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Avifaunal diversity and conservation in the semi-arid landscapes of Dharashiv District, Maharashtra, India: A critical review of species records, habitat change and research priorities

Dr. Surwase Sanjay Sukhdeo
Assistant Professor, Department of Zoology, Government Vidarbha Institute of Science and Humanities Amravati, Maharashtra, India
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Abstract
Dharashiv District (formerly Osmanabad), in the Marathwada region of Maharashtra, occupies a semi-arid part of the Deccan Plateau where agricultural fields, open scrub, grasslands, rocky terrain, settlements and artificial or natural wetlands form a heterogeneous landscape. Birds use these habitats for feeding, breeding, roosting and seasonal movement, making avifaunal records valuable for understanding ecological change in a heavily used dryland region. The principal district-level baseline identified for this review is the survey by Narwade and Fartade (2011) [6], which documented 165 species during surveys conducted from March 2007 to July 2008 across Yedshi grassland, Terna Lake and the Masla area. The authors recorded resident, locally migratory and migratory species and described habitat-specific and seasonal variation, while also raising concerns about changing aquatic landscapes. A later study of the south-western Deccan Plateau, including the Great Indian Bustard Sanctuary landscape in neighbouring Solapur, provides a broader regional comparison and illustrates the conservation importance of open habitats (Narwade & Rahmani, 2020) [5]. This review synthesizes the available district and regional evidence, evaluates the ecological roles and pressures affecting the main habitat types, and proposes a reproducible monitoring framework. It identifies a key limitation: the 2011 checklist is a historical baseline, not a current estimate of richness, abundance or conservation status. Updated, seasonally balanced surveys, transparent checklist validation, habitat mapping, and integration of field observations with carefully screened citizen-science records are required to assess change. Conservation planning should retain the ecological value of open natural habitats, improve wetland management, reduce disturbance at breeding and roosting sites, and coordinate biodiversity monitoring with agricultural and infrastructure planning.

Keywords: Avifauna, birds, Dharashiv, Osmanabad, Marathwada, Deccan Plateau, semi-arid landscape, grassland, wetland, conservation, citizen science

Introduction

Birds are widely used in ecological assessment because they occupy diverse trophic levels, respond to changes in vegetation and water availability, and can often be surveyed through standardized visual and acoustic methods. Their distributions and seasonal occurrence reflect a combination of climate, habitat structure, food resources, disturbance, landscape connectivity and species-specific life histories. A checklist can establish a baseline for further work, but its interpretation depends on survey effort, season, observer experience, identification standards and the spatial coverage of the study (Bibby *et al*., 2000; Sutherland, 2006) [2, 7].

Semi-arid regions of peninsular India contain a mosaic of cultivated land, fallows, open grassland, thorn scrub, rocky outcrops, village commons and water bodies. These environments are often treated as degraded or low-value land, even though they support distinctive bird assemblages, including open-country specialists, ground-nesting species, raptors and seasonal waterbirds. The ecological value of such landscapes can be overlooked when conservation is planned only around forest cover or formally protected areas. The Deccan Plateau literature, particularly work from the Great Indian Bustard Sanctuary and surrounding areas, illustrates the importance of maintaining open habitats and understanding how birds use working landscapes (Narwade & Rahmani, 2020) [5].

Dharashiv District was formerly known as Osmanabad District. For literature searching, both names must be used because older research is indexed under Osmanabad. The most directly relevant published baseline located for this review is Narwade and Fartade (2011) [6], who surveyed selected sites in the district and reported 165 bird species. Their study remains useful because it records the survey period, selected habitats and seasonal patterns, but its age means that it cannot establish present-day status. The central purpose of this review is therefore not to reproduce a checklist as if it were current; rather, it is to critically interpret existing records, identify evidence gaps, and develop priorities for future conservation and monitoring.

The review addresses four questions: (i) what district-level and regional evidence is available for the avifauna of Dharashiv; (ii) how do the principal habitat types contribute to bird occurrence; (iii) which environmental pressures require assessment; and (iv) what research design would provide a defensible basis for evaluating change over time?

Review scope and approach

This manuscript is a critical narrative review based on published literature relevant to Dharashiv, the adjoining Deccan Plateau and Indian bird conservation. The core evidence consists of the district-level paper by Narwade and Fartade (2011) [6], the regional study by Narwade and Rahmani (2020) [5], and general ornithological survey methods described by Bibby *et al*. (2000) and Sutherland (2006) [2, 7]. Search terms appropriate to reproduce or update this review include “Dharashiv birds”, “Osmanabad avifauna”, “birds of Osmanabad District”, “Yedshi grassland birds”, “Terna Lake birds”, “Marathwada bird

diversity", "Deccan Plateau avifauna" and "Great Indian Bustard Maharashtra".

The review gives greatest weight to sources with clearly described study areas and methods. Regional and national studies are used to establish ecological context, not to assign unverified species records or population trends to Dharashiv. The manuscript does not calculate a new species total, diversity index, trend estimate or statistical relationship because no harmonized district-wide dataset was available for such analysis. A formal systematic review would require documented database-by-database searches, a defined screening protocol, duplicate removal, explicit inclusion criteria and a study-quality assessment; these steps should be completed and reported if the target journal requires a systematic rather than narrative review.

Landscape setting and habitat mosaic

The district lies within the semi-arid Deccan Plateau, where seasonal rainfall produces marked changes in vegetation growth, surface-water availability and agricultural activity. Dry-season conditions can concentrate birds around remaining water sources and productive feeding areas, while the monsoon changes ground cover, insect availability, crop structure and breeding opportunities. These seasonal contrasts mean that one-time or seasonally restricted surveys are unlikely to represent the complete annual bird community.

The landscape should be considered as a connected mosaic rather than a set of isolated habitat categories. Wetlands and reservoirs may provide feeding or roosting sites for waterbirds, while adjacent fields and fallows supply terrestrial prey and seeds. Grasslands, scrub and rocky areas can support ground-foraging birds and species associated with sparse vegetation. Farms, orchards, roadside trees and settlements provide additional resources, but they may also expose birds to pesticide use, vehicle collision, disturbance, domestic animals and altered nesting opportunities. The conservation value of a site therefore depends not only on the habitat label but also on vegetation structure, water regime, management history and connectivity with nearby habitats.

District-level evidence and its interpretation

Narwade and Fartade (2011) [6] surveyed three blocks or localities—Yedshi grassland, Terna Lake and the Masla area—and surrounding villages, covering approximately 300 km². Their field work was carried out bimonthly from March 2007 to July 2008. The authors used direct observation while walking roads, tracks, grassland and agricultural areas, with binoculars and cameras supporting identification. Their published checklist contained 165 species, categorized as 109 resident, 15 local migrant and 41 migrant species. The paper also reported eight species in threatened categories as understood at the time of publication. Those threat categories must not be repeated as current classifications without checking each species against the latest IUCN Red List and applicable national assessments.

The study reported seasonal variation in species records and found the largest number of species in winter, consistent with the presence of migratory birds and seasonal changes in resource availability. Wetland areas supported the greatest number of species in the study's habitat comparison, followed by agricultural and grassland habitats. The authors also described habitat change associated with water-management and lake-linking activities as a concern. These observations are important as a historical record, but they do not demonstrate that the same richness ranking or species composition persists today. Survey methods, land use, water regimes and detectability may have changed in the intervening years.

A regional study by Narwade and Rahmani (2020) [5] documented 282 bird species in the Great Indian Bustard Sanctuary and surrounding south-western Deccan Plateau landscape, combining field observations with a review of eBird checklists. The study is not a substitute for a Dharashiv survey because it covers a different landscape and sampling design. It is nevertheless relevant for regional comparison, particularly for open-area birds and the conservation implications of land-use change. Regional findings should be used to guide survey questions and methods, while district-level claims should be based on records validated at an appropriate spatial and temporal scale.

Table 1: Key evidence relevant to avifaunal conservation in Dharashiv and the surrounding region

Source	Spatial and temporal scope	Main contribution	Interpretive limitation
Narwade & Fartade (2011) [6]	Selected sites in former Osmanabad District; March 2007–July 2008	District-level checklist of 165 species; resident and migratory categories; habitat and seasonal observations	Historical survey; cannot be treated as a current checklist or trend estimate
Narwade & Rahmani (2020) [5]	Great Indian Bustard Sanctuary and surrounding south-western Deccan Plateau	Regional comparison for open habitats and conservation-sensitive birds; combines field records and eBird review	Different geographic coverage and sampling design; not a district-specific census
Bibby *et al*. (2000); Sutherland (2006) [2, 7]	General survey methodology	Principles for survey design, detection, effort and repeatable monitoring	Methodological sources, not local biodiversity records

Ecological roles of the principal habitat types

1. Wetlands, reservoirs and seasonal water bodies

Wetlands and reservoirs can provide feeding, roosting and resting sites for resident waterbirds and seasonal migrants. Shallow margins, exposed mud, emergent vegetation and open water support different feeding guilds; consequently, water-level fluctuation and shoreline condition can influence the species detected at a site. The district baseline identified wetland areas as particularly species-rich among the habitats surveyed (Narwade & Fartade, 2011) [6]. This finding supports the need to monitor wetlands, but it should not be interpreted as proof that all reservoirs or water bodies have equal conservation value.

Water management can produce both benefits and ecological costs. Maintaining water in drought-prone landscapes may support birds and other wildlife, but rapid changes in water level, shoreline construction, disturbance, nutrient enrichment, waste discharge and removal of marginal vegetation can reduce habitat suitability for some species. Management should therefore consider seasonal

water depth, undisturbed roosting zones, exposed feeding margins and the quality of water entering the wetland. Any claim that a particular irrigation or lake-linking project has caused a measured decline would require before–after data or another defensible comparative design.

2. Grasslands, scrub and open natural habitats

Open habitats are important for ground-foraging and ground-nesting birds, larks, coursers, harriers and other species that depend on relatively open vegetation. Their ecological value is easily underestimated when natural grassland is mistaken for unused land or degraded forest. In the Deccan, open natural ecosystems often occur alongside farms and fallows; the distinction between native grassland, seasonal fallow and heavily modified land is therefore essential for habitat mapping and management.

The regional work of Narwade and Rahmani (2020) [5] highlights the importance of the Deccan open-country landscape, particularly for conservation-sensitive birds such as the Great Indian Bustard. That species should not be described as currently present in a specific Dharashiv locality unless a recent, verifiable record supports the statement. The broader lesson is that conservation of open-country birds requires attention to vegetation height and density, disturbance, nesting areas, prey availability and landscape continuity. Tree planting or afforestation is not automatically beneficial in naturally open ecosystems and should be guided by habitat-specific ecological objectives.

3. Agricultural land and fallows

Agricultural landscapes can support birds through grain, weed seeds, insects, field margins, irrigation channels and scattered trees. Their value varies with crop type, cropping intensity, pesticide use, harvest timing and the availability of fallows. Some species exploit cultivated land, whereas others depend on uncultivated patches for nesting or feeding. A bird checklist alone cannot distinguish beneficial use of farmland from long-term population stability, so future research should measure habitat features and bird responses together.

Potential pressures include conversion of mixed cropping to intensive monocultures, removal of field boundaries, burning or frequent mechanical disturbance, pesticide exposure, and loss of fallow or grassland patches. These are plausible mechanisms based on wider agricultural-ecology literature and should be treated as hypotheses to test locally, rather than as demonstrated causes of decline in Dharashiv in the absence of district-specific measurements.

4. Settlements, roadside habitats and built-up areas

Villages and towns provide nesting and foraging opportunities for some generalist species through buildings, gardens, planted trees, food waste and artificial water. At the same time, traffic, glass, outdoor lighting, free-ranging cats and dogs, nest-site removal and disturbance may affect birds. Urban and peri-urban observations are valuable, but they should be sampled separately from natural habitats because detectability and community composition differ substantially.

Seasonal patterns, migration and detectability

The historical district study found greater recorded richness during winter, which the authors linked to migratory occurrence (Narwade & Fartade, 2011) [6]. This is ecologically plausible for inland Maharashtra, where winter can bring visiting waterbirds and other migrants while local resident species remain present. However, seasonal differences in recorded species can reflect not only genuine arrival or departure but also weather, observer effort, vegetation visibility, water availability and species vocal activity.

A robust annual assessment should sample at least the post-monsoon, winter, pre-monsoon and monsoon periods, with repeat visits to the same sites. Survey dates, start and finish times, weather, route length, observer number and time spent should be recorded. Dawn surveys are useful for many species, but wetlands and nocturnal species may require complementary visits at other times. Repeat sampling helps separate absence from non-detection, while standardized effort permits cautious comparison among habitats and years (Bibby *et al*., 2000; Sutherland, 2006) [2, 7].

Migration status and seasonal presence should be assigned using regional field guides and authoritative species accounts, not inferred from a single observation. Unusual records should be supported by photographs, sound recordings or detailed field notes and reviewed before inclusion. Taxonomy and English names should follow a consistent, current authority throughout the manuscript.

Conservation pressures and evidence needs

1. Land-use conversion and fragmentation

Conversion of open habitat to intensive agriculture, built infrastructure, industrial land or other uses can reduce feeding and nesting areas and separate patches that previously formed a connected landscape. Fragmentation may also increase disturbance at remaining sites. For Dharashiv, these pressures are reasonable priorities for investigation because the district is a working semi-arid landscape and the earlier district paper already noted habitat change concerns (Narwade & Fartade, 2011) [6]. Nevertheless, the magnitude and direction of change should be established through mapped land-cover data and repeat biological surveys rather than assumed.

2. Water-resource development and wetland disturbance

Dams, reservoirs, water transfers and changes in irrigation can alter the timing, extent and quality of aquatic habitats. Such changes may favour some generalist or open-water species while disadvantaging birds dependent on shallow margins, mudflats or seasonally exposed ground. A useful assessment would compare water-level records and mapped shoreline habitats with standardized bird observations. Where project impacts are being evaluated, a before–after/control–impact design or a carefully matched comparison among affected and unaffected wetlands would provide stronger inference than anecdotal observations.

3. Agricultural chemicals and food-web effects

Pesticides can affect birds directly through exposure and indirectly through reductions in insect prey or contamination of food resources. The actual risk depends on compound, dose, application practice, timing and species ecology. A review should not claim pesticide-driven population declines in Dharashiv without local exposure or demographic evidence. Future studies could combine farmer interviews, crop-use records, prey sampling and targeted toxicological monitoring, subject to appropriate ethical and analytical safeguards.

4. Power lines, roads and other infrastructure

Power lines can pose collision and electrocution risks for some large birds, while roads may cause mortality and create disturbance corridors. The risk is highly site- and species-specific. Infrastructure screening should prioritize verified records of threatened or collision-prone species, flight paths, wetland approaches and open-country movement areas. Mitigation should be based on mapped risk rather than blanket assumptions that all infrastructure has equal effects.

5. Climate variability and drought

Rainfall variability and high temperatures can influence the persistence of shallow water, plant growth, insect availability and the timing of breeding. In semi-arid systems, these drivers interact with water extraction, cropping patterns and land management. A single year's observations cannot establish a climate-driven trend. Long-term monitoring paired with rainfall, temperature and water-level data would be needed to distinguish climate effects from land-use change and normal seasonal variation.

Threatened and conservation-sensitive birds

Narwade and Fartade (2011) [6] reported eight species in threatened categories according to the assessment framework available at that time, including records of the Great Indian Bustard and several waterbirds or raptors. Conservation categories are revised periodically; the historical labels in the original paper must therefore be treated as time-specific. Any updated table should verify each species against the current IUCN Red List, and where appropriate national schedules and state-level conservation assessments, with the assessment year stated explicitly.

The Great Indian Bustard is especially relevant to the wider Deccan Plateau because it is a highly threatened open-country species and has been a focus of regional conservation research. The south-western Deccan study provides important regional context (Narwade & Rahmani, 2020) [5], but a regional record does not establish current occupancy within Dharashiv District. The manuscript should distinguish confirmed district records, historical reports, records from neighbouring districts and species that are only potential priorities for targeted surveys.

Conservation priority should not be based solely on global threat status. Locally important criteria include habitat specialization, breeding evidence, regularity of occurrence, population concentration, ecological function and exposure to local pressures. A common species can also be a useful indicator of environmental change when its observations are collected consistently over many years.

A proposed framework for future monitoring

A district-wide programme should begin by dividing the landscape into sampling strata representing wetlands and reservoirs, open grassland and scrub, agricultural mosaics, rocky habitats, settlements and peri-urban areas. Within each stratum, sites should be selected to represent variation in disturbance, water regime and land use. The sampling frame and selection procedure should be documented so that results are not biased toward easily accessible or bird-rich locations.

At each site, fixed-length transects or fixed-duration point counts can be used, provided the method is appropriate to the habitat and applied consistently. Wetlands may require shoreline transects and counts of roosting or feeding birds; open habitats may be better sampled with repeated transects or points that capture distance and detectability; settlement surveys should use routes or points that can be revisited. Observers should record species, number of individuals, behaviour, breeding evidence, habitat, date, time, weather, effort and confidence of identification. Photographs or audio should be retained for unusual records.

A verified master checklist should include accepted scientific name, common name, evidence source, date, locality, habitat, seasonal status, conservation category and confidence level. Taxonomic synonyms should be reconciled, duplicate citizen-science records removed, and records with imprecise coordinates or uncertain identification flagged. eBird or similar platforms can extend spatial coverage, but opportunistic records should not be combined naively with standardized counts because observation effort is uneven.

For quantitative analysis, observed richness can be reported alongside sampling effort and coverage estimates. Diversity indices such as Shannon or Simpson may be used only when the underlying abundance data are suitable and sampling is sufficiently comparable. Occupancy models may help account for imperfect detection where repeat-visit data are available. Trend analyses require repeated observations using consistent protocols and should report uncertainty. Land-cover change can be quantified using satellite-derived classifications validated with field observations; conclusions should distinguish correlation from causal evidence.

Table 2: Recommended monitoring design and outputs

Component	Recommended practice	Primary output
Habitat stratification	Sample wetlands, open natural habitats, farms/fallows, rocky areas and settlements separately	Comparable habitat-specific records
Seasonal coverage	Repeat surveys in monsoon, post-monsoon, winter and pre-monsoon periods	Seasonal occurrence and turnover
Standardized effort	Record route length or count duration, start time, weather and observers	Effort-aware comparisons
Record validation	Use current taxonomy; retain evidence for rare or unusual records; flag uncertain records	Auditable checklist
Citizen-science integration	Use dated, georeferenced records and screen duplicates, effort and identification confidence	Expanded distribution context
Habitat-change analysis	Map land cover, shoreline and open-habitat change with field validation	Spatially explicit change indicators
Trend analysis	Use repeat-visit models or comparable annual indices when data permit	Estimates with uncertainty rather than unsupported claims

Research gaps and priorities

The first priority is an updated district-wide checklist based on a documented sampling design. Since the principal published district survey dates to 2007–2008, a new assessment should not assume that the historical total of 165 species is either complete or unchanged. It should also distinguish new records from species missed in earlier work, seasonal visitors from accidental occurrences, and confirmed breeding from simple presence.

The second priority is a habitat-focused assessment of open natural ecosystems. Grassland and scrub should be mapped according to ecological structure and land-use history rather than grouped automatically with degraded land. Surveys should target open-country specialists and ground-nesting birds while also recording common species that can serve as indicators of landscape change. Potential records of highly threatened species require independent verification and careful handling of sensitive locality information.

The third priority is long-term wetland monitoring. Terna Lake and other district water bodies could be assessed with repeated seasonal counts, water-level observations and shoreline habitat mapping. The goal should be to determine how bird use changes with water regime and disturbance, not to assume in advance that any particular management intervention has caused a decline.

The fourth priority is a transparent data infrastructure. A district bird atlas or open checklist should document sources, survey effort, record confidence, taxonomic decisions and revision history. Collaboration among universities, local naturalists, forest and wetland managers, and citizen-science contributors could improve coverage. Data should be archived in a form that permits future researchers to reproduce analyses and compare later surveys with the historical baseline.

Finally, research questions should be framed so that evidence can answer them. For example: do open-habitat specialists occur less frequently in sites with greater conversion of natural grassland; does wetland bird richness vary with water-level fluctuation and shoreline disturbance; and are seasonal occurrence patterns changing across repeated years? These questions require appropriate sampling and covariates. They should not be answered using a simple comparison of checklist totals compiled under different methods.

Conservation recommendations

Conservation planning should recognize wetlands, grasslands, scrub, fallows and agricultural margins as parts of a connected landscape. For wetlands, priorities include retaining suitable shallow-water and shoreline habitat, limiting avoidable disturbance at roosting sites, monitoring water quality and water-level changes, and managing waste inputs. For open natural habitats, planning should avoid indiscriminate conversion or tree planting that changes naturally open vegetation, and should protect breeding areas where confirmed records justify action.

Agricultural measures can include retaining field margins and selected fallows, reducing unnecessary pesticide exposure, protecting nesting sites during sensitive periods where feasible, and maintaining small habitat patches within cultivated landscapes. Infrastructure planning should use verified bird records and habitat maps to identify potential collision or disturbance risks. These recommendations should be adapted through consultation with landholders and local agencies so that conservation actions are feasible within the district's agricultural and water-management context.

Monitoring and management should be linked through periodic review. A district-level conservation dashboard could report survey coverage, verified species records, status of selected priority habitats, wetland condition and implementation of management actions. It should clearly distinguish measured indicators from management activities and avoid presenting the number of observations submitted by citizen scientists as a direct measure of population size.

Conclusion

Dharashiv's avifauna is associated with a semi-arid landscape in which wetlands, open grassland and scrub, cultivated land, fallows and settlements form an interdependent habitat mosaic. The 165-species checklist published by Narwade and Fartade (2011) [6] remains the central historical district-level reference, while the regional study of the south-western Deccan Plateau provides useful comparative and methodological context. Neither should be mistaken for a contemporary district census. The most urgent scientific need is a repeatable, seasonally balanced survey linked to habitat mapping and transparent record validation. Conservation should protect the ecological functions of both aquatic and naturally open habitats, evaluate land-use and water-management changes with measurable indicators, and integrate standardized field surveys with carefully screened citizen-science data. Such an approach would move local ornithology beyond checklist accumulation toward evidence-based assessment of ecological change and practical conservation priorities.

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