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# PAIRING BEHAVIOUR AND TERRITORIALITY IN INDIAN GREAT REED WARBLER (*ACROCEPHALUS STENTOREUS BRUNNESCENS*, JERDON) AT LAKE WULAR, KASHMIR

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**Abstract**

The behavioural study of Indian great reed warbler was carried out at Wular Lake Kashmir from 2007 -2009. Reed warblers were earlier birds that arrived the lake in 3rd week of March.Their arrival co-related with the height of the reeds. Males landed at the lake prior to females. During pairing females were mostly attracted by the quality of territory. The common pairing behaviours were opening of wings, spreading of tail feathers and fluffing and fluttering of body feathers by both the individuals.Great reed warblers were mostly monogamous but polygamy was observed in settlers with good quality territory. Great reed warblers were territorial and territories were established and maintained by males only. Territorial size varied from 540m$^2$ to 2000m$^2$. Monogamous males had larger territories than polygamous ones.

Key words: spring arrival,pairing,territoriality,polygamous,great reed warbler,Wular.

## INTRODUCTION

Indian Great Reed Warbler a regular summer migrant to the valley of Kashmir is present in all wetlands and marshy areas during summer months.This passerine bird generally preferrs large reeds and bushy willows.It is the largest of all the warbler species and over-winters in tropical and sub tropical regions of indian sub-continent as far south west as western ghats (Bates and Lowther,1952).Reed warblers breed in marshland habitats,almost exclusively in reed beds (Schulz-Hagen 1991, Cramp1992).In central and western Europe the reed warblers have relatively long breeding season which lasts from May until August/ September( Schulz-Hagen 1991, Cramp 1992). It is mostly monogamous but in good quality territories males undergo polygamy.The females take the quality of the nesting area, quantity of food and predation risk into consideration before determining the territory (Ali UZUN *et al* 2014). A lot of work has been done on the breeding ecology of Great Reed Warbler(Dyrcz and Nagata,2002 and Ali UZUN *et al* 2014) but certain breeding behaviours viz pairing and territoriality has not been studied in detail. The aim of present paper is to describe these breeding behaviours of this passerine bird species that have been evaluated during a study of this bird at Wular lake Kashmir India.

## MATERIAL AND METHODS

### Study area

The study was conducted from 2007 to 2009 at Wular Lake (34º15□ to 34º25□ N, 74º32□ to 74º42□ E), a Ramsar Site in the Baramulla and Bandipore districts of Jammu & Kashmir, India (Fig.1). The lake has a maximum depth of 4.9 m with an area of 111.71Sq. Km (Latief 2012), that remains covered with dense growth of free floating and emergent vegetation during the major part of the year. The common species are *Trapa bispinosa, Nymphoides peltatum, Nelumbo nucifera, Ceratophyllum demersum, Hydrilla verticillata, Potamogeton indicus, P. lucens, Butomus umbellatus, Carex sp., Phragmites communis, P. elephantoides, Typha angustata, Myriophyllum verticillatum, Sparganum ramosum, Lemna sp. and Saccharum spontaneum.* The dense floating vegetation and reed beds are partitioned by a series of boat channels varying in width between 1–6 m. Besides several springs that are occasionally seen bubbling up to the surface and streams, especially, Erin, Mudhumati, and Ningal Nallah, the lake is mainly and chiefly fed and drained by the river Jehlum. It

flows into the Wular on its south-eastern side, near the middle of the lake and leaves the lake at its south-western corner near Sopore.

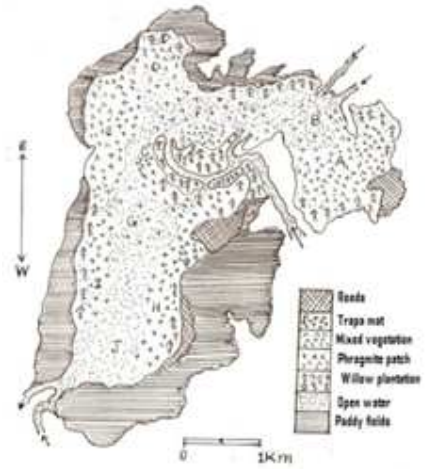


Figure 1.Wular Lake

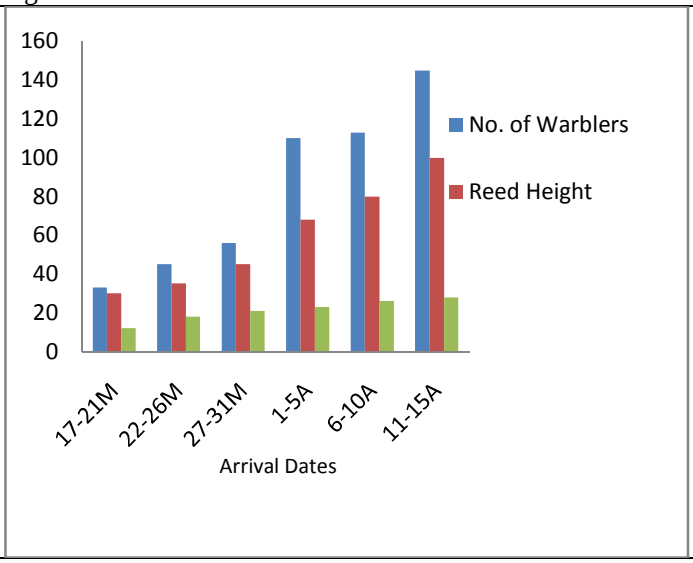


Fig.2 Arrival of warblers in relation to reed height and average temperature

**METHODS OF OBSERVATION**

For the purpose of present investigation the lake was divided into ten study sites mainly on the basis of different vegetational types, bird habitat preferences and other characteristics. Observations on breeding behaviours were carried out in Five Sites - A to E, because these areas had dense growth of emergent vegetation in addition to thick strands of bushy willows and less human interference. To observe the breeding behaviour from spring arrival to rearing of young ones, the lake was visited regularly during the breeding season from March to October. The activities of birds were recorded on daily basis and the number of the birds settled in study sites was estimated once every week by visual census using field binoculars and Transect method (Watson 1965; Gaston 1975). Initially when the growth of vegetation was low visual counting was conveniently employed. An estimate was -obtained without disturbing the birds, by scanning each part of the study site from good viewpoints with the aid of powerful field binoculars. From April onwards when there was thick growth of reeds, transect method was used for counting birds. The method entailed moving along a series of transects to and fro to cover the sites, identify the birds and count the number of the species under observation. The bird under study was identified by studying its characteristic features, in accordance with identification keys, evolved by Bates and Lowthcr (1952), Ali and Ripley (1968, 1974).

Once the warblers settled they were observed for 30 - 35 minutes daily in each site for detailed observation on their territorial behaviour. During the observation the points at which chasing occurred between the owners and the intruders were plotted directly on the field maps for this study. Then many points on different maps were superimposed on to a map and the outer most points were connected with line so as to include all the others. The obtained area was regarded as territory. If a single nest with eggs or nestling was found within the territory throughout the breeding season the bird was considered monogamous. If two or many viable nests were found in the same territory and the interval between the dates of egg laying in such nests was within a month the territory owner was considered as bigamous or polygamous. However, in this case the repeated nests were excluded. Pair formation and courtship displays were observed from the bank or from the boat. Hides were also raised to record the pairing and territorial behavior of the birds.

## RESULTS

### Spring Arrival and Pair formation:

Indian great reed warblers were among the early arrivals that reached the lake in 3rd week of March. The dates of arrival during three years of investigation varied due to variation in climatic conditions. In 2007, the warblers first landed in the lake on April, 01 and were found to be the early migrants during the course of study. In proceeding years the warblers reached the lake from 3rd week of March till 2nd week of April. The arrival of maximum number of birds co-related with the maximum height of the reeds and daily temperature( Fig.2). At the start of their arrival the reeds had attained only 30-45cm height but at the time of their complete arrival the reeds had acquired the height of 70-100cm. The males were the first to arrive the lake followed by the females. During pairing females were mostly attracted by the quality of the nesting area, quantity of food, predation risk, singing quality and vigour of the males to defend the territory. They generally preferred those areas which were close to open water with dense vegetation that provided concealment to the nest as well as to their offsprings and had enough food in addition to the defending ability of the male owning the area.The common pairing behaviours were opening of wings, spreading of tail feathers and fluffing and fluttering of body feathers by both the individuals. Polygamy was observed only in early settlers with good quality territory in terms of food availibility, vegetation density and low predation risk. Majority of late comers were either monogamous or without any female (Table1). Polygamous males paired with second or third females only when their first females initiated egg-laying. Out of 145 males studied, 72 were monogamous; 41 bigamous; 12 trigamous; 3 each tetragamous and pentagamous. There were regular unmated males in the three years. A proportion of them was 9.52% in 2007, 1.96% in 2008 and 22.5 8% during 2009. The monogamous males were 57.1% in 2007, 60.8% in 2008 and 16.12% in 2009. There were 40.69% polygamous, 49.66% monogamous and 9.65% unmated males during three years of study (Table2).

### Territories and Territorial behaviour

Territories were established amongst the thick growth of reeds and willow plantation. The males used many singing posts in and around the periphery of their territory and made themselves conspicuous. Initially, there were only a few males, which established territories and it was easy for a new comer to find an unoccupied area. As soon as the males arrive the study area, they became active with time, flying over the reed marshes and feeding among the reeds in the surrounding *Salix* plantation. Soon they begin to sing their well-known characteristic loud song. During singing the male used several posts selected in or about the periphery of the territory. The singing posts were taller than the average height of reeds comprising of either dead reeds or branches of trees or protruding stems. The singing posts played an important role in the maintenance of the territory since the owner could scan over its territory from the singing posts. The activities were mostly restricted to the area and males spent most of the time in singing and guarding the territory from the singing posts. On seeing any intruder in the territory, the owner chased and drove it away. When the owners encountered near the" boundary of their territories they dashed towards one another and withdrew one after another. This action continued for some time and later on both the owners returned to their territories without resolving the territorial dispute, which continued for a long time till their mates were obtained and fledglings fully-grown. Initially the size of the territory was much larger as the early settlers tried to occupy isolated areas having less attack of intruders but as the time passed, the

territory got restricted to small area or only to defendable area. Therefore, for new settlers it was easy to take up a territory among the established territories because the owners were not capable of holding larger territories. In this case the new comer tried to establish singing posts in the distant area of the established territory. The owner chased the intruder and after several chasings left certain area of its established territory and selected new posts. In this way the intruder easily snatched a portion of territory and established its singing posts in it which it later on extended by adopting a similar method.

**Table 1: Pairing success of Indian Great Reed Warbler males and period of spring arrival of Males in 2007- 2009. The figure is number of males. Data is pooled for three years.**

| | **Period of spring arrival** | | | | |
|---|---|---|---|---|---|
| | **Late March** | **Early April** | **Middle April** | **Late April** | **Early May** |
| Mated males | 19 | 39 | 59 | 13 | 1 |
| Monogamous | 7 | 24 | 29 | 11 | 1 |
| Bigamous | 10 | 10 | 19 | 2 | - |
| Trigamous | 1 | 3 | 8 | - | - |
| Tetragamous | - | 1 | 2 | - | - |
| Pentagamous | 1 | 1 | 1 | - | - |
| Unmated males | - | - | 2 | 10 | 2 |
| Total | 19 | 39 | 61 | 23 | 3 |

When the territories with diminished size were fully established, with clearly defined boundaries the late comers still tried to settle and establish their territories within. In doing so they flew through the territories along the border with a distinct type of flight - slow wing beating with long glides. The owner drove the intruder off violently by flying straight towards it with fast beating wings. However, the intrusions and chasings were repeated persistently for longer time ranging from 25 minutes to 3 hours. Finally the vigour of the chasing was lost and the intruder occupied a small region among the established territories. Although persistent intrusions were observed frequently, many of the intruders were not capable of establishing their territory in the crowded area. They had to occupy less favourable marshy areas. In the course of establishing a territory an intruder had to acquire first a singing post which it used as base for operation for extending its territory, and capturing many other posts. Singing posts have major role in the maintenance and defence of territory.At several occasions the intruders were chased by the owners of the adjacent territories But some times the owners while chasing the intruder, tried to chase one another and in this chasing give a way to the intruder to capture a singing post which was later on difficult to push out.

**Table2 : Percentage pairing success of males of Great Reed Warbler during three consecutive breeding cycles.**

| | **2007** | | **2008** | | **2009** | | **Overall percentage** | |
|---|---|---|---|---|---|---|---|---|
| | **No.** | **%** | **No.** | **%** | **No.** | **%** | **No.** | **%** |
| Mated males | 57 | 90.5 | 50 | 98.04 | 24 | 77.42 | 131 | 90.35 |
| Monogamous | 36 | 7.1 | 31 | 69.8 | 5 | 16.12 | 72 | 49.66 |
| Bigamous | 15 | 23.8 | 14 | 27.5 | 12 | 38.70 | 41 | 28.27 |
| Trigamous | 4 | 6.3 | 3 | 5.9 | 5 | 16.12 | 12 | 8.27 |
| Tetragamous | 1 | 1.6 | 1 | 1.9 | 1 | 3.22 | 3 | 2.06 |
| Pentagamous | 1 | 1.6 | 1 | 1.9 | 1 | 3.22 | 3 | 2.06 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Unmated males | 6 | 9.52 | 1 | 1.96 | 7 | 22.58 | 14 | 9.65 |
| Total | 63 | | 51 | | 31 | | 145 | |

The size of territory decreased with the increase in number of males. In 2007 there were 8 territorial males in the middle of April and the average size of territory was 2000$m^2$.This territory size then decreased from 1000$m^2$ on April, 20 to 540$m^2$ April, 25 with an average size of 750$m^2$.But in 2008 and 2009 the average size of territory was 850$m^2$ and 900$m^2$ respectively.

The breeding activities of the bird like mating, nesting and a part of feeding occurred usually in the territory. But most of foods for nestling were gathered out of the territory. In bigamous males the size of the territory was smaller than polygamous and unmated males. In unmated males the territory was 1000$m^2$ and in monogamous males it was approximately 900$m^2$ while as in bigamous and polygamous males the territory was 860$m^2$. In monogamous males the size of the territory was larger than bigamous and polygamous ones but the quality of the territory varied in different aspects like plant density, food availability or position of territory.

## DISCUSSION

Factors that govern the breeding and migrational cycles of birds is an internal rhythm, under hormonal control and often modified to keep tune with prevailing environmental conditions. Day length appeared to be the chief external factor stimulating hormone flow and .recrudescence of the gonads, but favourable or unfavourable weather conditions as well as the availability of the right kind of food and suitable nesting sites can apparently modify the inherent internal rhythm (Wallace and Mahan, 1975). According to Lack (1960) the ultimate factor concerned with the timing of spring migration is the need for the birds to reach their breeding,grounds in time to take advantage of most favourable season.

A marked variation in the arrival time of the warblers under observation was observed during the three years of observation. In 2007, the warblers first landed in the lake on April, 1st and were found to be the early migrants during the course of study. In proceeding years the warblers reached the lake from 3rd week of March till 2nd week of April. The delay in the arrival time during first year of observation seem to be due to the non availability of nesting sites and lack of right kind of food due to low temperature and lake deluge.

As is known in many migratory species of warblers, the males reach breeding grounds about ten days or two weeks earlier than females (Haneda and Teranishi 1968a; Kikuchi et al. 1957; Saitou 1976a: Dyrcz 1986). It seems that the Indian great reed warbler males may be taking their routes earlier to their breeding grounds and were probably first to arrive in the lake followed by females that reached 10-15 days after their arrival. The difference in the arrival of males and females of Indian great reed warbler has also been observed by Nisbet and Medway (1972). They have ascertained that the difference in the date of arrival between both the sexes coincided with the date of spring departure from wintering grounds. Kluyver (1955) stated that low temperature could delay the arrival.

In great reed warbler pairs were established generally by assessing the quality of territory having high attractiveness and male's ability to defend it. They were found either monogamous or polygamous. Out of 145 males studied, 90.35% were mated and 9.65% unmated. Among mated males 49.66% were monogamous and 40.66% polygamous. Among polygamous ones majority were bigamous (28.27%), some trigamous (8.27%) and a few tetragamous and pentagamous (2.06% each). Similar type of pairing in great reed warbler has been reported by a number of workers (Haneda and Teranishi, 1968 a; Kikuchi et al., 1957; Kluyver, 1955; Dyrcz 1977 and Saitou, 1976a). They reported that majority of great reed warblers as bigamous or trigamous but only Kikuchi et al. (1957) have reported a pentagamous condition in which a male mated with five females. The high percentage of polygamous males seemed to be due to availability of smaller but better nesting sites with good concealing arrangement and food availibility.

After the birds established their pair bonds they maintained and defended certain areas representing future nesting and rearing sights "the territories". Detailed study on territorial behaviour has been done in many bird species and many authors have classified the territories (Mayr, 1935; Nice, 1941 and Hinde, 1956). On the other hand possible function of the territory has also been subject of arguments. There are some excellent reviews on territorial function by Lack, (1933), Nice (1941),

Hinde (1956) and Tinbergen (1957). Hinde's (1956) review concluded that territorial behaviour has both harmful and advantageous consequences to individual's chances of ultimate productive success and that the interaction between selective forces governing behaviour, structure and physiology of birds are extremely complex.

Among great reed warbler the territory was defended and maintained only by males and average size of territory varied during the three years of investigation. The method of the establishment of the territory was same from year to year but the size was large in initial stages of establishment, which then reduced as new individuals settled either by invading or wedging or carving their areas from the previously established ones. The territories of polygamous males were smaller than the monogamous or unmated males. Mating, nesting and a part of feeding were carried in the territory[7] and nestlings were fed by the food collected either within the territory or outside it. Haneda and Taranishi (1968b) and Saitou (1976a) observed similar type of establishment of territories in eastern great reed warbler. They also observed that the males established the territories and territorial size decreased as breeding proceeded nest concealment and availability of plenty of food.

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