

## THE TRAGIC FATE OF THE FIRST GOLDEN EAGLE *Aquila chrysaetos* TRACKED BY SATELLITE TELEMETRY IN CROATIA

*Stradavanje prvog surog orla Aquila chrysaetos obilježenog satelitskim odašiljačem u Hrvatskoj*

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The Golden Eagle *Aquila chrysaetos* is distributed across Europe, northern and Central Asia, North America and northern Africa, where it is the largest *Aquila* species. In Croatia, it breeds in the coastal and mountain part, with at least 35 identified territories. These territories are occupied by 20-25 pairs, several territories are occupied by just one subadult/adult bird, and some of the territories are vacant or permanently abandoned (MIKULIĆ *et al.* 2012, 2013, 2014).

Based on monitoring data (MIKULIĆ *et al.* 2012, 2013, 2014), the Golden Eagle in Croatia has an overall stable national population. On the one hand, it has favourable territory occupancy in the northern mountain and coastal part (Kvarner islands, Ćićarija and Učka mountains, Gorski kotar and Lika region and Velebit mountain), but on the other hand, territories in Dalmatia have only few pairs, some are permanent abandoned, vacant or occupied by single birds. The high percentage of unpaired birds in Dalmatia is a result of low immigration rates of subadult birds (BUDINSKI 2013) and, generally, less favourable breeding conditions. Due to its low population numbers and increasing threats, such as the construction of wind farms in its territories, in particular in Dalmatia, the Golden Eagle is a species of high conservation concern in Croatia.

Raptor populations are more affected by survival rates of long-living adult birds than by nesting success; the mortality rate of juvenile birds is much higher than the mortality of adults (NEWTON 1979). However, the period after fledging is the least known stage in the life of the Golden Eagle (WATSON 1997), but it is crucial for a better understanding of the turnover and recruitment of individuals to the reproductive population. Hence, the identification of factors that contribute to elevated mortality rates of the Golden Eagle is of conservation interest. The development of light satellite telemetry in the last two decades facilitated

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tracking of large bird species (SOUTTULLO *et al.* 2006) enabling thereby individual threat assessments.

In 2017, for the first time in Croatia, an individual Golden Eagle was equipped with satellite telemetry. The aim was to collect data on its movements to find out more about the threats affecting the survival of juvenile Golden Eagles. A GPS-GSM logger was deployed on a young male that had been before rehabilitated in the Sokolarski centar Association (SCA) in Dubrava near Šibenik. The bird stemmed from the Promina Mountain (Central Dalmatia), where it had hatched in spring 2016. It was found near Drniš with both wings injured and was admitted to the SCA on 4 October 2016. X-Ray scanning revealed the presence of 3 shotgun pellets (5 mm in diameter) in one wing and neck. This was clear evidence that this bird has been illegally shot. The young male recovered during the next seven months at the SCA and was subsequently released in spring 2017.

A GPS-GSM logger from Ecotone (SAKER H LF device, dimensions 79x36x36 mm, weight 33 g) was provided by the Croatian Agency for the Environment and Nature, and was deployed by the ringing team of the Association BIOM. A tracker was set to mark GPS positions every 30 minutes and sent data via GSM network. The tagged Golden Eagle was released on 29 April 2017 in the Krka National Park. This particular area was chosen due to its vicinity of the SCA and good habitat conditions.

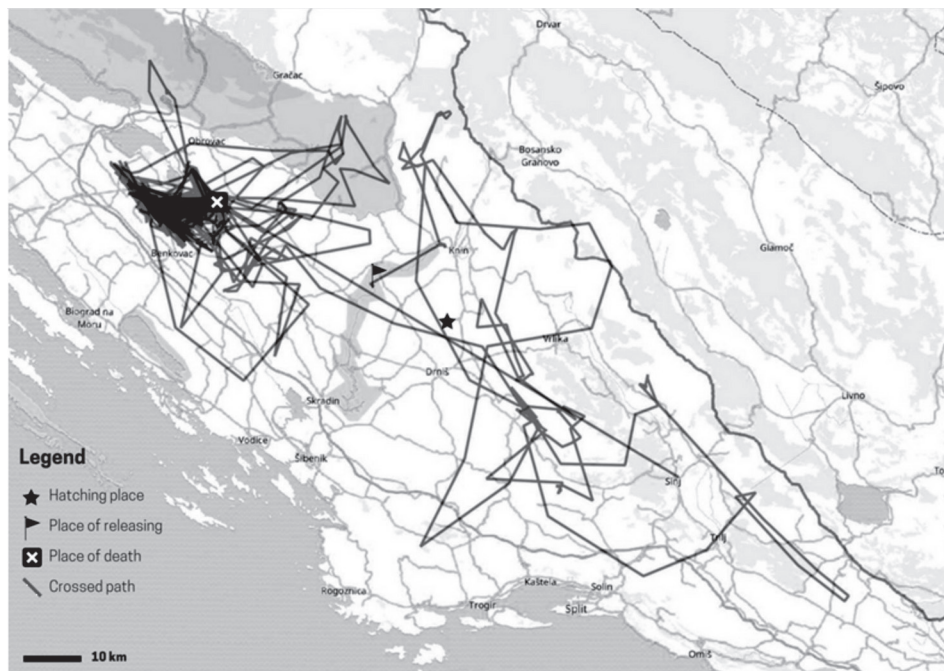
After the release, the Golden Eagle followed the Krka River upstream to the city of Knin and visited briefly the Zrmanja spring, where there is an established Golden Eagle territory. Then it flew southeast to the Svilaja Mountain, briefly visiting the hinterland of Trogir before returning northwest to the Zrmanja spring. It again crossed Svilaja, going further south to the Mosor Mountain (near Split), then turning north to the Dinara Mountain range and reaching its southernmost point near the Lovreć municipality. Following the Dinara mountain range, it flew west to the Ravni kotari plain (near the town Biograd na Moru), where it resided for the longest period. It spent the second part of May, the whole of June and the beginning of July in the area covering Gornje Biljane, Benkovac and Bruška, making occasional visits to Paklenica (the Velebit Mountain), the Zrmanja River, and the town of Pirovac. Most of the marked GPS positions concentrated around Gornje Biljane and the Gornji Karin hill, which were the locations that the eagle used for overnight while hunting in the surrounding area. The operating wind farm “VE Bruška” was located on these hills. The total path crossed from 29 April to 7 July 2017 was 3419.31 kilometres in length (Figure 1).

On 7 July 2017, the satellite track stopped moving near Gornji Karin. Two days later, the GPS logger and several feathers were found 350 meters off one of the wind turbines of the Bruška wind farm. Before the signal was lost, the eagle had been moving in line with the wind turbines. The most probable scenario was that it collided with one wind turbine blade. Death by natural cause can be

excluded, as the eagle was very active from the moment it was released until its premature demise, and had hardly any natural enemies. Since the tracker was the only thing found, foxes or badgers probably scavenged the eagle remains.

Although little is known about the mortality of subadult Golden Eagles, SOUTULLO *et al.* (2006) reported the rate of 12.5% of annual mortality of young birds in Spain. Similar results (16 %) were found in California (HUNT 2002), while in Britain, the annual mortality of young Golden Eagles was 21% (WHITFIELD *et al.* 2004). It is known that the Golden Eagle in particular succumbs to wind turbine blade-strikes (PAGEL *et al.* 2013), which add to natural mortality.

The Golden Eagle leaves its nest 75-85 days after fledging, and the breeding starts when they are 3-5 years old (WATSON 1997, URIOS *et al.* 2007). In that period the dispersion of the young individuals takes place. The first dispersive phase is characterised by frequent long-distance movements. In the second phase, birds restrict their movements to an area closer to their place of birth, where they become advanced hunters and learn the best sources of food (WATSON 1997). The tracked eagle did not stay in the proximity of its hatching place, probably because it spent a long time in rehabilitation and his native territory was still occupied by its parents. In its first three weeks, the tracked eagle covered the majority of the total distance. After that, its movements were restricted to the Gornje



**Figure 1.** Crossed path of the tracked Golden Eagle in the period from 29 April to 7 July 2017.  
**Slika 1.** Prijedeni put obilježenog surog orla u razdoblju od 29. travnja do 7. srpnja 2017.

Biljane area and Gornji Karin (located ca 50 kilometres away from the Promina Mt.). These two centres with the most tracking points are 10 kilometres apart and might be considered as parts of one territory. Since the Golden Eagle stayed for eight weeks at that place before its sudden death, we may conclude that it was an established territory of a subadult bird. Interestingly, this area was previously not considered as “Golden Eagle land”; this proves that immature bird may use areas unsuitable for reproduction as foraging grounds. It further underpins that such areas are necessary for the survival of young birds during the life history of the Golden Eagle, and that such areas have to be identified and protected in order to favour the effective conservation of the Golden Eagle.

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## SAŽETAK

Suri je orao gnjezdarica priobalne i gorske Hrvatske. Zbog općenite malobrojne nacionalne populacije i sve većeg pritiska, prije svega vjetroelektrana u Dalmaciji, ova je vrsta ugrožena i potrebno je pratiti sudbine surog orla na razini jedinke. Razvojem satelitske telemetrije omogućena su praćenja mladih ptica čija je disperzija bila dosad slabo istražena. 29.4.2017. počelo je praćenje prve jedinke surog orla obilježene u Hrvatskoj. GPS-GSM uređajem obilježen je mladi mužjak porijeklom s Promine oporavljen od posljedica prostrjeljivanja koji je pušten u prirodu u Parku prirode Krka. Praćenje orla trajalo je malo više od dva mjeseca kad su uređaj i ostaci ptice pronađeni u blizini vjetroagregata kod Bruške. Gotovo je sigurno stradao od sudara s elisom vjetroagregata. Nakon prvotnog istraživanja većeg područja, većinu vremena suri se orao zadržavao u okolici Gornjih Biljana i Gornjeg Karina. S obzirom na to da se suri orao zadržavao gotovo osam mjeseci na tom području, smatramo da se radi o teritoriju nedorasle jedinke i upućuje na važnost identifikacije takvih područja za učinkovitu zaštitu surog orla.