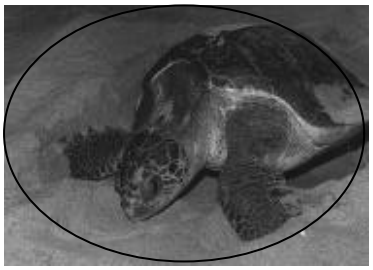


Kachhapa

A newsletter for the Indian ocean on sea turtle conservation and management

The wandering minstrels of Orissa – singing to save turtles (see article, pp 19)

Guest Editorial

The Future of Ridley Arribadas in Orissa: From Triple Waste to Triple Win?

AND

India and Marine turtles at the WTO
Sea turtles along the Gujarat coast
An overview of the WII's sea turtle research program in Orissa

Issue No. 5
July, 2001

HELP US WITH OUR MAILING LIST

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 Indian subcontinent and neighbouring regions. The newsletter also intends to cover related aspects such as fisheries and marine biology. In the first issue, Kachhapa provided a compilation of organisations working on sea turtles in the subcontinent. From the second issue on, Kachhapa has included articles on the above subjects. Kachhapa articles are now peer reviewed. For the moment, Kachhapa will come out twice a year, sometime at the beginning and sometime at the end 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:

Kartik Shanker
A1/4/4, 3rd Main Road, Besant Nagar, Chennai 600090. India.

Or by email to:

editors@kachhapa.org

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.

KACHHAPA ONLINE IS AVAILABLE AT http:// kachhapa.org

IN THIS ISSUE

I feel a special regard for Nicholas Mrosovsky, the founding editor of the Marine Turtle Newsletter, which has served as an inspiration and model for Kachhapa. Through the MTN, he was instrumental in launching two letter writing public awareness campaigns that focused international attention on the situation of olive ridleys in India. He is a former co-chairman of the MTSG and present member. His scientific work on turtles has concerned sea finding orientation, sex ratio, and thermal biology. His books include: Conserving Sea Turtles (1983) and Sustainable Use of Hawksbill Turtles (2000). It is in the context of the issue of sustainable use that I invited him to share with us his thoughts on the subject. The community of conservationists, particularly those concerned with sea turtles, seem to be largely reluctant to consider sustainable use and I hope this will stimulate some debate on the issue. Also in the issue, Sali Bache clarifies the details of the WTO case regarding shrimp and turtles, which has suffered from lack of adequate coverage in India. Biswajit Mohanty tells us about success of the wandering minstrels in spreading the word of turtle conservation in Orissa. For the first time, we have contributions from the Forest and Fisheries Department. Finally, in the spirit of the recently concluded MoU on the Indian Ocean and South East Asia (report in this issue), this newsletter hopes to serve to further regional communication and cooperation for the conservation of marine turtles in the Indian ocean region.

Kartik Shanker, Editor

Guest Editorial
The Future of Ridley Arribadas in Orissa: From Triple Waste to Triple Win?

Nicholas Mrosovsky
Department of Zoology, 25 Harbord Street, University of Toronto, Toronto, Ontario, Canada M5S 3G5
Email: mro@zoo.utoronto.ca

I am grateful to the editors of Kachhapa for their invitation to give an outside perspective on the arribadas of olive ridley turtles in India. From a distant viewpoint what I see is waste, waste, and waste.

The first waste is that of adults, often in reproductive condition full of eggs, caught in fisherman's gear, some dead already, others killed to disentangle them from nets, carcasses washed ashore, bloated, rotting. These animals might have contributed to augmenting the next generation of turtles.

The second waste is that of eggs and potential hatchlings on the beaches. The reduction of preferred nesting beaches by erosion, combined with the tendency of the turtles to select such beaches, has led to nesting densities so high that large numbers of eggs are destroyed by turtles nesting subsequently; sometimes as many as 70% of the eggs are destroyed in this way (Mohanty-Hejmadi & Sahoo 1994). Sometimes the production of virtually a whole arribada is lost to high seas. Predators are also numerous, digging up eggs and killing hatchlings. This type of situation is not peculiar to the ridley beaches in Orissa. After arribadas in Costa Rica, sometimes "the stench addled eggs and decomposing hatchlings is overpowering (Hughes & Richard 1974)".

The third waste is that of the opportunity to help impoverished people. The rotting carcasses and rotting eggs might otherwise have provided protein for people in need of better nutrition. Around 35% of the population of India is considered "food-insecure", consuming less than 80% of the recommended minimum energy requirement; Nearly 9 out of 10 pregnant women aged 15 – 49 are malnourished; anaemia results in 1 out of 5 babies dying (World Food Programme 2000).

It is only natural then to wonder whether somehow the situation at the turtle beaches in Orissa could be rearranged in a mutually beneficial way. Sea turtles have a high output of eggs, but poor survival to adulthood. Mortality at the early stages of the life cycle is especially high. The arribadas of ridleys are perhaps the most spectacular manifestation of attrition

of eggs and hatchlings. This type of life cycle presents an opportunity for conservation and management: save eggs that would otherwise have been destroyed, allocate some for consumption, and set aside others to augment the output of hatchlings from the beach. This strategy is laid out in general terms in Fig. 1.

It is a conservative strategy in that not all the saved eggs are taken for consumption; some go toward increasing recruitment to the wild population. These eggs might have to be incubated elsewhere than the site of arribadas. With attention to such matters as temperature and sex ratio, it should be possible to solve potential problems associated with ex-situ incubation (see also Mrosovsky 1989). Initially, experiments on a modest scale might be advisable. Appropriate administrative arrangements would be as important as the biological aspects.

This general strategy also has the advantage that at least some of the money needed to pursue it would be generated by the operation itself. It is not assumed that no outside funds would be needed; some input might be required especially at the startup phase, but, nevertheless, there is an important closed loop element evident in Fig. 1. A project with this structure would generate funds from the sale of saved eggs, some of which could go to government organizations running the project. With funds for conservation being limited, this is important. There should also be a boost to the local economy, and this, plus direct involvement of villagers in conservation and harvesting, would enable the people in closest contact with the animals to benefit from their management.

Step 1 in Fig. 1 is the identification of sources of mortality on a particular beach. Sometimes these are obvious, but there may often also be a need for experiments and quantification. An example of an intelligent investigation in this category is the work of von Mutius (2000). Studying olive ridleys at La Flor, Nicaragua, she found that in double clutches (i.e. one nest laid on top of and disturbing a previous nest) the mortality was 63.6 % compared to 41.3% in single clutches. The idea that hatch rates of ridleys may be better when nest density is less has been around for some time (Cornelius & Robinson 1982). In India, it has been noted that at Rushikulya, a beach with relatively sparse arribada nesting, hatch rates (74.3%) are much higher than those at the more densely packed Gahirmatha (Pandav 2001). For step 1 (Fig. 1), data specific to particular circumstances are needed, but application to Orissa of step 1 should not be too hard.

Step 2, the reduction of mortality should also be feasible. There may be difficulties, for instance when losses result from unpredictable storms. Nevertheless, doubtless there are ways to save at least some of the eggs and hatchlings that are likely to suffer mortality on arribada beaches. The possibility that eggs that do not hatch might end up in some important part of the food chain should be kept in mind.

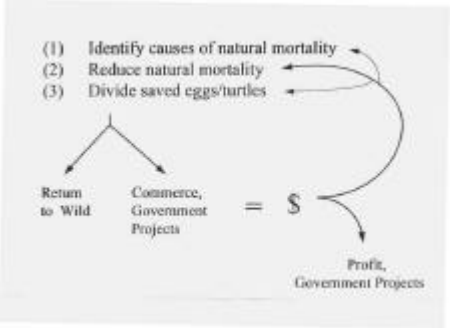
Step 3 might be more of a challenge, requiring ingenuity and creativity to get eggs from remote locations to markets. Pickling or other preservatives could be tried, or locally making eggs into some kind of cake or item that would last longer. Powdered egg might be considered. Doubtless people will laugh at such suggestions. These are not advocated as the best or even necessarily feasible methods, but offered simply to indicate that problems of transport could probably be solved by entertaining a variety of ideas.

People can always find arguments why something might not work. The history of science is full of cases of people being told things were impossible. Preservationists are adept in finding arguments against experimental projects for sustainable use of resources. The IUCN Marine Turtle Specialist Group (MTSG), while paying lip service to sustainable use, has a dismal record in terms of actually helping and fostering creative investigation of such options (cf Campbell submitted). In the past, it failed to get involved in the very conservative egg harvesting system at Ostional, Costa Rica. More recently, it has set up a sustainable use task force that is virtually non-functional. If people in India wish to try new approaches in Orissa, they should not look to the present MTSG for help. Their efforts would have to be powered by their own conviction that something new needs trying, and that by using their own expertise it is possible to achieve something better than the present waste.

The reasons for conservation need to be thought about. Is the aim to preserve arribadas for their own sake only, or to preserve the resource so that it can be used, or both? If use of the resource is part of the aim, the present wastage of eggs on the beach shows that some use is already possible. And of course some use is currently being made of this resource. But this is largely haphazard, illegal, and not well monitored,

very different from the kind of controlled and conservative use outlined in Fig. 1 here.

Fig. 1. A general strategy for utilisation of sea turtles (Mrosovsky 1997).



The alternatives also need to be assessed realistically, as well as idealistically. Despite progress and hopeful signs (Wright et al. 2001), enforcement of wildlife laws is likely to be partial, because with unemployment, the need for better health care, infra structure maintenance, and numerous other demands, there are often higher priorities for governments. Moreover, suppose enforcement were totally effective and that fishing boats and gill nets were eliminated from the area. That would not address the waste on the beaches of eggs, those neat packages of protein conveniently delivered to the shore.

I grew up in the war. As children we were taught that waste was one of the worst most sinful offenses. For some people on the margins of existence, it is always wartime for survival. The present juxtaposition of need and waste is disturbing.

The phenomenon of these massive arribadas is so striking, that even from a distance some of the main biological aspects stand out clearly. Various details cannot be discerned and the human social factors appear nebulous, complex. No detailed prescriptions are offered. It is only asked that all types of option for the ridley arribadas be seriously considered, that undoctrinaire and open-minded discussion occur, that people ask themselves if they are comfortable with the present situation and if there is any way in which triple waste can be transformed into triple gain.

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India and Marine Turtles at the WTO

Sali Jayne Bache
Research Fellow,
Center for Marine Policy, University of Wollongong
NSW, 2522, Australia.
Email: sali_bache@uow.edu.au

Five of the seven species of marine turtles occur in India, with the exceptions of Kemp's ridley and flatback turtles. All five species are protected under India's Wildlife Protection Act of 1972 and under the several international treaties to which India is a party. Of particular concern in India is the mortality of olive ridley sea turtles, the main cause of which is believed to be from shrimp trawl operations (Pandav et al. 1998). Much of this mortality (> 75,000 turtles over the past five years) occurs off the coast of Orissa which has three major mass nesting sites. India is one of four nations that, in 1996, challenged the imposition of United States import embargoes on shrimp caught in nations where their trawl vessels were not required to use turtle excluder devices or TEDs. Though it was estimated that should TEDs be made mandatory in India, a loss of US$23 million would occur (Bharucha 1994), the actual impact on India of the US embargo has been slight, due in part perhaps to their focus on the Japanese frozen shrimp market.

United States shrimp import embargoes

In the early 1980s the US began a process of requiring all domestic shrimpers to use gear modifications to drastically reduce the mortality of sea turtles incidentally caught in shrimp trawls. In November 1989 the United States Congress expanded this policy so as to apply to all shrimp sold on the US market through the enactment of section 609 Conservation of Sea Turtles: Importation of Shrimp. Section 609 placed two requirements upon the US government. The first directed the Secretary of State to negotiate with foreign nations the development of measures to ensure sea turtle protection in shrimp harvesting operations. The second, subsection b(2), created a process where under nations desiring to import shrimp into the US must be certified by the US government. The US's leverage came from its considerable market size - United States shrimp imports total more than $US1.2 billion per year (Department of Commerce, in anon, 1996). Certification was to be carried out by the President (acting through the Secretary of State), and had to be supported by credible evidence. It was available to fishing nations whose sea turtle bycatch rate was comparable to that of the US's as judged by meeting several conditions, the primary of which was the use and enforcement of TEDs. Without certification of a comparable program, the Secretary of State was required to embargo the importation of shrimp and shrimp products from the relevant nation(s).

With regard to the placement of embargoes on countries which did not meet US standards, the Department of State decided in 1991 to limit this provision to nations in the Caribbean region. These nations were granted three years to bring their regulations up to US standards. Through legal appeal by environmental NGOs to domestic US courts, this decision to geographically limit the law's application was overturned in April 1996, and hence the US comparability requirement became applicable to all nations wishing to import shrimp into the United States.

Shrimp-turtle dispute at the WTO

Two immediate responses to the US domestic court decision occurred. Firstly, in March 1996, the Association of Southeast Asian Nations (ASEAN), along with India, Pakistan, Hong Kong, Korea, Australia, Mexico and Venezuela, protested the US ruling and law 609 to the World Trade Organisation (WTO) (Batcki 1996). In July 1996, Suvit Khunkitti, Thailand's Agriculture and Cooperatives Minister, issued a statement warning the US to ease the ban or else the ASEAN members would raise the issue at the WTO's December 1996 meeting (Kibel 1996). In the event only four nations — India, Malaysia, Pakistan, and Thailand — requested consultations.

Consultations at the WTO between the US and the four plaintiff nations occurred in November 1996, wherein India, Malaysia, Pakistan and Thailand

argued the appropriateness of the US's attempts to impose its domestic policies upon foreign nations through import restriction. Unsatisfied with the outcome of consultations, these four nations requested the establishment of a dispute settlement panel to consider the legality of section 609 embargoes.

In April the following year, the WTO established a three person dispute resolution panel. Findings were handed down a little over twelve months later (WTO 1998a). The US measures were found to be inconsistent with Article XI of the General Agreement on Tariffs and Trade (GATT), which maintains that WTO members shall not impose import restrictions. The US claimed that the measures fell within Articles XX(b) (relating to the protection of animal life or health) and XX(g) (environmental exceptions). The Panel however dismissed these claims and insisted that the US measures were an unjustifiable discrimination between nations and hence did not comply with the necessary conditions of the introductory sentence of Article XX.

Meanwhile, the second response to the April 1996 US domestic Court of International Trade decision was affected through the State Department's promulgation of new regulations to implement the foreign shrimp certification program (61 Fed. Reg. 173342 (1996)). These regulations allowed for shipment-by-shipment certification of shrimp caught with TEDs. They provided that all shipments of shrimp and shrimp products into the US had to be accompanied by a declaration that the harvest was either under conditions that do not adversely affect sea turtles; or in waters subject to the jurisdiction of a nation currently certified by the President. Environmentalists and other agencies were concerned that nations that had been certified as comparable to the US would abandon their programs given the new shipment-by-shipment assessment provisions, or that uncertified nations would see no benefit in expanding their policies, as their product was already granted US import access. Thus the Department of State committed to reviewing the effect of the decision, every six months, over a three year period, and to redressing the decision should TED programs be abandoned or their adoption dwindle.

WTO Appellate Body decision

In July 1998, after two months of concerted NGO campaigning, the US lodged an appeal on the WTO's turtle-shrimp decision. In August, the Appellate Body heard both oral arguments by the parties and accepted three amicus curiae (friend of the court) briefs from environmental NGOs. In issuing its surprise findings on 12 October, the Appellate Body largely rejected the Panel's original decision, describing its earlier interpretation as "a result abhorrent to the principles of interpretation we are bound to apply" (WTO 1998b). The Appellate Body interpreted its governing Convention in light of its general preamble, which endorses sustainable development and environmental protection.

The case rested on the applicability of Article XX exceptions. This article reads:
Subject to the requirements that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures: ….
(g) relating to the conservation of exhaustible resources if such measures are made effective in conjunction with restrictions on domestic production or consumption.

A nation wanting to use Article XX has two hurdles to clear. Firstly it must establish provisional justification for using Article XX by showing that a particular sub-paragraph applies. It then must establish a final justification by showing that the measure in question does not contravene the chapeau or introductory paragraph.

In terms of the first, a State claiming an exception under XX(g) must be able to demonstrate that the resource it is aiming to protect is an exhaustible natural resource. The appellate body found that sea turtle were endangered world wide, that shrimping was the greatest source of mortality, and that TEDs were the best, inexpensive way to eliminate that mortality. They accepted that sea turtles were exhaustible natural resources: thus acknowledging that exhaustible resources could be both living or non-living and could be renewable and non-renewable resources.

Secondly, in order for a measure to be deemed "related to" the conservation of an exhaustible natural resource, the measure must not be incidentally or inadvertently aimed at such conservation. The law must be "aimed primarily" at the conservation

objectives and show "a close relationship between means and ends". This was interpreted as being satisfied if "sufficient nexus" between the law and the environment of the enacting State could be demonstrated, a condition the Appellate Body held was being met in the case of section 609.

In considering the application of a measure to Article XX subsections, the requirements of the chapeau to Article XX must also be met. To recall, the chapeau requires that measures not be applied in a manner which constitutes either:
arbitrary or unjustifiable discrimination between countries; or
a disguised restriction to trade.

The Appellate Body in turtle-shrimp decision offers the clearest analysis of this provision yet, and defined a number of criteria for not meeting these tests. It held that:
A nation may not require another State to adopt a particular technology or measure, in that other technologies or measures that have the same effect must be accepted;
When applying measures to other countries regulating counties must take into account differences in the prevailing conditions in those countries;
Before enacting trade measures nations should attempt to enter negotiations with the exporting state;
Foreign countries affected by trade measures should be allowed time (and all should be afforded the same length of time) to make adjustments; and
Due process, transparency, appeals procedures and other appropriate procedural safeguards must be available to foreign States or producers to review the application of the measure.

Although the Appellate Body upheld the validity of section 609 as a conservation measure permissible under Article XX of the GATT, it found that the US's application of section 609 resulted in arbitrary and unjustified discrimination against the four complainant nations. The criticisms took issue with several aspects of the US law, including that:

- the four complainant nations had received a significantly shorter compliance time than had other (Caribbean) nations;
- insufficient account was taken of the conditions in the different nations from which the shrimp export originated; and
- that the US had made inadequate efforts to secure international agreements with the complainant nations.

Subsequent to the decision by the Appellate Body, the 132 member nations of the WTO adopted the decision by consensus on 6 November 1998. The US was then provided 30 days to report back to the WTO as to what measures it would take to implement this decision. That is, although section 609 did not have to be altered, the application of it was required to be amended to meet the above conditions within an agreed to 13 month implementation period.

US implementation and the WTO compliance panel ruling

The US submitted five status reports on its implementation of the Appellate Body decision, the last occurring on 27 January 2000. The US's implementation scheme consisted of:

- confirmation, refinement and implementation of the allowance of shipment-by-shipment certification hence permitting the import of TED caught shrimp from non-certified countries,
- increased efforts in technology transfer in regard to the design, construction, installation and operation of TEDs to any government that so requests, and
- active participation in negotiations for an Indian Ocean and South East Asian Memorandum of Understanding on the Conservation of Marine Turtles and their Habitats (IOSEA).

An appeal lodged by Malaysia on 12 October 2000 under Dispute Settlement Understanding (DSU) Article 21.5 challenged the adequacy of the US's implementation of the Appellate Body findings. Malaysia claimed that the US's refusal to remove all import prohibitions from non-certified nations amounted to a failure to implement the WTO decision. A compliance panel was established, consisting of the original panel members, and on 16 May 2001 it handed the parties its confidential decision on whether the US's actions met the recommendations of the Appellate Body ruling (WTO 2001). A finding by the compliance panel against the US would have allow retaliatory trade measures to be placed on the United States by Malaysia under Article 22.6 of the DSU.

The compliance report, released publicly on 15 June, found, however, that Malaysia had failed to provide sufficient evidence to rebut a prima facie case that the US had complied with the Appellate Body findings. It held broadly that the US had made serious efforts in good faith to reach a consensual multilateral arrangement for conserving sea turtles, and as such would be provisionally permitted to keep embargoes

in place so long as such efforts continued. There remains some uncertainty as to whether Malaysia is likely to lodge a further appeal on the WTO implementation panel findings.

On the 23rd of June the IOSEA was concluded under the auspices of the Convention for the Conservation of Migratory Species of Wild Animal (CMS). This Memorandum of Understanding (MoU) and attached plan of management received eight signatures and has a potential membership of more than 40 nations. It is due to become active on the 1st of September 2001. As an MoU, the IOSEA is a non-binding agreement, though it does contain a commitment to consider a timeline for its transformation into a formal treaty at the first meeting of parties.

Although India has not continued a formal pursuit of the WTO turtle-shrimp case, it did submit a third part brief to the compliance panel, supporting Malaysia's position. Notwithstanding India's rejection of the US's imposition its domestic conservation standards upon shrimp importing nations, TEDs are scheduled to be made mandatory on bottom trawl vessels in at least one state, Orissa, during 2001. Concerns expressed by fishers are that these gear modifications will result in both safety and technical complications, as well as a reduction in catch and consequent loss of jobs in the affected regions. These are, interestingly, similar concerns to those that were expressed by US shrimpers when TED provisions were first introduced to US trawl fisheries in the 1980s. Additional issues for fishers include the fairness of targeting one particular impact whilst other activities impacting upon sea turtle populations remain unregulated. Indeed, India has stated in one of its WTO submissions a belief that TEDs should be seen as only one of several available means of conserving sea turtles, citing the use of area closures as a practicable alternative. In fact, coastal states such as Orissa already have a 10 km nearshore ban on mechanised fishing, though these bans have not been strictly enforced. A series of workshops on TED awareness and implementation have been scheduled to be held in Orissa and Andhra Pradesh as a part of the national GOI UNDP Sea Turtle Project. In addition, a program has been initiated to facilitate the distribution of about 700 TEDs to trawler operators, though the major obstacle to the use of TEDs in India remains that of compliance and enforcement.

Acknowledgements

I would like to thank Jack Frazier and Kartik Shanker for their helpful comments.

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Appendix

Conditions to be met for section 609 certification:

• countries with a fishing environment that does not pose a threat of incidental takings of sea turtles because of:

a. an absence of the species within its jurisdiction,

b. exclusive use of harvest methods which do not pose a threat to sea turtles, or

c. whose commercial harvest occurs exclusively in areas where sea turtles do not occur; or

• harvesting nations that provide documentary evidence of the adoption of a regulatory program governing the bycatch for turtles in shrimp trawling operations to the effect that:

a. requirements to use turtle excluder devices (TEDs) are comparable in effectiveness to those in the US — that is a 97 percent turtle exclusion rate, and

b. a credible enforcement effort including monitoring, compliance and appropriate sanctions (56 Fed. Reg. 1051 (1991); 58 Fed. Reg. 9015 (1993); and 61 Fed. Reg. 17342 (1996)).

The Economic Value of Natural Products and Ecological Services Generated by Mangrove Ecosystems

Patrik Rönnbäck

Department of Systems Ecology, Stockholm University

S-106 91 Stockholm, Sweden.

Email: ronnaback@hotmail.com

One major driving force behind the loss of more than 50% of the world's mangroves during the last decades, is the inability among economists to recognize and value all natural products and ecological services produced by this ecosystem (Saenger et al., 1983; Hamilton et al., 1989; Barbier, 1994; Ronnback, 1999, 2000). In part, this trend of undervaluation is due to the difficulty involved in placing a monetary value on mangrove goods and services that are: (1) not traded on markets and thus do not have a directly observable value; and (2) harvested or enjoyed outside of the mangrove system and therefore not readily acknowledged as generated by this system (Hamilton and Snedaker, 1984; Barbier, 1994). Lack of ecological knowledge among valuators is another important determinant to the undervaluation of mangroves (Rönnbäck, 1999). Consequently, mangroves are considered as wastelands and are therefore prime candidates for conversion into alternative uses like shrimp aquaculture, which generate directly marketable products.

The number of valuation studies is limited. Furthermore, the quality/objectiveness of existing studies is sometimes highly questionable. In general though, the major value can be found in fisheries products and ecological services supported by mangroves, whereas the value of forest products is less significant. The valuation of fish and shellfish is straightforward, since these goods usually have an easily observed value. The valuation of ecological services is more complicated, and involves a number of techniques, ranging from willingness-to-pay to replacement cost methods.

An important aspect of the valuation process is the identification of dose-response relationships, i.e., what happens if 50% of a forest is lost or degraded? Is there a linear relationship, i.e., do we loose 50% of the value of that forest? The answer to this question will depend on the type of goods and services in question and the type of disturbance regime. In general, riverine and fringe mangroves would have a higher value (stronger support to fisheries products and many ecological services) compared to basin forests. At this point there is, however, no possibility to separate the value of basin mangroves from fringe and riverine types. Neither is it possible to quantitatively rank the relative importance among mature, recovering and cleared mangroves (although they would rank in that order). I would therefore argue that the precautionary principle is used, where all types of mangroves are given the same value per ha.

Costanza et al. (1997) reviewed the literature to assess the economic value of 16 different biomes, including tidal marsh/mangroves. The total annual value of mangroves was estimated at US$9,900 per ha, where

ecological services like storm protection and waste treatment accounted for 85% of the total value. The value of the waste treatment service (US$6,700/ha/yr), which was derived from tidal marsh systems, is somewhat higher than for mangroves. Based on the cost of constructing a sewage treatment plant, the waste disposal service of mangroves has been estimated at US$ 5,820 in Fiji (Lal, 1990) and US$ 1,190 in Mexico (Cabrera et al., 1998). Costanza et al. (1997) estimated the value of mangrove food production (mainly fish and shellfish) to US$ 640/ha/yr, which can be considered as a lower bound estimate. To identify commercial and subsistence fisheries supported by mangroves, economic analyses must take into account: (1) the large number of resident and transient species that utilise mangroves as habitat; (2) the biophysical interactions in the coastal seascape biome; (3) that shrimps and indirectly mangroves subsidize total fisheries catch by shrimp trawlers; and (4) the aquaculture industry's dependence on inputs like seed, spawners and feed (Rönnbäck, 1999).

Acknowledgement of these support functions illuminates the potential life-support value of mangroves. One ha mangrove generate 1,100-11,8000 kg fisheries catch (3,600 kg as mean), which in developing countries correspond to a market value of US$900-12,400 (US$3,400 as mean), annually (reviewed by Rönnbäck, 1999, 2000). In areas with underdeveloped fisheries, the annual value of natural products and ecological services generated by mangroves probably lies in the order of US$10,000 per ha mangrove. In areas where commercial and subsistence fisheries are well-developed, the value would be around $20,000/ha/yr. It should be emphasized that these economic values are ballpark estimates. From an ecological-economics perspective it can be misleading to generalize about the value of an ecosystem. Rather, site-specific studies should be done in order to account for non-linearities, thresholds and discontinuities in dynamic ecological and socio-economic systems. It is, however, clear that considerable economic benefits can be gained by restoring mangroves, which cost approximately US$100-1000 per ha. Moreover, the significant economic value of mangroves places serious doubt on the low lease fees (usually a few dollars per ha mangrove) paid by logging concessionaries or shrimp aquaculture prospectors.

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An Overview of Wildlife Institute of India's Sea Turtle Research Program in Orissa

Bivash Pandav
Wildlife Institute of India
P.O. Box # 18, Chandrabani, Dehradun 248 001, Uttaranchal
Email: pandavb@wii.gov.in

Four species of sea turtles – olive ridley (*Lepidochelys olivacea*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), and leatherback (*Dermochelys coriacea*) – are reported to occur in the coastal waters off Orissa (Dash and Kar, 1990; Pandav, 2000). However, nesting of only one species, the olive ridley has been confirmed so far. The remaining three species are extremely rare in Orissa. The olive ridleys arrive in the coastal waters of Orissa by late October and early November. Mating takes place in the coastal waters during November and December followed by sporadic and mass nesting from January to April. Scientific research on sea turtles started in Orissa a little over two decades ago. Nevertheless, much of this has remained largely confined to the world's largest known sea turtle rookery at Gahirmatha. An estimated half a million ridleys have been recorded to lay their eggs at Gahirmatha (Dash and Kar, 1990). While most of the studies on sea turtles in Orissa concentrated on the Gahirmatha nesting population, little attention was paid to other sea turtle nesting beaches along the Orissa coast.

The Wildlife Institute of India's (WII) involvement with sea turtle research in Orissa started in 1993. During the 1993-94 sea turtle breeding season, the WII, in collaboration, with the wildlife wing of Orissa Forest Department, carried out a six month status survey of olive ridley sea turtles and nesting habitats along the Orissa coast (Pandav *et al.*, 1994a). Apart from documenting the sea turtle nesting and mortality all along the Orissa coast, this survey led to the discovery of a new sea turtle mass nesting beach near the mouth of river Rushikulya along the southern Orissa coast (Pandav et al., 1994b). After the discovery of Rushikulya rookery, the WII initiated a long-term research and monitoring program all along the Orissa coast. The three mass nesting beaches in Orissa at Gahirmatha, Devi River mouth and Rushikulya together support a significant portion of the world's olive ridley population. Although the nesting population at Gahirmatha has been the focus of several studies over the past two decades, little is known about the turtles at the other two rookeries in Orissa. This study was aimed at monitoring the turtle population all along the Orissa coast and addressing key issues related to their conservation.

The off shore aggregations of olive ridleys in the coastal waters off Gahirmatha as well as the nesting populations at the three rookeries were studied during 1995 – 1999. 1,767 olive ridley mating pairs were captured in the coastal waters off Gahirmatha of which 1,657 males and 1,616 females were double tagged using monel metal flipper tags. On the beach, 10,327 nesting females were tagged during the study. This study reveals that straight carapace lengths of males and females at Gahirmatha are $66.2 \pm 2.9_{sd}$ cm and $66.7 \pm 2.4_{sd}$ cm respectively. When compared with sizes from other populations, it appears that average lengths of carapaces and range of sizes obtained in this study are larger than other geographical regions. Both male and female olive ridleys showed strong fidelity to breeding ground. Ridleys tagged at Rushikulya rookery nested within 100 to 300 m (range of 0 to 1,000 m) during subsequent seasons. Nesting females also showed some degree of movement between nesting beaches, both within as well as between nesting seasons. The range of such inter-rookery movement of olive ridleys in Orissa varied from 35 to 320 km (n = 6). Recovery of 18 tagged turtles from Sri Lanka and three from southern Tamilnadu (Gulf of Mannar) provides a clue about the non-breeding areas of the olive ridleys nesting in Orissa. One-year remigration intervals were most common for recaptured ridleys of both sexes with second and third year intervals correspondingly less common. Tag recovery from dead turtles washed ashore on the Orissa coast also provided evidence of considerable movement in the coastal waters off Orissa.

The location of olive ridley mating pairs sighted during the study in the coastal waters off Gahirmatha were recorded and the extent of distribution was obtained by drawing a Minimum Convex Polygon (MCP) around the turtle locations. Mating pairs were found to be aggregated in an area of 52.58 sq. km (100% MCP) in the coastal waters off Gahirmatha and

the area of maximum utilisation was 27.52 sq. km (90% Harmonic Mean). All the sightings of mating pairs recorded during the study were within 5 km of the coastline. All the observed mating took place within a depth of 20 metres. Turtles nesting in Orissa showed a distinct temporal pattern of nesting with most of the nesting taking place during neap tidal nights. A drastic change in beach profile was observed at the Nasi rookery, Gahirmatha during the study. In total, 34,469 and 77,208 eggs were examined at Gahirmatha and Rushikulya rookeries, respectively, to determine the incubation success. The mean hatching and emergence success at Gahirmatha varied from 47.7% to 94.4% and 39.8% to 84.3% respectively. Similarly, the mean hatching and emergence success at Rushikulya varied from 83.8% to 97.01% and 69.78% to 96.1% respectively. The hatching success of the eggs laid at Rushikulya rookery was found to be significantly higher than that at Gahirmatha.

Of the two mass nesting beaches (Gahirmatha and Rushikulya) regularly monitored during the study, extensive beach erosion was observed at the Nasi rookery, Gahirmatha. Beach erosion resulted in loss of almost 59% of the total nesting area at Nasi rookery, Gahirmatha. The disorientation of turtle hatchlings due to lighting was prevalent at Rushikulya rookery. During the study, the Orissa coast witnessed an exponential increase in number of dead turtles. In total 46,219 adult olive ridleys were counted dead along the Orissa coast during the study. All the dead turtles counted during the study were adults. The number of dead turtles counted in the survey sectors showed a strong correlation with the number of mechanised fishing vessels operating in their respective coastal waters.

The findings of this study strengthen the case for establishing a network of protected areas for sea turtles along the Orissa coast. This study proves that olive ridleys in Orissa use more than one beach for nesting during and across breeding seasons. Based on the movement of turtles between nesting beaches and in the coastal waters off Orissa obtained during this study it is proposed that the entire sea turtle population visiting Orissa coast should be considered as a single conservation unit. Therefore, protection of all the three mass nesting beaches as well as their coastal waters is extremely crucial for the survival of sea turtles in Orissa. Further, the analysis of incubation success data strengthens the importance of smaller rookeries like Rushikulya.

The large-scale mortality of adult turtles in Orissa recorded during the study is a matter of utmost concern and needs to be addressed immediately. The need for strengthening patrolling in offshore waters where turtle congregations occur and the use of TEDs are some of the steps that need to be taken up immediately. Turtle congregations elsewhere along the coast other than Gahirmatha need to be located so that adequate protection can be provided to the turtles in those offshore waters. Keeping in view the intensity of artificial illumination at Rushikulya rookery, the use of low intensity lights is suggested to mitigate the problem. Finally, this study recommends a continuous monitoring of the turtle population in Orissa.

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Sea Turtles along the Gujarat Coast

S.F. Wesley Sunderraj*, Justus Joshua, and Sesh Serebiah.

Gujarat Institute of Desert Ecology
Patwadi Naka, Bhuj, Kachchh- 371 001, Gujarat.
** Email: jaws_Wesley@hotmail.com*

Introduction

The state of Gujarat is bestowed with the longest coastline in the country covering more than 1600 km. However, of four turtle species believed to occur in the state, only the Olive ridley (*Lepidochelys olivacea*) and Green turtle (*Chelonia mydas*) are reported to breed while Leatherback (*Dermochelys coriacea*) and Hawksbill (*Eretmochelys imbricata*) are seen occasionally (Bhaskar, 1978, Kar and Bhaskar, 1982 and Bhaskar 1984). Other than these studies, no recent status information on the breeding populations of these species is available. The geo-morphological condition of the coast has favoured industrial sectors to develop many ports, jetties, petrochemicals, oil refineries and pipeline terminals, mining industries, and cement factories to get transportation by sea. Impacts of industrial development on this coastal ecosystem are discussed by Sen Gupta and Deshmukhe (2000). Lack of studies and coupled with rapid industrial development necessitated this study to assess the status of breeding population of sea turtles along the Gujarat coast under GOI – UNDP Sea Turtle Project with the following objectives.

- **To assess the breeding population status**
- **To identify existing threats and suggest conservation strategies.**

Study approach

Prior to the intensive field survey, potential nesting sites, i.e., extent and distribution of sandy beaches were identified from 1:50,000 Survey of India (SoI) topo maps. A rapid questionnaire survey was conducted along the coastal villages to determine the current status of nesting beaches. To estimate the status of the breeding population, intensive field survey was conducted along the coast during night and day depending on accessibility between August and December. This paper discusses the population status and predation threat with suggested conservation strategies.

Result

Distribution of major shore types

Out of 19 districts and 184 talukas of the state, 11 districts and 40 talukas actually share the coastline of the state. Based on SoI topo sheet, four major shore types have been identified such as: pure sandy shore (S), rocky shore with sandy patches (RS), marshy shore with sandy patches (MS) and pure marshy stretches (M). A qualitative assessment of different shore types showed that out of 40 talukas, only 12 talukas (30%) had pure sandy shore, which supposedly provide potential habitat for nesting. Nearly 45% of the talukas (18) fall under total marshy category, which is not suitable for nesting. Six are rocky shores and four are marshy shores with sandy patches.

Nesting population and density

A total of 676 nests were encountered during this survey, of which there were Green turtle 461 nests and the rest were of Olive ridley nests. Nesting of Leatherback (*Dermochelys coriacea*) and Hawksbill (*Eretmochelys imbricata*) were not recorded. Estimated nesting density of Olive ridley and Green turtle for the entire survey area was 0.44 and 0.94 nests/km respectively **(Table. 1**). Among the districts Jamnagar had the highest density of Olive ridley (0.81nests/km) and Green turtle (2.10 nests/km) nests. The second dominant district was Kachchh for Olive ridley (0.73) and Junagadh for Green turtle (1.32). In Kachchh and Bhavnagar coasts only Olive ridley nests were recorded. Irrespective of species, the overall estimated density of nests were 3 nests/km for Jamnagar followed by Junagadh coast (1.64) (Table 2).

Table 1. Nesting population and density for different districts

District	Distance Survey (km)	No. of OR Nest	Density	No. of GR Nest	Density	Total Nest	Density
Kachchh	83.50	61	0.73	0	0	61	0.73
Jamnagar	111.50	90	0.81	234	2.10	324	2.91
Junagadh	170.50	54	0.32	225	1.32	279	1.64
Amreli	25.00	3	0.12	2	0.08	5	0.20
Bhavnagar	100.75	7	0.07	0	0	7	0.07
Total	**491.25**	**215**	**0.44**	**461**	**0.94**	**676**	**1.38**

OR = Olive Ridley; GR = Green Turtle

Threats

Nest predation

Excluding Amreli and Bhavnagar data (due to low record) and 37 nest collected by the forest department for hatchery in Kachchh, 627 out of 676 recorded nests were used to assess the predation rate. Out of 627 nests recorded in three districts, 21% (131 nests) were predated by human and 36% (227) by animal. Estimated overall predation rate was 57%. The beach in Kachchh had sporadic nesting with all the 24 nests encountered being predated (100%). Comparison between Jamnagar and Junagadh showed, significantly more predation (75%) in Jamnagar. Turtle nests were under higher animal predation than human predation (**Table 2)**.

Turtle mortality

During the survey, 37 dead turtles were encountered in different areas. The mortality rate estimated based on encounter rate per km showed comparatively high mortality in Kachchh coast (0.12 turtle/km). Despite their being no record of Green turtle nesting on the Kachchh coast, five fresh dead turtles were found. Species specific mortality showed comparatively high rate in Green turtles (0.06) than in Olive ridley (0.02) with the overall mortality rate of 0.08 turtle/km (**Table 3**) Other existing threats identified were the spread of oil particles, sand mining and sewage pollution. However these threats were recorded more frequently in Jamnagar and Junagadh coasts compared to other areas. A detailed quantitative study is needed to understand the magnitude and the significance of their impacts on the nesting population.

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Table 2. Nest predation in different districts

Districts	Total nest	Human predation	Animal predation	Overall
Kachchh	24	37.50% (9)	62.50% (15)	100% (24)
Jamnagar	324	20.37% (66)	41.09% (136)	75.09 (202)
Junagadh	279	20.07% (56)	27.24% (76)	47.31%(132)
Total	**627**	**20.89%(131)**	**36.20% (227)**	**57.09%(358)**

Number of nest predated are given in parenthesis

Table 3. Turtles mortality recorded in different districts

Districts	No. of dead turtle recorded		Total	Distance covered	Mortality rate
	GR	OR			
Kachchh	5	5	10	83.50	0.12
Jamnagar	10	1	11	111.5	0.10

Junagadh	13	1	14	170.50	0.08
Amreli	0	0	0	25.0	
Bhavnagar	0	2	2	100.75	0.02
	28 (0.06)	**9 (0.02)**	**37**	**491.25**	0.08

Species specific mortality is given in parenthesis

Discussion

Among the districts surveyed, Jamnagar and Junagadh coasts provide potential habitat for nesting compared to other coasts. This estimate was lower than the earlier estimate (Bhaskar 1984) for the western part of Saurashtra Peninsula (between Okha to Veraval). No nesting of Leatherback (*Dermochelys coriacea*) and Hawksbill (*Eretmochelys imbricata*) were recorded during this survey. Turtle eggs are under predation by animals and human beings. Animal predation (36%) is more than human predation, which is higher than the estimates for Olive ridley (20-30%) in Rushikulya on the Orissa coast (Pandav *et al*. 1998). The estimated overall 57% predation rate will have significant impact on the survival rate of sea turtles on the Gujarat coast. Record of only 37 dead turtles with the encounter rate of 0.07 turtles/km showed mortality due to incidental catch along this coast was very low. However this needs an inepth study..

Conservation strategy

- Public awareness should be created keeping fisherfolk, NGOs, local students and coastal industrial based working people as target groups.
- Involvement of local people for the continuous monitoring of nesting population survey during the entire nesting season would provide good data base and also help in conservation activities.
- For the entire Jamnagar and Junagadh coast, the only turtle hatchery centre is at Madhavpur. Therefore one more hatchery is suggested for Jamnagar coast.
- Training programme for the forest field staff and local villagers in turtle hatchery management will improve the hatching success and thereby increase the survival rate.

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Orissa Coastal Management Initiatives: Protection of Nearshore Fishing Areas and Turtle Breeding Ground Through the Deployment of Artificial Reef Units

Linda Peer-Groves
1192, 2nd Lane, Ratnakar Bagh, Tankapani Road,
Bhubaneshwar. India.
Email: peergroves@hotmail.com

Olive ridley turtles (*Lepidochelys olivacea*) exhibit a unique behavior, mass nesting, or 'arribada' in only a few places in the world. Along the coast of Orissa, there are three known mass nesting beaches at Gahirmatha, Rushikulya and Devi mouth..

Over the past five years, more than 75,000 olive ridley turtles have washed up dead along Orissa's coastline, which has coincided with an increase in shrimp trawling. The sea turtle is acknowledged to be an indicator species and its rapid annihilation is indicative that many other species are at risk as well. Artificial reefs have been shown to protect inshore coastal areas from shrimp-trawlers who are capturing the turtles and other species as 'incidental catch'. The inshore coastal areas of Orissa are already protected legally by a series of laws intended to support local fishermen. These include the Orissa Marine Fisheries Regulation Act (1982) and Rules (1983) which prohibit mechanised fishing within a distance of 10 km from the shore. Although laws are in place, the local government enforcement agencies do not currently have the means to consistently patrol and prosecute offenders of these laws. Artificial reefs provide protection from trawlers entering into protected areas. In Orissa, the major turtle concentrations are off the coast of Gahirmatha and Devi mouth. In fact, studies have shown that most of the turtles near Gahirmatha are found within an area of 50 square kilometres (Ram and Pandav, 2001).

In addition to protecting designated areas from intrusion of trawlers into illegal territory, the presence of artificial reefs may increase both the variety and number of fish which inshore local fishermen depend on for their livelihood. In fact, from experience with artificial reefs in Kerala, it is recommended that local authority should prepare guidelines or proposed laws regarding ownership and exploitation rights to manage increased fishing activity in artificial reef areas.

In an ongoing project in Malaysia, it is believed that the number of deaths by incidental catch of marine turtles in some areas has been greatly reduced by using artificial reef balls. This is a compelling example of a possible intervention that could support conservation efforts in Orissa as well as protect and support rural livelihoods for coastal residents. The role and use of artificial reefs in turtle conservation was discussed by many researchers and government representatives at the workshop for the development of a national sea turtle conservation action plan, April 9-10 2001, Bhubaneshwar, Orissa conducted by the Forest Department, Govt. of Orissa, and Wildlife Institute of India, Dehradun. However, there are currently no available funds for supporting artificial reef construction along the Orissa coast.

Here, I propose a conservation and management initiative for sea turtles in Orissa, focusing largely on education and awareness programmes for local communities, including a test site for artificial reefs as one component. It must be stressed that, while artificial reefs may be useful, they are only likely to work over small areas and careful evaluation has to be carried out before any programmes are implemented.

Key components of the programme

1. Chemical and physical surveys of proposed sites for Artificial Reefs (Institutes such as School of Oceanography, Indian Institute of Technology, Madras and National Institute of Oceanography should be able to assist)
2. Survey of current fishery activities and practices (local offshore fishing, fish farming, trawlers operating in the area)
3. Selection of site for trial artificial reef units, based on surveys. (Gahirmatha or Devi River mouth.)
4. Decisions to be made: a) On materials used to make AR block, b) Design of blocks to be constructed, c) Where and how reef blocks are to be produced, d) Area covered with AR blocks and e) Patterns of deployment.
5. Construction of reef blocks and deployment off shore.

6. Awareness/Education
   a. Awareness campaign in local media about existence of artificial reefs; Where are they? and Why are they there?
   b. Use of newspapers, magazines, radio, billboards
   c. Experience in Malaysia demonstrated that 50% of the artificial reef success is achieved through awareness in local media
7. Sponsoring a series of local town meetings, inviting all stakeholders for Question-and-Answer sessions and producing handouts and media releases, which are based on concerns aired in these meetings. For:
   i. trawlers
   ii. fishermen
   iii. local authorities
   iv. residents
   v. educators and students
8. Introduction of primary and secondary curriculum supplements and materials to schools in coastal region. A booklet and a package of teaching aids used in delivery of educational activities about turtles and other coastal resources nearby in order to promote local environmental awareness and encourage discussion of strategies for protection and management. Education of school children is a means of ensuring that future generations have the skills to engage in discussion and democratic decision making on these issues.
9. Continued studies and surveys to assess the impact artificial reefs have on physical environment, fish populations, turtle breeding habits and mortality rates.

In summary, artificial reefs would deter trawl fishing and would have a positive impact on artisanal fishing. While they might not be the single magical solution to conserving sea turtles in Orissa, they could provide a much needed alternative to labour intensive enforcement in selected areas.

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Some Notes on the Olive Ridley Sea Turtle from the Fishery Desk, West Bengal

Madhumita Mukherjee
Deputy Director of Fisheries (M & P), Govt. of West Bengal
Captain Bheri, P.O. Naubhanga, Kolkata 700 039.
Email: madmita@cal.vsnl.net.in

The migration of Olive Ridley turtles to West Bengal for nesting has been documented. The coast of West Bengal extends from Sundarbans to Midnapore district. The turtles prefer the islands for nesting.. This region is characteristised by abundant food, favourable ecosystems with creeks, canals, lagoons, luxuriant forest of mangrove vegetation and sandy beaches. Olive Ridley turtles are found in the coastal areas of the Sundarbans where they nest in small numbers. During the visit to different islands of Sundarban, viz., Bijera, Kalas, Jambudwip & Marichjhanpi, turtles were found in Bijera and turtle nests were found in Kalas and Jambudwip. Turtles were also found nesting at Kedurdeep, Hansaraj in Sundarbans.

Olive Ridleys are abundant in the Bay of Bengal near the coast of Midnapore. From the region known as 'Military boya' to Dhamra of Orissa, from November till the 1st week of January. From February onwards their presence starts to diminish in Shankarpur coast.

Trading of different types of sea turtles has been documented at many places in the maritime districts. Turtles are hauled along the coastline from Kakdwip towards Midnapore district and landed at Babasahed ghat at Rasulpur and Petuaghat. These hauls never land at Digha or Shankarpur area to avoid guards. The meat of turtle are sold at interior markets viz., Sopna, Chowrangee in Contai sub-division. With an aim to conserve sea turtles, the Fishery Department, Government of West Bengal issued an order regarding introduction of TED in the mechanised trawlers.

A trematode *Parangiodictyum satyabrati* was isolated by the author from a marine turtle *Chelonia mydas* from the coast of Orissa

When Arribadas Fail to Arrive

N. Mrosovsky[1]
Department of Zoology, 25 Harbord Street, University of Toronto
Toronto, Ontario, Canada M5S 3G5
Email: mro@zoo.toronto.edu

In some years arribadas of olive ridleys fail to materialize at sites previously hosting these events. Although naturally this is worrying, it would seem improbable, though not impossible, that hundreds of thousands of turtles would all have met their end within one year. That this does not happen is shown by large arribadas occurring in the years after those without arribadas. But that still leaves the question as to what these turtles are doing in the years in which mass nesting is not observed.

I have taken figures from the literature for the number of turtles emerging in different years at Gahirmatha and plotted them against figures for the number of dead turtles washed ashore, expressed as a percentage of the number emerging (Fig. 1). The data come from Mohanty-Hejmadi (2000) and are based on records from the Wildlife Division, Government of Orissa. The graph shows that in years when large arribadas of a few lakh (a few hundred thousand) emerge, a few thousand dead turtles can be expected to wash ashore. That means that at such times the number of turtles found dead is about 1% of the number estimated to have emerged. However, in years when arribadas are absent, and only a few hundred turtles emerge, a few thousand dead turtles may still be recorded. In such years the number of dead turtles can reach about 5000% of the number emerging. Put in another way, there is no obvious relationship between the number of turtles emerging and the number of dead turtles: the number of dead is not a constant proportion of those emerging.

Of course, there are approximations in estimating numbers of turtles coming ashore. And the number of dead turtles will be affected by the number of trawlers active in the area, and the number of gill nets set. These will account for some of the variability in the relationship shown in Fig. 1. Notwithstanding factors contributing variability, one interpretation of these data is that in years when arribadas are skipped, the turtles still migrate to the breeding area, and are available for incidental catch and other causes of off-shore mortality. But for some reason they do not come ashore – or perhaps do so elsewhere along the coast.

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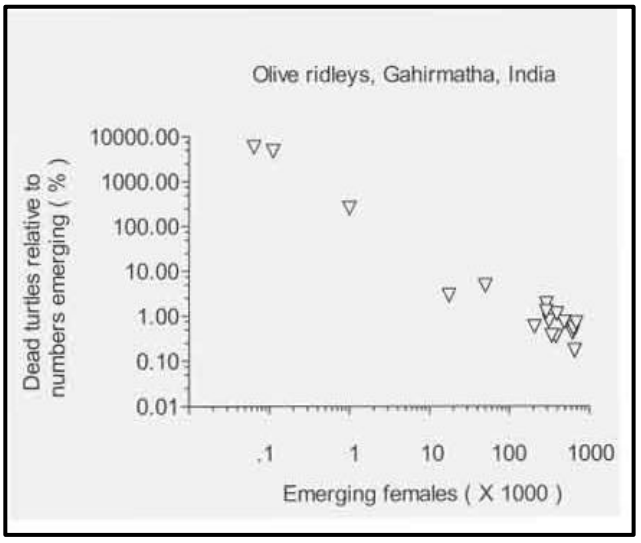
[1] Supported by the Natural Sciences and Engineering Council of Canada.

Fig. 1. Number of dead turtles as a function of number of emerging turtles at Gahirmatha (data from Mohanty-Hejmadi 2000). Note log scales on both axes. If the absolute number of dead turtles were exactly the same each year, then when expressed as a % of the number emerging, the points would fall on a straight line on this plot.



Olive Ridley Hatchery Program of Point Calimere Wildlife Sanctuary, Tamil Nadu

A.D. Baruah,
Wildlife Warden, Forest Department,
Government of Tamil Nadu
Nagapattinam, Tamil Nadu.

Olive Ridley (*Lepidochelys olivacea*) is one of the five marine turtles found in the Indian waters. The Olive Ridley and 4 other marine turtles is listed under Schedule I of the Wildlife Protection Act, 1972 and in Annexure-I of CITES.

Nesting of Olive Ridley turtles have been observed along the beach of Point Calimere Wildlife Sanctuary, Tamil Nadu for many years. The late Prime Minister Indira Gandhi had initiated a conservation program for olive ridley sea turtles in 1982 under which an artificial hatchery was set up in the sanctuary. Dr. Abdul Rahman, Thanjavur had run the hatchery for the incubation and release of hatchlings. The program was, however, discontinued in '87 due to lack of funding. In January 1999 it was decided to revive the conservation effort and accordingly a field study on "Nesting Ecology of Olive Ridley" was conducted by the sanctuary biologist P. Sathiyaselvam. The major finding of the study was that hatching failure was primarily due to predation by jackals, wild boars, mongooses and brahminy kites. Based on the findings of the study, an artificial hatchery was set up in the sanctuary in January 2000. The hatchery was fortified with chain link fence all around and zinc sheets driven into the ground along the periphery to prevent damage by wild boars, mongooses, snakes and jackals. The hatchery was fully covered with fishing nets to prevent predation by raptors, mostly brahminy and pariah kites. A temporary shed was also erected inside the hatchery for monitoring and vigil.

With the commencement of nesting season in January, 2000, the sanctuary biologist and field personnel kept vigil along the sanctuary coast during each night. The first clutch was collected on 23rd January. Nesting was observed till February end mostly during the dark phase of the moon. Mortality of 7 gravid females was observed during the period. In all, 14 nests were detected and 1586 eggs were collected. Detection was mainly by following turtle tracks and then probing the soil. The sites from which the clutches had been collected were marked on the beach. Each clutch of eggs was then buried inside the hatchery and their progress monitored.

The first clutch hatched on 16th March, 2000 after 54 days. The last clutch had hatched in the 3rd week of April. In all 1202 eggs hatched, yielding 1010 live hatchlings. The hatchlings weighed on an average 17gms. Care was taken to release the hatchlings at the same spot from where the eggs had been collected. The conservation effort was aimed basically at successful recruitment of hatchlings into the sea by providing adequate protection against predation and no experimental studies were conducted.

Request for turtle barnacles

The most common barnacle on sea turtles is the large and conspicuous *Chelonibia testudinaria* (L.). It commonly occurs on the carapace and plastron. I am preparing a world-wide study of this species and would like to obtain specimens from the Indian subcontinent and adjoining regions. Preferably they should be preserved in 95% ethanol or 70% or even dried. Data for the specimens should include locality, date, species or common name of the host turtle, and name of the collector. All collectors will be acknowledged in the final study. Please ensure that all necessary permits are acquired before shipping. Please forward the specimens to:

Arnold Ross
Marine Biology Research Division, Scripps Institution of Oceanography
La Jolla, California 92093-0202. USA.

The Wandering Minstrels of Orissa – Singing to Save Sea Turtles

Biswajit Mohanty# & Belinda Wright*

 # Wildlife Society of Orissa, TULEC Building, Link Road, Cuttack 753001.
Email: Biswajit_m@vsnl.com
** Wildlife Protection Society of India, Thapar House, 124, Janpath, New Delhi 110001.*

Operation Kachhapa engaged two *minstrels* to sing turtle songs in the coastal fishing villages of Orissa. The song was composed by Trilochan Dwivedi, Natya Taranga in the local language, *Oriya*. It was set to music by. Aditya Mohapatra, Bhubaneshwar, who is a wildlife lover and a flute player.

This team also used hand painted scrolls of:
a) turtles in nesting beach
b) dead turtles lying in the beach with a fishing trawler in the background
c) image of Lord Vishnu in his incarnation as a turtle
d) country boat and trawler showing the prohibited fishing zone of 10 kms from the coast for trawlers

A brief survey was made of the number of coastal villages and the routes to approach them. Many fishing villages could only be approached by water. The group's performances were in the villages of Ganjam, Puri and Jagatsinghpur districts in 110 fishing villages. The group went to each of these coastal fishing villages and performed the song along with the posters. The singers often stayed overnight in these fishing villages and also put up posters and stickers to spread the message of turtle conservation in the fishing villages. The posters carried conservation messages in Oriya regarding the role of the turtle in marine ecosystems and urged people to protect it . The painted scrolls were a huge attraction and many fishermen and their families showed great interest in them.

There was much interaction with the villagers in the evenings and many questions about turtles and Government. rules were put to the group. These questions were patiently answered and the group explained the rules to them. There was a problem with language at some fishing villages such as Nolia in the south where Telugu was spoken. However, the issues were conveyed by the use of the posters.

It came to light that traditional fishermen in this region were completely ignorant of the fishing regulations of the state government. They also vociferously complained about the way trawlers are affecting their livelihoods by destroying their nets. They also said that they were threatened by the trawler crew many times . At the instance of Operation Kachhapa, petitions were received from villagers of Agasti - Nuagaon addressed to the Director of Fisheries complaining of the lack of implementation of the fishing laws by the Department. Operation Kachhapa forwarded these petitions to the concerned Director. However, it is regretted that no steps have been taken towards enforcement by the Fisheries Department.

The song being sung by the minstrels was very catchy. Following the success of the song with the fishing community, it has been proposed that cassettes of this song would be made and distributed amongst these communities so that they remember the message. It may also be pointed out that this effort was the first such endeavour in the state involving the spread of a wildlife conservation message through songs and painted scrolls.

TURTLE SONG PERFORMED BY THE WANDERING MINSTRELS OF OPERATION KACHHAPA IN THE FISHING VILLAGES OF ORISSA COAST

The Lord of the Universe, Lord Jagannath had taken the form of turtle in the 10 avatars to save the world
Catching Mandaragiri mountain he churned the oceans and took the form of the turtle to rescue the gods and goddesses;

Nowadays, cruel man is destroying the natural world
Without considering the pros/cons, they eat turtle meat ;
Man never thinks that with every passing day their numbers are decreasing
Please think once o brothers how to save our environment ;

The turtle is a useful animal and we should not harm it knowingly
The jellyfish which eats shrimp juveniles cause much harm to the fishermen community ;
For the benefit of the fishermen community, the turtle chases and gobbles up the jellyfish
If shrimps live, then fishermen survive and shall improve their economic position;
Fishing is the profession of the fishermen and without fish there is no life or existence of the fishermen
By selling the fish, he obtains money and without fish he is helpless;
The turtle is our only support and it eats plenty of jellyfish ;
Increases shrimp juveniles which enables the fishermen to sustain himself;

The entire world is aware of Orissa 's pride.... the turtles
Turtles are found from Rushikulya mouth to Balasore ;
Masses of turtles come rushing to Gahirmatha to stay and nest
Without destroying turtle eggs let us increase their numbers ;

We should save Orissa's turtle and not destroy their population
Since this is our race's pride , let us not forget this fact ;
Remember remember o fishermen brothers that government rules are not false
Motorized trawlers are supposed to fish after a distance of 10 kms from the Shore;
They are prohibited from fishing within 10 kms of the coast
We wish to remind you of this rule which is for big motorized boats ;
Those who do not obey this law will be surely be punished
Caught in the nets, the turtles o brothers sacrifice their lives day by day ;
The law provides that upto 10 kms from the coast, country boats can fish,

Do not forget this o brothers ;
Whenever you see turtles release them o brothers since they are our beneficial Friends;
Let us take an oath ; let us take an oath
Let us join together and take an oath ;
United we should join our hands ;
And save the turtle race together

If turtles survive we survive;
Let us be prepared for our own selves;

Chorus **: If turtles survive we survive .....**

Conflict between a local sea turtle conservation group and a sand mining community at Kottapuzha estuary, Kozhikode, Kerala – an investigative report

Roshni Kutty
Kalpavriksh
Apt. 5, Shree Dutta Krupa,908, Deccan Gymkhana, Pune – 411004
Email: roshi73@rediffmail.com

Kolavipaalam, Kerala has come to prominence due to the protection of an olive ridley nesting site by a local fishing community (Kutty, 2001). Unfortunately, this wonderful initiative and the nesting ground is under serious threat of disappearing due to illegal sand mining activity in Kottapuzha estuary, drained by the Kottapuzha River, north of Kolavipaalam. Part of Kolavipaalam beach is backed by this estuary, away from community dwellings of the area. This sandy beach spreads over an area of 50 acres stretching from the estuary mouth towards Kolavipaalam, and is an ideal turtle nesting site.

Kolavipaalam beach and the sandy stretch between the sea wall and the sea from Thikkody located 12 kms south to Chombal, located 15 kms north, are fast disappearing due to the sand mining activity in Kottapuzha estuary. Kerala coast (like much of the western coastline of India) undergoes fluctuations through the shifting of sand deposits and also due to monsoonal tides and currents. River mouths are known to be especially dynamic with regard to erosion of beaches and formation of new sand bars and beaches by accretion. The state administration has attempted to counter the erosion by erecting continuous sea walls, composed of granite blocks, along the coast. A study conducted by the Western Ghat regional station of Zoological Survey of India categorically states that the sand mining activity along with illegal coastal construction poses a very serious threat to the turtle nesting habitat at Kolavipaalam (Gopi & Radhakrishnan, 1999). The sea wall which stretches continuously along the shore is in ruins at many places. It has thus become dysfunctional, noticeably near the estuary mouth, where it has sunk and waves are carrying away sand located beyond the sea wall. The sand deposits between the sea and the sea wall have been indiscriminately quarried. The ZSI study says that unabated sand mining near the estuary mouth at the current intensity will destroy this nesting beach shortly. Sand mining may also be ecologically hazardous, leading to irreversible degradation of coastal habitat, leading to beach erosion and subsidence and mangrove depletion (Gopi & Radhakrishnan, 1999).

The fisherfolk of the coastal villages claim that they noticed their shore line receding at a faster rate about a couple of decades ago. A diminishing shore has many repercussions on the coastal community, especially the fisherfolk community. A seashore is necessary to park[1] the country boats on the shore. Now they have to come all the way through the estuary into the river and park it on the river bank. Safety is another issue: fishermen say that during rough weather when they need to land on the shore very quickly, the sea wall actually hampers the process of coming ashore. Sandy beaches are also necessary for certain kinds of net fishing such as "chavittu vala". This method of fishing has been vastly reduced; from Kolavipaalam to Aynikadu, where 15 such nets were once operated, there are now only two. The children and the youth have lost the recreation space that these beaches once provided. Nearly all the drinking water wells near the sea have turned saline and drinking water has become scarce. For the turtles, it means no nesting area. *Theeram Prakruti Samrakshana Samiti* (see Kutty, 2001), had to reconstruct their hatchery several times as with each year, the sea was destroying the hatchery.

Perceiving sand mining to be a major cause of these problems, *Theeram* with the backing of the seashore residents, filed a petition in the High Court in February 1999, asking for a ban on sand mining in the estuary. On 11th February, 1999 the court passed an interim stay order on the mining activity.

This was the beginning of a major conflict between the sand mining community and the fishing community, particularly members of *Theeram*. The

[1] Country boats in Kerala are kept on the beach, high up on the sand dunes when not in use. When fishermen go to sea, about 3-4 of them push the boat down the sandy shore in to the sea.

sand miners say that the stay order affected their livelihoods and began driving their families into poverty. They also allege that *Theeram* members and other residents of Kolavipaalam had encroached on Revenue Department land by planting coconut trees very near the seashore. They claim that *Theeram* filed a petition in the high court under the ruse of turtle nesting habitat protection in order to protect their illegally obtained land.

However, the coastal residents allege that most miners also have other occupations – such as autorickshaw driving, small trade and even teaching – but sand mining has become an easy way of obtaining additional income. A 5-tonne truckload fetches about Rs. 600 and it only requires two trips by two people on a country boat to fill a truck with sand. This fetches each person about Rs. 100–150 per day after various deductions. *Theeram* members state that most of the sand miners collect sand early in the morning and by 10.00 a.m. are ready to return to their regular occupations.

Sand mining at Kottapuzha estuary does not require the kind of hard labour that is involved in river sand mining. In the latter, one person has to dive underwater to fill in a basket of sand and bring it up, where his partner empties the basket into the boat. Apparently, one consequence of the traditional method of sand mining is that most miners experience loss of hearing by middle age (due to repeated underwater diving). In Kottapuzha estuary however, the country boats are brought up the beach where, with the help of spades and baskets, sand is directly removed from the shore and loaded into boats which are taken to the trucking centres. The sand removed from the seashore is said to be used for house construction (plastering), concrete blocks and cement pots and drums. However, most of the sand is utilised for land filling. Sand mixed with river alluvium is used as a fertilizer for coconut trees in nearby areas.

In their petition, *Theeram* has alleged that about 300 truckloads of sand has been removed every day for the last thirty years. *Theeram* has notified the concerned government authorities about the illegal activity and has been requesting them to take action since March 1998. On January 26, 1999 (Republic Day), all the residents of the fishing community from Kodikkal to Chombala formed a human chain in protest against sand mining. They also received support from the Forest Department which was reflected in their affidavit in court. It is interesting that the Divisional Forest Officer (DFO) was transferred shortly thereafter. Some government officials have admitted to the role of political pressure in the mining issue. The sand miners are seen to have a political lobby that ensures that they are not affected. Even during the period of the High court's stay order on mining, the miners have continued their activities. This forced *Theeram* to file a contempt of court petition in October 1999 against the district authorities as no action was taken despite repeated complaints about the violation. The High Court then asked for strict implementation of its stay order. Meanwhile, a petition was submitted to the Court signed by 977 persons claiming loss of livelihood if sand mining is banned in the estuary. A copy of this was not even served to *Theeram*. On 22nd March 2000, a final judgement on the writ petition was passed, stating that while the environment needs to be protected, sand is also necessary for construction work and if the sand is not collected, it can lead to its accumulation. The Court went on to order the District Collector to consider all concerned parties and issue licences and fix the quantum of sand to be mined. Local activists and even some government officials have expressed dissatisfaction over how an activity that was illegal and unauthorised has now been given credence under the law. Subsequent to the final judgement, the District Collector held meetings with both the parties and a ban on sand mining up to 200 m from the high tide line was issued. The sand mining area was demarcated from where only 25 loads of sand per day is permitted to be mined with identity cards that would be issued by the Vadakara Municipality. The Payyoli Circle Inspector was asked to oversee the implementation of the orders and the Mining & Geology Department was asked to study the effects of sand mining on the ecology of the area. On 16th February 2001, the District Collector met with the parties to review the situation. The Mining & Geology scientist, Vadakara Municipal secretary, the Tehsildar, and *Theeram* members reported that the previous orders were being violated by the sand miners. Thus, a restriction in the timing for mining from 7.00 a.m. to 12.00 noon has been placed and the Vadakara Rural Police has been asked to put up a picket at the site to ensure the implementation of the orders. However, no police picket was seen and sand was being illegally removed even as this investigation was being carried out. *Theeram* members had filed a Writ Appeal in the High Court in August 2000 and have now filed a fresh petition seeking justice.

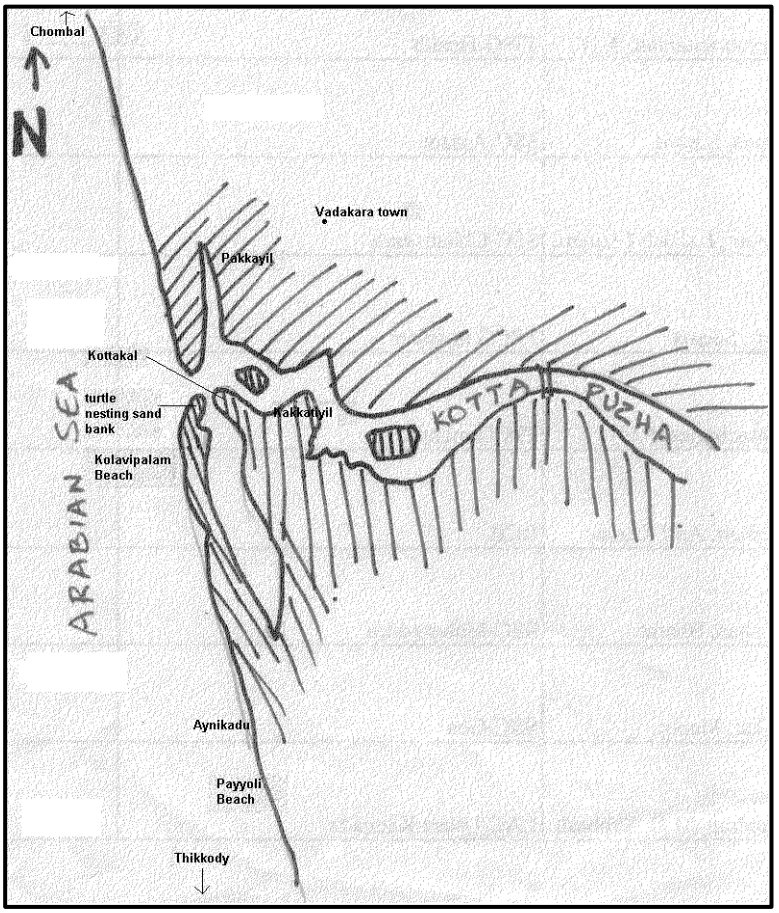
References

GOPI, K.C. & C. RADHAKRISHNAN (1999) A Site-study report on coastline habitat degradation and threat to the turtle nesting site at Kolavipaalam beach, Kozhikode District, Kerala. Zoological Survey of India, Kozhikode.

KUTTY, R. (2001) Community effort at Kolavipaalam, Kerala. Kachhapa 4: 11

A PUBLIC PROTEST

Kalpavriksh along with Thanal Conservation Action & Information Network, Trivandrum have decided to help Theeram Prakruti Samrakshana Samiti to save Kerala's only community conserved turtle nesting site from habitat destruction. Kalpavriksh realises that livelihoods will be affected if a complete ban on sand mining is effected. We are therefore seeking a comprehensive study to be conducted by a scientific body such as Centre for Earth Science Studies, Trivandrum to find out the effects of sand mining in the estuary on the ecology of the region. We hope to arrive at a sustainable solution after the study has been conducted. We plan to begin by sending protest letters to the state government to take action on the illegalities and to commission a study. Readers who would like to give a helping hand to this effort are requested to kindly send in their contact details to us, in order to help us achieve this goal. The protest letters will be drafted and sent out to all those readers. Please remember – the more the number of protest letters, the greater the impact on the state government.



The Management of Olive Ridley Sea Turtles at Devi River Mouth, Orissa

S.K. Chadha[#] & Biswajit Mohanty[*]

 # - Divisional Forest Officer, Puri Forest Division, Government of Orissa
Khurda, 752055
Email: skc36@hotmail.com

The mouth of the Devi river in Puri District (19°57' N & 86° 22' E) is one of the three mass nesting beaches along the Orissa coast. Mass nesting of ridley turtles was first reported in this area by Kar (1981) and later, Pandav (1997) conducted a systematic study of nesting and mortality. The offshore waters of this coast are not protected, unlike Gahirmatha, which has been declared as a Marine Sanctuary. For the last two years, the Forest Department of Orissa has constituted a special squad, based at a monitoring camp in Muhan, to keep the area free of trawlers. Turtle congregations are seen here at the same time as Gahirmatha. From October onwards, a large number of dead turtles are stranded along the coast from Devi river to the Chilika coast. Systematic surveys are being conducted by the Forest Department along with Operation Kachhapa. The beach is covered on foot or by cycle and dead turtles are enumerated.

Beach Topography

The topography of the mass nesting beach of Devi river has undergone many changes over the years. The Survey of India map of 1928 depicts a long beach with a bulging sand bar over Kadua tip, extending northwards and narrowing the river mouth. It was fragmented in 1972 – 73 and a small island and a few sand bars were formed towards the northern tip. During the supercyclone of 1999, the northern tip was fragmented again and a second mouth was formed. During 2000, this newly created mouth started getting closed because of accretion of sand. During an aerial survey in a coast guard plane, and ground truthing in a trawler, it was found that a big congregation of turtles was located between Muhan and Gundalaba village.

Management Issues

The management of this nesting beach is a big challenge for the Forest Department in this area. Some of the important issues are listed below.

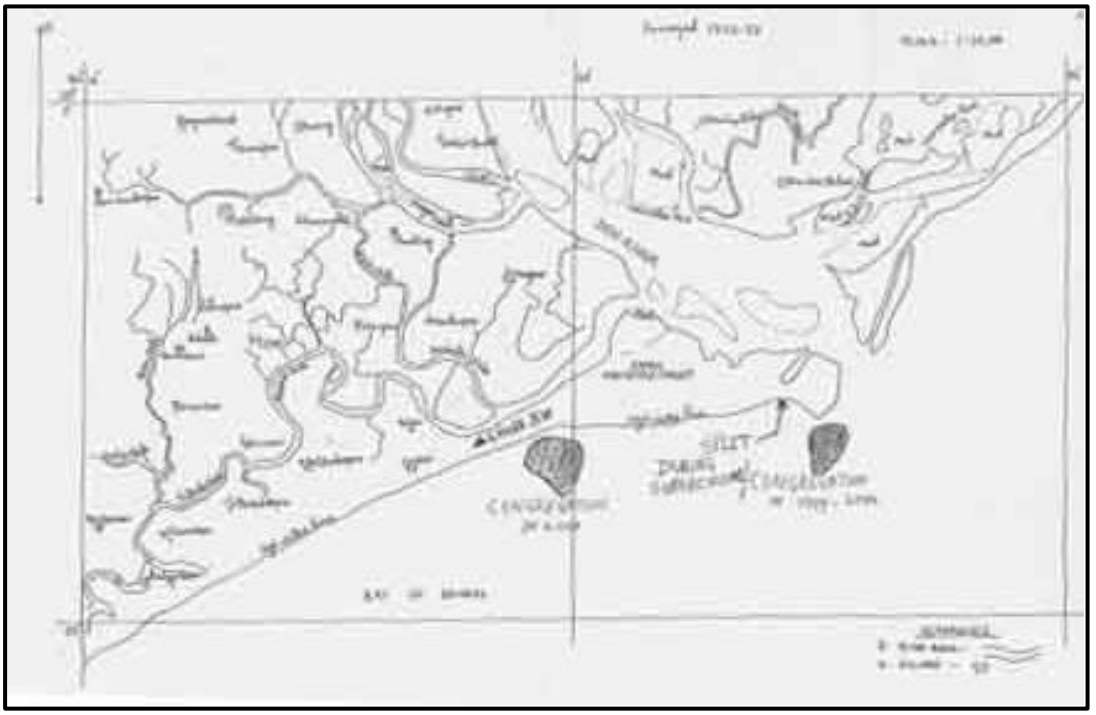
1. Excessive trawling in the restricted area close to the turtle congregations, including influx of trawlers from neighbouring fishing bases
2. Lack of proper enforcement infrastructure
3. Lack of cooperation from the Fisheries Department in the implementation of the Orissa Marine Fishing Regulation Act (1982)
4. Lack of infrastructure for keeping the seized trawlers and arrestees
5. Insufficient sorties by the coast guard ship
6. Lack of awareness amongst the local fishermen about the fishing and wildlife laws
7. Growing conflict between traditional fisherman and the trawler owners over fish resources
8. Capture of prawn larvae from the creeks and river for shrimp culture thus reducing the catch in the wild
9. No use of TEDs by the trawlers despite Government and court orders

Management Intervention in the past two years

1. From the arrival of the mating pairs, a special camp is established in the area and a VHF station is established from better communication
2. Special staff are posted in the camp for monitoring turtle nesting
3. Patrolling in the sea is conducted by armed police using the trawler provided by Operation Kachhapa. The congregations are protected by early morning and late night patrolling
4. For protection of nests, special staff are deployed and systematic counting of nests has been introduced for the last two years
5. Motivation of the villagers of the coastal area for the first time under Operation Kachhapa by traditional song and dance programmes for increasing awareness about turtles and their importance for fishermen

Cooperation from Operation Kachhapa

1. Hiring of trawler and support boat for patrolling
2. Volunteers for survey of beaches
3. Public Awareness - Two artists were engaged by Operation Kachhapa to sing about sea turtles in the coastal villages (for details, see Mohanty and Wright, this issue and Back Cover)



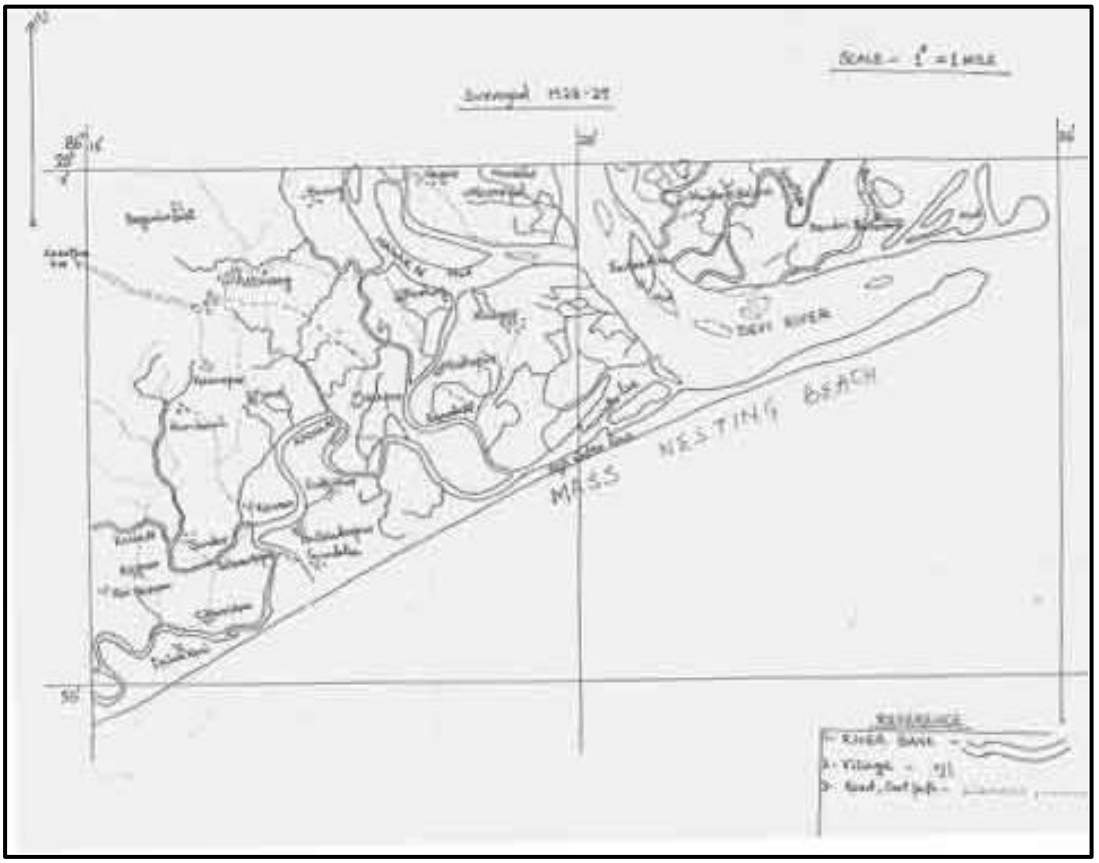

SCALE - 1" = 1 MILE
MASS NESTING BEACH

Table 1: Turtle casualty on the Devi coast from Devi river to Kadua river mouth from 1999 –2001

	1999 - 2000	2000 – 2001
December	120	535
January	963	833
February	236	714
March	114	194
Total	1433	2276

The main achievements of this programme are

1. The country fishermen were enlightened about the role of the sea turtles in marine ecosystems
2. They were also made aware of the provisions of law regarding marine fisheries and the reservation of an exclusive fishing zone for them

Conclusion

Despite financial and infrastructure constraints, better protection is given to the turtle population to turtles in the Devi river coast by actively involving the district administration. Much is needed to be done towards upgradation of the enforcement and involving local fishermen in turtle protection. The area has to be declared as protected to strengthen the legal provisions. Use of Turtle Excluder Devices (TEDs) at Nuagadh and Paradeep has to be enforced strictly

NEWS AND REPORTS

Satellite Telemetry of Olive Ridley Sea Turtles on the East Coast of India

Source: GOI UNDP Sea Turtle Project
Wildlife Institute of India
PO Box 18, Chandrabani, Dehradun 248001. India.
Email: undpturtle@wii.gov.in

Though sea turtles have been the focus of conservation attention and scientific research for decades, much about these ancient animals is still unknown to us. This is particularly true of the mass nesting populations in Orissa. Foremost amongst these questions is where do these turtles migrate after they have nested in large numbers on the coast of Orissa ? Sea turtles are known to migrate thousands of kilometres across international waters. Satellite telemetry is now being used to track olive ridley turtles which nest on the coast of Orissa to study their long range migrations and foraging areas. This is a collaborative project between the Orissa Forest Department and the Wildlife Institute of India, Dehradun, made possible by the GOI UNDP sea turtle project of the Ministry of Environment and Forests. Dr. Jack Frazier of the Conservation and Research Center, Smithsonian Institution is providing technical assistance on the project. From April 17 –19, 2001, 4 nesting sea turtles were fitted with the satellite transmitters. The first of the turtles was named 'Chandra' after Dr. Chandrasekhar Kar, well known turtle biologist of the Orissa Forest Department. The four turtles have been transmitting data which is being analysed and mapped at the Wildlife Institute of India (an updated map is available at http://www.wii.gov.in)

A National Workshop For The Development Of A National Sea Turtle Conservation Action Plan For India

Source: GOI UNDP Sea Turtle Project
Wildlife Institute of India
PO Box 18, Chandrabani, Dehradun 248001. India.
Email: undpturtle@wii.gov.in

A national workshop on sea turtles was conducted at Bhubaneshwar from April 9 –10, 2001 with about 100 participants including Forest and Fisheries Department officials from most coastal states, academic institutions, agencies involved in the UNDP sea turtle project, and many individuals interested in

sea turtle conservation in Orissa. The workshop was jointly conducted by the Wildlife Institute of India, Dehradun and the Orissa Forest Department with the support of Ministry of Environment and Forests, Government of India and UNDP. The first day began with presentations on the history of sea turtle conservation in India and in Orissa. This was followed by presentations and intense discussion on threats to sea turtles, the impact of fisheries and possible solutions including the use of Turtle Excluder Devices. Methods of estimation of turtles during arribadas was also extensively discussed. Research techniques and the results of research studies in Orissa were included in the next session. The day ended with presentations and discussion on the protection of ridley sea turtles by various agencies in Orissa. The second day consisted of presentations by various agencies working under the GOI UNDP Sea Turtle Project. This included surveys on the east and west coasts and reviews of legislation and community based conservation. The afternoon session was devoted to group discussions on three topics namely (1) Protection and Enforcement (2) Monitoring, Research and Evaluation and (3) Community participation. The group leaders made presentations on the points raised within the group. During the valedictory session, the main recommendations of the workshop were summarized. The presentations made at the workshop are being compiled into a proceedings by Wildlife Institute of India.

Workshop Recommendations

On Enforcement and Management

- Uniform guidelines from Government of India for responsible fisheries.
- Identification of nodal agencies and delineation of authority.
- Co-ordination mechanism amongst agencies.
- Training of grassroots level staff for enforcement.
- Monitoring of compliance of international conventions.
- Augmentation of infrastructural facilities.
- Demarcation of Protected Areas.
- Use of 'TED' as statutory requirement.
- Use of innovating preventive techniques such as artificial reefs.

On Monitoring, Evaluation and Research

- Setting up of a national directorate.
- Five year national situation report and annual state report on sea turtle status.
- Standardization of survey and research methods.
- Global and regional collaboration.
- Priority studies on population dynamics, migration, pollutants and impacts.
- Comprehensive study on marine turtle genetics
- Database and resource centre for sea turtle.

On Community Based Conservation and Participatory Management

- Economic and livelihood strategies to be safeguarded.
- Local ethnic community with cultural linkages to be prioritized.
- Incentives to local stakeholders.
- Alternate livelihood strategies for affected fishermen.
- Development of a national and local education awareness programmes.
- Review of progress and monitoring.

Conference on the Conservation and Management of Marine Turtles of the Indian Ocean and South-East Asia 19 to 23 June 2001, Manila, Philippines

Press release June 23, 2001

Delegates from 21 countries agreed on a comprehensive plan for conserving marine turtles in the Indian Ocean and South-East Asia during a meeting in Manila from 19 –23 June, 2001. The meeting was held under the auspices of the Convention on Migratory Species (CMS) and was hosted by the Government of the Philippines. The meeting was convened to conclude the best possible conservation and management plan to achieve the objectives of the Memorandum of Understanding on the Conservation and Management of Marine Turtles of the Indian Ocean and Southeast Asia, building on

the progress of previous meetings held in Perth, Australia (October, 1999) and Kuantan, Malaysia (July, 2000).

In Manila, Government representatives agreed on the terms of a region-wide plan aimed at reversing the decline of marine turtle populations. At the conclusion of the meeting, Douglas Hykle, Deputy Executive Secretary of CMS said, "*The delegates have succeeded in laying out an ambitious programme of activities aimed at addressing the root causes of the problems facing marine turtles. The plan stresses the involvement of non-governmental organizations and local communities in planning and implementation.*"

Eight countries – Australia, Comoros, Philippines, Sri Lanka, Tanzania, USA – signed the Memorandum of Understanding, which will come into effect for the signatory States on September 1st, 2001 and others are expected to sign after review by the responsible government authorities. The United Nations Environment Programme will host the MoU secretariat at its regional office for Asia and the Pacific in Bangkok.

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>

Issue No. 92, April 2001

Editorial:
B.J. GODLEY & A.C. BRODERICK. Making the Books Balance and a Look to the Future.

Articles:

R. MARQUEZ-M. *ET AL.*. Update on the Kemp's Ridley Turtle Nesting in Mexico
J. ALVARADO- DIAZ *ET AL.*. Evaluation of the Black Turtle Project in Michoacan, Mexico
A. BILLES & J. FRETEY. Nesting Morphology of the Leatherback Turtle.
S.J. BLAMIRES *ET AL.* Using GIS for Sea Turtle Research at the Fog Bay Rookery in Northern Australia
G. SCHOFIELD *ET AL.*. Mediterranean 'Holiday Hotspots' versus Sea Turtle 'Nesting hotspots'.

Notes:
J. TOMAS *ET AL.*. From Hook to Hook: The Odyssey of a Loggerhead Sea Turtle in the Mediterranean

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Articles:
A.S. GARMESTANI *ET AL.* Preliminary Evaluation of Helicopter Survey as a Method of Assessing Sea Turtle Nesting Distribution in the Ten Thousand Islands of Florida
D. DIMOPOULOS. The National Marine Park of Zakynthos: A Refuge for the Loggerhead Turtle in the Mediterranean

Notes:
W.J. NICHOLS *ET AL.* Records of Pelagic East Pacific Green Turtles Associated with *Macrocystis* Mats Near Baja California Sur, Mexico
R. ADJEI *ET AL.* Organisational Profile: Ghana Wildlife Society
N. LEOTAUD. Organisational Profile: Save Our Sea Turtles (SOS) – A Research, Education and Action Programme
J. HAELTERS *ET AL.* Third Leatherback Turtle Stranding in Belgium

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For more information, contact:
Operation Kachhapa
Wildlife Protection Society of India (WPSI),
Thapar House, 124 Janpath, New Delhi 110048
Phone: *011 6213864/6238710* ***Fax:*** *011 6464918*
Email: *kachhapa@vsnl.com*

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