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Biodiversity of birds in Jamtara, Jharkhand, India

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Abstract
This is an ornithological study based in the nature field to study the birdlife diversity in the district of Jamtara which is in the eastern state of India, Jharkhand, during the period of 3 months between the months of February to April 2025. The main purpose consisted in recording distribution of bird species and abundance along a gradient of diverse habitat types, such as freshwater wetlands, sal-dominated dry deciduous forest, agro-scrub mosaics as well as forest-village ecotones. The research utilized a multi-faceted method that incorporated line transect studies, the point count technique and opportunistic sightings to provide a strong data of regional avifaunal diversity. The survey recorded 134 species of birds indicating an abundance and diversity of avifaunal assemblage. It was found that some 45 percent of the noted species were recorded during winter visitation or migrant passage, in keeping with the distribution of the district being part of the Central Asian Flyway network, which is a major one of the world migratory patterns. Among these were species of international conservation concern like Woolly-necked Stork (*Ciconia episcopus*), Common Pochard (*Aythya ferina*) and Tufted Duck (*Aythya fuligula*) which are rated as Vulnerable in the IUCN Red List.
In order to measure the ecological diversity of study area, Shannon Diversity Index (H′) was computed and the value of this index was found to be 2.23, which portrays moderate to high species diversity and comparatively uniform distribution of individuals within various habitat types. The species-habitat relationship analysis showed evident ecological patterns, whereby wetlands were important habitats to migratory waterfowl and waders; forests supported a large number of fruit and insectivorous citizens such as barbets, woodpeckers, and green pigeons; on the agricultural-scrub interface, ground-foraging birds were found in abundance, comprising lapwings, pipits, and larks. Based on the findings, it provides support to the ecological diversity and conservation relevance of Jamtara landscape, especially with the prevailing anthropogenic pressures, such as deforestation, poor habitat fragmentation, and uncontrolled wetland exploitation. The research suggests that repeated seasonal observation, community-centered conservation awareness, and habitat restoration programs to be vital measures of protecting avian biodiversity. Such baseline data will play a major role in regional planning in the future and ecological studies in eastern Jharkhand.

Keywords: Avian diversity, Jamtara District, migratory birds, shannon diversity index, habitat gradient, conservation planning, wetland and forest ecosystems, central asian flyway

Introduction
Biodiversity is central to the functioning of an ecosystem and more specifically birds play a significant role as bioindicators of the health of an ecosystem. Their presence, variety and their behavior are manifestation of the quality of habitats and sustainability of ecosystems (Sutherland *et al*., 2004) [8]. Birds play a critical role in the ecosystem services i.e. pollination, pest control, seed dispersal and nutrient cycling (Whelan *et al*., 2008) [9]. Avian diversity monitoring assists in identifying changes and devising conservation plans on the environment. Birds are also one of the most obvious and most tested indicator of ecosystem health as they respond well to changes in habitat, their trophic levels, and migrations (Gregory & van Strien, 2010) [4]. They live in different ecological niches and are quick to adapt to the change in the environment hence play a critical role in determining the biodiversity and the integrity of the habitat (Bibby *et al*., 2000) [2]. The surveillance of bird diversity, is hence an effective method of assessing the effects of the changes of land-use, changes of climate, and other conservation efforts.
Jamtara, a district in East India section of Jharkhand, India has a heterogeneous landscape, consisting of dry deciduous forests, crops, scrubland and fresh water wetlands. They give ecological environments that are friendly to both migratory and resident species of birds because such types of habitat exist in a relatively small part of the geographical land. The area is located in the Central Asian Flyway, one of the major migratory flyways which helps to facilitate seasonal migration of water birds and passerines in Eurasia and Indian sub continent (CMS, 2020) [3]. The diversity of birds across seasons particularly change between the late winter (Feb) and early breeding time (April) is unexplored since it is important in determining fluctuations in species composition, arrival/departure patterns of migrants, and local breeding proxies. In a bid to fill these research gaps, this study carried out a three months field survey in Jamtara, between February and April 2025. These aims were to (i) measure the number of avian species and their abundance in different types of habitats and (ii) determine priority conservation-relevant species and migratory taxa as well as (iii) derive patterns of diversity in terms of ecological indexes, including the Shannon-Diversity Index (H). In this way, the study would give a foundation to future ecological monitoring and conservation planning in the eastern Jharkhand.

Study Area

Field research was undertaken at Jamtara district in the eastern state of Jharkhand in India in the geographical region of the Chotanagpur Plateau, whose varieties of ecological habitats featured dry deciduous forests, seasonal freshwater wetland, scrubland, cultivated lands and villages. The district is located in an area of about 1,800 square kilometers and is characterized by subtropical climatic conditions that have the wet and the dry seasons, which is a favorable area both to the resident and migratory birds. To conduct systematic avian surveys, four representative sites were chosen depending on heterogeneity and ecological value. Ladhna Dam (23.9380° N, 86.8434° E) is a seasonal freshwater body, and acts as an essential stopover place during the migration of ducks, waders and other water birds along the Central Asian Flyway. Jamtara Forest Range (23.9601° N, 86.8002° E) comprise mostly of sal dominated dry deciduous forests with bamboo and riverine patches which extend and accommodate canopy insectivores and also forest specialists. Kundhit Block (24.1000° N, 87.0167° E) favoring seed-eaters and to some extend, ground-nesting birds, includes a transitional agro-scrub zone of open fallow fields and scattered trees which is visited by seed-eaters such as pipits and larks. Technical Narayanpur Range (23.8700° N, 86.7700° E), on the boundary between human settlement and forest area, is a forest village edge site with great diversity of generalist and synanthropic species that becomes moderate impact tolerant. The combination of the four ecologically diverse sites therefore give a good cross-section of Jamtara with respect to habitat diversity and a meaningful analysis can be done concerning the bird distribution and bird richness as well as habitat specific assembly.

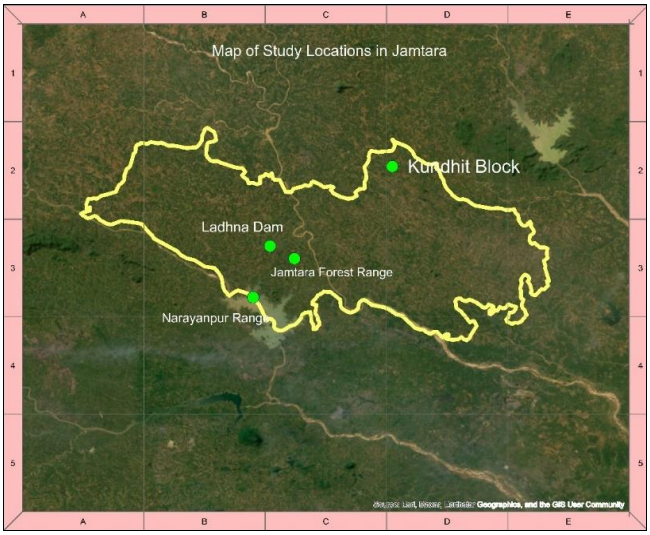

Fig 1: Map of Study Location in Jamtara

Materials and Methods

1. Survey Period

The avifaunal survey was carried out in three months between 1 st February and 30 th April 2025, which is in the late winter to early breeding season in eastern India. Observation days were divided into 54 days of equal distribution in four sites that were ecologically different in the Jamtara district to allow a constant sampling effort and patterns of time in bird diversity.

2. Survey Design and Sampling Methods

A stratified habitat-based sampling strategy was used in order to increase coverage of the habitat types; wetlands, sal forests, agro-scrub mosaics and village-forest ecotones. The ornithological field procedures listed below were applied standardly:

Line Transect Sampling: Each of the four study sites has 12 transects, with each being between 1.5 to 2 kilometers. Transects were walked twice a week ideally at the time of the day when birds were most active (0600-0930hrs and 1600-1800hrs). Any bird noticed or heard at least 50-meter on either side of the transect was observed with no duplication achieved by paying attention when tracking.

Point Count Method: The Point Count Method entailed the designation of six fixed-point stations of representative microhabitat in the study landscape, in addition to the transect walks. Census was performed twice a week at each station (10 minutes), and all species of birds that were identified around the census area (50 meters) were listed. This was particularly helpful in finding shy, immobile or canopy living species which may be under-represented in transects.

Opportunistic Sampling: Species which were sighted in between formal sampling periods (transect or point counts) (e.g. species sighted in transit to/from other study locations, or in early morning/evening) were recorded, to augment the species inventory, but were excluded during quantitative analysis in other ways.

3. Tools and Equipment

Birdwatching equipments used include; a standard birdwatching kit that carried binoculars 10x 50, a Canon EOS DSLR camera with zoom lens 300mm to capture photographs of birds and an audio recorder to record bird calls, printed field data sheets, and a GPS device to geotag the field observation. The field guide by Grimmett, Inskipp & Inskipp (2011) [5] was used to identify species, and local checklists as well as eBird India information was used to verify species records.

4. Data Analysis

All the observations made were all collected into a central database, including the name of species, the number of individual creatures, the place, habitat, and behavior (e.g., flying, foraging, vocalizing). The species richness and relative abundance of each type of habitat was obtained. To assess species diversity, the Shannon-Wiener Diversity Index (H′) was applied using the formula:

$$H' = -\sum_{i=1}^{S} p_i \ln (p_i)$$

Where, p_i represents the proportion of individuals belonging to the i^{th} species and S is the total number of species. Habitat-specific diversity values were compared to identify patterns of species assemblages and habitat preferences. Migratory status and conservation concern (e.g., IUCN Red List categories) were also recorded for focal species.

Results

1. Species Observed

A total of 134 bird species were recorded. Below is a sample species table

Species Name	Count	Habitat Type	Migratory	IUCN Status
Rufous Treepie	21	Agroforestry	No	Least Concern
Jungle Myna	25	Forest	No	Least Concern
Black Drongo	15	Agroforestry	No	Least Concern
Blue-throated Barbet	10	Forest	No	Least Concern
Pied Starling	17	Agroforestry	No	Least Concern
Red -wattled Lapwing	13	Wetland	No	Least Concern
Copper Smith barbet	11	Forest edge	No	Least Concern
Common Pochard	9	Wetland	Yes	Vulnerable
Yellow-footed Green Pigeon	5	Forest	No	Least Concern
Tufted Duck	7	Wetland	Yes	Vulnerable
Woolly-necked Stork	1	Forest edge	No	Vulnerable

Out of the three months field survey that was completed between the months of February- April 2025, 134 numbers of bird species were observed in four most common habitats of the Jamtara district. These were resident and migratory ones that have been seen in the wetlands, forests, the agroforest areas and the village-forest boundaries. The diversity of avifauna forms in the region reflects by a sample of the recorded species. Such frequently observed resident species might be Rufous Treepie (*Dendrocitta vagabunda*, 21 individuals), Jungle Myna (*Acridotheres fuscus*, 25), Black Drongo (*Dicrurus macrocercus*, 15), and Blue-throated Barbet (*Psilopogon asiaticus*, 10), which are characterized as Least Concern species by IUCN. The observable species were major in the agroforestry and their sal dominated forest habitats.

The presence of wetland environments, including the area near Ladhna Dam, sustained water-related birds such as Red-wattled Lapwing (*Vanellus indicus*, 13) and Common Pochard (*Aythya ferina*, 9), with the latter being a migrant bird that is currently on IUCN Red List as Vulnerable. In the same way, but in lower numbers, there were the Woolly-necked Stork (*Ciconia episcopus*, 1) and Tufted Duck (*Aythya fuligula*, 7), both attending to Vulnerable status with comparatively low international populations. The Yellow-footed Green Pigeon (*Treron phoenicoptera*, 5) was normally linked to interior forest areas whereas the Pied Starling (*Gracupica contra*, 17) and Coppersmith Barbet (*Psilopogon haemacephalus*, 11) were characterized to the edge habitats and semi-urban green midst.

This mini-dataset indicates an ecological gradient that exists in Jamtara, such as water bodies, forests interiors, and anthropogenic landscapes, and it makes it clear that multi-habited conservation approaches would be beneficial to conserve generalist and specialist, bird species. The occurrence of IUCN Vulnerable species (especially involving wetland ecosystems) calls a special need to protect the habitat and subsequent monitoring of it.

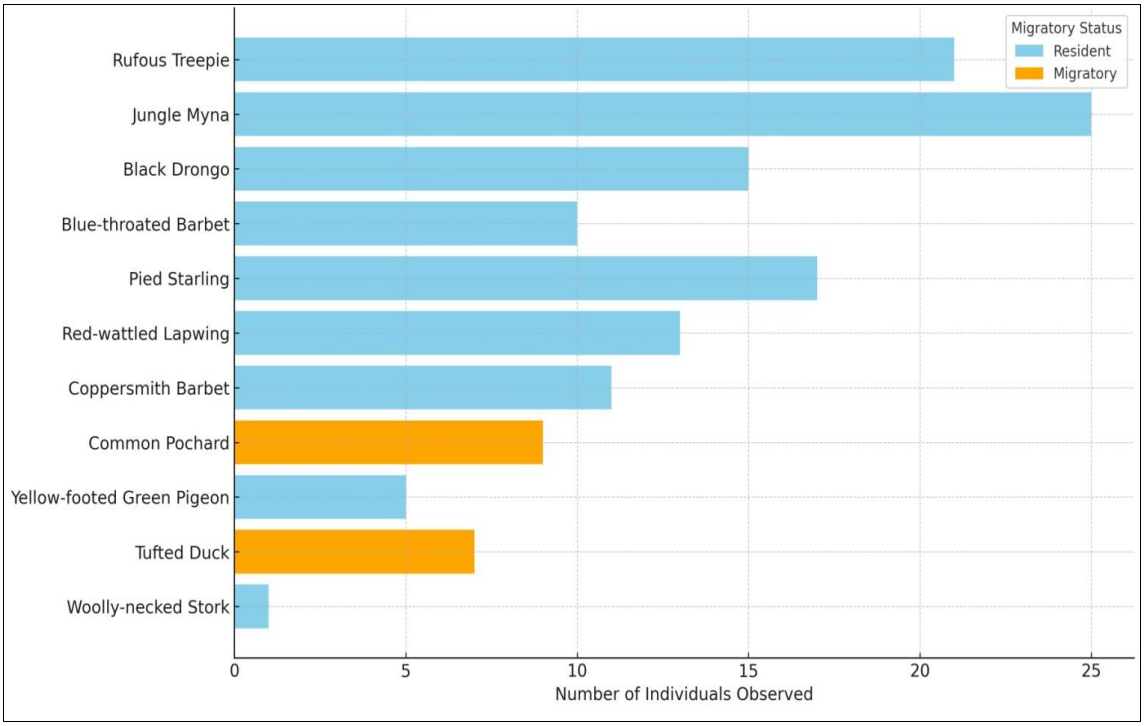

Fig 2: Bird Species Count (Feb–Apr 2025, Jamtara)

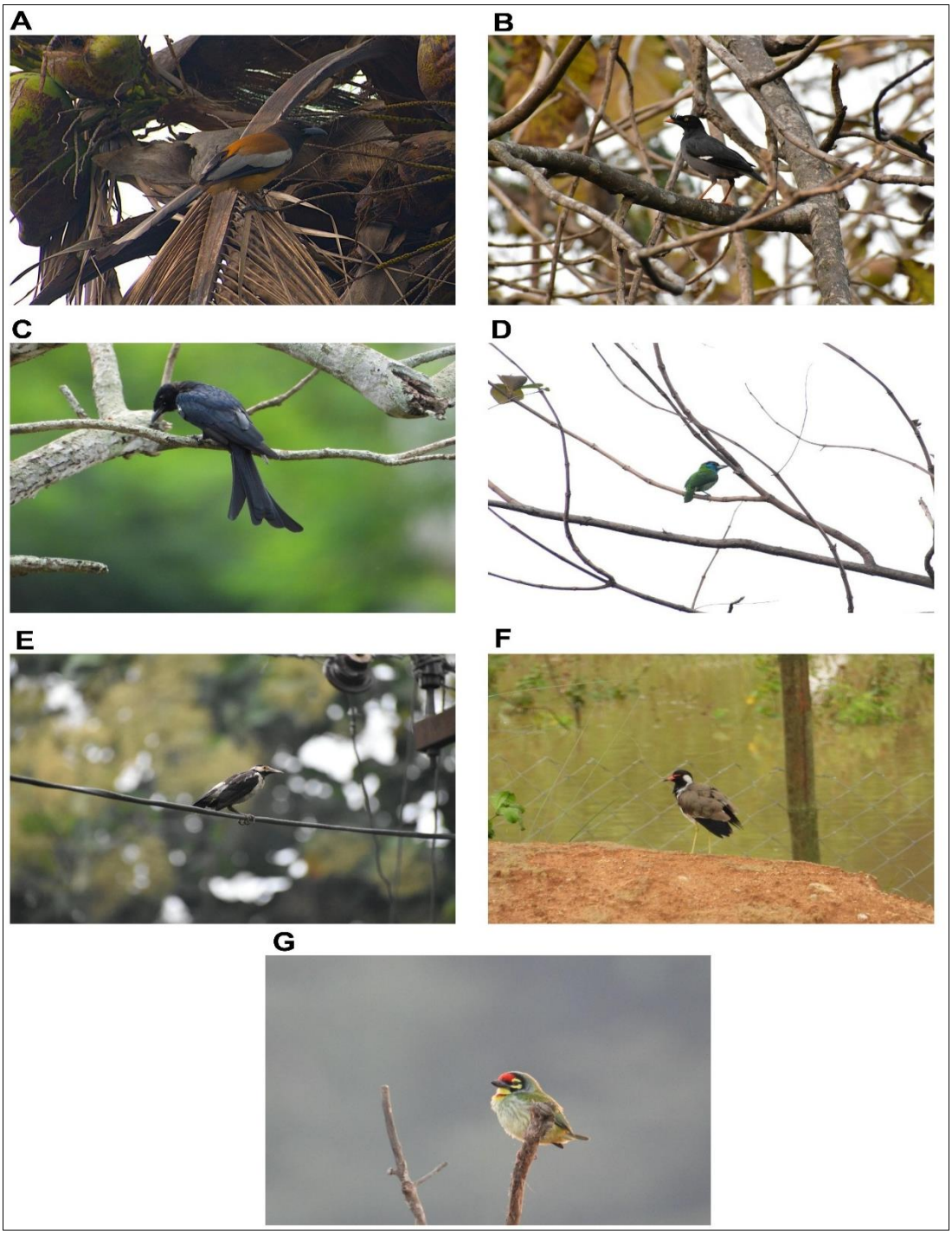

Fig 3: A. *Dendrocitta vagabunda* B. *Acridotheres fuscus* C. *Dicrurus macrocercus* D. *Psilopogon asiaticus* E. *Gracupica contra* F. *Vanellus indicus* G. *Psilopogon haemacephalus*

2. Diversity Index

The ecological measures of bird diversity in study area were quantified with standard measures of ecology. The species richness (S) which refers to the count of unique bird species found was discovered to be 11 species on the basis of the sample data set. The species were spread into several habitat classes such as wetland, forest, agroforestry, and edge environments. In the count of individual birds (N), the number of birds found in the study sites is 134, and hence, the avian population in the studied habitats is moderately dense. The Shannon Diversity Index (H) was utilized to assess the homogeneity of species taking into consideration the abundance and evenness of the species. The obtained value of 2.23 shows that the number of species representing the avian diversity was moderate to high and thus the community of the birds was likely to consist of a couple of species of somewhat equal numbers instead of being represented by a few ones. The following index is associated with the fact that at least in Jamtara, the study sites harbor a structurally rich avifauna, comprised of widely distributed basic birds as well as migrants of conservation interest. High species richness, the moderate amount of population abundance, and a balanced distribution of species underlines the ecological value of the area and justifies the hope of developing the region as a conservation priority landscape.

Discussion

1. Seasonal Patterns

The bird census carried out throughout the months of February and April in the year 2025, showed clear seasonal differences in the presence of the species and the behavior. A strong concentration of the migrating waterfowl in the wetland areas of the region, especially Ladhna Dam, was also observed during February to early March, which correlates with the trends along the Central Asian Flyway (CMS, 2020) [3]. These migratory species are using the water bodies of Jamtara as pit stops or wintering grounds to on route their way back to Central and Northern Asia breeding habitats. In April, the behavior of avian species changed dramatically with a heightened frequency of aggressive, courtship, and nesting behaviours occurring in resident forms of Rufous Treepie, Jungle Myna and Blue-throated Barb*et al*though the intensity of such activities pattern with the phenology of tropical Indian avifauna (Ali & Ripley, 1987 [1]; Grimmett *et al*., 2011) [5].

2. Habitat-Specific Observations

The survey also supported the significance of heterogeneous habitat in species richness preservation. Such wetlands as Ladhna Dam proved very important to migrating ducks, plovers, and lapwings once again demonstrating that small water areas are the essential wet-season refuges (Manakadan & Pittie, 2001) [7]. Sal dominated forests had species variation of woodpeckers, green pigeons and parakeets and the sal forests were important in terms of vertical complexity of habitats that supported canopy and understorey insectivores. These agricultural and scrub mosaics are the source of ground-nesting birds, like pipit, larks and lapwings point to the conclusion that even semi-modified lands are having significant value as foraging and nesting areas. This kind of variation within the landscape encourages niche separation and temporal outcrop between the avifaunal groups thereby improving the diversity of the community (MacArthur & MacArthur, 1961) [6].

3. Threats

Though the ecological richness has been found, it was realized that there are several anthropogenic hazards that may impact the avian habitats in Jamtara. Uncontrolled fishing, grazing of livestock and reed-burning that occurs some time at Ladhna Dam disturbed known foraging sites of wetland-dependent birds directly. Likewise, the practices of deforestation and extraction of fuelwood on the forest peripheries particularly Narayanpur Range were destroying important nesting or roosting sites of forest dwelling species. What is most worrying perhaps is the fact that the community did not even seem to have a clue about the ecological and legal status of some of the protected species. The interviews with the local people proved that there is very little awareness of the IUCN Red List categories or the importance of such birds as the Woolly-necked Stork and the Common Pochard, the former category being Vulnerable and the latter, Endangered. Such results indicate that joined conservation activities which incorporate a mixture of habitat safeguards, long-term sustainable land-use and ecological training that can be designed to satisfy land people in rural forest-edge homes (Kumar & Bhatt, 2000).

Conclusion

The results of the three months field survey explain why Jamtara district is an ecologically important living hotspot of avian biodiversity in the region. Records of 134 species of birds with some migratory birds involved and the IUCN threatened species like the Woolly-necked stork, Common Pochard, and the Tufted Duck demonstrate the positioning of the district in sheltering other birds (resident and transient) in the mosaic habitat. The Shannon Diversity Index ($H'=2.23$) computed does not only represent a moderate to high species diversity, but also a more or less equal distribution of the species representing relative ecological stability and heterogeneity of the habitat across wetlands, forests, agro-scrub mosaics and interface villages. Nonetheless, it is important to note that in some habitats, the existence of environmentally specific threats, like unrestricted use of resources within wetlands, deforestation of forest edges, and the lack of popular awareness are the important reasons why conservation should focus more on such sensitive wetland-dependent migrants and forest specialists. Depending on observation, the study proposes a broad-scaled conservation, with the incorporation of the season and long-term avifaunal monitoring, localized habitat restoration, and community environment education programs. The steps are not only necessary to support the unique bird life of Jamtara but will also help incorporate the conservation of biodiversity in the ecological planning and policy of the region.

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