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Coastal wetlands, which act as buffer zones between the marine and upstream land area, are increasingly under pressure due to an array of activities by multiple users. The wetlands are under the influence of both fresh and saline water. Many bird species including migratory seabirds and resident coastal birds use wetlands as resting place, for breeding or feeding purposes or to take cover from predators. The Ramsar Convention on Wetlands, of which India is a signatory, uses a broad definition of wetlands which includes all lakes and rivers, underground aquifers, swamps, marshes, wet grasslands, peatlands, oases, estuaries, deltas, tidal flats, mangroves, other coastal areas, coral reefs,

all human-made sites such as fish ponds, rice paddies, reservoirs and salt pans. The contracting parties are committed to (a) work towards the wise use of all their wetlands; (b) designate suitable wetlands for the list of Wetlands of International Importance (the “Ramsar List”) and ensure their effective management; (c) cooperate internationally on transboundary wetlands, shared wetland systems and shared species.

The coastal plain of Dakshina Kannada District in Karnataka is narrow and thickly populated. Though the district receives more than 3000 mm rainfall annually, problems such as flooding, coastal erosion, and salinity ingress in coastal aquifers and

along river course exist and proper water management strategies are required. The salinity ingress of coastal aquifers is mainly during the summer months when river flow decreases. Over the years the percentage area of creeks, lagoon and wetlands in Dakshina Kannada has decreased due to increasing urbanization resulting in loss of habitat to the multiple users of these wetland areas. The motion or path of the water flow and the forces which act on the type of soil in the area determines the wetland formed. The most common feature of all wetlands is that the water table (the ground water level) is very near to the soil surface or shallow water covers for at least part of the year. The main characteristics of a wetland are determined by the combination of the salinity of the water in the wetland, the soil type and the plants and animals living in the wetland (Fig. 1). The coastal buffer zones of sandy beaches and marsh lands help prevent saline water intrusion. The textural variation of a sandy shore with higher pore size helps in retention of fresh water during monsoon which in turn helps bind the grains together and aids in the growth of sand dune plants. The marsh lands on the upstream have higher percentage of clay, contain Kaolinite minerals joined by strong hydrogen bonds, and thus capable of retaining fresh

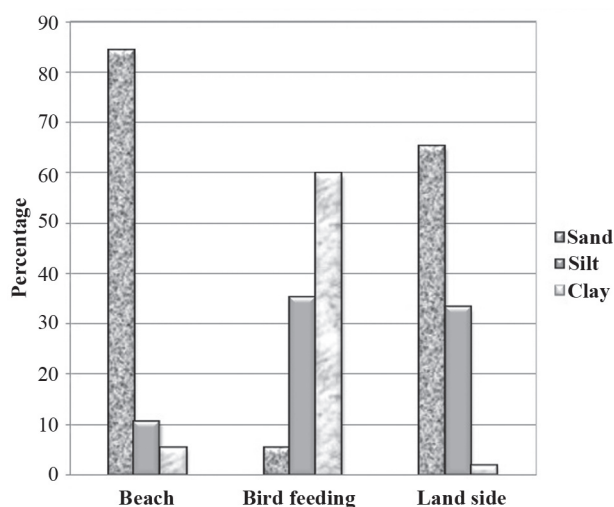


Fig. 1. Soil types in a wetland

water for longer duration even during dry weather period.

The coastal area between Baikampady (Fig. 2) and Chithrapur in Dakshina Kannada district of Karnataka is a typical example of a coastal buffer zone. This wetland is a 'Fern type' and characterized by peaty soil, with dominance of grass like plants, grasses, sedges and reeds. Peat soil is formed in wetland areas when plant material is inhibited from decaying fully due to anaerobic conditions. The 'Ferns type' wetlands are alkaline, receiving water mostly from surface and subsurface flow. It receives sea water from the Arabian Sea during high tide and drains rainwater into the sea during monsoon. The subsurface flow is from upper Chithrapur area where marsh lands are present. However during the process of urbanization and development of cities most of these channels are converted into city waste water drainages. Unfortunately, the precious nutrient rich storm water mixes with waste water and drains into the sea. In the natural course when rainfall is less, there is an inflow of saline water into the region. The higher the ground water table along the adjacent landmass, the less will be the saline water intrusion due to hydrostatic pressure difference in the system. However, during unplanned development activities, more of these precious and natural marsh lands are filled with debris, hence disturbing the natural balance of water flow in these

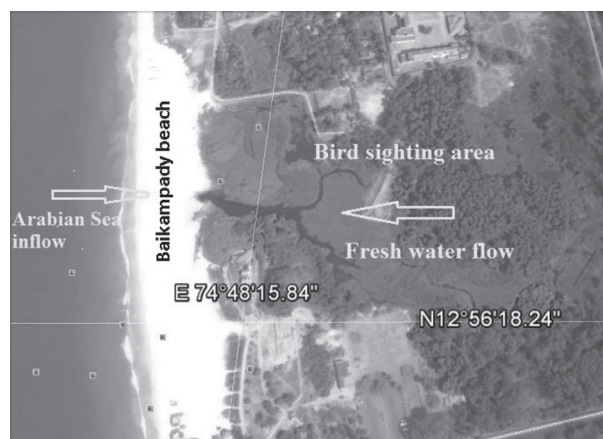
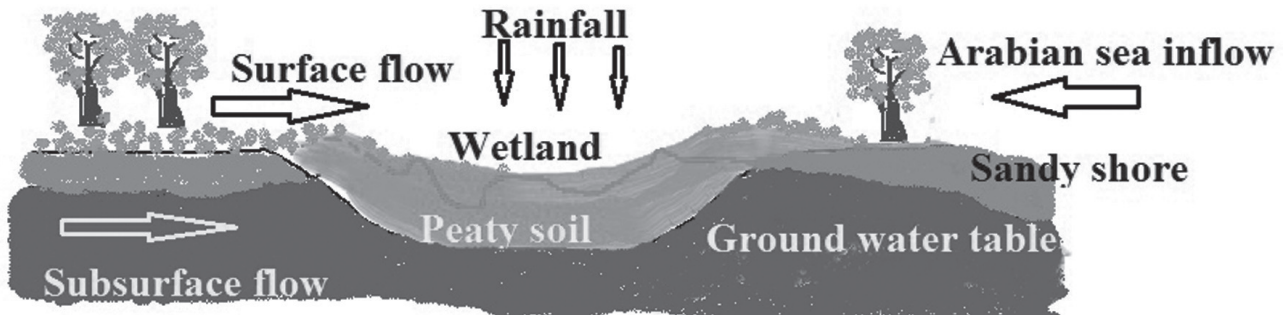


Fig. 2. Coastal wetland and bird sighting area



Schematic diagram of the hydrodynamics and soil type of a wetland

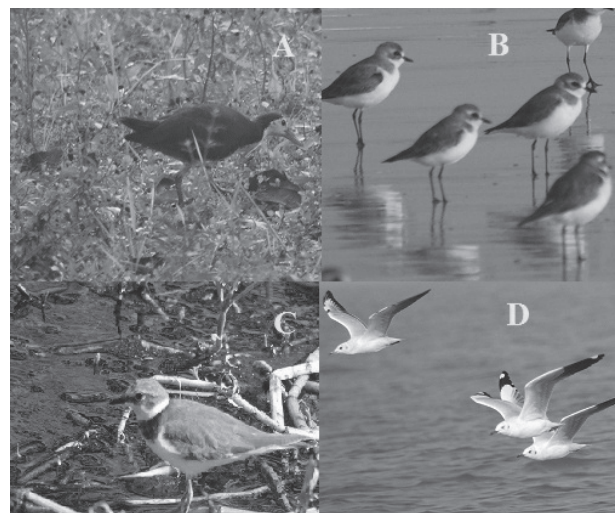
ecosystems. The marsh lands on the upstream area of Chithrapur, act as hydrologic sponge, temporarily storing flood waters and releasing them slowly, thus reducing flood peaks and protecting downstream areas. These functions are all the more important in urban areas where development has increased the rate and volume of runoff.

Wetlands generally host a number of avian fauna and the value of a wetland to a specific bird species is dependent on the moisture present in the soil and the duration and timing of flooding. At times, the water may not be present at the surface, but be close enough to support growth of vegetation and organisms that are needed as food by birds. Birds generally use wetlands formed as depressions in an otherwise dry landscape. These generally occur along streams or in tidally influenced areas near shorelines. The coastal birds especially the shanks and the sandpipers, feed on the beaches during early morning and late evening and take shelter in the inland areas as the beach sand heats up during the day time. The red-wattled lapwing *Vanellus indicus* another bird sighted in this area scrape the ground



Red-wattled lapwing *Vanellus indicus*

and make small depressions on which they lay their eggs. Breeding season is during March to August. The need for lapwings to be near a wetland is that the adult soak their belly feathers to provide water to their chicks as well as to cool the eggs during hot weather. On the other hand the water hens prefer to nest in the marsh lands and ponds in the upstream areas. The decrease in number of sightings of the water hens is an indicator of reduction in wetland areas and stress on the ecosystem. The white breasted water hen *Amaurornis phoenicurus* is an omnivorous species preferring insects, molluscs, grains, shoots of paddy and marsh plants available in its foraging area, which include grass land, mud and shallow water. They usually nest during June



(A) White breasted waterhen *Amaurornis phoenicurus* (B) Kentish plover *Charadrius alexandrinus* (C) Little ringed plover *Charadrius dubius* (D) Black headed gull *Larus ridibundus* and Brown headed gull *Larus brunnicapalus*

to October. The nests are a shallow cup of twigs, creeper stems which is positioned in bushes in proximity to the water bodies. The other birds sighted in this area were cattle egret *Bubulcus ibis*, which chiefly feeds on grass hopper, other insects, frogs, lizards, fish etc., Kentish plover *Charadrius alexandrinus* which nests in sandy bed above the high tide mark in seashore or in dry river bed, Little ringed plover *Charadrius dubius*, Brown headed gull *Larus brunnicephalus*, black headed gull *Larus ridibundus* and the Eurasian oyster catcher *Haematopus ostralegus*, which is a winter visitor to India.

Conservation of these coastal buffer zones is of prime importance for the preservation of many diverse species of flora and fauna. Urbanization in these coastal buffer zones has led to people disposing off litter in these empty spaces which obstructs the natural hydrodynamic flow and leads to stagnation of water, eutrophication and breeding of mosquitoes. When more sand dune in the beaches are transported elsewhere and less of marsh lands are available for the retention of rainfall, the recharge capacity of the ground water table is



Eurasian oyster catcher *Haematopus ostralegus*

reduced, which in turn can lead to saline water intrusion. Population increase compels more people to depend on ground water for their daily need. These zones could be cleared of debris and maintained as protected sites with a limited tourist access. The study of the ecology of wetland birds by identifying the patterns of use of habitat, breeding site and resources such as food will be useful for designing strategies to conserve our wetlands.