OCCURRENCE AND MORTALITY OF MARINE MAMMALS ALONG THE ANDHRA PRADESH COAST, EAST COAST OF INDIA

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Introduction

The worldwide efforts to save marine animals, notably whales, dolphins, porpoises and several other animals in the marine ecosystem stems form the growing fundamental notion "Marine mammals are common heritage of mankind" (Bhatt, 1985). In recent times, the conservation of marine mammals has received global attention due to endangered status of many cetaceans. The 1979 declaration (Bonn Convention, 1979) calling for "Indian Ocean as sanctuary for marine mammals" to study and conserve the endangered species in the region marked not only a milestone in the history of worldwide marine conservation campaign, but provided a unique opportunity to put into motion the scientific and technical machinery to embattle the issue in time. However, no conservation attention is evident in this area, therefore seeking further improvement.

Most species of marine mammals that occur in the Indian waters are listed in the IUCN Red Data Book. However, no efforts have been made towards their conservation in India. Despite of the fact that Indian Ocean is declared as the sanctuary for marine mammals (Bhatt, 1985; James, 1986, James and Lal Mohan, 1987), there are large gaps in our knowledge on the biology, ecology and abundance of marine mammals in the seas around India. More particularly our knowledge on the status of different species, their population size and distribution and threats facing marine mammals in the offshore waters are grossly inadequate. This is mostly due to lack of scientific knowledge, systematic surveys and ignorance of the situations that marine mammal population facing in the Indian Ocean area.

In the seas around India, there are 24 catalogued species of marine mammals frequenting the coastal waters, mostly for feeding and breeding (James and Lal Mohan, 1987; De Silva, 1987). James and Lal Mohan (1987) recorded 14 species of Odontoceti from the Indian coast. The commonly occurring marine dolphins in Indian waters according to them are the Spinner Dolphin (*Stenella longirostris),* Bottlenose Dolphin *(Tursiops tracatus),* Common Dolphin *(Dephinus delphis),* Indo-Pacific Hump-backed Dolphin *(Sousa chinensis),* Finless Porpoise *(Neophocaena phocaenoides)* and the Irrawaddy Dolphin (*Orcaella brevirostris*) that frequent the Indian coastal waters throughout the year.

Increasing attention has been diverted in the past one decade or so to the impact of marine fisheries on the marine mammals

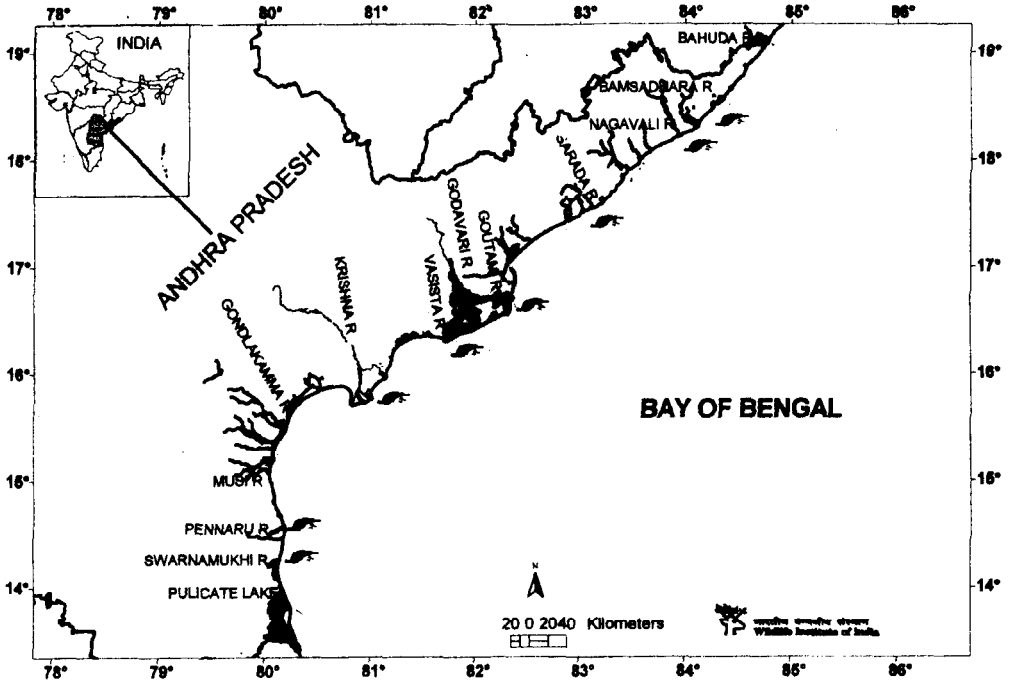
and the ways in which marine mammals might compete with or cause damage to fisheries (Manning, 1989; Northridge, 1991). Anecdotal evidence suggests that coastal cetaceans and dugongs in South Asia are facing serious threats from marine fisheries operations and that these are extensive and increasing in magnitude. Meanwhile, knowledge is severely lacking on even such basic information as to what species occur in coastal waters or how severe are the threatening factors, such as deliberate killing, fishery bycatch and habitat degradation. Furthermore, there is almost no information available on offshore fisheries interface (bycatch and predation) with cetaceans, although this is believed to be an increasing problem. In India, expansion of marine fisheries operations to feed the country's human population, are resulting in a number of cetaceans dying in gillnets (Lal Mohan, 1990, 1994). He also reported marine dolphins damaging catch and fishing nets in Indian coastal drift fisheries but the problem has not been studied in detail. According to Lal Mohan (1990) species *viz.* Spinner Dolphin (*Stenella longirostris*), Common Dolphin (*Delphis delphis*) and Finless Porpoise (*Neophocaena phocaenoides*) are frequently caught in the fishing nets such as purse seine and shore seine and also in shark gillnets, mostly along the East coast of India. Although they are repeatedly caught in large numbers, the specific identities of various species in catch are yet to be reported adequately.

Species such as Spinner Dolphin (*Stenella longirostris*), Common Dolphin (*Delphis delphis*) and Finless Porpoise (*Neophocaena phocaenoides*) have been reported along the Andhra Pradesh coast as early as 1890. While Blanford (1891) reported sighting of Indo-Pacific Hump-backed Dolphin (*Sousa chinensis*) along the Waltair/Vizagapatnam (now Visakhapatnam) coast, Owens (1866) reported *Delphinus godamu* based on a skull from Vizagapatnam. The Bottlenose Dolphin (*Tursiops truncatus*) was also reported from Visakhapatnam coast of Andhra Pradesh (Leatherwood and Reeves, 1990; De Silva, 1987). The Finless porpoise (*Neophocaena phocaenoides*) was reported to occur from both West coast and East coast of India (De Silva, 1987). In recent years, marine mammals (dolphins and porpoises) washed ashore along the coast of Andhra Pradesh was reported by Rao and Rao (1993), Chandrasekhar *et al.* (1993) and Rao and Venkataramana (1994), besides personal observations by various workers (Pradeep Nath *Pers. comm.*, Varaprasad *Unpublished data*). During the course of author's survey of sea turtles along the Andhra Pradesh coast as part of GoI – UNDP Sea Turtle Project from April 2000 to May 2001, some observations were made on the sighting of marine dolphins and porpoises and also washed ashore specimens of marine mammals based on which this account is given.

Study Area

Andhra Pradesh is located along the Bay of Bengal on the East coast of India and is one of the nine maritime states of India with a coastline of 980 km (13°34.42' N and 80°16.03' E to 19°06.55' N and 84°47.19' E). The major rivers joining the Bay of Bengal in Andhra Pradesh are the Bahuda, Vamsadhara, Nagavali, Godavari, Krishna, Pennaru and Swarnamukhi with several smaller rivers, tributaries, backwaters and lagoons (Fig. 1). The deltas of Godavari and Krishna River hold good mangrove patches. The offshore waters of

Fig. 1



Dolphin sighting points along the river mouths of the Andhra Pradesh coast

Andhra Pradesh has a continental shelf area of 31,000 km^2 with an annual fish production of 1,50,000 tonnes (George *et al.*, 1981). Andhra Pradesh, being the state with the second longest coastline in the country makes a major contribution to fisheries and ranks fifth in India in terms of marine fish production (Alagaraja *et al.*, 1987). The continental shelf extends upto a distance of 20 km from the shore and to an average depth of 200 fathoms.

Methodology

Time constrained opportunistic survey : The survey method consisted of time constrained opportunistic observations made at the offshore waters along the mouth of rivers based on secondary information obtained from coastal fisherfolk about occurrence of marine mammals. Since the entire Andhra Pradesh coast was being monitored for dead marine turtles, examination was also conducted on all washed ashore dead dolphins along the beach. During such surveys, opportunistic sightings of dolphins were made in the river mouth of Vamsadhara, Nagaveli, Tandava, Goutami Godavari, Vasista Godavari and Veineteya Godavari, Krishna and Pennaru, all of which are draining into the Bay of Bengal at different locations along the Andhra Coast. One hour each both during high tide and low tide time was spent sighting of dolphins near river mouth areas close to the sea and in the estuaries. All the sightings were made from the shore and riverbank by scanning the water surface from all angles repeatedly within 50 to 200 m from the observation points. Especially where the sightings were far from the point of observation, the diving

and surfacing patterns of dolphins were taken into accounts for species identifications as suggested by Norris (1966).

Specimen observed washed ashore along the beach : During the beach survey (from January 2001 to April 2001) for sea turtles along the Andhra Pradesh coast (Tripathy and Choudhury, 2001) dead dolphins and porpoises washed ashore were also counted. The morphometric measurements were taken from fresh specimens. Measurements were taken from each animal as suggested by Norris (1966). Individual animals that were washed ashore were identified from their morphological characters. For species identification, the FAO Marine Mammals Identification Sheets and marine mammal species descriptions provided by Agrawal and Alfred (1999) was used. The details of the measurements taken from the dead specimens are given in Table 2.

Results

Dolphin sightings along the river mouth of Andhra Pradesh : A total of 47 pairs and 25 individual dolphins were sighted during the river mouth survey. Caution, however must be exercised with the results since basic assumptions are violated (i.e. no standard time and space were maintained). The details of dolphin sightings in different river mouth along the Andhra Pradesh coast is given in Table 1. The single dolphin sightings were significant in this region (n>5). Although sighing of two species of dolphins (*Sousa chinensis* and *Torsiops truncatus*) was confirmed in all the estuaries, they were more frequent in the Goutami, Veineteya and Vasista Godavari, Krishna and Pennaru river mouth and rarely sighted in Vamsadhara, Nagavali and Tandava river mouth (Table 1). Significant number of dolphin pair sightings was recorded in the river mouth of Goutami Godavari and Vasista Godavari (n=10).

A distinctly different dive pattern was observed between Finless Porpoise and Bottlenose/Hump-backed Dolphins. While Finless porpoises were observed swimming just beneath the surface with sudden darting movement and mostly close to the estuarine banks, the Bottlenose and Hump-backed Dolphin species were observed diving mostly in the deeper part of the estuaries and breaking the surface at an angle of 30° to 45° clearly showing the beak and sometime the entire head. However, no distinction could be made between Bottlenose and Hump-backed Dolphin from their diving pattern. Hence

Table 1

Marine Dolphins and Porpoises sighted in different river mouth of Andhra Pradesh coast during 2001.

Location (River mouth)	No. of Dolphin pairs sighted (n)	No. of single Dolphins sighted (n)	No. of surface leaps recorded
Vamsadhara	4	2	6
Nagavali	4	1	5
Tandava	0	2	2
Goutami Godavari	10	6	16
Veineteya Godavari	10	4	14
Vasista Godavari	8	4	12
Krishna	7	5	12
Pennaru	4	1	5

Table 2

Morphometric measurements taken from specimen of Marine Dolphins and Porpoises washed ashore along the Andhra Pradesh coast

Morphometric measurements	Specimen No. 1 12.1.2001 Visakhapatnam	Specimen No. 2 16.3.2001 Sacramento	Specimen No. 3 8.2.2001 Kalingapatnam
	(Measurements in cm)		
Total length	158	161	320
Tip of the snout to centre of eye	26	30	81
Tip of the upper jaw to anus	121	133	228
Tip of the upper jaw to umbilicus	89	95	195
Tip of the upper jaw to centre of the eye	32	18	49
Length from tip of the upper jaw to mid line of blow hole	27	45	55
Height of dorsal fin from tip to base	48	-	59
Teeth count :			
Right upper	14	18	24
Left upper	16	17	24
Right lower	17	18	18
Left lower	16	17	20

*Specimen No.1. Hump-backed Dolphin, No.2. Finless Porpoise No.3. Bottlenose Dolphin

there is a possibility of sighting of one or both species in some area. The Bottlenose Dolphin and Hump-backed Dolphins are known to occur in association in their feeding grounds and difficult to distinguish (Agrawal and Alfred, 1999).

Dolphin stranded along the coast : A total of eight dead specimens that were observed washed ashore along the beach were recorded during the survey. We could not examine all the washed ashore specimen as coastal dweller dump these immediately due to it high stinking. Of the eight specimens, five were between Visakhapatnam and Kalingapatnam coast, which hold most part of the northern Andhra Pradesh coast. The other three observed were between the river Goutami Gadavari and Krishna river mouth. Among the eight specimens, five were identified as Humpback dolphin (*Sousa chinensis*), one as Bottlenose dolphin (*Torsiops truncatus*) and two as Finless porpoise (*Neophocaena phocaenoides*). The morphometric measurements of one Humpback dolphin (*Sousa chinensis*) could only be possible because all other were in highly putrefied condition and beyond handling while morphometric measurements of the other two species viz. Bottlenose dolphin (1) and Finless porpoise (1) were taken at the washed ashore site (Table 2). In all the dead Humpback dolphin species, the forehead was rounded and bulbous; almost

protuberant in profile, with the absence of dorsal fin and prominent beak and spade shaped conical teeth. Besides these characters, all these animals acquire a hump on their back; dorsal fin with a little elevation and feebly indented posterior border flippers recurved and distinguished broad at base with longitudinal blotches on ventral side of the body. The Bottlenose dolphin's (*Torsiops truncatus*) head was moderately large with a defined beak. The pectoral fin was sickle shaped and pointed. The tail fluke was horizontally flattened with a notch in the middle.

Discussion

Despite evidence of extensive threats to marine mammal populations in the Indian Ocean region, there are some reasons for cautious optimism. During the present survey, in 8 field days and 8 observation hours, a total of 47 pairs and 25 individual sightings of marine dolphins and the abundance and diversity of cetaceans throughout the coast of Andhra Pradesh was 'remarkable'. These findings indicate that at least some of the areas near river mouths along the Bay of Bengal probably still support sufficient numbers of cetaceans for timely conservation efforts to be successful. However, mechanized fishing in near shore water is recognized to be the most dangerous practice along the Bay of Bengal particularly in the upper East coast. The marine mammal mortality along with sea turtles along the East coast of India was documented by James *et al.* (1989), James and Lal Mohan (1987), Das and Kar (1990) and Pandav *et al.* (1994). Recent newspaper articles indicate that dolphin (possibly Bottlenose Dolphin, *Tursiops aduncus* and Indo-Pacific Hump-backed Dolphin, *Sousa chinensis*), are being deliberately killed along the coast of Andhra Pradesh. The newspaper stories also concur with Smith *et al.* 2002 observation that this is being done as they are perceived as competitors for diminishing fish resources. This coastline, at least as far South as Vishakhapatnam, includes the western-most range of the Irrawaddy Dolphin (Stacey and Leatherwood, 1997), a species that is particularly vulnerable to gillnet entanglement because of its affinity for estuarine waters where fishing pressure is most intense.

According to Lal Mohan (1987, 1990) species such as Spinner Dolphin (*Stenella longirostris*), Common Dolphin (*Delphis delphis*) and Finless Porpoise (*Neophocaena phocaenoides*), are frequently caught in Indian catfish and shark gillnets along the East coast of India. However, recent information on the interaction of marine mammals with fishery sector in East and West coast of India is lacking. It is possible that these species may also be heavily impacted in those parts of their range where they remain, but studies are lacking in much of this region. The intensity of fishing is on the increasing trend along the East coast of India and the mortality of marine mammals in the sea is a serious concern for national and international communities. The existing literatures on dolphin reported from Andhra Pradesh indicate at least eight species to occur in the offshore waters of A.P. However, the present survey documents only five species both offshore as well as onshore. Therefore, there is possibility of reduction in the number of species from this coast. During the survey, mechanized fishing was observed as close as 100 m to the beach all along the Andhra Pradesh predominantly

along the northern part (Tripathy and Choudhury, 2001). This may be the primary reason for several dolphin mortality along the Andhra Pradesh coast and reduction in the species diversity from this maritime State.

Recommendations

All the species of dolphins and porpoises occur in seas around India are legally protected under the Schedule I & II of the Indian Wildlife (Protection) Act, 1972. It is essential that intensive surveys need to be taken up so as to yield important information on the different species occurring along the East coast of India. The assessment of biotic and abiotic threats needs to be addressed immediately. Besides, the knowledge on population size of marine mammal is of paramount importance for formulating any management policy. This will help in developing a long-term conservation and management of marine mammal population in Indian Ocean area.

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SUMMARY

A survey of marine mammals of the Andhra Pradesh coast of India was undertaken for a period of one year from April 2000 to May 2001. Time-constrained opportunistic marine mammal sightings were made in the near shore waters and close to important river mouth areas. Dead specimens of dolphins and porpoises stranded along the coast were documented by visiting the entire coast every month. Morphometric measures were taken from all stranded marine mammals and standard identification keys were used identification. Five species of marine mammals along the Andhra coast were recorded during the study. However, based on other records, at least 3-4 other species of marine mammals are expected to occur along the Andhra Pradesh coast. Besides deliberate killing and destruction of natural marine habitat, incidental capture related mortality was found to be amongst the major threats to marine mammals of Andhra Pradesh coast. Awareness drives combined with stringent protection and conservation measures by the marine fisheries and wildlife authorities are suggested to safeguard these important marine mammal fauna along the East coast of India.

आन्ध्र प्रदेश तट के किनारे भारत के समुद्रतट पर समुद्री स्तनियों का मिलना और उनका मरण

बासुदेव त्रिपाठी व बी०सी० चौधरी

सारांश

भारत के आंध्र प्रदेशीय समुद्रतट पर मिलने वाले समुद्री स्तनियों का सर्वेक्षण अप्रैल 2000 से लगाकर मई 2001 एक वर्ष तक किया गया । तट के निकट वाले समुद्रजल में और महत्वपूर्ण नदी मुख क्षेत्रों के निकट समय बाधित अवसरों पर स्तनियों को परिदर्शित किया गया । समुद्रतट पर बह कर भटक आए शिंशुमार और शिंशुकों के मृत नमूनों का प्रलेखन प्रतिमास जाकर पूरे तट की जांच करते रहकर किया गया । तट पर बहकर आए सभी समुद्री स्तनियों के रचनापिकीय नाप लिए गए और उनकी पहचान करने के लिए प्रतिमानित अभिज्ञान कुंजियां उपयोग में लाई गई । इस अध्ययन के दौरान आंध्र प्रदेशीय

समुद्र तट के किनारे सात जातियों के समुद्री स्तनि आलेखित किए गए । तथापि, अन्य आलेखों के आधार पर कम से कम 3 - 4 अन्य समुद्री स्तनि जातियों की आंध्र प्रदेशीय तट पर और होने की प्रत्याशा की जाती है। इसके अलावा, जानबूझकर की जाने वाली हत्या, स्वाभाविक समुद्री प्राकृतावास विनाश, और पशुओं को पकड़ने के सम्बन्ध में होने वाला उनका मरण आंध्र प्रदेशीय समुद्रतट के समुद्री स्तनियों को होने वाले बड़े खतरों में कारण पाए गए। जानकारी फैलाने के अभियानों के अलावा कड़ाई से प्राणि सुरक्षा करना तथा समुद्री मत्स्यपालन और वन्यप्राणी अधिकारियों द्वारा उनका संरक्षण करने के उपायों को सुझाया गया है जिनसे भारत के पूर्वी समुद्रतट के किनारे के इन महत्वपूर्ण समुद्री स्तनि प्राणियों की रक्षा की जा सकेगी ।

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