

Status of Brahminy Kite *Haliastur indus* (Boddaert 1783) in Rameswaram Island, Tamil Nadu, India

Introduction

Raptors are wide ranging avian species occupying high trophic level, excellent indicators of biodiversity health, and provide critical ecosystem services (Newton 1979; Thiollay 1992; Redpath & Thirgood 1999). The Brahminy Kite *Haliastur indus* (Boddaert 1783) (Aves: Accipitriformes: Accipitridae) occur in India, Nepal, Bhutan, Pakistan, Sri Lanka, China, Taiwan, Thailand, Vietnam, and United Arab Emirates (BirdLife International 2016). The species inhabits coastal areas, mangrove-backed intertidal flats (Wells 1999; Robson 2002), and large inland lakes up to 3,000 m (MacKinnon et al. 2000; Ferguson-Lees & Christie 2001). In India, this species is distributed along tidal creeks, docks, dammed reservoirs, rivers, flooded areas (Ali & Ripley 1987), towns, waste dumps, and close to human habitations for construction of nests (Anoop et al. 2018). Few studies have documented nest site-fidelity (Balachandran & Sakthivel 1994) and sunbathing behaviour of the species (Sanuraj & Cherian 2020). The breeding biology of this raptor species was documented in Thanjavur and Thiruvavur districts of Tamil Nadu (Sivakumar & Jayabalan 2004). Globally, the general population trend of this species is decreasing and is declining in some parts of Java (van Balen et al. 1993). As per the IUCN Red List category, the status of this species is 'Least Concern' (BirdLife International 2016). Raptors have low population density, and are sensitive to anthropogenic threats

and habitat alteration. In Tamil Nadu, only few literatures are available on the quantitative study and other behaviours of this species especially, pertaining to Rameswaram island of Tamil Nadu. The present study is conducted to create baseline information and to assess the present status of this species, number of individuals enumerated, distribution, behaviours and interactions with other bird species in and around Rameswaram Island.

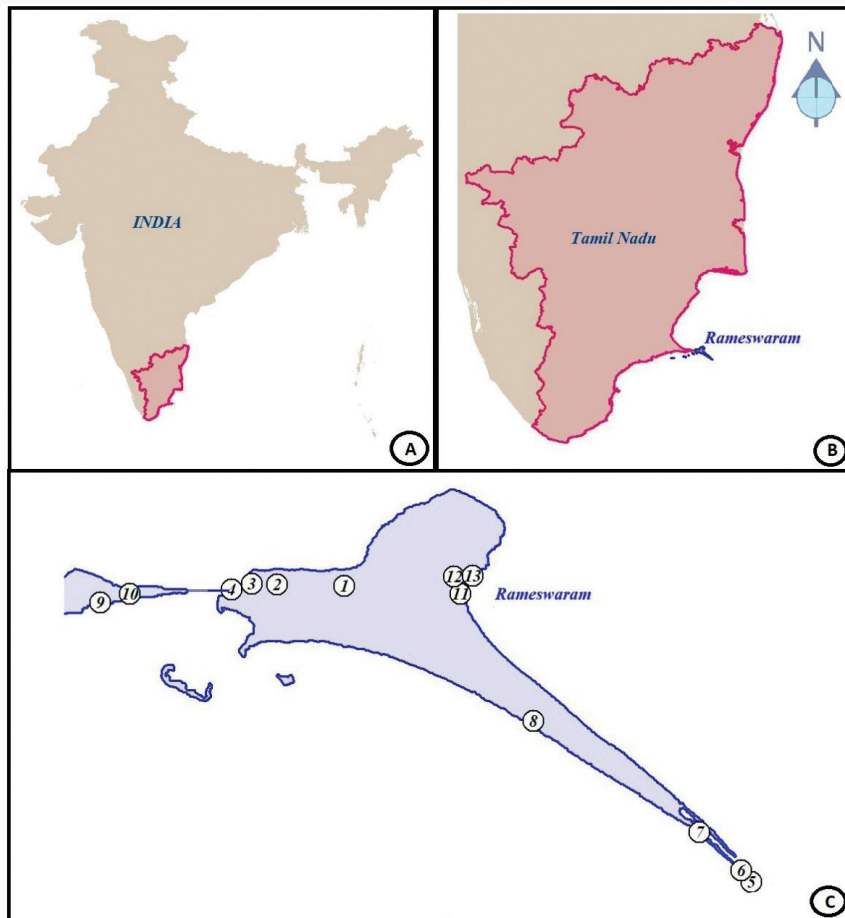
Materials and Methods

Study Area

Rameswaram is the largest island in the state of Tamil Nadu located in Ramanathapuram District, with an area of about 67 km². As per the 2011 census, the human population of the island is 82,675. The island is devoid of traditional crop cultivation. However, tourism, pilgrimage, fishing and palm products are the major sources of income for the people. The average annual rainfall is about 80mm with maximum and minimum annual temperatures of 36°C and 20°C, in the district respectively (www.ramanathapuram.nic.in) (Figure 1).

Methods

With the help of two field assistants, we identified different habitats of Brahminy Kites such as intertidal coasts, fishing harbours, areas of fish processing and transport, human dwellings, garbage dump yards (including dumping of slaughterhouse wastes) located at 13 sites (names listed in



Study area map. (A) India map showing Tamil Nadu, (B) Tamil Nadu indicating Rameswaram Island, and (C) Names of the 13 study sites viz., 1. Thangachimadam, 2. Akkamadam, 3. Pamban Bridge, 4. Pamban Fishing Harbour, 5. Dhanushkodi Road, 6. Dhanushkodi Beach, 7. Dhanushkodi Light House, 8. Kothandaramar Shrine, 9. Mandapam Fishing Harbour, 10. Kovilvadi Fishing Harbour, 11. Rameshwaram Fishing Harbour, 12. Muthusavadi, and 13. Agnitheertham Beach.

Figure 1) in Rameswaram Island and adjacent Pamban areas. At each survey site, individuals were counted by direct count method (Bibby et al. 2000) at 0800 h and repeated at 1600 h in the from 01 January to 25 February, 2021. Census was made during every fortnight and a total of four censuses were made during the study period and the numbers were

arithmetically averaged to get a representative value. In order to avoid repeated counts, census was carried out fortnightly basis and each team had surveyed 6–7 sites in a single day. Birds observed over sky were taken at multiple places in the residential areas. In the remaining days direct visual observations were made through binoculars

on activities such as flying, catching prey, eating fishes in flight, sunbathing, roosting, carrying nest materials, nesting, and interactions with other birds from 0600 to 1800 h. Locations of all the sites were recorded using a standard GPS (Garmin Etxox 20x). Photographs and videography were made using a Nikon P1000 digital camera without disturbing the birds and their nests.

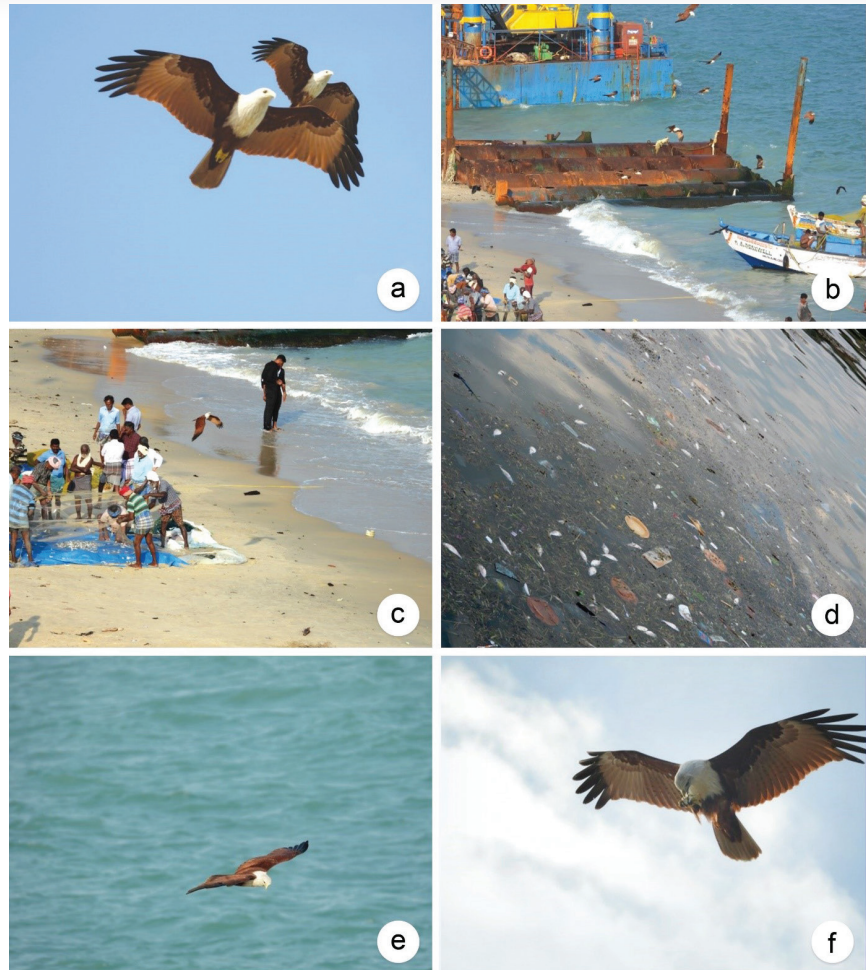
Results and Discussion

The census was conducted fortnightly during the mornings (0800 h) and evenings (1600 h) at 13 locations in the Rameswaram Island and adjacent Pamban fishing harbour during January-February 2021 and the numbers were arithmetically averaged. A total of 217 adults *H. indus* were enumerated, i.e., 239 individuals were counted in the morning and 195 individuals were counted in the evening (average was 217). It indicated that the birds were found more active in the morning and less active in the evening hours. In the fishing harbours the individuals of *H. indus* appeared more in morning as fishing activities of fishermen

including unloading of fish caught and transportation would be more during morning hours. Out of 217 individuals, 12.9% birds ($n=28$) were found flying over residential areas, 67.7% birds ($n=147$) were found preying on spill over fish in the coastal water in and around fishing harbours, 16.1% birds ($n=35$) were found flying above municipal garbage dump yards, 1.4% birds ($n=3$) were found roosting on the beach, and 1.8% individuals ($n=4$) were observed in and around nests.

Prey

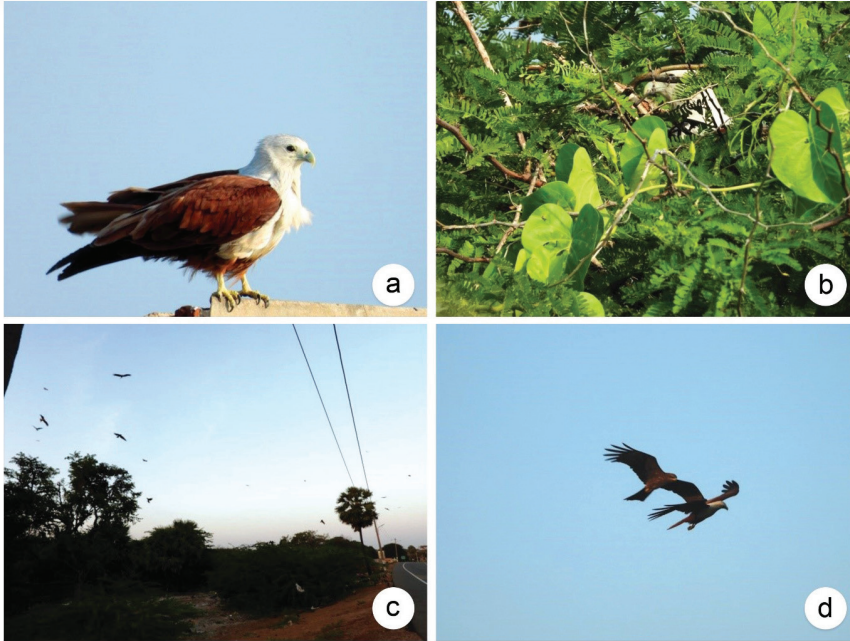
Out of 217 individuals enumerated, 67.7% individuals ($n=147$) were found flying above fishing harbours ($n=4$) and processing areas. A maximum of 160 individuals appeared in the fishing harbours in morning and 134 individuals were found in the evening. Since fishing harbours were more active in the morning, more individuals appeared during the morning hours. In 530 incidents, the *H. indus* individuals came to the sea coast and took spill over fishes from nets and boats, and most of the time they consumed the



Foraging habits of *Haliastur indus*. (a) A pair in flight, (b) Group of *H. indus* individuals flying around boats in fishing harbour, (c) Individual coming close to humans to catch spill over fish from nets, (d) Dead spill over fishes floating in the water, (e) Individual coming close to water surface to lift floating dead fishes, and (f) Ingestion of fish in flight. © M. Pandian.

fish while in flight and no incidents of carrying the prey to nearby trees, docked boats or man-made structures like electricity poles, roof of building, and mobile-phone towers for feeding were noticed during the survey. In 243 incidents, the flying individuals took away small fishes which were spilled over on the ground during the processing and transport of

fish caught. Janra (2017) had observed the behaviour of individuals of *H. indus* eating fish in flight in West Sumatra. Moreover, eating of fish in flight might be to circumvent kleptoparasitism (Kalsi & Kaul 1992). The present observations in Rameswaram area, corroborate the findings of Janra (2017) and Kalsi & Kaul (1992).



Nesting of *Haliastur indus* and interactions with other birds. (a) One of the pair roosting adjacent to nest, (b) Probably incubating eggs, (c) Individuals of *H. indus* flying above garbage dump yard, and (d) Black Kite chasing Brahminy Kite. © M. Pandian.

The study revealed that 16.13% individuals ($n=35$) were found hovering over municipal garbage dump yards where dumping of slaughterhouse wastes was happening generally from 0600 to 1830 h daily. This raptor depends on slaughterhouse wastes for food in urban areas of Java (Newton 1979). The appearance of individuals at municipal garbage dump yards where it was observed to feed on slaughterhouse wastes matches with the observations made by Newton in 1979. The study also revealed that 12.90% individuals ($n=28$) were found flying above residential areas

probably searching for prey. Hence, 96.77% ($n=210$) of enumerated individuals were foraging on fish at fishing harbours, slaughterhouse wastes and searching prey above human habitations. The remaining 2.23% individuals ($n=7$) were found in nest, roosting on wall, and over the beach.

Sunbath

On 10 February 2021, two individuals were found taking sunbath on Dhanushkodi coast and another one was found roosting on an abandoned wall. Sanuraj & Cherian (2020) had stated that incidents of *H. indus* individuals sunbathing were

observed at Kappad beach, Kozhikode District of Kerala which is in confirmation with the present observation of sunbathing.

Nests

Two nests, one hidden amongst dense vegetation of *Prosopis juliflora* at a height of six meters in an uninhabited area near Dhanushkodi light house and the other nest was observed at 11 m height on a *Cocos nucifera* L. (Arecaceae) tree in a residential (Muthusavadi) area. Between 03 and 12 February, 2021, two adults were observed carrying dry sticks and twigs from the shore to the nest under construction on *P. juliflora*. Wells (1999) had stated that muddy and mangrove backed intertidal coasts were the primary habitats for *H. indus*. In the present study also, this species had selected short trees situated on waterlogged intertidal coast for construction of nests. Hence, it corroborates partly with the views of Wells (1999). Balachandran & Sakthivel (1994) had stated that the individuals of *H. indus* exhibited nest-site fidelity and also observed nests on the ground. In the present study, no nest was

Table 1. Details of survey sites, number of *Haliastur indus* counted and their behaviours.

	Study sites and GPS	No. of <i>H. indus</i> counted in morning (0800 h)	No. of <i>H. indus</i> counted in evening (1600 h)	Average no. of <i>H. indus</i>	Flying	Preying	On the ground/wall	In the nests	In/above garbage dump yard
1	Thangachimadam 9.2846° N, 79.2622° E	21	17	19	0	0	0	0	19
2	Akkamadam 9.2854° N, 79.2317° E	12	8	10	10	0	0	0	0
3	Pamban Bridge 9.2840° N, 79.2144° E	20	12	16	0	0	0	0	16
4	Pamban Fishing Harbour 9.2831° N, 79.2109° E	52	40	46	0	46	0	0	0
5	Dhanushkodi Road 9.1502° N, 79.4474° E	3	5	4	4	0	0	0	0
6	Dhanushkodi Beach 9.1555° N, 79.4428° E	4	2	3	0	0	3	0	0
7	Dhanushkodi Light House 9.1728° N, 79.4237° E	2	2	2	0	0	0	2	0
8	Kothandaramar Shrine 9.2234° N, 79.3483° E	4	4	4	4	0	0	0	0
9	Mandapam Fishing Harbour 9.2770° N, 79.1512° E	20	16	18	0	18	0	0	0
10	Kovilvadi Fishing Harbour 9.2811° N, 79.1646° E	37	35	36	0	36	0	0	0
11	Rameshwaram Fishing Harbour 9.2811° N, 79.3150° E	51	43	47	0	47	0	0	0
12	Muthusavadi 9.2862° N, 79.3107° E	2	2	2	0	0	0	2	0
13	Agnitheertham Beach 9.2891° N, 79.3206° E	11	9	10	10	0	0	0	0
	Total	239	195	217	28	147	3	4	35

observed on the ground along the coasts of Rameswaram Island. Continuous monitoring of nests during successive breeding seasons will throw more light on the possibility of nest site-fidelity. The present survey didn't focus on the nesting and breeding activities of this raptor.

Interactions with other birds

Interspecific interactions existed between

H. indus and other birds such as Black Kite *Milvus migrans*, House Crow *Corvus splendens*, Large-billed Crow *Corvus macrorhynchos*, Black Drongo *Dicrurus macrocercus*. Among these interactions, the highest number (n= 84) incidents of *C. splendens* chasing *H. indus*, followed by *C. macrorhynchos* (n= 43) and *D. macrocercus* (n= 14) were observed during the present survey. Overlapping of feeding

among various birds' species create interspecific competitions for sharing of food resources (Pohajdak 1998). Vice-versa kleptoparasitism was observed between *H. indus* and *C. splendens* at dumping sites of slaughterhouse wastes (Bolen & Robson 2002). In the present study also, three incidents of competitions with *M. migrans* and 12 incidents with *C. splendens* over sharing of slaughterhouse wastes were noticed. Incidents of *Dicrurus macrocercus* chasing individuals of *H. indus* were observed above the open ground and residential areas. The availability of abundant fish and slaughterhouse wastes and non-use of pesticides might have been the reasons for the existence of this species in substantial numbers in the island including Pamban fish landing area. The enumeration of 217 individuals in the island and Pamban areas will form a baseline data for future study on the ecology and breeding of this species. A detailed systematic survey on the population status, foraging behaviour and breeding of this species covering the entire State may be useful in drafting an action plan to conserve this species from possible decline in future.

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