

DATES CONCERNING BREEDING BIOLOGY AT THE GREAT REED WARBLER (*Acrocephalus arundinaceus*)

Constantin ION¹

¹University "Al. I. Cuza", Iași

INTRODUCTION

The Great Reed Warbler is the most common warbler populating the wet areas of Romania. The distribution area comprises North-West Africa, Europe, Turkey, Eastern Coast of Mediterranean Sea, East of Trans-Caucasian region, Caspian Sea and Volga River' basin (Cramp S., 1992).

In Romania it can be found especially around the reeds beds from plain (The Atlas of Nesting Species of Romania, 2002) and it visits our country in summer. The Great Reed Warbler arrives in the wet areas of Romania at the beginning of March and the spring passage continues until the first weeks of May. It leaves at beginning of August and the autumn passage continues until the middle of October.

The species number in Romania is estimated at about 100.000-400.000 breeding pairs (The EBCC Atlas of European Breeding Birds, Their distribution and abundance, 1997). Regarding the same bibliographic source the Romanian effectives are the greatest from the south-eastern Europe.

Our study includes a synthesis of our observations from 2000-2005, concerning breeding biology of The Great Reed Warbler- *Acrocephalus arundinaceus* species in the wet zones of Moldavia.

MATERIALS AND METHODS

The field observations have been undertaken during 2000-2005, from April to July.

The following wet Moldavian zones were submitted to investigation: Larga Jijia- Vladeni Ponds (Iasi District); Balta Lata Lake (Botosani District); Iezar Lake (Botosani District); Carja Ponds (Vaslui District); Vladesti Ponds (Galati District); Beresti Lake (Bacau District), Natural Reservation Balatau (Iasi District); Natural Reservation Teiva (Iasi District), as well as The Botanical Garden of Iasi.

The investigated habitats are relatively homogenous as regards the vegetation and human influence. The vegetation typically paludal with reed (*Phragmites australis*), bulrush (*Typha angustifolia*, *Typha latifolia*), sedge (*Carex*) and scoulingrush (*Scirpus*) is represented by vegetal associations such as: *Scirpo-Phragmitetum*, *Typhaetum angustifoliae-latifoliae*, *Caricetum acutiformis ripariae*.

The human impact in the wet zones of Moldavia is pretty insignificant and it consists of a rudimentary agriculture and fish exploitation which does not affect much the bird populations living in the reeds beds.

For observation we used an Exacta 10x50 binoculars and a Nikon 40x60 field scope. We have also searched some aspects of breeding biology in the reed beds by boat.

The methods employed for observation were visual and auditive transects along 1 km distance in the reed bands, as well observations taken from a fixed point.

Our data include aspects concerning the populations' dynamics, nest, pairing, breeding, offspring, fledging, younglings emancipation, environmental and human factors influence to reproduction of The Great Reed Warbler (*Acrocephalus arundinaceus*).

The data concerning estimated effectives are reported at 1 ha reed surface and were statistically processed with XI-stat software. Also, with a ruler we have measured the nest parameters: the large and small diameter, external and internal height. The dates were statistically processed to have an overall imagine concerning nest characteristics.

RESULTS AND DISCUSSIONS

In the investigated wet zones, reed warbler's cenosis is dominated by The Great Reed Warbler (*Acrocephalus arundinaceus*). The effectives in breeding season are on average: 7 breeding pairs per 1 ha reed bed.

The Great Reed Warbler flocks are the largest (table 1) in all studied areas than other reed passerines (Ion C, 2003). The greatest density of specimen are created in the North of Moldavia (the Balta Lata lake), Larga Jijia Ponds, while the smallest gatherings were found at Beresti Lake- Siret Valley, at Iezar- Jijia Valley, Carja (Prut Valley).

In the north-eastern Moldavia (Balta Lata Lake) and the Prut Valley (Larga Jijia and Vladesti) there are large reed areas which provide optimal life conditions and feeding sources to The Great Reed Warbler. For this reason this species is highly abundant in the area.

The invertebrate's communities, especially insects (Ion C., 2004) and the low human impact, thanks to the fishing protection laws in the area applied by trained personals lead to a large number of Great Reed Warbler individuals in the area.

The confidence interval limits of the flocks are very large, because during the years of our field observation there were high variations of temperature according to the season, and the period of the night/day (10-12°C). Dry periods alternated with high precipitations. The temperature variations and especially the pouring rains in Prut Valley, in the north areas sometimes determined nest destruction and a lack of insects as food source for these birds. The unfavorable conditions and absence of food caused in many cases the Great Reed Warbler's departure towards Southern regions such as Danube Delta a more favorable living habitat.

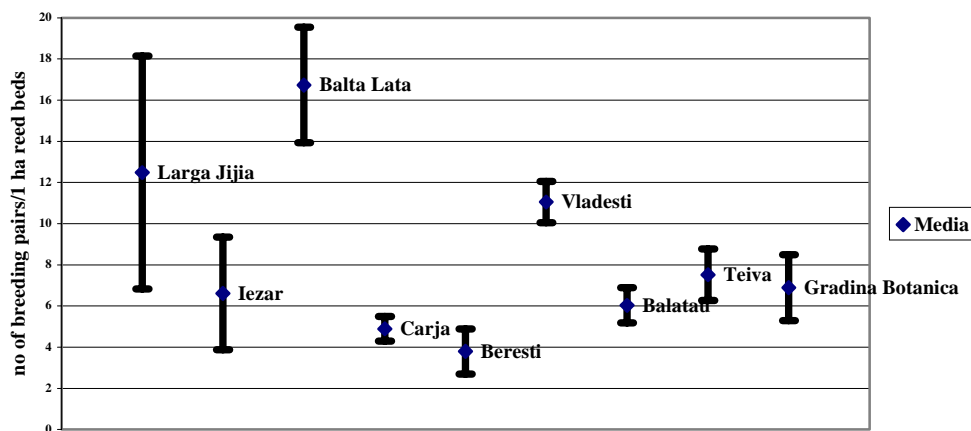


Figure 1. The confidence interval of *Acrocephalus arundinaceus* populations in Moldavian wet zones

The pairing at this species generally takes place at the end of May- beginning of June in the wet zones of Moldavia.

In this period, male individuals compete for females and for access to the resources preferred by females as well as for food or proper places for nestling (Eimlen and Oriny, 1977, mentioned by Hasselquist D., 1998)

The females' arrival is shortly followed by pairing and copulation at the end of May. When a female arrives in breeding territories she does not choose her partner straight away. We observed females gather in compact reeds beds, where they find refuge and from where they can fly to the reeds beds edges to find food. After 5-6 days the females begin to form hutching trail and after recovering energetically they start searching for a partner.

The beginning of the breeding season follows the Bohning G.' principle (mentioned by Vâlcu M., 2003): the long distance migratory start breeding season later than other passerines.

The female is always the one to choose the mating partner. Of great importance are the quality and surface of habitat and the food available where the male settles his territory (Cramp S., 1992). We observed that the Great Reed Warbler male starts to build a new nest before mating, when the female search her future partner. The male collects all the material necessary to build the nest from the reed or from the water edges. A female entering the male territory does not bother its owner as he is mostly interested in building his nesting place. When the nest is sttled both partners contribute to finish it.

After accepting male courtship, the mating female is the one which will finish the nest construction. Meanwhile the male flies close to her and they carry together materials for the nest. The female movements are short and of small amplitude while the male executes long flies, more than 100 m distances, for bringing nest materials. Often, the female flies behind the male and follows him within the territory to learn the boundaries territory. In this period the male mating song can barely be heard showing that mating period is already finished.

Another sign of pairing is also indicated by the partner aggressive inhibition. At first the female is aggressive but starts to accept male presence near her and it even accepts his help.

Concrete data on copulation are not known (Cramp S., 1992). In our opinion it takes place inside the reed beds and does not last more than 2-3 minutes. Both partners can be seen during this period, with the tail rise and fan spread; the wings opened, the male plumage is ruffled and at the female is sleeked. There is a

situation mentioned in literature (Cramp S., 1992), when the female can pair with more males, but only the first partner of the breeding period ensures reproductive success.

The mating period of the Great Reed Warbler lasts between 7- 14 days.

The Great Reed Warblers build their nests, especially towards the waters edges, where they found enough food resources for them and their offspring. Also the Great Reeds Warblers built the nest in such manner so it provides an easy access to the water. We have scarcely observed the nests inside the compact surface reeds beds. The nest construction lasts on average 5 to 6 days. The nests are placed at 0.3-2 m from the water level or from the marsh surface. They are made of vegetal materials knitted around 3-4 reed stems.

The Great Reed Warbler's nests consist of sedge (*Carex sp.*), as a base for the nest structure. On this structure there are mostly knitted *Agrostis stolonifera* blades but also lower quantities of *Scirpus maritimus*, *Typha angustifolia*, *Phragmites australis*. In nests we have also found pieces of plastic, horse hairs, bird puff; among other materials there are sometimes added roots, plants fibers, flowers, as mentioned in the specialized literature (Harrison C., 1988).

The nest has a dense knitter bottom, and on the sides and top, the blades plants blender is more and more lax.

The nests' opening is ellipsoidal, with a greater diameter and one smaller at the surface. The nest shape is bowl-like with the bottom almost round. The nests walls are between 1-3 cm thick (Tabel 1).

The Great Reed Warbler distance their nests at minimum 15 m one form each other. Therefore, the family territory has at least a 30 m diameter. The nests density, is between 1,2-11 nests/ha (The EBCC Atlas of European Breeding Birds, Their distribution and abundance, 1997).

The data collected from literature show that the territories of The Great Reed Warbler (*Acrocephalus arundinaceus*) are smaller than other warbler species (Cramp S., 1992). We estimate that the nests density at The Great Reed Warbler is very high, but the distance between them is large enough leading to a minimal concurrence.

The nestling habitat of the Great Reed Warbler is made only of reed. The reed high is between 3,5-5 m. We have not noticed nests placed in reed smaller than 3 m or higher than 6 m.

We have also registered the nests depth is relatively high, 6-8 cm. It is considered that the nest depth is related to the long incubation period which may exceed 12 days (Schulze H. K., 1996). The nest needs a constant high temperature for incubation and this could explain the relatively great nest dimensions reported to The Great Reed Warbler size body (12-14 cm, Munteanu D., 1999). The nest shape and his depth depend on natural selection ways which favor nest parasitism by the Cuckoo-*Cuculus canorus* (Moksnes et al., 1993). We have registered the nest parasitism incidence in the reed areas rises if the nests are placed near forests: Botanical Garden Lake, Larga Jijia, Vladesti, Balatau.

The Great Reed Warbler is considered one of the common hosts for the Cuckoo (Moksnes, 2000). The nest parasitism reaches 40 % within a Great Reed Warbler population (Moksnes, 1993).

Table 1 shows the comparative analysis for the Great Reed Warbler's- *Acrocephalus arundinaceus*-nests.

From the statistical analysis we have noticed that the average value and the median value are close (Table 1) and the standard error is very low. So, we can consider our statistical results to be relevant (Fowler et al., 1998) for the Great Reed Warbler populations.

Tabel 1. The comparative analysis of Great Reed Warbler nests

<i>Acr aru</i>	Great Diameter	H ext	H int.	Small Diameter
No. obs. (cuiburi)	17	17	17	17
Average	10.41765	9.111765	7.294118	8.741176
Standard Error	0.199122	0.284512	0.391779	0.29319
Median	10.4	9.1	7.3	8.7
Mod	10.3	10.5	5.8	10
Standard Deviation	0.821002	1.173074	1.615345	1.208852
Variance	0.674044	1.376103	2.609338	1.461324
Minimum	8.9	7.1	4.3	6.3
Maximum	12.1	11	10.2	11
Confidence interval (95,0%)	0.42212	0.603139	0.830534	0.621534
SL	10.83977	9.714904	8.124651	9.362711
IL	9.995527	8.508626	6.463584	8.119642

Legend: *Acr aru*- *Acrocephalus arundinaceus*; *Acr*- *Acrocephalus*; *no. obs*- number of observations; *SL*- superior limit; *IL*- Inferior limit; *H ext*- External High; *H int*- Internal high;

In the investigated Great Reed Warbler's nests there are on average 4-5 eggs. Our observations are similar with those found in the literature (Literak I., 1998).

The eggs are always set on with the peak towards the nest interior or towards the closest egg, but usually are deposited with the larger side towards nest exterior.

The eggs shape is oval, under-elliptic and it is generally colored in green with black- brown spots. The surface is smooth and glowing. Our observations are similar with those from the ornithological literature (Harrison C., 1988).

Eggs' laying lasts 3-6 days. One female lays on average between 2-5 eggs. The Great Reed Warbler female lays one egg per day. During eggs laying, female leave his nest only for drink water. Males bring her food in all this time. When all the eggs are laid, both male and female leave the nest for several hours. Firstly, they glide above the water, fly around the water, to the water edges, surveying the territory, after which they search for insects.

We observed that after eggs laying both partners start searching for food. Males fly especially in the grassland and forests near water. The female presence is yet more discreet than her partner and is limited only to short movements around the nest.

We estimate that the incubation lasts 10-14 days. The female clutches the eggs. Rarely, male can be seen clutching. This is possible only for the monogamous male in specialists' opinion (Cramp S., 1992).

While the females clutches, the male brings food to the nest. It does not go further than 50-100 m from nest. Our observations reveal that some times females leave her nest for more than 10 minutes, but only in search of food or to clean their own plumage. Afterwards, both partners could be seen flying together at the edges of reed bed and the female return at nest. During one day, the female could leave her nest several times.

At the beginning of the breeding period the female departures from the nest are very rare. When the hatching moment is close, the female leaves her eggs more often for search food. In this period, male does not stop to show his presence or to sing around the nest. This behavior is displayed in order to maintain the territory boundaries intact and to frighten potential predators.

Our observations from Iezar (Botosani District) show that the female could be replaced by male in the nest during the day, even if he does not know the incubation patch.

The Great Reed Warbler is a typical altricial species. In the first days after hatching, the younglings are very fragile and they need a complex and sustained care from their parents. The parent's care is, in fact, an altruist behavior since the parents take care of their younglings first and afterwards for themselves.

At the beginning of the breeding both parents stay inside the nest and replace one another. Especially, during the night they protect their young, covering them with wings. In this period, the adults' behavior is more subtle. They fly very close to ground or the water-surface and their movements are short and quick.

The hatching rate is, in most of our observations almost 75%. In 2003, 2004, 2005; we have monitored 24 nests, 6 at Botanical Garden Lake (2004 and 2005) and 18 at Iezar- Botosani (2003 and 2004). Usually only 3 younglings hatch from 4 eggs laid. In 2001, from 7 registered nests we have registered a total 21 eggs and 15 younglings hatched. But, usually, not all the younglings survive until migration period.

Only one or two younglings fleeing nest survive in more than 50 % cases. Mostly die because of inanition. Rains and strong winds prevent their parents can not satisfy their food needs because the food resources are few. So was the case in 2002, 2004, 2005 years when in the fleeing period there were long rains, which lead especially to lack of insects, the main food source for the younglings.

Another cause for their high rate mortality is caused by predators. We have noticed on many occasions that Water Snake (*Natrix tessellata*) or House Snake (*Natrix natrix*) climb up on the reed stems and eat reed warbler's eggs, or broods from nest.

The Marsh Harrier (*Circus aeruginosus*) is also one the predators of the Great Reed Warbler' broods. Marsh Harriers are numerous in wet zones of Moldavia (3 individuals/10 ha) and attack the birds nest and eat broods or eggs.

The literature indicates that hawks *Accipiter gentilis* and *Accipiter nissus*, rarely, action, especially in scarce reeds beds, killing reeds warblers or their young, more often at the begging of breeding season (Hansson B., 2000).

The Great Reed Warbler's broods or eggs, found in nests placed inside the compact reeds beds can be eaten by Bittern (*Botaurus stellaris*) and Water Rail (*Rallus aquaticus*) (Hansson B., 2000).

In our field trips we have found Great Reed Warbler younglings or adults with their head eaten. In these cases we made the supposition they were killed by Muskrats, living in large number in wet zones from Larga Jijia, Beresti, Carja or Vladesti.

We ascertained that the first hatch brood has most chances to survive. He usually grows faster and tends to push out his brothers from nest. He is the first to receive food from his parents. It does not always happen like this because we saw the little Great Reed Warbler nests where the younglings (4 or 5) stayed very close one to each other, thronged. Despite this when they reach maturity only one, maximum three younglings survive in each Great Reed Warbler nest.

The young need a short period for learn to fly and feed themselves, 2-3 weeks.

In the first 2-3 days as mentioned in literature (Tobler, 1924, mentioned by Cramp S., 1992), the excrements are swallowed by parents and throw out the nest. Later, as female, as male carry out the excrements from the nest, with their beak or claws.

The plumage grows at younglings very fast. At 2, 3 days, from hutch, the body is covered with grey puff. At 5-6 days, they have the body covered with brown coverts. At more than 10 day appear wing and tail feathers.

The coverts appear at all the examined youngling more or less simultaneously. This does not apply to the flying feathers. We think the remiges and rectrices develop according to the food supplied. We have noticed that in the years with nice weather and with plenty of food (insects especially), the younglings' feathers grow very fast. If during the hutch period it is bad weather, the younglings' plumage grows very slowly. The younglings complete their plumage no later than 30 days.

The younglings usually flee after 10-21 days from hutch.

At the beginning, after they leave their nest, younglings are unable to fly well. At least for one or two hours, they hide closely to the nest. After 4-5 days they could fly on short distances. After 10 days, the juveniles leave the nestling territory, a moment the territory notion lost his significance.

During the period when they earn their independence, they learn from their mother to search food and to catch it. At first, they catch insects or other invertebrates by small dimensions.

The parents take care of their younglings until they start to fledge. This is the moment when the juveniles become independent. However we have noticed there are very rare cases when the male parent stays until younglings start to fly. The male leaves previously when the younglings' plumage is not entirely formed.

The younglings' complete their development after 30-40 days from hutch. In those years of a low insect, the young develops in almost a month (a month and half) so that they became to flee later at the beginning of August.

Conclusions:

The average Great Reed Warbler population in Moldavia wet zones is 7 pair breeding per 1 ha reed bed.

In general the pairing is finished in the wet zones of Moldova at the end of May- beginning of June.

The female is the one to choose the partner.

Pairing period lasts between 7 and 14 days at The Great Reed Warbler.

The Great Reed Warblers built their nest, especially towards water edges, where they find enough food resources for them and their siblings. The nest construction lasts 5-6 days.

The Great Reed Warbler nests are made especially of sedge (*Carex sp.*), which represent the nest structure.

Eggs laying lasts between 3-6 days. A Great Reed Warbler female lay on average 2-5 eggs.

Eggs incubation lasts 10-14 days. Only the female breeds. The male hardly ever breeds.

Hutching rate is usually almost 75%.

The younglings need a short period for learn to fly and feed themselves, approximately 2-3 weeks.

The youngling completes his development after 30-40 days from hutching.

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