IMPLEMENTING THE CENTRAL ASIAN FLYWAY NATIONAL ACTION PLAN WITH SPECIAL FOCUS ON PREPARATION OF SITE-SPECIFIC ACTIVITY PLAN, CAPACITY BUILDING, DEVELOPING BIRD SENSITIVITY MAP FOR SETTING UP OF WIND ENERGY AND SPECIES ACTION PLANS

Progress Report

July–September 2021

Programme supported by

Ministry of Environment, Forest & Climate Change

National Authority,
Compensatory Afforestation Fund Management and Planning Authority (CAMPA),
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Report submitted by

Bombay Natural History Society
Hornbill House, S.B. Singh Road
Mumbai – 400 001

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Progress report

July to September, 2021

1 BACKGROUND

A total of 48 wetlands and 31 landbird areas across different landscapes of India have been prioritized in the India's National Action Plan for Conservation of Migratory Birds and their Habitats along Central Asian Flyway (2018–2023) as important sites for the survival of migratory waterbirds and landbirds. The Ministry of Environment, Forest and Climate Change (MoEF&CC), New Delhi, has granted a project 'Implementing the Central Asian Flyway National Action Plan with special focus on preparation of site-specific activity plan, capacity building, developing bird sensitivity map for setting up of wind energy and species action plans' to Bombay Natural History Society (BNHS). The objectives/components of the project are:

1) Developing site-specific actions and objectives related to the conservation of migratory bird species and their habitats in protected area plans (both management and working plans) and details of action to be taken for the non-protected areas.
2) Imparting training to forest staff and other stakeholders in various aspects of migratory bird conservation
3) Preparing bird sensitivity maps for setting up of the windfarms and energy sectors in India
4) Preparing a single species action plan for the 20 species prioritized in the National Action Plan.

This project covers all 48 wetlands and 31 landbird sites across 17 states in the country. The project was initiated in February 2020. So far, six progress reports have been submitted. This is the seventh progress report which covers the period from July to September, 2021.

2 SITE SPECEIFIC RECOMMENDATIONS

2.1 Review of Management Plans

One of the important components of the project is habitat conservation and sustainable management which deals with assessing the management measures/interventions required for the conservation of the sites (habitat restoration) and preparation /updating of Management Plans of selected wetlands and landbird sites.

A Management Plan is a document which sets out the management approach and goals, together with a framework for decision making, to apply in a specific protected area over a given period of time.

A Management Plan plays an important role in conservation of habitat and related species through identifying key issues, defining role and significance of an area within a system, setting out policy and zoning for protection, development and management of resources and attributes, ensuring that development and management are compatible with environmental protection, providing a basis for ongoing monitoring of PA development, facilitating communication & understanding within organization & outside and providing continuity of the efforts.

There could be so many natural and anthropogenic factors like climate change, increasing human population and land use and land cover pattern which are affecting the health and structure of forest cover and wetlands. With changing time and current challenges faced by protected areas, management plans need to be reviewed to modify or add new solutions which help in protection and conservation of habitat and species.

During this progress period (July to September 2021), a total of four management plans from two states have been reviewed based on the activities to be considered for inclusion in the management plan provided below. The sites include Khijadiya Bird Sanctuary, Marine National Park and Sanctuary along with some associated islands from Gujarat and Keoladeo National Park, and Sambhar Lake from Rajasthan.

2.1.1 Khijadiya Bird Sanctuary, Gujarat

2.1.1.1 Species Conservation

- Nesting and roosting areas within and in near vicinity need to be mapped precisely
- Black-necked Stork nest needs to be marked
- The area supports good numbers of pelicans. The preferred fish species can be introduced to support the population
- As the migration season progresses, bird and habitat parameters are needed to be maintained twice a month to understand the wetland dynamics.

2.1.1.2 Habitat Conservation and Sustainable management

- ***Prosopis* management**: **Section-1** - *Prosopis* removal in the blocks have to be carried further especially in the lower areas where the water inundation during monsoon takes place. This exercise can be repeated in subsequent years depending upon the extent of *Prosopis* removed in a single year and fresh growth in future. Removal of new growth of *Prosopis* has to be prioritized than the older growth. While removing *Prosopis*, care has to be taken to retain trees like *Acacia nilotica* and *Salvadora persica* and other native species. Removal of *Prosopis* have to be done gradually and in a systematic manner.
- **Section-2 (Jambuda side) –** Though section-2 of the Sanctuary have more area covered with water and had been mostly devoid of *Prosopis*, recent growth has been observed in these places. Fortunately, these areas also have good numbers of *Acacia* and *Salvadora*. The shores and shallow regions of section-2 are preferred especially by cranes, gulls, and terns. *Prosopis* proliferating in these regions also pose a threat to open grounds, mudflats and grasslands. Before the density of *Prosopis* grows as thick as in section-1, immediate removal is required while taking care of the local varieties of plants and bushes to remain undisturbed. In section-2 selective removal is possible as the vegetation has proliferated in most of the area instead of thick impenetrable bushes.
- **Causeway management**: The causeway height in section-1 needs to be increased. The first and second causeway can be increased to 0.3 to 0.45 meters. This will help retain water for a longer time but it might cause submergence of the bunds hence the height and strength of bunds may also need to be ensured.
- **Sluice Gate**: In the last causeway of section-1 sluice gate can be constructed. The river flows very close to the last causeway and hence during the monsoon massive amount of

water flows out towards the creeks from the area. The construction of a sluice gate will help maintain the water level in the western part of the sanctuary in section-1 of Khijadiya. The need to increase the storage capacity of Khijadiya wetlands is also discussed in Rao *et al*. (2017).

- **Removal of exotic species**: Bottle Palm has been planted in some of the places in section-1. Although most of the saplings seem to be destroyed, the existing ones need to be removed completely,while local varieties of bushes like *Salvadora* and *Azaraca indiaca* can be planted instead. Though *Prosopis* is the key species for birds for resting, hiding and perching on which maximum birds were observed, however, this plant should be gradually replaced by *Acacia nilotica* and *Salvadora persica*. The fruit of *Salvadora persica* was the main source of food for terrestrial birds (Jambu 2017).
- **Bunds**: It was observed that many small bunds have been created in section-1. In older images of Khijadiya, these areas were more open. The small pools of water are not ideal to support a good population of water birds. It was also noted that a huge congregation of ducks and waders were observed outside the boundary of the sanctuary where a mix of shallow and deep water, as well as a relatively larger submergence area, were available. Hence, it is recommended to remove these small bunds or else widen the mouths of the bunds giving more area for free movement of waterbirds. Also, *Prosopis* needs to be removed from the existing bunds so as to increase the roosting and nesting sites for waterbirds.
- **Other issues**: Though the impact of Nilgai and feral/domesticated dogs has not been studied in the current work however, increase in the population of dogs has to be checked. During the survey packs of dogs were seen roaming inside the Sanctuary. Depending on future observations and studies forest department may consider neutering dogs in the near vicinity of the Park especially if the dogs are feral and not domesticated. This recommendation can only be considered if clear evidence is seen that dogs are harming the waterbird population.

2.1.1.3 Capacity Development

- Training of FD staff in bird counting techniques, bird migration, habitat parameters, disease monitoring

2.1.1.4 Communication and Outreach

- **Involving local Community**: *Prosopis* is a fast-growing plant and hence requires continuous removal on annual basis. Also removing *Prosopis* demands substantial investments. Local communities around Khijadiya can be involved in carrying out these tasks as they can use these for fuel-wood and fodder. Since the area of Khijadiya is just 600 ha, a precise area has to be marked from where locals can remove the extra growth. These areas can be the low-lying areas in which water inundation takes place. The areas having old-growth *Prosopis* should be kept untouched in the first phase of removal.
- *Prosopis* removal can be initiated during pre-monsoon with each phase targeting to remove at least 10 ha of young growth of *Prosopis* in two months starting from April or June depending upon the opening up of inundated areas and bird movements. The areas for removal have to be marked precisely. After the first few showers, these marked areas have to be checked for *Prosopis* seedlings. Manual labour is encouraged in the areas as this will provide marginal employment opportunities for the local communities. This practice has to be repeated every year to check the growth of the species and simultaneously initiate the removal in the other areas.
- Local communities involvement as nature guides: As informed by Khijadiya forest department staff few youths have already been identified and trained as nature guides which sometimes accompany tourists on a need basis. Khijadiya as such doesn't need a guided tour for seasonal birders however, for the tourist visiting for recreational propose, a nature guide could be made available during the migratory season. This will help create employment as well to keep a check on the tourist activities. A basic training course on bird identification and basic information can be designed for the interested locals.
- **Setting up of hides:** Currently, the hides set up in the park are at incorrect locations as the hides are exposed from all three sides and hence rendered useless. The hides have to be placed in the points where they will be covered by at least two sides by thick vegetation. Or else local varieties of sapling can be planted on the sides. As the area is devoid of cattle grazing, planting of a sapling and its growth can be monitored easily. Currently, the colour of hides is white which can be painted in dull grey or green which will help in camouflaging with the environment. The hide at the entrance of section-2 can be removed and can be set near the approaching path of the watchtower in the same

section as the path is covered with thick vegetation. The placement of hides in section-1 has to be revised, depending on the Prosopis removal from the walking paths.

2.1.1.5 Research Knowledge-based development

- A study on resident and migratory species with habitat preference needs to be undertaken.
- the result of Prosopis removal on terrestrial and waterbirds is also detrimental to the area and hence needs to have a long-term study of the area.

2.1.2 Marine National Park and Sanctuary, Gujarat

2.1.2.1 Species Conservation

- Heronries already identified by the forest department are required to establish a protocol for regular monitoring. As most of these heronries will be away from human settlements, direct threats may not exist, however, the behaviour of these community nesters in this region needs to be studied for any future change and conservation.
- The areas where bunds have been created to store the freshwater along the Gulf are also sites supporting migratory birds. These areas need to be mapped and small-scale studies could be initiated in collaboration with local colleges to create baseline data.
- Many non-protected areas also support species like migratory cranes. These areas also need to be mapped and future development in these areas need to be studied.
- The saltpans, mudflats, sandy shore and fallow lands which are roosting and feeding grounds for shorebirds need to be mapped. The movement patterns in these areas can be monitored. This will be a necessary input for the department in case they need to lease out any lands for industrial purposes.

2.1.2.2 Habitat Conservation and Sustainable management

- As more mangrove plantation in the mudflats is proposed, due consideration of mudflat ecosystem needs to be made. Some of the mudflats could be marked where mangrove plantations should be restricted.
- In the future proposals for the lease of lands, the salt industries should agree to leave a portion of the land in case it coincides with the roosting place for birds.

- The industrial area can be asked to grow some local varieties of plants suggested by the FD to support the terrestrial birds or collection of twigs by the colonial nesting birds in heronries.
- A buffer of fruiting plants of local varieties or shade plant needs to be maintained/planted by the industries which can be monitored by the FD.
- Prosopis removal and encouragement for local varieties of trees and plants can be done by the respective industries.
- Phase wise removal and a strict plan with an allocated budget needs to be made for the removal of Prosopis especially for the areas where the invasive species is a threat to waterbird habitat.
- Management of reed beds to render succession towards a woodland.
- A fish sampling of wetlands to check for invasive species which may be a threat to the native fish population.
- If tourism is being planned to any of the islands, then carrying capacity needs to be studied prior full opening of the facility.
- The bunds need to be identified for which the height could be increased to reduce surface runoff. The flooding situation in case of heavy rain needs to be analysed in these areas and the increase in height and depth can then be decided. The suggestion of a hydrologist needs to be taken into account for this.

a) Jodiya: Since many areas are interspersed between the protected area and partially owned by revenue land, this needs to be assessed urgently so that the areas attracting waterbirds can be taken under protection if needed. Some of the areas near the creeks seem to be good areas for roosting migratory birds which need to be checked during the appropriate high tide. These are the areas that also share the boundaries with the saltpans. Jodiya needs urgent attention and areas attracting heavy congregation needs to be marked and proposed to extend the protected area status as they are in demand by the salt industries for extension of the salt works.

Due to the expanse of the area, it has a combination of wetlands, saltpans and fallow lands that are known for migratory bird congregation. The areas supporting high congregation needs to be mapped and the protection status of the area needs to be assessed. Wetlands depending upon the monsoon needs to be monitored for maintaining adequate water for both resident and migratory birds.

b) **Pirotan Island**: To evaluate the shrinking of mudflats (if any) because of the increasing mangrove cover. Evaluation of developing tourism infrastructure inside the island and regulating movement around the island to maintain the area for roosting or feeding migratory/resident birds.

c) **Sachana-Balachadi**: Coastal beach with tidal mudflats. With the construction of shipbreaking yard, there seems to be slight displacement of the roosting sites along the sandy beach. For maintaining the roosting sites, the beach area which is under forest department needs to be monitored. The spread of mangrove in this area needs to be assessed as to maintain the exposed mudflats in near vicinity of the beach.

d) **Khijadiya Bird Sanctuary**: Khijadiya Bird Sanctuary has both freshwater marshes and intertidal mudflats and marshes (divided by a 5,996 m earthen reclamation bund). The biggest management issue is removal of Prosopis which needs to be carried out regularly to maintain the spread of water during the monsoon and for rest of the year. However, in the current survey a large spread of reeds were observed which have taken over much part of the wetlands area. Hence, selective and intermittent removal of reeds could also be planned for better management of the area.

e) **Narara and Vadinar Saltpans**: Narara is a protected area known for corals and marine life. During receding and approaching tide wader congregation can be seen in good numbers. The mangrove areas in the near vicinity could be supporting small heronries which needs to be identified. Mangrove plantation activity in this area needs to be assessed. Vadinar saltpans are near the vicinity of Narara and KPT Jetty. The saltpans serve as high tide roost for the birds which feeds at Narara during the low tide. The saltpans which support a sizeable congregation of waders can be identified for future monitoring.

f) **Beyt Dwarka:** The island didn't seem to support bird congregation at par with the nearby known bird congregation sites. The northern portion of the island which is under forest department protection needs to be monitored for bird congregation.

g) **Bhaidar Island**: The area along with the nearby islands needs to be monitored for migratory birds' congregation and the possibility of small heronries among the mangrove patches. Inside the island, the high tide roost for shorebirds needs to be mapped and monitored. The mangrove plantation needs to be assessed in the area in terms of mudflat encroachment.

h) **Arambhada, Mithapur Saltpans**: The saltpans support a large congregation of migratory waterbirds and monitoring during the migratory season is recommended.

i) **Charakla Saltpans**: These saltpans are known to support a high congregation of birds and some reports of nesting of terns as well. No recommendations are to be made for the saltpans as they are privately owned except that monitoring especially during the migratory season can be carried out. Some of the fringe areas like fallow saline lands and village ponds are supporting a good number of migratory waterbirds which is recommended to be monitored and maintained.

j) **Gaga Bustard Sanctuary:** The Sanctuary is primarily a grassland habitat and mostly have an even slope. The Sanctuary is data deficient in terms of avifauna and needs to be surveyed in all seasons especially grassland-dependent birds. There are areas where water gets accumulated and hence a temporary refuge for waterbirds however, the management of this Sanctuary should focus on maintaining the grassland habitat. Prosopis removal from the grassland areas needs to be carried out regularly which the forest department is already carrying out. Older growth of Prosopis can be maintained as such with some intermittent removal to plant some fruit-bearing trees like Salvadora and other local varieties. This area is drought-prone and dry and hence the management needs to be devised to take care of water requirements inside the protected area and around the fringes. Additionally, it needs to demark the boundaries of the sanctuary. This sanctuary is currently closed for tourists and is advisable to remain so as the area is too small for tourist movement. However, a portion of the area where waterbirds were seen congregating is partially on revenue lands and can be accessed by locals. Farming in these areas was also seen.

2.1.2.3 Capacity Development

- Training of staff on bird identification, counting techniques, database management, reporting, habitat parameters, disease monitoring, banded bird reporting

2.1.2.4 Communication and Outreach

- Identify places for the construction of watchtowers to increase the vigilance and bird tourism in the area
- Interested locals can be trained as naturalists and involved in tourism
- For removal of Prosopis and plantation activities the locals can be approached. The removed Prosopis can be given for free to the locals for firewood use if needed.
- Initiation of annual counts for the gulf can be made in collaboration with NGO's, birdwatchers and local industries.
- A monthly update on birds or any other taxa on local channels, **ex-radio** can be made by chosen staff of forest department or any local involved such activities in local language to increase the awareness about the habitat.
- To increase bird tourism in the area the website of MNP&S can be updated regularly showing the time of visit to different areas as most of the viewing is dependent on the tidal fluctuations. A timetable with the height of tide can be maintained for selected areas to help tourist.

2.1.2.5 Research Knowledge based development

- To undertake annual bird count for the whole Marine National Park and Sanctuary.
- Conducting bird festival in select areas of MNP&S
- Need based research having association with marine flora and fauna with birds.
- Annual budget for certain studies could be made on the important topics related to MNP&S

2.1.3 Desert National Park, Rajasthan

2.1.3.1 Species Conservation

- All existing powerlines should be laid underground and new lines should be rerouted away from the GIB distribution sites
- Control over free ranging dogs and Wild Boars (across the sites) and from the roosting and foraging ground of Cranes.

- An all-season survey should be carried out in this area to get an overall idea of the status and distribution of migratory and threatened species.
- Awareness programmes should be organized in schools regularly to make the students aware of the importance of Demoiselle Crane and other wildlife in the ecosystem and the threats faced due to Chinese Manja.
- The contamination of grains with high levels of insecticides is the reason behind the mortality of the highest number individuals in the last 11 years. Therefore, awareness campaign among farmers is recommended to reduce the incidences of food poisoning
- The injured individuals can be ringed or satellite-tagged before release. A study dedicated to the movement ecology of Demoiselle Crane will provide information on their migration routes, stopover sites, and their breeding ground. This study will be helpful for the conservation of this species.

2.1.3.2 Habitat conservation and sustainable management

- Boundary demarcation, notification, and inclusion within land-use records (DNP)
- A strict ban on any further destruction of the Oran through privatization and infrastructure development.
- All existing powerlines could be laid underground and new powerlines should be rerouted from outside the Oran.
- Through consultations with the locals, the process of declaring Deg Rai Mata Oran as a Community Reserve, which will be managed by a Community Reserve Management Committee, should commence immediately.
- Strict ban on further infrastructure development planned in GIB areas near **PFFR**
- Government departments such as Agriculture, Horticulture, Animal Husbandry, Public Works Department and Energy Department should utilize the area focussing the sustainable and environmental friendly approach
- The habitat should be restored by removing exotic and invasive plant *Prosopis juliflora* in villages around **PFFR**.
- The old wells inside PFFR should be filled up and closed permanently to avoid accident
- The proposal to transform Jaisalmer district into a ‘solar hub’ is threatening the future of GIB. A solar power plant was installed in 2019 in Chayan, historically a suitable habitat of the GIB . The need of the hour is to safeguard these critical habitats to save the future of the species. These areas should be purchased after consultation with the

gram panchayat, community leaders and land owners and transform it into a Reserve, thus providing a safe wintering ground for the GIBs. Locals should be employed to monitor the reserve

- It was found that the area near NH 11 is intensively used by various wildlife species to cross the national highway to approach the perennial source of water (Naadis in local language) such as Khetolai naadi and Silotra naadi to quench their thirst. It is also the only road for travellers coming from Jaipur, Bikaner, and Jodhpur to Jaisalmer. BNHS with the help of Khetolai gram panchayat has installed a sign board near Khetolai bus stop to make people aware of the need to maintain a minimum vehicle speed while driving through the area; there is a need to install more colourful boards with photographs of the wildlife along with attractive slogans to make people aware of the dangers of over speeding, creating wildlife corridors, putting speed breakers

2.1.3.3 Capacity development

- Capacity building of the community and frontline staff of the forest department for effective conservation actions

2.1.3.4 Communication & outreach

- Cross-sectoral Mechanism – multiple stakeholders involvement setup in non-protected areas
- Encourage research institutes, civil society, and community-based organizations to act as 'knowledge hubs', custodians or stewards of birds and their habitats.
- Strategies for communication and awareness (bird fair, species-specific festivals (GIB, Demoiselle Crane) days
- Conservation initiatives through local community participation
- Effective communication and outreach at landscape- and site-level
- Develop outreach material on birds, key fauna of Thar Desert and their habitats
- To maintain People's Biodiversity Register and devise strategies for the conservation of birds should feature as a key segment in the District Administrative Plans.
- Create awareness amongst mass media on the importance of the conservation of migratory birds and their habitats.
- Sensitization of BSF personnel by organizing a workshop once or twice a year.

- Construction of a Nature Interpretation Centre in Longewala somewhere near the Army Museum. This will help to create awareness on wildlife of Thar among the army personnel and tourists

2.1.3.5 Research knowledge-based development

- Conservation-oriented research and knowledge-base development
- Use of conventional ringing and advanced technologies (satellite tagging, GSM tagging) to assess ecology, migration strategies, and population dynamics of migratory birds (GIB, Larks, raptors)
- Plan for periodic assessment and monitoring of the sites to understand the response by the birds to the rapidly changing landscape
- Analyse existing data for population trends/creating and managing site-specific database and establishing decision supporting system

2.1.4 Keoladeo National Park, Rajasthan

2.1.4.1 Species Conservation

- Nesting and roosting areas within and in near vicinity needs to be mapped precisely
- Heronries needs to be identified in the park and a protocol for regular monitoring should be established for a regular data collection.
- Seasonal breeding bird surveys need to be conducted to record the species breeding success and threats faced by the species.
- As the migration season progresses, bird and habitat parameters are needed to be maintained to understand the wetland dynamics twice a month.
- Steps should be taken to ensure timely and sufficient availability of water in the park from major water sources. In order to achieve this, regular communication with the irrigation department, periodic repair/cleaning of all the canals and strict vigilance is required.
- Expanding storage capacity of the park by developing and maintaining perennial deep ponds, new peripheral water body or canal system, watershed (provided in management plan).
- Permanent Depth pillars could be established at deepest points in each block to measure periodic water levels and siltation rates.

- A desilting schedule needs to be prepared on regular basis to maintain depth of waterbodies.

2.1.4.2 Habitat conservation and sustainable management

- Smaller perennial ponds are to be developed to host a greater diversity of fish that can spread and breed during monsoon season to prevent fish kills during summer.
- Catfish has dominated most parts of the wetland. Introducing native species of fishes in the wetland should be prioritized.
- A network of connected perennial water bodies to conserve fish, turtles and other important aquatic species should be developed in blocks D, E and A.
- Removal and monitoring of invasive species like Water hyacinth (*Eichornia crassipes*) *Lantana camara*, *Ipomoea* and *Prosopis juliflora.*
- The gaps created by removal of mother trees should be planted with indigenous trees if the natural regeneration is not good enough.

Conservation and maintenance of Grassland and woodland Zones:

- A separate grassland revival plan is needed to maintain grassland and eradicate *Prosopis juliflora* from the grassland area.
- Clipping and clearing vegetation along surface soil, burning of grasses, harvesting should be done periodically in order to maintain the quality of grassland habitat.

Park protection:

- To prevent trespassing, illegal extraction of forest resources by the people living around the park, regular patrolling in all existing patrolling paths should be done.
- Construction of more watch towers at strategic locations. This will not only enhance the efficiency of patrolling staff but also help in monitoring of fire chances within the Park.

Pollution control:

- Water runoff from the surrounding agricultural areas flows in this wetland. This could lead to increase in chemical levels in water affecting its quality. Monitoring chemical levels on seasonal basis especially in areas of high congregation and heronries will help to analyse its effect on waterbirds.

Fire control:

- Controlled burning at the edges of the grassy patches, clearing of fire lines along the road side and other vulnerable places needs to be taken up in advance before summer to act as fire breaks.

2.1.4.3 Capacity development

- Training workshops should be conducted for forest department staff on monitoring of migratory birds, bird ringing/ banding and reporting.
- Building capacity and protocols for disease surveillance in poultry and wild birds.

2.1.4.4 Communication & outreach

- Long-term studies based on Bird ringing and Satellite tracking should be done to obtain migration pattern.

2.1.4.5 Research knowledge-based development

- The long-term data collected needs to be assessed to understand the pattern of change in the avifaunal species recorded here. Based on the findings, specific management actions to be undertaken which give preference to the health and safety of non-generalist species.

2.1.5 Sambhar lake, Rajasthan

2.1.5.1 Species Conservation

- Detailed surveys need to be carried out throughout the year to assess the nature and level of threats and disturbances to the waterbirds such as:
    a. Illegal trapping or intentional poisoning
    b. Habitat encroachment and degradation
    c. Pollution (Agricultural run-off, industrial effluents, and sewage disposal)
    d. Water level in the lake
- Monthly monitoring should be carried out for population of birds and water level in the area.
- Counting and monitoring of breeding bird needs to be conducted every year with special focus on breeding success. In case of breeding failure, identification of factors responsible for failure should be documented.

2.1.5.2 Habitat conservation and sustainable management

Catchment area management and Ground water conservation

- Problems: Indiscriminate extraction of ground water, diversion of surface water inflows in the lake's catchment and construction of rainwater harvesting structures in the flow path of the rivers and drains feeding the lake for existing irrigation practices and climate change results in inadequate recharge of the aquifer and change in hydrological pattern of the area.
- Surface embankments such as bunds, gabion structures, and silt trap are present in the catchment of Sambhar. The collection of water at such structures on a considerable scale reduces the downstream flow towards the lake, resulting in to the scarcity of water in the lake.
- Proper studies on impacts of such structure needs to be done before construction.
- Studies could be made to link the impact of such structures with current scenario and their numbers can be reduced to make water available for Sambhar Lake.
- Avoiding construction of small dams in catchment area of the lake.
- The pumping pattern needs to be maintained and optimal pumping of ground water should be made mandatory in the region. Further, illegal pipelines drawing lake water for salt production should be eradicated.
- Construction of rainwater harvesting systems around the periphery of the lake should be planned to replenish ground water.

Biodiversity conservation measures

- Delineation of Core and Buffer Area or Sambhar Lake Wetland Area has been proposed in the management plan.
- The delineation and demarcation of wetland should be done.
- Salt mining related activities within an area of 500 m buffer surrounding the lake and the dry lake bed should be banned.
- Restricting excessive water withdrawal from the buffer zone.

2.1.5.3 Capacity building

- Training workshops for the field staff covering bird identification, bird migration, monitoring, and counting techniques and reporting of data should be scheduled.
- Sambhar Lake has previously experienced large number of mortalities due to bird flu and thus disease surveillance in the area and its reporting is necessary in future. Frontline staff should be aware about such outbreaks and symptoms in birds for reporting.
- Some basic equipment's like GPS, camera, binocular, and torches should be provided to increase protection level and keep records.

2.1.5.4 Communication & outreach

- Awareness program should be conducted on importance of wetlands and ground water resource conservation.
- Training could be organized at panchayat level regarding rainwater harvesting systems and traditional rainwater harvesting structures could be developed in association with locals to reduce pressure on ground water.
- Public awareness and support could be made to emphasize the importance of wetland, and association with bird conservation.
- Modern agricultural techniques such as drip irrigation, and close field distribution channels could be the effective solution for optimizing the utilization of the water in agricultural fields.

Ecotourism

- Ecotourism activities could be encouraged in the area to provide alternate source of income for locals.
- Local people could be selected to work as guides (after training) and labours (to perform management activities in the sanctuary).
- Watch towers should be constructed at suitable areas which will be helpful in monitoring the area, bird count, and bird tourism.

2.1.5.5 Research knowledge-based development

- Existing foraging and roosting grounds of birds need to be identified.

- Salinity check: The Sambhar Lake covers a wide range of salinity. Salinity plays a major role in determining the number of algae in the lake. Due to high salinity, the biodiversity is restricted to salt tolerant species only with a very little faunal background leading to shorter food chain.
- Increased salinity of the lake could affect the food availability for migratory and local birds in the area.
- Diversity and abundance of food availability in the lake should be checked on periodically.
- Regular testing of water samples could be done to monitor the salinity value of lake and efforts could be done to maintain the salinity level of lake.
- Studies could be done to link the salinity level and its impact on biodiversity specially birds.
- A Management cell/ committee needs to be made for Sambhar Lake for regular monitoring and data collection on biomonitoring, water birds counting and ecological conservation at local level.
- Involving and encouraging scientific, educational and research organizations to carry out studies and research on avifauna within the sanctuary and nearby areas.

3 CAPACITY BUILDING

The capacity building workshop for Madhya Pradesh has been finalised during 9th to 11th December 2021. Communications were made with the forest departments of Tamil Nadu, Andhra Pradesh, Maharashtra, Sikkim, Rajasthan, Puducherry and all the governments responded positively. The convenient dates of the forest departments are being worked out. The translation of trainging manual from English to Tamil has been completed and formatting is being done for the printing. The status of organising workshops is given in the Table 1.

Table 1: Status of capacity workshop planinng in different states

States	**Status**
Madhya Pradesh	Workshop dates and arrangements are finalised and will be held in 9th to 11th December 2021.
Tamil Nadu	BNHS Team met Chief Wildlife Warden and explained about the workshops and dates need to be finalised.
Andhra Pradesh	Manual in Telugu is ready and printed. As previously, it is postponed by the Andhra Pradesh Forest Department, BNHS team is in touch for fixing a date for the workshop
Maharashtra	As previously it is postponed by the Maharashtra Forest Department, BNHS team is in touch for fixing a date for the workshop
Sikkim	BNHS team met Sikkim Forest Department, as the calender of Forest department is preoccupied in 2021 the workhop will be organised in January- Febraury 2022.
Rajasthan	Discussed with Forest Department of Rajasthan and mutual dates for the workshop are being worked out
Puducherry	Discussed with Forest Department of Puducherry and mutual dates for the workshop are being worked out

4 BIRD SENSITIVIY MAPPING

During this reporting period, methodology for assigning sensitiviy score has been worked out with the experts from BirdLife International. Avian sensitivity maps will be developed separately for wind energy facilities using the following approach:

4.1 Sensitivity Index

Not all bird species are equally affected by energy infrastructures, certain taxonomic, ecological, and conservation aspects make them more sensitive to this form of human development (D'Amico *et al*., 2019; Thaxter *et al*., 2017). In this first step, our objective will be to assess the sensitivity of each bird species to energy infrastructures and to produce a sensitivity index that will produce a quantitative value. This index could be considered as a likelihood of a particular species being negatively impacted by a particular energy development. It will be calculated based on two main components: the first one will capture the susceptibility or likelihood of the species being impacted, and the second one will capture the severity of the impact for the conservation of the species. This quantitative value will allow us to rank all species present in each country, producing an objective and standardized method to prioritize and categorize areas and species according to their sensitivity (Allinson *et al*., 2020). To finalize this section, we will choose 15% of species with the highest scores (i.e., most sensitive) to create a final list that will be used in the next steps of the mapping process.

4.2 Wind Energy Sensitivity Index

Three of the main impacts that have been described for wind energy are collision, displacement, and habitat loss (Drewitt and Langston, 2006; Marques *et al*., 2014). Two different parameters were created to capture collision and displacement susceptibility for bird species. The first parameter will capture the susceptibility or likelihood of the species being impacted, and the second one will capture the severity of the impact for the conservation of the speciesIn relation to habitat loss, this impact will be accounted for by the selection of land cover and land use data that will be applied in our analysis further on. We included two parameters that will capture the conservation implications of these impacts for the species. The index was calculated using the following formula:

Wind Energy Sensitivity Index = Co + (Di/5) + CnS + S

Co = Collision

Di = Displacement

CnS = Conservation Status

S = Survivorship (k- and r-selected species)

Collision (Co) is the most direct threat to bird populations, and it has been reported in multiple species and locations across the world (Loss *et al*., 2013; Marques *et al*., 2014; Perold *et al*., 2020; Thaxter *et al*., 2017). However, multiple factors related to wind farm characteristics (e.g., turbine type, spatial design) and site location (e.g., topology, land use) have been identified as influencing collision risk (Marques *et al*., 2014). To develop a metric that could identify the sensitivity of different taxonomic groups, we used a study by Thaxter *et al*., (2017). In this study, the authors analysed the ecological traits and phylogenetic characteristics that make different taxonomic groups more sensitive to collision. Through a modelling approach they assigned a collision probability to each land-bird species worldwide. Following the authors recommendations, we summarized it at the family level (average value). After that, we transformed it to a categorical value between 1 and 4. These categories were calculated dividing the total list of taxonomic families in equal intervals. Thus, category 4 corresponds to the first quartile (25% with higher values), category 3 to the second quartile (25 – 50% with higher values) and so on. Higher categories mean higher probability of collision. Based on the review done on Indian studies some speciesspecies and families were directly given top score for collision risk.

Displacement (Di) generally refers to the reduction in the habitat use of areas under the influence of wind energy facilities, which in the long-term produce a decrease in bird density and functional habitat loss (Drewitt and Langston, 2006). This type of impact has been proven for marine and land-birds (Furness *et al*., 2013; Marques *et al*., 2020; PearceHiggins *et al*., 2009), and after collision it is thought to be the major threat to birds posed by wind farms (Hötker, 2017). However, its importance and magnitude has been difficult to quantify due to the scarcity of long-term and rigorous studies employing BACI methodologies (i.e., Before-after control-impact) (Hötker, 2017). A recent study from India has reported that the displacement of raptors had consequences on lower trophic levels, producing cascading effects on the food web (Thaker *et al*., 2018). This highlights the largely underestimated effect that displacement could have on ecosystems.

To produce a parameter that was able to capture this impact, we referred to Hötker (2017). In this study, the authors reviewed all the evidence from the scientific and grey literature reporting displacement in bird species in Europe. Impact was divided into two categories: negative (when displacement was reported to reduce species abundances) and positive (when there was no change, or a positive effect was found in species abundances). By this literature review, the authors were able to report the number of times a positive or negative effect has been found per species.

For those groups large enough, the statistical significance of this difference was calculated (binomial test). To transform these values into a parameter that we could employ in the final equation, we assigned the following values:

4 = Negative impacts more often reported and differences statistically significant.

3 = Negative impacts more often reported but differences not statistically significant.

2 = Negative impacts reported for the species

1 = Displacement impact never reported.

These scores were given at the family level. The whole family received the value of the highest scoring species included in that family. This precautionary approach was taken in order to assure that similar species that have not been studied could be evaluated. This approach is especially important when impacts have to be assessed in new areas where little scientific evidence is found, like in this project covering Asia. An exception was made for the Accipitridae family, recent studies suggest that this impact is more severe that previously acknowledged (Marques *et al*., 2020; Santos *et al*., 2021; Thaker *et al*., 2018), so a value of 4 was directly assigned to this group.

Conservation status (CnS) was assigned at the species level using the most updated version of the IUCN Red List (BirdLife International, 2020) using the following scores:

5 = Critically Endangered (CR)

4 = Endangered (EN)

3 = Vulnerable (VU)

2 = Near Threatened (NT)

1 = Least Concern (LC) and Data Deficient (DD)

Survivorship (S) (k- and r- selected species): The population-level impact of a single individual mortality event depends on the life history traits of the species involved. Particularly, some life history traits like fecundity, age of maturity, and adult survivorship are especially relevant, k-selected species are characterized by low fecundity, late ages of maturity and high survivorship, thus adult mortality has high impacts on the population (Niel and Lebreton, 2005; Sæther and Bakke, 2000). The species groups with the highest rates of impact from wind development tend to be k-selected species such as Accipitridae, Ciconiidae and Bucerotidae (Thaxter *et al*., 2017), thus it is factor that must be carefully considered when evaluating impacts on bird conservation. To include a parameter that could capture this factor, we employed survivorship (S), which has been recently calculated for all bird species (Bird *et al*., 2020). This value ranges from 0.31 to 0.98 and was included without any transformation in the sensitivity index formula.

4.3 Creating Species Sensitivity Maps

After assessing the species sensitivity, we will need to relate this value to the species geographical distribution, to do so we will employ several sources of information that will provide different levels of geographical accuracy. The most basic level of geographical information will be provided by the BirdLife species distribution maps (http://datazone.birdlife.org).

These distribution maps represent the geographical space where the species is most likely to occur based on published literature, experts' opinion, and global databases. This information is regularly updated by BirdLife International, and it is used for biological conservation and research. However, this information has a coarse spatial resolution so, to add an extra level of spatial accuracy, we will employ Area of Habitat (AOH) maps, which have been recently developed for conservation purposes (Brooks *et al.*, 2019). AOH represent habitat present within the range of a species and can be considered an intermediate step between Extent of Occurrence (EOO) and Area of Occupancy (AOO). These maps are calculated based on remotely sensed land cover and elevation datasets (Brooks *et al*., 2019). Lastly, to add a final level of spatial accuracy, we will compile all available species distribution information from field surveys and citizen science projects available to date. We will work with the four national partners to compile information from field surveys conducted by different national

organizations (e.g., partners, NGOs, government). In addition, we will promote new surveys to be conducted in particular areas and/or for particular species of interest.

In relation to datasets coming from citizen science projects, our main source of information will be eBird (https://ebird.org/home), but also others will be used (e.g., Asian Waterbird Census). Citizen science data can be a powerful tool for conservation; however, spatial and temporal biases can make them challenging to use (Johnston *et al*., 2020), particularly when combining information from different sources, collected following different methodologies, and aiming at various objectives. This "on-the-ground" information will be employed to provide an estimation of probability of species presence, and thus, a measure of the accuracy of our sensitivity assessment. Spatial locations where the species presence/ absence has been confirmed by such information will receive a higher value of certainty than, for instance, locations where no survey information is available. This approach was preferred over more advanced modelling techniques, due to low data availability for certain areas and species. By combining these three sources of information, we will provide the most accurate geographical distribution of species available to date, which will enable a precise assessment of sensitivity. Once a map for each of the high priority species has been produced, a composite map of species assemblage distribution will be created by combining all sensitivities.

4.4 Incorporating land use and landcover data

To account for habitat loss derived of energy infrastructure development, several layers of land cover and land use information will be added to the sensitivity assessment. Firstly, we will incorporate Important Bird and Biodiversity Areas (IBAs) which are geographical areas that due to their particular ecological characteristics congregate large amounts of birds and/ or species considered of conservation importance (datazone.birdlife.org). Secondly, Protected Areas (PA) will be included—we will consider all protected areas regardless of their level of protection. This information will be downloaded from Protected Planet (www.protectedplanet.net/) which is the global dataset jointly managed by IUCN and UNEP-WCMC (UN Environment Programme World Conservation Monitoring Centre). Both of these layers will receive the higher sensitivity value, which means that no development will be recommended in these areas. To further account for areas of ecological and biological importance that are not captured by the layers aforementioned, we will use land cover data (from GlobCover 2009; http://due.esrin.esa.int). This dataset is derived from remotely sensed

imagery, classifying the globe surface in 22 land cover categories. Higher sensitivity scores will be given to natural areas, as opposed to areas of high human use.

4.5 Species of concern

Based on the sensitivity index, Indian species were assinged with scores and top 15% of the speciesspecies (183 species) were taken for incorporting in the mapping. The list of species and scores were given in Appendix 1.

5 SINGLE SPECIES ACTION PLAN

In order to collate information from citizen scientist involved in monitoring as well as experts from other organisations, a fill-in form was developed. The species-form was designed to collect information on the current as well as the historical population counts from sites harbouring significant populations of the species. Similarly, the threat-form was designed to report the threats and disturbances at these above-mentioned sites.

A consultation with the experts was scheduled on September 12, 2021 and information about it was circulated on multiple forums. A total of 50 participants registered to attend the meeting. Summary records of the meeting are given in Appendix 2.

The meeting commenced with explanation of the objective for compiling information on the population, trend and threats to the shorebird and flamingo species listed in the CAF NAP. The staff also gave a brief orientation on the CAF NAP and the project. Later, the form filling procedure was explained in detail, followed by a discussion with the participants. It was also discussed that the citizen science data collected during Asian Waterbird Count and the Ebird entries will be collated to understand the long-term trend. The participants were to submit their entries by end of September.

Information about 20 species has been collated from wetlands across the states. This information will be compiled with the data obtained from literature survey, AWC and Ebird in order to comprehensively present records.

Ebird data on the priority species has been preliminarily analysed and useful data on the habitats with more than 1% geographical population of the priority species has been identified (Table 2). These sites included both winterring areas and also passage sites. Number of passage and wintering sites for each species is given in figure 1. Further analysis is being done to map the overall distribution of the priority species in different states.

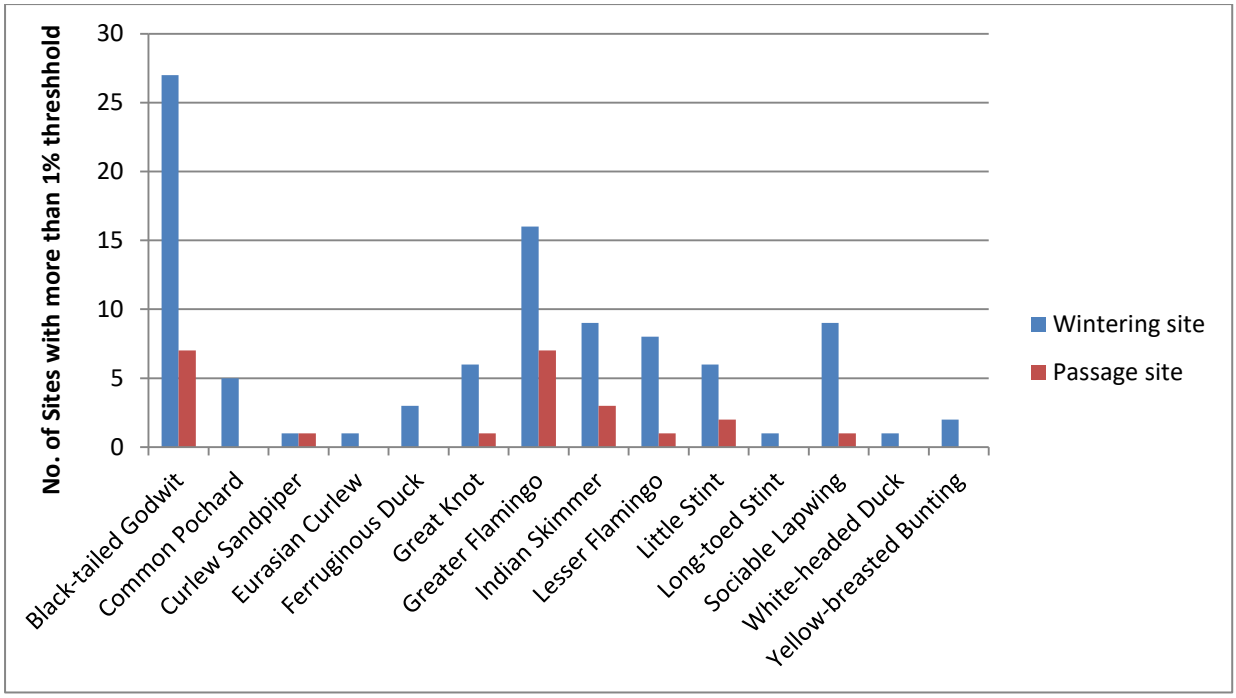

Figure 1. Number of passage and wintering sites for priority species based on Ebird data

Table 2. Statewise list of sites with more than 1% biogeographical population of the prioritised (based on the Ebird Data)

Site Name	Number of Priority species (above 1% biogeographical population) supported
ANDAMAN & NICOBAR	
Sippighat Wetlands	1
ANDHRA PRADESH	
Kakinada	3
Pulicat Lake	3
Singanamala Cheruvu	1
ASSAM	
Deepor Beel	1
Kaziranga National Park	1
Pobitora	1
GUJARAT	
Bagodara Wetlands and Saltpans	1
Bhaskarpura Wetlands	1
Dhrafad Sichai Yojana Vishavadar	1
Great Rann of Kachchh--Banni Grasslands/Wetlands	2
Great Rann of Kachchh--Dholavira/Nanda	4

Site Name	Number of Priority species (above 1% biogeographical population) supported
Bet	
Haathab Beach	1
Juni Akhol	1
Kantiyajal	1
Khijadiya/Sachana/Dhinchda	5
Khodiyar Dam	1
Kuchhadi/Javar Wetlands	2
Kumbharwada Wetlands	3
Little Rann of Kachchh	4
Mandvi Beach	1
Mendha Creek	4
Mokarsagar Wetland Complex	5
Nalsarovar Bird Sanctuary	4
Nyari-1 Dam	1
Pariej Lake	1
Sodam Bhandhara	1
Thol Bird Sanctuary	2
HARYANA	
Budhera WTP	1
KARNATAKA	
Almatti Reservoir/Backwaters	2
Hadinaru Kere	1
Karanja Backwaters	1
Krishna River—Galagali	1
Markalu Kere	1
Sule Kere	1
Tungabhadra Reservoir/Backwaters	1
KERALA	
Changaram Wetlands	1
Kuttanad Wetlands—Pallippad	1
Kuttanadu Wetlands--Poovathikkari	1
Mamprapaadam	1
Mapranam Wetlands	1
Puthupally	1
Vayalapara River--Athiyadam Bird Sanctuary	1
Vettatheril Puncha	1
MADHYA PRADESH	
Halali Dam	1
National Chambal Gharial Sanctuary--Morena/Dholpur	1
National Chambal Sanctuary--Bhind	1

Site Name	Number of Priority species (above 1% biogeographical population) supported
MAHARASHTRA	
Akshi	1
Jaikwadi Bird Sanctuary	1
Thane Creek/Estuary	5
Uran	1
ODISHA	
Chilika Lake	1
Chilika Lake—Mangalajodi	1
Satkosia Gorge Sanctuary	1
PUDUCHERRY	
Neelapalli Island	1
PUNJAB	
Harike Bird Sanctuary	1
RAJASTHAN	
Alania Dam	1
Bhupal Sagar Lake	1
Jorbeer	1
Soorwal Lake	1
Tal Chhapar	1
TAMIL NADU	
Kaliveli Lake	1
Mudhaliyarkuppam Backwaters/Odiyur Lake	2
Pallikaranai Marsh	1
Point Calimere	3
Pulicat Lake—Annamalaicheri	1
Pulicat Lake—Pazhaverkadu	2
Valinokkam	1
UTTAR PRADESH	
Ganga River—Prayagraj	1
Haiderpur Wetlands and Bijnor Barrage	2
National Chambal Sanctuary—Agra	1
National Chambal Sanctuary--Etawah	1
Surajpur Wetlands	1
Yamuna River—Karehada	1
WEST BENGAL	
Bakkhali Sea Beach	1
Farakka IBA Panchanandapur	1
Fraserganj/Kargil Sea Beach	1
Fulbari Wetlands	1
Jambudweep	1

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Appendix 1. Top 15 % species with highest sensitivity index for wind energy development in India

S.No	Family name	Common name	Scientific name	Red List	Collision	Displacement	Survivorship	Sensitivity Index
1	Accipitridae	Indian Vulture	*Gyps indicus*	5	4	4	0.9088	10.7088
2	Accipitridae	Slender-billed Vulture	*Gyps tenuirostris*	5	4	4	0.9088	10.7088
3	Accipitridae	Red-headed Vulture	*Sarcogyps calvus*	5	4	4	0.9039	10.7039
4	Accipitridae	White-rumped Vulture	*Gyps bengalensis*	5	4	4	0.9034	10.7034
5	Otididae	Great Indian Bustard	*Ardeotis nigriceps*	5	4	2	0.9311	10.3311
6	Gruidae	Siberian Crane	*Leucogeranus leucogeranus*	5	4	2	0.8849	10.2849
7	Otididae	Bengal Florican	*Houbaropsis bengalensis*	5	4	2	0.8842	10.2842
8	Glareolidae	Jerdon's Courser	*Rhinoptilus bitorquatus*	5	4	1	0.7769	9.9769
9	Accipitridae	Steppe Eagle	*Aquila nipalensis*	4	4	4	0.8769	9.6769
10	Accipitridae	Pallas's Fish-eagle	*Haliaeetus leucoryphus*	4	4	4	0.8584	9.6584
11	Accipitridae	Egyptian Vulture	*Neophron percnopterus*	4	4	4	0.8484	9.6484
12	Scolopacidae	Spotted Greenshank	*Tringa guttifer*	4	4	4	0.7948	9.5948
13	Scolopacidae	Great Knot	*Calidris tenuirostris*	4	4	4	0.7906	9.5906
14	Charadriidae	Sociable Lapwing	*Vanellus gregarius*	5	3	4	0.7158	9.5158
15	Laridae	Black-bellied Tern	*Sterna acuticauda*	4	4	2	0.8065	9.2065
16	Otididae	Lesser Florican	*Sypheotides indicus*	4	4	2	0.7768	9.1768
17	Ardeidae	White-bellied Heron	*Ardea insignis*	5	3	2	0.7724	9.1724
18	Falconidae	Saker Falcon	*Falco cherrug*	4	4	2	0.7517	9.1517
19	Laridae	Indian Skimmer	*Rynchops albicollis*	4	4	2	0.6813	9.0813
20	Ciconiidae	Greater Adjutant	*Leptoptilos dubius*	4	4	1	0.8559	9.0559
21	Emberizidae	Yellow-breasted Bunting	*Emberiza aureola*	5	3	2	0.5278	8.9278
22	Accipitridae	Tawny Eagle	*Aquila rapax*	3	4	4	0.8843	8.6843
23	Accipitridae	Eastern Imperial Eagle	*Aquila heliaca*	3	4	4	0.8711	8.6711
24	Accipitridae	Indian Spotted Eagle	*Clanga hastata*	3	4	4	0.871	8.671
25	Accipitridae	Greater Spotted Eagle	*Clanga clanga*	3	4	4	0.8496	8.6496
26	Accipitridae	Andaman Serpent-eagle	*Spilornis elgini*	3	4	4	0.7998	8.5998

S.No	Family name	Common name	Scientific name	Red List	Collision	Displacement	Survivorship	Sensitivity Index
27	Accipitridae	Nicobar Sparrowhawk	*Accipiter butleri*	3	4	4	0.7796	8.5796
28	Anatidae	Pink-headed Duck	*Rhodonessa caryophyllacea*	5	2	4	0.7066	8.5066
29	Scolopacidae	Wood Snipe	*Gallinago nemoricola*	3	4	4	0.6835	8.4835
30	Anatidae	Baer's Pochard	*Aythya baeri*	5	2	4	0.6474	8.4474
31	Gruidae	Sarus Crane	*Grus antigone*	3	4	2	0.8753	8.2753
32	Laridae	River Tern	*Sterna aurantia*	3	4	2	0.8714	8.2714
33	Otididae	Asian Houbara	*Chlamydotis macqueenii*	3	4	2	0.8691	8.2691
34	Corvidae	Andaman Treepie	*Dendrocitta bayleii*	3	4	2	0.7415	8.1415
35	Ciconiidae	Lesser Adjutant	*Leptoptilos javanicus*	3	4	1	0.883	8.083
36	Bucerotidae	Rufous-necked Hornbill	*Aceros nipalensis*	3	4	1	0.8773	8.0773
37	Bucerotidae	Wreathed Hornbill	*Rhyticeros undulatus*	3	4	1	0.8648	8.0648
38	Bucerotidae	Great Hornbill	*Buceros bicornis*	3	4	1	0.8616	8.0616
39	Bucerotidae	Narcondam Hornbill	*Rhyticeros narcondami*	3	4	1	0.8226	8.0226
40	Motacillidae	Nilgiri Pipit	*Anthus nilghiriensis*	3	4	2	0.5952	7.9952
41	Strigidae	Forest Owlet	*Athene blewitti*	4	3	1	0.7616	7.9616
42	Bucerotidae	Malabar Grey Hornbill	*Ocyceros griseus*	3	4	1	0.7521	7.9521
43	Apodidae	Dark-rumped Swift	*Apus acuticauda*	3	4	1	0.61	7.81
44	Accipitridae	Himalayan Griffon	*Gyps himalayensis*	2	4	4	0.9117	7.7117
45	Accipitridae	Cinereous Vulture	*Aegypius monachus*	2	4	4	0.9106	7.7106
46	Accipitridae	Bearded Vulture	*Gypaetus barbatus*	2	4	4	0.9018	7.7018
47	Accipitridae	Grey-headed Fish-eagle	*Icthyophaga ichthyaetus*	2	4	4	0.8838	7.6838
48	Accipitridae	Rufous-bellied Eagle	*Lophotriorchis kienerii*	2	4	4	0.8535	7.6535
49	Scolopacidae	Eurasian Curlew	*Numenius arquata*	2	4	4	0.8413	7.6413
50	Scolopacidae	Bar-tailed Godwit	*Limosa lapponica*	2	4	4	0.8406	7.6406
51	Accipitridae	Great Nicobar Serpent-eagle	*Spilornis klossi*	2	4	4	0.8346	7.6346
52	Scolopacidae	Black-tailed Godwit	*Limosa limosa*	2	4	4	0.8275	7.6275
53	Scolopacidae	Asian Dowitcher	*Limnodromus semipalmatus*	2	4	4	0.8228	7.6228

S.No	Family name	Common name	Scientific name	Red List	Collision	Displacement	Survivorship	Sensitivity Index
54	Accipitridae	Lesser Fish-eagle	*Icthyophaga humilis*	2	4	4	0.815	7.615
55	Scolopacidae	Red Knot	*Calidris canutus*	2	4	4	0.7699	7.5699
56	Accipitridae	Pallid Harrier	*Circus macrourus*	2	4	4	0.706	7.506
57	Scolopacidae	Curlew Sandpiper	*Calidris ferruginea*	2	4	4	0.7	7.5
58	Scolopacidae	Red-necked Stint	*Calidris ruficollis*	2	4	4	0.6778	7.4778
59	Haematopodidae	Eurasian Oystercatcher	*Haematopus ostralegus*	2	4	3	0.8772	7.4772
60	Muscicapidae	Nilgiri Sholakili	*Sholicola major*	4	2	4	0.6659	7.4659
61	Anatidae	White-headed Duck	*Oxyura leucocephala*	4	2	4	0.648	7.448
62	Anatidae	White-winged Duck	*Asarcornis scutulata*	4	2	4	0.6465	7.4465
63	Columbidae	Pale-capped Pigeon	*Columba punicea*	3	3	3	0.7261	7.3261
64	Columbidae	Nilgiri Woodpigeon	*Columba elphinstonii*	3	3	3	0.7115	7.3115
65	Gruidae	Black-necked Crane	*Grus nigricollis*	2	4	2	0.8714	7.2714
66	Columbidae	Yellow-eyed Pigeon	*Columba eversmanni*	3	3	3	0.612	7.212
67	Otididae	Little Bustard	*Tetrax tetrax*	2	4	2	0.7558	7.1558
68	Falconidae	Laggar Falcon	*Falco jugger*	2	4	2	0.7308	7.1308
69	Burhinidae	Beach Thick-knee	*Esacus magnirostris*	2	4	1	0.907	7.107
70	Phoenicopteridae	Lesser Flamingo	*Phoeniconaias minor*	2	4	1	0.9021	7.1021
71	Pelecanidae	Dalmatian Pelican	*Pelecanus crispus*	2	4	1	0.8944	7.0944
72	Burhinidae	Great Thick-knee	*Esacus recurvirostris*	2	4	1	0.8925	7.0925
73	Ciconiidae	Black-necked Stork	*Ephippiorhynchus asiaticus*	2	4	1	0.8828	7.0828
74	Ciconiidae	Painted Stork	*Mycteria leucocephala*	2	4	1	0.8753	7.0753
75	Phasianidae	Himalayan Quail	*Ophrysia superciliosa*	5	1	3	0.4749	7.0749
76	Ciconiidae	Asian Woollyneck	*Ciconia episcopus*	2	4	1	0.8632	7.0632
77	Falconidae	Red-headed Falcon	*Falco chicquera*	2	4	2	0.6548	7.0548
78	Pelecanidae	Spot-billed Pelican	*Pelecanus philippensis*	2	4	1	0.8436	7.0436
79	Threskiornithidae	Black-headed Ibis	*Threskiornis melanocephalus*	2	4	1	0.8411	7.0411
80	Paridae	White-naped Tit	*Machlolophus nuchalis*	3	3	2	0.6142	7.0142

S.No	Family name	Common name	Scientific name	Red List	Collision	Displacement	Survivorship	Sensitivity Index
81	Bucerotidae	Malabar Pied Hornbill	*Anthracoceros coronatus*	2	4	1	0.801	7.001
82	Bucerotidae	Austen's Brown Hornbill	*Anorrhinus austeni*	2	4	1	0.7994	6.9994
83	Psittacidae	Long-tailed Parakeet	*Belocercus longicaudus*	3	3	1	0.761	6.961
84	Leiotrichidae	Bugun Liocichla	*Liocichla bugunorum*	5	1	1	0.6726	6.8726
85	Accipitridae	White-tailed Sea-eagle	*Haliaeetus albicilla*	1	4	4	0.9079	6.7079
86	Accipitridae	White-bellied Sea-eagle	*Haliaeetus leucogaster*	1	4	4	0.9063	6.7063
87	Accipitridae	Griffon Vulture	*Gyps fulvus*	1	4	4	0.9054	6.7054
88	Accipitridae	Golden Eagle	*Aquila chrysaetos*	1	4	4	0.8897	6.6897
89	Accipitridae	Bonelli's Eagle	*Aquila fasciata*	1	4	4	0.8894	6.6894
90	Accipitridae	Mountain Hawk-eagle	*Nisaetus nipalensis*	1	4	4	0.8814	6.6814
91	Accipitridae	Changeable Hawk-eagle	*Nisaetus cirrhatus*	1	4	4	0.8735	6.6735
92	Accipitridae	Short-toed Snake-eagle	*Circaetus gallicus*	1	4	4	0.8638	6.6638
93	Accipitridae	Black Eagle	*Ictinaetus malaiensis*	1	4	4	0.862	6.662
94	Accipitridae	Oriental Honey-buzzard	*Pernis ptilorhynchus*	1	4	4	0.8615	6.6615
95	Accipitridae	Crested Serpent-eagle	*Spilornis cheela*	1	4	4	0.8431	6.6431
96	Accipitridae	Brahminy Kite	*Haliastur indus*	1	4	4	0.8363	6.6363
97	Accipitridae	Upland Buzzard	*Buteo hemilasius*	1	4	4	0.8334	6.6334
98	Accipitridae	Long-legged Buzzard	*Buteo rufinus*	1	4	4	0.8274	6.6274
99	Scolopacidae	Ruddy Turnstone	*Arenaria interpres*	1	4	4	0.8166	6.6166
100	Accipitridae	Booted Eagle	*Hieraaetus pennatus*	1	4	4	0.8122	6.6122
101	Accipitridae	Jerdon's Baza	*Aviceda jerdoni*	1	4	4	0.8117	6.6117
102	Accipitridae	Eurasian Buzzard	*Buteo buteo*	1	4	4	0.8097	6.6097
103	Accipitridae	Japanese Buzzard	*Buteo japonicus*	1	4	4	0.8084	6.6084
104	Accipitridae	Himalayan Buzzard	*Buteo refectus*	1	4	4	0.8084	6.6084
105	Scolopacidae	Whimbrel	*Numenius phaeopus*	1	4	4	0.8039	6.6039
106	Scolopacidae	Common Greenshank	*Tringa nebularia*	1	4	4	0.8024	6.6024
107	Scolopacidae	Spotted Redshank	*Tringa erythropus*	1	4	4	0.7948	6.5948

S.No	Family name	Common name	Scientific name	Red List	Collision	Displacement	Survivorship	Sensitivity Index
108	Scolopacidae	Common Redshank	*Tringa totanus*	1	4	4	0.7855	6.5855
109	Accipitridae	Crested Goshawk	*Accipiter trivirgatus*	1	4	4	0.7786	6.5786
110	Accipitridae	Northern Goshawk	*Accipiter gentilis*	1	4	4	0.7667	6.5667
111	Accipitridae	Black Baza	*Aviceda leuphotes*	1	4	4	0.7618	6.5618
112	Scolopacidae	Marsh Sandpiper	*Tringa stagnatilis*	1	4	4	0.7606	6.5606
113	Accipitridae	White-eyed Buzzard	*Butastur teesa*	1	4	4	0.7591	6.5591
114	Scolopacidae	Ruff	*Calidris pugnax*	1	4	4	0.7563	6.5563
115	Accipitridae	Black Kite	*Milvus migrans*	1	4	4	0.7531	6.5531
116	Charadriidae	Northern Lapwing	*Vanellus vanellus*	2	3	4	0.7469	6.5469
117	Accipitridae	Western Marsh-harrier	*Circus aeruginosus*	1	4	4	0.7397	6.5397
118	Scolopacidae	Wood Sandpiper	*Tringa glareola*	1	4	4	0.7167	6.5167
119	Scolopacidae	Sanderling	*Calidris alba*	1	4	4	0.7164	6.5164
120	Accipitridae	Montagu's Harrier	*Circus pygargus*	1	4	4	0.7126	6.5126
121	Accipitridae	Black-winged Kite	*Elanus caeruleus*	1	4	4	0.7116	6.5116
122	Scolopacidae	Terek Sandpiper	*Xenus cinereus*	1	4	4	0.7101	6.5101
123	Accipitridae	Hen Harrier	*Circus cyaneus*	1	4	4	0.7073	6.5073
124	Scolopacidae	Green Sandpiper	*Tringa ochropus*	1	4	4	0.706	6.506
125	Accipitridae	Pied Harrier	*Circus melanoleucos*	1	4	4	0.6983	6.4983
126	Scolopacidae	Dunlin	*Calidris alpina*	1	4	4	0.6978	6.4978
127	Charadriidae	River Lapwing	*Vanellus duvaucelii*	2	3	4	0.6967	6.4967
128	Muscicapidae	White-bellied Sholakili	*Sholicola albiventris*	3	2	4	0.6963	6.4963
129	Scolopacidae	Long-toed Stint	*Calidris subminuta*	1	4	4	0.6851	6.4851
130	Scolopacidae	Jack Snipe	*Lymnocryptes minimus*	1	4	4	0.6835	6.4835
131	Accipitridae	Shikra	*Accipiter badius*	1	4	4	0.6804	6.4804
132	Scolopacidae	Broad-billed Sandpiper	*Calidris falcinellus*	1	4	4	0.6777	6.4777
133	Anatidae	Common Pochard	*Aythya ferina*	3	2	4	0.6759	6.4759
134	Columbidae	Nicobar Pigeon	*Caloenas nicobarica*	2	3	3	0.8677	6.4677

S.No	Family name	Common name	Scientific name	Red List	Collision	Displacement	Survivorship	Sensitivity Index
135	Scolopacidae	Swinhoe's Snipe	*Gallinago megala*	1	4	4	0.6641	6.4641
136	Scolopacidae	Pintail Snipe	*Gallinago stenura*	1	4	4	0.6598	6.4598
137	Scolopacidae	Common Snipe	*Gallinago gallinago*	1	4	4	0.6598	6.4598
138	Accipitridae	Besra	*Accipiter virgatus*	1	4	4	0.6531	6.4531
139	Scolopacidae	Solitary Snipe	*Gallinago solitaria*	1	4	4	0.6528	6.4528
140	Accipitridae	Eurasian Sparrowhawk	*Accipiter nisus*	1	4	4	0.6519	6.4519
141	Scolopacidae	Common Sandpiper	*Actitis hypoleucos*	1	4	4	0.6494	6.4494
142	Scolopacidae	Temminck's Stint	*Calidris temminckii*	1	4	4	0.648	6.448
143	Scolopacidae	Little Stint	*Calidris minuta*	1	4	4	0.6425	6.4425
144	Scolopacidae	Eurasian Woodcock	*Scolopax rusticola*	1	4	4	0.5891	6.3891
145	Anatidae	Andaman Teal	*Anas albogularis*	3	2	4	0.5779	6.3779
146	Muscicapidae	White-browed Bushchat	*Saxicola macrorhynchus*	3	2	4	0.5711	6.3711
147	Columbidae	Andaman Woodpigeon	*Columba palumboides*	2	3	3	0.7563	6.3563
148	Muscicapidae	White-throated Bushchat	*Saxicola insignis*	3	2	4	0.5125	6.3125
149	Anatidae	Marbled Teal	*Marmaronetta angustirostris*	3	2	4	0.5121	6.3121
150	Muscicapidae	Kashmir Flycatcher	*Ficedula subrubra*	3	2	4	0.5061	6.3061
151	Laridae	Lesser Crested Tern	*Thalasseus bengalensis*	1	4	2	0.9044	6.3044
152	Laridae	Pallas's Gull	*Larus ichthyaetus*	1	4	2	0.882	6.282
153	Laridae	Greater Crested Tern	*Thalasseus bergii*	1	4	2	0.8767	6.2767
154	Gruidae	Common Crane	*Grus grus*	1	4	2	0.8748	6.2748
155	Laridae	Sandwich Tern	*Thalasseus sandvicensis*	1	4	2	0.8716	6.2716
156	Laridae	Caspian Tern	*Hydroprogne caspia*	1	4	2	0.8614	6.2614
157	Laridae	Saunders's Tern	*Sternula saundersi*	1	4	2	0.8578	6.2578
158	Gruidae	Demoiselle Crane	*Anthropoides virgo*	1	4	2	0.857	6.257
159	Laridae	Black-headed Gull	*Larus ridibundus*	1	4	2	0.8537	6.2537
160	Laridae	Lesser Black-backed Gull	*Larus fuscus*	1	4	2	0.8527	6.2527
161	Laridae	Roseate Tern	*Sterna dougallii*	1	4	2	0.8486	6.2486

S.No	Family name	Common name	Scientific name	Red List	Collision	Displacement	Survivorship	Sensitivity Index
162	Laridae	Slender-billed Gull	*Larus genei*	1	4	2	0.8464	6.2464
163	Laridae	Common Tern	*Sterna hirundo*	1	4	2	0.8418	6.2418
164	Phasianidae	Manipur Bush-quail	*Perdicula manipurensis*	4	1	3	0.6383	6.2383
165	Laridae	Black-naped Tern	*Sterna sumatrana*	1	4	2	0.8344	6.2344
166	Laridae	Brown Noddy	*Anous stolidus*	1	4	2	0.8329	6.2329
167	Laridae	Brown-headed Gull	*Larus brunnicephalus*	1	4	2	0.8297	6.2297
168	Corvidae	Large-billed Crow	*Corvus macrorhynchos*	1	4	2	0.8278	6.2278
169	Laridae	Little Tern	*Sternula albifrons*	1	4	2	0.8264	6.2264
170	Laridae	White-cheeked Tern	*Sterna repressa*	1	4	2	0.8146	6.2146
171	Laridae	Sooty Tern	*Onychoprion fuscatus*	1	4	2	0.8055	6.2055
172	Laridae	Bridled Tern	*Onychoprion anaethetus*	1	4	2	0.8004	6.2004
173	Corvidae	Eurasian Jackdaw	*Corvus monedula*	1	4	2	0.7912	6.1912
174	Falconidae	Peregrine Falcon	*Falco peregrinus*	1	4	2	0.7884	6.1884
175	Laridae	Common Gull-billed Tern	*Gelochelidon nilotica*	1	4	2	0.7882	6.1882
176	Corvidae	Red-billed Chough	*Pyrrhocorax pyrrhocorax*	1	4	2	0.7768	6.1768
177	Corvidae	Carrion Crow	*Corvus corone*	1	4	2	0.7767	6.1767
178	Corvidae	Common Raven	*Corvus corax*	1	4	2	0.761	6.161
179	Corvidae	Rook	*Corvus frugilegus*	1	4	2	0.7602	6.1602
180	Corvidae	Black-headed Jay	*Garrulus lanceolatus*	1	4	2	0.7349	6.1349
181	Corvidae	Plain-crowned Jay	*Garrulus bispecularis*	1	4	2	0.725	6.125
182	Corvidae	White-faced Jay	*Garrulus leucotis*	1	4	2	0.725	6.125

Appendix 2. Summary Records of online Meeting held with IBCN members

Summary Records of online Meeting held with IBCN members, State Coordinators and Birdwatchers for consultation on the preparation of Single Species Action Plan for the 20 species prioritized in the National Action Plan

Venue: via Online platform (Google meet)

Date:12th September2021 **Time:**10.30 AM - 12.00 PM

Participants of the meeting:

1	Dr. Balachandran	26	Dr. Amit Kumar Saini
2	Dr. Nita Shah	27	Mr. Abhishek Abhi
3	Dr. Sathiyaselvam P.	28	Mr. Anil Pimplapure
4	Ms. Parveen S	29	Mr. Biswajit
5	Dr. Sivakumar	30	Mr. Chandra Sekar
6	Dr. Ramesh K	31	Mr. Chitrabhanu Pakaravoor
7	Ms. Tuhina Katti	32	Mr. Dhaval Vargiya
8	Dr. Madhumita P	33	Mr. Dinmala Maheshbabu
9	Ms.Nisha Singh	34	Mr. Dipak Sinha
10	Mr. Niketan Thakur	35	Ms. Gayatri Devi
11	Ms. Shalini Jain	36	Mr. Kalaimani Ayuthavel
12	Mr. Omkar Joshi	37	Mr. Kannan Vaithianathan
13	Ms. Subhiksha S	38	Mr. Hussain Shaikh
14	Dr. Dishant P	39	Ms. Monalisa Bhujabal
15	Mr. Khoyanuthan B Rajesh	40	Mr. Rudra Prasad Das
16	Mr. Solanki Chirag	41	Mr. Sarvan Railla
17	Ms. Sonika Kushwaha	42	Mr. Subramanya S
18	Sony Nongneikapam	43	Dr. Babu S

19	Sy Handicraft	44	Mr. Sathvik Reddy N
20	Mr. Tarunk Roy	45	Ms. Shraddha Kulkarni
21	Mr. Ganesh Pallela	46	Dr. Sivaperuman
22	Mr. Uday Vora	47	Mr. Gopi Krishnamurthi
23	Birds Kta	48	Mr. R. Hari
24	Mr. Rahul Wakare	49	Dr. Sumit Dookia
25	RHB Wild Odissa	49	Mr. Taej Mundkur
		50	Mr. Ramade Bhatiya

The 1st meeting with the IBCN members, State Coordinators and Birdwatchers for consultation on the preparation of Single Species Action Plan for the 20 species prioritized in the National Action Plan by BNHS Wetlands Programme was conducted on September 12, 2021.

At the outset of the meeting, Dr Ramesh Kumar, Scientist, greeted all the participants and explained the agenda of the meeting. After a brief welcome address to the meeting participants by Dr. Balachandran, Deputy Director; a presentation on the Central Asian Flyway- National Action Plan under CAMPA project was given by Dr Sathiyaselvam, Assistant Director.

1. Dr Sathiyaselvam explained India's National Action Plan for conservation of migratory birds and their habitats along the Central Asian Flyway and its components. He elaborated one of the important components of the project, i.e., developing a Species Action Plan for twenty species prioritised in the National Action Plan. List of fourteen species (waterbird) of the 20 need input from experienced persons was shared with the participants to be included in the action plan. He further explained how the valuable inputs and suggestions by the participants regarding the numbers, sites, distribution, threats, and conservation actions needed for the targeted species in their state would be vital to be included in the action plan.

2. Ms Tuhina, Scientist, projected the datasheet prepared by the BNHS team for collecting species specific data from the participants and demonstrated how the datasheet needs to be filled based upon their observation or experience for a particular species and site.

3. Dr Nita Shah, Deputy Director, shared her thoughts on the Single Species Action Plan and the present idea of sharing information on prioritized species by key birders through their field expertise. She pointed out the importance of contributions made by people across the country in preparation of the Species Action Plan.

4. Dr Taej Mundkur, Senior Technical Officer, Wetlands International, briefly explained about the importance ofdeveloping Species Action Plans and internationalising them.

Open discussion with participants:

1. Mr Uday Vora felt that the datasheet is extensively comprehensive and thus suggested making all columns of the threat datasheet optional instead of mandatorily selecting from the dropdown option as several birders might not be aware of all of the details as per the datasheet. He also suggested using the ebird data for this exercise.

2. Dr Sathiyaselvam agreed to incorporate the suggestions made on the threat datasheet and asserted that ebird data is already being looked at.

3. Mr Dhaval Vargiya pointed towards the sites names which were grouped together in the datasheet and suggested checking the site names before circulating the sheets.

4. Dr Madhumita and Ms Tuhina said that the sites list will be checked and corrections will be made accordingly. In any case, persons filling up the form can always make a separate entry of sites and fill the necessary details in the datasheets in the space provided at the end of the shared datasheet.

5. Dr Dishant Parasharya suggested for using the AWC database as a benchmark for this exercise.

6. Ms. Tuhina addressed the suggestion, mentioning that AWC data is collected only in certain months of the year and all sites are not looked at periodically even during the AWC. She further explained that looking at the trend during different months other than January to March (probable duration of AWC) will add to stopover site information for a species.

7. Dr. Sivaperuman said that his team has been working in Andaman and Nicobar Islands from the last decade and has collected information especially on both waterbirds and land birds. Dr. Sathiyaselvam requested Dr Sivaperuman to contribute data on the Andaman and Nicobar group of Islands. He agreed to look at the datasheets and share information accordingly.

8. Dr. Subramanya also agreed to take a look at the sheets and contribute information for Karnataka. He mentioned that there are no sites listed in the datasheet. He also requested BNHS to aid in capacity building and training of Forest Department staff in the state for which Dr Sathiyaselvam responded positively.

9. Mr Dhaval Vargiya enquired about the output of this exercise and structure of the final document.

10. Dr Balachandran said that a single document including all the 14 species will be made or birds will be grouped based on their habitat and two documents would be made.

11. Mr Tarun K. Roy asked whether sites from Delhi have been included in this exercise or not.Dr. Sathiyaselvam cleared as of yet, no sites of Delhi have been included however, recommendations made through the datasheets will be used in the Species Action Plan.

12. Suggestion of using the CMS format for preparation of the Species Action Plan was addressed by Dr Madhumita who confirmed that CMS format has been followed for for the exercise.

13. Dr Taej Mundkur suggested including all the 20 prioritised species instead of 14 in the data sheet

14. Mr Dhaval Vargiya suggested sharing a poster of the 20 prioritized species in regional language for easy identification of species.

Broad decisions and outcomes from the meeting:

1. The presentation, National Action Plan, IBA sites list along with their codes will be shared with participants, to give a better idea of the proposed exercise.

2. The Single Species Action Plan draft would be shared with all the participants once the compilation of submitted information by the participants would be done and the draft would be ready.

3. A poster of the 20 species in regional languages will be made and shared with participants for easy identification of species.

The filled in data sheet needs to be sent on the below mentioned email Ids before **September 30th 2021**.

i. t.katti@bnhs.org
ii. r.selvaraj@bnhs.org
iii. r.shaikh@bnhs.org

Meeting ended with a vote of thanks by Dr Sathiyaselvam