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Observation on breeding behavior of white breasted water hen (*Amaurornis phoenicurus*: Pennant, 1769) in the wetlands of East Calcutta, and Behala

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Abstract
The white breasted water hen (*Amaurornis phoenicurus*) is a small water bird, locally known as 'Dahuk' in West Bengal, India. The bird is black in colour dorsally and ventrally white. There is a red spot present on the base of beak and a large red spot under the tail. Beak and legs are pale yellow in colour. Legs and fingers are very long and bony; adapted for movement over aquatic vegetation. Tail is very short. Male is slightly larger than female, Their pairing or life partnership is life long and male bird strongly maintain their territory. They made the floating nest during egg laying. Both male and female show parental care and learning behavior. Newborn chick of white breasted water hen is completely black in colour.

Keywords: Territory, breeding, parental care, floating nest

Introduction
The white breasted water hen (*Amaurornis phoenicurus*) is a water bird under the family, Rallidae and its very common in Singapore, India, Southern China, Southeast Asia and Philippines. Water birds have attracted the attention of the Public and Scientists for their beauty, abundance, visibility, social behavior, as well as their recreational and economic importance. Recently, water birds have become of interest as indicators of wetland quality and as parameters of restoration success and regional biodiversity (Kumar and Gupta, 2009) [1], The white-breasted water hen is commonly known as "Dahuk" in West Bengal and it is seen in wetlands of different area of West Bengal. The Wet lands are complex water and land interactive systems and are supposed to be the most festive and productive sites in the world (Bhat *et al.*, 2009) [10]. The study of avifauna of different wetlands gained momentum only after Ramasar site convention in 1971.
White breasted waterhen (*Amaurornis phoenicurus*) is a resident bird, found throughout the year. They are more heard than seen because they disappear quickly on sighting the danger. Similar opinion was expressed by Fredickson and Reid (1986) [7] about Indian moorhen. They are very shy in nature and like to remain away from the human sight. Food habits of water birds of Sundurban was studied by Mukherjee (1972) [8]. Uttangi (2001) [9] reported on the conservation and management for the waterfowls in Dhanwad dist. They are knew vulnerable due to their shy nature. So in this investigation I have tried to study the general biology of this bird specially the breeding biology.

Materials and Methods
Study site: The study was carried out in three sites of Kolkata, West Bengal. The first one was based on wetland of Behala and other two were based on East Calcutta of wetlands, Kolkata, which were declared as a Ramasar site (site no. 1208) in 19th August, 2002. (Fig. 1,2,3) Wetlands provide home for and huge diversity of birds. Wet lands in India cover an area of 58.2 million hectors (Prasad *et al.*, 2002) [3] of 1340 bird species found in India (Ali and Ripley, 1987) [5], 310 species are known to be dependent on Wet Lands (Kumar *et al.*, 2005) [2]. So, the Wetland birds were chosen to study.

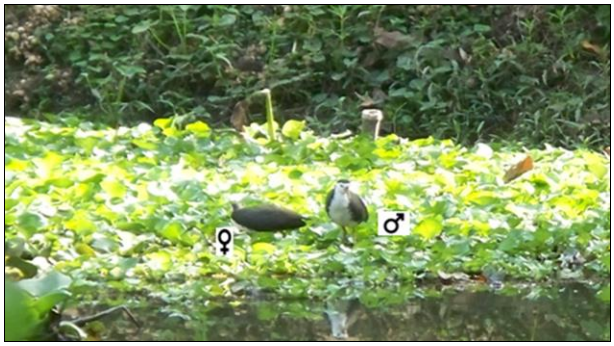

Fig 1: Behala Wetland

Fig 2: Charcharia Bheri, East Calcutta

Fig 3: Nalbon fisheries, East Calcutta Wetlands

Description of study

Observation was made over a period of one and half year *i.e.* during October, 2021 to March, 2023. Regular summaries and data were done systematically marking and constant watching the birds on above these fixed place. Birds were observed in calm and quietly without any noises, because they were very shy and liked to remain away from human sight. Three successive sessions were fixed for observation depending their habitat and movement. The time of my study are from 7.00 to 8.00 am in the morning which was suggested their first feeding time. Next one was 1.00 pm to 2.00 pm. at noon seemed to be bathing and feeding time. The last one was in between 4.00 pm to 5.00 pm at dusk. This was another feeding and roaming time. Studies were carried out with the aid of binoculars (Olympus:8-16x40; zoom- DPS1; field: 5.0º – 3.4º), Stop watch, Camera (Nicon; optical zoom; 20x; megapixel; 12x) and also scale, pencil and diary. Different type of behavior, habit and habitat, frequency of occurrence and observation of their nest were recorded. Birds were watched from a wall and data were recorded.

Histology

Ovaries were fixed in 10% formalin solution for 24 hours. The tissues were rinsed repeatedly in 70% alcohol, dehydrated through graded ethanol followed by acetone and cleared by xylene. Then tissues were kept in molten paraffin for 4 hours prior to embedding in paraffin wax (Merck) of 56-58ºC melting points. The tissues were sectioned serially at 6 µm thickness with a rotary microtome (SIPCON SP 1120A) and stained with Haematoxylin and counter stained with 2% eosin stain (Merck). The prepared slides were examined with Motic Research Microscope (Model: B1SERIES)

Results

Table 1: Showing morphological parameters of *Amaurornis phoenicurus*

	Male	Female
Average Weight (gm)	225	130
Average length (cm)	28.7	27.0
Average length of beak(cm)	4	3.2
Average length of wing(cm)	14.5	14
Average length of leg		
Right	22.5 cm	21.2 cm
Left	22.5 cm	21.5 cm
Length of finger (with claw)		
1st	3 cm	3.1
2nd	5.8 cm	6.1
3rd	7 cm	6.7
4th	4.6 cm	4.4

Table 2: Showing parameters of breeding biology

No. of Nest	No. of Birds	No. of Egg	No. of chicks/nest	Incubation period (day)	Average of incubation period
1.	1M + 1F	3	2	18	
2.	1M+1F	2	2	19	19
3.	1M+1F	2	2	20	

Description of the site: Wet lands of both east Calcutta and Behala were covered with different types of weed such as *Echhorina* sp., anabaena, *Pistia*, *Lemna*, *Wolffia*, *Ipomoea* etc. of these, *Echhornia* was the most dominant species which most of the wetlands (Fig 1, 2)

Morphology

The adults were dark grey or black in colour, male was always larger than female (male -28.0 cm and female 27.0 cm in average), length of leg, beak and finger were all larger in length in male than female (Table: 1). The leg were long (14.5cm male, 14.0 cm female), muscleless, bony in nature and provided with claw. Face and breast are milky white in colour. They always kept their tail high, so the rusted iron colour of the tail was easily seen. The eyes were black and the beak was faded yellow in colour (fig:4).

Fig 4: Adult Dahuk

Behaviour and Ecology

This birds can not live without water. They were mostly seen in wetlands and referred as wetland birds. They were seen always in pair specially in breeding season. Occasionally they were seen alone for searching food. They were very timid in nature and liked to live away from human sight. The general habitat of this bird had been studied by Morten Strange (2000) [12] and David, R. Wells (1999) [16]. They were noisy at dawn and dusk with loud croaky calls. This waterhen is a monogamous bird *i.e.* the male chooses only one female for pairing. They fed on worms, insects, different types of seed, small fishes etc. they also foraged above ground in low bushes and small trees, but their long toes made them rather clumsy among the branches.

The birds were usually seen in three times mainly. The first session was from 7.00 am to 8.30 am. The second times they were seen at noon at 1.00pm to 2.00 pm, bathing and seeking food in water and at dusk, 4.00 to 5.00 pm. They were roaming and searching food during day time in the wet lands.

A) Breeding biology

Breeding Season

Monsoon was the breeding season for *Amaurornis phoenicurus*. It started from March and ended in August, but in south-east Asia it may be started from April and ended in September (Morten Strange, 2000) [12]. Studied on breeding biology of Chinese white breasted waterhen, *A. phoenicurus chinesis* (Boddaest).

Pre-mating behaviour

Just before the breeding season, the male became more active than female. They began to call their mate. The sound was not very pleasant and rough. Some times he made sound continuously "crorro-corror-cock", just like flour machine.

The calling continued about 15 – 20 minutes at a time. On a cloudy day, the male bird called whole day and night. This time the male bird were visible most of the times, the female were rarely seen, but present hiding around the male probably feeling secured.

Nesting

At the end of March, nesting started by both parents. Nest was built by both the birds on the wetlands specially in the *Echhornia* leaves. It is looked like a bowl, made up of small sticks, dry grass, creepers and leaves. But unfortunately it could be hardly seen them during nest building. Because the birds immediately hid themselves as soon as they heard any sound. They only made this floating nest during time of egg laying. In general adults birds live under the bush, palm tree, date tree *i.e* trees with thorns.

Egg laying

The female laid eggs on an average 2.33 in number, though Morten Strange, (2000) [12] reported that 6-9 eggs were laid by females in south east Asian countries. No such observation could be seen in our experiment. The colour of the egg was faded yellow with reddish brown spot.

Incubation period varied from 18-20 days on an average 19 day. Morten Strange (2000) [12] reported it varied from 18-20 days. Both parents incubate their eggs. But the female had never seen out of the nest during this period. Male occasionally had been seen for searching food during a definite period.

Hatching

The eggs hatched out within 16 – 18 days. New born chicks were helpless. They were completely black with very long fingers and claw. Beaks and eyes were also black (fig 5). The black and fluffing chicks left the nest soon after a week.

Fig 5: Hatchling

Fig 6: Hatchlings are running with mother and father guarding from a distance.

Both parents cared for them and may be seen running with their parents.

They were roaming and searching food during day time in the wet lands.

C) Parental care

Both father and mother fed them. But usually the father went to search for food on the bank of the pond.

Fig 7: Parent searching food

Mother rarely left their chicks. The male bird always became alert about their predator.

Fig 8: Parental care: watching their children sitting on Wall

If he saw crow or any type of predator birds, human, cat, mongoose or hearing any types of sound, he made a sound like "*kok—kok*" by giving alarm call to alert his child. He shook his tail downwards and upwards showing rusted red colour associated with alarm call. By hearing alarm call from father, the mother immediately hides her child under the bush of *Echhornia* leaf. If, sometimes, the predator came too close to the nest, the mother swam with her children to the opposite bank of the pond. Chicks are always remain in between their parents. On the other bank of the pond, the parent hide the children under the bush of shrubs and herbs.

Fig 9: Parental care: showing to hide their children from predator

They were guarding the children to some distance

Fig 10: Father watching their children from

Fig 11: Chick to show mimicry

Standing still a distance

If by chance, the predator came close to the chick, the chick showed a peculiar behaviour just like mimicry to puzzle the predator. At the same time the parents start jumping far apart from the chick. So predator becomes puzzled. The chick, stood still, not moving any part of the body.

It looked like a dark leaf or mud on the ground *i.e.* chaemophlaging with background. So the predator thought them to be dead leaf and went away. The parents then made a soft call "*kook, kook*" and the chicks returned to their normal position. They all together returned to their *Echhornia* nest. If any predator such as mongoose or cat tried to catch the baby, the father chased towards the predator with all his feathers standing upwards. Ultimately he was successful in chasing away the predator. During this period, the mother was also very alert about her children.

She hide the children under the *Echhormia* leaf and gives a sharp look on their babies.

Fig 12: Showing Parental care to hide their

Fig 13: Male maintain their territory children under *Echhornia* leaf.

The father also chased if any other male water hen coming near the nest. So they maintained the territory during breeding period.

There was a storm of summer, namely "*Kalbaishakhi",* which happened during this period. All the nests were disrupted and broke during the storm. At that time the parents covered their babies by their wings, sitting on a twig or bamboo pole remained in pond. Next day, the father collected dry grass, mango leaf, banana leaf and immediately made a nest for his children. These nest was made above the remnants of previous nest. Interestingly the chicks are floating not immersed in water whereas other chicks of bird may immersed if they fall in water. Their body never drained with water.

Fig 14: Making nests after natural calamities

The father put some *Echhornia* under the nest with his beak, for floating the nest. When the atmospheric temperature was very high (38 ^{o}C), the children rested under the *Echhornia* leaf. During the mid day parents took bath along with their children (fig 16)

Fig 15: Parents take bath on a hot day.

In the afternoon, the parents took their children for roaming. They moved around their parents. After 3 weeks or 21 days, the parents taught them to fly. They also learned swimming from their parents. After 65 days (aprox), white colour appeared on the breast of each child. (fig: 17)

Fig 16: Non breeding.

Ovary

The histology of ovary consisted of an outer cortex containing ova which surrounds a highly vascular medulla. The medulla composed of primary connective tissue. The surface of the cortex was covered by the cuboidal germinal epithelium. A vast number of ova developed in the ovary. A very few of them reached maturity and only few were ovulated. The whole surface of the ovary was covered by germinal epithelium consisting of a single longer of columnar epithelium cells. All the ova within the ovary were primary oocytes until before ovulation. Within the cortex, there were numerous minute developing ova. The inner medullar stroma was composed of well vascularised and innervated connective tissue with spaces (Lacunae). In breeding females, maximum number of medium sized follicles with biggest diameter was observed.

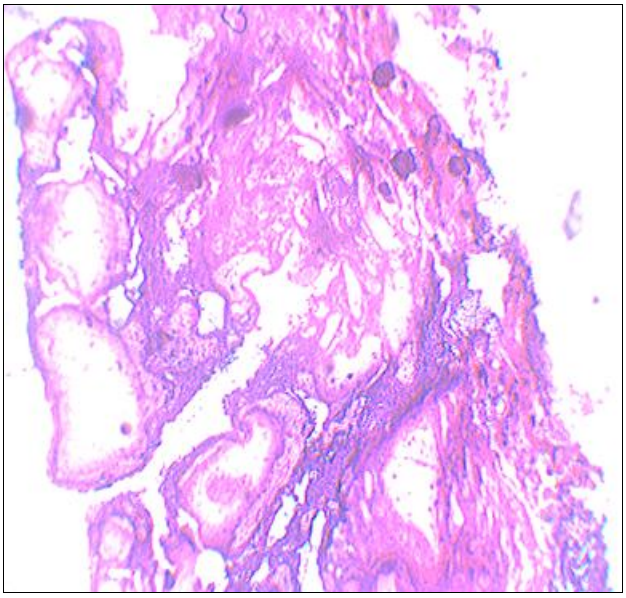

Fig 17: T.S. of ovary (10x)

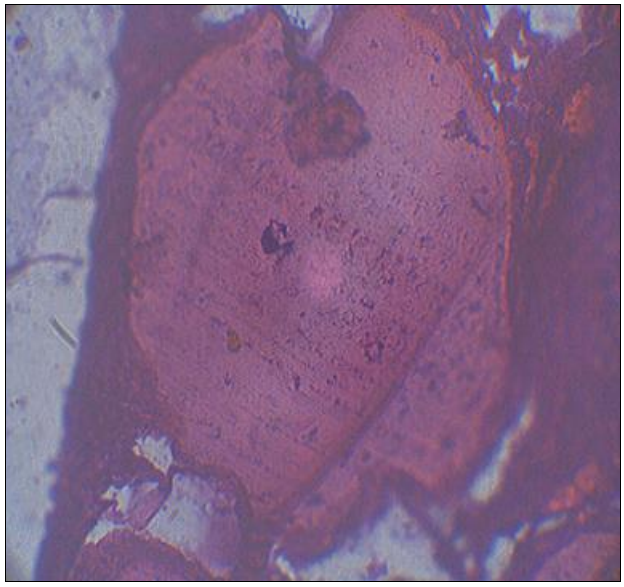

Fig 18: Graafian follicle.(40x)

Discussion

Parental Care: Parental Care can be defined as an association between the parents and the offerings so as to increase the chances of survival of the young ones and it includes also the post – spawning care of the offspring by the

parents. It is instinctive and species – specific behavior. The birds showed the extreme nature of parental care. They made nest in the pond during breeding for protection of chicks from predators. Whereas adults live in trees in other time. They spent time and energy to secure survival of their broods at their own cost: After about 18 to 20 days, hatchlings came out. The newborn chicks were helpless. They were completely black (fig.5) with very long fingers and claw. Beaks and eyes were also black. The hatchlings were atrial type *i.e.* they required more protection and defense from their predators. They were fed both by their parents at regular internals. On an average two to three chicks were born. But Morten and Strange (2000) [12] reported 6 to 9 eggs laid in South Asian countries.

Post-breading care: parental care did not end with the care of the nestling. For success in the struggle for existence, young birds needed to be educated by their parents in behavioural aspects such as skill in finding suitable food, skill in flight, learning to sing and social relationship etc. The adult looked after the young till the skills were perfected. Both the parents protected their young ones as soon as they left the nest. The male bird goes out in search of food near the water bodies and by watching predators like human beings, big birds, cat and mongoose and made sound to alert their chicks. They also shook their tail up and down showing the rust red colour as alarm. On hearing the alarm call from the male, the female immediately hid the young ones under the bush of *Eichhornia* leaf, grass or bush. Sometimes, the mother swam away with their chicks to the opposite bank of the pond, if the predator came too close to the nest. The chick remained always in between parent birds. Sometimes the young bird pretended like dead leaf if the predator came too close to them. If the bank of pond became free of predators the parent made a sound and the hatchlings returned to their normal position. Sometimes it has been seen that the nests were broken during storms and rains. At that time, both the parents covered their babies with their wings sitting on a twig or bamboo pole floating on the water. The very next day, the male made the nest in the same spot. At mid day, the parents take bathing and during afternoon, they guided the young bird roaming on the ground. After about 65 days, a white patch appeared on the black breast of each chick.

Ovary: The ovary consisted of an outer cortex containing ova which surrounds a highly vascular medulla. The medulla composed of primary connective tissue. The surface of the cortex was covered by the cuboidal germinal epithelium. A vast number of ova developed in the ovary. A very few of them reached maturity and only few were ovulated. The whole surface of the ovary was covered by germinal epithelium consisting of a single longer of columnar epithelium cells. All the ova within the ovary were primary oocytes until before ovulation. Within the cortex, there were numerous minute developing ova. The inner medullar stroma was composed of well vascularised and innervated connective tissue with spaces (Lacunae). In breeding females, maximum number of medium sized follicles with biggest diameter was observed. Similar observations were reported by Guraya and Chalana, 1976 in louse sparrow, Saxena and Saxena, 1980 in grey quail, Naik and Naik, 1965 in house swift, and Bhavna and Geeta, 2010 in Jungle babbler. The breeding ovaries showed cells at various stages of follicular maturation.

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