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Cover: Common Keeled Skink *Eutropis carinata* in oil pastels, colour pencils, & micron pen adapted from photograph by H. Byju © Pooja Ramdas Patil.



INTRODUCTION

Long-term bird monitoring is essential for understanding climate change, habitat dynamics, and population trends of the concerned taxa (Gregory et al. 2009; Amat & Green 2010). Northern Bengal has extensive forest cover but retains less water as the soil is coarse and alluvial in nature known as Bhabar soil. Despite heavy rainfall and the presence of rivers and rivulets from the Himalaya, large water bodies are scarce (Champion & Seth 2005). The Buxa Tiger Reserve, representing northern Bengal's rich biodiversity, harbours a small waterbody 'Narathali beel' (Bengali: Beel= Lake) in the Alipurduar district. This small waterbody supports diverse flora and fauna, serving as a crucial habitat for winter migrants and resident waterbirds. The present study provides a 10-year record of bird counts for selected species at Narathali.

Study area

Narathali, a small water body located at Buxa Tiger Reserve in the northeastern corner of West Bengal (26.5152°N, 89.7319°E), is surrounded by rivers Dima, Bala, and Sankosh. While Sankosh remains perennial, the other rivers are seasonal and lack consistent water throughout the year. Due to the coarse nature of the soil, the terrain fails to retain water, resulting Narathali as an exceptional waterbody- attracting numerous waterfowl. This perennial water body, covering an approximate length of 1.3 km and a width of 50 m, is encompassed by small patches of grassland and woodland. The entire ecosystem serves as a crucial habitat for both winter migratory waterbirds and land birds. Various authors have presented bird inventories, with the initial study on waterbirds conducted during 1999–2000, describing Narathali as stagnant water. At the culmination of the rainy season, the water body submerges an area of 0.085 km² (Image 1) within its boundaries, highlighting its significance as a dynamic habitat for avian diversity in the region (Sivakumar & Prakash 2004).

METHODS

Throughout the study period from 2009 to 2019, a total of 75 visits were carried out to the Narathali study site during 10 winter seasons, covering the months of November to February. Bird counts were conducted from a designated vantage point, primarily in the morning (n = 69), with only a few counts taking place in the late afternoon (n = 6). The researchers employed telescopes,

binoculars, and photography to observe and document the bird species. Accurate species identification was ensured by referring to field guides, namely Grimmett et al. (2011) and Rasmussen & Anderton (2012).

The study focused on monitoring the waterfowl species present at the site, including six winter visitors (Gadwall *Mareca strepera*, Northern Shoveler *Spatula clypeata*, Northern Pintail *Anas acuta*, Common Teal *Anas crecca*, Red-crested Pochard *Netta rufina*, and Ferruginous Duck *Aythya nyroca*) and four resident species (Little Grebe *Tachybaptus ruficollis*, Lesser Whistling-Duck *Dendrocygna javanica*, Cotton Teal *Nettapus coromandelianus*, and Spot-billed Duck *Anas poecilorhyncha*). These waterfowl counts were diligently maintained throughout the entire study duration. For each winter season, the maximum count of each species was recorded, enabling the construction of graphs illustrating the trends observed over the 10 years.

Furthermore, counts of three resident waterbird species (Eurasian Moorhen *Gallinula chloropus*, Purple Swamphen *Porphyrio poliocephalus*, and Bronze-winged Jacana *Metopidius indicus*) were specifically monitored for five years, covering the period from 2015 to 2019. Although a few additional waterfowl and raptor species were documented, their limited sample sizes precluded their inclusion in the graph format. A comprehensive bird list, with a specific emphasis on waterfowl and raptor species, is provided in Table 1, serving as a valuable reference for future analysis and documentation.

RESULTS

The wintering duck species at Narathali (Figure 1)

Gadwall *Mareca strepera*: Common (Range 12–50, Average 26.9, Median 25, n = 10)

A widespread winter visitor in India, the species was represented by 12 to 50 individuals at the water body. Its trend appears to be constant.

Northern Shoveller *Spatula clypeata*: Fairly Common (Range 2–4, Average 2.8, Median 3, n = 5)

A widespread winter visitor in India, the species was represented by two to four individuals at the water body. Its trend appears to be constant.

Northern Pintail *Anas acuta*: Fairly Common (Range 2–10, Average 5.5, Median 6, n = 6)

A widespread winter visitor in India, the species was represented by two to 10 individuals at the water body. Its trend appears to be constant.

Common Teal *Anas crecca*: Uncommon (Range 7–55, Average 27.5, Median 24, n = 4)

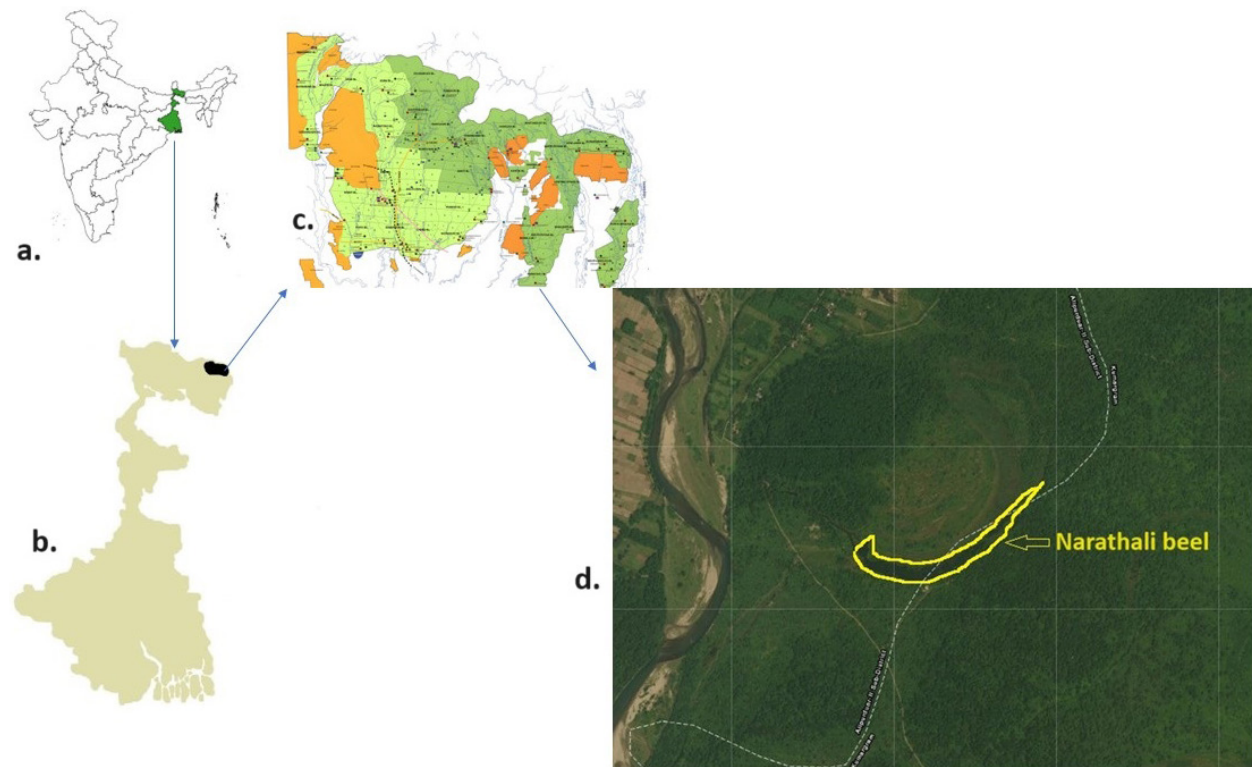


Image 1. Narathali Waterbody, Buxa Tiger Reserve, Alipurduar West Bengal. (a—West Bengal in India | b—Buxa Tiger Reserve in West Bengal | c—Narathali in the Buxa Tiger Reserve | d—The Narathali beel).

A widespread winter visitor in India, the species was represented by seven to 55 individuals at the water body. Its trend appears to be constant.

Red-crested Pochard *Netta rufina*: Uncommon (Range 2–6, Average 3.6, Median 3, $n = 5$)

A widespread winter visitor in India, the species was represented by two to six individuals at the water body. It's interesting to see that this species got attracted to Narathali in the last three years of the observation.

Ferruginous Duck *Aythya nyroca*: Common (Range 14–60, Average 35.2, Median 36, $n = 10$)

A Near-Threatened species (BirdLife International 2019), a widespread winter visitor in India, the species was represented by 14 to 60 individuals and the trend appears to be stable.

The resident duck species and Grebe at Narathali (Figure 2)

Little Grebe *Tachybaptus ruficollis*: Common (Range: 28–37, Average 31.4, Median 29, $n = 5$)

A widespread resident in India, the species was represented by 28 to 37 individuals at the water body. Its trend appears to be constant throughout the observations.

Lesser Whistling-Duck *Dendrocygna javanica*:

Common (Range 46–1000, Average 171.3, Median 74, $n = 10$)

A widespread resident in India, the species was represented by 46 to 1000 individuals at the water body. Its trend appears to be increasing. In 2019, a melanistic individual was noted in the flock (Image 2). During the last season, a population of about 1,000 individuals was noted.

Cotton Teal *Nettapus coromandelianus*: Common (Range 5–33, Average 19, Median 20, $n = 7$)

A widespread resident in India, the species was represented by 5–33 individuals at the water body. Its trend appears to be constant.

Spot-billed Duck *Anas poecilorhyncha*: Common (Range 8–50, Average 28.9, Median 26, $n = 10$)

A widespread resident in India, the species was represented by 8–50 individuals at the water body. Its trend appears to be constant.

Three resident waterfowl species monitored at Narathali (Figure 3)

Bronze-winged Jacana *Metopidius indicus*: Common (Range 15–25, Average 19, Median 17, $n = 5$)

A widespread resident in India, the species was represented by 15–25 individuals at the water body. Its trend appears to be constant.

Table 1. List of birds at Narathali Waterbody in Buxa Tiger Reserve, West Bengal.

	Family	Common name	Scientific name	Abundance	Migrant/Resident status
1	Podicipedidae	Little grebe	<i>Tachybaptus ruficollis</i>	Common	Resident
2	Phalacrocoracidae	Little cormorant	<i>Microcarbo niger</i>	Common	Resident
3	Anhingidae	Darter	<i>Anhinga melanogaster</i>	Uncommon	Resident
4	Ardeidae	Little Egret	<i>Egretta garzetta</i>	Fairly Common	Resident
5	Ardeidae	Grey Heron	<i>Ardea cinerea</i>	Rare	Winter Visitor
6	Ardeidae	Purple Heron	<i>Ardea purpurea</i>	Rare	Resident
7	Ardeidae	Great Egret	<i>Egretta alba</i>	Uncommon	Resident
8	Ardeidae	Intermediate Egret	<i>Egretta intermedia</i>	Uncommon	Resident
9	Ardeidae	Eastern Cattle Egret	<i>Bubulcus coromandus</i>	Common	Resident
10	Ardeidae	Indian Pond-Heron	<i>Ardeola grayii</i>	Common	Resident
11	Ardeidae	Yellow Bittern	<i>Ixobrychus sinensis</i>	Rare	Resident
12	Ardeidae	Chestnut Bittern	<i>Ixobrychus cinnamomeus</i>	Rare	Resident
13	Ciconiidae	Asian Openbill-Stork	<i>Anastomus oscitans</i>	Common	Resident
14	Ciconiidae	Lesser adjutant stork	<i>Leptoptilos javanicus</i>	Fairly Common	Resident
15	Anatidae	Lesser Whistling-Duck	<i>Dendrocygna javanica</i>	Common	Resident
16	Anatidae	Greylag Goose	<i>Anser anser</i>	Irregular	Winter Visitor
17	Anatidae	CottonTeal	<i>Nettapus coromandelianus</i>	Common	Resident
18	Anatidae	Gadwall	<i>Mareca strepera</i>	Common	Winter Visitor
19	Anatidae	Falcated Duck	<i>Mareca falcata</i>	Irregular	Winter Visitor
20	Anatidae	Eurasian Wigeon	<i>Mareca penelope</i>	Uncommon	Winter Visitor
21	Anatidae	Mallard	<i>Anas platyrhynchos</i>	Uncommon	Winter Visitor
22	Anatidae	Indian Spot-billed Duck	<i>Anas poecilorhyncha</i>	Common	Winter Visitor
23	Anatidae	Northern Shoveler	<i>Spatula clypeata</i>	Fairly Common	Winter Visitor
24	Anatidae	Northern Pintail	<i>Anas acuta</i>	Fairly Common	Winter Visitor
25	Anatidae	Common Teal	<i>Anas crecca</i>	Uncommon	Winter Visitor
26	Anatidae	Red-crested Pochard	<i>Natta rufina</i>	Uncommon	Winter Visitor
27	Anatidae	Common Pochard	<i>Aythya ferina</i>	Irregular	Winter Visitor
28	Anatidae	Ferruginous Duck	<i>Aythya nyroca</i>	Common	Winter Visitor
29	Accipitridae	Oriental Honey-Buzzard	<i>Pernis ptilorhynchus</i>	Rare	Resident
30	Accipitridae	Black-winged Kite	<i>Elanus caeruleus</i>	Rare	Resident
31	Accipitridae	Black Kite	<i>Milvus migrans</i>	Common	Resident
32	Accipitridae	Grey-headed Fish-Eagle	<i>Ichthyophaga ichthyaetus</i>	Rare	Resident
33	Accipitridae	Crested Serpent-Eagle	<i>Spilornis cheela</i>	Common	Resident
34	Accipitridae	Shikra	<i>Accipiter badius</i>	Uncommon	Resident
35	Accipitridae	Himalayan Buzzard	<i>Buteo burmanicus</i>	Irregular	Winter Visitor
36	Accipitridae	Black Eagle	<i>Ictinaetus malayensis</i>	Uncommon	Winter Visitor
37	Accipitridae	Greater Spotted Eagle	<i>Clanga clanga</i>	Irregular	Winter Visitor
38	Accipitridae	Steppe Eagle	<i>Aquila nipalensis</i>	Rare	Winter Visitor
39	Pandionidae	Western Osprey	<i>Pandion haliaetus</i>	Common	Winter Visitor
40	Falconidae	Collared Falconet	<i>Microhierax caerulescens</i>	Rare	Resident
41	Falconidae	Common Kestrel	<i>Falco tinnunculus</i>	Rare	Winter Visitor
42	Falconidae	Red-headed Falcon	<i>Falco chicquera</i>	Rare	Resident

	Family	Common name	Scientific name	Abundance	Migrant/Resident status
43	Rallidae	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	Common	Resident
44	Rallidae	Purple Swamphen	<i>Porphyrio poliocephalus</i>	Common	Resident
45	Rallidae	Common Moorhen	<i>Gallinula chloropus</i>	Common	Resident
46	Rallidae	Eurasian Coot	<i>Fulica atra</i>	Common	Resident
47	Jacanidae	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	Rare	Resident
48	Jacanidae	Bronze-winged Jacana	<i>Metopidius indicus</i>	Common	Resident
49	Charadriidae	Red-Wattled Lapwing	<i>Vennalus indicus</i>	Common	Resident
50	Alcedinidae	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	Common	Resident
51	Scolopacidae	Common Greenshank	<i>Tringa nebularia</i>	Common	Winter Visitor
52	Scolopacidae	Green Sandpiper	<i>Tringa ochropus</i>	Common	Winter Visitor
53	Scolopacidae	Wood Sandpiper	<i>Tringa glareola</i>	Common	Winter Visitor

Abundance categories based on sightings in the seasons: Common—8–10 times out of 10 seasons | Fairly common—6–8 times out of 10 seasons | Uncommon—4–5 times out of 10 seasons | Rare—2–3 times out of 10 seasons | Irregular—once in ten seasons.

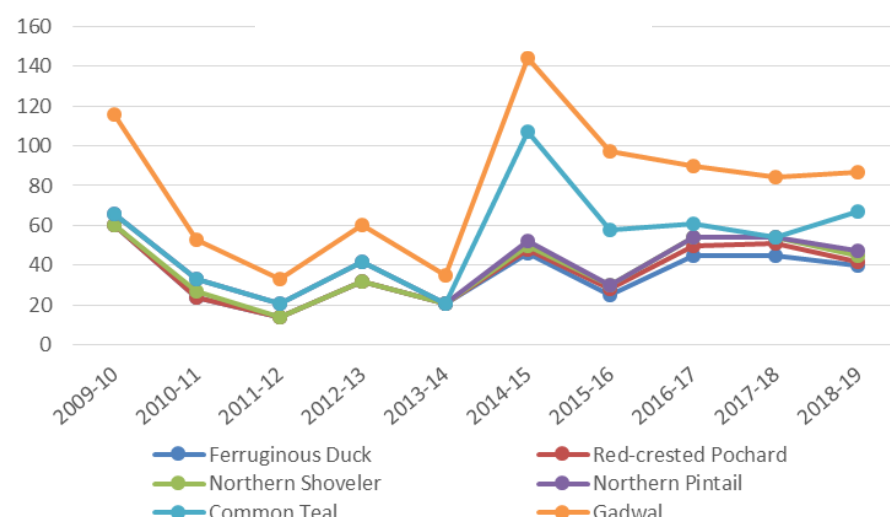


Figure 1. Maximum count of six wintering duck species at Narathali during 2009–2019 (10 seasons).

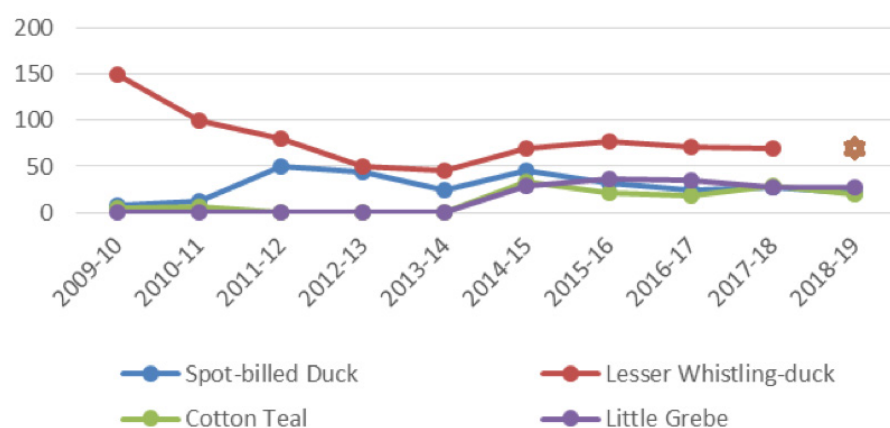


Figure 2. Maximum count of three resident duck species and Little Grebe during the winter season, 2009–2019 at Narathali (10 seasons).

*—About 1000 Lesser Whistling Ducks during 2019–2020

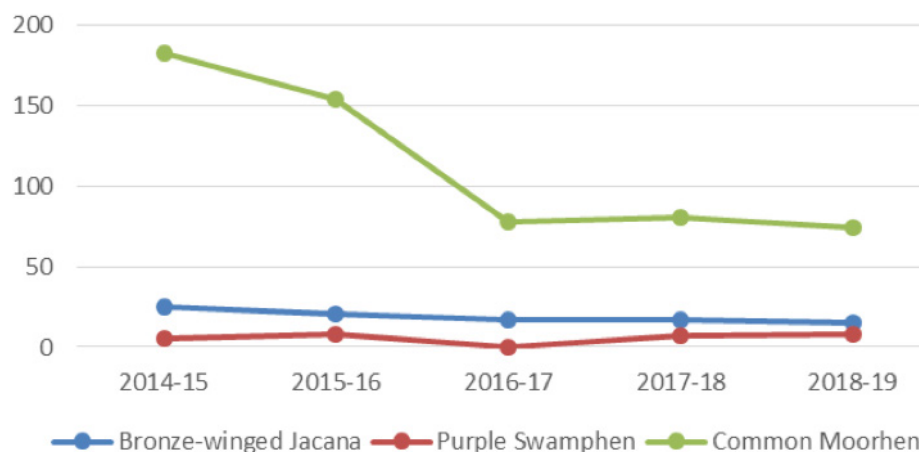


Figure 3. Maximum count of three resident wader species during the winter season, 2015–2019 at Narathali.

Purple Swampphen *Porphyrio poliocephalus*: Common (Range 5–8, Average 7, Median 8, n = 4)

A widespread resident in India, the species was represented by 5–8 individuals at the water body. Its trend appears to be constant.

Common Moorhen *Gallinula chloropus*: Common (Range 40–183, Average 114, Median 81, n = 5)

A widespread resident in India, the species was represented by 40–183 individuals at the water body. Its trend appears to be declining at Narathali.

Other winter visitor duck species observed at Narathali:

Mallard *Anas platyrhynchos* and Eurasian Wigeon *Anas penelope* were sighted only in the years 2016–19. The Falcated Duck *Mareca falcata* (Image 3), Greylag Goose *Anser anser* (2013–14) and Common Pochard *Aythya ferina* (2014–15) were sighted during only one season.

Raptor species

There were nine species of raptors recorded in the area as regular visitors. Two of them were wetland dependent fish-eating eagles while rest seven species were not dependent on wetlands yet were indicators of the biodiversity and quality of the whole protected habitat. The Osprey *Pandion haliaetus* was found during all of the 10 years. The water body supported one or two individuals. The Grey-headed Fish-Eagle *Haliaeetus ichthyaetus* was recorded in the years 2016, 17 and 19. The raptors Oriental Honey-buzzard *Pernis ptilorhynchus*, Shikra *Accipiter badius* and Crested Serpent-Eagle *Spilornis cheela* were also sighted regularly. The Black Kite *Milvus migrans* had a nest on a tree and could be sighted throughout the year for 10 seasons. The Steppe

Eagle *Aquila nipalensis*, Himalayan Buzzard *Buteo burmanicus*, and Black Eagle *Ictinaetus malaiensis* were winter visitors in the area and were not uncommon.

DISCUSSION

The water source, its quality and quantity matter a lot for waterfowl. This specialized avifauna is one of the indicators of the health of the ecosystem as well as pollution (Ormerod & Tyler 1993; Amat & Green 2010; Rajpar & Zakaria 2011; Zhang & Ma 2011; Ogden et al. 2014). Allen et al. (1996) had published a detailed checklist of birds in the Buxa Tiger Reserve. There were 28 species of waterbirds recorded at Narathali during 2000–01 (Sivakumar & Prakash 2004). The current study recorded 53 avian species which is the result of a longer duration of study period. It is interesting to note that during those years, the Ferruginous Duck was noted at Rydak and Dima rivers but not at Narathali. The species has been attracted to the Narathali and has become a regular visitor to the *beel* during 2009–19. The Red-crested Pochard is also a regular visitor since 2017 but was absent during 2009–2016. Sivakumar & Prakash (2004) recorded the Goosander (Common Merganser) *Mergus merganser* in Narathali, but we could not find it in the habitat. We have noted the species in the Rydak River at Bhutan-ghat in the Buxa Tiger Reserve from 2015–2019. The Bhutan-ghat has clear fresh water and icy torrential streams which is the favoured habitat of the species (Ali & Ripley 1983; Rasmussen & Anderton 2012). Out of the six wintering species monitored in this study, Ferruginous Duck is in the Near Threatened category and the global population is on the decline



Image 2. Melanistic Lesser Whistling-Duck *Dendrocygna javanica* at Narathali.

(BirdLife International 2019). The rest five species are in the Least Concern category. While globally, the Northern Shoveler and Northern Pintail populations are on the decline, the trend in the population of Common Teal and Red-crested Pochard is unknown, whereas the Gadwall population is increasing. In the case of the resident waterfowl, the Little Grebe, Lesser Whistling-duck and Spot-billed Duck are also in the Least Concern category but have the global population on the decline, while the trend in the population of Cotton Teal is unknown (BirdLife International 2016). The highest bird count of Lesser Whistling Duck shoot up to about 1,000 individuals during 2019 which could be an abnormally high number, hence it was not considered in the graph (Figure 2). The Population trend in Bronze-winged Jacana and Purple Swampphen is stable at Narathali, both of them listed under the Least Concern category and their global population trend is unknown. The Common Moorhen is also in the Least Concern category and the global population is stable though the local population counts are declining. One may conclude that most of these waterbirds are common birds yet showing various degrees of decline (BirdLife International 2016, 2021). In the case of Mallard, Eurasian Wigeon, Falcated Duck, and Greylag Goose, the species were known as rare species in northern Bengal (Allen et al 1996; Rahmani & Islam 2008).

The raptors at Narathali were fairly constant, although low in number. The Osprey appeared during all 10 seasons indicating sufficient food supply for a couple of individuals in the form of fish fauna. The Grey-headed Fish-Eagle has done a comeback in recent years. Earlier, it was recorded as a fairly common species (Allen et al. 1996). While the global population trend for the Osprey is increasing, the Grey-headed Fish Eagle is on the decline whereas the Oriental Honey Buzzard, Shikra, and Crested Serpent Eagle have stable populations (BirdLife



Image 3. Falcated Duck *Mareca falcata* at Narathali, during January 2014.

International 2021).

The observation and records of waterbirds have been carried out for 10 winter seasons (November–February) from 2009 to 2019 for the first time in this region. The trends in the population are fairly stable. One of the reasons the species are attracted to this water body could be the poor condition of water bodies in human habitation. The Rasik beel –a waterbody in the Cooch Behar district is located about 30 km from Narathali. It is an interesting example of attracting migratory waterbirds by scientific management of the waterbody and the waterfowl numbers varying accordingly. The waterbody supported Sarus Crane (*Antigone antigone*) till 1990 (Das et al. 2013). In the first-ever systematic bird survey, 138 species of birds were recorded out of which 88 were water dependent bird species. This survey was carried out by Himalayan Nature and Adventure Foundation (HNAF 2001). Out of 165 bird species, 67 water-dependent bird species were recorded by Das et al. (2011). The overall number of bird species in the checklist increased, but the number of water bird species declined which is a cause of concern. There is a possibility of the swing of bird populations from Rasik beel to Narathali or similar locations in protected areas, and a future extensive study on the effects of urbanization around Buxa Tiger Reserve is necessary (Wang et al 2021). In the case of Narathali, the Forest department maintains the water body by removing the Water Hyacinth *Eichhornia crassipes* that would clog it. Removal of the clogging vegetation before the winter seems to attract the population of migratory waterbirds. We believe the slight peak in the bird count of all wintering ducks was due to the timely removal of the Water Hyacinth in the year 2014-15 (Figure 1). This ten-year study emphasizes importance of wetlands in protected areas for migratory and resident waterbirds.

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