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ON SOME BREEDING PARAMETERS OF LITTLE BITTERN AT HAIGAM WETLAND, KASHMIR (INDIA)

Mustahson F. Fazili, G. Mustafa Shah, Ulfat Jan, Fayaz A. Ahangar

Abstract. Breeding biology of Little Bittern were studied at Haigam wetland, Kashmir (India) in 1991. Breeding occurred from June to August and was initiated by nest building. Both sexes built nest. Nests as well as nest sites are briefly described. Bitterns were territorial to limited extent. Average clutch size was 5.6 ± 0.7 eggs (± SD, n = 17), mean egg measurements were 34.3 ± 1.6 mm x 25.5 ± 0.7 mm (n = 24). Incubation was performed by both sexes, mean incubation period was 16.8 ± 0.8 days. Egg weight losses and comparison of nest attention during incubation by both the sexes are reported. Hatchlings were precocial and overall hatching success was 68.9%. The effect of predation in different habitats is reported. Fledging occurred at the age of 25 to 30 days.

Key words: Little Bittern, *Ixobrychus minutus*, ecology, behaviour, egg, nest, incubation.

✉ M.F. Fazili, P.G. Department of Zoology, The University of Kashmir, Hazratbal, Srinagar, Kashmir, 190006, India; e-mail: drmustahsonwl@kashmieuniversity.ac.in.

О некоторых параметрах гнездования малой выпи в Хайгаме, Кашмир (Индия). - М.Ф. Фазили, Г.М. Шах, У. Джан, Ф.А. Ахангар. - Беркут. 19 (1-2). 2010. - Исследования проводились в 1991 г. в резервате Хайгам (у г. Сринагар). Первые малые выпи прилетели в середине апреля. Гнездовой период продолжался с июня по август. В постройке гнезд принимали участие оба партнера. Гнезда в тростнике строились из стеблей и листьев тростника, рогоза и других водных растений, в кустарниках – из веток. Полные кладки содержали 5–7 яиц, в среднем 5,6 ± 0,7 (± SD, n = 17). Средний размер яиц 34,3 ± 1,6 мм х 25,5 ± 0,7 мм (n = 24). Насиживание начиналось после откладки первого яйца. Насиживали обе птицы 16–18 дней, в среднем 16,8 ± 0,8 дня. Успешность вылупления составляла 80,8% в тростнике и только 44,4% – в кустарниках из-за хищничества ворон и коршунов. Птенцы покидали гнездо через 25–30 дней.

The cosmopolitan genus *Ixobrychus* is represented by four species in South-East Asia. Two of these (*I. sinensis and I. cinnamomeus*) have both resident and migrant populations. One species (*I. flavicollis*) is a non-breeding migrant species while as Little Bittern (*I. minutus)* is a breeding migrant and preferres to breed in the wetlands, lakes, rivers and ponds (Ali, Ripley, 1968; Lansdown, 1988). The Kashmir population of Little Bittern belongs to the subspecies *I. m. minutus* which has its breeding range extending from Europe to about 80° E. Besides Kashmir, this bird breeds in suitable localities along the outer Himalayas as far east as Nepal and is winter visitor to Punjab (Baker, 1929). Very little information has been published on this subspecies from Indian subcontinent. The present paper is an attempt to study some breeding parameters of this species at Haigam wetland.

STUDY AREA

Haigam wetland is the largest of the few remaining wetlands of Kashmir, situated at a distance of 55 km to the north-west of Srinagar near Sopore town. It is a well protected reserve for birds especially waterfowl – ducks and geese (Shah, 1984). The wetland with a maximum depth of 1 m has an area of 14 km^2. About half of this area is covered by a dense growth of reeds and other emergent and free floating vegetation. The common species are *Eleocharis palustris*, *Carex* spp., *Phragmites communis*, *Typha angustata*, *Butomus umbellatus*, *Sparganium ramosum* and S*accharum spontaneum*. The reedbed is partitioned by a series of boat channels varying in width between 1 to 4 m. There is a protective bank around the reserve and inside the bank there are strips of long and bushy willows (Fig. 1).

MATERIAL AND METHODS

Breeding ecology of Little Bittern was studied at Haigam wetland in 1991.

For the purpose of present investigation the wetland was divided into four units (I–IV: Fig. 1). The units Ist and IVth mostly contained open water or free floating/thin emergent

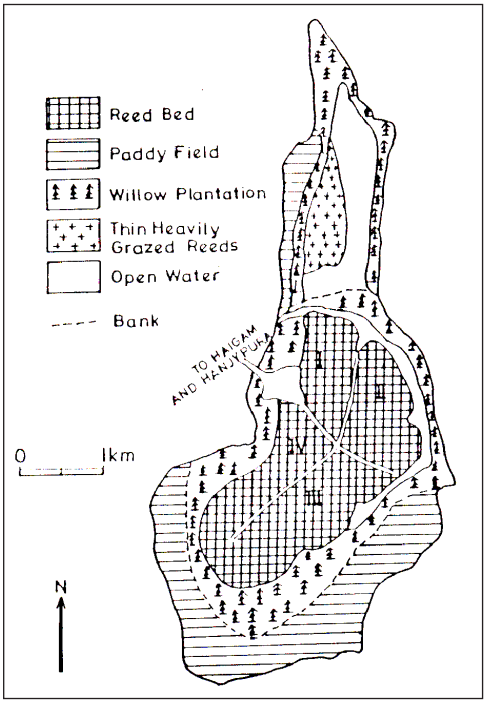

Fig. 1. Study Area.
Рис. 1. Район исследований.

vegetation. Observations on various breeding parameters were confined to IInd and IIIrd units only because these units comprised of dense and long vegetation and strips of bushy willows at its out skirts. The nests of bitterns were generally located in these units by observing birds flying to and from particular areas and by wading through the reeds. Some nests were also located by conspicuous white splashes of excreta over reeds. The nest sites were marked by slender willow stakes flagged with small strips of red cloth at about a distance of 5 m from the nest in a particular direction. Any residing place of the bird with one or more eggs was classified as a nest. Nest identification marks were marked on the flags with waterproof ink and also on squarish cardboard attached to the nest. Newly laid eggs were weighed to an accuracy of 0.1 g using a 50 g balance. Vernier Callipers were used to measure eggs. The eggs were also marked with waterproof ink to determine laying and hatching intervals. To calculate egg weight losses, eggs were weighed regularly till they hatched. Freshly hatched chicks were weighed to the nearest gram and their beaks and tarsi measured with the help of Vernier Callipers. 20 x 50^{x} field binoculars were used to observe the movements of bitterns and hides were raised to record the behavior of breeding pairs and nestlings. Hatching was defined as the time at which all eggs had hatched and hatching success calculations were done in accordance with Mayfield (1975) and Johnson (1979).

RESULTS AND DISCUSSION

Spring Arrival and Breeding Season

Little Bittern is a regular breeding migrant, it came to the wetland premises either singly or in groups of 2 to 3 after the middle of April (Fig. 2). Heavy rains, low temperature and wetland inundation delayed its arrival (Fig. 2, 3). However, as reported earlier, the wetland birds come to the valley in late March or early April (Shah, 1984).

During their stay in the wetland from April to September bitterns completed the breeding phase of their annual cycle right from formation of nest (June) to raising of young (August) which dispersed and lived independently before they left the wetland back to the plains of India. So a single breeding season extending from June to August was noted at Haigam wetland. Bates and Lowther (1952) and Holmes (1983) have also reported a single

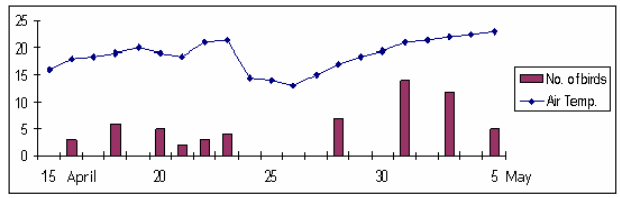

Fig. 2. Arrival of Little Bittern and daily temperatures.
Рис. 2. Прилет малой выпи и дневные температуры.

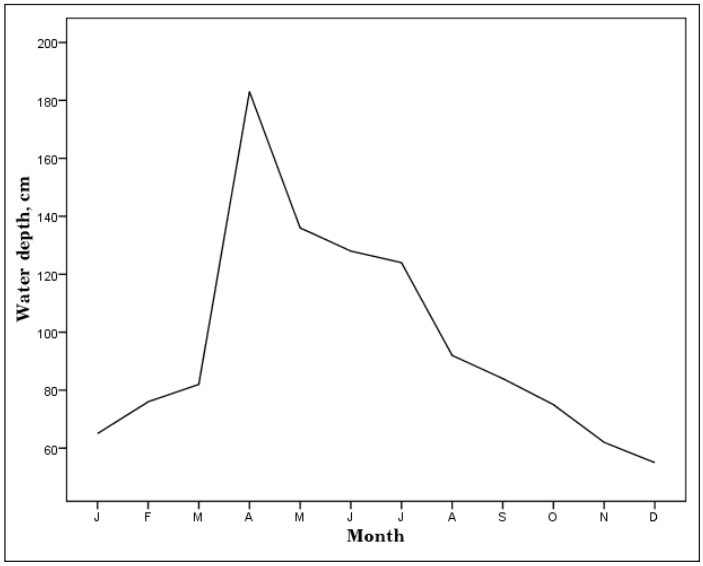

Fig. 3. Monthly fluctuations of water depth at Haigam wetland (cm).
Рис. 3. Месячные колебания глубины воды в Хайгаме (см).

breeding season but from May to August and Ali and Ripley (1983) have recorded the breeding season from May to July only. The delay in the onset of breeding was due to weather conditions. Due to heavy rains in the valley during April and May which inundated the whole wetland and there by the nesting areas (Fig. 3), the breeding season was slightly delayed. A similar situation in relation to water level has also been reported by Gorenzal et al. (1981) and Shah (1984).

Nest Site, Structure and Territorial Behavior

Breeding habitat by the bitterns was so chosen that there was sufficient emergent vegetation to support the nest and provide efficient cover and protection. Nests were constructed in dense emergent vegetation of S*parganium ramosum, Phragmites communis, Saccharum spontanium* and *Typha angustata* that provided additional adequate cover and protection from predators. Like the findings of Baker (1929), Bates and Lowther (1952) and Hoeher (1972) some birds preferred bushy willows for construction of their nests.

The first noticeable activity in the bittern recorded was their engagement in the collection of material for construction of nests and laying of territorial claims around these. The first signs of nest building were noticed after the middle of May on willows and in the beginning of June in reeds when they had attained a maximum height of 2–3 feet. The nests were built by placing small twigs on forked branches of willow to form a platform which was raised along its periphery to make a shallow depression and by bending down a number of reeds and then adding other pieces of dead reeds and their leaves to form a shallow platform. Similar pattern of nest building in bitterns has also been found by Baker (1929), Bates and Lowther (1952), Ali and Ripley (1983).

Both sexes took part in nest building and its maintenance like the earlier findings of Bates and Lowther (1952) and Ali and Ripley (1983). However, Cramp and Simmons (1977), Langley (1983) and Weller (1961) have reported a different situation in European and African Little Bitterns and in Least Bitterns (*Ixobrychus exilis*), where only males have been found to construct nests.

The nests located in reeds were fairly substantial platforms of dead reed stems with 1–3 mm depression lined with finer stems and leaves of S*parganium ramosum, Phragmites communis* and *Typha angustata*. But nests on willows were made up of fine twigs with a marked depression of 4–7 mm. The nest structure resembles with the findings of Bates and Lowther (1952) and also with those of European race of Little Bittern as reported by Wackernagel (1950).

Little bitterns were territorial only during nesting. A male was seen chasing other males that tried to initiate nest construction in the area until his female had completed her clutch, while a second male did not allow a third to nest and so on. These observations are inconsistent with the findings of Wackernagel (1950) and Langley (1983).

Table 1

Parameters of eggs of Little Bittern at Haigam wetland
Параметры яиц малой выпи в Хайгаме

Parameter	n	M ± SD	Range
Weight of unincubated eggs, g	40	11.92 ± 0.93	10.5 – 13.7
Weight of incubated eggs, g	40	9.90 ± 0.89	7.9 – 11.0
Length, mm	24	34.3 ± 1.6	31.3 – 37.7
Width, mm	24	25.5 ± 0.7	24.2 – 26.8

Courtship and Mating

Two types of courtship behaviour were observed: (a) bill crossing with raised crests and nibbling of breast and nap feathers of females by males and (b) displaying birds' bill flushing red. All these displays were followed by copulation which generally took place on nest during and after nest building and before and during the incubation of the eggs. This behavior probably has this advantage that females would be able to replace the eggs which get lost just after laying. The behavior of copulation during incubation is also apparently common in European Little Bitterns (Wackernagel, 1950; Cramp, Simmons, 1977) and also in closely related Least Bittern (Weller, 1961).

The bill colour in both the sexes turned red rapidly during courtship and nest relief. The functions of bill flushing were obscure but could serve to strengthen the pair bond during interaction. Similar pattern of bill flushing has also been reported in south African Little Bittern by Langley (1983).

Egg Morphometry and Clutch Size

The oval smooth but glossless white eggs often with bluish tinge were generally laid by Little Bittern after two days interval. But in two cases eggs were laid daily. Bates and Lowther (1952), Ali and Ripley (1983) also found additional egg after every two days. However, Langley (1983) has noticed daily laying in *I. m. payesii.* Egg dimensions measured for 24 eggs of little bittern were 34.3 ± 1.6 x 25.5 ± 0.7 mm and they weighed on an average 9.90 ±0.89 grams (Table 1). Ali and Ripley (1983) have given average measurements as 34.1 x 26.0 mm, and Baker (1929) as 34.00 x 26.00 mm.

The egg laying was initiated on June, 4 and was extended up to July, 25 and a total of 109 eggs were laid. The clutch size of 17 full clutches observed varied from 5–7 eggs with an average of 5.6 ± 0.7 eggs per clutch (Table 2).

Bates and Lowther (1952) also reported up to 7 eggs but 5 being a common number. Different workers have reported different clutch sizes of *I. m. minutus*: Oorte (1922) gives 7–8; Steinfatt (1935) – 3–6; Großkopf and Graszynzski (1958) – 7–8; Witherby et al. (1939) and Holmes (1983) – 4–5 eggs with

Table 2

Clutch size of Little Bittern at Haigam wetland
Размер кладки малой выпи в Хайгаме

Month	Number of eggs			Total	M ± SD
	5	6	7		
June, 4 to June, 30	3	6	–	9	5.7 ± 0.5
July,1 to July, 25	5	1	2	8	5.6 ± 0.9
Total	8	7	2	17	5.6 ± 0.7

Table 3

Nest attention during incubation of both sexes in Little Bittern
Пребывание обоих полов на гнезде во время насиживания

Periods	♀	♂
Total attentive time	34 h. 33 min.	30 h. 7 min.
Number of attentive periods	14	13
Mean duration of attentive periods	148 min.	139 min.
Longest attentive period	450 min.	240 min.
Shortest attentive period	106 min.	52 min.

Total observation time: 64 h. 40 min.

a model number of 4 eggs and Holmes and Hatchwell (1991) – 3–5 eggs.

Incubation

Incubation started with laying of the first egg and both the sexes took part in incubation. This pattern of incubation resulted in asynchronous hatching as also been reported by Holmes (1983), Holmes and Hatchwell (1991). The period during which eggs were incubated varied from 16–18 days with an average of 16.8 ± 0.8 days at Haigam. Oorte (1922) has also found the incubation period of 16–18 days with a mean of 17 days. However, other researches reported a fluctuating incubation period of 18–19 days (Groebbles, 1935), 19 days (Wackernagel, 1950) and 16–17 days (Ali, Ripley, 1983).This variation seems to be due to varied environmental temperatures and availability of food and consequently incubation duration.

There was little difference in the time spent in incubating the eggs by either sex. Both the sexes took almost equal part in incubation with 34 hours and 33 minutes by a female and 30 hours and 7 minutes by male during 64 hours and 40 minutes observations (Table 3).

Almost equal time taken by males and females coincided with the findings of Langley (1983) for *I. m. payesii.* But Weller (1961) has concluded from his findings that females do most of the incubation. Equal time spending by males and females in incubation may be due to the availability of more suitable food and therefore stay for more time in the nest. In the areas were food availability is scarce males spent most of the time in food gathering and less in incubation.

There appeared a gradual loss of about 18.4% in weight of eggs during incubation (Fig. 4). This loss could be due to evaporation rate which increases with continued incubation and with rising temperature.

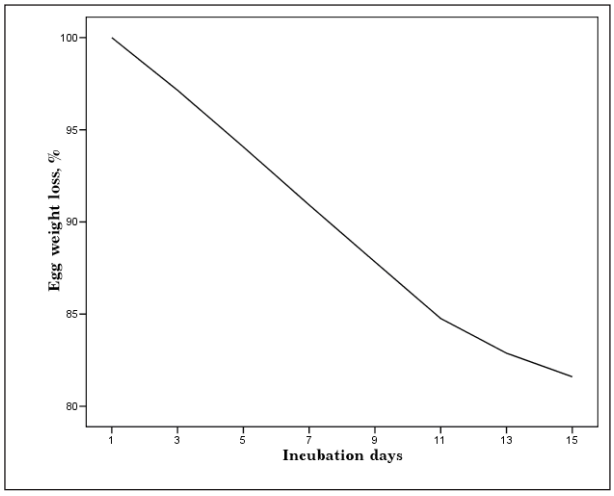

Fig. 4. Egg weight loss during incubation in Little Bittern.
Рис. 4. Потеря веса яиц во время насиживания у малой выпи.

Hatching and Hatching Success

Hatching in Little Bittern was asynchronous, the eggs hatched in order they were laid. The du-

ration of hatching from piping to complete freedom of the chick from the egg shell varied from 1–2 days. After chick emergence the remains of egg shells were thrown out and generally dipped in water by the attending parent.

Table 4

Hatching success of Little Bittern in different habitats at Haigam wetland
Успешность вылупления у малой выпи в разных биотопах в Хайгаме

Habitat	No. of nests	No. of eggs	Eggs lost trough predation and faulty incubation		Hatching success, %
			n	%	
Willows	7	36	20	55.6	44.4
Reeds	13	73	14	19.2	80.8
Total	20	109	34	31.2	68.8

The hatching success in reeds was 80.8% in contrast to Holmes (Holmes 1983; Holmes, Hatchwell, 1991) who recorded 90% during 1978 and 53% during 1983. High percentage of hatching success in reeds was due to less attack of predators as the nests were more concealed in thick growth of macro vegetation. But on willow trees the hatching success was only 44.4 % (Table 4). This low percentage was due to exposed nature of nests to high avian predation (crows and kites) as they also use willows for roosting and nesting purposes.

Chicks and Their Behaviour

The precocial hatchlings were covered with orange down and had flesh coloured bill and distinctive blue grey eyelids. The average weight of chicks was 9.2 grams (range 7.3–10.2 grams), their beak and tarsus lengths were 8 mm (range 7–9 mm) and 1 cm (range 0.9–1.1cm) respectively. Langley (1983) and Wackernagel (1950) have recorded chick weights between 7 to 9 grams and 10 to 11 grams respectively. The difference may be due to variation in egg size and some ecological factors prevailing in the respective regions.

After a few hours of hatching the nestling tried to raise their heads which seemed to be an important stimulus for the adults to initiate feeding. The chicks collected regurgitated food either from nest or directly from parents by beak to beak transmission. The feeding intensity by parents varied at different parts of the day (Fig. 5). Holmes (Holmes 1983; Holmes, Hatchwell, 1991) has also reported similar

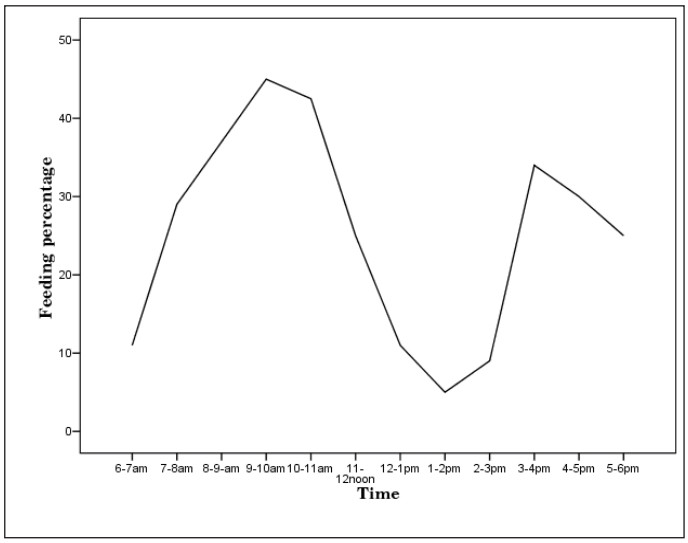

Fig. 5. Feeding of chicks of Little Bittern during day.
Рис. 5. Кормление птенцов на протяжении дня у малой выпи.

pattern of chick feeding. Chicks responded to high temperature by raising their necks upward and vibrating throats rapidly. Guller fluttering has also been observed in bitterns by Holmes (1983) and Langley (1983) and in Cattle Egret (*Bubulcus ibis*) chicks by Blaker (1969).

The age at which the chicks permanently left their nests to reside in surrounding reeds was 16 to 18 days. They were capable of limited flight at about 21–24 days if disturbed but achieved strong voluntary flight at the age of 25–30 days. Langley (1983) stated that chicks of South African Little Bittern remain in the nest untill they are 14–16 days old. Witherby et al. (1939) however gives only 7–9 days which is more likely the age at which they first leave the nest and not the final nest departure. Cramp and Simmons (1977) gives a nestling period of 25–30 days for European race, Langley (1983) – 27 days for South African race and Pforr and Limbrunner (1981) one month for *I. m. minutus*.

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Книжкова полиця

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Адреса редакції:

ЗУОТ, Державний природознавчий музей НАН України, вул. Театральна, 18, 79008, м. Львів;
e-mail: zuot@org.lviv.net.