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Salt pans act as the alternate habitat for migratory and resident migratory shorebirds, East Coast of Tamil Nadu, India

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Abstract

Shorebirds are long-distance migratory species which are using many stop-over sites during their migration to fulfill their high energy requirements. The salt pans are the vital and significant habitats among the wetlands available in the costal ecosystem for the migratory shorebirds as alternate feeding grounds. The study was carried out from August 2012 to June 2015 in the five different salt pans of east coast of southern India. The shorebirds were counted by using total count method with the help of 7×50 binocular and 20x60 spotting scope from different vantage points. Totally 40 migratory and resident migratory bird species were recorded, in which 4 species viz., Red-necked Stint, Curlew Sandpiper, Eurasian Curlew and Painted Stork are categorized under 'Near Threatened' category as per IUCN 2016. The density of Little stint was highest than the other species recorded in the salt panss. The monsoon season supported highest density of shorebirds than the other seasons. The study concluded that the salt pans attract diverse array of shorebird species and they salt pans are act as an important feeding and roosting habitat for migratory and resident migratory shorebirds.

Keywords: Shorebirds, Salt pans, Migration, Conservation.

INTRODUCTION

Shorebirds are long-distance migratory species which use many stop-over sites during their migration to fulfill their high energy requirements. Salt pans are among the most important areas for shorebirds during the migratory season (Pandiyan et al. 2014). Salt pans are well-known artificial hyper saline habitats that are of great significance for the migratory shorebirds due to the high productivity and certainty in time and space, as well as their shallow depth (Britton and Johnson, 1987; Warnock et al. 2002). Artificial salt ponds have existed in the estuary for more than 150 years (Ver Planck, 1958), and these habitats have become an integral part of the landscape as well as critical habitats for a large proportion of the shore birds in the estuary both during the wintering and migratory seasons (Anderson, 1970; Swarth *et al.* 1982; Accurso, 1992).

Many birds use supratidal habitats such as human-made salt pans, as a complementary feeding habitat during the high-tide period, when sediment flats are submerged (Britton and Johnson, 1987; Masero et al. 2000; Masero and Perez-Hurtado, 2001; Yasue and Dearden, 2009). Some species may even prefer to feed in salt pans instead of mudflats during the low tide period (Murias et al. 2002; Masero, 2003; Dias, 2009; Yasue and Dearden, 2009). Therefore, salt pans can potentially act as an alternative feeding habitat for some shorebird species in case of reduction or degradation of the intertidal mudflat area (Sripanomyom *et al.* 2011).

In the recent decades, many coastal wetlands have been damaged or altered, resulting in major impacts on shorebird populations (Goss-Custard *et al.* 1977a, b; Goss-Custard and Moser, 1988, Pandiyan, 2000, 2002). Artificial wetlands such as salt pans can provide important foraging habitats for shorebirds as alternate foraging habitat, (Perez-Hurtado and Hortas, 1991). Salt extraction is one of the major professions of the coastal areas of Tamil Nadu, India, seasonally, and there are more than 12,000 hectares are under salt extraction. The salt pans represent 16% of the surface area of the coastal area, an important feeding and roosting area for shorebirds (Pandiyan *et al.* 2014). The Vedaranyam salt pans are one of the most diverse and productive man-made wetland in Southern India. The salt pans are located adjacent to Point Calimere Wildlife sanctuary and only RAMSAR site in Tamil Nadu. During the migration period high numbers of shorebirds were regularly observed. The aim of the present study was the role of salt pans and utilization of shorebirds have been studied from 2013-2015.

MATERIALS AND METHODS:

Study Area

The study was carried out in the Kodikkarai salt panss of the east coast of Tamil Nadu, India. The salt pans in the study area comprised 930 ha. and divided into five

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different salt pans areas viz., Chemplast (250 ha. 10º 019.678'N, 79º 49.809'E), Kovilthalvu (190 ha. 10º 20.793'N, 79º 048.163'E), Nandupallam (170 ha. 10 º 20. 394'N, 79º 50.714'E), Nedunthittu (160 ha. 10º 20.520'N, 79º 50.203'E) and Pushkarani (160 ha. 10º 20.444'N, 79º 48.989'E). These salt pans are located on the east coast of India near an important water bird wintering area i.e. Point Calimere Wildlife Sanctuary, which is the only RAMSAR site located in Tamil Nadu, India.

The salt pans primarily comprise of reservoir ponds (which are mainly used to store sea water), evaporation ponds (which are mainly used for increasing the salinity of the water) and crystallization ponds (these are true salt panss in which the sea water crystallizes into salt particles), which differ mainly in their salinity, vegetation and water levels. The salinity of the first (reservoir) pond type is very similar to that of the marine environment (35-38%), whereas the last pond type (crystallization ponds) reaches more than 250% of salinity. This region is subjected to the Northeast monsoon, with most of the rainfall occurring during October–December. However, in the past decade, rainfall declined remarkably and, in the recent years, most of the rainfall was over a period of 2–3 weeks except 2015. In fact, these study areas are important and are acting as stopover sites for the migratory birds during their migratory periods (Sampath and Krishnamoorthy, 1989; Pandiyan *et al*. 2014).

METHODOLOGY

Since all the salt pans appeared relatively homogenous, the study area was divided into five different areas, and their names were based on their nearby location to categorize the spatial variations of birds and density of benthic organisms. Birds were counted with the help of 7 × 50 binocular and 20 x 60 spotting scope from vantage points on the salt pans. Birds were counted individually using the 'direct count' method which gave a total count of birds in each area (Yates and Goss Custard, 1991). On each day, two counts of 3.00 h duration were carried out, and as far as possible, counts were made on clear and sunny days to minimize bias arising from variation in weather. All the study areas were entirely open and had very scanty vegetation and birds could be seen and counted without difficulty. During the census, any arrival or departure of birds in the areas were also counted to avoid missing or duplicating records. Shorebird density was calculated as number per hectare

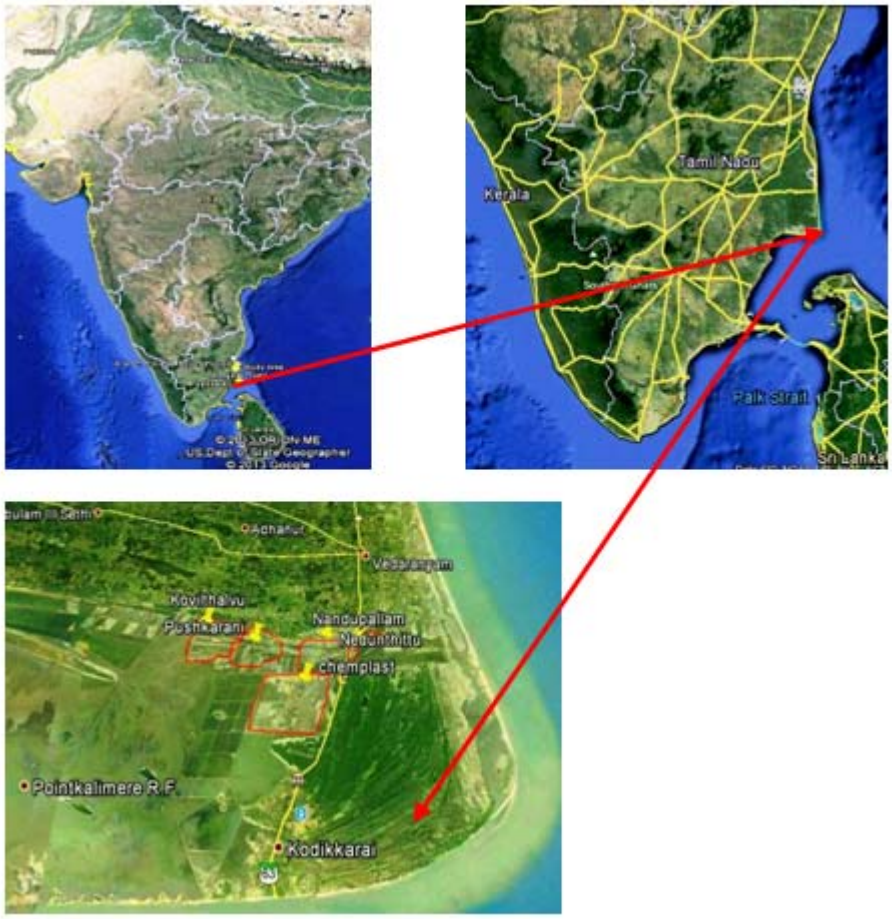

Fig.1. Map showing the salt pans areas of Kodikkarai, Tamilnadu.

Table 1. Shorebird densities (birds/ ha; mean ± SE) recorded on salt pans in the Vedaranyam, East Coast Tamil Nadu, Southern India during August 2012 to June 2015.

S.No	Species	Year		
		2012-13	2013-14	2014-15
1	Little Stint	96.2 ± 17.07	66.1 ± 8.02	106 ± 10.94
2	Marsh Sandpiper	9.1 ± 2.26	16.8 ± 3.31	6.3 ± 1.22
3	Pacific Golden Plover	0.8 ± 0.28	2 ± 0.52	1.1 ± 0.51
4	Red-necked Phalarope	0.4 ± 0.16	0.8 ± 0.23	0.2 ± 0.11
5	Ruddy Turnstone	0.9 ± 0.33	0.2 ± 0.11	0.6 ± 0.21
6	Red-necked Stint	0.6 ± 0.31	0.8 ± 0.32	0.7 ± 0.28
7	Sandwich Tern	0.7 ± 0.28	2.8 ± 0.66	0.5 ± 0.26
8	Spotted Redshank	4.7 ± 1.06	3.6 ± 0.77	0.3 ± 0.13
9	Whimbrel	0.2 ± 0.1	0.2 ± 0.07	0.2 ± 0.05
10	Wood Sandpiper	2.2 ± 0.59	4.4 ± 0.73	4.8 ± 0.79
11	Yellow-legged Gull	1.6 ± 1.5	1.8 ± 0.81	1.3 ± 0.97
12	Heuglin's Gull	3.4 ± 1.36	1.74 ± 0.71	15.1 ± 6.91
13	Green Sandpiper	2.6 ± 1.23	0.4 ± 0.17	0.6 ± 0.18
14	Curlew Sandpiper	3 ± 0.43	3.5 ± 0.61	2.8 ± 0.46
15	Dunlin	0.9 ± 0.25	0.1 ± 0.04	0.4 ± 0.16
16	Eurasian Curlew	0.1 ± 0.06	0.02 ± 0.01	0.1 ± 0.02
17	Common Greenshank	5.4 ± 1.02	3.9 ± 0.56	4.3 ± 0.55
18	Black-headed Gull	0.2 ± 0.1	0.2 ± 0.1	0.3 ± 0.13
19	Broad-billed Sandpiper	5.3 ± 3.22	4.6 ± 1.71	2.5 ± 0.49
20	Temminck's Stint	4.2 ± 0.95	3.8 ± 0.78	2.9 ± 0.65
21	Terek Sandpiper	1.7 ± 0.82	2.5 ± 0.79	0.3 ± 0.11
22	Brown-headed Gull	3.3 ± 0.73	4.9 ± 0.77	3.4 ± 0.59
23	Caspian Tern	4.6 ± 0.63	6.1 ± 0.92	6.2 ± 0.79
24	Common Kingfisher	0.7 ± 0.19	1.5 ± 0.27	0.2 ± 0.9
25	Common Redshank	18.3 ± 4.41	9.3 ± 1.73	13 ± 1.73
26	Common Ringed Plover	5.8 ± 1	5.9 ± 0.79	5.4 ± 0.71
27	Common Sandpiper	6.8 ± 0.93	3.1 ± 0.31	3 ± 0.37
28	Common Tern	1.4 ± 0.43	0.5 ± 0.18	1.1 ± 0.21
29	Greater Flamingo	1 ± 0.41	0.1 ± 0.06	0.5 ± 0.25
30	Gull-billed Tern	2.2 ± 0.49	1.6 ± 0.18	3.6 ± 0.68
31	Grey Heron	0.2 ± 0.07	0.3 ± 0.06	0.2 ± 0.05
32	Intermediate Egret	2.8 ± 0.45	2.1 ± 0.31	0.7 ± 0.13
33	Kentish Plover	6.9 ± 1.03	10.8 ± 1.51	11 ± 1.16
34	Lesser Sand Plover	9.4 ± 1.64	6.3 ± 1.14	8.7 ± 1.2
35	Little Cormorant	0.1 ± 0.4	0.1 ± 0.05	0.3 ± 0.18
36	Little Ringed Plover	23.8 ± 3.66	8.4 ± 1.45	8.1 ± 1.02
37	Painted Stork	7.4 ± 1.85	2.4 ± 0.68	7.4 ± 1.09
38	Western Reef Egret	0.46 ± 0.1	0.1 ± 0.03	0.4 ± 0.12
39	Whiskered Tern	3.5 ± 0.54	4.2 ± 0.42	4.6 ± 0.47
40	Yellow Bittern	0.2 ± 0.56	0.1 ± 0.04	0.2 ± 0.06

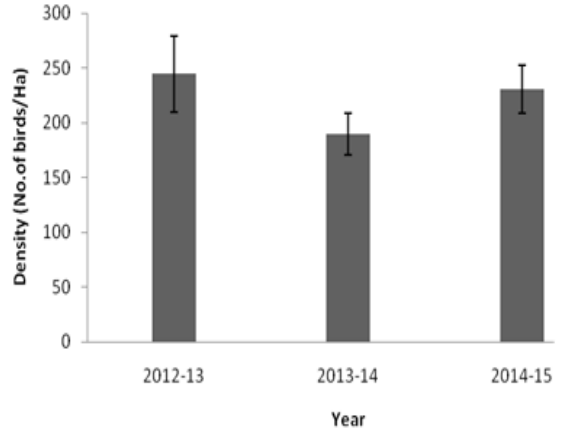

Fig 1. Density of shorebirds (Number of birds/ha) recorded in Vedaranyam salt pans during August 2012 to June 2015.

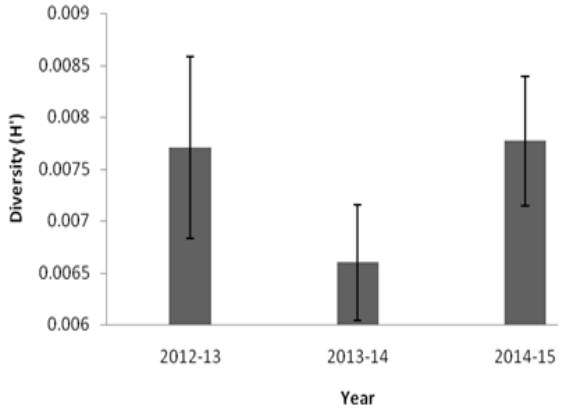

Fig 2. Diversity of shorebirds (H') recorded in Vedaranyam salt pans during August 2012 to June 2015.

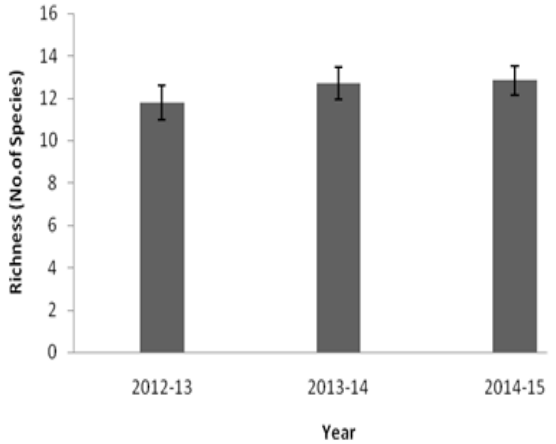

Fig 3. Richness of shorebirds (Number of Species) recorded in Vedaranyam salt pans during August 2012 to June 2015.

for each area. Species richness was calculated by the number of shorebird species recorded in the salt pans (Verner 1985), and species diversity was calculated by using the Shannon-Wiener Index (H': Shannon and Wiener 1949).

RESULTS

Totally 40 migratory and resident migratory bird species were recorded, in which 4 species viz., Red-necked Stint, Curlew Sandpiper, Eurasian Curlew and Painted Stork are categorized under 'Near Threatened' category as per IUCN 2016. Among the 40 species 21 species were migratory birds and remaining 19 species are resident birds. The abundance and distribution of shorebird species in Vedaranyam salt pans were determined. The most abundant species were Little stint (89.7±7.28) followed by Common redshank (13.5±1.67) and Little ringed plover (13.4±1.39) and Yellow bittern were observed in low density (0.1±0.03) followed by Grey heron (0.2±0.03) and Whimbrel (0.2±0.04). All these species reached their peak season during the monsoon period. The highest density of birds recorded in the year of 2012-13 (Fig.1).

Table 1. Shorebird densities (birds/ ha; mean ± SE) recorded on salt pans in the Vedaranyam, East Coast Tamil Nadu, Southern India during August 2012 to June 2015.

DISCUSSION

The present study showed that salt pans are very important site for many migrating shorebirds for their feeding and roosting. This study recorded high number of migrant and resident migrant shorebirds including four 'Near Threatened' species. The high density of birds is observed during the monsoon season because of food availability. As the winter progressed, significantly more shorebirds were observed using the salt panss, with the greatest densities being documented in January, 2013 (Pandiyan *et al*. 2014).

The salt pans of the Mondego estuary provided important food resources for dunlin, Kentish plover and ringed plover, especially in terms of insect larvae (*Chironomus spp.* and Ephydridae). Overall, the macroinvertebrate species found in salt pans were different and smaller than those of the surrounding mudflats (Lopes *et al.,* 1998; Cabral *et al.,* 1999; Pardal 1998; Cardoso *et al.,* 2004; Múrias *et al*., 2005) The presence of marine prey in the droppings collected in salt pans suggests that shorebirds had been feeding in the mudflats and moved to salt pans to complement their foraging activities (Pedro and Ramos, 2009). Due to the alteration of coastal ecosystem the water birds and shorebirds are shifting their feeding grounds to some other habitats such as salt panss (Rehfisch, 1994 and Pandiyan *et al.* 2010).

The salt pans generate a higher availability of chironomid prey, which provide a preferred habitat for shorebirds. The extent to which a high production of chironomid larvae is translated into a good foraging habitat for shorebirds depends largely on appropriate management of water levels (Velasquez, 1992; Rehfisch, 1994). Smaller shorebird species are those that are most limited in the depth range where they can feed, and also those most dependent on alternative, artificial habitats such as salt pans since their low body mass and high metabolic rate requires them to feed practically all day round (Goss-Custard *et al*., 1977b; Fasola and Canova, 1993). The high density of shorebirds determined by highest use this habitat by migrating shorebirds. In our study little stint was the most abundant species then the other species. The study showed that man-made salt pans could represent an alternative feeding and roosting habitat for the wintering and migrating shorebirds.

CONCLUSION

This study concludes that the salt pans could act as viable alternate foraging habitat for the shorebirds. Hence conservation of salt pans is important because many shorebird including near threatened species use salt pans as alternate habitat.

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