

QUALITATIVE STRUCTURE OF THE COMMUNITY OF NESTING BIRDS BETWEEN 1971–2000 IN THE MOKRICE RURAL AREA (NW CROATIA)

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Dolenc, Z.: Qualitative structure of the community of nesting birds between 1971–2000 in the Mokrice rural area (NW Croatia). *Nat. Croat.*, Vol. 12, No. 3., 121–130, 2003, Zagreb.

We describe the qualitative community structure of birds nesting in and around the village of Mokrice (46°00'N, 15°55'E) over a period of twenty years (1971–2000). The Mokrice rural area (614 ha) was divided into three areas for this investigation: A-area (village itself), B-area (mainly forest and vineyards), and C-area (mainly meadows, arable land with small water areas and small isolated forests). A total of 74 nesting bird species were registered in all three areas. The studies showed that there was no significant difference in the qualitative structure of bird communities per nesting period (1971–1980, 1981–1990 and 1991–2000; Sorensen's index of similarity: $QS > 80$), but that there was a significant difference among nesting areas (A-area, B-area and C-area; $QS < 80$)

Key words: nesting birds, qualitative structure, Mokrice rural area, NW Croatia

Dolenc, Z.: Kvalitativni sastav ptica gnjezdarica na području sela Mokrice u razdoblju od 1971. do 2000. godine (sjeverozapadna Hrvatska). *Nat. Croat.*, Vol. 12, No. 3., 121–130, 2003, Zagreb.

U razdoblju od 1971. do 2000. godine praćen je kvalitativni sastav ptica gnjezdarica u samom selu Mokrice (46°00'N, 15°55'E), ali i širem području koje pripada spomenutom selu. Područje sela Mokrice (614 ha) podijelio sam na tri dijela: A – područje (naselje sa stambenim i gospodarskim zgradama, vrtovi, voćnjaci), B – područje (šumske i manje vinogradarske površine) i C – područje (livade i oranice, manje vodene površine, dio srednjeg toka rijeke Krapine, pojedinačno drveće i manje izolirane šumske površine). Ukupno su (na sva tri područja) zabilježene 74 vrste ptica u tridesetgodišnjem razdoblju. Istraživanja su pokazala da nije bilo razlika u kvalitativnom sastavu ptica gnjezdarica između razdoblja (1971–1980, 1981–1990 i 1991–2000; Sorensenov indeks sličnosti: $QS > 80$), ali je bilo razlike prema različitim područjima gniježdenja (A, B i C područje; $QS < 80$).

Ključne riječi: ptice gnjezdarice, kvalitativni sastav, selo Mokrice i njegovo šire područje sa šumama, poljoprivrednim površinama i dr., sjeverozapadna Hrvatska

INTRODUCTION

Environmental changes are becoming both more numerous and more intensive. The global warming of the atmosphere is between 0.2 and 0.5° C for every 10 years (HOUGHTON *et al.*, 1992). Birds are important indicators of the climatic changes (FURNESS & GREENWOOD, 1993). In the last 50 years, some bird species have moved their nesting areas more toward the north (e. g. THOMAS & LENNON, 1999), some have begun to nest earlier (e. g. CRICK *et al.*, 1997), some return earlier from their wintering areas (e. g. MORITZ, 1993). All this underlines the need for more intensive study of bird populations (using both qualitative and quantitative methods). This study contributes to the knowledge of the structure of birds nesting in the Mokrice rural area between 1971–2000. Very few studies have been published on the qualitative structure of birds in this area (e. g. KRONEISL, 1950; RUCNER, 1967; DOLENEC, 1993). Most studies on Hrvatsko Zagorje ornithofauna are focused on the nesting characteristics of particular species (e. g. DOLENEC, 1994; 1999a).

STUDY AREA AND METHODS

The data were gathered in and around the village of Mokrice (46°00' N; 15°55' E), from 1971–2000 (Hrvatsko Zagorje region). The analysis encompasses a period of 30 years. The Mokrice rural area (614 ha) was divided into three areas:

A – area consists of the village itself with all the buildings (houses, byres, garages, etc.), gardens, orchards and trees and bushes at the end of the village.

B – area is a little higher southern part of the village (3/4 forests and 1/4 arable land and vineyards). The dominating tree is the Hornbeam (*Carpinus betulus*). The bush layer includes Hornbeam and European elder (*Sambucus nigra*) and some other species.

C – area includes the lowest north-western part of the village, which goes as far as the left bank of the Krapina River. It consists of meadows, arable land and smaller forest areas in the form of islands. The dominating trees are Hornbeam and Common Oak (*Quercus robur*). Other three species present in low proportion are Common maple (*Acer campestre*), Ash (*Fraxinus angustifolia*) and Common Elm (*Ulmus minor*). The most common bush species are the Black-thorn (*Prunus spinosa*) and Willow (*Salix* sp.). Along the Krapina grow the Willow (*Salix* sp.) and the Sticky Alder (*Alnus glutinosa*).

The agriculture is of the mixed farming type (the most common crops are wheat, corn and potatoes). All study areas were visited at least 10 times from mid-March till mid-June (1971–2000). The study was performed early in the morning. The aim was to gather as much information on the number of nesting bird species as possible. According to OELKE (1980), such data can be used for qualitative analysis of nesting bird communities. Possible nesting bird species were not taken into analysis, only those for which the nesting could be established with certainty; finding nests, eggs in the nest (e.g. Fig. 1, Fig. 2 and Fig. 3) and young birds in the nests (e.g. Fig. 4) enabled the definition of any bird that nested at least in one year dur-



Fig. 1. Eggs of the barn swallow (*Hirundo rustica*) in the village of Mokrice; A-area, 2nd May 1998 (Photo Z. Doleneć)



Fig. 2. Eggs of the song thrush (*Turdus philomelos*) in the Mokrice rural area; B-area, 25th April 1999 (Photo Z. Doleneć)



Fig. 3. Eggs of the tree pipit (*Anthus trivialis*) in the Mokrice rural area; B-area (vineyard), 16th May 1999 (Photo Z. Dolenec)



Fig. 4. Nestlings of the starling (*Sturnus vulgaris*) in the Mokrice rural area; C-area 24th May 2000 (Photo Z. Dolenec)

ing this period as a nesting bird. This paper encompasses only the qualitative analysis of nesting birds, and not the quantitative analysis. Therefore, only the number of species (per area and per period) and not the number of nesting pairs was analysed.

The data gathered were analysed with the Sorensen index of similarity (QS):

$$QS = (2c / (a+b)) \times 100$$

following the instructions by TOMIAŁOJĆ *et al.* (1984); where c is the common part of the sets, a is the size of the first set and b is the size of the second set as used by other authors (e.g. BIADUN, 1994; VOGRIN, 1998a; 1998b).

RESULTS AND DISCUSSION

The qualitative analysis of the structure of the community of nesting birds was done on the basis of data gathered over a 30-year period (Tab. 1). Similar studies have also been performed in other European countries (e. g. SMITH *et al.*, 1992; AMAN, 1994; ZOLLINGER, 1996; CHRISTEN, 1997). In the 1971–2000 period, 74 species of nesting birds were registered (Tab. 1). 31 species were registered in the A-area, 48 in the B-area and 47 in the C-area. I registered a total of 51 bird species that nested every year during the 30-year-period and 23 bird species that did not nest every year. This group includes former nesting birds (birds that used to nest, but do not nest any more), new nesting birds and occasional nesting birds. The species *Ciconia ciconia* and *Dendrocopos martius* nested only in the 1971–1980 period. One pair of *Ciconia ciconia* nested until 1973 in a willow (*Salix* sp.) in the Krapina valley. Eight bird species, *Ciconia ciconia*, *Dendrocopos martius*, *Pernis apivorus*, *Actitis hypoleucos*, *Otus scops*, *Coracias garrulus*, *Upupa epops* and *Lanus minor* do not nest in the village of Mokrice any more. They were found nesting in the last 10 years of the study. Two species *Coturnix coturnix* and *Miliaria calandra* were again found nesting in the 1991–2000 period after the 1971–1980 period. After 1971–1980 period, 5 new nesting bird species were found. In the 1981–1990 period, *Phoenicurus ochruros* (DOLENEC, 1999b) was found nesting. The colonization of the species *Phoenicurus ochruros* is connected with the general spreading of the species from mountain to lowland areas during the last two decades of the 20th century. The species *Remiz pendulinus* was first found nesting in the Hrvatsko Zagorje region in 1988 (DOLENEC, 1990). In the 1991–2000 period, three new nesting bird species were registered: *Ardea cinerea* (DOLENEC, 1997), *Alcedo atthis* and *Delichon urbica*. The colonization of the species *Ardea cinerea* is probably connected with appearance of small ponds in the old bed of the Krapina. The species *Alcedo atthis* nested only in 1994 and 1995 on the banks of the Krapina. The species *Delichon urbica* was first registered nesting in the village of Mokrice in 1998 (in the suburban settlement of Oroslavje, 1 km away, it was found nesting several years). In the C-area it has been nesting since 1991 (not a regular nesting bird). The species *Otus scops* was not found nesting from 1991 to 2000 in any research area.

Tab. 1. Qualitative structure of breeding bird communities in the Mokrice rural area (NW Croatia) from 1971–2000. Birds that did not nest every year in at least one of the periods are marked with (+).

	area			period		
	A	B	C	1971–1980	1981–1990	1991–2000
<i>Ardea cinerea</i>	–	–	+	–	–	(+)
<i>Ciconia ciconia</i>	–	–	+	(+)	–	–
<i>Anas platyrhynchos</i>	–	–	+	+	+	+
<i>Pernis ptilorhynchus</i>	–	+	–	+	(+)	–
<i>Milvus migrans</i>	–	–	+	(+)	(+)	(+)
<i>Accipiter nisus</i>	–	+	–	+	+	+
<i>Buteo buteo</i>	–	+	+	+	+	+
<i>Falco tinnunculus</i>	+	+	+	+	+	+
<i>Perdix perdix</i>	–	–	+	(+)	+	+
<i>Coturnix coturnix</i>	–	–	+	(+)	–	(+)
<i>Phasianus colchicus</i>	–	+	+	+	+	+
<i>Gallinula chloropus</i>	–	–	+	+	+	+
<i>Vanellus vanellus</i>	–	–	+	+	+	+
<i>Actitis hypoleucos</i>	–	–	+	–	(+)	–
<i>Columba palumbus</i>	+	+	+	+	+	+
<i>Streptopelia decaocto</i>	+	–	–	+	+	+
<i>Streptopelia turtur</i>	–	+	+	+	+	+
<i>Cuculus canorus</i>	–	+	+	+	+	+
<i>Otus scops</i>	–	+	–	(+)	(+)	–
<i>Athene noctua</i>	+	–	–	+	+	+
<i>Strix aluco</i>	+	+	–	+	+	+
<i>Asio otus</i>	–	+	+	+	+	+
<i>Caprimulgus europaeus</i>	–	+	–	(+)	(+)	(+)
<i>Alcedo atthis</i>	–	–	+	–	–	(+)
<i>Coracias garrulus</i>	–	+	–	+	(+)	–
<i>Upupa epops</i>	+	–	–	+	(+)	–
<i>Jynx torquilla</i>	+	+	–	+	+	+
<i>Picus canus</i>	–	+	–	(+)	(+)	(+)
<i>Picus viridis</i>	–	+	+	+	+	+
<i>Dendrocopos martius</i>	–	+	–	(+)	–	–
<i>Dendrocopos major</i>	+	+	+	+	+	+
<i>Dendrocopos minor</i>	–	+	–	(+)	(+)	(+)
<i>Alauda arvensis</i>	–	–	+	+	+	+
<i>Hirundo rustica</i>	+	–	–	+	+	+
<i>Delichon urbica</i>	+	–	–	–	–	(+)

<i>Anthus trivialis</i>	-	+	-	+	+	+
<i>Motacilla alba</i>	+	-	-	+	+	+
<i>Erithacus rubecula</i>	+	+	+	+	+	+
<i>Luscinia megarhynchos</i>	-	+	+	+	+	+
<i>Phoenicurus ochruros</i>	+	-	-	-	+	+
<i>Phoenicurus phoenicurus</i>	-	+	-	+	+	+
<i>Saxicola torquata</i>	-	-	+	+	+	+
<i>Turdus merula</i>	+	+	+	+	+	+
<i>Turdus philomelos</i>	-	+	+	+	+	+
<i>Turdus viscivorus</i>	+	+	-	+	+	+
<i>Acrocephalus palustris</i>	-	-	+	+	+	+
<i>Acrocephalus arundinaceus</i>	-	-	+	+	+	+
<i>Sylvia communis</i>	-	+	+	+	+	+
<i>Sylvia atricapilla</i>	+	+	+	+	+	+
<i>Phylloscopus collybita</i>	-	+	+	+	+	+
<i>Aegithalos caudatus</i>	+	+	+	+	+	+
<i>Parus palustris</i>	+	+	+	+	+	+
<i>Parus caeruleus</i>	+	+	+	+	+	+
<i>Parus major</i>	+	+	+	+	+	+
<i>Sitta europaea</i>	+	+	+	+	+	+
<i>Certhia brachydactyla</i>	-	+	-	+	+	+
<i>Remiz pendulinus</i>	-	-	+	-	(+)	+
<i>Oriolus oriolus</i>	-	+	+	+	+	+
<i>Lanius collurio</i>	+	+	+	+	+	+
<i>Lanius minor</i>	+	-	+	+	(+)	-
<i>Garrulus glandarius</i>	-	+	-	+	+	+
<i>Pica pica</i>	+	+	+	+	+	+
<i>Corvus monedula</i>	-	+	-	+	+	(+)
<i>Corvus corone cornix</i>	-	+	+	+	+	+
<i>Sturnus vulgaris</i>	+	+	+	+	+	+
<i>Passer domesticus</i>	+	-	-	+	+	+
<i>Passer montanus</i>	+	+	+	+	+	+
<i>Fringilla coelebs</i>	+	+	+	+	+	+
<i>Serinus serinus</i>	+	+	+	+	+	+
<i>Carduelis chloris</i>	+	-	-	(+)	+	+
<i>Carduelis carduelis</i>	+	+	+	+	+	+
<i>Coccothraustes coccothraustes</i>	-	+	-	(+)	(+)	(+)
<i>Emberiza citrinella</i>	-	+	-	+	+	+
<i>Milliaria calandra</i>	-	-	+	(+)	-	(+)
Total (number of species)	31	48	47	68	67	66

Tab. 2. Qualitative similarity of birds nesting in the Mokrice rural area from 1971–2000 (according to period)

Period	number of nesting birds	common species	Different species	index of similarity (QS)
1971–1980	68	64	4	94.81
1981–1990	67	64	3	
1971–1980	68	61	7	91.04
1991–2000	66	61	5	
1981–1990	67	61	6	91.73
1991–2000	66	61	5	

Tab. 3. Qualitative similarity of birds nesting in the Mokrice rural area from 1971–2000 (according to three areas)

Area	number of nesting birds	common species	different species	index of similarity (QS)
A	31	22	9	55.69
B	48	22	26	
A	31	20	11	51.28
C	47	20	27	
B	48	30	18	63.16
C	47	30	17	

According to some authors, if the QS – value is more than 80, we can talk about the same bird communities (e. g. SUŠIĆ, 1988; BIADUN, 1994). Following that criterion, there was no significant difference in the qualitative structure of nesting birds between nesting periods (QS > 80, Tab. 2). However, the difference in the qualitative structure of birds between several study areas was significant (QS < 80, Tab. 3).

Received July 2, 2002

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SAŽETAK

Kvalitativni sastav ptica gnjezdarica na području sela Mokrice u razdoblju od 1971. do 2000. godine (sjeverozapadna Hrvatska)

Z. Dolenec

U razdoblju od 30 godina praćeno je gniježđenje ptičjih vrsta na dijelu sjeverozapadne Hrvatske (selo Mokrice s okolnim pripadajućim šumama, poljoprivrednim površinama i dr.), na 3 različita područja. Najmanji broj vrsta na gniježđenju zabilježen je u samom naselju (A – područje) – 31 vrsta, na B – području 48 vrsta i na C – području 47 vrsta. Između pojedinih područja istraživanja vidljiva je značajna razlika u kvalitativnom sastavu ptica gnjezdarica ($QS < 80$). Mađutim, to isto nije zabilježeno između pojedinih razdoblja istraživanja ($QS > 80$). Na sva tri istraživana područja ukupno su zabilježene 74 vrste ptica na gniježđenju. 51 vrste gnijezdile su svih godina istraživanja, a ostale 23 vrste – ili su gnijezdile povremeno, ili su prestale gnijezditi, ili su to nove gnjezdarice.