Asian Openbill Stork (*Anastomus oscitans*), Not a "Nutcracker": A Study from Kole Wetlands of Thrissur, Kerala

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Abstract

Birds are considered as an indicator of environmental health. The Asian openbill stork (*Anastomus oscitans*) is a large wading bird and belongs to the family Ciconiidae under the order Pelecaniformes. This paper deals with the food and feeding behavior of Asian openbill storks in Kole Wetlands of Thrissur, Kerala, India. Observations on feeding behavior were made with the help of spotting scope (10–45×), stopwatch, Sony HDR videocam, and binocular (7×50). The observation was made between 06.30 and 18.30 h, and the entire day was divided into four time intervals: morning (06.30–09.30), midday (09.30–12.30), afternoon (12.30–15.30), and evening (15.30–18.30). Focal-animal sampling method and direct observation method were used for studying the food and feeding of Asian openbill stork. September–January was the most active season for openbill storks. Feeding activity was highest during morning (06.30–09.30) and evening (15.30–18.30) hours. Asian openbill stork feeds on molluscs mainly snail *Pila globosa* (genus *Pila*) and freshwater mussel (genus *Unio*). Prey-capturing success was more through multiple probing. Detachment of *Pila* takes place underwater, but in the case of *Unio*, it occurs in land. Crushing of shells and feeding on fishes by openbill stork were not supported from our observations from Kole Wetlands.

Keywords

Asian openbill stork · Feeding · Kole Wetlands · Kerala

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7.1 Introduction

Birds are considered as an indicator of environmental health. India is rich in avifaunal diversity with passerines and nonpasserines. Storks belong to the family Ciconiidae under the order Pelecaniformes. Nineteen species of storks (Ali and Ripley 1983) are found globally, and out of these, nine species are found in India and six stork species in Kerala (Praveen 2015). South and Southeast Asia have the richest stork diversity with 11 species: 8 residents and 3 migratory (Anam et al. 2016). The Asian openbill stork is a large wading bird with grayish or white with glossy black wings and tail characterized by long legs, neck, and bill, which meets together only at the tip (Hancock et al. 1993). Collection of basic data regarding food availability, habitat use, and foraging techniques is needed for the effective implementation of conservation strategy. The peculiar name "openbill" is derived because of the presence of the distinctive gap formed between the recurved lower and arched upper mandible of the beak in adult storks. Young storks do not have this gap. The fine brushlike structure at the cutting edges of the mandible gives them better grip while holding the snails (Gosner 1993). The food and feeding behavior of openbill storks, *Anastomus lamelligerus* and *Anastomus oscitans*, were studied in Africa, India, Ceylon, and Thailand by Kahl (1971). The general and popular notion about the openbill is that the openbill functions in the fashion of a "nutcracker." This paper deals with the food and feeding behavior of Asian openbill storks in Kole Wetlands of Thrissur, Kerala, India.

7.2 Study Area

The Kole Wetlands is one of largest, highly productive, and threatened wetlands in Kerala and has been declared as Ramsar site for protection (2002), and it comes in the Central Asian Flyway of migratory birds. The Malayalam word "Kole" indicates bumper yield, which refers to a particular type of cultivation method adopted in backwaters from December to April. The Kole Wetlands lies between 10° 20′ and 10° 40′ N latitudes and 75° 58′ and 76° 11′ E longitudes. The Kole Wetlands are low-lying tracts located 0.5–1 m below mean sea level (MSL) and remain submerged for about 6 months in a year. Jayson and Sivaperuman (2005) and Sivaperuman and Jayson (2000) during their avifaunal studies in various regions of Thrissur District concluded that the highest number of birds was reported from Kole Wetlands. This study was carried out in the Kole Wetlands of Thrissur District of Kerala from 2015 January to 2016 November.

7.3 Methods

Observations on feeding behavior were made with the help of spotting scope (10–45×), stopwatch, Sony HDR videocam, and binocular (7×50). The observation was made between 06.30 and 18.30 h, and the entire day was divided into four time

Fig. 7.1 Openbill stork in dewatered land

intervals: morning (06.30–09.30), midday (09.30–12.30), afternoon (12.30–15.30) and evening (15.30–18.30). Activity data were collected according to this time period. The parameters taken for the study of feeding ecology of openbill stork were food items consumed, size of the prey, time for feeding, flock size, and inter-bird distance and techniques adopted for feeding. As openbill storks forage in open wetlands, it was so easy to observe the feeding behavior. Most of the observations were taken from a distance of 50–200 m with the help of spotting scope and recorded with videocam. Focal-animal sampling method and direct observation method (Altmann 1974) were used for studying the food and feeding. The water depth, where the foraging occurred, was also measured. Identification of prey species was made by direct observation.

7.4 Results

In Kerala, Asian openbill stork (*Anastomus oscitans*) is known as "*Njhaunipottan*" (one who cracks snail) and "*Cherrakokkan*" (without a closed bill). Openbill storks forage in Kole Wetlands in different microhabitats like mudflats (Fig. 7.1), shallow water streams, paddy fields (Fig. 7.2), small ditches, and along the bank of small canals characterized by diurnal feeding.

In response to habitat conditions, openbill stork displayed local movements. Large population of openbill stork was seen during the post-monsoon period and least during monsoon. With the advent of post-monsoon, dewatering of paddy fields started, and openbill storks were seen in a flock of 63–378 individuals. September–January is the most active season for openbill storks. Kole lands after dewatering and harvested paddy fields are the favorite foraging ground for the storks. During the dewatering time, it was seen that openbill storks reached the feeding ground after 10–25 min after sunrise. They arrived to the Kole lands as solitary and in groups of three to seven individuals and immediately started feeding. During the

Fig. 7.2 Openbill stork in paddy field

Fig. 7.3 Openbill stork on a raised mudflat

month of December and January, it was seen that openbill storks arrive as one by one to the harvested paddy field and they stood idle on a heap of hay or in a raised mudflat by drooping their head and beak (Fig. 7.3).Usually the individuals stood in a group (inter-bird distance of 2.0–10.0 m) (Fig. 7.4), and they start feeding only after 30–55 min, one by one individually. Moreover they always keep a distance and get scattered away to choose different feeding areas within the same habitat.

Feeding activity was highest during morning (06.30–09.30) and evening (15.30–18.30) hours. In between, the activity was less, and most of the individuals went for roosting in the nearby trees in the bund (Fig. 7.5). It had been observed that after morning feeding, they exhibit preening, basking (Fig. 7.6), and soaring behavior (Fig. 7.7) and they change the feeding ground. The selection of feeding ground mainly depends on the foraging success (prey-capturing success and with least disturbance). Asian openbill storks feed on molluscs mainly snail *Pila globosa* (genus *Pila*) and freshwater mussel (genus *Unio*). The favorite food item was *Pila globosa* which are abundantly distributed throughout the wetlands. The shells of *Pila* and

Fig. 7.4 Openbill storks in paddy field

Fig. 7.5 Roost of openbill stork

Unio discarded by the storks were collected from the Kole lands and measured using vernier calipers (Fig. 7.8), and it was seen that *Pila* shell size ranges from 2.53 to 83 cm in length and 4.83 to 3.92 cm in breadth (n = 206) and *Unio* ranges from 4.7 to 6.15 cm in length and 2.94 to 3.36 cm in breadth (n = 113).

Feeding on crab by openbill stork was recorded only in a single occasion. Openbill stork feeding on fishes was not supported from my observations from Kole lands. *Anastomus oscitans* forage in groups as well as in single and also with mixed flock consisting of painted storks (*Mycteria leucocephala*), black-headed ibis (*Threskiornis melanocephalus*), gray heron (*Ardea cinerea*), purple heron (*Ardea purpurea*), Indian pond heron (*Ardeola grayii*), little egret (*Egretta garzetta*), intermediate egret (*Mesophoyx intermedia*), and great egret (*Ardea alba*). Openbill stork was a long-distance walker and generally walks forward in a linear fashion and thoroughly wades in the substrate. It walks continuously probing in the substrate, up to a distance of more than 60–110 m, touches the end of the paddy field, and returns back after moving straight through the vegetation side along the bunds. This zigzag movement pattern is found to be a simple strategy to find almost every patch of food (Fig. 7.9).

Fig. 7.6 Openbill stork basking in paddy field

Fig. 7.7 Openbill stork soaring in Kole lands

While foraging in dewatered paddy fields, openbill storks always keep a minimum distance (>2 m). They also follow linear movements while foraging on the banks of small streams. Openbill storks were also seen feeding in a tightly packed group when they are foraging in areas with a water depth of 15–26 cm. The individuals were well structured in the group as one individual will move in front and lead the group. Here the probing technique was different as they dip their entire bill up to the eye into the water. Multiple probing (34–129/ min) (n = 112) increased with increased water depth. Usually, the stork slightly opens its bill and stabs through the water. While openbill storks walk, they probe only once in a spot, and when they felt the presence of food item, they stopped walking and undergo multiple probing. During multiple probing, they insert more than half of their bill into the substrate in various directions by twisting their neck, but during single probe, only one third of the bill is gone inside the substrate. In the paddy fields, the probing intensity was inversely proportional to the footstep rate (n = 293), whereas adjacent to floating vegetation and rice stalks, footstep rate is inversely proportional to the probing intensity (n = 149). Feeding techniques employed by openbill stork were

Fig. 7.8 Measuring shell size with vernier calipers

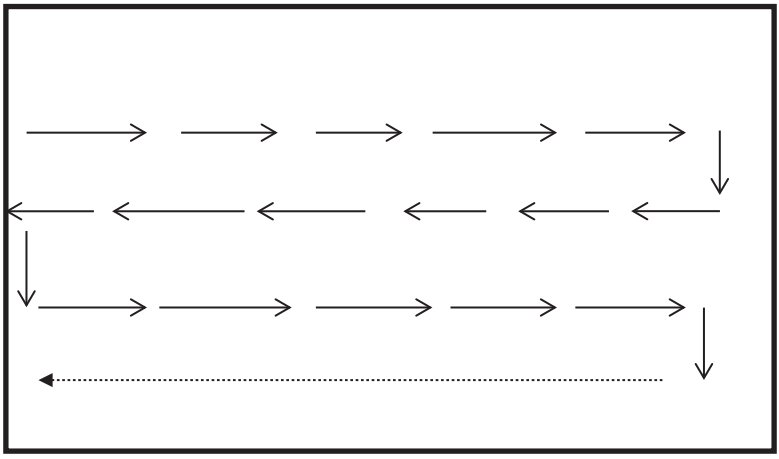

Fig. 7.9 Diagrammatic sketch of foraging path of openbill stork in Kole Wetlands

found to be a successful one. Prey-capturing success was more through multiple probing. When the stork captured a *Pila* of small size (2.53 cm in length and 4.83 cm in breadth) (Fig. 7.10), it picked up with the tip of the bill, inserted the lower mandible into the opening, held tightly using the upper mandible, and shook the bill toward the right and left side (six to nine times) very fast to detach the flesh from the shell. But when they captured large *Pila* (4.83 cm in length and 3.92 cm in breadth) (Fig. 7.11), they picked up with the tip of the bill and rolled up to the middle of the bill and held it for some time (36–129 s).Usually they feed from the same spot where they captured their prey, but sometimes in order to avoid snatching, they kept the prey inside the bill and flew to a distant area from other storks.

After reaching a suitable location, the stork rolled down the *Pila* to the tip or to the ground and pushed the tip of the lower mandible to open the operculum. It dipped the *Pila* (two to four times) in water in order to open the operculum easily. Once the operculum was opened, the stork then inserted its mandibles, lifted up

Fig. 7.10 Openbill stork with small *Pila globosa*

Fig. 7.11 Openbill stork with large *Pila globosa*

Pila, shook its bill (5–14 times) to free the snail's body from its shell, swallowed the flesh by tossing back the head (4–6 s), and discarded the shell. Cracking of shell was not supported from my observations. In summer season, openbill stork was seen foraging in shallow water in streams in search of freshwater mussel. Through multiple probing, they picked up the mussel (Fig. 7.12) with the bill tip, held it, and

Fig. 7.12 Openbill storks foraging in shallow waters, holding freshwater mussel

Fig. 7.13 Openbill stork inserting lower mandible inside the freshwater mussel shell

moved from the water to the mudflat. While feeding on freshwater mussels, the lower mandible was inserted between the two halves of the mussel shell (Fig. 7.13) and forced to break the hinge, where the two halves were connected. The whole mass was consumed immediately after the shell was opened (Fig. 7.14) by tossing back the head, and the shell was left open in the mudflat. Snails were found to be the most favorite food ($n = 397$), then freshwater mussel ($n = 79$), and then crab ($n = 1$). Percentage of prey consumption is plotted in Figs. 7.15 and 7.16.

7.5 Discussion and Conclusion

Food play an inevitable part in the life cycle of birds, especially related to reproductive activities. Kahl (1966) also mentioned about the role of food availability. Major food items consumed by openbill storks were apple snail and freshwater mussels, which are available throughout the season in the Kole Wetlands. The movement pattern and quick movements in mudflats and shallow water were to cover the whole

Fig. 7.14 Openbill storks tossing back the head and feeding freshwater mussel

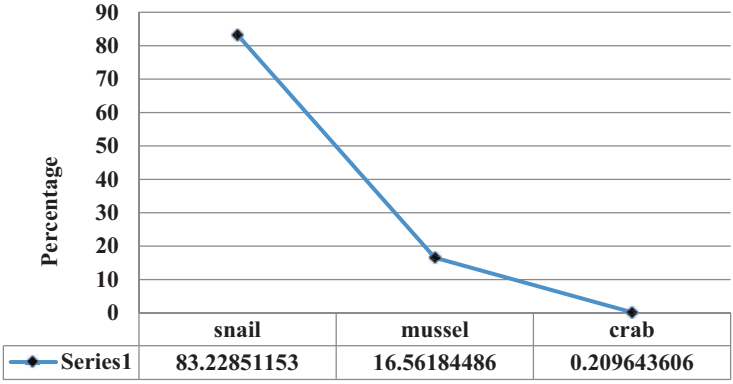

Fig. 7.15 Percentage of prey consumed by openbill stork

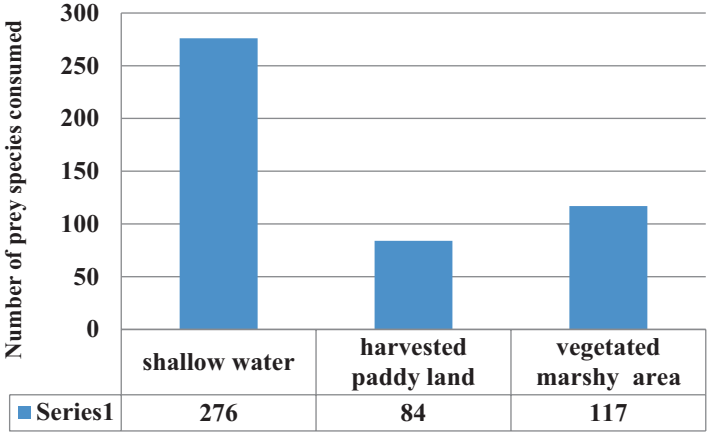

Fig. 7.16 Feeding habitat of openbill stork

food patch. Like egrets, openbill storks also wade very fast that makes their prey capturing a success. This point was substantiated with the findings of Meyerriecks (1962) and Kushlan (1976) that wading birds of family Ciconiiformes walk fast or running behavior was displayed mainly for capturing of moving prey and spotting the prey better. It was observed that openbill storks and black-headed ibises spent more time in vegetated areas and floating vegetation. The reason may be that, when predator pressure is more, the prey species move to safer places. The "openbill" makes the stork to invade a variety of habitat and to handle different prey species very easily. The mandibles firmly held the prey underwater without being washed off, which helps to roll up and roll down the snails and to extract body mass from the shells. Kahl (1971) also supported that the snails were handled in the distal part of the bill and are not crushed. Feeding on fishes by openbill stork as described by Anam (2016) was not supported from our observations from Kole Wetlands.

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