

FISH BIODIVERSITY OF INDIAN EXCLUSIVE ECONOMIC ZONE

K. K. Joshi, Sethulakshmi, M. and Varsha M. S.

Marine Biodiversity Division
ICAR-Central Marine Fisheries Research Institute

Introduction

Indian fisheries have a long history, starting with Kautilya's *Arthashastra* describing fish as a source for consumption and provide evidence that fishery was a well-established industry in India and fish was relished as an article of diet as early as 300 B.C, the ancient Hindus possessed a considerable knowledge of the habit of fishes and the epic on the second pillar of Emperor Ashoka describing the prohibition of consumption of fish during a certain lunar period which can be interpreted as a conservation point of view. Modern scientific studies on Indian fishes could be traced to the initial works done by Linnaeus, Bloch and Schneider, Lacepède, Russell and Hamilton. The mid 1800s contributed much in the history of Indian fish taxonomy since the time of the expeditions was going through. Cuvier and Valenciennes (1828-1849) described 70 nominal species off Puducherry, Skyes (1839), Günther (1860, 1872, 1880) and *The Fishes of India* by Francis Day (1865-1877) and another book *Fauna of British India Series* in two volumes (1889) describing 1,418 species are the two most indispensable works on Indian fish taxonomy to date. Alcock (1889, 1890) described 162 species new to science from Indian waters.

In the 20th century, the basis of intensive studies on the different families and groups of freshwater fishes was done by Chaudhuri along with Hora and his co-workers. Misra published *An Aid to Identification of the Commercial Fishes of India and Pakistan* and *The Fauna of India and Adjacent Countries (Pisces)* in 1976. Jones and Kumaran described about 600 species of fishes in the work *Fishes of Laccadive Archipelago*. Talwar and Kacker gave a detailed description of 548 species under 89 families in his work, *Commercial Sea Fishes of India. The FAO Species Identification Sheets for Fishery Purposes - Western Indian Ocean* (Fischer and Bianchi) is still a valuable guide for researchers.

The long coastline of 8129 km² with an EEZ of 2.02 million sq. km including the continental shelf of 0.5 million sq. km harbors extensively rich multitude of species. Vast regions of mangroves are found along the coast of West Bengal, Orissa, Andhra Pradesh, Tamilnadu, Maharashtra, Gujarat and Andaman Islands which extends up to about 6,82,000 ha area. Coral reefs are found in the Gulf of Kutch, along the Maharashtra coast, Kerala coast, in the Gulf of Mannar, Palk Bay and the Wadge Bank along the Tamilnadu coast and around Andaman and Lakshadweep Islands. The variety of coastal ecosystems includes brackish water lakes, lagoons, estuaries, back waters, salt marshes, rocky bottom, sandy bottom and



muddy areas provides a home and shelter for the mega biodiversity of India. These regions support very rich fauna and flora and constitute rich biological diversity of marine ecosystems. Diversity in the species complex, typical of tropical waters and co-existence of different fish and shellfish species in the same ground are important features of Indian Marine Biodiversity.

Species Diversity

Fin fishes

Of the 33,059 total fish species of the world, India contributes of about 2,492 marine fishes owing to 7.4% of the total marine fish resources. Of the total fish diversity known from India, the marine fishes constitute 75.6 percent, comprising of 2,492 species belonging to 941 genera, under 240 families of 40 orders. Among the fish diversity-rich areas in the marine waters of India, the Andaman and Nicobar Archipelago, shows the highest number of species, 1,431, followed by the east coast of India with 1,121 species and the west coast with 1071. Detailed taxonomy of 18 families of fishes occurring in Indian EEZ was done as shown in the Table 1. As many as 91 species of endemic marine fishes are known to occur in the coastal waters of India. As of today, about 50 marine fishes known from India fall into the Threatened category as per the IUCN Red List, and about 45 species are Near-Threatened and already on the path to vulnerability. However, only some species (10 elasmobranchs, 10 seahorses and one grouper) are listed in Schedule I of the Wildlife (Protection) Act, 1972 of the Government of India. The ecosystem goods and services provided by the fauna and flora and the interrelationship between the biodiversity and ecological processes are the fundamental issues in the sustainability and equilibrium of the ecosystem.

Table 1. List of Fish families and corresponding authors

No	Name of the Family /group	Authors
1	Flatfishes	Norman, 1934, Menon, 1977
2	Scombridae	Jones and Silas, 1962
3	Mugilidae	Sarojini, 1962
4	Clupeidae	Whitehead, 1985
5	Trichiuridae	James, 1967
6	Leiognathidae	James, 1975
7	Chirocentridae	Luther, 1968
8	Mullidae	Thomas, 1969
9	Sphyraenidae	De Sylva, 1975
10	Syngnathidae	Dawson, 1976
11	Scorpaenidae	Eschmeyer, 1969



12	Platycephalidae	Murty, 1982
13	Callionymidae	Ronald, 1983
14	Sciaenidae	Lal Mohan, 1972, 1982, Trewavas, 1977
15	Nemipteridae	Russell, 1986
16	Priacanthidae	Phillip, 1994
17	Carangidae	Sreenivasan, 1976, Joshi, 2011
18	Balistidae	Sathish Sahayak, 2015

Recent analysis indicates that 18 resource groups fall under abundant category, five fall under less abundant category and one each fall under declining, depleted and collapsed category. The resource groups under the abundant category indicates good condition of the stock. The less abundant category includes elasmobranchs, threadfins, ribbon fishes, mullets and flat fishes. Big-jawed jumper under the declining category, flying fishes under depleted and unicorn cod is in the collapsed category. While certain stocks such as those of Mackerel, Lesser Sardines, White bait, Seer fish, Coastal and oceanic tunas, Croakers, Pig face breams, Groupers, Snappers, Cat fish, Lizard fish, Silver bellies and Goat fishes are exploited all along the Indian coast. Bombay duck is caught mainly along the Gujarat and Maharashtra coast and to a lesser extent along certain pockets of Andhra, Orissa and West Bengal coasts. *Hilsa* is harvested mainly along the West Bengal coast and Gujarat coast.

Elasmobranchs

The elasmobranchs consists of sharks, sawfishes, rays, skates and guitar fishes. They are fished using different types of gears and in recent years have assumed great significance in the export market. They are exploited by a variety of fishing gears like gillnets, long lines and trawls along the Indian coast by both traditional and mechanized sectors. Though there is no directed fishing for elasmobranchs in certain places of Tamilnadu, large meshed bottom set gillnets called as 'thirukkuvalai' are operated for fishing the rays. They are all predatory feeding on a wide range from zooplankton to benthic invertebrates, bony fishes, other sharks, turtles, seabirds and marine mammals. Akhilesh *et al.* (2014) provided a checklist of 227 chondrichthyan species belonging to 11 orders and 41 families from Indian seas and it was mentioned that 27 species (12%) have questionable status with regard to their occurrence because their distributional range does not fall within Indian seas.

The Whale shark is huge, sluggish, pelagic filter-feeder, often seen swimming on the surface. Viviparous and gravid female have 300 young ones of several stages of development. The protected elasmobranchs as per the Wildlife (Protection) Act, 1972, Schedule I are *Rhincodon typus* (Whale shark), *Anoxyprisits cuspidata* (Pointed saw fish), *Prisits microdon*



(Large tooth sawfish), *Pristis zijsron* (Longcomb sawfish), *Carcharhinus hemiodon* (Pondicherry shark), *Glyphis gangeticus* (Ganges shark), *Glyphis glyphis* (Spear tooth shark), *Himantura fluviatilis* (Gangetic sting ray), *Rhynchobatus djiddensis* (Giant guitarfish) and *Urogymnus asperimus* (Thorny ray).

Ornamental fish

The Gulf of Mannar, Palk bay, Gulf of Kutch, South West coast and the Lakshadweep and Andaman group of Islands are known to be rich in Ornamental fishery. The Wrasses, damsel fish, Surgeon, Butterfly fish, Moorish idol, Squirrel fish, Trigger fish, Rabbit fish, Parrot fish, Angels, Goat fish and Puffer fish are the major aquarium fishes represented by about 180 species. As the majority of these fishes is associated with coral reefs and those in great demand and are not very abundant, their exploitation may disturb the habitats and result in depletion of stock, if a suitable mechanism for sustainable exploitation for example sample traps, monitoring the exploitation and export are not developed. The seahorses and pipefishes are known to live in seagrass beds, mangroves and reefs in most shallower coastal waters of the temperate and tropical regions. About 300 species of ornamental fishes from 30 genera are known. CITES have listed all the seahorses in the Appendix I to stop the trade of these organisms. Indian wild Life Act 2002 also protects the seahorse by putting them in Schedule list I. Dried seahorse has got a high demand in Singapore and China for making soup and for medicinal purposes.

Ecosystem Diversity

Gujarat coast

Gujarat has the longest coastline of more than 1,600 km and the most extensive continental shelf of nearly 1,64,000 km², which represents nearly 20% and 32 % of India's coastline and continental shelf. The EEZ of Gujarat covers 2,14,000 km. The coast has broadly been divided into four sections: the Gulf of Kutch, the Saurashtra coast, the Gulf of Khambhat and the South Gujarat coast. The ecological importance is that India's first Marine National Park was notified in the Gulf of Kutch. In the ecological sense, the habitats exhibit considerable diversity and they include mangroves, salt marshes, coral reefs, beaches, dunes, estuaries, intertidal mudflats, gulfs, bays and wetlands. Gujarat has India's second largest extent of area under the mangroves. Gulf of Khambhat (Gulf of Cambay) is 190 km wide at its mouth between Diu and Daman, rapidly narrows to 24 km. The gulf receives many rivers, including the Sabarmati, Mahi, Narmada, and Tapti. The Gulf of Kutch is rather shallow with a depth of nearly 60 m at the mouth to less than 20 m near the head. The total gulf area is about 7,350 km². In the Gulf of Kutch, there are 42 islands & some islets, covering a total area of about 410.6 km².



About 306 fish species are listed from the sea and coastal waters of Gujarat. Some of the important group of fishes that are occurring in the Arabian sea and also ventured into Gujarat waters include sharks, rays, sea horses, catfishes, groupers, ribbon fishes, jewfishes, mullets, puffer fish, coral fish, lady fish, etc. Out of total 306 reported species, 23 fish species were found in the IUCN's Red Data list. Importantly, 9 of these species belong to shark families, including the whale shark, are also listed in Schedule I of Wildlife Protection Act, 1972. The fishery at present is dominated by fishes like ribbon fishes (*Trichiurus lepturus*), Bombay duck (*Harpodon nehereus*), croakers, carangids, threadfin breams, lizard fishes, tuna (*Euthynnus affinis*, *Thunnus tonggol*, *Katsuwonus pelamis*, *Thunnus albacores* and *Sarda orientalis*), seerfish, pomfrets, catfish, flatfishes and non penaeid prawns. The Bombay duck (*Harpodon nehereus*) fishery was dominant at Nawabunder, Rajpara and Jaffrabad along the Saurashtra coast.

Mumbai coast

The Maharashtra coast that stretches between Bordi/Dahanu in the North and Redi/Terekhol in the South is about 720 km long and 30-50 km wide. The shoreline is indented by numerous west flowing river mouths, creeks, bays, headlands, promontories and cliffs. There are about 18 prominent creeks/estuaries along the coast many of which harbor mangrove habitats. Bombay duck fisheries form the mainstay of the commercially important fisheries of the coast from Ratnagiri to Broach. The coastline between Bombay and Kathiawar is found to be productive for Sciaenids, *Leptomelanosoma indicus* (= *Polynemus indicus*), *Polynemus* spp., perches and eels. The Gulf of Cambay and North Bombay coast are also rich in Bombay duck fisheries. About 285 species have been reported from the coast. Major finfishes along this coast was Bombay duck, ribbonfish, sharks, pomfrets, lizardfish, catfishes, oil sardine, anchovy, barracudas, fullbeaks, sailfish, Cobia, wolf herring, groupers, whitefish and mackerel.

Konkan coast

The Konkan coast stretches like a beautiful chain of 720 km formed from the coastal districts of the states of Maharashtra, Goa and Karnataka. Many river mouths, creeks, small bays, cliffs and beaches, interspersed with historic forts, lend an alluring charm to this landscape. Konkan is also rich in coastal and marine biodiversity. Mangrove forests, coral reefs, charismatic marine species like dolphins, porpoises, whales, sea turtles, many species of coastal birds and other fauna make the Konkan coast a veritable treasure trove biological diversity. The Malvan Marine Sanctuary has spread over 29 km²; the sanctuary is rich in coral and marine life. The Karwar group of islands with its unique rocky with sandy shore supports a wide range of fauna. There are more than 170 different species of food fishes landing in the coast and is famous for its large shoals of mackerel, *Rastrelliger kanagurta* dominating



the coasts of Karnataka. Oil sardine along with *Sardinella fimbriata*, anchovies, clupeids, ribbonfishes, seerfishes, *Lactarius lactarius*, carangids, pomfrets, croakers, catfish, whitefish, flatfishes, silver bellies also contribute much to the fisheries of both the coasts.

Malabar Coast

Characteristic features of the Malabar Coast are the upwelling, southwest monsoon, northeast monsoon, mud-bank along the southwest coast and high coastal production. Upwelling occurs in the region between Kanyakumari and Karwar during the onset of southwest monsoon. It starts in the southern region first and then extends northwards with the progress of southwest monsoon. Southwest monsoon season is the period when mud-banks are formed in some places along the southwest coast of India especially the Kerala coast. Mud banks of the Alleppey region is formed by the subterranean mud and the Vembanad lake system provides the mud for this. The mud-banks between Parapanangadi and Tanur are the aggregation of coastal mud. The mud-banks at Chellanam, Narakkal, Valappad, Elathur, Quilandy, Muzhuppilangadi, Kottikalam, Anjur, Adakathubali, Kumbala, Uppala and Ullal are formed by the sediments and organic debris discharged from river and estuaries. Mud-banks at Vypeen are formed from dredging operation. Along the southwest coast in India the maximum production of phytoplankton takes place during the southwest monsoon months.

The peak of plankton biomass is observed during peak southwest monsoon and pre-monsoon periods that is during and after upwelling, while the abundance of fish eggs and larvae shows peak during the pre-monsoon. Thus, it is well known that the intensity of southwest monsoon plays an important role in the fluctuation of the fishery resources especially the pelagic fishes. The fish diversity occurs at the mud banks are characteristic of the fishing grounds off the south-west coast of India. About 50 species of fish were recorded from these regions. Fishes of the families Carcharhinidae, Clupeidae, Dussumieriidae, Engraulidae, Chirocentridae, Bagridae, Hemiramphidae, Sphyaenidae, Mugilidae, Polynemidae, Ambassidae, Terapontidae, Sillaginidae, Lactaridae, Siganidae, Carangidae, Gerridae, Leiognathidae, Pomadasyidae, Sciaenidae, Trichiuridae, Scomberesocidae, Stromateidae, Cynoglossidae, Chirocentridae and Drepaneidae were come across in the landings.

Lakshadweep

The Union territory of Lakshadweep consists of 36 islands covering an area of 32 km² of which 10 islands are inhabited, 20,000 km² of lagoons and 4,000 km² oceanic zones. Among the fishes of Lakshadweep, those of ornamental value are abundant. Of the 603 species of marine fishes belonging to 126 families that are reported from the islands, at least 300 species belong to the ornamental fish category. Oceanic species of tuna such as Skipjack and Yellowfin tuna constitute the major tuna resources from Lakshadweep Islands. The



main economy of the islanders is dependent on the tuna catch and fishing is done for nearly six months of the year from October to April. The most common species of sharks that occur in Lakshadweep are the Spade-nose shark/Yellow dog shark, and the Milk shark. The Blacktip Shark and Hammerhead shark are also commonly found in the waters around Lakshadweep.

Gulf of Mannar

The Gulf of Mannar located in the Southern part of the Bay of Bengal with a string of 21 islands which has been declared as a marine National Park under the Wild Life (Protection) Act 1972 by the Government of India. The reserve covers 10,500 km², which comprises of a variety of sensitive marine habitats like coral reefs, mangroves and sea grasses, and could be considered as one of the most productive ecosystems. The core area of the reserve is comprised of a 560km² of coral islands and shallow marine habitat. The Gulf of Mannar alone produces about 20% of the marine fish catch in Tamil Nadu. A total of 1,182 species belonging to 476 genera in 144 families and 39 orders was reported from GOM ecosystem. The finfish resources, mainly comprises of small pelagics, barracudas, silverbellies, rays, skates, eels, carangids, flying fish, full beaks and half beaks. The demersal finfish resources, mainly associated coral reefs are threadfin breams, grouper, snappers, emperor and reef associated fishes. Further, large pelagic species like skipjack tuna, yellowfin tuna, bigeye tuna, kawakawa, frigate tuna and seer fish, bill fishes, eagle rays are most abundant in offshore and oceanic areas, but also occur in coastal waters are found in certain areas of the Gulf of Mannar.

Palk Bay

Palk Bay is situated on the southeast coast of India encompassing the sea between Point Calimere near Vedaranyam in the north and the northern shores of Mandapam to Dhanushkodi in the south. The Palk Bay itself is about 110 km long and is surrounded on the northern and western sides by the coastline of the State of Tamil Nadu in the mainland of India. The coastline of Palk Bay has coral reefs, mangroves, lagoons, and sea grass ecosystems. Elasmobranchs are the largest group of fishes and are well represented in the fishery wealth of the Ramewaram Island on the Palk Bay side. This is one of the best fishing grounds for smaller sardines, silver bellies, common white fish and half beaks, mullets and sciaenids. The common fishes found in this area also include Sharks, Rays, Skates, Tiger-sharks and Hammer-headed sharks.

Coromandel Coast

Seer fishes are most abundant in the Coromandel Coast of Tamil Nadu along with miscellaneous fisheries formed of trichiurids and percoids. The flying-fish fishery is an



important seasonal fishery on the east coast of India extending from Madras to Point Calimere along the Coromandel Coast. Three species of flying-fish, viz., *Hirundichthys coromandelensis*, *Cheliopogon spilopterus* and *C. bahiensis*, are generally found in these waters, but more than 90% of the catch consists of *C. coromandelensis*.

Deep-sea fish diversity

A first authentic record of the deep-sea fishes from India was by Alcock in the book *A Descriptive Catalogue of the Indian deep-sea fishes in the Indian museum* based on the fishes collected during the explorations in the Indian Ocean by *RIMS Investigator* (1889-1900). Then comes the results of R.V. *VARUNA* cruises (1962-1968) showed the presence of *Anodontostoma chacunda*, *Atropus atropus*, *Benthodesmus tenuis*, *Brachirus orientalis*, *Chlorophthalmus agassizi*, *C. corniger*, *Carangoides malabaricus*, *Caranx kalla*, *Centropristis investigatoris*, *Chascanopsetta lugubris*, *Chlorophthalmus corniger*, *Cubiceps natalensis*, *Cynoglossus bilineatus*, *C. semifasciatus*, *Decapterus russelli*, *Drepane punctata*, *Epinnula orientalis*, *Goniolosa manmina*, *Grammoplites scaber*, *Himantura urnak*, *Holocentrum rubrum*, *J. diacanthus*, *Johnius dussumieri*, *Kowala coval*, *L. argentimaculatus*, *L. bindus*, *L. johni*, *L. kasmira*, *L. malabaricus*, *Lactarius lactarius*, *Leiognathus splendens*, *Lepidopus caudatus*, *Lepturacanthus savala*, *Megalaspis cordyla*, *Myripristis murdjan*, *Nemipterus japonicus*, *Netuma thalassinus*, *Opisthopterus tardoore*, *Otolithes argentatus*, *P. sexifilis*, *Parastromateus niger*, *Paseneopsis cyanea*, *Pastinachus sephen*, *Pellona ditchela*, *Polymixia nobilis*, *Polynemus plebius*, *Pomadasy hasta*, *Psenes indicus*, *Pseudorhombus arsius*, *Rexea prometheoides*, *Rhynchobatis djiddensis*, *Saurida tumbil*, *Scoliodon palasorrah*, *Scyllium hispidum*, *Sillago sihama*, *Solea elongata*, *Sphyræna acutipinnis*, *Synagrops japonicus*, *Synodus indicus*, *Thrissocles mystax*, *T. malabarica*, *Trichiurus lepturus* and *Tylosurus crocodilus* from the depth zone of 1 to 450m.

A checklist of fishes of Indian EEZ was published based on the surveys of *FORV Sagar Sampada* in the EEZ of India during 1985-'87. This list is arranged alphabetically by families and genera. The list contains 242 species belonging to 87 families with both conventional and nonconventional fish fauna of the Indian EEZ with the scientific and common names of fishes, details of the depth of occurrence, depth of fishing, position and the gear were also included. The study by Hashim (2012) reported and the occurrence of 188 species of deep-sea fishes from Indian EEZ during the exploratory surveys. Deep sea fish species like *Psenopsis cyanea*, *Bembrops caudimacula*, *Chlorophthalmus bicornis*, *C. agassizi*, *Uranoscopus archionema*, *Gavialiceps taeniola*, *Priacanthus hamrur* and *Neopinnula orientalis* were found to be the most abundant during the study. Hashim (2012) observed a highest diversity in Arabian Sea (4.95) followed by Andaman Waters (4.12) and Bay of Bengal (3.55).



Biodiversity conservation

The exploited marine fisheries resources from the Indian EEZ area have been reached maximum from the present fishing grounds up to 200 m depth. The coastal fisheries faces several threats such as indiscriminate fishing, habitat degradation, pollution, social conflicts, the introduction of highly sophisticated fishing gadgets with a need for management measures and conservation of marine biodiversity to maintain sustainable use of marine biodiversity. A total of 65 species of fishes is under the threatened category of IUCN from the Indian seas (Table 2).

Table 2. Threatened fishes from the Indian seas (1,2)

	Species	Family	Threat Category
1	<i>Aetobatus flagellum</i>	Myliobatidae	Endangered (EN)
2	<i>Aetomylaeus maculatus</i>	Myliobatidae	Endangered (EN)
3	<i>Aetomylaeus nichofii</i>	Myliobatidae	Vulnerable (VU)
4	<i>Alopias pelagicus</i>	Alopiidae	Vulnerable (VU)
5	<i>Alopias superciliosus</i>	Alopiidae	Vulnerable (VU)
6	<i>Alopias vulpinus</i>	Alopiidae	Vulnerable (VU)
7	<i>Anoxypristis cuspidata</i>	Pristidae	Endangered (EN)
8	<i>Balistes vetula</i>	Balistidae	Vulnerable (VU)
9	<i>Carcharhinus albimarginatus</i>	Carcharhinidae	Vulnerable (VU)
10	<i>Carcharhinus hemiodon</i>	Carcharhinidae	Critically Endangered (CR)
11	<i>Carcharhinus longimanus</i>	Carcharhinidae	Vulnerable (VU)
12	<i>Carcharhinus obscurus</i>	Carcharhinidae	Vulnerable (VU)
13	<i>Carcharhinus plumbeus</i>	Carcharhinidae	Vulnerable (VU)
14	<i>Carcharias taurus</i>	Odontaspidae	Vulnerable (VU)
15	<i>Carinotetraodon travancoricus</i>	Tetraodontidae	Vulnerable (VU)
16	<i>Centrophorus squamosus</i>	Centrophoridae	Vulnerable (VU)
17	<i>Chaenogaleus macrostoma</i>	Hemigaleidae	Vulnerable (VU)
18	<i>Cheilinus undulatus</i>	Labridae	Endangered (EN)
19	<i>Cromileptes altivelis</i>	Serranidae	Vulnerable (VU)
20	<i>Epinephelus lanceolatus</i>	Serranidae	Vulnerable (VU)
21	<i>Epinephelus marginatus</i>	Serranidae	Endangered (EN)
22	<i>Etroplus canarensis</i>	Cichlidae	Endangered (EN)
23	<i>Glaucostegus granulatus</i>	Rhinobatidae	Vulnerable (VU)
24	<i>Glaucostegus typus</i>	Rhinobatidae	Vulnerable (VU)
25	<i>Glyphis gangeticus</i>	Carcharhinidae	Critically Endangered (CR)
26	<i>Gymnura zonura</i>	Gymnuridae	Vulnerable (VU)
27	<i>Hemigaleus microstoma</i>	Hemigaleidae	Vulnerable (VU)
28	<i>Hemipristis elongata</i>	Hemigaleidae	Vulnerable (VU)



29	<i>Himantura gerrardi</i>	Dasyatidae	Vulnerable (VU)
30	<i>Himantura leoparda</i>	Dasyatidae	Vulnerable (VU)
31	<i>Himantura polylepis</i>	Dasyatidae	Endangered (EN)
32	<i>Himantura uarnak</i>	Dasyatidae	Vulnerable (VU)
33	<i>Himantura undulata</i>	Dasyatidae	Vulnerable (VU)
34	<i>Hippocampus histrix</i>	Syngnathidae	Vulnerable (VU)
35	<i>Hippocampus kelloggi</i>	Syngnathidae	Vulnerable (VU)
36	<i>Hippocampus kuda</i>	Syngnathidae	Vulnerable (VU)
37	<i>Hippocampus trimaculatus</i>	Syngnathidae	Vulnerable (VU)
38	<i>Hyporhamphus xanthopterus</i>	Hemiramphidae	Vulnerable (VU)
39	<i>Isurus oxyrinchus</i>	Lamnidae	Vulnerable (VU)
40	<i>Lamiopsis temminckii</i>	Carcharhinidae	Endangered (EN)
41	<i>Makaira nigricans</i>	Istiophoridae	Vulnerable (VU)
42	<i>Manta birostris</i>	Myliobatidae	Vulnerable (VU)
43	<i>Mobula mobular</i>	Myliobatidae	Endangered (EN)
44	<i>Monopterus fossorius</i>	Synbranchidae	Endangered (EN)
45	<i>Monopterus indicus</i>	Synbranchidae	Vulnerable (VU)
46	<i>Nebrius ferrugineus</i>	Ginglymostomatidae	Vulnerable (VU)
47	<i>Negaprion acutidens</i>	Carcharhinidae	Vulnerable (VU)
48	<i>Oostethus insularis</i>	Syngnathidae	Vulnerable (VU)
49	<i>Plectropomus areolatus</i>	Serranidae	Vulnerable (VU)
50	<i>Pristis pectinata</i>	Pristidae	Critically Endangered (CR)
51	<i>Pristis pristis</i>	Pristidae	Critically Endangered (CR)
52	<i>Pristis zijsron</i>	Pristidae	Critically Endangered (CR)
53	<i>Rhina ancylostoma</i>	Rhinobatidae	Vulnerable (VU)
54	<i>Rhincodon typus</i>	Rhincodontidae	Vulnerable (VU)
55	<i>Rhinobatos obtusus</i>	Rhinobatidae	Vulnerable (VU)
56	<i>Rhinoptera javanica</i>	Myliobatidae	Vulnerable (VU)
57	<i>Rhynchobatus djiddensis</i>	Rhinobatidae	Vulnerable (VU)
58	<i>Sphyrna lewini</i>	Sphyrnidae	Endangered (EN)
59	<i>Sphyrna mokarran</i>	Sphyrnidae	Endangered (EN)
60	<i>Sphyrna tudes</i>	Sphyrnidae	Vulnerable (VU)
61	<i>Sphyrna zygaena</i>	Sphyrnidae	Vulnerable (VU)
62	<i>Stegostoma fasciatum</i>	Stegostomatidae	Vulnerable (VU)
63	<i>Taeniurops meyeri</i>	Dasyatidae	Vulnerable (VU)
64	<i>Thunnus obesus</i>	Scombridae	Vulnerable (VU)
65	<i>Urogymnus asperimus</i>	Dasyatidae	Vulnerable (VU)

Source : 1. Froese, R. and D. Pauly, Editors. 2017. FishBase. World Wide Web electronic publication. www.fishbase.org.
2. The IUCN Red List. 2017: www.iucnredlist.org



Human activities are the major causes for the loss of biodiversity and degradation of marine and coastal habitats, which needs immediate attention and comprehensive action plan to conserve the biodiversity for living harmoniously with nature. Some of the measures such as control of excess fleet size, control of some of the gears like purse seines, ring seines, disco-nets, regulation of mesh size, avoid habitat degradation of nursery areas of the some of the species, reduce the discards of the low value fish, protection of spawners, implementation of reference points and notification of marine reserves are required for the protection and conservation of marine and coastal biodiversity.



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