Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

J E Z S Journal of Entomology and Zoology Studies

ISSN 2320-7078
JEZS 2014; 2 (5): 358-364

Received: 17-08-2014
Accepted: 13-09-2014

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Review on fresh water fish diversity of Maharashtra (India)

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Abstract
Biodiversity is essential for balancing ecosystem and facing varied problems to environment. Globally nature as well as animal diversity are affected due to increase in unwise anthropogenic activities. Aquatic ecosystem is also adversely affected due to release of wastes in it. In the field of Ichthyology there is valuable contribution by many workers. As far as economic importance is concerned, the scope of fish and fisheries in Maharashtra is of prime interest. The current review deals with the freshwater fish recorded and confirmed by various authors, 165 species belonging to 09 orders, 26 families and 82 genera in Maharashtra during 2000 to 2014 and will be useful for fishermen, consumers, fish industry producers and researchers.

Keywords: Fresh water fish diversity, Maharashtra and Western Ghats.

1. Introduction
The fresh water resources are very precious for the life on our planet. The number of dams, reservoirs, tanks, etc. has significantly increased in last few years. The aquatic ecosystem is important and it has large number of economically important animals especially fish which is an important source of food. The development of fisheries in these fresh water resources needs to be increased through the scientific development. Anthropogenic activities have drastically damaged the natural habitat of all the living beings. Fresh water resources are used for various purposes, like agricultural, industrial, household, recreational, environmental activities etc. Though river water is used for agriculture, fisheries, residential and industrial developments, mining activity, navigation, power generation and variety of other activities including sand digging and disposal of industrial and domestic wastes, some natural breeding does exist in the nature. Identification of those natural breeding grounds and to bring them under proper conservation is the most effective way of natural breed conservation. Several authors showed Western Ghats of India as a rich freshwater fish fauna with a high level of endemism [13]. The reservoirs form one of the most important sources of large number of living aquatic animals, which are economically important for nature as well as for human beings as food. Cyprinid fish is one of the most important groups of vertebrates for man and influencing his life. The nutritive and medicinal value of fish has been recognized from ancient time to recent era. Maharashtra is rich in freshwater (rivers, irrigation canals, dams, and lakes) reservoirs and its fish diversity. Therefore, Maharashtra is one of the important states for fish production and natural water resources and there is great scope for developing fisheries in this state. Fish diversity is declining rapidly each day due to unending anthropogenic stress. This diversity is not only the wealth of our world but it also has some serious implications on fishery. Thus there is an urgent need for proper investigation and documentation of this fish diversity in order to develop a fresh water fish diversity information system having both bioinformatics and georeferenced databases of fish and fish habitat. In the present review documentation of the fish fauna of fresh water reservoirs in the Maharashtra state for 2000 to 2014 is done.

2. Discussion
A total of 165 fish species have been recorded and confirmed by various authors in Maharashtra, belonging to 09 orders, 26 families and 82 genera. Sakhare [23] investigated the occurrence of 23 fish species belonging to 7 orders in Jawalgaon reservoir in Solapur district of Maharashtra.

The fishes belonging to order Cypriniformes were dominant with 11 species followed by order Siluriformes with 4 species, while orders like Osteoglssiformes, Perciformes and Channiformes were represented by 2 species and the rest of the orders by single species. Yazdani and Sing [34] have given an account of fish resources of Bhima river at Indapur and found 54 species belonging to 15 families. Wagh and Ghate [33] noticed 62 species from Mula and Mutha River in Pune. Pawar *et al.* [20] noticed 11 fish species belonging to 5 orders from Sirur dam of Nanded District. Khedkar [14] observed 67 fish species belonging to 7 orders and 19 families from Nathsagar reservoir from Paithan, Dist. Aurangabad. Of the total 58 species, 8 were abundant, 21 common, 19 moderate and 10 rare in the study area. 6 species are considered as threatened from the Koyna river by Menon [16]. Kalbande *et al.* [9] noticed 29 fish species from Rawanwadi Lake in Bhandara district. Shinde *et al.* [28] have recorded that the order Cypriniformes is found to be dominant with 11 species, followed by Perciformes 3 species and Siluriformes with 1 species from the Harsool-Savangi dam (Aurangabad) *Hypothalmichthys molitrix* and *Puntius ticto* were found in abundance. Shinde *et al.* [29] in Pravara river at Pravara Sangam (Ahmednagar) reported 41 fish species belonging to 7 orders, 14 families and 26 genera. Among the collected species, order Cypriniformes was the most dominant constituting 50% followed by order Siluriformes constituting 19%, Perciformes constituting 14.28%, Osteoglossiformes and Synbranchiformes constituting 4.76% and Mugiliformes and Beloniformes constituting 2.38% of the total fish species. Shahnawaz *et al.* [25] recorded 56 species of fish representing 39 genera and 15 families from Bhadra river of Western Ghats. Sarwade and Khillare [24] reported the variety and abundance of fresh water fish from Indapur Dist. Pune. In this investigation the occurrence of 60 fish species belonging to 6 orders, 15 families and 36 genera was noted. The members of order Cypriniformes were most dominant constituting 66.66%, Perciformes constituting 11.66%, Siluriformes constituting 10%, Beloniformes constituting 8.33%, Osteoglossiformes constituting 3.33% and Synbranchiformes constituting 1.66% of the total fish species. Heda [4] identified 47 fish species from two rivers of Godavari basin. Ohol and Kamble [17] observed 59 diferent species of fish from the Sangli District. Supugade *et al.* [30] recorded 20 species from 13 genera and 7 families included in 4 orders from Ghogaon reservoir of Satara district. Ubharhande *et al.* [31] reported that ichthyofauna of Ambadi dam belonged to 08 orders 11 families, 22 genera and 27 species where Cyprinidae family was found to be dominant with 13 species which constituted 48.16% besides family Balitoridae, Bagridae, Channidae and Mestacembelidae contributed 02 species each with 7.41% and family Clarridae, Cichlidae, Notopteridae, Belonidae and Mugilidae contributed 01 species each with 3.70%. Shaikh *et al.* [26] observed 27 fish species belonging to 7 orders 15 genera and 9 families from upper Dudhna project water reservoir near Somthana at Jalna. Jadhav *et al.* [6] have recorded 58 fish species belonging to 16 families and 35 genera. Rankhamb [22] investigation revealed the occurrence of 26 fish species belonging to 05 orders, 07 families and 15 genera from Godavari River at Mudgal, Pathri, Dist. Parbhani. Joshi, *et al.* [8] recorded 20 species belonging to 7 families from Purna River at Buldhana District. Kharat, *et al.* [13] recorded 51 species belonging to 14 families and 33 genera out of 15 fish species were endemic from Krishna River at Wai, Northern Western Ghats, India. Ubharhande and Sonawane [32] observed fish fauna belonging to 07 orders 10 families, 19 genera and 21 species.

Table 1: Order and familywise list of freshwater fish in Maharashtra

Orderwise percentage	Familywise percentage	Total sps.
Osteoglossiformes (1.21)	Notopteridae (1.21)	2
Angulliformes (0.6)	Anguillidae (0.6)	1
Cypriniformes (63.06)	Cyprinidae (52.72)	87
	Parapsilorhynchidae (1.81)	3
	Balitoridae (5.45)	9
	Cobitidae (3.03)	5
Siluriformes (16.36)	Bagridae (9.09)	15
	Schilbeidae (1.81)	3
	Siluridae (1.81)	3
	Sisoridae (1.81)	3
	Clariidae (1.21)	2
	Heteropneustidae (0.6)	1
Cyprinodontiformes (1.81)	Poecilidae (1.21)	2
	Aplocheilidae (0.6)	1
Beloniformes (0.6)	Belonidae (0.6)	1
Perciformes (12.12)	Ambassidae (3.03)	5
	Channidae (3.03)	5
	Anabantidae (0.6)	1
	Nandidae (0.6)	1
	Cichlidae (1.81)	3
	Gobiidae (1.21)	2
	Osphronemidae (1.81)	3
Mugiliformes (2.42)	Mugilidae (1.21)	2
	Hemiramphidae (1.21)	2
Synnbranchiformes (1.81)	Mastacembelidae (1.21)	2
	Synbranchidae (0.6)	1

Cyprinidae family is dominant with 10 (47.61%) species, Channidae and Mastacembelidae with 02 (9.52%) species, Balitoridae, Bagridae, Clariidae, Belonidae, Notopteridae, Cichlidae, and Poecilidae contributed 01 (4.76%) species each from Paintakli dam at Buldhana district. Pawara and Patel [21] have recorded 25 fish species belonging to 03 orders, 05 families and 13 genera. Among the collected species, family Cyprinidae was the most dominant constituting 68% followed by Channidae constituting 12%, Balitoridae constituting 08%, Bagridae constituting 08% and Cobitidae constituting 04% of the total fish species from the Karvand dam (Shirpur) during July, 2011 to February, 2012. Bhalerao [2] reported 15 fish species belonging to 3 orders, 4 families and 12 genera in the Kasar Sai Dam. Katwate *et al.* [11] collected 66 fish species belonging to 31 families and 53 genera from northern Western Ghats at Raigad. Kamble and Mudkhede [10] reported 15 species of fish from Loni reservoir, Tq. Kinwat. Jaiswal and Ahirrao [7] have observed 28 fish species in Rangavali Dam (Navapur). Among 28 fish species, 25 genera and 12 families were grouped under seven orders. Paliwal *et al.* [18] studied fisheries and its conservation in Itiadoh dam reservoir Dist. Gondia and recorded 35 fish species belonging to 6 orders and 16 families. Keshave *et al.* [12]) recorded commercially important 9 fish species belonging to 6 families from Isapur Reservoir. Humbe *et al.* [5] showed occurrence of 32 fish

species belonging to 18 genera, 8 families and 6 orders from Sina Kolegoan Dam, Dist. Osmanabad. Bobdey [3] collected 63 species of 8 orders and 17 families from Bhandara. Ahirrao [1] reported an account of fish resources of 39 fish species belonging to 24 genera and 12 families from Bori dam at Tamaswadi, Parola, Dist. Jalgaon. Pawar [19] has reported 42 fish species belonging to 29 genera, 15 families and 9 orders from Majalgaon reservoir from Beed district. Sheikh [27] reported 37 species belonging to 21 different genera, in 11 families and 08 orders. Kumbar and Lad [15] recorded 13 species of catfish belonging to 5 families and 10 genera. The aim of review was to assess the variety and abundance of the important fish fauna inhabiting fresh water of Maharashtra.

3. Conclusion

There is a rich diversity of fish in Maharashtra which suggests that a major part of this is threatened by human activities. Fish fauna and distribution is useful for designing and implementing conservation strategies, to make fishermen aware of fishing, to give scientific training, to provide facilities to the fish farmers and to avoid immature fishing as well as providing subsidies on loan may help in high yield as well as there is an urgent need to adopt legislative and other measures for conservation by Fishery and Department of Environment for minimizing anthropogenic activities.

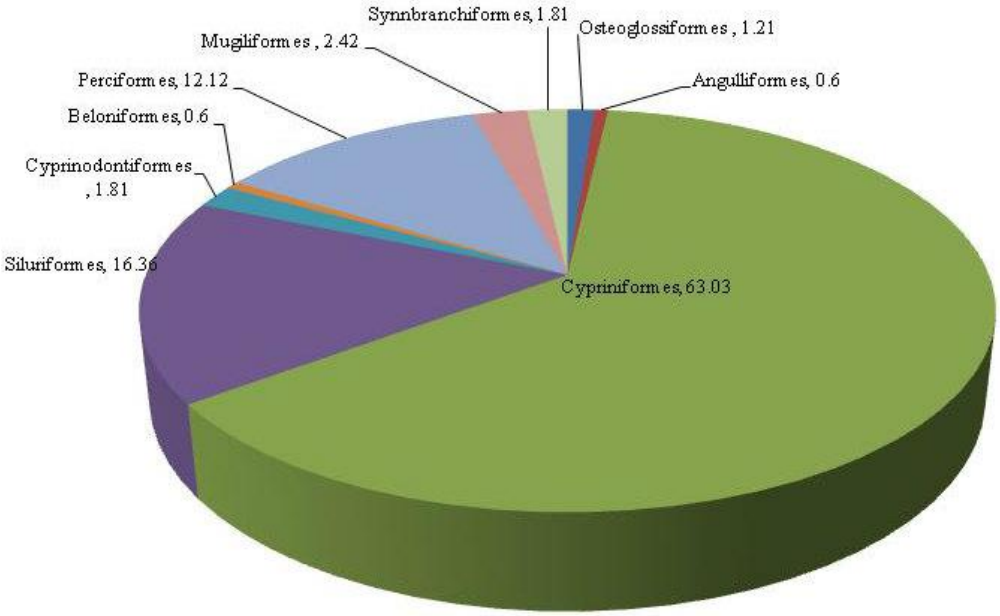

Fig 1: Orderwise freshwater fish species percentage in Maharashtra (India)

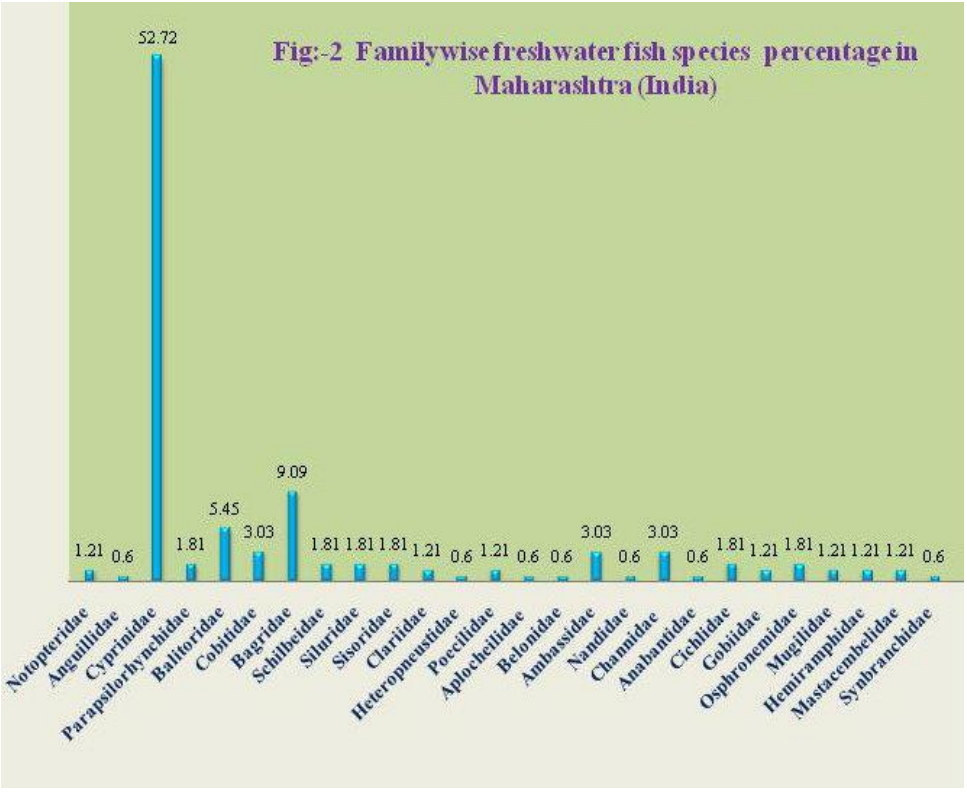

Fig 2: Familywise freshwater fish species percentage in Maharashtra (India)

Table 2: list of freshwater fish species recorded by various workers in maharashtra (India)

Order:- Osteoglossiformes (Berg, 1940)	26. *Garra mullya* (Sykes, 1839)
Family:- Notopteridae **(Bleeker, 1859)**	27. *Gonoproktopterus curmuca* (Hamilton, 1807)
Scientific name:-	28. *Gonoproktopterus kolus* (Sykes, 1839)
1. *Notopterus notopterus* (Pallas, 1769)	29. *Gonoproktopterus thomassi* (Day, 1874)
2. *Notopterus chitala* (Hamilton, 1822)	30. *Heteropneustes fossilis* (Bloch, 1739)
Order:- Angulliformes (Berg, 1940)	31. *Hypothalmichthys molitrix* (Valenciennes, 1844)
Family:- Anguillidae (Rafinesque, 1810)	32. *Hypselobarbus curmuca* (Hamilton, 1807)
1. *Anguilla bengalensis* (Gray, 1831)	33. *Labeo bata* (Ham. 1822)
Order:- Cypriniformes (Bleeker, 1859)	34. *Labeo boga* (Hamilton, 1822)
Family:- Cyprinidae	35. *Labeo boggut* (Sykes, 1839)
1. *Amblypharyngodon mola* (Hamilton, 1822)	36. *Labeo calbasu* (Ham. 1822)
2. *Ambylpharyngodon microlepis* (Bleeker, 1854)	37. *Labeo dero (*Hamilton, 1822)
3. *Barilius barna* (Hamilton, 1822)	38. *Labeo fimbriatus* (Bloch. 1795)
4. *Barilius bendelisis* (Hamilton, 1807)	39. *Labeo kawrus* (Sykes, 1839)
5. *Barillius bakeri* (Day, 1865)	40. *Labeo porcellus* (Heckel, 1844)
6. *Barillius evezardi* (Day, 1872)	41. *Labeo potail* (Sykes, 1839)
7. *Carassius auratus* (Linn., 1758)	42. *Labeo rohita* (Ham. 1822)
8. *Catla catla* (Ham. 1822)	43. *Laubuca laubuca* (Hamilton, 1822)
9. *Chela cachius* (Ham. 1822)	44. *Osteobrama bakeri* (Day, 1873)
10. *Cirrhinus cirrhosus* (Bloch. 1795)	45. *Osteobrama bhimensis* (Singh and Yazdani, 1992)
11. *Cirrhinus fulungee* (Sykes, 1839)	
12. *Cirrhinus macrops* (Steindachner,1870)	46. *Osteobrama catio catio* (Hamilton, 1822)
13. *Cirrhinus mrigala* (Ham. 1822)	47. *Osteobrama cotio* (Ham. 1822)
14. *Cirrhinus reba* (Hamilton, 1822)	48. *Osteobrama cotio cunma* (Day, 1888)
15. *Crossocheilus cf. latius* (Hamilton, 1822),	49. *Osteobrama nielli* (Day, 1873)
16. *Ctenopharyngodon idella* (Steindachner, 1866)	50. *Osteobrama vigorsii* (Sykes, 1839)
17. *Cyprinus carpio* (Linn., 1758)	51. *Osteochilichthys godavariensis* (Rao, 1977)
18. *Danio aequipinnatus* (McClelland,1839*)*	52.*Osteochilichthys nashii* (Day, 1869)
19. *Danio malabaricus* (Jerdon, 1849)	53. *Oxygaster gora* (Hamilton, 1822)
20. *Devario fraseri* (Hora, 1935)	54. *Rohtee ogilbii* (Sykes, 1839)
21. *Discognathus modests* (Hackel, 1843)	55. *Parluciosoma daniconius* (Hamilton, 1822)
22. *Esomus danrica* (Hamilton, 1822)	56. *Pseudoxygaster sp.* (Van Hasselt, 1823)
23. *Garra bicornuta* (Narayan Rao, 1920)	57. *Puntius amphibious* (Valenciennes, 1842)
24. *Garra gotyla stenorhynchus* (Jerdon, 1849)	58. *Puntius conchonius* (Hamilton, 1822)
25.*Garra lamta* (Hamilton, 1822)	59. *Puntius chola* (Hamilton, 1822)

60. *Puntius jerdoni* (Day, 1870)
61. *Puntius neilli* (Day, 1865)
62. *Puntius sarana subnasutus* (Valenciennes, 1842)
63. *Puntius sahyadriensis (*Silas, 1953)
64. *Puntius sarana* (Ham. 1822)
65. *Puntius sarana sarana* (Hamilton, 1822)
66. *Puntius sophore* (Ham. 1822)
67. *Puntius sophore* Sophore (Ham. 1822)
68. *Puntius ticto* (Ham. 1822)
69. *Puntius ticto ticto* (Ham. 1822)
70. *Puntius tor* (Ham. 1822)
71. *Rasbora daniconius* (Ham. 1822)
72. *Rohtee ogilbii* (Sykes, 1839)
73. *Salmophasia balookee* (Sykes, 1839)
74. *Salmophasia boopis* (Day, 1874)
75. *Salmophasia novacula* (Valenciennes, 1840)
76. *Salmophasia sladoni* (Day, 1870)
77. *Salmophasia bacaila* (Hamilton, 1822)
78. *Salmophasia phulo* (Hamilton, 1822)
79. *Salmostoma bacaila* (Hamilton, 1822)
80. *Salmostoma boopis* (Day, 1874)
81. *Salmostoma horai* (Silas, 1951)
82. *Salmostoma untrahi* (Day, 1869)
83. *Schismatorhynchos nukta* (Sykes, 1839)
84. *Thynnichthys sandkhol* (Sykes, 1839)
85. *Tor khudree* (Sykes, 1839)
86. *Tor mussullah* (Sykes, 1839)
87. *Tor tor* (Hamilton, 1822)

Family:- Parapsilorhynchidae

1. *Parapsilorhynchus cf. tentaculatus* (Annandale,1919)
2. *Parapsilorhynchus discophorus* (Hora, 1921)
3. *Parapsilorhynchus tentaculatus* (Annandale, 1919)

Family:- Balitoridae (Swainson, 1839)

1. *Acanthocobitis moreh* (Sykes, 1839)
2. *Indoreonectes evezardi* (Day, 1872)
3. *Nemacheilus anguilla (*Annandale, 1919)
4. *Nemacheilus beavani* (Günther, 1868)
5. *Nemacheilus botio* (Ham. 1822)
6. *Nemacheilus denisonii* (Day,1867)
7. *Nemacheilus moreh* (Sykes,1839)
8. *Nemachilichthys rueppelli* (Sykes, 1839)
9. *Schistura denisoni (*Day, 1867)

Family:- Cobitidae (Swainson, 1838)

1. *Botia striata* (Narayan Rao, 1920)
2. *Lepidocephalichthys guntea* (Hamilton, 1822)
3. *Lepidocephalichthys thermalis* (Valenciennes, 1846)
4. *Lepidocephalus guntea* (Hamilton, 1822)
5. *Lepidocephalus thermalis* (Valenciennes, 1846)

Order:- Siluriformes (Cuvier, 1817)

Family:- Siluridae (Cuvier, 1816)

1. *Ompok bimaculatus* (Bloch, 1794)
2. *Ompak pabda* (Hamilton, 1822)
3. *Wallago attu* (Schlegel, 1839)

Family:- Bagridae (Bleeker, 1858)

1. *Aorichthys aor* (Hamilton, 1822)
2. *Aorichthys seenghala* (Sykes, 1839)
3. *Mystus aor* (Hamilton, 1822)
4. *Mystus bleekeri* (Day, 1877)
5. *Mystus cavasius* (Hamilton, 1822)
6. *Mystus malabaricus* (Jerdon, 1849)
7. *Mystus seenghala* (Sykes, 1839)
8. *Mystus seengtee* (Sykes, 1839)
9. *Mystus tengara* (Hamilton, 1822)
10. *Mystus vittatus* (Bloch, 1794)
11. *Rita chrysa* (Day, 1877)
12. *Rita gogra* (Sykes, 1839)

13. *Rita kuturnee* (Sykes, 1839)
14. *Rita rita* (Hamilton, 1822)
15. *Sperata seenghala* (Sykes, 1839)

Family:- Schilbeidae (Berg, 1958)

1. *Clupisoma taakree* (Sykes, 1839)
2. *Neotropius khavalchor* (Kulkarni, 1952)
3. *Proeutropiichthys taakree taakree* (Sykes, 1839)

Family:- Sisoridae (Bleeker, 1852)

1. *Glyptothorax cf. poonaensis* (Hora, 1938)
2. *Glyptothorax lonah* (Sykes, 1839)
3. *Glyptothorax trewavasae* (Hora, 1938)

Family:- Clariidae (Bonaparte, 1846)

1. *Clarias batrachus* (Linnaeus, 1758)
2. *Clarias gariepinus* (Burchell, 1822)

Family:-Heteropneustidae (Hora, 1936)

1. *Heteropneustes fossils* (Bloch, 1794)

Order:- Cyprinodontiformes (Berg, 1940)

Family:- Poecilidae (Garman, 1895)

1. *Poecilia reticulata* (Peters,1859)
2. *Gambasia affinis* (Baird and Girard, 1853)

Family:- Aplocheilidae (Bleeker, 1860)

1. *Aplocheilus lineatus* Valenciennes, 1846)

Order:- Beloniformes (Berg, 1837)

Family:- Belonidae (Bonaparte, 1832)

1. Xenentodon cancila (Ham. 1822)

Order:- Perciformes (Bleeker, 1859)

Family:- Ambassidae (Klunzinger**, 1870)**

1. *Chanda nama* (Hamilton, 1822)
2. *Parambassis ranga* (Hamilton, 1822)
3. *Pseudoambassis ranga* (Ham., 1822)
4. *Ambassis ranga (*Ham., 1822)
5. *Parambassis baculis* (Hamilton, 1822)

Family:- Nandidae (Bleeker, 1852)

1. *Nandus nandus* (Hamilton, 1822)

Family:- Channidae (Fowler, 1934)

1. *Channa striatus* (Bloch. 1793)
2. *Channa punctatus* (Day, 1878)
3. *Channa gaucha* (Ham. 1822)
4. *Channa marulius* (Hamilton, 1822)
5. *Channa orientalis* (Bloch & Schneider, 1801)

Family:- Anabantidae (Bonaparte, 1831)

1. *Anabas testudineus* (Bloch, 1792)

Family:- Cichlidae (Bonaparte, 1835)

1. *Oreochromis mossambica* (Peters, 1852)
2. *Etroplus maculatus* (Bloch, 1795)
3. *Tilapia mossambica* (Peters, 1852)

Family:- Gobiidae (Cuvier, 1816)

1. *Glassogobius giuris* (Hamilton, 1822)
2. *Glassogobius giuris giuris* (Hamilton, 1822)

Family:- Osphronemidae (Van der,1832)

1. *Colisa fasciata* (Bloch & Schneider, 1801)
2. *Pseudosphromenus cupanus* (Cuvier 1831)
3. *Trichogaster fasciatus*) (Bloch & Schneider, 1801)

Order:- Mugiliformes (Berg, 1940)

Family:- Mugilidae (Cuvier, 1829)

1. *Mugil cephalus* (Linn. 1758)
2. *Rhinomugil carsula* (Hamilton, 1822)

Family:-Hemiramphidae

1. *Hemirampus georgii* (Valenciennes, 1847)
2. *Hyporhamphus limbatus* (Valenciennes, 1847)

Order:- Synnbranchiformes

Family:- Mastacembelidae

1. *Mastacembelus armatus* (Lecepede, 1800)
2. *Mastacembelus pancalus* (Lecepede, 1800)

Family:- Synbranchidae

1. *Monopterus* cf. *indicus* (Silas & Dawson, 1961)

4. Acknowledgements

Authors are thankful to Mr. Dadasaheb Govind Mundade, The Chairman, K.E. Society, The Principal, Pratap College, Amalner for continuous encouragement as well as providing library facilities during the tenure of this work. Thanks are also due to Mr. Nitin Patil for helping in strengthening the language. Mr. R. H. Pawara is grateful to UGC, New Delhi for providing Rajiv Gandhi National Fellowship.

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