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RESEARCH ARTICLE

NEST SITE SELECTION AND BREEDING PARAMETERS OF COMMON MOORHEN *GALLINULA CHLOROPUS* IN HOKERSAR WETLAND KASHMIR

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ABSTRACT

Different parameters of nesting biology of common moorhen (*Gallinula chloropus*) were studied at hokersar wetland Kashmir, during 2012 breeding season. Breeding was initiated by the pair formation. Nesting sites were chosen in thick emergent vegetation, dominated by *Typha* and *Phragmites*.Nest were constructed by both sexes on a average in 6 days(range 4-10) but females played the dominant role and dimensions varied in different vegetation. Clutch size varied from 4-12 eggs and mean egg measurement were 41.10±1.94mmX30.08±2.11mm. Incubation was mainly performed by females during an average period of 21 days. Hatchlings were nidifugous and hatching period varied between 15hr to 21hr (average 18±1.58hr).Nesting and hatching success was calculated both by Mayfield (1975) as well as by traditional method. Causes of low success were also reported.

INTRODUCTION

The common moorhen *Gallinula chloropus* essentially a waterbird and a member of the rail family is a predominant species of the wetlands of the valley of Kashmir during summer (Shah 1984). Various species have been recognized, based on minor differences, giving them worldwide distribution. Males and Females are sexually monomorphic in plumage although females are often smaller than males (Petrie 1983). This bird has been extensively studied in Europe (Relton 1972; Huxley and Wood 1976) and North America (Freidrickson 1971; Brackney and Bookhout 1982; Greij 1994; Bannor 1997, 1998) but the bird has not been studied in detail from Indian subcontinents and there are only some fragmentary reports of its breeding biology. (Bates and Lowther, 1952).The aim of the present paper is to describe its breeding parameters analysed from the data collected from the hokersar wetland during 2012 breeding season.

MATERIAL AND METHODS

Study Area: The study was carried out at Hokersar wetland (34°06' N, 74°05' E) a Ramsar site. It lies 10 kms west of Srinagar on Srinagar Baramullah highway, Figure 1. The wetland provides excellent wintering resorts, cover and safe roosting and feeding grounds to a large number of migratory waterfowl as well as breeding and nesting grounds for diverse migratory and resident birds in summer. This wetland is mainly fed by Doodhganga watershed in Pir Panjal range of Himalayas. It has the dominant vegetation of *Typha angustata, Phragmites communis, Sparganium Ramosum, butomus umbellatus and Saccharum spontaneum.*

Field procedures

Nests were searched systematically throughout the wetland. On finding a nest nest dimensions viz diameter, depth and height above vegetation were measured with the help of measuring tape. Egg mass and egg morphometry were taken using electronic balance and digital calliper respectively.

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Freshly laid eggs were marked with indelible marker pen in the order of their laying to calculate egg weight loss, incubation period and hatching period. Slender willow stakes flagged with strips of red cloth were used to mark nest locations so that nests could be relocated (Klett *et al.*, 1998). To monitor outcome of nests, nests were visited thrice in a week. A nest was defined as successful: if there was at least hatchling of one chick in the nest, the presence of piping holes made by the chick, distraction displays of flight inability by the breeding pair. Unsuccessful nests were characterised as: if the eggs were cold, no adults were seen in vicinity of the nest, eggs found outside the nest.

To find whether there is any variation in the egg dimensions of early and late clutches the clutches were divided into three groups. The first 25% of the total clutches found were considered early clutches, the second 50% of the total clutches were considered as intermediate clutches and the last 25% of the total clutches were considered as late clutches. Incubation period was defined as the period since the laying of last egg of clutch until the hatching of first egg (Gill 1994), To calculate the average weight losses, eggs were weighed regularly with the help of digital balance till they hatched. Freshly hatched chicks were weighed to the nearest gram and their beaks and tarsi were measured with the help of vernier callipers. The incubation and hatching behaviour was studied with the help of Super Zenith binoculars (50x70) from a hide at least 10m away from the nest. Egg volume was calculated as $V=0.051\times L\times B^2$ and Shape index as $W/L\times 100$ (Coulson, 1966). Nesting and hatching success was determined using Mayfield's (1975) method based on exposure days as well as by traditional method.

Statistical analyses

Measurements of early, intermediate and late clutches were compared with one way ANOVA followed by post-hoc Tuckeys test. Independent T -test was used to compare the height of vegetation of nests found in grasses and that in emergent vegetation. Mann Whitney U test was used to compare the nest diameters. Probabilities were two tailed, and significance level was set to as a=0.05.All statistical analysis were performed using SPSS and MS Excel.

RESULTS

Breeding season: The breeding season is initiated by pair formation and maintenance of territories in the first week of April when the air temperature is more than 25°C and the reeds have attained the height of 45cm to 60cm. It extends upto August during which single generation is raised which disperse in different parts of the wetland and other adjacent marshy areas.

Nest site, building and structure

Nest sites were chosen in the areas which had dense growth of emergent vegetation dominated by *Typha angustata, Sparganuim ramosum and Phragmites communis*. Some nests were formed on floating vegetation. Reed height in nesting sites varied from 89.1 to 107cm and density from 56-71/m². But in floating sites reed height varied from 24-30cm and density 25-38/m². The first signs of nest building were noticed in the middle of April. Both the parents built the nest but most of the architectural work of arranging and giving the nest characteristic shape was done by female. The intensity of nest building was very high during morning hours around noon the building activity almost ceased but was resumed in the afternoon. In the nest formation, macrophytes were used. The dominant being *Typha angustata, Phragmites communis, Saccharum spontaneum*, and *Spargancium ramosum*. Besides these grasses, *juncus* and leaves of *Trapa* spp were used in nest building. The nest diameter ranged from 12.8-23.1cm in emergent vegetation and 15-18.9cm in floating vegetation.

Egg morphometry, Clutch size and Incubation

Eggs were elliptical, dark white in colour with scattered brown markings and measured on an average 41.10±1.94mmX30.08±2.11m (Table 1). The volume and egg shape index of eggs was found to be 19.07±3.49cm³ and 12.40 ±1.43 respectively. The mean clutch size of moorhen was found to be 8. A positive correlation was found between the clutch size and the nest diameter (Figure 2). The average volume of eggs within a clutch had a marginally significantly negative correlation with the size of the clutch (Figure 3). The eggs of early and intermediate clutches were significantly longer (F_2, 87=44.64, P<0.005) and broader (F_2, 87=55.57, P<0.005) as compared to final clutches. But there was no significant difference between early and intermediate clutches (P= 0.80). Incubation period varied from 18-22 days with an average of 21 days (Table 2). During incubation the eggs lose on an average 17.27% of weight (Figure 4). Both the parents incubated the eggs but females which are larger attended the nests and eggs the most. From the observations on nests it was found that females spent 80% of the day time in incubating and shading the eggs and males only when females leave for feeding.

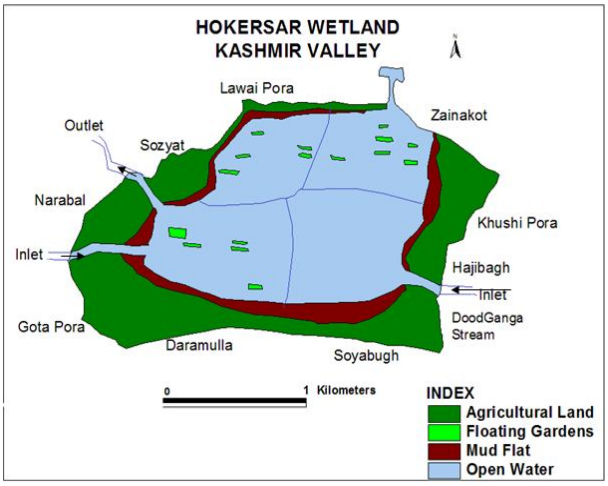

Figure 1: Study Area

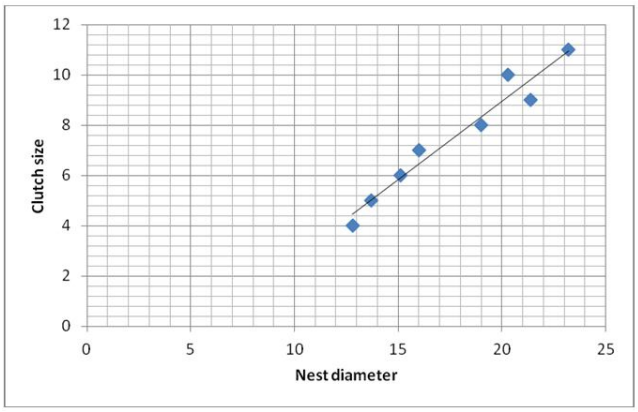

Figure 2: Correlation between clutch size and the nest diameter

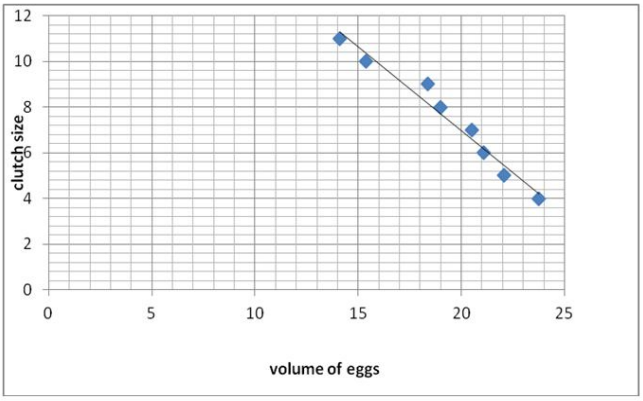

Figure 3: Correlation between clutch size and egg volume

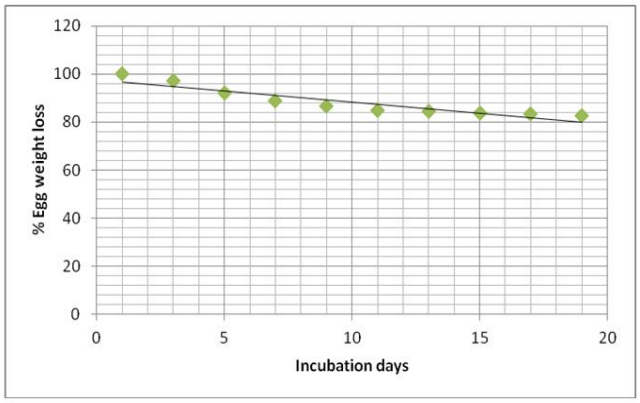

Figure 4: Percentage Egg Weight Loss

Table 1. Egg parameters

Egg parameter	minimum value	maximum value	mean value	number measured
Weight (un- incubated)	17.8g	22.5g	20.69±1.50	30
Weight(incubated)	14g	17g	14.64±0.90	30
Length	38.11mm	43.36mm	41.10±1.94	90
Breadth	27.01mm	33.05mm	30.08±2.11	90

Table 2. Length of incubation days

No. of clutches observed	no. of incubation days					mean incubation period(days)
	18	19	20	21	22	
40	12	4	8	10	6	21 days

Table 3. Nesting date

No. of nests	no. of nests failed	no. of nest hatched	nesting success	hatching date range
104	36	68	68.7%	21 April-August11

Table 4. Reproductive Success Estimated by the Proportion of Successful Nests using Mayfield's Method.

Total exposure days	1199
Nesting period (d)	29
Percent(%)nest survival probability	41.3%

Hatching and Hatching success

The hatching was asynchronous and the eggs hatched in the nests in which they were laid. The hatchlings were nidifugous and weighed on an average 19.6g. Soon after emergence they followed their parents for food. The hatching success during the study was 68.7% (traditional method) and 44% (Mayfield). The major causes for unsuccessful hatching were flooding, predation, abandonment of nest by female and eggs lost due to faulty incubation. Nesting Success: Nesting success accounted for 65.38% (traditional method tab 3) and 41.3% (Mayfield Table 4). The major causes of failure were predation flooding and abandonment of the nest by the females (8%).

DISCUSSION

The breeding biology of birds is a beautiful expression of the correlation of various activities and adaptations evolved, as a result of natural selection with environmental and environment dependent conditions. The duration of breeding season in moorhen lasted for nearly five months, with a single breeding season extending from April to August. Bates and Lowther (1952) and Ali (1979) also reported a single breeding season for moorhen but from May to August. Shah (1984) also reported a single breeding season extending from April to August, so present findings seem to be in accordance with later findings. The inception of breeding earlier can be attributed to the climatic conditions as during April there were low rains and mercury level was high in comparison to the preceding month i.e. March. The nesting site varied greatly but it was mostly characterised by thick growth of *Typha angustata, phragmites communis, Butomus umbellatus and Sparganum ramosum*, and it provided adequate cover and protection to the eggs and nestlings from the predators. The varied nesting sites have been reported by Wood 1974. He further reported that nests may be found in water or suspended above it or on mud banks surrounded by water. During the present study some nests were also found suspended above water, but most of nests were found in emergent vegetation. Bates and Lowther (1952), Hylander (1959), Whisteler (1963), Relton (1972), Wood (1974) and Ali (1979) also found the cattail and rushes as the preferred sites of moorhen.

Both the sexes took part in nest building and its maintenance like the earlier findings of Bates and Lowther (1952), Ali and Ripley (1983). The intensity of nest building was high during morning hours and around noon the building activity almost ceased. This could be preferably because birds seem to be more active during morning hours.Relton (1972) recorded the clutches to have started as early as 26th March and as late as 8th August in Huntingdonshire. Wood (1974) found the earliest egg laying on 6th April and the latest on 22th July, in Hampshire. Thus there seems to be a great variation in the period when egg laying starts. During the course of present studies egg laying started in mid April (21th) and the last egg laying took place on August 11, these studies are in confirmation to the findings of Shah (1984). Like other rails moorhens laid one egg per day until the clutch was complete. Similar observations were made by Witherby *et.al.* (1938-1941), Steinbacher (1939) and Wood (1974). During the present study the clutch size in moorhen ranged from 4-11 eggs with an average clutch size of 8 eggs. Various workers have reported about the average clutch size of moorhen. It was found to be 7.6 by Anderson in 1965 in Aberdeenshire, 7.5 by Anfennsen 1961, and 6.8 by Steinbacher in 1939.The variation in clutch size have been correlated with environmental and physiological factors (Tollenaar 1972, Kluijver 1951, Willson 1966, Crawford, 1980). The clutch size appeared to vary inversely with the progress of breeding season.

It was noticed that initial and intermediate clutches had eggs in larger number as well as in measurement than that of final clutches. It is because of the fact that the birds breeding for the first time usually breed late in the season and lay smaller clutches than the older ones which start breeding early in season. These findings seem to be in accordance to the findings of Kluijver, 1951, Willson 1966, Crawford, 1980 in different bird species. This is further supported by the fact that clutch size in birds is often dependent on the age of the parents, younger parents lay fewer eggs (Coulson 1966, Kcomp 1970, Coulson and Porter 1985). Moorhen egg measurement reported by various workers were more or less the same: 41.9× 30.7mm (Wells 1940), 41.3x 29.5mm (Xin Lu 2011), and 41.4 × 29.6 mm (Ali and Ripley, 1969). During the present investigation egg measurements were 41.10× 30.08mm. Like other rails both parents took part in incubation but female is largely responsible for it. The mean incubation period of moorhen was 21 days, these observations seem to be in accordance to the findings of Bent 1926, Kebbe 1985, Delpraaf and Yamasaki 2001.Rahn and Ar (1974) reported that egg lose 16% to 18% of their weight during incubation and attributed this weight loss to loss of water due to evaporation during incubation. During the present study there also appeared a gradual loss of 17.17% in egg weight during incubation. Ahanger (2008) also reported a gradual loss of 17.17% in egg weight during incubation in case of Mallard.

Hatching was asynchronous. Lack (1968) also observed asynchronous hatching in moorhen and according to him this phenomenon is an adaptation to a variable food supply. The causes of nest failure were predation, flooding and abandonment. Factors that contributed low hatching success were flooding, predation, faulty incubation, and abandonment. Common crow (*corvus splendens*), Pariah kite (*Milvus migrans*) and Night Heron (*Nycticorax nycticorax)* were main egg predators. Shah (1984) also found the common crow and pariah kite to be main predators of moorhen in Hokersar wetland of Kashmir. Eggs were most vulnerable to predation during the early part of the breeding season when vegetation had not attained significant height to fully conceal the nests. Hill (1984) also reported that proportion of Mallard and tufted nests destroyed by predation generally decreased as the minimum vegetation height around the nest increased.

REFERENCES

Ahanger F.A.2009.Avian Diversity and Breeding Biology of Mallard *Anas platyrhynchus* in Hokersar wetland Kashmir, ph.d thesis submitted to University of Kashmir.

Ali, S.1979.The books of Indian Birds. Bom. Nat Hist. Soc., Bombay.

Ali, S.Ripley, D.S. 1969.*Handbook of birds of india and Pakistan*. Volume 2 Oxford university press, London.

Ali, S. and Ripley, S.D. 1983. Handbook of the birds of india compact edition oxford univ. press. Delhi.

Anderson 1965.Moorhens at newburgh scott birds, 3:230-233.

Anfinnsen,M.T. 1961. Sivhana, Gallinula chlorophus(L). I.Norge. Sterna, 4:345-377.

Bannor,B.K.1997.High breeding density of Commom Moorhens at a zoological park. florida scientist 60:236-238.

Bates, R.S.P and lowther, E.H.N. 1952. Breeding birds of Kashmir. Oxford *univ. press*, London 367.

Brackney, A.W., and T.A..Bookhout.1982.Population Ecology of Common gallinules in southwestern lake Erie marshes. Ohio j.sci.82:229-237.

Bent, A.C. 1926. Life Histories of North American Marsh Birds. Dover publications. Inc., New York, NY, USA.

Coulson, J.C.1963.Egg size and shape in the kittiwake (Rissa tridactyla) and their use in estimating age composition of populations. *Proceedings of the Zoological Society of London,*140: 211-227.

Coulson J.C. 1966. The influence of the pair bond and age on the breeding biology of the Kittiwake Gull *Rissa tridactyla. Journal of Animal Ecology* 35:264-279.

Coulson J.C . and Porter J.M .1985.Reproduction success of the kittiwake Gull *Rissa tridactyla*: The role of clutch size. Chick growth rates and parental quality *ibis* 127:450-466

Crawford, R.D. 1980.Effects of age on Reproduction in American coots.J.Wildl. Manage.,44 :183-189.

Degraaf,R.M., and M. Yamasaki. 2001.New England wildlife Habitat, Natural History and Distribution .University Press of New England Hanover, NH,USA.

Fazili M.F. 2002.Studies on annual cycle of some birds of wular lake, Kashmir ph.d thesis submitted to University of Kashmir.

Freidrickson, L.H. 1971. Common gallinule breeding biology and development .*Auk* 88:914-91.

Gill, F.B .1994. Ornithology W.H freeman and company. New York.

Greij, E.D. 1994. Common moorhen 145-157 in T.C. Tacha.

Hill, D.A. 1984. Clutch predation in relation to nest density in mallard and tufted duck. *Ornis scand* 15:115-122.

Huxley C.R and N.A. wood. 1976.Aspects of breeding of the moorhen in Britain. *Bird study* 23:1-10.

Hylander,C.J. 1959. Feathers and Flight. The Mac millen co. New York.

Kibbe, D.P .1985. Common Moorhen (Gallinule chloropus) 100-101. In. S.B Laughlin and D.P. Kibbie (ed.). The Atlas of Breeding Birds of Vermont. University press of New England. Hanover, USA.

Klett, Albert. T. Terry, L. Shaffer and Douglas, H. Johnson.1988. Duck nest success in Prairie Pathole region. *J.Wildl.Manag.* 52(3):431-440.

Klomp, H.1970. The determinants of clutch size in birds. *Ardea* 58:1-124.

Kluijver, H.N.1951. The population Ecology of the Great Tit. *Parus major* L. *Ardea*, 39, 1-135.

L. Xin. 2011. Reproduction Ecology of Three Tibetan water bird Species with Special Reference to Life History Alterations along Elevational Gradients. *zoological studies* 50(2):192-202.

Lack, D. 1968. Ecological adaptations for breeding in birds. London: Methuen.

Mayfield, G.1975.Suggestions for calculating Nest Success. *Wilson Bull.87:465-466*

Petrie, M. 1983. Female Moorhens compete for small fat males. Science 220:413-415.

Petrie, M. 1984. Terrotory size in the Moorhen (*Gallinula chloropus*): an outcome of RHP asymmetry between neighbours. Anim.Behav.32:861-870.

Rahn, H and Ar.A.1974.The avian egg; incubation time and water loss. *Condor* 76; 133-155.

Relton, J. 1972. Breeding biology of moorhens on huntingdonshire farm ponds Brit Birds 65:248-256.

Shah, G.M .1984. Birds of Hokersar. Food feeding and breeding biology of some resident and nonresident birds. Phd thesis, university of Kashmir (unpublished).

Steinbacher, G.1939. Zur brutbidogie des GgrunfussigenTeichhuhns. J.or., 87:115-135

Tollenear, D.1922.Legparioden en oierproductie bijeenige wilde Vogelsoorten, Vergeleken *Landb Hoogesch Wageningen*.23, (2):1-46

Whistler, H.1963. *Popular Handbook of Indian birds*, 4th ed.,Oliver and Boyl, London

Wilson, M.F. Breeding Ecology of the Yellow headed-Blackbird. ECOL.Mong., 36(1):51-77.

Witherby, H.F., F.C.R jourdain, N.F. Ticehurst and B.W. Tucker. 1941. *The Handbook of British Birds*. Vol V London.

Wells, D.R .1999. The birds of the thai- Malay peninsula. Volume 1, Non- Passerines Academic press, London.

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