

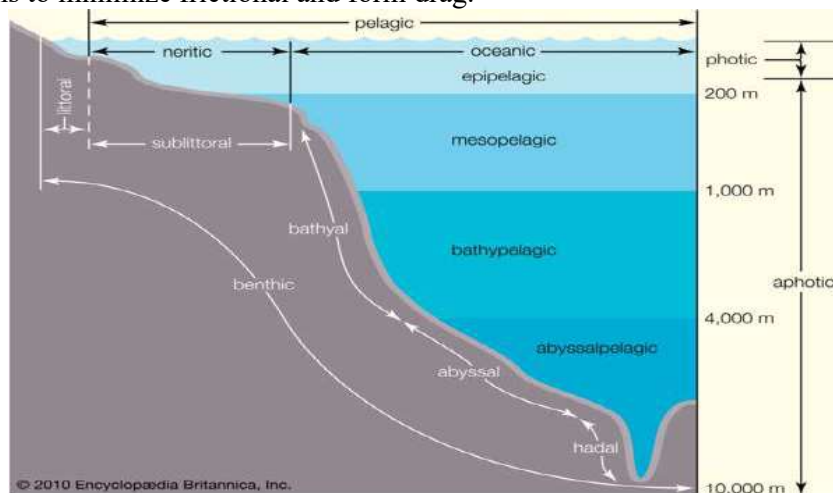
CHAPTER 11

Pelagic Fisheries of India: An Overview



Fishes that generally occupy the upper strata and columnar open waters in the oceans are referred to as pelagic fishes and range from small fishes (clupeoids) to the large sized fishes (tuna, billfishes and the whale sharks). The pelagic region in the ocean generally refers to open water region extending from the upper surface area to the deep waters. Pelagic fishes differ from other species in that they live in a three-dimensional environment without any discrete boundaries that impede their horizontal and vertical movements through the water column.

As these pelagic fishes live in open waters and not attached to any fixed structures for their feeding or as refugia, their body and physiology are suitably adapted for such a free living lifestyle. Most of them with some exceptions move in schools and swim continuously. The extent and degree to which they swim varies widely from minimal swimming in neutrally buoyant species (sunfish, whale sharks) to extensive swimming in negatively buoyant fishes (tunas, mackerels, barracudas, billfishes). These fast moving constantly swimming fishes have a streamlined body, a high aspect ratio caudal fin, narrow caudal peduncle and large pectoral fins, adaptations to minimize frictional and form drag.

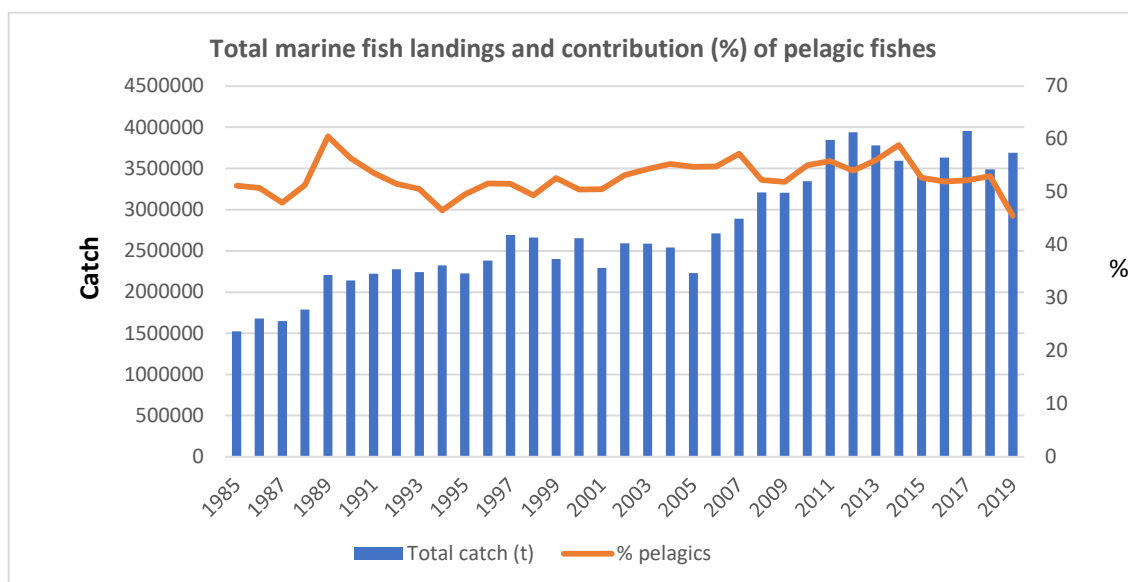


Source: Encyclopedia Britannica

India with a long coastline of 8129 km, continental shelf area of 0.5 million sq. km and of EEZ is 2.02 million sq. km is blessed with copious marine fauna and flora. The annual marine fishery potential of the EEZ is estimated at 5.31 million tonnes (excluding the non-conventional resources) of which the pelagic resources form more than 50% of the total marine fish landings of the country.

Pelagic fishes encompass an array of species residing in all realms of the pelagic region and include the small unicorn cod to the large billfishes, the planktivorous to the highly carnivorous fishes. The pelagic fishes therefore play a multi-faceted role in the food web of the marine system forming an important prey item of several larger fishes and as a predator of several other marine organisms. Further, their vast distributional range makes them vulnerable to exploitation by different categories of gears (seines, gillnets, lines and pelagic & mid-water trawls). The pelagic fishes have always played a pivotal role in dictating the general trend of the marine capture fisheries of the country through their sheer bulk catches. Clupeoids contribute to the food resources in two ways: directly, through actual consumption (fresh, frozen or processed) and indirectly, by providing products used for animal feeds and fertilisers or by serving as bait to catch other fishes. In addition, most of the pelagic fishes contribute significantly to the protein food basket providing the much needed comparatively cheaper protein source to the coastal fishers, considerable part of the marine domestic and export trade and supporting fishing industries (fishmeal, surimi and fish processing plants) and several ancillary industries. The larger fishes, mainly the scombroids, the billfishes and the carangids are valued as food fishes in the fresh as well processed forms, a valued in the sport fishery and play a significant role in maintaining the balance in the marine ecosystem.

A perusal of the marine fish landings of the country revealed the trends in landings of total fish as well as the pelagic group fluctuated over the years. However, the contribution of the pelagic fishes to the total catch was always more than 50% of the total catch.



The major groups / species comprising the pelagic fishes of the country include the clupeids, carangids, scombroids, ribbonfish, unicorn cods, Bombay duck, billfishes and barracudas. These major groups and its taxonomic classifications are briefly described for the purpose of this winter school.

Clupeoids

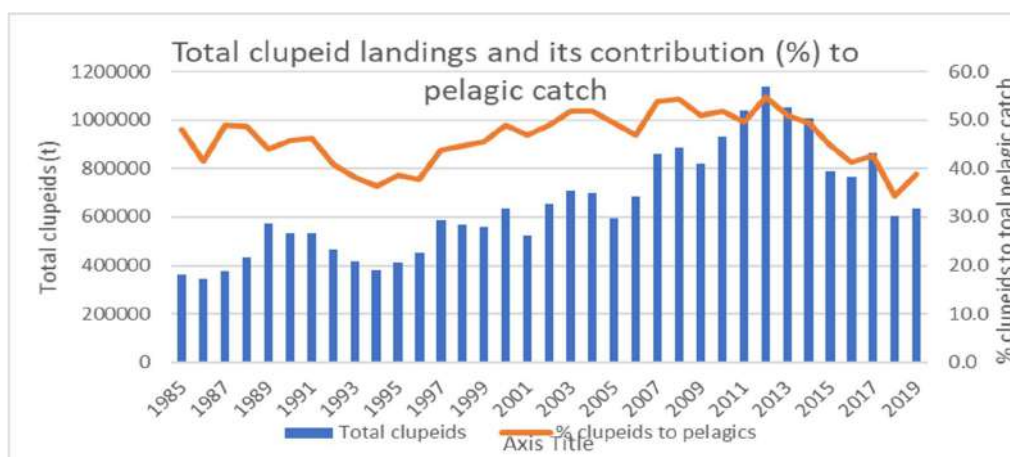
This is a large group consisting mostly small to moderate sized fishes belonging to several families, genera and species and accounts for more than quarter of the fish catch. The clupeid fishes are grouped under four families (Clupeidae, Engraulidae, Pristigasteridae and Chirocentridae) and seven subfamilies. The main groups included under these families include the sardines, anchovies, herrings, shads and sprats.

Clupeoid's species have a complete covering of easily shed cycloid scales on the body (except Chirocentridae) and can be easily identified in the field with the absence of spines in the fins, single short dorsal fin (11 to 23 finrays), situated usually near the midpoint of the body (except in *Chirocentrus*), small pelvic fins, short or moderate anal fins and a forked caudal fin (except rhomboid in *Coilia*). The body is usually fusiform, sometimes almost round in cross-section (*Dussumieria*, *Etrumeus*, also *Engraulis*), but more often compressed, sometimes highly compressed (Chirocentridae, some Pristigasteridae). Typically, there is a pelvic scute with ascending arms just in front of the pelvic fins (absent in Chirocentridae, W-shaped in the Dussumieriinae, and a series of similar scutes in front of the pelvic fins and behind them, but absent in the Dussumieriinae, some Pellonulinae, *Engraulis*. Mouth is either terminal or superior. Small conical teeth are typically present in the jaws and on the vomer, palatines and endo-and ectopterygoids but some or all may be absent, or the jaws may bear canine teeth (Chirocentridae).

Table 1 General Classification Of Clupeids

FAMILY	SUBFAMILY	GENUS	DOMINANT (INDIA)	SPECIES
Denticipitidae				
Engraulididae	Coiliinae	<i>Coilia</i>	<i>C.dussumieri</i>	
		<i>Lycothrissa</i>		
		<i>Papuengraulis</i>		
		<i>Pseudosetipinna</i>		
		<i>Setipinna</i>	<i>S.breviceps</i>	
		<i>Thryssa</i>	<i>Thryssa</i> spp. (5 spp.)	
		<i>Amazonsprattus</i>		
	Engraulinae	<i>Anchoa</i>		

		<i>Anchovia</i>	
		<i>Anchoviella</i>	
		<i>Cetengraulis</i>	
		<i>Encrasicholina</i>	<i>E.punctifer, E.heteroloba</i>
		<i>Engraulis</i>	
		<i>Jurengraulis</i>	
		<i>Lycengraulis</i>	
		<i>Pterengraulis</i>	
Spratelloididae		<i>Stolephorus</i>	<i>S.indicus, S.commersonii, S.waitei</i>
Pristigasteridae	Pristigasterinae	<i>Chirocentrodon</i>	<i>C.dorab</i>
		<i>Ilisha</i>	<i>I.melastoma</i>
		<i>Neoopisthopterus</i>	
		<i>Odontognathus</i>	
		<i>Opisthopterus</i>	<i>O.tardoore</i>
		<i>Pellona</i>	<i>P.ditchela</i>
		<i>Pliosteostoma</i>	
		<i>Pristigaster</i>	
		<i>Raconda</i>	<i>R.russeliana</i>
Chirocentridae		<i>Chirocentrus</i>	<i>C. dorab, C.nudus</i>
Dussumieriidae		<i>Dussumieria</i>	<i>D.acuta</i>
		<i>Etrumeus</i>	
		<i>Trollichthys</i>	
Clupeidae	Clupeinae	<i>Amblygaster</i>	<i>A.sirm</i>
		<i>Clupea</i>	
		<i>Clupeonella</i>	
		<i>Escualosa</i>	<i>E.thoracata</i>
		<i>Harengula</i>	
		<i>Herklotsichthys</i>	
		<i>Lile</i>	
		<i>Opisthonema</i>	
	Alosinae	<i>Alosa</i>	
		<i>Brevoortia</i>	
		<i>Ethmalosa</i>	
		<i>Ethmidium</i>	
		<i>Gudusia</i>	
		<i>Hilsa</i>	<i>H.kelee</i>
		<i>Tenualosa</i>	<i>T.ilisha, T.toli</i>



Carangids

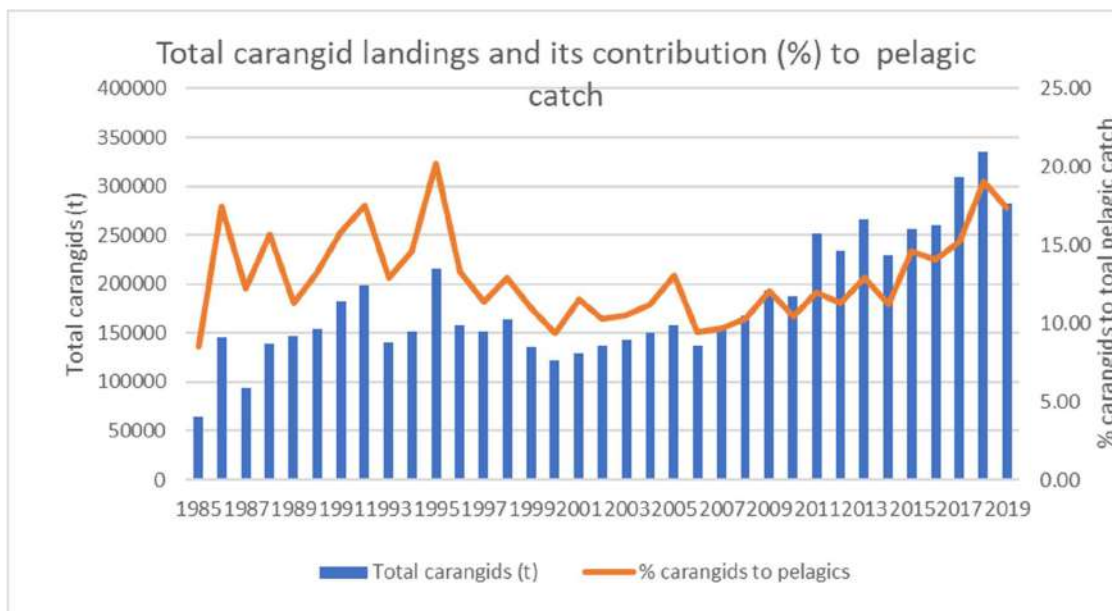
Carangids yet another vast group consisting of several families, several genera and species. Six families are included under Carangiformes and the family Carangidae is the largest of them and includes jacks, pompanos, jack mackerels, runners, scads. The important features used to identify carangids are the presence of two preanal spines, scutes on the body and scapulation in the breast area. It forms an important fishery along the Indian coast with most of the species being commercially valuable and exploited by several gears. Some species are popular in sport fishing. Three species have been successfully bred and being cultured.

Table 2 General classification of Carangiformes

Family	Subfamily	Genus	Dominant species (India)
Nematistiidae		<i>Nematistius</i>	
Coryphaenidae		<i>Coryphaena</i>	<i>C. hippurus</i> , <i>S. equiselis</i>
Rachycentridae		<i>Rachycentron</i>	<i>R. canadum</i>
Echeneididae		<i>Echneis</i>	<i>E. naucrates</i>
		<i>Phtheirichthys</i>	
		<i>Remora</i>	<i>R. remora</i>
Carangidae	Trachinotinae	<i>Lichia</i>	
		<i>Trachinotus</i>	<i>T. mookalee</i> , <i>T. baillonii</i> , <i>T. blochii</i>
	Scomberoidinae	<i>Oligoplites</i>	
		<i>Parona</i>	
		<i>Scomberoides</i>	<i>S. commersonianus</i> , <i>S. lysan</i> , <i>S. tala</i> , <i>S. tol</i>
	Naucratinae	<i>Campogramma</i>	
		<i>Elagatis</i>	<i>E. bipinnulata</i>
		<i>Naucrates</i>	<i>N. doctor</i>

		<i>Seriola</i>	<i>S.dumerili</i> , <i>S.fasciata</i> <i>S.lalandi</i> , <i>S.rivoliiana</i> <i>S.quinqueradiata</i> <i>S.nigrofasciata</i>
	Caranginae	<i>Alectis</i>	<i>A.ciliaris</i> , <i>A.indica</i>
		<i>Alepis</i>	<i>A.djedaba</i> , <i>A.kleinii</i> <i>A.melanoptera</i> <i>A.vari</i>
		<i>Atropus</i>	<i>A.atropus</i>
		<i>Atule</i>	<i>A.mate</i>
		<i>Carangoides</i>	<i>C.armatus</i> , <i>C.bajad</i> , <i>C.chrysophyrus</i> , <i>C.ciliaris</i> , <i>C.coeruleopinnatus</i> , <i>C.dinema</i> , <i>C.equula</i> , <i>C.ferdau</i> , <i>C.fulvoguttatus</i> , <i>C.gymnostethus</i> , <i>C.hedlandensis</i> , <i>C.malabaricus</i> , <i>C.oblongus</i> , <i>C.praeustus</i> , <i>C.talamparoides</i>
		<i>Caranx</i>	<i>C.heberi</i> , <i>C.ignobilis</i> , <i>C.melampygus</i> , <i>C.sexfasciatus</i> , <i>C.tille</i>
		<i>Chloroscombrus</i>	
		<i>Decapterus</i>	<i>D.kurroides</i> , <i>D.russelli</i> , <i>D.macrosoma</i> , <i>D.macarellus</i> , <i>D.tabl</i>
		<i>Gnathodon</i>	<i>G.speciosus</i>
		<i>Hemicaranx</i>	
		<i>Megalaspsis</i>	<i>M.cordyla</i>
		<i>Pantolabus</i>	
		<i>Parastromateus</i>	<i>P.niger</i>
		<i>Pseudocaranx</i>	
		<i>Selar</i>	<i>S.crumenophthalmus</i>
		<i>Selaroides</i>	<i>S.leptolepis</i>
		<i>Selene</i>	
		<i>Trachurus</i>	<i>T.trachurus</i>
			<i>T.indicus</i>
		<i>Ulua</i>	<i>U.mentalis</i>
		<i>Uraspis</i>	<i>U.uraspis</i>
Menidae		<i>Mene</i>	<i>M.maculata</i>

Coryphaenidae, Rachycentridae, and Echeneidae have been suggested to comprise a monophyletic grouping which has been recovered as a sister clade to the Carangidae.



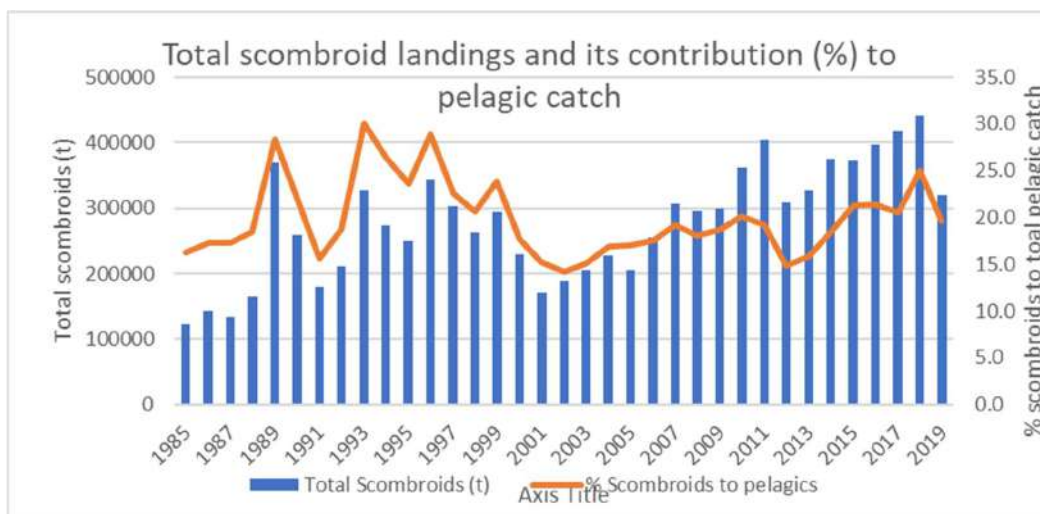
Scombriformes

This group includes different species of pelagic fish (the mackerels, tunas, bonotos) mostly from the family Scombridae, all being very important and favored food fishes with very high domestic as well as export demand. They are found in both temperate and tropical seas, mostly living along the coast or offshore in the oceanic environment.

Mackerel species typically have stream lined body, vertical stripes on their backs and deeply forked tails, two separate dorsal fins and finlets following the dorsal and anal fins. Forked caudal fin, with a slender ridged base. The first (spiny) dorsal fin and the pelvic fins are normally retracted into body grooves.

Fishes are medium to large sized; all undertake either short distance long distance migrations. Smaller mackerel are forage fish for larger predators, including larger mackerel Sport fishermen value the fighting abilities of the king mackerel.

Scombriformes is an order of bony fish containing nine families which were classified under the suborders Scombroidei and Stromateoidei.



General Classification of Scombriformes

Family	Subfamily	Tribe	Genus	Dominant species (India)
Gempylidae			<i>Diplospinus</i>	
			<i>Epinnuli</i>	
			<i>Gempylus</i>	
			<i>Lepidocybium</i>	
			<i>Nealotus</i>	
			<i>Neopinnula</i>	
			<i>Nesiarchus</i>	
			<i>Paradiplospinus</i>	
			<i>Promethichthys</i>	
			<i>Rexea</i>	
			<i>Rexichthys</i>	
			<i>Ruvettus</i>	
			<i>Thyrsites</i>	
			<i>Thrsitoidesy</i>	
		<i>Thyrsitops</i>		
Trichiuridae	Aphanopodinae		<i>Aphanopus</i>	
			<i>Benthosesmus</i>	
	Lepidopodinae		<i>Assurger</i>	
			<i>Eupleurogrammus</i>	
			<i>Evoxymetopon</i>	
			<i>Lepidopus</i>	
			<i>Daemissolinea</i>	
	Trichiurinae		<i>Lepturacanthus</i>	<i>L.savala</i>
			<i>Tentoriceps</i>	

			<i>Trichiurus</i>	<i>T.lepturus,</i> <i>T.auriga</i>
Scombridae	Gasterochismati nae		<i>Gasterochisma</i>	
	Scombrinae	Scombrini	<i>Rastrelliger</i>	<i>R.kanagurta</i> <i>R.brachysoma</i> <i>R.faughni</i>
			Scomber	<i>S.indicus</i> <i>S.japonicus</i>
		Scomberomorini	<i>Acanthocybium</i>	<i>A.solandri</i>
			<i>Grammatorcynus</i>	
			<i>Orcynopsis</i>	
			<i>Scomberomorus</i>	<i>S.commerson</i> <i>S.guttatus</i> <i>S.lineolatus</i>
		Sardini	Sarda	<i>S.orientalis</i>
			Cybiosarda	
			Gymnosarda	<i>G.unicolor</i>
		Thunnini	<i>Allothunnus</i>	
			<i>Auxis</i>	<i>A.rochei</i> <i>A.thazard</i>
			<i>Euthynnus</i>	<i>E.affinis</i>
			<i>Katsuwonus</i>	<i>K.pelamis</i>
			<i>Thunnus</i>	<i>T.albacares</i> <i>T.tonggol</i> <i>T.obesus</i>
Amarsipidae			<i>Amarsipus</i>	
Centrolophidae			<i>Centrolophus</i>	<i>C.niger</i>
			<i>Hyperoglyphe</i>	
			<i>Icichthys</i>	
			<i>Psenopsis</i>	<i>P.intermedia</i>
			<i>Schedophilus</i>	
			<i>Seriolella</i>	
			<i>Tubbia</i>	
Nomeidae			<i>Cubiceps</i>	<i>C.caeruleus</i>
			<i>Nomeus</i>	
			<i>Psenes</i>	<i>Psenes sp.</i>
Ariommatidae			<i>Arioma</i>	<i>A.indica</i>
Tetragonuridae			<i>Tetragonurus</i>	
Stromateidae			<i>Pampus</i>	<i>P.chinensis,</i> <i>P.argentius</i>
			<i>Peprilus</i>	
			<i>Stromateus</i>	
Arripidae			<i>Arripis</i>	

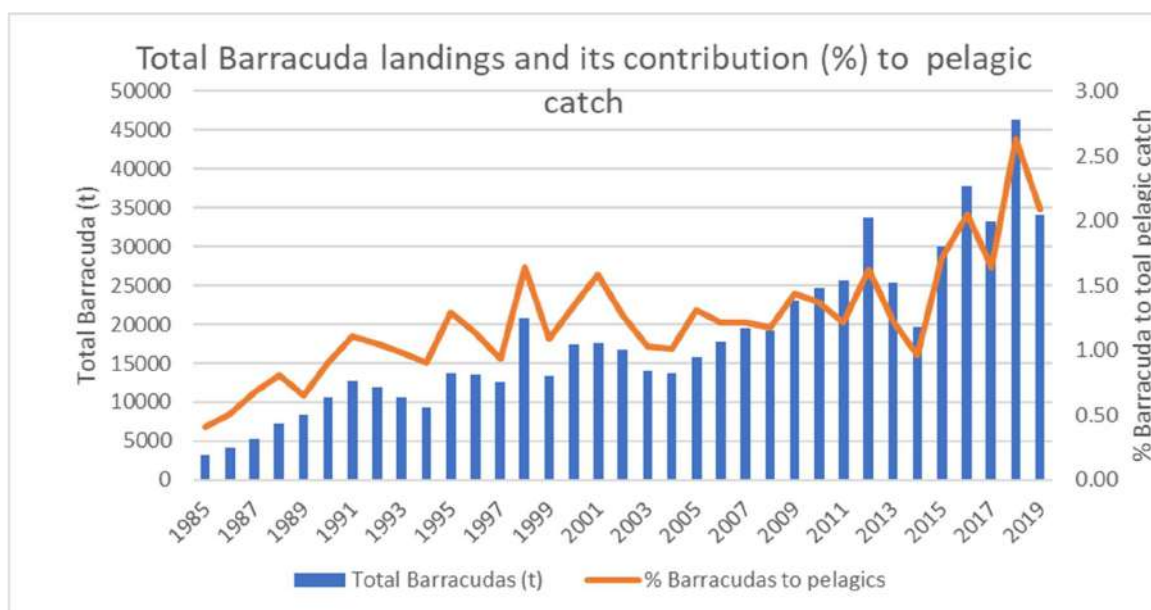
Bramidae			<i>Brama</i>	
			<i>Eumegistus</i>	
			<i>Pteraclis</i>	
			<i>Pterycombus</i>	
			<i>Taractes</i>	
			<i>Taractichthys</i>	<i>T.rubescens</i>
			<i>Xenobrama</i>	
Caristiidae			<i>Caristius</i>	
			<i>Neocaristius</i>	
			<i>Paracaristius</i>	
			<i>Platyberyx</i>	
Chiasmodontidae			<i>Chiasmodon</i>	
			<i>Dysalotus</i>	
			<i>Kali</i>	
			<i>Pseudoscopelus</i>	
Icosteidae			<i>Icosteus</i>	
Pomatomidae			<i>Pomatomus</i>	
Scombrolabracidae			<i>Scombrolabrax</i>	
Scombropidae			<i>Scombrops</i>	

Barracudas

The barracudas are considered as one of the most predatory fishes in the marine system. With a wide distribution in warm- temperate waters is represented by several species. Can be easily identified by the scaled slender body, two well-separated dorsal fins with the anterior fin having five spines, and the posterior fin having one spine and 9 soft rays. The posterior dorsal fin is similar in size to the anal fin and is situated above it. The lateral line is prominent and extends straight from head to tail. The spinous dorsal fin is placed above the pelvic fins and is normally retracted in a groove. The caudal peduncle is stout and the fin is moderately forked, a jutting lower jaw, and a large mouth with many large, sharp teeth. Their gill covers have no spines and are covered with small scales. They are popular as sport fishes, and also valued as food. *Sphyaena*, is the only genus in the family Sphyraenidae and included several species.

Colouration ranges from dark gray, dark green, white, or blue on the upper body, with silvery sides and a chalky-white belly. Coloration varies somewhat between species. For some species, irregular black spots or a row of darker cross-bars occur on each side. Their fins may be yellowish or dusky.

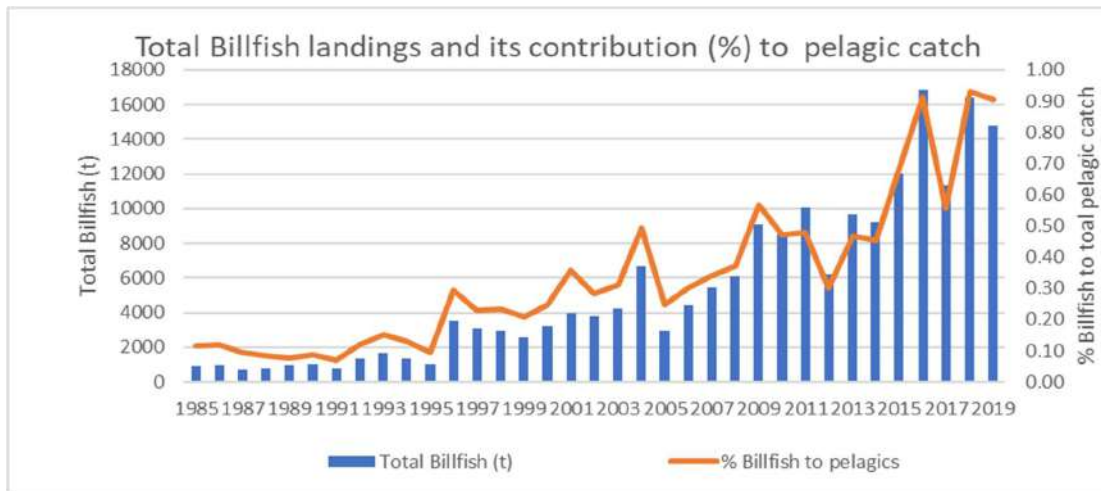
Family	Genus	Dominant species (India)
Sphyraenida	<i>Sphyraena</i>	<i>S. putnamae</i> , <i>S. obtusata</i> , <i>S. jello</i> , <i>S. forsteri</i> , <i>S. barracuda</i> , <i>S. arabiansis</i>



Istiophoriformes

These are a group of highly migratory pelagic fishes characterised by prominent bills, or rostra and popularly referred to as billfishes. They are found in all oceans, although they usually inhabit tropical and subtropical waters and highly valued as gamefish by sports fishermen. They include sailfish and marlin, which make up the family Istiophoridae, and swordfish, sole member of the family Xiphiidae.

Family	Genus	Dominant species (India)
Istiophoridae	<i>Istiophorus</i>	<i>I. platypterus</i>
Xiphiidae	<i>Xiphias</i>	<i>X. gladius</i>



Bombay duck

The Bombay duck under the family Synodontidae is a benthopelagic oceanodromous economically important pelagic fishery group of the country. It is characterized by its limited distribution along the northwest and north east region. Distinguishing characteristics of the Bombay duck are a compressed body with small eyes covered with adipose eyelid on anterior and posterior margins. Large mouth, gape tending obliquely and upper jaw not protractile. Teeth on palatines, vomer and tongue. Body naked except for a series of scales along lateral line and on to tail. *Harpodon nehereus* is the major species occurring along the Indian Coast.

