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NEST CHARACTERISTICS, EGG BIOMETRY, INCUBATION AND HATCHING SUCCESS OF PHEASANT-TAILED JACANA *Hydrophasianus chirurgus* SCOPOLI (Charadriformes: Jacanidae) AT LAKE WULAR, KASHMIR (INDIA).

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1. INTRODUCTION

A circum-tropical family of shorebirds the "Jacanidae" is represented by eight species that prefer freshwater swamps and marshes and possess a number of unique characters, the most outstanding among which are their long trailing legs and toes which facilitate them to walk with ease over floating vegetation (AUSTIN, 1983) and their polyandrous mating system (HOFFMAN, 1950; MATHEW, 1964; JANNI & COLLIER, 1972; TARBOTON, 1995). The family Jacanidae is represented by two species *Metapodius indicus* and *Hydrophasianus chirurgus* in the Indian subcontinent. Of these only the Pheasant-tailed Jacana (*Hydrophasianus chirurgus)* is a summer visitor to the wetlands of the valley where it enjoys the cold temperate climate and after raising its new generation leaves back to the plains of India (BAKER, 1929; BATES & LOWTHER, 1952). Lake Wular (a Ramsar site), the largest Asian wetland which harbours globally important aquatic birds has not yet been studied in terms of its avifauna and Pheasant-tailed Jacana a conspicuous, widespread, locally common migrant to this wetland has not been investigated extensively in terms of its breeding biology.

The objective of the present study is to describe some breeding aspects of Pheasant-tailed Jacana from the data collected during three consecutive breeding seasons from 1997 to 1999 at Lake Wular and to co-relate them with previous findings of allied species.

2. MATERIAL AND METHODS

2.1. Study area

Lake Wular (a Ramsar site) is in the north-western part of the valley of Kashmir (33-35^{0}N, 73-76^{0}E) in India. It has a maximum depth of 5.86 meters with an area of 240 sq.km (HUSSAIN, 2000) that remains covered with dense growth of free-floating and emergent vegetation during the major part of the year. The major species are *Trapa bispinosa, Nymphoides peltatum, Nelambo nucifera, Ceratophyllum demersum, Hydrella verticellata, Potamogeton indicus, P. lucense, Butomus umbellatus, Carex spp., Phragmites communis, P. elephantoides, Typha angustata, Myriophyllum verticellatum, Sparganum ramosum, Lemna sp.* and *Saccharum spontaneum.* The dense floating vegetation and reedbeds are partitioned by a series of boat channels varying in width between 1 – 6 meters. There is a protective bank mostly on the southern and eastern sides of the lake. Inside the bank and at some places outside the bank there are dense willow plantations of both tall and bushy *Salix* tree species

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that provide best roosting and breeding grounds to a wide variety of resident and non-resident birds. In addition, outside the bank on the southern side of the lake there are two large marshy areas attached to the lake locally known as Rakhi Saderkote and Rakhi Muqdemyoor. These rakhs (morasses) have dense growth of reeds and emergent and free floating vegetation of *Phragmites communis, P. elephantoides, Typha angustata, Saccharum spontaneum, Sparganum ramosum, Eleocharis palustris, Carex* species *and Butomus umbellatus.* They also harbor a wide variety of aquatic bird species. The river Jehlum flows into the Lake Wular on its south-east near the middle and leaves at its south-western corner near Sopore (**Figure 1**). Besides Jehlum the streams especially Erin, Mudhumati, Pohru, Arrah and Ningal also feed the lake.

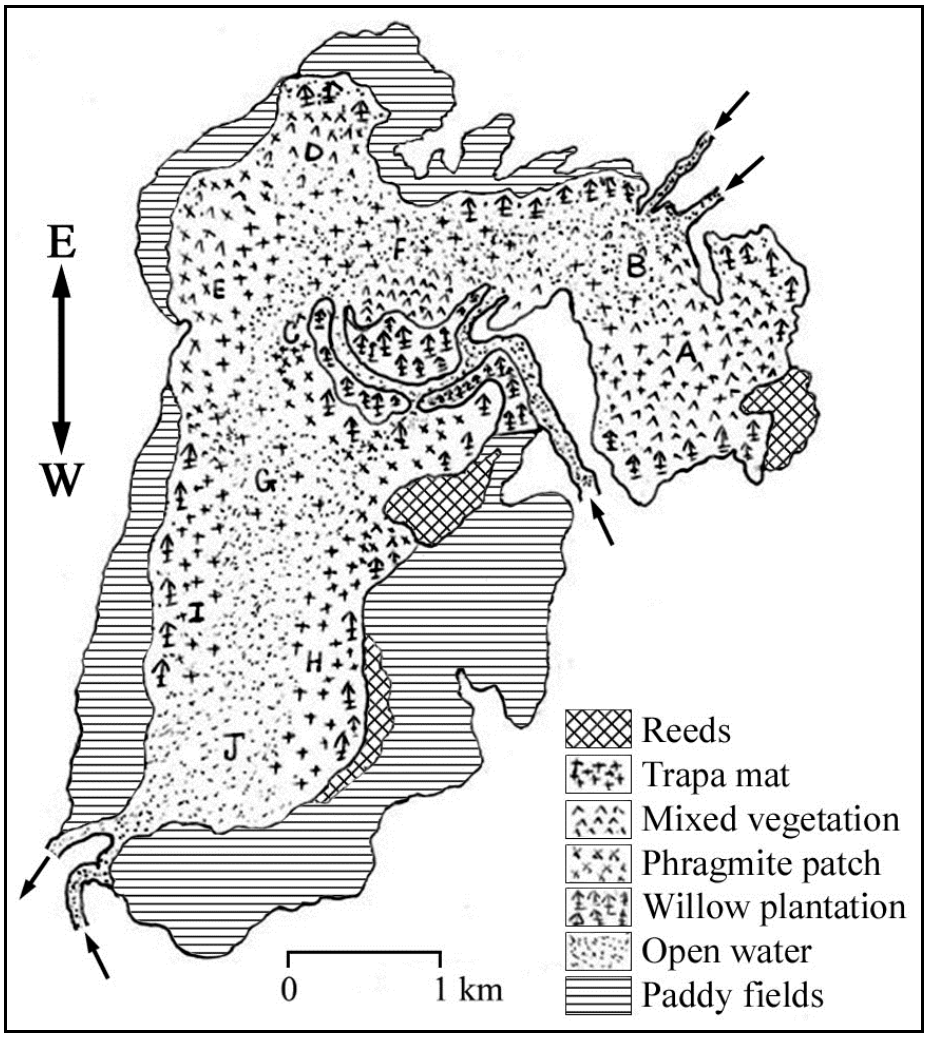

Figure 1: Map of Lake Wular showing study sites

2.1. Methods

For the purpose of the present investigation the lake was divided into ten sites (A-I) mainly on the basis of different vegetation types, bird habitat preferences and other characteristics (**Figure 1**). Observations on breeding biology were carried out at five sites (**Figure 1,** A to E), because these areas had dense growth of both free-floating and emergent vegetation and less human interference. The entire floating vegetation area in these sites was searched for nests during three consecutive breeding seasons from 1997-1999. Nesting site was defined as an

area where mating, nest building, adult incubating and brooding occurred. The nests were generally located in the study sites by wading through shallow regions and by moving in a boat through the channels. Most searching was done close to boat channels. Any residing place of a bird with one or more eggs was classified as a nest. The nest sites were marked by slender willow stakes, flagged with small strips of white cloth, fixed at about a distance of 5 meters from the nest in a particular direction and plastic numbers were tied to the nest material. When a nest was spotted the following parameters were recorded (i) location (ii) nesting material (iii) plant species in the immediate vicinity of the nest and (iv) water depth at the nesting site. In addition, at each nest the type of vegetation cover and its condition, shape, size and the position of the nest and concealing arrangements were recorded. During laying each nest was visited daily and the newly laid eggs were weighed to an accuracy of 0.1 mg using 50 mg scales. To determine egg laying and hatching intervals, the eggs were marked with waterproof ink and placed properly in the nest without disturbing the arrangement of other eggs in the nest. Morphometric measurements of eggs were taken to 0.1 mm using Vernier Callipers.

The length and width were measured at the highest points of the egg, obtained by sliding the Calipers gently on the egg. *Shape index* (SI) of eggs was calculated as SI = b/l x 100 (MAND, 1988) where b = egg breadth and 1 = egg length. After laying eggs were weighed on alternate days till hatching. A few nests were found late where incubation of the eggs had already started. Their incubation period was estimated by egg immersion technique in which the eggs were immersed briefly in water alongside the nest and judging the extent to which they sank or floated. This was compared with our previously determined scale in which sink/float characteristics of eggs of known age were assessed (**Table 1**). Incubation period was measured from the day of egg laying till the emergence of chick from the shell. Efforts were made to determine causes of losses. Hatching was defined as the time at which first cracks appeared till complete emergence. The calculations for the hatching success were done in accordance with MAYFIELD (1975) and JOHNSON (1979). A movable hide was used to observe the birds as they nest in open vegetation. The hides were raised to record the behaviour of breeding pairs. Also 20×50X binoculars were used in the field for this purpose.

Table 1: The stage of incubation and the respective sinking or floating properties of Pheasant-tailed Jacana eggs in water (day 1= day on which final egg in clutch was laid)

Stages of Incubation(d)	Sinking /Floating properties of eggs
1-3	Eggs sink rapidly.
4-5	Eggs sink slowly.
6-8	Eggs float just below water surface.
9-11	Eggs float at the water surface.
12-14	Eggs float with cap less than 8mm exposed.
15-17	Eggs float with the cap about 10mm exposed.
+18	Eggs float with the cap more than 12mm exposed.

3. RESULTS

3.1 Nest characteristics

Pheasant-tailed Jacana selected the sites with dense and abundant growth of fixed or movable floating aquatic vegetation and did not prefer shallow damp soils or dry land. The choice of substrate used for nests varied greatly from year to year and even during the same breeding

season depending on the density of the aquatic plants growing and the type of plant communities established. The early migrants chose sites which had dense growth of *Nymphoides peltatum, Potamogeton lucense* with sparse emergent strands of *Phragmites elephantoides and P. communis* and where the water depth was less than one meter. The late migrants established their territories and nesting sites in the areas of the lake where the water depth was less than 2.5 meter. These areas had dense growth of *Trapa bispinosa, Nelumbo nucifera, Myriophyllum spicatum, Potamogeton amphobium, Ceratophyllum demersum* etc. The males of primordial pairs changed their nest frequently to protect them from drying and even destruction as the water level receded. But in the belated breeders the water column had no effect as they had chosen such sites where water level never dropped below 2 meters.

No doubt shifting of nest was also found in late breeders but the main factor as in advanced pairs was not found to be the water depth rather the threat of predators and human interference. Out of total of 83 nests 59 nests were located on grass mat and 24 nests were on grass float (**Table 2**). The grass mats were dense living rooted plants attached to the ground while grass floats were decayed plants with or without live vegetation. The grass mats were of two types *Trapa* mat with a few *Hydrilla* plants and *Nymphoides* mat with *Potamogeton* and *Nelumbo* species whereas grass floats mostly contained all the types of dead aquatic plants like decayed *Nymphoides*, *Potamogeton* and *Trapa* with their few live twigs.

Nest building was initiated only when the floating vegetation was dense enough to hold the nest. But the nest mounds were formed from fresh living vegetation as early as just after establishment of territories or naturally formed of dead decayed vegetation. All these mounds were used for comfort, preening, sunbathing and finally for nest building. All mounds (two to three per pair) were not always used for nest building, sometimes fresh mounds were raised to construct nests. The mounds were inconspicuous, visible hardly at about 4-6 meters. They varied from 25 to 40 cm in diameter. There was very close correlation between nest building and courtship. The males while emitting courtship calls always deposited a few twigs generally cut and pulled from adjacent vegetation on the nest mound. Thirty seven observations made in the present study showed that females deposited nest material while uttering courtship calls. Nests were generally built in 3 to 8 days before the laying of first egg but replacement nests were built hardly within one day. Five nests were observed translocated to three different spots each varying in distance from previous ones by 9 to 15 ft. and the final distance from the original position was found from 18 to 33 ft. Three types of nests were observed (**Plate 1**): (a) a flat platform without a depression hardly raised to 0.5 to 0.9 cm above water (b) a raised platform with a depression of 1 to 2.3 cm and (c) a bowl shaped nest embedded within the surrounding vegetation with the depression of 2.8 to 4.00 cm (**Table 2**). Flat platforms were constructed on grass float in which eggs were more often partly submerged. Raised platforms were on grass mat especially *Nymphoides* mat in the regions of substantial thick aquatic vegetation. The eggs in these nests were well above water. Slightly bowl shaped nests were on *Trapa* mats characterized by well-marked depression and better concealment. The eggs in these nests were inconspicuous and well protected. They did not roll down by the fluctuations in the water column. The nests varied in diameter from 11 to 17 cm and in thickness from 0.5 to 10 cm (**Table 2**). The commonly used nest materials were *Nymphoides peltatum, Trapa bispinosa, Potamogeton lucense, Nelumbo nucifera, Hydrilla verticellata* and *Spirogyra sp.*

Table 2: Nest characteristics of Pheasant tailed Jacana.

Year	No. of Nests	Location of Nest				Vegetation Cover			Size and Shape of Nest												
		Aspect	Water depth			Grass mat		Grass float	Shape	Diameter			Thickness			Depth			Diameter of nest mound		
			Min.	Max.	Mean	Trapa mat	Nym-phoides mat	(Dead mixed vegetation)		Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
1997	8	SW	0.8	2.25	1.53 ±0.85	-	+	-	RP	11	16	13.75 ±1.8	5	9	6.77 ±1.77	1.0	2.0	1.56 ±0.71	28	40	33 ±8.48
	9	S	0.92	2.48	1.77 ±0.87	+	-	-	BS	11.5	17	14.44 ±1.41	4.5	9.5	7 ±2.47	2.2	4	3.17 ±1.27	25	34	29.22 ±6.36
	4	SE	1.0	2.35	1.7 ±0.18	-	-	+	FP	11.8	15	13.57 ±0.35	0.5	0.8	0.65 ±0.21	0	0	0	27	38	32.5 ±7.78
1998	15	SW	1.25	2.0	1.6 ±0.53	+	-	-	BS	12	16.5	14.35 ±2.12	4.0	9.0	6.63 ±2.12	2.8	3.1	2.96 ±0.14	28	34	30.93 ±1.41
	11	NW	1.45	2.15	1.79 ±0.32	-	-	+	FP	11.7	15.9	13.65 ±1.63	0.6	0.8	0.71 ±0.11	0	0	0	27	40	34.91 ±6.36
	9	SE	1.35	2.30	1.78 ±0.22	-	+	-	RP	12.3	16.4	14.54 ±1.2	4.0	8.5	6.22 ±1.41	1.3	2.2	1.72 ±0.64	27	37	32.56 ±7.07
1999	5	S	1.10	1.78	1.51 ±0.35	-	+	-	RP	13	17	15±2.83	5.0	9.0	7 ±2.83	1.4	2.3	1.8 ±0.64	29	38	33.4 ±4.24
	13	SE	1.15	1.85	1.52 ±0.18	+	-	-	BS	11.4	16.8	14.22 ±1.84	5.5	10.0	7.65 ±1.98	2.1	3.8	2.88 ±1.2	25	36	30.46 ±3.53
	9	NW	1.28	1.95	1.58 ±0.23	-	-	+	FP	12.2	15.5	13.39 ±0.92	0.7	0.9	0.8 ±0.14	0	0	0	26	39	33.22 ±9.19

RP = Raised platform BS = Bowl shaped FP = Flat platform SW = Southwest
S = South SE = Southeast NW = Northwest

3.2. Egg biometry

In monoandrous pairs first eggs were laid after a period of 3 to 6 days after nest completion but in polyandrous pairs, laying commenced after 3 to 12 days of nest completion. First mates received their clutches after 3 to 4 days but 2nd and 3rd mates after a gap of 8 to 12 days. During first year of study egg laying was delayed due to lake inundation and was initiated in the third week of June. In the following years laying started much earlier and first eggs were seen in fourth week of May as environmental conditions were conducive to breeding as compared to previous year. However, this did not seem to affect the laying capacity of birds as in all years, the average clutch size was almost the same with 3.6 in 1997 and 1998 and 3.5 in 1999 (**Table 3**). The laying peaked in July (**Figure 2**), particularly in 1998 and 70% of the overall laying of eggs occurred from May to August (**Table 4**).

Table 3: Clutch size in Pheasant-tailed Jacana

Year	Clutch size 1	3	4	5	Total	Average size
1997	-	8	12	1	21	3.6
1998	-	15	19	1	35	3.6
1999	1	10	16	-	27	3.5

The eggs were laid almost daily and only six monoandrous pairs laid the eggs on alternate days. However, two monoandrous pairs laid replacement clutches when their first clutches were predated. Most of the eggs were laid between 6.00 hrs to 9.00 hrs. Laying was observed once when a female nudged off her incubating male and sat on the nest restlessly. She changed her position more often and finally sat in incubating posture and pulled twigs 2-3 times from the nest rim. Then she inclined down her cloaca with half curved back and raised her dark yellow nape feathers and ruffled body feathers. Within 30 seconds an egg was deposited. The female after spending 3-4 minutes on nest flew away.

The freshly laid eggs were glossy bronze in colour with a greenish or olive tinge that blends with the bright green hues of the surrounding aquatic plants. The colour of eggs changed as incubation proceeded. They became rufous brown and then dark brown. Eggs were of two different shapes (a) slightly oval shaped and (b) oval with broad base and pointed apex. The average weight of un-incubated eggs was 17.100 (±1.63 SD) g and measured on an average 37.29 (± 1.75 SD) mm in length and 27.6 (± 0.69 SD) mm in width. The mean shape index of 100 eggs was 75.07 (± 2.45 SD) (**Table 4**).

Table 4: Size and weight of eggs in Pheasant-tailed Jacana

	Min.	**Max.**	**Mean**	**SD**	**n**
Weight of un-incubated eggs (g)	13.500	19.500	17.100	1.063	105
Weight of incubated eggs (g)	10.500	15.300	13.000	0.997	105
Length (mm)	29.7	40.5	37.2	1.75	100
Breadth (mm)	26.1	29.2	27.6	0.69	100
Shape index	72.09	87.87	75.07	2.45	100

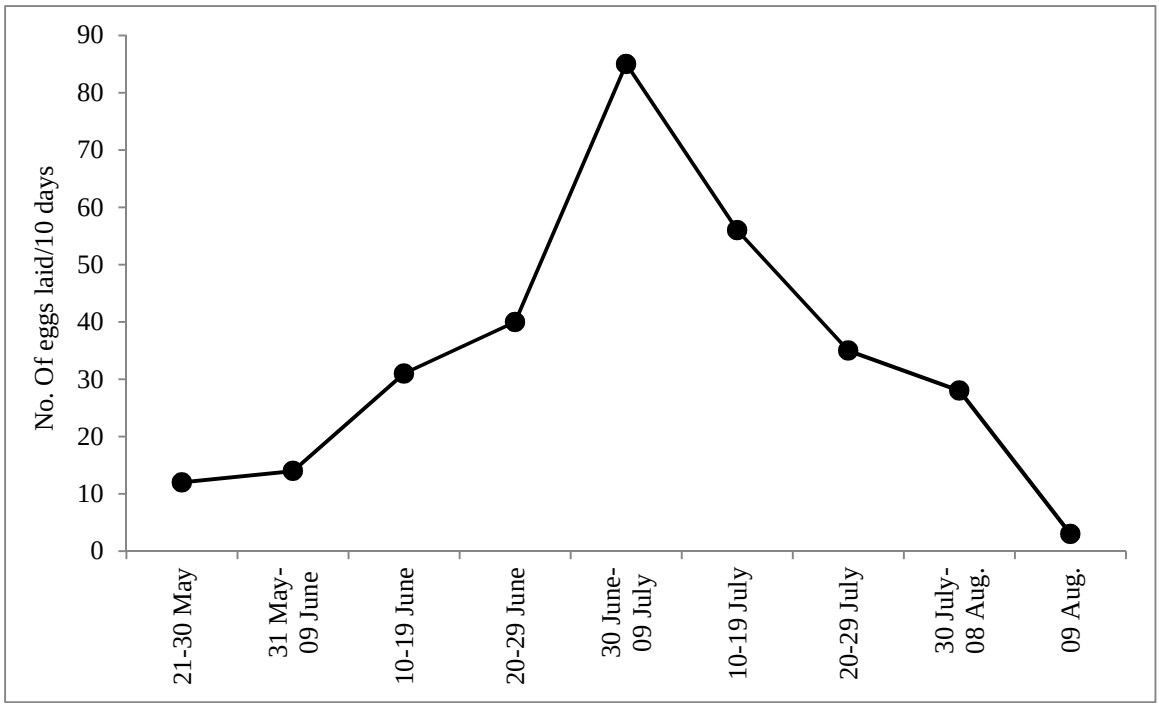

Figure 2: Peak egg laying in Pheasant-tailed Jacana

3.3 INCUBATION

Incubation started after the laying of 2nd egg but in a few cases it was initiated after the laying of 3rd egg. It was performed only by males (**Plate 2A**). The eggs were incubated and shaded by adopting a characteristic posture. Since the nests were more often damp, the eggs were protected from dampness and incubated by raising them in the wings which were wrapped under the body. During hotter parts of the day the eggs were shaded by keeping wings slightly open, whereas during heavy rains wings were spread and tightly wrapped over the eggs. **Figure 3** shows that incubating males spent 56.5% of day's time with incubation and shading of eggs.

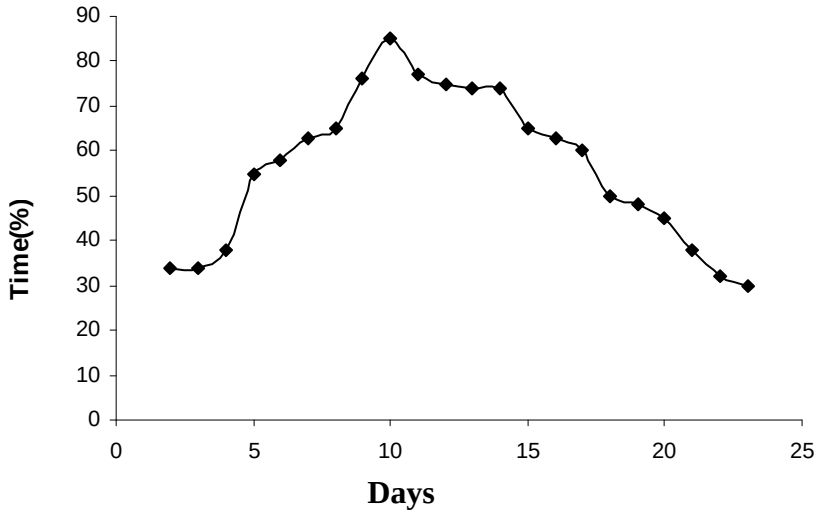

Figure 3: Percentage of time spent on incubation by male jacana.

On seeing a predator they at once left the nest to chase him emitting quick chaoo, chaoo calls to inform other males or females which assisted warding off the predator. They generally performed elaborate distraction displays when approached during peak incubation. The incubation period varied from 24 to 28 days (**Table 5**). In majority of cases it was completed in 25 – 26 days with an overall average of 25.7 (+ 1.23 SD) days. The marked eggs which were weighed regularly showed an average wt. loss of 3.070 g till hatching (**Figure 4**). It constitutes about 17.5% of the average egg weight.

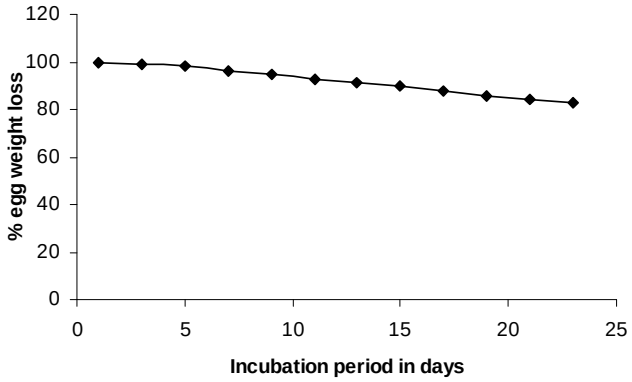

Figure 5: Percentage egg weight loss during incubation in Pheasant-tailed Jacana**.**

Table 5: Length of incubation period of Pheasant-tailed Jacana

No. clutches observed	No. of incubation days					Mean incubation period ± S.D
	24	25	26	27	28	
36	7	9	11	5	4	25.7±1.23

3.4 Hatching and hatching success

There was both inter- and intra-clutch variation in the degree of synchrony in hatching. But in all clutches hatching was asynchronous as the eggs generally hatched in the order of their laying (**Plate 2B**).

The period of hatching varied from year to year and occurred between 3rd weeks of June to 1st week of September (**Figure 5**). But hatching was maximum in the month of August in almost all the years (**Figure 5**). Hatching success also varied annually. It was 40.26% in the first year, 56.35% in 2nd year and 28.43% in 3rd year (**Table 6**). The overall hatching success was 43.29%. Factors that contributed to low percentage of hatching success included predation, faulty incubation and infertility. The predation and stealing of eggs by man were the major factors responsible for great losses of eggs. The other predators were Black Kite (*Milvus migrans*) House Crow (*Corvus splendens*), Black-crowned Night Heron *(Nycticorax nycticorax*), Marsh Harrier (*Circus aeruginosus*), Golden Jackals (*Canis aureus*) and feral dogs. The eggs were most vulnerable during early stages of laying. It was observed (**Table 5**) that the percentage of eggs lost through predation was 54.36%. Failure of hatching due to other factors like faulty incubation, infertility – death of embryos and desertion, was 2.35%.

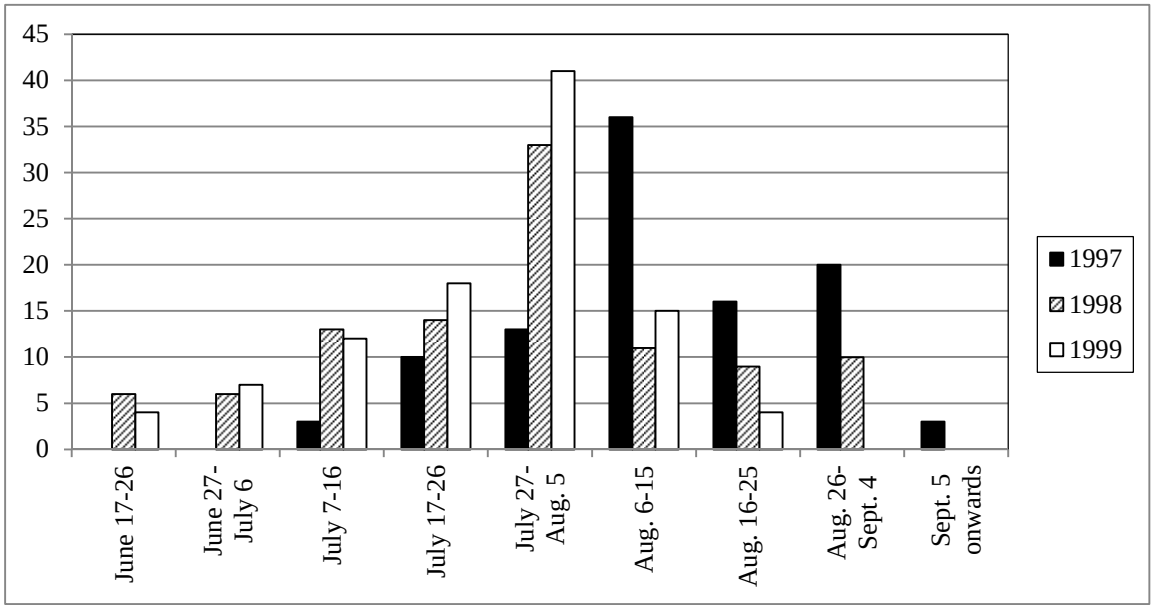

Figure 5: Percentage hatching dates of Pheasant-tailed Jacana

Table 6: Hatching successes in relation to the month of laying in Pheasant-tailed Jacana

Year	Month	No. of eggs	Eggs lost through predation		Eggs lost through desertion and faulty incubation		Hatching success	
			No	%	No	%	No.	%
1997	May	--	--	--	--	--	--	--
	June	13	8	61.54	--	--	5	38.46
	July	47	25	53.20	--	--	22	46.80
	August	17	12	70.60	1	5.90	4	23.50
1998	May	9	5	55.55	--	--	4	44.45
	June	38	18	47.37	3	7.90	17	44.73
	July	74	25	33.78	1	1.35	48	64.87
	August	5	3	60.00	--	--	2	40.00
1999	May	6	4	66.67	1	16.67	1	16.66
	June	34	26	76.50	1	2.94	7	20.56
	July	53	34	64.15	--	--	19	35.85
	August	2	2	100	--	--	--	--
Total		298	162	54.36	7	2.35	129	43.29

4 DISCUSSION

On the Lake Wular Pheasant-tailed Jacana's nestsites were open; characterized by dense growth of floating vegetation. Some nests were constructed on grass floats composed of dead and decayed floating vegetation with occasional living plant twigs and leaves and in majority of cases the nests were built on grass mat composed of rooted plants that reach to water surface and emerge out of it. Many have reported that the members of family Jacanidae preferably use open sites for construction of nests which were characterized by high growth of both living and dead vegetation (BATES & LOWTHER, 1952; TARBOTON & FRY, 1986;

TARBOTON, 1992; RAMCHANDRAN & VIJAYAN, 1995; THONG-AREE *et al*., 1995).
The nests of jacanas were either flat platforms without a depression or raised or bowl shaped structures with a marked depression to hold the eggs. The flat nests were constructed on grass float and in the regions with sparse floating vegetation while as raised platforms were observed on substantially thick vegetation or grass floats and bowl shaped nests were found on grass mats of *Trapa bispinosa*. The nests varied in diameter from 11 cm to 17 cm and in thickness from 0.5 cm to 10 cm and depression from 1 to 4 cm. The nesting material commonly used was *Nymphoides peltatum, Nymphaea maxicanus, Potamogeton indicus* and *Trapa bispinosa* stems and occasionally their leaves. The nest structure compares with the findings of TARBOTON & FRY (1986), TARBOTON (1992), SHAH (1984) and THONG-AREE *et al.* (1995).

Nest mounds naturally formed or built by male jacana were used as display platforms for copulation, resting or preening and sunbathing and occasionally for final nest formation. Both members of the pair constructed more often fresh nests but only males maintained the nests till chicks hatched and also constructed translocated nests in which females did not take any part. TARBOTON (1992) has reported similar pattern of nest building in African Jacana and TARBOTON & FRY (1986) in Lesser Jacana. BUTCHART (1998) has reported that in Bronze-winged Jacana generally males and occasionally females construct nests and THONG-AREE *et al.* (1995) have observed that females built the nests in Pheasant-tailed Jacana. However, there was close relation in nest building and courtship and addition of nest material was a courtship display as both sexes performed this activity while emitting courtship calls. In addition, males built all the shifted nests always without the assistance of females. It took 3 to 8 days for a pair to finish nest building before laying of the first egg. As for the elaborateness of the nest is concerned, Pheasant-tailed Jacanas were fast, building in short period as compared to American Goldfinch *(Spinus tristis)* (13 days; STOKES, 1950) Common Myna *(Acridotheres tristis tristis)* (6- 8 days; SEN GUPTA ,1965) and Black-billed Magpies *(Pica pica)* (40 days; ERPINO, 1968).

The glossy appearance and striking markings of the eggs of jacanidae have often attracted comments (MACLION, 1972; STEYN, 1971; BURTON 1979). They lay exceptionally small eggs in relation to their body mass (ROSS, 1979). The egg dimensions of 100 eggs of Pheasant-tailed Jacana measured were 37.2 $\pm$ 1.75x27.6 + 0.69 mm. They were thick–shelled, highly glossed without markings, often bronze in colour with greenish or olive tinge that changed to rufous brown as incubation proceeded. BATES & LOWTHER (1952) and RAMCHANDRAN & VIJAYAN (1995) have reported similar types of eggs in Pheasant-tailed Jacana but with slightly varied dimensions.

Pheasant-tailed jacana often shifted their eggs to newly constructed nests but the way the eggs were shifted was not observed. They probably carried them by holding between the body and the wings. Egg shifting has been reported earlier by many researchers in Pheasant-tailed Jacana (ALI & RIPLEY, 1983; SERRAO & SHEKHAR, 1962; RAMCHANDRAN & VIJYAN, 1995). RAMCHANDRAN & VIJAYAN (1995) have reported that an egg was shifted by scooping with the bill. According to ALI & RIPLEY (1983) by pressing the egg between throat and beak and dragging or rolling it over the mated vegetation while the male walked backwards. SERRAO & SHEKHAR (1962) reported by holding the pointed end of the egg between the mandibles and dragging it backwards. This has not been noticed during present studies as the egg has such a size and shape that it will not be held in beak so easily.

Only males incubated the eggs and incubation period varied from 24 to 28 days with an average of 25.7 $\pm$ 1.23 days. In majority of jacana species incubation by males has been reported earlier (TARBOTON & FRY, 1986; TARBOTON, 1992; BUTCHART, 1998; HOFFMAN, 1950; THONG -AREE *et al.*, 1995). However, BATES & LOWTHER (1952) has reported that

females only incubate the eggs in Pheasant-tailed Jacana. But THONG AREE *et al*. (1995) and HOFFMAN (1950) like in present study have reported that only male Pheasant-tailed Jacana incubated the eggs. The average incubation period found during the present investigation is almost similar to the findings of THONG AREE *et al.* (1995) who reported an average incubation period of 25.3 days for *Hydrophasianus chirurgus* in central Thailand. Males incubated and shaded the eggs for 56.75 % of day hours. TARBOTON (1992) has reported that incubating African Jacana males attended their eggs for 53% of the day time. The higher percentage of attentive time during present study coincided with the day's low temperature when the bird tried to maintain the normal temperature of the eggs by sitting over for a longer time.

During incubation there is loss in egg weight probably due to evaporation rate, which increases with continued incubation and rising temperature. There appeared a gradual loss of about 17.5% in weight of eggs during incubation. SHAH (1984) has recorded a loss of 10.5% in the egg weight in moorhen. Irrespective of size eggs generally lose between 15-18% of their initial mass as water as incubation proceeds till hatching (RAHN *et al.* after BROWN, 1994). Hatching was almost asynchronous as the eggs hatched in the order in which they were laid because incubation started prior to the completion of the clutch generally after the laying of 2nd egg and rarely after laying of 3rd egg. Asynchronous hatching has also been reported in a wide variety of birds and variation in hatching asynchrony has been reported by CLARK & WILSON (1981), and SLAGSVOLD (1985, 1986). SLAGSVOLD & LIFJELD (1989) have suggested that in addition to increasing the density or quality of young raised, asynchronous hatching is beneficial as it provides more time to males in feeding the nestling and maximizes the male's potential contribution to the brood. During the present investigation it seemed to improve the quality and quantity of the nestling and males also benefited by decreasing their toil to rear the young in the absence of female's assistance.

The hatching success of jacana varied greatly during three years and the overall hatching success was 43.29%. The hatching success was more related to habitat selection and experiences of the incubating birds. The main reason for low hatching success could be due to their exposed nests that were most vulnerable to human and avian predation in addition to losses due to high fluctuation in water table. TARBOTON (1992) has also reported low hatching success of only 30% in African Jacana due to its exposed nature.

5. CONCLUSIONS

Pheasant-tailed Jacana, a regular summer migrant to the wetlands of Kashmir especially Lake Wular, after raising its new generation leaves back to the plains of India in the month of October. The nesting sites were chosen in dense floating vegetation zones and the nests were constructed by both members of a pair. Eggs were laid daily and incubated for 24-28 days by males only. They hatched in asynchronous manner and the hatching success was 43.29% during three years of observation. Low hatching success was due to a number of factors but human predation was the most pertinent one.

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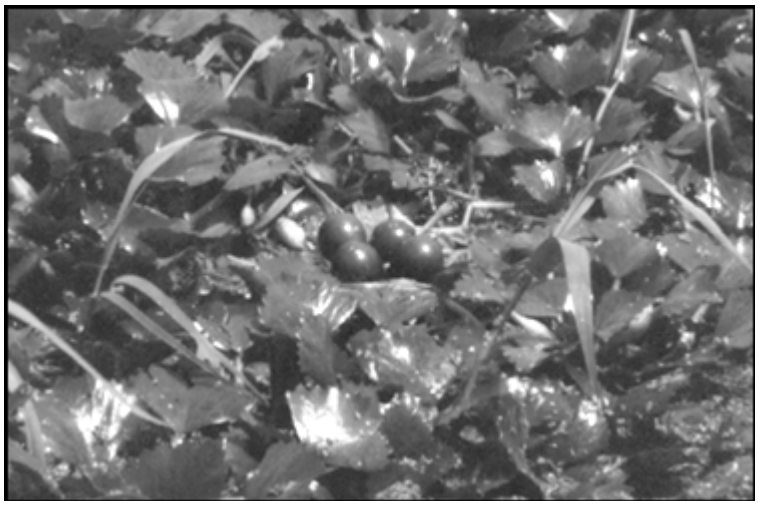
Plate 1: Nests of Pheasant-tailed Jacana



(A): *Bowl shaped nest on Trapa mat.*

(B): *Flat platform on grass float*

(C): *Raised platform of mixed vegetation on Nymphoides mat*

Plate 2:

(A): *Male Pheasant-tailed Jacana incubating the eggs*

(B): *Asynchronous hatching in Pheasant-tailed Jacana*

NEST CHARACTERISTICS, EGG BIOMETRY, INCUBATION AND HATCHING SUCCESS OF PHEASANT-TAILED JACANA *Hydrophasianus chirurgus* SCOPOLI (Charadriformes : Jacanidae) AT LAKE WULAR, KASHMIR (INDIA).

Fazili, M. F., Shah Mustafa, G. & Ulfat, J.

SUMMARY

Some breeding parameters of pheasant tailed jacana *(Hydrophasianus chirurgus*) were investigated at Lake Wular, Kashmir (India**).** Nest sites were selected in those areas which had dense growth of fixed and free-floating vegetation. Nests were built on floating vegetation by both the members of a pair but maintained by males only. Egg biometry is reported. Only males incubated the eggs and translocated them when disturbed. Incubation period was 25.7(±1.23 SD) days. Eggs suffered an average weight loss of 17.5 % during incubation. Hatching was asynchronous and the hatching success was 43.29%. The observations recorded are thoroughly discussed in the light of relevant literature.