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Breeding population size of the Great Reed Warbler (*Acrocephalus arundinaceus* Linnaeus, 1758) in Sombor municipality

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INTRODUCTION

The Great Reed Warbler (further in the text GRW) (*Acrocephalus arundinacues*) breeds in middle latitudes of the western Palearctic (CRAMP, 1992). This species mostly prefers strong, tall and dense reed (*Phragminthes australis*) on the periphery of riverbanks or swamps, but also uses reed patches formed in the shallow bottoms of lakes or sluggish rivers (CRAMP, 1992). The population of GRW in 25 countries of the European Union is estimated between 240 000 and 460 000 pairs and has been moderately declining since 1970 (BIRDLIFE INTERNATIONAL, 2004). Long-term studies from the 1980s and 1990s also showed that GRW populations have declined considerably in Central Europe (KUX, 1987; CRAMP, 1992; KLOUBEC, 1987; TRNKA, 1999). However, we have very little information on population sizes and trends in non-EU countries, in which 84% of the pan-European population breeds (BIRDLIFE INTERNATIONAL, 2004).

The aim of this study was to quantify the nesting density and the size of the breeding population of GRW in Sombor municipality.

STUDY AREA

The main study area was the municipality of Sombor, which has 97 263 inhabitants (VOJNOVIĆ, 2001). The municipality lies on 1178 km^2 at an elevation of 89 m above sea level in the northwestern part of the northern Serbian province of Vojvodina. It is a typical lowland area with a semi-dry continental climate, where the mean annual precipitation is about 590 mm (400-900 mm). The mean annual temperature is 10.7˚C, and July is the warmest month with a mean monthly temperature of 21.1˚C and January is the coldest with a mean monthly temperature of 0.8˚C (ĐUKANOVIĆ, 1970).

We attempted to cover all reed habitats, and categorised them in five different habitat types: wide canals, narrow canals, marshlands, mining ponds and fishponds.

Canals

The canals in Sombor municipality are classified in two categories: the OKM (from Otvorena Kanalska Mreža or Open Canal Network) which contains wide canals of the whole hydro-system Danube-Tisa-Danube and a few other wider canals, and the DKM (from Detaljna Kanalska Mreža or Detailed Canal Net) which contains all the canals (mainly narrow) of the whole melioration system (Table 1). The total length of OKM canals in Sombor municipality is 77 km. In the category OKM we putted the river Plazović with its total length of 37.35 km, because as a habitat type it is very similar to the OKM canals. This results a total length for the OKM of 114.35 km.

Table 1. Main characteristics of the study areas. OKM: VBK-Lugovo to Kiđos-Bački Monoštor, DKM: Mostonga-Nenadić I to Čonić, mining ponds: Bager to Pond Gakovo, marsh: Jezero Stanišić to Medura, Riđica, fishponds: Kolut fishpond bank I to Kolut fishpond island

Study area	Central position	Size of area sampled	Date of field survey	Period of survey	Vegetation structure (%)			Area of open water
					Reed	Other herb	Woody	
VBK-Lugovo	45°44'20" N 19°09'57" E	910 m	25.05.-24.07.	B	15	4	1	80
VBK-Pik	45°45'18" N 19°05'00" E	806 m	31.07.	Both	6	4	10	80
VBK-Šikara	45°46'02" N 19°02'55" E	704 m	04.08.	P	12	6	2	80
DTD-Aerodrom	45°42'23" N 19°00'28" E	505 m	30.07.-31.07.	P	20	8	2	70
DTD-Bezdan	45°50'52" N 18°51'53" E	705 m	01.09.	P	1	14	5	80
Bajski kanal	45°51'45" N 18°54'08" E	698 m	05.08.	P	12	6	2	80
Plazović-Kolut	45°52'48" N 18°56'59" E	712 m	02.07.-31.07.	B	17	2	1	80
Plazović-Bezdan	45°50'33" N 18°57'50" E	602 m	24.07.	Both	17	2	1	80
Plazović-Bački Monoštor	45°47'45" N 18°59'26" E	741 m	26.07.	P	25	5	0	70
Mostonga-Nenadić I	45°49'34" N 19°05'30" E	999 m	29.07.	P	14	35	1	50
Mostonga-Nenadić II	45°50'28" N 19°05'05" E	1002 m	03.08.	Both	15	25	0	60
Čonić-Mostonga	45°47'48" N 19°08'30" E	1019 m	18.06.-28.07.	B	20	11	1	68
Čonić	45°47'17" N 19°08'41" E	1002 m	25.07.	P	4	35	1	60
Bager	45°47'16" N 19°05'54" E	1.2 ha	23.05.-30.07.	B	85	5	0	10
Pista	45°50'24" N 19°02'53" E	0.6 ha	25.05.-04.07.	B	60	35	0	5
Pond Gakovo	45°53'55" N 19°04'45" E	2 ha	15.08.	P	75	5	0	20
Jezero Stanišić	45°59'08" N 19°10'07" E	3.0 ha	06.08.	Both	85	4	1	10
Medura, Riđica	45°59'32" N 19°08'02" E	8.4 ha	29.07.	P	30	5	0	65
Kolut fish pond bank I	45°53'42" N 18°56'58" E	392 m	29.08.	P	55	44	1	-
Kolut fish pond bank II	45°53'42" N 18°56'58" E	400 m	29.08.	P	100	0	0	-
Kolut fish pond island	45°53'42" N 18°56'58" E	364 m	29.08.	P	70	30	0	-

B: breeding season, P: postbreeding season

The total length of the DKM in the municipality is 821 km, which is categorised in four categories by the water authority. For the nesting of the GRW, only the canals in the first-order have adequate reed vegetation, while the other three canal cathegories do not. The total length of the first order canals of the DKM in Sombor municipality is 205 km. These are official data given by the water management company "Zapadna Bačka" in Sombor.

Marsh, mining ponds and fishponds

Marsh are characterised by widespread or closed reed formed in long, continuous succession, whereas reed in mining ponds is usually patchy or fragmented. Because there was no information available on the number and area of the marsh and lakes, we had used Google Earth to determine the total of the areas of both in Sombor. Total area was 238 ha for marsh and 23 ha for mining ponds.

Figure 1. Pond Bager (September 2009). Photo by: T. O. MÉRŐ

For estimating the breeding population in municipality Sombor, we included the Kolut fishpond (200 ha, perimeter 14.8 km), which has adequate reed vegetation but excluded nine smaller and newer fishponds without adequate reed and all fish wintering. The perimeter of the fish ponds was measured by Google Earth. The proportion of reed, and other herbaceaous and woody vegetation in each study area is given in Table 1.

MATERIAL AND METHODS

Nests were surveyed from 23th of May to 1th September 2009 during the breeding and post-breeding season (Table 1). We surveyed randomly chosen sections of canals (both sides) and localities on fishponds and marsh, and the entire extent of mining ponds. At each survey site, we attempted to find all GRW nests. Every nest found was considered as a nesting pair. However, due to the inaccessibility of extensive reed-beds on marsh, mining and fish ponds there remained a very small possibility that we did not found every nest.

Figure 2. Čonić (Mostonga) (June 2009). Photo by: T. O. MÉRŐ

The breeding success of most (72.6%) of the nests (n = 146) was examined trough their cups because these nests were surveyed in the postbreeding season. Their nesting success was categorized in three categories (Table 2). This technique was verified by examining 40 nests in detail, which were regularly checked once every five days during the nesting period and where the detailed history was known. We recorded the number of eggs, of chicks and breeding success at each nest. We noticed that if the presence of fledglings was well indicated by feather dandruff in the nest. The presence of Cuckoo (*Cuculus canorus*) fledgling was shown by large-sized dandruff and lack of dandruff or other evidence suggested that the nest was lost (Table 2).

Table 2. Categorisation of the nesting successes.

Nest success	Determination of the nesting success
Fledglings in nest	Small (< 1 mm) feather epidermis remains (dandruff) accumulated in the nest-cup, suggesting feathery young in the nest.
Cuckoo in nest	Large (> 1.5 mm) feather epidermis remains (dandruff) in the nest-cup from Cuckoo young.
Lost nests	Death remains of young, remains of eggs and the absence of epidermis remains of the epidermis suggest that the nest was lost during incubation period or when young were newly hatched.

For every study area we calculated nest density and the percent of successful, lost and Cuckoo-parasitised nests (Table 3). Using the densities of study areas we defined the mean density for each habitat type in Sombor. For estimating the size of the breeding population of canals, we multiplied the average nesting densities with the total length of the canals. For the other three habitat types, we multiplied the nesting density by the measured or estimated areas.

RESULTS AND CONCLUSIONS

Table 3. Density of nests and nesting success in the studied localities.

Study area		Number of nests found	Density of nests	Nesting success		
				Number successful nest	Number of nests with cuckoo young	Number of nests lost
OKM	VBK-Lugovo	11	12.1 km^{-1}	0	5 (36%)	7 (64%)
	VBK-Pik	8	9.9 km^{-1}	3 (38%)	2 (24%)	3 (38%)
	VBK-Šikara	10	14.2 km^{-1}	4 (40%)	0	6 (60%)
	DTD-Aerodrom	14	27.7 km^{-1}	7 (50%)	1 (7%)	6 (43%)
	DTD-Bezdan	0	0.0 km^{-1}	0	0	0
	Bajski kanal	0	0.0 km^{-1}	0	0	0
	Plazović-Kolut	10	14.0 km^{-1}	5 (50%)	0	5 (50%)
	Plazović-Bezdan	14	23.2 km^{-1}	9 (64%)	0	5 (36%)
	Plazović-Bački Monoštor	12	16.2 km^{-1}	7 (58%)	0	5 (42%)
DKM	Mostonga-Nenadić I	3	3.0 km^{-1}	2 (67%)	1 (33%)	0
	Mostonga-Nenadić II	5	5.0 km^{-1}	3 (60%)	1 (20%)	1 (20%)
	Čonić-Mostonga	9	8.9 km^{-1}	3 (33%)	5 (56 %)	1 (11%)
	Čonić	5	5.0 km^{-1}	2 (40%)	0	3 (60%)
Mining ponds	Bager	11	9.2 ha^{-1}	8 (73%)	0	3 (27%)
	Pista	5	8.6 ha^{-1}	3 (60%)	2 (40%)	0
	Pond Gakovo	18	9.0 ha^{-1}	6 (33%)	1 (6%)	11 (61%)
Marsh	Jezero Stanišić	6	2.0 ha^{-1}	3 (50%)	0	3 (50%)
	Medura, Riđica	1	0.1 ha^{-1}	0	0	1 (100%)
Fishponds	Kolut fish pond bank I	2	5.1 km^{-1}	1 (50%)	0	1 (50%)
	Kolut fish pond bank II	0	0.0 km^{-1}	0	0	0
	Kolut fish pond island	2	5.5 km^{-1}	1 (50%)	0	1 (50%)
Total		**146**	**-**	**66 (45%)**	**18 (12%)**	**62 (43%)**

Figure 3. Great Reed Warbler (*Acrocephalus arundinaceus*). Photo by: T. O. MÉRŐ

The quality of the reed affects GRW preference of the breeding habitat. GRW appeared to avoid reed laid flat by strong wind or storms, reed of short height, reed standing loose, reed interspersed with trees or with other plants (*Carex* ssp., *Typha* ssp.) as nesting habitats. Furthermore, GRW did not breed in reed without constant water.

Table 4. Estimates on the breeding population of GRW for Sombor municipality and their nesting success for 2009.

Habitat type	Census		Estimated number of breeding pairs Sombor municipality	Estimated nest success (%)		
	Number of nests found	Mean density of nests		Succesful nests	Nests with cuckoo young	Lost nests
OKM	79	13.0 km^{-1} *SD* ±9.2	1491	44.3	8.9	46.8
DKM	22	5.5 km^{-1} *SD* ±2.5	1123	45.5	31.8	22.7
Mining ponds	34	8.9 ha^{-1} *SD* ±0.3	205	50.0	8.8	41.2
Marsh	7	1.1 ha^{-1} *SD* ±1.3	252	42.9	0	57.1
Fish ponds	4	3.5 km^{-1} *SD* ±3.1	52	50.0	0	50.0
Total	**146**	**-**	**3123**	**46.5 *SD* ±3.3**	**9.9 *SD* ±13.0**	**43.6 *SD* ±13.0**

The estimated breeding population resulted 3123 breeding pairs for Sombor municipality (Table 4), with mean density of 2.65 pairs/km^2. Based on the field data and results from 2009 we estimate the nesting population of the GRW in Sombor municipality between 3000-3300 pairs.

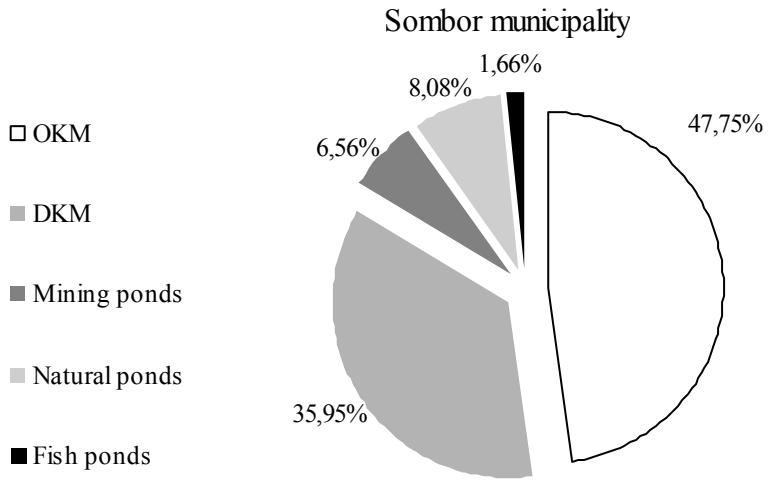

Figure 4. The distribution of the GRW population among the five different habitat types in Sombor municipality.

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Figure 5. Measuring the weight and the ringing of nestlings of the Great Reed Warbler. Photo by: A. ŽULJEVIĆ

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