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DESCRIPTION OF BATHING BEHAVIOUR IN INDIAN SPOT-BILLED DUCK - *Anas poecilorhyncha*

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between all the authors. Authors RN (Principal & Head) and SA (Controller of Examinations) designed the study, performed the analysis, wrote the protocol and wrote the first draft of the manuscript. Author MAP (Research Scholar) carried out the field word, managed the analyses of the study and literature searches. All the authors read and approved the manuscript.

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ABSTRACT

Birds are intelligent, sociable creatures and exhibit a wide array of behaviours. The behaviours often do not occur in isolation and have Fixed Action Patterns (FAP). Indian spot-billed duck revealed certain FAP with regard to the bathing behaviour. Hence, bathing sequence in Indian spot-billed duck was recorded systematically to analysis the sequence of events, illustrate it using kinematic diagram. Data indicate that the probability of occurrence followed FAP. In the present study two bathing methods were recorded with differences between these two bathing methods. In this study, FAP analysis was done for head-dip bath and wing-thrashing. Further, somersault and wing thrash action was a part of FAP. Wing flap action was always recorded following head dip bath which was rare.

Keywords: Indian Spot-Billed Duck; *Anas poecilorhyncha;* bathing behaviour; bathing methods; kinematic diagram; Fixed Action Patterns (FAP).

1. INTRODUCTION

Indian spot-billed duck (*Anas poecilorhyncha*) is a large dabbling duck that is a non-migratory breeding duck throughout freshwater wetlands in the Indian subcontinent. While, in water it can be identified from a long distance by the white totals that form a stripe on the side, whereas in flight it is distinguished by the green speculum with a broad white band at the base. The duck is of same size as a mallard and has a scaly patterned body of a green speculum bordered by white. At rest white stripe stands out and long neck

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and bill for yellow tip and orange red spots at the base are distinct in the subspecies. The red spots on the base of the bills are absent in Haringtoni. The bird measures 55–63 cm (22-25 in) from 83-95 cm in length and (33-37 in) across the wings, with a body mass of 790-1,500 g (1.74-3.31 lb). The wings are whitish with black flight feathers below and from above show a white-bordered green. In addition, the male has a typical red spot on the base of the bill, which is absent or inconspicuous in female. The male does not have an eclipse plumage, the legs and feet are bright orange to coral red. Juveniles are browner and duller than adults. Both males and females undergo a complete post-breeding moult, dropping all their wing feathers simultaneously [1].

In birds, bathing is an important part of feather maintenance in which the dampening of feathers loosens the dirt and makes their feathers easier to preen [2]. The birds carefully rearrange the feathers and spread oil from the preen gland so they remain waterproof and trap an insulating layer of air underneath to keep them warm. In birds, the feathers and skin will look healthier if they bathe frequently. Special methods are needed to cleanse both skin and feathers.

Basically, the cleansing action involves extremely rapid and well-coordinated operation of feather tracts or pterylae and movements of the body and its parts. Bathing birds opens and close certain feather tracts to expose the bare spaces momentarily to the water, which is then entrapped and squeezed through the feathers. Thermoregulation is an important adaptive phenomenon in birds, and they play a key role in its survival like plumage maintenance, sun-bathing, sun-basking, and water bathing [3-14].

The Indian spot-billed duck to take bath regularly and can be seen taking bath multiple times a day. This bathing behaviour has FAP. The general characters of bathing procedure include the visible bearing and the complex techniques. In bathing behaviour, "manner" implies individual bearing or behaviour which denotes a distinctive external way of bathing as the eye sees it, whereas "technique" emphasizes the sequence and combinations of bathing actions while “frequency” denotes the repetition of a particular action in the bathing sequence [15]. This behaviour may be exhibited by a solitary bird but, as observed and reported earlier, it is contagious and when one or two birds begin others nearby follows [16-17].

2. MATERIALS AND METHODS

The work was carried out during Aug 2018 - Jul 2019 in Suchindram Bird Sanctuary located in Kanniyakumari District (Lat - 8°8'52.40"N; Lon - 77°27'12.23"E). This is a large perennial water body of about 236 acres and is one of the most preferred habitats for Indian spot-billed duck. The study area has a sub-tropical climate of four seasons: Winter (Jan-Feb); Summer (Mar-May); Monsoon (Jun-Sep); and Post-monsoon (Oct-Dec). The mean annual temperature in the study area ranges from 22-38^0 C, whereas the study area receives rain from both the North East and South West monsoons, annual rainfall averages to 1456 mm.

Observations and recording were made using Olympus DPS I (8x40) binoculars and Nikon P900 camera. In this study, focal animal method paired with all occurrence sequence sampling [5] was adopted to construct the behavioural sequences of the Indian spot-billed duck for bathing. Action patterns were recorded in order in which they occur, *i.e.*, the sequence of events. Repeated actions (self-transitions) in a row are recorded multiple times including the counts. The observed FAP for bathing was used to construct a matrix that listed the number of times for transition to one type of behaviour [5].

The percentage of times that a particular action pattern follows another is used to calculate the transition frequency of each behavioural sequence. Statistically significant deviates were compiled into kinematic diagrams [6]. showing the flow and probability of each transition. The salient movements and positions of a typical sequence were observed and the frequency of transition is illustrated using a kinematic diagram. In addition, incomplete or imperfect sequences with deviations from FAP were also observed and recorded. This involved a minor imperfection, which was presumed to be insertion, omission, reversal or replacement of a movement or position within the identified typical sequence.

3. RESULTS

3.1 Head Dip Bathing - Typical Sequence

Typically, the action starts with a strong forward head dip in the water and the duck retracts its head with the same force scooping out the water backwards which makes the water flow through its back. The number of head dips is random in each bath and in a single sequence, the repeats were observed anywhere between 1 to 18 times. The bath usually takes place after preening and the bath would be to clean off all the loose dirt in the feathers.

A wing flap and tail-wag is usually seen after a bath. Head dipping was preceded by Tail-wag (52%). Mostly the head-dip-bath movement is repeated continuously (65%) (Fig. 1; Plate 1).

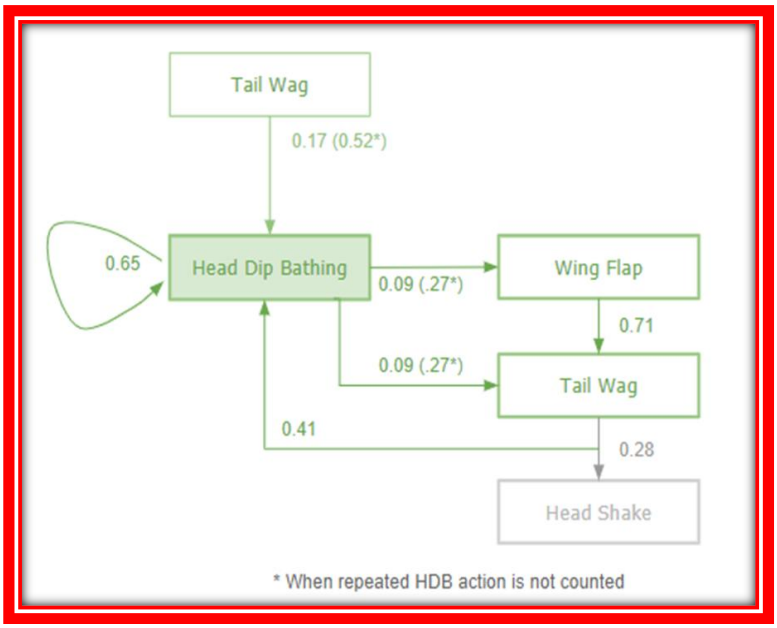

Fig. 1. Kinematic diagrams of behavioural sequence showing transition frequency
Note: Probability values higher than 0.05 are highlighted.

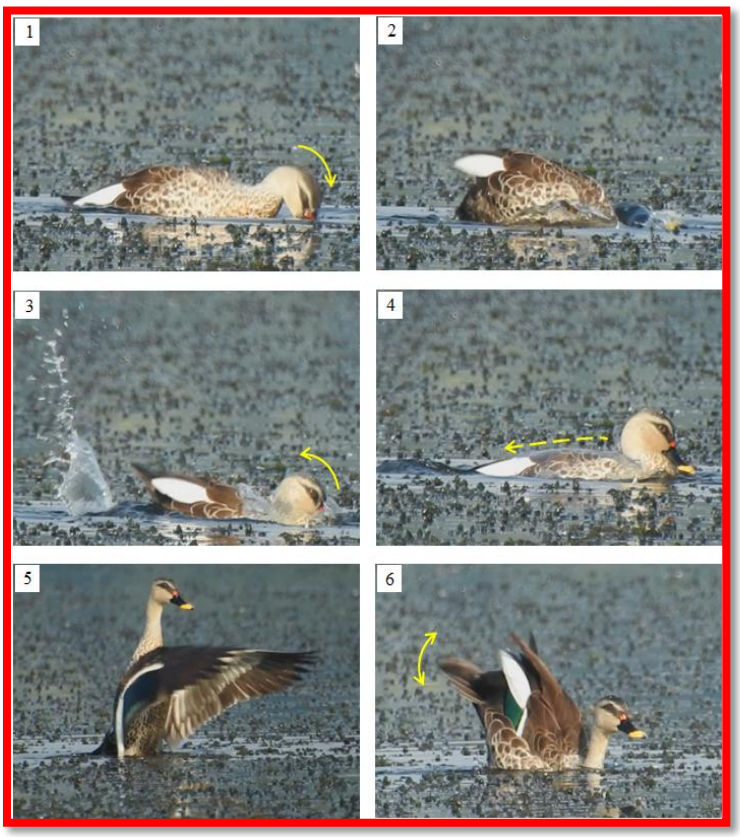

Plate 1. Head Dip Bathing Sequence (1-6)

Typical and the common sequence of this behaviour can be written as

Tail wag > Head dip bathing > Wing flap > Tail wag > Head shake

Tail wag > Head dip bathing > Tail wag > Head shake

3.2 Salient Positions and Movements

Typical and most common sequence of this behaviour can be summarised as:

1. Head is dipped in a forward motion.
2. Head is fully plunged in water.
3. Head is quickly pulled back slopping water towards its back.
4. A thin film of water spreads over the back and wings.
5. Quick paddling followed by raised body and wing flapping.
6. The tail is shaken quickly from side to side several times.

3.3 Deviations from a Typical Sequence

Head dip bath was followed by either Wing flap (27%) or Tail-wag (27%). Wing flap, movement is usually followed by a Tail-wag (71%). After Tail-wag movement, it can go back to a sequence of Head-dip bathing (41%).

Some of the atypical movements observed are listed below
Tail wag > Head dip bathing > Wing flap > Tail wag > Head shake
Tail wag > Head dip bathing > Tail wag > Head shake

3.4 Wing-Thrash Bathing - Typical Sequence

The duck leans to one side and thrashes the water with its wings. As it is leaning on one side, that side is partly immersed in water and the thrashing movement is much lesser on that side. Vigorous thrashing movement is clearly visible on the other wing with water splashed around the bird. Wing thrashing was usually observed following the somersault, but also have been noted to follow the head dipping. This is usually followed with a wing flap, and a headshake. The final action is a tail-wag. Wing flap and headshake were not observed in few instances. Preening, head to body rub and scratching was also commonly seen during this bath (Fig. 2; Plate 2).

The typical and most common sequence of this behaviour can be written as
Head dip bathing > Wing-thrash bathing > Head dip bathing > Tail wag
Head to body rub > Somersault > Wing-thrash bathing > Tail wag

3.5 Salient Positions and Movements

Typical and most common sequence of this behaviour can be summarised as

1. The duck plunges its head and neck into the water forming a “U” shape with its neck and raises its rear.
2. It kicks its feet in water causing the bird to fall on its back or on its side in a random direction.
3. It emerges from that position partly rising its body out of water and does a headshake.
4. Vigorous wing thrashing movement is visible on one side with water splashing around the bird.
5. Typically followed with a wing flap, and a headshake.
6. The final action is a tail-wag.

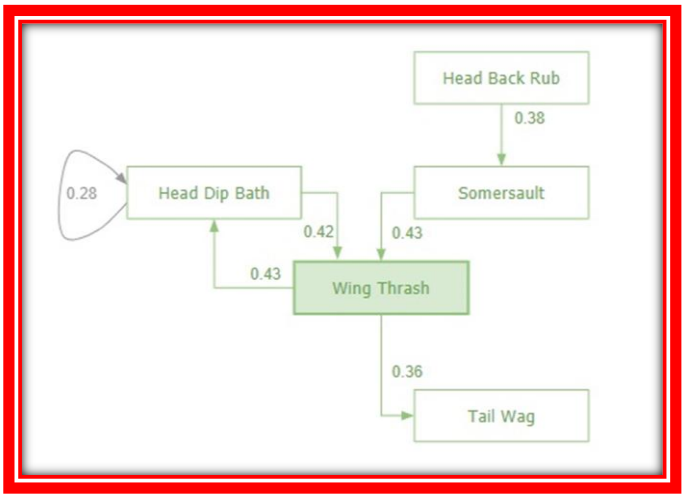

Fig. 2. Kinematic diagram for wing-thrash bathing showing transition frequency
Note: Probability values higher than 0.04 are highlighted

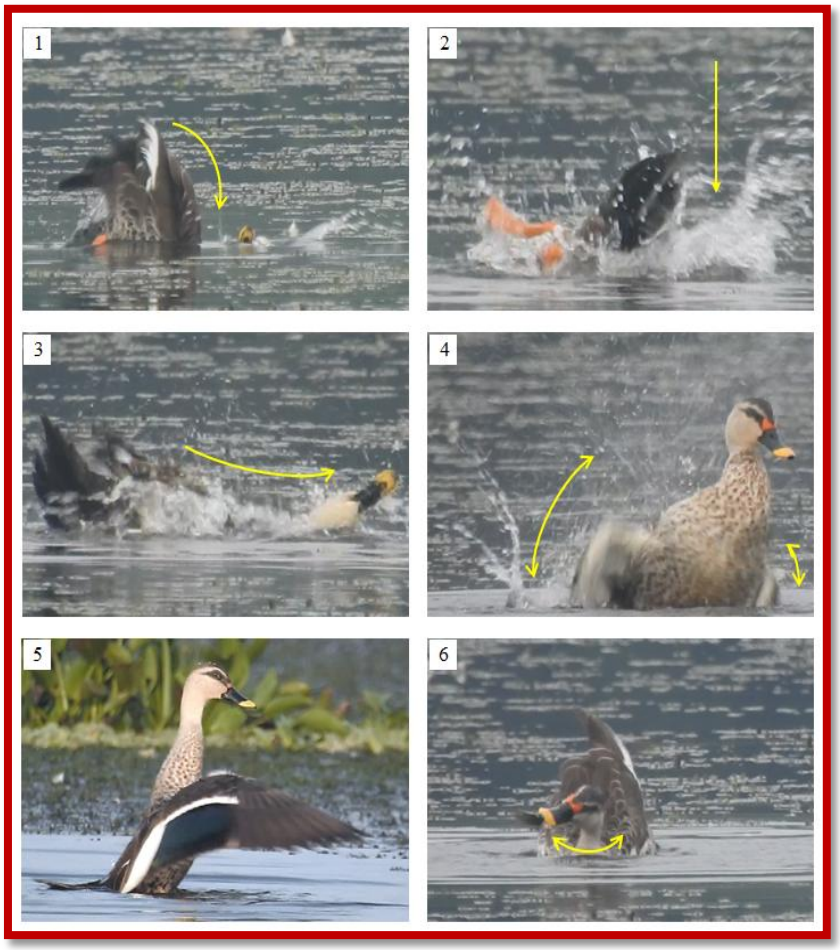

Plate 2. Wing-thrash bathing sequence (1-6)

3.6 Deviations from Atypical Sequence

Wing thrash was preceded by Head Dip (10%) or Head Flick (10%) most of the times. When a Head Flick preceded wing thrashing, it was also found to follow (7%) the Wing Thrash movement. In other sequences a somersault was observed (7%) followed by a tail-wag. This may also be assumed as an imperfect or partial execution of the falling on its back (step 2 of the sequence).

Some of the atypical movements observed are listed below

Head flick > Wing-thrash bathing > Head flick > Tail wag
Head to body rub > Wing-thrash bathing > Somersault > Tail wag

4. DISCUSSION

McKinney [15] indicated that Head dip bath by most of the Mallard follows the typical pattern as laid down by Weidmann [18] and similar FAP has been reported form members in the Anatidae family which is functional in wetting and cleaning the plumage. If the bird is standing in shallow water, undulating movements of the body may follow head-dipping for a few seconds. Further it has been reported that there are three main bathing movements: head-dipping, wing-thrashing, and somersaulting. In this study, FAP sequential analysis was done for head-dip bath and wing-thrashing. The somersault and wing thrash action is a part of wing thrashing bathing sequence. McKinney mentioned that wing thrashing immediately follows a somersault [15]

Another action observed during bathing was wing-scooping. The wings are opened and water is scooped up so that water is splattered on the underside of its wings. Neither dust-bathing nor anting was observed in the Indian spot-billed duck supporting McKinney's record [15]. McKinney describes head dip bath as a method in which the head is dipped forward under the water and rapidly withdrawn so that water is thrown over the back. The intensity of head-dipping usually

increases to incorporate tail-wags and rapid wing-shuffling. A series of head-dips occurs without any cessation of wing-shuffling, the wing and tail movements being most intense as the water flows over the back. It has been reported that head- flick is frequent after each dip or a series of dipping. However, the head-flick action was not observed in the Indian spot-billed duck during head dip bathing sequence [15].

In Wing-thrash bath, head-back-rub followed by a somersault often preceded a wing-thrash bathing sequence. In White-backed ducks, shoulder-rubbing is often combined with bathing and performed when the head is thrown backwards which is then followed by Wing-thrashing, usually with both wings together [19]. Wing-thrash bathing is contagious in the sense that when one or two ducks begin, others nearby follow suit, agitating the water surface.

5. CONCLUSION

This study provides a detailed description of the behavioural progression of bathing in Indian spot-billed ducks, with kinematic diagrams visually depicting the probability estimates of each sequence. Wing-thrash bath typically begins with head-dip or somersault while in head-dip bath, no specific action can be considered as preceding. Both methods of bathing ends with a tail wag which is considered as a signature ending to the bathing sequence. During the tail wag, excess water is removed from the tail feathers. Head-dip bathing is the most frequently observed method of bathing in Indian spot-billed ducks. This study also uncovers differences in these two bathing techniques. Wing-flap action was always recorded following head-dip bath which was rarely seen in wing-thrash bathing. The somersault action or head dip action usually preceded wing-thrash bathing. The somersault action is not related to any other activity and is seen only before wing-thrashing. Wing-thrash bathing was usually observed during cloudy days.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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