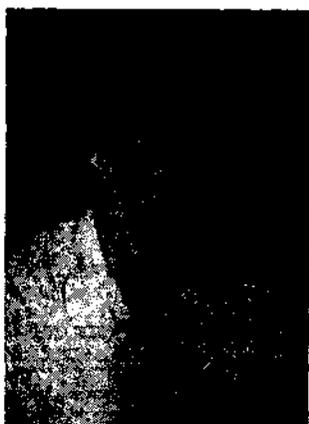


THE DISTRIBUTION AND STATUS OF SEA TURTLES IN INDIA



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INTRODUCTION

Of 7 or 8 species belonging to five genera and 2 families of sea turtles living today, five species, representing each of the five genera are known from the Indian Seas.

Family	Genus	Sp. known from India	Absent or unrecorded from India
Cheloniidae	<i>Chelonia</i>	<i>mydas</i>	<i>depressa, agassizi</i>
	<i>Eretmochelys</i>	<i>imbricata</i>	
	<i>Lepidochelys</i>	<i>olivacea</i>	<i>kempi</i>
	<i>Caretta</i>	<i>caretta</i>	
Dermochelidae	<i>Dermochelys</i>	<i>coriacea</i>	

Sea turtles commute between nesting and feeding areas which may lie adjacent to each other or be separated by distances of over a thousand miles.

Species	Feeding area in Indian waters	Nesting in India
<i>C. mydas</i>	Present	occurs
<i>E. imbricata</i>	Present	occurs
<i>L. olivacea</i>	Unknown	occurs
<i>C. caretta</i>	Present	unknown
<i>D. coriacea</i>	Unknown	occurs

GUJARAT

Leptochelys olivacea nest on both the western and eastern coasts of India, in Lakshadweep and in the Andaman and Nicobar Islands. The most important nesting beaches for the species exist in the state of Orissa, where one of the world's biggest aggregations of turtles nest yearly at Gahirmatha and neighbouring beaches. The best nesting locations on the west coast of India exist in Gujarat, where the olive ridley nests everywhere on the available sandy beaches but the most favoured beach is a 2.5 km beach on uninhabited Bhaidar Island in the Gulf of Kutch, where on a peak night 70 ridleys nested. The green turtle (*Chelonia mydas*) is found to nest commonly in Kutch District and on the western and southern shores of the Saurashtra Peninsula.

Gujarat is thinly populated and its beaches are at present less prone to human disturbance though, at places interference is maximal with industrial growth and fishing activity.

On Saurashtra's northern shore, mangrove swamps that fringe much of the coast leave little nesting habitat suitable for olive ridley and practically none for green turtle which require nesting beaches where the sand above high tide level is deeper and covers more expanse. However, seagrass beds and coral reefs in this area especially in the vicinity of Karumbhar island—provide food for a considerable population of green turtle whose numbers and nesting migration routes have yet to be ascertained. There is a strong possibility that some of the green turtle that feed in the Gulf of Kutch migrate to the nesting beaches at Sandspit and Hawkes Bay near Karachi, Pakistan.

Eretmochelys imbricata, has not yet been reported to occur along Gujarat coast although fishermen's reports suggest that it does occur in far lesser numbers than the green turtle and the olive ridley. The loggerhead (*Caretta caretta*) is not known from the area and the leatherback (*Dermochelys coriacea*) is encountered but rarely by fishermen at sea.

Reasonably fresh olive ridley nests were recognizable with certainty only if they had been destroyed by animal predators,

the visible evidence in such cases mainly a conical pit in the sand with the eggshells strewn about. An unknown, perhaps considerable proportion of ridley nests would therefore have gone unnoticed. Human-predated ridley nests could sometimes have been confused with 'crabbing' excavations on the beach sand, made by poor fisherfolk, and with shallow burrows made by jackals on the lee side of clumps of tall grasses on the beach. 'Crabbing' excavations were, however, usually shallower and lower down the beach than turtle nests.

It was possible to make a reasonably accurate count of the total number of green turtle nests made since the beginning of the nesting season. Occasional sites where liquor had been illicitly distilled could have been mistaken for old nesting pits made by green turtles, though the former excavations tended to be larger and closer to a rectangle in shape.

Green turtles were sighted close inshore throughout the survey period, August-October usually off rocky cliffs, on the coastal stretch between Mangrol and Okha and near the times of high tide. Similar sightings of green turtles were recorded in the area in June during a 1977 survey by the Madras Snake Park Trust. A maximum of about five turtles could be seen intermittently from favourable vantage points as they came up for air.

A total of 1243 Olive ridley nests and 866 green turtle nests were located on the Saurashtra Peninsula (excluding islands). On an average, nesting was denser on the peninsula's western coast roughly between Okha to Veraval, than on the southern coast (Veraval to Gogha). The nesting densities on roughly 200 km of the west coast were 3.95 nests/km for ridleys and 3.88 nests/km for green turtles, as compared to 3.31 nests/km for ridleys and 0.36 nests/km for green turtles on the 250 km southern coast of the peninsula. There were several stretches where the density of nesting was much higher than the averages given above; to consider the best example, there were 29 old nests made by olive ridley and 39 green turtle nests on a 2 km stretch immediately south of the Indian Navy's Defence Security Corps establishment at Okha when surveyed on 19th October 1981.

All the figures relating to nesting densities and numbers given above are lower than the true figures for an entire nesting season, because,

- (a) The survey covered the period August-October whereas, the nesting season for the olive ridley starts in June and ends about early November, and that for the green turtle spans at least July to January.
- (b) Many olive ridley nests would have gone unnoticed for reasons stated earlier.

The 110 km stretch between Veraval and Porbandar, when surveyed in December 1980 yielded 504 green turtle nests, for a density of 4.58 nests/km as compared to 4.20 nests/km for the same stretch when surveyed in October 1981.

Uninhabited Bhaidar island and little-disturbed Piram island are also important olive ridley nesting areas. Bhaidar has a 2 km long sandy beach of which a half kilometre stretch on its northeastern end is favoured by nesting ridleys. The numbers that nested during the period 11-15 August 1981 were :

11 August 1981—	76
12 August 1981—	26
13 August 1981—	9
14 August 1981—	(3 Ridleys came ashore but did not nest)
15 August 1981—	0

Ridleys can nest at Bhaidar only near the time of high tide owing to the large tidal range there. Nesting may tend to be more frequent at spring rather than neap tides, but the prevalence of strong winds appears to be a much stronger influence favourable to nesting. Fishermen who occasionally visit the island report that there are nights when over 100 turtles nest there. Mammal and reptilian predators do not exist on Bhaidar, though a species of wild cat, probably *Felis chaus* exists there. However, a considerable proportion of the clutches laid are inundated and destroyed by high spring tides. Accidental intra-specific nest destruction is common. Green turtles frequently enter and leave

a creek on the island during flood and ebb tides respectively, and are caught and usually released by fishermen operating nets, but do not appear to nest at Bhaidar. They require a longer time to complete the nesting process than ridleys, a propensity that could leave them stranded by the tide. The carcasses of five olive ridleys were found in a swamp that backs the nesting beach, evidently a result of fatal misorientation landwards.

The nesting beach at Piram island is hardly about 300 metres in length and only 11 nests made by olive ridleys were identified during a 4 day stay from 28-31 August, 1981 ; the island, however, assumes importance because (a) daytime nesting by olive ridleys, a rare phenomenon elsewhere in India, is common place there ; (b) the island has a human population of about 18 of whom only four eat turtle eggs, making protection of the turtles nesting there easier ; (c) it provides a natural laboratory to monitor the nesting numbers over the course of a year in order to determine more precise limits and peaks of the nesting season, and to determine re-nesting (within-season) intervals, remigration (between-season) intervals and other valuable data.

Nesting at daytime occurs only on those days when the time of high tide falls around late evening or early morning—the unusually large tidal range (maximum, over 10 metres) which exposes a large area around Piram island at low tide forces ridleys to nest around the time of high tide—an occurrence which is the rule at Bhaidar island also. Dogs and jackals being absent, two species of monitor lizards (*Varanus flavescens* and *V. bengalensis*) are the main animal predators on sea turtle eggs at Piram.

No sandy beach exists on the Saurashtra Coast to the north of Gogha, which is the eastern limit of ridley nesting on the peninsula. In Saurashtra, green turtles do not nest further east than Chanch island where a single old nest was located. The coast near the village of Cangnath 17 km west of Diu island is the easternmost area where green turtles nest in numbers, in Saurashtra.

Green turtles and olive ridleys also nest in the district of Kutch. Twenty-eight animal-predated ridley nests and 7 nests of green turtles were found on a 30 km stretch immediately to the east of Jakhau Port. Nesting is reportedly more frequent on the coast

east of this stretch, upto the town of Mandovi. Seventeen ridley nests were located on the four km stretch west of Mandovi. Most ridley nests in Kutch get obliterated by wind-blown sand in a few days, often sooner. This could partly account for the fact that only one old nest was identified on Navinar island, whereas, the Lighthouse staff stationed there estimate that six or seven ridleys may nest nightly on the kilometre-long beach in August, the peak season.

Eastwards from Navinar, the nesting density tapers off until a point where the last traceable ridley nest was located 15 km west of Tuna Port. No suitable sandy habitat in Kutch exists to the east of this point.

The eastern bank of the wide Kori creek and the mangrove-rich coast extending southeast from it upto Jakhau port have yet to be investigated as to sea turtle nesting.

Sea turtle eggs are removed in varying degrees at different localities by humans for consumption and for sale. Thus on the southern coast of Saurashtra, every nest found is searched and the eggs removed. They may be sold at the rate of 2 or 3 to the rupee, usually privately and not in fish markets. Human predation on eggs is less common on the peninsula's western coasts, one indication being the greater proportion of animal-predated nests on this coast. Though most Hindus consider turtles as sacred, individuals of at least two communities—the Waghiris and the Kolis—walk the beaches in the early morning on hunts for turtle eggs. In Kutch, the Lodhis are the main turtle-egg consumers. Turtles are rarely sought (for their meat) while nesting, and many fishermen state that they release those caught in their nets at sea. However, there is a small though apparently growing market for turtle meat at some places. Sea turtles caught accidentally in trawl nets are brought to the fish market at Mithapur where they are butchered and sold. It is reported that 10 to 15 turtles may be sold daily soon after the southeast monsoon ends in September. Turtle meat, fat and eggs are believed by some coastal inhabitants to help in the cure of lung diseases.

Dogs, jackals, monitor lizards, crabs and crows and perhaps wild pigs and hyaenas number among the creatures that prey on

sea turtle eggs or hatchlings. The nests of green turtles escape predation by animals more frequently than ridley nests do, without doubt because their nest excavation are deeper and more extensive.

The rapidly growing fleets of mechanised fishing boats in Saurashtra and Kutch, and the increasing number of outboard engines that are being fitted on to traditional fishing sail boats will require more effective conservation action in future, to restrict accidental catch and drowning of sea turtles in nets. Much nesting habitat is being destroyed for construction purposes and for the manufacture of cement. For the latter purpose, a 12 km stretch of sandy beach extending southwards from 2 km south of Dwarka upto Gorinja has been physically trolleyed away in its entirety (a railway track has been laid specifically for this). Large quantities of sand have been removed from many other beaches in Saurashtra and Kutch. At Jafarabad, a breakwater that all but encloses a beach once favoured by nesting turtles has been constructed. These developments necessitate quick action in setting aside as sanctuaries the productive nesting beaches presently known to exist.

India's second Marine National Park includes most of the favoured turtle-grass habitats in the Gulf of Kutch and the important ridley nesting island of Bhaidar.

MAHARASHTRA

Green turtles and olive ridleys occur in Maharashtra waters. Stray nesting instances have been recorded, but surveys have apparently not been conducted.

GOA

Thirty-five per cent (about 65 km) of Goa's 160 km coastline is sandy beach inherently suitable for sea turtles to nest on, the remaining coast being mostly rocky. Six major rivers including the Zuari and the Mandovi flow into the Arabian sea. Elsewhere in the world, leatherbacks often favour beaches near river-mouths.

in order to nest on. It appears very likely that Goa's beaches once hosted large nesting populations of this species prior to man's intervention.

Salm identified the olive ridley as being the commonest sea turtle on this part of India's west coast, found a ridley nest in February at Calangute and repeated the rarity of the occurrence and nesting of the leatherback turtle in the area. He also quoted Goa fishermen as stating that instances of nesting (presumably by olive ridleys) had declined in recent years.

A live but weak ridley, an adult female, was found on shore 2 km north of Mandrem on 21 July 1981 at 1 p.m. An infected, ring-shaped injury present around its right foreflipper may have been caused either by entanglement in a net at sea or by a tether tied by a prankster who may have encountered the turtle as it nested. Many goose-barnacles (*Lepas* sp.) and a 3 mm thick layer of algae were present on most of its carapace.

The freshly—stripped carapace of an olive ridley lay in the fish market at Panaji (Panjim). The meat had been sold at the rate of Rs. 30 per kg the highest price I know of for turtle meat in India. This turtle, like one at Mandrem had algae and *Lepas* growing on its shell. The possibility that some Ridleys 'reside' in the waters around neighbouring islands (e.g. St. George's island, 4 km from Vasco-da-Gama) requires investigation.

The July 14th issue of the daily 'Navprabha' refers to a 200-250 kg turtle having a shell 4 ft long and 3 ft broad which was caught by a fisherman at Ribandar (7 km upriver from the mouth of the Mandovi), and sold for Rs. 200. The description fits a very large green turtle (*Chelonia mydas*).

A fisherman named Pedro states that 30 to 40 sea turtles, most or all caught in nets at sea had been consumed by humans at Shirdon this year. Like most coastal folk in Goa, Pedro relishes turtle meat and eggs; he states that the main nesting season in Goa is September-October. Turtle meat is usually sold by the handful, Rs. 5 a portion.

Sea turtle bones were found near Harmal (Arambol) but no evidence of nesting was found on the 50 km of beaches surveyed.

sacials were heard calling at night. They probably destroy fewer turtle nests than do dogs and man.

Most of Goa's sandy beaches have become tourist attractions; the resultant disturbance, especially in the post-monsoon period which is believed to be the main nesting season, coupled with the heavy demand for turtle eggs and meat leaves scant hope for the survival of sea turtles in Goa in the absence of conservation measures.

KARNATAKA

Long stretches of sandy beaches exist in Karnataka and nesting has been reported by the CMFRI at Karwar. I have no first-hand data from this state, however.

KERALA

Four species—the olive ridley, the green turtle, the hawksbill and the leatherback—of the five found in India are known from Kerala waters. However, all except the olive ridley are now rare or uncommon. The virtual absence of leatherback (*Dermochelys coriacea*) in Kerala is directly traceable to man (see Smith, 1931) i.e., to the indiscriminate killing of nesting females and to the collection of their eggs. That the common species found today (the olive ridley) suffers exploitation was confirmed in 1979 by Dr. Lal Mohan of the Central Marine Fisheries Research Institute (CMFRI) and by L. Namassivayam of the Kerala Natural History Society (pers. comm.). Local but substantial commerce in sea turtle eggs and meat was recorded, despite wide-spread knowledge among coastal inhabitants of the legally protected status of sea turtles. At Calicut, the CMFRI began protecting a few clutches of eggs from human and canine predation by the use of wire enclosures around natural nests. The Institute also undertook a leaflet campaign advising local people against exploiting sea turtles. Recently the CMFRI has advocated the establishment of a sea turtle reserve to include the stretch Cannanore to Ponnani.

Sea turtle nesting beaches in Kerala have been (a) 'fenced off' by granite blocks and embankments as protection against sea erosion, thereby excluding sea turtles from nesting on about 200 km

of Kerala's 590 km coast (b) rendered unproductive by human disturbance of nesting habitat and predation on eggs and adult turtles, a consequence of human overpopulation (c) physically trucked off for the extraction of titanium *e.g.*, at Chavara 15 km north of Quilon by the Indian Rare Earths (IRE).

Despite this, nesting by the olive ridley occurs, mainly during the period August to November. A nest made on 24-25 May could not be confirmed as to species (Ridley or Hawksbill). Leatherbacks nest on rare occasions in Kerala. Nesting by the green turtle and the hawksbill in Kerala remains unconfirmed.

Large concentrations of sea turtles (perhaps ridleys) are reportedly seen at sea by fishermen during the monsoon months. Sea turtles are killed while nesting and netted at sea, for their meat. Their eggs are sold or locally consumed nearly everywhere they are found in Kerala (rate Rs. 15-20 per hundred). Village dogs excavate and eat the few clutches that escape the attention of humans. Sea turtle oil is used as a cure for asthma. Seven ridley carcasses found on Kerala beaches in April-May 1981 may have belonged to turtles drowned accidentally in trawl nets and to those attacked by sharks or injured against reefs or seawalls. Heavier mortality may occur during the nesting season when turtles congregate offshore to breed. The waters around Sacrifice Rock reportedly harbour a year-round population of sea turtles.

TAMIL NADU

The state is unique in India in possessing five species of sea turtles ; three species—the olive ridley, the hawksbill and the leatherback—nest here (the last very rarely).

The coral and seagrass areas in the Gulf of Mannar and Palk Bay provide rich feeding habitats for turtles.

Four to five thousand turtles were being caught annually in the late nineteen sixties in southern Tamil Nadu, three quarters being green turtles ; olive ridleys and loggerheads together formed one fifth of the total (Jones and Fernando, 1968). The projected formation of India's first Marine National Park, the hatchery

programmes operated by the CMFRI, the Forest Department and the Madras Snake Park and the nesting areas/islands located in the state will be described by CMFRI officials during this workshop.

ANDHRA PRADESH

Forty-five km in Southern Orissa, 209 km in the extreme north of Andhra Pradesh and the 16 km stretch between Kakinada and Uppada—a total of 270 km was surveyed between 18 January—26 February 1982, a year when the 'arribada' at Orissa was exceptionally late and scanty—only less than 1000 turtles nested at Gahirmatha.

Olive ridleys nested wherever suitable sandy beach existed, but no 'arribada-like' proportions were found. A total of 444 ridley nests were counted on the 270 km stretch surveyed (average nesting density 1.64 nests per km). Only four nests had not been predated upon by canines or humans—these nests were all very fresh, made on the nights before I reached their sites and in one case, while I walked a beach at 2 pm (this is apparently a rare instance of an olive ridley having nested on a sunny afternoon). The total number of nests counted is undoubtedly low because (a) the survey did not span the entire ridley season (December-March) (b) many nests and tracks could have been obliterated by the elements and by the activities of fishermen on the beach. The possibility of nesting by other species on unsurveyed areas such as the Krishna and Godavari deltas (including the Coringa wildlife sanctuary) remains. The find of a hawksbill hatchling north of Visakhapatnam in a shore seine net raises the possibility that this species also nests in Andhra Pradesh. A single instance of attempted nesting by *Dermochelys* has been reported (Dutt, 1979).

Despite protective legislation, sea turtle eggs are collected and eaten all along the Andhra coast and were sold in the Visakhapatnam fish market until a few years ago. Andhra fishermen annually establish temporary fishing camps on the southern parts of the Orissa coast, at least as far north as the mouth of the Rushikulya river; as the main fishing season largely coincides with the turtle nesting season, many turtle nests are collected by them in each winter. No evidence of an 'arribada'—the mass-nesting over

time and space characteristic of the ridleys—was present in southern Orissa upto 21 January 1982, the date this coast was surveyed.

Adult ridleys netted by Andhra fishermen were being transported by rail and lorry to markets in West Bengal from points at least as far south as Waltair a few years ago, before the transport of turtles by rail was prohibited. Large numbers of sea turtles caught along Andhra coast were supplied to a big refugee camp near Raipur (in the interior state of Madhya Pradesh) for consumption by displaced persons from Bangladesh. Turtle meat is, however, not eaten by most inhabitants of Andhra Pradesh.

Besides accidental catch or drowning in trawl nets, nesting habitat destruction *i.e.* beach-side development and beach sand removal by the IRE (Indian Rare Earths) and removal for construction purposes may be listed among the recent factors working against sea turtles in Andhra Pradesh.

THE ANDAMAN ISLANDS

Four species occur and nest in the Andamans, the green turtle, the hawksbill, the leatherback and the olive ridley. Important nesting beaches exist for each of these except the last.

A total of over 360 hawksbill nests were found on 12 uninhabited islands during a 2 month survey covering the period 16 November 1983 to 18 January 1984. Two islands—South Reef Island and North Brother Island—accounted for at least 158 nests. The breakup was :

<i>Island</i>	<i>Minimum No. of hawksbill nests</i>
Snark	27
Kwangtung	27
Latouche	12
Interview	17
North Reef	19
South Reef	80
North Cinque	18
South Cinque	20
North Brother	78
South Brother	37
West Twin	12
East Twin	13

The highest concentrations of nests occurred on islands where water monitor lizards (*Varanus salvator*) were absent e.g., South Reef and Snark islands and where human disturbance was minimal. The hawksbill's peak nesting period in the Andamans is believed to be April-January, with some nesting taking place round the year. The tabulated figures therefore do not give the total number of nests per season at any island.

Approximately 194 green turtle nests were found on 4 islands :

Snark Is.	12
Interview Is.	105
S. Reef Is.	40
S. Brother Is.	37

The green turtle nests were all old, strong evidence that as in Lakshadweep, the peak nesting period for this species is the south-west monsoon, June-September ; sporadic year-round nesting may also occur. Uninhabited South Sentinel island is known to be favoured by nesting green turtles.

In addition to the previously-known leatherback nesting beaches at West Bay and South Bay in Little Andaman, 20 Leatherback nests were found on two hitherto undocumented beaches on Little Andaman—a 4 km stretch north of the mouth of Jackson creek (16 nests) and a 1½ km stretch further north (4 nests). The 7 km beach at West Bay, one of the three most productive leatherback beaches surviving in India (the other 2 are on Great Nicobar island) had 80 visible leatherback nests when visited on each of 2 occasions, in January 1979 and February 1981. The smaller beach at South Bay has 10 nests on both occasions ; these figures, added on to 4 stray leatherback nests present on the island's north-eastern side during the 1979 survey give a composite total of 114 nests for the whole island. The eastern part of the island is inhabited. With the recent proliferation of small mechanised boats in the Andamans, most of the once-remote islands are now within easy reach of poachers and unlicensed shell-divers posing a serious threat to the continued existence of the turtles and their habitats. Feeding habitats for turtles occur in many areas in the Andamans. Two Marine Biosphere Reserves have been set up by the Administration.

THE NICOBAR ISLANDS

Four species of turtles—the green, the hawksbill, the leatherback and the olive ridley—occur and nest in the Nicobars. While feeding and nesting habitats are widespread, the turtle population is limited to some extent by the average Nicobarese keenness in hunting and fishing.

Great Nicobar Island is the most important nesting island. The two beaches at the mouth of the Dagmar and Alexandria River on the island's west coast each showed about 80 leatherback nests during a survey in April 1979. However, when they were visited in February 1981, the numbers were 55 nests near the Alexandria and 8 near the Dagmar. The fall in numbers could be explained by the second survey having been conducted earlier in the nesting season than the first—however, predation by Nicobarese on the eggs is substantial, of the 63 leatherback nests 10 had been marked with upright stakes indicating human predation. Olive ridley nests numbered 137 (this may have included a few hawksbill nests) of these, 33 were near the Alexandria and 104 near the Dagmar.

The olive ridley nests, predictably, suffer heavier human predation on account of the relative ease with which a probe stick will locate the eggs—98 of the 137 nests had been marked with upright stakes. Monitor lizards prey on the eggs. The sea between Great Nicobar and Kandul island appears to be a favoured inter-nesting habitat for olive ridleys—four were seen at sea in the span of 1½ hours.

Hawksbills nest at Pygmalion Point, the southernmost point of India.

Islands of lesser but still appreciable importance as regards nesting are Katchal, Trinkat and Teressa Islands. It is reported that uninhabited Meroe island is favoured by nesting green turtles.

LAKSHADWEEP

Four species occur and nest in Lakshadweep—the green turtle, the hawksbill, the olive ridley and the leatherback; the last is very rare.

Green turtles nest primarily during the months of the southwest monsoon, June-September, though nesting may occur at other times too. Nesting islands for this species are Suheli Valiyakara, Tinnakara, Bangaram, Suheli Cheriya-kara and Parali, all of which are uninhabited during the monsoon nesting season. On Suheli Valiyakara, the most important nesting island over 200 nesting craters by green turtles had been counted in October 1977; the total number of green turtle nests made during the southwest monsoon period (May-October) in 1982 was between 119 and 135; this involved between 22 and 27 turtles. The 1977 survey found 45, 15, 8, 10 and 13 green turtle body pits respectively on Tinnakara, Bangaram, Pitti, Parali II and Suheli Cheriya-kara island. A few hawksbills and olive ridleys also nest on the inhabited islands of Androth, Kadmat and Agathi. Minicoy appears to possess a feeding population of green turtles, though nesting by this species also occurs there. In earlier years, hawksbill scutes were being exported to Mangalore, but the degree of trade in this is presently unknown. The fat of all turtles is used to water proof the joints of the mechanised boats belonging to the islanders. Behavioural and other studies of green turtles in their feeding habitat can be profitably undertaken at Minicoy on account of the turtles relative insensitivity to human disturbance, probably a result of centuries-old abstinence from turtle hunting by the Minicoyans.