

Field protocol for the population monitoring of Saker Falcons (*Falco cherrug*) in Hungary

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Abstract The Saker Falcon population in Europe is divided into two main blocks: the Central European and Eastern European populations. Although these groups are somewhat connected, they do not form a single reproductive population. The Eastern European population is highly fragmented and spreads across a vast area, posing significant challenges for monitoring due to geographical and political barriers. In contrast, the Central European population is more compact but extends across seven countries, making cross-border coordination essential. Despite ongoing monitoring programmes in the countries in question, there is a lack of harmonisation in the methods and terminology used, complicating efforts to collect, compare and interpret data effectively on European level. This article draws on decades of experience from Hungary, where a comprehensive monitoring protocol for the Saker Falcon has been developed and refined over the years. Based on this experience, the authors propose common standards covering various aspects of monitoring, including field visits, ringing, satellite tracking, sampling, health and safety, and documentation. These standards are not intended to replace existing methodologies but serve as a base for harmonised Saker Falcon monitoring across Europe. Standardization is critical to ensure that data from different countries are compatible and continuous, enabling more accurate assessments of the species' conservation status and more effective planning of conservation measures at a European level. The authors emphasize that their goal is not to prescribe the only effective methods but to highlight the need for agreed-upon terminology and harmonised monitoring methods. This article aims to initiate a discussion among Saker Falcon experts across Europe, encouraging collaboration to develop consistent and compatible methodologies that will enhance coordinated conservation efforts for this endangered species.

Keywords: Saker Falcon, raptor, endangered species, monitoring, conservation, protocol

Összefoglalás A kerecsensólyom európai állománya közép-európai és kelet-európai populációkra oszlik. Bár ezek bizonyos mértékig kapcsolódnak egymáshoz, nem alkotnak összefüggő állományt. A kelet-európai populáció erősen széttagolt, és elterjedési területe hatalmas, ami földrajzi és politikai okokból jelentős kihívást jelent a monitorozás szempontjából. Ezzel szemben a közép-európai populáció kompaktabb, de hét országot ölel fel, ami elengedhetetlenül teszi a határokon átnyúló koordinációt. Bár a szóban forgó országokban folynak a monitoring programok, a módszerek és a terminológia egységességének hiánya európai szinten megnehezíti az adatok hatékony gyűjtését, összehasonlítását és értelmezését. Ez a cikk a magyarországi évtizedes tapasztalatokat dolgozza fel, ahol az évek során kidolgozták és finomították a kerecsensólyom átfogó monitoring protokollját. Ezen tapasztalatok alapján a szerzők közös módszertant javasolnak a monitoring különböző elemeire, beleértve a fészekellenőrzéseket, a gyűrűzést, a műholdas nyomkövetést, a mintavételt, az egészségügyi és biztonsági előírásokat, valamint a dokumentációt. Ez a módszertan nem kívánja felváltani a már meglévőket, hanem inkább alapot kíván adni a kerecsensólyom monitorozásának harmonizálására. Az egységésítés elengedhetetlen ahhoz, hogy a különböző országokból származó adatok kompatibilisek és folyamatosak legyenek, lehetővé téve a faj védelmi helyzetének pontosabb felmérését és hatékonyabb védelmi intézkedések megtervezését európai szinten. A szerzők hangsúlyozzák, hogy a céljuk nem egy egyedüli hatékony módszertan leírása, hanem a figyelmet szeretnék felhívni a közös terminológia és az egységes monitoring módszerek szükségességére. E cikk célja, hogy párbeszédet indítson el a kerecsensólyom európai szakértői között, ösztönözve az együttműködést a következetes és összehangolt

módszertan kidolgozása érdekében, amely segíti az összehangolt védelmi erőfeszítések megvalósítását e veszélyeztetett faj megővése érdekében.

Kulcsszavak: kerecsensólyom, ragadozómadár, veszélyeztetett faj, monitoring, természetvédelem, protokoll

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Introduction

Population monitoring and individual marking methods are essential elements of raptor research and conservation, as many biologically important parameters can only be evaluated with the help of such long-term datasets (Newton 1979). However, these research methods, which usually require approaching nesting sites at great height, and capturing and handling birds, are inevitably posing risks to both the birds and the personnel involved. Therefore, such research should be carried out within well-planned and coordinated frameworks, using the most efficient methods and utmost caution (Hardey *et al.* 2013).

The Saker Falcon (*Falco cherrug*) is a globally endangered Eurasian bird species, which suffered population decrease and range reduction in the past decades (BirdLife International 2021). Europe holds only about ~10% of the global population or even less (BirdLife International 2021, Prommer *et al.* 2024a), but this small European population is significantly different genetically from the Asian Sakers (Zinevich *et al.* 2023). The European population consists of two distinct (sub)populations: one in Central Europe (Austria, Croatia, Czechia, Hungary, Serbia, Slovakia and Western Romania) and one in Eastern Europe (Armenia, Bulgaria, Moldova, Eastern Romania, Türkiye and Ukraine) (Prommer *et al.* 2025). While the continuous Central European subpopulation is increasing and well-studied, the eastern subpopulation is fragmented and has been declining dramatically over the past decades. Additionally, our knowledge of that subpopulation can be considered scarce (Aghababayan *et al.* 2025, Ajder *et al.* 2025, Arkumarev *et al.* 2025, Fântână *et al.* 2025, Prommer *et al.* 2025). Regular monitoring of Saker Falcon breeding populations is ongoing in several European countries, such as Slovakia (Chavko *et al.* 2025), Austria (Zink *et al.* 2025), Czech Republic (Škorpíková *et al.* 2025), and less regularly in Armenia (Aghababayan *et al.* 2025), Bulgaria (Arkumarev *et al.* 2025), Moldova (Ajder *et al.* 2025), Romania (Fântână *et al.* 2025) and Serbia (Puzović 2024). Although those population surveys follow more-or-less detailed monitoring protocols in each country, no detailed methodology and suggested practices have been published until now. Consequently, the potential inconsistencies in methodology and/or terminology can hamper the comparison, aggregation and interpretation of national datasets. Therefore, harmonisation of monitoring methods and terminology across the European breeding range is more than desirable. It is especially important in Central Europe, where a single continuous population expands beyond political borders to several countries.

This paper attempts to give a suggestion for such harmonisation by providing an example through one of the longest running Saker Falcon monitoring programmes globally. The

article summarizes the practical experience gathered during the field monitoring of the species in Hungary over the past five decades and introduces a methodological protocol that can serve as a reference for national and international monitoring programmes focusing on the Saker Falcon.

Methods

In the past five decades, conservation efforts in Hungary that have been largely based on the annual population surveys, played a crucial role in the survival of the species in Europe (Bagyura *et al.* 2012). Monitoring of raptor populations has a long tradition in Hungary and monitoring schemes for most of the strictly protected species have already been running for several decades (Haraszthy & Bagyura 1993, Kovács *et al.* 2012). Those schemes result in detailed datasets that can be used for analysing population dynamics and ecology, as well as breeding biology (e.g. Horváth *et al.* 2014). Accordingly, the Saker population in Hungary is the largest and one of the longest monitored populations in the European Union (Kovács *et al.* 2014).

The first significant population surveys and focussed conservation efforts for the Saker Falcon began in 1974 in Hungary, when MME BirdLife Hungary (Hungarian Ornithological and Nature Conservation Society) was founded. By 1980, these surveys had become regular, and the monitoring methodology was continuously developed over the following decades in close cooperation with national park directorates, the ranger service, and various non-governmental and governmental organisations (Bagyura *et al.* 2022, Bagyura *et al.* 2025). As the bulk of the Saker Falcon population has been breeding on the high-voltage (120–400 kV) powerline network since the mid-1990s, the MAVIR Zrt. (Hungarian Transmission System Operator Company Ltd.) and distribution system operator companies became key partners in the monitoring programme.

The Saker monitoring and research are coordinated on national level to minimise disturbance and standardise data collection. All research activities must be pre-agreed and harmonised with the relevant national park directorates, as well as with the Saker Falcon conservation coordinator appointed by the MME Raptor Protection Group and the Hungarian Raptor Conservation Council. The execution of the work is facilitated by cooperation agreements between MME, the National Park Directorates and MAVIR Zrt.

The “traditional” field monitoring of nesting sites has been undertaken since the beginning of the programme, which included observations of nesting sites several (usually 2–5) times during the breeding season and ringing activities once a year at selected nesting sites (Bagyura *et al.* 2019a, Bagyura *et al.* 2023). Modern technology has enabled the application of new methods, such as satellite tracking since 2006 (Prommer & Bagyura 2009, 2010, 2023), camera traps since 2011 (Bagyura *et al.* 2014), genetic analyses since 2016 (Bagyura *et al.* 2019b) and drones since 2020.

The presented methods were elaborated to gather datasets annually, to answer the following biological and conservation questions, and monitor their trends in long-term:

– What is the size of the breeding population and breeding success? (population dynamics)

- What is the extent of the distribution area and what are the habitats preferred for nesting? (habitat selection)
- What are the survival rates of different age groups and sexes? (survival)
- What is the significance of various mortality causes? (mortality)
- What is the proportion of different prey species? (foraging ecology)
- When, how far, and in what direction do young birds choose nesting sites relative to their fledging site? (natal dispersal)
- How regularly and how far do breeding birds switch nesting sites? (breeding dispersal)
- What areas and habitats do non-breeding birds use? (temporary settlement areas, migration routes, wintering areas)
- What areas and habitats do breeding birds use during and outside the breeding season? (home range)

Results

Definition and monitoring of breeding stages

The breeding season of Saker Falcons in Hungary is between February and July, and territorial birds usually spend the whole year within or close to their territories. We suggest not to handle those territories as “active” for a given breeding season, where the presence of birds/pairs was only detected before mid-March or where only single birds were observed during the breeding season without the proof of breeding. Similarly, observations in a territory only after mid-June can be also misleading, because by this time both adults and juveniles can appear further from their active/natal nests. The dependence period (when nestlings are depending on their parents for food) lasts usually till mid-July, by when most of the juveniles will leave the natal territories eventually.

To gather data from each main breeding stages (i.e. territory occupancy, incubation, rearing and fledging) usually five inspections are suggested between March and June (*Figure 1*). We apply the following categories and timing to monitor nest status at the various stages (the monitored parameters are given in *italics*):

(1) Territory occupation stage (*territorial pairs, TP*): The best period to locate active nesting sites is middle or second half of March, when the birds are starting or just before egg-laying and should be around the nest sites most of the day. This period is also suitable for searching tree-nesting pairs as nests are usually well-visible on leafless deciduous trees. Like other falcons, Saker Falcons do not actively build or renovate nests. However, territorial pairs may visit and inspect several available nests within their territory before egg-laying. Therefore, we suggest not to define a separate “nesting” stage, due to overlapping behaviour and timing (in contrast to most accipitrid raptors, which build or renovate their own nests, therefore nesting can be usually distinguished objectively both from territory occupancy and breeding).

(2) Incubation stage (*breeding pairs, BP*): Egg-laying can be detected most precisely in the beginning of April. Most of the pairs already start the incubation in middle or late March, but some pairs usually start egg-laying a few weeks later. The incubation lasts for 34–35

Saker Falcon (<i>Falco cherrug</i>) population monitoring in Hungary		February			March			April			May			June			July		
		1-10	11-20	21-28	1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20	21-30	1-10	11-20	21-31
Annual breeding cycle	Territory occupation	█	█	█	█	█	█	█											
	Incubation				L														
	Chick rearing								H	SN	MN	LN	F						
	Dependence period																		
Monitoring methods	Territory monitoring				TP		BP		HP		RP		SP						
	Breeding success						NE*		NH*		NN		NF						
	Drone inspection																		
	Ringling																		
	Mounting telemetry																		
	Nest camera																		

Figure 1. Annual breeding cycle and suggested timing of monitoring methods for Saker Falcons in Hungary. Darker colour represents the main periods, while lighter colours the possible but not usual timing. The most common timing of main breeding stages is indicated within the breeding cycle: egg-laying (L), hatching (H), small nestlings (SN), medium-aged nestlings (MN), large nestlings (LN) and fledglings (F). The suggested breeding parameters to be monitored are indicated within the monitoring methods: territorial pairs (TP), breeding pairs (BP), hatching pairs (HP), nestling rearing pairs (RP), successful pairs (SP), number of eggs (NE), number of hatchlings (NH), number of medium-aged nestlings (NN), number of fledglings (NF). *: NE and NH are not suggested to be monitored in the frame of general population monitoring (see notes in the text)

1. ábra Kerecsensólymok éves költési ciklusa és a monitoring módszerek javasolt időzítése Magyarországon. A sötétebb színek a legjellemzőbb, míg a világos színek a kevésbé gyakran előforduló időszakokat jelzik. A legjellemzőbb költési időszakok a költési cikluson belül: tojásrakás (L), kelés (H), kis fiókák (SN), középkorú fiókák (MN), nagy fiókák (LN) és kirepült fiókák (F). A monitorozásra javasolt költési paraméterek a monitoring módszereken belül: territoriális párok (TP), költő párok (BP), keltető párok (HP), fiókanevelő párok (RP), sikeres párok (SP), tojások száma (NE), kikelt fiókák száma (NH), középkorú fiókák száma (NN), kirepült fiókák száma (NF). *: az NE és NH paramétereket nem javasoljuk monitorozni az általános populációs monitoring során (ld. megjegyzéseket a szövegben)

days in average in Hungary (Bagyura *et al.* 2022), therefore early April is the period when almost all the breeding pairs are incubating. This period is also suitable to check alternative nesting sites within the territory (within 5–10 km radius) if the nests used in previous years have been abandoned, and pairs were not present nearby. We do not suggest monitoring the *number of eggs (NE)* in the frame of general population monitoring, to avoid unnecessary disturbance and threat posed by chasing the parents from their nests. Therefore, we suggest defining breeding pairs indirectly based on the behaviour of parents, i.e. when one of the parents is lying horizontally in the nest almost constantly and they do not leave the eggs unattended for more than 30 minutes. In case of longer observations, the care and/or turning of the eggs in the nest cup can be also detected. Unfortunately, *NE* cannot be estimated

indirectly, as the chances to detect the remains of the unhatched/rotten eggs in later stages is incidental. After a while they explode, and the eggshell pieces deteriorate into the nest material among other prey remains.

(3) Hatching stage (*hatching pairs, HP*): In the end of April, presence of nestlings can already be detected in most of the cases, either by direct observation or indirectly by the behaviour of parents. Although brood size usually cannot be determined accurately at this stage, we do not recommend to monitor *number of hatchlings (NH)* in the frame of general population monitoring either, because chasing away the parents could decrease the survival of hatchlings or eggs (as incubation can still be ongoing in case of late-breeding pairs, and there can be up to a several days difference in hatching between the first and last hatching in case of larger broods Bagyura *et al.* 2022). The time of return of parents after such an intervention is unpredictable and even a short time exposure of hatchlings/eggs to direct sun, cold, rain or predators – as a result of the absence of parents – increases the chance of mortality. Similarly to the *number of eggs (NE)*, the number of hatchlings cannot be estimated indirectly either, as the chances to detect the carcasses of hatchlings in later stages is minimal. Parents can take them out, siblings can eat them, or they simply decay, and their small remnants are incorporated into the nest material among other prey remains.

(4) Nestling rearing stage (*rearing pairs, RP*): Mid-May is the first period when there is a good chance to determine brood-size by the *number of medium-aged nestlings (NN)*, when the nestlings are about 15–25 days old in average. This period is also the peak season for ringing and/or drone inspection, which are the most accurate methods to determine NN (see below).

(5) Fledging stage (*successful pairs, SP*): Juveniles start fledging usually in early June and at this stage the brood can be usually observed inside or close to the nest. Although, brood size sometimes cannot be determined accurately and a proportion of juveniles can be missed at this stage as well, unless long-term surveillance (e.g. nest camera or nest-guarding) is applied during the last weeks of breeding. Some juveniles can perch further away from the nests or can hide in the vegetation on the ground, where they spend significant time after fledging. Moreover, some juveniles could be already dead even a few days after fledging, as post-fledging mortality could be significant, and these carcasses are extremely rarely found (unless telemetry and dog-unit is applied). The remains (especially feathers) of large nestling – i.e. which died since mid-May – can be usually detected inside or under the nests, if drone inspection or climbing can be applied (climbing into the nests is not suggested at this stage if fledglings/juveniles are still around the nest). Therefore, if there is no possibility for long-term surveillance of the total population (which is usual for field studies focusing on larger raptor populations), we suggest estimating indirectly the *number of fledglings (NF)* by extracting the detected number of dead nestlings from the number of *middle-aged nestlings (NN)*. Similarly, *successful pairs (SP)* can be estimated by extracting the detected number of breeding failures (i.e. mortality of the total brood of large nestlings) from *rearing pairs (RP)*. Although it should be considered that these estimations could be also biased, as a proportion of dead nestlings can disappear from the nest without any visible signs. Nevertheless, we propose that this indirect estimation is less biased than simply using the number of observed juveniles outside the nest during one or two short-term visits after fledging.

In case the desired number of visits (five occasions) is not possible due to limited capacity, we suggest focusing on three visits (the 1st, 2nd and 4th) to gather cost-effectively the most crucial data for population monitoring. We suggest applying the following three parameters to assess breeding performance for long-term population monitoring:

- success rate (SP/TP);
- brood size (NF/SP);
- productivity (NF/TP).

Other calculation methods can be also applied depending on the available and most reliable parameters (e.g. BP instead of TP), but the selected method should be applied universally for the whole dataset and the limitations of the methodology (e.g. underestimated pre-fledging mortality of large nestlings) must be clearly mentioned.

Definition of nestling age categories

A guide to determining the age of the nestlings is summarized in *Figure 2* based on the following categories (commonly used wider umbrella terms are indicated in brackets):



Figure 2. Age estimation (days after hatching) of Saker Falcon nestlings in Hungary based on average development. See notes in the text (Photo: Márton Horváth & Gábor Tihanyi)

2. ábra Kerecsensólyom-fiókák korbecslése (kelés után eltelt napban) az átlagos fejlődési ütem alapján. További megjegyzéseket lásd a szövegben (Fotó: Horváth Márton és Tihanyi Gábor)

- Days 1–5 (*hatchlings*): Newly hatched, small downy nestlings primarily lie curled up in the nest. Their eyes are still closed, and heads are large compared to their bodies, and they can barely hold them.
- Days 6–10 (*small nestlings*): Fully downy nestlings, with heads still large in proportion to their bodies, but they can now sit stably. Their eyes are open, and they have begun to grow their second set of down feathers.
- Days 11–15 (*small nestlings*): Fully downy nestlings, with head-to-body proportions approaching that of older nestlings. They have grown their second set of down feathers, resulting in dense downy plumage.
- Days 16–18 (*medium-aged nestlings*): The first brown feathers start to appear on the body, visible on the growing primary flight feathers and tail feathers.
- Days 19–21 (*medium-aged nestlings*): In addition to the clearly visible flight and tail feathers, the shoulder coverts also start growing, forming a brown V shape on the back. Besides, first brown feathers also begin to appear on the sides of the chest.
- Days 22–24 (*medium-aged nestlings*): Wing, back, and tail coverts start to grow, and facial feathers begin to emerge, giving the nestlings a mottled appearance, though white down is still more prevalent than brown contour feathers.
- Days 25–27 (*medium-aged nestlings*): Feather growth intensifies across the entire body, with brown feathers becoming dominant, though down is still visible. During this period, the nestlings begin moulting their down feathers, which can often be seen in and around the nest.
- Days 28–30 (*large nestlings*): Down is still visible among the primarily brown body feathers, and the head begins feathering, though the crown remains downy.
- Days 31–35 (*large nestlings*): Only a few down feathers remain visible on the body, and the crown is feathering, but still noticeably downy.
- Days 36–40 (*large nestlings*): Down feathers disappear from the entire body, with only the last few remaining on the crown.
- Days 41–45 (*large nestlings*): The fully feathered nestlings no longer show any down feathers, but the flight and tail feathers are still growing. Their wings and tails are shorter than those of adult birds, they can already flight shorter distances if forced, but they do not yet leave the nest on their own.
- Days 46–55 (*fledglings*): During this period, the primary flight and tail feathers reach their final length. The nestlings begin to leave the nest at varying times and intensities, taking their first flights but still regularly returning to the nest.

It must be mentioned that the categories listed above represent the average development of Saker Falcon nestlings in the Pannonian Region, therefore the development of some individuals can be slower caused by their poor feeding condition or health status. Similarly, the development of nestlings can be slightly different in other geographical populations in East Europe or Asia.

Based on the average development of the oldest nestling within a brood (in case of nestlings which are less than 46 days old) and the average incubation time (34–35 days), the date of egg-laying can be estimated usually within a ± 3 days interval for a given breeding attempt.

Field monitoring of nesting sites

Observations of the nesting sites during field visits should generally be conducted from 500–1,000 m, preferably by using a tripod-mounted spotting scope with 20–60× magnification. Under normal visual conditions, and from a good viewpoint, this distance is usually suitable to check the breeding stage and determine the number of medium- or large-sized nestlings. At the same time, this distance is sufficient to avoid any disturbance to the breeding birds. However, regardless the distance, if we observe that our presence is disturbing the parents, particularly if they leave the nest site during incubation or when the nestlings are small (not older than 12–14 days), we should immediately leave the area to allow parents to return as soon as possible.

It should be noted that during a single, brief observation, the presence of breeding birds might be missed, or – especially in the case of nest boxes on high-voltage power line pylons – the brood size could be easily underestimated. Therefore, we recommend conducting observations over relatively longer intervals (30–60 minutes), repeating the observation during the second half of the rearing period, and combining it with drone surveys to obtain a more accurate determination of brood size. Early morning and late afternoon/evening hours are generally better for observation, as the falcons are more active during these times of the day. In contrast, there may be little to no movement in the middle of the day, especially during the later stages of breeding.

Use of drones in nest monitoring

In recent years, advanced drone technology has become widespread and easily accessible, providing significant assistance in inspecting raptor nests (Gallego García & Sarasola 2021, Bird *et al.* 2024). Visiting nests with drones helps estimating brood size and age of young more accurately than observations from the distance using binoculars or spotting scopes. In most cases, one or two drone visits during the breeding season are sufficient to determine the number and age of nestlings, ideally conducted between 15 and 25 May. Experience suggests that drones equipped with telephoto or zoom lenses are much less invasive and more effective for observing nestlings than those with wide-angle primary lenses. However, it has been observed that brood size can still be underestimated by one or two nestlings, particularly in the early nestling stage and at larger broods (4–5 nestlings) where the nestlings may completely cover each other. Therefore, we recommend taking photos/videos from different angles, repeating the observation during the second half of the rearing period, and always conducting distant scope observations as well to achieve a more accurate determination of brood size.

It is crucial to emphasize that the use of drones also causes significant disturbance to birds, so it should be applied only within the frame of national monitoring programme, and it must be agreed in advance with the species conservation coordinator, or a species expert, and the relevant conservation authority or management (national park directorates in Hungary). Before departure, the pilot should approach the nest as closely as possible (preferably within 100 metres) and maintain a clear view of the drone and its surroundings throughout

the flight. Although there is no available data or experience suggesting that Saker Falcons have ever attacked a drone, we recommend paying extra attention if a bird approaches. If aggressive behaviour is observed toward the drone, it should be moved farther away or landed immediately. The flight should be efficient and brief, with the drone landing or moving away from the nest as soon as the necessary information has been gathered and recorded.

One must pay special attention to avoiding accidents during flight (especially steering clear of people, birds and objects such as power lines). It is also important to note that in the European Union, only pilots with the necessary licenses are permitted to operate drones. Drone operators must comply with all safety regulations and legal requirements, and they must obtain temporary airspace use permits wherever and whenever required.

Approaching the nests

If a particular nest is selected for ringing or telemetry research, it should be climbed only once during the breeding season to minimize disturbance to the birds. The age of the nestlings should be between 15 and 40 days in these nests, in order to avoid significant negative effects on breeding performance.

There can be significant differences, sometimes as much as a month, in the timing of individual breeding attempts. Therefore, it is crucial to assess the progress of each pair's breeding during the nest visits preceding climbing to determine the appropriate timing. Proper timing ensures that the nestlings are not too young to be ringed (see details under *Ringing the nestlings*), thereby avoiding the need for extra climbing and unnecessary disturbance. Additionally, proper timing is more economical, considering labour time and fuel costs.

When at the nest, a final check with a drone is strongly recommended to ensure that all conditions are met for climbing. This check allows us to determine the breeding stage, the number and age of nestlings, and to detect any special circumstances (e.g. a dead bird or a critical health condition). By evaluating the drone footage on the spot, we can make the final decision whether to climb the nest or not. This approach significantly reduces the chances of accidents and unnecessary time spent around the nest.

We avoid climbing to nests with eggs or small nestlings (completely downy, i.e. less than 12–14 days old) to prevent potential mortality from hypothermia or overheating if they are exposed to the sun due to the absence of adults caused by our disturbance. In such cases, we should leave the area as soon as possible to allow the parents to return. Similarly, we do not climb to nests with nestlings close to fledging (no visible downy feathers on the head, i.e. older than 40 days) to avoid forced premature fledging, which could increase mortality rates.

During nest visits for ringing or installing telemetry devices, we should spend only the necessary time within the immediate vicinity (<500 m) of the nest and leave it as soon as possible to minimize disturbing the birds' activities. In most cases, ringing can be completed within 30 minutes from arriving at the nest site, while attaching transmitters may take up to an hour depending on the brood size, but in any case, we advise under no circumstances should more than two hours be spent near the nest as a general precautionary rule.

Approaching a tree or cliff nest should only be done by experienced personnel with the necessary qualifications and equipment for tree or cliff climbing. During climbing, pay special attention to avoid accidents (especially for people under the tree or cliff and the birds), and comply with all safety regulations and legal requirements.

Conservation experts and network operators must work in close coordination to protect Saker Falcon nesting on high-voltage transmission line pylons. On the one hand, only trained and authorised personnel are permitted to climb nests on these pylons, and they must follow the network operators' rules and protocols. Everyone else is strictly prohibited from scaling these towers. On the other hand, network operators should avoid any non-urgent maintenance work on pylons with active Saker Falcon nests, as well as on the nearest pylons, between 15 February and 15 July, to prevent endangering breeding success. Therefore, any approach to such nests must be discussed and agreed upon by both network operators and conservation experts. If the network operator is unaware of active breeding in a nest, they should consult the relevant national park directorate before taking any action.

Handling the nestlings

Handling nestlings in the nest

Handling nestlings in the nest requires particular attention and experience. Nestlings are extremely vulnerable, and improper handling techniques can easily cause internal injuries or fractures (especially in the wings). Additionally, nestlings may attempt to free themselves, posing a risk of falling from the nest, which could be fatal. Therefore, only nature conservation experts or trained personnel (e.g. who have participated in training by nature conservation experts, receiving detailed practical guidance on the methods and risks of handling birds), should perform such operations.

Upon approaching the nest and entering the nestlings' line of sight, avoid sudden movements and, if possible, wait 1–2 minutes for the nestlings to calm down. When handling nestlings in the nest, constantly monitor the movement of all nestlings, with ground personnel assisting through binoculars or even continuous drone observation. Nestlings that are on the edge of the nest should be gently guided towards the nest's interior before handling.

In the case of nest boxes on pylons, particularly with larger nestlings, if the nest box has two open sides, it is advisable to cover one of the two open sides, positioning the climber at the only open side to minimize the chances of nestlings jumping out. If the climber or ground personnel assess that one or more nestlings cannot be removed without the risk of falling, the operation should be immediately halted, and the nesting site should be vacated.

Nestlings should be handled with both hands, positioning your thumbs on their backs, firmly (but not too tightly) pressing the birds' closed wings to their bodies with your palms, and pressing their legs against their abdomens with the rest of your fingers (*Figure 3*). For larger nestlings, it may be necessary to hold the legs between your little and ring fingers to prevent scratching and uncontrolled movements. If necessary and with sufficient practice, larger nestlings can be securely held with one hand by gripping the base of their wings and tail with your thumb and index finger, while holding the legs between your other fingers

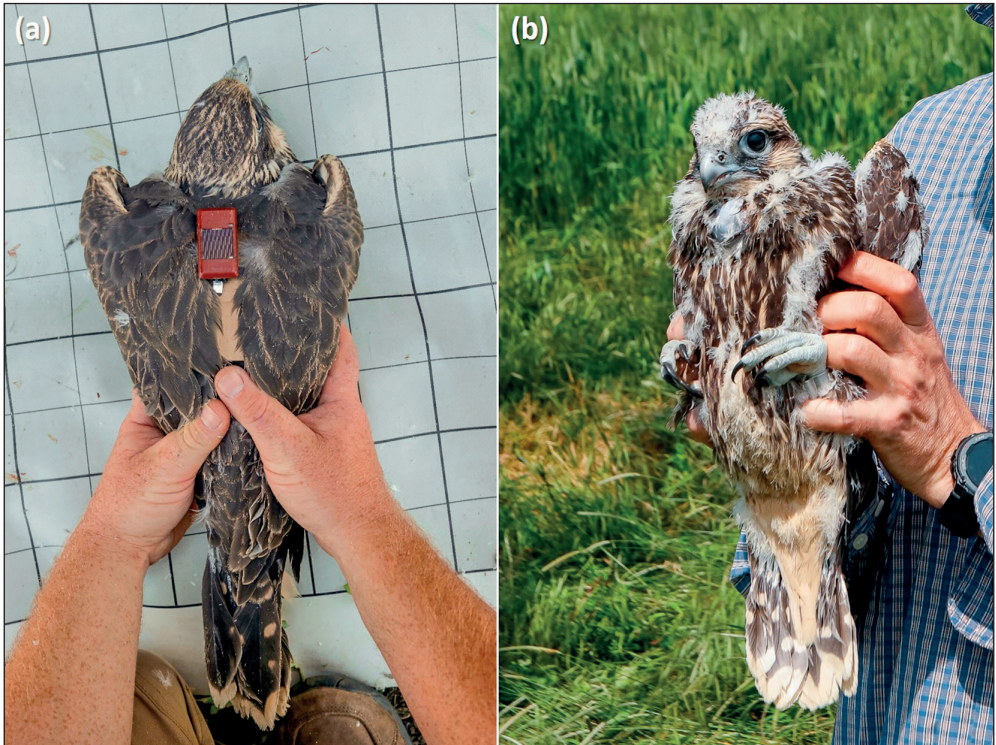


Figure 3. Proper handling of Saker Falcon nestlings: (a) dorsal view; (b) ventral view (Photo: Márton Horváth)

3. ábra Kerecsensólyom-fiókák megfelelő fogási technikája: (a) hátoldali nézet; (b) hasoldali nézet (Fotó: Horváth Márton)

(Figure 5a). It is crucial that nestlings should be never hold by their wings, legs, or feathers, as this can cause fractures, joint injuries, or permanent damage to developing feather follicles.

When handling large (>28 days old nestlings, juveniles or adults) Saker Falcons, it is advisable to bandage the bird's legs and place a falconer hood on its head to reduce stress and prevent injuries (Figure 5b).

The risk of physical injuries can be minimised by following the guidelines described here. However, if an injury does occur, disinfect minor wounds and return the nestling to the nest. If there is significant bleeding, a fracture, dislocation, or abnormal behaviour, consult a veterinarian experienced with raptors and, if necessary, arrange for the bird to be transported to a nearby rescue station in consultation with the relevant national park directorate.

Ringling and infection risks

The ringling process carries a risk of spreading infection because the same personnel and equipment are used for multiple nests consecutively, often within the same day. Any young bird can be sick and contagious, even if it shows no visible symptoms, which could lead to

the transmission of infectious diseases between broods and potentially increase mortality rates among nestlings and parent birds. To prevent the spread of disease from one brood to another, it is crucial to handle all young birds with strict adherence to the hygiene guidelines outlined in the human health considerations section below.

Transporting nestlings

After capturing nestlings in the nest, place them in a suitable carrier to prevent injury to each other. Preferably, nestlings should be placed individually into carriers unless they can be safely separated in stable compartments. During lowering, ensure the carrier does not accidentally hit the pylon or branches, as this could injure the nestlings. The carrier must be securely attached with a carabiner to the rope during lowering to prevent accidental falls, and it should be closable to ensure nestlings cannot escape while still allowing air circulation. It is important that the carrier is made of material that prevents the nestlings' talons from getting stuck in its walls or floor, as talons can break off, which would significantly impact the nestling's future survival.

Ring the nestlings

The ideal age for ringing nestlings is between 18 and 28 days, which in Hungary generally occurs from 10 May to 10 June. Most nestlings reach this age between 15 and 25 May, so most ringing activities should be planned for this 10-day period. In exceptional cases, slightly younger (15–17 days old) or older (29–40 days old) nestlings can be ringed as well, but the risk of accidents or unsuccessful attempts is higher in both cases (see under *Mounting telemetry device*). Each young nestling should be individually assessed to ensure that its leg is large enough to keep the ring securely in place at the tarsus (i.e. it cannot slip down toward the toes).

Nestlings can be sexed from about 10 days of age at the earliest. Females typically have larger and stronger beaks and feet, thicker legs, but their heads are proportionally smaller compared to their bodies (in comparison to males). As they grow older, the differences between males and females become more pronounced. Males usually develop plumage faster and are the first to leave the nest. Sexing nestlings requires considerable experience, especially when the young are of the same sex or when there is only one nestling, making comparison impossible. It should be noted that large falcon species typically begin incubating after laying the third egg. As a result, any eggs laid afterward will hatch later, leading to differences in the developmental stages of the oldest and youngest nestlings. In the case of the Saker Falcon, this often results in one or two nestlings being at a different stage of development than the rest of the brood, which may further complicate sexing.

It is important to consider that during ringing, the parent birds cannot protect the nestlings from adverse weather conditions due to human presence. Therefore, nests with downy nestlings (less than 15 days old) should be completely avoided, and even older nestlings should not be approached during extreme weather conditions (e.g. storms, extreme cold or heat). Additionally, ensure continuous shading for nestlings in strong sunlight during

the procedure to prevent them from falling out of the nest as they seek shelter from the scorching sun.

Only a licensed expert with the necessary ringing and research permits is authorised to ring nestlings. If possible, perform the ringing and associated measurements and sampling procedures on the ground under comfortable conditions. In Hungary, official aluminium ornithological rings with a unique number approved by the Hungarian Bird Ringing Centre should be placed on the nestlings' left leg. The ring should have an inner diameter of 14 mm (suitable for both larger females and smaller males) and a height of 10–20 mm. The numbers on the ring should be oriented so that they are readable when the bird is standing. It is important to ensure that the rings are properly closed on the tarsus of the birds, i.e. they do not remain even partially open, as it could increase the chance of accidents.

A coloured ring, which has a visible base colour and a few large characters for identification from a distance or in photos, may be placed on the right leg. In Europe, colour ringing programmes must be harmonised and registered internationally (<https://cr-birding.org/>) to prevent overlapping markings and misidentification.

For nestlings already being handled during ringing, it is worthwhile to measure a few important biometric parameters and take additional samples for research projects, provided it does not cause injury or significantly increase handling time. Recommended measurements include weight, tarsus length, tarsus diameter, hind claw length and tail feather vane length (*Figure 4*).

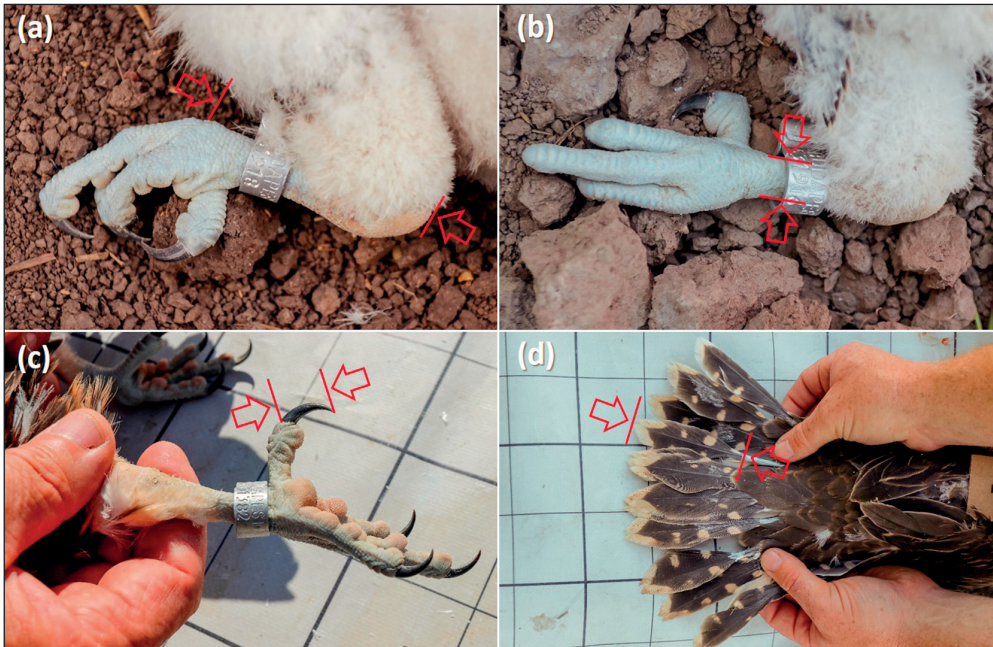


Figure 4. Recommended measurements of Saker Falcon nestlings: (a) tarsus length; (b) tarsus diameter; (c) hind claw length; (d) tail feather vane length (Photo: Márton Horváth)

4. ábra Javasolt mérések kerecsensólyom-fiókákon: tarsus hossz; (b) tarsus átmérő; (c) hátsó karom hossz; (d) farktoll-zászló hossz (Fotó: Horváth Márton)

Mounting telemetry device on nestlings

The ideal time to attach a tracking device to young Saker Falcons is as close to fledging as possible, as the body parameters (especially the girth in front of and behind the wings) will closely match those of free-flying juveniles. However, accidentally forcing premature fledging during the mounting procedure (when climbing the nest) can result in a lengthy search for the fledged individual or even losing the bird altogether, which decreases the survival chances of the nestlings. Therefore, it is recommended to time the attachment when the nestlings are 36–40 days old, which in Hungary generally occurs between 21 May and 20 June. In Hungary, most nestlings are within this age range between 25 May and 5 June, so most tagging activities should be planned during this period.

The ideal age for tagging is a very narrow window when the body is fully covered by contour feathers, the remiges and rectrices are well developed but still in sheath at the base, and a few downy feathers are visible on the otherwise feathered head (see 36–40 days category in *Figure 2*). Once the downy feathers disappear completely from the head, the likelihood of involuntary fledging due to disturbance becomes very high (see 41–45 and 46–55 days categories in *Figure 2*). Accidentally forced premature fledging can increase mortality due to a higher risk of injuries (to bones, joints, or sensitive growing feather pulps) or because the fledglings may land in high vegetation, making it difficult for them to return to the nest or maintain visual contact with the parents. Therefore, the surrounding vegetation and wind direction (as first-time flying juveniles will glide downwind after jumping from the nest) should be considered before approaching large young to ensure they can be located and returned if accidental fledging occurs. For example, avoid risking fledging in nests surrounded by large contiguous fields of sunflower or rape, as it would be particularly difficult to find the fledgling, and they may not be able to escape such vegetation on their own.

It is recommended that more than two people participate in the tagging process. While one person climbs to the nest and another waits directly beneath it, the rest of the team should stay 50–200 meters away in case a nestling jumps out. At least one person should position themselves downwind, as this is the most likely direction for a fledgling to glide. First-time flyers cannot actively fly far, but if the wind is strong, they may glide up to 800–1,000 metres from a nest box situated 30–40 metres high on a pylon.

Any premature fledging accidentally caused by climbing the nest may result in injury or death of the fledglings, and even without such incidents, it increases their risk of predation. Therefore, all fledglings that have jumped must be collected and returned to the nest. If a nestling leaves the nest, its flight must be visually tracked until it lands, and the landing site should be approached without losing visual contact. The immediate landing area must be approached carefully, especially if the vegetation is dense, as personnel could accidentally step on the fledgling. If the vegetation is less dense at ground level (e.g. sunflower fields) or the fledgling lands on a dirt road, it may move relatively far on foot, leaving the initial landing area. A trained dog or a drone may assist in locating the fledgling if it is not found through a standard search. If the fledgling is not found by nightfall, the search must be repeated the following day. In some cases, a ‘lost’ fledgling may find its way back to the pylon with the nest – repeated visits after such incidents can confirm the fledgling’s fate.

The collected fledglings that have jumped must be checked for injuries before being placed back in the nest box. It should be noted that these individuals may have undetectable internal injuries from the forced fledging, therefore later inspections are especially needed to assess their health condition and fledging success. If weather conditions allow, it is advisable to water the fledglings before returning them to the nest. Soaking their feathers makes them less likely to jump out immediately after being returned, a situation that has occurred on a few occasions in Hungary.

The attachment of telemetry devices should only be undertaken by a licensed expert with the necessary experience and research permits. Marking nestlings with transmitters requires more precise timing and can have a more significant impact on survival than ringing, necessitating extensive experience and careful planning. It is advisable to select the brood proposed for transmitter attachment early in the breeding season, with a drone inspection 1–2 weeks before the planned tagging to accurately determine the age and number of nestlings.

Transmitters can negatively affect breeding behaviour or even the survival of birds (Barron *et al.* 2010). It is generally recommended that the weight of backpack transmitters should not exceed 3% of the bird's weight (Kenward 2001). Given that any artificial 'accessories' – regardless of their weight – on birds, especially on actively hunting raptors, are unlikely to support survival, tracking should be applied only if the expected new information provided by the tracking devices clearly offers greater overall benefits for the population (e.g. by enhancing the effectiveness of conservation measures) than the potential negative effects on the tagged individuals. Moreover, sample sizes should be kept to the minimum necessary to answer the specific conservation-related research questions. In addition, special caution should be taken in the selection of transmitter type and its attachment method.

We recommend a maximum transmitter weight of 1.5% of body mass for this species. However, it is important to note that the possible negative effects of harness-mounted transmitters may still be present even with very small devices. The average weight of Saker Falcons in Hungary was measured at 1,240 g for adult females (n=14) and 880 g for males (n=15), with the smallest male weighing only 790 g (Bagyura *et al.* 2022). Therefore, transmitters under 12 g are recommended for this population. Solar-powered devices of this size (10–12 g) are available on the market, but significantly smaller devices may face charging issues as feathers could completely cover the solar panels.

Significant sexual dimorphism and minor individual differences among Saker Falcons must be considered when attaching satellite transmitters. Generally, we recommend using the "backpack" method with special Teflon tape, usually provided with the transmitter. The commonly used "leg-loop" method has not yet been sufficiently tested on large falcons, although it has been suggested to be better for larger vultures and eagles (Longarini *et al.* 2023), and less effective for smaller *Falco* species (Biles *et al.* 2023).

We suggest using 6 mm wide Teflon tape for both male and female birds, typically requiring an 80 cm length per bird. The method of attaching the tape to the transmitter depends on the transmitter type and preference of the tagging expert. The tape must be securely fixed to the front of the transmitter, and we suggest sewing the two tapes together diagonally, forming

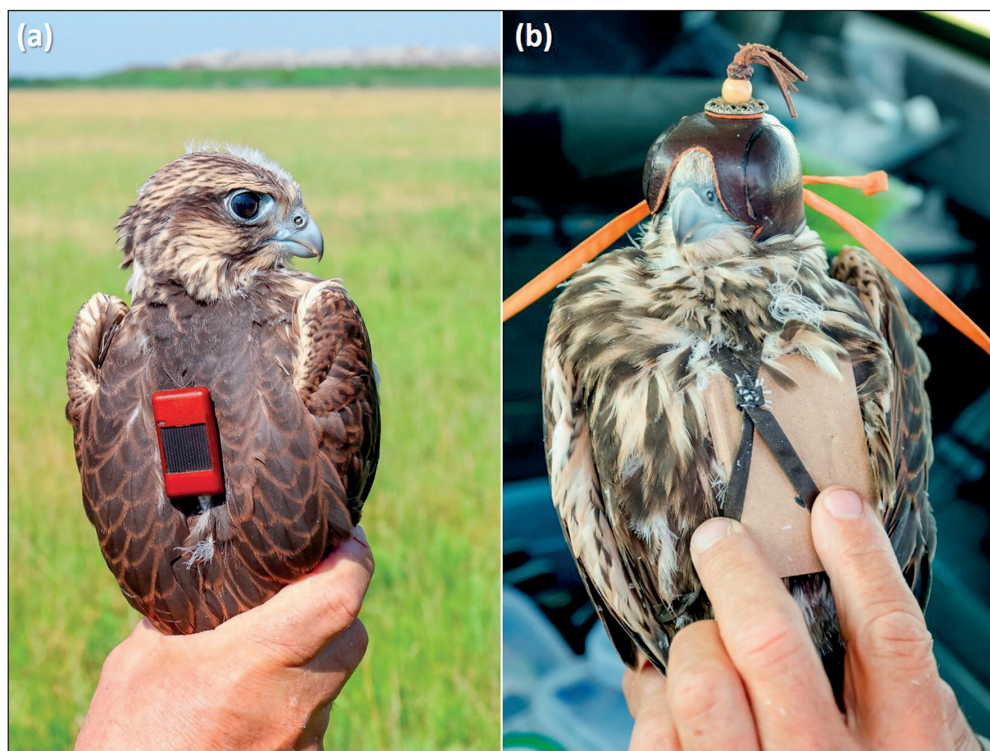


Figure 5 Telemetry device mounted on Saker Falcon nestling: (a) dorsal view; (b) ventral view (piece of cardboard is used temporarily to avoid accidental gluing of feathers) (Photo: Márton Horváth)

5. ábra Kerecsensólyom-fiókára szerelt jeladó: (a) hátoldali nézet; (b) hasoldali nézet (a kartonlap ideiglenesen, a tollak véletlen ragasztása elkerülésére kerül felhasználásra) (Fotó: Horváth Márton)

an 'X' above the sternum of the bird. The length of the two sides of this neck-loop must be equal and each sides should be approximately 10–13 cm long (10.5 cm for males and 12.5 cm for females on average), but it should always be fitted to the size of the individual bird, with the seam positioned at the sternum's tip. The tape should run behind the falcon's wings, be thoroughly adjusted under the feathers, and reach back toward the transmitter's caudal end, ensuring that the ribbons are not twisted. Temporarily secure the tape ends to the transmitter's end (e.g. with a surgical clamp), position the transmitter symmetrically between the bird's shoulders, ensuring it is neither too tight nor too loose (*Figure 5*). When the tag is lifted at the back of the bird, there should be a gap of approximately 10–20 mm for fully developed (i.e. juvenile or adult) birds to allow the necessary space for natural movements. In the case of nestlings or fledglings, when pectoral muscles are still developing, this gap should be larger (i.e. 15–30 mm) and should be carefully determined by the tagging experts based on the size, development, and condition of the individual nestling. If the length of the tapes has been carefully determined, they should be sewn, and the seams reinforced with adhesive to prevent them coming undone.

Optionally, metal (aluminium or copper) crimps can be used instead of sewing the harness. Applying that method can save a significant amount of time during the process, but it should be used with caution, as metal structures can easily cause injuries (such as scratches or inflammation) if they contact the skin. Additionally, improperly positioned crimps with sharp edges may damage and eventually cut through the harness.

Collecting biological samples from the nestlings

Genetic methods can be employed for sex determination, individual identification, or population-level genetic analyses. The least invasive way to collect genetic samples from nestlings is by pulling out small, growing feathers along with their *calamus* when handling the birds for ringing. Generally, underwing covert feathers with a vane of 0.5–2 cm are the most suitable, ensuring that their feather shafts do not break into the skin. Larger feathers, particularly flight or tail feathers (remiges and rectrices), should not be plucked under any circumstances, as they can bleed significantly, and their absence can impair flying performance. A maximum of three samples per bird should be collected in three different Eppendorf tubes containing silica gel – or alternatively, 96% ethyl alcohol – allowing for at least three different analyses.



Figure 6 Veterinary sampling of Saker Falcon nestlings: (a) cloacal swab; (b) tracheal swab; (c) blood sample taken from the nestling's wing vein (Photo: Márton Horváth)

6. ábra Állatorvosi mintavétel kerecsensólyom-fiókákon: (a) kloáka tampon; (b) *trachea* tampon; (c) vérvétel a fióka szárny vénájából (Fotó: Horváth Márton)

Veterinary sampling from nestlings may be warranted to address animal health concerns. This may involve collecting bacteriological, virological, or parasitological samples quickly and with minimal intervention. Monitoring for avian influenza virus is particularly important, as it has been detected in Saker Falcons, with cases of entire brood mortality confirmed in 2022 (Bagyura *pers. comm.*). For this purpose, cloacal or tracheal swabs are commonly used, and qualified personnel may also collect blood samples from the nestlings' wing veins (Figure 6).

Camera traps

Camera traps may be placed at nests to identify prey brought in for feeding nestlings, identify parent birds, observe behaviour patterns of parents and nestlings, or study nestling mortality. The ideal time to place cameras is before the breeding season (i.e. by 1 February), provided the nest location remains stable, the camera can store or transmit all footage throughout the breeding season, and the batteries can be kept charged continuously until fledging (e.g. by using solar-powered devices). Alternatively, a simpler and more cost-effective solution is to install the camera during ringing activities (typically between 15 and 25 May), as this allows for additional data collection without extra disturbance or logistical challenges.

A camera with a commonly used focal length lens (e.g. 60–80 mm) should be positioned 50–60 cm above and 100–150 cm to the side of the nest to provide an optimal view of the nest and its surroundings. Depending on the resolution of the camera trap, any greater distance may prevent the capture of photos or videos clear enough to read (colour) rings, while closer exposure of the camera to the nest could cause disturbance for the parents. The sensitivity of the motion sensor, the frequency of shots, and the number of photos taken in quick succession should be adjusted according to the needs. However, it should be noted that the continuous movement of young in the nest will likely trigger the camera trap frequently, resulting in a high volume of photos, with only a small portion capturing the adults. We typically set the camera trap to take batches of three photos at 30-second intervals. As there are a wide variety of cameras on the market with numerous setting options, the most important recommendation is to check the settings before and immediately after placement by taking test shots.

The camera should be retrieved a few weeks after the nestlings have fledged and are no longer regularly around the nest or have developed sufficient flight skills (typically between 1 and 30 July). This timing helps avoid disturbing the juveniles, but it is advisable not to wait too long, as leaving the batteries in the camera for several months could lead to battery leakage and potential damage.

While the previous section focused on traditional camera traps without telecommunication capabilities and using conventional batteries, there are now camera traps equipped with solar panels and capable of communicating through GSM, Wi-Fi, or Bluetooth. These advanced traps can operate 'indefinitely' without the need for retrieval. Although these camera traps likely represent the future of wildlife monitoring, they are relatively new to the market, and there is still limited experience in using them at nests, and they come with additional costs (e.g. GSM service, virtual storage place, etc.).

Collecting addled eggs, carcasses and prey remains

During monitoring activities, remains of Saker Falcons, such as addled eggs, eggshell fragments, and dead nestlings or adults, may be found. These remains can be valuable for determining causes of death or for genetic sampling, so they should be collected and sent for laboratory analysis.

Similarly, you may find moulted feathers of adults, which are also valuable as they typically contain sufficient DNA for genetic analyses (Horváth *et al.* 2005), or potentially can be used also for other analyses (e.g. heavy metal contamination). Feathers should be collected in separate zip-lock bags for each nest. They must be stored in dry, dark, room-temperature conditions, free from contamination, as humidity, UV light, and heat can significantly degrade DNA quality (Vili *et al.* 2013). Including a silica gel packet in the bags is recommended to absorb moisture.

Additionally, prey remains are often found in or under Saker Falcon nests. These remains can provide valuable insights into the species' feeding habits and should be collected and examined (e.g. Horváth *et al.* 2018). Before leaving the nest site, it is advisable to collect all identifiable remains in one place, categorize them by species, and photograph them with a scale reference. Record the number of identifiable species/taxa on a data sheet, and collect unidentifiable remains (pellets, bone fragments, etc.) if you have the capacity for later identification.

All collected materials should be properly labelled and delivered to the relevant laboratory as soon as possible. Always consult with the responsible laboratory personnel beforehand to ensure proper storage and handling of the samples until they are analysed.

The labelling principles outlined in the Documentation section should be followed for all collected samples. Additionally, the guidelines detailed under Human Health Considerations should be strictly adhered to when handling and collecting biological remains.

Human health considerations

Handling nestlings and working in nests involves risks to human health, including the potential for physical injury and infection. Although rare, there is a risk of physical injury, particularly when dealing with larger nestlings. Saker Falcons can occasionally cause injuries with their beaks, and their talons may cause accidental (usually superficial) scratches. It should be noted, however, that unlike large raptors, this species cannot cause serious injury to humans. Additionally, when nestlings are handled properly, as described in the previous section, injuries are uncommon. If a bleeding injury occurs, allow the wound to bleed, disinfect it thoroughly, apply a medical bandage, and seek medical attention promptly to prevent infection.

Prey remains and faeces in nests, as well as nestlings infected with zoonotic pathogens (which can be transmitted from animals to humans), can pose infection risks to handlers. To minimize these risks, adhere to the following hygiene practices:

- Wear disposable masks (minimum FFP2 standard) and change them after handling each nest.
- Avoid touching your face (especially eyes, mouth, nose and ears) and refrain from eating during work.

- Use disposable gloves and disinfected “bird bags” (breathable canvas drawstring bags) when handling birds, replacing them after each nest.
- After placing nestlings back in the nest, always disinfect your hands with an alcohol-based disinfectant (at least 50%) and clean any clothing or equipment that may have had physical contact with the nestlings (e.g. carrier bags, tongs, measuring and sampling equipment).
- Dispose of used masks, gloves, and paper towels in hazardous waste bags before leaving the site and ensure proper disposal.
- Place collected samples or remains in separate, sealable plastic bags and store them properly until analysis to avoid contamination with biological samples.

Documentation

Finally, and importantly, it is crucial to strive for the most complete written and photographic documentation during nest inspections. Many years of experience show that inconsistencies or unclear information on breeding success in long-term national datasets often result from inadequate field documentation.

The following data are minimally required in written or online documentation (preferably on specially designed data sheets) during fieldwork:

- Date and time;
- Settlement/area name;
- Territory and nest ID;
- Coordinates;
- Nest base: tree species or power line section (including section ID and the ID number of pylon);
- Nest type (natural nest/platform/box);
- Activity (active breeding/failed/unknown) and breeding stage (nesting pair, incubation, rearing, fledging);
- Breeding success (number of nestlings/eggs) and estimated age of nestlings (if relevant);
- Ring number(s), sex and measurements of nestlings (if relevant);
- Tracking device ID(s), parameters (type, size), and attachment method (if relevant);
- Collected sample types and numbers (prey, feather, DNA, veterinary, etc.) (if relevant);
- Identified prey species and the minimum number of specimens (if relevant);
- Details of other remains and collected materials (if relevant);
- Names of participants in the nest inspection, including separately the drone pilot, climber, ringer, or the person mounting the tracking device.

Additionally, it is strongly recommended to create detailed photographic documentation of the nest inspections, including:

- Habitat with the nest;
- Brood in the nest (in case of drone inspection or climbing);
- Rings (with readable ring number), full-body and head photos showing development/age and any observed abnormalities (in case of ringing);
- Tracking device on the bird (with readable ID);
- Biological samples (Saker Falcon or prey remains, moulted feathers).

A small data slip (separately enclosed or attached to the bag) must accompany and be fixed to all collected materials, including the following minimal information:

- Date;
- Area/territory name;
- Coordinates;
- Collector's name and contact information.

It is important to mention that the locations of nesting sites of strictly protected bird species are usually considered confidential information. This confidentiality helps prevent intentional disturbance or destruction of breeding sites by certain interest groups (e.g. destruction of broods and/or nests, illegal harvesting of nestlings). Additionally, inexperienced observers could unintentionally disturb the breeding process, causing harm. Therefore, efforts should be made to ensure that nesting sites are not disclosed to the public, involving only the necessary number of appropriately trained personnel in nest inspections. Participants must accept and follow the basic rules suggested in this guide, understanding that the exact locations of nests can only be shared with third parties with prior consent from the relevant conservation authorities/managers (National Park Directorate in Hungary) or the relevant conservation experts (the Saker Falcon conservation coordinator in Hungary).

Discussion

While political borders do not fragment the Saker Falcon population biologically, they do affect the design and implementation of monitoring programmes. This complicates data collection and harmonisation, making it difficult to assess conservation status and plan and implement conservation measures at a European level (Prommer *et al.* 2025). Although ongoing monitoring programmes exist in each European country of the species' breeding range, this article represents the first attempt to propose a standard for terminology in data collection and for the methods applied. It summarises decades of experience gathered through Saker Falcon monitoring in Hungary, and the suggested standards can be applied across the European population.

However, we emphasise that we do not intend to suggest that these are the only effective and final standards or that others cannot be accepted and used. Our intention here is merely to draw attention to the lack of and need for agreed terminology and harmonisation in monitoring methods at the European level for this endangered species. Additionally, we propose a starting point for discussion about harmonising and improving monitoring efforts among Saker Falcon experts across the species' European range.

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