

Population size, migration routes and breeding origin of Purple Sandpipers *Calidris maritima* wintering in Sweden

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Abstract

We analysed the occurrence and breeding origin of Purple Sandpipers *Calidris maritima* wintering in Sweden, using data from long-term surveys along the Swedish west coast, sightings in other parts of the country, and ringing data from Sweden, Svalbard and the Baltic Sea coasts. About 2000 Purple Sandpipers were estimated to winter in Sweden. Most of them (75%) occurred in the outer archipelago off the west coast, where birds arrived in October and November. This arrival coincided with the migration of birds along the east coast and across Sweden. Sightings and ringing recoveries confirmed that some wintering birds followed a migration route along the Swedish east coast and across northern Finland, but the data also showed that some wintering birds originated from Svalbard and migrated along the Norwegian coast. Accordingly, bill-length distribution of birds captured at the Swedish west coast indicated that at least two populations regularly occur here. Most birds had bill-lengths similar to Svalbard

breeders, but several had bills longer than the maximum measurement recorded at Svalbard. Bill-lengths of migrating Purple Sandpipers captured at the Baltic Sea coasts, as well as sightings and recoveries of birds ringed in Sweden, suggested that the long-billed Purple Sandpipers use the migration route along the Swedish east coast. Probably, these birds originate from breeding grounds on the Taymyr Peninsula.

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Introduction

The Purple Sandpiper *Calidris maritima* breeds on tundra and high-altitude plateaux from northeastern Canada in west, to the Taymyr Peninsula in east. It is an exceptional species among Palearctic waders, as it winters on small islands and rocky sea shores in the northern, temperate parts of western Palearctic and eastern Nearctic (Cramp & Simmons 1983). In Europe, most wintering birds are found in northern Norway, Great Britain and Iceland (Timmerman 1938–39, Folkestad 1975, Atkinson et al. 1978, Wilson 1982, Alerstam 1982, Nicoll et al. 1988, Summers et al. 1990), and only a few migrate further south (Meininger 1977, Boere et al. 1984). In Sweden, Purple Sandpipers are regular winter visitors to small islands and rocky shores, mainly along the west coast (SOF 1990). However, the distribution and size of the Swedish wintering population have not been analysed.

The migration system of the Purple Sandpiper is complex and not yet well understood (Summers 1994). Icelandic breeding birds are resident (Summers et al. 1988), and the main part of the population wintering in NE Great Britain breeds in southern Norway (Atkinson et al. 1981, Rae et al. 1986). The origin of birds wintering in other parts of Europe is poorly known. Based on ringing recoveries and differences in biometrics between populations (particularly bill-lengths; see Prater et al. 1977, Cramp & Simmons 1983, Boere et al. 1984 for details), birds wintering in The Netherlands and Great Britain (except those mentioned previously) may breed in Canada, Greenland or Russia (Boere et al. 1984, Nicoll et al. 1988, Summers et al. 1988), whereas those wintering in northern Norway are considered to be Russian breeders (Summers et al. 1990, Summers 1994). If Russian birds occur in the North Sea area, it is likely that at least some of them migrate

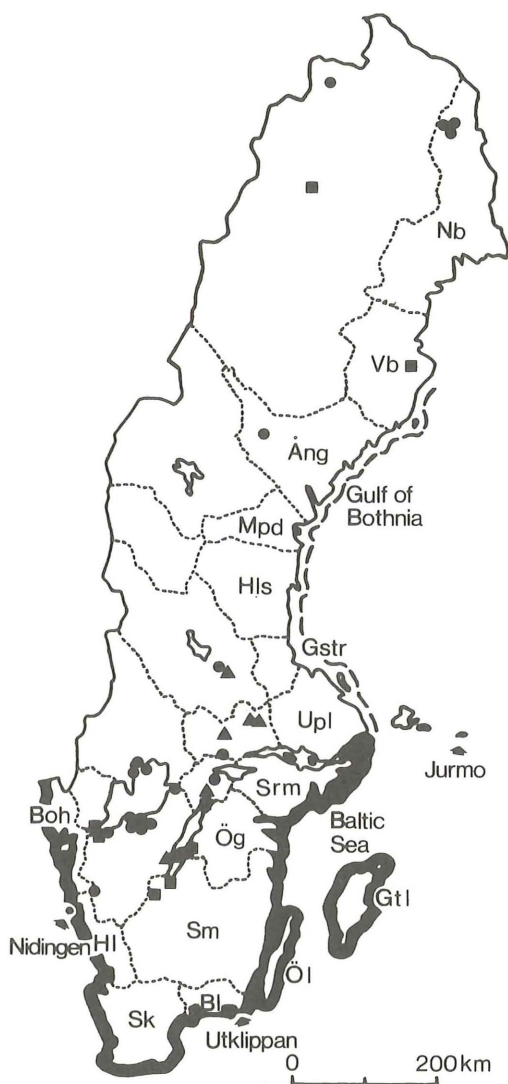


Figure 1. Map of Sweden showing: i) the provinces, ii) the bird observatories at Nidingen, Utklippan and Jurmo, iii) the winter distribution of Purple Sandpipers (thick line: regular wintering site, dashed line: wintering may occur during warm winters; SOF 1990, this study), and iv) all reported inland observations of Purple Sandpipers outside the breeding area between 1965 and 1992 ($n = 35$, single birds, except three observations of two birds and one observation of three birds). Circles: sighting made in autumn (9 September–27 November), squares: winter (2 December–14 March), triangles: spring (19 April–15 May).

Karta som visar: i) Sveriges landskap, ii) fågelstationerna vid Nidingen, Utklippan och Jurmo, iii) vinterutbredningen av skärsnäppa (kraftig linje: regelbunden övervintring, streckad linje: övervintring kan förekomma under milda vintrar; SOF 1990, denna studie) och iv) alla rapporterade inlandsobservationer av skärsnäppa utanför häckningsområdet 1965–1992 ($n=35$, enskilda fåglar förutom fyra fynd av 2–3 ex.). Cirklar: observationer under hösten (9 september–27 november), kvadrater: vinterfynd (2 december–14 mars), trianglar: vårfynd (19 april–15 maj).

ringing data, we here examine population size, migration and origin of Purple Sandpipers wintering in Sweden. We also discuss possible migration routes and origins of birds wintering in other parts of NW Europe.

Material and methods

All reported observations of Purple Sandpipers outside the breeding areas between 1965 and 1992 were obtained from the regional ornithological societies in the 25 provinces of Sweden (see Figure 1). Also, Purple Sandpipers were regularly counted in 1967–1991 during surveys of seabirds and waterfowl on the Swedish west coast (i.e. in the provinces of Bohuslän [Boh] and Halland [Hl]; Figure 1). These surveys were performed three times each year (mid January, March and November, respectively) along five standardized boat-routes in the outer archipelago (mean route length=109 km, s.d.=11 km; see Pehrsson 1990, Pehrsson et al. 1990, Johansson et al. 1997 for further details). Survey data and reported observations of wintering birds were used to estimate the size of the Swedish wintering population (based on maximum numbers recorded at each site).

Timing of migration was only investigated in provinces where local movements of wintering birds do not occur, i.e. outside the regular wintering areas (SOF 1990, see also Figure 1). To obtain comparable data, observations of migrating birds in adjacent provinces with few records were pooled.

through Sweden and along the Gulf of Bothnia and the Baltic Sea during autumn, as this route is used by many other species of the genus *Calidris* (Wilson et al. 1980, Cramp & Simmons 1983, Morrison 1984). Should such a migration route exist, it is important for the understanding of the migration and breeding origin of Purple Sandpipers wintering in different parts of western Europe. Furthermore, it may shed light on the migration system of the species in general.

Based on long-term counts along the Swedish west coast, sightings in other parts of the country and

Table 1. Estimated maximum numbers of wintering Purple Sandpipers in the Swedish provinces based on observations between 1965 and 1992.

Maximalt antal övervintrande skärsnäppor i de svenska landskapen beräknat på observationer under åren 1965–1992.

Province <i>Landskap</i>	No. of birds <i>Antal fåglar</i>
Skåne (Sk)*	120
Blekinge (Bl)	75
Öland (Öl)	30
Gotland (Gtl)	150
Halland/Bohuslän (Hl/Boh)	1500
Uppland (Upl)	25
Södermanland (Srm)	100
Total <i>Totalt</i>	2000

* Abbreviations as in Figure 1.

* *Förkortningar som i Figur 1.*

A local population was studied in detail at Nidingen, a small island (1000 m x 300 m) about 10 km off the Swedish west coast (Figure 1). The Nidingen Bird Observatory was usually occupied from mid March until early November each year, and the staff almost daily counted the number of Purple Sandpipers present on the island. Mean maximum number of birds between 1980 and 1996 was 195 (s.d.=73, n=17 years). Most birds remained at Nidingen and on nearby skerries during the entire winter (Hake 1996). From April 1980 to November 1996, 883 birds were caught in walk-in traps placed on seaweed banks. Birds were ringed and aged according to the colouration of the inner median coverts (Prater et al. 1977). From 1986, almost all captured birds were also ringed with individual colour-combinations (n=470).

Between 1988 and 1996, several birds ringed at Swedish wintering grounds were recorded in Svalbard during the breeding season, and birds ringed on Svalbard were also sighted along the Swedish west coast (see below). Ringing data from Svalbard, collected during the breeding seasons of 1986–1988 and 1993, were therefore included in the analyses. In total, 92 birds were captured at Ny Ålesund (78°55'N/11°56'E) and Longyearbyen (78°13'N/15°38'E) during June–August. Birds were caught with mist-nets and a clap-net trap when foraging in estuaries, or when tending nests or young. Most captured birds were ringed with individual colour-combinations (n=55). Only breeding birds were sexed (n=41),

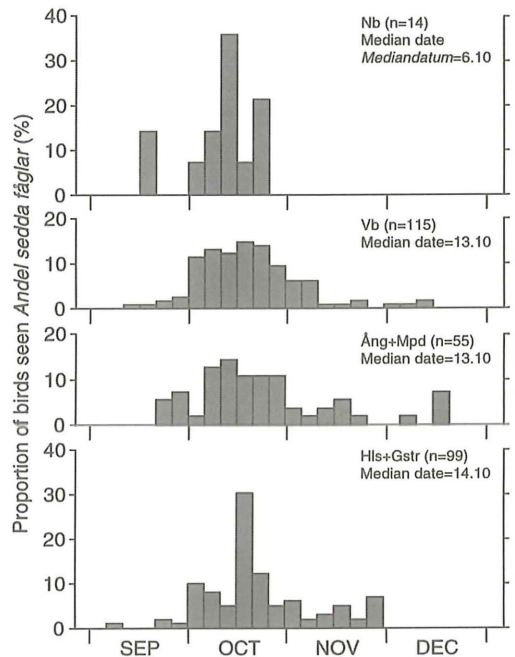


Figure 2. Timing of migration of Purple Sandpipers along the Gulf of Bothnia during autumn. Observations are grouped into five-days periods. Number of birds in each province within parenthesis (abbreviations as in Figure 1, pooled data from 1965–1992).

Observationer av sträckande skärsnäppor utmed Bottenhavet under hösten. Observationerna är grupperade i femdagsperioder. Antalet fåglar i varje landskap inom parantes (förkortningar som i Figur 1, sammanslagna data från 1965–1992).

assuming that the female was the larger and longer-billed bird in each pair (e.g. Prater et al. 1977, Cramp & Simmons 1983). Since females usually desert the brood soon after hatching (Bengtson 1970, Pierce 1997), a single parent tending chicks was assumed to be the male.

Data on birds captured at the Baltic Sea were obtained from the local bird observatories Utklippan, SE Sweden, and Jurmo, SW Finland, respectively (Figure 1). At all sites, bill-length was measured with vernier callipers to the nearest 0.1 mm. Since Purple Sandpiper populations differ in biometrics (e.g. Prater et al. 1977, Boere et al. 1984), we used differences in bill-lengths to examine whether different populations winter in Sweden. The analysis was done on bill-length data only, as other size measurements (e.g. wing-length) were not recorded at all sites.

Table 2. Data on all sightings and recoveries of Purple Sandpipers ringed on Nidingen between April 1980 and November 1996. Age classes (EURING codes): 2 = age unknown, 3 = first autumn, 4 = second autumn or older, 5 = first spring, 6 = second spring or older. Bill-lengths are given in mm (total number of birds ringed = 883, also see Figure 3).

Ringling date <i>Ringmärkt</i>	Age <i>Ålder</i>	Bill <i>Näbb</i>	Date and site of recovery <i>Datum och plats för återfyndet</i>
18.04.80	6	36.0	20.05.86 Eckerö, Archipelago of Åland, Finland (60.17N/19.12E)
07.05.80	2	29.0	12.04.82 Oostende, West-Vlaanderen, Belgium (51.13N/02.55E)
20.04.81	5	29.9	24.02.96 Hendon, Sunderland, England
29.04.81	5	34.0	18.02.82 Haviksanden, Farsund, Vest-Agder, Norway (58.04N/06.44E)
18.05.81	6	31.0	00.02.82 Oldeog, Ostfriesische Inseln, Germany (53.46N/08.00E)
06.11.81	4	28.5	07.01.82 Leeuwarden, Friesland, The Netherlands (53.12N/05.49E)
11.11.81	3	28.5	25.12.81 Horseklint, Tornen, Fynshoved, Fyn, Denmark (55.37N/10.37E)
10.05.82	6	33.5	17.02–15.03.85 Zuidpier, IJmuiden, The Netherlands (52.28N/04.38E)
14.05.82	6	29.0	15.03.85, 18.03.86 and 22–25.01.87 Zuidpier, IJmuiden, The Netherlands
12.05.83	6	27.0	28.02–06.04.85 Zuidpier, IJmuiden, The Netherlands
02.05.84	5	33.0	17–21.03.85 Landguard Point, Felixstowe, Suffolk, England (51.56N/01.20E)
06.04.85	5	33.1	16–17.09.88 Longyearbyen, Svalbard (78.13N/15.38E)
03.11.85	3	29.5	07.04.86 Bottsand, Schleswig-Holstein, Germany (54.25N/10.16E)
28.12.85	3	30.5	12–16.02.91 Lossiemouth, Grampian Region, Scotland (57.44N/03.18W)
31.12.85	3	29.0	11.04.86 Ness Point, Lowestoft, Suffolk, England (52.29N/01.46E)
13.04.86	5	31.5	29.07–08.08.88 Russehamna, Bear Island (74.25N/19.15E)
13.04.86	6	30.0	01–08.03.87 The Wash, Heacham, Norfolk, England (52.54N/00.27E)
19.04.86	5	30.8	13.12.86 Archipelago of Hartsö*, Sweden (58.40N/17.35E)
20.04.87	5	29.7	21.07.92 Bjørndalen, Svalbard (78.12N/15.17E)
01.05.87	5	31.4	11.12.88 Siurunmaa, Sodankylä, Finland (67.27N/26.51E)
08.05.89	5	32.1	31.07.89 Gipsvika, Svalbard (78.26N/16.27E)
24.03.90	5	33.0	13.07.91 Bockfjorden, Svalbard (79.30N/14.30E)
22.03.91	6	33.2	23–24.04.94 and 16–22.04.95** Archipelago of Hartsö*, Sweden
03.05.91	5	29.0	06–09.06.93 Longyearbyen, Svalbard
16.03.93	5	27.6	27.08.94 Flinholmen, Ekmanfjorden, Svalbard
17.03.93	5	31.9	06.06.93 Longyearbyen, Svalbard
17.03.93	6	31.9	13.03.94 Tynemouth, Newcastle, England
20.03.93	6	30.0	13.06.93 Longyearbyen, Svalbard
09.05.94	2	32.0	23.09.94 Longyearbyen, Svalbard
09.05.94	2	31.0	20.07.95 Longyearbyen, Svalbard
—***	2	—	17.11–01.12.96 Archipelago of Hartsö*, Sweden

* Situated in province “Srm” (see Fig. 1).

* *Beläget i Södermanland.*

** This bird was seen wintering in Nidingen area 1993/94, 1994/95 and 1995/96.

** *Denna individ övervintrade vid Nidingen 1993/94, 1994/95 och 1995/96.*

*** One of six possible birds, ringed between 20.04.81 and 22.03.96.

*** *En av sex möjliga fåglar som ringmärktes mellan 20.04.81 och 22.03.96.*

Results

Based on maximum numbers of birds seen at each regular winter site in the different Swedish provinces between December and mid April 1965–1992, the size of the wintering population was estimated at 2000 birds (Table 1). About 75% were found on skerries and small islands in the outer archipelago off the west coast, and the remaining birds were

found at similar sites and at rocky shores along the south and east coast (Table 1, Figure 1).

Observations of Purple Sandpipers in non-wintering areas confirmed a migration route along the Swedish east coast, both during autumn and spring. In autumn, migration along the Gulf of Bothnia mainly took place in October, although some movements also seemed to occur in late November and December (Figure 2). Observations in the northern

Samtliga observationer och kontroller av skärsnäppor som ringmärkts på Nidingen mellan april 1980 och november 1996. Åldersklasser enligt EURING standard: 2 = obestämd ålder, 3 = första höst (10), 4 = andra höst eller äldre (2+), 5 = första vår (20), 6 = andra vår eller äldre (3+). Näbb längder är angivna i mm (antalet ringmärkta fåglar totalt = 883, se även Figur 3).

Details of recovery
Återfyndsdetaljer

Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Controlled by ringer *Kontrollerad av ringmärkare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Dead, leg and ring found *Död, benet och ringen hittade*
 Dead for at least a week *Död i minst en vecka*
 Found dying *Hittad döende*
 Dead, no details *Död, inga detaljer*
 Ringnumber read through telescope *Ringnumret avläst med tubkikare*
 Ringnumber read through telescope *Ringnumret avläst med tubkikare*
 Ringnumber read through telescope *Ringnumret avläst med tubkikare*
 Ringnumber read through telescope *Ringnumret avläst med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Controlled by ringer *Kontrollerad av ringmärkare*
 Controlled by ringer *Kontrollerad av ringmärkare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Killed by car in the middle of the night *Påkörd av bil mitt i natten*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Ringnumber read through telescope *Ringnumret avläst med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Colour-rings read through binoculars *Färgringar avlästa med handkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
 Colour-rings read through telescope *Färgringar avlästa med tubkikare*

parts of the Gulf of Bothnia in May (n=5 birds), spring sightings in the Baltic Sea of birds ringed at Nidingen (Table 2), and one recovery at Nidingen of a bird previously ringed at Utklippan in May (Table 3), showed that Purple Sandpipers migrate along this route also during spring (Figure 3). Furthermore, several inland observations, mainly in May (15% of all records) and October (32%), but also during December-March (26%), showed that Purple Sand-

pipers fly across Sweden during migration as well as in winter (Figure 1).
 The autumn migration along the east coast coincided with the arrival of birds to Nidingen, where numbers increased in October and November (Figure 4). In spring, most birds left Nidingen in May, but some were still present in early June. The pattern of occurrence also indicated that some birds used the island as a stopover-site in spring (see Figure 4).

Table 3. Data on sightings and recoveries in Nidingen area 1980–1996 of birds ringed elsewhere. Age classes (EURING codes): 3 = first autumn, 4 = second autumn or older, 5 = first spring.

Ringing date and site Datum och plats för ringmärkningen	Age Ålder	Bill Näbb
24.10.83 Donna Nook, Lincolnshire, England (53.28N/00.10E)	4	37.0
24.10.83 Donna Nook, Lincolnshire, England*	4	
02.11.90 Langenwerder, Wismar, Germany (54.02N/11.30E)	3	26.7
02.11.90 Langenwerder, Wismar, Germany*	3	
14.05.92 Utklippan, Blekinge, Sweden (see Fig.1)	5	30.0

* Same bird as above.

* *Samma fågel som föregående.*

Recoveries and sightings of Purple Sandpipers ringed at Nidingen suggested that these birds used at least two different migration routes. Some birds migrated along the Swedish east coast and across northern Finland, and others used a route along the Norwegian and Swedish west coast (Table 2, Figure 3). Several records along the coasts of the southern parts of the North Sea (Denmark, Germany, The Netherlands, Belgium and England) showed that their wintering range, at least in some years, also included this area (Table 2, Figure 3). Also, four birds ringed in Germany or England were later sighted at Nidingen (Table 3).

Eleven sightings of birds ringed at Nidingen supported that at least a part of this population breeds in the Svalbard area (Table 2, Figure 3). Sightings of birds ringed at Svalbard confirmed the connection to the Swedish west coast, as well as the migration route along the Norwegian coast. Furthermore, they implied a wide wintering range of Svalbard breeders, covering a large part of the Swedish and Norwegian west coasts, and also the coasts of northern Norway and Scotland (Table 4, Figure 3).

The bill-length distribution of birds caught at Nidingen suggested two peaks at about 29.0 mm and 33.0 mm, but the distribution had extended tails in both ends (Figure 5). Due to the complexity of the frequency distribution, it was not possible to estimate mean and standard deviation of the different modes with the graphical method used by some other workers (e.g. Atkinson et al. 1981, Nicoll et al. 1988). At the Baltic Sea, captures were made in October (2), November (5), December (21) and May (6), and bill-length varied considerably among these birds (Figure 5). For birds caught on Svalbard, the distribution seemed to consist of two distinct peaks (Figure 5). Mean bill-lengths were 28.2 mm (s.d.=1.0, range: 26.6 - 30.4 mm, n=26) and 32.5 mm (s.d.=1.0, range: 30.8 - 34.4 mm, n=15) for males and females,

respectively, which is close to the values of Nicoll et al. (1991), who reported 28.1 mm (s.d.=1.0) for males and 32.9 mm (s.d.=1.0) for females.

We found that bills of individuals ringed at Nidingen during their first autumn (October–November) and recaptured the following spring (March–June) or later, had grown significantly (mean difference=0.24 mm, s.d.=0.36, n=29, t=3.57, p<0.002, paired t-test). There was, however, no age-dependent bill-length difference in birds caught during their first spring and later recaptured as adults (mean difference=0.05 mm, s.d.=0.72, n=70, t=0.56, n.s.). When comparing bill-length distribution between Nidingen and Svalbard, we therefore excluded birds caught during their first autumn at Nidingen, as only birds with full-grown bills were present at Svalbard. Birds were, however, not aged at Jurmo and Utklippan, and bill-lengths of all Purple Sandpipers ringed at Nidingen were therefore compared with those from the Baltic Sea.

A comparison of the bill-length distribution at the different sites showed no significant difference between Nidingen and Baltic Sea birds (Kolmogorov-Smirnov test: D=0.17, n=650 and 34, respectively, n.s.), whereas the distribution at Svalbard was different from the two other sites (Nidingen – Svalbard: D=0.17, n=596 and 92, respectively, p<0.05; Svalbard - Baltic Sea: D=0.28, n=92 and 34, respectively, p<0.05).

Discussion

Although the estimate of 2000 wintering Purple Sandpipers is based on maximum numbers, it is likely that this figure is too low. Most birds inhabited small islands and skerries in outer archipelagos, and there are several such sites in Sweden which are rarely visited by ornithologists. There is, however, no doubt that the Swedish wintering population is

Samtliga observationer och kontroller gjorda på Nidingen 1980–1996 av skärsnäppor ringmärkta på andra platser. Åldersklasser enligt EURING standard: 3 = första höst (10), 4 = andra höst eller äldre (2+), 5 = första vår (20).

Date and details of recovery
Datum och detaljer för återfynd

02.05.84 Controlled by ringer *Kontrollerad av ringmärkare*
09.03–19.04.87 Ringnumber read through telescope *Ringnumret avläst med tubkikare*
20.03.91 Controlled by ringer *Kontrollerad av ringmärkare*
20.03–03.04.91 and 06.01.94 Colour-rings read through telescope *Färgringar avlästa med tubkikare*
09.04.96 Controlled by ringer *Kontrollerad av ringmärkare*

small compared to some other populations in NW Europe. For example, Summers et al. (1990) estimated that 18000 birds winter within a relatively limited area in northern Norway, supporting Alerstam's (1982) suggestion that several hundred thousand birds winter along the Norwegian coasts.

At least two populations of Purple Sandpipers seem to occur at the Swedish wintering grounds. Several sightings and recoveries of birds ringed at Nidingen showed that part of the wintering population originates from Svalbard. We found, however, that the bill-length distribution differed significantly between Nidingen and Svalbard birds. Thus, even if most Nidingen birds had bill-lengths similar to Svalbard breeders, several had bills longer than the maximum measurement recorded at Svalbard (Løvenskiöld 1954, Bengtson 1975, Nicoll et al. 1991, this study). Since females have longer bills than males (e.g. Prater et al. 1977, Cramp & Simmons 1983), such birds should be females of a more long-billed population. Consequently, as the overlap in bill-length between males and females from Svalbard is small (Nicoll et al. 1991, this study), birds in the overlap zone of the Nidingen distribution (about 31.0 mm) may be long-billed males (see Figure 5).

There were also a few birds with bills shorter than the minimum measurement recorded for birds captured at Svalbard, possibly males from a population with very short bills. The only birds with bills shorter than 25 mm are males of the population breeding in southern Norway (Atkinson et al. 1981, Nicoll et al. 1988). These birds normally winter within a limited area in eastern Scotland and NE England (Atkinson et al. 1981, Rae et al. 1986) but sometimes occur elsewhere, particularly during autumn migration (Boere et al. 1984, Dierschke 1995). Thus, they probably do not winter regularly in Sweden.

We also found that Purple Sandpipers wintering in Sweden seem to use at least two different migration

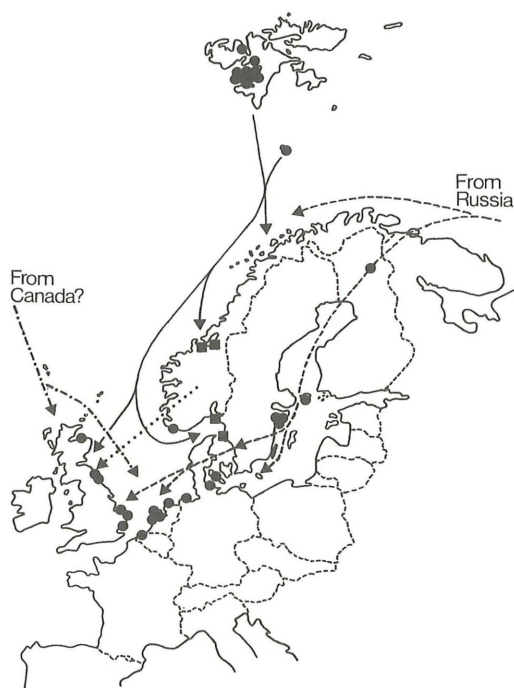


Figure 3. Map of north-western Europe showing all sightings and recoveries of Purple Sandpipers ringed at Nidingen (circles) and Svalbard (squares, see Tables 2 and 4). Possible migration routes are indicated by lines of different types for the different populations (additional data from Atkinson et al. 1981, Boere et al. 1984, Nicoll et al. 1988, Summers et al. 1990).

Karta över nordvästra Europa som visar alla observationer och kontroller av skärsnäppor ringmärkta på Nidingen (cirklar) och Svalbard (kvadrater, se Tabell 2 och 4). Tankbara flyttningssvägar indikeras med olika linjer för de olika populationerna (data även från Atkinson m.fl. 1981, Boere m.fl. 1984, Nicoll m.fl. 1988, Summers m.fl. 1990).

Table 4. Data on sightings of Purple Sandpipers ringed on Svalbard, and sightings and recoveries made on Svalbard of birds ringed elsewhere (also see Fig. 3). Age classes (EURING codes): 1 = nestling, 2 = age unknown, 3 = second spring or older. All sighted birds could not be identified, as some had seasonal colour combinations only.

Ringed <i>Ringmärkt</i>	Age <i>Ålder</i>	Date and site of recovery <i>Datum och plats för återfyndet</i>
1987 Ny Ålesund	-	18.12.88 Bolleskären, Hönö, Archipelago of Göteborg (54.31N/11.39E)
1988 Adventdalen	1	12.03.89 Malvik beach, Trondheim, Norway (63.26N/10.41E)
1988 Longyearbyen	-	22–23.03.89 Vinge, Skatval, Trøndelag, Norway (63.30N/10.47E)
1988 Longyearbyen	-	18.03.90 Vinge, Skatval, Trøndelag, Norway*
1988 Longyearbyen	6	06.11.93 Segelskären, Archipelago of Koster, Sweden (58.47N/10.59E)
1993 Gypsdalen**	6	Spring vår 1994-spring vår 1996 Nidingen area <i>Nidingeområdet</i>

* Possibly the individual seen at this site 22–23.03.89
 * *Möjligen samma individ som sågs här 22–23.03.89*
 ** (Ron Summers in litt.).
 ** (Ron Summers i brev).
 *** Controlled at the same site 17.10.92 and also seen here during the winter 1993/94 (Karl-Birger Strann in litt.).
 *** *Kontrollerad på samma plats 17.10.92 och även sedd här under vintern 1993/94 (Karl-Birger Strann i brev).*

routes. Observations of ringed birds showed that Svalbard breeders mainly migrate along the west coast of Norway and Sweden. In addition, the autumn migration along the Gulf of Bothnia and across Sweden, coinciding with the arrival of birds at the Swedish west coast, suggested an eastern origin of other wintering birds. This was also supported by recoveries and sightings of birds ringed at Nidingen

(see Table 2), as well as the difference in bill-length distribution between birds caught in the Baltic Sea and those breeding at Svalbard, with more long-billed birds occurring along the coasts of the Baltic Sea. For example, the bird ringed at Nidingen, seen on migration in the archipelago of Åland (Table 2, Figure 3), had a bill-length (36.0 mm) that was well outside the range recorded for birds breeding at Svalbard.

Long-billed populations of Purple Sandpipers are known from three breeding areas: Canada, Iceland and the Taymyr Peninsula (Atkinson et al. 1981, Boere et al. 1984, Morrison 1984). Ringing recoveries suggest that Canadian birds, which may winter in Germany, The Netherlands and northern Britain, migrate through Iceland (Boere et al. 1984, Nicoll et al. 1988, Dierschke 1995), whereas Icelandic breeders are resident (Summers et al. 1988). Thus, the long-billed birds wintering in Sweden should originate either from Canadian breeding grounds or from the Taymyr area. Since they seem to migrate across northern Finland and along the Swedish east coast, it is likely that they originate from Taymyr. The study of Tatarinkova (1977), who caught birds with very long bills (some ≥ 37 mm) on migration through the Murmansk area, seems consistent with this conclusion. However, the possibility of Canadian birds occurring at the Swedish wintering grounds cannot be ruled out (cf. Gudmundsson & Lindström 1992 for Sanderling *C. alba*).

Some Purple Sandpipers wintering in SE England, Germany and The Netherlands have bill-lengths

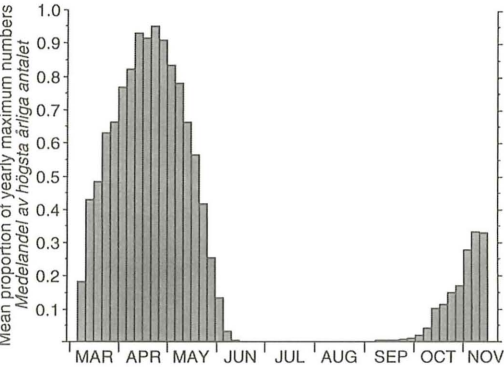


Figure 4. Relative occurrence of Purple Sandpipers at Nidingen between March and November 1980–1996, expressed as mean proportions of yearly maximum numbers, observed within five-days periods (number of years ranging from 3 to 17, depending on if the bird observatory was occupied or not).
Relativ förekomst av skärsnäppa vid Nidingen mellan mars och november 1980–1996, beräknad som medelandelan av det högsta årliga antalet. Observationerna är grupperade i femdagarsperioder (3–17 år, beroende på om fågelstationen var bemannad eller inte).

Samtliga observationer av skärsnäppor som ringmärkts på Svalbard, samt observationer och återfynd gjorda på Svalbard av fåglar som ringmärkts på andra platser (se även Fig. 3). Åldersklasser enligt EURLING standard: 1 = bounce (00), 2 = obestämd ålder, 3 = första höst (10), 6 = andra vår eller äldre (3+). Alla fåglar kunde inte bestämmas till individ, eftersom några av de observerade endast var försedda med säsongsfärger.

Details of recovery
Återfyndsdetaljer

Colour-rings read through binoculars *Färgringar avlästa med handkikare*
Leg flag seen through telescope *Benflagga sedd med tubkikare*
Leg flag seen through telescope *Benflagga sedd med tubkikare*
Leg flag seen through telescope *Benflagga sedd med tubkikare*
Colour-rings read through telescope *Färgringar avlästa med tubkikare*
Ringnumber read through telescope *Ringnumret avläst med tubkikare*

similar to the long-billed birds captured at Nidingen. As mentioned above, others workers (Boere et al. 1984, Nicoll et al. 1988, Dierschke 1995) have suggested that these birds originate from Canadian or Russian breeding grounds. The spring peak in numbers at Nidingen (see Figure 4) and the many sightings and recoveries of birds in the North Sea area, could imply that Purple Sandpipers use the Swedish west coast as a stopover-site on migration in late April and May. Local movements and resumed migration may, however, account for most of these patterns. Between autumn arrival and early spring, birds wintering in the Nidingen area usually forage on skerries and small islands close to Nidingen. In late March and early April, they move to Nidingen, where they utilize the rich food production of the seaweed banks before northbound migration in May-June (Hake 1996). Moreover, Nidingen birds were only found along the coasts of the southern North Sea in cold winters (M. Hake et al. in prep.). Several of these birds returned to Nidingen within the same wintering season, suggesting that such movements were temporary and probably due to severe weather conditions at the Swedish wintering grounds. Anyhow, it seems likely that birds from eastern breeding grounds (Russia) occur in the North Sea area at least during some winters (cf. Boere et al. 1984, Nicoll et al. 1988).

Resumed migration may also explain the occurrence of late migration in November-December along the Gulf of Bothnia (see Figure 2). These birds might have failed in wintering further north, trying to

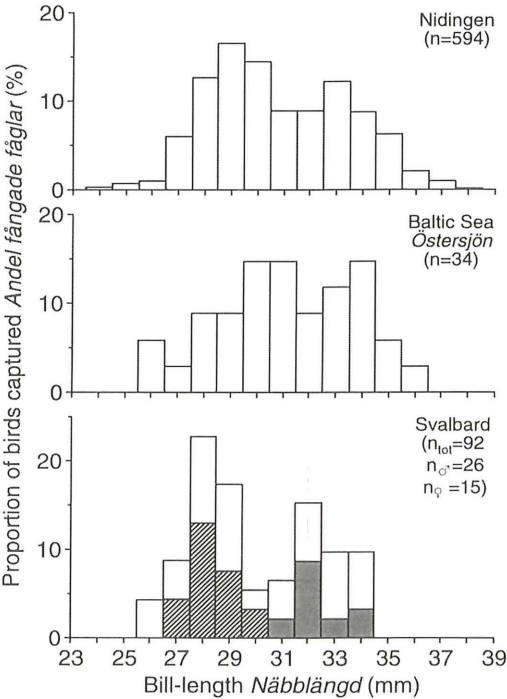


Figure 5. Bill-length distribution of Purple Sandpipers captured at Nidingen, Svalbard and the Baltic Sea (Jurmo and Utklippan). For Svalbard, the numbers of sexed birds are indicated by hatched (males) and shaded (females) areas. Näbblängdsfördelning hos hos skärsnäppor fångade vid Nidingen, Svalbard och Östersjön (Utklippan och Jurmo). För Svalbard anges antalet könsbestämda fåglar med streckning (hannar) respektive skuggning (honor).

escape deteriorating foraging conditions along the Arctic Sea coast. The bird ringed at Nidingen, recovered in northern Finland in December (Table 2, Figure 3), supports the occurrence of late migration, as well as an eastern origin of birds using this route.

For birds breeding at Svalbard, several sightings at the Swedish west coast and in the Trondheim area, and observations of birds ringed in Scotland and in the Tromsø area, northern Norway (Table 4), suggest that the wintering range of these birds may cover the entire Norwegian and Swedish west coasts, as well as parts of northern Great Britain (see Figure 3). Summers et al. (1990) concluded that Purple Sandpipers wintering in the Tromsø area almost exclusively originate from breeding grounds in NW Russia, but obviously Svalbard birds also winter there. Different populations may thus overlap in their wintering ranges, as found in this and other studies (Atkinson et al. 1981, Boere et al. 1984, Nicoll et al. 1988, Dierschke 1995).

To summarize, the Swedish wintering population of Purple Sandpipers originates from breeding grounds at Svalbard and probably also from the Taymyr Peninsula. Conclusions regarding the eastern origin of long-billed birds are, however, based on bill-lengths and sightings of few individuals. Moreover, data on biometrics of Purple Sandpipers breeding in some areas, e.g. in Canada and Russia, are still scarce (Prater et al. 1977, Cramp & Simmons 1983, Boere et al. 1984). Further studies of the seasonal occurrence and distribution of individuals with different measurements should therefore be useful in determining the true winter distribution and origin of the long-billed population.

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Sammanfattning

Populationsstorlek, flyttningsvägar och ursprung hos skärnsnåppor Calidris maritima övervintrande i Sverige

Skärnsnäppan är unik bland Palearktiska vadare eftersom den övervintrar på kala skär och utmed klippiga havsstränder i de nordliga, tempererade delarna av västra Palearktis och östra Nearktis. I Europa förekommer de flesta övervintrande fåglarna i norra Norge, Storbritannien och på Island (t.ex. Alerstam 1982, Cramp & Simmons 1983). I Sverige påträffas skärnsnåppor främst på Västkusten under vintern (SOF 1990), men den övervintrande populationens utbredning och storlek i landet har inte blivit analyserad i detalj.

Skärnsnäppans flyttning är komplex och ofullständigt känd (Summers 1994). Fåglarna som häckar på Island tycks vara stannfåglar (Summers m.fl. 1988), och huvuddelen av populationen som övervintrar i nordöstra Storbritannien häckar i södra Norge (Atkinson m.fl. 1981, Rae m.fl. 1986). Ringmärkningsåterfynd och biometriska data (främst skillnader i näbb längd; se Prater m.fl. 1977) indikerar att skärnsnäpporna som övervintrar i övriga delar av Storbritannien och i Nederländerna härstammar från Kanada, Grönland eller Ryssland (Boere m.fl. 1984, Ni-

coll m.fl. 1988, Summers m.fl. 1988), medan de som förekommer vintertid i Nordnorge anses häcka i Ryssland (Summers m.fl. 1990, Summers 1994). Om skärnsnåppor från ryska häckningsområden övervintrar i länderna runt Nordsjön, är det troligt att åtminstone en del av dessa fåglar flyttar genom Sverige och utmed Bottenhavet och Östersjön under hösten (eftersom denna flyttningsväg utnyttjas av flera andra *Calidris*-vadare; Wilson m.fl. 1980, Cramp & Simmons 1983, Morrison 1984). Information om en sådan flyttningsväg är viktig för förståelsen av artens flyttnings- och övervintringsstrategier.

I denna uppsats försöker vi klarlägga populationsstorlek, flyttning och troliga häckningsområden för de skärnsnåppor som övervintrar i Sverige. Vi diskuterar även tänkbara flyttningsvägar och häckningsområden för de fåglar som övervintrar i andra delar av Nordvästeuropa.

Material och metoder

Alla rapporterade observationer av skärnsnåppor utanför häckningsområdena 1965–1992 insamlades från de regionala rapportkommittéerna. Dessutom räknades övervintrande skärnsnåppor i samband med inventeringar av sjöfåglar på Västkusten under perioden 1967–1991. Inventeringarna gjordes längs standardiserade båttrutter i ytterskärgården i Bohuslän och Halland vid tre tillfällen varje år (januari, mars och november; se Pehrsson 1990, Pehrsson m.fl. 1990, Johansson m.fl. 1997 för ytterligare detaljer). Dessa data utgjorde underlag för skattningen av den totala svenska vinterpopulationen (baserat på högsta antalet sedda fåglar vid varje lokal).

De rapporterade observationerna användes även till att undersöka artens flyttning genom landet. Flyttningsrörelser analyserades dock endast i de landskap som ligger utanför artens normala övervintringsområde (se Figur 1).

En lokal övervintrande population studerades i detalj på ön Nidingen, belägen ca 10 km utanför kusten i norra Halland (se Figur 1). Nidingens Fågelstation var som regel bemannad från mitten av mars till början av november varje år, och stationspersonalen räknade nästan dagligen antalet skärnsnåppor på ön. Totalt ringmärktes 883 fåglar (470 även med individuella färgringskombinationer) på Nidingen under perioden 1980–1996. De flesta av de ringmärkta fåglarna åldersbestämdes med hjälp av dräktkaraktärer (se Prater m.fl. 1977).

Mellan 1988 och 1996 påträffades flera Nidingenmärkta fåglar på Svalbard under häckningssäsongen, och flera individer observerades även vid Öster-

sjön (se nedan). Därför har vi även inkluderat ringmärkningsdata från dessa två områden i analyserna. På Svalbard märktes totalt 92 skärsnäppor (55 med färgringar) 1986–1988 och 1993. Endast häckande fåglar könsbestämdes (med hjälp av biometrisk data och/eller beteende; se t.ex. Prater m.fl. 1977, Pierce 1997). Data på skärsnäppor fångade vid Östersjön erhöles från fågelstationerna vid Utklippan (Blekinge) och Jurmo (sydvästra Finland; Figur 1).

På samtliga fyra platser mättes näbb längden hos de fångade fåglarna med skjutmått, och vi har använt skillnader i näbb längd för att undersöka om olika populationer av skärsnäppor övervintrar i Sverige (se t.ex. Prater m.fl. 1977, Boere m.fl. 1984).

Resultat och diskussion

Totalt beräknades ca 2000 skärsnäppor övervintra i Sverige; de flesta (75%) förekom på kala skär och mindre öar i ytterskärgården på Västkusten (Tabell 1, Figur 1). Även om den beräknade populationsstorleken kan vara en underskattning (det finns mängder av till synes lämpliga områden i de svenska skärgårdarna som aldrig besöks av ornitologer), är det övervintrande beståndet i Sverige litet i jämförelse med populationer i andra delar av nordvästra Europa (se t.ex. Summers m.fl. 1990).

Observationer utanför häckningsområdena visade att skärsnäppan flyttar utmed Bottenhavet och Östersjön under både vår och höst (Tabell 2 och 3, Figur 2). Flera observationer visade dessutom att arten sträcker över inlandet i Sverige (Figur 1). Flyttningen längs Bottenhavet (Figur 2) sammanfaller med ankomsten av fåglar till Nidingen (Figur 4). Återfynd och observationer av skärsnäppor ringmärkta på Nidingen indikerade att dessa fåglar utnyttjar åtminstone två olika flyttningssvågar: dels över norra Finland och längs svenska östkusten, dels längs norska och svenska västkusten (Figur 3, Tabell 2). Flera fynd visade att övervintringsområdet för dessa fåglar vissa år även omfattar kusterna längs södra Nordsjön (Tabell 2 och 3, Figur 3). Fåglar från Nidingen påträffades vid södra Nordsjön dock endast under kalla vintrar, och flera av dem återvände senare samma vintersäsong till Nidingen (M. Hake opubl.). Detta antyder att sådana flyttning rörelser var tillfälliga och förmodligen orsakade av försämrade väderförhållanden i det svenska övervintringsområdet. Återupptagen flyttning skulle även kunna förklara det sena sträcket av skärsnäppor vid Botten-

havet under november–december (Figur 2). Detta sträck kan ha utgjorts av fåglar som tvingats överge mer nordligt belägna övervintringsområden (t.ex. vid Ishavskusten).

Elva avläsningar av skärsnäppor ringmärkta på Nidingen visade att åtminstone en del av den svenska övervintrande populationen häckar på Svalbard (Tabell 2, Figur 3). Observationer av fåglar som märkts under häckningstid på Svalbard bekräftade sambandet med svenska västkusten, liksom att dessa fåglar följer en flyttningssvåg längs norska kusten. Återfyndsdata visar även på ett vidsträckt övervintringsområde för den häckande populationen på Svalbard (Tabell 4, Figur 3).

Vi fann även att frekvensfördelningen av näbb längder skiljde sig signifikant mellan fåglar fångade på Nidingen och Svalbard ($p < 0.05$, Kolmogorov-Smirnov test; Figur 5). Även om de flesta av Nidingens skärsnäppor hade en näbb längd motsvarande den hos fåglar från Svalbardpopulationen, hade ett flertal individer en längre näbb än vad som har uppmätts på Svalbard (jmf. t.ex. Nicoll m.fl. 1991). Eftersom honor i genomsnitt har längre näbb än hanner (t.ex. Prater m.fl. 1977, Cramp & Simmons 1983), bör sådana fåglar vara honor från en mer långnäbbad population. Fåglar i överlapps zonen i fördelningen från Nidingen (ca 31 mm) kan följaktligen vara långnäbbade hanner (se Figur 5).

Det fanns också en signifikant skillnad i näbb längdsfördelning mellan fåglar från Östersjön och Svalbard ($p < 0.05$; Figur 5). Materialet från Östersjön var mer begränsat, men data antydde att även här förekom mer långnäbbade fåglar jämfört med på Svalbard. Som exempel kan nämnas fågeln som ringmärktes på Nidingen, och som senare observerades i Ålands skärgård (näbb längd 36 mm; se Tabell 2).

Långnäbbade populationer av skärsnäppa är kända från Kanada, Island och Taymyr-halvön (Atkinson m.fl. 1981, Boere m.fl. 1984, Morrison 1984). Skärsnäpporna på Island är stannfåglar (Summers m.fl. 1988), vilket innebär att de långnäbbade fåglar som övervintrar i Sverige bör härstamma från endera Kanada eller Taymyr. Eftersom de tycks flytta över Finland och längs svenska östkusten, förefaller det troligt att de häckar på Taymyr (jmf. Tatarinkova 1977). Ytterligare studier krävs dock för att fastställa ursprunget för de långnäbbade skärsnäppor som övervintrar i Sverige och på andra platser i nordvästra Europa.