NAT. CROAT. | VOL. 10 | No 4 | 315–320 | ZAGREB | December 31, 2001

ISSN 1330-0520
UDK 598.822˙591.568:591.551(497.5)

original scientific paper / izvorni znanstveni rad

INTRASPECIFIC NEST PARASITISM IN THE STARLING (*STURNUS VULGARIS*) IN NORTHWESTERN CROATIA

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Dolenec, Z.: Intraspecific nest parasitism in the starling (*Sturnus vulgaris*) in northwestern Croatia. Nat. Croat., Vol. 10, No. 4., 315–320, 2001, Zagreb.

This study reports intraspecific nest parasitism in starlings (*Sturnus vulgaris*) in the village of Mokrice, northwestern Croatia, in 1999 and 2000. Twenty one (30.5%) out of 70 observed nests during the two years contained one or two parasitic eggs. One parasitic egg was laid in 17 (24.8%) nests and two in 4 (5.7%) nests. No statistically significant differences were found between egg dimensions (length, breadth, volume, egg shape index) of parasitic females and hosts. Also, there was no statistically significant correlation between egg volume of parasitic and host eggs. There is thus no evidence that parasitic females select host nests on the basis of egg dimensions of the host. Parasitic females laid their eggs mostly in host nests that already had two or three eggs (in 72.8% cases).

Key words: starling, *Sturnus vulgaris*, intraspecific nest parasitism, NW Croatia

Dolenec, Z.: Nametništvo tijekom gniježđenja unutar vrste čvorak (*Sturnus vulgaris*) na području sjeverozapadne Hrvatske. Nat. Croat., Vol. 10, No. 4., 315–320, 2001, Zagreb.

U ovome radu dati su rezultati istraživanja pojave nametništva tijekom razmnožavanja unutar populacije vrste čvorak (*Sturnus vulgaris*) na području sela Mokrice (sjeverozapadna Hrvatska) u razdoblju od 1999. do 2000. godine. U uzorku od 70 gnijezda u obje godine istraživanja u 21 gnijezdu (30.5%) sneseno je jedno ili dva tuđa jaja. Jedno tuđe jaje sneseno je u 17 (24.8%) gnijezda, a dva u 4 (5.7%) gnijezda. Dimenzije jaja (duljina, širina, volumen, indeks oblika jaja) ženke-nametnika nešto su manje u odnosu na ženku-domadara, ali ne i statistički značajne. Također, statistički nije značajna povezanost između volumena jaja nametnika i srednje vrijednosti pologa domadara. To znači da ženka nametnik ne bira gnijezda određene veličine jaja ženke domadara u koja nese svoja jaja. Ženke-nametnice najčešće su polagale svoja jaja u gnijezda domadara kada su u njima već bila dva ili tri jaja (u 72.8% slučajeva).

Ključne riječi: čvorak, *Sturnus vulgaris*, nametništvo tijekom gniježđenja unutar vrste, sjeverozapadna Hrvatska

INTRODUCTION

Nest parasitism has been registered in less than 2% of all bird species (YOM-TOV, 1980). According to POWER *et al*. (1989), a parasite's goal is to lay eggs in the nest of the host at the appropriate time, while the host's goal is to avoid being parasitized. If this is not possible, then the host should attempt to avoid the deleterious consequence of parasitism. Intraspecific nest parasitism is more frequent in waterfowl than in any other group of birds (e.g. ROHWER & FREEMAN, 1989; SORENSON, 1993) but it does occur in some passerines. There are now many studies on the problems of interspecific nest parasitism within the passerines (e.g. YOM-TOV *et al*., 1974; FEARE, 1984; 1991; HÅLAND, 1986; MÖLLER, 1987; EVANS, 1988; GREIG-SMITH *et al*., 1988; BROWN & BROWN, 1989; KENNEDY *et al*., 1989; LOMBARDO *et al*., 1989; PINXTEN *et al*., 1991a; 1991b; ROMAGNANO *et al*., 1993), although it can be difficult to record because intraspecific phenomena can be difficult to observe (e.g. since host and parasite, and their eggs, are often difficult to distinguish) (MACWHIRTER, 1989). In this study, I report the frequency of parasitic egg laying with respect to a population of starlings (*Sturnus vulgaris* L.) in northwestern Croatia.

MATERIALS AND METHODS

Intraspecific nest parasitism in the starling was studied during the breeding seasons of 1999 and 2000 in the village of Mokrice (46°00'N – 15°55'E) in northwestern Croatia. Starlings from the study area wintered in Italy, Algeria, Tunisia and Morocco (DOLENEC, 1994), and returned to their nesting area in late February and early March (DOLENEC, 1998). Male yearlings do not breed, but some female yearlings do (DOLENEC, 1997). Females begin nesting in early to mid – April (DOLENEC, 1999). Thirty five nests, all in nestboxes, were observed in both breeding seasons. All new eggs were measured (length and breadth to nearest 0.01 mm) with sliding callipers and marked with permanent ink. The analysis includes the mean value of clutch size of both host and parasitic eggs. If one clutch contained two parasitic eggs, we took their mean value for the analysis. The nests were inspected every day between 3 and 5 p.m. The disturbance of birds was minimal. There was no female bird hunting in the colonies where the parasitism was observed. Since the weather conditions in the egg laying period in 1999 and 2000 were very similar, both years were analyzed together. Egg volume was calculated according to HOYT (1979), and the egg shape index according to SCHÖNWETTER (1967–1979). According to EVANS (1980), intraspecific parasitism can be detected in several ways: A – by the presence of eggs of different colour, shape or size to the rest of the clutch; B – by capturing two females using one nest-box; C – by finding two or more eggs laid on the same day; D – by electrophoresis of blood proteins.

According to PINXTEN *et al*. (1993) and SMITH & VON SCHANTZ (1993), DNA fingerprinting will allow more accurate determination of the incidence of this behaviour, but studies have so far been limited to colonies where brood parasitism appears uncommon. I recognized parasitically laid eggs by colour differences, shape

and size from the other eggs in the clutch and by the appearance of two eggs laid the same day (Fig. 1). The latter is considered strong presumptive evidence of parasitism (e.g. MARTIN, 1984; COLWELL, 1986; SEMEL *et al*., 1988).

RESULTS AND DISCUSSION

Intraspecific nest parasitism, where some female starlings lay eggs in other starlings' nests, was first recorded by YOM-TOV *et al*. (1974), but this behaviour has also proved to be common and widespread (FEARE, 1996). In 1999, 10 (28.6%) out of 35 nests contained parasitic eggs. In 9 nests (25.7%) one parasitic eggs was found, and 1 nest contained two parasitic eggs (2.9 %). In 2000, parasitic eggs were found in 11 nests (31.4%), 8 nests containing one parasitic egg (22.9%) whereas 3 nests had two parasitic eggs (8.6%). Some authors mention even more frequent intraspecific nest parasitism: POWER *et al*. (1989) registered 33.3% nests with parasitic eggs and other authors registered up to 37% of nests with parasitic eggs (e.g. ROMAGNANO *et al*., 1990, PINXTEN *et al*., 1991a). POWER *et al*. (1989) also found even more than two parasitic eggs in one nest.

Tab. 1 shows mean egg dimensions of host and parasitic eggs. Host eggs were not significantly different in length, breadth, volume or shape index in relation to parasitic eggs, all $p>0.05$. The correlation between mean egg volume of host and

Fig. 1. Four host eggs (1, 2, 3, 4) and one parasitic egg laid on day 3 in the species *Sturnus vulgaris* in the village of Mokrice.

Tab. 1. Dimensions of host eggs (HE, mean clutches) and parasitic eggs (PE) of the starling in the village of Mokrice during 1999–2000 (only first clutches included). For four clutches with two parasitic eggs, we took the mean value.

variable		mean	SD	range	N	p
	HE	29.29	0.83	27.52–30.43	21[a]	
length (mm)						n.s.
	PE	28.99	1.28	26.18–30.91	21[b]	
	HE	21.29	0.43	20.42–22.36	21[a]	
breadth (mm)						n.s.
	PE	21.37	0.84	19.21–22.69	21[b]	
	HE	6771	448.33	6229–7517	21[a]	
volume (mm^3)						n.s.
	PE	6751	649.75	4922–7569	21[b]	
	HE	1.37	0.06	1.27–1.43	21[a]	
shape index						n.s.
	PE	1.36	0.06	1.26–1.45	21[b]	

a = number of clutches, b = number of eggs
n.s. = not significant, p>0.05

parasitic eggs (Pearson's correlation, r=0.19; p>0.05; n=21) showed no statistical significance (Fig. 2).

EVANS (1988) proposed four possible causes of intraspecific nest parasitism in starlings: A – a female that lays eggs in other birds' nests, called a »professional«

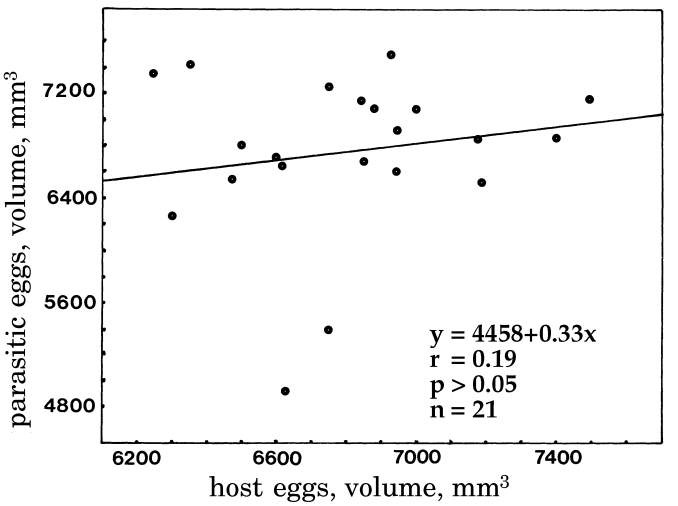

Fig. 2. Correlation coefficients between host eggs and parasitic eggs of the starling in the village of Mokrice during 1999–2000 (only first clutches included). For four clutches with two parasitic eggs, we took the mean value.

parasite; B – a paired female with an unsuccessful nest; C – an unpaired female that paired with a male which already has a female mate and D – a paired female competing for the nest of another pair. My observations showed that these samples of parasitism were also present in the territory of this study. According to FEARE (1991), disturbance of the starling population during breeding can increase the incidence of parasitic behaviour. Further studies with carefully selected methods are necessary to provide answers to questions on intraspecific nest parasitism.

Received November 11, 2000

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SAŽETAK

Nametništvo tijekom gniježđenja unutar vrste čvorak (*Sturnus vulgaris*) na području sjeverozapadne Hrvatske

Z. Dolenec

Nametništvo u kojem ženka nese jaja u tuđa gnijezda smatra se rijetkom pojavom u ornitofauni (MACWHIRTER, 1989). Spomenutu reproduktivnu strategiju primjenjuje manje od 2% svih vrsta ptica (YOM-TOV, 1980). Ovaj oblik nametništva najčešće je zabilježen u ptica reda guščarica (Anseriformes), a u novije vrijeme sve više radova govori o nametništvu reda vrapčarki (Passeriformes), primjerice HÅLAND (1986), MÖLLER (1989), LOMBARDO i suradnici (1989) i drugi. U ovome radu iznose se rezultati istraživanja nametništva u gnijezdu populacije vrste čvorak koja gnijezdi na području sjevrozapadne Hrvatske. Prema EVANSU (1988) nesenje jaja u tuđa gnijezda ima više uzroka. Nesparena ženka pari se s mužjakom koji je u paru; zatim, stradanje gnijezda u kojem je ženka počela nesti jaja; ili, neke se ženke postupno profiliraju kao »profesionalni« nametnici. Spomenuti uzroci nametništva tijekom gniježđenja zabilježeni su i na području sjeverozapadne Hrvatske.