

# Breeding Biology of Great Thick-Knee (*Esacus recurvirostris*) in Fresh Water Reservoir near Wankaner of Morbi District, Gujarat

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## Abstract

*The Great Thick-knee (Esacus recurvirostris) is a captivating bird species that has garnered significant attention from researchers due to its unique breeding behaviors and adaptations. This large wader, characterized by its distinctive upturned bill and striking black and white facial pattern, is a local breeder in humid southern Asia. The breeding season of the Great Thick-knee typically commences in February and extends through July, with peak laying activity occurring in March and April. During this period, pairs establish and defend territories, often selecting dry, open areas near water bodies such as reservoirs, riverbeds, and lakeshores. The nest is just a shallow depression in the bare ground, without any complex structure. A clutch usually consists of two large, cryptically colored eggs, which are incubated by both parents for approximately 28 days. Parental care extends beyond incubation. Both parents actively participate in brooding and guarding the chicks, shielding them from potential predators and harsh weather conditions. The chicks are precocial, which means they are quite developed when they hatch and can move around on their own. Both parents feed the chicks by placing food directly into their mouths. Around 40 days after hatching, the chicks fledge, becoming independent and able to find food on their own. The breeding habits of the Great Thick-knee depend on several factors, such as habitat quality, food supply, and the risk of predators. Human activities, such as habitat loss and disturbance, can pose significant threats to their breeding success. However, based on available research, it is generally quite low at 0.2887 and 0.343 for two different sites of studies. Understanding the intricacies of their breeding ecology is crucial for implementing effective conservation measures to protect this remarkable species.*

**Keywords:** Breeding biology, hatching success, nesting success, great thick-knee, breeding

## INTRODUCTION

The Great Thick-knee (*Esacus recurvirostris*) is a large, distinctive wader with a global distribution spanning across tropical Asia [1]. While its breeding biology has been studied in various regions, there remains a paucity of information, particularly from the Indian subcontinent, especially in the arid and semi-arid regions of Gujarat [2, 3]. The freshwater reservoir near Wankaner in Morbi District of Gujarat provides a unique habitat for this species, offering a suitable breeding ground. This study aims to investigate the breeding biology of the Great Thick-knee in this specific location, focusing on aspects such as nesting behavior, egg laying patterns, incubation periods, and chick rearing, potential threats. By understanding the breeding ecology of this species in this region, we can contribute to the overall knowledge of its life history and identify potential

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conservation challenges. This research will help in developing actual conservation approaches to ensure the long-term survival of the Great Thick-knee in Gujarat.

## STUDY AREAS

The study area includes the Garida Dam and Machchhu I Dam, both located in the arid and semi-arid regions of Saurashtra, Gujarat, India. Garida Dam, an earthen dam, is situated at (22.489685° N, 71.042040° E). Machchhu I Dam, a masonry dam built across the Bhogavo River, a tributary of the Machchhu River, is located at (22.4494943° N, 70.9615704° E). The study area experiences a tropical arid and semi-arid climate, marked by hot, dry summers and mild winters. The region experiences erratic rainfall, with most of the annual precipitation occurring during the monsoon season (June-September). The average annual rainfall in the region ranges from 400 to 600 mm. The study area is predominantly covered by scrubland and agricultural land. The major soil types found in the region are Vertisols, Entisols, and Aridisols. The region faces water scarcity issues, especially during the non-monsoon months. The Garida Dam and Machchhu I Dam play a crucial role in providing irrigation water to the agricultural fields in the region (Figures 1 and 2).

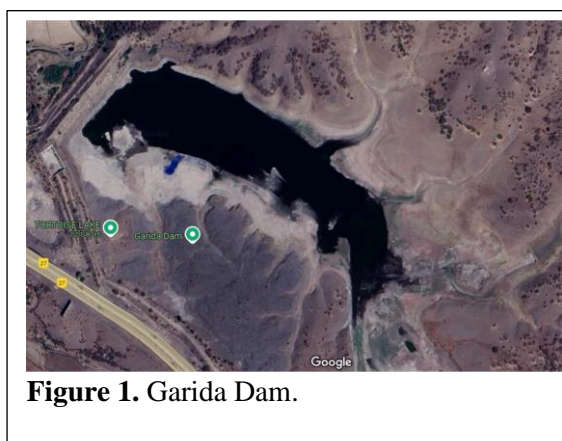


Figure 1. Garida Dam.

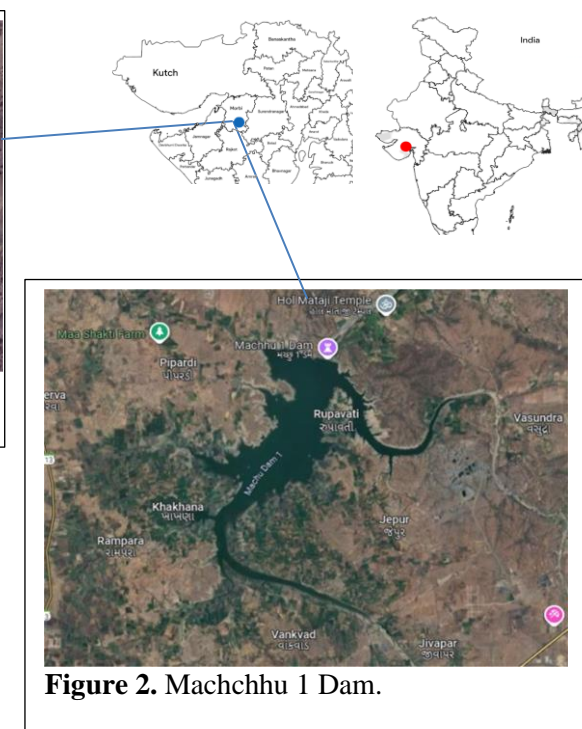


Figure 2. Machchhu I Dam.

## METHODOLOGY

### Data Collection

The research on the breeding biology of the Great Thick-knee (*Esacus recurvirostris*) near the freshwater reservoir in Wankaner involved a comprehensive data collection process. The study period spanned from March to July, encompassing the entire breeding season of the species. Field surveys were conducted to identify and monitor active nests [4]. Detailed observations were made on nest location, clutch size, incubation period, and parental care behaviors. GPS coordinates were recorded for each nest to map their distribution within the reservoir area. Nest success rates were monitored by regular visits to assess hatching and fledging success [5]. Data on nest predation and disturbance factors, such as human activities and livestock grazing, were also collected. Additionally, information on the habitat characteristics of the nesting sites, including vegetation cover, soil type, and proximity to water bodies, was recorded. To gather information on the diet of the chicks, regurgitated food items were collected and identified. This helped to understand the foraging ecology of the species and its

reliance on specific prey items [6, 7]. The data collected during this study provides valuable insights into the breeding biology of the Great Thick-knee in this specific location, contributing to a better understanding of the species' ecology and conservation needs.

### **Monitoring Nests**

Nest monitoring was a crucial component of this study on the breeding biology of Great Thick-knees. Nests were located by careful observation of the birds' behavior, including incubation shifts, territorial displays, and nest building activities [8]. Once a nest was identified, it was monitored regularly to assess its status and collect data on various parameters. To minimize disturbance to the incubating birds, nest visits were planned during the early morning or late evening hours. Observations were made from a distance using binoculars or spotting scopes to avoid direct contact with the nest. The number of eggs in the clutch was recorded, and the incubation period was estimated by monitoring the presence of both parents on the nest [9]. Nest success was monitored by regular visits to assess hatching success and chick survival. Factors influencing nest success, such as predation, flooding, and human disturbance, were also noted.

### **Clutchsize and Egg**

Clutch size was determined by direct observation of the eggs within the nest. To minimize disturbance to the nest, observations were conducted from a distance using binoculars or a spotting scope. When direct observation was not possible, photographs were taken to document the number of eggs. The egg size was monitored by carefully measuring each egg in the clutch. A digital caliper was used to precisely measure the length and width of each egg to the nearest 0.1 mm. The measurements were recorded in a field notebook, along with the nest identification number and the date of measurement [10]. To minimize disturbance to the incubating birds, measurements were taken swiftly and efficiently. Along with the length and breadth, the weight of each egg was also recorded using a precision digital scale. The eggs were carefully removed from the nest, weighed, and then placed back in their original position.

### **Hatching and Nesting Success**

To assess hatching success, nests were monitored regularly throughout the incubation period. The number of eggs laid in each clutch was recorded, and subsequent visits were made to determine the number of eggs that hatched. By comparing the initial clutch size to the number of hatchlings, hatching success rates were calculated. Nests were monitored regularly throughout the breeding season to assess nesting success [11]. Nest success was defined as the proportion of nests that produced at least one fledgling. If a nest was found to be depredated or abandoned, the date of failure was recorded. The overall nesting success rate was determined by calculating the number of successful nests relative to the total number of nests initiated.

### **Fledging Success**

Fledging success was a key aspect of the study, offering valuable insights into the overall reproductive output of the Great Thick-knee population. Regular monitoring of nests allowed for the recording of hatching dates and the subsequent survival of chicks [12]. Factors influencing fledging success, such as predation, food availability, and weather conditions, were carefully observed and noted [13].

## **RESULT AND DISCUSSION**

The breeding season of the Great Thick-knee (*Esacus recurvirostris*) at the freshwater reservoir near Wankaner was observed to extend from March to July, with peak breeding activity occurring in April and May [2]. Nests ( $n=11$ ) were typically located on bare ground patches within the reservoir bed, often near water. The average clutch size was found to be two eggs ( $n = 22$ ), with both parents actively involved in incubation and chick rearing. Incubation period lasted for approximately 28–30 days. Both parents shared incubation duties, taking turns to sit on the eggs. During incubation, the

parent on the nest was vigilant, often camouflaging itself by stretching its neck and blending with the surrounding environment. The other parent remained nearby, keeping a watch and occasionally relieving the incubating bird [14]. Nest success rates were monitored throughout the breeding season (Table 1). Several factors were found to influence nest success, including predation and human disturbance. Predation by mammalian predators, such as feral dogs and reptiles like monitor lizards and snakes, was identified as a major cause of nest failure. Human activities, such as recreational use of the reservoir and livestock grazing, were observed to disturb nesting birds and potentially impact breeding success (Table 2).

**Table 1.** Average clutch size, number of eggs hatched and lost in Great Thick-knee between study year (2018–23).

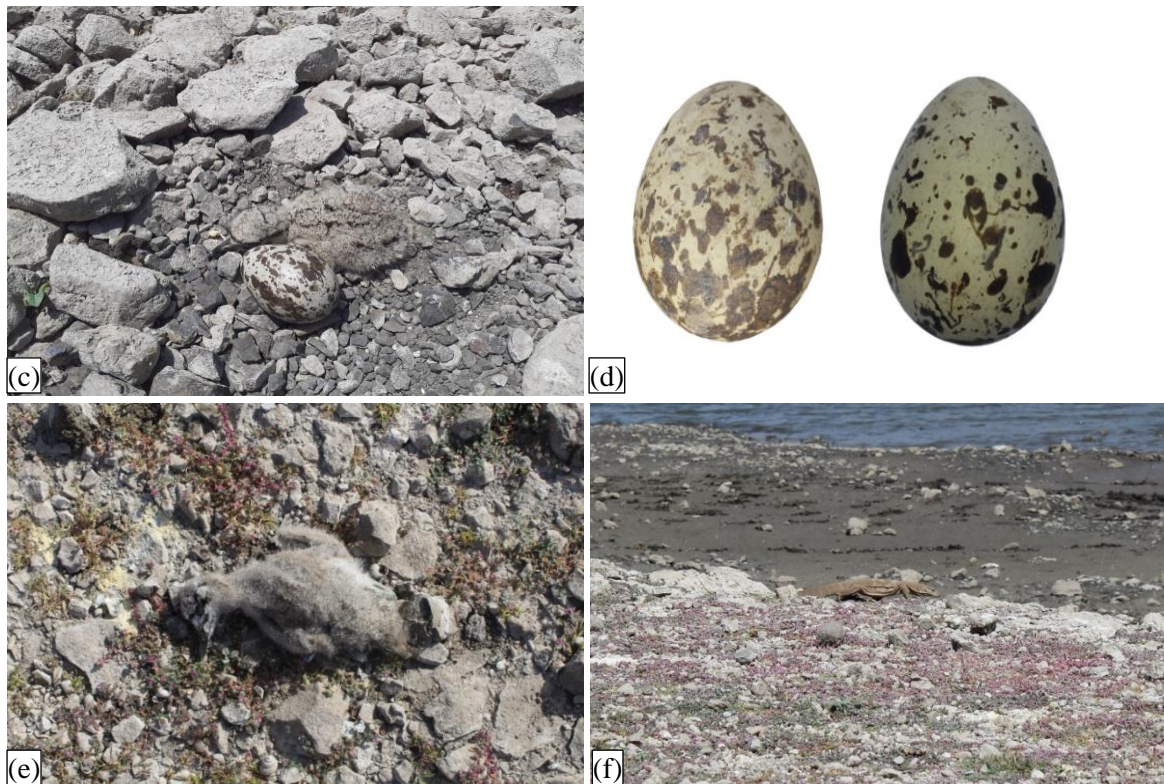
Clutch Size (Mean ± SD)		No. of Eggs Hatched (Mean ± SD)		No. of Eggs Lost (Mean ± SD)	
Garida Dam	Machchhu 1	Garida Dam	Machchhu 1	Garida Dam	Machchhu 1
2 ± 0.8	2 ± 0	1.2 ± 0.4	1.6 ± 0.68	0.8 ± 0.74	0.83 ± 0.68

**Table 2.** Productivity in nests of the Great Thick-knee during 2018–23.

Site	Nest Observed	Eggs Laid	Eggs Hatched	Hatching Success (%)	Egg Lost	Loss of Eggs (%) Due to		
						Predation	Nest-Damage	Hatching Failure
Garida Dam	5	10	6	60	4	50	25	25
Machchhu 1	6	12	7	58.33	5	25	75	–

The study provided valued understandings into the reproductive biology and success of this Near Threatened species. The study period spanned from March to July, encompassing the entire breeding season. Both reservoirs were found to be suitable breeding habitats for the Great Thick-knee, offering essential resources like open ground for nesting, abundant food sources, and minimal human disturbance. However, significant differences were observed in the hatching success between the two sites. At Garida Dam, a relatively undisturbed reservoir, the hatching success rate was observed to be 60%. This relatively high success rate can be attributed to factors such as minimal human disturbance, adequate food availability, and suitable nesting conditions. In contrast, Machchhu 1, which experiences higher levels of human activity, exhibited a lower hatching success rate of 58.33%. Human disturbance, such as recreational activities and livestock grazing, can disrupt nesting and parental care behaviors, leading to reduced hatching success. Additionally, fluctuating water levels can inundate nests, resulting in egg loss. These findings underscore the importance of habitat quality and disturbance minimization in ensuring the successful breeding of the Great Thick-knee. Conservation efforts should focus on protecting these critical breeding habitats, minimizing human disturbance, and implementing measures to mitigate the impact of water level fluctuations (Figure 3a-f).





**Figure 3(a)–(f).** Cycle of Great Thick-Knee. (a). Breeding ground, (b). Great Thick-knee on nest, (c). Egg and chick in nest, (d). Clutch size, (e). Dead chick, (f). Monitor lizard as natural predator.

## CONCLUSIONS

The study highlighted the importance of the freshwater reservoir as a critical breeding habitat for the Great Thick-knee. The availability of suitable nesting sites, abundant food resources, and minimal human disturbance were crucial factors for successful breeding.

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