



*Silas*

Dr E. G. Silas is senior Indian marine biologist. From 1960 to 1985 he was on the scientific staff of the Central Marine Fisheries Research Institute. During this period he participated in several national and international fishery and oceanographic expeditions either as member or leader. His major scientific contributions are on tuna, bill fish and related species, squid, cuttlefish and octopus, and endangered marine species such as whales, dolphins, dugongs and sea turtles.

## MARINE LIFE

In February 1976, India declared an Exclusive Economic Zone along its extensive coastline and now has jurisdiction over 2 million square kilometers of sea area.

A rich and varied marine life is present in the Indian seas which is also characterized by a diversity of habitats — the barrier reefs and atolls of the Lakshadweep Islands, the fringing reefs of the Andaman-Nicobar Islands, the Gulf of Mannar and the Gulf of Kutch, the mangrove and coastal lagoons, lakes, backwaters, estuaries and mudflats, and the rocky and sandy shores, harboring myriads of animal and plant species.

**Human Impact:** Man's greatest impact on marine life is in the coastal waters and estuaries. Using diverse types of fishing craft and gear, India alone fishes about 1.6 million tonnes of marine fish annually, with sardines, mackerel, Bombay-duck and prawns forming the major catches. **Thirutai** or **gray mullet** (*Mugil cephalus*), **kanumbu** (*Mugil macrolepis*), **Indian salmon** (*Polyneemus indicus*) and **bhekki** (*Lates calcarifer*) in the hauls are not uncommon.

Marine penaeid prawns breed in the sea and the larvae of some species such as the **tiger prawn** (*Penaeus monodon*) and the **white prawn** (*P. indicus*) emigrate to the Cochin backwaters and with the tidal waters are allowed to enter the paddy fields through sluices, where they are netted every few days as the water is allowed to ebb with the tide.

**Visit to Kovalam:** Kovalam, the picturesque palm-fringed beach, 10 miles (16 km) south of Trivandrum, is also a place where you find abundant marine life, the most desired being the **spiny lobster** (*Panulirus hormarus*) and the **brown mussel** (*Perna indicus*).

**In Lakshadweep:** Ten of the islands of the Lakshadweep archipelago are inhabited. The lagoons in these islands are relatively shallow and the largest is in Minicoy. Luxuriant growth of branching and massive corals such as species of *Acropora*, *Montipora*, *Pocillopora* and *Porites*, along with associated fish and invertebrates occur in the reefs. The one item most sought after in the lagoons is bait fish, some 60 or so species used for attracting the **skipjack** and young **yellowfin tuna**. The reefs also support spiny lobsters and a good many species of fish. A few miles to the north of Kavaratti Island lies Pitti Island which is one among the very few rookeries for sea birds in India. Both the **sooty tern** and the **noddy tern**

breed on this tiny island about 7½ acres (three hectares) in area. A number of other species of sea birds also congregate here.

The **green turtle** (*Chelonia mydas*) is known to nest at **Suhuli Parr**, **Pitti Island** and **Minicoy Island**. It is at this southernmost island in the Lakshadweep that **mas** — a cured smoked and dried product which is a must with every meal for the islanders — is made from the tuna meat. The once ornate sail fishing boats of Minicoy known as **odams** are now almost a thing of the past, having been replaced by mechanized boats fitted with a bait well for carrying live bait fish for rod and line fishing for tuna.

**Mannar:** Krusadai Island in the Gulf of Mannar is an important center for students of marine biology from all over the country. The island now comes within the delineated area of the National Marine Park in the Gulf of Mannar, covering a chain of 21 islands from Rameswaram to Tuticorin. The park has been established with a view to conserving the fringing coral reef and sea grass ecosystems from further human interference and giving adequate protection to the **dugong** or **sea cow** (*Dugong dugon*), **sea turtles** and other vulnerable and endangered species, including the unique **enteropneustan** or **acorn worm** (*Ptycodera flava*) occurring in Krusadai.

South of this, off Tuticorin, are the pearl banks or **parrs** and conch beds. Prior to the mid-1960s, a number of pearl fisheries were conducted from time to time in the Gulf of Mannar, the pearl oyster being *Pinctada fucata*. A falling number of oysters in the **parrs** has resulted in the failure of this fishery during the last 20 years.

The **conch** (*Xancus pyrum*) is also known as the sacred conch on account of its use in religious ceremonies. Skin diving is done for collecting conch in depths up to 65 feet (20 meters) from November to mid-May in the Gulf of Mannar and June to October in Palk Bay with the search always on for the rare **sinistral shell** (*Valampuri chanku*) which is considered priceless.

**Seaweeds:** The Mandapam-Rameswaram coasts are rich in seaweeds but the natural beds are being rapidly depleted to meet industrial demands. A number of *Agrophytes* (species of *Gracelaria*, *Gelidiella* and *Hypnea*), and *Alignophytes* (species of *Sargassum* and *Turbinaria*) occur in the area. It is a common sight to see a few hundred men, women and children collecting seaweeds from the intertidal and shallow areas in and around this chain of islands for supplying to the seaweed processing industries in the hinterland and other parts of the country.

**Dugong and Whale:** The **dugong** is the most

Left, mangrove swamps harbor a range of fascinating life.

endangered of India's marine animals. The residual population of this herbivore in the Gulf of Mannar and Palk Bay is very vulnerable. Excessive and unregulated fishing with mechanized boats and canoes resulting in incidental capture, injuries due to boat hits and various methods of illegal take have drastically depleted the population. At the turn of the century they were so abundant in the area that there used to be regular organized herding and spear fishing for them. They are closely associated with the sea grass ecosystem in the shallow sub-littoral and intertidal areas where beds of *Halophila ovalis*, *Zostera sp.* and *Cymodacea spp.* occur. It is today a rare event to see a dugong in the foraging grounds or in the open water around the islands. They move individually or in small groups, with the calf riding on the cow while submerged.

watching.

**Turtles:** The world's largest aggregation or arribada of sea turtles takes place along the Gahirmata coast of Orissa where, in January or early February, over 300,000 olive ridley (*Lepidochelys olivacea*) females emerge for nesting along a six-mile (10-km) stretch of the beach within five to seven days. Access to this nesting beach which forms the eastern fringe of Bitarkanya Sanctuary is difficult. A second arribada of the same magnitude takes place at Gahirmata in March or early April. The hatchlings, in millions, emerge after an incubation period of about 45 to 58 days, depending on the time of the arribada and the prevalent temperatures. A recent significant discovery is that turtle eggs developing above a pivotal temperature all turn out to be females and those below, males.



Every three or four minutes they come up to the surface to breathe, normally in a horizontal position, but when curious about a floating object or an approaching boat, or when there is wave action, they break the surface more vertically. The uprooted floating sea grass sticking to the dugong's head probably gave rise to the legends about mermaids.

Not far from here, in the Sri Lankan waters off Trincomalee is where the **blue whale** (*Balaenoptera musculus*) has recently been observed to calve. The stranding of **baleen whales** (*B. musculus*, *B. borealis*) and young and adult **sperm whales** (*Physeter macrocephalus*) in the Gulf, Palk Bay and along the Madras coast indicate the proximity of the breeding grounds of these species, an area promising for whale

A headstarting program of olive ridley can be seen at Kovalam (earlier Covalong) 22 miles (35 km) south of Madras (not to be confused with the place of the same name in Kerala) where due to heavy egg predation by man and wild animals, freshly laid clutches of eggs of the olive ridley are transplanted in hatcheries and the hatchlings released on the same beach.

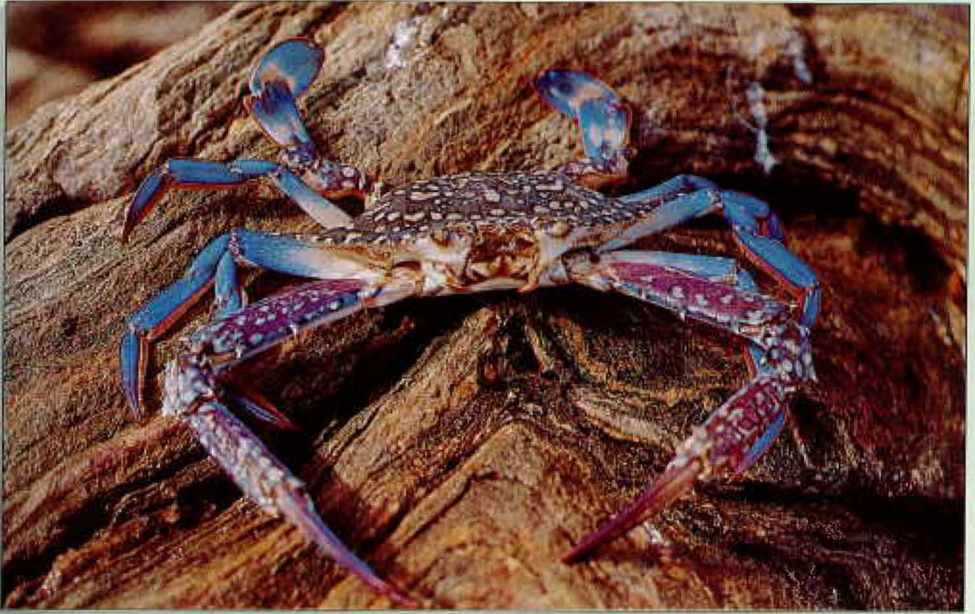
All five species of sea turtles are on the endangered list. Several stretches of the beaches along the mainland coast and Andaman-Nicobar and Lakshadweep have been identified as nesting sites of the **green turtle** (*Chelonia mydas*), the **hawksbill** (*Eretmochelys imbricata*), the **leathery turtle** (*Demochelys coreacea*) and the olive ridley, with very little known about the **loggerhead** (*Caretta caretta*).

**Plankton Blooms and Noxious Animals:** A major feature along the west coast of India is the very large scale blooms of the nitrogen-fixing blue-green algae (*Trichodesmium erythreum*) from February to May. No deleterious effects are noticed. On the other hand, "red tides" caused by the dinoflagellate (*Notiluca miliaris*) results in fish mortality. Still more dangerous are blooms of *Hornellia marina*, another highly toxic dinoflagellate which are seen at the onset of the monsoon along the Kerala coast, causing mortality of fish, crustaceans and other invertebrates.

In treading in the lagoons of the Lakshadweep one has to be careful not to step on the spines of the well-camouflaged **stone fish** or to handle the beautiful **scorpion fish**, the spines of which are venomous and injury from which could be excruciatingly painful.

namely the passive **whale shark** (*Rhineodon typus*), growing to a length of 40 feet (12 meters) or so is a visitor to the Indian coastal waters and, to date, the largest number of captures of this giant shark has been along the Gujarat coast where it is harpooned or caught in gill nets for its liver oil, the carcass being discarded.

**Game Fish:** Sport fishing possibilities in the sea are great, especially as excellent game fish such as **tuna, seerfish, wahoo, marlin, swordfish, sailfish, barracuda, dolphinfish, rainbow runner, telang queenfish, pelagic shark** and many others are available. There are areas along the west coast of India (Ratnagiri, Goa, Karwar, Cochin), the Gulf of Mannar (Tuticorin, Mandapam), the Lakshadweep sea and the Andaman and Nicobar Islands where these can be taken in rod and tackle. They are now obtained in surface trolling from



Among the coelenterates, the sting of the nematocysts of *Physalia physalis*, commonly known as the **Portuguese Man-o'-War** could even be fatal. *Physalia* occurs along the east coast with the commencement of the northeast monsoon. *Porpita porpita* and *Vellela vellela*, two chondrophorans which immobilize prey organisms with their stinging cells, are closely associated as commensals with young fish. Among corals, the sting from the polyps of *Millipora* is said to be very painful.

**The Whale Shark:** The largest of all fishes,

sailboats, mechanized boats and catamarans.

**Mangrove:** The estimates are that there are nearly a million acres (405,000 hectares) of mangrove forests along India's coasts, the most important being the Sunderbans in West Bengal. While large areas have already been denuded of mangrove for conversion to agricultural land, human settlement, industries, salt production and other uses, an awareness has grown concerning the need for conservation and management of this resource. Mangrove waters get greatly enriched with nutrients and act as an important nursery for many species of marine animals which later return to the sea for maturing and breeding. Some, like the much sought after **Indian shad** (*Hilsa ilisha*) in West Bengal, enter the estuaries for breeding in freshwater.

Left, the mudskipper, an amphibious fish, is found amongst mangrove swamps and right, a Neptune crab.