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# RESEARCH ARTICLE

# OVERVIEW PRESENTATION AND STATISTICAL REPRESENTATION OF ICTHYOFAUNAL DIVERSITY, THREATS AND CONSERVATION OF SRIKAKULAM DISTRICT WETLANDS, ANDRAPRADESH, INDIA

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## ABSTRACT

Wetlands are among the most productive ecosystems in the srikakulam district and its play a vital role in flood control, aquifer recharge, nutrient absorption and erosion control. . In addition, wetlands provide home for a huge diversity of fishes. The Indian fish fauna is divided into two classes, viz., Chondrichthyes and Osteichthyes. The Chondrichthyes are represented by 131 species under 67 genera, 28 families and 10 orders in the Indian region (Kar *el al,* 2000). The Indian Osteichthyes are represented by 2,415 species belonging to 902 genera, 226 families and 30 orders,birds, mammals, frogs, insects and plants (Buckton, 2007).Thus the wetlands help in maintaining biodiversity of fauna. Fourt six (46) fish species of fishes were collected during a systematic survey of 54 wetlands in srikakulam district in andrapradesh state, during the study period from April 2013 to March 2014. Based on this survey and on literature review I was prepared a checklist with 46 species , economic classification , statistical reports and threats of srikakulam district welands. The present study indicates importance of the icthyofauna of wetlands. In view of the degradation of wetlands more complete detailed studies and conservation measures should be necessary for sustainable ecosystems in the district srikakulam.

***Key Words:*** Wetlands, Diversity, Economic Classification, Checklist, Conservation, Srikakulam

## INTRODUCTION

Fresh waters make up only around 0.01% of the world's water and approximately 0.8% of the earth's surface (Gleick 1996). Hence, although fresh water is quantitatively much smaller than marine water, it owns high biodiversity. For instance, Nelson (2006) recorded that about 11,952 fish species, or 43% of all fish species, belonging to 33 orders, live exclusively in freshwater lakes and rivers. However, fresh water ecosystems may well be the most endangered ecosystems in the world and the decline in fresh water biodiversity is far greater than in most affected terrestrial ecosystems (Sala *et.al.*2000). The wetland provides habitat to diverse fauna including some rare and threatened fauna. Potentially fish resources are the richest, in terms of production too. The wetlands of Srikakulam district has been faced several anthropogenic pressures and has undergone tremendous ecological changes. These wetlands are facing multidimensional threats and are under pressure from pollution, eutrophication and agricultural encroachments besides conversion of wetland for aquaculture. The plethora of factors contributing to the decline in habitat quality and species population has been growing in the past few decades.

### Icthyfaunal diversity in wetlands

The Indian fish fauna is divided into two classes, viz., Chondrichthyes and Osteichthyes. The Chondrichthyes are represented by 131 species under 67 genera, 28 families and 10 orders in the Indian region (Kar *et al,* 2000). The Indian Osteichthyes are represented by 2,415 species belonging to 902 genera, 226 families and 30 orders, of which five families, notably the family Parapsilorhynchidae is endemic to India. These small hill stream fishes include a single genus, viz., *Parapsilorhynchus,* which contains 3 species. They occur in' the Western Ghats, Satpura Mountains and the Bailadila range in Madhya Pradesh only. The fishes of the family Psilorhynchidae with the only genus *Psilorhynchus* are also endemic to the Indian region. Other fishes endemic to India include the genus *OZytra* and the species *Horaichthys setnai* belonging to the families Olyridae and Horaichthyidae respectively. The latter occur from the Gulf of Kutch to the Trivandrum coast. The endemic fish families form 2.21 per cent of the total bony fish families of the Indian region. 223 endemic fish species are found in India, representing 8.75 per cent of the total fish species known from the Indian region and 128 monotypic genera of fishes found in India, representing 13.20 per cent of the genera of fishes known from the Indian region.

Fish are invariable living components of water bodies. These organisms are important food resource and good indicators of the ecological health of the waters they inhabit. However, the rich biodiversity of the freshwater fish of the Indian region has been rapidly dwindling because of increasing degradation of inland water. Srikakulam distict has lot of wetlands which are home to diverse fish species, of which many are endemic to this region. The fish resources in the lotic systems had not been completely explored because most of the rivers are located in unapproachable mountainous steep terrain with dense forest cover. The aim of this study was to catalogue the wetland fish species diversity in srikakulam district.

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## MATERIALS AND METHODS

Srikakulam District (Fig1) formerly known as Chicacole. Historically, Srikakulam is a part of Kalinga kingdom which was ruled by the kings of Eastern Ganga Dynasty for more than 800 years from 6th to 14th Centuries A.D. During the early centuries and even before Christ Buddhism flourished here and the excavations of Salihundam, Jagathimetta and Danthapuri reveal that the people enjoyed rich cultural life and that they did peace love. The land is famous for so many temples with exquisite sculpture which are like LYRICS ON STONE. It was carved out in 1950 by bifurcating it from Visakhapatnam District; it remained unaffected in its territorial jurisdiction for quite some time. The district Srikakulam, situated between $18^0$ 20' and $19^0$, 10'N latitudes and $83^0$ 05' and $84^0$ 50' E longitudes, is the north eastern most one in AP state. The district is divided into 38 Mandals under three Revenue Divisions viz. Srikakulam, Palakonda and Tekkali. The district shares boarders with Odisha state in the north, Vizhinagaram district of AP in the south while Bay of Bengal lies along the east. In the district the altitude varies from sea level to above 1100 m above msl in the hills. The district receives an annual average rainfall of 1162.5 mm. The district can be distinctively divided, based on the terrain and geomorphology, into three zones namely i) the Hills, ii) the Midland plains and iii) the Coastal plains. Most of the wetlands are seen in the coastal plains followed by the midland plains. The coastal plains harbour major four large wetlands namely, Naupada, Sompeta, Ichapuram and Poondi.

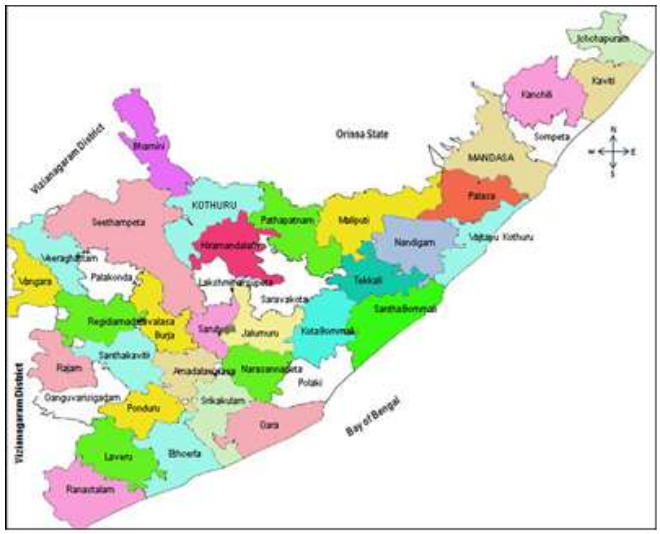


**Fig.1. study area**

Apart from these major wetland complexes, there are hundreds of small and medium, seasonal and perennial wetlands in the coastal area. The major rivers of the district, Nagavalli, Mahendratanaya and Vamsadhara drain into Bay of Bengal. The river Vamsadhara originating in the Eastern Ghats of Odisha state enters Srikakulam district in Bhamini Mandal and finally flows into the Bay of Bengal near Kalingapatanam. The river Nagavalli and its tributary, Swarnamukhi originate in the Eastern Ghats and joins the Bay of Bengal at Kallepalli near Srikakulam town. Other smaller rivers such as Mahendratanaya and Bahuda drain into the northern parts, a narrow stretch of land between the Eastern Ghats and the sea. The fishes were collected with the help of local fishermen by using different types of nets viz. hand nets, cast nets, stake nets, drag nets and gill nets. A Collection of catch and statistics based on regular surveys to make an assessment of the stock of the different species and the important varieties. February onwards water in the shallow areas which are likely to be exposed in the immediate future is bailed out and cross bunds are raised across the wetland areas, so that fish get congregated near the shore into pits. The fish are caught by dragnets or hand picking. The fishes caught were examined for their colour bands or spots present on the body and recorded in the field. They were brought to laboratory noting down the colour and other morphological features and the specimens were preserved in 4% formalin. Seasonal collections were made from April 2012 to Mrch 2014 spanning over a period of two years.

The specimens brought to laboratory were further studied for their species identification. The collected specimens were immediately dipped in 10 % formalin after removed from water in a spacious container that allowed proper spreading of their fins. Two to three changes of specimens in fresh formalin preparation of 10 % dilution was adopted during the sampling time. When necessary, peritoneal administration of the preservative has also been done. By the end of each sampling the specimens were examined on field and classified into different families; which were carried in separate containers. Each container was labeled properly against the physical data sheet of the sampling station and brought to the laboratory for further taxonomic exercise. Morpho-taxonomic counts and identifications have been done following Kottelat (2001). Measurements were taken up to the one tenth of a millimeter using dial calipers. Some published literatures were consulted for confirmation of the species and taxonomic review of the identification (e.g, Hora and Mukerji 1935; Hora 1937; Ghosh and Lipton 1982; Sen 1985; Sen 2000; Kottelat 1990; Talwar and Jhingran 1991; Nath and Dey 1997; 2000; Jayaram 1999; Menon 1999; Ng and Rainboth 2001; Ng 2005; 2006; Tamang et al. 2006; 2007; Vishwanath and Darshan 2007; Nebeshwar et al. 2007). The present checklist has been prepared as per the valid names available in the online catalog of fishes. The results of this study are presented in a way to provide relevant information.

## RESULTS AND DISCUSSION

The results of present investigations confirmed the occurrence of fourty six (46) species of fishes belonging to six orders and eighteen families recorded in commercial catches (check list, table 1,2,3,4, fig1, 2, 3,). The order cypriniformes was dominant with 18 species followed by order perciformes with 16 siluriformes with 08 species, while the order cyprinidontiformes were represanted by 02 Angulliformes were represented by 01 species and order osteoglossiformes with 01 species. The commercial catches are represented by Carps, Catfishes, Eels, Perches, Murrels and rest of them belonging to miscellaneous category. The average annual catches of various species and their percentage composition in the annual landings in the year 2006 the production of fish was 84,597 metric tonnes and the catch decreased to 76, 215 metric tonnes in 2010. After that implimantation of proper technical and traditional methods the production in 2013 is 1, 02,161 metric tonnes per year. The major carps like *Catla catla, Cirrhinus mrigala and Labeo rohita,* were once available in large numbers growing to a very large size. These fishes

**Table 1. Percentage composition of different species of fish in srikakulam wetlands (7093 m.t)**

| Species | Percentage (%) |
|---|---|
| Barbus | 7.6 |
| Indian major carps | 69.9 |
| Catfishes | 2.0 |
| Murrels | 4.9 |
| Mullets | 1.8 |
| Miscellaneous | 13.8 |
| Total | 100% |

**Table 2. Economic classification of fishes of srikakulam wetlands**

| Name of the fish | Commercial | Fine food | Coarse food | Aquarium fish | Forage fish | Others |
|---|---|---|---|---|---|---|
| *1.Notopterus notopterus* | - | - | X | - | - | MV |
| *2.Anguilla nebulosa* | - | - | X | X | - | - |
| *3.Catla catla* | X | - | - | - | - | C |
| *4.Cirrhinus mrigala* | X | - | - | - | - | C |
| *5.C. reba* | X | X | - | - | - | C |
| *6.Ctenopharymgodon idellus* | X | - | - | - | - | C |
| *7.Cyprinus carpio* | X | - | - | - | - | C |
| *8.L.calbasu* | X | - | - | - | - | - |
| *9. L. fimbriatus* | X | - | - | - | - | C |
| *10.L. rohita* | X | - | - | - | - | C |
| *11.Osteobrama catiocunma* | - | - | X | - | X | - |
| *12.Puntius amphibious* | - | - | - | X | - | - |
| *13.P. chola* | - | - | X | X | - | - |
| *14.P. sarana sarana* | X | X | - | - | - | - |
| *15.P. sophore* | - | - | - | X | - | B&MV |
| *16.P. ticto* | - | - | - | X | - | B |
| *17.P. stigma* | - | - | - | X | - | - |
| *18.Hypophthalmichthys molitrix* | X | - | - | - | - | C |
| *19.Amblypharyngodon mola* | - | - | - | X | X | - |
| *20.Esomus barbatus* | - | - | - | X | - | - |
| *21.Mystus bleekeri* | - | - | X | - | - | |
| *22.M. cavasius* | - | X | - | - | - | |
| *23.M. gulio* | - | X | - | - | - | |
| *24.M. vittatus* | - | - | X | - | - | |
| *25.Ompok bimaculatus* | X | - | - | - | - | |
| *26.Wallago attu* | X | - | - | - | - | |
| *27.Clarias batrachus* | X | X | - | - | - | BP&SV |
| *28.Heteropneustes fossilis* | X | X | - | - | - | MV |
| *29.Aplocheilus panchax* | - | - | - | - | X | LV |
| *30.Gambusia affinis* | - | - | - | - | - | LV |
| *31.Chanda nama* | - | - | - | X | - | PH |
| *32.Nandus nandus* | - | - | X | - | X | - |
| *33.Etroplus maculates* | - | - | - | X | - | - |
| *34.E. suratensis* | - | - | - | X | - | - |
| *35. Glossogobius giuris* | - | - | X | - | - | - |
| *36. Anabas testudineus* | - | - | X | - | - | - |
| *37. A. oligolepis* | - | - | - | - | X | MV |
| *38. Colisa fasciatus* | - | - | - | X | - | - |
| *39.Osphronemus goramy* | X | - | - | - | - | - |
| *40.Channa marulius* | X | - | - | - | - | C |
| *41. C. orientalis* | - | X | - | - | - | C |
| *42. C. punctatus* | X | - | - | - | - | C |
| *43. C. striatus* | X | - | - | - | - | C |
| *44. Macrognathus aral* | - | X | - | X | - | - |
| *45. M. pancalus* | - | - | - | X | - | - |
| *46.Mastacemblus armatus* | X | - | - | - | - | - |

**Key to Table: X**-Use, - - Not in use, **Commercial** - Species which are prolific breeders, can be cultured and have market value**, Fine food** - Having good taste and protein value, **Coarse food** - Have less food value and preferred as a food by the poor people, **Aquarium fish -** Can be maintained in aquarium for aesthetic and recreational value, **Forage fish** - Food for predatory fishes**, Others** - Having some extra qualities such as **MV** - Medicinal value, **B** - Bait, **SV** - Scientific value, **BP** - By-product, **PH** - Public Health, **LV** - Larvivorous, **C** – Cultivable.

became increasingly scarcer in recent years. Apart from carps, the tanks used to support a rich fishery of catfishes, perches, murrels, eels and miscellaneous groups of fish, with an estimated catch of over 7607 M. tons /year. Presently the fishery consist mostly Airbreathing fishes like *Anabas, Clarius, Heteropnuestes, Mastacembalus*, which are also depleted. Their number has not dwindled so drastically as the major carps. Fishes of minor importance are Mystus which are patchy in their distribution in the lake. *Puntius sarana* represented in small numbers.*Channa marulius* and *C. orientalis* are rare in the catches. The species are classified on the basis of commercial importance by following proforma given by Lalger (1956). Out of 46 species, 19 species are commercially important, 08 species have fine food value and

14 species are classified as coarse food fishes as they form food for poor people of this region.

**Table 3. Order wise Ichthyofauna diversity of srikakulam wetlands**

| Orders | Families | Sub families | Genus | Species |
|---|---|---|---|---|
| Angulliformes * | 1 | 0 | 1 | 1 |
| Cypriniformes * | 1 | 3 | 10 | 18 |
| Osteoglssiformes | 1 | 0 | 1 | 1 |
| Cyprinodontiformes | 2 | 0 | 2 | 2 |
| Siluriformes | 4 | 0 | 5 | 8 |
| Percifromes | 9 | 2 | 10 | 16 |
| | 18 | 5 | 29 | 46 |

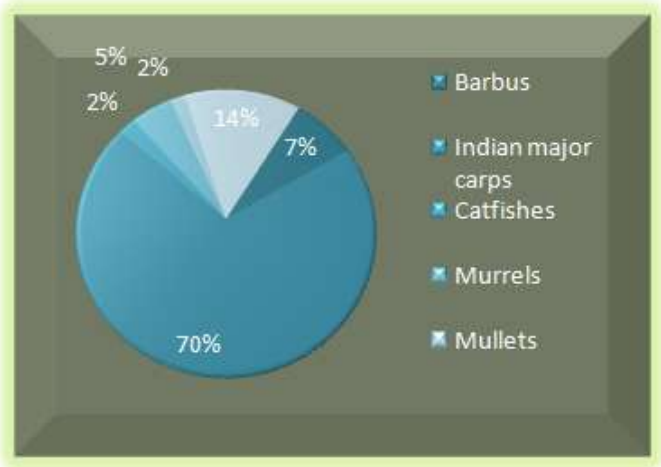


**Fig. 2. species wise percentage representation of icthyofaunal diversity**

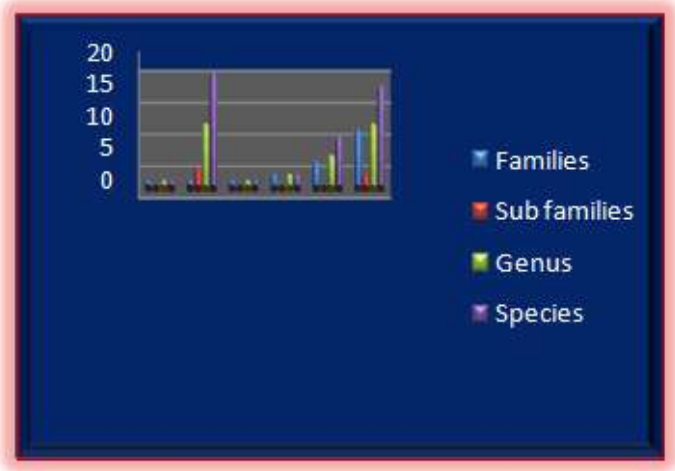


**Fig. 3. Order wise number of itchy faunal diversity in srikakulam wetlands**

14 species are suitable for aquarium, while 02 species have importance in public health, as they are larvivorous and others are of medicinal value. Jayaram (1981) listed 742 freshwater species of fishes under 233 genera, 64 families and 16 orders from the Indian region, the fishes of India contain 223 endemic species and 127 monotypic genera representing 13.10% of the Indian genera of fishes. There are 159 species of fishes listed in Andhra Pradesh, out of this 53 species are carnivorous, 26 are herbivorous and 81 are omnivorous. Cat fishes are omnivorous species. In my observations Wetlands of srikakulam harbour 46 species of fishes, of which 19 species contributed to the commercial fisheries. Indian major carps occupy a prominent place among the commercially important fishes. More recently, number of exotic species contributed substantially to commercial fisheries. Being basically a carp country both the indigenous and exotic Carps, Catla, Rohu, Mrigal, Silver carp, Grass carp and Common carp account for a great bulk of the production. The natural waters of the lake support fisheries of considerable magnitude.The species identified include rare and threatened species *(Anguilla nebulosa, Cirrhinus Reba, Puntius chola, Puntius sarana* etc.), under various degree of threat. The categorization and status is accordingly to Menon (1999) and others (Jayaram 1999, Chhapgar and Manakadan 2000 and Viswanath 2002). The categorization has been done on the basis of the population size or degree of threat within the state. The distribution of threatened freshwater fishes in India compiled by Ranjit Danials (2006). Few fish species are considered as edible healing for diseases. *Channus punctatus* is used in the treatment of Asthmatic pateints. Airbreathing fishes *Heteronuestos, Clarius and Anabas* are known for their nutritive, invigorating and therapeutic qualities and recommended by Physicians as diet during convalescence. Fish farms situated closer to the industrial effluents points are the worst effected. Heavy mortality of *L. rohita* and *C. catla* was observed in culture tanks. On examination, they were found to be anaemic. Yasuo (1979) states that anemia sometimes occurs to cultured fishes as a result of eutrophic disease or herbicides or due to loss of blood resulting from gill capillary wall. Cultured fish con not escape adverse conditions. They simply die enmasse. Apart from these drawbacks fish exposed continuously to polluted waters are impoverished because of the pathological changes taking place on a large scale.

**Table 4. Order and percentage wise no of fishes of srikakulam wetlands**

| Order | No of fishes | Percentage of fishes% |
|---|---|---|
| Angulliformes * | 1 | 2.2 |
| Cypriniformes * | 18 | 39.1 |
| Osteoglssiformes | 1 | 2.2 |
| Cyprinodontiformes | 2 | 4.4 |
| Siluriformes | 8 | 17.3 |
| Percifromes | 16 | 34.8 |
| | 46 | 100% |

Such fish are vulnerable for diseases. The parasites are opportunists and take a firm hold on impoverished fish. External symptoms, (gill rot, fin rot, descaling, opercular rot, skin rot, bulged abdomen, etc.) fungal, bacterial infested fish are a common sight in these tanks. Fish diseases have given rise to heavy fish mortalities observed in fish tanks. Indiscriminate Fish diseases are experienced and epizootic ulcerative syndrome symptoms and genetically deformed fishes are observered in water bodies of these areas. The water of these wetlands maintains ideal ecological conditions suitable for fish production. The Temperature $32^0$, dissolved $O_2$ 5-7 ppm, PH 7.5-8.5, turbidity 25-40 cm, and nutrients (rich) appear to be ideal for pisciculture. Hence Schemes were formulated to construct fish tanks along the wetlnds. Each tank is given to a Fishermen Cooperative Societes. There are 127 such societies with a membership of 22,525 People. Aquaculture operations have negative impact on the ecosystem. There is rapid deterioration of the waters of these wetlands, because of the indiscriminate discharge of pollutants,

which are posing an environmental problem for the very existence of these wetlands. Extensive encroachments of these wetlands for intensive agriculture, using chemical fertilizers and pesticides. The conditions with regard to pesticides accumulation in wetlandswaters are quite serious and not only uninhabitable to fish, but also toxic for long stretches in the neighborhood of effluent points. Aquaculture effluents and agriculture runoff directly enter the area. The possible effects of aquaculture chemicals on the quality of water and fish have the effects on those who consume contaminated fish with pesticides i.e humans and birds. Pesticides in water and from fish farms produce various effects on fish such as chronic changes in behaviour and morphological and physiological changes. The hygienic viewpoint the pesticide levels of fish from fish farms were higher. Fishes contaminated with pesticides may not be consumed as food. The input of chemicals such as pesticides in intensive agriculture may cause the accumulation of pesticides in fish tissues from fish farms. It is dangerous for the human beings who consume them without fear by eating pesticide contaminated fish. These need to be accelerated by regular monitoring of water quality with regard to pesticides and their accumulation in fish muscle.

The fish fauna have been subjected to the adverse impact resulting in dwindling of certain species. In recent times fishes are being threatened due to loss of habitat and diverted the wetland for agriculture purposes. Deleterious effects also result from pollution. Hence there is need for the conservation of the wetlands for future generations. People living near wetlands whose livelihood on the services are directly harmed by their degradation. Conservation of water bodies of these wetland areas helps in maintaining the freshwater Ichthyofaunal diversity and production to some extent. It is an important factor for sustaining of fisheries and their interconnected role in the food chain where waterfowl depend upon. This communication is primarily aimed to compile the information generated by me and previous workers on the occurrence of various fish species from the wetlands of srikakulam district, andrapradesh, india, the details about taxonomy and speciation have not been considered.

**Check – List of Fishes**

| | | |
|---|---|---|
| Grade | : | Pisces |
| Class | : | Osteichthyes |
| Sub – Class | : | Actinopterygii |
| Sub-division | : | Teleosti |

Order: Osteoglossiformes
Family**:** Notopteride **(Feather backs)**
Genus: Notopterus Lacepede

1. *Notopetus notopterus* (Pallas)
Order: Cypriniformes
Family: Cyprinidae (Carps)
Sub- family: Cyprininae
Genus: Catla Valenciennes

13. *Catla catla* (Hamilton-Buchanan) **(Catla)**
Genus: Cirrhinus Cuvier

3. *Cirrihinus mrigala* (Hamilton-Buchanan)
4. *Cirrihinus reba* (Hemilton-Buchanan)
Genus: Ctenopharyngodon Steindachner

**5.*Ctenopharyngodon idellus* (Valenciennes)
Genus: Cyprinus Linnaeus

**6. *Cyprinus carpio* Linnaeus **(Common Carps)**
Genus: Labeo Cuvier

7. *Labeo calbasu* (Hamilton-Buchanan)

8. *Labeo fimbriatus* (Bloch)

9. *Labeo rohita* (Hamilton-Buchanan)

Genus: Osteobrama Heckel

10. *Osteobrama Catio cunma* (day)
Genus: Puntius Hamilton-Buchanan

11. *Puntius amphibious* (Valenciennes)

12. *Puntius chola* (Hamilton-Buchanan)

13. *Puntius sarana* (Hamilton-Buchanan)

14. *Puntius sophore* (Hamilton-Buchanan)

15. *Puntius ticto* (Hamilton-Buchanan)

16. *Puntius stigma* (Day)
Genus: Thynnichthys Bleeker
Sub- family: Leuciscinae
Genus: Hypophthalmichthys bleeker

** 17. *Hypophthalmichthys molitrix* (Valenciennes)
Sub-family: Rasborinae
Genus: Amblypharyngodon Bleeker

18. *Amblypharyngodon mola* (Hamilton-Buchanan)
Genus: Esomus Swainson **(Flying barb)**

19. *Esomus barbatus* (Jerdon)
Family: Coditidae
Sub- family: Cobitinae
Order: Siluriforme
Family: Bagridae **(Bagrid Catfishes)**
Genus: Mystus Scopoli

20. *Mystus bleekeri* (Day)

21. *Mystus cavasius* (Hamilton- Buchanan)

22. *Mystus gulio* (Hamilton-Buchanan)

23. *Mystus Vittatus* (Bloch)
Family: Siluridae **(Eurasian catfishes, Sheat fishes)**
Genus: Ompok Lacepede

24. *Ompok bimaculatus* (Bloch)
Genus: Wallago Bleeker

25. *Wallago Attu* (Schneider*)*
Family: Clariidae **(Air- breathing catfishes)**

Genus: Clarias Scopoli

26. *Clarius batrachus* (Hamilton-Buchanan)
Family: Heteropneusstidae **(Stinging catfishes)**
Genus: Heteropneustes Muller

27. *Heteropneustes fossilis* (Bloch)
Family: Aplocheilidae (Riverlines)
Genus: Aplocheilus McClelland

28. *Aplocheillus Panchax* (Hamilton-Buchanan)
Family: Poeciliidae **(Live bearers)**
Genus: Gambusia poey

29. *Gambusia affinis* (Baird & Girard)
Order: Perciformes
Family: Ambassiade **(Glass fishes)**
Genus: Chanda Hamilton- Buchanan

30. *Chanda Nama* (Hamilton-Buchanan)
Family: Nandinade (Leaf fishes)
Genus: Nandus Valenciennes

31. *Nandus nandus* (Hamilton-Buchanan)
Family: Cichlidae **(Cichlids)**
Genus: Etroplus Cuvier **(Pearlspot)**

32. *Etroplus maculates* (Bloach)

33. *Etroplus suratensis* (Bloch)
Sub-order: Mugiloidei
Family: Gobiidae (**Gobies)**
Sub-family: Gobiinae
Genus: Glossogobius Gill

34. *Glossogobius giuris* (Hamilton-Buchanan)
Family: Anabantidae **(Climbing perches)**
Genus: Anabas Cuvier & Cloquet

*35*. *Anabas testudinenus* (Bloch)

36. *Anabas oligolepis* (Bleeker)
Family: Belontiidae
Sub family: Trichogasterinae
Genus: Colisa Cuvier

37. *Colisa fasciatus* (Scheneider)
Family: Osphronemidae **(Giant gouramy)**
Genus: Osphronemus Lacepede

38. *Osphoronmus goramy* (Lacepede)
Family: Channidae **(Snake- heads/ Murrels)**
Genus: Channa Scopoli

39. *Channa marulius* (Hamilton-Buchanan)

40. *Channa Orientalis* (Bloch&Schneider)

41. *Channa punctatus* (Bloch)

42. *Channa striatus* (Bloch)
Family: Mastacembelidae **(Spiny eels)**
Genus: Macrognathus Lacepede

43. *Macrognathus aral* (Bloch& Schenider)

44. *Macrognathu spancalus* (Hamilton-Buchanan)
Genus: Mastacembelus Scopoli

45. *Mastacembelus armatus* (Lacepede)
Order: Anguilliformes
Family: Angullidae **(Freshwater eels)**
Genus: Anguilla schrank

46. *Anguilla nebulosa* Mc Clelland
**Introduced fishes; ***Invasive alien species

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