saccobranchus*, 3. *Rohtee*, 4. *Amblypharyngodon*, 5. *Nuria*, 6. *Danio*, 7. *Perilampus*, 8. *Semplotus*, and 9. *Amphipnous*. Restricted to *Hindustan and Burma* :—1. *Trichogaster*, 2. *Erethistes*, 3. *Rita*, 4. *Silundia*, 5. *Eutropiichthys*, 6. *Gagata*, 7. *Catla*, 8. *Aspidoparia*, and 9. *Acanthophtalmus*.

Having thus briefly examined what the Indian freshwater fish-fauna is as a whole, we next come to the consideration of *what is the Fish-fauna of Ceylon?* Here a great difficulty exists, as the fishes of that island still remain to be thoroughly worked out. Bleeker's 'Cobitoides et de Cyprinoides de Ceylan' unfortunately does not enumerate the localities whence his examples were obtained; consequently one is ignorant as to whether they came from the northern or southern districts, or from both. And this question is important when examining into the zoology of that island, the southern portion consisting of hill-tracts which Mr. Blanford classes with Malabar and the "low country on the west coast of India from Cape Comorin to a little north of Bombay, and a range of hills near the same coast as far north probably as the Tapti river." The northern portion of Ceylon, he considers, belongs to the Indian province or subregion.

Some materials, however, exist for investigating this question, as we know of 41 species of freshwater fishes belonging to 29 genera inhabiting Ceylon. The *genera* consist of 9 Acanthopterygians, 6 Siluroids, 1 Scombresocid, 1 Cyprinodont, and 12 Cyprinoids, with one exception, all having representatives in Malabar, the single exception being the genus *Channa*, very closely allied to the ubiquitous Indian genus *Ophiocephalus*, from which it is separated because it is deficient of ventral fins.

The 41 *species* consist of :—13 Acanthopterygians, 9 of which extend through India and Malabar; 1 to Southern India and Malabar; 1 to Java and China; whilst 1 is restricted to Ceylon. 7 Siluroids, 4 of which are distributed through India and Malabar;



1 to South India and Malabar; 1 to Java; and 1 restricted to Ceylon. 1 Scombresocid, common to India and beyond. 1 Cyprinodont, found also in Malabar. 19 Cyprinoids, 3 of which are distributed through India and Malabar, 1 extending to Africa; 6 to South India, 5 of which are also found in Malabar; 1 to India, excluding Malabar; 2 to Malabar; while 7 are restricted to Ceylon.

In short, the freshwater fish-fauna of Ceylon would show a very slight connexion with Africa, and that only through the same genera being distributed throughout India and Malabar; but certainly there exists a Malayan<sup>1</sup> element, to which I shall refer further on.

The Malabar fish-fauna is intimately related to that of Ceylon and (but to a decreased extent) with that of the southern portion of the Coromandel coast, as some species extend their range as far as the Kistna. The following Table will show the relationship of the Ceylonese freshwater fish-fauna to that of the remainder of the region on the continent of India, also how it agrees with the Hindustan subregion or elsewhere.

Family and Genus <sup>2</sup> .	Subregions.			Range beyond region.
	Ceylonese.		Hindu- stan.	
	Ceylon.	Malabar and main- land.		
ACANTHOPTERYGII.				
1. <i>Ambassis</i> .....	1	1	1	Africa ; Burma, Siam, Malay archipelago.
2. <i>Badis</i> .....	0	1	1	Burma.
3. <i>Nandus</i> .....	0	1	1	Burma, Siam, Malay archipelago.
4. <i>Pristolepis</i> .....	0	1	0	Burma, Siam, Malay archipelago.
5. <i>Gobius</i> .....	1	1	1	Cosmopolitan.
6. <i>Sycidium</i> .....	0	1	0	Burma, Malay archi- pelago, and beyond.
Carried forward .....	2	6	4	

<sup>1</sup> Wallace remarks of Ceylon that although it "generally agrees in its productions with the southern part of India, yet it has several birds which are allied to Malayan and not to Indian groups, and a fine butterfly of the genus *Hestia*, as well as several genera of beetles, which are purely Malayan."

<sup>2</sup> Those genera which have marine as well as freshwater representatives are printed in italics.



Family and Genus.	Subregions.			Range beyond region.
	Ceylonese.		Hindu- stan.	
	Ceylon.	Malabar and main- land.		
Brought forward ...	2	6	4	
ACANTHOPTERYGII ( <i>con- tinued</i> ).				
7. <i>Eleotris</i> .....	1	1	1	Africa ; Burma, Siam, and Malay archipe- lago.
8. <i>Mastacembelus</i> ...	1	1	1	Mediterraneo-Persic region, West Africa, Burma, to Malay archipelago.
9. <i>Ophiocephalus</i> ...	1	1	1	Burma, Siam, to Malay archipelago and be- yond.
10. <i>Channa</i> .....	1	0	0	China.
11. <i>Anabas</i> .....	1	1	1	Burma, Siam, Malay archipelago, and be- yond.
12. <i>Polyacanthus</i> .....	1	1	0	Malay archipelago.
13. <i>Etroplus</i> .....	1	1	0	
SILURIDÆ.				
14. <i>Macrones</i> .....	1	1	1	Burma, Siam, Malay archipelago.
15. <i>Pseudeutropius</i> ...	1	1	1	Burma, Siam, Malay archipelago.
16. <i>Callichrous</i> .....	1	1	1	Burma, Siam, Malay archipelago.
17. <i>Wallago</i> .....	1	1	1	Burma, Siam, Malay archipelago.
18. <i>Silurus</i> .....	0	1	0	Himalayas, Burma, Siam, Malay archi- pelago, China ; Palæ- arctic region.
19. <i>Clarias</i> .....	1	1	1	Africa, Mediterraneo- Persic region, Burma, Siam, Malay archi- pelago, &c.
20. <i>Saccobranhus</i> ...	1	1	1	Burma, Siam, Cochin China.
21. <i>Bagarius</i> .....	0	1	1	Burma, Siam, to the Malay archipelago.
22. <i>Glyptosternum</i> ...	0	1	1	Malay archipelago.
SCOMBRESOCIDÆ.				
23. <i>Belone</i> .....	1	1	1	Almost cosmopolitan.
Carried forward .....	16	22	17	



Family and Genus.	Subregions.			Range beyond region.
	Ceylonese.		Hindustan.	
	Ceylon.	Malabar and mainland.		
Brought forward ...	16	22	17	
CYPRINODONTIDÆ.				
24. Haplochilus .....	1	1	1	Tropical Africa, Burma, and the Malay archipelago.
CYPRINIDÆ.				
25. Homaloptera .....	0	1	0	Himalayas and Malay archipelago.
26. Discognathus .....	1	1	1	Africa, Mediterranean-Persic region, Himalayas, Burma.
27. Cirrhina .....	1	1	1	Burma to the Malay archipelago, &c.
28. Scaphiodon.....	0	1	0	Mediterraneo-Persic region and Sind hills.
29. Amblypharyngodon.	1	1	1	Burma.
30. Barbus .....	1	1	1	The Old World.
31. Nuria .....	1	1	1	Burma and the Nicobars.
32. Rasbora .....	1	1	1	Africa, Burma, to the Malay archipelago.
33. Rohtee.....	0	1	1	Burma.
34. Barilius .....	1	1	1	East Africa, Burma, to the Malay archipelago.
35. Danio .....	1	1	1	Burma.
36. Perilampus.....	1	1	1	Burma.
37. Chela .....	1	1	1	Burma to the Malay archipelago.
38. Lepidocephalichthys.	1	1	1	Burma to the Malay archipelago.
39. Jerdonia .....	0	1	0	
40. Nemacheilus .....	1	1	1	Burma to the Malay archipelago.
NOTOPTERIDÆ.				
41. Notopterus .....	0	1	1	Burma to the Malay archipelago.
SYMBRANCHIDÆ.				
42. Symbranchus .....	0	1	1	Burma to the Malay archipelago and beyond.
Total .....	29	41	33	



We can deduce the following results as to the distribution of the 29 genera present *in the island of Ceylon*.

Present on the mainland of the Ceylonese subregion.	Present in Hindustan.	Present elsewhere.
28	26	1 China ; 1 Madagascar ; but also mainland.

The Malabar fish-fauna is intimately related to that of Ceylon, and (but to a diminishing extent) with the southern portion of the Coromandel coast, as some species extend their range as far as the Kistna. Amongst the Cyprinidæ, 16 *genera*<sup>1</sup> are represented in Malabar, 12 of which are likewise found in Ceylon: of the remaining 4, 1 is common to the western Ghauts and the Himalayas, 1 to Western Asia and Sind; while of the other 2, one is distributed through India, the other is local at Madras. Ceylon possesses no genus of Carps unrepresented in Malabar.

Of *species*, 60 are found from Canara down to the western Ghauts (including the Neilgherry hills and rivers at their bases) and Ceylon; 40 are found in Canara or Malabar (2 of which are common to the Himalayas, and 5 to the plains of India); 7 are found in Malabar and Ceylon; 7 restricted to Ceylon; 1 to India and Ceylon.

Amongst the Acanthopterygians, 11 *genera* are found in Malabar and Ceylon: 2 of these are restricted to Malabar; 2 are common to India and Malabar; 6 to India, Malabar, and Ceylon; 1 is only found in Ceylon. Of *species*, 27 are found in Malabar and Ceylon: 14 are Malabar forms, 7 of which are found in the plains of India; 9 are common to India, Malabar, and Ceylon; 1 to Malabar and Siam; 3 to Ceylon, one of which extends to Java.

I have now to refer to a certain peculiar distribution of fishes, already remarked upon, but respecting which a more detailed examination is necessary.

Genus *Pristolepis* is found along the western Ghauts of India, is absent from the Hindustan subregion, but reappears in Burma, whence it is distributed to the islands of the Malay archipelago. *Ophiocephalus micropeltes* is found from Canara to Cochin, is absent from Hindustan, but reappears in Siam.

<sup>1</sup> This must not be understood to mean that these genera are absent from the waters of the plains of India.



*O. gachua* is found at the Andaman Islands. Genus *Channa* is found in Ceylon and China, but absent from intermediate localities. *Polyacanthus signatus* has only been taken in Ceylon and Java. Genus *Etroplus* through the Ceylonese subregion, and an allied genus in Madagascar. Genus *Silurus*, Himalayas to Akyab; Tenasserim, Cochin China, the Malay archipelago and beyond; also Eastern Europe and Turkestan, and along the Malabar Ghauts; but is not found in the Hindustan subregion. *Exostoma* along the Himalayas to Assam, Pegu, Tenasserim, and the confines of China. *Haplochilus panchax* from the Hindustan subregion, through Burma and Siam to the islands of the Malay archipelago, and is also common at the Andaman Islands. *Scaphiodon* from Western Asia to the Sind and the Punjab, and along the western Ghauts, but is otherwise absent from India. *Nuria danrica* extends from the Ceylonese and Hindustan subregions to Burma and the Nicobars; but is absent from the islands of the Malay archipelago. *Homaloptera Brucei* and *H. maculata* are common to the Himalayas and the western Ghauts of India, but are absent from the Hindustan subregion.

The preceding and other somewhat similar instances offer a wide field for conjecture as to how these fishes came in such localities, and by what means they have spread to more distant districts; but before offering any remarks on the subject, it will be necessary to digress a little, and refer to the opinions of others who have written on this question.

Geologists have pointed out that the plains of Hindustan are Tertiary with a few isolated patches of Secondary rocks, and the peninsula in the later Tertiary epoch was an island, an arm of the sea existing along the present deltas of the Ganges and the Indus. Ceylon and South India consist (at least on the western Ghauts) mainly of granitic and old metamorphic rocks; and they probably formed during a portion of the Tertiary period a large continent, the zoology of which had a close affinity to that of the Malayan region.

Dr. Stoliczka observed that "it does not appear improbable that the fauna of India was at some remote period chiefly or altogether Malayan, and that it had been more or less destroyed in those parts which were affected by the enormous volcanic eruptions, characterized as the Trappean formation of Central and N.W. India. It must have been somewhere about that time when a communication was established between India and Africa,



and when African forms were enabled to travel eastwards and attain a firm hold in India. The immigration from the west must have been considerable; for it seems to have greatly checked the further development of the Malayan fauna, which remained preserved only on the more elevated hills, chiefly those consisting of gneissose and metamorphic rocks" (Proc. As. Soc. 1871, p. 84).

In short, many zoologists consider that the Indian fauna was formerly very similar to the Malayan; that something occurred which acted injuriously on that fauna; while a communication occurring with Africa, and perhaps due to the Indian climate becoming more tropical, a development of African forms occurred, but that this commingling did not take place on the more elevated regions; that afterwards there was a large irruption of Malayan forms due to a connexion being formed between Burma and Eastern Bengal, and that they overran the Hindustan subregion.

The distribution of the freshwater fishes in these regions ought to give us some facts which support or refute these opinions; for although marine fishes can ascend into fresh water, and should their retreat to the sea be cut off, they are able to make it their home, it is not so with true freshwater forms, which never breed in the sea, and cannot exist in it for any length of time. Thus the freshwater forms are unable to pass from the mainland to islands<sup>1</sup>; they must have a freshwater channel up which they can proceed; but for this to exist, a land-continuity becomes necessary. Land connexion alone between two continents may not always be sufficient; as even if such were present, it does not necessarily follow that freshwater would be also there. Again, a mountain-chain may extend across the isthmus over which freshwater fishes would not be able to pass.

It has been advanced that freshwater fishes have two modes of dispersal:—(1) carried by external agency out of one river-system to another, or from the mainland to islands; (2) by river-systems due to some cause commingling and permitting the fish to migrate.

Under the head of external agency, the action of hurricanes and whirlwinds have been adduced, when with the downpour of

<sup>1</sup> Wallace observes of *Amphibia*:—"Salt water is fatal to them as well as to their eggs; and deserts and oceans would probably form the most effectual barriers to their dispersal; whereas both snakes and lizards abound in deserts, and have some means of occasionally passing the ocean which frogs and salamanders do not seem to possess."



water fishes are said to have descended, it is assumed in a living state; but of the instances I have had unequivocal evidence of, they were invariably dead, sometimes putrid. Proof of their descending alive is yet wanting. Then it has been stated, on the authority of Gmelin, that fish-eggs may be carried by aquatic birds. It appears hardly credible that fish-eggs could be swallowed by birds and subsequently extruded *per anum* with their vitality intact. If the fish were ovi-viviparous, the mothers (inside whom were fertilized eggs) might be swallowed, and thus the eggs might (?) be extruded with the vitality unimpaired. But there are no Indian freshwater fishes which are ovi-viviparous; and the aquatic bird which swallowed the unfertilized fish-eggs would hardly assist in producing fishes in distant localities. That some birds might gorge themselves with fish-eggs, and having flown some distance, might disgorge some, is not improbable; and in such a manner fishes might be distributed. In fact, in India we see some marine forms of Siluroids in which the males carry about the eggs in their mouths until the young are hatched. Water-beetles are likewise believed to occasionally convey fertilized fish-eggs from one piece of water to another, and sometimes without destroying their vitality.

Respecting river-systems, by commingling (due to changes in level, or from other causes), enabling fish to migrate, such appears to be very likely. One might take as an example how some of the Himalayan streams go to the Indus and western coast of India, and others descend to the Ganges and pass to the Bay of Bengal. Here a communication by their lateral branches might occur during some period of flood.

But I have shown that some fishes of the western coast of India and Ceylon have a very peculiar distribution; present along the mountain-summits or some distance up their sides, they are absent from the plains, but reappear in the Himalayas, in Burma, Siam, the Malay archipelago, or China.

The geographical distribution of the amphibious Oriental family of Ophiocephalidæ is well worthy of an attentive investigation. Species extend through vast districts. Thus *O. striatus* is found throughout the fresh waters of the plains of India and Ceylon, Assam, Burma, Siam, and in most of the islands of the Malay archipelago. This would be one reason for believing either that these freshwater fishes at a former period could inhabit the sea and thus extend from island to island, or else that land once joined



these islands together and to the mainland, while over this land were streams or ponds of fresh water along which these fishes went. *O. gachua* is first met with at Guadur, also on the hills of Beluchistan and Afghanistan; it extends through the Indian and Ceylon subregions, Assam, and Burma; while, as I have formerly remarked, it is common in the streams at the Andaman Islands. I can only account for their presence in such a spot by the same theory of a former land-connexion with the mainland; the distance is too far for any accidental cause to have occasioned its presence there.

*O. micropeltes* is present in the rivers of Canara and Malabar, absent from the plains of India and Burma, reappearing in Siam; and is distributed through the fresh waters of the islands of the Malay archipelago. The allied genus *Channa* is also found in Ceylon, but disappears between that island and China. The percoid genus *Pristolepis* exists at the base of the Malabar hills, but is not found elsewhere in India, reappearing in Burma. The amphibious *Polyacanthus signatus* is only found in Ceylon and Java.

The delicate little *Haplochilus panchax* is distributed in the fresh waters of the Andaman Islands, and is likewise found through the Ceylonese and Hindustan subregions, also in Burma and the islands of the Malay archipelago.

But the Nicobars give us another freshwater fish which is absent from the islands of the Malay archipelago, but present on the mainland of India, Burma, and Siam, whence it has probably spread; it is the little *Nuria danrica*, of which Mr. Ball brought several examples from the Nicobars.

Amongst the Siluridæ we find somewhat the same distribution may occur. *Clarias magur* is found throughout India, Burma, and the Malay archipelago, *C. Teysmanni* in Ceylon and Java, and *C. Dussumieri* along the coasts of India and the islands of the Malay archipelago, these last two, so far as is known, being absent from the intervening districts. The Cyprinoid *Thynnichthys* is also a resident only in the Deccan, Kistna, and Godavery rivers in India, reappearing in the islands of the Malay archipelago.

These examples of distribution are not peculiar to fishes, but are seen in other divisions of the animal kingdom, and would seem to point out that there must at a former period have existed a land communication between Malabar and Ceylon and the Malay



peninsula, and which may have embraced the Andamans and Nicobars.

Mr. Kurz (Journ. As. Soc. 1876, p. 105) observes that "the Nicobars form a link in the chain of islands that stretches up from Sumatra to the Arracan Yomahs (mountains), and they are in all probability the remnants of a mountain-range that connected Sumatra (and more especially the Nias Islands, where the same sandstone prevails as that of the Andamans and Arracan) and Arracan at a time when the sea covered the vast alluvial plains of the Ganges and the Indus, thus rendering Hindustan an island subsequent to its probable connexion with Africa."

Were the chain of mountains carried from about the Nicobars to the west and joined to Ceylon, we should thus have the means of communication between the Malay peninsula and the Ceylon region complete: we could in this manner understand how freshwater fishes might be absent from the subregion of Hindustan, but present on either side, as Ceylon and Burma. Perhaps, as has been advanced, the Bay of Bengal was a portion of a large continent now submerged, and it was by that route that the Ceylonese subregion received its Oriental forms of animal life at a time when the plains of Hindustan were submerged.

That this region did not extend to Madagascar or the Mauritius would also appear to be demonstrated by the freshwater fishes; for we do not find (unless they have been introduced) *Rhynchobdellidæ*, *Ophiocephalidæ*, nor the genera *Polyacanthus*, *Osphromenus*, *Trichogaster*, nor any of the Indian genera of the *Siluridæ*, *Cyprinodontidæ*, *Cyprinidæ*, or *Symbranchidæ*<sup>1</sup>.

But in the higher elevations of the western Ghauts I have observed that forms occur similar to those of the Himalayas, and also having representatives on the Malay peninsula and in the Malay archipelago; I have also remarked upon the genus *Scaphiodon* extending from the rivers of Syria, Palestine, and Asia Minor to Sind, where they have representatives in the hills, and also to the Salt range of the Punjab. Passing along the western Ghauts, we again come upon the same genus, which extends to the most southern extremity of the Neilgherries<sup>2</sup>. In a similar

<sup>1</sup> See 'Poissons de Madagascar,' Bleeker, 1874.

<sup>2</sup> I may also suggest an alternative route. *Homaloptera Brucei* and *H. maculata* are both found in the western Ghauts and also on the Himalayas. The genus exists in Java and Sumatra; we can also trace it up the Tenasserim coast, but it is absent from the Hindustan subregion. It would seem to have spread



manner I have taken the Siluroid genus *Euglyptosternum* from the rivers of the hills of N.E. Assam, from the upper portion of the Jumna at the foot of the Himalayas, and it likewise has been captured in Syria. *Barilius*, likewise found in East Africa, is distributed to both the Hindustan and Ceylonese subregions, extending into the Himalayas, and also distributed along the western Ghauts to Ceylon. These facts, if they prove any thing, would serve to show that at a former period a communication must have extended up the western coast of India to Sind; and as we do not find African types represented on the western Ghauts, we may infer that such occurred prior to the communication which took place between Africa and India. If, however, one genus of Carps could pass this way, so could another; and by this route the means of extension to the Himalayas would have been open; while by Ceylon and the Andamans fishes might also have extended to the Malay peninsula or the islands of the Malay archipelago.

I will but briefly remark upon the freshwater fishes of the Himalayan region, as I have elsewhere ("Fishes of Yarkand," P. Z. S. 1876, p. 781) followed out their distribution. We find two great classes, the Tartarian fauna from the Palæarctic region above the Himalayan descending to where it meets the Hindustan forms. It must not be forgotten in working out the details of these regions, that vast valleys having a tropical temperature exist in the Himalayas; and here some Indian forms have found congenial homes.

The *Schizothoracinae*, or hill Barbels, are entirely distinct from any low-country forms, consisting of *Carps more or less covered with minute scales or destitute of any; a membranous sac or slit exists anterior to the anal fin, and is laterally bounded by a row of vertically-placed scales arranged like eave-tiles, and which are continued along the base of the anal fin.* The genus *Oreinus* is that most frequently observed by European visitors to India, as it is found along the sub-Himalayan range: it is possessed of a transverse inferior mouth, and a sucker behind the lower jaw, demonstrating its necessity for some mechanical apparatus to enable it to withstand the force of the hill-torrents. As we ascend to the higher and less precipitous regions we find the gape of the

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from the Malay archipelago; but it is remarkable that the same species should only be found in two such widely separated localities as the Himalayas and the Ceylonese subregion of India.



mouth, if transverse, is anterior in the various genera; but the head is most commonly compressed, and the dorsal fin armed with a strong, serrated bony ray.

Having thus briefly shown the distribution of the Indian fresh-water fishes, and traced out the countries from which they have been derived, we come to the question, *What are the most typical families having representatives in India?*

Those most extensively distributed are the Ophiocephalidæ and Symbranchidæ, to which I have already alluded as strictly Oriental forms possessing an amphibious respiration: next we have the Labyrinthici, also Oriental, but with some African representatives which, however, do not extend to India; the Oriental genus *Anabas* extends from Assam to the eastwards; *Osphromenus* from N.E. Bengal and Assam, also to the east; whilst some have a more local range, as *Trichogaster*, from the Hindustan sub-region to Burma.

Doubtless the Siluridæ and Cyprinidæ are the forms most prevalent in the Indian fresh waters, the former being represented by 26, the latter by 35 genera. I propose first to investigate the Cyprinidæ, as they appear to be of a more northern (if not Palæarctic) origin than the scaleless Siluroids. Amongst the Cyprinidæ the first thing that deserves attention is the absence of additional means of respiration to the gills, as we see in the Acanthopterygians (as in Ophiocephalidæ and amongst the Labyrinthici), an addenda which is likewise seen amongst the Siluroids in the genera *Clarias* and *Saccobranchus*, and in the Symbranchidæ in the genus *Amphipnous*.

Seeing that out of these four large divisions of Indian freshwater fishes, the Cyprinidæ is the single one not possessing any species favoured with an amphibious form of respiration, we come to the consideration of what are the most typical genera of Indian Carps. We know of 226 species of Carps in India, 70 of which, or nearly one third, belong to the genus *Barbus*, a genus which has very close affinities with several others. If the mouth were a little more transverse, it would lead us to the *Cirrhina*<sup>1</sup>, possessing 5

<sup>1</sup> *Cirrhina latia* takes on various modifications in accordance with the localities it inhabits. In hill-streams it is seen as if it attached itself by the lower surface of its head to stones, as we find occurs in *Discognathus*, and the rudiment of a pad may be observed behind the lower lip. The passage of this form into *Discognathus*, having about the same number of rays and scales, would not appear to be very difficult. There is likewise another curious structural change which



species, while *Labeo*, with its 25 species, is simply a *Cirrhina* with more developed lips and a more extended dorsal fin; and the Burman forms of *Osteochilus* and *Dangila* are not very distantly removed from *Cirrhina* and *Labeo*.

Of the genus *Barbus* we have 3 subgenera:—(1) *Barbodes*, with four barbels, the species of which, if soberly coloured, attain to a large size, as the Mahseer to 90 lb., or even upwards of 100 lb., in weight; whereas those which are found richly coloured in clear and rapid mountain-streams are usually small: a strong dorsal spine (unless serrated) is mostly a sign that the species exists in the vicinity of high mountains. (2) Subgenus *Capoëta*, with two barbels, never attain the size reached by many of those with four barbels; some, especially when residents of hill-streams, are vividly coloured. (3) Subgenus *Puntius*, destitute of barbels, are usually of a small size.

If we briefly examine into the distribution of these three subgenera of the genus *Barbus*, we observe that the forms which exist in the European subregion are only those possessing four barbels; that they are distributed as far as the other divisions of the genus, but diminish in size the nearer they are to the tropics, provided they are solely residents of the waters of the plains. The subgenus *Capoëta* has not been recorded from Europe, but has been taken in Africa and also in Persia; still its numbers are small until we arrive at the Oriental region, throughout which it is distributed. The subgenus *Puntius* appears to be confined to Southern Africa and the Oriental region.

The foregoing seems to show that the larger forms, all of which are *Barbodes*, are probably descendants from Palæarctic progenitors. And this view is still further confirmed if we investigate *where these fishes breed*. If the hot plains of India in which they abound were the home of their ancestral forms from immemorial

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occurs not only in old examples of *Discognathus*, but in other Carps having Palæarctic representatives. I allude to a deep transverse fissure (generally accompanied with numerous large glands in its vicinity) which in some adults extends across the snout (see 'Fishes of India,' pls. 122 and 123), in others only a trace of such is present. We see the same modification occur in large examples of *Labeo* or *Cirrhina* in hilly regions and Assam, also, but to a less extent, in some species of *Barbus*, as *B. Thomassi* from the western Ghauts and *B. spilophilos* in Assam; while the only other true Carp which has Palæarctic representatives (excluding *Scaphiodon*) is the *Barilius*, and in hill examples of *B. tileo* this fissure is more or less well marked.



time, we should expect to see them breeding there; but we find that Barbels in India breed either in the waters of the plains or in those of hilly regions, whilst it is an invariable rule that the larger forms choose the latter place. Thus we see the Mahseer and its allies residents of rivers which take their origins in mountains, that during the cold months of the year, when the mountain-streams are at their minimum size, these fishes descend to the waters of the plains, but reascend the hill-waters with the first burst of the monsoon in order to deposit their ova in cooler localities. Although this is most easily observed on the Himalayas, I have likewise found the Mahseer in Sind, and that it ascends the Beloochistan hills to breed; that the same phenomenon occurs in Malabar, where the rivers descend from the western Ghauts; and I have likewise been fortunate enough to be a witness to the fact that the larger species of Barbel (*Barbodes*) in Southern India ascend the Neilgherry streams for the same purpose.

Some species of *Barbodes* of a moderate size breed in the waters of the plains of India; but these have generally a serrated bony ray to the dorsal fin. As a rule, all Barbels breeding in the plains are of a moderate or small size; whilst of the subgenus destitute of any barbels (*Puntius*) all are small, some minute, whilst none normally breed in hill-waters. This leads me to believe that *Puntius* is a degenerate *Barbodes*, due perhaps to constant residence in the plain; that such deterioration is shown in their diminutive size and want of barbels.

If such is the case, we ought perhaps to be able to show species in which this modification is even now going on; and such I believe I have found in Southern India. *Barbus mahicola*, Cuv. & Val., has two barbels, but is otherwise similar to *B. filamentosus*, Cuv. & Val., which possesses none. Should a number of examples be examined, it is seen that these appendages in some are very minute, being, as a rule, smallest in specimens obtained furthest from the hills. In South Canara, the Wynaad, and base of the Neilgherries, where the finest examples are met with, *B. mahicola* abounds; towards Cochin and up the Coromandel coast as far as Madras the barbels, when present, are small, and the *B. filamentosus* is the common type.

I may also here record a curious change which has occurred in one species of *Barbus*, the *B. conchoniis*, H. B., which has been transported, within the memory of man, from the plains into the *Nainee-tal* lake on the Himalayas. It is evidently losing the ser-



rations from its dorsal spine ; and in time, if this continues, it will become more like *B. terio*, H. B., than the typical form.

On the other hand, some Carps would appear to be more derived from the east, as :—*Chela*, from the Malay archipelago to the Hindustan and Ceylonese subregions ; *Semiplotus*, from Burma to Assam ; *Catla*, also from Siam and Burma to the Hindustan (but not the Ceylonese) subregions ; *Amblypharyngodon*, *Danio*, *Perilampus*, *Nuria*, and *Rohtee*, from Burma to India generally.

If we now turn to the Siluridæ or scaleless fishes, we find them represented by 26 genera composed of 85 species, demonstrating how inferior in numbers they are to the Carps. Some of these genera, as *Clarias* and *Saccobranchus*, have, as I formerly observed (“ On Amphibious and Migratory Fishes of Asia,” Journ. Linn. Soc. Zool. vol. xiii. p. 198 *et seq.*), respiratory organs having a lung-like function, and which are distinct from the gills ; and as all fishes having these accessory breathing-organs are restricted to tropical regions, we may assume that *Clarias* and *Saccobranchus* are tropical fishes.

I have already (Journal Linn. Soc. Zool. xii. p. 338) given an account of these fishes as found in India with the localities they inhabit ; and it is therefore unnecessary to adduce further reasons for considering that we have the remains of three distinct and separate faunas existing amongst the living freshwater fishes of India. The *first*, among the ancient granitic hills of the Western Ghauts, extending into Ceylon, and also found on the Himalayas and in the Malay archipelago, shows some former connexion between these various points. That the fish themselves are of two races—the Palæarctic, which were derived from Asia (or the Mediterraneo-Persic subregion) west of the Indus ; and the Malayan, which came through a continent now submerged beneath the Indian Ocean, a portion of which we, however, still discern in the Andamans and Nicobars. The *second* fauna, that of the plains, has an African element in it, and was likewise derived by a land communication west of the river Indus ; but, due to some cause, its genera, unless widely distributed, give but a small proportion of existing forms. The *third* fauna, and by far the largest, is spread over the plains of India, and derived its existence through communication being formed with Burma and countries to the eastward ; and these appear to have supplanted the prior African element from the waters of the plains.



*Table showing the distribution of Genera in the various Subregions.*

	Hindu- stan sub- region.	Ceylo- nese sub- region.	Hima- layas.	Burma and Siam.	Malay archipe- lago.
Ambassis .....	1	1	0	1	1
Nandus .....	1	1	0	1	1
Badis .....	1	1	0	1	0
Pristolepis.....	0	1	0	1	1
Sciæna .....	1	1	0	1	1
Gobius .....	1	1	0	1	1
Sicydium .....	0	1	0	1	1
Periophthalmus .....	1	0	0	1	1
Eleotris .....	1	1	0	1	1
Rhynchobdella .....	1	1	0	1	1
Mastacembelus .....	1	1	1	1	1
Mugil.....	1	0	0	1	1
Ophiocephalus .....	1	1	1	1	1
Channa .....	0	1	0	0	0
Anabas .....	1	1	0	1	1
Polyacanthus.....	0	1	0	0	1
Osphromenus .....	1	0	0	0	1
Trichogaster .....	1	0	0	1	1
Etroplus .....	0	1	0	0	0
Macrones .....	1	1	0	1	1
Liocassis.....	1	0	0	0	1
Erethistes .....	1	0	0	1	0
Rita .....	1	0	0	1	0
Pangasius .....	1	0	0	1	1
Pseudeutropius.....	1	1	0	1	1
Olyra .....	1	0	0	1	0
Callichrous .....	1	1	0	1	1
Wallago.....	1	1	0	1	1
Silurus .....	0	1	1	1	1
Chaca .....	1	0	0	1	1
Clarias .....	1	1	0	1	1
Saccobranchus .....	1	1	0	1	0
Silundia .....	1	0	0	1	0
Ailia .....	1	0	0	0	0
Ailiichthys.....	1	0	0	0	0
Eutropiichthys .....	1	0	0	1	0
Amblyceps.....	1	0	0	1	0
Sisor .....	1	0	0	0	0
Gagata .....	1	0	0	1	0
Nangra .....	1	0	0	0	0
Bagarius .....	1	1	0	1	1
Glyptosternum .....	1	0	1	0	1
Euglyptosternum .....	1	0	0	0	0
Pseudecheneis .....	1	0	1	0	0
Exostoma .....	1	0	1	1	0
Belone .....	1	1	0	1	1
Cyprinodon .....	1	0	0	0	0
Haplochilus .....	1	1	0	1	1
Carried forward ...	42	25	6	35	29



Table (continued).

	Hindu- stan sub- region.	Ceylo- nese sub- region.	Hima- layas.	Burma and Siam.	Malay archipe- lago.
Brought forward ...	42	25	6	35	29
Homaloptera.....	0	1	1	1	1
Psilorhynchus .....	1	0	0	0	0
Discognathus.....	1	1	1	1	0
Oreinus .....	0	0	1	0	0
Schizopygopsis .....	0	0	1	0	0
Schizothorax .....	0	0	1	0	0
Ptycobarbus .....	0	0	1	0	0
Diptychus .....	0	0	1	0	0
Labeo .....	1	1	1	1	1
Osteochilus .....	0	0	0	1	1
Dangila .....	0	0	0	1	1
Cirrhinna .....	1	1	1	1	1
Semiplotus.....	1	0	0	1	0
Scaphiodon .....	1	1	0	0	0
Catla .....	1	0	0	1	0
Thynnichthys .....	1	0	0	0	1
Amblypharyngodon ...	1	1	0	1	0
Barbus .....	1	1	1	1	1
Nuria .....	1	1	0	1	0
Rasbora .....	1	1	0	1	1
Aspidoparia .....	1	0	0	1	0
Rohtee .....	1	1	0	1	0
Barilius .....	1	1	1	1	1
Danio .....	1	1	0	1	0
Perilampus .....	1	1	0	1	0
Chela .....	1	1	0	1	1
Botia .....	1	0	1	1	1
Acanthopsis .....	0	0	0	1	1
Somileptes .....	1	0	0	0	0
Lepidocephalichthys...	1	1	0	1	1
Acanthopthalmus ....	1	0	0	1	0
Apua .....	0	0	0	1	0
Jerdonia .....	0	1	0	0	0
Nemacheilichthys.....	1	0	0	0	0
Nemacheilus .....	1	1	0	1	1
Notopterus.....	1	1	0	1	1
Amphipnous .....	1	0	0	1	0
Monopterus .....	0	0	0	1	1
Symbranchus.....	1	1	0	1	1
Total .....	69	44	18	63	46





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