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BREEDING OF THE COMMON KINGFISHER

Alcedo atthis AT THE BORAČKA RIVER

ABSTRACT: The breeding population of the common kingfisher Alcedo atthis was studied in the Boračka River area in 2006 and 2007. A high breeding density was documented in 2007 with five breeding pairs recorded along the 1.4 km section of a stream habitat. All of the studied nests were placed in vertical banks without excessive riparian vegetation, while the distance between adjacent nests ranged 120–430 m. The same nest holes were used in both years, although birds excavated a couple of new ones in 2007. One pair bred in two consecutive years; the same pair had two breeding attempts in 2007, while three breeding attempts were recorded for one male. Birds used the same holes for subsequent clutches or excavated new nests. Also, one nest was used by different pairs in the same breeding season. In the study period 21 individuals were banded – none of the juvenile individuals was recaptured, suggesting that the fledglings dispersed shortly after they had left their nests. Also, none of the breeding individuals was recaptured at the river outside the breeding season.

KEYWORDS: Kingfisher, Alcedo atthis, Serbia, breeding, population density

INTRODUCTION

The common kingfisher, Alcedo atthis, is widely distributed throughout the Palearctic and Indo-Malayan region where it inhabits different types of water habitats with available aquatic prey and suitable nest sites, such as streams, rivers, canals, drains, lakes, fishponds and occasionally seashore bays [Cramp 1985; Fry et al. 1992]. Kingfishers nest in tunnels, usually excavated in steep stream or river banks, occasionally in holes in walls or tree stumps [Eastman 1969; Morgan and Glue 1977]. In Europe, breeding season starts in mid-April and ends at the beginning of September. In that period, birds typically have two broods, occasionally three [Cramp 1985].

Populations of the common kingfisher have been experiencing long term declines across the European part of the species range, most likely due to river
pollution. For that reason, the common kingfisher is classified as a vulnerable species in Europe [BirdLife International 2015]. In Serbia, the common kingfisher has the status of a breeding species and year round resident. During the period 1990–2003, its breeding population was estimated at 1,200–1,800 breeding pairs with stable population trend [Puzović et al., 2003]. However, common kingfishers were rarely subjects of ornithological research in Serbia, hence, information on this species can be found mainly in ornithofaunistic reports. Matvejev [1950] confirmed the presence of common kingfishers at 37 locations in Serbia, while Simić [2004] examined seasonal changes in the occurrence of kingfishers on the Danube near Belgrade, in the period 1993–1996, concluding that these birds are the most abundant from September to November and very rare from February to June. In the EMERALD network in Serbia, the presence of the common kingfisher had been confirmed at 144 locations [Sekulić and Šinžar-Sekulić 2010].

Breeding of common kingfishers has never been investigated in Serbia. Therefore, the major goals of this study are to examine breeding habits of this species and to determine how many pairs of kingfishers can breed along a stream habitat that is, due to presence of steep banks and available fish prey, suitable for their nesting. Better understanding of breeding biology of common kingfishers is necessary for accurate estimates of their population trends and sizes.

**MATERIAL AND METHODS**

The Boračka River is ~9 km long tributary of Gruža accumulation, central Serbia, that along the entire course flows through arable land [Čomić and Ostojačić 2005]. In the study section, shallow main stream alternates with deeper pools, with rocks that dominate the bottom in riffles, gravel and sand in pools, while mud is the prevalent substrate close to the accumulation. Turbidity varies from low in shallow pools to high after heavy rains. In the lower reaches, the river is surrounded by high banks and tree cover mainly of willow (Salix spp.), poplar (Populus spp.) and black locust (Robinia pseudoacacia).

I examined breeding habits of kingfishers along the 1.9 km section of water course close to the junction of the river and accumulation, during the breeding seasons in 2006 and 2007. In 2006 I examined 1 km of the water course beginning from the accumulation, while in 2007 I examined additional 900 m of the water course. Kingfishers were captured in nylon mist nets set across the river, close to kingfisher nests, and banded with metal bands (issued by the National Center for Animal Marking). Sex and age of captured birds were determined following Cramp [1985] and Baker [1993]. To examine if birds used their breeding areas outside the breeding season, I continued mist-netting throughout the fall and winter period.

All nests were located by walking along the stream; I found six nests that are from now on referred to as nests A – F. I used several parameters to confirm the breeding activity of individuals within nest tunnels – adult birds that where flying in or flying out of nests, usually with fish in their beaks, fresh feces on
the bank bellow nest holes and calls of chicks. In addition, three nest tunnels were examined with a camera during the breeding season in 2007. I assumed that adult individuals that were captured two or more times in mist nets close to a particular nest were a breeding pair of that nest. On several occasions, individuals flew into mist nets directly from their nests, which verified the occupancy of nests. The distance between nests was determined using global positioning system (GPS; Garmin eTrex Vista).

RESULTS

During the study period 21 individuals were banded, nine adults (four males and five females) and 12 juveniles. None of the adult birds and juveniles banded during the breeding season was recaptured on the river during the fall and winter period. Two nests were located in 2006, but only one breeding pair was identified, while six nests were detected in 2007, when four breeding pairs were identified and assumed the presence of a fifth one (Table 1). All of the studied nests were placed in vertical banks without excessive riparian vegetation. The distances between recorded nests were: A – B 150 m, B – C 120 m, C – D 450 m, D – E 430 m and E – F 260 m, while the distances from the accumulation were: 340 m (A), 490 m (B), 610 m (C), 1,060 m (D), 1,490 m (E) and 1,750 m (F) (Figure 1).

Figure 1. The position of kingfisher nests (A-F) in the study area (Boračka river)
Breeding season 2006

Along the 1 km long section of the river, only nests B and C were detected. A breeding pair from the C-nest was identified; a male (further in text m) and female (f1) were captured twice from June 15 – July 7. The activity of the C-nest was not registered throughout August. The activity of the B-nest was confirmed on May 26, although the breeding pair was not identified. That nest was inactive in July, but its activity was documented again at the beginning of August, when chirping of chicks was recorded and the female f1 was captured by the nest. A single recapturing of the female f1 by the B-nest does not confirm that she bred there, but it indicates that she may have laid the second clutch in that nest.

Breeding season 2007

Along the 1.9 km long section of the river, all six nests were recorded. Throughout May the activity of four nests was confirmed – A, B C and E; the A-nest was newly excavated (not recorded in 2006), while the E-nest was detected in the section that was not examined in 2006. In that period, two breeding pairs were identified; a male (m2) and female (f2) that bred in the B-nest and the male m1 and female f1 that bred in the C-nest. In addition, a male (m3) was captured with a fish in his beak in front of the E-nest, which suggests that he may have bred there. A breeding pair from the A-nest was not identified. However, on June 1 fledglings were recorded with a camera, both in nests A and C, while eggs were registered in the B-nests. This indicated the presence of a distinct breeding pair in the A-nest, given that it is less likely that the m1-f1 and m2-f2 pairs were able to raise two broods simultaneously.

During June and July three nests were active. In June, a breeding pair m1-f1 started their second brood in a newly excavated D-nest, while a new pair, a male (m4) and female (f4) inhabited the C-nest. The F-nest was registered in March 2007, although its activity was confirmed for the first time at the end of June when the male m3 was captured there. The same male was captured in front of that nest at the beginning of July again, but he was also captured once in June and at the end of July at the E-nest. Thus, it is possible that after he had his first brood in the E-nest (in May and June) he started his second brood in the F-nest at the beginning of July and then returned to the E-nest for the third brood at the end of July. His partner at the end of July in the E-nest was a female f3.

In the breeding season 2007 nine hunting perches were recorded, they were recognized based on the presence of bird feces containing fish scales. Perches were placed 20–150 cm above the water level, while the depth of water pools below them ranged 20–105 cm, although measurements were conducted at the end of June, when the water level was very low.
Table 1. The nest activity in the breeding seasons 2006 and 2007

<table>
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<tr>
<th>Nest</th>
<th>2006</th>
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<td></td>
<td>I</td>
<td>II</td>
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<tr>
<td>Brood</td>
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<td>Active, breeding pair unidentified</td>
<td>Inactive</td>
<td>Active, breeding pair m₁-f₁</td>
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<td>Active, breeding pair unidentified (possibly f₁)</td>
<td>Unknown</td>
<td>Active, breeding pair m₁-f₁</td>
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<td>Did not exist</td>
<td>Did not exist</td>
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<td>Unknown</td>
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DISSCUSION

The Boračka River is suitable for breeding of common kingfishers, providing that five pairs bred there along the 1.4 km of water course. I was not able to determine the exact sizes of their breeding territories; however, based on flight directions of captured birds, I concluded that kingfishers captured prey upstream and downstream from their nests. Most likely, the birds captured all prey at the Boračka River, given that it is the only water course in that area and that the Gruža accumulation near the river junction lacks appropriate hunting perches.

The breeding densities of common kingfishers are variable. Typically, breeding pairs are separated around 1–2 km along a water course or even more [Kumari 1978; Glutz and Baurer 1980; Čech 2006]. However, in spite of documented territorial behavior of these birds [Eastman 1969; Kumari 1978], the breeding density recorded at the Boračka River is not unusual. Thus, simultaneously active nests were separated 150 m in Scotland [Brown 1935], 125 m and 200 m in Sweden [Svensson 1978], 300 m in Estonia [Kumari 1978], 100 m in Japan [Sayako and Tatsuhiko 2002], 50 m in Czech Republic [Čech 2006], while four breeding pairs were recorded along 650 m of a water course in Belgium [Libois 1994]. Breeding territory size of the common kingfisher depends on the availability of food and nest sites together with the overall population level [Libois 1997]. In the Boračka River area, breeding kingfishers reached the high density most likely due to presence of river banks suitable for nesting, as well as due to available prey and foraging sites. It is not known how such nest distribution affected reproductive success of individuals as overcrowding...
often leads to increased incidence of aggressive encounters between neighboring breeding pairs [Clancey 1935; Boag 1982].

Common kingfishers can use suitable nest sites many years [Eastman 1969; Kumari 1978]. At the Boračka River, the same nest was used in consecutive breeding seasons by one breeding pair. Thus, the breeding pair m1-f1 bred in the C-nest in both study years, while in 2007 the same pair excavated a new nest for the second brood. Excavation of additional nesting tunnels within the breeding season is not uncommon among kingfishers and thus subsequent broods may overlap [Brown 1935; Eastman 1969; Kumari 1978]. The pair m1-f1 most likely started building a new tunnel while still taking care of the young from the first brood, given that I recorded fledglings in the C-nest on June 1 2007, whereas their parents were captured in front of the D-nest on June 13.

Under favorable environmental conditions, birds can continue using breeding territories as feeding territories throughout the fall and winter [Boag 1982]. However, I did not recapture any of the breeding individuals outside the breeding season even though the Boračka River was mainly ice-free during the winter 2006/07. It is not known where these birds spent the winter. In addition, I did not recapture any of juvenile individuals banded throughout the breeding period as the young disperse from the nesting place just a few days after leaving their nests [Clancey 1935; Eastman 1969; Boag 1982].

**CONCLUSION**

Stream habitats with suitable vertical banks, foraging areas and available fish prey can support relatively high breeding densities of common kingfishers in spite of documented territoriality of these birds. Providing documented breeding dynamics of kingfishers, such as excavation of new nest tunnels for the second clutch, as well as utilization of one nest by different pairs within the same breeding season, more research is necessary for correct estimates of the size and trends of their populations.

**ACKNOWLEDGEMENT**

I would like to thank Biljana Mitrović, Sanja Alaburić, Daliborka Stanković, Aleksandar Vlajić, Aleksandar Stojanović, Miloš Milivojević and Miloš Jović for their help with the field work. Also, I would like to thank Voislav Vasić whose advice improved the quality of collected data.
REFERENCES


Matvejev SD (1950): Rasprostranjenje i život ptica u Srbiji. SAN, Beograd.


ГНЕЖЂЕЊЕ ВОДОМАРА *Alcedo atthis* НА ПОДРУЧЈУ БОРАЧКЕ РЕКЕ

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КЉУЧНЕ РЕЧИ: водомар, *Alcedo atthis*, Србија, гнежђење, густина популације