



**CREL Knowledge and Impact Series – Report 2**

# **Waterbird Trends and Impacts of Conservation and Co-management in Four Wetlands**



Paul Thompson, Enam Ul Haque, Sayam Chowdhury, and Samiul Mohsanin

**Climate-Resilient Ecosystems and Livelihoods (CREL)  
in association with Bangladesh bird club**

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## Dhaka July 2018

Cover photo: Spoon-billed Sandpipers, Sonadia Island ECA, February 2016 (Sayam Chowdhury)  
Inner photo: Survey team, Nijhum Dwip, 2018 (Samiul Mohsanin)

### Climate-Resilient Ecosystems and Livelihoods (CREL) project

House 13/B Road 54, Gulshan  
Dhaka 1212, Bangladesh

### Winrock International

2101 Riverfront Drive  
Little Rock, AR 72202-1748, USA



### Bangladesh bird club

House 11, Road 4, Banani DOHS  
Dhaka 1206, Bangladesh



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## Executive Summary

In four co-managed wetlands, known to be internationally important for biodiversity, waterbirds have been monitored as an indicator of ecosystem health and the impacts of co-management and conservation initiatives. Two of these sites – Baikka Beel within Hail Haor and Hakaluki Haor – are freshwater wetlands in northeast Bangladesh; and two sites – Nijhum Dwip and Sonadia Island – are coastal islands in south and southeast Bangladesh. A time-series of data has been collected largely by volunteers during midwinter waterbird counts conducted as part of the international Asian Waterbird Census. This has been complemented by additional surveys and studies including counts in other months, studies of other wetland dependent birds, and ringing studies, all under different initiatives and funding, all coordinated by Bangladesh bird club. Only part of the data presented in this report was sponsored by CREL.

Within the 13,000 ha of **Hail Haor**, a permanent sanctuary covering about 170 ha was set aside by Ministry of Land in 2003. This sanctuary known as **Baikka Beel** is managed and protected by a community based organization – Barangangina Resource Management Organization – under the oversight and support of local government. Conservation interventions supported by USAID include protection from all extractive use, localized dredging in the early years, and swamp forest restoration, and these were complemented from 2006 onwards by development of visitor infrastructure. Waterbird counts since 2003 show a dramatic increase from a baseline of under 1000 bird of under 20 species to 10,000 to 12,000 birds of around 40 species in recent mid-winter counts, and in total 77 waterbird species have been recorded in the sanctuary. Numbers fluctuate for different species, but 23 species showed patterns consistent with positive impacts from community based conservation. Although the main habitat restoration works took place during 2005-7, many species increased during this period, and 11 species increased during the ten years after those interventions. Multiple waterbird counts made in most winters reveal that in some winters over 15,000 waterbirds use the sanctuary, and 1,000-2,500 waterbirds regularly use sympathetically managed aquaculture areas near the sanctuary. Small numbers of nine globally threatened and eight near-threatened species occur in the sanctuary, most notably up to 13 wintering Pallas’s Fish Eagle (globally endangered). A nest box program for Cotton Pygmy-goose has proven successful as a solution to the lack of old trees and natural crevices, and numbers wintering in the sanctuary have increased. Bird ringing in restored swamp forest and thicket areas along one side of the sanctuary has revealed the importance of this habitat for wintering passerines dependent on this habitat, and which are otherwise rarely seen, adding four new species for Bangladesh. Swamp thicket, emergent wetland plants, open water and mud are the four wetland habitats preferred by the highest numbers of species emphasizing the need to maintain an ecologically diverse wetland sanctuary. Large parts of Hail Haor have been converted to aquaculture during this period, and increasing intensification of human use of the rest of the haor emphasizes the importance of continued protection of this sanctuary and the achievements of the community organization.

**Hakaluki Haor** is a large complex wetland system comprising over 200 waterbodies. Designated an Ecologically Critical Area (ECA), from the mid-2000s a set of Village Conservation Groups (VCG) have undertaken conservation measures, mainly protecting over 1,300 ha where swamp trees have been planted under different projects and attempting to reduce illegal hunting of ducks. Since 2010-11 12 beels have been designated as sanctuaries, and some of these are managed by the VCGs. Mid-winter waterbird counts covering most of the important beels (up to 40 in a year) were made each year from 2006 to 2018 except for 2012 and 2013. In all years over 20,000 waterbirds were counted, with a peak of 114,000 in 2008. Numbers declined after 2008, but appear to have partly recovered in 2016 to 2018. Comparing 2014-18 (period with sanctuaries and stronger VCG initiatives) with 2006-11, there is no clear trend among most of the 81 waterbird species recorded, but six species showed statistically significant increases (mainly shorebirds and also Little Cormorant), while one species (Ruddy Shelduck) declined significantly. The haor is notable for historically being the most important wintering site worldwide for the critically endangered Baer’s Pochard (1,000 were counted here in 1993), numbers have declined to an average of 4-5 a year, mainly due to threats in its nesting grounds in China and Russia, but possibly also affected by the regular practice of using poisoned grain to hunt

ducks in this site. The site is important internationally for a further 19 waterbird species – three threatened species, ten near-threatened species, and six species that regularly exceed 1% of the flyway population, among these Ferruginous Duck is probably the most notable with up to 4,500 of this near-threatened duck counted. The beels used by waterbirds vary greatly between years due to factors such as fishing pressure and dewatering. During 2014-2018 waterbirds were counted in ten sanctuaries (five protected by VCGs receiving CREL support). Although waterbirds increased during 2014-17 in the sanctuaries (combining all ten), this was in line with the wider trend in the haor as a whole. The sanctuaries mostly hold small numbers of waterbirds (averaging 200-500 per beel). Maintaining a network of sanctuaries within this large haor wetland, adding at least one larger sanctuary in a beel preferred by waterbirds, preventing poisoning of waterbirds, and setting and enforcing conservation conditions on waterbody leaseholders are priorities that require stronger initiative from co-management partners and government agencies.

**Sonadia Island** ECA includes mudflats, salt pans, sand dunes, and farmland. It has five VCGs but no formal sanctuary areas, and weak coordination between VCGs and government agencies. Shorebirds (but not other waterbirds) have been counted in multiple months each year since 2009-10 winter, generating mid-winter counts and a winter maximum for each species. Initiatives from 2011 onwards involved agreements to end hunting and support to change occupations of former shorebird trappers, and guarding of high tide roosts. From 2010-11 onwards shorebird numbers show a strong upward trend, mostly for smaller species. Up to 9,500 shorebirds have been recorded in a winter involving 30 species, and in total 46 waterbird species have been recorded. The Kaldia area was found to be the most important site within the ECA for shorebirds. Sonadia is the regular wintering area of 22-23 Spoon-billed Sandpipers, 5% of the global population of this critically endangered shorebird. Despite global threats and declines the wintering population of Sonadia appears stable, and individuals have been tracked returning annually after nesting in Chukotka in far north-east Russia (based on leg-flags). Sonadia also regularly hosts over 1% of the global population of Spotted Greenshank (globally Endangered) and Great Knot (globally Endangered), and is used by five near-threatened waterbirds. VCGs have successfully worked with NGOs to end shorebird hunting, but vital shorebird feeding and roosting habitat is threatened by Forest Department initiatives to plant mangroves and casuarina (jhaui) respectively. Recommendations for improved conservation and management include: removing saplings from high tide roost sites, ending mangrove afforestation, and banning sand extraction.

**Nijhum Dwip** was declared a National Park in 2001 and comprises of planted mangroves, fishing villages, estuarine waters, and extensive intertidal mudflats mostly on Domar Char (where waterbirds are concentrated). Co-management was introduced following the Forest Department model in 2014. Waterbirds were counted in mid-winter in 2006 and each year 2008 to 2018 (counts by species in the 1990s and early 2000s were not available for analysis). Mid-winter waterbird totals fluctuate between just under 5,000 and 17,000, and there is no clear trend. However, surveys in four years in March indicate that waterbird numbers peak at this site in spring migration when they regularly exceed 20,000 birds (one criteria for a wetland of international importance), with a record count of 28,000 waterbirds of 50 species in March 2015. Although numbers fluctuate, in most years one or more large flocks of Indian Skimmer (globally Vulnerable) are present and up to 43% of the world population of this species winter at this site. Numbers of a further five species of waterbird also regularly exceed 1% of the flyway population. Small numbers of three other threatened shorebird occur: Spoon-billed Sandpiper, Spotted Greenshank and Great Knot. Ten species of near-threatened waterbird have been recorded, including Indian River Tern which nests on Domar Char, large flocks of Black-tailed Godwit, and this is the main site in Bangladesh for Asian Dowitcher with up to 42 recorded. Co-management is relatively recent in this site and has yet to bring any improvement in waterbird conservation or status. Threats that remain to be addressed include disturbance of roosts and feeding areas by cattle and fishers, and conversion of mudflats to mangroves and agriculture, pollution, and unregulated tourism. Practical actions that the co-management stakeholders are recommended to adopt include: stopping conversion of shorebird foraging and roosting sites – mudflats - to mangrove plantations or allocation for agriculture, protect key sites for waterbirds as strict no-entry sanctuaries, and strengthen awareness raising activities.

All four of these sites are internationally important bird and biodiversity areas, and meet the criteria for designation as Ramsar sites (information sheets in support of this have been prepared by CREL for Hakaluki Haor and Nijhum Dwip, and an information sheet in support of Hail Haor was prepared by MACH). Community based conservation is clearly shown to be successful in Baikka Beel, and has had some success in Sonadia Island. Wetland sanctuaries protected by communities may have some positive impacts in Hakaluki Haor, but do not include the most ecologically important of the many beels within that haor. However, co-management, coordination and regulation of land uses and practices harmful to waterbirds and wetland ecology remain weak in the larger wetland landscapes (including public waterbodies and lands) of all four sites as evidenced by continued threats. There is great scope for local co-management bodies and their constituent stakeholders from communities and government to improve conservation in all four wetland systems. To track impacts of management and the populations of waterbirds, it is vital that annual mid-winter censuses and other related surveys continue, and that the results are shared with the co-managers.

## Acknowledgements

### *Hail Haor*

Waterbird surveys were conducted at Baikka Beel since 2002, largely by Paul M. Thompson (PMT) with logistical and other support from MACH and CREL projects, and particular thanks to the site staff of CNRS and Md. Maizharul Islam. Surveys in some years/visits were by personal initiative. Assistance with counts in different years was provided by: Enam Ul Haque, William Collis, Nick Dymond, Israt Jahan, and Tania Khan. In addition nest boxes for Cotton Pygmy-geese were installed by Barangina Resource Management Organization and CNRS with MACH and PMT support. Bird ringing was undertaken by many members of the Bangladesh bird club with support from the Wetland Trust and as a special study by Israt Jahan with support from Bangladesh bird club. The members of Barangina RMO, and sanctuary guards and guides, especially the late Mirash Mia, helped greatly in undertaking surveys and of course in protecting the sanctuary.

### *Hakaluki Haor*

Waterbird surveys have been conducted across Hakaluki Haor since 2006 by Bangladesh bird club. In 2006 the first organized waterbird survey was conducted jointly by the Department of Environment (DoE) and Bangladesh bird club and was coordinated by Enam Ul Haque. The survey was conducted each February up to 2010 with support from the Coastal and Wetland Biodiversity Management Project. USAID's IPAC project supported the survey in 2011 and from 2014 to 2018 CREL project supported the survey. Waterbird counts were undertaken by or with the assistance of: Bashir Ahmed, Bill Jones, Bisharga Das, Enam Ul Haque, Farhad Ahsan Pavel, Fatema Tuz Zohra Mila, Md. Foyosal, Gazi Monsur Aziz, Golam Monowar Kamal, Golam Shafiq, Hassan Al-Razi Chayan, Humayra Mahmud, Israt Jahan, Majeda Haq, Mohammad Taher, Nusrat Zahan, Obaidul Haque, Omar Shahadat, Onu Tareq, Parveen Akhter, Paul M Thompson, Quazi Ahmed Hussain, Rajib Barua, Rajib Rashedul Kabir, Rezvin Akhtar Lipi, Saifuddin Saif, Sakhawat Hossain, Samia Saif, Samiul Mohsanin, Saniar Rahman Rahul, Sayam U. Chowdhury, Shafiqur Rahman, Shahad Ferdous, Shibli Sadik, Shimanto Dipu, SI Sohel, Sourav Mahmood, Stephen Samworth, Tania Khan, Ton Eggenhuizen, Md. Zahangir Alom, and Zenifer Azmiri. Particular thanks go to the site staff of CNRS, Department of Environment and local guides from the Village Conservation Groups.

### *Sonadia*

Shorebird surveys were conducted at Sonadia Island since 2009 coordinated by Sayam U. Chowdhury (SUC) with support from The Explores Club in 2009-2010, Oriental Bird Club in 2010, Spoon-billed Sandpiper Task Force and Royal Society for the Protection of Birds (RSPB) in 2011, RSPB in 2012, Save Our Species via Wildfowl and Wetland Trust in 2013, RSPB and CREL in 2014-2016, RSPB and International Conservation Fund of Canada (ICFC) in 2016-2017, and ICFC in 2017-18. Waterbird counts were undertaken by or with the assistance of: Md. Foyosal, Nazim Uddin Khan Prince, Omar Shahadat, Shafiqur Rahman Suvro, Enam Ul Haque, Sourov Mahmood, Shimanto Dipu,

Abida Rahman, Rabiul Rabi, Yann Muzika, Simon Carter, Rob Sheldon, John Sharpe and Onu Tareq. In addition staff of CREL, particularly Samiul Mohsanin and Safiqur Rahman, provided assistance.

### *Nijhum Dwip*

Waterbird surveys were conducted at Nijhum Dwip since 2006, mainly in January each year during Asian Waterbird Census by the Bangladesh bird club coordinated by Enam Ul Haque. Since 2012, Samiul Mohsanin started to count waterbirds covering winter months mainly January-March with support from Oriental Bird Club (2012-2013), Asian Waterbird Conservation Fund (2014), Bangladesh Forest Department's SRCWP project (2014-2016), and CREL (2018). Waterbird counts were undertaken by or with the assistance of: Allama Shibli Sadik, Bill Jones, Enam Ul Haque, Fatema-tu-zohora Lonnie Bregman, Mila, Humayra Mahmud, Israt Jebin Jahan, M. A. Mohit, Mohammad Foysal, M. Monirul H. Khan, Md. Zahangir Alom, Munir Ahmed Khan, Omar Shahadat, Onu Tareq, Partha Biswas, Philip D. Round, Reinier de vries, Ronald Halder, Samiul Mohsanin, Samir Saha, Saniar Rahul, Sayam U. Chowdhury, Simon Carter, Shuvo Saha, Shimanto Dipu, Stephen Samworth, Ton Eggenhuizen, S.I. Sohel, Taijul Islam, S.M.A. Rashid, Wouter van der Ham, Zenifer Azmiri.

## Abbreviations & Acronyms

AWC	Asian Waterbird Census
Bbc	Bangladesh bird club
BSCP	Bangladesh Spoon-billed Sandpiper Conservation Project
CR	Critically endangered (global IUCN /BirdLife threat status)
CREL	Climate Resilient Ecosystems and Livelihoods project
CWBMP	Coastal and Wetland Biodiversity Management Project
ECA	Ecologically Critical Area
EN	Endangered (global IUCN /BirdLife threat status)
EUH	Enam Ul Haque
IBA	Important Bird and Biodiversity Area
IPAC	Integrated Protected Areas Co-management project
IUCN	International Union for the Conservation of Nature
MACH	Management of Aquatic ecosystems through Community Husbandry project
NP	National Park
NT	Near-threatened (global IUCN /BirdLife status)
PMT	Paul M Thompson
RMO	Resource Management Organization
SM	Samiul Mohsanin
SUC	Sayam U. Chowdhury
VCG	village conservation group
VU	Vulnerable (global IUCN /BirdLife threat status)

# CHAPTER 1 INTRODUCTION AND SITES

## 1.1 Context

USAID's Climate Resilient Ecosystems and Livelihoods (CREL) project envisages promoting collaborative management of natural resources in 31 conservation sites notable for their biodiverse ecosystems, including forest protected areas, wetlands and ecologically critical areas in Bangladesh. In this connection a project aim was to monitor biophysical and biodiversity changes in these areas. Bangladesh lies at the junction of the Central Asia and East Asia/Australasian flyways, and offers key wintering and staging grounds for numerous migratory waterbirds, many of which are of international conservation concern.

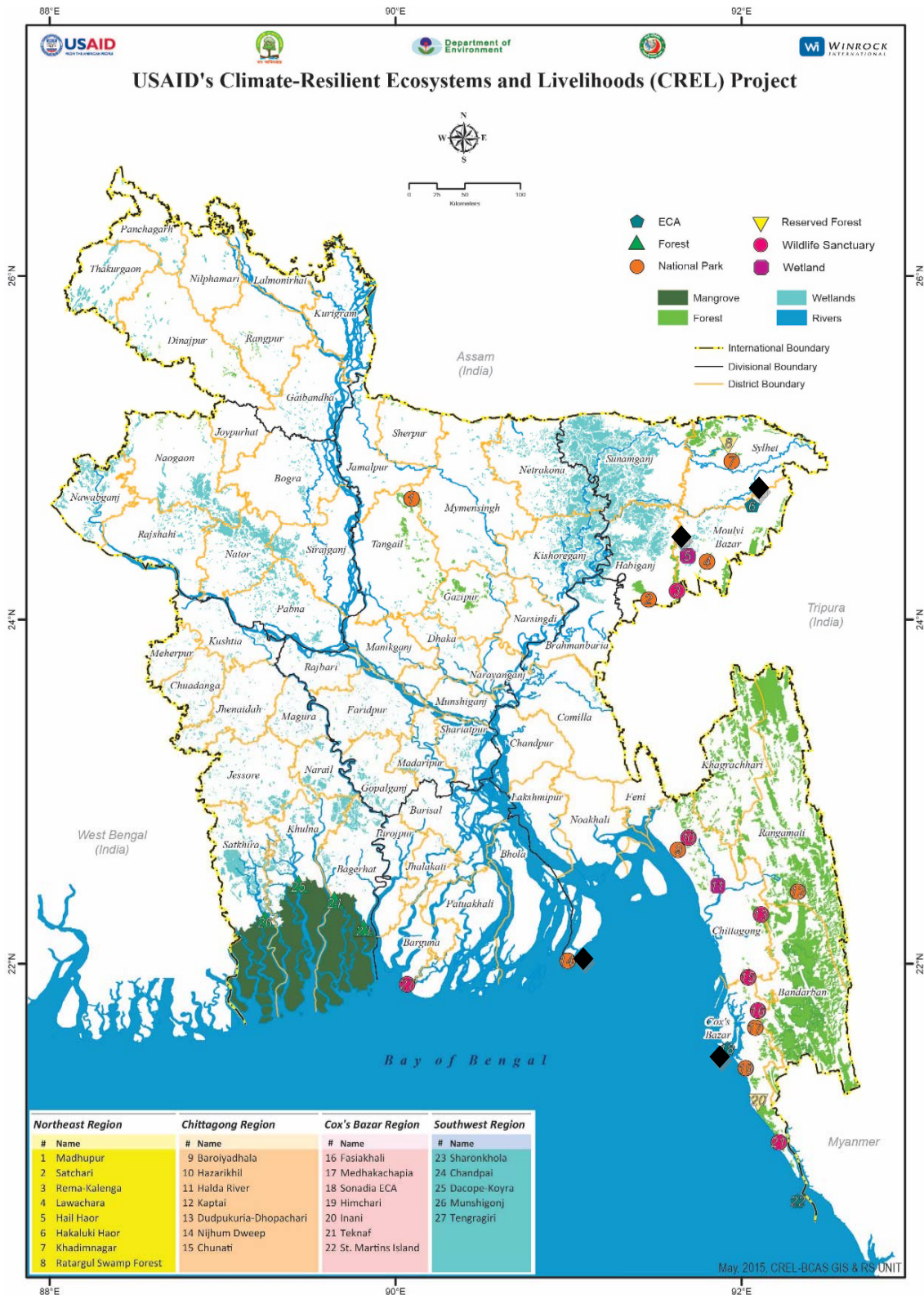
Out of these sites, ten can be considered wetland sites in a broad sense: Hail Haor and Hakaluki Haor are two large freshwater wetlands in northeast Bangladesh; four ranges and co-management committee areas of the Sundarbans cover extensive natural mangrove forest and associated waterways; Tengragiri Wildlife Sanctuary comprises mostly planted mangroves and tidal creeks; Nijhum Dwip National Park (NP) comprises similar planted mangroves but also large intertidal mudflats and recently emerged islands; Sonadia Ecologically Critical Area (ECA) comprises of mixed coastal habitats including mangroves, sand dunes, and extensive intertidal mudflats; and St. Martin's Island ECA includes steep foreshores, shallow seas and coral block formations (see Fig. 1.1 for locations). Out of these sites four are well known for hosting internationally and nationally important numbers of migratory waterbirds and are considered to be important bird and biodiversity areas (BirdLife International 2017) – Hail Haor, Hakaluki Haor, Sonadia ECA, and Nijhum Dwip NP. Moreover all four are considered to meet several criteria for recognition as internationally important wetlands, although they have not yet been designated as such, and for these reasons these four sites have been the subject of regular waterbird surveys. For all four sites data was already available on waterbird counts from previous years before CREL started (in 2012/13). Also the numbers and diversity of wintering waterbirds were considered to be a good practical indicator of the biophysical condition of these wetlands, being visible, relatively easily surveyed, and associated with the status of the ecosystem as a whole including a wide range of species (fish, invertebrates, plants and others) along food chains supporting waterbirds.

## 1.2 Objectives

The major objectives of conducting bird surveys in CREL wetland sites, and in particular annual mid-winter censuses, were to:

1. develop a biophysical baseline for each wetland;
2. develop and continue a time series of data on waterbird populations to determine trends in species and overall numbers;  
analyze past and current waterbird populations;
3. provide rigorous data in support of proposals for designation of wetlands as wetlands of international importance (Ramsar sites)
4. understand the health of wetlands and the impact of conservation efforts using birds as indicators;
5. provide information for community and co-management bodies that could be used to improve their conservation efforts;
6. build up capacity of surveyors (primarily Bangladesh bird club members) in waterbird identification and census methods; and
7. create awareness among the local people on the importance for waterbird conservation.





**Fig. 1.1** Bangladesh showing CREL working areas and the wetlands covered by waterbird monitoring (black diamond adjacent to sites surveyed)

### 1.3 Survey sites

This section provides a short profile of each of the four wetlands covered in this study.

### 1.3.1 Hail Haor

Hail Haor is a large wetland in Moulvibazar district, northeast Bangladesh, extending over 12,000 ha in the monsoon season, holding over 3,000 ha of water in the dry season, and providing livelihoods to around 160,000 people. Community-based co-management has successfully restored these uses and values through a series of projects supported by USAID starting with Management of Aquatic ecosystems through Community Husbandry (MACH) during 1999 to 2007, and continuing through Integrated Protected Areas Co-management (IPAC) project and CREL. Unlike the other wetlands monitored, in Hail Haor surveys concentrated on just part of this large wetland – the areas managed and influenced by Baragangina Resource Management Organization (RMO) on the east side of the haor specifically Baikka Beel permanent sanctuary, and also fish ponds and floodplain fields and wetlands north of this sanctuary. Fig 1.2 shows the haor and location of Baikka Beel sanctuary.

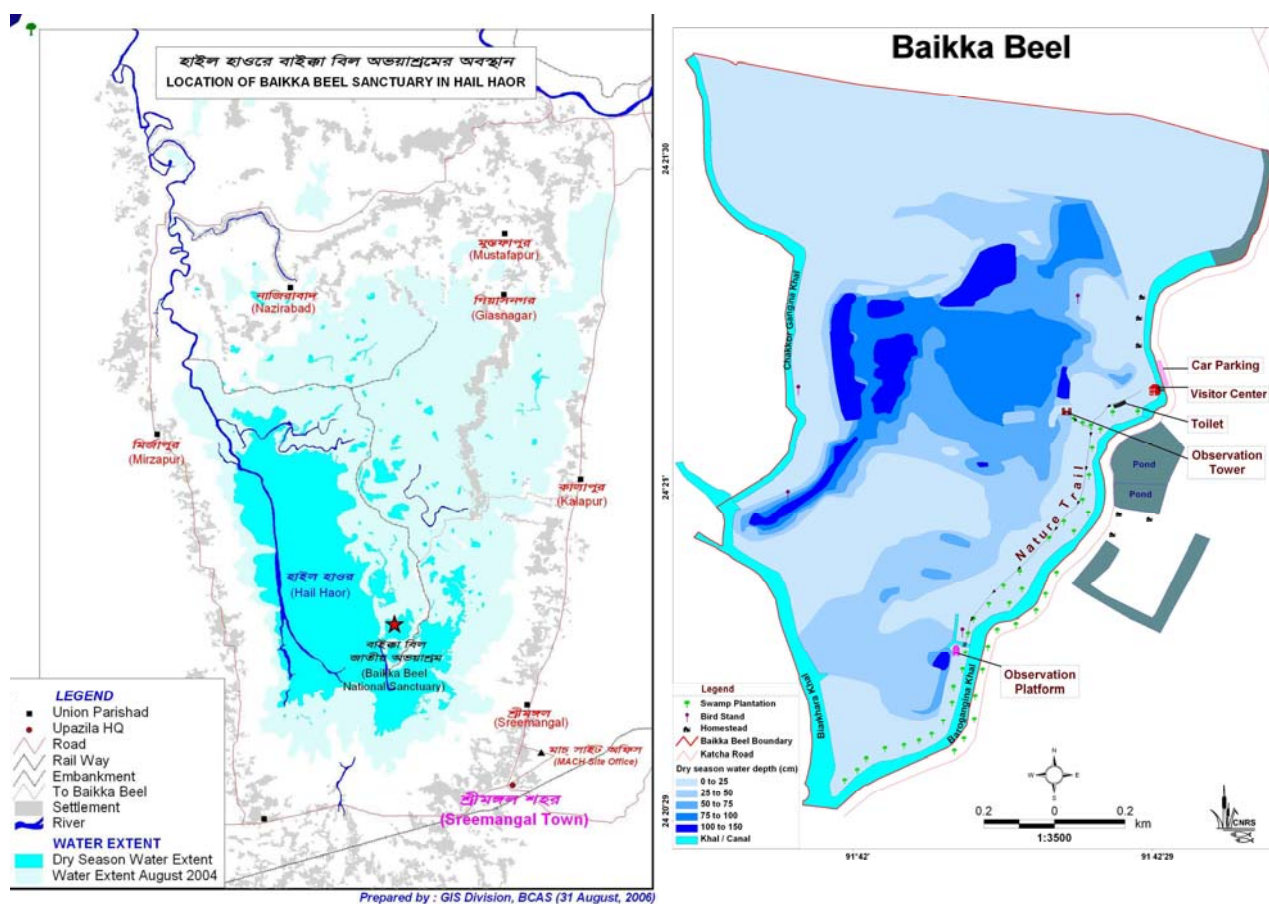


Fig. 1.2 Hail Haor and Baikka Beel

With facilitation by MACH, consultations were held to identify part of this heavily used and degraded wetland that could be suitable for a permanent sanctuary area. After local people agreed on the most suitable area, support from each tier of government from union parishad upwards was gradually obtained, resulting in the Ministry of Land setting aside "Baikka Beel" as a permanent sanctuary in July 2003 (officially Chapra-Magura and Jadura fisheries or waterbodies covering 122.38 acres). In practice a consolidated area of about 170 ha has been protected as the sanctuary including areas of khas (public) land, and khals adjoining the waterbodies by the community organization - Baragangina RMO. Conservation measures in this sanctuary protect fish stocks for the whole haor. Baikka Beel is the key dry season refuge for fish, although each of the other RMOs also managed smaller sanctuaries (but these were lost since 2012 due to non-renewal of their rights). Baikka Beel sanctuary has restored diverse wildlife and the wetland landscape and ecosystem.

From 2004 onwards the RMO quickly stopped fishing and hunting in the sanctuary, with support from local government, and employed local guards, initially with grants and since 2007 with a regular allocation of funds as a grant from an endowment fund established by USAID and Government of Bangladesh. From 2003 to 2006 major habitat restoration was funded. Local contractors innovated small scale dredgers to deepen just over 3 ha of silted up beel. In most years since modest areas have been re-excavated by hand. Here submerged concrete hexapods and pipes were placed to shelter fish, as a deterrent to fishing and to provide surfaces for periphyton (natural fish food) growth. Over 11,000 koroch (*Millettia pinnata*, syn. *Pongamia pinnata*) and hijal (*Barringtonia acutangula*) swamp trees were planted by the RMO during MACH, with further smaller planting using endowment fund resources and support from Chevron and CREL. These have developed into a swamp woodland strip along the east site of the sanctuary flanked. This is flanked by bushy swamp thicket dominated by dhol kolmi *Ipomoea fistulosa*. This has restored an important habitat for small migratory birds and other fauna.

### 1.3.2 Hakaluki Haor

Hakaluki Haor is one of the largest wetlands of Bangladesh covering 181 km<sup>2</sup>, and is situated in the northeast of Bangladesh, close to the Assam-Bangladesh border. Designated as an Ecologically Critical Area (ECA) by Government of Bangladesh in 1999, Hakaluki Haor falls under Maulvibazar and Sylhet districts and contains parts of five upazilas or sub-districts (Barlekha, Kulaura, Fenchuganj, Golapganj and Juri). This is a complex wetland ecosystem, containing more than 238 interconnected beels (permanent water bodies), public waterbodies in the haor are reported to cover 4,635 ha, and it connects to the Kushiara River.

Since the early 2000s a number of projects working with Department of Environment have established and supported 28 village conservation groups (VCG) in the main villages using the haor, and have then worked with these community organizations to promote wise use of resources and conservation of wildlife. In addition to encouraging people to stop hunting birds and other wildlife, to protect nesting colonies of egrets, and to diversify their livelihoods, the emphasis has been on waterbody sanctuaries and swamp forest restoration.

In 2010 and 2011 a total of 12 waterbodies/beels within the haor were declared as permanent sanctuaries and taken out of competitive leasing of fishing rights by Ministry of Land, ten of these beels are ultimately being protected as sanctuaries. Since then a series of actions have been taken to protect these areas from fishing and other uses, and to retain more water in them through excavation and raising submersible bunds. VCGs have taken responsibility for protecting these areas, and USAID supported projects (IPAC and CREL) as well as other Department of Environment projects supported by UNDP and Netherlands, have provided grants to VCGs to conserve these sanctuaries including signage, brushpiles, and guards.

Also many of the VCGs have been involved in planting and protecting with external support from the same sources native swamp forest trees to restore a habitat that had been almost lost. This has involved planting hundreds of thousands of saplings of Hijal and Koroch, and also preventing human and livestock entry into planted areas and other areas where existing rootstock and seeds have regenerated. Now there are extensive areas of swamp thicket vegetation regenerating covering in total about 1,310 ha. Many of these areas are adjacent to the sanctuary waterbodies, creating several substantial wetland sanctuary areas in the wider sense of a set of wetland micro-habitats. Fig 1.3 shows the haor and the locations of sanctuaries.

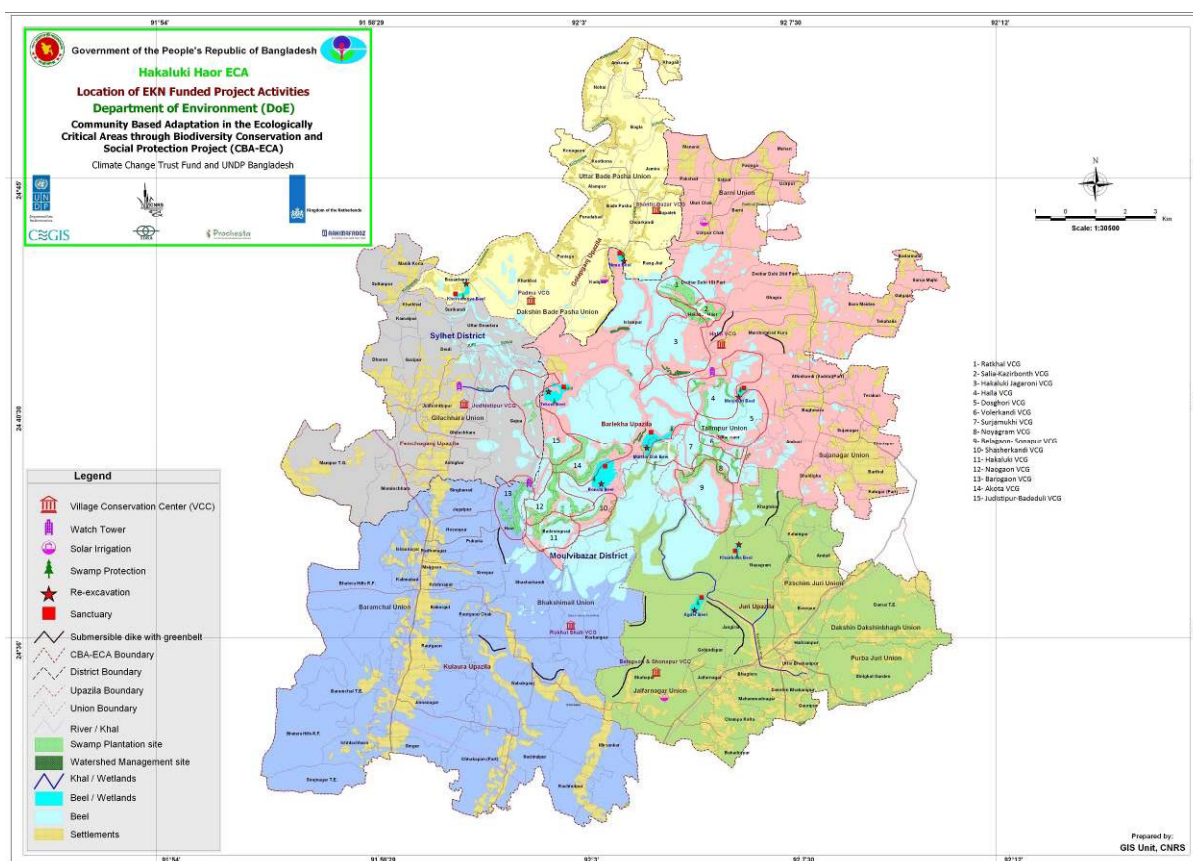
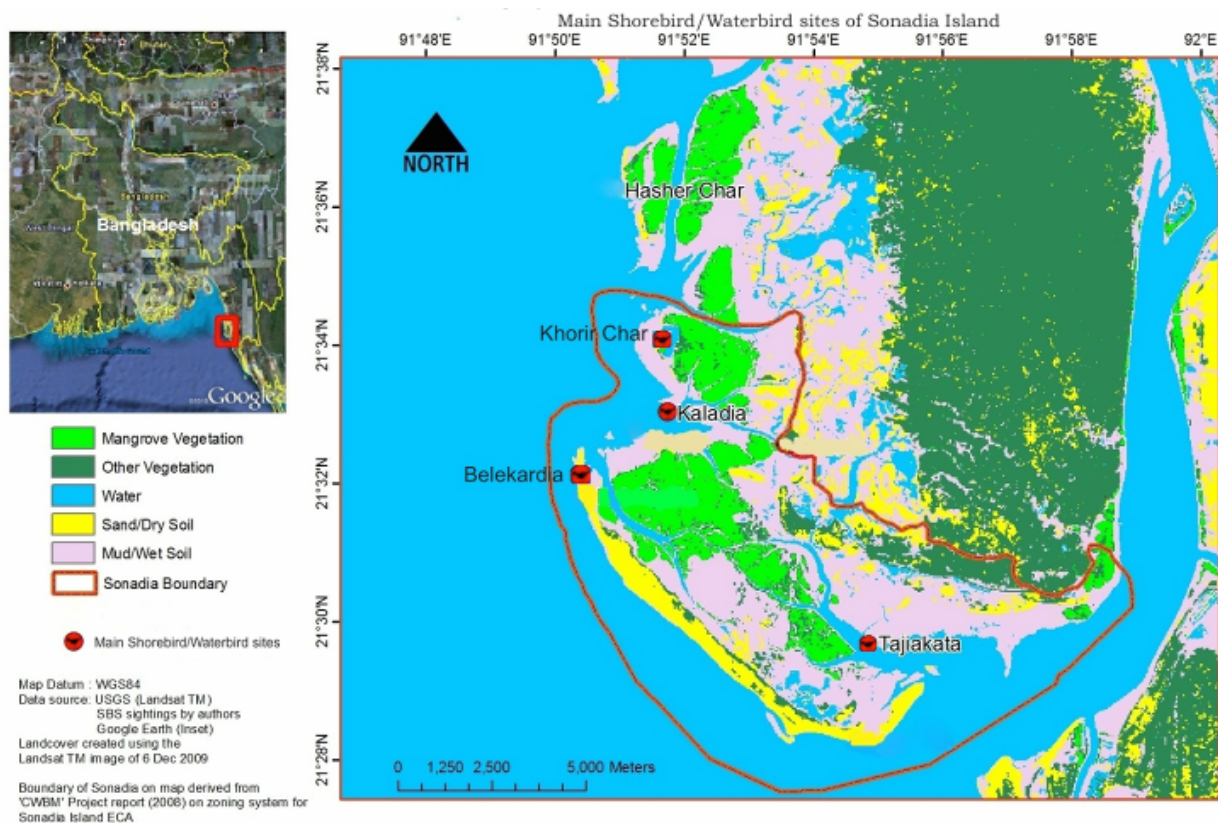


Fig. 1.3 Hakaluki Haor showing beel sanctuaries and protected swamp forests

### 1.3.3 Sonadia Island ECA

The 4,916 ha Sonadia Island is located just north of the district town in Cox’s Bazar district on the southeast coast of Bangladesh (Fig. 1.4) and comprises a wide variety of wetland habitats including mudflats, sand dunes, mangroves, sand bars, lagoons, saltpans and beaches (CWBMP 2006). It was declared an Ecologically Critical Area (ECA) by the Government of Bangladesh in 1999 and an Important Bird and Biodiversity Area (IBA) by BirdLife International in 2013.

Sonadia Island is one of the key sites in Bangladesh for the critically endangered Spoon-billed Sandpiper *Eurynorhynchus pygmeus* hosting 12.5-7.5% of the estimated world population of 240–400 (BirdLife International 2015), and endangered Spotted Greenshank *Tringa guttifer* hosting 8.5-4.1% of the world population of 330-670 (Birdlife International 2015), as well as three other shorebird species that are near threatened or vulnerable: Great Knot *Calidris tenuirostris*, Eurasian Curlew *Numenius arquata* and Black-tailed Godwit *Limosa limosa*. It is a major site for migratory shorebirds, waterfowl, gulls and terns, and provides refuge for many resident species such as Small Pratincole *Glareola lactea*, as well as terns, egrets and herons (collectively waterbirds). It is an important nesting ground for both Olive Ridley Turtle *Lepidochelys olivacea* and Green Turtle *Chelonia mydas*, which are respectively categorized as “vulnerable” and “endangered” in the 2010 IUCN Red List of Threatened Species. Moreover three species of endangered cetaceans, Finless Porpoise *Neophocaena phocaenoides*, Irrawaddy Dolphin *Orcaella brevirostris* and Bottlenose Dolphin *Tursiops aduncus*, occur in the channels, and the offshore and near-shore areas around the island (CWBMP 2006).



**Fig. 1.4** Map of Sonadia Island with main shorebird sites (source: Chowdhury et al. 2011)

Sonadia Island is not currently recognized as a Wetland of International Importance under the Ramsar Convention, Sonadia Island as a whole clearly meets three Ramsar criteria and probably meets a fourth. Moreover three of the seven sites surveyed within Sonadia meet the 1% threshold of Criterion 6 by themselves (Ramsar Convention Secretariat 2007; see Chowdhury *et al.* 2011).

### 1.3.4 Nijhum Dwip NP

Declared as a National Park in April, 2001, Nijhum Dwip National Park encompasses 16,352 ha including Nijhum Dwip island itself, Domar Char, other small islands and the southern fringe of the larger Hatia Island in Jahajmara Range. It is located in the Bay of Bengal in Noakhali District, see Fig. 1.5 for location and features. Nijhum Dwip is the wintering ground of internationally significant numbers of migratory water birds, including several globally threatened species (it is the world's main wintering site for Indian Skimmer *Rynchops albicollis*, regularly hosts Spotted Greenshank and sometimes the critically endangered Spoon-billed Sandpiper).

Nijhum Dwip NP protects a planted mangrove forest and tidal grasslands (home to an introduced population of about 5,000 Spotted Deer), and extensive intertidal mudflats and accreting char areas and coastal waters. The vast inter-tidal mudflats, sand bars, and shallow waters are the main habitats of 81 species of waterbirds. Domar Char in particular is home for half the year to important numbers of shorebirds. The coastal waters within and adjacent to the NP are also an important fishery.

Within Nijhum Dwip National Park live about 30,000 people who depend on fishing, grazing and other natural resources. Strengthening livelihoods in ways that reduce pressure on the biodiversity and ecology of Nijhum Dwip NP, including zoning, wildlife protection and sustainable fisheries, were priorities when co-management was established in September 2014.

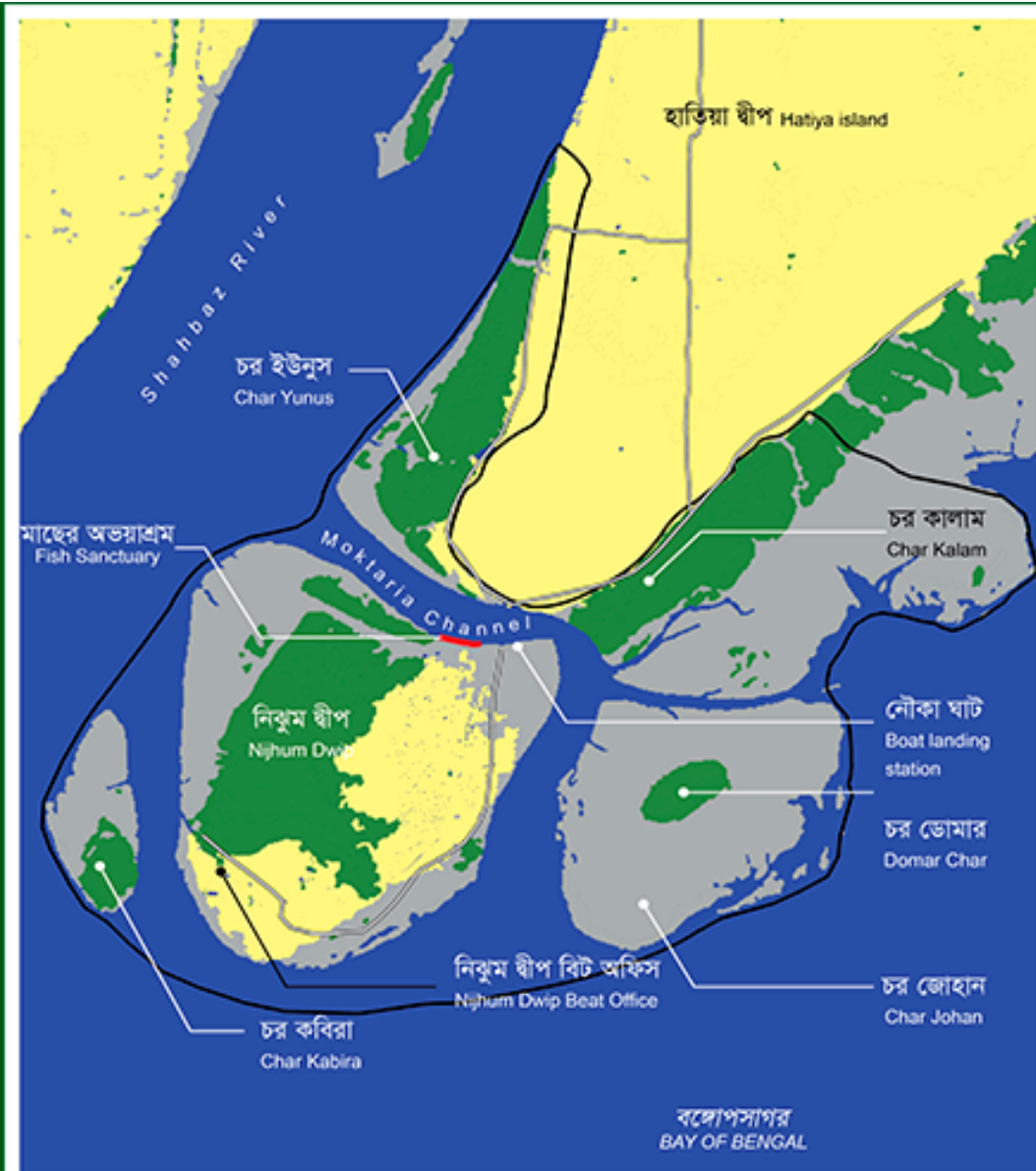


Fig. 1.5 Nijhum Dwip National Park

## CHAPTER 2 METHODS

### 2.1 General Census Method

The methods used follow those widely used in the Asian Waterbird Census (AWC) which is coordinated across Asia each year by Wetlands International (*Liet al.* 2009). Bangladesh bird club (Bbc) has been conducting midwinter waterbird counts as part of the AWC for many years, and the data generated in earlier years under the AWC has been used in this report, and data collected with CREL support was also shared with AWC. This results in so far as possible consistent data sets, and has contributed to longer term and larger scale continent level monitoring of waterbirds.

Under this system all of the waterbirds present in a wetland were counted one by one by species through direct observation from vantage points, including by walking along the perimeter of wetlands, and/or from boats where appropriate. Where birds were distant or in large flocks, numbers are estimated in blocks of 10s or 100s by species, and in some cases where reliable identification is difficult are recorded as numbers of unidentified birds by category (the totals of these are small in each site and year). Binoculars and spotting-scopes have been used for counting and species identification. The experienced surveyors using their own binoculars, spotting-scopes, cameras, and field guides during the surveys.

The AWC is officially conducted as a single survey for each wetland during the middle part of January each year, although for logistical reasons in the surveys reported here surveys in January or early February have been used. This period is considered mid-winter and on average maximum numbers of wintering waterbirds are present in this period (although some sites and species have higher numbers earlier in the winter or later in the dry season/spring just before northbound migration). Not only are most waterbird numbers at their annual peak, but also in general access to the wetlands is easiest and less hazardous in this period.

With existing data sets covering in some cases 10 or more years, and with gaps going back into the 1990s, it is important that AWC-based waterbird census continue to be carried out each year at the same time (January or early February) using the same methods for comparability.

### 2.2 Method Issues and Additional Data in Survey Sites

#### 2.2.1 Hail Haor

Mid-winter surveys of Baikka Beel were conducted on foot from the east side of the sanctuary in every year from winter 2002-3 to 2017-18. In some years of higher water level part of the beel was surveyed by taking a boat across the sanctuary. In later years most counting was possible from the observation tower (constructed in 2006) and later a second observation platform (constructed in 2012) which give a more elevated view over the wetland habitat, improving count accuracy. All midwinter counts were conducted by Paul M Thompson (PMT), except for the first two years conducted by Enam Ul Haque (EUH), who (along with other birdwatchers) also contributed to counts in other years. Midwinter counts usually took all or most of one day. In each survey at least two counts were made for each species and the highest number recorded as the census figure.

In addition to mid-winter counts, PMT made counts in other dry season months (from late October to early May) from 2005 onwards when feasible, either during visits related to MACH, IPAC or CREL, or as personal visits. This gives a total of 48 dates with counts over the period December 2002 to January 2018. In addition from 2006 onwards as part of the midwinter survey, waterbirds were

counted (and recorded separately) from the access route between Hazipur Bazar and the entrance to Baikka Beel covering those fields, marshes and ponds visible from the track, counting from the track (using a vehicle) or short walks from it.

In addition to waterbird counts, under Bangladesh bird club (Bbc) regular dry season bird ringing camps have taken place at Baikka Beel since 2011 to investigate the species using swamp forest and swamp thickets such as dhol kolmi. Baikka Beel is also visited by many birdwatchers who have contributed casual observations. Lastly a nest box program for Cotton Pygmy-Goose has been operated in the sanctuary by Barangina RMO since 2006, and has helped to restore a local population of this attractive small duck.

### 2.2.2 Hakaluki Haor

With about 50 individual beels/waterbodies being counted in an attempt to cover the whole wetland complex, the haor was divided into four approximate quarters and on two consecutive days in each annual survey two teams of birdwatchers walked around their allocated part of the haor visiting each beel there. Each team consisted of Bbc members experienced in conducting waterbird censuses (professionally and as amateurs), along with a representative of the VCGs in the area and a member of the development project team (CREL partner or other project partner), these later two persons were vital for local knowledge of which beels are located where and the access routes between them. The surveys involved in each reported year EUH and in many of the years the other authors, along with up to 12 other Bbc members. Counts in some years were affected by early morning fog, while in some years some beels had no or very few birds present after being dewatered for fishing. While the main beels were counted in earlier years, during CREL an effort was made to count as many beels as possible and to ensure that the sanctuary beels were counted.

Surveys in different years have covered most of the main beels for waterbirds out of about 100 within Hakaluki Haor. Table 2.1 shows the coverage of beels by year, in total 54 have been surveyed in one or more of these years. In some years beels were not surveyed when local people reported that they had been completely dewatered by the date of the survey and there were likely no or very few waterbirds present, as this enabled more time to be spent censusing those beels with more waterbirds. In total 43 beels were counted both in 2017 and 2018, the highest number since 2009. Only 17 of the more important beels for waterbirds have been counted in all the last seven years, but even Haor Khal (which holds the largest water area and some of the highest waterbird numbers recorded) was not counted in all years. Those beels surveyed in five or more years are the main ones holding waterbirds, and almost all beels among this core set of 39 beels have been surveyed each year since 2011. Due to lack of resources surveys of Hakaluki Haor were not possible in 2012 and 2013 before CREL was under full operations. Surveys of 18-21 of the main beels were undertaken in each year 2006 to 2010 with support of CWBMP, and summary data from those surveys is also used in the analysis. Increased coverage from 2014 onwards was mainly associated with counting all of the declared sanctuary beels, few of which were counted in the period up to 2010 since in general they held few waterbirds at that time.



**Table 2.1 Beels surveyed at Hakaluki Haor in 2006-2011 and 2014-2018.**

no.	Beel	2006	2007	2008	2009	2010	2011	2014	2015	2016	2017	2018
1	Agdar										Y	
2	Balijuri	Y	Y		Y	Y		Y	Y	Y		Y
3	Bali Kuri	Y	Y	Y						Y		Y
4	<b>Baya</b>			Y	Y		Y	Y	Y	Y	Y	Y
5	Bilaya		Y									
6	Chandar							Y		Y	Y	
7	Charra						Y					
8	Chatla	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
9	Chinaura	Y				Y		Y			Y	Y
10	Chokia		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
11	Choula							Y	Y	Y	Y	Y
12	Digar							Y		Y	Y	
13	Dudhai							Y	Y	Y	Y	Y
14	Foot	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y
15	Fuala	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
16	Furfuria	Y										
17	Goaljur **		Y				Y			Y	Y	Y
18	Goberkuri											Y
19	<b>Gojua</b>			Y	Y	Y	Y	Y	Y	Y	Y	Y
20	Gorkuri		Y	Y		Y	Y	Y	Y	Y	Y	Y
21	Gorchikona ***							Y	Y	Y	Y	Y
22	Halla Roost							Y				
23	Haor Khal	Y		Y		Y	Y	Y	Y	Y	Y	Y
24	Haramdinga	Y		Y	Y		Y	Y	Y	Y	Y	Y
25	Hawa-Bonna	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
26	Hingajur	Y	Y		Y		Y				Y	Y
27	Jolla	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y
28	Kalapani		Y		Y	Y	Y	Y	Y	Y	Y	Y
29	<b>Kangli</b>					Y	Y	Y	Y	Y	Y	Y
30	Katakhali Khal	Y										
31	Katua	Y						Y	Y	Y	Y	Y
32	<b>Koirkona</b>							Y	Y	Y	Y	Y
33	Kukurdubi		Y					Y		Y	Y	Y
34	Loribai	Y *	Y *	Y *		Y *	Y *	Y		Y	Y	Y
35	Maisla	Y	Y		Y		Y	Y	Y	Y	Y	Y
36	<b>Maislar Dak</b>							Y		Y	Y	Y
37	Majair											Y
38	Malam	Y	Y		Y	Y	Y	Y				Y
39	Meda			Y		Y	Y	Y	Y	Y	Y	Y
40	<b>Muiaa-Juri</b>							Y	Y	Y	Y	Y
41	Nagoa	Y *	Y *	Y *		Y *	Y *	Y		Y	Y	
42	Nagua-Dhalia		Y		Y	Y	Y	Y	Y	Y	Y	Y
43	Nama Turol	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
44	Padma							Y		Y	Y	Y
45	Pingla	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
46	<b>Polobhanga</b>			Y			Y	Y	Y	Y	Y	Y
47	Poroti	Y				Y	Y	Y	Y	Y	Y	Y
48	<b>Ronchi</b>			Y	Y		Y	Y	Y	Y	Y	Y
49	Singayr							Y	Y	Y	Y	
50	<b>Tekoni</b>					Y	Y	Y	Y	Y	Y	Y
51	<b>Tolar</b>							Y	Y	Y	Y	Y
52	Ujan-Torul		Y	Y			Y		Y	Y	Y	Y
53	Uper Kuri									Y		
54	Vitor Ghabi										Y	Y
	Total counted	21	20	19	18	21	29	41	32	42	43	43
	Main (shaded)	18	20	19	18	21	28	35	31	36	36	38
	Sanctuaries	0	0	3	3	3	6	10	9	10	10	10

The highlighted sites (shaded) were surveyed in five or more years. Beels shown in bold are sanctuaries. Waterbody names all end in beel which is omitted here for space reasons. \* Counted and recorded jointly in two years. Note that the sanctuary beels were only declared as such in 2010 and 2011.

\*\* also known as Boaljur Beel

\*\*\* also known as Gorchiura Beel or Gorsikona Beel

### 2.2.3 Sonadia Island

In addition to the known and historical sites used by waterbirds, and in the absence of a detailed map of Sonadia Island, Google Earth was used to identify potential shorebird sites (mainly mudflats). In 2009 and 2010 Bangladesh Spoon-billed Sandpiper Conservation Project (BSCP) and Bbc conducted a thorough survey in order to identify major shorebird/waterbird sites of Sonadia Island (Bird *et al.* 2010; Chowdhury *et al.* 2011). Based on the results of the initial surveys in 2009-2010, four main waterbird sites (Tajiakata, Belekardia, Kaladia and Khorir Char) of Sonadia Island (Fig. 1.4) were identified for long-term monitoring; census results of these four sites are discussed and presented in this report. Surveys here have been led by BSCP with support from several agencies and projects including CREL, but also funding via Royal Society for Protection of Birds and Oriental Bird Club. Most surveys have been undertaken or led by Sayam U. Chowdhury (SUC) but with significant inputs from M. Foyсал, Nazim Uddin Khan Prince and Omar Shahadat.

Access was largely by speedboat. Time spent surveying at each site varied depending on the number of birds present, and typically ranged between 3-8 hours covering both tides and two to three days every month to cover four main sites of Sonadia Island. Counts were repeated twice (the second count right after the first count) in most of the occasions and the maximum number is presented here. Counts were undertaken during both high and low tides, depending on the habitat type (mudflat or high tide roost).

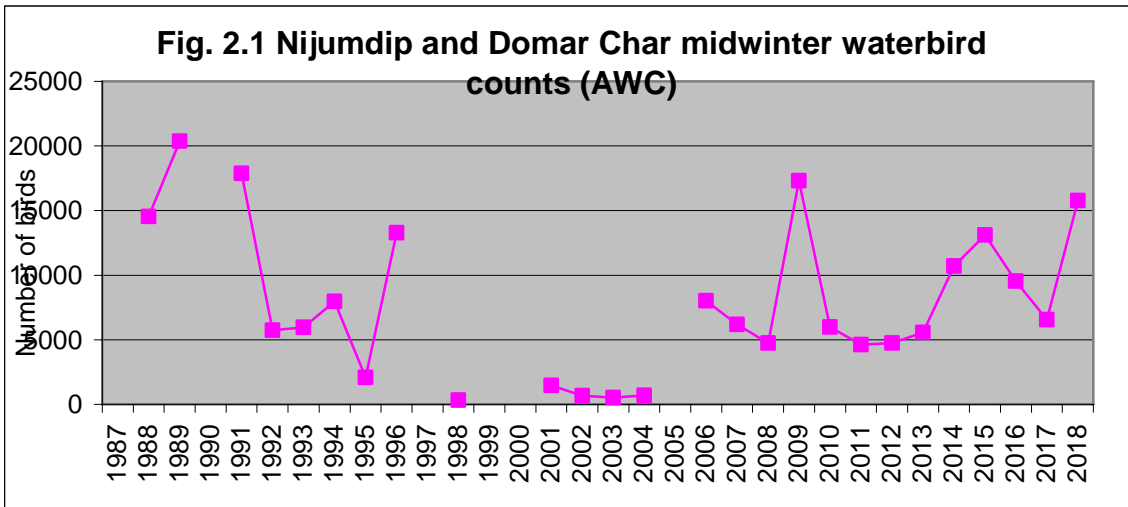
During the winter months we found it difficult and time consuming to separate Red-necked Stint *Calidris ruficollis* and Little Stint *Calidris minuta* (which are sometimes only separable in the hand); therefore they were lumped together as “Little / Red-necked Stint”; similarly it was not always possible to distinguish Lesser and Greater Sandplovers, so some were recorded as “unidentified sandplovers”.

Each of the four main sites of Sonadia Island was visited from the onset of winter migration in October and surveys were conducted every month until the end of northward migration in April. In order to determine the population trend of shorebirds of Sonadia Island, maximum counts (between October and April) for each species were analyzed (October 2009 – April 2016).

### 2.2.4 Nijhum Dwip

Although the area has been covered by waterbird counts under the AWC in most years since 1988; detailed data was available for this analysis from AWC surveys undertaken by Bbc for 2006 and for 11 consecutive years 2008 to 2018 for the Nijhum Dwip NP area (usually counted as 2 or 3 sub areas – Domar Char, the main shorebird and waterbird area, Nijhum Dwip proper, and the channel separating it from Hatiya). No survey was undertaken in 2007, and species-wise data from years before 2006 was not available, but the total counts of all waterbirds shown in Fig. 2.1 indicate high counts up to 1991, and very low counts in the late 1990s to early 2000s. Bbc kindly shared data from 10 years with CREL for monitoring and analysis of trends in this protected area.

The site was counted by small teams based on boats and making excursions on foot when tide conditions permitted into the mudflats (see photograph), in most years Samiul Mohsanin (SM) was part of these teams. In addition with support from several sources including CREL, SM undertook more intensive surveys and counts of waterbirds in most months of the winters 2012-13 to 2014-15, and during 2012-2016 studied wintering Indian Skimmer in the area including counts, bird ringing and satellite tracking, with follow up additional waterbird counts in early 2018.



Survey team at Nijhum Dwip in 2016

Photo: CREL



Survey team at Sonadia Island in 2014

Photo: CREL

# CHAPTER 3 BAIKKA BEEL AND HAIL HAOR

## 3.1 Overview

Waterbird numbers and diversity increased rapidly after the Baikka Beel permanent sanctuary was established in 2003 and protected since 2004. The mid-winter waterbird census shows an increase from about 300 waterbirds of 16 species in January 2004 to 12,250 water birds of 40 species in January 2010, 10,479 waterbirds of 41 species in January 2014, and 10,713 waterbirds of 41 species in January 2017.



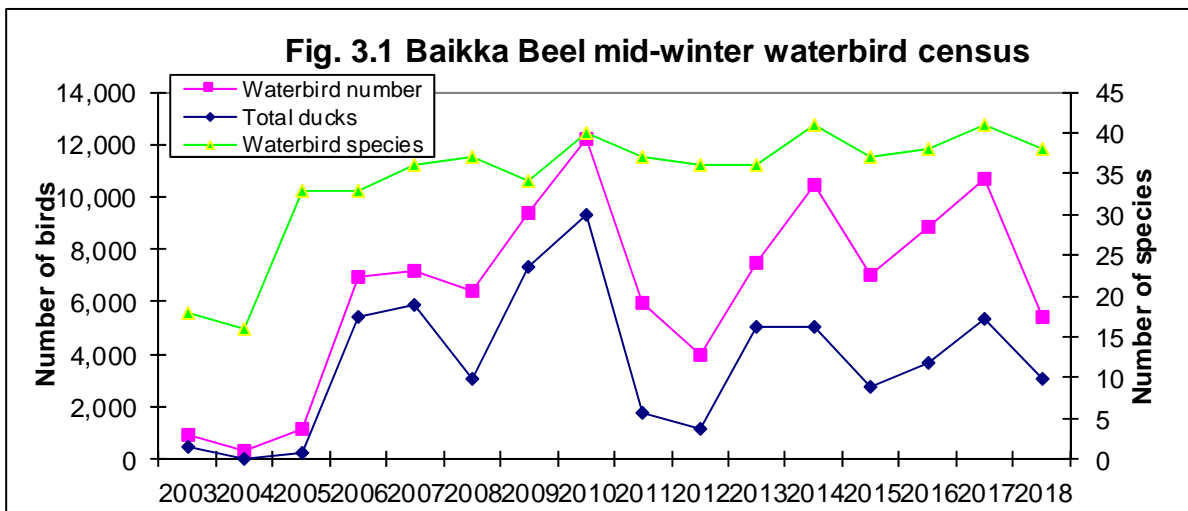
View of Baikka Beel sanctuary with observation tower

Photo: Paul Thompson

Based on maximum counts for each species, during the course of a winter at least 15,000 waterbirds typically use Baikka Beel, this is because for some species the highest numbers occur in the early dry season, but other species peak later in the winter. In total seven globally threatened, seven near-threatened, and one “data deficient” (likely to be threatened) species occur in the sanctuary. It is particularly important as a wintering area for non-breeding Pallas’s Fish Eagle *Haliaeetus leucoryphus*, and is the winter home to up to 10% of South Asia’s Fulvous Whistling Duck *Dendrocygna bicolor*.

## 3.2 Baikka Beel Midwinter Waterbird Totals

Although the area was declared a sanctuary in mid-2003, it took until 2004 for Baragangina RMO to establish guarding and protection of the area. The area was chosen by the community and MACH project for already having value for wetland biodiversity and for having the scope to be restored. Fig 3.1 clearly reveals an increase in waterbird species diversity in early 2005 compared with the two previous winters, and after that a small increase and fluctuations in the number of species recorded (usually 35-42 each year). There was a similar jump in waterbird numbers one year later in 2006 driven almost entirely by the arrival of wintering ducks that had been virtually absent in earlier years.



Numbers of waterbirds more or less increased each year up to 2010, presumably reflecting habitat improvements and maturing including excavation and dredging that took place in three winters during MACH project support (MACH ended in 2008). The reasons for the substantial drop in waterbird numbers in 2011 and 2012 midwinters are uncertain, factors could include water levels, and relatively less lotus (important for foraging and shelter) in these years. This was the situation in 2018 compared with 2017: after a high and long flood season in



**Fulvous Whistling-ducks, fish ponds close to Baikka Beel**

Photo: Paul Thompson

2017 lotus, emergent waterplants, and adjoining thickets of dhol kolmi were all badly affected and waterbird numbers were reduced. Moreover fluctuations in waterbird numbers may also result from factors away from Hail Haor: conditions in alternative wintering areas, conditions affecting migration routes (for migratory species), and conditions on breeding grounds. Fig. 3.2 shows that cormorants and egrets have generally increased but are not a major component of the total waterbirds – these are largely resident within Bangladesh (although only in the more recent years has Indian Pond Heron started to nest within Baikka Beel as trees are maturing) and primarily eat small fish and amphibians. Ducks which are largely migrants to the area show the greatest fluctuations in numbers, while shorebirds (long distant migrants) and *Rallidae* (mainly shorter distance movements) which feed on invertebrates in shallow marshy areas have increased over time but depend on muddy fringes and emergent vegetation respectively.

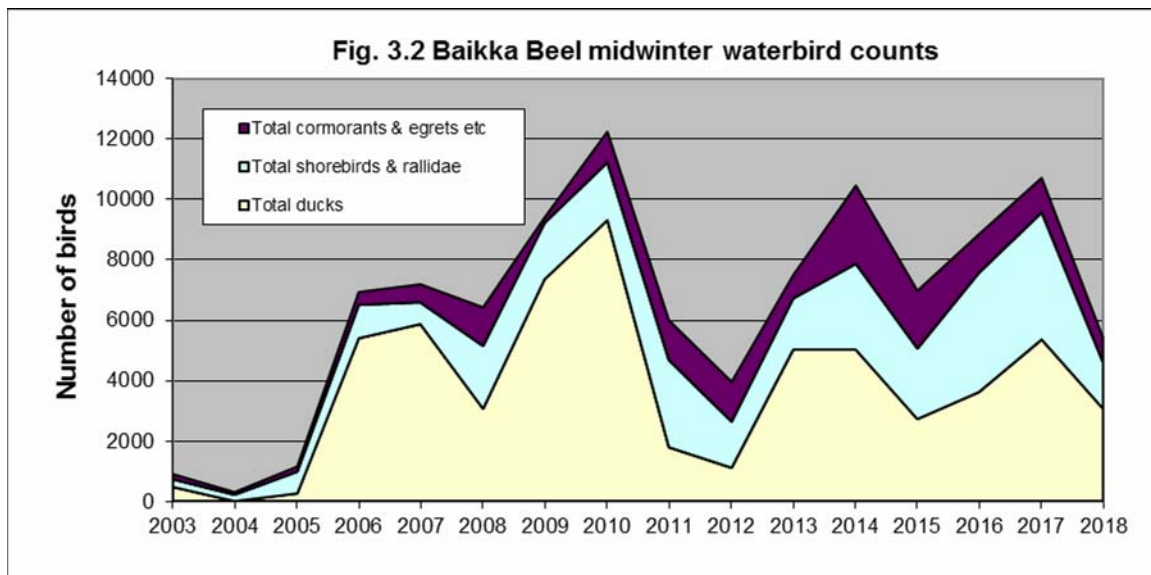


Table 3.1 lists all 88 waterbird species ever recorded in Hail Haor, and the 77 waterbird species so far recorded in Baikka Beel (including ones seen at other times than midwinter surveys. It also gives details of the midwinter counts in Baikka Beel of all species classed as waterbirds, along with their general status.

**Table 3.1 Waterbird counts in Baikk Beel from mid-winter Asian Waterbird Census surveys 2004 to 2018**

English name	Scientific name	Seas	Thr	Haor	Baikka	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
<b>DUCKS, GEESE, SWANS</b>	<b>ANATIDAE</b>																					
Fulvous Whistling Duck	<i>Dendrocygna bicolor</i>	W		c	c				1500	1000	2	4000	4500			900	2250					
Lesser Whistling Duck	<i>Dendrocygna javanica</i>	W		c	c	460		18	2500	3500		2500	2500	150		1400	100			2500		
Bar-headed Goose	<i>Anser indicus</i>	W		r	2																	
Greylag Goose	<i>Anser anser</i>	W		1	1					2												
Common Shelduck	<i>Tadorna tadorna</i>	W		1	1																	
Ruddy Shelduck	<i>Tadorna ferruginea</i>	W		r	4			2														
African Comb Duck	<i>Sarkidiornis melanotos</i>	W		2	2																	
Cotton Pygmy-goose	<i>Nettapus coromandelianus</i>	R*		uc	uc	4	8		50	50	115	26	41			36	83		200	439	327	
Red-crested Pochard	<i>Netta rufina</i>	W		2	1														1			
Common Pochard	<i>Aythya ferina</i>	W	VU	r	4								1						1			
Baer's Pochard	<i>Aythya baeri</i>	W	CR	2	1																	
Ferruginous Duck	<i>Aythya nyroca</i>	W	NT	uc	uc				87	53	89	57	10	15	3	1	151	78	163	23	188	
Tufted Duck	<i>Aythya fuligula</i>	W		r	5							2	2		1							
Garganey	<i>Spatula querquedula</i>	W		c	c			30	200	100	440	130	200	450	200	60	170	300	100	414	610	
Northern Shoveler	<i>Spatula clypeata</i>	W		uc	uc		1	4	5	14	8	7	6	17	9	23	21	14	8	15		
Falcated Duck	<i>Mareca falcata</i>	W	NT	4	3								2			1	2					
Gadwall	<i>Mareca strepera</i>	W		uc	uc				50	50	187	150	244	92		658	331	534	700	513	281	
Eurasian Wigeon	<i>Mareca penelope</i>	W		r	r					3	1		2	1				2		3		
Indian Spot-billed Duck	<i>Anas poecilorhyncha</i>	W		r	2															2		
Mallard	<i>Anas platyrhynchos</i>	W		1	1															1		
Northern Pintail	<i>Anas acuta</i>	W		c	c			100	700	500	642	74	800	9	5	58	403	583	590	375	62	
Common Teal	<i>Anas crecca</i>	W		c	c			100	300	600	1600	400	1000	1060	900	1900	1520	1200	1862	1100	1580	
<b>GREBES</b>	<b>PODICEPIDAE</b>																					
Little Grebe	<i>Tachybaptus ruficollis</i>	W		uc	uc		r		4		1	1	1		2	1	7	1	8	1	23	
Great Crested Grebe	<i>Podiceps cristatus</i>	W		2	2																	
<b>RAILS, COOTS</b>	<b>RALLIDAE</b>																					
Eastern Water Rail	<i>Rallus indicus</i>	W		2	1																	
Slaty-breasted Rail	<i>Lewinia striatus</i>	R		2	1																	
Ruddy-breasted Crake	<i>Zapornia fusca</i>	R		r	r	1		2				2			1						1	
Baillon's Crake	<i>Zapornia pusilla</i>	V		1																		
White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	R		2	2								1	1			1				1	
Watercock	<i>Gallinula cinerea</i>	R		r	3									1								
Purple Swamphen	<i>Porphyrio porphyrio</i>	R		c	c	29	8	21	300	174	285	505	1102	826	208	373	682	414	641	737	257	
Common Moorhen	<i>Gallinula chloropus</i>	W		c	c	48	4	13	100	213	27	168	108	79	63	334	337	289	425	766	36	
Eurasian Coot	<i>Fulica atra</i>	W		uc	uc				48	12	1	18	24		6	54	110	177	396	609	95	
<b>STORKS</b>	<b>CICONIIDAE</b>																					
Asian Openbill	<i>Anastomus oscitans</i>	R		c	uc			49											7	192	240	2
<b>IBISES</b>	<b>THRESKIORNITHIDAE</b>																					
Black-headed Ibis	<i>Threskiornis</i>	R	NT	uc	uc			3	2	7					3	17	2					

English name	Scientific name	Seas	Thr	Haor	Baikka	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	<i>melanocephalus</i>																				
Glossy Ibis	<i>Plegadis falcinellus</i>	W		r	r												15	15	86	70	2
<b>HERONS</b>	<b>ARDEIDAE</b>																				
Great (Eurasian) Bittern	<i>Botaurus stellaris</i>	W		l																	
Yellow Bittern	<i>Ixobrychus sinensis</i>	R		r	r			3		1	1	2	2	5		1			2	1	1
Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	R		r	2												1			1	
Black Bittern	<i>Ixobrychus flavicollis</i>	R		4	3									1							
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	R		4	2																
Indian Pond Heron	<i>Ardeola grayii</i>	R *		c	c		22	8	6	75	28	11	248	272	471	199	461	493	157	123	14
Chinese Pond Heron	<i>Ardeola bacchus</i>	V		2	1																
Cattle Egret	<i>Bubulcus ibis</i>	R		c	c		27	30	79	175	194	20	2	100	37	81	200	285	45	50	54
Grey Heron	<i>Ardea cinerea</i>	W		c	c		11	13	25	12	25	13	25	21	42	18	57	89	41	27	2
Purple Heron	<i>Ardea purpurea</i>	R		uc	uc	2		1	1	2	2	4	7		1	3	6	4	2	3	
Great Egret	<i>Ardea albus</i>	R		c	c		1	26	70	72	177	52	297	72	400	99	400	27	176	102	20
Intermediate Egret	<i>Ardea intermedia</i>	R		c	c	136	1	12	180	36	21	40	88		3	47	209	183	178	34	150
Little Egret	<i>Egretta garzetta</i>	R		c	c	17	11	20	10	1	152	15	132	369	150	76	70	170	109	105	142
<b>CORMORANTS</b>	<b>PALACROCORACIDAE</b>																				
Little Cormorant	<i>Microcarbo niger</i>	R		c	c	3	7	11	50	39	521	28	235	64	154	207	98	500	222	90	99
Great Cormorant	<i>Phalacrocorax carbo</i>	W		uc	uc							2			34	38	17	49	21	12	128
<b>DARTERS</b>	<b>ANHINGIDAE</b>																				
Oriental Darter	<i>Anhinga melanogaster</i>	W	NT	uc	uc					2			3	8	13	10	3	4	4	5	2
<b>STILTS, AVOCETS</b>	<b>RECURVIROSTRIDAE</b>																				
Black-winged Stilt	<i>Himantopus himantopus</i>	W		c	c	37		42	2	90	327	419	430	211	414	82	125	220	244	186	4
<b>PLOVERS</b>	<b>CHARADRIIDAE</b>																				
Grey Plover	<i>Pluvialis squatarola</i>	W		l																	
Pacific Golden Plover	<i>Pluvialis fulva</i>	W		c	c		30		20												
Long-billed Plover	<i>Charadrius placidus</i>	V		l																	
Little Ringed Plover	<i>Charadrius dubius</i>	W		c	c			13	3	4	10		5	8	7	1		2	1	3	8
Kentish Plover	<i>Charadrius alexandrinus</i>	W		r																	
Lesser Sandplover	<i>Charadrius mongolus</i>	W		r	1	30															
Northern Lapwing	<i>Vanellus vanellus</i>	W	NT	2	2										1						
Grey-headed Lapwing	<i>Vanellus cinereus</i>	W		c	c		70	116	108	34	140	3	83	257	41	47	350	16	38	18	245
Red-wattled Lapwing	<i>Vanellus indicus</i>	R		r																	
<b>PAINTED SNIPE</b>	<b>ROSTRATULIDAE</b>																				
Greater Painted-snipe	<i>Rostratula benghalensis</i>	R		r	r										3	3	2				
<b>JACANAS</b>	<b>JACANIDAE</b>																				
Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	R*		c	c	7		20	111	4	11		2	3	50	48	114	2	42	112	152
Bronze-winged Jacana	<i>Metopidius indicus</i>	R		c	c				30	9	1	5	2	1	9	10	10	2	8	6	6
<b>SNIPES, SANDPIPERS</b>	<b>SCOLOPACIDAE</b>																				
Bar-tailed Godwit	<i>Limosa lapponica</i>	W		l																	
Black-tailed Godwit	<i>Limosa limosa</i>	W	NT	uc	uc			75			60	32	16	139	200	150	220	81	230	250	52
Ruff	<i>Calidris pugnax</i>	W		c	c	73	115	350	400	57	356	526	30	874	158	323	370	160	1088	1342	648

English name	Scientific name	Seas	Thr	Haor	Baikka	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Curlew Sandpiper	<i>Calidris ferruginea</i>	W	NT	r	2						1			3							
Temminck's Stint	<i>Calidris temminckii</i>	W		uc	uc					2	4			26	8			5		12	
Little Stint	<i>Calidris minuta</i>	W		r	r	5		10						11							
Pin-tailed Snipe	<i>Gallinago stenura</i>	W		uc	r				1								2				2
Swinhoe's Snipe	<i>Gallinago megala</i>	V		l																	
Common Snipe	<i>Gallinago gallinago</i>	W		c	uc	12	1		1	20	23	1	1	24	4		8	3	1	2	9
Jack Snipe	<i>Lymnocyptes minimus</i>	W		r																	
Common Sandpiper	<i>Actitis hypoleucos</i>	W		r	r		2	1													
Green Sandpiper	<i>Tringa ochropus</i>	W		uc	r	2	1														
Spotted Redshank	<i>Tringa erythropus</i>	W		c	c			47	1	130	157	50	23	357	285	220	481	446	664	58	17
Common Greenshank	<i>Tringa nebularia</i>	W		uc	r	14		3						5					32		4
Common Redshank	<i>Tringa totanus</i>	W		r																	
Wood Sandpiper	<i>Tringa glareola</i>	W		c	uc			5	6	6	7	1	15	12	12	3	9	6	4	3	1
Marsh Sandpiper	<i>Tringa stagnatilis</i>	W		c	c			14		27	289	100	51	54	58	48	11	140	143	69	3
<b>PRATINCOLES</b>	<b>GLAREOLIDAE</b>																				
Oriental Pratincole	<i>Glareola maldivarum</i>	R		r	l																5
Small Pratincole	<i>Glareola lactea</i>	R		2	1						2										
<b>GULLS, TERNS</b>	<b>LARIDAE</b>																				
Brown-headed Gull	<i>Larus brunnicephalus</i>	W		3	2																
Black-headed Gull	<i>Larus ridibundus</i>	W		r	r								8	2							
Whiskered Tern	<i>Chlidonias hybridus</i>	W		uc	uc			15			6										17
Common Tern	<i>Sterna hirundo</i>	V		1																	
<b>WATERBIRD TOTAL</b>						907	296	1174	6949	7204	6429	9405	12250	5989	3964	7499	10479	6991	8832	10713	5418

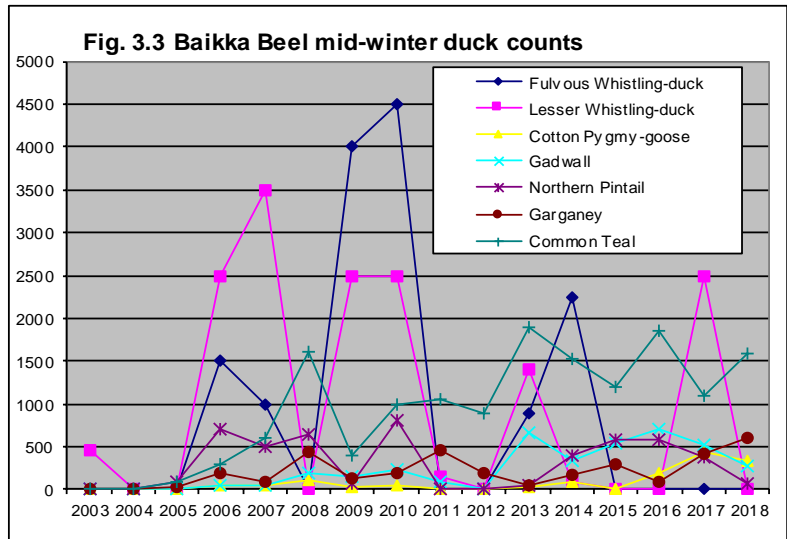
Seas (season): W=winter visitor, R=resident, \* proven nesting in Baikka Beel

Thr (global threat status): NT=near threatened, VU=vulnerable, CR=critically endangered

Haor and Baikka status: R=rare (but over 5 records), uc=uncommon, c=common, numbers indicate number of records where up to 5

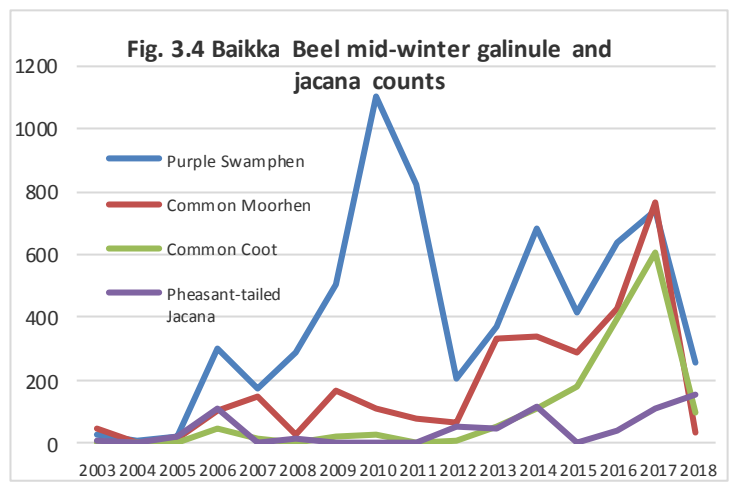


Considering only the more numerous species, more detailed analysis indicates that duck numbers (on average the larger proportion of waterbirds in midwinter) are strongly influenced by fluctuations in two short distance migrants – Lesser and Fulvous Whistling-duck (Fig. 3.3). In 2009 and 2010 Baikka Beel held over 10% of the South Asian population of Fulvous Whistling-duck (this population mainly nests in northeast India). These ducks tend to be found in large flocks and since 2012 have increasingly used fish ponds as well as the sanctuary for resting, appearing to show preferences for recently excavated areas as well as aquatic plants. Some longer distance migrants such as Gadwall and Common Teal have increased significantly (t-test 2003-10 v 2011-18). Lastly, Cotton Pygmy-goose has increased notably to record numbers in 2016 to 2018, which may reflect successful nesting seasons in the nest boxes in Baikka Beel (see Section 3.5)



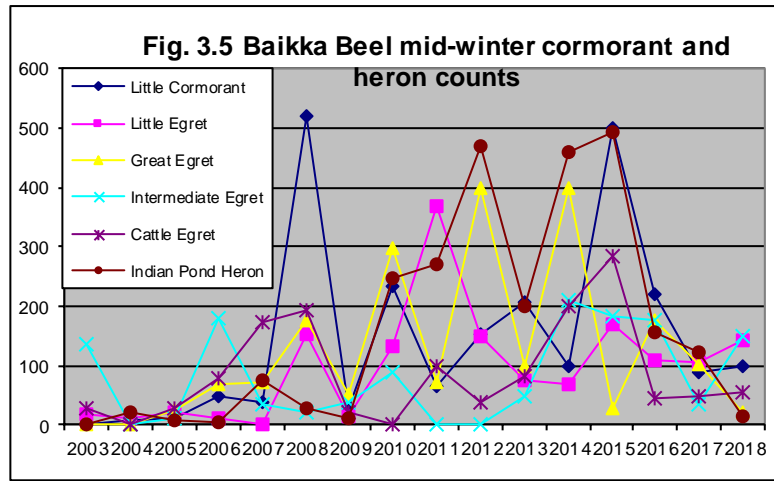
**Pheasant-tailed Jacana in breeding season**  
Photo: Paul Thompson

Pheasant-tailed Jacana is another resident species nesting on floating plants in the sanctuary, and has also shown higher numbers in general in the most recent five winters (Fig. 3.4). The three commoner rallidae or gallinules have increased considerably since 2012 (although Purple Swamphen numbers have fluctuated since about 2009, and numbers were low in 2018). The reasons are unclear but appear to reflect habitat conditions and detectability – Common Moorhen is difficult to count and prefers to be among floating vegetation, Purple Swamphen mainly uses tall wet grasses (which have declined somewhat) and water hyacinth, while Common Coot is more easily counted and prefers areas of open water (since it dives to forage on aquatic plants). Overall these species indicate continued healthy and diverse aquatic vegetation and dropped in 2018 due to short term flood impacts on aquatic plants.



Hérons, egrets and cormorants are largely resident in Bangladesh and forage on small fish, amphibians and some invertebrates. Numbers generally increased in the 2000s and have then

fluctuated (Fig. 3.5). This is the one category of waterbird that might have shown any impact of the mass poaching event in April 2013 (if it reduced fish populations and subsequent reproduction). This did not appear to happen, but numbers fell during 2016-18, possibly due to adverse population trends in the northeast region. The increase in Indian Pond Heron numbers from about 2010-15 was associated with this species using the swamp forest in the sanctuary as a night-time roosting area when it matured sufficiently. The decline since 2015 is unexpected as the trees continue to grow into a healthy patch of swamp forest, but pre-roost gatherings have shifted to old aquaculture enclosures within the Barangina RMO area.



Great Egret from observation tower, Baikka Beel

Photo: Paul Thompson

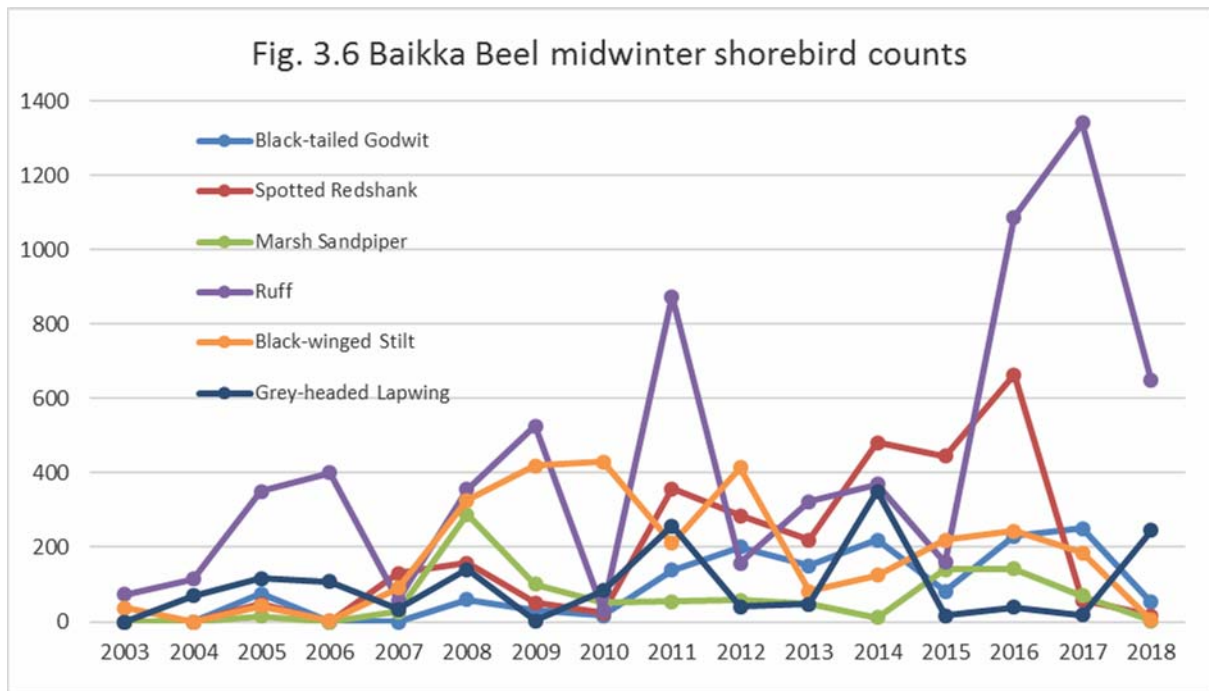
Most shorebirds wintering at Baikka Beel are long distance migrants nesting in north-east Asia, southern or far northern Siberia. Numbers have generally increased, and these species make use of very shallow water and emergent mud, or in the case

of Grey-headed Lapwing short wet grass (in recent years when this habitat has declined due to higher water levels this species has moved away to nearby rice fields). Notable trends were the increasing wintering flock of Spotted Redshank (once thought to be rare in Bangladesh), although this species declined in 2017 and 2018; and the large flocks of wintering Ruff in recent years (Fig. 3.6). In 2018 January conditions were more suited to lapwings and Ruff foraging in short wet grass than to shorebirds foraging in mud and shallow water.



Typical mixed shorebird flock comprising of Spotted Redshank, Marsh Sandpiper and Ruff in Baikka Beel

Photo: Paul Thompson



Despite the large set of data available, the scope for statistical analysis of trends is limited as there are only 16 years of surveys, so non-parametric statistics were used due to their greater robustness for small data sets. For statistical analysis the 16 years of data were divided into four periods (Table 3.2):

- 2003 and 2004 were treated as the baseline pre-sanctuary situation (although the sanctuary was declared in July 2003 effective protection was not established by January 2004);
- 2005, 2006 and 2007 were treated as the development period when there were major investments in habitat restoration through MACH; and
- the remaining 11 years of mature sanctuary were subdivided into two periods to determine if there are any trends after the main interventions –
  - 2008 to 2012 coincides with the period of limited support from IPAC
  - 2013 to 2018 coincides with the period of limited support from CREL.

Out of those species that were regularly recorded through the period in all or almost all years as well as species with at least 100 birds recorded in one winter, 21 species showed statistically significant variation associated with these four periods (Krukshal-Wallis non-parametric analysis of variance), almost all of these had no or very few birds in the baseline period and higher numbers in later periods, exceptions to this are Little Ringed Plover which increased and then decreased, and Intermediate Egret which was stable, then decreased in 2008-12 and then increased. The species that increased significantly with management periods include four species of long distance migratory dabbling ducks (dependent on invertebrates in shallow water), three migratory and resident *Rallidae* (vegetation and invertebrate eaters), seven resident herons, egrets and cormorants (dependent largely on small fish), and six shorebird species (dependent on invertebrates in soft mud and shallow water). Several species which have in general increased do not show statistically significant trends due to the considerable variation between years that is shown in Table 3.1 and discussed above.

During the mature sanctuary period, 13 species showed statistically significant differences in mean numbers during mid-winter counts between 2008-12 and 2013-18 (Mann-Whitney U test; or 11 species if t-tests are considered) (Table 3.2). Out of these Black-winged Stilt and Little Ringed Plover declined (although the latter only occurs in small numbers), and the other species all increased. Since a range of species from different families of birds with different micro-habitat and feeding needs, and including long distance migrants and resident birds, continued to increase after the major habitat restoration works, this indicates that on balance conditions in the sanctuary have continued to improve and that its protection remains effective as habitats mature.

**Table 3.2 Analysis of trends in mid-winter waterbird numbers in Baikka Beel**

Species	Average midwinter count				2008-12 v 2013-18		KW anova
	2003-04	2005-07	2008-12	2013-18	t-test	MW U	
Fulvous Whistling Duck	0	833	1700	525	ns	ns	ns
Lesser Whistling Duck	230	2006	1030	667	ns	ns	ns
Cotton Pygmy-goose	6	33	36	181	ns	ns	ns
Ferruginous Duck	0	47	35	101	ns	ns	ns
Garganey	0	110	284	276	ns	ns	p<0.1
Northern Shoveler	0	3	10	15	ns	ns	p<0.05
Gadwall	0	33	135	503	p<0.01	p<0.01	p<0.01
Northern Pintail	0	433	306	345	ns	ns	ns
Common Teal	0	333	992	1527	p<0.1	p<0.05	p<0.01
Purple Swamphen	19	165	585	517	ns	ns	p<0.05
Common Moorhen	26	109	89	365	p<0.05	p<0.01	p<0.1
Eurasian Coot	0	20	10	240	p<0.1	p<0.01	p<0.01
Asian Openbill	0	16	0	74	ns	p<0.1	ns
Black-headed Ibis	0	4	1	3	ns	ns	ns
Glossy Ibis	0	0	0	31	p<0.1	p<0.05	p<0.05
Indian Pond Heron	11	30	206	241	ns	ns	P<0.1
Cattle Egret	0	95	71	119	ns	ns	ns
Grey Heron	6	17	25	39	ns	ns	ns
Purple Heron	1	1	3	3	ns	ns	ns
Great Egret	1	56	200	137	ns	ns	p<0.1
Intermediate Egret	69	76	30	134	p<0.1	p<0.05	ns
Little Egret	14	10	164	112	ns	ns	p<0.05
Little Cormorant	5	33	200	203	ns	ns	p<0.05
Great Cormorant	0	0	7	44	p<0.1	p<0.05	p<0.05
Oriental Darter	0	1	5	5	ns	ns	p<0.1
Black-winged Stilt	19	45	360	144	p<0.01	p<0.05	p<0.05
Little Ringed Plover	0	7	6	3	p<0.1	p<0.1	ns
Grey-headed Lapwing	35	86	105	119	ns	ns	ns
Pheasant-tailed Jacana	4	45	13	78	p<0.1	p<0.1	ns
Bronze-winged Jacana	0	13	4	7	ns	p<0.1	ns
Black-tailed Godwit	0	25	89	164	p<0.1	p<0.05	p<0.05
Ruff	94	269	389	655	ns	ns	ns
Common Snipe	7	7	11	4	ns	ns	ns
Spotted Redshank	0	59	174	314	ns	ns	p<0.1
Wood Sandpiper	0	6	9	4	ns	ns	p<0.1
Marsh Sandpiper	0	14	110	69	ns	ns	p<0.05

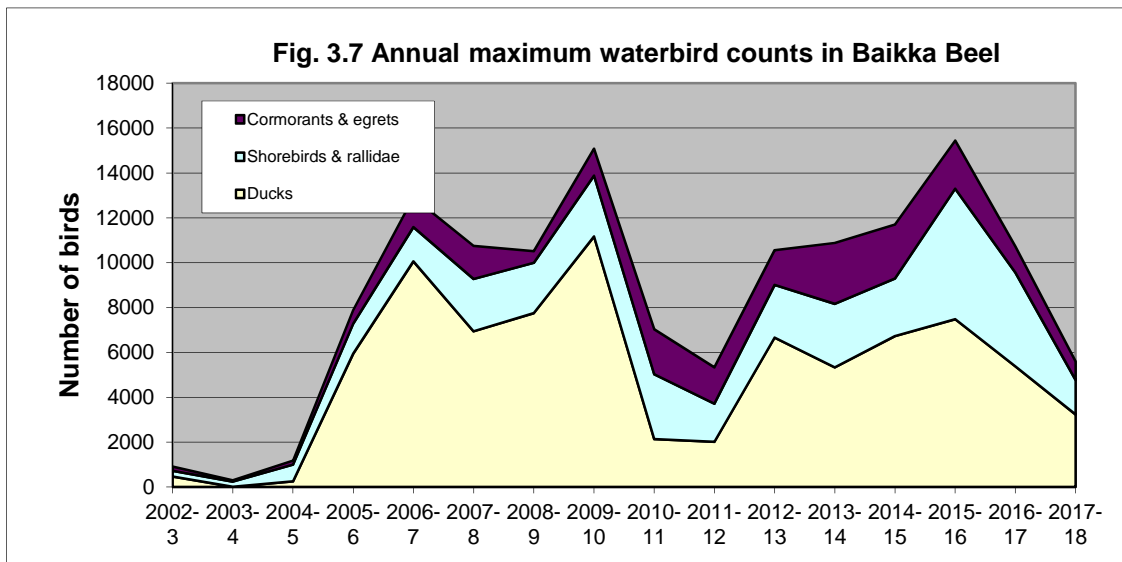
Yellow highlights where differences between periods were statistically significant  
 MW U = Mann-Whitney U test; KW anova = Kruksal-Wallis analysis of variance

Overall the censuses confirm the continued value and health of the sanctuary, not just for waterbirds but for the range of water depths, muddy areas, plants, and aquatic fauna that are used by birds. This also confirms the continued effectiveness of community protection and management of the sanctuary. This is all the more important considering that the extensive areas of shallow marshy wetland and wet grazing that previously bordered the northern and eastern sides of the sanctuary in the dry season, and were also used by waterbirds, have now largely been converted to aquaculture farms and rice fields.

### 3.3 Baikka Beel Annual Maximum Waterbird Numbers

In most years from 2006 to 2018 in addition to the mid-winter census, additional complete counts of waterbirds were made according to convenience and visits for other purposes. This gives 45 dates with “complete” counts including the midwinter censuses, plus a few other dates with partial counts, all between the beginning of November and beginning of May. Some species, such as whistling ducks, tend in some years to visit the sanctuary only in the early winter period, while some shorebirds can be present in higher numbers in the late winter, and some species are more easily counted when water levels drop at the end of the dry season. By reviewing each species the highest number recorded each winter can be determined as the highest count recorded, the sum of these is the annual maximum

waterbird count as shown in Fig 3.7 (note that this is still a minimum estimate of the waterbirds using the sanctuary in that winter, as it does not take into account turnover in individual birds of a species, and also depends on the timing of the additional surveys. These figures smooth somewhat the fluctuations shown in mid-winter counts, and confirm that almost every winter over 10,000 waterbirds have used the sanctuary since waterbirds returned there in numbers. The exceptions to this are the poor years of 2010-11 (which had only two counts and the midwinter count was in February rather than the optimal mid-January period, 2011-12 (which had four counts including a mid-January census), and 2017-18 (which had only two counts and was affected by early, long and late floods in 2017 resulting in a lack of emergent aquatic vegetation in the winter).



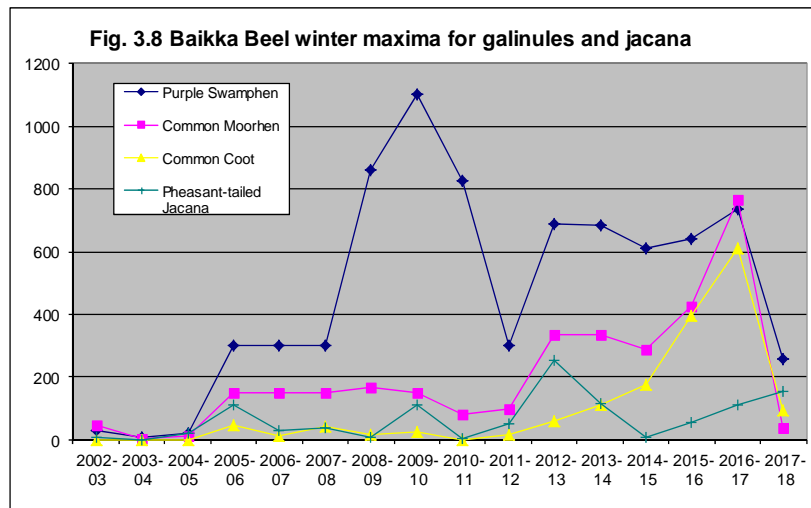
The species maxima for each winter show similar trends to the mid-winter census results, with a few adjustments. This is illustrated for three species of gallinules and Pheasant-tailed Jacana in Fig. 3.8. Purple Swamphen has shown a more stable population than suggested by midwinter counts since it can be easier to count later in the winter, and Pheasant-tailed Jacana numbers can be considerably higher in late-winter or even April than in January as numbers appear to increase and become more obvious in some years in the late dry season just prior to the start of nesting. Otherwise the same trends are shown as those revealed by the mid-winter census, such as the recent increase in Common Coot up to 2016-17, which is correlated with more open water in the sanctuary in the 2010s.



**Purple Swamphen**

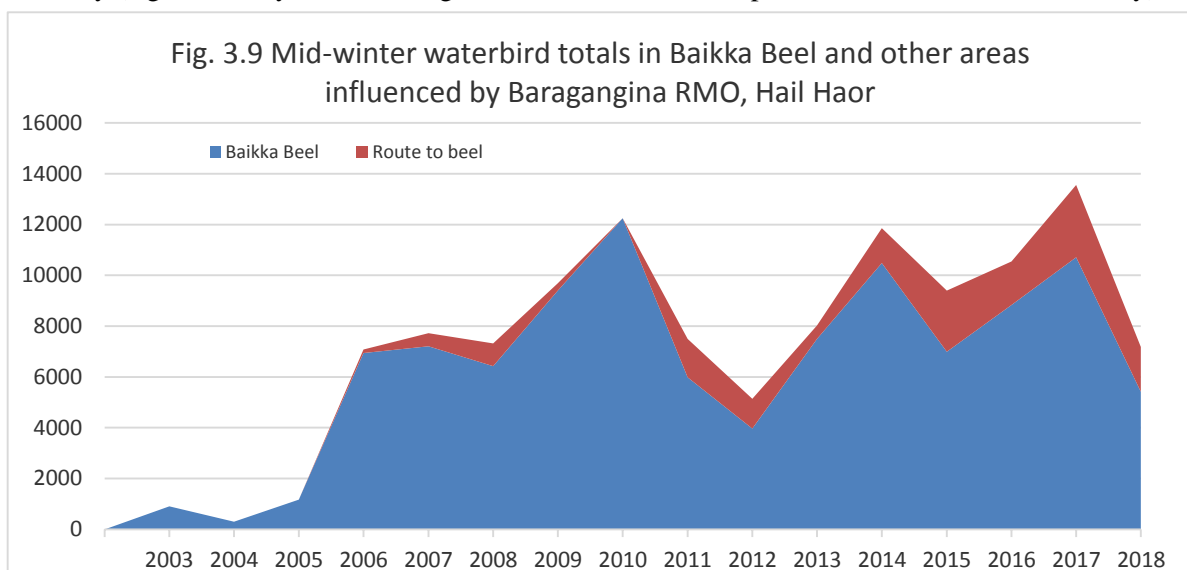
Photo: Paul Thompson

Overall both mid-winter AWC and annual winter maximum counts indicate that eight species showed statistically significant increases in numbers comparing eight earlier winters (2002-3 to 2009-10) with eight later winters (2010-11 to 2017-18): Gadwall and Common Teal among the ducks, Common Coot and Common Moorhen among Rallidae, Black-tailed Godwit and Spotted Redshank among shorebirds, and Little Egret and Indian Pond Heron among herons, cormorants and allies.



### 3.4 Baragangina RMO Area (including Baikka Beel)

Although the main site within Hail Haor for waterbirds is clearly Baikka Beel sanctuary, and there has been no attempt to regularly count waterbirds throughout the haor, in the mid-2000s some counts along the western shore of the haor were made indicating that some species such as egrets and Pheasant-tailed Jacana were widely distributed over the haor. However, from 2006 onwards (apart from 2010 which was missed due to fog and limited time available for surveys) as part of the mid-winter AWC counts waterbirds have been counted for an approximately 5 km transect route through the influence area of Baragangina RMO from Hazipur Bazar up to Baikka Beel. Counts were on the same day or day before mid-winter counts of Baikka Beel to minimize any risk of double counting. The method has remained constant (a slow drive along the earth track with regular stops to scan and count waterbirds visible from the track, particularly on fish ponds. This is important for several reasons: open marshy floodplain has been converted to fish ponds, some fish ponds are managed sympathetically for wildlife under the influence of the RMO, and there are spill-over effects with the sanctuary (e.g. in some years whistling duck flocks roost on the ponds rather than in the sanctuary).



Up to 2,800 waterbirds each year of up to 23 species in a year have been counted along the route to Baikka Beel (Table 3.3). Numbers have increased in general over time (Fig. 3.9), and have also

increased relative to the totals recorded in Baikka Beel, being 20% or more of the Baikka total in 2011, 2012, 2015, 2016 and 2017. Years since 2011 with higher waterbird counts from this route reflect flocks of Lesser Whistling-ducks (often 2,000 or more), and accompanied in some years by substantial numbers of Fulvous Whistling-ducks, these usually rest on the older fish ponds which are managed sympathetically for wildlife by one of the RMO leaders. These ducks are mobile and regularly use these specific fish ponds (and some of the larger more recently created aquaculture enclosures and ponds) – in some years they were seen on both fish ponds and on Baikka Beel, in which case they have been included in the Baikka totals, but in other years they are not seen in the sanctuary during surveys.

**Table 3.3 Waterbird counts in fish ponds and seasonal floodplain of Baragangina RMO area from mid-winter Asian Waterbird Census surveys 2006 to 2017**

Species	3 Feb 06	13 Jan 07	4 Feb 08	6-7 Jan 09	16 Feb 11	22 Jan 12	13 Feb 13	22 Jan 14	8 Jan 15	22 Jan 16	11 Jan 17	24 Jan 18
Fulvous Whistling-duck								38	1245	676	50	3
Lesser Whistling-duck			10	54	1000	864		1045	767	587	2550	1050
Cotton Pygmy-goose						2			4	1		
Gadwall						106	301					
Northern Shoveler						15						
Northern Pintail						3						
Garganey		10				4	2					
Common Teal						30						
Ferruginous Duck		159	2	6		16	80		41			12
Tufted Duck				2		1						
Ruddy-breasted Crake							1					
Purple Swamphen			6	5					1		11	17
Common Moorhen		79	10	9	13	10	10	19	41	86	24	46
Common Coot		3	8		4					1		4
Common Snipe		6	300	8								
Black-tailed Godwit								1				
Spotted Redshank		2	2		26	36				1		2
Marsh Sandpiper		2	1	1	54	1						1
Green Sandpiper										1		1
Wood Sandpiper	20	7	34	9	27			25		3	1	2
Temminck's Stint		4	1		12			20	5	2		
Ruff	20											1
Greater Painted-snipe		30			17							
Pheasant-tailed Jacana		2	2									
Black-winged Stilt					16			9				
Little Ringed Plover		8		1	11				1	1		4
Grey-headed Lapwing	96	9	64	20	4		1	13	10		5	20
Red-wattled Lapwing			2									
Little Grebe		4	4	3	5	10	2	8	3	4	3	5
Oriental Darter		1				1			1			
Little Cormorant		73	13	7	104	30	20	41	68	33	20	24
Great Cormorant									7	5	46	19
Little Egret		10	54	8	106	1		33	2	5	1	13
Grey Heron		1	1	1	2				1			1
Purple Heron		2				2						
Great Egret		2	3	3	66	2		24	4	1	5	2
Intermediate Egret		1	51	7	1			4				2
Cattle Egret		96	262	107	25	10	115	76	66	223	75	37
Indian Pond Heron		15	63	29	16	37		18	22	84	26	340
Cinnamon Bittern							1					
Asian Openbill									120		23	
<b>Total waterbird number</b>	<b>136</b>	<b>526</b>	<b>893</b>	<b>280</b>	<b>1509</b>	<b>1181</b>	<b>533</b>	<b>1374</b>	<b>2409</b>	<b>1714</b>	<b>2840</b>	<b>1766</b>
<b>Total waterbird species</b>	<b>3</b>	<b>23</b>	<b>21</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>10</b>	<b>15</b>	<b>19</b>	<b>17</b>	<b>14</b>	<b>22</b>

Note: no survey in 2010

## 3.5 Other Aspects of Importance of Baikka Beel for Birds

### 3.5.1 Species of global conservation concern

The following 17 globally threatened and near threatened bird species, plus one data deficient species, have been recorded within the Baikka Beel permanent sanctuary:

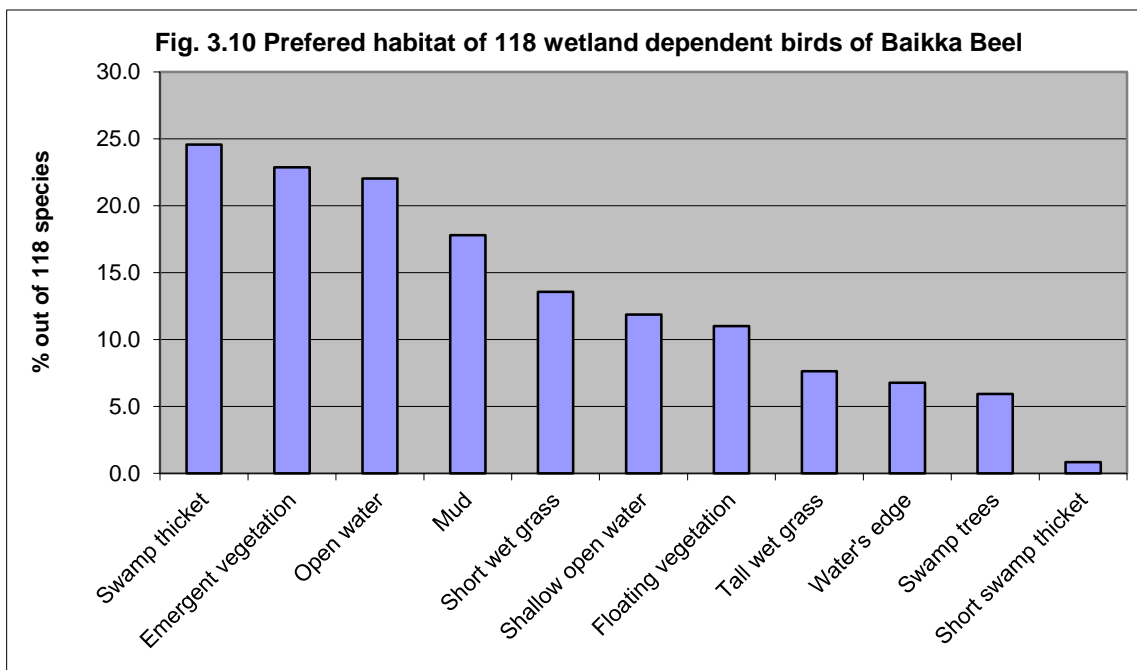
- *critically endangered* –
  - **Baer’s Pochard** (just one record (Chowdhury *et al.* 2012) of a species that has suffered a major decline since the 1990s and usually occurs with large flocks of diving ducks).
  - **White-rumped Vulture** (just one record over the sanctuary in January 2017 of a species that declined massively in the 1990s due to use of veterinary drugs, but there are other records from Hail Haor and the haor is within a “vulture safe zone” that aims to protect remnant colonies in Moulvi Bazar and adjacent districts).
  - **Yellow-breasted Bunting** (few records since the sanctuary was established, this species was a common winter visitor to fields around Hail Haor in general but has declined greatly at global level in this period (trapping in its breeding range in China, agricultural intensification and pesticide use), it was seen on 66% of nine winter visits by PMT to the haor from 1986 to 2000, but in only 3% of 64 visits during 2001-2018).
- *endangered* –
  - **Steppe Eagle** (recorded in most winters, and on 12 dates with waterbird counts, but no more than two seen at a time in the sanctuary).
  - **Pallas’s Fish Eagle** (multiple birds winter in and around the sanctuary, mostly immatures but with adults also visiting, with a peak count in Baikka Beel of 13 in March 2016, but numbers on most visits appear to be lower since 2016, although platforms were installed in the hope that this winter-nesting species would nest in the sanctuary, and eagles have shown some interest in the platforms so far (for example carrying branches to one platform in 2018) they have not nested here. A pair did nest in the northern part of Hail Haor in some years during the 2000s, but the tree has since been felled).
- *vulnerable* –
  - **Common Pochard** (occasional visitor - only four sightings of singles in the sanctuary).
  - **Indian Spotted Eagle** (occasional visitor - four sightings of up to two birds together).
  - **Greater Spotted Eagle** (a regular winter visitor each year, usually 1-2 birds spend the winter in Baikka Beel but with a maximum of five present at the same time in January 2017).
  - **Imperial Eagle** (rare visitor with just two records in the sanctuary).
- *near threatened* –
  - **Falcated Duck** (occasional visitor with just three records – two on two occasions and another single – in the sanctuary).
  - **Ferruginous Duck** (small flocks are present each winter, average of winter peak counts is just over 60 per year, with a record count of 188 in January 2018).
  - **Black-tailed Godwit** (flocks are present each winter since 2005, averaging about 140 in mid-winter counts and with a maximum recorded of 250 in January 2017).
  - **Grey-headed Fish Eagle** (occasional visitor, there are only two sightings from the sanctuary).
  - **Oriental Darter** (since December 2006 a few have been present each winter, averaging 6-7 birds and with a peak of 13 in January 2012).
  - **Black-headed Ibis** (a few have been present each winter since 2005 averaging about 7 birds a winter and with a peak of 24 in March 2010).
  - **Northern Lapwing** (two records – two together and a single – of this rare winter visitor to Bangladesh).



- **Curlew Sandpiper** (two records of single birds of this shorebird that is common on the coast but rare inland).
- *data deficient* –
  - **Large-billed Reed Warbler** (one record, see section 3.5.4 on ringing).

### 3.5.2 Wetland habitat use

The 118 species of birds recorded in the sanctuary that depend on wetland habitats (waterbirds plus some other wetland dependent species) make use of 11 wetland micro-habitats, most using only one or two of these as shown in Fig. 3.10. Among these wetland micro-habitats swamp thicket, shallow water with emergent vegetation, deeper open water and wet mud are the four most important for wetland birds, particularly in the dry season. Some of these habitats such as swamp thicket (tall tangled vegetation comprising mainly *dhol kolmi* in Baikka Beel), swamp trees and short wet grass are used by few waterbirds (those bird families designated as waterbirds in international censuses such as AWC) but are important for other wetland species. This highlights the importance of maintaining a diversity of wetland habitats within the sanctuary and not just focusing on maintaining or creating habitat for a few species.



### 3.5.3 Resident species

Resident waterbirds in Baikka Beel are much fewer in numbers and species diversity than those wintering, but the sanctuary is important for Pheasant-tailed Jacana which nests on floating vegetation. Of particular note is the nest box system (the first in the wild) operated in the sanctuary for Cotton Pygmy-goose. This species depends on cavities in trees or other structures for nesting, and the swamp trees planted in Baikka Beel are not yet old enough to have developed large enough cavities, but the boxes have helped these birds recover and nest successfully in the sanctuary each year since 2006. The wooden boxes constructed for this were modified from designs used for American Wood Duck, and this remains the only such scheme in the wild that we are aware of for this species.

In 2011, 10 of 21 boxes were used; in 2015, 21 of 30 boxes were used (7 successful); and in 2016, 13 of 30 boxes were used (11 successful including repeat broods). Out of these experiences boxes tend to be successful when they are: newer (wooden boxes tend to rot quite quickly), are relatively short (19”

tall), face west, have at least 2 m of open space from other vegetation in front of the box front, and on average have their floor about 2 m above peak monsoon water level (range 0.6-3 m). In 2016 and 2017 boxes made of concrete were tested to increase durability and appeared to be successful.

### 3.5.4 Bird ringing

Since 2011 bird ringing in the swamp forest and thickets including *dhol kolmi* of Baikka Beel has been

organized as a series of camps/expeditions by Bangladesh bird club and then as regular ringing visits by one of the club members - Israt Jahan. This has revealed how important this habitat is for several rare and skulking bird species including four new to Bangladesh. These species include Sykes's Warbler, Oriental Reed Warbler, Baikal Bush Warbler, and most notably in December 2011 the little known Large-billed Reed Warbler *Acrocephalus orinus* was caught (the first undoubted record in South Asia for 78 years)(Round *et al.* 2014).

The Large billed Reed Warbler is a rare and little-known bird, first described from a single specimen collected in the upper Sutlej Valley, Uttar Pradesh, India in 1867. Its status as a unique and distinct species was not confirmed until 2002 when an analysis of DNA from the specimen was carried out. Subsequently, the first ever live bird was captured and ringed on migration in Thailand in 2006 (Round *et al.* 2007), as were two more individuals during 2006-2009. Other, previously unrecognized specimens, collected during 1869-1937 were later identified in museums from central Asia, Pakistan, N. India and Myanmar (Svensson *et al.* 2008). Recent ornithological fieldwork in central Asia by Afghan, Russian, Swiss and British ornithologists has revealed that its breeding areas lie in northern Afghanistan and nearby Tajikistan, in riverine scrub in montane valleys. In winter, there are records from Myanmar, Thailand, Bangladesh and India. Destruction of scrub for fuel on breeding areas, and drainage of wetlands in which it winters are thought to threaten its future.

Overall between 2011 and December 2016, 1402 birds (including re-trapped birds) of 63 species have been caught in Baikka Beel. This has revealed the importance of the site for wintering secretive passerines such as Pallas's Grasshopper Warbler (65 captures) and White-tailed Rubythroat (66 captures), which are otherwise rarely seen. Ringing has also shown how small birds such as Dusky Warbler weighing less than 10 g and which migrates to nest in Siberia return year after year to the same swamp thicket (for example one rung bird has wintered in Baikka Beel for six years).



Newly hatched Cotton Pygmy-goose ducklings in a nest box

Photo: Maizharul Islam



Large-billed Reed Warbler caught at Baikka Beel

Photo: Philip Round

### 3.5.5 Species diversity

Total bird species diversity in the relatively small sanctuary of Baikka Beel covering about 170 ha has rapidly increased with protection and habitat restoration:

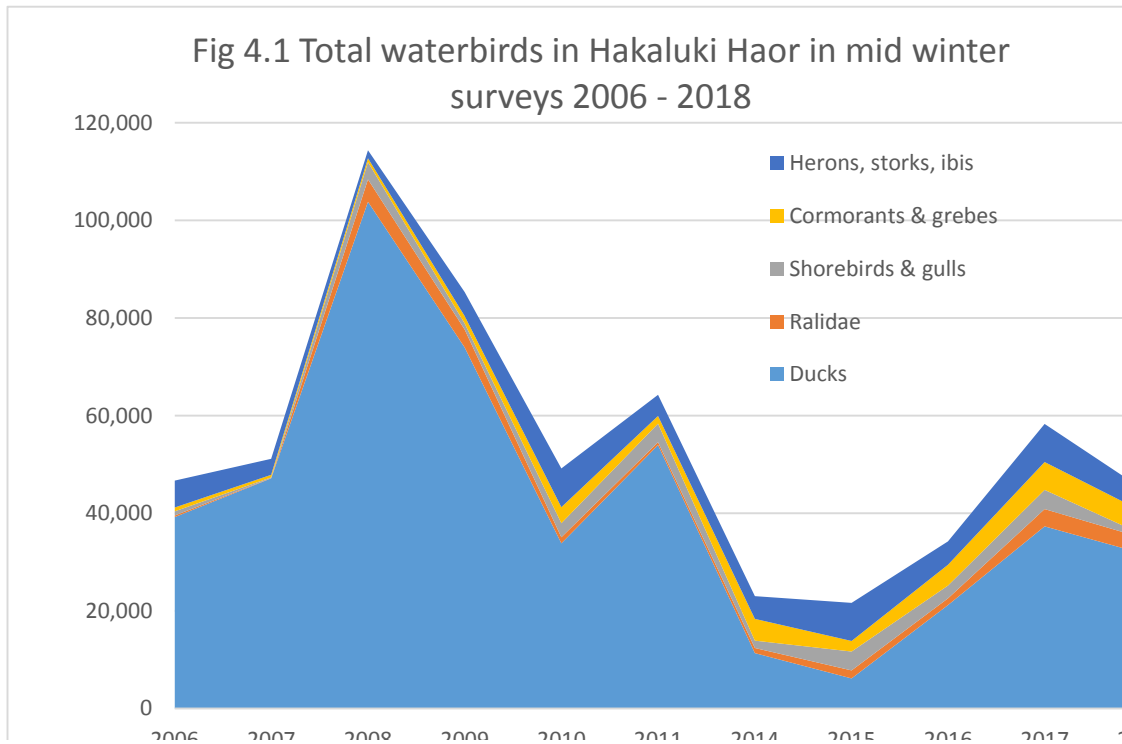
<b>Month and year</b>	<b>Number of species</b>
February 2005 -	59
September 2006 -	91
February 2008 -	125
February 2012 -	169
January 2014 –	175
March 2018 -	193

This increase in bird diversity reflects a range of factors, including relatively good observer coverage (not only for waterbird counts but also frequent visits from other birdwatchers and photographers), the introduction of bird ringing, changes in wider bird distributions (for example the arrival of Glossy Ibis since about 2012 in Bangladesh, with the largest flock for Bangladesh of 123 recorded in Baikka Beel), the maturing of wetland habitats, and most importantly continued protection of the sanctuary by Barangina RMO.

## CHAPTER 4 HAKALUKI HAOR

### 4.1 Trends in Wintering Waterbird Population

In total 81 species of waterbird have been recorded during mid-winter waterbird censuses in Hakaluki Haor from 2006 to 2018, with a peak count of 114,000 birds in 2008, a decline in the years following, and then a recent increase since 2015. As noted in Chapter 2, the haor was not surveyed in two years 2012 and 2013 in between project supports, and from 2014 the censuses have been more comprehensive, but in most years a majority of the main beels for waterbirds were counted. Fig. 4.1 shows an increase through 2016 and 2017 after recent declines, for example three times more ducks were counted in 2017 than in 2015, and numbers remained high in 2018. Almost all species of ducks show an increased number in the last two years compared with 2015, except for Eurasian Wigeon *Anas penelope* and Garganey *Anas querquedula*, compared to a decrease in the total number of shorebirds, indicating that the extensive areas of wet mud and short wet grasses exposed in low count years such as 2015 were reduced by higher water level and slightly earlier survey dates in 2016 to 2018 (high water levels remaining from 2017 resulted in very few shorebirds in 2018).



Note: no surveys in 2012 and 2013; fewer beels covered in early years of surveys

Details of the totals of each species counted in each year are given in Table 4.1 along with averages and the longer term trends comparing 2006-2011 with 2014-2018. Few species show higher numbers since 2014, given that the overall numbers were very high in 2008 and 2009 and low in 2014 and 2015, but six have shown statistically significant increases: Spotted Redshank, Marsh Sandpiper, Great Crested Grebe, Little Cormorant, Purple Heron, and Black-headed Ibis. These comprise two long distance migrant shorebirds, and four resident or short distance migrants that feed mainly on fish and also invertebrates. Three duck species – Ruddy Shelduck, Northern Shoveler and Tufted Duck, all long distance migrants (that representing grazing, dabbling and diving foraging strategies) show statistically significant declines (see Table 4.1).

**Table 4.1 Hakaluki Haor midwinter waterbird census summary 2006 – 2018 and tend analysis.**

Sponsors ->	CWBRMP					IPAC	CREL					Peak count	Average ('06-'18)	Average ('06-'11)	Average ('14-'18)	Trend
Species	2006	2007	2008	2009	2010	2011	2014	2015	2016	2017	2018					
Fulvous Whistling-duck	1,600	13,308	28,518	9,146	2,076	3,856	509	851	2,400	3,115	476	28,518	5,987	9,751	1,470	increase then decline
Lesser Whistling-duck	2,100	18,042	1,103	18,554	35	93	314	478	609	204	836	18,554	3,852	6,655	488	increase then decline
Lesser White-fronted Goose	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	
Greylag Goose	0	3	0	0	16	14	28	6	3	18	0	28	8	6	11	fluctuate
Bar-headed Goose	0	0	0	4	0	0	5	0	3	0	0	5	1	1	2	
Ruddy Shelduck	1,089	499	1,247	1,991	1,227	1,218	196	71	246	236	57	1,991	734	1,212	161	decline *
Common Shelduck	0	4	4	0	6	11	0	0	0	0	0	11	3	4	0	
Comb Duck	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
Cotton Pygmy-goose	307	12	440	17	56	78	203	161	101	<b>515</b>	167	515	187	152	229	
Gadwall	504	2,405	9,624	14,938	5,616	4,401	3,862	1,699	2,219	6,373	5,675	14,938	5,211	6,248	3,966	decline then increase
Falcated Duck	0	1	6	6	2	4	7	4	2	4	3	7	4	3	4	
Eurasian Wigeon	75	37	1,948	190	4,906	31	35	22	4	11	5	4,906	660	1,198	15	decline
Mallard	0	1	0	0	48	0	0	0	0	0	0	48	4	8	0	
Indian Spot-billed Duck	50	0	0	0	0	0	6	0	0	0	0	50	5	8	1	
Northern Shoveler	886	607	649	4,076	389	3,525	80	38	400	2	326	4,076	998	1,689	169	increase then decline *
Northern Pintail	6,080	3,078	23,294	10,304	8,700	9,971	2,566	520	5,312	10,206	3,092	23,294	7,557	10,238	4,339	fluctuate
Garganey	112	103	239	172	203	4,518	120	161	0	280	61	4,518	543	891	124	increase then decline
Eurasian Teal	1,407	2,115	185	439	1,619	2,547	35	11	1,395	2	<b>3048</b>	3,048	1,164	1,385	898	fluctuates
Red-crested Pochard	0	0	0	3	34	0	2	32	28	85	0	34	17	6	29	
Common Pochard	856	1,163	10,029	1,304	24	1,938	338	63	338	3,500	3,252	10,029	2,073	2,552	1,498	fluctuates
Ferruginous Pochard	677	857	4,545	2,234	955	2,529	1,538	1,549	1,973	<b>6,507</b>	1,642	6,507	2,273	1,966	2,642	fluctuates
Baer's Pochard	0	0	10	14	3	8	1	0	5	4	0	14	4	6	2	
Tufted Duck	2,607	2,777	5,918	8,069	2,552	10,565	447	215	824	1,204	5,446	10,565	3,693	5,415	1,627	increase then decline *
Water Rail	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	
White-breasted Waterhen	2	0	0	0	0	0	0	0	3	0	1	2	1	0	1	
Watercock	2	0	0	0	1	2	0	2	3	0	0	2	1	1	1	
Purple Swamphen	17	3	32	183	139	141	82	161	85	<b>731</b>	461	731	185	86	304	increase
Ruddy-breasted Crake	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	
Common Moorhen	1	0	0	12	15	18	16	10	5	7	1	18	8	8	8	
Eurasian Coot	252	95	4,519	3,502	1,096	447	946	1,480	1,235	2,804	2,774	4,519	1,741	1,652	1,848	fluctuates
Pintail Snipe	0	2	0	0	0	1	3	1	0	0	4	3	1	1	2	
Common Snipe	3	0	0	3	0	24	12	1	0	1	0	24	4	5	3	
Black-tailed Godwit	0	0	0	1	0	6	0	0	0	2	0	6	1	1	0	
Spotted Redshank	0	0	0	0	0	267	662	681	536	<b>703</b>	0	703	259	45	516	increasing *
Marsh Sandpiper	0	11	25	18	4	110	58	161	71	139	30	161	57	28	92	increasing *

Sponsors ->	CWBRMP					IPAC	CREL					Peak count	Average ('06-'18)	Average ('06-'11)	Average ('14-'18)	Trend
Species	2006	2007	2008	2009	2010	2011	2014	2015	2016	2017	2018					
Common Greenshank	1	3	35	11	98	7	12	2	45	4	7	98	20	26	14	
Green Sandpiper	2	0	42	25	16	0	0	2	0	0	0	42	8	14	0	high no may be mis id
Wood Sandpiper	14	8	87	86	23	91	33	72	25	17	1	91	42	52	30	
Common Sandpiper	73	0	7	2	12	1	0	3	1	0	6	73	10	16	2	high no may be mis id
Ruddy Turnstone	0	0	0	0	0	8	0	0	0	0	0	8	1	1	0	
Little Stint	0	0	336	47	59	54	0	155	0	9	0	336	60	83	33	likely some mis id in earlier counts
Temminck's Stint	0	0	0	11	48	602	155	182	45	200	18	602	115	110	120	fluctuates
Curlew Sandpiper	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	
Ruff	0	0	0	0	0	522	55	34	350	8	0	522	88	87	89	
Greater Painted-snipe	0	0	0	0	0	0	3	0	1	0	0	3	0	0	1	
Pheasant-tailed Jacana	55	2	0	96	182	28	19	35	37	<b>378</b>	46	378	80	61	103	
Bronze-winged Jacana	1	0	0	2	0	1	0	0	0	0	0	2	0	1	0	
Black-winged Stilt	0	0	0	0	0	1	17	18	0	0	0	18	3	0	7	
Pied Avocet	0	0	8	0	40	0	10	0	0	0	0	40	5	8	2	
Pacific Golden Plover	7	68	34	502	8	740	46	366	8	2	44	740	166	227	93	fluctuates
Grey Plover	0	0	8	0	0	0	3	0	0	0	0	8	1	1	1	
Little Ringed Plover	308	9	14	49	68	112	119	350	20	28	27	350	100	93	109	
Kentish Plover	39	0	0	0	6	12	0	1	380	0	0	39	40	10	76	
Lesser Sand Plover	7	0	13	3	0	0	0	0	0	0	0	13	2	4	0	
Northern Lapwing	0	1	0	0	0	11	0	24	0	0	0	24	3	2	5	
Grey-headed Lapwing	20	0	80	111	27	125	252	358	77	294	0	358	122	61	196	increase
Red-wattled Lapwing	8	5	1	0	0	2	0	0	0	0	0	8	1	3	0	
Oriental Pratincole	0	0	0	0	0	0	0	0	0	0	<b>1</b>	1	0	0	0	
Small Pratincole	0	0	0	0	0	13	1	301	1	5	0	301	29	2	62	
Brown-headed Gull	318	27	0	129	323	181	2	11	19	144	205	323	124	163	76	
Black-headed Gull	2	4	541	142	1,671	450	39	85	593	890	299	1,671	429	468	381	increase then decline
Whiskered Tern	0	0	0	0	81	0	0	0	0	0	0	81	7	14	0	
Little Grebe	53	52	68	82	88	74	165	75	28	109	62	165	78	70	88	
Great Crested Grebe	19	35	42	46	118	53	103	77	106	86	<b>179</b>	179	79	52	110	increase *
Oriental Darter	0	0	4	1	2	13	2	0	7	4	0	13	3	3	3	
Little Cormorant	745	304	639	1,346	2,933	1,405	4,086	1,947	3,922	<b>5,471</b>	4,344	5,471	2,467	1,229	3,954	increase *
Great Cormorant	4	82	22	7	119	40	112	15	211	67	78	119	69	46	97	
Little Egret	1,263	156	45	931	385	54	511	225	172	844	204	1,263	435	472	391	decline
Grey Heron	520	80	177	274	1,430	132	119	211	145	147	182	1,430	311	436	161	
Purple Heron	6	0	0	1	6	8	14	12	10	7	<b>16</b>	16	7	4	12	increase *

Sponsors ->	CWBRMP					IPAC	CREL					Peak count	Average ('06-'18)	Average ('06-'11)	Average ('14-'18)	Trend
Species	2006	2007	2008	2009	2010	2011	2014	2015	2016	2017	2018					
Great Egret	253	2,152	277	585	434	1,217	697	784	543	998	634	2,152	779	820	731	
Yellow-billed Egret	546	245	311	580	1,105	60	514	174	28	166	221	1,105	359	475	221	
Cattle Egret	180	200	328	20	771	82	650	1,064	320	<b>1076</b>	157	1076	441	264	653	
Indian Pond Heron	29	38	71	84	149	124	92	63	195	134	144	195	102	83	126	
Black-crowned Night Heron	0	0	0	0	550	0	73	0	0	0	0	550	57	92	15	
Cinnamon Bittern	0	0	0	0	1	0	1	0	1	0	1	1	0	0	1	
Black-headed Ibis	0	0	4	0	0	19	197	192	163	13	6	197	54	4	114	increase *
Glossy Ibis	0	0	0	0	0	0	3	27	4	1	5	27	4	0	8	
Painted Stork	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	
Asian Openbill	2,700	401	462	2,441	3,150	2,533	1,238	4,928	3,169	4,377	3,072	4,928	2,588	1,948	3,357	
Black-necked Stork	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	
UID ducks	20,900	2,135	16,100	2,500	5,389	8,670	1,062	300	5,347	5,082	7,723	20,900	6,837	9,282	3,903	
UID shorebirds	2	0	2,200	13	200	344	4	901	432	67	21	2,200	380	460	285	
UID gulls	0	0	118	0	0	70	0	132	0	1,008	22	1008	123	31	232	
UID egrets	0	0	0	0	0	98	558	126	33	0	18	558	76	16	147	
<b>Total number</b>	<b>46,703</b>	<b>51,130</b>	<b>114,410</b>	<b>85,307</b>	<b>49,214</b>	<b>64,282</b>	<b>23,041</b>	<b>21,631</b>	<b>34,240</b>	<b>58,289</b>	<b>45,100</b>	<b>179,597</b>	<b>54,825</b>	<b>68,508</b>	<b>36,460</b>	
<b>Total species</b>	<b>48</b>	<b>42</b>	<b>47</b>	<b>51</b>	<b>55</b>	<b>61</b>	<b>60</b>	<b>56</b>	<b>55</b>	<b>50</b>	<b>44</b>	<b>81</b>				

\* statistically significant difference between 2006-11 and 2014-18 average of mid-winter counts, 2-tailed t-test, p<0.05

## 4.2 Species of Conservation Concern

Waterbird species of particular conservation concern and importance recorded in Hakaluki Haor comprise 20 species:

**Fulvous Whistling Duck** *Dendrocygna bicolor*, average per year of 5,987 (Table 4.1), recorded in all years with over 1% of the flyway population present in all years and a peak count of 28,518 in 2008.

**Lesser White-fronted Goose** *Anser erythropus*, a globally *vulnerable* species with one record in 2011 of a vagrant (Thompson 2011).

**Ruddy Shelduck** *Tadorna ferruginea*, average per year of 802, this least concern species is recorded in all years with over 1% of the flyway population in 5 years and a peak count of 1,991 in 2009, but has shown a statistically significant decline in numbers.

**Common Pochard** *Aythya ferina*, average of 2,073, recorded in all years, this globally *vulnerable* species is a common winter visitor to the haor, and in 2008 the peak count of 10,029 exceeded the 1% flyway population threshold.

**Baer's Pochard** *Aythya baeri*, Hakaluki is a key site for this globally *critically endangered* (CR) diving duck. Its status in Bangladesh was reviewed by Chowdhury et al. (2012). The count of 1,000 in Hakaluki Haor in 1993 is one of the highest on record, and 70 were seen in the haor in the following year. However, surveys were either not undertaken or were not considered reliable between 1995 and 2002, and in 2003-5 there was only partial coverage of the haor. Between 3 and 14 birds were seen each year during 2008 to 2011, whereas during 2014 to 2018 from zero to five birds were seen. Hakaluki Haor was probably one of the main wintering areas globally for this species in the past, and its status in Hakaluki parallels the rapid global decline of this species. It may be that small numbers of Baer's Pochard are overlooked in some years among distant mixed flocks of diving ducks, but it is still encouraging that five and four birds were respectively counted in 2016 and 2017.



**Baer's Pochard (center) in Hakaluki Haor January 2017**

*Photo: Enam Ul Haque*

**Ferruginous Duck** *Aythya nyroca*, average per year 2,273, recorded in all years, this is a globally *near-threatened* species and Hakaluki is an important wintering site with over 1% of the flyway population in five of the survey years and a peak count of 6,507 in 2017.



**Ferruginous Duck, Hakaluki Haor 2016**

*Photo: Sayam Chowdhury*



**Falcatad Duck** *Mareca falcata*, this globally *near threatened* species is a regular visitor in small numbers each winter, averaging 3-4 birds, with a maximum of seven in 2014.

**Gadwall** *Mareca strepera*, average of 5,211, this least concern duck is a common winter visitor, recorded every year and has exceeded 1% of the flyway population in seven years, with a peak of 14,938 in 2009.

**Painted Stork** *Mycteria leucocephala*, the only record in the haor of this *near-threatened* species, which is a scarce visitor to Bangladesh, was of two in the 2014 survey.

**Black-necked Stork** *Ephippiorhynchus asiaticus*, there are three records of this *near-threatened* species from the haor, two documented in Thompson *et al.* (2014) and one in the 2015 survey.

**Black-headed Ibis** *Threskiornis melanocephalus*, there was only one count of just four birds of this *near-threatened* species in the first five years of surveys reported here, but since 2011 it has been recorded every year with a peak of 197 in 2015, and has shown a significant increase (except for a decline in 2017 and 2018), birds are concentrated in shallow and drying up beels foraging on molluscs, other invertebrates and small fish.

**Little Cormorant** *Microcarbo niger*, average of 2,467, this least concern species is a common resident and has exceeded 1% of the flyway population in five years, with a peak of 5,471 in 2017.

**Oriental Darter** *Anhinga melanogaster*, this *near-threatened* species is recorded in small numbers in most years, with a peak of 13 in 2011.

**Northern Lapwing** *Vanellus vanellus*, this *near-threatened* species is a scarce winter visitor to Bangladesh and was recorded in only three years of the surveys, with a peak of 24 in 2015.

**Black-tailed Godwit** *Limosa limosa*, this *near-threatened* species is surprisingly scarce in Hakaluki (compared with Baikka Beel and Nijhum Dweep, where it is more numerous), recorded in only three years with a maximum of six in 2011.

**Curlew Sandpiper** *Calidris ferruginea*, just two records of single birds of this *near-threatened* species which is mostly a coastal shorebird.

**Spotted Redshank** *Tringa erythropus*, an average of 259 but only recorded from 2011 onwards when it has been found to be one of the most numerous shorebirds in the haor, the earlier surveys may have failed to identify this species correctly. Although of least concern, counts have exceeded 1% of the flyway population in five recent years, maximum of 703 in 2017, but none recorded in 2018 when water levels were high and suitable shallow waters were absent.

**Spotted Greenshank** *Tringa guttifer*, one older record of this *endangered* species - a flock of 25 on 2 December 1992 (Thompson and Johnson 1993) although this seems unlikely for this inland site.

**River Tern** *Sterna aurantia*, one record of this *near-threatened* species but not during surveys, a declining resident in Bangladesh mostly found along main rivers and the coast.

In addition to these species, threatened birds of prey (not waterbirds) recorded in the haor comprise five species:

- **White-rumped Vulture** *Gyps bengalensis*, this *critically endangered* species was formerly regular in the haor but there have been no records in the last ten years (the last record is of one on 11 February 2005 (PMT)), the haor is within a Vulture Safe Zone that covers this district and still has a small remnant breeding population although it is distant from the haor.

- **Slender-billed Vulture** *Gyps tenuirostris*, one record of this **critically endangered** species by SMA Rashid on 28 March 1992 during surveys for Flood Action Plan component 6.
- **Greater Spotted Eagle** *Clanga clanga*, this **vulnerable** species is a rare but regular winter visitor in small numbers to the haor (usually 1-4 birds per year during waterbird surveys).
- **Steppe Eagle** *Aquila nipalensis*, this **endangered** species is a regular but rare winter visitor in ones and twos, recorded in most years.
- **Pallas's Fish-eagle** *Haliaeetus leucoryphus*, on average about one bird is seen per year (maximum in a year two), this is a globally **endangered** species and a few birds visit Hakaluki, but it has not been recorded nesting here unlike some other haors, presumably due to the lack of large trees in the haor.

In addition eight other species have in one or two years exceeded 1% of their flyway population:

- Lesser Whistling Duck *Dendrocygna javanica* (1% threshold 10,000) in 2007 and 2009 over 18,000 present;
- Garganey *Spatula querquedula* (1% threshold 3,500) in 2011 over 4,500 counted;
- Eurasian Wigeon *Mareca penelope* (1% threshold 2,500) in 2011 4,900 counted;
- Northern Pintail *Anas acuta* (1% threshold 20,000) in 2008 over 23,000 counted;
- Great Egret *Ardea albus* (1% threshold 1,000) in 2007 over 2,100 counted;
- Intermediate (Yellow-billed) Egret *Ardea intermedia* (1% threshold 1,000) in 2010 over 1,100 counted;
- Pacific Golden Plover *Pluvialis fulva* (1% threshold 710) in 2011 740 counted; and
- Little Ringed Plover *Charadrius dubius* (1% threshold 250) in 2006 308 counted and in 2015 350 counted.

Overall the most abundant species were ducks - in the earlier years particularly the two whistling ducks, but during CREL surveys migratory species particularly Northern Pintail *Anas acuta*, Gadwall *Anas querquedula*, and Ferruginous Duck *Aythya nyroca* - and resident waterbirds particularly Little Cormorant *Phalacrocorax niger* (e.g. 5,471 in 2017; 9.38% of total) and Asian Openbill *Anastomus oscitans* (e.g. 4,377 in 2017; 7.50% of total) which have both been increasing.

### 4.3 Distribution of Waterbirds Within the Haor

The distribution of waterbirds within the haor varies between years. Four beels were among the top five in three or more of the last five years of censuses supported by CREL (Chokia, Haor Khal (east side), Haor Khal (west side), and Pingla), while 12 beels were among the top five in at least one year (Table 4.2), of these only one is a sanctuary beel (Koirkona in the top five in one year).

**Table 4.2 Top beels within Hakaluki Haor by number of waterbirds 2014 to 2018**

Rank	2014*	2015	2016	2017	2018
1 <sup>st</sup>	Pingla (1982)	Chatla (3878)	Fuala (10692)	Foot (6952)	Haor Khal (W) (11060)
2 <sup>nd</sup>	Fuala (1944)	Chokia (2132)	Haor Khal (W) (4178)	Haor Khal (W) (6285)	Hawa-Bonna (6142)
3 <sup>rd</sup>	Chokia (1866)	Pingla (2063)	Haor Khal (E) (3932)	Haor Khal (E) (6000)	Haor Khal (E) (4675)
4 <sup>th</sup>	Chatla (1240)	Koirkona (1483)	Chokia (1878)	Hawa-Bonna (4507)	Foot (4616)
5 <sup>th</sup>	Nagua-Dhalia (1215)	Haor Khal (E) (1387)	Gorkori (1736)	Kalapani (4176)	Pingla (3427)

\* The highest sub-site count in this year was of birds entering Halla Roost, but in the day time these birds use various beels in the haor and the roost was not counted in later years. Total waterbirds counted in parenthesis.

Out of all the beels surveyed, only 12 averaged over 1,000 waterbirds in the five years of CREL supported surveys, and can be considered generally the most important for waterbirds (Table 4.3), none of these have been designated as sanctuaries.

**Table 4.3 Waterbird numbers and diversity by individual beels in Hakaluki Haor 2014-18**

Beel	Total waterbirds						Number of waterbird species					
	2014	2015	2016	2017	2018	Mean	2014	2015	2016	2017	2018	Mean
Kangli Beel (Sanctuary)	60	89	649	518	67	276.6	6	5	15	9	8	8.6
Hawa-Bonna Beel	1096	1108	1622	4507	6142	2895.0	19	11	4	11	17	12.4
Foot Beel	461	127	60	6952	4616	2443.2	13	11	11	10	22	13.4
Singayr Beel (Hingra Juri)	376	864	61			433.7	11	10	5			8.7
Loribai Beel	206		532	666	1819	805.8	14		17	9	8	12.0
Nagoa Beel	231						6					
Goberkuri Beel					17						6	
Uper Kuri Beel			123						8			8.0
Tekoni Beel (Sanctuary)	231	69	24	178	68	114.0	13	9	4	7	7	8.0
Gojua Beel (Sanctuary)	712	432	500	226	399	453.8	12	9	15	9	14	11.8
Ronchi Beel (Sanctuary)	290	177	483	37	380	273.4	11	8	10	5	10	8.8
Kalapani Beel	359		458	4176	28	1255.3	13		8	14	5	10.0
Meda Beel	134	65	66	75	981	264.2	9	7	10	7	9	8.4
Baya Beel (Sanctuary)	43	781	117	476	516	386.6	8	13	11	11	10	10.6
Haramdinga Beel	187	324	53	10	46	124.0	11	12	5	4	5	7.4
Goaljur Beel			35	265	13	104.3			6	5	2	4.3
Koirkona Beel (Sanctuary)	326	1483	448	374	227	571.6	9	14	7	11	9	10.0
Gorsikona Beel	405	442	353	390	192	356.4	8	13	7	8	8	8.8
Chola Beel	341	13	78	143	136	142.2	10	4	5	9	10	7.6
Jolla Beel	986	1097	235	4030	271	1323.8	13	15	8	23	6	13.0
Majair Beel					277						10	
Balijuri Beel	476	439	956	3260	789	1184.0	20	17	7	18	11	14.6
Padma Beel	67		41	42	42	48.0	5		2	1	6	3.5
Bali Kuri Beel			332		138	235.0			5		5	5.0
Katua Beel	316	30	399	152	102	199.8	11	4	10	5	7	7.4
Kukurdubi Beel	849		65	228	239	345.3	13		9	6	4	8.0
Maisla Beel	162	44	137	1372	198	382.6	10	6	5	10	4	7.0
Haor Khal (nr tower) (east)		1387	3932	6000	4675	3998.5		10	18		14	14.0
Haor-khal Beel (west)	787	818	4178	6285	11060	4625.6	11	11	6	12	10	10.0
Polobhanga Beel (Sanctuary)	30	25	190	69	448	152.4	8	4	3	4	8	5.4
Halla Roost	2757						3					
Dudhai Beel	275	90	10	1	142	103.6	7	7	3	1	5	4.6
Muiaa-Juri Beel (Sanctuary)	67	258	493	354	274	289.2	3	5	6	8	6	5.6
Malam Beel	677				242	459.5	10				7	8.5
Fuala Beel	1944	166	10692	343	1868	3002.6	10	9	16	5	17	11.4
Gorkori Beel	262	535	1736	143	1894	914.0	5	6	9	6	11	7.4
Ujan Turol		201	453	18	169	210.3		9	8	3	4	6.0
Nama-Turol Beel	523	170	267	562	41	312.6	13	4	7	13	7	8.8
Nagoa-Dhulia Beel	1215	1056	64	2564	658	1111.4	15	17	5	16	8	12.2
Chokia Beel	1866	2132	1878	4856	59	2158.2	18	20	15	17	12	16.4
Tolar Beel (Sanctuary)	62	178	186	1785	96	461.4	10	15	15	14	5	11.8
Hinga Jur Beel				1548	376	962.0				9	9	9.0
Chenaura Beel	37			73	28	46.0	9			7	7	7.7
Digar Beel	347		183	173	317	255.0	16		10	9	7	10.5
Chandar Beel	4		9	41	82	34.0	3		2	6	4	3.8
Katua Beel (different)	376						17					
Pingla Beel	1982	2063	812	768	3427	1810.4	18	5	15	12	23	14.6
Chatla Beel	1240	3878	266	3412	152	1789.6	14	30	8	22	9	16.6
Poroti Beel	217	1090	629	133	1240	661.8	7	3	9	7	16	8.4
Vitor Ghabi Beel				50	71	60.5				3	3	3.0
Agdar Beel				38						5		
Maislar Dak Beel (Sanctuary)	59		459	996	78	398.0	9		3	9	4	6.3
<b>Total</b>	<b>23041</b>	<b>21631</b>	<b>34264</b>	<b>58289</b>	<b>45100</b>	<b>36465.0</b>	<b>60</b>	<b>56</b>	<b>56</b>	<b>50</b>	<b>44</b>	<b>53.2</b>

Note: means only calculated for beels with 2 or more years of data; beels with blank data (no count) for a year were not considered for calculating means. In many cases they were reported to be fished and/or drained out in that year and were reported by local people to hold very small numbers of birds, if any, so they were missed/skipped in the survey and probably would have had very low counts but cannot be assumed to have zero counts, to this extent the means are overestimates for beels with one or more missing years.

**Bold** – on average over 1,000 waterbirds per year; **green** – sanctuary beels.

Discerning trends over five years is difficult. The average count in 2017 and 2018 was compared with the average of 2014 and 2015 to compensate to some extent for the considerable variability in waterbird numbers between years at the beel level. Among beels that averaged over 200 waterbirds per year, waterbird numbers doubled or more in 14 beels over this period, while numbers fell by a third or more in six beels. Waterbird numbers appear to have increased substantially in three beels that are now of particular importance: Hawa-Bonna Beel (from just over one thousand to 4,507 in 2017 and over 6,000 in 2018), Foot Beel (under 1,000 to 6,952 in 2017 and 4,616 in 2018), and Haor Khal (combining both sides) (from under 1,000 to over 10,000 2017 and 2018). Among the beels showing a decline in numbers Chatla Beel is most worrying as it has recorded the greatest diversity of waterbirds of any beel (average of 16 species per year and peak of 30 species in 2015) – this and reveals the impact of drainage and fishing in 2018 when only 152 waterbirds were present compared with over 3,000 in 2015 and 2017.

#### 4.4 Waterbirds in Sanctuary Beels

Ten sanctuary beels were surveyed in all five years of CREL surveys (except for Maislar Dak in 2015), out of these five are managed by village conservation groups supported by CREL project. In general waterbird numbers were modest in all of these sanctuaries, only exceeding 1,000 in Koirkona in 2015 and Tolar in 2017 (Table 4.4). Species diversity was on average higher in the sanctuaries supported by CREL, except for Polobhanga which remains largely dried up in the dry season. Overall the number of waterbirds has increased in the sanctuaries – more than doubling between 2014 and 2017, but then dropping to half that number in 2018. Also the total number of waterbirds counted in the haor has increased on average over this period. However, the increase between 2014 and 2015 in CREL supported sanctuaries coincided with a decline in the overall haor total, in 2015 16% of waterbirds in the haor were found in sanctuaries, whereas in other years about 8% are present in the sanctuaries, and in 2018 only 6% of all waterbirds counted were found in sanctuaries. The reasons for this relative decline in the sanctuaries in 2018 is unclear and deserves further investigation – potential reasons being either less effective guarding or changes in physical/ecological conditions. Where sanctuary beels are larger and retain water local communities have succeeded in protecting birds, but many of the sanctuary beels are small and/or dry out.

**Table 4.4 Sanctuary beels of Hakaluki Haor and their waterbird populations 2014-18**

Sanctuary Beel	Area (acres) *	Total waterbirds						Number of waterbird species					
		2014	2015	2016	2017	2018	Mean	2014	2015	2016	2017	2018	Mean
Gojua Beel	45.65	712	432	500	226	399	453.8	12	9	15	9	14	11.8
Baya Beel	62.94	43	781	117	476	516	386.6	8	13	11	11	10	10.6
Koirkona Beel	30.45	326	1483	448	374	227	571.6	9	14	7	11	9	10.0
Polobhanga Beel	160.22	30	25	190	69	448	152.4	8	4	3	4	8	5.4
Tolar Beel	26.57	62	178	186	1785	96	461.4	10	15	15	14	5	11.8
Kangli Beel	17.43	60	89	649	518	67	276.6	6	5	15	9	8	8.6
Tekoni Beel	32.54	231	69	24	178	68	114	13	9	4	7	7	8.0
Ronchi Beel	90.69	290	177	483	37	380	273.4	11	8	10	5	10	8.8
Muiaa-Juri Beel	11.42	67	258	493	354	274	289.2	3	5	6	8	6	5.6
Maislar Dak Beel	25.69	59		459	996	78	398	9		3	9	4	6.25
<b>Total CREL supported</b>		1173	2899	1441	2930	1686							
<b>Total other sanctuaries</b>		707	593	2108	2083	867							
<b>Total all sanctuaries</b>		1880	3492	3549	5013	2553							

\* based on Hakaluki Haor draft management plan prepared under CREL and official records, this does not necessarily correlate with the actual dry season water area (e.g. Polobhanga is largely dry and is not yet effectively protected unlike the other sanctuaries supported by CREL, in part this is due to disputes between local people over where bunds should be implemented to retain more water). Also these areas do not include the extensive areas of swamp thicket and regenerating forest protected by some of the VCGs around some of the sanctuary beels.

**Bold** = sanctuaries managed by VCGs supported by CREL

Bird numbers in two CREL-focused beel sanctuaries (Polobhanga Beel and Tolar Beel) increased comparing 2017-18 with 2014-15, especially in Tolar Beel, but the number of waterbirds decreased over the same period in two CREL-focused sanctuary beels (Gojua Beel and Koirkona Beel), conservation interventions should be strongly continued and renewed there.

Prioritization of beels for conservation efforts should take into account past waterbird counts and not just those in 2014-2018, for example in 2011 Haor Khal alone held internationally significant numbers of waterbirds (over 20,000). Moreover, noteworthy fluctuations in waterbird number and diversity can be observed in a number of beels in the recent past, for example, Fuala Beel supported only 166 waterbirds in 2015 but the numbers increased greatly to 10,692 individuals in 2016 but then again decreased to just 343 in 2017 before returning to 1,868 waterbirds in 2018. This highlights the need to work with fishers and leaseholders to ensure that in each year some of the most important beels for waterbirds are not under intensive fishing and draining.

#### 4.5 Issues Arising from Monitoring

For waterbird conservation and management, it is important to investigate and clearly understand what beel management strategies lead to increasing or decreasing numbers of waterbirds. There is an urgent need to investigate what factors may be behind declining waterbird numbers in particular beels and/or more generally - possible changes in underwater vegetation, mollusk and invertebrate populations, in water quality, in fishing practices, in draining out of beels (water depth), in operation of “pile” fisheries, in direct persecution of waterbirds, and in any other disturbance (Ma *et al.* 2010).

Waterbody (jalmohal) leaseholders should be required to protect waterbirds, and to enforce this, since the whole of the haor (including all beels within the haor) is an ECA. The larger beels that were most important for waterbirds in the past are leased out for fishing, yet leaseholders are not made responsible for maintaining the aquatic ecosystem, preventing hunting and disturbance, and protecting waterbirds as conditions on their leases, and the land administration has no effective monitoring or system of punishments on leaseholders for disturbance of waterbirds, draining out beels or damage to habitat.

For long term scientific monitoring mist-netting and bird ringing targeting passerines can also be adopted in Hakaluki Haor. This will primarily help to determine the health of reed swamps and bushy regenerating swamp forest/thicket. Initial surveys of this type were carried out by Bbc and IUCN Bangladesh separately in 2015, 2016, 2017 and 2018. Further studies on waterbird habitat preference should be taken up to understand more about the ecology of the haor.

Consistency in surveying at least the most important beels is needed. Expert led waterbird census should continue to take place every winter, and ideally should be organized three times every winter (early, mid and late) to determine seasonal occurrence and variation in waterbird population over the wintering season. A minimum of at least one count a year is needed to monitor the health of the wetland complex, ideally in mid-winter as part of the Asian Waterbird census. This will also assist to define status of rare and threatened birds of Hakaluki Haor.



Survey team, Hakaluki Haor 2015

Photo: CREL

# CHAPTER 5 SONADIA

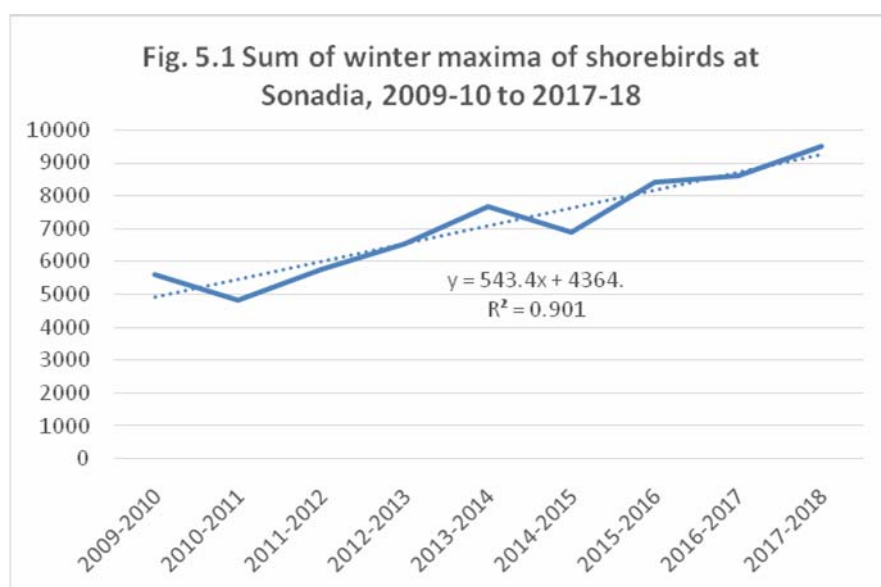
## 5.1 Population Trend of Shorebirds of Sonadia Island 2009 to 2018

Within Sonadia ECA, after initial surveys covering seven sites in 2009-10, four main sites where shorebirds occur were monitored for shorebirds in winter during 2009 to 2018. In addition from 2014-15 onwards when CREL support started other waterbirds in addition to shorebirds were also counted in at least January of each winter. These sites are shown in Table 5.1 and comprise a mix of the main high tide roosts in the ECA and the mudflats favored by shorebirds based on fieldwork over several years.

**Table 5.1** Sites surveyed on Sonadia Island.

Site Name	Habitat Type	Length (km)	Coordinates	No. of species meeting 1% Ramsar criterion
Tajiakata	Mudflat & high tide roost	1.5	21.4959°N, 91.9154°E	1
Belekardia	High tide roost	2	21.5311°N, 91.8425°E	1
Kaladia	Mudflat	2	21.5512°N, 91.8632°E	2
Khorir Char	Mudflat & high tide roost	1	21.3539°N, 91.5121°E	2

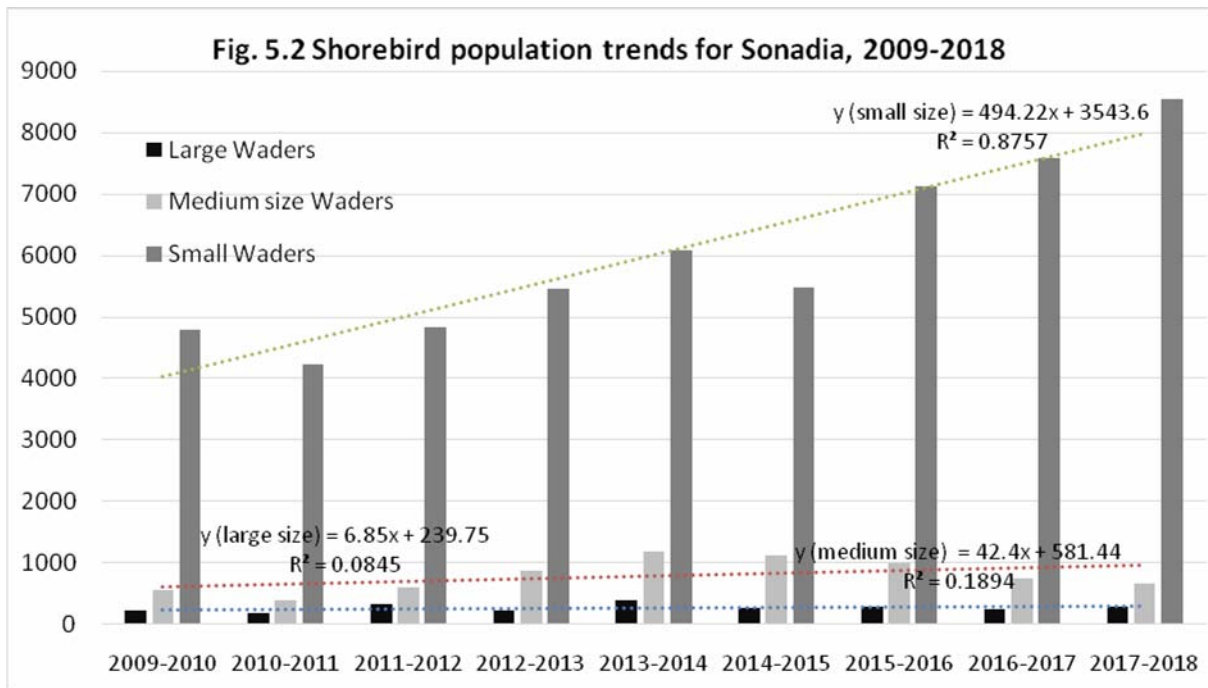
In general, shorebird numbers on Sonadia have increased between 2009 and 2018, with a linear trend of an additional 500 birds per year, and the sum of species maximum counts in each of the last four years surveyed was higher than that of the first four years surveyed (Fig.5.1).



Although total shorebird numbers appear to be increasing (Fig. 5.1), low totals during the initial

two years of surveys (2009-2010) could also be because at that time the survey team's knowledge of Sonadia Island was partial, and there were fewer counts of shorter duration - censuses were conducted only in October, January and March (but in the other seven years counts were made in every month of the winter, and this may affect the peak count). On the other hand methods were comparable in the other seven years, so there is most likely a real increase in shorebirds, which may be at least in part a result of the mitigation of shorebird hunting and the associated human disturbance.

The numbers of smaller shorebirds (species with a mid-point of the mass ranges given in Handbook of Birds of the World Alive (2017) of under 100 g, mostly (sandpipers, stints and sandplovers) show a strongly increasing trend (Fig. 5.2,  $R^2 = 0.88$ ), whereas medium sized species (mass between 100 and 300 g) and large species (mass greater than 300 g – Eurasian Curlew, Whimbrel, and godwits) as categories both show no real trends (weak increasing, increase then decrease or near static trends).



At species level, the number of years with data is limited to determine trends, and most shorebird species are considered to fluctuate in numbers or to be stable, or show small but non-significant changes over time (Table 5.2). Only Lesser Sand (Mongolian) Plover (a common widespread species) and Great Knot (globally endangered) appear to be increasing, while three globally widespread species that occur on Sonadia Island in modest numbers appear to be declining: Common Greenshank, Terek Sandpiper and Dunlin (comparing mean of annual peak counts 2009-14 with 2014-2018, t-tests showing significant differences,  $p < 0.05$ ). The other threatened and near-threatened species are probably in stable numbers, and it is notable that the rarest species globally (Spoon-billed Sandpiper) has the most stable numbers between years of all the species recorded.

## 5.2 Importance of Sites within Sonadia

In mid-winter (AWC) counts Kaladia held the highest numbers and diversity of shorebirds and waterbirds in the four years with detailed site counts supported by CREL and others (Table 5.3), being the only site of some importance for ducks as well as shorebirds. The three globally threatened shorebird species were all only found in Kaladia and Khorir Char in mid-winter, except that in 2017 Tajjalkata held unusually high numbers of shorebirds including a flock of Great Knot. The conservation of Kaladia is particularly important, but other areas should not be neglected as conditions and importance for waterbirds can change between years, months, and tidal conditions.

Considering other months, Belekardia held high numbers of shorebirds in the early winter in 2017-18, for example 5,774 in December 2017 (87% of all waterbirds counted on Sonadia that month), but numbers dropped later in the winter. However, Kaladia consistently supports large numbers of waterbirds throughout the October to March wintering season each year, for example 5,992 in December 2015 (83% of all waterbirds counted on Sonadia Island that month) and 4,045 waterbirds in February 2016 (58% of all waterbirds counted on Sonadia Island in that month). Moreover, Kaladia held over 90% of the Critically Endangered Spoon-billed Sandpiper *Calidris pygmaea* of Sonadia Island throughout the season with maximum counts of 23 in January 2015, 22 individuals in March 2016, and 18 in February-March 2018. This indicates that Kaladia is overall the most important site of Sonadia Island for waterbirds.



**Table 5.2 Peak counts of wintering shorebirds in Sonadia ECA 2009-2017**

Species	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	Maximum count	Average	Trend
Sponsors	Explorers Club + OBC	SBSTF	SBSTF/USFWS	SOS + RSPB	SOS + RSPB	CREL + RSPB	CREL + RSPB	RSPB + ICFC	ICFC			
Grey Plover <i>Pluvialis squatarola</i>	18	80	210	400	586	560	330	240	244	586	296.4	Increase
Pacific Golden Plover <i>Pluvialis fulva</i>	0	0	0	2	0	4	10	47	12	47	8.3	
Kentish Plover <i>Charadrius alexandrinus</i>	117	119	492	800	25	28	175	163	250	800	241.0	Fluctuate
Lesser Sand Plover <i>Charadrius mongolus</i>	907	1232	1160	1290	1550	2220	3300	2700	2100	3300	1828.8	<b>Increase</b>
Greater Sand Plover <i>Charadrius leschenaultii</i>	646	545	700	277	550	480	1065	720	900	1065	653.7	Stable
Unidentified Sandplover	1000	550	400	500	10	40	200	300	350	1000	372.2	N/A
Whimbrel <i>Numenius phaeopus</i>	22	55	92	35	44	30	21	22	150	150	52.3	Stable
Eurasian Curlew <i>Numenius arquata</i> <b>NT</b>	120	88	117	77	210	210	227	160	90	227	144.3	Increase
Bar-tailed Godwit <i>Limosa lapponica</i>	20	34	110	100	82	40	45	65	46	110	60.2	Fluctuate
Black-tailed Godwit <i>Limosa limosa</i> <b>NT</b>	70	3	6	10	65	0	0	0	0	70	17.1	Decrease
Ruddy Turnstone <i>Arenaria interpres</i>	23	39	93	30	43	28	38	20	35	93	38.8	Stable
Great Knot <i>Calidris tenuirostris</i> <b>EN</b>	270	110	120	160	335	420	450	265	254	450	264.9	<b>Increase</b>
Red Knot <i>Calidris canutus</i> <b>NT</b>	21	12	5	0	35	0	10	5	10	35	10.9	Fluctuate
Broad-billed Sandpiper <i>Calidris falcinellus</i>	105	136	513	190	884	400	839	530	885	885	498.0	Increase
Curlew Sandpiper <i>Calidris ferruginea</i> <b>NT</b>	817	543	400	226	854	280	533	688	450	854	532.3	Stable
Temminck's Stint <i>Calidris temminckii</i>	100	33	0	141	30	36	40	0	0	141	42.2	Fluctuate
Long-toed Stint <i>Calidris subminuta</i>	0	8	0	6	0	4	0	0	0	8	2.0	
Spoon-billed Sandpiper <i>Calidris pygmaea</i> <b>CR</b>	25	24	24	26	26	23	22	20	24	26	23.8	Stable
Little & Red-necked Stint	898	843	710	1550	1800	1670	750	2270	3360	3360	1537.9	Increase
Sanderling <i>Calidris alba</i>	20	21	45	200	50	39	35	20	12	200	49.1	Fluctuate
Dunlin <i>Calidris alpina</i>	20	33	63	53	40	20	11	7	20	63	29.7	Stable
Asian Dowitcher <i>Limnodromus semipalmatus</i> <b>NT</b>	2	0	0	0	0	0	0	0	0	2	0.2	
Terek Sandpiper <i>Xenus cinereus</i>	95	76	65	80	57	30	50	45	40	95	59.8	<b>Decrease</b>
Common Sandpiper <i>Actitis hypoleucos</i>	1	3	7	8	2	2	3	5	2	8	3.7	Stable
Common Greenshank <i>Tringa nebularia</i>	114	75	92	86	60	54	55	35	43	114	68.2	<b>Decrease</b>
Common Redshank <i>Tringa tetanus</i>	78	81	77	190	100	48	87	130	70	190	95.7	Fluctuate
Wood Sandpiper <i>Tringa glareola</i>	8	12	0	6	53	30	20	0	0	53	14.3	Fluctuate
Marsh Sandpiper <i>Tringa stagnatilis</i>	11	44	101	54	150	172	70	112	110	172	91.6	Increase
Spotted Greenshank <i>Tringa guttifer</i> <b>EN</b>	28	5	3	1	25	6	13	5	4	28	10.0	Fluctuate
Oriental Pratincole <i>Glareola maldivarum</i>	15	0	23	0	0	0	0	0	0	23	4.2	Decline
Small Pratincole <i>Glareola lacteal</i>	12	11	123	50	0	11	25	12	30	123	30.4	Fluctuate
<b>Total Number</b>	<b>5583</b>	<b>4815</b>	<b>5751</b>	<b>6548</b>	<b>7666</b>	<b>6885</b>	<b>6855</b>	<b>8586</b>	<b>9491</b>	<b>14278</b>	7082.1	
<b>Total Species</b>	<b>28</b>	<b>27</b>	<b>25</b>	<b>27</b>	<b>25</b>	<b>26</b>	<b>26</b>	<b>24</b>	<b>24</b>	<b>30</b>		

Sponsors: CREL – Climate Resilient Ecosystems and Livelihoods project; ICFC - International Conservation Fund of Canada, OBC – Oriental Bird Club, RSPB – Royal Society for the Protection of Birds, SBSTF – Spoon-billed Sandpiper Task Force, SOS – Save Our Species.

Global extinction threat status (BirdLife 2017): NT – Near-threatened, VU – vulnerable, EN – endangered, CR – critically endangered

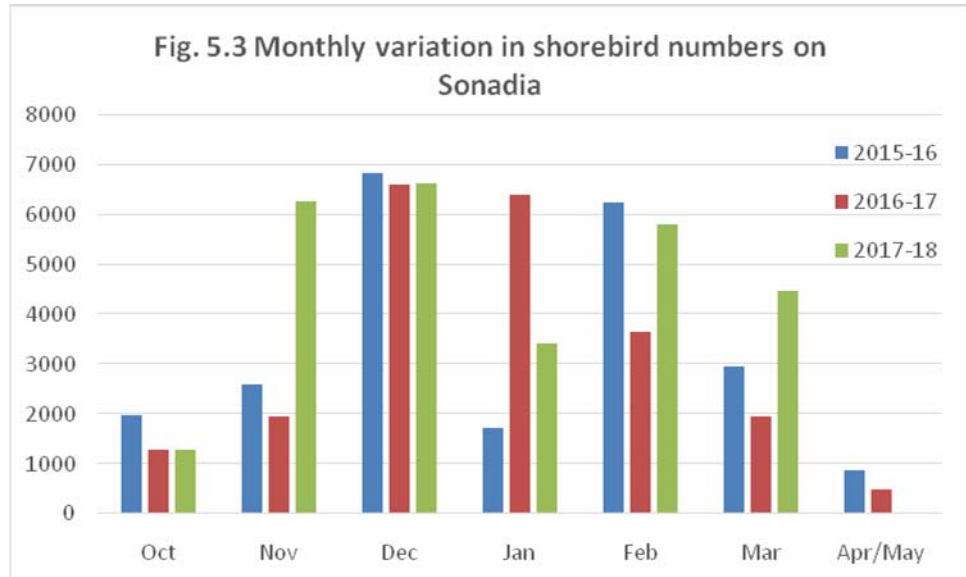
**Table 5.3 Waterbird species recorded by sub-sites within Sonadia in mid-winter census 2015 to 2018**

Species	23-24 January 2015					10 & 11 January 16					6 & 7 January 2017					23-24 January 2018				
	Tajjakata	Balakerdia	Kaladia	Khorirchor	Total	Tajjakata	Belekardia	Kaladia	Khorir Char	Total	Tajjakata	Belekardia	Kaladia	Khorir Char	Total	Tajjakata	Belekardia	Kaladia	Khorir Char	Total
Bar-headed Goose <i>Anser indicus</i>					0					0		6		6						0
Common Shelduck <i>Tadorna tadorna</i>					0					0			4	4						0
Northern Shoveller <i>Spatula clypeata</i>			150		150			40		40			10	10			40	68	108	
Gadwall <i>Mareca strepera</i>					0			25		25				0						0
Eurasian Wigeon <i>Mareca penelope</i>					0			10		10				0						0
Northern Pintail <i>Anas acuta</i>					0			20		20				0						0
<b>Black-headed Ibis <i>Threskioris melanocephalus</i> NT</b>			17		17					0		2	23	25			11			11
Indian Pond Heron <i>Ardeola grayii</i>	10		12	2	24	1				1				0	10		8			18
Grey Heron <i>Ardea cinerea</i>			4		4					0				0			6			6
Great Egret <i>Ardea alba</i>	2		11		13					0				0	30		17	1		48
Little Egret <i>Egretta garzetta</i>	9		12		21	10				10				0	34		14			48
Little Cormorant <i>Microcarbo niger</i>	9	2	15		26	20				20				0	29		5	5		39
Grey Plover <i>Pluvialis squatarola</i>	30		100		130	30		110	190	330	80	10	150	240	110	1	55			166
Pacific Golden Plover <i>Pluvialis fulva</i>					0				10	10				0						0
Kentish Plover <i>Charadrius alexandrinus</i>					0					0	2	12	33	2	49		23	50	20	93
Lesser Sandplover <i>Charadrius mongolus</i>	100		400	100	600	150	170	300	100	720	400	150	2000	150	2700		56	900	80	1036
Greater Sandplover <i>Charadrius leschenaultii</i>			200	50	250	30	20	50	20	120	100	50	500	50	700		9	300	30	339
Whimbrel <i>Numenius phaeopus</i>					0			3		3	5	2	1	8	57		3	4		64
<b>Eurasian Curlew <i>Numenius arquata</i> NT</b>			100	110	210	3		114	110	227	20	20	25	65	36		30	12		78
Bar-tailed Godwit <i>Limosa lapponica</i>			10		10			17	1	18		7	10	17			14			14
Ruddy Turnstone <i>Arenaria interpres</i>					0		10	5		15		5	15	20			8			8
<b>Great Knot <i>Calidris tenuirostris</i> EN</b>			120	300	420			60	100	160	80		33	113			40			40
<b>Red Knot <i>Calidris canutus</i> NT</b>					0			10		10				0			2			2
Broad-billed Sandpiper <i>Calidris. falcinellus</i>			250	15	265		50	50	80	180	50		100	150			130	8		138
<b>Curlew Sandpiper <i>Calidris ferruginea</i> NT</b>					0	10	70	100	120	300	50	10	200	260	22		400	15		437
Temminck's Stint <i>Calidris temminckii</i>	200		300	5	505					0				0						0
<b>Spoon-billed Sandpiper <i>Calidris pygmeus</i></b>			23		23	1		15	3	19			14	14			15			15

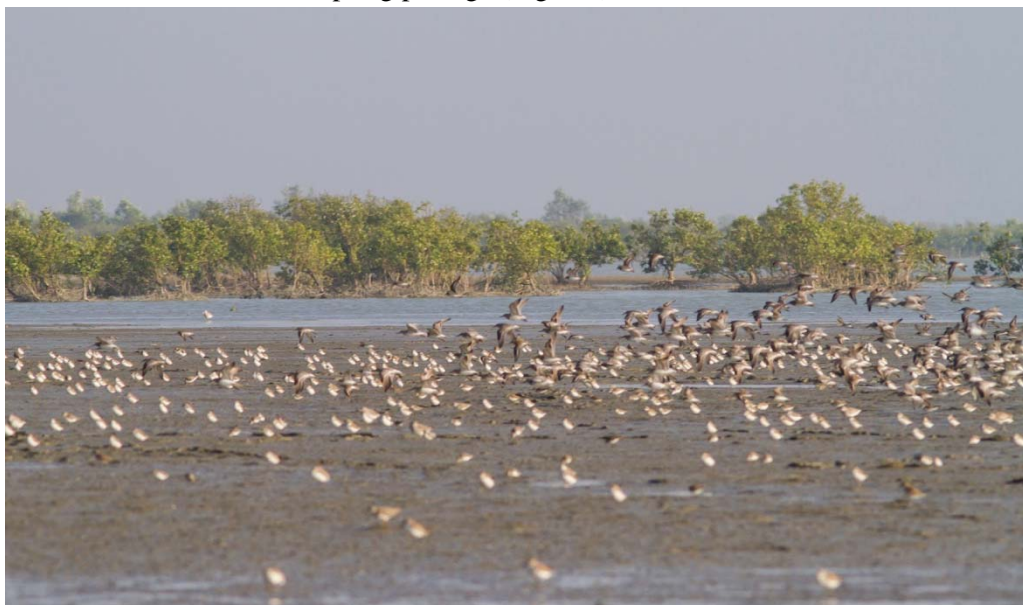
Species	23-24 January 2015					10 & 11 January 16					6 & 7 January 2017					23-24 January 2018				
	Tajikata	Balakerdia	Kaladia	Khorirchor	Total	Tajikata	Belekardia	Kaladia	Khorir Char	Total	Tajikata	Belekardia	Kaladia	Khorir Char	Total	Tajikata	Belekardia	Kaladia	Khorir Char	Total
<b>CR</b>																				
Little Stint <i>Calidris minuta</i> & Red-necked Stint <i>Calidris ruficollis</i>					0	30	20	100	30	180	500	25	300		825	12	4	500	10	526
Sanderling <i>Calidris alba</i>				4	4	2	10	2		14	8				8		1	1		2
Dunlin <i>Calidris alpina</i>			100	150	250					0					0			3		3
Terek Sandpiper <i>Xenus cinereus</i>			13	5	18			20	25	45	5		35	1	41		4	12	4	20
Common Sandpiper <i>Actitis hypoleucos</i>					0					0					0		2			2
Common Greenshank <i>Tringa nebularia</i>	10		10		20	20		10	1	31	20	3			23	1	6	5		12
Common Redshank <i>Tringa tetanus</i>			30		30	15		20		35	50	20			70	13	12			25
Marsh Sandpiper <i>Tringa stagnatilis</i>			25		25	20		3		23	70	2	40		112	8	10	25		43
<b>Spotted Greenshank <i>T. guttifer</i> EN</b>				6	6			3	10	13			2		2			2		2
Small Pratincole <i>Glareola lacteal</i>					0					0					0				10	10
Slender-billed Gull <i>Larus genei</i>					0	3				3					0		1			1
Brown-headed Gull <i>Larus brunicephalus</i>	21	40	12	11	84	100	15		12	127	200				200	19	22	1	4	46
Pallas's Gull <i>Larus ichthyæus</i>	2	54	7	1	64	10	1		18	29					0		25		32	57
Lesser Black-backed (Heuglin's) Gull <i>Larus fusca (heuglini)</i>					0					0					0		5			5
Little Tern <i>Sternula albifrons</i>	11	22	12	15	60		30		20	50	30	8			38		22	15		37
Common Gull-billed Tern <i>Gelochelidon nilotica</i>	2	5	12	11	30		1			1					0					0
Whiskered Tern <i>Chlidonias hybrida</i>	11	21	3		35					0					0					0
Common Tern <i>Sterna hirundo</i>					0	30			25	55					0					0
Great Crested Tern <i>Thalasseus bergii</i>					0	11				11					0		2	1		3
<b>Total Shorebirds</b>	<b>340</b>	<b>0</b>	<b>1681</b>	<b>745</b>	<b>2766</b>	<b>311</b>	<b>350</b>	<b>992</b>	<b>800</b>	<b>2453</b>	<b>1440</b>	<b>316</b>	<b>3458</b>	<b>203</b>	<b>5417</b>	<b>409</b>	<b>128</b>	<b>2695</b>	<b>193</b>	<b>3425</b>
<b>Total Shorebird species</b>	<b>4</b>	<b>0</b>	<b>14</b>	<b>10</b>	<b>16</b>	<b>11</b>	<b>7</b>	<b>19</b>	<b>14</b>	<b>20</b>	<b>15</b>	<b>13</b>	<b>16</b>	<b>4</b>	<b>19</b>	<b>9</b>	<b>11</b>	<b>21</b>	<b>10</b>	<b>24</b>
<b>Total Waterbirds</b>	<b>417</b>	<b>144</b>	<b>1948</b>	<b>785</b>	<b>3294</b>	<b>455</b>	<b>438</b>	<b>1087</b>	<b>875</b>	<b>2855</b>	<b>1670</b>	<b>332</b>	<b>3495</b>	<b>203</b>	<b>5700</b>	<b>531</b>	<b>205</b>	<b>2813</b>	<b>303</b>	<b>3852</b>
<b>Total Waterbirds Species</b>	<b>13</b>	<b>6</b>	<b>26</b>	<b>15</b>	<b>28</b>	<b>17</b>	<b>13</b>	<b>23</b>	<b>18</b>	<b>34</b>	<b>17</b>	<b>16</b>	<b>19</b>	<b>4</b>	<b>25</b>	<b>14</b>	<b>17</b>	<b>31</b>	<b>15</b>	<b>37</b>

### 5.3 Seasonal Variation in Shorebird Numbers

A total of 46 species of waterbirds were recorded between October 2015 and April 2016 (Table 5.4), compared with 37 between January and April 2015. Monthly counts are only available for shorebirds for a full set of seven consecutive months (October to April/May) for three years (2015-16, 2016-17, 2017-18) while counts for



shorebirds are also available for January to April 2015 (Table 5.4). The most abundant species were Lesser Sandplover *Charadrius mongolus* followed by Greater Sandplover *Charadrius leschenaultia*, Broad-billed Sandpiper *Calidris falcinellus*, and Red-necked/Little Stints. Shorebird numbers showed a distinct bi-polar pattern in winter 2015-16 and winter 2017-18 with unusually low numbers in January, this is believed to be a result of survey timing. The 2016 January counts took place during spring high tides when shorebirds disperse and presumably moved to other roosting and feeding areas, in other months and years the surveys took place during neap tides which give more time to safely cross mudflats to count birds. The monthly count pattern of 2015-16 and 2017-18 was not repeated in 2016-17 when December and January had the highest numbers. The high count in November 2017 was at the end of the month. In general it appears that shorebird numbers peak in Sonadia in December, with relatively low numbers on autumn and spring passage (Fig. 5.3).



Migratory shorebird flock at Kaladia, Sonadia Island

Photo: Sayam Chowdhury

**Table 5.4 Monthly variations in waterbird numbers on Sonadia in winters 2014-15 and 2015-16**

Species	Jan15	Feb 15	Mar 15	Apr 15	14-15 max	Oct 15	Nov 15	Dec 15	Jan 16	Feb 16	Mar 16	Apr 16	15-16 max
Cotton Pygmy Goose <i>Nettapus coromandelianus</i>													0
Northern Shoveller <i>Spatula clypeata</i>	150				150	10	225	104	40	75	155	0	225
Gadwall <i>Anas strepera</i>					0								0
Eurasian Wigeon <i>Anas penelope</i>					0	0	0	0	10	0	0	0	10
Northern Pintail <i>Anas acuta</i>					0	0	0	20	20	0	0	0	20
<b>Black-headed Ibis <i>Threskiornis melanocephalus</i> NT</b>	17				17	0	11	28	0	11	30	0	30
Indian Pond Heron <i>Ardeola grayii</i>	24				24	8	32	15	1	21	4	0	32
Grey Heron <i>Ardea cinerea</i>	4				4	6	1	1	0	8	8	4	8
Great Egret <i>Ardea alba</i>	13				13	1	14	7	0	19	6	0	19
Intermediate Egret <i>M. intermedia</i>	8				8	1	0	0	0	14	3	0	14
Little Egret <i>Egretta garzetta</i>	21				21	9	4	16	10	27	10	8	27
Little Cormorant <i>Microcarbo niger</i>	26				26	8	12	20	20	50	28	1	50
Grey Plover <i>Pluvialis squatarola</i>	130	400	40	80	400	9	80	210	330	112	165	75	330
Pacific Golden Plover <i>Pluvialis fulva</i>	0	0	0	4	4	0	3	0	10	7	0	0	10
Kentish Plover <i>Charadrius alexandrinus</i>	0	0	20	0	20	0	0	50	0	67	175	0	175
Lesser Sand Plover <i>Charadrius mongolus</i>	600	600	920	450	920	1155	1242	3300	0	2510	1410	445	3300
Greater Sand Plover <i>Charadrius leschenaultii</i>	250	150	250	100	250	200	400	1065	120	710	220	100	1065
Unidentified Sandplover					0	0	0	0	0	200	0	0	200
Whimbrel <i>Numenius phaeopus</i>	0	12	22	7	22	2	21	10	3	12	14	6	21
<b>Eurasian Curlew <i>Numenius arquata</i> NT</b>	210	140	35	30	210	5	190	60	227	158	61	2	227
Bar-tailed Godwit <i>Limosa lapponica</i>	10	20	25	2	25	4	30	22	18	35	45	15	45
<b>Black-tailed Godwit <i>Limosa limosa</i> NT</b>					0	0	0	0	0	0	0	0	0
Ruddy Turnstone <i>Arenaria interpres</i>	0	2	25	18	25	7	5	35	15	38	20	2	38
<b>Great Knot <i>Calidris tenuirostris</i> EN</b>	420	100	100	40	420	65	101	450	160	84	73	1	450
<b>Red Knot <i>Calidris canutus</i> NT</b>					0	0	0	0	10	5	0	0	10
Broad-billed Sandpiper <i>Calidris falcinellus</i>	265	215	100	70	265	60	20	240	180	839	337	45	839
<b>Curlew Sandpiper <i>Calidris ferruginea</i> NT</b>	250	170	110	32	250	230	60	390	300	533	118	70	533
Temminck's Stint <i>Calidris temminckii</i>	0	30	35	10	35	0	40	0	0	2	0	0	40
<b>Spoon-billed Sandpiper <i>Calidris pygmeus</i> CR</b>	23	19	9	3	23	1	14	18	19	18	22	0	22
Little Stint & Red-necked Stint	505	405	209	200	505	160	230	740	180	716	126	35	740
Sanderling <i>Calidris alba</i>	4	1	4	2	4	30	35	25	14	27	17	8	35
Dunlin <i>Calidris alpina</i>	0	0	20	5	20	0	0	0	0	11	7	4	11
Terek Sandpiper <i>Xenus cinereus</i>	18	11	17	8	18	30	50	27	45	49	29	19	50
Common Sandpiper <i>Actitis hypoleucos</i>	0	0	2	2	2	1	3	0	0	3	1	0	3
Common Greenshank <i>Tringa nebularia</i>	20	20	19	10	20	12	10	55	31	16	17	22	55
Common Redshank <i>Tringa tetanus</i>	30	30	20	16	30	18	45	87	35	76	74	18	87
Wood Sandpiper <i>Tringa glareola</i>	0	0	2	5	5	1	20	0	0	0	0	0	20
Marsh Sandpiper <i>Tringa stagnatilis</i>	25	0	8	8	25	3	3	70	23	20	8	0	70
<b>Spotted Greenshank <i>Tringa guttifer</i> EN</b>	<b>6</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>13</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>13</b>

Species	Jan15	Feb 15	Mar 15	Apr 15	14-15 max	Oct 15	Nov 15	Dec 15	Jan 16	Feb 16	Mar 16	Apr 16	15-16 max
Oriental Pratincole <i>Glareola maldivarum</i>					0								0
Small Pratincole <i>Glareola lacteal</i>					0	0	0	0	0	5	25	10	25
Slender-billed Gull <i>Larus genei</i>					0	0	0	3	3	0	7	0	7
Brown-headed Gull <i>Larus brunnicephalus</i>	84				84	0	5	70	127	380	131	0	380
Pallas's Gull <i>Ichthyaetus ichthyaeus</i>	64				64	4	10	2	29	23	3	0	29
Lesser Black-backed Gull <i>Larus fuscus</i>					0	0	0	0	0	6	0	0	6
Little Tern <i>Sterna albifrons</i>	60				60	0	0	10	50	27	12	14	50
Gull-billed Tern <i>Gelochelidon nilotica</i>	30				30	0	0	0	1	4	0	0	4
Whiskered Tern <i>Chlidonias hybrida</i>	35				35	10	0	0	0	0	0	0	10
Common Tern <i>Sterna hirundo</i>					0	0	0	0	55	2	0	0	55
Lesser Crested Tern <i>Thalasseus bengalensis</i>					0								0
Great Crested Tern <i>Thalasseus bergii</i>					0	0	0	0	11	0	0	0	11
<b>Total shorebirds</b>	<b>2766</b>	<b>2328</b>	<b>1995</b>	<b>1102</b>	<b>3504</b>	<b>1993</b>	<b>2602</b>	<b>6855</b>	<b>1733</b>	<b>6257</b>	<b>2965</b>	<b>877</b>	<b>8414</b>
<b>Shorebird species</b>	<b>16</b>	<b>18</b>	<b>23</b>	<b>22</b>	<b>24</b>	<b>19</b>	<b>21</b>	<b>19</b>	<b>19</b>	<b>26</b>	<b>22</b>	<b>17</b>	<b>27</b>
<b>Total waterbirds</b>	<b>3302</b>				<b>4040</b>	<b>2050</b>	<b>2916</b>	<b>7151</b>	<b>2110</b>	<b>6924</b>	<b>3362</b>	<b>904</b>	<b>9401</b>
<b>Waterbird species</b>	<b>29</b>				<b>37</b>	<b>28</b>	<b>30</b>	<b>31</b>	<b>32</b>	<b>40</b>	<b>34</b>	<b>21</b>	<b>46</b>



Two globally Endangered shorebirds of Sonadia Island: Spotted Greenshank (left and center) and Great Knot (right)

Photo: Sayam Chowdhury

## 5.4 Spoon-billed Sandpiper

Sonadia is one of the most important wintering areas for the critically endangered Spoon-billed Sandpiper – a regular wintering population of 22-24 birds represents over 5% of the global population. Major efforts are being made to help this charismatic small shorebird with its uniquely specialized bill which remains at risk of imminent extinction. Efforts to protect nesting birds and to help rear chicks up to fledging to reduce nesting ground predation need to be complemented to strong protection on migration staging and wintering grounds. At Sonadia the BSCP had already worked with local communities to end shorebird hunting and change the occupations of hunters during 2011-12, as well as with VCGs to raise awareness of this species and other shorebirds and to regularly guard high tide roosts. It continued these conservation measures through the monitoring period.

In order to evaluate the effectiveness of the hunting mitigation scheme and awareness programs, a semi-structured questionnaire survey was conducted in December 2016 in and around Sonadia Island by the BSCP team. A total of 46 villagers and 17 ex-hunters were individually interviewed in and around Sonadia. To avoid bias an independent researcher carried out the survey.

Every respondent in the survey knew that migratory birds arrive on the island in early winter and stay throughout the winter. Among 47 respondents, only three had not heard about the Spoon-billed Sandpiper.

Many villagers know about Spoon-billed Sandpipers through billboards, posters or leaflets that have been distributed by BSCP, but 80% of the interviewees heard about the Spoon-billed Sandpiper via the school programs and boat race (Nouka Baich). Less than 10% of the respondents attended the village drama (Jatraa). Half of the respondents had attended at least one event organized by BSCP. About 30% of the respondents knew about the events but did not attend, and the remaining 20% were not aware of these events.

All the respondents said there is no more hunting in the area. According to the survey responses, hunting stopped around five years ago (2011). The main reasons given for hunting ending were strict laws and regulations, education and higher profitability of catching crabs and shrimp farming.

In winter 2014-15 the survey team spotted a flagged (Light Green 09) Spoon-billed Sandpiper which remained throughout the winter (November 2014 - March 2015). This female was captured and marked on 15 June 2014 on her nest after her eggs were taken for artificial incubation in Meinypilgyno, Chukotka, Russia. Her replacement clutch was found on 27 June and last seen with the hatchings in the second nest on 18-19 July 2014. This bird was later seen on 17 August 2014 in Yangkou, Rudong, China then finally on Sonadia Island, Bangladesh in November 2014.



**Flagged Spoon-billed Sandpiper – Light Green V4 January 2016**

Photo: Sayam Chowdhury

In winter 2015-16 the survey team spotted four Spoon-billed Sandpipers with

engraved leg flags between November 2015 and March 2016, these included the same female - Light Green 09 - which had spent winter 2014-15 at Sonadia, and she again spent all winter at Sonadia in 2015-16. In winter 2016-17 three birds with engraved leg flags were observed, including two returning birds from winter 2015-16. All flagged birds were captured and marked in Meinypilgyno, Chukotka, Russia (Table 5.5).

In winter 2017-18 five marked birds were recorded including two females returning for their respectively third and fourth consecutive winters. The first two “head started” juveniles were recorded (eggs removed from the nest for artificial incubation, with the chicks reared in captivity adjacent to the nesting grounds to improve survival rates and then released on site when capable of flight. Also in this winter the first bird marked on its migration route was recorded having been flagged in Kamchatka, see Table 5.5 for full details).

**Table 5.5 Details of marked Spoon-billed Sandpipers seen on Sonadia Island between December 2014 and February 2017.**

Flag details (leg)	Marked at	First seen	Last seen
<b>Winter 2014-15</b>			
Light green 09 (L)	Adult female marked on 15 June 2014 on her nest in Meinypilgyno, Chukotka, Russia	15 Dec 2014	26 March 2015
<b>Winter 2015-16</b>			
Light green 09 (L)	See 2014-15, returning individual spending 2 <sup>nd</sup> consecutive winter on Sonadia	12 Nov 2015	16 March 2016
Light green A2 (R)	Wild chick marked ca. 25 km west of Meinypilgyno, Chukotka, Russia on 8 July 2014	12 Nov 2015	12 Nov 2015
Light green 31 (L)	Adult female marked (with ring KA05213) on her nest on 6 July 2015 north on Meinypilgyno	20 Dec 2015	16 March 2016
Light green V4 (R)	Marked as juvenile (offspring of the headstarted female lime '8' and wild male lime '21'). This bird was marked with ring KA05214 on 12 July 2015 close to the nest in Meinypilgyno, Chukotka, Russia where it hatched	20 Dec 2015	12 Jan 2016
<b>Winter 2016-17</b>			
Light green 09 (L)	See 2014-15, returning individual spending 3 <sup>rd</sup> consecutive winter on Sonadia	21 Nov 2016	6 March 2017
Light green 07 (L)	Adult male marked on its nest on 23 June 2013 in Meinypilgyno, Chukotka, Russia	21 Nov 2016	17 Feb 2017
Light green 31 (L)	See 2015-16, returning individual spending 2 <sup>nd</sup> consecutive winter on Sonadia	21 Nov 2016	17 Feb 2017
<b>Winter 2017-18</b>			
Light green 09	See 2014-15, returning individual spending 4 <sup>th</sup> consecutive winter on Sonadia	24 Jan 2018	9 Mar 2018
White 3C	Hatched on 7 July 2017 in Chukotka, Russia, released into the wild on 28 July 2017, observed at the release area on 4 August 2017. Seen at Yabu Island, Korea on 23 September 2017.	25 Jan 2018	9 Mar 2018
White 3M	Hatched on 7 July 2017 in Chukotka, Russia, released into the wild on 28 July 2017, observed at the release area on 4 August 2017.	24 Jan 2018	9 Mar 2018
Yellow VE	Flagged on August 18, 2017 in Kamchatka (Russia, Kamchatka, Sobolevo district, Ustyevoe N 54.10 'E 155.50) by Dr. Yu. Gerasimov.	8 Feb 2018	12 Feb 2018
Light green 31	See 2015-16, returning individual spending 3 <sup>rd</sup> consecutive winter on Sonadia	9 Mar 2018	9 Mar 2018

Note that so far only one male has been recorded, although similar numbers of males and females have been flagged, females are heavier and may be able to perform longer migrations. Also returning individuals are adult females, while first winter birds recorded on Sonadia in 2015-16 and 2016-17 were not recorded in subsequent years. The stable wintering population on Sonadia and two returning birds that



were first flagged as adults suggests that survival of adults may be quite high despite this species being a small bird making long distance migrations (factors often associated with short lifespans).

## 5.5 Conservation Significance and Concerns

### 5.5.1 Conservation value

Although Sonadia Island is recognized as an ECA and IBA, the island qualifies for a higher protection category, both nationally (national park/marine protected area) and internationally (Ramsar site). The Island meets the qualifying criteria as an internationally important wetland under Ramsar Criterion 4, 5 and 6 as it is a major site for migratory shorebirds, waterfowl, gulls and terns and provides refuge for many resident species such as Small Pratincole, as well as terns, egrets and herons. Nine globally threatened and near-threatened waterbird species have been recorded on Sonadia:



Flagged Spoon-billed Sandpiper “VE” at Sonadia in winter 2017-18

Photo: Sayam Chowdhury

- It regularly supports more than 1% of the individuals in the global population of two globally threatened birds:
  - Spoon-billed Sandpiper (see Section 5.5) and
  - Spotted or Nordmann’s Greenshank *Tringa guttifer* (Endangered, maximum 13 in January 2016, recorded in all winters, average 11 birds).
- Flocks of Great Knot *Calidris tenuirostris* (Endangered, maximum 450 in December 2015) are regular each winter, peak counts averaging 260 birds per winter.
- Of the near threatened species, the most numerous are:
  - Curlew Sandpiper *Calidris ferruginea* (maximum 533 in December 2015, average over 500 per winter) and
  - Eurasian Curlew *Numenius arquata* (maximum 227 in December 2015, average 150 per winter).
- Other near threatened waterbirds recorded comprise:
  - Black-tailed Godwit *Limosa limosa* (present in small numbers in some months,
  - Red Knot *Calidris canutus* (maximum ten in January 2016), and
  - Black-headed Ibis *Threskiornis melanocephalus* (maximum 30 in March 2016).

Sonadia is also an important nesting ground for both Olive Ridley Turtle *Lepidochelys olivacea* and Green Turtle *Chelonia mydas*, which are respectively categorized as “vulnerable” and “endangered” in the 2010 IUCN Red List of Threatened Species. Moreover three species of endangered cetaceans, Finless Porpoise *Neophocaena phocaenoides*, Irrawaddy Dolphin *Orcaella brevirostris* and Bottlenose Dolphin *Tursiops aduncus*, occur in the channels, and the offshore and near-shore areas around the island. Sonadia Island as a whole clearly meets three Ramsar criteria and probably meets a fourth. Moreover all the four sites we surveyed meet the 1% threshold of Criterion 6 by themselves (CWBMP 2006; Chowdhury *et al.* 2011).

## 5.5.2 Conservation concerns and threats

There are several major known threats from planned development projects that would affect Sonadia in part or as a whole, including **aproposed deep-sea port, tourism, a major power plant, and gas pipelines**. For example, a 1,200 megawatt coal-fired power plant at Matarbari of Maheshkhali, c.15 km north from the key shorebird site (Khan 2014), Liquefied Natural Gas terminals at Maheshkhali (Rasel 2017) and tourism development by Bangladesh Economic Zone Authority. These projects will acquire 3,831 ha or 78% of Sonadia Island ECA, of which 20% is intended to be for infrastructure development, despite promises that development will be eco-friendly (Patwary 2017).

**Shorebird hunting** was reported from Sonadia Island (Chowdhury 2010) but subsequently has been addressed by providing alternative livelihood support to 25 bird trappers in and around Sonadia Island and has been successfully ended since 2011 (Section 5.5). During 2011-2014, the Village Conservation Groups (VCGs) monitored the new livelihood activities provided to former shorebird hunters and they repaid a small percentage of the income generated to their VCG. The VCGs then used this money for further hunting mitigation and shorebird conservation awareness activities (e.g. billboards, school campaign) within their villages. The entire process is being monitored and guided by BSCP and has proven to be very successful (Section 5.5).

Habitat degradation is also a threat, and in this case mainly relates to conversion of coastal habitats that shorebirds depend on to trees.

**Mangrove reforestation** is a common strategy for coastal rehabilitation and climate change adaptation in Bangladesh (Iftekhar and Island 2004). Similarly, mangrove plantations made by the Forest Department and other parties have been a growing practice across various mudflats of Sonadia Island. Evidence suggests that mangrove plantations reduce the available feeding grounds of shorebirds (Custodio 1996), therefore these should be avoided at least in and around the four major waterbird/shorebird sites of Sonadia Island. Intertidal mudflats should be conserved as these constitute an important habitat in themselves, supporting a high biodiversity and biomass of benthic invertebrates, sustaining productive fisheries, providing important feeding grounds for thousands of migratory shorebirds, and supporting the socio-economic livelihood of many coastal villagers who collect shellfish and crabs (Erfteemeijer and Lewis 2000).

**Jhau trees** *Casuarina* spp. were again planted at Belekardia in 2014-2015 after failed attempts in 2012-2013 by the Forest Department. The trees seem to be surviving but this is altering natural habitat. **This intervention is a substantial threat to the international ecological value of this site: the site is not only a major high tide roost for shorebirds (which require an open sandy area without trees) but also an important nesting ground for sea turtles (which again require an open upper beach free of trees)**. Further plantations in sensitive locations such as this should be avoided, and the surviving jhau saplings removed from this site, before lasting damage is suffered to the international importance of Sonadia. In future any habitat interventions (especially in case of any kind of plantation) should be made cautiously after assessment of their likely impacts on threatened species. Risk-adverse management of this internationally important wetland is necessary for the long-term conservation and management of wetland dependent species.

**Sand extraction** activities were observed at Khorir Char in January 2016 and March 2016, this is a new threat to Sonadia Island that was never been recorded before.

In brief management recommendations for Sonadia are:

1. Continue monitoring waterbird populations
2. Continue tracking livelihoods of ex-hunters, ensure there are no new entrants to hunting, and encourage local recognition and awareness of the ecological and conservation importance of the Island
3. End mangrove afforestation on mudflats used by shorebirds
4. Remove jhau saplings and trees from high tide roosts of shorebirds
5. Ban sand extraction from the Island
6. Enhance VCG involvement in conservation in terms of targeted livelihood support, awareness raising, monitoring, and low impact ecotourism away from roosting areas.



**Shorebird high-tide roost at Sonadia Island**

Photo: Sayam Chowdhury

## CHAPTER 6 NIJHUM DWIP NATIONAL PARK

### 6.1 Midwinter Waterbird Totals

On the coast, waterbirds have been counted in Nijhum Dwip National Park for 11 consecutive years – 2008-2018, as well as in 2006 when there was a systematic survey of most of the Bangladesh coastline – in fact 2006 was probably the most comprehensive count for Nijhum Dwip. In general the number of species recorded in each census ranges between 35 and 45 (Fig. 6.1), and in total 76 species of waterbird have been recorded in these eleven years. Total waterbird numbers have also fluctuated, with the highest counts of 15,000-17,000 in 2006 and 2009 and 2018. On average there was some recovery in numbers in 2014-2018 (during CREL support) compared with 2010-2013. There is no obvious association yet between waterbird numbers and conservation status or co-management, partly because it appears that peak numbers of waterbirds occur in the late winter at this site – after the traditional mid-winter census month of January. Nine near threatened and four globally threatened species are present, of which Nijhum Dwip is especially important for holding up to 43% of the global population of Indian Skimmer *Rynchops albigollis*, a globally threatened (vulnerable) species.

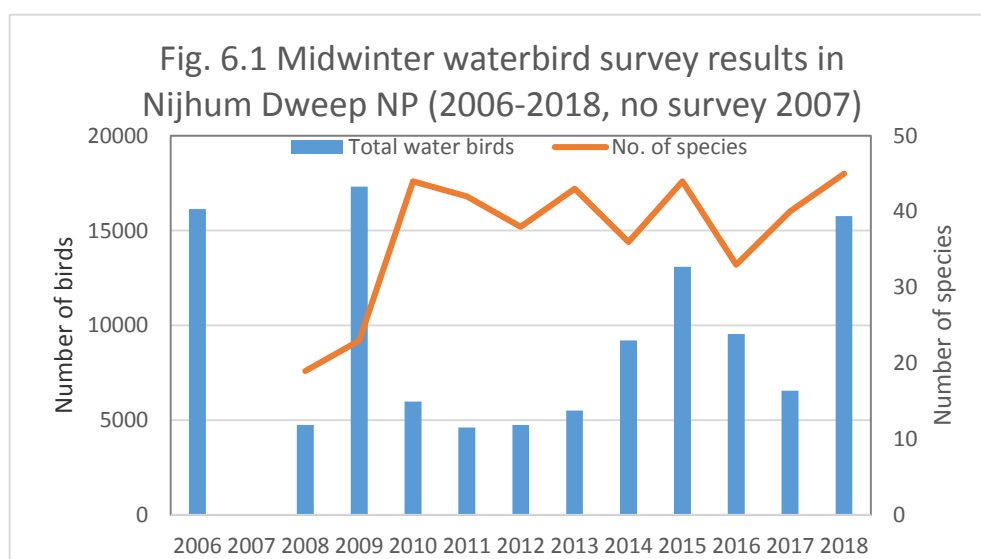


Table 6.1 details by species all of the censuses (combining census locations within the Nijhum Dwip complex, but with the vast majority of birds counted in Domar Char). Six species were recorded in internationally important numbers (over 1% of flyway population) in one or more years of surveys:

- **Common Shelduck** and **Eurasian Wigeon**, both of these ducks appear to be declining considerably (reduced to under half of past numbers) comparing the last six years (2013-18) with the previous six years;
- **Mongolian Plover** (or Lesser Sand Plover) and **Black-tailed Godwit** – both of these shorebirds have increased considerably (more than doubling in numbers) in the last six years compared with the previous six years (2006-12);
- **Brown-headed Gull** which has quadrupled in numbers in the last six years compared with the earlier six years (although this is substantially due to a very high count in 2018); and
- **Indian Skimmer** which has fluctuated in numbers but appears to be declining, halving in average numbers in the second six-year period. This is a globally vulnerable species and the main wintering concentration of this species worldwide is in coastal Bangladesh and in recent years specifically around Nijhum Dwip (see Section 6.4).

**Table 6.1 Midwinter waterbird census results for Nijhum Dwip NP 2006-2018 (mainly Domar Char plus Muktaria Channel and northeast Nijhum Dwip)**

Species	Th	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018*	Max	Av 2006-12	Av 2013-18
<b>Cormorants &amp; Darter</b>																	
Little Cormorant <i>Microcarbo niger</i>		29		3	15	27	20	4	23	22	23	1	24	14	29	18.8	15.9
<b>Hérons &amp; Egrets</b>																	
Black-crowned Night Heron <i>Nycticorax nycticorax</i>		1					1	3	2		4			4	4	0.8	1.7
Indian Pond Heron <i>Ardeola grayii</i>		7		36		33	10	60	12		32	21	7	13	60	24.3	14.2
Stiated Heron <i>Butorides stiatu</i>				5											5	0.8	0.0
Cattle Egret <i>Bubulcus ibis</i>		29		3				27	9	136	8		106	66	136	9.8	54.2
Little Egret <i>Egretta garzetta</i>		361		2	12	8	2	26	18	35	5	25	18	82	361	68.5	30.5
Intermediate Egret <i>E. intermedia</i>				54	38	17			10	21	10	15	30	13	54	18.2	16.5
Great Egret <i>E. alba</i>		880		151	55	75	7	40	146	185	48	74	39	236	880	201.3	121.3
Purple Heron <i>Ardea purpurpurea</i>					2					2	1				2	0.3	0.5
Grey Heron <i>A. cinerea</i>		4			1	1	5	2		4	1	2	2	9	9	2.2	3.0
unidentified egrets		300													300	50.0	0.0
<b>Ibis &amp; Spoonbill</b>																	
Black-headed Ibis <i>Threskiomis melanocephalus</i>	NT	63		82	31	25	20	45	34	119	18	47	47	103	119	44.3	61.3
Eurasian Spoonbill <i>Platalea leucorodia</i>		16			11	2	2	15							16	7.7	0.0
<b>Geese &amp; Ducks</b>																	
Greylag Goose <i>Anser anser</i>						30		6							30	6.0	0.0
Bar-headed Goose <i>A. indicus</i>		304				390	120	56	208			4	103		390	145.0	52.5
Ruddy Shelduck <i>Tadorna ferruginea</i>		43			22	33	50		35	65	42	41	56	21	65	24.7	43.3
Common Shelduck <i>T. tadorna</i>		1630		48	1550	1085	108	80	550	333	172	50	42	111	1630	750.2	209.7
Eurasian Wigeon <i>Anas penelope</i>		1797		550	11000	885	3000	1600	1700	884	1696	2900	962	286	11000	3138.7	1404.7
Gadwall <i>A. strepera</i>		116				65					232		6		232	30.2	39.7
Falcated Duck <i>A. falcata</i>	NT													1	1	0.0	0.2
Common Teal <i>A. crecca</i>									15						15	0.0	2.5
Northern Pintail <i>A. acuta</i>					6				50		20		12		50	1.0	13.7
Northern Shoveler <i>A. clypeata</i>		42				36	16		25	22	130	37	37	34	130	15.7	47.5
Gargany <i>A. querquedula</i>													1		1	0.0	0.2
Unidentified ducks					228				100						228	38.0	16.7
<b>Rails</b>																	
White-breasted Waterhen <i>Amauornis phoenicurus</i>		1													1	0.2	0.0
<b>Shorebirds</b>																	
Eurasian Oystercatcher <i>Haematopus ostralegus</i>									1						1	0.0	0.2
Pied Avocet <i>Recurvirostra avosetta</i>		3			15	18	1	15	147	35	18	12	17		147	8.7	38.2
Great Thick-knee <i>Esacus recurvirostris</i>	NT								1						1	0.0	0.2
Little Pratincole <i>Glareola lactea</i>					12		30	100	2	4					100	23.7	1.0
Red-wattled Lapwing <i>Vanellus indicus</i>		2												4	4	0.3	0.7

Species	Th	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018*	Max	Av 2006-12	Av 2013-18
Pacific Golden Plover <i>Pluvialis fulva</i>		885				170	40	300	100	16	72	350			885	232.5	89.7
Grey Plover <i>P. squatarola</i>		205			2	22	1	79	4	37	124	99	24	89	205	51.5	62.8
Kentish Plover <i>Charadrius alexandrinus</i>		10				12	1	50		43	24	6	6		50	12.2	13.2
Mongolian Plover <i>C. mongolus</i>		5520				505	1	1000	500	1800	2511	3250	3805	3107	5520	1171.0	2495.5
Greater Sand Plover <i>C. leschenaultii</i>						10	14	22	15	170	310	520	275	796	796	7.7	347.7
Little Ringed Plover <i>C. dubius</i>						11		10		11					11	3.5	1.8
Black-tailed Godwit <i>Limosa limosa</i>	NT	347		270	103	280	60	79	370	225	1527	110	288	2185	2185	189.8	784.2
Bar-tailed Godwit <i>L. lapponica</i>	NT					16	15	4			9			7	16	5.8	2.7
Whimbrel <i>Numenius phaeopus</i>		25		25		9	5	18	25	54	151	79	96	56	151	13.7	76.8
Eurasian Curlew <i>N. arguata</i>	NT	400			280	127	53	34	89	87	96	117	114	199	400	149.0	117.0
Spotted Redshank <i>Tringa eruthropus</i>													2		2	0.0	0.3
Redshank <i>T. totanus</i>		216		100	5	173	38	60	32	153	76	67	80	654	654	98.7	177.0
Marsh Sandpiper <i>T. stagnatilis</i>					2	1		1		2	1	8	1	3	8	0.7	2.5
Greenshank <i>T. nebularia</i>		104		35		22	12	9	12	11	12	37	25	53	104	30.3	25.0
Spotted (Nordmann's) Greenshank <i>T. guttifer</i>	EN	2				1	3		1			1			3	1.0	0.3
Green Sandpiper <i>T. ochropus</i>		1					7								7	1.3	0.0
Wood Sandpiper <i>T. glareola</i>						4		8							8	2.0	0.0
Terek Sandpiper <i>Xenus cinereus</i>		197				5	18	1	33	6	20	48	17	40	197	36.8	27.3
Common Sandpiper <i>Actitis hypoleucos</i>							2		3		9	3	1	14	14	0.3	5.0
Ruddy Turnstone <i>Arenaria interpres</i>						14		20			13		61		61	5.7	12.3
Pintail Snipe <i>Gallinago stenura</i>								2							2	0.3	0.0
Common Snipe <i>G. gallinago</i>		10													10	1.7	0.0
Asian Dowitcher <i>Limnodromus semipalmatus</i>	NT	11									28		1	2	28	1.8	5.2
Red Knot <i>Calidris canutus</i>	NT	2												1	2	0.3	0.2
Great Knot <i>C. tenuirostris</i>	EN						4						1	12	12	0.7	2.2
Sanderling <i>C. alba</i>						2								41	41	0.3	6.8
Little Stint <i>C. minuta</i> /Red-necked Stint <i>C. ruficollis</i>		230				16	150	250	3	70	112	130	157	149	250	107.7	103.5
Temminck's Stint <i>C. temminckii</i>						4	3			15	3		2		15	1.2	3.3
Long-toed Stint <i>C. subminuta</i>											5				5	0.0	0.8
Dunlin <i>C. alpina</i>										7				2	7	0.0	1.5
Curlew Sandpiper <i>C. ferruginea</i>	NT	256				4	82	2	2		398	8	28	145	398	57.3	96.8
Spoon-billed Sandpiper <i>C. pygmeus</i>	CR	1					1					3		1	3	0.3	0.7
Broad-billed Sandpiper <i>Limicola falcinellus</i>		3				3	22	2	2	18	9		5	48	48	5.0	13.7
Unidentified shorebirds					250		500	400	400		2500		50	800	2500	191.7	625.0
<b>Gulls, Terns &amp; Skimmer</b>																	
Heuglin's Gull <i>Larus heuglini</i>							2							2	2	0.3	0.3
Brown-headed Gull <i>L. brunnicephalus</i>		960		188	801	231	100	300	148	3531	1205	326		5966	5966	430.0	1862.7
Black-headed Gull <i>L. ridibundus</i>						2			3						3	0.3	0.5
Great Black-headed Gull <i>Ichthyaeetus ichthyaeetus</i>		84			350	4	64		2	5	68			235	350	83.7	51.7

Species	Th	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018*	Max	Av 2006-12	Av 2013-18
Whiskered Tern <i>Chlidonias hybridus</i>		12		2							5		7	15	15	2.3	4.5
Gull-billed Tern <i>Gelochelidon nilotica</i>		144		3		2	12		19	12	9	7		74	144	26.8	20.2
Caspian Tern <i>Hydroponge caspia</i>		2		2											2	0.7	0.0
River Tern <i>Sterna aurantia</i>	NT	3			20	7	20	4	5	5	4	11	4	2	20	9.0	5.2
Common Tern <i>S. hirundo</i>									2					2	2	0.0	0.7
Little Tern <i>S. albifrons</i>		2					1		50					64	64	0.5	19.0
Sandwich Tern <i>Thalasseus sandvicensis</i>		1													1	0.2	0.0
<b>Indian Skimmer <i>Rynchops albicollis</i></b>	VU	<b>875</b>		<b>3200</b>	<b>2500</b>	<b>1600</b>		<b>20</b>	<b>600</b>	<b>1060</b>	<b>1342</b>	<b>1138</b>	<b>1</b>	<b>4</b>	3200	1365.8	690.8
<b>Total water birds</b>		<b>16136</b>	na	<b>4759</b>	<b>17311</b>	<b>5987</b>	<b>4623</b>	<b>4754</b>	<b>5508</b>	<b>9205</b>	<b>13103</b>	<b>9547</b>	<b>6560</b>	<b>15765</b>	<b>40368</b>	8928.3	9948.0
No. of species		46		19	23	44	42	38	43	36	44	33	40	45	76		

Th=global threat status: NT=near threatened, VU=vulnerable, EN=endangered, CR=critically endangered

**Yellow** highlights species that in at least one year have exceeded the 1% flyway population – an indicator of international importance for waterbirds.

**Bold** in averages columns: statistically significant (t-test,  $p < 0.05$ ) increases in numbers of wintering Lesser Sand Plover and Whimbrel occurred, comparing 2013-18 with 2006-12, other changes in average numbers are not statistically significant, due to between year variability and the modest number of years with census data.

Note that the 2016 total for Indian Skimmer is from a repeat count in February, the January 2016 total was only 796.

\*The 2018 counts reported are from 22-23 February. Counts on 12 January 2018 (as part of the traditional January AWC survey) showed only 4,371 waterbirds present, which does not represent the numbers of waterbirds using this site and appears to be a result of lower than normal numbers of waterbirds being present in the Bangladesh coast in general in January 2018 compared with February, possibly due to a later than usual arrival of migrant waterbirds. Therefore as an exception the February waterbird counts have been reported for 2018.

## 6.2 Species of Conservation Concern

Considering mid-winter censuses and additional surveys undertaken in some years (for example 2012-15 and 2018 when surveys also took place in November, December, February, March and April), four globally threatened species were found here:

- Three of the critically endangered **Spoon-billed Sandpiper** were present in 2016, and single birds have been counted in two earlier years reported here.
- The endangered **Spotted** or **Nordmann's Greenshank** was recorded in six years with a maximum of three birds.
- The endangered **Great Knot** was recorded in three years with a maximum of 17 in March 2018.
- The importance of Nijhum Dwip for vulnerable **Indian Skimmer** has already been mentioned and its status, trends and conservation are discussed separately in Section 6.4.

Globally near-threatened species found in Nijhum Dwip comprise:

- **Falcated Duck**, one seen in February 2018, this species is more usual in freshwater wetlands such as the northeastern haors.
- **Black-headed Ibis**, recorded in almost all years and apparently stable with a maximum of 334 in March 2018, and averaging about 50 birds each year.
- **Great Thick-knee**, one seen in 2013, presumably a local visitor or wanderer as this is usually a resident species of river and coastal chars.
- **Black-tailed Godwit**, a common winter visitor that appears to be increasing and has a maximum count of 2,751 in March 2018.
- **Bar-tailed Godwit**, a scarce winter visitor recorded in just five years with a peak of 16 in 2010
- **Eurasian Curlew**, recorded in most years in modest numbers, after a peak of 400 in 2006 it appears to be declining here.
- **Asian Dowitcher**, although irregular in mid-winter in Nijhum Dwip, with sightings during AWC counts in only three years, from 2013 onwards this species has been recorded more regularly and this is the main site in Bangladesh for this species, 28 in 2015 was the highest mid-winter count, and the highest count for the site and for Bangladesh was 42 in February 2014. In 2016 and 2017 this species was present on Char Birbira associating with godwits.
- **Red Knot**, with just two records (two in 2006 and one in 2018) this species is rare in this site.
- **Curlew Sandpiper**, although a common winter visitor to coastal Bangladesh it is relatively scarce at this site averaging under 100 per winter and with a peak of under 400.
- **River Tern**, is a resident species and is regular in small numbers most years, with a peak of 20 birds, but appears to be declining. This species regularly nests in sandbars of Domar Char between January and March. A maximum of 20 pairs were recorded in February 2013. This species nests colonially with Gull-billed Tern and Small Pratincole in the island.



**River Tern nest with chicks, Domar Char**

Although long term monitoring focused on mid-winter counts, there is good evidence that

Photo: Samiul Mohsanin



Nijhum Dwip is more important than Table 6.1 would indicate as waterbird numbers average much higher in the late winter to spring period – see the next section.

### 6.3 Significance of Domar Char

With additional resources from Forest Department, Bangladesh Bird Club (Bbc), and Nature Conservation Management (NACOM), SM undertook monthly waterbird monitoring in Domar Char – the main location for waterbirds and especially shorebirds and skimmers within the national park; while CREL supported additional counts in 2018. This study found that peak waterbird numbers occurred in March in each year and on average were about double the January numbers (Tables 6.2 and 6.3). In three out of four years the March total exceeded 20,000 waterbirds (one of the criteria for a site to be an internationally important wetland), and based on the highest counts for each species at least 30,000 waterbirds probably use Domar Char each year. Species diversity from these multiple counts was consistent at 53-57 species each year.

Of particular note are the annual concentration of about 2,500 near-threatened Black-tailed Godwit on this island each March, large flocks of Lesser Sand Plover (for example about 15,000 in March 2015), higher March than mid-winter counts of River Tern, large usually early winter flocks of Eurasian Wigeon, and two records of Painted Stork in 2013 which is a rare visitor to Bangladesh and near-threatened. The 2018 surveys also reveal that Char Birbira (the intertidal zone furthest northeast in/bordering Nijhum Dwip NP) is significant for waterbirds, mainly shorebirds, and should be included in protection efforts.

The main conservation value in global terms of Nijhum Dwip NP is for its waterbird populations during winter and especially late winter-spring on Domar Char. Although co-management has been introduced in the NP, conservation efforts from the Forest Department and communities have not so far placed enough emphasis on shorebirds, mudflats and open chars, and Domar Char. It is important that deliberate planting of trees on Domar Char be halted since this will make globally important intertidal mudflats unsuitable for shorebirds.

**Table 6.2 Results of monthly waterbird monitoring on Domar Char, 2012-2015**

Sl. No.	Species	2012-13							2013-14				2014-15				
		19-20 Nov 12	26-28 Dec 12	14-15 Jan 13	14-16 Feb 13	11-13 Mar 13	19-20 Apr 13	winter max	22 Jan 14	14-22 Feb 14	14-15 Mar 14	winter max	22 Dec 14	14 Jan 15	5 Feb 15	23 Mar 15	winter max
1	Greylag Goose <i>Anser anser</i>		50					<b>50</b>				<b>0</b>			3		<b>3</b>
2	Bar-headed Goose <i>Anser indicus</i>	36	200	8	2	3		<b>200</b>				<b>0</b>					<b>0</b>
3	Ruddy Shelduck <i>Tadorna ferruginea</i>	19	20	35				<b>35</b>	65	75	42	<b>75</b>	22	42	17	24	<b>42</b>
4	Common Shelduck <i>Tadorna tadorna</i>	101	480	150	74	45	15	<b>480</b>	333	450	1029	<b>1029</b>	30	172	332	559	<b>559</b>
5	Gadwall <i>Anas strepera</i>	22	60					<b>60</b>		70	23	<b>70</b>	120	232	112	57	<b>232</b>
6	Eurasian Wigeon <i>Anas penelope</i>	2060	650	1400	570	30	49	<b>2060</b>	884	210	115	<b>884</b>	1556	1696	1500	1050	<b>1696</b>
7	Common Teal <i>Anas crecca</i>			15				<b>15</b>		15	7	<b>15</b>					<b>0</b>
8	Northern Pintail <i>Anas acuta</i>	4		50	5			<b>50</b>		2	13	<b>13</b>		20	13	7	<b>20</b>
9	Northern Shoveler <i>Anas clypeata</i>	32	20	25	63	22	18	<b>63</b>	22	69	82	<b>82</b>	50	130	65	29	<b>130</b>
10	Black-tailed Godwit <i>Limosa limosa</i> NT	171	240	370	163	2300	250	<b>2300</b>	225	1500	2500	<b>2500</b>	2515	1527	1766	1856	<b>2515</b>
11	Bar-tailed Godwit <i>Limosa lapponica</i> NT	20				150		<b>150</b>		300	220	<b>300</b>		9	12	16	<b>16</b>
12	Whimbrel <i>Numenius phaeopus</i>	25	11	24		25	13	<b>25</b>	54	43	75	<b>75</b>	117	151	43	38	<b>151</b>
13	Eurasian Curlew <i>Numenius arquata</i> NT	101	32	75	93	180	37	<b>180</b>	86	67	84	<b>86</b>	55	96	97	112	<b>112</b>
14	Common Redshank <i>Tringa totanus</i>	102	50	32	30	52	23	<b>102</b>	153	70	29	<b>153</b>	50	76	64	89	<b>89</b>
15	Marsh Sandpiper <i>Tringa stagnatilis</i>		1			4		<b>4</b>	2	2	3	<b>3</b>	2	1		3	<b>3</b>
16	Common Greenshank <i>Tringa nebularia</i>	5	3	12	3	3	2	<b>12</b>	11	115	90	<b>115</b>	4	12	54	67	<b>67</b>
17	Nordmann's Greenshank <i>Tringa guttifer</i> EN	1		1				<b>1</b>				<b>0</b>			1	2	<b>2</b>
18	Terek Sandpiper <i>Xenus cinereus</i>	3	10	32	22	43	31	<b>43</b>	6	33	56	<b>56</b>	5	20	28	67	<b>67</b>
19	Common Sandpiper <i>Actitis hypoleucos</i>	2	10	2		5	4	<b>10</b>		12	6	<b>12</b>	7	9	7	4	<b>9</b>
20	Ruddy Turnstone <i>Arenaria interpres</i>	2	5			2		<b>5</b>		17	9	<b>17</b>	11	13	21	17	<b>21</b>
21	Asian Dowitcher <i>Limnodromus semipalmatus</i> NT					5		<b>5</b>		42	33	<b>42</b>	6	28	2	23	<b>28</b>
22	Sanderling <i>Calidris alba</i>		13		2	25	3	<b>25</b>		17	13	<b>17</b>			4	13	<b>13</b>
23	Little Stint/Red-necked Stint <i>Calidris minuta/ruficolis</i>	5	12		11	62	5	<b>62</b>	70	300	700	<b>700</b>	20	112	127	92	<b>127</b>
24	Temminck's Stint <i>Calidris temminckii</i>							<b>0</b>	15	8	5	<b>15</b>	1	3	4	7	<b>7</b>
25	Dunlin <i>Calidris alpina</i>		10		2	11		<b>11</b>	7	9	4	<b>9</b>	2	5	4	18	<b>18</b>
26	Curlew Sandpiper <i>Calidris ferruginea</i> NT	8	36	2	6	28	11	<b>36</b>	19	450	500	<b>500</b>	29	398	130	257	<b>398</b>
27	Broad-billed Sandpiper <i>Limicola falcinellus</i>		60	2	5	15	12	<b>60</b>	18	12	21	<b>21</b>		9	2	3	<b>9</b>
28	Pied Avocet <i>Recurvirostra avosetta</i>	5	50	140	12	3	8	<b>140</b>	35	26	46	<b>46</b>	152	18	38	29	<b>152</b>
29	Small Pratincole <i>Glareola lactea</i>		320	2	6	50	27	<b>320</b>	4	2	2	<b>4</b>	4		355	459	<b>459</b>
30	Little Ringed Plover <i>Charadrius dubius</i>							<b>0</b>	11	5	7	<b>11</b>	10			7	<b>10</b>
31	Pacific Golden Plover <i>Pluvialis fulva</i>		800	100	65	42	39	<b>800</b>	16	65	167	<b>167</b>	712	72	330	1500	<b>1500</b>
32	Grey Plover <i>Pluvialis squatarola</i>	91	65	4	85	48	21	<b>91</b>	37	142	92	<b>142</b>	60	124	70	87	<b>124</b>
33	Kentish Plover <i>Charadrius alexandrinus</i>	26	30		13	21		<b>30</b>	43	50	250	<b>250</b>	4	24	22	20	<b>24</b>

Sl. No.	Species	2012-13							2013-14				2014-15				
		19-20 Nov 12	26-28 Dec 12	14-15 Jan 13	14-16 Feb 13	11-13 Mar 13	19-20 Apr 13	winter max	22 Jan 14	14-22 Feb 14	14-15 Mar 14	winter max	22 Dec 14	14 Jan 15	5 Feb 15	23 Mar 15	winter max
34	Lesser Sand Plover <i>Charadrius mongolus</i>	5000	830	500	1665	1250	450	<b>5000</b>	1800	3500	3200	<b>3500</b>	5021	2511	5500	15000	<b>15000</b>
35	Greater Sand Plover <i>Charadrius leschenaultii</i>	100	165	15	110	250		<b>250</b>	170	1000	500	<b>1000</b>	1102	2010	1000	3000	<b>3000</b>
36	Yellow-legged Gull <i>Larus michahellis</i>					2		<b>2</b>				<b>0</b>					<b>0</b>
37	Pallas's Gull <i>Larus ichthyaetus</i>	90	10	65	65	17	12	<b>90</b>	5	63	80	<b>80</b>	34	65	21	34	<b>65</b>
38	Heuglin's Gull <i>Larus heuglini</i>					3		<b>3</b>		2	1	<b>2</b>					<b>0</b>
39	Brown-headed Gull <i>Larus brunnicephalus</i>	400	75	145	2500	800	250	<b>2500</b>	3531	2500	1500	<b>3531</b>	400	1205	240	350	<b>1205</b>
40	Caspian Tern <i>Hydroprogne caspia</i>							<b>0</b>		1		<b>1</b>			1		<b>1</b>
41	Gull-billed Tern <i>Sterna nilotica</i>	8		17	3	22		<b>22</b>	12	70	79	<b>79</b>	12	9	25	45	<b>45</b>
42	Great Crested Tern							<b>0</b>		37		<b>37</b>				2	<b>2</b>
43	River Tern <i>Sterna aurantia</i> NT	6	14	5	13	40	28	<b>40</b>		12	30	<b>30</b>	2	4	10	16	<b>16</b>
44	Common Tern <i>Sterna hirundo</i>	4	16	2	4			<b>16</b>		15	26	<b>26</b>			2	5	<b>5</b>
45	Little Tern <i>Sterna albifrons</i>	2		30	5	12		<b>30</b>		23	12	<b>23</b>			21	23	<b>23</b>
46	Whiskered Tern <i>Chlidonias hybrida</i>	12	2			17		<b>17</b>		2	6	<b>6</b>	7	5	12	15	<b>15</b>
47	Indian Skimmer <i>Rynchops albicollis</i> VU			600	559	200	89	<b>600</b>	1060	1062	650	<b>1062</b>		1342	1300	589	<b>1342</b>
48	Little Cormorant <i>Phalacrocorax niger</i>	15		18		7		<b>18</b>	22	27	12	<b>27</b>	12	23	55	65	<b>65</b>
49	Little Egret <i>Egretta garzetta</i>	12		18	25	8	7	<b>25</b>	35	29	13	<b>35</b>	27	5	65	112	<b>112</b>
50	Great Egret <i>Casmerodius albus</i>	10	6	26	78	22	28	<b>78</b>	185	15	9	<b>185</b>	15	48	34	34	<b>48</b>
51	Intermediate Egret <i>Mesophoyx intermedia</i>	200		10	92	10	12	<b>200</b>	21	12		<b>21</b>	7	10	12	12	<b>12</b>
52	Cattle Egret <i>Bubulcus ibis</i>	160	10	9	100	35	54	<b>160</b>	136	37	41	<b>136</b>	26	8	65	140	<b>140</b>
53	Indian Pond Heron <i>Ardeola grayii</i>	50	15	12	5	8	11	<b>50</b>		43	38	<b>43</b>	18	32	21	35	<b>35</b>
54	Purple Heron <i>Ardea purpurpurea</i>							<b>0</b>	2			<b>2</b>		1			<b>1</b>
55	Grey Heron <i>Ardea cinerea</i>	2	1	2				<b>2</b>	4	7	5	<b>7</b>	7	1	4	11	<b>11</b>
56	Black-crowned Night-heron <i>Nycticorax nycticorax</i>	4		2				<b>4</b>		12	17	<b>17</b>		4	3	7	<b>7</b>
57	Black-headed Ibis <i>Threskiornis melanocephalus</i> NT	331	18	34	31	15	8	<b>331</b>	119	73	17	<b>119</b>	60	18	117	310	<b>310</b>
58	Eurasian Spoonbill <i>Platalea leucorodia</i>					4		<b>4</b>				<b>0</b>					<b>0</b>
59	Painted Stork <i>Mycteria leucocephala</i> NT	7				2		<b>7</b>				<b>0</b>					<b>0</b>
60	Unidentified Shorebirds	1000	500	400	250	20000	300	<b>20000</b>	1500	2000	5000	<b>5000</b>	1300	2500	1500	2000	<b>2500</b>
	<b>Total</b>	<b>10254</b>	<b>4900</b>	<b>4391</b>	<b>6737</b>	<b>25898</b>	<b>1817</b>	<b>36874</b>	<b>10718</b>	<b>14720</b>	<b>17459</b>	<b>22378</b>	<b>13594</b>	<b>14800</b>	<b>15231</b>	<b>28317</b>	<b>32563</b>
	<b>Number of species</b>	<b>41</b>	<b>38</b>	<b>39</b>	<b>35</b>	<b>45</b>	<b>29</b>	<b>54</b>	<b>36</b>	<b>52</b>	<b>49</b>	<b>53</b>	<b>40</b>	<b>44</b>	<b>49</b>	<b>50</b>	<b>53</b>

Yellow highlights the highest count in each year

**Table 6.3 Results of waterbird surveys covering all key sites of Nijhum Dwip study area in January-March 2018**

Species	12 Jan-18			22 - 23 Feb-18						15--17 Mar 18						
	Domar Char	Nijhum Dweep	Total	Domar Char West-South/Rahman Char	Chowakhali-Sotoful, Nijhum Dweep	Domar Char-East	Char Birbira	Chotakhali, Nijhum Dweep	Total	Domar Char-South/Rahman Char	Domar Char-West	Domar Char-East	Char Birbira	Chowakhali-Sotoful, Nijhum Dweep	Chotakhali, Nijhum Dweep	Total
	High tide	High tide		High tide	High tide	Low tide	Low tide	Low tide		High tide	Low tide	Low tide	Rising tide	High tide	Low tide	
Bar-headed Goose <i>Anser indicus</i>	132		132													0
Ruddy Shelduck <i>Tadorna ferruginea</i>	70		70	21				21			5					5
Common Shelduck <i>Tadorna tadorna</i>	16	30	46	37		74		111	3		11	39				53
Gadwall <i>Anas strepera</i>		150	150													0
Falcated Duck <i>Anas falcate</i> NT			0	1				1								0
Eurasian Wigeon <i>Anas penelope</i>	567		567	235			51	286			15	31				46
Common teal <i>Anas crecca</i>			0													0
Northern Pintail <i>Anas acuta</i>	4		4													0
Northern Shoveler <i>Anas clypeata</i>	344		344			4	26	4	34		7	12	32			51
Red-wattled Lapwing <i>Vanellus indicus</i>			0		4				4		4					4
Black-tailed Godwit <i>Limosa limosa</i> NT	80		80	32		170	826	1157	2185		730	115	750		1156	2751
Bar-tailed Godwit <i>Limosa lapponica</i> NT			0	2				5	7		7					7
Whimbrel <i>Numenius phaeopus</i>	60		60	17	1	14	17	7	56	7	51	36	41		27	162
Eurasian Curlew <i>Numenius arquata</i> NT	65	10	75	11	100	24	54	10	199	27	35	57	66	2	31	218
Common Redshank <i>Tringa totanus</i>	89		89	51	50	37	378	138	654		81	53	226		163	523
Marsh Sandpiper <i>Tringa stagnatilis</i>	20		20				3		3							0
Common Greenshank <i>Tringa nebularia</i>	22		22	3	17	20		13	53		13	4		3	18	38
Nordmann's Greenshank <i>Tringa guttifer</i> EN			0						0		1					1
Terek Sandpiper <i>Xenus cinereus</i>	22		22	23		17			40	8	17	6	27		8	66
Common Sandpiper <i>Actitis hypoleucos</i>			0	2	1	8		3	14		4	3			4	11
Ruddy Turnstone <i>Arenaria interpres</i>	17		17							6						6
Great Knot <i>Calidris tenuirostris</i> EN			0			12			12	12	5					17
Red Knot <i>Calidris canutus</i> NT			0					1	1							0
Asian Dowitcher <i>Limnodromus semipalmatus</i> NT			0				2		2							0
Little Stint <i>Calidris minuta</i>	45		45	96		53			149	35	70	26	160		50	341

Species	12 Jan-18			22 - 23 Feb-18						15--17 Mar 18						
	Domar Char	Nijhum Dweep	Total	Domar Char West-South/Rahman Char	Chowakhali-Sotoful, Nijhum Dweep	Domar Char-East	Char Birbira	Chotakhali, Nijhum Dweep	Total	Domar Char-South/Rahman Char	Domar Char-West	Domar Char-East	Char Birbira	Chowakhali-Sotoful, Nijhum Dweep	Chotakhali, Nijhum Dweep	Total
	High tide	High tide		High tide	High tide	Low tide	Low tide	Low tide		High tide	Low tide	Low tide	Rising tide	High tide	Low tide	
Red-necked Stint <i>Calidris ruficolis</i> NT																
Temminck's Stint <i>Calidris temminckii</i>			0													0
Sanderling <i>Calidris alba</i>	12		12	37		4			41							0
Dunlin <i>Calidris alpina</i>			0					2	2		2		5			7
Curlew Sandpiper <i>Calidris ferruginea</i> NT	25		25	76		31	38		145	21	55	56	106		64	302
Spoon-billed Sandpiper <i>Eurynorhynchus pygmeus</i> CR			0	1					1							0
Broad-billed Sandpiper <i>Limicola falcinellus</i>			0	36		12			48	12	5		20			37
Pied Avocet <i>Recurvirostra avosetta</i>	45		45									4	6			10
Small Pratincole <i>Glareola lactea</i>			0							12						12
Little Ringed Plover <i>Charadrius dubius</i>			0													0
Pacific Golden Plover <i>Pluvialis fulva</i>	310		310							3650	120		1550			5320
Grey Plover <i>Pluvialis squatarola</i>			0					89	89	27	13	16			57	113
Kentish Plover <i>Charadrius alexandrinus</i>	108		108							156	150		120			426
Lesser Sand Plover <i>Charadrius mongolus</i>	350		350	2196	56	525	330		3107	227	1112	112	1250		250	2951
Greater Sand Plover <i>Charadrius leschenaultii</i>	120		120	586		150	60		796	75	150	17	36		27	305
Pallas's Gull <i>Larus ichthyæetus</i>		5	5	133	29	50	21	2	235		6	12	25			43
Heuglin's Gull <i>Larus heuglini</i>			0	2					2							0
Brown-headed Gull <i>Larus brunnicephalus</i>	30	120	150	2919	170	1500	1377		5966	2030	2050	1600	600		194	6474
Gull-billed Tern <i>Sterna nilotica</i>	15	4	19	10		64			74		16	53	60		8	137
River Tern <i>Sterna aurantia</i> NT	3		3			2			2		6	2	6			14
Common Tern <i>Sterna hirundo</i>			0			2			2							0
Little Tern <i>Sterna albifrons</i>			0				64		64			52				52
Whiskered Tern <i>Chlidonias hybrida</i>			0				15		15			7				7
Indian Skimmer <i>Rynchops albicollis</i> VU			0			4			4							0
Little Cormorant <i>Phalacrocorax niger</i>	9	5	14	4		2		8	14		4		26			30

Species	12 Jan-18			22 - 23 Feb-18						15--17 Mar 18						
	Domar Char	Nijhum Dweep	Total	Domar Char West-South/Rahman Char	Chowakkhali-Sotoful, Nijhum Dweep	Domar Char-East	Char Birbira	Chotakhali, Nijhum Dweep	Total	Domar Char-South/Rahman Char	Domar Char-West	Domar Char-East	Char Birbira	Chowakkhali-Sotoful, Nijhum Dweep	Chotakhali, Nijhum Dweep	Total
	High tide	High tide		High tide	High tide	Low tide	Low tide	Low tide		High tide	Low tide	Low tide	Rising tide	High tide	Low tide	
Little Egret <i>Egretta garzetta</i>	13		13	11	4	40	12	15	82		150	130	20	17		317
Great Egret <i>Casmerodius albus</i>	75	100	175	35	48	67	74	12	236	4	250	170	91	54		569
Intermediate Egret <i>Mesophoyx intermedia</i>	22		22			13			13		90	120	35	11		256
Cattle Egret <i>Bubulcus ibis</i>			0	14				52	66	7	250		22			279
Indian Pond Heron <i>Ardeola grayii</i>	10		10			5	2	6	13			5				5
Purple Heron <i>Ardea purpurpurea</i>			0													0
Grey Heron <i>Ardea cinerea</i>	1		1			6	2	1	9			7	4			11
Black-crowned Night-heron <i>Nycticorax nycticorax</i>			0		2			2	4							0
Black-headed Ibis <i>Threskiornis melanocephalus</i> NT	<b>66</b>	<b>80</b>	<b>146</b>		<b>49</b>	<b>31</b>	<b>16</b>	<b>7</b>	<b>103</b>		<b>62</b>	<b>96</b>	<b>163</b>		<b>13</b>	<b>334</b>
Unidentified Ducks		200	200							100						100
Unidentified Shorebirds	800	100	900	300			500		800		100	250				350
<b>Total</b>	<b>3567</b>	<b>804</b>	<b>4371</b>	<b>6891</b>	<b>531</b>	<b>2942</b>	<b>3868</b>	<b>1535</b>	<b>15767</b>	<b>6419</b>	<b>5617</b>	<b>3053</b>	<b>5517</b>	<b>87</b>	<b>2072</b>	<b>22765</b>

Based on the surveys since 2013 the areas particularly important for waterbirds in winter and spring are marked in Fig. 6.2. These include foraging areas (yellow) and roosting areas (red) where concentrations of birds occur including threatened species. For example, in February 2018 one Spoon-billed Sandpiper was spotted at the red arrow location in Fig 6.2, and in March 2018 one Spotted Greenshank was recorded at the yellow arrow location along with many other shorebirds. Surveys have also shown that Indian Skimmers (see Section 6.4) most often have a day-time roost on the sand bars of west Domar Char (red rectangular block).

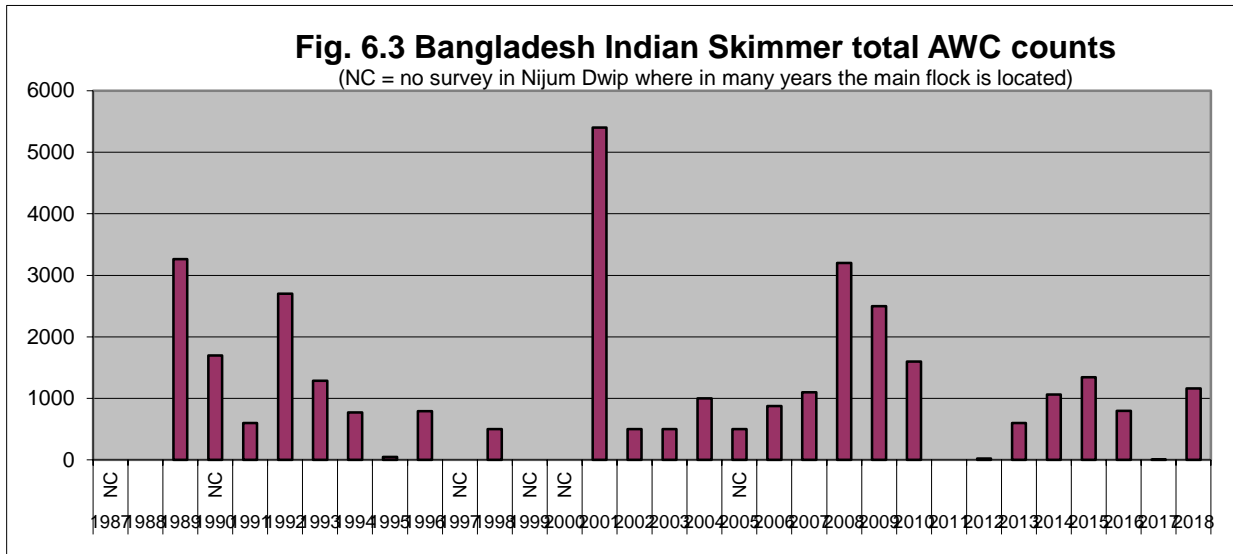


**Fig 6.2** Map showing the shorebird hot spot areas (yellow and red marked areas) in Nijhum Dweep NP

## 6.4 Indian Skimmer

The coastal chars of Bangladesh are the main wintering area globally for this vulnerable species, and since around 2000 the main wintering area within Bangladesh has been Nijhum Dwip NP, specifically Domar Char. Fig 6.3 consolidates the total counts of skimmers across all sites covered in each AWC survey.

During the three years 2012-13 to 2014-15 the January and February totals of Indian Skimmer were almost identical, in 2016 although a smaller total (796) was recorded in January a repeat count in February 2016 found 1,138 birds, comparable to the previous years. However, in January 2017 only one skimmer was seen during the AWC count of not just Nijhum Dwip but also other regularly counted coastal sites (although a small number were subsequently seen at a site not usually counted), and in 2018 1,160 skimmers were present at just one site - Jahaijjar Char located northeast of Hatiya Island - but none in Nijhum Dwip. Numbers of skimmers present clearly can fluctuate between and within years, and since this species habitually occurs in flocks which spend significant amounts of time resting on sandbanks, variations are presumed to reflect changes in the suitability of the area in terms of feeding and safety from human disturbance. Nevertheless it appears that the wintering population in Bangladesh in 2013 onwards has averaged just over 1,000 birds – down considerably from some of the peaks of 3,000 or more birds recorded in earlier decades.



In a separate study by SM, four Indian Skimmers were fitted with satellite tags in 2016 of which one transmitter failed immediately, One of the tagged skimmers (Tag#154798) at its furthest was recorded about 590 km north-west of Domar Char and reached this area in only two days by following the Ganges River into India where signals were received from different sand bars (Tarapur Diara, Sulem Pur, Nawa garhi, Ganganiya and Jamalpur) all in the Ganges in Bihar State, before the transmitter failed. The other satellite tagged skimmers (Tag#154800 and Tag#154801) gave signals from inside Bangladesh (near Domar Char) before they ceased to transmit.

**Indian Skimmer with satellite transmitter**  
Photo: Samiul Mohsanin



## 6.5 Migration Studies

To better understand bird migration, separate studies supported by Bbc were undertaken. A total of 91 waterbirds of 17 species were captured and ringed in six separate ringing camps in 2014 and 2015. Metal rings with unique engraved numbers under the Bbc ringing program were fitted on all the birds left tibia. Threatened and near-threatened waterbirds that were ringed include Indian Skimmer (VU), Eurasian Curlew (NT), Bar-tailed Godwit (NT), and Red-necked Stint (NT), as well as species that are not threatened such as Lesser Sand Plover, Little Stint, Whimbrel and Ruddy Turnstone.



Besides regular bird ringing, yellow color flags (an alpha-engraved flag above a numeric-engraved flag) were fitted on the right tibia. Out of 91 ringed birds, 53 individuals of nine species were color flagged comprising: Bar-tailed Godwit (1), Red-necked Stint (1), Common Redshank (4), Common Sandpiper (1), Curlew Sandpiper (3), Lesser Sand Plover (31), Little Stint (9), Temminck's Stint (2) and Terek Sandpiper (1). Of the flagged birds from Domar Char, one Little Stint was sighted from Sittwe, Myanmar (in the same year in 2014), one Little Stint was sighted on Sonadia, Cox's Bazar, Bangladesh twice in consecutive years (2014 and 2015). The Red-necked Stint was sighted at Khairusova-Belogolovaya estuary, Western Kamchatka, Russia (30 July 2016) over 6,500 km from Nijhum Dwip and presumably close to its nesting ground. In addition several of the flagged Lesser Sand Plovers and Common Redshanks were observed in subsequent years (2014, 2015 and 2016) returning to Domar Char after presumably completing migrations to and from their nesting grounds.



**SM tagging an Indian Skimmer**

Photo: Fatema Tuz Zohora



**Color flagged Red-necked Stint**

Photo: Samiul Mohsanin

## 6.6 Threats and Recommended Responses

Important threats to the survival of wintering waterbirds in the Nijhum Dwip NP area include the following:

- **Cattle grazing:** domestic water buffalo and cows graze in most of the open areas in the islands, invading the roosting grounds of waterbirds and trampling the nests of terns, plovers and pratincoles.
- **Over fishing** and associated human disturbance: seasonally intense fishing during both day and night at all states of the tide may have a direct impact on the reduction of shorebird abundance. Intense use of set bag nets, long shore nets along the shores, seine nets and beach seine nets result in waterbird disturbance.
- **Tourism:** uncontrolled tourism results in tourists wandering into waterbird foraging and roosting sites with negative impacts.
- **Habitat conversion:** conversion of natural island habitats to arable farming also affects waterbirds. Claims of use-rights to newly formed mudflats and chars by influential local people are part of this threat.
- **Water pollution:** industrial waste, agricultural pesticides, fuel and chemical discharges from marine vessels; also plastic and other material discharge on open water pollute the water.
- **Land erosion:** every monsoon small or large scale land erosion takes place causing loss of natural shorebird roosting areas. Waves generated by speed boats and launches also erode river banks.

- **Feral dogs:** these disturb and/or predate on waterbirds on Nijhum Dwip proper (but not yet on Domar Char).
- **Plantation:** creating mangrove plantations by the Forest Department on mudflats used for feeding by shorebirds (and also important for local fisheries) and on key high tide roosting areas for shorebirds has negative impacts.
- **Hunting:** although in small scale, some occasional hunting of shorebirds raises the possibility of catching globally threatened species.

The following actions are recommended for consideration and implementation as community led initiatives for waterbird conservation by the Nijhum Dwip Co-Management Committee:

1. Leaving a few areas restricted for waterbirds only – this means there would be zero fishing, zero cattle grazing, and zero people entering and causing disturbance in waterbird hotspot areas (see Fig. 6.2) - the yellow and red marked areas are the hotspot areas for waterbirds that could be set aside as waterbird sanctuaries.
2. Installation of signage/information boards for community and visitor awareness – suitable places include the jetty areas where many people visit regularly (Tomuroddy launch ghat, Nijhum Dweep jetty, Kalam Char Switch, and one in Domar Char).
3. Provide some bird conservation message to local religious leaders (Imam, priests and “saints”) so that they can disseminate knowledge and messages during Jumma prayers and other religious meetings.
4. Meeting and campaign with political leaders, Deputy Commissioner and other government bodies to stop allocating land in char islands for agriculture conversion. Demarcate some areas for strict bird conservation – see point 1 and Fig. 6.2.
5. To reduce the water pollution, conservation message should be given to launch staff, and boatmen not to throw waste in river water or in the sea.
6. Over fishing has to be controlled and fishing activity needs to be restricted in the bird hotspot areas. The CMC needs to discuss sustainable fishing practices and conservation with the fishing community and develop or liaise with a fishery management group, the establishment of a fish sanctuary based on local co-management initiative is a good sign that this is possible.
7. Organize regular consultation workshops, meetings with different stakeholders, and school awareness campaigns within the communities living inside and impacting on Nijhum Dwip NP.

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