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Fish diversity and conservation aspects in an aquatic ecosystem in Indian sundarban

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Abstract
Sundarban is the largest delta on the planet.it covers about one million hector. Sundarban situated in the delta of the river Ganga, Brahmaputra and Meghna and it is famous for his marine and estuarine fish resources. Sundarban shared two country borders- one is India and other is Bangladesh.in sundarban around 440 species of fishes, 20 species of prawn and 44 species of crabs are present. But now a days sundarbans faces lots of difficult problems which have an impact on the biodiversity, sustainability and live hood of fish resources and also natural climate changes such as cyclonic storms, low pressure in bay of Bengal, shrinking tiger pawn population, fish seed collection etc. the present study highlight the present status of fish biodiversity in sundarban and their actual threats.

Keywords: Fish Biodiversity, IUCN Status, Threats, Sundarbans, Physicochemical parameter

1. Introduction
Sundarban is the largest delta on the planet. Indian sundarban present in the state of west Bengal. Indian sundarbans (Latitude $21^{0}32^{/}$-$22^{0}40^{/}$N, Longitude $88^{0}22^{/}$-$89^{0}0^{/}$E) in the north east coast of India occupy 9630 km^2 and are bounded by river Hooghly in the west, River Raimanghal in the east, Bay of Bengal in the south and Dampier Hodges line in the north. The whole area of sundarban about one million hector. 0.4million hector are forest areas and other part includes water bodies, rivers, and canals. The annual rainfall of sundarban is 1600-1800mm and in sundarban several cyclone storm hit every year. People live hood of sundarban is typical. Occupation is totally dependent on fisheries and farming. Now a day's major problem in sundarbans is biodiversity changes and pollution in water system. Due to water pollution the production of fish rate is low this effect directly hit the sundarban people occupation. The major causes of species loss in sundarban is environmental changes. Over exploitation of resources, oil leaks from ship, habitat loss, pollution, uncontrolled development activities.

2. Materials and Methods
2.1 Study Area: the present study totally based on freshwater, marine water fish biodiversity in sundarban, west Bengal, India. So, this study chose a proper place where freshwater and marine water are mixed that is sundarban. Sundarban is a largest delta in the world where three river- Ganga, Brahmaputra and Meghna meat each other. The Indian sundarbans (Latitude $21^{0}32^{/}$-$22^{0}40^{/}$N, Longitude $88^{0}22^{/}$-$89^{0}0^{/}$E) which is covered in two districts in west Bengal. Sundarban consists of 102 island. Out of 102 island 54 island present in north and south 24parganas. Sundarban is a mixed of environment product where one side is mangrove forest other side is marine biodiversity. Most eight important estuary present in sundarban area. They are-Hooghly, Muriganga, Saptamukhi, Thakuran, Matla, Gosaba, Bidyadhari and Harinbhanga. A large amount of freshwater fishes totally depend on these estuary.

Hooghly is western boarder of Indian sundarban.it is main river of west Bengal it is direct connect with river Ganga. The end of Hooghly mixed with sundarban.
Muriganga is a branch of Hooghly river.it flows along the east of Sagar Island, the largest island in the deltaic complex mangrove vegetation found in this area.
Saptamukhi origin from sultanpur it connected with muriganga through the Hatania-Dunia canal.
Thakuran begins near jayanagar in 24parganas and it is connected with saptamukhi.
Matla River originates from bidyadhari and it connected to bidyadhari and ultimately flows to the Bay of Bengal. Matla river salinity is relatively high.
Bidyadhari was a branch of Bhagirathi during 15^{th} and 16^{th} centuary. Now a day's bidyadhari is drying condition. But it totally depend on rainfall. The waters of matla and raimangal through a large number of canals from the Gosaba estuary. The estuary flow through the reserve forests.
Harinbhanga is the extreme eastern most river in the Indian sundarban deltaic complex.

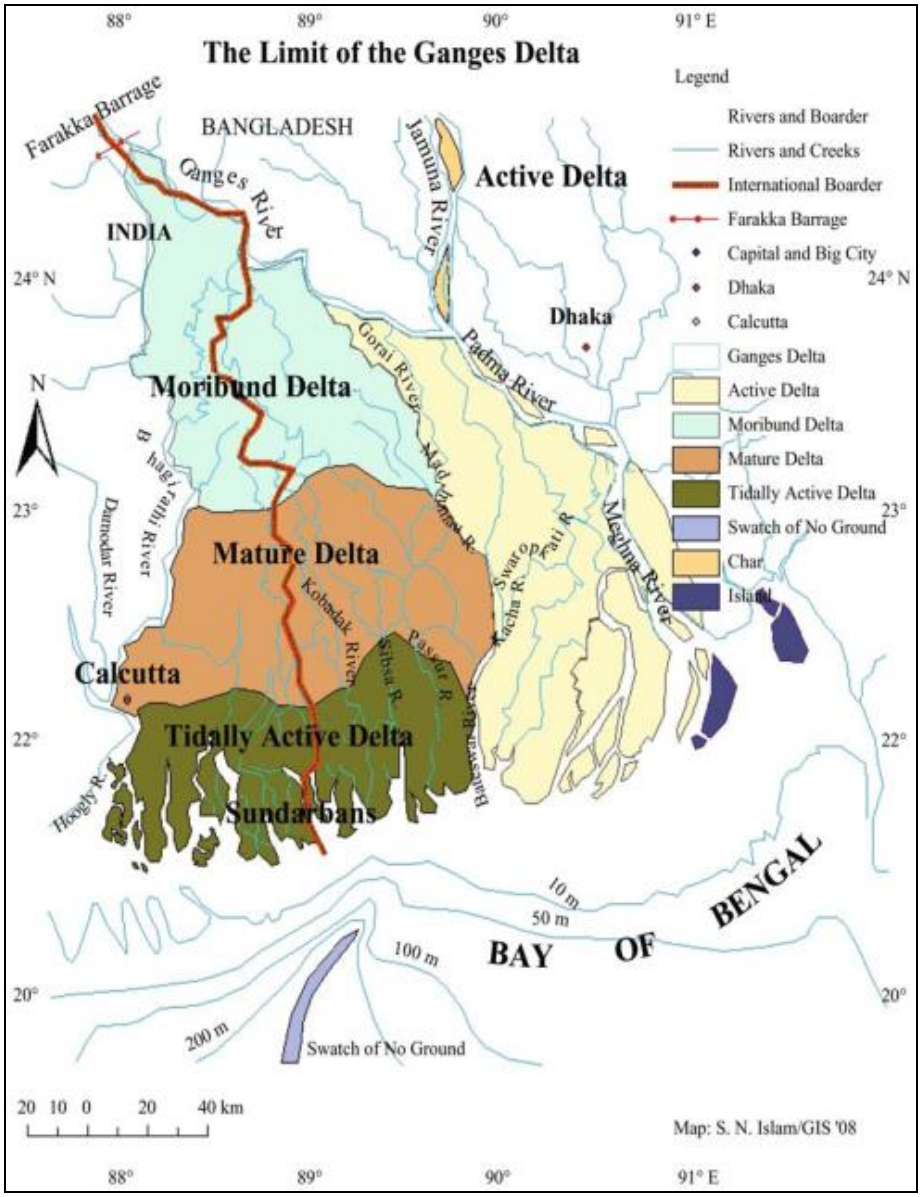


Fig 1: The Limit and location of the Ganga Brahmaputra Delta

2.2 Sample collection and analysis: Sample collection is a vital process in this case. Three times water sample are collected-post monsoon (November-February), pre monsoon (March-June) and monsoon (July-October). Surface water samples were collected in pre cleaned polythene bottles and it were filtered for the study of physic chemical parameters. For Dissolved oxygen (DO) and Biological Oxygen Demand (BOD) we follow Winkler's titrimetric method. Temperature was measured by mercury thermometer, transparency of water was determined by sechidisc, and pH and turbidity measured digital pH meter (Hanna) and turbidity meter. Other micro-nutrient measured by calorimetric methods.

2.3 Physicochemical analysis

2.3.1 Temperature: During post monsoon temperature showed between 27^0c-25^0c and in pre monsoon time temperature showed between 27.6^0c-34.1^0c, in monsoon time temperature showed 33.6^0c-29^0c. Table1 Highlight the temperature Reading in sundarban.

2.3.2 pH: Sundarbans pH Levels Generally Average From7.0-7.8 in the freshwater section and in saline areas levels average between 8.0-8.3. Table1 Highlight the pH Reading in sundarban. During post monsoon time pH levels are between 7.8-8.19 and in pre monsoon time pH levels indicates between 8.23-7.89, during monsoon time pH levels shows between 8.2-7.96

2.3.3. Salinity: Sundarban is a mixer of sea water and freshwater.so, salinity power is higher than freshwater but lower than sea water. Sundarban situated in the delta of Bay of Bengal showed salinity gradient from the upstream to downstream and also margin to central part. Highest value in pre monsoon stage between 21.2-24.7 and middle value in post monsoon stage between 14.9-17.3, lowest value in monsoon time between 12.8-15.2

2.3.4 Dissolved Oxygen (DO): Dissolved oxygen is one of the most important controlling factor in sundarban areas fish species.it helps to support respiration. Dissolve oxygen totally depend on temperature, salinity. In sundarban dissolved oxygen higher value in post monsoon time 8.19-9.98 mg/l and in pre monsoon7.2-6.65 mg/l, monsoon time dissolved oxygen varying between 6.74-7.98 mg/l.

2.3.5 Suspended Particulate Matter: During post monsoon time SPM concentration observe between 177.7-92.8 mg/l and in pre monsoon time SPM concentration between 101.5-192.3 mg/l, during monsoon time SPM

concentration are high 233.7-255.6 mg/l

2.3.6 Turbidity: turbidity indicates the water clearity. Several factors are responsible for water turbidity. Clay, sand, silt, phytoplankton, zooplankton control the water clearity. In post monsoon times sundarban turbidity ranges from 61.2-31.3 NTU and in pre monsoon time turbidity observe between 26.6-22.4 NTU, monsoon time turbidity is high than other time 60.8-131.3 NTU

2.3.7 Sechi Disc Pre monsoon time sechi disk range between 55.3-79.3 cm and post monsoon time sechi disc range shows 142.3-192.2 cm and lowest range in monsoon time, between 52.3-19.1 cm. Table1 Highlight the Sechi Disc Reading in sundarban.

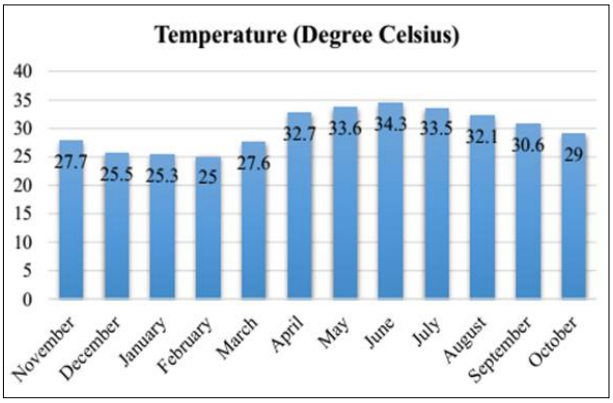
Table 1: Monthly Variation of Physical and Light Availability Parameters in Sundarban

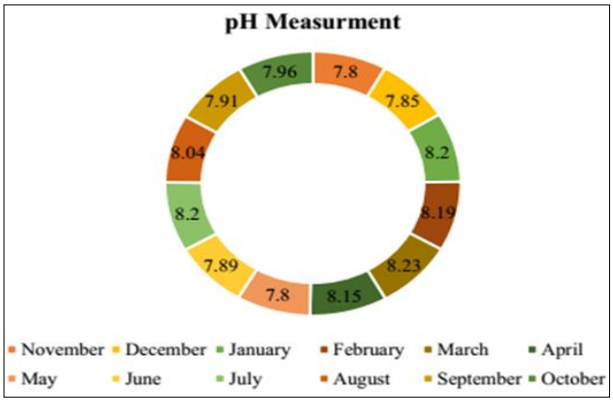
Month	Temperature (Degree Celsius)	pH	Salinity (PSU)	DO (mg/l)	SPM(mg/l)	Turbidity (NTU)	Secchi Disc(cm)
November	27.7	7.8	14.9	8.19	177.7	61.2	55.3
December	25.5	7.85	15.5	8.17	140.3	55.5	62.2
January	25.3	8.2	16.6	9.4	113.5	44.8	73.5
February	25	8.19	17.3	9.98	92.8	31.3	79.3
March	27.6	8.23	21.2	7.2	101.5	26.6	142.3
April	32.7	8.15	22.3	7.12	78.6	25.4	173.5
May	33.6	7.8	23.6	6.8	70.2	24.2	179.3
June	34.3	7.89	24.7	6.65	192.3	22.4	192.2
July	33.5	8.2	15.2	6.74	233.7	60.8	52.3
August	32.1	8.04	14.1	7.02	233.8	114.2	24.3
September	30.6	7.91	13.5	7.75	240.6	117.5	22.6
October	29	7.96	12.8	7.98	255.6	131.3	19.1

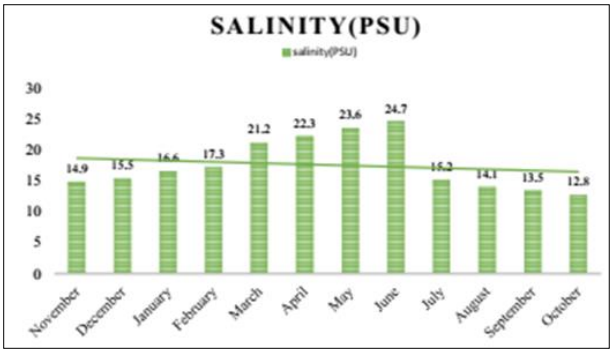
2.7.8 Nutrients: Nutrients are important for sundarban ecosystem. The nutrients are Phosphate, Nitrate, Nitrite, Silicate Ammonia and TN. Sundarban is a nutrient Rich tropical estuary with high Nutrient influx, where a huge quantity of leaf litter is loaded it came from mangrove forests.in sundarban phosphate concentration is 0.75 to 1 micro mol/lit, nitrate concentration is 2.4-39.9 micro mol/lit, nitrite concentration is 0.6-1.6 micro mol/lit, silicate concentration is 4.8-49.1 micro mol/lit, ammonia concentration is 0.2 -0.4 micro mol/lit and TN concentration is 29.2-36.5 micro mol/lit.

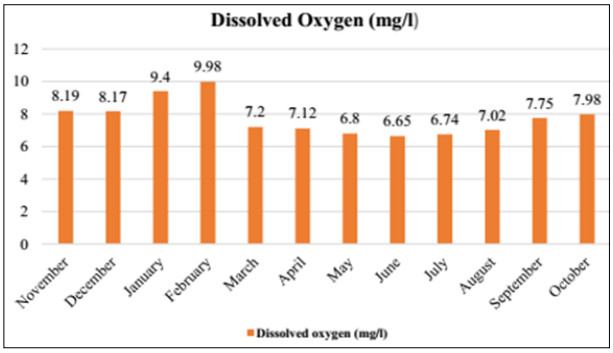
Table 2: Nutrients concentration in Sundarban

Season	Phosphate	Nitrate	Nitrite	Silicate	Ammonia	TN
Post monsoon	0.75	12.6	0.8	16.5	0.4	36.5
Premonsoon	0.4	2.4	0.6	4.8	0.2	29.2
Monsoon	1	39.9	1.6	49.1	0.3	33.1









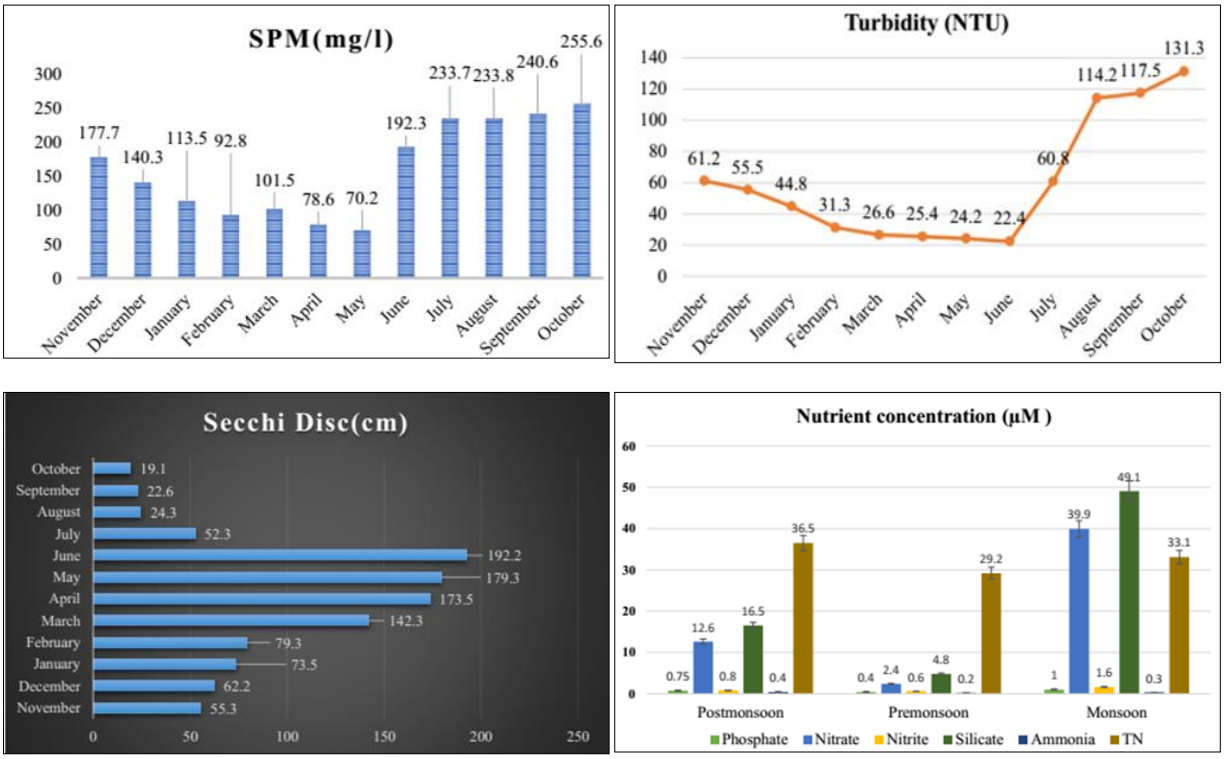


Fig 2: Different physicochemical parameter Graph of sundarban water system

Result and Discussion- the area of sundarban is an aquatic Hotspot where freshwater fish and saline water fish are mixed each other. The coastal fishery of eastern India is totally dependent on sundarban. According to this study we get total 317 fish species, 20 species of prawn and 44 species of crabs are present in sundarban. The most important and commonly available fresh water fish are- mourala, koi, bele, chanda, parse, aor, boal, chuche,tangra, Bata, phasa,pangas. Among brackish water fish- Aor Tangra, milk fish, bhetki, surungi Bhola, Topse and marine fish Hangor, Aar, moonfish, Pomfret, Shankar available in sundarban.

Various economically important prawn species available in this region. They are- Ghuso Chingri (*Acetes indicus*), Goda chingri (*Macrobrachium rude*), Galda chingri (*macrobrachium rosenbergi)*, Honne chingri (*metapenaeus Monoceros*), chamme chingri (*metapenaeus brevicornis*), and brown shrimp (*metapenaeus dobsoni*), hende bagda chingri (*panaeus semisulcatus),* Nona chingri (*parapenaeopsis sculptilis*), chapda chingri (*penaeus indicus*), bagda chingri (*Penaeus monodon*).

Freshwater and marine crab also available in sundarban. They are Nona Kankra (*Scylla serrate*), flower moon crab (*matuta planipes*), tele kankra (*sartorianas pinigera*).

In this study we highlight total 317 species fishes which belongs into 24 order and 84 family and also highlight their IUCN status. Out of 317 species Near Threatened (NT) Species are 18, Critically Endangered (CR) species are 6, Data Deficient (DD) species are 28, and Least Concern species (LC) are 179, Not Evaluated (NE) species are 70, Vulnerable Species (VU) are 11, Endangered (EN) species are 5

Table 3

Sl.No	Order	Total Number of Species	Occurrence						
			NT	CR	DD	LC	NE	VU	EN
1.	Carcharhiniformes	6	03	02	**	**	**	**	01
2.	Pristiformes	2	**	2	**	**	**	**	**
3.	Torpediniformes	1	**	**	01	**	**	**	**
4.	Rajiformes	6	**	**	02	**	**	04	**
5.	Myliobatiformes	9	03	**	01	**	01	04	**
6.	Osteoglossiformes	2	01	**	**	01	**	**	**
7.	Elopiformes	2	**	**	**	02	**	**	**
8.	Anguilliformes	14	04	**	**	04	06	**	**
9.	Clupeiformes	30	**	**	08	20	01	01	**
10.	Gonorynchiformes	5	**	**	**	04	01	**	**
11.	Cypriniformes	38	01	02	**	31	01	01	02
12.	Siluriformes	29	05	**	01	18	04	**	01
13.	Gadiformes	1	**	**	**	**	01	**	**
14.	Batrachoidiformes	1	**	**	**	**	01	**	**
15.	Mugiliformes	9	**	**	01	06	02	**	**
16.	Beloniformes	9	**	**	**	06	03	**	**
17.	Cyprinodontiformes	1	**	**	**	01	**	**	**
18.	Syngnathiformes	3	**	**	**	03	**	**	**

19.	Synbranchiformes	6	**	**	**	06	**	**	**
20.	Scorpaeniformes	2	**	**	01	**	01	**	**
21.	Perciformes	124	01	**	13	68	40	01	01
22.	Pleuronectiformes	10	**	**	**	03	07	**	**
23.	Tetraodontiformes	6	**	**	**	06	**	**	**
24.	Aulopiformes	1	**	**	**	**	01	**	**

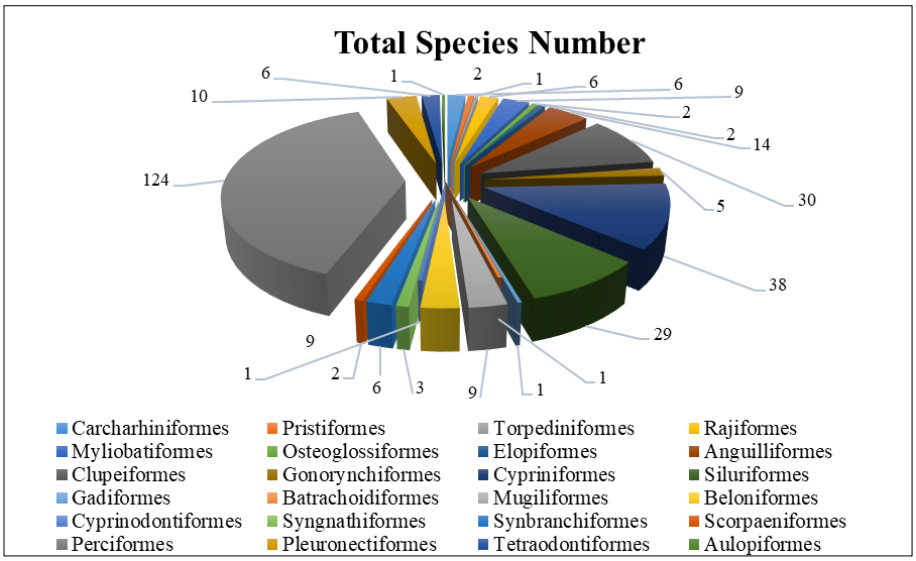


Fig 3: Variation of fishes list according their order wise

Table 4

Sl.No	*Scientific Name*	Common Name	Order	Family	IUCN Status
1.	*Glyphis gangeticus*	Gangetic Shark	Carcharhiniformes	Charcharhinidae	CR
2.	*Carcharhinus hemiodon*	Pondicherry Shark	Carcharhiniformes	Charcharhinidae	CR
3.	*Carcharhinus leucas*	Bull Shark	Carcharhiniformes	Charcharhinidae	NT
4.	*Carcharhinus limbatus*	Blacktip Shark	Carcharhiniformes	Charcharhinidae	NT
5.	*Carcharhinus sorrah*	Spot Tail Shark	Carcharhiniformes	Charcharhinidae	NT
6.	*Eusphyra blochil*	Wing Head Shark	Carcharhiniformes	Sphyrnidae	EN
7.	*Pristis clavata*	Dwarf Sawfish	Pristiformes	Pristidae	CR
8.	*Pristis pristis*	Large tooth Sawfish	Pristiformes	Pristidae	CR
9.	*Narcine brunnea*	Brown Numfish	Torpediniformes	Narcinidae	DD
10.	*Glaucostegus granulatus*	Sharp nose Guitarfish	Rajiformes	Rhinobatidae	VU
11.	*Glaucostegus obtusus*	Wide nose Guitarfish	Rajiformes	Rhinobatidae	VU
12.	*Rhina anclyostoma*	Bow mouth Guitarfish	Rajiformes	Rhinobatidae	VU
13.	*Rhinobatos annandalei*	Annandalei Guitarfish	Rajiformes	Rhinobatidae	DD
14.	*Rhinobatos lionotus*	Smooth back Guitarfish	Rajiformes	Rhinobatidae	DD
15.	*Rhynchobatus laevis*	Smooth Nose Wedge fish	Rajiformes	Rhinobatidae	VU
16.	*Himantura fava*	Honeycomb Whipray	Myliobatiformes	Dasyatidae	NE
17.	*Himantura gerrardi*	Sharp nose Stingray	Myliobatiformes	Dasyatidae	VU
18.	*Himantura uarnacoides*	Bleeker Whipray	Myliobatiformes	Dasyatidae	VU
19.	*Himantura uarnak*	Honeycomb Stingray	Myliobatiformes	Dasyatidae	VU
20.	*Himantura walga*	Dwarf Whipray	Myliobatiformes	Dasyatidae	NT
21.	*Pastinachus sephen*	Cowtail Stingray	Myliobatiformes	Dasyatidae	NT
22.	*Gymnura japonica*	Japanese Butterfly Ray Fish	Myliobatiformes	Gymnuridae	DD
23.	*Gymnura poecilura*	Long Tail Butterfly Ray Fish	Myliobatiformes	Gymnuridae	NT
24.	*Aetobatus ocellatus*	Ocellated Eagle Ray	Myliobatiformes	Myllobatidae	VU
25.	*Notopterus notopterus*	Folui Fish	Osteoglossiformes	Notopteridae	LC
26.	*Chitala chitala*	Chital Fish	Osteoglossiformes	Notopteridae	NT
27.	*Elops machnata*	Lady Fish	Elopiformes	Elopidae	LC
28.	*Megalops cyprinoides*	Indo Pacific Tarpon	Elopiformes	Megalopidae	LC
29.	*Anguilla bengalensis*	Indian Mottled Eel	Anguilliformes	Anguillidae	NT
30.	*Anguilla bicolor*	Indonesian Short Fin Eel	Anguilliformes	Anguillidae	LC
31.	*Anguilla nebulosa*	Mottled Eel	Anguilliformes	Anguillidae	NE
32.	*Moringua guthriana*	Bengal Spaghetti Eel	Anguilliformes	Moringuidae	NE
33.	*Moringua raitaborua*	Purple Spaghetti Eel	Anguilliformes	Moringuidae	NE
34.	*Gymnothorax tile*	Indian Mud Moray	Anguilliformes	Muraenidae	LC
35.	*Strophiden sathete*	Slender Giant Moray	Anguilliformes	Muraenidae	NT
36.	*Lamnostoma orientalis*	Oriental Worm Eel	Anguilliformes	Ophichthidae	LC
37.	*Ophichthus apicalis*	Blunt Nose Snake Eel	Anguilliformes	Ophichthidae	NT

38.	*Pisodonophis hijala*	Bengal Snake Eel	Anguilliformes	Ophichthidae	NT
39.	*Uroconger lepturus*	Slender Conger	Anguilliformes	Ophichthidae	LC
40.	*Congresox talabon*	Yellow Pike Conger	Anguilliformes	Muraenesocidae	NE
41.	*Congresox talabonoides*	Indian Pike Conger	Anguilliformes	Muraenesocidae	NE
42.	*Muraenesox bagio*	Common Pike Conger	Anguilliformes	Muraenesocidae	NE
43.	*Anodontostoma chacunda*	Gizzard Shad (Koi Puti)	Clupeiformes	Clupeidae	LC
44.	*Anodontostoma thailandiae*	Thai Gizzard Shad	Clupeiformes	Clupeidae	LC
45.	*Corica soborna*	Ganges River Spart	Clupeiformes	Clupeidae	LC
46.	*Gonialosa manmina*	Gangateic Khoira	Clupeiformes	Clupeidae	LC
47.	*Gudusia chapra*	Chapila Fish	Clupeiformes	Clupeidae	LC
48.	*Nematalosa galatheae*	Galathea Gizzard Fish	Clupeiformes	Clupeidae	LC
49.	*Tenualosa ilisha*	Gangetic Hilsha	Clupeiformes	Clupeidae	LC
50.	*Tenualosa toli*	Chandan Hilsha	Clupeiformes	Clupeidae	VU
51.	*Llisha elongate*	Elongate Hilsha	Clupeiformes	Pristigasteridae	LC
52.	*Llisha kampeni*	Kampen's Hilsha	Clupeiformes	Pristigasteridae	LC
53.	*Llisha megaloptera*	Bigeye Hilsha	Clupeiformes	Pristigasteridae	LC
54.	*Llisha melastoma*	Indian Hilsha	Clupeiformes	Pristigasteridae	LC
55.	*Llisha sirishai*	Lobe Jaw Hilsha	Clupeiformes	Pristigasteridae	DD
56.	*Pellona ditchela*	Indian Pellona	Clupeiformes	Pristigasteridae	LC
57.	*Coilia dussumieri*	Gold Spotted Grenadier Anchovy	Clupeiformes	Engraulidae	LC
58.	*Coilia neglecta*	Neglected grenadier anchovy	Clupeiformes	Engraulidae	LC
59.	*Coilia ramacarati*	Ramcarat grenadier anchovy	Clupeiformes	Engraulidae	DD
60.	*Setipinna brevifilis*	Short hairfin anchovy	Clupeiformes	Engraulidae	DD
61.	*Setipinna phasa*	Phasa Fish*	Clupeiformes	Engraulidae	LC
62.	*Setipinna taty*	Teli Phasa Fish*	Clupeiformes	Engraulidae	NE
63.	*Setipinna tenuifilis*	Common hairfin anchovy	Clupeiformes	Engraulidae	DD
64.	*Stolephorus baganensis*	Bagan anchovy	Clupeiformes	Engraulidae	LC
66.	*Stolephorus commersonii*	Commerson's anchovy	Clupeiformes	Engraulidae	LC
67.	*Stolephorus indicus*	Indian anchovy	Clupeiformes	Engraulidae	LC
68.	*Thryssa dussunieri*	Dussunier's thryssa	Clupeiformes	Engraulidae	LC
69.	*Thryssa gautamiensis*	Gautama thryssa	Clupeiformes	Engraulidae	DD
70.	*Thryssa hamiltonii*	Hamilton thryssa	Clupeiformes	Engraulidae	LC
71.	*Thryssa malabarica*	Malabar thryssa	Clupeiformes	Engraulidae	DD
72.	*Thryssa purava*	Oblique jaw thryssa	Clupeiformes	Engraulidae	DD
73.	*Thryssa stenosoma*	Slender thryssa	Clupeiformes	Engraulidae	DD
74.	*Chanos salmonoides*	Milk Fish	Gonorynchiformes	Chanidae	LC
75.	*Chanos lubina*	Milk Fish	Gonorynchiformes	Chanidae	LC
76.	*Chanos cyprinella*	Milk Fish	Gonorynchiformes	Chanidae	NE
77.	*Chanos orientals*	Milk Fish	Gonorynchiformes	Chanidae	LC
78.	*Chanos chanos*	Milk Fish	Gonorynchiformes	Chanidae	LC
79.	*Amblypharyangodon mola*	Mourola Fish*	Cypriniformes	Cyprinidae	LC
80.	*Aspidoporia jaya*	Piali Fish*	Cypriniformes	Cyprinidae	LC
81.	*Barilus barila*	Boroli Fish*	Cypriniformes	Cyprinidae	LC
82.	*Barilus barna*	Ghol*	Cypriniformes	Cyprinidae	LC
83.	*Barilus bendelisis*	Joia Fish*	Cypriniformes	Cyprinidae	LC
84.	*Barilus vagra*	Boroli Fish*	Cypriniformes	Cyprinidae	LC
85.	*Chagunius chagunio*	Pithkati Fish*	Cypriniformes	Cyprinidae	LC
86.	*Chela laubuca*	Dankea Fish*	Cypriniformes	Cyprinidae	LC
87.	*Esomus danrica*	Dankya Fish (Flying Barb	Cypriniformes	Cyprinidae	LC
88.	*Garra gotyla gotyla*	Klagachhi*	Cypriniformes	Cyprinidae	LC
89.	*Labeo angra*	Kharsa Fish*	Cypriniformes	Cyprinidae	LC
90.	*Labeo gonius*	Kurechi*	Cypriniformes	Cyprinidae	LC
91.	*Labeo pangusia*	Utti Fish*	Cypriniformes	Cyprinidae	NT
92.	*Laubuka laubuca*	Indian Glass Barb	Cypriniformes	Cyprinidae	LC
93.	*Puntius chelynoides*	Sar Punti*	Cypriniformes	Cyprinidae	VU
94.	*Puntius chola*	Chela Punti*	Cypriniformes	Cyprinidae	LC
95.	*Puntius conchonius*	Chena Punti*	Cypriniformes	Cyprinidae	LC
96.	*Puntius amphibious*	Kirundi Punti*	Cypriniformes	Cyprinidae	DD
97.	*Puntius binotatus*	Spotted Punti*	Cypriniformes	Cyprinidae	LC
98.	*Puntius puntio*	Puntio Barb*	Cypriniformes	Cyprinidae	NE
99.	*Puntius phutunio*	Kurta*	Cypriniformes	Cyprinidae	LC
100.	*Puntius sarana*	Sarana Punti*	Cypriniformes	Cyprinidae	LC
101.	*Puntius sophore*	Punti*	Cypriniformes	Cyprinidae	LC
102.	*Puntius terio*	Teri Punti*	Cypriniformes	Cyprinidae	LC
103.	*Puntius ticto*	Tit Punti*	Cypriniformes	Cyprinidae	LC
104.	*Salmophasia bacaila*	Chela*	Cypriniformes	Cyprinidae	LC
105.	*Salmophasia phulo*	Phulo Chela Fish*	Cypriniformes	Cyprinidae	LC
106.	*Salmophasia gora*	Ghorchelwa Fish*	Cypriniformes	Cyprinidae	LC

107.	*Tor putitora*	Putitor Fish*	Cypriniformes	Cyprinidae	EN
108.	*Tor tor*	Mahasol Fish*	Cypriniformes	Cyprinidae	EN
109.	*Systomus sarana*	Olive barb	Cypriniformes	Cyprinidae	DD
110.	*Rasbora daniconius*	Slender rasbora	Cypriniformes	Cyprinidae	LC
111.	*Danio rerio*	Zebra danio	Cypriniformes	Cyprinidae	LC
112.	*Pethia conchonius*	Rosy barb	Cypriniformes	Cyprinidae	LC
113.	*Pethia gelius*	Goldern barb	Cypriniformes	Cyprinidae	LC
114.	*Pethia phutunio*	Spotted sail barb	Cypriniformes	Cyprinidae	LC
115.	*Pethia ticto*	Titpunti*	Cypriniformes	Cyprinidae	LC
116.	*Ompok pabda*	Pabda Fish*	Siluriformes	Siluridae	NT
117.	*Wallago attu*	Boal Fish*	Siluriformes	Siluridae	NT
118.	*Ompok bimaculatus*	Butter Catfish*	Siluriformes	Siluridae	NT
119.	*Lepidocephalichthys guntea*	Guntea Loach	Cypriniformes	Cobitidae	LC
120.	*Pachypterus atherinoides*	Indian Potasi	Siluriformes	Horabagridae	LC
121.	*Batasio batasio*	Batasio	Siluriformes	Bagridae	LC
122.	*Mystus bleekeri*	Tengra Fish	Siluriformes	Bagridae	LC
123.	*Rita rita*	Rita Fish*	Siluriformes	Bagridae	LC
124.	*Mystus cavasius*	Gangetic Tengra*	Siluriformes	Bagridae	LC
125.	*Mystus gulio*	Long Whiskers Catfish	Siluriformes	Bagridae	LC
126.	*Mystus tengra*	Tengra Fish*	Siluriformes	Bagridae	LC
127.	*Mystus vittatus*	Tengra Fish*	Siluriformes	Bagridae	LC
128.	*Sperata aor*	Aor Fish	Siluriformes	Bagridae	LC
129.	*Sperata seenghala*	Giant River Catfish	Siluriformes	Bagridae	LC
130.	*Ailia coila*	Gangetic Ailia	Siluriformes	Schilbeidae	NT
131.	*Silonia silondia*	Silond Catfish	Siluriformes	Schilbeidae	LC
132.	*Pangasius pangasius*	Pangas Catfish*	Siluriformes	Pangasiidae	LC
133.	*Bagarius bagarius*	Goonch Fish	Siluriformes	Sisoridae	NT
134.	*Clarias batrachus*	Magur Fish*	Siluriformes	Clariidae	LC
135.	*Clarias magur*	Magur Fish*	Siluriformes	Clariidae	EN
136.	*Heteropneustes fossilis*	Singi Fish*	Siluriformes	Hetropsteunidae	LC
137.	*Arius arius*	Sea Catfish	Siluriformes	Ariidae	LC
138.	*Arius jella*	Black Fin Sea Catfish	Siluriformes	Ariidae	NE
139.	*Cephalocassis jatia*	River Catfish	Siluriformes	Ariidae	DD
140.	*Hexanematichthys sagor*	Sagor Catfish	Siluriformes	Ariidae	NE
141.	*Netuma thalassina*	Giant Sea Catfish	Siluriformes	Ariidae	LC
142.	*Osteogeneiosus militaris*	Soldier Catfish	Siluriformes	Ariidae	NE
143.	*Plicofollis platystomus*	Flat Mouth Sea Catfish	Siluriformes	Ariidae	LC
144.	*Plotosus canius*	Gray Eel Catfish	Siluriformes	Plotosidae	NE
145.	*Plotosus lineatus*	Striped Eel Catfish	Siluriformes	Plotosidae	LC
146.	*Harpadon nehereus*	Bombay Duck	Aulopiformes	Synodontidae	NE
147.	*Bregmaceros mcclellandi*	Spotted Codlet	Gadiformes	Bregmacerotidae	NE
148.	*Allenbatrachus grunniens*	Grunting Toadfish	Batrachoidiformes	Batrachoididae	NE
149.	*Ellochelon vaigiensis*	Squaretail Mullet	Mugiliformes	Mugilidae	LC
150.	*Liza macrolepis*	Large-Scale Mullet	Mugiliformes	Mugilidae	LC
151.	*Liza parsia*	Gold Spot Mullet	Mugiliformes	Mugilidae	NE
152.	*Liza tade*	Trade Gray Mullet	Mugiliformes	Mugilidae	DD
153.	*Liza subviridis*	Green Back Mullet	Mugiliformes	Mugilidae	LC
154.	*Rhinomugil corsula*	Corsula	Mugiliformes	Mugilidae	LC
155.	*Valamugil buchanani*	Blue Tail Mullet	Mugiliformes	Mugilidae	LC
156.	*Valamugil seheli*	Blue Spot Mullet	Mugiliformes	Mugilidae	LC
157.	*Valamugil speigleri*	Speigler's Mullet	Mugiliformes	Mugilidae	NE
158.	*Oryzias dancena*	Rice Fish	Beloniformes	Adrianichthyidae	LC
159.	*Hemiramphus far*	Black Barred Halfbeak	Beloniformes	Hemiramphidae	NE
160.	*Rhynchorhamphus georgii*	Long Billed Halfbeak	Beloniformes	Hemiramphidae	LC
161.	*Zenarchopterus buffonis*	River Garfish	Beloniformes	Zenarchopteridae	NE
162.	*Zenarchopterus dispar*	Feathered Garfish	Beloniformes	Zenarchopteridae	LC
163.	*Zenarchopterus striga*	Hooghly Halfbeak	Beloniformes	Zenarchopteridae	NE
164.	*Strongylura leiura*	Banded Needlefish	Beloniformes	Belonidae	LC
165.	*Strongylura Strongylura*	Spot Tail Needle Fish	Beloniformes	Belonidae	LC
166.	*Xenentodon cancila*	Freshwater Garfish	Beloniformes	Belonidae	LC
167.	*Aplocheilus panchax*	Blue Panchax	Cyprinodontiformes	Aplocheilidae	LC
168.	*Hippichthys spicifer*	Belly Barrred Pipefish	Syngnathiformes	Syngnathidae	LC
169.	*Ichthyocampus carce*	Carse Pipefish	Syngnathiformes	Syngnathidae	LC
170.	*Microphis cuncalus*	Crocodile Tooth Pipefish	Syngnathiformes	Syngnathidae	LC
171.	*Monopterus albus*	Boluk Fish*	Synbranchiformes	Synbranchidae	LC
172.	*Monopterus cuchia*	Kuche Fish*	Synbranchiformes	Synbranchidae	LC
173.	*Ophistemon bengalense*	Bengal Swampeel	Synbranchiformes	Synbranchidae	LC
174.	*Macrognathus aral*	One Stripe Spinyeel	Synbranchiformes	Mastacembelidae	LC

175.	*Macrognathus pancalus*	Barred Spinyeel	Synbranchiformes	Mastacembelidae	LC
176.	*Mastacembelus armatus*	Zig-Zag Spinyeel	Synbranchiformes	Mastacembelidae	LC
177.	*Grammoplites scaber*	Rough Flat Head	Scorpaeniformes	Platycephalidae	NE
178.	*Platycephalus indicus*	Bartail Flathead	Scorpaeniformes	Platycephalidae	DD
179.	*Lates calcarifer*	Bhetki Fish*	Perciformes	Latidae	NE
180.	*Ambassis kopsii*	Hawkfish	Perciformes	Ambassidae	NE
181.	*Chanda nama*	Glass Perchlet Fish	Perciformes	Ambassidae	LC
182.	*Parambassis baculis*	Himalayan Glassy	Perciformes	Ambassidae	LC
183.	*Parambassis ranga*	Indian Glassy Fish	Perciformes	Ambassidae	LC
184.	*Epinephelus lanceolatus*	Giant grouper	Perciformes	Serranidae	DD
185.	*Epinephelus malabaricus*	Malabar grouper	Perciformes	Serranidae	LC
186.	*Sillaginopsis domina*	Flathead sillago	Perciformes	Sillaginidae	NT
187.	*Sillago sihama*	Silver sillago	Perciformes	Sillaginidae	LC
188.	*Alectis indicus*	Indian threadfish	Perciformes	Carangidae	LC
189.	*Atule mate*	Yellowtail scad	Perciformes	Carangidae	LC
190.	*Carangoides chrysophrys*	Longnose trevally	Perciformes	Carangidae	LC
191.	*Carangoides malabaricus*	Malabar trevally	Perciformes	Carangidae	LC
192.	*Caranx ignobilis*	Giant trevally	Perciformes	Carangidae	LC
193.	*Megalaspis cordyla*	Torpedo scad	Perciformes	Carangidae	LC
194.	*Parastromateus niger*	Black pomfret	Perciformes	Carangidae	LC
195.	*Scomberoides tala*	Barred queen fish	Perciformes	Carangidae	LC
196.	*Trachinotus blochii*	Snub nose pompano	Perciformes	Carangidae	LC
197.	*Aurigequula fasciata*	Striped pony fish	Perciformes	Leiognathidae	LC
198.	*Eubleekeria splendens*	Splendid pony fish	Perciformes	Leiognathidae	LC
199.	*Leiognathus equula*	Common pony fish	Perciformes	Leiognathidae	LC
200.	*Nuchequula blochii*	Two blotch pony fish	Perciformes	Leiognathidae	NE
201.	*Photopectoralis bindus*	Orange fin ponyfish	Perciformes	Leiognathidae	DD
202.	*Secutor insidiator*	Pug nose ponyfish	Perciformes	Leiognathidae	DD
203.	*Secutor ruconius*	Deep pug nose ponyfish	Perciformes	Leiognathidae	NE
204.	*Lutjanus argentimaculatus*	Red snapper	Perciformes	Lutjanidae	LC
205.	*Lutjanus fulvus*	Blacktail snapper	Perciformes	Lutjanidae	LC
206.	*Lutjanus indicus*	Indian snapper	Perciformes	Lutjanidae	LC
207.	*Datnioides polota*	Tiger fish	Perciformes	Datnioididae	LC
208.	*Gerres filamentosus*	Whip Fin Silver Biddy	Perciformes	Gerreidae	LC
209.	*Gerres oyena*	Common silver Biddy	Perciformes	Gerreidae	LC
210.	*Gerres setifer*	Bengal silver biddy	Perciformes	Gerreidae	NE
211.	*Pomadasys argenteus*	Silver grunt	Perciformes	Haemulidae	LC
212.	*Pomadasys kakken*	Javelin grunt	Perciformes	Haemulidae	LC
213.	*Pomadasys maculatus*	Saddle grunt	Perciformes	Haemulidae	LC
214.	*Acanthopagrus longispinnis*	Longfin sea bream	Perciformes	Sparidae	DD
215.	*Rhabdosargus sarba*	Goldlined seabream	Perciformes	Sparidae	LC
216.	*Sparidentex datnia*	Yellowfin sea bream	Perciformes	Sparidae	DD
217.	*Eleutheronema tetradactylum*	Fourfinger threadfin	Perciformes	Polynemidae	EN
218.	*Leptomelansoma indicum*	Indian threadfin	Perciformes	Polynemidae	LC
219.	*Polydactylus sextarius*	Blackspot threadfin	Perciformes	Polynemidae	NE
220.	*Polynemus paradiseus*	Paradise threadfin	Perciformes	Polynemidae	LC
221.	*Daysciaena albida*	Bengal corvine	Perciformes	Sciaenidae	NE
222.	*Dendrophysa russelii*	Goatee croaker	Perciformes	Sciaenidae	NE
223.	*Johnieops borneensis*	Hammer croaker	Perciformes	Sciaenidae	NE
224.	*Johnieops dussumieri*	Sin croaker	Perciformes	Sciaenidae	NE
225.	*Johnius carutta*	Karut croaker	Perciformes	Sciaenidae	DD
226.	*Johnius coitor*	Coitor croaker	Perciformes	Sciaenidae	LC
227.	*Johnius gangeticus*	Ganges croaker	Perciformes	Sciaenidae	NE
228.	*Macrospinosa cuja*	Largespine croaker	Perciformes	Sciaenidae	NE
229.	*Nibea soldado*	Soldier croaker	Perciformes	Sciaenidae	NE
230.	*Otolithoides biauritus*	Bronze croaker	Perciformes	Sciaenidae	NE
231.	*Otolithoides pama*	Pama croaker	Perciformes	Sciaenidae	NE
232.	*Panna microdon*	Panna croaker	Perciformes	Sciaenidae	NE
233.	*Protonibea diacanthus*	Black spotted croaker	Perciformes	Sciaenidae	LC
234.	*Pterotolithus maculatus*	Tiger toothed croaker	Perciformes	Sciaenidae	LC
235.	*Toxotes chatareus*	Spotted archerfish	Perciformes	Toxotidae	NE
236.	*Toxotes jaculatrix*	Banded archerfish	Perciformes	Toxotidae	LC
237.	*Drepane longimana*	Concertina fish	Perciformes	Drepanidae	LC
238.	*Drepane punctate*	Spotted sickle fish	Perciformes	Drepanidae	NE
239.	*Badis badis*	Badis fish	Perciformes	Badidae	LC
240.	*Nandus nandus*	Gangetic leaf fish	Perciformes	Nandidae	LC
241.	*Terapon puta*	Small Scaled terapon	Perciformes	Terapontidae	LC
242.	*Terapon theraps*	Large scaled terapon	Perciformes	Terapontidae	LC

243.	*Callionymus fluviatilis*	River dragonet	Perciformes	Callionymidae	NE
244.	*Callionymus megastomus*	Indian dragonet	Perciformes	Callionymidae	NE
245.	*Callionymus sagitta*	Arrow dragonet	Perciformes	Callionymidae	LC
246.	*Eleutherochir opercularis*	Flap-gilled dragonet	Perciformes	Callionymidae	NE
247.	*Butis butis*	Duckbill sleeper	Perciformes	Eleotridae	LC
248.	*Butis humeralis*	Black spotted gudgeon	Perciformes	Eleotridae	NE
249.	*Odonteleotris macrodon*	Gangetic sleeper	Perciformes	Eleotridae	NE
250.	*Giuris margaritacea*	Snalehead gudgeon	Perciformes	Eleotridae	LC
251.	*Ophiocara ophicephalus*	Mud gudgeon	Perciformes	Eleotridae	LC
252.	*Acentrogobius caninus*	Tropical sand goby	Perciformes	Gobiidae	LC
253.	*Acentrogobius viridipunctatus*	Spotted green goby	Perciformes	Gobiidae	NE
254.	*Amblyeleotris gymnocephala*	Masked goby	Perciformes	Gobiidae	NE
255.	*Amblyotrypauchen arctocephala*	Armor eel goby	Perciformes	Gobiidae	NE
256.	*Apocryptes bato*	Flat toothed goby	Perciformes	Gobiidae	LC
257.	*Apocryptodon madurensis*	Madura goby	Perciformes	Gobiidae	NE
258.	*Bathygobius fuscus*	Frill goby	Perciformes	Gobiidae	LC
259.	*Boleophthalmus boddarti*	Goggle eyed goby	Perciformes	Gobiidae	LC
260.	*Brachygobius nunus*	Bumblebee goby	Perciformes	Gobiidae	NE
261.	*Caragobius urolepis*	Sumatra eel goby	Perciformes	Gobiidae	LC
262.	*Glossogobius giuris*	Tank goby	Perciformes	Gobiidae	LC
263.	*Gnatholepis cauerensis*	Eye bar goby	Perciformes	Gobiidae	LC
264.	*Gobiopsis macrostoma*	Long jaw goby	Perciformes	Gobiidae	NE
265.	*Gobiopterus chuno*	Glass goby	Perciformes	Gobiidae	DD
266.	*Hemigobius hoevenii*	Banded mulletgoby	Perciformes	Gobiidae	NE
267.	*Istigobius ornatus*	Ornate goby	Perciformes	Gobiidae	LC
268.	*Oligolepis acutipennis*	Sharptail goby	Perciformes	Gobiidae	DD
269.	*Oxuderces dentatus*	Chinese goby	Perciformes	Gobiidae	NE
270.	*Parachaeturichthys polynema*	Tail eyed goby	Perciformes	Gobiidae	LC
271.	*Parapocryptes serperaster*	Large scaled goby	Perciformes	Gobiidae	LC
272.	*Paratrypauchen microcephalus*	Comb goby	Perciformes	Gobiidae	LC
273.	*Periophthalmodon schlosseri*	Giant mudskipper	Perciformes	Gobiidae	LC
274.	*Periophthalmodon septemradiatus*	Hamilton mudskipper	Perciformes	Gobiidae	NE
275.	*Periophthalmodon argentilineatus*	Barred mudskipper	Perciformes	Gobiidae	NE
276.	*Periophthalmus kalolo*	Common mudskipper	Perciformes	Gobiidae	LC
277.	*Periophthalmus novemradiatus*	Pearse mudskipper	Perciformes	Gobiidae	NE
278.	*Periophthalmus variabilis*	Variable mudskipper	Perciformes	Gobiidae	NE
279.	*Scartelaos histophorus*	Walking goby	Perciformes	Gobiidae	NE
280.	*Kurtus indicus*	Indian humphead	Perciformes	Kurtidae	NE
281.	*Scatophagus argus*	Spotted scat	Perciformes	Scatophagidae	LC
282.	*Siganus canaliculatus*	White spotted spine foot	Perciformes	Siganidae	LC
283.	*Siganus javus*	Streaked spine foot	Perciformes	Siganidae	LC
284.	*Sphyraena obtusata*	Obtuse barracuda	Perciformes	Sphyraenidae	LC
285.	*Eupleurogrammus muticus*	Small head hairtail	Perciformes	Trichiuridae	DD
286.	*Lepturacanthus pantului*	Coromandel hairtail	Perciformes	Trichiuridae	DD
287.	*Trichiurus ganeticus*	Gangetic hair tail	Perciformes	Trichiuridae	NE
288.	*Trichiurus lepturus*	Large head hair tail	Perciformes	Trichiuridae	LC
289.	*Scomberomorus guttatus*	Indian mackerel	Perciformes	Satromateidae	DD
290.	*Pampus argenteus*	Silver pomfret	Perciformes	Satromateidae	VU
291.	*Pampus chinensis*	Chinese pomfret	Perciformes	Satromateidae	NE
292.	*Anabas cobojius*	Gangetic koi	Perciformes	Anabantidae	DD
293.	*Anabas testudineus*	Climbing perch	Perciformes	Anabantidae	DD
294.	*Trichogaster fasciata*	Banded Gourami	Perciformes	Osphronemidae	LC
295.	*Trichogaster lalius*	Dwarf Gourami	Perciformes	Osphronemidae	LC
296.	*Trichogaster chuna*	Honey Gourami	Perciformes	Osphronemidae	LC
297.	*Colisa fasciata*	Gourami fish	Perciformes	Osphronemidae	LC
298.	*Channa gachua*	Dwarf snakehead	Perciformes	Channidae	LC
299.	*Channa orientalis*	Cheng fish	Perciformes	Channidae	NE
300.	*Channa marulius*	Great Snakehead	Perciformes	Channidae	LC
301.	*Channa punctate*	Spotted Snakehead	Perciformes	Channidae	LC
302.	*Channa striata*	Striped Snakehead	Perciformes	Channidae	LC
303.	*Pseudorhombus arsius*	Largetooth Flounder	Pleuronectiformes	Paralicgthyidae	LC
304.	*Pseudorhombus elevates*	Deep Flounder	Pleuronectiformes	Paralicgthyidae	NE
305.	*Cynoglossus arel*	Large-Scale Tongue Sole	Pleuronectiformes	Cynoglossidae	LC
306.	*Cynoglossus cynoglossus*	Bengal Tongue Sole	Pleuronectiformes	Cynoglossidae	NE
307.	*Cynoglossus lingua*	Long Tongue Sole	Pleuronectiformes	Cynoglossidae	NE
308.	*Cynoglossus macrostomus*	Speckled Tongue Sole	Pleuronectiformes	Cynoglossidae	NE
309.	*Paraplagusia bilineata*	Double Lined Tongue Sole	Pleuronectiformes	Cynoglossidae	NE
310.	*Brachirus pan*	Pan Sole	Pleuronectiformes	Soleidae	LC

311.	*Synaptura albomaculata*	Kaup's Sole	Pleuronectiformes	Soleidae	NE
312.	*Synaptura commersonnii*	Commerson's Sole	Pleuronectiformes	Soleidae	NE
313.	*Pseudotriacanthus strigilifer*	Long Spined Tripod Fish	Tetraodontiformes	Triacanthidae	LC
314.	*Triacanthus biaculeatus*	Short Nosed Tripod Fish	Tetraodontiformes	Triacanthidae	LC
315.	*Chelonodon patoca*	Milk Spotted Puffer	Tetraodontiformes	Tetraodontidae	LC
316.	*Dichotomyctere fluviatilis*	Green Pufferfish	Tetraodontiformes	Tetraodontidae	LC
317.	*Legocphalus lunaris*	Green Rough Backed Puffer	Tetraodontiformes	Tetraodontidae	LC
318.	*Leiodon cutcutia*	Ocellated Pufferfish	Tetraodontiformes	Tetraodontidae	LC

3. Threats: Indian sundarban is under threat by several factors. The threats to sundarban mangrove ecosystem and their surrounding environment. Sundarban is a coastal area where weather changes, cyclones, climate changes, sea level rising, temperature increasing and many environmental hazards are present. Due to the environmental problem and other threats cause of the biodiversity lost in sundarbans. They are-

a) High salinity, low water table and acidity problem effect direct in fish resources.
b) Uncontrolled collection of prawn seeding.
c) Uncontrolled fishing in the water of reserve forests.
d) Reduction in the periodicity and quantity of freshwater reaching the mangrove environment due to diversion of freshwater.
e) Toxic product and urban wastes of Ganga and Brahmaputra River are enters in to this ecosystem.
f) Temperature increasing— Due to the global warming temperature are highly increase .in sundarbans has been observed that the sea water temperature are increased and increased rat is 0.50c per decade.in global sea surface temperature warming rate is 0.60c per decade. This temperature increase causes biodiversity lost. Increasing temperature is harmful for aquatic animal.it also affects the health of the mangrove system.
g) Rising levels of sea--- Due to the sea levels raising the mangrove ecosystem cannot produce their food through the process of photosynthesis and regeneration process of mangrove rate is decreased. Due to the production of food mangrove tree cannot grow properly for this causes we are lost the mangrove system. Due to the sea levels raising many area of sundarbans is present under the water.
h) Pollution--- There are no factory in the area of sundarbans, but sundarbans is an outside border of West Bengal. Several rivers are join the coastal area of sundarbans, due to the water pollution sundarban water be polluted. Sundarban cannot received fresh water. Heavy metals which may have changed the estuary's geochemistry, coastal environment and aquatic animal life.it also harmful for mangrove tree. Pollution change the biodiversity of sundarbans.
i) Rampal power station--- Now a day's environment is very poor condition. Water, sound, air pollution is a main part for poor condition environment. Rampal power station is present in to the sundarbans due to the Rampal power station air environment of sundarbans is polluted. Due to this cause fish cannot take proper O_2 for their respiration.

4. Conservation: conservation help fish production to be more sustainable while at the same time maintain diversity. Due to several factors such as human modification, over exploitation, Habitat loss, exotic fishes and others aquatic biodiversity is greatly threatened. Due to the water pollution Gangetic dolphin number are decrease. Immediate conserve the Gangetic dolphin. Stop over fishing and diesel boat entry in sundarban.

a) Artificial breeding of threatened species for restocking in their natural habitat and establish in gene bank.
b) New born fish and young juveniles, breeding adults fish catching is illegal stop this type of fish catching.
c) Give more proper training for fisherman.
d) Control of fishing gear.
e) For conservation there are several act are present. Such as- West Bengal fisheries Act, 1984 and west Bengal ground water resources act 2005.

5. Conclusion- Due to overfishing and water pollution in sundarban area fish and unfished population have been effected. Fishing thus effects not only exploited species but also other species that are linked ecologically or environmentally with fish species and their ecosystem. We conclude that significant overall reduction in fishing mortality is very much important to sustaining fisheries and marine ecosystem. If the specific conservation implemented would contribute to an overall reduction in fishing mortality, which is required to rebuilt the population.

6. Author's Contributions: this work was carried out in collaboration between the authors. Authors KS designed the study area and collect the data and author collect the picture and analysis the sample. Author KS and RM wrote the Paper. Both authors read and approved the final manuscript. All laboratory work done under on Department Laboratory (Zoology Colour Lab)

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