

Pictorial Handbook on
Marine Reptiles of India

T.S.N. MURTHY



ZOOLOGICAL SURVEY OF INDIA

Pictorial Handbook on
MARINE REPTILES OF INDIA

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PREFACE

Herpetologists in India have, until recently, paid little attention to the reptiles in the sea. However, thanks to the emphasis laid now to explore the animal life of our seas, special attention is being paid to unravel the mysteries of the marine reptiles. Even so most Indians are unaware of the rich and varied assemblage of these fascinating creatures probably because of the lack of readily available and informative books on the subject. The pictorial handbook is, therefore, presented to fill the void.

The pictorial handbook, written in simple but scientifically accurate language, is aimed at serving as an introduction to the marine reptiles of India. The book is by no means an exhaustive account of the subject, but it does present a brief synopsis of the identification, habitat and habits of these fascinating creatures, thus making it useful for the marine biologists, wildlife enthusiasts, navy personnel, herpetologists and the lay public. Moreover, the "References" section will help to extend the reader's interest in the marine reptiles of India.

T.S.N. MURTHY

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INTRODUCTION

Reptiles are the first vertebrates to break their link with water and become truly adapted to a life on land. They have evolved from the amphibians and in turn, they have given rise to the birds and mammals. Unlike amphibians, reptiles lay eggs on land and do not go through the aquatic larval phase but hatch out as miniature versions of the adult, though differing in colour and pattern. The most striking character of reptiles is their scaly skin which prevents them from drying out.

A typical reptile is lizard-like in shape, with three main parts – the head, trunk, and the tail – constituting the body. Reptiles are poikilothermic animals, that is their body temperature is not constant and varies with the surroundings. They avoid the severe cold by hibernation and the dry hot weather by aestivation. A vast majority are carnivorous, insects constituting their main food. Sexes are separate but are not easily distinguishable. Most reptiles lay hard-shelled eggs which are usually buried in pits in the soil for incubation but a few species produce living young.

Though reptiles form only a small component of animal life in the sea, there are about 60 species of snakes, seven or eight species of turtles and a single lizard which may definitely be called marine reptiles.

SEA TURTLES

The turtle is the only reptile that has a shell which is a dome-like protective armour for the creature. The turtle shell which is composed of bony plates covered by horny scales, has an arched upper part called, 'carapace', and a lower part called 'plastron'. The ribs are immobile and fused to the shell. The Leatherback sea turtle differs from other turtles in having its back covered

with smooth skin. All sea turtles have paddle-like limbs in tune with the aquatic mode of existence of the creatures. Sea turtles, other aquatic turtles and tortoises belong to the reptilian Order Testudines (also called Chelonia) that has survived for 200 million years and remained unchanged throughout the long process of evolutionary history.

Tortoise, turtle or terrapin

The varied usage of the word 'turtle' in English language has given rise to much confusion. In proper usage "tortoise" is referred to the strictly land dwelling forms with elephant-like stubby feet, "turtle" for those found in seas and rivers and "terrapins" for the hard-shelled, edible freshwater species.

DISTRIBUTION

The leatherback turtle is generally distributed in the tropics, but appears to be scarce everywhere. The green turtles, hawksbills, loggerheads and the ridleys are distributed in the tropical and subtropical seas. They visit the temperate coasts but occasionally. Depending on the availability of the diet of their choice, carnivorous sea turtles such as hawksbills and loggerhead turtles prefer to spend much of their life near reefs and rocky shallows respectively. The herbivorous green turtle is partial to areas rich in turtle grass and seaweeds, the animal's principal food. The leatherback, a pelagic sea turtle, lives in the open ocean.

HABITS

Turtles are proverbially slow in movement, but the sea turtles, with their feet modified to form flippers, swim with a speed of 32 km an hour. Sea turtles have no external ears and so their power of hearing is dull. But their vision seems to be fairly good. Recent study has shown that the green turtles have underwater vision. Sea turtles are fond of basking asleep, floating on the surface of the water. Turtles are toothless but

have a beak with horny sheaths, supplemented with a cutting edge. Sea turtles feed mostly on marine invertebrates such as sponges, marine worms, and mollusks. The hawksbill feeds exclusively on sponges and the leathery turtle is a jellyfish specialist. The juvenile green turtle are carnivorous but the adult is a strict herbivore. Sea turtles must stay near the surface to breathe frequently but when they are inactive, resting or sleeping, they are capable of staying underwater for hours without breathing.

Turtles, in general, are silent creatures except for making a variety of sounds such as barking, grunting and gasping especially during courtship. Recent studies reveal that the leatherback turtle makes loud gurgling and rumbling noises when it comes onto land for egg-laying and it is also believed to make a loud noise when injured. Generally speaking, sea turtles are gentle in disposition. The green turtle is said to be the gentlest of all sea turtles, rarely attempting to bite, even if provoked. But the loggerhead turtle is reported to be a vicious creature, delivering nasty bites with its formidable jaws.

REPRODUCTION

Sea turtles generally mate in the waters near their nesting beaches. The females can retain sperm in their oviducts to continue to lay fertilized eggs for several years after a single mating.

BREEDING HABITS

Available data shows that the big sea turtles start breeding when they are 3 to 8 years old. The breeding of marine turtles makes interesting reading. The egg-laden female leaves the water usually at night during the spring and summer months to discharge its parental obligation. She makes her way across the beach clumsily accompanied by painful noises made because of the tiresome dragging of its body. With her rear flippers she digs a flask-shaped hole approximately of 20" deep and 8"–10" in

diameter. After a pause of momentary hesitation, she begins to deposit her eggs, slightly larger than a ping-pong ball, in clutches. A clutch may contain 50 to 250 eggs and the whole process of laying is over in a few hours. The female may lay upto 10 or more nests in a year. The egg-laying female takes no notice of the surroundings and goes on laying eggs like a machine set to motion. The presence of humans or any other animal or even a blow on the shell of the turtle will not disturb its activity. Taking advantage of the defenceless character of the female turtle, some people living on the coasts often sit right at the nesting site and collect the eggs as they are expelled. However, the innocent female turtle fills the egg-hole with the sand as carefully as though it contained all the eggs and returns to the sea, leaving the fate of her progeny to face the challenges of Nature, beast, and man.

While the eggs, buried in the beach sand, incubate, they are easy prey for predators. Heavy waves of cyclonic storm may wash away the nests before the eggs have become turtles. After a period of incubation which lasts approximately two months, all the young of one batch hatch out, scratch their way to the surface and head instinctively towards the sea probably guided by the light which is brighter over the sea. *En route* they become the target of attack by sea birds, crabs, lizards, dogs, and of course, man. After the carnage, just a fraction of the hatchlings reach the sea, to fall a prey to the carnivorous fishes lurking in the shallows. The young remain in the open sea until they are about a year old during which period, many of them are eaten up by predators. It is estimated that only half of the eggs laid hatch and of these, one in thousand will attain maturity. Yet sea turtles have not only persisted for millions of years but also outlasted the great dinosaurs. Nature had wisely visualized the high infant mortality among the sea turtles and devised ways and means to protect them. The number of eggs laid by a female turtle, the number of nests laid in a year and the high adult survival rate provide us with a clue. More important, the repeated capacity for reproduction also adds to their continued existence. There are but a few predators which could overpower and kill an adult

turtle. Once a turtle reaches an adult size of 1 to 2 metres, sharks and humans are the chief predators they face while in the sea and on land, only a mammalian predator like a panther could kill it. But human interference in the life of the sea turtle is the great challenge that they are not able to face now.

THREATS

Since time immemorial, people on the coasts have hunted the sea turtles to help feed their families. Fishermen harpooned a good-sized sea turtle or two for eating. Still some more were netted when the turtles surfaced to breathe. But all this carnage had but little effect on the vast hordes of the giant creatures. Then came the demand for sea turtles which mounted correspondingly with the increasing human populations. Soon the greedy man found wealth in the turtle and its products; the hunters took thousands of turtles netted out of the sea and even on the land, when they come out of the sea for nesting; female turtles, going up the beach or returning to the sea, are turned on their backs and easily captured by poachers as the egg-laden females and their eggs will fetch the poacher a good remuneration. Some sea turtles face instant death when they are caught incidentally. The turtles swept along in the nets of Shrimp trawlers will be hard put to come up to the surface to breathe and thus they are drowned. Long stretches of the undisturbed sandy beaches which attracted the female turtles for centuries to nest in peace are no more there thanks to the increasing urbanization on the sea front.

DIVERSITY

Of the seven living species of sea turtle, five species namely, the Leatherback sea turtle (*Dermochelys coriacea*), the Hawksbill sea turtle (*Eretmochelys imbricata*), the Loggerhead turtle (*Caretta caretta*), and the Olive (or Pacific) ridley (*Lepidochelys olivacea*) are found in the coastal waters of India. The Flatback sea turtle (*Chelonia depressa*) and Kemp's (or Atlantic) ridley (*Lepidochelys kempi*) do not inhabit the waters of India.

SEA SNAKES

Sea snakes are air-breathing, highly venomous reptiles closely allied to the front-fanged cobras and kraits, and to a greater degree to the Australian elapids. In fact, it is believed that the present-day sea snakes have evolved independently at least twice (there are amphibious sea kraits and there are totally marine species) and that both groups of sea snakes, tracing their ancestry to the same stock which gave rise to the elapid snakes.

DESCRIPTION

With the body flattened from side to side and the most obvious paddle-like tail and the upward positioning of the nostrils, the sea snakes are at ease in the sea. In addition, they exhibit special adaptations much needed in a marine environment all sea snakes have salt glands in the body to get rid of the excess salt and their right lung is extensile and is used for absorption of oxygen and also as a hydrostatic organ which enables the snakes to remain submerged for several hours if occasion so demands. The skin is rather thick, particularly between the scales, which protects against loss of fluid or penetration of the body by salt ions. Though the sea snakes are graceful swimmers, they are helpless on land where they move with a slow and awkward gait owing to the absence of the enlarged belly scales so characteristic of the land snakes.

Though sea snakes do not exhibit any definite scheme of colouration, majority of them are strikingly banded, for the most part the young are patterned and coloured more distinctly than the adults. This is primarily because sea snake colouration fades with age. Sometimes the variation in colour is so great that it is difficult to distinguish the individuals within the species.

SEA SNAKE OR EEL?

Sea snakes and eels resemble each other but the dry, scaly skin of the sea snake distinguishes it from the eel which has a

smooth and slimy skin, in addition to fins and a gill pouch in the area around the neck.

FOOD

Sea snakes eat fish (particularly eels) and marine invertebrates. At least two species eat fish eggs. As is with other snakes, sea snakes swallow fish much larger than their size. Some sea snakes have curious shapes, which act as a camouflage enabling them to strike the prey in water. It is remarkable that some of the longest sea snakes have a small head, hardly wider than neck, and a bulky posterior half of the body.

REPRODUCTION

The majority of sea snakes give birth to live young, but a few species (*i.e.* the *Laticaudinae*) are egg layers.

WHERE ARE THEY FOUND?

Sea snakes generally prefer inhabiting the shallow waters along the coasts, where they can readily dive to the bottom for food and can rise quickly to the surface to breathe. They are also found among the rock crevices, tree-roots along the beaches, or pilings that support houses built over the water near the sea shore. Some species are common in the estuaries.

Sea snakes are attracted by light and that is why they gather in large numbers near the gangways in the harbours. Like other marine reptiles (sea turtles), they love basking on the surface of water and on days when the sea is calm, hundreds of them can be seen from the bows of steamers.

Long columns of sea snakes congregating in thousands have often fascinated the naturalists on sea voyages. A European Naturalist, Lowe, while on a voyage from Malay to Sumatra observed in 1932, a line of these creatures across the surface of the sea, about 300 cm wide and 100 km long. The enthralled

naturalist has estimated this congregation to include millions of individuals. This incredible get-together may have something to do with the breeding behaviour or migration of these reptiles.

VENOM

Although the sea snakes are generally described as timid and easy going, biting only under provocation or when mishandled, the fact is that all sea snakes are deadly possessing neurotoxic venom which is estimated to be 4 to 10 times potent than that of a cobra. In common with their counterparts – the cobras and kraits, the fangs of sea snakes are short, grooved and immobile. But because their venom apparatus is not as efficient as that of the cobras, sea snakes deliver a lesser quantity of venom resulting in slow signs of poisoning. There may be no pain or reaction at the site of the bite and the person bitten by the sea snake hardly feels them. The initial symptoms accompanying the bite range from an ill-feeling or anxiety to muscular stiffness. Late symptoms include blurred vision, locking of jaws and respiratory difficulties leading to death. The antivenom for sea snake bite is manufactured in Japan and Australia only and is not available in India.

SEA SNAKES A THREAT TO FISHERFOLK AND DIVERS?

Though there are numerous accounts of fishermen picking up the sea snakes with impunity and throwing them back into the sea, a greater number of victims are the fishermen of Asia who wade barefoot in the slushy shores with their nets when they are most likely to be bitten by stepping inadvertently on a snake. Another occasion when they are prone to be bitten is when the fishermen sort out their catch with bare hands. At such times, they come into contact with a snake hidden among the fish or lurking in a corner of the net. Sometimes sea snakes travel considerable distances from the sea and may enter rivers and canals, posing a threat to the people living nearby. Despite

conflicting accounts, the fact is that sea snakes can be a source of considerable trouble to the unwary divers. Sea snakes swim quite quickly and may often approach a diver apparently out of sheer curiosity. A mere approach by the snake should not be taken as a sign of attack and the best course in the event is to withdraw calmly from the vicinity of sea snakes. Even if a sea snake bites then, divers with wet suits escape death, as the snake's short fangs cannot reach the flesh of the victim. As far as India is concerned, there are no records of a sea bather or diver having been bitten by a sea snake. The powerful venom of the sea snake is primarily meant for paralyzing and killing the fast-moving and slippery prey such as fish, which otherwise swim away.

DISTRIBUTION

Sea snakes are mostly confined to the tropical portions of the Indian and Pacific Oceans. The species of subfamily Hydrophiinae range from the Persian Gulf to the Idzu sea of Japan, southward to the coast of Tasmania and across the Pacific to the Gilbert Islands. One species, the yellow-bellied sea snake (*Pelamis platurus*), occurs outside these limits. It ranges from the east coast of Africa, across the Indian and Pacific Oceans to the west coast of Latin America, and from southern Siberia to Tasmania.

DIVERSITY

Approximately sixty kinds of sea snakes are recognized today, of which twenty species are found in the waters of India. These are divided into two subfamilies namely *Hydrophiinae* (true sea snakes) comprising 18 species, and the amphibious *Laticaudinae*, including two species.

The members of the *Laticaudinae* have retained the overlapping dorsal scales and enlarged belly scales (ventrals), as is common with most of the terrestrial species. While the laticaudids may come out of the water to lay their eggs on land,

the true sea snakes seldom venture far out from the sea. Evidently, the sea snakes of the subfamily *Laticaudinae* are the types in transition. (See Sections 'Updated Checklist' and 'Species accounts of sea snakes').

SEA SNAKES AS FOOD

The deadly serpents of the sea are a popular delicacy in Singapore, Hongkong, Japan and some other countries of the Far East. The demand for the delicacy is so heavy in Japan that millions of sea snakes are shipped from the Philippines to Japan. For edible purposes, the snakes are held on pointed bamboo sticks, roasted and smoked, and served with a side dish. Apart from their food value, the skin of sea snakes also commands a good market.

AN UPDATED CHECKLIST OF THE MARINE REPTILES OF INDIA (with common names)

Note Following is the updated list of 5 species of sea turtles nesting on the coasts of the Indian mainland as well as on the beaches of Andaman and Nicobar Islands and Lakshadweep, and 20 species of sea snakes inhabiting the waters of India. The English (or common) names of all the species also are given.

SEA TURTLES

Class REPTILIA

Order TESTUDINES

Suborder CRYPTODIRA

Family DERMOCHELYIDAE

1. *Dermochelys coriacea* (Vandelli, 1761)

Leatherback sea turtle

Family CHELONIIDAE

2. *Caretta caretta* (Linnaeus, 1758)

Loggerhead sea turtle

3. *Chelonia mydas* (Linnaeus, 1758)

Green turtle

4. *Eretmochelys imbricata* (Linnaeus, 1766)

Hawksbill sea turtle

5. *Lepidochelys olivacea* (Eschscholtz, 1829)

Olive ridley sea turtle

SEA SNAKES

Class REPTILIA

Order SQUAMATA

Suborder SERPENTES

Family HYDROPHIIDAE

Subfamily HYDROPHIINAE

1. *Astrotia stokesii* (Gray, 1846)
Stokes' sea snake (or) Large headed sea snake
2. *Enhydrina schistosus* (Daudin, 1803)
**Common sea snake; Hook-nosed sea snake;
Beaked sea snake**
3. *Hydrophis caerulescens* (Shaw, 1802)
Many-toothed sea snake
4. *Hydrophis cantoris* Gunther, 1864
Cantor's small headed sea snake
5. *Hydrophis cyanocinctus* (Daudin, 1803)
Annulated sea snake
6. *Hydrophis fasciatus* (Schneider, 1799)
Banded sea snake
7. *Hydrophis gracilis* (Shaw, 1802)
Common narrow headed or small headed sea snake
8. *Hydrophis lapemoides* (Gray, 1839)
Persian Gulf sea snake
9. *Hydrophis mamillairs* (Daudin, 1803)
Bombay sea snake

10. *Hydrophis nigrocinctus* (Daudin, 1803)
Black-banded sea snake or Daudin's sea snake
11. *Hydrophis obscura* Daudin, 1803
Estuarine sea snake; Eccentric sea snake
12. *Hydrophis ornatus* (Gray 1842)
**Spotted sea snake; Gray's sea snake;
Cochin branded sea snake; Ornate sea snake**
13. *Hydrophis spiralis* (Shaw, 1802)
Yellow sea snake
14. *Hydrophis stricticollis* Gunther, 1864
Bengal sea snake; Gunther's sea snake
15. *Kerilia jerdonii* (Gray, 1849)
Jerdon's sea snake
16. *Lapemis curtus* Shaw, 1802
Short sea snake; Short tailed sea snake
17. *Pelamis platurus* (Linnaeus, 1766)
**Black and yellow sea snake; Pelagic sea snake;
Yellow-bellied sea snake**
18. *Thalassophis viperina* (Schmidt, 1852)
Viperine sea snake

Family HYDROPHIDAE

Subfamily LATICAUDINAE

19. *Laticauda colubrina* (Schneider, 1799)
Banded sea krait; Yellow lipped sea krait
20. *Laticauda laticaudata* (Linnaeus, 1758)
Common sea krait; Black banded sea krait

ACCOUNTS OF SPECIES

SEA TURTLES

Family DERMOCHELYIDAE

Leatherback Sea Turtle

1 *Dermochelys coriacea* (Vandelli)

Other common names Trunkback , Leathery (or Leather) turtle; Luth.

Vernacular names Gujarati – Daryani kachabi; Hindi – Sher kachua; Kannada – Ishwar aame; Oriya – Samudra kaichha (for any sea turtle); Tamil – Ezhuvari amai; Dohoni amai.

Names in Islands Lysermuller (Amindivi); Kap chyoot (Car Nicobar); Kap heebu (Central Nicobar).

Distinctive features : The only sea turtle that is devoid of an outer covering of horny shields and instead, has a leathery skin. The most remarkable feature of the torpedo-like shell is that the ribs and vertebrae are free from the exoskeleton and the carapace, which consists of numerous small, separate polygonal plates, is covered or lined with thick leathery skin, an unusual feature distinguishing the leathery turtle, necessitating the



Fig. 1. Leatherback sea turtle, *Denmochelys coriacea*. Hatchlings.

erection of a separate genus and separate family to contain it. Some bones of the dermal mosaic are enlarged, following twelve longitudinal ridges, seven on the carapace and five on the plastron. The epidermal horny shields are lacking but the hatchlings are covered with small polygonal shields, which disappear in the adult. The snout is blunt and there are two strongly marked cusps on the upper jaw. The neck is not retractile. The limbs are highly modified as flippers and clawless, the anterior pair being much larger than the posterior. The tail is short.

Colour The young are blackish above, with the longitudinal ridges on the carapace and borders of the limbs being yellowish white; adults predominantly dark brown or black above, spotted with white or pale yellow, especially around the neck and at the base of flippers. The plastron is paler.

Size The largest of all the Chelonians in existence, some giants reaching a total length of two metres and beyond, and an estimated weight exceeding 900 kg.



Fig. 2. Close-up of head of the Leatherback sea turtle showing the longitudinal ridges.

Habits : The leatherback is rare everywhere probably because it leads a truly pelagic life, diving at the least sign of danger, and coming onto the land only for the sake of breeding. Using its huge front flippers, the animal seems to roam the seas far and wide.

The leatherback feeds mainly upon jellyfish, which are caught by the strong cusps of the upper jaw. The animal's habit of swallowing the floating plastic bags in the sea, apparently mistaking them for its favourite food – jellyfish, is an added threat to the survival of the turtle. A recent study on the stomach contents of adult leatherbacks has revealed the presence of plastic in their gut.

The breeding habits are similar to that of the other sea turtles, described in detail (see section II). In conformity with the distribution of these creatures, the time of breeding is not the same everywhere. Though these turtles generally nest at night, a few instances of their nesting during the day have been reported



Fig. 3. Close-up of head of the Leatherback sea turtle showing the white spots.

from the coasts of Kerala. Unlike other sea turtles which take nearly ten years to attain adulthood, the leatherback is said to mature in two years.

Distribution Although generally distributed in the tropical seas, the leatherback appears to be scarce everywhere and it is but an occasional/accidental visitor to the temperate regions. The turtle's major nesting grounds in India are located in the Andaman and Nicobar Islands. Recent studies indicate that it also nests on the beaches of Gujarat, Kerala and Lakshadweep, though on a minor scale. The leatherback used to frequent the outskirts or the Tangasseri reef, off the coast of Quilon, Kerala in the early 1900s in considerable number and was indeed said to be quite common there but it has become a rare visitor to the coasts to Kerala now, probably due to the increasing human interference.

Economic importance The flesh of the leatherback is not edible but the eggs are considered a delicacy when fresh. The oil, extracted from the carapace, is used as a lubricant for the wooden boats. The skin is also of good value.

Status and conservation The worldwide decline in the populations of the leatherback has been attributed to the heavy consumption of eggs by humans, incidental catch in shrimp trawlers and the destruction of the turtle's nesting grounds. Although the leatherback turtle's meat is not as wholesome as that of the edible species, considerable numbers are still captured for flesh. In India, the developmental activities undertaken on the beaches of Kerala have greatly altered the few nesting grounds available for the rare species. The leatherback is afforded protection under Schedule I of the Indian Wildlife (Protection) Act, 1972 and is listed under Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Family CHELONIIDAE

Sea turtles of the Family Cheloniidae are characterized by the shell covered with horny shields and the paddle-shaped limbs with one or a pair of claws. The four species included in the family are described below :

Loggerhead Sea Turtle

2. *Caretta caretta* (Linnaeus)

Vernacular names : Tamil – Kadal amai (for any sea turtle); Perunthalai amai.

Distinctive features : The loggerhead is distinguished from other sea turtles by its large, massive head, which gives the turtle its common name, broad, short neck and the complete ossification of the carapace in the adult. The shields of the carapace imbricate only in the young, but in the adult they become smooth and juxtaposed. The large head is armed with very strong hooked jaws, with a median prominent ridge on the upper beak. The head is not retractile. The flippers bear a pair of



Fig. 4. Loggerhead sea turtle, *Caretta caretta*.

claws or one in the adult and the young usually have two claws on each flipper. The tail is extremely short.

Colour The general colour of the shell is reddish-brown above and yellowish below. In the very young specimens, it is uniform dark brown or blackish above and below.

Size The species may attain a carapace length of 1.25 metres and weigh over 180kg.

Habits The loggerhead is carnivorous, feeding chiefly on crustaceans, mollusks, sponges, sea urchins, fish and marine plants. The turtle is said to frequent the coral reefs and rocks, where it hunts for its food. The animal is reported to be a vicious creature since it can deliver nasty bites with its powerful jaws.

This species is a solitary nester, preferring generally continental beaches to island beaches. The nesting takes place mostly during the summer.

Distribution The turtle inhabits the temperate and tropical seas. In India, it is occasionally caught in the waters around the Gulf of Mannar, where it supposedly nests, and off the Tuticorin coast, Tamil Nadu. However, this turtle seems to be rare in the coastal waters (east and west) directly surrounding India and, in fact, is considered rare throughout its range. Literature records of the occurrence of the loggerhead on Indian coasts are not reliable since this species has always been confused with the Olive ridley sea turtle (*Lepidochelys olivacea*), which is common both on the east and west coasts of India.

Economic importance Though the flesh of this species is not edible, its eggs are much relished and sought after. The shell can be put to good use in the preparation of crude ornaments.

Status and conservation The survival of this rare turtle is threatened mainly due to fishing, overexploitation, and lack of suitable nesting grounds. The loggerhead is protected under the Indian Wildlife (Protection) Act of 1972 and listed under Appendix I of CITES.

Green Turtle

3. *Chelonia mydas* (Linnaeus)

Other common names Edible turtle; Soup turtle; Sunray turtle

Vernacular names Bengali – Sabuj Samudrik kachim; Gujarati – Daryani kachbi; Hindi – Dudh kachua; Samunder kachua; Malayalam – Kadal aama; Oriya – Samudra kaichha; Tamil – Pal amai; Then amai.

Names in Islands Yadi – da (Andamans); Kap chyoot (Car Nicobar); Kap ka (Nicobar); Mirigham (Lakshadweep).

Distinctive features The carapace is ovoid or heart shaped, smooth, and covered with shields which do not overlap. The snout is short and the jaws are not hooked, with the horny sheath of upper jaw with feebly, of lower jaw with strongly, denticulated edge. The limbs have generally one claw each on first digit; the second digit of young sometimes has a claw. The head is not retractile. The tail is quite short.

Colour Although it is called green turtle because of its greenish fat, this species is actually light to dark brown in colour, the shields with a pattern of irregular, olive-coloured streaks. The plastron is yellow. The young are olive or dark



Fig. 5. Green turtle, *Chelonia mydas*.

brown above, the limbs margined with yellow and yellow below, with a large patch on each forelimb and hindlimb. Half-grown specimens bear radiate patterns on the carapace and hence are referred to as “Sunray turtles”

Size A large adult may attain a maximum shell length of 1.4 metres and weight upto 250 kg.

Habits The green turtle usually inhabits shallow waters less than 25 metres in depth and prefers areas sheltered by reefs where it feeds on algae. The adult green turtle is a herbivore, feeding upon sea grass and sea weeds, but the young are carnivorous, the food comprising mostly of crustaceans, mollusks, and fish.

The green turtle is known to swim remarkably well because of its oval shell and long flippers and is often found far out in the sea, but it is primarily a coastal animal. It prefers remote islands to the mainland beaches for nesting. The green turtles nest throughout the year but the peak season is said to be from May to September, as far as India is concerned. A female turtle is said to attain maturity when its carapace is one metre in length.

Distribution The green turtle is a circumtropical species in range, generally distributed throughout the Indian and Indo – Chinese waters. In India, it is recorded from the waters off the coasts of Gujarat, Maharashtra, Gulf of Mannar and off the islands of Andamans and the Lakshadweep. The overall distribution of this species depends mostly on the availability of the sea grass, the adult’s chief article of diet.

Economic importance The green turtle, widely distributed around the world, has supplemented the diet of people of more different cultures than has any other vertebrate in the wild. It is appropriately named ‘Buffalo of the sea’ because as an efficient herbivore, it mainly feeds upon the tropical marine grasses and is capable of turning these grasses into human food. Every part of this turtle is valuable and what is more, is marketable; its flesh is turned into tasty steaks; its calipee (the gelatinous material between the shell and bones) is used for turtle soup; its

oil softens cosmetics; its blood is sipped as 'elixir'; its eggs are not only considered a delicacy but also consumed for increasing man's vitality; its shell is cut and polished for jewellery and the skin of its flippers are made into fancy bags, belts and wallets. A new use has been found even for the baby turtles. They are killed, cured, stuffed and sold as gift items.

Status and conservation The green turtle, the world's most valuable reptile, declined at an alarming rate, because of heavy exploitation wherever it occurs. Prior to the ban on trade in sea turtles, live turtle and their products were sold in the markets of Tuticorin, Tamil Nadu. Because of the religious belief that the turtle is an incarnation of Lord Vishnu, the fisherfolk in some coastal States of India release the sea turtles, if caught in fishing nets. The species is protected under Schedule I of the Indian Wildlife (Protection) Act of 1972.

Hawksbill Sea Turtle

4. *Eretmochelys imbricata* (Linnaeus)

Other common names Tortoiseshell turtle; Carey.

Vernacular names Gujarati – Daryani moti kachabi; Hindi – Kanga kachua; Oriya – Bada thantia kachha; Tamil – Alunk amai; Nanja aamai; Seep amai.



Fig. 6. Hawksbill sea turtle, *Eretmochelys imbricata*.

Names in islands Tau-da (Andamanese – Andaman Islands); Kap sah (Car Nicobar); kap kael (Nicobar); Ama (Lakshadweep); Kahahmb (Minicoy).

Distinctive features This sea turtle derives its popular name from its bird-like hooked jaws, with sharp but smooth or feebly denticulated ridges. It also differs from other sea turtles in having the carapace covered with strongly imbricate shields (except in the very young), which become smooth and juxtaposed in the old adults. The head is narrow and slender. The fore and hind limbs have two claws each.

Colour The young are brown above and blackish below. The carapace of adult is pale yellow, marbled and streaked with rich brown; the plastron is yellow.

Size The size is small for a sea turtle since this species attains a maximum carapace length of 90 cm and weight as much as 125 kg.

Habits Although it is omnivorous, the hawksbill turtle tends to be a strict carnivore feeding mainly on sponges, fish and mollusks, the shells of which are crunched. Using its hooked beak, the animal is adept at extracting invertebrates hidden among corals and crevices. The hawksbills, like the green turtles, nest throughout the year but the nesting activity reaches its peak during the monsoon months. The egg-laying takes place during the day and the incubation takes about two months.

Distribution This turtle is widely distributed both in the tropical and subtropical seas, but is not so common as the green turtle or the loggerhead turtle. In India, the feeding grounds of the hawksbill include both the eastern and western coasts of India and the Andaman and Nicobar Islands and Lakshadweep. It is not known to nest on the coasts of India, but does nest (regularly) on some of the Andaman and Nicobar islands. Reportedly, this species also nests sporadically on Lakshadweep.

Economic importance Although not eaten, the hawksbill is the source of the famous “tortoise shell”, which is obtained from

its dermal plates. This shell, known as 'carey' in trade, is probably the most famous product derived from turtles. It is said that the best tortoise shell (actually turtle shell) comes from the species of the Indian Ocean. Each turtle may give 6 to 8 lb of the shell which is used in the making of jewellery and *objects d'art*. A small-sized industry has developed for making ornamental articles like combs, buttons, small snuff boxes cigar-cases etc., from the turtle-shell in the coastal states of southern India in the not too distant past.

Status and conservation As the hawksbill is a solitary nester, the turtle's nesting population cannot be ascertained. But the fact remains that the hawksbill is a critically endangered species throughout its range due to the loss of habitat, fishing and trade. In India, the hawksbill is protected under Schedule I of the Indian Wildlife (protection) Act of 1972 and globally, this species is listed under Appendix I of CITES.

Miscellaneous remarks The meat of the hawksbill, which is not generally consumed, is said to become poisonous in certain seasons because of the turtle's habit of feeding on certain toxic invertebrates and algae. Several cases of sickness and even death in humans after having consumed the turtle's flesh were reported from the States of Tamil Nadu and Kerala (India), and Sri Lanka.

Olive Ridley Sea Turtle

5. *Lepidochelys olivacea* (Eschscholtz)

Other common names Pacific Ridley sea turtle; Olive – back loggerhead turtle.

Vernacular names Bengali – Gola kachchop; Jalpairanger katha; Gujarati – Daryani kachhi; Hindi – Gadha kachua; Kannada – Kardelu aame; Oriya – Samudrik kachhima; Malayalam – Kadalama; Tamil – Kadal amai, Sith amai; Telugu – Samudrapu thabelu.

Distinctive features The carapace of the adult is somewhat arched and heart-shaped. The head is large when compared to the overall size of the turtle. The upper jaw is hooked but is without a ridge. A distinctive feature is the presence of 3 or 4 pores on the marginal region of plastron. The tail is short in males, longer in females.

Colour The shell of adult is dark grey above and bluish white or cream below. Hatchlings are slight grey above and dull yellow below.

Size The smallest of the sea turtles, the carapace length rarely exceeding 80cm, and weighing upto 55kg.

Habit The Olive ridley is a pelagic species, feeding in the open ocean. It is an omnivore, feeding on crustaceans, mollusks, jellyfish, tunicates, echinoderms, fish and their eggs, and marine algae.

This sea turtle nests in large numbers on the coasts of India, between November and February on the east coast and during the summer and monsoon months on the west coast. The



Fig. 7. Olive ridley sea turtle, *Lepidochelys olivacea*. Hatchling.



Fig. 8. Olive ridley sea turtle. Adult.

incubation period varies from 50 to 70 days. The Gahirmatha beach, located within the Bhitarkanika Wildlife Sanctuary, Orissa, is the world's largest nesting ground for the Olive ridley, where the turtles nest *en masse* annually with considerable variation in the number of nesting females numbering from some tens of thousands to several lakhs. Since the discovery of the mass nesting of the turtle on Gahirmatha beach in 1970s, two more nesting grounds (rookeries) of the species were discovered in the same State (Orissa). The nesting grounds of the Olive ridley have attracted the attention of the scientific community as well as that of the conservationists.

Distribution : The Olive ridley is widely distributed in the warmer parts of the Indian and Pacific Oceans. It is the commonest sea turtle in India, nesting on the mainland as well as the island beaches.

Status and conservation : The species is endangered and the factors responsible are attributed to fishing, predation, artificial lighting (on the nesting beaches), and increasing human interference. This turtle is a protected species, under the Schedule I of the Indian Wildlife (Protection) Act of 1972 and under Appendix I of CITES.

SEA SNAKES

Family HYDROPHIIDAE

Subfamily HYDROPHIINAE

Stokes' Sea Snake

1. *Astrotia stokesii* (Gray)

Other common names Large headed sea snake.

Distinctive features Head large, with entire and regular shields arranged as follows: one pre and 2 postoculars; 2-3 anterior temporals; 8-10 supralabials, the 2nd and sometimes the 3rd, in contact with the prefrontal, the 4th-6th touching the eye; 10-12 infralabials; no distinct genials. Eye moderate or small.

Body short, stout and covered with strongly imbricate, pointed and keeled scales, in from 47-59 rows round the body; the keels of dorsal scales often broken up into tubercles and the scales on the forebody often with dentate tips. Ventrals 226-286, in two halves except a few of which being entire anteriorly; preanals strongly enlarged.

This sea snake is easily distinguished by its size, the strongly imbricate body scales and divided belly plates.

Colouration Brownish or yellowish brown to orange-red above, with a dorsal pattern of 24-36 broad, dark brown or black bands, or with dorsal bars and ventral spots; the dorsal bands are sometimes interrupted by spots or narrow bars. Head dark olive to yellowish.

Size The most massive, if not the longest, of all known sea snakes. Adults attain a maximum length of 1.83 metres. The girth of the type-specimen is about 260 mm.

Habits This species is involved in the largest concentration of sea snakes reported by Naturalists. The female is reported to produce from 12 to 14 young at a time.

Common Sea Snake

2. *Enhydrina schistosus* (Daudin)

Other common names Hook-nosed sea snake; Beaked sea snake.

Distinctive features Head moderate, slightly distinct from neck; end of snout extends over lower jaw, giving a beak-like profile which accounts for the common name(s), 'Beaked or Hook-nosed sea snake'; mental shield elongate, partly hidden between first infralabials. Body elongate.

Head shields entire, regular and arranged as follows one preocular and 1 or 2 postoculars; 7-8 supralabials, the 3rd and 4th or 4th only touching the eye; 5 infralabials in contact with the genials; nostrils on top of the head; nasals in contact with one another.

Scales keeled and overlapping, in 49-60 rows in males, and in from 51-66 rows in females; ventrals 239-322 (rarely 354), a little broader than the adjacent scales, each one with two keels; preanals feebly enlarged.



Fig. 1. Common sea snake, *Enhydrina schistosus*. Juvenile.

Colouration : Adults dirty white to pale greenish grey, young with a dorsal pattern of 45-50 jet-black crossbands that are wider in the middle and taper to a point on the sides.

Size : Most specimens do not exceed 1.4 metres in total length.

Habits : The common sea snake is generally found in shallow waters with a muddy bottom. It is also frequently noticed in the streams to about the limits of tidal flow. On days when the sea is calm, this snake is seen hiding under the surface. It enters the tidal creeks during the monsoon.

Disposition : The snake is very aggressive in disposition and bites readily if restrained. However, the fisherfolk throughout Asia pick up the common sea snake with apparent unconcern and throw it back in the sea.

Venom : The common sea snake is responsible for a considerable number of deaths attributed to the bites of sea snakes. Though sea snakes do not secrete large quantities of



Fig. 2. Common sea snake. Adult.

venom when they bite, the common sea snake is reported to yield up to 80 mg (dry weight) of venom at one bite.

Distribution This sea snake ranges from the Persian Gulf to the Gulf of Thailand and south to New Guinea and the northern coast of Australia. In India, it is recorded from the coastal areas of the Arabian Sea, Indian Ocean, and the Bay of Bengal in the waters of which the snake is so numerous that it can be expected with each haul of the fishing nets.

Although this species is common in the tidal waters of the Bay of Bengal, Smith (1943) has made no mention of its possible occurrence in the estuarine waters. Murthy (1977, 1988) has recorded this species from the estuaries of the east coast, including the Chilka Lake.

Many-toothed Sea Snake

3. *Hydrophis caeruleus* (Shaw)

Note The genus *Hydrophis*, which includes twelve species, seems to be undergoing rapid evolution, resulting in major changes in the nomenclature and classification. Pending a reassessment of the classification of the family Hydrophiidae and its wider acceptance and application, Smith's (1943) classification is adopted here but for a minor change. The two species of the small (or narrow) – headed sea snakes i.e. *Microcephalophis cantoris* and *M. cantoris gracilis* are incorporated in the genus *Hydrophis*, which is reflective of the latest revisionary work.

Unless otherwise stated, the species of the genus *Hydrophis* are characterized by the following combination of diagnostic features. Head shields entire, nostrils dorsal, located in nasal shields that are in contact with each other. Eye small, with round pupil; loreal shield absent. Body elongate, scales imbricate, subimbricate or juxtaposed; scales in form 29-57 rows at the midbody. Ventrals usually distinct throughout, not much broader than the adjacent scales.

Distinctive features Head moderately small, not distinct from neck which is slender; one pre and one, sometimes 2, postoculars; 2, sometimes 3, anterior temporals; 7-8 supralabials, the 2nd in contact with the prefrontal, the 3rd and 4th touching the eye; 4 infralabials in contact with the genials. Body compressed laterally, covered with feebly imbricate or juxtaposed scales, in 38-54 rows at midbody. Ventrals 253-334, distinct throughout; preanals 4.

Colouration This sea snake is normally bluish-grey above and yellowish below, with from 40-60 broad, black bars that encircle the snake these bands, which are about twice the width of the interspaces anteriorly, taper towards the belly where they may be incomplete and with age the pattern may become obscured, the snake being uniformly grey in colour. The head is black in the young, dark grey in the adults, with or without a light streak behind the eye.

Size 92 cm.

Distribution From the coasts of Pakistan, India, Myanmar and Malaysia to the northern coasts of Java and Borneo (Indonesia), then northward to the Bay of Tsingtau in China.

Cantor's Small-headed Sea Snake

4. *Hydrophis cantoris* (Gunther)

Distinctive features Head small, neck long and slender. Snout projecting beyond the lower jaw. One pre and 1 postocular; one large anterior temporal, followed by another scale as large or larger; 7 or 8 supralabials, third and fourth in contact with the eye; 4 infralabials. Body slender anteriorly and much compressed behind, covered with elongate imbricate, juxtaposed scales somewhat hexagonal in shape, in form 41-48 rows at the midbody, the vertebral rows with two tubercles, one behind the other, the lower rows sometimes with a bunch of three or four tubercles. Ventrals 404-468, entire anteriorly, more or less completely divided by a longitudinal fissure, and with heavy tubercles posteriorly; preanals feebly enlarged.

Colouration : The anterior half of body is dark olive or greyish above, yellowish below, with about 25 grey to black bands or lateral spots which may fade with age; posterior half of body greyish above, yellowish below, with faint dark lateral bars; there is often a dark median stripe along the ventrals. The head is coloured black in the young, greyish or yellowish-green in the adult.

Size : 1.88 metres.

Distribution : Recorded with certainty from the coastal areas of the Arabian Sea, Indian Ocean, and the Bay of Bengal. In particular, this sea snake has been recorded from the west coast from Cannanore (Kerala) north to Karachi (Pakistan), and on the east coast from Orissa north to the Sundarbans.

Annulated Sea Snake

5. *Hydrophis cyanocinctus* Daudin

Other common names : Chittul.

Distinctive features : Head moderate, slightly distinct from neck; 1 pre and 2 postoculars ; 2 anterior temporals, placed one



Fig. 3. Annulated sea snake, *Hydrophis cyanocinctus*. Juveniles.

above the other; 7-8 supralabials, the 2nd in contact with the prefrontal, the 3rd, 4th and 5th, or only two of them, in contact with the eye; 4 lower labials. Eye small in the adult. Body rather cylindrical anteriorly and compressed posteriorly; scales imbricate throughout, with a central keel or row of tubercles, in from 37-47 rows at the midbody; Ventrals 290-390, distinct throughout; preanals much enlarged; as in most members of the genus *Hydrophis*, many of the ventrals are fragmented, making an accurate count difficult.

Colouration : The young are olivaceous or yellowish in colour, with a light-coloured horseshoe-shaped mark on top of the head, and a pattern of black crossbands on the back, which is much variable as follows : in some, the bands are broader and encircle the body completely; in others, the bands are complete and broadest dorsally and ventrally, sometimes leaving a colourless area on the flanks; in some others, the bands taper to a point on the sides. In addition a black stripe is present ventrally. The characteristic pattern of black crossbands as well as the mark on the head disappear as age advances.

Size : 2.14 metres.



Fig. 4. Annulated sea snake. Adult.

Habits This species frequents the shallow, muddy mangrove swamps during the monsoon season. It is reported to crawl on land without much effort and while doing so, an adult can lift its head upto 10 cm or less above the surface. The snake readily bites if restrained.

The venom yield of this sea snake is small and less toxic than that of the hooknosed sea snake (*Enhydrius schistosus*). However, this sea snake is considered a dangerous species as the recorded deaths due to its bite indicate.

The female is said to produce from three to fifteen live young at a time.

Distribution A widely distributed species, found from the Persian Gulf to the Idzu Sea of Japan southward to Sri Lanka and the islands of Indonesia. Rare south of the equator. In India, this sea snake is recorded from the coastal areas of the Arabian Sea, Indian Ocean, and the Bay of Bengal.

Smith (1943), quoting Wall (1909), states that the annulated sea snake is rare on the east coast of India. Murthy (1977) has, however, recorded this species in good number from the coastal waters off Chennai.

Banded Sea Snake

6. *Hydrophis fasciatus* (Schneider)

Distinctive features Head very small; 1 pre – and 1 (rarely 2), postoculars; a single large anterior temporal accompanied by another scale as large or larger; 6 or 7, rarely 5, supralabials, the 2nd in contact with the prefrontal, the 3rd and 4th touching the eye; 4 infralabials.

Body long and very slender anteriorly and larger and much compressed posteriorly; scales subimbricate posteriorly and rather hexagonal in shape, each scale with a short keel or central tubercle, in 39-58 rows at midbody; ventrals 323-514, not twice as broad as the adjacent scales, and each one with two keels.

Colouration : The head, neck and anterior half of the body are black or dark olive, with pale yellowish oval spots on the sides which may be connected as dorsal bars; the posterior part of the body is greyish above and whitish below, with dark rhomboidal spots that extend down the sides of the body and form complete rings in the young. The general colour is greyish or dirty yellow above and white below.

Size : 1.1 metres

Distribution : From the coasts of Thailand to the Straits of Malacca, New Guinea and the northern coast of Australia. In India, this snake is recorded from the coastal areas of the Arabian Sea, Indian Ocean, and the Bay of Bengal. It seems to be rare on the west coast, but on the east coast it is found from Chennai north to the Sunderbans.

Common Small-headed Sea Snake

7. *Hydrophis gracilis* (Shaw)

Distinctive features : Body shape and head shields to those of *H. cantoris* except second upper labial touching prefrontal and there are five or six upper labials. Scale rows at midbody 29-43; ventrals 220-350.



Fig. 5. Common small-headed Sea Snake.

Colouration The young are black above with 35-61 paired spots, adults are grey, with ale yellowish spots on the side of neck and posterior crossbars in the rear; with age the markings fade and the adult is greyish above and paler below.

Size 1.03 metres

Distribution From the Persian Gulf to Southern China and the coasts of Australia. Reported to be common on the Coromandel and Malabar coasts of Southern India.

Persian Gulf Sea Snake

8. *Hydrophis lapemoides* (Gray)

Distinctive features Head moderate; 1 pre – and 2-3 postoculars; temporals small, 2+3 or 3+3; 8 supralabials, the 2nd usually in contact with the prefrontal, the 3rd and 4th, or 3rd to 5th in contact with the eye; 4 infralabials in contact with the genials.

Body robust (in the adult), not markedly elongate, in from 43-51 rows at the midbody, the posterior scales being hexagonal and very feebly imbricate, with a feeble tubercle or central keel (adult female), with a strong spinose tubercle (adult male); ventrals 314+372, distinct throughout, twice as broad as the adjacent dorsal scales, less so posteriorly; preanals moderately enlarged.

Colouration The young are yellowish or whitish in colour, with 33-43 dark dorsal bands which tend to fade or disappear with maturity. The head is black, with a yellow curved mark, which may or may not persist in the adult.

Size 1.30 metres

Distribution The Persian Gulf and coasts of India and Sri Lanka. In India, it is found in the waters of the Arabian Sea, Indian Ocean, and the Bay of Bengal. Rare on the east coast.

Bombay Sea Snake

9. *Hydrophis mamillaris* (Daudin)

Distinctive features : Head small; scarcely distinct from neck, which is rather slender and much elongated in adult ; one pre – and 2 postoculars; 2 (anterior) +3 (posterior) temporals; 7 or 8 supralabials, 2nd in contact with the prefrontal, 3rd and 4th in contact with the eye; 4 lower labials in contact with the genials. Eye moderate. Body slender anteriorly, much compressed posteriorly; scales in 35-43 rows at the midbody, the posterior more or less hexagonal in shape, feebly imbricate or juxtaposed, with central tubercle or short keel; ventrals 302-390, distinct throughout, not twice as the adjacent scales, and each one with two keels.



Fig. 6. Bombay Sea Snake.

Source : Sharma, 2003. Handbook on Indian Snakes

Colouration The normal colour is white in the young and light grey in the adult, with 42-57 broad black bands encircling the body; these bands are slightly expanded dorsally and somewhat narrower on the sides. The head, chin, and throat are uniform black; a yellow streak on the temporal region.

Size 82.5 cm.

Distribution A rare species, known from a few specimens. Restricted to the coasts of India, in particular, recorded from Mumbai and Gulf of Cambay on the west coast and Visakhapatnam on the east coast.

Black-banded Sea Snake

10. *Hydrophis nigrocinctus* Daudin

Other common names Daudin's sea snake.

Distinctive features Head moderate; one, rarely 2, pre – and 1 or 2 postoculars; temporals 2+3, small and not distinguishable from other scales; 7-9 supralabials, the 2nd normally not in contact with the prefrontal, the 3rd, 4th and 5th touching the eye; 4 lower labials touching the genials.

Body elongate, robust (in the adult), scales imbricate throughout and strongly keeled, in from 39-45 rows at midbody; ventrals 296-330, distinct throughout, not twice as broad as the adjacent scales; preanals considerably enlarged.

Colouration This sea snake is usually olivaceous to brownish above, with 40-60 narrow, dark bands and yellowish below; the dorsal bands, more or less uniform in width and sometimes incomplete ventrally, fade with age. The head is yellowish, with a dark line along the upper lip and dark triangular patch on the top of the head, which extends to the prefrontals.

Size 1.08 metres

Distribution Restricted to the coastal areas of the Bay of Bengal, particularly around the Sundarbans, and the Myanmarese coast.

Estaurine Sea Snake

11. *Hydrophis obscura* Daudin

Other common names : Eccentric sea snake.

Distinctive features : Head small, neck not distinct; 1 pre – and 1 (rarely 2), postoculars; a single larger anterior temporal followed by another as large ; 6-7 supralabials, the 3rd and 4th touching the eye; 4 infralabials in contact with the genials. Body elongate, slender anteriorly and much compressed posteriorly; scales imbricate throughout, smooth or each one with a central keel, in from 29-37 rows at midbody; Ventrals 300-338, distinct throughout, each one with 2 keels, and not twice as broad as the adjacent dorsal scales; preanals moderately enlarged.

Colouration : Variable; the young are more distinctly coloured than the adults as is the case with most of the sea snakes. The juveniles are bluish-black or black, with from 35 to 55 bright yellow bars, which encircle the body on the hinder part. The adult is of a uniform greyish or bluish colour above



Fig. 7. Estuarine sea snake, *Hydrophis obscura*.

and yellowish below, without traces of the markings found in the young. There is a curved yellow mark on top of the head.

Size 1.2 metres. Females are larger.

Distribution From the east coast of India to the Myanmarese coast. Besides the Chilka Lake where it is reported to be common, this sea snake is equally common at the mouth of Hooghly River.

Spotted Sea Snake

12. *Hydrophis ornatus* (Gray)

Other common names Gray's sea snake; Cochin banded sea snake; Ornate sea snake.

Distinctive features Head large; one pre – and 2-3 postoculars; 7-8 supralabials, the 2nd normally in contact with the prefrontal, the 3rd and 4th touching the eye; 2 superposed anterior temporals; 4 infralabials in contact with the genials. Eye moderate. Body robust, rather stocky, not elongate; scales imbricate, in 31-45 rows (in males), 39-55 rows (in females); the scales posteriorly more or less hexagonal in shape, subimbricate or juxtaposed, each one with a central tubercle or short keel; Ventrals 209-260 (in males,) 236-312 (in females), broadest anteriorly and narrower posteriorly; preanals feebly enlarged.

Colouration The overall colour is pale greyish or olivaceous, often almost white above, yellowish or whitish below, with 41-45 broad, dark bars or rhomboidal spots separated by narrow interspaces. The head is olivaceous above.

Size 1.25 metres.

Distribution From the Persian Gulf to the coasts of China and New Guinea. In Indian waters, this species is recorded from the coastal areas of the Arabian Sea, Indian Ocean, and the Bay of Bengal. Rare on the west coast.

Yellow Sea Snake

13. *Hydrophis spiralis* (Shaw)

Distinctive features : Head rather large and slightly distinct from neck; one preocular; 1 or 2 postoculars; 1 (anterior) +2 (posterior) temporals; 7 supralabials, with the 3rd and the 4th in contact with the eye; 9 lower labials. Eye moderate.

Body slender and compressed; scales smooth or feebly keeled posteriorly, each one with a central keel or tubercle, in form 35-39 rows at midbody; ventrals 340-350, twice as broad as the adjacent scales; 2-5 preanals.

Colouration : The ground colour is golden yellow to yellowish green, encircled by 44-48 more or less complete dark rings which are widest at the midbody and becoming narrower on flanks and ventrally; the scales in the light areas are margined with black; the belly both in the juvenile and adult is yellowish; tail banded, and with an irregular black patch near the tip. The head is uniformly yellow in the adult, blackish, with a yellow horseshoe-shaped mark in the young, which in addition may have a median black line.



Fig. 8. Yellow sea snake, *Hydrophis spiralis*.

Size The largest of all sea snakes, growing to a maximum length of about 2.75 metres.

Habit This species does not enter the mangrove creeks and swamps, which are generally favourite places for some sea snakes. The venom of the largest sea snake is reported to be similar to that of *H. cyanocinctus*.

Distribution From the Persian Gulf, around the coasts of India to Celebes and Philippines. In India, this species is recorded from the Arabian Sea, Indian Ocean, and the Bay of Bengal.

Bengal Sea Snake

14. *Hydrophis stricticollis* Gunther

Other common names Gunther's sea snake.

Distinctive features Head small, one pre – and 1-2 postoculars; anterior temporal single (rarely divided); 7-8 supralabials, the 2nd in contact with the prefrontal, the 3rd and 4th touching the eye; 4 infralabials.

Body long and slender anteriorly, compressed posteriorly; scales in 45-55 rows at the midbody, posteriorly somewhat hexagonal in shape, subimbricate and keeled; Ventrals 374-452, entire, not twice as broad as the adjacent dorsal scales, each one with 2 keels.

Colouration The sea snake is coloured greyish or olivaceous above, yellowish below, with from 45-65 dark dorsal bands which fade as age advances. The head is black to olive in colour, with yellow markings mainly on the snout and the sides of the head.

Size 1.06 metres.

Distribution From the east coast of India to the Myanmarese coast.

Jerdon's Sea Snake

15. *Kerilia jerdonii* (Gray)

Distinctive features Head short, very narrow; snout sloping downward; nostrils superior, nasal shields in contact with one another, one pre – and 1 postocular; 6 supralabials, the 3rd and 4th touching the eye, 7-8 infralabials. Eye moderate.

Body slender, of almost equal diameter throughout, covered with imbricate and strongly keeled scales, in 21 or 23 (rarely 19) rows at midbody, ventrals 225-253 (in specimens from the coasts of India), narrow, slightly broader than the adjacent scales.

Colouration Olive brown above, yellowish or white below, with a series of black spots or rhombs, broadest at the base and narrow at the sides; these spots may completely encircle the body to form complete bands in the young; additional bars and spots may be present in between the larger markings.

Size 1 metre.

Distribution Found from the coasts of India and Sri Lanka to the Straits of Malacca, east as far as south Vietnam, and south to Borneo, Indonesia.

Short Sea Snake

16. *Lapemis curtus* Daudin

Other common names Short-tailed sea snake.

Distinctive features Head large, slightly distinct from neck; nostrils on top of the head, in contact with one another; one pre – and 1 (or 2) postoculars; 2 anterior and 3 or 4 posterior temporals; 7 supralabials, the 3rd and 4th touching the eye; 3 or 4 infralabials, in contact with the genials; parietals broken up into five or six small shields. Eye moderate. Body short, strongly

compressed laterally throughout, covered with hexagonal or squarish scales which do not overlap one another; the scales adjacent to the belly scales are slightly larger than the other; scale rows 33-39 (in males), 36-43 (in females); ventrals small, distinct anteriorly, narrower or absent, or vestigial, 154-168 (in males), 160-194 (in females); preanals slightly enlarged.



Fig. 9. Short sea snake, *Lapemis curtus*.

Colouration : Variable, Light or dark or greyish above, whitish below, with from 45-55 narrow, black dorsal bars, which taper to a point on the sides or sometimes encircle the body completely. Head blackish in the young, olive or greyish in the adult, with or without a curved yellow mark.

Size : Upto 1 meter and slightly above.

Distribution : Coastal areas of the Arabian Sea, Indian Ocean, and the Bay of Bengal; common along the Malabar and Coromandal coasts of southern India, although it is rare in the latter region.

Black and Yellow Sea Snake

17. *Pelamis platurus* (Linnaeus)

Other common names : Pelagic sea snake; Yellow – bellied sea snake.

Distinctive features : Head long, narrow, distinct from rather slender neck; shield entire; nostrils superior, nasals in contact with one another; one or 2 pre – and 2 or 3 post oculars; two



Fig. 10. Black and yellow sea snake, *Pelamis platurus*.

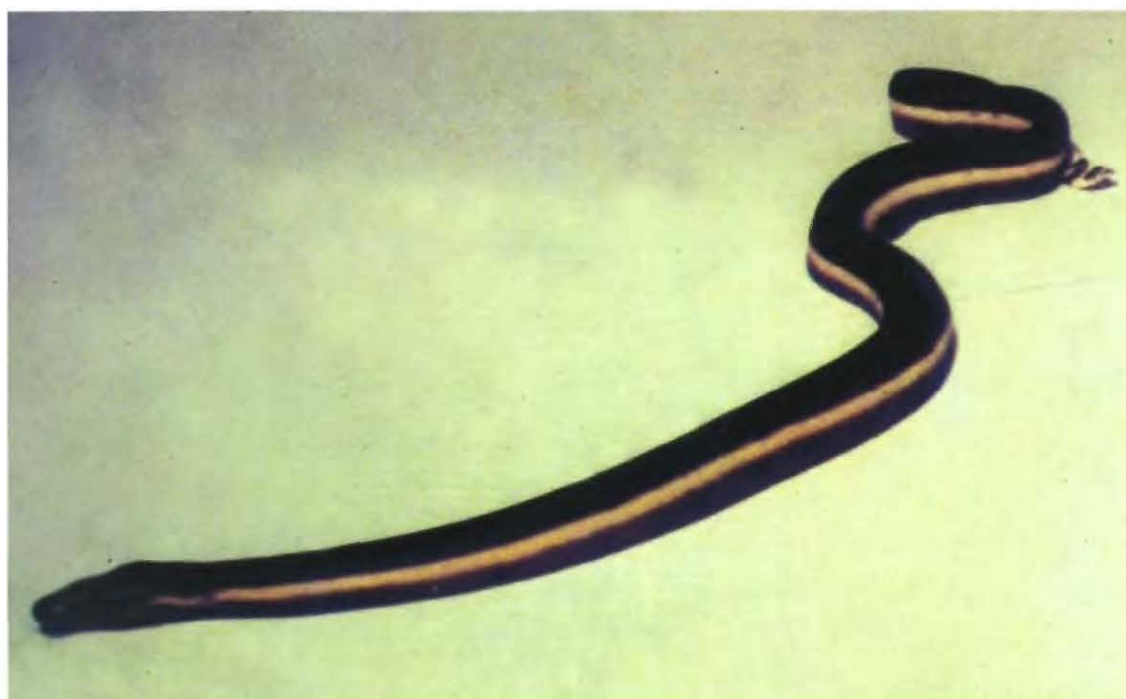


Fig. 11. Black and yellow sea snake, *Pelamis platurus*.



Fig. 12. Black and yellow sea snake, *Pelamis platurus*.

(occasionally three) anterior temporals and 2-4 posterior temporals; 6 to 8 supralabials, 4th and 5th below the eye, usually separated from it by suboculars; nine to 13 lower labials. Eye moderate.

Body short, stoutish, markedly compressed laterally, covered with hexagonal or quadrangular scales, the lowest rows in males with minute tubercles; scale rows at thickest part of the body 47-63; ventrals 264-406, mostly divided by a median longitudinal fissure or broken up and indistinct; preanals slightly enlarged.

Colouration : There is so much variation in colouration of the pelagic sea snake, from one portion of its range or another, that as many as seven colour varieties are recognised although no geographical races are described. The most common colour varieties of the snake occurring in the waters of India are : (1) black above and yellow or brown below, with a prominent yellow line that separates the two colours and; (2) black above, brown below, with an intervening stripe of yellow. The head, in both colour forms, is black above, the upper lip being yellow. The tail may be barred with black, or some other colour.

Size : Maximum length attained : 98 cm.

Habits : The pelagic sea snake is normally found far from land. It lives only in salt water and is never found in the estuaries. Although a rapid and graceful swimmer, the snake is quite helpless on land and moves under stress.

Distribution : The most widely distributed of all sea snakes, ranging from the east coast of Africa, across the Indian and Pacific oceans, to the west coast of Mexico, Central and northern South America, and from southern Siberia to Tasmania.

Viperine Sea Snake

18. *Thalassophis viperina* (Schmidt)

Distinctive features : Head- short and not very wide, shields entire; nasal shields subtriangular, as long as broad; one (rarely 2) preoculars); 1-2 postoculars; 7-9 supralabials, the 3rd to the 5th, or only two of them, in contact with the eye ; two anterior or 3-4 posterior temporals; seven or eight lower labials. Body thick, laterally compressed posteriorly, covered with scales



Fig. 13. Viperine sea snake, *Thalassophis viperina*.

juxtaposed and somewhat hexagonal in shape; scale rows at midbody 38-47; ventrals 181-291 (or 226-274), broad anteriorly, narrow posteriorly.

Colouration : Grey above and white below in colour. Some specimens have dark rhomboidal spots or 25-38 bars, while others are completely banded.

Size : Maximum length : 1 metre.

Distribution : From the Persian Gulf around the coasts of India to southern China and the northern coasts of Borneo and Java.

Subfamily LATICAUDINAE

Amphibious Sea Snakes/Sea Kraits

Banded Sea Krait; Yellow lipped sea krait

19. *Laticauda colobrina* (Schneider, 1799)

Other common names : Yellow – lipped sea krait.

Distinctive features : Body cylindrical, slightly compressed, of almost uniform width throughout except towards the head. Head shields entire; nostrils lateral; nasal shield separated by the internasals; one preocular and 2 postoculars; 7-8 supralabials, the 3rd and 4th touching the eye; temporals 1+2; five infralabials in contact with genials.



Fig. 14. Banded sea krait, *Laticauda colubrina*.

Scales smooth and overlapping, in from 21-23 (rarely 25) rows; ventrals 213-245, large, half as broad as the body; caudals 37-47 (males), 29-35 (females); anal divided.

Colouration The body colour is light or dark bluish-grey above and yellowish below, with conspicuous dark-brown or black bands of uniform width or narrowing across the belly; some or all of these bands on the belly may sometimes be interrupted. Head entirely black; snout yellow, the colour extending backwards on each side of the head crossing over the eye to the upper lip; lower jaw with a streak on either side, with an elongated yellow patch in between.

Size Adult attains a total length of 1.42 metres. Females are longer, with proportionately longer tails.

Habits Sea snakes of the subfamily Laticaudinae are amphibious and tend to acquire terrestrial habits. These snakes are usually found among rocky crevices around the coasts, where they moult, mate and nest. Unlike other sea snakes which produce live young, the laticaudids lay eggs on land. Observations made on the behaviour of the common sea krait indicate that it is gentle in disposition and reluctant to bite unless provoked.

Distribution From the Bay of Bengal and the seas south of Japan to the coast of Australia and islands of Oceania. The banded sea krait is recorded in India from the coastal waters of the Bay of Bengal (around Kolkata) and the Andaman and Nicobar Islands, where it is reported to be very common.

Black Banded Sea Krait

20. *Laticauda laticaudata* (Linnaeus)

Distinctive features This sea krait is closely allied to *L. colobrina*, from which it differs in the absence of an azygous

prefrontal shield on the head and in the reduced number of scales, in 19 rows round the body.

Colouration : Light or dark bluish-grey above, with numerous black bands round the body; belly yellowish. Head black, with a curved yellow mark above, the colour sometimes, extending forwards to cover the entire snout and downwards, crossing over the eye to the upper lip; a median, elongated yellow patch below the lower jaw.



Fig. 15. Black Banded sea krait, *Laticauda laticaudata*.

Size : Adults attain a maximum length of 1.07 metres.

Distribution : From the Bay of Bengal and the seas south of Japan to the coast of Australia and islands of Oceania. It is recorded in India from the coastal areas of the Bay of Bengal (Kolkata) as well as the Nicobar Islands. The snake is usually found in the vicinity of rocky coasts.

SUMMARY

The pictorial book represents an overview of the five sea turtle species that nest on the coasts of India, and the 20 sea snake species found in the coastal waters of India. Besides a brief synopsis of the classification, description, and distribution of all the species covered, an updated checklist, a glossary of technical terms, references and salient features of the sea turtles and sea snakes are incorporated. In keeping with the title of the book, several species are illustrated.

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GLOSSARY

SEA TURTLES

adaptation the condition of showing fitness to a particular environment.

adult fully grown or sexually mature animal.

alveolar pertaining to the margin of the jaw where the teeth are situated.

anal the posterior – most scute of the lower shell of the turtle.

anterior towards the head end.

arribada a Spanish word, which means arrival, used to describe the spectacular event (in Nature) of the arrival enmasse of sea turtles at a nesting beach.

axilla armpit.

axillary of the angle between the forelimb and the body.

bask lying with the body exposed to the sun.

bicuspid possessing two cusps or points.

bridge the part of the shell connecting the carapace and plastron.

carapace bony upper shell of a turtle.

carinate having a keel.

carnivorous flesh-eating.

caudal of or pertaining to the tail.

cervical a scute in the neck region of the upper shell (carapace).

clutch the total number of eggs laid by a female in one breeding attempt.

clutch size the total number of eggs found in a nest.

costals the scutes pertaining to the ribs of a turtle.

cusp a point.

denticulate having small tooth-like projections.

depressed body flattened from side to side.

digit a finger or toe.

diurnal said of animals active during the day.

egg tooth (or caruncle) a cutter-like hard, sharp prominence on the nose of egg-laying reptiles which assists the embryo in breaking the egg shell prior to emerging.

endemic restricted or indigenous to a particular area

emarginate opened in the form of a broad notch at the margin..

environment a combination of all the essential conditions which aid the growth and survival of an organism.

entoplastron an unpaired, median bony element of the plastron, situated between the epiplastra and hyoplastra.

epiplastron (plural epiplastra) the anterior-most bony element of the plastron.

femoral the fifth paired scute of the lower shell of a turtle.

fontanelle the space left between two or more bones of the skull, upper shell or lower shell usually found in the young of most turtles; this space may or may not close up later in life.

frontal the single scute situated between the eyes of a turtle.

gular pertaining to throat.

habitat the type of an environment in which the animal occurs.

hatchling life-history and behaviour of an animal.

herbivorous said of animals which feed upon plants.

hexagonal having six sides.

humeral pertaining to the humerus or bone of the upper arm.

imbricate overlapping, like the tiles of a roof.

inguinal pertaining to the groin.

juvenile sexually immature animal.

juxtaposed placed in apposition to, not overlapping.

mandible the lower jaw.

marine sea - living.

maxilla skeleton of the upper jaw.

migration movement of animals, sometimes on a large scale, from one place to another.

nest a structure prepared by the female for egg – laying.

nocturnal active at night.

nuchal pertaining to the neck.

omnivorous said of animals which feed upon both plant and animal matter.

paddle oar - like.

pelagic living in the deep or open sea.

plastron the lower part of the shell of a turtle.

poikilothermic said of animals in which the body temperature varies with the temperature of the environment.

posterior situated away from the head end; towards the tail end.

scute a horny epidermal shield.

serrated notched like a saw.

symphysis the union of two bones in the median plane of the body, such as the two halves of the lower jaw.

vertebral pertaining to the backbone.

SEA SNAKES

anal the single or divided scale in front of the anus.

belly plates enlarged scales on the lower parts of the body.

dorsal scales scales on the back and sides of the body.

interparietal the single shield behind the nostral.

keel the sharp edge of scales.

labial pertaining to the lips.

labials, upper scales bordering the lower lip.

labials, lower scales bordering the lower lip.

loreal the scale situated between the nasal and preocular.

mental of the chin.

mental groove longitudinal furrow on the chin of a snake.

mucronate ending in a sharp point.

oculars scales surrounding the eye.

ovoviviparous said of animals producing young by eggs which are retained and incubated within the body of the female; the eggs hatch within the uterus of the mother and the young are born alive after due process of development.

parietal the paired scales behind the eye.

prefrontal single or paired scales on the head in front of the frontal.

preoculars scales in front of the eye.

rostral scale at the end of the snout.

subcaudals scales on the underside of the tail behind the anal.

suboculars scales between the eye and the labials.

supraoculars scales above the eyes.

temporals one or more longitudinal scales between the parietals and the upper labials.

tubercle a wart-like projection.

ventral pertaining to the underside.

viviparous said of animals which produce living young.

