

2.14 COASTAL FISHES

The Sundarbans have numerous rivers, creeks, and channels which form important fish resources.

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32500 extant fishes

The Raimangal River flows along the Indo-Bangladesh boundary. Such an environment provides an ideal environment for fish diversity (figure 1).

The term 'fish' precisely describes any non-tetrapod craniate (that is, an animal with a skull and, in most cases, a backbone) that has gills throughout life and whose limbs, if any, are in the shape of fins (Nelson 2006). Unlike groupings such as birds or mammals, fish are not a single clade but a paraphyletic collection of taxa, including hagfishes, lampreys, sharks and rays, ray-finned fishes, coelacanths, and lungfishes (Helfman et al. 1997).

Fish come in many shapes and sizes. Tuna, swordfish, and some species of sharks show some warm-blooded adaptations; they can heat their bodies significantly above ambient water temperature. Streamlining and swimming performance varies from fish such as tuna, salmon, and jacks that can cover 10–20 body-lengths per second to species such as eels and rays that swim no more than 0.5 body-lengths per second. Many groups of freshwater fish extract oxygen from the air as well as from the water using a variety of different structures. Lungfish have paired lungs similar to those of tetrapods; gouramis have a structure called the labyrinth organ that performs a similar function, while many catfish such as *Corydoras* extract oxygen through the intestine or stomach (Moyle and Cech 2003). Body shape and the arrangement of the fins are highly variable, covering such seemingly un-fishlike forms as seahorses, pufferfish, anglerfish, and gulpers. Similarly, the surface of the skin may be naked (as in moray eels) or covered with scales of different types, usually defined as placoid (typical of sharks and rays); cosmoid (fossil lungfishes and coelacanths); ganoid (various fossil fishes but also living gars and bichirs); cycloid; and ctenoid (these last two are found on most bony fish). There are even fishes that live mostly on land, for example,

mudskippers. They feed and interact with one another on mudflats and go underwater to hide in their burrows (Froese et al. 2006).

The living fishes belong to class Infraphylum Gnathostomata (jawed vertebrates); the cartilaginous fishes belong to class Chondrichthyes; and the bony fishes belong to class Actinopterygii (ray-finned fish) and class Sarcopterygii (lobe-finned fish), under the superclass Osteichthyes (Nelson 2006). There are almost 28,000 known extant species, of which almost 27,000 are bony fish, with 970 sharks, rays, and chimeras and about 108 hagfishes and lampreys. About 64 families are monotypic, containing only one species. The total of extant species may grow to exceed 32,500 (Nelson 2006).

OVERVIEW

Nelson (2006) estimated 27,977 valid species of fishes world over under 62 orders, 515 families, and 4,494 genera, and the eventual number of extant fish species is projected to be close to 32,500. About 11,952 species or 42.72 percent normally live in freshwater lakes and rivers that cover only 1 percent of the earth's surface and account for a little less than 0.01 percent of its water. The secondary freshwater species numbers 12,457 and the remaining 3,568 species are exclusively marine.

The Indian subcontinent harbors rich ichthyofaunal diversity, comprising about 2,500 species (Talwar 1991), of which 930 species are freshwater inhabitants and 1,570 are marine. The Indian species represent about 11.72 percent of the known fish species of the world (Lakra et. al. 2010).

Species composition and community structure vary from east to west and along the hydrological and salinity gradients (Gopal and Chauhan 2006). Jhingran (1977) recorded a total of 172 species from a variety of sources and also mentioned that the diversity of the Hooghly-Matlah estuary increases along an increasing salinity gradient. Numerous species (estimated to be 400) are known to use mangrove swamps in India as nursery grounds (Gundermann and Popper 1984; McConnell 1987). The number of fish species in the world, India, and the Sundarbans is shown in table 1.

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SPECIES RECORDED FROM INDIA

Table-1: Comparison between the Number of Fish Species in World, India and the Sundarbans:

Group	No. of available species				
	World	India	Percentage	Sundarbans	Percentage
Fishes	29977 (Nelson, 2006)	2500 (Talwar, 1991)	About 11.72% of world spe- cies (Lakra et. al., (2010))	364	About 14.56 % of Indian species About 1.21% of World spe- cies

The Indian Sundarbans at the apex of the Bay of Bengal (between 21°40' N, 88°03' E and 22°40' N, 89°07' E) located on the southern fringe of West Bengal, on the northeast coast of India, is a dynamic environment with a complex of features and biogeochemical properties. The aquatic biodiversity in the Sundarbans delta is largely controlled by freshwater flux, nutrient inputs, and changing environmental conditions such as salinity and temperature. Plankton communities are generally well studied in the deltaic ecosystem over a time scale encompassing more than three decades and show patterns or trends similar to those found in other mangrove ecosystems at a regional and global scale.

SUMMARY

Diversity

The dynamics of the fish communities of the Sundarbans are poorly understood (Rainboth, 1990). Although there are many published works on the fish fauna of different states of India including that of West Bengal, there is no comprehensive account of the fishes recorded from the Sundarbans. However, the works of Talwar et al. (1992); Mukherjee (1995); Das and Nandi (1999); and Gopal and Chauhan (2006) report the fish diversity of the Sundarbans. Compilations of the species listed in these works reveal that 364 species distributed under 215 genera are available in the Sundarbans as against 4,494 genera world over.

364 SPECIES
ARE DISTRIBUTED
UNDER 215 GENERA

It was hypothesized that fish assemblages would vary between mangroves and mudflats and that species richness and abundance would decrease with increasing distance from the mangrove forest. Patterns were expected to be species specific, that is, some species are found in higher numbers in mangroves and others are more abundant in mudflat habitats (Payne and Gillanders 2009).

Species Richness and Functional Groups

Functional type classification is a contemporary topic at the forefront of ecology throughout the world. The species guild is frequently cited as an ecological entity but lacks any formal or testable definition (Adams 1985). A review of literatures worldwide shows that functional groups in fishes have been formed on the basis of diet similarity, namely piscivores, benthivores, planktivores, and so on. Functional guilds of the species representing their families are listed in the annexure.

Gopal and Chauhan (2006) reported 250 fish species from the Indian Sundarbans. Among fin fish, the highly priced Hilsa (*Hilsa ilisha*), Bhetki (*Lates calcarifer*), Bhangon (*Liza tade*), and Mullets (*Liza parsia*) form a lucrative fishery of this region. About 400 fish species (pelagic and demersal) are reportedly available in the combined Sundarbans (India and Bangladesh). The largest fishing ground in the Bay of Bengal is close to the Sundarbans.

A list of the fish species recorded from the Indian Sundarbans is given in the annexure. Table 2 lists the fish families recorded from the Sundarbans together with the number of species under each of them.

Table-2: List of the fish families recorded from the Sundarbans together with the number of species

Sl. No.	Family	No. of Sp.	Sl. No.	Family	No. of Sp.
1	Hemiscyllidae	2	41	Rachycentridae	1
2	Stegostomatidae	1	42	Carangidae	19
3	Rhincodontidae	1	43	Coryphaenidae	1
4	Proscylliidae	1	44	Parastromateidae	1
5	Carcharhinidae	9	45	Leiognathidae	10
6	Sphyrnidae	1	46	Lutjanidae	4
7	Pristidae	3	47	Lobotidae	1
8	Torpedinidae	4	48	Gerreidae	4
9	Rhinobatidae	6	49	Haemulidae	4
10	Dasyatidae	7	50	Sparidae	3
11	Gymnuridae	2	51	Nemipteryidae	3
12	Myliobatidae	2	52	Sciaenidae	25
13	Elopidae	1	53	Mullidae	2
14	Megalopidae	1	54	Toxotidae	1
15	Anguillidae	2	55	Ephippididae	4
16	Moriguidae	2	56	Scatophagidae	1
17	Muraenidae	10	57	Mugilidae	11
18	Muraenesocidae	4	58	Sphyraenidae	2
19	Ophichthidae	3	59	Polynemidae	7
20	Clupeidae	12	60	Uranoscopidae	1
21	Pristigasteridae	8	61	Callionymidae	5
22	Engraulidae	16	62	Blenniidae	2
23	Chirocentridae	1	63	Eleotridae	8
24	Ariidae	15	64	Gobiidae	47
25	Harpadontidae	1	65	Kurtidae	1
26	Synodontidae	1	66	Siganidae	2
27	Bregmacerotidae	1	67	Trichiuridae	6
28	Antennariidae	1	68	Scombridae	3
29	Hemiramphidae	7	69	Stromateidae	2
30	Belonidae	3	70	Psettodidae	1
31	Fistulariidae	1	71	Citharidae	1
32	Syngnathidae	1	72	Bothidae	5
33	Synanceiidae	2	73	Cynoglossidae	9
34	Platycephalidae	1	74	Soleidae	6
35	Ambassidae	2	75	Triacanthidae	3
36	Centropomidae	1	76	Balistidae	1
37	Serranidae	3	77	Ostraciidae	1
38	Teraponidae	3	78	Tetraodontidae	11
39	Sillaginidae	2			
40	Lactariidae	1			

Distribution and Local Community Dependencies

The Sundarbans at present has an estimated water area of 27,085.39 ha under fishing and 19,390.73 ha under aquaculture

in its northern and southern parts, respectively (Das 2009). The estimated total number of inland fisherfolk families in the 24-Parganas South District is 52,917 and 50,897 in the 24-Parganas North District (Government of West Bengal 2005). The 24-

Parganas South District has a marine fisherfolk population of 269,565, with an active fisher population of 70,750, located in 237 villages (CMFRI 2005). Some of the popular commercial fishes are listed in table 3.

Table 3: Commercially important fishes

Scientific name	Common Name	Local name
<i>Lates calcarifer</i>	Sea perches	Bhetki
<i>Johnius spp.</i>	Croakers	Bhola
<i>Mugil cephalus</i>	Mullets	Parse
<i>Polynemus spp.</i>	Threadfins	Tapse
<i>Pampus spp.</i>	Pomfrets	Pomfret
<i>Hilsa ilisha</i>	Hilsa	Ilish
<i>Trichiurus spp.</i>	Ribbonfishes	Rupabati, Patia
<i>Harpodon nehereus</i>	Bombay duck	Nehara, Lote
<i>Cynoglossus spp.</i>	Tongue soles	Pata machh
<i>Arius spp.</i>	Sea cat fishes	Kanta
<i>Mystus spp.</i>	Cat fishes	Tangra
<i>Parastromateus niger</i>	Black pomfret	Baul
<i>Setipinna phasa</i>	Anchovies	Phyasa, Tapra
<i>Coilia dussumieri</i>	Anchovies	Ruli

During winter, a large number of fishermen migrate in groups from different areas of the Hoogly-Matla estuary to practice traditional fishing. They move to suitable areas near the sea or in lower zones to establish fishing camps and remain engaged in bag net fishing till early February. Traditional fishers use rowboats or boats with small diesel engines while fishing in rivers and creeks. Estimation of the number of fishing boats in the region is very difficult as the smaller boats require no registration or license except when fishing within the protected area (Danda 2007).

Sarkar (2009) highlights the processes and procedures of the indigenous fishing communities through time and space to grapple with the eco-environmental setting in making their

living through uninterrupted fishing operations. Around 2,069 km² inside the SBR is considered ideal for riverine fishing using traditional methods (Mukherjee 2007). The Sundarbans being the nursery for nearly 90 percent of the aquatic species of the eastern coast, the coastal fishery of eastern India is dependent upon the Sundarbans (Chandra et al. 2003). Since fishes are active swimmers, they are not confined to particular blocks; all riverine fishes are distributed in all blocks of South 24-Parganas and North 24-Parganas parts of the Sundarbans and coastal fishes are distributed in all blocks of South 24-Parganas. Brackish-water fish farms (*bheries*) are predominant in North 24-Parganas District. Block-wise distribution of important fish landing centers, fishing harbors, and *bheries* are shown in table 4.

Table-4: Distribution of important fish landing centers, fishing harbours and 'bheries'

Blocks	Important Fish Landing Centers	Fishing harbours	Large scale 'Bheries'
Sagar	-	+	-
Namkhana	+	+	-
Patharpur-tima	+	+	-
Mathurapur-I	-	-	-
Mathurapur-II	+	-	-
Canning-II	+	-	-
Kakdwip	+	+	-
Sandesh-khali-I	-	-	+
Sandesh-khali-II	-	-	+
Haroa	-	-	+
Mina-khan	-	-	+

Note: '+' denotes predominant

The main areas of traditional fishing (migratory bag net fishery) are Sagar Island, Frasergunj, Bakkhali, and Kalishthan. The significant inland fish landing centers in the Sundarbans include Canning, Herobhanga, and Gosaba. Other landing centers deemed important by the Fisheries Department, where traditional fishing is predominant, are Kakdwip, Frazerganj, Buroburir tath, Bakkhali, Namkhana, Jambu Island, Chemaguri, Hatipitha, Maragoli, Haribhanga, Sagar, Shikarpur, Gobindapur, Bankimpur, Boatkhali, Roydighi,

Domkhal, Sitarampur, and Kakramari.

Block-wise location of traditional fishing zones and important fish landing centers are shown in figure 1. Sorting of commercial catches and some fish and prawns are shown in figures 2 and 3. Different types of traditional gears used in the inland waters of Sundarbans (Mukherjee 2007) are shown in figure 4. In 2005–06, West Bengal recorded the highest fish production in India of 1.2 million tons, of which 1.09 million tons were from inland resources (Government of India 2006).

Fig.1: Rivers and location of important inland fish landing centers and traditional inland fishing zones in Sundarban Biosphere Reserve

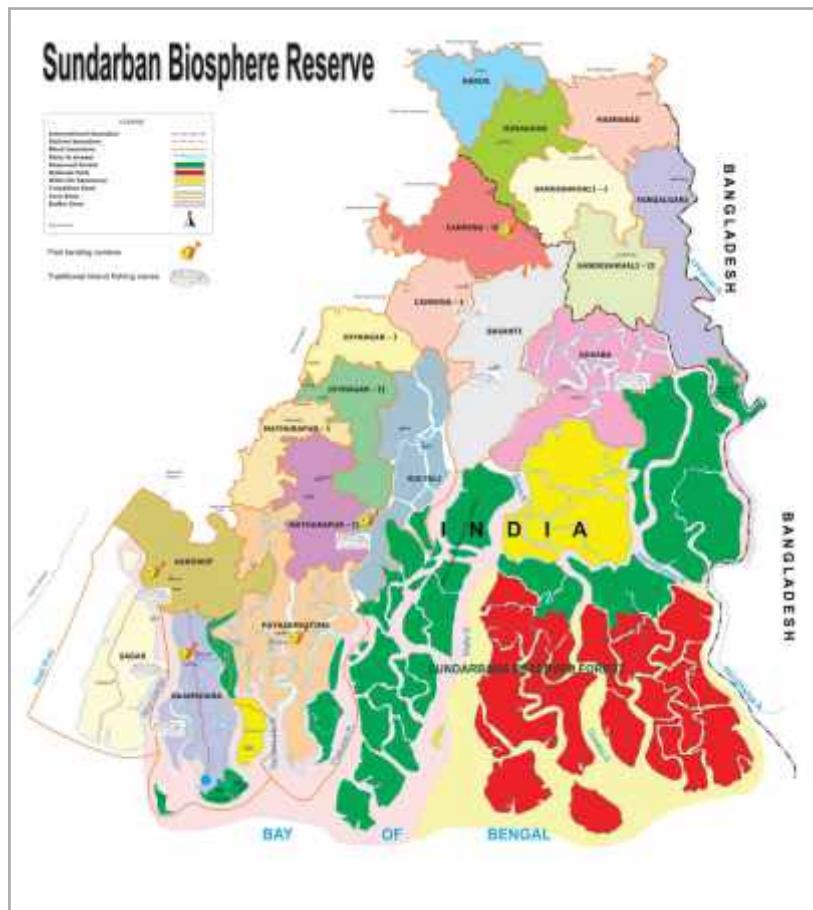


Fig.4: Traditional fishing nets (after Mukherjee, 2007)



A large section of the poor tribal population of the Sundarbans, especially the females and minors living far below subsistence level, are engaged in the practice of spawn collection of *Penaeus monodon* and *Penaeus indicus* during daily tides using unscientific gears like mosquito nets (figure 5). A number of individual groups of commercial fishermen and multinational companies are collecting large-scale commercial catch from the vast coastal, estuarine, and deep-sea zone of the Sundarbans throughout the year. The fish-landing stations at Canning, Raidighi, Diamond Harbour, Kakdwip, and Namkhana are for the latest fishing crafts and gears like big bull trawlers; mechanized boats; and polyvinyl chloride (PVC) trawl, gill, and bag nets. Built-in slaughtering-washing units and artificial units are collectively helping in profitable export-based fishing economy as well as in degrading the sensitive aqua-mangrove ecosystem of the Sundarbans (Das 2009).

Fisheries in the Sundarbans are based on both inland and marine fisheries' resources. West Bengal is the highest fish-producing state of India and in 2002–03, 11.20 lakhs metric tons of fish were exported earning 5331.34 million of rupees. In this coastal terrain, there is vast scope for shrimp-based polyculture. Fisheries extension programs need to be strengthened through the active involvement of fisherfolk working in inland, brackish-water, and marine sectors;

industrialists; end users; the Fisheries Department; universities; research institutes; and nongovernmental organizations. The new infrastructural facilities, such as six new fishing harbors, are being set up by the Fisheries Department, complete with cold storage facilities, packaging centers, and modern fish markets at Frazerganj, Diamond Harbour, Kakdwip, Sagar, and Patharpratima. Construction works have already been completed at Frazerganj and Diamond Harbour. These harbors together will provide export opportunities to fish farmers and fish sellers (*Fish Biz Bonanza to Boost State 2003*).

STATUS AND THREATS

Six fish species of the Sundarbans are under the Indian Wildlife (Protection) Act, 1972. Schedule-I Part 2 (A) Fishes (Lakra et al. 2010). According to the IUCN Red List of all life forms, 16,928 species are threatened globally and of these, 1,275 species are fishes. Further, out of 659 globally threatened Indian fauna, 42 species belong to fishes according to the IUCN classification under different categories. Eight fish species from the Sundarbans are in this list. The Convention on International Trade in Endangered Species (CITES) Appendices II includes two species of fishes common to the Sundarbans, namely *Pristis microdon* and *Rhincodon typus* (table 5).

Table- 5: Protection regime of Fish in Sundarbans.

Sr. No.	Name	Schedules of Wildlife (Protection) Act 1972	IUCN Red Data Book	CITES appendices
1	<i>Anoxypristes cuspidata</i> : (Knifetooth Sawfish)	I	Critically Endangered	-
2	<i>Aetomylaeus nichofii</i> (Banded Eagle Ray)	-	Vulnerable	-
3	<i>Carcharhinus heimodon</i> (Pondicherry Shark)	-	Critically Endangered	-
4	<i>Glypis gangeticus</i> (Ganges Shark)	I	Critically Endangered	-
5	<i>Himantura fluviatilis</i> (Ganges Stingray)	I	Endangered	-
6	<i>Pristis pectinata</i> (Wide Sawfish)	-	Critically Endangered	-
7	<i>Pristis microdon</i> (Largetooth Sawfish)	I	Critically Endangered	II
8	<i>Rhincodon typus</i> (Whale Shark)	I	Vulnerable	II
9	<i>Rhina ancylostoma</i> (Bowmouth Guitarfish)	-	Vulnerable	-
10	<i>Rhinobatos obtusus</i> (Widenose Gui tarfish)	-	Vulnerable	-
11	<i>Rhynchobatus djiddensis</i> (Whitespotted Wedgefish)	I	Vulnerable	-

Limited extraction of mangroves for fuelwood and poles is an old practice. However, in the revenue areas, the destruction of mangroves is conspicuous and at places the area has been reclaimed for agriculture as well as for settlement. The extent and condition of the crop and the threat to such mangrove areas need to be assessed. The problems of marine and estuarine fisheries in the Sundarbans can be categorized into the following groups:

¾ Indiscriminate seed collection and bycatch.

Thousands of untrained workers who collect shrimp fry from the sea, channels, and rivers cause significant losses to the fry of other fishes. Frequently, collectors discard non-shrimp fry, perhaps one of the main causes of a gradually declining supply of different natural fish (Baer 2001). In a study in the SBR, it was found that to catch 1 tiger prawn seed in the Sundarbans, collectors destroyed juveniles of 161 other prawns, 7 fishes, 30 crabs, 1 mollusc, and 8 unidentified meroplanktons (Das and Nandi 1999).

¾ Lack of post-harvest and other infrastructure. Proper storage, preservation, and prompt disposal or transport service are essential (Yadava 2004).

¾ Water pollution. The current environmental status of the Sundarbans water systems is relatively poor. A mixture of domestic sewage and industrial waste is discharged into the canal systems of Kolkata and these waters eventually reach the Sundarbans and are responsible for the accumulation of heavy metals and the presence of organic pollutants in the tissue of fish (ADB 2003). The river channels of the Sundarbans have experienced high rates of deterioration largely due to this sewage discharge. Choudhury and

Choudhury (1994) note that the Bidhadhari and Piali Rivers have been transformed into dead water bodies and these waters have experienced the knock-on impact of affecting the Matla River. The same review notes the steady degradation of fisheries resources in the Ichhamati, Bidyadhari, Kalagachia, Matla, Moni, Satumukhi, and Hataniadoania waterways. Agricultural runoff and effluents from fish farms are thought to be responsible for increased levels of eutrophication in the Indian Sundarbans and are also thought to be the cause of dinoflagellate blooms that are now a common phenomenon in the coastal waters of West Bengal (Mukherjee et al. 2007).

¾ Impact of coastal aquaculture (*bheri* fishing).

Local fishermen have converted many coastal swamps into *bheries*, that is, artificial enclosures for taking the tidal saline water in and out through sluices from nearby rivers for commercial pisciculture. Sinha (1998) reports that 1,392 *bheries* covering 43,000 ha are operative in the Sundarbans.



Fig.5 - Collection of prawn seeds

Table 6: Magnitude of commercial coastal fishing in southern Sundarbans

Police Station	Total production in Kgs (1997-'98)	No. of Vessels	Distance of Fishing trips	No. of Trips/months	Capacity Of Vessels
Canning	50,40,000	Trawlers-10	60 kms (monsoon), 100 kms (winter).	7 days x 4 trips(monsoon), 15 days x 2 trips (winter).	8000 kgs.
		Mechanized			
		Boats-12			
Diamond Harbour	151,60,000	Trawler-100	25 kms. (monsoon), 180 kms (winter).	7 days x 4 trips (monsoon), 10 days x 3 trips(winter).	18,000 kgs.
		Mechanized boats-60			
Kakdwip	435,40,000	Trawlers-100	80 kms. (monsoon) 180 kms (winter)	7 days x 4 trips (monsoon), 15 Days x 2 trips (winter).	12,000 kgs.
		Mechanized boats-2000.			
Roydighi	62,22,400	Trawlers-200	100 kms (monsoon), 180 kms (winter)	7 days x 4 trips (monsoon)	8000 kgs
		Mechanized boats-600		15 days x 2 trips(winter).	
Nam-khana	1,49,200,00	Trawler-200	70 kms (monsoon), 200 kms (winter).	10 days x 4 trips (monsoon), 15 days x 2 trips(winter).	8000 kgs.
		Mechanized boat-500			

Source: Primary data from field survey at Namkhana, Kakdwip, Diamond Harbour, Roydighi & Canning on 30.4.99, 25.4.99, 23.4.99, 1.4.99 & 14.4.99 respectively (Das, 2009).

ANNEXURE

Family/ Species	Common name	Habitat
CLASS CHONDRICHTHYES		
ORDER ORECTOLOBIFORMES		
Family Hemiscyllidae	Bamboo sharks	Pelagic
<i>Chiloscyllium indicum</i> (Gmelin)		
<i>Chiloscyllium griseum</i> Muller and Henle		
Family Stegostomatidae	Zebra sharks	Pelagic
<i>Stegostoma fasciatum</i> (Hermann)		
Family Rhincodontidae	Whale sharks	Pelagic
<i>Rhincodon typus</i> Smith		
Order Carcharhiniformes		
Family Proscylliidae	Finback catsharks	Pelagic
<i>Eridancis radcliffei</i> Smith		
Family Carcharhinidae	Requim sharks	Oceanic/Pelagic/semi pelagic/ littoral
<i>Carcharhinus dussumieri</i> (Valenciennes)		
<i>Carcharhinus hemiodon</i> (Valenciennes)		
<i>Carcharhinus leucas</i> (Valenciennes)		
<i>Carcharhinus melanopterus</i> (Quoy and Gaimard)		
<i>Carcharhinus limbatus</i> (Valenciennes)		
<i>Glyphis gangeticus</i> (Muller and Henle)		
<i>Lamiopsis temmincki</i> (Muller and Henle)		
<i>Rhizoprionodon acutus</i> (Ruppell)		
<i>Scoliodon laticaudus</i> (Muller and Henle)		
Family Sphyrnidae	Hammerhead sharks	Semi pelagic and littoral
<i>Eusphyra blochii</i> (Cuvier)		
Order Rajiformes		
Family Pristidae	Sawfishes	Demersal
<i>Anoxypristes cuspidata</i> (Latham)		
<i>Pristis microdon</i> Latham		
<i>Pristis pectinata</i> Latham		
Family Torpedinidae	Electric Rays	Benthic and semi pelagic
<i>Bengalichthyes impennis</i> Annandale		

Family/ Species	Common name	Habitat
<i>Narke dipterygia</i> (Schneider)		
<i>Narcine timlei</i> (Schneider)		
<i>Narcine brunnea</i> Annandale		
Family Rhinobatidae	Guitar fishes	Demersal
<i>Rhina aenyllostoma</i> Schneider		
<i>Rhina grannulatus</i> Cuvier		
<i>Rhina lionotus</i> Norman		
<i>Rhinobatos obtusus</i> Muller and Henle		
<i>Rhinobatos annandalei</i> Norman		
<i>Rhynchobatus djeddensis</i> (Forsskal)		
Family Dasyatidae	Sting Rays	Demersal
<i>Dasyatis microps</i> (Annandale)		
<i>Himantura bleekeri</i> (Blyth)		
<i>Himantura fluviatilis</i> (Hamilton-Buchanan)		
<i>Himantura marginata</i> (Blyth)		
<i>Dasyatis zugei</i> (Muller and Henle)		
<i>Himantura imbricata</i> (Schneider)		
<i>Himantura uarnak</i> (Forsskal)		
Family Gymnuridae	Butterfly Rays	Demersal
<i>Aetoplatea tentaculata</i> (Valenciennes)		
<i>Gymnura (Gymnura) poecilura</i> (Shaw)		
Family Myliobatidae	Eagle Rays	Benthic littoral and semi pelagic
<i>Aetobatus narinari</i> (Blainville)		
<i>Aetomylaeus nichofii</i> (Schneider)		
CLASS: ACTINOPTERYGII		
Family Elopidae	Lady fishes	Pelagic
<i>Elops machnata</i> (Forsskal)		
Family Megalopidae	Tarpons	Demersal/Pelagic
<i>Megalops cyprinoides</i> (Broussonet)		
Family Anguillidae	Freshwater Eels	Demersal
<i>Anguilla bengalensis bengalensis</i> (Gray)		
<i>Angilla bicolor bicolor</i> Mc Clelland		
Family Moriguidae	Worm Eels	Demersal

Family/ Species	Common name	Habitat
<i>Moringua arundinacea</i> (Mc Clelland)		
<i>Moringua raitaborua</i> (Hamilton-Buchanan)		
Family Muraenidae	Moray Eels	Demersal
<i>Sideria picta</i> (Ahl)		
<i>Thyrsodea macrura</i> (Bleeker)		
<i>Uropterygius tigrinus</i> (Lesson)		
<i>Echidna nebulosa</i> (Ahl)		
<i>Echidna zebra</i> (Shaw)		
<i>Gymnothorax meleagris</i> (Shaw and Nodder)		
<i>Gymnothorax sathete</i> (Hamilton-Buchanan)		
<i>Gymnothorax tile</i> (Hamilton-Buchanan)		
<i>Leptocephalus milnei</i> Southwell and Prasad		
<i>Leptocephalus vermicularis</i> Southwell and Prasad		
Family Muraenesocidae	Pike Congers	Demersal
<i>Congresox talabon</i> (Cuvier)		
<i>Congresox talabonoides</i> (Bleeker)		
<i>Muraenesox bagio</i> (Hamilton-Buchanan)		
<i>Muraenesox cinerius</i> (Forsskal)		
Family Ophichthidae	Snake Eels	Demersal
<i>Neenchelys buitendijki</i> Weber and de Beaufort		
<i>Pisodonophis boro</i> (Hamilton-Buchanan)		
<i>Lamnostoma orientalis</i> (McClelland)		
Order Clupeiformes		
Family Clupeidae	Herrings, Sardines, Sprats, Gizzard shads	Pelagic
<i>Hilsa (Hilsa) kelee</i> (Cuvier)		
<i>Hilsa (Tenualosa) ilisha</i> (Hamilton-Buchanan)		
<i>Hilsa (Tenualosa) toli</i> (Valenciennes)		
<i>Escualosa thoracata</i> (Valenciennes)		
<i>Herklotischthys quadrimaculatus</i> (Ruppell)		
<i>Sardinella brachysoma</i> Bleeker		
<i>Sardinella fimbriata</i> (Valenciennes)		
<i>Sardinella gibbosa</i> (Bleeker)		
<i>Anodostoma chacunda</i> (Hamilton-Buchanan)		

Family/ Species	Common name	Habitat
<i>Anodostoma thailandiae</i> Wongratana		
<i>Nematalosa nasus</i> (Bloch)		
<i>Corica soborna</i> Hamilton-Buchanan		
Family Pristigasteridae	Ilishas, Pellonas	Pelagic
<i>Ilisha filigera</i> (Valenciennes)		
<i>Ilisha kampeni</i> Weber and De Beaufort		
<i>Ilisha megaloptera</i> (Swainson)		
<i>Ilisha melastoma</i> (Schneider)		
<i>Opisthopterus tardoore</i> (Cuvier)		
<i>Opisthopterus valenciennesi</i> Bleeker		
<i>Pellona ditchela</i> Valenciennes		
<i>Raconda russeliana</i> Gray		
Family Engraulidae	Anchovies	Pelagic
<i>Coilia dussumieri</i> Valenciennes		
<i>Coilia neglecta</i> Whitehead		
<i>Coilia ramcarati</i> Hamilton-Buchanan		
<i>Coilia reynaldi</i> Valenciennes		
<i>Setipinna brevifilis</i> (Valenciennes)		
<i>Setipinna phasa</i> (Hamilton-Buchanan)		
<i>Setipinna taty</i> (Valenciennes)		
<i>Setipinna tenuifilis</i> Valenciennes		
<i>Stolephorus baganensis</i> Hardenberg		
<i>Stolephorus commersonii</i> Lacepede		
<i>Stolephorus heterolobus</i> (Rupell)		
<i>Stolephorus indicus</i> (van Hasselt)		
<i>Thryssa dussumieri</i> (Valenciennes)		
<i>Thryssa hamiltonii</i> (Gray)		
<i>Thryssa malabarica</i> (Bloch)		
<i>Thryssa purava</i> (Hamilton-Buchanan)		
Family Chirocentridae	Wolf Herring	Pelagic
<i>Chirocentrus nudus</i> Swainson		
ORDER SILURIFORMES		
Family Ariidae	Sea catfishes	Demersal
<i>Arius arius</i> (Hamilton-Buchanan)		

Family/ Species	Common name	Habitat
<i>Arius caelatus</i> Valenciennes		
<i>Arius duuumieri</i> Valenciennes		
<i>Arius gagora</i> Hamilton-Buchanan		
<i>Arius jella</i> Day		
<i>Arius maculatus</i> (Thunberg)		
<i>Arius parvipinnis</i> Day		
<i>Arius platystomus</i> Day		
<i>Arius sagor</i> (Hamilton-Buchanan)		
<i>Arius sona</i> (Hamilton-Buchanan)		
<i>Arius tenuispinis</i> Day		
<i>Arius thalassinus</i> (Ruppell)		
<i>Batrachocephalus mino</i> (Hamilton-Buchanan)		
<i>Hemipimelodus jatius</i> (Hamilton-Buchanan)		
<i>Osteogeniosus militaris</i> (Linnaeus)		
ORDER AUROPIFORMES		
Family Harpadontidae	Bombay Duck	Pelagic
<i>Harpodon neherius</i> (Hamilton-Buchanan)		
Family Synodontidae	Lizard fishes	Demersal
<i>Saurida tumbil</i> (Bloch)		
ORDER GADIFORMES		
Family Bregmacerotidae	Codlets	Demersal
<i>Bregmaceros maclellandi</i> Thompson		
ORDER LOPHIFORMES		
Family Antennariidae	Frog fishes	Demersal
<i>Antennarius hispidus</i> (Bloch and Schneider)		
ORDER CYPRINODONTIFORMES		
Family Hemiramphidae	Halfbeaks	Demersal
<i>Dermogenys brachynopterus</i> (Bleeker)		
<i>Hemiramphus far</i> (Forsskal)		
ORDER SYNGNATHIFORMES		
Family Fistulariidae	Cornet fishes	Pelagic
<i>Fistularia petimba</i> Lacepede		
Family Syngnathidae	Pipe fishes and Sea horses	Shallow coastal waters and estuaries

Family/ Species	Common name	Habitat
<i>Ichtyocampus carce</i> (Hamilton-Buchanan)		
ORDER SCORPAENIFORMES		
Family Synanceiidae	Minous	Pelagic
<i>Minous coccineus</i> (Alcock)		
<i>Trachicephalus uranoscopus</i> (Bloch and Schneider)		
Family Platycephalidae	Spiny flatheads	Benthic
<i>Platycephalus indicus</i> (Linnaeus)		
ORDER PERCIFORMES		
Family Ambassidae	Perchlets	Near river mouths
<i>Ambassis nalua</i> (Hamilton-Buchanan)		
<i>Ambassis kopsii</i> Bleeker		
Family Centropomidae	Sea Perches, Sea bass, Barramundi	Demersal and bottom dwelling
<i>Lates calcarifer</i> (Bloch)		
Family Serranidae	Groupers	Pelagic
<i>Epinephelus malabaricus</i> (Schneider)		
<i>Epinephelus tauvina</i> (Forsskal)		
<i>Promicrops lanceolatus</i> (Bloch)		
Family Teraponidae	Tiger perches	Pelagic
<i>Terapon jarbua</i> (Forsskal)		
<i>Terapon puta</i> (Cuvier)		
<i>Terapon theraps</i> (Cuvier)		
Family Sillaginidae	Whitings	Sandy shores and estuarine waters
<i>Sillago sihama</i> (Forsskal)		
<i>Sillaginopsis panijus</i> (Hamilton-Buchanan)		
Family Lactariidae	False trevallis	Waters shallower than 100m
<i>Lactarius lactarius</i> (Schneider)		
Family Rachycentridae	Cobia	Pelagic
<i>Rachycentron canadum</i> (Linnaeus)		
Family Carangidae	Jacks, Scads	Pelagic
<i>Alectis ciliaris</i> (Bloch)		
<i>Alectis indicus</i> ((Ruppell))		
<i>Alepes djedaba</i> (Forsskal)		

Family/ Species	Common name	Habitat
<i>Atropus atropus</i> (Schneider)		
<i>Atule mate</i> (Cuvier)		
<i>Carangoides chrysophrys</i> (Cuvier)		
<i>Carangoides malabaricus</i> (Bloch and Schneider)		
<i>Caranx carangus</i> (Bloch)		
<i>Caranx ignobilis</i> (Forsskal)		
<i>Caranx sexfasciatus</i> Quoy and Gaimard		
<i>Decapterus russelli</i> (Ruppell)		
<i>Elagatis bipinnulata</i> (Quoy and Gaimard)		
<i>Megalaspis cordyla</i> (Linnaeus)		
<i>Scomberoides commersonianus</i> Lacepede		
<i>Scomberoides lysan</i> (Forsskal)		
<i>Scomberoides tala</i> (Cuvier)		
<i>Selar crumenophthalmus</i> (Bloch)		
<i>Trachynotus blochii</i> (Lacepede)		
<i>Uraspis uraspis</i> (Gunther)		
Family Coryphaenidae	Dolphin fish	Pelagic
<i>Coryphaena hippurus</i> Linnaeus		
Family Parastromateidae	Black Pomfret	Deep coastal waters
<i>Parastromateus niger</i> (Bloch)		
Family Leiognathidae	Slipmouths	Pelagic
<i>Gazza minuta</i> (Bloch)		
<i>Leiognathus blochii</i> (Valenciennes)		
<i>Leiognathus brevirostris</i> (Valenciennes)		
<i>Leiognathus daura</i> (Cuvier)		
<i>Leiognathus dussumieri</i> (Valenciennes)		
<i>Leiognathus equulus</i> (Forsskal)		
<i>Leiognathus fasciatus</i> (Lacepede)		
<i>Leiognathus splendens</i> (Cuvier)		
<i>Secutor insidiator</i> (Bloch)		
<i>Secutor ruconius</i> (Hamilton-Buchanan)		
Family Lutjanidae	Snappers	Deep coastal waters
<i>Lutjanus argentimaculatus</i> (Forsskal)		
<i>Lutjanus bengalensis</i> (Bloch)		

Family/ Species	Common name	Habitat
<i>Lutjanus johnii</i> (Bloch)		
<i>Lutjanus russelli</i> (Bleeker)		
Family Lobotidae	Tripletails	Brackish waters and large river mouths
<i>Datnioides quadrifasciatus</i> (Sebastianov)		
Family Gerreidae	Mojarras	Sandy shores
<i>Gerres (Gerres) oyena</i> (Forsskal)		
<i>Gerres (Gerres) poieti</i> Cuvier		
<i>Gerres (Pertica) filamentosus</i> Cuvier		
<i>Gerreomorpha setifer</i> (Hamilton-Buchanan)		
Family Haemulidae	Grunts	Demersal
<i>Pomadasys argenteus</i> (Forsskal)		
<i>Pomadasys argyreus</i> (Valenciennes)		
<i>Pomadasys furcatus</i> (Schneider)		
<i>Pomadasys maculatum</i> (Bloch)		
Family Sparidae	Seabreams	Demersal
<i>Acanthopagrus berda</i> (Forsskal)		
<i>Acanthopagrus latus</i> (Houttuyn)		
<i>Rhabdosargus sarba</i> (Forsskal)		
Family Nemipteryidae	Threadfin Breams	Pelagic and Demersal
<i>Nemipterus bipunctatus</i> (Ehrenberg)		
<i>Nemipterus japonicus</i> (Bloch)		
<i>Nemipterus tolu</i> (Valenciennes)		
Family Sciaenidae	Croakers	Demersal
<i>Bahaba chaptis</i> (Hamilton-Buchanan)		
<i>Chrysichthys aureus</i> (Richardson)		
<i>Daysciaena albida</i> (Cuvier)		
<i>Dendrophysa russelli</i> (Cuvier)		
<i>Johnius (Blythsciaena) macropterus</i> (Bleeker)		
<i>Johnius (Johnieops) dussumieri</i> (Cuvier)		
<i>Johnius (Johnieops) sina</i> (Cuvier)		
<i>Johnius (Johnieops) vogleri</i> (Bleeker)		
<i>Johnius (Johnius) belangerii</i> (Cuvier)		
<i>Johnius (Johnius) carutta</i> Bloch		
<i>Johnius (Johnius) coitor</i> (Hamilton-Buchanan)		

Family/ Species	Common name	Habitat
<i>Johnius (Johnius) macrorhynus</i> (Mohan)		
<i>Nibea maculata</i> (Schneider)		
<i>Nibea soldado</i> (Lacepede)		
<i>Macrospinosa cuja</i> (Hamilton-Buchanan)		
<i>Otolithoides biauritus</i> (Cuvier)		
<i>Otolithes cavieri</i> Trewavas		
<i>Otolithes ruber</i> (Schneider)		
<i>Pama pama</i> (Hamilton-Buchanan)		
<i>Panna microdon</i> (Bleeker)		
<i>Panna heterolepis</i> Trewavas		
<i>Pennahia macrocephalus</i> (Tang)		
<i>Pennahia macrophthalmus</i> (Bleeker)		
<i>Protonibea diacanthus</i> (Lacepede)		
<i>Pterotolithus maculatus</i> (Kuhl and van Hasselt)		
Family Mullidae	Goat fishes	Benthic predator
<i>Parupeneus indicus</i> (Shaw)		
<i>Upeneus vittatus</i> (Forsskal)		
Family Toxotidae	Archer fishes	Demersal
<i>Toxotes chatareus</i> (Hamilton-Buchanan)		
Family Ephippidae	Space-fishes	Pelagic and often enters estuaries
<i>Drepane longimana</i> (Bloch and Schneider)		
<i>Drepane punctata</i> (Linnaeus)		
<i>Ephippus orbis</i> (Bloch)		
<i>Platax pinnatus</i> (Linnaeus)		
Family Scatophagidae	Scats	Shallow brackish waters
<i>Scatophagus argus</i> (Bloch)		
Family Mugilidae	Mullets	Coastal waters and estuaries
<i>Liza macrolepis</i> (Smith)		
<i>Liza parsia</i> (Hamilton-Buchanan)		
<i>Liza subviridis</i> (Valenciennes)		
<i>Liza tade</i> (Forsskal)		
<i>Liza vaigiensis</i> (Quoy and Gaimard)		

Family/ Species	Common name	Habitat
<i>Mugil cephalus</i> Linnaeus		
<i>Rhinomugil corsula</i> (Hamilton-Buchanan)		
<i>Valamugil buchanani</i> ((Bleeker))		
<i>Valamugil cunnesius</i> (Valenciennes)		
<i>Valamugil seheli</i> (Forsskal)		
<i>Valamugil spigleri</i> (Bleeker)		
Family Sphyraenidae	Barracudas	Mostly occurring in coastal waters, from the surface to about 100m depth
<i>Sphyraena jello</i> Cuvier		
<i>Sphyraena obtusata</i> Cuvier		
Family Polynemidae	Threadfins	Shallow coastal waters and in estuaries
<i>Polynemus paradiseus</i> Linnaeus		
<i>Eleotheronema tetradactylum</i> (Shaw)		
<i>Polydactylus indicus</i> (Shaw)		
<i>Polydactylus plebeius</i> (Broussonet)		
<i>Polydactylus sextarius</i> (Bloch)		
<i>Polynemus paradiseus</i> Linnaeus		
<i>Polynemus longipectoralis</i> Weber and de Beaufort		
Family Uranoscopidae	Stargazers	Demersal- typically lie buried in sand
<i>Uranoscopus cognatus</i> Cantor		
Family Callionymidae	Dragonets	Benthic
<i>Callionymus carebares</i> Alcock		
<i>Callionymus fluviatilis</i> Day		
<i>Callionymus recurvispinnis</i> Li		
<i>Callionymus sagitta</i> Pallas		
<i>Eleutherochir opercularis</i> (Vallenciennes)		
Family Blennidae	Blennies	Primarily in shallow marine habitats, and are especially common in the intertidal and subtidal zones.
<i>Petroscirtes breviceps</i> Valenciennes		
<i>Petroscirtes variabilis</i> Cantor		

Family/ Species	Common name	Habitat
Family Eleotridae	Sleepers	Brackish waters and estuaries
<i>Eleotris fusca</i> (Bloch and Schneider)		
<i>Eleotris melanosoma</i> Bleeker		
<i>Eleotris lutea</i> Day		
<i>Butis butis</i> (Hamilton – Buchanan)		
<i>Butis melanostigma</i> (Bleeker)		
<i>Ophiocara porocephala</i> (Valenciennes)		
<i>Ophieleotris aporos</i> (Bleeker)		
<i>Odonteleotries macrodon</i> (Bleeker)		
Family Gobiidae	Gobies	Mostly marine, bottom-dwelling, some inhabiting brackish or fresh waters
<i>Odontamblyopus rubicundus</i> (Hamilton– Buchanan)		
<i>Taenioides buchanani</i> (Day)		
<i>Taenioides anguillaris</i> (Linnaeus)		
<i>Taenioides cirratus</i> (Blyth)		
<i>Taenioides erruptionis</i> (Bleeker)		
<i>Caragobius urolepis</i> (Bleeker)		
<i>Pseudotrypauchen multiradiatus</i> Hardenberg		
<i>Trypauchen vagina</i> (Bloch and Schneider)		
<i>Amblyotrypauchen arctocephalus</i> (Alcock)		
<i>Ctenotrypauchen microcephalus</i> (Bleeker)		
<i>Trypauchenichthys sumatrensis</i> Hardenberg		
<i>Trypauchenichthys typus</i> Bleeker		
<i>Apocryptes bato</i> (Hamilton – Buchanan)		
<i>Apocryptodon madurensis</i> (Bleeker)		
<i>Oxuderces dentatus</i> Eydoux and Souleyet		
<i>Pseudapocryptes elongatus</i> (Cuvier)		
<i>Pseudapocryptes borneensis</i> (Bleeker)		
<i>Parapocryptes serperaster</i> (Richardson)		
<i>Boleophthalmus boddarti</i> (Pallas)		
<i>Boleophthalmus dussumieri</i> Valenciennes		

Family/ Species	Common name	Habitat
<i>Scartelaos histophorus</i> (Valenciennes)		
<i>Periophthalmus chrysopilos</i> Bleeker		
<i>Periophthalmus koelreuteri</i> (Pallas)		
<i>Periophthalmus malaccensis</i> Eggert		
<i>Periophthalmus pearsei</i> Eggert		
<i>Periophthalmus vulgaris</i> Eggert		
<i>Periophthalmus novemradiatus</i> (Hamilton-Buchanan)		
<i>Periophthalmus kalolo</i> Lesson		
<i>Periophthalmodon schlosseri</i> (Pallas)		
<i>Periophthalmodon septemradiatus</i> (Hamilton – Buchanan)		
<i>Gobiopterus chuno</i> (Hamilton – Buchanan)		
<i>Stigmatogobius sadanundio</i> (Hamilton – Buchanan)		
<i>Bathygobius fuscus</i> (Ruppell)		
<i>Gnatholepis cauerensis</i> (Bleeker)		
<i>Acentrogobius viridipunctatus</i> (Valenciennes)		
<i>Drombus globiceps</i> (Hora)		
<i>Istiogobius ornatus</i> (Ruppell)		
<i>Glossogobius giuris</i> (Hamilton – Buchanan)		
<i>Parachaeturichthys polynema</i> (Bleeker)		
<i>Hemigobius hoevenii</i> (Bleeker)		
<i>Gobiopsis macrostoma</i> Steindachner		
<i>Brachygobius nunus</i> (Hamilton – Buchanan)		
<i>Amblyeleotris gymnocephala</i> (Bleeker)		
<i>Oligolepis scutipennis</i> (Valenciennes)		
<i>Awaouichthys menoni</i> Chatterjee		
Family Kurtidae	Humpheads	Shallow coastal waters
<i>Kurtus indicus</i> Bloch		
Family Siganidae	Rabbit fishes	Shallow coastal waters, including estuaries
<i>Siganus canaliculatus</i> (Park)		

Family/ Species	Common name	Habitat
<i>Siganus javus</i> (Linnaeus)		
Family Trichiuridae	Ribbon fishes	Coastal waters to about 100m depth
<i>Eupleurogrammus glossodon</i> (Bleeker)		
<i>Eupleurogrammus muticus</i> (Gray)		
<i>Lepturacanthus pantului</i> (Gupta)		
<i>Lepturacanthus savala</i> (Cuvier)		
<i>Trichiurus gangeticus</i> (Gupta)		
<i>Trichiurus lepturus</i> Linnaeus		
Family Scombridae	Mackerels	Epipelagic
<i>Rastrelliger kanagurta</i> (Cuvier)		
<i>Scomberomorus commerson</i> (Lacepede)		
<i>Scomberomorus guttatus</i> (Bloch and Schneider)		
Family Stromateidae	Silvery pomfrets	Pelagic
<i>Pampus argenteus</i> (Euphrasen)		
<i>Pampus chinensis</i> (Euphrasen)		
ORDER PLEURONECTIFORMES		
Family Psettodidae	Indian Halibuts	Demersal
<i>Psettodes erumei</i> (Schneider)		
Family Citharidae	Flounders	Demersal
<i>Brachypleura novae-zeelandiae</i> Gunther		
Family Bothidae	Lefteye Flounders	Demersal
<i>Pseudorhombus arius</i> (Hamilton-Buchanan)		
<i>Pseudorhombus elevatus</i> Ogilby		
<i>Pseudorhombus javanicus</i> (Bleeker)		
<i>Pseudorhombus malayanus</i> Bleeker		
<i>Pseudorhombus triocellatus</i> (Bloch)		
Family Cynoglossidae	Tonguesoles	Demersal
<i>Cynoglossus arel</i> (Schneider)		
<i>Cynoglossus cynoglossus</i> (Hamilton-Buchanan)		
<i>Cynoglossus lida</i> (Bleeker)		
<i>Cynoglossus lingua</i> Hamilton-Buchanan		
<i>Cynoglossus macrostomus</i> Norman		
<i>Cynoglossus puncticeps</i> (Richardson)		

Family/ Species	Common name	Habitat
<i>Cynoglossus semifasciatus</i> Day		
<i>Paraplagusia bilineata</i> (Bloch)		
<i>Syphurus gilesii</i> (Alcock)		
Family Soleidae	Soles	Demersal
<i>Euryglossa pan</i> (Hamilton-Buchanan)		
<i>Heteromycteris oculus</i> (Alcock)		
<i>Synaptura albomaculata</i> Kaup		
<i>Synaptura commersoniana</i> (Lacepede)		
<i>Zebrias altipinnis</i> (Alcock)		
<i>Zebrias quagga</i> (Kaup)		
ORDER TETRADONTIFORMES		
Family Triacanthidae	Triplespines	Benthic
<i>Pseudotriacanthus strigilifer</i> (Cantor)		
<i>Triacanthus biaculeatus</i> (Bloch)		
<i>Triaxyphichthys weberi</i> (Chaudhuri)		
Family Balistidae	Trigger fishes	relatively shallow coastal habitats, some are pelagic
<i>Canthidermis rotundatus</i> (Proce)		
Family Ostraciidae	Box fishes	Benthic
<i>Rhynchostracion nasus</i> (Bloch)		
Family Tetraodontidae	Puffers	Estuaries and fresh- waters
<i>Arothron immaculatus</i> (Bloch and Schneider)		
<i>Arothron nigropunctatus</i> (Bloch and Schneider)		
<i>Arothron stellatus</i> (Bloch and Schneider)		
<i>Chelonodon fluviatilis</i> (Hamilton-Buchanan)		
<i>Chelonodon patoca</i> (Hamilton-Buchanan)		
<i>Fugu oblongus</i> (Bloch)		
<i>Kanduka michiej</i> Hora		
<i>Lagocephalus inermis</i> (Temminck and Schlegel)		
<i>Lagocephalus lunaris</i> (Bloch and Schneider)		
<i>Lagocephalus sceleratus</i> (Gmelin)		
<i>Tetraodon cutcutia</i> (Hamilton-Buchanan)		

REFERENCES

- Adams, J. 1985. "The Definition and Interpretation of Guild Structure in Ecological Communities." *J. Anim. Ecol.* 54: 43–59.
- ADB (Asian Development Bank). 2003. "Conservation and Livelihoods Improvement in the Indian Sundarbans." ADB TA No. 3784-IND, ADB.
- Baer, A. 2001. *Biodiversity and Fisheries*. Chapter 3: Aquatic Biodiversity Country Thematic Reviews - Argentina to Colombia, An International Workshop Funded by UNEP and IDRC Victoria, BC, June 2001.
- Chandra G. and R.L. Sagar. 2003. "Fishery in Sundarbans: Problems and Prospects" (accessed on August 03, 2011). <http://zunia.org/post/fishery-in-sundarbans-problems-and-prospects/>.
- Choudhury, A. B., and A. Choudhury. 1994. Vol. 1 of *Mangrove of the Sundarbans: India*. Bangkok: IUCN.
- CMFRI (Central Marine Fisheries Research Institute). 2005. *Marine Fisheries Census 2005, Part-III (1) - West Bengal*. New Delhi: Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India, Krishi Bhavan.
- Danda, Anurag A. 2007. "Surviving in the Sundarbans: Threats and Responses: An Analytical Description of Life in an Indian Riparian Commons." PhD thesis, University of Twente, Netherlands.
- Das, A. K., and N. C. Nandi. 1999. "Fauna of Sundarban Biosphere Reserve." *Enviro. News* 3: 7–8.
- Das, M. 2009. "Impact of Commercial Coastal Fishing on the Environment of Sundarbans for Sustainable Development." *Asian Fisheries Science* 22: 157–167.
- "Fish Biz Bonanza to Boost State." 2003. *The Times of India*, Kolkata, November 25, 2003 Vol. 5: 47.
- Froese, R. et al. 2011. "Fish Base, version (06/2011)" (accessed on August 21, 2011). www.fishbase.org.
- Gopal, B., and M. Chauhan. 2006. "Biodiversity and its Conservation in the Sundarban Mangrove Ecosystem." *Aquat. Sci.* 68(3).
- Government of India. 2006. *Handbook of Fisheries Statistics: 2006*. New Delhi: Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India, Krishi Bhavan.
- Government of West Bengal. 2005. *Administrative Report: 2004–2005*.
- Sundarbans Development Board, Sundarbans Affairs Department, Government of West Bengal.
- Gundermann, N., and D.M. Popper. 1984. "Notes on the Indo-Pacific Mangal Fishes and on Mangrove Related Fisheries." *Hydrobiologia* of the *Mangal* 201–206.
- Helfman, G., B. Collette, and Facey. 1997. *The Diversity of Fishes*. Malden, USA: Blackwell Science.
- Jhingran, V. G. 1977. *Fish and Fisheries of India*. Delhi: Hindustan Publ.
- Lakra, W. S., U. K. Sarkar, A. Gopalakrishnan, and A. Kathirvelpandian. 2010. *Threatened Freshwater Fishes of India*. Lucknow: National Bureau of Fish Genetic Resources, ICAR.
- Moyle, P. B., and J. J. Cech. 2003. *Fishes, An Introduction to Ichthyology*, 5th edition. Pearson Prentice Hall.
- Mukherjee, M. 2007. *Sunderban Wetlands*. Department of Fisheries, Aquaculture, Aquatic Resources and Fishing Harbours, Government of West Bengal.
- Mukherjee, P. 1995. *Estuarine Ecosystem Series, Part 2: Hugli Matla Estuary*. Zool. Surv. India: 345–388.
- Mukherjee, S., and A. Kashem. 2007. "Silvi-pisci Culture Project in Sundarbans" (accessed on August 21, 2011). <http://www.epubs.biod.consv.resource.php/>.
- Nelson, J. S. 2006. *Fishes of the World*. John Wiley & Sons Inc.
- Payne, N. L., and B. M. Gillanders. 2009. "Assemblages of Fish along a Mangrove–mudflat Gradient in Temperate Australia." *Marine and Freshwater Research* 60: 1–13.
- Sarkar, R. M. 2009. *Sundarban Fishermen in the World Heritage Setting: A Community Striving in the Mystic Mangrove Ecosystem*.
- Sinha, M. 1998. *Fisheries in Coastal Areas of West Bengal and Required Conservation*. Barrackpore, India: CIFRI.
- Talwar, P. K. 1991. "State of Art Report: Pisces." *Animal Resources of India*: Zool. Surv. India: 577–630.
- Talwar, P.K., P. Mukherjee, D. Saha, and S. Kar. 1992. "Marine and Estuarine Fishes of West Bengal (India)." *Rec. Zool. Surv. India, Occ. Paper*: 243–342.
- Yadava, Y.S. 2004. "Exploring Deep Sea Avenue." *The Hindu Survey of Indian Agriculture*: 91–95.