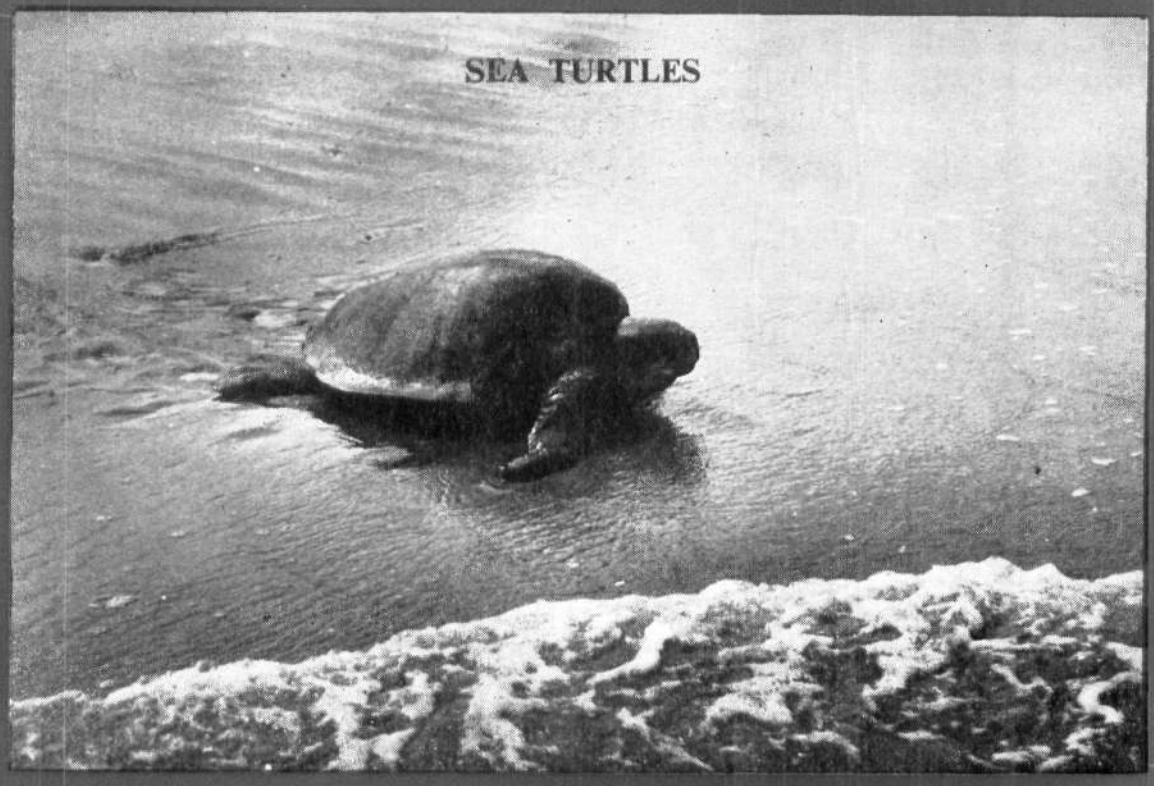
MARINE FISHERIES INFORMATION SERVICE

SPECIAL ISSUE ON
MANAGEMENT AND CONSERVATION



Technical and Extension Series

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CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

COCHIN, INDIA

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

THE MARINE FISHERIES INFORMATION SERVICE: Technical and Extension Series envisages the rapid dissemination of information on marine and brackish water fishery resources and allied data available with the Fishery Data Centre and the Research Divisions of the Institute, results of proven researches for transfer of technology to the fish farmers and industry and of other relevant information needed for Research and Development efforts in the marine fisheries sector.

Abbreviation — *Mar. Fish. Infor. Serv. T & E Ser.*, No. 50 : 1983.

CONTENTS

Cover Photo: Olive ridley back to sea after egg laying.

SEA TURTLES OF INDIA — NEED FOR A CRASH PROGRAMME ON CONSERVATION AND EFFECTIVE MANAGEMENT OF THE RESOURCE

E.G. SILAS, M. RAJAGOPALAN and A. BASTIAN FERNANDO

Introduction

Great interest is now focussed 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 Wildlife (Protection) Act (1972) wherein all species of marine turtles have been placed as endangered species in Schedule I and are thereby completely protected. Nevertheless, there has been a subsistence fishery for the Green turtle and the Olive Ridley, the former in the Gulf of Mannar and the latter as a much larger directed fishery along the Orissa and West Bengal Coast primarily to cater to the Caluctta market. The 1980–'83 period has seen a phasing out of these directed activities. However, poaching in limited scale cannot be ruled out in some areas along our coast where people have been "addicted" to eating turtle meat or taking turtle blood as an efficacious remedy for certain ailments.

A major threat today is the incidental catch of turtles in gill net and trawl fishing operations. The last two years have seen large numbers of live turtles thus caught either being mutilated and removed from the nets and thrown out in the open sea to be washed ashore dead or where gill nets are used over long hours the animals 'drown' and the carcass thrown out is again washed ashore. We have to find feasible ways and means of regulating fishing activity during periods when turtles congregate close to inshore. Implementation of such management measures, though it may take time, should be pursued vigourously combined with an intensive extension programme on conservation. It is our responsibility to make the artisanal fishermen who may be involved in small-scale operations aware of the need for the protection and propagation of these animals.

On and off we have reports, particularly along south Tamil Nadu and Kerala Coast about turtle poisoning mainly caused by eating the meat of the hawksbill *Eretmochelys imbricata* during certain seasons.

All these point to the need for developing a good monitoring system for understanding the resource, advancing our knowledge on the biology, life history and behaviour of turtles and utilising the information for developing proper management strategies. It is with this view that at the recent National Workshop on the Acquisition and Dissemination of Data on Marine Living resources of Indian Seas (*Mar. Fish. Infor. Serv. T & E Ser.* No. 46, January 1983), an important recommendation was made on the need for collecting data on endangered and rare marine species such as turtles and Cetaceans reading as follows:

"The Workshop,

noting that the populations of certain valuable species in the sea are showing decreasing trend due to exploitation, mortalities and other reasons and some of the endangered species such as the dugong, lesser cetaceans including dolphins and the turtles occur as incidental catch in fishing operations,

stressing that it is essential to conserve those species showing declining population structure through appropriate management and conservation measures,

recommends that all data/information pertaining to resources, exploitation and mortalities due to strandings and incidental catches in fishing operations of endangered marine mammals and turtles be collected and made available to the NMLRDC for analysis and action.

Action to be taken by: World Wildlife–India; Department of Fisheries, Governments of maritime States and Union Territories; Bombay Natural History Society; Public and private sector organisations/companies engaged in fishing directly/through charter; National Institute of Oceanography; Naval Physical Oceanographic Laboratory; CMFRI."

The proformae developed at the Workshop for the various types of fishing activities have also to report sightings and other details on sea turtles.

Sea Turtles of India

We have five species of sea turtles as follows:

Scientific name	Common name	Vernacular (Tamil) name
Dermochelys coriacea	Leatherback turtle	Elu varai amai; Thoni amai
Eretmochelys imbricata	Hawksbill turtle	Alungamai
Chelonia mydas	Green turtle	Peramai
Lepidochelys olivacea	Olive ridley turtle	Sithamai
Caretta caretta	Loggerhead turtle	Perunthalai amai

Data Acquisition

We have given here with the aid of simple line drawings and photographs, field identification characters for these species so that species-wise information on sightings, incidental catch in fishing operations, observations from the nesting grounds during the breeding seasons and so on could be collected in the proformae which have been designed (Annexe I, II, and III) and sent to the National Marine Living Resources Data Centre (NMLRDC), Central Marine Fisheries Research Institute, Cochin-682 018 for further analysis and advice.

The Central Marine Fisheries Research Institute has 12 Research Centres and about 30 Field Centres along the coast from where data on exploited marine fishery resources from the artisanal and industrial sectors are being obtained and evaluated. The Institute is advantageously placed that a fund of field data is being collected by the staff for developing proper monitoring of marine living resources. Besides this, we would like other organisations and individuals to cooperate in obtaining as much information on sea turtles for which the NMLRDC would be the repository of data which could be utilised for various purposes. With this in view, the Central Marine Fisheries Research Institute has prepared code number for the five different species of sea turtles for facilitating computer analysis (CMFRI Spl. Publn. No.12). The code numbers are as follows:

Species	Common name	Code
Eretmochelys imbricata	Hawksbill turtle	5101
Chelonia mydas	Green turtle	5106
Caretta caretta	Loggerhead turtle	5111
Lepidochelys olivacea	Olive ridley	5116
Dermochelys coriacea	Leatherback turtle	5121

We would solicit our readers and those who have an opportunity to come across sea turtles to help in developing this national facility and to write to us. It is proposed to bring out with immediate effect in the issues of *Marine Fisheries Information Service, Technical and Extension Series*, a monthly awareness publication from CMFRI, a section on 'Turtle News' indicating field observation made by staff of CMFRI and others with acknowledgements.

The illustrations to help in identification have been taken from published illustrations, such as FAO species identification sheet for Fishery Purposes, Western Central Atlantic (Fishing Area 31), Volume VI, edited by Fischer (1978) and "Sea Turtle Manual of Research and Conservation Techniques prepared for the Western Atlantic Turtle Symposium by Peter C. Pritchard *et al.* (1983) and supplemented by original photographs.

A Key for identification of sea turtles from India

1. a. Skin smooth and without any scutes on head; 7 longitudinal narrow ridges on carapace and 5 on plastron; horny beak with well defined cusp on each side of upper jaw (beak 'W' shaped when viewed from front) and central cusp on lower jaw; flippers without claws ..... *Dermochelys coriacea*

   b. Shell, head and flippers covered with scutes; no longitudinal ridges on carapace or plastron; horny beak not 'W' shaped when viewed from front; flippers with one or two claws 2

2. a. Carapace with 4 pairs of lateral scutes 3

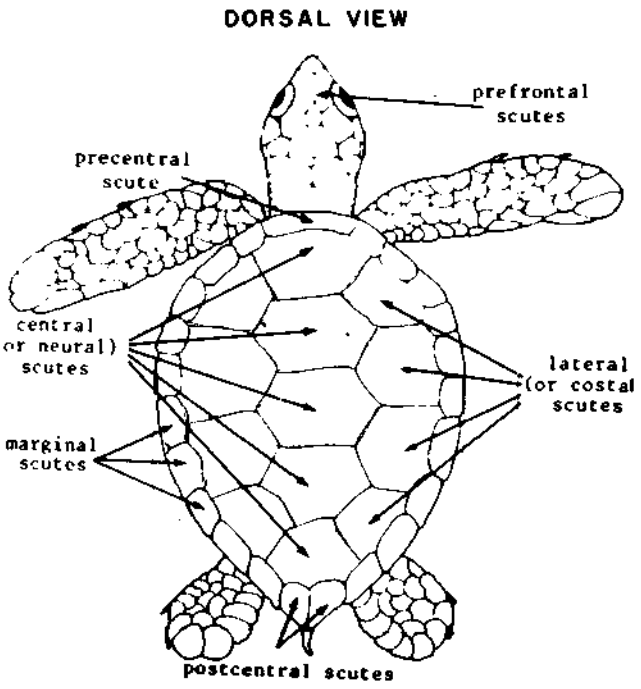
   b. Carapace with 5 or more pairs of lateral scutes 4

3. a. Horny scutes imbricated (overlapping); two pairs of prefrontal scutes; 2 claws on each flipper; carapace is brown with darker markings; skin of neck region pale orange in colour ..... *Eretmochelys imbricata*

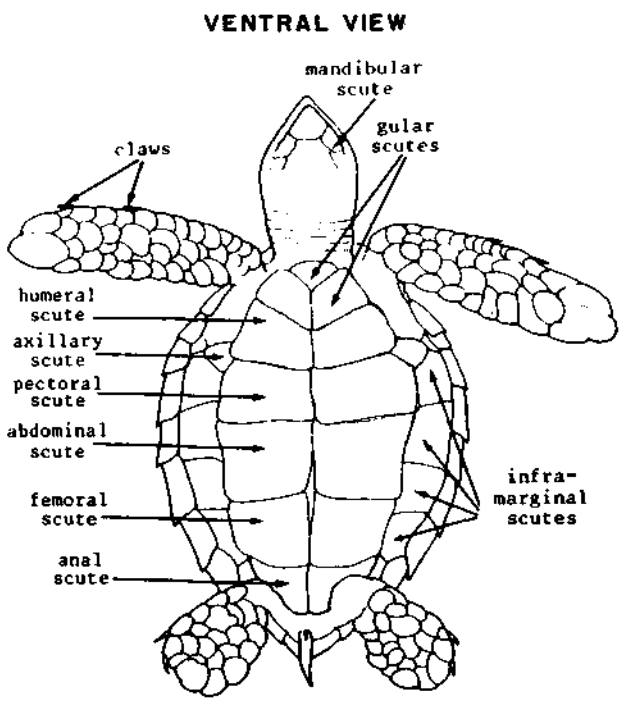
   b. Horny scutes not imbricated but juxtaposed; one pair of prefrontal scutes; single claw on each flipper; carapace green with violet markings; skin of neck region yellow to cream in colour .... *Chelonia mydas*

4. a. Plastron with 3 pairs of enlarged inframarginal scutes without pores; lateral scutes 5; carapace brownish red with light spots and plastron yellow with orange spots .... *Caretta caretta*

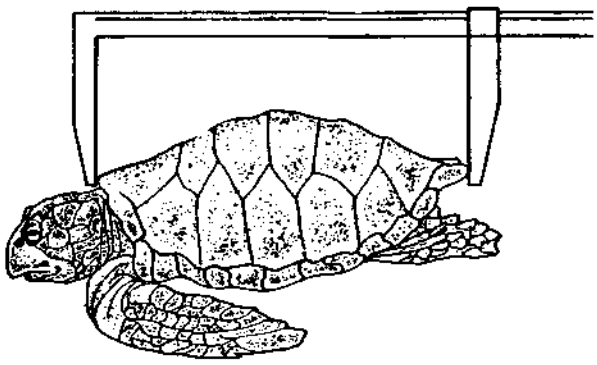
   b. Plastron with 4 pairs of inframarginal scutes each with pores on hind margin; lateral scutes 6 or more, generally 7; carapace grey and plastron yellow .... *Lepidochelys olivacea*



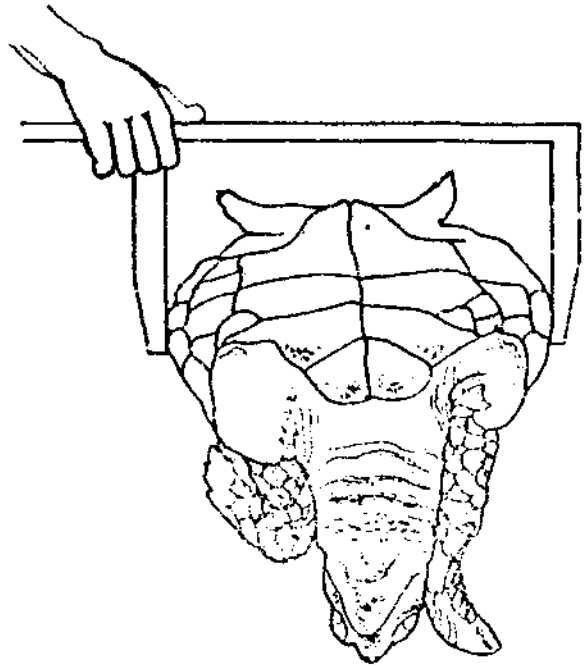
Dorsal view



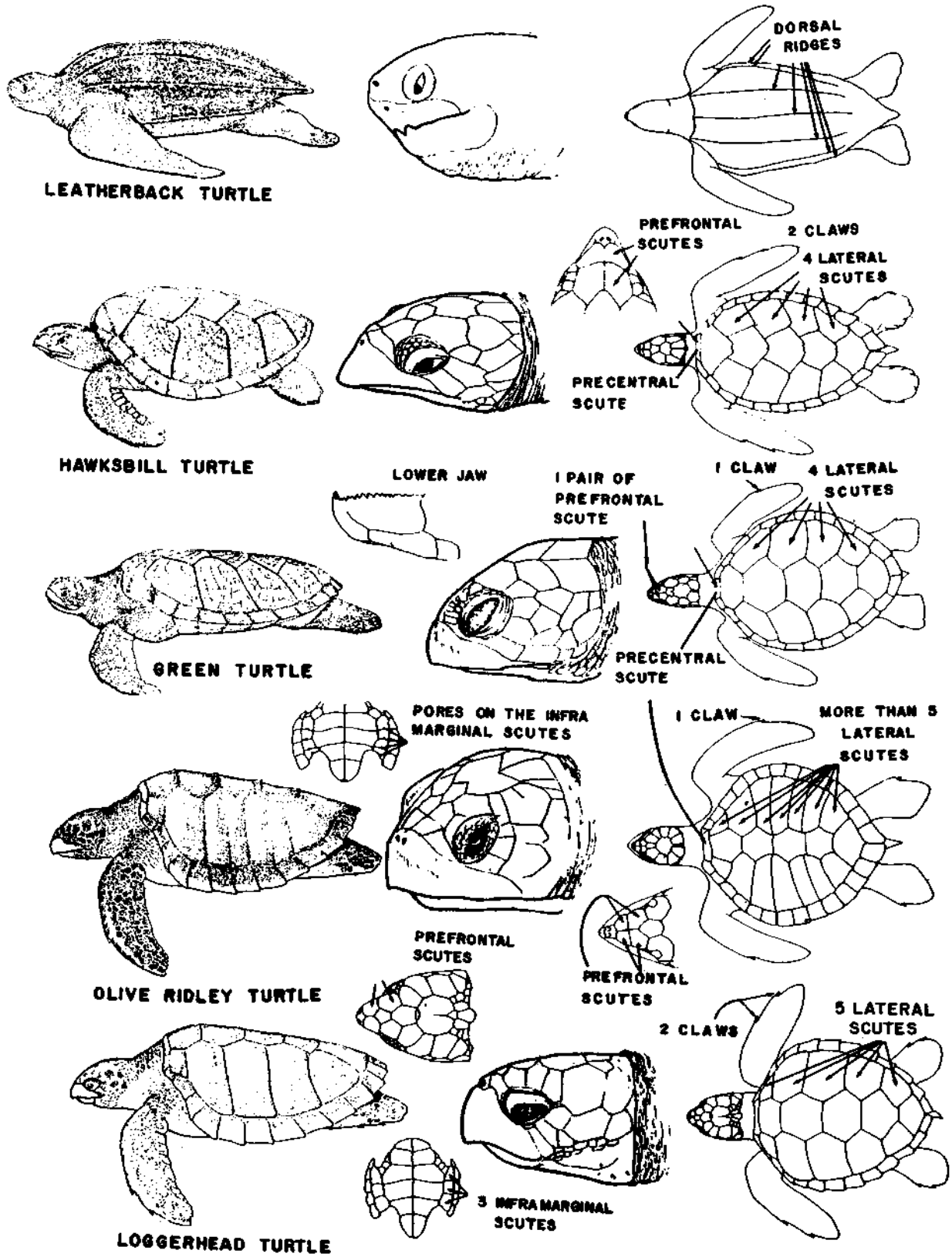
Ventral View



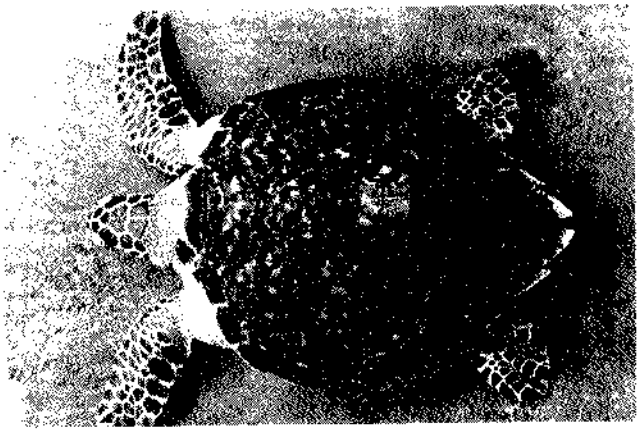
Measuring the length of Carapace



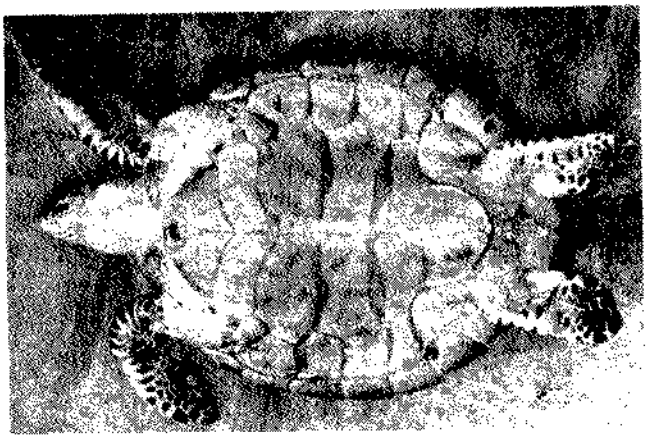
Measuring the width of carapace



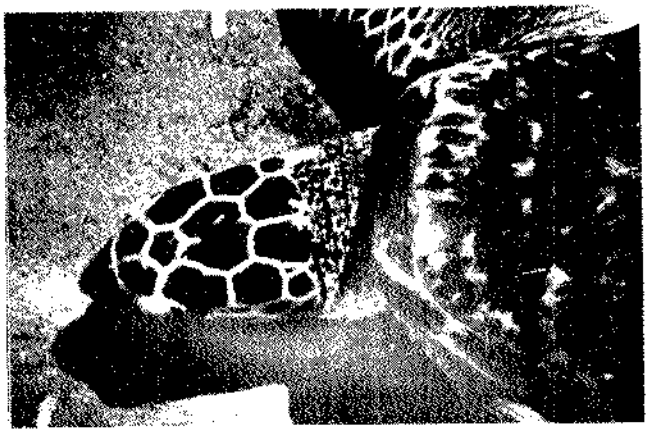
Identifying features of different species.



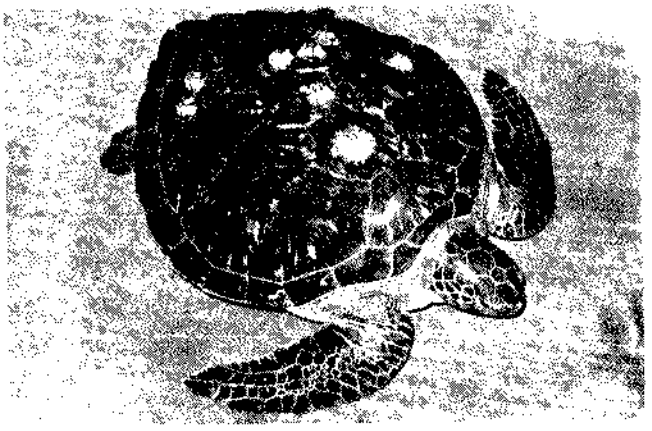
Dorsal view of *Eretmochelys imbricata*



Ventral view of *E. imbricata*

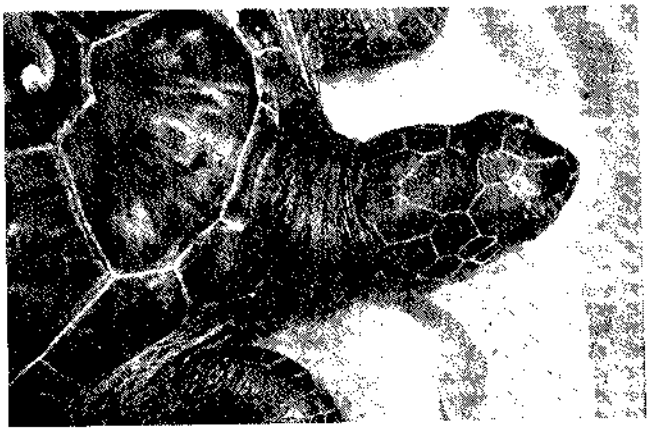


Head of *E. imbricata*



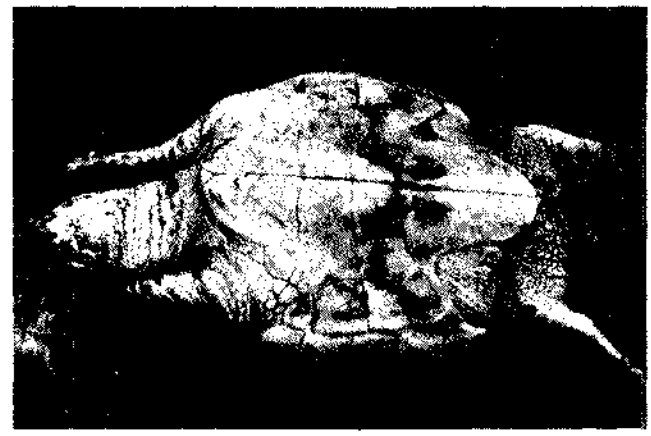
Dorsal view of *Chelonia mydas*

Ventral view of *C. mydas*

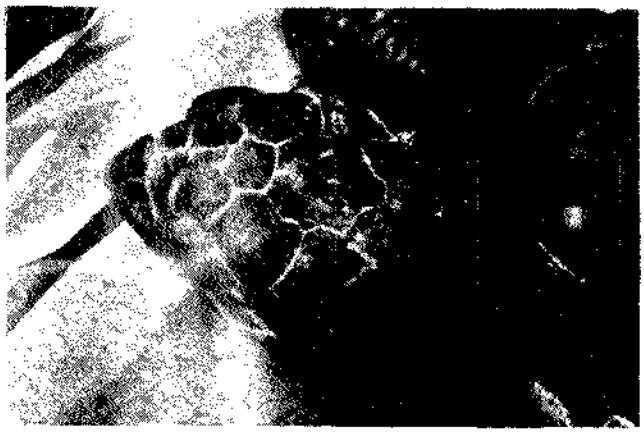


Head of *C. mydas*

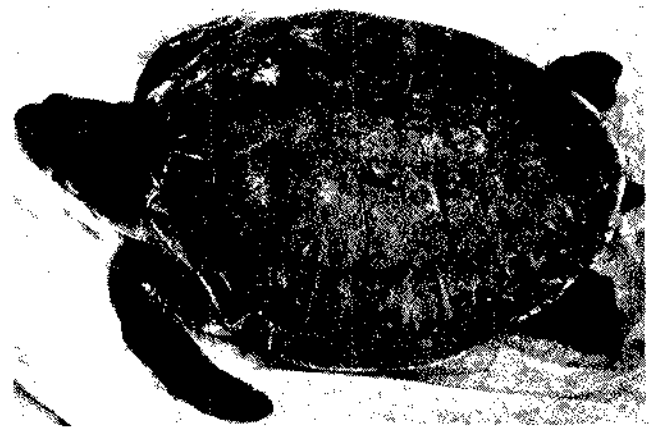
Dorsal view of *Caretta caretta*.



Ventral view of *C. caretta*



Head of *C. caretta*



Dorsal view of *Lepidochelys olivacea*

Ventral view of *L. olivacea*

Head of *L. olivacea*

Need for a national coordinated programme for studies on sea turtles

A number of governmental and non-governmental organisations are in some way or other involved with sea turtle programmes. We would like to list some of these below:

Central Marine Fisheries Research Institute and its subordinate establishments; Zoological Survey of India; Bombay Natural History Society, Bombay; World Wild Life-India; Snake Park, Guindy, Madras; Forest/Fisheries Departments of Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa and West Bengal and Union Territories of Goa, Pondicherry, Lakshadweep and Andaman and Nicobar Islands.

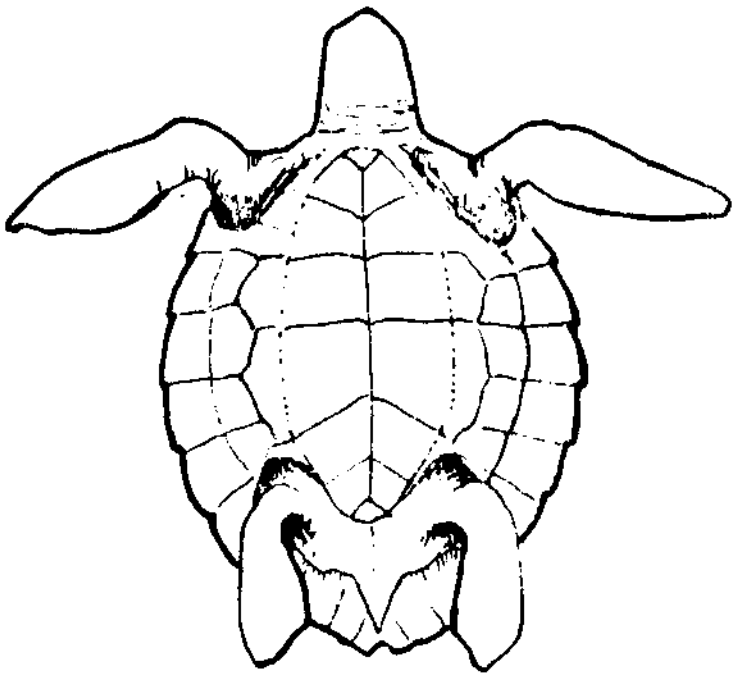
The list may not be exhaustive and we feel that in next few years the sea turtle programme may catch the attention of more organisations and individuals. At the level of Government of India, the Department of Agriculture and Cooperation (Wild Life Protection Section); the Department of Agricultural Research and Education (I.C.A.R); the Department of Environment; the Department of Ocean Development and the Department of Science and Technology have important roles to play.

While our interest in sea turtles is increasing, this should also be linked with a national coordination of the effort being expended. At the same time, a greater awareness on the problem has to be built up in as diverse groups as the artisanal fishermen, industrial fishing sector, officials of Fisheries and Forest Departments for implementing regulation and the public at large. Extension and training are essential components to be integrated in this programme. The identification sheets and the Proformae given in the Annexure will also be printed in regional languages and distributed for strengthening acquisition of data. Recently a trawl net with escape mechanism for allowing turtles to escape from nets (turtle excluder net) has been developed in the U.S.A. The adoption of such nets during the nesting season and trials with such nets to study the economics of the operations for shrimp and other fish forming bycatch need serious considerations. All this call for the active involvement of many agencies and it is felt that such coordinated effort will fructify in developing sound conservation and management measures for sea turtles. It is hoped that this publication will help in the collection of information for baseline studies as well as tackling specific problems.

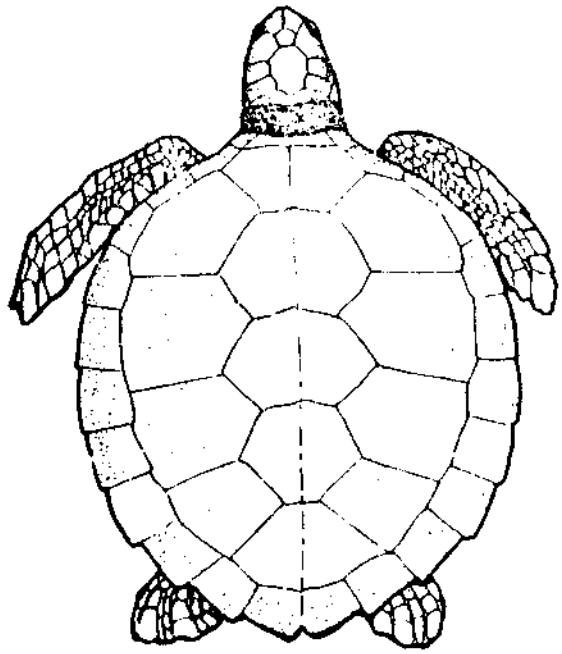
Areas needing priority attention

There is a need for developing a crash programme on sea turtles on scientific lines. This would call for an identification areas for studies and we have tried to identify these here. It is likely that concurrent works may have to be undertaken in some of the aspects detailed below.

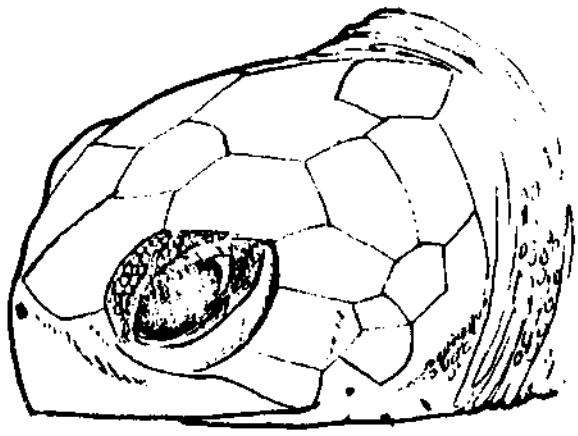
1. Survey of the coast line and Bay Islands for identifying nesting beaches and areas to be protected during the nesting seasons. This will also include demarcation of areas to be developed eventually as reserves where human interference will be minimal and thus affording complete protection to turtles during nesting seasons.
2. Developing a national programme where heavy predation by man and animals on nesting turtles and eggs exists. Hatchery programme for incubating and releasing hatchlings into the sea to improve survival at that stage to enhance possible recruitment.
3. More effective implementation of Indian Wild Life (protection) Act by the State Governments through a programme of training the staff of the concerned Departments in conservation and management of sea turtles and for the implementation of the Wild Life (Protection) Act and regulations.
4. Benign research involving the study of life history, biology and ecology of sea turtles to be carried out with proper dispensation from the concerned authorities.
5. There is a large lacunae in understanding the behaviour of all species of turtles from hatchlings to adults, their migratory habits and movements to and from feeding grounds. This is an area which need important attention.
6. Non-consumptive utilisation of turtle resources so that the relationship between man and turtles could change from killing them for its products to utilize them for educational values, captive and display aspects, recreational/tourist potential, ecosystem concept and so on. There is a great need for creating awareness through proper extension and education programmes on sea turtles among the public.
7. Monitoring of turtles incidental catch in fishing operations and finding ways and means of reducing mortality.
8. An impact study on phasing out subsistence/directed fishery of turtles on the artisanal sector traditionally involved in such activities.
9. Monitoring of the resource to find out whether any of the species could be shifted from Schedule I to Schedule II of the Wild Life (Protection) Act, if sufficient scientific data is forthcoming to indicate the enhancement of resources through proper management measure. This will also have an implication on the CITES convention



Ventral view of *Chelonia depressa* (Flatback turtle)



Dorsal view of *Chelonia depressa* (Flatback turtle)



Head view of *Chelonia depressa* (Flatback turtle)

Species to be on the look out for

Chelonia depressa Garman (Flatback turtle) has been reported from Northern Australia and adjacent waters and its distribution limits are not well defined. The occurrence of this species in the Andaman and Nicobar Islands and along the mainland coast of India cannot be ruled out. Inview of this, the salient features of *C. depressa* along with line drawings to facilitate field identification are given here.

The salient features of *C. depressa* given by Pritchard *et al.* (1983) in the Sea turtle Manual of Research and Conservation techniques, Western Atlantic Turtle symposium are as follows:

"Four pairs of lateral scutes, head upto about 13 cm wide; carapace upto 100 cm long. One pair of prefrontal scutes. Carapace scutes do not overlap, very thin with indistinct margins, especially in adults; dorsal colour yellow grey to grey-green, without spots or radiating markings; underside light yellow; weight upto about 90 kg."

The main difference is that the carapace in *C. depressa* is flatter, more rounded and not tapering behind as in *C. mydas*. The major visual difference between *C. mydas* varies from light tan to almost black above, often with radiant or spotted markings and with underside yellow; while in *C. depressa* the carapace is yellow grey to grey-green without spots or radiating markings, with underside light yellow. *C. depressa* seems to be a smaller species weighing about 90 kg while *C. mydas* weighs upto about 230 kg.

From literature it is seen that the clutch size and size of eggs of *C. depressa* and *C. mydas* differ as follows:

C. depressa	*C. mydas*
1. Average cluctch size about 50 eggs (maximum 73 eggs)	Average clutch size about 85 eggs (maximum 200 eggs)
2. Diameter of egg 5 cm	Diameter of egg 4 to 5.5 cm

C. mydas makes the tracks which are deeply cut with symmetrical diagonal marks made by the front flippers while *C. depressa* makes relatively lightly cut, with symmetrical diagonal marks made by the front flippers.

Confirmatory evidences of the occurrence of *C. depressa* in the Indian seas, including the Andaman-Nicobar Islands, is wanting.

Conclusion

While very dedicated and valuable work has been carried out under extremely difficult and inhospitable conditions along Orissa and West Bengal Coasts by Chandrashekar Kar and other areas by Satish Bhaskar and others the time has come when our efforts should be expended to obtain maximum information in the shortest time possible. The identification sheets and the proformae given in the Annexure which are also to be printed in regional languages for distribution in coastal areas would strengthen the acquisition of data and help to create greater awareness. When turtle tagging programme are undertaken in future wider publicity will be given in coastal areas for recovery of tags/noting of tag numbers and other details during nesting seasons. Adoption of modified fishing gear as the 'turtle excluder net' during the nesting season should be done after suitable trials. It is hoped that this publication will help to accelerate Research and Development programmes on sea turtles and assist in the collection of information for different studies to help and evolve conservation and management strategies for our sea turtles.

NATIONAL MARINE LIVING RESOURCES DATA CENTRE (NMLRDC)

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE, COCHIN-682 018

PROFORMA I

DATA ON SEA TURTLES AT FISH LANDING CENTRES

Species : ..... NMLRDC's Code No. .....

Location : ..... Sex : .....

Date : ..... Dead or Live : .....

Evidence of any previous tag : Yes/No.
If Yes, give details of Tag number, etc : .....

New tag number if tagged
and released : .....

Carapace length (Straight Line) : ..... cm Total weight : ..... Kg

Carapace width (Straight line) : ..... cm

Evidence of any injury : Yes/No. If Yes, give details .....

If incidental catch in fishing gear, type of
fishing craft and gear used : .....

Any turtle trade in that area : Yes/No. If Yes, give details .....

Any turtle egg trade in that area: Yes/No.
If Yes give details : .....

Any incident of turtle poisoning : Yes/No. If Yes, give details .....

Remarks: .....

Investigator : .....

NATIONAL MARINE LIVING RESOURCES DATA CENTRE (NMLRDC)

CENTRAL MARINE FISHRIES RESEARCH INSTITUTE, COCHIN-682 018

PROFORMA II

DATA ON NESTING SEA TURTLES

Species : ..... NMLRDC's Code No. .....

Location : ..... Sex: .....

Date : ..... Time : From ..... To .....

Weather condition : .....

Surf Temperature : ..... Sand temperature : .....

Evidence of any previous tag : Yes/No. If Yes, give details of Tag Number, etc: .....

New tag number, if tagged and released : .....

Carapace length (Straight line) : ..... cm Total weight : ..... Kg

Carapace width (Straight line) : ..... cm

Evidence of any injury : Yes/No. If Yes, give details: .....

If incidental catch in fishing gear, type of fishing craft and gear used : .....

Surf condition : ..... Distance of nest high water line:..... (m)

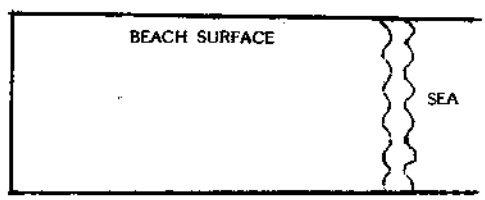
Number of eggs : .....

Any predation of eggs on nesting beaches : Yes/No. If Yes, give details: .....

Remarks : .....

Investigator : .....

NATURE OF CRAWL (Draw a sketch of crawling pattern in the box)



NATIONAL MARINE LIVING RESOURCES DATA CENTRE (NMLRDC)

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PROFORMA III

DATA ON SEA TURTLES TAKEN AS INCIDENTAL CATCH IN FISHING AND TAGGING OPERATIONS

Species : ..... NMLRDC's Code No. : .....

Location : ..... Sex: : .....

Date : ..... Depth : .....

Time of capture : ..... Time of release: .....

Gear operated : ..... Depth at which operated : .....

Evidence of any previous tag : Yes/No.
If Yes, give details of Tag number, etc. .....

New tag number, if tagged and released : .....

Carapace length (Straight line) : ....,, cm Total weight : ..... Kg

Carapace width(Straight line)..... cm

Evidence of any injury : Yes/No. If Yes, give details: .....

Evidence of any ectoparasite : Yes/No. If Yes, give details :.....

Any sighting of mating of
turtles in that area Yes/No. If Yes, give details : .....

Remarks : .....

.....

Investigator : .....

MARINE TURTLE CONSERVATION AND MANAGEMENT: A SURVEY OF THE SITUATION IN ORISSA 1981/82 AND 1982/83

E.G. SILAS, M. RAJAGOPALAN, A. BASTIAN FERNANDO and S.S. DAN

Introduction

One of the most spectacular sea turtle activity is the mass emergence (arribadas) of the Olive Ridley *Lepidochelys olivacea* along the north Orissa Coast, more specifically along the Gahirmatha Beach. The unique phenomenon which may or may not occur annually, have been reported by Kar (1980) and Biswas (1982). This is the largest rookery of olive ridley and for that matter, of any species of marine turtle in the world. The mass capture and transport of live olive ridley from the nesting beaches of Orissa and West Bengal to Calcutta and other markets have been reported by Bobb (1982). Such exploitation, despite the endangered status of the species and the protection accorded under the Wildlife (Protection) Act 1972, has attracted considerable public attention and concern for marine turtles at all quarters. Incidental catch in fishing gear also accounts for the death of several hundred turtles during their nesting season. Varied efforts both by the Forest Departments of Government of West Bengal and Orissa and other agencies and individuals, are under way to study these problems.

Programme at the Central Marine Fisheries Research Institute

The CMFRI has also developed a national programme for :

1. surveying and demarcating nesting grounds of marine turtles along the Indian Coast and the Bay Islands;
2. monitoring incidental catch of turtles in fishing operations and finding ways and means of minimising the same;
3. developing hatchery and hatchling release programme;
4. carrying out tagging of turtles to understand their population structure, migratory habits, growth, longevity and mortality rates;
5. investigating biological aspects and behaviour of turtles; and
6. strengthening the National Marine Living Resources Data Centre (NMLRDC) for the acquisition and dissemination of data on marine turtles from our Exclusive Economic Zone (EEZ).

Nesting ground survey

Valliappan and Whitaker (1974) and Whitaker (1977) gave an account of Olive ridley of the Coromandel Coast and Biswas (1981) gave an account of olive ridley of Bay of Bengal, identifying some of the nesting beaches. Bhaskar (1981) in a preliminary report, has indicated the important nesting beaches of sea turtles along the Indian Coast and the Bay Islands. He (Bhaskar, 1983) also reported the nesting beaches of the leatherback turtle in the Andaman Islands. It is proposed to map all this information so as to make it available for further consideration towards taking conservation and management measures for protecting the nesting beaches especially during the nesting seasons (Fig. 1).

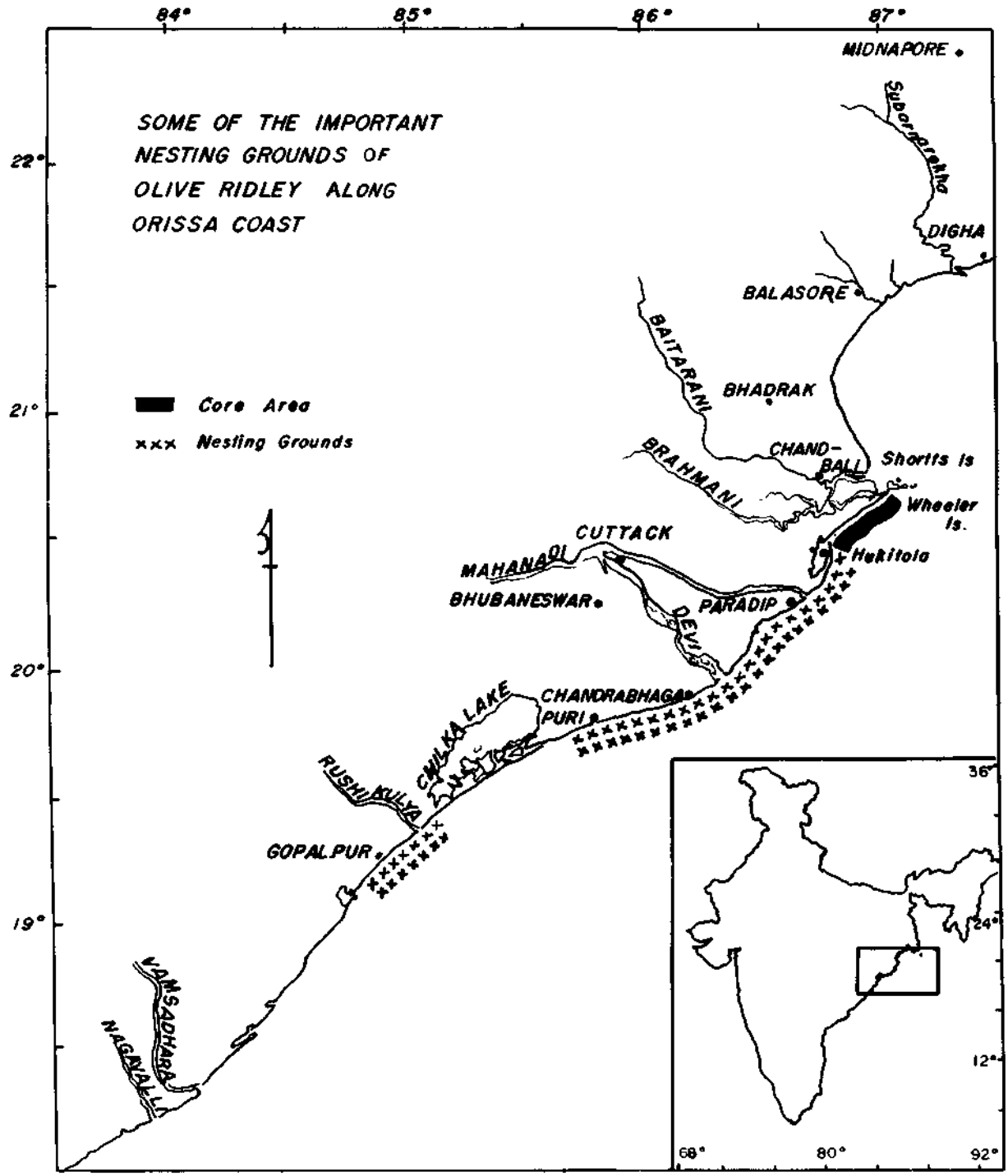
Gahirmatha sea turtle rookery 1981/82 and 1982/83 season

For earlier accounts of the nesting habits and intensity of breeding activity of the olive ridley reference is invited to Bustard (1976), Biswas *et al.* (1977), Davis *et al.* (1978), Kar (1980, 1982), Biswas (1981) and Kar and Bhaskar (1982).

In view of the importance of the nesting grounds of olive ridley along the Orissa Coast, teams from CMFRI have been sent to the area in 1981–82 and 1982–83 seasons to study the situation and evaluate the options open for evolving in the future management strategies. It is proposed to outline here the factual information gathered from different locations along the Orissa Coast.

1981/1982 season

During the 1981-1982 season, turtle landing centres, such as Pentakotah, Astrang, Chandrabagh, Nuagoda and Paradeep were visited by the team. In order to collect information on the landings and transport of turtles, officials of the Departments of Fisheries, Forest and Railways were contacted. Official attempts have been under way by the State Forest Department to effectively enforce the Wildlife (Protection) Act from October 1977 for marine turtle protection. Prior to the Wildlife (Protection) Act coming into force, Pentakotah was the main fishing centre for sea turtles and from there during the season, around 2000 turtles used to be sent to Calcutta market where the meat was sold at the rate of Rs. 6 per kg. In the 1981 season, there was



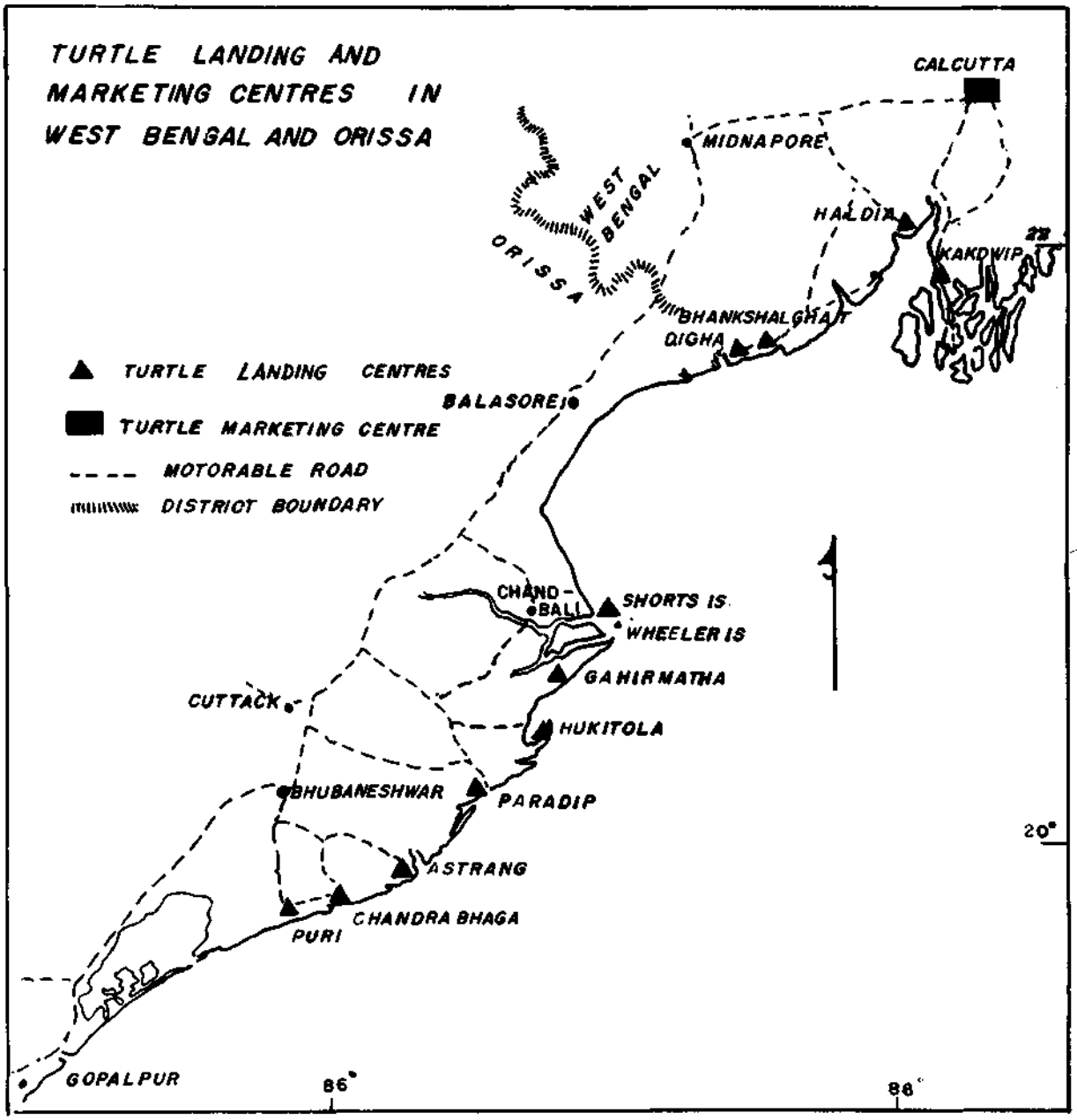
no fishery at all due to the ban imposed and enforced by the Forest officials of the Government of Orissa. The South Eastern Railway authorities also refused to book the turtles for transportation by train from Puri to Calcutta. There is no market for sea turtles in Orissa State. Some of the fishermen seasonally operating along the Orissa Coast hail from East Godavari District of Andhra Pradesh and due to religious taboo, turtle meat is not consumed by them. In fact, the turtle is venerated as according to Hindu belief, it is the second incarnation of Lord Vishnu (in the form of turtle He was born 'Koorma avathar').

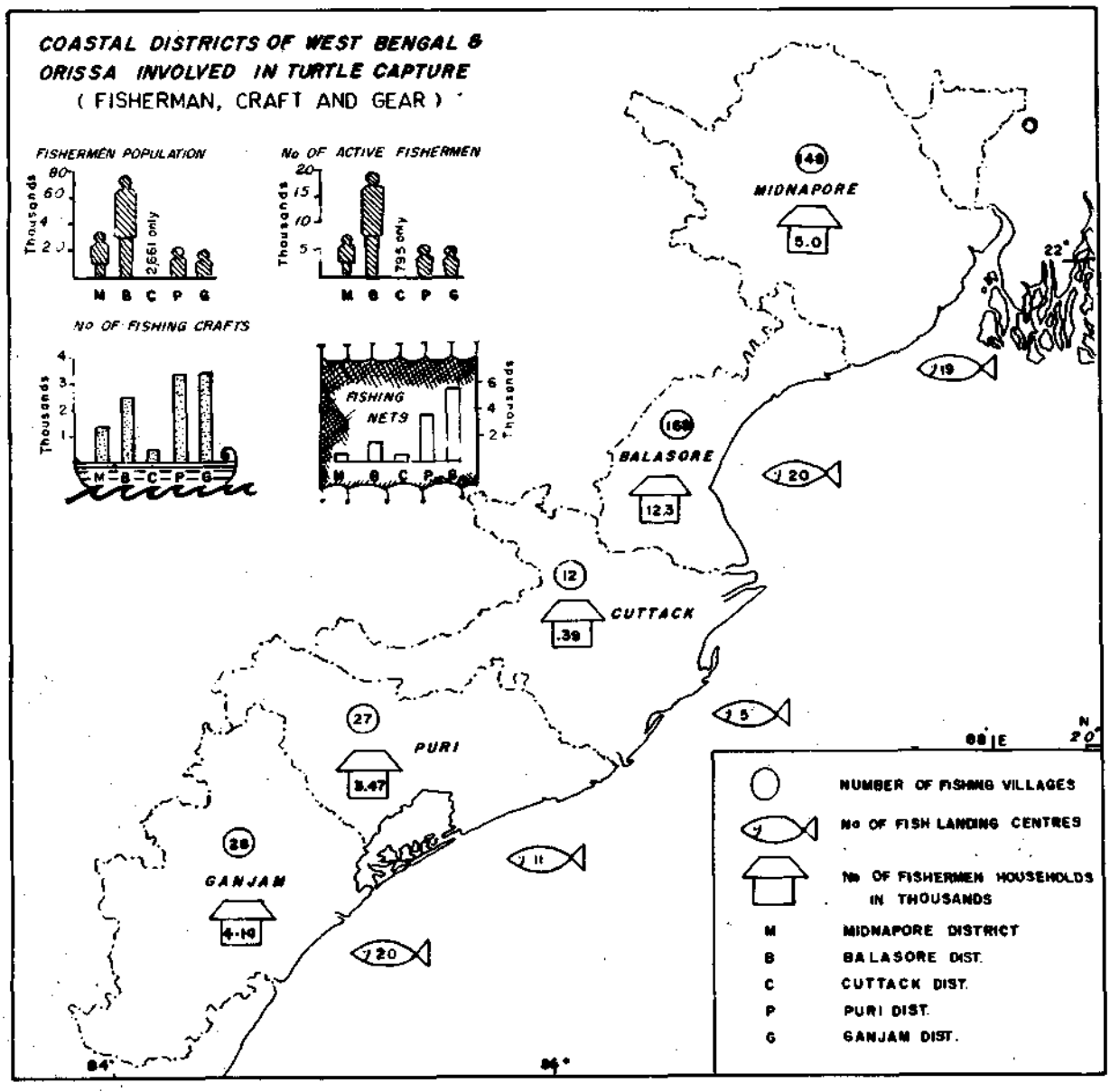
Pilfering of fish from Railway wagons has been a matter of routine. Live turtles were transported in trains without being confined to cages. On one such

fish pilfering spree, it is said that an employee of the Railway Department accidently stepped on the back of a turtle which quickly snapped at his foot and relieved him of two of his toes. Due to this incident the Railway authorities later insisted for proper caging of turtles for booking. As this would unreasonably increase the cost, there was reluctance and lack of interest on the part of traders to fabricate cages for transport. Besides, the price of turtle meat was hardly Rs. 6 per kg in the Calcutta markets and the cost at the landing site, hardly Rs. 15 to 20 per turtle. The investigations indicated that as late as in 1981, transport of turtles by Railways from Orissa to Calcutta was in vogue.

Fishery of the past

During the heyday of the fishery in the late seventies, no special turtle nets were used. The fishing season was from the second fortnight of October to the first fortnight of February. Turtle fishery was always a supplementary one. Gill nets with 70 mm mesh size were used for fishes such as seer fish, pomfrets and other pelagic fishes. These nets are used at different depths in the water column by changing different types of sinkers and floats. Fishermen in this area use catamarans and Kakinada type boats. During mating, the turtles are extremely sluggish and they are easily hauled aboard by hand or they were easily encircled with





nets and trapped without causing any damage to the nets. Usually during the mating season, turtles were caught in pairs. However, merchants preferred female turtles and males were generally released back into the sea. Illegal transport from landing centres by road to Calcutta and adjacent markets (Fig. 2) needs checking.

Status of the turtle fishery, 1981-82

Except at Pentakotah and Astrang turtles entangled in fishing nets are nowhere landed now. At each of these villages on an average one or two turtles are brought ashore per day. Only a few fishermen, if at all they do, eat turtle meat and as there are no buyers (a turtle fetching hardly Rs. 5 to 10) often they are released back into the sea. This has been witnessed by CMFRI team when they visited these villages. It was estimated that about 12 to 15 turtles were landed per week at Pentakotah and 4 per week at Astrang. In other landing centres, since they are operating small meshed drift nets for sardines, the incidental catch of turtles is extremely rare.

Another important fact is that the fishermen are fully aware of the ban imposed and exercised by the Forest Department. The officials of the Fisheries Department are more preoccupied with culture fisheries and execution of economic plans concerning the upliftment of the impoverished artisanal fishermen of Orissa, leaving the turtle protection to the Forest Department. An anomolous situation prevails, where the Department of Forest and not the Department of Fisheries is empowered to control a resource that is

caught in the sea. The extent to which this would be a constraint for the development of proper management measures is yet to be seen.

In the recent past, the chief poachers of turtles have been the fishing vessels from Thailand and Taiwan. The CMFRI team met a number of skippers of Indian fishing vessels both at Paradeep and Vizagapatnam. They confirm that the area north of Gopalpur is a mating ground of turtles, and during mating, the turtles are remarkably sluggish. Males are often seen in fewer numbers than females, one male often favouring many females. During the mating season, the fishermen from foreign vessels (it is reported that atleast 70 vessels can be sighted in a day on the prawn fishing grounds close inshore) scoop off from the surface turtles methodically, while they fish for prawns from within our territorial and contiguous continental shelf waters.

Railway officials are unable to provide any data on the numbers of turtles carried by their wagons because almost all the turtles booked in the Railways were simply categorised as 'fish' since the turtles were not properly caged and as fish carried lesser freight rates.

1982/1983 Season

The 1982-83 season brought to light a very significant event along the Orissa Coast where exceptionally large number of dead turtles in various stages of decay were found along the Gahirmatha Beach during the first week of March 1983. This was undoubtedly the result of 'incidental catch' from fishing gears operated from mechanised and non-mechanised fishing crafts. The remains of nylon webbing around the neck and flippers of many of the carcasses are ample testimony to what happened prior to the visit of the team from the Institute. Another sad fact noted from the carcasses was that animals were mutilated before disentangling them from nets as evident from deep gashes on the head and parts of the body.

Kar (1980) indicated that incidental catch accounted for about 500 olive ridley along the Gahirmatha Beach area and opined that 'this of course represents a tiny fraction of the actual offshore catch'. His suggestion in this context is very pertinent and we would endorse the same for enlarging the limits of the Bhitarkanika Wild Life Sanctuary limits northwards to include Wheeler and Short s Islands and southwards to include Hukitola Island and the beaches upto Paradeep, as the olive ridley is known to often congregate in large numbers along inshore waters off these beaches for nesting. Besides, a seasonal restriction in the fishing activity using certain types of gears such as wide meshed gill nets would be imperative. This along with a clearly demarcated inshore area should afford protection to the turtles from fishing activity during the mating season. A "turtle excluder" net for shrimp trawling has been developed in the U.S.A. and trials with similarly designed trawl nets should be undertaken to see its efficacy in allowing turtles to escape while fishing selectively for shrimp from mechanised boats in our coastal waters. We feel that unless urgent action is taken in regulating or adopting new modifications in fishing gear, the nesting beaches along Orissa Coast may turn to be indeed the grave yard - the largest graveyard of olive ridley - anywhere in the world.

Observations at Gahirmatha turtle rookery

The CMFRI team vistied the Bhitarkanika Wild Life Sanctuary and specifically Gahirmatha to study the nesting beach conditions. Gahirmatha Marine Turtle Research and Conservation Unit was established in 1976 and the detailed studies on the nesting conditions of olive ridley was reported by Kar (1980). During the 1982-'83 season from 3rd to 9th February mass nesting of about 200,000 olive ridley turtles was reported (Courtesy: Orissa Forest Department).

In the first week of March 83, thousands of dead turtles strewn on a stretch north of Gahirmatha Beach was noticed. The numbers varied from 55 to over 150 per 100 metres of stretch of beach (average 59 turtles-/100 metres). It was estimated that around 7000 to 7500 dead turtles were strewn along the stretch of 15 km at Gahirmatha a true 'grave yard' for turtles. The details of measurements in cm of dead turtles based on measurements of several dozens are as follows:

Carapace length 51-72 (62.2)	Carapace width 48-63 (57.8)
Plastron length 44-57 (51.8)	Plastron width 43-53 (49.3)
Head length 18-23 (20.9)	Head width 12.5-14.5 (13.6)

In addition to dead turtles, about 6 beaked dolphins were also noticed in different stages of decomposition, off Gahirmatha Beach along a stretch of 7.5 km. The details of measurements in cm are as follows:

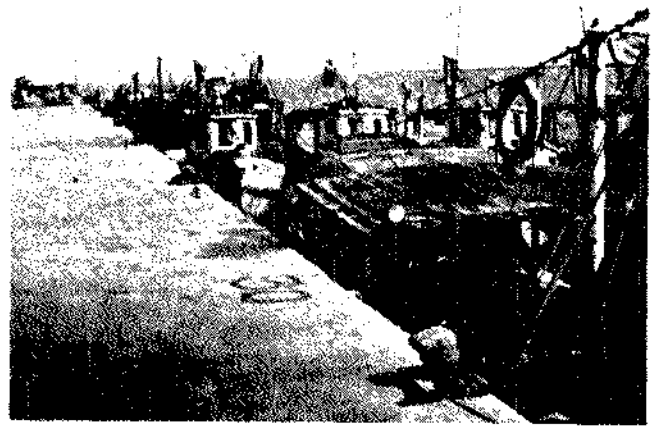
Total length (to fork of tail fluke)	170-286
Tip of snout to flipper origin	32-35
Tip of snout to dorsal origin	76-105

The dead turtles and dolphins, both endangered species were the result of incidental catch in gill net fishery as evidenced from pieces of net-webbing on the animals.

Predation by wild animals

Heavy predation on the eggs of olive ridley especially by jackals, wild boars, hyaena, dogs and other wild animals was noticed. They also create extensive damage to the nests, destroying not only the fresh ones, but the 5 to 15 days old nests as well. The predation was noticed mainly very near the mangrove areas.

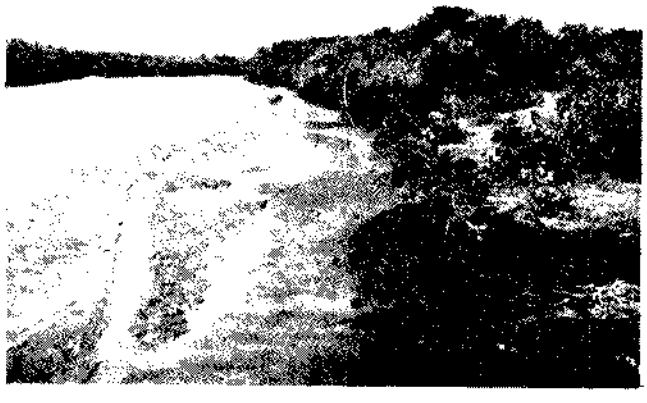
Fish landing centre at Chandpali



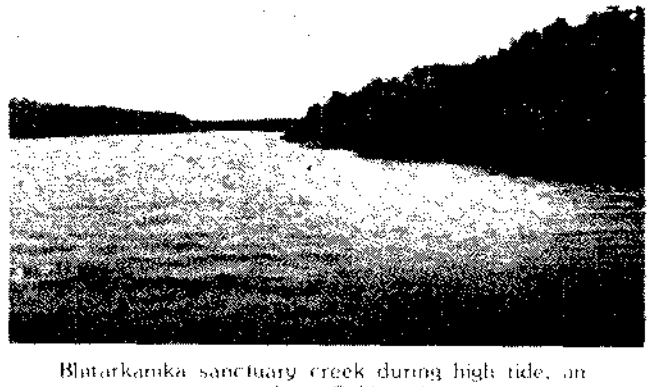
Fishing harbour at Dhamra.

Fishing harbour, Paradeep

Landing centre at Gahirmatha.



Bhitarkanika sanctuary creek during low tide.

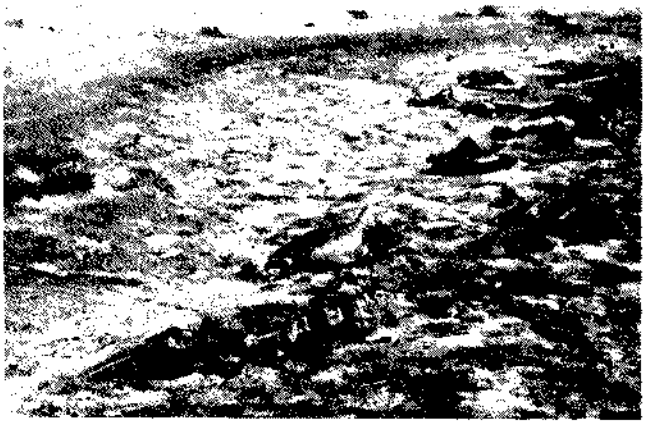


Bhitarkanika sanctuary creek during high tide, an approach to Gahirmatha

Carcasses of olive ridleys washed ashore along Gahirmatha Beach

Carcasses strewn along Gahirmatha Beach

Close up view of dead turtles at Gahirmatha.



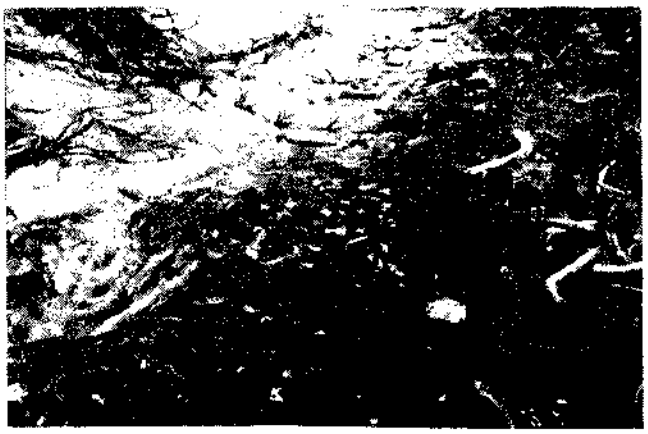
Dead turtles (olive ridley) along with decomposing dolphin at Gahirmatha Beach

Collection of data on dead turtles and dolphins by CMFRI team

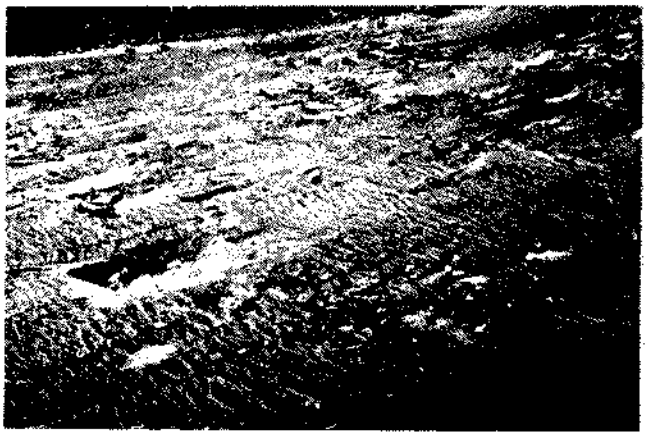
Dead turtles washed ashore near Gahirmatha Turtle Research and Conservation Centre, Orissa Forest Department

Remnants of cyclone affected mangrove at Gahirmatha.

Uprooted mangrove stumps for use as fuel at Gahirmatha a potential danger inviting sea erosion



Broken egg shells of olive ridley predated by wild animals immediately after nesting



Predation of eggs near mangrove area, Gahirmatha

Carcasses of beaked dolphin at Gahirmatha.

Piece of gill net around the neck of an olive ridley.

The damage was noticed upto 10 metres inside the mangrove area. The pugmarks of wild animals were seen in the mangrove area and upto the level of high water mark along the beaches.

Since predation is heavy and also the possibility of damage to earlier nests by subsequent nesting turtles due to pressure on the restricted nesting grounds, it is imperative that hatchery programmes for collecting the eggs, incubating them, releasing the hatchlings from the same beaches should be organised.

Need to preserve the mangrove

Erstwhile coastal mangrove vegetation said to have been destroyed earlier by cyclone is today indicated by mere stumps. The removal of stumps from the area may be fraught with increasing erosion of the beach and this should be prevented. Efforts to replant mangrove along the coast as a conservation measures should be given priority consideration.

Prevention of poaching of turtles

The problem faced by the forest officials is prevention of poaching by fishermen in the sea. The help of the Coast Guard was sought. During the year 1981-82 season Coast Guard vessels 'Rajhansa' and 'Rajtarang' patrolled between Paradeep to Dhamra area to prevent turtle poaching in the sea. During the 1982-83 season, Coast Guard vessel 'Rajhansa' patrolled coastal waters from Paradeep to Dhamra on 6th and 7th February '83. Since the mass emergence 'arribada' occurred at Gahirmatha from 3.2.'83 to 9.2.'83 the patrolling by Coast Guard vessel was very effective in preventing poaching. With their help, the Orissa Forest officials on 6.2.'83 seized 3 trawlers and 10 country boats with gear and arrested 32 persons belonging to West Bengal. The arrested persons were produced before the Judicial Magistrate at Kendrapara, Orissa.

The alert action taken by Forest Department officials needs appreciation. Here we reproduce extracts from the Press with English translation which should be of interest (Appendix I to III).

Fishermen population and infrastructure facilities

For any management strategies to be developed for conservation and management of turtles, it is essential that we have information on the existing infrastructure which has a direct link with resource. Here fishermen population along the coastal villages and their fishing craft and gear and marketing facilities should be known. The Central Marine Fisheries Research Institute has collected valuable information of the coastal fishermen population, craft and gear, village-wise, household-wise in Orissa and this information is summarised here. It is felt that this would be useful in planning any regulartory measure in fishing activities.

The number of marine fishing villages in Orissa State is 236, the maximum being Balasore District (169) and fewer in Cuttack (12). The number of fish landing centres in the State is 56 and of which 36 are in Balasore District.

Of the total 20,329 number of marine fishermen households, 61% of fishermen families is in Balasore and 17% in Puri and 2% in Cuttack Districts. The total fishermen population in the state is 1.17 lakhs and 64% are from Balasore District and 18% from Puri and 2% from Cuttack. The number of fishermen engaged in actual fishing in Orissa is about 30,724 forming 26% of the total fishermen population. In Balasore District the percentage of fishermen engaged in full time fishing is 62 and the part time and occasional being 23 and 15 respectively. The percentage of fishermen belonging to full time category in Cuttack District is 55, part time being 44 and occasional 1. The number of mechanised boats owned by fishermen is 106, all these being gill netters from Balasore District. The total number of non-mechanised crafts is about 10,000 and of this Puri District has 34% and Balasore District has 25%. Catamarans constitute the largest number of non-mechanised crafts (64%) followed by plank built boats (34%) and dug out canoes (2%). In Balasore District, plank built boats constitute 96% and in Puri District catamarans constitute 84% of non-mechanised crafts. Details of figures of marine fishing villages and fishermen population of Balasore, Cuttack and Puri Districts are given in

Table 1. *Details of marine fishing villages and fishermen population in Orissa 1980*

	Balasore	Cuttack	Puri
Number of villages	169*	12	27
Number of landing centres	20	5	11
Number of fishermen households	12316	393	3472
Fishermen population:			
a. Male	24145	886	6733
b. Female	20963	728	6119
c. Children	29410	1047	7888
Total	74518	2661	20740
Educational Status:			
a. Primary	6119	25	1180
b. Secondary	1362	2	545
c. Above Secondary	215	—	118
Total	7696	27	1843
Number of fishermen engaged in actual fishing:			
a. Full time	11539	442	4938
b. Part time	4204	349	643
c. Occasional	2766	4	417
Total	18509	795	5998

Table 2. *Mechanised and non mechanised fishing crafts and gears in Orissa 1980*

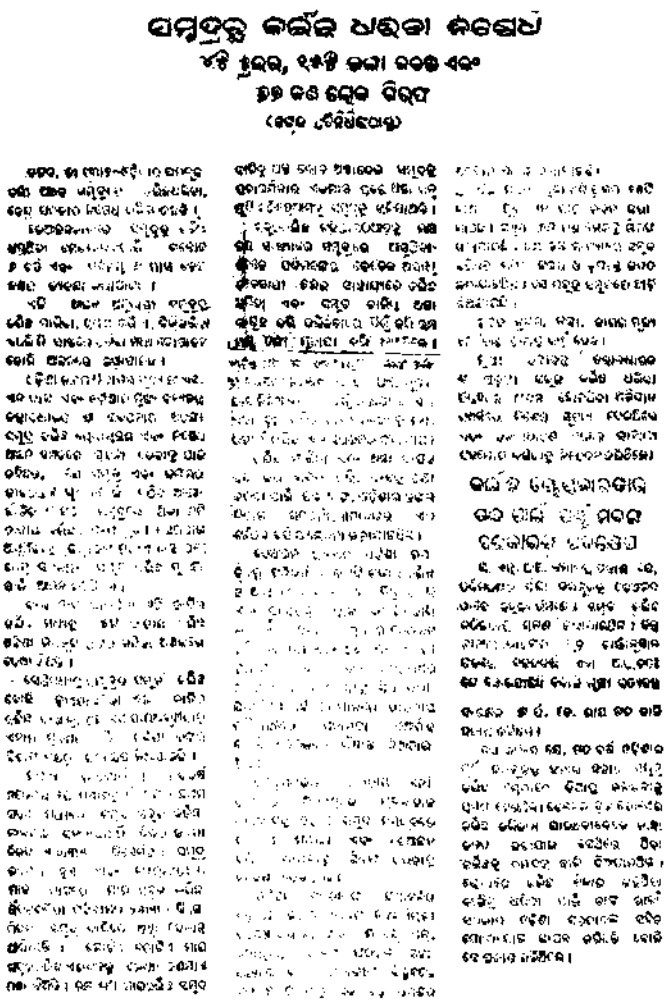
Number of fishing crafts	Balasore	Cuttack	Puri
a. Mechanised			
Gill netters	106		—
b. Non mechanised			
Plank built boats	2324	218	475
Dug out canoes	103		76
Catamarans	1	228	2831
Other	4	-	--
Total	2432	446	3382
C. Number of fishing gears			
Drift/Gill nets	1702	425	2782
Boat seines	141	19	1467
Fixed bag nets	2507	198	1
Hooks and lines	212	242	10688
Shore seines	2475	--	58
Traps	492	23	—
Scoop nets	14	-	--
Others	4575	4	13

Table 1 and the details of figures of marine fishing crafts and gears of the three districts are given in Table 2

General remarks

The 'turtle problem' along Orissa Coast calls for an integrated crash programme of conservation and management to be developed in the shortest time possible. This may have to be given a national priority in our programmes on the conservation and management of living marine resources. Since the inputs have to come from different agencies, a coordination body or cell will have to be constituted to discuss with specialists and planners for a long term programme for the area. The major initiative has to come from the Department of Environment of which Wild Life Protection is also a part.

APPENDIX I



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(ନଜର ପ୍ରତିନିଧିଙ୍କଠାରୁ)

APPENDIX II

'The Samaj' Oriya daily published from Cuttack-1 dated 15.2.'83

Capture of turtles in the sea is prohibited

4 trawlers, 15 country boats seized and 66 persons arrested. (From Cuttack representative)

Cuttack Dated 13th Feb. '83

The Central Government has banned the capture of sea turtles from Orissa Coast. An imprisonment upto maximum of 6 years and minimum of 6 months has been provided in the law for the turtle poachers. Capture of sea turtle from the sea and also its transport, sale and keeping them in custody is banned.

The Additional Chief Conservator of Forests, Orissa Forest Department Sri. S.N. Das and the Chief Wildlife Warden Sri. U.N. Sarangi said that the Central Government has enforced the wild life protection act on marine turtles after the International Organisations expressed concern about the possible extinction of six varieties of turtles available in the sea. Out of six endangered species of turtles five are found near Bhitarkanika area.

One of the varieties, known as Olive Ridley turtle is facing the possible extinction and hence the Forest officials have taken steps to protect them. Every year these olive ridley turtles of the Pacific Ocean found to float in the sea water upto 30-35 km off Bhitarkanika for mating and the period is form 2nd week of November to 1st week of December and during February and March female olive ridely turtles lay eggs in the sand at Gahirmatha covering the area of 25 to 30 km beach.

One female turtle lays 100-110 eggs at a time. Lakhs of such turtles lay eggs in the sand and after one month the hatched out young ones go back into the sea. Some dishonest businessmen from West Bengal have been making huge profits by catching of lakhs of turtles from the sea using trawlers and collecting eggs from the beaches. Turtle meat (flesh) and eggs are served as costly items in big modern hotels in Calcutta. Apart from this, export of turtle meat to foreign countries is a profitable business.

To save the progeny of the olive ridley turtle, capture of turtle and collection of turtle eggs are prohibited and the officials of Government of West Bengal and Orissa meet together in the arranged meeting and discussed about the steps to be taken for protecting the marine turtles.

It was estimated that the turtle meat and eggs worth 4 crores of rupees was sold every year in Calcutta markets and also exported to foreign countries. For the protection of marine turtles in the sea, help of Indian Navy was sought. The Central Government had instructed to use the most modern ship 'Rajhansa' to maintain vigilance in Orissa Coast and to arrest people engaged in illegal fishing. The officials of forest department, Orissa especially Sri. L.N. Chowdheri, Divisional Forest Officer raided the poachers on 5.2.'83 with the help of police.

By noon 4 trawlers and 15 country boats with costly nets were seized. Altogether 66 persons were arrested. Thousands of turtles were seized from them.

The cost of country boats and trawlers is above 18 lakhs.

The Chief Wildlife Warden Sri. Sarangi appealed the public to cooperate in the protection of marine turtles.

The steps taken by West Bengal Government to prevent poaching of turtles

U.N.I. report: According to Sri. P.K. Roy, Chief Wildlife warden, large number of turtles used to be transported to Calcutta markets from Digha. But due to stern action taken by the Government this has come to an end. Last year thousands of turtles captured in Orissa Coast were landed at Digha and transported to Calcutta markets. This year some turtles which were transported from Digha were caught on the way and released back into the sea. West Bengal Government is regulary contacting the Orissa Government and steps are taken to arrest the persons engaged in this illegal business.

APPENDIX III

THE TIMES OF INDIA, MONDAY, DECEMBER 6, 1982 7

Turtle poaching causes concern

BHUBANESWAR, December 5 (UNI).

LARGE-SCALE poaching of the Pacific Ridley sea-turtles (Lepidochelys Olivacea) and wanton destruction of their nests by various beach predators has caused concern to the government.

According to an Orissa forest department report, these oval-shape, olive-green creatures which form an endangered species used to migrate in large numbers from the Pacific Ocean to the shallow waters all along the eastern coast, especially the high sand dunes interspersed by forests, creeks and nullahs between the mouth of the Mahanadi river and Hagirmatha, and the adjacent Wheeler and Shoals islands near the Bhitar Kanika Crocodile Sanctuary in Cuttack district.

Though preliminary studies in 1976 revealed that their courting and mating usually takes place during October-December when a large number of copulating pairs can be seen floating near the rookeries on the beach, little is known about their migratory routes, food habits, life circle and other data necessary for formulating a scheme for their preservation and scientific examination.

The report points out that a large number of hatchings which fail to enter the sea before dawn are preyed upon by thousands of migratory sea gulls and other birds and mammalian predators like wild boars, dogs, jackals, hyenas and panthers.

Poachers in big groups from Digha in West Bengal and Rushikulya in Orissa also catch thousands of sea-turtles by nylon nets in violation of the Wild Life (Protection) Act, 1972 and sell them openly in the Calcutta market.

The adults and their eggs are also collected by the poachers from the rookeries on the beach and trawlers which go sea-fishing in the vicinity of the breeding ground, causing accidental killings.

The department has suggested a scheme to regulate such fishing activities especially during the peak mating and nesting season, and transplanting of the nests to protect the hatchlings from high-tide flooding.

It has also suggested more scientific research on their behaviour patterns, protection in their natural habitat and proper exploitation of the surplus turtles and eggs without affecting the population.

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MARINE TURTLE CONSERVATION AND MANAGEMENT: A SURVEY OF THE SITUATION IN WEST BENGAL 1981/82 AND 1982/83

E.G. SILAS, M. RAJAGOPALAN and S.S. DAN

Introduction

In spite of the promulgation of the Indian Wildlife (Protection) Act 1972 and the protection accorded to sea turtles, fishermen and traders from West Bengal and Orissa have been carrying trade on turtles resorting to poaching from the inshore fishing grounds along Orissa-West Bengal, not sparing the turtles even during mating season off Gahirmatha, Orissa State. However, during the last two seasons, the West Bengal and Orissa Forest officials have taken constructive steps, though inadequate, to prevent turtle poaching and marketing. To create public awareness the regional and national dailies have been publishing articles on sea turtles with a stress on conservation.

Turtle poaching at various centres

Midnapore District, West Bengal

The fishermen from Midnapore District used to arrange organised capture of marine turtles from the fishing grounds of Orissa. During 1981-82 season it was estimated that 15 fishing units, each unit comprising of a motor launch with 6 country crafts were deployed from Digha. Each unit captured about 6000 numbers during the season. During the 1982-83 season the scale of poaching of turtles was reduced to a great extent due to the vigilance by the Forest officials. It was estimated that from mid-December 1982 to end of February 1983 about 10,000 live turtles were clandestinely landed at Bhanshalghat from where they were transported to Calcutta and Tatanagar for marketing. Thus, the 1982-83 season saw a reduction in the catch by almost 90% over the previous season.

At Digha

On 14th and 15th December 1982 a team from Central Marine Fisheries Research Institute visited Digha and adjacent areas to study the situation. On 15.12.'82 at the Digha fish landing centre, live olive ridley were detected in two sheds. The first shed was located on the western side of the landing centre, where 34 turtles (14 males and 20 females) were kept. The second shed was located on the eastern side of the landing centre where 25 live turtles (10 males and 5 females) were dragged along the beach and kept for transport to the market.

The turtles measured (in cm)

Males :	Carapace length 67-72	Carapace width 56-68
	Plastron length 50-54	Plastron width 42-50
Females :	Carapace length 65-69	Carapace width 54-64
	Plastron length 49-59	Plastron width 40-54

The live turtles weighed between 30 to 40 kg and was for sale by the fishermen to the traders at the rate of Rs. 40 to 50 per animal at the landing centre.

On the same day, Sri. A.K. Basu, Forest Beat Officer, West Bengal Forest Department on a surprise inspection of this centre, confiscated the 59 turtles from the two sheds and arranged for their release into the sea. At Digha beach, on 15.12.1982 in a two km stretch more than 12 dead turtles were noticed. Dogs were eating the flesh from the carcasses which had been freshly washed ashore, apparently 'drowned' as a result of entanglement in the gill nets operated along the coast.

When the team visited Digha on 1st February 1983, 11 live turtles tied by ropes and 57 dead turtles strewn along a 3 km stretch of Digha Beach were noticed. The latter were undoubtedly part of the incidental catch in the gillnet fishery and were discarded in the sea by fishermen and washed ashore, while the live ones were brought to shore in boats for trade. The team visited Digha again in the last week of February '83. At that time neither live turtles nor freshly washed ashore dead turtles were noticed. About 25 decomposed carcasses of olive ridley were seen at the landing centre of which 9 were seen with their flippers tied together with nylon ropes. The measurement in cm were as follows:

Carapace length 57-67 (63.0)	Carapace width 48-61 (57.1)
Plastron length 48-58 (54.1)	Plastron width 45-52 (47.0)

On 20th February '83 at Digha Muhana landing centre, the team noticed about 15 carcasses of olive ridley of which five had their flippers tied together with nylon ropes. The measurements in cm of the specimens were:

Carapace length 63-71 (66.7)	Carapace width 53-65 (58.6)
Plastron length 55-61 (58.3)	Plastron width 48-53 (48.7)

At Bhankshalghat

Bhankshalghat is located on the banks of a creek 20 km away from Digha and 7 km to the interior from sea coast. Due to the vigilance of the forest officials at Digha, the fishermen resorted to transporting the turtles to Bhankshalghat during nights through the creek in boats and from there to Calcutta by trucks. On 19.12.'83 the team observed 15 fresh carcasses of male and female olive ridley at Bhankshalghat measuring (in cm):

Carapace length 59-70 (64.2) Carapace width 49-64 (57.7)
Plastron length 49-59 (57.1) Plastron width 45-51 (47.5)

As already mentioned, during 1982-83 season Bhankshalghat was the most active centre for this nefarious trade. The possibility in future of turtles being transported through the creeks to landing centres in the interior cannot be ruled out.

Turtle sale at Calcutta markets

As a result of the preventive measures taken by Orissa and West Bengal Forest officials during the 1982-83 season the number of turtles transported to Calcutta markets had diminished to a few thousands from about 90,000 to 100,000 during the previous season.

Date	Place	Number of olive ridley noticed in Calcutta markets
20.12.1982	Howrah	165
22.12.1982	Shealdah	58
23.12.1982	Howrah	134
7. 1.1983	Howrah	35
13. 1.1983	Howrah	27
24. 1.1983	Howrah	50

The weight and selling price of turtles varied from 30 to 45 kg and from Rs. 110 to 160 per turtle respectively.

The West Bengal Forest officials were also active in booking offences under the Act of illegal transport of turtles. On 21st December 1982, a truck which was transporting turtles was caught near Narghat and the vehicle and the persons involved were produced before the Subdivisional Judicial Magistrate, Contai. In this case, 90 turtles were recovered and they were released back into the sea at Junput. Totally three such offences were registered against transport of turtles by the West Bengal Forest officials at the Subdivisional Magistrate court, Contai between 17.12.'82 and 28.12.'82. This action no doubt had some deterrent effect but the effort will have to be vigourously pursued in future with wider publicity on conservation programme on turtles to make the system more effective.

Table 1. *Details of marine fishing villages and fishermen population in Midnapore District, West Bengal*

Number of villages	148
Number of fish landing centres	19
Number of fishermen households	5028
Fishermen population	
a. Male	11442
b. Female	9515
c. Children	12970
Total	33927
Educational Status	
a. Primary	7112
b. Secondary	1351
c. Above Secondary	116
Total	8579
Number of fishermen engaged in actual fishing	
a. Full time	6034
b. Part time	2114
c. Occasional	265
Total	8413

Table 2. *Mechanised and non-mechanised marine fishing crafts and gears in Midnapore District, West Bengal*

Number of fishing crafts:	
Mechanised gillnetters	57
Others	15
Total	72
Non-mechanised	
Plank built boats	1130
Dug out canoes	2
Total	1132
Number of fishing gears:	
Drift/Gill nets	437
Fixed bag nets	2752
Hooks and lines	60
Shore seines	97
Scoop nets	82
Others	1864

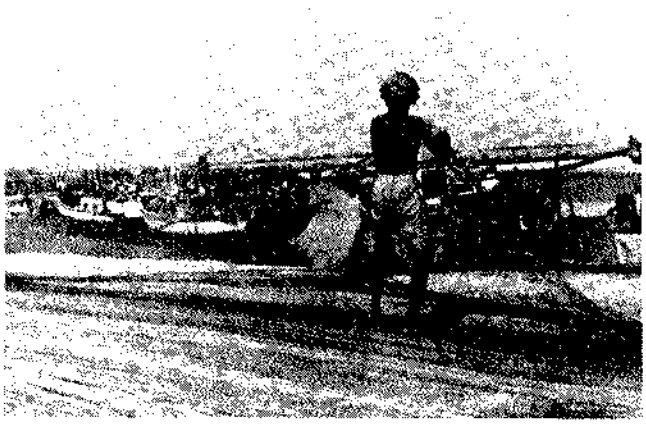
Fishermen population and infrastructure facilities

In the All India census conducted during 1980 by CMFRI, information on the fishermen population and the infrastructure facilities available in the major fishing centres along West Bengal Coast has been collected and is briefly as follows.

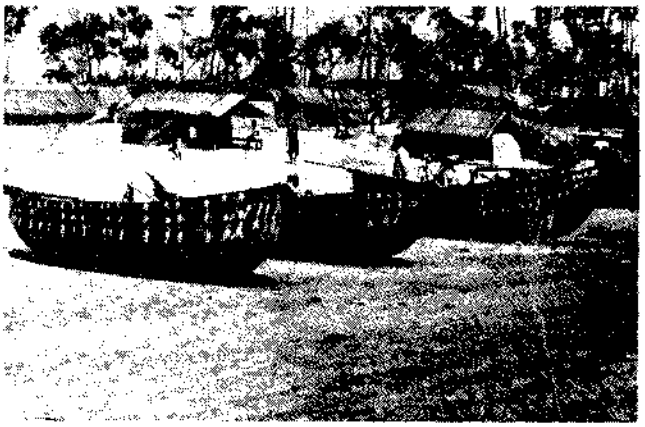
The six districts of West Bengal comprise 303 fishing villages and most of them (148) are in Midnapore District. Fishermen from Midnapore District operate their boats along the Orissa Coast. The total number of fish landing centres in Midnapore District is 19. Of the 14000 fishermen households the maximum number (35%) is in Midnapore District. The total sea going fishermen population in West Bengal is about 84000 of which Midnapore District accounts for 41%. The number of fishermen engaged in actual fishing forms 24% of

Fish landing centre, Digha a noted place from where hundreds of turtles used to be sent to Calcutta market.

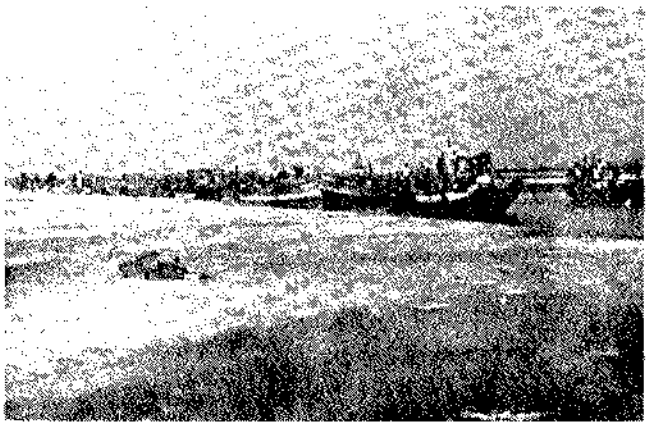
Ice packing of fishes to be transported to Calcutta market.



Gill nets being dried at Digha fish landing centre.



Fishing canoes at Digha fish landing centre.



Fishing trawlers at Digha Mohana fish landing centre

Fish landing centre, Bhankshalghat 7 km from the sea, from where truck loads of turtles used to be sent by road to Calcutta market.

Temporary shed for the olive ridley at Digha fish landing centre for illegal transport to Calcutta market as on 15.12.1982.

Easy way of transporting from fishing boats to turtle shed by cycle rickshaw, the hard beach surface facilitates this transport.

Turtles being lifted bodily from rickshaw to the shed.

Turtles being dragged from the rickshaw to the shed.

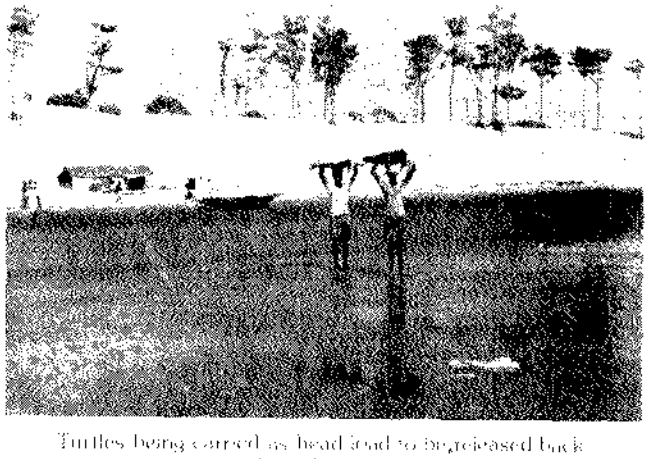
Scene of turtles kept supine in the shed enclosure

Turtles awaiting transport at the beach.

One more turtle shed at the western side of Digha fish landing centre located on 15.12.82.

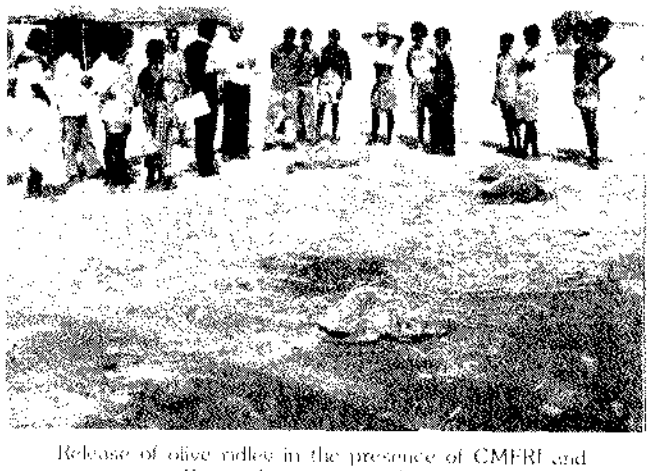
Plight of protected turtles in the hands of illegal traders

Timely and prompt check by Forest officials of Govt of West Bengal.



Turtles being carried on head road to be released back into the sea

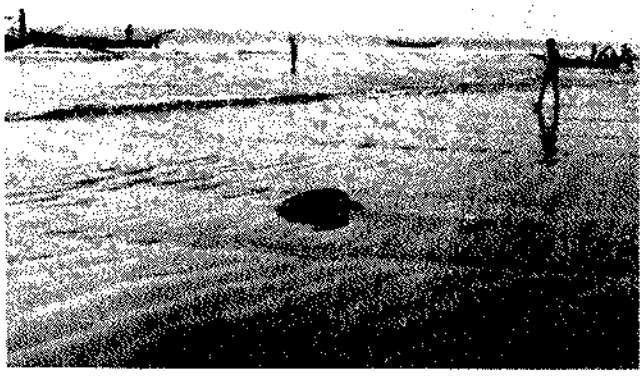
Olive ridley on way back to sea owing to the vigilance of forest officials of West Bengal



Release of olive ridley in the presence of CMFRI and Forest Department officials

Sign board at Forest Department office, Contai notifying Wildlife Protection Act.

Dog licking the blood of freshly washed ashore olive ridley at Digha Beach.

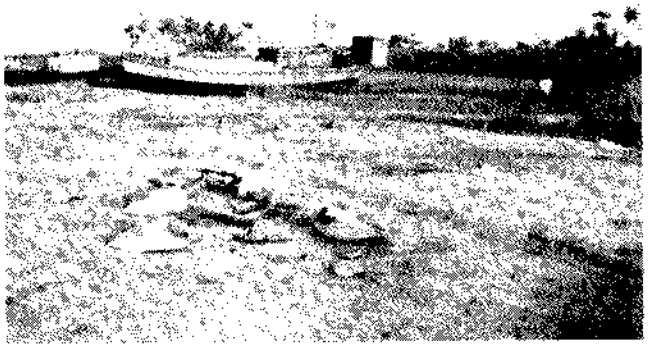


Turtle washed ashore at Digha fish landing centre.

Dogs feeding on the carcasses at Digha Mohana fish landing centre.

At Digha fish landing centre.

At Bhanksbalghat.



Discarded carapaces of olive ridley seen during the last week of February '83 at Bhankshalghat

Remains of carapaces at Bhankshalghat — remainder of 1982-83 season

Carcasses at Digha Mohana seen during the last week of February '83.

Carcasses at Digha fish landing centre.

Remains of nylon rope around flippers and carapace to help transport of turtles from Gahirmatha to Digha

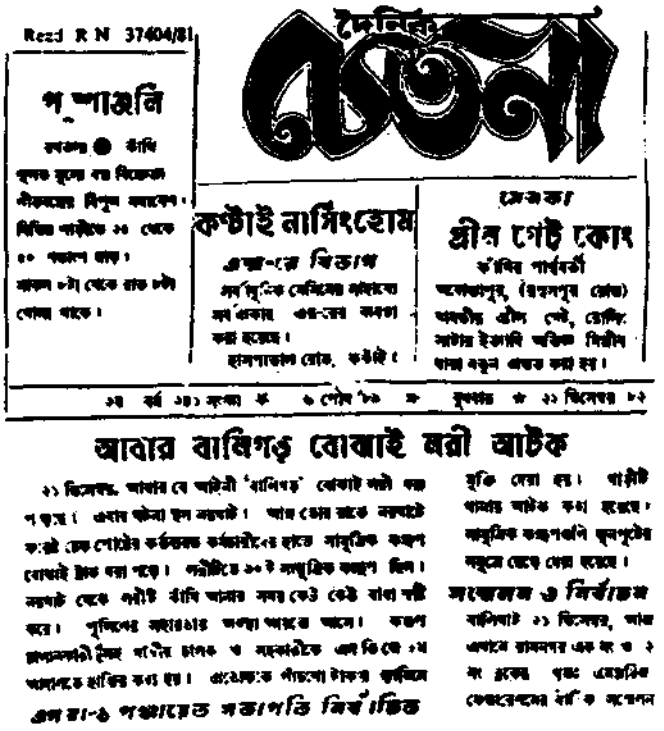
Close up view of flippers tied with nylon rope at Digha

the total fishermen population. In the Midnapore District as much as 72% of the fishermen engaged in actua fishing belong to the full time category and only 25% come under the part time category.

In this State the number of mechanised crafts owned by fishermen is 310. Out of this, gillnetters constitute 80%. The number of mechanised boats in Midnapore District is 72. Gillnetters form the maximum number (57), there being only 15 carrier boats. Midnapore District has 28% of the 4100 non-mechanised boats recorded in West Bengal. Of the 6200 fixed bag nets recorded in West Bengal 44% is found in Midnapore and of the 2500 drift/gill nets 18% are recorded from Midnapore. Details of marine fishing villages and fishermen population of Midnapore are given in Table 1 and the details of marine fishing crafts and gears in Midnapore are given in Table 2.

The information on the census of fishermen and craft and gear should enable an objective regulatory programme to be developed in case any restriction on fishing activity is contemplated. Any such action should not affect the artisanal fishermen for whom alternate seasonal avenues of work and source of income may have to be properly planned. This will call for a special study of the artisanal fisheries of this particular area extending From Midnapore Coast in West Bengal to Paradeep in Orissa. The CMFRI is already aware of this problem and is initiating a survey to be followed up later by a more detailed study of the socioeconomic aspect of the artisanal fisheries and the impact of cessation of the seasonal turtle fishery along the coast.

APPENDIX I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দৈনিক চেতনা

পুষ্পাঞ্জলি

কন্টাই নার্সিংহোম

গ্রীন গেট কোং

আবার বালিগড় বোঝাই লরী আটক

"DAINIK CHETANA" dated 22.12.1982

(Bengali Daily published from Contai)

Lorry loaded with sea turtles is seized again

Dated 21st Dec. 1982

Again a lorry illegally loaded with sea turtles is caught. Now the place of incidence is Narghat.

Today early in the morning a truck loaded with sea turtles was caught at the Forest Department Check Post by employees on duty. There are 90 sea turtles in it. Some people created objections when the lorry was brought to Contai from Narghat. The situation came to control after the arrival of police officials. The transported turtles along with the driver and his assistant were produced before the Subdivisional Judicial Magistrate, Contai. The driver and his assistant were released on bail after the payment of Rs.500/-. The vehicle was seized and the sea turtles were released back into the sea at Junput.

APPENDIX II

দৈনিক চেতনা

বালিগড় এখনো ধরা হচ্ছে

২ জানুয়ারী, শৌলা, হরিপুর, পুরুষোত্তমপুর, জুনপুট ও বাঁকশাল প্রভৃতি ঘটিতে সরকারী বিধি নিষেধ অগ্রাহ্য করে এখনও বালিগড় ধরা হচ্ছে। বাঁকশালে এক ব্যবসায়ী গোপনে বালিগড় চালান দিতে গিয়ে কয়েকবার ধরা পড়েছে। এ বিষয়ে স্থানীয় পুলিশ প্রশাসনকে জানানো সত্ত্বেও কোন ব্যবস্থা গৃহীত হয়নি বলে প্রকাশ।

"DAINIK CHETANA" dated 3-1-1983

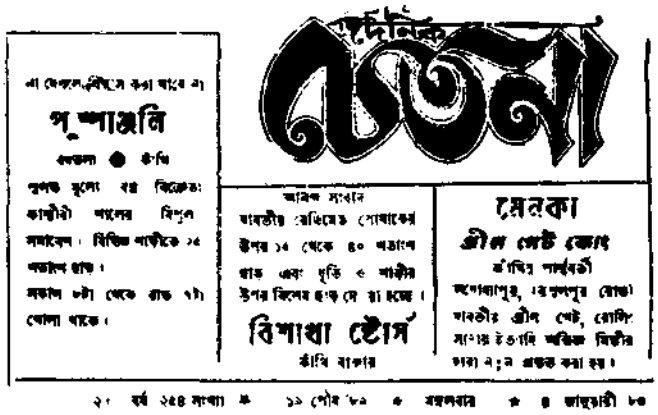
(Bengali Daily published from Contai)

Sea turtles are being caught even now

Dated 2nd Jan. 1983.

Even now sea turtles are being caught at Saula, Haripur, Purushottampur, Junput and Bankshalghat by defying Government ban. A businessman was caught several times during his attempt to transport sea turtles secretly. It is reported that no action is being taken by local police although they have been informed.

APPENDIX III



দৈনিক চেতনা

এ কেলেঙ্কারীতে কথা যাবে না

পুষ্পাঞ্জলি

বসনা ● কাঁথি

সুলভ মূল্যে বস্ত্র বিক্রেতা কাপড়ের বিপুল সমাহার। বিভিন্ন পার্টিতে ১৫ পারসেন্ট ছাড়। সকাল ৮টা থেকে রাত ৭টা খোলা থাকে।

আমিন সংবাদ

যাবতীয় রেডিমেড পোষাকের উপর ১৫ থেকে ৪০ পারসেন্ট ছাড় এবং ধুতি ও শাড়ীর উপর বিশেষ ছাড় দেওয়া হচ্ছে।

বিশাখা ষ্টোর্স

কাঁথি বাজার

মেনকা

ফ্রীজ সেট কোং

কাঁথির পার্শ্ববর্তী অঞ্চলগুলি, যেমন পুরী রোড সংলগ্ন ফ্রীজ সেট, রোগি সাপ্লাই ইত্যাদি অফিস বিল্ডিং ভাড়া দেওয়া হয়।

২১ বর্ষ ২৫৪ সংখ্যা ★ ১১ পৌষ '৮৯ ★ মঙ্গলবার ★ ৪ জানুয়ারী '৮৩

খেজুরী উন্নয়ণ পরিষদ

কাঁথি মহকুমার এলাকাভুক্ত তপশীল জাতি বসতি বহুল থানা। স্বাধীনতার পরে ৩৬ বছরে যতগুলি নির্বাচন হয়েছে প্রতিবারেই ঐ এলাকা তপশীল জাতি নির্বাচনী এলাকা বলে সংরক্ষিত থেকেছে। এবং প্রতিবারেই স্বাভাবিক ভাবে তপশীলজাতি ভুক্ত প্রার্থী জয়ী হয়েছেন। একবার বাংলা কংগ্রেস, একবার জনতা ও একবার কমুনিষ্ট প্রার্থী ঐ নির্বাচিত হয়েছেন।

রাতের অন্ধকারে বে-আইনী ব্যাবসা।

৩ জানুয়ারী, বড়দিনের রাতে সমুদ্রপুর থেকে একটি লরীতে বালিগড় পাচার করার সময়ে—রামচন্দ্র নগরে ব্যবসায়ী ও চালক ধরা পড়ে। কয়েক কাঠিকে তিনশো সত্তর টাকা দিলে লরীটি ছাড়া পায় বলে সংবাদে প্রকাশ পরে পিছাবনী বাস ষ্টাণ্ডে আবার লরীটিকে আটক করা হয়। সেখানেও জনৈক প্রভাবশালী ব্যক্তিকে সাতশো টাকা উৎকোচ দিলে লরীটি ছাড়া পায়। স্থানীয় বাসিন্দাদের অভিযোগ সামুদ্রিক কড়াকড়ি হ্রাস পাওয়া সত্ত্বেও রাতের অন্ধকারে বে আইনী ব্যবসা চলছে তবে চলছে।

কিন্তু কয়েক মাইল দিঘা রাস্তা হওয়া ছাড়া খেজুরীর মানিক উন্নয়ণ এখনও অবহেলিত খেজুরীতে প্রয়োজন অনেক কিছুই। তাই খুব বিশ্বাসীর খেজুরীর সাধারণ মানুষ আজ এম-এল-এ, এম, পি-দের উপর নির্ভর না করে—নিজেদের চেষ্টায় একটি উন্নয়ণ পরিষদ গঠনের কথা ভাবছেন। এখন শুধু ভাবনার স্তরেই আছে। জনৈক যুবকের মোট প্রকাশে অনিচ্ছুক কারণেন আপাতত: তারা কেবল মাত্র দুইটি খাবী নিয়ে খুব তাড়াতাড়ি সংগ্রহ অভিযানে নামবেন। প্রথম দাবী

"DAINIK CHETANA" dated 4.1.1983

(Bengali Daily published from Contai)

Irregular business in the darkness of night

Dated 3rd Jan. 1983

A businessman and the driver were caught when they tried to transport turtles in the night of Christmas day. It is reported that the lorry was released on payment of Rs.370. The lorry was again stopped at Pichabani bus stand and a bribe of Rs.750 had to be given to an influential man to release the lorry. The local inhabitants complained that illegal business is flourishing well in the darkness of night although capturing of sea turtles is prohibited.

NESTING SITE AND HATCHING OF THE HAWKSBILL TURTLE ALONG TIRUNELVELI COAST OF TAMIL NADU*

In the year 1975, the Central Marine Fisheries Research Institute began regular investigations on turtles as a research project. As a part of this programme mapping of the nesting sites of turtles along south Tamil Nadu Coast including the islands of Gulf of Mannar was undertaken. In pursuance of this study, every year during the nesting season in this area, from September to early February periodically walking trips in the night hours were made along the coast, backed by the knowledge accumulated over the past by the local fishermen. Even though there are evidences of turtle nesting all along the coast of Tirunelveli and Kanyakumari Districts the core area of nesting is demarcated as the stretch between Manapad and Periathalai, villages 20 km south of Tiruchendur.

This stretch of seashore between the villages aforementioned is about 8 km long and is very much jagged with the presence of sandstone formations. The seashore either stretches flat landward to some 60 m or rises to a height of 9 m abruptly from the high tide water mark. In other locations the beach is 1 m high from the sea level without a slope. Owing to this condition there are relatively a few patches of sea shore which is gradually sloping up to allow a turtle to climb up from the sea and crawl beyond the high tide water mark.

From the night trampings carried out by the Institute staff it became known that olive ridleys usually were nesting in this belt and the season almost coincides with that of Madras Coast. From our observations it became known that olive ridleys seem to be less shy as evidenced by their selection of nesting sites right in the fish landing centre of Periathalai or Manapad which are ever pestered by stray dogs round the clock. During the period of our observation it was a matter of routine with the local fishermen to capture the egg laying turtle which unwittingly chooses the fish landing centre as their nesting site by overturning them and later butchering them. The eggs were boiled and sold for five paise each. It has been estimated that as many as 40 turtles were captured on the shore when they were laying eggs. Now owing to the intervention of Wild Life officers this method of easy capture of turtles is being phased out.

On 28th December, 1980, a nest with 103 eggs was noticed at about 0230 hrs on following the track left by a turtle. The eggs were found to be different from those of olive ridley. They were dirty white in colour as opposed to olive ridleys eggs which are bright white, 30 to 35 mm in diameter and weighing about 25 gm each. Upon seeing the difference in colour and size of the eggs, they were transported in a 50 litre plastic storage bin with sand from the seashore to Tuticorin Research Centre of CMFRI, 60 km away by jeep. Owing to the terrain of the seashore and poor condition of the road, the eggs had been subjected to heavy jolting.

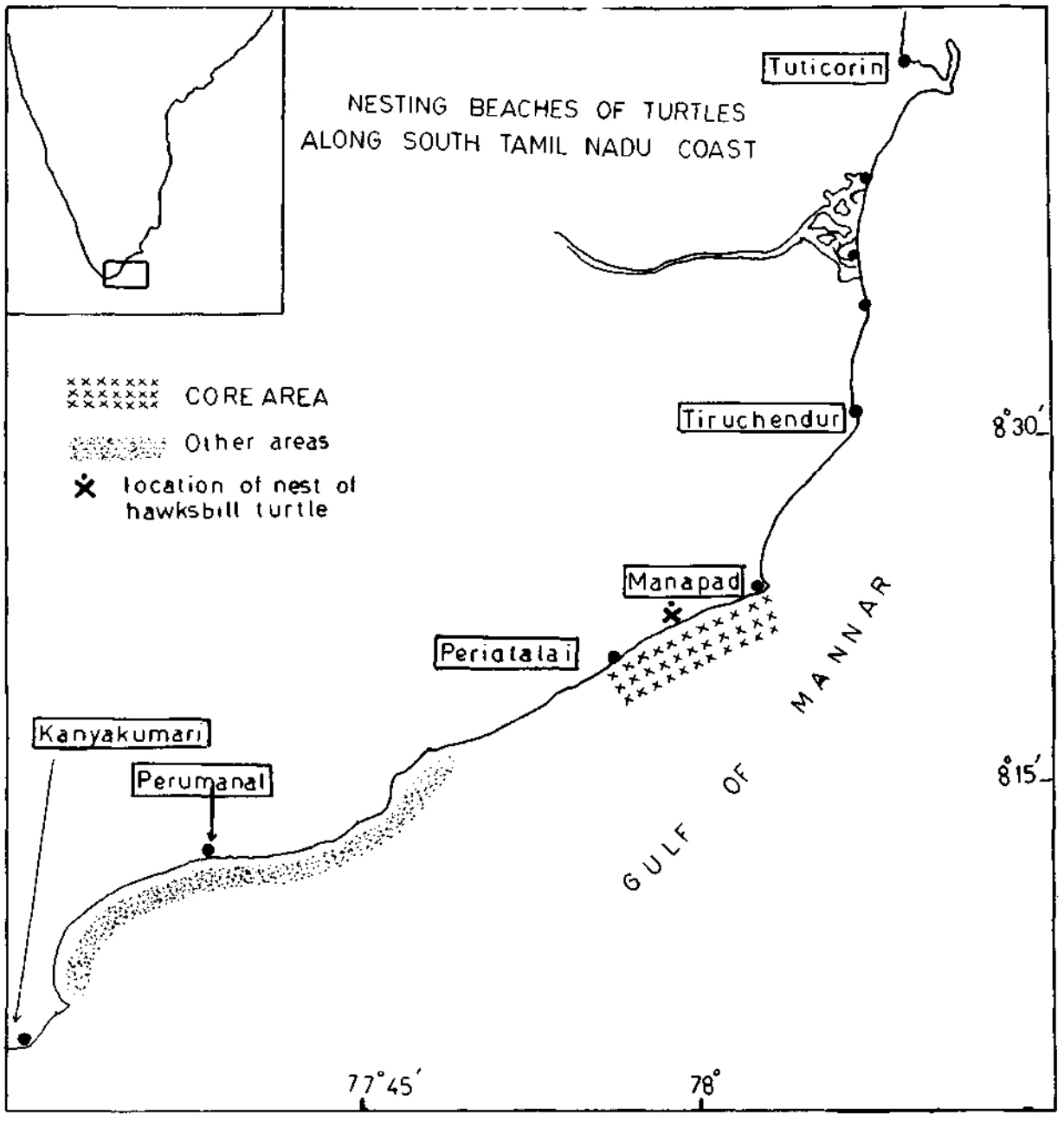
The very same day the eggs were burried near the sea in a rectangular pit with coarse sand. The eggs were evenly spread in two tiers. The pit was 50 cm deep and was just one metre away from the high tide water mark. On rainy days the pit was covered with water proof canvass as the ground was clayey without the possibility of good drainage of rain water. On hot days in February sea water was sprinkled over the pit. On 23.2.81 that is, after 57 days, the first batch of hatchlings of hawksbill turtles *Eretmochelys imbricata* emerged as indicated in the following Table. In total 63 hatchlings came out bringing the rate of hatching to about 63 per cent.

Date	No. of hatchlings		
	Morning	Evening	Total
23-2-'81	5	4	9
24-2-'81	10	6	16
25-2-'81	9	8	17
26-2-'81	0	8	8
27-2-'81	3	2	5
28-2-'81	4	0	4
1-3-'81	2	0	2
2-3-'81	2	0	2
	35	28	63

It is believed that heavy jolting of eggs during transport, clayey soil of the pit where they were buried and sprinkling of water on eggs must have had some effect on the hatching rate of the eggs.

It was interesting to note that all the hatchlings did not come out on one day or two but through eight

*Prepared by A. Bastian Fernando.



days. Young ones emerged from the pit either in the morning or in the evening between 1600 hrs and 1800 hrs. They moved away from the pit in all directions.

The colour of the carapace of the hatchlings was chrome yellow with brown margins. The carapace margin was smooth, not serrated as seen in adults, and scutes on carapace were fused, not imbricated. The plastron was yellow. When released into plastic tubs with 10 cm column of water the hatchlings showed much agility and soon they began to float with the front flippers tucked under the plastron as if dead, probably to conserve their energy as their intake of food had not begun. Measurements were made before releasing them into the sea.

Carapace length	35 mm
Carapace width	26 mm
Weight	12 gm

A few of the hatchlings were kept in the laboratory for studies and the rest were released into the sea from the nearby island Karaichalli Tivu where coral reefs and sea weeds are available.

LEATHERBACK TURTLE *DERMOCHELYS CORIACEA* WASHED ASHORE AT KOVALAM, MADRAS*

Of the five species of sea turtles occurring in the Indian seas, the leatherback turtle *Dermochelys coriacea* (Linnaeus) popularly known as 'Eluvarai amai' or 'Dhoni amai' is rare. The egg laying habits of *D.coriacea* has been described by Deraniyagala (1939). Bhaskar (1979, 1981) reported on the nesting grounds and capture of this species in Lakshadweep and Andaman Islands. The nesting of leatherback turtle along the Kerala Coast has been reported by Cameron (1923) and Jones (1959) and along the Andhra Coast near Visakhapatnam by Dutt (1979). The washing ashore of the carcass of a female *D. coriacea*, 35 km south of Madras near Kovalam fishing village is recorded here.

Description

The body of the adult is smooth skinned, without any scutes; carapace is black with seven longitudinal ridges and plastron with five longitudinal ridges. Upper jaw with a well defined cusp on each side, giving the horny beak a W-shaped appearance when viewed from front; flippers without claws and the anterior much larger and posterior broadly connected with tail by a web. The carapace is dark brown to almost black; whitish spots on neck increasing in number on the ventral and caudal areas.

This species is said to nest three to four times in a year but the peak intensity is during May and June. The eggs vary from 50 to 55 mm in diameter and weigh from 70 to 80 gm. The period of incubation is from 50 to 70 days. The carapace length of hatchlings varies from 80 to 85 mm and weighs about 32.5 to 33.5 gm. The species is predominantly pelagic and highly migratory and found usually in the open sea.

Distribution

Western Central Atlantic, northward extending to Nova Scotia, Canada, southward to Rio de la plata, Argentina, Mediterranean, Eastern Atlantic from the British Isles to Cape of Good Hope; Pacific and Indian Oceans.

Details of specimen recorded at Kovalam

A female leatherback turtle (Plate I) was washed ashore near Kovalam, Chinglepet District, Tamil Nadu on 28th March 1982. The carcass was in an advanced state of decomposition and in almost two pieces, the anterior part of the carapace was almost disconnected from the posterior part. The seven ridges on the carapace were clear in the anterior part and the plastron was completely exposed. Head was incomplete, only the posterior portion of the head was attached to the body. The lower jaw was intact. The fore flippers were elongate while the hind flippers were damaged. In Table 1 the stranded specimen is compared with the specimens reported along the Kerala Coast.

Table 1. *Details of leatherback turtle reported along Kerala and Tamil Nadu Coasts*

	Off Quilon (after Cameron, 1923)	off Calicut (after Jones, 1959)	Off Madras (present record)
Reported in	1923	July 1956	March 1982
Carapace length (cm)	213.3	190.5	195
Carapace width (cm)	—	116.8	119
Plastron length (cm)	—	—	162 (incomplete)
Plastron width (cm)	—	—	102 (incomplete)
Head width (cm)	—	—	34
Length of anterior flipper (cm)	—	—	110
Length of posterior flipper (cm)	—	—	85
Weight (kg)	272.4	—	—
Sex	Female	Female	Female

*Prepared by M. Rajagopalan.

Leatherback turtle *Dermochelys coriacea* ashore at Kovalam, Madras.

Stranded leatherback turtle at Kovalam Beach

Dorsal view of the same

Close up view of the head

Ventral view showing the decomposed state

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CONSERVATION OF FRESH WATER TURTLES OF INDIA*

The focus in the recent past has been on sea turtles. The hardshell and softshell freshwater turtles from Indian Coast is a very neglected group. Except for taxonomic studies and a few stray observations on their life history practically nothing is known of our freshwater turtles. In Table 1, a list of the freshwater species of turtles and tortoises occurring in India is given and of these Indian softshelled turtle *Lissemys punctata punctata*, Indian tent turtle *Kachuga tecta tecta*, Peacock marked soft-shellled turtle *Trionyx hurnum* and three Keeled turtle *Geoemyda tricarinata* find a place in Schedule I of the Wildlife (Protection) Act 1972. While the Act in Schedule I mentions, Tortoise (Testudinidae, Trionychidae) it will be desireable to specify the species, once more information becomes available. There is an urgent need for a critical appraisal of the population structure and hibitat of the species of freshwater turtles to see whether any species needing protection have been left out. The status survey currently being conducted by Professor E.O.Moll, Vijaya and Satish Bhaskar in India should bring to light very useful information. While we eagerly look forward to their report, we take an opportunity to record some observation made in West Bengal on freshwater turtle trade. The people of West Bengal, while they shun marine fish do not mind consuming sea turtles as well as freshwater turtles. The trade in freshwater turtle in the West Bengal market is one of long standing and as late as 1983 season there was no indication of any diminution in the trade.

Table 1. *List of fresh water species of turtles occurring in India*

Scientific name	Common name
Family: Emydidae (Hard-shelled Freshwater turtles)	
Batagur baska	The common Batagur or Tuntong
Cuora amboinensis	Amboina or Malayan box turtle
Hardella thurji	Brahminy river turtle
Morenia petersi	
Geoclemys hamiltoni	Black pond turtle
Kachuga tecta tecta	Indian *tent turtle*
Kachuga tentoria	
Kachuga tentoria circumdata	
Kachuga smithi	
Kachuga dhongoka	
Kachuga kachuga	
Kachuga sylhetensis	
Heosemys silvatica	
Melanochelys tricarinata	Tricarinate turtle
Melanochelys trijuga trijuga	Common pond terrapin
Melanochelys t.indopenisularis	
Melanochelys t. thermalis	Common hard shelled terrapin or Ramnad pond turtle
Melanochelys t. coronata	Malabar pond terrapin
Cyclemys mouhoti	
Cyclemys dentata	
Family: Testudinidae (Tortoises)	
Geochelone elegans	Indian star tortoise
Geochelone (Manouria) emys	Burmese brown tortoise
Geochelone elongata	Red nosed tortoise
Geochelone travancorica	The Travancore tortoise
Family: Trionychidae (Soft shelled turtles)	
Lissemys punctata punctata	Indian spotted flat shelled turtle
Lissemys punctata granosa	Southern soft shell turtle
Chitra indica	Narrow headed soft shelled turtle
Trionyx gangeticus	Ganges soft-shell turtle
Trionyx leithi	Nagpur soft-shell turtle
Trionyx hurnum	Peacock soft-shell turtle

Observations in West Bengal

During November and December 1982, when the CMFRI team visited Calcutta and adjacent places, the sale of freshwater turtles was noticed at the Howrah whole sale fish market and Shealdah fish market. At Shealdah the freshwater turtle *Lissemys punctata punctata* was mainly sold in large numbers. They were stored alive and sold in stalls in the fish market and were also sold openly on the footpath on Mahatma Gandhi Road every afternoon. During the visit on 17th December '82 it was noticed that more than 100 turtles were kept for sale inside the market and these were sold by weight and some were slaughtered and the meat sold by weight. Outside the market the turtles were sold alive at the rate of Rs.9 per kg. About 500 turtles were kept for sale on 17th December '82 and of these about 300 turtles were in the weight range of 2 to 3 kg (plastron length 19-21 cm; plastron width 12-14 cm) about 200 turtles in the range 1 to 2 kg (plastron length 13-15 cm and plastron width 8-9.5 cm). Customers who purchased more than one kg of turtle were given a few fresh water turtle eggs free of cost. It is understood that fresh water turtle trade activity at Shealdah market happens only in the afternoon hours.

The team again visited Calcutta and Contai in February and March 1983 and gathered additional information on freshwater turtle trade. Contai fish market was visited on Sunday 20th February '83 and sale

*Prepared by M. Rajagopalan and S.S. Dan

Freshwater turtles for sale at Shealdah market, Calcutta.

A buyer of freshwater turtle at Shealdah market.

Turtle seller displaying his wares at Contai fish market

A close-up view of *L. punctata punctata*, Indian soft shell turtle.

of the fresh water turtle *L. punctata punctata* was noticed. From the enquiry it was found that the turtles were brought from Howrah whole sale fish market every Sunday and resold at Contai. The details of measurements of *L. punctata punctata* in cm taken from the specimens kept for sale are as follows:

Carapace length 18-28 (24.7)	Carapace width 15-23 (18.4)
Plastron length 13-31 (20.2)	Plastron width 12-24 (16.1)

During February and March 1983 also freshwater turtle trade was noticed at Howrah wholesale fish market and Shealdah fish market. At the Howrah market on 22nd February '83 more than 50 turtles of two species *Chitra indica* and *L. punctata punctata* were noticed. They were sold at the rate of Rs. 8 to 9 per kg. Details of measurements of turtles in cm are given below:

Chitra indica	Plastron length 41-50	Plastron width 36-49
L.punctata punctata	Carapace length 18-26	Carapace width 16-23
	Plastron length 13.5-24	Plastron width 12-20

On 22nd February '83 when the team visited Shealdah market, the sale of fresh water turtles were again in evidence and the species mainly *L. punctata punctta*. Details of measurements in cm of six specimens are as follows:

Carapace length 19-27 (23.6)	Carapce width 16 23.5 (19.9)
Plastron length 13-30 (21.2)	Plastron width 11 20 (15.5)

From the enquiry it was found out that the trade in freshwater turtles goes on throughout the year despite the protected status of the species. The freshwater turtles are collected from Naraj, Golari, Paguda and Tickkerpara in Orissa and transported to Calcutta. The important centres in Uttar Pradesh from where turtles are booked by rail to Calcutta are Sikendara Road, Izatnagar, Bednam, Bhogipura and Collegeganj. From our observations it is evident that freshwater turtles are received at Calcutta markets regularly from one source or another despite the protection afforded under the Wildlife (Protection) Act. The sign boards displayed by the West Bengal Forest Department prohibiting sale of turtles and turtle products mentions the protection of marine species only.

General remarks

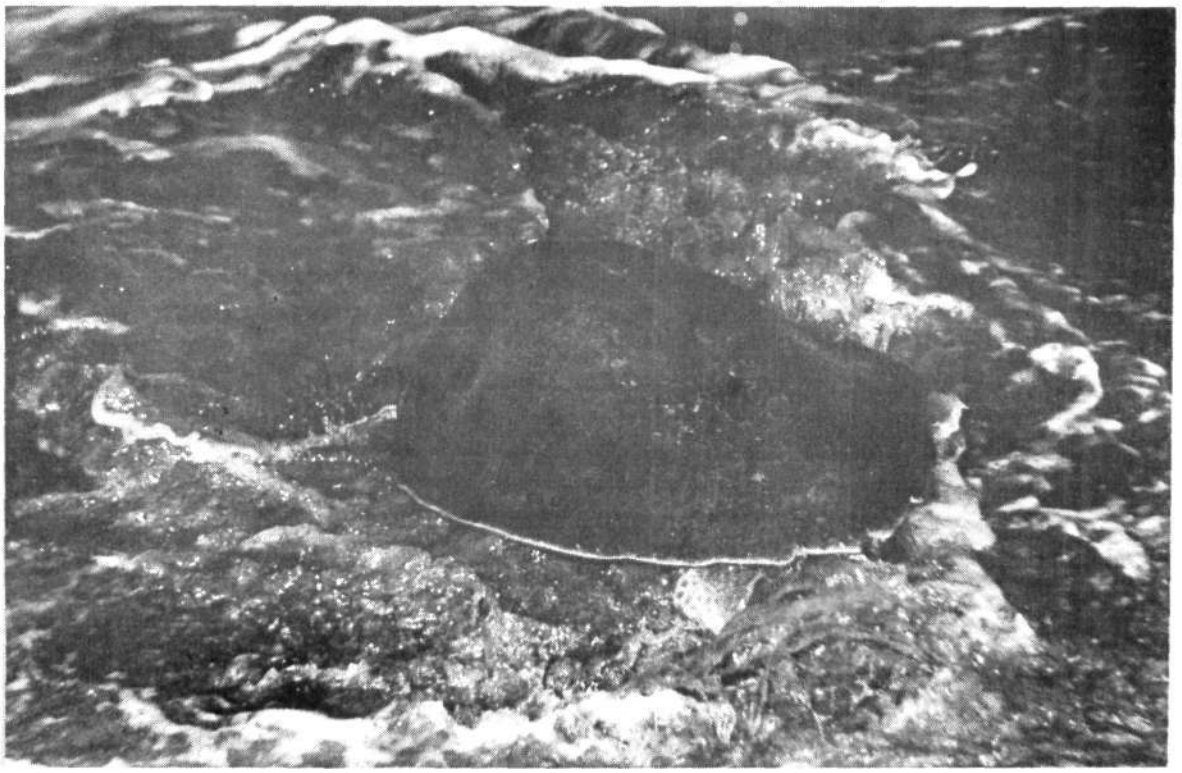
The study of freshwater turtles and their life history, ecology and behaviour need to be intensified in order to understand

a. their population structure and behaviour,
b. reproductive potential,
c. habitat limitations; and
d. effect of pollutants on turtles and so on.

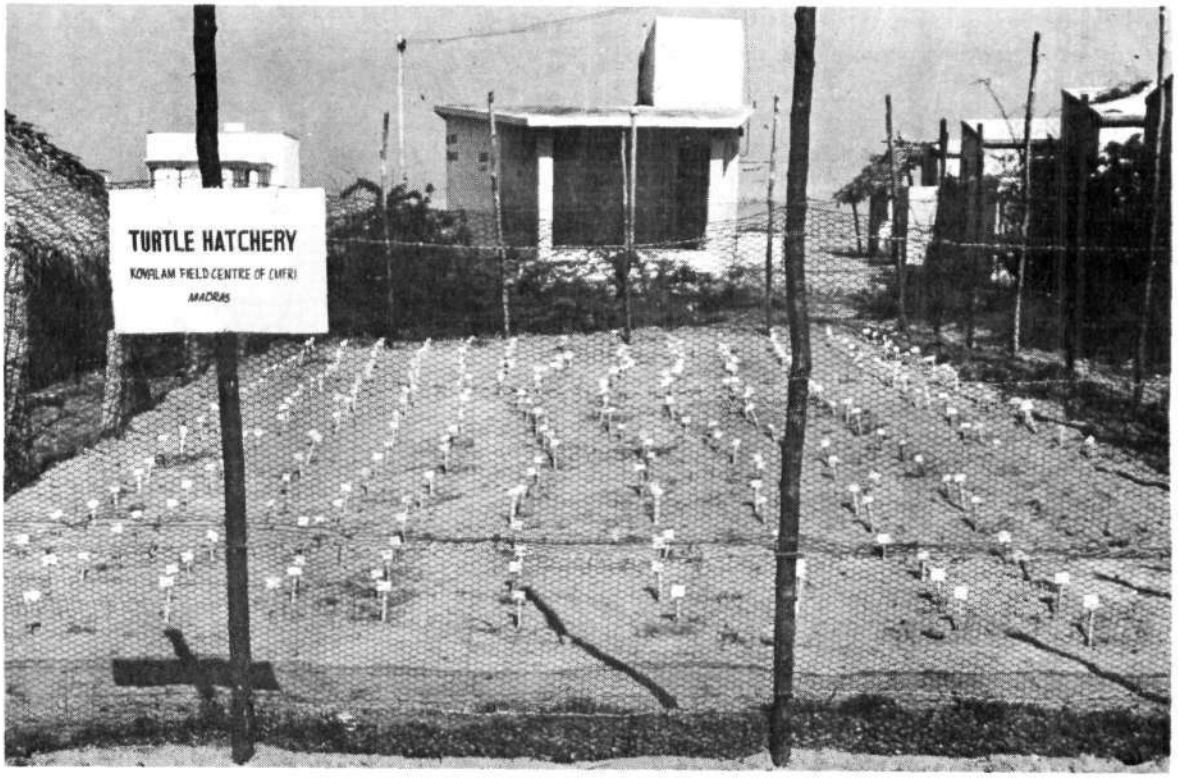
There is also a need for an active extension programme to make available information on turtles and tortoises to the public particularly educational organisations, if any effective management measures are to be developed.

The authors are thankful to Dr. E.G. Silas, Director of CMFRI for his constant encouragement and guidance.

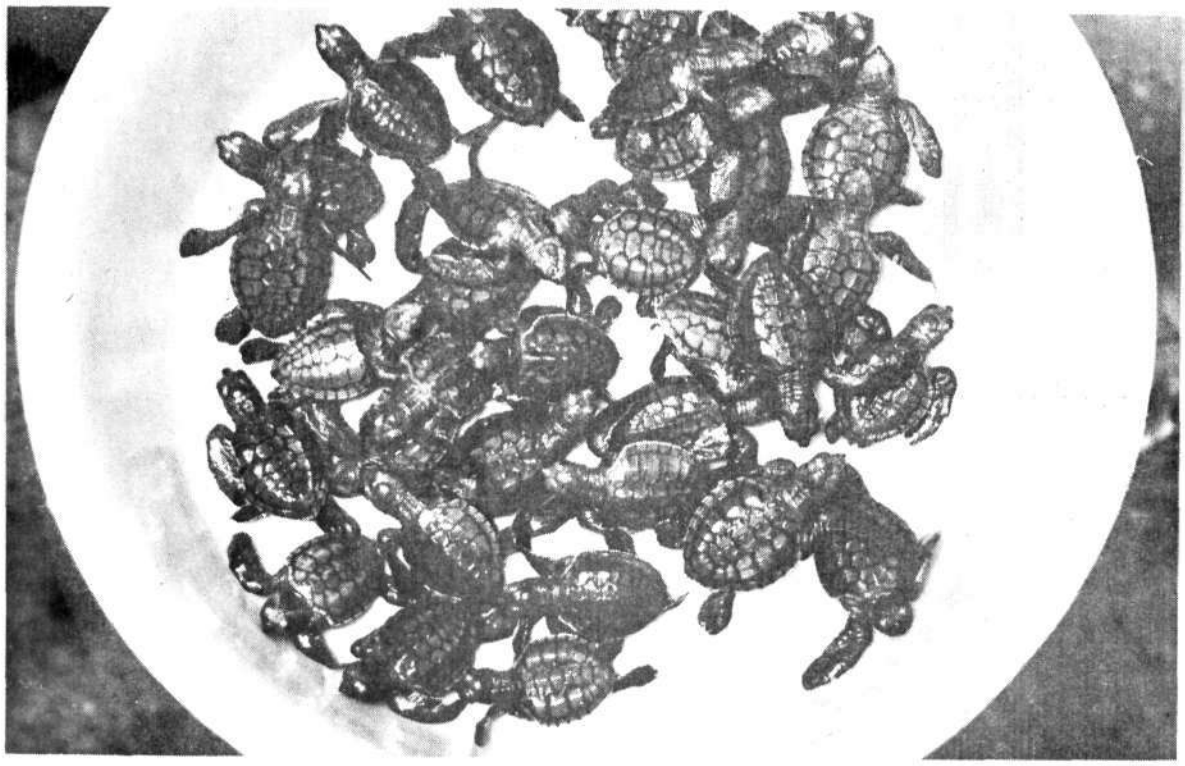
CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
TURTLE HATCHERY PROGRAMME, KOVALAM, MADRAS



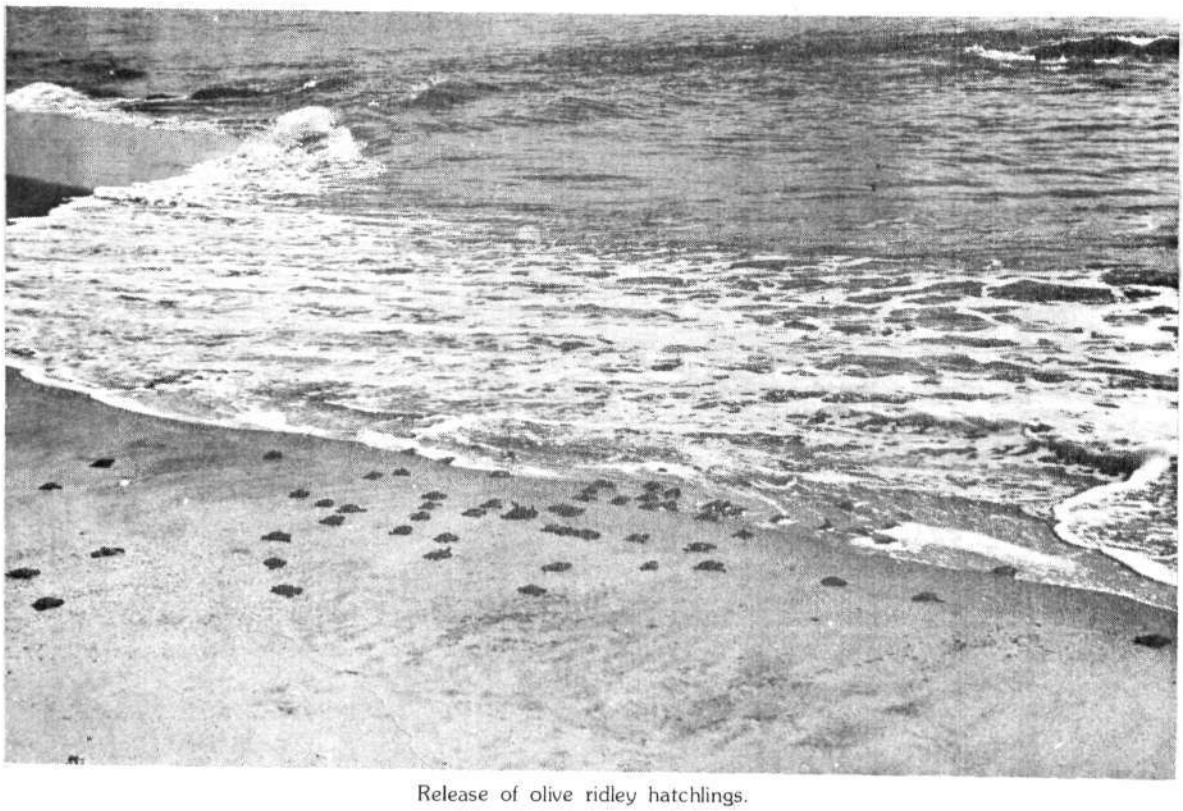
Back to sea after nesting.



Turtle hatchery at CMFRI, Kovalam.



Newly hatched olive ridley.



Release of olive ridley hatchlings.

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