NINA Rapport 442

NORDISK KONGEØRNSYMPOSIUM

TROMSØ 25. - 28. SEPTEMBER 2008

Karl-Otto Jacobsen (red.)

NINA
Norsk institutt for naturforskning

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Norsk institutt for naturforskning

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FORSIDEBILDE
Voksen kongeørn rastende i tørrfuru i nærheten av reiret.
Bildet er tatt fra helikopter under feltarbeid.
Foto: Karl-Otto Jacobsen ©

NØKKELORD
- Norden
- Kongeørn
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Innhold

Forord

Det nordiske kongeørnsymposiet i 2008 var det tiende i rekken. Forrige gang det ble arrangert i Norge var i Stjørdal i Nord-Trøndelag i 2003. I 2008 var det igjen Norges tur til å være arrangør, og NINA tok også denne gangen på seg oppgaven. Symposiet ble holdt på Scandic hotell i Tromsø.

Takk til alle deltagere, foredagsholdere og andre som medvirket til et interessant og nesten knirkefritt arrangement. Selv om ikke været var på vår side denne helga fikk deltagerne på lørdagens busstur til Kvaløya se litt av hva området har å by på av både natur og ikke minst kongeørn. Videre takk til Direktoratet for naturforvaltning, Fylkesmannen i Finnmark, Troms og Nordland for økonomisk støtte som gjorde det mulig for oss å gjennomføre symposiet. Innholdet i denne rapporten er både på engelsk, svensk og norsk, som også var de språkene som ble brukt under foredragene.

I 2009 er det 10 års jubileum for disse symposiene. Da blir det et nasjonalt (svensk) symposium i Jämtland. I 2010 er det imidlertid igjen tur for et nordisk symposium og da er det Finland som er arrangør.

31. januar 2009
Karl-Otto Jacobsen

Program

Torsdag 25/9		
1930 -	**Velkomst og sosial samling på Scandic Hotell, Tromsø (Welcome and social gathering at Scandic Hotell, Tromsø)**	
Fredag 26/9		
0900	**Åpning (Opening)**	
	Ørn og vindkraft (Eagles and windfarms)	
0915	Wind farms and Golden Eagles (Vindkraft og kongeørn)	Phil Whitfield, Natural Research, Scotland
1000	Radar studies on White-tailed Sea Eagle at an on-shore wind farm on the island of Smøla. (Radarstudier på havørn i Smøla vindpark)	Roel May, NINA, Norge
1030	Dispersal of young satellite-tracked Golden Eagles from Jämtland mountains (Rörelser hos satellitmärkta kungsörnar från Jämtlandsfjällen)	Ulla Falkdalen, Jaktfalk/ Kungsörn Jämtland-Härjedl. Sverige & Torgeir Nygård, NINA, Norge
1100	**Kaffe (Coffee)**	
1120	Wind power plans and White-tailed Sea Eagles in Germany (Vindpark planer og havørn i Tyskland)	Oliver Krone, Leibniz institute for zoo and wildlife research, Germany
	Kartlegging (Mapping)	
1150	Mapping of Golden Eagles on the coast of North Norway (Kartlegging av kongeørn på kysten av Nord-Norge)	Karl-Birger Strann, NINA, Norge
1215	The status of Golden Eagles in Östergötland, Sweden – an area with more than 20 artificial nests (Kungsörnens situation i Östergötland och däromkring, med tanke på 20-tals konstbon)	Tord Nilsson, Örn-72, Sverige
1240	Pictures and experiences from my checking trips in East Lapland, Finland (Bilder og erfaringer fra kongeørnfeltarbeid i det østlige Lappland)	Jarmo Ahtinen, Finland
1300-1400	**Lunsj (Lunch)**	
	Forvaltning (Management)	
1400	Conservation framework for the Golden Eagle in Scotland (Rammeverk for bevaring av kongeørn i Skottland)	Phil Whitfield, Natural Research, Scotland

1500	Ten years experiences with the new system of compensation for Golden Eagle predation in Finland (Ti års erfaring med revirbasert erstat-ningssystem)	Tuomo Ollila**,** Metsähallitus, Finland
1530	The Golden Eagle in the Swedish Predator Policy (Kungsörnen i den svenska rovdjursutredningen)	Thomas Birkö & Bert-Ove Lindström, Sverige
1600	**Kaffe (Coffee)**	
1630	New program for monitoring Golden Eagle in Norway (Nytt overvåkingprogram for kongeørna i Norge)	Jan Ove Gjershaug, NINA, Norge
1645	Golden Eagle management in Norway (Forvaltning av kongeørn i Norge)	Arild Espelien, Direktoratet for naturforvaltning, Norge
1700	The conservation status of the Golden Eagle in Finland (Status for kongeørn i Finland).	Tuomo Ollila & Pertti Koskimies, Finland
1730-1900	**Besøk på Polaria (Visit Polaria) (www.polaria.no).**	
1930	**Middag (Dinner)**	
	Video, pictures, bar	
Lørdag 27/9		
	Forskning (Research)	
0900	Reindeer calves *Rangifer tarandus* as prey for Golden Eagle *Aquila chrysaëtos* in alpine and subalpine landscape: a spatio-temporal analysis.	Harri Norberg, University of Lapland, Finland
0945	Dispersal of young satellite-tracked Golden Eagles from Finnmark (Vandringer hos unge satellitt-merkete kongeørner fra Finnmark)	Torgeir Nygård, NINA, Norge
1030	Variation in territory occupancy and reproductive output of Golden Eagles in Finnmark: 2001-2008 (Variasjon i antall okkuperte territorier og repro-duksjon hos kongeørn i Finnmark: 2001-2008)	Geir Helge Systad, NINA, Norge
1100	**Kaffe (Coffee)**	
1130	The occurence of reindeer calves in the diet of nes-ting Golden Eagles in Finnmark (Forekomst av reinsdyrkalver i næringen til hekkende kongeørn i Finnmark)	Karl-Otto Jacobsen, NINA, Norge
1200	Causes of mortality in reindeer in Finnmark county, Norway (Tapsårsaker i reindrifta i Finnmark)	Knut Langeland, NINA, Norge
1230-1330	**Lunsj (Lunch)**	
1345-1900	**Busstur til Kvaløya og Sommarøya. Husk varme klær! (Bustrip to Kvaløya and Sommarøya. Remember warm clothes!).**	

1930	**Middag (Dinner)**	
	Video, pictures, bar	
Søndag 28/09		
	Overvåking (Monitoring)	
	Bestandsstatus og oppsummering av årets inven-teringer (Population status and summary of this year's censuses)	
0900	Sverige (Sweden)	Thomas Birkö, Sverige
0930	Finland (Finland)	Toumo Ollila, Finland
1000	Norge (Norway)	Jan Ove Gjershaug, Norge
1030	**Kaffe (Coffee)**	
1100	**Eventuelt/oppsummering (Other/summing up)**	
1200	**Lunsj, avreise (Lunch, closing)**	

Wind farms and Golden Eagles

Phil Whitfield
Natural Research, Scotland

There are three main potentially adverse effects of terrestrial wind farms on birds:

- Collision fatality
- Displacement through disturbance (= indirect habitat loss)
- Direct habitat loss (land take)

For large birds, like golden eagles, direct habitat loss through land take (construction of turbine bases and access tracks) should rarely be problematic due to the scale of eagle range use relative to the extent of habitat loss.

Collision fatality case study: Altamont Wind Resource Area, California
About 5,000 operational turbines, in a rolling hill landscape, first constructed in the early 1980s. Several studies have been conducted due to concern over the large number of raptors apparently being killed by collision with turbine blades. Area predominantly used by subadult eagles, breeding territories mostly outwith wind farm but some territories within. About 50 golden eagles killed per year by wind turbines based on tracking individuals (Hunt et al. 1998): compare with about 67 killed per year according to Smallwood & Thelander (2008) based on searches. Most fatalities occurred in subadults (> 1 year old but < 4 years old) and 'floating' non-breeding adults (> 4 years old): first year juveniles and breeding adults seldom killed. Eagles using lattice towers as perches was considered by early research to be a factor in causing fatalities, but most recent work indicates that perch availability is probably not important since birds mainly perch when turbines not operational. Golden eagles, like other raptors at Altamont, fly disproportionately frequently close to turbines, indicating the areas close to turbines are attractive. This is probably because land management (e.g. creation of rock piles) and prey species congregate near turbines. Interaction of topography and wind conditions is also probably influential: many turbines do not result in any collisions but some turbines are repeated 'killers' in particular topographic locations.

Other studies of collision fatalities
A small number of other studies in USA suggest no displacement occurs and that few casualties result from collision. But there are too few studies to draw definitive conclusions on collision fatality of golden eagles.

Displacement: Beinn an Tuirc wind farm, SW Scotland
Recent research in SW Scotland (Beinn an Tuirc) where a wind farm has been constructed within the territory of a breeding pair of eagles strongly indicates that the pair avoids the wind farm site (Walker et al. 2005). The possibility of displacement was anticipated and so some habitat enhancement management was instigated to the north of the wind farm, which tends to confound a definitive conclusion but on balance it seems likely that the termination of use of the wind farm site is due to the presence of turbines.

Displacement = (indirect) habitat loss
If eagles are displaced from an area delimited by part, all or the environs of a wind farm then this is effectively a form of habitat loss. Habitat loss can lead to reduced survival, reduced productivity and/or territory abandonment. Can the effects of such habitat loss be predicted? Impossible to do this from typical avian surveys for assessment of proposed wind farms: these only give an indication of how much eagle activity occurs within the wind farm and not how important the area is for the birds. For breeding pairs, it is necessary to quantify the range use for the entire territory, not only the area which will be lost to the eagles. This allows the 'lost' area to be put in its proper context and so allow quantification of how frequently the eagles use the area relative to the rest of their range. However, quantifying range use is relatively time consuming and costly and rarely undertaken. Alternative solution is to model predicted range use.

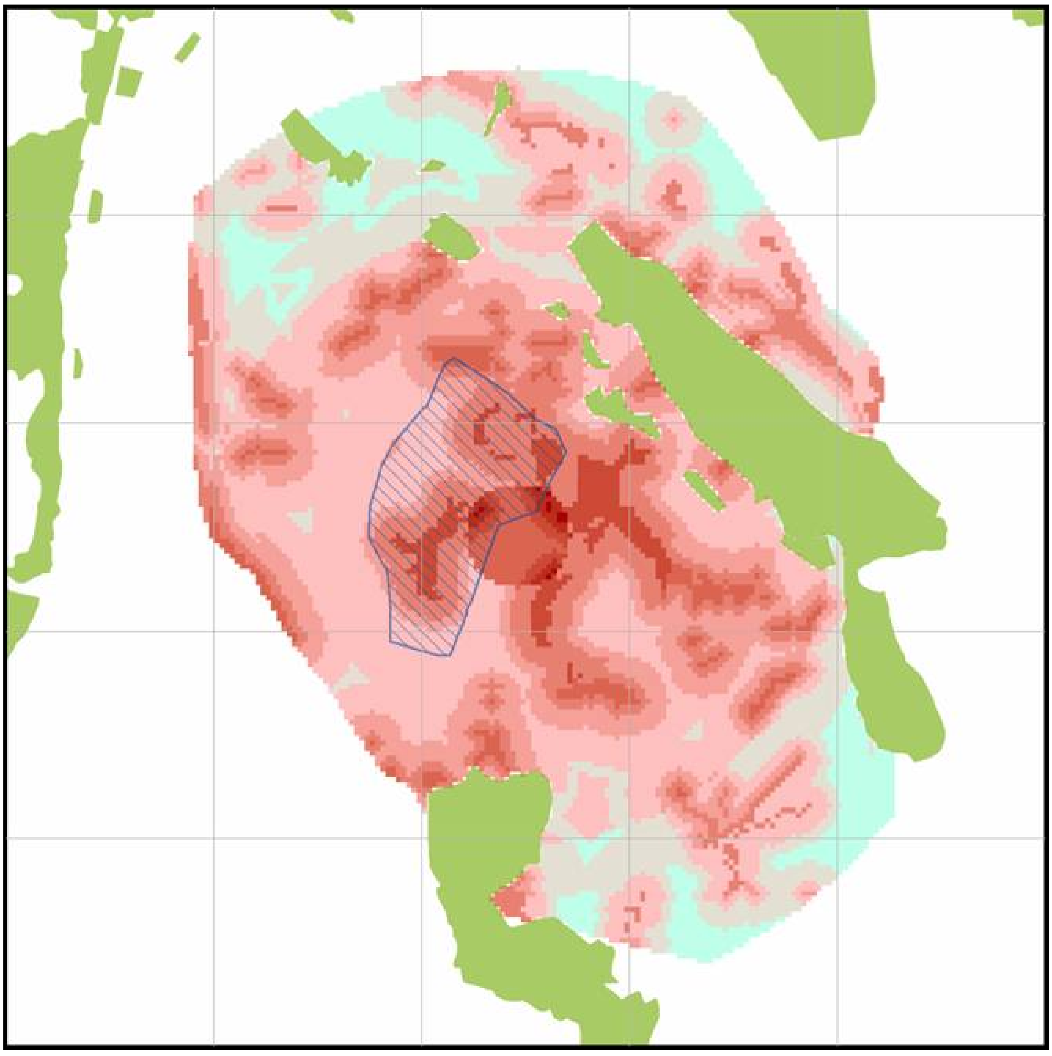
Modelling range use

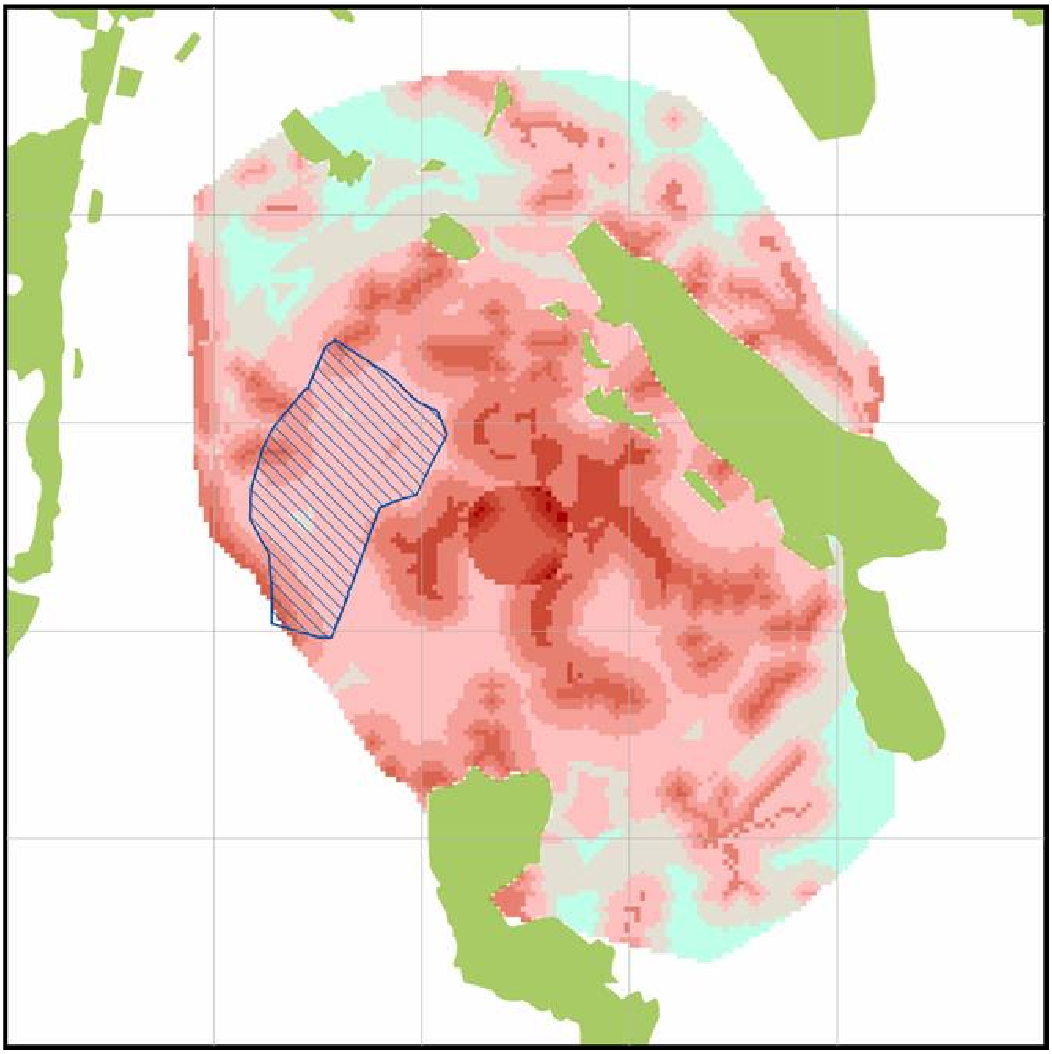
Traditionally researchers have implicitly described the territory by drawing a circle of a given radius around the nest or territory centre. This assumes that the eagles use all of the area within the circle equally, yet this is highly unlikely to occur: some parts of the territory will be used more than others.The 'RIN' (Research Information Note) and more advanced 'PAT' (Predicting Aquila Territory) models attempt to derive more realistic estimates of likely range use. Models are developed from territories where range use had been observed: spatial activity patterns were quantified to derive predictions which can be applied to territories where no range use observations have been undertaken.

The PAT model is GIS software and is based on two main findings:

- Eagles prefer to use areas close to the centre of their territory (the area of their nest site(s)).
- Eagles prefer to use convex terrain features, such as ridges, crests, cliff tops: probably because of the updraft wind conditions making flight more efficient.

The model can be set up to assume that eagles also avoid forest and other features, such as major water bodies. Each 50 x 50 m pixel in the GIS has a predicted proportion of overall range use, so the overlap between a development (such as a wind farm or a new woodland plantation) and the PAT predictions can give a predicted proportional loss of range use. The potential effects of different development locations, such as wind farm, can also be compared. In the example below, the lower wind farm location would be less problematic because a lower proportion of the eagle's range use would be lost through displacement.





Through PAT model we have an improved method for characterising the extent of range loss to habitat change through, for example, a wind farm. How can we predict what effect such range loss has on eagle territory occupancy and/or breeding success?

‘Rules’ for predicting the effect of habitat loss

Through studies of the effects of habitat loss through commercial forest plantations in SW Scotland we have an improved means of assessing how habitat loss may affect eagles through reduced breeding success and/or territory abandonment (Whitfield et al. 2001, 2007a,b). There is no simple correlation between breeding success and extent of loss: territories and their occupants differ in quality. Loss of food resources through habitat loss is more likely to lead to territory abandonment in a poor quality territory (low breeding success) than in a high quality territory. A loss of food resources in a poor quality territory may negate any prior small prospect of a pair being able to breed and so make occupation of the territory unprofitable. Although the same loss in a high quality territory may also reduce breeding success, higher food resources (or better abilities to exploit them) before the loss still make occupation of the territory profitable. In a poor quality territory a loss of 5% of range use may cause territory abandonment but just cause a reduction in breeding success in a high quality territory. A territory in which the pair can shift its range use because, for example, it is not surrounded by other pairs of eagles or other ‘unsuitable habitat’ is less likely to incur an adverse effect of habitat loss than a territory where compensatory range use shift is not possible. The use of several alternative nest sites (especially if far apart) by a pair is likely to be an indication that there is capacity for compensatory shifts in range use. Territories where there are only one or two alternative nest sites may be more vulnerable to habitat loss.

Predicting collision fatalities: the 'Band' collision risk model
Model is described by Band, Madders & Whitfield (2007). The calculation is in two stages: number of birds colliding per annum = number flying through rotor (Stage 1) x probability of bird flying through rotor being hit (Stage 2).

Combining Stage 1 with Stage 2 gives a predicted collision mortality rate that assumes birds take no action to avoid collision. In practice, birds probably show a very high degree of collision avoidance, which dramatically lowers predicted mortality. The model is frequently used in assessment of UK wind farm proposals, but is not problem-free:

- Model assumes that birds take no action to avoid colliding – in practice the vast majority do take avoidance action (e.g. 99% of flights). An avoidance rate must be applied to correct for this.
- Avoidance rate is highly influential on predicted deaths…but very little empirical information on avoidance rates (although probably typically 98% – 100%) – high dependence on avoidance rate correction factor in the absence of empirical data means high uncertainty in model outputs and arguments over predictions.
- Model produces a value for fatality rate: gives a false sense of security in prediction which ignores the many potential model biases.
- Fundamental assumption of CRM that deaths should increase with bird activity in rotor swept area (RSA) is not strongly supported by empirical data. (A problem shared with more crude simple method.)
- CRM probably better than a 'guess': at least a degree of quantification is available and the factors involved in influencing risk are quantified.

Figur 1. Phil Whitfield from Scotland was an invited speaker to the symposium.
Photo: Karl-Otto Jacobsen ©

Radar studies on White-tailed Sea Eagle at an onshore wind farm on the island of Smøla

Roel May[1], Yngve Steinheim[2], Frank Hansen[1], Roald Vang[1], Kjetil Bevanger[1], Espen Lie Dahl[1], Stig Clausen[1], Torgeir Nygård[1] & Andreas Smith[3]
[1] Norsk institutt for naturforskning (NINA), [2] SINTEF , [3] DeTect, Inc. Norge

Wind energy provides renewable non-polluting energy. Norway has a large potential to utilize the wind along its long coast line by establishing offshore, near-shore or onshore wind farms. However, wind farms may also have unfavourable effects on the environment, in particular on birds. Since autumn 2005, twenty white-tailed sea eagles (*Haliaeetus albicilla*) have been found killed by collisions at a single wind farm on the island of Smøla, Central Norway. The Smøla wind farm is with its 68 turbines Norway's largest, and was built in two stages between 2001 and 2005. Smøla has one of the world's densest populations of white-tailed sea eagle.

In 2003 the Norwegian Institute for Nature Research (NINA) started an extensive research project at the wind farm on Smøla to study the impact of wind turbines on avian wildlife; with a special focus on the white-tailed sea eagle. The objective of the project is to obtain an improved information base and tools for the energy industry and environmental and energy authorities to use in determining siting and conflict-reduction of new wind turbine projects. The project further aims to identify the biological, species-specific, ecological and external factors which make birds vulnerable to wind turbines, and assess the population consequences of wind turbine induced bird mortality.

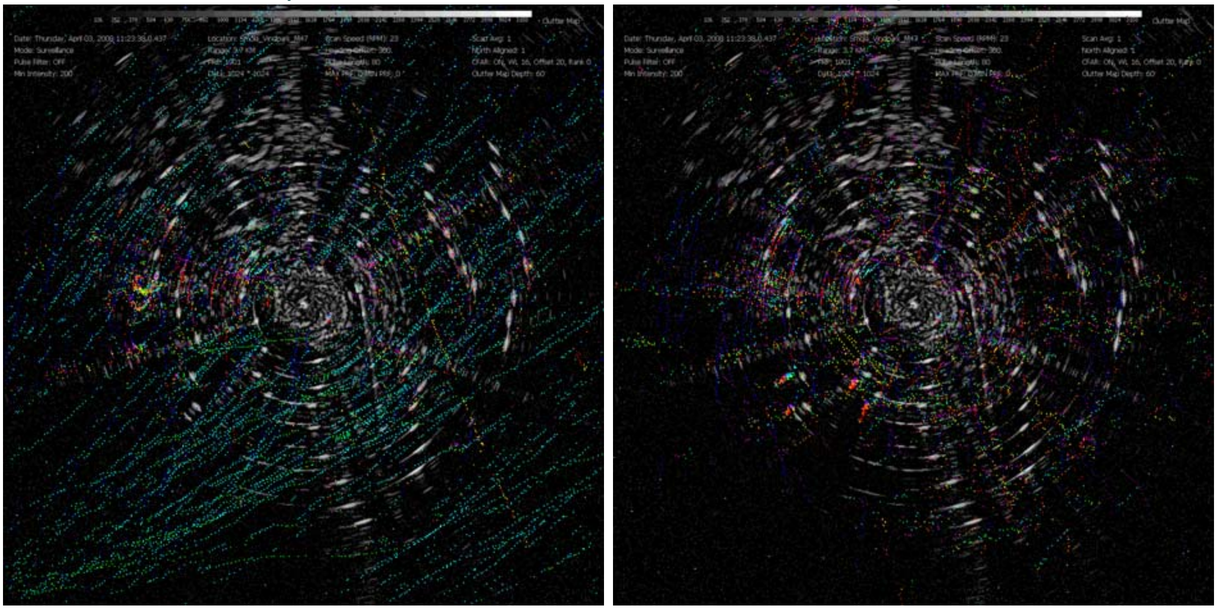
To assess the spatial responses and consequent collision risk of white-tailed sea eagles to wind turbines we employ avian radar technology, in addition to GPS satellite telemetry. The first part aims to investigate the spatial responses of white-tailed sea eagles to wind turbines at different spatial scales (i.e. loss of habitat due to displacement effects, and movement patterns and avoidance effects). The second part aims at constructing statistical collision models for estimating the risk of collisions between white-tailed sea eagle and wind turbines, given their resource utilisation and flight behaviour.

Figure 1. The Merlin Avian Radar System that gather data on Smøla. Photo: Roel May ©

Spring 2008 the Merlin Avian Radar System (DeTect, Inc.) was set up at the Smøla wind farm, and has recorded bird activity continuously since (Figure 1). The radar system gathers data using horizontal S-band radar and vertical X-band radar. Within the trailer the radar images are automatically analyzed and detections are stored in Access databases, which are downloaded automatically once a day to NINA headquarters in Trondheim through a wireless broadband connection. The radar system detects and tracks birds ('targets') of various sizes on the horizontal plane within a circular area with a radius of 3.7 km (2 nautical miles). In addition flight altitudes up to 5,000 m are recorded within a strip with a width of approx. 300 m and a range of 2.8 km (1.5 nautical miles). Because the system is built on top of a trailer, it can be placed practically everywhere on level ground. It may be powered either by generator or commercial power; at Smøla it is connected to one of the turbines. The radar was placed in the best suitable place in the centre of the wind farm to enable the capture of all bird activity within and directly surrounding the wind farm.

The first preliminary results from the radar data clearly show the spring migration activity, which is at its heaviest in April. Migration activity was highest during the night; whereas daytime activity shows a pattern more characteristic to resident bird activity (see examples below). The migration was directional towards north to northeast and mainly happened at higher altitudes (i.e. high over the wind farm); although some avoidance of the wind farm has been recorded.

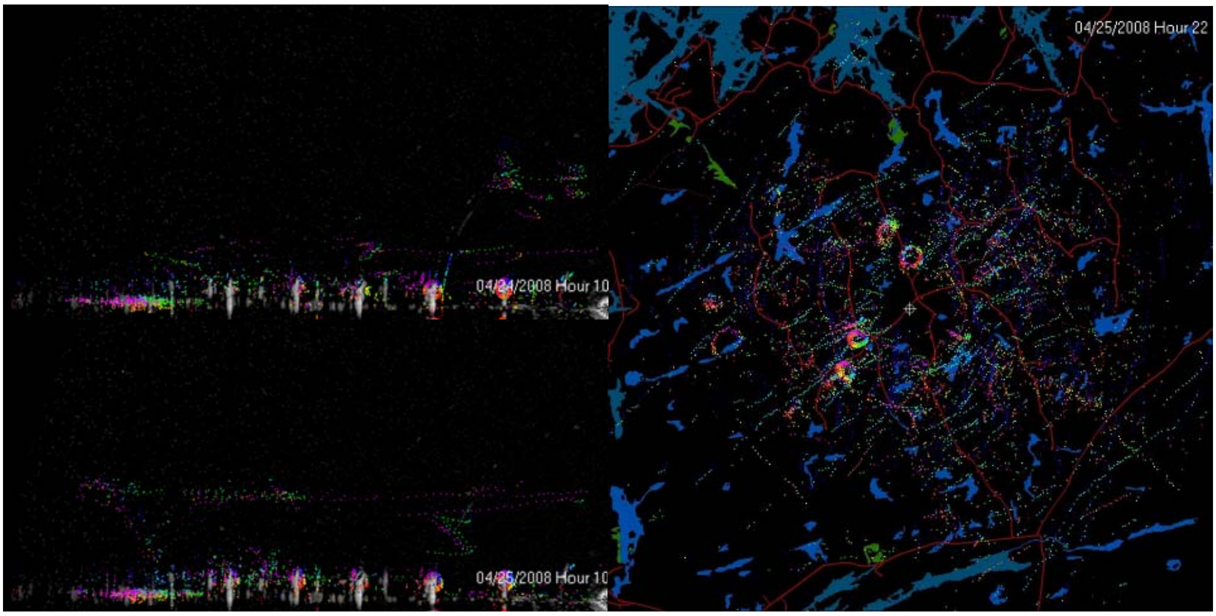
16th of April 01:00 AM | 16th of April 09:00 AM



A central component within the radar studies is the verification whether sea eagles that have been found killed by a wind turbine have actually been tracked by the radar. A first check on the six dead eagles found in spring and summer 2008, revealed that in most cases one or two tracks were recorded to have ended within a 50 m radius of the wind turbine. These tracks were recorded during late evening or early morning.

The fine-scale recording of avian movements of the radar (i.e. one tracking point every third second) enables us in our further work to analyze movement patterns carefully, and investigate bird behaviour more closely. Specific sea eagle behaviour, such as thermal circling (see examples below – left-hand panel), can easily be distinguished. Also other behavioural phenomena have been recorded this spring; so-called bird circles (below – right-hand panel). As yet we do not know which species is responsible for these circles, which were performed at one specific altitude below or at rotor swept height, they were created especially at night (21:00-03:00) towards the end of April.

Within the next stages of the project, the methodological aspects of using radar technology will be assessed. This includes ground-truthing radar data, executing detection and calibration tests using model airplanes and aluminous spheres, and developing the information-technological infrastructure for data flow and storage (many terabytes of data). When these methodological challenges have been met, filtering of and analyzing the data can commence.



Investigation of the spatial requirements (i.e. habitat selection, flying patterns) of white-tailed sea eagle enhances our understanding of their spatial response to wind turbines at different scales. Flying behaviour will be assessed using direct observations, GPS satellite telemetry data and radar flight tracks. The spatial responses of white-tailed sea eagles to wind turbines at different spatial scales will simultaneously form important bird-related information for the development of the collision risk models. The purpose of constructing collision risk models is to identify which factors contribute to an increased risk of collision between birds and wind turbines.

Figure 2. Roel May was telling us about the work at Smøla. Photo: Karl-Otto Jacobsen ©

Rörelser hos satellitmärkta kungsörnar från Jämtlandsfjällen

Ulla Falkdalen[1] & Torgeir Nygård [2]
[1]Jaktfalk/ Kungsörn Jämtland-Härjedalen, Sverige
[2] Norsk institutt for naturforskning (NINA), Norge

I samband med planering och byggande av Storrun vindkraftanläggning i Jämtland, Sverige, inleddes en undersökning av fågellivet före och efter byggandet av vindkraftanläggningen. Ekonomisk stöd till undersökningen erhölls genom Naturvårdsverkets program *Vindval* som finansieras av Energimyndigheten. Förstudien är genomförd och de tolv vindkraftverken är på väg att uppföras i området. Anläggningen beräknas vara i drift 2010 varvid en tvåårig undersökning av vindkraftanläggningens inverkan på fågellivet kommer att inledas.

I fågelundersökningen ingår

- Direktobservationer av sträckande fåglar under vår och höst
- Standardrutter för kartläggning av häckfågelfaunan i ett större område
- Revirkartering av den häckande fågelfaunan i tre mindre områden (totalt 60 hektar), två i den planerade vindkraftparken och ett referensområde utanför området som berörs av vindkraftanläggningen.
- Myrfågelinventering av ett närliggande Natura 2000-område
- Översiktlig vårinventering av hönsfåglar
- Höstinventering av hönsfåglar med hjälp av fågelhundar
- Satellitsändarstudier av rörelser hos ungfåglar av kungsörn och jaktfalk
- Nattlig inventering för att påvisa ev. spelplatser för dubbelbeckasin

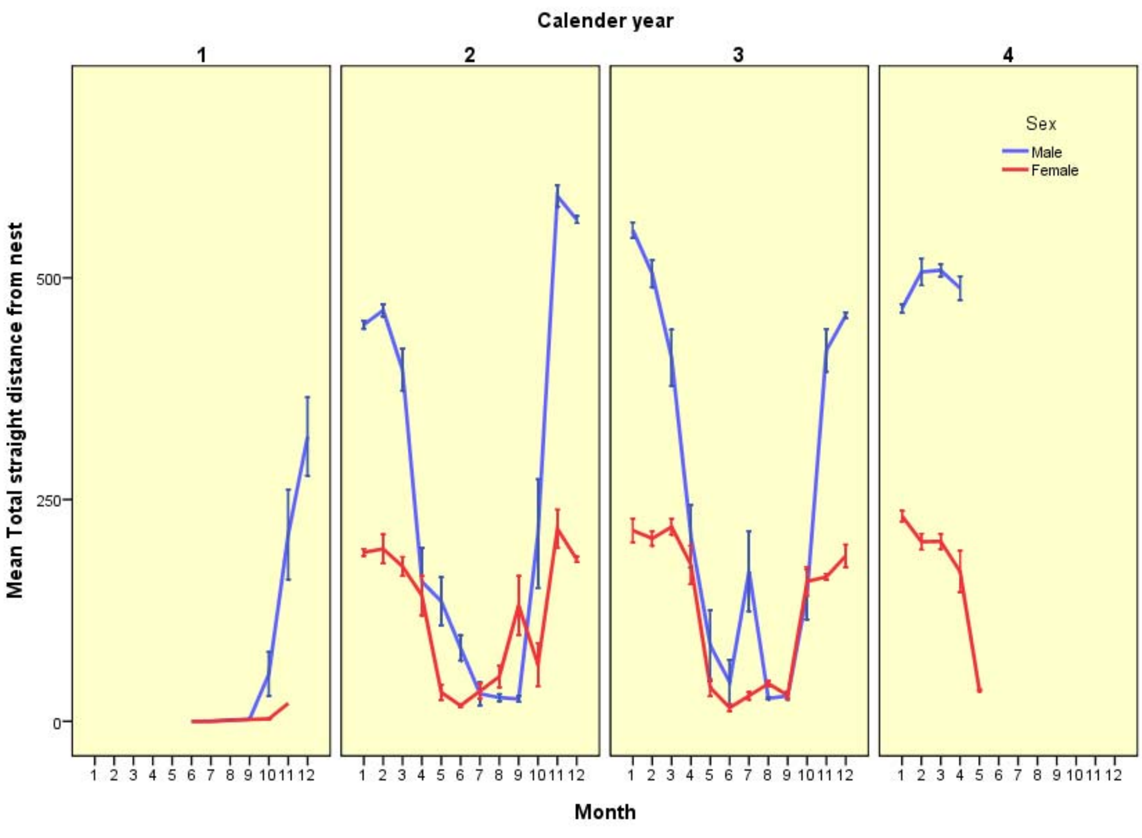
I föredraget redovisades några preliminära resultat gällande unga kungsörnars flyttningsrörelser som framkommit tack vare de pågående sändarstudierna.

Hittills har sex juvenila kungsörnar (boungar) försetts med satellitsändare i denna undersökning. Sändarna monteras med hjälp av band av tubvävd teflon, som förs framför och bakom vingen och kopplas samman över bröstbenet. Metoden är standard för radiomärkning av rovfågel i både Europa och USA. Fåglarna släpps fria omedelbart efter märkning. Satellitdata är åtkomliga på Internet efter några timmar, och möjliggör studie av fåglarnas rörelser från dag till dag. Alla data sänds även en gång i månaden på CD-rom från Argos i Toulouse för att säkerställa att datamaterialet blir komplett. Datan bearbetas vidare med GIS-verktyg av typen ArcView och ett statistikprogram (SPSS).

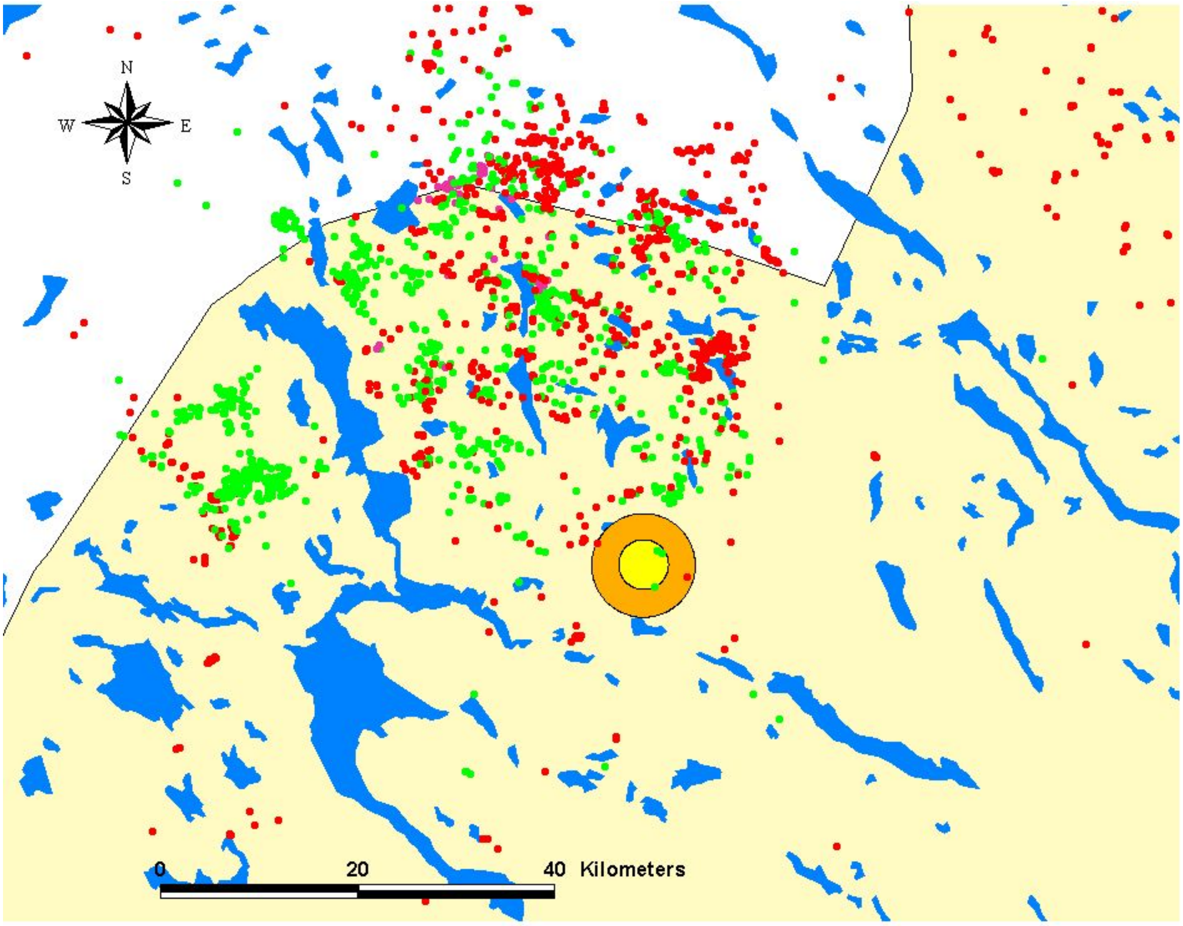
Sändarstudierna på kungsörn har i stort sett fungerat bra. Speciellt två av örnungarna som märktes 2005 har bidragit till att öka kunskapen väsentligt om örnarnas rörelser under sina första tre år. Tiden som sändarna har sänt signaler har varierat mellan fyra månader till 35 månader. Tre av kungsörnarna har plockat av sig eller tappat sina sändare (Tabell 1). Sändaren som skickade signaler i bra fyra månader satt på en ungfågel som dog, troligen pga svält och långvarigt snöfall i samband med att vinterflyttningen skulle inledas i slutet av oktober 2006. Det var dåligt med föda för rovfåglar i Jämtland under det året. En annan örn som burit sin sändare i tre år, hittades död i Uppland på väg norrut. Dödsorsaken kunde inte fastställas, då kadavret legat för länge innan den analyserades av Statens veterinärmedicinska Anstalt, SVA. Däremot noterade SVA att det inte fanns några skavsår eller andra skador på kroppen som kan ha orsakats av sändare eller sele. Förgiftning misstänktes, men detta kunde inte bekräftas då det var för sent att påvisa ev giftrester. Flertalet av kungsörnarnas sändare har sänt så pass noggranna GPS-positioner att de har kunnat återfinnas ute i terrängen. Dessa sändare kan efter service återanvändas i undersökningen på andra kungsörnar. De unga kungsörnarna håller sig i föräldrarnas revir utöver hela hösten, men ingen av ungfåglarna är kvar i hemområdet under perioden januari - mars. De drar relativt snabbt söderut när snön kommer i fjällen. De flyttar tillbaka nästa vår och strövar då omkring inom ett område på någon mil under sin andra sommar. Sändarstudierna har även visat att ungfåglar av bägge könen i genomsnitt vistas inom 10-20 km från boplatsen när de återkommit efter vinterflyttningen. Däremot är det en skillnad mellan könen i vinterflyttningens längd. Hannarna flyttar längre söderut under vintern än honorna, ca 500-600 km mot honornas ca 200 km (Figur 1).

Undersökningen har visat att det är stor ortstrohet hos kungsörnsungar som växer upp i Jämtlandsfjällen. Även om materialet är litet, finns en klar tendens till att ungarna återvänder till det område de är födda i till den andra, tredje och fjärde sommaren efter att de övervintrat söderut (Figur 2).

Resultaten har visat att det sannolikt är närheten till boplatsen som är den viktigaste faktorn när det gäller potentiell risk för kollision med vindkraftverk. Ungfåglarna befinner sig i hemreviret upp emot 5 km från boplatsen fram till oktober– november varefter de flyttar iväg i huvudsak i sydlig riktning. Ny kunskap från denna undersökning är att ungfåglarna återvänder till födelseområdet både den andra och den tredje sommaren, varvid de exponeras för nya risker om det finns vindkraftverk i närheten. De vuxna kungsörnarna löper viss risk för kollisioner under hela året eftersom de sannolikt håller sig inom reviret i stort sett året runt.



Figur 1. Avstånd från boet i förhållande till kalenderår och månad för satellitmärkte ungfåglar av kungsörn från Jämtland.



Figur 2. Ungfåglarna strövar omkring inom några mil från hemområdet under båda sin andra och tredje sommar (röda punkter = andra sommar, gröna punkter = tredje sommar). Gul cirkel markerar vindkraftanläggningen som ligger söder om örnarnas hemområde.

Sändarnr.	märkdatum	Stoppdatum	Antal dagar	Antal mån.	Öde
58957	2005-07-04	2008-05-05	1035	33,9	Tappat sändaren
58962	2005-07-04	2006-04-14	283	9,3	Tappat sändaren
58963	2005-07-04	2008-04-08	1006	32,9	Död pga gift?
67125	2006-06-30	2007-05-01	300	9,8	Tappat sändaren
67126	2006-06-30	2006-11-03	125	4,1	Död pga svält?
158962	2007-07-12		461*	15,1*	Sänder ännu

Tabell 1. De satellitmärkta kungsörnarnas sändningstid och öde *pr. oktober 2008

Wind power plans and White-tailed Sea Eagles in Germany – preliminary results

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Wind power provides up to 7.2% of power consumption in Germany (Molly 2008). The development of wind power plants resulted in an increase in the number of birds that collided with wind turbines. The first two white-tailed sea eagles (*Haliaeetus albicilla*) became victims of wind power plants in 2002 (Krone & Scharnweber 2003). Since then at least 36 white-tailed sea eagles (WTSEs) have been killed by collisions with the blades of wind turbines. More than 50% of the eagles were adult (n = 19) and the remaining birds juvenile to subadult (n = 17). The north-eastern federal countries (Schleswig-Holstein and Mecklenburg-Western Pomerania) with high numbers of white-tailed sea eagle breeding pairs and high numbers of wind parks are especially affected. Adult WTSEs were mainly found during the winter months and in the spring time when the territory is re-established and flight activity is high. Young WTSEs have been found mainly in autumn and towards the end of winter, very likely during their dispersal. To investigate whether juvenile WTSEs are affected by wind power plants (WPPs) during their dispersal and whether WPPs have an influence on habitat selection and spatial use of territorial eagles we equipped WTSEs with satellite transmitters and performed visual observations. One adult WTSE was caught with a bow net in January 2008 and equipped with a data logger. Despite extensive search for VHF signals the bird could not be located. Three nestlings of WTSEs from two nests were equipped with GPS-GSM transmitters at an age of six to eight weeks during ringing in June 2008. One nest with two nestlings (eagle #5841, eagle #5901) was located 5 km onshore of the Baltic sea between the cities Wismar and Rostock, the other nest with one eagle chick (eagle #5902) was located within the Mecklenburg Lake District east of Schwerin, capital of the federal state Mecklenburg-Western Pomerania.

The satellite transmitter of eagle #5841 was programmed to receive three positions per day. The device generated 527 positions in 178 days. Using all positions the calculated dispersal area was 13.885 km² (100% MCP). Within this area 53 wind parks and thirteen single wind turbines were found. The transmitter of eagle #5901 which received four positions per day generated 696 positions in 174 days resulting in an area of 9.144 km² (100% MCP) including an extensive excursion to the coast of the North Sea west of Bremerhaven. Without this excursion the reduced MCP covers 2.894 km² including 11 wind parks and seven single turbines. Neither eagles were recorded near wind turbines nor flying through wind parks thus. Even the neighbouring wind power plants were not crossed or approached. The satellite transmitter of eagle #5902 receiving four positions per day sent 647 locations over 173 days amounting to a dispersal area of 43.082 km² (100% MCP) also covering one large single excursion to the Netherlands, west of Arnhem. Excluding this long excursion from the MCP resulted in a dispersal area of 2.020 km² including 11 wind parks. The closest distance of a single position to a wind turbine was 150 m. Assuming that direct connections between two single positions representing more or less direct flight routes 15 flights went directly through or very close to the neighbouring wind park. One subadult WTSE (#2356) was captured in the Mecklenburg Lake District by using the noosed fish method and fitted with a GPS-GSM device in August 2008. This still active satellite transmitter was programmed for only one position per day to save battery power. It has sent 99 positions since capture. The position data from 99 days were used to calculate a dispersal area of 2.298 km² (100% MCP). Nine wind parks and 3 single wind turbines are located within the dispersal area.

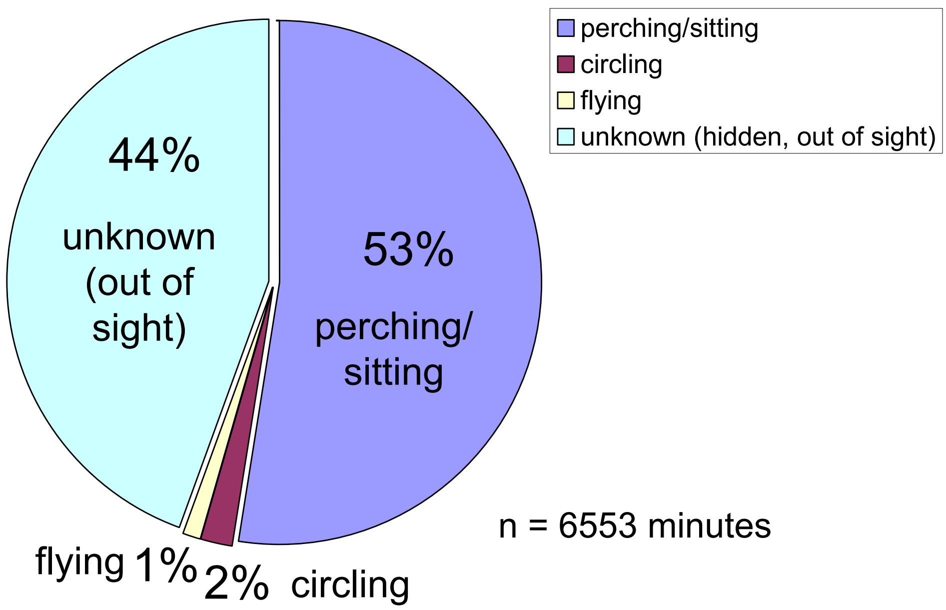

Figure 1. Time budget of the juvenile white-tailed sea eagle #5902 in the post-fledging period from July to September 2008 (overall observed time = 6553 min.).

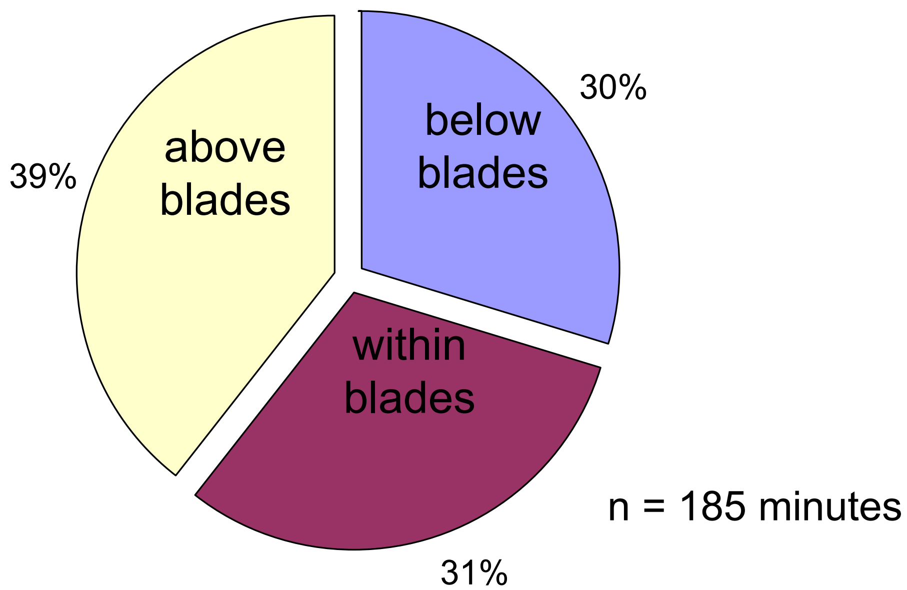

Figure 2. Flight heights of the juvenile white-tailed sea eagle #5902 in the post fledging period from July to September 2008. Graph shows the flight heights during the time when the observed eagle was flying or circling near turbines in the wind park (185 min. = 3% of the overall observed time in fig. 1)

The closest distance of a single position of this eagle to a wind turbine was 150 m to a field water hole. The core area of activity (5% Kernel) lies only 10 km southwest to the place where the eagle was captured. Visual observations of the juvenile eagle #5902 confirmed that the eagle flew through the wind park as suggested by the automatically received GPS positions. However, 97% of the time of observation (~ 110 hours), the eagle did not move or was out of sight (Fig. 1). During the 185 min. when the eagle was flying or circling in the area of the wind park, only 3% of the observed time, the bird often flew above the blades of the generators (39%) as shown in fig. 2. In two out of three cases when the eagle was flying within the generators range there was no wind and no movement of the propellers. In the time observing the young eagle the parents were also observed passing through the wind park. An adult white-tailed sea eagle visited the wind park on two consecutive days in August when up to three pairs of red kites (*Milvus milvus*) were searching for food after a farmer had spread dung on the field.

Our results show that young as well as adult WTSEs fly into and through wind parks as proven by visual observation and telemetry, exposing themselves to the risk of collision. Obviously WTSEs are not afraid of wind turbines. Permanent or temporal structures or food availability may be one reason why eagles approach and hunt or even forage near or within wind farms. As shown in our study a subadult eagle visited a field water hole only 150 meters next to a wind park, consisting of eight turbines. An adult, together with a juvenile eagle, were seen crossing a neighbouring wind park. In addition an adult eagle was observed circling above the wind park while a farmer was spreading dung on the field. Depending on the region, relief, wind speed, thermals and updrafts, wind power plants are mainly situated at places with highest numbers of windy days. Those places maybe open country sides, hills, mountains, ridges, and fjords which are also frequently used by large birds for hunting, arial display or other daily requirements taking advantage of updrafts and thermals. In contrast to other studies on the problem of colliding birds with wind turbines (Follestad et al. 2007, Hunt 2002, Smallwood and Thelander 2004) the situation in Germany differs in that aspect that potential collision can occur in the whole landscape without any particular concentration at one specific location. To reduce the risk of collisions permanent or temporal structures providing perches or potential prey should be reduced, or when planning WPPs such structures should be considered. Despite potential perches the abundance of prey in the area of the wind park maybe one of the most important factors responsible for attracting raptors into wind farms. Wind parks should be built outside the average home range size of the WTSE. However, only very few data exist on the home range size of WTSE. Most estimates varied between 12 to 120 km² (Looft and Neumann 1981, Oehme 1975, Struwe-Juhl 2000).

The first telemetry study on a territorial WTSE in Germany revealed a 4,5 km² home range size calculated as 95% kernel, respectively 8,2 km² calculated as minimum convex polygon (Krone et al. 2009). The rather small home range size may be explained by a good habitat including a part of a large fresh water lake. Other home ranges may be much larger and excursions might also lead into wind farm areas. To reduce the risk of collision the Working Group of German State Bird Conservancies suggests a minimum distance of 3 km from a wind power plant to the next breeding place of a WTSE. Additionally, within a radius of 6 km to the breeding place eagle flight ways or hunting grounds should be considered when planning a wind park (Länder-Arbeitsgemeinschaft der Vogelschutzwarten 2007). Those measures may mitigate the risk for breeding pairs but not for young eagles during their dispersal or older birds searching for a territory. Regardless of the age and spatial behaviour, hunting eagles might be attracted into the area of a wind park due to potential prey while the structure within a wind park should neither form a feeding ground for geese and other waterfowl nor for rodents or other small mammals. Even the occasional fertilizing of the field by the farmer with dung which may contain dead mice or rats could attract raptors into the area increasing their risk of collision.

Kartlegging av kongeørn på kysten av Nord-Norge

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Bakgrunnen til at jeg initierte kartlegging av hekkende kongeørn på slutten av 1990-årene skyldes at voksne, utfargede individer ofte ble registrert på kysten i hekketida. Allerede på slutten av 1980-tallet og utover 1990-tallet ble arten regelmessig registrert i forbindelse med kartleggingsarbeid på sjøfugl i kystområdene mellom Lofotodden og Nordkapp. Flere hekkefunn ble også gjort i denne perioden uten at det ble jobbet målrettet for å finne kongeørnhekkinger. Nykartlegging av hekkende kongeørn ble først satt i gang i Troms fylke i 1999. De første kartleggingene i dette fylket omfattet både innlandsområder og kystområder. Siden da har det blitt gjennomført en rekke delkartlegginger slik at det i 2006 var gjennomført en første tilnærmet totalkartlegging av dette fylket. I forbindelse med generelle viltkartlegginger ble det startet opp med kartlegging av kongeørn i de nordre delene av Nordland fylke i fra våren 2001. Dette arbeidet omfattet fire kommuner i Ofoten-regionen. Fra 2007 ble det også igangsatt kartlegging av hekkende kongeørn i Vesterålen, og samme år ble det gjennomført viltkartlegginger i Lofoten. Disse generelle viltkartleggingene i kommunene er imidlertid ikke så omfattende at de kan karakteriseres som fullverdig kartlegging av arten, men har gitt betydelig økt viten om forekomsten av kongeørn så langt ut på kysten. Fra 2004 ble det så satt i gang rene kartlegginger av hekkende kongeørn på kysten av Vest-Finnmark og dette arbeidet ble videreført hver vår fram til 2006. I 2006 ble så også kystområdene i Øst-Finnmark kartlagt på kyststrekningen fra Hammerfest til Nordkinn. Fra 2007 ble så områdene fra Nordkinn og østover kartlagt, men kyststrekket fra Varangerbotn til Russlands grense ble ikke fullført, men skal nå sluttføres våren 2009. Finansieringen de første årene etter 1999 var minimal, det meste av arbeider ble dekket gjennom frivillig innsats fra Trond Johnsen, Vigdis Frivoll og undertegnede. Arve Østlyngen har deltatt i flere av feltperiodene i Vest-Finnmark. Fra 2006 har det blitt gitt bevilgninger til kartleggingen hovedsakelig fra Direktoratet for naturforvaltning (DN). Dette har muliggjort et større omfang på feltarbeidet, noe som har vært nødvendig når en tar i betraktning de omfattende kyststrekkene som de tre nordnorske fylkene har. Til sammen har de tre nordligste fylkene rundt 35 000 km kystlinje.

Kartleggingsarbeid langs kysten av Nord-Norge fordrer god logistikk ettersom store deler av områdene er veiløse og svært vanskelig tilgjengelig. Den viktigste samarbeidspartneren i dette kartleggingsarbeidet har vært Kystvakten. Vi har vært så heldige at vi har fått bruke fartøyer fra deres flåte og derigjennom kunnet får tilgang til hele kysten på en glimrende måte (Figur 1). Under kartleggingen blir alle hekkende og territorielle par kartlagt og samtlige påviste reir blir dokumentert ved digitale fotos og geografisk fastsatt ved GPS. Alle dokumenterte hekkefunn blir lagt inn i DNs Rovbase i etterkant av feltarbeidet. Sammen med NINAs forskningsprosjekt på kongeørn i indre Finnmark (se Systad m.fl 2007) har vi nå skaffet en rimelig god oversikt over antallet hekkende par i landsdelen. Riktignok gjenstår det noe kartlegging i de søndre delene av Nordland fylke, men innsatsen de siste 8-10 årene har gitt oss et nytt og oppdatert estimat over antallet par hekkende kongeørn (tabell 1). Det totale antallet hekkende kongeørn i Nord-Norge ligger på mellom 540 og 690 par. Rundt 40 % av totalbestanden hekker langs kysten.

Fylke	Estimat	% på kysten
Finnmark	140-160	≈40
Troms	200-230	≈50
Nordland	200-300[1]	≈30[2]

Tabell 1. Oversikt over antall hekkende par kongeørn i de tre nordnorske fylkene og prosentandel som hekker på kysten.[1](estimatet er noe grovt ettersom de sørlige delene enda ikke er kartlagt), [2] (denne prosentandelen er basert på fordelingen i den nordligste delen av fylket).

Årsaken til at så vidt mange par hekker på kysten kan i stor grad forklares og oppsummeres i tre punkter:

1) Store områder med velegnede hekkeplasser. Mye av den nordnorske kysten har bratte klippeforekomster med egnede hyller. Så langt ut på kysten er våren tidligere enn innover i landet pga. tidlig snøsmelting.

2) Stabil tilgang på mat. På kysten finnes det solide bestander med hønsefugl og hare, arter som utgjør en viktig del av næringen for kongeørn. I tillegg så har kongeørna en solid bestand av sjøfugl å kompensere med i år der bestandene av hønsefugl og/eller hare er lave.

3) Mye av kystområdene har ingen bebyggelse og lite ferdsel. Den forrevne kyststripen langs store deler av landsdelen medvirker til at det er langt mellom bosetningene. Det er også lite med vei som går mange steder, noe som resulterer i at her finnes betydelige arealer med tilnærmet null menneskelig trafikk i hekketida.

Figur 1. Kystvakta har stilt fartøyer til disposisjon for feltarbeidet, noe som har forbedret logistikken betydelig. Foto: Karl-Birger Strann ©

Kungsörnens situation i Östergötland och däromkring, med tanke på 20-tals konstbon

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Våra örnar i södra Sverige börjar så sakteliga att återta sina tidigare sannolika revir. Vad det gäller havsörnen så har det gått tämligen överraskande fort. Vad det gäller kungsörnen är återetableringen tämligen osäker - med undantag för utvecklingen i Skåne och på Gotland. Antalet lyckade häckningar i Svea- och Götaland (med ovan nämnda undantag) i modern tid har aldrig överstigit tio st per år. Antalet kända revir är dock minst tredubbelt större. De häckande paren har tyvärr visat en mycket dålig stabilitet – bl.a. ofta varannanårshäckning. Detta är till stor del beroende på att ena parten i paret har förolyckats på ett eller annat sätt. Det noteras fortfarande t.ex. påskjutna örnar. Det får väl förmodas att detta endast återspeglar en liten del av totalantalet skjutna örnar. Tågdöden vintertid är fortfarande ett stort olöst problem. Till detta kommer nu även ett förväntat ökande antal som kommer att dödas vid kollision med planerade vindkraftverk och kraftledningar.

Mot bakgrund av detta måste kungsörnspopulationens utveckling i nämnda områden vara tämligen osäker. Till icke obetydlig del så är väl även avsaknad av lämpliga boplatser ett av hindren för stabil återetablering. De nu tämligen få nyupptäckta ”örnbyggda” bona är relativt bristfälliga och faller ofta ner efter ett eller något år - både med och utan ungar. Därför har ett inventeringsarbete påbörjats för snart 5 år sedan för att finna lämpliga platser för konstruktion av konstbon. Detta arbete sammanfaller i stort sett med inventeringen av kungsörn i länet. Det noteras nu en påfallande brist på lämpliga boträd i lämpliga biotoper. Örnbon kräver flerhundraåriga tallar med kraftigt grenar för att bära de med tiden ganska tunga bona. Sedan 1960-talet har konstbon konstruerats med framgång inom ”Projekt Havsörn” (Helander et al. 2003). Den senaste kända häckningen i Östergötland var 1983 - parets och boets senare öde förblev okänt.

Inventeringsarbetet avslöjar dock flertal besatta revir och lyckade häckningar i länet. I linje med detta och i väntan på en nationell förvaltningsplan för kungsörn i Sverige så har sedan 2005 ett tjugotal konstbon konstruerats – initialt med visst ekonomiskt stöd av statliga medel (”Kungsörn E-län Norrköpings kommun”).Mest ostörda konstbon byggs oftast på kärrholmar som ligger i blöta myrmarker - än lugnare blir det om ägogräns delar holmen. Denna placering minskar även så risken för störning från jakt och skogsbruk De första av våra konstbon konstruerades endast av ”naturliga skogsprodukter”, men då blir antalet möjliga aktuella bon nästan lika med noll och arbetsinsatsen orimligt stor. Då vi planerade ett större antal konstbon (en del avsedda även för havsörn) så rationaliserade vi bobyggandet. För att få ett stabilt varaktigt konstbo så görs botten i boet av ett drygt kvadratmeterstort ”armeringsnät”. Hittills har vi klippt itu de stora fyrkantiga järnkorgarna som finns kring kemikaliebehållare för vätskor (Cipax). (De tidigaste versionerna av dessa containrar var gjorda av ca 7-8 mm tjocka järntenar med knappt dm-stora rutor - ogalvat och således rostbruna). Denna botten fixeras nu på lämpligt sätt i tallens grenverk. Oftast får i brist på två lämpligt bärande grenar en järnkonsol monteras som ersättning för den ”saknade”stödgrenen. Därpå fixeras en granriskrans i kanten på nätbottnen för att ge ytterligare stabilitet av den därpå placerade gräs/ristorvsbädden. All verksamhet göres i samråd med berörd skogsägare. Vi måste dock nu notera att örnarna inte känt något akut behov av våra konstbon – trots att vi får förmoda att de är kända av våra tänkta kommande hyresgäster. Så t.ex. flög en ungfågel över ett konstbo som vi just byggt för någon timme sedan. Ävenså försökte vårt havsörnpar i Glan förgäves bygga bo i toppen av stor gran i våras, trots att det finns flera konstbon i närheten - det närmsta på ca 100m´s avstånd. Deras senaste självbyggda bo blåste ner för två år sedan med 2 halvvuxna ungar. Vi räknar dock med att våra ”okända” örnpar tar över de lämpligaste konstbona med tiden och att därmed inventeringsarbetet blir lite lättare.

Pictures and experiences from field work on Golden Eagle in East Lapland, Finland

Jarmo Ahtinen
Finland

Volunteer birdwatchers have done an extensive amount of field work on Golden Eagles in Finland. I started my career in 1990 by ringing and searching new territories. I am living and working as an engineer and technical office chief in Savukoski municipality, which is also my place of birth. The volunteers have an agreement with the National Board of Forestry (Metsähallitus), Nature Services and Tuomo Ollila is the contact person. Travel expences to cover the costs of driving by own car from home to nests are paid at a price of 44 cents per kilometre, but no salary is paid. Our main duty is to report annual breeding success in every nest and territory where Golden Eagles live in Finland. We take pictures of all interesting things like chicks, females, males, trees, nests and biotopes. We use to ring all the chicks available and collect DNA specimens, feathers, unfertilized eggs and diet rests. The list of volunteer birders includes the following professions: teacher, doctor, baker, engineer, technician, carpenter, policeman, student, ambulance driver, professional nature photographer, export trade advisor, unemployed, radio reporter, ringing centre worker, Metsähallitus worker, boarder guard, writer, biologist, farmer, painter, machine contractor, and pensioner. The average age of all 30 persons is now 54 years. All volunteers have birding as a hobby. The most common reason to report something else to Tuomo is that we have found a new forestry's logging plan too close to the nest tree.

The typical location of a Golden Eagle nest in Finland is in a pine situated on a south facing hillside. Few nests are found in other trees or on cliffs. All our territories and nests are named. One named person is responsible for checking and reporting annual breeding success for each nest to Tuomo Ollila. The nest trees are also signed and numbered. So if someone finds a nest tree, the first question is "was it signed". Answer "no" means that we have a new nest again. Only once I have found a dead adult eagle and it was caused by the poison strychnine (used by fox hunters in the last century). Other ways to disturb the breeding is to build a ladder to the nest tree or more usually to drive by snow scoter near and under nests in spring. I use my ATV when checking the nests, because it is then possible to cover a higher number of nests during one single day. If you first do 8-9 hours at your ordinary job and after that use evenings and weekends to visit the nests, you wish to do the birding part as easy as possible. The climbing equipment in the pack weighs 14 kg and includes safety belt, iron spike shoes, leg shields and fireman leather gloves. In the safety belt there are two ropes with a length of 4,5 meters and two-hold safety lock. When climbing up the tree and reaching a branch I throw the free rope over the branch and locks it to the safety belt and then releases the lower one. There is only one 4 cm length spike downwards in each of my iron spike shoes. Fireman leather gloves are thick and protect wrist arteries if the chick is big and hit talons when handling and ringing.

Cainism is common on Aquila Eagles. The older brother kills the younger one by pecking continuously to the head and body. Some twins are friendly and kind to each other and some are aggressive. The reason for cainism is if there is not enough food to feed both chicks. I have never been attacked by an aggressive female eagle on the nest, but some of my colleagues has been attacked and Tuomo even in the helicopter. Rests of diet found in the nests proved that Golden Eagle's most common prey is mountain hares, grouses and reindeer calves. The highest number of hares found is 18 in one nest and the highest number of reindeer calves is 14. There is normally only one, two or none calves in nests. Some pairs are specialized to use high density of prey like squirrels, martens, snakes, owls and thrushes.

During my career as a volunteer, covering 19 summers in the period 1990-2008, I have ringed a total of 316 Golden Eagles. The best year was 2004, when I ringed 33 Golden Eagles. My ringings have been done in 70 different territories and 108 nests in Eastern Lapland of Finland.

A total of 66 (21 %) of the ringed birds have been discovered later. The number of discovered ringed birds by different countries are: Russia 8, Sweden 8, Belarus 3, Poland 1, Lithuania 1, Estonia 1, Ukraine 1 and Finland 49**.** The five longest distances from the nest to the place of death are Nikolajev in Ukraine 2221 km, Krakow in Poland 1993 km, Orel in Russia 1759 km and 1717 km and Eslöv in Sweden 1481 km. Other Swedish control places are Åsnen, Karlskoga, Leksand, Söderhamn, Gävle, Piteå and Kalix. From Russia and East Europe the normal brief that the ringing centres have sent to me is "found dead under electrical wire lines" and from Finland and Sweden it is "controlled alive in feeding carcass". One of my ringed Golden Eagles has been controlled 83 times in Kouvola feeding on carcass in seven winters. Normally he arrived to the feeding area in November and left for the breeding area in January-February. This bird has been photographed each time when visited. At the age of seven years it looked very whitish on the underwing like a 3rd calendar year bird. It proves that the individual variations of each bird can cause miss determination of age in the field if ageing is considered only on the basis of the plumage colour.

Every 5th successful breeding produced two fledging chicks. One of the top moments of my birding career happened in 2004 when I found and ringed the first three chicks brood in Finland. All of them also survived alive to fledging. Another highlight was in 1993 when I, in Savukoski, ringed one of the three chicks in a brood of hybrids between Pallid Harrier and Montagu's Harrier.

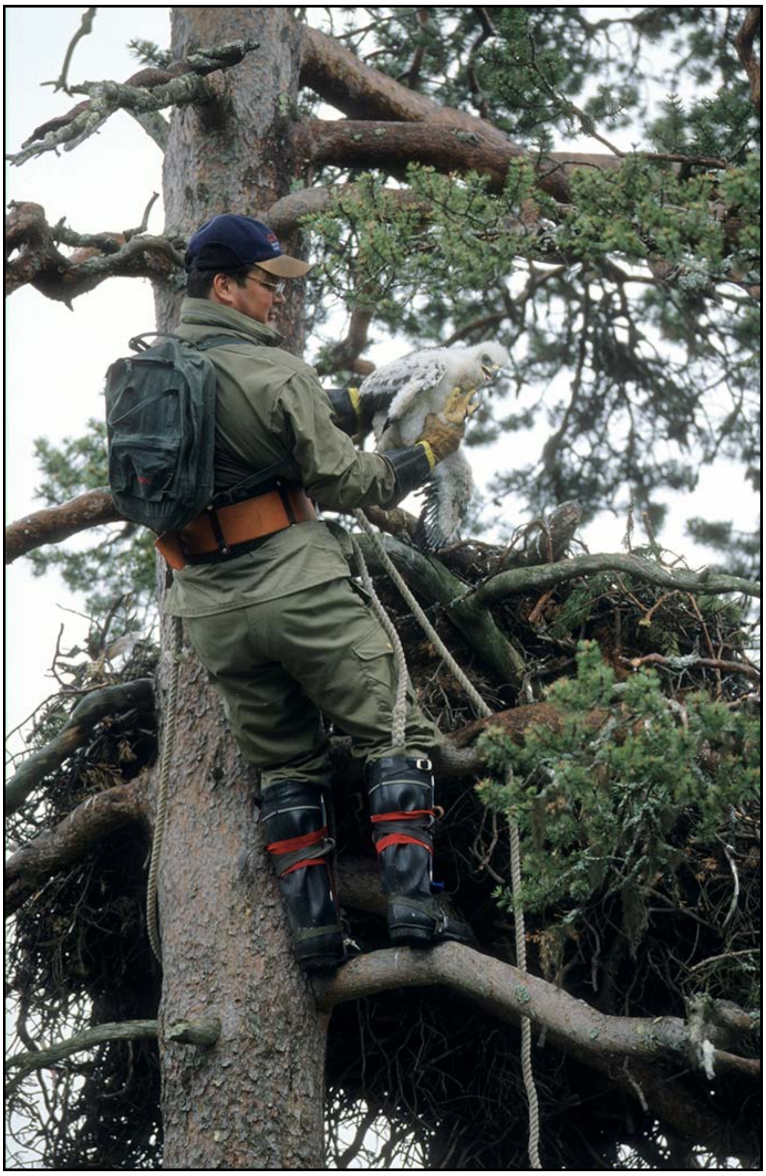

Figure 1. Jarmo Ahtinen in one of his many visits in Golden Eagle nests. Foto: Jarmo Ahtinen ©

Conservation framework for the Golden Eagle in Scotland

Phil Whitfield*[1]*, Alan Fielding, David McLeod, Paul Haworth, Jeff Watson †
[1]*Natural Research, Scotland*

An effective conservation strategy for uncommon and widely distributed species, such as the golden eagle, needs to have three elements: a) species protection; b) site protection; and c) conservation in the wider environment (i.e. outwith protected sites). **Species protection** typically involves legislative provisions against human interference such as killing, capture or disturbance. In Scotland, the golden eagle is protected against killing and intentional disturbance by its listing on Schedule 1 of the Wildlife and Countryside Act (1981). The main focus for **site protection** of Scottish golden eagles is through the UK government's commitment to the European Union (EU) Wild Birds Directive (79/409/EEC) and the listing of the species under Annex 1 of the Directive. Several Special Protection Areas (SPAs) have been classified in Scotland for golden eagles under the Birds Directive. However purely site-based approaches to large raptor conservation have limitations, and several studies indicate that these alone are unlikely to successfully conserve eagle populations. Hence, the main challenge to successful conservation of the golden eagle lies in developing a strategic approach to **conservation in the wider environment** which complements existing site and species protection measures.

Watson & Whitfield (2002) proposed a conservation framework for the golden eagle in Scotland with the overall aim to maintain the population in favourable conservation status by implementing effective site and species protection measures, and by adopting and implementing conservation policies which are targeted at known constraints across the species' current range. The framework recognised the need to implement conservation policies which a) are targeted at known constraints (factors acting on a population which may impinge on meeting or improving favourable conservation status) across the golden eagle's distribution; and b) explicitly acknowledge that the constraints' influences would need to be addressed on a regional basis to be effective. Hence, essentially, the proposed conservation framework has two elements:

- Set targets for favourable conservation status (FCS) based on criteria of abundance, demography and distribution, and assess whether these targets are being met; and
- Identify those constraints acting on the population(s), assess their regional influence on favourable conservation status, and use these assessments to implement policies targeted at influential constraints.

FCS targets were set as follows (Whitfield *et al*., 2006):

- Nationally at least 500 golden eagle territories should be occupied by pairs;
- Regionally, at least 66% of known (Highlands and Islands) or potential (south of the Highlands) territories should be occupied by pairs; and
- Demographic parameter values (i.e. production of young, pre-breeding survival and adult survival) should allow the maintenance of a stable or expanding population.

Tests as to whether these targets were being met were carried out based on Scottish Natural Heritage's Natural Heritage Zones (NHZs) as regional divisions and using the results of the three national surveys of golden eagles (1982, 1992 and 2003).

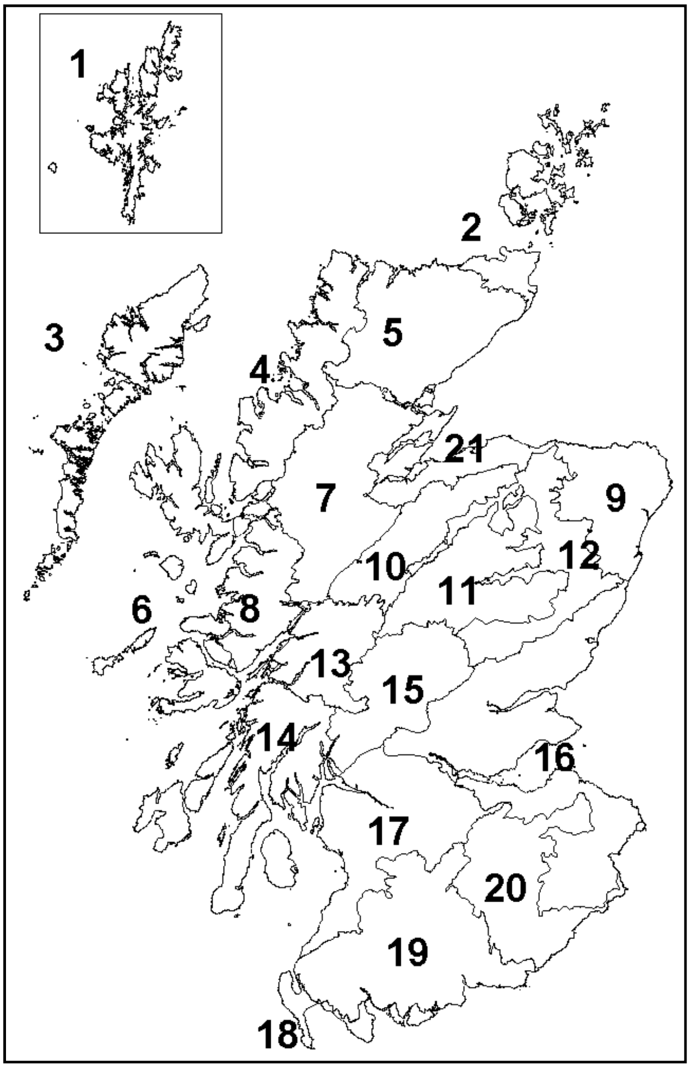

Figure 1. Biogeographic zones of Scotland, termed Natural Heritage Zones (NHZs)

With approximately 440 occupied territories in 2003, the national golden eagle population failed to meet the abundance target for favourable conservation status. Only three of sixteen regions where eagles have occupied territories since 1982 were considered to be in favourable conservation status.The most serious failures to meet FCS tests were in NHZs in the central and eastern Highlands, where less than half of all known territories were occupied. Based on the production of young golden eagles, the populations in these regions should be expanding markedly but instead they continue to decline (there was a loss of 15 occupied territories between 1992 and 2003, and 86 vacant territories by 2003), indicating, in the absence of any evidence for emigration, that survival of subadult and/or adult birds is low. In two regions of western Scotland unfavourable status arose because of insufficient young birds being produced, probably because of a shortage of live prey through a possible combination of heavy grazing by deer and sheep and burning of vegetation. Many constraints have been examined rigorously and objectively for their influence on golden eagles, including: vegetation and land cover, geology, commercial forestry, unintentional human disturbance, wind farms, expansion of white-tailed eagles, persecution, and grazing by sheep and deer. Studies of the influence of different constraints on FCS, which have been published recently in several scientific papers and reports, are summarised. Current evidence indicates that persecution and low food availability in parts of western Scotland are the two main constraints on the Scottish golden eagle population. Eight lines of evidence indicated that illegal persecution of eagles, principally associated with grouse moor management in the central and eastern Highlands, is the most severe constraint on Scottish golden eagles.

The failure of the national golden eagle population to meet favourable conservation status targets is apparently due largely to the marked failures to meet favourable status in those regions where grouse moor management prevails, and the failure to meet favourable conservation status in these 'grouse moor' regions is largely through the continued, illegal killing of eagles. The highest national priority for conservation and management of golden eagles is to tackle persecution in those areas where it still persists. A secondary national priority for restorative management is to promote greater availability of live prey in parts of the western Highlands, potentially through the management of deer and sheep, although further research on the interactions between deer and sheep grazing and golden eagle ecology would be beneficial due to their complexity.

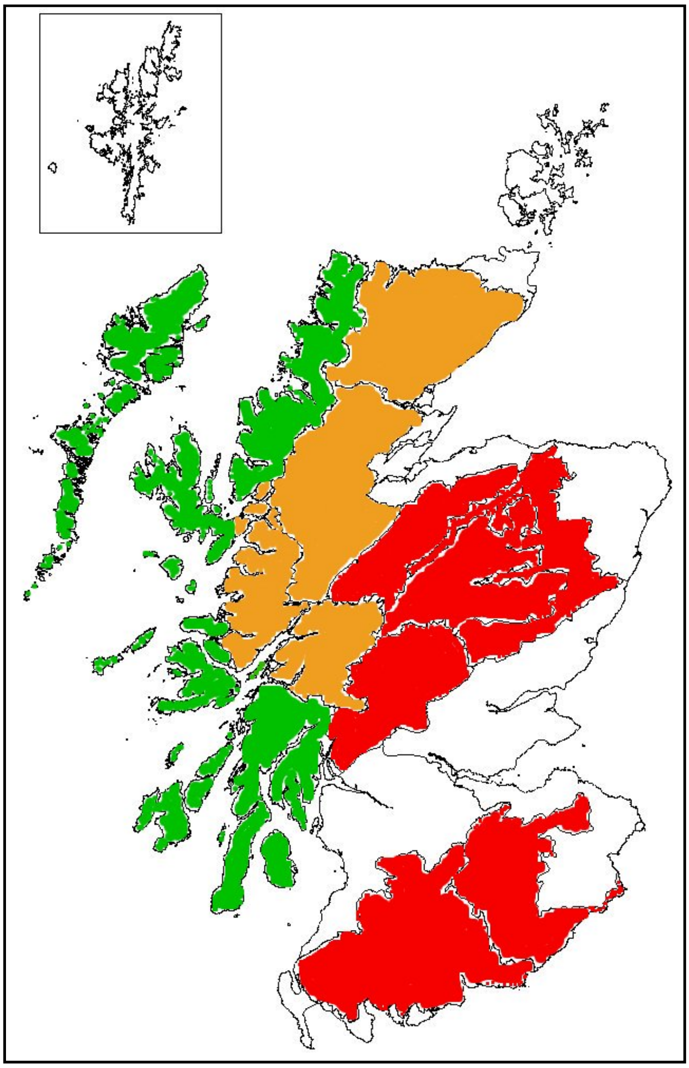

Figure 2. Summary of the conservation status of the golden eagle in Scotland in 2003. Green = region in favourable conservation status (note NHZ 4 classed as favourable here, because 'abundance' test failure was marginal), Amber = region in unfavourable conservation status, but failure in only one test, Red = region in unfavourable conservation status, with failure in more than one test.

The territory-based compensation system for the economic losses caused by the Golden Eagle to the reindeer husbandry. Experiences after ten years in Finland

Tuomo Ollila
Metsähallitus, Natural Heritage Services, Finland

Reindeer calves belong to the natural diet of the Golden Eagle. The number of killed calves fluctuates both spatially and temporarily. Preying of calves by eagles has a negative effect on the economy of reindeer owners, which led earlier to legal, and later on to illegal killing of the birds. Persecution was the main reason for the decline of the Golden Eagle population in Finland in the 19^{th} and early 20^{th} century. The Golden Eagle became legally protected in Finland in 1962. However, in the northern half of the country, in the reindeer husbandry area (see Fig. 1), it was possible to kill Golden Eagles by special permits until 1968. After that the Finnish Government started to compensate economic losses to reindeer owners. The compensation system was based on reindeer carcasses which were found by the owners, and which were presumed to be animals killed by Golden Eagles themshelves.

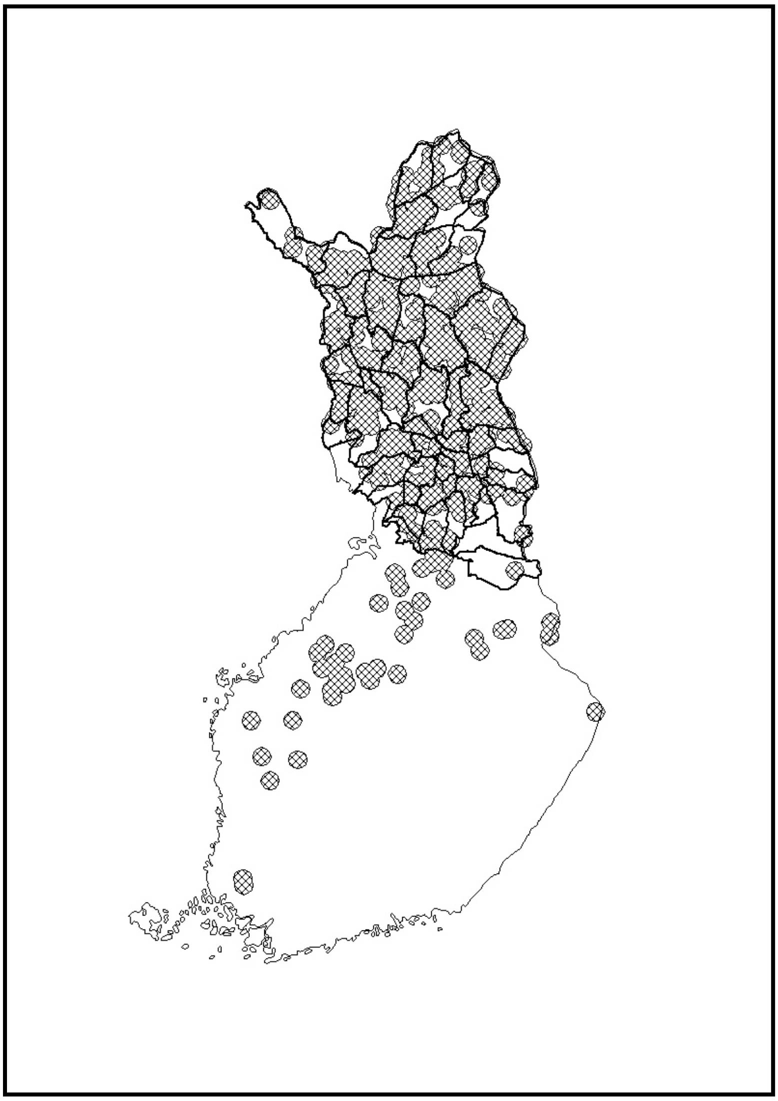

Figure 1. The territories of the Golden Eagle (circles) and the boundaries of the 52 reindeer herding co-operatives in Finland.

The first doubts that this kind of compensation principle is not good enough were presented in the late 1970s. At the same time, a proposal to change the system was made. A more valid system, however, was taken into action not until the year 1998. The main principle of a new system is to compensate economic losses to local reindeer owners according to the number of Golden Eagles and their reproductive success within a respective region. The compensatory sum of money per a territory is higher, if a pair occupying it produces nestlings. If a territory has been unoccupied over three years, no compensation is paid. Compensatory sums per territory are higher in northern fjell regions than in southern forest-dominated areas. In the year 2008, the compensation for an occupied territory without nestlings in forest areas was 449 €, and in fjell areas 898 €. Compensation for a territory with nestlings in forest areas was 1347 €, and in fjell areas 2245 €, respectively. The amount of compensation is connected to the annual price level of reindeer meat. In total, the Government paid 351 000 € for compensation of the eagle-caused losses in 2008 (see Fig. 2).

Experiences after ten years are positive. The reindeer owners´ attitudes towards Golden Eagles are now much more tolerant than earlier. Although they do not perhaps love eagles, they let them fly in free; illegal killing is very uncommon nowadays. The field-observations by reindeer owners made it much easier for the nature conservation authorities and bird-ringers to find almost one hundred new territories, as well as alternative new nests in the territories already under monitoring. Yearly meetings with administration and reindeer owners help to build atmosphere of confidence between the respective parties which is a necessary base for a well-working cooperation and the compensation system. The territory-based compensation system requires a lot of work, because every known nest in the reindeer husbandry area has to be visited at least once every breeding season. At the same time, however, authorities responsible for monitoring and protection of the eagle population receive a good amount of high-level data. A minor problem is that some volunteer bird-ringers are not committed enough to the requirements of the compensation system, especially open and confident cooperation with reindeer owners. Although the present Finnish compensation system is probably not theoretically the best possible, at least it is for sure better than the earlier one.

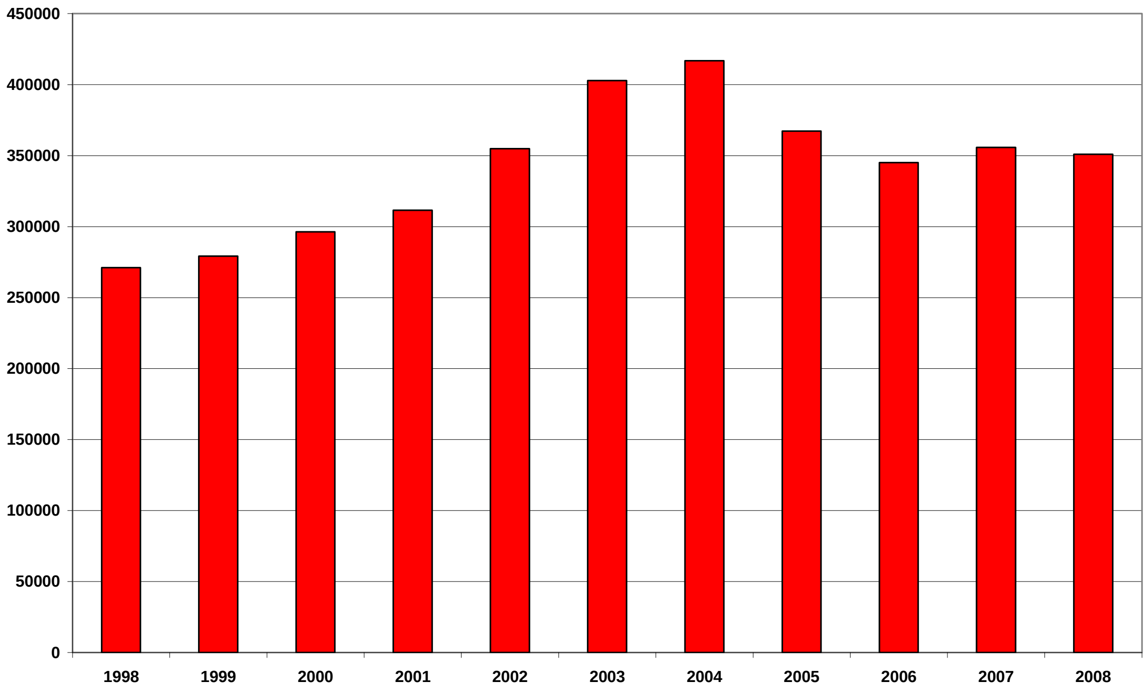

Figure 2. Total amount of compensation (euros) paid by the Finnish Government to compensate the economic losses of the reindeer husbandry from 1998 to 2008.

Kungsörnen i den svenska rovdjursutredningen

Thomas Birkö[1] & Bert-Ove Lindström[2]
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Kungsörnsgrupperna i Sverige har till den nya svenska rovdjursutredningen lämnat ett gemensamt remissvar. Kungsörnsgruppen noterar att de stora rovdjuren i utredningen huvudsakligen beskrivs som ett problem och inte som den tillgång de är. Summan av de regionala målen för rovdjurspopulationerna når inte upp till det nationella målet och därför förordas fortsatta nationella mål och skyddsjaktskvoter i stället för regionala. Kungsörnsgrupperna menar att Sverige idag inte har en gemensam förvaltning utan 21 olika förvaltningar, en för varje länsstyrelse. I vissa län tillåts exploateringsintressena jakt och rennäring dominera. När då inte den nationella myndigheten, Naturvårdsverket, koordinerar de olika länens förvaltningsplaner får vi en situation där vissa län t.ex. har en nolltolerans för etablering av varg.

När det gäller regional förvaltning anser Kungsörnsgrupperna att det endast är björnen, som har nått gynnsam bevarandestatus, och som på prov kan ges ett regionalt förvaltningsansvar. De övriga varg, lo och järv har inte nått gynnsam bevarandestatus. Det har ej heller kungsörn där beståndet är långt från det nationella målet på 600 häckande par. I 2007 konstaterades 271 par, men bara 219 par som lyckades med reproduktionen. I remissvaret tillstyrker vi ett nytt ersättningssystem till renägare men endast för åretruntmarkerna och inte för vinterbetesområdena eftersom det bara är i åretruntmarkerna det sker predation på ren från kungsörn. Den predationen är ej särkilt stor och i många fall anklagas kungsörnen för predation medan obduktionerna sedan visar att renkalvar ej örndödats.

Beslut om skyddsjakt på kungsörn är något som vi anser inte skall ges till den regionala förvaltningen. Dessutom välkomnar vi att ökade insatser ges till polis för övervakning av illegal jakt i f.f.a fjällområdena.

Den svenska rovdjursutredningen togs också som utgångspunkt för en granskning av förvaltningsplanen för de norska fylkena Troms och Finnmark. Beståndsmålen i dessa fylken är; lodjur/gaupe - 10 årliga föryngringar var av 4 i Finnmark, järv - 10 årliga föryngringar varav 3 i Finnmark, björn - 6 årliga föryngringar och varg - ingen etablering av revirmarkerande par eller familjegrupp. För kungsörn anges bestånden till dagens nivå?

Det konstaterades också att Norge har en zonindelening där man i zon A, som är området närmast den svenska gränsen, som beståndsmålet skall uppnås medan det i zon B inte är önskvärt med rovdjur.

Om det är svårt att vara rovdjur i Sverige är det ännu värre i Norge. Några saker som vi tycker saknas i förvaltningsplanen för Troms och Finnmark är bl.a.

- att det ej anges några andra förluster för näringarna än stora rovdjur, t.ex. hund, räv, sjukdom, brist på bete och sjukdomar
- hur näringarna jobbar med förebyggande åtgärder
- resultatet över vad forskningen har bidragit med när det gäller ny kunskap om de stora rovdjuren och kungsörn.
- en redovisning av de statliga pengar som går till produktionsstöd till näringarna.
- en dokumentation över antalet besiktade kadaver efter ren och får.

Nytt overvåkingprogram for kongeørna i Norge

Jan Ove Gjershaug, Karl-Birger Strann, Torgeir Nygård og John Atle Kålås,
Norsk institutt for naturforskning (NINA), Norge

DN har forespurt NINA om å utarbeide en skisse for overvåking av kongeørn i Norge som en integrert del av DNs rovviltovervåking. En direkte overvåking av bestandsstørrelse (N) eller bestandsvekst (λ) for en art som kongeørn er av flere grunner svært krevende (Katzner et al. 2007). Dette skyldes både populasjonsbiologiske forhold og praktiske forhold. Det populasjonsbiologiske er særlig forårsaket av at vår kongeørnbestand trolig består av både en reproduserende andel (som det er praktisk mulig å overvåke) og en andel som ikke har tilgang til territorium, en såkalt flytende bestand (som vi anser som ikke praktisk mulig å overvåke). Dette medfører at den reproduserende bestanden vil kunne være relativt stabil selv om totalbestanden endrer seg. En overvåking som utelukkende måler antall hekkende/etablerte par vil derfor kunne gi feil bilde av hvilke endringer som pågår for bestanden, blant annet ved at en eventuell bestandsnedgang først vil detekteres mange år etter at den har startet. Vi ser det som praktisk mulig å følge bestandsendringer for den reproduserende andelen av bestanden, mens vi anser det som ikke praktisk mulig å overvåke bestandsendringer for den flytende bestanden av kongeørn. Derfor bør en overvåking av den norske kongeørnbestanden inkludere flere parametere enn bare bestanden av reproduserende par/individ. Parametere som er brukt ved bestandsovervåking av rovfugl inkluderer variabler som: i) andel av territorier som er okkupert, ii) andel territorier med hekkeforsøk, iii) andel territorier med ungeproduksjon, iv) antall unger produsert innen et gitt areal, v) gjennomsnittlig antall unger per territorium, vi) overlevelse hos adulte individ, vii) overlevelse hos subadulte individ, viii) andel adulte vs subadulte, og ix) andel subadulte i hekkebestanden. Av disse parametrene tyder simuleringer på at voksenoverlevelse og andel subadulte i hekkebestanden er de beste indirekte parametrene for å følge reelle bestandsendringer (Katzner et al. 2007). Dette er også parametere som er praktisk mulige å måle i den norske kongeørnbestanden.

Et mål ved bestandsovervåking er tidlig å oppdage tegn på uheldige bestandsforhold slik at eventuelle tiltak for å hindre uønsket bestandsnedgang kan settes inn på et tidlig tidspunkt. I denne sammenheng er produksjon av unger en sentral parameter. To meget aktuelle trusler mot kongeørn: i) forurensning og ii) forstyrrelse av mennesker, er begge påvirkninger som vi forventer hovedsaklig vil ha populasjonseffekt via ungeproduksjonen. Derfor betrakter vi ungeproduksjon som en meget relevant parameter å overvåke. Dette er også hovedparameteren som benyttes i Program for terrestrisk naturovervåking. Basert på de muligheter og utfordringer som her er skissert foreslår vi at en overvåking av kongeørn inkluderer en ekstensiv del og en intensiv del. Den ekstensive delen er landsdekkende, mens den intensive delen foregår i et utvalg av områder. Den ekstensive delen vil gi grov informasjon om endringer i kongeørnas arealbruk/utbredelsesområde. Den ekstensive delen omfatter en mer eller mindre systematisk registrering av hekking/hekkeforsøk for kongeørn i hele Norge (se kvalitetsgrad B i Ekenstedt et al. 2004). Dette er en kartlegging som allerede er under etablering ved DN (blant annet basert på informasjon fra lokalt oppsyn, SNO, osv.), og vi går her ikke inn i detaljer når det gjelder dette arbeidet.

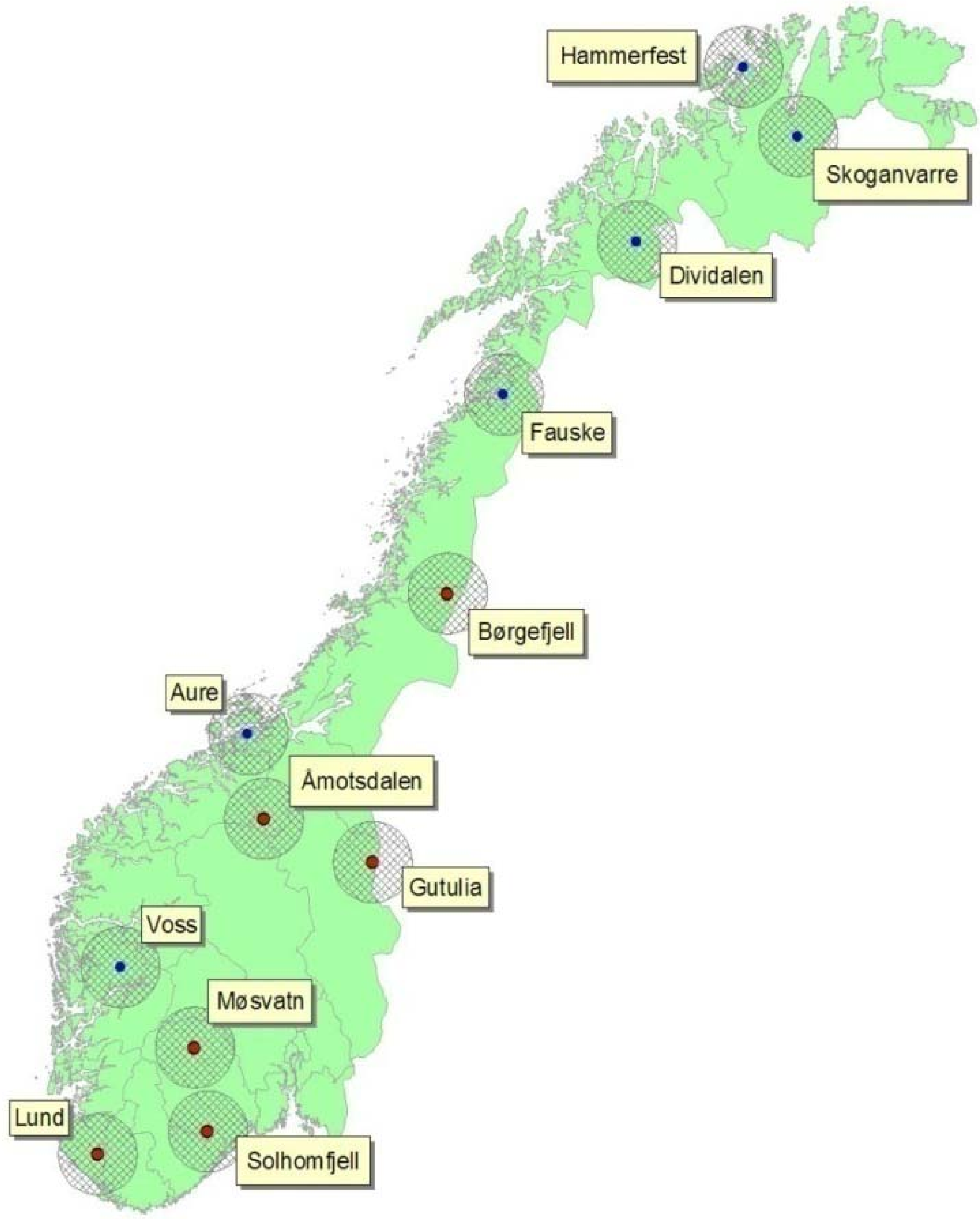
Om en skal være helt sikker på at en slik overvåking skal bli representativ og forventningsrett for den norske kongeørnbestanden ville det vært tryggest å gjøre et tilfeldig (randomisert) utvalg av de areal eller territorier som skal inkluderes (se Yoccoz 2001). Norsk topografi og også til dels mangelfull detaljkunnskap om hvor kongeørn hekker gjør at dette vil bli meget ressurskrevende. Vi anbefaler derfor at den intensive overvåking gjennomføres i et utvalg av områder som legges ut slik at de til sammen representerer den norske kongeørnbestanden. Hvert av disse områdene er avgrenset til en sirkel med radius ca 50 km (ca 8 000 km^2) og for hvert av disse områdene velges det ut ca. 15 territorier der nødvendig datainnsamling utføres. Denne datainnsamlingen omfatter innsamling av mytefjær fra voksne individer og fjærprøver fra unger for identifisering av foreldreindivider ved hjelp av DNA-analyser, aldersbestemmelse/individidentifisering basert på draktkarakterer, samt måling av produksjon av unger etter kvalitetsgrad A i nordisk standard (se Ekenstedt et al. 2004). Vi forventer at et datasett basert på ca. 180 territorier vil gi statistikk som er relativt presis og med høy statistisk teststyrke når det gjelder endringer over tid. Når overvåking må baseres på et utvalg av en bestand, slik vi her foreslår, vil det alltid kunne stilles spørsmål om representativitet. Vårt forslag av områder er gjort med tanke på å få mest mulig representativ informasjon. Det vil også være viktig å bruke den kunnskapen som etter hvert genereres for å få mer informasjon om representativitet. Dette vil en kunne få ved å se på forskjeller mellom områder og tidsperioder når det gjelder de parametere som måles. Det vil i denne sammenheng også være nyttig å se denne variasjonen i sammenheng med faktorer en forventer vil påvirke kongeørnbestanden (mattilgang, klima, menneskelig forstyrrelse osv.).

Når det gjelder den geografiske fordelingen av de overvåkingsområdene som velges må denne tilpasses den variasjonen vi har (både når det gjelder naturgitte forhold og menneskelig påvirkning) innenfor kongeørnas nåværende reproduksjonsareal i Norge. Dette medfører at det må dekkes en nord-sør-gradient og en øst-vest-gradient samtidig som både innlandsområder og kystområder er representert. Basert på informasjon om forekomsten av kongeørn og arealforhold i Norge vil vi anbefale at en slik overvåking gjennomføres ved at det velges 12 områder for intensiv overvåking. Dette vil medføre at ca 15 % av den antatte norske kongeørnbestanden omfattes av den intensive overvåkingen. I regi av DN's 'Program for terrestrisk naturovervåking' (TOV) foregår det i dag overvåking av ungeproduksjon for kongeørn i 6 områder. Dette er Lund i Rogaland, Solhomfjell i Aust-Agder/Telemark, Møsvatn i Telemark, Gutulia i Hedmark, Åmotsdalen i Sør-Trøndelag og Børgefjell i Nord-Trøndelag/Nordland (se Fig. 1) (Fremstad 2007, Gjershaug et al. 2008). Denne overvåkingen inkluderer registrering av produksjon i 10 til 15 faste territorier innen et område med 50 km avstand fra sentrum av overvåkingsområdene, og har i de fleste av disse områdene pågått siden begynnelsen av 1990-tallet.

Vi foreslår at en intensiv overvåking av kongeørn i det nasjonale overvåkingsprogrammet for rovvilt tar utgangspunkt i den allerede etablerte overvåkingen, supplert med arealer som nå ikke er representert. Det er ingen overvåkingsområder i sentrale deler av Vestlandet og i Nord-Norge, og kysten av Midt-Norge er heller ikke representert til nå. Det opplegget for intensiv overvåking vi her foreslår tar utgangspunkt i de allerede etablerte TOV-områdene, med en supplering langs øst-vest-gradienten med inkludering av kystnære bestander, og innføring av nye områder i nord. For å dekke opp øst-vest-gradienten i Sør-Norge foreslår vi å ta inn et intensivområde på Vestlandet. For å dekke opp hele nord-sør-gradienten foreslår vi et nytt område med sentrum i nordlige deler av Nordland, ett område med sentrum i indre Troms og ett område med sentrum i indre deler av Finnmark. For at kystbestandene skal bli representert foreslår vi ett område med sentrum i grenseområdet mellom Møre og Romsdal og Sør-Trøndelag, og ett område på kysten av Vest-Finnmark (se også Tabell 1).

Tabell 1. Oversikt over foreslåtte områder for intensiv overvåking av kongeørn i Norge.

Område	Dominerende naturtype	Status
Lund	Skog - fjell	TOV, etablert 1992, 13 territorier
Solhomfjell	Skog - fjell	TOV, etablert 1992, 11 territorier
Møsvatn	Fjell	TOV, etablert 1997, 12 territorier
Gutulia	Fjell - skog	TOV, etablert 1993, 10 territorier
Åmotsdalen	Fjell	TOV, etablert 1991, 15 territorier
Børgefjell	Fjell	TOV, etablert 1991, 13 territorier
Voss	Fjell	God bakgrunnskunnskap
Fauske	Fjell - kyst	Begrenset bakgrunnskunnskap
Dividalen	Fjell	God bakgrunnskunnskap
Skoganvarre	'Fjell'	God bakgrunnskunnskap
Aure	Kyst	God bakgrunnskunnskap
Hammerfest	Kyst	God bakgrunnskunnskap



Figur 1. Geografisk lokalisering av de foreslåtte områdene for intensiv overvåking av produksjon av unger og overlevelse hos voksenfugl hos kongeørn. Røde punkter viser TOV-områder med allerede etablert overvåking av kongeørn.

Forvaltning av kongeørn i Norge

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Fram til årtusenskiftet var det varierende fokus på kongeørn i Norge. Med den nye Rovviltmeldinga i 2003-2004 ble det et betydelig økt fokus på arten. Den nye Rovviltmeldinga innholdt krav om bedre kunnskap, noe som har utløst økt ressursbruk i forhold til kongeørn.

Før år 2000 har kunnskapsinnhenting for kongeørn begrenset seg til ringmerkingsaktivitet, ekstensiv kartlegging, en del mindre FoU-prosjekt og overvåking i regi av TOV-prosjektet (Program for terrestrisk naturovervåking). I tilegg har det foregått en del kunnskapsinnhenting i regi av lokale rovfuglgrupper.

Etter år 2000 har aktivitetsnivået steget markant. Blant annet er det igangsatt et større prosjekt ”Kongeørn i Finnmark” som hadde oppstart i 2001 og som går fortsatt (se Systad et al. 2007). Rovviltmeldinga satte krav om bedre kunnskap om kongeørnas bestandsstørrelse, forekomst og bestandsutvikling. For å imøtekomme dette behovet er det igangsatt kartleggingsprosjekter og da spesielt i Nord-Norge. Videre er det gjort forarbeider med tanke på å utvide overvåkinga av kongeørn. NINA har laget en skisse for hvordan denne overvåkinga kan utvides (se foregående bidrag i denne symposierapporten).

Rovbase er basen hvor data om de store rovdyra i Norge lagres. Denne er nå utvidet til å motta data om kongeørn, og det er utarbeidet et feltskjema for registrering av kongeørn. Rovbasen inneholder nå kongeørndata fra de nye kartleggingene og eldre kvalitetssikrede data. Det er også gjort tilpassninger slik at basen kan benyttes i våre naboland.

Det jobbes videre med å tilrettelegge eksisterende data. Etter tilrettelegging og analysering av eksisterende data, vil det iverksettes kartlegging for å tette kunnskapshull. En komplett kartlegging vil også være med å danne grunnlag for utvelgelse av lokaliteter som skal inngå i overvåkinga. På bakgrunn av NINAs skisse til overvåking av kongeørn, vil Direktoratet iverksette en begrenset oppstart av overvåking i 2009, og implementere flere lokaliteter etter hvert (se figur 1 side 34).

Som en del av overvåkinga vil det bli igangsatt innsamling av DNA prøver. Disse vil på sikt bli registrert i Rovbasen, som er klargjort for å ivareta slike data. Innsamlingen av DNA vil i første rekke skje ved overvåkingslokalitetene, men det er også aktuelt å ta prøver i forbindelse med ordinær ringmerking eller utenfor faste aktiviteter (fallvilt og lignende). Det er planlagt at dette skal starte i 2009.

Når vi har oppnådd en tilfredsstilende dekningsgrad på kartleggingsdelen og når overvåkinga er ferdig etablert, vil vi ha et verktøy hvor vi med langsiktig perspektiv kan følge endringer i kongeørnas forekomst og demografi.

Conservation status of the Golden Eagle in Finland

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Background and aims of the assessment
The conservation status of the Golden Eagle was evaluated for the first time in Finland in 2007. It was assessed in connection to, and by similar criteria as, the evaluation of the species listed in EU Habitats Directive, inquired by the EU Commission from member states. The assessment was made for conservation, monitoring and research purposes by a number of raptor researchers and other specialists. They form an advisory working group for the monitoring projects of the Golden Eagle, Peregrine Falcon and Gyrfalcon run by Metsähallitus, a governmental nature conservation organisation. The aim of the assessment is to evaluate, if the conservation status of the Golden Eagle is favourable or not nation-widely in Finland, assessed by the total influence on range and population size by various factors. According to the Habitats Directive, the status of a species in a geographical region is favourable if, and only if, (1) the population remains viable, (2) the range is not diminishing, and (3) there are enough suitable habitats available. This is a preliminary report of the first assessment of the Golden Eagle, and it will be focused regionally later on.

Data bases
We have various types of data bases available for the evaluation of the range changes and trends of the Finnish Golden Eagle population. There are many kinds of qualitative, local or regional descriptive sources on the occurrence of the species in various parts of the country from the 1850s to the 1940s. In addition, egg and bird collections from natural history museums, as well as bounty statistics give an idea of the former distribution and numbers. Many municipalities and other regions were surveyed by naturalists especially from the 1880s to the 1950s. Two national inquiries, one for bird watchers, and the other for hunters, were made in the 1950s. Special field studies on the distribution and ecology (e.g. food) of the Golden Eagle were initiated mainly since the 1960s. Nation-wide monitoring, by checking all known territories and nest-sites, was started with the present methods in the 1970s, although the intensity of the field-work reached a satisfied level non until in the late 1980s and 1990s.

Legal protection status
The Golden Eagle has been legally protected in Finland since the year 1962, although special licenses to kill individual birds causing economic losses to reindeer husbandry were permitted in the northern half of the country up to the year 1968. At present, the Golden Eagle belongs to the species in need of special protection by the nature conservation law. It has been classified as vulnerable in the national listing of threatened species (2000), and it belongs to the species listed in Appendix I of the EU Birds Directive. A national conservation plan of the breeding population was compiled by Metsähallitus in 1993, listing territory- and nest-specific measures. After 15 years, however, the plan should be up-dated. In total, 44% of nests lie in protected areas. Of other nests, 74% are in state-owned land with special forestry regulations (felling of trees forbidden near nest-sites). In total, 118 nest-sites are in unprotected areas. All known nest-sites of the Golden Eagle are controlled every year and new ones looked for in the monitoring programme, which was evaluated as mainly positive conclusions by specialist population biologists of the University of Helsinki in 2008. In the near future, a coherent plan will be made for building of artificial nests and providing possible winter carcasses, in order to help new pairs to settle in the most undisturbed forest areas in southern Finland.

Breeding range and population
The breeding range of the Golden Eagle covered the whole of Finland up to the 1890s. By the 1930s, however, the species had been disappeared from the southern third of the country, mainly due to persecution and fragmentation of forests because of agriculture, roads and other

human activities. By the 1950s the uniform range in the northern half of Finland was as present, but many scattered pairs nested further south in Central Finland than nowadays (Fig. 1), because there were more undisturbed forest areas and open peat lands left at that time. The first valid and reliable estimate for the Finnish breeding population is 250–300 pairs in the 1950s. In 2008 there were 433 known territories, 392 of which have been occupied at least during one season from 2004 to 2008. We estimate the present number of breeding pairs as 430–460. In addition, we roughly estimate the non-breeding population as 500–1000 individuals. The breeding productivity has remained presumably at a satisfied level (Fig. 2). The declining trend in recent time can possibly be explained by more active controlling of productive pairs by bird-ringers in the 1970s and 1980s. If all more or less suitable habitats will be occupied also in southern and central Finland by the Golden Eagle in the future, requiring that newcomer pairs will tolerate human activities better than nowadays, there will be potentially room for 600 pairs. We set this level as the potential maximum target for active conservation measures. This means that the present range of ca. 150000 sq. km should increase to 200000 sq. km. The present density is near carrying capacity in Lapland, and the range should expand southwards, as has happened during the recent decades; the number of less shy adults is growing slowly after cessation of persecution all over the range. On average, two or three new pairs have settled to the Finnish population per year in recent decades. The present population is probably higher than at any time during the last two centuries in Finland.

Habitat and prey

The habitat of the Golden Eagle is favourable in most of Lapland thanks to vast protected areas, a lot of open hunting grounds, and sparse human population. In southern Finland, however, it has become more and more unfavourable due to intensive forestry, which has led to fragmented and young forests, as well as lack of undisturbed nest-sites and secure, big nest-trees. Drainage of open peat lands for forestry has destroyed most of the natural hunting grounds of the species, although clear-felled areas have compensated for a small part this loss of open habitats. Disturbance due to intensifying recreational activities is also a major hinder for potential breeding pairs in the southern half of Finland. The Golden Eagle is a versatile predator in Finland, with grouses, mountain hares as the main live prey, and carrion of especially reindeers as an important winter food. Some of the prey populations are declining and others increasing in the Golden Eagle range, but no quantitative evaluation of prey availability has been done so far. There are no real signs that lack of food should act as the primary limiting factor for an expanding population; lack of suitable hunting habitat in many regions remains a more probable problem.

Conclusive status assessment

As a rough conclusion at the national level, we summarise the conservation status of the Golden Eagle in Finland as unfavourable and insufficient, because of its necessary components are as follows:

- The range is 20 % smaller than the maximum possible range.
- The population size is 25% smaller than the potential one.
- The habitat quality in a potential new range is unfavourable.

In addition, the vulnerability of the Finnish population – less than 1.000 reproductive individuals – reinforces our estimate of an unfavourable conservational status.

The present, short-term trend of the conservation status, however, is improving, because the population size has increased steadily, and because there are no serious threats to halt slow recovery in foreseeable future. The most important future threats for the breeding population include disturbance at nest-sites (forestry, recreational activities, etc.), deterioration of habitat quality (forestry, lack of big trees, drainage of peat lands, too bushy clear-felled areas, construction of roads, etc.), possible decline of prey populations, as well as climate change, the effects of which we are not able to foresee at present in necessary detail.

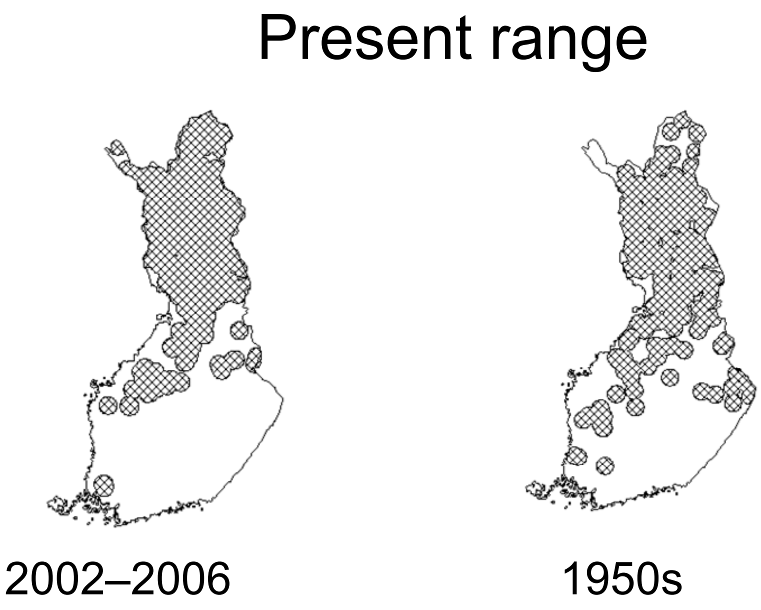

Figure 1. The breeding range of the Golden Eagle in Finland in 2006 and 1950 (based on known nest-sites, shown with an accuracy of 50 km). The present range is based on territories which have been occupied at least once in 2002–2006 (in addition, 2007 a new nest-site was found in North Karelia, easternmost Finland in a previously known territory where the nest has not been known since the mid-1990s). The range in the 1950s is based on the material gathered in nation-wide inquiries to bird-watchers and hunters.

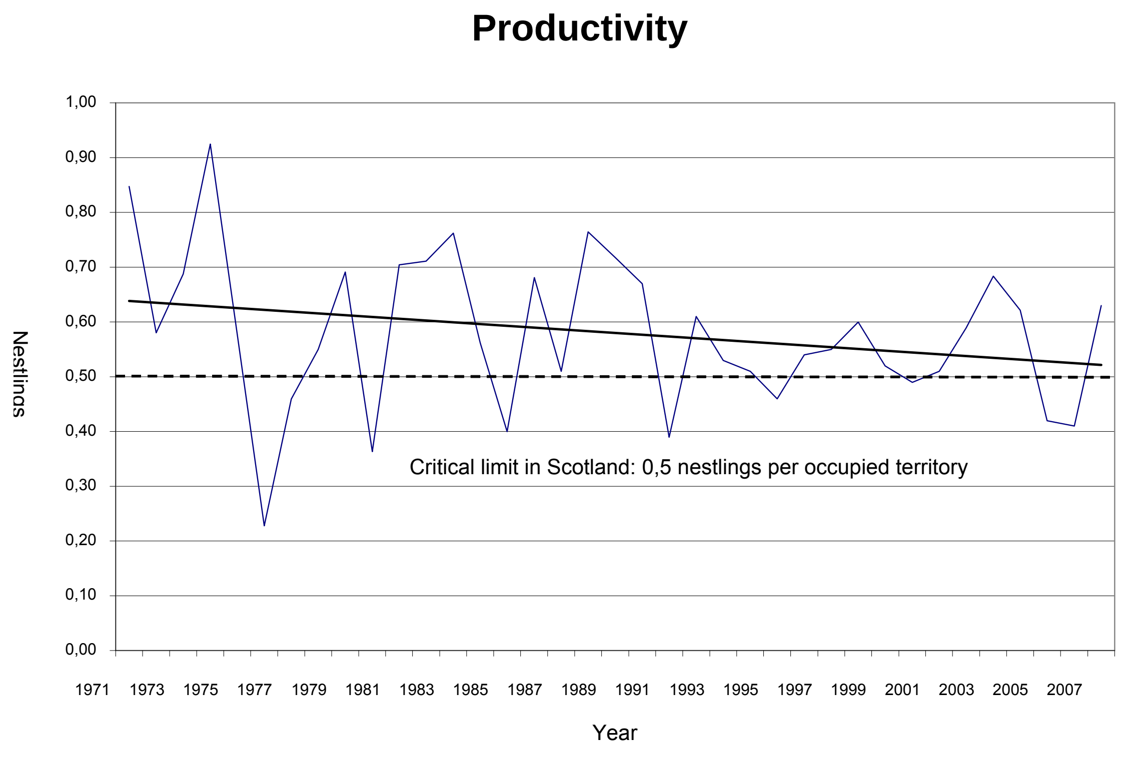

Figure 2. The average number of big nestlings (ca. 6–8 wk old) of the Golden Eagle in Finland in 1971–2007.

Reindeer calves as prey for Golden Eagle in alpine and subalpine landscape: a spatio-temporal analysis

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The distribution of the Finnish Golden Eagle (GE) population overlaps to a great extent with the area of reindeer husbandry: 90% of the Finnish GE territories are situated within the reindeer-herding area. While GEs inhabit the whole reindeer-herding area, comprising 36% of Finland, the registered eagle damages on reindeer are strongly concentrated in the northernmost parts of the area. This may be linked 1) to more open and mountainous habitats in the North providing favourable hunting grounds to GE, 2) to differences in the abundance of other prey species as mountain hare and grouses, or 3) to population intrinsic qualities (body mass and condition) of the prey species, mediated e.g. by the availability of food. Based on earlier knowledge, the abundances of mountain hare, black grouse and capercaillie decrease towards the North while the abundance of willow grouse increases. Body mass and nutrition (condition) of reindeer, on the other hand, is influenced by the availability of food, which is affected by management (supplementary feeding), pasture quality and stochastic weather conditions.

In a calf mortality study conducted by Finnish Game and Fisheries Research Institute from 1997-2006, we investigated the extent and causes of calf mortality in different parts of the Finnish reindeer-herding area. Here, we present some results from three northern study areas, Lappi, Ivalo and Käsivarsi, where eagle predation was found to comprise the most significant single cause of mortality in reindeer calves (33-45% of all deaths). We focus our analysis and discussion on the spatio-temporal distribution of eagle predation. From 1997-2004 we marked in total 2 346 reindeer calves with mortality indicating radio-transmitters in the northern study areas (altogether more than 4 000 calves were radio-tagged in seven reindeer-herding districts from 1997-2006, including also districts from central, eastern and southeastern part of the Finnish reindeer-herding area). In the North, radio-collaring and subsequent monitoring of survival was conducted in one reindeer-herding district at a time: Lappi in 1997-98, Ivalo in 1999-2001 and Käsivarsi in 2002-04. Calves were weighed and marked both in calving corrals in May-June and in mid-summer earmarking round-ups in June-July.

The spatial and temporal patterns of mortality, when associated with eagle predation, can not be uncoupled as both components are associated with seasonal movements of reindeer. In the middle of the summer reindeer migrate to higher elevations, if available in their range, seeking relief for the insect harassment and high day temperatures. In northern Finland, this means altitudinal migration to highest hills and fells, which comprise mostly of open alpine/subalpine habitats. Open habitats are known to be favourable hunting grounds for the Golden Eagle, and thus there is an increased risk of eagle predation associated with the spatio-temporal migration pattern of reindeer herds. Indeed, most mortality caused by eagle predation (annually between 2,8-4,4% of radio-collared calves in Lappi, 0-3,4% in Ivalo and 0-3,5% in Käsivarsi) occurred in open habitats (including forestry areas). In a pooled data for all three districts 55% of the deaths associated with eagle predation were found in open fell habitats, 30% in forest habitats (including open clear-cut areas 7%), 12% in mires and 3% in other habitats, while in all other causes of death the habitat distribution was 38%, 42%, 10% and 10%, respectively. Due to greater variation in habitat composition, the distribution was even more pronounced in the districts of Lappi and Ivalo, where 43% and 28% of eagle predation occurred in open fells compared to 20% and 5% of other mortality, respectively. The rest of the eagle predation in Lappi occurred in forest habitats (32%), mires (18%) and other habitats (7%). In Ivalo, 72% of the eagle predation occurred in forest habitats, including 22% of open clear-cut or seedling stand areas. In contrast, 53% and 81% of the other mortality occurred in forest habitats in Lappi and Ivalo, respectively. In Käsivarsi, due to high proportion of open mountainous landscape, 85% of eagle predation and 79% of other mortality occurred in fell habitats. The rest of the eagle predation (15%) in Käsivarsi occurred on mires. The general openness (ranked from open to closed by a factor from 1-4) of the habitats did not differ between eagle-kills and other mortality in pooled data or in the three study districts. This was partly due to fact that the openness of habitats of calves killed in traffic (roads) and some round-up events were also classified open (1) although the surrounding habitat was pine forest with openness factor 3. However, the average altitude of the habitats where eagle-killed calves were found was mainly higher compared to other sources of mortality.

The study setup in the district of Lappi was special as during the first study year (1997) reindeer were able to migrate to the Saariselkä mountain range during summer, but access was blocked the next year (1998) due to new pasture rotation fence. As a consequence, in 1997, those calves killed or scavenged by Golden Eagles were found on average at 348 m.a.s.l. (s.d.=60, n=17) and other dead calves at 304 m.a.s.l. (s.d.=91, n=5), while in 1998 there was no difference in the altitude between the eagle-killed/scavenged calves (288 m.a.s.l., s.d.=31, n=11) and those succumbed due to other causes (292 m.a.s.l., s.d.=25, n=10). Thus, access to higher altitude during summer affected the altitude distribution between eagle-kills and other causes of death in the district of Lappi (Fig 1). In Ivalo district, there were no fences blocking access to the few fells in the area, and a statistically significant difference in altitude between those calves killed/scavenged by Golden Eagle (291 m.a.s.l., s.d.=81, n=18) and those that died on other causes (220 m.a.s.l., s.d.=58, n=19; p=0,004) was found. In Käsivarsi, which is the most mountainous area of the three areas presented here, there was no statistical difference in the altitudes between eagle-kills and other causes of death, even though confirmed eagle-kills (n=16) were found on average 53 meters higher compared to other deaths.

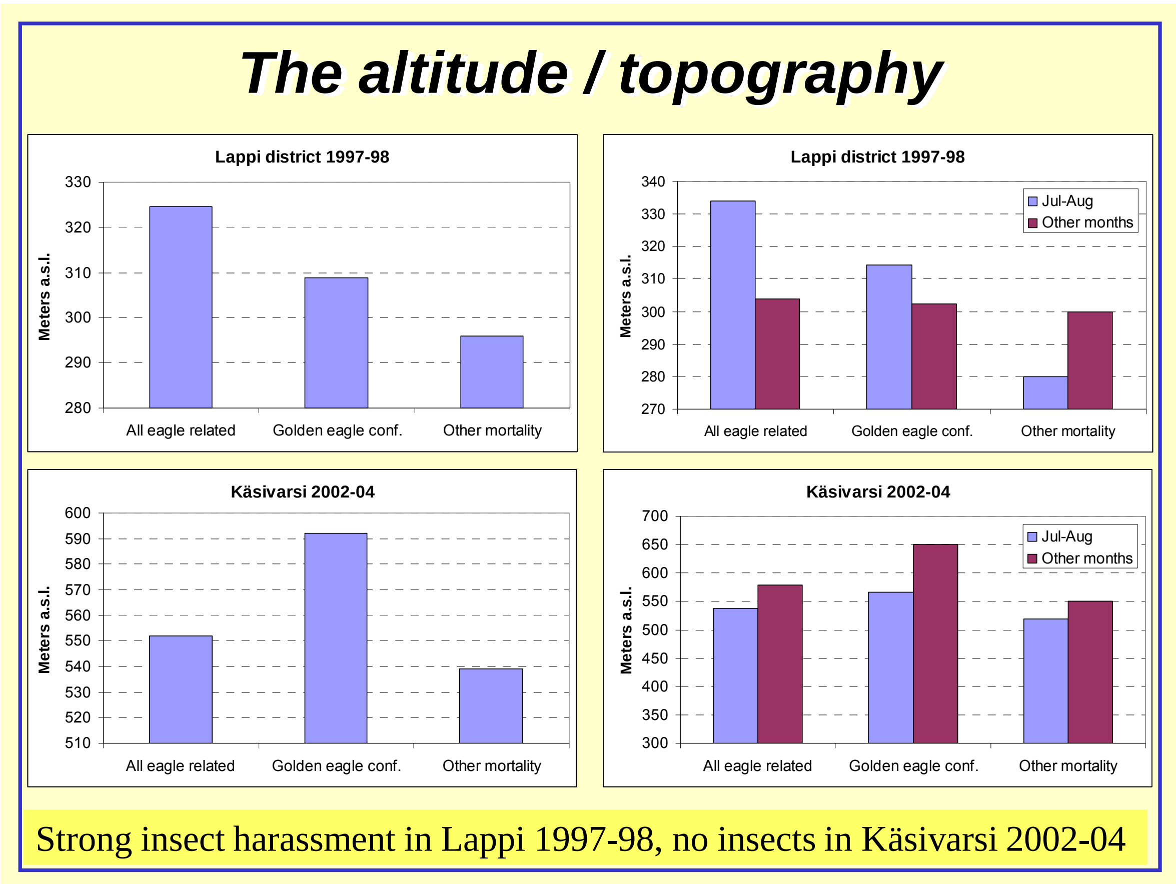

Figure 1. In the middle of the summer, reindeer seek for hill and fell tops to escape insect harassment and heat. If insect harassment is strong, there seems to be an increased risk of golden eagle predation due to habitat selection. In years of weak insect harassment no difference in the altitude between eagle-killed and calves succumbing to other causes was observed in our study.

Calves killed by eagles were found on average at 592 m.a.s.l. (s.d.=136, n=16), calves killed/scavenged by eagles at 552 m.a.s.l. (s.d.=140, n=27) and those that died on other causes at 539 m.a.s.l. (s.d.=127, n=20). The level of insect harassment was weak during the study in Käsivarsi in 2002-04, which might partly explain the lack of altitude difference in Käsivarsi. In contrast, insect harassment was strong or moderate during years from 1997-2000 and might explain the obtained results in the districts of Lappi and Ivalo (Fig 1).

Radio-collaring of calves was started after mid-June in the district of Lappi and two of the herding-groups of Käsivarsi, right after calving time in early June in Ivalo, and during calving (in May) in one herding-group (Kova-Labba) in Käsivarsi. Therefore, we were not able to completely reveal the patterns of mortality from calving time on in all intensive study areas. However, the temporal distribution of eagle-killed calves supported the idea that calves are vulnerable to eagle predation during the warmest summer months, when reindeer aggregate in big herds and migrate to more open and higher areas. Altogether, 49 eagle-killed calves were found in Lappi (n=17), Ivalo (n=16) and Käsivarsi (n=16). Most of this eagle-predation occurred in July (39% of all observed) and August (29%). If all cases with signs of eagles at the carcass were considered (n=73), even 59% of all eagle-related cases were found in July. In the study area of Kova-Labba in Käsivarsi, where monitoring was started already at calving, 27% of eagle-kills were found in May, 18% in June, 18% in July and 36% in August. Even though the data does not represent a full temporal scale, it shows that eagle predation occurs starting from calving time and peaks commonly in July-August (Fig 2). A few calves (14% of 49 confirmed eagle-kills) were killed by eagles also in September (10%) and October (4%).

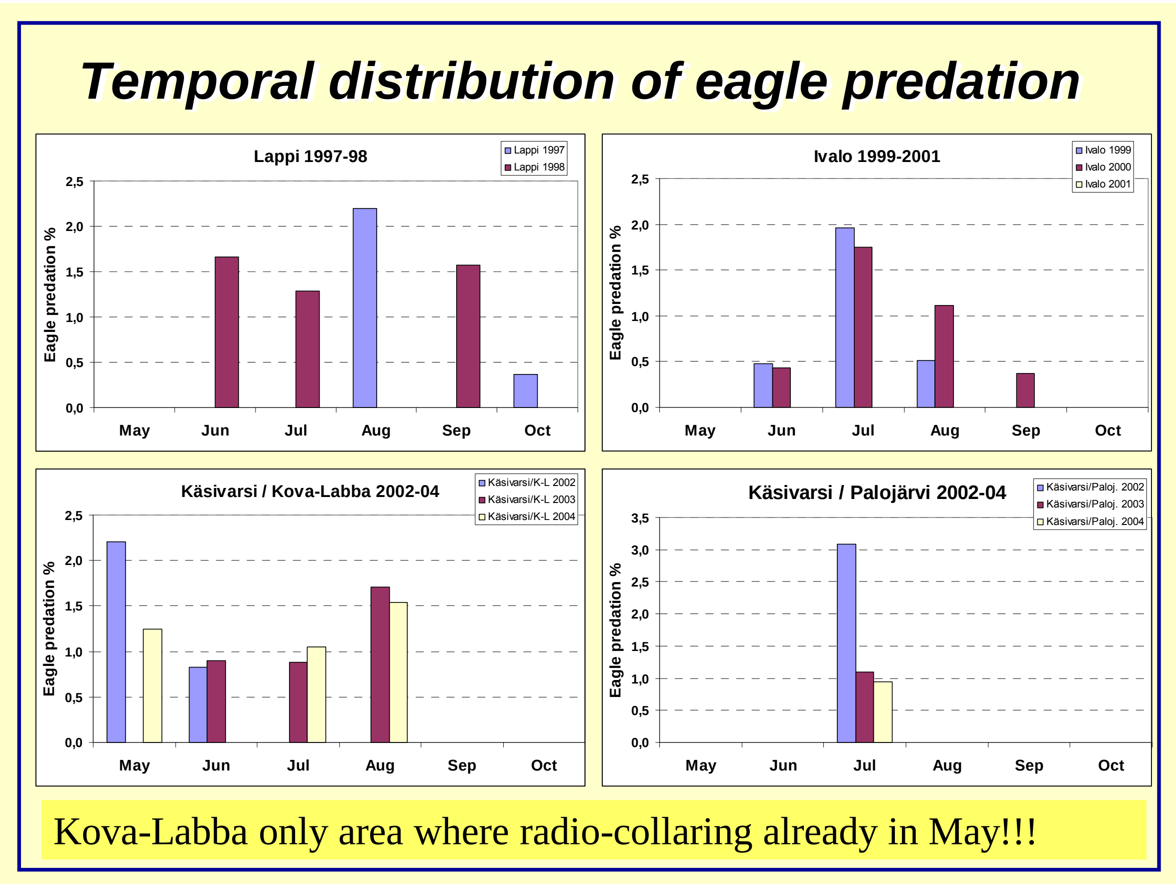

Figure 2. Most eagle predation on reindeer calves occurs before September, mainly in July and August. However, there is site-specific and year-specific variation in the temporal distribution of eagle predation. We still need better knowledge on the predation rates of reindeer calves in May and June, the months when calves are small and thus prone to predation.

Vandringer hos unge satellittmerkete kongeørner fra Finnmark

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I reindrifta i Finnmark varierer tapstallene kraftig mellom områder, sesonger og år, og en av de potensielle predatorene er kongeørn. Kongeørnas bestandsforhold, forekomst og bevegelser til ulike deler av året, og dens rolle som predator var dårlig kjent før Kongeørnprosjektet i Finnmark ble startet. I perioden 2002-2007 er det merka 21 reirunger av kongeørn med satellittsendere, 11 solcelledrevne GPS/Argos, 7 batteridrevne GPS/Argos, og tre batteridrevne Argos-sendere. Disse hadde pr august 2008 gitt over 10,000 GPS-posisjoner (±15 m) og over 50,000 Argos-posisjoner (nøyaktighet fra 150 m og oppover til flere kilometer). Resultatene viser at de fleste første års ungfugler drar ut av Finnmark om vinteren. Midlere dato for at de forlater reviret er ca 10. oktober. Trekket har ingen bestemt retning annet enn at det i hovedsak skjer i sørover, men i alle retninger fra Lofoten i sørvest til Kola i sørøst. Enkelte individer har dratt så langt sørover som til Skåne, og noen har vært nede i Finskebukta første vinter. To av 17 overvintra i Finnmark. Det er en generell returforflytning til hjemmeområdet neste sommer. (Figur 1).

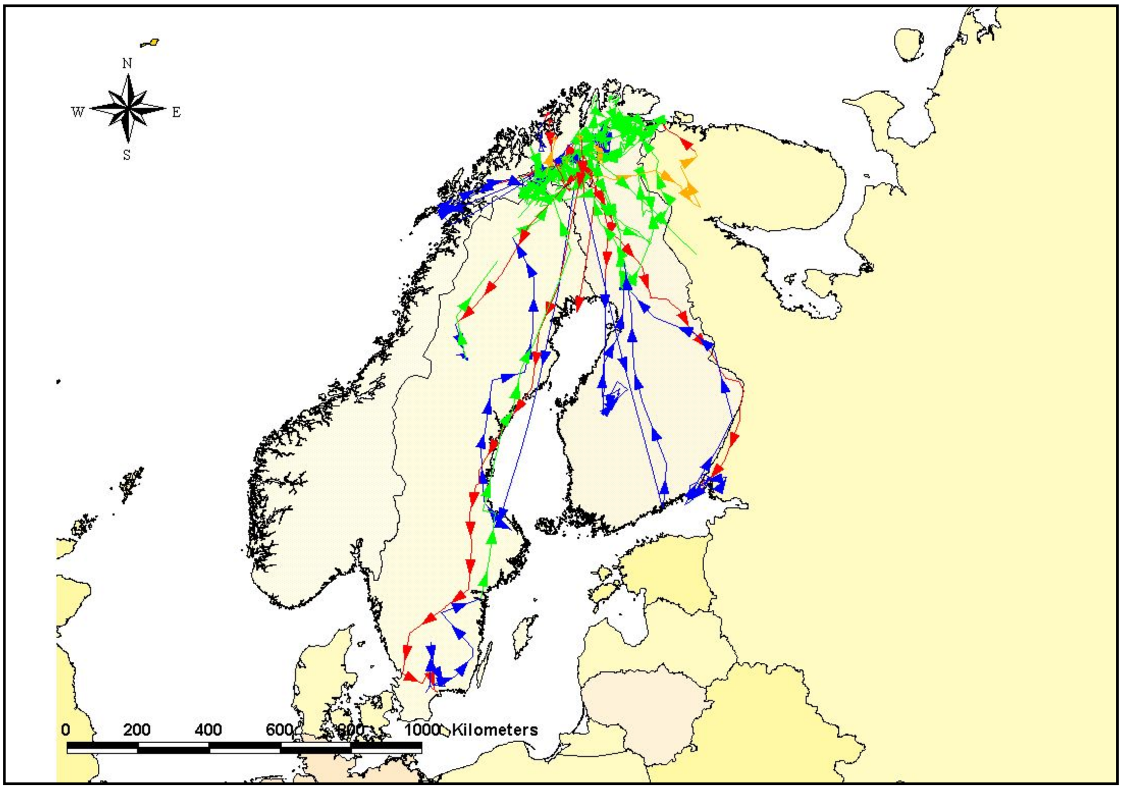
I sitt andre leveår begynner stedtroheten til hjemmeområdet å vise seg ved at forflytningene i deres andre vinter er mindre, og flere overvintrer i Finnmark. Denne tendensen forsterker seg i tredje og fjerde leveår. Under trekkperiodene kan individene forflytte seg med opptil 300 km pr dag. I gjennomsnitt drar hannene lenger vekk fra fødestedet om vinteren enn hunnene. Dette gjentar seg både første, andre og tredje vinter (Figur 2). Det er indikasjoner på at individer fra Finnmark har oppsøkt foringsplasser for ørn i Sverige.

De fleste posisjonene for satelittmerkete kongeørner i sin andre, tredje og fjerde sommer er fra indre Finnmark, Nord-Finland og Nord-Sverige. Det er svært få posisjoner fra kalvingsområdene for rein i Finnmark, som er lenger ut mot kysten. Det ser derfor ikke ut til at kalvingsflokkene er noen viktig matressurs for unge kongeørner i Finnmark. Kalvingstiden er uansett et tidsrom med allmenn god tilgang på næring. Det kan også tenkes at voksne, etablerte par holder subadulte fugler unna. I tillegg kjenner de territoriet godt i forhold til småvilt som rype og hare, og vil dermed kunne være mindre avhengig av rein som tilleggsnæring. Siden de fleste unge individer av kongeørn trekker ut av Finnmark midtvinters, er det lite sannsynlig at denne aldersgruppen står for tap av rein av betydning om vinteren (Figur 3).

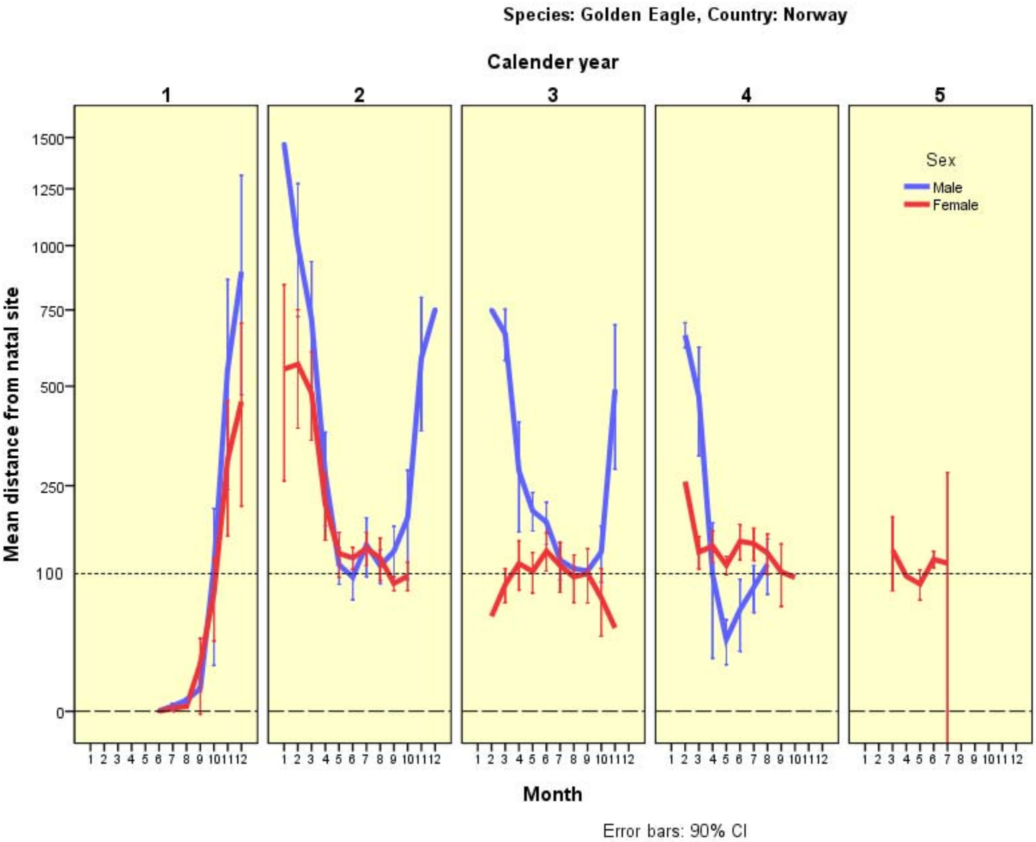
I 2004 ble tre reirunger av kongeørn merket med satellittsender; i henholdsvis Alta, Kautokeino og i Karasjok kommune. Senderne fra disse ble funnet igjen i Nord-Sverige. Omstendighetene rundt funnene tyder sterkt på ulovlig avliving, og to hadde skarpt avskårne reimer. Den tredje senderen ble funnet igjen på søppelplassen i Gällivare. Det er mye som tyder på at naturforvaltningen i Norrland står overfor et problem her (Figur 4 & 5).

Materialet er enda litt lite til å regne overlevelse på, men dataene så langt tyder på en første års overlevelse på ca. 0,6, andre års på ca. 0,7 og tredje års på ca. 0,9.

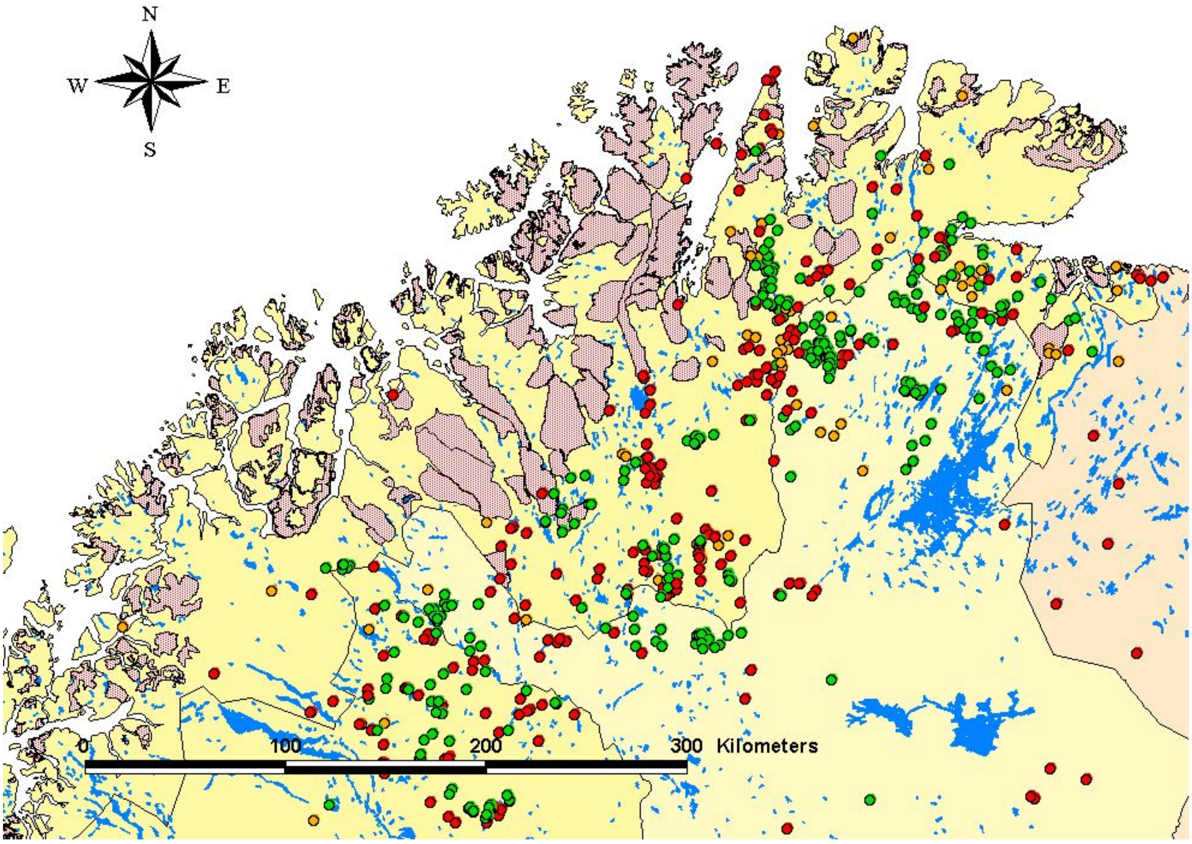
Bevegelsene til de ulike ørnene kan nå følges av alle interesserte, ved å klikke seg inn på NINAs hjemmeside www.nina.no, og følge lenken til Dyreposisjoner. Datasettene oppdateres en gang i måneden. Google Earth kan også brukes til å vise ørnenes posisjoner og visualisere bevegelser.



Figur 1. Bevegelser hos unge kongeørner merka med satellittsender i Finnmark, i sitt første leveår.

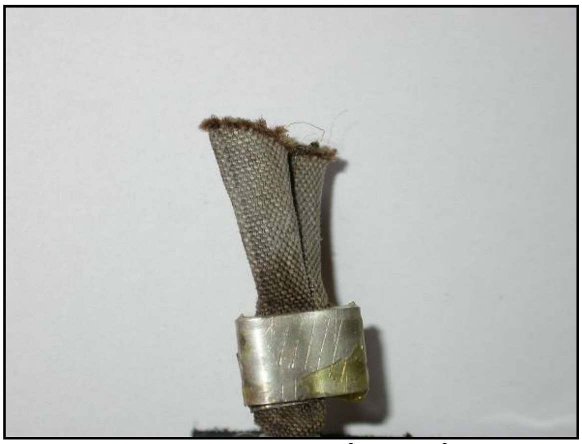


Figur 2. Avstand fra merkested i forhold til kalenderår og måned for unge kongørner merka i Finnmark. 90% konfidensintervall.



Figur 3. Satellittmerkede unge, ikke-territorielle ørners bevegelser i Finnmark i perioden i mars-mai. Få av plottene berører etablerte kalvingsområder

Figur 4. Satellittsenderne slik de ble gjenfunnet: Fra venstre: 52453, 52456 og 52457.



Figur 5. Nærbilde av festebåndet på sender nr 52456, funnet øst for Torneträsk. Det rene kuttet ser ut til å ha vært utført med en skarp gjenstand.

Variation in territory occupancy and reproductive output of Golden Eagles in Finnmark: 2001-2008

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The Golden Eagle project in Tromsø was started in 2001 and was financed by the Norwegian Directorate of Nature Management (DN), the County Governor of Finnmark and the Reindeer Husbandry Administration in Norway (RUF). The background was lack of knowledge about the Golden Eagle as a predator of reindeer in Finnmark. The aim was to document consumption of reindeer calves by the eagles using various methods. Since then the project has developed into a long-term monitoring program which includes about 80 territories financed by DN and the County Governor of Finnmark. The central aim of the program is to monitor important population parameters of breeding Golden Eagles in Finnmark, including territory occupancy, adult survival, production of young and recruitment. The aim is also to understand which factors influencing the production of golden eagles in Finnmark, including availability of important food items like grouse and hare, availability of reindeer carcasses and calves, climatic factors like temperature, snow depth, NAO etc., and other factors, human disturbance etc.

The study area is situated in Finnmark, the northernmost county in Norway (Figure 1). Thus, the breeding population of golden eagles in this area is the northernmost population in the world. The study area was split in three different areas, namely the inner areas, valley- and fjord areas, and outer coast, based on geography, but also distinct differences between the habitats in the different areas (see also Systad et al. 2007).

The methods used in this report have been described in Systad et al. (2007). In figure 2 follows the distribution of the different parameters during 2001-2008. The coastal part of the population (area C) was larger than expected when the area was surveyed in 2005, and was included in the study that year.

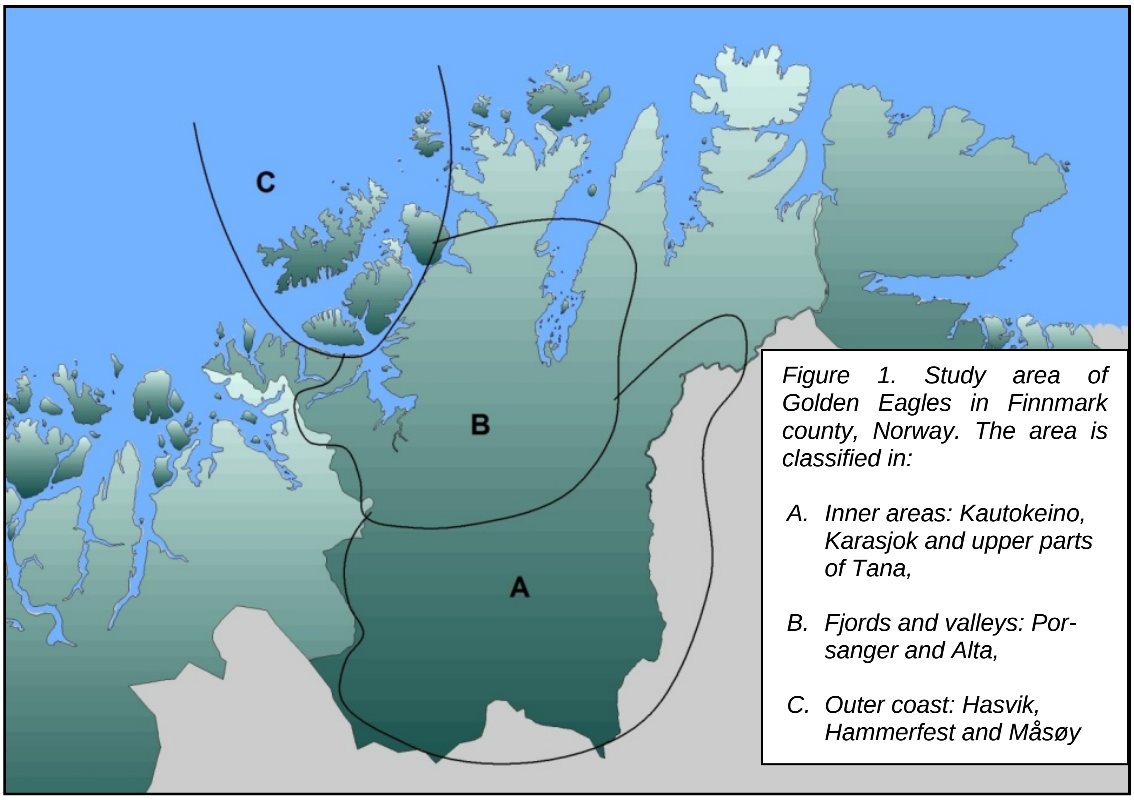

Figure 1. Study area of Golden Eagles in Finnmark county, Norway. The area is classified in:

A. Inner areas: Kautokeino, Karasjok and upper parts of Tana,

B. Fjords and valleys: Porsanger and Alta,

C. Outer coast: Hasvik, Hammerfest and Måsøy

Figure 2. Territory attendance and breeding success in golden eagles, Finnmark County in Norway 2001-2008.

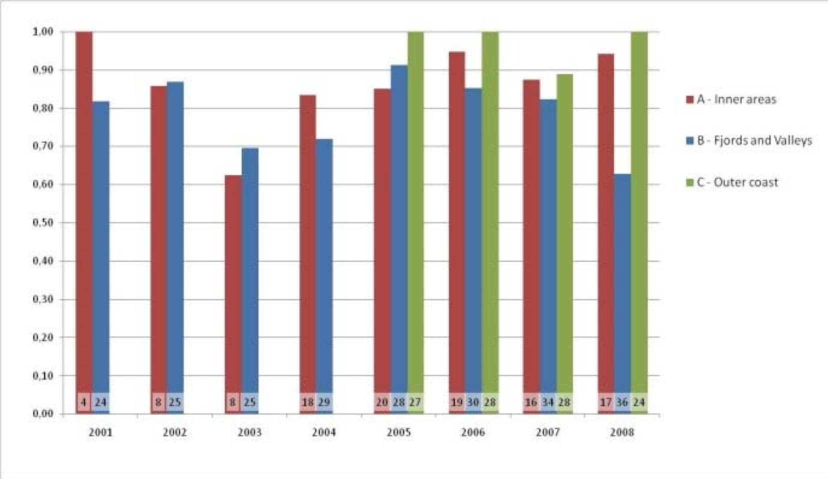

Figure 2a. Proportion of territories occupied (TP), based on territories occupied last five years

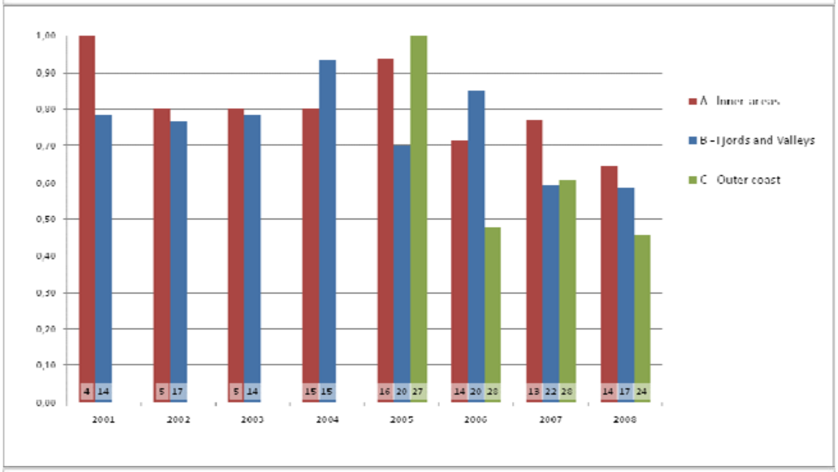

Figure 2b. Proportion of pairs breeding (HP) in occupied territories (TP)

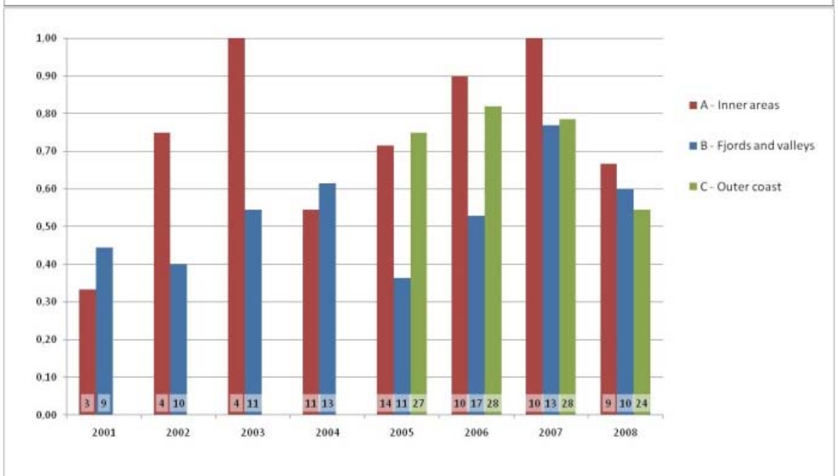

Figure 2c. Proportion of successful pairs (VH) to breeding pairs (HP)

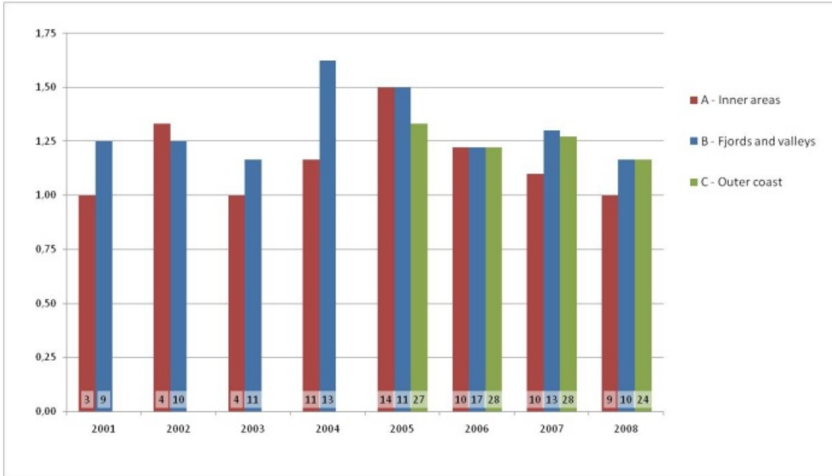

Figure 2d. Number of full-grown chicks per successful pairs

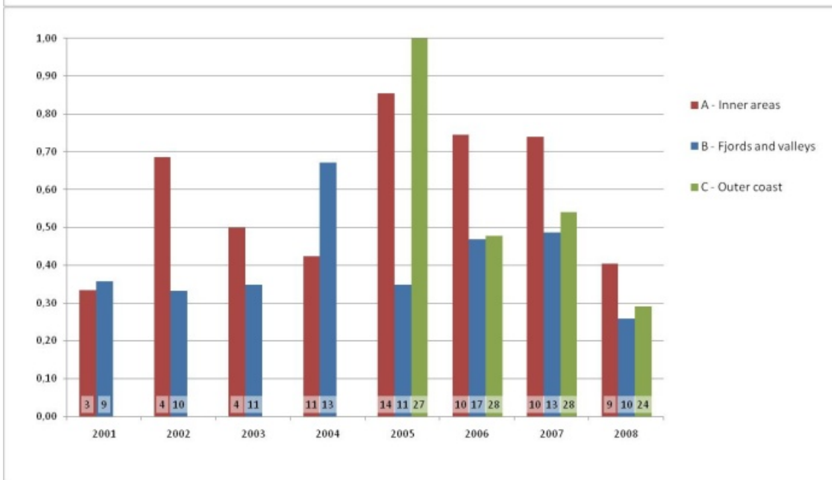

Figure 2e. Mean number of chicks produced per active territory. This is an estimate based on number of active territories, breeding attempts, successful pairs and mean number of offspring per successful pair.

(TP×HP×VP×Production)

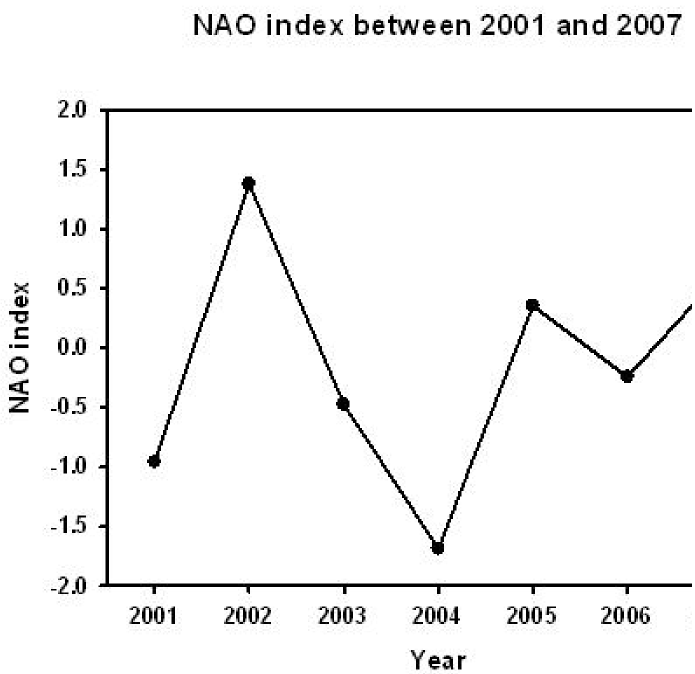

Figure 3. Climatic variation (NAO) 2001-2007.

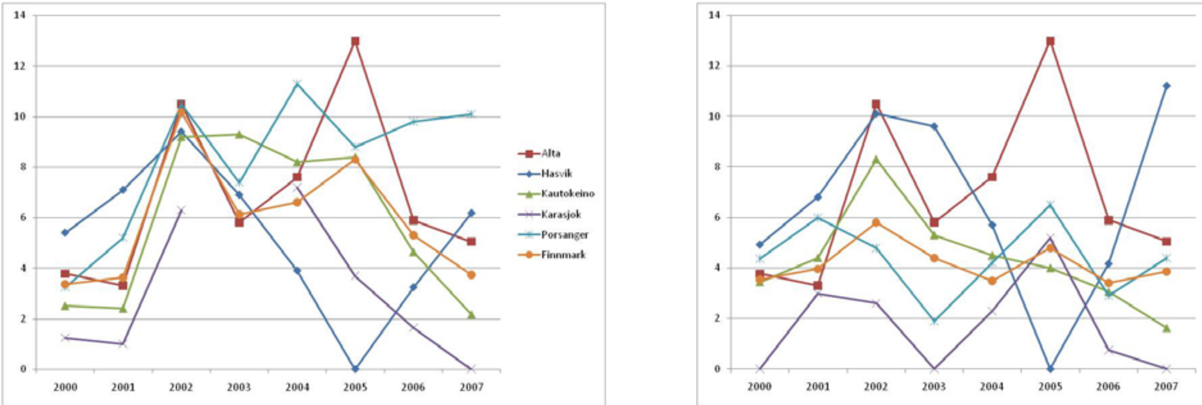

Figure 4. Grouse a) observed per hours in different areas of Finnmark and b) estimated production per hen.

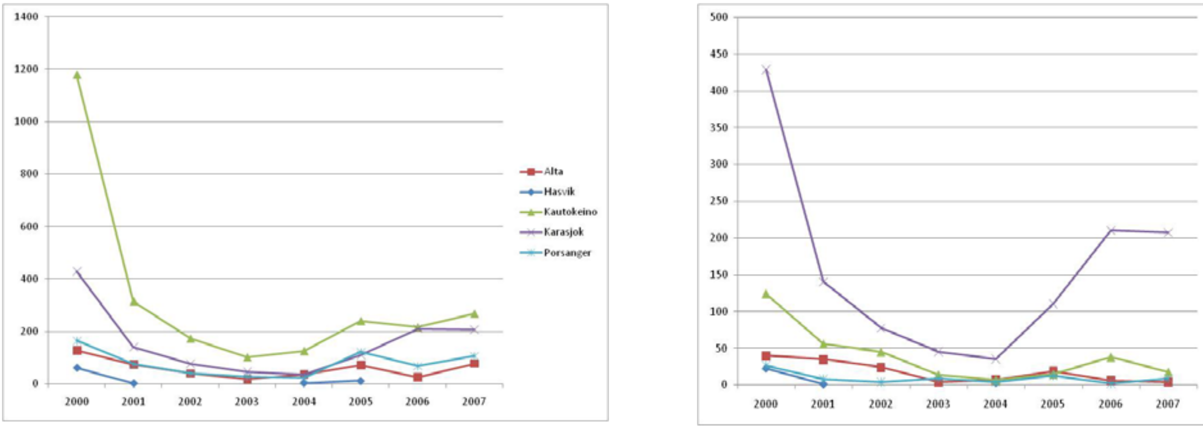

Figure 5. Number of a) all reindeer carcasses reported, and b) reindeer carcasses assigned as killed by golden eagle (Rovbasen, DN)

Climatic variation, illustrated by the NAO index in figure 3, is one of the aspects we are looking at as explanatory to the breeding success of the Golden Eagle. Other parameters we have yearly data on, is grouse population indexes (Figure 4) (gathered by the county and SNO), calving areas and reindeer carcasses (Figure 5).

The statistical analyses of the data are still going on, but preliminary results show that high density of willow grouse and reindeer carcasses both tend to influence active territories, breeding attempts and the breeding success. There are differences between the areas, but the preliminary analyses show similar trends for the different areas. Production varies greatly between years, but the variation in territory occupancy is lower. The breeding success and production shows dependencies on food availability. But: Data have to be reanalysed on different scales and different stages in the breeding cycle. Further analyses will also account for climatic variables like precipitation and bad weather during the incubation, and different measurements of food availability.

The Norwegian Nature Inspectorate (SNO) and the Norwegian Coastguard have been invaluable helpers in the project. Trond Vidar Johnsen has been the main field assistant since the project started in 2001. The raptor group in Alta has delivered material for the same time period, and they have joined us during the fieldwork several times and years. The project group includes, in addition to the authors, the present project administrator Karl-Otto Jacobsen, Trond Johnsen, Torgeir Nygård and Duncan Halley. Mike Grady helped us with valuable discussions and ideas for catching birds during the early stages of the project.

The occurence of reindeer calves in the diet of nesting Golden Eagles in Finnmark

Karl-Otto Jacobsen, Trond Vidar Johnsen, Geir Helge Systad, Torgeir Nygård & Jan Ove Bustnes
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To assess the importance of semi-domesticated reindeer calves in the diet of Golden Eagles in Finnmark (northern Norway), we collected prey remains at 37 nests over six years (2001–2006). The study area was divided into 1) a fjord area, which is an important calving area for reindeer, and 2) an inland area where few reindeer give birth (See figure 1 at page 45). 469 prey items were collected over the years. The diet of eagles was numerically dominated by birds (73% of collected prey items), especially grouse *Lagopus* spp. (51%), while mammals made up 27%, with mountain hare *Lepus timidus* as the most common species.

Remains of reindeer calves were found in half of the nests studied and made up 8.5% of the collected prey items: 13.2% in the fjord area and 6.5% in the inland area (Figure 1). There was a higher chance of finding reindeer calves at nests in the fjord area than inland, and in nests situated in birch forest than in pine forest (Johnsen et al. 2007). In Finnmark, there are probably between 140 and 160 pairs of nesting Golden Eagles (see page 21). Between 30–50% of these nests may produce young in a given year and if we assume that half of the pairs feed on reindeer calves. Since each of these pairs brings in average 2.2 calves to their nest during the nestling season (Johnsen et al. 2007), between 51 and 88 reindeer calves are brought to successful nests in Finnmark. We don't know how many of these are actually killed by the eagles. This is however a very small fraction of the reindeer calves produced since the population is about 150,000 animals. However, this does not take into account the number of calves eaten by unsuccessful and non-breeding eagles, or what successful eagles feed on without bringing them to the nest. Furthermore, this study covered primarily May and June, and predation on ungulate calves by eagles may be higher later in the summer (Nybakk et al. 1999, Warren et al. 2001, Norberg et al. 2006).

In conclusion, our study seems to corroborate other studies in Fennoscandia, suggesting that reindeer calves contribute about 10% of the diet of nesting Golden Eagles in Finnmark, depending on the location of the nests in relation to reindeer distribution. The importance of the Golden Eagle as a predator on reindeer can't, however, be assessed here.

From 2006 we have started to collect prey items from Golden Eagle nests on the coast of Finnmark. These islands have a large population of mountain hare, grouse and seabirds. There are also semi-domestic reindeer in most of the islands. Preliminary results show that mountain hare dominate with approximately 48% of the number preys, while grouse made up 27%. Remains of reindeer calves made also here up 10% of the collected prey items (Figure 2). In one single nest on Rolvsøya we found remains of 35 (!) mountain hare. These data are removed in the results in figure 2.

Figure 1. Diet of Golden Eagles in fjord and inland area in Finnmark 2001-2006 (n=469 / 37 nests).

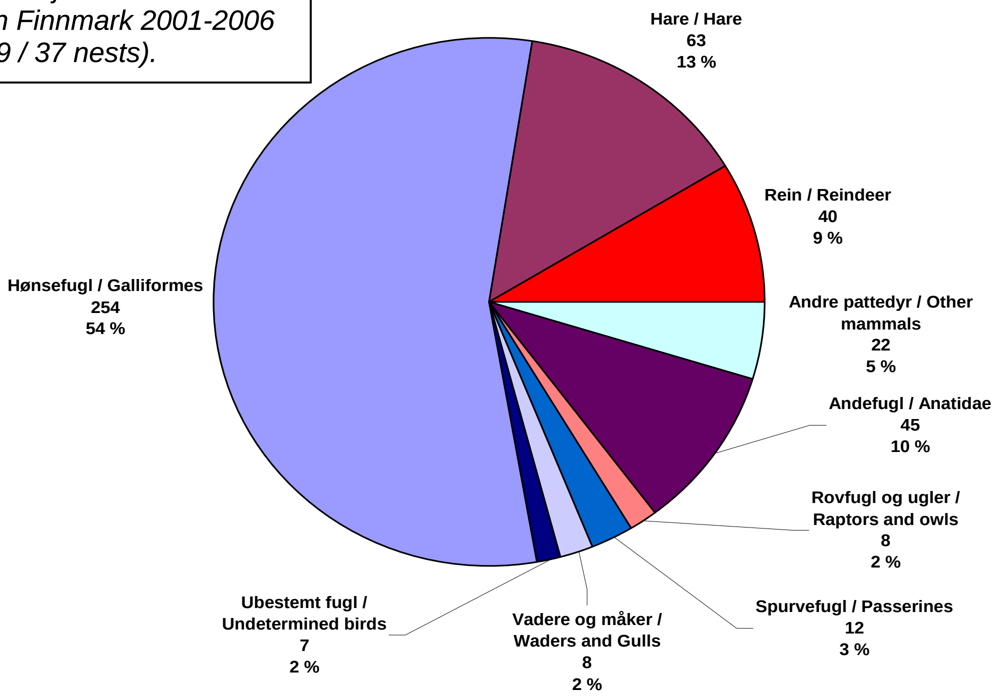
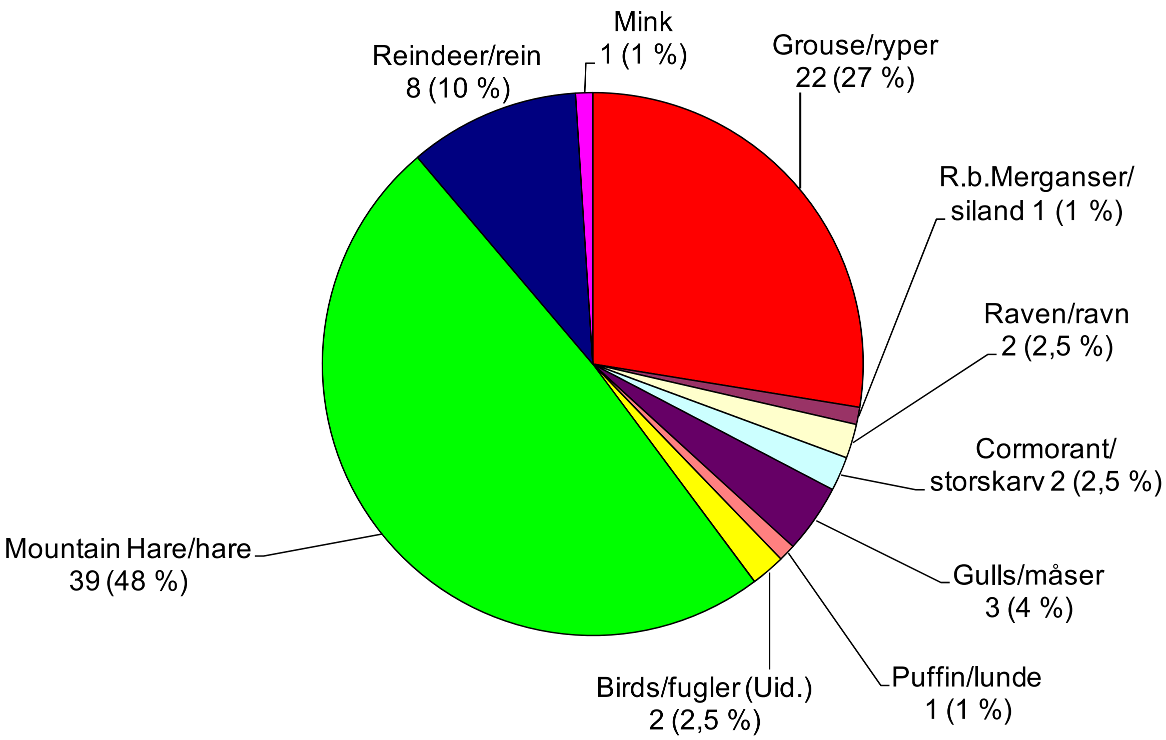


Figure 2. Preliminary results on diet of Golden Eagles in Coastal Finnmark 2006-2008 (n=81 / 9 nests).



Causes of mortality in reindeer in Finnmark county, Norway

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The causes of calf mortality in reindeer has been heavily debated over the last decades. From 2000 several studies have obtained information about the extent of annual losses, and examined the causes of mortality with a focus on both predation and food limitation (Tveraa et al. 2003, Fauchald et al. 2004a, Fauchald et al. 2004b). Of a total of 827 calves that were fitted with mortality transmitters during the years from 2000 to 2004, only 33 died during the period they were monitored on free pastures (May to September). The causes of death were hard to establish, as 40% of the causes of death remained unknown. The causes of death are outlined in fig. 1. Inside the calving enclosures 4 calves were killed by Golden Eagle, while 12 causes of death were unknown. Following the harsh winter in 2000, 14 calves died of starvation inside the calving enclosure. There is a large annual variation in mortality. In 2000 mortality exceeded 80%, which were related to the bad condition the females were in after the harsh winter. A large part of the mortality that year was due to abortions and stillbirths, but the portion of deaths caused by predators were also higher that year compared to the following four years.

From 2001 to 2004 winter conditions were better, giving a calf mortality rate under 20% amongst monitored calves. The predation in 2000 appeared to be compensatory as opposed to the following years where losses caused by predators is considered additive. Since 2005, the project has been studying mortality indirectly by registering body mass and calf production (Fig.2), in anticipation of development of more accurate mortality transmitter technology to reduce the portion of unidentifiable death causes. During these years both female body mass and calf production has been declining, at the same time as reindeer numbers and claimed losses are rising.

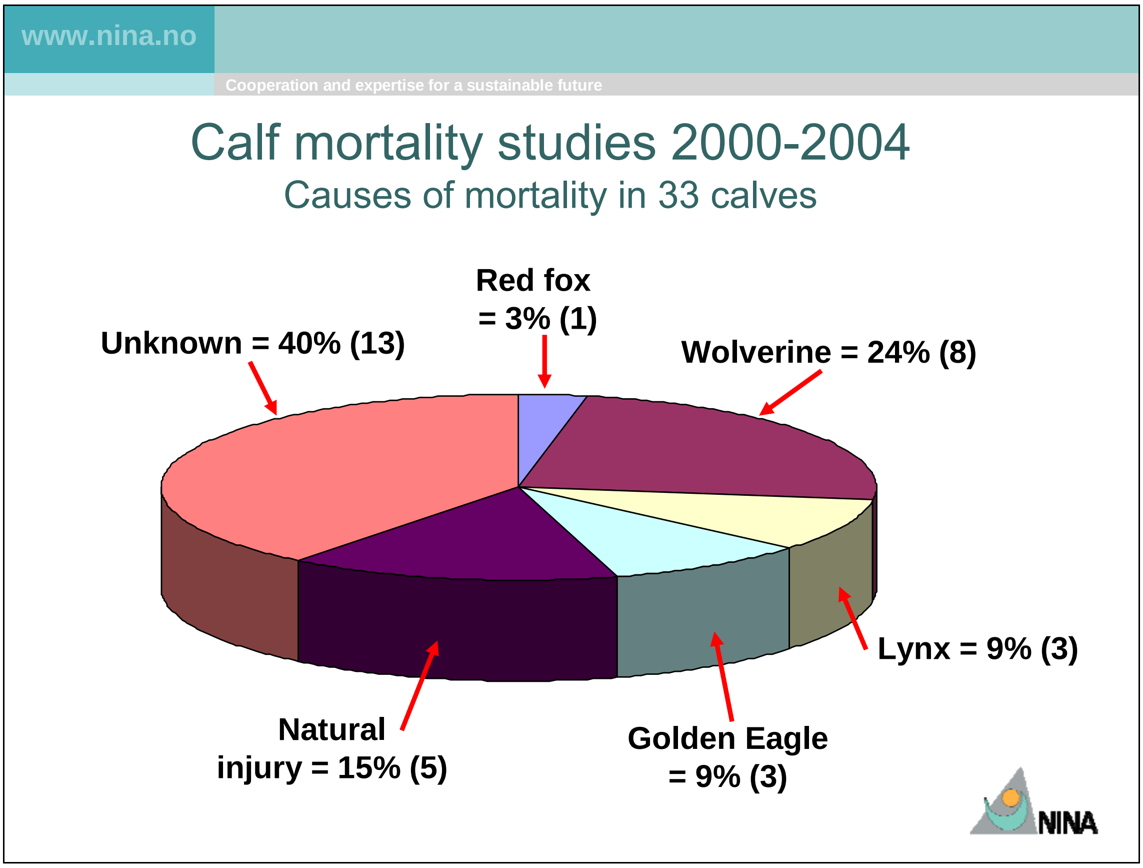


Figure 1: Causes of mortality in reindeer calves at free pastures from 2000 to 2004.

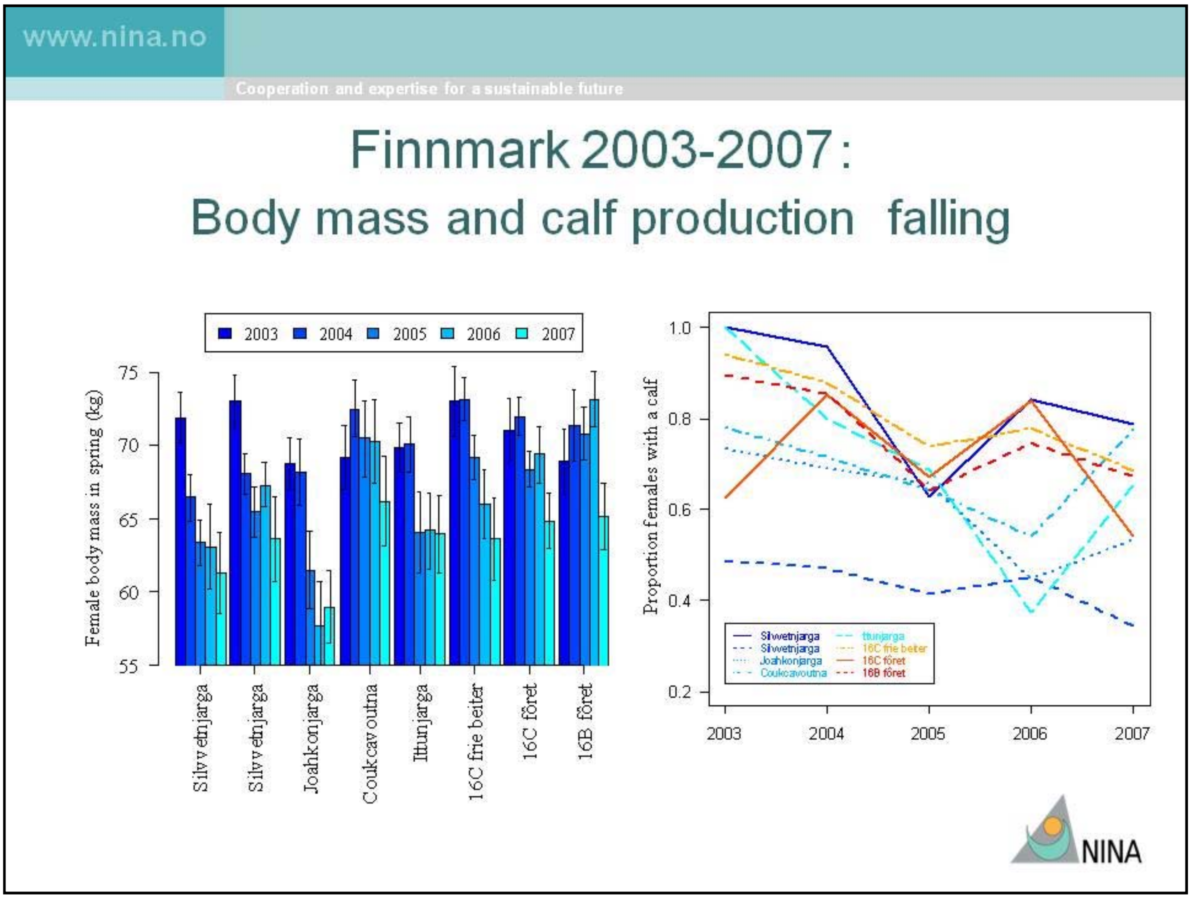


Figure 2: Body weight and calf production in 8 reindeer herds in Finnmark from 2003 to 2007.

Figure 3. A female reindeer with her calf. Photo: Karl-Otto Jacobsen ©

Beståndsstatus och summering av 2008 inventering i Sverige

Thomas Birkö
Kungsörngruppen i Västernorrland, Sverige

Kungsörnsåret 2008 blev på det hela taget ett bra år med bättre häckningsframgång än 2007.. Den svenska populationen är långt från det nationella målet på 600 årliga föryngringar. 2008 konstaterades 221 reproducerande par som tillsammans fick 280 ungar. Det ger ett snitt på 0,68 ungar per par med kända bon (421). Räknar vi på det total antalet par blir häckningsresultatet ett 0,59 ungar/par. Totalt noterades 472 par i Sverige 2008.

Inventeringen i Sverige bedrivs till största delen av ideell fågelskådare i kungsörnsgrupperna.. I fjällområdet sköter länsstyrelserna inventeringen i samarbete med kungsörnsgrupperna.. Spaning sker systematiskt i februari och mars då flyktlekande örnpar eftersöks och reviren försöker då särskiljas. I slutet av maj och juni sker häckningskontroll då bon och alternativbon besöks och ungar ringmärks. I juli och augusti görs återigen kikarspaning av reviren och sök efter bon för att försöka fånga in häckningar som vi inte lyckats hitta i maj och juni. Denna inventeringstyp är något som 2008 gett bra resultat då flera nya revir och bon har upptäckts.

Kungsörnen finns häckande i hela norrlands fjäll och skogslanskap utom närmast Bottniska Vikens kuster. Vidare häckar kungsörn med några par i Värmland, Uppland, Södermanland, Närke, Östergötland och Småland. I Skåne förekommer ett tiotal revir och Gotland har den tätaste stammen på närmare 50 par.

Kungsörnarna lever fortsatt ett farligt liv. Förföljelse sker framförallt i fjällområdet och i Norrbotten kontrollerades t.ex. 249 kungsörnrevir 2007 men antalet besatta kungsörnrevir (där aktivitet av kungsörnar kunde noteras) var bara 144. Det innebär att det i över 100 kungsörnrevir i Norrbotten 2007 inte finns några kungsörnar på plats. I vissa områden i skogslandet och i en del fjällområden är det nästan alltid tomt på häckande kungsörnar.

Kungsörnar dör också av kollisioner f.f.a med tåg längs järnvägen. Flera nya fall inträffade 2008 bl.a. tre tågdödade örnar inom en vecka i Jämtlands län på en sträcka av några kilometer. Även elström och ledningar dräper örnar. I år blev en årsunge i Skåne eldödad i en transformator.

Nya hot som kommer är den starka vindkraftsutbyggnad som planeras i hela Sverige. Örnarna vistas på höghöjdsområden i norra Sverige, oftast över 300 m där vindförhållanden är bra. Örnarna ockuperar alltså samma områden som vindkraftsindustrin är intresserade av.

Häckningar:	Norrbotten	Västerbotten	Jämtland	Västernorrland	Dalarna	Gävleborg	Värmland	Uppland	Södermanland	Östergötland	Närke	Småland (F-län)	Småland (G-län)	Halland	Gotland	Skåne	Totalt
A > Häckande par	66	66	49	20	20	10	3	1	3	0	1	0	1	3	29	9	281
B > Lyckade häckningar (med ungar)	56	61	33	17	15	8	3	1	1	0	0	0	1	1	16	8	221
C > Häckning med okänt resultat	0	0	1	1	0	0	0	0	2	0	0	0	0	1	0	0	5
D > Misslyckade/ avbrutna	10	4	15	2	5	2	0	0	0	0	1	0	0	1	13	1	54
E > Antal ungar	70	80	42	21	20	9	4	1	1	0	0	0	1	1	20	10	280
F > Antal dubbelkull	14	19	9	4	5	1	1	0	0	0	0	0	0	0	4	2	59
G > Antal årlig upprepning	24	28	12	9	8	5	2	0	0	0	0	0	0	0	11	5	104
Revir:																	
H > Besatta revir = Par	122	99	68	52	35	19	5	1	3	2	1	1	2	3	50	9	472
I > Besatta med känd bolokal (Bmkb)	122	96	62	36	34	11	4	1	0	0	1	1	1	2	42	9	422
J > Besatta utan känd bolokal	0	3	6	16	1	8	1	0	3	2	0	0	2	1	8	0	51
K > Ockuperat sista fem åren		146	108	55	44	19	5	1	6	2	1	1	2	3		9	402
L > Ej ockuperat sista fem åren		21	23	2	3	0	0	0	0	0	0	0	0	0		0	49
M > Kända revir inklusive historiska	301	167	131	57	47	19	6	2	6	3	1	1	2	3	53	9	808
N > Besökta (*kontrollerade*)	235	144	126	54	45	19	6	1	3	3	1	1	2	3	50	9	702
Ringmärkning																	0
O > Antal ringmärkta	16	20	34	13	18	9	0	1	0	0	0	0	0	0	13	8	132
P > Antal färgringmärkta	16	20	32	13	16	9	0	1	0	0	0	0	0	0	13	6	126
Jämförelsetal i %																	
Q > Ungar/ lyckad häckning	1,25	1,31	1,27	1,24	1,33	1,13	1,33	1,00	1,00	0,00	0,00	0,00	0,00	0,00	1,00	1,25	1,27
R > Ungar / besatt med känd bolokal	0,57	0,83	0,68	0,58	0,59	0,82	1,00	1,00	0,00	0,00	0,00	0,00	1,00	0,50	0,48	1,11	0,66
S > Ungar/ par	0,57	0,81	0,62	0,40	0,57	0,47	0,80	1,00	0,33	0,00	0,00	0,00	0,50	0,33	0,40	1,11	0,59
T > Par av besökta	51,9	68,8	54,0	96,3	77,8	100,0	83,3	100,0	100,0	0,0	100,0	100,0	100,0	100,0	100,0	100,0	67,2
U > Lyckade häckn av besatta revir (Bmkb)	45,9	61,6	48,5	32,7	42,9	42,1	60,0	100,0	33,3	0,0	0,0	0,0	50,0	33,3	32,0	88,9	46,8
V > Missl.häckn av besatta revir (Bmkb)	8,2	4,0	22,1	3,8	14,3	10,5	0,0	0,0	0,0	0,0	100,0	0,0	0,0	33,3	26,0	11,1	11,4
X > Lyckad häckn. av besökta	23,8	42,4	26,2	31,5	33,3	42,1	50,0	100,0	33,3	0,0	0,0	0,0	50,0	33,3	32,0	88,9	31,5
Y > Besökta av kända revir	78,1	86,2	96,2	94,7	95,7	100,0	100,0	50,0	50,0	0,0	100,0	100,0	100,0	100,0	94,3	100,0	86,9

Tabell 2. Häckningsresultat for kungsörn i Sverige i 2008.

The Golden Eagle in Finland in 2008

Tuomo Ollila
Metsähallitus, Natural Heritage Services, Finland

In 2008, the number of known territories in Finland was 443, and 392 of them have been occupied during the last five years. The present estimate of unknown territories ranges from 20 to 40. Thus, the total number of territories is most probably from 460 to 480. About 80 % of them are in Lapland. The breeding range of the Golden Eagle is slowly expanding southwards in Central Finland.

In total, 439 territories were visited once in June 2008. A little more than one hundred territories in Lapland's remote wilderness areas were controlled from a helicopter. The fieldwork was done mainly by specialised bird-ringers and other volunteer ornithologists (in total, 174 working days for monitoring).

The total number of pairs found was 316, and the number of successfully breeding pairs was 115, respectively. The number of nestlings was 123 (at suitable age to be ringed). The breeding productivity was lowest since 1991, only 1.07 young/ successful nesting, and 0.39 young/ pair, respectively. The comparable figures from 1990 to 2008 were, on the average, 1.22 and 0.57. Probably cold and rainy weather in May was the main reason for low breeding success, as well as the very low density of the Willow Grouse, an important prey especially in northern Lapland.

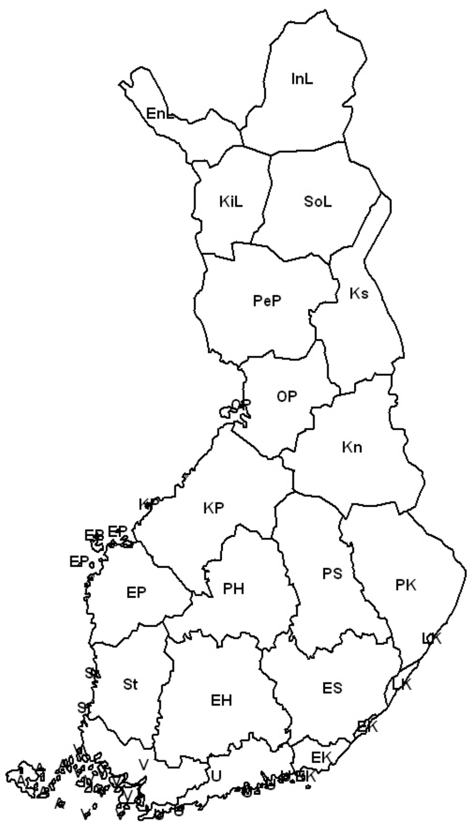


Figure 1. Biogeography areas in Finland

Territory	EnL	InL	KiL	SoL	PeP	Ks	OP	Kn	KP	EP	PH	PS	PK	St	EH	ES	V	U	EK	In total 2008	In total 2007
Known territories	19	83	53	75	72	52	33	16	20	4	9	0	4	1	0	0	2	0	0	443	435
Occupied during last 5 years	16	76	43	71	69	47	26	12	17	4	7	0	2	1	0	0	1	0	0	392	377
Unoccupied during last 5 years	3	7	10	4	3	5	7	4	3	0	2	0	2	0	0	0	1	0	0	51	58
Occupied territory with known nest	10	61	38	59	53	40	20	8	15	2	5	0	3	1	0	0	1	0	0	316	311
Occupied territory without known nest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visited territories	19	83	53	75	72	52	33	16	20	4	7	0	3	1	0	0	1	0	0	439	433
Pairs	10	61	38	59	53	40	20	8	15	2	5	0	3	1	0	0	1	0	0	316	311
Breeding																					
Failed breeding	0	4	3	3	3	7	0	1	4	0	0	0	0	0	0	0	0	0	0	25	15
Successful breeding	1	16	15	24	20	18	7	5	5	1	2	0	0	0	0	0	1	0	0	115	153
Youngs	1	16	16	24	22	20	7	6	7	1	2	0	0	0	0	0	1	0	0	123	193
Successful breeding with two youngs	0	0	1	0	2	2	0	1	2	0	0	0	0	0	0	0	0	0	0	8	40
Annual repetition																					
Youngs/successful breeding	1,00	1,00	1,07	1,00	1,10	1,11	1,00	1,2	1,4	1,00	1,00	0	0	0	0	0	1,00	0	0	1,07	1,26
Youngs/occupied territory	0,10	0,26	0,42	0,41	0,42	0,50	0,35	0,75	0,47	0,50	0,40	0,00	0,00	0,00	0,00	0,00	1,00	0,00	0,00	0,39	0,62
Youngs/pair	0,10	0,26	0,42	0,41	0,42	0,50	0,35	0,75	0,47	0,50	0,40	0,00	0,00	0,00	0,00	0,00	1,00	0,00	0,00	0,39	0,62
Banded																					
Youngs banded																					
Youngs banded with colour ring																					
Percentage																					
Percentage of visited territoris with pair	53	73	72	79	74	77	61	50	75	50	71	0	100	100	0	0	100	0	0	72	72
Percentage of occupied territory with successful breeding	10	26	39	41	38	45	35	63	33	50	40	0	0	0	0	0	100	0	0	36	49
Percentage of occupied territory with unsuccessful breedings	0	7	8	5	6	18	0	13	27	0	0	0	0	0	0	0	0	0	0	8	5
Percentage of visited territoris with successful breeding	5	19	28	32	28	35	21	31	25	25	29	0	0	0	0	0	100	0	0	26	35
Percentage of visited territory	100	100	100	100	100	100	100	100	100	100	78	0	75	100	0	0	50	0	0	99	100

Table 1. Nesting result of the Golden Eagle in Finland in the year 2008 in biogeography areas and in the whole Finland

Kongeørna i Norge i 2008

Jan Ove Gjershaug & John Atle Kålås
Norsk institutt for naturforskning (NINA), Norge

Det siste bestandsestimatet fra 2002 var på 836-1190 hekkende par eller egentlig territorielle par, da det vanligvis foregår hekking i bare halvparten av dem i det enkelte år (Gjershaug & Nygård 2003). Dette bestandsestimatet er nå justert opp til 1176-1454 territorier basert på nye estimater fra Buskerud (Jelstad m.fl. 2007), Oppland (Knoff 2008), samt for Nordland, Troms og Finnmark (Karl-Birger Strann pers. medd. & tabell 1 side 21), se tabell 1. Årets kongeørninventeringer har som i tidligere år foregått i seks intensivområder som del av *Program for terrestrisk naturovervåking (TOV)*. Disse områdene er vist på figur 1 på side 34. I tillegg har det foregått inventeringer i Aust-Agder, Buskerud, Hedmark, Hordaland, Sør-Trøndelag og Finnmark (tabell 2). Dette er mindre intensive studier med større mulighet for at hekkinger kan være oversett. I 2008 ble 276 territorier besøkt. Dette utgjør 23-33 % av den estimerte bestandsstørrelsen i Norge. Det ble registrert par på 242 lokaliteter, med vellykket hekking på 98 lokaliteter og mislykket hekking på 27 lokaliteter. Antall mislykkete hekkinger er trolig undervurdert, da det ofte er vanskelig å skille mellom ikke-hekking og hekkinger som blir mislykket på et tidlig tidspunkt dersom lokalitetene ikke blir besøkt flere ganger om våren. Det ble produsert 117 unger, hvilket gir en produktivitet på 0,48 unger per par (se tabell 2).

For TOV-områdene var produktiviteten på 0,54 unger per par, mens den for de øvrige områdene var på 0,46 unger per par. Det var jevnt over et middels produksjonsår for kongeørna de fleste steder i Norge. Lavest produksjon ble registrert i Hordaland, med bare 0,17 unger per par. Det ble registrert minimum en unge i to reir. Selv om det hadde vært to unger i disse reirene ville produksjonen vært på bare 0,3 unge per par. Også i Finnmark var produksjonen lav med 0,32 unge per par. Dette skyldes trolig delvis at et polar lavtrykk med snøstorm i begynnelsen av mai sannsynligvis førte til at mange par på kysten fikk mislykket hekking (K.-B. Strann pers. medd.). Produktiviteten hos kongeørn (unger per okkupert territorium) i de 6 TOV områdene for perioden 1991-2008 er vist i figur 1.

Tabell 1. Populasjonsestimat for kongeørn i Norge

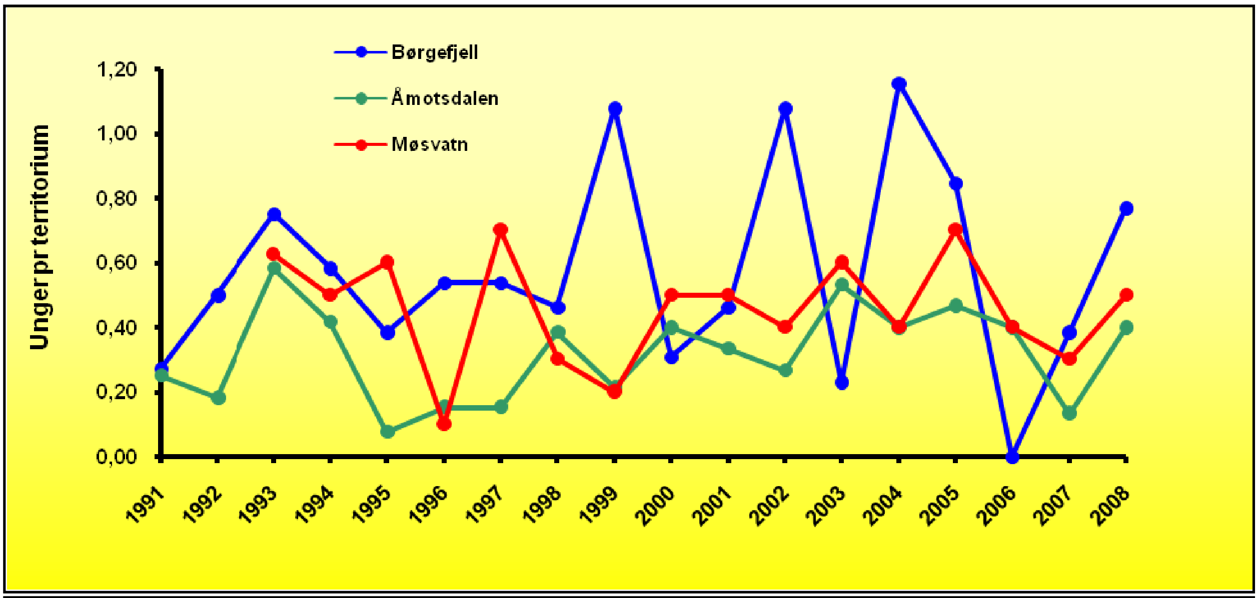
Fylke	**Bestandsestimat i 2008 Antall territorier (par)**	**Bestandsestimat for 2002 (Gjershaug & Nygård 2003) Antall territorier (par)**
Hedmark	66-76	66-76
Oppland	50-60	38-52
Buskerud	46-53	45-50
Telemark	53-60	53-60
Aust-Agder	35-40	35-40
Vest-Agder	28-40	28-40
Rogaland	40-52	40-52
Hordaland	46-52	46-52
Sogn og Fjordane	65-85	65-85
Møre og Romsdal	95-123	95-123
Sør-Trøndelag	50-60	50-60
Nord-Trøndelag	60-63	60-63
Nordland	200-300	90-149
Troms	202-230	86-190
Finnmark	140-160	39-100
Total	**1176-1454**	**836-1190**

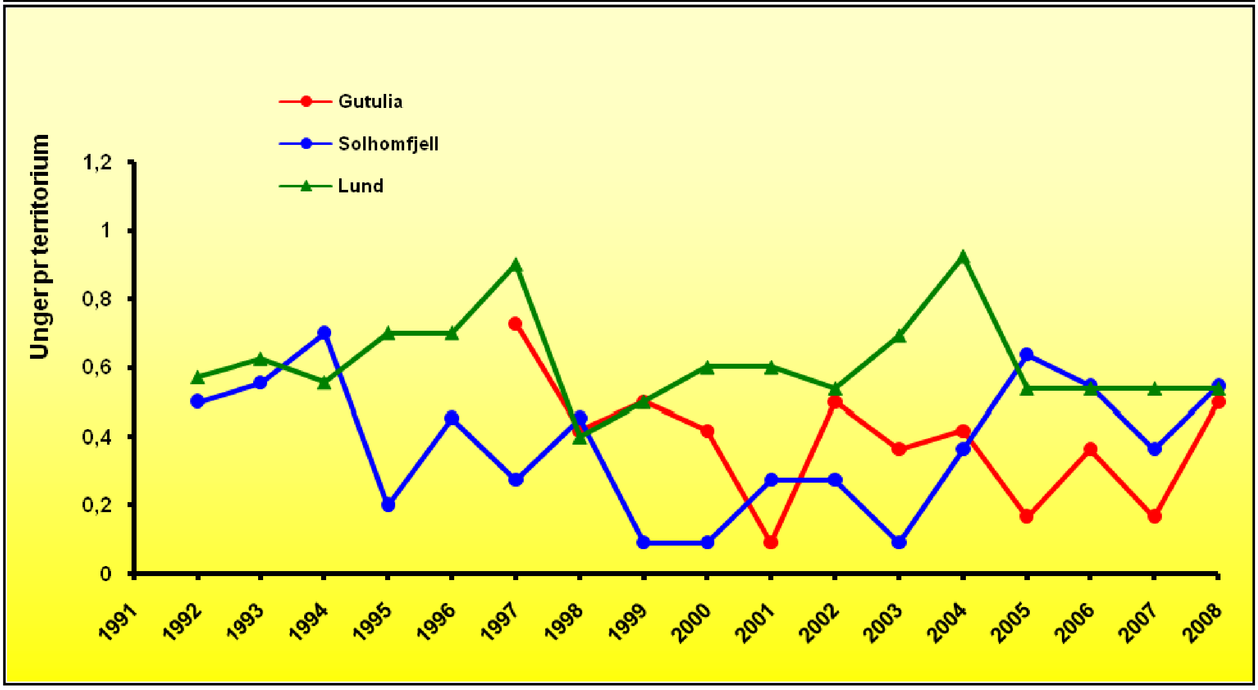
Revir	Lund	Solhomfjell	Gutulia	Møsvatn	Åmotsdal	Børgefjell	Aust-Agder	Buskerud	Hedmark (minus Gutulia)	Hordaland	Sør-Trøndelag - kyst	Vest-Finnmark	Finnmark
A :kjente	13	11	12	10	15	13		59				21	
B: okkupert siste 5 år		11	12	10	15	13					12	16	77
C: ikke okkupert siste 5 år	0	0	0	0	0						0	5	
D: besatt med kjent reir	13	11	12	10	15	13					12	7	77
E :besatt uten kjent reir	0	0	0	0	0	0					0	0	
F: besøkte	13	11	12	10	15	13	18	58	25	12	12	15	77
G: par	13	11	12	10	15	13	11	46	25	12	12	7	62
Hekkinger													
H: mislykket	0	0	1	0	2	0	4	5			3?	2	12
I: vellykket	5	5	5	5	3	9	7	21	11	2	7	3	18
J: antall unger	7	6	6	5	6	10	7	25	16	2+	7	4	20
K: antall dobbelkull	2	1	1	0	3	1		4			0	1	2
L: årlig hekkegjentagelse					3							0	
M: unger per vellykket hekking	1,4	1,2	1,2	1,0	2,0	1,1	1,0	1,19	1,45	1+	1,0	1,33	0,66
N: unger per besatt med kjent reir					0,4			0,54	0,64	0,17+	0,58	0,57	0,32
O: unger per par	0,54	0,55	0,5	0,5	0,4	0,77	0,64	0,54	0,64	0,17+	0,58	0,57	0,32
Ringmerking													
P: antall ringmerket					2			12	17		2	3	13
O: antall fargemerket					2			12	17		2	2	8
Sammenligningstall i %													
R: par av besøkte	100	100	100	100	100	100	61	79,3		100	100	47	81
S: vellykket av besatte revir	38,5	45,5	45,5	50	20		63,6	45,7		16,7	58	43	33
T: mislykket av besatte revir			9,1		13,3		36,4	10,9			25?	29	22
U: vellykket av besøkte	38,5	45,5	41,7	50	13,3	69,2	38,9	36		16,7	58	20	23
V: besøkte av kjente	100	100	100	100	100	100		98				71	

Tabell 2. Hekkeresultat for kongeørn i Norge i 2008.

Overvåkingen i 2008 ble utført av følgende personer:

- Hedmark: Carl Knoff & Per Nøkleby.
- Buskerud: hovedsak utført av Martin Lindal, Lars Egil Furuseth, Per Furuseth & Thor Erik Jelstad.
- Møsvatn og Solhomfjell: Odd Frydenlund-Steen.
- Lund: Toralf Tysse
- Aust-Agder: Leif Gunleifsen.
- Åmotsdalen: Harald Jære, Ane Marte Gjershaug & Jan Ove Gjershaug.
- Sør-Trøndelag kyst: Livar Ramvik, Martin Pearson & Jan Ove Gjershaug
- Børgefjell: Øivind Spjøtvoll & Per Lorentzen.
- Alta og Kautokeino: Arve Østlyngen, Bjørnulf Håkenrud, Kenneth Johansen, Olaf Opgård & Trond Johnsen
- Ellers i Finnmark: Trond Johnsen, Karl-Otto Jacobsen, Arve Østlyngen & Olaf Opgård





Figur 2. Produktiviteten hos kongeørn (unger per okkupert territorium) i de 6 TOV områdene for perioden 1991-2008.

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Vedlegg 2. Forsamlingen i møterommet på Scandic Hotell. Foto: Karl-Otto Jacobsen ©

Vedlegg 3. De fleste av deltagerne på kongeørnsymposiet samlet under utflukten til Kvaløya og Sommmarøya. Foto: Jan Eric Hägerroth

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