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Födosök hos skrattmås *Chroicocephalus ridbundus* under häckningstid

Foraging of Black-headed Gull Chroicocephalus ridibundus *during the breeding season*

THOMAS KARLSSON

Abstract

During the 1990s, I compared the feeding habitat use during the breeding time of two Black-headed Gull colonies in south-western Sweden, a small urban colony (<100 pairs; Skövde city) and a large rural colony (>2000 pairs; Hornborgasjön), 20 km apart. Randomly selected roads were patrolled and gulls were counted and allocated to the observed feeding habitat (within 7.5 km of the small and within 15 km of the large colony). Refuse dumps were used by both colonies, but studied only for the rural colony with up to 30% of the birds counted at the dump. In spite of this apparent importance, the dump was not critical as closure of it did not affect colony size. With the dumps excluded, the birds from the urban colony used predominantly lawns (c. 70%) and those from rural colony bare soil (43%), newly sawn fields (20%) and pasture (14%). When feeding young the gulls collected food at a larger distance than during incubation: 2.7 vs. 1.6 km for the urban and 9.9 vs. 8.4 km for the rural colony.

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Inledning

Skrattmåsen minskade kraftigt i Sverige under 1970- och 1980-talen med en stabilisering av förekomsten på lägre nivå under 1990-talet, varefter beståndet har varit oförändrat (Green m.fl. 2016). Mest påtaglig var minskningen i uttalade slättområden (Svensson m.fl. 1999). Det finns sannolikt flera olika orsaker till artens tillbakagång som Källander (1996ab) redogör för, med försämrade näringsförhållanden för både gamla och unga skrattmåsar som en viktig orsak. Predation på häckande skrattmåsar torde knappast haft någon större inverkan på artens tillbakagång (Bensch m.fl. 1996). En nedgång i födotillgången och därmed följande minskning av ungproduktion borde alltså sannolikt ha större effekt på populationsnedgången hos skrattmås (Källander 1996b). Bensch (1992) gav ett exempel där massvält rådde i en koloni och där födobrist borde ha varit den rimliga orsaken. Minskad häckningsframgång hos skrattmås kan också bero på vilken kännedom om födoplatser den enskilda skrattmåsen har, i synnerhet sent häckande och unga par kunde i högre utsträckning sakna information om bra födosöksplatser, en fördel som äldre och tidigt häckande par kan inneha (Viksne & Janaus 1980). Födotillgången, förändringar i jordbrukslandskapet och konkurrens om denna föda inom en radie runt en skrattmåskoloni påverkar dessutom kolonins storlek och existens (Brandl & Gorke 1988, Brandl 1987, Birkhead & Furness 1985). Skrattmåsen har ett opurtunistiskt födointag (Glutz von Blotzheim m.fl. 1982), där förutom daggmask också insekter spelar en viktig roll (Götmark 1984). Karlsson (2003) redovisade ett regelbundet födouttag av hushållsrester från en soptipp sydöst om Havstenasjön, men då framkom inte vilken betydelse födouttaget från soptippen hade för skrattmåskolonin i förhållande till andra födokällor.

Syftet med den här undersökningen var att undersöka var i området runt två kolonier som skrattmåsen hämtar sin föda och om det fanns någon födoplats som var mer betydelsefull.

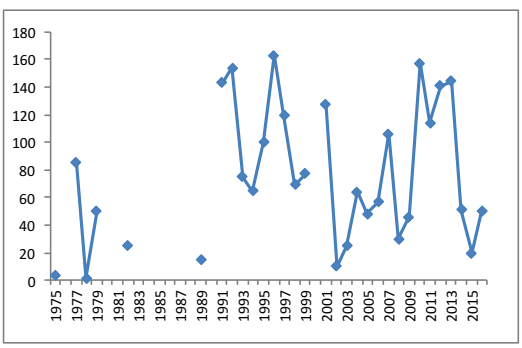
Undersökningsområdena

Undersökningarna utfördes i områden runt två skrattmåskolonier, en mindre koloni vid Havstena-

sjön i Skövde åren 1993–1995 och 1998–1999 och en större koloni i Hornborgasjön åren 1994–1995. Landskapets utformning runt respektive koloni framgår av Tabell 1.

Havstenasjön

Sjön är 2,5 ha stor och ligger i centrala Skövde. Närmaste landskapet runt sjön utgörs av en stadsbebyggelse och resten av området är ungefär lika fördelat på öppen mark, 46%, och skog, 42% (Tabell 1). Jordbruksmarkerna ger intryck av att vara relativt torra. Det finns ett större grässtäppliknande område sydöst om stan bestående av ett militärt övningsområde. En soptipp som besöktes av skrattmåsarna var belägen 3,65 km sydost om sjön. Denna soptipp hade en öppen förvaring av hushållsavfall fram till och med 1999. Antalet häckande skrattmåsar mellan åren 1975, då arten etablerade sig vid Havstenasjön, och till 2016 har pendlat runt 75 ± 50 (SD) par med som mest 163 par (Figur 1). Skrattmåskolonin höll 65–100 par de aktuella studieåren (Tabell 2). Skrattmåsen häckar i de vassöar som finns i sjön.



Figur 1. Antal par av skrattmås *Chroicocephalus ridibundus* i Havstenasjön mellan 1975 och 2016. För åren 1975 och 1977 uppgifter från Gotthardsson (1977) och för 1978–1979 från Gustafson & Hermansson (1981).
The number of pairs of Black-Headed Gull breeding at Havstenasjön 1975–2016.

Hornborgasjön

Skrattmåsen häckade för första gången vid Hornborgasjön 1895. Sjön är ca 31 km^2 stor. Omgivningarna består av jordbruksmark, 61%, och skog, 33%. Bara någon procent är tätort (Tabell 1). En soptipp var belägen 5,8 km nordväst om skrattmåskolonierna i sjön, som under inventeringsåren låg runt Fågeludden, utmed sjöns östra sida. Häckningskolonierna var här uppdelade i flera mindre kolonier. Markerna intill sjöns södra och sydöstra del är fuktigare och översvämmas vid högt vatten. Denna lite fuktigare typ av åkermark intill vattendrag med mestadels betesmark finns inte alls runt Havstenasjön. Kolonierna höll 2400–3300 par de två studieåren (Tabell 2).

Metodik

Enligt Glutz von Blotzheim m. fl. (1982) nyttjar små skrattmåskolonier ett mindre område runt kolonin med en radie som oftast inte är större än 7,5 km och för en stor koloni är motsvarande avstånd 15 km för födosök. Som undersökningsområden valdes därför cirkelområden med dessa radier runt respektive sjö.

Cirkelområdena genomkorsades på slumpvis utvalda vägar. Runt Havstenasjön slumpades fyra vägar varje vecka. De tätbebyggda områdena inom undersökningsytan delades upp i de naturliga stadsdelarna, 7 stycken, och 2 av dessa slumpades ut varje vecka. Vid Hornborgasjön slumpades 4 vägar ut 1994 och 8 vägar 1995. Vägarna kördes sedan i en sådan turordning att resvägen mellan varje sträcka blev så liten som möjligt. Bilen fördes fram i en hastighet på 50–70 km/h, ibland gjordes stopp när så trafiken tillät det förutom att stopp gjordes vid varje observation av en skrattmås.

Uppgifter om skrattmåsförekomsten vid soptippen sydost om Havstenasjön har hämtats från Karlsson (2003). Deponin vid Hornborgasjön har inte varit möjlig att besöka i samma utsträckning, endast ett besök kunde göras på själva soptippen och ett par observationer gjordes från de slumpade vägarna.

Undersökningsperioden omfattade tiden från skrattmåsarnas ankomst och tills ungarna lämnar häckningsplatsen, perioden 1 april till och med 10 juli. De flesta skrattmåsarna har lämnat häckningsplatsen runt 15 juli. Vid Skövde soptipp har genomförts separata räkningar en gång i veckan av mås- och kråkfåglar under åren 1992–1999 och ur detta material har hämtats uppgifter om skrattmåsförekomsten (Karlsson 2003).

Skrattmåsens häckning indelades i tre perioder nämligen botiden (B), ruvningstiden (R) och ungtiden (U) (Karlsson 2004).

Vid varje iakttagelse av skrattmås registrerades antal, sysselsättning och underlag. Vid observationer av flygande måsar noterades huruvida de var högflygande (HF) eller spaningsflygande (SF). Skrattmåsar som kretsade på en höjd sällan över trädhöjd, mellan hus och liknande betecknades

Tabell 1. Biotoper runt skrattmåskolonierna och antalet registrerade skrattmåsflockar i de olika biotoperna. *Distribution of habitats around the colonies of Black-headed Gull and number or flocks recorded in the different habitats.*

	Havstenasjön			Hornborgasjön		
Biotop *Habitat*	km²	%	Antal flockar *Number of flocks*	km²	%	Antal flockar *Number of flocks*
Tätort *Urban*	20	12	209	9	1	1
Skog *Woodland*	75	42		234	33	2
Öppen mark *Fields*	82	46	50	433	61	132
Sjöområde *Lake area*			*	31	5	**
Summa	177		259	707		135

* = ej räknade *not counted*: ** = ej tillgänliga att räkna *not possible to count*

Tabell 2. Totala antalet observationer av skrattmås runt Havstenasjön och Hornborgasjön (medelvärde ± SD). *Total number of records of Black-headed Gulls around Havstenasjön and Hornborgasjön (mean ± SD).*

	Havstenasjön	Hornborgasjön
År *Years*	1993–1995; 1998–1999	1994–1995
Kolonistorlek par *Colony size pairs*	65–100	2400–3300
Totalt antal flockar *Total number of flocks*	259	135
Flockens medelstorlek *Average flock size*	6,3±9,8	30,2±38,4
Flockens medelavstånd i km från kolonin *Average distance between flock and colony in km*	2,1±1,59	9,1±3,6
Antalet måsar i förhållande till avståndet från kolonin *Number of gulls in relation to distance from the colony*	$r^2 = 0,003$; p = 0,197	$r^2 = -0,01$; p = 0,13

som spaningsflygande under aktivt födosök. Högt flygande skrattmåsar kom alltid på högre höjd än träd och hus och med en distinkt riktning och dessa räknas inte som födosökande på den plats och i den biotop över vilken de observerades.

Räkningarna genomfördes under dagtid mellan klockan 06 och 18, men mestadels om förmiddagen, men enligt Brandl & Nelsen (1988) skall detta inte ha så stor betydelse då matning av ungarna är jämt fördelat över dygnets ljusa timmar.

Resultat

Skrattmåsarnas aktivitet

Av iakttagna flockar utgjordes ca 62,9% av flygande måsar och övriga aktiviteter bestod av gående matsök 24,6% medan 12,5 % vilade någonstans i omgivningarna runt Havstenasjön (Tabell 3). Fördelning mellan högflygande och spaningsflygande skrattmåsar var lika (Tabell 3). Vid Hornborgasjön var andelen flygande skrattmåsar 17,8%, gående matsök 77% och andelen vilande var 5,2%. Inga högflygande sågs alls vid Hornborgasjön (Tabell 3).

Avstånd

Det genomsnittligt totala avståndet framgår av Tabell 2. Vid Havstenasjön flög skrattmåsar från kolonin i medeltal 2,7±1,86 km (n = 119) under ungperioden jämfört med 1,64±1,12 km (n = 140) under övriga perioder (Mann-Whitney; W = 18125; p<0,001). Motsvarande vid Hornborgasjön var 9,9±3,66 km (n=56) under ungperioden och

8,4±3,47 km (n=79) (Mann-Whitney; W = 4341; p=0,017).

Antalet skrattmåsar födosökande på marken ökade ju längre från Havstenasjön de befann sig (r^2 = 0,078; p = 0,02; n=57) medan det inte var någon skillnad totalt (Tabell 2). Vid Hornborgasjön noterades ingen motsvarande skillnad (r^2 = 0,01; p=0,29; n=95).

Födosöksunderlag

Valt födounderlag framgår av Tabell 4. Runt Havstenasjön förekom födosök på 6 olika underlag där gräsmattor med 71% av skrattmåsflockarna (Chi^2 = 14,9; p = 0,001) framstod som det vanligaste underlaget över skrattmåsens häckningsperioder. På motsvarande sätt identifierades runt Hornborgasjön 11 olika födounderlag med jordåker, bråddåker och betesmark med 78% av observationerna, som vanligast (Chi^2 = 28,6; p<0,001). Vid Hornborgasjön var det en plats där 4,4% av observationerna gjordes med jordåker som underlag, men vid Havstenasjön var det två dammar som tillsammans hyste 5,8% av observationerna.

Födosök på soptipp

Under häckningsperioden när vårsträcket var över, d.v.s. vecka 18–26, uppehöll sig vid soptippen sydost om Havstenasjön i medeltal 39,6±16,7 skrattmåsar vid soptippen (Karlsson 2003). Dessa utgjorde mellan 19% och 30% av antalet häckande skrattmåsar vid Havstenasjön. Här kunde man se skrattmåsarna hämta vilka födorester som helst från hushåll, från chips till korv.

Vid det enda besök, som tilläts, vid soptippen nordväst om Hornborgasjön, meddelade personalen, att det inte fanns några måsar på soptippen, men jag kunde ändå notera åtminstone ca 400 skrattmåsar då. Vid de slumpvis valda observationerna gjordes två observationer av skrattmåsar som kunde härledes till soptippen vid Hornborgasjön.

Diskussion

Den här undersökningen återger sannolikt främst uppgifter om födosökande skrattmåsar på marken eller spaningsflygande måsar på grund av vald metodik med spaning från bil. Själva sjöområdet vid Hornborgasjön hyste ett stort antal födosökande skrattmåsar, vilket kunde konstateras i samband med andra besök. Däremot ingår inte någon observation från detta område i denna undersökning för att vägarna runt sjön ligger avsides från sjön. Det är en brist i undersökningen.

Enligt Gorke & Brandl (1986) ökar födosöksavståndet med åldern på ungarna. Detta stämmer med mina observationer att skrattmåsarna sökte föda längre från kolonierna under ungperioden än tidigare under häckningen.

Landskapet runt Havstenasjön utgjordes av 46% öppen mark medan andelen observationer av skrattmåsflockar i det öppna landskapet endast var 19,3%. I tätort, som utgjorde 12% av ytan sågs 80,7% och i skogsmark sågs inga skrattmåsar. För Hornborgasjön gällde 61% öppen mark och där sågs däremot hela 95,6% av skrattmåsflockarna (Tabell 1). Gorke & Brandl (1986) menar att mask, en viktig del av födan, kräver områden med kort gräsväxt, eller öppen jord för att vara nåbar. Nyslagen vall torde väl också tillhöra denna kategori. Den stora skillnaden i utnyttjande av öppna marker mellan Hornborgasjön och Havstenasjön torde sannolikt bero på den goda tillgången kortklippta gräsmattor i tätorten kring Havstenasjön. Motsvarande tätorter runt Hornborgasjön ligger dels längre bort, dels utgör en mycket mindre ytandel.

Götmark (1984) nämner att skrattmås huvudsakligen lever på insekter, men att den också tar mask och rester från mathållning. Födobiotopen är, enligt Källander (1996b), kanske den avgörande faktorn för att en skrattmåskoloni skall klara sig över en längre period. I jordbrukslandskapet sågs skrattmåsar på jordåker, bråddåker och nyslagen vall. De två senare åkertyperna fanns endast att tillgå korta perioder under ungperioden i juni och början av juli medan jordåker var vanlig under såperioden i april, men också denna biotop nyttjas kort period i samband med sådd. Runt Hornborgasjön noterades skrattmåsar vid två tillfällen som sökte föda i högt gräs att jämföra med 92 flockar som höll till på ytor med kort eller inget gräs alls, vilket jag antar beror på att dessa senare ytor exponerar födan lättare. Ytor med högt gräs fanns inte vid undersökningens genomförande runt kolonin vid Havstenasjön.

Under häckningstiden fanns det regelbundet skrattmåsar vid soptippen sydöst kolonin vid Havstenasjön. Under maj och juni torde det huvudsakligen röra sig om det lokala beståndet. Mellan 19% och 30% av skrattmåsarna vid Havstenasjön sökte föda vid soptippen. Om man för över dessa siffror till Hornborgasjön skulle regelbundet minst mellan 450 och 1000 skrattmåsar besöka soptippen vid Hornborgasjön. År 1999 var sista året som man deponerade hushållsrester öppet på soptippen i

Tabell 3. Antalet iakttagna flockar av skrattmås runt Havstenasjön och Hornborgasjön med olika aktiviteter. *Number of recorded flocks of Black-headed Gull around Havstenasjön and Hornborgasjön with different activities.*

Aktivitet *Activity*	Havstenasjön		Hornborgasjön	
	Antal flockar *Number of flocks*	Medealantal *Average number*	Antal flockar *Number of flocks*	Medealantal *Average number*
Födosök på marken *Feeding on the ground*	57	10,8±10,7	95	35,6±41,4
Ej definierat födosök *Undefined feeding*	8	10,1±8,0	9	31,6±35,7
Högflygande *High-flying*	83	3,9±7,05		
Spaningsflygande *Low-flying*	83	2,3±2,68	24	10,9±19,2
Vila *Resting*	33	13,7±16,3	7	21,7±29,9
Summa	264		135	

Tabell 4. Fördelning av aktivt födosökande skrattmåsar på olika underlag inkluderande matsök på marken och spaningsflygande.
Distribution of actively foraging Black-Headed Gulls in different habitats, including foraging on the ground and birds flying low in search of food .

Födobiotop *Feeding Habitat*	Havstenasjön		Hornborgasjön	
	Antal flockar *No. of flocks*	Flockstorlek *Flock size*	Antal flockar *No. of flocks*	Flockstorlek *Flock size*
Gräsmatta *Lawn*	54	7,9±8,8	8	42,5±49,2
Vatten *Water*	14	8,2±9,0	2	1,5±0,71
Väg *Road*	5	2,4±3,13	1	
Jordåker *Bare soil*	4	10,8±12,9	55	13,3±20,3
Bråddåker *Newly sawn soil*	4	17,8±8,4	26	13,3±20,3
Nyslagen vall *Newly cut hay field*	4	18,8±9,78	7	28,6±23,8
Träd/skog *Trees/wood*	2	10,5±13,4		
Oslagen vall *Non-cut hay field*			6	31,7±21,8
Betesmark *Active pasture*			18	46,7±40,3
Högt gräs *Tall grass*			2	72,5±84,1
Soptipp *Refuse dump*	*	*	2	60±42,4
Minkfarm *Mink farm*			1	
Summa	87		128	

= Soptippen i Skövde redovisas i Karlsson (2003). *Numbers from the refuse dump at Skövde is shown in Karlsson (2003).*

Skövde och från år 2000 har skrattmåsarna successivt försvunnit från soptippen. Soptippen har varit en viktig födokälla där upp till 30 % av kolonins skrattmåsar befunnit sig, men någon påverkan på antalet häckande skrattmåsar tycks det inte haft att den viktigaste födokällan för kolonin försvunnit då antalet par i kolonin i medeltal inte minskat (Mann-Whitney test; W=247; p=0,8; Figur 1). Antalet häckande par torde sannolikt bero på något annat, t.ex. möjligheten att bygga bo på tillgängliga ytor i vassen eller någon annan födokälla ger tillräckligt med föda till ungarna. Enligt Brandl & Gorke (1988) är födotillgången avgörande för antalet häckande par i en skrattmåskoloni. Det verkar som om jordbrukslandskapet runt Skövde inte utgör någon större födokälla mer än vid enstaka tillfällen då föda blottläggs t.ex. vid nyslagna vallskördar eller då åkrar plöjs, båda moderna jordbruksmetoder med tämligen kortlivade tillstånd av ytor med lättillgänglig föda. Födotillgången inom stadsområdet runt Havstenasjön verkar ändå leverera tillräckligt med föda för att kolonin skall bestå (Tabell 1 och 4).

Vid Hornborgasjön flyger skrattmåsarna tämligen långt och når Skara samt ett antal mindre tätorter, som skulle kunna ge samma effekt som stadsområdet runt Havstenasjön. Annars kan man notera att öppna fält attraherar skrattmåsen i högre utsträckning runt Hornborgasjön än vid Havstenasjön (Tabell 1 och 4). Under sommaren sjunker också vattennivån i Hornborgasjön med blottlagda fuktiga ytor, vilket skulle kunna generera föda något som inte den undersökningen ger ett säkert svar på.

Tack

Bidrag från Uddenberg-Nordingska stiftelsen gjorde att undersökningarna kunde genomföras. Olof Johansson tackas för metoddiskussion.

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Summary

Due to the decrease of the Black-headed Gull population in the 1990s there was of interest to know where and in which habitats the Black-headed Gulls were feeding around two colonies in southwestern Sweden. One of the study colonies was small (65–100 pairs) and located at Havstenasjön in the city of Skövde. It was studied during 1993–1995 and 1998–1999. The other colony was big (2400–3200 pairs) and located at Hornborgasjön, 20 km southwest of Skövde. It was studied during 1994–1995. In the neighbourhood of booth colonies there was a refuse dump. The number of gulls using the dump at Havstenasjön has been published (Karlsson 2003). This dump was closed in 2000.

No information was collected from the refuse dump at Hornborgasjön. The habitats around each colony can be seen in Table 1.

Based on literature information on the size of the feeding area by birds from colonies of different size, an area of 177 km^2 was surveyed around Havstenasjön and 707 km^2 around Hornborgasjön. Within these areas randomly choosen roads were patrolled once week between 1 April and 10 July. The gulls were counted and allocated to one of several feeding habitats and feeding modes during daytime between 06.00 and 18.00 hrs.

The result can be seen in Tables 1–4. When feeding young, the Black-headed gulls were feeding a bit farther away from the colony than during the nest-building and incubation period: at Havstenasjön 2.7±1.86 km versus 1.64±1.12 km (Mann-Whitney; W = 18125; $p<0.001$; n=119) and at Hornborgasjön 9.9±3.66 (n=56) km versus 8.4±3.47 km (n=79) (Mann-Whitney; W = 4341; p=0.017; n=81).

The distribution of activity in the different feeding grounds is given in Table 4. Around Havstenasjön there were six different feeding grounds where lawns had 71% of the flocks ($Chi^2 = 14.9$; $p = 0.001$, Table 4). Around Hornborgasjön eleven different feeding grounds were found with fields of different kind having 78% of the feeding flocks ($Chi^2 = 28.6$; $p<0.001$).

The surroundings of Havstenasjön were 46% open fields but only 19% of the flocks were seen in that environments. Around Hornborgasjön there were 61% open fields and 88% the flocks were seen there (Table 1).

Up to 30% of the Black-headed Gulls breeding at Havstenasjön were seen at the refuse dump southeast of the colony (Karlsson 2003). The last year when food waste was dumped was 1999. One could have expected a decline in size or disappearance of the Havstenqsjön colony. However, there is no difference in number of pairs before and after 1999 (Mann-Whitney test; W=247; p=0.8). The number of breeding pairs at Havstenasjön is obviously not depending on food from the refuse dump. The amount of food in the surroundings seems to be enough. The city itself may provide some junk food and the lawns with worms etc. may offer a small colony sufficient food.

ORNIS SVECICA 26: 10–12, 2017

Are there more ground-dwelling invertebrates inside than outside Grashopper Warbler *Locustella naevia* territories?

Finns det fler marklevande evertebrater inom eller utanför gräshoppsångares Locustella neavia *revir?*

JONAS ENGZELL

Abstract

I investigated differences in the number of ground-dwelling invertebrates inside as compared with just outside Grasshopper Warbler *Locustella naevia* territories, using glue traps. No statistical difference was found in the total number of invertebrates caught. There was, however, a significantly higher number of spiders within territories. This may indicate that spiders are an important food source for Grasshopper Warblers, or that spider density indicates other territory qualities for Grasshopper Warblers.

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Background

There are several sources that provide information about the diet and feeding behaviour of the grasshopper warbler *Locustella naevia*. According to Kennerley & Pearson (2010), the grasshopper warbler "feeds from low stems or among dead leaves and other ground debris". Another source describes that it feeds mainly on "insects; also spiders (Araneae), some small molluscs. Feeds while moving actively through low vegetation. Gleans from stems, working from top to bottom. Forages also on ground; searches among dead leaves" (del Hoyo, Elliot & Christie 2006). And a search on Wikipedia gives this information; "The common grasshopper warbler is insectivorous, feeding on a wide range of invertebrates. Its diet includes flies, moths, beetles, aphids, dragonflies and mayflies and their larvae. Spiders and woodlice are also eaten and the chicks are fed on aphids, green caterpillars, woodlice and flies" (Wikipedia.org 2016).

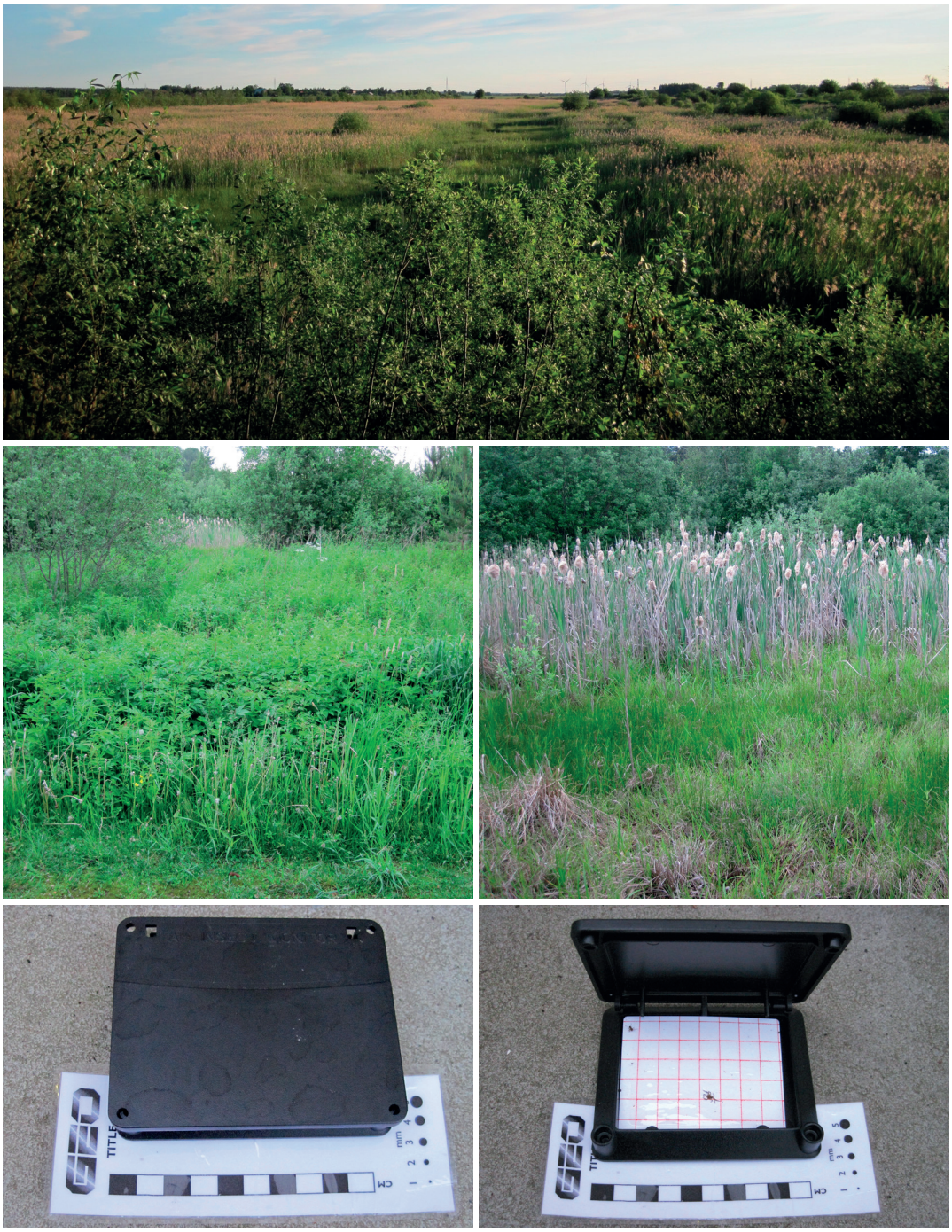
My aim with the present study was to investigate whether there are more ground-dwelling invertebrates inside territories occupied by Grasshopper Warblers than in nearby areas just outside occupied territories.

Materials and methods

The study was carried out in the nature reserve Björka lertag (Natura 2000 sites: SE0240078 Björka lertag, SE0240134 Vissberga lertag. Object number RegDOS: 2000249. Central coordinates (RT90): X 6554548, Y 1460369). Björka lertag is located in Kumla, Närke, in southern Central Sweden, and it is a former clay-pit that now has been turned into a reed- and bush-dominated wetland.

The fieldwork was carried out during the breeding season of 2016. I monitored and ringed singing grasshopper warbler males from 5 May to 6 June. The singing positions of males were used to determine the location and size of each grasshopper warbler male's territory in the study area. In 2016 there was a total of 6 singing males in Björka lertag. Of these, one male switched territory after a while. A seventh male was heard singing in an additional, (8th) territory one night, but was not heard thereafter. This latter (8th) singing site was not considered as an occupied territory in the present study.

I used glue traps to measure abundance of invertebrates on the ground. The glue traps have been designed to detect insects in homes etc., and I used AF Insect Monitor (black) with glue pads. Glue pads for these traps can be with or without invertebrate-attracting odour. I used glue pads without attractant. In total, 20 traps were placed in the study area. Of these, 8 traps were placed close to (within 5m of) singing positions of the six territorial males. The remaining 12 glue traps were randomly placed



The stuey area, a former clay-pit. Glue-traps were placed on the ground covered with vegetation. After three days they were collected and opened and the number of different invertebrates was counted.
Försöksområdet, ett tidigare lertag. Klisterfällor placerades på marken täckta av vegetation. Efter tre dagar samlades de in och öppnades de och antalet evertebrater av olika slag räknades.

in the study area. They ended up between 43 and 115 meters from the singing position of the closest male (mean distance 71 m). The traps were placed on the ground, so that both new and old vegetation covered the traps to ensure that they stood firmly on the ground. The traps were in place from the morning of 6 June to late evening of 8 June.

After collecting the traps the total number of invertebrates caught per trap was noted. In addition, I also counted the total number of ants, spiders and beetles separately. All other invertebrates, found in small numbers in the traps, were grouped into "other invertebrates" and also counted.

Results

The total number of invertebrates caught in the traps was 497. Of these 414 were ants, 36 spiders, 5 beetles and 42 other invertebrates. Ants dominated the catch and represented 82% of the total number of caught invertebrates.

In this study there was no statistically significant difference between traps close to singing males and traps far from singing males, regarding the number of ants, beetles, "other invertebrates" or the total number of caught invertebrates. However, the number of caught spiders was significantly larger within territories (i.e., close to singing grasshopper warbler males) than in traps outside territories (i.e., 43–115 m from singing males; Mann-Whitney U-test, $U = 6$, $P < 0.05$).

Discussion

When Grasshopper Warbler males arrive to the study area in late April and the beginning of May, the weather is often cold. The vegetation is not fully foliated and it is possible to see through a lot of the Salix bushes. This may result in Grasshopper Warblers searching for food closer to the ground, in ground cover and at the soil surface. Many of the insect types listed as food for Grasshopper Warblers are not found in any abundance in the study area until later in spring (personal observation during 35 years of monitoring the area). However, spiders (and ants) emerge earlier in spring than the other invertebrate groups listed as prey for Grasshopper Warblers. Thus, one reason for the higher abundance of spiders in territories is that spiders could be an important food source for Grasshopper Warblers when they just have arrived to their territories in early spring.

However, it is also possible that the higher number of spiders within Grasshopper Warbler territories could indicate higher number of insects that is not possible to detect with the ground traps I used in this study. Further studies might shed more light on the subject.

Sammanfattning

Under 2016 har en undersökning av marklevande evertebrater i och utanför gräshoppsångarrevir genomförts. Studien genomfördes i Naturreservatet Björka lertag i Kumla, Närke. Syftet var att se om det var mer marklevande evertebrater i revir som hölls av sjungande hanar än på andra platser utan sjungande gräshoppsångare i studieområdet. Undersökningen utfördes genom att 8 klisterfällor placerades på marken nära (inom 5 meter ifrån) sjungande hanar medan 12 andra klisterfällor placerades ut slumpmässigt i området (i genomsnitt 71 m från närmaste sjungande hane). Jag fann inga statistiskt säkerställda skillnader vad gäller det totala antalet fångade evertebrater, antalet myror, skalbaggar eller övriga evertebrater mellan besatta revir och andra plaster i undersökningsområdet. Däremot fann jag att det var signifikant fler fångade spindlar i besatta gräshoppsångarrevir jämfört med de slumpmässigt utvalda platserna i studieområdet. Detta resultat kan tyda på att spindlar är en viktig födoresurs för gräshoppsångare i studieområdet. Kanske är spindlarna speciellt viktiga tidigt på våren när andra evertebrater är ovanliga. Men det kan också vara så att spindlarna indikerar andra kvaliteter i gräshoppsångarens revir.

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ORNIS SVECICA 27: 00–00, 2017

Local movements of Greylag Geese *Anser anser* in South Sweden during the non-breeding season

Lokala rörelser av grågäss Anser anser *i södra Sverige utanför häckningstiden*

LEIF NILSSON & HAKON KAMPE-PERSSON

Abstract

During 1984–2009, Greylag Geese *Anser anser* were neck-banded at two lakes six kilometres apart in southwest Scania, southernmost Sweden: 2308 at lake Yddingen and 633 at Klosterviken (part of lake Börringe). Through 2013 we recorded 51 132 and 29 937 re-sightings, respectively. We analyse the distribution patterns within Scania during the post-breeding months July–March. In spite of the short distance between the breeding sites, marked differences in the local distributions were found. In late summer and early autumn, Greylags from Klosterviken stayed longer inland close to the breeding lake than geese from Yddingen, the availability of good inland feeding sites close to Klosterviken explained the difference. In late autumn, when many re-sightings were made along the western coast, it seemed that the distance from the breeding lake explained some of the differences, geese from Yddingen dominated in the northern part, whereas geese from Klosterviken were found further south. There was also a time difference in that the birds from Yddingen moved to the coast earlier than those from Klosterviken

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Introduction

Fifty years ago, the Greylag Goose *Anser anser* was a rare breeding bird in southernmost Sweden, but during the 1970s a marked increase in the population started here as in other parts of Sweden, and in other countries as well (Kampe-Persson 2002). Large flocks of non-breeding geese started to appear in different areas and were experienced as a management problem in relation to agriculture. To get better information about the situation the Nordic Collegium for Wildlife Research (NKV) started a Nordic Greylag Goose project in 1984 (Andersson et al. 2001). One of the main aims of the project was to study the migration patterns of the species by neck-banding a large number of geese from different areas. In the same year, a monitoring program of Greylag Geese started in Sweden and other countries (Nilsson 2013).

In Sweden, the neck-banding of Greylag Geese was mainly undertaken in two areas, a lake area in southwest Scania, southernmost Sweden and an area in Södermanland, south of Stockholm (Andersson et al. 2001). The studies in South Sweden were concentrated to an area in southwest Scania (Figure 1). Based on the neck-banded popula-

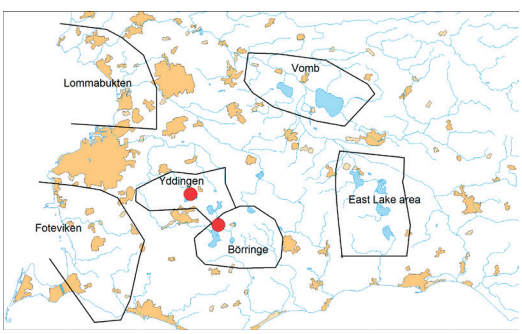


Figure 1. Map of southwest Scania, South Sweden, showing the main goose areas used in the study. Red dots show the geographical position of the marking areas at Lake Yddingen and Lake Klosterviken (in the Börringe area). Urban areas marked with yellow colour.
Karta över sydvästra Skåne, södra Sverige, med de viktigaste gåsområdena markerade. Röda markeringar visar märklokalerna vid Yddingen och Klosterviken (i Börringeområdet). Bebyggda områden markerade med gul färg

tion different aspects of the breeding ecology and population dynamics were studied as was moulting ecology, dispersal, field choice, habitat selection and effects of different wintering and spring staging strategies (Nilsson & Persson 1992, 1994, 1996, 1998, 2001, Nilsson et al. 1997, 2001, 2002, Persson 1996a, 1999).

The local distribution and field choice of the Greylag Geese in south-western Sweden was studied during 1984–2010 based on censuses of staging and wintering geese (Nilsson & Persson 1992, 1998, Nilsson & Kampe-Persson 2013). In the present study, the local distribution of the non-breeding Greylag Geese in the area was studied based on re-sightings of individually marked geese to establish home-ranges of the geese from two different but neighbouring breeding lakes.

Material and study area

The study was undertaken in southwestern Scania, southernmost Sweden (Figure 1). Neck-banding of breeding Greylag Geese were mainly undertaken at Lake Yddingen and Lake Klosterviken (part of Börringe area) but catching was also undertaken in some years at Lake Fjällfotasjön (in the Yddingen area), Lake Börringe (in the Börringe area) and at Lake Snogeholm (in the East Lake area) (see Figure 1). In this study, we compare the local distributions of re-sightings of Greylag Geese marked at Lake Yddingen and at Lake Klosterviken, the two marking sites that were used regularly during the entire study.

The lakes are situated in a rolling landscape with agricultural land and smaller forest patches. Lake Klosterviken has a border of reed and there are some shore meadows offering good feeding opportunities during brood-rearing. Lake Yddingen is somewhat larger and has extensive reed beds in the bays plus some islands that are used for breeding. There are shore meadows in some areas and part of the lake borders to a golf course that offers good feeding conditions during brood-rearing. For more detailed description of the breeding lakes see Nilsson & Persson (1994).

Families of Greylag Geese were caught during early summer by driving them into nets mounted on the shore meadows and the golf course (Andersson et al. 2001, Persson 1994). Marking started in 1984 and the last geese were marked in 2009. In all, 136 adults and 497 goslings were neck-banded at Lake Klosterviken and 361 adults and 1 947 goslings at Lake Yddingen.

The areas around the breeding lakes were checked for the occurrence of neck-banded geese several times a week during spring and early summer. From July to late autumn regular controls for marked geese were undertaken in the main feeding areas of the Yddingen and Börringe areas and the coastal areas at Foteviken (Figure 1). The other goose areas outlined in Figure 1 were checked at least once a month during the non-breeding season. The use of feeding areas in the lake areas and at Foteviken were discussed by Nilsson & Persson (1992, 1998) where information about available food types can be found.

In all, 29 937 re-sightings of Greylag Geese neck-banded at Lake Klosterviken and 51 132 re-sightings of Greylag Geese neck-banded at Lake Yddingen were made in the study area in southwest Scania during the years 1984–2013.

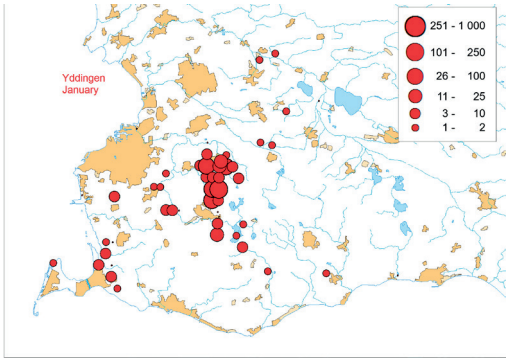
Results

During the breeding season in April–June, the fieldwork was concentrated to the breeding areas and accordingly only few re-sightings were obtained from other areas (Figure 2). The flocks gathering before the migration to the moulting areas were mostly found close to the breeding lakes, but before late May there were still some non-breeding geese moving around.

In July, the families were fledged and moulters had returned from the moult migration. Large numbers of re-sightings were made in the inland areas around the breeding lakes but also some at Foteviken on the coast (Figure 2, 3, Appendix 1, 2). Greylag Geese from both marking areas were found in the inland areas and at Foteviken. There was a difference between the two marking areas however, as several re-sightings of Yddingen-geese were made in the Börringe area, whereas only few Klosterviken-geese were seen in theYddingen-area. In July, 14% (of 2186) of sightings of Yddinge Greylags were from the Börringe area, whereas only 4.7% (of 1348) of the sightings of Börringe Greylags were made in the Yddinge area.

August showed a similar overall picture as July, but a larger proportion of the geese from Lake Yddingen (>50%) had left for the Foteviken area, whereas this proportion was only about 30% for the geese marked at Klosterviken. In August, 23% (of 1859) sightings of geese from Yddingenwere in the Börringe area compared to 2.4% (of 1155) sightings of Börringe geese from the Yddingen area.

In September, the same trend continued for the Yddingen-geese, whereas the geese from Lake


Yddingen
January
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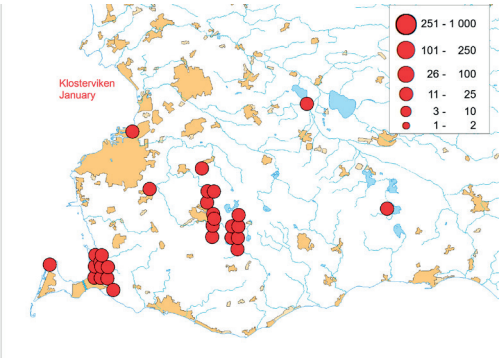
101 - 250
26 - 100
11 - 25
3 - 10
1 - 2


Klosterviken
January
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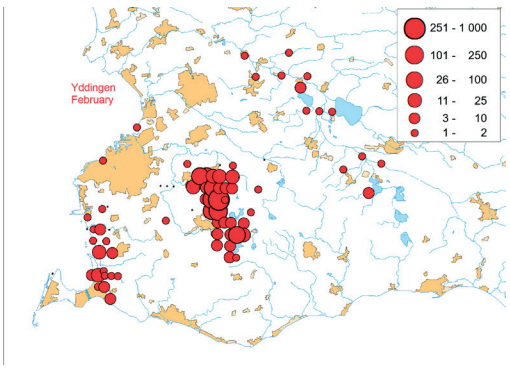
Yddingen
February
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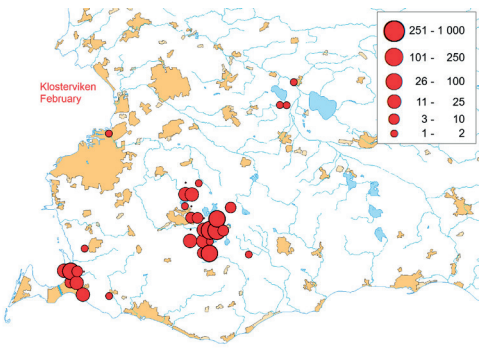
Klosterviken
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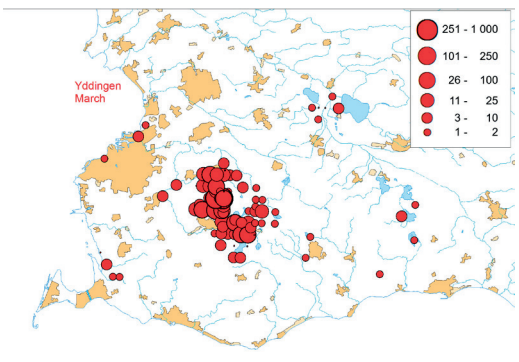
Yddingen
March
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3 - 10
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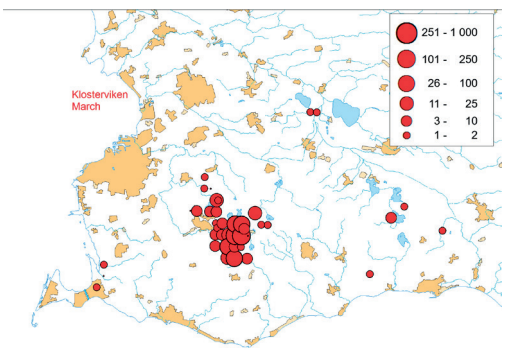
Klosterviken
March
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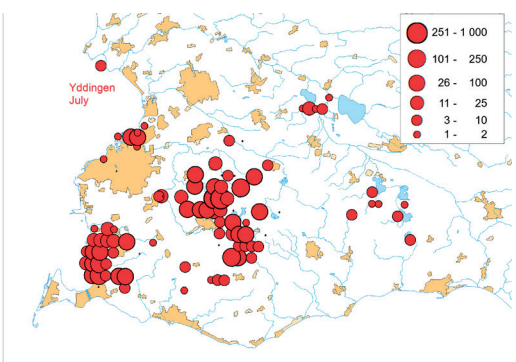
Yddingen
July
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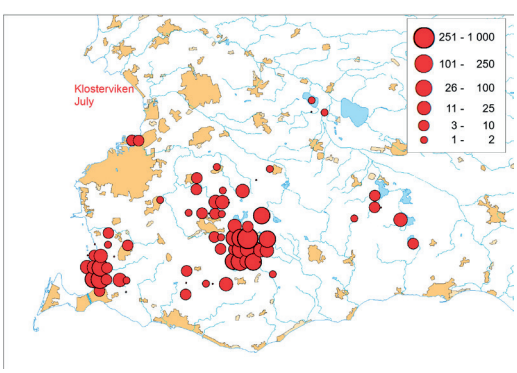
Klosterviken
July
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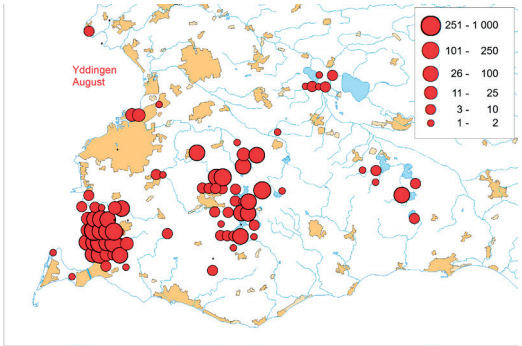
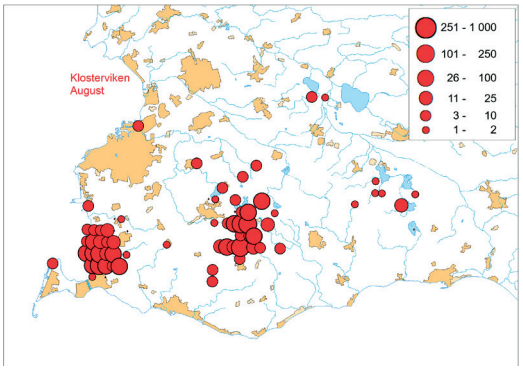

Yddingen
August
251 - 1 000
101 - 250
26 - 100
11 - 25
3 - 10
1 - 2


Klosterviken
August
251 - 1 000
101 - 250
26 - 100
11 - 25
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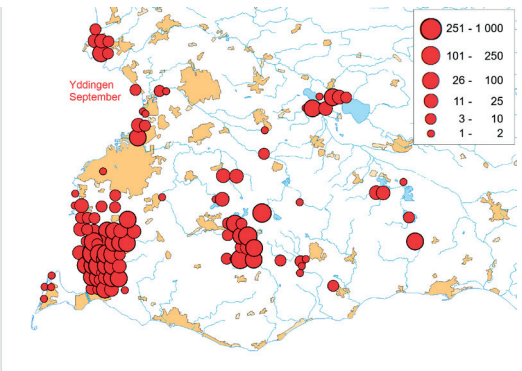
Yddingen
September
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101 - 250
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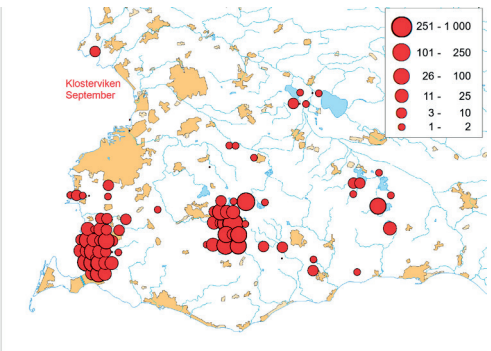
Klosterviken
September
251 - 1 000
101 - 250
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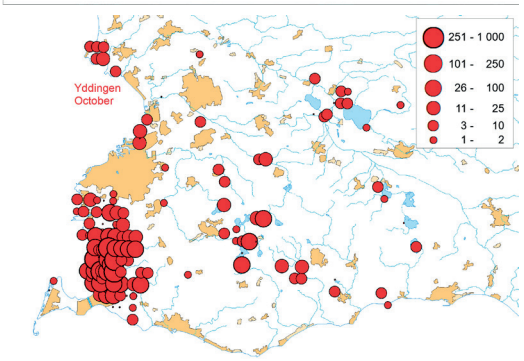
Yddingen
October
251 - 1 000
101 - 250
26 - 100
11 - 25
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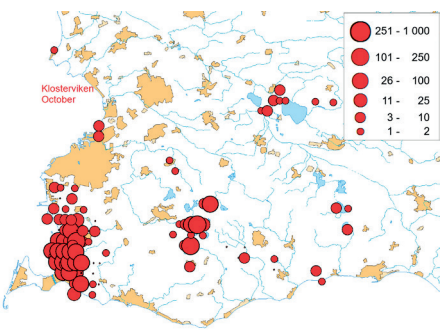
1 - 2


Klosterviken
October
251 - 1 000
101 - 250
26 - 100
11 - 25
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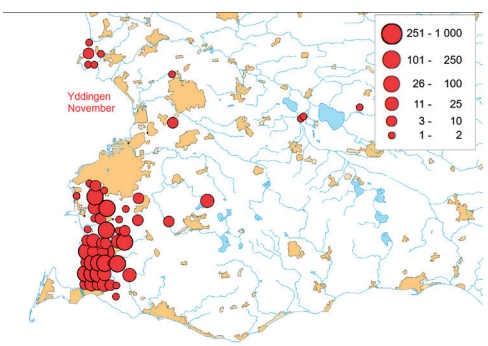
Yddingen
November
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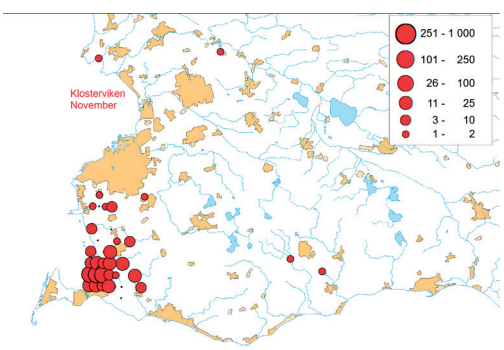
3 - 10
1 - 2


Klosterviken
November
251 - 1 000
101 - 250
26 - 100
11 - 25
3 - 10
1 - 2

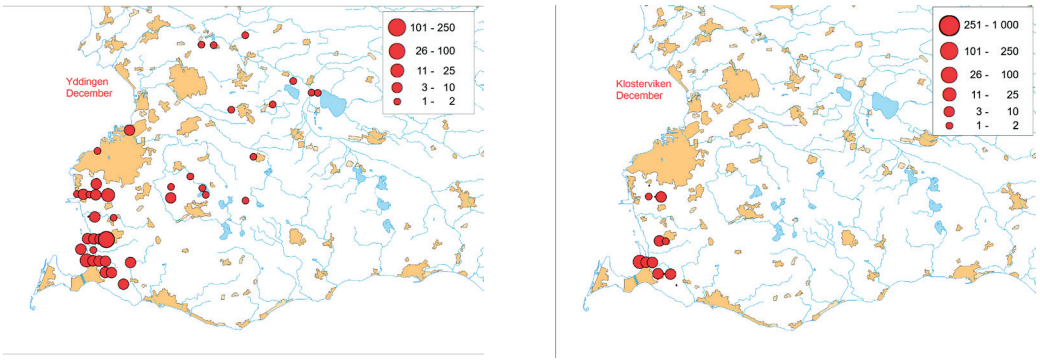


Figure 2. Monthly distribution of local re-sightings of neck-banded Greylag Geese *Anser anser* marked at Lake Yddingen (left) and Lake Klosterviken (right), accumulated for the years 1984–2009.
Månadsfördelning av lokala observationer av halsmärkta grågäss Anser anser *märkta vid Yddingen (vänster) och Klosterviken (höger) åren 1984–2009.*

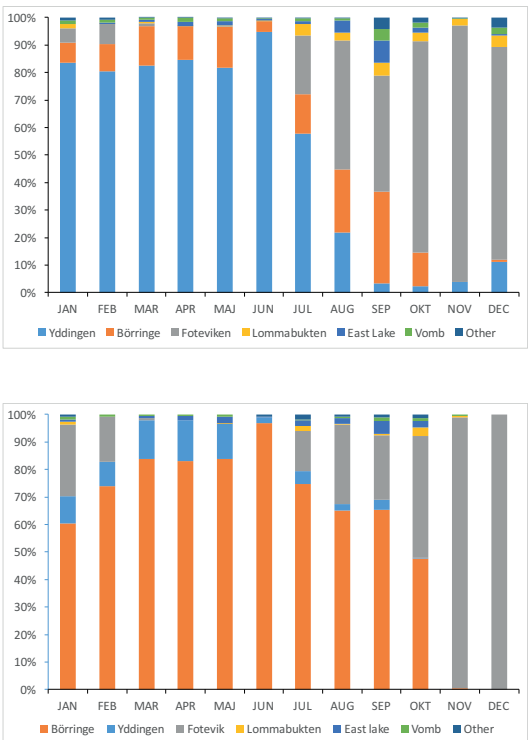


Figure 3. Monthly distribution (per cent) of re-sightings of neck-banded Greylag Geese *Anser anser* marked at Lake Yddingen (upper diagram) and Lake Klosterviken (lower diagram) in the different areas outlined in Figure 1.
Procentuell månadsfördelning av observationer av halsmärkta grågäss Anser anser *märkta vid Yddingen (övre diagrammet) och Klosterviken (nedre diagrammet) i de olika områdena, som visas i Figur 1.*

Klosterviken showed a similar picture as in August. Very few re-sightings of Yddingen-geese were made in the Yddingen area. In September, close to 20% of all re-sightings were obtained from areas outside the three main study areas.

In October, the movement to the coast continued and Foteviken was the main site for re-sightings of geese marked at Lake Yddingen with almost 80% of the re-sightings made here. Most of the Greylags from Yddingen remaining inland were still reported from the Börringe area. Greylag Geese marked at Lake Klosterviken remained in the inland to a higher frequency than the Greylags from Yddingen, about 45% of the re-sightings came from the Börringe area with a similar percentage noted at Foteviken.

During the autumn, smaller numbers of marked Greylag Geese from both lakes were seen in the Vomb area and the East Lake area. Especially in later years, marked geese were also reported from Lommabukten, both from the Barsebäck area in the north and Sjölunda in the south. As the tradition to use the Öresund areas was established later than the tradition to use the Foteviken area, there are fewer observations from the earlier years. Even if the proportion of birds using the Öresund area was quite low, more Greylags marked at Lake Yddingen were found here compared to birds from Lake Klosterviken.

By November and December, almost all re-sightings of Greylag Geese marked at Lake Klosterviken were from the Foteviken area. The majority of the geese from Lake Yddingen were also concentrated to this area but in December close to 10% of the re-sightings were reported from other

areas. Due to departures for the winter quarters, the total number of geese (and re-sightings) was much lower in December than in November.

Especially in later years, the Greylag Geese started to return to southwest Sweden already in January in mild winters, whereas smaller numbers were found here in colder winters. In both cold and mild winters, marked Greylag Geese from both areas were seen both at Foteviken and in the inland areas. About 80% of January re-sightings of Yddingen-geese were from the Yddingen area, whereas the proportion of geese marked at Lake Klosterviken seen in the Börringe area in January was about 60%. February showed a similar picture to January but there was some variation between years related to weather conditions. During periods with snow in south Sweden there was often areas with no (or only little) snow cover close to the coast and a concentration of Greylags present to these areas was noted.

In March, finally, the vast majority of the re-sightings were from the breeding areas even if some individuals were lingering around. As later in spring, some Yddingen-geese were found at Börringe and vice versa.

When studying the maps of neck-band re-sightings (Figure 2), a marked difference in the distribution pattern of re-sightings of Yddingen-geese and Klosterviken-geese within the Foteviken area becomes obvious. Splitting the re-sightings according to latitude it is clearly seen that re-sightings of geese from both areas were more or less equally common in the southern part of the Foteviken area, whereas almost all geese seen in the northern part of the area were from Lake Yddingen (Figure 4, Appendix 3).

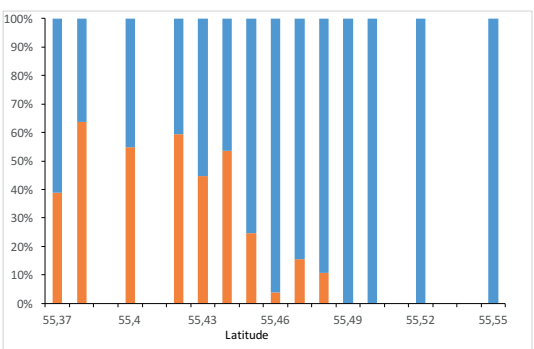


Figure 4. Percentage distribution of neck-band re-sightings of marked Greylag Geese *Anser anser* from Lake Yddingen (blue) and Lake Klosterviken (orange) in different parts of the Foteviken area (Figure 1). Different positions in the area are given by the latitude of the re-sightings shown in intervals of 0.01 degrees.
Procentuell fördelning av observationer av märkta grågäss Anser anser *från Yddingen (blå) och Klosterviken (orange) i olika delar av Foteviken-området (figur 1). Olika läge i området anges med latitud visad i intervall om 0,01 grader.*

Discussion

Even if the two marking areas (breeding lakes) were situated quite close to each other (less than six km from shore to shore), there were some clear differences in the utilization of the different areas by the geese, both during late summer and early autumn, and later in the autumn before the geese left the area on autumn migration. When discussing these differences between the two areas it is important to consider the marked changes in the number of Greylag Geese that has occurred during the long study period. The breeding population of the lake area has increased from little more than 100 pairs, reaching a peak of 1400 pairs in 2004 before decreasing to about 800–900 pairs. At the same time, the total number of staging Greylag Geese in southernmost Sweden has shown a very marked increase (Nilsson 2013) and new staging areas were established within the province.

At a larger scale, the migration patterns of the species have changed as a reaction to climate change and milder winters with the Greylag Geese wintering further north and migrating south later in the autumn (Andersson et al. 2001, Nilsson 2006, Ramo et al. 2015), a change that was accelerated by large differences in hunting exploitation among winter quarters (Persson 1996b). In Sweden, moreover a wintering tradition was established in later years (Nilsson 2013).

In summer, after the breeding season, the majority of the Greylag Geese stayed inland close to the breeding lakes, even if there were some movements and some geese already in July turned up at the coast. Comparing geese from the two marking areas in summer and early autumn it is clear that the geese from Lake Klosterviken remained for a longer period inland than the geese from Lake Yddingen. Moreover, quite a number of the marked geese from Lake Yddingen remaining inland, were found in the Börringe area in the same flocks as the locally marked geese. One main difference between the two inland areas was the availability of good feeding areas close to the lakes (Nilsson & Persson 1992, 1998), which was much better in the Börringe area.

The earlier arrival to the coast of the geese from

Lake Yddingen compared to the geese from Lake Klosterviken is probably also related to the availability of suitable feeding areas close to the roost. Whereas there were fewer good feeding areas close to Lake Yddingen compared to Lake Klosterviken, there was a good availability of feeding areas close to the roosts at Foteviken (Nilsson & Persson 1992, 1998). Usually, Greylag Geese shift to another roost in another gathering area, when they cannot find suitable feeding grounds within five km of their first roost (Nilsson & Persson 1992).

There was also a tendency for the Greylag Geese from the two study lakes, when moving to the coast, to move to the closest part of Foteviken. Thus, the proportion of marked geese from the two lakes was similar in the southern part of the Foteviken area in spite of the numbers marked at Lake Yddingen were three times higher than the numbers marked at Lake Klosterviken, whereas no geese from Lake Klosterviken were found in the northern parts of the Foteviken area. In the same way, geese marked at Lake Yddingen were seen in the newly established staging areas in Lommabukten, where only singly individuals from Lake Klosterviken were found.

With the change in wintering habits and migration patterns, some marked geese were found in Sweden in January, with early arrivals in the breeding areas in this month. Most January records were from the southernmost part of Foteviken with a higher proportion of birds from Lake Klosterviken seen here in January compared to birds from Lake Yddingen. For newly-arrived geese, Lake Yddingen probably offered better feeding conditions in early spring with highly nutritious grass on the golf course, which was available early compared to the shore meadows at Lake Klosterviken. Foteviken on the other hand offered large areas of grassland for the geese when arriving early in the season.

Even if differences were found in the local movement patterns of the Greylag Geese from two neighbouring lakes in southwest Sweden, no clear differences in the migration patterns were found between the two groups of geese.

Acknowledgements

The Greylag Goose project started as a joint Nordic program supported by the Nordic Council for Wildlife Research (NKV). Over the years, the project was supported by different grants from the Swedish Environmental Protection Agency and the Swedish Sportsmen's Association ("Jägartjugan"). During some years, neck-banding was supported by the Öresund Bridge Company as a part of one of their control programs. The second author was responsible for the catching and marking operations during the first 24 years, with the help of a large number of voluntary "goose-catchers".

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Sammanfattning

För femtio år sedan var grågåsen en sällsynt häckfågel i Sverige, men från 1970-talet noterades en markant ökning av beståndet samtidigt som arten spreds till nya områden och betydande flockar av icke-häckande gäss kom att etableras i olika områden. För att få bättre information om utvecklingen hos grågåsbeståndet, dess flyttningsvanor och rörelsemönster mm startades därför ett gemensamt nordiskt grågåsprojekt av Nordiskt Kollegium för Viltforskning, som bl.a. innefattade omfattande märkningar med halsringar i olika områden (Anderson et al. 2001). I Sverige var ett av huvudområdena sydvästra Skåne, där undersökningarna också kom att omfatta olika aspekter på grågåsens ekologi (Nilsson & Persson 1992, 1994, 1996, 1998, 2001, Nilsson et al. 1997, 2001, 2002, Persson 1996a, 1999).

I föreliggande studie analyseras de lokala rörelserna hos de märkta gässen från två närliggande häckningssjöar i sydvästra Skåne.

Undersökningsområdet omfattade sydvästra Skåne (Figur 1). Fångst och märkning skedde huvudsakligen vid Yddingen och Klosterviken, de sjöar som omfattas av denna undersökning, men märkningar förekom också i mindre omfattning på andra lokaler. Grågåsfamiljer fångades genom att drivas in i nät monterade längs strandängarna eller golfbanan vid Yddingen under den period då ungarna var tillräckligt stora för att märkas, men innan de och föräldrarna kunde flyga. För närmare beskrivning av metodiken hänvisas till Andersson et al. (2001) och Persson (1994).

Området kring häckningssjöarna kontrollerades efter förekomsten av märkta gäss flera gånger i veckan under våren och den tidiga sommaren. Från och med juli kontrollerades sjöarna och angränsande födosöksområden här och vid Foteviken regelbundet, medan andra gåsområden kontrollerades åtminstone en gång per månad.

Totalt märktes 136 gamla fåglar och 497 ungar vid Klosterviken, medan motsvarande antal för Yddingen var 361 gamla och 1 947 ungar. Under perioden 1984–2013 erhölls 29 937 observationer av gässen märkta vid Klosterviken, medan 51 132 observationer erhölls av gässen märkta vid Yddingen.

De lokala observationerna av halsmärkta gäss från de båda sjöarna presenteras månadsvis i en serie kartor (Figur 2), medan den procentuella fördelningen av observationerna på olika delområden för gässen från de båda sjöarna framgår av Figur 3. Tidigt på säsongen observerades de flesta gässen i närheten av häckningsområdena (märkplatserna), men redan i juli noterades en rörelse ut mot kusterna, där merparten av gässen återfanns under senhösten.

En jämförelse mellan de båda märkområdena visar att gässen från Klosteviken i större utsträckning fanns kvar i närområdet under sommaren och den tidiga hösten jämfört med Yddinge-gässen som tidigare lämnade detta område. En betydande del av Yddinge-gässen förekom under den tidiga hösten också i Börringeområdet, medan endast få gäss från Klosterviken noterades vid Yddingen. Orsakerna till dessa skillnader kan förmodligen sökas i skillnader i tillgången på bra födosöksområden i inlandet (Nilsson & Persson 1992, 1998), vilka var avsevärt bättre i Börringeområdet än vid Yddingen.

Under hösten utgör Foteviken ett viktigt område för grågässen innan de lämnar landet på flyttningen. Gässen från Yddingen anländer normalt tidigare till Foteviken än de gäss som märkts vid Klosterviken (Figur 3). I Foteviken finner man också skillnader i uppträdande mellan gässen från de båda sjöarna (Figur 4). I södra delen av Foteviken är observationer av gäss från de två sjöarna ungefär lika vanliga, trots att det märkts ungefär tre gånger så många gäss i Yddingen, medan gäss från Klosterviken helt saknas i norra delarna. Likaledes är den absoluta merparten av de märkta gäss som ses i Lommabukten från Yddingen. Således en tendens att flytta till den del av de kustnära rastområdena som ligger närmast häckningsområdet.

Under senare år har en betydande del av grågässen övervintrat i Sverige. Dessutom anländer de som flyttat tidigare och det ses regelbundet betydande antal grågäss i Sverige i januari. Majoriteten av de anländande gässen ses vid häckningsområdena, men även här finns skillnader i fördelningen av gässen och en större del av observationerna av Klosterviks-gäss i januari kommer från Foteviken än vad som är fallet för Yddingegässen.

Appendix 1. Number of sightings of Greylag Geese *Anser anser* neck-banded at Lake Yddingen made in the different areas in SW Scania marked out on the map in Figure 1. Note each individual only included once per month, year and area.
Antal observationer av grågäss Anser anser *halsmärkta vid Yddingen från olika områden i SV Skåne markerade på kartan i Figur 1. Observera varje individ noterad endast en gång per månad, år och område.*

	Yddingen	Börringe	Foteviken	Lommabukten	East Lake	Vomb	Other	Total
JAN	240	21	15	4	0	4	3	287
FEB	590	73	53	1	3	9	5	734
MAR	784	135	11	3	9	6	1	949
APR	756	109	0	1	12	14	1	893
MAY	758	138	3	1	15	10	2	927
JUNE	911	37	1	1	5	3	3	961
JULY	1263	313	467	92	25	23	3	2186
AUG	406	425	874	53	80	18	3	1859
SEP	70	686	873	100	168	83	87	2067
OCT	32	162	1013	44	24	23	24	1322
NOV	25	0	596	15	0	3	1	640
DEC	19	1	131	7	1	4	6	169

Appendix 2. Number of sightings of Greylag Geese *Anser anser* neck-banded at Lake Klosterviken made in the different areas in SW Scania marked out on the map in Figure 1. Note each individual only included once per month, year and area.
Antal observationer av grågäss Anser anser *halsmärkta vid Klosterviken från olika områden i SV Skåne markerade på kartan i Figur 1. Observera varje individ noterad endast en gång per månad, år och område.*

	Börringe	Yddingen	Foteviken	Lommabukten	East lake	Vomb	Other	Total
JAN	67	11	29	1	1	1	1	111
FEB	308	37	68	0	0	3	0	416
MAR	421	70	4	0	5	2	0	502
APR	394	71	0	0	7	3	0	475
MAJ	406	61	1	1	11	4	0	484
JUN	477	11	0	0	1	0	4	493
JUL	1008	64	194	26	27	3	26	1348
AUG	751	28	335	3	23	5	10	1155
SEP	944	53	339	9	68	17	17	1447
OKT	392	2	365	26	18	9	11	823
NOV	1	0	196	1	0	1	0	199
DEC	0	0	42	0	0	0	0	42

Appendix 3. Number of sightings of Greylag Geese *Anser anser* neck-banded at Lakes Klosterviken and Yddingen seen in different parts of the Foteviken area (Figure 1) defined from the latitude of the observations.
Antal observationer av grågäss Anser anser *halsmärkta vid Klosterviken och Yddingen från olika delar av Foteviksområdet (Figur 1) definierade efter latitud för observationerna.*

Latitude	Klosterviken	Yddingen
55,37	7	11
55,38	14	8
55,39	0	0
55,4	34	28
55,41	0	0
55,42	311	213
55,43	991	1226
55,44	15	13
55,45	571	1758
55,46	3	76
55,47	405	2208
55,48	126	1045
55,49	0	1
55,5	0	396
55,51	0	0
55,52	0	122
55,53	0	0
55,54	0	0
55,55	0	64

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Hanöbukten, an important wintering area for waterbirds in South Sweden

Hanöbukten, ett viktigt övervingringsområde för sjöfåglar i södra Sverige

LEIF NILSSON & MATS OLSSON

Abstract

Hanöbukten in SE Sweden (including Blekinge archipelago) is an important wintering and staging area for a number of waterbird species. The inshore parts have been covered by counts from the shore during the International Waterbird Counts (IWC) since 1969. In the present study we analyze these counts for the period 1969–2014. When the counts started the total number of wintering waterbirds varied between 20 000 and 40 000 per year. However, from the early 1990s the number doubled, reaching 60 000 to 80 000 birds per year. All species with the exception of the Long-tailed Duck *Clangula hyemalis* showed similar increase. The area had a high proportion of the Swedish wintering population of Pochard *Aythya ferina* and Smew *Mergellus albellus*. Large numbers of Tufted Duck *Aythya fuligula* also wintered in the area, and some parts of the archipelago had internationally important concentrations of Tufted Duck and Smew. The increase in numbers in the study area showed the same pattern as in all Sweden and was most probably a result of milder winters in recent years.

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Introduction

The Blekinge archipelago in the innermost part of Hanöbukten, is the southernmost archipelago area in Sweden, showing a somewhat different appearance from the larger archipelago areas further north in the Baltic Sea and on the Swedish west coast. The Blekinge archipelago is rather shallow with few islands further out to sea compared with the other archipelagos in Sweden. Together with the offshore parts of Hanöbukten, the area has been well-known as an important area for various species of wintering waterbirds. Being the southernmost archipelago in the country it offers vast shallow feeding areas and sheltered wintering areas for the waterbirds, and the area remain free of ice for a longer period of the winter than the archipelagos further to the north in the Baltic Sea.

When the International Waterfowl Counts (IWC) started in 1967 it was realized that this area was important to cover on a regular basis. Thus from 1969, large scale annual counts have been organized from the shore in a systematic way covering most of the inshore parts of Hanöbukten from Åhus to Torhamns udde (Figure 1) producing a valuable long-term dataset allowing us to analyze the change in numbers of the populations of wintering waterbirds over more than four decades.

From the early years it was also well-known that the offshore parts of Hanöbukten were important

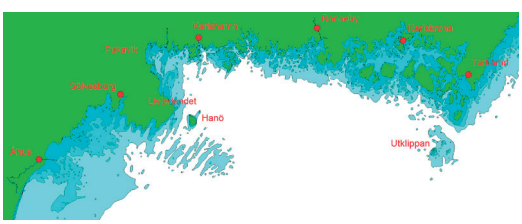


Figure 1. Map of the northern part of Hanöbukten (mainly the Blekinge archipelago), showing the position of different areas mentioned in the text. Blue color denotes different depth from <6 m, 6–10 m and 10–20 m, when going from darker to lighter tone.
Karta över norra delen av Hanöbukten (huvudsakligen Blekinge skärgård) med de i texten nämnda lokalerna markerade. Blå färg markerar olika djup från <6 m, 6–10 m och 10–20 m när man går från mörkare till ljusare nyanser.

Figure 2. Different habitats in the archipelago of Blekinge.
Habitatbilder från olika delar av Blekinges skärgård.

for wintering seaducks and regular surveys were undertaken in the area from the patrol boats of the Swedish Coast Guard during the 1960ies and 1970s (Nilsson 1972, 1980). In later years, extensive aerial surveys of the offshore parts of Hanöbukten were performed as part of Baltic Sea-wide surveys in 2007–2011 and in 2016 (Nilsson 2012, 2016).

In the present paper we summarize the surveys of wintering water birds undertaken in inshore parts of the area (the archipelago of Blekinge and adjacent areas in NE Skåne) during the years 1969–2014 to illustrate the importance of the area and to investigate the changes in the wintering water bird populations. The occurrence of seaducks in the offshore waters of Hanöbukten will not be analyzed here as these aspects have been treated previously (see Nilsson 1972, 2012, 2016, Nilsson et. al. 2016).

Study area

The western part of Hanöbukten (Skåne) is mainly characterized by large sandy beaches, whereas the northern, inshore parts of the area, which has been covered by the counts presented here, is mainly an archipelago habitat (Figure 1). The islands in the northeastern part of Skåne (Åhus) and eastwards to Sölvesborg in Blekinge are small, low moraine islands. Vast areas of very shallow waters are found in this area, especially around the islands.

The western part of Blekinge, Listerlandet, has an open coast but the part from Pukavik to Torhamn a vast archipelago. The western part of the archipelago is rather narrow and mostly made up of rocky islands, and rather narrow. In the eastern part of the archipelago, from SE of Ronneby to Torhamn, there is a chain of larger islands separating the inner waters from the more exposed outer areas. Even if there are rocky islands also in this area, moraine islands dominate. Some typical areas are shown in Figure 2.

The inner parts of the archipelago are characterized by large areas of shallow water and extensive meadows of underwater vegetation with a rich fauna of different important food species, e.g. crustaceans, molluscs and other invertebrates. The marine habitats of the area were extensively studied during the MARMONI- project and are thoroughly documented in Wijkmark et al. (2015).

In the west, Hanö is a more isolated island separated from the mainland. In the east a group of small skerries, Utklippan, is situated far out at sea south of Torhamns udde. These two areas are not included in the regular surveys but have been covered from the air on some occasions.

Methods

The waterbird counts in the inner parts of Hanöbukten are a part of the International Waterfowl Counts (IWC). In this project the entire Swedish coast has been divided into smaller counting units that are covered by observers from the ground (cf. Nilsson 1975, 2008, Nilsson & Haas 2016). Observations are made from observation points using telescope and binoculars.

In the archipelago it is not possible to cover all sectors completely, because parts of a sector can be concealed behind an island. Instead, in the present study, the observation points were selected so that it was possible to cover all important parts of the sectors. As the counts were made in the same way, using the same observation points, over the years, the total numbers obtained will be fully comparable between years and over the long-term period.

On some occasions (1971–1973, 1987–1989, 2004 and 2015), country-wide midwinter surveys were undertaken in the inshore waters of the Swedish coast using a combination of aerial surveys and ground counts (Nilsson 1975, 2008, Nilsson & Haas 2016). On these occasions aerial surveys have also been made in the Blekinge archipelago, showing that the ground counts discussed here give a representative picture of the waterbird communities in the area. In connection with these aerial surveys, Hanö and Utklippan were also surveyed.

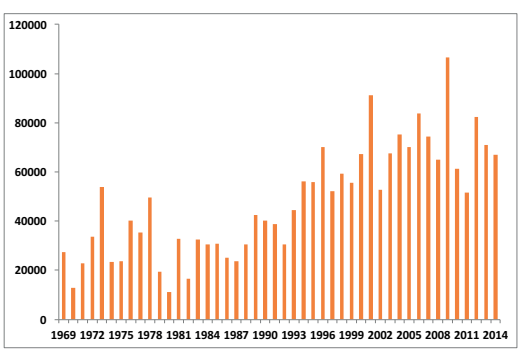


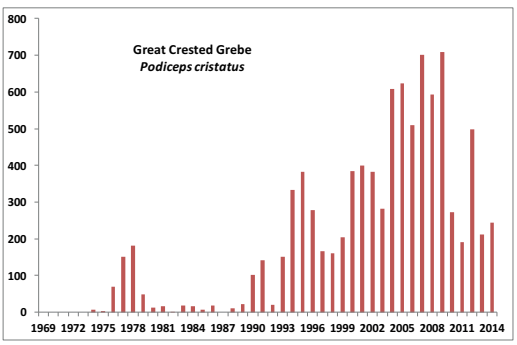
Figure 3. Total number of waterbirds counted in the Blekinge archipelago and NE Skåne at the midwinter counts in 1969–2014.

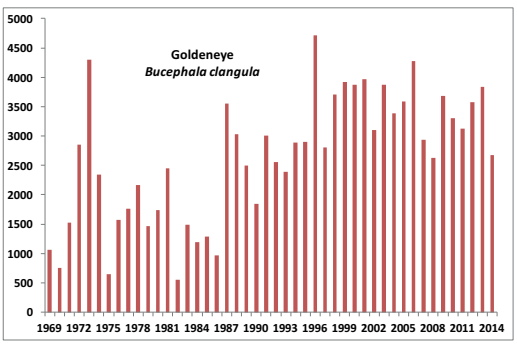
Totalantalet inräknade sjöfåglar i Blekinge skärgård och NE Skåne vid midvinterinventeringarna 1969–2014.

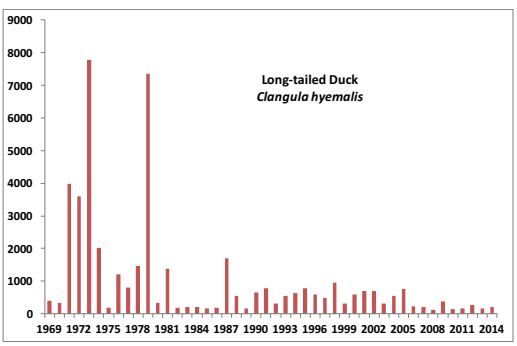
Two different teams have surveyed the areas between Åhus and Sölvesborg (Skåne) and between Sölvesborg and Torhamn, however the same observers have covered the same sectors over a long period of years.

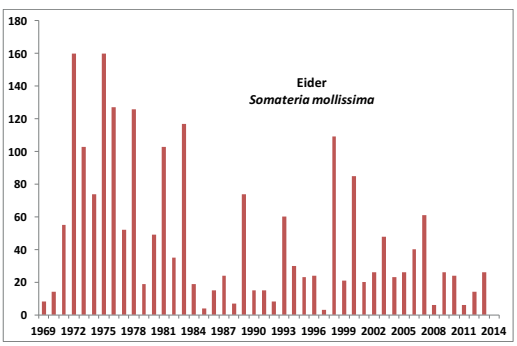
Results

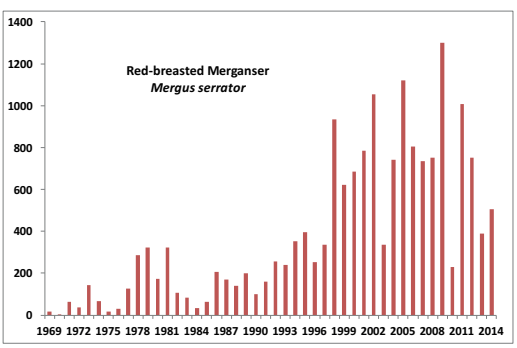
When the counts started in 1969 (some areas were counted during the first years of the IWC, 1967 and 1968, but 1969 was the first year with a full cover count), the total annual number of waterbirds counted was in the order of 25 000 (Figure 3). The total number of waterbirds in the surveyed area did not show any clear trend for the first twenty years, merely fluctuations around a mean between 20 000 and 30 000 with one peak of more than 50 000. During the 1990s, the numbers of wintering birds started to increase reaching annual means between 60 000 and 80 000 for the

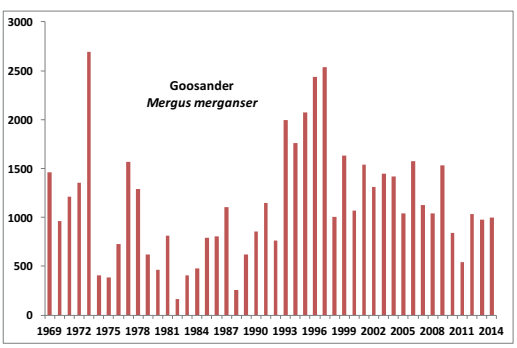


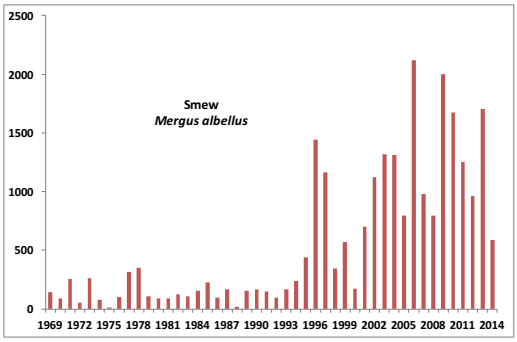


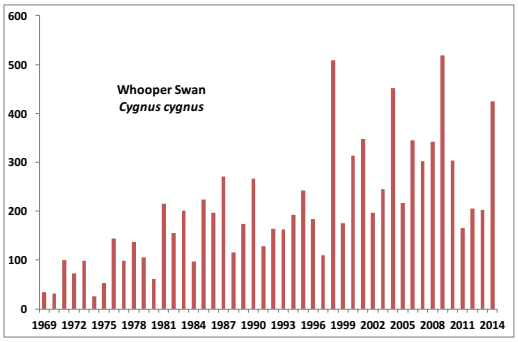


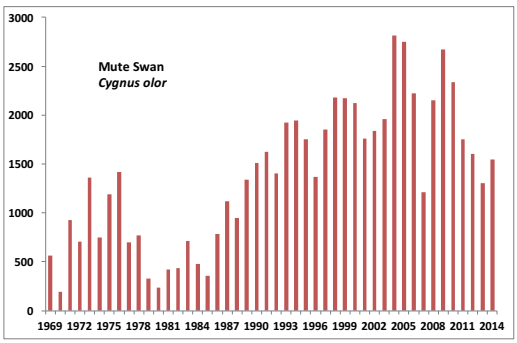


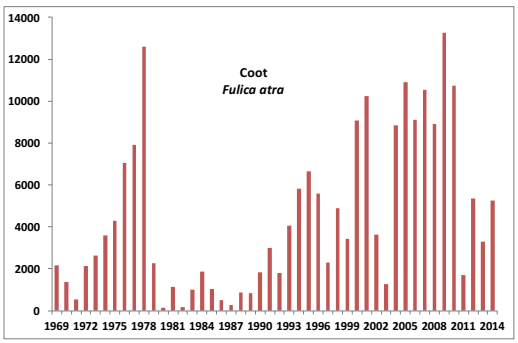


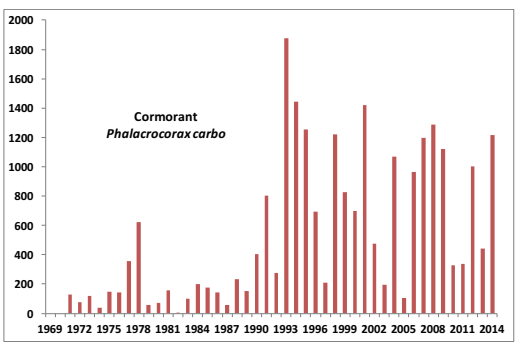


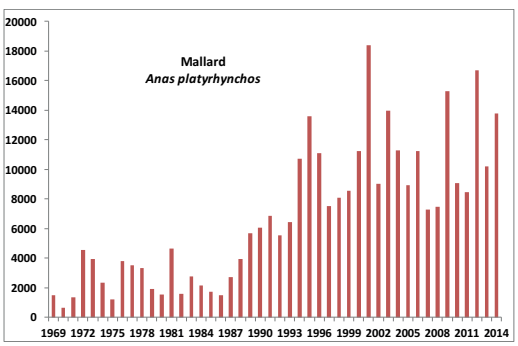

Smew
Mergus albellus
2500
2000
1500
1000
500
0
1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008 2011 2014

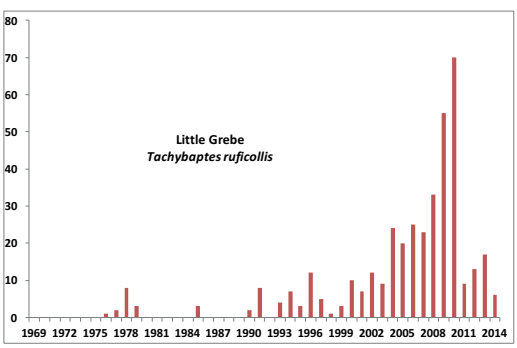

Whooper Swan
Cygnus cygnus
600
500
400
300
200
100
0
1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008 2011 2014

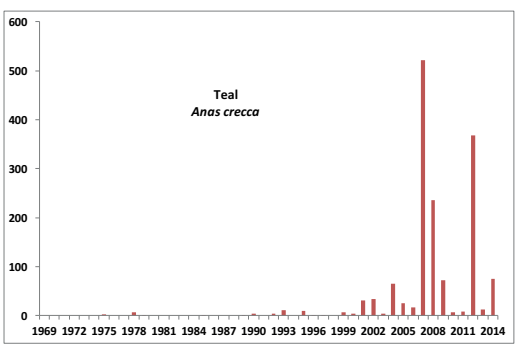

Mute Swan
Cygnus olor
3000
2500
2000
1500
1000
500
0
1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008 2011 2014


Coot
Fulica atra
14000
12000
10000
8000
6000
4000
2000
0
1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008 2011 2014


Cormorant
Phalacrocorax carbo
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008 2011 2014


Mallard
Anas platyrhynchos
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008 2011 2014


Little Grebe
Tachybaptes ruficollis
80
70
60
50
40
30
20
10
0
1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008 2011 2014


Teal
Anas crecca
600
500
400
300
200
100
0
1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008 2011 2014

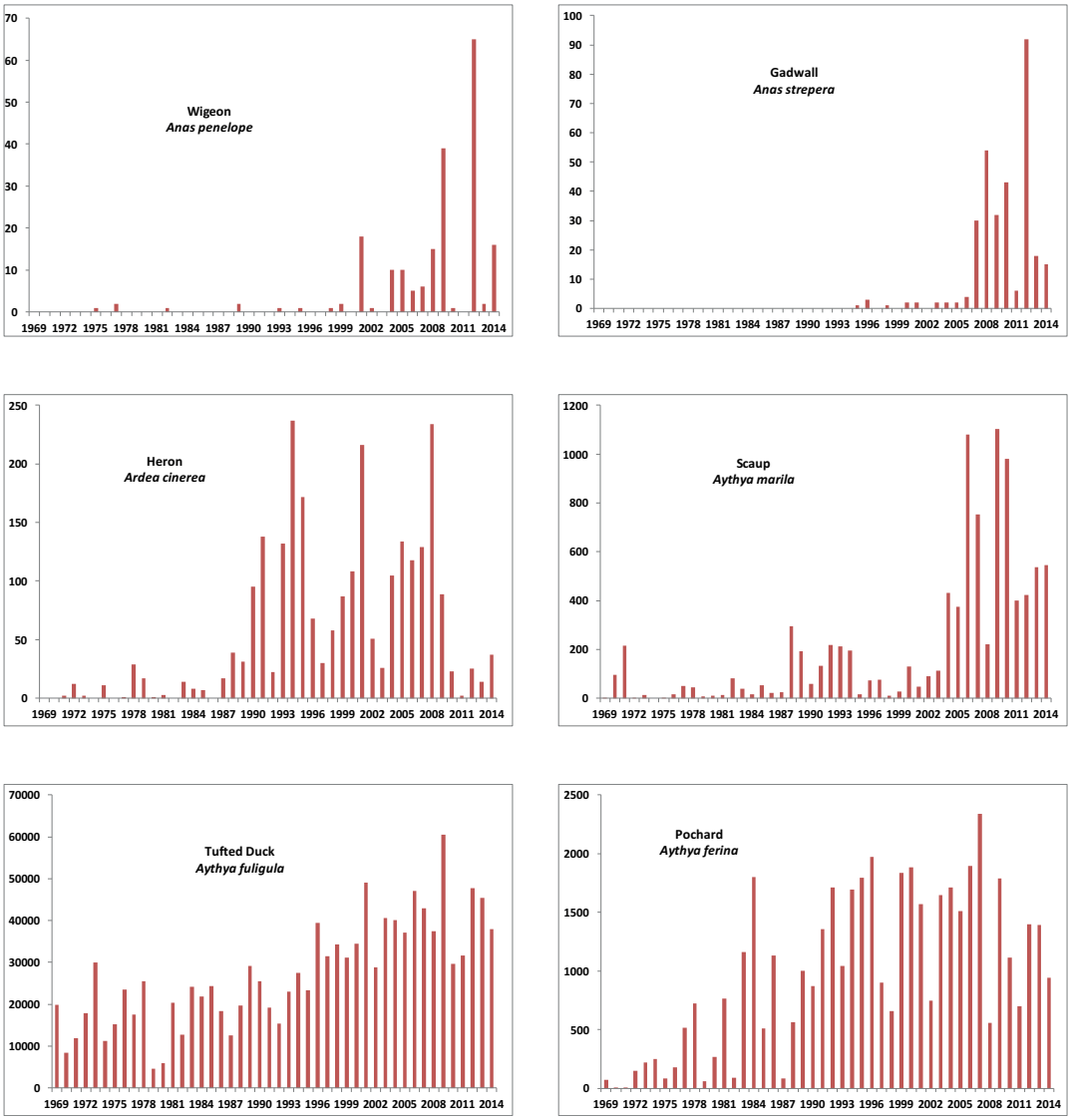


Figure 4. Total numbers counted of different waterbird species in the Blekinge archipelago and NE Skåne 1969–2014.
Antalet inräknade individer av olika sjöfågelarter i Blekinge skärgård och NE Skåne 1969–2014.

mid-1990s and a top value of more than 100 000 in January 2009.

The results for the different species will be presented in a series of graphs (Figure 4) and maps showing the distribution of some waterbird species in the area in January 2012, a typical mild winter for the more recent part of the survey period (Figure 5).

During the first years of IWC in Sweden very few grebes were counted in the country. Larger number of Great-crested Grebes *Podiceps cristatus* being counted first during the mild winters in the 1970s with small numbers also being seen in the following years until the 1990ies. The same applies to Hanöbukten, where some flocks were seen during these years (Figure 4). During the 1980s only small numbers were counted and it was not until the 1990s, when an increase in the wintering num-

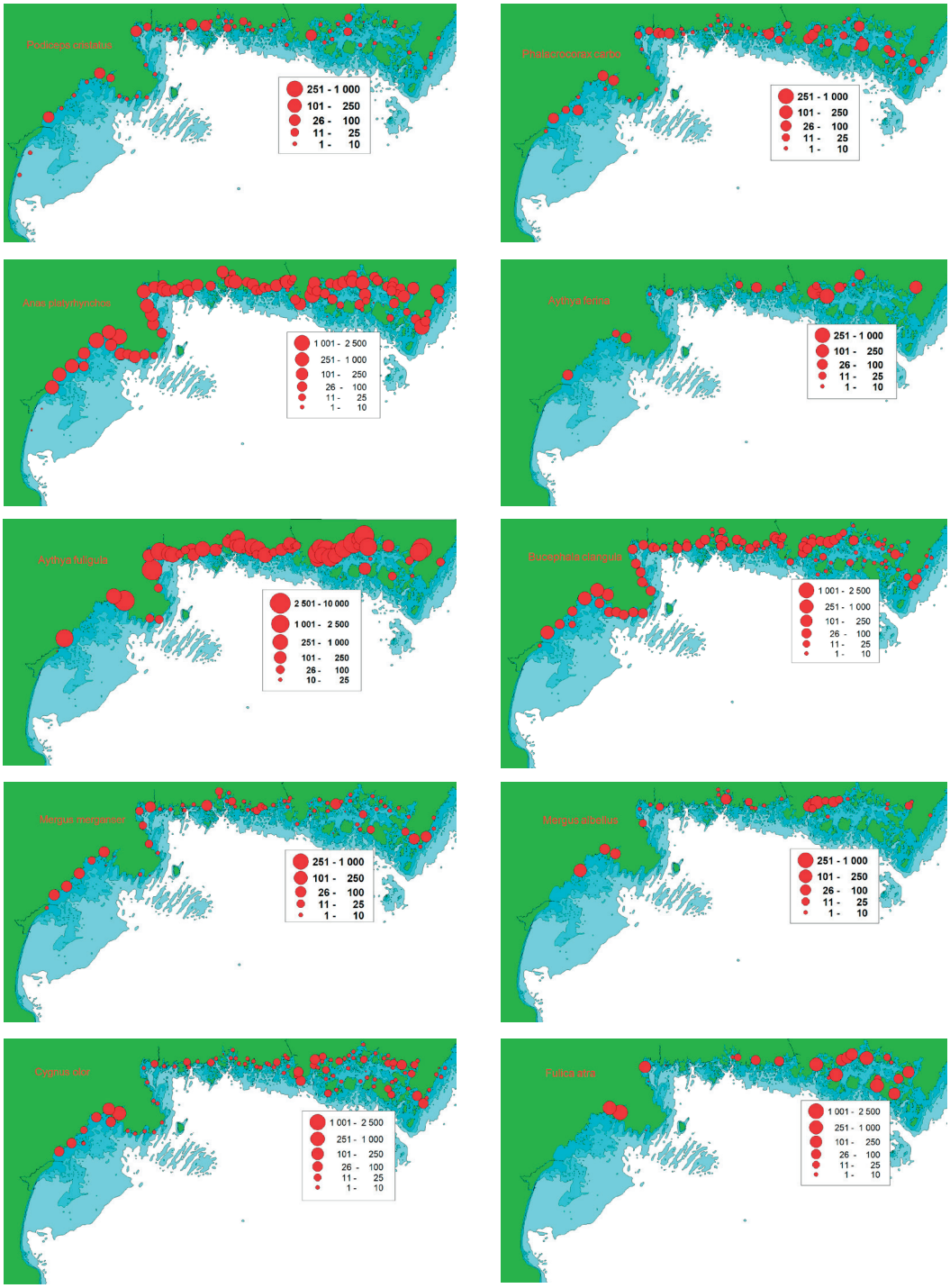


Figure 5. Distribution of some waterbird species in the Blekinge archipelago and NE Skåne at the midwinter count in January 2012.

Utbredning för några olika sjöfågelarter i Blekinge skärgård och NE Skåne vid midvinterinventeringen i januari 2012.

bers started, reaching peaks of 600–700 wintering grebes in 2005–2010. The Great-crested grebes were found in groups well spread out over the area (Figure 5). During 1969–1990, Little Grebes *Tachybaptes ruficollis* were only seen in smaller numbers in some years. However, this species has become more regular in later years, with a peak count of 70 individuals in 2010. Small numbers of Slavonian Grebe *Podiceps auritus* and Red-necked Grebe *Podiceps griseigena* were seen in several winters.

Cormorant *Phalacrocorax carbo* and Grey Heron *Ardea cinerea* show similar pattern in the counts, although the Cormorant has been much more common than the Heron. Both species have increased a lot in numbers after 1990 and especially the Heron was more irregular before 1990 (Figure 4). The Cormorant is normally evenly spread over the entire area in midwinter (Figure 5).

The Mallard *Anas platyrhynchos* has been a common species in the study area since the start of the counts. It shows a similarly increasing pattern as several other waterbird species, with relatively low numbers (2 000–4 000) during the first half of the study period and then a marked increase to a level between 8 000 and 10 000 with some higher peaks during the latter part of the study period (Figure 4). The Mallard is normally distributed over the entire study area (Figure 5). Before 2000, only single individuals of other dabbling ducks were seen in the area in the winter. After 2000, also Teal *Anas crecca*, Wigeon *Anas penelope* and Gadwall *Anas strepera* were regularly counted although in quite low numbers (Figure 4), and Pintail *Anas acuta* and Shoveler *Anas clypeata* were seen in single individuals in some winters.

The Tufted Duck *Aythya fuligula* was the most common waterbird species in the area. Until the mid-1990s numbers fluctuated around 20 000 with up to 30 000 in one year (Figure 4), then numbers increased to around 40 000 in later years with a peak of 60 000 in 2009. The Tufted Duck was distributed all over the inner bays of the archipelago from Pukavik to Torhamn and also in some bays in the western part of the area (Figure 5). The Tufted Duck is night active and it roosts in protected areas during daytime from which it disperses over the feeding areas in the evening. The largest number of Tufted Ducks were found in the shallow bays between Gö (east of Ronneby) and Karlskrona. In this area, the numbers exceeded the criteria for being identified as of international importance (Figure 6).

Together with the Tufted Ducks, but also to some extent in pure flocks, reasonable numbers of wintering Scaup *Aythya marila* and Pochard *Aythya ferina* were found on some sites in the archipelago. Larger numbers of Scaup were only found during 2005–2014, with peaks of more than 1 000 in 2006 and 2009. The Pochard was sparse when the counts started but then increased to a higher level from the mid-1980s, showing fluctuations between years with very few in the ice winter of 1987 and a peak of more than 2 000 in 2007. The Pochard was found in the same sites as the Tufted Duck with the largest flocks in the areas west of Karlskrona (Figure 5).

With the exception of a marked peak with more than 4 000 individuals in 1974, the Goldeneye *Bucephala clangula* shows the same picture as most of the other species with lower counts during the years until the late 1980s and then fluctuations between 3 000 and 4 000 in later years (Figure 4). The Goldeneye was spread all along the coast, both along open shores in the west and in the archipelagos in the east, but flocks were generally smaller east of Karlskrona (Figure 5).

During the early years of the study large flocks of Long-tailed Ducks *Clangula hyemalis* were seen in some years from the shores of the western part of the study area and in Pukavik, where in two years counts of more than 7 000 were obtained. These areas are close to the main offshore areas used by the species in Hanöbukten (Nilsson 1972, 2012). In later years, only small numbers of Long-tailed Ducks were counted from the shore in the study area. Very few Long-tailed Ducks were counted in the archipelago, a picture that was verified during aerial surveys in 2007–2009 and 2016 (Nilsson 2012). For the offshore distribution, see Nilsson (2016) and Nilsson et al. (2016).

Scoters Melanitta spp. were only seen in very low numbers in the land-based counts, but can occur in the offshore areas with large numbers in some years (Nilsson 2012). In spite of Blekinge archipelago being a breeding area for the Eider *Somateria mollissima*, small and decreasing numbers were found in this area in the midwinter counts (Figure 4).

The Red-breasted Merganser *Mergus serrator* is a species that prefers open coasts and is normally seen in small numbers in the archipelago, and most individuals counted occurred in the western part of the study area. Few individuals were counted in the first years but numbers increased during the latter part of the study, and in some years more than 1 000 were counted (Figure 4).

The Goosander *Mergus merganser* is a more wide-spread species with flocks appearing in all

parts of the area with the exception of Listerlandet (Figure 5). The number of Goosanders over the study period show a more variable picture that differs somewhat from the other species, with one high count in 1973 and some high counts in the late 1990ies (Figure 4).

The Smew *Mergus albellus* shows a pattern that is more similar to the other species with low fluctuating counts until the mid-1990ies, when numbers increased markedly although showing large variation between years. The highest count during the study period was 2 000 birds in 2006 (Figure 4). The Smews occurred in flocks in some protected areas in the archipelago with the majority being found in the shallow areas west of Karlskrona (Figure 5).

Both the Whooper Swan *Cygnus cygnus* and the Mute Swan *Cygnus olor* increased over the study period although the increase for the Mute Swan started already in the 1980s as for several other species (Figure 4). Mute Swans were well spread out over the study area without any marked concentrations (Figure 5).

The Coot *Fulica atra* is the species that shows the largest changes in numbers in the data from the inner parts of Hanöbukten (Figure 4). During the early part of the study, there was a very marked increase from 2 000 to 12 000 over a short period of years. Then, after the hard winter of 1979 hardly any Coots were found in the area in 1980 and the same was true for the hard ice winters of 1982 and 1987. In the 1990s the numbers started to increase again, with annual fluctuations, before a peak of almost 13 000 was reached in 2009. The Coot was found in protected areas within the archipelago (Figure 5).

Discussion

From the count results presented here it is clear that Hanöbukten is an important wintering area for several species of waterbirds. During recent years, two country-wide surveys of wintering waterbirds have been undertaken in Sweden, in 2004 (Nilsson 2008) and 2015 (Nilsson & Haas 2016). In these two surveys of the whole Swedish coastline, for some species Hanöbukten was harboring a high proportion of the total wintering population. The largest concentration was noted for the Pochard, where Hanöbukten had 51% and 78%, respectively of the population. The area also had a high proportion of the Swedish wintering population of the Smew (27%, resp. 18%) and the Coot (26% resp. 55%). For the most common species in the inshore parts of Hanöbukten, the Tufted Duck, the area accounted for 14% (2004) and 21% (2015), respectively. It should however be noted that the number of counted Tufted Ducks in Hanöbukten did not differ between 2004 and 2015, as it was actually the total wintering population of Tufted Ducks in Sweden that was lower in 2015 than in 2004 (Nilsson & Haas 2016).

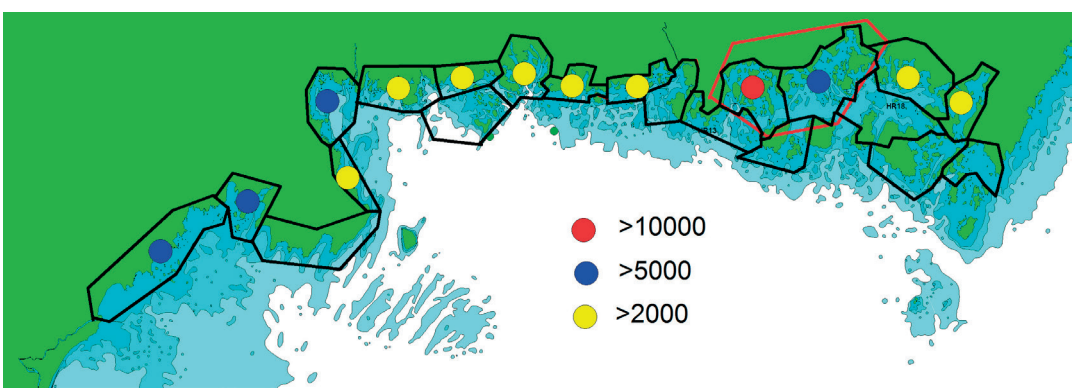


Figure 6. Important wintering areas for waterbirds in the inner parts of Hanöbukten. The smaller counting units have been grouped into larger, more functional units. The colour symbols show the mean total waterfowl counts for the larger units for the last decade. The area marked with red denotes an area classified as internationally important for the Tufted Duck and Smew according to the criteria of Wetlands International (Delany & Scott 2006).
Viktiga övervintringsområden för sjöfåglar i den inre delen av Hanöbukten. De små räkningsenheterna har slagits samman till större mer funktionella enheter. Färgerna betecknar medeltalet sjöfåglar inom respektive enhet för den senaste tioårsperioden. Det med rött markerade området uppfyller kriterierna för internationell betydelse för vigg och salskrake enligt Wetlands International (Delany & Scott 2006).

To establish the importance of different parts of the study area for wintering waterbirds, the counts from the smaller counting sectors were joined into "functional units" (Figure 6). For these units the mean wintering numbers of all species were calculated for the last ten years, providing indications of which areas were the most important for the wintering waterbirds. Combining two of these functional units west of Karlskrona (Figure 6), the mean counts for Tufted Duck and Smew exceed the criteria for a wintering site of international importance according to Wetlands International (Delany & Scott 2006).

As is apparent from Figure 4, most wintering species in the inshore areas of Hanöbukten show an increase over the 45 years long study period. Seven species were counted in such numbers that TRIM-indices for the period 1971–2015 could be calculated with some confidence for different regions along the Swedish coast (Nilsson & Haas 2016). Of these, Mallard, Tufted Duck, Goldeneye, Red-breasted Merganser, Mute Swan and Coot showed highly significant increasing trends in the study area, whereas no trend was found in the number of wintering Goosanders. Significantly increasing trends were found for Mallard, Tufted Duck, Goldeneye and Mute Swan for other east-coast regions of Sweden.

More local wintering species occurring in high numbers in Hanöbukten like the Pochard and the Smew, both showed nationally increasing trends in Sweden (Nilsson & Haas 2016).

The number of Long-tailed Ducks seen in the inner parts of Hanöbukten showed a marked decrease and this was also the case for the inshore parts of the coasts of Skåne and the offshore areas of Hanöbukten (Nilsson 2012, 2016). The Eider also showed a decrease over the years although it was counted in small numbers in the inner parts of Hanöbukten.

The regional trends presented here are fairly similar to the national trends for these species (Nilsson & Haas 2016). Nationally, all species except the Long-tailed Duck showed significantly increasing trends over the entire series of midwinter counts. There were, however, fluctuations and several species had decreased over the last ten years in the nation-wide counts. With counts in only one region, it is difficult to separate changes due to real changes in population size and changes in winter distribution dependent on climate change and milder winters.

Nilsson & Haas (2016) compared the distribution patterns of the more common coastal wintering waterbirds between the country-wide surveys in 1971, 2004 and 2015 and found a marked shift northward in the Baltic Sea archipelagos related to more ice-free conditions in recent years. On a larger scale, Lehikoinen et al. (2013) analyzed the IWC data for the Tufted Duck, Goldeneye and Goosander in NW Europe and found marked increases in the north and decreases further to the south in Europe. Similar changes in the distribution on a larger scale was found for the Smew (Pavo-Jordan et al. 2015), which could explain the marked increase for these species in Swedish coastal areas including the Blekinge archipelago.

Acknowledgements

The waterfowl counts in the area is a part of the International Waterfowl Counts (IWC) in Sweden supported by the Swedish Environmental Protection Agency. Over the years, several observers have taken part in the counts. In the Hanöbukten area, we would like to give our sincere thanks to Thomas Nilsson, Johan Wolgast, Ulf Oscarsson, Rolf Larsson, Lars Olsson, Jörgen Westergren and observers from Nordöstra Skånes Fågelklubb.

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Sammanfattning

Blekinge skärgård i den inre delen av Hanöbukten är den sydligaste skärgården i Sverige och visar lite annan karaktär än övriga skärgårdar längre norrut i landet. Tillsammans med de yttre delarna av Hanöbukten har området också blivit känt som ett viktigt övervintringsområde för olika sjöfågelarter. Som den sydligaste skärgården i landet erbjuder den stora grunda födosöksområden för sjöfåglarna samt skyddade övervintringsområden. Området är också isfritt under längre perioder än övriga kustområden

När de internationella midvinterinventeringarna av sjöfågel startade stod det klart att området var viktigt att täcka vid inventeringarna. Med start 1969 har omfattande årliga inventeringar utförts i de strandnära områdena på ett sätt så att merparten av de inre områdena kunnat täckas.

I denna uppsats analyserar vid materialet från de landbaserade inventeringarna för perioden 1969–2014. Hanöbukten är också ett viktigt område för havslevande dykänder, speciellt alfågeln. Förekomsten av dessa arter har tidigare behandlats av Nilsson (2012), Nilsson (2016) samt Nilsson et al. (2016).

Undersökningsområde

Den västra delen av Hanöbukten (Skåne) kännetecknas av vidsträckta sandstränder, medan den del som diskuteras här (Figur 1) i huvudsak utgörs av skärgård. En mindre skärgård återfinns i NE Skåne. I Blekinge är den västra delen mestadels öppen kust, men från Pukavik till Torhamn utbreder sig en skärgård. I väster är denna mest av urbergskaraktär, medan den östra skärgården har mest karaktär av moränöar. Olika delar av skärgården visas i bilder i Figur 2.

De inre delarna av skärgården kännetecknas av vidsträckta grunda områden med rik undervattensvegetation och goda födosöksförhållanden för sjöfåglarna. De marina habitaten har studerats intensivt under MARMONI-projektet och har dokumenterats i Wijkmark et al. (2015).

Metodik

Inventeringarna i Hanöbukten ingår i de internationella midvinterinventeringarna av sjöfågel. Inom ramen för detta projekt har hela den svenska kusten delats in i mindre räkningsenheter, vilka täcks av markbaserade observatörer från olika observationsposter varifrån man kan täcka området med kikare eller tubkikare.

I en skärgård är det inte möjligt att täcka alla sektorer fullständigt vid markbaserade inventeringar eftersom delar av området kan döljas bakom öar. Inventeringarna har emellertid genomförts på ett standardiserat sätt så att resultaten mellan olika år skall kunna jämföras.

Vid några tillfällen har landsomfattande inventeringar genomförts av de inre svenska farvattnen, varvid en kombination av landbaserade inventeringar och flyginventeringar använts (Nilsson 1975, 2008, Nilsson & Haas 2015). Vid dessa tillfällen har flyginventeringar också genomförts i skärgårdarna i Blekinge och inom övriga delar av Hanöbukten. Dessa inventeringar har visat att de årliga landbaserade inventeringarna ger en representativ bild av fågelförekomsten i området.

Resultat

Under de första 20 - 25 åren visade inventeringarna ingen klar tendens i antalet övervintrande sjöfåglar utan detta varierade mellan olika år, bl.a. i relation till variationer i vinterns ”hårdhet”. Med början på 1990-talet har ett generellt ökande antal övervintrande sjöfåglar i området noterats och mer än 100000 noterades i januari 2009 (Figur 3). Antalet övervintrande sjöfåglar var generellt sett ungefär dubbelt så många under senare delen av undersökningsperioden jämfört med när inventeringarna startade.

I rapporten redovisas antalet övervintrande sjöfåglar av de olika arterna i en serie diagram för de arter som regelbundet noterades i någorlunda stora antal (Figur 4). Rent generellt kan konstateras att

alla arter som förekommer i de inre farvattnen ökat med undantag för alfågeln. Denna art har visserligen sin huvudförekomst i de yttre havsområdena, men i början av undersökningsperioden kunde betydande antal alfåglar räknas från stränderna, vilket inte varit fallet under senare år.

Förutom den generella ökningen som noterats för i princip alla arter så har tre arter etablerats som regelbundna övervintrare i området under perioden, nämligen kricka, bläsand och snatterand.

Utbredningen för de vanligaste arterna exemplifieras i en serie kartor baserade på inventeringarna under den förhållandevis milda vintern 2012 (Figur 5). Gräsand, knipa, storskrake och knölsvan var tämligen väl spridda över hela området, medan övriga arter var mer koncentrerade till skärgårdsområdena och andra skyddade områden. Utbredningsbilden för 2012 stämmer väl med den generella bild som erhållits från övriga inventeringsår.

Diskussion

De presenterade inventeringarna visar klart att Hanöbukten är ett viktigt vinterområde för flera sjöfågelarter. Vid de två senaste landsomfattande inventeringarna 2004 (Nilsson 2008) och 2015 (Nilsson & Haas 2016) noterades inte mindre än 51% resp. 78% av de övervintrande brunänderna i det aktuella området. Området hyste också en betydande andel av det svenska vinterbeståndet av salskrake (27% resp. 18%) samt sothöna (26% resp. 55%). Vid den senaste inventeringen 2015 sågs inte mindre än 21% av viggarna i Hanöbuktsområdet.

Flera områden inom Hanöbukten kan betecknas som viktiga övervintringslokaler för sjöfåglar på en nationell skala (Figur 6). Ett område mellan Ronneby och Karlskrona uppfyller dessutom kriterierna för internationell betydelse som övervintringslokal för vigg och salskrake.

Flertalet arter visade en markant ökning som övervintrare under perioden. Enda undantaget var alfågeln som under senare år endast noterats i små antal vid de landbaserade inventeringarna och som visar samma bild ute till havs (Nilsson 2016). Sjöfågelbestånden i Hanöbukten visar samma ökande tendens som de nationella indexen. Genom åren har det dock förekommit en förskjutning av utbredningen mot nordligare områden inom Sverige (Nilsson & Haas 2016), dvs. ökningen i det övervintrande beståndet har varit större i de norra skärgårdarna än i Hanöbukten även om antalen ökat i båda dessa områden. Denna förskjutning mot nordligare övervintring har också konstaterats på internationell nivå för vigg, knipa, storskrake och salskrake (Lehikoinen et al. 2013, Pavo-Jordan et al. 2015).

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What do Bohemian Waxwings *Bombycilla garrulus* find on agricultural fields in winter?

Vad hittar sidensvansar Bombycilla garrulus *på åkerfält vintertid?*

ADRIAAN ”ADJAN” DE JONG & FREDRIK OLSSON

Abstract

We describe three cases when Bohemian Waxwings *Bombycilla garrulus* behaved as if they were searching for food on the ground in frozen fields in the winter. Inspection of the sites where they searched revealed little or no available food items. In one case the droppings contained juniper seeds but these must have been consumed elsewhere as there were no junipers at the site. Drinking water may have been the explanation in one case where upwelling water flowed over the ice. We speculate that eating minerals is another possible explanation, but leave the question open.

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Introduction

During the breeding season, insects taken in the air are an important, but probably over-estimated, food source for Bohemian Waxwing *Bombycilla garrulus* (Witmer 1996, del Hoyo et al. 2005). Outside the breeding season, their diet is dominated by berries and fruits (e.g. from Rowan *Sorbus aucuparia*, Aronia *Aronia arbutifolia* and Apple *Malus pumila*) and large flocks can be seen around these food sources in urban and rural environments. Throughout the year, Bohemian Waxwings spend most of their non-flying time perched on trees, shrubs, buildings and other structures.

Occasionally, we have observed flocks of Bohemian Waxwing on agricultural fields, e.g. >120 near Degernäs on 6 December 2015 and four individuals near Överboda on 28 December 2015, both in Umeå municipality, Sweden. In the latter case, the birds repeatedly landed on a sparsely stocked grassland for short spells, frequently interspaced by perching on nearby trees. Also in case of the former, the birds appeared to be reluctant to stay on the ground and wave after wave flew up only to return seconds or minutes later. Here the peat-rich soil was largely barren and the surface had recently been affected by frost heaving caused by vertical ice pinnacles formed by intermittent freezing of moist soil. After observing the behaviour of the birds for c. 20 minutes we searched the field for clues to explain their behaviour. The dark soil surface was still largely frozen. To the naked eye, there were no insects and only small numbers of seeds from weeds. The birds had left no tracks and no droppings were noticed. Nevertheless, from their behaviour it was obvious that they were searching and occasionally took something from the surface, while walking around rather frantically.

On New Year’s Eve 2016, four Bohemian Waxwing flew off and soon returned to a part of an agricultural field in Hössjö, Umeå. Like earlier observations, the birds were on the ground only for very short periods of time. At closer range, it became clear that the birds focused on an approximately 20×50 m sized patch of ice, formed by overflowing water from a clogged water-logged ditch. The whole ice-sheet had formed over the last few days and, despite below-freezing ambient temperatures, small amounts of water were still flowing across the surface. Parts of the ice and the water flowing on top of it were rusty-brown from iron-colloids. Across the whole ice-sheet, only a few straws of vegetation emerged through the ice, so there was

Bohemian Waxwing Sidensvans. Photo: Lars Edenius.

virtually no plant matter available as a food source, which effectively excluded herbivory. Searching for invertebrates, again with the naked eye only, resulted in a few specimen of spiders *Araneae*, beetles *Coleoptera* and flies *Diptera* (probably Winter Crane Flies *Trichoceridae*). Locally slightly higher densities of tiny springtails *Collembola* occurred. Even by waxwing standards, this was probably a poor and easily depleted serving.

Nevertheless, on the surface of the ice there were numerous droppings of birds; some on top of it, but the majority partly embedded into the ice. Obviously, these droppings had been deposited after the last snowfall a few days earlier. Given the low densities of small passerine birds in the open parts of this winter landscape, there were few candidate bird species who could have produced these droppings. In addition, their size, shape and colour were clearly different from "normal" droppings of tits or sparrows. The freshness of some of the droppings also pointed at a nearby producer. These factors combined give us strong reason to believe that these were Bohemian Waxwing droppings. We managed to collect c. 40 droppings and intended to get back later for photo-documentation. Unfortunately, early darkness and the onset of snowing prevented this.

Figure 1. Seed of *Juniperus communis* found in droppings of Bohemian Waxwing. In wet conditions the husk of the seed has a shine to it. Length c. 4.5 mm.
Frö av en påträffat i spillning från sidensvans.

Figure 2. Head capsule of the *Boreus westwoodi* (Hagen 1866) found in one of the collected droppings of Bohemian Waxwing. The head is c. 1.8 mm long, including the maxillary palps.
Huvud av Boreus westwoodi *påträffat i spillning från sidensvans.*

Almost all the droppings were very dark and c. 2×5 mm in size. They were packed with glossy, blackish "shales", superficially reminding of the external chitin skeletons of insects. At closer examinations under an 8–35 times magnification microscope, almost all proved to be fruits and seeds from Juniper *Juniperus communis* cones (Figure 1). The glossy shales noted in the field were the husks of the Juniper seeds which have a shine to them when wet. Juniper bush is absent from the open farmland area where the ice-field was located, but not uncommon in the nearby forest (closest distance c. 450 m).

Apart from the Juniper parts, only the remains of two invertebrates were found in the droppings. One head of a cold-tolerant, wingless species of the genus *Boreus (Boreidae*, Snow Flies) and one elytron of a Rove Beetle (*Staphylinidae*). In Sweden, two species of *Boreus* occur, *B. westwoodi* and *B. hyemalis*, both found on snow during the winter months (Tjeder 1951). Most likely, the head capsule belonged to the more common species *B. westwoodi* (Hagen 1866). This species has a metallic microsculpture on the forehead (Figure 2), which is a diagnostic character to differentiate these two species.

Then what was the reason for the Bohemian Waxwing to land repeatedly on a wet ice-sheet out on an open field? Feeding on plant matter can be ruled out, there wasn't any. Feeding on invertebrates was not very likely either, because invertebrate numbers were low. Instead, the Bohemian Waxwings may have been there to drink from the water flowing over the ice. Due to low moisture content in their winter food, Bohemian Waxwing are known to drink often (del Hoyo et al. 2005). Neither the precise places where the birds were observed nor the positions of their droppings suggested a strong association with the miniature streams on the ice. To a human observer, there were better drinking places nearby in the landscape, but all of those were either concealed by vegetation or below ground-level in ditches and streams. Maybe Bohemian Waxwings require good visibility when on the ground, an unfamiliar environment for them. Their reluctance to

settle on the ground has been reported by Dana Anderson (1948) from Nebraska, USA, where Cedar Waxwing *Bombycilla cedrorum* were on the ground drinking from pools while Bohemian Waxwing from the same flock stayed in the trees.

In addition to water, the Bohemian Waxwing may have been in search of the colloidal soil chemicals made available by the upwelling water. Like parrots and crossbills, Waxwing are likely to need detoxifying chemicals to handle metabolically challenging chemical compounds in their food (Woldemeskel & Styer 2010). Both Rowan berries and Juniper cones are rich in secondary compounds, e.g. phenolics (including tannins) and glycoalkaloids (Cipollini & Levey 1997a, Cipollini & Levey 1997b, Mikulic-Petkovsek et al. 2012). Tropical parrots cure themselves by eating special clays (e.g. kaolin, Gilardi et al. 1999), and crossbills have been reported to eat soil (Latta 2012) and mortar from buildings (A. de Jong, personal observation); all examples of geophagy. We have been unable to find references on Bohemian Waxwing feeding on potentially detoxifying materials (but see: de Jong 2003). However, a suspected case of road salt poisoning (Töpfer 2010) could indicate geophagy also in this species.

The bottom line: The quest for the true reason why Bohemian Waxwing visit agricultural fields in winter is still open. The authors welcome reports of similar sightings as well as relevant literature references.

Acknowledgement

The field observations and the collection of droppings were made by AdJ and the analysis of the samples by FO.

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Sammanfattning

Vid några tillfällen har vi sett sidensvansar vistas på jordbruksmark vintertid. Tre fall redovisas här. I det första fallet, med fyra individer, gjorde vi ingen närmare inspektion av platsen utan noterade bara att de betedde sig som om de sökte föda på marken. I det andra fallet, med 120 individer, noterade vi samma sak och studerade fåglarnas beteende i tjugo minuter. Vi inspekterade sedan platsen noga. Trots att fåglarna uppvisade ett intensivt födosöksbeteende och då och då faktiskt också plockade upp något fann vi inte några insekter utan bara enstaka små ogräsfrön; någon spillning sågs inte heller. I det tredje fallet var det fyra fåglar som uppehöll sig inom ett område på 20 gånger 50 meter med vattenöversilad is på en åker. Här fanns spillning och vi samlade in ungefär fyrtio stycken. Analys under mikroskop visade att spillningarna, som var mycket mörka, var packade med fröskal från en (Figur 1). I övrigt hittade vi bara rester av två insekter, en kortvinge och en snöslända. Intaget av enfrön kan dock inte ha skett på platsen eftersom det är 450 meter till närmaste enbuske.

Eftersom vi i det tredje fallet endast hittade små mängder möjlig föda var födosök antagligen inte fåglarnas främsta sysselsättning. Möjligen drack de av vattnet som rann på isfältet eller så var de ute efter mineraler som fläckvis färgade vattnet brunt. Att äta jord o.d. för att få i sig mineraler är känt från flera olika fågelarter. Men frågan om varför sidensvansar kan ses på skenbart födosök på åkrar får lämnas öppen. Vi efterlyser observationer av liknande slag eller tips om litteratur som beskriver fenomenet.

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Allmänt gäller att bidrag skall vara avfattade enligt den modell som finns i tidigare häften av tidskriften. Titeln skall vara kort, beskrivande och innehålla ord som kan användas vid indexering och informationssökning. Uppsatser, men ej andra bidrag, skall inledas med en Abstract på engelska om högst 175 ord. Texten bör uppdelas med underrubriker på högst två nivåer. Huvudindelningen bör lämpligen vara inledning, metoder/studieområde, resultat, diskussion, tack och litteratur. Texten får vara på svenska eller engelska och uppsatsen skall avslutas med en fyllig sammanfattning på det andra språket. Tabell- och figurtexter skall förses med översättning till det andra språket. Manuskriptet bör sändas som epostbilaga till soren.svensson@biol.lu.se. Texten bör vara i format MS-Word. Figurer och tabeller skall inte inarbetas i den löpande texten utan sändas som separata filer.

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Referenser *References*
I texten *In the text*: Andersson (1985), Bond (1913a, 1913b), Carlsson & Dennis (1956), Eriksson et al. (1989), (Andersson 1985), etc.

I referenslistan *In the reference list:*

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