

Marine Fisheries Research and Management

Editors

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11 Sea turtles

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ABSTRACT

All five species of the turtles occurring in the Indian seas are placed in Schedule I of the Indian Wildlife (Protection) Act 1972 thereby according them complete protection from exploitation. The programme at the Central Marine Fisheries Research Institute on the conservation and management of endangered sea turtles generated a good amount of awareness on sea turtles at various levels and these efforts would go a long way in strengthening the national effort in the conservation and management of sea turtles.

Introduction

Sea turtles are fascinating creatures. They were common in the Cretaceous, 130 million years ago and their fossil record extends back at least 200 million years. They lived together with dinosaurs and have survived the giant Plesiosaurus and Ichthyosaurus. All present day genera and species originated in the period from the early Eocene to the Pleistocene between 60 and 10 million years ago. Together with the marine snakes and iguanas, they are the only surviving sea-water adapted reptiles. Their distribution is mostly tropical and subtropical and they depend on the land only during the reproduction period. In spite of their circumtropical distribution sea turtles are represented by species that differ widely in their seasonal cycles, geographical ranges and behaviour. There are also considerable differences among populations of the same species.

India has been playing a major role in the protection and conservation of endangered and vulnerable species of animals and plants. Wildlife ecology has received great attention in the terrestrial sanctuaries and parks. Great interest is now focused on the study of sea turtle resources in our Exclusive Economic Zone to develop proper conservation and management

measures. The turning point has been the promulgation of the Indian wild-life (Protection) Act 1972 wherein all species of marine turtles have been included as endangered species in Schedule I and are thereby completely protected.

Turtle fishery

Turtle fishing was practised in the Gulf of Mannar and Palk Bay in Tamil Nadu for ages mainly by non-Hindu fishermen. In the sixties it was estimated that an average about 3000 to 4000 turtles were landed every year between Pamban and Cape Comorin. In the Palk Bay the fishery was of a much lower level and about 1000 turtles were landed annually between Rameswaran and Mimisal. The main fishing centres in the Gulf of Mannar were Pamban, Kilakarai, Tuticorin, Ovari, Kuttankuli, Periathalai and Cape Comorin while along the Palk Bay the centres were Rameswaram, Tondi, Thirupalakudi and Devipattanam. The green turtle constituted about three-fourth of the total catch. Olive ridley and loggerhead formed about 20% of the catch. The catch was mainly sent to Tuticorin from different assembling centres where special pens were constructed in the sea close to shore for keeping the turtles alive.

Turtles were caught by special type of wall-nets made of fibres of *Acacia planifrons* or of cotton yarn. Two types of nets, known as *pachuvagai* and *kattuvagai*, were used, requiring 5 to 8 men each for operation. The *pachuvagai* was usually cast during night at the entrance of two parallel coral reefs and hauled after a lapse of 12 to 18 hours. *Kattuvagai* fishing was also conducted between two coral reefs but in much shallower water and six fishermen usually operate the net. The net was usually laid on fullmoon nights and fishing was generally conducted for two hours.

Status of export

Prior to the enforcement of Wildlife Act, there was a regular trade in turtles between India and Sri Lanka. Live turtles were transported in sailing boats from Pamban to Jaffna. Chelonian products have been exported under the categories as turtle meat, turtle shell, turtles, tortoise shell, living tortoise, tortoise belly and tortoise skin. Between 1963 and 1974 about 102 tonnes of sea turtle products valued \$ 1,00,800 were exported from India. The price of 1 kg of tortoise shell increased from Rs. 1 in 1967 to Rs. 20 in 1969 and Rs. 500 in 1985. Turtle flesh as calipash, the light greenish fat-like

meat found as irregular patches inside the carapace immediately below the scutes, and calipee the light yellowing meat found in patches attached to the plastron were exported.

Present status

Five species of sea turtles are known to inhabit Indian coastal waters and Bay Islands. In the order of abundance they are the olive ridley *Lepidochelys olivacea*, the green turtle *Chelonia mydas*, the hawksbill *Eretmochelys imbricata*, the loggerhead *Caretta caretta* and the leather back *Dermochelys coriacea*. At present all the five species of turtles occurring in Indian seas are protected as they are placed in Schedule I of the Indian Wildlife (Protection) Act 1972 as per the Amendments made to the Schedule in September 1977. India abides by the Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES) which prohibits the trade in turtle products. In June 1981, India became a party to the Bon Convention on the Conservation of Migratory Species of Wild Animals. In 1975, to protect sea turtles, 65,000 h.a. area of Gahirmatha, Bhitarkanika, Orissa were declared as wildlife sanctuary.

All the five species of turtles are highly migratory and visit parts of our coast and the Islands of Lakshadweep and Andaman and Nicobar for nesting during certain months. Some of the marine habitats such as coral reef areas in the Gulf of Mannar, Andaman and Nicobar Islands and Lakshadweep form the feeding grounds for turtles. None of the species are endemic and may undertake long migration to feeding and breeding grounds often across international boundaries.

The explosive trade which sprung up for the olive ridley in the late seventies and early eighties despite the Indian Wildlife (Protection) Act, created considerable concern at the national level. During the 1981-82 season it was estimated that 15 fishing units each unit comprising of a motor launch with six country boats were deployed from Digha, West Bengal. Each unit captured about 6,000 turtles during the season from November to January off Orissa coast. During the 1982-83 season significantly large numbers of dead olive ridley were washed ashore the Gahirmatha coast, Orissa. This might be the result of incidental catch of mechanised and non-mechanised boats. It was estimated that about 7000 to 7500 dead turtles were washed ashore along a stretch of 15 km at Gahirmatha, Orissa. The incidental catch was drast-

cally reduced in the 1983-84 season to about 400 turtles stranded over a stretch of 15 km along Gahirmatha coast chiefly due to voluntary restriction of fishing. A major threat which persists is the incidental catch of turtles in fishing gears like trawl net and gill net. The total number of mechanized craft has increased from 19,210 in 1980 to 47706 in 1994. Almost the entire fishing fleet exploit the inshore area exerting enormous pressure on the living resources.

Sea turtle research

It is against this background that the Central Marine Fisheries Research Institute initiated a major programme on the conservation and management of endangered marine animals and habitats to obtain as much information as possible on sea turtles, whales, dolphins and dugong and other endangered and vulnerable marine animals and marine habitats.

The Central Marine Fishing Research Institute has developed a national sea turtles research programme for:

- a. surveying and demarcating nesting grounds of marine turtles along the Indian main land coasts and the Bay Islands,
- b. monitoring incidental catch of turtles in fishing operations and finding ways and means of minimising the same.
- c. developing hatchery and hatchling release programme,
- d. carrying out tagging of turtles to understand their population structure, migratory habits, growth, longevity and mortality rates,
- e. investigating biological aspects and behaviour of turtles and
- f. strengthening the National Marine Living Resources Data Centre (NMLRDC) for the acquisition and dissemination of data on marine turtles from Exclusive Economic Zone (EEZ) of India.

In view of the endangered status and total ban on trade in sea turtle products under the Convention of International Trade in Endangered Species of Fauna and Flora (CITES), the identification of the turtle resources in our Exclusive Economic Zone is important for which the keys for field identifica-

tion have been prepared by CMFRI with the aid of simple line drawings and photographs.

Results of field surveys carried out by the CMFRI along the Orissa, West Bengal and Tamil Nadu Coasts have been published. Nesting ground of the hawksbill turtle was, for the first time, reported from the Tirunelvely coast of Tamil Nadu. In order to collect data for the National Marine Living Resources Data Centre (NMLRDC) the CMFRI prepared standard proformae to collect data at fish landing centres, at nesting grounds and at sea where turtles are taken as incidental catch in fishing operations. The proformae are designed to facilitate computer analysis and code numbers have also been given for the five species as follows.

Species	Common Name	Code
<i>Eretmochelys imbricata</i>	Hawksbill turtle	5101
<i>Chelonia mydas</i>	Green turtle	5106
<i>Caretta caretta</i>	Loggerhead turtle	5111
<i>Lepidochelys olivacea</i>	Olive Ridley	5116
<i>Dermochelys coriacea</i>	Leather back turtle	5121

A 'Recovery Programme' for the olive ridley was started along the Madras coast as a conservation measure due to heavy predation on eggs by man as well as wild animals. The need for developing a sea turtle hatchery for the transplantation of egg from the clutches of natural nests as soon as they are laid to a safer location closer to sea shore for incubation and release of hatchlings was keenly felt by CMFRI. Under the 'Recovery Programme 60410 hatchlings have been successfully released at Madras by CMFRI and the details are given below.

Sea turtles			
Year	Number of eggs collected	Number of nests observed	Number of hatchlings released
1977	14546	132	8800
1978	11423	106	5386
1979	38817	309	5007
1980	20438	165	5849
1981	13403	128	748
1982	30013	234	18090
1983	8133	72	5011
1984	13846	131	7941
1985	1163	11	740
1986	3973	37	2086
1987	1543	13	752
Total number of hatchlings released by CMFRI from 1977 to 1987			60410

The work of the CMFRI sea turtle project team has created a greater awareness in Tamil Nadu and adjacent maritime states for developing and enlarging similar conservation programme for sea turtles.

In the year 1983 to 1989 the CMFRI team visited and spent several days at Gahirmatha, Orissa for on the spot investigation. During the successive spectacular 'arribadas' at Gahirmatha the number of females coming shore for nesting were as follows:

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Year	Month	Number of nests
1983	February	2,00,000
1984	January - March	5,00,000
1985	January - March	2,87,000
1986	April	48,000
1987	January - March	6,02,000
1988	January	100
1989	February	3,25,600

Incidence of abnormalities and teratological conditions were noticed and types were categorised for the first time for olive ridley. The work by the CMFRI team drew attention to the exceptionally large number of olive ridley carcasses washed ashore along the Gahirmatha beach during 1983 and the publications of CMFRI were instrumental for the Wildlife Department, Government of the Orissa, to take prompt and speedy action in preventing the poaching and illegal fishing off Gahirmatha coast.

Biology of sea turtles

Our observation on the flexible shelled egg of the olive ridley has shown that the egg of this species is non-cleidoic. Due to the capacity for water absorption, protein and lipid utilisation and nitrogen excretion during incubation in the turtle eggs, the sea and fresh water turtles lay non-cleidoic eggs. The clutch size of the olive ridley varied from 70 to 160 (mean 120). The diameter of the egg in a single clutch varied from 35.0 to 39.6 mm (mean 38.0). The weight of the eggs in different clutches varied from 22.9 to 36.5 gm. (mean 29.0). The incubation period of transplanted clutches upto the point of emergence varied from 45 to 58 days. For the first time in sea turtles, chemical and energy conversion of yolk was studied in the olive ridley hatchlings and eggs by the CMFRI. Study from egg laying to pipping (hatchling), pipping to emergence of hatchlings has brought to light many new findings. It was possible to define three phase of embryonic development such as pe-

riod of slow growth (upto 30 th day), period of fast growth (30th to pipping 42nd day) and period of intense activity for emerging out of the nest (3 days from 42nd to 45 th). Cumulative conversion efficiency of whole egg and of yolk at pipping in terms of enegy are 71.91% and 30.42% and at the time of emergence these values get reduced to 60.97% and 26.17% respectively. These are significant new findings.

The investigations on the food intake and conversion efficiency in hatchlings, the effect of starvation, the detection of a 6-day non-feeding phase after emergence, food preference and food intake and absorption and conversion based on feeding hatchlings on clam meat, sea grass and a combination of both have given useful results. From these and other studies carried out by CMFRI, it has been concluded that the olive ridly hatchlings are obligatory carnivores and may not have the digestive climate to utilise plant food exclusively.

The CMFRI successfully reared olive ridly for four years and during that period the carapace length increased from the hatchling stage of 37 mm to 528 mm and the weight from 16.3 gm to 19.5 kg. The captive rearing is important as in the next phase it will be seen whether mating and successful nesting of captive reared olive ridly will be possible, which may enable taking up sea ranching programme. The studies have identified some of the health associated measures to prevent heavy infestation and morality. The work has also been carried out on a second species hawksbill turtle *Eretmochelys imbricata*.

The CMFRI carried out observations on turtle poisoning or chelonitoxication involving human fatalities. Details of a number of instances of turtle poisoning involving fatalities have been reported and the documents brought out by CMFRI has attracted considerable bio-medical attention from India as well as overseas. The causative factors for chelonitoxin are yet unknown and even today there appear to be no antidotes.

Conservation and management

The CMFRI organised a workshop on sea turtle conservation at Madras in February 1984 and recommendations have been outlined under five major subject areas namely:

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"Habitat Preservation of the present critical areas, already identified vulnerable areas, new areas and the national sea shore system;

Species Preservation through recovery programmes, translocation of nests and setting up of hatcheries;

Legislation and Enforcement of prevalent laws and regulations and future requirements;

Research Pertaining to biology, ecology, reproductive physiology and endocrinology, behaviour and

Education, Training and Extension especially among public and children, the supervisory personnel on the importance of turtles and the need for their conservation.

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