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Coastal dune flora and fauna of Arribada beach, Rushikulya in Ganjam district, Odisha, India

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ABSTRACT

Coastal sand dunes are susceptible and fragile ecosystems with an array of floral and faunal species composition. Studies on coastal sand dunes especially those of eco-sensitive coastal and marine ecosystem of Indian coast are scanty. Hence, a detailed survey along the coast of Rushikulya sea turtle Arribada beach in Ganjam district, Odisha was carried out. A total of 37 species belonging to 32 genera and 17 families of plants and 15 species belonging to 11 genera and 09 families of faunaal elements were encountered on the beach and identified at different locations from the shoreline towards inland of the coastline. The flora and fauna composition of Rushikulya coast was found to be rich, indicates to constitute a variety of habitats and gather vital ecological and economic importance. Such sensitive eco-systems have to be protected from habitat degradation in order to protect their diversity and ecological functioning and to supporter the associated floral and faunal assemblages in the area.

Key words: Conservation, fauna, flora, Rushikulya, sand dune

INTRODUCTION

Dunes occur throughout the world, from coastal and lakeshore plains to arid desert regions. In addition to the remarkable structure and patterns of sand dunes, they also provide habitats for a diversity of life which is a remarkable in terms of adaptation also. Coastal sand dunes are natural abotic component which protect the coastal environment by absorbing energy from wind, tide and wave action. Sand dunes due to their dynamic but fragile buffer zones of sand and vegetation resulted in large quantities of sand, persistent wind capable of moving the sand and suitable locations for sand to accumulate. Coastal sand dune formations ultimately depend on embayment size and prevailing wind energy (Kumar *et al.,* 1993). Their heights differ in response to adequate sand supply, climate and local topographic features (Barbour *et al.,* 1985). Despite geographical differences, coastal sand dunes have been considered as a specific ecosystem due to numerous general environmental features. Coastal sand dunes constitute a diversity of microenvironments due to substrate dynamism and physical processes. Vegetations and faunal communities establishing on

coastal sand dunes are subjected to environmental variation which affect their growth, survival and community structure and composition. Plants on coastal dunes are specially adapted to withstand various environmental stresses which allow them to grow, establish and to trap sand in such harsh conditions of coastal zones, so they are mostly represented by herbs, shrubs, creepers or runners. Similarly, animals on the coastal dunes are adapted primarily to burrowing habitat to withstand environmental stress *viz.* heating of the sand and escape from predators.

Pioneer zone, intermediate zone and back zone / forest zone were recognized earlier in coastal dunes and later several workers found shore, fore dune, main dune with wind ward and lee ward slopes, wet dune slacks and back dunes with plateaus, holes complex ecosystem diversity (Wood house 1978; Hesp 2004). Temperate coastal dunes are well studied and documented (Koske and Gemma 1997; Sridhar and Bhagya, 2007) as compared to studies on tropical coastal dunes (Kulkarni *et al.,* 1997; Sridhar and Bhagya, 2007).

Coastal sand dunes provide ecological services in more than one ways *viz*. storing of essential sediments, act as a barrier against storm erosion and by curbing potential sea level rise; rainwater and ground water filtration, act as niche for shore birds, and animals, act as nesting habitat and incubator for egg laying animals on the shore *viz.* shore birds, sea turtles, horseshoe crabs, sea snake (*Laticauda* sp.) etc. This paper aims to provide some baseline biodiversity information on the coastal sand dune of Rushikulya sea turtle rookery at Ganjam along Odisha coast.

MATERIALS AND METHODS

Study site

The study was carried at Rushikulya rookery which is the mass nesting beach for Olive Ridley sea turtles. The Rushikulya river estuary is a shallow tidal estuary, which opens into the Bay of Bengal near Ganjam town. The estuary mouth is connected with the southern sector of the Chilka lagoon through a man-made channel known as Palur channel. The Palur channel runs parallel to the nesting beach for 8 km. The physiographic features of the estuarine environment have undergone many recognizable changes since the last two-decade (Gouda and Panigrahy, 1992). The irregular floods in river Rushikulya leading to formation of new mouths on several occasions.

The mass nesting beach is located on the sand spit along the northern side of Rushikulya River mouth (19º 22’ N and 85º 02’E; Fig. 1). Turtle nesting at this rookery takes place along a stretch of 5 km immediately north of Rushikulya River mouth from the village Purunabandha (1 km north of the Rushikulya River mouth) to Kantiagada village. The beach is more or less flat with scattered sand dunes of 1-2 m high. The average beach width is 80 m above the high tide line, though at some places, the extent of beach is more than 150 m. The extended sandy beach adjacent to north of Rushikulya river mouth has been proved as a favorable site for mass nesting of Olive Ridley turtles since its discovery. However, with the change of the beach topography, the mass nesting has shifted towards further north up to four kilometer from the earlier nesting area. Remarkable changes such as development of a typical lagoon like structure comparably lowering of wave action and beach gradients and enormous growth of vegetations on the beach taken place in the old nesting beach. The new nesting beach located between the Gokhurkuda and Kantiagarha village, two kilometers north of

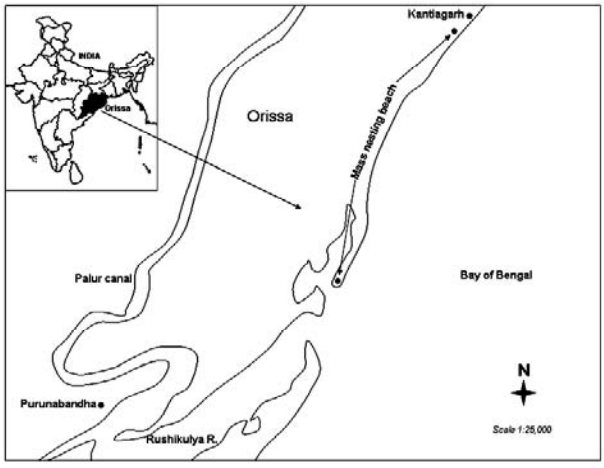

Fig.1. Map of Rushikulya beach at Ganjam in Odisha

Rushikulya river mouth. The new nesting site which is relatively flat and subjected to minimum human interference and away from the fish-landing centres.

At present, this rookery and its near shore coastal waters does not come under any Protected Area management. Gopalpur (20 km north of Rushikulya) is being developed as a sea port. Recently the Reliance Petroleum and the Indian Oil have identified the offshore waters (~ 75 km from the seashore and inside the sea) of the rookery for major oil exploration. Near Arjipalli, the Indian Rare Earths Limited mines the beach for sand. There are abandoned prawn farms that are immediately behind the nesting beach. A chloro-alkali plant situated on the right bank of the Rushikulya River, which discharges effluents directly into the estuary. The Ganjam Township as well as the NH-5 is just a kilometer away from the mass-nesting beach. During night high illumination on the beach occurs due to these establishments.

Table 1. List of coastal dune plants recorded from Rushikulya beach, Ganjam district Odisha

Sl.No.	Family	Scientific Name	English Name
1	Convolvulaceae	*Ipomoea pes-caprae*	Sea morning glory
2	Cyperaceae	*Cyperus alternifolias*	Dwarf beach grass
3	Cyperaceae	*Cyperus arenarius*	Dwarf beach grass
4	Cyperaceae	*Cyperus compressus*	Nut grass
5	Cyperaceae	*Cyperus rotundus*	Nut grass
6	Cyperaceae	*Bulbostylis barbata*	Water grass
7	Cyperaceae	*Fimbristylis cymosa*	Hurricane grass
8	Cyperaceae	*Fuirena ciliaris*	Umbrella grass
9	Cyperaceae	*Kyllinga triceps*	White water sedge
10	Cyperaceae	*Pycreus polystachyos*	Bunchy flat sedge
11	Poaceae	*Spinifex littoreus*	Feathertop
12	Poaceae	*Spinifex squarrosus*	Feathertop
13	Poaceae	*Cynodon dactylon*	Bermuda grass
14	Poaceae	*Cynodon sp.*	Bermuda grass
15	Poaceae	*Dactyloctenium aegyptium*	Egyptian grass
16	Poaceae	*Eragrostis viscosa*	pond lovegrass
17	Poaceae	*Panicum repens*	Torpedo grass
18	Poaceae	*Zoysia matrella*	Siglap grass
19	Asteraceae	*Launaea sarmentosa*	Beach launea
20	Fabaceae	*Indigofera enneaphylla*	Birdsville indigo
21	Fabaceae	*Mimosa pudica*	Sleeping grass
22	Fabaceae	*Canavalia virosa*	Maunaba
25	Fabaceae	*Canavalia maritima*	Bay bean
26	Fabaceae	*Desmodium triflorum*	Black clover
27	Asclepiadaceae	*Calotropis gigantea*	Milkweed or swallow-wort
28	Casuarinaceae	*Casuarina equesitifolia*	Beach sheoak
29	Pandanaceae	*Pandanus fascicularis*	Screw pine
30	Arecaceae	*Cocos nucifera*	Coconut
31	Rubiaceae	*Hydrophylax maritima*	East Indian water bluet
32	Cactaceae	*Opuntia dillenii*	Chenille prickly pear
33	Anacardiaceae	*Anacardium occidentale*	Cashew nut
34	Euphorbiaceae	*Acalypha indica*	Indian nettle
35	Euphorbiaceae	*Croton bonplandianus*	Ban tulsi
36	Euphorbiaceae	*Euphorbia rosea*	Rosy spurge
37	Nyctaginaceae	*Boerhavia diffusa*	hogweed
38	Apocynaceae	*Catharanthus roseus*	Rosy periwinkle
39	Molluginaceae	*Glinus oppositifolius*	Indian tree pix

Data Collection

A total of 10 belt transects of about 5 × 100m were laid randomly (wherever the vegetation cover was predominantly found) in 10 different regions at different distance gradients from high tide line till the estuary/lagoon/*Casuarina* plantation boundary begins. Every plant and animal species found along the 10 transects were recorded by observation and photographed while walking. Species were identified then and there and doubtful specimen were brought to the field laboratory and identified with the help of keys. Species list of plants are given in Table 1 and animals in Table 2.

RESULTS AND DISCUSSION

In the present study, 37 species belonging to 32 genera and 17 families of plants were identified. Cyperaceae was the most common and dominant family followed by Poaceae, Fabaceae, Euphorbiaceae and Rubiaceae (Table 1). A conspicuous feature of the Rushikulya beach is the absence of *Casuarina* plantation in the old nesting area and dense *Casuarina* plantation in the new nesting stretch. The natural beach vegetation on the sand dunes also includes psammophytes such as sea morning glory (*Ipomea pescaprae*), feathertop (*Spinifex littoreus*), *Gisekia phranacoides* and Indian waterbluet (*Hydrophylax maritima*). On the beach, exotic and invasive species like prickly pear (*Opuntia* spp.), swallow-wort *(Calotropis gigantea),* sleeping grass (*Mimosa pudica*) can be seen. Besides, species such as Bermuda grass (*Cynodon dactylon),* screw pine (*Pandanus fascicularis)* and casuarina (*Casuarina equisetfolia*), which grows in patches in some parts. The backwater of the river Rushikulya fringed by cashew (*Anacardium occidentale*) and coconut (*Cocos nucifera*) which extended to 4 km northwards along the nesting beach.

Similarly, 15 species belonging to 11 genera and 09 families of animals were encountered on the sandy beach of Rushikulya estuary and were

Table 2. List of fauna encountered at the Rushikulya beach, Ganjam in Odisha, India

Sl. no.	Family	Scientific name	English name
Mammals			
1	Hyaenidae	*Hyaena hyaena*	Striped hyaena
2	Canidae	*Canis familiaris*	Domestic dog
3	Canidae	*Canis aureus*	Jackal
Birds			
4	Laridae	*Larus ichthyaetus*	Pallas's gull
5	Laridae	*Larus brunnicephalus*	Brown-headed gull
6	Laridae	*Larus hemprichii*	Sooty gull
7	Corvidae	*Corvus splendens*	House crow
8	Accipitridae	*Haliastus indus*	Brahminy kite
9	Accipitridae	*Haliastus leucogaster*	Sea eagle
Reptiles			
10	Agamidae	*Sitana ponticeriana*	Agamid lizard
11	Chelonidae	*Lepidochelys olivacea*	Olive ridley
Invertebrates			
12	Accipitridae	*Haliastus leucogaster*	Sea eagle
13	Ocypodidae	*Ocypode ceratophthalmus*	Ghost crab
14	Portunidae	*Ovalipes australiensis*	Sand crab
15	Paguridae	*Pagurus berhardus*	Hermit crab
16	Ocypodidae	*Ocypode ceratophthalma*	Red ghost crab
17	Ocypodidae	*Uca sp.*	Fiddler crab

identified either by direct sighting or through photographs (Table 2). During the sea turtle hatching period, hatchlings turtles on the beach were found predated by feral dogs (*Canis familiaris*), house crows (*Corvus splendens*), brahminy kites (*Haliastur indus*) and brown-headed gulls (*Larus ridibundus*) mostly during early morning hours. Besides ghost crab, large numbers of nests were found predated by various mammalian species *viz.* feral dog, hyenas and jackals immediately after nesting was over. Those sea turtle nests that were laid inside the *Casuarina* shrubs were found to be immediately predated upon by jackals and dogs at Rushikulya beach.

As evident from literature that sand dune ecosystems support high species richness and diversity values (Grootjans *et al.*, 2004; Fontana 2005; Celsi and Monserrat 2008). The present study corroborates the observation made elsewhere and also indicates that the study area preserves a rich flora and fauna with high number of native dune biodiversity. Moreover, the different vegetation formations together with the dune field geomorphologic heterogeneity of the beach provide a wide range of environmental conditions and habitat types that support a diverse native fauna like crabs, dune lizards etc. More importantly, the sand dune binders viz. *Ipomea*, *Spinifex* etc. makes the sand conducive for sea turtle nesting. Therefore, the conservation of the native vegetation of the Rushikulya sea turtle beach is a priority to conserve the integrity of the natural communities in coastal regions as well as making the beach suitable for sea turtle egg laying.

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