Golden Eagle Symposium 2024

Tornio, Finland *October 4-6*

Content

Cover photo: Nesting pair of Golden Eagles in Rendalen in Norway. The photo shows the first documentation of a Swedish/Norwegian pair in Norway. The female is ringed by Gunnar Lind in Härjedalen 2007, and the male by Carl Knoff in Stor-elvdal. Photo: Steinar Myhr.

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24 years of Golden Eagle symposia since 1999

1999. Tåsjö, Ångermanland, Sweden
2000. Årrenjarkka, Lappland, Sweden
2001. Lövånger, Västerbotten, Sweden
2002. Grövelsjön, Dalarna, Sweden
2003. Stjärndal, Trøndelag, Norway
2004. Rovaniemi, Lappland, Finland
2005. Stornäset, Medelpad, Sweden
2006. Järvsö, Hälsingland, Sweden
2007. Holmhällar, Gotland, Sweden
2008. Tromsø, Troms, Norway
2009. Vålådalen, Jämtland, Sweden
2010. Stockholm, Sweden
2011. Tornio, Lappland, Finland
2012. Höllviken, Skåne, Sweden
2013. Hjerkinn, Oppland, Norway
2014. Boden, Norrbotten, Sweden
2015. Stockholm, Sweden
2016. Waasa, Österbotten, Finland
2017. Kungälv, Bohuslän, Sweden
2018. Lille Vildmose, Denmark
2019. Funäsdalen, Härjedalen, Sweden
2020-2021. No symposium because of Covid-19
2022. Åkrestrømen, Innlandet, Norway
2023. Anumark, Västerbotten, Sweden
2024. Tornio, Lappland, Finland

Feather of a Golden Eagle. Photo: Jan-Eric Hägerroth.

Preface

On the first weekend of October 2024, about 50 Golden Eagle enthusiasts from three Nordic countries gathered in Tornio for the annual Golden Eagle symposium. As far as we remember, this was the fourth time the symposium was held in Finland and the second time it took place at the Perä-Pohjolan Opisto in Tornio.

On Saturday, we heard two interesting talks by teams studying Golden Eagles in Russia and Kazakhstan, presented by Elena Shnayder and Viacheslav Gabyshev. Then, we discussed how much White-tailed Eagles prey on reindeer calves, and Camilla Ekblad shared the results of her research on this topic in northern Finland. She also presented new research on the effects wind farms on Golden Eagles.

Navinder Singh´s presentation was about the population ecology of Golden Eagle on the island of Gotland. “How human actions shaped the DNA of Finnish Golden Eagles?” was the topic of Ekaterina Karabaninas presentation. Olli-Pekka Karlin’s presentation “How I catch eagles to set transmitters” was an example of practical work in the field.

On Sunday morning, Alv Ottar Folkestad spoke about Golden Eagle attacks on people in Norway. This topic has been widely covered in the media across the Nordic countries. Before going home, there were presentations about Golden Eagle’s breeding results in 2024 in the four Nordic countries: Finland, Sweden, Norway, and Denmark.

Througout the symposium there were active discussions not only after the presentations, but also in the evenings, when we had many other topics to talk about.

We want to thank all the participants. Special thanks to Ekaterina Karabanina who arranged the contacts in Russia - without her help, this would not have been possible. And to Thomas Birkö - we are very grateful for his time and effort in preparing this symposium’s report and all the other things he made to the meeting.

We will see you in 2025 in Sweden!

Tuomo Ollila & Eetu Sundvall

Photo: Thomas Birkö.

Impact of White-tailed Eagles on reindeer herding in Finland

Camilla Ekblad

In this project, conducted in 2021-2022 by the Osprey Foundation in Finland and the University of Turku, we assessed the impact of White-tailed Eagles (WTE) on reindeer husbandry in Finnish Lapland. The WTE population has increased significantly lot in the reindeer herding area, and herders have long advocated for a territory-based compensation system for WTEs similar to the one in place for Golden Eagles.

The research questions in the study were :
- What is the diet of WTEs in Finland?
- What is the proportion of reindeer calves in the WTEs diet??
- What is the space use by floaters?
- Does WTEs hunt in calving areas?
- How many reindeer are killed by WTEs in different areas
- How can all the above be compared to Golden Eagles?

According to diet studies, reindeer calves compise 3,1% of the diet of WTEs nesting in the reindeer herding area. Remains of reindeer calves were collected from White-tailed and Golden Eagle nests, and the occurrence was compared between the two species. The proportion of reindeer calves in the WTE nests increased towards north, in territories with fewer water bodies, and in late springs. An attempt was made to assess the age and viability of the calves found in nests. The proportion of nests with remains of reindeer calves was 20% for WTEs and 43% for Golden Eagles. For WTEs it was not possible to determine whether the reindeer calves were in viable condition. For Golden Eagles, where viability could be assessed, over half of the reindeer calves were considered viable

In the project, ten WTE's were equipped with GPS transmitters in the summer of 2021, and four of these transmitters are still active. Analyses show that young WTE's in the reindeer herding area prefer northern regions, proximity to water and their own birth territory, and areas with a lot of water, marshes, wetlands, and sparse forests. WTEs breeding in the reindeer herding area tend to spend most of their summers and autumns there, whereas WTEs from coastal territories visit the reindeer herding area less often in summer. Gathering sites for WTEs include power plant dams, fish farms, and landfills.

During the project, WTEs were frequently observed near reindeer carcasses, but none were seen killing or disturbing reindeer calves. Both eagle species were observed eating afterbirth without disturbing the reindeer. In 2021, WTEs were seen making fake attacks in calving enclosures, and of the eight calves likely killed by eagles, WTEs may have been responsible for some. However, in 2022, no WTEs were observed in the calving enclosures.

WTEs were estimated to consume about 320 reindeer calves per year, which is 0,27% of the total calves born. However, the project coulld not determine what proportion of these calves were actually killed by WTE's.

The main conclusions were:

1) The proportion of reindeer calves in the WTEs diet is small,

2) There significant difference between areas, years, and individuals,

3) The proportion of reindeer calves in the WTEs diet increases northward, in areas with fewer lakes, and during late spring and

4) WTEs consume 10-33% less reindeer calves compared to Golden Eagles.

We concluded that some form of compensation for the presence of WTEs may bee justified, but it has to take into account both nesting pairs and floaters, as well as geographical differences. However there is currently no consensus on how such a compensation system should be designed.

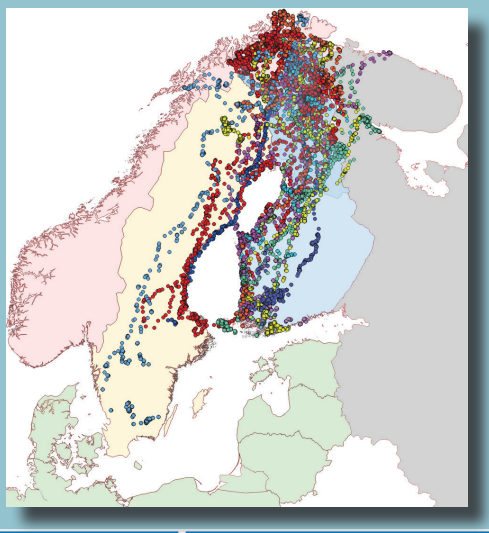


Figure 1. Movements of GPS-tagged, Lapland born White-tailed Eagles in Fennoscandia. Lapland- born Eagles are distributed further north throughout the year.

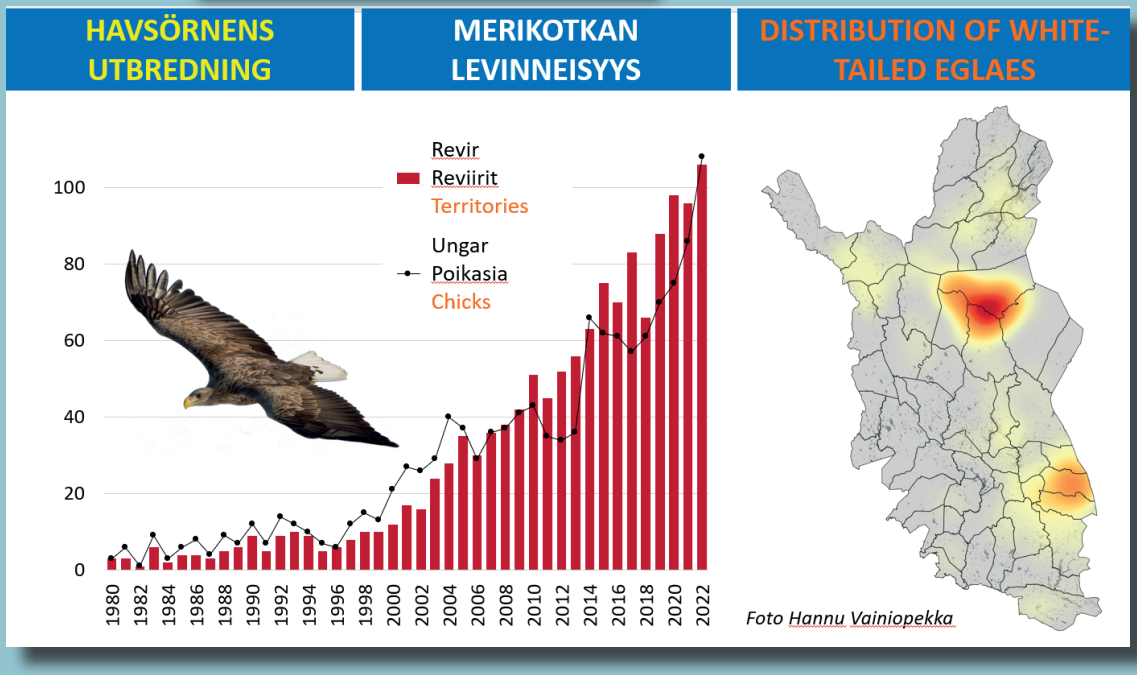


Figure 2. Population trend of the White-tailed Eagle in Finland (left) and their gathering sites in northern Finland (right). The population is the densest around the artificial reservoirs of Lokka and Porttipahta.

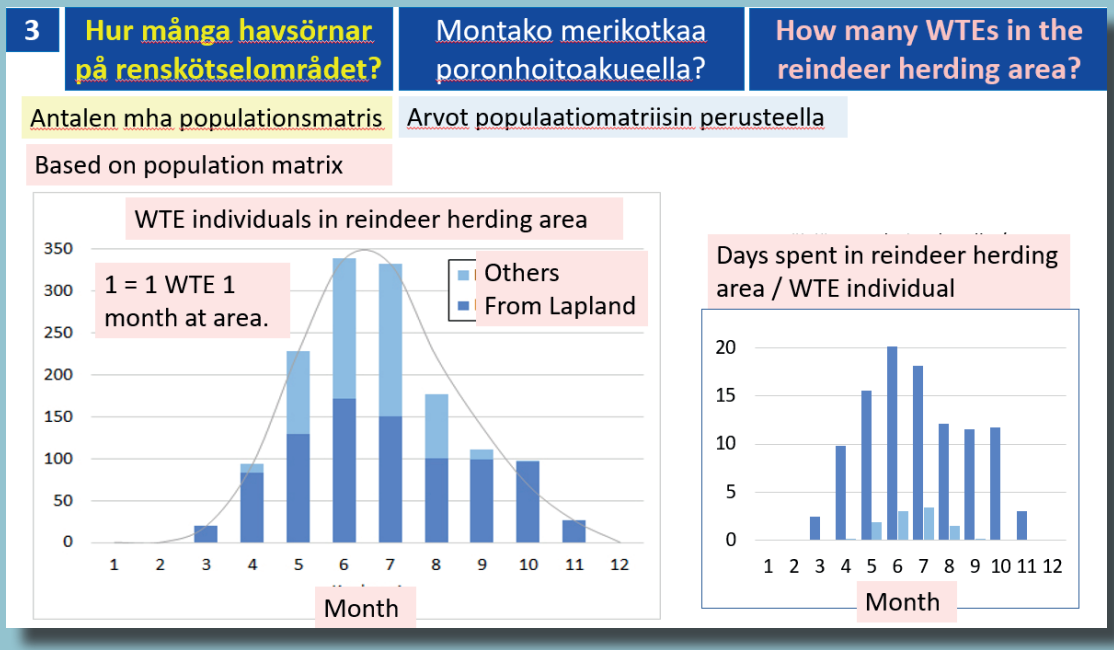


Figure 3. Number of White-tailed Eagles in the reindeer herding area throughout the year. The left figure shows the number of individuals throughout the year from Lapland and other regions. The right figure shows the number of days White-tailed Eagles spend in reindeer herding areas.

How human actions shaped the DNA of Finnish Golden Eagles

Ekaterina Karabanina

Golden Eagles were once widespread across Finland until the 19th century, but today the species breeds mostly in the northern part of the country. While limited records from before the 20th century make it challenging to accurately assess their historical population size and distribution, some information is still available. Thus, in 1868, the Finnish Hunting Decree classified most raptors, including Golden Eagles, as pests, and bounties were soon introduced for every bird killed (Vuorisalo & Laihonen, 2000). This classification was reinforced by the Hunting Act of 1898, and from 1899 to 1915, bounties were increased, leading to a dramatic rise in the number of birds of prey killed across Finland (Erkamo, 1990).

As a result, Golden Eagles vanished from southern Finland and their numbers dwindled nationwide by the early 20th century (Ollila & Koskimies, 2007). The first Finnish Nature Conservation Act (1924) granted Golden Eagles legal protection south of Oulu Province from 1926, and in 1955, hunting them was prohibited in reindeer herding area (Below, 2000). Despite these protections, exceptions were occasionally made when eagles threatened livestock. These factors, combined with human disturbance and habitat destruction, led to a severe population collapse, with only 250-300 breeding pairs recorded by the 1950s and 1960s (Ollila & Koskimies, 2007).

Full protection of Golden Eagles was finally granted in 1969 (Below, 2000). Since then, efforts like building artificial nests, providing supplemental winter feeding, and compensating reindeer herders for eagle-related damage have helped the population recover. Today, a national monitoring program estimated that there were between 371 and 498 breeding pairs in 2023, but the majority of the territories are still located in the northern part of the country (Siivonen, 2023).

In our study, we aim to explore the genetic consequences of this sharp population decline. We are comparing the genetic diversity and genomic structure of Golden Eagles from three periods: before the decline (1886-1914), during the decline (1955-1969), and the modern population (2012-2021). We analyzed whole-genome data from 27 individuals, which, despite the small sample size, provides significant genetic insights.

Preliminary results show that the modern population has lower levels of heterozygosity compared to the pre-decline population (Figure 1). Heterozygosity is crucial for species to adapt to environmental changes and diseases, influencing their long-term survival (Frankham et al., 2010). We also identified an increase in the proportion and length of deletions in the modern eagles' genomes (Figure 1). These structural changes can potentially disrupt gene function, leading to genetic disorders and affecting reproductive success and overall health (Rowe et al., 2017). Our research is ongoing, and we expect to have more findings in the coming months. For updates on the study, visit our website: https://wildlifegenomics.wordpress.com/study-systems/golden-eagle/

Toe pads of museum specimens are commonly used as a DNA source for molecular studies because they are less affected by preservative chemicals compared to skin. Photo: Ekaterina Karabanina.

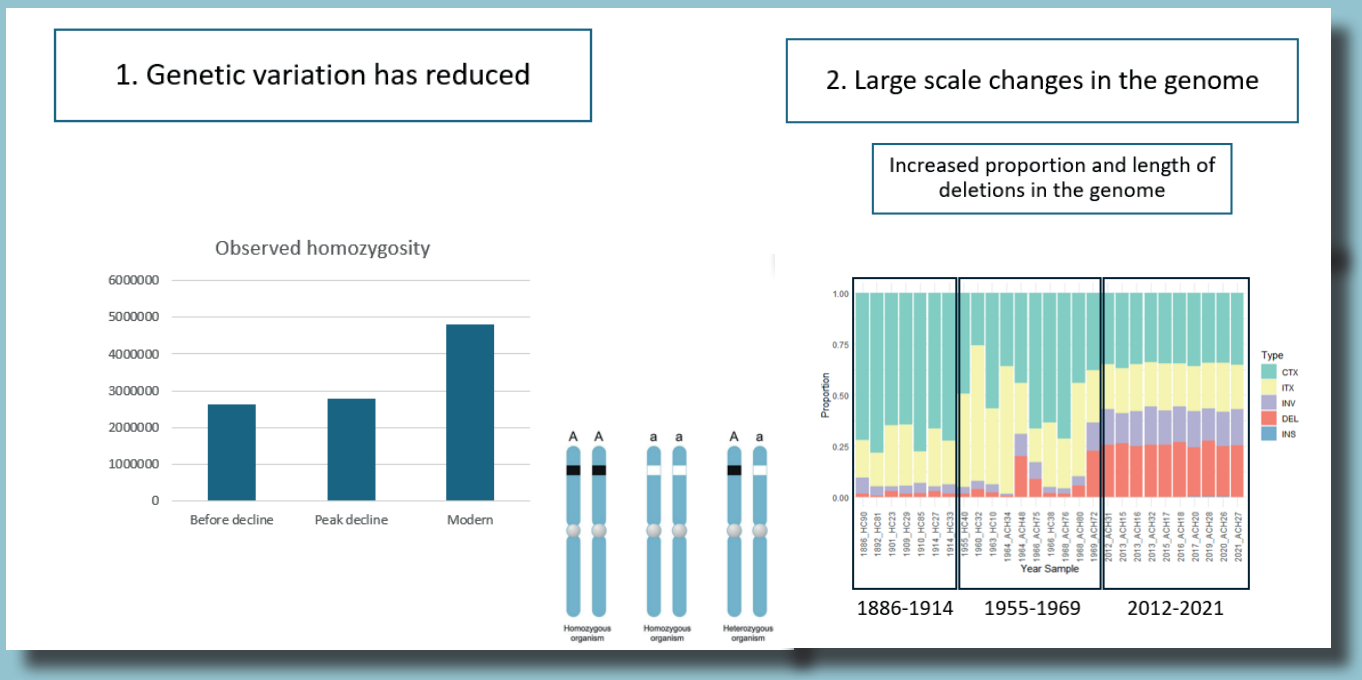
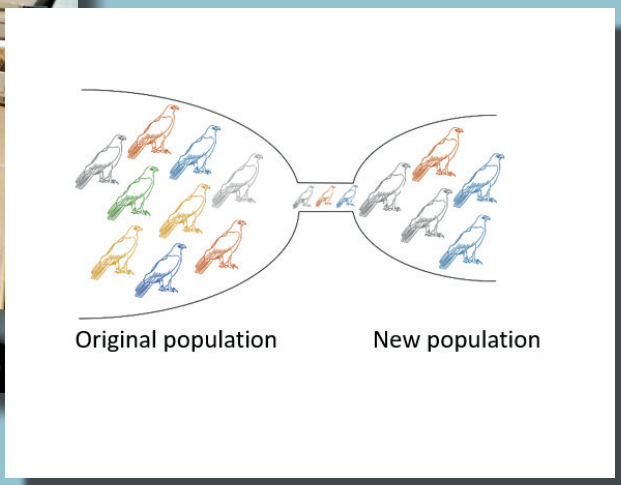


Figure 1. The modern population has lower levels of heterozygosity compared to the pre-decline population.

Two stuffed juvenile Golden Eagles at Oulu Zoological Museum. Museum samples are essential for studying population changes over time. Photo: Ekaterina Karabanina.



Schematic representation of a population bottleneck. After the bottleneck, the population loses genetic variabilty which leads to reduction in fitness and adaptability potentially causing lower reproduction rates and higher mortality.

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Golden Eagles in Northwestern Russia

Ekaterina Karabanina

The Golden Eagle is listed as a rare species in the Red Book of the Russian Federation (2021) and in regional Red Lists. However, due to the lack of regular censuses, estimating population size, distribution, and trends remains difficult. The latest estimates suggest there are 355-400 breeding pairs in European Russia, although earlier reports from the beginning of the 21st century stated that the population may have been twice this size (Artemiev et al., 2020; Pchelintsev & Shergalin, 2024). Northwestern Russia, which consists of eleven administrative regions is thought to harbor only around 200 breeding pairs of Golden Eagles (Figure 1).

In Karelia, most Golden Eagle territories are found near the region's largest protected areas, including Kostomukshsky Nature Reserve, Paanajärvi National Park, and Vodlozersky National Park (Zimin et al., 2005). The total population size in Karelia was estimated to be around 36 breeding pairs, but it has been declining in last years (Artemiev, 2010; Artemiev et al., 2020). For example, Golden Eagles were regularly observed in the Kizhi Reserve (northern part of the Onega Lake) until the mid-1990s, but no sightings have been reported since the turn of the century (Artemiev et al., 2020). Similarly, Paanajärvi National Park, which borders Oulanka National Park in Finland, had five pairs of Golden Eagles by the end of the 20th century, but no observations were made in 2017 (Zimin et al., 2005; Artemiev et al., 2020). In southern Karelia, near the border with Leningrad oblast', only two Golden Eagles nests are known, but neither has been inspected in the last decade (Artemiev et al., 2020). Similarly to most parts of Russia, much of the region lacks consistent surveys to accurately assess population size and understand population dynamics. Overall, Golden Eagle sightings in Karelia are rare, with little recent information confirming their breeding status or the locations of nesting territories.

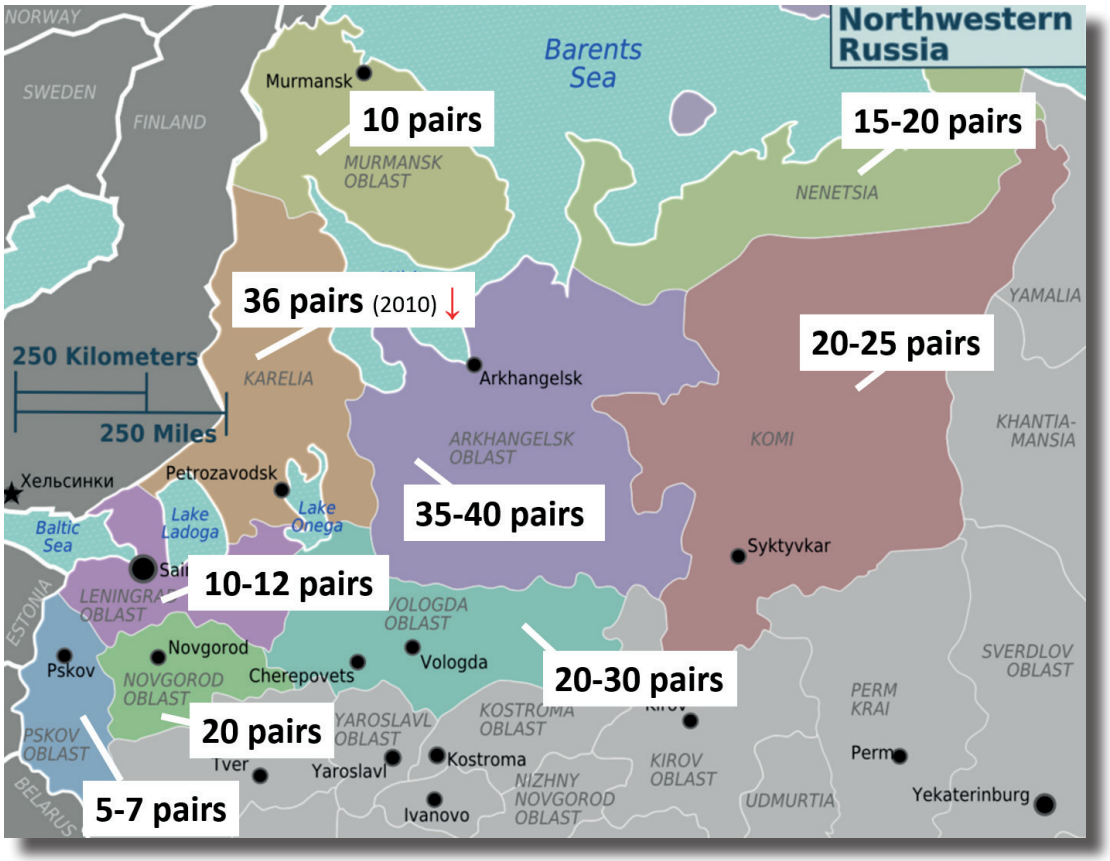

Figure 1. Population size estimates of Golden Eagles in Northwestern regions of Russia (values obtained from Artemiev et al., 2020; Pchelintsev & Shergalin, 2024). The numbers are presented for the following federal subjects: Arkhangelsk Oblast', Murmansk Oblast', Republic of Karelia, Republic of Komi, Leningrad Oblast' (including Saint Petersburg federal subject), Novgorod Oblast', Pskov Oblast', Vologda Oblast', and Nenets Autonomous okrug. Kaliningrad Oblast', which is also a part of the Northwestern Federal District, is not included here. Base map by Peter Fitzgerald (CC 2.5).

Carolina – an adult Golden Eagle born in 1996 in the Pryazha region of Karelia, Russia (west of Lake Onega). Carolina lived in captivity after being found with a broken wing in December 1996. She passed away in November 2019. Photo: Mikhail Fyodorov.

References to Ekaterina's both lectures

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Past and current status of the Golden Eagle in Yakutia on the example of Central Yakutia and Central Verkhoyan regions

Viacheslav Gabyshev & Arkadiy Isaev

Golden Eagles are naturally rare, and their population has fluctuated significantly. Historically, they were most numerous in Yakutia's Chersky and Verkhoyansky Ranges and the Yansk Plateau. However, about 70% of old, uninhabited nests remain, reflecting a significant decline in the region. The current status of the Verkhoyansk population is unclear, and systematic studies are needed to assess the species' numbers in Yakutia. Key conservation areas in the region include resource reserves in Jerono, Kenkeme, Verkhoyanye-Kele, Tuostaakh, and Oldjo, and resting areas like Erik-maara, Oyun-Yurege, Lake Inderkey, and the Nelgese and Echiy Rivers.

Historical records on the Golden Eagle population in Verkhoyansky Region

The Central Verkhoyansky Range, one of Northeast Asia's largest mountain systems, faces extreme temperature fluctuations, with winter temperatures below -50°C. Golden Eagles in this region primarily prey on hares, with their population density linked to hare cycles. During high hare years, eagle density increases from the southern to the northern foothills, while in lean years, eagles are more concentrated in the northern foothills and slopes. On the southern slope, eagle density remains low even in favorable foraging conditions. Most of the observed nests were located in large larch trees on mid-to-upper slopes, while only a few were on rocky outcrops.

Already during the 1950s-1970s golden eagles were rarely observed in the region. Later surveys indicated the population density varied depending on the area:

- **Southern foothills:** No sightings (1987-1989), though breeding pairs may still exist due to limited surveys.
- **Southern slopes:** One sighting in the 1990s-2000s, indicating very low density.
- **Axial ridge:** During observations in 1986-1994 and 1997-2001, breeding density ranged from 0.7-1.1 pairs/1000 km^2, rising to 3.4 pairs during hare peaks. In low hare years, eagles shifted

The Golden Eagle in the Middle Lena basin adheres to river valleys and open spaces. Nesting sites are located mostly on slopes of hills and floodplain terraces, sometimes on island forests in meadows and forest edges at the edge of arable land and wide meadows. Photos: Ruslan Kirillin.

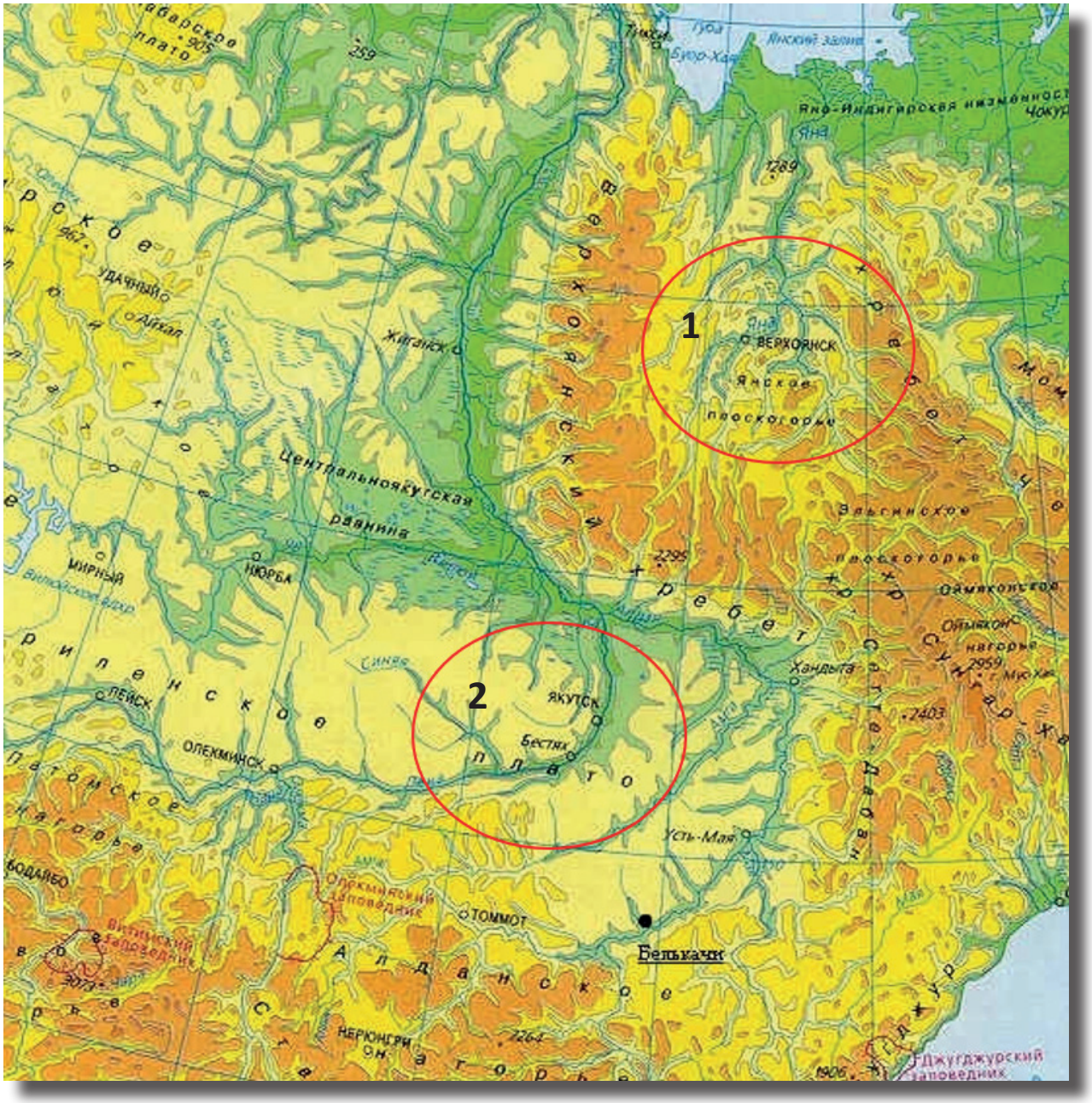


Figure 1. The two study areas described in the text. 1 - The Central Verkhoyansky Range is one of the largest mountain systems in northeast Asia. 2 -The Central Yakut lowland in the Middle Lena River at the Central Siberian plateau.

to tundra.

- **Northern slopes:** During 1987-1992, breeding eagles were common but at low density (0.8-1.4 pairs/1000 km^2), with rare sightings in sparse larch forests and alpine zones.
- **Northern foothills:** In some parts, nests were found every 5 km in 1991. Eagle density was 1.6-2.5 pairs/1000 km^2, with numbers dropping drastically during hare-poor years, as seen in 2000 with only one pair nesting along a 500-km transect.

Central Yakutia

The Middle Lena region, part of the Central Yakut lowland, is bordered by the Verkhoyansk mountains and the Central Siberian plateau. Golden Eagles were once common breeders along the Middle Lena River until the mid-1950s, but habitat destruction, human disturbance, and a decline in hares led to a sharp population drop (Red Book of the Republic of Sakha, 2003). By the early 1960s, nesting sites near settlements like Tabaga, Tulagino, Khomustakh, Krasny Partizan, and Nikoltsy had disappeared.

Since 2006, we have documented 27 Golden Eagle nests in the Middle Lena region, with nine active sites. Some pairs maintain two nests, generally 60-200 meters apart, though one pair's nests were located 1 km from each other. Egg-laying occurs in late April to May, with clutches of 1-2 eggs, occasionally 3. Most

Diet

In the 1970s-1980s, studies showed that Arctic hares made up 89% of the Golden Eagle's diet in Central Yakutia. However, by the 1980s-1990s, this figure had dropped to 37.7%. Historically, hares were highly abundant in the region, peaking during population booms when up to 850 000 pelts were harvested annually. Since the 1970s, hare numbers have sharply declined, largely due to overhunting and other anthropogenic factors. By 2000, hare hunting ceased in the region because of the species' low numbers. Surveys from 2008 to 2018 recorded very low hare populations, with only 0.2-0.3 individuals per 10 km of survey route.

In recent years, Golden Eagles in Central Yakutia have been documented feeding on 11 species of mammals, 29 species of birds, and primarily the Asian long-tailed ground squirrel (gopher). The dominance of the gopher in the eagle's diet suggests a shift away from hares due to their declining numbers, as gophers remain abundant in the area. Seasonal variation in diet is also evident. In spring, the diet includes young roe deer, gophers, and less frequently, hares, sable, and other mammals. There are occasional reports of eagles preying on weakened adult roe deer during this time. Interestingly, Golden Eagles have also been observed scavenging on fallen horses, with horsehair found in at least one examined nest, confirming this behavior. By June, the Golden Eagles focus primarily on long-tailed gophers, though small mammals and passerines also appear in their diet. Additionally, it is worth noting the presence of insects in the nests, likely collected from burrows, suggesting another interesting aspect of their foraging behavior.

Photo: Ruslan Kirillin.

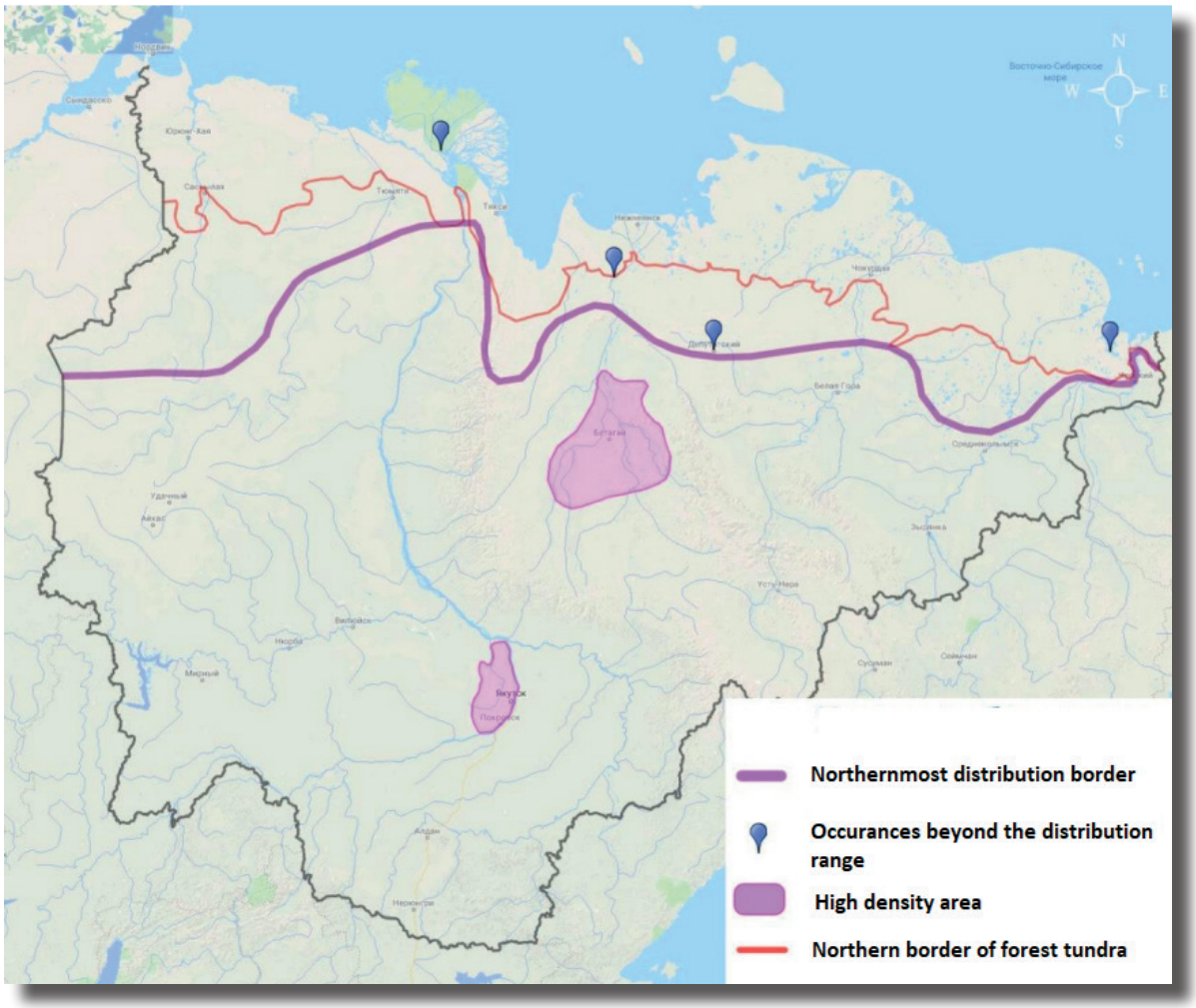
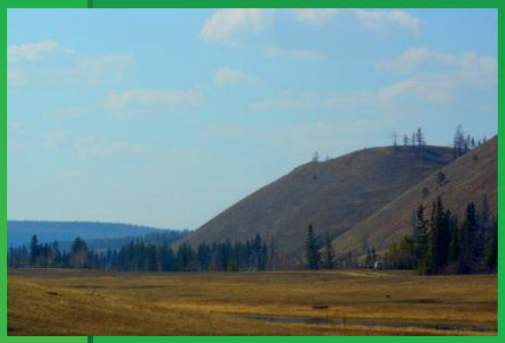


Figure 2. Distribution of the Golden Eagle in Yakutia.

The Golden Eagle in the Middle Lena basin adheres to river valleys and open spaces. Nesting sites are located mostly on slopes of hills and floodplain terraces, sometimes on island forests in meadows and forest edges at the edge of arable land and wide meadows



Eagles make nests on overmature larch trees 120 and more years old (in one case on dry larch) 13 to 19 m high (n=6). Nests are located at heights from 4 to 11 m, mostly at 9 to 10 m (n=9) and are made of thick twigs, with pine branches, grass rags and wool as bedding. The structure is renewed and increases in size over the years, reaching sizes from 1 to 1.6 m in diameter and 0.7 to 1.2 m in height (n=8). 3 pairs have 2 nests each, which are used in turn and are located 60 - 200 m apart and once 1000 m apart.

Photos: Arkadiy Isaev and D. Isaev

Golden Eagle in Russia and Kazakhstan

Elena Shnayder

The Golden Eagle is protected under governmental environmental laws in both Russia and Kazakhstan. The estimated population size is around 18 000 – 22 000 breeding pairs in Russia and at least 5 000 breeding pairs in Kazakhstan.

Since 1989, a team of the Russian Raptor Research and Conservation Network has studied Golden Eagles in four key areas: the Ural region of Russia, the Altai-Sayan region of Russia, Aral-Caspian region of Kazakhstan and Karatau, and Chu-Ili Mountains of Kazakhstan (Figure 1). The estimated population sizes in these regions are as follows:

- Ural region: 1 000 – 1 200 breeding pairs;

- Altai-Sayan region: 1 400 -1800 breeding pairs;

- Aral-Caspian region: 416 – 557 breeding pairs;

- Karatau and Chu-Ili Mountains of Kazakhstan: 700 – 900 breeding pairs.

Breeding conditions and nesting preferences of Golden Eagles vary across these regions (Figure 2). In the Ural region, most nests are built in trees, predominantly pines. In the Altai-Sayan region and the mountainous areas of Kazakhstan, eagles typically nest on rocky cliffs, while in the Aral-Caspian region, they prefer chalk cliff faces. About one-third of the Altai-Sayan population, however, nests in trees, primarily larches.

Golden Eagles are resident in all study areas, and their breeding depends largely on diet, which varies with altitude. Lowland populations, which predominantly prey on hares, begin laying eggs from late February to early March. Mountain populations at altitudes above 2 500 meters delay egg-laying until late March to early April, as they rely on marmots that hibernate until spring. Populations in hills and low mountains have intermediate egg-laying timelines.
Brood sizes range from one to three nestlings, with the average number differing between regions. The highest average brood size was reported in the Aral-Caspian region, with 1.86±0.48 nestlings per nest. The densest population is found in the southern Altai-Sayan region, with 0.6–0.9 breeding pairs per 100 square kilometers. Furthermore, population in this region is growing.

Prey preferences also vary across regions. In the Ural region, Golden Eagles primarily hunt Mountain Hare (*Lepus timidus*) and Black Grouse (*Lyrurus tetrix*). In the Altai-Sayan region, their main prey includes hares (*Lepus tolai*, *L. timidus*) and Grey Marmot (*Marmota*

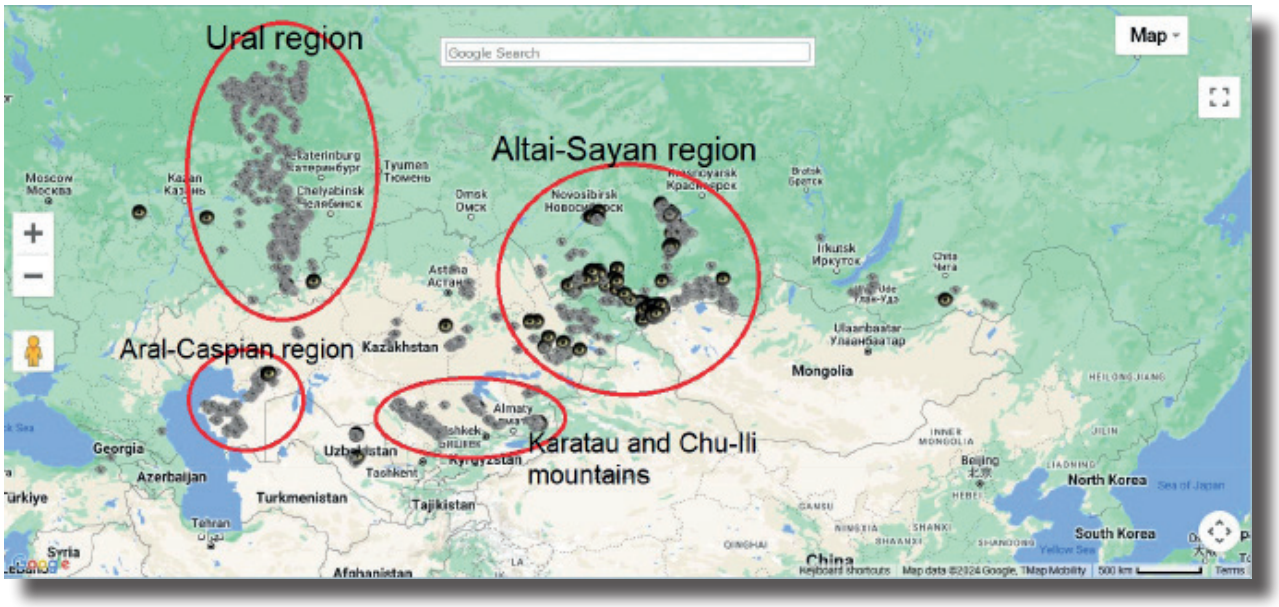


Figure 1. Four key areas of Golden Eagle research conducted by the Russian Raptor Research and Conservation Network in Russia (The Ural region, the Altai-Sayan region) and Kazakhstan (Aral-Caspian region and Chu-Ili Mountains).

Igor Karyakin and Elvira Nikolenko from the RRRCN during the field work. Photo: Oleg Polevoi; taken from RRRCN website.

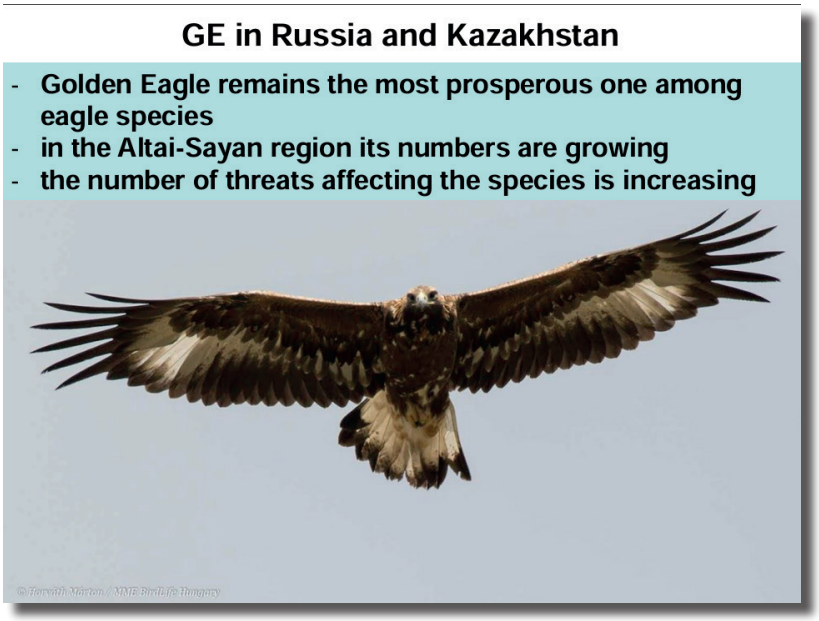
Members of the RRRCN during the field work. Photo: Elena Shnayder.

baibacina). In Kazakhstan, prey species include the Central Asian Tortoise (Testudo horsfieldii), Tolai Hare (Lepus tolai), Chukar Partridge (Alector chukar), and Great Gerbil (Rhombomys opimus).

Despite being the most prosperous eagle species in Russia and Kazakhstan, the Golden Eagle faces increasing threats. The most common threats include electrocution on aerial powerlines, poisoning from wolf-bites and pesticides, illegal trapping for traditional hunting with eagles, and habitat degradation by fires (deliberate arson of dry grass in hayfields which spreads to woodlands) and illegal logging (mainly in Russia). Recently, the construction of wind power plants in southern Kazakhstan's Karatau Ridge has posed a significant new threat. Three wind farms have been built in Golden Eagle nesting areas, leading to the abandonment of five breeding territories within a six-kilometer radius and the documented deaths of two individuals.

To address these challenges, our team has implemented several conservation measures. These include providing artificial nesting platforms to increase local breeding pairs, collaborating with powerline operators to retrofit dangerous stretches with protective devices, and working with authorities to combat illegal trapping. We are also tracking young Golden Eagles using GPS-GSM transmitters to study their early-age movements and identify potential threats. Furthermore, we engage in ecological education to raise awareness among local communities about Golden Eagle ecology and environmental legislation.

Below and on pages 17-25 are slides from Elena's presentation.



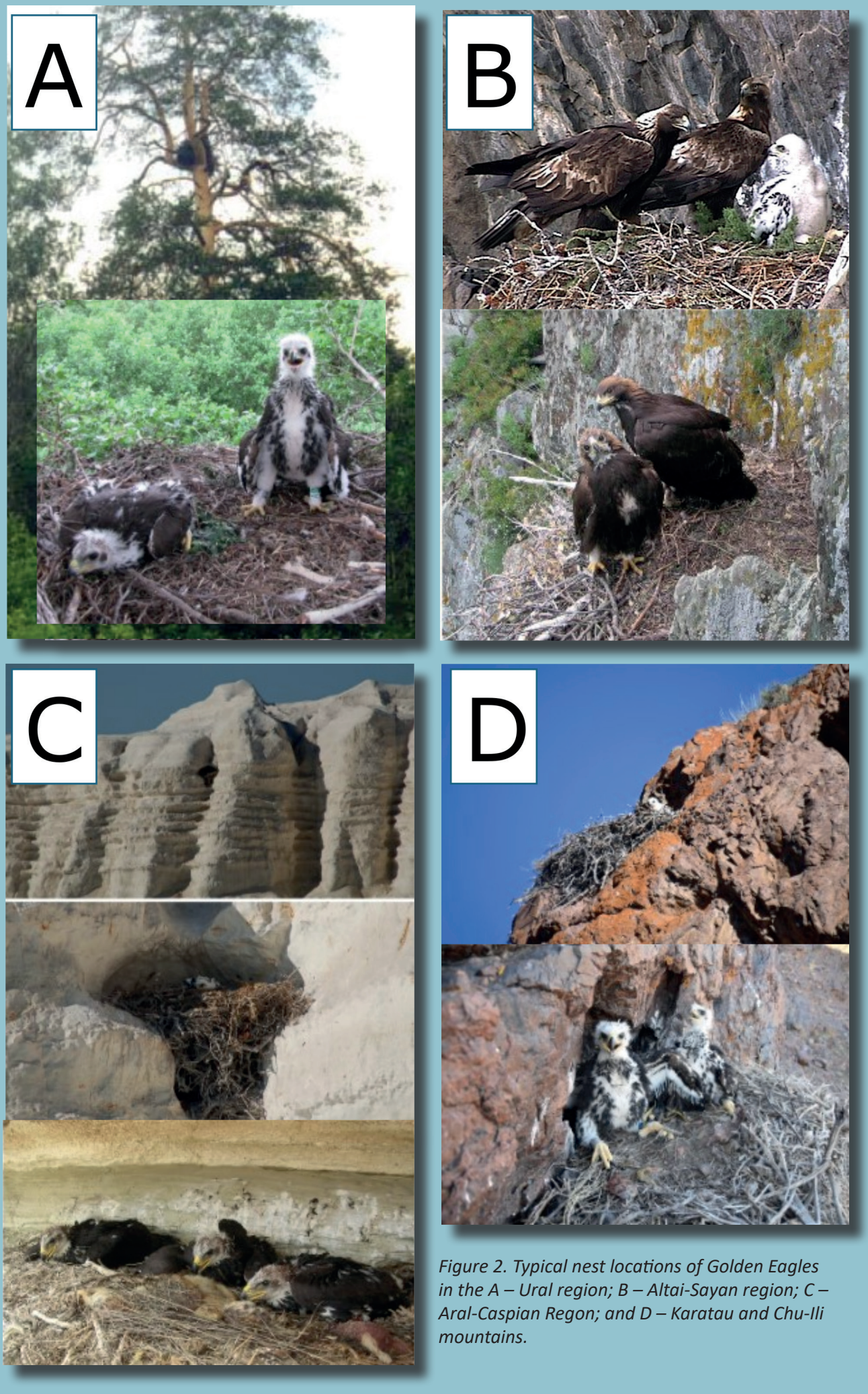
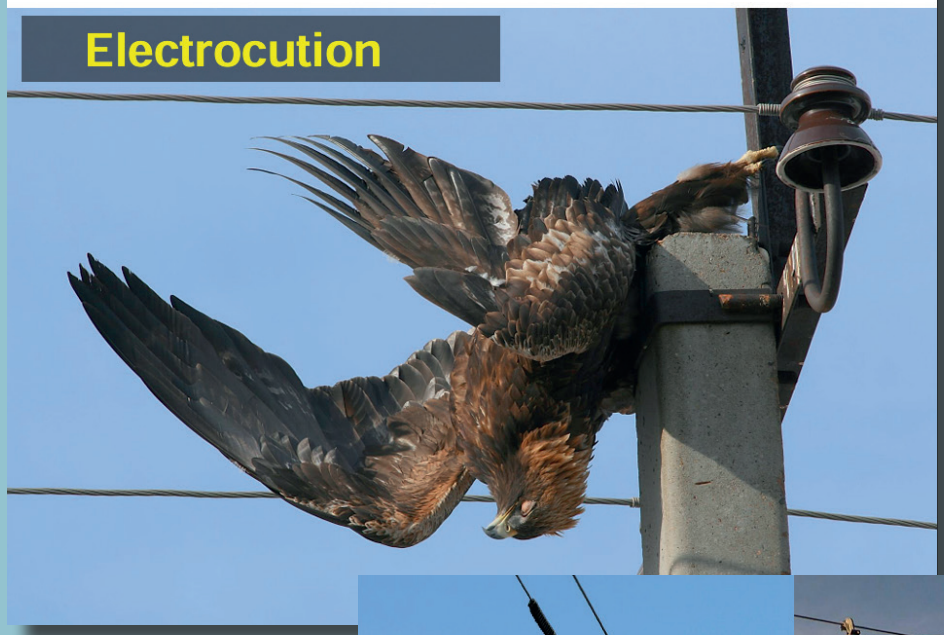
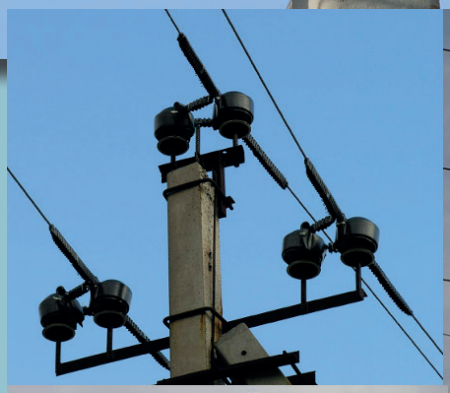
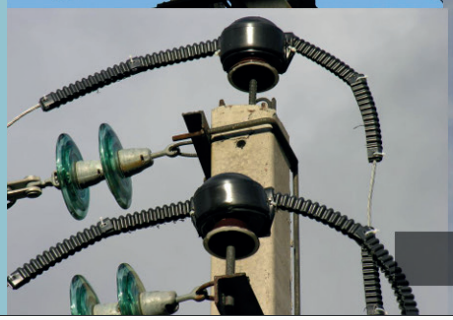


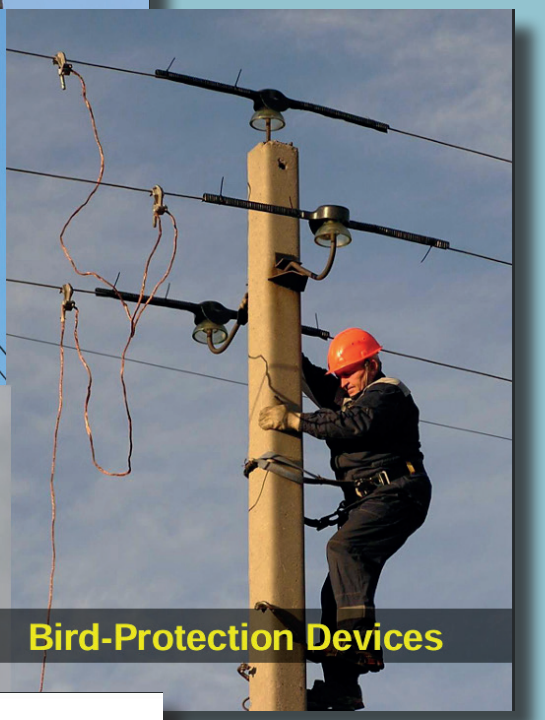
Figure 2. Typical nest locations of Golden Eagles in the A – Ural region; B – Altai-Sayan region; C – Aral-Caspian Regon; and D – Karatau and Chu-Ili mountains.

Threats



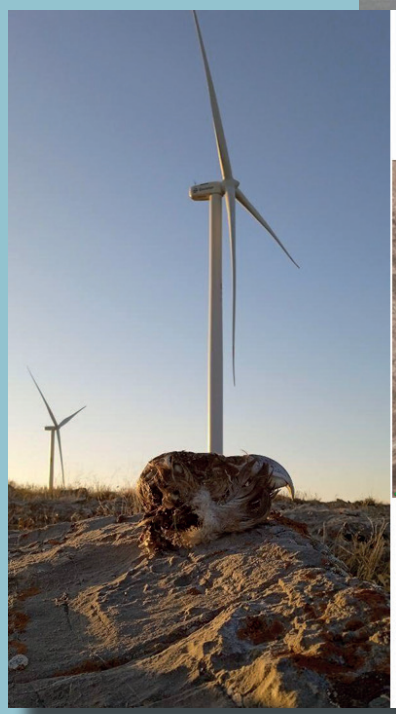






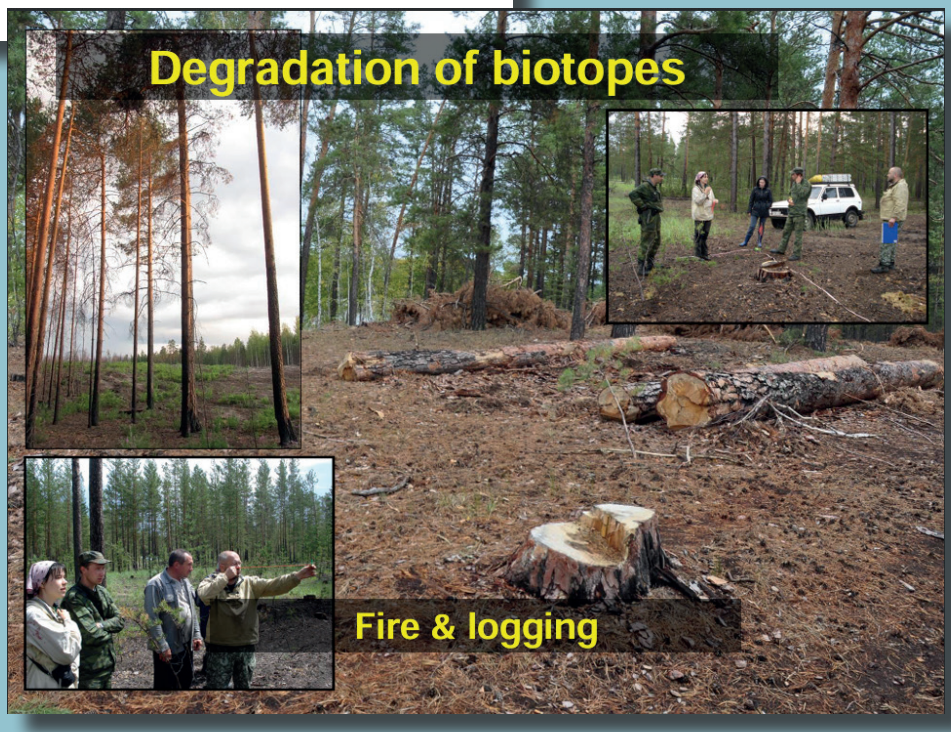
Threats

- Poisoned baits for wolves
- Chemicals used for pest control

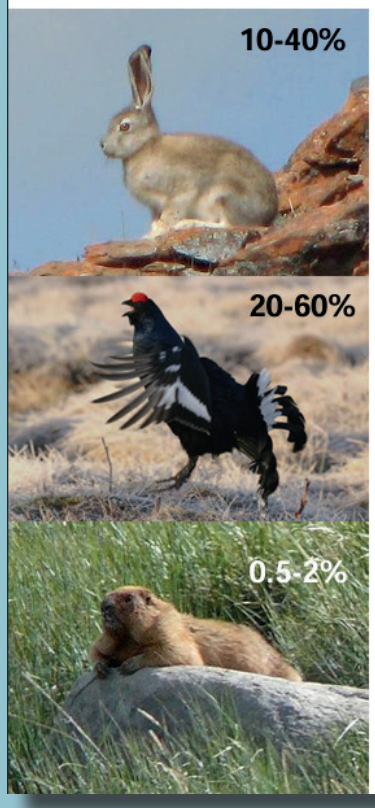


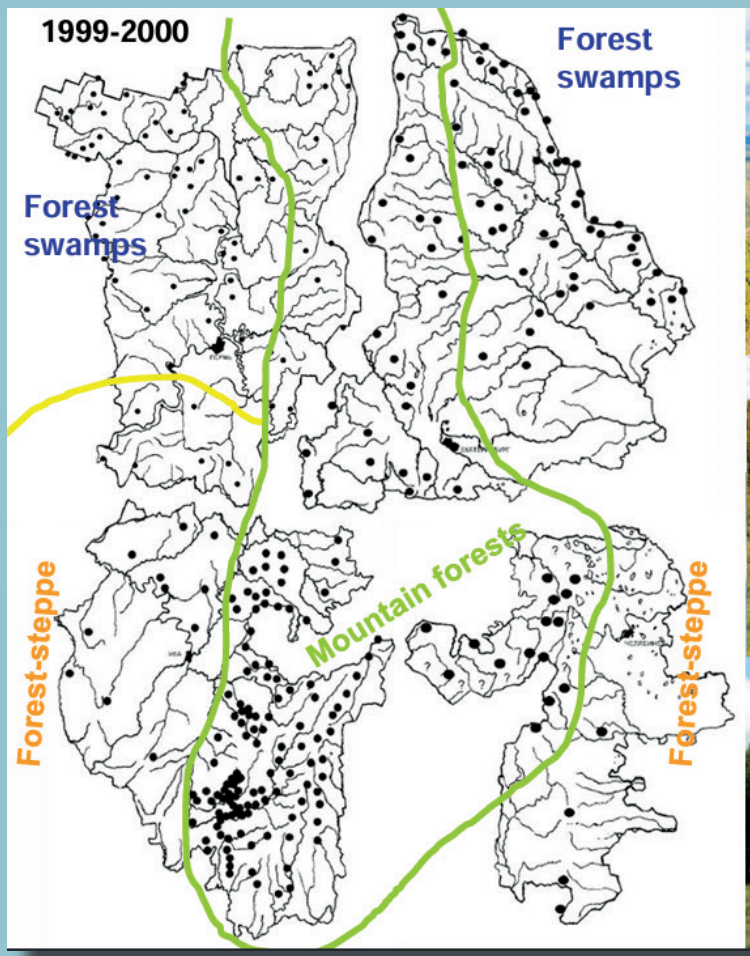
Wind farms

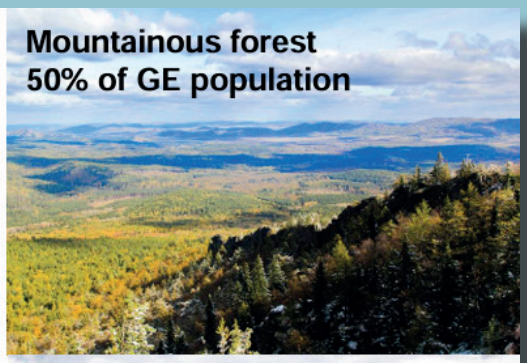
In Southern Kazakhstan
-5 breeding territories
-2 mature individuals



GE in the Ural region: diet



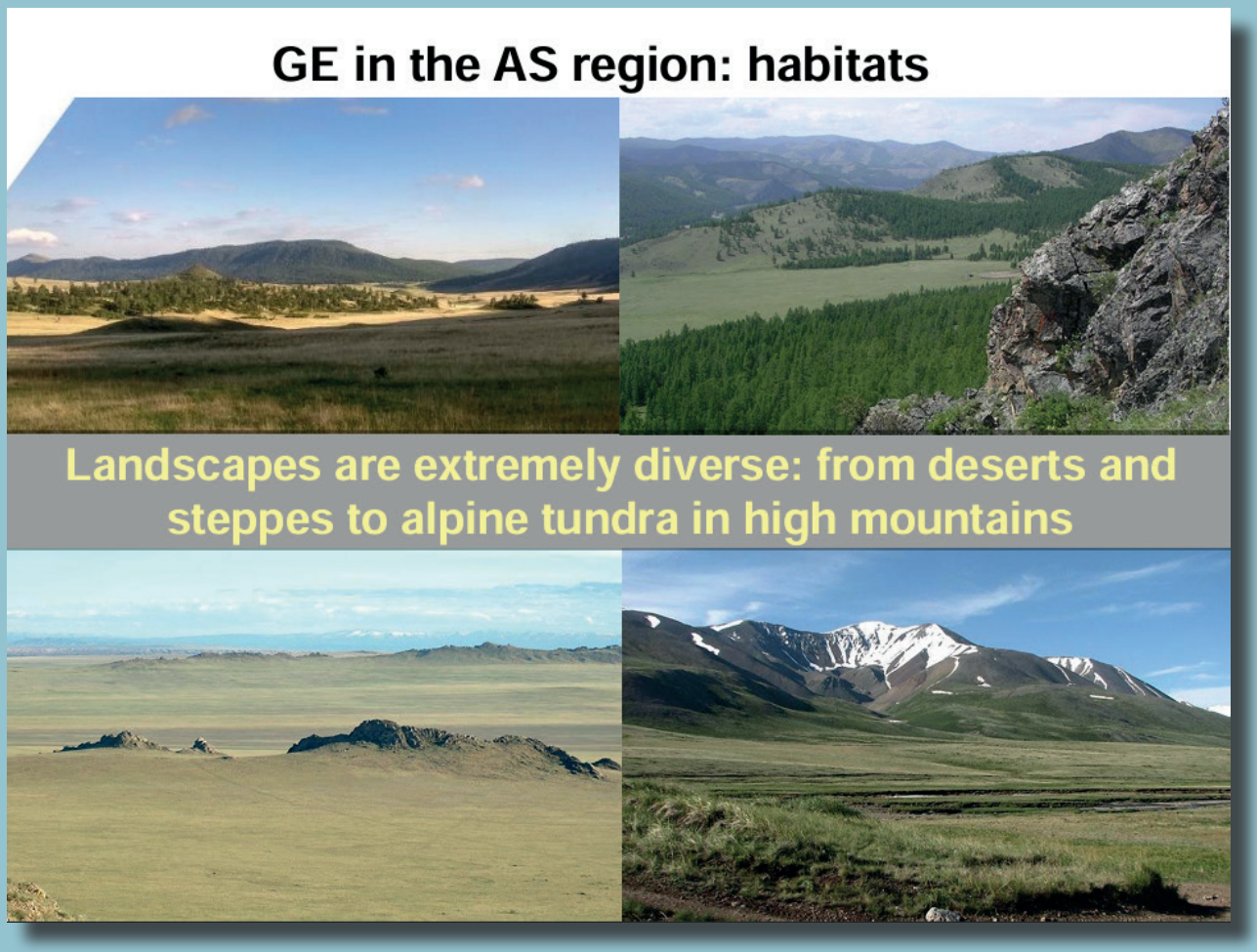




GE in the Ural region: brood size

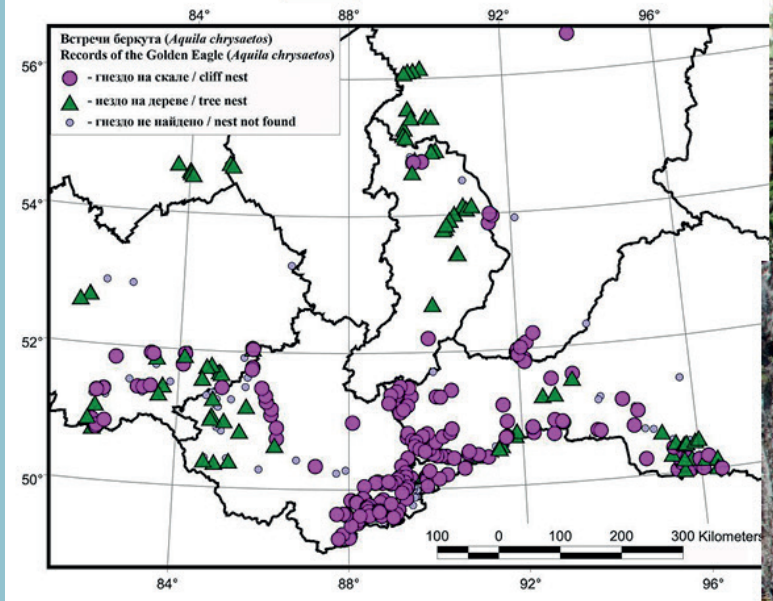
N of nestlings per brood:
1-3 nestlings
mean (n=168): 1.2 nestling


Altai-Sayan region


GE in the AS region: habitats
Landscapes are extremely diverse: from deserts and steppes to alpine tundra in high mountains

GE in the AS region: nest location

Trees – 33.5%



Cliffs – 66.5%

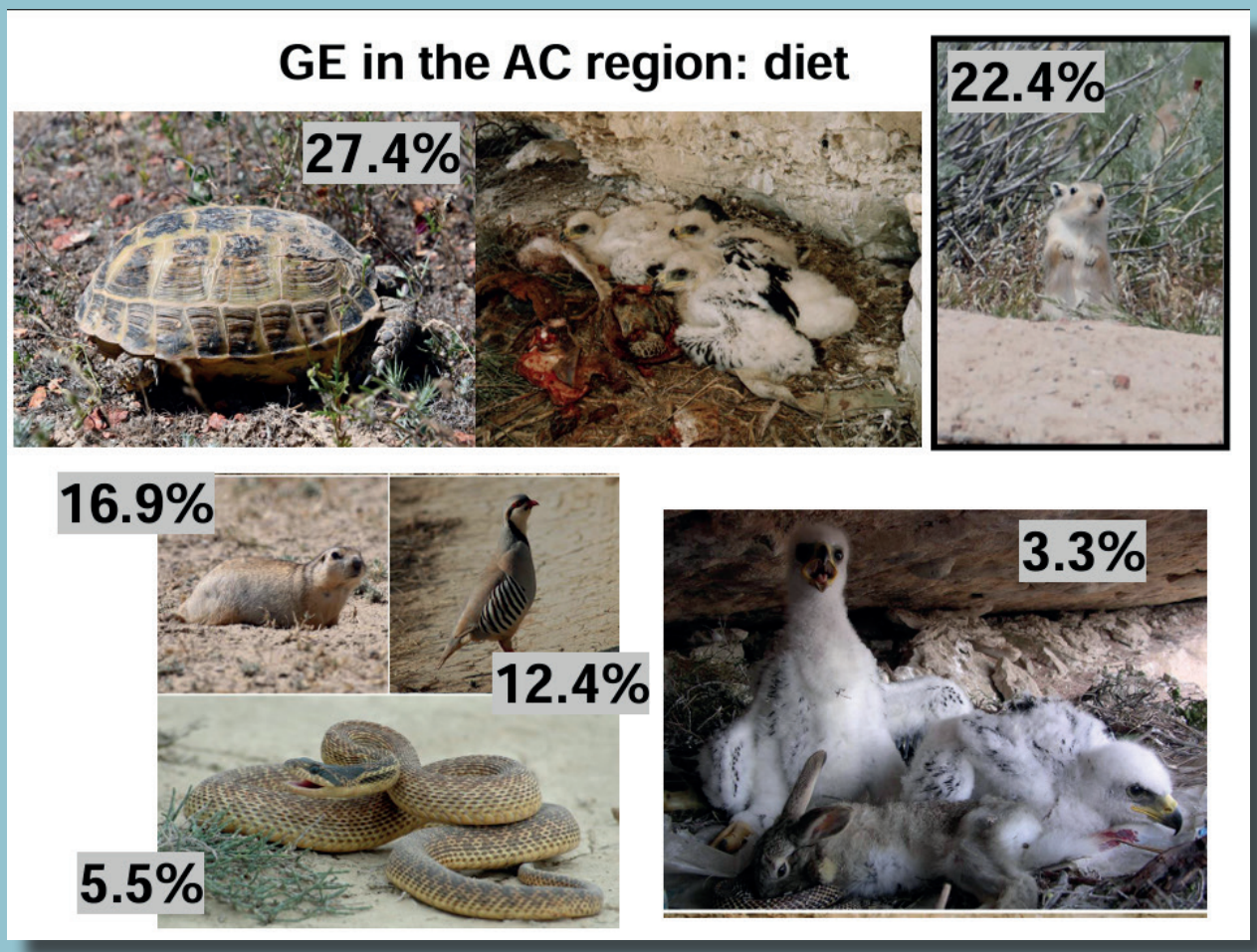
GE in the AS region: nest location

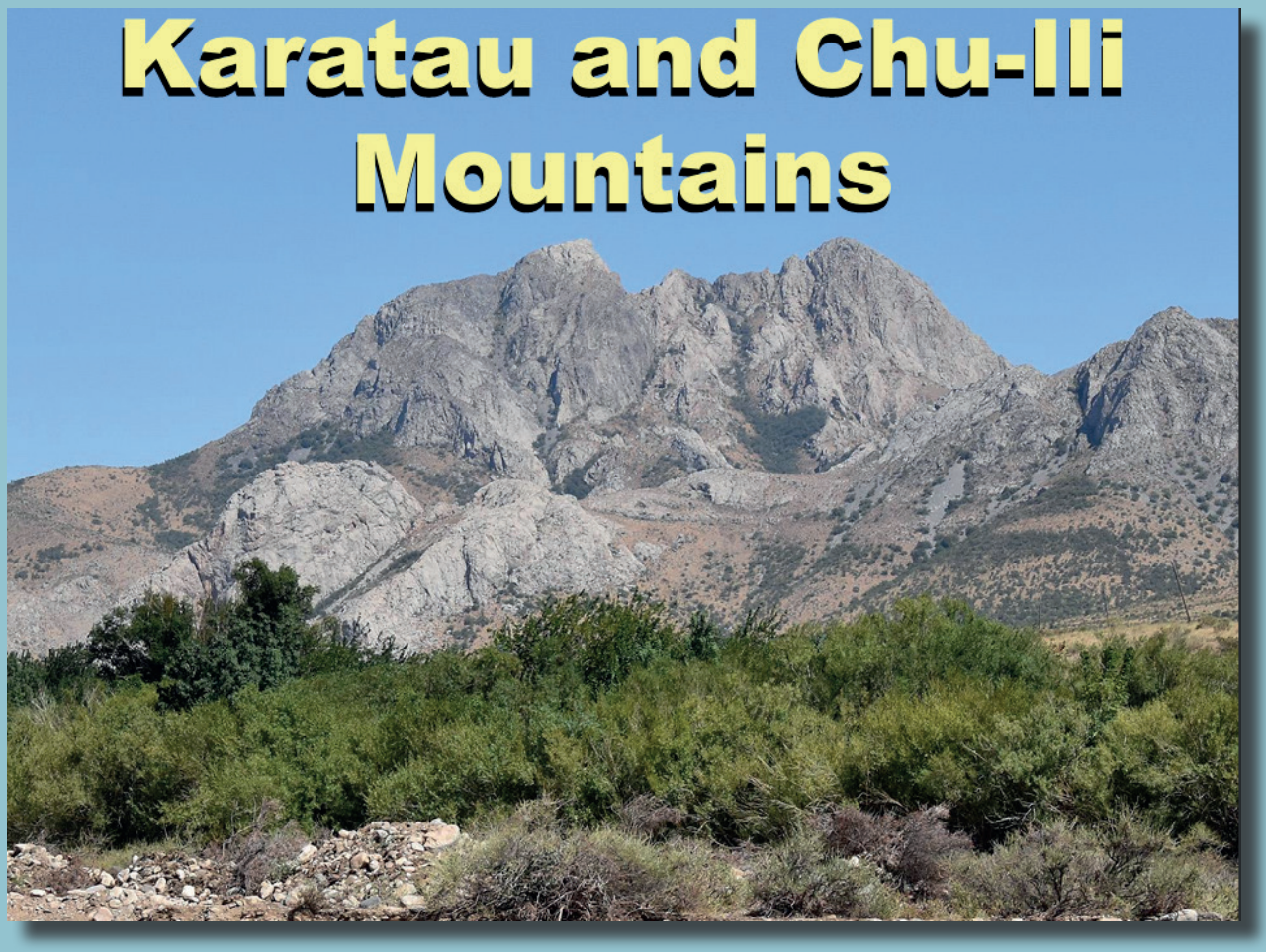
Larch: 75%

Pine: 22%

Birch: 3%


Aral-Caspian region


GE in the AC region: diet
27.4%
22.4%
16.9%
12.4%
3.3%
5.5%


Karatau and Chu-Ili Mountains


GE in the S KZ region: nest location
Cliffs – 100%

Avian influenza in birds of prey

Thomas Birkö

It was initially planned for a veterinarian from SVA in Uppsala to give a lecture on bird flu; unfortunately, this did not happen. Instead, Thomas Birkö from Kungsörn Sverige presented information obtained through contact with the Avian Influenza Working Group (AIW), a working group within BirdLife International.

Bird Flu, also known as Highly Pathogenic Avian Influenza (HPAI), is caused by Influenza A virus subtype H5N1 (A/H5N1). Many cases go undetected across Europe and worldwide. The AIW-group within BirdLife advocates for increased testing and monitoring, suggesting that existing raptor monitoring programs (e.g., wildlife crime, West Nile virus, blood lead levels, etc.) could also be used to test for immune status. If funding allows, testing the blood of young eagles for antibodies would be particularly interesting.

The European Food Safety Authority (EFSA) publishes quarterly reports on the current bird flu situation and the species affected. While previous outbreaks primarily occurred in winter, since 2022, many cases have also been recorded during summer. The species most commonly infected are seabirds, colony nesters, and easily detectable birds such as the Mute Swan. In Europe, most cases have been detected in the Netherlands, Germany, and the United Kingdom (Figure 1). This is likely due to the fact that many seabirds winter in these countries.

Many birds of prey species are listed among the affected species, including Golden Eagles. Raptors that prey on ducks, waders, and Black-headed Gulls are most affected, as are scavengers like vultures.

The Peregrine Falcon has been one of the most severely affected species, with population numbers and breeding success declining in recent years, including in Sweden and Norway. Ringers report that pairs that survived the flu appear run-down, weak, and behave less aggressively in their territories than usual.

In the Netherlands, researchers closely examined Peregrines and found that wintering individuals, which concentrate in open landscape

Peregrine Falcon is one of the raptors commonly affected by Avian Flu causing reduced reproduction and decrease of breeding pairs in the Nordic countries 2023 and 2024. Photo: Patrik Tjärnström.

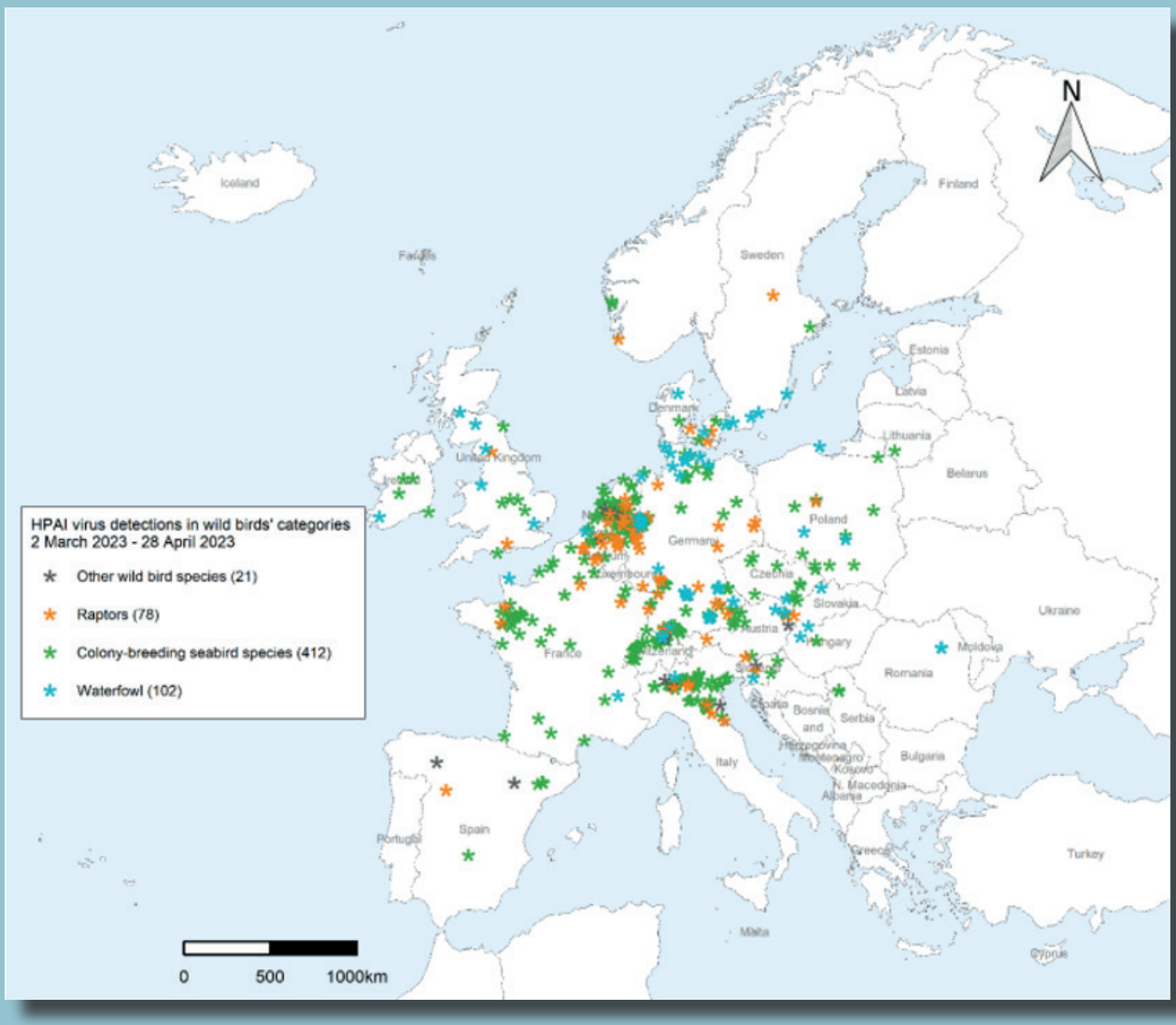


Figure 1. Geographical distribution of HPAI detections in different categories of wild birds in Europe, by species category, from 2 March to 28 April 2023. The orange stars in the map are raptors.

and hunt infected species, are hit harder than local breeding birds. The latter may be less affected because they feed on different prey, such as pigeons.

Other affected species include Gyrfalcon, Goshawk, and scavenging or opportunistic raptors such as White-tailed Eagles, buzzards and harriers. Eagle Owls are also relatively frequently found with the virus, as well as a wide range of other birds of prey, including smaller species like Little Owls.

In the USA, Bald Eagles have been heavily impacted in some locations, as have Turkey Vultures. Antibody testing for H5 and N1 in the USA shows that Bald Eagles are the most affected (69,9%), followed by Red-tailed Hawks (12,3%) and Great Horned Owls (14,7%).

The virus affects the same species to varying degrees in different locations. For example, Common Cranes died in large numbers in Hungary and Serbia, but a few weeks later, when they migrated to Spain and other areas, hardly any dead birds were found.

Some interesting questions remain:

- Did the weaker individuals already succumb to the virus?

- Was immunity developing rapidly?

- Were habitat conditions significantly different influencing the virus's spread?

Webbsites about Avian Flu

Finland. **Avian influenza in Finland - Finnish Food Authority (ruokavirasto.fi)**

Denmark. **Fugleinfluenza beredskab (fvst.dk)**

Norway. **Fugleinfluensa | Mattilsynet**

Sweden. **Smittläge för fågelinfluensa - SVA**

Results from the monitoring of the Golden Eagle in the Nordic countries 2024

In 2024, monitoring across the four Nordic countries identified approximately 1900 Golden Eagle territories. Of these, 1332 territories were occupied. Successful breeding was recorded in 328 territories, resulting in a total of 537 nestlings. This yields a reproduction rate of 0,40 nestlings per occupied territory across the Nordic countries.

It should be noted that this summary does not include all territories in the region. Particularly in Norway, many territories remain uninvestigated, so these figures do not represent a comprehensive assessment. The results are considered average – neither particularly good nor particularly bad. The most northern parts of Norway, Sweden, and Finland showed relatively good outcomes, likely due to an abundant food supply of Willow Grouse and Ptarmigan.

The results were compiled by Börje Dahlén (Kungsörn Sverige), Hans Christophersen (Dansk Ornitologisk Förening), Carl Knoff (Norsk Ornitologisk Förening), and Tuomo Ollila (Metsähallitus, Finland). These findings were presented at the symposium in Tornio, Finland, and are summarized by country in this report.

Results from Finland 2024

Eetu Sundvall and Tuomo Ollila

Metsähallitus is responsible for the inventory of Golden Eagles in Finland. The organization is supported by 35 volunteers (licensed bird ringers) who assist with the monitoring. In the reindeer herding area, helicopters are used to inspect every nest – a method employed for the past 25 years. The inventory area has expanded over time due to Finland's compensation system for reindeer herding communities, which is based on the number of occupied and successfully breeding Golden Eagle territories. Metsähallitus must verify all eagle nests within this area. The inventory process takes 10-11 days and costs around 85 000 Euros (58 Euros per nest).

In 2024, approximately 1400 nests were checked in early June. Not all of these were Golden Eagle nests, some belonged to other raptors such as White-tailed Eagles, Gyrfalcons, Peregine Falcons and Ospreys.

Since the 1970s, nearly 600 Golden Eagle territories have been recorded in Finland (Figure 1). Of these, around 500 have been used at least once during the past five years. Over the same period, successful breeding was recorded in 362 territories.

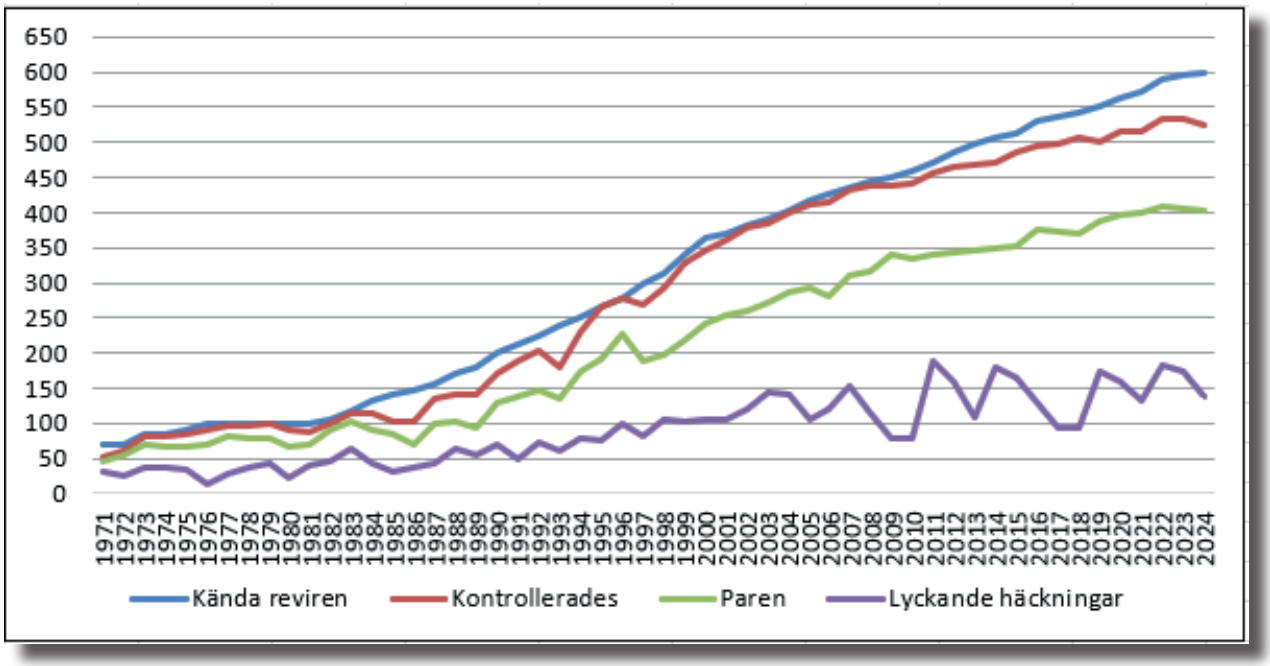


Figure 1. Number of known (blue) and visited (brown) Golden Eagle territories in Finland from 1971 to 2024. The figure also shows the number of Golden Eagle pairs (green) and successfull nestings (violet) during the past 53 years.

Most territories are located in the northern reindeer herding regions (Figure 2). In contrast, there are no known territories in the southwestern part of Finland, despite its large forests and sparse population. The reason for this absence remains unknown.

In 2024, results were below average compared to previous years. There were 403 occupied territories, 138 successful breedings, 21 double clutches, and a total of 159 nestlings (Figure 1). This equates to 1,15 nestlings per successful breeding and 0,39 nestlings per occupied territory (Figure 3) – both lower than in previous years. The best-performing area in 2024 was around Inari, in northern Finland, where grouse were abundant in spring.

The Golden Eagle population in Finland has been increasing, but it is uncertain how much further it can grow. The maximum population is estimated at around 700 territories. This year, three new territories were discovered, along with 28 new nests in previously known territories. Two of the newly discovered territories are located outside the reindeer herding area in central Finland.

The number of nestlings per pair appears to gradually decrease over time (Figure 3). The reasons for this trend are unclear. Could it be related to the inventory methods? Alternatively, it may be due to denser forest landscapes that hinder hunting or a reduction in food availability.

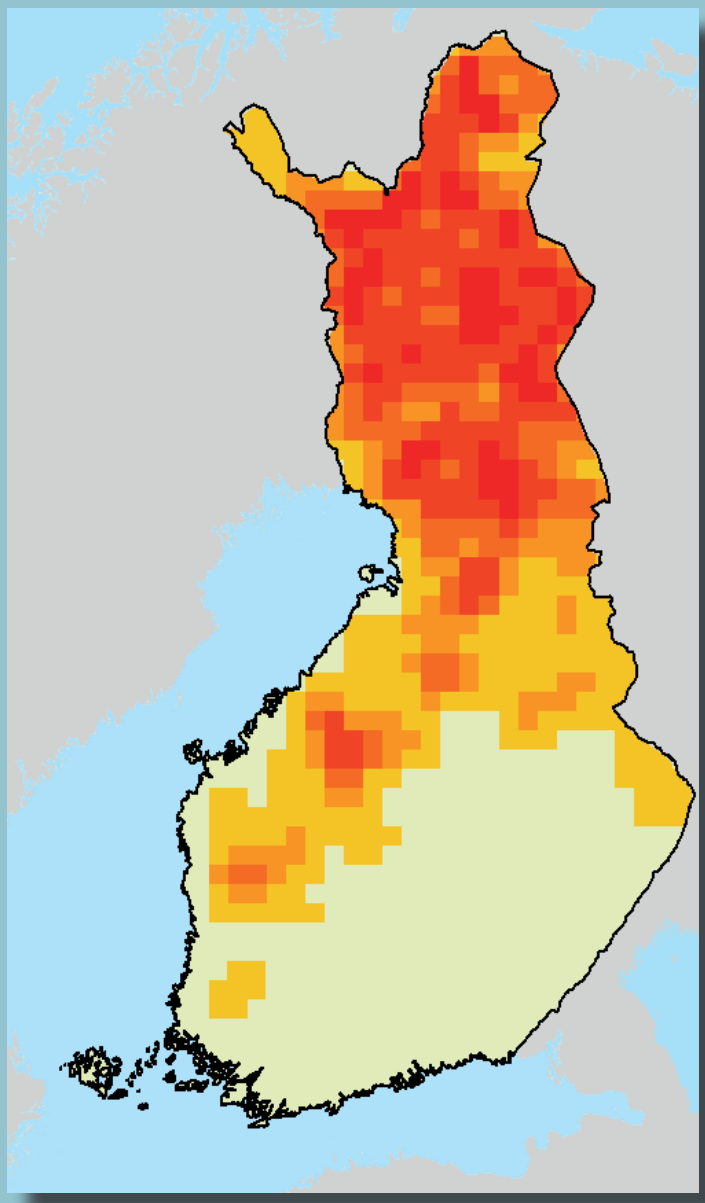


Figure 2. Distribution of 599 Golden Eagle territories in Finland occupied at least once since 1971.

Eagle nest in a witch´s broom on a pine in northern Finland. Photo: Stefan Siivonen.

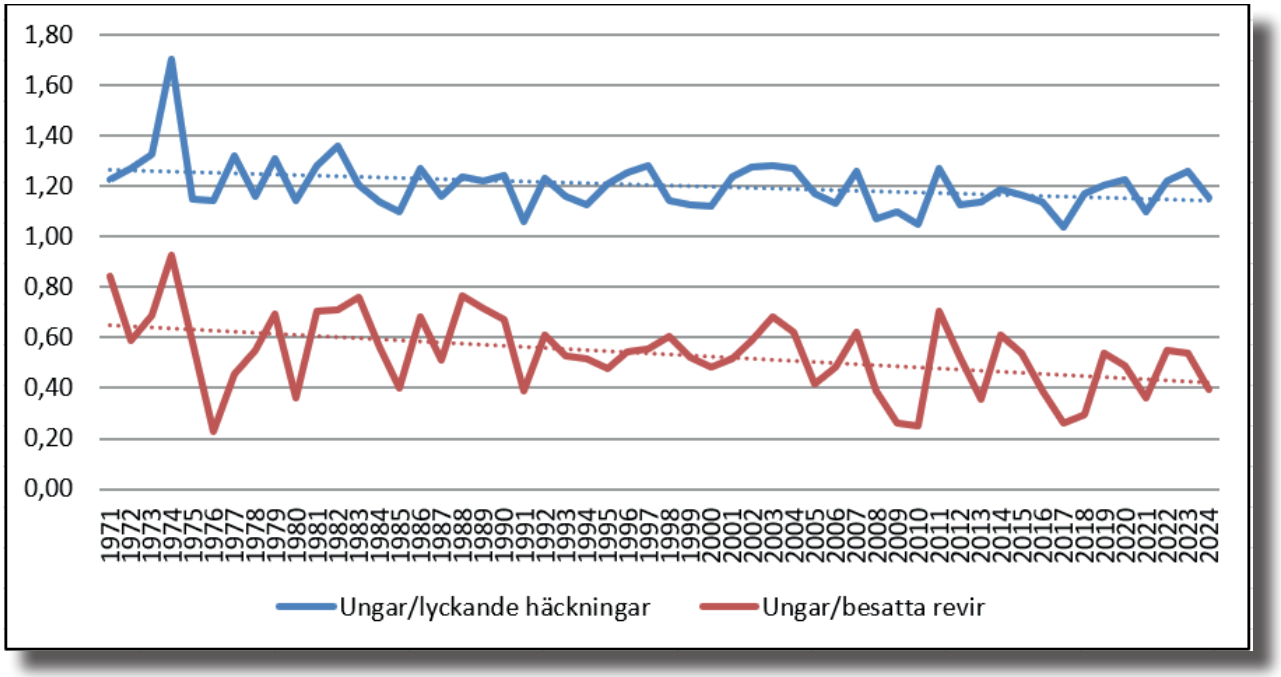


Figure 3. Reproduction rate per successfull nesting (blue) and per occupied territory (brown) in Finland, 1971-2024.

Results from Denmark 2024

Hans Christophersen (presentation by Thomas Birkö)

Denmark was not represented at the symposium in Tornio, therefore, Thomas Birkö presented on behalf of Hans Christophersen.

In 1998, Golden Eagles were spontaneously established in Denmark. The origin of these eagles remains unknown. The Danish landscape offers a constant food supply, and fluctuations in breeding success are almost nonexistent.

In 2024, eight Golden Eagle territories were known. The results for 2024 are the best ever recorded, with six pairs producing seven fledglings (Figure 1). The number of occupied territories has increased over time (Figure 2). Seven of these territories are located in the northern part of Jutland, with the eighth territory in the western part of Jutland.

The reproduction rate since the first successful breeding in 1999 is 0,88 juveniles per/pair, equating to 68 fledged juveniles from 77 breeding attempts.

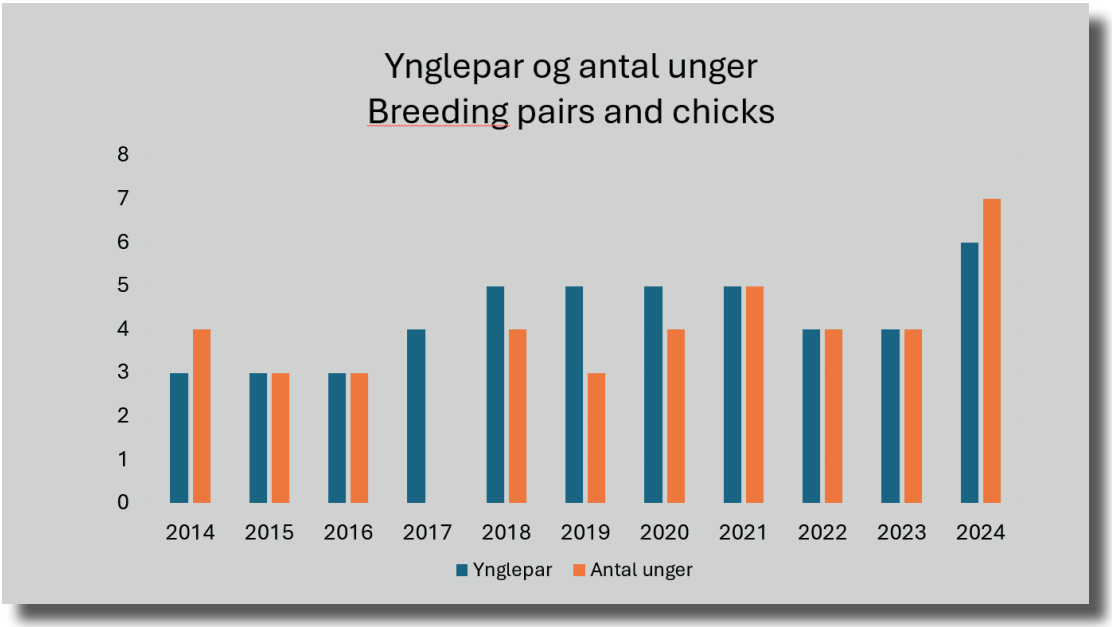


Figure 1. The number of successful breedings (blue) and fledged juveniles (orange) in Denmark, 2014-2024.

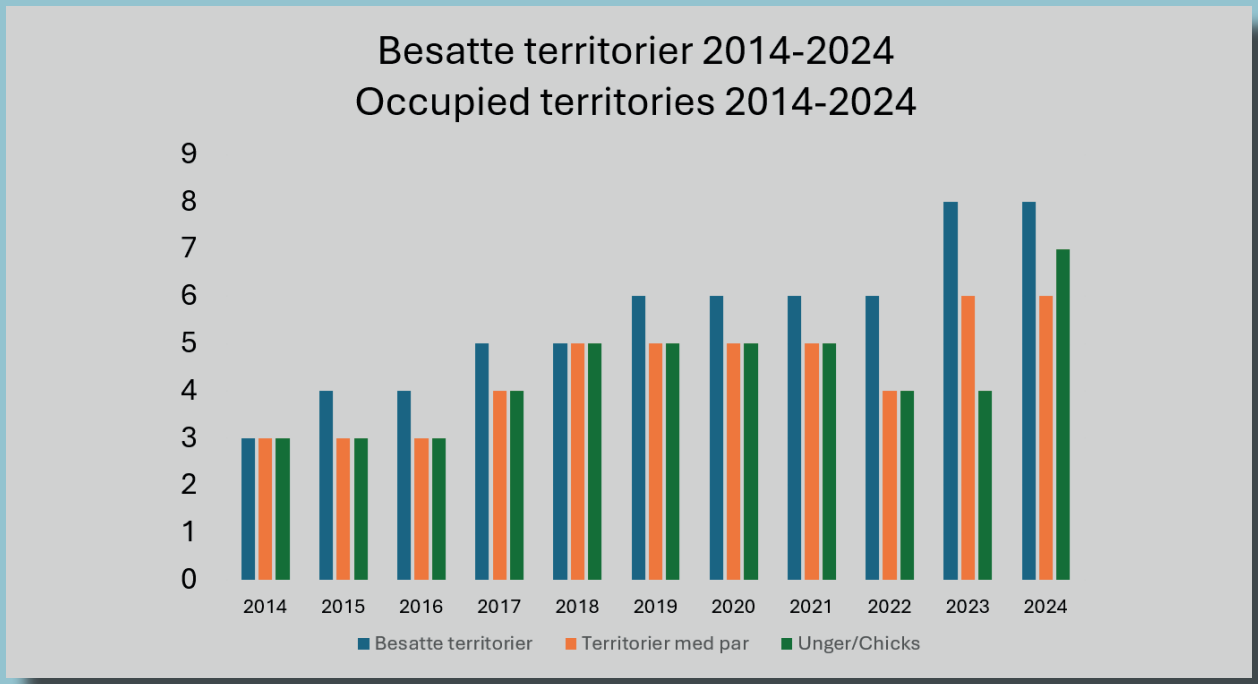


Figure 2. Number of Golden Eagle occupied territories in Denmark, 2014 - 2024. The figure shows the total number of territories (blue), territories with pairs (orange), and number of chicks (green) over the past 11 years.

Gennemsnitlige produktionsdata Danmark 1998-2024
I alt 77 yngleforsøg - 68 udfløjne unger

Unger/Chicks	n	%
2	11	14,2
1	46	59,7
0	20	26,0

Gennemsnit antal juv/par	0,88
Gennemsnit antal juv/par med juv	1,19

Figure 3. Reproduction rate of Golden Eagles in Denmark from 1998 to 2024 was 0,88 chicks per pair. This is a very good result. Around 60 % of the pairs produced one fledgling while around 14% of pairs produced two fledglings during this period.

Photo: Hans Christophersen.

Results from Norway 2024

Carl Knoff

In Norway, the authorities conduct intensive monitoring of Golden Eagles in 15 territories across 12 areas (Figure 1). Carl has been responsible for monitoring one area since 2007. The methodology and instructions are consistent across all areas. In addition, there is extensive monitoring where all territories and nests are included in the national database "Rovbase". The estimated Golden Eagle population in Norway was 914-1145 (average 1027) in 2020 (Mattisen et al. 2020). This estimate is based on comprehensive monitoring, and a new population estimate will be conducted next year.

Several important factors affect the nesting success of Golden Eagles. For instance, harsh winter conditions, like those in April 2023, when southeast Norway experienced a late and heavy snowfall, with 60-80 cm of snow falling over three days. In contrast, the winter of 2024 was more typical.

Small rodent populations also play a crucial role in Golden Eagles' breeding. In 2023, the rodent population was high in northern Norway, particularly in Finnmark, but very low in the southern parts of the country. In 2024, rodent populations were high in Nordland, especially in Borgefjell, but remained low elsewhere. In Hedmark, 40 pairs of Great Grey Owls nested in 2024, indicating favourable conditions.

Every year, before the start of small game hunting on September 10, estimates are made for populations of Capercaillie, Black Grouse, Willow Grouse, and Ptarmigan, all of which are important prey for Golden Eagles. In 2023, Willow Grouse and Ptarmigan populations were very low in southern Norway but much higher in the north. In 2024, populations of all four species increased in southern Norway, while remaining high in the north, where hunting continued as usual. Unfortunately, there is no data available for hare populations. These estimates provide insight into the potential breeding success of Golden Eagles in the following season.

Statistics from small game hunting indicate a declining trend for all species since 1995, particularly after 2008. Today, only one-third as many small game animals are harvested compared to 20-30 years ago, despite changes in the number of hunters. Fewer people hunt hares now compared to the past.

There were some good years for small rodents and voles in Southern Norway in 2017 and 2018, which benefited the Golden Eagle population.

The breeding results from Norway, as shown in Table 1 represent only 25% of the total Norwegian Golden Eagle population. The monitored areas are shown in Figure 2. In 2024, breeding success in Southern Norway improved compared to 2023, with Buskerud achieving particularly good results: 75% of territories there were occupied, and chicks from many nests were ringed thanks to Lars Egil Furuseth. Results in Buskerud, Oppland, and Hedmark were much better than the previous year, with outcomes close to average.

In northern Norway, Nordland had the best results in 2024, likely due to abundant small rodents. Finnmark also performed well, despite a spring crash in rodent populations. Similar to northern Finland, good access to grouse and hares likely contributed to breeding success. In 2024, 428 territories were checked, of which 308 were occupied. There were 122 successful breedings, producing 145 chicks. This equated to 0,47 nestlings per pair, compared to 0,32 nestlings per pair in 2023.

Figure 3 presents the reproduction rate, which averages 0,41 nestlings per occupied territory. Figure 4 compares reproduction rates between northern and southern Norway. Over the past two years, the northern regions have outperformed the southern regions.

Since 1994, a total of 1115 Golden Eagles have been color-ringed in Norway.

Golden Eagle nest in Norway. Photo: Carl Knoff.

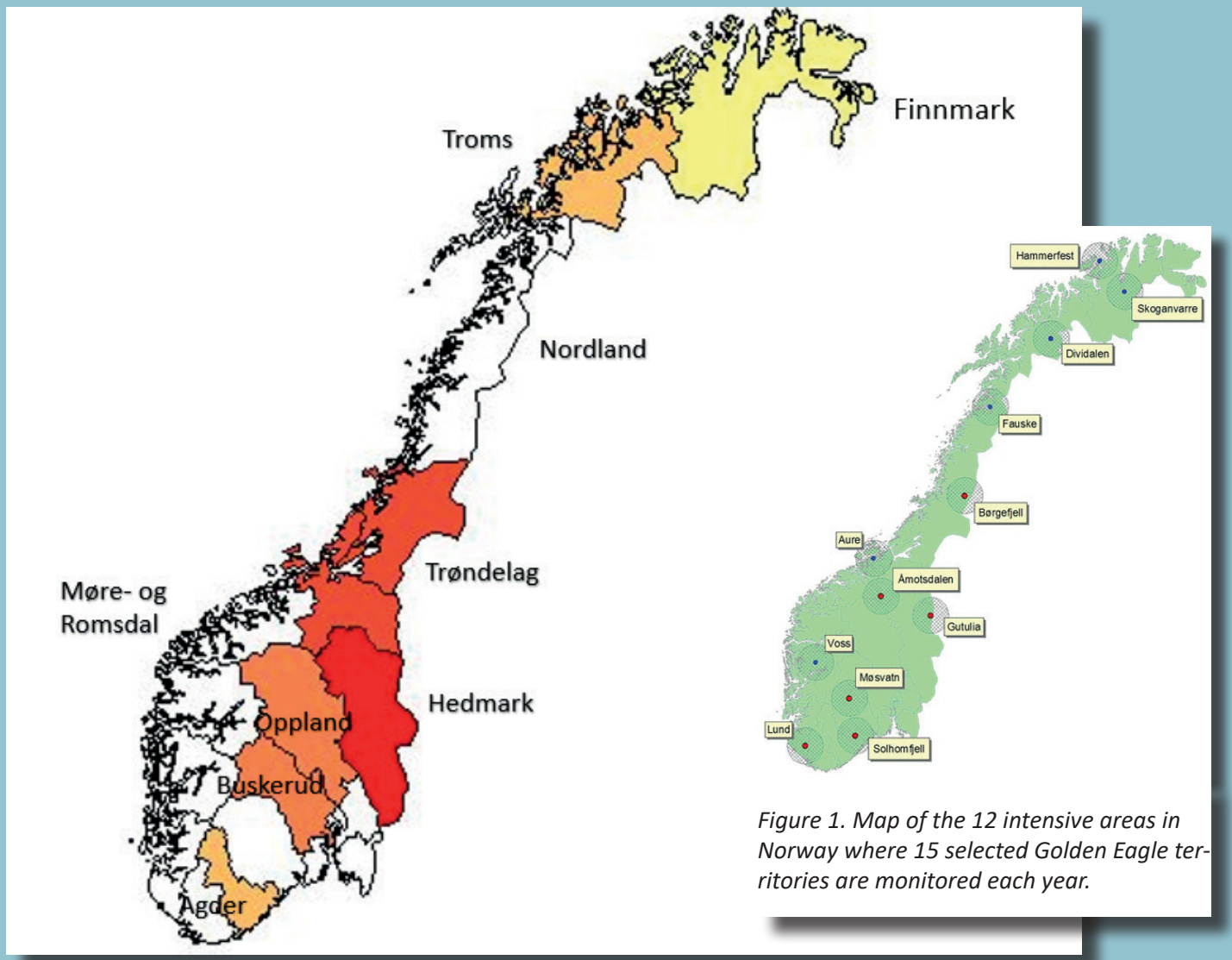


Figure 1. Map of the 12 intensive areas in Norway where 15 selected Golden Eagle territories are monitored each year.

Figure 2. Map of the areas in Norway from which data in Table 1 were collected. These areas represent only 25% of the Golden Eagle population in Norway and not all parts of the regions are included in the compilation, except from Oppland.

	Checked territories	Occupied territories	Successful breedings	Number of chicks	Chicks per territoriy	Colour-ringed chicks
Aust-Agder	17	10	3	3	0,30	0
Vest-Agder	25	16	5	5	0,31	1
Buskerud	52	39	13	16	0,41	12
Hedmark	31	26	10	11	0,42	6
Oppland	80	47	20	22	0,47	0
Møre og Romsdal	53	33	6	7	0,21	1
Trøndelag	13	13	5	5	0,46	0
Nordland	70	50	26	33	0,66	5
Troms	30	29	9	11	0,38	0
Finnmark	57	45	25	32	0,71	10
TOTALT	428	308	122	145	0,47	35

Table 1. Golden Eagle breeding results from some counties in 2024. Reporters: Leif Gunleifsen & Jan E. Gunnersen (Aust-Agder), Runar Jåbekk (Vest-Agder), Lars Egil- & Per Furuseth (Buskerud), Jon Opheim & Geir Høitomt, (Oppland), Per Nøkleby, Roar Svenkerud, Øyvind Fredriksson & Carl Knoff (Hedmark), Alv Ottar Folkestad & Ingar Støyle Bringsvor (Møre og Romsdal), Per Willy Bøe (Trøndelag), Frantz Sortland, Maria Myklebust, Trond Johnsen & Jim Kristensen (Nordland), Trond Johnsen (Troms), Karl-Otto Jacobsen, Arve Østlyngen & Kenneth Johansen (Finnmark).

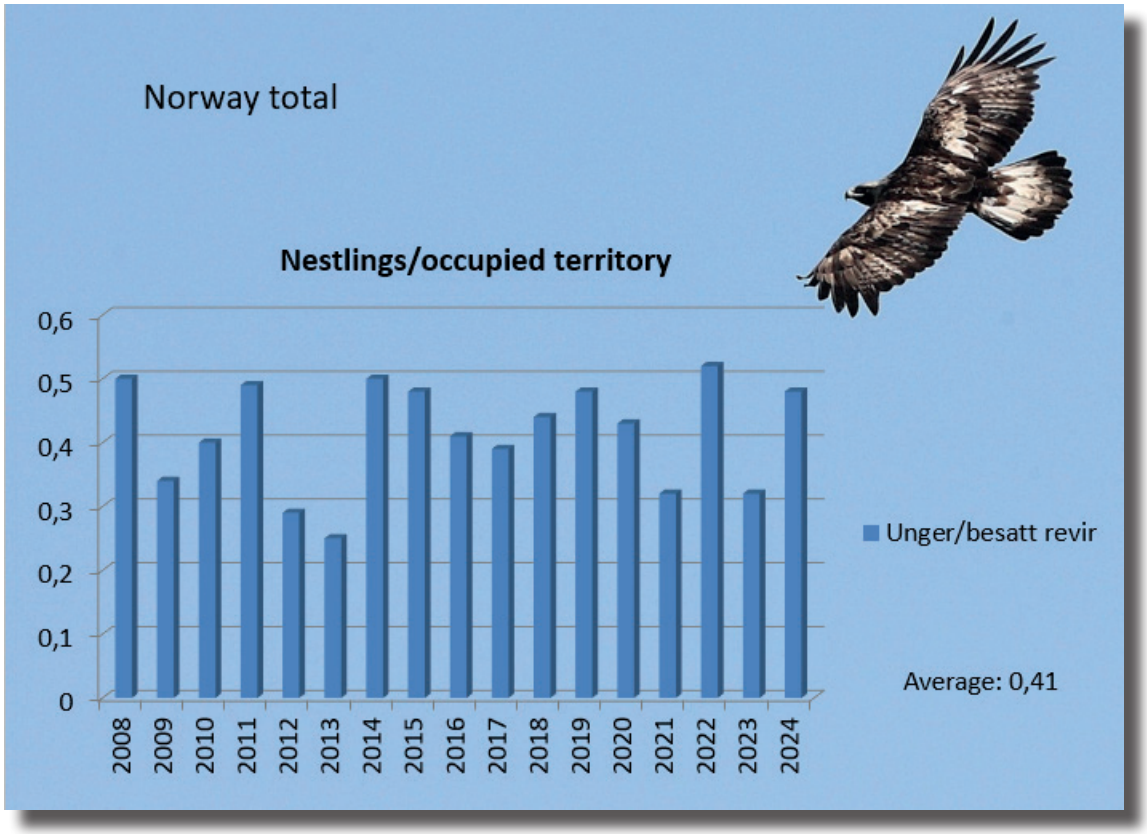


Figure 3. Reproduction rate of Golden Eagles in Norway from 2008 to 2024. The average is 0,41 nestlings per occupied territory.

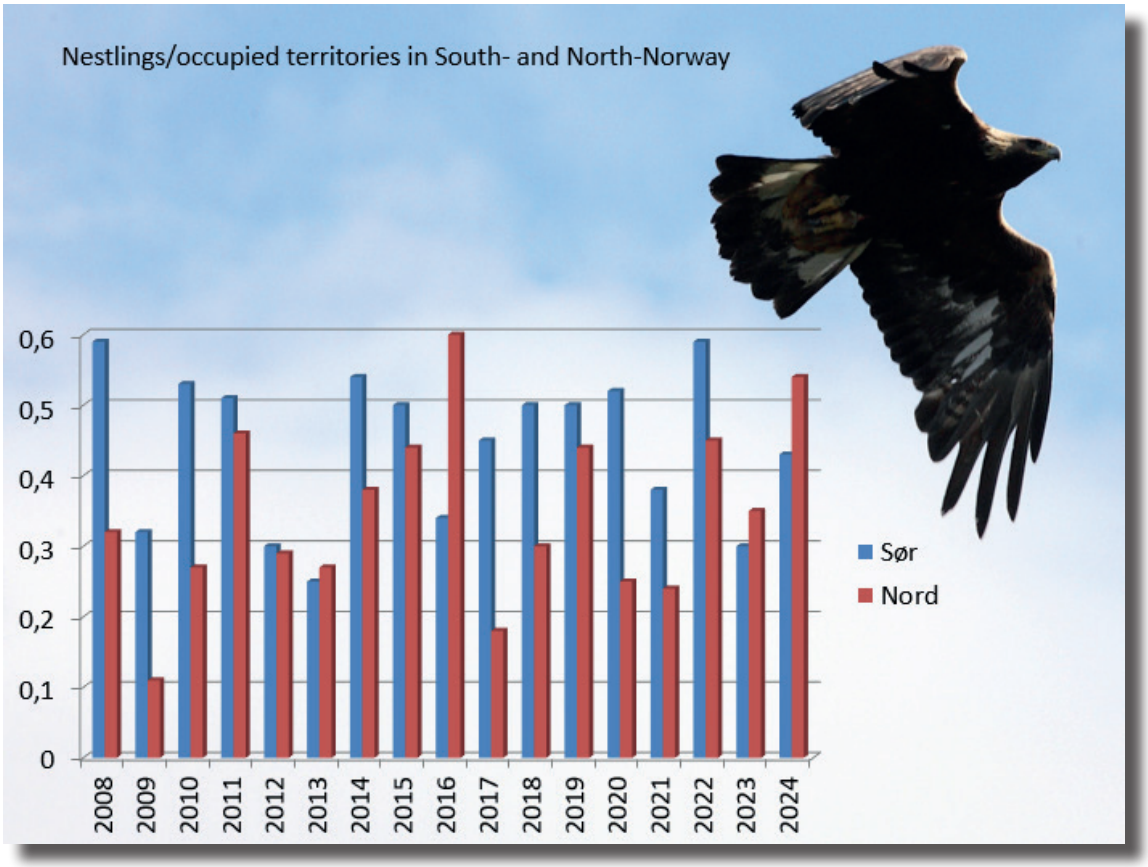


Figure 4. Comparison of reproduction rate of Golden Eagles in northern (red) and the southern (blue) Norway.

Reference

Mattisson, J., Nilsen, E. & Brøseth, H. 2020. *Estimering av antall hekkende par kongeørn basert på kjent forekomst i Norge for perioden 2015–2019.* NINA Rapport nr 1858. Norsk institutt for naturforskning(NINA), Trondheim.

Results from Sweden 2024

Börje Dahlén

In Sweden, Golden Eagles are monitored annually following a methodology established by Naturvårdsverket, with the aim of conducting a comprehensive nationwide survey. Länsstyrelserna are responsible for the monitoring. In some counties (län), Länsstyrelserna conducts the survey directly, while in others, the work is carried out by NGO volunteers from Kungsörn Sverige, or a combination of both.

Since 2020, all monitoring data has been reported to Rovbase (as in Norway), and the Swedish Natural Museum in Stockholm compiles the results.

Population trends and monitoring results

Figure 1 shows the development of the Swedish Golden Eagle population. Before 2008, data was collected by regional Golden Eagle groups. While there has not been a sharp increase in population, the gap between known territories and occupied territories has grown over time The results from 2024 are preliminary because the monitoring concluded on September 15. In 2024, 952 territories were registered slightly more than in the previous year. The number of occupied territories, successful breeding attempts, and nestlings has increased. The reproduction rate improved compared to 2023, though it is worth noting that 2023 was a weak year. This year's results are slightly better..

Figure 2 presents the results from 2024 for the two main contiguous areas of Golden Eagle activity, outlined in blue on the map. The first stretches from Norrbotten to the northern parts of Värmland, and the second encompasses Gotland. Compared to the past decade, the results were lower in northern Sweden and on Gotland. Outside these two areas, some scattered territories were recorded, including 12 in Östergötland – the first even documented in this region. These results are an improvement over previous years.

Regional insights

In Skåne, Sweden's most southern region, there were seven occupied territories in 2024. All initiated breeding, but only two produced fledged juveniles (three individuals). In two other nests, both nestlings died; they had

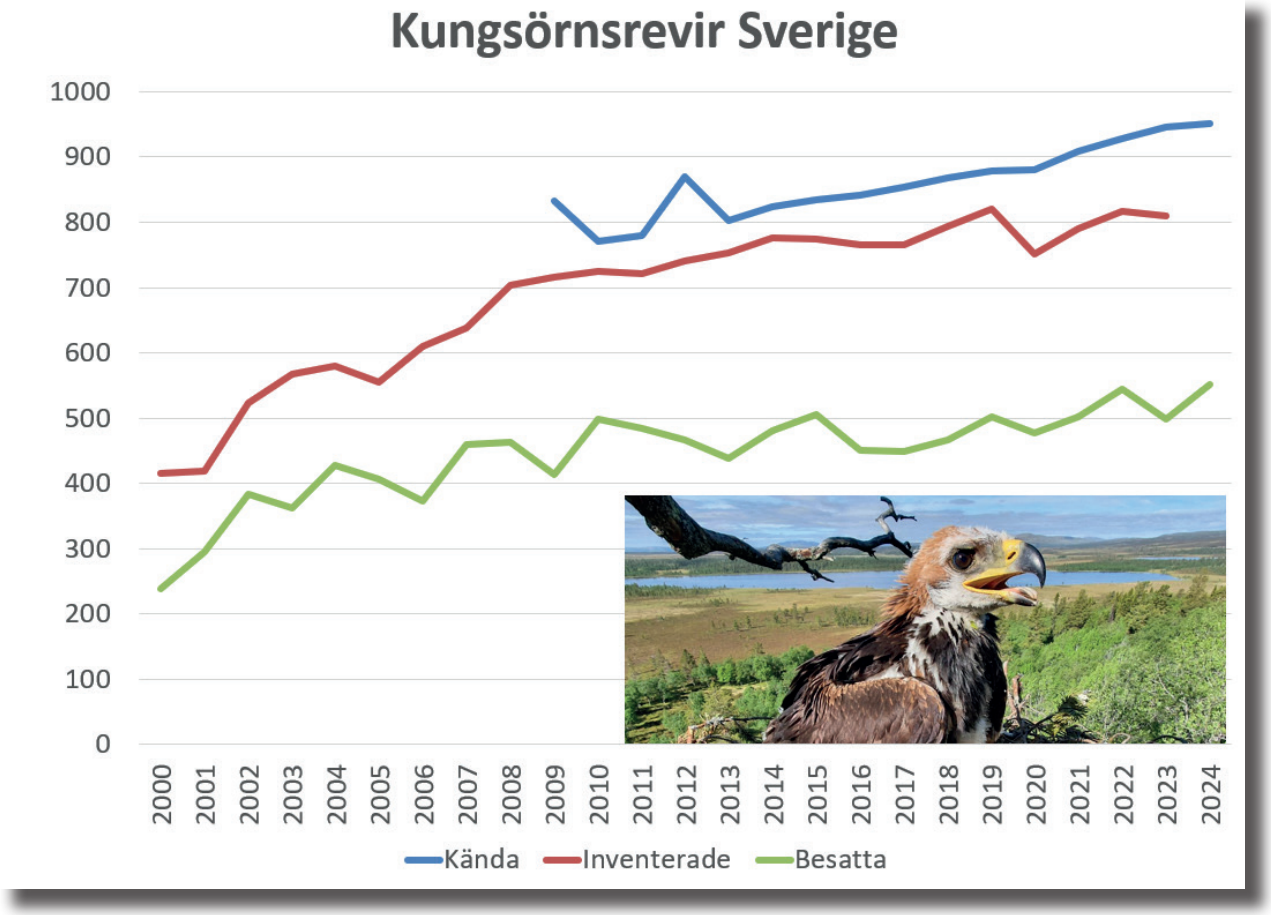
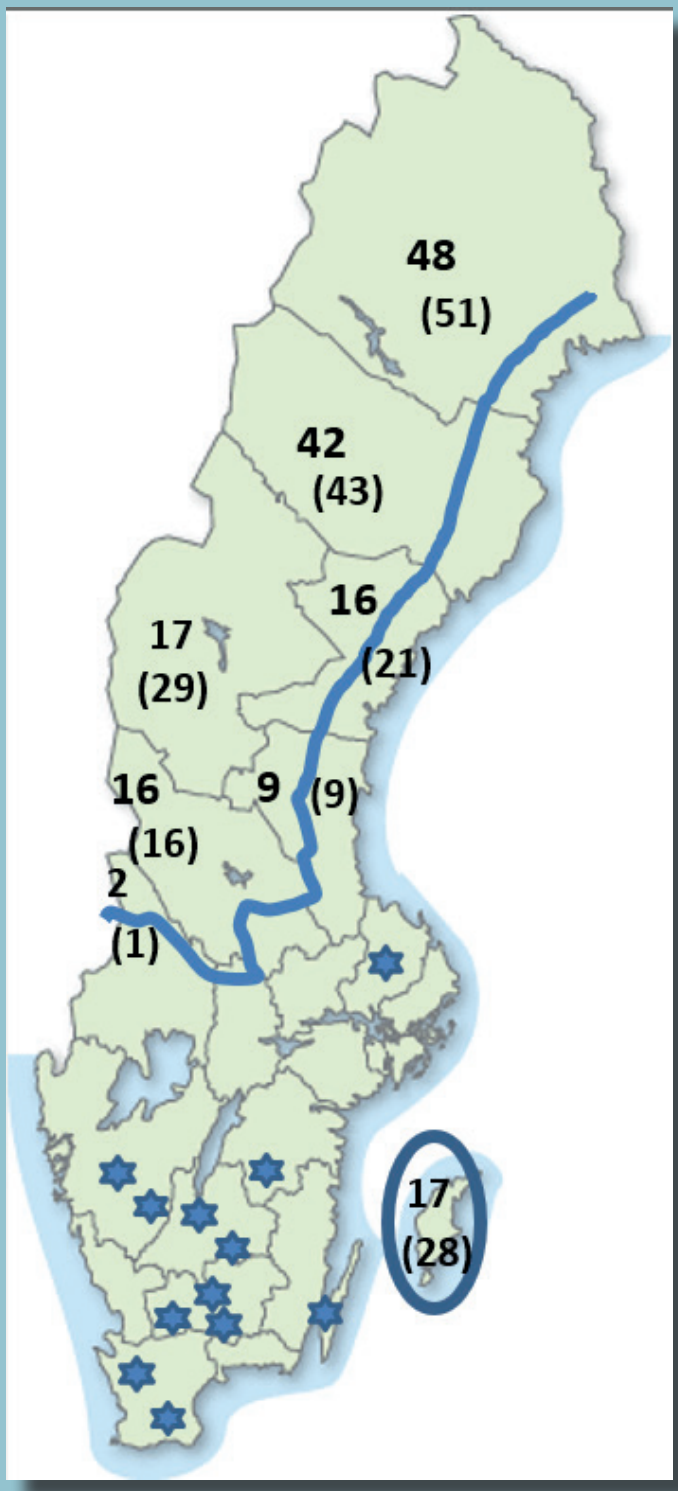


Figure 1. Known Golden Eagle territories in Sweden since 2008 (blue) and investigated (red) and occupied (green) territories since 2000.

	Sweden	Best value ever (year)	Northern Sweden	Southern Sweden	Gotland
Occupied territories	552	549 (2022)	438	41	73
Successful breedings	179	266 (2019)	148	14	17
Number of chicks	222	328 (2019)	188	15	19
Clutches with two chicks	43	94 (2019)	40	1	2
Ringed chicks	93	149 (2007)	77	10	6
Chicks per pair	0,40	0,70 (2004)	0,43	0,37	0,26

Table 1. Results from the Golden Eagle monitoring in Sweden in 2024, divided by geographical areas.



The results in 2024 have been updated since the October symposium presentation by Jessica Åsbrink, Naturhistoriska Riksmuséet.
Thank you for this!

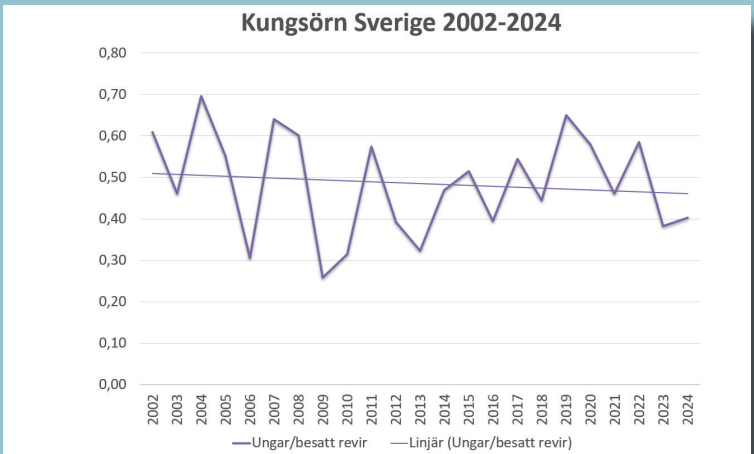


Figure 3. Golden Eagles reproduction rate (number of chicks per occupied territory) in Sweden from 2002 to 2024. The rate fluctuates significantly, with a minimum of 0,26 in 2009 and a maximum of 0,70 in 2004. In 2024, reproduction rate was 0,40. Source: Kungsörn Sverige.

179 succesful breedings 2024

12 breedings outside the coherent nesting territories

In total 222 juveniles

Figure 2. Number of successful breedings in Sweden 2024, within the two main contiguous areas (northern Sweden and Gotland). Twelve successful breedings occured outside these areas (marked with stars). Numbers in parentheses are average values from 2014-2023.

been GPS-tagged and were confirmed as failed breeding attempts before October 15. In one territory, a pair of adult eagles aged 31 and 32 years, laid three eggs, but none hatched. In another territory, a 37-year-old female laid one egg, which also did not hatch. This female disappeared afterward and is probably deceased.

Gotland experienced especially poor reproduction in 2024, with a breeding rate of only 0,26 nestlings per pair.

The population in Norrland constitutes about 80% of Sweden's Golden Eagle population. While fewer territories were occupied in 2024 compared to the peak year of 2022, Norrbotten - the largest and most significant region - had 48 successful breeding attempts. The northern parts of the Gällivare and southern Kiruna mountains showedbetter results compared to 2023, but results in the Arjeplog and Jokkmokk mountains were worse, likely due to differences in food availability and weather. Länsstyrelsen in Norrbotten suggests that the cyclic nature of small rodent populations may be weakening. In Norrbotten, 44% of nests contained double clutches, and only four nests failed. This is a big difference compared to Dalarna, where many territories are monitored. In Dalarna, 25% of nests had double clutches, 16 breeding attempts succeeded, and six failed. An additional six nests were likely unsuccessful. The superior results in Norrbotten may be due to the use of helicopters for monitoring in early June. However, this timing may miss failed nests and overlooks whether some double clutches reduce to one or fail entirely later in the season.

In Ångermanland, one adult Golden Eagle was found electrocuted in March (Figure 4), and another adult was found dead at a wind farm in September.

Long-term trends

Over the past 20 years, there has been an average annual increase of 1,3% in occupied territories and 1,2% in successful breeding attempts. The reproduction rate fluctuates significantly from year to year. (Figure 3) The highest recorded rate was 0,70 nestlings per pair in 2004, while the lowest was 0,26 in 2009. In 2024, the reproduction rate was 0,40 nestlings per pair (Figure 3).

Kungsörn Sverige emphasizes the importance of ringing juvenile birds because it provides valuable information. In 2024, 80 nestlings were ringed, bringing the total to 2 477 ringed juveniles in Sweden since the start of the 21st century.

Figure 4. An electrocuted Golden Eagle found in Näsåker, Ångermanland, on March 27, 2024, beneath a 20 kV power line. The line was not insulated, and the eagle came into contact with this "killer pole" transformer. Photos: Daniel Rutschman.

Golden Eagle attacking people in Norway 2024

Alv Ottar Folkestad

In the autumn of 2024, a series of reported Golden Eagle attacks on humans in Norway caused a significant media attention. Alv Ottar Folkestad from BirdLife Norway investigated the incidents to understand their circumstances

On September 5, Alv Ottar received information that a police officer had engaged in a fight with a Golden Eagle for over 30 minutes in Valdres on September 3. This incident had been reported in newspapers on September 4 and was documented with a mobile phone video. Shortly after, additional reports of eagle confrontations emerged on September 5, 6, and 7, involving several individuals across different locations in Norway. Following the killing of an eagle during the final reported confrontation on September 7, the incidents ceased.

In total, Alv Ottar received 15 reports from 13 different locations. The distances between some of these locations were significant. For example, between an attack on October 5 at 4:35 p.m. and another on October 6 at 11:30 a.m., there was a distance of 280 km. All reports involved a juvenile (1K) Golden Eagle, but due to the long distances between signtings, it was initially assumed that multiple eagles were responsible. Authorities considered collecting feathers from DNA analysis to confirm this. However, BirdLife Norway's examination of photos from the different locations showed that all the incidents involved the same eagle (Figure 1).

Eagle behaviour and witness accounts

Witness accounts indicated also indicates that the eagle's actions were not intented to harm people. Its behavior and vocalizations suggested it was begging for food.

September 5, Tyin: A man reported, "She tried to come in contact with me, I felt. She was definitely not attacking".

September 5, Jotunheimen: A woman on a mountain top, accompanied by four large dogs lying nearby, described how the eagle landed three meters away from the dogs without fear. She noted, "This bird must have had contact with people and dogs before, because it was not scared of them at all".

Figure 1. The eagle was identified as the same individual in all incidents by examining its distinctive markings, such as white patches on its wings. The bird is determined to have been born in the summer of 2024. Photos: Arvid Flæte (upper), and May Birkeland (lower).

September 5, German tourists: A German couple described an encounter saying, "When the eagle flew directly towards me, it reminded me of a falconry show when eagles land on the falconer's arm. And when the eagle landed two meters beside us, it bent its body and looked up at us with its head."

September 6, Dovreskogen: A witness reported, "She rested in front of us for an hour, allowing photos to be taken from about five meters away. She did not seem worried about anything". Later that day, other incidents nearby included the eagle attempting to perch on people's shoulders.

September 7, Svorkmo incident and eagle's death: A woman was feeding chicks and rabbits, while her three children played outside. She heard her 1,5-year-old daughter scream and discovered the eagle perched on her child with its talons gripping her skin. The mother managed to pry the eagle's talons loose and removed the bird. The child was taken to the hospital but sustained only minor puncture wounds. The eagle was killed later that day.

Analysis of behaviour

Analysis of the incidents revealed interesting patterns:

- The eagle more frequently approached women than men.

- On three occasions, it flew towards dogs and landed just a few meters away from them.

This behaviour strongly suggests that the eagle had been hand-reared by humans and was accustomed to receiving food from them. Its lack of fear toward people and dogs supports this theory. The origin of the eagle – whether it had been released or escaped – is unknown. It may have been cared for and fed until it was able to fly independently.

Figure 1. In September 2024, there were a total of 15 reports from 13 different locations involving confrontations or encounters with a juvenile Golden Eagle. The first incident occurred in Valdres in southern Norway on September 3, and the final encounter occurred in Svorkmo in northern Norway on September 7, where the eagle was killed. The total distance between these locations is about 330 km.

Similar historical eagle attacks in Sweden

Håkan Söderberg & Börje Dahlén

In Sweden, there have been similar incidents involving Golden Eagles on a few occasions. One such case occurred in the early 1960s when nature photographer Jan Lindblad obtained a hand-raised juvenile Golden Eagle from Spain for use in his nature film "Mitt vildmarksrike". The eagle was later released at Bispbergs klack in Dalarna, where it displayed food-begging behaviour and reportedly attacked young people, much like in the Norwegian eagle in 2024. A more recent incident took place in southern Sweden in 2020, involving a juvenile (1K) Golden Eagle.

Timeline of the 2020 incident

August 5, Aneby, Småland: A large raptor was reported perched in a tree at Skärsjö gård, 3 km south of Aneby. The bird was identified as a juvenile Golden Eagle, fearless around humans. It was seen and photographed the next morning (Figure 1) but flew away from the area around at 8:00 a.m.

August 7, Skavesta, Östergötland: At 8:00 a.m., a report was made to Länsstyrelsen in Östergötland about an eagle sighting in the village Skavesta, between Linköping and Norsholm. That same morning, a woman who had been out for a walk between 7:00 and 8:00 a.m. reported being attacked by an eagle.

The bird struck her from behind, sinking its talons into her right leg about 10 cm above her ankle. Initially, she thought a dog had attacked her but managed to pull the eagle away and run home. She reported the incident and sought medical attention at a hospital.

Martin Larsson, working with nature conservation management and responsible for the investigation of Golden Eagle in the authority, visited the area at 10:00 a.m. He found the eagle perched on a pile of branches in a field. He photographed the bird (Figure 2), confirming it was a juvenile Golden Eagle unafraid of humans. Länsstyrelsen issued warnings to local residents and attempted to scare the eagle away, but it was uncooperative.

August 13, Tuna Kungsgård, near Lake Roxen: Six days after the initial sighting, the eagle was observed again, this time about 10 km north of Linköping. Martin Larsson visited the site and confirmed it was the same bird. When he approached within 10 meters, the eagle flew away.

Figure 1. The young juvenile Golden Eagle sitting perched in a tree at Skärsjö gård, south of Aneby, in Småland, on August 5, 2020. Photo: Mats Thorin.

Later observations: The eagle was last definitively observed on August 14, but reports on Artportalen included sightings on August 25, 15 km northeast of Linköping, and again on September 4, 15 km south of Linköping (Figure 3). Interestingly, there are no territories of Golden Eagles known in this area in Östergötland. It was the last observation of the eagle but in Artportalen there was a report on August 25 about 15 km ONO Linköping, and again on September, 4, 15 km south of Linköping.

Analysis and connection to Norwegian attacks

Subsequent studies revealed that the eagle observed in Linköping was the same individual first seen in Aneby. These events only gained broader significance after the Norwegian attacks in 2024, which prompted researchers to revisit the 2020 incidents. While it is unknown whether this eagle had been raised or handled by humans, its behavior strongly suggests prior human interaction.

Figure 2. The same juvenile Golden Eagle perched in a pile of branches in Skavesta, Östergötland, on August 7 (left photo) and Tuna Kungsgård on August 13, 2020 (right photo). Photos: Martin Larsson, County Administrative Board of Östergötland.

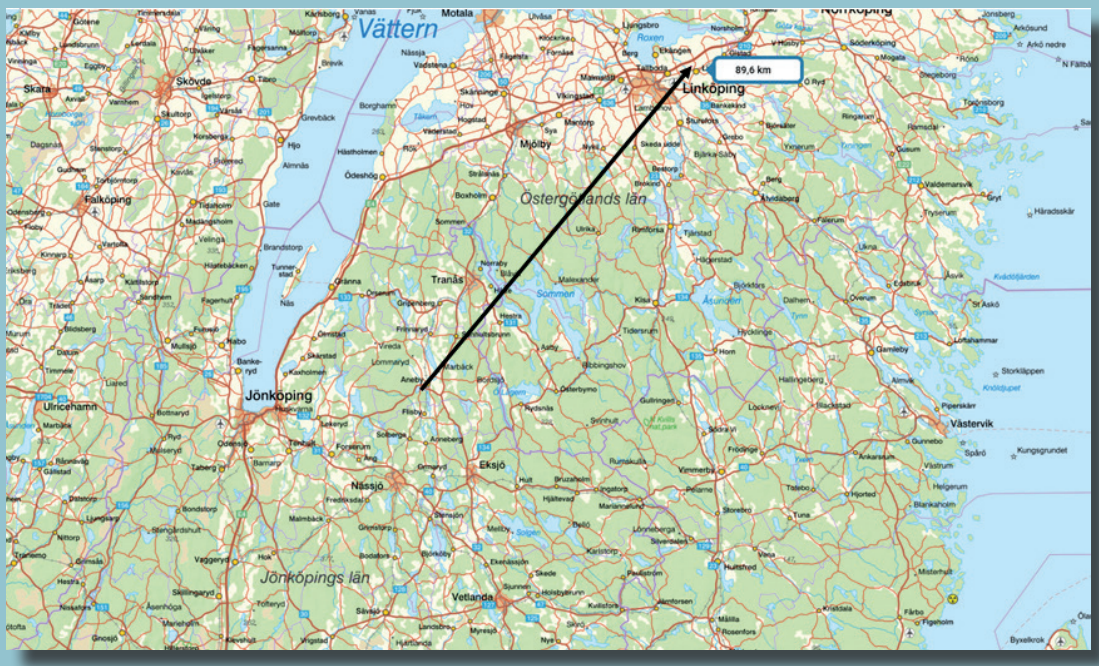


Figure 3. Map showing the movements off the juvenile Golden Eagle in early August 2020. The bird was first seen at Skärsjö gård in Aneby, Småland, on August 5, and later at Skavesta, Östergötland, on August 7. The total distance travelled was 89,6 km.

Windlife - Golden Eagle

Camilla Ekblad

Windlife is a project by the National Resources Institute Finland (LUKE) that studies the im pact of wind power on Finnish Golden Eagle territories. In addition to Golden Eagles, wolves, Finnish Forest Reindeer and domestic Reindeer have been included in the study.

The study investigates the occurrence and habitat use of forest animals near wind turbines, addressing key questions such as:
- Do animals avoid wind turbines, or can they utilize important habitats close to these structures?
- How does space use change as young Golden Eagles grow?
- How does space use relate to habitat, land use, and proximity to wind turbines?

Golden Eagle tracking and habitat modeling

Ten Golden Eagle chicks have been equipped with GPS-transmitters to model their movement patterns around nests during theirfirst autumn and to analyse how these patterns changes over time and in relation to habitat, land use, and the distance to wind turbines. Similar modeling has been done for adult Golden Eagles.

In the territorial habitat model used by Metsähallitus, Golden Eagles prefer proximity to their nests, old forests, sparse forests and marsh edges. There is a negative correlation with houses, watercourses, and the distance to the neighboring territory's nest. This model will be updated by adding data on populations of Capercaillie, Black Grouse, Willow Grouse, Ptarmigan, and hare from the game triangles that have been inventoried for a long time by LUKE to calculate the occurrence of forest game to assess the prey availability (Figure 1).

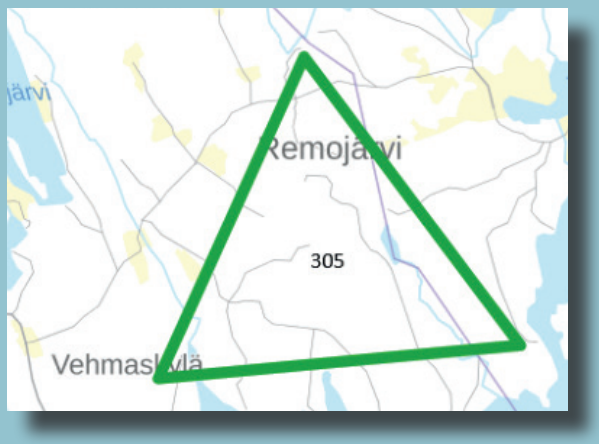


Figure 1. Wildlife triangles is a method developed for forest game abundance monitoring in Finland.

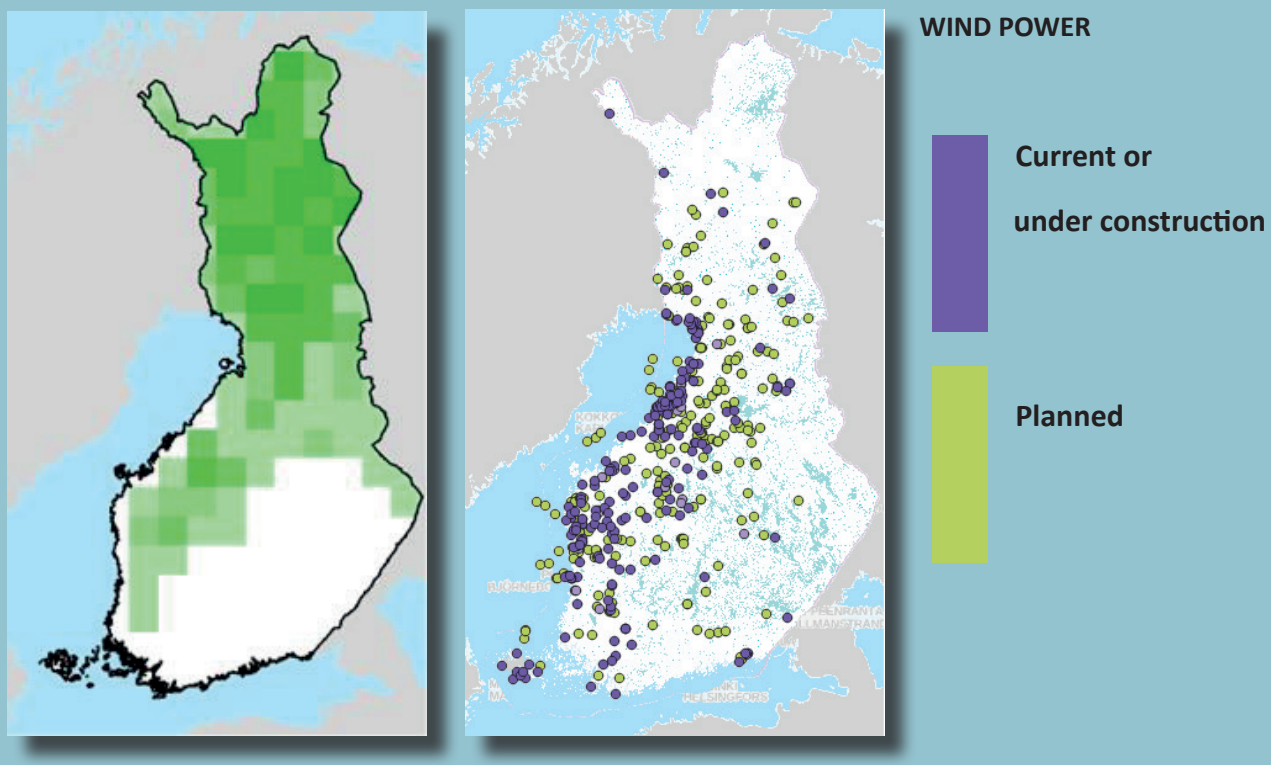


Figure 2. The Golden Eagle distribution in Finland (left). Map obtained from Siivonen 2023, Metsähallitus Darker colors indicate higher population densities. The right map shows current wind farms and those under construction (in violet), as well as planned wind farms (in yellow).

Wind turbine expansion in Finland

In the spring of 2023, there were about 1500 wind turbines in Finland. About 400 of these are located in Golden Eagle territories. The plans have stated that it is possible to build an additional 12,400 turbines, of which 6,700 would end up in 191 different Golden Eagle territories (Figure 2). A territory is defined as an area with a radius of 10 km from the nest.

Preliminary findings

Although the study is ongoing, some preliminary results are available:

Behaviour near wind turbines:

Preliminary observations suggest that young eagles react to wind turbines differently. Two GPS-tagged juveniles seemed to avoid wind turbines, suggesting habitat loss within their territories, while another young eagle frequently flew inside the wind farm, demonstrating risky behavior. The 2023 juvenile eagles left their territories on October 8, October 18 (3 individuals), and October 31. In 2024, the first yearling left the territory on October 3.

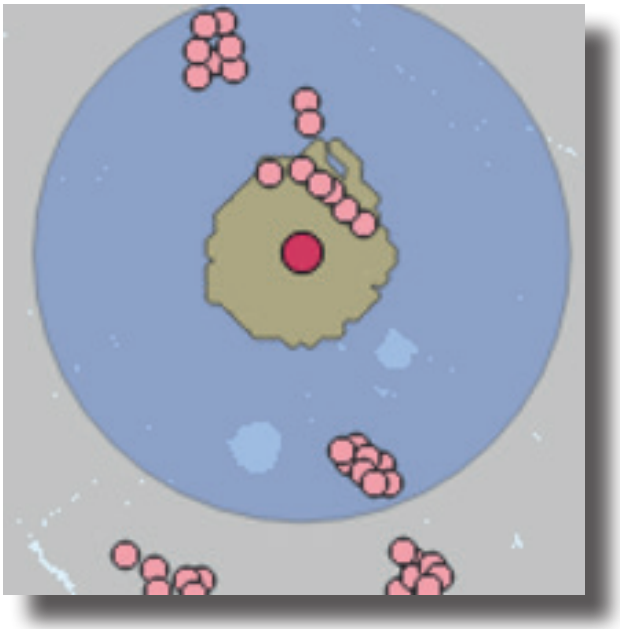


Figure 3. The blue area shows the modeled territory of an adult Golden Eagle (a radius of 10 km from the nest, red dot), while the yellow area shows the modeled core area, where 50% of the eagle flight locations are positioned. The pink dots represent wind turbines. Territory model developed by Metsähallitus.

Golden Eagle in a study area. Photo: Olli-Pekka Karlin.

How I catch eagles

Olli-Pekka Karlin

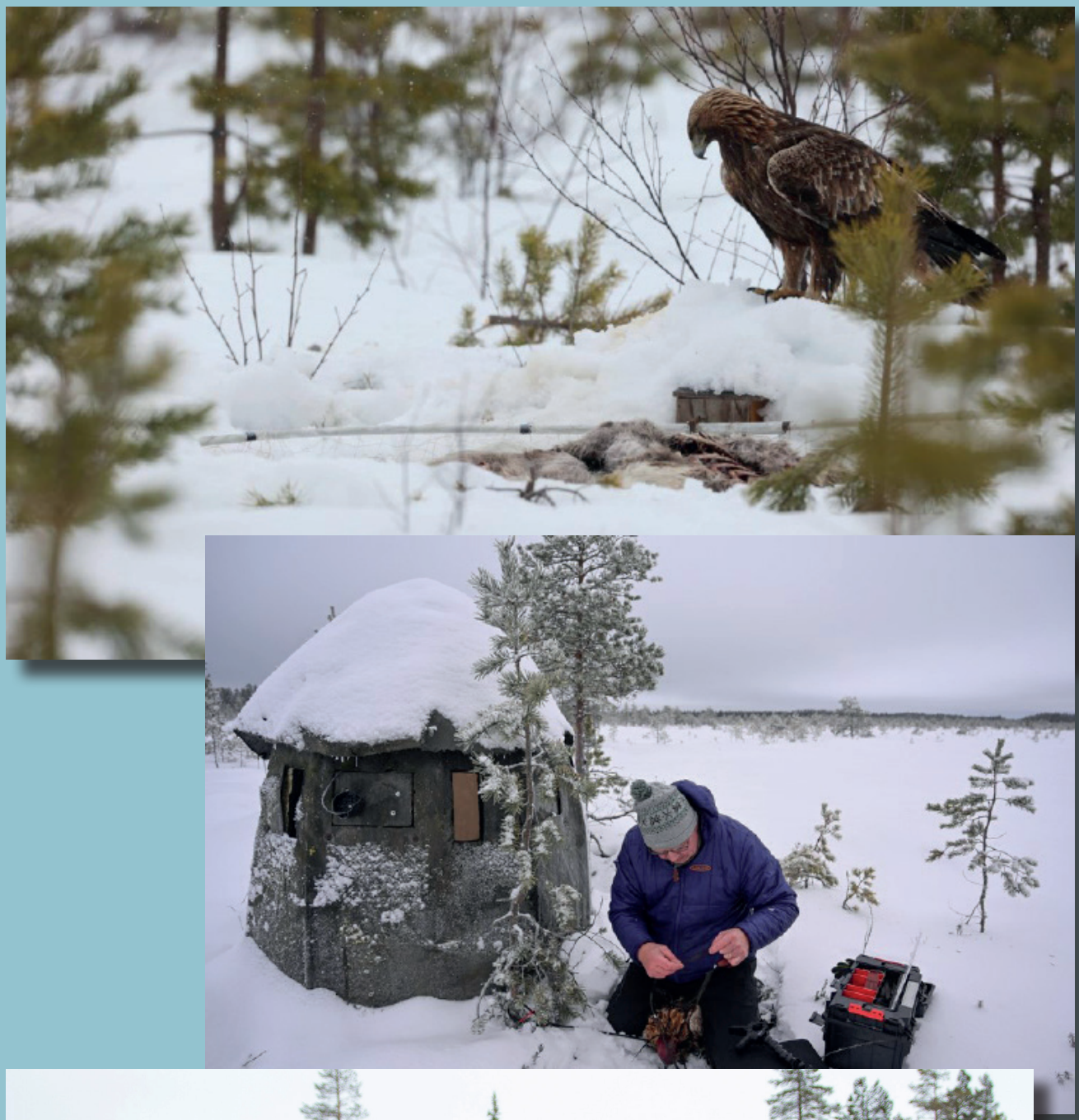
In some wind power and mining operations, Finnish licensing authorities require GPS tagging of eagles in nearby areas. Often, it is Olli-Pekka Karlin who is tasked with capturing the eagles. For this, special permission is required from the Centre for Economic Development, Transport and the Environment at Southwest Finland and from veterinary authorities of each location. The Golden Eagle is a nationally protected species and is also listed under Annex 1 of the EU Birds Directive.

Olli-Pekka Karlin shared photos from some of the 32 catches and taggings he has completed since 2011. He uses a self-designed trapping device which he places at a feeding site along with a transmitting game camera and a portable hide located 20-25 meters away.

Of the captured Golden Eagles, eighteen were already ringed. The GPS tagging has led to the discovery of eleven new nests, and nesting cameras have been installed in some of these nests. One camera documented a failed nesting, likely caused by Great Spotted Woodpecker damaging the eggs. In some areas, multiple cameras have been installed in alternative nests. These revealed that, following a failed nesting attempt in one nest, a pair will immediately begin decorating another nest.

Photos from the work, showing the transport of hides, carcasses, and preparation of the trapping site. Photos: Olli-Pekka Karlin.

An adult Golden Eagle is lured to the carcass in its territory. When the trap is mounted at the carcass, there can be a long wait for the eagle to descend. From the hide, Olli-Pekka observed the eagle, waiting for it to move into the correct position inside the trap before triggering it. Photos: Olli-Pekka Karlin.



Once the eagle is removed from the trap, a GPS-transmitter is mounted, and the bird is released. Photos: Olli-Pekka Karlin and Lea Maalismaa.

Population Ecology of Golden Eagles on Gotland

Navinder J Singh, Robin Olofsson, Aemilius van der Meiden, Andres Lopez-Peinado, Johan Månsson

SLU in Umeå has initiated a collaboration with the County Administrative Board (Länsstyrelsen) of Gotland. Several factors make Gotland's Golden Eagle population interesting to study. Firstly, island populations are always ecologically unique. Furthermore, Gotland has a very dense Golden Eagle population, despite being a landscape heavily influenced by human activities and continuous exploitation. In addition, the population of White-tailed Eagles is increasing, alongside the growing number of wind turbines.

Given the dense population on the island, the study aims to address several questions:

1. What proportion of the population breeds every year?

2. Where do young eagles go after leaving the nest?

3. What differences exist between Gotland's population and mainland Sweden?

4. How does human use of the landscape affect the Golden Eagles?

5. What are the impacts of wind power on this population?

The project began in 2023, with Robin Olofsson conducting the first year's work for his Master's thesis. The aim is to investigate spatial and temporal patterns in breeding and relate these to different aspects of territory quality, including the effects of habitat, food, inter- and intraspecific competition, and human disturbance. In addition, Robin looked at the effects of distance to the nearest neighbour territory of both Golden- and White-tailed Eagle, and the nearest wind farm and powerline.

Methods

The study utilizes year-round territory mapping, breeding parameters, behavioural observations, prey surveys, GIS mapping, and statistical modelling.

Some results

There are 86 known Golden Eagle territories on Gotland, 63 of which have been occupied in all three years. However, not all territories breed annually. Between 30-50% of the territories produce young every year. Breeding success rates varied over the years:

- 2021: 19 out of 28 attempts were successful (68%).

- 2022: 30 out of 42 attempts were successful (71%).

- 2023: 43 out of 43 attempts were successful (100%).

- Data from 2024 is not yet available.

Figure 1 compares the temporal dynamics in breeding success between Gotland and mainland Sweden from 2005 to 2023. While breeding success varies annually, the patterns on Gotland differ significantly from those on the mainland, requiring further investigation.

Breeding success varies greatly from year to year, and the rabbit population appears to be too heterogeneous and subject to fluctuations to be a consistently critical prey source.

The Roe Deer population has increased significantly since the 2000s, correlating with an increase in Golden Eagle territories. However, the impact of Roe Deer on eagles' population dynamics needs further investigation (Figure 2).

Statistical analyses suggest a higher breeding success in territories with up to four neighbors within 10 km. However, breeding success declines when there are five or more neighboring territories (Figure 3).

Coastal territories may have better food availability than inland territories. Interactions with White-tailed Eagles vary between pairs, showing no clear pattern.

To better understand Gotland's Golden Eagles, more information is needed about their prey species. In addition, it is worth conducting long-term studies in the area, including studying population genetics, individual turnover rates and pair dynamics, as well as demographic data, such as age structure, migration patterns, dispersal rates, and responses to local threats.

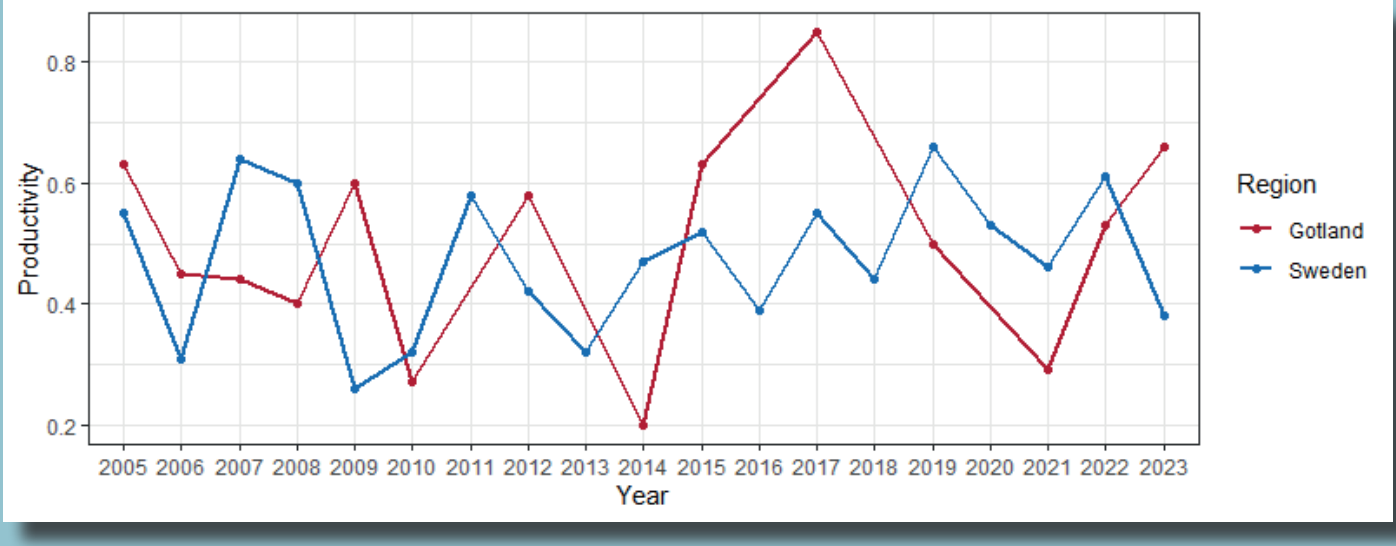


Figure 1. Temporal dynamics in Golden Eagle's breeding success on Gotland compared to mainland Sweden (2005-2023).

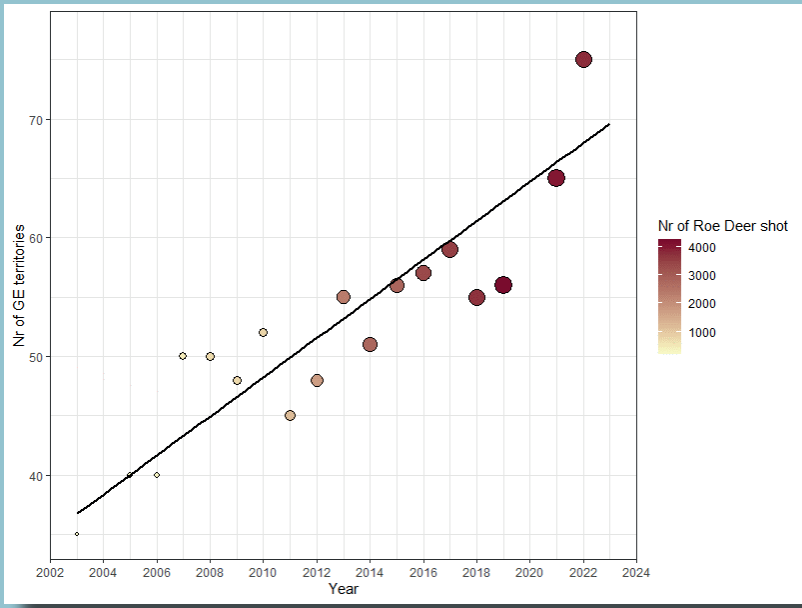


Figure 2. The number of Roe Deer shot annually on Gotland in relation to the number of Golden Eagle territories. Larger and darker points indicate higher numbers of Roe Deer.

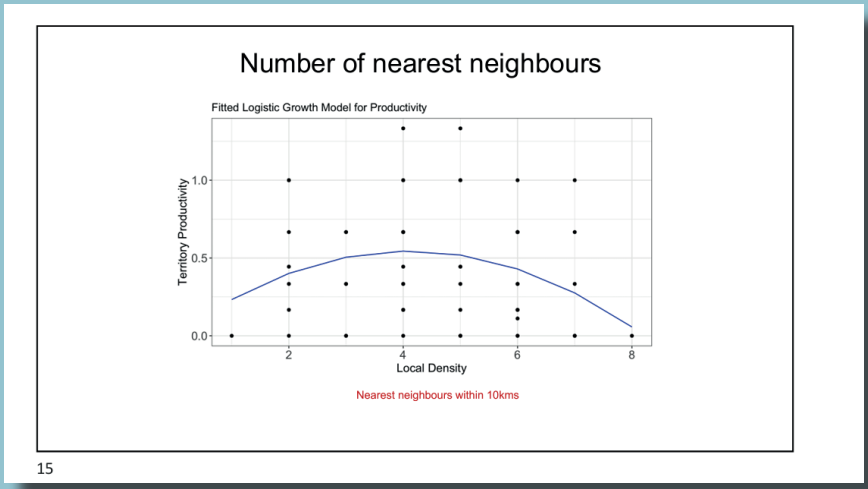


Figure 3. Breeding success of Golden Eagles on Gotland compared to the number of neighboring territories within 10 km from the nest. Breeding success decreases when there are five or more neighbors.

A Golden Eagle in Gotland. Photo: Johan Månsson.

A Golden Eagle perched on a windmill in a snowy landscape. Photo: Johan Månsson.

AquilaNorth - Conserving the Golden Eagle in a rapidly transforming Nordic ecosystem

Navinder Singh

AquilaNorth is a new international project initiated in collaboration between Golden Eagle researchers in Norway, Sweden, and Finland in 2024. The overall goal is to harmonize the methods for collecting and analyzing data on the Golden Eagle's population ecology, interaction with domestic livestock (reindeer and sheep), and landscape use in relation to wind power and forestry.

The project partners include SLU in Umeå, University of Oulu, NINA Tromsö, Wind farm industry representatives - Vattenfall and Statkraft, County Administrative Boards - Länsstyrelsen of Västerbotten and Norrbotten, Västerbottens Ornitologiska Förening and Metsähallitus Finland

AquilaNorth is part of the Interreg Aurora (Figure 1), a European Interreg program for cross-border cooperation (2021- 2027). The program facilitates collaboration and provides opportunities for innovative projects in the northernmost regions of Europe and Sápmi. Interreg Aurora is deeply integrated with the Sami people and their indigenous culture. The program is co-funded by EU funding, Norwegian IR funding, and national co-funding.

Figure 1. Map showing the Intereg Aurora area (yellow) in the northern parts of Norway, Sweden and Finland.

For more information contact

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Golden Eagle is the study species of a new international project "AquilaNorth", which began in 2024, fostering cooperation between northern Norway, Sweden, and Finland to address conservation challenges in rapidly changing ecosystems. Photo: Olli-Pekka Karlin.

Diet of the Mediterranean Golden Eagle *(Aquila chrysaetos homeyeri)* during the breeding season across its distribution range

Daniel Gambra, Enrique Navarro, Marta Peláez & Ramón Perea.

Daniel Gambra is a visiting researcher at SLU in Umeå who studied Golden Eagle's diet during the breeding season in central Spain

The AEQUILIBRIUM+ Project initiated in 2016 originally aimed to study the synchronization between Roe Deer births and Golden Eagle hatchings on the Iberian Peninsula. Over the years the project expanded its focus to include the Mediterranean Golden Eagle *(Aquila chrysaetos homeyeri)* across its distribution range (Figure 1).

The main goal of the project is to analyze the diet of Golden Eagles during the breeding season. For that purpose, two methodologies are used:

1. Camera traps installed at the nest which provide exhaustive data, including hunted and consumed prey, and behavioural aspects, such as which parent delivers specific prey, whether the prey is brought alive, and the plant species used for nest decoration (Figure 2).

2. Food remains collection from nests or their surroundings, which complements the data gathered from camera traps (Figure 3). This method allows to complete the information given by camera traps.

So far, over 1,3 million photos have been reviewed, identifying 78 prey species from various taxonomic groups, including Squamata (reptiles), Artiodactyla (ungulates), Lagomorpha (rabbits and hares), Carnivora (meat-eaters), Columbiformes (doves and pigeons), Passeriformes (perching birds), and even other birds of prey.

Due to the diversity of monitored territories over the past eight years, the project has found that eagle's diet varied with ecological features of territories, like altitude and land use. For example, in the Iberian Peninsula, the frequency and biomass of reptiles and ungulates increased with altitude. In contrast, the Lagomorpha and Columbiformes were more common in lower altitudes. These results showed the Golden Eagles' adaptability to prey availability in

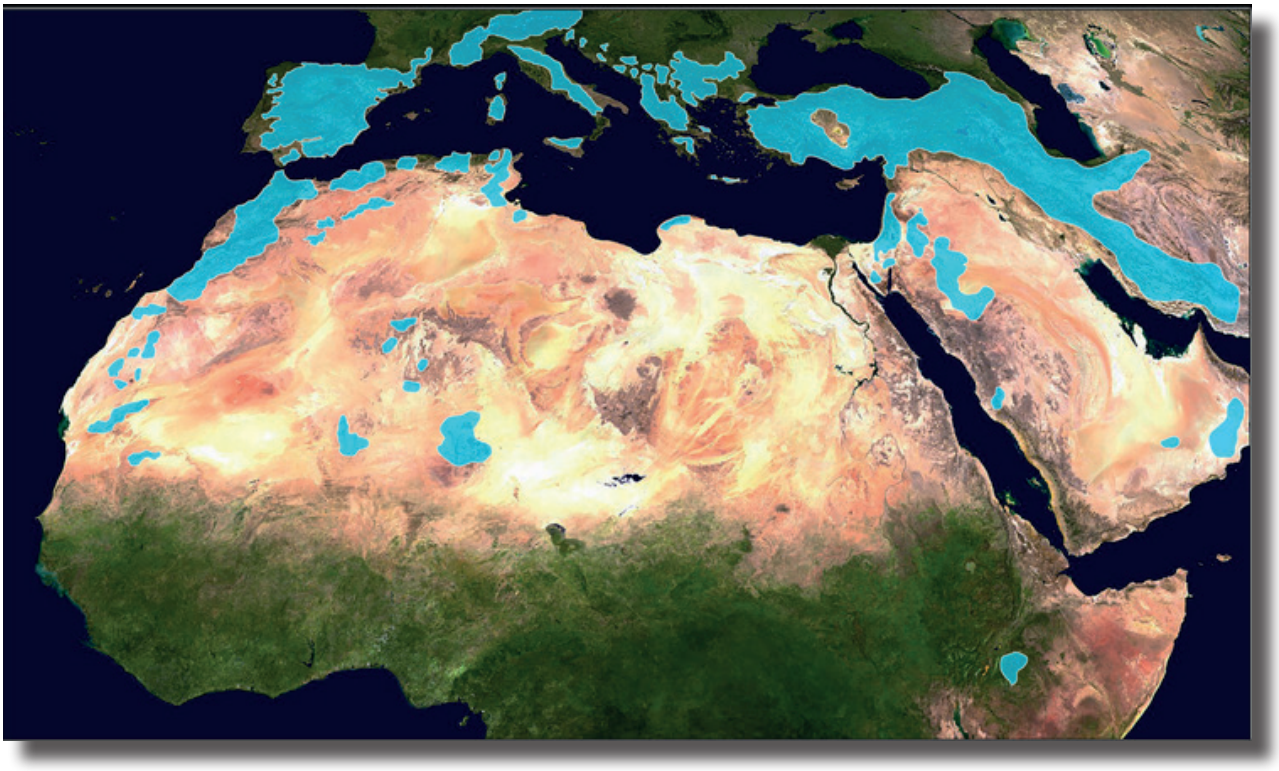

Figure 1. Distribution range of Aquila chrysaetos homeyeri in the Mediterranean and northern Africa.

Figure 2. Photo from a nest camera, which captured two Golden Eagle nestlings. Cameras traps provide extensive data about prey species in different regions and habitats. Photo: AEQUILIBRIUM+ project

Figure 3. Roe deer is an important prey species for Golden Eagles in Spain. The breeding season of the Golden Eagle appears to synchronize with the Roe Deer's reproductive cycle. At higher altitudes (around 1500 meters and above) Roe Deer are more frequently preyed upon compared to lower-altitude habitats. Photo: AEQUILIBRIUM+ project.

Figure 4. Monitored territories span various habitats, primarily in central Spain, with additional sites in southern Spain and in a mountainous areas in Portugal.

different environments. However, diet analysis is just one aspect of the project. Since its inception, 26 individuals – both territorial adults and juveniles - have been equipped with GPS/GSM (Figure 5). Studying juvenile eagles allows researchers to gather valuable insights into their early life stages, including their preferred flight areas maximum travel distances, and primary mortality causes.

Among the racked individuals 87% of deaths were caused by electrocution, while others resulted from collisions with wind turbines or gunshots (8%).

The project uses GPS data to identify "critical areas" based on land use, and occurrences of major threats (e.g., electric posts, wind farms, and hunting grounds).

In 2025, the AQUILIBRIUM+ Project will enter start its ninth season, with the team dedicated to continuing their work on Golden Eagles conservation for years to come.

Follow project updates at **https://www.aequilibrium-project.org/** or on social media **(@proyecto_aequilibirum)**.

Figure 5. The photo shows a Golden Eagle chick, named Ninfa, equipped with a GPS near Madrid during the summer 2024. Photo: AEQUILIBRIUM+ project.

Participants of the 24th Nordic Golden Eagle symposium in Tornio, Finland October 4-6, 2024. Photo: Thomas Birkö.

Kungsörn Sverige

Kungsörn Sverige är en obunden ideell förening som har som ändamål att samordna kungsörnsinventeringar i Sverige, förmedla och bistå med kunskap och handha uppgifter om kungsörnsförekomst på länsnivå (eller motsvarande) samt att aktivt verka för en livskraftig kungsörnpopulation med delbestånd i Sverige.

Föreningen vill förverkliga denna målsättning bland annat genom att:

- verka för kungsörnsforskning och fågelskydd
- med sakkunskap hjälpa myndigheter och organisationer i behandling av för kungsörn betydelsefulla naturskydds- och bevarandefrågor
- informera om föreningen och kungsörn
- organisera inventeringar och utveckla inventeringsmetoder
- arrangera symposier och andra sammankomster

KUNGSÖRN SVERIGE

Next year's Golden Eagle Symposium will take place on October 17-19 in Tallnäs, Småland, Sweden

For more information visit the Kungsörn Sverige's website.
www.kungsorn.se