

The Saker Falcon (*Falco cherrug*) in Southern Romania: population, trend and habitat requirements in the breeding season

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Received: March 03, 2022 – Revised: November 08, 2024 – Accepted: November 09, 2024



Fântână, C., Veres-Szászka, J., Szabó, J., Bugariu, S., Todorov, E., Drăgan, D., Damoc, D., Veres-Szászka, N., Domșa, C., Pui, A., Benkő, Z. & Pál, L. 2025. The Saker Falcon (*Falco cherrug*) in Southern Romania: population, trend and habitat requirements in the breeding season. – Ornis Hungarica 33(1): 159–176. DOI: 10.2478/orhu-2025-0009

Abstract We summarise the monitoring efforts for the Saker Falcon (*Falco cherrug*) in Southern Romania between 2016 and 2023, presenting population size and short-term population trend. Using the degree of occupancy of 31 artificial and 5 natural nests, we analyse the species' preferences when choosing nesting sites in relation to the presence of grasslands, agricultural lands, settlements and woodlands around the nest. Considering the large-scale wind farm developments of the past 15 years in the Saker's Dobrudjan range, we also analyse the effect of wind farms on nest site selection. We estimate the size of the Saker population in Southern Romania to 7–9 pairs. The core of this population is in Dobrudja, with occasional breeding attempts in the rest of Southern Romania. While the species has occupied nests with relatively large areas of grassland in their 10 km radius, the proximity of grasslands around the nest is not a key factor in nest site selection. The Sakers avoided occupying nests with turbines closer than 2 km to them and the average number of turbines was significantly lower to up to 10 km around the nest in the occupied territories.

Keywords: Saker Falcon, Southern Romania, nest occupancy, habitat use, wind farms

Összefoglalás A dél-romániai kerecsensólyom-állomány 2016 és 2023 közötti felméréseinek eredményeit összegezzük, bemutatva az aktuális populációméretet és rövidtávú trendet. Emellett 31 költőláda és 5 természetes fészkek adatai alapján elemezzük a faj fészekválasztási preferenciáját a gyepek, szántók, települések és erdők fészkek körüli jelenléte szempontjából. Tekintve az elmúlt 15 év nagyléptékű szélenergia-beruházásait a kerecsensólyom dobрудzsai elterjedési területén, a szélenergia-beruházások fészekválasztásra gyakorolt hatását is vizsgáljuk. A dél-romániai kerecsensólyom-állományt 7–9 párba becsüljük. Az állomány magja Dobrudzsában található, alkalmankénti költési próbálkozásokkal Dél-Románia többi részén. Bár a faj olyan fészkeket foglalt el, amelyek viszonylag nagy gyeppelülettel rendelkeznek a 10 km-es körzetükben, a gyepek közelsége nem kulcsfontosságú a fészekválasztásban. A kerecsensólymok nem foglaltak el olyan fészkeket, amelyek 2 km-nél közelebb voltak egy szélenergia-beruházásnak, és a turbinák átlagos száma is alacsonyabb volt a foglalt fészkek 10 km-es körzetében.

Kulcsszavak: kerecsensólyom, Dél-Románia, fészekfoglalás, élőhelyhasználat, szélenergia-beruházások

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Introduction

The Saker Falcon (*Falco cherrug*) used to be a widespread species in the lowlands of Romania at the beginning of the 20th century, being frequent especially on the Danube corridor and in the Danube Delta (Linția 1954). Following a century of human induced habitat alteration and direct persecution, nowadays the species has become increasingly rare at a national level, being considered as Endangered species according to the Red List of breeding birds of Romania (MEWF 2022). Currently the species is breeding in two geographically distinct strongholds, one in the western part of the country near the border with Hungary, part of the Pannonic or Central European Saker population and another in the southeastern part of Romania, in Dobruđa (Figure 1).

The Dobruđian stronghold represents the southern limit of the East European (or Pontic) population which is continuing to the north, in Moldavia, Ukraine and Southern Russia (Bauer 2020), with a distribution that is following especially the Pontic steppe region and continuing further east in Asia. In the past, these two populations had a more-or-less continuous distribution, through the Southern Romanian Plain, where in the present, the breeding evidence is rather occasional, and Bulgaria, where during the last years the breeding evidence involved birds from reintroduction programs (Gradinarov *et al.* 2019). The most recent official estimates for Romania regarding the Saker Falcon indicate a population size of 6–10 pairs for the period of 2009–2013 (Societatea Ornitologică Română & Asociația Grupul Milvus, 2015) and 4–30 pairs for 2013–2018 (Fântână *et al.* 2021).

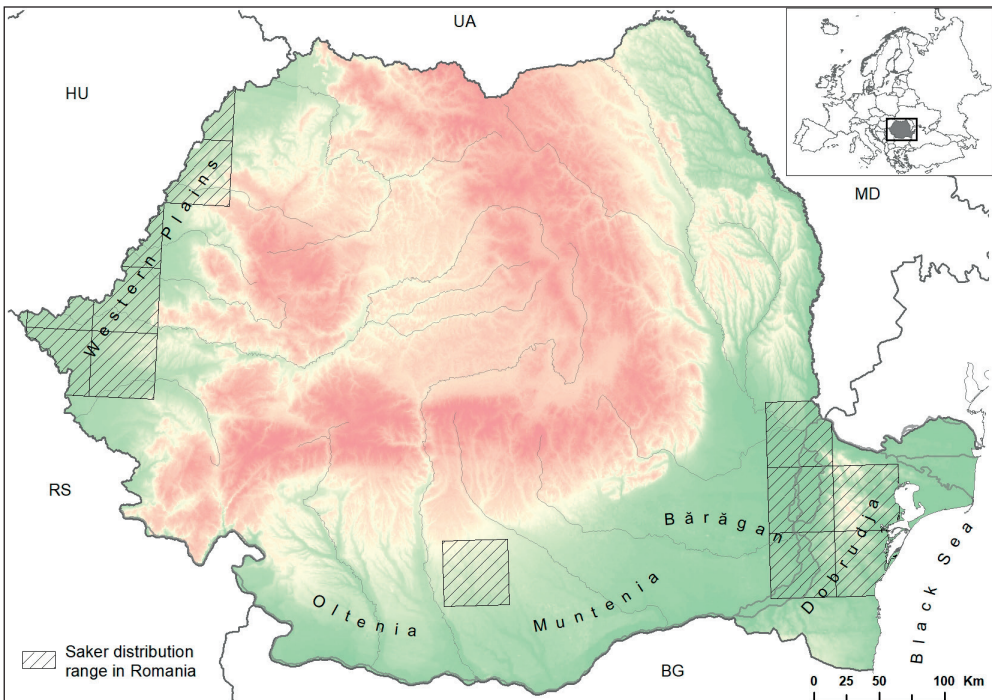


Figure 1. The current range of the Saker Falcon in Romania
1. ábra A kerecsensólyom jelenlegi elterjedése Romániában

The present article is dealing only with the Southern Romanian breeding pairs of the Saker Falcon, concentrating on the monitoring efforts between 2016 and 2023 in Dobrudja and the Romanian Plain (Oltenia and Muntenia regions) and analysing the degree of nest occupancy in relation with habitat types and settlements. Currently, the range of the Saker Falcon in Dobrudja is the subject of a large-scale expansion of wind farms, driven by the European Decarbonisation (COM 2015, 2022) and Energetic Independence Strategies (COM 2022). While there is a strong pressure for the use of wind energy, several studies show that while being a direct threat to soaring birds due to collision, wind farms are also responsible for the displacement of resident and migrating birds due to nesting and foraging habitat destruction (Thealander *et al.* 2003, Keil & Motter 2005, Fielding *et al.* 2006, Smallwood & Thealander 2008, Schaub 2012). The construction of maintenance roads and generally increased human activity can further impact a species sensitive to disturbance as the Saker Falcon (Tingley 2003). Based on available data, we also try to assess the effect of the presence of windfarms on nest site selection.

Materials and Methods

Trend and population size

To assess the population size, as a first step, from the historical range covered by Sakers in Southern Romania, we have selected, following especially the lowland distribution, the most suitable areas based on habitat and casual Saker observations. The resulting area has a surface of 28,065 km² and was the baseline area covered by censusing efforts in 2016, 2017, 2022 and 2023. Due to the large surface of the baseline area as well as human and time limitations, this area was not covered synchronously during one singular breeding season but in stages, covering different regions in different years. During this period, we covered the entire area by using two main methods: visual observation from preselected points and detailed investigation of suitable nesting locations.

Due to the large size of the area that had to be surveyed, census efforts undertaken outside Dobrudja, along the Romanian Plain in the historical regions of Oltenia and Muntenia have been spread over four years. In 2016 we covered, synchronously, in April, with 6 observers in two days, the area between the Danube River in the west, the Siret River's confluence with the Danube in the north and Bucharest in the west. In 2017, the effort was directed, synchronously, in April, with 6 observers in two days, toward west of Bucharest, to the Olt River and small areas west of the Olt River. In 2022, we visited again some of the areas we covered in 2016 and 2017 to confirm our findings. The general area surveyed was extended in Oltenia, to west of the Olt River as far as Drobeta Turnu-Severin, towards the Serbian Borders. Thus, Southern Romania has been covered in 2022, non-synchronously by eight observers in 22 days, in March – April. In 2023, the monitoring efforts in Southern Romania spanned 17 working days by three observers and were directed to the eastern part of the Bărăgan Plain, covering the areas along the Danube and in the western parts of the Romanian Plain in the counties Teleorman, Olt, Dolj and Mehedinți (*Figure 2*).

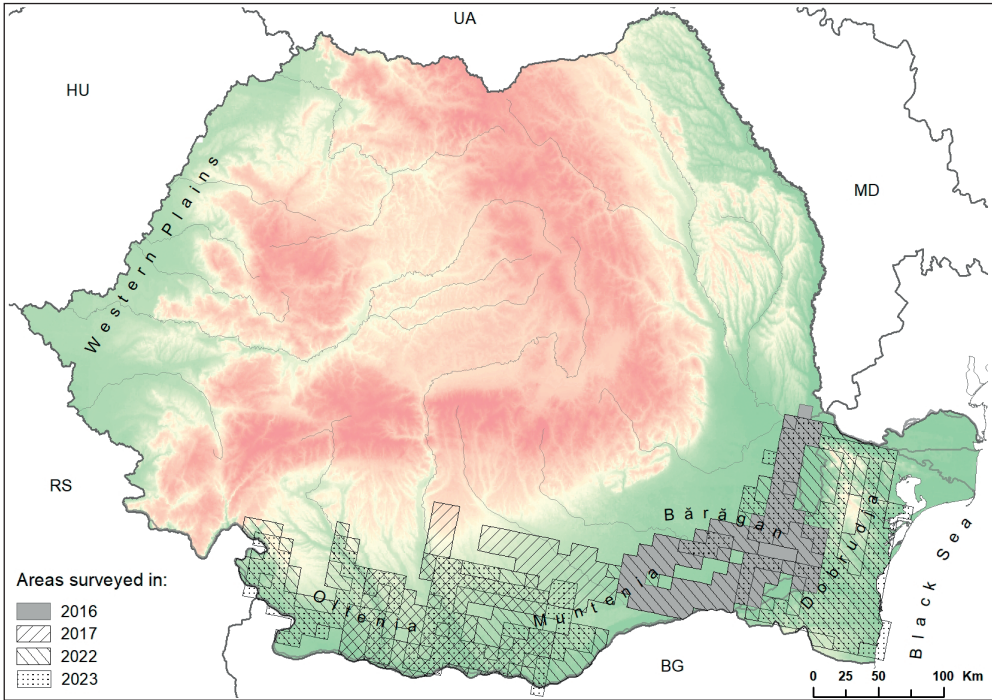


Figure 2. The coverage of census efforts in Southern Romania between 2016 and 2023
 2. ábra A 2016 és 2023 között Dél-Romániában felmért területek

We visited Dobrudja, which represents the core area for the species' distribution in Romania, more frequently, the known territories being monitored also in 2019, 2020 and 2021, apart from the visits made in 2017, 2022 and 2023.

To assess the trend of the population, we monitored all the known occupied territories in 2017, 2019, 2020, 2021, 2022 and 2023. We implemented the monitoring scheme in Dobrudja with two observers for two days in March – April in 2017, 2020 and 2021, with three observers for four days in May and June in 2019 and with 5 observers in 2022, in March – April for 15 days. In 2023, the monitoring efforts in Dobrudja lasted 16 days and were implemented by five observers. In 2022 and 2023, we also managed to check the breeding success in May. We compared the results with the baseline index, established by the number of territories detected in Dobrudja between 2011 and 2014, during the LIFE09 NAT/HU/000384 “Conservation of *Falco cherrug* in Northeast Bulgaria, Hungary, Romania and Slovakia” project, implemented in Romania by the Milvus Group Association and the Romanian Ornithological Society. As shown below, the breeding population in Southern Romania, outside of Dobrudja, is almost non-existent, thus we did not use data from there for the trend calculation. To resume, the time series which have been used to calculate the trend is based on the years 2012, 2013, 2017, 2018, 2019, 2020, 2022 and 2023.

To assess the health of the Dobrudjan population, from 2022 we have started to collect systematically a series of demographical parameters based on the number of pairs and the number of nestlings, namely the breeding success (calculated as the number of successful

breeding/all breeding attempts) and brood size (nestlings/successful pairs). Based on data from 2022 and 2023, we have compared the value of these demographical parameters with the corresponding values from the Central European population.

Breeding requirements/habitat use

During the period of 2012–2013, as part of the “Conservation of *Falco cherrug* in Northeast Bulgaria, Hungary, Romania and Slovakia” project, 31 artificial nests have been installed in Dobruja’s Saker range. We visited all known natural nests and artificial platforms during the monitoring efforts to assess the species’ preference for such structures. Collecting the data from censuses as well as completing it with additionally known territories, we obtained a data set of 186 entries regarding 36 nests for the period between 2012 and 2023.

We obtained the locations of active wind turbines as well as the year of their commissioning from The Wind Power database (2023), and by manual search using Google Earth satellite images. To assess their effect on the nest site choices of Saker Falcons, we measured both the distance of each nest from the nearest turbine operational in the year of assessment as well as the number of turbines in a 1, 2, 3, 4, 6, 8, 10, 15 and 20 km radius around the nests.

To assess the habitat preferences for nesting sites as well as the sensitivity to human disturbance, we used a CORINE vector layer (CLC2018, European Environmental Agency 2018), based on which we calculated the distances of each nesting site (including artificial nest box and natural nest) from the nearest patch of grassland and arable land, as well as from the nearest village. Additionally, we calculated the area of four key habitat types: grassland, agricultural land, forests and settlements, using three buffer categories: 4, 7.8, and 10 km, based on the minimum, average and maximum home range sizes identified by Prommer *et al.* (2018). Based on the findings of Prommer and Bagyura (2015), we excluded from the analysis all land falling in the 300 m range of individual wind turbines, as well as those tightly encircled by them, because we determined them as uninhabitable for Saker Falcons.

For analysing the data, we used the QGIS Software (QGIS Development Team 2022) and the R statistical environment (R Core Team 2023). Considering the small and uneven datasets (33 occupancies and 153 vacancies), as well as the lack of normal distribution and difference in variances, we used Wilcoxon’s rank sum test for data analysis.

Results

Trend and population size

In Southern Romania, outside Dobrudja, we found only very few breeding Saker Falcons during our four-year monitoring. A breeding attempt was recorded in 2017, in Teleorman County, when a pair was detected occupying an old Raven (*Corvus corax*) nest in April. At the subsequent visits, in May we did not observe chicks or adults at the same nest, so we presumed that the brood has failed. Additionally, an adult bird was observed near the Olt

River in 2022, on two occasions in the last week of March, in an area with available old nests built by Long-legged Buzzards (*Buteo rufinus*) and Hooded Crows (*Corvus cornix*). In 2023, an adult bird has spent the breeding season, between March and June, in a defined area in Dolj county but despite intensive search in the area, no nest has been detected. Except for these two cases recorded during the Saker census, the rest of the Saker detections from Southern Romania, outside of Dobrudja, were casual observations, most of them located in Oltenia, some from Bărgăan and mainly of immature birds without breeding evidence. Based on the current data, we estimate the population of the Saker in Southern Romania, outside of Dobrudja to 0–2 pairs.

From Dobrudja, we have data from a monitoring scheme undertaken in 2017, 2019, 2020, 2021, 2022 and 2023. The monitoring effort was constant in the period of 2017–2020 and was considerably increased in 2022 and 2023, when new areas were surveyed. In most years, we found 3–4 territories, except for 2022 and 2023, when we detected 5 territories in the first case and 7 territories in the second. We have additional casual observations far away from these territories, but mostly immature birds. Based on this data, we estimate the Dobrudjan population to 5–7 pairs.

Therefore, for Southern Romania, we are estimating a population of 4–9 breeding pairs, for the period of 2016–2022. Towards the end of the monitoring period, in 2022 and 2023, the data indicate a population of 7–9 pairs. During this period, we registered 33 cases of occupancy from 13 nests, where most nests were occupied only a single year, while one was registered as being occupied by a breeding pair in 7 different years between 2012 and 2023.

For the period 2012–2023 the trend for the Dobrudjan population is showing an increase (linear model, estimate=0.25, SE=0.12, $t=2.04$, $P=0.097$, $R^2=0.35$) (Figure 3), but it must be noted however that the monitoring effort has not been equally distributed between the years, with a lower monitoring effort in 2012, 2013, 2017 and 2020.

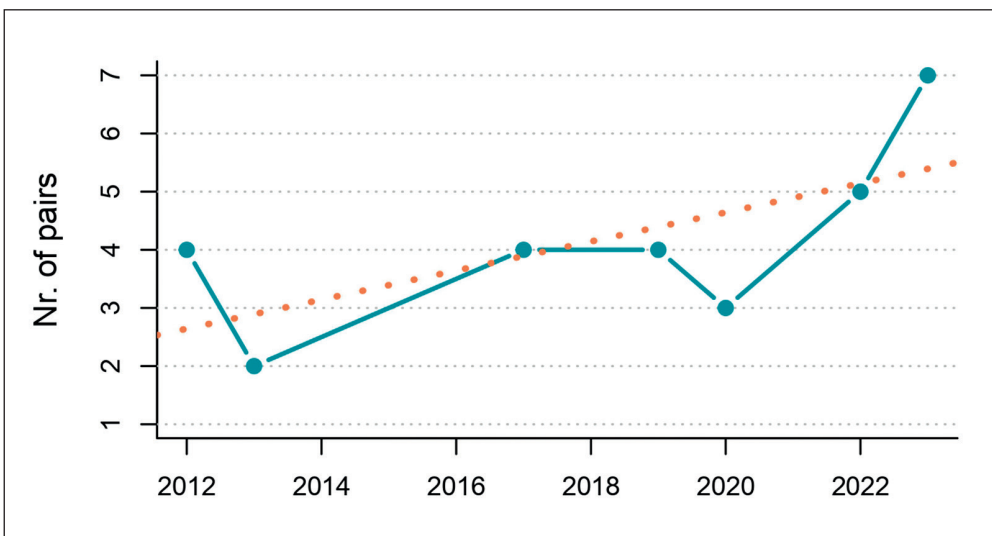


Figure 3. The trend of the Dobrudjan Saker population for 2012–2023

3. ábra A dobudzsai kerecsensólyom-állomány alakulása 2012 és 2023 között

In 2022 and 2023, a series of demographical parameters have been collected (Table 1) to compare the Dobrudjan sub-population with the Central European population. Despite some differences, which will be detailed below, most of the values are consistent, or close to the values of demographical parameters for the Central European population.

Table 1. Demographical parameters of the Saker's Dobrudjan Population

1. táblázat A kerecsensólyom dobрудzsai populációjának demográfiai paraméterei

Demographical parameters	2022	2023
No. Pulli	13	14
Mean Brood Size	3.25	2.33
Breeding success	0.8	0.86

Breeding requirements/habitat use

Regarding the use of artificial nests, our data suggest that in a 10-year period the Saker pairs in Dobrudja shifted almost completely towards artificial nests. All of the four known breeding attempts of Sakers from 2012 were in old Hooded Crow nests. The shift occurred during the period of 2015–2016 and for a time, between 2018 and 2021, all known Saker breeding attempts were detected in artificial nests (Figure 4). In 2017 a breeding pair was detected outside Dobrudja, in Teleorman county, in an abandoned nest of Common Raven. In 2022, a pair bred successfully in an old nest of Long-legged Buzzards in Dobrudja, while in 2023, we had two pairs using Long-legged Buzzard nests, one of them having transitioned from an artificial nest box following a failed breeding the year before.

Occupied Saker nests were both further away (Wilcoxon's rank sum test, $W=1898.5$, $P=0.013$) (Figure 5) and had significantly less grassland areas around them in a 4 km radius than unoccupied nests ($W=3494.5$, $P<0.001$) (Figure 6), though the difference became not significant when calculating with a 10 km radius ($W=2876$, $P=0.105$).

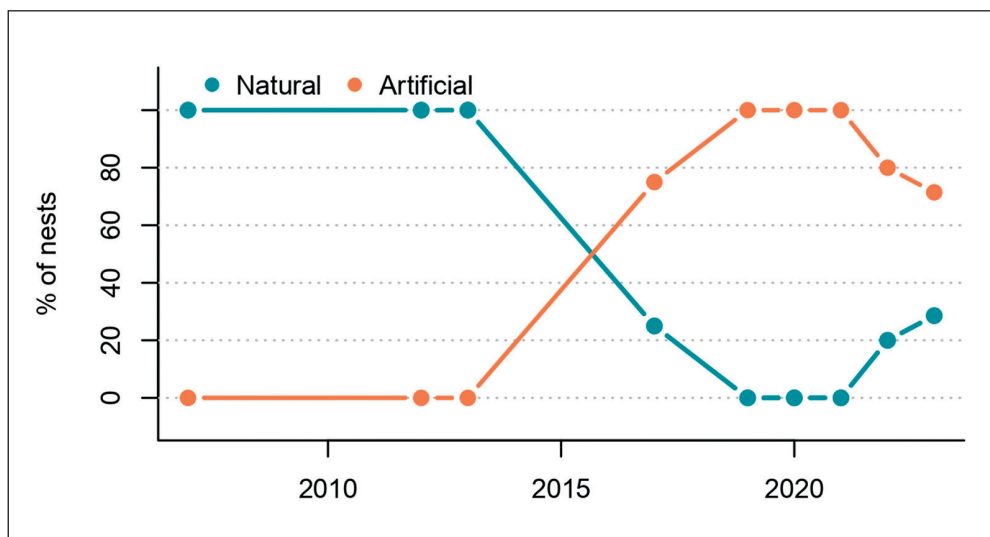


Figure 4. Ratio of occupied natural and artificial nests between 2007 and 2023
 4. ábra A foglalt természetes és mesterséges fészkek arányának változása 2007 és 2023 között

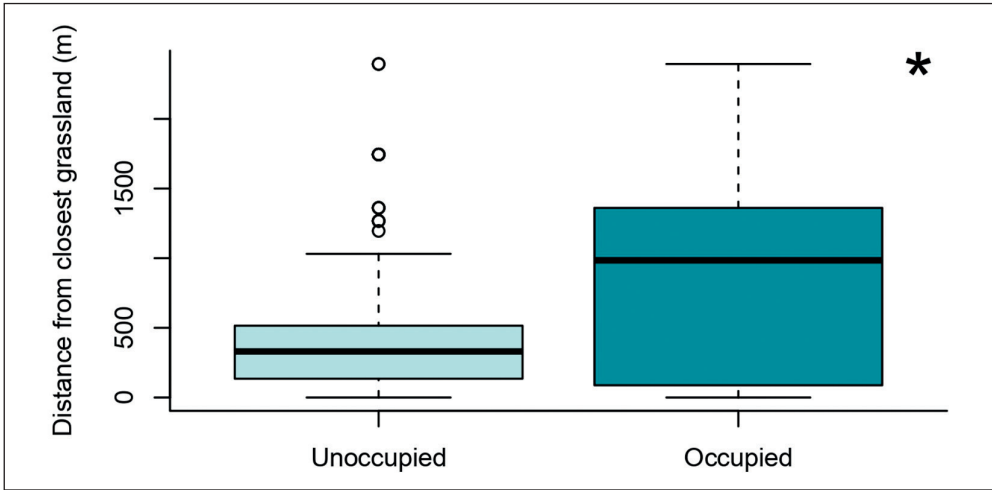


Figure 5. Distance of occupied and unoccupied nests from the closest grassland
5. ábra A foglalt és nem foglalt fészkek távolsága a legközelebbi gyeptől

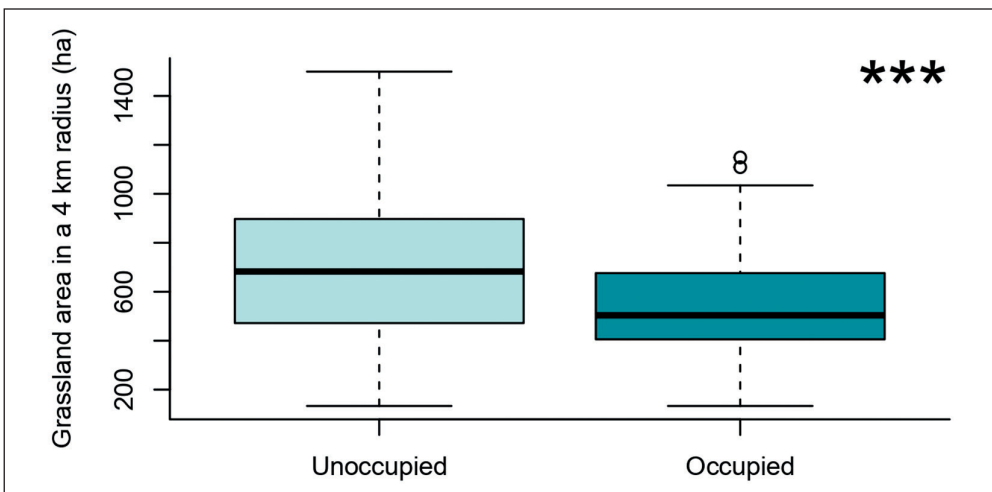


Figure 6. Grassland area in the 4 km radius of the occupied and unoccupied nests
6. ábra A foglalt és nem foglalt fészkek 4 km-es körzetében található gyepek összfelülete

The area of agricultural land was significantly larger in occupied territories in all distance categories ($W=1074.5$, $P<0.001$) (Figure 7). We found no significant difference between occupied and unoccupied nests in terms of distance to agricultural habitats ($W=1695$, $P=0.24$).

The human settlement area was significantly smaller in occupied territories ($W=3036.5$, $P=0.034$) (Figure 8), and the distance of the nest from the settlements also had a significant effect on site choice, occupied nests being further away ($W=1975.5$, $P=0.025$) (Figure 9).

Occupied territories had significantly fewer woodland habitats compared to unoccupied ones in all buffer categories ($W=3655$, $P<0.001$) (Figure 10).

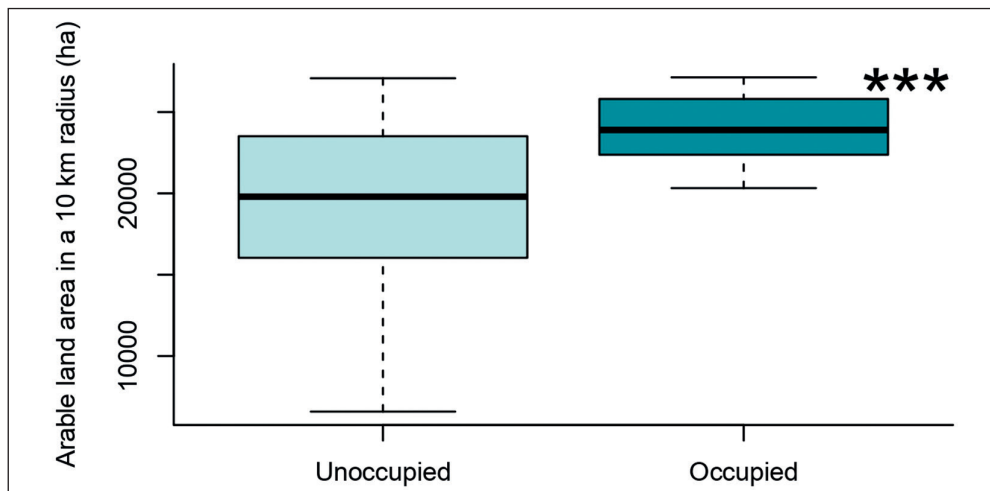


Figure 7. Farmland area in the 10 km radius of the occupied and unoccupied nests
 7. ábra A foglalt és nem foglalt fészkek 10 km-es körzetében található szántók összfelülete

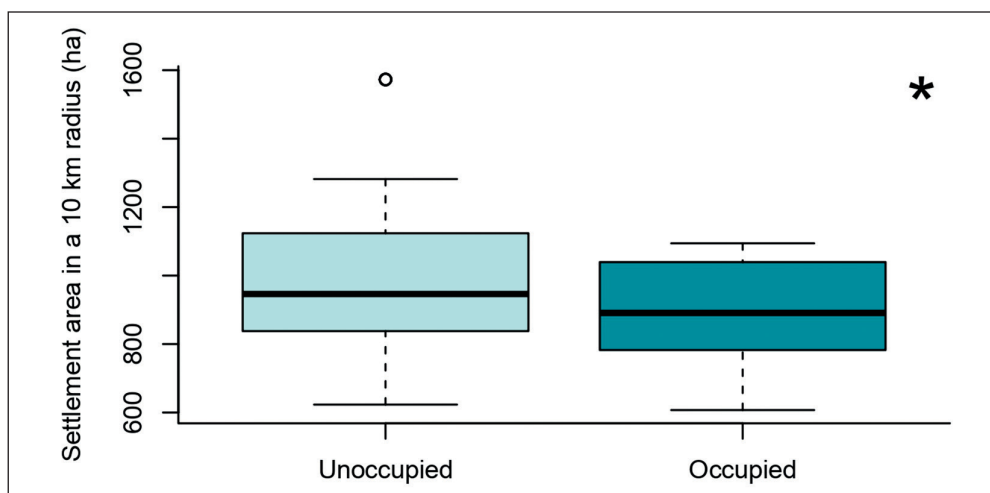


Figure 8. Settlement area in the 10 km radius of the occupied and unoccupied nests
 8. ábra A foglalt és nem foglalt fészkek 10 km-es körzetében található települések összfelülete

The effect of the wind turbine proximity was only significant when excluding the nestboxes falling outside of the current range of the species ($W=1223.5$, $P=0.031$) (Figure 11), the closest occupied nest being found at 2 km from a turbine.

The number of turbines in different distance categories was significantly higher around unoccupied nests for up to 10 km ($W=84575$, $P=0.008$) (Figure 12), the maximum area taken up by wind farms being under 6% around occupied nests for up to a radius of 20 km.

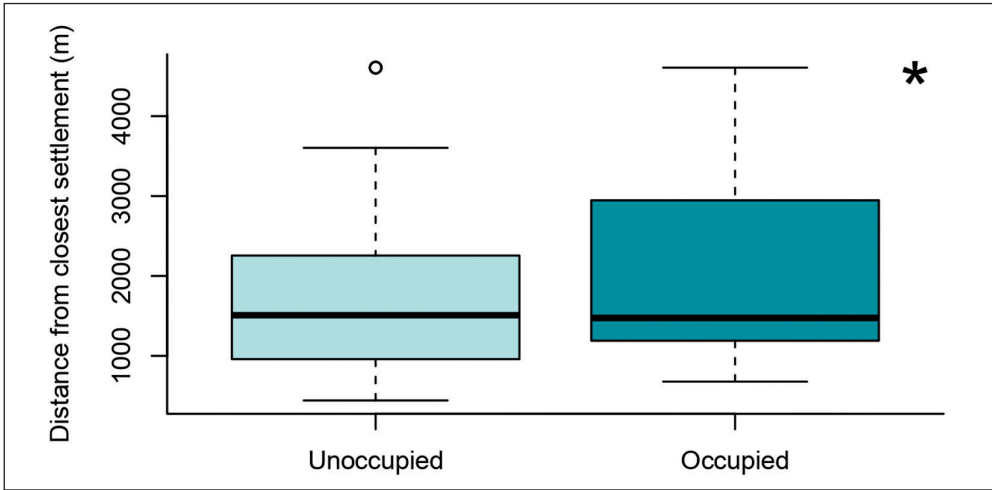


Figure 9. Distance of occupied and unoccupied nests from the closest settlement
 9. ábra A foglalt és nem foglalt fészkek távolsága a legközelebbi településtől

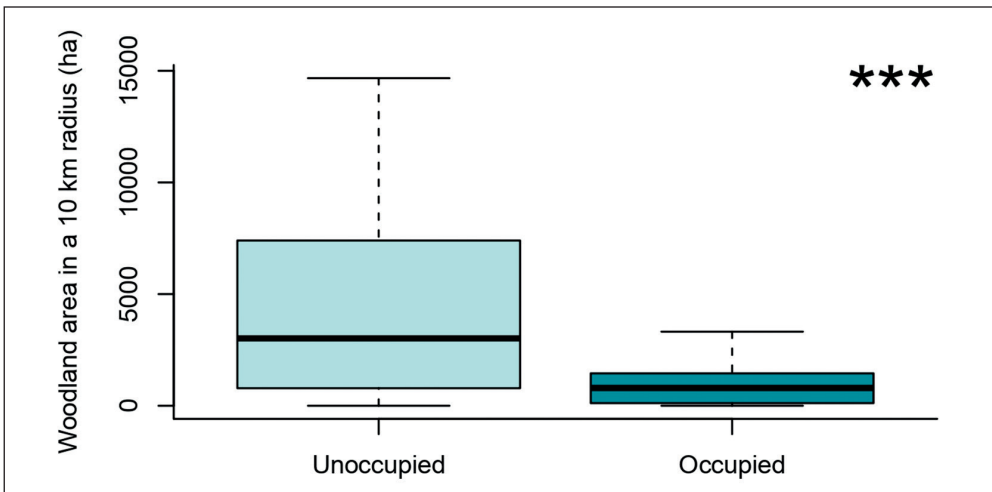


Figure 10. Woodland area in the 10 km radius of the occupied and unoccupied nests
 10. ábra A foglalt és nem foglalt fészkek 10 km-es körzetében található erdők összfelülete

Discussion

Trend and population size

With 7–9 pairs, the Saker population in Southern Romania has a very small size. The core of the population is in Dobrudja, with scattered breeding attempts in the rest of Southern Romania. At the same time, many areas in the potential range were searched only once in this period, therefore we cannot exclude the possibility that some pairs were missed. Even so, casual observations of adult Sakers are also lacking in most of the range outside of

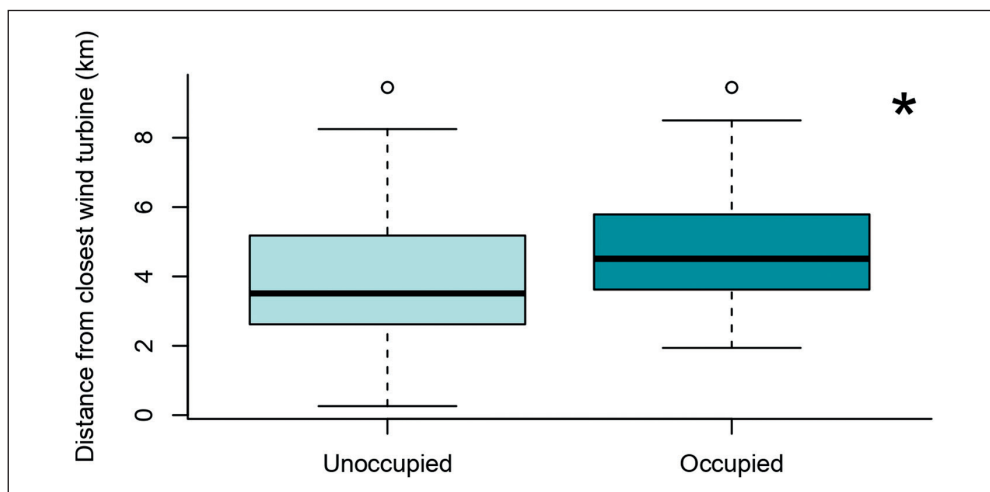


Figure 11. Distance of occupied and unoccupied nests from the closest wind turbine
 11. ábra A foglalt és nem foglalt fészkek távolsága a legközelebbi szélerőműtől

Dobrudja, so probably the real size of the population is not considerably bigger than our estimate.

The short-term trend (for the period of 2012–2023) for this population is showing an increase. However, due to the fact that the monitoring effort was considerably increased in 2022 and 2023, when more breeding pairs were found, we cannot exclude the possibility that the perceived increase in population size is an artefact, and the real trend could be considered stable. Using a generation length of 6.08 years (Bird *et al.* 2020), the calculated population trend is covering almost two generation lengths (1.81 generations). Considering historical accounts which present the species as “frequent” in the plains along the Danube and in the Danube Delta, we can assume that the long-term trend is strongly decreasing. Even if the trend for two generations is increasing, assuming a maximum of 18 mature individuals, the regional population of Sakers in Dobrudja qualifies as Critically Endangered based on the D1 criterion. This status is more severe than the status of the whole Romanian population which is considered Endangered (MEWF 2022), mainly due to the higher numbers of the western population. On a larger scale, if we include the other populations in the Pontic range, the ‘Critically Endangered’ status likely would not apply, especially considering the possibly declining but still considerable Ukrainian population, which brings the estimated Eastern European population to between 168 and 333 pairs in 2022 (Prommer *et al.* 2025).

At a national level, there is a discrepancy between the populational trends and the speed of recovery of the two populations breeding in Romania. Even if both populations benefited from the same conservation measures, the Sakers breeding in Western Romania have a larger number of breeding pairs and the trend is strongly ascending (Hegyeli *et al.* 2019). The European Ground Squirrel (*Spermophilus citellus*) population, one of the main preys of the Saker, is considerably more abundant in Dobrudja compared to the western part of the country (Baltag *et al.* 2016), thus we consider that the speed of recovery is not necessarily related to the food availability in Dobrudja.

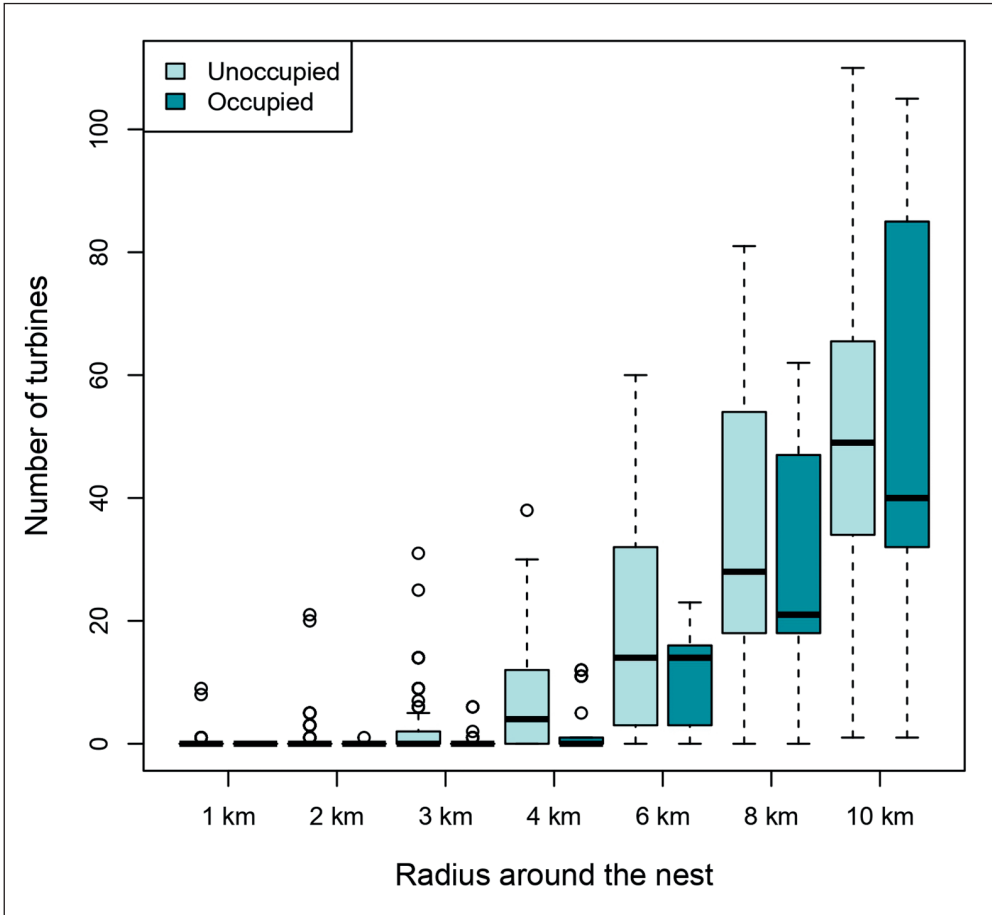


Figure 12. Number of wind turbines in the 1, 2, 3, 4, 6, 8 and 10 km radius of the occupied and unoccupied nests

12. ábra A foglalt és nem foglalt fészkek 1, 2, 3, 4, 6, 8 és 10 km-es körzetében található szélérőművek száma

One of the possible reasons for the different speed of recovery of the two groups could be the immigration rate, which could be higher in the case of the western birds. While the previous statement is only a speculation, the immigration of new breeding birds could occur mainly through the establishment of adult birds from the Ukrainian and Moldavian population, which are in the closer proximity of Dobrudja. This type of colonisation has occurred in the western part of Romania where, through the observations of ringed birds, has been established that a significant part of the breeding birds came from Hungary (Hegyeli *et al.* 2019), the closest natural population in that case being represented by the Central European population. The exchange of genes between the Central European and Pontic populations is considered to be insignificant and isolated (Prommer *et al.* 2014), so the colonisation by new pairs should appear from Moldavian or Ukrainian pairs, which are geographically closer. In the case of the breeding population of Dobrudja, the probability of

colonisation with adult birds from Ukraine or Moldavia is unknown due to the lack of data both from ringed and satellite tagged birds from these countries. Recent monitoring efforts suggest that the Moldavian population became extinct (Ajder *et al.* 2025) and the trend in Ukraine is unknown, so the potential of immigration could be reduced for the Sakers in Dobrudja, and even more so further west, for a colonisation in Southern Romania.

Exceptionally, immigration of breeding birds could also happen from birds born in other populations which could establish for breeding in Dobrudja or Southern Romania. Studies based on satellite telemetry have shown that both Hungarian (Prommer *et al.* 2012) and, in a smaller percent, Ukrainian (Prommer *et al.* 2014) immature birds have appeared both in Dobrudja and Southern Romania. In the literature, there are also accounts of birds belonging to the Central European population that have established temporary settlement areas in Dobrudja (Prommer *et al.* 2014). Birds from Ukraine have the tendency to disperse towards east/northeast (Prommer *et al.* 2014) in the post-fledging period, so the likelihood of such birds to disperse to Southern Romania is rather small. The telemetric study on the Ukrainian birds had a limited number of specimens, so the author of the study considered that a more ample study with more birds could show different results (Prommer *et al.* 2014). Most of the immatures from the Central European population that dispersed to Eastern Europe returned to their natal areas to breed when reaching adulthood (Prommer *et al.* 2012), thus the probability of an immigration by this type of colonisation is negligible (Prommer *et al.* 2012, 2014). To date, there is only one known case for a falcon hatched in the Central European population that bred in the Pontic population, in Crimea (Prommer *et al.* 2014, Hegyeli *et al.* 2019).

A series of demographical parameters (mean brood size and breeding success) are available in literature for the Saker's Central European population (Prommer *et al.* 2025). The values of these parameters are comparable with the values for the Saker pairs that breed in Dobrudja. The mean brood size of 3.25 in 2022 for the Dobrudjan pairs is above the values of the mean brood size for most of the countries from the Central European population in the same year, being exceeded only by the value of Slovakian pairs (Prommer *et al.* 2024). By contrast, the breeding success (0.8) in 2022 for the Dobrudjan pairs was noticeably smaller than the similar value (0.89) for the Central European population. For the moment, we do not have enough data to explain this difference in the breeding success, but taking into account the high value of the mean brood size probably this is not related to possible differences in the food richness or availability between the two populations. For a more comprehensive and meaningful comparison, a larger data set for the Dobrudjan pairs is required.

Breeding requirements/habitat use

Previously metal artificial nests have been extensively used in the Central European strongholds but not in the Pontic area, where only a few wooden artificial nests were installed in the past. The occupancy rate of those nests was low. The installation of 31 metal nest boxes on power line pylons allowed us witnessing how the species that naturally used to occupy other species' nests shifted its preference to artificial nests.

Once the artificial nests became available, the Sakers occupied the new opportunities leaving natural nests built by other species. In 2012 when the artificial nests were not available, all known four breeding attempts were in Hooded Crows' old nests. In Hungary, this type of nest ensured the smallest breeding success for the species with a 46% degree of failure for the Saker broods laid in old Hooded Crow nests (Bagyura *et al.* 2012). Before the instalment of artificial nests, this was the most frequent nest type available for Sakers in Dobrudja too. Other, bigger natural nests built e.g. by Ravens were scarce, considering the low abundance of Ravens in the areas occupied by Sakers at that time. After the installation of the artificial nests, no breeding attempts in Hooded Crow nests have been detected. Once safer opportunities became available, the species moved toward those, following the same trend as in Hungary (Bagyura *et al.* 2012) and Slovakia (Noskovic *et al.* 2016). In 2016 and 2022, we managed to register breeding attempts in old Raven and Long-legged Buzzard nests. Considering that, it is likely that some breeding attempts in natural nests were overseen during the monitoring due to the insufficient coverage of the areas where the species can appear. In 2023, however, we have registered one case when a shift towards a natural nest happened. This pair had a failed breeding attempt during the 2022 season in an artificial nest, and in the next breeding season they moved to a neighbouring natural nest, which in 2022 was occupied by a Long-legged Buzzard pair. This last case is singular and does not affect the general conclusion, namely that the species moves towards artificial nests, if these structures are associated with an increase in reproductive success.

While we found a contradictory relationship between occupied Saker territories and both grassland proximity and area, this can be explained by the birds' willingness to travel greater distances in search of more abundant feeding sites, as found by Prommer *et al.* (2018). It should be noted that all occupied nests had over 2,000 ha grassland habitats in their 10 km radius. Another explanation could also be a shift in diet as found by Chavko *et al.* (2014, 2019) in the Slovakian population, where up to 62% of the Sakers' diet consisted of feral pigeons. This would also explain the Sakers occupying territories with larger agricultural areas, though there is need both for telemetric data and diet analysis for the Sakers breeding in Dobrudja to confirm it. We would also need more data to clarify whether Saker Falcons avoid nest boxes surrounded with larger forest areas because of smaller hunting grounds (Nemcek *et al.* 2016), or because the trees offer alternative nesting sites. This latter theory is also supported by the fact that one of the earliest documented pairs in the region, in the Măcin Mountains, while breeding on a cliff, had a 52% forest coverage in a 10 km radius around the nest.

Regarding restrictive factors, the birds also showed a preference for less populated areas and nests further away from settlements, but we documented, though only a single instance of, an occupied nest as close as 700 m to a village. One of the territories that was occupied at least 6 times for the past 9 years is also only 1,200 m from the nearest settlement.

In line with the findings of Prommer and Bagyura (2015), the birds avoided to occupy nest boxes less than 2 km from wind turbines. We also have a documented case in Dobrudja of a pair attempting, then abandoning breeding as wind turbines were being erected first at less than 900, then at under 300 m from the nest (Fidlóczky 2013). Excepting the historical territory in the Măcin Mountains and the one in Teleorman county (at more than 250 km from the other nesting sites), all nests had wind farms in their 10 km radius. Still, at all

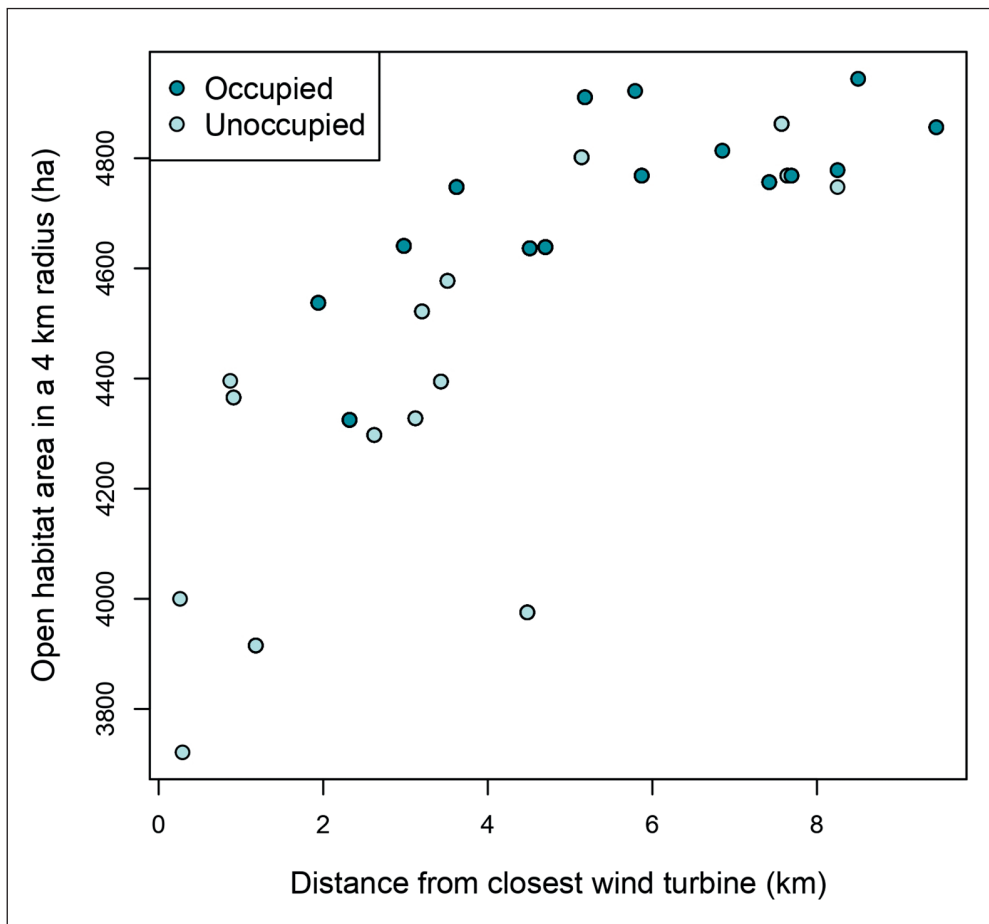


Figure 13. Open habitat area in the 4 km radius and distance to closest wind turbine from the occupied and unoccupied nests

13. ábra A foglalt és nem foglalt fészkek 4 km-es körzetében található gyepek összfelülete és a fészkek távolsága a legközelebbi szélérőmtől

distance categories, up to 10 km, the number of turbines was significantly lower in the occupied territories, showing that the birds would occupy a nesting site up to 2 km from a wind turbine, as long as the wind farms take up less than 6% of the area and there is at least 25,000 ha of open habitat in a radius of 10 km around the nest (Figure 13). Though we lack telemetry data from the Sakers breeding in this region, and thus do not have information regarding their movements and the exact shape of their home ranges, based on the studies of Prommer and Bagyura (2015) as well as Nemček *et al.* (2016), we can assume that they generally avoid the windfarms and hunt in the available open habitats. Considering the large-scale development of wind farms in the past and foreseeable future in Dobrudja, as well as the rather limited range of Sakers in this region, great care should be taken in both planning and approval of new wind farms, to not further restrict their distribution by cutting them and other raptor species off from their breeding and feeding grounds.

Acknowledgements

The artificial platforms which have been the base of our analyses regarding habitat use were funded and mounted during the LIFE09 NAT/HU/000384 “Conservation of *Falco cherrug* in Northeast Bulgaria, Hungary, Romania and Slovakia” project. Field work from 2022 was funded by the LIFE20 NAT/BG/001162 “Securing the recovery of the Endangered Saker Falcon in Bulgaria and Southern Romania” project. Both projects were supported by the LIFE-Nature fund of the European Union. Monitoring efforts in 2016, 2017, 2019 and 2020 were funded by the Romanian Ornithological Society/Birdlife Romania.

We would like to thank the following people who have supported in a way or another the work for this paper: Marius Drugă, who was part of SOR’s team during the implementation of the LIFE09 NAT/HU/000384 “Conservation of *Falco cherrug* in Northeast Bulgaria, Hungary, Romania and Slovakia” project, Attila Nagy and Lőrincz Bărbos from the Milvus Group Association, for kindly providing their data regarding the Sakers from their 2019 expedition in Dobrudja, Zsolt Hegyeli from the Milvus Group Association, for providing information regarding the breeding population of Sakers from Western Romania, Cornel Cotorogea, who voluntarily provided data in 2021, Paul Țibu, who participated in the fieldwork in 2016 and Alexandru Birău, who participated in the field work in 2022 and 2023.

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