

An important fish group in brackish water fisheries is the Grey Mullet(35), 13 species of which are recorded from our waters. They include species that freely spread into estuaries from either the sea or the rivers and a few of them(36) apparently range in all three habitats.

4. MARINE WATERS

Physical Features. The coastline is approximately 1,100 miles long and contains several small bays and shallow inlets. There are about 220 fish landing centres scattered along this coast, many of them being no more than sheltered sandy beaches on which fishing craft can be drawn up to lie above the water line. Fringing reefs, principally formed of coral, lie close to the coast and at most times they remain completely submerged, though their presence may be discerned by the breaking of waves a short distance from shore. Reefs are noticeably absent from areas near river mouths. The continental shelf round Ceylon is a narrow platform for the greater part of its extent, even narrowing to a width of one to two miles at a few points off the east coast. To the north-west and north this shelf widens into an extensive shallow bank where it constitutes the floor of the Gulf of Mannar, Palk Bay and the Pedro Bank, before merging into the continental shelf of the Indian mainland. Ceylon also obtains fish supplies from trawling the Wadge Bank, which lies as a southward extension of the continental shelf opposite Cape Comorin. The total area of this bank is nearly 4,000 square miles and it possesses a relatively clear, flat surface sloping westwards, in depths ranging from ten to fifty fathoms.

Coastal Waters. The sea shore flora and fauna are not often seen in their great variety because the tidal movement is limited to a few feet and scarcely uncovers them. However, enthusiasts who go to the many reefs skirting the sea shore for spear fishing or underwater photography can observe the presence of almost every type of marine organism, some of which are conspicuous in their rich colours and curious forms.

Shallow waters abound with small seaweeds and often large quantities are cast ashore during storms. Through several decades a small industry had existed at Kalpitiya (on the west coast) based on a red seaweed(37) sometimes called "Ceylon Moss". A second species(38) of commercial importance is found further north near Mannar and on the east coast. Both species yield agar. Brown seaweeds(39) are present along the west coast but are not utilized locally although similar forms constitute the main commercially valuable seaweeds of temperate countries.

As is characteristic of tropical seas the marine fish fauna around Ceylon is very rich in species and much varied in quantity. There are over 500 species of edible fish and they range in size from the two-inch long sprat to those reaching a length of 15 feet in the large marlins, sharks and saw-fish.

About 40 edible species of herring-like fishes(40) are known; many of them are of small size and live within the coastal waters. They move in such large shoals that at times they form the dominant group in beach seine landings. For example the success of the seasonal fishery at Karaduwa (on the west coast) is measured by the abundance of sprats(41). In good seasons sprats seem to flock into sandy bays and are easily baled out with seines. Sardines(42) are obtained in great quantities in the coastal waters which are also visited by schools of larger species, e.g., the Wolf Herring(43).

Like the herring fishes, Pony fishes(44) are found throughout the fishing season in coastal waters. These species are of small size and form large schools which together with that of the Sardines(45) contribute greatly to the sustenance of inshore net fisheries. Pomfrets(46) also gather in schools and two of their species(47) regularly move into the shallow sea near Alambil (on the east coast) to support a highly profitable beach seine fishery conducted during the south-west monsoon season.

(35) Mugilidae.

(36) *Mugil cephalus*. L.
Liza waigiensis (Q. & G.), etc.

(37) *Gracilaria lichenoides*.

(38) *Gracilaria confervoides*.

(39) *Sargassum* spp.

(40) Clupeiformes.
(41) *Anchoviella* spp.

(42) *Amblygaster* spp.

(43) *Chirocentrus* spp.

(44) *Leiognathidae*.

(45) *Sardinella* spp.

(46) *Stromateidae*.

(47) *Pampus argenteus* (Euphrason) and
Pampus chinensis (Euphrason).

In some years, around the month of August, heavy catches of Flying Fish(48) are taken in the east coast fisheries. Three species(49) of Flying Fish are recorded from Ceylon seas. They are blue to silvery in colour and can be mistaken for herring. They swim near the surface and when disturbed leap out to glide varying distances in the air, supported on their large pectoral fins. They also spread into oceanic waters where they form the favourite food of tuna.

Many species of Horse Mackerel(50) are found swimming in schools close inshore. They are frequently taken in beach seines, at times with one species(51) forming the sole constituent in the catch of several thousand fish. In general, small sized species are found in these shallow seas.

Sier or Spanish Mackerel(52) have always been regarded as our topmost prime fish. They are widely distributed in coastal waters, especially the younger fish that swim in schools, from which beach seines often make large hauls. Of the three known species from our waters, the Barred Spanish Mackerel(53) remains the most abundant and best preferred for eating. The Mackerel(54) is another species, important enough in catches to determine the success or failure of a season's beach seine fishery.

Dense schools of Skipjack(55) approach Ceylon's south and west coasts and there is a long standing seasonal fishery for them. Yellow-fin Tuna(56) are also present but the larger fish are found in deeper water near the edge of the continental shelf. Two species, the Mackerel Tuna(57) and the Frigate Mackerel(58) come inshore and are rounded up within beach seines of the north-west and east coasts. A haul of about 5,000 fish is not rare and one such catch alone may make the entire season a profitable one to fishermen.

A group of large-sized fish caught in coastal waters are the Garfish(59), some of which even enter estuaries. Their elongated jaws are armed with spinous teeth used for feeding on shoals of small fish, especially herring. The Alligator Garfish(60) grow to lengths of three to four feet. Two other groups of fish bearing powerfully toothed jaws are the Ribbon fishes(61) and Barracudas(62) which enter inshore waters and are sometimes encircled by seine nets. There are five species of barracuda ranging from one foot to five feet in maximum lengths but only the smaller ones (up to two feet in length) are found inshore.

Coastal areas of the sea are not often visited by large sharks although their chance presence, especially of the man-eating Tiger Shark(63), could be dangerous to bathers. The small size Dog Sharks(64) are taken in gill nets and beach seines, more particularly from the northern areas. Cat-sharks(65) are harmless and comparatively sluggish species frequenting coral reefs; they have sharply defined colour markings on their skin which vary with age, e.g., the Zebra Shark(66). The Shovelnose Sharks(67) and Saw-Fishes(68) are also found in shallow seas, a few entering lagoons and estuaries. They are reported to exceed a length of 10 feet when full grown.

Drag nets operating in coastal waters often bring in Rays(69), some species of which grow to a large size (five feet across the "wings"). Ceylon's seas are known to contain about 25 species, including Sting rays, Eagle rays, Cow rays and Electric rays.

A large group(70) of rough fish are represented by 8 families and 48 species but are of little value to the fishing industry as many are inedible or poisonous, and so they are discarded when found in landings from nets. This group includes Puffers, Box-fish, Porcupine-fish, Leather-jackets and File-fish. There is a limited demand for File-fishes(71), the flesh of which is considered tasty and worth the task of removing the thick and fibrous skin, necessary before cooking. Another unpleasant group of animals are the Sea Snakes(72), many of which are reported to be poisonous. They live in holes in coral, among rocks and weeds. Ceylon's seas have gained a reputation among scientists of being a good collecting centre for sea snakes.

- (48) *Exocoetus volitans* (L).
 (49) *Exocoetus volitans* (L); *Cypselurus comatus* (Mitchill) *Progimichthys Gibbifrons* (Valenciennes).
 (50) Carangidae.
 (51) *Alectis indica* (Ruppell).
 (52) *Scomberomorus* spp.
 (53) *Scomberomorus commersoni* (Lac.).
 (54) *Rastrelliger kanagurta* (Cuv.).
 (55) *Katsuwonus pelamis* (L).
 (56) *Neothunnus macropterus* (Schlegel).
 (57) *Euthynnus affinis* (Cantor).
 (58) *Auxis thazard* (Lac.).
 (59) Belonidae.

- (60) *Tylosurus* spp.
 (61) Trichuridae.
 (62) Sphyraenidae.
 (63) *Galeocerdo cuvieri* (Le Seur).
 (64) *Scoliodon* spp.
 (65) Orectolobidae.
 (66) *Stegostoma fasciatum* (Hermann).
 (67) Rhinobatidae.
 (68) Pristidae.
 (69) Rajiformes.
 (70) Tetrodontiformes.
 (71) Balistidae.
 (72) Hydrophiidae.

Marine mammals have never supported an important fishery in Ceylon. Porpoise(73) are often seen surfacing in schools but these heavy, fast swimming animals are regarded by fishermen as pests because they damage fishing nets. Dried porpoise meat found occasionally on the market is derived from accidental catches in gill nets. There are known instances of large schools of porpoises running aground, and when pushed back into the sea, the animals refused to swim away and eventually died on shore. The False Killer Whale(74), a porpoise growing to a length of 12 feet has sometimes perished in this manner after running aground in groups of 80 or more. Among large Baleen Whales(75) there have been many young specimens cast ashore, whose presence supports the belief that seas near Ceylon constitute one of their breeding areas. Sperm Whales(76), both adults and young, visit our coastal waters. However, there is inadequate information on the numbers of whales in our seas to consider them as an useful resource for development of a fishery.

The Dugong(77) is a mammal which lives in coastal shallow areas. It is captured by nets in the Gulf of Mannar and transported alive to markets in Colombo. Proposals have been made from time to time to control and reduce this fishery because the present catches are very scanty and may have resulted from overfishing in the recent past.

The same fear of overfishing has been expressed on the fishery for Green Turtle(78) carried out around the northern peninsula. When taken in nets they are often retained alive until sale, by placing in pens constructed along the shore of lagoons and bays. Other species of turtle are caught only when they come onto sandy shores to lay eggs, but their numbers have declined considerably in recent times. The Hawksbill or Shell Turtle(79) is now rarely obtained in the Southern Province, though it was once common there. Oil and flesh are used from the Leather-backed Turtle(80), an oceanic species which comes inshore very occasionally.

Coastal Reefs. Brightly coloured fish are characteristic of coral reefs. Younger representatives of many valuable bottom-living species of fish are found here, e.g., Groupers(81). Parrot fishes(82), with their fused teeth borne on strong jaws, are well adapted to feed on algal and coral growths. They rarely exceed a foot in length and are green or brown coloured with varied markings of red.

Of less commercial importance are many other species that live in this environment such as Wrasses(83), Demoiselles(84), Angel Fish(85) and Coral Fish(86). They have varied shapes and colouration, fitted well to swim or hide in passages and crevices. Few reach a length of six inches but they swarm in large numbers as is typical of reef fauna. A total of 77 species has been recorded from the last five groups mentioned here and presumably more species await identification. Noted for their contrasting body colouration and curious habits are the Anemone Fish(87) which live among and even seek protection between the masses of tentacles of large sea anemones.

Another group inhabiting reefs are the Moray Eels(88) which are equally striking in their bright colours and markings. They are voracious fish with sharp teeth and are known to dart out of reefs to make vicious attacks. Many of them are two to three feet long but the largest(89) of the recorded species attains a length of 10 feet. They are not used as food and one kind of eel(90) is believed to be poisonous.

Lobsters(91) find shelter among the crevices in coral reefs but they venture out at night into the open areas of the sea in search of food. About five species are known from our waters but none of them support any extensive fishery. The trawlers often obtain lobsters from the Wadge Bank which also provides, very occasionally, large catches of Prawns(92). All these crustacea are considered delicacies and they never fail to realise high market prices.

(73) *Delphinus delphis*. L. and *Tursiops truncatus*.
 (74) *Pseudorca crassidens*.
 (75) *Balaenoptera*.
 (76) *Physeter catodon*. L.
 (77) *Halicore dugong* (P. L. S. Muller).
 (78) *Chelone mydas* (L).
 (79) *Eretmochelys imbricata* (L).
 (80) *Dermochelys coriacea* (L).
 (81) Serranidae.
 (82) Scaridae.
 (83) Labridae.

(84) Pomacentridae.
 (85) Pomacanthidae.
 (86) Chaetodontidae.
 (87) Amphiprion spp.
 (88) Muraenidae.
 (89) *Thyrosoida macrura* (Bikr.).
 (90) *Gymnothorax punctatus* (Bl. & Schn.).
 (91) *Panulirus* spp.
 (92) *Penaeus indicus*. H. Milne-Edwards.
 and *P. semisulcatus* de Haan.

Submerged Banks. Ceylon's famed pearl oyster fisheries are based on one species of Pearl Oyster(93) which grows attached by horny threads to large patches of hard sea bed called "paars", located in shallow seas with depths of 5 to 10 fathoms. Though these oysters are known to occur at many points round the coast, the large fishable populations are concentrated in the Gulf of Mannar where the sea bed seems most suitable for them. The oysters apparently form dense layers on the paars but they also occur, though in small numbers, in the intervening sandy areas. The more valued pearls are embedded in the oyster's fleshy tissue, which is edible but not utilized in this manner as yet.

Another long standing fishery from early historical times is that for Chanks(94) obtained from shallow coastal waters of Palk Bay and the Gulf of Mannar. Different varieties of this mollusc were recognized as separately distributed near the shores of India and Ceylon around the two bays. The northern shallow seas contain in addition several other species of molluscs such as the Melon Shell(95) and Scorpion Shell(96). Shell collectors will find even greater interest in the many attractively tinted Cowries(97) and Cones(98) found there.

The commercially most valued types of fish present on submerged banks are Groupers(99), Snappers(100), Pigface Breams(101) and some species of Horse Mackerel(102). Groupers and snappers are represented by a large number of species. Like many other fish that live among rocky banks and coral reefs they are distinctively and often brilliantly coloured with sharply contrasted markings of spots and stripes on a background ranging from red through yellow to olive brown. The breams have mainly a grey or other dull colour. Fishermen obtain all these kinds by using hand lines and a day's catch may contain a mixture of several species. In some areas these fish move in schools and then one species may be prominent in the catch. These schools are seldom of the density characteristic of sardines or other herring-like fish.

Though a great many kinds of horse mackerel live in mid-water levels and frequent shallow coastal waters, the large sized fish are also found near the sea bottom in submerged banks of deeper waters. A regular seasonal fishery is conducted on banks opposite Pattanangalla (south-east coast) where the catch consists of a few kinds(103) that grow to a length of as much as four feet. Large-sized fish also characterize the Wadge Bank fishery where three species(104) dominate trawler landings of horse mackerel. Moreover, considerably greater catches are trawled during the south-west monsoon period and this increase may be explained as probably caused by migration of some horse mackerel from shallower waters near the coast. An alternate inference is that large numbers descend to the sea bottom when the upper water layers are disturbed by stormy weather from this monsoon.

Fishing gear operated near the floor of these submerged banks obtain many sharks and rays. For instance catches of Dog Shark(105) amount to nearly five per cent. of the total trawler landings from the Wadge Bank. Cat-fish from this bank appear to belong to one species only(106) and are found in considerable numbers there. Just as with horse mackerel there is a marked seasonal increase in trawled supplies suggesting a comparable migratory behaviour.

Soles, Halibut and Flounders(107) contribute little to our fisheries although 36 species are recorded from our fishing grounds. Only small quantities are taken in drag nets and are therefore hardly known in the market. In contrast, catches of these flatfish from cold seas are large and some kinds are accepted as prime fish by people living in temperate lands.

Deep Seas. Since World War II considerable interest has been directed to the exploitation of tuna which are regarded as the principal high quality fish from the deep tropical seas. The Japanese and Americans have successfully developed the Pacific Ocean fisheries for these widely distributed species and they are now seeking to examine the fishing potential of the Indian Ocean.

- (93) *Pinctada vulgaris*. Schum.
- (94) *Turbinella pyrum* (L).
- (95) *Melo indica* Gmelin.
- (96) *Lambis lambis* (L.).
- (97) Cypraeaidae.
- (98) Conidae.
- (99) Serranidae.
- (100) Lutjanidae.
- (101) Lethrinidae.

- (102) Carangidae.
- (103) *Caranx gymnostethodon*, Day, *C. ignobilis*, (Forsk.) and *C. stellatus*. Eydoux and Souleyet.
- (104) *Caranx chrysophrys* (C. V.); *C. carangus* (Bl.) and *C. malabaricus* Day.
- (105) *Scoliodon* spp.
- (106) *Netuma thalassinus* (Ruppell).
- (107) Pleuronectiformes.

There is yet no certain evidence to define either the extent of mixing or the separateness of populations from the three oceans. Apparently the Yellow-fin tuna(108) and the Skipjack(109) of our seas are identical with those of the Pacific Ocean.

Very little is known about the deeper seas around Ceylon as few fishermen can venture beyond the continental shelf with the types of fishing craft at their disposal. However, regular seasonal fisheries are operated from the south and west coasts where fishermen sail to the deep seas near the continental edge in search of large fish found swimming in the upper layers of the sea, e.g., Tuna(110), Marlin(111) and Sailfish(111) and large sharks. The Yellow-fin tuna frequenting these oceanic waters are much larger than those caught from coastal depths. Fishermen realise a good income from sale of large-sized marlins and related species although this flesh is somewhat coarse for eating and therefore not in great demand.

The deeper tropical seas are infested with large voracious sharks which roam over great distances in search of food, sometimes following ships. They are seen trailing trawlers on the Wadge Bank to feed on fish offal thrown overboard from gutting of the catch. They also feed on tuna hooked on longlines, proving themselves pests to fishing in deep seas. Adult lengths of 6 to 15 feet are reached by many species such as the Blue Sharks(112), Hammerhead Sharks(113) and Tiger Shark(114). An occasional visitor from oceanic areas is the harmless, plankton-feeding Whale Shark(115), the largest of known sharks attaining a maximum length of 50 feet.

POPULAR NAMES

(of some of the fauna and flora mentioned in the text)

<i>English</i>	<i>Sinhalese</i>	<i>Tamil</i>
Anemone-fish ..	Pol kicha ..	—
Angel fish ..	Namba ..	Manjel meen
Barb ..	Titteya, Petiya ..	Kendhai
Barracuda ..	Theliya, Jeela ..	Seela
Box fish ..	Dhara pethiya ..	Pethai
Bream ..	Mivatiya ..	Villai mean
Cat-fish ..	Anguluva ..	Ven keleru
Chank ..	Hakgediya ..	Chanku
Cone ..	Sippi ..	Chanku
Coral fish ..	Manamalaya ..	Pooyalai
Cowrie ..	Sippi ..	Chozhi
Crab ..	Kakuluva ..	Nandu
Dugong ..	Moodhu ura ..	Kadal pandi
Eel ..	Arndha ..	Villangu
Fan shell ..	Arkku ..	Arkku
File fish ..	Pothupara ..	Klathi
Flatfish ..	Patahmadiya ..	Nakku meen
Flying fish ..	Piha massa ..	Paravai meen
Garfish ..	Muralla ..	Mural
Grouper ..	Kossa, Lavaya ..	Kalavai
Half-beaks ..	Marandha ..	Mural
Herring ..	Saleya, Hurulla ..	Sallai
Herring, giant ..	Mannava ..	Manna
Herring, wolf ..	Katuvalla ..	Vallai meen
Labeo, green ..	Kalu gadaya ..	—
Lady fish ..	Miya ..	Eli meen

(108) *Neothunnus macropterus* (Shlegel).

(109) *Katsuwonus pelamis* (L).

(110) *Thunnidae*.

(111) *Histiophoridae*.

(112) *Carcharinidae*.

(113) *Sphyrna* spp.

(114) *Galeocerdo cuvieri* (Le Seur).

(115) *Rhincodon typus* Smith.