



Kachhapa

A Newsletter for the Indian Ocean on Sea Turtle Conservation and Management



EDITORIAL

Contemporary Science or Interference?

The inclusion of modern thought and science into traditional management practices

ARTICLES

Marine Turtles of Lakshadweep Islands, India
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AND

23rd Annual Symposium on Sea Turtle Biology and Conservation
Announcement and Registration

***Issue No. 7
September, 2002***

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Since this newsletter hopes to serve as a link for coastal and marine conservation, the more people we can reach, the more effective it will be. You can help by passing the newsletter around to people and organizations who are interested, and by helping us build up our mailing list. Please send us names and addresses of individuals, NGOs, research institutions, schools and colleges and anyone else who would be interested in receiving Kachhapa.

CALL FOR ARTICLES

Kachhapa, the newsletter, was initiated to provide a forum for exchange of information on sea turtle biology and conservation, management and education and awareness activities in the in the Indian subcontinent, Indian Ocean region, and south/Southeast Asia. The newsletter also intends to cover related aspects such as fisheries and marine biology. Kachhapa articles are peer reviewed. Kachhapa will come out two to three times a year. We request all our contributors and readers to send us information from their part of the subcontinent or Indian ocean region, including notes, letters and announcements. We also welcome casual notes, anecdotal accounts and snippets of information.

OPINION

In addition to information and articles, we now invite your opinion on subjects related to turtles, their habitats and conservation.

BIBLIOGRAPHY

We plan to publish a complete bibliography of literature on sea turtles in the Indian subcontinent in the near future. Meanwhile, the bibliography will be available at our website. We would welcome any additional references that we have missed and copies of articles, papers or reports that are absent from the bibliography.

ALL MATERIAL SHOULD BE SENT TO:

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And / Or by email to:

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Email attachments should be sent as text files or Word 2000 documents (or any older version of Word). Please refer to earlier issues for formatting articles and references.

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Editorial
Contemporary Science or Interference?
The inclusion of modern thought and science into traditional management practices

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It has long been brewing, and will for many more moons, this conflict between resource users and managers who promote traditional resource management practices, and modern day 'know-it-all' scientists. Much has been said about the value of traditional resource management practices that date back several hundred years, and many believe that modern-day conservation would be useless without drawing on these ancient customs. These practices are built-upon to create what are often termed 'community conservation methods' or 'traditional resource management', while excluding modern thinking and knowledge.

While there are communities which are happy to embrace so-called modern knowledge and conservation approaches, there are others who eschew these in favour of the older traditional methods. Personally I think that in today's modern world, it is doubtful there can be a successful 'traditional management scheme' without the input of modern science. For the record, I am in the scientist group, but at the same time I am constantly trying to work with the traditional resource manager group. Some of my earlier reflections on this subject went along the lines of "What makes us (as a whole) think that advocating community conservation projects using traditional management schemes without outside (modern science) input is feasible?" "When have traditional communities ever heard of PCBs, or of all the products that get washed into our waters daily?" "When have they ever had to deal with foreign commercial fishing fleets?" "When have they ever had to deal with artisanal versus commercial domestic fishing disputes?" And that brings me to the discussion at hand.

Can traditional management practices succeed in today's environmental climate without the input of modern science? I think not. I think there needs to be a dramatic shift away from solely traditional methods in favour of a combination of science and tradition. This is not to say it is not being practiced in some parts of the world, merely that those who

believe science has little to contribute to practices that have been handed down through generations need to wise up to the fact that their world is not the one inhabited by their ancestors' ancestors. Many modern threats never existed in the days when what are now referred to as 'traditional community conservation methods' were applicable. Today, those communities who believe they can succeed with their traditional conservation approaches and who oppose outside input need to understand that the pressures they face are not those of the 'good old days' but rather the reality of modern threats and their resulting resource use and habitat degradation.

Let's stop and reflect for a moment: In the last thirty years the global population has increased threefold. And we're talking billions here. From two to six *billion* people. Nearly 60% of the population in South and Southeast Asia is believed to live near the coast. Mere numbers and lifestyle patterns tell us this must have caused a tremendous increase in pressure on the environment, particularly our seas. I'll bet few traditional leaders ever experienced a fourfold increase in the numbers of people in their villages in thirty years (or their leadership period) even in the last two hundred years, and the resulting increase in demand for natural resources. The industrial revolution over the last 200 years similarly has brought the planet to a state of resource-utilisation far beyond anything that could have been envisaged by rulers of days past. Mankind creates hundreds of new chemicals each month, and many of these find their way into the oceans. Supertankers carry bulk crude oil around the globe, and hundreds of ships each day traverse delicate marine ecosystems. Fishing fleets fish down the food chain in a never-ending quest to meet developed and developing country markets and needs.

It is really only modern science and technology that has the capacity to detect and measure many of these changes and threats. I know of few local communities who have the ability to determine if carcinogens are present in their traditional fishing

waters for instance, or who can estimate the impact on coastal fisheries by commercial trawl fleets - and without that kind of input, communities implementing conservation programmes based on traditional resource management approaches will rarely be effective. What's more, I believe that many of what are commonly referred to as 'traditional conservation practices' were more likely simply 'efficient use' practices back in their day - keeping in mind that the objective was the harvesting of a particular species - and that these practices evolved over many centuries of mistakes - as we are making today, and that they would be no more useful today in the form remembered by village elders than a Kelvinator washing machine with no electricity. In many cases, when there was lots of something, it was harvested, and when there was less, a ruler stepped in and told everyone to stop for a while. That is, many older management approaches were likely reactive rather than proactive.

So how does any of this relate to sea turtles? In so many ways: Only through modern tagging and satellite tracking have we understood the actual migrations that sea turtles undertake. Only modern biological assays are helping understand green turtle fibropapillomas and their origin (in fact, these are probably a result of the modern threats that a traditional ruler would not have had to deal with anyhow). Only through genetic marker testing has science defined matriarchal lineages and clarified the existence of ecologically significant, discrete reproductive units. Only with the modern development of TEDs have turtles been spared from trawler-related mortality (again a modern threat not anticipated by traditional rulers).

Also related to sea turtles, one of the problems that exists is the overwhelming lack of knowledge among many traditional turtle or egg takers, who often are unaware of the age-to-maturity and low-survival rates common to sea turtles and who rarely understand issues of inter-seasonal intervals (although several cultures understand within-season movements such as the two week interval between nests). Few communities realise turtles don't nest every year. Even fewer realise how long it takes them to reach maturity, or just how few eggs make it to adult-hood. These are all knowledge gaps that have been filled by modern day science. Several communities have traditional turtle management practices that are still in effect today. In Palau for instance, there are size restrictions (taking only the

larger turtles, which are now understood by science to be among the most valuable biologically) and seasonal closures based not on nesting periods but rather the periods in between, when most turtles likely emigrate to their foraging pastures. In Malaysia there was a maximum permissible percentage of egg take - typically about 90%, which has proven unfeasible following the decline of the leatherback population off Terengganu.

Clearly the answers provided by modern science and the solutions to modern-day threats are critical to any conservation strategy. Don't get me wrong: I do not advocate using solely modern conservation practices dreamed up by bureaucrats in some plush office. I do see the need to incorporate community values, cultures and traditions, but only so both sides come together to reflect efficient practices which incorporate the value of science and modern technology in helping learn what we need to learn in order to really make a difference. Today, there can be no such thing as a community conservation programme using only traditional resource management approaches except for in a very few discreet cases. There can be, however, conservation programmes that are based on traditional conservation methods, but which incorporate modern knowledge, about our planet in its current state, our knowledge of modern impacts upon it, and with some modern solutions.

So what should we do? There is a true need for us scientists to communicate what we know in an easy-to-understand manner, something which we are not particularly good at; and to turn many of our findings into effective conservation practices, again something we rarely do. Classic examples of these failures are reflected in the dearth of popular, easy to read and accessible literature on turtles, and the profusion of scientific, not-for-your 'typical community leader' journal articles. Hatcheries supported by scientific projects which do not make use of the latest information on biological developmental needs of turtles. Poorly designed head-starting programmes. The lack of promotion of trans-border agreements when we know of turtle migrations. On the other side of the coin are the traditional managers who scorn modern science. I know of a hatchery program where the management clearly refuses to use modern day knowledge, such as the effects of hatchery retention on turtle hatchlings' orientation and swimming behaviour.

We know keeping hatchlings for a day or two in tanks robs them of their natural inclination to swim offshore, yet the hatchery continues to do so. In other cases it concerns the use of metal enclosures: we know metal cages confuse hatchlings, yet many hatcheries continue to employ them. Let's all

understand these failings, and be more proactive about using the knowledge that we possess, be it traditional, technical or scientific for the better common goal, and let's see a reversal in the decline of today's sea turtle populations in our present lifetime.

Marine Turtles Of Lakshadweep Islands, India

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Introduction

Five of the seven species of sea turtles viz. olive ridley (*Lepidochelys olivacea*), green turtle (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), leatherback turtle (*Dermochelys coriacea*) and loggerhead turtle (*Caretta caretta*) are reported to occur in Indian waters (Kar & Bhaskar, 1982). The first survey of sea turtles in Lakshadweep was conducted during 1976 (Bhaskar 1978a&b, 1979a&b). Besides, Central Marine Fisheries Research Institute records (Silas 1984a&b, Lal Mohan 1989) indicate that these four species of sea turtles occur and nest in the Lakshadweep Islands. While Satish Bhaskar worked extensively on green turtle nesting in Suheli Valiakara, a seasonally inhabited island, during the monsoon (Bhaskar, 1979 a&b, 1980), the information available from other islands on sea turtle nesting is very limited and no detailed work has yet been done in any of the islands of Lakshadweep.

The Lakshadweep, Maldives and Chagos Archipelagoes are located on the 2500 km long North-South aligned Maldives Ridge (Chagos-Laccadive Plateau). There is a possibility of migration of sea turtles between Laccadive, Maldives and Chagos Archipelago. Hawksbill and green turtles are also found to the southwest in Seychelles and Madagascar midway between the African coast and west coast of India, and there may be a significant migration and exchange of sea turtle populations in the western Indian Ocean. With this background, the Wildlife Institute of India conducted the survey of the islands from July 2001 to May 2002, under the GOI –UNDP Project.

Study area

The Lakshadweep Islands are irregularly scattered in the Arabian Sea between 8° to 12° 30' north latitude and between 71° to 74° east longitudes. There are 36 islands (see map) including 12 tolls, 3 reefs and 5 submerged banks covering an area of 32 km² land, 4200 km² of lagoon and 40,000 km² of oceanic zone. Among the 36 islands, only 10 are inhabited and the rest are seasonally inhabited or uninhabited islands (Anonymous, 2000). At present, except Pitti island, no other area of Lakshadweep is protected by law.

Methods

Secondary sources of information: Extensive interviews with islanders, fishermen and officials from the Forest and Fisheries Departments were carried out in all the inhabited islands. A total of 300 persons were interviewed in the islands of which 37 % were islanders, 36 % were seagoing fishermen and 27 % were others. A standard questionnaire (Schroeder & Murphy, 1999) was followed. During the interview, they were primarily asked about the species of turtles that occur and nest in their islands, season of nesting, threats to sea turtles and turtle byproducts used in the islands.

Survey of turtle abundance and foraging habitat: The distribution of turtles in foraging areas was determined by offshore surveys of lagoons and nearshore waters by a country craft and by snorkeling. Turtles of different species were recorded while foraging, resting and swimming in the water. The presence or absence of seagrass in the lagoon waters was also documented for

assessment of the habitat availability and habitat preference by green turtles. A total of nine island lagoons were surveyed by snorkeling and ocular observation from a boat.

Survey of nesting beaches: The direct ground survey of all islands of Lakshadweep was conducted from August 2001 to February 2002. All the island beaches were covered by foot several times during the survey period. Nesting was confirmed from crawl marks, nesting pits, eggs, live/dead hatchlings and carcasses & other remains of turtle (shells & carapace) washed ashore. Selected nesting beaches were monitored during night to witness species of turtles nesting in the islands. The presence/absence of habitation, beach vegetation, beach substratum and beach armoring and other developmental activities and their levels of impact on the nesting beach were determined for assessment of threats to turtles and nesting beaches in Lakshadweep

Results & Discussion

Secondary sources of information - Although there is some confusion in identifying olive ridleys and green turtles by the islanders, the other two species viz. leatherback and hawksbill are clearly recognized in Lakshadweep. It was found from interviews that nesting beaches in Lakshadweep were dominated by the green turtles, followed by olive ridleys and hawksbill turtles. However, the nesting season of each species could not be ascertained from such interviews. Most interviewees in Agatti island felt that green turtles occur in the lagoon throughout the year whereas hawksbills are commonly seen during pre-monsoon and olive ridleys after December and rarely after April.

Survey of turtle abundance in the lagoon - Different size classes of green and hawksbill turtles are often caught in gillnets during lagoon fishing. During the survey, juvenile, sub-adult and adult green and hawksbill turtles were caught in gillnet during fishing in the lagoons of Agatti, Kavaratti and Minicoy. Most of the juvenile, sub-adult and adult turtles (green & hawksbill) were observed in the deeper part of the lagoon and outside the reef between the depths of 2-5mts. Green turtles were the most abundant species and olive ridleys were observed only occasionally outside the reef or in the lagoon. Among the different islands, Agatti had the maximum number of green turtles in the lagoon followed by Minicoy and Kadmat.

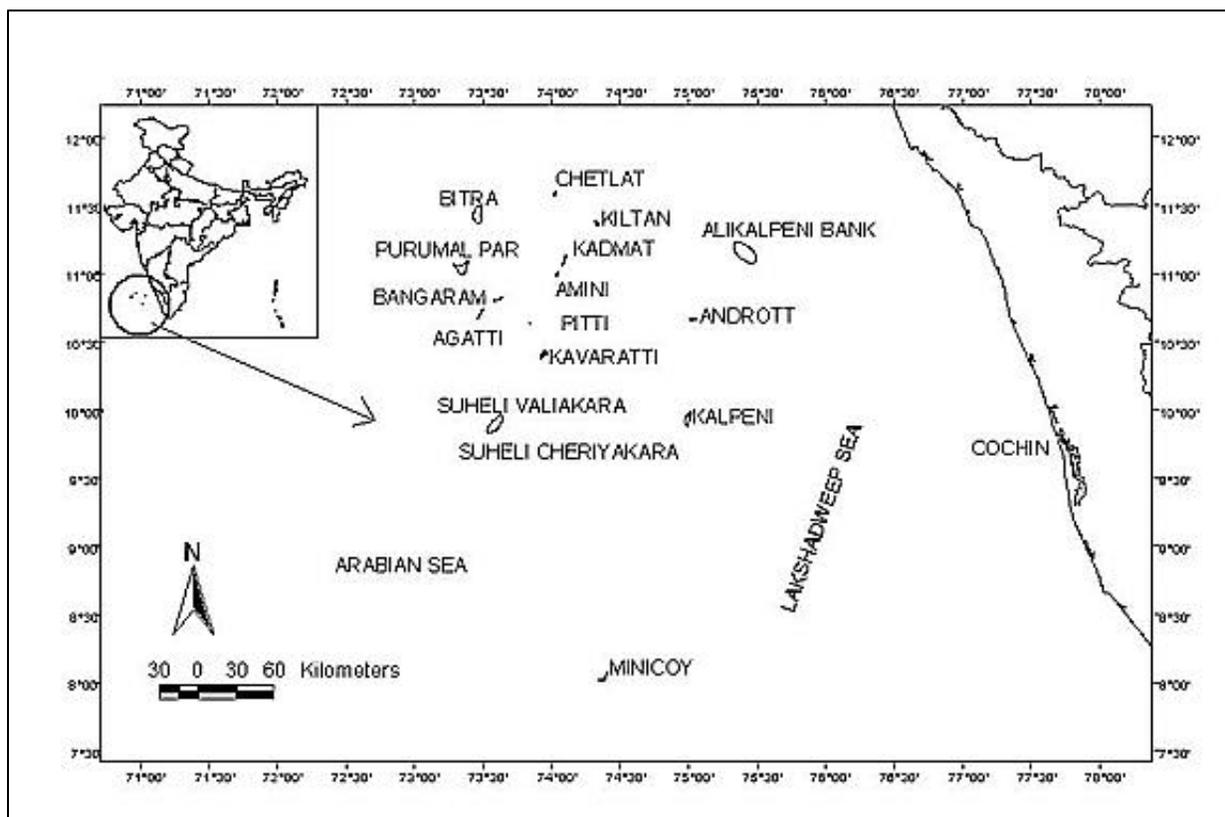
Survey of foraging habitat - A total of 9 island lagoons were surveyed for foraging habitat analysis. The maximum seagrass coverage in the lagoon was observed in Minicoy (55.5%) and Kadmat (52%) lagoon. However, in terms of turtle abundance, the Agatti island had the maximum foraging turtles in the lagoon. Therefore, no definite correlation could be established between presence of seagrass and foraging of turtles in the lagoon, but this needs to be more carefully studied.

Survey of nesting beaches - Approximately 130 km of coastline was surveyed in the entire island group of Lakshadweep. All sandy beaches available, mostly with vegetation were found to be suitable areas for sea turtle nesting. All the beaches where turtle nesting was observed were narrow (5-10 m) with dense beach vegetation of *Scaevola sericea*, *Thespesia spp.* and *Pemphis acidula* shrubs in the background. During the survey, nesting of three species was documented (Table 1). The number of nests estimated included old and new nests and live nesting observed. Among the three species viz. green, olive ridley and hawksbill turtles, the green turtle was the dominant species in all islands. However, the maximum number of green turtle nests were observed in Suheli Valiakara followed by Tinnakara and Parali I islands, all of which are uninhabited islands.

Threats to sea turtles - Carapaces of green turtle were found in uninhabited/seasonally inhabited islands viz. Tinnakara, Parali I & II, Suheli Valiakara and Cheriya island. According to fishermen, green turtles are generally caught during nesting and slaughtered for extraction of oil, which is used for painting country boats as this works as an excellent waterproofing agent. Many people differentiate green and olive ridley turtles by the quality and quantity of oil and the former is preferred because of its oil content. There is no consumption of turtle meat and eggs due to Islamic religious taboo. However, the stuffing of juvenile hawksbill turtles is still in practice in many islands. The stuffed specimens fetch about Rs. 500/- to Rs. 1500/- and are sold to tourists or in the mainland at Mangalore, Calicut or Cochin. There is no incidental fishing related mortality in Lakshadweep, as the fishing method is very different from the mainland coast. The only method used for tuna fishing is pole and line, which pose no threat to sea turtles.

Table 1. Sea turtle nesting in different islands of Lakshadweep (2002)

Name of the island	Area (km ²)	No. of nests encountered		
		Green turtle	Olive ridley	Hawksbill turtle
Kavaratti	4.22	2	3	-
Agatti	3.84	80	16	6
Kalpitti	0.02	4	-	-
Kiltan	1.63	3	-	-
Chetlat	1.14	7	-	-
Bitra	0.1	6	-	-
Andrott	4.84	2	6	-
Kalpeni	2.79	4	6	-
Kadmat	3.12	11	6	-
Amini	2.59	8	-	-
Minicoy	4.39	10	2	-
Suheli Valiakara	0.29	358	-	7
Karingikuppu	0.02	5	48	-
Suheli Cheriyakara	0.28	4	-	-
Tinnakara	0.42	54	-	-
Parali I	0.02	38	-	-
Parali II	0.02	18	-	-
Bangaram	0.58	6	2	2
Viringili	0.02	2	-	-
Pitti	0.02	10	-	-
Total		632	89	15



The immediate threat to sea turtles and their nesting beaches in Lakshadweep is beach armoring, human habitation reaching closer and closer to the beach, lighting and clearing of beach vegetation for coconut plantation. Amongst these, beach armoring is the most serious threat as it leaves little or no space for turtles to nest once the concrete tetrapods are positioned on the beach to check erosion. Tourism in the lagoons and on the islands is slowly becoming an additional pressure for sea turtles due to disturbance during foraging and nesting.

Recommendations

1. All species of sea turtles occurring in Indian waters are listed as endangered and are included in Schedule I of the Indian Wild Life (Protection) Act, 1972. The department of Environment and Forests, Lakshadweep has banned killing and poaching of turtles but due to lack of staff in far reaching islands this is ineffective. Therefore the department needs to be strengthened to check illegal poaching. Also, the Government of Lakshadweep should provide a subsidized substitute for green turtle oil to the islanders to discourage killing of turtles for oil.

2. Beaches with natural vegetation of *Pemphis* and *Scaevola* appear to be favorable for sea turtle nesting. Therefore such vegetation near the beach should not be removed and their role in forming sea turtle nesting beaches should be studied.

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3. There should a be complete ban on coral collection, sand mining and removal of other natural resources from the island coasts for any purpose. This will help to check beach erosion and eliminate the need for beach armoring.

4. Developmental activities such as human habitation, lighting and beach armoring need to follow the guidelines of coastal zone management plan Act, 1997 of Lakshadweep.

5. An effective, education campaign should be started in all islands on the importance and benefit of turtles to islanders. Sea turtle based tourism has a bright future in Lakshadweep, which in turn could benefit the islanders but it should be monitored carefully.

6. The high intensity turtle nesting areas such as Suheli Valiakara, Tinnakara and the most important green turtle foraging grounds such as the Agatti lagoon should be declared as protected areas with permission for artisanal fishing practices only.

Acknowledgements - We thank the Wildlife Institute of India, Dehradun and Government of India – United Nations Development Programme's Sea turtle project for funding support. We acknowledge the Lakshadweep Administration for permits, logistic support and Environment and Forest Department for help during the survey work.

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Beach Armouring in Lakshadweep



Status of Sea Turtles along the Tamil Nadu Coast, India

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Introduction

All five species of sea turtles, leatherback (*Dermochelys coriacea*), olive ridley (*Lepidochelys olivacea*), loggerhead (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*) and green turtle (*Chelonia mydas*), found within Indian limits are reported along the Tamil Nadu coast (Kar and Bhaskar 1982). Barring the loggerhead, all the other species are reported to nest along the coast of this state. Several institutions such as the State Forest Department, Central Marine Fisheries Research Institute (CMFRI), Madras Snake Park Trust (MSPT) and Student's Sea Turtle Conservation Network (SSTCN) have been involved in sea turtle conservation in this part of the country (Valliappan and Whitaker 1974, Whitaker 1977, Agastheesapillai and Thiagarajan 1979, Bhaskar 1981, Silas and Rajagopalan 1984, Shanker 1995, Rajagopalan *et al.*

1996). The Chennai (Madras) coast is being monitored annually by SSTCN since 1988 (K. Shanker, pers. comm.).

Sea turtles are reportedly declining all over the world due to habitat loss, mortality due to unscientific fishing practices and exploitation for food (Limpus 1995). Mortality of thousands of olive ridleys has been reported in the mass nesting areas due to incidental catch in the fishing gear (Pandav *et al.* 1998). Mortality in the breeding ground will lead to severe population decline as matured individuals are eliminated forever. Also, sea turtles require several years to attain sexual maturity. In addition, they are also exploited by humans for meat and eggs all over their range. Available information on the sea turtles along the entire coast of the country is largely anecdotal, and is restricted with respect to area or time. In this background, the Ministry of

Environment and Forests, Government of India initiated the GOI-UNDP-WII Sea Turtle Conservation Project covering all maritime states of the country to determine the status of sea turtles along the entire coastline. As a part of this project, the Salim Ali Centre for Ornithology and Natural History (SACON) has conducted field surveys along the Tamil Nadu coast from November 2000 to May 2001. In the present paper we report the status of sea turtles along the Tamil Nadu coast, and propose measures for conserving them.

Field methods

- Tamil Nadu, with 980 km coastline has both east (900 km) and west (80 km) coasts (Fig 1). Methods followed for data collection are given below.
- A preliminary survey was conducted along the entire Tamil Nadu coast during November-December 2000 recording coastline characteristics such as sand, rock, mangrove and swamp at every 10-15 km. Sandy beaches were considered suitable for sea turtle nesting, and rock, swamps and development activities as unsuitable for the same.
- Based on the preliminary surveys, locations for intensive studies were short-listed. Fortnightly monitoring of beaches during the olive ridley nesting season (December-April) were done along the Nagapattinam, Rameswaram and Tiruchendur - Kanniyakumari coasts.

- In addition, a co-ordinated survey was done from January 20 to February 20, 2001 covering most parts of the Tamil Nadu coast to assess the overall sea turtle nesting.
- Field survey started at 0500 hrs continued up to 0800 hrs. On an average, 10 km was covered in a day. Information on the nest predation, mortality of turtles and reasons for the death were recorded. Select village markets were monitored to quantify exploitation of sea turtles by local people.

Results and discussion

Status of Tamil Nadu coast - Of the 980 km shore, about 821 km was surveyed during the preliminary study which include 79 localities. About 530 km (65%) of the coast had sandy beaches, and are assumed to be suitable for sea turtle nesting (Table 1). Human habitations and related development activities, and rock and swamps occupied the remaining portion of the coast. Even though a majority of the west coast and east coast along Kanniyakumari-Tiruchendur were sandy, the area was highly disturbed due to sand mining. Sea walls built to protect the land from sea erosion provided no space for nesting in parts of the west coast. Also, the interface between the sea and human habitation was minimal (<5 m) in parts of this sector.

Table 1. Beach characteristics of Tamil Nadu with reference to sea turtle nesting

Coastal sector	Sampled (km)	Nesting suitability		Unsuitable beach for nesting		
		Suitable	Unsuitable	Rocky	Development	Swamp
West Coast	63	50	13	10	3	0
Kanniyakumari- Tiruchendur	78	72	6	4	2	0
Tiruchendur- Tuticorin	41	30	11	0	11	0
Tuticorin- Mandapam	114	102	12	12	0	0
Rameswaram Island	38	15	23	8	15	0
Mandapam- Thondi	69	36	33	0	0	33
Thondi-Athirampatinam	80	15	65	0	5	60
Athirampatinam- Nagapatinam	107	44	63	0	13	50
Nagapatinam-Cuddalore	90	60	30	1	14	15
Pondicherry - Chennai	141	110	31	1	30	0
Total	821	534	287	36	93	158

Fig. 1. Map of Tamil Nadu showing coastal districts



Coastal districts			
1. Tiruwallur	4. Cuddalore	7. Thanjavur	10. Tutucorin
2. Kanchipuram	5. Nagapattinam	8. Pudukkottai	11. Tirunelveli
3. Vilupuram	6. Thiruvarur	9. Ramanathapuram	12. Kanniyakumari

Composition of turtles - The composition and abundance of turtles were based on number of nests, dead turtles observed on the beach, and in select village markets. Totally, 516 observations of five species were made during this study. The most common species was the olive ridley followed by the green turtle. The turtle composition of the Gulf of Mannar and Nagapattinam was different. Along the coast of Nagapattinam, olive ridleys and green turtles were observed, of which the former constituted 98.1%. In the Gulf of Mannar, olive ridleys (59.6%) and green turtles (35.2%) together constituted 94.8%, while the other three species were rare and constituted only 5.2% of the total.

Nesting - The olive ridley does not show any pattern with respect to their arrival and departure for nesting along the Kanniyakumari coast and Gulf of Mannar. However, along the Nagapattinam coast, turtles emerged for nesting during the second half of December and continued up to first half of April with the peak during the second half of February

(Table 2). An estimated 1080 nests (22/ km) were seen in the 50 km of this coast (Table 2). In other areas, such as Rameswaram and Kudankulam-Tiruchendur (Gulf of Mannar), it was about 1 and 3 nests/km respectively. It appears that the Gulf of Mannar is largely a feeding ground for turtles rather than a nesting area.

Co-ordinated sampling along the entire coast during 20 January – 20 February 2001 showed that turtles nested comparatively higher north of Point Calimere up to Chennai. The estimated frequency of nesting in this sector varied from 0 to 11 nests /km (Table 3). Important areas of turtle nesting are coastline between Tranquebar – Pazhaiyar (Nagapattinam district) and Pondicherry – Chennai.

Both rapid and intensive surveys showed that the nesting of olive ridleys along the Tamil Nadu coast is sporadic, and the estimated number of nests is 2500-4000/ season.

Table 2. Fortnightly nesting of the olive ridley along select sectors of Tamil Nadu

Month & Fortnight	Nagapattinam (50 km)		Rameswaram (15 km)		Kanniyakumari-Tiruchendur (70 km)	
	Nest	Nest/day/10 km	Nest	Nest/day/10 km	Nest	Nest/day/10 km
December I	1	0.2	0	0	0	0
December II	3	0.6	0	0	4	0.6
January I	1	0.2	1	0.5	1	0.1
January II	6	1.2	0	0	0	0
February I	3	0.6	0	0	4	0.6
February II	28	5.6	0	0	4	0.6
March I	14	2.8	0	0	1	0.1
March II	15	3	0	0	0	0
April I	1	0.2	0	0	0	0
April II	0	0	0	0	0	0
Total	72	14.4	1	0.5	14	2
Estimated nest	1080		11		210	
Nest/km	22.6		1.0		3.0	

Table 3. Sea turtle nesting along various sectors of the Tamil Nadu during January-February 2001; Distance sampled per day=10 km, Higher nesting was assumed to occur for 30 days during the peak season

Coastal sector	Distance (Km)	Survey days	Nests	Nests/ night/ 10 km	Estimated nest/ 30 days	Nest/ km
Kanniyakumari-Thiruchendur	80	8	4	0.5	120	1.5
Thiruchendur- Mandapam	60	6	1	0.17	30	0.50
Rameswaram	15	1.5	1	0.67	30	2
Mandapam- Thondi	30	3	0	0	0	0
Point Calimere-Nagapattinam	30	3	4	1.33	120	4
Tranquebar-Pazhaiyar	50	5	18	3.6	540	11
Pondi-Mamallapuram	60	6	7	1.17	210	3.5
Mamallapuram-Chennai	40	4	13	3.25	390	9.8
Total	365	36.5	48	10.69	1440	

Overall nesting intensity in the sampled areas = 4/km

Nest estimate for all over Tamil Nadu coast (980 km) = 3920 nests

Nest estimate for suitable nesting area (637 km or 65%) = 2548 nests

Mortality - A total of 462 dead turtles was observed during this study. Higher number of dead turtles were observed along the Nagapattinam coast (4.5 turtles/ km). Rapid surveys showed that turtle mortality was also high along the Chennai and Pazhayar coasts (Table 4). Incidental catch in the

fishing nets and mechanical injury and exploitation for food are major reasons for turtle mortality. The incidental catch in the fishing gears is wide spread along the Tamil Nadu coast, whereas the exploitation is restricted to the southern parts.

Table 4. Mortality of turtles along select coastline sectors of Tamil Nadu from November 2000 to April 2001

Species	Kanniyakumari-Tuticorin	Mandapam	Nagapattinam	Chennai*	Total
Olive ridley	64 (59)	36 (6)	239	38	377
Loggerhead	0	4 (2)	0	0	4
Green turtle	55 (52)	13 (3)	6	0	74
Hawksbill	2 (2)	2 (0)	0	1	5
Leatherback	1 (1)	1 (0)	0	0	2
Total	122 (114)	56 (11)	245	39	462

* one survey only; No. in paranthesis is number of turtles exploited by locals

Incidental catch - Gill nets are widely used for marine fishing along the Tamil Nadu coast. Of the 245 dead turtles found on Nagapattinam coast, 94 were fresh. Among them, 66 had visible injuries. The head or one of the flippers was missing in eight of them. When turtles get entangled in fishing nets and are found alive, the fishermen chop off their flippers or club the head to remove them from net without damaging the net or themselves. This is common along the Nagapattinam and Chennai coasts. In the southern parts, live turtles are

collected and consumed, and dead turtles discarded in the sea. A higher number of fishing vessels operate in south Tamil Nadu compared to the northern parts i.e. Nagapattinam coast. However, the registered number of vessels are very low compared to the number seen in the field (Table 5). For instance, according to the Fisheries department, there are 1278 fishing vessels registered in the Nagapattinam district. However, interviews and counting in 11 villages show at least 2110 vessels.

Table 5. Statistics of fishing gears in major coastal districts of Tamil Nadu

Statistics	Tuticorin	Ramanathapuram	Nagapattinam
Mehanised boat	361	5973	1278 (2110)
Non- mechanised boat	2617	786	-
No. of Catamaran	1516	-	-
Number of fishing villages	25	149	42
Vessels/fishing village	180	46	30 (192)

Source: Tamil Nadu Fisheries Department; No. in parenthesis is figures obtained based on counts in 11 coastal villages in Nagapattinam district.

Exploitation - The present study showed that turtles were regularly exploited for food along the southern districts especially south of Tuticorin (Table 4). Mandapam is a part of the Gulf of Mannar Biosphere Reserve, and the presence of field staff of the wildlife wing of the Tamil Nadu Forest Department deterred the fishermen from catching turtles. The locals of this area are aware of the Wild Life (Protection Act) 1972, and punishment for hunting wildlife, especially sea turtles. The olive ridley and green turtles were commonly exploited species. Barring protected areas such as Point Calimere Wildlife Sanctuary and Gulf of Mannar Biosphere Reserve, turtle eggs were collected from all over the Tamil Nadu coast. Eggs are consumed by the locals, and about 95.4% (n=87) of depredated nests were stolen by human.

Olive ridley migration - The Wildlife Institute of India (WII), Dehradun had marked about 6800 turtles with monel metal tags along the Gahirmatha, Rushikulya and Devi coasts, Orissa during 1997-99. Two tags were recovered from Kanniyakumari area, the southern tip of the Indian peninsula. The turtle bearing tag WR 26135 was a female and was tagged during the nesting in Rushikulya rookery on 22.03.1998 (Pandav, pers. comm.). The fishermen near Kanniyakumari collected the tag from a dead turtle during mid June 2000 while fishing in the Indian Ocean near their village. This recovery is during the non-breeding season, 27 months after it was tagged at Rushikulya, Orissa. The turtle bearing tag WG 14805, also a female, was marked on 6.1.1999 near Gahirmatha while mating (Pandav, pers. comm.). This and five more turtles were found dead in a gill net during mid November 2000 north of Kanniyakumari (in Bay of Bengal). This tag recovery coincided with the beginning of migration

to the nesting ground. This recovery is about 22 months after it was marked at Gahirmatha. These recoveries confirm the migration of olive ridley from the southern Bay of Bengal and Indian Ocean to the Orissa coast for nesting.

Suggestions for sea turtle conservation

Important measures for sea turtle conservation in Tamil Nadu are given below.

- Subsistence exploitation of sea turtles exists in the southern districts. Exploitation control is suggested as the Gulf of Mannar forms a part of the foraging and nursery ground for turtles, and exploitation in this area would have serious impact on the long term survival of turtles. Intensive beach patrolling by the Forest Department during February and March may reduce egg poaching, and would help in recruitment.
- Live turtles entangled in the fishing nets are beaten (to death?) especially along the Nagapattinam-Chennai coast. Awareness programmes to obtain voluntary support from the local fishing communities for the safe release of turtles and protection of eggs is necessary. This programme should include demonstration of appropriate techniques for removing entangled turtles.
- Regular monitoring and tagging of sea turtles in the Gulf of Mannar, Nagapattinam and Chennai coast would provide further insights on the migration of olive ridleys. Information on the trend in population, nesting intensity and poaching are also important for planning

conservation measures.

- Development of resource personnel is important for long term conservation of a species or ecosystem. Training programmes and workshops may be organised especially for the benefit of field officers of the Forest and Fisheries Departments. Resource persons may also be developed at local levels involving stake holders such as government departments, fishing community, students and research organisations.

Tamil Nadu should be given higher priority in sea turtle conservation programmes as it harbours all

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five species, and holds both breeding and foraging areas of major turtle species.

Acknowledgements - This study was supported by the GOI-UNDP-WII olive ridley sea turtle project (IND/97/964). We thank Dr. Sukhdev Thakur IFS, Tamil Nadu Forest Department; Mr. B.C. Choudhury, Wildlife Institute of India and Dr. V.S. Vijayan, Salim Ali Centre for Ornithology and Natural History for their help at various levels. Drs. P.A. Azeez, Ajith Kumar, Kartik Shanker, P.R. Arun and A. Rajasekaran had gone through the draft manuscript and offered comments

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Marine Biodiversity of Lakshadweep: An overview

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Introduction

The oceans and seas are the most dominant and significant features on this planet, covering over 71 % of its surface. This environmental component, with its vast expanse and sheer volume, is of immense importance to mankind, and serves as the economic lifeline for coastal communities, fish workers and those who sail in its water. Also, the seas and oceans play a pivotal role in shaping the world climate maintaining the water cycle and bio-geo-chemical cycling of elements. It contains a great variety of flora and fauna from its upper sunlit zone to the depths. But except for hotspots like coastal wetlands, mangroves and coral reefs, little is known about the biological diversity, abundance and distribution of marine organisms or the structure and function of the marine ecosystem in its totality (USNRC 1992). Marine species that face the greatest risks of extinction include corals, sponges, oysters, octopus, porpoises, whales, ornamental fishes, sea turtles and dugongs. The Lakshadweep Islands of India being oceanic in nature harbour important marine flora and fauna in the seas around it. An overview of some of the marine flora/fauna, their status, distribution, threats, sustainable uses and conservation need in Lakshadweep archipelago are discussed here.

Marine Geology and Geomorphology

The most accepted theory on the formation of the coral atolls is that put forward by Sir Charles Darwin. He proposed that the subsidence of volcanic islands resulted in the formation of fringing reefs which encircled the lagoon, following which the coral islands were formed by the accretion of corals in the lagoon. The Lakshadweep Islands are typical atolls, formed by constant deposition of corals.

The Lakshadweep group of islands forms the smallest Union Territory of India. It lies in the Arabian Sea between 8° and 12° 30' N latitude and 71° and 74° E longitude, scattered at a distance of 220-440 km from the mainland coast. Among the 36 islands, 10 are inhabited while others are *seasonally*

inhabited or uninhabited islands. The Lakshadweep archipelago also consists of 12 Atolls, 3 reefs and 5 submerged banks covering a land area of 32 km², 20,000 km² of lagoons and 4000 km² oceanic zones. All islands are coral atolls with live corals and reef surrounding it. The soil is formed by weathering the dead corals. It is estimated to have 95% calcium carbonate. Phosphorous and potash are also present in small quantities (Morgan, 1981).

Marine biological wealth of Lakshadweep

Seaweeds and sea grasses: Marine algal distribution is generally sparse and heterogeneous. Altogether, 62 genera and 114 species of seaweeds have been recorded from Lakshadweep (CSMCRI, 1979; Kaliaperumal *et al.*, 1989). Among them the most abundant species are the *Gracilaria edulis*, *Sargassum duplicatum* and *Turbinaria ornata* which grow luxuriantly on the lagoon beds of many islands. The shallow water lagoons of these atolls support rich beds of seagrass adjacent to the beach. The grasses help considerably in preventing erosion of beaches. A total of 6 species of sea grasses are identified from this area. The most common of these are the *Cymodocea rotundata* and *Thalassia hemprichii*, which the green turtles predominantly forage upon in the lagoon (Jagtap, 1987).

Mangroves: Two mangrove ecosystems are found in south and south east areas of Minicoy island. *Ceriops candolleana* is reported from the south and *Bruguiera cylindrica* from the southeast (Radhakrishnan *et al.*, 1998). Besides these two patches, no mangroves exist in any of the islands of Lakshadweep.

Corals: To date, there are no comprehensive accounts of coral fauna of Lakshadweep (though a study is currently being carried out by Rohan Arthur, James Cook University, Australia). The diversity studies of corals are limited only to Minicoy. Pillai (1983) recorded 70 species of hermatypic corals representing 26 genera from the shallow waters of Minicoy reef and lagoon. It is likely that many more

common Indo-Pacific genera may be occurring in the Lakshadweep. Few widespread but less common Indo-Pacific genera such as *Coscinarea*, *Siderastrea*, *Pachyseris*, *Oulophyllia*, *Trachyphyllia*, *Mycedium*, *Oxypora*, *Plerogyra* and *Seriatopora* still await detection from the reef of Lakshadweep. Future investigation on corals is bound to bring forth many more unrecorded species and genera from this archipelago. However the most common corals found in the lagoon and reef at present are the genus *Acropora* and *Montipora* while the massive species of corals are mainly those of genus *Porites* and *Heliopora* (Rodrigue 1995, Wafar 1986, Pillai & Jasmine, 1989). Besides, *Fungia* and *Favia* are also widespread in many island lagoons.

Marine fishes: The fishes that occur in the coralline niches of the lagoon exhibit the characteristic variety of colours and mainly consist of perches, gar-fishes, half-beaks, scarids, goat-fishes, carangids, grey mullets, antherinids, spyraenids, polynemids, balistids, blennids and globe-fishes (Balan, 1958; Kumaran *et. al.*, 1989). Jones and Kumaran (1980) recorded 603 species of fish from the Laccadive archipelago.

The offshore fishery is constituted by fishes *viz.* seer fish, sharks, sail fish, tunnies, flying fish, carangids and ribbon fish. Moreover, rays and skates are also common in the Lakshadweep water. Fishes such as *Crenimugil crenilabis*, *Polynemus sexfilis*, *Naso tuberosus*, *Naso unicornis*, *Gomphosus varius*, *Novaculichthys taeniurus* and *Anampses diadematus* are common in the offshore waters of Lakshadweep (James *et. al.*, 1989).

Others finfish fauna: Among the fishes of Lakshadweep, those of ornamental value (aquarium fishes) are abundant. Of the 603 species of marine fishes belonging to 126 families that are reported from the islands, at least 300 species belong to the ornamental fish category. There is however no information on the relative abundance or areas of occurrence of these fish in the lagoons and seas around the islands. The ornamental fish such as *Abudefdu*, *Amphiprion*, *Apogon*, *Coris*, *Balistes*, *Platax* are common in Lakshadweep lagoons (Murthy *et al.*, 1989).

Benthos: Prawns and crabs are not fished in Lakshadweep. In all, 41 species of crabs and two species of lobsters are recorded from this region (Meiyappan and Kathirvel, 1978; Shankarankutty,

1961, Rao *et al.*, 1989). The brachyuran crab *Grapsus albolineatus* and panulirid lobster *Panulirus homarus* are among the most common crustaceans in the lagoon and reef flats of this archipelago.

Mollusca: The giant clam *Tridacna (Tridacna maxima)* is found on the reef flat of many islands while octopus (*Octopus vulgaris*, *O. membranaceus* and *O. cyaneus*) are common in the lagoon bottom. In addition to this, 48 species of gastropods and 12 bivalves have also been documented from the Lakshadweep archipelago (George *et. al.*, 1986, Appukuttan *et. al.*, 1989). Among the gastropods, Cone shells (*Conus leopardus* and *C. litteratus*), and Cowries (*Cypraea caputserpentis* and *C. tigris*) are the commonly found molluscs in the island reef bottom.

Sponges: 41 species of sponges are identified from the Lakshadweep group. Only the class *Demospongean* is documented from this area. The common Indian sponge *Spongia officianalis* is for the first time recorded from Minicoy island of Lakshadweep (Thomas, 1989).

Economically and ecologically important fauna

Tuna: Oceanic species of tuna such as Skipjack (*Katsuwonus pelamis*) and Yellowfin tuna (*Thunnus albacares*) constitute the major tuna resources from Lakshadweep Islands (Alagaraja, 1987; Jones, 1986; Kumaran and Gopakumar, 1986; James *et. al.*, 1989). The main economy of the islanders is dependent on the tuna catch and fishing is done for nearly six months of the year from October to April.

Sharks: The most common species of sharks that occur in Lakshadweep are the Spade-nose shark/Yellow dog shark, *Scoliodon laticaudus* and the Milk shark, *Rhizoprionodon acutus* (Devdoss *et. al.*, 1985). The Blacktip Shark, *Carcharhinus limbatus* and Hammerhead shark, *Sphyrna mokarran* are also commonly found in the waters around Lakshadweep (Hanfee, 1997; Basudev Tripathy, *Pers. Obs.*).

Marine turtles: There are four species of marine turtles that occur and nest in the islands of Lakshadweep (Bhaskar, 1978). The green turtle (*Chelonia mydas*) is the common species that nests in inhabited islands whereas hawksbills (*Eretmochelys imbricata*) and leatherbacks nest more frequently in the uninhabited islands. The olive

ridley (*Lepidochelys olivacea*) nests from January to March where as the former two species nest in the monsoon (Tripathy *et. al.*, 2002 unpublished Report) (see Article, pp 3-7, this issue).

Dolphins and whales: In the seas around India, there are 24 species of cetaceans frequenting the coastal waters, mostly for feeding and breeding (James & Mohan 1987, De Silva 1987). However, no detailed scientific investigation has been carried out so far on the species diversity of dolphins in different coastal regions of India. Pillai (1981) reported the occurrence of Cuvier's beaked whale (*Ziphius cavirostris*) from Minicoy island of Lakshadweep. There is a skeleton of false killer whale (*Pseudorca crassidens*) kept for display in the museum at Kavaratti island. The common species of dolphin that are caught as bycatch are the Spinner dolphin (*Stenella longirostris*), Indo-pacific humpback dolphin (*Sousa chinensis*), Bottlenose dolphin (*Tursiops truncatus aduncus*) and Cape dolphin (*Delphinus delphis*) (Lal Mohan, 1989). Dolphins are frequently sighted close to the island coast between October and April (Basudev Tripathy, *Pers. Obs.*). To the fishermen, this animal serves as an indicator of tuna shoals in the offshore waters of Lakshadweep.

There are unconfirmed reports of the collection of ambergris by islanders, when washed ashore. This indicates that sperm whales may also occur in the offshore waters of Lakshadweep.

Dugongs: Dugongs, reported to be historically present in Lakshadweep, are probably extinct from this area now. However, there are some unconfirmed reports that islanders have sighted dugongs while fishing in offshore areas.

Birds: The Pitti island of Lakshadweep is inhabited by three species of terns namely the Noddy Tern (*Anous stolidus pileatus*) Sooty Tern (*Sterna fuscata nubilosa*) and the Brown winged Tern (*Sterna anaethetus*)(see Article, pp 19, this issue). Besides, there are Gray Plovers, Golden Plovers, Crab Plovers, Whimbrels, Curlews and common Sandpipers around the islands (Betts, 1938; Daniel, 1999; Mathew & Ambedkar, 1964).

Productivity: Coral reefs are the most productive marine ecosystems, with annual gross production rates in the range of 2000 to 5000 g cm² (Mann, 1982). These reefs are known to be more

biologically productive and with exceptionally diverse fauna and flora. Lakshadweep coral ecosystem is among the most productive marine ecosystem of India.

Important species

From one point of view, all species are equally important. But certain species loom large in people's perception due to their economic value, uniqueness or endemism. The colourful corals, turtles and marine mammals such as dolphins & porpoise and birds found in Lakshadweep are amongst these. The former are important flagship species for Lakshadweep not only because of their uniqueness in occurrence but as the structural framework on which the Lakshadweep atoll system depends. The species diversity is certainly noteworthy with the range of corals, fish, marine turtles, marine mammals and many more smaller but endemic flora and fauna that are found from the seas around Lakshadweep Island.

Threats to marine biodiversity in Lakshadweep

The exploitation of marine living resources is an age-old practice for human civilization. However, the extent of exploitation has crossed the limit of sustainable utilization of these resources due to anthropogenic pressures such as over fishing, developmental activities and pollution. Conservation and management of marine living resources is therefore necessary in many coastal areas. Though the present level of exploitation of marine living resources other than faunal elements like turtles, dolphins and corals have not reached alarming levels in the Lakshadweep archipelago, if the trend of over exploitation continues, the rest of the common flora/fauna of Lakshadweep will also soon be included in the Red Data Book of the IUCN.

Marine protected areas for Lakshadweep

The *in situ* conservation strategy for marine living resources remains restricted to 3 major protected areas notified by the Govt. of India, in accordance with the provisions of the Wildlife Protection Act, 1972 [See 35(1) and 35(6)], constitution of India [Art. 48 A and 51A (g)] and CRZ Notification, 1991 [CRZ I, 6(2) and CRZ IV]. The archipelago of Lakshadweep is a typical marine system where delineation of some areas, which are ecologically sensitive and fragile, is difficult due to people's

dependence on the resource. Therefore there is a need for further revision in the act for sensitive areas like coral islands where fishing is the major occupation. The adequate protection, propagation and development of fragile ecosystems are of urgent concern. However, the livelihood dependence on the resources also needs to be taken into consideration.

Important Areas

As is the case with important species, important areas also merit special attention due to various subjective and objective reasons. Although there have not been serious attempts to demarcate the marine hotspots, based on available information, the Lakshadweep archipelago is among the thirteen marine hotspot identified in India's oceanic space. Luxuriant coral beds are found around many islands of this archipelago. Marine turtles especially *Chelonia mydas* are abundant in lagoons and nest in large numbers on the island beaches. Dolphin sightings are common in the nearshore waters of the islands. The Pitti island is a haven for terns where more than 5000 terns nest every year.

Conclusion

Management of the Marine biodiversity of Lakshadweep

Today, more emphasis is placed on the biodiversity found within a "Large Marine Ecosystem (LME)" as a measure of the condition of any region's living resources. The marine and coastal habitats of India are facing environmental crisis due too many reasons and the worst affected habitats in the country seem to be coral reefs and reef resources. The fact that our knowledge of marine biodiversity is yet highly insufficient to inform our action fully, a cautious approach may need to be followed such as creation of marine refugia or reserves. Considering the status, exploitation level and conservation needs, the Indian Wild Life (Protection) Act, 1972 made amendments in schedule I, III and IV of the act and in which it was recommended to insert sharks, sea horse and giant groupers in part II (A), all corals and

sea fans in IV (B), 9 species of molluscs in IV (C), while sea cucumbers and calcareous sponges are included in the schedule II which also included 15 species of other molluscs (Lakshadweep Gazetteer, 2001).

Lakshadweep is a fragile coral ecosystem and is deteriorating due to natural and manmade causes. It is imperative that conservation measures be urgently implemented in some of these islands to preserve and protect these habitats for scientific, cultural and economic purposes. Establishment of marine parks and reserves can be helpful in the conservation of the biodiversity of Lakshadweep. However, it should be clear that the idea of protected area status to few islands and lagoon systems is to give protection to the corals and associated fauna and not to prevent the entry of islanders and fishermen whose livelihood depends entirely on the ecosystem. Therefore, the livelihood of islanders and their rights to the limited utilization of resources should be taken into consideration. This includes rights of artisanal fishing activities within the protected areas. Also, before taking any steps, there is need to identify species that are in need of immediate conservation. Tuna fishing contributes in major way to the economy of the islanders. These fishermen spend six months of the year in the uninhabited islands viz. Suheli Valiakara, Suheli Cheriyakara, Tinnakara and Cheriyabani & Valiabani islands. While the faunal diversity is highest in these areas, disturbance from fishing is limited and negligible. However, besides fishing, any other anthropogenic pressure such as tourism promotion, mechanized fishing, artificial lighting and construction activities will certainly have severe impact on the marine biodiversity of this area. Therefore, there is a need for the protection of lagoons and marine ecosystems of Lakshadweep to safeguard the biodiversity as well as the fisherfolk who depend on the coral ecosystem. No conservation programme is successful without people's participation. Therefore it is also essential that the fishermen and islanders should be involved while formulating any policy and guidelines concerned with marine biodiversity conservation in the archipelago.

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A Sanctuary For Terns In The Arabian Sea

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About 25 km north-west of the Kavaratti island of Lakshadweep is a tiny sandy patch hardly 2m above sea level covering an area of approximately 200x300 yards, called the Pitti island. The sand bank of Pitti is well known for its bird nesting. Thousand of terns migrate to this island every year for nesting.

The Pitti island is inhabited by three species of Terns namely the Noddy Tern (or Brown Noddy) (*Anous stolidus pileatus*) Sooty Tern (*Sterna fuscata nubilosa*) and the Brown winged Tern (or Bridled Tern) (*Sterna anaethetus*). The biology and migration of these birds are little known but they are reported to migrate every year to Pitti for nesting as early as 1903 by Gardiner during his flora and fauna survey in Maldives and Laccadives. The islanders from Kavaratti have long visited Pitti for the collection of eggs but have contradictory opinions on the nesting of terns. Some claim that bird nesting occurs in Pitti throughout the year, but according to others, the birds leave by end of September. The Sooty Tern is known to occur along the coastal states of India and its Bay islands coast, Burma, Mauritius and Seychelles areas whereas the Noddy Tern is basically a oceanic bird that is less seen along the mainland coast.

During my survey for turtles in 2001-02, I had visited Pitti several times and observed different flocks in different months but the February visit was the most significant. I could see countless birds in several flocks through out the Pitti island. The nesting season was perhaps approaching as I saw a majority of the birds in nesting position. I also observed a few solitary eggs on the sand and eggs looking very fresh, which must have been laid within the past couple of days. From a safe distance, I identified the nesting flock from their colour. The Sooty Tern flock was black and white where as the Noddy Tern flock was smoky brown. The nesting area was widely separated for the two species.

Mathew & Ambedkar (1964) of Bombay Natural History Society have reported the Brown winged Tern nesting at Cheriyanani island of Lakshadweep and during my visit I observed them in Pitti too. But I could not confirm the nesting as they were very few in number and not in nesting position. However when I returned to Kavaratti, islanders told me that this species nests in Pitti during the monsoon, when the chicks of Sooty and Noddy Tern start flying.

Lakshadweep is famous for its nature tourism and Pitti island can be another attraction for tourists and bird watchers, if managed properly. However, it is also essential to ensure that birds are not disturbed

due to tourism. It is also in the interest of conservation that the poaching of eggs should be checked.

Casuarina Forests Ruin Turtle Nesting Beaches In Orissa

Biswajit Mohanty

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Email: biswajit_m@vsnl.com*

The prolific plantation of *Casuarina* forests along Orissa's coast has upset its coastal ecology and led to environmental degradation of the coast. *Casuarina*, which was imported from Australia, is favoured due to its fast growing abilities. These forests were created after the last cyclone of 1971 which hit the Orissa coast after Swedish experts advised their creation. The entire Orissa coast including the vital and ecologically sensitive areas like the turtle mass nesting area of Gahirmatha Marine Sanctuary beach has been covered by *Casuarina* plantations. Beaches serve as turtle nesting sites in many areas like Devi river mouth, Rushikulya river mouth and Gahirmatha coast and hence no plantations should be established in these areas. Unfortunately, due to these plantations, a noticeable shift has been noticed in turtle nesting trends in these areas since sea turtles avoid nesting on beaches covered by forests.

Operation Kachhapa has protested to the state government about the indiscriminate planting of *Casuarina* trees even on the beach right upto the high tide line in sea turtle mass nesting areas of Devi river mouth. We have noted several instances of sea turtles coming ashore and stopping right at the fencing which protects these plantations. These turtles returned without nesting. These forests have failed to serve their purpose which was apparently the protection of the coastal villages from the cyclonic winds. *Casuarina* is a weak tree which collapses under the force of powerful winds. During the last super cyclone in October, 1999, the entire *Casuarina* belt which fell in the cyclone zone of the coastal stretch from Puri to Paradeep collapsed like matchsticks and was rendered useless. This clearly proved their ineffectiveness against high speed cyclonic winds.

In spite of this, no lessons were learnt by the state government and an ill advised massive *Casuarina* planting programme was launched in 2000 and 2001 to re-create the destroyed forests. *Casuarina* plantations have come up on the Chilika coast, the Puri coast, the Konark coast and the Kujang coast and planting after the supercyclone has been done even upto the high tide line in many places. Millions of rupees have been spent in creating such forests which are obviously of little utility against cyclones.

Once, the Orissa coast had natural sand dunes which were sometimes as high as 80 feet in areas like Satbhaya village in the Gahirmatha coast. The old topography sheets of this area show these sand dunes. Fresh water springs were running perennially from these sand dunes. Sand dunes serve as reservoirs of underground fresh water for farming and drinking. Sand dunes are dynamic and shifting in nature and change their position and height according to seasonal winds. Sand dunes provide another ecological function by arresting catastrophic tidal surges which was seen at Ersama coast during the previous super cyclone. By planting trees like *Casuarina* sand dunes become flat and have almost disappeared from the Orissa coast. Beach formation by build up of sand deposits is also helped by sand dunes and artificially restricting their formation is leading to coastal erosion at many places. Expert studies are immediately called for to assess the environmental impact of *Casuarina* forests on the beaches of Orissa and to suggest remedial measures.

If concerned individuals and organizations would like to protest against loss of sea turtle nesting beaches in Orissa due to *Casuarina* plantations by the forest department, they may write to the following officials :

Director General of Forests,
Ministry of Environment, Government of India,
New Delhi

Mr. S.C. Sharma,
Additional Director General (Wildlife)
Ministry of Environment, Government of India,

New Delhi (E-mail : sssharma@nic.in)

Mr. Paramatma Singh,
Principal Chief Conservator of Forests,
Government of Orissa,
Aranya Bhavan, Chandrasekharpur,
Bhubaneswar - 751 023

Nesting of a Small Hawksbill Turtle at Indira Point, Great Nicobar Island

Kartik Shanker & Meera Anna Oommen

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Indira Point on Great Nicobar Island is the southernmost point of India (6°45'38"N, 93°48'85"E) and is only about 150 km from Sumatra, Indonesia. Great Nicobar Island is a part of the Andaman & Nicobar group of islands, which have important nesting and feeding populations of leatherbacks, green turtles and hawksbills (Bhaskar, 1993; Andrews, 2000). Great Nicobar Island also has a significant nesting population of leatherback turtles (Andrews & Shanker, 2002). Hawksbill turtles have been reported to nest at a few beaches on this island. Bhaskar (1979) reported nesting of hawksbills at Indira point (or Pygmalion point as it was then known). The beach at Indira point is less than half a kilometer in length and the offshore approach is very rocky.

During monitoring of leatherback turtles at Galathea during 2001-02, we visited the beach on a single night. On January 23, 2002, a hawksbill was observed nesting at Indira point. The turtle was extremely small for a nesting hawksbill (CCL – 63 cm; CCW – 52 cm). She laid 46 eggs. Following this, the beach was monitored for one week, during which period a single hawksbill (CCL – 83 cm, CCW – 73 cm) nest was recorded.

While winter may not be the peak nesting season for hawksbills, interviews with the locals suggest that intensity of green turtle and hawksbill nesting at Indira point is low. There is a lighthouse at Indira Point, and perhaps one or two of the workers can be trained and remunerated for monitoring this beach.

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NEWS

Experts advocate closure of Oswal Plant

Bhubaneswar : A high level official expert group has recommended the closure of the private DAP fertilizer plant at Paradeep for causing environmental pollution.

The group, comprising members from the Union Forest and Environment Ministry, state Pollution Control Board and other officials, at a meeting here recently reviewed the anti-pollution measures suggested earlier and the steps taken by the plant authorities to adhere to it. The committee also felt that the plant run by the Oswal group had polluted the river Mahanadi and nearby water bodies posing threat to human habitation and other living beings. In its report submitted to the government, the committee said the plant should not be allowed to operate till it met full environmental measures. The polluted water has proved to be dangerous for human beings and aquatic creatures as well. Besides damaging crop, it had led to causing many diseases amongst human beings and animals, informed sources quoted the report as saying.

The committee arrived at the conclusion after collecting water samples from the nearby fishing jetty, river Mahanadi and creeks there. The experts also visited the plant and collected samples of effluents released to Mahanadi from the plant. They found that the effluents were polluting the river water to the extent of 318 to 793 mg of fluoride against the permissible limit of 20 mg. The ph level of water had been pegged at 6.5 to 8.5 . The report also brings out high content of phosphate (589 mg per litre of water) released from the plant.

Effluents discharged from the phosphoric plant are released to the river directly without being treated, the report said and added that the plant should be shut down forthwith till anti – pollution measures were taken strictly.

Source: Times of India , Orissa Special Edition dated Monday, 17.6.2002

Biswajit Mohanty comments:

The above news report illustrates the ills plaguing India's environmental protection. Though we have

excellent environmental laws, very often solely due to connivance of enforcement agencies with polluters they are never enforced and the health of thousands of local people, animals and water and air is damaged, many times irreversibly. I feel that Acts should be amended to provide for claim of damages by any member of the public against the government officials for failure to act against an errant unit .

Since the year 2000, the Wildlife society of Orissa had been regularly pointing out the extremely harmful nature of the effluents illegally being discharged by the polluting DAP fertiliser unit to the various government enforcement agencies which are supposed to protect the citizens of this country from pollution. This unit has turned the Mahanadi river's rich estuarine area into a graveyard for fish, shrimps and crabs apart from damaging the local mangroves. 10,000 people of Paradeep port were injured in an ammonia gas discharge from this unit in 2000. The local port officials have lodged an F.I.R. with the police for action against the unit officials. No arrests have been made by the police which speaks for the clout wielded by the unit. Shall the state government act on the latest recommendation by the experts for closure or shall it allow the unit to merrily go on polluting the locality and destroy people's lives ?

We have a non- functional pollution control board in Orissa with an equally useless and somnolent Ministry of Environment (MOEF) which is supposed to implement the environmental laws. They are only good for carrying out surveys and studies...no action ever ! What a terrible waste of public funds on their salaries and perks !

In Oswal's case we felt that damages for environmental harm should be claimed from this unit and we have filed a case in the year 2000 claiming a total of Rs. 2200 million from the Company for damaging the mangroves, destroying the spawning ground of fish and other fauna, for loss of livelihoods of local fishermen and farmers, injuries to humans and animals and causing diseases to local residents. We feel that our claim has now been vindicated after the report of experts as is apparent from the above news report. The tragedy is that it has taken the experts 2 ½ years to recommend closure when it should have been ordered in the year 2000 itself.

Scientists Call for Fishing Moratorium to Save Leatherback Sea Turtles

Monterey, CA—Scientists and environmental experts have called for a moratorium on all fishing methods that cause harm to Pacific leatherback sea turtles which are in danger of imminent extinction. Concluding the International Leatherback Survival Conference, 36 participants signed a resolution asking the United Nations, United States and all other nations whose citizens fish in the Pacific to institute a moratorium, and other conservation measures, to halt the dramatic decline of these ancient creatures.

“Leatherback sea turtles swam the seas while dinosaurs walked the Earth,” said Todd Steiner, biologist and Director of Sea Turtle Restoration Project. “But they will not survive the next decade if we do not take dramatic and immediate action, including halting the use of fishing methods that kill turtles.”

At the three-day conference held at Asilomar in Monterey, California, scientists from around the world reported that populations of Pacific leatherback sea turtles are plummeting. The Pacific population has dwindled from 91,000 in 1980 to fewer than 5,000 now. In what may be the worst year ever, minimal numbers of females are returning to nesting beaches throughout the world. Mexican

See Related Leatherback Articles

ANDREWS, H.V. & K. SHANKER (2002) A significant population of Leatherback turtles in the Indian ocean. *Kachhapa* 6: 17

ANDREWS, H.V., S. KRISHNAN & P. BISWAS (2002) Leatherback nesting in the Andaman & Nicobar Islands. *Kachhapa* 6: 15 – 18.

biologist Laura Sarti reported that in the mid-1980s, there were around 1,000 leatherback nesting at Mexiquillo, Mexico, but over the last few breeding seasons, there were less than 25 with just 4 returning this year. Scientists from Malaysia and Costa Rica reported similar declines.

“The decline in the last five years is nothing short of catastrophic,” said Dr. Sylvia Earle, an Explorer in Residence at National Geographic and leatherback expert. “The number has dropped at a precipitous rate. Their future depends on what we do — or may not do — even in the next five years.”

The causes are many, but industrial longline fishing, primarily for swordfish and tuna, appears to be a major one. Leatherback numbers have dropped while longlining use has risen dramatically. A single football-field size longline ship can send out thousands of baited hooks on hundreds of lines that total 60 miles in length. The hooks also snag and kill seals, sharks and seabirds.

Leatherbacks, the Earth’s most ancient and largest living reptile, can reach 9 feet long and 2,000 pounds, and are one of six species of endangered sea turtles. They range throughout the world’s oceans.

*Source: Doug Israel, Marine Species Campaigner
The Sea Turtle Restoration Project
California, USA*

SPOTILA, J.R., *ET AL.* (1996) Worldwide Population Decline of *Dermochelys coriacea*: Are Leatherback Turtles Going Extinct?. *Chelonian Conservation and Biology* 2: 209 – 222.

SPOTILA, J.R., *ET AL.* (2000) Pacific leatherback turtles face extinction. *Nature* 405: 529-530.

WORKSHOP REPORTS

GOI – UNDP workshop on Sea turtle conservation and management in Lakshadweep, 9th February 2002, Kavaratti

Under the sub-programme of Govt. of India – United Nations Development Programme's Olive Ridley Sea Turtle Project, the Wildlife Institute of India conducted a detailed survey of sea turtles in the islands during July 2001 to February 2002. To disseminate the information gathered and to develop a turtle conservation action plan in a participatory manner, the Wildlife Institute of India organized a workshop on "Sea turtle Conservation and Management in Lakshadweep" at Kavaratti, Lakshadweep on 9th of February 2002 in collaboration with the Department of Environment & Forests, Administration of the Union Territory of Lakshadweep.

This one-day workshop was inaugurated by Shri K.S. Mehra, I.A.S, the Administrator of Lakshadweep. The Director of Wildlife Institute of India, Shri S. K. Mukherjee presided over the function and Shri B. C. Choudhury, Nodal Officer of

GOI – UNDP Olive Ridley Sea Turtle Project conducted the workshop. It was attended by more than 48 participants from different governmental agencies and representatives from the non-governmental organizations of Lakshadweep. The workshop was conducted in three sessions that discussed available updated information on i) current situation and problems of sea turtles ii) involvement and action by other organizations in sea turtle conservation and iii) Assessment of conservation needs and action plan for the Lakshadweep group of islands. The proceedings encompass the collective opinion and ideas of a conceptual plan that can be refined and shaped into a proper implementable action plan for the benefit of the sea turtles and people of the Lakshadweep Islands.

Source: Basudev Tripathy, Lakshadweep survey component of GOI – UNDP Sea Turtle Project, Wildlife Institute of India, Dehradun

Report on the Capacity Building Training Workshop on Sea turtle conservation and management, 19 - 21 June 2002, Cochin

Under the GOI – UNDP sea turtle project, the Central Marine Fisheries Research Institute (CMFRI), Cochin conducted a workshop on "Capacity Building and Training for the frontline staff of Wildlife, Fisheries and Research organizations of the west coast of India and Lakshadweep" during 19 – 21 June, 2002 at Cochin, jointly with the Wildlife Institute of India, Dehradun. The workshop was sponsored by the Ministry of Environment and Forests, Government of India, and UNDP. Prof. K.V. Peter, Vice Chancellor, Kerala Agricultural University inaugurated the workshop. Prof. Mohan Joseph Modayil, Director, CMFRI, presided over the function. Prof. N.R. Menon, Director, CIMCOZ, Cochin University, offered felicitation. Prof. K.V. Peter released the book "Management of Scombroid

fishes", edited by N.G.K. Pillai, N.G. Menon, P.P. Pillai and U. Ganga of CMFRI. The workshop imparted training by resource personnel from CMFRI, Central Institute of Fisheries Technology (CIFT), Marine Products Exports Development Authority (MPEDA), WII and Coast Guard to 50 frontline and field staff in the protection of sea turtles, fishery interface problems, monitoring of breeding and nesting grounds, community participation and education programmes towards sea turtle conservation. The workshop also provided a forum to share experiences in the area of sea turtle conservation and management.

Source: Dr. M. Rajagopalan, Central Marine Fisheries Research Institute (CMFRI), Cochin

A report on the capacity building training workshop for the frontline staff involved in sea turtle conservation along the east coast maritime states held at Rambha and Barkul, Orissa from 27 – 29 June, 2002.

Five species of sea turtles: leatherback, loggerhead, green, hawksbill, and olive ridley are reported to occur along the east coast of India. Nesting of olive ridley sea turtle along most part of east coast of India has been well documented. Sea turtles along the east coast are mostly migratory and arrive in the coastal waters with the onset of winter. Most of the nesting takes place during late winter and early summer and by late summer most of the turtles migrate back to their foraging areas. Sea turtles face a multitude of problems during this period that they spend along the east coast of India. Realizing the intensity and magnitude of the problem that turtles face along our coast, the Government of India – United Nations Development Program National Sea Turtle Program organized a capacity building training workshop for the frontline staff involved in sea turtle conservation along the east coast maritime states. The three day workshop was conducted at from 27 – 29 June, 2002 at Rambha and Barkul, Orissa along the bank of Chilika Lake. The workshop was jointly organized by the Wildlife Institute of India, Dehradun and the wildlife wing of Orissa Forest Department. Shri A. P. Tripathy, IFS, Chief Conservator of Forests and the Chief Wildlife Warden inaugurated the workshop on 27 June, 2002. In his inaugural address, Shri Tripathy emphasized the need of scientific training for the frontline staff so as to enable them to properly manage the sea turtle population along the maritime states.

The workshop was attended by 42 frontline staff from the east coast maritime states of West Bengal, Orissa and Andhra Pradesh. The frontline staff were from the Indian Coast Guard, State Forest department and State Fisheries Departments. No frontline staff from Tamil Nadu participated in this workshop. Frontline staff of the rank of Assistant Commandant and Deputy Commandant from Indian Coast Guard; Range Forest Officer, Assistant Conservator of Forests, and Deputy Conservator of Forests from the Forest department; and Fisheries Extension Officer, Junior Fisheries Officer and

Assistant Director of Fisheries from the Fisheries Department participated in this workshop.

At the outset of the workshop, Shri B.C. Choudhury, Nodal Officer of GOI-UNDP sea turtle project gave an overview of sea turtles in India, their status and conservation. The three day workshop was divided into seven technical sessions. 14 resource persons provided their inputs in the technical sessions of the workshop. The first technical session dealt with species identification, survey techniques and ecology of nesting beach. Maintenance of natural beach profile and adverse impacts of *Casuarina* plantation on sea turtle nesting habitats was discussed in this session. Situation of sea turtles along the four east coast maritime states was presented in the second technical session. Sea turtles and problems associated with mechanized fishing activities, use of Turtle Excluder Device (TED) during shrimp trawling and the TED distribution initiative by the Marine Products Export Development Authority (MPEDA) was discussed in the third technical session. Hatchery management techniques and the pros and cons of raising a hatchery were deliberated upon in the fourth technical session. The fifth session of the workshop pertained to NGO involvement, community participation in sea turtle conservation and sea turtle based eco-tourism. Protection strategies and legislations related to sea turtles were discussed in the sixth technical session. In the final session of the workshop the participants developed state specific conservation action plan for sea turtles.

During the workshop the participants were taken to the nearby Rushikulya sea turtle rookery for field visit. The participants were briefed about the dynamics of the nesting beach at Rushikulya, sea turtle nesting activity at the rookery, problems that sea turtles face at Rushikulya and the active participation of local community in saving the sea turtles at Rushikulya.

Source: Bivash Pandav, Wildlife Institute of India, Dehradun

Marine Turtle Newsletter

ONLINE - The *Marine Turtle Newsletter* and *Noticiero de Tortugas Marinas* are both available at the MTN web site <<http://www.seaturtle.org/mtn>> and <<http://www.seaturtle.org/ntm>>

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23rd Annual Symposium on Sea Turtle Biology and Conservation

Kuala Lumpur, Malaysia
17-21 March, 2003

Dear Colleagues and Friends:

It is my pleasure to formally announce the upcoming 23rd International Sea Turtle Symposium, to be held at The Legend Hotel in Kuala Lumpur, Malaysia, from 17 to 21 of March, 2003, and to invite you to submit your papers for presentation. I look forward to personally welcoming each of you to this important event, which due to its venue location, brings with it many changes and, I hope, a new experience to all. This meeting will be hosted by the Community Conservation Network, WWF-Malaysia and the Department of Fisheries, Malaysia.

Adopting the theme “Living With Turtles”, the meeting aims to bring together the world’s foremost turtle biologists and conservationists, government, fisheries and indigenous community representatives, and people who just love to love turtles, in a geographical setting that befits the migratory nature marine turtles. The much-anticipated move to a distant venue is finally upon us, and preparations have started in earnest to assure each of you a Symposium that is both informative and educational, but more importantly, one from which you will take home lessons from a part of the world which has been underrepresented in past meetings, and with which you can share your experiences and knowledge.

Sincerely,



Nicolas J. Pilcher
President, International Sea Turtle Society

For those of you who will be undertaking your first long-distance migration, and for those who will be re-migrating, I assure you it will be a most worthwhile effort. The Legend Hotel has assured us they will provide the utmost in facilities and service to make this a memorable event. Kuala Lumpur itself, gateway to the far east, offers wonderful opportunities to learn of new cultures and people in a country where different religions and ethnic origins coexist in peaceful and harmonious freedom. Just out of Kuala Lumpur await a myriad treasures: Taman Negara, a world famous, pristine rainforest reserve; Kuala Selangor, bird watching heaven and home to the synchronised fireflies; Malacca, ancient trading post and gateway to Asia for many ethnic groups; the list is endless. I assure you a trip to Malaysia will be more than just a Sea Turtle Symposium, it will be a memory of a lifetime. And just think, you’ll be helping turtles, too.....

While the final details are being ironed out, I offer below some glimpses of what is in store. I look forward to a productive and informative gathering, to welcoming old friends, and to making many new ones.

STS 2003 – KUALA LUMPUR, MALAYSIA

Associated Events

One of the highlights of the meeting will be a mini-symposium on the interactions between indigenous cultures and marine turtles, at which we hope to bring together people from each major stakeholder group. The meeting will also help host the 10th Reunion of Latin American Sea Turtle Specialists (for additional details about these meetings, please contact Alejandro Fallabrino <afalla@adinet.com.uy>), and we will also welcome meetings of the Mediterranean Sea Turtle Specialists and the Reunion of West African Specialists and other regional groups prior to the symposium should they wish.

Schedule of Events

March 16th (Sunday):

10th Latin American Sea Turtle Specialists Reunion

March 17th (Monday):

Check-in and Late Registration

10th Latin American Sea Turtle Specialists Reunion

Regional and Other Meetings

Late Registration begins

Social Gathering

March 18th (Tuesday):

Late Registration continues

Oral and Poster Sessions begin

March 19th (Wednesday):

Oral and Poster Sessions continue

Live Auction

March 20th (Thursday):

Oral and Poster Sessions continue to 3:00 pm

Plenary Session

STS 2003 Banquet

March 21st (Friday):

IUCN Annual General Meeting

Field Trips

The Meeting Venue

The 23rd Annual Sea turtle Symposium will be held in the Legend Hotel, at Putra Place, 100 Jalan Putra, 50350 Kuala Lumpur, Malaysia. The Legend Hotel has 620 rooms, a number of fine restaurants and lounges, and offers a fully serviced business center, recreation facilities, and a host of other services. A forty minute ride from Kuala Lumpur's International Airport (KLIA), the hotel is close to the city's main

commercial district, and the KTM commuter train and STAR Light Rail Transit stations are just downstairs. Learn more about the hotel at <http://www.legendhotels.com>.

Getting There

Malaysia Airlines offers non-stop services from many European capital cities, from South Africa and Mauritius, a number of cities in Australia, several places in the Middle East, all over South and Southeast Asia, and from Los Angeles in the USA. In addition, Singapore Airlines fly to a number of major cities around the globe, and offer a nearly-hourly shuttle service to Kuala Lumpur. These two will probably be among the cheapest and most accessible airlines to bring you to the Symposium. From the USA, Northwest Airlines also fly to Kuala Lumpur, and a number of European carriers fly to both Kuala Lumpur and many US destinations, offering alternate travel routes. We are currently negotiating discounted fares and will advise on these shortly. I would urge all of you to make bookings and purchase tickets early, as there are savings to be made on many tickets purchased in advance. Remember, while the ticket costs may be higher than hoped-for, the costs once in Malaysia will be drastically lower. Take for instance the Hotel rate, at just US\$ 39.5 per night all inclusive! Think also that this trip can not only get you to the 2003 STS, but to the experience of a lifetime, and what better way to look at things...

Once there, the Kuala Lumpur International Airport (KLIA) is about forty minutes from the city itself. There is a train shuttle service from the airport that will bring you to Central Station in Kuala Lumpur, from which you can take a taxi or a Light Rail Transit train to the hotel. Alternatively, taxis can be taken from the airport for about USD 20 each way (if a few people share, this can be a cheap easy way to get to the hotel).

Fare-Hunting and Reservations Assistance

In a new move for the Society, we will be teaming up with an international travel consultant, Morrison International, who will be assisting attendees in getting low fares to Kuala Lumpur and making flight reservations. Their web designer is currently adding a page to their web site (www.morrisontravel.com) that will have an online booking form and a faxable

form. I will post announcements on this shortly. There will be a page with the zone fares from North America and the Caribbean to Kuala Lumpur along with fares from the South American, European, Asian and Australian gateways. Symposium attendees just need to click on the logo for the symposium and they will be taken directly to the site. The Agency can also help with side trips, pre or post tours and anything else to help you travelers. Symposium participants will now be able to book online, via fax or direct with Morrison International. They will attempt to offer zone fares starting around \$750.00 (we will have the exact fares soon for all the zones and the cities in each zone) that will be published on their website, along with international destinations. Morrison International has been in services for over 50 years and has one of the best reputations in the travel industry with suppliers and clients, and their agents average over 15 years serving as travel consultants. We hope this will be a great help to all of you who will be coming so far to be with us in 2003.

Visas

Visas to enter Malaysia are only required for nationals from Bangladesh, Bhutan, India, Pakistan, Sri Lanka, Myanmar, Nepal, Nigeria, and the People's Republic of China. An additional Special Approval must be sought for a Visa by nationals from Israel and Yugoslavia. Other countries not listed above do not require a visa for social/business visit for a stay not exceeding one month.

Field Trips

Details on departure times and costs will be announced soon. However, please note that all field trips will take place after the last meeting (the IUCN meeting on the 21st), giving everyone the opportunity to attend at least one of the field trips. We might also schedule some of the trips on Saturday 22nd to give people an opportunity to participate in more than one trip.

Malacca Old Town / Turtle Information and Management Center: Hosted by WWF Malaysia and the Department of Fisheries, this trip will take you about two hours south of Kuala Lumpur to the magical city of Malacca. Here, traders came together in years past to form a melting pot of cultures and bring their own unique signatures on life, religion, cuisine and architecture, much of which is preserved today. A stop at the Turtle Information and

Management Center will provide an insight into local educational and conservation campaigns to protect marine turtles.

Batu Caves: A short thirty-minute trip north of Kuala Lumpur and a mere climb of 272 steps are the impressive Batu Caves, site of a local Hindu temple and pilgrimage destination during the celebration of Taipusam, the Hindu festival of faith and endurance celebrated in Malaysia, Singapore, Mauritius, and South Africa.

Selangor Bird Sanctuary and Fireflies: Departing in the late afternoon, this trip will take you out to the coast to a wonderful mangrove and forest reserve, where migrating and resident birds abound. As the sun sets, you will proceed to the Selangor river, where you will be quietly rowed among the mangrove trees to observe the fireflies, which in a uniquely manner blink in synchrony, with one tree lighting up after the next.

Bird Park / Orchid Park: Within the city limits, the bird park is a massive enclosed area containing hundreds upon hundreds of species of birds in a carefully designed enclosed landscape. The Orchid Park, just across the road, offers a colourful view of the many orchids available in the far east, and even offers small cuttings and adult plants for sale. The National Planetarium, Butterfly Park and Tun Abdul Razak Memorial are all nearby.

Kuala Lumpur Treasure Hunt: For the first time ever, the Sea Turtle Symposium will host an exiting city-wide treasure hunt with prizes for the lucky winners. The hunt will take you to a number of the city's key attractions, where you will be handed the clue to your next destination, giving you a first-hand glimpse of the wonders of Kuala Lumpur.

Call for Papers

While final details are being worked out, we would like to invite you to submit oral and poster presentations, which will be accepted until 15 November 2001. The programme committee will review each presentation and attempt to schedule a single session for most of the meeting, but for this we urge you to submit posters where possible, giving us more time to prepare a talk schedule from which you will get the very best of turtle biology and conservation.

If possible, please use the Symposium web site (<http://www.seaturtle.org/symposium/2003/>) for your abstract submission. If you cannot access the Symposium web site, you may submit your abstract in one of three alternate ways: (1) as a text file attachment (other formats cannot be accepted) to an e-mail sent to <symposium_abstracts@seaturtle.org> - please note this e-mail account is for abstract submission only; (2) via fax sent to +680-488 8730; or (3) via snail mail sent to Sam Sadove, Program Chair, Puffin Consulting, Inc. P.O. Box 361 Jamesport, NY 11947, USA. If you are not submitting your abstract over the web, you must include the following information, in this order, along with your abstract:

1. Name of presenting author.
2. E-mail of presenting author (strongly recommended).
3. Fax number of presenting author.
4. Date this information was submitted (DD/MM/YY).
5. Title of presentation (ALL IN UPPERCASE).
6. All authors of the presentation in the order you want them to appear in the program. Please place each author name on a separate line.
7. Author(s) affiliation(s) in the same order as above. Please clarify any multiple affiliations.
8. Abstract (in English) describing your presentation (250 words maximum).
9. Type of presentation you prefer to make (oral, poster, either oral or poster, or video/film).
10. Equipment needed (slide projector, overhead projector, computer projector system with MS Power Point or Corel Presentations, video tape player).
11. Indicate whether you are a student and whether you would like to be considered for the Archie Carr Student Paper Awards (given to both oral and poster presentations of merit). Recently graduated presenters who are presenting work done as students will qualify for these awards.

Resolutions

If you wish to submit a Resolution to be considered by the Board of Directors and the International Sea Turtle Society, please follow the guidelines presented at to the Symposium website for the submission of resolutions (<http://www.seaturtle.org/symposium/2003/resolution>) or email <symposium_resolutions@seaturtle.org>

for a set of Guidelines. Complete the required fields and supply any additional information related to the proposed resolution. For submission via e-mail please send Resolutions to the following address: Resolutions Committee
<symposium_resolutions@seaturtle.org>

Travel Awards

Limited travel funds are available to assist U.S./Canadian students and international participants in their efforts to attend the Symposium. Be aware that these awards *will not* cover the full cost of Symposium travel. Priority will be given to those individuals who will be presenting papers or posters, who apply before the 15 November 2002 deadline, and who are from relatively under-represented regions. The Travel Committee looks favorably upon those who demonstrate efforts to secure additional sources of travel funds or matching grants. If you are in need of assistance for travel to the Symposium, apply via the Symposium web page. Applicants should follow this procedure:

1. Register for the Symposium
2. Submit your abstract (if applicable) to the Symposium for consideration
3. Using your Symposium registration number, complete the online travel grant application in full prior to the 15 November 2002 deadline

If you do not have Internet access, please contact the Travel Chair, Jeffrey Seminoff by fax or mail; however, it is highly preferred that all correspondence be carried out by e-mail. Grant recipients are expected to attend the entire Symposium. Candidates should not hesitate to contact their regional travel chair for advice (see Travel Support Contacts section).

Travel Support Contacts

Travel Chair:

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E-mail: abb@zoo.ufl.edu

Symposium Registration

You must register to attend the Symposium. The preferred registration method is to visit us online at the Symposium's web site: <http://www.seaturtle.org/symposium/2003/>. There you will find everything you need to know about the Symposium in addition to a user-friendly interface for Symposium registration. Please help us by registering via the Internet. However, if you do not have Internet access you may also register by post mail.

Contact Carmen for all questions about registration and hotel accommodations.

Register on-line at:

<http://www.seaturtle.org/symposium/2003/>.

Alternatively, complete the following form and email to Carmen Leong <ccn@palaunet.com> or fax to ++ (680) 488-8730

If you cannot register at the Symposium web page, complete the following forms and send them to:

Carmen Leong
Symposium Registration Coordinator
PO Box 1017, Koror, Palau.
Tel/Fax: ++ (680) 488 8730
Email: ccn@palaunet.co

REGISTER EARLY... DON'T WAIT... DO IT NOW!

REGISTRATION FORM

First Name: _____ Last Name: _____ Name for Badge: _____

Post or Position: _____ Title (e.g., Dr., Mr., Ms.): _____

Institution or Affiliation: _____

Abbreviation of Institution: _____ E-mail Address: _____

Mailing Address: _____

City: _____ State: _____ Postal Code (Zip Code): _____

Country: _____ Country Phone Code (e.g., USA = 1): _____

Phone # with City/Area Code: _____ Fax # with City/Area Code: _____

require Spanish <=> English translation require French <=> English translation.
 need a room reserved need roommates need a personal letter of invitation.

Payment Information (in US\$):

Pre-registration Prepayment (received by 1 February 2003) (Non-Student)*	\$80	_____
Pre-registration Prepayment (received by 1 February 2003) (Student)*	\$45	_____
Late Registration (received after 1 February 2003) (Non-Student)	\$125	_____
Late Registration (received after 1 February 2003) (Student)	\$65	_____
Social Gathering (food and drink provided)	\$15	_____
Awards Banquet (Non-Student)	\$30	_____
Awards Banquet (Student)	\$20	_____
Coffee Break Sponsorship (acknowledgment in program & at break site)	\$1,500	_____
Coffee Break Co-Sponsorship (with similar acknowledgment)	\$500	_____
Vendor Table, 2.5 x 6.0 ft or 76 x 183 cm (For-Profit Organization)	\$200	_____
Vendor Table, same size (Not-For-Profit Organization)	\$75	_____
TOTAL PAYMENT in US\$ (fill in amount)	\$	_____

*Individuals that pre-register but who will have difficulty prepaying by 1 February 2003 should contact Nicolas Pilcher, President, International Sea Turtle Society, by e-mail at nick@dominomail.unimas.my, fax at +(680) 488-8730, or post mail at Community Conservation Network, PO Box 1017, Koror, Palau, to request and explain the need for a waiver of the late registration fees.

Payment Method:

Check or Money Order Enclosed (make check or money order payable to Sea Turtle Symposium)

Credit Card Payment (Visa, MasterCard, Discover, or American Express)

Credit Card Number: _____

\$ Amount Authorized: _____

Cardholder Signature: _____

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Cover Photograph: Kalpitti island, near Agatti, Lakshadweep (Basudev Tripathy)

Page 7: Beach Armouring in Lakshadweep (Kartik Shanker)

Operation Kachhapa is coordinated by the Wildlife Protection Society of India and supported by the Barbara Delano Foundation.

The opinions expressed in this publications are those of the individual authors and are not necessarily shared by the Editors, members of the Editorial Board, the Wildlife Protection Society of India, or any individuals or organisations providing financial support.

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