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Cover: Oil painting of Humpback Whale *Megaptera novaeangliae*. © R. Mahesh.



A nesting attempt by Greater Flamingo *Phoenicopterus roseus* in an inland wetland in Kachchh District, Gujarat, India

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Abstract: India is home to the two flamingo species – Greater Flamingo *Phoenicopterus roseus* and Lesser Flamingo *Phoeniconaias minor*. Saline mudflats (Rann) of the Kachchh landscape in western India support the largest breeding sites of flamingos in Asia. In 2019, we conducted a wetland survey across Kachchh between January and December 2019 and recorded nesting of Greater Flamingos in Ratnal, a freshwater irrigation tank. Around 400 Greater and 700 Lesser Flamingos were observed foraging at this site on 25 July 2019. We recorded a total of 35 mud mounds, the morphometrics of 10 intact mud mounds were taken, and the mean height was 26.4 (\pm 2.38) cm, and the circumference was 28.4 (\pm 1.36) cm. These measurements closely matched the published dimensions of Greater Flamingo nests, indicating the species likely constructed them. The courtship displays of both species were observed during the study period; however, no eggs were laid. Further, the nests were abandoned following heavy rainfall in August 2019. We monitored the wetland for the next three years, 2020–2023, but no further nesting attempt was recorded. This observation likely represents a false nesting attempt by Greater Flamingo and highlights potential flexibility in nest-site selection, underscoring the importance of systematic monitoring of freshwater wetlands, and they may serve as both breeding and non-breeding habitats.

Keywords: Breeding sites, foraging, freshwater irrigation tank, nest-site selection, Phoenicopteriformes, Phoenicopteridae, wetland survey.

The Greater Flamingo *Phoenicopterus roseus* and Lesser Flamingo *Phoeniconaias minor* are the two most widely distributed flamingo species across Asia,

Africa, and Europe (BirdLife International 2025). In India, Greater Flamingo is widely distributed across the country, with the exception of the northeastern Indian states, and occurs in a diverse range of wetland habitats, such as inland freshwater bodies, reservoirs, salt pans, coastal wetlands, lagoons, and intertidal zones (Tere 2005; Salvador et al. 2022). In contrast, Lesser Flamingo has a more restricted distribution, particularly in mudflats near coastal areas (Tere 2005). The wetlands of Kachchh District serve as significant sites for both breeding and non-breeding populations of flamingos. The Greater Rann and Little Rann of Kachchh, collectively spanning over 20,000 km², are vast seasonal salt marshes that get inundated during the monsoon season, creating ideal conditions for flamingo nesting. The Greater Rann of Kachchh houses one of Asia's largest breeding colonies of Greater Flamingos at the site famously known as 'Flamingo City'. The Little Rann of Kachchh largely supports a breeding population of Lesser Flamingos, especially in shallow saline mudflats and salt pans (Ali 1945; Mundkur et al. 1989; Singh et al. 1999; Tere 2005; Vyas 2015; Rathwa 2022). Both species are recorded breeding successfully at the Great Rann of Kachchh, near Kuda (Parasharya et al. 2010; Sirola &

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Kumar 2023; Tere et al. 2025). The nesting of flamingos is highly erratic, influenced by a complex interplay of hydrological conditions, habitat availability, and anthropogenic disturbances (Johnson & Cézilly 2007; Krienitz 2018). Irregular nesting and low reproductive success due to human disturbances pose a threat to the population of both species of flamingos (BirdLife International 2025). In India, flamingos have been listed as a Schedule II species under the Wildlife Protection Act 1972. In recent years, the Greater Flamingos have been recorded breeding successfully at the Gulf of Khambhat, outside their regular breeding sites in the Rann of Kachchh (Parasharya & Gadhi 2020). Both species are also recorded making nesting attempts at several non-traditional sites across India, suggesting a potential shift

and expansion in their nesting sites (Andharia & Andharia 2024). These observations indicate the importance of regular and systematic monitoring of flamingos' habitats (Byju et al. 2025) to assess habitat quality and guide targeted conservation interventions.

We conducted pilot surveys across 91 wetlands of Kachchh District from January to March 2019 to record the presence of flamingos as part of a study to assess the impacts of energy infrastructure on large bird species (Image 1). Based on the pilot surveys, the Ratnal wetland (23.19° N, 69.91° E) was selected for monthly monitoring to understand the seasonal fluctuations in the population of flamingos. Ratnal is a 19 ha freshwater irrigation tank built to collect rainwater and irrigate agricultural fields in the surrounding areas. We report

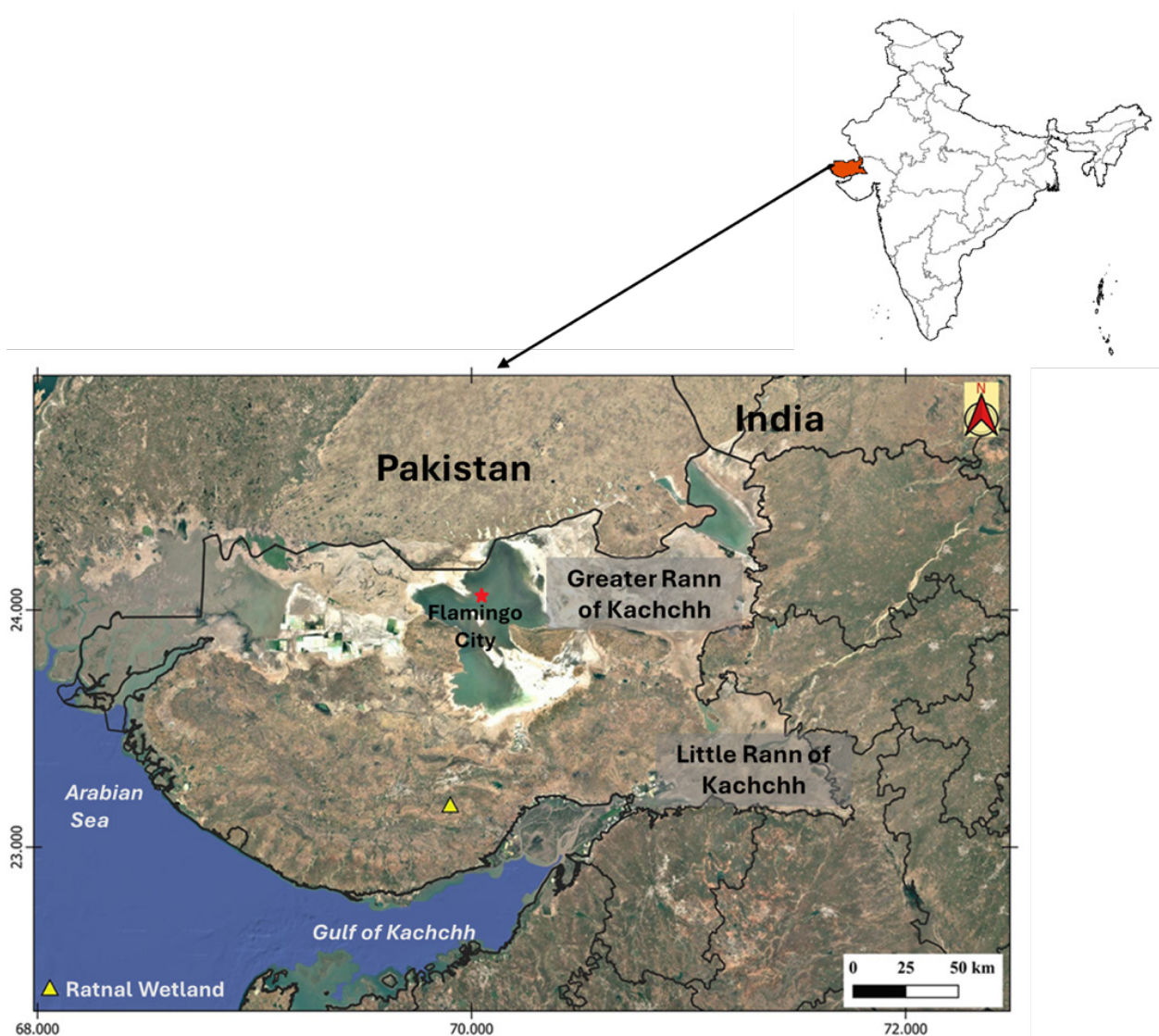


Image 1. Location of Ratnal wetland in western India.

an instance of Greater Flamingo attempting to nest in the Ratnal freshwater wetland.

OBSERVATIONS

We recorded Lesser Flamingos (~700) and Greater Flamingos (~400) at the Ratnal wetland on 25 July 2019. Both species were foraging actively. We documented 35 cylindrical, empty, unattended mud mounds of flamingos on the eastern side of the wetland (Image 3). These structures were not observed in our previous field visits in June 2019, indicating their construction in the interim period. Among the total, eight mounds were smaller and malformed, likely representing incomplete nest structures. Thereafter, the site was monitored continuously over three consecutive days from a fixed position from the bank of the wetland, using a spotting scope to minimize disturbance to the birds. Both the flamingo species were observed engaging in courtship displays (Image 2); however, none approached or occupied the nests, suggesting their abandonment prior to egg-laying. All nests were located on an island with an area of 645 m² and surrounded by knee-deep water on the northern side and shallow water on the southern fringes (Image 3). The nesting area was estimated by recording the boundary of the wetland through GPS tracking along its perimeter. The recorded track was then imported into QGIS software, where it was converted into a polygon using the “Path to polygon” tools. This polygon was subsequently used to calculate the total nesting area. The nest monitoring was retrospectively conducted in accordance with the guidelines proposed in Barve et al. (2020). The nests were not physically examined by the authors until the flamingos left the site. With the onset of monsoon in August, the area experienced heavy rainfall and subsequently, all flamingos left the wetland on 14 August 2019, likely moving toward the Rann of Kachchh. The morphometric data of 10 fully intact nests with the



Image 2. a—Greater Flamingos performing Wing Salute and Alert posture | b—Lesser Flamingos displaying at Ratnal wetland in July 2019. © Harindra Baraiya.

Table 1. Comparison of nest morphometrics with available published literature.

Source	Species	Average Height (cm)	Top Diameter (cm)
Makwana 2022	Lesser Flamingo	~16	~21
Tere 2005	Lesser Flamingo	11.7–17.9	21.5–27.4
Vyas 2015	Lesser Flamingo	29.5–30.8	25.4–26.5
Salvador et al. 2024	Greater Flamingo	7.6–40	25–37
Tere 2005	Greater Flamingo	11.3–33.2	11.7–17.7
Current Study*	Greater Flamingo	26.4	28.4

*Measurements were taken post rainfall; actual height may be higher and diameter lower.

least visible damage due to rainfall were collected on 20 August 2019. The mean top diameter of the nests was 28.4 ± 1.36 cm, and the mean height was 26.4 ± 2.38 cm. These measurements were compared with published nest morphometry data for flamingos (Table 1). Although there is some overlap in nest dimensions between Lesser and Greater Flamingos, the observed values in the present study more closely align with those reported for Greater Flamingos, particularly in terms of the larger top diameter.

Follow-up visits (once a month) in the breeding season (July–December) of 2020 and 2021 (February–March, July–October) were made, but no nest-building activity was recorded. Continuous monthly monitoring could not be maintained throughout 2020 and 2021 due to COVID-19 restrictions and was resumed in 2022 and 2023. On 04 July 2022, Greater Flamingos were once



Image 3. Several nest mounds were observed near the eastern edge of the Ratnal wetland, July 2019. © Harindra Baraiya.



Image 4. Greater Flamingos observed performing a wing salute, a type of courtship display at Ratnal wetland, July 2022. © Gaurav Sirola.

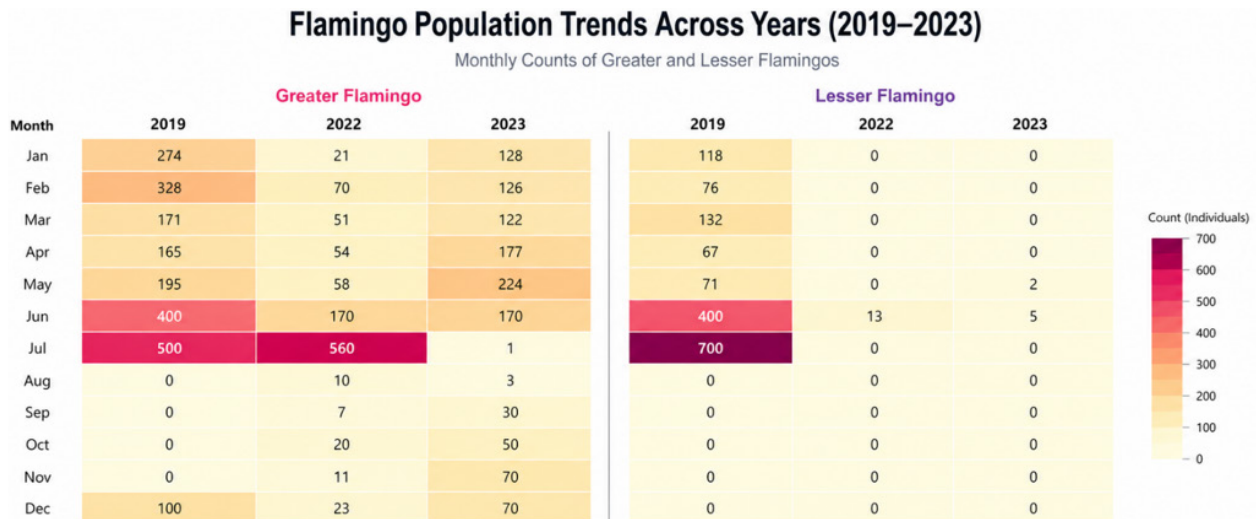


Figure 1. Details of flamingo recorded at Ratnal during monthly surveys.

again observed performing courtship displays (Image 4), but no nest-building activity was observed during weekly visits conducted through the remainder of the season in 2022 and 2023.

DISCUSSION

This is the first instance of a Greater Flamingo attempting to nest in a freshwater inland wetland in Gujarat's Kachchh District close to the "Flamingo City". Thakker (1983) recorded 70–80 nests of flamingos along with juveniles at Thol Bird Sanctuary near Ahmedabad, Gujarat; however, no confirmed successful breeding was documented at the site. Later, in 1993, at Shahwadi Wetland, Gujarat, Tatu (1997) observed 12 nests built by Greater Flamingos, which were later abandoned. Recently, Andharia & Andharia (2024) reported Lesser Flamingos nesting near Bhavnagar airport in Gujarat in 2021. They recorded 42 intact nests, however, the site was abandoned shortly after the nest-building phase.

In the present study, nest morphometrics were recorded after heavy rainfall, after the birds had vacated the site. Flamingo nests, being composed primarily of mud, are susceptible to erosion, compaction, and structural alteration following rainfall events (Johnson & Cézilly 2007). Greater Flamingo nests are generally larger and more robust, whereas Lesser Flamingo nests are typically smaller and less elevated (Johnson & Cézilly 2007). Hence, we assume rainfall and weathering may have reduced the original height of the nests and slightly increased the apparent top diameter due to structural flattening. Consequently, the original nest dimensions were likely somewhat taller and narrower than actually recorded. This limitation should be considered

when comparing the present measurements with published data. Despite this potential bias, the overall morphometric characteristics remain more consistent with Greater Flamingo nests and exceed those typically described for Lesser Flamingo nests, thereby supporting species identification (Table 1).

Flamingos generally prefer remote, undisturbed wetlands for breeding (Krienitz 2018), and nesting attempts in urban or inland environments near human settlements are uncommon. Abandonment of nests is often observed in flamingos and is commonly attributed to human disturbances, flooding of nest sites or the presence of predators. Furthermore, Johnson & Cézilly (2007) have described a phenomenon termed 'false nesting attempts', in which flamingos gather at non-breeding sites, construct elaborate nests, but do not proceed to egg-laying. Whereas in a failed breeding attempt, eggs are laid and the nest is abandoned due to disturbance or drastic changes in water level. False nesting has been widely documented across the distribution range of the flamingos, though the underlying mechanisms remain unclear. Interestingly, in some cases, false nesting sites later transform into permanent breeding colonies (Johnson & Cézilly 2007). Ratnal Wetland is surrounded by dense thickets of *Suaeda* spp. and *Neltuma juliflora*, with minimal to no human or livestock disturbance. Additionally, water levels were sufficient, and the nesting island was surrounded by water on all sides. Therefore, nest abandonment at this site is unlikely to have been driven by disturbance. We conclude that the nesting event at Ratnal wetland may likely be a false nesting attempt and is documented for the first time in an inland freshwater

wetland from Kachchh close to the traditional nesting site of flamingos in the Greater Rann of Kachchh.

Additionally, we recorded a huge flamingo population at Ratnal wetland just before their breeding season at regular nesting sites in Rann of Kachchh, and then declined rapidly, suggesting their pre-breeding congregation at this site. The largest gathering was observed in July 2019 (approximately 500 Greater and 700 Lesser Flamingos), with numbers decreasing in subsequent years, likely due to increased water depth exceeding 50 cm, which is unsuitable for flamingos. The seasonal fluctuation in the population of flamingos in Ratnal was recorded for three years (Figure 1). This trend was echoed in other inland wetlands studied during the same period. Crucially, all these wetlands lie outside the protected area network and face anthropogenic pressures, such as the establishment of powerlines, water pollution, and wetland reclamation. Collisions with powerlines pose a significant threat to flamingos, particularly when these lines pass through or near wetland habitats (Tere & Parasharya 2011). Thus, systematic ecological monitoring is imperative to identify sites with potential for future breeding colonies, to assess the quality of these habitats, and to propose ways to conserve them.

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