

## Breeding Biology of Indian Pond Heron (*Ardeola grayii*) in Hokersar Wetland, Kashmir

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### Abstract

Breeding parameters of Indian pond heron, a resident bird of Old World origin and widely distributed in the wetlands and other water bodies of the world were recorded in the breeding season of 2015, which extended from March to September in Hokersar Wetland, Kashmir. Information on nesting sites, clutch size, egg dimensions of abandoned and rolled off eggs, incubation period, hatching success, breeding success and nesting success was yielded through direct observations in the field. Nest site selection initiated in the month of April in willow plantations. Nests were more or less like a platform with slight depression. Average clutch size was  $3.28 \pm 0.80$  eggs per nest ( $n = 60$ ) and the mean egg dimensions of 30 (abandoned and rolled off) eggs were  $38.78 \times 30.48$  mm. Volume and shape index of the same eggs were  $27.80 \pm 1.92$  cm<sup>3</sup> and  $76.10 \pm 2.74$  respectively. Both sexes incubated eggs and the mean incubation period was  $20.9 \pm 1.18$  days. Hatching was asynchronous. The hatching, nesting and fledging success were 71.56 %, 73.33 % and 64.40 % respectively. Overall the breeding success was 64.38%.

**Keywords:** Clutch, egg biometry, fledging, hatching, incubation, nesting

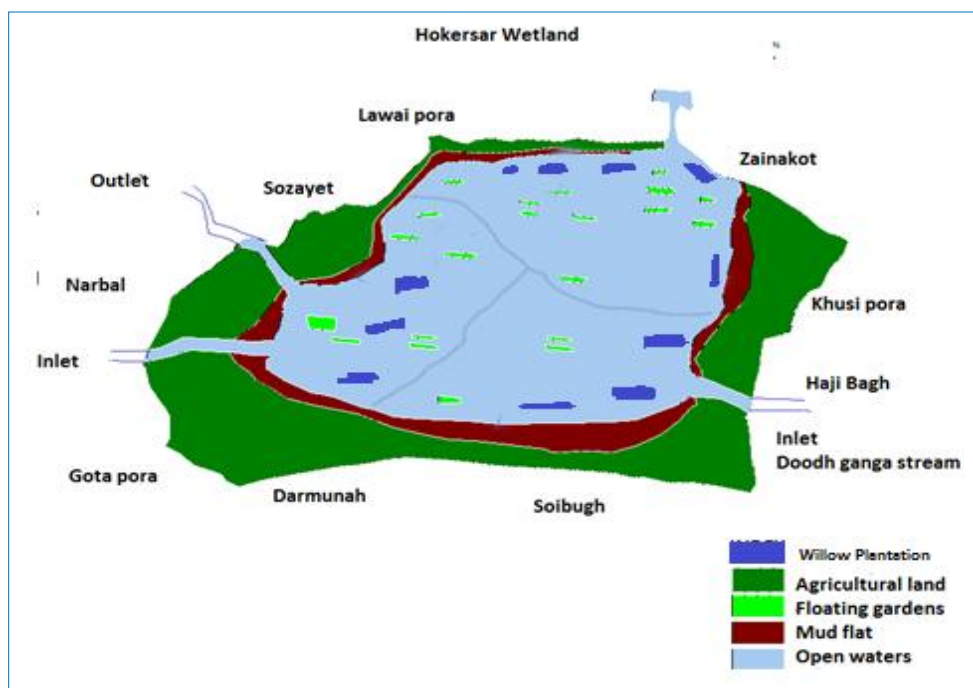
### Introduction

Indian pond heron (*Ardeola grayii*), a stocky resident bird with short neck, thick bill and buff-brown back shows local movement exclusively for foraging (Manikannan *et al.*, 2012; Mariapan *et al.*, 2013; Habib, 2014 and Kait *et al.*, 2014). Though a considerable amount of literature is available on breeding aspects of the pond heron from various parts of the world including India (Panday, 1958; Lamba, 1963; Parasharya, 1985; Yesmin *et al.*, 2001; Begum, 2003; Jaman, 2012; Jha, 2012), preliminary information on the nesting parameters has been documented from Kashmir (Fazili, 2014). The willow plantation in the Hokarsar wetland supports a good breeding population of Indian pond heron (Wani, 2016). The present study on breeding biology of Indian pond heron at world famous Ramsar site of Kashmir, Hokersar wetland is therefore, aimed to substantiate the already available literature.

### Material and Methods

The study was carried out in Hokersar (34°06'N and 74°06'E) a Ramsar site and a protected wetland of Kashmir with an area of about 13.75 Km<sup>2</sup>. and average depth of 3 meters (Wetland Division, Department of Wildlife, Jammu and Kashmir (**Figure 1**). The wetland is mainly fed by Doodhganga watershed in Pir Panjal range of Himalayas and is an ideal habitat for migratory as well as resident birds. The dominant components of vegetation include *Typha angustata*, *Phragmites communis*, *Sparganium ramosum*, *Butomus umbellatus* and *Saccharum spontaneum*. It has also patches of willow plantation that serve as breeding sites of Indian pond heron (**Plate 1 and 2**). Paddy cultivation is

practiced in the periphery of the wetland that act as supplementary feeding and roosting sites for a number of waders include Indian pond heron.



**Figure 1. Map of Hokersar Wetland (Site A: Darmunah; Site B Soibugh)**

The study was mainly restricted to two sites A and B (**Figure 1**) dominated by willow trees. Nests were located by observing birds flying in and out of the willow plantations and by wading through these sites. Trees with nests were marked with white paint and some piece of cloth as has been done by Klett *et al.*, (1988). Binoculars (8 x 40X) were used for observing the birds during the nesting and breeding period. On the basis of hatching of at least one chick, nest was declared as successful (Gill, 1994). A total of 60 nests were studied. Clutches were described as early, intermediate or late clutches for comparison. The dimensions of abandoned and fallen down eggs were recorded using digital vernier calipers. Volume of the same eggs was calculated using formula  $V = 0.051 \times L \times B^2$  where L= length of egg and B = breadth of egg (Hoyt, 1979). Camera of focal length 50-300 mm was used for photographic records. Shape index was calculated using formula  $B/L \times 100$  (Coulson 1963). Hatching success calculations were done in accordance with Mayfield (1975) and Johnson (1979). Statistical analysis was done through MINITAB software.

## Results

The breeding season of 2015 started in April and continued up to August. During onset of breeding season, colour of both the sexes changed which helped in sex recognition. From the colour difference and further activities of each individual, one with maroon plumes and black tinge and actively building

the nest was female and the other one with reddish buff colour that only supplemented the nest building was male. Pond herons were territorial in nature with territorial size varying from 1 to 3 m<sup>2</sup>. Both the sexes fought vigorously against the intruders.

### *Nesting and clutch size*

Nesting started from late April and nest sites were chosen at two sites (A & B) with dense willow plantations (**Figure 1**). Both the sexes were involved in the construction of nests which were simple shallow platforms made of willow twigs without any leaf canopy (**Plate 3**). Nest construction took 6-8 days (n=15) and repairing of the old nests 3-6 days (n=3). The average height of nests was  $6.09 \pm 1.78$  meters (n = 60). Distance between nests varied from 1 to 1.74 m<sup>2</sup>. The duration of the mating was observed to last for 8-18 seconds. The process of egg laying usually started after 6-7 days of completion of nests. First egg was sighted on 8<sup>th</sup> May 2015. Egg laying continued till July. A total of 204 eggs were laid in whole breeding season in 60 nests (**Table 1**). Eggs were generally laid daily (n=15) and rarely on alternate days (n=2). The clutch size of Indian pond heron varied from 2-5 eggs, with an average of  $3.28 \pm 0.80$  eggs per nest (**Plate 4, Plate 5**).

**Table 1: Month wise egg laying process at two sites of Hokersar**

Month	No. of nests observed at site A	No. of eggs observed	No. of nests at Site B	No. of eggs observed
May	9	31	9	26
June	15	53	15	47
July	6	20	6	27
<b>Total per site</b>	30	104	30	100

### *Incubation period*

Both sexes incubated eggs with most of the time and effort by female, except on a few occasions (n=3) when one of the parents attended the nest and left only after the arrival of the partner. Incubation was intense during early morning and late evening hours (**Table 2**). The mean incubation period was  $20.9 \pm 1.18$  days continuous time spent by any of the parents on eggs during incubation in a day varied from a minimum of 50 minutes to a maximum of 4 hours.

**Table 2: Incubation period**

Site	No. of clutches	Incubation period (days)								Mean $\pm$ S.D
		18	19	20	21	22	23	24	25	
Site A	15	-	1	4	5	3	1	1	-	21.12 $\pm$ 1.03
Site B	15	-	2	4	7	1	1	-	-	20.5 $\pm$ 1.12
<b>Total</b>	30	-	3	8	12	4	2	1	-	20.9 $\pm$ 1.18

Eggs were broad, oval and pale greenish in colour with a mean length of 38.78mm and breadth of 30.48mm as revealed from dimensions of abandoned and rolled off eggs (**Plate 7**). Volume and shape index of the eggs was  $27.80 \pm 1.92 \text{ cm}^3$  and  $76.10 \pm 2.74$  respectively (**Table 3**)

**Table 3: Parameters of abandon eggs/fallen down eggs**

Egg Parameter	Minimum value	Maximum Value	Mean	S.D	N
Length (mm)	35.70	42.98	38.78	$\pm 1.65$	30
Breadth (mm)	26.7	35.54	30.48	$\pm 1.99$	30
Egg volume ( $\text{cm}^3$ )	12.72	27.14	25.80	$\pm 1.92$	30
Egg shape Index	71.71	82.68	76.10	$\pm 2.74$	30

### Hatching

Hatching was asynchronous. The fresh hatchlings were thinly covered with down feathers, having a prominent natal plumage on forehead. The overall hatching success was 71.56 % (**Table 4**). The overall nesting success was 73.33 % and breeding success was 64.38 %.

**Table4: Month wise hatching Success**

Months	No. of Eggs At site A and B	Eggs lost by Predation		Faulty incubation		Hatching success	
		Number	%	Number	%	Number	%
May	57	8	14.0	6	10.52	43	75.43
June	100	23	23	8	8.00	69	69.00
July	47	11	23.40	2	4.25	34	72.34
<b>Total</b>	204	42	20.58	16	7.84	146	71.56

After 5 days of hatching (**Plate 8**), chicks showed slight movements and made calls when visited by parents and predatory birds (**Plate 6**). After 10 days of hatching, chicks could move about in their nests and after 18-20 days chicks were found perching on the branches of the nesting trees. They acquired flight between 25-30 days of age when they left their nests completely and followed their parents in the field.

### Fledging success

Out of a total 204 eggs from 60 nests, only 146 eggs hatched successfully. Fledging period varied from 25 to 30 days with an average of 27.65 days. Overall fledging success was 64.40 % and on the basis of exposure days fledging success was calculated as 34.50 % (**Table 5**).

**Table 5: Fledging success.**

Month	No. of Chicks	Chick lost by predation		Chicks lost by human disturbance		Fledging success	
		No.	%	No.	%	No.	%
June	39	10	25.64	3	7.6	26	66.6
July	63	18	28.57	5	7.9	40	63.49
August	44	12	27.27	4	8.6	28	63.63
<b>Total</b>	146	40	27.40	12	8.20	94	64.40

Out of a total 30 nests at each site, 23 nests succeeded at site A and 21 at site B with nesting success of 76.66 % and 70.00% respectively. The success rate of earlier nests was higher than late nests with 72.22% for the nests established in May, 76.66% for the nests established in June and only 66.66% for the nests established in July. The overall nesting success was 73.33 % (**Table 6**). On the basis of exposure days (**Table 7**), hatching, nesting and fledging successes were 52.41%, 63.14% and 34.5% respectively.

**Table 6: Nesting success**

Month	Nests	Unsuccessful Nests		Predated Nests		Successful Nests	
		Number	%	Number	%	Number	%
May	18	1	5.5	4	22.22	13	72.22
June	30	1	3.3	6	20	23	76.66
July	12	2	16.6	2	16	8	66.66
<b>Total</b>	60	4	6.66	12	20	44	73.33

**Table7: Mayfield probability success for different stages of pond heron.**

	Exposure days	No. of eggs/ nesting/nests	No. of eggs/ nesting/ nests failed	Daily survival	Success rate
Hatching	2699	204	58	0.97	52.41%
Nesting	1564.5	60	16	0.99	63.14%
Fledging	1317	146	52	0.96	34.5%

## Discussion

The breeding season started from April and continued up to August as reported by Fazili (2014) and Seedikkoya *et al.* (2012), however Jaman *et al.* (2012) reported the onset of breeding season from March. This variation in the commencement of breeding season is due to varied climatic conditions prevailing in the respective regions. During breeding season colour of both the sexes changed which is

in agreement with Sundar (2004) and Seedikkoya *et al.* (2012). Pond herons were found nesting in mixed colonies with little egrets, cattle egrets and black crowned night herons as has been verified from the findings of Fazili and Mir (2013). Willow trees were preferred for nest construction however, Seedikkoya (2012) reported nest building on different species of trees with *Mangifera indica* being the most prominent one, whereas, Jha (2012) observed the nest formation on tamarind trees. Both sexes were active in construction of nests which is in consonance with Bates and Lowther (1952), Fazili and Mir (2013) and Seedikkoya *et al.* (2012). Shape of the nest was like a platform made of willow twigs. Ali and Ripley (1983) have described the nest of pond heron as an untidy structure of twigs while Henry (1971) reported the nest as flat platform and devoid of inner lining. The average height of nests was  $6.09 \pm 1.78$  m and average distance between nests was 1 to 1.74 meters. Pond heron made their nests within 6-8 days as has also been reported by Fazili (2014). The other studies recorded about 7- 14 days for completing their nest construction with an average duration of 10 days (Jaman *et al.*, 2012, Seedikkoya *et al.*, 2012). Clutch size of 3 was the most common (**Plate 5**) which agrees with other workers (Seedikkoya *et al.*, 2012; Jaman *et al.*, 2012; Jha 2012). Incubation started immediately after laying of first egg. The average incubation period was  $20.9 \pm 1.18$  (range 19- 24 days) which agrees with Fazili and Mir (2013). However, the incubation period is reported to vary from 18 to 24 days with mean duration of  $20.9 \pm 1.66$  days (Seedikkoya *et al.*, 2012). Slight variation in the mean incubation period may be attributed to the different climatic conditions and varied temperatures prevailing at different study sites. Overall hatching success was 71.56 %. The fledging period varied from 25-30 days. The overall nesting success was 73.33 % and breeding success of 64.38 %. Fazili and Intiaz (2013) reported nesting breeding success and hatching success of 86.67 %, 59.26 % and 75.31 % respectively. Seedikkoya *et al.* (2012) estimated the hatching success of 86 %, and Yesmin *et al.* (2001) reported hatching success of 46.5%. Different levels of hatching success may be attributed to different climatic conditions and different levels of predation.



Plate 1. Indian pond heron (breeding plumage)



Plate 2. Pond heron in flight





**Plate 3. Nest of Indian pond heron**



**Plate 4. Two egg clutch**



**Plate 5. Three egg clutch**



**Plate 6. Egg predators**



**Plate 7. Rolled off egg from nest**



**Plate 8. Five day old chick**

## References

- Ali, S. and Ripley, S. D. 1983. *Handbook of the Birds of India and Pakistan*. Compact edition Oxford Univ. Press, New Delhi. Vol 4, 2<sup>nd</sup> Edition, 737 pp.
- Bates, R. S. P. and Lowther, E. H. N. 1952. *Breeding Birds of Kashmir*. Oxford Univ. Press, London, 367 pp.
- Begum, S. 2003. Colonial nesting behaviour in Indian pond heron (*Ardeola grayii*) of Bangladesh. *Zoo's Print. J.* **18**(6): 1113-1116.
- Coulson, J.C. 1963. Egg size and shape in the Kittawake *Rissa tridactyla* and use in estimating age composition of populations. *J. of Zoo.* **140**(2): 211-226.
- Fazili M. F. and Imtiaz, H. 2013. Nest site selection and breeding parameters of common moorhen *Gallinula chloropus* in Hokersar wetland Kashmir. *Inter. J. Curr. Res.* **5**: 1561-1564.
- Fazili, M. F. 2014, Some Breeding Parameters in a Colony of Indian Pond Herons (*Ardea grayii*). *Inter. J. Envr. Sci.* **3** (2). 60-64.
- Fazili, M. F. and Mir, R. 2013. Nest site selection and breeding parameters of Night heron *Nycticorax nycticorax* in Hokersar wetland Kashmir. *Inter. J. Curr. Res.* **5**: 1529-1532.
- Gill, F. B. 1994. *Ornithology* (2<sup>nd</sup> ed) W. H. Freeman and Company. New York, 766 pp.
- Habib, M. 2014. Bird community structure and factors affecting the avifauna of Hokersar wetland Kashmir. *Inter. Jou. curr. Res.* **6**(7): 7397-7403.
- Henry, G.M. 1971. A guide to the birds of Ceylon. Oxford University Press. London, Bombay, New York, 457 pp.
- Hoyt, D. F. 1979. Practical methods of estimating volume and fresh weights of bird eggs. *The Auk.* **96**: 73-77.
- Jaman, M. F., Sarker S. U. and Sarker, N. J. 2012. Ecology and Breeding Biology of the Pond Heron, *Ardeola Grayii* (Sykes, 1832) and Its Conservation Aspects. *J. Asiat. Soc. Bang. Sci.* **38**(1):99-109
- Jha, K. 2012. Some breeding and ecological aspects of heronry birds at Soor Sarovar bird Sanctuary Agra, Northern India. *Asi. J. Conserv. Bio.* **1**(1): 35-41.
- Klett, A. T., Shaffer, T. L. and Johnson D. H. 1988. Duck nest success in Prairie Pathole region. *J. Wildl. Manag.* **52**(3): 431- 440.
- Johnson D.H. 1979. Estimating nest success: The Mayfield method and an alternative. *The Auk.* **96**(4): 651-661.
- Kait, R., Manhas, R., Aggrwal, S. and Sahi, D. N. 2014. Birds of Srinagar city, Jammu and Kashmir, India. *Int. J. of Biodivers. Conserv.* **6**(3): 217-221.
- Lamba, B.S. (1963) Nidification of some Indian birds. No.6. The Indian Pond Heron or Paddy bird *Ardeola grayii* (Sykes). *Pavo.* **1**(1): 35-43.
- Manikannan, R., Asokan, S., Ali, A.M.S. 2012. Abundance and Factors Affecting Population Characteristics of Waders (Charadiformes) in Great Vedaranyam Swamp of Point Calimere Wildlife Sanctuary, South-east coast of India. *Int. J. Eco.* **2**(1): 6-14.
- Mariappan, N., Kalfan, A.K.B., Krishnakumar, S. 2013. Assessment of bird populations in different habitats of agricultural ecosystems. *Int. J. Sci. Res. in Env. Sci.* **1**(1):306-316
- Mayfield, H. F. 1961. Nesting success calculated from exposure. *Wilson Bull.* **73**: 255-261.
- Mayfield, H. F. 1975. Suggestions for calculating nest success. *Willson Bull.* **87**: 456-466.
- Panday, D.J. 1958. Cormorants and egrets fishing in co-operation. *J. Bom. Natu. Hist. Soci.* **55**(1), 170-171.
- Parasharya, B.M. 1985. Pairing between pond heron and intermediate egret. *Pavo.* **23**: 103-104.
- Seedikkoya, K., Azeez, P., Abdul-Shukkur., E.A.A., (2012). Breeding biology of Pond Heron in Kerela, South India. *Sci. J. Zool.* **1** (3); 42-51.
- Sundar, G. 2004. Abundance and seasonality of Indian pond herons *Ardeola grayii* with red legs in Uttar Pradesh, India. *Forktail* **20**: 131-132.
- Wani, I. N. 2016. *Population structure and reproductive biology of pond heron (Ardeola grayii) in some wetlands of Kashmir*. Ph. D thesis, Department of Zoology, University of Kashmir (Unpublished).
- Yesmin, R., Rahman, K. and Haque, N. 2001. The breeding biology of the pond heron (*Ardeola grayii*) in captivity. *Tigerpaper.* **28** (1): 15-18.