The occurrence and reestablishment of White-tailed Eagle and Golden Eagle as breeding birds in Denmark

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(Med et dansk resumé: Forekomst og genetablering af Havørn og Kongeørn som danske ynglefugle)

Abstract Except for a number of largely unsuccessful breeding attempts during the second half of the 20th century, the White-tailed Eagle *Haliaeetus albicilla* had been absent as a breeding bird in Denmark for more than 80 years, when a population established itself during the second half of the 1990s. Released from persecution and contaminants the population has grown to 37 pairs in just 16 years. Reproductive success has grown with age and experience of the birds, so that the average number of fledged young per breeding pair peaked with almost two per pair 8-10 years after the establishment of each breeding pair. Similarly, the Golden Eagle *Aquila chrysaetos* reestablished a small population in Denmark from 1999 onwards after probably having bred here until about 150 years ago. For both species, this success was facilitated by conservation efforts including protection zones around eagle nests, monitoring and public outreach mainly carried out by volunteers from the Danish Ornithological Society / BirdLife Denmark.

Introduction

The reestablishment of White-tailed Eagle *Haliaeetus albicilla* and Golden Eagle *Aquila chrysaetos* as breeding birds in Denmark in the 1990s is one of the greatest achievements in modern Danish bird and nature conservation. Hitherto, is has been questioned that the Golden Eagle bred in Denmark in former times, while the White-tailed Eagle bred in Denmark until it was driven extinct by persecution in 1912 (Løppenthin 1967). The latter species made a number of – usually unsuccessful – breeding attempts during the second half of the 20th century, until the first pair of the recent population succeeded in 1996 (Juhl et al. 1996, Génsbøl 2003). The first

pair of Golden Eagles nested a few years later (Knudsen et al. 2000).

The present paper is largely a summary of data already published in reports and papers on the occurrence and reestablishment of these two species as breeding birds in Denmark with the aim of making these reports available to an international audience (see also Tofft 2002 for an account on Danish White-tailed Eagles in German).

Material

The data for this paper were collected by the Danish Ornithological Society / BirdLife Denmark. Since 1991, *Project Eagle* has monitored the reestablishment and growth in the Danish eagle populations. The monitoring is organized through two volunteer national coordinators (LP and EE) and a network of volunteer 'nest coordinators' responsible for each eagle pair, keeping track of the whereabouts of the eagles, their nests and their reproduction. However, with the recent increase and expansion of the population it has proved increasingly difficult to keep track of all the pairs, and it is likely that a few pairs have been missed in the latest years.

In addition, national censuses of wintering eagles have been organized each February since 2006. Also, a chick-ringing programme was initiated in 2007. The results of all these efforts are published in annual reports (e.g. Pedersen & Ehmsen 2010).

In connection with the present review, the literature was scrutinized for information on historical records. Since the 1970s, regional and national 'Report Groups' have gathered bird observations from all parts of the country and produced annual reports summarising the most interesting observations (e.g. Christensen & Lange 2010). The observations are now recorded digitally in a web-based database, DOFbasen, holding more than one million annual bird records from recent years.

Pre-1970 occurrence of eagles in Denmark

The White-tailed Eagle had probably nested in Denmark for thousands of years when it became extinct in 1912 (Løppenthin 1967), and until the mid-19th century the species was a relatively common breeder in most parts of the country. In total, 50-60 nesting sites are documented in Denmark from the second half of the 19th century (Fig. 1; Skovgaard 1927, Schiøler 1931), but at that time the decrease of the population had already begun, especially in regions harbouring the densest human population. After 1890, only a few pairs bred, all at

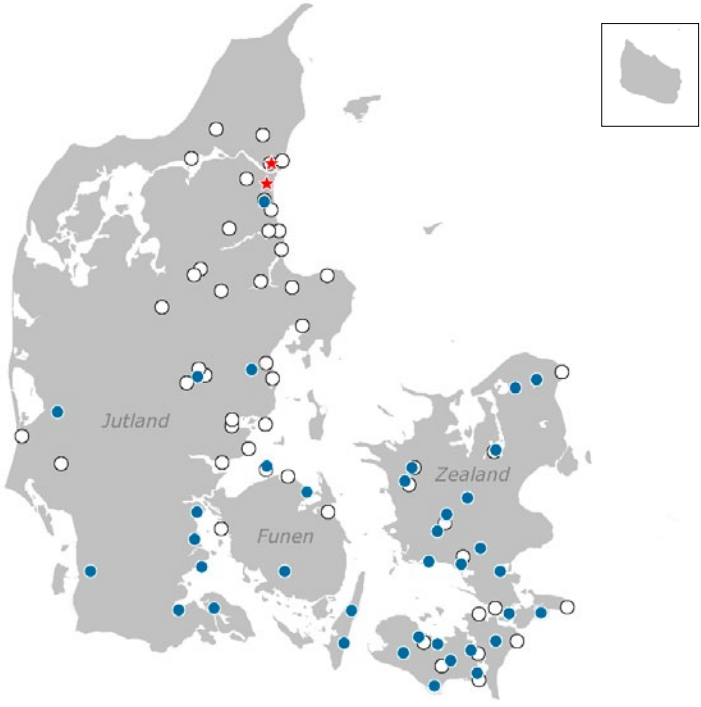

Fig. 1. Nineteenths century nest sites (open circles; from Skovgaard 1927) for White-tailed Eagles in Denmark, together with present nest sites for White-tailed Eagles (2010; filled circles) and Golden Eagles (red stars). The lack of 19th century sites in southernmost Jutland is confirmed by German ornithologists (the area belonged to Germany during 1864-1918). The position of one nest in SE Denmark is kept secret and marked a little off the true position on the map.

Kendte ynglepladser for Havørn i Danmark i 1800-tallet (åbne cirkler) sammen med de nuværende ynglepladser for Havørn (2010; fyldte cirkler) og Kongeørn (røde stjerner). Placeringen af en rede på Møn holdes hemmelig og er markeret lidt forskudt på kortet.

fjords in East Jutland, and in 1912 one of the birds in the last pair was deliberately poisoned (Schiøler op.cit.). The main reason for the extermination was shooting and poisoning by gamekeepers, but also collectors took their toll of birds and eggs. A few examples illustrate the intensity by which eagles were shot: at one estate, twelve White-tailed Eagles were shot in 1885, and at another eight were shot in 1889 (Jørgensen 1989). Eagles could legally be shot year round until 1922, when a closed season from 1 February to 31 July was introduced; they were fully protected in 1928.

Since then, a pair of White-tailed Eagles nested in southern Zealand in 1952-1960 and another pair on Lolland in 1957-1961, but only the pair on Zealand succeeded in raising young (in 2-3 of the years (Jørgensen 1989); see also Preuss & Aaris-Sørensen 1981). At the same time, during a few years around 1960, a pair nested at lake Bankel in South Jutland (Tofft 2002). A pair attempted to breed on Lolland again in 1979-1980, but failed (perhaps due to contamination of the eggs, Dyck et al. 1988).

Concerning the Golden Eagle, earlier reports of breeding in Denmark (until the mid 19th century) were questioned by Schiøler (1931) and rejected by Salomonsen (1963) and Løppenthin (1967). However, since the species is currently breeding in old forests in Denmark, it may well have done so even in former times.

In addition to the breeding birds, both White-tailed and Golden Eagles have always been annual visitors in Denmark. According to Dybbro (1978), the White-tailed Eagle was a rare visitor during winter and migration and a very rare, but regular summer visitor. Most birds occurred on traditional wintering sites in the eastern parts of the country, with a total of 20-40 observations per year. Andersen-Harild (1968) estimated the number of individuals on the traditional wintering sites at 7-13 (1-6 adults and sub-adults (≥5th year of life) and 3-7 younger birds. The birds began to arrive in October, but numbers did not peak until late January – early February, and most birds departed during March and early April (Fig. 2). In northern Jutland, spring migration peaked in March-April (Møller 1978). The White-tailed Eagles in eastern and southern Denmark probably came from Sweden and Germany, while Norwegian birds may occur in Jutland (Jørgensen 1989, Bakken et al. 2003, Bønløkke et al. 2006).

With a total of c. 20 observations per year the Golden Eagle was a rare visitor in most of the country during winter and migration, and a very rare and irregular summer visitor (Dybbro 1978). All individuals were immature, and most were seen in northern Jutland where the majority were recorded as spring migrants during April and May at Skagen, the northernmost tip of Jutland (Møller 1978, Jørgensen 1989). Wintering birds were concentrated to eastern Denmark and probably came from Sweden and Finland (Jørgensen op.cit.).

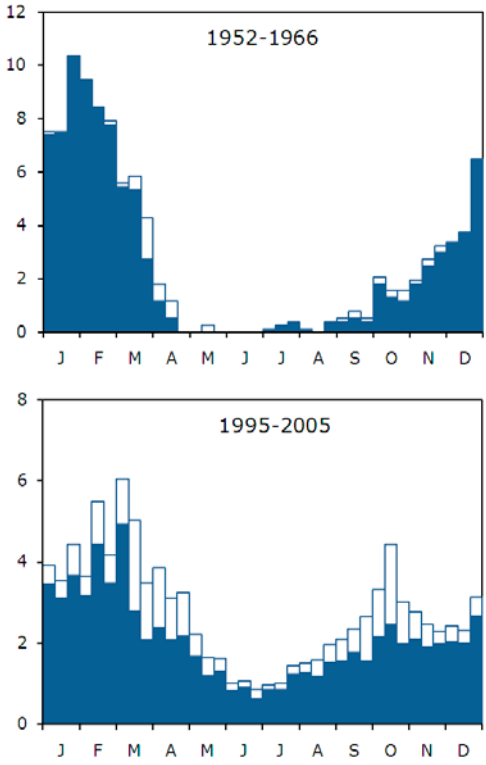

Fig. 2. Phenology of stationary (filled bars) and migrating (open bars) White-tailed Eagles in Denmark 1952-1966 (N = 540) and 1995-2005 (N = 14597), shown as percent per 10-day period (data from Andersen-Harild (1968) and the present study).
Fænologi for stationære (blå søjler) og trækkende (åbne søjler) Havørne i Danmark 1952-66 og 1995-2005, vist som procent pr 10-dagesperiode (ældre data fra Andersen-Harild 1968).

Post-1970 occurrence of eagles in Denmark

The characteristics by Dybbro (1978) were largely maintained in the last annotated Danish checklist (Olsen 1992), although the annual number of wintering and migrating White-tailed Eagles now were given as 5-30 and 20-40 per year, respectively. For Golden Eagles, 2-5 records per year were given for the autumn passage, 1-5 for the spring migration at Skagen, and 1-4 for wintering birds on Zealand.

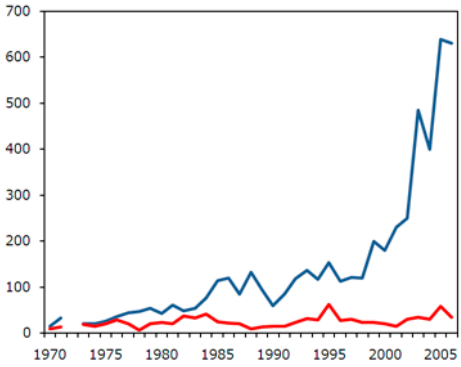

Fig. 3. Number of records of White-tailed (blue) and Golden Eagles (red) per year in Denmark, 1970-2006. Figures are from annual bird reports from the Danish Ornithological Society, corrected for multiple records of the same individuals at the same site, but not for records of the same individuals at different sites.

Udviklingen i antal observationer af Havørne (blå) og Kongeørne (rød) pr år i Danmark, 1970-2006. Tallene er fra Rapportgruppernes årsrapporter og er i varierende omfang blevet renset for registreringer af de samme individer på de samme lokaliteter, men ikke for registreringer af de samme individer på forskellige lokaliteter.

In his account of Danish raptors, Jørgensen (1989) worked up all available data until then. The White-tailed Eagle was stated to be a regular winter visitor with 10-15 individuals at about 15 sites, primarily on Zealand and adjacent islands, but with up to 20-25 individuals in cold winters (see also Dybbro 1985). Numbers were said to have been stable since at least the middle of the century, with 55-60 % being 1st-4th year birds. Most birds were present from October and left again from February, but an increasing number stayed even in summer in the south-eastern parts of the country, and more birds were also recorded on migration. The preferred winter habitat was fjords and big lakes with large concentrations of waterbirds and surrounded by a mosaic of forests and large fields with few houses (Jørgensen op.cit.).

Since then, numbers of White-tailed Eagles have increased considerably, so that the total (corrected for records of the same individual on the same site, but not for the same individual on different sites) exceeded 600 in 2005-2006 (Fig. 3), and more recent figures have been difficult to estimate (see *Winter censuses* below for numbers of individuals). In the annual Danish bird report from 2007, 85 White-tailed Eagles were seen on spring migration at six sites, and 78 were seen on autumn migration at eight sites (Lange & Christensen 2008).

The increase is illustrated in Fig. 3 which, however, is also influenced by the reporting intensity from the Danish birdwatchers. To get some idea of the development of this reporting intensity, we have used 29 other bird species for which data are available during the entire period, and for which the status has remained more or less stable during the period (data from P. Lange and J.S. Christensen in litt.). According to this, reporting intensity increased by 25 % between 1978-87 and 1988-1997, and by 37 % between 1978-87 and 1998-2006. These increases clearly are far too small to have caused the increase apparent in Fig. 3, and the general picture of a substantial increase in White-tailed Eagle numbers during the last decades remains.

According to the account by Jørgensen (1989), 2-4 Golden Eagles wintered annually in most years during the second half of the 20th century, with a few more in some years and none in others. All of them were immatures, arriving in October-November and leaving again during March, and most occurred in the eastern part of the country where large estate fields, meadows and forests made out the preferred habitat (see also Dybbro 1985). During recent years, numbers have been fairly stable with about 30 Golden Eagles recorded in most years (Fig. 3). Most are seen near the breeding sites in north-eastern Jutland (see below) or as migrants at Skagen.

Reestablishment of the White-tailed Eagle as a breeding bird in Denmark

Inspired by very encouraging results from feeding eagles and other raptors with contaminant-free food in Sweden during winter, mainly with the aim of improving the survival of juveniles, the Danish Ornithological Society initiated a similar programme under *Project Eagle* in 1991, hoping that this might ultimately lead to the reestablishment of a breeding population of White-tailed Eagles (Génsbøl 1998, 2003). As it turned out, however, the wintering eagles in Denmark had access to so rich food resources – not least the tens of thousands of wintering waterbirds, in many places including large numbers of birds crippled from shooting – that the feeding sites did not attract them to any large extent, and in 2000 the winter feeding was abolished. What the project did achieve, however, was to promote a positive attitude among Danes towards the eagles that established themselves in our country from 1995 onwards (Génsbøl op.cit.).

Table 1. Numbers of territorial pairs (pairs with a nest) and breeding pairs (pairs supposed to have laid eggs) of White-tailed and Golden Eagles in Denmark 1995-2010, and their reproductive success.

Territoriale par af Havørn og Kongeørn i Danmark 1995-2010, med antal reder og ynglesucces.

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
White-tailed Eagle *Havørn*																	
Territorial pairs *Territoriale par*	1	1	3	3	5	6	6	9	9	11	13	13	15	18	22	29	37
Breeding pairs *Ynglepar*	0	1	2	3	4	5	5	8	7	10	11	13	13	17	20	24	31
Successful pairs *Par med succes*	-	0	2	2	4	5	3	8	5	7	9	10	11	15	17	19	24
Nests with 1 fledgling *Reder med 1 unge*	-	-	2	2	2	3	1	4	3	2	2	3	2	5	7	8	10
Nests with 2 fledglings *Reder med 2 uger*	-	-	0	0	2	2	2	4	2	4	7	6	6	9	10	10	14
Nests with 3 fledglings *Reder med 3 unger*	-	-	0	0	0	0	0	0	0	1	0	1	3	1	0	1	0
Total fledged young *Totalt antal udfløjne unger*	-	-	2	2	6	7	5	12	7	13	16	18	23	26	27	31	38
Fledged young/breeding pair *Unger pr ynglepar*	-	-	1.0	0.7	1.5	1.4	1.0	1.5	1.0	1.3	1.5	1.4	1.8	1.5	1.4	1.3	1.2
Fledged young/successful pair *Unger pr par med succes*	-	-	1.0	1.0	1.5	1.4	1.7	1.5	1.4	1.9	1.8	1.8	2.1	1.7	1.6	1.6	1.6
Golden Eagle *Kongeørn*																	
Territorial pairs *Territoriale par*	-	-	-	1	1	1	1	2	2	2	2	2	3	3	3	3	2
Breeding pairs *Ynglepar*	-	-	-	0	0	1	1	1	1	1	1	2	2	2	3	3	2
Successful pairs *Par med succes*	-	-	-	-	-	1	1	1	1	1	1	1	1	2	3	2	2
Fledged young *Affløjne unger*	-	-	-	-	-	2	1	1	1	1	1	1	1	2	4	2	2
Fledged young/breeding pair *Unger pr ynglepar*	-	-	-	-	-	2.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.0	1.3	0.7	1.0
Fledged young/successful pair *Unger pr par med succes*	-	-	-	-	-	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.3	1.0	1.0

The first breeding attempt in 1995 failed but, much to the satisfaction of *Project Eagle*, in the second year (1996) two young fledged from three nests (Table 1). Since then, the population has grown to 37 pairs (2010), of which 31 apparently laid eggs (seen sitting deep in the nest day after day; Table 1, Fig. 4). In addition, as mentioned above, a few pairs may well have been missed during the last few years. Young production has grown at a similar rate, so that at least 233 young White-tailed Eagles have fledged from Danish nests during 1996-2010.

The production of young has increased with the age of the territory, hence probably the age and experience of the adults. This relationship was analysed by a general linear model, using a logarithmic link function and a Poisson-distributed error structure. A quadratic model described the relations significantly better than a linear model (deviance reduction 10.8, P = 0.001), while increasing the model complexity to a cubic model did not improve the description significantly (deviance reduction 2.6, P = 0.11). According to the adopted quadratic model, the production per pair increased with age of the territory up to a peak about 8-10 years after establishment, and thereafter declined (Fig. 5).

Fledglings from Danish nest can have started joining the breeding population from about 2002. This fact, together with the increasing productivity during the first years after establishment, may explain the increased growth rate in recent years (Fig. 4). Even three year old individuals have been found to breed successfully (Juhl et al. 1996, Ehmsen 2009; see also Struwe-Juhl & Grünkorn 2007).

The average annual productivity since 2002 has been 1.36 fledglings per breeding pair, peaking with 1.8 young per breeding pair in 2006 (Table 1). This is higher than the average

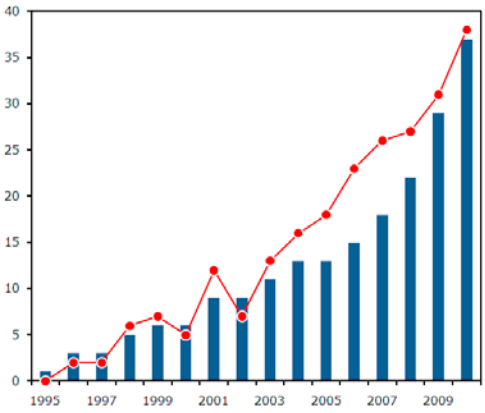

Fig. 4. The number of territorial pairs of White-tailed Eagles (bars) in Denmark, and the number of fledged young (red line), 1995-2010.

Antal territoriale havørnepar (søjler) i Danmark 1994-2010, og deres produktion af udfløjne unger (rød linje).

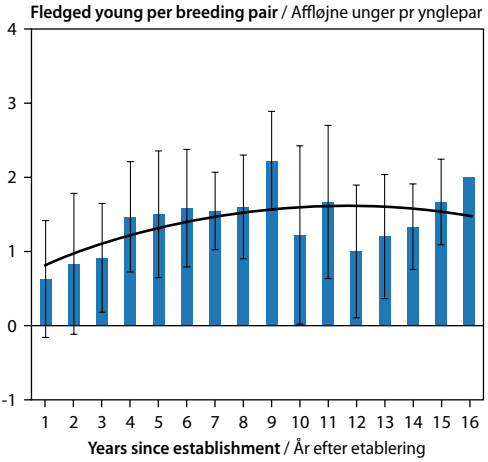

Fig. 5. The average production of fledged young per breeding pair of White-tailed Eagles shown against time since the territory was occupied. Error bars show standard deviations.

Udviklingen i ungeproduktionen pr ynglepar i årene efter første yngleforsøg på de enkelte territorier.

productivity in Sweden and Germany (1.0 and 1.2, respectively), suggesting that the population is still not saturated (cf. Kollmann et al. 2002). The high reproductive success in Denmark is the more notable as the population has a large proportion of young birds with low success (Fig. 5). In fact, the productivity is on level with the productivity in Sweden before the introduction of DDT and PCB into the environment (Helander 2003). However, the productivity can be expected to decrease as the still increasing eagle population is approaching saturation.

Egg-laying has been reported from late February until early April, and the young fledge in late June or early July.

The first pairs settled in the same areas in southern Denmark where the early breeding attempts occurred in 1952-1961 and 1979-1980, and close to the population in northern Germany (see below). Since then, the population has become dispersed all over Zealand, Funen and southern Jutland (Fig. 1), in areas with many lakes, fjords and shallow coastal areas rich in fish and waterbirds during most of the year (Stabell 2005). To some extent it is the same areas where the species bred in the 19th century (Fig. 1), except that the eagles are still largely missing in north-eastern Jutland and instead have occupied new sites in southern Funen and southern Jutland.

Most White-tailed Eagles breed close to EC special protection areas – often less than 2-3 km from a lake or fjord – where most feeding takes place within 5-10 km from the nests (Stabell 2005). The maximum recorded distance from a coast or lake is 7 km, but one of the current pairs regularly flies more than 20 km from the nest to feed. Judged from a small sample of 64 prey items recorded at eight nests, the food is waterbirds, Pheasants *Phasianus colchicus* and fish, with Coot *Fulica atra* (28) as the most abundant species (Rasmussen et al. 2010). In a much larger study mainly from the breeding season, Struwe-Juhl (2003) found that fish constituted 73% of 618 recorded food items in Schleswig-Holstein, the rest being birds (24%) and mammals (3%); Coots accounted for 56% of the birds.

Most often nests are situated 15 m or more above the ground (range 9-29 m), in trees more than 100 years old and close to forest edges or clearings. Of 58 nests, 29 were in beech *Fagus* sp., 13 in spruce *Picea* sp., six in pine *Pinus* sp., five in oak *Quercus* sp. and five in other deciduous trees. The size of the forest is of less significance, provided that there are sufficiently large trees, and little or no disturbance from humans (e.g., at least 250-300 m distance to houses etc.). In the initial stage of the reestablishment, no breeding occurred in parishes with more than 100 inhabitants per km^2 (Stabell op.cit.), but some habituation to humans seems to have taken place during the years, and a few pairs now breed in more densely populated areas.

We have several records of ringed birds which all point to northern Germany as the area of origin of

One of the goals of Project Eagle was to give ordinary people the chance to experience free-flying, wild eagles instead of kept birds in so-called "eagle reserves." Here, a young Golden Eagles "made in Denmark" is airborn over the breeding territory in northern Jutland. Photo: Ole Krogh.

Et af formålene med Projekt Ørn var at give befolkningen mulighed for at opleve fritflyvende, vilde ørne som alternativ til håndholdte fugle i såkaldte "ørnereservater." Juvenil Kongeørn over Høstemark Skov.

the new White-tailed Eagle population in Denmark (see Struwe-Juhl & Grünkorn 2007). The population in northern Germany has increased significantly during much of the 20th century, when also Schleswig-Holstein was re-colonised (Kollmann et al. 2002). However, some immigrants could have come from Sweden, where the population has also grown since about 1980 and expanded towards the south (Helander 2003), and from where immature birds are known to reach Denmark in winter (Jørgensen 1989). But so far, we have no observations of breeding eagles in Denmark with Swedish rings (Bønløkke et al. 2006), although many Swedish White-tailed Eagles have been colour-ringed (Fransson & Pettersson 2001).

Reestablishment of the Golden Eagle as a breeding bird in Denmark

Only four years after the first White-tailed Eagles nested in Denmark, a pair of Golden Eagles bred successfully in a forest in NE Jutland in 1999 (Knudsen et al. 2000). What was probably the same birds had been stationary in the area since the autumn of 1996 and may have nested already in 1998. During 1999-2002 the pair bred successfully at the same site, but since then only non-breeding birds have been seen here. However, Golden Eagles pairs have since become established at three other sites in the region, and successful breeding has occurred at all of them (Table 1). In addition, summering Golden Eagles have occurred at three sites in other parts of Jutland.

One of the current pairs breeds in a forest from where the species was reported breeding until 1850 (Kjærbølling 1852), a report that – as mentioned above – was questioned by Schiøler (1931) and rejected by both Salomonsen (1963) and Løppenthin (1967) as being misidentified White-tailed Eagles. Similar records of breeding Golden Eagles

in central Jutland and on Lolland in the mid 19th century (Schiøler op.cit.) met the same fate. With the current knowledge, however, it seems likely that the species did actually breed in Denmark during the 19th century, and probably had done so for thousands of years, although very likely in much lower numbers than the White-tailed Eagle. A similar (re-) establishment of the species in southernmost lowland Sweden occurred from the late 1980s onwards (Bengtsson 1999).

During 1999-2010 a total of 19 young Golden Eagles have fledged from Danish nests, giving an average of 0.95 young per breeding pair. The first two of the breeding sites were in private preserves with old deciduous forests, closed to the public and with nearby extensive moorland. The next two breeding sites were in private forest, with public access limited to tracks and roads during daytime hours.

In recent years, fledged young were seen from July onwards, indicating egg-laying in March (cf. Cramp & Simmons 1980).

Waterbirds – including a Great Cormorant *Phalacrocorax carbo* colony – are common in the region, and in wintertime plenty of geese and swans reside there. However, at one of the breeding sites Pheasants are released for hunting, and here Pheasants made up 73% of 154 identified prey items (Nielsen 2009). At another breeding site in the region, the main prey was waterbirds together with 21% mammals (N = 103).

Winter censuses

The winter populations of White-tailed and Golden Eagles have been censused each January-February since 2006 (Table 2). During these years, recorded numbers of White-tailed Eagles have grown from about 125 to almost 200, while the numbers of Golden Eagles have remained below 10. Real winter numbers are likely to be somewhat higher, since a proportion of the eagles are probably not found at the censuses. In the severe winter of 2010/2011, c. 300 White-tailed Eagles were counted.

As seen from Figs 6 & 7, the eagles are mainly found in the same regions as the breeding pairs: most White-tailed Eagles in SE Denmark, but also many in the rest of Zealand, Funen and East Jutland, and most Golden Eagles in NE Jutland.

On one of the census days, a congregation of 21 White-tailed Eagles was present at a large lake in SE Denmark, and two weeks later up to 27 were seen at the same place.

Discussion

A hundred years ago, the Danish breeding population of White-tailed Eagles was exterminated by persecution, and it is very likely that the same happened to the Golden Eagle somewhat earlier. The future looked so glooming for the eagles that the nestor of Danish ornithology, E. Lehn Schiøler (1931) wrote: "In Europe the saga of the White-tailed Eagle will sooner or later come to an end. Timely efforts should therefore be made to preserve the species in Greenland – the only place, where this can be done in an efficient way."

As we know today, things didn't turn out quite so bad. The most important precondition for the two eagle species to reestablish themselves in Denmark was rather simple: a change in the minds of humans. The attitude towards the eagles has changed from being considered robbers of game and farm animals to being admired and respected.

The breeding attempts by White-tailed Eagles between the 1950s and 1980 had to be kept secret, and guards kept watch day and night at the nest to prevent egg collectors from taking the eggs. Similar fears concerned poaching. But when the White-tailed Eagles reappeared in 1995, the Danish Ornithological Society came to the conclusion

Table 2. Estimated totals of White-tailed and Golden Eagles in Denmark 2006-2010 at censuses in January-February each year. Attempts have been made to avoid double records. For sites not covered on the census day, numbers from adjacent days were used. The weather at the 2006 and 2010 censuses was poor in parts of the country, so these estimates are less accurate.

Estimerede totaler af Havørne og Kongeørne i Danmark ved fem tællinger i januar-februar hvert år 2006-2010. Dobbeltregistreringer er søgt eliminerede, mens tal fra udækkede lokaliteter blev hentet fra tilstødende dage. Ved tællingerne i 2006 og 2010 var der dårligt vejr i store dele af landet, hvorfor estimaterne er mindre sikre.

	2006	2007	2008	2009	2010
White-tailed Eagle *Havørn*	110	117	156	191	192
Golden Eagle *Kongeørn*	5	9	7	9	7

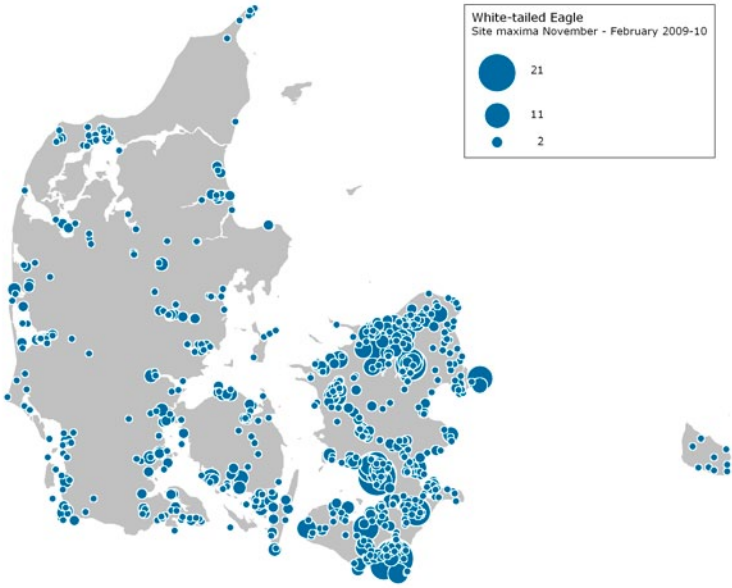

Fig. 6. Map of Denmark with maximum records of White-tailed Eagles per site during November-February 2009-2010. The area of the dots varies proportionally to the number of eagles seen.

Maksimumforekomster af Havørne pr lokalitet i november-februar 2009-2010 (fra DOFbasen).

Fig. 7. Map of Denmark with maximum records of Golden Eagles per site during November-February 2009-2010. The area of the dots varies proportionally to the number of eagles seen.

Maksimumforekomster af Kongeørne pr lokalitet i november-februar 2009-2010 (fra DOFbasen).

that time was ripe for the opposite strategy: to give maximum publicity to the eagles and their need for protection. In consequence, the reestablishment of the breeding populations has been facilitated by management plans developed by the society and for each nesting pair implemented via negotiations with forest owners (Génsbøl et al. 1997, DOF 2005). Together with the national coordinators of *Project Eagle*, local nest coordinators cooperate with local authorities and land owners on the regulation (limitation) of access to the eagle nest, the production of printed and digital information material, and the establishment of good spotting sites at safe distance from the nests.

The strategy proved fruitful in that we have no indications that nests have been robbed. But there have been a number of incidents, where heavy disturbance at nests have caused, or is suspected to have caused, breeding failures. It is also noteworthy that it took 13 years from the first breeding attempt in 1995 before a White-tailed Eagle pair bred successfully in a state-owned forest, and even now

(2010) only two out of 37 nests are in state forest. In contrast to the private forest, where access is limited to established paths between 6 a.m. and sunset, there is public access everywhere and at all times in state-owned forests.

The situation is somewhat similar for the Golden Eagles. Here, the first two pairs were in forest reserves with no public access, and the next two in areas with very little human disturbance.

The most severe incidents have been that one White-tailed Eagle apparently was shot and two were poisoned.

Nevertheless, the eagles' general escape distance from humans is no more than a few hundred metres. This has allowed them to re-colonise a densely populated country like Denmark (120 inhabitants per km^2). The eagles are now among the most highly valued birds in Denmark, and each year in February between 1250 and 3200 people have joined *The Day of the Eagles* organized by the Danish Ornithological Society, with public outreach material and guides at about 20 good eagle-spotting sites (e.g. Pedersen & Ehmsen 2010).

To reduce conflicts between breeding pairs and the public, non-disturbance zones of c. 300 m have been established around nests (500 m across open water) between 1 February and 31 July, or at some sites year-round (Génsbøl et al. 1997, DOF 2005). However, almost half the eagle nests are in areas with so little disturbance – or no public access at all – that it has not been necessary to establish formal protection zones.

Since 2004, nesting trees have been protected by law, and at most breeding sites forestry activities have voluntarily been limited to the period 15 September – 31 January within a few hundred meters from nests and totally avoided within 100 m. This has generally proved sufficient, even though there are many reports of minor violations, and at one occasion logging close to a Golden Eagle nest apparently was the cause that the birds abandoned the site.

A further precondition for the reestablishment of the eagles was reduction of the contamination with heavy metals and pesticides (Helander & Stjernberg 2002). The failures of the breeding attempts in 1979-1980 could at least in part have been due to DDE/PCB-contamination of the eggs (Dyck et al. 1988). A potential source of contamination with heavy metals was eliminated when the use of lead shot for hunting in Denmark was banned in wetlands in 1986 and in the entire country in 1996.

So far, we know of no incidents of eagles colliding with wind turbines in Denmark, but it is a potential risk, since wind turbines have become very numerous in the country. A wind turbine park has been constructed in close proximity to a breeding site for Golden Eagles, but the birds bred successfully in the following year.

As stated above, and contrary to recommendations in BirdLife International's action plan for the conservation of White-tailed Eagles (Helander & Stjernberg 2002), we have not kept nests "strictly confidential." Instead, we have established viewing points and public outreach information material at several nests, hoping that this will further facilitate the positive attitude towards the need for protection of the immediate surrounding of the nests.

The White-tailed Eagle is on the Danish national red list as vulnerable (VU), while the Golden Eagle is listed as not applicable (NA). Furthermore, both species are on the list of species on which the designation of a number of EC special protection areas is based, even though only a few of the nesting sites are situated in such areas.

Introduction of eagles have never been an issue in Denmark, and it is now directly forbidden by law (cf. Meltofte 1987). Less radical means of aiding the eagle populations are permitted, for example have a few pairs nested on artificial platforms.

The future prospects for the White-tailed Eagle seem bright, while prospects for the Golden Eagle are more uncertain, since we after 13 years still have very few pairs in the country. Provided that the general public will remain willing to accept protection zones around nests, the population of White-tailed Eagles could probably grow to more than 100 pairs. There is, however, some opposition to restrictions of public access, and conflicts are certain to arise in the future.

Such conflicts are already present in case of the one third of the Danish forests that are state-owned. Here, few eagles breed, probably because disturbance is intensive. This is unfortunate, not least because currents plans favour a development towards more old-growths in these forests. Many privately owned forests are forested more intensively and hence have fewer potential nesting trees. The Danish Ornithological Society therefore recommends that disturbance-free refugia are established in little used parts of the state forests. As recommended in the BirdLife strategy (Helander & Stjernberg 2002), this should be part of the national land-use planning, and should be embedded in a long awaited management plan for the breeding eagles in Denmark.

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Resumé

Forekomst og genetablering af Havørn og Kongeørn som danske ynglefugle

Genindvandringen af Havørn og Kongeørn som danske ynglefugle er en af de største succeser i moderne dansk naturforvaltning. Genindvandringen er blevet fulgt tæt af Dansk Ornitologisk Forenings *Projekt Ørn*, som begyndte som et vinterfodringsprojekt i 1991, men som skiftede fokus mod sikring af fredelige zoner omkring ørnereder samt formidling til befolkningen, da de første Havørne byggede rede i 1995. I dag (2010), kun 15 år efter, har vi 37 etablerede par Havørne og 2-3 par Kongeørne her i landet (Tabel 1, Fig. 1).

Genindvandringen og fuglenes ynglesucces er blevet afrapporteret løbende i talrige artikler, pressemeddelelser og årsrapporter (f.eks. Pedersen & Ehmsen 2010), på DOFs hjemmeside samt i brochurer og andre publikationer. Med denne artikel formidler vi tillige succeshistorien til de mange i udlandet, som arbejder med de samme problemstillinger omkring forvaltningen af ynglende ørne, og som forhåbentlig kan drage nytte af de danske erfaringer.

Havørnen blev udryddet som dansk ynglefugl i 1912, hvorimod der har været usikkerhed om, hvorvidt Kongeørnen tidligere har ynglet i Danmark. Men med den nye udvikling, hvor et par Kongeørne yngler i samme skov ved Hals i Nordjylland, som blev angivet som yngleskov af Kjærbølling (1852), og hvor arten nu i 20 år har ynglet i Skåne, forekommer det sandsynligt, at Kongeørnen blev udryddet i 1800-tallet parallelt med bekæmpelsen af Havørnen.

I alle de mellemliggende år har begge arter optrådt som fåtallige vintergæster i Danmark (Fig. 2), og nogle få par Havørne forsøgte at yngle i 1952-61 og 1979-80. Det skal ses i lyset af, at en ny og meget alvorlig trussel mod især Havørnen var kommet til efter 2. Verdenskrig, nemlig forureningen med tungmetaller og pesticider, der reducerede ørnenes formeringsevne. Først med reduktionen af denne trussel i 1980erne og bestandsfremgangen i vores nabolande begyndte også antallet af havørneobservationer i Danmark at stige (Fig. 3).

DOFs *Projekt Ørn* fra 1991, med fodringspladser mange steder i landet, påbegyndtes i håb om, at fodring med giftfrit foder kunne stimulere unge ørne til at forblive i landet og begynde at yngle. Det viste sig imidlertid, at der var rigeligt med føde, bl.a. de store mængder vandfugle langs de lavvandede danske kyster, at ørnene ikke havde behov for fodring. I mellemtiden var ørnene begyndt at yngle i landet, og beskyttelsen af de ynglende ørne ved etablering af zoner med adgangsbegrænsning omkring ørnerederne betød, at bestanden reproducerede sig godt (Tabel 1, Fig. 4 & 5). Ynglesuccesen hos de danske Havørne (1,36 udfløjne unger pr ynglepar 2002-10, kulminerende med 1,8 i 2006; Tabel 1) ligger således væsentligt over både svenske og tyske tal. Produktiviteten steg med alderen og erfaringen hos de ynglende Havørne, således at den kulminerede med et gennemsnit på næsten to affløjne unger pr par, når territorierne havde været besat i omkring 8-10 år (Fig. 5).

Samtidige optællinger af ørne om vinteren viser, at der nu opholder sig flere hundrede Havørne og en halv snes Kongeørne i landet i januar-februar (Tabel 2). Mens Havørne ses over hele landet – med en vis overvægt i ynglområderne – er næsten alle observationer af Kongeørne fra området nær redepladserne (Fig. 6 & 7).

Umiddelbart ser fremtiden lys ud for de danske Havørne, mens kongeørnebestanden stadig er meget lille. Vi kan formentlig få mere end 100 par ynglende Havørne i Danmark, og måske også nogle flere Kongeørne, men det forudsætter, at der fortsat er villighed til at sikre rimeligt uforstyrrede forhold i redernes umiddelbare omgivelser. Dette er specielt et problem i statsskovene, hvor der er adgang overalt døgnet rundt, hvorfor der hidtil kun er gjort få og lidet succesrige yngleforsøg i statsskov. Hvis ørnene også skal kunne yngle i den tredjedel af de danske skove, som er i offentligt eje, er det efter DOFs opfattelse nødvendigt med en forvaltningsplan, hvor etablering af fredelige områder indgår i planlægningen for de danske statsskove.

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