

## SEASONAL VARIATIONS IN NUMBERS OF GREAT CORMORANT (*PHALACROCORAX CARBO*) ON THE KOLUT FISH FARM (NW SERBIA)

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**Abstract** - Seasonal variations in numbers of great cormorant were studied between 1998 and 2004 on ponds of the Kolut fish farm (NW Serbia). Its presence is not detected only during winter. Spring migration culminates in early March. Autumn migration lasts for a long time, with the peak in early October. During the breeding period, the average number never exceeded 20 individuals, probably coming from the nearest breeding colony (35 km from the fishponds). Predation pressure was very low throughout the year, except in October (2.44 individuals/10 ha of ponds). No reason for great cormorant depletion exists in the breeding period, when the predation pressure was below 0.5 birds/10 ha.

**Key words:** Seasonal variation, *Phalacrocorax carbo*, breeding, predation pressure

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### INTRODUCTION

Breeding and wintering distribution and numbers of great cormorant (*Phalacrocorax carbo*) are well known in Serbia. It breeds in seven colonies, mainly along the Danube and Tisa in Vojvodina, as well as on Lake Vlasina in SE Serbia (Puzović *et al.*, 1999; Simonov and Popović, 2001; Tucakov, 2002; Puzović, 2003). The most important wintering areas are situated on the Danube, where 5000-8000 individuals overwintered in the late 1990s (Puzović, 1999).

The presence of this species during the year has been confirmed on many waterbodies in Vojvodina (Purger, 1989; Gergelj and Šoti 1990; Dević, 1995; Lukač *et al.*, 1995; Lakatoš, 1992; Lukač and Lukač, 1992; Agošton, 2004.). It is a regular migrant: birds passing through or wintering in Northern Serbia have been shown to breed in Estonian, Polish, Swedish, Danish, and Hungarian colonies (Novčić and Ivović, 2000; Novčić and Barjaktarov, 2002; Barjaktarov and Novčić, 2001, 2004). However, migration patterns and seasonal variations in numbers on particular sites have remained poorly researched. The aim of this paper is to present seasonal variations in great cormorant numbers on the Kolut fish farm as established on the basis of a 6-year survey on this man-made wetland.

Ponds of the Kolut fish farm are situated on the edge of the village of Kolut in the northwestern part of Serbia, province of Vojvodina (UTM CR48, 45° 53' N 18° 57' E). The Danubian type of continental climate is characteristic of the area, with the highest temperature (20.9°C) in July and the lowest (-0.9°C) in January. The highest precipitation is recorded in June, the lowest in February, while the yearly average is 569 mm (Tomić, 1996).

The dominant fish species is carp (*Cyprinus carpio*), but small percentages of grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*), big-head carp (*Hypophthalmichthys nobilis*), Danube catfish (*Silurus glanis*), zander (*Stizostedion lucioperca*), and pike (*Esox lucius*) are also reared. At the moment, 175 ha is in usage. Fish production takes place in eight large ponds, while 10 small ones serve for winter storage (Barjaktarov, 2004). All ponds receive water from the Plazović river. Fish feeding starts in April. Fattening technology includes occasional enhancing of benthos production by fertilizers, as well as water calcification throughout the year. Fish fattening lasts until late September, after which emptying of the ponds takes place and lasts up to one month. Fish harvesting ends by mid-December, but the ponds stay empty until the end of February. However, the ratio of empty ponds and surface covered with water throughout the winter is approximately 50%-50%: since fish production lasts at least two years, just two-year individuals are harvested, while the

others hibernate.

The shallow banks of all ponds and several small islets within the ponds are covered by dense emerging vegetation (*Phragmites australis*, *Typha* sp.). During the growing season, submerged vegetation (*Myriophyllum* sp., *Ceratophyllum* sp.) covers the greater part of pond bottoms, while floating vegetation (*Nymphaea alba*) is developed just patchily. Within the fish farm area there are groups of blackthorn (*Prunus nigra*), white willow (*Salix alba*), white poplar (*Populus alba*), goat willow (*S. caprea*), and grey willow (*S. cinerea*), growing on the pond edges. The fish farm is surrounded by agricultural fields, marshy depressions of the Plazović, and gardens of the village of Kolut.

#### MATERIALS AND METHODS

We made 118 visits to ponds of the Kolut fish farm between July 4<sup>th</sup>, 1998 and May 15<sup>th</sup>, 2004, when the entire surface of all ponds was examined from the embankments situated between the ponds, using points from which all parts of this site were clearly visible. All individuals registered in the study area were counted. It was assumed that few birds were overlooked during migration, having in mind that great cormorants were very distinctive and visible.

For the purpose of comprehensive analysis of this species' presence, monthly data were divided into three periods (first: 1<sup>st</sup> – 10<sup>th</sup>, second: 11<sup>th</sup> – 20<sup>th</sup>, third: 21<sup>st</sup> – 31<sup>st</sup> day in the month). The average number of birds present on the fish farm in each period ("decade") was calculated and taken into account in drawing the graph.

#### RESULTS

The frequency of great cormorant occurrence on the study site was 74,45%. Its presence is detected throughout the year excluding late December and January (Fig. 1). Spring migration is poorly pronounced and culminates in early March (the maximum number in that period was 52 individuals, on March 2<sup>nd</sup>, 2001). Although birds were also present during breeding, numbers varied, but never exceeded 20 individuals on average. Autumn migration lasts for a very long time, but the period of intensive flocking is early October (maximum: 210 individuals, October 1<sup>st</sup>, 2000).

Relative evaluation of great cormorant presence

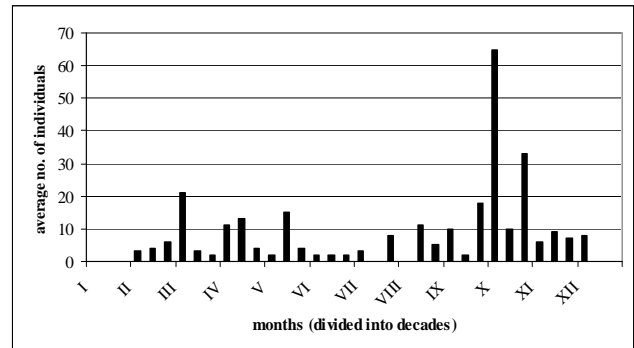


Fig. 1. Changes in average number of great cormorants occurring on the Kolut fish farm between 1998 and 2004

gave similar results. The average number of individuals per 10 ha of the fish-rearing ponds was very low throughout the year, except in October (Fig. 2).

Except during foraging, great cormorants rest on fishponds, exclusively on the bare edges of the reed islets or on the bare shallow part of the banks. Roosting of a maximum of 10 individuals was observed on a neighboring stand of white poplar. However, the great majority leave the fishpond and fly west before dark.

#### DISCUSSION

A period of occurrence of great cormorant similar to that on the Kolut fish farm was established on fishponds at Srpski Miletic (P u r g e r, 1988), Becej (L u k a c h and L u k a c h, 1992), and Svilojevo (L a k a t o š, 1992). Lack of foraging possibilities after freezing of the ponds caused absence of this and other waterbirds during most of December and the whole of January (T u c a k o v, 2004, 2005a), which is also true of other fishponds in Central Europe (B u k a c i n s k a *et al.*, 1996). A simi-

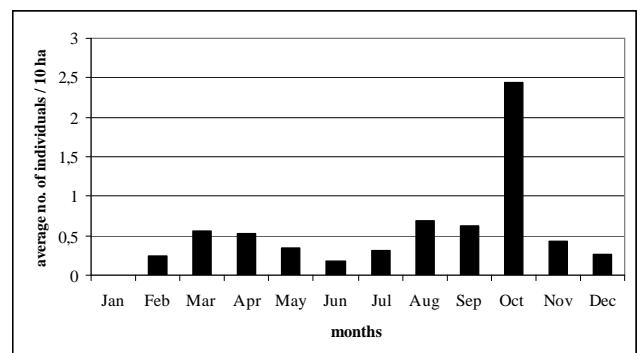


Fig. 2. Changes in average number of great cormorants per 10 ha on the Kolut fish farm during the year in the study period

lar spring migration peak was observed in Slovenian wetlands (V o g r i n, 1996a), as well as in ones of the Czech Republic (V a v r i k, 1998). Autumn migration in Slovenia, however, reaches its peak later in comparison to our study site (V o g r i n, 1995, 1996b).

The presence of great cormorants on our study site during the breeding season (April-June) suggest the origin of these birds from the nearest breeding colony, which is situated on the Danube floodplain at Kopački Rit (Croatia), 35 km southwest of the fish farm. That is in agreement with the flying direction of birds leaving the fishponds (see Results). The number of pairs breeding in this colony has heavily increased during the last 30 years and reached 2500 in recent years (M i k u s k a and M i k u s k a, 1994; R a d o v i ć *et al.*, 2003). Since fish farms which are situated immediately next to the colony are far more important feeding sites, judging from the number of birds regularly foraging on them (T a d i ć, pers. com.), it is possible that, in view of the much smaller average number of registered birds during the breeding period, the Kolut fish farm is on the edge of the home range of that colony.

However, the presence of great cormorant, which is a very important fish predator on fish farms (P u z o v i ć, 1999), causes problems for fishpond managers. In order to scare the birds and not allow their feeding on the ponds, shooting was a regular and omnipresent practice throughout the period of our study. This has been shown to have possible indirect negative implications for other waterbirds, which react in the same way, especially during the breeding period (M i k u s k a and M i k u s k a, 1994; T u c a k o v, 2005b). Thus there is cause for conservation concern, bearing in mind the rich avian diversity in the area (T u c a k o v, 2004, P u z o v i ć and G r u b a č, 2000). Results of the present study show that there is no reason for aggressive defensive measures during the breeding period, when the predation level, measured by average numbers of individuals per 10 ha, is very low (Fig. 2).

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## СЕЗОНСКЕ ПРОМЕНЕ БРОЈНОСТИ ВЕЛИКОГ ВРАНЦА (*PHALACROCORAX CARBO*) НА КОЛУТСКОМ РИБЊАКУ (СЕВЕРОЗАПАДНА СРБИЈА)

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Сезонске промене бројности великог вранца су праћене у периоду од 1998. до 2004. године на рибњаку код Колута. Присуство јединки ове врсте је потврђено током целе године, осим већег дела децембра и у јануару. Пролећна сеоба врхунац достиже почетком марта, док јесења траје веома дуго, са врхунцем почетком октобра. Током периода гнезђења просечна бројност јединки на рибњаку није прелазила 20. Праћењем правца долета и вечерњег одласка закључено је да су ове птице највероватније долазиле на истраживано подручје из најближе

гнездилишне колоније која се налази у Копачком риту (источна Хрватска, 35 км од колутског рибњака у правцу ЈЗ). Ниво предационог притиска на гајене рибе је током године био веома низак (просечно испод 0,5 јединки/10 ха водене површине рибњака), искључујући октобар (просечно 2,44 јединке/10 ха водене површине). Због посредних негативних ефеката које пуцање на велике вранце има на богату гнездилишну фауну овог локалитета, разлози за примену овакве одбране од ове ихтиофагне врсте не постоје током године, осим у октобру.