

A Review on Aves Diversity of Wetland Bird in Maharashtra with Reference to The Impact of Various Factors

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Abstract: *Birds are rightly defined as 'feathered bipeds' by Salim Ali. Birds are found throughout the world, at approximately all altitudes and in nearly every climate. Bird population plays an important role in normal functioning of ecosystem. Birds are good bio-indicators in terms of pollinators and scavengers. About 9000 living species of birds are known at present, 25 to 30 avian orders are recognized depending on the taxonomist. A total of 1300 species of birds found in India, which form 13% of total species of birds found on earth. In the state Maharashtra there are 568 species belonging to 272 genera, under 83 families and 20 avian orders. Water birds are most important components of wetland ecosystem as they occupy important position in the food web of wetland nutrient cycle. This review study provides an overview of the current state of knowledge on the distribution, diversity, ecology and conservation of avifaunal diversity. Now-a-days, avifaunal diversity has been decreasing due to anthropogenic activities and destruction of natural habitats by human beings, environmental pollution and also natural disasters. Currently about 1200 species of birds are threatened with extinction by human activities. Birds are important animal group of an ecosystem and maintain a trophic level. Therefore, there is a need of detail study on avifauna and their ecology is important to protect them.*

Keywords: Birds, wetlands, diversity, ecosystem, Maharashtra

1. Introduction

Wetlands are areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six meters (Ramsar, 2004). These are the lands transitional between terrestrial and aquatic ecosystem where the water table is usually at or near the surface or the land is covered by shallow waters (Narayanan and Vijayan, 2007). Wetlands are crucial bird habitats because they provide them with resources. Birds utilize them for breeding, nesting and rearing young, as a source of drinking water and for feeding, resting, shelter and social interactions. Wetlands are one of the most crucial habitats, yet they are also among the most threatened ecosystem in the world. Wetland is called "Kidney of the Earth". The natural reservoir and species bank, in general wetlands are identified in the major types as coastal wetland, classified as mangroves/creeks, intertidal mud flats/beaches/shares and salt pans/fish farm and inland wetlands i.e. rivers/streams, tanks/ponds and reservoirs/barrages. The state of Maharashtra is blessed with a large number of coastal and inland wetlands. Wetland area in the 35 districts of Maharashtra state is estimated to be 1014522 ha as compared to the total geographic area of 307748 sq km which accounts to 3.30% the total geographic area of the state. Wetlands in India cover an area of 58.2 million hectares and are support over 310 avian species.

2. Diversity of Wetland Birds in Maharashtra

Pawar (2011) studied species diversity of birds in mangrove of Uran (Raigad). They were recorded 56 species of birds representing 11 orders, 29 families and 46 genera. Of these species, 33.93% belonged to order Passeriformes, 26.79% to

Ciconiiformes, 8.93% to Charadriiformes, 7.14% to Anseriformes, 5.36% each to Coraciiformes and Falconiformes, 3.57% each to Columbiformes and Gruiformes and 1.79% each to Cuculiformes, Pelecaniformes and Psittaciformes. The order Passeriformes was dominant in Uran mangroves and was represented by 11 families followed by order Ciconiiformes with 5 families. The species found in Uran mangroves comprises 33 residents, 20 winter visitors and 3 occasional visitors. Chilke (2012) recorded 58 species of birds belonging to 9 orders and 29 families from Bamanwada lake, Chandrapur district. Mostly species were resident (R), resident migrant (RM) and very few were migrant (M).

Hinchkhede and Kedar (2013) were recorded 126 species from Navegaon National park. A total count included 5 species of local migrants, 2 species of summer migrants, 15 species of winter migrants and the rest 104 species were found to be residing in the study area. The density of avifauna was found to be highest during winter, due to the winter migrant. Mhatre et al. (2013) recorded 131 species belonging to 35 families from Nigade, Raigad. It comprises of 106 (80.91%) residents, 20 (15.27%) migrant (19 winters and 1 summer migrant) and 5 (3.82%) occasional visitors. The highest number of species belonged to family Accipitridae and Corvidae (14), followed by Passeridae (11), whereas 10 families represented by single bird species.

Bhandarkar and Paliwal (2014) investigated Shrungarbandh lake, district Gondia. A total of 52 bird species recorded which belonging to 10 families and 5 orders. Out of total orders 32 species of the birds belongs to order Ciconiiformes followed by 11 species from Anseriformes, remaining orders Gruiformes, Graciformes and Passeriformes comprises of 95, 03 and 01 bird species respectively. Abdar (2014) observed 47 species of water birds visited to the Ramling island, out of that 32 species are regular visitor and 15

species are winter visitor. Maximum species were recorded in order Ciconiiformes and followed by Anseriformes and among winter visitor species belonging to Anseriformes and Ciconiiformes orders. The population of Egret, Herons, Black Ibis, Stork, Cormorants and Terns were increased in the month of March, April and May. Kumbhar and Ghadage (2014) identified 126 bird species belonging to 30 families from the Krishna river basin. Out of 30 families, 15 families were represented by one or two species, while 2 families Ardeidae and Muscicapidae were represented by 9 and 16 species respectively. According to the feeding habits, 38 insectivorous, 28 piscivorous, 25 omnivorous, 19 carnivorous, 9 granivorous, 5 frugivorous and 2 nectar sucker and insectivorous birds found. High percentages (30.16%) birds were found insectivorous. Of the total species, 57 were recorded as common, 52 as moderate and 17 as rare species. Out of 126 bird species, 91 (72.22%) were resident, 16 (12.69%) were migratory, 12 (9.52%) were resident and 7 (5.55%) were resident and migratory. 82 species found in all season, 26 in winter, 12 in summer and 6 species in monsoon season.

Lad and Patil (2015) were recorded 131 species of birds from estuarine wetland area Bhayander and Naigaon. 68% of the species were resident while 32% were migratory. These migrants includes species such as Greater Flamingo, Northern pintail, Brown Shrike, Large Cormorant, Rosy starling, Eurasian Hobby, Lesser Falcon, Heuglin's Gull, Eurasian Curlew, Little stint etc. 45 families were noticed during the study period among them Scolopacidae and Accipitridae were the dominant families with 12 species each followed by family Ardeidae and sylvidae with 8 and 7 species respectively, family Laridae, Motacillidae and Rostratulidae with 6 species each. Patil (2015) recorded 44 bird species from Tasgaon tahsil. They were belongs to 10 orders and 18 families. Among these 10 are migratory and 34 are native birds. Puri S. D. (2015) investigated Malguzari lake Amgaon and recorded 27 species of birds which belonging to 08 orders and 11 families. Out of 27 species, 11% were abundant, 48% common, 33% uncommon and 08% were rare species. The maximum species were recorded during winter season followed by summer.

Abdar (2016), investigated diversity of wetland birds from water reservoir of Welturi, Dist. Beed. A total number of 32 birds recorded from 6 different orders and fourteen families. Ciconiiformes is the dominating with fifteen wetlands birds. The most dominated group was that Duck is followed by Ibis, Egrets. Puri and Virani (2016) studied Bodalkasa lake in Gondia District and recorded 69 bird species. Ardeidae was the dominant family with 07 species and followed by the family Anatidae with 06 species. The highest RDI value (10.14) was recorded for Ardeidae family.

Puri and Virani (2017) were reported 86 bird species from Khairbandha lake in Gondia district. Out of 86 species, 56 species were residents (65%), 23 species were winter visitors (27%), 02 species were summer visitors (6%), Anatidae was the dominant family with 15 species followed by the families Ardeidae and Scolopacidae with 07 and 06 species respectively. Khot (2017) studied avian diversity of Dongri village wetlands Bhayander west Thane. A total 21 families, 30 genera and 33 species of birds were recorded.

Karikar et al. (2017) were recorded a total 72 aquatic species of birds belonging to 9 orders and 18 families from two adjacent lakes near Ujjani reservoir. Among these 72 species, 43 were found at Bhadalwadi lake and 70 species were found at Palasdeo lake. Maximum number of species was observed from the families Scolopacidae and Anatidae respectively. Fule et al. (2017) observed 41 species of bird from Simbhora reservoir. The maximum bird species were recorded during winter season, early monsoon while less number of species found during late summer. Patil et al. (2018) studied aves of Ajanti reservoir region of Wena river, Hinganghat (Wardha). A total of 134 species of birds belonging to 16 orders, 48 families and 104 Genera were recorded. From order Passeriformes, a maximum number of 59 species were recorded from 45 genera belongs to 22 families. Out of 134 bird species 89 (66.41%) are resident, 38 (28.35%) species were migratory; while 102 (76.11%) species were common, 28 (20.89%) were occasional and 4 (2.98%) were rare. Some rare species particularly: European White Stork (*Ciconia ciconia*), Indian eagle owl (*Bubo bengalensis*), Brown Hawk Owl (*Ninox scutulata*), Stark-billed Kingfisher (*Halcyon capensis*) were recorded.

Shelke (2019) recorded total 45 species of birds from Hatale dam, Jalgaon, which belonging to 9 orders and 21 families. Out of which, 26 were of Resident (R) i.e. House Crow, Black Drongo, Paddyfield Pipit, Yellow Wagtail, Jangal Babber, Pied Bushchat, Indian Robin, Red Vented Bulbul, Purple Rumped Sunbird, Common Myna, Brahminy Starlings, Greater Cuckoo, Red Wattled Lapwing, Breasted Kingfisher, small blue Kingfisher, Blue-Tailed Bee Eater, small bee eater, Indian Roller, Blue Rock Pigeon, Spotted Dove, laughing Dove, Parakeet. 8 species were local migrant (LM), Asian Koel, Intermediate Egret, Little Egret, Cattle Egret, Indian Cormorant, Painted stork, Lesser Pied Kingfisher and Common hoopoe. 11 species were winter Migrant (WM), Indian spot-billed duck, Northern Pintail, Ruddy shelduck, Black winged stilt, Semipalmated Piper, sand Piper, Grey Heron, Little Cormorant, Asian Openbill-stark, common Moorhen and common coot. Sangode and Chavhan (2019) studied avifaunal diversity of futala lake, Nagpur and recorded a total of 30 bird species belongs to 12 orders, 14 families and 30 genera. Columbidae family represents the maximum (5) number of birds followed by Strigidae (3) then Accipitridae (2) and Phasianidae (2). Among the orders Passeriformes represent maximum 43 number of birds followed by Ciconiiformes (8), Falconiformes and Columbiformes (7); Piciformes and Caraciformes represent 5 birds species each; Charadriiformes consist of 4 birds; Cuculiformes and Strigiformes consist of 3 species each. Anseriformes, Apodiformes, Gruiformes, Psittaciformes, Pelicaniformes and Galliformes represent 2 birds each. The least (1) number of birds species represented by Podicipediformes. Rao et al. (2019) studied Bird diversity in the coastal talukas of Sindhudurg district. A total 307 species were recorded, 283 recorded during survey and 24 more species compiled from the published literature, belonging to 78 families and 22 orders. Species richness was highest in Vengurla Taluka (256 species) followed by Malvan Taluka (247) and Devgad Taluka (213). Order Passeriformes (111) species had the highest species representation followed by Charadriiformes (63), Accipitridae (20) and Pelecaniformes (15) and one

species each represented in Procellariiformes and Gaviiformes. 14 more species fall under the Near Threatened Category of IUCN. Grey-headed Bulbul *Pycnonotus priocephalus*, Malabar Grey Harnbill *Ocyrceros griseus*, Crimson-backed Sunbird, *Leptocoma minima* and Vigor's Sunbird *Arthopyga Vigorsii* are the birds recorded, they are considered to be endemic to the Western Ghat. Based on the sighting percentage 151, 114 and 18 species were common, uncommon, and rare respectively. Deshmukh and Rudey (2019) surveyed Dev talav, Nagbhid and found 105 species of avifauna, representing 16 orders and 48 families. Maximum abundance recorded from order – Passeriformes with 49.50% of total avian species represented by 52 species belonging 23 families. Maximum abundance noted from Fam- Muscicapidae represented by 8 species followed by Fam- Ardeidae and Sturniidae. Only one bird, Black Headed Ibis (*Threskiornis melanocephalus*) is placed in Near Threatened (NT) category, while all other birds were Least Concern (LC) category as per IUCN list. Deshmukh (2019) recorded 52 species of birds, belongs to 36 genus, 14 families and 7 orders from Bikli lake Nagbhid. Maximum abundance 32.69% (n=17) recorded from uncommon (UCom) water bird species followed by 26.92% (n=14) from common (Com) and rare (Ra) birds.

Rohankar and Kathore (2020) were recorded 17 species of birds of 16 families of 17 genera from Saikheda dam of Yavatmal district. Gawande and Deshpande (2020) investigated avian diversity from Mahim Bay, Mumbai. A total 25 bird species belonging to families Accipitridae, Ardeidae, Charadriidae, Corvidae, Laridae, Phalacrocoracidae and Scolopacidae. Out of 25 species, 12 were residents and 13 were winter visitors. Pawar et al. (2020) observed 102 bird species, representing 16 orders, 48 families and 84 genera from coastal region of Panvel. Out of these 45 species belongs to family Passeriformes, 12 species to Charadriiformes, 10 species to pelecaniiformes, 8 species to Accipitriiformes, 7 species to Coraciiformes, 3 species each to Columbiformes, Piciformes and Strigiformes, 2 species each to Anseriformes, Bucerotiformes and Gruiformes and 1 species each to Cuculiformes, Galliformes, Phoenicopteriformes, Psittaciformes and Suliformes. Parwate (2020) recorded 51 species of the birds from local ecosystem of Lakhani. Out of total, 20 species were residence common, they were Pond Heron, Little Egret, Red Vented Bulbul, Indian Ring Dove, Rose ringed Parakeet, Crow Pheasant, Asian Koel, Cattle Egret, Brahminy Sterling, Magpie Robin, Indian Robin, Purple Rumped Sunbird, Tailor Bird, White Breasted Kingfisher, Pariah Kite, Red wattled Lapwing, Blue Rock Pigeon, Jungle Babbler, Common Myna, House Swift, House Sparrow, House Crow etc. Pimpalshende and Sitre (2020) were identified 40 species of bird from Satara tukum lake and 33 bird species from Satara Bhosale lake. The family Columbidae, Ardeidae, Pycnonotidae, Sturnidae, Passeridae and Cuculidae noted to be dominant in both the lakes. Gadekar et al. (2021) studied a Konkan coast of Western ghat. A total 114 species belonging to 51 families were detected from seven habitats in two seasons. 83 bird species belonging to 40 families in the dry season and 113 species belonging to 51 families in the monsoon season were detected at seven habitats. Among 114 species 82 (72%) bird species were common to both seasons. However, only one

species (red rumped vulture) belonging to the Accipitridae family. Out of the total 114 bird species only 10 (9%) bird species such as *Dicrurus macrocerus* (Black Drongo), *Bubuleus ibis* (Cattle Egret), *Saxicoloides fulicata* (Indian Robin), *Carvus macrorhynchos* (jungle crow), *Vanellus indicus* (red-wattled Lapwing), *Pycnonotus jocosus* (red-whiskered Bulbul), *Psittacula krameri* (rose-ringed Parakeet), *Merops orientalis* (spotted Dove) and *Halycon smyrnensis* (white throated kingfisher) were recorded at all land use types during the dry and monsoon season. Patode et al. (2021) investigated bird diversity of Siddheshwar reservoir of Hingoli district. A total 70 species of bird were reported, belonging to 54 genera, 26 families and 12 orders. The order Passeriformes dominated among the avian diversity with 27 species. Family wise analysis of bird communities showed that family Ardeidae, Anatidae and Muscicapidae (06 species each) which is dominated and followed by Rallidae, Pycnonatidae and Cuculidae (4 species each) besides Cionidae, charadriidae, Columbidae, Alcedinidae, Hirundinidae and Paridae (3 species each) while Threskiornithidae, Pistacidae, Meropidae, Motacillidae, Laniidae, Passeridae, Sturnidae and Carvidae (2 species each) whereas Podicipidae, Phalacrocoracidae, Gruidae, Recurviorstridae, Apodidae and dicruridae (1 species each). Chaudhary and Sitre (2021) recorded 65 bird species from Manda Tukum lake of Mul Tehsil of Chandrapur. Out of 65 species, 10 species were classified as resident migratory, two species as resident migratory common and remaining birds as resident birds of the area. Among the families recorded species of birds Scolopacidae was dominant family with 8 species followed by ardeidae and Columbidae with 5 species each. Maximum birds were spotted during winter season while very less in summer season. The resident birds includes little Grebe, Indian Pond Heron, Cattle Egret, Common Snipe, Little Egret, Catton Teal, Purple Heron etc. Asian open bill stark and black Ibis are resident migratory in nature.

Raut et al. (2022) studied diversity and conservation status of wetland birds in Nagzira-Navegaon Tiger corridor and identified 87 species of birds belonging to 38 families. Out of 87 birds species, 69 bird species were resident, 13 bird species were winter migrant, 3 bird species were local migrant and summer migrant with 2 bird species. Majority of the birds i.e. 95% of the total number of species were classed as Least Concern (LC) followed by 3.4 % were near threatened and 2.3% were vulnerable as per the IUCN red list status. Kakde and Kasture (2022) recorded 55 birds belonging to 18 different orders from Nalganga dam of Buldana district. Out of 55 birds, 45 birds were residential birds and 10 birds were migratory visited to this Dam during winter season. From these migratory birds 04 birds becomes residential due to abundant availability of food, shelter and other environment such as *Anser indicus* (Bar headed Goose), *Actitis hypoleucos* (common Sandpiper), *Cacomantis flabelliformis* (Fan tailed Cockoo) and *Microcarbo niger* (Carmorant). Gharat and Shaikh (2022) observed 50 species of bird from Panje wetlands. Nikam (2022) observed 75 bird species belonging 10 orders and 15 families from Zambre reservoir, Chandgad, district Kolhapur. Maximum number of species i.e. 11 recorded from Order Charadriiformes. Family Anatidae has maximum number of species (12) followed by family Ardeidae (10).

Joshi (2022) studied bird species of various dam ecosystem of Yavatmal district. He observed some migratory waterfowl which were considered rare for Yavatmal district these were Brown breasted Flycatcher, Common Shelduck, Ferruginous Pochard, Jack Snipe, Eurasian Curlew, Wimbrel, Terek Sandpiper, Ruff, Red Necked Phalarope, Grey Plover, Grey Headed Lapwing, Heuglin's Gull, Indian Skimmer, Black Bellied Tern, Caspian Tern and Saunders tern. Bhagwat et al. (2022), observed 11 species were in the "Near Threatened" category as per the red data book from Sonvad reservoir. Common Pochard (*Aythya ferina*) is the only 'Vulnerable' species sighted occasionally in good numbers, while Egyptian Vulture (*Neophron percnopterus*) is only 'Endangered' species sighted once. Patil and Chavhan (2022) studied bird diversity in and around Pardi lake, Gadchiroli and recorded 50 species. The most abundant species were *Bulbulcus bis* and *Egretta garzetta*.

Deshmukh and Chavan (2023) investigated wetland bird diversity of Pandav Talav, Nagbhid. 2587 birds were recorded which belongs to 54 species, 24 families and 10 orders. The species recorded included 13 migrant (M), 22 Passage Migrant (LM) and 40 Residents. Maximum abundance recorded from family Ardeidae with 16% of total waders represented by 8 species followed by fam-Anatidae represented by 7 species. Harney (2023) investigated Avifauna of Sonagaon Tukum lake near Chandrapur. A total of 99 bird species belonging to 22 different orders and 54 families were recorded. 30 species belongs to Passeriformes, 12 species belongs to Charadriiformes. 11 species belongs to Ciconiiformes, 7 species belongs to Caraciformes, 5 species each belongs to Piciformes and Falconiformes, Strigiformes and 1 each species belongs to Podicipediformes, Pelecaniformes, Galconiformes, Apodiformes, Caprimulgiformes, Pelecaniformes, Passerinae, Ploceinae, Gruiformes and Rhipiduridae. Bhaisare and Harney (2023) recorded 64 species from Gadchiroli. Among the recorded species of birds, 01 species belongs to families Corvidae, Hirundinidae, Recurvirostridae, Ciconiidae, Anhingidae, Phalacrocoracidae, Cuculidae, Psittaculidae, Apodidae, Dicuridae, Nectariniidae, Oriolidae, Passeridae, Pynonotidae, Leiothrichidae, Paradoxornithidae, Bucerotidae, Coraciidae each. 2 species belongs to Motacillidae, Estrildidae, Meropidae, Jacanidae, Charadriidae, Scolopacidae and Threskiornithidae. 3 species belongs to Laniidae, Sturnidae, Cisticolidae, Alce Dinidae, Accipitriformes and Rallidae. 4 species belongs to Muscicapidae and 5 species belongs to Ardeidae.

Impact of Various Factors on Bird Diversity

To study any ecosystem the birds serve as important component as they have the ability to fly away and avoid any obnoxious condition. Hence they are considered as important health indicators of the ecological conditions and productivity of an ecosystem. The water birds are very specific in their choice of wetlands. This often strongly associated with prey distribution and abundance. Presence of food resources is a key factor which affects the habitat suitability of bird species. Likewise diversity may be also affected by other various factors such as wetland size, water level fluctuation, predators and habitat heterogeneity. In addition to habitat loss and climate change, birds face numerous other issues and threats. These include excavation

on sites, summer cultivation on wetland, over cattle grazing, excessive fishing, habitat destruction, trapping of birds, pollution and pesticides; fire and controlled burning regimes; invasive species; collision entanglement and entrapment; predation; disease; and illegal trade in wildlife.

The quality of water is an important factor that affects the quality of life. In Maharashtra, the largest source of the water pollution is the discharge of the untreated sewage into the water bodies. The nitrate and phosphate shows positive correlation with the number of species (Thomus et al. 2016). Some farmers use diesel engines and electric motors to draw the water, this creates a lot of pollution (Kumar et al.,). The birds present in and around the local ecosystem are affected by many factors such as Agriculture pollution, distributed by human activities and lack of maintenance (Parwate 2020, Kakde and Kasture, 2022). Climate changes have been taken into consideration to identify threats to avian species in the Nashik region (Andhale and Jadhav, 2020). The abundance of avifauna indicates the healthy status of lakes owing the availability of water, safe habitat and food sources for both adults and nestings, and essential nesting / roosting sites in and around the lakes are important for the occurrence and abundance of aquatic bird populations (Joshi, 2012). Sonvad reservoir has several threats and anthropogenic pressure such as uncontrolled water draining for agricultural activities, over-fishing, hunting and poaching. So it is necessary to take adequate serious measure to prevent degradation, misuse or over exploitation of the wetland (Bhagwat et al., 2022). The freshwater bird biodiversity is the most Threatened of all types of diversity and wetlands are found to be the richest zone of existing, avifauna. It was found that bird communities respond to the factors like food availability, predator abundance, human density, competition and climate. Out of these, availability of food substrate may be an important parameter in avian habitat selection (Pimpalshende and Sitre, 2020). Anthropogenic activities like live stock grazing, fishing, uses of pesticides in agriculture and deforestation are posing threat to the bird diversity (Deshmukh and Rudey, 2019). Decline in the bird population can have negative impact on an ecosystem, and their sensitivity to the environmental change often tends them as useful indicators of environmental quality (Mhatre et al., 2013). Most sea birds feed on the rich benthic fauna and fishes, pollution may affect these food resources impacting the avian diversity in the Mahim bay (Gawande and Deshpande, 2020). Puri and Virani, 2016 noticed that, Adani thermal power station near the study site may increase temperature of surrounding area which affects the bird diversity adversely in future. Over- extraction of the wetland resources result into degradation of floating and submerged aquatic plants from the lake and this ecological condition affect the avian diversity in the region (Raut et al., 2022). Fluctuating water level in the reservoir i.e. sometimes the reservoir is filled to capacity and there are hardly any shallow ponds for waders. When all the water released through canals, the reservoir becomes dry. This becomes a pinch period for birds (Kumar et al., 1996). Development project like extensions of roads, because of cutting of very huge amount of roads trees under the label of development will deplete the breeding and feeding ground of the avifauna and will affect the diversity of that area (Shelke, 2019). Dumping of industrial effluents, untreated sewage and

unchecked encroachment along the coastal line have resulted in deterioration of water quality and incidences of industrial pollution are common in creeks of Mumbai and Navi Mumbai (Pawar, 2011). Partial or complete destruction of any wetland would lead to the displaced of a large population of the water birds or increase competition for space and food in already existing habitat due to overpopulation. In both the scenarios birds will be under tremendous stress. Water birds will lose a large amount of energy in search of new habitats or while competing in existing habitat or if they found suitable roost at a longer distance, ultimately, they may not store the fats (energy reserve) essential for completing their migration. It would adversely affect the survival of the birds and will impact negatively to already declining population of these species (Gharat and Shaikh, 2022). In addition to climate change, other factors contributing to biodiversity loss are land use changes, invasive species, overexploitation and pollution. Species that have the capability to keep up with climate shifts may survive; other that cannot respond are likely to suffer species with high fertility and dispersal capacities have proved to be highly adaptive to variable climatic condition (Khot, 2017). Hinchkhede and Kedar 2013, points out that a gradual decline in the density of avifauna and disappearance of some species in the span of a few decades from Navegaon National Park by anthropogenic activities. The avifauna of the western Ghat is facing the threats of rapid economic development, deforestation and installation of various energy power plants (Gadekar et al., 2021). Rising pollution of water by agricultural waste and toxic pesticides has led to fall in the number of birds coming to Mayani dam with each passing year (Karkar, 2021). Baisare and Harney, 2023 observed that Gadchiroli lake contaminated by throwing polytene bags and garbage. In the festival season, immersion of god idols made of harmful chemicals and colours has spoilt the water resulting in declining the quality of water and also destruction of the habitat of birds. Unregulated tourism and associated development, sand mining, stray dogs and conversion of laterite grasslands are the major threats to the coastal avifauna in the Sindhudurg district (Rao et al., 2019). Pawar et al. 2020 concluded that over-exploitation of natural resources and deforestation in Panvel region due to ongoing construction of Navi Mumbai International Airport are the key factors affecting the diversity and distribution of avian species.

3. Conclusion

Above review of literature shows that almost every part of Maharashtra has diversity of birds. Their diversity varies according to the changes in quality of water parameter. Now a days, avifaunal diversity has been decreasing due to the destruction of natural habitats and human disturbances. Several conservation measures are suggested such as restriction on land use, management of water use, fishing, protection and prevention of hunting.

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