

## Breeding of Eurasian Sparrowhawks (*Accipiter nisus*) in two Hungarian towns

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**ABSTRACT** — Raptors are becoming increasingly urbanized worldwide. My study summarizes the data on breeding Eurasian Sparrowhawks (*Accipiter nisus*) in a seven-year period (2003–2009) in two medium-sized Hungarian towns, Dunaújváros and Gödöllő. Four territories were found in city outskirts in urban parks and a narrow forest belt along the road, while a further territory was found in the downtown area of Dunaújváros. Altogether 19 nests were found in the vicinity of streets or lanes. Nests were built mostly on coniferous trees, 12–23 m above the ground. Breeding success was high: out of 4–6 eggs, 82.8% hatched, and 4 chicks fledged per nest on average, with no nest failing to fledge young. Both adults and nestlings were tolerant and more tolerant to human disturbance than those in natural habitats. These observations support the findings on other urbanized populations of the species, demonstrating that the Sparrowhawk became a successful city-dwelling bird.

**Key words:** *Accipiter nisus*, breeding biology, human disturbance, nesting behaviour, urbanization.

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### Introduction

Several raptor species are becoming increasingly urbanized recently throughout the world (Sorace & Gustin, 2008). One of these species is the Sparrowhawk (*Accipiter nisus*), although traditionally it has avoided human settlements for breeding, and its breeding populations extensively decreased around the middle of the 20th Century in Europe, mainly due to the use of organochlorine pesticides in agriculture (Newton, 1986; Perrins, 1998). This decline was also perceptible in Hungary (Tapfer, 1983; Perrins, 1998). After the use of organochlorines has been banned, the population of the species started to increase again (Perrins, 1998; Biadun, 2006), and in the early 1980s it has begun to colonize urban habitats (Newton, 1986). Nowadays, the species breeds successfully in a variety of urbanized environments such as the city of Edinburgh (McGrady, 1991), Hamburg (Risch et al., 1996) and Lublin (Biadun, 2006). In Hungary, the first urban nests of Sparrowhawks were reported in 1985 (Bagyura, 1985) in the capital city of Budapest, where the species now has a well-established breeding population of ca. 200 pairs (Bércecs, 2007). However, very little information has been published about the urbanization of the Sparrowhawk elsewhere in the country (e.g. Prommer, 2006). Here I describe observations on the breeding biology of Sparrowhawks in two Hungarian towns.

### Materials and methods

I monitored the breeding of Sparrowhawks between 2003–2009 in the urban zone in two medium sized towns, Dunaújváros and Gödöllő. Dunaújváros (location: 46°58'25.72"N

18°55'40.52"E; area: 53 km<sup>2</sup>, population: ca. 50 000) was built in the 1950s during the industrialization of the country. Although the town is still a major host of industrial activity in Hungary, its built-up areas are interspersed with parks and greenery (Fig. 1), typically with coniferous trees. Gödöllő (location: 47°36'0.00"N 19°22'0.12"E; area: 62 km<sup>2</sup>, population: ca. 34 000) is about 30 km from the outskirts of Budapest. Similarly to Dunaújváros, its parks mainly consist of coniferous trees.

In the breeding seasons of 2003–2009, from early March to late August, I screened every possible area of the two towns for the presence of Sparrowhawk nests and any other sign of the birds' activity, such as plucking sites and display vocalizations. Every year from the beginning of March I searched all wooded areas such as parks, cemeteries and playgrounds in both towns. The nests which had been found were checked every week visually from the ground in order to determine breeding performance. Such ground controls did not cause significant disturbance as incubating females never left the nests. Once during incubation and every week during the chick-rearing period (from May to mid August) I also checked each nest by climbing up the nest tree. For each nest, I have recorded GPS coordinates, nest height, tree species, the number of eggs or the number and sex of chicks. Sparrowhawks usually build a new nest each year on a different tree within a 100 m radius of the old nest (*Newton, 1986*), therefore I assigned such nests found in consecutive years to the same breeding territory.

In the study period 19 nests were found in total, comprising four territories in Dunaújváros and one in Gödöllő (Table 1, Fig. 1). One territory was in the inner city and four in outskirts (Fig. 1), all located in small (<35 ha) timbered areas in the vicinity of streets with medium-hard traffic and buildings. Territory A was situated between the bus station and the steelwork factory, in a small forest reserve with predominantly deciduous trees and some coniferous trees. Many people used this area for jogging and walking from the downtown to the factory. Territory B was located in the middle part of the town, in a narrow timbered area of coniferous trees, surrounded by the inner city. Territory C was situated at the edge of the town, in a long but narrow wood patch of mostly pine trees, next to a highway with heavy traffic. Territory D was located in a floodplain with only deciduous trees, close to the malt factory. People used this area for recreation, camping and fishing. Territory E was situated in the heart of Gödöllő, at the edge of a park of mainly deciduous trees, next to a residential area.

Most nests were situated on coniferous trees; however, nests in territory D were consistently built on deciduous trees (Table 1). Nest height was on average 16.3 m (SD=2.8; Table 1). Nests were not re-occupied in subsequent years; the birds built new nests always within 80 m from the old nest in each territory (average=39.92; SD=19.11). Nest sites of the neighbouring territories of Dunaújváros were located at average 1938 m (SD=413.1 m) from each other in the same year.

## Results

Sparrowhawks usually started to build their nest at the beginning of April, than they continued until the end of the month. The timing of breeding varied both within and among territories (Table 1). The earliest breeding was in Dunaújváros (2007), when nest building

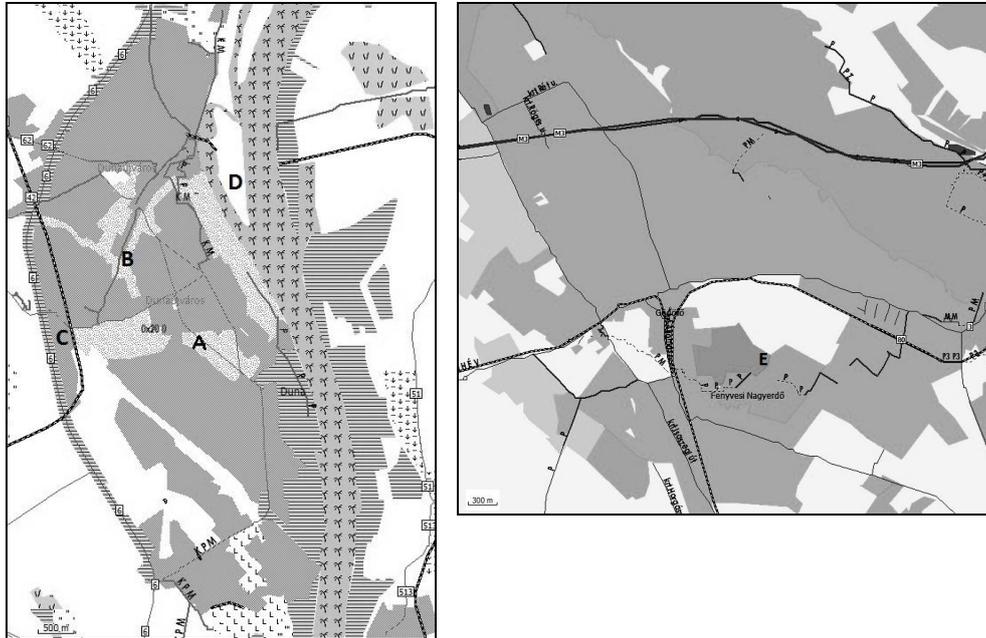
Territory	Town	Year	Tree type	Nest height (m)	Start of nest building	First egg date	Hatching date	Number of eggs	Number of hatched chicks	Chick sex ratio (male / female)
C	Dunaújváros	2003	Pine	15	10 Apr	8 May	6 June	4	4	4/0
A	Dunaújváros	2004	Pine	18	3 Apr	27 Apr	1 June	6	5	3/2
B	Dunaújváros	2004	Pine	12	9 Apr	30 Apr	3 June	4	4	3/1
A	Dunaújváros	2005	Pine	15	5 Apr	27 Apr	30 May	6	4	3/1
C	Dunaújváros	2005	Pine	16	17 Apr	17 May	19 June	6	3	1/2
D	Dunaújváros	2005	Poplar	12	12 Apr	14 May	16 June	4	4	4/0
A	Dunaújváros	2006	Pine	17	11 Apr	7 May	9 June	6	3	0/3
C	Dunaújváros	2006	Pine	17	6 Apr	24 Apr	27 May	4	4	1/3
D	Dunaújváros	2006	Poplar	18	5 Apr	30 Apr	1 June	6	4	4/0
E	Gödöllő	2006	Pine	16	16 Apr	5 May	6 June	4	4	3/1
A	Dunaújváros	2007	Pine	18	18 Mar	6 Apr	9 May	6	6	6/0
B	Dunaújváros	2007	Pine	13	28 Mar	20 Apr	20 May	4	4	2/2
E	Gödöllő	2007	Pine	18	14 Apr	2 May	4 June	4	4	2/2
A	Dunaújváros	2008	Pine	19	1 Apr	2 May	3 June	6	3	3/0
D	Dunaújváros	2008	Poplar	23	8 Apr	2 May	5 June	4	4	3/1
E	Gödöllő	2008	Pine	15	2 Apr	18 Apr	20 May	4	4	3/1
A	Dunaújváros	2009	Pine	17	28 Mar	18 Apr	20 May	6	4	2/2
D	Dunaújváros	2009	Ash	12	23 Mar	20 Apr	22 May	4	4	2/2
E	Gödöllő	2009	Pine	19	4 Apr	23 Apr	26 May	5	5	3/2

**Table 1.** Nest records of urban-breeding Sparrowhawks**1. táblázat.** A két vizsgálati területen költő karvalyok fészkelési adatai

started on the 18th of March and the first young hatched on the 9th of May. The fledglings left their nests usually between June and July.

Breeding was successful in all of the 19 nests monitored. Average clutch size was 4.9 eggs ( $SD=1.0$ ), out of which  $4.1 \pm 0.7$  chicks hatched (Table 1). In 7 nests in Dunaújváros, 1 to 3 of the eggs did not hatch (Table 1); 5 of these nests were in territory A. These unhatched eggs had abnormal shape and/or pigmentation, suggesting infertility (Bérces, 2007). Fledging success was 100% in all nests, thus overall breeding success was 82.8%. Although I have no comprehensive data on post-fledging survival, I have witnessed that one of the fledglings was hit by a car and died (territory C, 2003). Brood sex ratio was generally male-biased, with males comprising on average 66% ( $SD=28\%$ ) of the chicks (Table 1). No breeding took place in territory B and C in the same year. Since the birds were not marked it can neither be confirmed or ruled out that the same pair was breeding alternately in these territories. Population fluctuations between years may have been caused by loss through infectious agents (West Nile virus e.g.) or accidental death (bird crash to glass windows, wires, buildings during hunting, etc.).

The birds were usually tolerant towards humans. Females were especially aggressive and fearless in areas with many pedestrians (territories A and D). Upon nest checks, when I kicked the nest tree and climbed it, females stood up shouting, then left the nest but stayed nearby (ca. 30 m); they often attacked me from the air when I was close to the nest. In one case in 2005 in territory A, the female stayed in the nest while I climbed up to it, and



**Figure 1.** Breeding territories of Eurasian Sparrowhawks in Dunaújváros (left) and Gödöllő (right).  
**1. ábra.** A Dunaújvárosban (bal oldali ábra), illetve Gödöllőn (jobb oldali ábra) költő karvalyok fészkeinek elhelyezkedése

guarded her ca. 5 days old chicks even when I was about 1 m away. For the young birds in the nest, the run-away distance was as short as a few meters. Males never attacked me, but they were more active and vocalized more than females at the end of the breeding season.

## Discussion

My observations show that Sparrowhawks breed successfully in urbanized habitats that are smaller and thus have less timbered areas than the capital city. In both towns that I studied, the birds chose relatively small wood patches for nesting, similarly to what was noted for the species' natural environment (*Biadun, 2006*) and the Budapest population (*Bérces, 2007*). The preference for conifers as nest trees is consistent with that observed in natural habitats (*Tapfer, 1983; Newton, 1986*). Although Sparrowhawks in Budapest usually nest on deciduous trees, this is probably due to the limited availability of suitable coniferous trees (*Bérces, 2007*). Nevertheless, the repeated nesting on deciduous trees in territory D is in accordance with the finding that Sparrowhawks exhibit „tree fidelity” (*Bérces, 2007*). Utilizing the same nest in consecutive years was also observed in Budapest (*Bérces, 2007*), which is rare in natural habitats (*Newton, 1986; Perrins, 1998*). Nest height in both Du-

naújváros and Gödöllő was higher than in natural habitats (5-15 m; *Newton, 1986*) and in Budapest (8-15 m; *Bércecs, 2007*) but similar to the urban nests of Lublin (*Biadun, 2006*), despite that the trees in both towns in my study seem to provide suitable nesting sites at lower heights as well.

Similarly to what has been reported for other urbanized populations (*Biadun, 2006; Bércecs, 2007*), I have found relatively high breeding success compared to natural conditions. For example, only 57% of nests fledged at least one young and mean brood size was 3.3 chicks in *Newton's* studies (*Perrins, 1998*), contrasting with the 100% nest success and average brood size of four chicks in my study. Although the average clutch size of five in my study site was similar to both natural (*Perrins, 1998*) and urban populations (*Bércecs, 2007*), the 81.7% overall breeding success is the highest one published in this geographic region (76% in both Lublin and Budapest: *Biadun, 2006; Bércecs, 2007*). I have also found earlier fledging dates than those in natural environments (*Newton, 1986*), which is also consistent with the findings on another urban population (*Biadun, 2006*).

My results support that the Sparrowhawk has well adapted to breed in urbanized environments (*McGrady, 1991; Risch et al., 1996; Biadun, 2006; Bércecs, 2007*). This adaptation seems to include behavioural adjustments to human disturbance, which has been observed in several avian species but rarely reported for raptors (*Blumstein et al., 2005*). Sparrowhawks breeding in natural environments have been described as wary of humans and rarely attacking upon nest checks (*Perrins, 1998*), contrasting with the boldness of urban birds found in both Lublin (*Biadun, 2006*) and my study. Additionally, utilizing the urban avifauna as a rich prey source and „innovating” novel hunting techniques (*Bagyura, 1985*) make the Sparrowhawk a successful city-dweller. Conserving and managing urban parks in accordance with the nesting requirements of the species should aid its long-term protection in our rapidly urbanizing world.

**KIVONAT:** A ragadozó madarak világszerte egyre jobban urbanizálódnak. Tanulmányom két közepes méretű magyar város, Dunaújváros és Gödöllő fészkelő karvaly (*Accipiter nisus*)-állományán egy hétéves időszak (2003–2009) adatait összesíti. Négy territórium külváros városi parkjában és egy keskeny útszéli erdősávban, míg egy további Dunaújváros belterületen volt megtalálható. Összesen 19 fészkek volt utcák vagy sétányok közelében található. A fészkek túlnyomórészt örökzöld fákra épültek, 12–23 méterrel a talajszint felett. A költési siker jó volt: a 4-6 tojás 82,8%-a kikelt, és átlagosan 4 fióka kirepült fészkenként; egyetlen fészkekben sem maradt el a fiókaröpítés. A felnőttek és a fiókák egyaránt szelídek voltak, és jobban tűrték az emberi zavarást, mint természetes élőhelyen élő társaik. Ezek a megfigyelések alátámasztják a faj egyéb urbanizált állományain végzett megfigyeléseket, melyek szerint a karvaly sikeres városlakó fajjává vált.

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S. Papp

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