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COMPARATIVE FEEDING BEHAVIOR OF DUCKS AND GEESE (FAMILY: ANATIDAE) IN RAJSHAHI DIVISION OF BANGLADESH

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Birds of the family Anatidae includes ducks and geese that are important, especially in the river and beel regions of the Rajshahi Division in Bangladesh. Ducks have webbed feet for swimming and specialized beaks suited for feeding on various resources like water, soil and mud. Many Anatid species are migratory, travel vast distances from colder regions to find food and shelter in diverse wetland habitats of Bangladesh; such as charlands, beels and river ecosystems (Ali *et al.* 2014). These types of habitats exist in Rajshahi Division that are crucial to ecological balance, supporting both resident and winter visitor ducks. Reza *et al.* (2014) observed five anatid species and further research by Reza *et al.* (2017) documented 11 species. A checklist of birds along the Padma River by Reza *et al.* (2022) identified 21 anatids in the Rajshahi and Chapainawabganj districts. According to the Avibase (2025), 12 ducks and geese are in Pabna District, 14 in species in Naogaon and 9 species in Natore District. Waterbirds like the anatids show different kinds of behavior and feeding is significant due to their dependency on waterbody. For example, Kear (2005) studied ducks including Pochards (*Aythya ferina*) which dive underwater to forage on submerged aquatic vegetation and invertebrates. Olsen (2017) studied about diving birds such as cormorants and grebes which exhibit specialized adaptations, such as webbed feet and sharp beaks to hunt fish underwater. Northern Pintails (*Anas acuta*) increase their intake of invertebrates during breeding for higher protein requirements and consume seeds or vegetation in winter to build fat reserves for migration (Baldassarre & Bolen, 2006). Habitat loss due to urbanization and agriculture reduces food availability, forcing birds to adapt to suboptimal feeding conditions (Davidson, 2014). Feeding behaviors reflect available resources and are shaped by habitat types, seasonal changes and migratory needs (Johnson *et al.* 2010). Seasonal dietary shifts are also influenced by rapid avian metabolism as noted by Gere and Andrikovics (1994), Guillemain *et al.* (2007) and Owen *et al.* (2019). This study investigated feeding behavior of three resident and sixteen winter-visiting duck and geese species in the wetlands of Rajshahi Division.

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A total of 8 beels in Pabna, Natore, Naogoan and Rajshahi districts of Rajshahi Division and 5 sites of Padma and Jamuna River were the study area (Fig.1). A Canon 60D camera and a pair of Nikon 8x32 binoculars were used for the observation of the ducks behavior. The study was conducted throughout 2021 to 2024. To observe the feeding behavior of winter visitor and resident ducks, data collection were done by focal sampling method (Altmann, 1974). Feeding behavior of every focal duck was observed 10 minutes for its total activity budget. Behavioral data were taken with a 10 minutes gap for the same species by using data sheet. Ducks behavioral time were considered separately for the calculation. Sometimes videography were taken to observe ducks behavior perfectly. All these sample had been taken for the focal birds from a suitable place by using camera and the binoculars by two observers. Surveys were done from morning (8am) to evening (5pm), but some night survey were done by using torch light to observe night activity. For the purpose of the study, eating is used to describe the combined action pecking and swallowing; foraging is short locomotion by swimming, walking, diving or dabbling. In dabbling, ducks tip forward in shallow water to forage for food without fully submerging; diving is going completely underwater to retrieve food from deeper levels; in surface filtering ducks use their bills to filter food particles from the water's surface; grazing is the act of animals feeding on grasses, plants, or algae. Total 489 hours' time had been spent at the study area within the study time. Percentage has made by using their time of specific behavior time and total time. Data compilation were done by the Microsoft excel.

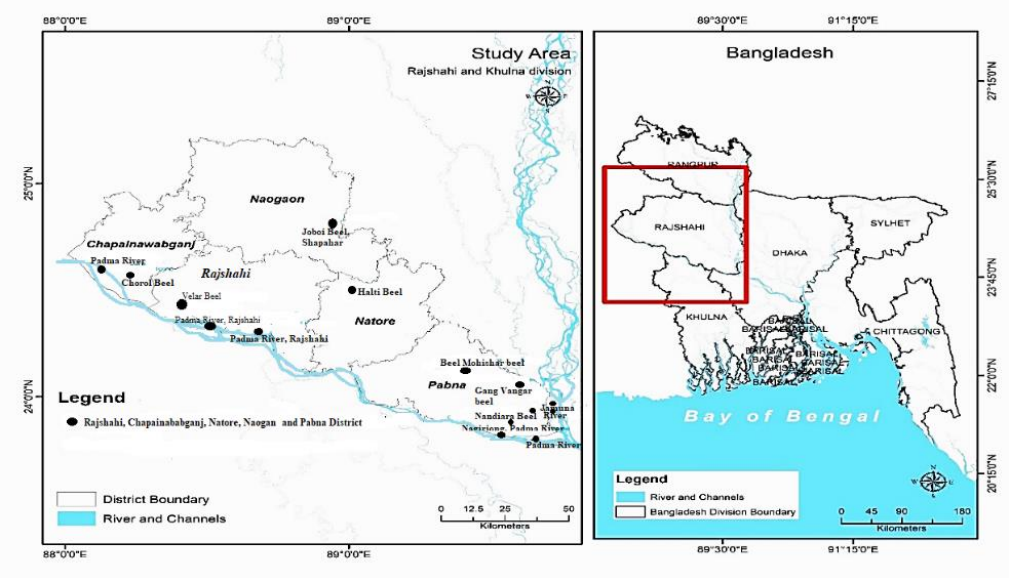

Fig. 1. Map of the study area.

Within the study time, the resident Cotton Pygmy Goose (*Nettapus coromandelianus)* were seen to use 35.43% time for eating including pecking and swallowing; within the winter visitor ducks Graylag Goose (*Anser anser*) 36.90%, lowest eating time were seen in Ruddy Shelduck (*Tadorna ferruginea*) which were 16%.

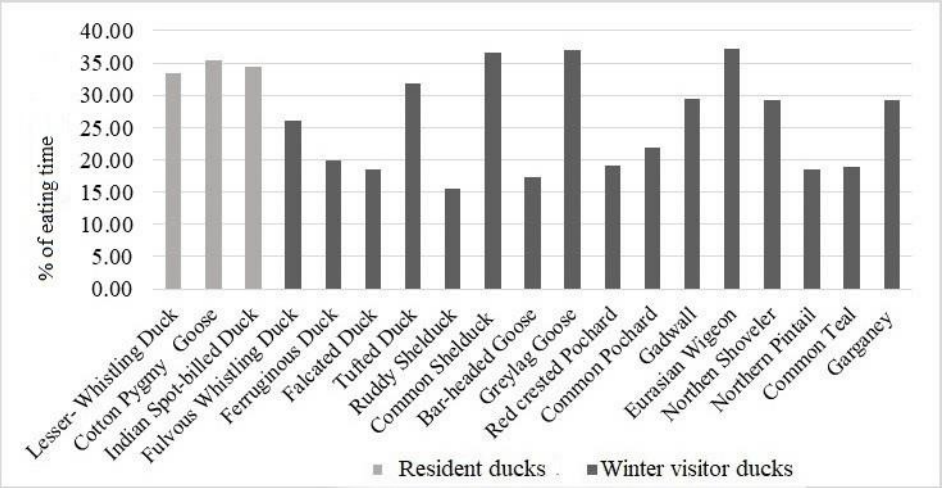

Fig. 2. Eating percentage of resident and winter visitor ducks.

The eating (including pecking and swallowing) times of winter visitor ducks in Rajshahi Division display broader variability compare to residents, likely due to distinct pecking strategies, food availability and habitat preferences. Notably, species like the Tufted Duck (*Aythya fuligula*, 31.78%), Gadwall (*Mareca strepera*, 29.47%) and Northern Shoveler (*Anas clypeata*, 29.19%) dedicated significant eating time, suggests abundant wetland resources that supported their energy needs during migration preparation. In contrast, species such as the Ruddy Shelduck (*Tadorna ferruginea*, 15.54%), Bar-headed Goose (*Anser indicus*, 17.28%) and Falcated Duck (*Mareca falcata*, 18.49%) allocated less time in eating, possibly due to efficient foraging or alternative survival strategies. These findings align with observations by *Upadhyaya et al. (2010)* which linked pecking time variations to prey abundance in Cotton Pygmy-goose (*Nettapus coromandelianus*). Feeding time in literature ranges widely, from 24.3% to 84.2% (Birds of the World, 2020), with this finding of 29.19% aligning with the lower end of this range Resident species, exhibiting consistent high eating times , emphasize the need for stable food resources year-round. Both Eurasian Wigeon (*Mareca penelope*) and Common Shelduck (*Tadorna tadorna*) had shown a high percentage of time spent in food pecking and swallowing (>36%), suggesting that wetlands of Rajshahi Division provide an abundant food source. This contrast underscores differing ecological roles and adaptations among species, shaped by migratory behavior and local conditions.

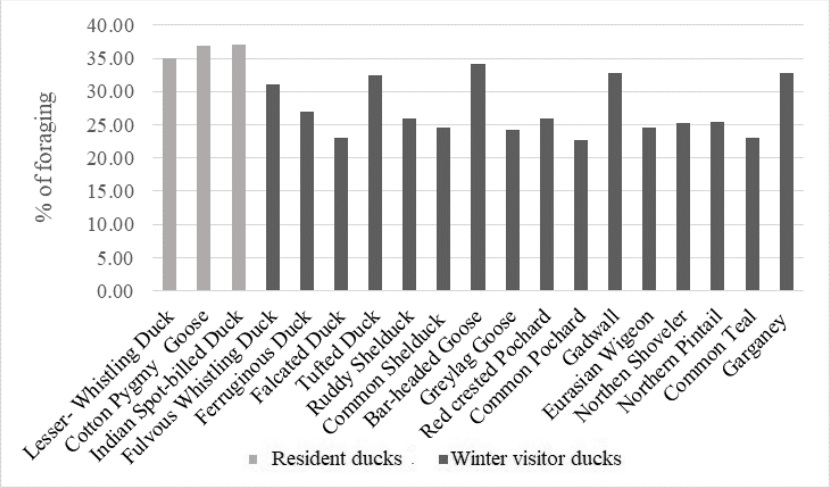

Fig. 3. Comparative foraging percentage of resident and winter visitor ducks.

The Indian Spot-billed Duck (*Anas poecilorhyncha*) was seen to show 37.02% foraging behavior during their activity which were the highest foraging times; Cotton Pygmy Goose (*Nettapus coromandelianus*) 36.83%, and Lesser Whistling Duck (*Dendrocygna Javanica*) 34.95%. Within the winter visitor birds, Bar-headed Goose (*Anser indicus*) were seen to forage 34.21%, Gargeney (*Spatula querquedula*) 32.84% Gadwall (*Mareca strepera*) 32.73% and Tufted Duck (*Mareca strepera*) 32.48%, Fulvous Whistling Duck (*Dendrocygna bicolor*) 31.10%, rest of ducks foraged 20% to 30%. The foraging range (22.64% to 37.02%) highlights the diversity in foraging strategies among waterfowl.

The variations in foraging times among duck species in Rajshahi Division reflect differences in feeding strategies, habitat use and resource availability. Cotton Pygmy Goose (*Nettapus coromandelianus*), Lesser Whistling Duck (*Dendrocygna javanica*) and Indian Spot-billed Duck (*Anas poecilorhyncha*) had exhibited the longest foraging times, suggesting a need to gather sufficient food in less resource-dense environments or due to their dietary preferences. In contrast, species like the Common Pochard (*Aythya ferina*, 22.64%), Falcated Duck (*Mareca falcata*, 23.00%) and Common Teal (*Anas crecca*, 22.98%) had shown shorter foraging durations, indicative of efficient foraging strategies or abundant, accessible food resources. Adaptations such as specialized feeding behaviors and morphological traits likely contribute to their efficiency, as supported by findings from Kear (2005) on foraging ecology in waterfowl. This highlights the ecological importance of preserving diverse and resource-rich ecosystems, as species reliant on extended foraging durations may be particularly vulnerable to habitat degradation, consistent with studies on the impact of wetland quality on waterfowl foraging by Green *et al.* (2002).

In Rajshahi Division, where there are rivers, beels and agricultural fields, ducks utilize a combination of foraging techniques. Many ducks are dabblers, which means they dip their heads into the water and tip their bodies forward to graze on algae, tiny insects and aquatic vegetation. Ducks like filter feeding swim with their bills partially submerged, filtering out small crustaceans, insects and plant matter from the water. Some are grass grazing ducks; ducks might graze on to eat grasses, seeds and small insects. Some ducks graze on land during their foraging. Ducks forage in groups, which can provide them with safety from predators and also help in finding food more efficiently. Large flocks of ducks were seen foraging together in various habitats around Rajshahi Division.

Ducks in Rajshahi Division had exhibited diverse foraging behaviors. Dabbling was common (e.g., Tufted Duck, Common Teal, Garganey, 58.33%), while diving was frequent in species like Lesser-Whistling Duck *(Dendrocygna javanica*) and Red Crested Pochard *(Netta rufina* (30-35%). Filter feeding was dominated for Northern Shoveler *(Spatula clypeata*, 45%) and Northern Pintail *(Anas acuta)* (26.67%), whereas grazing was exclusive to Bar-headed Goose *(Anser indicus*) (35%) and Greylag Goose *(Anser anser*, 31.67%). Niche preferences varied, with some focusing on aquatic foraging and others on terrestrial habitats.

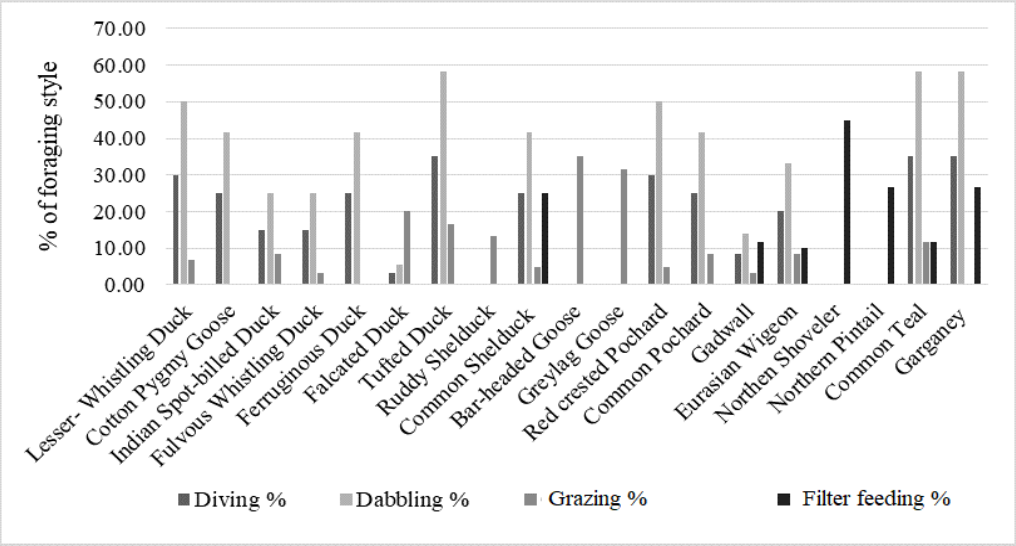

Fig. 4. Foraging style of resident and winter visitor ducks

Ducks and geese adapted their feeding and foraging based on habitat, with divers and dabblers like Tufted Duck (*Aythya fuligula*) and Lesser Whistling Duck (*Dendrocygna javanica*) relying on clean, abundant aquatic environments,

while grazers such as Bar-headed Goose (*Anser indicus*) and Greylag Goose (*Anser anser*) depended on grasslands and farmlands. These findings align with studies by Kear (2005), which emphasize habitat-specific foraging adaptations in waterfowl. The need for diverse ecological management is evident: protecting wetlands ensures water-dependent species thrive, while sustainable agricultural practices support terrestrial feeders.

Ducks have a great contribution within in the wetland ecology to increase the richness of species ducks have a great role to the environment of the wetland. (Skinner *et al.*, 2008). The study underscores the feeding behavior, which have importance of conserving wetland habitats of Rajshahi to support both resident and migratory bird populations. Protecting these areas ensures the survival of species that depend on them for pecking, foraging and overall activity during critical periods of their life cycles. The survival of anatids is jeopardized by habitat destruction, pollution and poaching; yet, they maintain crucial ecological and economic functions in Rajshahi Division. These areas are essential for both resident and migratory waterfowl, particularly ducks. Research, monitoring, sustainable conservation initiatives, and community awareness regarding the significance of wetland ecosystems and the protection of migrating ducks must be enhanced. We must ensure that these ducks continue to flourish in the Rajshahi Division's diverse and dynamic environments. Through ongoing site efforts in this division, the study can serve as a bastion for enhancing both the region's traditional legacy and biodiversity. Extensive water management initiatives have influenced waterfowl populations in these areas, a phenomenon Rajshahi may encounter if modifications to waterways persist (Bhattacharjee, 2021). Rajshahi Division could gain from analogous conservation-oriented tourist models to promote wetland preservation and diminish reliance on seasonal agricultural wetlands (Bhattacharjee, 2021; BirdLife International, 2021). Feeding behavior influences community structure and ecological interactions of waterbirds. Understanding the feeding strategies of these ducks is vital not only for research and conservation but also for supporting local ecotourism which benefits the livelihoods of fishermen and boatmen.

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