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# Asian Waterbird Census in Jammu and Kashmir [2015-21] Spatial attributes and trend analysis



*Compiled by*



Department of Wildlife Protection, Govt. of Jammu and Kashmir



Institute of Mountain Environment, University of Jammu

# ASIAN WATERBIRD CENSUS

in

Jammu and Kashmir

[2015-21]

[Spatial attributes and Trend analysis]

Citation : Neeraj Sharma, Asha Sohil, Muzaffar Ahmed Kichloo, M.K Kumar, Rashid Naqash, Ifshan Dewan, Anil Atri, Vijay Kumar (2022). Asian Waterbird Census in Jammu & Kashmir [2015-21, Spatial Attributes and Trend Analysis], Department of Wildlife Protection, Government of Jammu & Kashmir, pp 49.

Contributors : AWC team, Range Officers, ground staff, voluntary observers, citizen scientists, bird watchers, naturalists, and photographers.

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Department of Wildlife Protection,  
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## Author's Preface

Water birds, one of the key constituents of the biodiversity serve as important indicators of the ecological condition and productivity of wetland ecosystems, and their presence is widely valued. The ecological significance of the wetland is attributed to the number of water birds visiting that water body. This appears vital evidence for their categorization in terms of protection. Water birds are relatively easy to count as many species congregate conspicuously during several stages of their annual cycle and as such this group is being comprehensively studied and monitored. This long-term monitoring proved handy in the identification and declaration of wetlands of international importance. Co-ordinated by Wetlands International, the Asian Waterbird Census is a vital component of the International Waterbird Census, a global waterbird monitoring programme.

It is the longest running citizen science programme that systematically monitors waterbird numbers and wetland condition in India. The annual event, which takes place in January, aims to collect data on bird counts and wetland assessment of numerous coastal and inland wetlands in India, including Protected Areas, Important Bird Areas, Ramsar Wetlands, and other wetland types. The counts in Jammu and Kashmir are usually held during this period occasionally commencing from December to last till March for comprehensive observations. Organized surveys have been taking place in the wetlands of ecological concern and international significance since 2015. Over the years, there has been a rise in species richness and diversity, notably among winter migrants, indicating the potential wintering grounds these water bodies provide to the transboundary visitors.

We are elated to offer this compendium to the ever-growing community of bird watchers, hobbyists and researchers in Jammu and Kashmir. We present through this report, 75 species of water birds recorded during Asian Waterbird Census 2021, 56 species each from Jammu & Kashmir with 37 species observed in common. The results are based on the observations from 21 wetlands, six from Jammu and 15 from Kashmir region. These include 3 Ramsar sites, 11 wetland conservation reserves and 7 wetlands of ecological importance. The report besides highlighting the richness and abundance of water birds, depicts the trend in water bird population during five years of extensive surveys. Wetlands in Jammu region, less in numbers and smaller in size than those of Kashmir, reported low abundance of water birds. Hygam wetland recorded a high number of waterbirds followed by Mirgund and Hokersar wetland reserves during AWC 21. The water bodies surveyed during AWC 2021 in Jammu & Kashmir yielding a total of 11,18,737 water birds, making it the largest water bird survey ever done for the former state and current Union Territory. During AWC -21, Jammu (division) recorded 3,50,839 birds, while Kashmir reported 7,67,898.

Besides the AWC results, the report also includes a checklist of 152 aquatic birds comprising 120 water birds and 32 wetland dependent species grouped into 10 orders and 27 families from the Union Territory of Jammu and Kashmir. The birds have been categorized based on their habitat and feeding guilds, as well as their migratory patterns and conservation status. Pertinently, 57 among these are transboundary winter migrants and 19 are globally threatened and this speaks about the ecological significance of water bodies of Jammu and Kashmir.

This report is the testimony of passion, enthusiasm, and hard work of number of passionate wildlife officers, ground staff, AWC team members, researchers, bird watchers and hobbyists who have contributed a lot in collecting and collating the observations on water birds from the erstwhile state and now the Union Territory of Jammu and Kashmir. The department of Wildlife Protection gratefully acknowledges the support and patronage received from worthy Lieutenant Governor of J & K, Sh. Manoj Sinha. The department expresses its sincerest thankfulness to Dr. Arun Kumar Mehta (IAS), Chief Secretary J&K and Sh. Sanjeev Verma (IAS) Commissioner Secretary, Forests, Ecology and Environment Department, J&K and Sh. Mohit Gera (IFS) PCCF and Head of Forest Department, Govt. of Jammu and Kashmir for their untiring support and valuable guidance from time to time.

Institute of Mountain Environment, University of Jammu place on record its sincere gratitude to Sh. Suresh Gupta (IFS), PCCF and Chief Wildlife Warden, Department of Wildlife Protection, J&K for his untiring support, guidance, and timely inputs in making the contents of this report valuable. We are grateful to Prof. Manoj K Dhar, Hon'ble Vice Chancellor, University of Jammu, Prof. Rahul Gupta, Rector Baderwah Campus and Prof. Piyush Malaviya, Head, Department of Environmental Sciences, University of Jammu as well as other colleagues from the department, friends and well-wishers for their unwavering support and help during the report compilation.

We are quite hopeful that the information contained in this report is of considerable scientific value at regional, national, and international scale.

Authors



*Chief Secretary  
Jammu & Kashmir*



*Dr. Arun Kumar Mehta  
IAS*

### **Message**

I am pleased to know that the Department of Wildlife Protection is bringing out a compendium on the Asian Water Bird Census of the last five Censuses.

The importance of wetlands has received international acknowledgment as their ecosystem services play an important and indispensable role in the preservation of ecological cycles. Jammu & Kashmir is blessed with some of the most pristine and glorious wetlands, which are thronged by thousands of migratory birds from Central Asia in winters. These birds are a key component in the wetland assessment studies as their population trends indicate the health status of our wetlands.

The Department of Wildlife Protection has been closely monitoring this migratory trend over the past few years through an annual census of water birds and is now coming out with its census-based evaluation. I hope that this compilation shall become a useful tool in the hands of researchers and scholars working on the conservation of wetlands and water birds as well as wetland managers.

I compliment the officers of the Wildlife Department for taking this initiative.

  
(Dr. Arun Kumar Mehta)

**Commissioner/ Secretary to Government  
Forest, Ecology & Environment Department  
Jammu & Kashmir**



*Sanjeev Verma, IAS*

### **MESSAGE**

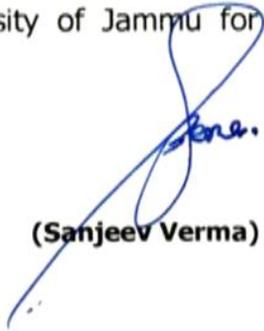
Union Territory of Jammu & Kashmir is blessed with varied natural endowments. Wetlands are one of such gifts of nature, which enhance the beauty of landscape, especially with avifauna which they host. Our wetlands provide home to resident and migratory birds which visit these wetlands during winter, covering long distances from Central Asian Countries.

Department of Wildlife Protection conducts Asian Water Bird Census, annually, during winter months in the wetlands of Jammu & Kashmir. The exercise is conducted with the assistance of some NGOs and volunteers. The data obtained during the census/ survey is analysed and results are obtained with regard to species and number of birds in each wetland.

Department of Wildlife Protection has brought out a comprehensive report with the help of Institute of Mountain Environment, University of Jammu, showing the population trends of water birds in last five census in various wetlands of Jammu & Kashmir.

I am sanguine that this compilation will serve as valuable data base for wetland managers, researchers, nature enthusiasts and field officers of department.

I compliment the officers of Department of Wildlife Protection and team of Institute of Mountain Environment, University of Jammu for their efforts invested to bring out this publication.

  
(Sanjeev Verma)



Chief Wildlife Warden,  
Jammu & Kashmir



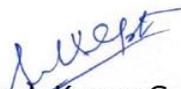
*Suresh Kumar Gupta, IFS*

## FOREWORD

Asian Water Bird Census is a regular feature of the Department of Wildlife Protection. This exercise is conducted in the wetlands of Jammu & Kashmir during winter months of January and February. Various NGOs, institutions and volunteers participate during the survey. The data obtained after completion of survey is put to analysis for the results giving trends and abundance of various water bird species in the wetlands.

This publication gives us results of last five such census conducted between 2015 to 2021. The data with respect to years 2017 and 2018 is not available. The attempt has been made to give salient features of each wetland where the survey has been conducted, methodology for undertaking survey and data analysis. The publication gives comprehensive trends about species diversity and abundance of various migratory birds visiting our wetlands. The compilation shall serve as handy material with regard to wetlands, diversity of water birds and their numbers over the years in Jammu & Kashmir.

I feel great pleasure in recording my appreciation for the efforts put forth by Dr. Kumar M.K., IFS, Regional Wildlife Warden, Jammu, Shri Rashid Yahya Naqash, Regional Wildlife Warden, Kashmir, Dr. Neeraj Sharma, Assistant Professor, IME and his team and Ms. Ifshan Dewan, Wildlife Warden, Wetlands Kashmir for their commendable work in bringing out this publication.

  
(Suresh Kumar Gupta) IFS

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## Water birds

As the name implies, a waterbird or aquatic bird lives on or near water, including freshwater and marine environments. Since their adaptations vary according to their habitat, some water birds (mostly waders) are more terrestrial, while others, such as ducks, are more aquatic. Among these adaptations include webbed feet, beaks, and legs adapted for aquatic feeding, as well as the ability to dive from the surface or air to



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prey in water. Wetlands provide feeding, resting, roosting, and foraging habitats for these charismatic species. Water birds are regarded as critical bio-indicators owing to their conspicuous and meaningful responses to changes in wetland habitats. These are the first to respond to contamination and loss of ecosystem quality due to their diverse diet and habitat usage. As a result, there is an ongoing need to build an effective monitoring system that makes use of waterbird

species to provide an early warning of potential dangers to the environment, particularly wetland ecosystems. The birds use flyways as a flight path for migration (Boere & Stroud, 2006) and a flyway population is the number of individuals of a certain species included in a given flyway area. If a particular site holds 1% or more of the flyway population of a given species, the area is considered important for that population (Marchowski et al., 2018) and this 1% criterion is used to qualify an area as a wetland of international importance under the Ramsar Convention on Wetlands. This is used by BirdLife International for identifying the Important Bird Areas (IBAs) in wetlands, worldwide (BirdLife International, 2015; Wetlands International, 2010). It's difficult to get an accurate census of waterfowl on big water bodies such as lakes and reservoirs, yet accurate counts are essential for determining population estimates. This includes counting from the ground and boats as well as other ways specific to a particular region (Wetlands International, 2010).



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We know that water birds rely on wetlands for most or all of their annual cycle. Water birds with a high proportion of migrants are a well-known part of India's avifauna. These primarily include members of the families Gaviidae, Podicipedidae, Pelecanidae, Phalacrocoracidae, Anhingidae, Anatidae, Pedionomidae, Gruidae, Aramidae, Rallidae, Heliornithidae, Eurypygidae, Jacanidae, Rostratulidae (Wetlands International, 2002). Many

other species have been designated as 'wetland associated' due to their ecological dependence on wetlands, but no comprehensive global list of such species exists for Asia (Crosby and Chan, 2005).

The residents like Indian Spot-billed Duck, Gray-headed Swamphen, Common Teals are common to spot. These are joined by a host of species that include other ducks, geese, gulls, terns, and migrant shorebirds like plovers, stints and sandpipers that arrive from the temperate regions for wintering in the Indian sub-continent.

Water birds, like many other groups, have seen long-term declines, which look to be continuing today. Migratory shorebirds, gulls and terns appear to have had the greatest decreases, while waterfowl (ducks and geese) and other resident waterbirds (such as swamphens, coots, and storks) also exhibit clearly identifiable declines. The severe drop in migratory shorebirds is consistent with demographic trends observed in arctic-breeding shorebirds. It is unknown if these declines are the result of changing conditions at breeding, staging, and wintering grounds, or all three.



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The Indian Subcontinent is a critical wintering habitat for many species that migrate south to avoid harsh winters and spend a considerable portion of their life cycle. Their progeny's long-term survival is dependent upon the health of the ecosystems and habitats they visit.



Red-naped Ibis

© Pankaj Chibber



Wolly-necked Stork

© Suresh Kumar



Purple Heron

© Sudesh Kumar

## Why conserve wetlands? Ramsar Convention

Wetlands are vital for human survival. They are among the world's most productive environments; cradles of biological diversity that provide water and productivity upon which countless species of plants and animals depend for their survival. With the mandate to halt the worldwide loss of wetlands and to conserve, through wise use and management, an international treaty widely known as 'The Convention on Wetlands of International Importance' was signed at Ramsar (Iran) in 1971. The Ramsar Convention encourages the



Pallas's Gull

© Neeraj Sharma

designation of sites containing representative, rare, or unique wetlands, or wetlands that are important for conserving biological diversity. Once designated, these sites are added to the Convention's list of Wetlands of International Importance and become known as Ramsar sites.

The Convention has adopted eight criteria for identifying wetlands of international importance, three of which relate to water birds. A wetland can be considered internationally important :

**Criterion 2:** if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

**Criterion 5:** if it regularly supports 20,000 or more water birds.

**Criterion 6:** if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird. (In box, Wetlands International 2007)

### Citizen Science

Citizen science is the concept of involving the public in scientific research to further scientific understanding. Individuals collaborate, share, and contribute to data monitoring and collection activities on voluntary basis. This approach is increasingly being used to address significant global issues, including the biodiversity assessments, and monitoring that rely on the contribution of hundreds of thousands of hours of efforts by citizen scientists. Birdwatchers enable the documentation of birds by surveying wetlands, walking transects, doing point counts, or just compiling the lists. The technological advancements, such as the internet and mobile gadgets have facilitated the flow of information.

### Asian Waterbird census

The Asian Waterbird Census is a vital component of the International Waterbird Census, a global waterbird monitoring programme. Co-ordinated by Wetlands International, it is the longest running citizen science programme that systematically monitors waterbird numbers and wetland condition in India (State of India's Birds, 2020). The broad objective of the census is to collect annual data on waterbird populations at wetlands in the region during the non-breeding season for many species; to monitor the status and condition of wetlands on an annual basis; and to encourage greater interest in water birds and wetlands amongst citizens. Over 6,100 sites in 27 countries have been covered to date, thanks to the active participation of thousands of volunteers. The data collected is made available to a broad range of government agencies and non-governmental groups, and it aids in conservation efforts on a local to global scale for increasing public awareness of water birds besides assisting local conservation efforts in ecologically significant wetlands (Wetlands International, 2012).



Pheasant-tailed Jacana

© Neeraj Sharma

The annual AWC cover two weeks and three weekends in January, however the counts may commence as early as December to last till February end. Records of all AWC counts are updated annually on the publicly accessible International Waterbird Census website. The AWC site network map includes all sites covered by AWC participants over the last three decades. Commenced in the year 1987, this effort in India is coordinated by Wetlands International South Asia and the Bombay Natural History Society. The annual event, which takes

place in January, aims to collect data on bird counts and wetland assessment of over 1,400 coastal and inland wetlands in India, including Protected Areas, Important Bird Areas, Ramsar Wetlands, and other wetland types (SOIB, 2020).



AWC has developed into a significant resource of information on water birds and wetlands, assisting in the formulation of national and international conservation policies and programmes, including the National Action Plan for the Conservation of Aquatic Ecosystems, the National Biodiversity Action Plan, and the National Action Plan for the Conservation of Migratory Birds and their Habitats Along the Central Asian Flyway (2018-2023).

### Why is the Asian Waterbird Census important?

The importance of wetlands cannot be understated – the term defines a wide umbrella of important feeding, roosting and foraging habitats for a multitude of species, including millions of migratory waterbirds. The Ramsar Convention lists all types of natural and man-made wetlands, including rivers, lakes, reservoirs, ponds, freshwater swamps, mangroves, mudflats, coral reefs, rice fields and sewage farms in its definition of the term, making it of utmost significance to protect and safeguard these important nesting, feeding and roosting habitats (Suri, 2021).

### The methodology adopted for Asian Waterbird Census in Jammu and Kashmir – ‘Wildlife SOS’ efforts



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Different teams are allocated the areas where each group count the number of birds and take pictures to generate an estimate. The data gathered by these groups are recorded in standardized forms. The teams use checklists of bird species recorded from the wetland to ascertain the occurrence and proper identification. Depending on the number of birds of a certain species spotted in a preset area, an

estimation of the species population is generated. The results compiled as an annual report by the organizers are then published on public domains where they can be accessed by anyone after a few months of the census. These results go on to help bring in new legislation for conservation purposes and are used as references for other publications, amongst many others (Suri, 2021).

## Objectives of Asian Waterbird Census

The AWC aims to contribute to the conservation of water birds and their wetland habitats by

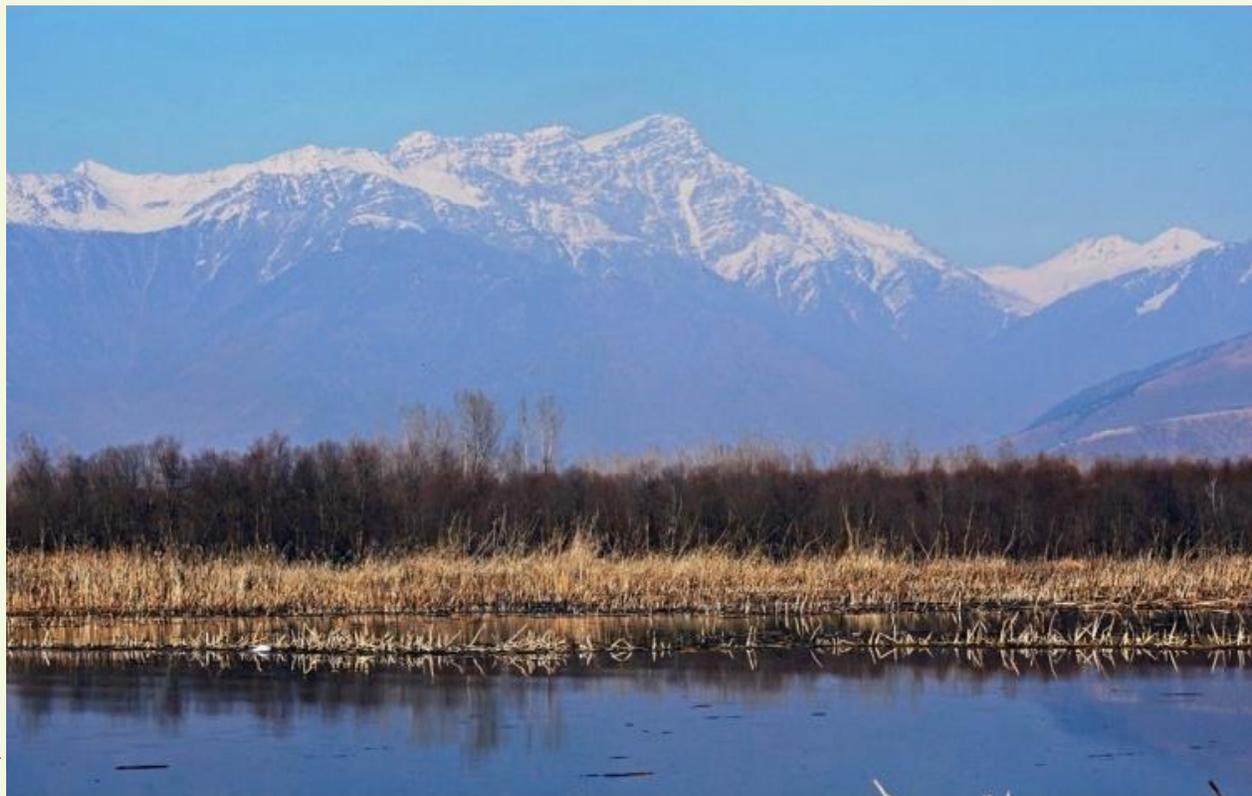
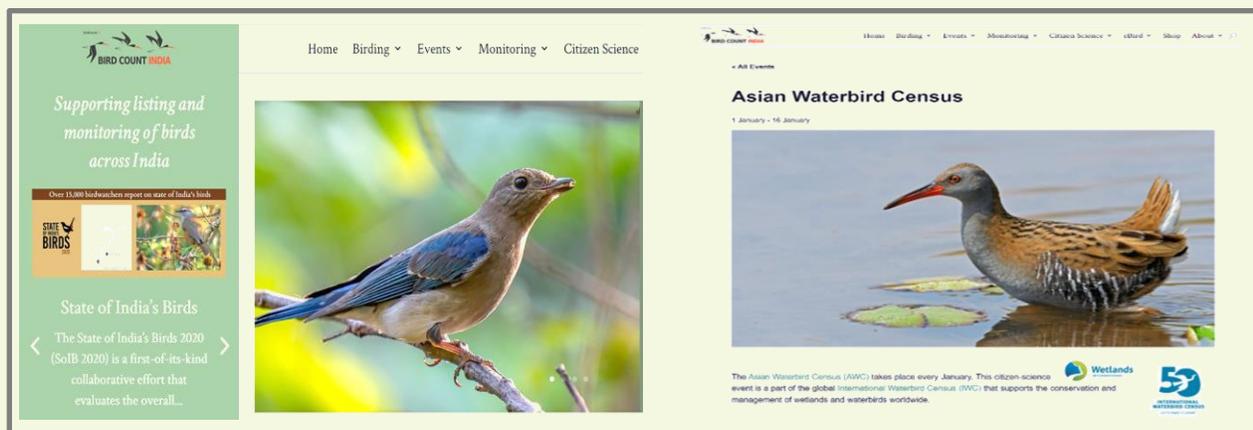
- providing the basis for estimates of waterbird levels ranging from local to global by supporting populations;
- monitoring changes in waterbird numbers and distribution by regular, standardized counts of representative wetlands;
- improving knowledge of little-known waterbird species and wetland sites;
- identifying and monitoring (networks of) sites that are important for waterbirds in general and, more specifically, identifying and monitoring sites that qualify as Wetlands of International Importance under the Ramsar Convention on Wetlands;
- providing information on the conservation status of waterbird species and wetland sites, for use by international agreements and other initiatives;
- increasing awareness of the importance of waterbirds and their wetland habitats at local, national and international levels (In box, Wetlands International, 2007)

### Applications of the Asian Waterbird Census

- It has contributed to a variety of conservation activities at providing the basis for estimates of waterbird levels ranging from local to global:
- the Ramsar Convention in identifying wetlands of international importance through regular monitoring of waterbird sites
- the Convention on Migratory Species (CMS) by monitoring the status of migratory waterbirds and their habitats
- the Convention on Biological Diversity (CBD) in its goal to conserve and use biodiversity sustainably
- the development and implementation of the East Asian – Australasian Partnership and Central Asian Flyway Action Plan initiative
- BirdLife International's Important Bird Areas (IBA) Programme
- IUCN Red List/BirdLife International's Global Species Programme
- Wetlands International's Waterbird Population Estimates (WPE) Programme
- Global Avian Influenza Network for Surveillance (GAINS) programme led by the Wildlife Conservation Society
- The development of national wetland and waterbird conservation Action Plans and Strategies
- Species and site conservation and research programmes and campaigns to raise awareness of the importance of wetlands and waterbirds in many countries (Wetland International, 2007)
- The updated information on waterbird populations and wetlands provided by the AWC helps governments in the region discover new wetlands worthy of being designated as Wetlands of International Importance. In addition, the data published in various AWC reports make a vital contribution to the understanding of status of the wetlands and waterbird species through the assessment of population sizes and trends; these are regularly published by Wetlands International in the Waterbird Population Estimates series (Wetland International, 2007)

## Bird count India

A sizable population of bird enthusiasts in India includes individual birdwatchers, photographers, and naturalists. Besides the individual efforts, several organizations and institutions are committed to bird education, research, and conservation. Founded in 2014, the Bird Count India aims to bring these individuals and organizations together to improve understanding and documentation of distribution, abundance, and seasonality of Indian birds, across different scales in the country (SOIB, 2020). Bird Count India accomplishes this by conducting seminars on bird documentation and monitoring for interested groups throughout the country. It is responsible for organizing national birding events such as the Great Backyard Bird Count, Campus Bird Count, Endemic Bird Day, and Wild Bird Day. Additionally, it helps regional and state-level events and projects through publicity and technical assistance, such as the Mysore City Bird Atlas, the Kerala Bird Atlas, the Pongal Bird Count, the Bihu Bird Count, and the Onam Bird Count. Bird Count India urges birdwatchers to record sightings on the eBird-India platform so that the data can be used for research and conservation purposes.



## The eBird platform

Birdwatchers have a long history of compiling lists of species seen while out birdwatching. With the introduction of the internet, bird lists are now maintained online. eBird is a global online tool for birdwatchers to keep and share their bird lists, photographs, and audio recordings. While eBird is established at the Cornell Lab of Ornithology, United States of America, Bird Count India curates and customises an India-specific platform. eBird is the world's largest store of biodiversity data, with more than 700 million bird records as of January 2020. eBird-India maintains about ten million records at the country level, constituting a sizable database of information. eBird-data India's data quality is ensured through several customized seasonal and geographical filters, augmented by manual review by over 140 volunteer editors dispersed across the country. eBird data are publicly available for educational, scientific, and conservation purposes, and are also uploaded to the Global Biodiversity Information Facility on an annual basis. All data from India are credited as part of India's contribution to the Global Biodiversity Information Facility (GBIF) database. Birdwatchers in India have been increasingly using eBird since 2014. Moreover, a huge number of birders have uploaded old bird lists



© Parvez Shagoo

from their notebooks to eBird, giving critical historical data for trend analysis. Over 15,500 birders have contributed lists including over ten million records from approximately 200,000 distinct places across India, encompassing all States/UTs and over 95% of Districts (eBird India, 2022).

## Jammu and Kashmir - a heaven for water birds

India's northernmost territory, the erstwhile state of Jammu and Kashmir and now the Union Territory of Jammu and Kashmir (J&K) lies in the north-western complex of the Himalayan ranges. The UT of J & K spread



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over an area of 42,241 km<sup>2</sup> lies at 32°15' to 35°05' N and 74°02' to 76°80' E, and elevation between 247m (Chenab River) to 5425 m (Kolahi Peak) roughly divides into three climatically distinct biomes (Narwade et al., 2006). The southern alluvial plains of Jammu, a part of Indo-Gangetic plains, give rise to Shiwaliks, the outer Himalaya comprising hills of moderate elevations. The Pir-Panjal range, a part of lesser Himalayas in the north separates the intermontane Valley

of Kashmir from the hilly Jammu region while to the north-east, the Great Himalayas (Zaskar range) separate Kishtwar (in Jammu) and Valley of Kashmir from Ladakh. Sharing nearly fifty per cent of the geographical area, the forests in the Union Territory of Jammu and Kashmir belong to eight groups further divided into 42 forest types, highest in the country (FSI, 2019). The region's great topographical relief manifested in lush green forests, snow-capped summits, antecedent drainage, and complex geological structure is well represented with rich elements of floral and faunal diversity. The UT has a vast protected area network comprising 4 national parks, 14 wildlife sanctuaries, 16 conservation reserves, 14 wetland reserves including three Ramsar sites accounting for 11.31 % of the total area coverage (J&K Wildlife Department, 2022).



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Characterized by a diversified set of physical features, the region lies at the intersection of two bio-geographic regions of the world, the Palearctic and the Oriental having a rich mixed fauna and avian diversity (Roberts, 1991). Jammu and Kashmir lie in the Western Himalayan Endemic Bird Area, EBA 128 (Rahmani et al., 2012). With 11 Restricted Range species (Statterfield et al., 1998, Birdlife International 2001), it offers a crucial migratory gateway to the birds of Central and Northern Europe to enter India through Kashmir via Iran, Afghanistan, and Pakistan (Ali and Ripley, 1987). With 21 important bird areas (IBAs) (Islam and Rahmani, 2004) and seven

potential IBAs (Rahmani, 2013), the Union territory of Jammu and Kashmir including Ladakh is home to 32 globally threatened bird species (Rahmani et al., 2013; Suhail et al., 2020). The historical accounts of ornithology in the Union territory of Jammu and Kashmir goes back to the British era with observation-based preliminary descriptions by Theobald (1854) and Adams (1859) followed by investigations by Brooks (1871), Biddulph (1881 & 1882) and Scully (1881). Cordeaux (1888) conducted intensive avian surveys in Kashmir and Lawrence (1895) published the first checklist of birds of the valley of Kashmir. A comprehensive account of avian distribution was however presented by Ward (1906-1907), and subsequent additions made by Magrath

(1912 & 1921), Whistler (1922), Osmaston (1923-1927), Koul (1939), Ali (1949, 1996), Ali and Ripley (1968-74, 1987), Bates and Lowther (1952), Gauntlett (1972), among others.



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Interestingly the areas that remained unexplored for a long time lately emerged as the top birding destinations of the state (eBird, 2022). The growing interest among the people and access to affordable birding gadgets like cameras and binoculars, the bird watching over the last few years has seen a tremendous spur in the region. The native and indigenous bird watchers, ornithologists and naturalists started looking towards the potential birding hotspots in different parts of Jammu and Kashmir. It marked the beginning of modern ornithology, and much literature got published during this time. Of late, Suhail et al., (2020) published the first comprehensive checklist of 555 birds belonging to 20 orders and 76 families from all three distinct provinces of erstwhile state of Jammu and Kashmir, including Ladakh. A total of 624 bird species are listed on eBird for the (state) of Jammu and Kashmir (eBird, 2022). In a more recent account, Kichloo et al., 2022 (unpublished) reports 590 species from the Union territory of Jammu and Kashmir.

## Water bodies of Jammu and Kashmir

The hilly UT of Jammu and Kashmir endowed with rich natural resources is home to spectacular lakes, rivers, aquifers, and wetlands. They form the major source of freshwater to the inhabitants and millions living downstream besides providing a wide range of services in the form of irrigation, hydro-energy, recreation, aquatic habitats, buffering floods, among many others. Though any waterbody, even a small seasonal pond, can support a family or group of water and water-related birds for the



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entirety or a part of their life cycle, only a few have been identified as wetlands of international significance and protected as conservation areas. These include three Ramsar sites, the Surinsar-Mansar, Hokersar and



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Wular lake and fourteen wetland reserves including Gharana, Kukarian, Pargwal, Nanga, and Sangral-Asa Chak in Jammu, and Chatlam, Hygam, Freshkooori, Hokersar, Kranchoo, Malgoam, Mirgund, Shallabugh and Manibugh in Kashmir province, respectively (Table 1). Other wetlands of immense ecological importance included in the AWC surveys are Ranjitsagar Reservoir (Jammu Province), Anchar Lake, Dal Lake, Padgampora Wetland, Khurwan Sar, Ahan -Shalar - Waskur Sar and Sheikh Sar - Manasbal (Kashmir province). Besides the plains and valley lakes, the lower and Great Himalayas of Jammu and Kashmir include hundreds of high-altitude lakes that need to be explored for avian diversity. Table 1 & Figure 1 represent important wetlands in Jammu and Kashmir which are home to several resident, migratory and vagrant aquatic and wetland associated birds.

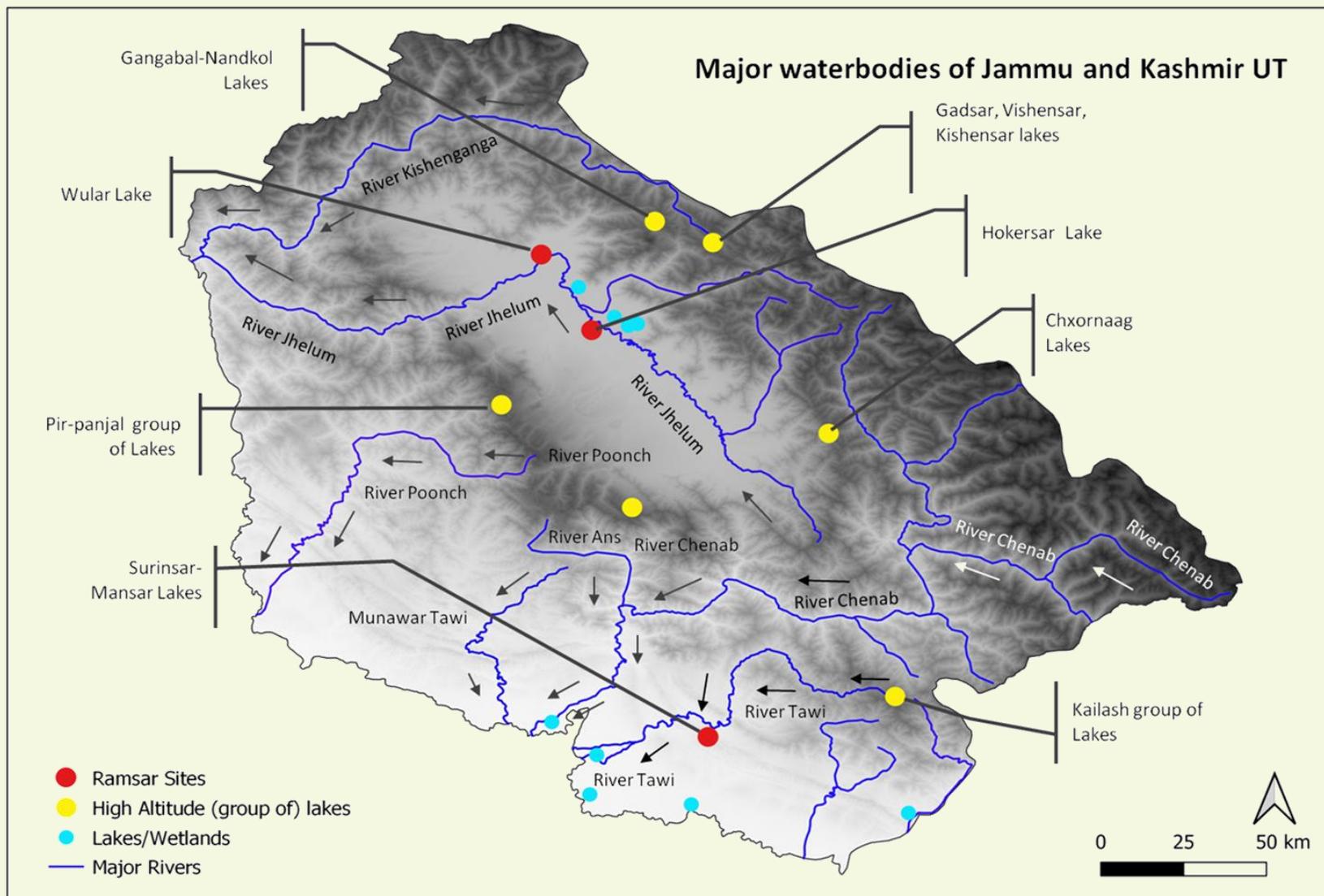


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**Table 1: Prominent wetlands of Jammu and Kashmir**

Region	Protected Wetlands		Water bodies of ecological interest / Valley lakes	Major high-altitude lakes / wetlands *
	Ramsar Sites (notification)	Wetlands Reserves		
Jammu	1. Surinsar-Mansar Lakes (2005)	1. Kukarian Wetland Reserve, 2. Pargwal Wetland Reserve, 3. Nanga Wetland Reserve, 4. Gharana Wetland Reserve 5. Sangral-Asa Chak Wetland Reserve *  (all notified during 1981)	1. Ranjit Sagar (Reservoir)	Nandan Sar, Gum Sar, Kaldachni Sar, Sukh Sar, Neel Sar, Katori Sar, Sarota Sar, Kailash group of lakes (Bhaderwah), and Chxornaag (Margan group of lakes), Barnaz and Panjidhar lakes
Kashmir	1. Wular Lake (1990) 2. Hokersar Lake (2005)	1. Chatlam Wetland Reserve, 2. Hygam Wetland Reserve, 3. Freshkooori Wetland Reserve, 4. Hokersar Wetland Reserve, 5. Kranchoo Wetland reserve, 6. Manibugh Wetland Reserve, 7. Mirgund Wetland Reserve, 8. Shallabugh Wetland, 9. Malgoam Wetland Reserve *  (all notified during 1945)	Anchar Lake, Dal Lake, Padgampora Wetland, Khurwan Sar, Ahan -Shalar - Waskur Sar, Sheikh Sar -Manasbal	Dudh Nag, Chaimar Sar, Chand Sar, Sursyar, Kotori Sar, Kaul Sar, Barani Sar, Daman Sar, Bram Sar, Watal Sar, Logul Sar, Chandan Sar, Handil Sar, Chhumhai Sar, Son Sar, Sona Sar, Sorus Nag, Charl Nag, Goli Sar, Nandan Sar, Pam Sar, Sarbal Sar, Nabler Sar, Krishan Sar, Patalwan Sar, Laksukh Sar, Harnag, Salnai Sar, Dhakalar Sar, Nund Kol, Gad Sar, Madmatti Sar, Mar Sar, Bodh Sar, Vishan Sar, Sheshnag, Bhag Sar, Tar Sar, Konsar Nag, Gnagabal lake

\* Not included in the AWC Surveys



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Fig. 1 Map showing major wetlands of UT of Jammu and Kashmir. High altitude lakes are represented in groups

## Water birds of Jammu and Kashmir

The work presented here is primarily based on Asian Water bird Census supplemented with observations by researchers, extracts from the published literature and contributions from online database and repositories mainly eBird, and active Facebook groups mainly Birds of Kashmir, J&K BirdLife and Kashmir Birdwatch devoted to birds in Jammu and Kashmir. The taxonomic order and nomenclature of the birds in the present guide follows the eBird. Kumar et al. (2005), Rasmussen and Anderton (2012) and Grimmett et al. (2011) have duly been consulted to ascertain the bird characters, morphology, and their distribution in the region.



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For the sake of convenience, the water birds (Table 2) and water associated birds (Table 3) have been listed separately with their order and familial description, species name (common and binomial) and occurrence in the respective provinces. Conservation status of the birds is based on IUCN, 2021. The birds have been categorized as local winter migrants (winter migrants from nearby areas or other parts of India), local residents (that stay in the region throughout the year), transboundary winter migrants (long-distance winter migrants to the region and India), altitudinal migrants (locally migrating to lower altitudes for wintering), local summer migrants (arriving from other part of the region or India during summers), local migrants (opportunistic migrants from other part of the region or India for habitat and food availability) as per ENVIS (India). Birds based on their food preferences have been categorized into five feeding guilds, Insectivorous (feeding on insects, earthworms), Carnivorous (feeding on reptiles, arthropods, small crustaceans, and rodents), Omnivorous (feeding both on animals and plants products), Herbivorous (feeding on plant material, algae, diatoms) and Piscivorous (feeding exclusively on fish). The images used in the report are subject to copyright of the researchers of the Institute of Mountain Environment, the bird watchers, and photographers.

India is home to 244 water birds and 66 wetland-dependent among 1347 birds documented so far (Kumar et al., 2005). The erstwhile state of Jammu and Kashmir is home to 624 birds. UT of J&K comprise of 120 water birds and 32 wetland dependent species distributed in 10 orders and 27 families (eBird 2022, Praveen et al., 2020) (Table 2 & 3). We present through this report, 75 species of water birds recorded during Asian Waterbird Census 2021, 56 species each from Jammu and Kashmir with 37 species observed in common (Table 2 & 3).



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## Residential status

India lies at a strategic bird migratory routes between Eurasia and South and South-East Asia, Central Asian-Indian Flyway and East Asian-Australian Flyway. The first is a major route between Siberia and Central Asia on



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the northern side accounting for significant number of migrant species to Indian subcontinent especially the water birds, often covering thousands of kilometers. The migratory waterbirds breed in Europe and northern Asia in early summer. With the approach of autumn, they make southward journeys into warmer tropical conditions until the climate becomes conducive. It leads to the arrival of millions of waterbirds at the onset of autumn (August to December) to spend the winter in the warm subtropical wetlands of the Indian subcontinent making wetlands

and other water bodies of Jammu and Kashmir as their potential wintering sites. The migratory status in the present study is based on the field observations, eBird data and secondary information duly crosschecked with Kumar et al., (2005). Analysis of migratory status reveal that most of the species are transboundary winter migrants (57 species) followed by residents (17), local winter migrants (9), local summer migrant (8) and local migrant (3). The rest of 58 species follow two and more trends including the altitudinal migrations (Table 2 & 3).



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Table 2 : Checklist of water birds of Jammu and Kashmir

S. No.	Common name , Binomial name (Authority)	Migratory Status	Feeding Type	Conser -vation Status	Occurrence	
					Jammu	Kashmir
<b>ORDER: ANSERIFORMES</b>						
<b>Family: Anatidae</b>						
1.	Lesser Whistling Duck, <i>Dendrocygna javanica</i> (Horsfield, 1821)	LSM	O	LC	+	-
2.	Bar-headed Goose, <i>Anser indicus</i> (Latham, 1790)	TWM	O	LC	+	+
3.	Graylag Goose, <i>Anser anser</i> (Linnaeus, 1758)	TWM	O	LC	+	+
4.	Greater White-fronted Goose, <i>Anser albifrons</i> (Scopoli, 1769)	TWM	O	LC	+	-
5.	Lesser White-fronted Goose, <i>Anser erythropus</i> , Linnaeus, 1758	TWM	O	VU	-	+
6.	Tundra Bean Goose, <i>Anser fabalis</i> (Latham, 1787)	TWM	H	LC	+	-
7.	Tundra Swan, <i>Cygnus columbianus</i> (Ord, 1815)	TWM	O	LC	-	+
8.	Whooper Swan <i>Cygnus Cygnus</i> (Linnaeus, 1758)	TWM	H	LC	-	+
9.	Knob-billed Duck, <i>Sarkidiornis melanotos</i> (Pennant, 1769)	LWM	O	LC	+	-
10.	Ruddy Shelduck, <i>Tadorna ferruginea</i> (Pallas, 1764)	TWM / LR	O	LC	+	+
11.	Common shelduck, <i>Tadorna tadorna</i> (Linnaeus, 1758)	TWM	O	LC	+	-
12.	Cotton Pygmy-Goose, <i>Nettapus coromandelianus</i> (J.F. Gmelin, 1789)	LSM	O	LC	+	-
13.	Baikal Teal, <i>Sibirionetta Formosa</i> (Georgi, 1775)	TWM	O	LC	-	+
14.	Garganey, <i>Spatula querquedula</i> (Linnaeus, 1758)	TWM	O	LC	+	+
15.	Northern Shoveler, <i>Spatula clypeata</i> (Linnaeus, 1758)	TWM / LR	O	LC	+	+
16.	Gadwall, <i>Mareca strepera</i> (Linnaeus, 1758)	TWM	O	LC	+	+
17.	Eurasian Wigeon, <i>Mareca Penelope</i> (Linnaeus, 1758)	TWM	O	LC	+	+
18.	Indian Spot-billed Duck, <i>Anas poecilorhyncha</i> (J.R. Forster, 1781)	LM / LR	O	LC	+	-
19.	Mallard, <i>Anas platyrhynchos</i> (Linnaeus, 1758)	TWM	O	LC	+	+
20.	Northern Pintail, <i>Anas acuta</i> (Linnaeus, 1758)	TWM	O	LC	+	+
21.	Common Teal, <i>Anas crecca</i> (Linnaeus, 1758)	TWM / LR	O	LC	+	+
22.	Marbled Teal, <i>Marmaronetta angustirostris</i> (Ménétriés, 1832)	TWM	O	VU	-	+
23.	Red-crested Pochard, <i>Netta rufina</i> (Pallas, 1773)	TWM	O	LC	+	+
24.	Common Pochard, <i>Aythya ferina</i> (Linnaeus, 1758)	TWM	O	VU	+	+
25.	Ferruginous Duck, <i>Aythya nyroca</i> (Linnaeus, 1758)	TWM	O	NT	+	+
26.	Tufted Duck, <i>Aythya fuligula</i> (Linnaeus, 1758)	TWM	O	LC	+	+
27.	Greater Scaup <i>Aythya marila</i> (Linnaeus, 1761)	TWM	O	LC	-	+
28.	Long-tailed Duck, <i>Clangula hyemalis</i> (Linnaeus, 1758)	TWM	C	VU	-	+
29.	Common Goldeneye, <i>Bucephala clangula</i> (Linnaeus, 1758)	TWM	C	LC	-	+
30.	Smew, <i>Mergellus albellus</i> (Linnaeus, 1758)	TWM	C	LC	-	+
31.	Common Merganser, <i>Mergus merganser</i> (Linnaeus, 1758)	LR/LWM/TWM	O	LC	-	+
32.	White-headed Duck, <i>Oxyura leucocephala</i> (Scopoli, 1769)	TWM	O	EN	-	+
<b>ORDER: PODICIPEDIFORMES</b>						
<b>Family: Podicipedidae</b>						
33.	Little Grebe, <i>Tachybaptus ruficollis</i> (Pallas, 1764)	LWM	C	LC	+	+
34.	Great Crested Grebe, <i>Podiceps cristatus</i> (Linnaeus, 1758)	TWM/LWM	C	LC	+	+
<b>ORDER: GRUIFORMES</b>						
<b>Family: Rallidae</b>						
35.	Water Rail, <i>Rallus aquaticus</i> (Linnaeus, 1758)	TWM	O	LC	+	+
36.	Spotted Crane, <i>Porzana porzana</i> (Linnaeus, 1766)	TWM	O	LC	+	+
37.	Eurasian Moorhen, <i>Gallinula chloropus</i> (Linnaeus, 1758)	LR	O	LC	+	+
38.	Eurasian Coot, <i>Fulica atra</i> (Linnaeus, 1758)	TWM / LR	O	LC	+	+
39.	Gray-headed Swampphen, <i>Porphyrio porphyrio</i> (Linnaeus, 1758)	LR	O	LC	+	+
40.	White-breasted Waterhen, <i>Amaurornis Phoenicurus</i> (Pennant, 1769)	LR	O	LC	+	+
41.	Ruddy-breasted Crane, <i>Zapornia fusca</i> (Linnaeus, 1766)	LR	O	LC	+	+
42.	Brown Crane, <i>Zapornia akool</i> (Sykes, 1832)	LR/LM	O	LC	+	-
43.	Baillon's Crane, <i>Zapornia pusilla</i> (Pallas, 1776)	TWM / LR	O	LC	+	+

<b>Family: Gruidae</b>						
44.	Demoiselle Crane, <i>Grus virgo</i> (Linnaeus, 1758)	TWM	O	LC	+	+
45.	Sarus Crane, <i>Antigone antigone</i> (Linnaeus, 1758)	LM	O	VU	+	-
46.	Common Crane, <i>Grus grus</i> (Linnaeus, 1758)	TWM	O	LC	+	-
<b>ORDER: CHARADRIIFORMES</b>						
<b>Family: Recurvirostridae</b>						
47.	Black-winged Stilt, <i>Himantopus himantopus</i> (Linnaeus, 1758)	TWM / LR	C	LC	+	+
48.	Pied Avocet, <i>Recurvirostra avosetta</i> (Linnaeus, 1758)	TWM/LWM/R	C	LC	-	+
<b>Family: Ibidorhynchidae</b>						
49.	Ibisbill, <i>Ibidorhyncha struthersii</i> (Vigors, 1832)	LR/AM	C	LC	+	+
<b>Family: Haematopodidae</b>						
50.	Eurasian Oystercatcher, <i>Haematopus ostralegus</i> (Linnaeus, 1758)	TWM	C	NT	-	+
<b>Family: Charadriidae</b>						
51.	Northern Lapwing, <i>Vanellus vanellus</i> (Linnaeus, 1758)	TWM	C	NT	+	+
52.	River Lapwing, <i>Vanellus duvaucelii</i> (Lesson, 1826)	LWM/LSM	C	NT	+	-
53.	Yellow-wattled Lapwing, <i>Vanellus malabaricus</i> (Boddaert, 1783)	LR/LM	C	LC	+	-
54.	Red-wattled Lapwing, <i>Vanellus indicus</i> (Boddaert, 1783)	LR	C	LC	+	+
55.	White-tailed Lapwing, <i>Vanellus leucurus</i> (M.H.C. Lichtenstein, 1823)	TWM	C	LC	+	-
56.	Kentish Plover, <i>Charadrius alexandrinus</i> (Linnaeus, 1758)	TWM / LWM	C	LC	+	+
57.	Little Ringed Plover, <i>Charadrius dubius</i> (Scopoli, 1786)	TWM / LWM	C	LC	+	+
<b>Family: Rostratulidae</b>						
58.	Greater Painted-snipe, <i>Rostratula benghalensis</i> (Linnaeus, 1758)	LWM	O	LC	+	+
<b>Family: Jacanidae</b>						
59.	Pheasant-tailed Jacana, <i>Hydrophasianus chirurgus</i> (Scopoli, 1786)	LSM	C	LC	+	+
<b>Family: Scolopacidae</b>						
60.	Whimbrel, <i>Numenius phaeopus</i> (Linnaeus, 1758)	TWM	C	LC	-	+
61.	Eurasian Curlew, <i>Numenius arquata</i> (Linnaeus, 1758)	TWM	C	NT	+	+
62.	Ruddy Turnstone, <i>Arenaria interpres</i> (Linnaeus, 1758)	TWM	C	LC	-	+
63.	Ruff, <i>Calidris pugnax</i> (Linnaeus, 1758)	TWM	C	LC	+	+
64.	Sharp-tailed sandpiper, <i>Calidris acuminata</i> (Horsfield, 1821)	TWM	C	LC	-	+
65.	Temminck's Stint, <i>Calidris temminckii</i> (Leisler, 1812)	TWM	C	LC	+	+
66.	Dunlin, <i>Calidris alpina</i> (Linnaeus, 1758)	TWM	C	LC	-	+
67.	Little Stint, <i>Calidris minuta</i> (Leisler, 1812)	TWM	C	LC	+	+
68.	Jack Snipe, <i>Lymnocyptes minimus</i> (Brünnich, 1764)	TWM	C	LC	+	+
69.	Eurasian Woodcock, <i>Scolopax rusticola</i> (Linnaeus, 1758)	TWM/LWM/LR	C	LC	-	+
70.	Solitary Snipe, <i>Gallinago solitaria</i> (Hodgson, 1831)	TWM/LWM/LR	C	LC	+	+
71.	Common Snipe, <i>Gallinago gallinago</i> (Linnaeus, 1758)	TWM / LR	C	LC	+	+
72.	Pintail Snipe, <i>Gallinago stenura</i> (Bonaparte, 1831)	TWM	C	LC	-	-
73.	Terek Sandpiper, <i>Xenus cinereus</i> (Güldenstädt, 1775)	TWM	C	LC	-	+
74.	Red-necked Phalarope, <i>Phalaropus lobatus</i> (Linnaeus, 1758)	TWM	C	LC	-	+
75.	Common Sandpiper, <i>Actitis hypoleucos</i> (Linnaeus, 1758)	TWM / LR	C	LC	+	+
76.	Green Sandpiper, <i>Tringa ochropus</i> (Linnaeus, 1758)	TWM	C	LC	+	+
77.	Spotted Redshank, <i>Tringa erythropus</i> (Pallas, 1764)	TWM	C	LC	+	+
78.	Common Greenshank, <i>Tringa nebularia</i> (Gunnerus, 1767)	TWM / LR	C	LC	+	+
79.	Marsh Sandpiper <i>Tringa stagnatilis</i> (Bechstein, 1803)	TWM	C		+	+
80.	Wood Sandpiper, <i>Tringa glareola</i> (Linnaeus, 1758)	TWM	C	LC	+	+
81.	Common Redshank, <i>Tringa tetanus</i> (Linnaeus, 1758)	TWM / LR	C	LC	+	+
<b>Family: Glareolidae</b>						
82.	Oriental Pratincole, <i>Glareola maldivarum</i> (J.R. Forster, 1795)	LSM	I	LC	+	-
83.	Small Pratincole, <i>Glareola lactea</i> (Temminck, 1820)	LSM	I	LC	+	-
<b>Family: Laridae</b>						
84.	Black-headed Gull, <i>Chroicocephalus ridibundus</i> (Linnaeus, 1766)	TWM	C	LC	+	+
85.	Brown-headed Gull, <i>Chroicocephalus brunnicephalus</i> (Jerdon, 1840)		C	LC	+	+

86.	Pallas's Gull, <i>Ichthyaeetus ichthyaeetus</i> (Pallas, 1773)	TWM	C	LC	+	+
87.	Little Tern, <i>Sternula albifrons</i> (Pallas, 1764)	TWM/LSM	C	LC	+	+
88.	Gull-billed Tern, <i>Gelochelidon nilotica</i> (J.F. Gmelin, 1789)	TWM/LWM/LR	C	LC	+	-
89.	Whiskered Tern, <i>Chlidonias hybrida</i> (Pallas, 1811)	LR/TWM/LWM	C	LC	+	+
90.	Common Tern, <i>Sterna hirundo</i> (Linnaeus, 1758)	TWM/LSM	C	LC	+	-
91.	Arctic Tern, <i>Sterna paradisaea</i> (Pontoppidan, 1763)	TWM	C	LC	-	+
92.	Black-bellied Tern, <i>Sterna acuticauda</i> (J.E. Gray, 1831)	LWM/LSM	C	EN	+	-
93.	River Tern, <i>Sterna aurantia</i> (J.E. Gray, 1831)	TWM / LWM	C	NT	+	+
<b>ORDER: CICONIIFORMES</b>						
<b>Family: Ciconiidae</b>						
94.	Asian Openbill, <i>Anastomus oscitans</i> (Boddaert, 1783)	LSM	C	LC	+	-
95.	Black Stork, <i>Ciconia nigra</i> (Linnaeus, 1758)	TWM	C	LC	+	+
96.	Woolly-necked Stork, <i>Ciconia episcopus</i> (Boddaert, 1783)	LWM	C	VU	+	-
97.	Black-necked Stork, <i>Ephippiorhynchus asiaticus</i> (Latham, 1790)	LR/LWM	O	VU	-	-
98.	Painted Stork, <i>Mycteria leucocephala</i> (Pennant, 1769)	LWM	C	NT	+	-
<b>ORDER: SULIFORMES</b>						
<b>Family: Anhingidae</b>						
99.	Oriental Darter, <i>Anhinga melanogaster</i> (Pennant, 1769)	LWM	C	NT	+	-
<b>Family: Phalacrocoracidae</b>						
100.	Little Cormorant, <i>Microcarbo niger</i> (Vieillot, 1817)	LWM / LR	C	LC	+	+
101.	Great Cormorant, <i>Phalacrocorax carbo</i> (Linnaeus, 1758)	LWM / LR	C	LC	+	+
102.	Indian Cormorant, <i>Phalacrocorax fuscicollis</i> (Stephens, 1826)	LWM / LR	C	LC	+	-
<b>ORDER: PELECANIFORMES</b>						
<b>Family: Ardeidae</b>						
103.	Great Bittern, <i>Botaurus stellaris</i> (Linnaeus, 1758)	TWM	C	LC	+	-
104.	Yellow Bittern, <i>Ixobrychus sinensis</i> (J.F. Gmelin, 1789)	LSM	C	LC	+	-
105.	Little Bittern, <i>Ixobrychus minutus</i> (Linnaeus, 1766)	LSM	C	LC	-	+
106.	Cinnamon Bittern, <i>Ixobrychus cinnamomeus</i> (J.F. Gmelin, 1789)	LM	C	LC	+	-
107.	Black Bittern, <i>Ixobrychus flavicollis</i> (Latham, 1790)	LM	C	LC	+	+
108.	Gray Heron, <i>Ardea cinerea</i> (Linnaeus, 1758)	LWM / LR	C	LC	+	+
109.	Purple Heron, <i>Ardea purpurea</i> (Linnaeus, 1766)	TWM / LR	C	LC	+	-
110.	Great Egret, <i>Ardea alba</i> (Linnaeus, 1758)	LR	C	LC	+	+
111.	Intermediate Egret, <i>Ardea intermedia</i> (Wagler, 1829)	LWM / LR	C	LC	+	+
112.	Little Egret, <i>Egretta garzetta</i> (Linnaeus, 1766)	LR	C	LC	+	+
113.	Cattle Egret, <i>Bubulcus ibis</i> (Linnaeus, 1758)	LR	C	LC	+	+
114.	Indian Pond Heron, <i>Ardeola grayii</i> (Sykes, 1832)	LR	C	LC	+	+
115.	Striated Heron, <i>Butorides striata</i> (Linnaeus, 1758)	LWM	C	LC	+	-
116.	Black-crowned Night Heron, <i>Nycticorax nycticorax</i> (Linnaeus, 1758)	LR	C	LC	+	+
<b>Family: Threskiornithidae</b>						
117.	Glossy Ibis, <i>Plegadis falcinellus</i> (Linnaeus, 1766)	TWM/LWM	C	LC	+	+
118.	Black-headed Ibis, <i>Threskiornis melanocephalus</i> (Latham, 1790)	LWM	C	NT	+	-
119.	Red-naped Ibis, <i>Pseudibis papillosa</i> (Temminck, 1824)	LWM	C	LC	+	-
120.	Eurasian Spoonbill, <i>Platalea leucorodia</i> (Linnaeus, 1758)	LWM	C	LC	+	-

Species occurrence : Presence (+), Absence (-)

Species marked in **RED** are the historic records with the specimen collected from different parts of Kashmir valley.

**Residential / Migratory Status :** LWM - Local Winter Migrant; LR - Local Resident; TWM - Transboundary Winter Migrant; AM - Altitudinal Migrant; LSM - Local Summer Migrant; LM - Local Migrant

**Feeding Guild :** I - Insectivorous; C - Carnivorous; O - Omnivorous; H - Herbivorous; P - Piscivorous

**Conservation Status :** EN - Endangered; VU - Vulnerable; NT - Near Threatened; LC - Least Concern.

Table 3: Checklist of water associated birds of Jammu and Kashmir

S. No.	Common name, Binomial name (Authority)	Migratory Status	Feeding Type	Conser- -vation status	Occurrence	
					Jammu	Kashmir
<b>ORDER: CHARADRIIFORMES</b>						
<b>Family: Burhinidae</b>						
1.	Indian Thick-knee, <i>Burhinus indicus</i> (Salvadori, 1865)	LR	C	LC	+	-
2.	Great Thick-knee, <i>Esacus recurvirostris</i> (Cuvier, 1829)	LR	C	NT	+	-
<b>ORDER: ACCIPITRIFORMES</b>						
<b>Family: Pandionidae</b>						
3.	Osprey, <i>Pandion haliaetus</i> (Linnaeus, 1758)	TWM/LWM	P	LC	+	+
<b>Family: Accipitridae</b>						
4.	Eurasian Marsh Harrier, <i>Circus aeruginosus</i> (Linnaeus, 1758)	TWM	C	LC	+	+
5.	Hen Harrier, <i>Circus cyaneus</i> (Linnaeus, 1766)	TWM	C	LC	+	+
6.	White-tailed Eagle, <i>Haliaeetus albicilla</i> (Linnaeus, 1758)	TWM	C	LC	+	+
7.	Pallas's Fish Eagle, <i>Haliaeetus leucoryphus</i> (Pallas, 1771)	TWM/LWM	P	LC	+	+
<b>ORDER: CORACIIFORMES</b>						
<b>Family: Alcedinidae</b>						
8.	Common Kingfisher, <i>Alcedo atthis</i> (Linnaeus, 1758)	LR	C	LC	+	+
9.	White-throated Kingfisher, <i>Halcyon smyrnensis</i> (Linnaeus, 1758)	LR	C	LC	+	+
10.	Crested Kingfisher, <i>Megaceryle lugubris</i> (Temminck, 1834)	LR/AM	C	LC	+	+
11.	Pied Kingfisher, <i>Ceryle rudis</i> (Linnaeus, 1758)	LR	C	LC	+	+
<b>ORDER: PASSERIFORMES</b>						
<b>Family: Hirundinidae</b>						
12.	Grey-throated Martin, <i>Riparia chinensis</i> (J.E Gray, 1830)	LR/LM	I	LC	+	-
13.	Pale Sand Martin, <i>Riparia diluta</i> (Sharpe & Wyatt, 1893)	LR/TWM	I	LC	+	-
14.	Eurasian Crag Martin <i>Ptyonoprogne rupestris</i> (Scopoli, 1769)	LR/TSM	I	LC	+	+
15.	Barn Swallow, <i>Hirundo rustica</i> (Linnaeus, 1758)	LR/TWM	I	LC	+	+
16.	Wire-tailed Swallow, <i>Hirundo smithii</i> (Leach 1818)	LR/TSM	I	LC	+	+
17.	Streak-throated Swallow, <i>Petrochelidon fluvicola</i> (Blyth, 1855)	LR/TSM	I	LC	+	-
<b>Family: Cinclidae</b>						
18.	White-throated Dipper, <i>Cinclus cinclus</i> (Linnaeus, 1758)	LR/AM	C	LC	+	+
19.	Brown Dipper, <i>Cinclus pallasi</i> (Temminck, 1820)	LR/AM	C	LC	+	+
<b>Family: Sturnidae</b>						
20.	European Starling, <i>Sturnus vulgaris</i> (Linnaeus, 1758)	TWM	O	LC	+	+
21.	Bank Myna, <i>Acridotheres ginginianus</i> (Latham, 1790)	LR	O	LC	+	-
<b>Family: Muscipidae</b>						
22.	Little Forktail, <i>Enicurus scouleri</i> (Vigors, 1832)	LR/AM	C	LC	+	+
23.	Spotted Forktail, <i>Enicurus maculates</i> (Vigors, 1831)	LR/AM	C	LC	+	+
24.	Plumbeous Redstart, <i>Phoenicurus fuliginosa</i> (Vigors, 1831)	LR/AM	C	LC	+	+
25.	White capped Redstart, <i>Phoenicurus leucocephalus</i> (Vigors, 1831)	LR/AM	C	LC	+	+
26.	White-winged Redstart, <i>Phoenicurus erythrogastrus</i> (Guldenstadt, 1775)	LR/AM	C	LC	+	+
<b>Family: Motacillidae</b>						
27.	Gray Wagtail, <i>Motacilla cinerea</i> (Tunstall, 1771)	TWM / LR	I	LC	+	+
28.	Western Yellow Wagtail, <i>Motacilla flava</i> (Linnaeus, 1758 )	LR/AM/TWM	I	LC	+	+
29.	Citrine Wagtail, <i>Motacilla citreola</i> (Pallas, 1776)	TWM / LR	I	LC	+	+
30.	White-browed Wagtail, <i>Motacilla maderaspatensis</i> (J.F. Gmelin, 1789)	LR	I	LC	+	-
31.	White Wagtail, <i>Motacilla alba</i> (Linnaeus, 1758)	TWM / LR	I	LC	+	+
32.	Water Pipit, <i>Anthus spinoletta</i> (Linnaeus, 1758)	TWM	I	LC	+	+

### Diet

Birds during their migration often use wetlands and other water bodies as stop over sites for feeding, breeding, and nesting purposes. They also depend on nearby agriculture, fallows, and shoreline vegetation for feeding and roosting. Carnivores among the water birds in J&K forms the main feeding guild (n=91) followed by omnivores (n=43) and insectivores (n=14). Piscivores and herbivores are represented by two species each (Table 2 & 3).



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### Conservation status



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Of the total 152 water birds observed, 133 have been found as least concerned (IUCN, 2021). Ten species viz., Great Thick-knee, *Esacus recurvirostris*; Black-headed Ibis, *Threskiornis melanocephalus*; Painted Stork, *Mycteria leucocephala*; Oriental Darter, *Anhinga melanogaster*; Eurasian Curlew, *Numenius arquata*; River Tern, *Sterna aurantia*; River Lapwing, *Vanellus duvaucelii*; Northern Lapwing, *Vanellus vanellus*; Ferruginous Duck, *Aythya nyroca*; and Eurasian Oystercatcher, *Haematopus ostralegus* fall in Near Threatened category whereas 7 species viz., Woolly-necked Stork, *Ciconia episcopus*;

Common Pochard, *Aythya ferina*; Lesser White-fronted Goose, *Anser erythropus*; Long-tailed Duck, *Clangula hyemalis*; Marbled Teal, *Marmaronetta angustirostris*; Black-necked Stork, *Ephippiorhynchus asiaticus* and, Sarus Crane, *Antigone antigone* are Vulnerable. Black-bellied Tern, *Sterna acuticauda*; and White-headed Duck, *Oxyura leucocephala* are categorized as Endangered (see Table 2 & 3).

### Potential wintering sites for water birds in Jammu :

The potential wintering sites for the local and transboundary migrants in Jammu division include Gharana, Pargwal, Kukarian and Nanga Wetland Reserves, Surinsar-Mansar lakes and Ranjit Sagar reservoir, Tawi riverside besides several shallow streams, pools, and ponds across the Jammu plains. The reeds and emergent



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vegetation along the margins of these water bodies, provide suitable nesting, feeding, and roosting sites for the water birds. Thousands of birds migrate to these wetlands, which are part of the Asian flyway zone, from Siberia and other parts of the world. The Government with reference to cabinet decision No. 35 dated 02-02-1981 accorded sanction to notify certain areas besides the National Parks and Wildlife Sanctuaries as Wetland Reserves in the interest of waterfowl and wetland conservation and development. Govt. order No. FST/20 of 1981 dated 04-02-1981 and subsequent orders notified five namely Gharana, Pargwal, Kukrian, Sangral-Asa Chak and Nanga wetlands as Wetland Conservation Reserves in Jammu region.

### *Mansar and Surinsar lakes, the Ramsar sites:*

Surinsar-Mansar lakes have been declared as Ramsar site (1573) on 8th November 2005. The twin Lakes are also part of the Government of India's National Wetland Conservation Program. Mansar Lake is a semi-oval body of water with an average width of 680 m and a depth of 37.8 mts. This wetland is revered through ages due to its religious importance and scenic beauty. Surinsar, Mansar's sibling lake, is semi-oval body of water with a maximum depth of 24.04 m, measuring 888 m in length and 444 m in width located northwest of Mansar. Surinsar is rain fed while Mansar is primarily fed by surface run-off and partially by mineralized water through paddy fields with an increased inflow during rainy season. Both the lakes are rich in micronutrients



Lake Surinsar

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that makes them a conducive breeding and nursery ground for migratory waterfowls like Tufted Ducks, Common Pochards as well as refuge during poor weather for species such as the Great Crested Grebe and the Garganey, Gadwall, etc. Other winter visitors include Night Heron, Grey Heron, Eurasian Coot, Indian White Wagtail, Rufous Black Shrike, Darter, Large Cormorant, and Indian Golden Oriole. The fish fauna comprises of *Cyprinus carpio*, *Channa* sps, *Puntius conchoni*, *Rasbora rasbora*, *Danio rerio* and *Trichogaster fasciatus*. Lake Mansar is also home to CITES-IUCN Red listed species of soft-shelled turtles, *Lissemys punctata* and *Nilssonina gangeticus*. This wetland nurtures a unique freshwater cnidarian medusa species, *Mansariella lacustris*.

### *Gharana Wetland Conservation Reserve :*

Located very close to the international Indo-Pak border, Gharana Wetland Conservation Reserve is a designated Important Bird Area (IBA) identified by birdlife International and is one of 115 aquatic ecosystems under the scheme of 'National Plan for Conservation of Aquatic Ecosystems (NPCA)' which is meant for holistic conservation of lakes and wetlands (ENVIS Centre). This



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small wetland of 0.75 sq km (~ 200 acres) (32°32.362' N to 32°32.632' N and 74°41.134' E to 74°41.678' E, elevation 213 m asl) is a wintering home to more than 20 transboundary migrants that flock during winters from across the continent, mostly from Russia and central south Asia. The frequently observed species in Gharana include Bar-headed Goose, *Anser indicus*; Ruddy Shelduck, *Tadorna ferruginea*; Gadwall, *Anas strepera*; Eurasian Wigeon, *Anas penelope*; Mallard, *Anas platyrhynchos*; Northern Pintail, *Anas acuta*; Northern Shoveler, *Anas clypeata*; Red-crested Pochard, *Rhodonessa rufina*; Common Pochard, *Aythya ferina* and Tufted Duck, *Aythya fuligula*. These species come from far off places of highlands of Central Asia.

### *Kukarian Wetland Reserve :*

The Kukarian wetland, home to several resident and migratory birds was notified as wetland reserve by the Forest department in 1981. The wetland spread in 24.25 km<sup>2</sup> (32°41.977' N and 74°41.584' E, elevation 211 m asl) is sprawled over Batore, Bangore, Kukrian, Sandun and Makwal villages in district Jammu.

### *Pargwal Wetland Reserve :*

A riverine wetland located on an island of the river Chenab earned its name from village Pargwal (32°47.878' N and 74°35.346' E, elevation 218 m asl) along the chicken-neck area of Indo-Pak border in Tehsil, Akhnour. The wetland reserve was notified in the year 1981 with an area coverage of 49.25km<sup>2</sup>. The wetland attracts several elevational and transboundary migrants including the raptors like Ospreys, Steppe eagles and several owls.



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### *Nanga Wetland Reserve :*

A small sized wetland is located along the border village Nanga in Vijaypur-Ramgarh area of district Samba. The wetland, an important abode of migrant and resident bird species was notified as wetland reserve in 1981. Located at 32°27.580' N and 74°57.688' E, at a low elevation of 247 m, the wetland is spread in 15.25 km<sup>2</sup>.

### *Sangral Asa Chak Wetland Reserve:*

Another small wetland sprawled in three villages Asa Chak, Abdullian and Sangral along the Indo-Pak border covers a linear narrow stretch of 7 km<sup>2</sup>. The wetland is located at 32°37.475' N and 74°39.627' E (elevation 205 m). The marsh provides a conducive home to several waders, ducks, and herons.



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### *Ranjit Sagar Reservoir:*

The Ranjit reservoir wetland, also known as Thein Dam, is a freshwater ecosystem situated on the river Ravi (tributary of the Indus River system) near Pathankot city, Punjab, India. This wetland falls into three states *i.e.*, Punjab, Himachal Pradesh, and Jammu and Kashmir. It is spread over an area of 87.60 sq km and catchment area consist of 6086 sq km. There are three major streams (Karnal, Basoli and Behni) feeding Ranjit Sagar Wetland



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### *Potential wintering sites for water birds in Kashmir :*

Kashmir, the paradise on Earth is known for its captivating beauty. It is situated in the middle of Himalayan range between latitude 33-35°N and longitude 73-76°E at an altitude of 1700 m above mean sea level (Koul, 1913). It is enriched by three mountain ranges of the Himalayas – Karakoram, Zanaskar and Pir Panjal. Kashmir valley nestled in northwestern folds of the Himalayas is replete with diverse types of freshwater bodies (Khan, 2000). Zutshi and Khan (1978) in a classic typology recognized three major categories of water bodies based on their origin, altitude, and nature of biota: the Valley lakes (1580-1600 m) of Kashmir valley, forest lakes (2000-2500 m) of Pir Panjal range and glacial or high altitude (3000 m) lakes (see Table 1). Valley lakes located in flood plains of river Jhelum and river Sind show varied hydroedaphic features. The valley wetlands provide over-wintering resort to millions of waterbirds from their breeding grounds in



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Palaearctic region extending from north Europe to Central Asia (Ali, 1979) and breeding ground to a segment of waterbird species (Pandit, 1982). The wetlands covered under AWC comprise of :

#### *Chatlam Wetland Reserve:*

Located close to Pampore town in south Kashmir Pulwama district. It is located about 16 kms from summer capital Srinagar. It was notified in the year 1945 and supports rich diversity of migratory birds coming from different parts of the world including Siberia and central Asia during winters. The wetland is spread in 8.52 km<sup>2</sup> (34°0.566' N to 34°1.230' N and 74°55.773' E to 74°56.523', elevation 1550 m asl) and its perimeter 3.64 kms.



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#### *Hygam Wetland Reserve:*



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A shallow perennial freshwater lake on the flood plains of Jhelum River in Kashmir Valley. It is commonly known as Hygam Rakh located in Baramulla district about 45 km northwest of capital city Srinagar. It is recognized as important bird area (IBA). Thousands of winter birds throng the wetland during winters. The wetland is spread in 7.25 km<sup>2</sup> (34°13.495' N to 34°16.125' N and 74°30.578' E to 74°32.962' E, elevation 1559 m asl). Perimeter of the wetland is 14.63 kms

#### *Freshkooari Wetland Reserve:*

It was notified in the year 1945 and supports a rich diversity of migratory birds coming from Siberia and central Asia during winters. It is located near Pampore town of South Kashmir Pulwama district. The wetland is spread in 3.41 km<sup>2</sup> (34°0.586' N to 34°1.025' N and 74°55.248' E to 74°55.424' E, elevation 1551 m asl). Wetland covers a perimeter of 1.89 kms.

#### *Hokersar Wetland Reserve:*

It was declared as Ramsar site in the year 2005. Thousands of waterfowls visit the wetlands during winters. It is 10 kms away from Srinagar. The wetland is spread in 13.75 km<sup>2</sup> (34°4.876' N to 34°6.893' N and 74°40.483' E to 74°44.170' E, elevation 1565 m asl). Perimeter of the wetland is 17.06 kms



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#### *Kranchoo wetland Reserve:*

It lies in Pampore town of south Kashmir Pulwama district, 16 kms from summer capital Srinagar. It was notified in the year 1945. The wetland is spread in 1.28 km<sup>2</sup> (34°59.576' N to 34°59.854' N and 74°55.935' E to 74°56.507' E, elevation 1551 m asl). It covers a perimeter of 2.25 kms



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#### *Manibugh Wetland Reserve:*

This wetland was Notified as a reserve in the year 1945 and is in Pampore town of south Kashmir about 16 kms from Srinagar. This wetland is adjoining to the famous saffron fields. The wetland is spread in 1.06 km<sup>2</sup> (33°59.883' N to 34°0.116' N and 74°55.574' E to 74°55.863' E, elevation 1544 m asl). Perimeter is 1.29 kms.

### *Mirgund Wetland Reserve:*

It is located at 16 kms from Srinagar towards northwest of Gulmarg road on one side and Baramulla Sopore highway on its right side. The wetland is spread in an area of 4 km<sup>2</sup> (34°6.860' N to 34°8.105' N and 74°37.615' E to 74°39.748' E, elevation 1562 m asl) with a perimeter of 9.88 kms.



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### *Shallabugh Wetland Reserve:*

This wetland is temporary shallow and is located About 15 kms from Srinagar and is famous game reserve. The main resource to this wetland is river Sindh.

### *Wular lake:*



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Wular is the largest freshwater lake in Asia. Fed by Jhelum River, this lake covers an area of around 200 sq km. It houses some of the rarest flora and fauna. It produces more than 60% fish yield of the state. The lake has been declared as a wetland of national importance under the wetlands programme of the Ministry of Environment and Forests, Government of India in 1986 and has been subsequently declared as Ramsar Site in 1990 giving it the status of wetland of international importance. The lake is situated at about 50 kms from Srinagar

at an average altitude of 1570 m asl. The lake is balloon shaped with a maximum length of 16 kms and breadth of 7.6 kms with an average depth of 5.8 m.

### *Anchar Lake:*

Anchar lake, a shallow water body is located at 10 kms northwest of Srinagar city located at an altitude of 1585m asl. The lake is a typical sub urban eutrophic water body with both rural and urban characteristics. The lake is a single basined, open drainage type water body fed by a network of channels from Sind nallah, springs in the basin and along the periphery. The lake outfalls in river Jhelum at Sangam on its north-east direction. It covers an area of 680 hectares, half of which has now completely become marshland.



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### *Dal Lake:*

It is a world-famous lake lying east of Srinagar city. It is Kidney shaped with an area of 11.20 sq kms as ascertained through the satellite imageries of the year 1994 and 1995. The water surface of the Dal Lake has slightly increased from 18.21 square kilometres to 20.21 square kilometres in the past 114 years (The Lakes and Water Development Authority, 2021). Dal and Wular Lakes are Crater lakes formed in volcanic craters and calderas which fill up with precipitation more rapidly than they empty via evaporation.

***Padgampora wetland:***

Padgampora wetland is located in 11 KM towards East of District headquarters Pulwama

***Khurwansar:***

Khurwansar is located in Sumbal area of north Kashmir in Bandipora.

***Ahansar-Shalasar-Waskursar:***

Ahansar Lake is a rural water body situated at about 30 kms from Srinagar city. Ahansar is one of the freshwater wetlands located in the flood plains of river Jhelum. It is an ox bow type of water body and has probably originated by the meandering of the alluvial deposits. Waskur sar is also an oxbow lake located 30 Kms from Srinagar city. The lake is a semi-drainage type having an outflow channel and no inflow channel. The lake is mainly fed by springs within the lake body and in its periphery. The lake lies in the flood plains of river Jhelum

***Sheikhsar-Manasbal:***

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Sheikhsar lake is a shallow fresh water closed type single basined valley lake located near Sumbal at a distance of 26 Kms northwest of Srinagar. The lake covers an area of 28 hectares with a maximum depth of 1.8 m. The lake supports a rich macrophytic growth. Manasbal lake lies at about 30 kilometers northwest of Srinagar in the direction of Wular lake and is connected to river Jhelum by a canal. It is oblong in shape in east west direction. It is about 4.5 kms in length and about 300 meters in width.

**Threats to water birds and their habitat:**

Thousands of migratory and resident waterbirds use wetlands, lakes, streams, reservoirs, and other freshwater bodies for feeding, roosting, and breeding. Transboundary winter migrants often use these water bodies as stop over sites for refueling themselves for their back journey. The floodplains have been heavily encroached, and small water bodies and shorelands are converted into landmass. Overfishing, introduction of exotic fishes, rising pollution besides the hunting and poaching are the major drivers for declining bird numbers across the region.



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## Asian Waterbird Census 2021, Jammu & Kashmir

The potential waterbird hotspots including the Important Bird Areas (IBA's) and a few protected sites were earmarked for annual water bird census programme in Jammu and Kashmir. Water bird population estimation was conducted in 21 water bodies that included 3 Ramsar sites, 11 Wetland reserves and 7 other wetlands including the artificially created reservoirs in the year 2021 (Table 4 & 5). These included six from Jammu and fifteen from Kashmir division. Water birds and water-associated birds found within, and the close vicinity were



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recorded. Direct count method was adopted, where the observers in a group of 3-4, surveyed the predefined areas and recorded the bird counts. The counts were made in different intervals during December 2020 to March 2021, mostly restricted to January and February. The average of species individuals was calculated by dividing the total number of individuals of the species observed divided by total number of sampling days. The bird groups observed included geese, ducks, divers, grebes, cormorants, herons, rails, cranes, waders, and kingfishers. During each count, all bird species and individuals seen or heard were recorded. To avoid double counting, the distance and sample time gap between the two sampling / viewpoint sites were kept constant. The information from the various sites was gathered and standardized to get an idea of (average) abundance by dividing the total number of birds seen at a site by the sampling effort.



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Table 4. Water / water associated birds observed during AWC-2021 from Jammu division

S. No	Common, binomial name	Wetlands / Waterbodies (Sampling Sites)						Total
		Gharana Wetland	Kukarian Wetland	Pargwal Wetland	Nanga Wetland	Surinsar-Mansar Lakes	Ranjit Sagar Reservoir	
<b>WATER BIRDS</b>								
<b>ORDER: ANSERIFORMES</b>								
<b>Family: Anatidae</b>								
1	Bar-headed Geese, <i>Anser indicus</i>	2447	73	0	13	0	2773	5306
2	Grey lag Goose, <i>Anser anser</i>	4	0	0	0	0	28	32
3	Greater White Fronted Goose, <i>Anser albifrons</i>	3	0	0	0	0	2	5
4	Ruddy Shelduck, <i>Tadorna ferruginea</i>	1	3	4	0	0	0	8
5	Garganey, <i>Anas querquedula</i>	1	0	0	0	0	0	1
6	Northern Shoveler, <i>Spatula clypeata</i>	93	13	0	8	0	0	114
7	Gadwall, <i>Mareca strepera</i>	53	1	0	16	10	0	80
8	Eurasian Wigeon, <i>Mareca penelope</i>	1	0	0	0	0	0	1
9	Indian Spot-billed Duck, <i>Anas poecilorhyncha</i>	0	1	1	0	0	0	2
10	Mallard, <i>Anas platyrhynchos</i>	0	0	0	0	3	0	3
11	Northern Pintail, <i>Anas acuta</i>	13	1	0	0	0	0	14
12	Common Teal, <i>Anas crecca</i>	164	65	59	21	0	131	440
13	Ferruginous Duck, <i>Aythya nyroca</i>	1	0	0	0	0	0	1
<b>ORDER: GRUIFORMES</b>								
<b>Family: Rallidae</b>								
14	Eurasian moorhen, <i>Gallinula chloropus</i>	43	4	0	27	8	8	90
15	Eurasian Coot, <i>Fulica atra</i>	42	4	4	13	14	4	81
16	Grey-headed, Swampphen, <i>Porphyrio porphyrio</i>	132	11	0	26	0	0	169
17	White-breasted Waterhen, <i>Amaurornis phoenicurus</i>	16	9	4	22	8	2	61
<b>ORDER: CHARADRIIFORMES</b>								
<b>Family: Recurvirostridae</b>								
18	Black-winged Stilt, <i>Himantopus himantopus</i>	8	8	2	1	0	6	25
<b>Family: Charadriidae</b>								
19	Red wattled Lapwing, <i>Vanellus indicus</i>	14	18	26	0	28	9	95
20	Little Ringed Plover, <i>Charadrius dubius</i>	0	0	0	0	0	2	2
<b>Family: Scolopacidae</b>								
21	Ruff, <i>Calidris pugnax</i>	1	0	0	0	0	0	1
22	Temminck's Stint, <i>Calidris temminckii</i>	0	0	0	0	0	2	2
23	Little Stint, <i>Calidris minuta</i>	0	4	7	0	0	0	11
24	Solitary Snipe, <i>Gallinago solitaria</i>	0	0	0	0	0	0	0
25	Common Snipe, <i>Gallinago gallinago</i>	0	2	1	0	0	2	5
26	Common Sandpiper, <i>Actitis hypoleucos</i>	1	6	3	1	0	0	11
27	Green Sandpiper, <i>Tringa ochropus</i>	0	0	0	0	0	1	1
28	Common Redshank, <i>Tringa tetanus</i>	2	0	0	0	0	0	2
<b>Family: Laridae</b>								
29	Pallas's Gull, <i>Ichthyaetus ichthyaeus</i>	0	0	0	0	0	12	12
30	River Tern, <i>Sterna aurantia</i>	0	3	2	0	0	4	9
<b>ORDER: CICONIIFORMES</b>								
<b>Family: Ciconiidae</b>								
31	Woolly-necked Stork, <i>Ciconia episcopus</i>	1	0	0	0	0	11	12

ORDER:SULIFORMES								
Family: Phalacrocoracidae								
32	Little Cormorant, <i>Microcarbo niger</i>	24	16	5	13	9	73	140
33	Great Cormorant, <i>Phalacrocorax carbo</i>	0	5	1	4	18	57	85
ORDER:PELECANIFORMES								
Family: Ardeidae								
34	Grey Heron, <i>Ardea cinerea</i>	3	1	0	3	1	34	42
35	Purple Heron, <i>Ardea purpurea</i>	1	0	1	4	0	0	6
36	Great Egret, <i>Ardea alba</i>	5	3	0	0	36	56	100
37	Intermediate Egret, <i>Ardea intermedia</i>	1	0	0	3	0	13	17
38	Little Egret, <i>Egretta garzetta</i>	15	14	6	36	15	27	113
39	Cattle Egret, <i>Bubulcus ibis</i>	33	4	5	39	12	11	104
40	Indian Pond-heron, <i>Ardeola grayii</i>	2	5	0	9	3	0	19
41	Striated Heron, <i>Butorides striata</i>	0	0	0	0	8	0	8
42	Black-crowned Night Heron, <i>Nycticorax nycticorax</i>	0	0	0	0	19	0	19
Family: Threskiornithidae								
43	Black-headed Ibis, <i>Threskiornis melanocephalus</i>	2	0	0	0	0	0	2
WATER DEPENDENT BIRDS								
ORDER: CHARADRIIFORMES								
Family: Burhinidae								
1	Great Thick-knee, <i>Esacus recurvirostris</i>	0	0	0	0	0	15	15
ORDER: ACCIPITRIFORMES								
Family: Pandionidae								
2	Osprey, <i>Pandion haliaetus</i>	0	0	0	0	0	4	4
Family: Accipitridae								
3	Black Kite, <i>Milvus migrans</i>	0	0	0	0	0	20	20
ORDER: CORACIIFORMES								
Family: Alcedinidae								
4	Common Kingfisher, <i>Alcedo atthis</i>	0	1	0	4	19	0	24
5	White-throated kingfisher, <i>Halcyon smyrnensis</i>	2	4	4	3	14	4	31
6	Crested kingfisher, <i>Megaceryle lugubris</i>	0	0	0	0	2	0	2
7	Pied kingfisher, <i>Ceryle rudis</i>	0	3	1	3	8	0	15
ORDER: PASSERIFORMES								
Family: Hirundinidae								
8	Barn Swallow, <i>Hirundo rustica</i>	0	0	0	0	0	10	10
9	Wire-tailed Swallow, <i>Hirundo smithii</i>	0	0	0	0	0	15	15
Family: Motacillidae								
10	Grey Wagtail, <i>Motacilla cinerea</i>	0	2	5	0	0	39	46
11	Yellow Wagtail, <i>Motacilla flava</i>	0	0	12	0	1	5	18
12	Citrine Wagtail, <i>Motacilla citreola</i>	0	0	0	0	2	0	2
13	White-browed Wagtail, <i>Motacilla maderaspatensis</i>	0	0	0	0	2	4	6
14	White Wagtail, <i>Motacilla alba</i>	2	3	26	0	10	4	45
<b>Total</b>		<b>3131</b>	<b>287</b>	<b>179</b>	<b>269</b>	<b>250</b>	<b>3388</b>	<b>7504</b>

'0' indicates non-detection of the species during the AWC observations and not its absence

### Wetland wise species abundance

The species wise abundance of first five birds observed during AWC 21 was calculated to portray the habitat suitability and health of the ecosystem in accommodating the winter migrants as well as the resident across Jammu and Kashmir. In Jammu, Gharana wetland reserve appears to be the perfect wintering ground for transboundary winter migrant as Bar headed Goose was recorded in high numbers (85%), followed by Common teal (6%), Grey-headed Swamphen (4%), Northern Shoveler (3%) and Gadwall (2%) (Fig 2). Similarly, in Pargwal Wetland Reserve, the Common Teal (53%) outnumbered Red wattled lapwing (23%), White wagtail (11%), Yellow wagtail (7%), and Little Stint (6%) (Fig 3). The transboundary winter migrant, Bar-headed Goose recorded flocked Kukarian wetland reserve (39%) followed by common teal (35%) and Red wattled lapwing (10%) (Fig 4). The residents and local migrants like little egrets, Cattle egrets and Eurasian moorhen predominated the Nanga wetland reserve (Fig 5).

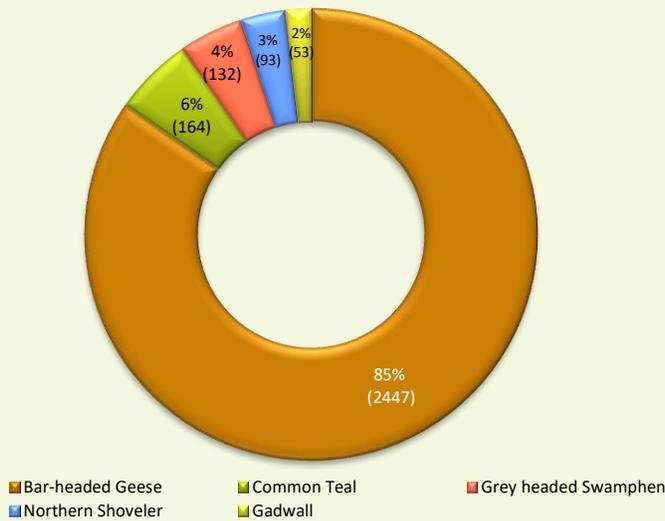


Fig. 2 Species abundance in Gharana Wetland Reserve

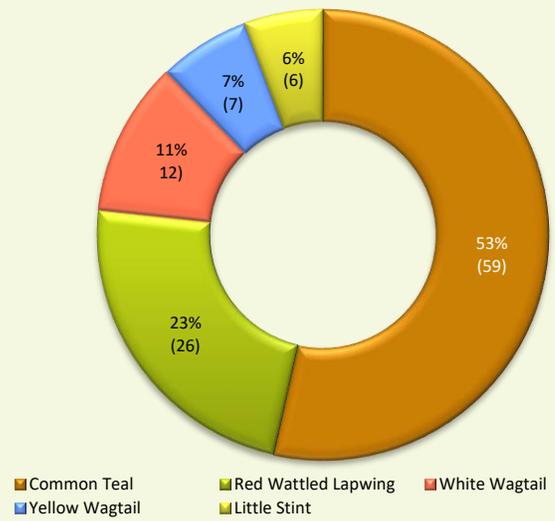


Fig. 3 Species abundance in Pargwal Wetland Reserve

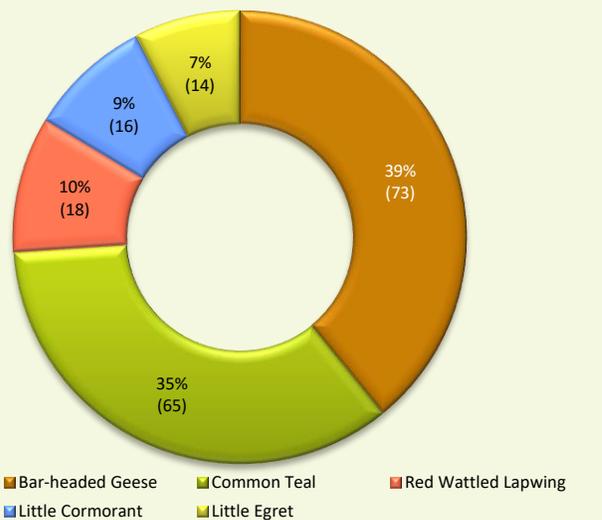


Fig. 4 Species abundance in Kukarian Wetland Reserve

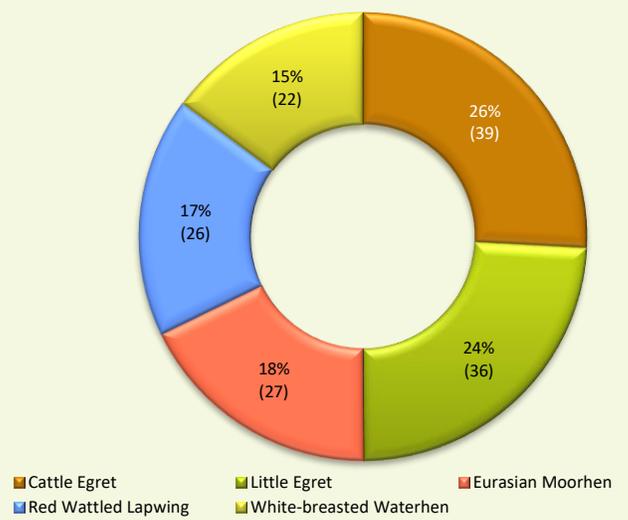
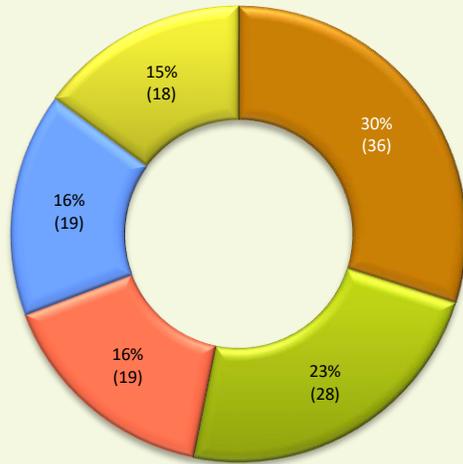
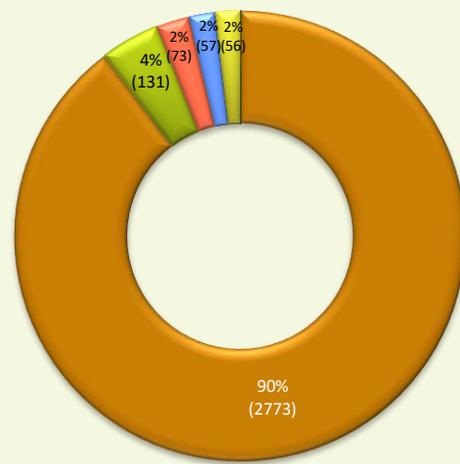


Fig. 5 Species abundance in Nanga Wetland Reserve

The sole Ramsar site from Jammu region comprising Surinsar and Mansar Lakes support more of the local migrants and resident bird species and a few transboundary migrants. A high abundance of Great Egret (30%) was reported during AWC-21 (Fig 6). This was followed by high number of Great Cormorants (23%), Black Crowned Night Herons (16%) and Red wattled Lapwings (15%).



■ Great Egret      ■ Red-wattled Lapwing      ■ Black Crowned Night Heron  
 ■ Common Kingfisher      ■ Great Cormorant



■ Bar-headed Geese      ■ Common teal      ■ Little Cormorant  
 ■ Great Cormorant      ■ Great egret

**Fig. 6 Species abundance in Surinsar-Mansar lakes**

**Fig. 7 Species abundance in Ranjit Sagar Reservoir**

An artificially created large reservoir, the Ranjit Sagar has over the years established itself as a perfect wintering habitat for several transboundary migrants, especially the ducks, gulls, and terns. The wetland surrounded by large farmlands especially along the northern fringe provides adequate foraging provisions with large flocks of Bar headed geese and Pallas Gulls frequently observed resting and feeding during the winters. The AWC-21 observations, revealed the predominance of Bar headed Geese (90%) followed by Common Teal (4%) and little cormorants, great cormorants and great egrets (2% each) (Fig 7).

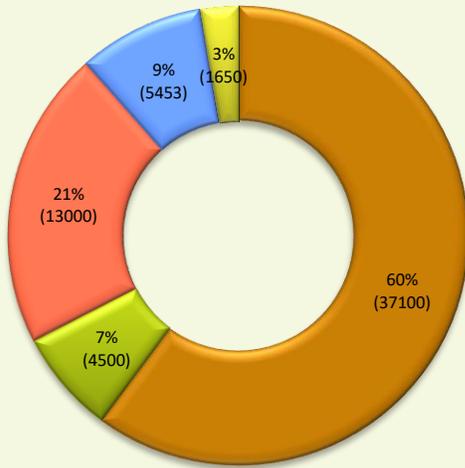
Table 5 Water / water associated birds observed during AWC-2021 from Kashmir division

S No	Common, binomial name	Hokersar Wetland	Hygam Wetland	Mirgund Wetland	Shallabugh Wetland	Chatlam Wetland	Freshkooi Wetland	Krandoo Wetland	Manibugh Wetland	Wular Lake	Anchar Lake	Dal Lake	Padgampora Wetland	Khurwan Sar	Ahan Sar Shalan Sar Waskur Sar	Sheikh sar Mansabal	Total Population
<b>ORDER: ANSERIFORMES</b>																	
<b>Family: Anatidae</b>																	
1	Grey lag Goose, <i>Anser anser</i>	7	2750	67	0	17	5	0	2	14	0	0	0	0	0	0	2862
2	Tundra Swan, <i>Cygnus columbianus</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3	Ruddy Shelduck, <i>Tadorna ferruginea</i>	2	0	0	0	0	0	0	0	164	0	0	0	0	0	0	166
4	Common Shelduck, <i>Tadorna tadorna</i>	3	0	0	0	1	0	0	0	2	0	0	0	0	0	0	5
5	Garganey, <i>Anas querquedula</i>	2305	15000	3	0	0	0	0	0	44	0	73	0	0	0	0	17425
6	Northern Shoveler, <i>Spatula clypeata</i>	1650	25500	7333	0	4557	2500	3360	366	12	0	67	0	12	0	0	45357
7	Gadwall, <i>Mareca strepera</i>	13000	55000	2667	0	12967	5359	4800	520	48	0	933	0	0	0	0	95294
8	Eurasian Wigeon, <i>Mareca penelope</i>	27	42500	4667	0	67	45	52	4	0	0	53	0	0	0	0	47415
9	Mallard, <i>Anas platyrhynchos</i>	4500	37000	40000	25	17024	13547	4236	2312	201	76	1687	4	3	3	0	120618
10	Northern Pintail, <i>Anas acuta</i>	295	36250	46667	0	8533	533	2561	831	120	0	267	2	10	2	0	96071
11	Coomon Teal, <i>Anas crecca</i>	37100	49750	33333	173	1857	1227	5500	0	0	269	333	0	0	0	0	129542
12	Red-crested Pochard, <i>Netta rufina</i>	25	0	0	0	1637	20	352	0	0	0	67	0	0	0	0	2101
13	Common Pochard, <i>Aythya ferina</i>	460	6750	1000	0	2007	10	0	230	0	0	1200	0	0	0	0	11657
14	Ferruginous Duck, <i>Aythya nyroca</i>	0	3250	0	0	0	0	0	0	0	0	100	0	0	0	0	3350
15	Tufted duck, <i>Aythya fuligula</i>	54	0	0	0	0	0	0	0	0	0	67	2	0	0	0	123
16	Common Merganser, <i>Mergus merganser</i>	4	0	0	0	2	0	0	0	0	0	0	0	0	0	0	6
<b>ORDER: PODICIPEDIFORMES</b>																	
<b>Family: Podicipedidae</b>																	
17	Little Grebe, <i>Tachybaptus ruficollis</i>	3	150	0	1	31	25	6	15	6	7	467	0	11	6	20	748
18	Great Crested Grebe, <i>Podiceps cristatus</i>	1	0	0	0	0	0	7	0	0	0	0	0	0	0	0	8
<b>ORDER: GRUIFORMES</b>																	
<b>Family: Rallidae</b>																	

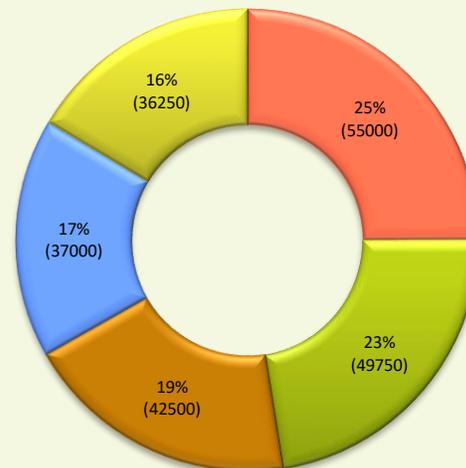
19	Eurasian moorhen, <i>Gallinula chloropus</i>	95	2450	0	35	671	0	1350	0	0	107	3333	20	8	0	0	8069
20	Eurasian Coot, <i>Fulica atra</i>	5453	6650	0	0	1669	23	780	340	12	0	42667	0	19	16	6	57635
21	Grey-headed Swampphen, <i>Porphyrio porphyrio</i>	50	3175	0	0	835	24	250	0	0	0	100	0	1	0	0	4435
22	Ruddy Breasted Crake, <i>Zapornia fusca</i>	1	0	0	0	233	0	0	0	4	0	0	0	0	0	0	238
23	Baillon's Crake, <i>Zapornia akool</i>	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
<b>ORDER: CHARADRIIFORMES</b>																	
<b>Family: Recurvirostridae</b>																	
24	Black-winged Stilt, <i>Himantopus himantopus</i>	0	0	0	0	0	0	0	0	0	0	33	0	0	0	0	33
<b>Family: Charadriidae</b>																	
25	Northern Lapwing, <i>Vanellus vanellus</i>	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
26	Yellow-wattled Lapwing, <i>Vanellus malarbaricus</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
27	Red wattled Lapwing, <i>Vanellus indicus</i>	3	0	0	0	67	0	27	0	0	0	0	2	0	0	0	99
<b>Family: Scolopacidae</b>																	
28	Solitary Snipe, <i>Gallinago solitaria</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
29	Common Snipe, <i>Gallinago gallinago</i>	5	0	2	0	0	0	0	0	0	0	167	0	0	0	0	174
30	Common Sandpiper, <i>Actitis hypoleucos</i>	5	0	2	2	51	0	0	14	0	3	100	0	0	0	0	177
31	Green Sandpiper, <i>Tringa ochropus</i>	3	0	5	0	11	0	0	0	0	0	0	6	0	3	0	28
32	Common Greenshank, <i>Tringa nebularia</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
33	Wood Sandpiper, <i>Tringa glareola</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
34	Common Redshank, <i>Tringa tetanus</i>	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
<b>Family: Laridae</b>																	
35	Brown-headed Gull, <i>Chroicocephalus brunnicephalus</i>	1	0	0	0	0	0	0	0	3	0	167	0	0	0	0	171
36	Black headed Gull, <i>Chroicocephalus ridibundus</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
37	Whiskered Tern, <i>Chlidonias hybrida</i>	1	0	0	0	5	0	0	0	0	0	0	0	0	0	0	6
38	River Tern, <i>Sterna aurantia</i>	0	0	0	0	0	0	0	0	0	0	667	0	0	0	0	667
<b>ORDER:SULIFORMES</b>																	
<b>Family: Phalacrocoracidae</b>																	
39	Little Cormorant, <i>Microcarbo niger</i>	1	0	0	0	0	8	0	0	0	0	0	0	0	0	0	9
40	Great Cormorant, <i>Phalacrocorax carbo</i>	2	150	0	0	143	49	0	26	0	0	400	0	0	0	0	770

<b>ORDER:PELECANIFORMES</b>																	
<b>Family: Ardeidae</b>																	
41	Black Bittern, <i>Ixobrychus flavicollis</i>	0	0	13	0	0	20	0	0	0	0	0	0	0	0	0	33
42	Grey Heron, <i>Ardea cinerea</i>	6	150	20	0	18	7	4	4	3	0	67	2	0	0	0	281
43	Great Egret, <i>Ardea alba</i>	0	0	0	0	0	0	0	0	1	0	267	0	0	0	0	268
44	Little Egret, <i>Egretta garzetta</i>	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
45	Cattle Egret, <i>Bubulcus ibis</i>	3	0	0	0	0	0	0	0	0	0	10	0	0	0	0	13
46	Indian Pond-heron, <i>Ardeola grayii</i>	4	150	0	1	63	29	15	6	14	2	413	6	9	9	24	745
<b>WATER DEPENDENT BIRDS</b>																	
<b>ORDER: ACCIPITRIFORMES</b>																	
<b>Family: Accipitridae</b>																	
1	Black Kite, <i>Milvus migrans</i>	25	0	7	23	368	10	23	16	27	32	287	0	5	0	5	828
2	Eurasian Marsh-harrier, <i>Circus aeruginosus</i>	15	0	3	0	0	0	0	0	0	0	0	0	1	1	1	21
<b>ORDER: CORACIIFORMES</b>																	
<b>Family: Alcedinidae</b>																	
3	Common Kingfisher, <i>Alcedo atthis</i>	8	10	0	1	25	3	4	4	0	1	33	0	2	0	6	97
4	White-throated kingfisher, <i>Halcyon smyrnensis</i>	9	10	0	2	11	3	14	26	8	6	140	3	2	0	3	237
5	Crested kingfisher, <i>Megaceryle lugubris</i>	0	0	0	0	0	0	0	0	0	0	40	0	0	0	2	42
6	Pied kingfisher, <i>Ceryle rudis</i>	0	0	0	2	0	1	3	0	11	3	287	4	0	0	0	311
<b>ORDER: PASSERIFORMES</b>																	
<b>Family: Hirundinidae</b>																	
7	Barn Swallow, <i>Hirundo rustica</i>	0	0	0	0	21	0	1	17	0	0	0	10	0	0	0	49
<b>Family: Motacillidae</b>																	
8	Grey Wagtail, <i>Motacilla cinerea</i>	5	0	1	0	5	1	14	0	3	0	0	0	0	0	0	29
9	Yellow Wagtail, <i>Motacilla flava</i>	1	0	0	5	3	1	0	0	0	8	0	0	0	0	0	18
10	Citrine Wagtail, <i>Motacilla citreola</i>	3	0	1	4	19	1	0	0	0	6	0	0	2	0	3	39
11	White Wagtail, <i>Motacilla alba</i>	5	0	0	0	0	2	0	0	10	0	0	0	0	5	0	22
<b>Total</b>		<b>65166</b>	<b>286645</b>	<b>135792</b>	<b>275</b>	<b>52918</b>	<b>23453</b>	<b>23359</b>	<b>4733</b>	<b>707</b>	<b>521</b>	<b>54492</b>	<b>61</b>	<b>85</b>	<b>45</b>	<b>70</b>	<b>648322</b>

When analyzed for the species abundance in Kashmir region, Hokersar wetland reserve reported highest abundance of Eurasian Teal (60%), followed by gadwall (21%), Eurasian Coot (9%), Mallard (7%) and Norther shoveler (3%) (Fig 8). Likewise for Hygam wetland reserve, Gadwall (25%) predominated others that included Eurasian Teal (23%), Eurasian wigeon (19%), Mallard (17%) and Northern pintail (16%) (Fig 9).



■ EurasianTeal ■ Mallard ■ Gadwall ■ Eurasian Coot ■ Northern Shoveler

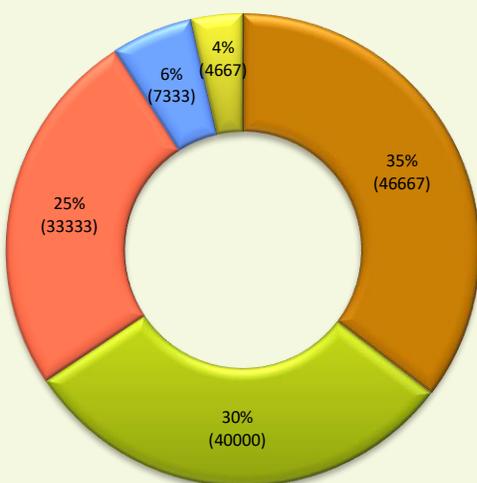


■ Gadwall ■ EurasianTeal ■ Eurasian Wigeon ■ Mallard ■ Northern Pintail

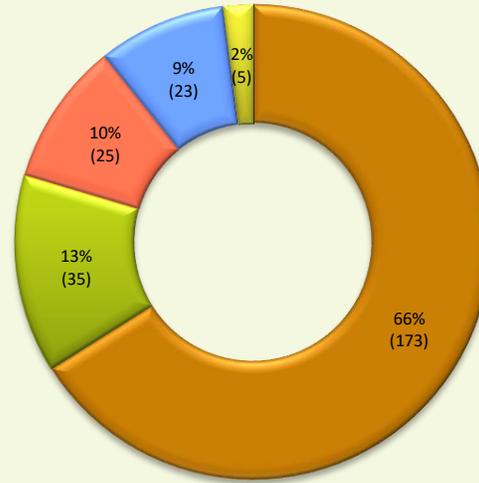
**Fig. 8 Species abundance in Hokersar Wetland Reserve**

**Fig. 9 Species abundance in Hygam Wetland Reserve**

Similarly in case of Mirgund wetland reserve, the most abundant among the other water birds were Northern pintail (35%) followed by Mallard (30%) and Eurasian teal (25%) (Fig 10). The Eurasian teal emerged as the highly abundant bird in Shallabugh Wetland Reserve (66%) followed by Eurasian moorhen (13%) and Mallard (10%) (Fig 11).



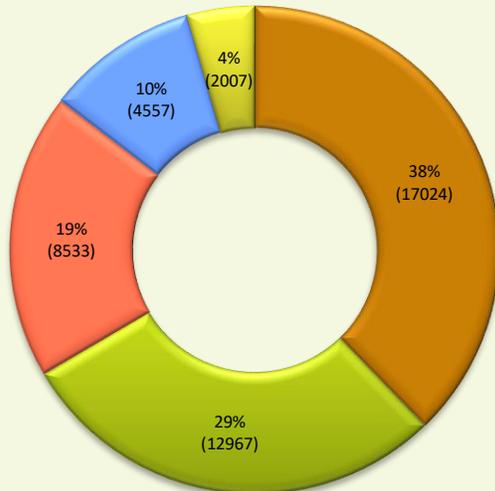
■ Northern Pintail ■ Mallard ■ EurasianTeal ■ Northern Shoveler ■ Eurasian Wigeon ■ EurasianTeal ■ Eurasian moorhen ■ Mallard ■ Black Kite ■ Yellow Wagtail



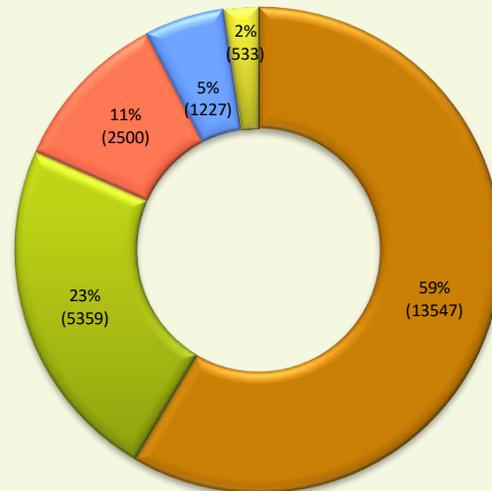
**Fig. 10 Species abundance in Mirgund Wetland Reserve**

**Fig. 11 Species abundance in Shallabugh Wetland Reserve**

Chatlam and Freshkroori Wetland Reserves recorded the high numbers of Mallards (38% & 59%) followed by Gadwalls (29% & 23%) and Northern Pintails (19% & 11%), respectively (Fig 12 & 13).



■ Mallard ■ Gadwall ■ Northern Pintail ■ Northern Shoveler ■ Common Pochard

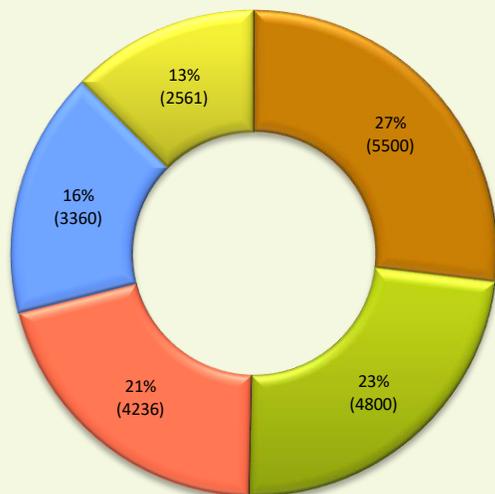


■ Mallard ■ Gadwall ■ Northern Shoveler ■ Eurasian Teal ■ Northern Pintail

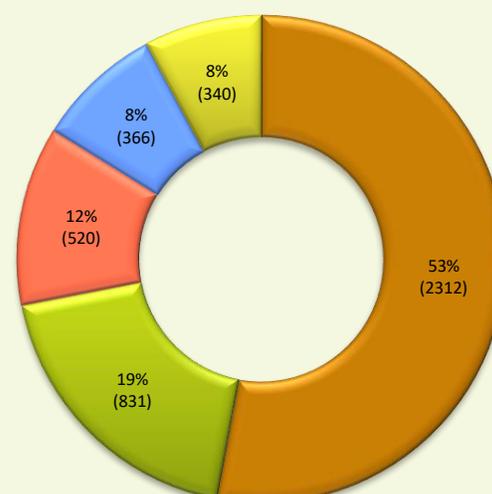
**Fig. 12 Species abundance in Chatlam Wetland Reserve**

**Fig. 13 Species abundance in Freshkroori Wetland Reserve**

Kranchoo wetland Reserve recorded highest number of Eurasian teal (27%) followed by Gadwall (23%), Mallard (21%) and Northern Shoveler (16%) (Fig 14). Similarly, Manibugh Wetland Reserve witnessed very high numbers of Mallards (53%) followed by Northern Pintails (19%) and Gadwalls (12%) (Fig 15).



■ Eurasian Teal ■ Gadwall ■ Mallard ■ Northern Shoveler ■ Northern Pintail



■ Mallard ■ Northern Pintail ■ Gadwall ■ Northern Shoveler ■ Eurasian Coot

**Fig. 14 Species abundance in Kranchoo Wetland Reserve**

**Fig. 15 Species abundance in Manibugh Wetland Reserve**

Wular Lake recorded highest number of Mallards (35%) followed by Ruddy shelduck (28%), Northern Pintail (21%) and Gadwall and Garganey (8%, each) (Fig 16). Similarly, Anchar Lake reported very high numbers of Eurasian Teal (55%) followed by Eurasian Moorhen (22%) and Mallards (15%) (Fig 17).

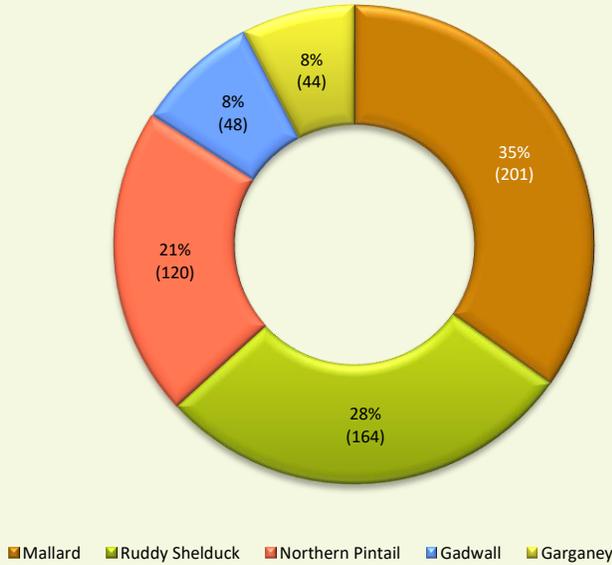


Fig. 16 Species abundance in Wular Lake

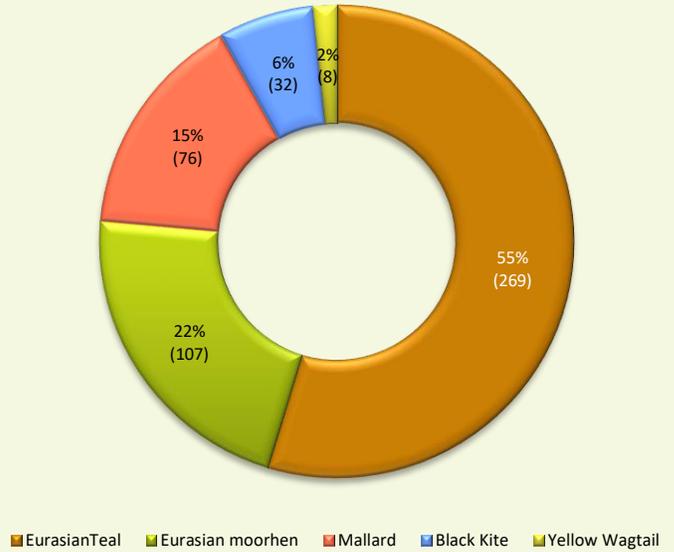


Fig. 17 Species abundance in Anchar Lake

Dal Lake recorded highest number of Eurasian Coot (86%) followed by Eurasian Moorhen (7%), Mallard (3%) and Common Pochard (2%) (Fig 18). Likewise, Padgampora Wetland reported high numbers of Eurasian Moorhen (43%) followed by Barn Swallow (22%) and Indian Pond-Heron (13%) (Fig 19).

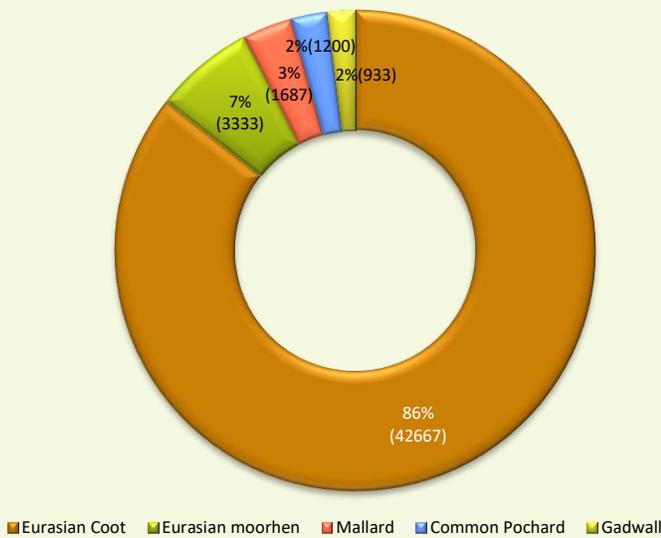


Fig. 18 Species abundance in Dal Lake

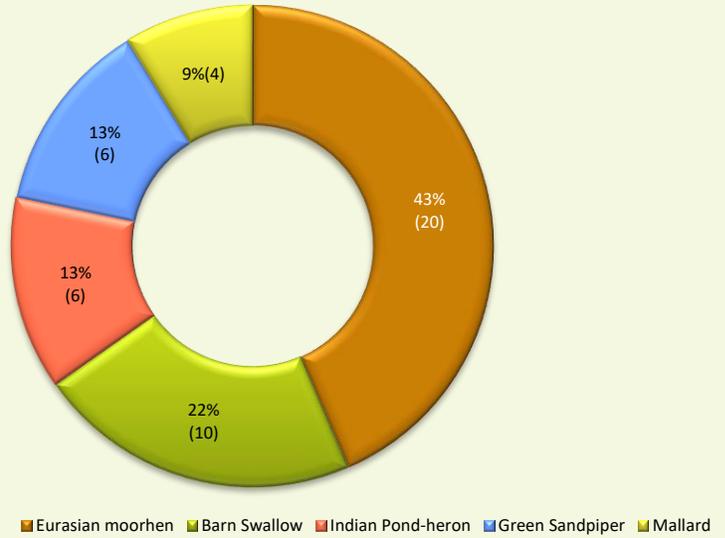
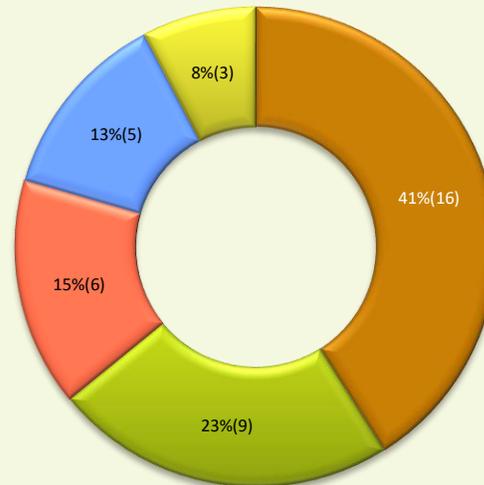
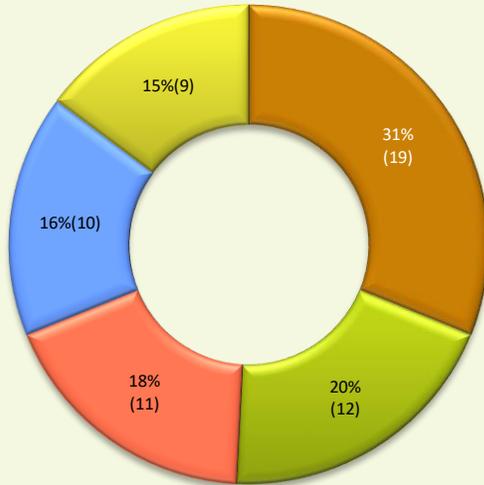


Fig. 19 Species abundance in Padgampora Wetland

Khurwan Sar recorded highest number of Eurasian Coot (31%) followed by Northern Shoveler (20%), Little Grebe (18%) and Northern Pintail (16%) (Fig 20). Likewise, Ahan Sar, Shalan Sar, Wakur Sar lakes reported high numbers of Eurasian Coot (41%) followed by Indian Pond-Heron (23%) and Little Grebe (15%) (Fig 21).

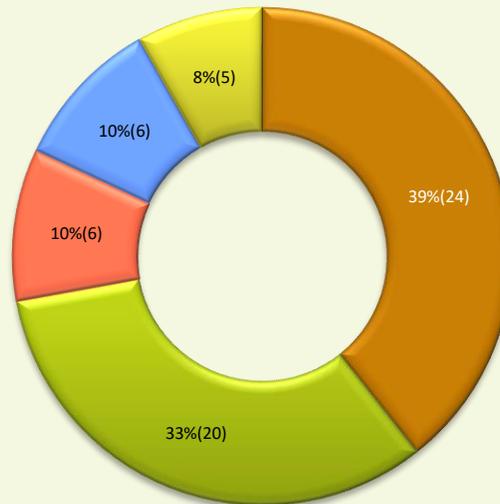


■ Eurasian Coot ■ Northern Shoveler ■ Little Grebe ■ Northern Pintail ■ Indian Pond-heron ■ Eurasian Coot ■ Indian Pond-heron ■ Little Grebe ■ White Wagtail ■ Mallard

**Fig. 20 Species abundance in Khurwan Sar**

**Fig. 21 Species abundance in Ahan Sar, Shalan Sar, Wakur Sar lake**

Sheikh Sar – Mansabal West recorded highest number of Indian Pond-Heron (39%) followed by Little Grebe (33%), Eurasian Coot (10%) and Common Kingfisher (10%) (Fig 22).



■ Indian Pond-heron ■ Little Grebe ■ Eurasian Coot ■ Common Kingfisher ■ Black Kite

**Fig. 22 Species abundance in Sheikh Sar – Mansabal West**

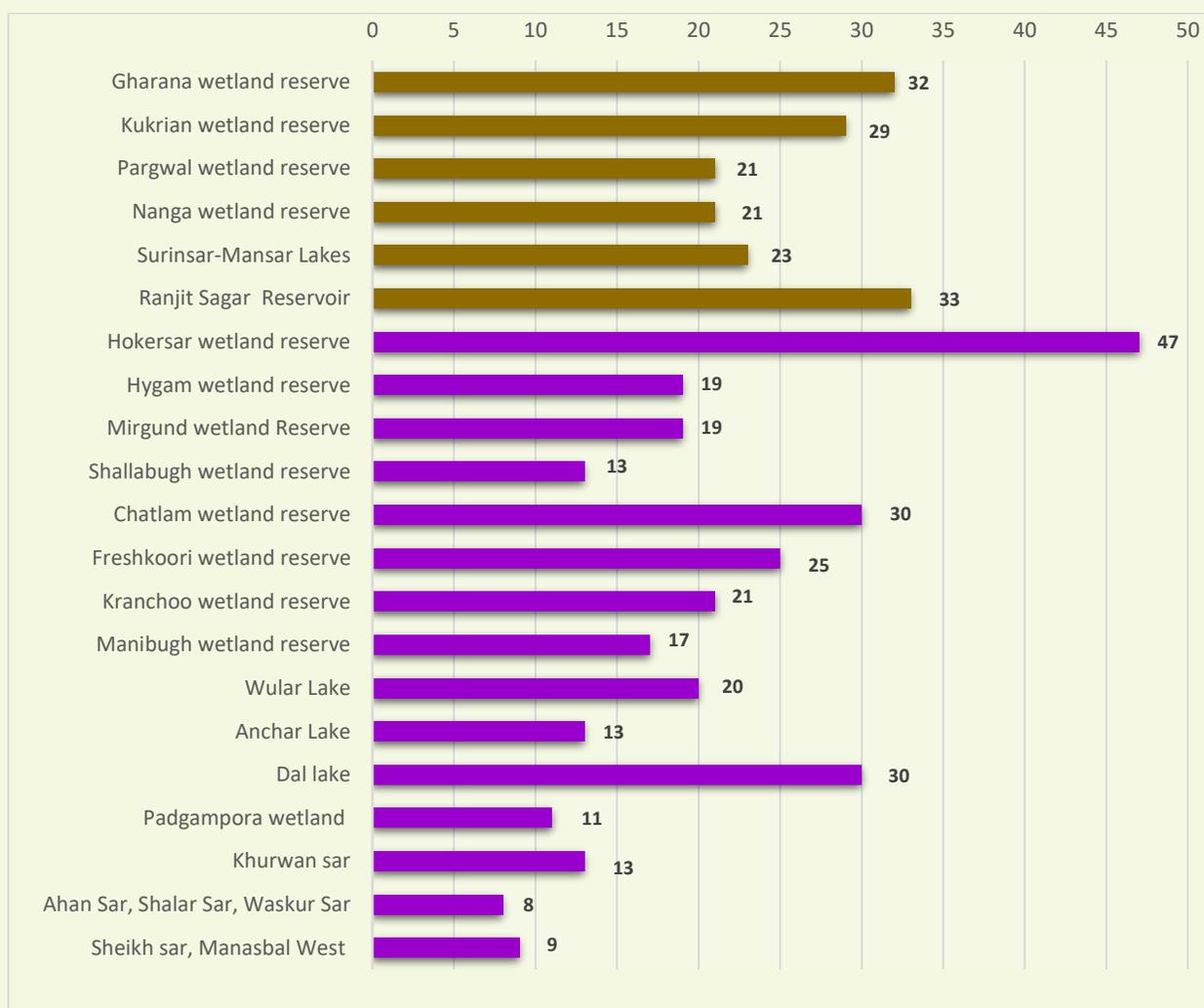
The above abundance is based on average species count from the observations of Asian Waterbird Census 2021

## Species richness and diversity attributes

The number of individuals recorded from each water body was used to calculate the species richness and diversity. The total number of species observed was used to compute species richness, whereas Shannon Weiner's diversity index was used to calculate species diversity as  $H' = - \sum (p_i \times \ln p_i)$ , Where,  $p_i$  = the proportion of each species in the sample;  $\ln p_i$  = natural logarithm of this proportion. Species diversity values typically range from 1.5 to 3.5, with values exceeding 4.0 indicating extremely high diversity.

## Bird Species richness observed during AWC 2021

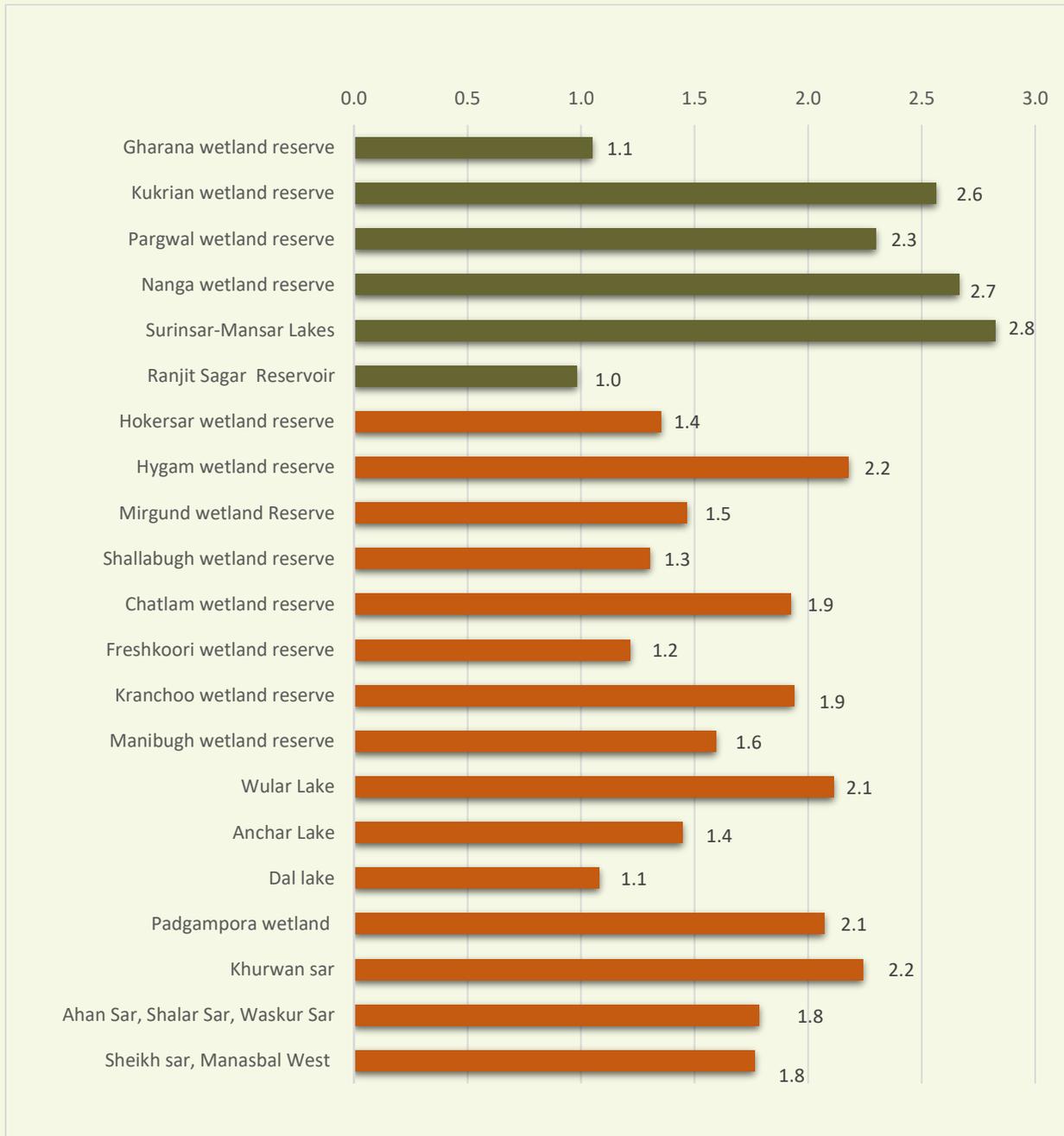
The AWC 2021 reported 75 water bird species in the sampled water bodies in Jammu and Kashmir, with 56 species each from the Jammu and Kashmir divisions. Thirty-seven of these birds were found to be common in both divisions. Hokersar wetland reserve had the most species (47), followed by Ranjit Sagar reservoir (33), Gharana wetland reserve (32), and Chatlam Wetland reserve and Dal Lake (both with 30) (Fig 23).



**Fig. 23 Bird species richness (taken as number of species encountered) during AWC-21 in the wetlands of Jammu and Kashmir**

### Bird Species diversity observed during AWC 2021

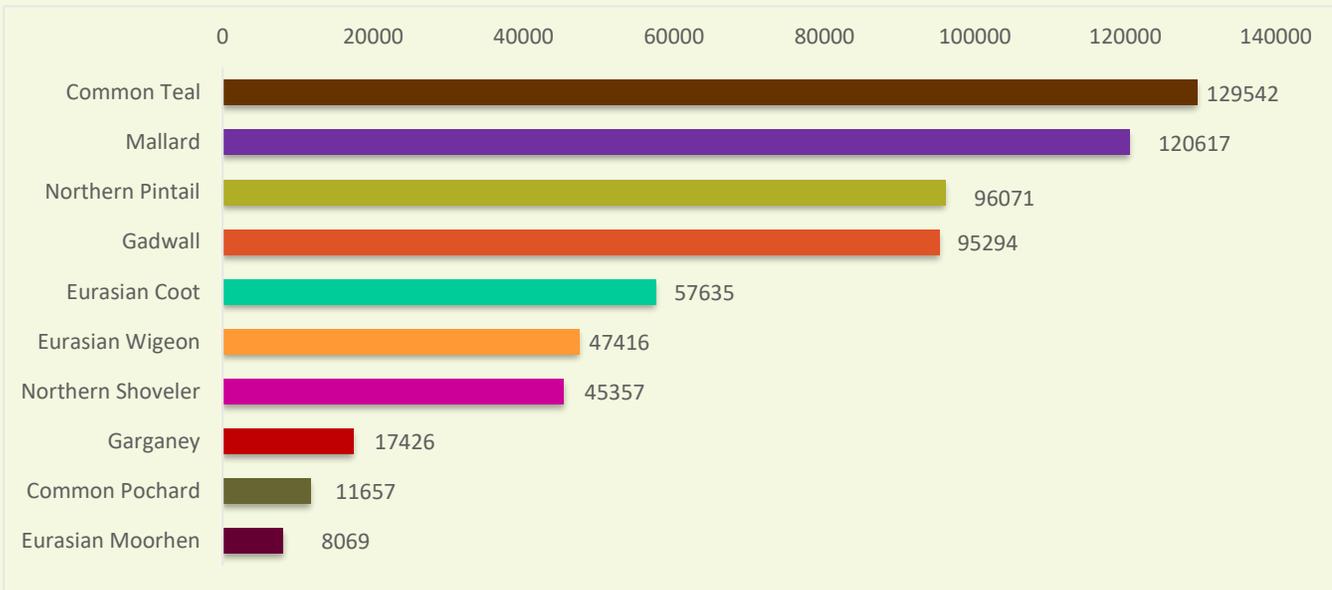
The Shannon-Wiener index ( $H'$ ) was calculated for all the sampled wetlands during AWC 2021. Among all, Surinsar-Mansar lakes exhibited maximum diversity of  $H' = 2.8$ , followed by Nanga ( $H' = 2.7$ ), Kukrian ( $H' = 2.6$ ), and Pargwal wetland reserves ( $H' = 2.3$ ). The wetlands / waterbodies of Kashmir harbored very high abundance of birds where Hygam and Khurwan Sar revealed a high bird diversity of  $H' = 2.2$ , each followed by Wular lake and Padgampora wetland ( $H' = 2.1$ , each) (Fig 24).



**Fig. 24 Bird species diversity (taken as Shannon-Weiner's index) during AWC-21 in the wetlands of Jammu and Kashmir**

### Most abundant (Average) bird species observed during AWC 2021

During AWC 2021, 11,18,737 water birds were observed in the water bodies surveyed in Jammu and Kashmir, making it the largest water bird survey ever done for the erstwhile state and present Union Territory. Jammu (division) recorded 3,50,839 birds while Kashmir reported 7,67,898, during AWC -21. The top 10 species recorded during AWC 2021 in terms of population number are Common Teal, Mallard, Northern Pintail, Gadwall, Eurasian Coot, Eurasian Wigeon, Northern Shoveler, Garganey, Common Pochard, and Eurasian Moorhen. Among these, Common Teal, Mallard, Northern Pintail, Gadwall accounted for 70% of the total birds recorded (Fig 25). Except, Eurasian wigeon and Common pochard, all are year-round residents or local migrants. Cumulative species abundance for all the top ten birds have been presented in Fig. 25.



**Fig. 25 Cumulative species abundance observed during AWC-21 in the wetlands of Jammu and Kashmir**

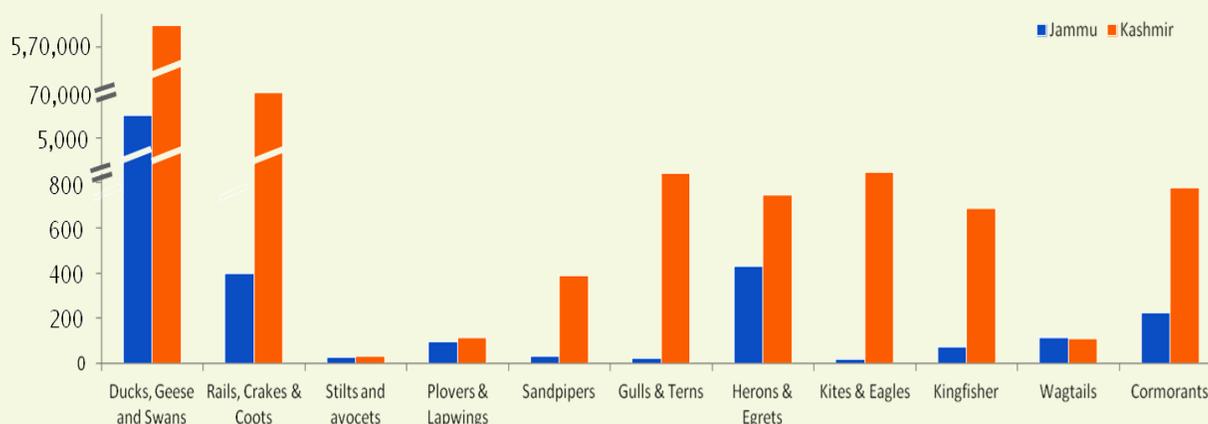


## Average abundance of water bird groups observed during AWC 2021

We attempted to classify the bird groups in terms of their order and familial affinities for better understanding the wetland dynamics. Ducks, geese, and swans (family Anatidae) were the most abundant water bird species, followed by rails, crakes, and coots (family Rallidae), which numbered in the thousands and lakhs. Other notable group of waterbirds included Herons and egrets (Ardeidae), cormorants (Phalacrocoracidae), kites and eagles (Accipitridae), gulls and terns (Laridae), kingfishers (Alcedinidae), grebes (Podicipedidae), sandpipers and snipes (Scolopacidae), storks (Ciconiidae), wagtails (Motacillidae), plovers and lapwings (Charadriidae). Table 6 and Fig 26 show a comparison of average abundance for bird groups for both divisions.

**Table 6: Average abundance of water bird groups (at any given time) observed in AWC 2021**

Water bird group	Jammu	Kashmir	Total
Ducks, Geese and Swans	6006	571992	577998
Rails, Crakes & Coots	400	70378	70778
Hérons and Egrets	431	745	1176
Cormorants	224	780	1004
Kites and Eagles	20	848	868
Gulls and Terns	21	844	865
Kingfisher	71	686	757
Grebes	Data deficit	755	755
Sandpipers and Snipes	32	387	419
Storks	224	Data deficit	224
Wagtails	116	108	224
Plovers and Lapwings	97	114	211
Swallow	25	49	74
Stilts and avocets	26	33	59
Thick-knees	15	Data deficit	15
Osprey	4	Data deficit	4



**Fig. 26 Group abundance of water and water associated birds during AWC-21 in the wetlands of Jammu and Kashmir**

## Population trend of water birds based on AWC across different years

We attempted to estimate the population trend of the species over the last five years of AWC monitoring to compare bird population changes over time. The trend was computed for species richness and diversity for all the wetlands sampled across Jammu and Kashmir. The AWC observations of years 2016, 2017, 2019, 2020 and 2021 were considered for Jammu and that of 2015, 2016, 2019, 2020 and 2021 for Kashmir, respectively.

### Trend analysis of bird species richness among wetlands in Jammu Division:

When compared year wise, Gharana wetland conservation reserve recorded the high species richness for all the years with 2019 accounting highest number of species recorded (n=39) followed by 37 (2017), 32 (2021) and 31 (2016). Among others, Ranjit Sagar reservoir reported a high number of 33 during AWC 2021 followed by Kukrian (29), Surinsar-Mansar lakes (23), and Pargwal and Nanga wetlands (21 each) (Fig 27).

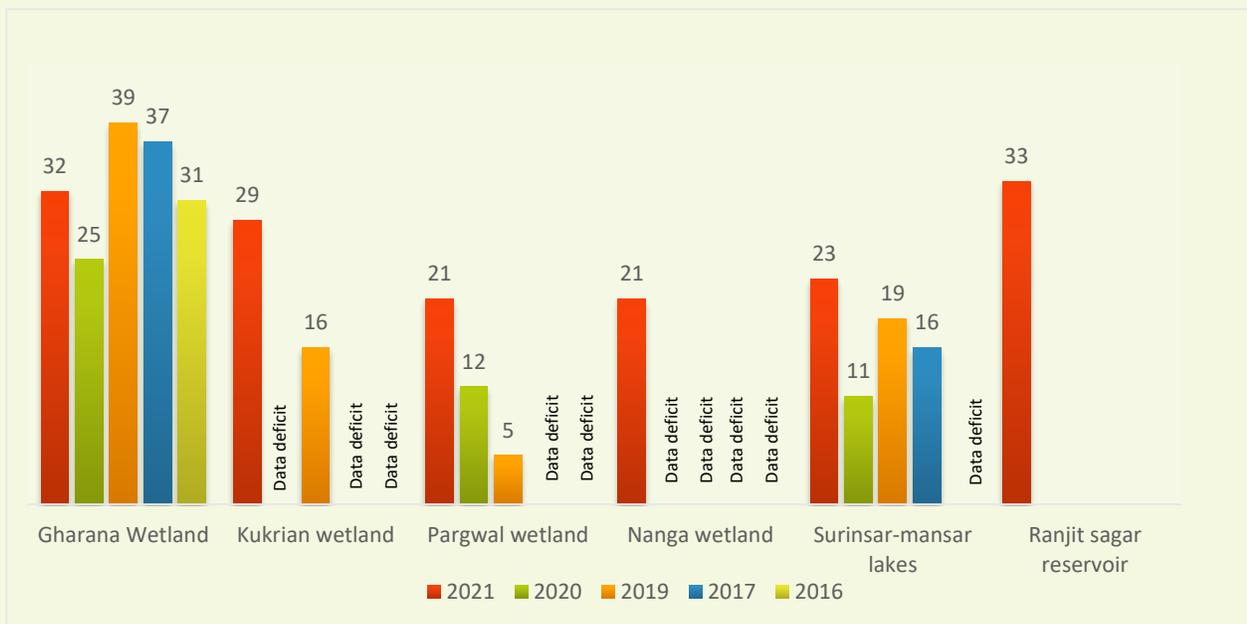


Fig. 27 Trend analysis of bird species richness based on AWC observations among the wetlands in Jammu Division

Trend analysis of bird species diversity among wetlands in Jammu Division:

The AWC 21 reported higher species diversity for all the wetlands compared to previous years. Surinsar-Mansar lakes recorded the highest diversity of  $H'=2.8$  followed by Nanga ( $H'=2.6$ ) Kukrian ( $H'=2.5$ ) and Pargwal ( $H'=2.3$ ) wetlands (Fig 27). Gharana wetland and Ranjit Sagar reservoir though species rich recorded a low diversity of  $H'=1.0$  and  $H'=0.9$ , respectively during AWC 21. Other wetlands except Gharana reported low species diversity for the previous years (Fig. 28).

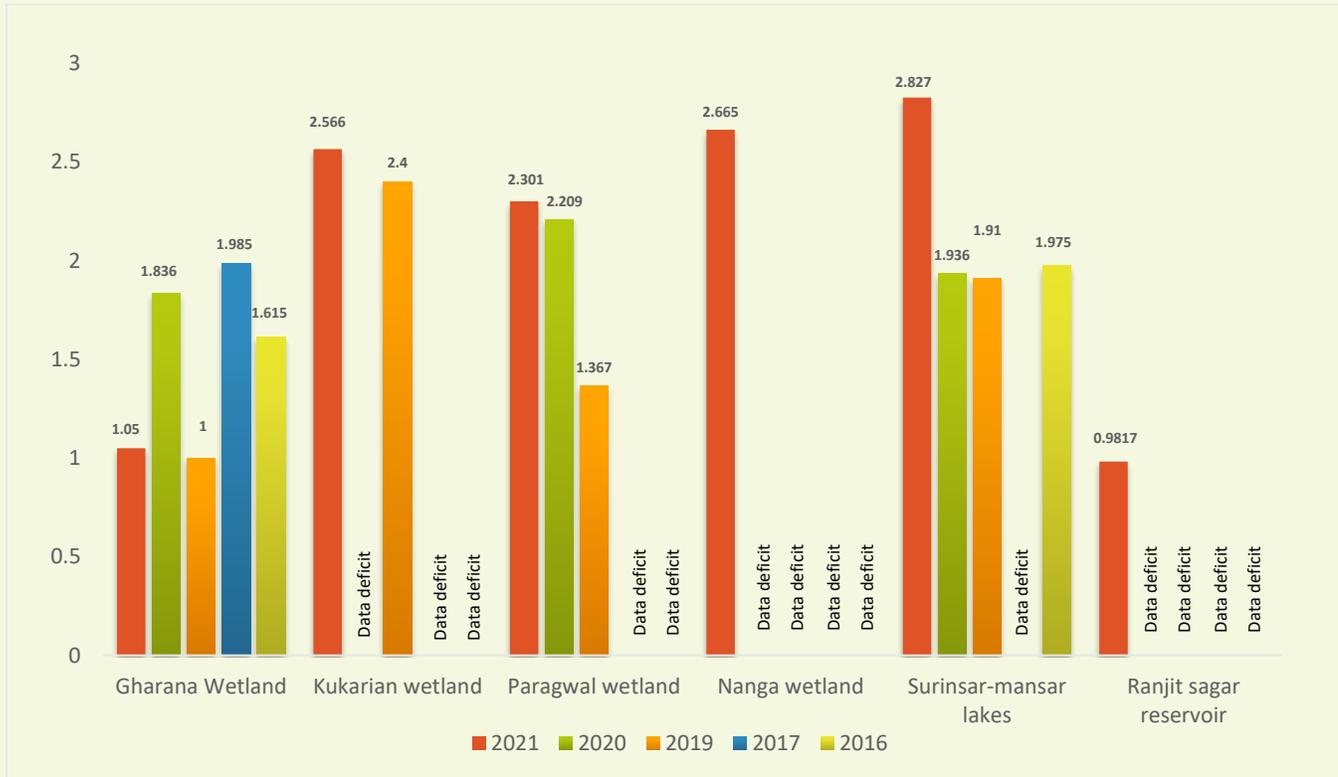


Fig. 28 Trend analysis of bird species diversity based on AWC observations among the wetlands in Jammu Division

### Bird species richness among wetlands in Kashmir Division:

Hokersar, one of the Ramsar sites in Kashmir recorded a high species number (n=47) followed by Chatlam wetland and Dal Lake (n=30, each) during AWC 2021 (Fig. 29). Wular and Dal lakes recorded 30 species each during AWC 2019. Mirgund, Freshkroori, Manibugh, Padgampora wetlands and Khurwan Sar reported high species richness during 2021, compared to the previous years of sampling. Anchar Lake and Sheikh Sar-Manasbal west reported high species number during AWC 2016 (Fig 29).

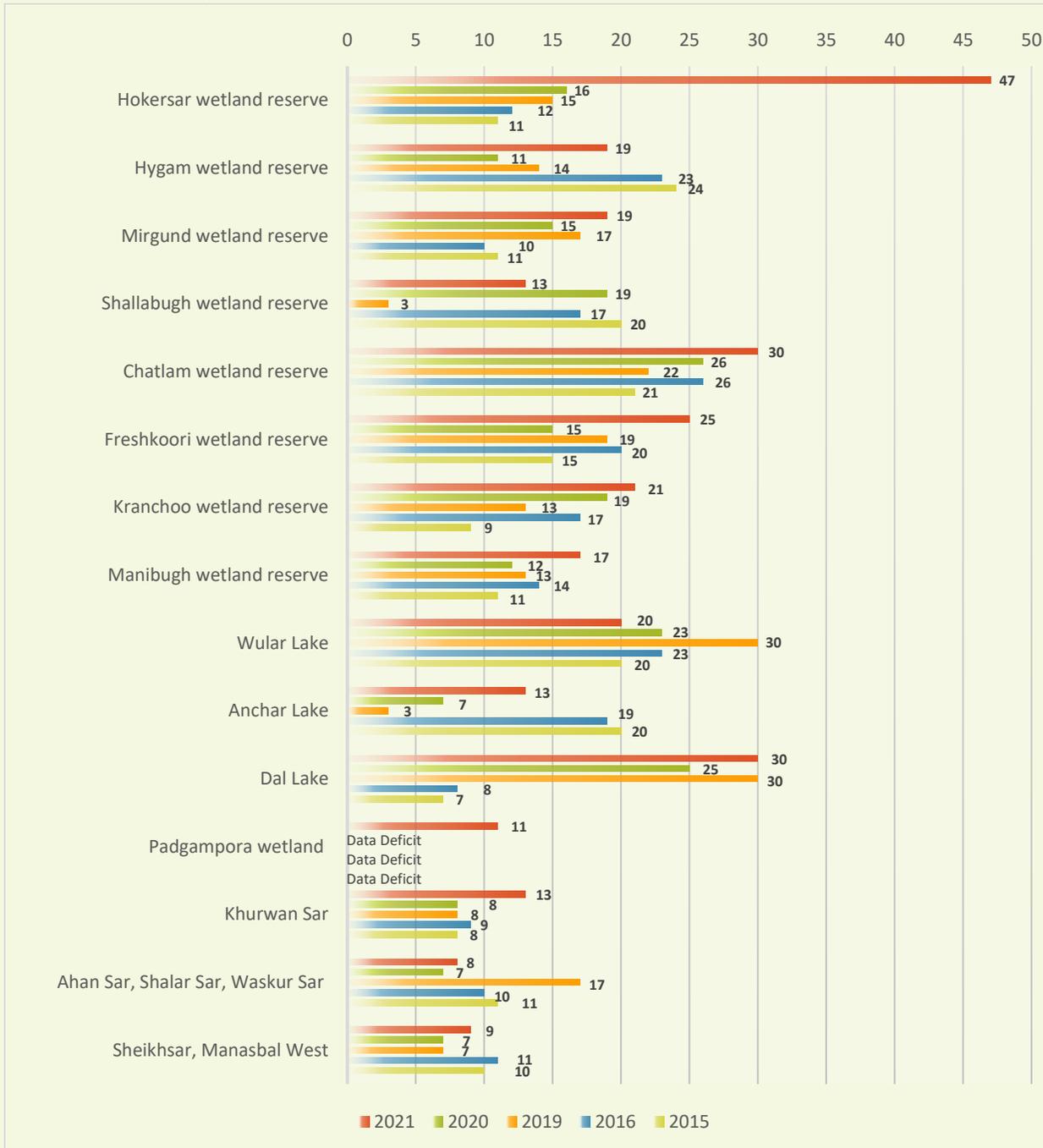
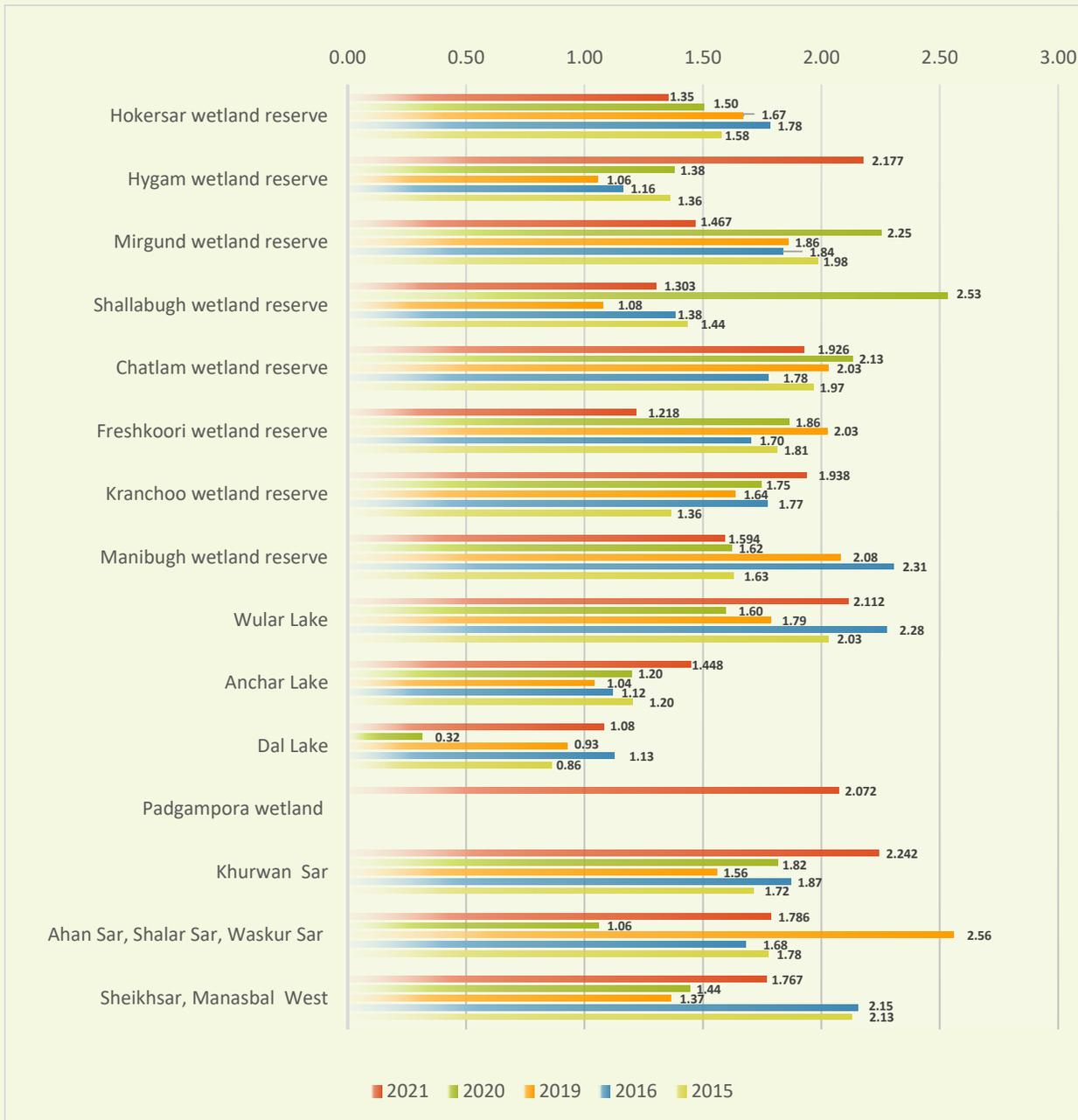


Fig. 29 Trend analysis of bird species richness based on AWC observations among the wetlands in Kashmir Division

**Trend analysis of water bird species diversity among wetlands in Kashmir Division:**

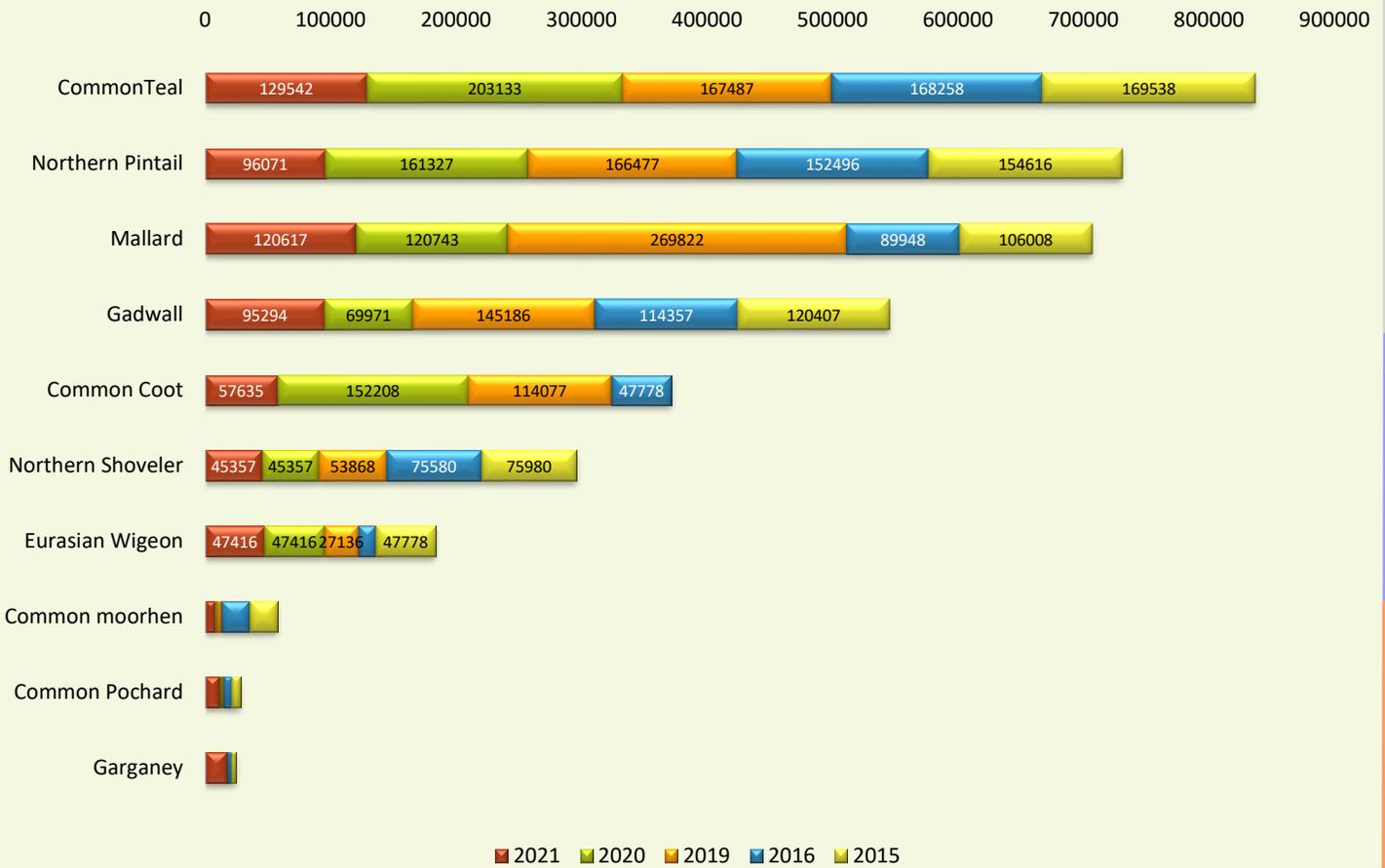
Likewise, the trends in species diversity were computed for all the sampled wetlands of Kashmir. Khurwan Sar recorded a high diversity of  $H'=2.2$  followed by Hygam and Wular ( $H'=2.1$ , each), Padgampora ( $H'=2.0$ ), Kranchoo ( $H'=1.9$ ) and Ahan Sar-Shalar Sar-Waskur Sar ( $H'=1.7$ ) during AWC 2021. Among all, Ahan Sar-Shalar Sar-Waskur Sar ( $H'=2.5$ ) and Shallabagh wetland ( $H'=2.5$ ) observed the highest species diversity during AWC 2019 and 2020, respectively. Mirgund, Chatlam, Freshkooori, Manibugh wetlands recorded highest diversity during 2020 and 2019 respectively. Rest of the wetlands Hokersar wetland, Wular Lake, Sheikh Sar-Manasbal West and Dal Lake recorded highest number of waterbirds during 2016. Year 2015 remained less diverse compared to other years of sampling (Fig 30).



**Fig. 30 Trend analysis of bird species diversity based on AWC observations among the wetlands in Kashmir Division**

### Trend analysis of most abundant species recorded during the last five AWC observations

We have attempted to present species-specific data for bird abundance of top ten bird species observed during the previous years of Asian Waterbird Census surveys (Fig. 31). These include Common Teal, Northern Pintail, Mallard, Gadwall, Eurasian Coot, Northern Shoveler, Eurasian Wigeon, Eurasian moorhen, Common Pochard and Garganey in descending order of their abundance. A large number of Mallards were encountered during 2019 followed by Common teal (2020, 2016 and 2015) and Northern Pintail (2019). Eurasian Moorhen, Common Pochard and Garganey were observed in very low numbers (Fig 31).



**Fig. 31** Trend analysis of most abundant bird species observed during last AWC annual counts (2015-2021) in Jammu and Kashmir

### Population trend of water birds in different wetlands of J&K (as per AWC-21)

Average abundance of all the birds encountered during the AWC surveys of 2015, 2016, 2019, 2020 and 2021 has been computed and presented in Table 7. Wetlands in Jammu region, less in numbers and smaller in size than those of Kashmir reported low abundance of water birds. Large flocks of Bar-headed geese were responsible for the high abundance in Gharana and Ranjit Sagar reservoir. Hygam wetland reported a high number of waterbirds followed by Mirgund and Hokersar wetland reserves during the AWC 21. Hokersar reported a record high number during the years 2015, 2016, 2019 and 2020. Hygam wetland was the second most occupied wetland with high numbers observed during 2016, 2016 and 2019 (Table 7).

**Table 7 Population trend of water birds (abundance) in different wetlands of J&K**

Name of the Wetland	Year of Observations				
	2021	2020	2019	2016	2015
<b>JAMMU REGION</b>					
Gharana Wetland Reserve	3131	905	1547	724	DD
Kukarian Wetland Reserve	287	DD	58	DD	DD
Pargwal Wetland Reserve	179	32	11	DD	DD
Nanga Wetland Reserve	269	DD	DD	DD	DD
Surinsar-Mansar Lakes	250	119	174	177	DD
Ranjit Sagar Reservoir	3388	DD	DD	DD	DD
<b>Total (A)</b>	<b>7504</b>	<b>1056</b>	<b>1790</b>	<b>901</b>	<b>NA</b>
<b>KASHMIR REGION</b>					
Hokersar Wetland Reserve	65166	481068	311388	502431	495385
Hygam Wetland Reserve	286645	33328	335791	128548	142370
Mirgund Wetland Reserve	135792	1806	575	500	658
Shallabugh Wetland Reserve	275	689	125	21595	43072
Chatlam Wetland Reserve	52918	66883	9567	43123	12545
Freshkooori Wetland Reserve	23453	2415	13790	13220	20615
Kranchoo Wetland Reserve	23359	1364	2942	9222	405
Manibugh Wetland Reserve	4733	1020	5189	3647	539
Wular Lake	707	121120	131360	1969	1525
Anchar Lake	521	1398	20	1480	1480
Dal Lake	54492	96247	93232	19271	19271
Padgampora Wetland	61	DD	DD	DD	DD
Khurwan Sar	85	105	269	153	135
Ahan Sar Shalar Sar Waskur Sar Group	45	22	84	50	75
Sheikhsar- Manasbal West	70	89	449	267	267
<b>Total (B)</b>	<b>648322</b>	<b>807554</b>	<b>904781</b>	<b>745476</b>	<b>738342</b>
	↓	↓	↓	↓	↓
<b>Total for J &amp; K (A +B)</b>	<b>6,55,826</b>	<b>8,0,8610</b>	<b>9,06,571</b>	<b>7,46,377</b>	<b>7,38,342</b>

DD : Data deficit

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