Náttúrufræðistofnun

REPORT

Date: November 16, 2026
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Case number: 202601-0041
Project number: 2862

Efni: New data on the movements and distribution of gyrfalcons

INTRODUCTION

The gyrfalcon is a widespread but scarce breeder in Iceland (Fig. 1). The rock ptarmigan is the gyrfalcon's most important prey, and until recently the gyrfalcon population's status was determined primarily by ptarmigan numbers. Gyrfalcons have declined sharply in Iceland in recent years; the cause is not a shortage of ptarmigan and starvation but disease. Highly pathogenic avian influenza reached Iceland in 2021, and since then there have been repeated outbreaks, most recently this autumn. The majority of gyrfalcons found dead or dying since 2021 have been infected with highly pathogenic avian influenza.[1] Following this sharp decline, the gyrfalcon has been classified as Endangered (EN) on the Icelandic Red List.[2]



Fig. 1. *First-winter gyrfalcon. Photo: Þorfinnur Sigurgeirsson.*

[1] https://www.natt.is/is/frettir/2025/08/sterkur-rjupnastofn-en-faekkun-falka-heldur-afram
[2] https://www.natt.is/is/midlun/utgafa/valistar/fuglar

GYRFALCON RESEARCH AND RINGING

For decades, the Natural Science Institute of Iceland has conducted research on gyrfalcons in Northeast Iceland. This research focuses on the predator-prey relationship between the gyrfalcon and the rock ptarmigan. Each year, the population size, breeding success, and diet of gyrfalcons are assessed, as is the number of ptarmigan in the study area. One part of this research is ringing; in total, 1,818 gyrfalcons were ringed in this project from 1981 to 2023, and 358 recoveries and resightings have been recorded. The data points are therefore relatively few, and a very large number of gyrfalcons need to be ringed to build a reliable picture of their movements. By fitting transmitters (GPS-GSM tags) to gyrfalcons, their movements can be recorded with great precision. These tags record locations and transmit that information automatically.



Fig. 2. *Kjell Janssens and Ólafur K. Nielsen fit a GPS transmitter to a gyrfalcon nestling. Photo: Ólafur H. Nielsen.*

GYRFALCONS FITTED WITH TRANSMITTERS

Seven gyrfalcon nestlings were fitted with transmitters in Iceland this summer, marking the first time this has been done in the country. The nestlings came from two broods, one with three chicks and the other with four. Three were females, and four were males. Both nests were near Lake Mývatn.

This is a collaborative project between the Natural Science Institute of Iceland and the Mohamed Bin Zayed Raptor Conservation Fund.[3] Ólafur K. Nielsen took part in the fieldwork on behalf of the Natural Science Institute of Iceland, and Kjell Janssens from the Instituut voor Natuur- en Bosonderzoek in Belgium and Jimmi Hill both on behalf of the Mohamed Bin Zayed Raptor Conservation Fund (Fig. 2).

The transmitter type is HQBG1206 by Global Messenger.[4] The device with harness weighs about 10 g and has a built-in antenna. A solar cell keeps the battery charged. The device uses GPS to determine location and the GSM mobile network to transmit data. The tag sits on the bird's back and is attached with a leg-loop harness.

The frequency of location fixes and data transmissions from the transmitters can be controlled remotely via the internet. Initially, the devices were set to take four to six locations per day, with data transmitted once a day. In recent weeks, locations have been taken twice a day, but from 3 November onward, one location is taken per day, and data are transmitted every five days. This is because battery voltage has dropped as days have shortened and air temperatures have fallen. During the darkest period, the devices cannot sustain more frequent data collection and transmission.

The transmitters were fitted to the nestlings when they were 40 to 42 days old, whereas gyrfalcon nestlings fledge at about 47 days.[5] Reolink monitoring cameras[6] were installed at both gyrfalcon nests when the nestlings were about three weeks old, and the chicks' behaviour was closely monitored in the days following tagging. The nestlings never showed any reaction to the tags, such as pulling at the tag or the leg harness.

All the tagged gyrfalcons were alive on 4 November, by which time a total of 2,653 locations had been recorded. More on the movements of the gyrfalcon juveniles. For convenience, the period from fledging to 4 November is divided into two parts: first, the period when the fledglings were dependent on their parents and confined to the immediate vicinity of the nest (the fledgling stage), and second, the first autumn of the juveniles' lives after independence.

The fledgling stage

According to earlier studies, gyrfalcon fledglings depend on their parents for four to six weeks after leaving the nest.[5] This aligns with this summer's tagging, which recorded 531 locations for this stage of the gyrfalcon's life cycle. The first juvenile dispersed about four weeks after fledging, and the last just over six weeks after fledging. While the fledglings were dependent on their parents, they initially stayed near the nest, then ventured farther during the day and returned to the vicinity of the nesting cliff to roost. The fledglings' longest trips during this period were up to 22 km from the nest. The females appeared to range farther than the males. One female was recorded 22 km from the nest, and the other two were each

[3] https://www.mbzraptorfund.org/
[4] https://www.gm-tracking.com/
[5] Booms, T. L., Cade, T. J. and Clum, N. J. (2020). Gyrfalcon (*Falco rusticolus*), version 1.0. In S. M. Billerman, (editor), *Birds of the World*. Cornell Lab of Ornithology. https://doi.org/10.2173/bow.gyrfal.01
[6] https://reolink.com/?srsltid=AYCX9vLGc8fObWnQF9GMof24kd0WNlEfNUOxj5f9olZkCbVIgKVu2034

recorded 21 km away. Two males were recorded 7 km from the nest, and two were recorded 16 km away. Each fledgling left its natal area independently of its siblings.

The independence stage

In total, 2,122 locations have been recorded for the seven juvenile gyrfalcons from the time they left their natal territory through 4 November. Broadly speaking, the juveniles showed similar behavioural patterns. Within a few days of leaving home, they reached areas (home ranges) where they remained. All the juveniles made shorter or longer exploratory trips from their home range. On these trips, some found a new home range (Fig. 3). Three juveniles remained in the same home range throughout the autumn: two near Mývatn (PX and PZ) and one on Melrakkaslétta (PY). Four of the juveniles occupied two main home ranges. One first stayed near Mývatn but then moved to Þistilfjörður (PT). The first home range of two juveniles was on Melrakkaslétta, but they have since moved on, one staying in the mountains above Bakkafjörður and Vopnafjörður (PU) and the other in Hérað (PS). The fourth juvenile (LA) in this group has had home ranges in Núpasveit and on Tjörnes. Presumably, local food availability largely determines where the juvenile gyrfalcons choose their home ranges. The autumn diet of gyrfalcons consists primarily of ptarmigan, but also includes shorebirds, gulls and alcids (Charadriiformes) and waterfowl (Anseriformes).[7]

During their travels, the juveniles have covered an average of about 14,400 km² (6,000 to 22,400 km²), according to the so-called minimum convex polygon method. The home ranges themselves are much smaller, yet still span tens or hundreds of square kilometers, depending on how they are defined.

The combined locations of all seven juveniles cover approximately 34,500 km², according to the minimum convex polygon. During their travels, the juveniles have ranged across almost the entire northeast corner of the country, from Eyjafjörður in the west; Grímsey and Melrakkaslétta in the north; Langanes, Bakkafjörður, Vopnafjörður, Hérað, and Austfirðir in the east; to the northeast part of the central highlands in the south (Fig. 4). Certain areas have appealed to them more than others. Notably, the heathlands and lava fields north and east of Mývatn stand out, as do the heathlands of Núpasveit, Þistilfjörður and Melrakkaslétta. The importance of Mývatn and its surroundings is presumably due both to the abundance of ptarmigan and to the fact that these juveniles' natal territories are in this area. The heathlands further north, i.e., in Núpasveit, Þistilfjörður and Melrakkaslétta, are also notable: five of the seven juveniles have spent extended periods in this area. This is remarkable given that these areas are 70 to 100 km from the natal territories of these gyrfalcons. These districts, Núpasveit, Melrakkaslétta and Þistilfjörður, are among the most important ptarmigan breeding grounds in Iceland, and the abundance of ptarmigan presumably accounts for the gyrfalcons' persistent presence there.

[7] Nielsen, O. K. and Cade, T. J. (1990). Seasonal changes in food habits of Gyrfalcons in NE-Iceland. *Ornis Scandinavica,* 202–211.

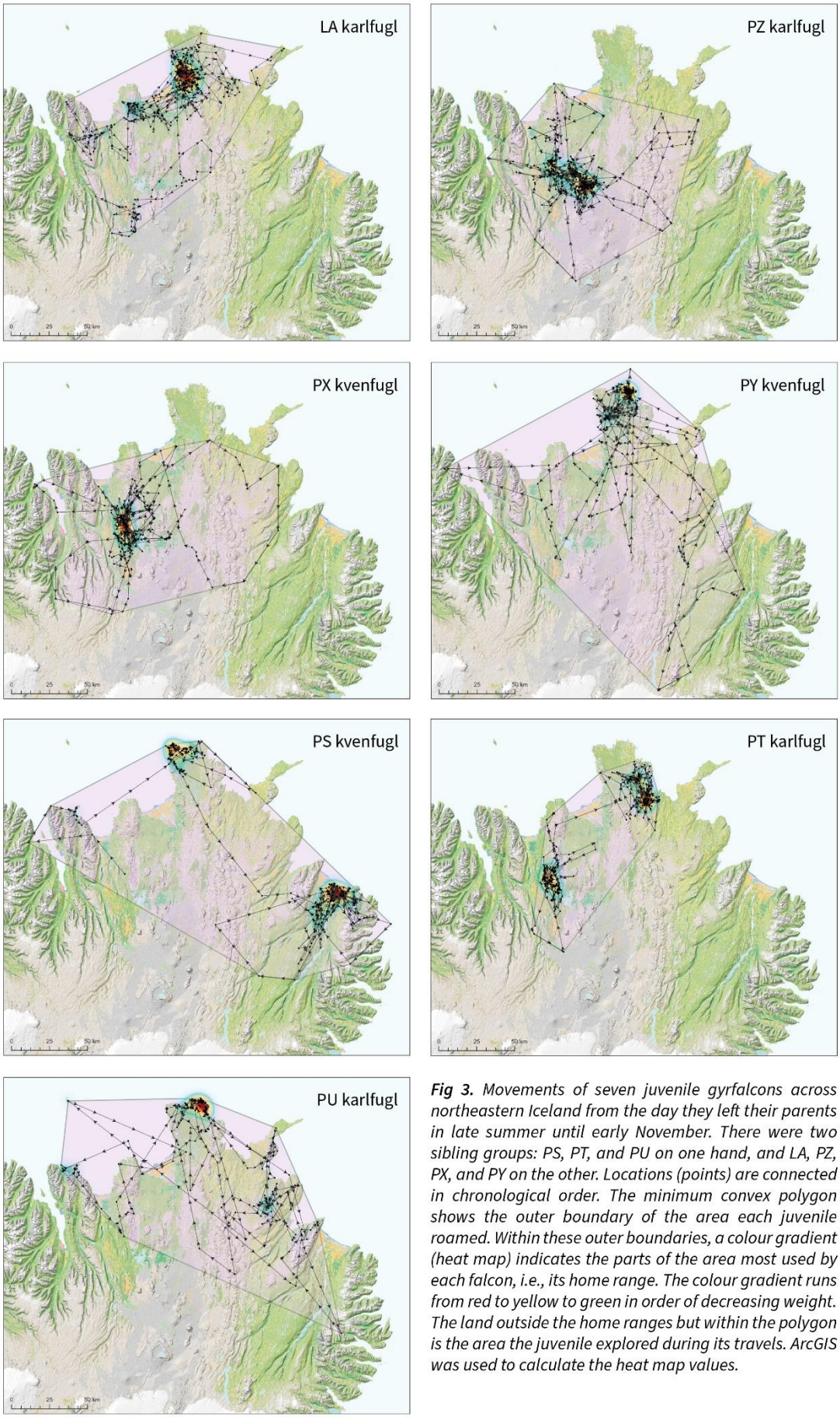


Fig 3. *Movements of seven juvenile gyrfalcons across northeastern Iceland from the day they left their parents in late summer until early November. There were two sibling groups: PS, PT, and PU on one hand, and LA, PZ, PX, and PY on the other. Locations (points) are connected in chronological order. The minimum convex polygon shows the outer boundary of the area each juvenile roamed. Within these outer boundaries, a colour gradient (heat map) indicates the parts of the area most used by each falcon, i.e., its home range. The colour gradient runs from red to yellow to green in order of decreasing weight. The land outside the home ranges but within the polygon is the area the juvenile explored during its travels. ArcGIS was used to calculate the heat map values.*

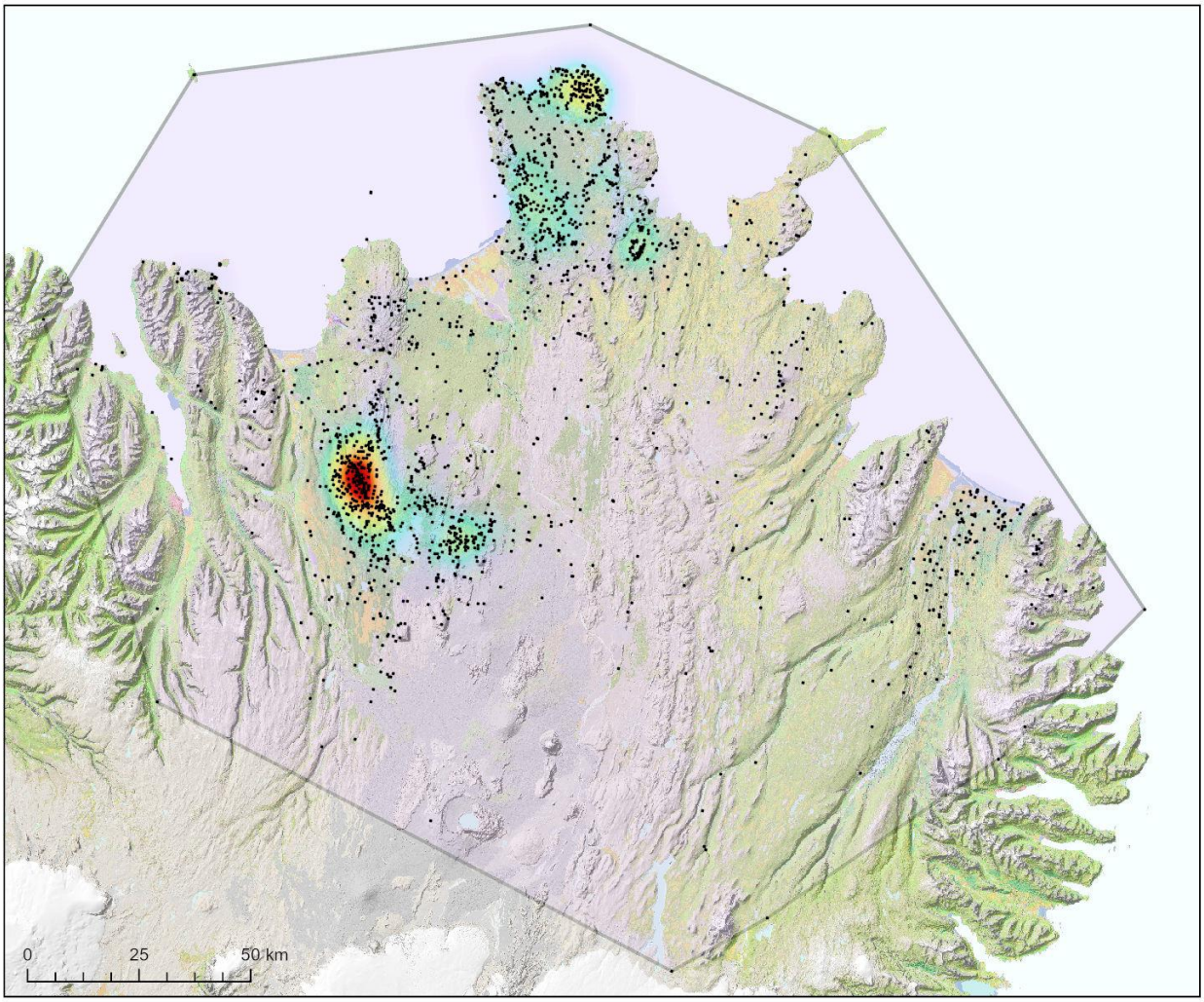


Fig. 4. *All locations for the seven juvenile gyrfalcons after dispersal in late summer through early November. The minimum convex polygon shows the outer boundary of the area over which the juveniles roamed. Within these outer boundaries, a colour gradient (heat map) indicates the parts of the area most used by the gyrfalcons. The most popular areas are shown in red, then yellow, then green, in order of decreasing weight. According to the heat map, the most important areas are, on the one hand, east and north of Lake Mývatn and, on the other, the heathlands of Þistilfjörður, Núpasveit and Melrakkaslétta. ArcGIS was used to calculate the heat map values.*

CONCLUDING REMARKS

A new chapter has opened in gyrfalcon research in Iceland. For the first time, the movements of Icelandic gyrfalcons are being recorded using tracking tags. The results have been promising: around 2,600 locations have already been recorded, compared with about 360 recoveries from traditional ringing. The data provide a clear picture of the movement patterns of juvenile gyrfalcons, both during the weeks when they are dependent on their parents and during the first autumn of their independent lives. There is no indication that the tags have bothered or hindered the birds. All are still alive, which is remarkable in itself,

as first-year mortality among Icelandic gyrfalcons is around 60%. [8] The results show that the fledglings stay with their parents for four to six weeks after fledging. During their first days as independent, the juveniles explore the landscape and then settle into a relatively well-defined home range. They also make both longer and shorter exploratory trips. Some juveniles have shifted their home range following these trips. It is interesting to see that, within about three months, the juvenile gyrfalcons have ranged over almost the entire northeast corner of the country. Food availability, i.e., the number of ptarmigan, presumably determines where they have spent most of their time. The most popular areas are the surroundings of Mývatn, Núpasveit, Melrakkaslétta and Þistilfjörður.

The plan is to tag more gyrfalcons next summer, in collaboration with the Mohamed Bin Zayed Raptor Conservation Fund. The gyrfalcons carry the tracking tags for life. It is hoped that these tags will make it possible to follow gyrfalcons throughout the year, both juvenile and adult, and to record their movements, habitat selection, and mortality. This will provide important data to improve understanding of gyrfalcon ecology and strengthen population conservation.

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[8] Barraquand F, Nielsen Ó. K. (2021). Survival rates of adult and juvenile gyrfalcons in Iceland: estimates and drivers. PeerJ., e12404. https://doi.org/10.7717/peerj.12404