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**Records of the
Zoological Survey of India**

Marine and estuarine fish fauna of Orissa

**R. P. BARMAN, S. S. MISHRA
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Kolkata**

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CONTENTS

INTRODUCTION	1
SYSTEMATIC LIST OF THE FISHES OF ORISSA COAST	3
SYSTEMATIC ACCOUNT	28
Class CHONDRICHTHYES	28
Key to orders	28
Order ORECTOLOBIFORMES	29
Family HEMISCYLLIDAE	29
Family STEGOSTOMATIDAE	30
Order CARCHARINIFORMES	30
Family HEMIGALEIDAE	30
Family CARCHARHINIDAE	31
Family SPHYRNIDAE	32
Order PRISTIFORMES	33
Family PRISTIDAE	33
Order TORPEDINIFORMES	34
Family TORPEDINIDAE	34
Family NARCINIDAE	35
Order RAJIFORMES	36
Family RHINOBATIDAE	36
Family DASYPATIDAE	37
Family GYMNURIDAE	39
Family MYLIOBATIDAE	40
Family MOBULIDAE	41
Class OSTEICHTHYES	41
Key to the orders	41
Order ELOPIIFORMES	44

Family ELOPIDAE	44
Family MEGALOPIDAE	44
Order ANGUILLIFORMES	45
Family ANGUILLIDAE	45
Family MORINGUIDAE	46
Family MURAENIDAE	46
Family OPHICHTHIDAE	47
Family NETTASTOMATIDAE	49
Family CONGRIDAE	49
Family MURAENESOCIDAE	50
Order CLUPEIFORMES	51
Family CLUPEIDAE	51
Family PRISTIGASTERIDAE	54
Family ENGRAULIDIDAE	56
Family CHIROCENTRIDAE	60
Order GONORHYNCHIFORMES	60
Family CHANIDAE	60
Order SILURIFORMES	61
Family BAGRIDAE	61
Family SILURIDAE	62
Family SCHILBEIDAE	63
Family PANGASIIDAE	64
Family Sisoridae	64
Family CLARIIDAE	65
Family HETEROPNEUSTIDAE	65
Family ARIIDAE	66
Family PLOTOSIDAE	68
Order AULOPIIFORMES	68
Family SYNODIDAE	69
Family HARPADONTIDAE	70
Order MYCTOPHIFORMES	70
Family MYCTOPHIDAE	70
Order GADIFORMES	71
Family BREGMACEROTIDAE	71
Family MACROURIDAE	71

Order OPHIDIIFORMES	72
Family OPHIDIIDAE	72
Order BATRACHOIDIFORMES	72
Family BATRACHOIDIDAE	72
Order LOPHIFORMES	73
Family LOPHIIDAE	73
Family ANTENNARIIDAE	74
Family OGCOCEPHALIDAE	74
Order MUGILIFORMES	75
Family MUGILIDAE	75
Order ATHERINIFORMES	77
Family ATHERINIDAE	77
Order BELONIFORMES	77
Family EXOCOETIDAE	78
Family HEMIRAMPHIDAE	78
Family BELONIDAE	80
Family ADRIANICHTHYIDAE	81
Order CYPRINODONTIFORMES	81
Family APLOCHEILIDAE	81
Order BERYCIFORMES	82
Family HOLOCENTRIDAE	82
Order SYNGNATHIFORMES	82
Family PEGASIDAE	83
Family FISTULARIIDAE	83
Family CENTRISCIDAE	83
Family SYNGNATHIDAE	84
Order SYNBRANCHIFORMES	85
Family SYNBRANCHIIDAE	85
Family MASTACEMBELIDAE	85
Order SCORPAENIFORMES	86
Family DACTYLOPTERIDAE	87
Family SCORPAENIDAE	87
Family SYNANCEIIDAE	89
Family TETRAROGIDAE	90
Family TRIGLIDAE	90

Family PLATYCEPHALIDAE	91
Order PERCIFORMES	93
Family CENTROPOMIDAE	99
Family AMBASSIDAE	99
Family ACROPOMATIDAE	101
Family SERRANIDAE	101
Family GRAMMISTIDAE	103
Family TERAPONIDAE	103
Family PRIACANTHIDAE	104
Family APOGONIDAE	105
Family SILLAGINIDAE	106
Family LACTARIIDAE	107
Family RACHYCENTRIDAE	108
Family ECHENEIDAE	108
Family CARANGIDAE	109
Family CORYPHAENIDAE	114
Family MENIDAE	114
Family LEIOGNATHIDAE	115
Family LUTJANIDAE	117
Family COIIDAE	119
Family LOBOTIDAE	119
Family GERREIDAE	120
Family HAEMULIDAE	121
Family SPARIDAE	122
Family LETHRINIDAE	124
Family NEMIPTERIDAE	124
Family SCIAENIDAE	125
Family MULLIDAE	129
Family MONODACTYLIDAE	131
Family TOXOTIDAE	131
Family KYPHOSIDAE	131
Family DREPANIDAE	132
Family EPHIPPIDAE	132
Family PLATACIDAE	133
Family SCATOPHAGIDAE	134

Family CHAETODONTIDAE	134
Family NANDIDAE	135
Family CICHLIDAE	135
Family SPHYRAENIDAE	136
Family POLYNEMIDAE	137
Family CHIASMODONTIDAE	138
Family CHAMPSODONTIDAE	139
Family URANOSCOPIDAE	139
Family TRICHONOTIDAE	140
Family BLENNIIDAE	140
Family CALLIONYMIDAE	141
Family ELEOTRIDIDAE	142
Family GOBIIDAE	143
Family GOBIOIDIDAE	149
Family TRYPACHENIDAE	150
Family KRAEMARIIDAE	150
Family KURTIDAE	151
Family ACANTHURIDAE	151
Family SIGANIDAE	152
Family TRICHIURIDAE	152
Family SCOMBRIDAE	154
Family CENTROLOPHIDAE	155
Family ARIOMMATIDAE	156
Family STROMATEIDAE	156
Family ANABANTIDAE	157
Family OSPHRONEMIDAE	157
Family CHANNIDAE	158
O PLEURONECTIFORMES	158
Family PSETTODIDAE	159
Family CITHARIDAE	159
Family BOTHIDAE	160
Family PARALICHTHYIDAE	161
Family CYNOGLOSSIDAE	162
Family SOLEIDAE	164
Order TETRAODONTIFORMES	167

Family TRIACANTHIDAE	168
Family BALISTIDAE	169
Family MONACANTHIDAE	169
Family OSTRACIIDAE	169
Family TETRAODONTIDAE	170
Family DIODONTIDAE	172
SUMMARY	172
ACKNOWLEDGEMENTS	173
REFERENCES	173
Table i. Fishes originally described as new to science from Orissa coast.....	183-186

INTRODUCTION

Orissa is one of the maritime states of our country, located on the east coast of India on the western bank of the Bay of Bengal. Andhra Pradesh borders this state in the south-east, Chattishgarh in the west, Jharkhand and West Bengal on its north side and the Bay of Bengal in the east. It has a coastal line of 482 km, extending from east of Subarnarekha river mouth, bordering West Bengal, to the Bahuda river mouth at Sunapur bordering Andhra Pradesh. The coastline of the state divides into six districts, viz., Balasore, Bhadrak, Kendrapara, Jagatsinghpur, Puri and Ganjam (Fig.1). Chilka lagoon (916.8 sq. km in summer), tidal mudflats (369.2 sq. km), mangroves (215.0 sq. km) and sandy beaches (219.3 sq. km) are the important coastal ecosystems of this state. Chilka Lake, a brackish water lagoon, is the largest natural wetland in the country. It is included in the Ramsar sites. The Nalaban Island and the water surrounding the island is a sanctuary. The marine environment influences this sanctuary, as it receives sea water directly through the new mouth opened by the Chilka Development Authority and the lagoon is also in contact with sea through the old mouth, Magarmukh. This state has one marine national park (Bhitarkanika, 145 sq. km) and two marine sanctuaries (Bhitarkanika Wildlife Sanctuary, 672 sq. km and Gahirmatha marine sanctuary, 1435 sq. km), covering a total area of 2252 sq. km. There are almost 17 small to large estuaries on the coastal line of Orissa which are of mixed type (Garg *et al.*, 1998). The major estuaries are of the rivers namely Subarnarekha, Budhabalanga, Brahmani-Baitarani, Mahanadi and its tributaries, Rushikulya and Bahuda. The deltas of Mahanadi and Brahmani-Baitarani provide virgin sites for growth of mangroves.

The 482 km long coastline of this state have been surveyed covering almost all the major and minor fish landing centers as well as estuaries. The present study is the consolidated work of our exploration for the marine and estuarine fish resources of all the six coastal districts of the state as well as the Chilka Lake that comes largely under Khurda district. During this study the fishes of this state lying in the National Zoological Collection of the Zoological Survey of India, Kolkata and Marine Biological Station, Chennai (collected during east-coast survey during 1992-93) and Estuarine Biological Station, Berhampur have been studied. One of the authors (S.S.M.) has studied a number of fishes from the Chilka Lake for the Chilika Development Authority, Balugaon, Orissa. The species that could not be examined by us, but taken only from literature are marked with '*' asterisk. A total of 605 species under 138 families and 27 orders has been included in this present work from this state. Brief descriptions of all the families, along with the systematic key to the orders, families, genera and species have been furnished in this study. The key to the species is applicable for them available along this coastal state only. Remarks or systematic notes of some species are also included. Common English name of the species incorporated against each species in the text, where ever known. In some of the species, common English names were not included here since those names are not available and have been marked "NA" against their names.

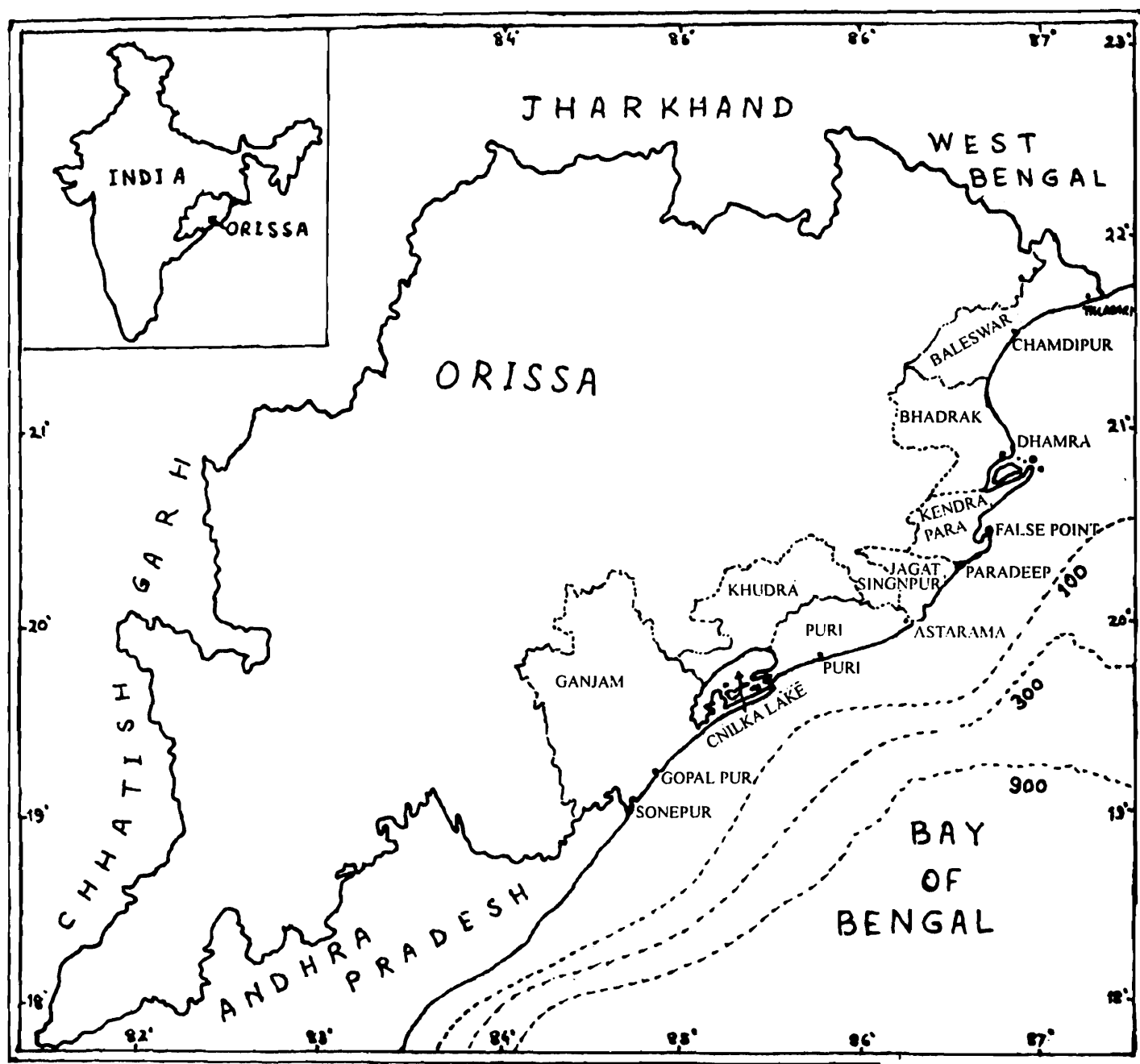


Fig. 1. Map of Orissa showing coastal districts and main collection sites.

The first ever study on fishes of Orissa was put forth by Day (1869) which included both marine and freshwater fishes. The major contributors to the study of coastal fishes were Alcock (1889, 1890); Annandale (1909); Annandale and Jenkins (1910) and Mishra *et al.* (1999). The Chilka Lake fishes were studied by Chaudhuri (1916, 1916a, 1916b, 1917, 1923); Hora (1923); Mohanty (1976); Rao (1995) and Bhatt *et al.* (2000). Venkateswarlu *et al.* (1998) studied the fishes of the Mahanadi estuary. All these studies are incorporated in this present work.

The literature consulted during this work for identification of specimens is mainly: Allen, 1985; Collette and Neun, 1983; Compagno, 1984; Day, 1875-78 (1888); Day, 1889-98; de Beaufort, 1940; de Beaufort and Briggs, 1962; de Beaufort and Chapman, 1951; De Bruin *et al.*, 1995; Fischer and Bianchi, 1984; Heemstra and Randall, 1993; Jayaram, 1999; Koumans, 1941; Koumans, 1953; Munro, 1955; Russell, 1990; Smith and Heemstra, 1986; Talwar and Jhingran, 1991; Talwar and Kacker, 1984; Weber and de Beaufort, 1916-1936.

Some Cypriniform fishes although found in the Chilka Lake and as well as upper reaches of estuaries are not included in this account, but Siluriform and Perciform fishes occur in the brackish waters, even though they are primarily freshwater forms, are included to avoid confusion when such fishes are captured.

SYSTEMATIC LIST OF THE FISHES OF ORISSA COAST

Class CHONDRICHTHYES
Order ORECTOLOBIFORMES
Family HEMISCYLLIIDAE

1. *Chiloscyllium griseum* Muller & Henle
2. *C. indicum* (Gmelin)

Family STEGOSTOMATIDAE

3. *Stegostoma fasciatum* (Hermann)

Order CARCHARHINIFORMES
Family HEMIGALIDAE

4. *Hemipristis elongata* (Klunzinger)*

Family CARCHARHINIDAE

5. *Carcharhinus limbatus* (Valenciennes)
6. *C. melanopterus* (Quoy & Gaimard)*
7. *C. sorrah* (Muller & Henle)
8. *Glyphis gangeticus* (Muller & Henle)

9. *Lamiopsis temminckii* (Muller & Henle)
10. *Rhizoprionodon acutus* (Ruppell)
11. *R. oligolinx* Springer
12. *Scoliodon laticaudus* (Muller & Henle)

Family SPHYRNIDAE

13. *Eusphyra blochii* (Cuvier)*
14. *Sphyrna lewini* (Griffith & Smith)*
15. *S. mokarran* Ruppell
16. *S. zygaena* (Linnaeus)*

Order PRISTIFORMES

Family PRISTIDAE

17. *Anoxypristis cuspidata* (Latham)
18. *Pristis microdon* Latham
19. *P. pectinata* Latham
20. *P. zijsron* Bleeker

Order TORPEDINIFORMES

Family TORPEDINIDAE

21. *Torpedo panthera* Olfers

Family NARCINIDAE

22. *Narcine brunnea* Annandale
23. *N. indica* Henle*
24. *N. timlei* (Bloch & Schneider)
25. *Narke dipterygia* (Bloch & Schneider)

Order RAJIFORMES

Family RHINOBATIDAE

26. *Rhina ancylostoma* Bloch & Schneider*
27. *Rhinobatus granulatus* Cuvier
28. *Rhynchobatus djiddensis* (Forsskal)

Family DASYATIDAE

29. *Dasyatis kuhlii* (Muller & Henle)
30. *D. zugei* (Muller & Henle)

31. *Himantura alcockii* (Annandale)
32. *H. bleekeri* (Blyth)
33. *H. fava* (Annandale)
34. *H. gerrardi* (Gray)
35. *H. imbricata* (Bloch & Schneider)
36. *H. jenkinsii* (Annandale)
37. *H. marginatus* (Blyth)*
38. *H. microps* (Annandale)*
39. *H. uarnak* (Forsskal)
40. *H. walga* (Muller & Henle)
41. *Pastinachus sephen* (Forsskal)
42. *Urogymnus asperrimus* (Bloch & Schneider)

Family GYMNURIDAE

43. *Aetoplatea tentaculata* Muller & Henle
44. *A. zonura* Bleeker
45. *Gymnura japonica* (Schlegel)
46. *G. poecilura* (Shaw)

Family MYLIOBATIDAE

47. *Aetobatus flagellum* (Bloch & Schneider)
48. *A. narinari* (Euphrasen)
49. *Aetomylaeus maculatus* (Gray)
50. *A. nichofii* (Bloch & Schneider)
51. *Rhinoptera javanica* Muller & Henle*

Family MOBULIDAE

52. *Manta birostris* (Donndorff)
53. *Mobula eregoodootenkee* Garman

Class OSTEICHTHYES
Order ELOPIFORMES
Family ELOPIDAE

54. *Elops machnata* (Forsskal)

Family MEGALOPIDAE

55. *Megalops cyprinoides* (Broussonet)

Order ANGUILLIFORMES
Family ANGUILLIDAE

56. *Anguilla bengalensis* (Gray)*
57. *A. bicolor* McClelland*

Family MORINGUIDAE

58. *Moringua arundinacea* (McClelland)*
59. *M. raitaborua* (Hamilton)

Family MURAENIDAE

60. *Gymnothorax meleagris* (Shaw)*
61. *G. tile* (Hamilton)*
62. *Strophidon sathete* (Hamilton)

Family OPHICHTHIDAE

63. *Bascanichthys deraniyagalai* Menon
64. *Lamnostoma orientalis* McClelland
65. *Muraenichthys macroptera* (Bleeker)*
66. *Myrophis lepturus* Kotthaus*
67. *Ophichthus apicalis* (Bennett)*
68. *Pisodonophis boro* (Hamilton)
69. *P. cancrivorus* (Richardson)

Family NETTASTOMATIDAE

70. *Saurenehelys petersi* Day

Family CONGRIDAE

71. *Ariosoma anago* (Temminck & Schlegel)
72. *Bathymyrus echinorhynchus* Alcock
73. *Uroconger lepturus* (Richardson)

Family MURAENESOCIDAE

74. *Congresox talabon* (Cuvier)
75. *C. talabonoides* (Bleeker)*
76. *Muraenesox bagio* (Hamilton)
77. *M. cinereus* (Forsskal)

Order CLUPEIFORMES
Family CLUPEIDAE

78. *Amblygaster sirm* (Walbaum)*
79. *Anodontosoma chacunda* (Hamilton)*
80. *Corica soborna* (Hamilton)
81. *Dussumieria acuta* Valenciennes
82. *D. elopsoides* Bleeker
83. *Escualosa thoracata* (Valenciennes)
84. *Gudusia chapra* (Hamilton)*
85. *Hilsa kelee* (Cuvier)
86. *Nematalosa galathea* Nelson & Rothman
87. *N. nasus* (Bloch)
88. *Sardinella albella* (Valenciennes)*
89. *S. jussieui* (Valenciennes)*
90. *S. fimbriata* (Valenciennes)
91. *S. gibbosa* (Bleeker)*
92. *S. longiceps* Valenciennes
93. *S. melanura* (Cuvier)
94. *S. sindensis* (Day)
95. *Tenualosa ilisha* (Hamilton)
96. *T. toli* (Valenciennes)

Family PRISTIGASTERIDAE

97. *Ilisha elongata* (Bennett)
98. *I. filigera* (Valenciennes)
99. *I. kampeni* (Weber & de Beaufort)*
100. *I. megaloptera* (Swainson)
101. *I. melastoma* (Bloch & Schneider)
102. *Opisthopecterus tardoore* (Cuvier)
103. *Pellona ditchela* Valenciennes*
104. *Raconda russeliana* Gray

Family ENGRAULIDIDAE

105. *Coilia dussumieri* Valenciennes
106. *C. neglecta* Whitehead

107. *C. ramcarati* (Hamilton)
108. *C. reynaldi* Valenciennes
109. *Encrasicholina devisi* (Whiteley)*
110. *E. heteroloba* (Ruppell)*
111. *Setipinna phasa* (Hamilton)
112. *S. taty* (Valenciennes)
113. *S. tenuifilis* (Valenciennes)
114. *Stolephorus andhraensis* Babu Rao
115. *S. baganensis* Hardenberg*
116. *S. commersonnii* Lacepede
117. *S. dubiosus* Wongratana
118. *S. indicus* (van Hasselt)
119. *S. insularis* Hardenberg*
120. *S. waitei* Jordan & Seale*
121. *Thryssa baelama* (Forsskal)
122. *T. dussumieri* (Valenciennes)
123. *T. gautamiensis* Rao
124. *T. hamiltonii* (Gray)
125. *T. kammalensis* (Bleeker)
126. *T. kammalensoides* Wongratana
127. *T. malabarica* (Bloch)
128. *T. mystax* (Bloch & Schneider)
129. *T. polybranchialis* Wongratana
130. *T. purava* (Hamilton)
131. *T. setirostris* (Broussonet)*
132. *T. vitrirostris* (Gilchrist & Thompson)

Family CHIROCENTRIDAE

133. *Chirocentrus dorab* (Forsskal)
134. *C. nudus* Swainson

Order GONORYNCHIFORMES

Family CHANIDAE

135. *Chanos chanos* (Forsskal)*

Order SILURIFORMES
Family BAGRIDAE

- 136. *Mystus bleekeri* (Day)*
- 137. *M. cavasius* (Hamilton)
- 138. *M. gulio* (Hamilton)
- 139. *M. vittatus* (Bloch)

Family SILURIDAE

- 140. *Ompok bimaculatus* (Bloch)
- 141. *Wallago attu* (Schneider)*

Family SCHILBEIDAE

- 142. *Ailia coila* (Hamilton)*
- 143. *Eutropiichthys vacha* (Hamilton)
- 144. *Pseudeutropius atherinoides* (Bloch)
- 145. *Silonia silondia* (Hamilton)*

Family PANGASIIDAE

- 146. *Pangasius pangasius* (Hamilton)

Family SISORIDAE

- 147. *Bagarius yarellii* Sykes
- 148. *Gagata cenia* (Hamilton)

Family CLARIIDAE

- 149. *Clarias batrachus* (Linnaeus)

Family HETEROPNEUSTIDAE

- 150. *Heteropneustes fossilis* (Bloch)*

Family ARIIDAE

- 151. *Arius arius* (Hamilton)
- 152. *A. caelatus* Valenciennes
- 153. *A. crossocheilos* Bleeker
- 154. *A. dussumieri* Valenciennes
- 155. *A. gagora* (Hamilton)*
- 156. *A. jella* Day

- 157. *A. maculatus* (Thunberg)
- 158. *A. parvipinnis* Day
- 159. *A. platystomus* Day
- 160. *A. sona* (Hamilton)
- 161. *A. tenuispinis* Day
- 162. *A. thalassinus* (Ruppell)
- 163. *Hemipimelodus jatus* (Hamilton)*
- 164. *Osteogeneiosus militaris* (Linnaeus)

Family PLOTOSIDAE

- 165. *Plotosus canius* Hamilton
- 166. *P. lineatus* (Thunberg)

Order AULOPIFORMES
Family SYNODIDAE

- 167. *Saurida gracilis* (Quoy & Gaimard)*
- 168. *S. micropectoralis* Shindo and Yamda
- 169. *S. pseudotumbil* Dutt & Sagar
- 170. *S. tumbil* (Bloch)
- 171. *S. undosquamis* (Richardson)
- 172. *Trachinocephalus myops* (Schneider)

Family HARPADONTIDAE

- 173. *Harpadon nehereus* (Hamilton)

Order MYCTOPHIFORMES
Family MYCTOPHIDAE

- 174. *Benthosema pterotum* (Alcock)

Order GADIFORMES
Family BREGMACEROTIDAE

- 175. *Bregmaceros maclellandi* Thompson

Family MACROURIDAE

- 176. *Coryphaenoides hoskynii* (Alcock)

Order OPHIDIIFORMES
Family OPHIDIIDAE

177. *Bassozetus glutinosus* (Alcock)
 178. *Holcomycteronus pterotus* (Alcock)
 179. *Tauredophidium hextii* (Alcock)

Order BATRACHOIDIFORMES
 Family BATRACHOIDIDAE

180. *Austrobatrachus dussumieri* (Valenciennes)*

Order LOPHIIFORMES
 Family LOPHIIDAE

181. *Lophiomus setigerus* (Vahl)

Family ANTENNARIDAE

182. *Antennarius hispidus* (Bloch & Schneider)

Family OGCOCEPHALIDAE

183. *Halieutaea indica* Annandale and Jenkins

184. *H. stellata* (Vahl)*

Order MUGILIFORMES
 Family MUGILIDAE

185. *Liza macrolepis* (Smith)
 186. *L. melinoptera* (Valenciennes)
 187. *L. parsia* (Hamilton)
 188. *L. subviridis* (Valenciennes)
 189. *L. tade* (Forsskal)
 190. *L. vaigiensis* (Quoy & Gaimard)*
 191. *Mugil cephalus* Linnaeus
 192. *Rhinomugil corsula* (Hamilton)
 193. *Valamugil buchanani* (Bleeker)*
 194. *V. cunnesius* (Valenciennes)
 195. *V. seheli* (Forsskal)
 196. *V. speigleri* (Bleeker)

Order ATHERINIFORMES
 Family ATHERINIDAE

197. *Athrinomorus duodecimalis* (Valenciennes)

198. *A. lacunosus* (Forster)

Order BELONIFORMES
Family EXOCOETIDAE

199. *Cypselurus poecilopterus* (Valenciennes)

200. *Exocoetus volitans* Linnaeus*

Family HEMIRAMPHIDAE

201. *Hemiramphus far* (Forsskal)*

202. *Hyporhamphus limbatus* (Valenciennes)

203. *H. unicuspis* Collette & Perine

204. *Rhynchorhamphus georgii* (Valenciennes)*

205. *R. malabaricus* Collette*

206. *Zenarchopterus buffonis* (Valenciennes,)

207. *Z. ectuntio* (Hamilton)

208. *Z. gilli* Smith

Family BELONIDAE

209. *Strongylura leiura* (Bleeker)

210. *S. strongylura* (van Hasselt)

211. *Xenentodon cancila* (Hamilton)*

Family ADRIANICHTHYIDAE

212. *Oryzias dancena* (Hamilton)*

Order CYPRINODONTIFORMES
Family APLOCHEILIDAE

213. *Aplocheilus panchax* (Hamilton)

Order BERYCIFORMES
Family HOLOCENTRIDAE

214. *Myripristis murdjan* (Forsskal)

215. *Sargocentron rubrum* Forsskal

Order SYNGNATHIFORMES
Family PEGASIDAE

216. *Pegasus volitans* Linnaeus

Family FISTULARIIDAE

217. *Fistularia petimba* Lacepede

Family CENTRISCIDAE

218. *Centriscus scutatus* Linnaeus

Family SYNGNATHIDAE

219. *Hippocampus fuscus* Ruppell*
 220. *H. histrix* Kaup
 221. *Ichthyocampus carce* (Hamilton)
 222. *Microphis brachyurus brachyurus* (Bleeker)*
 223. *M. cuncalus* (Hamilton)
 224. *M. deocata* (Hamilton)*
 225. *Trachyrhamphus longirostris* Kaup*

Order SYNBRANCHIFORMES

Family SYNBRANCHIDAE

226. *Ophisternon bengalense* McClélland

Family MASTACEMBELIDAE

227. *Macrogathus aral* (Bloch & Schneider)
 228. *M. pancalus* Hamilton
 229. *Mastacembelus armatus* (Lacepede)*

Order SCORPAENIFORMES

Family DACTYLOPTERIDAE

230. *Dactyloptena macracantha* (Bleeker)
 231. *D. orientalis* (Cuvier)

Family SCORPAENIDAE

232. *Apistus carinatus* (Bloch & Schneider)
 233. *Brachypterois serrulata* (Richardson)
 234. *Pterois miles* (Bennett)*
 235. *P. radiata* Cuvier
 236. *P. russelli* Bennett
 237. *Scorpaenodes guamensis* (Quoy & Gaimard)
 238. *S. muciparus* (Alcock)

239. *Scorpaenopsis cirrhosa* (Thunberg)

Family SYNANCEIIDAE

240. *Choridactylus multibarbatus* Richardson

241. *Minous coccineus* Alcock

242. *M. monodactylus* (Bloch & Schneider)

243. *Trachicephalus uranoscopus* (Bloch & Schneider)

Family TETRAROGIDAE

244. *Ablabys taenianotus* (Cuvier)*

245. *Tetraroge niger* (Cuvier)

Family TRIGLIDAE

246. *Lepidotrigla spiloptera* Gunther

247. *Pterygotrigla hemisticta* (Temminck & Schlegel)

Family PLATYCEPHALIDAE

248. *Cociella crocodila* (Tilseus)

249. *Grammoplites scaber* (Linnaeus)

250. *Platycephalus indicus* (Linnaeus)

251. *Rogadius pristiger* (Cuvier)

252. *Sorsogona melanoptera* Knap & Wongratana

253. *S. tuberculata* (Cuvier)

254. *Suggrundus rodericensis* (Cuvier)

Order PERCIFORMES

Family CENTROPOMIDAE

255. *Lates calcarifer* (Bloch)

Family AMBASSIDAE

256. *Ambassis ambassis* (Lacepede)

257. *A. dussumieri* Cuvier*

258. *A. gymnocephalus* (Lacepede)

259. *A. kopsii* Bleeker

260. *A. urotaenia* Bleeker*

261. *Chanda nama* Hamilton

262. *Paramabassis dayi* (Bleeker)*

263. *Pseudambassis lala* (Hamilton)

264. *P. ranga* (Hamilton)

Family ACROPOMATIDAE

265. *Synagrops pellucidus* (Alcock)*

Family SERRANIDAE

266. *Chelidoperca investigatoris* (Alcock)

267. *Epinephelus bleekeri* (Vaillant)

268. *E. coioides* (Hamilton)

269. *E. diacanthus* (Valenciennes)

270. *E. lanceolatus* (Bloch)

271. *E. latifasciatus* (Temminck & Schlegel)

272. *E. malabaricus* (Bloch & Schneider)*

273. *E. morrhua* (Valenciennes)*

Family GRAMMISTIDAE

274. *Diploprion bifasciatum* Cuvier

Family TERAPONIDAE

275. *Pelates quadrilineatus* (Bloch)*

276. *Terapon jarbua* (Forsskal)

277. *T. puta* Cuvier*

278. *T. theraps* Cuvier

Family PRIACANTHIDAE

279. *Priacanthus hamrur* (Forsskal)

280. *P. tayenus* Richardson

Family APOGONIDAE

281. *Apogon aureus* (Lacepede)

282. *A. endekataenia* Bleeker

283. *A. quadrifasciatus* Cuvier

284. *A. taeniatus* Cuvier

285. *Apogonichthys ellioti* (Day)*

286. *A. poecilopterus* (Cuvier)

287. *Fowleria aurita* (Cuvier)*

Family SILLAGINIDAE

- 288. *Sillaginopsis panijus* (Hamilton)
- 289. *Sillago intermedius* Wongratana
- 290. *S. chondropus* Bleeker*
- 291. *S. lutea* McKay
- 292. *S. sihama* (Forsskal)
- 293. *S. vincenti* McKay

Family LACTARIIDAE

- 294. *Lactarius lactarius* (Schneider)

Family RACHYCENTRIDAE

- 295. *Rachycentron canadum* (Linnaeus)

Family ECHENEIDAE

- 296. *Echeneis naucrates* Linnaeus
- 297. *Remora remora* (Linnaeus)*
- 298. *Remorina albescent* (Temminck & Schlegel)*

Family CARANGIDAE

- 299. *Alectis indicus* (Ruppell)
- 300. *Alepes djedaba* (Forsskal)
- 301. *A. kleinii* (Bloch)
- 302. *Atropus atropos* (Schneider)
- 303. *Atule mate* (Cuvier)*
- 304. *Carangoides armatus* (Ruppell)*
- 305. *C. chrysophrys* (Cuvier)*
- 306. *C. hedlandensis* (Whitley)
- 307. *C. malabaricus* (Bloch & Schneider)
- 308. *C. praeustus* (Bennett)
- 309. *Caranx carangus* (Bloch)
- 310. *C. ignobilis* (Forsskal)*
- 311. *C. melampygus* Cuvier*
- 312. *C. sexfasciatus* Quoy & Gaimard
- 313. *Decapterus russelli* (Ruppell)*
- 314. *Megalaspis cordyla* (Linnaeus)

- 315. *Parastromateus niger* (Bloch)
- 316. *Scomberoides commersonnianus* Lacepede
- 317. *S. lysan* (Forsskal)
- 318. *S. tala* (Cuiver)*
- 319. *S. tol* (Cuvier)*
- 320. *Selar boops* (Cuvier)
- 321. *S. crumenophthalmus* (Bloch)
- 322. *Selaroides leptolepis* (Cuvier)*
- 323. *Trachinotus blochii* (Lacepede)
- 324. *T. botla* (Shaw)
- 325. *T. mookalee* Cuvier
- 326. *Uraspis helvola* (Forster)*

Family CORYPHAENIDAE

- 327. *Coryphaena hippurus* Linnaeus*

Family MENIDAE

- 328. *Mene maculata* (Bloch)

Family LEIOGNATHIDAE

- 329. *Gazza achlamys* Jordan & Starks*
- 330. *G. minuta* (Bloch)
- 331. *Leiognathus hindus* (Valenciennes)
- 332. *L. blochii* (Valenciennes)
- 333. *L. brevirostris* (Valenciennes)
- 334. *L. daura* (Cuvier)
- 335. *L. dussumieri* (Valenciennes)
- 336. *L. elongatus* (Gunther)
- 337. *L. equulus* (Forsskal)
- 338. *L. fasciatus* (Lacepede)
- 339. *L. leuciscus* (Gunther)
- 340. *L. lineolatus* (Valenciennes)
- 341. *L. smithursti* (Ramsay & Ogilby)
- 342. *L. splendens* (Cuvier)
- 343. *Secutor insidiator* (Bloch)
- 344. *S. ruconius* (Hamilton)

Family LUTJANIDAE

- 345. *Lutjanus argentimaculatus* (Forsskal)
- 346. *L. erythropterus* Bloch
- 347. *L. fulvus* (Schneider)
- 348. *L. johnii* (Bloch)
- 349. *L. kasmira* (Forsskal)*
- 350. *L. lutjanus* Bloch*
- 351. *L. malabaricus* (Schneider)
- 352. *L. russellii* Bleeker

Family COIIDAE

- 353. *Coius quadrifasciatus* (Sevastianov)

Family LOBOTIDAE

- 354. *Lobotes surinamensis* (Bloch)

Family GERREIDAE

- 355. *Gerres erythrourus* (Bloch)
- 356. *G. longirostris* (Lacepede)
- 357. *G. filamentosus* Cuvier
- 358. *G. limbatus* Cuvier
- 359. *G. oblongus* Cuvier
- 360. *G. oyena* (Forsskal)
- 361. *G. phayia* Iwatsuki & Heemstra
- 362. *G. setifer* (Hamilton)
- 363. *Pentaprion longimanus* (Cantor)

Family HAEMULIDAE

- 364. *Plectorhinchus nigrus* (Cuvier)*
- 365. *Pomadasys argenteus* (Forsskal)*
- 366. *P. argyreus* (Valenciennes)
- 367. *P. kaakan* (Cuvier)
- 368. *P. maculatus* (Bloch)

Family SPARIDAE

- 369. *Acanthopagrus berda* (Forsskal)

- 370. *A. latus* (Houttyun)
- 371. *Argyrops spinifer* (Forsskal)
- 372. *Crenidens crenidens* (Forsskal)
- 373. *Rhabdosargus sarba* (Forsskal)

Family LETHRINIDAE

- 374. *Lethrinus nebulosus* (Forsskal)*

Family NEMIPTERIDAE

- 375. *Nemipterus bipunctatus* (Ehenberg)
- 376. *N. furcosus* (Valenciennes)
- 377. *N. japonicus* (Bloch)
- 378. *Scolopsis vosmeri* (Bloch)

Family SCIAENIDAE

- 379. *Atrobucca nibe* (Jordan & Thompson)
- 380. *Chrysochir aureus* (Richardson)
- 381. *Daysciaena albida* (Cuvier)
- 382. *Dendrophysa russellii* (Cuvier)
- 383. *Johnieops borneensis* (Bleeker)
- 384. *J. dorsalis* (Peters)
- 385. *J. dussumieri* (Cuvier)
- 386. *J. macrorhynchus* (Mohan)
- 387. *J. osseus* (Day)
- 388. *Johnius belangerii* (Cuvier)
- 389. *J. carouna* (Cuvier)
- 390. *J. carutta* (Bloch)
- 391. *J. coitor* (Hamilton)
- 392. *J. dussumieri* (Valenciennes)
- 393. *J. macropterus* (Bleeker)
- 394. *Kathala axillaris* (Cuvier)
- 395. *Nibea soldado* (Lacepede)
- 396. *Otolithes cuvieri* (Trewavas)
- 397. *O. ruber* (Schneider)
- 398. *Otolithoides biauritus* (Cantor)
- 399. *Pama pama* (Hamilton)

- 400. *Panna microdon* (Bleeker)
- 401. *Paranibea semiluctuosa* (Cuvier)
- 402. *Pennahia anea* (Bloch)
- 403. *Protonibea diacanthus* (Lacepede)
- 404. *Pterotolithus maculatus* (Cuvier)

Family MULLIDAE

- 405. *Mulloidichthys flavolineatus* (Lacepede)
- 406. *Parupeneus indicus* (Shaw)
- 407. *P. macronema* (Lacepede)*
- 408. *Upeneus sulphureus* Cuvier
- 409. *U. tragula* Richardson*
- 410. *U. vittatus* (Forsskal)

Family MONODACTYLIDAE

- 411. *Monodactylus argenteus* (Linnaeus)

Family TOXOTIDAE

- 412. *Toxotes chatareus* (Hamilton)*

Family KYPHOSIDAE

- 413. *Kyphosus cinerascens* (Forsskal)*

Family DREPANIDAE

- 414. *Drepane longimana* (Bloch & Schneider)
- 415. *D. punctata* (Linnaeus)

Family EPHIPPIDAE

- 416. *Ephippus orbis* (Bloch)

Family PLATACIDAE

- 417. *Platax pinnatus* (Linnaeus)*
- 418. *P. teira* (Forsskal)

Family SCATOPHAGIDAE

- 419. *Scatophagus argus* (Bloch)

Family CHAETODONTIDAE

- 420. *Chaetodon vagabundus* Linnaeus
- 421. *Heniochus acuminatus* (Linnaeus)

Family NANDIDAE

- 422. *Nandus nandus* (Hamilton)

Family CICHLIDAE

- 423. *Eetroplus maculatus* (Bloch)*
- 424. *E. suratensis* (Bloch)
- 425. *Oreochromis mosambicus* (Peters)

Family SPHYRAENIDAE

- 426. *Sphyraena acutipinnis* Day
- 427. *S. barracuda* Walbaum*
- 428. *S. jello* Cuvier
- 429. *S. obtusata* Cuvier
- 430. *S. putnamiae* Jordan & Seale

Family POLYNEMIDAE

- 431. *Eleutheronema tetradactylum* (Shaw)
- 432. *Filimanus heptadactyla* (Cuvier)*
- 433. *F. xanthonema* (Valenciennes)
- 434. *Polydactylus indicus* (Shaw)
- 435. *P. plebeius* (Broussonet)
- 436. *P. sexfilis* (Valenciennes)
- 437. *P. sextarius* (Schneider)
- 438. *Polynemus paradiseus* Linnaeus

Family CHIASMONTIDAE

- 439. *Chiasmodon niger* Johnson*

Family CHAMPSODONTIDAE

- 440. *Champsodon vorax* Gunther*

Family URANOSCOPIDAE

- 441. *Ichthyoscopus lebeck* (Bloch)

442. *Uranoscopus cognatus* Cantor

443. *U. crassiceps* Alcock

444. *U. guttatus* Cuvier

Family TRICHONOTIDAE

445. *Trichonotus cyclograptus* (Alcock)

Family BLENNIIDAE

446. *Omobranchus zebra* (Bleeker)

447. *Xiphasia setifer* Swainson

Family CALLIONYMIDAE

448. *Callionymus carebares* Alcock

449. *C. fluviatilis* Day

450. *C. sagitta* Pallas

451. *Eleutherochir opercularis* (Valenciennes)

452. *Synchiropus lineolatus* (Valenciennes)*

Family ELEOTRIDIDAE

453. *Butis butis* (Hamilton)

454. *B. melanostigma* (Bleeker)

455. *Eleotris fusca* (Schneider)

456. *E. lutea* Day

457. *E. melanosoma* Bleeker

458. *Ophiocara porocephala* (Valenciennes)*

459. *Prionobutis koilomatodon* (Bleeker)

Family GOBIIDAE

460. *Acentrogobius canius* (Valenciennes)*

461. *A. cyanomos* (Bleeker)

462. *A. griseus* (Day)*

463. *A. madraspatensis* (Day)*

464. *A. masoni* (Day)

465. *A. viridipunctatus* (Valenciennes)

466. *Apocryptes bato* (Hamilton)

467. *Apocryptodon madurensis* (Bleeker)

- 468. *Awaous grammepomus* (Bleeker)
- 469. *A. gutum* (Hamilton)
- 470. *Bathygobius fuscus* (Ruppell)*
- 471. *B. ostreicola* (Chaudhuri)
- 472. *Boleophthalmus boddarti* (Pallas)*
- 473. *Brachygobius nunus* (Hamilton)
- 474. *Chiramenu fluviatilis* Rao*
- 475. *Drombus globiceps* (Hora)
- 476. *Favonigobius reichei* (Bleeker)*
- 477. *Glossogobius giuris* (Hamilton)
- 478. *G. mas* Hora*
- 479. *Gobiopterus chuno* (Hamilton)
- 480. *Istigobius ornatus* (Ruppell)
- 481. *Obliquogobius cometes* (Alcock)
- 482. *Oligolepis acutipennis* (Valenciennes)
- 483. *O. cylindriceps* (Hora)
- 484. *Oxyurichthys microlepis* (Bleeker)
- 485. *O. tentacularis* (Valenciennes)
- 486. *Parachaeturichthys polynema* (Bleeker)
- 487. *Parapocryptes rictuosus* (Valenciennes)
- 488. *P. serperaster* (Richardson)*
- 489. *Paroxyurichthys laterisquamatus* (Weber)
- 490. *Periophthalmodon schlosseri* (Pallas)*
- 491. *Periophthalmus argentilineatus* Valenciennes
- 492. *P. kalolo* Lesson
- 493. *Psammogobius biocellatus* (Valenciennes)
- 494. *Pseudapocryptes elongatus* (Cuvier)
- 495. *Scartelaos histophorus* (Valenciennes)
- 496. *Stigmatogobius javanicus* (Bleeker)
- 497. *S. minima* (Hora)

Family GOBIOIDIDAE

- 498. *Brachyamblyopus brachysoma* (Bleeker)*
- 499. *Caragobius urolepis* (Bleeker)
- 500. *Odontamblyopus rubicundus* (Hamilton)

501. *Pseudotrypauchen multiradiatus* (Hardenberg)
502. *Tuenioides anguillaris* (Linnaeus)
503. *T. buehanani* (Day)*
504. *T. cirratus* (Blyth)*

Family TRYPAUCHENIDAE

505. *Amblyotrypauchen arctocephalus* (Alcock)
506. *Trypauchen vagina* (Bloch & Schneider)*

Family KRAEMARIIDAE

507. *Kraemeria samoensis* (Steindachner)

Family KURTIDAE

508. *Kurtius indicus* Bloch

Family ACANTHURIDAE

509. *Acanthurus lineatus* (Linnaeus)
510. *A. nigrofuscus* (Forsskal)
511. *A. nistis* Randall*

Family SIGANIDAE

512. *Siganus canaliculatus* (Park)
513. *S. javus* (Linnaeus)
514. *S. vermiculatus* (Valenciennes)*

Family TRICHIURIDAE

515. *Eupleurogrammus glossodon* (Bleeker) *
516. *E. muticus* (Gray)
517. *Lepturacanthus pantului* (Gupta)
518. *L. savala* (Cuvier)
519. *Trichiurus gangeticus* (Gupta)
520. *T. lepturus* Linnaeus

Family SCOMBRIDAE

521. *Euthynnus affinis* (Cantor)*
522. *Rastrelliger kanagurta* (Cuvier)
523. *Scomberomorus commerson* (Lacepede)*

524. *S. guttatus* (Bloch & Schneider)
 525. *S. lineolatus* (Cuvier)
 526. *Thunnus orientalis* (Temminck & Schlegel)*

Family CENTROLOPHIDAE

527. *Psenopsis cyanea* (Alcock)

Family ARIOMMATIDAE

528. *Ariomma indica* (Day)

Family STROMATEIDAE

529. *Pampus argenteus* (Euphrasen)

530. *P. chinensis* (Euphrasen)

Family ANABANTIDAE

- 531 *Anabus testudineus* (Bloch)*

Family OSPHRONEMIDAE

532. *Colia fasciata* (Schneider) *

Famly CHANNIDAE

533. *Channa marulius* (Hamilton)*

534. *C. orientalis* (Schneider)

535. *C. punctatus* (Bloch)*

Order PLEURONECTIFORMES

Family PSETTODIDAE

536. *Psettodes erumei* (Schneider)

Family CITHARIDAE

537. *Brachypleura novaezeelandiae* Gunther

Family BOTHIDAE

538. *Arnoglossus macrolophus* Alcock

539. *Bothus myriaster* (Temminck & Schlegel)

540. *Crossorhombus azureus* (Alcock)

541. *C. valderostratus* (Alcock)*

542. *Laeops guentheri* (Alcock)

- 543. *L. lophoptera* (Alcock)
- 544. *L. macrophthalmus* (Alcock)
- 545. *Psettina brevirectis* (Alcock)

Family PARALICHTHYIDAE

- 546. *Pseudorhombus arsius* (Hamilton)
- 547. *P. dupliciocellatus* Regan*
- 548. *P. elevatus* Ogilby
- 549. *P. javanicus* (Bleeker)
- 550. *P. malayanus* Bleeker
- 551. *P. micrognathus* Norman
- 552. *P. triocellatus* (Schneider)

Family CYNOGLOSSIDAE

- 553. *Cynoglossus arel* (Schneider)
- 554. *C. bilineatus* (Lacepede)
- 555. *C. carpenteri* Alcock
- 556. *C. cynoglossus* (Hamilton)
- 557. *C. itinus* (Snyder)*
- 558. *C. kopsii* (Bleeker)
- 559. *C. lida* (Bleeker)
- 560. *C. lingua* Hamilton
- 561. *C. macrostomus* Norman
- 562. *C. monopus* (Bleeker)
- 563. *C. puncticeps* (Richardson)
- 564. *C. semifasciatus* Day*
- 565. *Paraplagusia bilineata* (Bloch)
- 566. *P. blochii* (Bleeker)

Family SOLEIDAE

- 567. *Aesopia cornuta* Kaup*
- 568. *Aseraggodes cyaneus* (Alcock)
- 569. *Brachirus macrolepis* (Bleeker)*
- 570. *B. orientalis* (Bloch)
- 571. *B. panoides* (Bleeker)
- 572. *Heteromycteris oculus* (Alcock)*

- 573. *Pardachirus marmoratus* (Lacepede)
- 574. *P. pavoninus* (Lacepede)
- 575. *Solea elongata* Day*
- 576. *S. ovata* Richardson
- 577. *Synaptura albomaculata* Kaup*
- 578. *S. commersonnii* (Lacepede)
- 579. *Zebrias altipinnis* Alcock
- 580. *Z. annandalei* Talwar & Chakrapani
- 581. *Z. quagga* (Kaup)
- 582. *Z. synapturoides* (Jenkins)

Order TETRAODONTIFORMES
Family TRIACANTHIDAE

- 583. *Pseudotriacanthus strigilifer* (Cantor)
- 584. *Triacanthus biaculeatus* (Bloch)
- 585. *Tripodichthys oxycephalus* (Bleeker)*
- 586. *Trixiphichthys weberi* (Chaudhuri)

Family BALISTIDAE

- 587. *Abalistes stellaris* (Lacepede)*
- 588. *Balistes ellioti* Day*

Family MONACANTHIDAE

- 589. *Anacanthus barbatus* Gray
- 590. *Paramonacanthus choirocephalus* (Bleeker)

Family OSTRACIIDAE

- 591. *Rhynchostracion nasus* Bloch
- 592. *Tetrosomus gibbosus* (Linnaeus)

Family TETRAODONTIDAE

- 593. *Arothron immaculatus* (Bloch & Schneider)
- 594. *A. reticularis* (Bloch & Schneider)
- 595. *A. stellatus* (Bloch & Schneider)
- 596. *Canthigaster margaritata* (Ruppell)*
- 597. *Chelonodon fluviatilis* (Hamilton)
- 598. *C. patoca* (Hamilton)

- 599. *Lagocephalus inermis* (Schlegel)*
- 600. *L. lunaris* (Bloch & Schneider)
- 601. *L. spadiceus* (Richardson)
- 602. *Takifugu oblongus* (Bloch)
- 603. *Tetraodon cutcutia* (Hamilton)

Family DIODONTIDAE

- 604. *Cyclichthys orbicularis* Bloch*
- 605. *Diodon histrix* Linnaeus*

SYSTEMATIC ACCOUNT

The marine and estuarine fish fauna of Orissa coast can usually segregated into two classes : Chondrichthyes and Osteichthyes as under :

Key to the classes

- 1a. Body made up of cartilaginous skeleton. Five to seven pairs of lateral or ventral, nonconfluent gill slits without gill covers CHONDRICHTHYES
- 1b. Body made up of bony skeleton. One pair of lateral gill slits confluent as a single ventral slit or nonconfluent as lateral gill slits with gill cover
..... OSTEICHTHYES

Class CHONDRICHTHYES (Cartilaginous fishes)

Key to orders

- 1a. Gill slits present on lateral sides of head. Anal fin present..... 2
- 1b. Gill slits present on ventral sides of head. Anal fin absent (Skates and Rays)..... 3
- 2a. Mouth anterior to orbit ORECTOLOBIFORMES
- 2b. Mouth posterior to front margin of orbit CARCHARHINIFORMES
- 3a. Body not shark-like, but distinctly depressed. Pectoral fins broadly enlarged. Tail almost marked off from the body TORPEDINIFORMES
- 3b. Body shark-like appearance, somewhat depressed. Pectoral fins barely enlarged. Tail not distinctly marked off from the body 4

- 4a. Snout conspicuously elongate, prolonged into a long, flat plate having a row of large teeth-like structure (saw-like) on each side PRISTIFORMES
- 4b. Snout wedge-shaped and much prolonged, but not as a blade and without lateral teeth RAJIFORMES

Order ORECTOLOBIFORMES

Key to the families

- 1a. Caudal fin almost equal to rest of body STEGOSTOMATIDAE
- 1b. Caudal fin considerably shorter than rest of body HEMISCYLLIDAE

Family HEMISCYLLIDAE

(Bamboo sharks, Long-tailed carpet sharks)

Body cylindrical or slightly depressed, with or without ridges on sides. Mouth small and transverse, anterior to eyes. Eyes dorsolateral with large spiracles below them. Gill slits small and the fifth slit overlapping the fourth. Two dorsal fins without spines, the second dorsal fin insertion well ahead of anal fin origin. Anal fin rounded with keel-like apex, separated from the lower caudal origin by a narrow notch. Precaudal tail long, much greater than head length and body depth. Caudal peduncle without lateral keels and precaudal pits.

Species known to occur in Orissa

1. *Chiloscyllium griseum* Muller and Henle (Grey bamboo shark)
2. *C. indicum* (Gmelin) (Slender bamboo shark)

Key to the species

- 1a. Body and tail very slender; anal fin origin considerably posterior to free rear tip of second dorsal fin; length of anal fin, from origin to free rear tip, subequal to length of hypural caudal lobe from lower caudal origin to subterminal notch; body with numerous small dark spots and bars *C. indicum*
- 1b. Body and tail moderately slender to relatively stout; anal fin origin below or close behind free tip of second dorsal fin; length of anal fin very shorter than hypural caudal lobe; body colour varied but without numerous small dark spots and bars *C. griseum*

Fisheries information : *C. griseum* and *C. indicum* are very common species occurring in both the coasts of our country. These species caught by shore-line fishing and used for human consumption.

Family STEGOSTOMATIDAE
(Zebra shark)

Body cylindrical with conspicuous ridges on sides. Mouth small and transverse, anterior to eyes. Eyes lateral. Spiracles subequal in size to eyes but not below them. Gill slits small, fifth overlapping fourth. Caudal peduncle without lateral keels and precaudal pits. First dorsal fin larger than second, its origin extended well anterior to origin of pelvic fins and insertion almost over pelvic fins. Juveniles with dark saddles, adults with dark spots.

Species known to occur in Orissa

Stegostoma fasciatum (Hermann) (Zebra shark) (Threatened)

Fisheries information : Zebra shark is a common species that occurring in both the coasts of our country. The flesh used fresh and dried salted for human consumption. Their liver processed for vitamins; fins dried and processed for the oriental shark fin trade and offal used for fishmeal.

Order CARCHARHINIFORMES
(Ground sharks)

Key to the families

- 1a. Head with lateral, blade-like expansions..... SPHYRNIDAE
- 1b. Head normal, without lateral expansions 2
- 2a. Intestinal valve of scroll type..... CARCHARHINIDAE
- 2b. Intestinal valve of spiral type..... HEMIGALEIDAE

Family HEMIGALEIDAE
(Weasel sharks)

Body spindle shaped. Head without lateral expansions. Mouth large, extending to anterior border of eyes. Labial furrows long, extending well onto both jaws. Eyes with internal nictitating eyelids. Two moderate sized spineless dorsal fins and an anal fin, the first dorsal fin base considerably anterior to pelvic fin bases and its origin behind pectoral fin base. Precaudal pits present. Caudal fin with a strong ventral lobe and lateral undulations on its dorsal border. Intestine with a spiral valve. Spiracles present.

Species known to occur in Orissa

Hemipristis elongata (Klunzinger) (Snaggletooth shark)

Fisheries information : This is a commonly occurring shark along the coasts of India. The flesh used for human consumption, liver processed for oil rich in vitamins, fins used in the oriental shark fin trade and offal for fishmeal.

Remarks : *H. elongata* was reported as *Eulamia ellioti* (Day) (Nagabhushanam and Rao, 1969) and the synonymy in Talwar and Kacker (1984) is followed here.

Family CARCHARHINIDAE

(Requiem sharks)

Body spindle shaped. Head without lateral expansions. Mouth extends to anterior border of eyes. Eyes with internal nictitating eyelids. Fifth gill slit behind or over pectoral fin origin. Two dorsal fins and an anal fin, the first dorsal fin with its base well anterior to pelvic fin bases. Precaudal pits usually present. Caudal fin with a strong ventral lobe and lateral undulations on its dorsal border. Intestine with a scroll valve. Body colour variable.

Species known to occur in Orissa

1. *Carcharhinus limbatus* (Valenciennes) (Blacktip shark) (Threatened)
2. *C. melanopterus* (Quoy and Gaimard) (Blacktip reef shark)
3. *C. sorrah* (Valenciennes) (Spot-tail shark)
4. *Glyphis gangeticus* (Muller and Henle) (Ganges shark) (Threatened)
5. *Lamiopsis temminckii* (Muller and Henle) (Broadfin shark)
6. *Rhizoprionodon acutus* (Ruppell) (Milk shark)
7. *R. oligolinx* Springer (Grey sharpnose shark)
8. *Scoliodon laticaudus* Muller and Henle (Spadenose shark)

Key to the species

- 1a. Second dorsal fin almost or quite as large as first dorsal fin *L. temminckii*
- 2b. Second dorsal fin considerably smaller than the first 2
- 2a. Head depressed and trowel-shaped. Pectoral fins broadly triangular, length from origin to free rear tips almost equal to their anterior margins. Free rear tips of first dorsal fin about over midbases of pelvic fins. Postventral margin of caudal fin shallowly concave *S. laticaudus*
- 2b. Head varying from conical to slightly depressed. Pectoral fins narrow, length 4/5 or less of anterior margin (generally less). Free rear tip of dorsal fin over (or usually anterior to) pelvic fin origins. Postventral margin of caudal fin deeply incised 3
- 3a. Second dorsal fin origin well posterior to anal fin origin 4
- 3b. Second dorsal fin origin usually above vertical from anal fin origin 5

- 4a. Upper labial furrows long and conspicuous, more than 1% of total length and usually more than 1.3%; uppers generally as long as or longer than lower furrows. Tooth rows more numerous in average, counts 23 to 30/21 to 28 but mostly 25/24 or higher ..
..... *R. acutus*
- 4b. Upper labial furrows reduced and often inconspicuous, usually less than 1% of total length and rarely up to 1.3%; uppers generally shorter than lower furrows. Tooth rows averaging fewer, counts 23 to 25/21 to 24 but mostly below 25/24
..... *R. oligolinx*
- 5a. Cusps of lower teeth prominently protruding when mouth closed. Precaudal pits longitudinal (not crescentic) *G. gangeticus*
- 5b. Cusps of lower teeth not prominently protruding when mouth closed. Precaudal pits transverse and crescentic 6
- 6a. Second dorsal fin low, with very elongated inner margin over twice fin height. Interdorsal ridge present *C. sorrah*
- 6b. Second dorsal fin higher, with shorter inner margin less than 2 times fin height. Interdorsal ridge absent 7
- 7a. Entire posterior margin of caudal fin with a narrow black edge; pectoral, second dorsal and caudal fins with black tips. Snout very short and bluntly rounded
..... *C. melanopterus*
- 7b. Entire posterior margin of caudal fin not black or only partly dusky or black; fins dusky or black-tipped. Snout longer and pointed *C. limbatus*

Fisheries information : The livers utilized for production of vitamin oils, hides for leathers, fins used for shark-fin soup base and carcasses utilized for fishmeal. *G. gangeticus* is rare in occurrence and its catch is punishable under law.

Family SPHYRNIDAE

(Hammerhead sharks)

Head with laterally expanded blades, like 'hammer' heads. Eyes with internal nictitating eyelids. Spiracles absent. First dorsal fin ahead of pelvic fin bases, varying from equidistant between pectoral and pelvic fin bases to closer to pectoral fin bases; midpoint of first dorsal fin base always anterior to pelvic fin origins. Second dorsal fin much smaller than first. Precaudal pits present. Ventral caudal lobe strong, dorsal caudal border with undulations. Intestine with a scroll valve. Colour light grey or brownish above, white below.

Species known to occur in Orissa

1. *Eusphyra blochii* (Cuvier) (Winghead shark)

2. *Sphyrna lewini* (Griffith & Smith) (Scalloped hammerhead shark)
3. *S. mokarran* Ruppell (Great hammerhead shark)
4. *S. zygaena* (Linnaeus) (Roundheaded hammerheaded shark)

Key to the species

- 1a. Lateral blades of head very narrow and wing-like. Nostrils greatly enlarged, their width 0.8 to 0.9 times in the internarial width and almost twice the mouth width. Knobs present along anterior border of head, opposite nostrils *E. blochii*
- 1b. Lateral blades of head anteroposteriorly broad, not wing-like. Nostrils short, their width 7 to 14 times in internarial width and less than half of mouth width. No knobs along anterior border of head 2
- 2a. Prenarial grooves absent or weakly developed. Teeth strongly serrated. Pelvic fins high and falcate *S. mokarran*
- 2b. Prenarial grooves well-developed. Teeth smooth-edged to weakly serrate. Pelvic fins low and not falcate, with almost straight posterior margins 3
- 3a. Anterior border of head with a prominent median indentation. Anal fin base larger than second dorsal fin base *S. lewini*
- 3b. Anterior border of head without median indentation. Anal fin base as large as second dorsal fin base *S. zygaena*

Fisheries information : The flesh of these sharks is utilized for human consumption, hides are processed for leather, fins are used in the shark-fin soup base, and liver is processed for vitamins and carcasses for fishmeal. *S. lewini* is commonly occurring along Orissa coast.

Order PRISTIFORMES

Family PRISTIDAE

(Sawfishes)

Body shark-like. Snout produced into a narrow, flat blade, armed with teeth-like structures on each side (saw-like). Gill openings on ventral side. Eyes and spiracles on top of head. Two dorsal fins widely separated. Pectoral fins small. Caudal fin well developed. Tail not marked off from the trunk. Body, fins and rostrum covered with small, closely set dermal denticles in adults but juveniles of *Anoxypristis* are completely naked.

Species known to occur in Orissa

1. *Anoxypristis cuspidata* (Latham) (Knife-tooth sawfish) (Threatened)
2. *Pristis microdon* Latham (Large-tooth sawfish) (Threatened)

3. *P. pectinata* Latham (Smalltooth sawfish) (Threatened)
4. *P. zijsron* Bleeker (Longcomb sawfish) (Threatened)

Key to the species

- 1a. Rostral teeth depressed, broad and blade-like, in shallow broad sockets. Nasal flaps small. Caudal fin with a prominent subterminal notch and long ventral lobe *A. cuspidata*
- 1b. Rostral teeth narrow, not greatly depressed and spike-like, in deep, narrow sockets. Nasal flaps large. Caudal fin without a subterminal notch, with a short ventral lobe or none 2
- 2a. First dorsal fin almost entirely anterior to pelvic fins. Rostral teeth 17 to 22 pairs *P. microdon*
- 2b. First dorsal fin on or posterior to origin of pelvic fin. Rostral teeth 25 to 32 pairs 3
- 3a. First dorsal fin above pelvic fin origin *P. pectinata*
- 3b. First dorsal fin distinctly behind pelvic fin origin *P. zijsron*

Fisheries information : *A. cuspidata* is a euryhaline species, usually found on the east coast of our country. The liver of the sawfishes are used for extraction of oils, which contain high percentage of vitamin-A, and flesh is utilized for human consumption. But catching any of these species is banned under law.

Order TORPEDINIFORMES

Key to the families

- 1a. Disc truncate or emarginate anteriorly. Jaws extremely slender. Labial cartilage absent. Rostrum absent or reduced TORPEDINIDAE
- 1b. Disc rounded anteriorly. Jaws stout. Labial cartilage strong. Rostrum present NARCINIDAE

Family TORPEDINIDAE

(Electric rays)

Body soft and flabby with powerful electric organs, derived from branchial muscles in the head region. Disc truncate or emarginate anteriorly. Jaws slender; labial cartilage absent. Rostrum absent or reduced. Caudal fin well developed. Two spineless dorsal fins inserted on tail region. Pelvic fins well developed. Anal fin absent.

Species known to occur in Orissa

Torpedo panthera Olfers (Panther electric ray)

Fisheries information : Electric ray is a littoral species and its flesh is edible. This species can produce electric current over 100 volts. Its electric nervous energy gets exhausted easily.

Family NARCINIDAE (Numbfishes)

Body soft and flabby with electric organs derived from branchial muscles present in the head region. Disc rounded anteriorly. Strong labial cartilage present. Broad or narrow rostrum present. One or two spineless dorsal fins present on tail region. Dorsal fins, pelvic fins and caudal fin well developed. Anal fin absent.

Species known to occur in Orissa

- 1 *Narcine brunnea* Annandale (Brown numbfish)
2. *N. indica* Henle (Largespotted numbfish)
3. *N. timlei* (Bloch & Schneider) (Blackspotted numbfish)
4. *Narke dipterygia* (Bloch and Schneider) (Spottail sleeper ray)

Key to the species

- 1a. Shallow groove around mouth. Jaws short and weakly protractile. Rostrum narrow. Dorsal fin single *N. dipterygia*
- 1b. Deep groove around mouth and lips. Jaws long and strongly protractile. Rostrum broad. Two dorsal fins 2
- 2a. Mouth without buccal process. Dorsal side of disc uniform brown in colour *N. brunnea*
- 2b. Mouth with a pair of buccal processes on roof as well as on floor. Dark brown spots on dorsal side 3
- 3a. Interdorsal space 2.0 times in first dorsal in base. Teeth in 27 rows in upper jaw and 26 rows in lower jaw *N. indica*
- 3b. Interdorsal space 1.5 times in first dorsal fin base. Teeth in 23 rows in upper jaw and 21 rows in lower jaw *N. timlei*

Fisheries information : The fishes of this family have no commercial value and only occasionally caught as by catch.

Remarks : *N. dipterygia* was previously included under the family Narkidae. *Bengalichthys impennis* Annandale, described from Orissa coast (Annandale, 1909), is currently considered

to be a junior synonym of *N. dipterygia* by Eschmeyer (1998) which needs further studies. Identity of *N. indica* and *N. timlei* in Indian waters remains confused owing to their similar structure and colouration, while the occurrence of the former is said to be doubtful. Inclusion of *N. indica* here is based on Prasad (1920). *Narcine indica* was previously referred as *N. maculata* (Shaw) in Misra (1969).

Order RAJIFORMES

Key to the families

- 1a. Body moderately depressed, somewhat shark-like or intermediate between shark-like and skate-like. Pectoral fins barely enlarged. Tail not distinctly marked off body. Caudal fin present RHINOBATIDAE
- 1b. Body distinctly depressed. Pectoral fins broadly enlarged. Tail more or less sharply marked off body. Caudal fin absent 2
- 2a. Eyes and spiracles on sides of head. Dorsal fin present 3
- 2b. Eyes and spiracles on top of head. Dorsal fin absent 4
- 3a. Head with two widely separated anterior horn-like projections (cephalic horns) resemble ears MOBULIDAE
- 3b. Head with one soft fleshy lobe (sub-rostral lobe) protruding markedly forward under the head resemble a duck's beak MYLIOBATIDAE
- 4a. Disc more than 1.5 times broader than long. Tail slender, shorter than disc width. No buccal papillae on floor of mouth GYMNURIDAE
- 4b. Disc at most 1.3 times as broad as long. Tail (if complete) much longer than disc width. Floor of mouth usually with 2 to 4 papillae DASYATIDAE

Family RHINOBATIDAE (Guitar fishes)

Body more or less intermediate between shark-like and skate-like. Anterior part of trunk varying from more or less flattened to strongly flattened body. Snout elongate and tapering. Hind border of pectoral fins extending to origin of pelvic fins or beyond. Tail stout and not definitely marked off from body. Two well developed dorsal fins and a caudal fin. Caudal fin with or without a distinct lower lobe. No spine on tail. Denticles over body constitute a row on middle of back.

Species known to occur in Orissa

- 1 *Rhina ancylostoma* Schneider (Brownmouth guitarfish)

2. *Rhinobatos granulatus* Cuvier (Sharpnose guitar fish)
3. *Rhynchobatus djeddensis* (Forsskal) (Giant guitarfish) (Threatened)

Key to the species

- 1a. Snout broad and rounded. Posterior border of spiracle without folds.....
..... *R. ancylostoma*
- 1b. Snout long and pointed. Posterior border of spiracles folds 2
- 2a. First dorsal fin inserted above pelvic fin bases. Caudal fin bilobed. Anterior nasal flap not extending across inner margin of nostril. Rostral ridges separated
..... *R. djeddensis*
- 2b. First dorsal fin inserted behind tip of pelvic fins. Caudal fin not bilobed. Anterior nasal flap extending onto inner margin of nostril. Rostral ridge close together
..... *R. granulatus*

Fisheries information : The guitar fishes are of not much economic value. *R. djeddensis* grows up to 240 kg. The liver of this fish produce a good quality of liver-oil. Its flesh is also considered nourishing when consumed fresh or salted.

Family DASYATIDAE (Sting rays, Whiprays)

Disc kite-like, flattened, outer front margin of pectoral fins continuous along side of head. Spiracles large, close posterior to eyes on top of head. A long tail distinct from disc, with one or more long poisonous spines. Dorsal and caudal fin absent. Pelvic fins small, inserted below pectoral fins.

Species known to occur in Orissa

1. *Dasyatis kuhlii* (Muller and Henle) (Blue spotted sting ray)
2. *D. zugei* (Muller and Henle) (Pale-edged sting ray)
3. *Himantura alcockii* (Annandale) (Pale-spot whip ray)
4. *H. bleekeri* (Blyth) (Bleeker's whip ray)
5. *H. fava* (Annandale) (NA)
6. *H. gerrardi* (Gray) (Sharpnose sting ray)
7. *H. imbricata* (Schneider) (Scaly sting ray)
8. *H. jenkinsii* (Annandale) (Sharpnose sting ray)
9. *H. marginatus* (Blyth) (Blackedge whipray)
10. *H. microps* (Annandale) (Annandale's sting ray)

11. *H. uarnak* (Forsskal) (Honeycomb sting ray)
12. *H. walga* (Muller & Henle) (Dwarf whip ray)
13. *Pectinachus sephen* (Forsskal) (Drab sting ray)
14. *Urogymnus asperrimus* (Bloch & Schneider) (Porcupine ray) (Threatened)

Key to the species

- 1a. Tail without serrated spine. Upper surface of disc profusely covered with tubercles *U. asperrimus*
- 1b. Tail with serrated spine. Upper surface of disc sparsely covered with tubercles 2
- 2a. Tail with a longitudinal cutaneous fold 3
- 2b. Tail without a longitudinal cutaneous fold 5
- 3a. Tail with very prominent cutaneous fold on lower side *P. sephen*
- 3b. Tail with a short cutaneous fold on upper side 4
- 4a. Floor of mouth with two buccal processes (papillae). Disc brown with reddish margins and blue circular spots *D. kuhlii*
- 4b. Floor of mouth without buccal processes (papillae). Disc plain dusky brown *D. zugei*
- 5a. Disc oval, usually with two (rarely three) functional stings 6
- 5b. Disc diamond shaped, usually with a single functional sting 9
- 6a. Dorsal surface of disc with a well marked reticulated colour pattern *H. fava*
- 6b. Dorsal surface of disc plain 7
- 7a. Underside of disc with broad margin. Disc width of adults exceeds one meter *H. bleekeri*
- 7b. Underside of disc entirely white. Disc width of adults under 25 cm 8
- 8a. Eye diameter 5.5 times in snout and 3.3 times in interorbital width. Caudal spine elongate, longer than $\frac{1}{2}$ eye diameter *H. walga*
- 8b. Eye diameter 6.0 times in snout and 3.5 times in interorbital width. Caudal spine short, shorter than $\frac{1}{2}$ eye diameter *H. imbricata*
- 9a. Mouth with 2 buccal processes *H. marginatus*
- 9b. Mouth with 4 buccal processes 10

- 10a. Tail short, nearly as long as disc length *H. microps*
- 10b. Tail long, longer than disc length 11
- 11a. Upper surface of disc brown to black with honey comb or reticulated pattern in adult, 'leopard' pattern in young *H. uarnak*
- 11b. Upper surface of disc brown or grey, without any bright markings, at most with obscure pale spots 12
- 12a. Snout forming widely obtuse angle. Tail banded *H. gerrardi*
- 12b. Snout pointed. Tail not banded 13
- 13a. Eye diameter about 2 times in interorbital width. Snout about 6 times in disc length. Disc without spots *H. jenkinsii*
- 13b. Eye diameter about 4.5 times in interorbital width. Snout about 4 times in disc length. Disc with obscure pale spots *H. alcockii*

Fisheries information : The liver of *H. sephen* is utilized for the preparation of liver oil which contains high potency of vitamin A. The flaps of these rays are utilized only for the preparation of fishmeal.

Remarks : *H. walga* was kept under synonymy of *H. imbricata* by Talwar and Jhingran (1991); as the former is a valid species and based on the recent studies (Compagno, 1999) we kept them separate although authors doubt their occurrence along Indian coast.

Family GYMNURIDAE (Butterfly rays)

Disc rhomboic, at least 1.5 times as broad as long. Tail conspicuously marked off, slender and shorter than disc; with or no longitudinal folds on upper and/or lower surface. Some species have spiracular tentacles and/or saw-edged tail spines. Caudal fin absent.

Species known to occur in Orissa

1. *Aetoplatea tentaculata* Muller & Henle (Tentacled butter fly)
2. *A. zonura* Bleeker (Zonetail butterfly ray)
3. *Gymnura japonica* (Schlegel) (Japanese butterfly ray)
4. *G. poecilura* (Shaw) (Longtail butterfly ray)

Key to the species

- 1a. No dorsal fin. No cutaneous fold on tail 2

- 1b. Small but distinct dorsal fin near midlength of tail. A small longitudinal cutaneous fold present on tail 3
- 2a. Tail armed with a small, weak, serrated spine at its first third *G. japonica*
- 2b. Tail without serrated spine *G. poecilura*
- 3a. Small tentacle present at posterior angle of spiracle *A. tentaculata*
- 3b. Spiracular tentacle absent *A. zonura*

Fisheries information : These fishes are common in the commercial catches but are of no commercial value, only used for preparation of fishmeal.

Family MYLIOBATIDAE (Eagle rays)

Head elevated and distinctly marked off from disc. Disc rhombic, much broader than long, its width in adults measures up to more than 2.5 m. Eyes and spiracles lateral on head. Gill openings about eye length. Anterior subdivision of pectoral fins forms a single subrostral lobe. Floor of mouth with several fleshy papillae. Dorsal fin small; caudal fin absent. Tail long and whip-like and much longer than disc, a serrated caudal spine may be present.

Species known to occur in Orissa

- 1 *Aetobatus flagellum* (Bloch and Schneider) (Longheaded eagle ray)
- 2. *A. narinari* (Euphrasen) (Spotted eagle ray)
- 3. *Aetomylaeus maculatus* (Gray) (Mottled eagle ray)
- 4. *A. nicholfii* (Schneider) (Nieuhof's eagle ray) (Threatened)
- 5. *Rhinoptera javanica* Muller and Henle (Javanese cowray)

Key to the species

- 1a. Subrostral lobe divided (bilobed), deeply incised in midline. Floor of mouth without papillae. Teeth in seven series in both jaws *R. javanica*
- 1b. Subrostral lobe undivided. Floor of mouth with several fleshy papillae 2
- 2a. Single series of large teeth only in each jaw. Caudal spine present 3
- 2b. Teeth in seven series in each jaw. Caudal spine absent 4
- 3a. Snout straight, 1.8 times in mouth width. Body colour uniform *A. flagellum*
- 3b. Snout conical, 1.3 times in mouth width. Body spotted with white blotches
..... *A. narinari*

- 4a. Eyes larger, 2.5 times in snout length and 3.2 times in interorbital width. Disc with yellowish spots and blotches arranged in transverse bands *A. maculatus*
- 4b. Eyes smaller, 3.5 times in snout length and 5.0 times in interorbital width. Disc with 3 to 5 greyish blue bands, that disappear with age *A. nichofii*

Fisheries information : The eagle rays are occasionally found in the commercial catches along Orissa coast. These fishes are usually processed for fishmeal. The oil extracted from the liver of these fishes is utilized for smearing boats.

Family MOBULIDAE (Devil rays)

Head distinct; each side of snout with a fleshy horn-like projection, a cephalic fin, separated by width of mouth. Disc rhomboic. Eyes and spiracles lateral on head. Teeth minute, in several series forming bands; no papillae in mouth. Tail long, whip-like. Caudal fin absent; a small dorsal fin at base of tail present. These are large rays, grow to about 6 m disc width and weigh more than 1300 kg.

Species known to occur in Orissa

1. *Manta birostris* (Donndroff) (Giant manta)
2. *Mobula eregoodootenkee* Garman (Pigmy devil ray)

Key to the species

- 1a. Mouth terminal, extending across front of head *M. birostris*
- 1b. Mouth on lower surface of head *M. eregoodootenkee*

Fisheries information : Mantaray and Devil ray are occasionally caught in drift nets during September-October months.

Remarks : Recent authors place these fishes under family Myliobatidae. *Ceratoptera orissa*, described from Orissa coast (Lloyd, 1908) is a junior synonym of *M. birostris*. As per Talwar and Kacker (1984) two species, *Mobula diabolus* (Shaw) and *M. mobular* (Bonnaterre) occur along Indian coast, where as the former is relegated to the synonymy of the later (Compagno, 1999). On examination, the species from Orissa coast is confirmed to be *M. eregoodootenkee*.

Class OSTEICHTHYES (Bony fishes)

Key to the orders

- 1a. Body not bilaterally symmetrical, highly flattened. Eyes present on one side of body only. Dorsal and anal fins long based PLEURONECTIFORMES

- 1b. Body bilaterally symmetrical. Eyes present on both sides of body. Dorsal and anal fin base of variable length 2
- 2a. Gill openings below or posterior to pectoral fins. First spine of dorsal fin modified into a fishing pole. Body globose or depressed LOPHIFORMES
- 2b. Gill openings anterior to pectoral fins. First dorsal fin spine not modified 3
- 3a. Body cylindrical, much elongated, eel-shaped 4
- 3b. Body compressed, not eel-shaped 5
- 4a. Gill openings confluent, a single slit on ventral surface. Dorsal and anal fins vestigial or absent, when present, preceeded by spines SYNBRANCHIFORMES
- 4b. Gill openings free, narrow on sides of head. Dorsal and anal fins long, continuous with caudal fin, but without spines ANGUILLIFORMES
- 5a. Snout considerably elongate, tube-like, with the mouth at the end of tube. Pelvic fins, when present, abdominal and without spine SYNGNATHIFORMES
- 5b. Snout not tubular, but if it resembles a tube then pelvic fins under or not far behind pectoral fins and usually with a strong spine 6
- 6a. Snout beak-like with upper and/or lower jaws greatly prolonged or with enlarged wing-like pectoral fin. Lateral line near ventral profile of body
..... BELONIFORMES
- 6b. Snout not beak-like without prolongation of upper or lower jaw. Pectoral fins not greatly elongated, if so not wing-like. Lateral line usually on upper part of body ..
7
- 7a. Body without scales but a bony head shield often present. Barbels well developed, present around mouth. A single strong spine generally present at front of dorsal and pectoral fins SILURIFORMES
- 7b. Body with scales. Barbels usually not present, if present poorly developed 8
- 8a. Pelvic fins with 2 rays. Dorsal and anal fins united with caudal fin
..... OPHIDIIFORMES
- 8b. Pelvic fins with more than 2 rays. Dorsal and anal fins not united with caudal fin
9
- 9a. Mouth very small. Gill openings restricted (small). Scales usually modified into spines, shields or plates TETRAODONTIFORMES
- 9b. Mouth moderate. Gill openings normal. Scales not modified as above 10

- 10a. Head generally with well-developed spines. Cheeks with a bony ridge (posterior extension of suborbital bone to preopercle). Pectoral fins rounded. Caudal fin usually square-cut or rounded SCORPAENIFORMES
- 10b. Head and cheeks without spines and bony strut. Pectoral fin not rounded. Caudal fin usually forked 11
- 11a. Head large and depressed, body compressed. Fleshy tentacles around mouth. Body without scales BATRACHOIDIFORMES
- 11b. Head not depressed. No tentacle around mouth. Body with scales 12
- 12a. Fins with spines 13
- 12b. Fins without spines 16
- 13a. Lateral line present 14
- 13b. Lateral line vestigial or absent 15
- 14a. Pelvic fin with 6 or more soft rays. Orbitosphenoid present BERICIFORMES
- 14b. Pelvic fin with 5 or less soft rays. Orbitosphenoid absent PERCIFORMES
- 15a. First dorsal fin with 4 strong spines. No silvery stripe along sides. Anal fin with 3 spines MUGILIFORMES
- 15b. First dorsal fin with 4 to 7 weak spines. A silvery stripe along sides. Anal fin with one spine ATHERINIFORMES
- 16a. Adipose dorsal fin usually present. Photophores often present 17
- 16b. Adipose dorsal fin absent. Photophores absent 18
- 17a. Head lizard-like. Sharp, caniniform teeth on jaws. Anal fin inserted well behind dorsal fin AULOPIIFORMES
- 17b. Head not lizard-like. Teeth on jaws small. Anal fin inserted below or close behind dorsal fin MYCTOPHIFORMES
- 18a. Pelvic fins jugular to thoracic, placed before pectoral fin base GADIFORMES
- 18b. Pelvic fin always abdominal, placed behind pectoral fin base 19
- 19a. Lateral line present on sides of body 20
- 19b. Lateral line absent on sides of body 21
- 20a. Jaws toothless. Branchiostegal rays 3 or 4 GONORHYNCHIFORMES

- 20b. Jaws with tooth. Brachioistegal rays 6 to 35 ELOPIFORMES
- 21a. Dorsal fin insertion at about middle of body or before. Pelvic scute often present.
..... CLUPEIFORMES
- 21b. Dorsal fin insertion on posterior third of body. Pelvic scutes absent
..... CYPRINODONTIFORMES

Order ELOPIFORMES

Key to the families

- 1a. Lateral line with 30 to 40 scales. Last dorsal fin ray filamentous
..... MEGALOPIDAE
- 1b. Lateral line scales 95 to 120. Last dorsal fin ray not filamentous
..... ELOPIDAE

Family ELOPIDAE (Lady fishes)

Body cylindrical, elongate and fusiform. Mouth terminal; bands of fine teeth on jaws and palate. Adipose eyelids present. A large bony gular plate present below mouth, between the arms of the lower jaw. Dorsal fin with 20 to 25 unbranched soft rays, last ray not elongated; inserted about middle of the body. Anal fin with 18 to 20 rays, inserted well behind dorsal fin. Lateral line with 95 to 120 scales. Scales cycloid.

Species known to occur in Orissa

Elops machnata (Forsskal) (Lady fish)

Fisheries information : The lady fishes are abundant in the east coast of our country. These fishes are of minor commercial importance.

Family MEGALOPIDAE (Tarpons)

Body compressed and deep. Mouth superior, lower jaw projecting. A bony gular plate present below mouth between the arms of lower jaw. Dorsal fin with 13 to 21 unbranched soft rays, the last ray elongated and filamentous. Anal fin with 22 to 31 soft rays, inserted slightly behind last dorsal fin ray. Anal fin base longer than dorsal fin base. Lateral line with 30 to 40 scales.

Species known to occur in Orissa

Megalops cyprinoides (Broussonet) (Indo-Pacific tarpon)

Fisheries information : *M. cyprinoides* is a carnivorous and fast growing fish. It occurs in both the coasts of our country. Flesh is less and bony.

Order ANGUILLIFORMES

Key to the families

- 1a. Body with minute embedded scales ANGUILLIDAE
- 1b. Body without scales 2
- 2a. Large canine teeth (usually fang-like) on vomer (medially on roof of mouth) 3
- 2b. Vomer without large canine teeth 4
- 3a. Well developed pectoral fins present MURAENESOCIDAE
- 3b. Pectoral fins absent MURAENIDAE
- 4a. Gape of mouth generally extending beyond the orbits. Branchiostegal rays overlapping midventrally. Hind nostrils openings inside mouth, on upper lip or just above mouth OPHICHTHIDAE
- 4b. Gape of mouth never extending beyond the orbits. Branchiostegal rays not overlapping ventrally. Hind nostrils not labial, but lateral or superior 5
- 5a. Dorsal and anal fins reduced, confined to posterior part of body. Lower jaw projecting MORINGUIDAE
- 5b. Dorsal and anal fins well developed. Lower jaw not projecting 6
- 6a. Pectoral fins absent. Snout long. Body very slender NETTASTOMATIDAE
- 6b. Pectoral fins well developed. Snout short. Body rather robust CONGRIDAE

Family ANGUILLIDAE

(Freshwater eels)

Body elongate, robust, cylindrical anteriorly. Mouth terminal or slightly oblique, gape never extending to posterior margin of eye. Lips thick. Gill slits vertical, below origin of pectoral fins. Fins without spine. Dorsal and anal fins confluent with caudal fin. Dorsal fin inserted variously between pectoral fins and vent, in anterior part of body. Pelvic fins absent. Pectoral fins well developed. Lateral line systems present but not conspicuous, typically a series of minute, white pores. Scales minute, embedded in skin. Usually freshwater eels are catadromous fishes.

Species known to occur in Orissa

- 1. *Anguilla bengalensis* (Gray and Hardwicke) (Long-finned eel)
- 2. *A. bicolor* McClelland (Shrotfin eel)

Key to the species

- 1a. Dorsal fin inserted above vent or almost near to it *A. bicolor*
 1b. Dorsal fin inserted above almost at the middle of gill slits and vent
 *A. bengalensis*

Fisheries information : *A. bengalensis* is one of the most important commercial eels and fairly abundant. *A. bicolor* is not as common as the former. There is a good export market for both live elvers as well as eels.

Family MORINGUIDAE (Worm eels or spaghetti eels)

Body extremely elongate, slender. Mouth small; lower jaw projecting. Teeth small, sharp, more or less uniserial on jaws. Eyes small and covered with skin. Gill openings low on body. Dorsal and anal fin reduced, placed posterior to anus and confluent with the caudal fin. Pectoral fins reduced or absent. No scales on body.

Species known to occur in Orissa

1. *Moringua arundinacea* (McClelland) (Bengal spaghetti eel)
2. *M. raitaborua* (Hamilton) (Purple spaghetti eel)

Key to species

- 1a. Body depth 47 to 50 times, head length 10 to 12 times in total length
 *M. arundinacea*
 1b. Body depth 31 to 45 times, head length 8 to 10 times in total length
 *M. raitaborua*

Fisheries information : Of no fishery importance.

Family MURAENIDAE (Moray eels)

Body elongate, robust, almost compressed along tail. Mouth wide, maxilla extending well behind the orbits. Teeth usually sharp, mostly raptorial but sometimes molar-like. Teeth on vomer often in a median multiserial patch. Posterior nostrils either a slit or tube before or above anterior part of eye. Gill slits restricted to small roundish midlateral openings. Fins without spine. Dorsal and anal fins continuous with caudal fin. Pectoral and pelvic fins absent. Body without scales. Lateral line of 1 to 3 pores before gill slits.

Species known to occur in Orissa

1. *Gymnothorax meleagris* (Shaw) (Turkey moray)
2. *G. tile* (Hamilton) (Freshwater moray)
3. *Strophidon sathete* (Hamilton) (Slender giant eel)

Key to the species

- 1a. Head and trunk combined 1.5 to 2.0 times in tail. Head 3.5 times in trunk *S. sathete*
- 1b. Head and trunk combined less than 1.5 times in tail. Head less than 3.0 times in trunk 2
- 2b. Cleft of mouth 2 to 3 times in head length. Dorsal fin origin before gill opening. Body dark brown or black, with numerous fine light spots *G. meleagris*
- 2b. Cleft of mouth 3.8 to 4.2 times in head length. Dorsal fin origin above gill opening. Body brownish-yellow or greenish, with white spots (often absent in adults) *G. tile*

Fisheries information : *S. sathete* is the largest known species amongst eels, mostly used as fish bait. The moray eels are of no commercial value.

Remarks : *Thyrsoidea macrura* (Bleeker), as it was reported from Orissa coast, is considered to be a junior synonym of *Strophidon sathete* (Hamilton) by recent authors (Bohlke, 1997). *Gymnothorax punctatus* (Bloch and Schneider) reported from Orissa coast (Mishra *et al.*, 1999) is probably a misidentification, since it is known from Red Sea only.

Family OPHICHTHIDAE (Snake or worm eels)

Body cylindrical, snake-like or worm-like. Body without scales. Mouth terminal or inferior, maxilla generally extending posterior to the orbits. Teeth on jaws highly variable, strong and fang-like or small and pointed or blunt and granular; teeth on vomer either in 1 to 3 or in a solid patch. Gill openings small, slit-like or rounded. Fins without spines. Dorsal and anal fins, when present, continuous around the tail externally, or discontinuous, with the caudal fin rays reduced. Pectoral fins either present or absent. Pelvic fins absent.

Species known to occur in Orissa

1. *Bascanichthys deraniyagalai* Menon (Indian long-tailed sand eel)
2. *Lamnostoma orientalis* (McClelland) (Oriental worm eel)
3. *Muraenichthys macropterus* (Bleeker) (Slender snake eel)

4. *Myrophis lepturus* Kotthaus (NA)
5. *Ophichthus apicalis* Bennett (Pointed-tail snake eel)
6. *Pisodonophis boro* (Hamilton) (Bengal's snake eel)
7. *P. cancrivorus* (Richardson) (Longfin snake eel)

Key to the species

- 1a. Tip of tail with a fringe of fin around it, the dorsal, caudal and anal fins thus forming one continuous external fin 2
- 1b. Tip of tail finless externally, the tail tip hard and pointed 3
- 2a. Pectoral fins present *M. lepturus*
- 2b. Pectoral fins absent *M. macropterus*
- 3a. Pectoral fins much reduced or absent. Median fins if present, much reduced or absent 4
- 3b. Pectoral fins present, generally well developed. Median fins moderately well elevated, though low 5
- 4a. Dorsal fin originates well forward on head. Gill openings low-lateral, crescentic. Body depth more or less 30 times in total length *B. deraniyagalai*
- 4b. Dorsal fin originates above or behind gill openings. Gill openings entirely ventral. Body depth less than 30 times in total length *L. orientalis*
- 5a. Vomerine teeth pointed. Pectoral fin base restricted. Upper jaw teeth uniserial *O. apicalis*
- 5b. Vomerine teeth molariform. Pectoral fin base broad. Upper jaw teeth multiserial ... 6
- 6a. Dorsal fin origin above middle of pectoral fins *P. cancrivorus*
- 6b. Dorsal fin origin behind end of pectoral fins *P. boro*

Fisheries information : The snake eels are of little commercial value. *L. orientalis* is a very common species generally abundant in the East Coast of our country.

Remarks : *Pisodonophis chilensis* (Chaudhuri), reported from the Chilka Lake (Chaudhuri, 1916) is possibly a valid species (Jayaram, 1999) and as per the position of dorsal fin, it is similar to *P. boro* but differs in having a shorter head (5.0 to 5.5 times in trunk, c.f. 3.5 to 4.0 times in trunk in *P. boro*). *M. macropterus* is placed under genus *Scolecenchelys* Ogilby by recent authors (Castle and McCosker, 1999). Report of *M. lepturus* from Mahanadi

estuary (Venkateswarlu *et al.*, 1998) needs further investigation, since it is known to occur in Gulf of Aden only (McCosker, 1997). *B. deraniyagalai* was recorded as *B. longipinnis* (Kner and Steindachner) from Rushikulya estuary (Rao *et al.*, 1992).

Family NETTASTOMATIDAE (Duckbill eels)

Slender eels, with elongated snout. Closely similar to conger eels. Anterior nostril near tip of snout; posterior nostril close in front of eye. Teeth small, in several rows; canines present anteriorly; vomerine teeth large, compressed, without basal cusps. Pectoral fins absent. Adults on or near bottom in deep water; larvae in open ocean.

Species known to occur in Orissa

Saurenhelys petersi Day (NA)

Fisheries information : Of no interest to fisheries.

Remarks : It is a deep water species, known from the types only, as reported by Day (1878).

Family CONGRIDAE (Conger eels)

Body elongate and cylindrical, tail compressed. Body without scales. Mouth usually slightly inferior. Maxilla not extending beyond the orbits. Teeth on vomer typically in a triangular or oval, multiserial patch, sometimes uniserial. Nostrils separated, the anterior one is not tubular; the posterior nostril, as a simple aperture before or below front edge of eye. Dorsal and anal fins continuous around tail. Dorsal fin inserted almost above gill openings. Pectoral fins present; pelvic fins absent.

Species known to occur in Orissa

1. *Ariosoma anago* (Temminck & Schlegel) (Silver conger)
2. *Bathymyrus echinorhynchus* Alcock (NA)
3. *Uroconger lepturus* (Richardson) (Slender conger eel)

Key to species

- 1a. Snout longer than eye diameter. Tail narrow, considerably longer than head and trunk combined. Dorsal and anal fin rays segmented. Vomerine teeth small, sharp, in a single row, extending far back on roof of mouth *U. lepturus*

- 1b. Snout almost equal to eye diameter. Tail robust, about equal to or slightly longer than head and trunk combined. Dorsal and anal fin rays unsegmented. Vomerine teeth usually biserial anteriorly, not extending far back on roof of mouth 2
- 2a. Posterior nostril a slit below front edge of eye. Teeth uniserial in jaws. Rostral teeth in a prominent patch, that curved up on front of snout *B. echinorhynchus*
- 2b. Posterior nostril in front of middle of eye. Teeth multiserial in jaws. No curved up rostral teeth patch present *A. anago*

Fisheries information : The slender conger eels are of minor commercial values. Poor people generally locally consume these fishes.

Remarks : Distribution of *B. echinorhynchus* is not clearly known, as this species was known from the types only reported from Mahanadi delta (Alcock, 1889). However, one of the authors (SSM) has recently received few specimens from Godavari and Krishna river mouths.

Family MURAENESOCIDAE (Pike congers)

Body cylindrical, elongate without scales; tail compressed. Mouth terminal, maxilla extending well beyond the orbits. Snout pointed. Teeth large, prominent especially in front; sharp, multiserial on jaws and typically in 3 rows on vomer; a median row of canines flanked on each side by a row of much smaller teeth. Anterior nostril tubular, posterior nostril a simple opening in front of eye. Gill slits large, vertical or oblique, low on body. Dorsal fin inserted almost above gill slits. Fins without spines. Dorsal and anal fins united with caudal fin. Pectoral fins present; pelvic fins absent.

Species known to occur in Orissa

1. *Congresox talabon* (Cuvier) (Yellow pike conger)
2. *C. talabonoides* (Bleeker) (Indian pike conger) (Threatened)
3. *Muraenesox bagio* (Hamilton) (Common pike-conger)
4. *M. cinereus* (Forsskal) (Daggertooth pike conger) (Threatened)

Key to the species

- 1a. Largest teeth on lower jaw laterally compressed, sharp, with conspicuous anterior and posterior basal bulges, erect; principal teeth on vomer similar to jaw teeth 2
- 1b. Largest teeth on lower jaw conical, not laterally compressed, very sharp, without basal bulges, but with slightly swollen tips, directed outward; principal teeth on vomer similar but sometimes with weak basal bulges in juveniles 3

- 2a. Interorbital width 10 to 11 times in head; lateral line pores 33 to 39 before anus; dorsal fin rays 47 to 59 before level of anus *M. bagio*
- 2b. Interorbital width about 8 times in head; lateral line pores 39 to 47 before anus; dorsal fin rays 66 to 78 before level of anus *M. cinereus*
- 3a. Length of pectoral fins almost 4 times in head length. Vomerine teeth with minute, basal cusps. Dorsal fin rays 57 to 68 before anus *C. talabonoides*
- 3b. Length of pectoral fins almost 3 times in head length. Vomerine teeth without basal cusps. Dorsal fin rays 70 to 75 before anus *C. talabon*

Fisheries information : Pike congers are abundantly caught at Chandrabhaga (Puri district). *M. bagio* is the most common species along Orissa coast. These pike congers are commercially most important among the eels.

Order CLUPEIFORMES

Key to the families

- 1a. Teeth on jaws fang-like canines. Abdomen without scutes. Dorsal fin origin over anal fin origin, well behind midpoint of body CHIROCENTRIDAE
- 1b. Teeth on jaws minute or absent. Abdomen usually with scutes. Dorsal fin origin well ahead of anal fin origin, before or at about midpoint of body 2
- 2a. Mouth inferior. Snout projecting in front of lower jaw. Maxilla reaching well beyond posterior margin of orbit ENGRAULIDIDAE
- 2b. Mouth terminal or subterminal. Snout usually not projecting in front of lower jaw. Maxilla not reaching beyond orbit 3
- 3a. Anal fin with more than 30 rays. Lower jaw projecting PRISTIGASTERIDAE
- 3b. Anal fin with less than 30 rays. Lower jaw usually not projecting CLUPEIDAE

Family CLUPEIDAE (Herrings, Sardines)

Body fusiform with a complete series of scutes along the abdomen (pelvic scutes always present). Mouth more or less terminal with minute or small teeth on jaws. Dorsal fin short, inserted about middle of body. Anal fin short, inserted well behind the dorsal fin. Pelvic fins inserted anterior, below or just posterior to dorsal fin. Fins without spines. Scales cycloid. Body with 40 to 50 scales in lateral series; no lateral line.

Species known to occur in Orissa

- 1. *Amblygaster sirm* (Walbaum) (Spotted sardinella)

2. *Anodontostoma chacunda* (Hamilton) (Chacunda gizzard shad)
3. *Corica soborna* (Hamilton) (Ganges river sprat)
4. *Dussumieria acuta* Valenciennes (Rainbow sardinella)
5. *D. elopsoides* Bleeker (Slender Rainbow sardinella)
6. *Escualosa thoracata* (Valenciennes) (White sardine)
7. *Gudusia chapra* (Hamilton) (Indian River shad)
8. *Hilsa kelee* (Cuvier) (Kelee shad)
9. *Nematalosa galathea* Nelson & Rothman (Galathea gizzard shad)
10. *N. nasus* (Bloch) (Bloch's gizzard shad)
11. *Sardinella albella* (Valenciennes) (White sardinella)
12. *S. jussieui* (Valenciennes) (Mauritian sardinella)
13. *S. fimbriata* (Valenciennes) (Fringescale sardinella)
14. *S. gibbosa* (Bleeker) (Goldstripe sardinella)
15. *S. longiceps* Valenciennes (Indian oil sardinella)
16. *S. melanura* (Cuvier) (Blacktip sardinella)
17. *S. sindensis* (Day) (Sind sardinella)
18. *Tenualosa ilisha* (Hamilton) (Hilsa shad) (Threatened)
19. *T. toli* (Valenciennes) (Toli shad)

Key to the species

- 1a. Pelvic scute W-shaped. No other scutes along belly 2
- 1b. Pelvic scute with ascending arms. Scutes present before and behind pelvic fins ... 3
- 2a. Posterior part of scales with many small radiating striae. Lateral scale series 40 to 45. Body depth 3.4 to 4.5 in standard length *D. acuta*
- 2b. Posterior part of scales without striae. Lateral scale series 52 to 55. Body depth 4.5 to 6.2 in standard length *D. elopsoides*
- 3a. Lower jaw flared outward. Mouth generally inferior. Last dorsal fin ray filamentous in many species 4
- 3b. Lower jaw normal. Mouth terminal. Last dorsal fin ray normal 6
- 4a. Last dorsal fin ray normal, not filamentous *A. chacunda*
- 4b. Last dorsal fin ray produced, filamentous 5
- 5a. A pair of grooves in the spongy skin on top of head, converging posteriorly. Hind margin of scales not toothed. A dark shoulder spot and a series of spots behind it *N. galathea*

- 5b. No grooves in the spongy skin on top of head. Hind margin of scales toothed. A dark shoulder spot, but devoid of spots behind it *N. nasus*
- 6a. Upper jaw with a distinct median notch or cleft when seen from front..... 7
- 6b. Upper jaw rounded when seen from front..... 10
- 7a. Scales small, 77 to 91 in lateral series *G. chapra*
- 7b. Scales large, 37 to 47 in lateral series 8
- 8a. Fronto-parietal striae (on top of head) many (8 to 14). Gillrakers on inner arches distinctly curled outward. Scales perforated *H. kelee*
- 8b. Fronto-parietal striae weakly developed, generally hidden by skin. Gillrakers on inner arches straight. Scales not perforated 9
- 9a. Head length 28 to 32 % of standard length. Gillrakers numerous, almost 100 to 250 on lower arm of 1st arch. Caudal fin as long as head length. A dark blotch behind gill openings, followed by a series of small spots along flank *T. ilisha*
- 9b. Head length 25 to 27 % of standard length. Gillrakers fewer, 60 to 100 on lower arm of 1st arch (barely more after 10 cm standard length). Caudal fin shorter than head length. A dark diffuse mark behind gill opening; no other spots on flank *T. toli*
- 10a. Only 2nd (posterior) supramaxilla present *C. soborna*
- 10b. First (anterior) and 2nd (posterior) supramaxilla present 11
- 11a. Hind margin of gill opening evenly rounded, without fleshy outgrowth. Pelvic fin rays 7 *E. thoracata*
- 11b. Hind margin of gill opening with two fleshy outgrowths. Pelvic fin rays 8 or 9
..... 12
- 12a. Lower gillrakers 33 to 43. A median row of predorsal scales. A series of 10 to 20 gold (in life) or black (on preservation) spots down the flanks *A. sirm*
- 12b. Lower gillrakers usually more than 40 (mostly 45 to 90, but over 200 in some). Predorsal scales paired. No spots on flanks 13
- 13a. Pelvic fin with 9 rays. Pseudobranch long, with distinct ventral ridge. Epibranchial gillrakers curled upwards. Lower gillraker on first arch 145 to 258 *S. longiceps*
- 13b. Pelvic fin with 8 rays. Pseudobranch short, flat. Epibranchial gillrakers almost straight. Lower gillraker on first arch not more than 130 14
- 14a. Caudal fin tips jet black. Lower gillrakers on first arch 38 to 74 (at 75 to 100 mm standard length). Abdominal scutes usually 16 to 17 + 12 to 13 *S. melanura*

- 14b. Caudal fin tips plain, at most caudal fin margin dusky. Lower gillrakers on first arch 43 to 132 15
- 15a. Post-pelvic scutes 12 to 14 (rarely 11 or 15); total scutes 29 to 32 16
- 15b. Post-pelvic scutes usually 15 (less common 14, rarely 13); total scutes 32 to 34 ...
..... 17
- 16a. Lower gillrakers on first arch 40 to 67 (50 to 130 mm standard length). Perforations on hind part of scale more, at middle $\frac{1}{2}$ of scale *S. albella*
- 16b. Lower gillrakers on first arch 53 to 82 (50 to 130 mm standard length). Perforations on hind part of scale fewer, at middle $\frac{1}{4}$ of scale *S. fimbriata*
- 17a. Gillrakers 88 to 102 (at 90 mm standard length) on lower arm of first arch
..... *S. jussieui*
- 17b. Gillrakers less than 80 on lower arm of first arch 18
- 18a. Lower gillrakers on first arch 38 to 65 (at 40 to 170 mm standard length). Many perforations on exposed portion of scales *S. gibbosa*
- 18b. Lower gillrakers on first arch to 50 to 77 (at 50 to 140 mm standard length). Fewer perforations on exposed portion of scales *S. sindensis*

Fisheries information : The herrings and sardines are very important commercial fishes. These fishes are abundant throughout our coastal line. *T. ilisha* is one of the very important commercial fishes of our country. It is a well known anadromous migratory fish, entering all the major river systems of India.

Remarks : *S. jussieui* was reported as *S. dayi* (Regan) from Orissa coast (Venkateswarlu *et al.*, 1998), but its occurrence in this region is doubtful (Whitehead, 1985). Rao (1995) has not found *H. ilisha* in the Chilka Lake during the survey period 1985-87, which indicates a decline in its population.

Family PRISTIGASTERIDAE (Pristigasterids)

Body more or less compressed, abdomen with sharp median keel of scutes. Mouth moderate, terminal; lower jaw projecting. Teeth in jaws very small. Dorsal fin short, inserted ahead of middle of body in deep forms, but behind in elongate forms and missing in *Raconda*. Anal fin long, with more than 30 rays. Pelvic fin with 6 or 7 rays or entirely absent. Body with 35 to 55 thin and easily shade scales in the lateral series.

Species known to occur in Orissa

1. *Ilisha elongata* (Bennett) (Elongate ilisha)
2. *I. filigera* (Valenciennes) (Coromondel ilisha)

3. *I. kampeni* (Weber & de Beufort) (Kampen's ilisha)
4. *I. megaloptera* (Swainson) (Bigeye ilisha)
5. *I. melastoma* (Schneider) (Indian ilisha)
6. *Opisthopterus tardoore* (Cuvier) (Long-finned herring)
7. *Pellona ditchela* (Valenciennes) (Indian pellona)
8. *Raconda russeliana* Gray (Russell's smooth-back herring)

Key to the species

- 1a. Dorsal and pelvic fins absent. Anal fin very long with 81 to 92 rays *R. russeliana*
- 1b. Dorsal fin present and pelvic fins either present or absent. Anal fin not very long, with 34 to 65 rays 2
- 2a. Anal fin long, with 51 to 65 rays. Pelvic fins absent *O. tardoore*
- 2b. Anal fin moderate, with 34 to 53 rays. Pelvic fins present 3
- 3a. Toothed hypomaxilla present. Abdominal scutes 26 to 28 *P. ditchela*
- 3b. Toothed hypomaxilla absent. Abdominal scutes 30 or more 4
- 4a. Swimbladder with one post coelomic extension on right side of body 5
- 4b. Swimbladder with two post coelomic extensions 7
- 5a. Total abdominal scutes 30 to 32 *I. megaloptera*
- 5b. Total abdominal scutes 34 to 42 6
- 6a. Body depth 2.8 to 3.2 times in standard length. Pectoral fin tip reaching pelvic fin base *I. filigera*
- 6b. Body slender, its depth 3.3 to 3.7 times in standard length. Pectoral fin tip not reaching pelvic fin base (in adults) *I. elongata*
- 7a. Vertical striae on scales traversing whole scale or overlapping across center of scale. Body depth 2.4 to 3.0 times in standard length *I. melastoma*
- 7b. Vertical striae on scales not continuous, but with a distinct gap across center of scale. Body depth 3.1 to 4.1 times in standard length *I. kampeni*

Fisheries information : The fishes of this family are of little commercial value due to less flesh and more bone.

Family ENGRAULIDIDAE
(Anchovies)

Body cylindrical, usually fusiform and sometimes greatly compressed, tapering to a point posteriorly. Abdomen generally with scutes. Snout prominent and generally 'pig-like' and projecting in front of lower jaw. Mouth conspicuously inferior. Posterior tip of maxilla extending far back, sometimes projecting beyond operculum. Fins without spines. Pectoral fins inserted low on body, sometimes with free upper rays. Dorsal fin generally short and inserted at about midpoint of body. Caudal fin generally forked but sometimes tapering to a point. Body sometimes with light organs along sides.

Species known to occur in Orissa

1. *Coilia dussumieri* Valenciennes (Gold-spotted grenadier anchovy)
2. *C. neglecta* Whitehead (Neglected grenadier anchovy)
3. *C. ramcarati* (Hamilton) (Ramcarat grenadier anchovy)
4. *C. reynaldi* Valenciennes (Karua grenadier anchovy)
5. *Encrasicholina devisi* (Whitley) (Devis' anchovy)
6. *E. heteroloba* (Ruppell) (Short head anchovy)
7. *Setipinna phasa* (Hamilton) (Gangetic hairfin anchovy)
8. *S. taty* (Valenciennes) (Scaly hairfin anchovy)
9. *S. tenuifilis* (Valenciennes) (Govadari hairfin anchovy)
10. *Stolephorus andhraensis* Babu Rao (Andhra anchovy)
11. *S. baganensis* Hardenberg (Bagan Anchovy)
12. *S. commersonii* Lacepede (Commerson's anchovy)
13. *S. dubiosus* Wongratana (Thai anchovy)
14. *S. indicus* (van Hasselt) (Indian anchovy)
15. *S. insularis* (Hardenberg) (Hardenberg's anchovy)
16. *S. waitei* Jordan and Seale (Spotty-face anchovy)
17. *Thryssa baelama* (Forsskal) (Baelama thryssa)
18. *T. dussumieri* (Valenciennes) (Dussumier's thryssa)
19. *T. gautamiensis* Rao (Gautami thryssa)
20. *T. hamiltonii* (Gray) (Hamilton's thryssa)
21. *T. kammalensis* (Bleeker) (Kammal thryssa)
22. *T. kammalensoides* Wongratana (Godavari thryssa)
23. *T. malabarica* (Bloch) (Malabar thryssa)
24. *T. mystax* (Schneider) (Moustached thryssa)
25. *T. polybranchialis* Wongratana (Hump-head thryssa)

- 26. *T. purava* (Hamilton) (Oblique jaw thryssa)
- 27. *T. setirostris* (Broussonet) (Long jaw thryssa)
- 28. *T. vitrirostris* (Gilchrist and Thompson) (Orange mouth thryssa)

Key to species

- 1a. Body tapering, “rat tailed” Caudal fin small, rhomboid. Anal fin long, confluent with caudal fin. Five to 14 upper pectoral fin rays unbranched and free from each other 2
- 1b. Body normal, not tapering or rat tailed. Caudal fin large, forked. Anal fin short or moderate, not confluent with caudal fin. Upper pectoral fin rays not free from each other 5
- 2a. Longitudinal rows of pearl spots (light organs) on flanks of body present..... *C. dussumieri*
- 2b. Pearly spots on flanks of body absent 3
- 3a. Pelvic fin with 9 or 10 rays..... *C. ramcarati*
- 3b. Pelvic fin with 7 rays 4
- 4a. Pectoral filaments 10 to 14 *C. reynaldi*
- 4b. Pectoral filaments 6 (rarely 5) *C. neglecta*
- 5a. Only needle-like prepelvic scutes present. Anal fin short, with less than 25 rays ... 6
- 5b. Prepelvic and post pelvic scutes present. Anal fin long, with more than 25 rays 14
- 6a. Isthmus muscle not reaching to hind border of gill membrane. Urohyal exposed.. 7
- 6b. Isthmus muscle reaching to and beyond gill membrane. Urohyal not exposed..... 8
- 7a. Unbranched dorsal and anal fin rays 3 *E. devisi*
- 7b. Unbranched dorsal and anal fin rays 2 *E. heteroloba*
- 8a. Hind border of preoperculum indented near tip of maxilla 9
- 8b. Hind border of preoperculum rounded near tip of maxilla 12
- 9a. No double pigment line along back behind dorsal fin, melanophores irregularly scattered or absent. Body slender, its depth less than upper jaw *S. andhraensis*

- 9b. Double pigment line along back behind dorsal fin present. Body deep, its depth equal to upper jaw 10
- 10a. No spine on pelvic scute *S. insularis*
- 10b. Spine on pelvic scute present 11
- 11a. Lower gillrakers 20 to 23 *S. baganensis*
- 11b. Lower gillrakers 25 to 31 *S. dubiosus*
- 12a. Maxilla tip reaching to or only just beyond front margin of preoperculum. Pelvic fin tips failing to reach vertical from dorsal fin origin *S. indicus*
- 12b. Maxilla tip reaching to or beyond posterior margin of preoperculum 13
- 13a. Pelvic fin tips reaching well past vertical from dorsal fin origin. A pair of dark predorsal lines on back. No black spot below eye or on tip of lower jaw
..... *S. commersonii*
- 13b. Pelvic fin tips not reaching to vertical from dorsal fin origin. No dark lines on back. Many small black spots below eye and on tip of lower jaw *S. waitei*
- 14a. Upper pectoral fin ray produced into a filament 15
- 14b. Upper pectoral fin ray not extending as a filament 17
- 15a. Gillrakers on lower arm of first arch 13 to 14, serrae on rakers not forming distinct clumps *S. tenuifilis*
- 15b. Gillrakers on lower arm of first arch 17 to 21, serrae on rakers in distinct clumps 16
- 16a. Anal fin with 48 to 58 rays. Prepelvic scutes 20 to 29 *S. taty*
- 16b. Anal fin with 69 to 81 rays. Prepelvic scutes 15 *S. phasa*
- 17a. Maxilla reaches beyond pectoral fin tip; lower jaw with high coronoid process
..... *T. setirostris*
- 17b. Maxilla not reaching pectoral fin tip. Lower jaw slender 18
- 18a. Maxilla long, reaching to pectoral fin base or beyond 19
- 18b. Maxilla short, not reaching to pectoral fin base 21
- 19a. Lower gillrakers 13 to 16 on first arch, the serrae not clumped *T. mystax*
- 19b. Lower gillrakers 16 to 24 on first arch, the serrae in distinct clumps 20

- 20a. Maxilla reaching at least half way along pectoral fin length; postpelvic scutes 6 to 9; anterior supramaxilla absent; lower gillrakers 17 to 19 (rarely 20) *T. dussumieri*
- 20b. Maxilla shorter, reaching up to $\frac{1}{3}$ along pectoral fin; postpelvic scutes 8 to 12; anterior supramaxilla present; lower gillrakers 18 to 24 (usually 20 to 23)
..... *T. vitrirostris*
- 21a. Prepelvic scutes 4 to 9 *T. baelama*
- 21b. Prepelvic scutes 15 to 19 22
- 22a. Lower gillrakers on first arch 11 to 15; branched anal fin rays 32 to 39
..... *T. hamiltonii*
- 22b. Lower gillrakers on first arch 17 to 32 23
- 23a. Lower gillrakers 17 to 21 24
- 23b. Lower gillrakers 24 to 32 26
- 24a. Branched anal fin rays 38 to 44; enlarged teeth on lower jaw only *T. purava*
- 24b. Branched anal fin rays 33 to 38 25
- 25a. Body depth 3.6 to 4.3 times in standard length. No spots on cheek, maxilla, gillcover or paired fins. Teeth in both jaws enlarged *T. gautamiensis*
- 25b. Body depth 2.7 to 2.9 times in standard length. Small spots on cheek, maxilla, gillcover and paired fins. Teeth in jaws small *T. malabarica*
- 26a. Branched anal fin rays 35 to 39. Lower gillrakers 25 to 27. First supramaxilla present, minute, oval in shape *T. polybranchialis*
- 26b. Branched anal fin rays 30 to 33 27
- 27a. Lower gillrakers 24 to 25. First supramaxilla absent. Belly scutes 16 to 18 plus 10 to 11, total 26 to 29. Snout less than eye diameter *T. kammalensoides*
- 27b. Lower gillrakers 26 to 32. First supramaxilla about half of second. Belly scutes 15 to 16 plus 8 to 9, total 23 to 25. Snout equal to eye diameter *T. kammalensis*

Fisheries information : The anchovies are important commercial fishes of our country. The fishes of the genus *Stolephorus* are important food fishes. *C. dussumieri* is a common species found in both the coasts of our country.

Remarks : Whitehead et al. (1988) ruled out the presence of *T. kammalensis* along Indian coast, while its existence is beyond doubt (Mishra and Krishnan, 1999).

Family CHIROCENTRIDAE
(Wolf herrings)

Body greatly elongate and compressed with small, cycloid scales. Jaws with fang-like canine teeth. Dorsal fin with 16 to 19 rays, inserted posterior to middle of body. Anal fin with 32 to 35 rays, inserted below vertical from front of dorsal fin base. Pectoral fins inserted low on body, with 13 to 15 rays. Pelvic fins very small, with 6 to 7 rays, inserted about midway between pectoral fin base and origin of anal fin. Fins without spines. Caudal fin deeply forked. Scales minute, cycloid; no lateral line.

Species known to occur in Orissa

1. *Chirocentrus dorab* (Forsskal) (Dorab wolf-herring)
2. *C. nudus* Swainson (Whitefin wolf herring)

Key to the species

- 1a. Upper part of dorsal fin black. Pectoral fin length almost equal to length from center of eye to posterior border of operculum *C. dorab*
- 1b. Dorsal fin white or colourless. Length of pectoral fin longer than length from center of eye to posterior border of operculum *C. nudus*

Fisheries information : *C. nudus* is the most dominant species in the wolf-herring fishery along Orissa coast. Flesh is tasty, but very bony.

Order GONORHYNCHIFORMES
Family CHANIDAE
(Milkfish)

Body elongate and almost compressed with small cycloid scales. Eye covered by skin. Mouth small and terminal, toothless. Maxilla extending to middle of the orbit. No gular plate in between the arms of the lower jaw. Dorsal fin with 13 to 17 rays, inserted almost in the middle of body. Anal fin with 9 to 11 rays, inserted close to caudal fin. Dorsal fin and anal fins with basal sheath of scales. Pelvic and pectoral fin bases with large axillary scales. Fins without spines. Caudal fin deeply forked. Lateral line present.

Species known to occur in Orissa

Chanos chanos (Forsskal) (Milkfish)

Fisheries information : The milkfish can be cultured in the tanks and ponds where the water is slightly saline. It is an important commercial fish, found in both the coasts of our country.

Order SILURIFORMES

Key to the families

- 1a. Adipose dorsal fin absent 2
- 1b. Adipose dorsal fin present 5
- 2a. Dorsal fin with a spine. Pelvic fins with 15 to 16 rays PLOTOSIDAE
- 2b. Dorsal fin without any spine. Pelvic fins with 6 rays only 3
- 3a. Nasal barbels absent. No accessory respiratory organ SILURIDAE
- 3b. Nasal barbels present. Accessory respiratory organ present on gills or body cavity 4
- 4a. Dorsal fin long with 23 to 76 rays. Accessory respiratory organ present on gills ...
..... CLARIIDAE
- 4b. Dorsal fin short with 6 to 7 rays. Accessory respiratory organ as tubular air sac
present in the body cavity HETEROPNEUSTIDAE
- 5a. Nostrils close together, with very little interspaces between the two 6
- 5b. Nostrils widely separated, separated by some interspaces between the two 7
- 6a. Barbels 1 to 3 pairs, nasal barbels absent. Nostrils separated by valve
..... ARIIDAE
- 6b. Barbels 4 pairs, nasal barbels present. Nostrils separated by a barbel
..... Sisoridae
- 7a. Anal fin short with less than 20 rays (8 to 16) BAGRIDAE
- 7b. Anal fin long with more than 20 rays (24 to 90) 8
- 8a. Nasal barbels always present SCHILBEIDAE
- 8b. Nasal barbels absent PANGASIIDAE

Family BAGRIDAE (Bagrid catfish)

Body almost elongate and compressed. Nostrils widely separated, by some interspaces. Barbels 4 pairs, usually well developed. Dorsal fin with 6 to 8 rays, preceded by a spine. Adipose fin present, variable in size. Paired fins inserted horizontally. Pectoral fins with a strong serrated spine. Anal fin short with 8 to 16 rays, not confluent with caudal fin. Caudal fin forked or deeply emarginate. Lateral line present, generally complete.

Species known to occur in Orissa

1. *Mystus bleekeri* (Day) (Day's mystus) (Threatened)
2. *M. cavasius* (Hamilton) (Dwarf catfish)
3. *M. gulio* (Hamilton) (Long whisker catfish)
4. *M. vittatus* (Bloch) (Striped dwarf catfish) (Threatened)

Key to the species

- 1a. Adipose dorsal fin long, originating almost immediately behind rayed dorsal fin.. 2
- 1b. Adipose dorsal fin short, originating after an interspaces behind rayed dorsal fin...
..... 3
- 2a. Maxillary barbels extending to anal base. Interorbital width less than 3.0 in head length. No dark spot at the base of dorsal fin *M. bleekeri*
- 2b. Maxillary barbels extending to caudal fin base. Interorbital width more than 3.0 in head length. A dark spot at the base of dorsal fin *M. cavasius*
- 3a. Occipital process triangular, about 1.5 times longer than broad at its base. Branchiostegal rays 9. No longitudinal bands on body *M. gulio*
- 3b. Occipital process about 3.0 times as long as broad at its base. Branchiostegal rays 10. One or two longitudinal bands on body *M. vittatus*

Fisheries information : These are very common food fishes. *M. gulio* is the most common species in the catches of coastal waters.

Remarks : These fishes are primarily freshwater fishes. Out of many Bagrid fishes found in Orissa these four species are capable of tolerating saline condition of water to a greater extent and so, they are also found in the estuarine waters.

Family SILURIDAE (Sheatfishes)

Body elongate and compressed. Body smooth, without scales. Dorsal fin with 4 to 5 rays, not preceded by a spine. Adipose fin absent. Paired fins inserted laterally. Pectoral fins with a strong spine, sometimes serrated. Anal fin long, extending from just posterior to vent to caudal fin or confluent with it. Pelvic fins short, sometimes absent. Caudal fin deeply forked, lobes rounded or pointed or cut square. Lateral line straight and complete.

Species known to occur in Orissa

1. *Ompok bimaculatus* (Bloch) (Butter catfish) (Threatened)
2. *Wallago attu* (Schneider) (Freshwater shark)

Key to species

- 1a. Gape of mouth very wide, extending beyond the posterior margin of orbits. Anal fin with 86 to 89 rays *W. attu*
- 1b. Gape of mouth narrow, not extending beyond the anterior margin of orbits. Anal fin with 52 to 75 rays *O. bimaculatus*

Fishery information : *O. bimaculatus* is a highly esteemed priced food fish. *W. attu* is also a good food fish but it is generally regarded unclean and discarded by many people.

Remarks : These are primarily freshwater fishes, but tolerant to saline conditions.

Family SCHILBEIDAE (Schilbid catfishes)

Body elongate and compressed. Barbels 2 to 4 pairs, fairly well developed. Dorsal fin with a spine and 5 to 7 soft rays or absent. Adipose dorsal fin usually present. Paired fins inserted laterally. Pectoral fins with a strong spine, usually serrated. Anal fin long, with 40 to 46 rays, not confluent with caudal fin. Caudal fin forked. Lateral line usually complete.

Species known to occur in Orissa

- 1. *Ailia coila* (Hamilton) (Ailia) (Threatened)
- 2. *Eutropiichthys vacha* (Hamilton) (Vacha) (Threatened)
- 3. *Pseudeutropius atherinoides* (Bloch) (Indian potasi) (Threatened)
- 4. *Silonia silondia* (Hamilton) (Silond catfish)

Key to species

- 1a. Dorsal fin absent. Anal fin with 58 to 75 rays *A. coila*
- 1b. Dorsal fin present. Anal fin with 24 to 54 rays 2
- 2a. Two pairs of small barbels, maxillary and mandibular pair only. Maxillary barbel in a groove and not extending beyond orbit *S. silondia*
- 2b. Four pairs of longer barbels. Maxillary barbel extending beyond orbit 3
- 3a. Cleft of mouth extending to about posterior border of orbit. Vomero-palatine teeth in pyriform band, broad anteriorly, wider than maxillary band and close to it. Branchiostegal rays 11 *E. vacha*
- 3b. Cleft of mouth not extending to front border of the orbit. Vomero-palatine teeth in 2 narrow separate crescentic patches. Branchiostegal rays 6 *P. atherinoides*

Fisheries information : These fishes are usually very good food fishes. Due to bright colour and small size *P. atherinoides* is preferred as aquarium fish.

Remarks : The fishes of this family are primarily freshwater forms but the four species included here are tolerant to saline condition and found in estuaries.

Family PANGASIIDAE (Pungas)

Body elongate and moderately compressed; skin smooth. Mouth sub-terminal. Maxillary barbels and a single pair of mental barbels present; nasal barbels absent. Nostrils widely separated. Gill openings wide; gill membranes united to each other but separated from isthmus. Vomerine and palatine tooth in 2 patches each on roof of mouth. Dorsal fin short with a serrate spine. A small adipose dorsal fin present. Anal fin long based. Caudal fin forked. Inhabit lower portions of large rivers and estuaries.

Species known to occur in Orissa

Pangasius pangasius (Hamilton) (Yellowtail catfish) (Threatened)

Fishery information : A freshwater species, but enters into tidal zone of rivers and so, found in estuaries. It is esteemed as a good food fish.

Family SISORIDAE (Sucker catfish)

Body short or elongate. Head and anterior part of body depressed and tail compressed or entire body compressed. An adhesive apparatus on thorax present or absent. Nostrils close together, slit-like, separated by nasal barbels. Barbels 4 pairs, usually well developed. Rayed dorsal fin base short, with or without spine. Adipose dorsal fin present, usually large. Paired fins inserted horizontally. Pectoral fins with or without a spine, denticulate either on inner margin or outer margin, or on both. Anal fin short, not confluent with caudal fin. Caudal fin emarginate, truncate or rounded. Lateral line complete. Skin more or less thickened, leathery with unculiferous tubercles or polygonal plaques.

Species known to occur in Orissa

1. *Bagarius yarellii* Sykes (Goonch)
2. *Gagata cenia* (Hamilton) (Indian gagata)

Key to species

- 1a. Caudal fin rays prolonged. Body with bony plaques. Lower jaw teeth markedly heterodont. Maxillary barbels not osseous or stiff at bases. Three pigmented bands or blotches on body. Pectoral fin rays 11 to 14 *B. yarellii*

- 1b. Caudal fin rays not prolonged. Body smooth, without bony plaques. Lower jaw teeth not heterodont. Maxillary barbels osseous, with stiff bases. Four dark blotches on back extend to flanks. Pectoral fin rays 7 to 9 *G. cenia*

Fishery information : *G. cenia* is considered as a good food fish, while *B. yarellii* that known to grow up to 2 m but flesh not much relished being very stiff and fibrous.

Remarks : *Bagarius bagarius* (Hamilton) was the species earlier reported from the Chilka Lake (Rao, 1995). But during further investigations by one of the authors (SSM), the specimens collected from the Chilka Lake was turned out to be *B. yarellii*. Following Roberts (1983) we consider the earlier reports of *B. bagarius* from Chilka Lake as misidentified *B. yarellii*.

Family CLARIIDAE (Airbreathing catfish)

Body elongate and compressed. Nostrils widely separated; anterior tubular, situated near tip of snout; the posterior, slit-like and with nasal barbels. Barbels 4 pairs, well developed. Dorsal fin very long, separated or continuous with caudal fin. Adipose fin absent. Paired fins inserted horizontally. Pectoral fins with or without a spine, may be serrated. Anal fin long not confluent with caudal fin. Caudal fin rounded. Lateral line complete.

Species known to occur in Orissa

Clarias batrachus (Linnaeus) (Walking catfish) (Threatened)

Fishery information : It is one of the most common species found in fresh water and even in low saline water throughout our country. It is a high priced fish due to its rejuvenating vigor.

Family HETEROPNEUSTIDAE (Air-sac catfishes)

Body elongate and compressed. Nostrils widely separated, anterior one produced into a short tube, situated on tip of snout; the posterior, slit-like behind nasal barbels. Barbels 4 pairs, well developed. A long air sac, serving as a lung extending posteriorly from gill chamber. Rayed dorsal fin short without any spine. Adipose fin absent or represented by a low ridge. Paired fins inserted horizontally. Pectoral fins with a strong serrated spine. Anal fin long just reaching or confluent with caudal fin. Caudal fin almost rounded. Lateral line complete.

Species known to occur in Orissa

Heteropneustes fossilis (Bloch) (Stinging catfish) (Threatened)

Fishery information : It is also another most common species found throughout in our country. It is also a highly priced fish due to its rejuvenating vigour. It is primarily a freshwater fish, but can tolerate low saline conditions and so, found in the chilka Lake.

Family ARIIDAE
(Sea catfishes)

Body elongate, without scales. Head covered with plates. Teeth on palate villiform or conical, granular or molar-like, arranged in 1 to 3 patches on each side of palate. Barbels generally 3 pairs, nasal barbels absent. Dorsal and pectoral fins with spines. A short adipose dorsal fin present. Caudal fin forked.

Species known to occur in Orissa

1. *Arius arius* (Hamilton) (Threadfin sea catfish)
2. *A. caelatus* Valenciennes (Engraved sea catfish)
3. *A. crossocheilus* Bleeker (Rough back sea catfish)
4. *A. dussumieri* Valenciennes (Black-tip sea catfish) (Threatened)
5. *A. gagora* (Hamilton) (Gagora catfish)
6. *A. jella* Day (Blackfin sea catfish)
7. *A. maculatus* (Thunberg) (Spotted sea catfish)
8. *A. parvipinnis* Day (NA)
9. *A. platystomus* Day (Flat-mouth sea catfish)
10. *A. sona* (Hamilton) (Sona sea catfish) (Threatened)
11. *A. tenuispinis* Day (Thinspine sea catfish) (Threatened)
12. *A. thalassinus* (Ruppell) (Giant sea catfish) (Threatened)
13. *Hemipimelodus jatus* (Hamilton) (River catfish)
14. *Osteogeneiosus militaris* (Linnaeus) (Soldier sea catfish)

Key to the species

- 1a. One pair of stiff and semiosseous maxillary barbel present. Mandibular barbels absent *O. militaris*
- 1b. Three pairs of slender barbels (1 pair maxillary and 2 pairs mandibular) 2
- 2a. Palate without teeth. Mouth narrow *H. jatus*
- 2b. Palate with teeth. Mouth moderate 3
- 3a. Teeth on palate in three patches on each side, arranged in a large triangular group *A. thalassinus*
- 3b. Teeth on palate in one or two patches on each side 4
- 4a. Teeth on palate as a single patch on each side 5

- 4b. Teeth on palate in two patches on each side 12
- 5a. Teeth on palate as a single large patch, ovate or elongated in shape 6
- 5b. Teeth on palate as a single patch, not very large as above and not ovate or elongated but roughly triangular or conical in shape 9
- 6a. Pectoral spine longer than dorsal spine *A. jella*
- 6b. Pectoral spine shorter or equal to dorsal spine 7
- 7a. Palatine teeth patch more or less uniformly ovate in shape with a straight inner border. Teeth densely packed *A. maculatus*
- 7b. Palatine teeth ovate in shape with the inner border wider either posteriorly or anteriorly. Teeth loosely packed 8
- 8a. Anal fin with 18 or 19 rays. Horn-like conical projection of teeth patch present posteriorly. Dorsal fin without filamentous projection. Eye diameter 3.5 times in interorbital width and 3 times in snout length *A. gagora*
- 8b. Anal fin with 20 to 21 rays. Horn-like conical projection of palatine teeth patch present anteriorly. Dorsal fin with a filamentous projection. Eye diameter 3 times in interorbital width and 2 times in snout length *A. arius*
- 9a. Snout duck-bill shaped. Barbels thick and fleshy *A. platystomus*
- 9b. Snout obtusely rounded. Barbels thin and not fleshy 10
- 10a. Teeth patch on palate elliptical, placed deep in buccal cavity *A. tenuispinis*
- 10b. Teeth patch on palate pear-shaped or triangular, placed anteriorly 11
- 11a. Teeth patch distinctly pear-shaped. Maxillary and outer mandibular barbels nearly of same length *A. parvipinnis*
- 11b. Teeth patch triangular in shape. Maxillary and outer mandibular barbels are of different length *A. caelatus*
- 12a. Palatine teeth patches placed side by side laterally *A. sona*
- 12b. Palatine teeth patches one below the other 13
- 13a. A prominent protuberance of the lateral ethmoid bone on each side of eye present. Posterior patch of palatine teeth long, irregularly oval or elliptical *A. dussumieri*
- 13b. No protuberance of the lateral ethmoid bone. Posterior patch of teeth pear-shaped, converging posteriorly *A. crossocheilus*

Fisheries information : The species of the family Ariidae are important commercial fishes. These fishes are generally esteemed as food for human consumption. The swim bladder of these fishes is utilized for manufacture of isinglass.

Remarks : Although Burgess (1989) considered *Arius satparranus*, described from Chilka Lake by Chaudhuri (1916), as a valid species, Jayaram (1999) treated it as a synonym of *Arius tenuispinis* Day following Jayaram and Dhanze (1981).

Family PLOTOSIDAE (Eel catfishes)

Body elongate, almost eel-like without scales, tapering to a point posteriorly. Barbels 4 pairs, nasal and maxillary one pair each and mental 2 pairs. Two dorsal fins, first with 1 serrated spine and 4 to 6 soft rays and the second with 69 to 143 soft rays. Pectoral fins with 1 serrated spine and 9 to 16 soft rays. Pelvic fins with 10 to 16 soft rays. Anal fin with 58 to 130 rays. Caudal fin united with second dorsal and anal fins.

Species known to occur in Orissa

1. *Plotosus canius* Hamilton (Eel catfish)
2. *P. lineatus* (Thunberg) (Striped eel catfish)

Key to species

- 1a. Body without stripes. Maxillary barbels long, extending to or beyond opercular margin *P. canius*
- 1b. Body generally with 2 or 3 pale lateral stripes. Maxillary barbels short, extending almost posterior to orbits *P. lineatus*

Fisheries information : These are esteemed as good food fishes. *P. canius* is most abundant in coastal waters of Orissa.

Remarks : The dorsal and pectoral fin spines of the eel catfishes contain venomous glands. Therefore, great care has to be taken while handling these fishes. Death may even result during careless handling of these fishes.

Order AULOPIFORMES

Key to the family

- 1a. Caudal fin trilobed. Lateral line extending up to pointed median lobe of caudal fin. Eye small, covered by adipose membrane HARPADONTIDAE
- 1b. Caudal fin forked. Lateral line ends at caudal fin base. Eyes moderate, not covered by adipose membrane SYNODIDAE

Family SYNODIDAE
(Lizardfishes)

Head usually lizard-like. Body elongate, generally cylindrical with adipose dorsal fin. Mouth terminal and large, with rows of small, slender and pointed teeth, visible even when the mouth is closed. Dorsal fin with 9 to 14 rays. Anal fin with 8 to 16 rays. Caudal fin forked. Body and head with scales. Lizard-fishes not only resemble reptiles but also behave like that of reptiles. Most of their time is spent sitting on the bottom with the body at a slight angle, propped up on the front end by the pelvic fins, like a jet fighter ready to take off.

Species known to occur in Orissa

1. *Saurida gracilis* (Quoy & Gaimard) (Slender lizardfish)
2. *S. micropectoralis* Shindo and Yamda (Shortfin lizardfish)
3. *S. pseudotumbil* Dutt & Sagar (False Greater lizardfish)
4. *S. tumbil* (Bloch) (Greater lizardfish)
5. *S. undosquamis* (Richardson) (Brushtooth lizardfish)
6. *Trachinocephalus myops* (Schneider) (Bluntnose lizardfish)

Key to species

- 1a. Pelvic fin with 8 rays, inner ray much longer than outer. Palatine teeth in a single band on each side. Eye nearer to anterior end of upper jaw. Anal fin base longer than dorsal fin base *T. myops*
- 1b. Pelvic fin with 9 rays, inner ray barely longer than outer. Palatine teeth in 2 bands on each side. Eyes opposite midpoint of upper jaw. Anal fin base shorter than dorsal fin base 2
- 2a. Pectoral fins short, not reaching to level of pelvic fin origin 3
- 2b. Pectoral fins longer, reaching to or beyond level of pelvic fin origin 4
- 3a. Distinct blotches on flanks. Bars on upper edge of caudal fin. Inner surface of opercle grey; stomach and pyloric caecae unpigmented *S. micropectoralis*
- 3b. No blotch on flanks, if present indistinct. No bars on upper edge of caudal fin. Inner surface of opercle black; anterior 2/3 of stomach dark grey; pyloric caecae striped *S. pseudotumbil*
- 4a. Lateral line scales 55 to 58. No blotches on flanks. No dots or cross-bars on caudal or other fins *S. tumbil*
- 4b. Lateral line scales 45 to 52. Flanks with a series of blotches. Dots on upper edge of caudal fin and cross-bars or patches on other fins 5

- 5a. Dorsal fin rays 11 to 13; pectoral fin rays 14 or 15. A series of dark dots on second dorsal ray and upper caudal ray. Pectoral axillary scale long, pointed. Longest dorsal fin ray more than 3 times of last ray *S. undosquamis*
- 5b. Dorsal fin rays 9 to 11; pectoral fin rays 12 or 13. Dark cross-bars or a series of dark patches on all fins. Pectoral axillary scale short, broad. Longest dorsal fin ray less than 3 times of last ray *S. gracilis*

Fisheries information : Lizard fishes are of little commercial value. These fishes are edible, but of poor quality; marketed fresh or used for fishmeal.

Remarks : This family is often referred as Synodontidae.

Family HARPADONTIDAE (Bombay duck)

Body elongate and flat, compressed generally with an adipose dorsal fin. Eyes very small, near snout, directed forward. Mouth very large, with slender, recurved and depressible teeth; lower jaw longer than upper. Dorsal fin inserted opposite to pelvic fins. Pelvic fins very long. Scales deciduous, hence head and body seems to be naked except for scales on lateral line and some on posterior part. Lateral line extending up to pointed median lobe of caudal fin. Caudal fin trilobed.

Species known to occur in Orissa

Harpadon nehereus (Hamilton) (Bombay duck)

Fisheries information : The Bombay duck constitute a major fishery of commercial importance, particularly in the west coast. It is marketed fresh, salted dried or smoked.

Remarks : Although this family is usually considered as a subfamily of the family Synodontidae (Nelson, 1994), we preferred to keep them separate following Talwar (1991).

Order MYCTOPHIFORMES Family MYCTOPHIDAE (Lanternfishes)

Head and body compressed. Eyes lateral. Mouth large and terminal; mouth extends beyond vertical through middle of eye. Teeth small. Adipose dorsal fin present. Rudimentary spines at bases of fins. Anal fin origin under or close behind dorsal fin. Pelvic fins with usually 8 rays. Photophores (light organs) present, arranged in distinct groups on head and trunk. Scales cycloid. These are usually high-oceanic species.

Species known to occur in Orissa

Benthosema pterotum (Alcock) (NA)

Fisheries information : These fishes are potentially important for fish oil and fishmeal. But their commercial exploitation is wanting in India. They usually play an important role in food-chain of larger carnivore fishes.

Order GADIFORMES

Key to the family

- 1a. Caudal fin present. Trunk longer than head. No spinous rays in dorsal fin. A single elongate dorsal fin ray on top of head. Pelvic fin inserted under middle of head (jugular); outer 3 rays elongate free filaments BREGMACEROTIDAE
- 1b. Caudal fin absent. Trunk shorter than head. Two spinous rays in dorsal fin. No separate dorsal fin ray on top of head. Pelvic fin inserted behind head (thoracic), outer rays not free or elongate MACROURIDAE

Family BREGMACEROTIDAE (Codlets, Codlings)

Body elongate, almost cylindrical. Snout short. Head small, more or less compressed. Dorsal fins two, the first dorsal inserted on nape with one elongated ray. Second dorsal fin and anal fins very long with large notch in middle. Pelvic fins inserted on throat with 5 rays, outer 3 rays elongate, free filaments, extending backward up to one half length of the fish. Lateral line close to second dorsal fin.

Species known to occur in Orissa

Bregmaceros mccllellandi Thompson (Indian cod)

Fisheries information : The Indian cod is usually abundant in the west coast; caught along with other fishes in very less quantity along Orissa coast. It is marketed fresh.

Family MACROURIDAE (Grenadiers or rat-tails)

Head large, trunk short; tail long, tapering to a point. Snout often protruding. Eyes usually large. Caudal fin absent. Two dorsal fins; first dorsal fin short and high, first 2 rays spinous, but true spines absent. Second dorsal fin and anal fin long and continuous with tail. Pelvic fins thoracic to almost jugular, placed before pectoral fin base. Scales small, with spinules in most species.

Species known to occur in Orissa

Coryphaenoides hoskynii (Alcock) (NA)

Fisheries information : Of no interest to fisheries.

Order OPHIDIIFORMES Family OPHIDIIDAE (Cusk-eels)

Body elongate, tapered posteriorly. Barbels present on chin and snout in some species. Supramaxilla present. Dorsal and anal fin bases long, confluent with caudal fin. Dorsal fin rays usually equal to or longer than opposing anal fin rays. Anal fin origin behind pectoral fin tip. Pelvic fins absent or with 1 or 2 rays, inserted close together below preopercle or further anterior. Scales small, cycloid.

Species known to occur in Orissa

1. *Bassozetus glutinosus* (Alcock) (NA)
2. *Holcomycteronus pterotus* (Alcock) (NA)
3. *Tauredophidium hextii* (Alcock) (NA)

Key to species

- 1a. Very strong spines on preopercle and opercle. Atrophied eyes *T. hextii*
- 1b. Spines on opercle and preopercle more or less developed, but never very strong. Eyes moderate 2
- 2a. Opercular spine absent or weak, if present broad and flattened. Pectoral fins entire, pointed, with 28 to 30 rays. Pelvic fin with a single ray *B. glutinosus*
- 2b. Opercular spine sometimes hidden but strong, narrow, usually rounded in cross section. Pectoral fins feathery, with 16 to 20 rays. Pelvic fin with 2 rays
..... *H. pterotus*

Fisheries information : Of no interest to fisheries.

Order BATRACHOIDIFORMES Family BATRACHOIDIDAE (Toadfishes)

Body cylindrical, compressed posteriorly. Head and anterior part of body depressed. Mouth moderate; small conical teeth in both jaws and on palate. Gill openings a relatively large oblique slit above pectoral fin base. Operculum with 3 or 4 strong spines. Fleshy

tentacles on opercle, around mouth and above eyes. Dorsal fin two, first dorsal fin with 3 spines, inserted just behind head; second dorsal fin and anal fin with long bases. Pelvic fins jugular. Pectoral and caudal fins rounded. A moderate sized pocket often present in upper part of pectoral fin axil. Three lateral lines along sides represented by a series of small bifid tentacles. Skin smooth, loosely attached to head.

Species known to occur in Orissa

Austrobatrachus dussumieri (Valenciennes) (Flat toadfish)

Fisheries information : The toadfishes are of no commercial importance. They are found in trawl catches. These fishes are utilized for the production of fishmeal.

Order LOPHIFORMES

Key to families

- 1a. Head and body not depressed, but globose and slightly compressed
..... ANTENNARIIDAE
- 1b. Head and body greatly depressed (flattened) 2
- 2a. Body covered with hard spiny scales. Mouth small, inferior, with villiform teeth. A single short dorsal spine lying within a cavity between eyes. Head prolonged into a snout that overhangs the small mouth OGCOCEPHALIDAE
- 2b. Body naked. Mouth large, with long needle-like depressible teeth. At least 3 free dorsal spines on top of head. Head not prolonged, but rounded LOPHIIDAE

Family LOPHIIDAE (Goose fishes, Anglerfishes)

Anterior part of body much depressed and broad, posterior part tapering. Head rounded, with numerous sharp spines and ridges on dorsal and lateral surfaces. Mouth very large and wide, upper jaw protractile and lower jaw projecting; jaws with numerous long, sharp depressible teeth. Spinous dorsal fin with 2 or 3 isolated slender spines on head (cephalic spines) and second part with 1 to 3 spines before soft dorsal fin at the level of pectoral fins (post-cephalic spines). Soft dorsal fin on tail region. Pectoral fin rays unbranched, terminating in small fleshy filaments. Anal fin with 6 to 11 rays, inserted below second dorsal fin. Caudal fin with 8 rays, outer 2 rays unbranched.

Species known to occur in Orissa

Lophiomus setigerus (Vahl) (Blackmouth angler)

Fisheries information : The goose fishes are of no commercial importance. These fishes are found in the bottom trawls as bycatch in the commercial fisheries.

Remarks : *Lophius indicus* Alcock, described from Orissa (Ganjam) coast (Alcock, 1889) is a junior synonym of *Lophiomus setigerus* (Vahl) (Caruso, 1983).

Family ANTENNARIIDAE
(Anglers or frogfishes)

Body globose, short, slightly compressed. Mouth large, oblique to vertical. Teeth small, numerous. Gill opening is a small pore, behind and below pectoral fin base. Illicium slender, esca well developed. Second and third dorsal fin spines free from soft dorsal fin. Pectoral fin base elongate and limb-like. Skin spinulose or naked, often with membranous filaments or flaps.

Species known to occur in Orissa

Antennarius hispidus (Bloch and Schneider) (Shaggy angler)

Fisheries information : This fish is of no economic importance and so, unwanted in commercial catches, but it can be well utilized in aquarium trade.

Family OGCOCEPHALIDAE
(Batfishes, Handfishes)

Body greatly depressed, ventrally flattened. Head broader and more strongly depressed, prolonged into a snout that overhangs the small mouth. A bifid spine of dorsal fin hangs down as a tentacle from beneath the snout and serves as a lure. Pelvic fins widely separated, stout and leg-like, used for "walking" over the bottom. Pectoral fins large that extend out at sides of the head. Body with well developed tubercle-like scales.

Species known to occur in Orissa

1. *Haliëutaea indica* Annandale & Jenkins (Indian handfish)
2. *H. stellata* (Vahl) (Starry handfish)

Key to species

- 1a. Roof of rostral cavity extending forward as far as the edge of the disc, hence its opening not visible from above. Upper surface with irregular dark, more or less reticulated lines *H. indica*
- 1b. Roof of rostral cavity not extending to the margin of the disc, hence its opening partly visible from above. Upper surface often with dark spots, and also light blotches in large specimens *H. stellata*

Fisheries information : The batfishes are of no commercial importance. These fishes are found occasionally in the commercial catches.

Order MUGILIFORMES
Family MUGILIDAE
(Mulletts)

Body elongate, cylindrical or slightly compressed. Mouth small, terminal or inferior. Eyes usually partly covered by fatty tissue (adipose eyelids). Dorsal fin two, well separated, the first with 4 spines and the second with one spine and 8 or 9 soft rays. Anal fin with 3 spines and 8 or 9 rays. Pectoral fins set rather high on body. Pelvic fins subabdominal, with one spine and 5 branched rays. Caudal fin moderately forked, emarginate or truncate. Lateral line absent.

Species known to occur in Orissa

1. *Liza macrolepis* (Smith) (Largescale mullet)
2. *L. melinoptera* (Valenciennes) (Otonebora mullet) (Threatened)
3. *L. parsia* (Hamilton) (Gold-spot mullet)
4. *L. subviridis* (Valenciennes) (Greenback grey mullet)
5. *L. tade* (Forsskal) (Tade grey mullet)
6. *L. vaigiensis* (Quoy & Gaimard) (Square-tail grey mullet)
7. *Mugil cephalus* Linnaeus (Flathead grey mullet)
8. *Rhinomugil corsula* (Hamilton) (Corsula) (Threatened)
9. *Valamugil buechanani* (Bleeker) (Buchanan's bluetail mullet)
10. *V. cunnesius* (Valenciennes) (Longfin grey mullet)
11. *V. seheli* (Forsskal) (Blue-spot grey mullet)
12. *V. speigleri* (Bleeker) (Speigler's grey mullet)

Key to species

- 1a. Head concave between eyes, eyes projecting above head level. Anterior nostrils at level of eye centre or lower. Mouth ventral in position *R. corsula*
- 1b. Head less flattened or concave between eyes, eyes not projecting above head level. Anterior nostrils above level of eye centre. Mouth terminal in position 2
- 2a. Posterior tip of maxilla (upper jaw) not curved below tip of premaxilla. Adipose eyelids well developed. Anal fin with 8 soft rays *M. cephalus*
- 2b. Posterior tip of maxilla (upper jaw) curved below tip of premaxilla. Adipose eyelids well developed, feeble or absent. Anal fin with 9 soft rays (rarely 8) 3
- 3a. Pectoral axillary scale pointed and long. Scales with membranous digitated hind margin 4

- 3b. Pectoral axillary scale small or absent. Hind margin of scales not digitated 7
- 4a. Adipose tissue covers half to most of eye. Second dorsal fin origin on vertical through anal fin origin. Maxilla not reaching anterior margin of eye 5
- 4b. Adipose tissue around eye feeble or absent. Second dorsal fin origin on vertical behind anterior fourth of anal fin base. Maxilla reaching anterior margin of eye
..... 6
- 5a. Scales in lateral series 32 to 36. Second dorsal fin origin opposite 21 to 23rd scales in lateral series. Second dorsal and anal fins falcate, larger than pelvic fins
..... *V. buehneri*
- 5b. Scales in lateral series 38 to 42. Second dorsal fin origin opposite 26 to 28 scales in lateral series. Second dorsal and anal fins not falcate, shorter than pelvic fins
..... *V. seheli*
- 6a. Scales in lateral series 30 to 35. Soft dorsal and anal fins moderately scaled. Pectoral fin extending to vertical between 3rd and 4th spine of first dorsal fin
..... *V. cunnesius*
- 6b. Scales in lateral series 37 to 40. Soft dorsal and anal fins densely scaled. Pectoral fin extending to vertical from 2nd spine of first dorsal fin *V. speigleri*
- 7a. Anal fin rays 8. Caudal fin almost truncate *L. vaigiensis*
- 7b. Anal fin rays 9. Caudal fin forked 8
- 8a. Transverse rows of scales 12 *L. macrolepis*
- 8b. Transverse rows of scales less than 12 9
- 9a. Second dorsal fin origin over posterior half of anal fin base *L. tade*
- 9b. Second dorsal fin origin over anterior half of anal fin base 10
- 10a. Preorbital bone narrow, not filling space between mouth and eye. Corner of mouth on vertical through anterior nostril *L. subviridis*
- 10b. Preorbital bone wide, filling space between mouth and eye. Corner of mouth on vertical behind anterior nostril 11
- 11a. First dorsal fin origin nearer to snout tip than to caudal fin base. Transverse rows of scales 11 *L. parsia*
- 11b. First dorsal fin origin nearer to caudal fin base than to snout tip. Transverse rows of scales 9 to 10 *L. melinoptera*

Fisheries information : Mulletts are very important commercial fishes. Most of the species are suitable for aquaculture due to their rapid growth and hardiness. Mulletts form about 2.38 percent of total marine catch along Orissa coast in year 2000-01 (Anon., 2002)

Remarks : This family was under order Perciformes in literatures, but following Nelson (1994) and Jayaram (1999) it is being kept separate.

Order ATHERINIFORMES
Family ATHERINIDAE
(Siversides)

Body somewhat elongate, compressed with moderately large cycloid scales. Mouth small, terminal. Two dorsal fins, the first with 4 to 7 weak spines and the second with one spine and 8 to 12 rays. Anal fin with one weak spine and 12 to 18 rays. Pectoral fins inserted high on body. Pelvic fin with one spine and 5 rays. A midlateral stripe extending from pectoral fin to caudal fin.

Species known to occur in Orissa

1. *Atherinomorous duodecimalis* (Valenciennes) (Tropical silverside)
2. *A. lacunosus* (Forster) (Hardyhead silverside)

Key to species

- 1a. Midlateral scales 39 to 44. Distal end of upper jaw extending backward at least to vertical through anterior margin of pupil. No elevation on posterior end of dentary bone *A. lacunosus*
- 1b. Midlateral scales 33 to 38. Distal end of upper jaw extending backward slightly vertical through anterior margin of orbit. A distinct tubercle-like elevation on posterior end of dentary bone *A. duodecimalis*

Fisheries information : These fishes do not contribute to commercial fishery. Rare in this coast.

Order BELONIFORMES

Key to families

- 1a. Narial opening paired. Branchiostegal rays 4 to 7 ADRIANICHTHYIDAE
- 1b. Narial opening single. Branchiostegal rays 12 to 15 2
- 2a. Both upper and lower jaw extended into long beak with numerous needle-like teeth. Mouth large BELONIDAE

- 2b. Only lower jaw prolonged or none of jaws prolonged, with minute teeth or without teeth. Mouth small 3
- 3a. Lower jaw usually prolonged, much longer than upper. Pectoral and pelvic fins short HEMIRAMPHIDAE
- 3b. Both jaws short and normal and not prolonged into a long beak. Pectoral fins strikingly long, extending beyond origin of dorsal fin. Pelvic fins exceptionally large in some species EXOCOETIDAE

Family EXOCOETIDAE (Flying fishes)

Body elongate and cylindrical, flattened ventrally. Jaws more or less equal in length. Fins without spines. Dorsal and anal fins inserted far back on body. Pectoral fins considerably long, inserted high on sides, extending beyond dorsal fin origin. Pelvic fins inserted abdominal in position and greatly enlarged in many species. Caudal fin deeply forked, lower lobe longer than upper. Lateral line low on body.

Species known to occur in Orissa

1. *Cypselurus poecilopterus* (Valenciennes) (Yellow-wing flyingfish)
2. *Exocoetus volitans* Linnaeus (Tropical two-wing flyingfish)

Key to species

- 1a. Pelvic fins short, not reaching anal fin origin (barely reaching in juveniles) *E. volitans*
- 1b. Pelvic fins long, reaching beyond anal fin origin *C. poecilopterus*

Fisheries information : The flying fishes are commercially important and marketed fresh. These are delicately flavoured and highly nutritious fishes, but rarely caught along Orissa coast.

Family HEMIRAMPHIDAE (Halfbeaks)

Body greatly elongate. Lower jaw prolonged; upper jaw short, triangular. Fins without spines. Dorsal and anal fins inserted in posterior half of body. Pelvic fins with 6 soft rays, abdominal in position. Pectoral fins short. Lateral line originates from pectoral fin origin and then bends downward extending backward along the ventral border of body. Body with cycloid scales.

Species known to occur in Orissa

1. *Hemiramphus far* (Forsskal) (Black-barred halfbeak)
2. *Hyporhamphus limbatus* (Valenciennes) (Congaturi halfbeak)
3. *H. unicuspis* Collette & Perin (Simpletooth halfbeak)
4. *Rhynchorhamphus georgii* (Valenciennes) (Longbilled halfbeak)
5. *R. malabaricus* Collette (Malabar halfbeak)
6. *Zenarchopterus buffonis* (Valenciennes) (Buffonis halfbeak)
7. *Z. ectuntio* (Hamilton) (Ectuntio halfbeak)
8. *Z. gilli* Smith (Viviparous halfbeak)

Key to species

- 1a. Nasal papillae elongate and pointed, strongly projecting beyond nasal fossa. Caudal fin rounded or truncate 2
- 1b. Nasal papillae rounded, fan shaped or fimbriate, not projecting from margin of nasal fossa. Caudal fin emarginate or deeply forked 4
- 2a. Upper jaw nearly twice as long as broad, 2.0 to 2.8 times in free lower jaw
..... *Z. ectuntio*
- 2b. Upper jaw as long as broad, or broader than long, 6.5 to 8.0 times in free lower jaw
..... 3
- 3a. Dorsal fin black. Fourth or 5th dorsal fin ray in males elongate and often thickened. Upper jaw as long as wide at its base. No prominent stripe along midline of snout
..... *Z. gilli*
- 3b. Dorsal fin dusky. Fourth to 7th dorsal fin ray in males slightly elongate, but not thickened. Upper jaw distinctly wider than long. A prominent dark stripe along midline of snout *Z. buffonis*
- 4a. Upper jaw naked. Preorbital ridge absent. Anal fin rays 10 to 12. Sides of body with 3 to 9 black spots *H. far*
- 4b. Upper jaw covered with scales. Preorbital ridge well developed. Anal fin rays 12 to 17. No black spots on sides of body 5
- 5a. Nasal papillae fimbriate. Upper jaw arched. Gillrakers on first arch 47 to 78. Lateral line with two branches ascending behind opercle and pectoral fin origin 6
- 5b. Nasal papillae not fimbriate. Upper jaw flat or almost flat. Gillrakers on first arch 19 to 47. Lateral line with one branch ascending towards pectoral fin origin 7

- 6a. Upper jaw more highly domed, its width 1.2 to 1.3 times in its length. Sum of dorsal and anal rays usually 29 or more (26 to 32). Gillrakers 57 to 71 *R. georgii*
- 6b. Upper jaw less highly domed, its width 0.95 to 1.2 times in its length. Sum of dorsal and anal rays usually 28 or less (25 to 30). Gillrakers 52 to 60 *R. malabaricus*
- 7a. Teeth in both jaws mostly unicuspid, except for a few tricuspid teeth near base of upper jaw. Upper jaw longer, its width 0.8 to 1.15 in its length. Anal fin rays 16 to 18 *H. unicuspis*
- 7b. Teeth in both jaws tricuspid. Upper jaw short, its width 0.55 to 0.8 its length. Anal fin rays 13 to 16 *H. limbatus*

Fisheries information : The halfbeaks are important commercial fishes. These fishes are utilized fresh, dried salted and smoked. Live fishes can frequently be seen in waters of the Chilka Lake.

Remarks : Venkateswarlu and Rama Rao (1980) have mentioned *Hyporhamphus xanthopterus* (Valenciennes) as one among the fishes of Orissa, but its availability along Orissa coast is doubtful.

Family BELONIDAE (Needlefishes)

Body considerably elongate. Both upper and lower jaw extended into long beaks, with numerous needle-like teeth. Fins without spines. Dorsal and anal fins inserted in posterior half of body. Pelvic fins inserted in abdominal position and with 6 soft rays. Pectoral fins short. Lateral line extending down from pectoral fins origin and running along ventral margin of sides. Scales small, cycloid.

Species known to occur in Orissa

1. *Strongylura leiura* (Bleeker) (Banded needlefish)
2. *S. strogylura* (van Hasselt) (Spottail needlefish)
3. *Xenentodon cancila* (Hamilton) (Freshwater garfish)

Key to species

- 1a. Dorsal and anal fin rays nearly opposite to each other. One pair of dentigerous upper pharyngeals *X. cancila*
- 1b. Dorsal fin inserted behind anal fin origin. Two or three pairs of dentigerous upper pharyngeals 2
- 2a. Caudal fin rounded or truncate with a prominent black spot near its base; dorsal fin with 12 to 15 rays and anal fin with 15 to 18 rays *S. strongylura*

- 2b. Caudal fin emmarginate without any black spot near its base; dorsal fin with 17 to 21 rays and anal fin with 23 to 25 rays *S. leiura*

Fisheries information : The needle fishes are of commercial importance. These fishes are mostly utilized fresh and are very tasty for their excellent flavour. *X. cancila* is primarily a freshwater fish, but occurs in upper reaches of estuaries and Chilka lake.

Family ADRIANICHTHYIDAE (Rice fishes)

Head depressed; mouth small and terminal; upper jaw non-protractile; narial opening paired. Fins without spines. Dorsal fins placed close to caudal fin. Anal fin base longer than dorsal fin base. Scales large; lateral line absent. Very small, surface living fishes found in fresh and brackish waters. Useful as mosquito larvae killer.

Species known to occur in Orissa

Oryzias dancena (Hamilton) (Rice fish)

Fisheries information : No interest to fisheries, but used for mosquito control as it feeds on mosquito larvae.

Remark : Reported from Orissa as *O. melastigma* (McClelland). This is now considered as a junior synonym of *Aplocheilichthys panchax* (Hamilton) (Roberts, 1998). This fish was placed under family Oryziidae in literature. Previously recognised three families, viz., Oryziidae, Adrianichthyidae and Horaichthyidae, are now placed in the family Adrianichthyidae (Rosen and Parenti, 1981).

Order CYPRINODONTIFORMES Family APLOCHEILIDAE (Rivulines)

Body fusiform, compressed. Upper jaw protrusible; teeth villiform on jaws and vomer. Fins spineless. Dorsal fin short, inserted in posterior third of body; pelvic fin bases close together; caudal fin rounded. Scales large, cycloid; lateral line on head, but absent on body. Typically small, sexually dimorphic fishes.

Species known to occur in Orissa

Aplocheilichthys panchax (Hamilton) (Panchax minnow)

Fisheries information : Its brilliant colouration attracts attention of aquarists. Its utility for mosquito control is well established since it is larvivorous.

Order BERYCIFORMES
Family HOLOCENTRIDAE
(Squirrelfishes, Soldierfishes)

Body oblong and compressed. Margins of membrane bones of head serrated or with spines. Mouth terminal or lower jaw projecting. Dorsal fin with 11 or 12 stout spines and 12 to 17 rays, deeply notched between spinous and soft part. The base of spinous part 2 to 3.5 times longer than soft part. Anal fin with 4 spines, the third spine, the stoutest and usually the longest. Pelvic fins with one spine and 7 soft rays. Caudal fin forked, with 17 branched rays. Body with extremely rough ctenoid scales; lateral line complete. Usually reddish in colour.

Species known to occur in Orissa

1. *Myripristis murdjan* (Forsskal) (Blotcheye soldier fish)
2. *Sargocentron rubrum* (Forsskal) (Redcoat soldier fish)

Key to species

- 1a. Anal fin rays 7 to 10. Preopercle corner with a sharp stout spine. Front of swim bladder blunt, with no connection to auditory bullae of skull *S. rubrum*
- 1b. Anal fin rays more than 10. Preopercle corner without a sharp spine. Front of swim bladder bifurcate, anterior projections connecting to auditory bullae of skull
..... *M. murdjan*

Fisheries information : The soldier fishes are of little commercial importance. These fishes are caught as bycatch in the commercial trawls.

Order SYNGNATHIFORMES

Key to families

- 1a. Head and body depressed, the scales fused into bony armour. Large bony rostrum projecting over the small protrusible mouth. Pectoral fins enlarged, wing-like, horizontal PEGASIDAE
- 1b. Head and body elongated or S-shaped with curled prehensile tail, or the body deep and compressed. Mouth at the end of a long tubular snout 2
- 2a. Pelvic fins absent. Body encased in a series of bony rings. Gill openings restricted to a small pore on dorsolateral part of head SYNGNATHIDAE
- 2b. Pelvic fins present. Body armoured or not. Gill openings not restricted 3
- 3a. Body compressed, covered with smooth, stiff, transparent armour with a sharp ventral edge. Caudal and dorsal fins deflected to ventral edge of body. Caudal fin rounded CENTRISCIDAE

- 3b. Body depressed, naked. Caudal and dorsal fins in the usual positions. Caudal fin forked, the middle two rays fused and greatly elongated FISTULARIIDAE

Family PEGASIDAE
(Seamoths)

Body broad and depressed, armoured with bony rings; tail similar but flexible. Enlarged nasal bone forms rostrum projecting well forward above the small toothless mouth. Dorsal and anal fins with 5 rays each, placed in the tail region. Pectoral fins enlarged and horizontal. Pelvic fins abdominal, with 1 slender spine and 1 or 2 rays.

Species known to occur in Orissa

Pegasus volitans Linnaeus (Longtail seamothe)

Fisheries information : Of no interest to fisheries.

Remarks : Owing to have a strange shape and cryptic colour pattern this fish is able to live among weeds undetected by predators. Their biology and breeding habits are unknown to science till date. Pietsch (1978) placed this family in order Gasterosteiformes, but the evidence for this relationship is not convincing (Smith and Heemstra, 1986).

Family FISTULARIIDAE
(Flute-mouths, Cornet fishes)

Body greatly elongate, slightly depressed and naked. Mouth small, at the tip of a long tubular snout. Dorsal and anal fins opposite and with short bases, with 14 to 17 soft rays. Pectoral fins with 13 to 17 rays. Pelvic fins with 6 rays, inserted in the abdominal position. Caudal fin forked, with a long filamentous structure, extending from the middle of the lobes.

Species known to occur in Orissa

Fistularia petimba Lacepede (Red cornet fish)

Fisheries information : The cornet fishes are of little commercial importance. These fishes are generally used for fishmeal.

Family CENTRISCIDAE
(Razor fish)

Body elongate and strongly compressed, razor-like with sharp ventral edge, encased by three bony plates. Head anteriorly ending in a long tubular snout, having a small terminal mouth. Two dorsal fins, the first one short and having one of its spines strong. Second dorsal fin and anal fins placed ventrally and of moderate extent. Pelvic fins spineless and rudimentary. Pectoral fins inserted midway between the tip of snout and base of first dorsal spine.

Species known to occur in Orissa

Centriscus scutatus Linnaeus (Razor fish)

Fisheries information : The razor fishes are of no commercial value. These fishes are caught occasionally in the commercial catches.

Family SYNGNATHIDAE (Sea horses, Pipefishes)

Body elongate, angular or laterally compressed or rounded, encased in a series of bony rings. Head slender, generally with a produced tube-like snout. Mouth small, terminal and oblique. Dorsal fin with soft rays only. Pelvic fins absent. Caudal fin sometimes absent. Tail long, prehensile in Sea horses.

Species known to occur in Orissa

1. *Hippocampus fuscus* Ruppell (Sea pony) (Threatened)
2. *H. histrix* Kaup (Thorny seahorse) (Threatened)
3. *Ichthyocampus carce* (Hamilton) (Freshwater pipefish)
4. *Microphis brachyurus* (Bleeker) (Short-tail pipefish)
5. *M. cuncalus* (Hamilton) (Crocodile-tooth pipefish)
6. *M. deocata* (Hamilton) (Deocata pipefish)

Key to species

- 1a. Caudal fin absent. Distal part of tail prehensile, typically coiled ventrad in preservative 2
- 1b. Caudal fin present. Distal part of tail not prehensile, ventrad not coiled in preservative 3
- 2a. Body rings with long spines *H. histrix*
- 2b. Body rings without long spines, but with spinules *H. fuscus*
- 3a. Superior trunk and tail ridges continuous. Inferior trunk and tail ridges continuous. Lateral trunk ridge not confluent with inferior tail ridge, but deflected ventrad near anal ring. Trunk rings 14 or 15 *I. carce*
- 3b. Superior trunk and tail ridges discontinuous. Inferior trunk and tail ridges discontinuous. Lateral trunk ridge confluent with inferior tail ridge. Trunk rings 16 to 22 4
- 4a. Opercle with one or more supplemental ridges below longitudinal ridges. Trunk rings 20 to 22 and tail rings 21 to 24. Dorsal fin rays 37 to 41 *M. brachyurus*

- 4b. Opercle without supplemental ridges below longitudinal ridges. Trunk rings 15 to 18 and tail rings 24 to 32 5
- 5a. Tail rings 24 to 27. Dorsal fin rays 47 to 56. Lateral snout ridge distinct and arched. Snout depth 4.7 to 7.0 in its length *M. cuncalus*
- 5b. Tail rings 29 to 32. Dorsal fin rays 35 to 36. Lateral snout ridge poorly developed or obsolete. Snout depth 6.8 to 7.6 in its length *M. deocata*

Fisheries information : The sea horses are of great commercial importance since these fishes are used for medicinal purposes. These fishes are also used as popular aquarium exhibits.

Remarks : *Hippocampus brachyurus* Dunker, reported from the Chilka lake (Dunker, 1914), is now relegated to synonymy of *H. fuscus* Ruppell (Lourie *et al.*, 1999).

Order SYNBRANCHIFORMES

Key to the families

- 1a. Pectoral and pelvic fins absent. Median fins reduced or absent..... SYNBRANCHIIDAE
- 1b. Pelvic fin absent; pectoral fin present. Median fins developed; dorsal fin long, with a series of isolated stout spines MASTACEMBELIDAE

Family SYNBRANCHIIDAE (Swamp eels)

Body elongate, eel-like. Median fins vestigial. Paired fins absent. Gill membrane united, continuous around isthmus, with a single ventral opening. Branchiostegals 4 to 6. Inhabits fresh and brackish waters, mostly in swamps or marshy areas. Burrowing and amphibious in habit.

Species known to occur in Orissa

Opisternon bengalense McClelland (Bengal eel)

Fishery information : Of no interest to fisheries.

Family MASTACEMBELIDAE (Spiny eels)

Body elongate and eel-like. A fleshy rostral appendage present. Gill membranes united and attached to isthmus. Gill opening confluent into a single slit, situated on ventral surface of head. Dorsal fin preceded by a series of isolated spines; anal fin with 2 or 3 spines. Caudal and pectoral fins well developed; pelvic fins absent. Scales minute.

Species known to occur in Orissa

1. *Macrogathus aral* (Bloch & Schneider) ((Lesser spiny eels)
2. *M. pancalus* Hamilton (Striped spiny eels)
3. *Mastacembelus armatus* (Lacepede) (Tire-track spiny eels)

Key to species

- 1a. Dorsal fin spines 32 to 40 and 64 to 90 soft rays. Dorsal and anal fins broadly confluent with caudal fin, their outline merged *M. armatus*
- 1b. Dorsal fin spines 16 to 32 and 30 to 45 soft rays. Dorsal and anal fins distinctly separate from caudal fin 2
- 2a. Preopercle with 2 to 5 spines and preorbital with a strong spine. Rostrum rounded in cross-section, without tooth plates *M. pancalus*
- 2b. Preopercle and preorbital without spine. Rostrum with concave ventral surface lined with paired tooth plates *M. aral*

Fishery information : These are reported to be excellent food fish and marketed fresh. These can be placed in aquaria and kept by hobbyists.

Remarks : This family was earlier placed under order Perciformes.

Order SCORPAENIFORMES

Key to families

- 1a. Head encased by expanded bones that are firmly attached to each other 2
- 1b. Head not encased with bony armour 3
- 2a. Preopercular spine very long. Dorsal fin with 1 or 2 isolated spines on nape DACTYLOPTERIDAE
- 2b. Preopercular spine short. No isolated dorsal fin spine on nape TRIGLIDAE
- 3a. Two dorsal fins. Head strongly flattened. Anal fin spine absent PLATYCEPHALIDAE
- 3b. One dorsal fin. Head not strongly flattened. Anal fin with 2 or 3 spines 4
- 4a. Body naked SYNANCEIIDAE
- 4b. Body covered with scales 5
- 5a. Dorsal fin begins before or above eye TETRAROGIDAE
- 5b. Dorsal fin begins behind eye SCORPAENIDAE

Family DACTYLOPTERIDAE
(Flying gurnard)

Body more or less elongate with heavily armoured large and blunt head. Mouth small, almost ventral. Eyes large. Preopercle with a prominent long spine. Spinous and soft dorsal fins separated by a deep notch; 1st dorsal fin with 6 to 7 spines, of which the first or first two anterior ones are isolated and on nape; soft dorsal fin with 8 rays. Anal fin with 6 or 7 soft rays. Pectoral fins greatly elongated, divided into 2 parts, a short anterior part with 5 rays and a long posterior part with 25 to 31 rays, extending to base of caudal fin in adults. Pelvic fins thoracic. Lower side of posterior part of trunk with 2 to 4 enlarged keel-like scales. Scales scute-like, forming prominent keels.

Species known to occur in O

1. *Dactyloptena macracantha* (Bleeker) (Spotwing flying gurnard)
2. *D. orientalis* (Cuvier) (Oriental flying gurnard)

Key to species

- 1a. Lateral line present and extending to caudal peduncle. An oblong black blotch over middle of pectoral fins *D. macracantha*
- 1b. Lateral line absent. No black blotch over middle of pectoral fins
..... *D. orientalis*

Fisheries information : The flying gurnard fishes are of no commercial importance.

Family SCORPAENIDAE
(Scorpionfishes)

Body almost compressed to robust, with large spiny head. A bony ridge below eye (suborbital stay) extending posteriorly and firmly attaching to preopercle. Preopercular border with 3 to 5 spines, the uppermost 3 better developed. Opercle with 2 divergent spines or a single spine, the other spines scattered on head. A single dorsal fin, generally notched posterior to the spinous part, with 8 to 18 spines and 4 to 14 segmented rays. Anal fin with 2 to 4 spines and 5 to 14 segmented rays. Pectoral fins broad based, large, fan-like with 11 to 23 rays. Pelvic fins inserted in thoracic region, with one spine and 3 to 5 branched or simple rays. Caudal fin rounded to square-cut but never forked.

Species known to occur in Orissa

1. *Apistus carinatus* (Bloch & Schneider) (Ocellated waspfish)
2. *Brachypterois serrulata* (Richardson) (NA)
3. *Pterois miles* (Bennett) (Devil firefish)

4. *P. radiata* Cuvier (Radial firefish)
5. *P. russellii* (Bennett) (Plaintail firefish)
6. *Scorpaenodes guamensis* (Quoy & Gaimard) (NA)
7. *Scorpaenodes muciparus* (Alcock) (NA)
8. *Scorpaenopsis cirrhosa* (Thunberg) (Hairy stingfish)

Key to species

- 1a. Pectoral fin with the lowermost ray free. Dorsal fin usually with 15 spines. A large black spot on rear half of spinous dorsal fin *A. carinatus*
- 1b. Pectoral fin without free ray. Dorsal fin with 12 to 14 spines 2
- 2a. Dorsal fin spines short, usually half of body depth. Pectoral fins short, not reaching beyond anterior part of anal fin base. Lateral line scales 38 to 58 3
- 2b. Dorsal fin spines long, about equal to or longer than body depth. Pectoral fins long, reaching rear end of anal fin or beyond. Lateral line scales more than 70 4
- 3a. Dorsal fin spines 12. Palatine teeth absent. Scale rows between last dorsal fin spine and lateral line 7 or 8. Body depth 2.9 to 3.4 in standard length *S. cirrhosa*
- 3b. Dorsal fin spines 13. Palatine teeth present. Body depth 2.7 to 2.9 in standard length 4
- 4a. Scale rows between last dorsal fin spine and lateral line 5 or 6. Lateral line scales 39 to 43 *S. guamensis*
- 4b. Scale rows between last dorsal fin spine and lateral line 9. Lateral line scales 48 to 58 *S. muciparus*
- 5a. Dorsal fin spines short, about equal to length of dorsal fin soft rays, and usually less than $\frac{1}{2}$ body depth. Some upper rays of pectoral fin branched *B. serrulata*
- 5b. Dorsal fin spines long, longer than length of dorsal fin soft rays, and as long as or longer than body depth. All pectoral fin rays unbranched 6
- 6a. Scales on body ctenoid. Pectoral fin usually with 16 rays. About 5 or 6 broad dark bars on body; a broad dark horizontal stripe on caudal peduncle *P. radiata*
- 6b. Scales on body cycloid. Pectoral fin with 13 or 14 rays. Numerous thin dark bars on body; no horizontal stripe, but thin diagonal bars on caudal peduncle 7

7a. Soft dorsal, anal and caudal fin with small dark spots. Pectoral fins normally with 14 rays. Many spinules on bones below eye *P. miles*

7b. Soft dorsal, anal and caudal fin without spots. Pectoral fins normally with 13 rays. Few or no spines on bones below eye *P. russelli*

Fisheries information : The scorpion fishes are of little commercial importance. A few species are used as aquarium exhibits.

Remarks : Since the scorpion fishes contain venomous spines, these fishes should be very carefully handled. Recent authors consider a separate family Apistidae for *A. carinatus*. Another species *Pterois volitans* (Linnaeus) with spotted median fins closely resemble *P. miles*, may possibly occur in this region. The former differs from the latter in having almost scaleless nape and interorbital space (Scaled in *P. miles*) and fewer spines on head.

Family SYNANCEIIDAE (Rockfishes)

Body compressed posteriorly. Head bony, covered with several spines and ridges. Body smooth, without scales and usually covered with skin glands. Dorsal fin with 11 to 17 spines and 4 to 14 soft rays; anal fin with 2 to 4 spines and 4 to 14 soft rays. Pelvic fin with one spine and 3 to 5 soft rays. Pectoral fin rays 10 or 11. Most fishes with one to three lowermost pectoral fin rays separated from the rest. These fishes usually looking like rock.

Species known to occur in Orissa

1. *Choridactylus multibarbus* Richardson (Orange banded goblinfish)
2. *Minous coccineus* Alcock (Alcock's stingfish)
3. *M. monodactylus* (Bloch & Schneider) (Grey stingfish)
4. *Trachicephalus uranoscopus* (Bloch & Schneider) (Stargazing stonefish)

Key to species

- 1a. Pectoral fin normal, lowermost ray not free from remainder of fin *T. uranoscopus*
- 1b. Lowermost 1 to 3 pectoral fin rays free from remainder of fin 2
- 2a. Lowermost 3 pectoral fin rays free. Dorsal fin spines 12 to 15 *C. multibarbus*
- 2b. Only the lowermost ray of pectoral fin free. Dorsal fin spines 9 to 11 3
- 3a. First spine of dorsal fin equal to or longer than 2nd spine, well separated from 2nd spine base; total elements of dorsal fin 19 to 21. Inner side of pectoral fin pale, at most with some black streaks *M. monodactylus*

- 3b. First spine of dorsal fin less than $\frac{1}{2}$ of 2nd spine, close to 2nd spine base; total elements of dorsal fin 21 to 23. Inner side of pectoral fin with black spots *M. coccineus*

Fisheries information : No interest to fisheries. Need to be handled carefully when found in catches.

Remarks : These are the most venomous of all fishes. If stepped on this fish, the needle-sharp dorsal spine penetrates leading to release of venom into the wound which cause intolerable pain.

Family TETRAROGIDAE (Wasp fishes)

Body covered with small embedded scales. Dorsal fin originates on head. Usually 2 or 3 pairs of upper pharyngeal tooth plates. Pseudobranch well developed with 10 to 15 filaments. These are small to moderate sized benthic fishes, primarily restricted to Indo-West Pacific region and found up to the depth of 300 m.

Species known to occur in Orissa

1. *Ablabys taenianotus* (Cuvier) (Cockatoo wasp fish)
2. *Tetraroge niger* (Cuvier) (NA)

Key to species

- 1a. Body covered with small scales, embedded in skin. Dorsal fin with 17 spines, origin over front margin of eye *A. taenianotus*
- 1b. Body naked, with small rounded papillae. Dorsal fin with 13 spines, origin above posterior part of eye *T. niger*

Fisheries information : Of no fishery value.

Remarks : *A. taenianotus* was reported as *Amblyapistes taenianotus* from Orissa (Venkateswarlu *et al.*, 1998).

Family TRIGLIDAE (Gurnards or Sea robins)

Body elongate, fusiform, with a row of spines along each side of dorsal fin bases. Scales small, ctenoid and imbricate or rudimentary and more or less embedded. Head large, encased in bony plates. Maxilla covered by preorbital bone. Pectoral fin with lower 3 rays free and enlarged. Dorsal fin divided into two separate spinous and soft-rayed parts. Pelvic fins originate below pectoral fin base. Caudal fin with 11 or 12 principal rays and 9 or 10 branched rays.

Species known to occur in Orissa

1. *Lepidotrigla spiloptera* Gunther (Spottedwing gurnard)
2. *Pterygotrigla hemisticta* (Temminck & Schlegel) (Blackspotted gurnard)

Key to species

- 1a. Rostral process with several prominent spines. Bases of first and 2nd dorsal fin spines with small plates bearing strong lateral spines. Head with a groove on top, behind eyes. No dark spot on body *L. spiloptera*
- 1b. Rostral process with a single pair of prominent blade-like spines. Bases of first dorsal fin spines expanded into broad, flattened bony plates, no spines along 2nd dorsal fin base. Head without a groove on top, behind eyes. Dark spots on body
..... *P. hemisticta*

Fisheries information : Not of any fishery importance.

Remarks : Swim bladder of these species is known to be used in sound production. When taken out of water, they produce a bird-like chirping noise for which they are known as Sea-robins.

Family PLATYCEPHALIDAE (Spiny flatheads)

Body elongate. Head strongly depressed. Bony ridges of head generally with spines or serrations. Mouth large, lower jaw longer than upper. Two dorsal fins, considerably separated; spinous dorsal fin with 8 to 10 spines, the first spine short and scarcely connected to the second. Soft dorsal and anal fins with 10 to 15 rays. Pelvic fins thoracic in position and set far apart towards sides of body and with 1 spine and 5 soft rays. Lateral line complete, anterior scales of lateral line usually with spines.

Species known to occur in Orissa

1. *Cociella crocodila* (Tilesius) (Crocodile flathead)
2. *Grammoplites scaber* (Linnaeus) (Rough flathead)
3. *Platycephalus indicus* (Linnaeus) (Bartail flathead)
4. *Rogadius pristiger* (Cuvier) (Thorny flathead)
5. *Sorsogona melanoptera* Knap & Wongratana (Obscure flathead)
6. *S. tuberculata* (Cuvier) (Tuberculated flathead)
7. *Suggrundus rodericensis* (Cuvier) (Spiny flathead)

Key to species

- 1a. Pored scales in lateral line about 65 or more. Vomerine teeth in one transverse patch. Soft dorsal fin rays 13 *P. indicus*
- 1b. Pored scales in the lateral line about 60 or less. Vomerine teeth in 2 separate patches. Soft dorsal fin rays 11 or 12 2
- 2a. Body ridges above and below eye either with small spines or finely serrated 3
- 2b. Body ridges above and below eye bearing larger spines 5
- 3a. Preopercular spine single. Interorbital space narrow, 4.5 times or more in eye diameter *R. pristiger*
- 3b. Two or more preopercular spines. Interorbital space broader, generally less than 4.5 times in eye diameter 4
- 4a. Second dorsal and anal fin rays 11. Gillrakers 1+ 7 or 8. Preopercular spines 4 or more *S. tuberculata*
- 4b. Second dorsal and anal fin rays 12. Gillrakers 2 or 3 + 8 to 10. Preopercular spines 3 *S. melanoptera*
- 5a. Almost all pored lateral line scales bearing a backwardly directed spine *G. scaber*
- 5b. Pored scales of lateral line at least on posterior half of body without spine 6
- 6a. Bony ridge crossing below eyes with 3 spines. Number of scale rows slanting downward and backward above lateral line greater than the number of pored lateral line scales *C. crocodila*
- 6b. Bony ridge crossing below eyes usually with 4 or more spines. Number of scale rows slanting downward and backward above lateral line about the same as the number of pored lateral line scales *S. rodericensis*

Fisheries information : The spiny flathead fishes are of no commercial importance. These fishes are often found in the commercial catches.

Remarks : Following Knapp (1984) and Talwar and Kacker (1984), *R. pristiger* is erroneously identified as *R. asper* (Cuvier) from Indian waters and *R. asper* is unlikely to occur. Recent authors place *S. melanoptera* under genus *Rogadius* Jordan and Richardson (Imamura, 1996) and *S. rodericensis*, under genus *Kumococius* Matsubara and Ochiai (Knapp, 1999). *Platycephalus bengalensis* Rao reported from Orissa (Venkateswarlu *et al.*, 1998) is relegated to synonymy of *S. rodericensis* (Cuvier) (Knapp, 1984).

Order PERCIFORMES

Key to families

- 1a. Suprabranchial respiratory organ present 2
- 1b. Suprabranchial respiratory organ absent 4
- 2a. Dorsal and anal fins without spines. Pelvic fins subabdominal, with no spines and 6 soft rays CHANNIDAE
- 2b. Dorsal and anal fins with spines. Pelvic fins thoracic, each usually with one spine and 5 soft rays 3
- 3a. Prevomer with fixed conical teeth. Lateral line present, but interrupted ANABANTIDAE
- 3b. Prevomer without teeth. Lateral line usually absent, or when present, complete and continuous OSPHRONEMIDAE
- 4a. Pelvic fins placed below pectoral fins, close together, often united. Head generally with mucous canals and open pores 5
- 4b. Pelvic fins thoracic or abdominal, not united. Head without mucous canals or pores 9
- 5a. Body eel-like. Pelvic fins usually forming an adhesive disc. Eyes very small to virtually absent 6
- 5b. Body elongate to oblong, but not eel-like. Eyes prominent 7
- 6a. Opercular region with a pouch-like cavity. Caudal fin lanceolate TRYPAUCHENIDAE
- 6b. Opercular region without a pouch-like cavity. Caudal fin rounded GOBIOIDIDAE
- 7a. Body usually naked (no scales) KRAEMERIIDAE
- 7b. Body covered with scales 8
- 8a. Pelvic fins united, usually forming adhesive or sucking disc. Branchiostegal rays 5 GOBIIDAE
- 8b. Pelvic fins separate but bases close together or united. Branchiostegal rays 6 ELEOTRIDIDAE
- 9a. Gill openings reduced to a small opening on upper side of head. Preopercle with a strong spine CALLIONYMIDAE

- 9b. Gill openings broad. Preopercle without a strong spine 10
- 10a. Body naked or with modified scales 11
- 10b. Body with scales 12
- 11a. Mouth small. Teeth small, close-set. Head with tentacles BLENNIDAE
- 11b. Mouth large. Teeth large, spaced. Head without tentacle
..... CHIASMODONTIDAE
- 12a. A single nostril on each side of head CICHLIDAE
- 12b. Two nostrils on each side of head 13
- 13a. Pelvic fins with 2 strong spines separated by 3 soft rays SIGANIDAE
- 13b. Pelvic fins with at most 1 spine or absent and usually with 5 soft rays 14
- 14a. Pectoral fins divided into two parts: the upper part normal with rays attached, the lower part with 4 to 7 free filamentous rays POLYNEMIDAE
- 14b. Pectoral fins normal, without free rays in lower part of fin, lower rays sometimes separated from each other 15
- 15a. Head large and cuboid. Eyes dorsolateral or nearly so URANOSCOPIDAE
- 15b. Head not cuboid. Eyes not dorsolateral 16
- 16a. Dorsal and anal fins each with only soft rays, without spines 17
- 16b. Dorsal and anal fins each with spines and soft rays 20
- 17a. Head flattened with a characteristic laminated, oval shaped sucking disc
..... ECHENEIDAE
- 17b. Head without sucking disc 18
- 18a. Body disc-like with sharp abdomen. Ventral profile of body more convex than dorsal profile. First pelvic fin ray in adult prolonged MENIDAE
- 18b. Body elongate and compressed, not disc-like. Ventral profile of body more or less straight. First pelvic fin ray not prolonged 19
- 19a. Dorsal fin originating before pectoral fin base. Snout rounded
..... CORYPHAENIDAE
- 19b. Dorsal fin originating above pectoral fin base. Snout pointed
..... TRICHONOTIDAE

- 20a. Two short dorsal fins, widely separated from each other 21
- 20b. Dorsal fin either one or two; when two, with continuous bases, but if (rarely) the fins are separate, the interspace is negligible 23
- 21a. Pelvic fins larger than pectoral fins, inserted well in front of pectoral fins. Two indistinct lateral line with transverse branches CHAMPSODONTIDAE
- 21b. Pelvic fin shorter than pectoral fins, inserted behind the pectoral fins 22
- 22a. Dorsal fin with 6 to 7 spines APOGONIDAE
- 22b. Dorsal fin with 5 spines SPHYRAENIDAE
- 23a. A single folding, lancet-like spine on sides of caudal peduncle
..... ACANTHURIDAE
- 23b. No (folding) spine on caudal peduncle 24
- 24a. Anterior part of oesophagus, immediately posterior to last gill arch having lateral sacs (Pharyngeal sacs) supplied inside with papillae or longitudinal folds bearing teeth. Small uniserial teeth in jaws 25
- 24b. No lateral pharyngeal sacs. Teeth uniserial to mostly multiserial 27
- 25a. A continuous dorsal fin or two dorsal fins scarcely separated. Pelvic fins absent ..
..... STROMATEIDAE
- 25b. Two dorsal fins distinct, though scarcely separated. Pelvic fins always present
..... 26
- 26a. Dorsal fin with 13 to 16 rays ARIOMMATIDAE
- 26b. Dorsal fin with 25 to 40 rays CENTROLOPHIDAE
- 27a. Premaxilla fixed (upper jaw not protrusible), upper jaw often form a long, forward projecting sword-like structure 28
- 27b. Maxillary bones not very firmly attached to premaxilla, free to move forward
..... 29
- 28a. Caudal fin always present, well developed, lunate or strongly notched. Body spindle-shaped. Keels present on caudal peduncle SCOMBRIDAE
- 28b. Caudal fin often absent, but if present then not large nor lunate-shaped. Body elongate, ribbon-like. No keel on caudal peduncle TRICHIURIDAE
- 29a. Two long barbels on chin, folded into a median groove under head
..... MULLIDAE

- 29b. No barbels on chin 30
- 30a. Dorsal fin with 6 to 9 isolated spines, each depressible in a groove. Characteristic two silvery stripes on sides of body RACHYCENTRIDAE
- 30b. Dorsal fin without free spines. No such silvery stripes on side 31
- 31a. First two anal spines detached from rest of fin (partially or completely embedded in large fishes). Scutes on straight part of lateral line often present CARANGIDAE
- 31b. First two anal spines not detached from rest of fin. No scutes on caudal peduncle 32
- 32a. Dorsal fin inserted in posterior half of body and above anal fin. Length of soft dorsal fin base much shorter than soft portion of anal fin TOXOTIDAE
- 32b. Dorsal fin inserted in anterior half of body. Length of soft dorsal fin base longer or equal to soft portion of anal fin 33
- 33a. Anterior rays of soft dorsal and anal fins markedly elongated, giving both fins a sickle shape. Pelvic fins usually small or vestigial MONODACTYLIDAE
- 33b. Anterior rays of soft dorsal and anal fins not elongated, when elongate they do not give either fin a sickle shape. Pelvic fins well developed 34
- 34a. Body very deep, its maximum depth more than half the total length. Single dorsal fin, spines clearly distinguishable 35
- 34b. Body oblong to moderately deep, its depth less than half of total length. When deep-bodied and with single dorsal fin, then no spines or the spiny rays hard to distinguish from soft rays 39
- 35a. Spinous part of dorsal fin continuous with soft portion without a notch 36
- 35b. Spinous part of dorsal fin separated from soft portion by a deep notch 37
- 36a. Dorsal fin with more than 10 spines CHAETODONTIDAE
- 36b. Dorsal fin with 5 spines only PLATACIDAE
- 37a. Anal fin with 4 spines. Gill membranes narrowly united to isthmus SCATOPHAGIDAE
- 37b. Anal fin with 3 spines. Gill membranes broadly united to isthmus 38
- 38a. Mouth protractile. Pectoral fins falcate, longer than head length. Maxillae distally exposed DREPANIDAE

- 38b. Mouth not protractile or scarcely so. Pectoral fins short, rounded, shorter than head length. Maxillae distally hidden EPHIPPIDAE
- 39a. Lateral line interrupted or absent..... NANDIDAE
- 39b. Lateral line complete 40
- 40a. Two dorsal fins well separated but if close together then not joined by membrane 41
- 40b. Single dorsal fin, sometimes deeply notched between spinous and soft parts but in such cases, the membrane joining the parts intact 45
- 41a. Anal fin base considerably longer than second dorsal fin bases. Mouth large, oblique, with small canine teeth at front LACTARIIDAE
- 41b. Anal fin base as long as or shorter than second dorsal fin base 42
- 42a. Mouth small, upper jaw ending far short of eye and even before nostrils. Maxilla covered by preorbital bone. Dorsal fin with 10 to 13 spines SILLAGINIDAE
- 42b. Mouth moderate to large. Upper jaw reaching nostrils, but often anterior margin of eye. Maxilla not covered by preorbital bone. Dorsal fin with 7 to 10 spines 43
- 43a. Caudal fin rounded CENTROPOMIDAE
- 43b. Caudal fin forked 44
- 44a. Preopercle with a double edge (edge and ridge). Anal fin with 3 spines and 9 to 16 rays AMBASSIDAE
- 44b. Preopercle with single edge (no ridge). Anal fin with 3 spines and 7 rays or 2 spines and 9 or 10 rays ACROPOMATIDAE
- 45a. Pelvic fins usually with an axillary scale 46
- 45b. Pelvic fins without an axillary scale 57
- 46a. Anal fin with 2 spines 47
- 46b. Anal fin with 3 spines 48
- 47a. Caudal fin forked. Lateral line short or very small. A peculiar hook on head in males KURTIDAE
- 47b. Caudal fin usually rhomboid. Lateral line prominent and extending up to end of caudal fin. No hook in males SCIAENIDAE
- 48a. Dorsal and anal fins rounded and symmetrical so that with the tail they appear as a single three lobed fin 49

- 48b. Dorsal and anal fins not as above 50
- 49a. Second anal spine longer than third. Upper jaw strongly protrusible
..... COIIDAE
- 49b. Second anal spine shorter than third. Upper jaw slightly protrusible
..... LOBOTIDAE
- 50a. Mouth strongly protractile 51
- 50b. Mouth moderately protractile 52
- 51a. Head usually naked, upper surface with bony ridges with a nuchal spine on nape. Gill membrane united with isthmus LEIOGNATHIDAE
- 51b. Head entirely covered with clearly visible scales, upper surface smooth. Gill membranes free from isthmus GERREIDAE
- 52a. Distal end of premaxilla overlapping maxilla externally. Molar-like teeth in some species present at sides of jaws. No tooth on roof of mouth SPARIDAE
- 52b. Maxillae not overlapping by hind tip of premaxilla. No molar-like teeth on jaws..
..... 53
- 53a. Outer row of teeth in jaws of a peculiar hockey-stick shape (scalpiform), with their bases set horizontally, resembling a radially striated bony plate inside mouth
..... KYPHOSIDAE
- 53b. Typical scalpiform teeth absent..... 54
- 54a. Suborbital process well developed, sometimes forming a spine posteriorly 55
- 54b. Suborbital process either absent or weakly developed 56
- 55a. No teeth on roof of mouth. Weak spines in dorsal and anal fins
..... NEMIPTERIDAE
- 55b. Teeth usually present on vomer and palatines. Moderately strong spines in dorsal and anal fins LUTJANIDAE
- 56a. Dorsal fin with 12 to 16 soft rays. Lips not soft and fleshy HAEMULIDAE
- 56b. Dorsal fin with 9 to 10 soft rays. Lips soft and fleshy LETHRINIDAE
- 57a. Inner ray(s) of pelvic fins attached to abdomen by membrane 58
- 57b. Inner ray(s) of pelvic fins not confluent to abdomen by membrane 59
- 58a. Dorsal fin with 2 to 9 spines. Upper edge of preopercle fused to head
..... GRAMISTIDAE

- 58b. Dorsal fin with 10 spines. Upper edge of preopercle free from head
PRIACANTHIDAE
- 59a. Mouth large, upper jaw usually extends to below hind margin of eye or beyond.
 Operculum usually with 3 spines SERRANIDAE
- 59b. Mouth small or moderate, upper jaw not reaching beyond eye centre. Dorsal fin with
 11 to 14 spines. Operculum with 1 to 2 strong spines TERAPONIDAE

Family CENTROPOMIDAE (Sea perches)

Body elongate or oblong, slightly compressed. Mouth large, lower jaw extending to hind border of the orbit. Preopercle with a serrated hind margin and an enlarged spine at angle. Opercle with a spine. Dorsal fin deeply notched or separated into two parts, the first part with 7 to 8 strong spines and second part with 1 spine and 10 to 15 rays. Anal fin with 3 spines and 8 to 13 soft rays. Caudal fin rounded. Lateral line complete.

Species known to occur in Orissa

Lates calcarifer (Bloch) (Barramundi, Bhetki)

Fisheries information : The giant sea perch is one of the very important commercial fishes of our country. Its flesh is considered to be most delicious. Its swim bladder is used for making isinglass. Estuaries serve as main feeding ground for young ones of this fish.

Family AMBASSIDAE (Glassy perchlets)

Body more or less translucent and compressed. Mouth large, oblique, with small teeth in jaws and roof of mouth. Operculum with an ill-developed spine. Preoperculum with double margin having an edge and ridge. Dorsal fin of two continuous parts, with a deep notch. First dorsal fin with 7 or 8 spines. Second dorsal fin with one spine and 9 to 17 rays. Anal fin with 3 spines and 9 to 16 rays. Caudal fin forked. Lateral line complete, interrupted. Scales thin, cycloid, easily shed.

Species known to occur in Orissa

1. *Ambassis ambassis* (Lacepede) (Commerson's glassy perchlet)
2. *A. dussumieri* Cuvier (Malabar glassy perchlet)
3. *A. gymnocephalus* (Lacepede) (Nakedhead glassy perchlet)
4. *A. kopsii* Bleeker (Freckled hawkfish)
5. *A. urotaenia* Bleeker (Bandedtail glassy perchlet)

6. *Chanda nama* Hamilton (Elongate glassy perchlet)
7. *Parambassis dayi* (Bleeker) (Day's glassy perchlet)
8. *Pseudambassis lala* (Hamilton) (Highfin glassy perchlet)
9. *P. ranga* (Hamilton) (Indian glassy perchlet)

Key to species

- 1a. Scales smaller, 30 to 107 in longitudinal series. Tongue edentate. Cheek with 4 to 7 transverse scale rows 2
- 1b. Scales larger, 22 to 30 in longitudinal series. Teeth present on tongue. Cheek with 1 or 2 transverse scale rows 5
- 2a. Canine teeth on lower jaw. Scales minute, 100 to 107 in longitudinal series. Mouth with very prominent lower jaw *C. nama*
- 2b. No canine teeth on lower jaw. Scales moderate, 30 to 90 in longitudinal series. Lower jaw almost equal to upper jaw 3
- 3a. Lateral line scales about 30. Dorsal and anal fins with 9 to 11 rays. Supraorbital ridge smooth, at most 1 or 2 spines posteriorly. Cheek with 6 transverse scale rows *P. dayi*
- 3b. Lateral line scales 47 to 90. Dorsal and anal fin rays 11 to 15. Supraorbital ridge dentate. Cheek with 7 transverse scale rows 4
- 4a. Lateral line scales about 90. Median fins orange *P. lala*
- 4b. Lateral line scales 47 to 65. Median fins hyaline *P. ranga*
- 5a. Lateral line complete 6
- 5b. Lateral line interrupted 7
- 6a. Predorsal scales 16 to 21. Interoperculum margin entire *A. ambassis*
- 6b. Predorsal scales 8 to 12. Interoperculum margin serrated *A. kopsii*
- 7a. Suborbital ridge smooth, at most with a spine posteriorly. Lateral line interrupted twice. Cheek with one transverse scale-row *A. urotaenia*
- 7b. Suborbital ridge dentate with 3 to 5 spines. Lateral line once interrupted. Cheek with two transverse scale-rows 8
- 8a. Hind margin of preoperculum finely denticulate. Head length about 2.7 times in standard length. Predorsal scales 15 or 16 *A. dussumieri*

- 8b. Hind margin of preoperculum entire. Head length about 2.8 times in standard length.
Predorsal scales 12 or 15 *A. gymnocephalus*

Fisheries information : The glassy perchlets are of little commercial importance. These fishes are marketed fresh or dried and generally utilized as bait. *A. ambassis* and *A. gymnocephalus* are fairly common in catches.

Remarks : *A. ambassis* was reported as *A. commersoni* Cuvier, which is now considered as a junior synonym of the former (Anderson and Heemstra, 2003).

Family ACROPOMATIDAE (Lanternbellyfishes)

Body oblong, more or less compressed. Opercle with 2 or 3 spines. Gill membrane separate, free from isthmus. Gillrakers well developed. Dorsal fin divided to base or completely separated into spinous and soft-rayed parts; 1st part with 7 to 10 spines and 2nd part with 1 spine and 9 or 10 rays. Anal fin with 2 or 3 spines and 6 to 9 rays.

Species known to occur in Orissa

Synagrops pellucidus (Alcock) (NA)

Fisheries information : These fishes can be used for food, but most are too small to be of commercial value.

Remarks : These fishes, assigned to this ill-defined 'family', are placed by some recent authors in the family Percichthyidae (Heemstra, 1986).

Family SERRANIDAE (Groupers, Seabassess)

Body robust or somewhat compressed, oblong-oval to elongate. Mouth large, maxilla exposed, with or without supramaxilla; small teeth on jaws, vomer and palatine. Border of preopercle serrate; opercle with 3 flat spines. Dorsal fin with 7 to 12 spines and 10 to 19 rays. Anal fin with 3 spines and 7 to 10 rays. Caudal fin usually rounded or truncate, with 15 branched rays. Pelvic fins with 1 spine and 5 rays. Pectoral fins broadly rounded, with scaly base. Body with variable colour patterns of light or dark stripes, spots, vertical or diagonal bars or almost plain.

Species known to occur in Orissa

1. *Chelidoperca investigatoris* (Alcock) (NA)
2. *Epinephalus bleekeri* (Vaillant) (Dusktail grouper)
3. *E. coioides* (Hamilton) (Orange spotted grouper)

4. *E. diacanthus* (Valenciennes) (Spiny cheek grouper)
5. *E. lanceolatus* (Bloch) (Giant grouper) (Threatened)
6. *E. latifasciatus* (Temminck and Schlegel) (Striped grouper)
7. *E. malabaricus* (Bloch & Schneider) (Malabar grouper)
8. *E. morrhua* (Valenciennes) (Comet grouper)

Key to species

- 1a. Scales large, 40 to 45 along lateral line *C. investigatoris*
- 1b. Scales small or moderate, 80 or more along lateral line 2
- 2a. Caudal fin of adults truncate, slightly rounded in juveniles. Head, body, dorsal fin and upper part of caudal fin with small orange-yellow or brown spots. Caudal fin dark in lower $\frac{2}{3}$ part, and upper $\frac{1}{3}$ pale *E. bleekeri*
- 2b. Caudal fin rounded. Colour not as above 3
- 3a. Dorsal fin rays 12 (rarely 13). Juveniles with two broad, longitudinal black edged whitish band that disappear in adults, dark edges breaking into dashes and spots *E. latifasciatus*
- 3b. Dorsal fin rays 14 to 18. Colour not as above 4
- 4a. Lateral line scales with branched tubules. Eye diameter about 8 times (9 times in large specimens) in head length. Juveniles yellow with 3 broad black bars on body and irregular black bands on head *E. lanceolatus*
- 4b. Lateral line scales with a single tubule. Eye diameter less than 7 times (8 times in large specimens) in head length. Juveniles not coloured as above 5
- 5a. Numerous distinct dark spots (not dots) over most of head and body 6
- 5a. No distinct dark spots over most of head, body and fins 7
- 6a. Irregular white or pale spots or blotches usually present on head and body. Head and body with numerous small well-separated black spots (largest spots about twice size of rear nostrils). Pectoral fin rays modally 19 *E. malabaricus*
- 6b. No white or pale spots on head and body. Head, body and usually median fins with numerous orange to reddish-brown spots (diameter of largest spots about 4 or 5 times that of rear nostrils). Pectoral fin rays modally 20 *E. coioides*
- 7a. Dorsal fin rays usually 16 to 18. Middle opercular spine nearer to lower than the upper spine. Body with vertical broad dark bars *E. diacanthus*

- 7b. Dorsal fin rays usually 13 to 15. Middle opercular spine equidistant from upper and lower spine. Dark streaks across cheeks; oblique stripes or lines of spots on body *E. morrhua*

Fisheries information : Groupers are usually very important commercial fishes. *E. lanceolatus* is the biggest known species, but rare in occurrence and its fishing is banned under law.

Remarks : Report of *E. tauvina* from Orissa coast is based on misidentified *E. coioides* specimens. Further, *E. morrhua* is unlikely to occur along Orissa coast. Although we could not examine the specimen of Mishra *et. al.* (1999), it may probably be *E. radiatus* (Day, 1867), which was illustrated by Day (1875) as *Serranus morrhua* (not Valenciennes) (Heemstra and Randall, 1993). *E. radiatus* closely resembles *E. morrhua*, but differs in number of oblique stripes present on body.

Family GRAMMISTIDAE (Soapfishes)

Body oblong and fairly compressed. Mouth moderately large; lower jaw projecting. Opercle with three distinct spines. Dorsal fin with 2 to 9 spines and 12 to 27 soft rays. Anal fin with 2 to 3 spines and 8 to 17 soft rays. Innermost ray of pelvic fin broadly joined to abdomen by a membrane. Origin of pelvic fin below or little ahead of pectoral fin base. Lateral line with 75 to 140 scales. Skin coated with thick mucous containing the toxin 'gramistin'

Species known to occur in Orissa

Diploprion bifasciatum Cuvier (Two-banded soapfish)

Fisheries information : Of minor fishery importance, but not a common species along this coast.

Remarks : The fishes of this family are currently considered under family Serranidae.

Family TERAPONIDAE (Grunters, Tiger-perches or terapons)

Body oblong or oblong-ovate, almost compressed. Opercle with two spines; preopercle serrate. Dorsal fin with 11 to 14 spines and 8 to 14 rays, almost separated by a deep notch in some species. Anal fin with 3 spines and 7 to 12 rays. Caudal fin truncate or emarginate. Body usually with longitudinal dark stripes on sides and caudal fin with dark stripes.

Species known to occur in Orissa

1. *Pelates quadrilineatus* (Bloch) (Fourlined terapon)
2. *Terapon jarbua* (Forsskal) (Jerbua terapon)

3. *T. puta* Cuvier (Smallscaled terapon)
4. *T. theraps* Cuvier (Largescaled terapon)

Key to species

- 1a. Post-temporal not exposed posteriorly, edge not serrate, covered with skin and scales. Gill membranes united with isthmus. Caudal fin without stripe *P. quadrilineatus*
- 1b. Post-temporal extended and serrate posteriorly, exposed, skin and scale covering reduced. Gill membranes free from isthmus. Caudal fin with oblique stripes 2
- 2a. Lateral line with 46 to 56 scales, 6 to 8 scale rows above lateral line *T. theraps*
- 2b. Lateral line with 70 or more scales, 10 to 17 scale rows above lateral line 3
- 3a. Two to 4 straight longitudinal stripes on lateral side of body. Gillrakers 18 to 24 on lower arm of first arch *T. puta*
- 3b. Three downward curved stripes on lateral side of body. Gillrakers 12 to 15 on lower arm of first arch *T. jarbua*

Fisheries information : The terapons are important commercial food fishes. *T. jarbua* is a very common species and of aquarium interest.

Remarks : *P. quadrilineatus* is a common species known for its croaking noise it invariably makes when taken out of water. *T. jarbua* is very common in all coastal waters of the country.

Family PRIACANTHIDAE (Bigeyes, Bulleyes)

Body oblong, relatively deep and compressed. Eyes very large. Mouth large and oblique, with lower jaw projecting. Maxilla and lower jaw scaly. Dorsal fin with 10 spines and 10 to 15 rays. Anal fin with 3 spines and 9 to 16 rays. Pelvic fins with 1 spine and 5 rays, inserted anterior to pectoral fins and broadly united with body by a membrane. Caudal fin slightly emarginate to rounded, with 14 branched rays. Scales strongly ctenoid.

Species known to occur in Orissa

1. *Priacanthus hamrur* (Forsskal) (Duskyfinned bulleye)
2. *P. tayenus* Richardson (Purple spotted bigeye)

Key to species

- 1a. Dorsal fin with 14 to 15 soft rays. Fins dusky to blackish, darker near borders; a black basal spot on the dorsal surface of pelvic fin bases *P. hamrur*
- 1b. Dorsal fin with 12 to 13 soft rays. Fins not dusky or blackish *P. taylorus*

Fisheries information : The Bulleyes are important commercial fishes and are marketed fresh.

Family APOGONIDAE (Cardinal fishes)

Small fishes with elongate, oblong and slightly compressed body. Mouth usually large, teeth in villiform bands in jaws, and on vomer. Posterior margin of preopercle serrated. Dorsal fin two, the first with 6 to 8 spines and the second with one spine and 8 to 14 branched rays. Anal fin with 2 spines and 8 to 18 branched rays. Pelvic fins with one spine and 5 branched rays. Lateral line complete. Scales ctenoid.

Species known to occur in Orissa

- 1. *Apogon aureus* (Lacepede) (Bandtail cardinal fish)
- 2. *A. endekataenia* Bleeker (Candystripe cardinal fish)
- 3. *A. quadrifasciatus* Cuvier (Twostripe cardinal fish)
- 4. *A. taeniatus* Cuvier (Twobelt cardinal fish)
- 5. *Apogonichthys ellioti* (Day) (Elliot's cardinal fish)
- 6. *A. poecilopterus* (Cuvier) (Pearly-finned cardinal fish)
- 7. *Fowleria aurita* (Cuvier) (Crosseyed cardinal fish)

Key to species

- 1a. Lateral line incomplete. Palatine teeth absent. Preopercle edge smooth. An ocellus on opercle always present *F. aurita*
- 1b. Lateral line complete. No ocellus on opercle 2
- 2a. Preopercle edge smooth. Palatine teeth absent. Supramaxilla present 3
- 2b. Preopercle edge serrated. Palatine teeth present. Supramaxilla absent 4
- 3a. Depth 2.6 to 3.0 and head 2.4 to 2.6 times in standard length. No black band on dorsal and anal fin; borders dusky *A. poecilopterus*
- 3b. Depth about 3.2 and head about 2.8 times in standard length. Second dorsal fin with a marginal and median band and anal fin with a black median band
..... *A. ellioti*

- 4a. Dorsal spine weaker, the third one not or only slightly stronger than the others. No dark longitudinal bands. A broad dark band encircling the caudal peduncle.....
.....*A. aureus*
- 4b. Dorsal spine stronger, the third one generally much stronger than the others. Often dark longitudinal bands on the body 5
- 5a. Maxillary reaching to below middle of eye. Body with two transverse bands
.....*A. taeniatus*
- 5b. Maxillary reaching to below posterior half of eye. Body with dark longitudinal stripes, often continued on caudal 6
- 6a. Two bands on upper part of body only. Orbital rim serrated. Pectoral fin with 15 or 16 soft rays *A. quadrifasciatus*
- 6b. More than two bands, bands also on lower part of body. Orbital rim not serrated. Pectoral fin with 13 or 14 soft rays *A. endekataenia*

Fisheries information : The cardinal fishes are of minor commercial importance. These fishes play an important role in the food chain of carnivorous fishes.

Remarks : *A. endekataenia* was reported from Orissa coast as *Ostorhynchus endekataenia* (Bleeker) (Talwar and Sen, 1968). Report of *Apogon septemstriatus* Gunther (Nagabhusanam and Rao, 1969) needs further confirmation.

Family SILLAGINIDAE (Whitings)

Body elongate, slightly compressed and head tapering. Mouth small, terminal, maxillary end slides below preorbital bone. Teeth on jaws in villiform bands. Operculum with a small, sharp spine. Dorsal fin two, first dorsal fin with 10 to 13 spines, the second dorsal fin with one spine and 16 to 27 soft rays. Anal fin with 2 spines and 14 to 26 soft rays. Caudal fin emarginate. Scales small, ctenoid, easily shed.

Species known to occur in Orissa

1. *Sillaginopsis panijus* (Hamilton) (Gangetic whiting)
2. *Sillago chondropus* Bleeker (Club-foot sillago)
3. *S. intermedius* Wongratana (Intermediate sillago)
4. *S. lutea* McKay (Mud sillago)
5. *S. sihama* (Forsskal) (Silver sillago)
6. *S. vincenti* McKay (Vincent's sillago)

Key to species

- 1a. Snout and head greatly depressed. Second dorsal fin spine elongate. Eyes small, 3 to 11 % of head length and covered by adipose tissue. Swimbladder vestigial or absent *S. parijus*
- 1b. Snout and head not depressed. Second dorsal fin spine not elongate. Eyes normal, 17 to 30 % of head length. Swimbladder present 2
- 2a. Pelvic fin spine inconspicuous and almost hidden by the much thickened club-like first pelvic fin ray. Swim bladder without postcoelomic extensions *S. chondropus*
- 2b. Pelvic fins without a thickened club-like first ray. Swim bladder with one or two postcoelomic extensions 3
- 3a. Swim bladder divided posteriorly into 2 tapering extensions projecting into tail region; anterolateral extensions recurved posteriorly 4
- 3b. Swim bladder with a single posterior extension projecting into tail region; without recurved anterolateral extensions 5
- 4a. Body with a longitudinal row of dark spots below the lateral line and a series of dark saddle-like blotches on back *S. intermedius*
- 4b. Body uniform in colour; no spots or blotches *S. sihama*
- 5a. Second dorsal fin with at least 5 rows of dusky black or black-brown spots. Swimbladder with a small bulbous anterior projection *S. vincenti*
- 5b. Second dorsal fin without dark spots. Swimbladder with a short median projection and short anterolateral extensions directed forward *S. lutea*

Fisheries information : The whittings are important commercial food fishes. *S. sihama* is a very common species found along both the coasts of our country. These shallow water inshore species can be utilized in coastal aquaculture.

Remarks : *S. intermedius* was reported as *S. maculata* (Quoy and Gaimard) from Mahanadi estuary (Venkateswarlu et al., 1998) erroneously, possibly due to similar colour pattern, whereas *S. maculata* does not occur in this region (McKay, 1992).

Family LACTARIIDAE (False trevallies, Whitefish)

Body oblong and greatly compressed. Mouth large and oblique. Jaws with 2 small canines at front. Dorsal fin two, the first with 7 or 8 spines and the second with 1 spine and 20 to 22 soft rays. Anal fin with 3 spines and 25 to 28 soft rays. Soft dorsal and anal fins covered with scales that easily shed. Pelvic fins inserted just below pectoral fins. Caudal fin forked.

Species known to occur in Orissa

Lactarius lactarius (Schneider) (False trevally)

Fisheries information : The false trevally is a very important commercial fish, common in occurrence. It is marketed fresh or dried salted.

Family RACHYCENTRIDAE (Cobias)

Body elongate, subcylindrical; head broad and depressed. Mouth large, terminal; lower jaw projecting. Two dorsal fins, the first with 7 to 9 isolated spines, not connected by membrane; the second with 1 to 3 spines and 26 to 33 soft rays, anterior rays somewhat elevated in adult specimens. Anal fin long, with 2 weak spines and 22 to 28 soft rays. Pectoral fins pointed, becoming more falcate with age. Caudal fin lunate in adult specimens, upper lobe longer than lower. Juveniles with caudal fin rounded, the central rays much enlarged. Scales minute, embedded in thick skin. Lateral line slightly wavy in anterior half. Body with 2 sharply defined narrow light bands.

Species known to occur in Orissa

Rachycentron canadus (Linnaeus) (Cobia)

Fisheries information : The cobies are very delicate fishes of commercial importance. These fishes are generally marketed fresh or dried salted.

Family ECHENEIDAE (Sharksuckers, Remoras)

Body elongate with a transverse laminated, oval-shaped cephalic disc. Head wide, depressed to support disc. Dorsal fin with 18 to 45 rays. Anal fin with 18 to 41 rays. Pectoral fins inserted high on body with 18 to 32 rays. Pelvic fins with one spine and 5 rays, far forward, close together and narrowly or broadly united to underside of body. Caudal fin slightly forked, emarginate or slightly rounded. Body with cycloid scales, generally hidden in skin.

Species known to occur in Orissa

1. *Echeneis naucrates* Linnaeus (Live sharksucker)
2. *Remora remora* (Linnaeus) (Common remora)
3. *Remorina albescent* (Temminck and Schlegel) (White remora)

Key to species

- 1a. Suctorial disc with 21 to 27 laminae. No caninoid teeth on jaws and palate. Pectoral fin pointed. Dorsal and anal fins with 33 to 44 rays. Depth 10 to 14 times in standard length. A band from snout to caudal fin *E. naucrates*
- 1b. Suctorial disc with less than 20 laminae. Caninoid teeth on jaws and palate. Pectoral fin rounded. Dorsal and anal fins with 16 to 26 rays. Depth 5 to 8 times in standard length. No band along sides 2
- 2a. Disc laminae 12 to 14. Pectoral fin rays 16 to 20. Anal fin origin before origin of dorsal fin. Dorsal fin with 17 to 22 rays..... *R. albescens*
- 2b. Disc laminae 15 to 20. Pectoral fin rays 24 to 28. Anal fin origin behind origin of dorsal fin. Dorsal fin with 23 to 26 rays..... *R. remora*

Fisheries information : The sharksuckers are of minor commercial importance. These fishes are occasionally found in the commercial catches.

Family CARANGIDAE (Jacks, trevallies, scads, queenfishes, pampanos)

Body shape and size varies from species to species, from elongate and fusiform to deep, and highly compressed. Gillrakers moderate to long and their number decreasing with the age in some species. Dorsal fins two, the first with 4 to 8 spines (spines obsolete or embedded in adult specimens of some species), the second dorsal fin with one spine and 18 to 44 rays. Anal fin with 2 anterior spines separated from rest of the fin by a gap (becoming embedded in adult specimens in some species) followed by one spine and 15 to 39 rays. Caudal fin widely forked with slender peduncle. Lateral line arched anteriorly, becoming straight posteriorly. Scutes on straight part of lateral line present and prominent, or reduced in some species and absent in some genera.

Species known to occur in Orissa

- 1. *Alectis indicus* (Ruppell) (Indian threadfin)
- 2. *Alepes djedaba* (Forsskal) (Shrimp scad)
- 3. *A. kleinii* (Bloch) (Banded scad)
- 4. *Atropus atropus* (Schneider) (Cleftbelly trevally)
- 5. *Atule mate* (Cuvier) (Yellowtail scad)
- 6. *Carangoides armatus* (Ruppell) (Longfin trevally)
- 7. *C. chrysophrys* (Cuvier) (Yellowtail scad)
- 8. *C. hedlandensis* (Whitley) (Bumpnose trevally)
- 9. *C. malabaricus* (Bloch & Schneider) (Malabar trevally)

10. *C. praeustus* (Bennett) (Brown back trevally)
11. *Caranx carangus* (Bloch) (Blacktailed trevally)
12. *C. ignobilis* (Forsskal) (Giant trevally)
13. *C. melampygus* Cuvier (Bluefin trevally)
14. *C. sexfasciatus* Quoy & Gaimard (Bigeye trevally)
15. *Decapterus russelli* (Ruppell) (Round scad)
16. *Megalaspis cordyla* (Linnaeus) (Torpedo scad)
17. *Parastromateus niger* (Bloch) (Black pomfret)
18. *Scomberoides commersonnianus* Lacepede (Talang queenfish)
19. *S. lysan* (Forsskal) (Double spotted queenfish)
20. *S. tala* (Cuvier) (Barred queenfish)
21. *S. tol* (Cuvier) (Needle scaled queenfish)
22. *Selar boops* (Cuvier) (Yellowstripe scad)
23. *S. crumenophthalmus* (Bloch) (Bigeye scad)
24. *Selaroides leptolepis* (Cuvier) (Yellowstripe scad)
25. *Trachinotus blochii* (Lacepede) (Snubnose pompano)
26. *T. botla* (Shaw) (Large spotted dart)
27. *T. mookalee* Cuvier (Indian pompano)
28. *Uraspis helvola* (Forster) (Whitemouth jack)

Key to species

- 1a. Body very deep, about $\frac{2}{3}$ of fork length. Pelvic fins absent, or if present (in juveniles) positioned distinctly anterior to vertical line through pectoral fin base. Dorsal fin and anal fins completely covered with scales *P. niger*
- 1b. Body slender to moderate, less than or about half of fork length. Pelvic fins always present, not positioned distinctly anterior to vertical through pectoral fin base. Dorsal fin and anal fins not covered by scales, if scaled, basal half only 2
- 2a. Pectoral fins shorter than head length. Posterior straight part of lateral line with no hardened scutes (only pored scale, not enlarged) 3
- 2b. Pectoral fins equal to or longer than head length. Posterior straight part of lateral line with hardened scutes 9
- 3a. Body high, more than $\frac{1}{3}$ fork length. Soft dorsal and anal fins high, sickle-shaped 4
- 3b. Body low, less than $\frac{1}{4}$ fork length. Soft dorsal and anal fins short, not sickle-shaped

- 4a. Dorsal fin rays 21 to 24. Anal fin rays 19 to 22. Lower gillrakers 11 to 15. One to 5 spots in a row along lateral line *T. botla*
- 4b. Dorsal fin rays 18 to 20. Anal fin rays 16 to 18. Lower gillrakers 8 to 10. No spots on sides of body 5
- 5a. A narrow band of teeth on tongue. Dorsal fin height 24 to 34% of fork length (10 to 40 cm fork length size). Anal fin lobe yellow without a brownish anterior margin. First predorsal bone inverted 'L'-shaped *T. mookalee*
- 5b. No teeth on tongue. Dorsal fin height 35 to 60% of fork length (10 to 40 cm fork length size). Anal fin lobe usually orange-yellow with a brownish anterior margin. First predorsal bone oval or inverted tear-drop shaped *T. blochii*
- 6a. Total gillrakers on first arch 8 to 15. Dorsal fin lobe uniformly pigmented 7
- 6b. Total gillrakers on first arch 21 to 27. Distal half of dorsal fin lobe heavily pigmented with a white basal band 8
- 7a. Upper jaw extends well beyond posterior margin of eye, especially in adults. Teeth of inner and outer rows in lower jaw almost equal in size. Sides with large oval blotches above or touching lateral line *S. commersonianus*
- 7b. Upper jaw extends slightly beyond posterior margin of eye. Teeth of inner row in lower jaw distinctly larger than those of outer row. Sides with vertically elongate blotches intersecting lateral line *S. tala*
- 8a. A double series of 6 to 8 dusky, roundish blotches above and below lateral line. Scales on midbody below lateral line lanceolate *S. lysan*
- 8b. Oval or vertically oblong dark blotches along sides of body, the first 4 to 5 intersecting lateral line. Scales on midbody below lateral line needle-like *S. tol*
- 9a. Dorsal and anal fins followed by distinctly separate finlet(s) 10
- 9b. Dorsal and anal fins with none or at most one semidetached finlet 11
- 10a. Lower gillrakers 18 to 22. Straight part of lateral line with 51 to 59 broad scutes. Several finlets behind dorsal and anal fins. Shoulder girdle margin smooth
..... *M. cordyla*
- 10b. Lower gillrakers 30 to 39. Straight part of lateral line with 30 to 40 scutes. Single finlet behind dorsal and anal fins. Shoulder girdle margin with two papillae
..... *D. russelli*
- 11a. Body deeper, body depth more than ½ of standard length. Some rays of the dorsal and anal fins filamentous 12

- 11b. Body slender, body depth less than $\frac{1}{2}$ of standard length. Dorsal and anal fin rays not filamentous 13
- 12a. Dorsal spines small, but distinct. Scutes rather strong. Pelvic fins black and folded in a ventral groove *A. atropos*
- 12b. Dorsal spines vestigial, embedded in skin and not visible. Scutes weak. Pelvic fins not black; no ventral groove developed *A. indicus*
- 13a. Shoulder girdle margin with a furrow ventrally (cleithral furrow), a large fleshy papilla immediately above it 14
- 13b. Shoulder girdle margin smooth, without cleithral furrow or papilla 15
- 14a. Lateral line becoming straight below origin of soft dorsal fin, with 44 to 46 scutes; the largest scute about 4 times in body depth *S. boops*
- 14b. Lateral line becoming straight below middle of soft dorsal fin, with 32 to 38 scutes; the largest scute 9 to 10 times in body depth *S. crumenophthalmus*
- 15a. Terminal ray of dorsal and anal fins semidetached, finlet-like, 2 times in penultimate ray. Fleshy adipose eyelid completely covering eye except for a central slit
..... *A. mate*
- 15b. Terminal ray of dorsal and anal fins not finlet-like, not distinctly longer than penultimate ray. Fleshy adipose eyelid open in a wide slit 16
- 16a. Dorsal fin spines longer than soft dorsal fin rays 17
- 16b. Dorsal fin spines shorter than soft dorsal fin rays 19
- 17a. A bright yellow band on lateral line. Eyes about 3 times in head length. Lateral line scutes less developed *S. leptolepis*
- 17b. No yellow band on lateral line. Eyes about 4 times in head length. Lateral line scutes well developed 18
- 18a. Ventral profile of body more or less convex than its dorsal profile. A large black blotch on upper margin of opercle and adjacent areas of shoulder *A. kleinii*
- 18b. Dorsal and ventral profiles of body evenly convex. A distinct black spot on upper margin of opercle, bordered above by a small white spot, but not covering adjacent areas of shoulder *A. djedaba*
- 19a. Length of straight portion of lateral line about equal to that of arched portion. Tongue, roof and floor of mouth white, the rest of mouth dark *U. helvola*
- 19b. Length of straight portion of lateral line not equal to that of arched portion. Tongue and mouth lining not pigmented as above 20

- 20a.** Straight portion of lateral line longer than arched portion; scutes strong. Lower jaw teeth in a single row, outer teeth enlarged in both jaws. Adipose tissue well developed, covers posterior part of eye (*Caranx*) 21
- 20b.** Straight portion of lateral line shorter than arched portion; scutes weak. Lower jaw teeth in villiform band, no enlarged teeth in jaws. Adipose tissue weakly developed, not covering eye opening (*Carangoides*) 24
- 21a.** Breast completely scaled 22
- 21b.** Breast naked ventrally, often with a small patch of scale in front of pelvic fins
..... 23
- 22a.** Total gillrakers 25 to 29. Total soft rays in dorsal and anal fins 39 to 44. Maxilla extending to below front margin of eye (to front edge of pupil in juveniles). Small black spots on head and body. No small black spot on margin of opercle
..... *C. melampygus*
- 22b.** Total gillrakers 22 to 25. Total soft rays in dorsal and anal fins 33 to 39. Maxilla extending to below posterior margin of eye. No small black spots on head and body. A small black spot on upper margin of opercle *C. sexfasciatus*
- 23a.** Lateral line with 27 to 32 scutes. Dorsal fin with 18 to 20 soft rays
..... *C. ignobilis*
- 23b.** Lateral line with 33 to 37 scutes. Dorsal fin with 20 to 22 soft rays
..... *C. carangus*
- 24a.** Anterior part of second dorsal fin with a conspicuous black blotch. Breast completely scaled *C. praeustus*
- 24b.** Second dorsal fin without black spot. Breast naked and naked area of breast joined with naked base of pectoral fin 25
- 25a.** Snout short, equal to or smaller than eye diameter. Soft dorsal fin lobe longer than head length. Adult males with few central dorsal fin rays produced 26
- 25b.** Snout large, longer than eye diameter. Soft dorsal fin lobe shorter than head length. Central dorsal fin rays not produced in adult males 27
- 26a.** Lower gillrakers 20 to 24 on first arch. Dorsal profile of head gently sloped, without distinct bulging *C. armatus*
- 26b.** Lower gillrakers 14 to 17 on first arch. Dorsal profile of head steep, with a distinct bulge in interorbital region *C. hedlandensis*
- 27a.** Lower gillrakers 15 to 18 on first arch. Area anteriorly just above pectoral fin base scaled. Total soft rays in dorsal and anal fins 32 to 37 *C. chrysophrys*

- 27b. Lower gillrakers 21 to 27 on first arch. Area anteriorly just above pectoral fin base naked. Total soft rays in dorsal and anal fins 37 to 42 *C. malabaricus*

Fisheries information : The carangids are very important commercial fishes. These fishes are marketed fresh and utilized as food fishes.

Remarks : *C. carangus* is considered to be a junior synonym of *C. hippos* (Linnaeus) (Smith-Vaniz *et al.*, 1990) which is an Atlantic species and unlikely to occur in our area. Further, it is also said that Indian records may be misidentification of *C. ignobilis*. Pending confirmation, we used the name presently available in Indian literature for the species.

Family CORYPHAENIDAE (Dolphinfishes)

Body very elongate and compressed with cycloid scales. Mouth large with fine teeth in bands. Adult males have bony crest on front of head. Dorsal and anal fins very long, extending from nape to almost caudal fin, with 52 to 66 rays. Anal fin inserted in thoracic region, fitting into a groove on body. Caudal fin deeply forked, with keels on fin or caudal peduncle. Lateral line curved upward above pectoral fins.

Species known to occur in Orissa

Coryphaena hippurus Linnaeus (Common dolphin fish)

Fisheries information : The dolphin fishes are of highly flavoured food fishes and are of important commercial value.

Family MENIDAE (Moon fishes)

Body greatly compressed and disc shaped. Dorsal profile almost horizontal; breast sharp. Mouth protrudes forward; villiform teeth in jaws. Dorsal fin long and low, anterior rays slightly elevated, with 43 to 46 rays, the first 3 to 19 not branched, spine-like in juveniles. Anal fin also very long and low, with 30 to 33 rays. First 2 pelvic fin rays fused and greatly elongated in adults. Pectoral fins with 15 rays, shorter than head. Caudal fin forked. Lateral line extending up to end of dorsal fin base. Body with numerous small round spots on dorsal part.

Species known to occur in Orissa

Mene maculata (Bloch) (Moon fish)

Fisheries information : The moon fishes are of little commercial value. These fishes are marketed fresh or dried.

Family LEIOGNATHIDAE
(Ponyfishes, Slipmouths)

Body oblong, greatly compressed. Dorsal surface of head with bony ridges and well developed nuchal crest or spine. Mouth small and extremely protrusible forming a tube when extended. Single dorsal fin, with 8 (rarely 7 or 9) spines and 16 to 17 rays. Anal fin with 3 spines and 13 to 15 rays. Caudal fin deeply forked. Body slimy; scales minute, head scaleless. Body silvery, often with various markings.

Species known to occur in Orissa

1. *Gazza achlamys* Jordan & Starks (Small toothed ponyfish)
2. *G. minuta* (Bloch) (Toothed ponyfish)
3. *Leiognathus bindus* (Valenciennes) (Orange fin ponyfish)
4. *L. blochii* (Valenciennes) (Bloch's ponyfish)
5. *L. brevirostris* (Valenciennes) (Shortnose ponyfish)
6. *L. daura* (Cuvier) (Goldstripe ponyfish)
7. *L. dussumieri* (Valenciennes) (Dussumier's ponyfish)
8. *L. elongatus* (Gunther) (Slender ponyfish)
9. *L. equulus* (Forsskal) (Common ponyfish)
10. *L. fasciatus* (Lacepede) (Striped ponyfish)
11. *L. leuciscus* (Gunther) (Whipfin ponyfish)
12. *L. lineolatus* (Valenciennes) (Ornate ponyfish)
13. *L. smithursti* (Ramsay & Ogilby) (Smithurst's ponyfish)
14. *L. splendens* (Cuvier) (Splendid ponyfish)
15. *Secutor insidiator* (Bloch) (Pugnose ponyfish)
16. *S. ruconius* (Hamilton) (Deep pugnose ponyfish)

Key to species

- 1a. Caniniform teeth present in jaws. Mouth pointing forward when protracted 2
- 1b. Caniniform teeth absent in jaws 3
- 2a. Depth of body 1.98 to 2.20 times in standard length. Scales on body absent anterior to a line from origin of soft dorsal fin to behind pectoral fin base
..... *G. achlamys*
- 2b. Depth of body 2.27 to 3.14 times in standard length. Scales on body absent only from breast ahead a line from pectoral fin base to anal fin origin *G. minuta*
- 3a. Mouth oblique, pointing forward, when protracted 4

- 3b. Mouth horizontal, pointing forward or downward when protracted 5
- 4a. Lateral line reaching backward close to below end of dorsal fin. Cheek scaleless
..... *S. insidiator*
- 4b. Lateral line ending below about middle of soft part of dorsal fin. Cheek with minute
scales *S. ruconius*
- 5a. Body depth more than 3.3 times in standard length. Cheek with small scales
..... *L. elongatus*
- 5b. Body depth less than 3.0 times in standard length. Cheek without scales 6
- 6a. Breast scaleless 7
- 6b. Breast fully covered with scales 11
- 7a. Body depth 1.67 to 1.97 times in standard length 8
- 7b. Body depth 2.02 to 2.47 times in standard length 9
- 8a. Second dorsal and anal fin spines not elongated. A dark brown saddles on caudal
peduncle present *L. equulus*
- 8b. Second dorsal fin spine or both second dorsal and anal fin spines distinctly elongated.
No spot on caudal peduncle 10
- 9a. Only second dorsal fin spine distinctly elongated and filiform. About 11 widely spaced
dark vertical lines on back superimposed by a few yellow blotches
..... *L. fasciatus*
- 9b. Both second dorsal and anal fin spines greatly elongated. Back with a few faint,
unevenly spaced, horizontal elongate yellow blotches *L. smithursti*
- 10a. A distinct dark brown blotch on nape. Spinous dorsal fin without blotch. Dorsal
profile showing a distinct notch above behind eye *L. brevirostris*
- 10b. No blotch on nape. Upper half of spinous dorsal fin with a black blotch between
second and sixth spine. No distinct notch on dorsal profile *L. daura*
- 11a. Dark saddle-shaped blotch on nape. Black blotch on upper half of spinous dorsal fin
..... *L. blochii*
- 11b. No saddle-shaped blotch on nape 12
- 12a. Body depth less than 2.0 in standard length. Upper half of dorsal fin with a black or
orange blotch 13

- 12b. Body depth more than 2.0 in standard length. Upper half of dorsal fin without a blotch 14
- 13a. Mouth pointing downward when protracted. Faint grey wavy vertical lines above lateral line. A black spot on upper third of spinous dorsal fin *L. splendens*
- 13b. Mouth pointing forward when protracted. Dark vermiculations on back above lateral line. Spinous dorsal fin black at half height above which a bright orange blotch between second and fifth spine *L. bindus*
- 14a. Second dorsal fin spine distinctly and second anal fin slightly elongated *L. leuciscus*
- 14b. Second dorsal and second anal spines not elongated 15
- 15a. Body depth 2.32 to 2.98 times in standard length. Back with light grey, irregular vermiculations extending on sides to slightly below lateral line *L. lineolatus*
- 15b. Body depth 2.02 to 2.28 times in standard length. Sides of body with grey wavy vertical lines descending from back to little below lateral line *L. dussumieri*

Fisheries information : The pony fishes are of commercial importance since they provide a small amount of low cost protein. These fishes are also used for preparation of fishmeal. The pony fishes are found in both the east and west coasts of our country. About 487 MT of pony fishes caught during 2000-01 from Orissa coast (0.45% of total marine fish catch) (Anon., 2002).

Family LUTJANIDAE (Snappers)

Body more or less oblong to deep. Cheek and preopercle with scales, but preorbital region naked. Mouth terminal; enlarged canine teeth on jaws, small teeth on vomer and palatine. Maxilla slips below preorbital when mouth closed. Preopercle generally serrate, often finely. Dorsal fin continuous or with a shallow notch, with 10 to 12 spines and 10 to 17 rays. Anal fin with 3 spines and 7 to 11 rays. Caudal fin of various shapes ranging from lunate, emarginate, truncate to slightly forked. Scales ctenoid.

Species known to occur in Orissa

1. *Lutjanus argentimaculatus* (Forsskal) (Mangrove red snapper)
2. *L. erythropterus* Bloch (Crimson snapper)
3. *L. fulvus* (Schneider) (Black tail snapper)
4. *L. johnii* (Bloch) (John's snapper)
5. *L. kasmira* (Forsskal) (Common blue-stripe snapper)

6. *L. lutjanus* Bloch (Big-eye snapper)
7. *L. malabaricus* (Schneider) (Malabar blood snapper)
8. *L. russellii* Bleeker (Russell's snapper)

Key to species

- 1a. Preorbital space very narrow, 9.2 to 16.3 times in head length. Body slender, usually 3.0 to 3.3 times in standard length *L. lutjanus*
- 1b. Preorbital space wider, 3.3 to 8.9 times in head length. Body deeper, usually less than 3.0 times in standard length 2
- 2a. Longitudinal scale rows above lateral line horizontal (parallel to lateral line) or some rows rising only below posterior part of dorsal fin 3
- 2b. Longitudinal scale rows above lateral line rising obliquely 4
- 3a. A large black spot on upper back, if absent, ground colour pale *L. johnii*
- 3b. Black spot on upper back absent, ground colour dark *L. argentimaculatus*
- 4a. Ground colour pale (mainly yellow in life) with a series of 4 longitudinal stripes (blue in life, often brownish on preservation) on sides *L. kasmira*
- 4b. Colour not as in 4a 5
- 5a. Vomerine tooth patch triangular or diamond-shaped with a medial posterior extension. A large black spot mostly above lateral line below second dorsal fin. A series of 4 to 7 broad dark stripes on sides *L. russellii*
- 5b. Vomerine tooth patch crescentic or triangular without a posterior extension. Colour pattern not as above 6
- 6a. Preopercular notch distinctive (moderate to well developed). Caudal fin and distal third of dorsal fin blackish or dusky brown with a narrow white margin *L. fulvus*
- 6b. Preopercular notch indistinctive (shallow or absent). Caudal and dorsal fins not black and their margins not white 7
- 7a. Mouth larger, maxilla length about equal to distance between bases of last dorsal and anal rays. Interorbital width 5.1 to 6.6 in head length in specimens over 12 cm standard length. Some longitudinal scale rows below lateral line horizontal; but in juveniles under 10 cm standard length, slanting obliquely. Head profile straight or slightly concave *L. malabaricus*

- 7b. Mouth relatively small, maxilla length much less than distance between bases of last dorsal and anal rays. Interorbital width 3.5 to 4.8 in head length in specimens over 15 cm standard length. Some longitudinal scale rows below lateral line slanting obliquely in postero-dorsal direction. Head profile convex.....
 *L. erythropterus*

Fisheries information : Snappers are very important commercial fishes. *L. johnii* is the most common species in estuaries and coastal waters.

Remarks : *L. sanguineus* (Cuvier) reported by Mishra *et al.* (1999) and also included in Venkateswarlu and Rama Rao (1980) is probably based on specimens of *L. malabaricus* which is more similar in colour pattern.

Family COIIDAE (Tiger fish)

Body deep, elevated and strongly compressed. Mouth wide and terminal; upper jaw strongly protrusible; edge of preoperculum finely serrated. Second anal spine longer than third. These are voracious predators and not esteemed as food fish. The family was formerly placed under Lobotidae and at a later stage, it was known as Datnioididae.

Species known to occur in Orissa

Coius quadrifasciatus (Sevastianov) (Four-barred tiger fish)

Fisheries information : Young specimens are of aquarium interest. Not considered as food fish.

Remarks : Reported from Orissa coast (Rao, 1995) as *Datnioides quadrifasciatus*.

Family LOBOTIDAE (Tripletail fishes)

Body deep, oblong more or less compressed with ctenoid scales. Body depth much greater than head length. Upper jaw slightly protrusible. Preopercle coarsely serrated and opercle with 1 to 2 flat spines. Dorsal fin very long and broadly rounded, with 11 to 13 spines and 13 to 16 rays. Anal fin very long and broadly rounded, with 3 spines and 9 to 12 rays; second anal spine shorter than third. Caudal fin rounded. Round soft dorsal and anal fins reaching past caudal fin base, resembling the fish with three tails.

Species known to occur in Orissa

Lobotes surinamensis (Bloch) (Tripletail fish)

Fisheries information : The tripletail fish is a valuable commercial fish on account of its quality flesh. It is marketed fresh.

Family GERREIDAE
(Mojarras, Silver-biddies)

Body compressed and dorsal profile more or less elevated, with shiny scales. Mouth greatly protrusible, extending downwards when protracted. Cheeks and operculum scaly. Gill membrane separate, free from isthmus. Dorsal fin with 9 or 10 spines and 9 to 15 rays. Anal fin with 3 to 5 spines and 7 to 13 rays. Dorsal and anal fin bases with an elevated scaly sheath. Pelvic fins with 1 spine and 5 rays, a scaly flap present at the base of spine. Pectoral fins long and pointed. Caudal fin forked. Lateral line complete, with 33 to 48 scales.

Species known to occur in Orissa

1. *Gerres erythrouros* (Bloch) (Deepbody mojarra)
2. *G. longirostris* (Lacepede) (Longtail silver biddy)
3. *G. filamentosus* Cuvier (Whipfin mojarra)
4. *G. limbatus* Cuvier (Black tipped mojarra)
5. *G. oblongus* Cuvier (Slender silver biddy)
6. *G. oyena* (Forsskal) (Common silver biddy)
7. *G. phayia* Iwatsuki & Heemstra (Strong-spine silver biddy)
8. *G. setifer* (Hamilton) (Blacktipped mojarra)
9. *Pentaprion longimanus* (Cantor) (Long-fin silverfish)

Key to species

- 1a. Anal fin with 5 spines and 12 to 13 soft rays *P. longimanus*
- 1a. Anal fin with 3 spines and 7 soft rays 2
- 2a. Dorsal fin with 10 spines *G. setifer*
- 2b. Dorsal fin with 9 spines 3
- 3a. Second spine of dorsal fin greatly elongated and filamentous. A series of vertical or horizontal rows of dusky blotches on dorsal surface of body
..... *G. filamentosus*
- 3b. Second dorsal fin spine not greatly elongated and filamentous 4
- 4a. Body elongate, its depth 3.0 to 3.5 times in standard length *G. oblongus*
- 4b. Body relatively deep, its depth less than 3 times (1.9 to 2.8) in standard length ...
..... 8
- 6a. Three scale rows between lateral line and 5th dorsal fin spine *G. limbatus*

- 6b. Four to six scale rows between lateral line and 5th dorsal fin spine 7
- 7a. Body deep, its depth 1.9 to 2.3 times in standard length *G. erythroureus*
- 7b. Body oblong, its depth 2.5 to 3.0 times in standard length 8
- 8a. Second anal spine robust, often as long as anal fin base *G. phayia*
- 8b. Second anal spine slender and short, often shorter than anal fin base 9
- 9a. Lateral line with 42 to 45 scales. First dorsal fin with black tip
..... *G. longirostris*
- 9b. Lateral line with 40 or less scales. No black spot on dorsal fin *G. oyena*

Fisheries information : The mojarras are important commercial fishes and are found throughout the year.

Remarks : Since *G. poieti* Cuvier, 1829 was found to be a junior synonym of *G. longirostris* (Lacepede) (Iwatsuki *et al.*, 2001) and for our specimens referred to as *G. poieti* Cuvier, 1830, being it a preoccupied name, a replacement name *G. phayia* is considered (Iwatsuki and Heemstra, 2001). The specimens reported as *G. abbreviatus* Bleeker is a junior synonym of *G. erythroureus* (Bloch) (Iwatsuki *et al.*, 1998). *Gerres lucidus* Cuvier and *G. acinaces* Bleeker reported from Orissa coast are considered to be *G. limbatus* and *G. longirostris* respectively as the former two are junior synonyms (Iwatsuki *et al.*, 2001).

Family HAEMULIDAE (Grunts, Sweetlips, Hotlips)

Body oblong and compressed with ctenoid scales. Mouth with thick lips, tips of upper jaw hidden when mouth closed. Chin with 2 or 6 pores. Preopercle serrate in young, opercle with one indistinct spine. Dorsal fin with 9 to 15 spines and 12 to 26 rays. Pectoral fins long, its first ray sometimes forming a short filament. Pelvic fins inserted below pectoral fin base, with 1 spine and 5 rays. Anal fin with 3 spines, the second often very strong and 7 to 9 rays; height of fin more than its base. Caudal fin truncate or emarginate (rounded in juveniles).

Species known to occur in Orissa

1. *Plectorhinchus gibbosus* (Hombron & Jacquinot) (Black sweetlip)
2. *Pamadasys argenteus* (Forsskal) (Silver grunt) (Threatened)
3. *P. argyreus* (Valenciennes) (Bluecheek silver grunt)
4. *P. kaakan* (Cuvier) (Javelin grunt)
5. *P. maculatum* (Bloch) (Saddle grunt)

Key to species

- 1a. Chin with 6 pores and no median pit. Fin spines often weak. Dorsal fin with 14 spines and 15 or 16 soft rays. Body uniformly dark, no cross-bars present *P. gibbosus*
- 1b. Chin with two pores followed by a pit containing a pore on each side. Fin spines strong, second anal spine often enlarged and strongest. Dorsal fin with 12 spines and 13 or 14 soft rays. Body usually not uniform in colour, with or without bars 2
- 2a. Body uniformly silvery, no spots or lines present. Gill cover with a blue black blotch in young specimens, disappear with growth *P. argyreus*
- 2b. Body with conspicuous dark or beige spots, bands, blotches, lines or stripes 3
- 3a. A vertical black band about 8 scales wide over nape, terminating about 3 scales below lateral line. About 6 black blotches posterior to the vertical band. Spinous part of dorsal fin with a large black blotch *P. maculatus*
- 3b. Colour not as above 4
- 4a. Body with spots arranged in more or less thin, longitudinal irregular wavy lines in juveniles. Spots only on body and dorsal fin but absent on head and snout in adult. Five scale rows between lateral line and dorsal fin origin *P. argenteus*
- 4b. Body with pairs of spots arranged into vertical interrupted bars. Dorsal fin with two rows of black spots or blotches. Matured specimens uniform silvery, but spots on dorsal fin always present. Seven scale rows between lateral line and dorsal fin origin *P. kaakan*

Fisheries information : These fishes are not considered as good food fish although *P. kaakan* and *P. maculatus* are common in occurrence.

Remarks : *Plectorhinchus niger* and *Plectorhinchus nigrus* (Cuvier) reported from the Chilka lake and the Mahanadi estuary respectively are to be considered as *Plectorhinchus gibbosus* (Hombron and Jaquinot) (McKay, 1984; De Bruin *et al.*, 1995) while author for the name i.e. (Lacepede, 1802) is erroneous (Eschmeyer, 2005). But *P. nigrus* may possibly occurring along this coast which needs material confirmation and proper distinction from *P. gibbosus*.

Family SPARIDAE (Seabreams)

Body oblong, almost deep and compressed with cycloid or ctenoid scales. Head usually with a steep dorsal profile. Snout without scales but cheeks scaled. Opercle with or without

scales. Mouth subhorizontal and slightly protrusible. Maxilla not extending beyond the middle of the orbit. Posterior tip of premaxilla overlapping maxilla. Teeth conical or incisiform, some with molars; no teeth on vomer or palatine. Dorsal fin with 10 to 13 spines and 10 to 15 rays. Anal fin with 3 spines and 8 to 14 rays.

Species known to occur in Orissa

1. *Acanthopagrus berda* (Forsskal) (Picnic seabream)
2. *A. latus* (Houttuyn) (Yellowfin seabream)
3. *Argyrops spinifer* (Forsskal) (Long nose seabream)
4. *Crenidens crenidens* (Forsskal) (Karanteen seabream)
5. *Rhabdosargus sarba* (Forsskal) (Goldlined seabream)

Key to species

- 1a. Molariform teeth absent on jaws *C. crenidens*
- 1b. Molar or granular teeth present on jaws 2
- 2a. Head between eyes scaly. Elongated spines on dorsal fin *A. spinifer*
- 2b. Head between eyes naked. No elongated spines on dorsal fin 3
- 3a. More than 5 scales between lateral line and base of 4th dorsal spine. Usually dorsal spines slender, not alternately broad and narrow. One enlarged molar posteriorly on each side *R. sarba*
- 3b. Less than 5 scales between lateral line and base of 4th dorsal spine. Dorsal spines strong, appearing, alternately broad and narrow on each side. No single greatly enlarged molar posteriorly 5
- 4a. Six series of preopercular scales. Body depth less than 2.4 times in standard length. Anal and caudal fins blackish grey. No silvery margin to scales and no dark spot at origin of lateral line *A. berda*
- 4b. Four or five series of preopercular scales. Body depth greater than 2.4 times in standard length. Anal and lower caudal fins yellow. Scales with dark bases and silvery margins (especially above lateral line) and a dark spot at the origin of lateral line *A. latus*

Fisheries information : The sea breams are of much commercial importance. These fishes are marketed fresh and are excellent to eat and highly esteemed.

Family LETHRINIDAE
(Emperor fishes)

Body generally oblong and compressed. Mouth terminal, lips usually soft and fleshy; upper jaw protrusible. Hind margin of preopercle smooth. Cheek without scales. Dorsal fin with 10 spines and 9 to 10 soft rays. Anal fin with 3 spines and 6 to 10 soft rays. Caudal fin emarginate or forked, with 7 to 9 procurent caudal rays. Lateral line complete.

Species known to occur in Orissa

Lethrinus nebulosus (Forsskal) (Spangled emperor)

Fisheries information : The emperor fishes and large eye breams are important commercial fishes, and are usually marketed fresh. These fishes, otherwise known as 'pigface breams', contributed 0.35% of total marine fish catch of Orissa coast during 2000-01 (Anon., 2002).

Family NEMIPTERIDAE
(Threadfin breams, Monocle breams)

Body elongate to deep, compressed. Mouth terminal, small to moderate; premaxilla more or less protrusible. Dorsal fin continuous with 10 spines and 9 rays. Anal fin with 3 spines and 7 rays. Pectoral fins with 2 unbranched and 12 to 17 branched rays. Pelvic fins inserted in thoracic region, with 1 spine and 5 rays. Caudal fin emarginate, forked, lunate or falcate; the upper and/or lower tips of the fin with or without elongated or filamentous extensions. Mostly pink in colour.

Species known to occur in Orissa

1. *Nemipterus bipunctatus* (Ehrenberg) (Delagon threadfin bream)
2. *N. furcosus* (Valenciennes) (Forked-tail threadfin bream)
3. *N. japonicus* (Bloch) (Japanese threadfin bream)
4. *S. vosmeri* (Bloch) (Whitecheek monocle bream)

Key to species

- 1a. Suborbital naked, with a strong backwardly pointing spine and a small antrorse spine below eye. Posterior margin of preopercle coarsely denticulate. A broad white vertical bar from top of head onto opercle often present *S. vosmeri*
- 1b. Suborbital scaly or naked, spine absent. Posterior margin of preopercle finely denticulate or smooth. No white vertical bar on head 2
- 2a. Upper lobe of caudal fin produced into a narrow filament. Pectoral fins reaching to or beyond level of anal fin origin. Pelvic fins not reaching to level of anal fin origin *N. japonicus*

- 2b. Upper lobe of caudal fin pointed or rounded. Pectoral fins not reaching to level of anal fin origin 3
- 3a. Scales below lateral line in ascending rows anteriorly. Pelvic fins long, reaching to or beyond level of anal fin origin. No cross bars on back; 5 to 7 upward curved stripes on sides below lateral line *N. bipunctatus*
- 3b. Scales below lateral line in more or less horizontal rows anteriorly. Pelvic fins short, reaching to or short of anus. Back with 9 indistinct cross bars, extending to just beneath lateral line; no stripes on sides *N. furcosus*

Fisheries information : The threadfin breams are of considerable commercial importance. *N. japonicus* and *S. vosmeri* are very common species. *S. vosmeri* is a hardy species and can be used as aquarium fish. Threadfin breams contributed 0.66% of total marine fish catch of Orissa coast during 2000-01 (Anon., 2002).

Family SCIAENIDAE (Croakers)

Body elongate, moderately compressed with cycloid scales on head and ctenoid scales on body. Sensory pores usually conspicuous on tip of snout (rostral pores), on lower margin of snout (marginal pores) and on chin (mental pores). Some species with 1 or 2 mental barbels. Dorsal fin usually long, continuous, with a deep notch between anterior and posterior parts. The anterior spinous part with 8 to 10 spines (usually 10) and posterior part with 1 spine and 21 to 34 rays. Anal fin with 2 spines, the second spine may be enlarged and strong. Caudal fin emarginate to pointed, but never deeply forked.

Species known to occur in Orissa

1. *Atrobucca nibe* (Jordan & Thompson) (Blackmouth croaker)
2. *Chrysochir aureus* (Richardson) (Reeve's croaker)
3. *Daysciaena albida* (Cuvier) (Two-bearded croaker)
4. *Dendrophysa russelli* (Cuvier) (Goatee croaker)
5. *Johnnieops borneensis* (Bleeker) (Sharptooth croaker)
6. *J. dorsalis* (Peters) (NA)
7. *J. dussumieri* (Cuvier) (Sin croaker)
8. *J. macrorhynchus* Mohan (Bigsnout croaker)
9. *J. osseus* (Day) (Greyfin croaker)
10. *Johnius belangerii* (Cuvier) (Belanger's croaker)
11. *J. carouna* (Cuvier) (Caroun croaker)
12. *J. carutta* Bloch (Karut croaker)
13. *J. coitor* (Hamilton) (Coitor croaker)

14. *J. dussumieri* (Valenciennes) (Beared croaker)
15. *J. macropterus* (Bleeker) (Largefin croaker)
16. *Kathala axillaris* (Cuvier) (Kathala croaker)
17. *Nibea soldado* (Lacepede) (Soldier croaker)
18. *Otolithes cuvieri* (Trewavas) (Lesser tigertooth croaker)
19. *O. ruber* (Bloch & Schneider) (Tigertooth croaker)
20. *Otolithoides biauritus* (Cantor) (Bronze croaker) (Threatened)
21. *Pama pama* (Hamilton) (Pama croaker)
22. *Panna microdon* (Bleeker) (Panna croaker)
23. *Paranibea semiluctuosa* (Cuvier) (Half-mourning croaker)
24. *Pennahia anea* (Bloch) (Bigeye croaker)
25. *Protonibea diacanthus* (Lacepede) (Spotted croaker) (Threatened)
26. *Pterotolithus maculatus* (Cuvier) (Blotched tigertooth croaker)

Key to species

- 1a. Gasbladder with one or two pairs of simple or branched appendages 2
- 1b. Gasbladder with more than two pairs of diverticula, almost all arborescent 5
- 2a. Gasbladder appendages wholly directed forward from anterior end of bladder
..... *K. axillaris*
- 2b. Gasbladder appendages with at least the main part lying parallel to bladder
..... 3
- 3a. Gasbladder appendages arising from anterior end of bladder and immediately dividing
into branches, each side dividing into a cephalic and an abdominal branch, the former
branching in front of transverse septum of skull *P. microdon*
- 3b. Gasbladder appendages arising from posterior end of bladder 4
- 4a. Dorsal fin with 27 to 29 soft rays *O. biauritus*
- 4b. Dorsal fin with 40 to 45 soft rays *P. pama*
- 5a. Gasbladder carrot shaped 6
- 5b. Gasbladder hammer shaped 16
- 6a. Anterior pair of arborescent appendages of gasbladder branching on posterior surface
of transverse septum, but not entering the head 7

- 6b. Anterior pair of arborescent appendages of gasbladder extending into the head and branching under the skull 13
- 7a. Outer row of teeth in upper jaw enlarged and spaced, but no outstanding canines 8
- 7b. One or 2 pairs of outstanding canine teeth (near symphysis) in upper or both jaws 10
- 8a. Pores on chin of the “false five” pattern, those of first pair close together behind tip of jaw and united by a groove. Scattered small black spots on head, upper part of body and dorsal and caudal fins. “Tail” of tadpole-shaped impression of otolith strongly curved *P. diacanthus*
- 8b. First pair of pores small, on front of chin, one on each side of tip of jaw, not united by a groove, one or two pairs behind them. No scattered black spots ‘tail’ of tadpole-shaped impression of otolith (sagitta) only slightly curved 9
- 9a. Dorsal fin with 21 to 26 rays. Gas-bladder appendages wing-like, without a well-developed dorsal limb; the posterior ones parallel to wall of bladder *P. anea*
- 9b. Dorsal fin with 28 or 29 rays. Gas-bladder appendages each with a distinct short or long branched dorsal limb as well as a ventral limb; posterior appendages simple, very short, at right angles to wall of bladder *A. nibe*
- 10a. Canine teeth in upper jaw only. Mouth inferior *C. aureus*
- 10b. Canine teeth in both jaws. Mouth terminal or lower jaw projecting 11
- 11a. Some or all of the gas-bladder appendages ramifying on dorsal surface of bladder. Anal fin inserted either before middle of soft dorsal fin; soft anal rays 10 to 12. Three or four rows of black blotches on upper part of body *P. maculatus*
- 11b. Gas-bladder appendages set in an oblique plane in the wedge of tissue flanking the bladder, not wrapped around the main bladder. Anal fin inserted behind middle of soft dorsal fin; soft anal rays 7 or 8. No black blotch present 12
- 12a. Gillrakers 8 to 11 on lower arm of first arch. Distance between sphenotic ridge and angle of lower jaw less than length of lower jaw. Gasbladder with 30 to 38 pairs of arborescent appendages *O. ruber*
- 12b. Gillrakers 12 to 17 on lower arm of first arch. Distance between sphenotic ridge and angle of lower jaw as long as or longer than lower jaw. Gasbladder with 25 to 28 pairs of arborescent appendages *O. cuvieri*
- 13a. Chin with a single mental barbel or with two minute barbels 14
- 13b. No barbels on chin 15

- 14a. Chin with a single mental barbel; lower jaw teeth uniform *D. russelli*
- 14b. Chin with two minute barbels; lower jaw teeth well differentiated in size
..... *D. albida*
- 15a. Lower jaw teeth uniformly small *P. semiluctuosa*
- 15b. Lower jaw teeth well differentiated in size, the lower inner row enlarged
..... *N. soldado*
- 16a. Teeth of lower jaw differentiated in size, the inner lateral row enlarged and spaced. Outer row of teeth of upper jaw enlarged and widely spaced. Mouth usually subterminal (*Johnieops*) 17
- 16b. Teeth of lower jaw subequal. Outer row of teeth of upper jaw enlarged but not widely spaced. Mouth inferior (*Johnius*) 21
- 17a. Inner row of lower jaw teeth well developed and spaced. Mouth terminal
..... *J. borneensis*
- 17b. Inner row of lower jaw teeth moderately or slightly enlarged. Mouth subterminal to inferior 18
- 18a. Lower gillrakers 5 to 8. Outer upper row of teeth slightly enlarged and not widely spaced *J. macrorhynchus*
- 18b. Lower gillrakers 10 to 15. Outer upper row of teeth enlarged and widely spaced 19
- 19a. Snout and preorbital inflated. Teeth not well differentiated in size in jaws. Gillrakers short, rather stout, curved and coarsely toothed *J. dorsalis*
- 19b. Snout decurved but not inflated. Gillrakers not curved, not coarsely toothed
20
- 20a. Teeth well differentiated in size in both jaws. Gillrakers long and slender
..... *J. dussumieri*
- 20b. Teeth slightly differentiated in size in both jaws. Gillrakers short and spinulose....
..... *J. osseus*
- 21a. A barbel present on chin 22
- 21b. No mental barbel 23
- 22a. Scales on body ctenoid. Soft dorsal fin rays 30 to 33 *J. macropterus*
- 22b. Scales on body cycloid. Soft dorsal fin rays 22 to 26 *J. dussumieri*

- 23a. Lateral line with a conspicuous silvery or yellow streak. Interorbital width 8.9 to 9.3 percent of standard length. Second anal spine $\frac{1}{4}$ of head length *J. carutta*
- 23b. Lateral line without a distinct silvery streak. Interorbital width narrower, less than 8.5 percent of standard length. Second anal spine $\frac{1}{3}$ to $\frac{1}{2}$ of head length 24
- 24a. Snout conspicuously prominent and projecting, and 1.5 times in eye diameter. Second anal spine strong, 43 to 56% of head length. Lower gillrakers 10 to 13
..... *J. coitor*
- 24b. Snout projecting but less timidly, about equal to, or less than eye diameter 25
- 25a. Dorsal fin with 9 spines. Second anal spine about $\frac{1}{2}$ of head length
..... *J. belangerii*
- 25b. Dorsal fin with 10 spines. Second anal spine about $\frac{1}{3}$ of head length
..... *J. carouna*

Fisheries information : The croakers are very important commercial fishes and most common in trawl catches. The large fishes are usually esteemed as food fishes. The swim bladder of these fishes is used in the preparation of isinglass, a product used in the gelatin in confectionary and for the preparation of certain cements.

Remarks : *Johnieops sina* (Cuvier) have been synonymised with *Johnieops dussumieri* (Cuvier) (Heemstra, 1986a and Sasaki, 1996). *Johnius dussumieri* (Valenciennes) is usually recorded as *J. amblycephalus* (Bleeker) as a replacement name when the generic status of *Johnieops* Mohan is not considered and all *Johnieops* species are placed under genus *Johnius* Bloch. *Johnius aneus* (Bloch) and *Pennahia macropthalmus* (Bleeker) have been synonymised with *Pennahia anea* (Bloch) (Sasaki, 1994). *Johnieops osseus* (Day) is here considered, following De Bruin *et al.* (1995), for the species described from Indian coast as *Johnieops aneus* which is not a *Pennahia* species. Based on Mohan (1984) and Talwar (1995), the specimens determined as *Johnieops dussumieri* (Cuvier) is considered as *J. dorsalis* as per descriptions available with Sasaki (1997). *J. borneensis* was recorded as *J. vogleri* (Bleeker) (Venkateswarlu *et al.*, 1998) which is a junior synonym of the former (Sasaki, 2001).

Family MULLIDAE (Goat fishes)

Body elongate and almost compressed, with ctenoid scales. Chin with 2 long fleshy barbels, which can be folded into a median groove on throat. Mouth inferior, gape slightly diagonal. Eyes situated near dorsal profile on head. Dorsal fin two, well separated, the first with 7 to 8 (generally) slender spines (first spine often very small) and the second with 9 rays (first ray unbranched). Anal fin with 1 spine and 6 rays. Caudal fin deeply forked, with 13 branched rays.

Species known to occur in Orissa

1. *Mulloidichthys flavolineatus* (Lacepede) (Yellow-striped goatfish)
2. *Parupeneus indicus* (Shaw) (Indian goatfish)
3. *P. macronema* (Lacepede) (Long-barbeled goatfish)
4. *Upeneus sulphureus* Cuvier (Sulphur goatfish)
5. *U. tragula* Richardson (Freckled goatfish)
6. *U. vittatus* (Forsskal) (Striped goatfish)

Key to species

- 1a. Villiform teeth in several rows on vomer and palatines. Both dorsal fins with stripe. Second dorsal fin and anal fin scaly 2
- 1b. No teeth on vomer and palatines. Stripes sometimes present on second dorsal fin only. Second dorsal fin and anal fin not scaly 4
- 2a. Lower gillrakers 16 or 17. Interdorsal scales 3 or 4. Body with a reddish brown or blackish stripe from snout to middle of caudal fin base *U. tragula*
- 2b. Lower gillrakers 19 to 21. Interdorsal scales 5 to 7. No dark longitudinal stripe ...
..... 3
- 3a. No cross-bars on caudal fin. Barbels extend beyond rear edge of opercle
..... *U. sulphureus*
- 3b. Dusky cross-bar on caudal fin. Barbels not reaching rear edge of opercle
..... *U. vittatus*
- 4a. Teeth on jaws villiform in 1 to 3 rows. Interdorsal scale rows 4 or 5. No spot on caudal peduncle; a longitudinal yellow band on sides *M. flavolineatus*
- 4b. Teeth on jaws conical, strong, in one row only. Interdorsal scale rows 2 or 3. A roundish black spot on caudal peduncle 5
- 5a. Dark longitudinal band from snout to below second dorsal fin. A dark round blotch of 2½ scale wide on caudal peduncle centred on lateral line; no oblong yellowish blotch below dorsal fin *P. macronema*
- 5b. No dark longitudinal band on side. A large oval dark blotch, extending over 3 or more scales, on caudal peduncle; a yellowish oblong blotch from below mid 1st dorsal fin to front of 2nd dorsal fin *P. indicus*

Fisheries information : The goatfishes are important commercial fishes. These fishes are highly esteemed as food fish. *U. sulphureus* is the most common species.

Remarks : Report of *Parupeneus fraterculus* (Valenciennes), a junior synonym of *Parupeneus rubescens* (Lacepede), from Orissa coast by Mishra *et al.* (1999) is doubtful (Barman and Mishra, 2007).

Family MONODACTYLIDAE (Silver batfish, Moon fish)

Body strongly compressed, oval and deep, sometimes deeper than long. Mouth small, jaws with feeble teeth; vomer and palate with granulated teeth, maxilla exposed and scaly. Upper jaw slightly protrusible. Dorsal fin with 7 to 8 spines and 25 to 31 rays. Anal fin with 3 spines and 25 to 30 rays. Pelvic fins rudimentary or absent. Scales fine, cycloid or ctenoid, deciduous; extending on to median fin and head.

Species known to occur in Orissa

Monodactylus argenteus (Linnaeus) (Silver bat fish)

Fisheries information : The silver bat fishes are usually found in the coastal waters. *M. argenteus* is a very good aquarium fish since it thrives well in captivity.

Family TOXOTIDAE (Archerfishes, Riflefishes)

Body deep and compressed. Mouth large, terminal, and highly protrusible. Eyes large. Head flat above and pointed. Dorsal fin inserted far back on body, with 4 or 5 spines and 12 to 14 soft rays. Anal fin with 3 spines and 15 to 17 soft rays. Soft dorsal fin base considerably shorter than soft anal fin base. Dorsal and anal fins scaly. Lateral line complete, with 25 to 45 scales.

Species known to occur in Orissa

Toxotes chatareus (Hamilton) (Spotted archerfish)

Fisheries information : This species is of minor fisheries importance.

Family KYPHOSIDAE (Rudderfishes, Sea chubs)

Body oblong to ovate and compressed, with ctenoid scales. Mouth small, horizontal with an almost exposed maxilla; upper jaw slightly protrusible. Teeth close-set, strong, incisor-like, round tipped with long roots in jaws. Dorsal fin with 6 to 12 spines and 11 to 22 rays.

depressible in a sheath. Anal fin with 3 spines and 11 to 26 rays. Pectoral fins short. Pelvic fins with one spine and 5 rays and with a scaly axillary process. Caudal fin forked or emarginated.

Species known to occur in Orissa

Kyphosus cinerascens (Forsskal) (Blue sea chub)

Fisheries information : The blue sea club is of minor commercial value. It is captured along with commercial catches.

Family DREPANIDAE (Sickle fishes)

Body very deep, greatly compressed, with finely ctenoid scales. Head with a parabolic dorsal profile. Mouth terminal and protrusible, forming a downward projecting tube when protracted. Dorsal fin with 8 to 10 spines (the first small, procumbent, visible only in juveniles) and 19 to 22 rays, the spinous part separated from soft part of dorsal fin by a deep notch and expressible in a high basal scaly sheath. Anal fin with 3 spines and 17 to 19 rays. Pectoral fins long and falcate, extending to base of caudal fin. Caudal fin rounded. Lateral line highly arched.

Species known to occur in Orissa

1. *Drepane longimana* (Bloch & Schneider) (Banded drepane)
2. *D. punctata* (Linnaeus) (Spotted drepane)

Key to species

- 1a. Dorsal fin with 8 spines. Four to 9 vertical grey bars on upper half of sides, but devoid of spots *D. longimana*
- 1b. Dorsal fin with 9 spines. Four to 11 vertical rows of small black spots on upper half of sides *D. punctata*

Fisheries information : The sickle fishes form seasonal fishery along the coasts of our country. These fishes are marketed fresh only. Their flesh are said to be of excellent quality.

Family EPHIPPIDAE (Spade fishes)

Body greatly deep to more or less orbicular and highly compressed with scales. Head short, its profile either steep or considerably convex. Mouth small, horizontal; tip of maxilla concealed. Dorsal fin with 9 spines and 19 or 20 rays, interspinous membranes deeply incised, sometimes filamentous; spinous part separated from soft part by a deep notch. Anal

fin with 3 spines and 15 or 16 rays. Pectoral fins short and rounded. Pelvic fins thoracic, pointed, with an axillary process. Caudal fin almost sigmoid shaped distally, with an obtuse median angular process. Body with 4 or 5 vertical black bands which fade with the maturity of the fish.

Species known to occur in Orissa

Ephippus orbis (Bloch) (Spade fish)

Fisheries information : The spadefish is of little commercial importance. It is sometimes found in the commercial catches.

Family PLATACIDAE (Batfishes)

Body deep, rhomboid and greatly compressed. Eyes on both sides of flattened body. Dorsal profile of head almost angular, its length much shorter than height. Mouth, terminal, horizontal and scarcely protractile. Dorsal fin with 5 hidden spines and 35 to 39 rays, increasing in size posteriorly. Anal fin with 3 spines and 25 to 28 rays. Pectoral fins short and almost rounded. Pelvic fins produced, the first soft ray extending to at least anal fin origin. Caudal fin truncate. Lateral line arched with 50 to 55 scales. Scales finely ciliated, small, becoming minute on fins which are densely covered.

Species known to occur in Orissa

1. *Platax pinnatus* (Linnaeus) (Round batfish)
2. *P. teira* (Forsskal) (Longfin batfish)

Key to species

- 1a. Dorsal fin rays 28 to 34. Soft dorsal and anal fins greatly elongated. Mouth profile rounded. Scales small, 40 to 45 from lateral line origin to 1st dorsal spine
..... *P. teira*
- 1b. Dorsal fin rays 35 to 37. Soft dorsal and anal fins not much elongated. Mouth profile pointed. Scales larger, 25 to 30 from lateral line origin to 1st dorsal spine
..... *P. pinnatus*

Fisheries information : The batfishes are of not much commercial importance. These fishes are edible and palatable but not much esteemed as food on account of their foul feeding habits.

Remarks : Records of *Platax pinnatus* (Linnaeus) along Indian coast is questionable (Eschmeyer, 2005). Although we could not examine any specimen, it is included here

following literature. This may possibly be *P. orbicularis* (Forsskal) which have a convex snout and 5 mandibular pores on each side of chin (cf. snout concave before eyes and 3 or 4 mandibular pores in *P. pinnatus*) (Smith, 1986). These fishes are placed under family Ephippidae by recent authors.

Family SCATOPHAGIDAE (Scats)

Body quadrangular, greatly compressed. Head profile steep. Mouth small, horizontal with brush-like teeth. Dorsal fin with 11 to 12 strong spines and 16 to 18 rays, the first spine procumbent; middle of dorsal fin with a deep notch. Anal fin with 4 strong spines and 13 to 16 rays. Pectoral fins with 16 to 17 rays. Caudal fin truncate or slightly emarginate. Lateral line arched and complete. Body silvery or greenish with numerous dark spots.

Species known to occur in Orissa

Scatophagus argus (Bloch) (Spotted scat)

Fisheries information : The scats are not of much commercial importance. These fishes are popular aquarium fishes due to their attractive colour pattern of dark spots or bars on their body and orange-red colour on the dorsal profile.

Family CHAETODONTIDAE (Butterfly fishes)

Body oval to orbicular or subrhomboid and highly compressed. Mouth small, terminal and protractile; maxilla not extending to anterior border of eye. Snout slightly produced to highly elongate. Dorsal fin with 6 to 16 spines and 15 to 31 rays, sometimes with a slight notch between spines and soft rays. Anal fin with 3 spines (rarely 4) and 14 to 27 rays. Lateral line extending either up to base of soft part of dorsal fin or caudal fin base. An axillary scaly process at base of pelvic fin spine.

Species known to occur in Orissa

1. *Chaetodon vagabundus* Linnaeus (Vagabond butterfly fish)
2. *Heniochus acuminatus* (Linnaeus) (Pennant coral fish)

Key to species

- 1a. Lateral line complete, extending up to caudal fin base. Fourth dorsal spine elongate to filamentous, often longer than body depth. Snout with a dark blotch; a cross bar across interorbital region; two curved broad dark vertical bands on body.....
..... *H. acuminatus*

- 1b. Lateral line incomplete, extending up to near last rays of dorsal fin. Fourth dorsal spine normal, not extended or filamentous. Six diagonal lines from head to dorsal fin, 11 or 12 lines at right angles from the last line of these run downward and backward; a black band from spinous dorsal fin to posterior part of anal fin
.....*C. vagabundus*

Fisheries information : The juveniles of the butterfly fishes are used in the aquarium trade. These fishes are of the most colourful of the coral fishes.

Family NANDIDAE (Leaf fishes)

Body oblong and compressed with ctenoid scales. Head usually large and covered with scales. Mouth usually large and highly protrussible. Operculum with a spine. Dorsal fin continuous with a spinous and a soft part. Pelvic fins thoracic, without scaly axillary process. Dorsal fin with 10 to 18 spines and 8 to 16 soft rays. Anal fin with 3 spines and 6 to 9 soft rays. Caudal fin rounded. Lateral line incomplete or absent.

Species known to occur in Orissa

Nandus nandus (Hamilton) (Nandus)

Fishery information : It is a piscivorous fish preying upon small carps in fresh water ponds and ditches also found in estuaries and mangroves.

Family CICHLIDAE (Cichlids)

Body oblong, deep and compressed. Single nostril on each side of snout. Jaws toothed; palatine and vomer edentulous. Dorsal fin continuous, with 12 to 22 spines and 8 to 23 soft rays; anal fin with 3 to 16 spines and 6 to 15 soft rays. Caudal fin rounded. Head and body covered with weakly ctenoid scales. Lateral line interrupted, usually with 30 to 40 scales.

Species known to occur in Orissa

1. *Etroplus maculatus* (Bloch) (Spotted chromide)
2. *E. suratensis* (Bloch) (Banded Pearlsport)
3. *Oreochromis mossambicus* (Peters) (Tilapia)

Key to species

- 1a. Anal fin with 3 or 4 spines. Scales cycloid (rarely indistinctly ctenoid).....
.....*O. mossambicus*

- 1b. Anal fin with 12 to 15 spines. Scales slightly ctenoid 2
- 2a. Body with 1 to 3 dark circular blotches along sides. Dorsal fin with 8 to 10 soft rays. Anal fin with 8 to 9 rays *E. maculatus*
- 2b. Body with vertical bars along sides. Dorsal fin with 14 to 15 soft rays. Anal fin with 11 to 12 rays *E. suratensis*

Fishery information : Cichlids are excellent delicious fishes. These are also used in aquaculture and in aquaria. *E. suratensis* is very common in brackish waters and attains a length of 40 cm. *O. massambicus* is a prolific breeder almost throughout the year. It is an exotic fish, introduced in India, but now one of the most commonly found species in our country. The authors observed its presence in the Chilka Lake which might have escaped from culture systems.

Family SPHYRAENIDAE (Barracudas)

Body elongate with long pointed snout. Mouth large with lower jaw projecting beyond upper, with large fang-like teeth. Dorsal fin two, considerably separated, the first with 5 spines and second with one spine and 9 rays. Anal fin with 1 or 2 spines and 8 to 10 rays. Pectoral fins inserted low on body. Caudal fin forked.

Species known to occur in Orissa

- 1. *Sphyraena acutipinnis* Day (Sharp-fin barracuda)
- 2. *S. barracuda* Walbaum (Great barracuda)
- 3. *S. jello* Cuvier (Pickhandle barracuda)
- 4. *S. obtusata* Cuvier (Obtuse barracuda)
- 5. *S. putnamiae* Jordan and Seale (Sawtooth barracuda)

Key to species

- 1a. Gillrakers present on first arch 2
- 1b. Gillrakers absent on first arch 3
- 2a. Single gillraker at angle of first arch. Lateral line scales 120 to 128. Pectoral fin tip not reaching to origin of first dorsal fin *S. acutipinnis*
- 2b. Two gillrakers at angle of first arch. Lateral line scales 80 to 100. Pectoral fin reaching past origin of first dorsal fin *S. obtusata*
- 3a. Lateral line pores less than 100 (usually 80 to 85). Sides with several inky blotches below lateral line *S. barracuda*

- 3b. Lateral line pores more than 100. No black blotches on lower sides of body 4
- 4a. Preopercle edge obliquely rounded. Teeth slanted backwards. Sides with chevron-shaped markings *S. putnamiae*
- 4b. Preopercle edge smoothly rounded. Teeth erect. Dark bars on sides not in form of chevrons, but with short serpentine cross-bars reaching only slightly below lateral line *S. jello*

Fisheries information : The barracudas are of minor commercial importance. These fishes are marketed fresh, frozen, dried, salted or smoked.

Remarks : *S. putnamiae* probably misspelled, the correct name being *S. putnamae*.

Family POLYNEMIDAE (Threadfins)

Body almost elongate and compressed. Mouth subterminal. Dorsal fins two, well separated from each other, the first with 7 to 8 flexible spines. Anal fin with 2 or 3 spines. Pectoral fins divided into two parts, the upper part normal, the lower part with 3 to 15 free filamentous rays. Pelvic fins with one spine and 5 branched rays, subabdominal in position. Caudal fin deeply forked.

Species known to occur in Orissa

1. *Eleutheronema tetradactylum* (Shaw) (Four finger threadfin)
2. *Filimanus heptadactyla* (Cuvier) (Seven finger threadfin) (Threatened)
3. *F. xanthonema* (Valenciennes) (Silver sixfinger threadfin)
4. *Polydactylus indicus* (Shaw) (Indian threadfin) (Threatened)
5. *P. plebeius* (Broussonet) (Striped threadfin)
6. *P. sexfilis* (Valenciennes) (Golden sixthread tesselfish)
7. *P. sextarius* (Schneider) (Blackspot threadfin)
8. *Polynemus paradiseus* Linnaeus (Paradise threadfin)

Key to species

- 1a. Pectoral fin insertion near midline of body. Free pectoral filaments reaching beyond tip of caudal fin. Eye diameter 2 or more in snout length *P. paradiseus*
- 1b. Pectoral fin insertion well below midline of body. Free pectoral filaments not reaching caudal fin base. Eye diameter approximately equal to snout length 2
- 2a. Teeth extending labially on anterior two-third of dentary plate. Free lower lip restricted to posterior third of lower jaw. Tooth plates extending posteriorly from lateral margin

- of primary tooth plate on vomer. Gillrakers less than 20. Free pectoral filaments 4 *E. tetradactylum*
- 2b. Teeth on dentary restricted to dorsal surface or extending laterally only along anterior third of lower jaw. Free lower lip well developed. Tooth plate on vomer simple or absent. Gillrakers 18 to 60. Free pectoral filaments 5 to 7 3
- 3a. Width of band of teeth on upper and lower jaws 2 or more in space separating band of teeth on one premaxilla from other. Basisphenoid bones not contact prootic ... 4
- 3b. Width of band of teeth on upper and lower jaws less than 2 in space separating band of teeth on one premaxilla from other. Basisphenoid contacts prootic 5
- 4a. Pectoral filaments 6 (rarely 5), reaching just beyond tip of pelvic fins *F. xanthonema*
- 4b. Pectoral filaments 7, reaching to anal fin origin *F. heptadactyla*
- 5a. Pectoral fin with 5 free filamentous rays 6
- 5b. Pectoral fin with 6 free filamentous rays 7
- 6a. Eyes small, about 7 times in head length. Longest free pectoral filamentous ray extending nearly to anal fin. Body with faint dark stripes along scale rows *P. indicus*
- 6b. Eyes large, 3.8 to 4 times in head length. Free pectoral filamentous rays extend only to tip of pelvic fins. Body with dark narrow dusky stripes along scale rows *P. plebeius*
- 7a. Upper pectoral fin rays unbranched. Black shoulder spot absent *P. sexfilis*
- 7b. Upper pectoral fin rays branched. A black shoulder spot present *P. sextarius*

Fisheries information : The threadfin fishes are important commercial fishes. The Indian threadfin fish constitutes one of the important threadfin fisheries in our country.

Remarks : Recent authors consider *P. indicus* under a new generic name as *Leptomelanosoma indicum* (Shaw) (Motomura and Iwatsuki, 2001). The records of *P. heptadactyla* from Orissa coast may probably be *Filimanus similis* Feltes (Feltes, 1991), but need material confirmation.

Family CHIASMODONTIDAE (Swallowers)

Body elongate, moderately compressed. Mouth large; teeth long; premaxilla and maxilla long and slender. Dorsal fin spinous and soft part divided by a deep notch, with 9 to 13

spines, followed by 18 to 29 rays. Anal fin with 1 spine and 17 or 29 rays. Pectoral fin rays 9 to 15. Body naked with numerous small projecting spinules in juveniles. Stomach can expand to accommodate large pray.

Species known to occur in Orissa

Chiasmodon niger Johnson (NA)

Fisheries information : Of no interest to fisheries.

Family CHAMPSODONTIDAE (Gaperas)

Body elongate, slightly compressed, covered with very small, rough scales. A long, dagger-like spine at angle of preopercle. Two dorsal fins, first with 4 to 5 weak spines and second with 19 to 21 segmented soft rays. Anal fin with 18 to 19 segmented soft rays. Pectoral fins small, with one spine and 5 soft rays. Pelvic fins large, in front of pectorals. Two prominent lateral lines with transverse branches.

Species known to occur in Orissa

Champsodon vorax Gunther (NA)

Fisheries information : Of no commercial importance.

Family URANOSCOPIDAE (Stargazers)

Body elongate, thick, compressed posteriorly, naked or with small scales. Head large and cuboid with eyes on dorsal profile of it. Mouth large and oblique with fringed lips and small teeth in jaws. Lower jaw heavy and projecting, upper jaw protrusible; maxillaries exposed with supramaxilla. Lateral line on upper side of body. Pelvic fins narrowly separated, with one spine and 5 rays and inserted under throat. Spinous dorsal fin small or absent, or continuous with soft part of it; soft dorsal and anal fins similar, inserted in opposite position.

Species known to occur in Orissa

1. *Ichthyscopus lebeck* (Bloch) (Long nose stargazer)
2. *Uranoscopus cognatus* Cantor (Two-spine yellow-tail stargazer)
3. *U. crassiceps* Alcock (NA)
4. *U. guttatus* Cuvier (NA)

Key to species

- 1a. Spinous dorsal fin continuous with soft rayed portion. No spine above pectoral fin base *I. lebeck*

- 1b. Spinous dorsal fin separate from soft rayed portion by a notch. Large spine present just above pectoral fin base 2
- 2a. Head and body slaty brown with 2 or 3 rows of bluish white spots along back. Upper $\frac{2}{3}$ of first dorsal fin black, pure white at base *U. guttatus*
- 2b. Head and body brown above, light below; no white spots on back. First dorsal fin black 3
- 3a. Three pairs of short forwardly directed spines under head *U. cognatus*
- 3b. Two pairs of short forwardly directed spines under head *U. crassiceps*

Fisheries information : The stargazers are of no commercial importance. These fishes are sometimes seen in the commercial catches.

Remarks : Previous reports of *I. lebeck* are referred as *I. inermis* (Cuvier) (Venkateswarlu *et al.*, 1998) which is now considered as a junior name of the former.

Family TRICHONOTIDAE (Sand-divers)

Body very elongate, covered with large cycloid scales. Lower jaw projecting. Small sharp teeth on jaws, vomer and palatine. Gill membrane separate, not joined to isthmus. Dorsal fin inserted over pectoral fin base and continuous almost to caudal fin. Anal fin almost as long as dorsal fin. Lateral line continuous, on midside of body. Lateral line scales with a deep V-shaped notch in the posterior margin.

Species known to occur in Orissa

Trichonotus cyclograptus (Alcock) (NA)

Fisheries information : Of no interest to fisheries.

Family BLENNIIDAE (Comb-tooth blennies)

Body elongate without scales. Head always with cirri on eye, on nape and on posterior rim of anterior nostril. Mouth ventral, upper jaw not protractile. Eyes high on sides of head. Dorsal and anal fins long, their spines flexible. Dorsal fin with fewer spines than soft rays. Anal fin with 2 spines, usually rugose bulbous swellings on these spines, hardly separated from soft rays. Pelvic fins inserted ahead of pectoral fins, with one spine (not visible outwardly) and 2 to 4 soft rays. Pelvic fins sometimes deformed or absent. Caudal fin rounded.

Species known to occur in Orissa

1. *Omobranchus zebra* (Bleeker) (Zebra blenny)
2. *Xiphasia setifer* Swainson (Snake blenny)

Key to species

- 1a. Pelvic fin with one spine and 2 segmented rays *O. zebra*
- 1b. Pelvic fin with one spine and 3 segmented rays or absent *X. setifer*

Fisheries information : The blennies are of little commercial importance. These fishes are generally used for preparation of fishmeal.

Family CALLIONYMIDAE (Dragonets)

Body elongate and more or less compressed. Jaws with villiform teeth and upper jaw very protrusible. Preopercle armed with stout spine. Gill openings restricted to a small dorsal or sublateral pores. Eyes generally directed upwards. Dorsal fin two, the first with 4 flexible spines and the second with 7 to 11 rays. Anal fin with 6 to 12 rays. Pelvic fins with one spine and 5 rays, jugular in position, well separated from each other. Body without scales. Lateral line consisting of pores.

Species known to occur in Orissa

1. *Callionymus carebares* Alcock (Indian deepwater dragonet)
2. *C. fluviatilis* Day (River dragonet)
3. *C. sagitta* Pallas (Arrow-headed dragonet)
4. *Eleutherochir opercularis* (Valenciennes) (Indian dragonet)
5. *Synchiropus lineolatus* (Valenciennes) (NA)

Key to species

- 1a. Opercle with a free flap of skin *E. opercularis*
- 1b. Opercle without a free flap of skin 2
- 2a. Snout shorter than eye diameter. Gill opening sublateral. Soft dorsal fin rays branched. No antrorse spine at preopercular spine base. Membrane behind last dorsal fin spine usually very small or absent *S. lineolatus*
- 2b. Snout equal to or longer than eye diameter. Gill opening dorsal in position. Soft dorsal fin rays unbranched except the last one that divided at base. Antrorse spine at base of preopercular spine. Membrane behind last dorsal fin spine large 3

- 3a. Dorsal margin of preopercular spine with small serrae; main tip straight. Anal fin with 9 rays, the last ray divided *C. carebares*
- 3b. Dorsal margin of preopercular spine with large curved points; main tip upcurved 4
- 4a. Soft dorsal fin with 10 undivided rays, last ray divided at base *C. fluviatilis*
- 4b. Soft dorsal fin with 9 undivided rays, last ray divided at base *C. sagitta*

Fisheries information : The Dragonet fishes are of no commercial importance. These fishes are caught as bycatch in shrimp trawls.

Family ELEOTRIDIDAE (Sleepers)

Body elongate with ctenoid or cycloid scales, sometimes partially or completely naked. Dorsal fin two, the first with 6 flexible spines and the second with 1 spine and 8 to 19 rays. Anal fin with one spine and 6 to 19 rays. Pelvic fins separated with sucking disc, bases close together or united, with one spine and 5 rays. Caudal fin with 15 or 17 rays. Lateral line absent.

Species known to occur in Orissa

1. *Butis butis* (Hamilton) (Duckbill sleeper)
2. *B. melanostigma* (Bleeker) (Black-spotted gudgeon)
3. *Eleotris fusca* (Schneider) (Dusky sleeper)
4. *E. lutea* Day (Lutea sleeper)
5. *E. melanosoma* Bleeker (Broadhead sleeper)
6. *Ophiocara porocephala* (Valenciennes) (Northern gudgeon)
7. *Prinobutis koilomatodon* (Bleeker) (Mudsleeper)

Key to species

- 1a. Angle of preopercle with a single ventrally directed spine. Lateral series scales 45 to 68 2
- 1b. Angle of preopercle without spines. Lateral series scales 28 to 40 4
- 2a. Predorsal scales 23 or 24. Preoperculum and operculum scaled in upper part only *E. lutea*
- 2b. Predorsal scales 40 to 50. Preoperculum and operculum fully scaled 3

- 3a. Scales in lateral series 45 to 55. Anterior 3 vertical papillae rows below eye extend below longitudinal row of midcheek *E. melanosoma*
- 3b. Scales in lateral series 60 to 68. Anterior most and third papilla row under eye extend below longitudinal row of midcheek *E. fusca*
- 4a. Lateral series scales 35 to 40. No bony ridge above eye *O. porocephala*
- 4b. Lateral series scales 29 or 30. Bony ridge above eye 5
- 5a. Jaws and snout short; snout rounded, subequal to eye. Lower jaw not projecting..
..... *P. koilomatodon*
- 5a. Jaws and snout elongate; snout flat, about twice eye diameter. Lower jaw projecting
..... 6
- 6a. Maxilla extends to below anterior half of eye. Teeth in outer row not enlarged. Three crests on snout. Caudal fin uniformly black..... *B. melanostigma*
- 6b. Maxilla extends to below front edge of eye or not so far. Teeth in outer row enlarged. Two indistinct crests on snout. Caudal fin black with a light margin dorsally
..... *B. butis*

Fisheries information : The sleeper fishes are of no commercial importance. These fishes are generally used for the preparation of fishmeal.

Family GOBIIDAE (Gobias)

Body elongate or oval and compressed, with ctenoid or cycloid scales. Head with or without pores, but typically having sensory pore canals. Dorsal fin usually two, spinous dorsal fin when present, separated from soft dorsal fin and with 2 to 17 spines. The second or soft rayed dorsal fin and the anal fins are similar in shape and size. Pelvic fins united, sometimes entirely or posteriorly incised, usually forming an adhesive or sucking disc.

Species known to occur in Orissa

1. *Acentrogobius canius* (Valenciennes) (Tropical sand goby)
2. *A. cyanomos* (Bleeker) (NA)
3. *A. griseus* (Day) (Grey goby)
4. *A. madraspatensis* (Day) (NA)
5. *A. masoni* (Day) (NA)
6. *A. viridipunctatus* (Valenciennes) (Spotted green goby)
7. *Apocryptes bato* (Hamilton) (NA)

8. *Apocryptodon madurensis* (Bleeker) (NA)
9. *Awaous grammepomus* (Bleeker) (Scribbled goby)
10. *A. gutum* (Hamilton) (NA)
11. *Bathygobius fuscus* (Ruppell) (Frill goby)
12. *B. ostreicola* (Chaudhuri) (NA)
13. *Boleophthalmus boddarti* (Pallas) (Boddart's goggle-eyed goby)
14. *Brachygobius nunus* (Hamilton) (Bumblebel goby)
15. *Chiramenu fluviatilis* Rao (NA)
16. *Drombus globiceps* (Hora) (Bighead goby)
17. *Favonigobius reichei* (Bleeker) (Tropical sandgoby)
18. *Glossogobius giuris* (Hamilton) (Tank goby)
19. *G. mas* (Hora) (NA)
20. *Gobiopertus chuno* (Hamilton) (Glass goby)
21. *Istigobius ornatus* (Ruppell) (Ornate goby)
22. *Obliquogobius cometes* (Alcock) (NA)
23. *Oligolepis acutipennis* (Valenciennes) (Sharptail goby)
24. *O. cylindriceps* (Hora) (NA)
25. *Oxyurichthys microlepis* (Bleeker) (Maned goby)
26. *O. tentacularis* (Valenciennes) (Tentacled goby)
27. *Parachaeturichthys polynema* (Bleeker) (Taileyed goby)
28. *Parapocryptes rictuosus* (Valenciennes) (NA)
29. *P. seperaster* (Richardson) (NA)
30. *Paroxyurichthys laterisquamatus* (Weber) (NA)
31. *Periophthalmodon schlosseri* (Pallas) (Giant mudskipper)
32. *Periophthalmus argentilineatus* (Hamilton) (Barred mudskipper)
33. *P. kalolo* Lesson (Common mudskipper)
34. *Psammogobius biocellatus* (Valenciennes) (Sleepy goby)
35. *Pseudapocryptes elongatus* (Cuvier) (NA)
36. *Scartelaos histophorus* (Valenciennes) (Walking goby)
37. *Stigmatogobius javanicus* (Bleeker) (NA)
38. *S. minima* (Hora) (NA)

Key to species

- 1a. Single row of teeth on lower jaw 2
- 1b. Several rows of teeth on lower jaw 12

- 2a. Second dorsal fin long based. Scales cycloid..... 3
- 2b. Second dorsal fin not long based. Scales cycloid and/or ctenoid..... 9
- 3a. First dorsal fin higher than long. Free lower eyelid present. Eyes erectile above dorsal profile of head..... 4
- 3b. First dorsal fin longer than high. Free lower eyelid absent. Eyes not or only slightly above dorsal profile of head 5
- 4a. Mandibular teeth pointed. Scales minute to rudimentary. Lower side of head with barbels.....*S. histophorus*
- 4b. Mandibular teeth obliquely notched. Scales small, 75 to 100 in longitudinal series. No barbels on head *B. boddarti*
- 5a. Scales minute, more than 200 in longitudinal series. Teeth on upper jaw pointed. First dorsal fin with 5 spines *P. elongatus*
- 5b. Scales small to moderate, less than 150 in longitudinal series..... 6
- 6a. Teeth on lower jaw pointed. Anterior teeth on upper jaw caninoid. First dorsal fin with 5 spines 7
- 6b. Teeth on lower jaw truncate or obtuse or bilobate 8
- 7a. Body depth 6.0 to 8.5 times in standard length. Second dorsal fin with 26 or 27 soft rays*P. serperaster*
- 7b. Body depth 10.0 to 12.5 times in standard length. Second dorsal fin with 23 to 26 soft rays *P. rictuosus*
- 8a. First dorsal fin with 5 spines. Anterior teeth of upper jaw bilobate, not caninoid. About 100 scales in longitudinal series *A. bato*
- 8b. First dorsal fin with 6 spines. Anterior teeth of upper jaw caninoid. Scales 50 to 70 in longitudinal series *A. madurensis*
- 9a. Eyes not prominent. Free lower eyelid absent. Base of pectoral fin not muscular..
..... *G. chuno*
- 9b. Eyes prominent, placed above dorsal profile. Free lower eyelid developed. Base of pectoral fin muscular 10
- 10a. Teeth on upper jaw in two rows. Basal membrane of pelvic fins well developed; pelvic fins entirely united *P. schlosseri*
- 10b. Teeth on upper jaw in single row. Basal membrane of pelvic fins not well developed; pelvic fins not totally united 11

- 11a. Basal membrane of pelvic fins moderate or weak; inner ray of pelvic fins only united at base by a deeply emarginate membrane *P. kalolo*
- 11b. Basal membrane of pelvic fins very poorly developed; two halves of pelvic fin usually joined by a very narrow membrane *P. argentilineatus*
- 12a. Shoulder girdle with one to three finger-like flaps 13
- 12b. Shoulder girdle smooth or with minute bumps only 14
- 13a. Predorsal scales 13 to 15 *A. grammepomus*
- 13b. Predorsal scales 17 to 24 *A. gutum*
- 14a. Foremost median scale on nape unpaired and enlarged 15
- 14b. Foremost median scale on nape not unpaired and nor enlarged 16
- 15a. Two alternating rows of dark blotches on body. First dorsal fin with a dark spot..
..... *S. javanicus*
- 15b. No blotches and stripes on body. No spot on first dorsal fin *S minima*
- 16a. Upper pectoral fin rays free and silk-like. Head depressed 17
- 16b. Upper pectoral fin rays not free 18
- 17a. Tongue rounded *B. ostreicola*
- 17b. Tongue bilobate to emarginate *B. fuscus*
- 18a. Barbels present 19
- 18b. Barbels absent 20
- 19a. Caudal fin asymmetrical *O. cometes*
- 19b. Caudal fin symmetrical *P. polynema*
- 20a. Teeth on upper jaw in one to three rows 21
- 20b. Teeth on upper jaw in several rows 24
- 21a. Caudal fin shorter than head *C. fluviatilis*
- 21b. Caudal fin longer than head 22
- 22a. Teeth on upper jaw in two rows. No dermal crest on nape
..... *P. laterisquamatus*
- 22b. Teeth on upper jaw in one row. A membranous crest on nape present 23

- 23a. Distinct elongate tentacle over eye. First dorsal fin with 3 rows of reddish-violet spots; 2nd dorsal fin 5 or 6 rows of oblong reddish-violet spots *O. tentacularis*
- 23b. No tentacle, but often a bump over eye. First dorsal fin with two blue lines; 2nd dorsal fin with blue spots *O. microlepis*
- 24a. Caudal fin longer than head 25
- 24b. Caudal fin not longer than head 26
- 25a. Soft dorsal fin with 9 rays. Anal fin with 9 soft rays. Scales 25 in longitudinal series *O. cylindriceps*
- 25b. Soft dorsal fin with 10 or 11 rays. Anal fin with 10 or 11 soft rays. Scales 27 to 30 in longitudinal series *O. acutipennis*
- 26a. Simple first ray of 2nd dorsal fin segmented. Tongue rounded *B. nusus*
- 26b. Simple first ray of 2nd dorsal fin not segmented. Tongue emarginate, truncate or bilobate 27
- 27a. Gill opening extending to below rear margin of preopercle or further beyond 28
- 27b. Gill opening restricted to pectoral fin base or slightly below 30
- 28a. Branchiostegal membranes form a free fold across isthmus. Body dark with many longitudinal lines and saddles on back. Iris with a lappet dorsally covering part of pupil *P. biocellatus*
- 28b. Branchiostegal membranes attached to sides of isthmus. Body pale, without longitudinal lines and saddles on back. Iris without lappet dorsally covering part of pupil 29
- 29a. Maxilla extends to below anterior half of eye or shorter. Second dorsal fin with 8 or 9 soft rays *G. giuris*
- 29b. Maxilla extends to below just behind posterior margin of eye or beyond. Second dorsal fin with 7 soft rays *G. mas*
- 30a. Mouth small, subinferior, almost horizontal. Snout broadly rounded *I. ornatus*
- 30b. Mouth small to large, terminal, oblique. Snout gently or steeply sloping 31
- 31a. Predorsal scales 6 to 12 32
- 31b. Predorsal scales 17 to 30 33

- 32a. Head papillae pattern transverse *D. globiceps*
- 32b. Head papillae pattern longitudinal *F. reichei*
- 33a. A broad papilla on each side of chin *A. masoni*
- 33b. No papilla behind chin 34
- 34a. Scales 40 to 42 in longitudinal series *A. griseus*
- 34b. Scales 26 to 36 in longitudinal series 35
- 35a. Scales 35 to 36 in longitudinal series. Predorsal scales about 30
..... *A. viridipunctatus*
- 35b. Scales large, 26 to 32 in longitudinal series. Predorsal scales 14 to 20 36
- 36a. Predorsal scales 14 *A. cyanomos*
- 36b. Predorsal scales less than 17 to 20 37
- 37a. Scapula with a blue spot. Body with large spots *A. caninus*
- 37b. Scapula devoid of blue spot. Body with 5 to 8 narrow vertical black lines on ventral
half of body between pelvic fin base and middle of anal fin
..... *A. madraspatensis*

Fisheries information : The gobiids are most commonly sighted in estuaries, but of minor commercial importance in general. A few species, like *G. giuris* and *P. elongatus* are of some commercial value.

Remarks : *D. globiceps* was earlier recorded as *Acentrogobius globiceps* and *P. biocellatus*, as *Glossogobius biocellatus*. Recent authors consider *A. madraspatensis* under genus *Amoya* Herre (Larson, 2000); *P. laterisquamatus* under genus *Stenogobius* Bleeker (Watson, 1991); and *S. javanicus* under genus *Pseudogobius* Popta (Larson, 2001). Following Murdy (1989), *Boleophthalmus sculptus* Gunther, is here considered as junior synonym of *B. boddarti*; *Parapocryptes microlepis* (Bleeker), as *P. serperaster*; *Periophthalmus vulgaris* Eggert, as *P. argenteolineatus*; *Pseudapocryptes lanceolatus* (Bloch & Schneider), as *P. elongatus*; and *Scartelaos viridis* (Hamilton), as *S. histophorus*. In current parlance of nomenclature *Periophthalmus koelreuteri* (Pallas) is considered as a junior synonym of *P. barabrus* (Linnaeus), an Atlantic species (Murdy, 1989), that unlikely to occur in Indian coast. Koumans (1953) has observed that 'the subspecies *kalolo* seems to be most abundant' and hence, we considered the Indian specimens referred as *P. koelreuteri* should be known as *P. kalolo*. *Awaous gutum* is synonymised with *G. giuris* by Rema Devi (1993), probably based on Day (1876). Day (1876) described *G. giuris* as *Gobius gutum* and *A. gutum* as *Gobius striatus* (Day) (Talwar and Jhingran, 1991). Day (1969) reported this species from Orissa as *G. striatus*. Koumans (1941) placed this species under *A. stamineus* (Valenciennes), which

Watson (1992) consider as a synonym of *A. guamensis* (Valenciennes). Occurrence of *A. guamensis* along Indian coast is remote. Pending further studies, we opted to retain the name as *A. gutum* for specimens from Orissa coast.

**Family GOBIOIDIDAE
(Eel-like gobies)**

Body eel-like and compressed, naked or with cycloid scales. Eyes very small or practically absent. Opercular margin without pouch-like cavity. Dorsal fin single, very long, with 6 spines and 32 to 46 rays, generally united or almost so with the caudal fin. Pelvic fins united, forming an adhesive disc. Anal fin long, with 31 to 65 rays.

Species known to occur in Orissa

1. *Brachyamblyopus brachysoma* (Bleeker) (NA)
2. *Caragobius urolepis* (Bleeker) (Sumatran eel-goby)
3. *Odontamblyopus rubicundus* (Hamilton) (Rubicundus eel-goby)
4. *Pseudotrypauchen multiradiatus* (Hardenberg) (NA)
5. *Taenioides anguillaris* (Linnaeus) (Anguilla eel-goby)
6. *T. buchanani* (Day) (Burmese eel-goby)
7. *T. cirratus* (Blyth) (Hooghly eel-goby)

Key to species

- 1a. Barbels on chin and lower jaw. Canine teeth present 2
- 1a. No barbels on chin and lower jaw. Canine teeth absent 5
- 2a. Mouth oblique, with symphyial canine on lower jaw. Pectoral fin long, about 70 percent of head length *O. rubicundus*
- 2b. Mouth nearly vertical, with no symphyial canine on lower jaw. Pectoral fin short, about 30 percent of head length 3
- 3a. Dorsal and anal fins separate from caudal fin by a deep notch. Caudal fin rhomboid *T. cirratus*
- 3b. Dorsal and anal fins more or less confluent with caudal fin. Caudal fin pointed ... 4
- 4a. Vertical fins yellowish. Preanal distance less than 40% of standard length *T. anguillaris*
- 4b. Vertical fins black. Preanal distance more than 40% of standard length *T. buchanani*

- 5a. Pectoral fin rays about 40. Head scaled. Chin without pores *P. multiradiatus*
 5b. Pectoral fin rays about 20. Head naked. Chin with pores 6
 6a. Scales on body from before dorsal fin origin. Anal fin elements 28
 *B. brachysoma*
 6b. Scales on caudal part of body only. Anal fin elements 34 *C. urolepis*

Fisheries information : The eel-like gobies are of minor commercial importance. These fishes are generally used for preparation of fishmeal.

Remarks : These fishes are now being placed under family Gobiidae reducing the status of this group to subfamily by recent authors. *C. urolepis* is included here on the basis of *Taenioides chilensis* reported by Hora (1923) which is considered as a junior synonym of the former (Murdy and Shibukawa, 2003), while Talwar and Jhingran (1991) questionably placed the same under *T. buehneri*.

Family TRYPACHENIDAE (Burrowing gobies)

Body very elongate and eel-like. Eyes very small or indistinct. A pit opening into a pouch-like cavity at the superior margin of the opercular region. Dorsal fin single, very long with a distinct spinous portion. Pelvic fins usually form an adhesive disc.

Species known to occur in Orissa

1. *Amblyotrypauchen arctocephalus* (Alcock) (NA)
2. *Trypauchen vagina* (Bloch & Schneider) (Burrowing goby)

Key to species

- 1a. Pelvic fins short, 2.5 to 3.0 times in head length, completely united, forming a funnel-like disc *T. vagina*
 1b. Pelvic fins longer, about 2.0 times in head length, united at base only, emarginate posteriorly *A. arctocephalus*

Fisheries information : The borrowing goby is of no commercial value. It is used for preparation of fishmeal.

Remarks : These fishes are also placed under family Gobiidae by recent authors.

Family KRAEMARIIDAE (Sandgobies)

Body elongate. Head with small flaps along lower edge of preoperculum; operculum expanded covering pectoral fin base. Lower jaw protruding forward with enlarged chin; tongue bilobed. Body scaleless. Benthic tropical fishes living buried in sand.

Species known to occur in Orissa

Kraemeria samoensis (Steindachner) (Samon sand goby)

Fisheries information : Of no fishery value. Rare in occurrence.

Family KURTIDAE (Nursery fishes, Humpheads)

Body oblong and highly compressed with cycloid scales. Mouth large. Opercular bones thin and paper-like. Dorsal fin with very small 5 spines preceded by a recumbent spine directed anteriorly, and 12 or 13 rays. Anal fin with 2 spines and 31 to 47 rays. Pelvic fins with one spine and 5 rays. Caudal fin deeply forked. Males with occipital hook, used for carrying eggs.

Species known to occur in Orissa

Kurtus indicus Bloch (Indian humphead)

Fisheries information : The Indian humphead fishes are of little commercial importance. These fishes are often caught as bycatch in the commercial catches.

Family ACANTHURIDAE (Surgeon fishes)

Body almost elongate or deep, compressed with a single folding lancet-like spine or one or two body plates generally bearing sharp keels on sides of caudal peduncle. Mouth small, teeth in a single row, variable in shape with genus, but never caniniform or molariform. Dorsal fin with 4 to 9 spines and 19 to 31 soft rays. Anal fin with 2 to 3 spines and 19 to 36 soft rays. Pelvic fins with one spine and 3 to 5 soft rays. Caudal fin lunate or truncate.

Species known to occur in Orissa

1. *Acanthurus lineatus* (Linnaeus) (Lined surgeonfish)
2. *A. nigrofuscus* (Forsskal) (Dusky surgeonfish)
3. *A. tristis* Randall (Indian Ocean mimic surgeonfish)

Key to species

- 1a. Dorsal fin with 8 spines. Margins of opercle black *A. tristis*
- 1b. Dorsal fin with 9 spines. Margins of opercle not black 2
- 1a. Caudal spine length 1.9 to 2.0 times in head length. Dorsal $\frac{3}{4}$ of head and body with light blue stripes, broadly edged in black, alternately with yellow stripes. No spot at end of dorsal and anal fin base *A. lineatus*

- 1b. Caudal spine length more than 2.1 times in head length. No longitudinal lines on body, but head and chest with numerous orange dots. Prominent black spot at end of dorsal anal fin base present *A. nigrofuscus*

Fisheries information : The surgeonfishes are of little commercial importance. These fishes are generally found on or near the coral reefs.

Remarks : *A. tristis* along Indian and Sri Lankan coast was reported as *A. pyroferus* Kittlitz (De Bruin *et al.*, 1995).

Family SIGANIDAE (Rabbit fishes)

Body oval, compressed with very small and thin cycloid scales. Mouth small with a single row of fine, close-set teeth in each jaw. Dorsal fin with 13 strong spines and 10 rays, preceded by a forward projecting spines (sometimes covered by skin). Anal fin with 7 strong spines and 9 rays. Pelvic fins with 2 strong spines separated by 3 rays.

Species known to occur in Orissa

1. *Siganus canaliculatus* (Park) (Whitespotted spinefoot)
2. *S. javus* (Linnaeus) (Streaked spinefoot)
3. *S. vermiculatus* (Valenciennes) (Vermiculated spinefoot)

Key to species

- 1a. Body depth 2.4 to 2.8 times in standard length *S. canaliculatus*
 1b. Body depth 1.8 to 2.3 times in standard length 2
 2a. Scale rows between mid-dorsal fin base and lateral line 30 to 35 *S. javus*
 2b. Scale rows between mid-dorsal fin base and lateral line 17 to 28
 *S. vermiculatus*

Fisheries information : The rabbit fishes are generally found in the reef areas and among inshore commercial fishes of our country, but of minor fishery importance.

Remarks : The siganids are generally known as rabbit fishes due to their similarity with the mouth of rabbits. The spines of these fishes have the side grooves containing venom glands. The slightest contact with one of these spine tips may produce a very painful puncture wound.

Family TRICHIURIDAE (Ribbon fishes)

Body very elongate, extremely compressed, ribbon-like. Mouth large, with strong teeth in jaws; those at front of upper jaw fang-like. A single dorsal fin, extending almost the entire

length of body. Anal fin reduced, soft rays either spinules or buried in skin. Pelvic fins **absent**, or reduced to one scale-like spine and 0 to 2 rudimentary soft rays. Pectoral fins **rather** small. Tail tapered in to a hair-like process. Lateral line single. Body without scales.

Species known to occur in Orissa

1. *Eupleurogrammus glossodon* (Bleeker) (Longtooth hairtail)
2. *E. muticus* (Gray) (Smallhead hairtail)
3. *Lepturacanthus pantului* (Gupta) (Coromandel hairtail)
4. *L. savala* (Cuvier) (Savalani hairtail)
5. *Trichiurus gangeticus* (Gupta) (Gangetic ribbonfish)
6. *T. lepturus* Linnaeus (Largehead hairtail)

Key to species

- 1a. Pelvic fins scale-like. Free margin of subopercle convex 2
- 1b. Pelvic fins absent. Free margin of subopercle concave 3
- 2a. A pair of fangs on tips of lower jaw. Dorsal fin membrane slightly black along spines. Dorsal side of posterior part of body slightly black. A black spot just behind dermal process of lower jaw. Pelvic fins inserted below 11th to 14th dorsal fin rays
..... *E. glossodon*
- 2b. No fangs on tip of lower jaw. Dorsal fin membrane pale. Both dorsal and ventral sides of posterior part of body black. No black spot behind dermal process of ventral side of lower jaw. Pelvic fins inserted below 15th to 18th dorsal fin rays
..... *E. muticus*
- 3a. First anal fin spine large, its length half of eye diameter. Soft anal fin rays pungent spinules breaking through ventral skin. Two small canine teeth on upper jaw project forward. A small slit on ventral side of lower jaw for receiving anterior most fang of upper jaw 4
- 3b. First anal fin spine small, its length less than pupil of eye. Soft anal fin rays slightly breaking through ventral skin in smaller specimens. No canine teeth on upper jaw project forward. No slit on ventral side of lower jaw 5
- 4a. Snout rather short, its length 3 times in head length. Eye large, its diameter 5 to 7 times in head length. Dorsal fin elements 123 to 133 *L. pantului*
- 4b. Snout long, its length about 2.0 to 2.5 times in head length. Eye small, its diameter 7 to 9 times in head length. Dorsal fin elements 113 to 123 *L. savala*
- 5a. Pectoral fin spine serrated. First anal fin spine situated below about 36th soft dorsal fin soft rays *T. gangeticus*

- 5b. Pectoral fin spine not serrated. First anal fin spine situated below 39th to 41st soft dorsal fin soft rays *T. lepturus*

Fisheries information : The ribbon fishes contain scanty flesh, but meat excellent to eat. These are marketed fresh and mostly dried-salted. These fishes constitute one of the important commercial fisheries contributing 5.26% of total marine fish catch of Orissa coast during the year 2000-01 (Anon., 2002).

Family SCOMBRIDAE (Mackerels and Tunas)

Body torpedo-like, strongly built. Dorsal fin two (depressible into groove) with presence of finlets posterior to second dorsal and anal fin. Lateral line simple or branched. Caudal fin rays deeply divided covering completely the hypural plate. Caudal peduncle slender with a pair of oblique keels close to the end of caudal fin. Body uniformly covered with small cycloid scales or restricted to a corselet around anterior part of body. Body usually metallic blue or blue-green back.

Species known to occur in Orissa

1. *Euthynnus affinis* (Cantor) (Mackerel tuna)
2. *Rastrelliger kanagurta* (Cuvier) (Indian mackerel)
3. *Scomberomorus commerson* (Lacepede) (Spanish mackerel)
4. *S. guttatus* (Bloch & Schneider) (Indo-Pacific king mackerel)
5. *S. lineolatus* (Cuvier) (Streak seer fish)
6. *Thunnus orientalis* (Temminck & Schlegel) (Pacific blue-fin tuna)

Key to species

- 1a. Two small keels on either side of caudal peduncle. Dorsal and anal finlets 5 each. Adipose eyelids cover front and rear eyes. Dorsal fins well separated by wide space. Narrow dark longitudinal stripes on upper part of body *R. kanagurta*
- 1b. Two small keels and a large median keel between them on either side of caudal peduncle. Seven to 10 dorsal and 6 to 10 anal finlets. Adipose eyelids absent. No longitudinal stripe on upper part of body. Dorsal fins almost contiguous or separated by a narrow space 2
- 2a. Teeth in jaws slender, conical, hardly compressed. Corselet of scales well developed. Pectoral fin rays 26 to 36. Gillrakers 29 to 44. Anal fin with 13 or 14 soft rays ..
..... 3
- 2b. Teeth in jaws strong, compressed, almost triangular or knife-like. Corselet of scales obscure. Pectoral fin rays 20 to 25. Gillrakers 3 to 16. Anal fin with 17 or 22 soft rays
..... 4

- 3a. Body naked behind corselet. Pectoral fin rays 26 to 29. Gillrakers 29 to 35. Back dark blue-green with a striped pattern under dorsal fin base. Black spots between pectoral and pelvic fin bases *E. affinis*
- 3b. Body covered with minute scales behind corselet. Pectoral fin rays 30 to 36. Gillrakers 34 to 44. Back dark blue, without stripes. Abdomen with a faint pattern of paler lines alternating with rows of dots *T. orientalis*
- 4a. Gillrakers 3 to 6. Lateral line abruptly curving downward below 2nd dorsal fin. Numerous wavy vertical bars on sides of body *S. commerson*
- 4b. Gillrakers 7 to 16. Lateral line not abruptly curving downward below 2nd dorsal fin. No vertical bars on sides of body 5
- 5a. Lateral line with a wavy pattern below 2nd dorsal fin, without auxiliary branches or with only few branches anteriorly. First dorsal fin not black. Dark round spots and dashes on sides of body *S. lineolatus*
- 5b. Lateral line gradually descending posteriorly (not wavy), with many auxiliary branches anteriorly. First dorsal fin black up to 8th spine, the rest white. Irregular rows of round spots on sides of body *S. guttatus*

Fisheries information : The tunas and mackerels are very important commercial fishes. These fishes constitute an important economical, recreational and artisanal fishery. *R. kanagurta* is the most common species of Orissa coast which is marketed fresh and as well as dried. Scombrids contribute 6.92% of total marine fish catch of Orissa coast during 2000-01, out of which Indian mackerel alone form 2.68% (Anon., 2002).

Remarks : Apart from the above listed six species, some others may occur along Orissa coast, but confirm report is lacking. Although *Rastrelliger brachysoma* (Bleeker) is reported from Ganjam coast (Mishra et al., 1999), it needs confirmation.

Family CENTROLOPHIDAE (Medusafish)

Body oblong, compressed. Body depth 1.8 to 3.0 times in standard length. Preopercle margin denticulate. Dorsal fin continuous, its base longer than anal fin base. Dorsal fin with 5 to 7 stout, short spines and 25 to 40 rays. Dorsal fin origin over or before pectoral fin base. Anal fin with 2 or 3 spines and 18 to 30 rays. A band of oblique rows of 8 to 10 pores along dorsal and anal fin bases. Lateral line follow contour of dorsal profile.

Species known to occur in Orissa

Psenopsis cyanea (Alcock)

Fisheries information : Of no interest to fisheries.

Family ARIOMMATIDAE
(Driftfishes)

Body oval, deep and compressed. Mouth small with minute teeth in jaws. Dorsal fin two, first with 10 to 13 spines and second with one spine and 14 to 18 rays. Anal fin with 3 spines and 13 to 16 rays. Pectoral fins with 20 to 24 rays. Pelvic fins thoracic, attached to the abdomen with a membrane and folding into a long pronounced groove. Caudal fin stiff and deeply forked. Caudal peduncle with 2 low fleshy keels on each side. Scales cycloid and easily detachable.

Species known to occur in Orissa

Ariomma indica (Day) (Indian ariomma)

Fisheries information : The driftfishes are of limited commercial importance, but do not contribute to fisheries of Orissa. These fishes contain high amount of fat.

Remarks : This family is included under Nomeidae by recent authors.

Family STROMATEIDAE
(Pomfrets)

Body very deep and compressed. Mouth small with immovable maxilla. Eyes with adipose eyelid. Single dorsal fin and anal fin, long-based and slightly to deeply falcate, preceded by no spine (5 to 10 flat, blade-like spines in juveniles). Pectoral fins long and wing-like. Pelvic fins absent. Caudal fin generally forked.

Species known to occur in Orissa

1. *Pampus argenteus* (Euphrasen) (Silver pomfret)
2. *P. chinensis* (Euphrasen) (Chinese pomfret)

Key to species

- 1a. Dorsal and anal fins falcate, proceeded by 5 to 10 flat, blade-like spines. Caudal fin deeply forked *P. argenteus*
- 1b. Dorsal and anal fins not falcate but fin rays gradually diminish in length posteriorly, no spines preceding the median fins. Caudal fin emarginate *P. chinensis*

Fisheries information : Silver pomfret is one of the very important commercial fishes. It has a great demand; marketed mostly fresh and some dried-salted. Pomfrets contributed 2.95% of total marine fish catch of Orissa coast during 2000-01 (Anon., 2002). Both the fishes are fairly common in catches along Orissa coast.

Family ANABANTIDAE
(Climbing perch)

Body somewhat elongate and compressed. Head and body covered with ctenoid scales. Suprabranchial organ well developed. A long dorsal fin with 16 to 18 spines and 8 to 10 soft rays. Anal fin with 8 to 11 spines and 9 to 11 soft rays. A cavity above the third or upper portion of first branchial arch contains an elaborate apparatus consisting of thin laminae of bones, covered by a vascular mucous membrane for respiratory purposes. Lateral line interrupted.

Species known to occur in Orissa

Anabas testudineus (Bloch) (Climbing perch) (Threatened)

Fishery information : It is a common and highly esteemed food fish of our country. This fish can survive in oxygen deficient water because of its accessory respiratory organ. It can also move on dry land by means of its lateral movements of tail and paired fins and even can climb trees. This species is known as “Indian climbing perch” due to its climbing nature onto the trees.

Remarks : Mostly inhabit freshwaters and can thrive low saline water. Included here for its availability in the Chilka Lake. A second member of the family *Anabas cabojius* (Hamilton), usually well distributed in freshwater bodies of Orissa, recently observed in the Chilka Lake. It differs from the former in having a deep body and longer snout (depth 2.2 to 2.8 and snout 10.5 to 12.5 times in standard length, cf. 3.0 to 3.5 and 13.0 to 17.5 in *A. testudineus*).

Family OSPHRONEMIDAE
(Gouramies)

Body moderately elevated, compressed with rounded abdomen. Mouth small, terminal, oblique and protrusible. A suprabranchial organ present. A single dorsal fin inserted above tip of pectoral fin, with 11 to 14 spines and 11 to 12 soft rays; spinous part longer than soft part. Anal fin with 9 to 12 spines and 19 to 21 soft rays. Outer ray of pelvic fin much elongated, extending beyond caudal fin. Caudal fin rounded. Head and body covered with ctenoid scales. Lateral line complete and straight, with 30 to 33 scales. Swimbladder simple.

Species known to occur in Orissa

Colisa fasciata (Schneider) (Banded colisa)

Fishery information : It is popular fish both as a food fish and aquarium fish for its brilliantly coloured vertical bands and rapid growth. This species is a larvivorous fish.

Remarks : Gouramies are often placed under family Belontiidae in literature. Following Britz (2001) and Eschmeyer (2005), the family is named as Osphronemidae with 4 subfamilies.

viz., Osphroneminae, Belontiinae, Macropodinae and Luciocephalinae. *C. fasciata* is placed under genus *Polyacanthus* Cuvier by recent authors (Menon, 1999).

Family CHANNIDAE (Murrels)

Body elongate with large cycloid scales. Head with plate-like scales. Cephalic pits present. Suprabranchial organ for air breathing present. A single long dorsal fin and a similar anal fin present, both fins spineless and free from caudal fin. Dorsal fin with 29 to 55 rays, inserted almost above pectoral fin. Anal fin with 21 to 36 rays. Pelvic fins usually present, with 6 rays. Caudal fin rounded. Lateral line abruptly curved or almost interrupted with 37 to 110 scales.

Species known to occur in Orissa

1. *Channa marulius* (Hamilton) (Giant snake head fish)
2. *C. orientalis* (Schneider) (Brown snake head fish) (Threatened)
3. *C. punctatus* (Bloch) (Green snake head fish)

Key to species

- 1a. A black white-edged ocellus on basal portion of caudal fin present. Nine to 10 rows of scales between the orbit and preopercle *C. marulius*
- 1b. No such ocellus on basal portion of caudal fin. Four to five rows of scales between the orbit and preopercle 2
- 2a. Pelvic fins less than half length of pectoral fins. Pectoral fins spotted *C. orientalis*
- 2b. Pelvic fins more than half length of pectoral fins. Pectoral fins plain *C. punctatus*

Fishery information : Murrels are good food fishes. These are mostly marketed alive. *C. orientalis* is the smallest species attaining 203 mm (8 inches) and *C. marulius* is the largest species attaining 1219 mm (4 feet) among its family members.

Remarks : These are primarily fresh water fishes but fairly common in the Chilka Lake.

Order PLEURONECTIFORMES

Key to families

- 1a. Dorsal fin with few anterior spinous rays, its origin well posterior to upper eyes..
..... PSETTODIDAE

- 1b. Dorsal fin with soft rays only, its origin above or anterior to lower eyes 2
- 2a. Anus placed on eyed side. Pelvic fin with a flexible spine CITHARIDAE
- 2b. Anus placed on midventral or blind side. Pelvic fin without spine 3
- 3a. Preopercular margin not free, concealed under the skin or scales. Lower jaw not prominent. Eyes on either side 4
- 3b. Preopercular margin free and visible, not concealed by skin or scales. Lower jaw often prominent. Eyes on left side 5
- 4a. Eyes on right side of head SOLEIDAE
- 4b. Eyes on left side of head CYNOGLOSSIDAE
- 5a. Pelvic fin on eyed side generally much longer than that of blind side BOTHIDAE
- 5b. Pelvic fin bases short, that of blind side almost equal to eyed side PARALICHTHYIDAE

Family PSETTODIDAE (Indian Halibuts)

Body oval, flat and highly thick with eyes on either left or right side. The upper eye very close to dorsal margin of body. Mouth large, maxilla extends considerably beyond posterior border of lower eye. Single dorsal fin, long; its origin well behind eyes; anterior fin rays spinous. Lateral line almost straight, with 70 to 75 scales.

Species known to occur in Orissa

Psettodes erumei (Schneider) (Indian Halibut)

Fisheries information : The Indian halibut is an important food fish, but occurs in small quantities. It attains about 60 cm length.

Family CITHARIDAE (Citharids, Flounders)

A family of flatfishes with eyes on either left side or right side of the body. Branchiostegal membranes separated from each other. Vomer with teeth. Dorsal fin origin in front of upper eyes. Pelvic fins with 1 flexible spine and 5 soft rays and its base short. Anus placed on eyed side.

Species known to occur in Orissa

Brachypleura novaezeelandiae Gunther (Yellow dabbled flounder)

Fisheries information : This species is of no fishery value.

Family BOTHIDAE (Lefteye flounders)

Body flat. Eyes on left side. Mouth asymmetrical; teeth in jaws. Preopercle exposed, its hind margin free and visible. Pectoral and pelvic fins present, rays not branched. Dorsal fin long, inserted above or anterior to eyes, continued up to caudal fin base. Anal fin long, its origin below pectoral fins and continued up to caudal fin base. Pelvic fin base on blind side shorter than that of eyed side. Caudal fin separate, free from dorsal and anal fins. Fins without spines. Anus on blind side. Lateral line single, sometimes obscure or absent on blind side.

Species known to occur in Orissa

1. *Arnoglossus macrolophus* Alcock (Large-crested left-eye flounder)
2. *Bothus myriaster* (Temminck & Schlegel) (Oval flounder)
3. *Crossorhombus azureus* (Alcock) (Blue spotted flounder)
4. *Laeops guentheri* Alcock (Brown flounder)
5. *L. lophoptera* (Alcock) (NA)
6. *L. macrophthalmus* (Alcock) (NA)
7. *Psettina brevirectis* (Alcock) (NA)

Key to species

- 1a. All upper jaw teeth and nearly all lower jaw teeth confined to blind side. Mouth small; upper jaw 3.6 to 4.6 times in head length 2
- 1b. Teeth present on both sides of jaws. Mouth larger; upper jaw 2.6 to 4.0 times in head 4
- 2a. Teeth in villiform bands. Maxilla ends before anterior edge of eye. Dorsal fin with 97 to 102 rays and anal fin with 77 to 81 rays *L. guentheri*
- 2b. Teeth uniserial on jaws. Maxilla extends below anterior edge of eye. Dorsal fin with 85 to 90 rays and anal fin with 67 to 70 rays 3
- 3a. Longest dorsal fin ray shorter than head. Eye 3.7 to 4.2 times in head *L. macrophthalmus*

- 3b. Longest dorsal fin ray about as long as head. Eye about 5.2 times in head *L. lophoptera*
- 4a. Eyes separated by a more or less concave space, larger in males 5
- 4a. Eyes close together, separated by a bony ridge or narrow concave space, equally developed in males and females 6
- 5a. Lateral line scales more than 69. Scales mostly cycloid on ocular side, feebly ctenoid at edges of body *B. myriaster*
- 5b. Lateral line scales 36 to 67. Scales on ocular side strongly ctenoid, no cycloid scale on ocular side *C. azureus*
- 6a. Scales of eyed side strongly ctenoid (with elongate ctenii) *P. brevirectis*
- 6b. Scales of eyed side cycloid or feebly ctenoid (with short ctenii) *A. macrolophus*

Fisheries information : The left-eye flounders are of little commercial importance. These fishes are caught as bycatch in the commercial catches. Flesh excellent to eat.

Family PARALICHTHYIDAE (Large-tooth flounders)

Body flat with eyes on left side. Mouth asymmetrical; jaws with teeth, well developed on blind side. Preopercle exposed, its hind margin free and visible. Pectoral and pelvic fin rays branched. Pelvic fin bases short and nearly symmetrical. Dorsal fin long, inserted above or anterior to eyes. Anal fin long, originating below pectoral fins. Caudal fin free from dorsal and anal fins. Fins without spines. Lateral line single.

Species known to occur in Orissa

1. *Pseudorhombus arsius* (Hamolton) (Large toothed flounder)
2. *P. dupliciocellatus* Regan (Ocellated flounder)
3. *P. elevatus* Ogilby (Deep flounder)
4. *P. javanicus* (Bleeker) (Javan flounder)
5. *P. malayanus* Bleeker (Malayan flounder)
6. *P. micrognathus* Norman (NA)
7. *P. triocellatus* (Schneider) (Three spotted flounder)

Key to species

- 1a. Gill rakers palmate (short, strongly spinulate), as broad as long *P. dupliciocellatus*

- 1b. Gill rakers lanceolate, longer than broad 2
- 2a. Anterior rays of dorsal fin longer than those that follow. Gillrakers 23 to 25 on lower arm of first arch *P. triocellatus*
- 2b. Anterior rays of dorsal fin not prolonged. Gillrakers 8 to 15 on lower arm of first arch 3
- 3a. Scales on blind side of body ctenoid *P. malayanus*
- 3b. Scales on blind side of body cycloid 4
- 4a. Teeth strong, rather widely set, canines enlarged, 6 to 13 teeth on blind side of lower jaw *P. arsius*
- 4b. Teeth smaller, more close set, not much enlarged anteriorly, more than 24 teeth on blind side of lower jaw 5
- 5a. Origin of dorsal fin above space between nostrils or above posterior nostril *P. micrognathus*
- 5b. Origin of dorsal fin above or a little in advance of anterior nostril 6
- 6a. Scales ctenoid on ocular side. Upper profile on head notched *P. elevatus*
- 6b. Scales on ocular side more or less ctenoid anteriorly, mostly cycloid posteriorly. Upper profile of head scarcely notched, usually evenly curved *P. javanicus*

Fisheries information : The large-tooth flounders are of minor commercial importance. Flesh excellent for human consumption. These fishes are usually caught as bycatch of bottom trawl operations.

Remarks : These fishes are placed under family Bothidae till recent past in literature.

Family CYNOGLOSSIDAE (Tongue soles)

Tongue-shaped flat fishes with eyes sinistral (left side of head). Mouth asymmetrical, lips fringed in some species; rostral hook present below mouth. Preopercle margin not free, covered with skin and scales. Dorsal fin inserted on head, both dorsal and anal fins united with caudal fin. Pectoral fins absent. Only left pelvic fins present. Dorsal and pelvic fins without spiny rays. Lateral line variable 1 to 3 on ocular side and 0 to 2 on blind side.

Species known to occur in Orissa

1. *Cynoglossus arel* (Schneider) (Largescale tongue sole)
2. *C. bilineatus* (Lacepede) (Four lined tongue sole)

3. *C. carpenteri* Alcock (Hooktongue sole)
4. *C. cynoglossus* (Hamilton) (Gangetic tongue sole)
5. *C. itinus* (Snyder) (NA)
6. *C. kopsii* (Bleeker) (Shortheaded tongue sole)
7. *C. lida* (Bleeker) (Shoulderspot tongue sole)
8. *C. lingua* Hamilton (Long tongue sole)
9. *C. macrostomus* Norman (Malabar tongue sole)
10. *C. monopus* (Bleeker) (NA)
11. *C. puncticeps* (Richardson) (Speckled tongue sole)
12. *C. semifasciatus* Day (Indian tongue sole)
13. *Paraplagusia bilineata* (Bloch) (Doublelined tongue sole)
14. *P. blochii* (Bleeker) (Bloch's tongue sole)

Key to species

- 1a. Lips of ocular side with fringe of tentacles 2
- 1b. Lips smooth, not fringed 3
- 2a. Rostral hooks long, reaching beyond vertical from posterior border of lower eye. Scales between upper and middle lateral lines 16 to 19 *P. bilineata*
- 2b. Rostral hooks short, not reaching to below posterior border of lower eye. Scales between upper and middle lateral lines 13 to 15 *P. blochii*
- 3a. Single nostril on ocular side. Caudal fin with 8 rays *C. itinus*
- 3b. Two nostrils on ocular side. Caudal fin with 10 or 12 rays 4
- 4a. Scales on blind side of the body cycloid 5
- 4b. Scales on blind side of body ctenoid 8
- 5a. Two lateral lines on blind side. Caudal fin with 12 rays *C. bilineatus*
- 5b. No lateral line on blind side. Caudal fin with 10 rays 6
- 6a. Three lateral lines on ocular side of body. More than 14 scale rows between upper and middle lateral lines *C. carpenteri*
- 6b. Two lateral lines on ocular side of body. Less than 13 scale rows between upper and middle lateral lines 7
- 7a. Less than 10 scales (7 to 9) between upper and middle lateral lines *C. arel*

- 7b. More than 10 scales (11 to 12) between upper and middle lateral lines *C. lingua*
- 8a. Eyes pedunculate. Both nostrils situated close together in front of eyes *C. monopus*
- 8b. Eyes non-pedunculate. Nostrils separated by a gap, posterior nostril situated in interorbital space or between anterior part of eyes 9
- 9a. Maxillary extending to middle or posterior half of fixed eye 10
- 9b. Maxillary extending to posterior border of fixed eye or beyond 11
- 10a. Inter lateral line scale rows 7 to 12 *C. kopsii*
- 10b. Inter lateral line scale rows 15 to 19 *C. punticeps*
- 11a. Rostral hook long, extending to as far as below middle of fixed eye. Angle of mouth distinctly nearer to gill openings than tip of snout *C. lida*
- 11b. Rostral hook short, extending to front of anterior nostril or short of anterior border of fixed eye. Angle of mouth nearer to tip of snout than to gill openings 12
- 12a. Angle of mouth extending to below vertical from rear half of fixed eye. Snout obtusely pointed and longer *C. cynoglossus*
- 12b. Angle of mouth extending to below vertical from posterior border of fixed eye or beyond. Snout rounded and shorter 13
- 13a. Midlateral scale rows 80 to 92. Inter lateral line scale rows 14 to 16. Fins blackish *C. macrostomus*
- 13b. Midlateral scale rows 70 to 78. Inter lateral line scale rows 11 to 14. Fins pale *C. semifasciatus*

Fisheries information : The tongue soles are of minor commercial importance.

Family SOLEIDAE (Soles)

Body oval or almost elongate and highly compressed flat fish with eyes dextral (on right side of body). Mouth small and asymmetrical, terminal or slightly inferior. Snout sometimes hook-shaped. Preopercle without a free border, embedded in skin. Dorsal fin extends on head to above eye or forward; dorsal and anal fins free or confluent with caudal fin. Pectoral fins generally absent in adults. Pelvic fins sometimes asymmetrical, either free or joined to anal fin. Lateral line single and straight on body, sometimes branched on head. Scales moderately large, cycloid or ctenoid; sometimes modified into skin flaps fringed with sensory filaments.

Species known to occur in Orissa

1. *Aesopia cornuta* Kaup (Horned sole)
2. *Aseraggodess cyaneus* (Alcock) (NA)
3. *Brachirus macrolepis* (Bleeker) (NA)
4. *B. orientalis* (Bloch) (Oriental sole)
5. *B. panoides* (Bleeker) (NA))
6. *Heteromycteris oculus* (Alcock) (Alcock's cape sole)
7. *Pardachirus marmoratus* (Lacepede) (Finless sole)
8. *P. pavoninus* (Lacepede) (Peacock sole))
9. *Solea elongata* Day (Elongate sole)
10. *S. ovata* Richardson (Ovate sole)
11. *Synaptura albomaculata* Kaup (Kaup's sole)
12. *Synaptura commersonia* (Lacepede) (Commerson's sole)
13. *Zebrias altipinnis* Alcock (Alcock's zebra sole)
14. *Z. annandalei* Talwar & Chakrapani (NA)
15. *Z. quagga* (Kaup) (Quagga sole)
16. *Z. synapturoides* (Jenkins) (Jenkins sole)

Key to species

- 1a. Caudal fin completely separate from dorsal and anal fins 2
- 1b. Caudal fin confluent with dorsal and anal fins 7
- 2a. Snout forming a distinct hook *H. oculus*
- 2b. Snout not forming a distinct hook or only slightly hooked 3
- 3a. Pectoral fins well-developed. Pelvic fins of ocular side short based, as on blind side. No pore at base of dorsal and anal fin rays 4
- 3b. Pectoral fins absent. Pelvic fin of ocular side with a long base. Dorsal and anal fin rays with a pore each that produce a milky secretion 5
- 4a. Body ovate, its depth 2.0 to 2.2 times in total length. Dorsal fin with 58 to 67 rays. Anal fin with 41 to 51 rays *S. ovata*
- 4b. Body elongate, its depth 2.5 to 3.0 times in total length. Dorsal fin with 67 to 77 rays. Anal fin with 52 to 63 rays *S. elongata*
- 5a. Pelvic fin base of ocular side short, not joined to genital papilla or anal fin
..... *A. cyaneus*

- 5b. Pelvic fin base of ocular side long, joined to genital papilla or anal fin 6
- 6a. Scales on ocular side of head without marginal spinules. Lateral line with about 95 scales *P. marmorata*
- 6b. Scales on ocular side of head with marginal spinules. Lateral line with 75 to 85 scales *P. pavoninus*
- 7a. Pectoral fins well developed. Opercular membrane not joined to pectoral fins. No dark bars on body 8
- 7b. Left pectoral fin (on blind side) rudimentary or absent. Opercular membranes of both sides of body joined to upper rays of pectoral fins. Body with blackish brown bars 12
- 8a. Body elongate. A bony process on snout 9
- 8b. Body oblong. No bony process on snout 10
- 9a. A tentacle present between nostrils. Scales on head and body similar in size. Two or 3 rows of white spots on ocular side of body *S. albomaculata*
- 9b. No tentacles between nostrils. Scales on head and nape of ocular (eyed) side larger than those on body. No white spots on ocular side *S. commersonia*
- 10a. Pectoral fins of both sides well-developed *B. orientalis*
- 10b. Pectoral fin of right side rudimentary 11
- 11a. Eyes separated by a scaly interorbital space *B. panoides*
- 11b. Eyes continuous, without scaly interorbital space *B. macrolepis*
- 12a. First rays of dorsal fin enlarged and free *A. cornuta*
- 12b. First ray of dorsal fin not enlarged and free 13
- 13a. Eyes with small tentacles. On ocular side of body 10 or 11 cross bands *Z. quagga*
- 13b. Eyes without tentacles. Cross bands 12 or more on ocular side 14
- 14a. Posterior rays of dorsal and anal fins completely confluent with caudal fin; outline of fins continuous around caudal fin. Body with 14 unpaired cross-bars *Z. altipinnis*
- 14b. Posterior rays of dorsal and anal fins partly confluent with caudal fin, joined only to basal half of caudal fin; outline of fins not continuous 15

- 15a. Upper two rays of right pectoral fin abruptly produced. Lateral line scales 102 to 105. Body with 22 to 24 cross bands *Z. annandalei*
- 15b. Upper rays of right pectoral fin not produced. Lateral line scales 61 to 90. Body with 13 cross bands *Z. synapturoides*

Fisheries information : The soles are of little commercial importance. A few species are of some commercial value. These fishes are marketed fresh and dried salted.

Remarks : Occurrence of *Zebrias zebra* (Bloch) as reported in Mishra *et al.* (1999) is doubtful, and that probably based on specimens of *Z. quagga*.

Order TETRAODONTIFORMES

Key to families

- 1a. Teeth fused forming a parrot-like beak. Pelvic fins and dorsal fins without spines 2
- 1b. Teeth not fused to form a parrot-like beak as in 1a 3
- 2a. Body covered with spines, capable of great inflation. Teeth fused into a single beak-like structure in each jaw, without a median suture DIODONTIDAE
- 2b. Body naked or with only small scattered prickles. Teeth fused to form a beak-like structure, but separated by a median suture so that they are literally 'four toothed' TETRAODONTIDAE
- 3a. Body almost completely encased in a bony shell or carapace formed of enlarged, thickened scale plates, generally hexagonal in shape. Spinous dorsal fin absent OSTRACIIDAE
- 3b. Body not encased in a bony shell or carapace like as in 3a. Spinous dorsal fin present 4
- 4a. Pelvic fins represented by a pair of strong spines. Dorsal fin with 6 spines (generally only 5 visible, the 6th being very small) TRIACANTHIDAE
- 4b. Pelvic fins and spines very small or absent. Dorsal fin with 2 or 3 spines 5
- 5a. Dorsal fin with 2 spines, only first spine large and prominent. Body covered by smooth to rough shagreen like skin consisting of small scales armed with 1 to many fine spinules MONACANTHIDAE
- 5b. Dorsal fin with 3 visible spines. Body covered with very thick, tough skin with large rectilinear scale plates easily discernible as individual units BALISTIDAE

Family TRIACANTHIDAE (Tripodfishes)

Body compressed and deep with numerous scales not normally visible individually. Each scale with upright spinules. Mouth small and generally terminal. Dorsal fin with 6 spines (generally 5 visible only, 6th being very small) and 20 to 25 rays. Anal fin rays 15 to 20. Pelvic fins represented by a large spine which is movably articulated with anterior end of pelvis and capable of being locked erect at right angles to body. Caudal fin deeply forked. Caudal peduncle distinctly tapered.

Species known to occur in Orissa

- 1 *Pseudotriacanthus strigilifer* (Cantor) (Long spines tripodfish)
2. *Triacanthus biaculeatus* (Bloch) (Short-nosed tripodfish)
3. *Tripodichthys oxycephalus* (Bleeker) (Short-tail tripodfish)
4. *Trixiphichthys weberi* (Chaudhuri) (Blacktip tripodfish)

Key to species

- 1a. Ventral surface of pelvis between pelvic spines much wider anteriorly than posteriorly, distinctly tapered to a point 2
- 1b. Ventral surface of pelvis between pelvic spines almost as wide anteriorly as posteriorly, not distinctly tapered to a point..... 3
- 2a. Anal fin base about 2 times in soft dorsal fin base. Second dorsal fin spine more than $\frac{1}{2}$ length of 1st spine. Scales with a series of high, transverse ridges *P. strigilifer*
- 2b. Anal fin base 1.5 to 1.7 times in soft dorsal fin base. Second dorsal fin spine less than $\frac{1}{2}$ length of 1st spine. Scales with low, cruciform ridge..... *T. oxycephalus*
- 3a. Distance between hind edge of eye and gill opening short, 5.2 to 6.8% of standard length, slightly more than $\frac{1}{2}$ diameter of eye. Snout long, 3.6 to 4.7 times in standard length, distinctly concave *T. weberi*
- 3b. Distance between hind edge of eye and gill opening long, 7.0 to 9.9% of standard length, about equal to diameter of eye. Snout short, 4.8 to 6.4 times in standard length, straight or slightly concave *T. biaculeatus*

Fisheries information : The tripodfishes are of no commercial importance. These fishes are sometimes found in the commercial fish catches.

Remarks : *T. brevirostris* Schlegel is considered as junior synonym of *T. biaculeatus* (Bloch) (Hutchins, 1984).

Family BALISTIDAE
(Trigerfishes)

Body usually deep and compressed, covered with thick, tough skin with large rectilinear scale plates. Scales above pectoral fin base usually enlarged and slightly separated, forming a flexible tympanum. Mouth small and terminal. Dorsal fin two, the first with 3 spines and second spine more than one half the length of the first; the spine capable of being locked in an upright position of erection by the second. Most dorsal, anal and pectoral rays branched. Pelvic fins and spines very small or absent, represented by a series of 4 pairs of enlarged scales encasing the end of pelvis.

Species known to occur in Orissa

Abalistes stellatus (Lacepede) (Starry triggerfish)

Fisheries information : The trigger or filefishes are of no commercial importance. These fishes are caught as bycatch in the commercial catches.

Family MONACANTHIDAE
(Leatherjackets)

Body fusiform, deep and compressed covered by smooth to rough shagreen like skin consisting of minute to small scales armed with 1 to many fin spinules. Mouth small, terminal with pointed teeth not fused together. Gill openings a small pore on sides.

Species known to occur in Orissa

1. *Anacanthus barbatus* Gray (Barbeled leatherjacket)
2. *Paramonacanthus choirocephalus* (Bleeker) (Pigface leatherjacket)

Key to species

- 1a. A fleshy barbel on lower jaw *A. barbatus*
- 1b. No fleshy barbel on lower jaw *P. choirocephalus*

Fisheries information : The unicorn leather jacket is of no commercial value. This species is caught as bycatch in the commercial catches.

Family OSTRACIIDAE
(Boxfish, Cowfish)

Body elongate, almost completely covered in a bony shell or carapace formed of enlarged, thickened scale/ plates, usually hexagonal in shape and firmly sutured to one another. The carapace has opening for mouth, eyes, gill slits, pectoral, dorsal and anal fins and for the

flexible caudal peduncle. Scale plate sometimes with surface granulations and in some species these are enlarged into conspicuous carapace spine above eye or long ventrolateral or dorsal angles of body. Mouth small, terminal with fleshy lips. Spinous dorsal and pelvic fins absent. Caudal fin long.

Species known to occur in Orissa

1. *Rhynchostracion nasus* Bloch (Small-nosed boxfish)
2. *Tetrosomus gibbosus* (Linnaeus) (Humpback boxfish)

Key to species

- 1a. Body triangular in cross section, carapace 5 angled (two dorsolateral ridges low and indistinct). No dark spots on carapace *T. gibbosus*
- 1b. Body tetra angular in cross section, carapace 5 angled with a poorly defined central ridge along back. A small projection directly above mouth followed by a long concave profile. Round black spots irregularly scattered on carapace *R. nasus*

Fisheries information : The boxfishes and cowfishes are of no commercial importance. These fishes are caught in the commercial catches as bycatch.

Remarks : *R. nasus* is placed under genus *Ostracion* by some authors.

Family TETRAODONTIDAE (Pufferfishes)

Body naked or with only short prickles. Body heavy and blunt capable of rapid inflation by intake of water (or air). Jaws modified to form a beak of heavy, powerful teeth, 2 above and 2 below. Gill openings simple slits anterior to pectoral fins. Pelvic fins absent. Dorsal and anal fins inserted far posteriorly, without spines, but each with 7 to 15 rays. Caudal fin truncate, rounded or emarginate to almost lunate.

Species known to occur in Orissa

1. *Arothron immaculatus* (Bloch & Schneider) (Immaculate blowfish)
2. *A. reticularis* (Bloch & Schneider) (Reticulated pufferfish)
3. *A. stellatus* (Bloch & Schneider) (Starry blowfish)
4. *Canthigaster margaritata* (Ruppell) (Ocellated toad fish)
5. *Chelonodon fluviatilis* (Hamilton) (Estuarine blowfish)
6. *C. patoca* (Hamilton) (Gangetic blowfish)
7. *Lagocephalus lunaris* (Bloch & Schneider) (Green rough-backed blowfish)
8. *L. spadiceus* (Richardson) (Chinese pufferfish)

9. *Takifugu oblongus* (Bloch) (Oblong blowfish)
10. *Tetraodon cutcutia* (Hamilton) (Ocellated pufferfish)

Key to species

- 1a. Snout long, 1.3 to 1.8 times in head length. A single, inconspicuous nostril on each side of snout *C. margaritata*
- 1b. Snout short, 1.8 to 3.1 times in head length. Nasal organ variable, not as in 1a 2
- 2a. Nasal organ a short rounded tube with a terminal opening, not or only scarcely two-lipped *T. cutcutia*
- 2b. Nasal organ an upright sac with two openings, or a solid bifid tentacle, or an upraised cup with two fleshy lobes 3
- 3a. Nasal organ covered by a small sac with two openings 4
- 3b. Nasal organ not covered by a small sac, but with single opening 6
- 4a. Interorbital space longer than snout. Caudal peduncle depth subequal to its length. Caudal fin truncate *T. oblongus*
- 4b. Interorbital space shorter than snout. Caudal peduncle depth $\frac{1}{2}$ or less of its length. Caudal fin emarginate or truncate 5
- 5a. Spinules on dorsal surface of body extend to dorsal fin *L. lunaris*
- 5b. Spinules on dorsal surface of body extend only about halfway from interorbital region to dorsal fin origin *L. spadiceus*
- 6a. Nasal organs in form of a depression with slightly raised margin expanded before and behind into a pair of elongate flaps, or cup-shaped with front and rear edges produced into broadly rounded flaps. Two lateral lines 7
- 6b. Nasal organ a bifid tentacle, the opposing surface of each tentacle with minute pits. Single lateral line 8
- 7a. Nasal organ a depression with slightly raised margin, expanded before and behind into a pair of triangular flaps. Dorsal fin rays 9 or 10. Anal fin rays 8 to 10 *C. patoca*
- 7b. Nasal organ cup-like, with 2 rounded lobes at its tip. Dorsal fin rays 14 to 16. Anal fin rays 12 to 15 *C. fluviatilis*
- 8a. Margins of caudal fin black. No marks on body except a dark blotch at base of pectoral fin *A. immaculatus*

- 8b. Margins of caudal fin not black. Body with various markings 11
- 9a. Anus in a black area. Upper part of body spotted, ventral part in adults uniform, in juveniles with wide bands *A. stellatus*
- 9b. Anus not in black area. Dark longitudinal band on abdomen ascending to cheeks and snout *A. reticularis*

Fisheries information : The pufferfishes are of no commercial importance. These fishes are sometimes found in the commercial catches.

Family DIODONTIDAE (Porcupinefish)

Body fusiform and capable of inflation. Head broad and blunt. Mouth terminal with two fused teeth in jaws to form a beak-like structure without a median suture dividing upper and lower jaws into right and left halves. Dorsal and anal fins without spines, inserted far back on body. Pelvic fins absent. Caudal fin rounded. Body covered with well developed sharp spines. Long spines are generally erectile and two rooted, while short spines are fixed in an erect position by three rooted bases.

Species known to occur in Orissa

Cylichthys orbicularis Bloch (Birdbeak burrfish)

Fisheries information : The porcupine or ballonfishes are of no commercial value. These fishes are caught along with the commercial fishes as bycatch.

SUMMARY

Orissa, one of the states in the eastern India, situated on the bank of the Bay of Bengal. It has a coastal line of 482 km long. The coastal line of this state were visited by our survey parties covering almost all the fish landing centres in order to get fish collections for study. The present work is a synthesis of the study of materials collected during our survey tour to Orissa and those present in the National Zoological Collections, Z. S. I., Kolkata, materials collected during East Coast Survey and present at Marine Biological Station, Z. S. I., Chennai and the fishes already known to occur in this state as depicted in the literature. This work has recorded 605 species belonging to 138 families and 27 orders. A brief description of all the families has been provided. The systematic key to the orders, families, genera and species have been incorporated in this study for easy segregation of the species in order to identify them to ascertain their taxonomic and biodiversity significance. The common English names of the species are given within parentheses where ever it is known. If the English name of a species is not known, it has been marked as "NA" immediately after the scientific name of the species. On consultation with Menon (1999), Molur and Walker (1998) and

Eschmeyer (2005) it is observed that at least 38 species out of 605 species known to occur in this state should be designated as the threatened species. The names of the those species are as follows: *S. fasciatum*, *C. limbatus*, *G. gangeticus*, *A. cuspidata*, *P. microdon*, *P. pectinata*, *P. zijssoni*, *R. djiddensis*, *U. asperimus*, *A. nicholfii*, *C. talabonoides*, *M. cinereus*, *T. ilisha*, *M. bleekeri*, *M. vittatus*, *O. bimaculatus*, *A. coila*, *E. vacha*, *P. atherinoides*, *P. pangasius*, *C. batrachus*, *H. fossilis*, *A. dussunieri*, *A. sona*, *A. tenuispinis*, *A. thalassinus*, *L. melinoptera*, *R. corsula*, *H. fuscus*, *H. hystrix*, *E. lanceolatus*, *P. argenteus*, *O. biauritus*, *P. diacanthus*, *A. testudineus*, *C. orientalis*, *F. heptadactyla*, and *P. indicus*. The work is also appended with a table containing the list of the species described from Orissa coast as new to science and their current status.

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Table 1. Fishes originally described as new to science from Orissa coast

Sl. No.	Original Name	Author	Current Status	Status Reference
1.	<i>Amblyopus arctocephalus</i>	Alcock, 1890	<i>Amblyotrypauchen arctocephalus</i> (Alcock)	Larson, 2000
2.	<i>Arius satparanus</i>	Chaudhuri, 1916a	<i>Arius tenuispinis</i> Day	Jayaram, 1999
3.	<i>Arnoglossus brevirectis</i>	Alcock, 1890	<i>Psettina brevirectis</i> (Alcock)	Hensley, 1986
4.	<i>Arnoglossus macrolophus</i>	Alcock, 1889	<i>Arnoglossus macrolophus</i> Alcock	Munro, 1955
5.	<i>Bathymyrus echinorhynchus</i>	Alcock, 1889	<i>Bathymyrus echinorhynchus</i> Alcock	Castle, 1986
6.	<i>Bathyonus glutinosus</i>	Alcock, 1890	<i>Bassozetus glutinosus</i> (Alcock)	Nielson <i>et al.</i> , 1999
7.	<i>Bathyseriola cyanea</i>	Alcock, 1890	<i>Psenopsis cyanea</i> (Alcock)	Haedrich, 1984
8.	<i>Bengalichthys impennis</i>	Annandale, 1909	<i>Narke dypterygia</i> (Bloch & Schneider)	Eschmeyer, 1998
9.	<i>Brachypleura xanthosticta</i>	Alcock, 1889	<i>Brachypleura novaezeelandiae</i> Gunther	Weber & de Beaufort, 1929
10.	<i>Callionymus carebares</i>	Alcock, 1890	<i>Callionymus carebares</i> Alcock	Randall, 1995
11.	<i>Centropristis investigatoris</i>	Alcock, 1890	<i>Chelidoperca investigatoris</i> (Alcock)	Eschmeyer, 2003
12.	<i>Ceratoptera orissa</i>	Llyod, 1908	<i>Manta birostris</i> (Walbaum)	Misra, 1969
13.	<i>Ctenogobius cylindriceps</i>	Hora, 1923	<i>Oligolepis cylindriceps</i> (Hora)	Talwar & Jhingran, 1991
14.	<i>Ctenogobius dentifer</i>	Hora, 1923	<i>Acentrogobius cyanomos</i> (Bleeker)	Talwar & Jhingran, 1991
15.	<i>Ctenogobius globiceps</i>	Hora, 1923	<i>Drombus globiceps</i> (Hora)	Kottelat <i>et al.</i> , 1993
16.	<i>Ctenogobius minima</i>	Hora, 1923	<i>Stigmatogobius minima</i> (Hora)	Talwar & Jhingran, 1991
17.	<i>Cynoglossus carpenteri</i>	Alcock, 1889	<i>Cynoglossus carpenteri</i> Alcock	Menon, 1977
18.	<i>Cynoglossus intermedius</i>	Alcock, 1889	<i>Cynoglossus lida</i> (Bleeker)	Menon, 1977
19.	<i>Cynoglossus praecisus</i>	Alcock, 1890	<i>Cynoglossus kopsii</i> (Bleeker)	Menon, 1977
20.	<i>Cynoglossus versicolor</i>	Alcock, 1890	<i>Cynoglossus kopsii</i> (Bleeker)	Menon, 1977
21.	<i>Engraulis annandalei</i>	Chaudhuri, 1916a	<i>Thryssa purava</i> (Hamilton)	Whitehead, 1985
22.	<i>Engraulis kempii</i>	Chaudhuri, 1916a	<i>Thryssa purava</i> (Hamilton)	Whitehead, 1985

Sl. No.	Original Name	Author	Current Status	Status Reference
23.	<i>Engraulis rambhae</i>	Chaudhuri, 1916a	<i>Thryssa purava</i> (Hamilton)	Whitehead, 1985
24.	<i>Glossogobius mas</i>	Hora, 1923	<i>Glossogobius mas</i> Hora	Rao, 1995
25.	<i>Gobius ckilensis</i>	Jenkins, 1910	<i>Pseudogobius javanicus</i> (Bleeker)	Larson, 2001
26.	<i>Gobius cometus</i>	Alcock, 1890	<i>Obliquogobius cometus</i> (Alcock)	Koumans, 1941
27.	<i>Gobius ostreicola</i>	Chaudhuri, 1916	<i>Bathygobius ostreicola</i> (Chaudhuri)	Talwar & Jhingran, 1991
28.	<i>Haliutaea indica</i>	Annandale & Jenkins, 1910	<i>Haliutaea indica</i> Annandale & Jenkins	De Beaufort & Briggs, 1953
29.	<i>Hippocampus brachyrhynchus</i>	Dunker, 1914	<i>Hippocampus fuscus</i> Ruppell	Lourie <i>et al.</i> , 1999
30.	<i>Leiognathus indicus</i>	Singh & Talwar, 1978	<i>Leiognathus splendens</i> (Cuvier)	Present study
31.	<i>Lophius indicus</i>	Alcock, 1889	<i>Lophiomus setigerus</i> (Vahl)	Caruso, 1983
32.	<i>Macrurus hoskynii</i>	Alcock, 1890	<i>Coryphaenoides hoskynii</i> (Alcock)	Shcherbachev & Iwamoto, 1995
33.	<i>Micrapocryptes fragilis</i>	Hora, 1923	<i>Gobiopterus chuno</i> (Hamilton)	Talwar & Jhingran, 1991
34.	<i>Minous coccineus</i>	Alcock, 1889	<i>Minous coccineus</i> Alcock	Eschmeyer, 1986
35.	<i>Myliobatis niechofii</i> var. <i>cornifera</i>	Annandale, 1909	? <i>Myliobatis nichofii</i>	Need further study
36.	<i>Neobythites pterotus</i>	Alcock, 1890	<i>Holcomycterinus pterotus</i> (Alcock)	Nielsen <i>et al.</i> , 1999
37.	<i>Parascobrops pellucidus</i>	Alcock, 1889	<i>Synagrops pellucidus</i> (Alcock)	Heemstra & Tarr 1984
38.	<i>Petroscirtes bhattacharyee</i>	Chaudhuri, 1916	<i>Omobranchus zebra</i> (Bleeker)	Talwar & Jhingran, 1991
39.	<i>Pisodonophis chilensis</i>	Chaudhuri, 1916b	<i>Pisodonophis Chilensis</i> Chaudhuri	Jayaram, 1999
40.	<i>Ponerodon vastator</i>	Alcock, 1890	<i>Chiasmodon niger</i> Johnson	Johnson & Keene,
41.	<i>Prionotus alepis</i>	Alcock, 1889	<i>Pterygotrigla hemisticta</i> (Temminck & Schl.)	Richards, 1999
42.	<i>Psettyllis ocellata</i>	Alcock, 1890	<i>Bothus ovalis</i> Regan = <i>Bothus myriaster</i> (Temminck & Schl.)	Munro, 1955/ Hensley, 1986

Sl. No.	Original Name	Author	Current Status	Status Reference
43.	<i>Psettyllis pellucida</i>	Alcock, 1890	<i>Bothus ovalis</i> Regan = <i>Bothus myriaster</i> (Temm. & Schl.)	Norman, 1927/ Hensley, 1986
44.	<i>Pseudorhombus micrognathus</i>	Norman, 1927	<i>Pseudorhombus micrognathus</i> Norman	Talwar & Kacker, 1984
45.	<i>Rhomboidichthys azureus</i>	Alcock, 1889	<i>Crossorhombus azureus</i> (Alcock)	Munro, 1955
46.	<i>Saurenhelys petersi</i>	Day, 1878	<i>Saurenhelys petersi</i> Day	Day, 1878
47.	<i>Sciaena ophiceps</i>	Alcock, 1889	<i>Chrysochir aureus</i> (Richardson)	Talwar, 1995
48.	<i>Sciaenectes lophoptera</i>	Alcock, 1889	<i>Laeops lophoptera</i>	Norman, 1927
49.	<i>Scopelus (Myctophum) pterotus</i>	Alcock, 1890	<i>Bentho sema pterotum</i> (Alcock)	Hulley, 1986
50.	<i>Sebastes muciparus</i>	Alcock, 1889	<i>Scorpaenodes muciparus</i> (Alcock)	Eschmeyer, 1969
51.	<i>Solea cyanea</i>	Alcock, 1890	<i>Aseraggodes cyaneus</i> (Alcock)	Norman, 1928
52.	<i>Solea oculus</i>	Alcock, 1889	<i>Heteromycteris oculus</i> (Alcock)	De Bruin <i>et al.</i> , 1995
53.	<i>Solea synapturoides</i>	Jenkins, 1910	<i>Zebrias synapturoides</i> (Jenkins)	Menon, 1984
54.	<i>Sphyraena raghava</i>	Chaudhuri, 1917	<i>Sphyraena putnamae</i> Jordan & Seale	Talwar & Jhingran, 1991
55.	<i>Taenioides chilensis</i>	Hora, 1923	<i>Caragobius urolepis</i> (Bleeker)	Murdy & Shibukawa, 2003
56.	<i>Taeniolabrus cyclograptus</i>	Alcock, 1890	<i>Trichonotus cyclograptus</i> (Alcock)	Randall & Tarr, 1984
57.	<i>Tauredophium hextii</i>	Alcock, 1890	<i>Tauredophium hextii</i> Alcock	Nielsen <i>et al.</i> , 1999
58.	<i>Thaumastomias atrox</i>	Alcock, 1890	Uncertain	Need further study
59.	<i>Triacanthus weberi</i>	Chaudhuri, 1910	<i>Triphichthys weberi</i> (Chaudhuri)	Matsuura, 2001
60.	<i>Trygon alcockii</i>	Annandale, 1909	<i>Himantura alcockii</i> (Annandale)	Compagno, 1999
61.	<i>Trygon favus</i>	Annandale, 1909	<i>Himantura fava</i> (Annandale)	Talwar & Jhingran, 1991
62.	<i>Trygon jenkinsii</i>	Annandale, 1909	<i>Himantura jenkinsii</i> (Annandale)	Compagno, 1999
63.	<i>Uranoscopus crassiceps</i>	Alcock, 1890	<i>Uranoscopus crassiceps</i> Alcock	Pietsch, 1989

Sl. No.	Original Name	Author	Current Status	Status Reference
64.	<i>Zebrias annandalei</i>	Talwar & Chakrapani, 1967	<i>Zebrias annandalei</i> Talwar & Chakrapani	Talwar & Kacker, 1984

Note : The present state Orissa lies between 17°48' N to 22°34' N latitudes and 81°24' E to 87°29' E longitudes, while its coast line confined between 19°04' N to 21°36' N. The erstwhile Ganjam district (prior to 1936) was in Madras Presidency and the Ganjam coast was from 18° N northwards. In Alcock (1890) the specimens collected from 'Investigator' station No 96 (18°26' N, 85°24' E) and station No. 97 (18°30' N, 84°46' E) should be treated as from 'Ganjam coast' instead of 'Madras coast' Although those sites of stn. 96 and 97 (north-east of Kalingapatnam) are at present along Srikakulam (Dist.) coast of Andhra Pradesh, but very close to present political boundary of Orissa. All such species having type locality as Ganjam coast are included here.