Ornis Svecica

Vol. 22, 2012

SVERIGES
ORNITOLOGISKA
FÖRENING

Swedish Ornithological Society

Ornis Svecica utges av Sveriges Ornitologiska Förening, Stenhusa gård, 380 62 Mörbylånga.
Ornis Svecaica is published by the Swedish Ornithological Society, Stenhusa gård, 380 62 Mörbylånga.
ISSN 1102-6812

ORNIS SVECICA 22: 3–8, 2012

Behaviour and survival of Common Guillemot *Uria aalge* chicks at departure from a nest site in the Baltic Sea

Beteenden och överlevnadschanser för sillgrissleungar Uria aalge *i Östersjön när de lämnar sina boplatser*

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Abstract

Common Guillemots *Uria aalge* often breed high up in cliffs, forcing the juveniles to jump down to the beach or sea sea when leaving their nests. We studied survival of Common Guillemot chicks at time of nest departure on the island Lilla Karlsö in the Baltic Sea. All jumps were conducted either together with one of the parents, or, more commonly, the parent flew down shortly before the chick jumped. At this point, the parent was always found waiting for the chick directly underneath the nest, either on the beach or in the water, and never farther out than five meters if there was no beach below the cliff. If separated, all observed parents and juveniles reunited within one minute and then swam close together out to sea. Juvenile mortality was very low, only 0.5% in 2011, with 2 of 426 chicks dying. In both cases hitting a lower cliff ledge caused the mortality. No case of predation was observed. The high survival rates are most likely due to the chicks' close proximity to their male parent at all times.

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Received 15 November 2011, Accepted 13 January 2012, Editor : J. Waldenström

Introduction

Auks, *Alcidae,* are known for the extreme variation in age and body mass at which offspring leave the nest site (e.g. Sealy 1973, Gaston 1985, Gaston & Jones 1998). Three strategies exist. Precocial alcids leave the nest 2–4 days after hatching and are cared for at sea by both parents. Semiprecocial alcids leave after 25–75 days and are independent of their parents when they leave the nest, weighing between 50% and 100% of an adult's body mass. An intermediate strategy is used by Common Guillemot *Uria aalge,* Brünnich's Guillemot *Uria lomvia* and Razorbill *Alca torda*. Juveniles of these three auk species depart to the sea together with their male parent at 15–35 days of age, weighing only 12–30% of adult body mass (e.g. Sealy 1973, Gaston 1985, Gaston & Jones 1998). The underlying selective forces for these strategies are most likely shaped by trade-offs between mortality and growth at nest sites and at sea (e.g. Lack 1968, Sealy 1973, Gaston 1985, Gaston & Jones 1998).

Factors determining reproductive success in auks have been studied intensively during incubation and chick rearing periods, but less so during fledgling and post-nest departure. The lack of studies focused on post-nest departure is obviously due to the difficulties associated with studying auks at sea compared to at the nest site. However, assessing reproductive parameters up to departure may not be good measures of subsequent recruitment to the population (Spear & Nur 1994). For example, the body mass of juvenile Common Guillemots at departure from the breeding colony is not related to survival neither in the Baltic Sea (Hedgren 1981) nor in the North Sea (Harris et al. 1992, Harris et al. 2007). Furthermore, in Brünnich's Guillemots Gilchrist & Gaston (1997) showed that factors at departure had great significance for juvenile survival. These factors, for instance cliff ledge characteristics and time the juvenile is separated from its parents, are expected to be equally important for Common Guillemots and Razorbills given that these species all have strategies intermediate between precocial and semiprecocial and that they have very similar breeding biology to Brünnich's Guillemots.

When juvenile Common Guillemots depart from the nest, they cannot fly as they have not yet developed flight feathers, only primary and secondary coverts (e.g. Sealy 1973, Gilchrist & Gaston

The breeding ledges 10 and 30 meters above the sea shore, and a young taking the leap and walking with a parent to the water.
Häckningshyllorna 10 och 30 meter över stranden samt en unge som just hoppar och sedan följer en förälder till vattnet.

1997). Common Guillemots typically breed in dense colonies, often on exposed cliff ledges where they lay a single egg that is incubated for 33 days (s.d. 1.4–2.1; Gaston & Jones 1998). Nest sites can be located several hundred meters above ground or water. A few days before the juvenile departs, adult provisioning rates decrease or even cease, causing the juvenile to slow growth and to lose weight (Birkhead 1977, Hatchwell 1991, Barrett 2010). When the juveniles depart, they are led to the sea by one of the parents, most likely the male (e.g. Varoujean et al. 1979, Gaston & Jones 1998). If nesting on high-lying sites, chicks jump while flapping their wings and spreading their webbed feet, thereby falling, or gliding if wind conditions are right. They conduct this jump either together with, followed by, or with the parent waiting below. When the parent and juvenile reunite, they swim close together out to sea, departing together from the breeding site (e.g. Sealy 1973, Harris & Birkhead 1985, Gilchrist & Gaston 1997, Gaston & Jones 1998). The parent cares for the juvenile for about two month after departure (Varoujean et al. 1979).

There are several factors affecting a juvenile's likelihood of survival at this stage (e.g. Gilchrist & Gaston 1997). Despite the fact that most juveniles depart after dark or when light intensity is at a minimum, there is still a risk of predation (Gaston & Jones 1998). Not all nest sites allow a clear way to the shore and there may be ledges below the breeding ledge hindering a clear jump. Failing to reunite with its parent after a jump has been shown to cause an increased risk of juvenile mortality (Gilchrist & Gaston 1997). There are two reasons for this. First, juveniles without parents experience higher predation rates by e.g. gulls. However, predation events are generally rare even when juveniles fail to reunite with their parent immediately (Gilchrist & Gaston 1997 and references therein). Second, adult birds sometimes form groups that mobs unattended juveniles and juveniles that are departing together with their male parent. In fact, Gilchrist & Gaston (1997) showed that only 76.3% of juvenile Brünnich's Guillemots reunited with their parents and departed safely to sea. As many as 23.7% did not reunite quickly enough and therefore died, of which 11% was due to predation and 89% due to conspecific aggressiveness. Adult aggressive behaviour towards juveniles is observed also in Common Guillemots (Greenwood 1964, Harris & Birkhead 1985, Gaston & Jones 1998, pers.obs.), but the occurrence and specific behaviour likely varies depending on colony characteristics. Gilchrist & Gaston (1997) determined that the most important factor influencing departure success was whether the chick immediately reunited with the male parent or not, as only 21% of the juveniles that were separated later reunited. If the breeding site is situated so that the juvenile must cross a long beach or slope, the importance of predation is elevated (e.g. Williams 1975, Hatch 1983, Gaston & Jones 1998 and references therein).

The Common Guillemot and Razorbills are found breeding in the Baltic Sea, and although studies have been conducted on the breeding biology in several colonies (e.g. Hedgren 1979, Österblom et al. 2001, Hjernquist & Hjernquist 2010), departure of Common Guillemot juveniles has never previously been studied in detail. Unlike Gilchrist & Gaston's (1997) study, where Guillemots were observed from a distance, thereby avoiding disturbance, most knowledge about departing Common Guillemots in the Baltic Sea comes from projects tagging the juvenile birds with individually marked metal rings at the beach while departing (e.g. Hedgren 1979, Österblom et al. 2001). The juvenile departure process has only been described in sparse detail at Baltic Sea breeding sites (e.g. Hedgren 1979, Österblom et al. 2001) and no observational studies without human disturbance have been published.

Here, we observed juvenile Common Guillemots departing from their nest sites at Lilla Karlsö where about 2500 pairs breed. Observations were made from a distance, not to disturb the birds. We describe the departure of juveniles and factors affecting their survival probabilities while departing.

Methods

The study was conducted at the island of Lilla Karlsö (N 57° 18.800', E 18° 3.800'; WGS 84), near the island of Gotland, which together with Stora Karlsö sustain the only bird cliffs with breeding auks in the Baltic Sea. Eight cliff ledges with more than 600 pairs of breeding Common Guillemots were observed from a distance in a hide or with remote cameras between 27 June and 5 July 2011, the peak days of departure this year. Observations were made between 1800 and 0200 hrs (GMT+1, summertime) as Common Guillemots starts to depart after 1900 hrs and usually stop after midnight in the Baltic Sea (Hedgren 1979, pers. obs.). Weather conditions at nights when juvenile Common Guillemot departs are characterized by calm waters and very little or no wind, which was the case for all observations in this study. Cliff ledges were situated between 10 and 30 meters above the water line and the rocky beach. All cliffs are vertical and situated either directly at the shoreline or less than 15 meters inland. Several hundred chicks departed each night and the waters below the cliff ledges were full of several hundred adults. We successfully followed 436 juveniles departing from a cliff ledge, to the shore or water, and observed them until they either died or successfully departed together with the male parent from the island out of sight of the observer. We collected data on the location of the Common Guillemot parent when the juvenile jumped from the nest site (classified as either together with the juvenile, on the beach, less than 5 meters out in the water if there was no shore, or more than 5 five meters from the shore), how quickly the juvenile and parent reunited (within one minute, within two minutes, or never), and survival rates of juveniles and causes of mortality during departure.

For more details about the study species and site, see Hjernquist & Hjernquist (2010) and references therein.

Results

The parent departed at the same time as the juvenile from the cliff ledge in 26 out of 436 times (6.0%). This occurred more often (18 out of 26) from ledges situated at the top of the cliff (i.e. 20 meters or higher, $\chi 2 = 3.95$, $P = 0.047$). However, in the majority of the departures (94.0%) the male parent first flew down before the juvenile jumped (410 out of 436) and they reunited very quickly, never exceeding one minute, if the chick survived the fall (99.5% within one minute or never separated, 0% within two minutes and 0.5% never reunited). In all observations when the parent flew down first (410), the parent sat on the beach directly underneath the nest site (84.4%, 346 out of 410) or in the case of no existing beach, in the water directly below the cliff ledge (15.6%, 64 out of 410). Not a single observation was made with an adult further out than five meters from the cliff/shore. In a few cases, adults were observed performing behaviours associated with juvenile departures without any juveniles leaving the nest site, causing the parent to fly back up to the cliff ledge within less than five minutes. It was not clear, judging from our observations, if those few adults actually had a juvenile on the cliff ledge or not. During the departure, both adult and juvenile called out to each other and when the juvenile reunited with its parent this was followed by distinct social behaviours such as circling each other and touching beaks. The parent then led the chick out to sea, swimming very close to each other and continuously socializing.

Two juveniles out of 436 died during the departure (0.5%). In both cases, death was due to hitting a cliff ledge a few meters down during the descent and thereby losing control over the jump. We assumed the juveniles to have died, as they were seemingly lifeless during the entire observational period that lasted for several hours. The survival rate during departure, measured as a juvenile leaving the colony and together with its parent, swimming out of sight (several hundred meters outside the colony), was very high (99.5%). No predation from gulls (*Larus* spp.) was observed even though approximately 50 pairs of Great Black-backed Gulls *Larus marinus*, 1200 pairs of Herring Gull *Larus argentatus* and 130 pairs of Lesser Black-backed Gulls *Larus fuscus* were breeding on the island within close proximity to the Common Guillemot colony.

Discussion

Nearly all observed juvenile Common Guillemots survived the jump of the breeding cliff, landed on the beach or directly in the water and thereafter departed successfully together with their parent. The mortality related to the actual jump was only 0.5%, similar to that in other colonies (1.3%) studied in the Baltic Sea (Hedgren 1979). The small differences are most likely due to variation in the likelihood of a clear jump among different cliff ledges and colonies. However, this is the first time survival rates during the entire departure process are estimated in the Baltic Sea and no comparisons between this study and other colonies in the Baltic Sea are therefore possible at this point. Juvenile Common Guillemot departure from the studied breeding colony closely resembles the description based on observations from other breeding sites outside of the Baltic Sea (e.g. Greenwood 1964, Sealy 1973, Varoujean et al. 1979, Harris & Birkhead 1985, Gilchrist & Gaston 1997, Gaston & Jones 1998). The juveniles were never separated from their parent for more than one minute; they either jumped together from the cliff ledge, or, more commonly, the parent flew down just before the chick jumped and waited for a very short time, before they were reunited and together departed from the breeding colony. Groups of adult birds that we observed aggregating on the water were not waiting for juveniles to jump, supporting observations from other colonies of both Brünnich's and Common Guillemots (e.g. Gilchrist & Gaston 1997, Greenwood 1964, Harris & Birkhead 1985, Gaston & Jones 1998 and references therein). It has been suggested that such groups can consist of sub-adult birds that are not breeding and adults that have failed or lost a juvenile (Gilchrist & Gaston 1997, Harris & Birkhead 1985). Although other studies have shown that such groups can attack juveniles and kill them (Gilchrist & Gaston 1997, Harris & Birkhead 1985), we did not observe any juveniles being killed by other adults, although we did frequently observe groups of adults harassing the parent and its juvenile while swimming away from the colony. The lack of mortality caused by conspecific aggressiveness is probably explained by juveniles not being separated from the adult parent, as well as due to groups of adults being relatively small, mostly fewer than ten birds. Gilchrist & Gaston (1997) showed that juveniles that had a defending parent could successfully and safely leave the colony and that only larger mobs of adults (more than ten individuals) could separate the juvenile from the parent. It is therefore likely that intrinsic factors, such as colony characteristics, as well as extrinsic factors affect the group size of mobs and mobbing behaviours, influencing juvenile survival at departure from the colony.

On Lilla Karlsö, gulls are the only potential predators of juvenile Common Guillemots; yet, no predation was observed. Absence of predation has been recorded at other colonies as well (Greenwood 1964), and could be explained by several factors. At Lilla Karlsö, it could be because juveniles were never separated from their male parent, although studies have shown that predation from gulls on unattended juveniles is very low and the success rate of gulls attacking juveniles is also very low (e.g. Gilchrist & Gaston 1997, Gaston & Jones 1998 and references therein). Williams (1975) showed that predation rates were lower when chicks jumped directly into the water (0.6–2.2%) compared to when they were hampered by difficult terrain (17.5%). Chicks on Lilla Karlsö either jumped directly into the water or onto the beach a few meters from the shoreline, which could be an additional explanation for the absence of predation.

The results presented in this study are based on data from 2011. The same pattern has been apparent in other years as well in the same colony (own observations). In conclusion, we found that juvenile Common Guillemots depart from the colony in a similar way to what is described in colonies outside of the Baltic Sea (Gaston & Jones 1998 and references therein). However, they do not depart according to the general description found in Swedish media and popular scientific literature. Common Guillemot departure is often described as an event where the male parent is waiting out at sea, up to several hundred meters away from the shore, and where the juvenile swims out and reunites with the male parent in the open water, sometimes several hours or the following day after jumping from the cliff ledge (e.g. Wirdheim 2008, Kihlberg 2011). We also observed a very high success rate of departing juveniles, probably due to juveniles never being separated from their parent. These results provide insights to factors affecting juvenile to adult survival and will therefore contribute to an understanding of the determinants of reproductive success and the dynamics of Common Guillemot populations in the Baltic Sea.

Acknowledgments

We would like to thank A. Rice, and two anonymous referees for helpful comments. The Swedish Society of Nature Conservation owns the island of Lilla Karlsö and this study is a part of the environmental monitoring program that is conducted there.

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Sammanfattning

När sillgrissleungarna lämnar sin boplats kan de inte flyga eftersom deras vingpennor ännu inte börjat växa ut och de har uppnått en vikt på endast 12–30% av en vuxens fågel (t.ex. Greenwood 1964, Sealy 1973, Gaston 1985, Gaston & Jones 1998). Om de häckar på en lågt belägen plats följer hanen ungen ut till vattnet och vidare ut till havs där han tar hand om ungen i ytterligare ca två månader. Om boplatsen är belägen högre upp måste ungen hoppa ner till marken eller vattnet, ett fall som i Östersjön kan vara på flera tiotals meter. Beskrivningen av hur denna process går till har inte tidigare studerats för sillgrisslor som häckar i Östersjön, men den beskrivs i media och populärvetenskapen som att hanen väntar ute på vattnet, ibland flera hundra meter ut, och att ungen och hanen återförenas där ute, ibland flera timmar eller dagen efter att ungen lämnade boplatsen (t.ex. Wirdheim 2008, Kihlberg 2011). I den här studien har vi studerat händelseförloppet och överlevnaden av ungar när de lämnar boplatsen på Lilla Karlsö. Tvärtemot den populärvetenskapliga beskrivningen är ungen och föräldern aldrig skilda från varandra i mer än högst någon minut. Ungen hoppar tillsammans med föräldern i 6% av fallen, men det varierar med boplatsens läge. I resterande 94% av fallen hoppar ungen själv efter det att föräldern en kort tid innan (15 sekunder till någon minut) flugit ner till stranden/vattnet direkt nedanför klippan. Ungen och föräldern återförenas direkt efter hoppet. Därefter har de ett socialt spel där näbbarna rör varandra och medan de simmar från häckplatsen stannar de ofta upp och simmar i cirklar runt varandra. Under sommaren 2011 då studien genomfördes var ungarnas överlevnad mycket stor då ingen predation noterades och de enda ungarna som dog gjorde det på grund av att de slog i en klipphylla i fallet och därmed föll okontrollerat till marken (2 av 436 observationer). Andra studier från Nordamerika har funnit att överlevnadschanserna för spetsbergsgrissleungar när de lämnar bolokalen är helt beroende av att ungen återförenas med hanen (Gilchrist & Gaston 1997). Om de skiljs åt är det bara 21 % som återförenas och de andra dör. Resultaten från denna studie är viktig eftersom överlevnaden under själva processen att lämna häckplatsen ofta är förbisedd, men är av stor vikt för häckningsframgången och för populationsdynamiska processer.

ORNIS SVECICA 22: 9–15, 2012

Impact on breeding birds of a semi-offshore island-based windmill park in Åland, Northern Baltic Sea

Effekten på den häckande fågelfaunan av en vindkraftspark på småöar på Åland, norra Östersjön

ANTTI TANSKANEN

Abstract

Breeding bird populations were monitored at a windmill park on Båtskär in southern Åland archipelago 2006–2011. The area is in the outer archipelago and consists of four islands holding six windmills. The operation of windmills started during fall 2007. An environmental impact assessment for the area was done in 2002. The area holds 850–1050 pairs of breeding birds annually. Two species had significantly decreasing trends, namely herring gull Larus argentatus (annual decrease 6.9 pairs, p=0.003) and lesser black-backed gull Larus fuscus fuscus (annual decrease 2.8 pairs, p=0.004). The reason for the decline of the herring gull population is unlikely to be related to the windmill park. However, the close proximity of a windmill to the breeding colony of lesser black-backed gull has most likely contributed to their decline. Some species like swallow Hirundo rustica, house martin Delichon urbicum and auks Alcidae have benefitted of the construction of the windmill park and utilize new small environments created by the construction.

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Received 17 November 2012, Accepted 6 February 2012, Editor : S. Svensson

Background

During the last decade, wind power has been built increasingly on land, shores and large islands, with a current trend to build more offshore parks. Semi-offshore building on small islands and islets is rare; only few areas in the world have such possibilities, as are found around Åland.

The effects of wind power on birds have been studied mainly in North America and Europe, and these studies have mainly dealt with the impact of small units having a nominal capacity of less than 1 MW. Studies have dealt with raptors (Carwin et al. 2011, Lucas 2008), breeding birds on farmland (Pearce-Higgins 2009) and wintering birds (Devereaux 2008, Larsen & Guillemette 2007). Some studies have concentrated on bird collision (Desholm et al. 2006, Hüppop et al. 2006, Petersen et al. 2006, Drewitt & Langston 2008). Effects on coastal breeding terns have been studied in Belgium (Everaert & Stienen 2007), but studies of breeding birds on small islands having large (>1 MW) wind turbines are lacking. In the Baltic Sea area studies from Sweden (Petterson 2005) and Denmark (Petersen et al. 2006) describe results from offshore parks.

Desholm (2007) presents a model to examine different species' sensitivity to increased mortality due to windmill parks. Although knowledge of the effects of wind power on birds is increasing, local conditions may result in very different effects on local and migrating bird populations.

Selecting sites for windmills should incorporate economical and ecological aspects (Haaren & Fthenakis 2011) and the cumulative impacts of several windmill parks must be assessed (Carrete et al. 2009, Masden et al. 2010). In these decisions making processes all available information on the risks of wind power to birds is valuable.

The aim of this paper is to present a summary of the results of breeding bird counts in a semi-offshore windmill park in the northern Baltic Sea, and discuss the impacts of windmills to breeding bird populations.

Windmills

The park consists of six Enercon E-70 2.3 MW units, with hub height 64 m and rotor diameter 70 m. In 2010, the electricity production was between

Figure 1. Map of the Båtskär archipelago with the location of the windmills.
Karta over Båtskärs öar och vindkraftverkens placering.

6.1–6.4 GWh per unit. The construction begun during autumn 2006 and the park was in production in late fall 2007. The area is one of the windiest in Finland and the dominant wind direction is from south west.

Area

The area consists of a group of five islands or islets, south of Åland in the Baltic Sea (lat 59° 57.736', lon 19° 57.384') at the edge of open sea (Figure 1). Baltic Sea is a brackish water area that has practically no tide. The smallest islet Österbådan (0.5 ha) is swept over in storms and has no breeding birds. Two smaller islets Ryssklubben (1.5 ha) and Kummelpiken (3.1 ha) have open rock, ground vegetation and small bushes in sheltered places. There is one windmill on both islets. On Kummelpiken there is a stone field on the south side and on Ryssklubben there is a small mire.

Lilla Båtskär (5.1 ha) has been heavily exploited by man. It had earlier a pilot station and an iron

Figure 2. View from the roof of the mine tower to north. In front Lilla Båtskär's harbor and in the background Stora Båtskär.
Vyn från gruvtornet mot norr. I förgrunden är Lilla Båtskärs hamn, i bakgrunden Stora Båtskär.

mine, which was built in the 1950s but operated only a couple of years. The island has a sheltered harbor with substantial breakwaters and a few service buildings: a large main building to host the pilot station on the top of the island and a 33 m high mine tower. Most of the island is altered by man, with gravel fields and exploded rock with some vegetation, bushes and single trees. On the west side there is open natural rock. The island is a popular leisure boating destination during summer due its excellent harbor (Figure 2). The windmill is placed on the south side of the island. During 2011 a new test place for smaller wind power units was built on the north-west shore of the island.

Stora Båtskär (15.3 ha) is clearly the biggest of the five islands. There is an old pilot station from the 20th century, which has recently been renovated and will later hold a museum. The island has higher rocks and deeper shores on the northern side and has sheltered bays on the southern side. There are some small skerries in the sound between Lilla and Stora Båtskär. The island has small ponds that partly dry in hot summer periods. There are large areas of mire and moor vegetation (such as heather and juniper scrub). Some sheltered places hold birches, common alders and rowans. Three windmills are located on the island, one at the east end, one at west end and one in the center on northern higher rocks. By the central windmill there is a switchgear station and open insulated wires connect two other windmills to it. Tracks for four-wheelers are built between the units, and these tracks run on the bare rock with wooden bridges leading over small gorges. The water areas around Stora och Lilla Båtskär belongs to a small nature reserve.

The area is surrounded by three shipping channels carrying traffic between Mariehamn in Åland, Turku in Finland and the rest of the Baltic Sea. The channel on the northern side runs through a narrow sound. Every time a large vessel passes the sound, heavy currents first suck water from the bays of Stora Båtskär and then the water flows back soon after the vessel has passed. Traffic of large vessels is responsible for most of the erosion on shores and sheltered waters in the Archipelago Sea, as there is no tide, and natural currents thus depend mostly on winds and air pressure.

As a control, a planned windmill park "Stenarna" 22 km NW from Båtskär was used. Stenarna is a group of six islands and islets. It is similar to Båtskär but the disturbance level due to boating etc. is very low and the islands are further apart.

Material and methods

We did bird counts three times a summer, in early May, June and July. The method was adapted from Hildén et al. 1991, with the exception that for each round, birds were counted early in the morning from the roof of the mine tower with a telescope and binoculars, and also walking around all islands. The tower count gave good estimates for black guillemots *Gepphus grylle*, razorbills *Alca torda* and sea ducks like velvet scooters *Melanitta fusca* and eiders *Somateria mollissima*, whereas waders, passerines, gulls and terns were best spotted from ground level. When calculating the results, the higher figure of each species was used. For most of the species, the number of pairs was counted by dividing the maximum number of adult individuals by two, which gives a good estimate. When extraordinary high numbers of birds was observed at one of the three visits, half of the highest count exceeding the second highest one was assumed to represent migrants or locals from nearby areas. We noted nests and broods of all species during the counts. We counted nests of eider, herring gull *Larus argentatus* and greater black-backed gull *Larus marinus* in May and lesser black-backed gull *Larus fuscus fuscus* in June. Bird carcasses around the windmills were monitored during all visits. The numbers of breeding pairs from year 2002 are from the EIA report (Anon. 2002). Båtskär were surveyed in 2002, and in 2006–2011. Stenarna (control) was surveyed in 2006 and in 2009–2011.

Linear regression was used to examine the effect of operation of the windmill park (operation=0 for years 2002, 2006–2007 and operation =1 for years 2008–2011), and year on changes in population sizes for bird species having at least one year with 20 or more pairs in the area (7 species). For the same seven species Mann-Kendall test for trends were calculated. The Bonferroni correction for significance level 0.05 resulted in a corrected level of 0.007. Shannon index was calculated ($-\sum p_i \ln p_i$, where p_i is the fraction of pairs of species i) for each year for the whole area and for all species. Analyses were made with SPPS 19 (IBM corp.) and R 2.11 (www.r-project.org).

Results

Båtskär

The total number of breeding pairs varied from 844 to 1047 (Table 1). The most abundant species during the survey period were black guillemot (307–398 pairs in 2002–2011), eider (188–229 pairs) and razorbill (149–210 pairs). These three species

Table 1. The number of breeding pairs in Båtskär windmill park. The years that the windmill park has been operating are marked with a grey background.
Antalet häckande par I Båtskärs området. De åren vindkraften har varit i gång är i tabellen märkta med grå bakgrund.

Year	2002	2006	2007	2008	2009	2010	2011
Eider	200	211	212	198	188	193	229
Wildfowl excl. eider	32	21	21	26	26	23	32
Waders *vadare*	10	9	5	6	5	4	6
Arctic skua *kustlabb*	1	1	1	0	0	0	0
Common gull *fiskmås*	116	51	60	61	62	62	81
Herring gull *gråtrut*	55	18	19	22	19	12	10
Lesser black-backed gull *silltrut*	49	47	37	40	30	28	26
Greater black-backed gull *havstrut*	4	2	1	1	1	1	1
Arctic tern *silvertärna*	51	37	35	28	15	24	68
Black guillemot *tobisgrissla*	337	355	398	352	333	307	333
Razorbill *tordmule*	165	210	196	195	175	149	190
Passerines* *tättingar*	27	47	52	44	44	41	37
Total	1047	1009	1037	973	898	844	1013
Breeding species *häckande arter*	29	26	28	28	27	26	25
Breeding species with five or more pairs *arter med fem eller fler par*	13	11	11	12	12	12	11
Shannon index	2.05	1.91	1.87	1.92	1.89	1.89	1.92

*Black grouse (0–1 pairs per year) is included in the numbers of Passerines. *Orre (0–1 par årligen) ingår i tättingarnas antal.*

covered 75–80% of all breeding pairs in the area. Common gull *Larus canus* was the most abundant gull (51–116 pairs) and arctic tern *Sterna paradisaea* (15–68 pairs) was the only tern breeding in the area. The commonest passerines were house martin *Delichon urbicum* (7–18 pairs) and swallow *Hirundo rustica* (4–16 pairs).

The black guillemots were breeding mostly in the stony breakwaters of the harbor of Lilla Båtskär, and to some extend also in man-made landing places on other islands. Most eiders bred on Stora and Lilla Båtskär. The razorbill utilized man-made landing places with large stone blocks and natural gorges and stone fields.

Regression analysis did not give any significant results when testing either before or after operation. Year was a significant predictor for one decreasing species, herring gull (B=-6.9, p=0.003). A simpler model with only year as predictor gave significant result also for lesser black-backed gull (B=-2.8, p=0.004). Mann-Kendall test for trends gave significant trend (decrease) only for lesser black-backed gull (tau=-0.905, p=0.007). The composition of the avifauna did not change during follow-up; Shannon index varied from 1.87 to 2.05, the number of breeding species was between 25 and 29 and the number of species with five or more pairs between 11 and 13.

Seven carcasses of birds that had collided with the windmills were found in four years: four herring gulls (two adults and two juveniles), two white tailed eagles *Haliaeetus albicilla* and one arctic tern. One crow *Corvus corone* cornix had clung to power lines between units on Stora Båtskär. Thus, the total number of observed carcasses due wind production was eight, two per year.

Stenarna

The control area Stenarna had a smaller number of breeding pairs (between 306–352 pairs). In Stenarna the most abundant species were black guillemot (120–156 pairs), arctic tern (50–103 pairs), eider (28–61 pars) and common gull (24–37 pairs). The razorbill was lacking from this part of archipelago (0–1 pairs yearly) and swallows and house martins were missing because there are no buildings.

Discussion

When trying to identify the effect of one specific factor, in this case of windmills, it is always possible that other factors may confound the results. Spring hunting on eider males was reintroduced in 2011 in Åland, and it is known from elsewhere that this kind of disturbance can have impacts on breeding site selection of eider females. But in Båtskär there was no hunting. Another factor could be a shift in human presence in general. But, as described above, all three most abundant species, the eider and the auks, clearly benefitted rather than suffered from human activities and/or constructions in the area. On Lilla Båtskär incubating females were very tame and used to humans working in the area. It seems that breeding close to buildings and even in buildings where human activities are often present protects incubating females from predation by white tailed eagles.

The decline of the herring gull colony on Båtskär can be related to the closing of the last rubbish tip in Åland on New Year 2006/2007. Rests of human food packages were commonly found in the colony in 2006, but in 2011 there were no signs of any usage of human waste in the colony. Another reason to decrease can also be that the large scale elimination of herring gulls at rubbish tips in the Finnish mainland has decreased the number of new recruits in Åland. Systematic elimination of herring gulls has led to a clearly decreasing population for example at the Gulf of Finland (Hario et al. 2009). Ringing recoveries have shown, that many first summer herring gulls move from Åland towards east and visit these rubbish tips during late summer and autumn before migration to wintering areas.

The lesser black-backed gull colony is close to the windmill on Kummelpiken but did not change its place due to construction. However, there were two strong declines, one by 21% in 2007 and another by 25% two years later. Then decline has continued but at a lower rate. The decline of this species cannot be explained by the closure of the rubbish tips since no food rest were found in the colony in any years. It is possible that some pairs did not adapt to the windmill and moved to other colonies. Observing the colony from the Lilla Båtskär's mine tower did not show any disturbance due to windmill and no lesser black-backed gull carcasses were found in 2008–2011. There was no construction work going on where the lesser black backed gulls breed during the breeding season 2007 and thus possible impact on breeding population may have come from work on other islands.

When looking at the total number of breeding pairs and their relative changes there was some decline in both areas in 2009 and 2010 and increase in 2011 (Figure 3). This suggests that reasons for changes may be outside these limited areas of the archipelago, possibly wintering conditions or

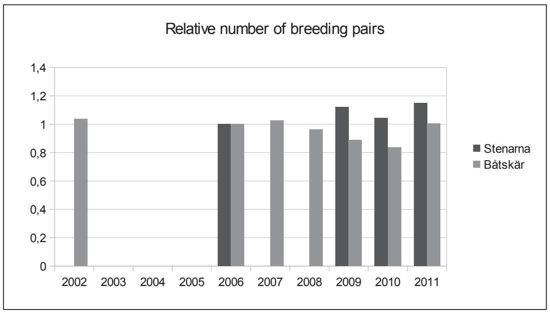

Figure 3. The relative number of breeding pairs, 2006=1. *Det relativa antalet häckande fågelpar; år 2006 motsvarar ett.*

breeding success of these species in larger areas during earlier seasons. The winters 2009–2010 and 2010–2011 were cold in northern Europe and the ice cover of the Baltic Sea was more extensive than for years (240 000 km2 in 2009–2010 and 315 000 km2 in 2010–2011; www.itameriportaali.fi). This may have caused some increased mortality to overwintering birds in the Baltic Sea. Almost all black guillemots and razorbills overwinter in the Baltic basin.

Carcasses were sought only during three breeding bird counts and thus the number of found carcasses is a clear underestimate of real deaths due to collisions (Krijgsveld et al. 2009, Huso 2011). In this part of the outer archipelago there were no observations of foxes or other mammals which eat carcasses during 2006–2011. Thus carcass removal is limited to birds, mainly to larger gulls, crows, ravens *Corvus corax* and white tailed eagles. The landscape is fairly open and not too difficult for searching for carcasses. Smaller carcasses like small passerines disappear faster than for example gulls of which some remains are found long after death. The carcass search covered spring and early summer, but one carcass search should have been done in late summer after the breeding season. The results show that collision is not a major threat for local breeding birds. The first collided white tailed eagle was a second calendar year bird from Sweden and the other was a 15 years old bird born in the Archipelago Sea, Finland. Both birds are assumed transients, not local birds.

Conclusions

This case shows that building wind power close to bird colonies can have relatively low negative impacts on local breeding avifauna. The local wildfowl fly very low close to colonies and the three most abundant species in Båtskär, black guillemot, eider and razorbill, are not in significant risk for collision. Gulls and terns show larger collision risk and this risk becomes active especially during sudden disturbances like boaters walking on islands with unleashed dogs or during white tailed eagle's hunting. During normal operation and weather conditions, local gulls and terns seem to avoid rotating blades well.

Disturbance and habitat loss may have caused the decline of lesser black-backed gull, a species that is classified as vulnerable in Finland (Mikkola-Roos et al. 2010). The building of this windmill park has also created some new small environments like sand roads, stony landing places and restoration of old houses. These activities have been beneficial at least for auks, eiders, swallows and house martins. The coin has always two sides and careful planning can increase the positive effects while diminishing the negative ones. Long follow-up studies are needed to discern any long term effects of wind power production.

Acknowledgements

I want to thank Kari Auranen, Peter Adrian and Rauno Yrjölä for valuable comments to the manuscript and Anki Aaltonen for proofreading Swedish text. I also thank for all that helped in the fieldwork, especially Risto Aalto and Sakari Tanskanen. This work was done according the follow-up program given by local authorities.

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Sammanfattning

Jag följde den häckande fågelfaunan i Båtskärs vindkraftpark i Ålands yttre skärgård mellan 2006 och 2011. Området består av fyra holmar på vilka det årligen häckar 850–1050 par fåglar. Området undersöktes också år 2002 för MKB. Två arter uppvisade signifikant minskning i området; gråtrutens stam minskade från 55 par 2002 till 10 par

2011, en årlig minskning med 6.9 par, p=0,003. Orsaken till gråtrutens minskning var sannolikt stängningen av Mariehamns soptipp i Ödanböle, Jomala och dödandet av trutar vid flera soptippar på fastlandet i Finland. Silltruten minskade från 49 par 2002 till 26 par 2011, en årlig minskning med 2,8 par, p=0.004. Orsaken till silltrutens nedgång var troligen byggandet av ett vindkraftverk nära silltrutkolonin. Möjligen har en del trutar lämnat kolonin efter bygget startade men sen dess har stammen varit ganska stabil. En del av arterna har gynnats av byggandet, sådana arter är till exempel hus- och ladusvalor, ejder samt tobisgrissla och tordmule. Dessa arter utnyttjar de nya omgivningarna som exempelvis grusfält, stenpirar och renoverade byggnader och det skydd, exempelvis mot havsörn, som mänskans närvaro ger. Som helhet har byggande av vindkraftparken haft både för- och nackdelar för den häckande fågelfaunan.

Incestuous broods of the Whooper Swan *Cygnus cygnus* in Poland

Häckning av syskonpar hos sångsvan Cygnus cygnus *i Polen*

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Abstract

We describe a rare case of incestuous broods of Whooper Swan *Cygnus cygnus* in Świętokrzyskie province, Poland. A sibling pair laid eggs and hatched young at the same site in 2010 and in 2011, nine kilometres from their own hatching place. Both broods were unsuccessful; the young died before autumn. We assume that the key factors explaining the inbreeding were the small local population and that Whooper Swans tend to disperse over short distances.

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Received 26 January 2012, Accepted 23 March 2012, Editor : S. Svensson

Incestuous broods have been recorded in a number of bird species (e.g. Nestler & Nelson 1945, Greenwood et al. 1978, Shaw & Dowell 1989). Several cases of incestuous breeding have been documented in Mute Swan *Cygnus olor* (Coleman et al. 1994, 2001), but only very few in Whooper Swan *Cygnus cygnus* (Dudzik et al. 2010).

Two incestuous broods of a sibling pair of Whooper Swan were recorded in Poland in 2010 and 2011. On 15 May 2010 a female on the nest with the male in the neighbourhood were found in the Chycza ponds (50°42'28.37"N, 20°5'46.69"E), about 45 km south-west of Kielce. Both parents were still seen together on 3–24 October. The same pair bred again at the same site in 2011. The female with a nest and a male were recorded on 16 May. Both broods were unsuccessful. During the 2010 breeding season three cygnets aged 3–5 days were noticed with the breeding pair on 15 June. Only one survived to the late summer and was ringed with a metal ring (AH 0450 Gdańsk) on 8 August, but it did not survive to the autumn. In the following season, the pair with three nestlings was seen on 5 June 2011. One of the cygnets was ringed on 31 July. It was too small for holding the neck collar and was ringed only with a metal ring (AH 0436 Gdańsk). The other young were marked with yellow neckbands: 0T80 (female) and 0T81 (male) on 7 September 2011. During the autumn only two nestlings were still present and both were found dead on 15 October (one probably killed by a mammal predator).

The inbred cygnets were also weighted (mean weigh = 3.6 kg), AH 0450 – 2,9 kg on 8 August 2010, AH 0436 – 2.8 kg on 31 July 2011 and 0T81 – 4.6 kg, 0T80 – 4.1 kg on 7 September 2011. The mean weight of non-inbred cygnets measured at the ponds in the neighbourhood in 2004–2011 between 22 July and 22 August was 5.1 kg ± 0.73 (mean ± standard deviation), and they were significantly heavier ($n_{non\text{-}inbred} = 24$; t-test for single mean: $t = 9.81$, $df = 23$, $p < 0.001$).The incestuous pair occupied a large reed belt in the pond, rarely visited by the people. The pond was surrounded by woodland.

Identification of the pair as being incestuous was possible because both birds had been marked with metal rings and yellow neck collars – male in 2005 (3R26) and female in 2006 (3R73) at Bałków (50°43'26.42"N, 19°58'43.30"E), nine km west from the Chycza ponds. They were known to have the same parents, namely a breeding pair that had been marked with yellow neck collars in 2004 and 2005 in this site as well (male – 3R04 ringed by R. Włodarczyk, and a female – 3R30 ringed by K. Dudzik).

The data were collected in 2007–2011 as a part of the State Monitoring Programme (Monitoring of Rare Species), organised by the Inspection for Environmental Protection and funded by the National Fund for Environment Protection and Water Management.

The breeding population of Whooper Swan was declining in the19th and 20th century in many European countries (except Russia and Iceland). However, since the 1950s a reverse trend has been noted and the population continues to spread southward (Boiko & Kampe-Persson 2010). The Polish breeding population size was estimated at 53–68 pairs in 2009 (Dudzik et al. 2010) and it still increases (Sikora & Wieloch 2011). In Świętokrzyskie province, where the incestuous pair was breeding, the Whooper Swan population was calculated to be 4 pairs (Dudzik et al. 2010). In this population, the birds leave the breeding sites for a couple of months in the winter to east Germany and west Poland where they winter together with other swans from rather wide areas (own ringing data, unpublished). Whooper swans appear to mate during the winter as well as in staging areas prior to their arrival in the wintering sites or in moulting areas (Brazil 2010). According to our ringing data, male 3R26 and female 3R73 spent the winter times in different areas until 2009. The first time they were seen together at Chycza ponds was on 22 March 2010. They probably mated at the winter site because before that time both birds were seen separately (female 3R73 on 13 December 2009 and male 3R26 on 6 December 2009).

Incestuous broods result in reduced fitness due to increased genome homozygosity (inbreeding depression) of the offspring, thus the natural selection should prefer behaviour which excludes the possibility of inbreeding (Pusey & Wolf 1996). Inbreeding in birds is normally reduced by natal dispersal (Szulkin & Sheldon 2008) and kin discrimination based on familiarity and experience (Wheelwright et al. 2006), as well as phenotypical cues correlated with genetic dissimilarity (Mays & Hill 2004). In spite of two breeding attempts with successful hatching, no young survived the first autumn. We observed evidence of inbreeding depression in the appearance of the young. They were much lighter and smaller compared to other non-inbred cygnets of Whooper Swan, and we consider this failure to grow properly to be a possible consequence of inbreeding depression. In our case, the key factors of inbreeding could be the small local population and short-distance pattern of dispersal (7 records of the Polish birds, mean value19.9 km, range 0–46 km; M. Wieloch, S. Czyż & K. Dudzik, unpubl. data). The same factors can incur hybrid broods with the Mute Swan (Bałdyga et al. 2003, Dudzik et al. 2010).

Acknowledgement
We are very grateful to Joanna Przybylska for the language corrections to the manuscript, as well as for Maria Wieloch and Stanisław Czyż for important comments to the manuscript.

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Sammanfattning

Parbildning av incesttyp har observerats hos många fågelarter. Flera fall har rapporterats hos knölsvan, men mycket få hos sångsvan. Vi rapporterar här om ett syskonpar av sångsvan som häckade och kläckte fram ungar i en damm nära Kielce i Polen åren 2010 och 2011. Att de två fåglarna verkligen var syskon visste vi tack vare att båda liksom deras föräldrar var märkta med både fotringar och halsringar. Föräldrarnas häckningsplats, dvs. syskonparets kläckplats, låg på ett avstånd av nio kilometer. Trots att sångsvanen har spritt sig söderut är de fortfarande sällsynta i denna del av Polen. Endast fyra par uppskattas häcka i provinsen och i hela Polen är beståndet 53–68 par.

Syskonparet fick ut ungar båda åren men inga ungar överlevde till hösten. Ungarna hade dålig tillväxt och vägde avsevärt mindre än icke inavlade ungar från trakten. Det är känt att ungar som är inavlade har sämre förutsättningar än utavlade ungar på grund av att deras arv blir mera homozygotiskt, och vi misstänker att detta kan ha varit en bidragande orsak till de misslyckade häckningarna. Trots att sångsvanarna från det aktuella området vintertid vistats tillsammans med andra svanar i östra Tyskland och västra Polen, bildade de således ett syskonpar. Första gången de sågs tillsammans var på häckningslokalen i mars 2010. Dessförinnan hade de observerat på olika vinterlokaler i december 2009. Att det blev en syskonhäckning tror vi beror på att det lokala beståndet är så litet att det inte fanns några främmande svanar att välja på när de återvände utan att ha bildat par på vinter- eller rastlokalerna.

ORNIS SVECICA 22: 19–24, 2012

A Blue Tit *Cyanistes caeruleus* population: its recent increase and breeding data

En blåmespopulation under 60 år: dess sentida ökning samt häckningsdata

KARL-GUSTAV SCHÖLIN & HANS KÄLLANDER

Abstract

Before 1983, Blue Tits *Cyanistes caeruleus* never made up more than four pairs of the breeding population in a nestbox study carried out in South Central Sweden. From five breeding pairs in 1983, the population increased to 29 pairs in 2007 and remained high to the end of the study in 2011. Mean laying date was strongly correlated with mean April temperature, which increased during 1983–2011. During the same period mean laying date became nearly ten days earlier. Mean clutch size was 9.90 eggs but varied both within and between years and showed a negative relationship to population size. The mean number of fledglings varied strongly between years, partly because of predation but also due to nestling starvation.

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Received 4 January 2012, Accepted 10 April 2012, Editor : S. Svensson

Introduction

The Swedish Blue Tit *Cyanistes caeruleus* population has increased by c.30 to 50 percent during the last 30 years (Ottvall et al. 2009) and the species has also spread northwards so that it now breeds not only along the northern Baltic coast but also in inland villages north of the Arctic circle (http://www.artportalen.se). In the present study, we show how this recent population increase is reflected in data from a nestbox study in South Central Sweden spanning a little more than 60 years. We also report data on laying date, clutch size and breeding success. In two earlier papers (Schölin 2009, Schölin & Källander 2011), corresponding data on Great Tits *Parus major* and Pied Flycatchers *Ficedula hypoleuca* from the same study plot have been presented.

Study area and methods

The study area has been described in Schölin (2009) and Schölin & Källander (2011). In short, 80 nestboxes were put up prior to the breeding season in 1948 over a large area of mixed deciduous-conifer forest some 5 km to the SE of Örebro, South Central Sweden (59° 14' N, 15° 13' N). Boxes were placed about 40–50 m apart at a height of at least 2 m, many of them at forest edges and at small clearings. The boxes had an entrance hole with a diameter of 30 mm, a bottom area of c.110 cm^2 and their base was about 16 cm below the lower rim of the entrance hole. Most were wooden boxes while about a third were hollowed-out tree trunks. Boxes were checked about once a week during the breeding season, sometimes somewhat less often. Clutch initiation date was back-calculated assuming the laying of one egg a day. The number of nestboxes varied during the course of the study from a maximum of 100 in 1951 to a lowest figure of 58 in 1961, but was mostly 60–70. The number of available nestboxes clearly could influence the number of pairs, but since Blue Tits are the earliest of the species after the Coal Tit *Periparus ater* to start breeding, and the Coal Tits were very few in each year (max 6 pairs), below we use the uncorrected number of pairs in the analyses. All data refer to first broods. Temperature data were taken from SMHI's weather station at Örebro, some 5 km to the north-west.

Results

The Blue Tit population

During 1948–1982, there were never more than four pairs of Blue Tits breeding in the nestboxes in any one year. However, from 1983 (5 pairs) the

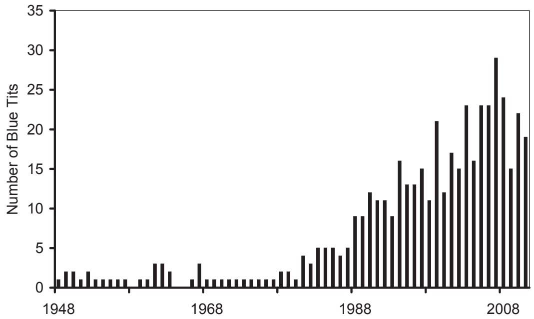

Figure 1. The number of Blue Tit pairs during 1983–2011.
Antal blåmespar 1983–2011.

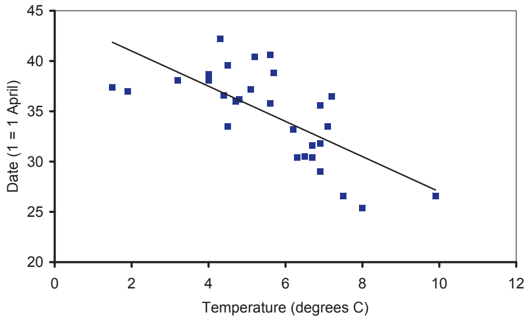

Figure 2. The relationship between Blue Tit mean laying date and mean April temperature.
Sambandet mellan medeldatum för blåmesarnas första ägg och medeltemperatur i april.

population increased to a top record of 29 in 2007, after which it varied from 15 to 24 pairs during the remaining four years (Figure 1).

Laying date

Mean laying date (mean of the means) was 8.8 May for the period 1948–1982 (N = 32 years, no Blue Tits in some years) vs 4.7 May during 1983–2011 (29 years). Because only none to four pairs bred each year during 1948–1982, here we analyse only data collected from 1983 onwards. Mean laying dates were strongly related to mean April temperature ($Y = –1.75X + 44.49$, $R^2 = 0.49$, df = 27, $P<0.001$, Figure 2) and became earlier during the period ($Y = –0.34X + 39.85$, $R^2 = 0.42$, df = 27, $P<0.001$, Figure 3). This earlier laying corresponded to an increase in mean April temperature during the same years ($Y = 0.14X + 3.46$, $R^2 = 0.45$, df = 27, $P<0.001$, Figure 4). The earliest clutch was started on 17 April (2007, 2009).

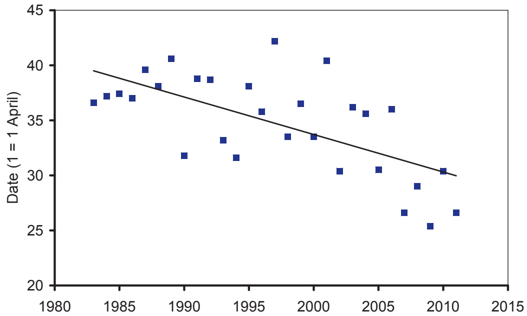

Figure 3. Mean Blue Tit laying dates during 1983–2011.
Medeldatum för första ägg hos blåmesarna 1983–2011.

Clutch size

The overall mean clutch size was 9.90 eggs (N = 461 clutches). Mean clutch size varied from 8.55 in 1991 to 10.73 in 1998. Individual clutches varied from 3 to 15 eggs (Table 1), with clutches of 10 eggs being most frequent followed by those of nine eggs. Mean clutch size showed a negative relationship with population density ($Y = –0.04X + 10.28$, $R^2 = 0.22$, df 27, $P<0.01$), but not with laying date or mean April temperature. Within years, clutch size decreased with the progress of the season in some but not in most years.

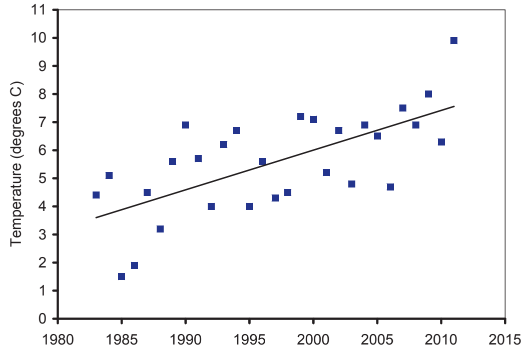

Figure 4. Mean April temperatures during 1983–2011 at Örebro, South Central Sweden.
Medeltemperatur för april åren 1983–2011.

Breeding success

When all clutches are included, i.e. also clutches from which no young fledged, an unweighted mean for all years was 6.73 fledged young per breeding attempt, while the lowest mean number of fledglings was 4.06 in 1994. The corresponding mean for clutches that produced at least one young was 7.91 and the lowest figure was 5.00 in 1991 (Table 2). Twenty-two nests were totally depredated by Pine Marten *Martes martes* during 1989 to 2010, while in another nine nests 38 young out of 124 (36%) survived marten attacks (Table 3). However, also in some years without marten predation, many broods produced few fledglings, apparently because of nestling starvation. Thus in 1991, from three clutches (22 eggs) only three young fledged, and in 2003 only 18 young fledged from five clutches (67 eggs).

Discussion

This study provides data on the increase of the Swedish Blue Tit population that has occurred during the last three decades. These data suggest that the increase may have been even stronger than that recorded in the point counts of the Swedish Bird Monitoring Programme (Ottvall et al. 2009). Also Svensson et al. (2010) recorded an increase from a mean of 3.07 pairs during 1953–1982 to 7.85

Table 1. Number of Blue Tit clutches of different sizes during 1948–1982 and 1983–2011 together with mean clutch sizes.
Antal blåmeskullar av olika storlek samt medelkullstorlek 1948–1982 och 1983–2011.

	No. of clutches with 3, 4, 5, etc. eggs *Antal kullar med 3,4,5, etc. ägg*													No. of clutches *Antal kullar*	Mean clutch size *Medelkull*
	3	4	5	6	7	8	9	10	11	12	13	14	15		
1948-1982							6	16	18	8	1			49	10.63
1983							1	3	1					5	10.00
1984							1	2	1	1				5	10.40
1985						1	1	2	1					5	9.60
1986							1	1	1	1				4	10.50
1987							2	2	1					5	9.80
1988							1	5	3					9	10.22
1989						1	3	2	1	1	1			9	10.11
1990						1	4	5	2					12	9.67
1991			1	1		2	4	2	1					11	8.55
1992					1		4	3	2		1			11	9.82
1993						2	1	2	3	1				9	10.00
1994					2	3	4	3	3	1				16	9.31
1995							3	5	3	2				13	10.31
1996						2	3	1	4	2			1	13	10.46
1997					1	1	5	4	3	1				15	9.67
1998							2	3	2	4				11	10.73
1999					1	4	4	7	4			1		21	9.67
2000						3	2	4		2	1			12	9.92
2001				1		1	5	7	2	1				17	9.59
2002					1		4	6	2	1	1			15	10.00
2003				1	1	2	10	6		2		1		23	9.43
2004			1	1	1	3	4	6						16	8.63
2005					4	3	6	7	1	2				23	9.17
2006			1	1	4	2	5	7	1	2				23	8.91
2007					1	2	9	12	4	1				29	9.66
2008					2	5	5	8	4					24	9.29
2009					1	2	2	3	5	2				15	10.00
2010					2	2	4	5	6	3				22	9.91
2011	1		1		1	2	2	8	2		2			19	9.32
Total	1		4	5	23	44	108	160	79	36	7	2	1	461	9.90

Table 2. Number of Blue Tit broods from which zero, one, two, three, etc. young fledged and mean number of fledglings from all broods (1) and from broods where at least one young fledged (2). Total number of broods 470.
Antal blåmeskullar från vilka ingen, en, två, tre, osv. ungar blev flygga samt medeltalet flygga ungar från alla kullar (1) och från kullar där minst en unge blev flygg (2). Totalt antal kullar 470.

	Number of fledged young *Antal flygga ungar*																Mean fledged young (no. of broods) *Medeltal flygga ungar (antal kullar)*	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total	(1)	(2)
1948-1982	2						1	1	6	20	18	2				443	8.86 (50)	9.23 (48)
1983					1				2		2					40	8.00 (5)	8.00 (5)
1984									1	2	1	1				47	9.40 (5)	9.40 (5)
1985	1							1		2	1					35	7.00 (5)	8.75 (4)
1986	1									2			1			30	7.50 (4)	10.00 (3)
1987	1					1			2	2						39	6.50 (6)	7.80 (5)
1988									2	3	4					83	9.22 (9)	9.22 (9)
1989	1								1	3	2	1	1			78	8.67 (9)	9.75 (8)
1990		1						1	2	5	1	2				101	8.42 (12)	8.42 (12)
1991	1	1	1		2	1	3		2							50	4.55 (11)	5.00 (10)
1992	3			1				2	1	2	1	1				64	5.82 (11)	8.00 (8)
1993	3			1				1	1	1	2					47	5.22 (9)	7.83 (6)
1994	8				1	1		2	2	1	1	1				69	4.06 (17)	7.67 (9)
1995	3	1				1	2	1		2	3					73	5.62 (13)	7.30 (10)
1996							2	1	3	2	3		1		1	117	9.00 (13)	9.00 (13)
1997	4				1	1		1	3	2	2	1				89	5.93 (15)	8.09 (11)
1998	2	1								4	2	1	3			104	8.00 (13)	9.45 (11)
1999	2					1	2	1	5	4	4	1		1		164	7.81 (21)	8.63 (19)
2000	2							2	1	2	3		2			94	7.83 (12)	9.40 (10)
2001	5		1	2		2	1	1	3	3	1					92	4.84 (19)	6.57 (14)
2002	3				2		2	1	2	3	2					90	6.00 (15)	7.50 (12)
2003	6			1	2	3	1	5	3	2						109	4.74 (23)	6.41 (17)
2004	3		1	1	1			3	3	2	2					92	5.75 (16)	7.08 (13)
2005	1		1		1	3	1	3	5	6	2		1			174	7.25 (24)	7.57 (23)
2006	5			2	1		2	4	3	3	2	1				132	5.74 (23)	7.33 (18)
2007	6	1	3		2	5		4	5	4						144	4.80 (30)	6.00 (24)
2008	1		1	1		2	1	5	6	3	3	1				172	7.17 (24)	7.48 (23)
2009	2					2	1		3	3	2	2				109	7.27 (15)	8.38 (13)
2010	3	1					1	3	3	4	6	1				159	7.23 (22)	8.37 (19)
2011	1		2	1	1	3	1	3	1	3	2			1		122	6.42 (19)	6.78 (18)

pairs during 1983–2009 in Fågelsångsdalen, a 13 ha wooded stream valley near Lund, South Sweden. The increase during the last three decades is most likely an effect of a warmer climate, especially during the winter months. Also the Blue Tit's northward expansion of its breeding range during the same period supports this hypothesis even though a more widespread winter feeding cannot be completely ruled out (Ottvall et al. 2009). Both in the Netherlands and in Finland Blue Tit populations have shown an upward trend since the 1960s. This trend is strong in the material from the Finnish winter bird census (Hildén 1990). In the Netherlands, the trend was present in two mixed forests, where Blue Tit density was low, but not in two high density oak woods (van Balen & Potting 1990). In the present study, however, Blue Tits were few until the early 1980s.

Mean laying date was about four days later in 1948–1982 than in 1983–2011, but became successively earlier by almost 10 days from 1983 to the end of the study. This earlier laying coincided with a positive trend in April temperatures in agreement with a close association between laying date and ambient temperature.

The mean clutch size (9.90 eggs) was somewhat lower than in a study in southern Finland (11.23 eggs, with a span from 10.71 to 11.81 eggs; Hildén 1990) and in Estland (11.3; listed in Glutz & Bauer 1993), both studies at comparable latitudes to Örebro. Clutch size in Blue Tits seems to be influenced by breeding habitat, as discussed in Glutz & Bauer (1993), who also present data on clutch sizes from various parts of Europe and North Africa.

Productivity, i.e. mean number of fledglings, was low in many years. This was partly the result of predation by martens but was also caused by nestling starvation and desertions. The latter two factors may indicate that the habitat was sub-optimal for Blue Tits, with a relatively high proportion of conifers and with the broad-leaved trees and shrubs dominated by birch *Betula* spp., aspen *Populus tremula*, alder *Alnus glutinosa* and rowan *Sorbus aucuparia.* Oak *Quercus robur*, which seems to be the most important tree for Blue Tits in the British Isles (Perrins 1979) and in continental Europe (Glutz & Bauer 1993), was absent in the area.

Table 3. Pine Marten predation of Blue Tit broods at Lövsätter during 1989 to 2010. The right column presents partial predation.
Mårdpredation på blåmeskullar vid Lövsätter 1989–2010. Den högra kolumnen redovisar partiellt predérade kullar.

Year	No. of totally depredated nests *Totalförluster av ungkullar*	No. of young taken (original brood size) *Antal tagna ungar (ursprungligt antal)*
1989	1	8 (11)
1993	3	
1994	5	6 (10)
1995	3	5, 4, 6 (10, 10, 9)
1997	3	5, 7 (9, 12)
1998	1	
2000	1	
2006	1	5 (8)
2007	1	
2008	1	2 (7)
2010	1	
Total	21	48

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Sammanfattning

Den svenska blåmespopulationen har ökat med 30–50 procent under de senaste tre decennierna (Ottvall m.fl 2009) och arten har också spritt sig norrut så att den numera häckar inte bara längs Östersjökusten utan också i byar i inlandet norr om polcirkeln (http:/www.artportalen.se/birds). I följande sammanställning visar vi hur denna sentida populationsökning speglas i data från en holkstudie i Mellansverige som spänner över mer än 60 år. Vi rapporterar också data om läggdatum, kullstorlek och häckningsframgång. I två tidigare uppsatser (Schölin 2009, Schölin & Källander 2011) har vi presenterat motsvarande data för talgoxe *Parus major* och svartvit flugsnappare *Ficedula hypoleuca.*

Studieområde och metoder

Studieområdet har beskrivits i Schölin (2009) och Schölin & Källander (2011). I korthet sattes 80 holkar upp inför häckningssäsongen 1948 i en blandskog av barr- och lövträd cirka 5 km SO om Örebro. Holkarna placerades med 40–50 m mellanrum på minst 2 m höjd i träden, många av dem i skogsbryn och gläntor i skogen. Holkarna hade ett ingångshål om 30 mm diameter, en bottenyta av cirka 110 cm^2 och holkbotten var ungefär 16 cm under ingångshålets nedre kant. De flesta holkarna var vanliga brädholkar, men cirka en tredjedel utgjordes av urholkade stammar. Holkarna kontrollerades ungefär en gång i veckan under häckningssäsongen, ibland något mindre ofta. Datum för

första äggets läggande bestämdes genom att räkna bakåt från iakttaget äggantal under antagande att ett ägg lagts per dag. Antalet holkar varierade under studiens gång från ett maximum av 100 1951 till det lägsta antalet, 58, 1961, men var vanligen 60–70. Antalet tillgängliga holkar kan givetvis påverka antalet par, men eftersom blåmesen är den art efter svartmesen *Periparus ater*, som påbörjar häckningen tidigast, och svartmesarna var mycket få varje år (max 6 par), har vi i analyserna nedan använt okorrigerade siffror för antalet par. Temperaturdata har tagits från SMHI:s väderstation i Örebro, ungefär 5 km nordväst om studieområdet.

Blåmespopulationen

Under åren 1948–1982 häckade inte under något år mer än fyra par blåmesar i holkarna. Från och med 1983 (5 par) ökade emellertid populationen till rekordantalet 29 par 2007. Därefter varierade antalet från 15 till 24 par under de följande fyra åren (Figur 1).

Läggdatum

Medeldatum för första ägget läggande 1948–1982 (32 år) var den 8,8 maj mot 4,7 maj 1983–2011 (29 år). Eftersom bara noll till fyra par häckade varje år under perioden 1948–1982, så analyserar vi här endast data från och med 1983. Medeldatum för första ägget var starkt relaterat till medeltemperaturen under april och lades 1,75 dagar tidigare för varje grads temperaturökning (Figur 2). Äggläggningsstarten blev allt tidigare under perioden (c.10 dagar, Figur 3) i takt med en ökning av den genomsnittliga apriltemperaturen (Figur 4). Den tidigaste kullen startades den 17 april (2007, 2009).

Kullstorlek

Kullstorleken, baserad på alla kullar, var i medeltal 9.90 ägg (N = 461 kullar) och varierade från 3 till 15 ägg (Tabell 1), med 10-äggskullar som de vanligast förekommande, följda av kullar med nio ägg. Medelkullstorleken minskade något (med 0.04 ägg) med ökande antal par men inte med medelläggdatum eller genomsnittlig apriltemperatur. Under vissa år minskade kullstorleken allt eftersom säsongen framskred, men oftast inte.

Häckningsframgång

När alla kullar inkluderas, dvs också kullar från vilka inga ungar blev flygga, var det ovägda medelantalet flygga ungar 6,73. Det lägsta antalet flygga ungar noterades 1994 med i medeltal endast 4,06 flygga. Motsvarande för kullar där minst en unge blev flygg, var 7,71 och den lägsta siffran (5,00) noterades 1991 (Tabell 2). Mellan 1989 och 2010 tog mård samtliga ungar i 22 bon, medan i ytterligare nio bon 38 ungar av 124 (36%) överlevde mårdpredationen (Tabell 3). Men också vissa år utan mårdpredation producerade många kullar få ungar, uppenbarligen på grund av svält. Sålunda gav 1991 22 ägg (tre kullar) endast upphov till tre flygga ungar, och 2003 blev bara 18 ungar flygga från 67 ägg (fem kullar).

Diskussion

Denna studie presenterar data som illustrerar den ökning av den svenska blåmespopulationen som skett under de senaste tre decennierna. Data antyder att ökningen kan ha varit ännu starkare än vad som dokumenterats med hjälp av punktrutterna i det svenska fågelövervakningsprogrammet (Ottvall m.fl. 2009). Också Svensson m.fl. (2010) registrerade en ökning från i medeltal 3,07 par 1953–1982 till 7,85 par 1983–2009 i Fågelsångsdalen, en 13 ha stor skogklädd bäckdal nära Lund. Ökningen under de senaste tre decennierna är högst sannolikt en effekt av ett varmare klimat, speciellt under vintermånaderna. Också expansionen av blåmesens häckningsområde norrut under samma period stöder denna hypotes även om en alltmer utbredd vintermatning inte helt kan uteslutas (Ottval m.fl. 2009).

Kullarnas första ägg lades under perioden 1948–1982 ungefär fyra dagar senare än under 1983–2011. Den senare perioden kännetecknas dock av en klar trend mot tidigare läggning, med en nästan 10 dagar tidigare läggstart i slutet än i början av perioden. Denna tidigare läggstart sammanföll med en signifikant trend mot högre apriltemperaturer.

Medelantalet flygga ungar var relativt lågt många år. Detta var delvis ett resultat av mårdpredation men orsakades också av att ungar svalt, samt av övergivningar (mest av nykläckta ungar). De senare två faktorerna indikerar möjligen att biotopen var suboptimal för blåmesen med en hög andel barrträd och med lövskog dominerad av träd och buskar som björk, asp och rönn men med avsaknad av ek, ett trädslag som anses vara optimalt för blåmesen.

ORNIS SVECICA 22: 25–32, 2012

Non-breeding ecology of the Whinchat *Saxicola rubetra* in Nigeria

Buskskvättans Saxicola rubetra *ekologi under övervintring i Nigeria*

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Abstract

This study on the non-breeding ecology of the Whinchat *Saxicola rubetra* was conducted in central Nigeria from February through April. The core site was at Gwafan (N09°53', E08°57'), an open scrubland located 10 km east of the city of Jos. The density of Whinchats at Gwafan was 0.58 individuals/ha, almost three times the overall density around Jos. Time budget observations of colour banded Whinchats, including six birds fitted with radio-transmitters, showed that they spent 80% of their time perching, 11% foraging, 7% preening, and 2% flying. The main method of catching insects was a swoop to the ground. There was no change in perching, preening or flying time but the time some Whinchats spent foraging increased towards the end of the study period. GPS positions of individuals showed that all birds held clearly demarcated territories and defended them against neighbours. Aggressive interactions were also recorded between Whinchats and other bird species. Three birds colour-ringed in 2006 returned to the study site in 2007 and one occupied almost the same territory, indicating site fidelity.

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Received 8 March 2012, Accepted 27 March 2012, Editor : S. Svensson

Introduction

With more than 2.1 billion Palaearctic birds estimated to winter in sub-Saharan Africa (Hahn et al. 2009), it is apparent that many species depend on favourable situations in Africa for maintaining their status in Europe. This intercontinental migratory connectivity was emphasized after 1968, when a severe drought in the Sahel zone of West Africa was mirrored in massive declines in the returning numbers to Europe of common migrant species that winter in northern Sahel (Winstanley et al. 1974, Cowley 1979, Cavé 1983). In Britain, for example, the Common Whitethroat *Sylvia communis* dropped in numbers by 70% between 1968 and 1969 (Hjort & Lindholm 1978, Marchant et al. 1990).

During the last four decades few papers on the non-breeding biology of Palaearctic birds have been published compared to the number produced relating to breeding biology studies in Europe. For instance, within Nigeria alone an estimated 75 million migrants are wintering (Elgood 1964, Elgood et al. 1966), but only a dozen or so studies on these birds have been published. The earliest publications from Marchant (1942), Rayner (1962), Brown (1964), Elgood et al. (1966) and Smith (1965), describes a situation that in large part has been altered in recent decades by rapid land changes due to alterations in agricultural practices, increased human population numbers, and massive deforestation of the dry savannah belts. A few recent studies point to the need for conducting more research in this region on all aspects from the density and distributions of migrants (e.g. Jones et al. 1996), intra- and inter-specific competition (Wilson & Cresswell 2007), habitat selection (Vickery et al. 1999), migration and territoriality (Ottosson et al. 2005) and even the effects of shared parasites (Waldenström et al. 2002).

We studied the non-breeding biology of the Whinchat *Saxicola rubetra* in a Nigerian wintering area and report the results of two years' fieldwork on behaviour, territoriality, and a density survey. The Whinchat is a long-distance migrant that breeds in Eurasia and spends a considerable proportion of the non-breeding part of its annual cycle in sub-Saharan Africa. It is a ground-foraging passerine bird, inhabiting primarily cultivated grassland and open scrubland (Baillie et al. 2005) and the extent of occurrence in Africa is estimated at 4,600,000 km² (Birdlife International 2006), stretching from Senegal to the Congo. Over the last decades drastic declines in numbers of many farmland bird species have been observed in Western Europe, a phenomenon linked to a decrease in arthropod availability due to the intensification of agriculture (Müller et al. 2005, Britschgi et al. 2006), the simplification of landscape structure and massive use of pesticides (Gillings & Fuller 1998, Brickle et al. 2000, Robinson & Sutherland 2002) coupled with nest loss (e.g. Tucker & Heath 1994, Blaxter & Robertson 1995). In Switzerland, the Whinchat is red-listed as it has disappeared almost completely from the lowlands (Keller et al. 2001) and it is currently among the top priority 50 bird species in Europe for which conservation plans are elaborated (Bollmann et al. 2002).

Within Nigeria, the species is an abundant winter visitor to the southern half of the country (Elgood 1964) and a passage migrant in the north except on the Jos Plateau where it appears to over-winter (Smith 1965). This study aims to examine the ecology of the Whinchat within the guinea savannah zone of the Jos Plateau, Nigeria. We examined the daily behaviour patterns and how they change over time, predicting that as time of migration approaches, birds will increase time spent foraging. We also examined territorial behaviours and estimated territory sizes, and estimated the density of Whinchats at the study site, comparing this with the estimated average density of Whinchats on the Jos Plateau.

Method

Study site

The study was carried out in Jos, North-central Nigeria (N09°56', E08°53'). Jos is located within the Guinea savannah belt that is the wintering area of many Palearctic migrants (Moreau 1952, Salewski & Jones 2006). The region is typically characterized by Savannah woodland but human activities have resulted in the extensive and severe degradation of the habitat. Remnants of the woodland are restricted to the steep and less accessible margins of the plateau, with open grassland occupying the remainder of the plateau (White 1983). The main site for this study is Gwafan (N09°53', E08°57'), an area of open scrubland interspersed by farmlands and a few ponds created by past mining activities. Here, time budget observations, Whinchat density and territory behaviour were observed.

Whinchat density

Transect counts were conducted around the study site in Gwafan during the dry season between February and April 2004. 25 transects were surveyed with 24 of these repeated once. Transects were 100 m long and were arranged in a random fashion with at least 200 m between starting points to avoid transects overlapping. Transects were surveyed between dawn and 10am. Perpendicular distances to birds seen from the transect were recorded using a laser range-finder. Transects were re-visited in the afternoons and the number of trees over 3 m tall within 20 m either side of each transect was recorded. Bird densities were calculated using distance sampling in the program Distance 5.0 version 2 (CREEM, St Andrews 2008). Whinchat observations were truncated at 60 m, the distance within which 95% of observations fell as detection decreased with distance from the transect (Buckland et al. 2001), and length of transect in metres was used as the measure of effort. A half normal model with no adjustments and total number of trees on the transect as a covariate was chosen using Akaike's Information Criterion (AIC) as the best detection function to fit the data. The overall Whinchat density on the Jos Plateau was estimated by one of the authors (Mark Hulme) in a separate study, using the same transect method

Territory mapping

This part of the study was carried out from February to April of 2006 and 2007 at Gwafan about 10 km east of the city of Jos. The core study area, about 1.5 km^2, was visited almost daily. In 2006, all birds but one observed within the core study area were trapped using a combination of mist-nets and claptraps. Seventeen Whinchats, 10 in 2006 and 7 in 2007 were caught and equipped with a numbered lightweight metal ring and three individual combinations of coloured rings. In 2007, six birds were fitted with Biotrack® tail-mounted radio-transmitters.

The territoriality and site fidelity of marked birds were estimated by recording the geographical positions of all marked birds within the area. Birds were either spotted using binoculars and a telescope (for colour-ringed birds) or detected by telemetry using a Biotrack® SIKA Radio tracking receiver connected to a Yagi Antenna. Bird positions were recorded using a Garmin® Geographic Positioning System (eTrex® H). The positions were exported to a computer and plotted using the Home Range extension of ArcView® Geographic Information System (GIS) where the territory of each Whinchat was estimated using the Minimum Convex Polygon (95% CI) method; only the territory of individuals with more than 15 GPS positions were calculated. Special aggressive interactions, such as chases and fights, with other Whinchats or other bird species were noted.

Time-activity budgets
We analysed the behaviour of Whinchats in the study area by making time-activity budget observations of all the colour-ringed individuals. In addition to observations on the ringed individuals, one unringed bird in 2006 and several unringed birds in 2007 were observed. Each individual was observed continuously for up to ten minutes and the duration of all activities within this time frame was recorded on a tape recorder (Martin & Bateson 1993). To get an unbiased representation of activities likely to be carried out by the Whinchats at the time of observation, only time budgets of more than five minutes were used in the analysis. The activities noted were: A) Perching: regarded as the observation time between feeding attempts or when a bird stays on a perch without engaging in some obvious activity; B) Foraging: considered as the time a bird is seen chasing after a prey item, pecks continuously at a place on the ground or flies at a prey in the air irrespective of the success of the action; C) Flying: this is considered a separate activity from the flight associated with feeding if the bird simply moves from perch to perch; D) Preening: when the bird is preening its feathers. Aggressive interactions were observed but took an insignificant proportion of the total time. All birds were observed with a telescope from at least 50m away to avoid any kind of disturbance which might affect their behaviour. In addition, when an individual bird was being observed, the height of all perches used by that individual was measured at the end of the observation.

Hourly temperatures and wind speed data were obtained from a weather station (Vantage Pro2 weather station) at the nearby A. P. Leventis Ornithological Research Institute located 5km from the study site. Statistica 8® was used for statistical analyses. For General Linear Model (GLM) analyses, data were transformed using Box-Cox transformation (Box & Cox 1964) to meet the condition of normal distribution. GLM analyses examining the change in the proportion of time spent on foraging, flying and preening over time (date from 1 February) were performed with hourly wind velocity and temperature (°C) as covariates and individuals as random factor to account for non-independence in the data due to repeated observations on the same individuals. The model also included two-way interactions of variables.

Results

Whinchat density
The overall density of Whinchats on the Jos Plateau was 0.21 individuals/ha (0.18 to 0.24 95% C.I.). At Gwafan Whinchat density was estimated at 0.51 individuals/ha (0.33 to 1.03 95% C.I.), higher than the average density on the Jos plateau. Because there were few trees at Gwafan, Whinchat density at this site was not significantly correlated with tree density.

Table 1. Dates when individual Whinchats were first ringed and last seen at Gwafan in Jos, Nigeria and estimates of their respective home ranges.
Datum för olika buskskvättors vistelse vid Gwafan, Jos, Nigeria samt storleken av deras hemområden.

Year	Id	First ringed *Ringmärkt*	Last seen *Sist sedd*	Area (m^2)
2006	1	07-Feb	10-Apr	3556
	2	08-Feb	17-Apr	2182
	3	09-Feb	15-Feb	
	4	09-Feb	13-Apr	962
	5	09-Feb	07-Apr	1890
	6	09-Feb	21-Apr	4697
	7	10-Feb	18-Apr	758
	8	22-Feb	17-Apr	823
	9	08-Mar	18-Apr	866
	10	20-Mar	18-Apr	4575
	11	21-Mar	21-Apr	358
2007	12	07-Feb	10-Apr	2286
	2*	07-Feb	13-Feb	
	5*	07-Feb	20-Feb	
	10*	07-Feb	21-Apr	7709
	13	08-Feb	28-Mar	3986
	14	08-Feb	29-Mar	5645
	15	08-Feb	21-Feb	5261
	16	08-Feb	08-Mar	2995

*Birds that were caught in 2006 and re-sighted at the study area in 2007.
**Fåglar som fångades 2006 och återsågs i området 2007.*

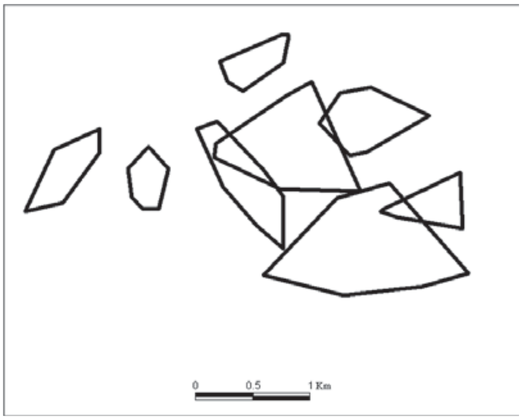

Figure 1. Home ranges of seven Whinchats in Jos, Nigeria (2006) plotted using the Minimum Convex Polygon method from GPS positions.
Hemområden för sju buskskvättor i Jos, Nigeria (2006) plottade med minsta konvexa polygonmetoden från GPS-positioner.

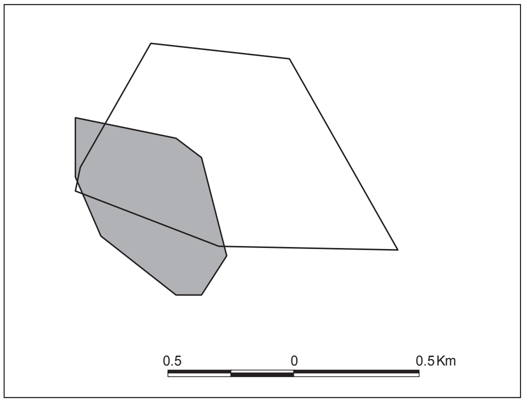

Figure 3. The home range of an individual bird occupied in 2006 (grey pentagon) which returned to the same site in 2007 (open pentagon).
Hemområden för en buskskvätta 2006 (grått) som återvände till samma plats 2007 (vitt).

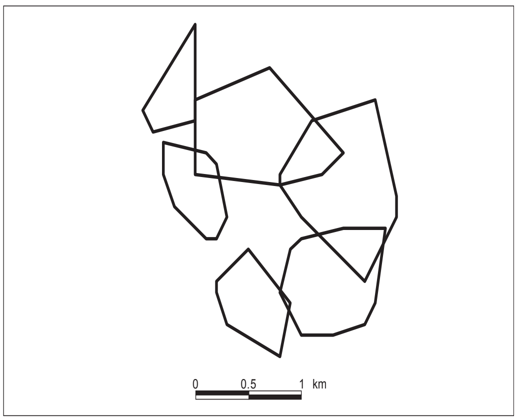

Figure 2. Home ranges of seven Whinchats in Jos, Nigeria (2007) plotted using the Minimum Convex Polygon method from GPS positions.
Hemområden för sju buskskvättor i Jos, Nigeria (2007) plottade med minsta konvexa polygonmetoden från GPS-positioner.

Territoriality and site fidelity

Whinchats usually arrive in Nigeria sometime in mid-September (Elgood *et al.* 1966) so that by the time this study commenced in February, birds had already arrived and settled into territories (Table 1). Of the 11 individuals (ten ringed, one unringed) observed in 2006, only one left the study site within five days of capture. All others were present until 7 April when the first Whinchat left the site, presumably on the first leg of northward migration and the last ringed individual seen was on 21 April. In 2007, however, the turnover of individuals at the site was higher. Of the seven individuals ringed, only three were still present at the site at the beginning of April. Three birds ringed in 2006 returned to the study site in 2007, though two stayed for only seven and 13 days and were not seen again in the study area.

Radio-tracked birds moved predominantly within an area that overlapped little with the areas utilised by other birds (Figure 1 and Figure 2). In 2006, the mean territory size was 2067 m^2 (range 358–4697 m^2, n=10), which was significantly smaller compared to the territories in 2007 when birds occupied on average 4647 m^2 (range: 2286–7709 m^2, n=6; $t = –2.82$, $p<0.01$). One Whinchat that returned to the study site in 2007 occupied almost the same area as in 2006 (Figure 3).

During the course of the study in 2006, nine aggressive interactions were recorded between the Whinchats. These consisted mainly of swift chases between birds occupying neighbouring territories but sometimes by fights (n=3). In addition, inter-specific interactions between Whinchat and Northern Wheatear *Oenanthe oenanthe* (3), Woodchat Shrike *Lanius senator* (2) and Crested Lark *Galerida cristata* (1) were observed. In 2007, five intra-specific aggression interactions were observed, in addition to inter-specific aggression between the Whinchat and Northern Wheatear (4) and Common Whitethroat *Sylvia communis* (1).

Time-activity budgets and foraging behaviour
In total we collected 193 time-activity budget observations totalling 1022 minutes of observations: 70 in February, 81 in March and 42 in April. These were observations from both ringed and un-ringed birds although observations from un-ringed birds were excluded from the GLM analyses. There was no statistical difference in foraging ($t=0.84$, $p=0.40$, $df=193$), preening ($t=-0.70$, $p=0.47$, $df=193$) and flying ($t=1.29$, $p=0.21$, $df=163$) activities between the two years, so data were pooled for the further analyses. On average Whinchats spent 80% of their time perching, 11% foraging, 7% preening and 2% flying. The trend in the proportion of time spent foraging over the study period varied between individuals ($F_{1,165}=3.84$, $p=0.042$). There was an increasing trend in the percentage time spent foraging in six birds, a decreasing trend in two birds, and no trend in six birds.

The percentage time allocated for foraging increased from the start of the study in February to when it ended in April, although this increase was borderline significant (Table 2). Foraging time increased with increase in mean hourly temperature and decreased with hourly wind velocity (Table 2). The interaction term of (date*mean daily temperature) was not significant ($F_{1,165}=3.63$, $p=0.05$, $b=-0.004$), neither was the interaction term (date*mean hourly wind velocity) ($F_{1,165}=3.04$, $p=0.08$, $b=0.01$), showing that the effect of temperature and wind on foraging activity was the same throughout the study period. The proportion of time spent preening increased significantly with an increase in the hourly wind velocity (Table 2), but the proportion of time spent preening over the study period varied between the focal study birds as indicated by the significant interaction of (Individual ID*date) ($F_{1,165}=1.84$, $p=0.03$). Flying and perching time did not change significantly with respect to date neither were they affected by hourly temperature nor wind speed (Table 2).

Birds were often seen perched on the highest bushes where they had a clear view of the ground. Mean perch height was 1.03 m (Range 0.5–1.8 m, n=203). Feeding behaviour usually involved a period of observation from a perch followed by a swooping flight to the ground to catch prey. There were only three observations of prey being caught in mid-air, compared to 103 of prey taken on the ground. No quantitative data on food availability or diet were collected but during time budget observations, there were five observations of birds feeding on caterpillars (Lepidoptera), 29 on ants (Hymenoptera), six on grasshoppers (Orthoptera), twice on antlions (Neuroptera), and eight times on berries of *Lantana camara* (Verbenaceae) which were fruiting at the time of the study.

Discussion

Territorial behaviour and density
Following colour-ringed birds and those equipped with transmitters, it was evident that the Whinchats held and defended well-defined territories during the non-breeding season. From the time birds were ringed in February to the 13th of March, there were no non-territorial birds. From 13th March, a few unringed birds were noticed; likely birds from further south making their way northward on passage to the edge of the Sahara (Elgood et al. 1966). Because they were un-ringed and non-territorial, it was not possible to estimate how long these birds

Table 2. GLM result to examine proportion of time spent flying, foraging, preening, and perching by the Whinchats over the whole study period (February – April) controlling for average hourly temperature (°C) and wind velocity from 0700. Dependent variable: total foraging time of all Whinchats each day, Random factor: Individuals' Id, b: parameter estimate.
GLM resultat för analys av andelen tid som buskskvättorna använde för flygning, födosök, fjädervård och stillasittande, kontrollerad för temperatur och vindhastighet. Beroende variabel: totala födosökstiden för alla fåglar varje dag; slumpfaktor: individens Id, b: parameterskattning.

	Forage *Födosök*			Preen *Fjädervård*			Fly *Flygning*			Perch *Sittande*		
	F	p	b	F	p	b	F	p	b	F	p	b
Date	3.82	0.05	0.1	0.04	0.82	-0.00	0.00	0.96	0.00	0.58	0.44	-146.01
Mean hourly temperature	4.55	0.03	0.38	1.2	0.27	-0.1	0.1	0.74	-0.01	0.5	0.47	1015.41
Mean hourly wind speed	7.2	0.01	-1.72	3.94	0.04	0.53	0.12	0.72	0.02	2.34	0.12	7478.14
Individual ID	0.75	0.74		1.23	0.24		1.51	0.09		0.99	0.46	

stayed at the site. Although the boundaries of territories were not sharply demarcated, each bird clearly had its own area of occupancy separated from that of its neighbours. These territories were defended against neighbouring birds by displays of aggressive behaviour consisting of swift chases and fights between the birds.

Dejaifve (1994) found that Whinchats in Zaire (now Democratic Republic of Congo) were territorial, occupying territories averaging 4,000 m^2 and density averaged 0.8 individuals/ha. This density is within the 95% confidence limits for Whinchat density observed at Gwafan, although the overall Whinchat density on the Jos Plateau appears to be significantly lower than that found on the core study area, suggesting that the open scrub habitat at Gwafan is better suited to over-wintering Whinchats. We cannot say for certain why the densities of whincats at Gwafan were higher than the estimated overall density for the Jos Plateaau but one possible reason for the higher densities at Gwafan compared to the other habitat types is the characteristic moist and open scrubland at this site, which is similar to the habitats occupied by the Whinchats in Europe (Cramp 1988).

Site fidelity

In 2007, the return of 3 birds out of 10 birds ringed in 2006 to the same site demonstrates substantial site fidelity since the annual mortality rate of migrants is likely to be around 50% (Sandercock & Jaramillo 2002, Sillett & Holmes 2002, Stokker et al. 2005). Fidelity to an overwintering site has been well documented in some migratory birds (McNeil 1982, Holmes et al. 1989, Latta & Faaborg 2001) and is usually an indication of adequate resources within a site to an over-wintering bird in the previous season. However, changes in land use practice and habitat loss could ultimately translate to changes in food availability and when areas of habitat are lost, bird numbers often change accordingly (Gibbons et al. 1993, Norris 2005). There was an observed increase in human activity at the study site in 2007, compared with 2006; two buildings were under construction within the study site, and during this time the vegetation was burnt once and some shrubs were removed for fuel wood, reducing the available area for the Whinchats. This may be the reason why only three out of the originally ringed seven Whinchats were still present at the site at the end of the study in 2007.

Foraging behaviour

There was an overall increasing trend in the proportion of time spent foraging as the time for spring migration approached although this result was borderline non-significant. This might be because different individuals showed varied trends in time spent foraging. However, the increasing trend in the proportion of foraging time is an indication that birds do try to increase their fat load as migration period approaches. Further studies which examine monthly weight of birds as well as fat stores will be necessary to confirm our prediction. However, it is noteworthy to mention that the cutting of shrubs for firewood, burning of the vegetation, and construction work would likely reduce the quality of the habitat, which could eventually translate into a loss of food. When food becomes scarce, birds will have to increase time spent foraging in order to meet their daily energetic requirements.

Some conservation implications are that the loss of a habitat could have a carry-over effect on individual fitness, which would eventually translate to the population level. As is typical of developing countries, the human population growth in Plateau state (largely identical with the Jos plateau) has put a major strain on resources through urban growth. A major threat to the environment is habitat loss and modification through agricultural intensification, overgrazing, uncontrolled bush burning and removal of woody plants for firewood (WWF 2007). Reduction in habitat translates to a reduction in resources, which is reflected in a lowered return rate. Eventually, the ability of the individuals to persist would depend on the availability and carrying capacity of suitable habitats elsewhere.

Acknowledgements

We thank the Swedish Ornithological Society and Lindgren's foundation for funding this project, staff of the A. P. Leventis Ornithological Research Institute especially Dr. Mwansat and Dr. S. Manu for logistic support, M. Samuel for her valuable help in the field, and Azi for helping with transport to the site, and Dr P. Jones and Dr S. Bensch for comments on an earlier draft. This is contribution no. 253 from Ottenby Bird Observatory and no. 51 from A. P. Leventis Ornithological Research Institute. This study was carried out in compliance with the current laws of the country in which it was conducted.

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Sammanfattning
Mer än två miljarder fåglar från Europa flyttar till tropiska Afrika. Vad som händer under övervintringen är därför av största betydelse för de häckande beståndens storlek och utveckling. Men jämfört med de otaliga studierna av häckningsbiologin finns det förhållandevis få studier från vinterkvarteren. Det gäller exempelvis för de uppskattningsvis 75 miljoner vintergästerna i Nigeria.

I denna uppsats rapporterar vi resultaten från en studie av buskskvättans ekologi under vistelsen i Nigeria perioden februari till april åren 2006 och 2007. Studien genomfördes i den biotop som kallas Guinea-savann, i vilken många flyttare tillbringar vintern och där buskskvättan är vanlig. Undersökningsområdet var en och en halv kvadratkilometer stort och låg vid Gwafan nära staden Jos. Området är relativt hårt exploaterat av jordbruk, men en del restbiotoper finns.

Vi arbetade såväl med linjetaxeringar för att bestämma tätheten av buskskvättor som med märkta fåglar för att studera deras revirförhållanden och tidsbudget. De märkta fåglarna hade en metallring och individuella kombinationer av tre färgringar samt små radiosändare. De följdes antingen med kikare eller med radiomottagare och deras positioner registrerades med GPS. Tidsstudier gjordes både på sådana individmärkta fåglar som på en del icke märkta. Tidsåtgången för fyra aktiviteter noterades: stillasittande (vanligen spaning mellan bytesfångster), födosök (förföljde byte, hackade på marken eller flög mot ett byte oberoende av om det fångades eller ej), flygning (av annat slag än i samband med jakt) samt fjädervård. Aggressioner med andra fåglar förekom, men var tidsmässigt utan betydelse.

Tätheten av buskskvättor på Jos-platån i allmänhet var 0,21 individer per hektar. I vårt undersökningsområde var tätheten klart högre, nämligen 0,51. Buskskvättorna kommer normalt till Nigeria i mitten av september och när vår studie började i februari hade de redan etablerat sina revir. Tiderna för deras vistelse framgår av Tabell 1. Av fåglarna från 2006 var det bara en som lämnade området efter ett fåtal dagar. Övriga stannade till april då de flyttade norrut, mellan 7 och 21 april. 2007 gav sig några av fåglarna iväg litet tidigare. Tre av fåglarna från 2006 återkom 2007, en av dem till nästan samma revir. De kartlagda reviren visas i Figur 1–3 och revirens storlek anges i Tabell 1. Medelstorleken var 2067 (358–4697) kvadratmeter 2006 och 4647 (2286–7709) 2007, alltså mer än dubbelt så stora det senare året. Figur 3 visar de delvis överlappande reviren för en av fåglarna.

Tidsstudien, baserad 193 tillfällen om tillsammans 1022 minuter, ungefär lika fördelade de tre månaderna, visade att buskskvättorna använde 80% av tiden till att sitta stilla, 11% till födosök, 7% till fjädervård och 2% till att förflytta sig flygande. Testerna enligt Tabell 2 visar att det var signifikanta effekter på födosök av temperatur och vindstyrka och på fjädervård av vindstyrka medan tiden för stillasittande och förflyttningar inte påverkades av någon av de studerade variablerna.

Sammanfattningsvis kunde vi således konstatera att buskskvättorna höll väl definierade och långvariga revir samt att det fanns en viss tendens till revirtrohet mellan åren. Huruvida våra tätheter är normala för liknande terräng i det stora vinterområdet vet vi inte, men det finns en uppgift från Kongo på 0,8 individer per hektar. Orsaken till att fåglarna 2007 inte stannade på samma sätt som 2006 kan ha varit mera omfattande störningar och att det skedde viss buskröjning och bränning som minskade den gynnsamma arealen. På Josplatån sker befolkningsökning och intensifiering av jordbruket och även annan exploatering. Detta gör att biotoperna kommer att bli sämre för buskskvättorna, vilket i sin tur ställer större krav på att ha tid till födosök, vilken vi visat kan påverkas av omvärldsfaktorer som temperatur och vind. Försämras förhållandena kraftig innebär det minskade möjligheter att samla på sig fett för flyttningen norrut och minskad överlevnad, fenomen som redan observerats hos flera arter i samband med biotopförsämringar orsakade av torrår.

ORNIS SVECICA 22: 33–38, 2012

Dräktvariation hos skärpiplärka *Anthus petrosus littoralis* och vattenpiplärka *Anthus spinoletta* i vinterdräkt

Plumage variation of Rock Pipit Anthus petrosus *littoralis and Water Pipit* Anthus spinoletta *in winter plumage*

REINO ANDERSSON

Abstract

Plumage variation in nine neutral (i. e. not concerning colour hues) characters was studied from October throug February in 77 Rock Pipit A*nthus petrosus littoralis* and 47 Water Pipit *Anthus spinoletta* in southern Sweden. The Rock Pipit generally showed more variation than the Water Pipit. Several characters were overlapping between the species, while especially streaking on the underparts significantly distinguished between them. The most reliable differences concerned the width and sharpness of the streaks on the lower breast, and on the anterior and, especially, rear flanks, the Water Pipit having considerably thinner and more clearcut streaks than Rock Pipit.

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Received 16 March 2012, Accepted 29 March 2012, Editor : S. Svensson

Inledning

Vintern 2004/2005 startade en studie av skärpiplärkans *Anthus petrosus littoralis* vinterekologi i mellersta Halland (Andersson & Nothagen 2011). I samband med detta insamlades även data om inbördes dräktvariation hos skärpiplärka och vattenpiplärka *Anthus spinoletta*. Bakgrunden var bestämningsproblematiken hos de båda arterna, som under ett flertal år diskuterats i olika sammanhang. I Sverige har flera artiklar publicerats i ämnet (t.ex. Ullman 1995, Larsson 1996, Alström & Mild 1997). Alström & Mild (2003) presenterar en övergripande genomgång av bl.a. dräkter och ruggning.

Någon utförligare beskrivning av dräktvariationen hos respektive art har dock inte publicerats tidigare. Då debatten kring bestämningsproblemen snarast har ökat under senare år, kan denna uppsats utöver att spegla variationen, förhoppningsvis även bidra till att säkerställa en korrekt artbestämning.

Material och metoder

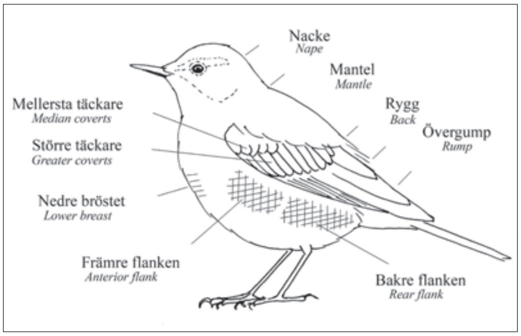
Under vinterstudien antecknades allmänna dräktdata för totalt 96 skärpiplärkor och 46 vattenpiplärkor. Med utgångspunkt från denna erfarenhet har jag valt ut ett antal karaktärer och bedömt variationen hos var och en av dem. För att erhålla en enhetlig och objektiv bedömning har jag dock uteslutande använt fotografier av god kvalitet och av säkert artbestämda individer, totalt 77 skärpiplärkor och 47 vattenpiplärkor. Av dessa foton är 25 skärpiplärkor och 16 vattenpiplärkor fåglar som jag själv studerat. Övriga fotografier har hämtats ur Artportalen Svalans bildgalleri (www.artportalen.se/birds/). Alla använda fotografier avser fåglar iakttagna i södra Sverige under perioden oktober–februari. Månadsvis fördelning av dessa fotograferade piplärkor redovisas i Tabell 1.

Varje individ som medtagits har fotograferats ur minst två vinklar, framifrån och från sidan. De har genomgått en likartad och jämförbar klassificering av nio neutrala karaktärer. Dessa omfattar inga färgnyanser i fjäderdräkten (t.ex. brun övergump/stjärttäckare, vitaktig undersida hos vattenpiplärka), detta för att undvika svårbedömda och subjektiva värderingar. Ett undantag utgör dock registrering av grå nacke hos vattenpiplärka, eftersom detta länge ansetts vara en viktig bestämningskaraktär och kan avgöras som en färgkontrast gentemot manteln.

De nio aktuella kriterierna är ögonbrynsstreck, ögonring, näbbens utseende, mantelteckning, mellersta och större täckarbräm, nedre bröststreckning samt främre och bakre flankstreckning. De två förstnämnda har poängsatts beroende på om karaktären saknats (1), varit otydlig (2) eller tydlig (3); vid den statistiska analysen i denna uppsats slog jag ihop (2) och (3). Den gula utbredningen på näb-

Tabell 1. Månadsvis fördelning av de studerade skärpiplärkorna och vattenpiplärkorna.
Distribution between month of the studied Rock Pipits and Water Pipits.

Månad *Month*	Skärpiplärka *Rock Pipit*	Vattenpiplärka *Water Pipit*
Oktober	22	1
November	16	17
December	8	10
Januari	13	9
Februari	18	10
Totalt	77	47



Figur 1. Fjäderfältens placering hos de studerade piplärkorna. Teckning: Anders Nothagen.
Location of the feather fields in the examined pipits. Drawing: Anders Nothagen.

ben har angetts som otydlig (begränsat svagt gul, 1) eller tydlig (utbrett kraftigt gul, 2). Manteln har endast bedömts utifrån otydlig (1) eller tydlig (2) streckning. Likaså har täckarbrämen poängsatts efter otydliga (mörka, 1) eller tydliga (ljusa, 2) bräm.

Streckningen på undersidan har tilldelats två olika poäng för vart och ett av de tre fjäderfälten. Det ena om fläckarna varit breda (1) eller smala (2), det andra om de haft diffust (1) eller skarpt avsatta (2) kanter. Nedre bröstet definieras av dess nedersta streckning mot buken. Med främre flanken menas fjäderfältet nedanför större täckarraden mot buken, medan bakre flanken utgjorts av fältet ovanför benet. De olika fjäderfältens placering på en piplärka och den terminologi för dessa som används i denna uppsats visas i Figur 1. Dräktvariationen har bedömts inom respektive arts karaktärsdrag, vilket innebär att vissa karaktärer, t.ex. ögonring, inte behöver vara identiska trots att de klassats likartat hos de bägge arterna. Statistiskt användes signifikansprövning med Fischer´s Exact Test.

Resultat

Av Tabell 2 framgår att de allra flesta vattenpiplärkor uppvisade ögonbrynsstreck och bland dem var 57 % tydliga. Drygt hälften av skärpiplärkorna hade ögonbrynsstreck, men endast 2 % av dessa ögonbrynsstreck framstod som tydliga. Samtliga piplärkor av de båda arterna hade ögonring. Hos 77

Tabell 2. Procentuell närvaro av nio studerade karaktärer hos 47 vattenpiplärkor* och 77 skärpiplärkor.
Percent presence of nine studied characters of 47 Water Pipits and 77 Rock Pipits.*

Närvaro av karaktären *Presence of the character*	Vattenpiplärka *Water Pipit*	Skärpiplärka *Rock Pipit*
Ögonbrynsstreck *Supercilium*	94	56
Ögonring *Eye ring*	100	100
Näbb med tydlig utbredning av gult *Bill with distinct yellow pattern*	76	23
Mantel med tydlig streckning *Mantle with distinct streaking*	11	48
Mellersta täckare med ljusa bräm *Median coverts with light edges*	81	79
Större täckare med ljusa bräm *Greater coverts with light edges*	83	25
Nedre bröst med smala streck *Lower breast with thin streaks*	100	35
Nedre bröst med skarpt avsatta streck *Lower breast with clearcut streaks*	100	17
Främre flank med smala streck *Anterior flank with thin streaks*	98	13
Främre flank med skarpt avsatta streck *Anterior flank with clearcut streaks*	98	4
Bakre flank med smala streck *Rear flank with thin streaks*	92	1
Bakre flank med skarpt avsatta streck *Rear flank with clearcut streaks*	89	0

*Näbbens gula och nedre bröstets streckning baseras på 45 individer hos vattenpiplärka på grund av olämplig fotovinkel för två individer. *Yellow of bill and streaking of lower breast is based on 45 individuals in Water Pipit due to inappropriate angle of view in the photographs of two birds.*

Figur 2. Skärpiplärka i typisk vinterdräkt fotograferad på Årnäshalvön norr om Varberg den 25 november 2008. Foto: Anders Nothagen.
Rock Pipit in typical winter plumage 25 november 2008.

Figur 3. Vattenpiplärka i typisk vinterdräkt fotograferad på Årnäshalvön norr om Varberg den 8 november 2008. Foto: Anders Nothagen.
Water Pipit in typical winter plumage 8 november 2008.

% av vattenpiplärkorna var den tydlig, jämfört med 90 % för skärpiplärka. Näbbens gula utbredning var tydlig hos en betydligt större andel vattenpiplärkor än skärpiplärkor. Manteln var däremot tydligt streckad i större utsträckning hos skärpiplärka. Förekomsten av ljusa bräm på de mellersta täckarna var likartad hos de bägge arterna. De större täckarnas bräm var däremot ljusa i högre grad hos vattenpiplärka. Av vattenpiplärkorna uppvisade 74 % grå nacke.

Skillnaden i variation hos arterna visas i Tabell 2. Skillnaden var höggradigt statistiskt signifikant ($\chi2>17$; $p<0,001$) för samtliga karaktärer utom för ögonring och mellersta täckarnas bräm. Särskilt stor var dock skillnaden för undersidans streckning på alla tre studerade fjäderfält. Samtliga vattenpiplärkor uppvisade smala och skarpt avsatta fläckar på nedre bröstet, till skillnad från skärpiplärkan som uppvisade en större variation. Denna variation tog sig i 5% av fallen även uttryck i en större utbredning av streckningen längre ned på buken. En majoritet av vattenpiplärkorna uppvisade smala respektive skarpt avsatta fläckar på främre flanken, medan ett motsatt förhållande rådde hos skärpiplärkan. Bakre flanken uppvisade en hög andel smala och skarpt avsatta fläckar hos vattenpiplärka. Hos skärpiplärka var endast 1 % smala, medan inga av dem uppvisade skarpt avsatta fläckar på den bakre flanken (Figur 2 och 3).

Diskussion

Av resultaten framgår att dräktvariationen är generellt större hos skärpiplärka jämfört med vattenpiplärka. En mycket liten andel av vattenpiplärkorna saknar ögonbrynsstreck, samtidigt som ytterst få skärpiplärkor uppvisar tydliga sådana

Undersidans streckning skiljer sig signifikant mellan de båda arterna. Det är intressant att nedre bröstet uppvisar minst variation hos vattenpiplärka och störst hos skärpiplärka. När det gäller främre flanken är variationen jämnare mellan de båda arterna, medan bakre flanken visar på minst variation hos skärpiplärka och störst hos vattenpiplärka, det vill säga omvänt förhållande jämfört med nedre bröstet. Streckningen på undersidan är hos piplärkor generellt bredare och diffusare i fräsch dräkt under hösten, för att i takt med slitage bli marginellt smalare och distinktare (Alström & Mild 2003). I denna studie är dock individerna jämnt fördelade över vintermånaderna, vilket gör eventuella avvikelser statistiskt försumbara.

Färgnyanser har undvikits i denna uppsats, men uppvisar en viss variation hos båda arterna. I synnerhet under senvintern då dräkten slitits och blekts, kan skärpiplärkan ibland upplevas som påtagligt ljus på undersidan. I sällsynta fall kan även övergumpen uppfattas som svagt brunaktig, dock aldrig på samma sätt som hos vattenpiplärka. Grå nacke hos vattenpiplärka har ofta angetts som en artskiljande karaktär, men här finns en stor variation från total avsaknad till markant gråblå nyans. Många av de grånackade individerna är också kastanjebrunt färgade på mantel, rygg och streckning. Sådana individer kan utifrån allmänna ålderskriterier och ruggning påfallande ofta bestämmas till adulter. I det fåtal fall som yngre fåglar konstaterats ha grå nacke, brukar den övriga dräkten inte vara särskilt kontrastrik. En i nuläget högst spekulativ tanke är att denna ”färgade” dräkt skulle kunna vara ålders- och kanske även könsberoende. Detta är en spännande dräktdetalj att studera mer ingående för hugade och bestämningsinriktade ornitologer.

Eftersom färger utgör subjektiva karaktärer, kan resultaten i föreliggande uppsats vara till hjälp för att uppnå en korrekt artbestämning. Utöver allmänna färgnyanser rekommenderas därför att beakta förekomsten av smala respektive skarpt avsatta fläckar på nedre bröst, främre och bakre flank. Närvaron av dessa kombinerade karaktärer utgör en säker indikation för vattenpiplärka. Omvänt uppvisar skärpiplärkan inte denna kombination av karaktärer, i synnerhet inte på den bakre flanken. Ofta bildar istället breda och diffusa streck en sammanhängande fläck på bakre flanken (s.k. ”flankblaffa”), vilken utgör en av de enskilt tillförlitligaste karaktärerna bland andra redan kända och vedertagna bestämningskriterier (jfr. Alström & Mild 2003).

Tack

Ett varmt tack riktas till Anders Nothagen och Bo Nielsen som deltagit såväl i studien av skärpiplärkans vinterekologi, som i fältarbetet om piplärkornas dräktförhållanden. De har granskat uppsatsen och bistått med många givande synpunkter, liksom Robin Andersson, Pär Sandberg och Kåre Ström. Bo Nielsen har dessutom varit behjälplig med de statistiska testerna. Ett särskilt tack riktas till Per Alström för sakkunnig granskning av manuskriptet.

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Summary

In 2004/2005, we began to study the winter ecology of the Rock Pipit in southwestern Sweden (Andersson & Nothagen 2011). During this study, I collected records about the plumage variation of 96 Rock Pipits and 46 Water Pipits. This information was used to identify a number of characters that could be used for a description of plumage variation in the two species. In order to make the evaluation uniform and objective, I used only high quality, detailed photographs, 77 of Rock Pipits and 47 of Water Pipits, all with both a side and a front view. Of these photographs, 25 of Rock Pipits and 16 or Water Pipits, were of birds that had been studied within my own project. The remaining photographs were obtained from the photo gallery at the Species Gateway (Artportalen, Svalan; (www.artportalen.se/birds/). All photographs are of birds observed in southern Sweden during October through February (Table 1). Every individual was thoroughly examined and judged by a similar and comparable classification of nine different neutral plumage characters. I excluded colour hues in the feather plumage in order to avoid subjective valuations and characters difficult to define. One exception was the registration of grey nape in Water Pipit, since this criterion since long has been considered an important character for identification of this species.

The nine characters are supercilium, eye-ring, amount of yellow on bill, mantle streaks, edges of median and greater coverts, lower breast, anterior and rear flank streaking. The two first characters have been scored from 1 to 3 depending of the appearance: not present (1), unclearly present (2) or distinctly present (3). For the statistical test, I pooled score (2) and (3). The yellow distribution on the bill has been classified as unclear (limited and slight yellow, 1) or distinct (spread and prominent yellow, 2). The mantle streaks have only been scored as unclear (1) or distinct (2). The edges of the coverts have also been scored as unclear (dark, 1) or distinct (light, 2). The streaking on the underparts has got two different scores for the three different feather fields. One of them concerned broad streaks (1) or thin streaks (2), and another referred to diffuse (1) or clearcut (2) edges. The lower breast was defined as the streaked feathers nearest to the belly. The anterior flank is the feather field below the row of the greater coverts towards the belly, whilst the rear flank constitutes the field above the leg of the bird. The location of the feather tracts that are described in this paper and the terminology I use are shown in Figure 1. The differences were tested with Fischer´s Exact Test.

Table 2 shows the percentage distribution of the nine studied characters. Besides this it will be added that 74 % of the Water Pipits showed grey nape. With the exception of the eye ring and the edges of to the median coverts, the variation of the characters was significantly different ($\chi 2>17$, $p<0.0001$) between the two species. The supercilium was distinctly present in 57% of the Water Pipits but only in 2% of the Rock Pipits. The eye-ring was distinctly present in 77% of the Water Pipits and in 90% of the Rock Pipits. The streaking of the underparts was significantly different between the species in all three feather fields. All Water Pipits showed thin and clearcut streaks on lower breast, in opposite to the Rock Pipits who showed a larger variation. A majority of the Water Pipits showed thin and clearcut streaks on the anterior flank, whilst it was a much lower proportion in the Rock Pipit. Also the rear flank showed thin and clearcut streaks in a high share of the Water Pipits. For Rock Pipit it was only one individual, 1 %, with thin streaks and none with clearcut streaks (jfr. Figure 2 and 3. The results show that the plumage variation is generally larger in the Rock Pipit than in the Water Pipit. Whilst almost all Rock Pipits lacked a distinct supercilium, more than half of the Water Pipits showed this character.

Colour hues have not been used in this study, but also these characters show some variation in both species. Especially during the late winter, when the plumage has been worn and bleached, the Rock Pipit sometimes shows a light appearance on the underparts. In rare cases even the rump of the Rock Pipit shows a slight brownish appearance, though never like the one of the Water Pipit. Grey nape in Water Pipit has often been considered as a dividing character between the two species. However, this character shows great variation, from total absence of this hue to an obvious grey-blue hue.

Since colours are normally subjective characters in these species, the results in this study could be important to attain a correct identification. Besides

colour hues, I therefore recommend to take careful notes on the occurrence of thin respectively clearcut streaks on the lower breast, anterior flanks and rear flanks. The presence of these characters will ensure the identification of a Water Pipit. The Rock Pipit does not show these combined characters, especially not on the rear flank. Instead the Rock Pipit often shows broad and diffuse streaks in form of a connected, diffuse spot on the rear flank, which constitutes one of the single most reliable characters among those that are already known and accepted (jfr. Alström & Mild 2003).

ORNIS SVECICA 22: 39–59, 2012

Distribution and numbers of wintering sea ducks in Swedish offshore waters

Utbredning och antal av övervintrande havsänder i svenska utsjövatten

LEIF NILSSON

Abstract

The first survey of seaducks covering the offshore waters of the entire Baltic was undertaken in 1992/1993, when, however, the Swedish waters were covered with relatively few ship surveys. The second all Baltic survey 2007–2011 included extensive aerial surveys of all Swedish offshore waters. This paper presents the Swedish data from these two surveys, supplemented with data from several other but partial surveys back to the early 1970s. The most numerous wintering seaduck in the Swedish waters was the Long-tailed Duck *Clangula hyemalis* with an estimated population of 1.41 million in 1992/1993, decreasing with 69% to 0.44 million in 2007–2009. Hoburg bank south of Gotland and the two Midsjö banks accounted for the vast majority of these ducks. In 2009–2011 only small numbers of scoters *Melanitta fusca* and *M. nigra* were found in Swedish Baltic waters. The totals for the Eider *Somateria molissima* and Red-breasted Merganser *Mergus serrator* were estimated at 20 000 and 8000, respectively. Larger numbers of Eiders (50 000) and scoters (20 000) were found on the west coast.

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Received 16 March 2012, Accepted 29 March 2012, Editor : S. Svensson

Introduction

Annual counts of wintering waterbirds have been undertaken in Sweden since 1967 as a part of the International Midwinter Counts organized by what is now Wetlands International (see Nilsson 2008 for a review of the Swedish studies and references to the international work). These surveys are now a part of the Swedish Bird Monitoring Program organized by The Swedish Environmental Protection Agency (SEPA, Naturvårdsverket). During the early years the counts aimed at the largest possible coverage (Nilsson 1975) but they were early focused on covering a representative sample of sites to produce annual indices for the major wintering species but also including country-wide surveys in some years.

During the period 1965–1978 a large number of boat surveys were undertaken in Swedish waters from the patrol boats of the Swedish Coast Guard and extensive areas in the archipelagos and off the more open coasts of southern Sweden were covered (Nilsson 1972, 1980). Extensive aerial surveys were also undertaken along the open coasts of south Sweden and in the Baltic archipelagos but also on the west coast (Nilsson 1975). Some offshore aerial surveys were also performed during this period.

The early surveys in near-shore areas and in the archipelagos during the sixties and seventies gave some information about the distribution and numbers of seaducks in these waters, for which only limited data were available earlier (see however Mathiasson 1970). In those years it was not possible to cover the offshore banks of the Baltic such as the Midsjö banks and Hoburgbank, which were known to have large numbers of wintering Long-tailed Ducks *Clangula hyemalis*. In the early years the value of the surveys was limited as it was not possible to get any information from the offshore areas in the eastern and southeastern parts of the Baltic.

After the political changes in Eastern Europe it became possible to survey the whole Baltic in the early 1990s, and in 1992 and 1993 the first coordinated census of the wintering waterbird populations of the entire Baltic was organized (Durinck et. al. 1994), for the first time producing distribution maps and population estimates for the Baltic Sea. A second survey of the entire Baltic was undertaken during 2007–2010, the SOWBAS project (Status of Wintering Waterbird Populations in the Baltic Sea; Skov et al. 2011).

In the present contribution I summarize the results of the SOWBAS project for Swedish waters including surveys in the Swedish Economic Zone of the Baltic Sea during 2010 and 2011 with the aim to develop a monitoring program for seabirds. The recent counts are compared with the population estimates based on modeling exercises from the first all-Baltic survey (Durinck et al. 1994) and regional estimates from the offshore areas that were covered in the seventies (cf. Nilsson 1975, 1980). To make the picture more complete I also include a special survey of wintering Eiders *Somateria mollissima* and Scoters on the west coast in 2009.

The species covered here are the offshore species that are not properly covered by the regular midwinter counts in the inner coastal areas, i.e. Long-tailed Duck, Common Scoter *Melanitta nigra,* Velvet Scoter *Melanitta fusca*, Eider and Red-breasted Merganser *Mergus serrator*. The latter two species do also occur in inshore areas in such numbers that annual indices can be calculated but they also have important offshore populations and are therefore included here. Other diving ducks considered as seaducks and occurring in Swedish waters are fully covered by the counts in inshore areas and will not be dealt with here see Nilsson (2008).

Material and methods

In the 2007–2011 survey the offshore areas were covered by line transects from an aircraft. The census lines were laid out so that all important water areas (including the offshore banks) in the Swedish part of the Baltic were covered out to a depth of about 30 m. The survey lines started at the shore

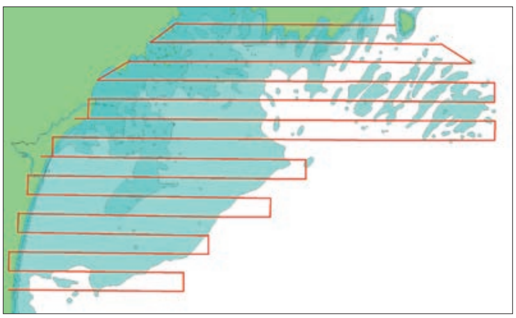


Figure 1. Example of lines used for aerial surveys in Hanöbukten in south Sweden. Here the lines are 2 km apart but in the main areas we used 4 km between the survey lines. The shades of blue refer to depths of <6 m (darkest), 6–10 m and 10–20 m (lightest).
Exempel på inventeringslinjer i Hanöbukten. Linjerna låg här med 2 km mellanrum, men vi utnyttjade 4 km mellanrum inom merparten av de svenska farvattnen. De blå nyanserna avser havsdjupen <6 m (mörkast), 6–10m och 10–20 m (ljusast).

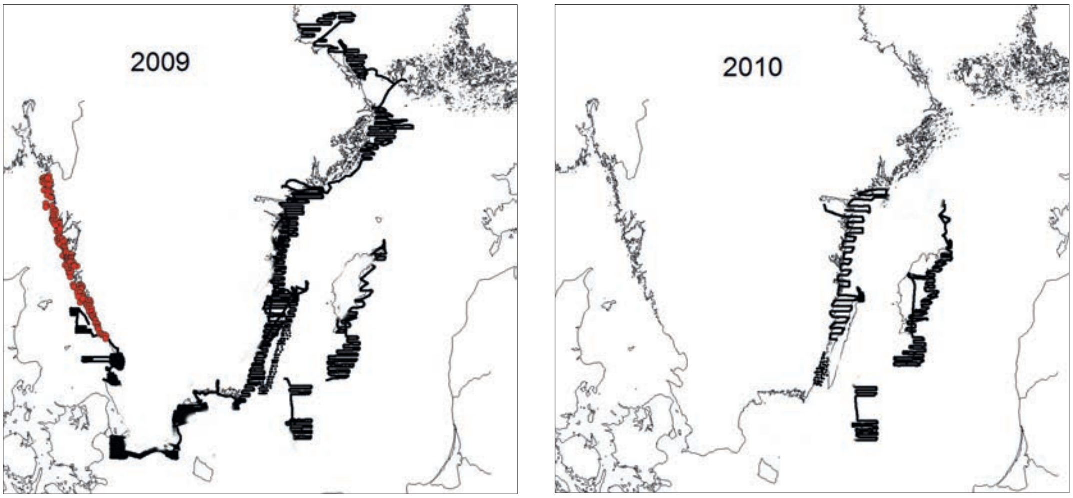
or in the extensive east coast archipelagos (mainly the Stockholm archipelago) from the inner larger islands and proceeded to deep water (30 m). Generally there was a distance of 4 km between the survey lines but in some special areas (e.g. Hanöbukten) there was a distance of 2 km between the lines. An example of the layout of the survey lines is given in Figure 1.

The main study area for the survey was the Baltic, but in 2009 we extended the counts to include the offshore areas on the Swedish west coast to cover the wintering Eiders and Scoters there. Line transects were used in the southern part (province of Halland) whereas an area based complete survey was made in the outer archipelagos of Bohuslän.

For the surveys a Cessna 337 Skymaster, a twin-engined high-winged aircraft with good visibility was used. The flying altitude was about 70 m and the speed 150–180 km/h, i.e. the slowest possible. Aerial surveys were only undertaken in good weather conditions. Fixed waypoints at the ends of each transect were established and navigation was undertaken with the aid of the GPS of the aircraft. Another GPS recorded the actual flight path taking positions every ten seconds. Two observers covered each side of the aircraft. All observations were recorded on tape with time and were later transferred to a data-base with the positions from the GPS recordings.

All waterbirds were counted within a belt extending 200 m on either side of the aircraft (called the main belt). As there was a dead angle zone of 60 m below the aircraft, we covered a 320 m wide zone. In this paper I use only the counts from this main belt. However, we also recorded observations of flocks outside the main belt. The counts from the main belt were used to estimate regional totals for the different species using expansion factors based on the coverage of the different regions (4000m/320m gives an expansion factor of 6.25 and 2000m/320m an expansion factor of 12.5 for transects separated by 2 and 4 km, respectively).

The official start of the SOWBAS survey was in 2007, but due to the weather conditions only a small part of the Swedish Baltic coast from the Falsterbo peninsula to the northern part of Öland could be covered. In 2008 the weather was also unsuitable for aerial surveys and only restricted flights could be made. In 2009, on the other hand, we managed to cover the entire Swedish coast of interest for the offshore species, i.e. from the Norwegian border on the west coast to Gävlebukten in the Baltic (Figure 2). 2009 was a mild winter with very limited ice cover in coastal wa-



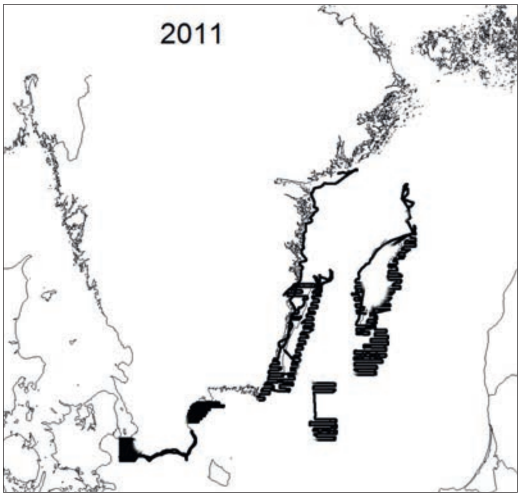


Figure 2. Coverage of the aerial surveys in offshore Swedish waters in the winters 2009, 2010 and 2011. Black lines = line transects, red dots = area-based counts. For ice cover in 2011, see Figur 3.
Täckningen med flyginventeringar i svenska utsjöområden vintern 2009. Svarta linjer = linjetaxeringar, röda punkter = områdesbaserade inventeringar. För istäcke 2011, se Figur 3.

ters, restricted to the innermost bays of the archipelagos.

The 2010 winter was a contrast to 2009, being the coldest winter since 1987. The archipelagos got covered by ice early and at the time of the survey there was compact ice from the Stockholm archipelago to Finland. The major offshore banks were surveyed during the winter but parts of the archipelagos could not be covered until the first days of April. Coverage of the counts in 2010 is seen from Figure 2.

2011 was another cold winter with very cold weather already in December 2010. There was open water along the south coast in Scania, but the archipelagos from Kalmarsund in the south were totally frozen and there was only small areas of open water in the outermost parts of the archipelagos north of Kalmarsund (Figure 2). The ice extended east over the Baltic Sea and the important offshore areas in the Baltic republics were all ice-covered (Figure 3).

The southern parts of the Baltic could be covered during the winter proper, whereas the archipelagos further north could not be covered until the first days of April in some cases. This is of no problem for the Long-tailed Ducks that leave the Baltic in May but the late surveys could not be used for the Eider and the Scoters. These species are however present in small numbers in these areas during the winter as shown by the country-wide surveys of the archipelagos. The offshore surveys in 2009 were for some species supplemented by observations from the annual midwinter counts for some inshore areas (mainly on west

Gotland), which were not extensively covered by the aerial surveys.

The efficiency of aerial surveys of different species was much studied during the seventies by air/ground comparisons for different species in different habitats (Nilsson 1975, cf. also Joensen 1974). In these studies marked differences in the survey efficiency was found between species but also between different observers as was also found for aerial surveys in the breeding areas (Haapanen & Nilsson 1979). The surveys during the seventies were area based, whereas the aerial surveys of the Swedish waters during the SOWBAS study were performed as line transects, so there might also be differences between the two kinds of aerial surveys.

One possible source of bias applying to the line transects undertaken during 2007–2011 is the possibility to see if the flocks observed are within the main belt or not. The inclusion of flocks outside this belt in the calculations would lead to an overestimate of the number of seaducks in an area. On the other hand some birds will be missed during the counts as they may be under water during the passage of the aircraft. The earlier studies (Nilsson 1975) did however establish that a relatively high proportion of the birds present in an area were actually seen from the aircraft during the passage.

When comparing the estimates for Swedish waters presented here with the population estimates for NW Europe presented by Delany & Scott (2006) and with the two All Baltic surveys (Durinck et al. 1994, Skov et al. 2011) it is important to bear in mind the differences in methods used as well as the different uncertainties and biases attached to the two methods. These factors will also have great importance when evaluating the population changes indicated in the report from the SOWBAS study (Skov et al. 2011).

For the Swedish waters the estimates presented here and included in the SOWBAS report (Skov et al. 2011) are all based on aerial line transects, whereas no aerial surveys could be undertaken during the 1992/1993 study. The estimates for Swedish waters in 1992/1993 were based on relatively few ship transects in some offshore areas, whereas many areas were very poorly covered with transects lines (see Durinck et al. 1994, map 4, for coverage), the estimates to a large extent being based on modeling exercises. The regional estimates from 1992/1993 presented in the tables are therefore considered to be imprecise. The overall estimates for the Baltic in the SOWBAS study were also based on modeling (Skov et al. 2011), whereas the estimates presented here are based on the totals from the line transects adjusted for coverage with the expansion factors presented above.

The overall Baltic survey in 1992/1993 included aerial surveys in some of the other countries but did rely heavily on boat transects for the offshore areas. As there are very marked differences in methods and coverage for the Swedish waters (and some other areas) between the two all Baltic surveys, the estimates from this survey must be regarded with large caution.

For the Long-tailed Duck, estimates are also presented for the period 1966–1974. For the areas in Scania and Blekinge these are based on line transects from patrol boats of the Swedish Coastguard. Details for these surveys including survey lines were published by Nilsson (1980). These counts were considered to cover 500 m on each side of the ship, based on which mean densities were calculated for different sectors. The densities were assumed to apply for areas out to 20 m depth. Estimates for the east and north coasts of Öland and for the areas east and north of Gotland were based on an aerial survey in 1974 and density estimates from line transects by boats. In the calculations the aerial survey was considered to cover 250 m on each side of the aircraft. The densities obtained from the boat surveys and aerial surveys were used to get a rough estimate for the total wintering populations based on the experiences of the distribution of Long-tailed Ducks from later more extensive surveys. Early estimates for the archipelagos from northern Kalmar to Stockholm were based on total surveys of the areas and have been published by Nilsson (1975).

Results

Long-tailed Duck Clangula hyemalis

The Long-tailed Duck is mainly restricted to the Baltic during the winter and only very small numbers are found on the west coast. The species is distributed from Falsterbo in the southwest to Finngrunden in Gävlebukten to the north (Figure 3). The absolute majority of the Long-tailed Ducks in Swedish waters in 2009 were found on the three offshore banks: Hoburg bank, N. Midsjö bank and S. Midsjö bank. In all 300 000 out of an estimated total for the Swedish waters of 436 000 in this winter were found here (Figure 3, 4, Table 1, 2).

Besides the three large offshore banks, important numbers of Long-tailed Ducks were also found on the east coast of Gotland and around Öland (Figure 3, Table 1). The areas north of Gotland were

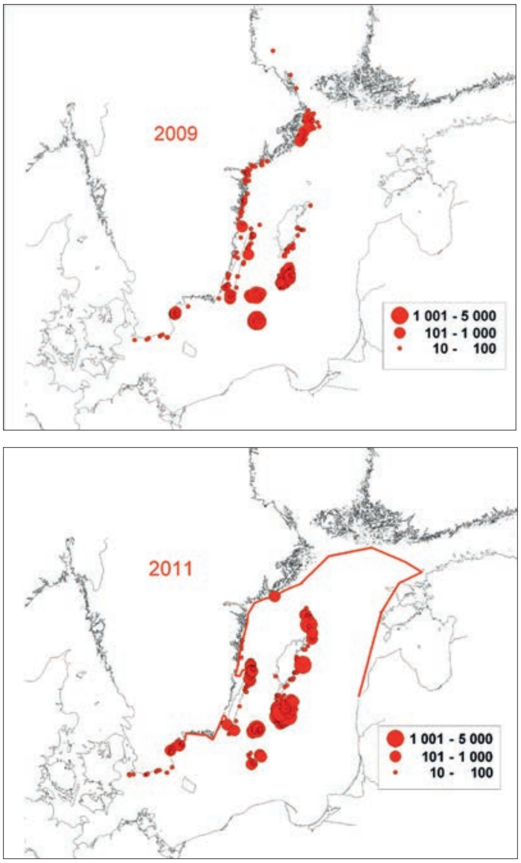


Figure 3. The distribution of Long-tailed Duck *Clangula hyemalis* in Swedish waters in the mild winter 2009 and the cold ice-winter 2011. The red line = border of ice.
Utbredningen för alfågel Clangula hyemalis *i svenska farvatten den milda vintern 2009 och den kalla isvintern 2011. Röd linje = isgränsen.*

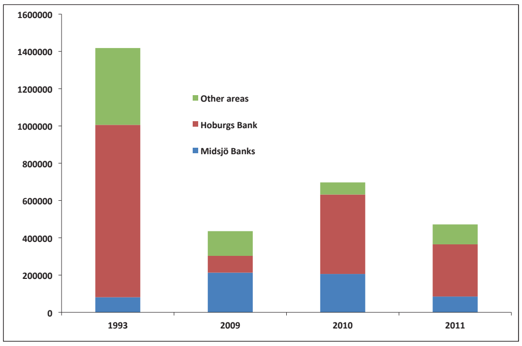


Figure 4. The estimated population of Long-tailed Duck *Clangula hyemalis* on the offshore banks and in other Swedish areas during the surveys in 1992/93, 2009, 2010 and 2011.
Det beräknade beståndet av alfågel Clangula hyemalis *på de viktiga utsjöbankarna och andra svenska områden vid inventeringarna 1992/93, 2009, 2010 och 2011.*

not surveyed in 2009 but important numbers were found here in other years. On the mainland coast only small numbers were counted on the south coast of Scania, and larger flocks from Hanöbukten and Kalmarsund north to Stockholm in the outer zone of the archipelagos (Figure 3).

In the two winters of 2010 and 2011, with hard ice conditions, the distribution of the Long-tailed Duck in Sweden was markedly different. Large numbers were concentrated to the offshore banks, with an estimated total there of 630 000 in 2010 and 365 000 in 2011. In 2010 426 000 of these Long-tailed Ducks were found on Hoburgbank (Table 1, Figure 4). The high counts on the offshore banks in 2010 and 2011 can most probably be related to the ice situation, especially on the eastern Baltic coast, where the important winter areas for the species such as Irbe strait and the Riga bay were totally ice-covered in 2010 and 2011.

The occurrence of Long-tailed Ducks on the three major offshore banks will be further discussed in another context, so I will not go into any details here. On Hoburgbank marked differences were found between the three years, related to the ice situation in the Baltic. On the Midsjö banks on the other hand the totals found in 2009 and 2010 were largely similar, but numbers were appreciably lower in 2011. The northern Midsjö bank however had similar totals for all three years (Table 2).

Compared to the first total survey of the Baltic sea in 1992/1993 there were marked differences in the total number of Long tailed Ducks estimated for the Swedish part of the Baltic in the two censuses, 1.41 million in the former compared to 0.44 million in 2009. The two estimates are however based on different methods with different kinds of bias, as discussed above.

The changes between the two major surveys are not the same for all areas. For the main areas around Gotland, Hoburgbank and the Midsjö banks, very marked differences were found between 1992/1993 and 2009. Estimates for Hoburgbank were 90 000 in 2009 compared to 925 000 in 1992/1993. For the east coast of Gotland the estimates for the two surveys were 11 000 compared to 270 000. Numbers on the Midsjö banks were markedly higher in 2009 than in 1992/1993 but this does not compensate for the decrease on Hoburgbank. Counts in 2009 and 2010 were similar but numbers were markedly lower on the southern Midsjö bank in 2011 than in the two previous years (Table 2) but there was no

Table 1. Estimated totals of Long-tailed Ducks *Clangula hyemalis* in different areas along the Baltic coast of Sweden. Distribution maps 2009 and 2011 in Figure 3; lack of agreement between table and map depends on superimposition of dots and different division into sections. A dash indicates absence of count.
Beräknat antal alfåglar Clangula hyemalis *inom olika delområden på den svenska kusten vid olika tillfällen. Utbredningskartor 2009 och 2011 i Figur 3; brist på överensstämmelse mellan tabell och karta beror på att punkter ligger på varandra och att områdesindelningen är olika. Ett streck anger avsaknad av räkning.*

Area	1967–74	1992–93	2007	2009	2010	2011
Falsterbo	1400	500	–	1600	2800	1200
Skåne south coast	9000	800	–	1700	–	2000
Skåne southeast	7000	200	–	100	–	300
Hanöbukten	25000	17000	23000	17000	–	7100
Blekinge archipelago	1600	1100	300	100	–	100
Kalmarsund	–	12000	23000	11000	11500	2500
Öland east coast	40000	10000	19000	26000	–	39000
Öland North banks	60000	30000	11000	5000	7200	22400
Midsjö banks	–	81000	–	213000	206000	85000
Hoburgs bank	–	925000	–	90000	426000	280000
Gotland east coast	400000	270000	–	11000	15100	15700
Gotland north	20000	10000	–		13500	14500
Gotland west	–	23000	–	2000	–	2000
Kalmar archipelago	10000	12000	–	14000	2700	ICE
Östergötland archipelago	1000	3500	–	8800	3200	ICE
Södermanland archipelago	4000	4000	–	4100	12000	ICE
Stockholm archipelago	24000	18000	–	26100	–	ICE
Uppland coast	–	–	–	3700	–	ICE
Gävlebukten	–	–	–	600	–	ICE
Total		1418100		435800		471800

similar decrease on the northern bank.

The offshore areas around Gotland could not be covered properly during the 1970s even if some boat transects were made along the east coast. In the winter 1974 an aerial survey was made along the entire east coast of Gotland. 26 000 Long-tailed Ducks were actually counted. Taking the coverage and the experiences from later aerial surveys here into consideration it is probable that the total wintering number of Long-tailed Ducks here was in the order of 200 000–400 000. The estimates for these waters in 2009–2011 were 11 000–15 700. It is clear that there has been a marked decrease in the waters east and north of Gotland.

From the mainland coast and the archipelagos fairly extensive data on the Long-tailed Ducks are available from the period 1971–1974 (1978). There are also some longer count series from areas where the Long-tailed Ducks can be counted more or less accurately from the shore. Regular counts of wintering ducks have been made on the coasts of south Scania between Ystad and Falsterbo Canal every winter since 1964. The depth profile makes it possible to cover an important part of the areas used by the Long-tailed Ducks in a standardized manner. During the first years more than 1000 Long-tailed Ducks were regularly counted here in January (Figure 5) but numbers have decreased markedly over

Table 2. Total estimated number of Long-tailed Ducks *Clangula hyemalis* on the Midsjö banks at all aerial surveys in the area. A dash indicates absence of count.
Beräknat antal alfåglar Clangula hyemalis *på Midsjöbankarna vid genomförda flyginventeringar. Ett streck anger avsaknad av räkning.*

	2005-04-01	2009-03-03	2010-03-16	2011-03-07	2011-03-29	2011-04-20
Norra	–	76000	74000	63000	37000	67000
Södra	160000	137000	132000	22000	7500	16500
Total		213000	206000	85000	44500	83500

the years. The same was noted for the archipelago of Blekinge (Figure 5). On the other hand there were no major changes in the number of wintering Long-tailed Ducks in Hanöbukten (Table 1), although the estimated total of Long-tailed Ducks here varied between 23 000 and 7100 at the different surveys in 2007–2011.

Kalmarsund was not well covered in the 1970s so there are no total estimates available. The estimates for 1929/1993, 2009 and 2010 were similar whereas many more Long-tailed Ducks were estimated here for 2007. Only few were counted here in 2011 as most of the area was ice-covered.

The east and north coast of Öland is an important area for the Long-tailed Duck. The 1992/1993 survey estimated the numbers here to about 40 000, the estimates for 2007 and 2009 being around 30 000 (Table 1). In the ice winter 2011 the estimate for these areas was about 60 000 but the entire Kalmarsund and the archipelagos were ice-covered and the Long-tailed Ducks had probably concentrated to the waters around Öland. From the surveys in the period 1971–1974 the estimated total for east and north Öland waters is in the order of 100 000 individuals. Regular shore-bound counts in January show a marked variation in the numbers of Long-tailed Ducks counted on the coasts of northern Öland between different years without any trend (Figure 5), but the counts are much influenced by the weather conditions.

Estimates from 1971–1974 are available from the archipelagos from Kalmar to Stockholm (Table 1) showing no differences in the estimated numbers of wintering Long-tailed Ducks here comparing with the recent survey in 2009 (these areas being ice-covered in 2010 and 2011). The coast of Väddö on the Uppland coast north of Stockholm archipelago showed marked variation between different years (Figure 5).

The local distribution of Long-tailed Ducks in some areas will be discussed in some detail here as the surveys in 2007–2011 were the first ones to obtain a comprehensive coverage of the entire offshore distribution in Swedish waters. The south

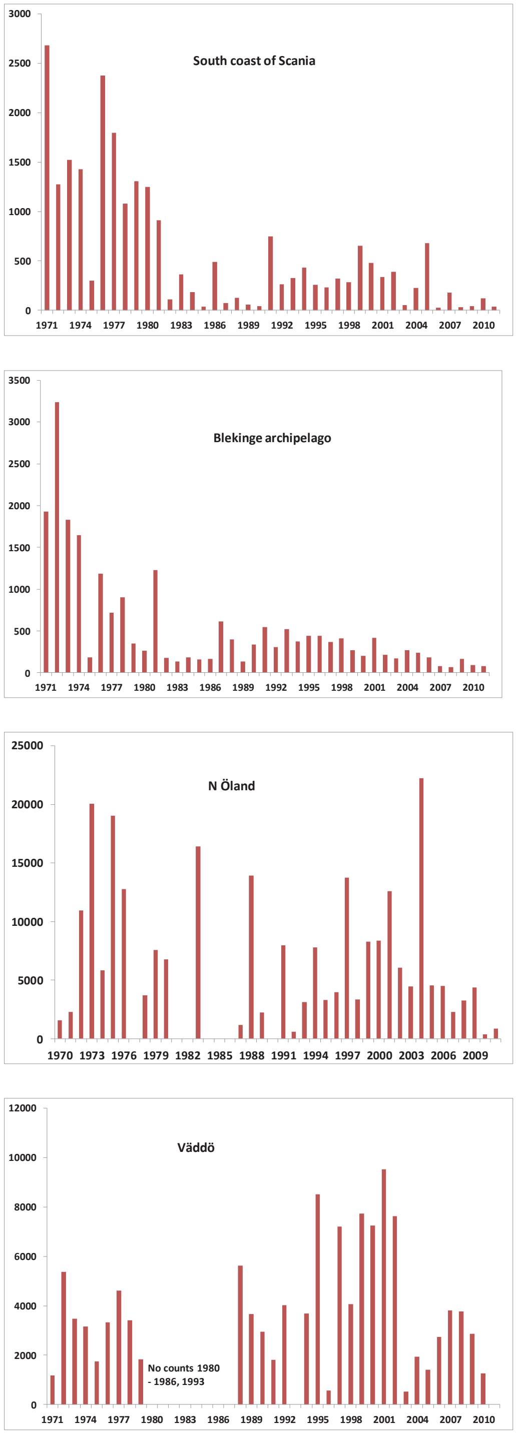


Figure 5. Annual totals of Long-tailed Ducks *Clangula hyemalis* in four reference areas of the International Midwinter Counts during 1971–2011.
Antalet alfåglar Clangula hyemalis *inom fyra referensområden vid de internationella midvinterinventeringarna 1971–2011.*

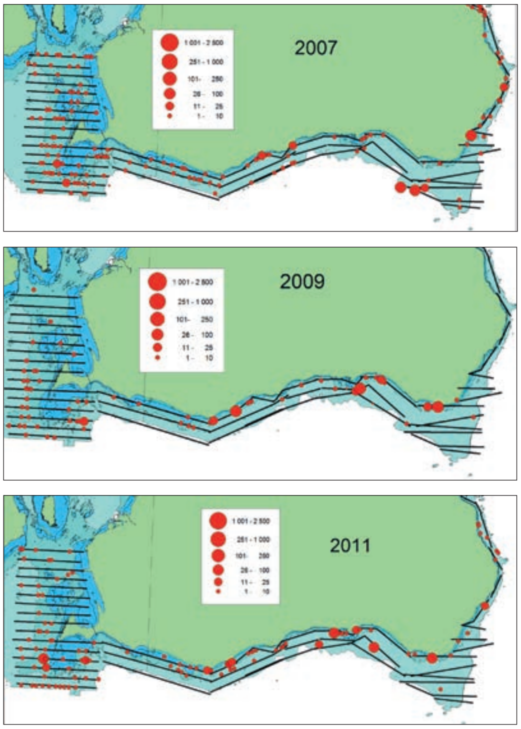


Figure 6. Number of Long-tailed Ducks *Clangula hyemalis* counted along the line transects off the south coast of Scania, southernmost Sweden during the winters 2007, 2009 and 2011. Black lines = transect lines.
Antalet inräknade alfåglar Clangula hyemalis *längs inventeringslinjer utanför den skånska sydkusten, södra Sverige, under vintrarna 2007, 2009 och 2011. Svarta linjer = inventeringslinjer.*

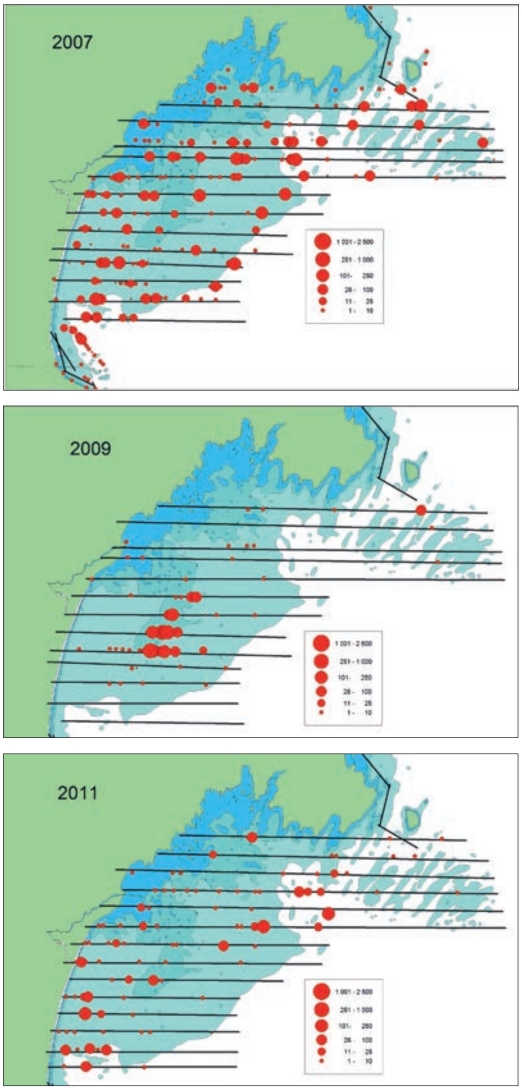


Figure 7. Number of Long-tailed Ducks *Clangula hyemalis* counted along the line transects in Hanöbukten, southernmost Sweden during the winters 2007, 2009 and 2011. Black lines = transect lines.
Antalet inräknade alfåglar Clangula hyemalis *längs inventeringslinjer i Hanöbukten, södra Sverige, under vintrarna 2007, 2009 och 2011. Svarta linjer = inventeringslinjer.*

coast of Scania has been surveyed completely from the air on three occasions during 2007–2011 (Figure 6). In the southern part of Öresund and around the Falsterbo peninsula, where detailed studies have been made (Nilsson & Green 2011) small groups of Long-tailed Ducks were found spread in the offshore areas. The Long-tailed Ducks were found spread off the entire south coast mostly in rather shallow waters relatively close to the shore even if flocks were found out to a depth of about 20 m. The distribution was similar during extensive boat surveys and counts from the shore during 1964–1970 (Nilsson 1972), but numbers in the area were much lower in 2007–2009 both in the offshore and inshore waters (Figure 5).

Hanöbukten in Scania is the southernmost offshore concentration area for the species in Sweden. Three surveys in 2007–2011 (Figure 7) show quite different distribution patterns. In 2007 they were highly spread out over the entire area, whereas they were much more concentrated in 2009. The totals estimated for the two surveys were not so different, 23 000 compared to 17 000, whereas much lower counts were obtained in 2011 (Table 1). The 2009 concentration was at a shallow area called Kiviksbredan, which had the highest densities of Long-tailed Ducks during studies in the 1960s (Nilsson

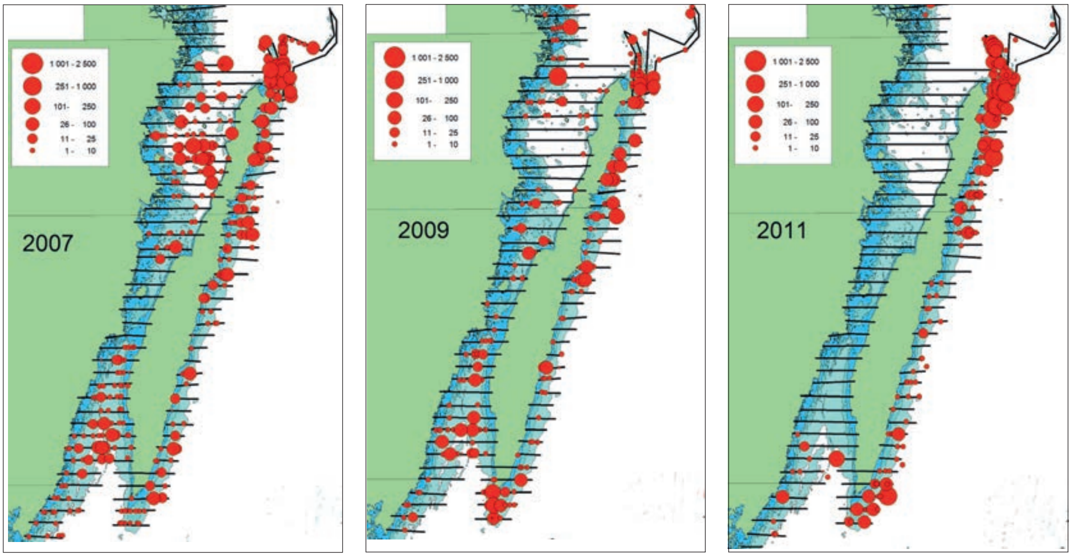


Figure 8. Number of Long-tailed Ducks *Clangula hyemalis* counted along the line transects in Kalmarsund and off Öland, southernmost Sweden during the winters 2007, 2009 and 2011. Black lines = transect lines.
Antalet inräknade alfåglar Clangula hyemalis *längs inventeringslinjer i Kalmarsund och utanför Öland, södra Sverige, under vintrarna 2007, 2009 och 2011. Svarta linjer = inventeringslinjer.*

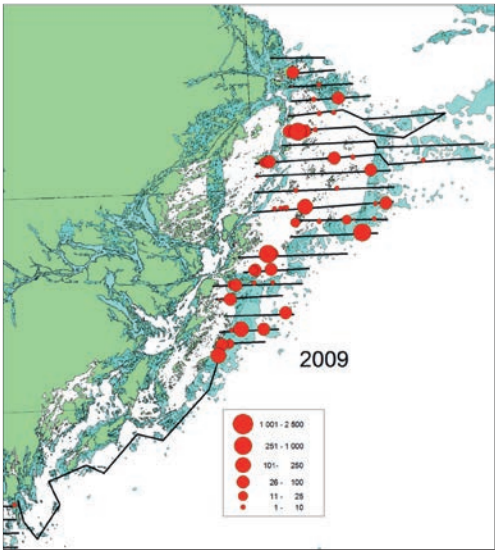
1972) but in most other surveys the species was more spread out than in the earlier years.

Kalmarsund and Öland were totally covered in three winters (Figure 8). 2007 and 2009 were mild winters with little ice and accordingly the Long-tailed Ducks were well spread both in the Kalmarsund and on the east and north coast of Öland. 2011 was a hard ice-winter and the only open water in the Kalmarsund was found in the far southern end of the area. In this winter the Long-tailed Ducks were found east and northeast of Öland, with an estimated total of 60 000 individuals in this area (Table 1).

In all years concentrations of Long-tailed Ducks were found on the banks north and northeast of Öland. Large numbers were often counted from the shore in this area (Figure 5). In two of the three surveys there was also a concentration of Long-tailed Ducks around southern Öland. In the Kalmarsund there are a number of shallow banks in the southern and northern parts of the area and most flocks of Long-tailed Ducks were accordingly found here. The distribution of Long-tailed Ducks in the waters around Öland was similar in the seventies with a marked concentration to the northern banks and the northeastern coast of the island.

Long-tailed Ducks were wide-spread in the outer zones of the archipelagos all the way from the Kalmarsund area to the northern part of the Stockholm archipelago (Figure 9). In the 2009 survey there were no larger regional differences with the exception of few Long-tailed Ducks in the southern part of the Stockholm archipelago. The inner parts of the archipelago were not covered in the 2009 survey, but counts at the countrywide aerial survey in 2004 did not show any larger numbers of Long-tailed Ducks here. The distribution of Long-tailed ducks in the archipelagos was similar in the surveys during the 1970s.

The best coverage of the offshore waters around Gotland was obtained in the ice winter 2011 (Figure 10). The species was well spread mostly in smaller groups and some flocks on the east coast and on the banks between mainland Gotland and Gotska Sandön with a flock on the isolated offshore bank Kopparstenarna. A concentration was found at Östergarn and some parts at Gotska Sandön. The counts of the east coast of Gotland in 2009 and 2010 show a similar distribution of the species but all parts were not covered. In the 1970s very large numbers of Long-tailed Ducks were found in the waters around Fårön and the northeast of Gotland, but during the recent surveys only relatively small numbers were found here. The situation for the Long-tailed Ducks on Hoburg bank and the Midsjö banks will be addressed in another paper analyzing



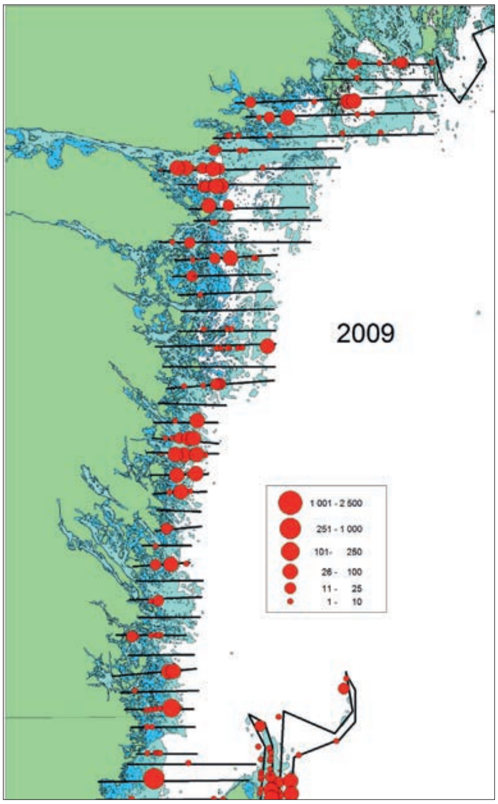


Figure 9. Number of Long-tailed Ducks *Clangula hyemalis* counted along the line transects in east coast archipelagos of Sweden during the winter 2009. Black lines = transect lines. *Antalet inräknade alfåglar* Clangula hyemalis *längs inventeringslinjer i de svenska ostkustskärgårdarna under vintern 2009. Svarta linjer = inventeringslinjer*

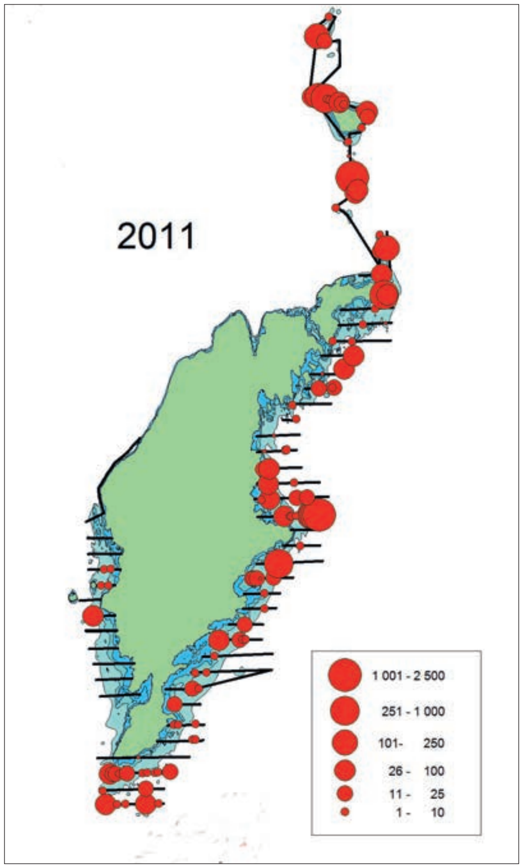


Figure 10. Number of Long-tailed Ducks *Clangula hyemalis* counted along the line transects at the coasts of Gotland during the winter 2011. Black lines = transect lines. *Antalet inräknade alfåglar* Clangula hyemalis *längs inventeringslinjer vid kusterna av Gotland under vintern 2011. Svarta linjer = inventeringslinjer*

the distribution of the species in relation to different habitat features (Larsson, Nilsson & Skov in prep.) but maps of the distribution on these banks from the 2009 survey are included here to make the overall picture complete (Figure 11).

Velvet Scoter Melanitta fusca

The Velvet Scoter is normally seen only in relatively small numbers in the Swedish part of the Baltic (Figure 12, Table 3). In 2007, when unusually high numbers of Common Scoters were found in parts of the Swedish Baltic, relatively high numbers of Velvet Scoters were also counted in Hanöbukten and along the east coast of Öland. Offshore counts in the waters around Falsterbo and in Hanöbukten have shown a regular occurrence of the species in

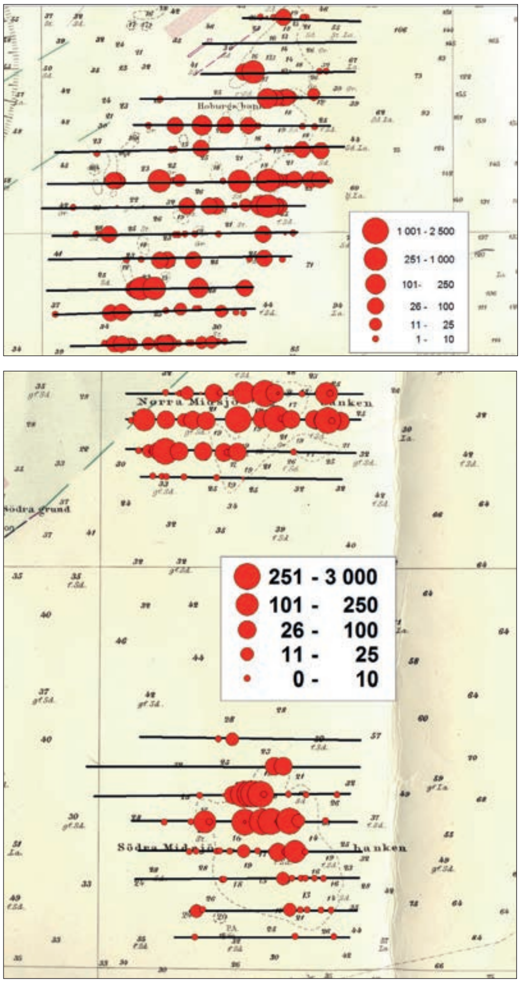


Figure 11. Number of Long-tailed Ducks *Clangula hyemalis* counted along the line transects on Hoburg Bank southeast of Gotland (upper map) and on the Midsjö banks southeast of Öland (lower map) during the winter 2009. Black lines = transect lines.
Antalet inräknade alfåglar Clangula hyemalis *längs inventeringslinjer på Hoburgs Bank sydost om Gotland (övre kartan) och Midsjöbankarna sydost om Öland (nedre kartan) vintern 2009. Svarta linjer = inventeringslinjer.*

small numbers in the winter, small numbers also occurring around Öland and Gotland (cf. Nilsson 1972, 1975, 2008, Nilsson & Green 2011).

In the southeastern part of Kattegatt, in Laholmsbukten and Skälderviken, Velvet Scoters and Common Scoters are regularly wintering in flocks (Figure 11, Table 4). The areas are regularly covered during the standard midwinter counts, but the flocks stay too far out from the shore to be adequately covered every winter. Scoter flocks have however been recorded here since the start of the counts in the 1960s (Nilsson 1975). In 2009, this area was surveyed from the air and the total number of wintering Velvet Scoters was estimated to be around 2500, compared to about 17 500 Common Scoters (Table 4, unidentified Scoters included in proportion to identified ones).

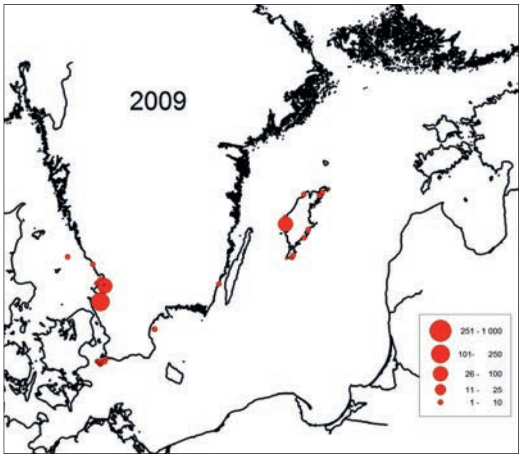


Figure 12. The distribution of Velvet Scoter *Melanitta fusca* in Swedish waters in the mild winter 2009.
Utbredningen för svärta Melanitta fusca *i svenska farvatten den milda vintern 2009.*

Common Scoter Melanitta nigra

The Common Scoter is a regular wintering bird in the southern part of the Swedish Baltic areas and in the southeast parts of the Kattegat (Figure 13). Normally it has been counted in relatively small numbers around the coasts of Scania, Kalmarsund and Öland, but in 2007 no less that 40 000 Common Scoters were estimated to be present in the offshore waters here compared to 1500–2000 in the other years (Table 5). Numbers were much lower in 2009 but a flock of no less than 600 was found on northern Gotland during the midwinter counts from the shore (Gotland was not covered in 2007).

The Common Scoter as well as the Velvet Scoter is regularly wintering in the southeast part of the Kattegat (Figure 13, Table 4). At the aerial surveys in 2009, the total number of Common Scoters in this area was estimated to be about 17 500. The annual midwinter counts in this region do not cover the offshore parts properly, but large flocks of wintering Common Scoters have been regularly seen since the start of the counts in the late sixties (Nilsson 1975, 2008).

Table 3. Estimated totals of Velvet Scoters *Melanitta fusca* in different areas along the Swedish Baltic coast in the winters 2007–2011. Distribution map for 2009 in Figure 12; further explanation in Table 1. A dash indicates absence of count.
Skattat antal svärta Melanitta fusca *inom olika områden efter den svenska Östersjökusten 2007 och 2009. Utbredningskarta i Figur 12; ytterligare förklaring i Tabell 1. Ett streck anger avsaknad av räkning.*

Area	2007	2009	2010	2011
Falsterbo	180	0	250	90
Skåne south coast	10	0	–	0
Skåne southeast	–	0	–	0
Hanöbukten	3240	60	–	330
Blekinge archipelago	0	0	–	0
Kalmarsund	870	30	325	13
Öland east coast	1850	0	–	0
Öland North banks	0	0	0	0
Midsjöbankarna	–	0	0	0
Hoburg Bank	–	0	0	350
Gotland east coast	–	20	–	1075
Gotland north	–	–	–	0
Gotland west	–	100	–	–
Kalmar archipelago	–	–	–	ICE
Östergötland archipelago	–	–	–	ICE
Södermanland archipelago	–	–	–	ICE
Stockholm archipelago	–	–	–	ICE
Uppland coast	–	–	–	ICE
Gävlebukten	–	–	–	ICE
Total	6150	210		1858

The local distribution of the Common Scoter in Hanöbukten is exemplified in Figure 14. In 2007, when the wintering population here was estimated to be around 13 500, the majority of the Common Scoters occurred far out at sea often at a water depth of about 20 m or more.

The Common Scoter has been seen in small numbers in the archipelagos of the Swedish Baltic coast in winter. The surveys in 2009, which were timed for covering the Long-tailed Ducks, were too late for Scoters (and Eiders) as the spring migration for these species had already started.

Table 4. Estimated totals for Common Scoter *Melanitta nigra* and Velvet Scoter *Melanitta fusca* in Skälderviken and Laholmsbukten in the winter 2009.
Räknat och skattat bestånd för sjöorre Melanitta nigra *och svärta* Melanitta fusca *i Skälderviken och Laholmsbukten vintern 2009.*

Species	Skälderviken	Laholmsbukten
Common Scoter *Melanitta nigra*	4500	11000
Velvet Scoter*Melanitta fusca*	1320	1120
Melanitta sp.	750	1310
Total	6580	13430

Eider Somateria mollisima

Wintering Eiders are mostly found on the west coast of Sweden (Figure 15, Table 6). During the more or less complete count in 2009, about 52 000 were counted on the west coast (Table 7) and about 20 000 on the east coast (Table 6). The majority of the wintering Eiders in the Baltic were found in two areas, around the Falsterbo peninsula in the southwest and around Gotland (Figure 15, Table 6). Only smaller numbers were found in the other parts of the Baltic coast in winter. The 2009 survey was undertaken too late for counting of wintering Eiders in the archipelagos (migration had started), but only small numbers were found in the 2004 inshore survey, which had a good coverage of potential Eider sites in the archipelagos.

On the west coast, the Eider is well spread over the entire area from northern Öresund and Skälderviken in the south to the Norwegian border (Figure 16). In the Kattegat the Eiders are mostly found inshore, but in Bohuslän the majority of the Eiders were found close to the outer islands and skerries, mostly on the western shores of small islands with rich supplies of blue mussels.

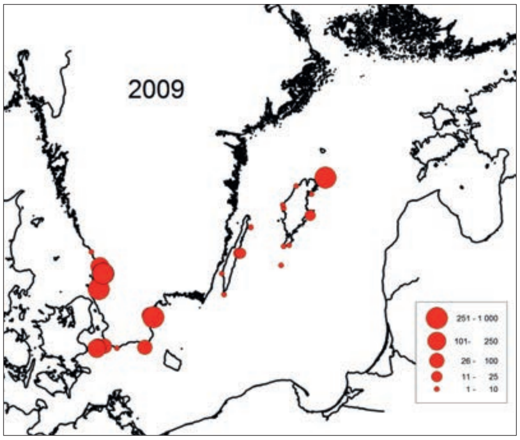


Figure 13. The distribution of Common Scoter *Melanitta nigra* in Swedish waters in the mild winter 2009.
Utbredningen för sjöorre Melanitta nigra *i svenska farvatten den milda vintern 2009.*

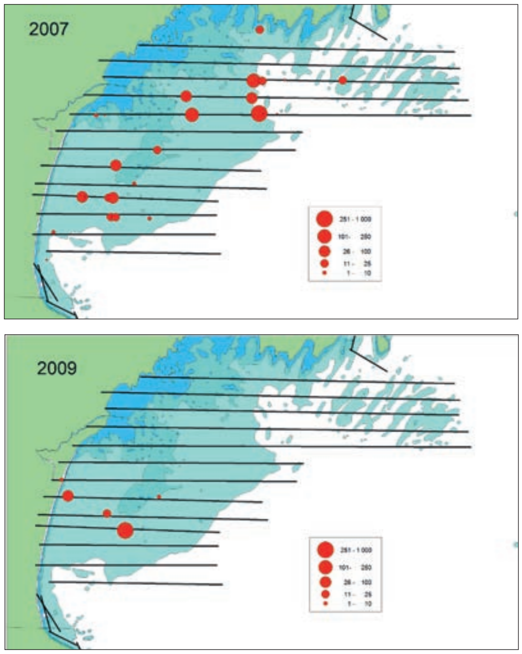


Figure 14. Number of Common Scoters *Melanitta nigra* counted along the line transects in Hanöbukten, southernmost Sweden during the winters 2007 and 2009. Black lines = transect lines.
Antalet inräknade sjöorrar Melanitta nigra *längs inventeringslinjer i Hanöbukten, södra Sverige, under vintrarna 2007 och 2009. Svarta linjer = inventeringslinjer.*

Table 5. Estimated totals of Common Scoters *Melanitta nigra* in different areas along the Swedish Baltic coast in the winters 2007–2011. Distribution map for 2009 in Figure 13; futher explanation in Table 1. A dash indicates absence of count.
Skattat antal sjöorrar Melanitta nigra *inom olika områden efter den svenska Östersjökusten 2007–2011. Utbredningskarta för 2009 i Figur 13; ytterligare förklaring i Tabell 1. Ett streck anger avsaknad av räkning.*

Area	2007	2009	2010	2011
Falsterbo	2100	470	300	375
Skåne south coast	500	430	–	0
Skåne southeast	–	–	–	0
Hanöbukten	13500	300	–	238
Blekinge archipelago	0	0	–	0
Kalmarsund	20600	60	150	25
Öland east coast	3200	560	–	500
Öland North banks	0	0	0	0
Midsjöbankarna	–	0	63	0
Hoburg Bank	–	40	2110	338
Gotland east coast	–	20	–	25
Gotland north	–	600	–	0
Gotland west	–	20	–	–
Kalmar archipelago	–	–	–	ICE
Östergötland archipelago	–	–	–	ICE
Södermanland archipelago	–	–	–	ICE
Stockholm archipelago	–	–	–	ICE
Uppland coast	–	–	–	ICE
Gävlebukten	–	–	–	ICE
Total	39900	2500		1501

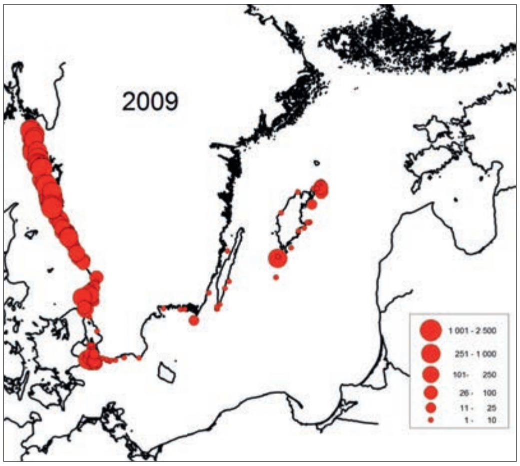


Figure 15. The distribution of Eider *Somateria mollissima* in Swedish waters in the mild winter 2009.
Utbredningen för ejder Somateria mollissima *i svenska farvatten den milda vintern 2009.*

The Eiders wintering on the west coast have been surveyed from the air during four periods (Table 7). At the first two surveys less than 10 000 wintering Eiders were found but from 1987–1989 to 2004 the number increased to 48 300 with no large changes to 2009 when 52 000 were counted here.

Table 7. Estimated totals of Eiders *Somateria mollissima* on the west coast in the four periods when aerial surveys were undertaken here (additional data from ground counts also included).
Beräknat antal ejdrar Somateria mollissima *på västkusten vid de fyra tillfällen områdena flyginventerats (kompletterat med landbaserade räkningar).*

	1971–74	1987–89	2004	2009
Bohuslän	2900	5500	36600	40700
Halland	1200	2300	9300	5300
NV Skåne	4500	1900	2400	6000
Total	8600	9700	48300	52000

Red-breasted Merganser Mergus serrator

The Red-breasted Merganser is well spread around the coasts of south Sweden occurring both in inshore and offshore waters (Figure 17). Numbers counted in the annual midwinter counts is large enough to allow the calculation of annual indices. In the 2009 survey the largest numbers counted in the Swedish part of the Baltic were found around the Falsterbo peninsula, in southern Kalmarsund and around Gotland. Only small numbers were found in the archipelagos as was also the case for the aerial surveys in the archipelagos and inshore

Table 6. Estimated totals of Eiders *Somateria mollissima* in different areas along the Swedish Baltic coast in the winters 2007–2011. Distribution map for 2009 in Figure 15. A dash indicates absence of count.
Skattat antal ejdrar Somateria mollissima *inom olika områden efter den svenska Östersjökusten 2007–2011. Utbredningskarta för 2009 i Figur 15. Ett streck anger avsaknad av räkning.*

Area	2007	2009	2010	2011
Falsterbo	10500	12700	11660	9915
Skåne south coast	300	90	–	348
Skåne southeast	–	–	–	–
Hanöbukten	1100	230	–	13
Blekinge archipelago	–	–	–	0
Kalmarsund	1500	780	363	0
Öland east coast	3800	420	–	113
Öland North banks	0	0	0	740
Midsjöbankarna	–	9	0	0
Hoburg Bank	–	90	0	40
Gotland east coast	–	5400	675	6700
Gotland north	–	–	–	0
Gotland west	–	–	–	–
Kalmar archipelago	–	–	–	ICE
Östergötland archipelago	–	–	–	ICE
Södermanland archipelago	–	–	–	ICE
Stockholm archipelago	–	–	–	ICE
Uppland coast	–	–	–	ICE
Gävlebukten	–	–	–	ICE
Total		19719	12698	17869

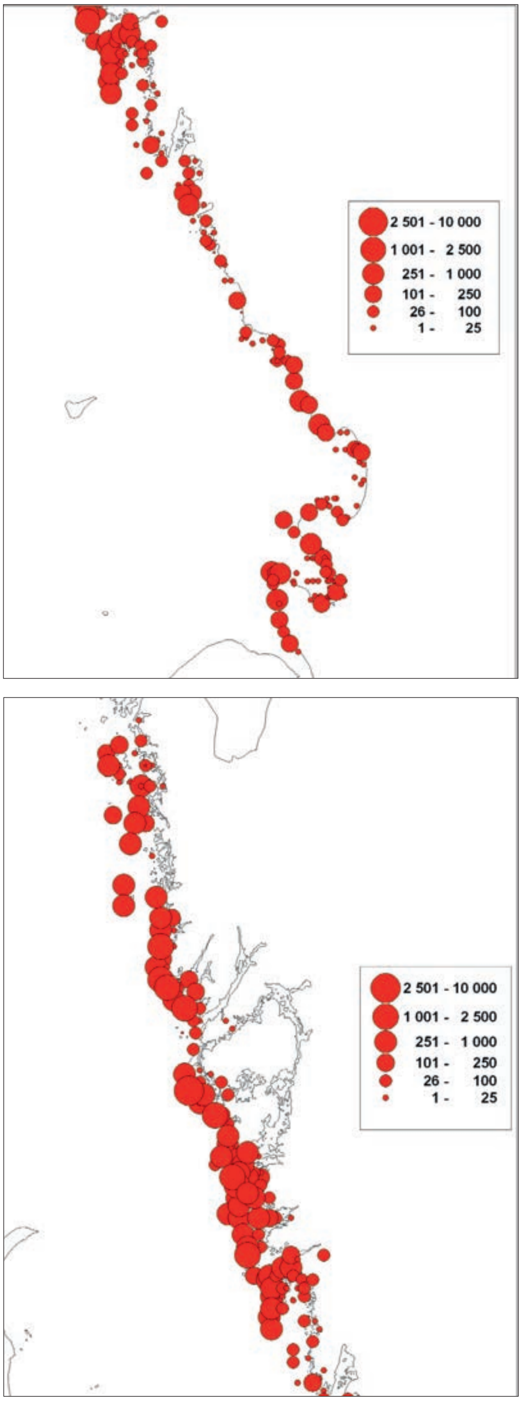


Figure 16. The distribution of Eider *Somateria mollissima* along the Swedish west coast during the winter 2009.
Ejderns Somateria mollissima *utbredning efter den svenska västkusten vintern 2009*

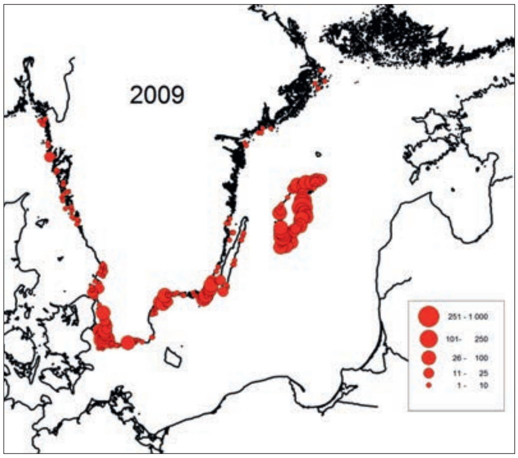


Figure 17. The distribution of Red-breasted Merganser *Mergus serrator* in Swedish waters in the mild winter 2009.
Utbredningen för småskrake *Mergus serrator* i svenska farvatten den milda vintern 2009.

areas in the early seventies and in 2004 (Nilsson 1975, 2008).

Based on the aerial surveys of the transects in the Baltic, adding grounds counts from the shore from areas not covered from the air gives an estimate of about 8000 Red-breasted Mergansers (Table 8). There is however a marked variation in the numbers of the species in the offshore Swedish waters. Thus the estimate for the waters around Falsterbo and the southern part of the Öresund was about 2000 for 2009, but censuses in connection with the Lillgrund offshore wind farm have given estimates of up to 12 000 Red-breasted Mergansers in this area (Nilsson & Green 2011). The surveys on the west coast in 2009 were aimed at covering Eiders (and Scoters in southern Kattegat) and do not allow an estimate of the wintering numbers of Red-breasted Mergansers here. In the Öresund about 900 were counted and close to 2000 were found on the west coast north of Öresund here at the country-wide surveys in 2004 (Nilsson 2008), so it is probable that the wintering population in Swedish waters in 2009 could be in the order of at least 11 000 individuals. There is however a very marked variation between years as seen from the Lillgrund studies mentioned above.

There are unfortunately no comparable data to elucidate any changes in the overall population of the species in offshore Swedish waters. The Swedish Midwinter counts show a significant increasing trend since the start of the counts (Nilsson 2008), although numbers were low

Table 8. Estimated totals of Red-breasted Mergansers *Mergus serrator* in different areas along the Swedish Baltic coast in the winters 2007–2011. Distribution map for 2009 in Figure 17. A dash indicates absence of count.
Skattat antal småskrakar Mergus serrator *inom olika områden efter den svenska Östersjökusten 2007–2011. Utbredningskarta för 2009 i Figur 17. Ett streck anger avsaknad av räkning.*

Area	2007	2009	2010	2011
Falsterbo	2600	2000	4510	2610
Skåne south coast	200	300	–	760
Skåne southeast	–	–	–	0
Hanöbukten	200	700	–	110
Blekinge archipelago	0	670	–	0
Kalmarsund	900	1200	60	638
Öland east coast	300	500	–	1575
Öland North banks	0	0	0	102
Midsjöbankarna	–	0	60	0
Hoburg Bank	–	0	0	238
Gotland east coast	–	1700	–	163
Gotland north	–	–	–	0
Gotland west	–	825	–	–
Kalmar archipelago	–	0	–	ICE
Östergötland archipelago	–	0	–	ICE
Södermanland archipelago	–	0	–	ICE
Stockholm archipelago	–	0	–	ICE
Uppland coast	–	0	–	ICE
Gävlebukten	–	0	–	ICE
Total		7840		

Discussion

From the data presented here and in comparison with the estimates from the total surveys of wintering seabirds in the Baltic (Durinck et al. 1994, Skov et al. 2011; see also Delany & Scott 2006 for the entire NW Europe) it is clear that the Swedish offshore areas in the Baltic are of very large international importance for wintering seaducks, especially for the Long-tailed Duck but also for the Red-breasted Merganser (Nilsson 2008) whereas the two scoter species are more sparse.

When comparing the estimates for Swedish waters presented here with the population estimates for NW Europe presented by Delany & Scott (2006) and with the two All Baltic surveys (Durinck et al. 1994, Skov et al. 2011) it is important to bear in mind the differences in methods used during the two all Baltic surveys with the different uncertainties and biases attached to the two methods (see above). These factors will also have a great importance when evaluating the population changes indicated in the report from the SOWBAS study (Skov et al. 2011).

The results of the two all-Baltic surveys indicate a very marked decrease in the population of Long-tailed Duck between the two surveys, from 4.3 to 1.5 million (Skov et al 2011). The Swedish wintering population was 32% and 29% of the published estimates for the entire Baltic in the two surveys, showing that the decline was similar in Swedish waters as elsewhere. The decrease in the population within Swedish waters was mainly concentrated to Hoburgbank and the offshore waters of east Gotland, whereas there was no such decrease for the Midsjö banks and with stable wintering numbers or only smaller decreases (within the calculation error) established for the wintering areas around Öland and along the mainland coast.

In spring, the Long-tailed Ducks migrate to the breeding areas in northern Russia, a major part of the population passing the Gulf of Finland. During this migration the numbers have been counted from sites in Finland and Estonia (Bergman 1974, Hario et al. 2009). Counts at Söderskär on the Finnish coast showed an increase from about 1970 to the early 1990s, followed by a marked decrease (Hario et al. 2009, see also Kauppinen & Leivo 2008). The highest counts of spring migrants coincided with the first all Baltic survey (1992/1993), which yielded much higher estimates than the 2007–2009 survey. Unfortunately there are no available data to show whether there has been a similar increase in the numbers of wintering Long-tailed Ducks in the Baltic as indicated from the Finnish migration counts. The only winter censuses from the seventies are the ones presented here which do not cover the important offshore banks, which are used by the majority of Long-tailed Ducks in Swedish waters.

Different factors have been discussed in relation to the marked decline of the Long-tailed Ducks during recent years such as oil pollution, bycatches in fishing equipment and decreased habitat quality (Larsson & Tydén 2005, Stempniewicz 1994, Skov et al. 2011, Zydelis et al. 2009) but also factors on the breeding areas on the Russian tundra(Hario et al.2009). Probably the decline of the wintering Long-tailed Duck population is caused by a combination of different factors. The availability and quality of the food is probably an important factor here as there have been marked decreases among several mussel eaters in the Baltic. The steady impact of small discharges of oil has certainly had an important impact on the wintering Long-tailed Ducks (Larsson & Tydén 2005). The most marked decline in the Swedish waters was found for the Hoburg bank and the east coast of Gotland, these waters being on the main shipping line to the Bay of Finland and St Petersburg. There are also indications on a low rate of young production that can either be related to factors on the breeding grounds in Russia or to a decline in the quality of the food for the females building up the condition before the migration to the breeding areas.

The idea has also been put forward that the decline in the Baltic Sea reflects a change in the winter distribution of the species, but there are no data supporting this idea. Within the Baltic all potential winter areas were surveyed during the SOWBAS study.

Similar to the Long-tailed Duck, the Common Scoter and the Velvet Scoter both have large wintering populations in the Baltic Sea and both have decreased markedly (Skov et al. 2011). These species have only small wintering populations in Swedish waters. The same applies to the winter population of Eiders in the Swedish part of the Baltic. The large numbers of breeding Eiders from the Swedish Baltic coast leave the country for the winter and are mainly found in the southwestern part of the Baltic and the Kattegat (Desholm et al. 2002, Ekroos et al. 2012).

The Swedish breeding population of the Eider showed a marked increase from the first larger studies in the seventies to the nineties, followed by a very marked decrease back to the level recorded in the seventies (Ekroos et al. 2012). Marked decreases have also been found in the wintering population of the whole northwestern Europe. In contrast to this there has been no decrease in the size of the wintering numbers of Eiders on the Swedish west coast. One cannot avoid drawing attention to the fact that that there is a parallel between the numerical patterns of wintering Long-tailed Ducks and breeding Eiders. In both species there was a long term increase to a peak followed by a decline, similar patterns even if they did not peak at exactly the same time. In the Eider, change in food availability (mussels) has been advanced as an explanation, and I consider it likely that the same factor may have played a role for the Long-tailed Duck.

The four seaduck species discussed above all show marked decreases between the two large surveys. All four species are benthic feeders to a large extent relying on mussels. The fifth species common in the Swedish offshore waters, the Red-breasted Merganser, is a fish-eater. According to the SOWBAS study (Skov et al. 2011) there are indications of a decrease also for this species, but the data from Swedish waters indicate an increasing trend. In contrast to the offshore species discussed here, counts of inshore seaducks (and other diving ducks) mainly show increasing trends (Nilsson 2008).

Acknowledgements

The offshore aerial surveys reported here as well as the Swedish Midwinter Counts are supported by grants from Naturvårdsverket (the Swedish Environmental Protection Agency). The same applies to the aerial surveys in the seventies which were also supported by the Swedish Airforce, which provided free flying time. I am also grateful for the support of the Swedish Coast Guard that allowed duck counters onboard their patrol ships during the surveys in the sixties and seventies.

The aerial surveys could not have been done without the help of a number of skilled observers and I will give my sincere thanks to David Erterius, Martin Granbom, Martin Green, Nils Kjellen, Johan Nilsson, Roine Strandberg and Mikael Svensson for many observer hours over the open sea. Martin Green kindly commented on an earlier version of the manuscript.

Permission to publish the maps in the figures granted by Sjöfartsverket© 12-01905.

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Sammanfattning

Årliga midvinterinventeringar av övervintrande sjöfåglar har organiserats i Sverige sedan 1967 som en del av de Internationella Midvinterinventeringarna samordnade av Wetlands International (Nilsson 2008). Dessa inventeringar utgör nu en del av det nationella miljöövervakningsprogrammet. Under de första åren försökte man täcka så stora områden som möjligt (Nilsson 1975), men senare koncentrerades inventeringarna till att täcka ett representativt urval lokaler för att ge underlag för beräkning av årliga index för de viktigaste arterna.

Under åren 1965–1978 genomfördes ett betydande antal båtinventeringar utanför de svenska kusterna från kustbevakningens patruller, varvid betydande områden i skärgårdarna och utanför de öppna kusterna kunde täckas (Nilsson 1972, 1980). Omfattande flyginventeringar genomfördes också i skärgårdarna och längs de öppna kusterna under dessa år (Nilsson 1975). Vissa offshore områden kunde också täckas med flyg.

De tidiga undersökningarna under 1960- och 1970-talen gav en hel del information om de havslevande dykändernas förekomst i svenska farvatten, något som tidigare varit ganska dåligt känt (jfr dock Mathiasson 1970). Under dessa år var det emellertid inte möjligt att täcka in utsjöbankar som Midsjöbankarna och Hoburgs Bank, som redan då var kända som viktiga lokaler för speciellt alfågel.

Efter de politiska förändringarna i området genomfördes en första samordnad inventering med båt och flyg i hela Östersjön 1992 och 1993 (Durinck et al. 1994). Denna inventering upprepades under åren 2007–2009 i SOWBAS-projektet (Skov et al. 2011). Parallellt med dessa undersökningar genomfördes under 2009–2011 på Naturvårdsverkets uppdrag inventeringar i de svenska farvattnen med flyg för att kartlägga sjöfågelförekomsten och för att utarbeta ett förslag på hur dessa fåglar skall kunna följas upp inom övervakningsprogrammen.

I denna uppsats sammanfattas resultaten från inventeringarna i de svenska farvattnen under 2007–2011 och jämförs med de inventeringar som genomförts i de inre farvattnen och vissa utsjöområden under den tidiga inventeringsperioden samt med resultaten från den första sammanfattande inventeringen av Östersjön (Durnick et al. 1994, Nilsson 1975, 1980). Jag koncentrerar mig här på de arter som täcks dåligt av de traditionella midvinterinventeringarna, dvs. alfågel, svärta, sjöorre, ejder och småskrake. De båda sistnämnda ses i tillräcklig omfattning vid de årliga midvinterinventeringarna för att ge underlag för indexberäkningar (Nilsson 2008), men de förekommer också i utsjöområdena och behandlas därför också i detta sammanhang.

Material och metodik

Vid inventeringarna 2007–2011 täcktes de yttre havsområdena med linjetaxeringar från flygplan. Inventeringslinjerna lades ut så att de täckte alla viktigare havsområden (inkl. utsjöbankar) i de svenska havsområdena. Gränsen mot djupare vatten lades vid ett djup på 30 m. Ett exempel på utlägg av inventeringslinjer visas från Hanöbukten (Figur 1). Här låg linjerna med 2 km mellanrum, men i de flesta havsområden låg de med 4 km mellanrum. I ostkustskärgårdarna startade linjerna i princip i zonen med större öar och gick ut till djupt vatten.

Vid flyginventeringarna använde vi en CESSNA 337 Skymaster, en tvåmotorig högvingad maskin, godkänd för utsjöflygningar, och med god sikt. Normalt flög vi på ca 70 m höjd med en hastighet av ca 150–180 km/h. Navigeringen skedde mellan förutbestämda punkter med planets GPS. Vid observationerna medverkade minst två observatörer, en bredvid piloten och en bakom, vilka täckte var sin sida av planet. Ibland medföljde en tredje observatör. Alla iakttagelser talades in på band med tidsangivelse. Den exakta flygvägen loggades på en separat GPS. Observationerna lades sedan in i en databas med exakta positioner för varje observation.

Vid inventeringarna räknade vi samtliga observerade fåglar. Inventeringarna koncentrerades till ett band på 200 m på vardera sidan av flygplanet. Fåglar utanför denna zon noterades som extra information och markerades speciellt i databasen. Observatörerna hade en död zon på vardera sidan av planet, som beräknas till ca 40 m på vardera sidan. Detta innebär i praktiken att den inventerade zonen blir 320 m bred. Vid analyserna har sedan inventeringsdata från denna 400 m breda zon omräknats till antal individer per större områden baserat på räkningarna i inventeringsbältet och uppräkningsfaktor (6,25 resp. 12,5 för inventeringslinjer med 2 resp. 4 km lucka) baserad på täckningsgraden inom relevanta djupområden.

Under 2007 kunde endast begränsade inventeringar genomföras i sydligaste Sverige, medan mer omfattande inventeringar gjordes under 2009–2011 (Figur 2). Vädermässigt skilde sig vintrarna åt markant. 2009 (liksom 2007) var en mild vinter med endast ringa isläggning, medan 2010 och 2011 var hårda isvintrar i Östersjön. Bland annat var Kalmarsund och skärgårdarna norr därom täckta med is liksom stora delar av östra Östersjön (jfr. Figur 5).

Resultaten från inventeringarna 2007–2011 jämförs nedan med de båda större Östersjöinventeringarna 1992/93 och 2007–2009 (Durinck et al. 1994, Skov et al. 2011). Vid jämförelserna måste man beakta att den svenska inventeringen 2007–2011 grundas på täta linjetaxeringar med flyg, medan många av de svenska områdena 1992/93 endast kunde täckas med ett fåtal inventeringslinjer från båt. Skattningarna grundas i betydande utsträckning på modellering, vilket innebär att det föreligger en betydande osäkerhet i många värden. Vid den senare inventeringen användes också modellering för totalskattningarna av Östersjön, men underlaget från de svenska vattnen var betydligt bättre. De i denna uppsats redovisade skattningarna baseras direkt på inventeringarna och de nämnda uppräkningsfaktorerna.

Resultat

Alfågel

Alfåglarna efter den svenska kusten är starkt begränsade till Östersjön med endast enstaka på västkusten (Figur 3). Merparten av alfåglarna vintern 2009 observerades på de tre utsjöbankarna: Hoburgs bank och de båda Midsjöbankarna. Totalt sågs här ca 300 000 av totalt beräknade 436 000 för hela det svenska området (Figur 3, 4, Tabell 1). Betydande antal återfanns också runt Ölands och Gotlands kuster, Hanöbukten, Kalmarsund samt ytterskärgårdarna från Kalmarsund till Stockholms skärgård.

De båda vintrarna 2010 and 2011 med hårda isförhållanden medförde en helt annan utbredning för alfåglarna i de svenska farvattnen. Totalt beräknades antalet alfåglar på de tre viktigaste utsjöbankarna till 630 000 2010 och 365 000 2011. Vintern 2010 beräknades inte mindre än 426 000 alfåglar för Hoburgs bank. En viktig orsak till dessa höga antal på de svenska utsjöbankarna är isläget i Östersjön. De viktiga alfågelområdena i Irbesundet och Rigabukten var helt istäckta och man kan anta att många av dessa alfåglar sökte sig till de svenska farvattnen.

Vid den tidigare totalinventeringen av Östersjön beräknades beståndet för de svenska farvattnen till 1,4 miljoner att jämföras med 0,44 miljoner 2009, en mycket markant nedgång, men den exakta storleken på nedgången är svårbedömt då skattningarna 1992/93 och 2007–2009 grundas på olika metoder.

Från flera viktiga områden föreligger data också från 1970-talet (Tabell 1, se också Nilsson 1980). För Hanöbukten och skärgårdsområdena föreligger det inga klara skillnader mellan 1970-talets inventeringar och de sentida inventeringarna, medan inventeringarna norr och öster om Öland antyder en nedgång av beståndet. Tyvärr saknas mer omfattande data från Gotland. Vid en flyginventering 1974 räknades 26 000 alfåglar efter inventeringslinjen, vilket med erfarenheter från de senare inventeringarna kan antas motsvara ett övervintrande bestånd på 200 000–400 000. Inom vissa områden täcks alfåglarna väl av de årliga midvinterinventeringarna från land (Figur 5). För den skånska sydkusten och Blekinges skärgård noteras signifikanta nedåtgående trender, medan det inte finns några klara trender för antalet alfåglar vid norra Öland samt vid Väddö i Uppland.

Alfåglarnas utbredning inom olika avsnitt av den svenska kusten exemplifieras i en serie regionala kartor från de viktigaste alfågelområdena efter den svenska kusten (Figur 6–11). Detaljutbredningen på de viktiga utsjöbankarna Midsjöbankarna och Hoburgsbanken diskuteras inte närmare här, då alfåglarnas uppträdande här är föremål för speciella undersökningar och kommer att behandlas i ett annat sammanhang.

I Hanöbukten och utanför Ölands ostkust är alfåglarna fördelade ut till ett djup av ca 30 m. För Hanöbukten visade inventeringarna på betydande skillnader mellan olika år. Vid något tillfälle förekom alfåglarna väl spridda, medan de under andra inventeringar var tämligen koncentrerade till vissa bankar, t.ex. Kiviksbredan, som vid båtinventeringar på 1960-talet konstaterades vara en viktig lokal. Vid Öland noterades koncentrationer vid södra Öland samt runt norra Ölands bankar. I skärgårdarna från Kalmarsund och norrut förekom de flesta alfågelflockar vid havsgrund främst i den yttre skärgådszonen.

Svärta

Svärtan förekommer i relativt låga antal efter den svenska kusten under vintern (Tabell 3, 4). Vid inventeringen 2009 förekom den i någorlunda antal bara i södra Kattegatt där ca 2500 individ noterades, medan antalet svärtor i Östersjön var betydligt lägre (Figur 13).

Sjöorre

Sjöorren är en regelbunden vintergäst i den södra delen av den svenska Östersjökusten samt i Laholmsbukten och Skälderviken i södra Kattegatt (Tabell 4, 5). Vid inventeringen i delar av undersökningsområdet vintern 2007 beräknades antalet sjöorrar till ca 40 000 i Hanöbukten, södra Kalmarsund och runt Öland (Tabell 5), men betydligt lägre antal fanns här de andra undersökningsåren. Beståndet i södra Kattegatt beräknades 2009 till 13 500. Sjöorrens utbredning vintern 2009 visas i Figur 13 och detaljutbredningen i Hanöbukten under två vintrar i Figur 14.

Ejder

I Sverige återfinns merparten av de övervintrande ejdrarna på Västkusten, medan Östersjöns häckande ejdrar i huvudsak lämnar den svenska delen av Östersjön under vintern (Figur 15, Tabell 6, 7). Vid inventeringarna 2009 beräknades beståndet på den svenska västkusten till ca 52 000, medan det fanns ca 20 000 övervintrande ejdrar i den svenska delen av Östersjön. Längs västkusten förekom ejdern spridd från norra Öresund till den norska gränsen med den största delen i Bohuslän (Figur 16). I Kattegatt fanns de i huvudsak i de ganska strandnära områdena, medan merparten av Bohusläns ejdrar fanns i ytterskärgården, huvudsakligen på öarnas västsidor där de rikaste musselbankarna finns. Det övervintrande ejderbeståndet på västkusten har inventerats vid fyra tillfällen (Tabell 7). Från 1987/89 till 2004 ökade antalet övervintrare från mindre än 10 000 till 48 300, medan endast en mindre ökning skedde därefter till 52 000 2009.

Småskrake

Småskraken var 2009 väl spridd efter kusterna i södra Sverige både i de inre farvattnen och i utsjövattnen, men förekomsten i skärgårdarna liksom på västkusten var ganska sparsam (Figur 17, Tabell 8). Flertalet småskrakar fanns efter kusterna av Skåne, södra Kalmarsundsregionen samt Gotland. Totalt beräknades beståndet till ca 9000 individer, varav 8000 på ostkusten (Tabell 8) och ca 1000 i Öresund och västkusten.

Diskussion

De här presenterade inventeringarna i relation till de båda Östersjöinventeringarna (Durinck et al.

1994, Skov et al. 2011), där de svenska inventeringarna ingår, visar klart att de svenska farvattnen i Östersjön är av stor betydelse internationellt för det övervintrande beståndet av alfågel.

Vid den första inventeringen (Durinck et al. 1994) beräknades totalbeståndet av alfågel i Östersjöområdet till 4,3 miljoner, varav 1,4 miljoner fanns i de svenska farvattnen, främst på Hoburgs Bank och områdena öster om Gotland. Inventeringen 2007–2009 (Skov et al. 2011) gav 1,5 miljoner för hela Östersjön, medan beståndet i de svenska farvattnen här skattas till 0,43 miljoner. Betydligt högre antal noterades i de svenska vattnen under isvintern 2010, då områdena vid Rigabukten var helt frusna.

Även om skillnaderna i inventeringsmetodik mellan de båda storinventeringarna gör dem svåra att jämföra står det klart att alfågelbeståndet minskat markant sedan 1990-talet. I de svenska farvattnen är detta mest markant för Hoburgs Bank och farvattnen runt Gotland och förmodligen till en del vid Öland, medan fastlandets skärgårdar visar ungefär samma alfågelbestånd som på 1970-talet. En signifikant minskande trend har dock noterats längs kusterna av Blekinge och södra Skåne.

Flera faktorer har framförts som möjliga orsaker till alfåglarnas markanta beståndsnedgång såsom oljeföroreningar, bifångster vid fiske, men också att förhållandena på häckningsområdena ändrats (Hario et al. 2009, Larsson & Tydén 2005, Stempniewicz 1994, Skov et al. 2011, Zydelis et al. 2009). Det minskande antalet alfåglar i Östersjön sedan 1990-talet återspeglas också i sträckräkningar från den finska kusten (Hario et al. 2009, se also Kauppinen & Leivo 2008), vilka också antyder en ökning av antalet från 1970- talet till 1990-talet före den markanta nedgången.

Även för svärtan och sjöorren, som endast övervintrar i mindre antal i de svenska vattnen, visar de internationella inventeringarna en nedgång i Östersjöbeståndet (Skov et al. 2011). För ejdern som är en viktig häckfågel efter den svenska kusten har beståndet visat en mycket markant ökning från 1970-talet till senare delen av 1990-talet följt av vad som kan betecknas som en populationskrasch (Desholm et al. 2002, Ekroos et al. 2012). Denna minskning i ejderbeståndet noterades först för de övervintrande ejdrarna främst i de danska farvattnen (Desholm et al. 2002). Huvuddelen av Östersjöns ejdrar övervintrar utanför de svenska farvattnen i främst i sydvästra Östersjön och Kattegatt samt Wadehavet, och någon minskning har inte setts i det svenska vinterbeståndet.

SOWBAS rapporten (Skov et al. 2011) visar också en nedgång för det övervintrande beståndet av småskrake i Östersjön. Regionalt konstaterades minskningar för de flesta områden, men de svenska midvinterinventeringarna visar en ökande trend. Underlaget för att bedöma populationsförändringar hos arten är emellertid inte det bästa eftersom bl.a. viktiga svenska farvatten inte var adekvat representerade i de större inventeringarna. Som kontrast till minskningarna hos de övervintrande bestånden av dykänder i uthavsområdena visar flertalet av de dykänder som övervintrar nära kusterna, liksom övriga dykänder, ökande eller stabila vinterbestånd (jfr Nilsson 2008).

FORUM

Ornitologernas världskongress: 2010 i Brasilien, 2014 i Japan – kort referat och inbjudan

The International Ornithological Congress: 2010 in Brazil, 2014 in Japan – brief report and invitation

SÖREN SVENSSON

Vart fjärde år sedan 1884 i Wien har den Internationella Ornitologiska Kongressen (IOC) hållit möten med uppehåll för krig. Länge var kongressen en rent europeisk angelägenhet. Sverige hade kongressen 1950 i Uppsala. Det var SOFs andre ordförande Sven Hörstadius (1947–1952), efterträdare till Sven Ekman (1945–1946), som höll i trådarna i egenskap av generalsekreterare för kongressen. Efter Uppsalakongressen skulle det bli ytterligare två kongresser i Europa: Basel 1954 och Helsingfors 1958. Men sedan förändrades bilden ett först steg i och med att USA fick hålla kongressen i Ithaca 1962. Efter ytterligare två möten i Europa, Oxford 1966 och Haag 1970, har dock de utomeuropeiska kongresserna varit i knapp majoritet: Canberra 1974, Berlin 1978, Moskva 1982, Ottawa 1986, Christchurch 1990, Wien 1994 (hundraårsjubileum), Durban 1998, Peking 2002 och Hamburg 2006. Nästa kongress, den tjugofemte, hölls i Campos do Jordão i delstaten São Paulo i Brasilen 22–28 augusti 2010. Den totala statistiken för hur kongresserna har fördelats över världen är alltså: Europa (10 gånger), Nordamerika (2), Australien/Nya Zeeland (2), Afrika (1), Asien (1) och Sydamerika (1). Och 2014 blir det Japan, andra kongressen i Asien.

Intressant nog har kongressen aldrig haft någon formell, huvudman eller organisation, med juridiskt säte på en viss plats. Något universitet eller ornitologisk förening i ett land har helt enkelt bjudit in till kongress och delegaterna har accepterat inbjudan att mötas där nästa gång. En ganska stor församling, ungefär två hundra delegater, har utgjort den ornitologiska kongressens permanenta organ med representanter från de flesta länder. Dessa delegater har valt kongressens ledning fram till nästa kongress. Själv har jag under många år varit svensk delegat, numera dock ”senior” sådan. De nuvarande ordinarie svenska delegaterna är Per Ericson från Stockholm, Jan Ekman från Uppsala, Bengt Silverin från Göteborg och Henrik Smith från Lund. Av dessa deltog Per Ericson personligen på kongressen medan Henrik Smith och Bengt Silverin bidrog som medförfattare i andra deltagares presentationer.

Vi lever i en värld som kräver alltmer formalia och vad gäller stora arrangemang också en juridisk och ekonomisk hemvist för sin verksamhet. Kongressen har därför länge strävat efter att skapa en internationell ornitologisk förening. Detta skedde på kongressen 2010 och föreningen fick namnet *International Ornithologists' Union* (IOU). Den kommer i fortsättningen att vara det organ som formellt har ansvar för IOC. Var unionen kommer att ha sitt säte var ännu inte bestämt. Tanken med IOU är också att vidga verksamheten till att omfatta mer än bara arrangera kongressen vart fjärde år. Målet är att Unionen skall ha fortlöpande verksamhet inom forskning, fågelskydd och publicering.

Campos do Jordão 2010

Campos do Jordão är en liten stad belägen i bergstrakterna ett tiotal mil nordväst om São Paulo och sydväst om Rio de Janeiro. Staden ligger på 1700 meters höjd och är tack vare frisk luft och svalkande sommarklimat framför allt en semesterort för kustlandets innevånare när stadsklimatet blir svåruthärdligt. Där finns mängder av hotell och restauranger och passar därför utmärkt som kongressort utanför sommarsäsongen. Vid den tid som den ornitologiska kongressen samlades, slutet av augusti, var vädret utmärkt och våren hade just börjat. På morgonen kunde det vara lätt frost men så fort solen gått upp steg temperaturen snabbt och låg sedan runt tjugo grader eller något däröver under dagen. Och solen gick upp med blå himmel varje dag.

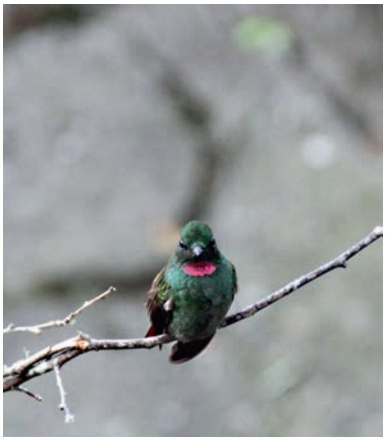
Alla kongressaktiviteter hölls i en och samma byggnad nära centrum av staden med talrika restauranger längs gatorna utanför. De drygt tusen deltagarna kom från 57 olika länder. De flesta, 37%, kom från Brasilien och 6% från övriga Sydamerika. Näst flest kom från Europa (25%) och Nordamerika (18%). Från Asien och Oceanien kom 11% och från Afrika 6%. USA var det enskilda land som efter Brasilien hade flest deltagare, tre gånger fler än Storbritannien, som kom på tredje plats. En stor andel deltagare var studenter, vilket naturligtvis är utomordentligt positivt. De får genom att delta på en kongress dels värdefull träning på att presentera sina resultat och dels ovärderliga kontakter med forskare världen över. Ungefär en tredjedel av deltagarna var studenter. Mycket glädjande var att denna andel var densamma från både fattiga och rika länder. Till dettas bidrog de prisreduceringar och stipendier som på olika sätt kunnat erbjudas. Brasilien utmärkte sig särskilt i detta avseende; här hade man gjort en enastående satsning på att få sina studenter till kongressen. Inte mindre än 60% av de brasilianska deltagarna var studenter. Det måste givetvis också tas som tecken på att den brasilianska ornitologin är på stark frammarsch.

Alla var där. Här Leif Nilsson med hustru Kristina under en paus i föreläsningarna. Leif är en välkänd medarbetare i *Ornis Svecica* med många uppsatser och ett par specialhäften om änder och gäss.

Plenarföreläsningar, symposier och postrar

Stora kongresser som den ornitologiska med över tusen deltagare är alltid delade i sektioner som delvis pågår samtidigt. Ett antal föreläsningar var dock gemensamma, de så kallade plenarföreläsningarna. Tio sådana gavs av särskilt utvalda forskare. Övriga bidrag presenterades antingen på ett antal symposier som arrangerats av en eller flera ämnesspecialister och med särskilt vidtalade föreläsare, eller som fria föredrag och postrar, som sänts in av presentatörerna själva. Sammanlagt var det 48 symposier med ungefär 220 föredrag, dvs. fyra till fem per symposium. De fria föredragen var ca 180 stycken och postrarna över 500 stycken. Hälften av bidragen var alltså postrar, och det var också i den hall där dessa var uppställda som huvuddelen av det vetenskapliga utbytet skedde. Här kunde man läsa själv i lugn och ro och direkt diskutera med den som utfört studierna. Denna möjlighet saknades vanligen efter föredragen som ofta drog över tiden så mycket att folk inte hann samla sig till vare sig kommentarer eller frågor innan det var dags att ila till något annat.

Två av symposierna hade sammankallats av svenska forskare, ett vardera av *Rachel Muheim* och *Jan-Åke Nilsson*, båda från Biologiska institutionen i Lund. Det första handlade om fåglarnas orientering. Rachel själv diskuterade magnetkompassens förhållande till andra sätt att uppfatta riktning och position. Man vet att fåglar både under höst- och vårflyttningen kalibrerar magnetkompassen med hjälp av polariserat ljus från områden nära horisonten vid soluppgång och solnedgång. Därför har de rimligen förmågan att göra detta regelbundet när som helst. Rachel föreslog att de lägger på minnet medelvärdet av morgon- och kvällskalibreringen och får ett äkta geografiskt referenssystem som är oberoende av breddgrad och datum. De övriga fyra bidragen handlade om själva magnetsinnets fysiologiska lokalisering och funktion. Det finns två magnetsinnen. Det ena är lokaliserat till ögats

Flera arter av kolibrier var extremt lätta att studera i detalj när de kom fram till nektarautomaterna. Här vid hotellet Ypê i Itatiaia nationalpark. Till vänster rubinstrupe *Clytolaema rubricauda*, som kunde se rätt intetsägande ut men som i rätt ljus visade sin glänsande strupe. Till höger svart jakobin *Florisuga fusca,* en av de allra sobraste kolibrierna

näthinna, det andra till luktnerven i övernäbben. I ett föredrag föreslogs att cryptokrom1 är det ämne i näthinnan som har rätt egenskaper för att kunna skapa signaler orsakade av magnetfält. I andra föredrag behandlas luktnervens funktion. Den skulle kunna förmedla signaler om hur den magnetit som finns på näbbens översida reagerar på magnetfält. Och i ett föredrag visade man genom starka magnetpulser att reaktioner på sådana kan avläsas i hjärnan just där information från luktnerven tas om hand. Det andra symposiet handlade om embryon. Där rapporterade *Andreas Nord,* Lund, resultaten från fältförsök med blåmes där man experimentellt manipulerat den temperatur under vilken äggen ruvades. Effekterna blev betydande, och man måste därför se ruvningen som en kostnadskrävande aktivitet, något som man länge trodde att den inte var. Det innebär att ruvningen är konkurrensutsatt och måste balanseras mot andra energikrävande aktiviteter före och efter ruvningsperioden. Men det innebär också att honan genom att variera temperaturen kan påverka ungarnas framtida öde redan på ruvningsstadiet; tidigare såg man matningen som hennes främsta möjlighet att sortera bland avkomman om det behövdes.

Biologiska institutionen vid Lunds universitet svarade för det klart största antalet föredrag och posters, inklusive de två redan nämnda inte mindre än tio stycken. Här följer några rader om varje. *Jannika Boström* redovisade hur stenskvättans flyttningsmönster ser ut och hur fåglar av denna art fettupplagar innan de ska passera en ekologisk barriär, till exempel ett hav eller en öken. I två studier där svenska unga stenskvättor förflyttats magnetiskt, men inte geografiskt, antingen via sin flyttningsrutt genom västra Europa till västra Afrika eller väster om sin flyttningsrutt till positioner i Atlanten, har Jannika och hennes kollegor funnit att stenskvättor som förflyttas till magnetiska positioner norr om det område de befinner sig i ökar mer i vikt än stenskvättor som förflyttas till magnetiska positioner längre söderut. Detta beror förmodligen på att de förbereder sig för en längre och/eller snabbare flygning då de tror att de befinner sig längre norrut. *Anders Brodin* rapporterade från en datorsimulering med markörgener för att ta reda på om hybridzonen mellan grå och svart kråka i Danmark förflyttar sig eller står stilla. Baserad på dessa två kråkvarianters egenskaper i den 70 km breda zonen (en tredjedel är hybrider i zonen) visade simuleringen att just denna hybridzon är stabil och förskjutningarna bara temporära. I andra delar av Europa har dock fortgående långsiktiga förskjutningar av motsvarande hybridzoner noterats. *Sandra Chiriac* hade testat två motstående hypoteser rörande överföringen av immunförsvar via ägget till den nykläckta ungen, som ännu inte har ett utvecklat sådant. Det alternativ som förkastades var att de överförda antikropparna hämmar ungens igångsättande av det egna immunförsvaret. Resultatet tydde i stället på att honans antikroppar fungerar som en slags modellmolekyler som stimulerar och förstärker ungens eget försvar. *Julia Dänhardt* hade studerat ljungpiparens ekologi på de ödsliga jordbruksslätter där så många fågelarter vantrivs. Men inte ljungpiparna. De väljer att rasta relativt länge på dessa slätter under sin flyttning, de ruggar där och där lägger de också på sig avsevärda mängder fett för fortsatt flyttning och vinteröverlevnad. Även om de anpassar sitt födosök både rumsligt och tidsligt till födotillgången så tyder observationerna på att ljungpiparen trivs rätt bra på den skånska slätten. *Miriam Liedvogel* rapporterade om en markörgen som är kopplad till kvantitativa gener som styr det nedärvda programmet för sträckor och riktningar under flyttningen. Hon jämförde nordliga sydostflyttande med sydliga sydvästflyttande lövsångare. Hon fann att den nordliga rasens genvariant, som dominerar i Skandinavien norr om flyttdelaren i södra Norrland, också var den dominerande genvarianten hos häckfåglarna längs med hela östra sidan av Östersjön ner till Litauen. Därefter blev den sydliga rasens genvariant successivt vanligare västerut längs med Östersjöns södra kust genom Polen. Förändringen i frekvenserna av dessa två genvarianter sammanfaller därför med flyttningsdelaren söder om Östersjön. Detta geografiska mönster gör markören till en stark kandidat till en av det okända antal gener som styr flyttningsbeteendet. *Jan-Åke Nilsson* visade att blåmesar går i nattide för att reducera matbehovet när det är kallt. Men alla gör det inte alltid; det som bestämmer när de väljer detta alternativ föreslog han vara predationsrisken, som avgör hur djupt de vågar sova. *Sören Svensson* hade studerat rubinkolibriers reaktioner på vridning av magnetfält under sydflyttning i Alabama. Resultatet visade att kolibrierna valde den av två vattenbehållare som fanns i burar med naturligt respektive vridet magnetfält sedan de tränats att förknippad detta magnetfält med en nektarbehållare. Experimentet visade också, för första gången, att även kolibrier kan känna av magnetfält och därför lika andra fåglar bör kunna använda magnetkompassen. *Maria von Post* rapporterade från studier av gråsparven som en av de många arter som har det problematiskt i det moderna jordbrukslandskapet. Trots sin starka knutenhet till gårdarna fann hon skillnader mellan olika landskapstyper. Förekomsten av gråsparv var signifikant lägre i intensivt odlade slättbygder än i mellanbygder. Skillnaden förstärktes av att gårdstätheten var lägre i slättbygderna. Tillgången på insekter var betydligt lägre på gårdar i slättbygen än i mellanbygden, vilket kan påverka ungarnas överlevnad negativt. Resultaten visar att åtgärder för att förbättra förhållandena i jordbrukslandskapet måste vara olika i olika typer av odlingslandskap.

Som god tvåa i antal deltagare kom Naturhistoriska riksmuseet med fem presentationer: *Per Ericson* analyserade de storskaliga mönstren i fåglarnas systematik och utbredning. Han fann att dessa, trots fåglarnas stora spridningsförmåga, bäst förklaras av globala geologiska skeende såsom kontinenternas drift. I takt med att molekylära data klarlägger sanna relationer mellan fåglarnas huvudgrupper kommer vi att konstatera att parallell evolution är vanligare än vi trott. *Magnus Gelang* använder sig av det enastående värdefulla material av fåglar som finns på våra museer och genomför fylogenetiska studier med hjälp av DNA-sekvenser. På kongressen redovisade han en utredning om fylogenin och den historiska utvecklingen sedan oligocen för den grupp där bland annat timalior och skriktrastar ingår. *Martin Irestedt* redogjorde för fylogenin på artnivå för lövsalsfåglarna och jämförde sedan utvecklingen av deras dräkter med hur utvecklingen gått hos paradisfåglarna. Tanken var att man på detta sätt kunde få klarhet i vilken betydelse sexuellt urval hade haft, eftersom de två grupperna har så olika typer av ornament och sexuella beteenden. *Jan Ohlson* hade undersökt en sydamerikansk art, *Calyptura cristata*, i SOFs namnlista kallad kungsfågelkotinga, en enormt exklusiv art; på museer finns exemplar från 1800-talet men i övrigt bara två sentida fältobservationer. Molekylärt visade sig arten ha rötter långt ner i tyrannernas släktträd, nära avgreningen till todytyranner och flatnäbbar. *Jan Ohlson* redovisade ytterligare en fylogenetisk analys, nämligen av en delgrupp (Fluvicolinae med bl.a. vattentyrannerna). De delas nu upp i fyra grupper, alla med varianter av en likartad födosöksteknik men med ringa överlapp i biotopval och utbredning.

Övriga svenska bidrag var ett från vardera Uppsala universitet och Linnéuniversitetet i Kalmar: *Niclas Backström*, Uppsala, hade studerat Z-kromosomen hos svartvit flugsnappare och halsbandsflugsnappare för att försöka hitta mönster som kunde hjälpa till att förklara artbildningen eller pågående riktade urvalsprocesser. Han fann några regioner med högre divergens än förväntat och dessa innehöll bland annat gener som kan ha betydelse för fjäderdräktens pigmentering. *Ola Österström*, Kalmar, testade hypotesen att frigörande av kalcium från äggskalet till embryot sker med hjälp av kolsyra som bildas med hjälp av ett anhydrerande enzym. Testen visade dock inte några tecken på att detta enzym fanns med i bilden och hypotesen kunde inte bekräftas.

Ytterligare fyra bidrag kan nämnas eftersom de har svensk anknytning genom A. P. Leventis ornitologiska forskningsinstitut i Jos, Nigeria. Här är både Biologiska institutionen i Lund och SOF genom Ottenby fågelstation involverade. Ornitologer från stationen i Jos har forskat både i Lund och Ottenby, och svenska ornitologer har på motsvarande

Många vackra arter kom fram och var lätta att fotografera på platser där de fick mat. Här några huvudsakligen fruktätare, som dock inte drog sig för att konkurrera med kolibrierna vid nektarautomaten. Överst till vänster kastanjebukad eufoina *Euphonia pectoralis*. Överst till höger grönhuvad tangara *Tangara seledon.* Nederst sayacatangara *Thraupis sayaca*. De två förstnämnda arterna har en begränsad utbredning till denna del av Sydamerika och finns främst i fuktiga naturskogar, medan sayacan har större utbredningsområde och ses i allehanda miljöer.

sätt arbetat i Jos. En nyckelperson i sammanhanget är *Ulf Ottosson*, som deltog på kongressen och var medförfattare för tre av bidragen. På Leventis-stationen ägnar man sig åt både afrikanska stannfåglar och europeiska flyttfåglar. Ett exempel på det senare är uppsatsen i *Ornis Svecica* nr 1, 2011 om rastningsbeteendet hos trädgårdssångaren med *Soladoye Iwajomo* som huvudförfattare. En av medförfattarna i den uppsatsen, *Yahkat Barshep*, hade på kongressen en presentation om en annan nordlig flyttfågel. Den handlade om buskskvättans vinterekologi, och från denna studie finns en uppsats i detta häfte av *Ornis Svecica*.

Kattpredationen

Många symposier var synnerligen intressanta, men när de låg parallellt kunde man inte besöka samtliga. Ett som jag valde ut på grund av att jag själv skrivit en uppsats i ämnet (*Ornis Svecica* 6, 1996, 127–130) handlade om huskattens inverkan på fågelbestånden. Jag hade hoppats på en del nyheter, men i detta avseende blev jag besviken. Vi vet redan att katten är ett av de för fåglarna mest skadliga av de djur som människan släpper ut i naturen. Vi vet att katten ensam utrotat minst 33 fågelarter och utgör det främsta hotet för ett stort antal arter som är rödlistade i kategorin akut hotade. Och här gäller det att göra det man faktiskt också gör på många håll. Man utrotar katterna och återinplanterar arter i de fall de ännu inte är helt utrotade; ibland gör man också förflyttningar av utrotningshotade fåglar från en plats där man inte kan utrota katterna till en plats där man lyckats utrota dem.

En stor fråga i forskningen om kattpredationen är

Chandler S. Robbins, en av fågelövervakningens internationella föregångsmän, grundare av North American Breeding Bird Survey, har fortsatt med långtidsstudier efter pensioneringen. På kongressen redovisades arton års studier i Guatemalas berg.

fortfarande inte ordentligt besvarad. Påverkar katterna också beståndsstorleken hos våra vanliga fågelbestånd i skogar, jordbruksmarker, villaområden och städer på fastlandet? Faktum är att vi inte vet säkert när och var katterna utgör en verklig fara. I Sverige konsumerar huskatterna 10–20 miljoner småfåglar per år och i hela världen troligen tusentals miljoner. Det innebär att katterna svarar för ungefär 3–4% av fågeldödligheten i vårt land. Men när vi skall bedöma om detta är ett problem har vi två faktorer att ta hänsyn till. Den ena faktorn är att nästan all predation sker inom de små delar av landet där såväl katter som människor bor. Kattpredationen är därför mycket hög i dessa miljöer men ingen alls ute i storskogarna och på fjället. Den andra faktorn är att predationen naturligtvis är multiplikativ, dvs. en kattdödad fågel kan inte dö av något annat och omvänt en av annan orsak död fågel kan inte dödas av en katt. Det är därför lika svårt att isolera just katteffekten i den totala bilden av dödsorsaker hos fåglar som det är i alla beräkningar av rovdjurs bytesuttag. Beståndet av huskatter i hela världen uppskattas till omkring 600 miljoner, och de flesta finns i USA.

Även om symposiet inte gav så mycket nytt om katters övergripande effekter på fågelfaunan så var några detaljer om hur man hanterar problemet i USA en nyhet för mig. Under lång tid har det vuxit fram en metod som man kallar TNR (Trap-Neuter-Return, fånga, sterilisera, släpp ut). Den går ut på att frivilliga kattvänner från djurrättsorganisationer tar hand om infångade katter. Många sådana grupper är också helt emot att döda katter, vilket naturligtvis är grunden till att denna rörelse vuxit fram. Visserligen försöker man först hitta nya hem åt katterna, men det har visat sig vara lika svårt i USA som här i Sverige. I stället letar man rätt på ställen där man kan släppa katterna, och sedan matar och skyddar man katterna på dessa ställen. Dessa kattkolonier växer naturligtvis, och det finns inte så många platser där man kan upprätta dessa kattreservat. Privata markägare vill inte ha dem och därför utnyttjar man ”public land”, områden som tyvärr ofta är identiska med de få naturskyddsområden och fritidsområden som kan finnas i en trakt, och självfallet med skador och kontroverser som följd.

Chandler Robbins – nestor och föregångare inom fågelövervakningen

Eftersom mitt huvudintresse är miljöövervakning och särskilt fågelinventering, var det ett stort nöje att träffa Chandler Robbins igen efter många år. Hans betydelse för utvecklingen av fågelövervakning i stor skala kan inte överskattas. I Nordame-


En del arter var svåra att hitta eftersom de levde djupt inne i skogarna. Dit hör myrfåglarna som lever i den täta undervegetationen. Till vänster en hane av eldögat P*yriglena leuconota,* här en hane, men den bruna honan hade samma lysande öga. Svärmande myror på skogsstigarna kunde dock locka fram dem till kameran. En lustig och svårfångad krabat var den lilla vipkolibrien *Stephanoxis lalandi,* som fått sitt namn av den spretiga tofsen.

rika hade det i början av 1960-talet sedan en del år pågått revirkarteringar i provytor. Det blev också den ledande metoden i Storbritannien när British Trust for Ornithology startade sin riksomfattande fågelövervakning 1961 (Common Birds Census). Och när jag startade Svenska häckfågeltaxeringen 1969 var det också revirkarteringsmetoden som valdes. Men förutsättningarna för att denna noggranna men arbetsamma metod skulle kunna användas i tillräckligt stor skala i stora och glest befolkade länder var inte goda. Och här var Chandler Robbins en framsynt föregångare och skapade 1965 The North American Breeding Bird Survey. Den var enkel och inriktad på att få ett mycket stort antal deltagare över hela Nordamerika. Lämpliga vägsträckor slumpades ut i alla stater och längs dessa fick fågelskådare i uppgift att köra med bil en gång om året, stanna på femtio ställen med en halv miles lucka och räkna alla fåglar under tre minuter på varje ställe. Det blev en succé och projektet utgör ännu i dag basen i fågelövervakningen i Nordamerika. Vid denna tid, närmare bestämt på den Internationella Ornitologiska Kongressen i Oxford 1966 tog man beslut om att försöka främja en uppbyggnad av en mera omfattande internationell fågelövervakning. Detta följdes upp med en konferens i Hillerød 1968. På denna konferens bildades International Bird Census Committee (IBCC) med Chandler Robbins som en av medlemmarna. Nästa gång jag träffade Chan, som han alltid kallades, var i Ammarnäs ett år senare. Jag hade nämligen som ordförande för IBCC kallat kommittén till ett första möte och därtill ett litet symposium på denna förnämliga ort. Chan presenterade här ”Progress report on the North American Breeding Bird Survey”. Han rapportera att redan 1968 hade hela tolv hundra rutter genomförts, spridda över nästan hela USA. Detta stimulerade naturligtvis oerhört till liknande aktiviteter i Sverige eftersom det snart började gå trögt med att få nya inventerare till revirkartering av provytor, och 1975 startade jag de så kallade punktrutterna som tjugo år senare utvidgades med de så framgångsrika standardrutterna (de senare visar ju sin styrka i SOFs nya bok *Fåglarna i Sverige – antal och förekomst*). Vi kan således konstatera att vår nuvarande svenska fågelövervakning plockade mycket av de grundläggande idéerna och inte minst stimulans från Chandler Robbins amerikanska motsvarighet. Under årens lopp träffades vi åtskilliga gånger på de möten som IBCC hade i olika länder, dock bara i Europa. Amerika föll så småningom bort ur bilden eftersom det snart bara var Chan som dök upp på mötena. Nordamerikanerna var nog litet frustrerade över att vi inte kunde samordna inventerandet på vår splittrade kontinent, och så småningom ändrades kommitténs namn till European Bird Census Council (EBCC). På europeisk nivå har denna organisation blivit mycket framgångsrik och kunnat samordna resultaten trots att varje land fortfarande kör själva inventeringarna enligt olika varianter (www.ebcc.info; en hemsida verkligen värd att besöka!)

På kongressen i Brasilien höll Chandler Robbins, vid den aktningsvärda åldern av nittiotvå år, ett mycket uppskattat och stimulerande föredrag om arton års fågelfångster i Guatemalas bergstrakter. Där möts inhemska stannfåglar och genomflyttare från Nordamerika. Han hade funnit mycket stora skillnader i överlevnad mellan stannfåglar och flyttfåglar. Hos de lokala arterna var överlevnaden 75% eller högre, medan den hos flyttande arter var 50% eller lägre. Föredraget ingick i ett symposium om ”Bird migration in the Southern Hemisphere” där forskare från både Nord- och Sydamerika presenterade ett nytt initiativ i form av nätverket ”Aves Internacionales”, som skall bli ett försök att samordna inventeringar och flyttningsstudier på de två kontinenterna. Blir det framgångsrikt kan det bli en modell för ett liknande initiativ i den gamla världen, där mig veterligt inget sådant samarbete ännu fått något fotfäste trots försök att uppamma intresse både på den Panafrikanska kongressen och i andra sammanhang.

Troligen kommer liknande internationella initiativ av olika slag att presenteras på Tokyokongressen. Sådana lanseras nämligen på flera håll i världen. Ett exempel är den nya fågelatlas som skall täcka hela Europa österut till Ural. Den håller nu på och lanseras för att starta 2013 (www.ebcc.info).

Exkursioner

En ornitologisk kongress är mycket mer än föreläsningar, seminarier och vetenskapliga diskussioner. Det vanliga är att kongressorganisatörerna har ett antal ”officiella” exkursioner att erbjuda både före och efter kongressveckan. Några sådana exkursioner hade man dock inte på Brasilienkongressen. Exkursioner före eller efter fick man köpa av olika researrangörer eller genomföra på egen hand. Och i den välbefolkade provinsen São Paulo med bra vägar och gott om hotell och restauranger så var det sistnämnda inga problem. Hur många av deltagarna som passade på att resa runt och fågelskåda vet jag inte, men mitt intryck var att ganska många tog tillfället i akt och gjorde det. Själv hyrde jag en bil direkt på flygplatsen när jag kom till São Paulo, något som gjorde att det var lätt att fara runt i närområdet när man hade tid över under själva kongressveckan också.

Att kunna kombinera nytta och nöje bidrar till att fler lockas att delta på kongressen även om man själv måste stå för hela eller del av kostnaden. Här ger jag några intryck från min egen ganska begränsade rundresa, som trots det gav väldigt mycket. Från São Paulo åkte jag direkt de 15 milen till Campos do Jordão och tog in på det hotell där jag beställt rum. Till skillnad från flertalet andra hade jag valt ett billigt och enklare hotell ett par mil utanför stan. Det visade sig vara ett lyckokast eftersom det låg ute i skogen med ett rikt fågelliv runt omkring. Under kongressveckan blev det kortare turer, mestadels tillsammans med Jim Danzenbaker, som valt samma hotell som jag och som var försäljare för Kowa USA och hade ett av flera bås i kongresshallen, där företag visade sina produkter eller föreningar värvade nya medlemmar. En heldagstur mitt i veckan förde oss till Pedra do Baú, ett praktfullt berg som dominerade landskapet på långt avstånd. Turen gick genom ett kuperat och fågelrikt mosaiklandskap av jordbruksmarker och skogar. Smärre morgon- och kvällsexkursioner övriga dagar ledde till den lättskådade Botaniska trädgården (Horta Flores) med flera trevliga stopp längs vägen. Och en kväll hade rätt många kongressdeltagare fått tips om var man kunde få se den säregna saxstjärtnattskärran. Bland flera dussin skådare fick vi på nära håll strax efter mörkrets inbrott se en praktfull hane försöka locka ner en hona med korta spelflykter och demonstration av sina enormt förlängda stjärtpennor på en grusväg i lyset från ficklampor och en och annan passerande moped.

När kongressen var slut gjorde jag på egen hand följande tvåveckorsresa: Itatiaia nationalpark 20 mil nordost om São Paulo, ner till kusten genom Serra do Mar med orörda skogar via Cunha till Parati, längs kusten via Ubatuba till São Vicente och vidare via Sorocaba till naturparken Intervales 25 mil sydväst om São Paulo. De två platser som stod i en klass för sig vara Itatiaia och Intervales. Ubatuba skall också vara bra, men jag hade otur med den guide som hotellet hjälpte mig att anlita, tyvärr okunnig om både fåglar och lokaler. Och jag hade inte läst på i förväg. Itatiaia var ett utmärkt ställe mitt i stora områden av mer eller mindre orörda skogar och bergsluttningar. Vandringsstigar och vägar gav god tillgänglighet. Men man behövde inte gå särskilt långt eftersom terrassen utanför restaurangen (utmärkta hotell Ypê i mitt fall) räckte till mycket. Här matades nämligen fåglarna med bl.a. frukt och nektar, det senare åt kolibrierna. Det gav utsökta möjligheter till närstudier och inte minst fotografering. Så har också Itatiaia blivit ett av de mera attraktiva målen för fågelskådare. Naturparken Intervales erbjuder enklare förhållanden men har vad som behövs, husrum och mat. Och bäst av allt, utomordentligt kunniga guider. Här stannade jag några dagar och hade nöjet att leta efter fåglar

Som fågelskådare träffar man alltid likasinnade när man är ute och reser. I parken Intervales träffade jag Thomas Grim från Tjeckien (till höger), som hade deltagit på kongressen med en studie av koltrastars förmåga att känna igen parasiterade ägg, samt paret van Muyen från Nederländerna, som var ute och reste på egen hand och som tillhör de stadiga Falsterbobesökarna på höstens rovfågelssträck. Tillsammans hyrde vi den utomordentligt skicklige guiden Faustino Avellino. Intervales, med stora arealer bergsregnskogar, har en utmärkt hemsida med promenadslingor och artlistor. Tillsammans med Kowa-säljaren Jim Danzenbaker gjorde jag flera givande exkursioner under kongressveckan, här vid ett besök vid Pedra do Baú, som dominerade landskapet vida omkring. Att ha honom med i bilen var utmärkt eftersom han också hade varit reseledare i Mellanamerika och kände de flesta arter även i Brasilien.

tillsammans med ett holländskt par och en skådare från Tjeckien. Vädret var inte det bästa, bara några få plusgrader och regnigt och blåsigt, men det spelade inte nämnvärd roll i skyddet av den högvuxna skogsterrängen, som var lättillgänglig längs flera mindre vägar, flera farbara med bilen.

För Tokyokongressen har exkursionsprogrammen ännu inte publicerats, men det jag skrivit om min egen resa visar att det är lätt att ordna sin egen fågelskådning om det inte blir några officiella kongressexkursioner eller om dessa blir för dyra. Under alla omständigheter brukar kongressen ta en dags paus mitt i veckan, och då brukar det alltid erbjudas ett antal kortare guidade turer med både fågelskådning och kultur.

Överraskande inblick om annat än fåglar

På återvägen till flygplatsen från Intervales hade jag rätt gott om tid och hade därför med bilkartans hjälp spanat in ett område som var markerat som skogsreservatet Ipanema strax nordväst om Sorocaba. Det visade sig inte vara något naturreservat i egentlig mening utan en park för skogsbruk och skogsodling. Men inte desto mindre blev besöket mycket intressant. Det visade sig nämligen att det fanns en spännande svensk anknytning. Hit hade nämligen Carl Gustaf Hedberg, kommen från Haraker och en tid runt sekeskiftet 1700/1800 ägare till Hagelsrums masugn, rest som ledare för en grupp svenska specialister för att starta ett järnbruk i början av 1800-talet. De gamla ugnarna och anläggningarna i övrigt är nu kulturminne och museum. I parken fanns också en naturskola där klasser med barn från staden undervisades i naturbruk och miljövård. Under helger och semestertider fungerade parken också som rekreationsområde. En rätt stor sjö fanns med smärre våtmarker och naturskog runt om, och därför också ett rikt fågelliv. Sjön är en dämning i Ipanemafloden som rinner igenom,

Anknytningen till Sverige vid ett besök i Ipanema skogsreservat nära Sorocaba blev en överraskning. Här hade Carl Gustaf Hedberg, dessförinnan ägare till Hagelsrums masugn, byggt upp en järnindustri i början av 1800-talet. Nu står den gamla anläggningen som byggnadsminnne.

och dammen är den äldsta fortfarande fungerande i Brasilien. Den byggdes också av Hedberg för brukets energiförsörjning. Denne industrialist dog i Rio och verkar i dag vara i stort sett bortglömd i Sverige, utom av Hagelsrums handtryck, som säljer en tapetbård under namnet Carl Gustaf Hedberg. Sådana litet udda upplevelser kan man alltså också få i anslutning till en ornitologisk kongress. Och säkert kommer Japan också att kunna erbjuda många spännande upplevelser utöver det rent ornitologiska.

This is a brief report on the Swedish contributions at the 25th International Ornithological Congress in Campos do Jordão, Brazil, in August 2010 and an invitation to the 26th Congress in Tokyo, Japan. All abstracts of the contributions at the Brazil congress can be found in the web site of the International Ornithologcal Union (http://int-ornith-union.org). The invitation and calls for contributions for the Japan congress have recently been announced at the web site http://ioc26.jp/. Apart from a few lines about each of the Swedish contributions at IOC25, I elaborate a bit more on two other contributions, a symposium on feral cats and a talk by Chandler Robbins on long term studies. Finally I give some notes from my own birding trip after the congress that brought me to the Itatiaia and Intervales reserves with excellent birding. The Japan congress will also provide opportunities for serious scientific exchange as well as good bird watching and experience of Japanese life and culture.

Viktiga adresser
Internationella Ornitologiska Unionen: http://int-ornith-union.org
Internationella Ornitologiska Kongressen, Tokyo 2014: http://IOC26.jp