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Forty years of midwinter counts of waterfowl along the coasts of Scania, south Sweden, 1964–2003

Fyrtio års midvinterinventeringar av sjöfåglar längs de skånska kusterna, 1964–2003

LEIF NILSSON

Abstract

The International Midwinter Counts, organised by Wetlands International, started in January 1967, but co-ordinated counts were organised along the coasts of Scania, south Sweden, already since January 1964. This paper summarises the results of the first forty years. During the first years full coverage was attained, but in later years the counts covered nine larger areas, containing about 75% of all waterfowl. Of the more common species, ten showed significantly increasing, four significantly decreasing, and two species no clear trend. National midwinter indices are available for 11 species; in 10 of these the regional trends are similar to the national trends, Scania forming an important part of the national sample. Several of the changes are related to the hardness of the winters, the milder winters making it possible for more waterfowl to winter in Sweden now compared to earlier years. The decreasing trend for *Aythya fuligula* in Scania is an example of such changes in winter distribution within he country, more individuals now staying in the Baltic archipelagos than earlier.

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Introduction

In January 1964, a complete count of wintering waterfowl was organized for the first time along the coasts of Scania, the southernmost part of Sweden (Nilsson 1974, 1977, 1983, 1994). The counts were first started in connection with ongoing studies of the ecology of wintering diving ducks, especially on the south coast of Scania and in the Öresund. The counts continued on an annual basis, from 1967 forming an important part of the Swedish contribution to the International Midwinter Census (IWC) organized by Wetlands International. The aim of the IWC is to establish the distribution and population sizes for the different waterfowl and to follow annual changes and long-term trends in their populations, thus giving background data for conservation of waterfowl and their habitats on a continental scale (cf. e.g. Gillissen et al. 2002, Delany & Scott 2002).

To full-fill these aims, as full coverage as possible was attempted in the IWC during the first years, and country-wide surveys were undertaken in a number of countries (e.g. Joensen 1974, Nilsson 1975). After the first years, a standard network of sites was established. These sites were counted annually for the calculation of population indices. Country-wide surveys were once more undertaken in NW Europe during 1987–1989 (Nilsson 1991).

In this contribution I present the first forty years of coastal counts in Scania, analysing the trends and fluctuations of the wintering waterfowl populations on the regional scale, but I will also put them into a larger context. Earlier reports from the local area have been published by Nilsson (1974, 1977, 1983, 1994), whereas results from the country-wide surveys in 1987–1989 were published by Nilsson (1991). During the first years, the counts included only Anatidae. The Coot Fulica atra was included in the counts from 1968, whereas divers Gaviidae, grebes Podicipedidae, Grey Heron Ardea cinerea, and Cormorant Phalacrocorax carbo were included from 1971. The main aim of the present paper is to present a documentation of the wintering populations of waterfowl and changes in their numbers over the forty year period. Even if the number of wintering waterfowl in a region is very much dependent on the winter situation, I will restrict the discussion of those influences to some general background information as a proper analysis of these aspects requires the analysis of longterm data from several regions in a larger

area. This aspect will be adressed in another paper (Nilsson & Svazas in prep.).

Material and methods

Study areas

For the International Waterfowl Counts the entire coast of the province of Scania was divided into 150 counting units, including offshore sectors not included in the present study. During 1964–1976, the entire coastline was covered, whereas the counts in the other years were concentrated to eight areas between Torekov and Ystad and one area in the northeast corner of the province. Below, a short description of the main characteristics of the nine areas is given (Figure 1).

1. *NE Scania*. This area is the only area on the east coast of Scania included in the sample. It is characterized of a mixture of low-lying moraine coast and some shallow sandy beaches. There is also a small archipelago which cannot, however, be adequately covered from the shore. There are large shallow areas with rich submerged vegetation.

2. *The South coast*. The coast between Ystad and the Falsterbo canal is an exposed coast with either moraine shores with a lot of boulders in the water and rich algal vegetation and a hard bottom community dominated by blue mussels on the stones or large sandy beaches with only little vegetation close to the shore. The area includes two larger and three smaller harbours offering shelter for waterbirds.

3. *Falsterbo*. The south-western tip of Sweden with extensive sandy beaches on exposed parts and vast areas of shallow water with rich *Zostera* meadows and shore meadows in the Öresund part. The area also offers protection for wind, particularly in the Falsterbo canal.

4. *Foteviken*. A vast shallow area with grazed shore meadows on land and large areas with *Zostera* meadows and other submerged vegetation in the water. Vast areas have a water depth of less than one metre with muddy bottom rich in benthic fauna. Foteviken together with the Falsterbo area is designated as a Ramsaar area.

5. *Klagshamn – Malmö*. The southern part of this area is dominated by the Klagshamn peninsula with stones from a now waterfilled quarry that is an important daytime roost for diving ducks in the area. The northern part of the area is occupied by the harbour of Malmö, but close to Klagshamn there are still extensive areas of shallow water with Zostera meadows.

Figure 1. Map of Scania, south Sweden, showing the geographical position of the nine study areas: 1. NE Scania, 2. South coast between Ystad and Falsterbo kanal, 3. Falsterbo peninsula, 4. Foteviken, 5. Malmö – Klagshamn, 6. Lommabukten, 7. Lundåkrabukten, 8. N. Öresund and, 9. Skälderviken.
Karta över Skånes kust med de 9 delområdena inlagda: 1. NE Scania, 2. Sydkusten mellan Ystad och Falsterbo kanal, 3. Falsterbo halvön, 4. Foteviken, 5. Malmö – Klagshamn, 6. Lommabukten, 7. Lundåkrabukten, 8. N. Öresund och 9. Skälderviken.

6. *Lommabukten*. A shallow bight with vast areas of water with a depth of less than one metre and with rich food supplies for diving ducks. Further out there are large Zostera meadows. There are also some mussel beds. In the northern part, the very shallow Salviken with sand banks at low water offers excellent feeding areas for waterbirds.

7. *Lundåkrabukten*. A smiliar shallow bight as Lommabukten. This area has even more extensive areas with sand banks and very shallow water.

8. *N Öresund*. The northern part of the Öresund, mostly characterized by moraine coasts but also with some smaller beaches. The water here has a higher salinity than further south and the benthic fauna has a more marine character. The northern border is characterized by the rocky coast of Kullaberg.

9. *Skälderviken (and Bjärehalvön)*. This area has large similarities with area 8, also being a more marine area. In the inner part of the bay there are some parts with vast shallow areas and

also some larger sandy beaches. There are also areas of rocky coast (especially Kullaberg).

For detailed description of areas 2, 5 and 6 including the bottom fauna see Nilsson (1969, 1972).

Counting methods

The different counting units were covered from the ground in such a way that the inshore species could be effectively counted, mostly from fixed observation spots using telescope. Counts were therefore only undertaken in favourable weather. Aerial surveys were also undertaken in some years of the 1970s, in 1987–1989, and in 1993. The present paper is only based on the results from the ground counts. Offshore counts were undertaken less regularly and are not included here.

The midwinter counts were organised in mid-January each year. The main counting date was the Sunday closest to the 15 January, including the entire weekend. In case of bad weather conditions during the main weekend, the counts were undertaken during the following week. The counts were undertaken by voluntary counters, many counters covering the same counting units for a long row of years in succession, thus granting a high degree of standardization.

Coverage of counts

During 1964–1976, 1978, 1979, 1982, 1987–1989, and 1993, almost all units along the entire coast of Scania were counted, whereas the counts in the other years were concentrated to the nine study areas presented above, these areas also being included in the national Swedish Enviromental Monitoring programme and form winter areas for about 75% of the inshore waterbirds in Scania.

Full coverage was obtained for most of the nine areas in almost all years, but the Falsterbo peninsula was not counted completely in 1978, 1981, 1983, 1990, 1991, and 1999, and the same applies to Foteviken in 1976, 1978, 1980, 1990 and 1991. With the exception of Mute Swan *Cygnus olor*, the number of waterbirds in the missing sectors was normally quite modest and well within the counting errors for the sectors where the species were more numerous. I have therefore not made any correction for the missing values. Only for the Mute Swan the situation was different, and large numbers were probably present in some of the years with missing counts. I have therefore excluded four years (1976, 1978, 1990, 1991) for this species. In the other years with missing counts, the ice situation was such that few or no swans could have been present; these years were included.

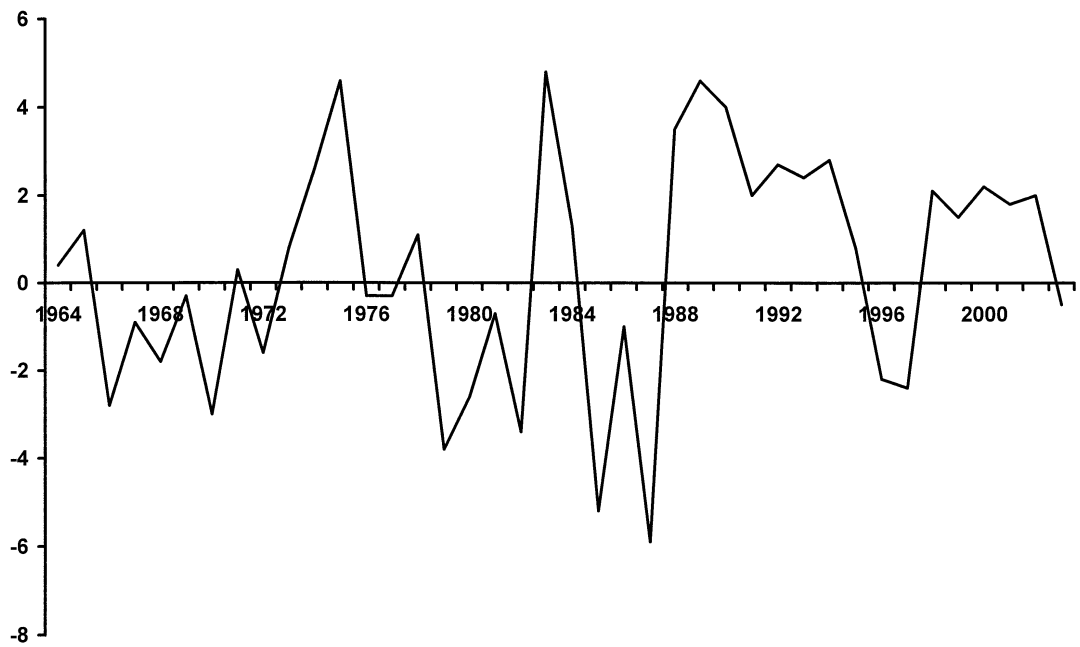


Figure 2. Monthly mean temperatures for January 1964–2003 at Malmö.
Månadsmedeltemperaturer för januari 1964–2003 vid Malmö.

Results

Weather and ice situation

The weather and especially the ice situation in the area and further north in the country are of special importance for the interpretation of the counts as the different waterfowl species are dependent on open water.

The weather situation during the forty-year period has shown marked variation between years, but overall the latter half has been warmer than the first twenty years (Figure 2). Until 1988, cold winters with ice coverage alternated with milder winters, but from 1988 through 2003, all winters were mild with the exception of January 1996 and 1997. The mean temperature for the selected stations during 1988–2003 was 2.42° higher then during the preceeding years since the start of the counts, the difference being significant ($P<0.01$).

Intensive ice coverage around the coasts of Scania (and also further north in the country) occurred in 1966, 1970, 1979, 1982, 1985, 1987, 1996, and for a shorter period, in 1997. The ice coverage was most heavy in 1987, when only small open areas were available along the entire coast of Scania. It may be noted, that the winter immediately before the start of the counts, 1963, was an extremely hard and long winter.

Occurrence of the different species

The distribution around the coasts of Scania for the different species is presented in Figure 3, and the annual totals are found in Figure 4. For those species, where significant trends were found over the entire period, correlation coefficients are given in the diagrams. Trend analysis was also made separately for the different areas. The results of these are discussed below under the different species, and the correlation coefficients are found in Table 1. The distribution maps are based on the full data set for Scania, thus also including counts in other parts of the coast than the nine standard areas.

For the commonest species, the regional dis-

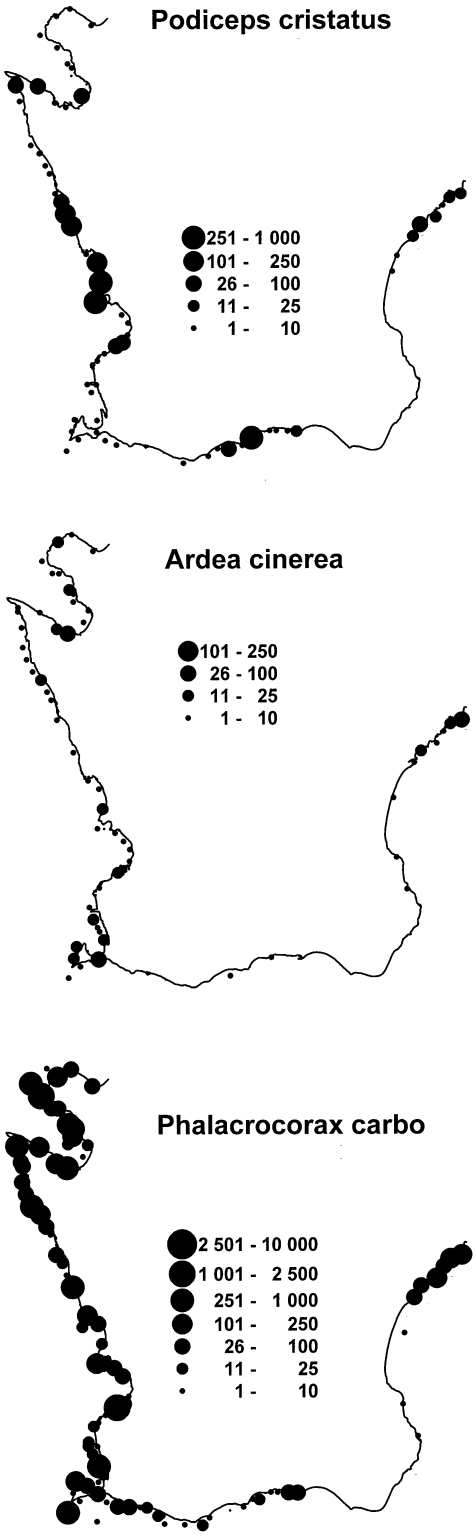
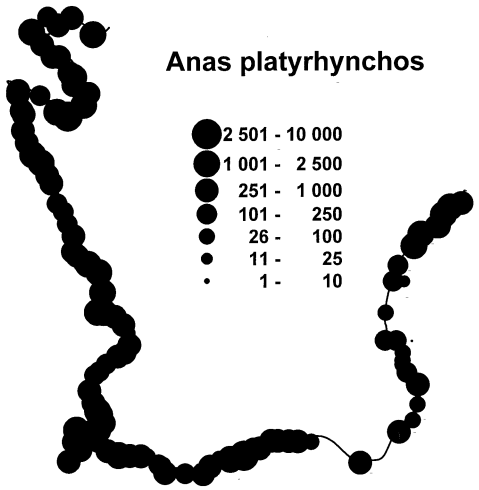


Figure 3. Distribution of different waterfowl species along the coasts of Scania 1964–2003 as maximum counts for each small counting unit (including all sectors, not only those covered in the annual counts.
Utbredning för olika sjöfågelarter efter de skånska kusterna 1964–2003 som maximumvärden för de olika arterna inom de små räkningsenheterna (alla inkluderade och inte bara de som täcks vid de årliga inventeringarna).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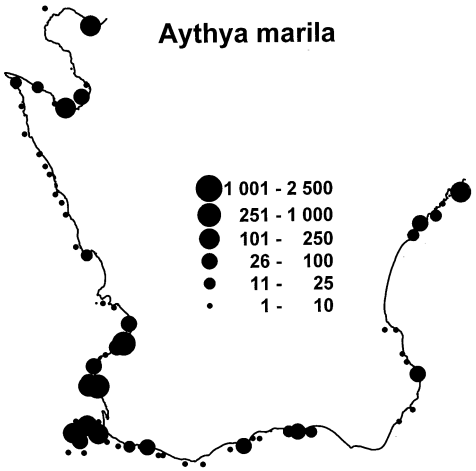
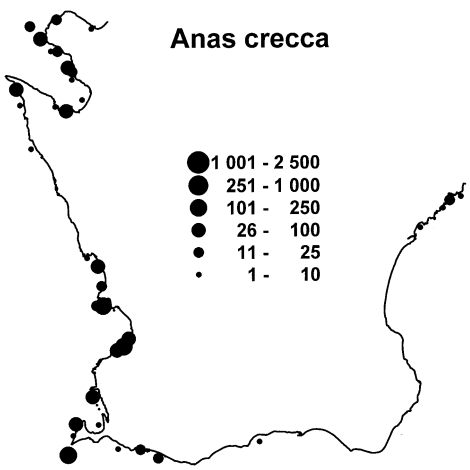
2 501 - 10 000
1 001 - 2 500
251 - 1 000
101 - 250
26 - 100
11 - 25
1 - 10


Aythya marila
1 001 - 2 500
251 - 1 000
101 - 250
26 - 100
11 - 25
1 - 10


Anas crecca
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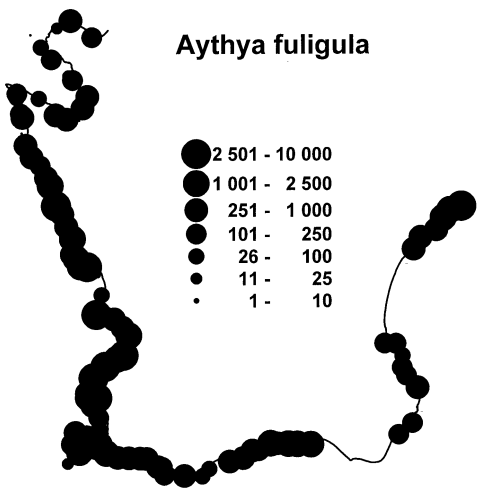
251 - 1 000
101 - 250
26 - 100
11 - 25
1 - 10


Aythya fuligula
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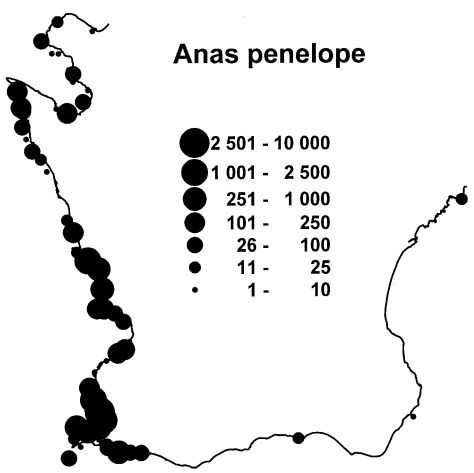
101 - 250
26 - 100
11 - 25
1 - 10


Anas penelope
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101 - 250
26 - 100
11 - 25
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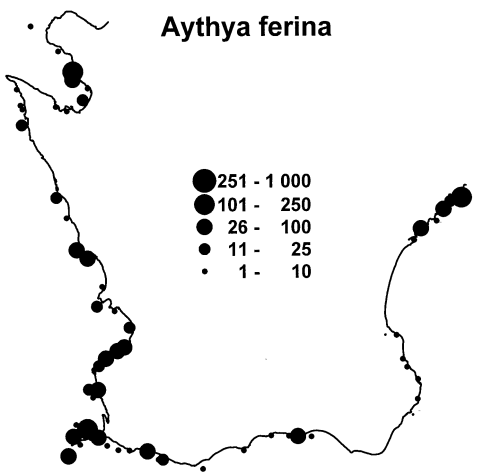
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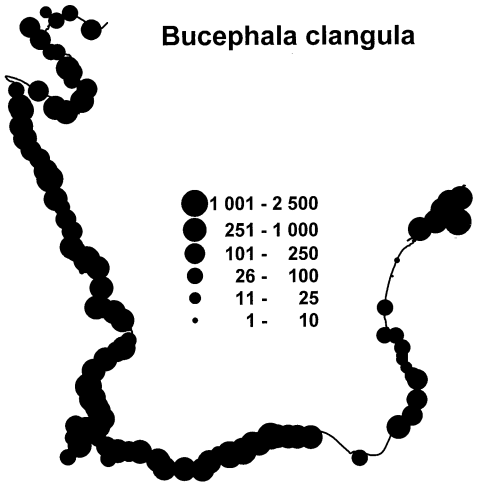
101 - 250
26 - 100
11 - 25
1 - 10


Bucephala clangula
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251 - 1 000
101 - 250
26 - 100
11 - 25
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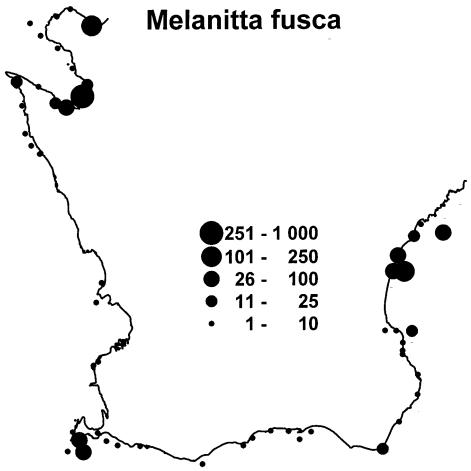
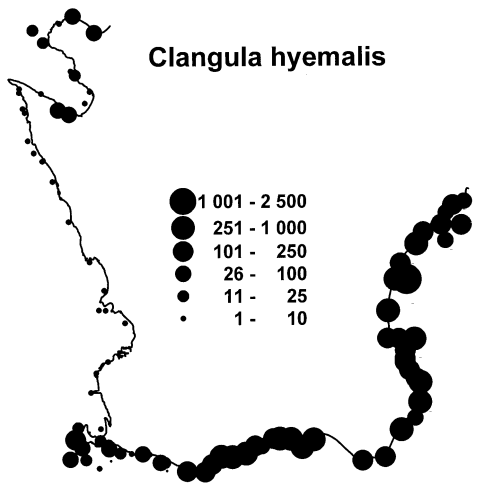

Melanitta fusca
251 - 1 000
101 - 250
26 - 100
11 - 25
1 - 10


Clangula hyemalis
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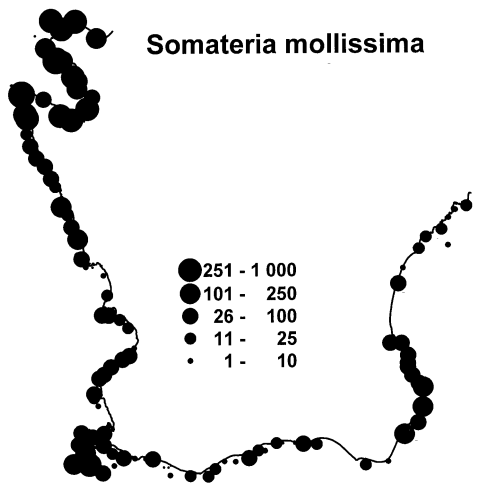
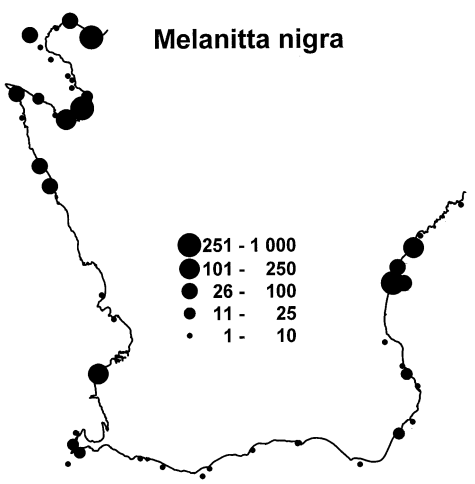
251 - 1 000
101 - 250
26 - 100
11 - 25
1 - 10


Somateria mollissima
251 - 1 000
101 - 250
26 - 100
11 - 25
1 - 10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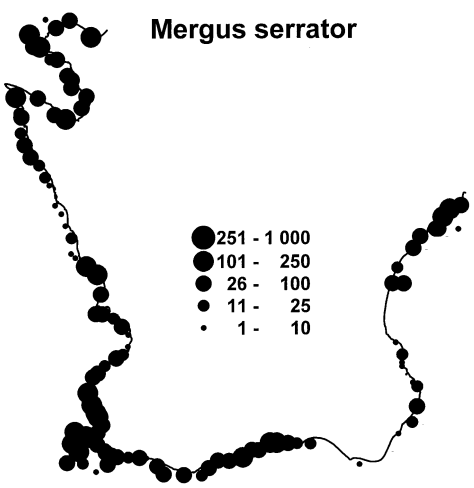
1 - 10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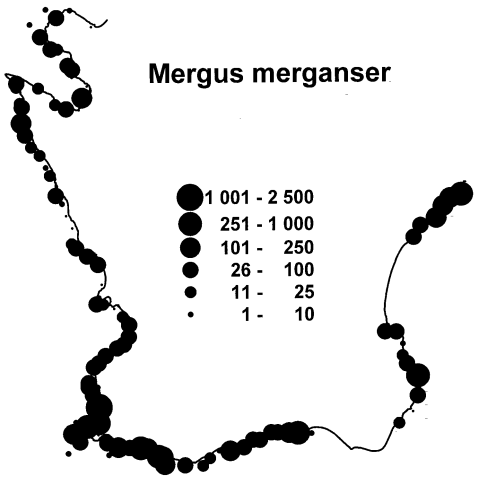
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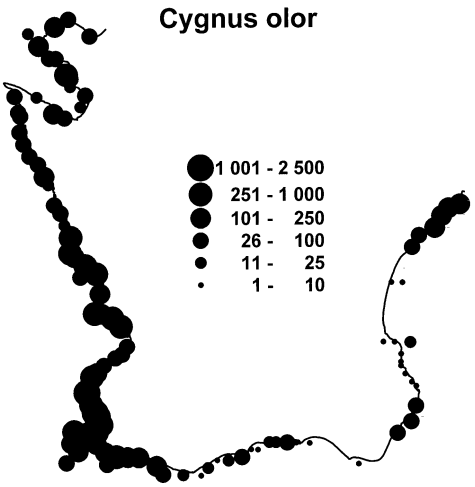
Cygnus olor
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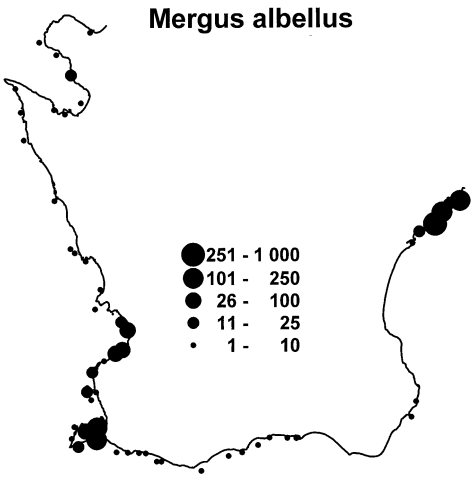
1 - 10


Mergus albellus
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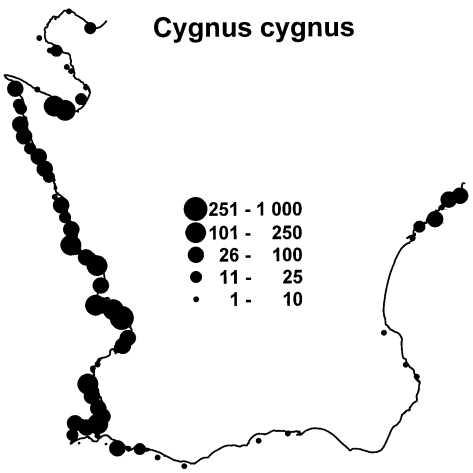
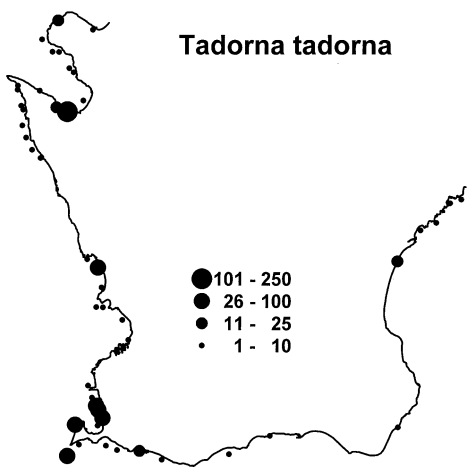
26 - 100
11 - 25
1 - 10


Cygnus cygnus
251 - 1 000
101 - 250
26 - 100
11 - 25
1 - 10


Tadorna tadorna
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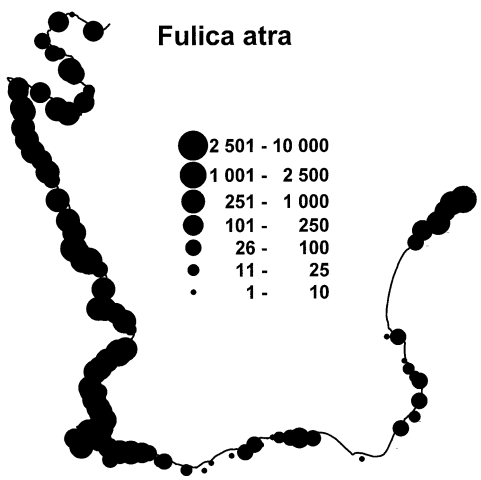
Fulica atra
2 501 - 10 000
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251 - 1 000
101 - 250
26 - 100
11 - 25
1 - 10

tribution during the four decades is illustrated in Figure 5. In these graphs some neighbouring areas of similar character have sometimes been treated as a unit to make the graphs more clear.

Red-throated *Diver Gavia stellata*
Until 1988, few divers were seen at the midwinter counts in Scania, but this year no less than 58 were counted. In most years after that, higher numbers than before were counted, especially in the northwest.

Great Crested Grebe *Podiceps cristatus*
Single individuals and small groups were seen at a number of sites, with the exception of the southeast corner, and at some sites flocks were regularly seen. Large flocks were seen in different parts of Lundåkrabukten in some years, but the counts showed much variation between years. During the first years since the counts started in 1971, only small numbers were counted. For the latter part of the study period much of the variation is probably due to the weather conditions at the count. Large flocks of grebes have regularly been reported from Lundåkrabukten, but often only few have been counted at the midwinter count in some years due to the problems to find the flock in rough sea as it often stays far out at sea. In January 2001, a big flock was also found at one site on the south coast and the total for the province exceeded 1000 individuals. During the first part of the study, Lundåkrabukten dominated markedly, but other sites have been more important in the second half of the study period (Figure 5).

Grey Heron *Ardea cinerea*
Smaller numbers were seen in most winters, with higher counts in mild years, especially during the series of mild winters in the latter part of the study period. The Herons were mostly found in the Öresund and Skälderviken with few observations on the south and east coast with the exception of the northeast corner.

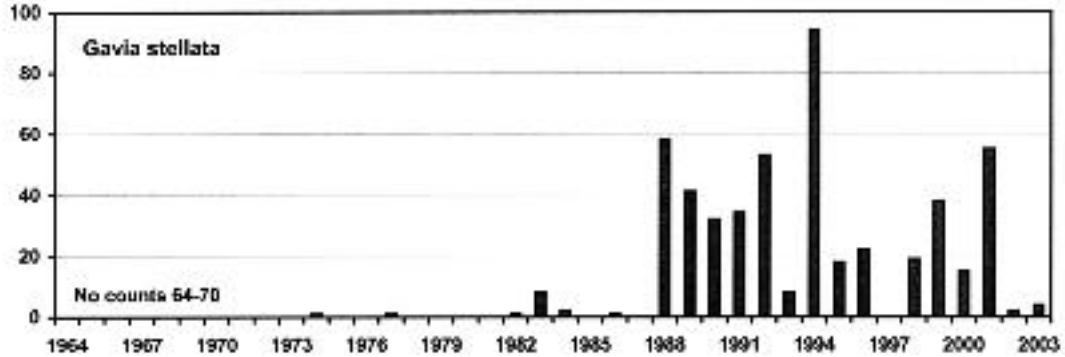
Cormorant *Phalacrocorax carbo*
The Cormorant is a regular winter visitor to large parts of the Scanian coast. Observations were few in the south-east, and most observations from the south and east coasts are of recent date. Overall, there has been an increase in the number of wintering Cormorants, but one period in the 1980s with the exception of a very high count in 1984 was characterized by low totals. The counts showed much variation, especially within the different sites. This variation can be related to the fishing habits of the Cormorants, which are easily counted when roosting, but difficult to count on the water. During the study period there has also been a spread to new sites, the totals in NE Scania being very low before 1991. In spite of marked variation between years, most areas showed the same increasing trend as in the overall totals (Table 1). The decrease in the last few winters has also been similar in most sectors. NV Scania dominated markedly over the years, whereas the proportion of the total counted in Lommabukten and Lundåkrabukten has decreased. The counts have increased in the southern part of Öresund, probably related to prevalence of mild winters in the latter part of the survey period (Figure 5).

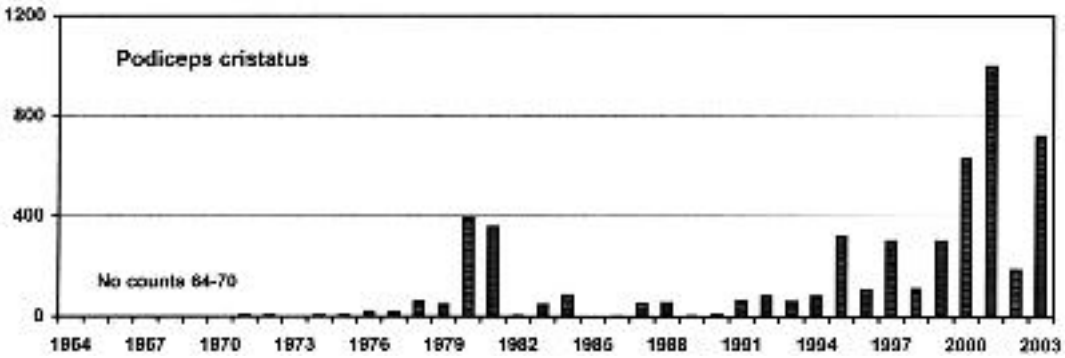
Mallard *Anas platyrhynchos*
The Mallard was distributed around the entire coast of the province. The only part where there were gaps in the distribution was on sandy beaches in the southeast corner of the province. The total number counted in the nine standard areas varied between 2400 in the cold ice-winter of 1982 and 29,400 in January 2000, a fairly mild winter. The overall trend was significantly increasing, but actually it could be described as fluctuations around a steady level until the late eighties, followed by a marked increase during the last fifteen years, even if there is much variation also during those years. The trend was increasing in 7 of the 9 areas, showing no clear tendency in Lommabukten and N Öresund (Table 1).

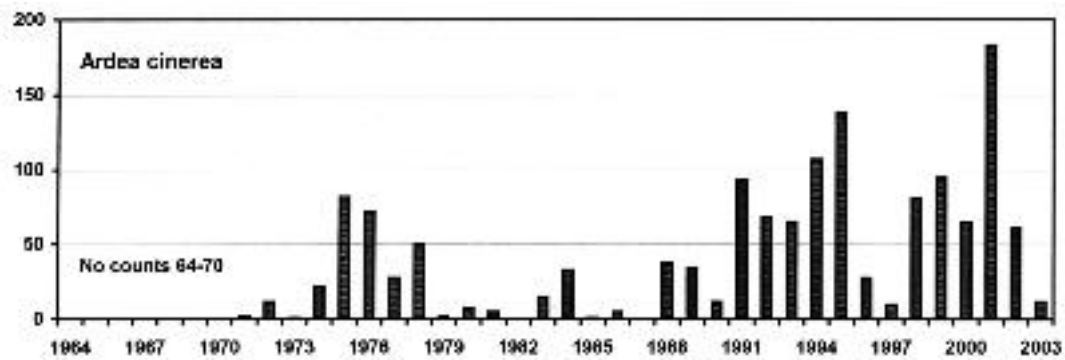
The regional pattern of distribution was quite similar between the four decades of counts, the northwest having a high proportion of the total population in the province (Figure 5). Through the years, a smaller proportion of the overall total has been found in Lommabukten and Lundåkrabukten, whereas the south coast had a markedly higher share of the total during the last survey decade.

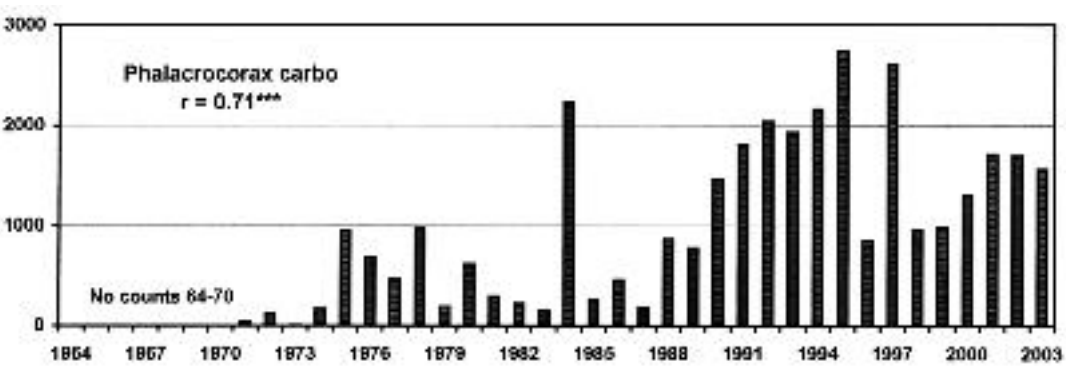
Teal *Anas crecca*
The Teal was a rare winter visitor to Sweden and the coasts of Scania during the major part of the study period. The only year before 1991 with

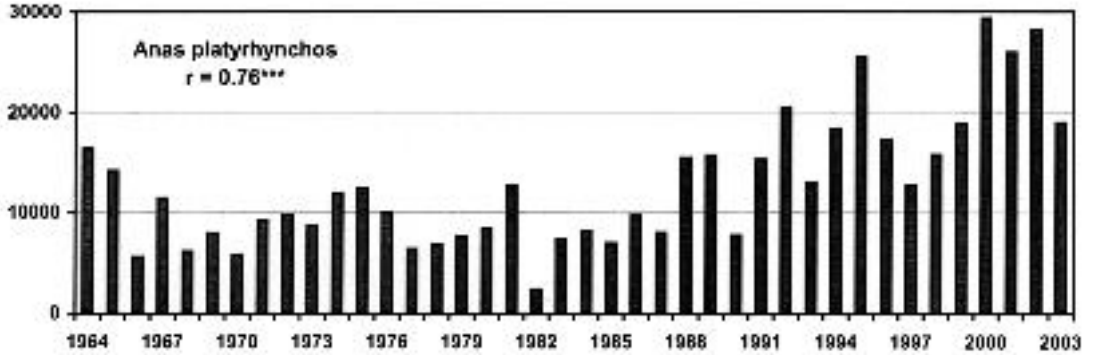
Figure 4. Annual totals for different species in the nine annually counted study areas (Figure 1) in January 1964–2003.
Årssummor för de olika arterna för de nio årligen inventerade områdena (Figur 1) januari 1964–2003.

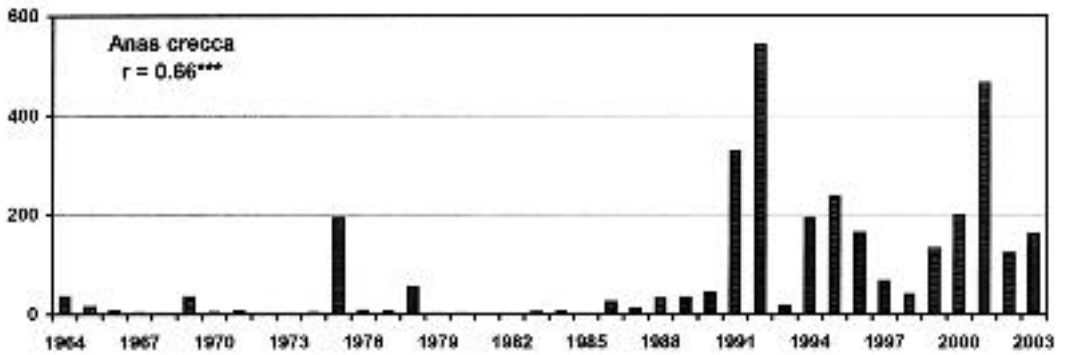

Gavia stellata
No counts 64-70
100
80
60
40
20
0
1964 1967 1970 1973 1976 1979 1982 1985 1988 1991 1994 1997 2000 2003

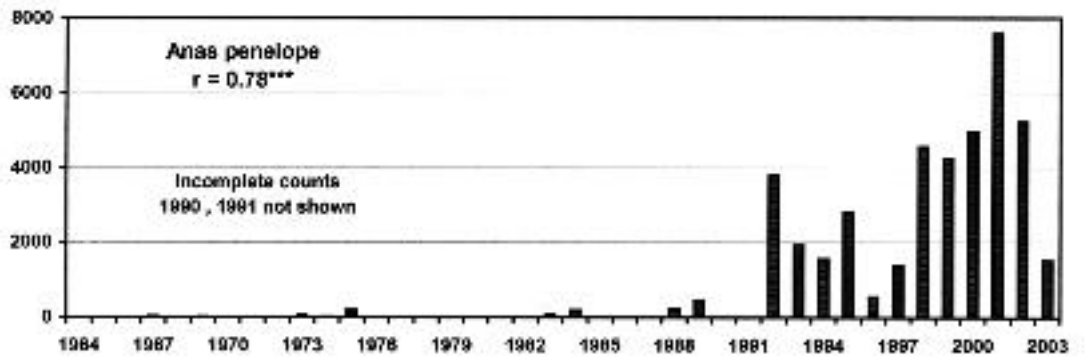

Podiceps cristatus
No counts 64-70
1200
800
400
0
1964 1967 1970 1973 1976 1979 1982 1985 1988 1991 1994 1997 2000 2003

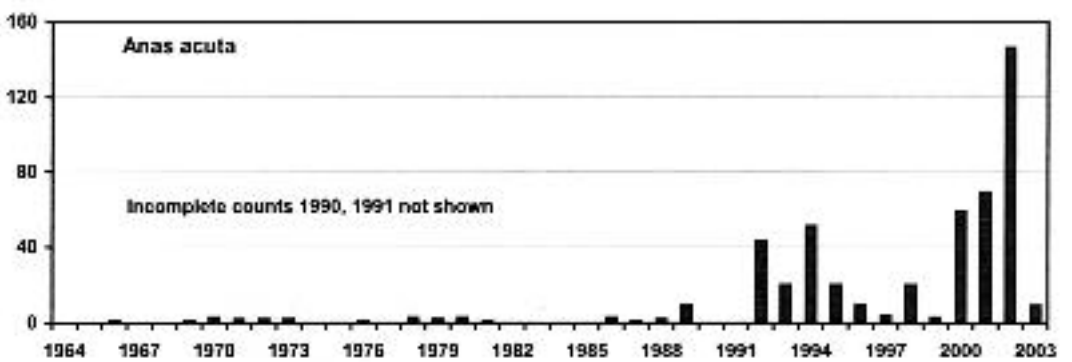

Ardea cinerea
No counts 64-70
200
150
100
50
0
1964 1967 1970 1973 1976 1979 1982 1985 1988 1991 1994 1997 2000 2003

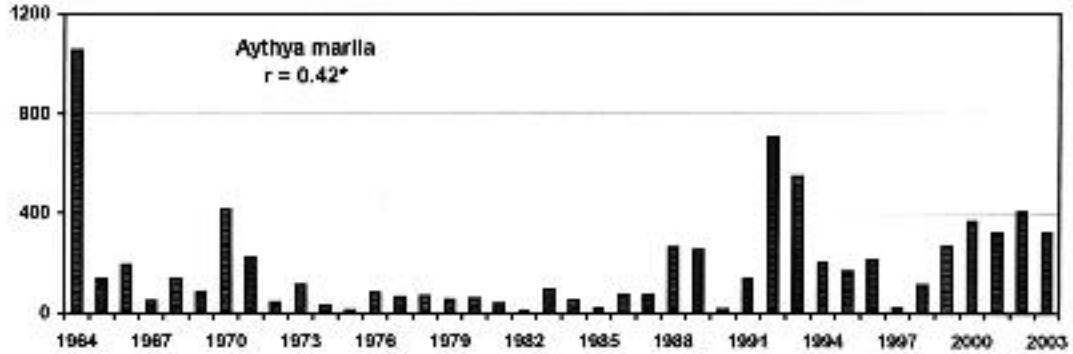

Phalacrocorax carbo
r = 0.71***
No counts 64-70
3000
2000
1000
0
1964 1967 1970 1973 1976 1979 1982 1985 1988 1991 1994 1997 2000 2003

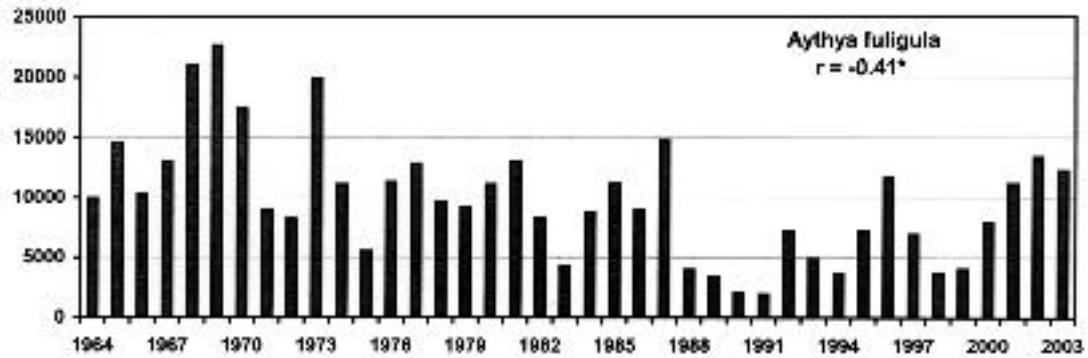

Anas platyrhynchos
r = 0.76***
30000
20000
10000
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003

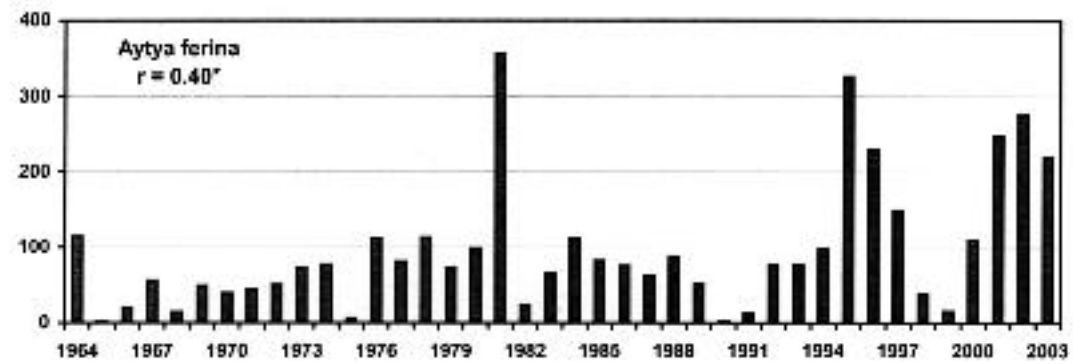

Anas crecca
r = 0.66***
600
400
200
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003

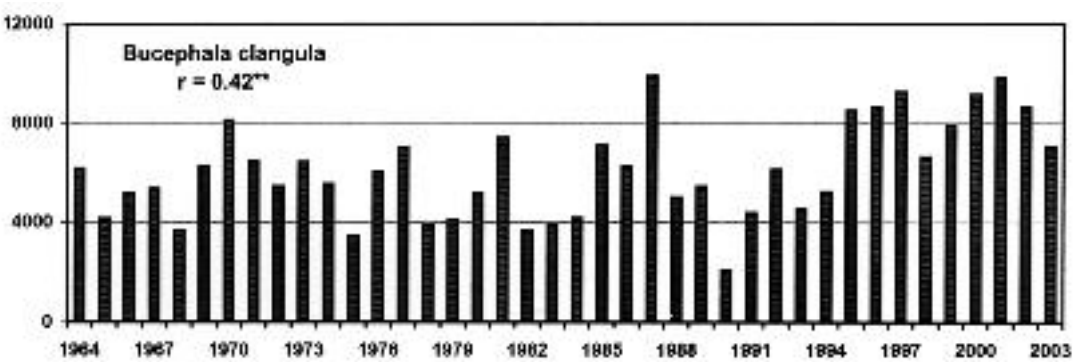

Anas penelope
r = 0.78***
Incomplete counts
1990 , 1991 not shown
8000
6000
4000
2000
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003

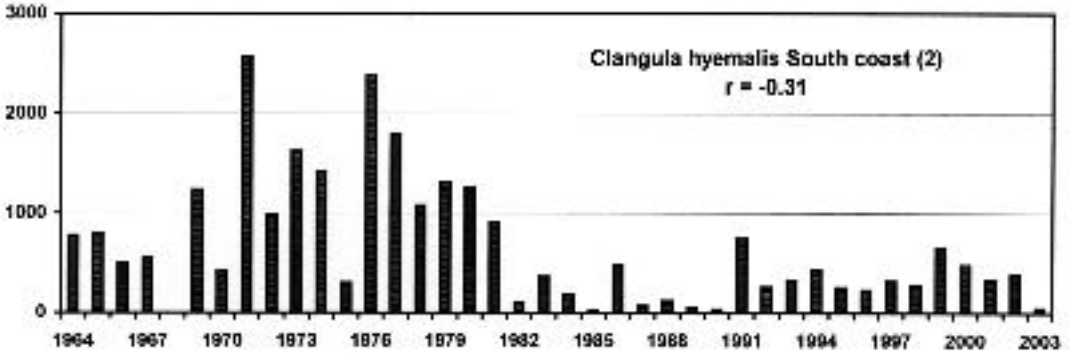

Anas acuta
Incomplete counts 1990, 1991 not shown
160
120
80
40
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003

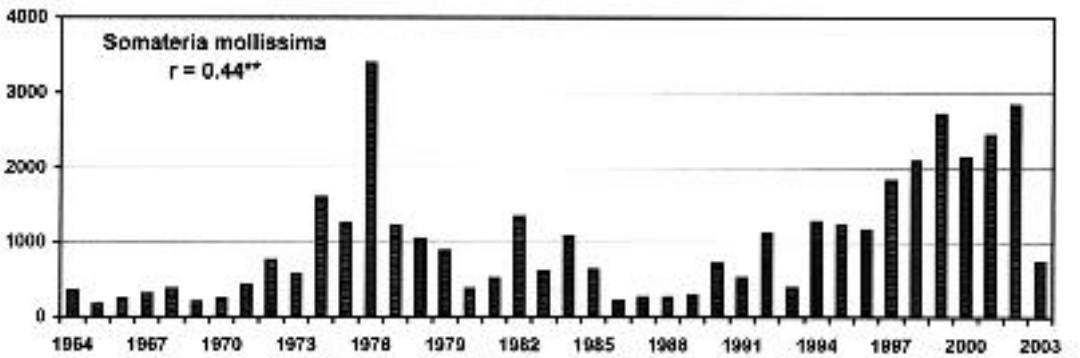

Aythya marila
r = 0.42*
1200
800
400
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003

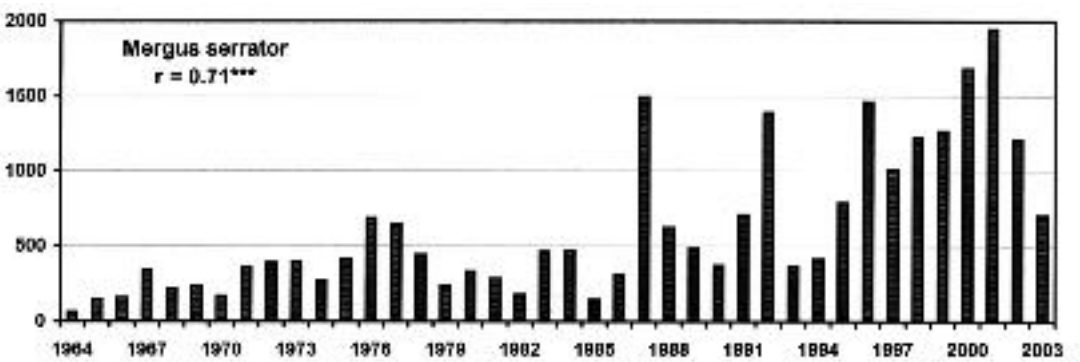

Aythya fuligula
r = -0.41*
25000
20000
15000
10000
5000
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003

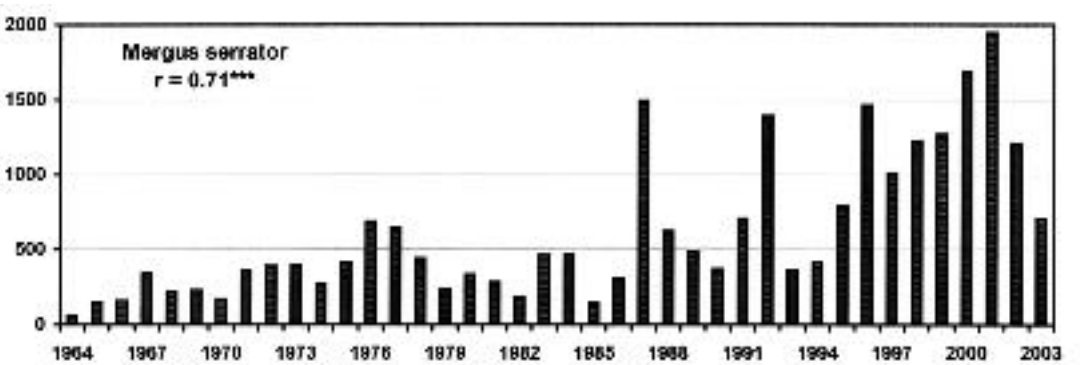

Aytya ferina
r = 0.40*
400
300
200
100
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003

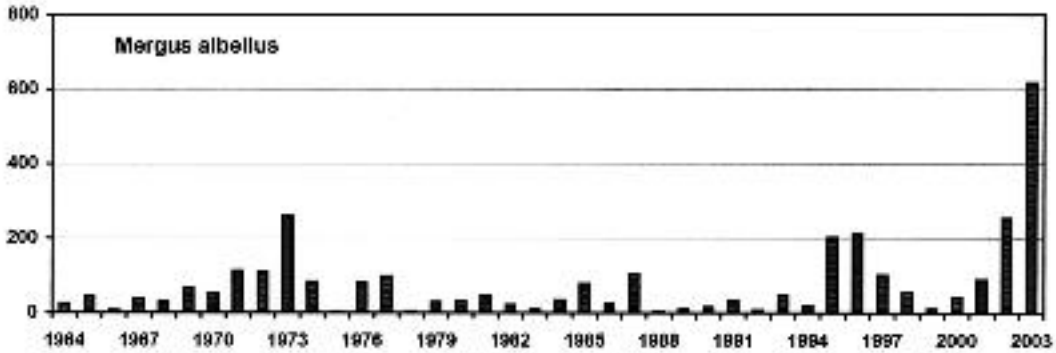

Bucephala clangula
r = 0.42**
12000
8000
4000
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003

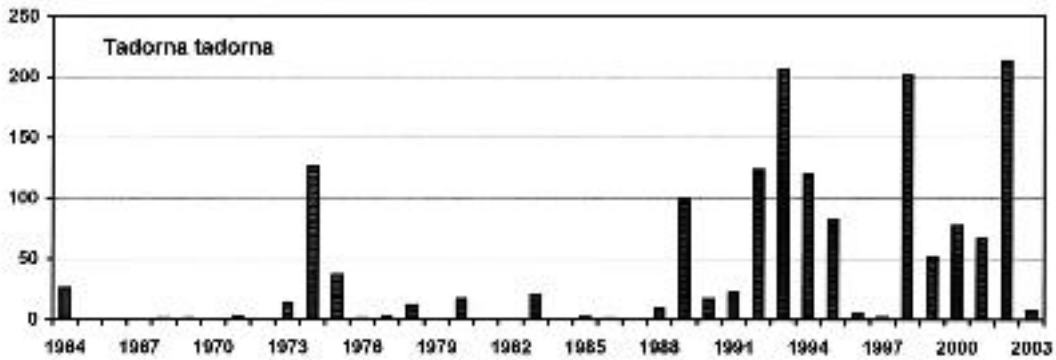

Clangula hyemalis South coast (2)
r = -0.31
3000
2000
1000
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003

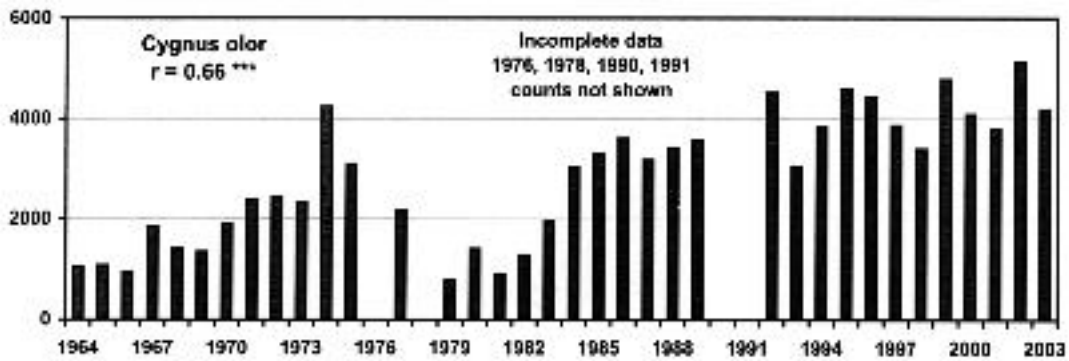

Somateria mollissima
r = 0.44**
4000
3000
2000
1000
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003

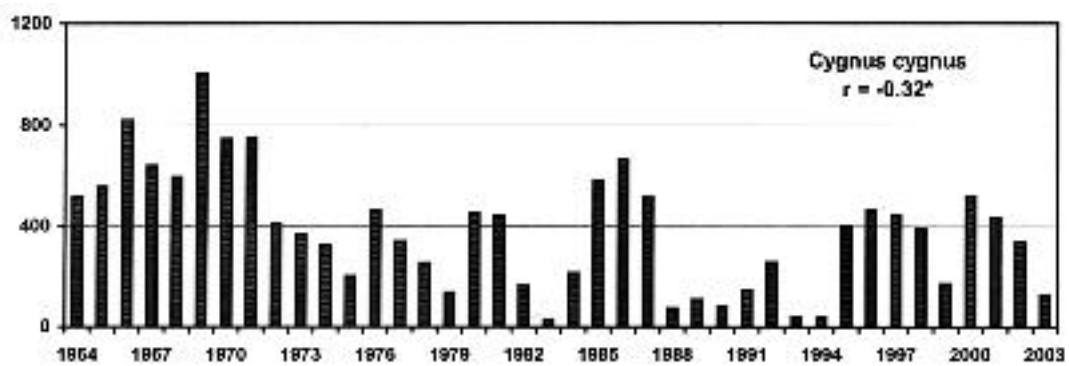

Mergus serrator
r = 0.71***
2000
1500
1000
500
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003

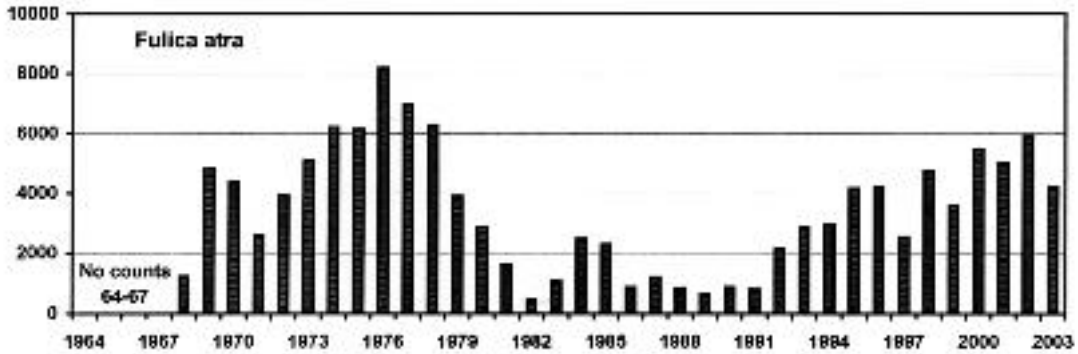

Mergus serrator
r = 0.71***
2000
1500
1000
500
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003


Mergus albellus
800
600
400
200
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003


Tadorna tadorna
250
200
150
100
50
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003


Cygnus olor
r = 0.66 ***
Incomplete data
1976, 1978, 1990, 1991
counts not shown
6000
4000
2000
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003


Cygnus cygnus
r = -0.32*
1200
800
400
0
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003



a high count was 1975, when close to 200 were counted. In 1991, 540 were counted, and in the following years more Teals were counted than before the 1990s. The Teals were mostly concentrated to a few sites in the Öresund region.

Wigeon *Anas penelope*
Before 1990, the Wigeon was a rare visitor to the Swedish coasts in winter, with even fewer observations than for the Teal. From 1992, there was a marked change, and a wintering tradition was established in the Öresund region, especially in the Foteviken area, with no less than 4000 in 1992, and a province total of 7500 in 2001. Note that Foteviken was not covered in 1990 and 1991, so the increase may have started two years earlier. The Wigeons remained even during the hard 1996 and 1997 winters, when 560 and 1390 Wigeons were counted, mainly in the southwest part of the province, especially Foteviken, but Wigeon flocks were also common in Lommabukten and Lundåkrabukten.

Pintail *Anas acuta*
The Pintail showed the same development as the Teal and Wigeon, only that the numbers were much lower. During the early years, until 1991 (no counts were made at Foteviken in 1990 and 1991), only single individuals were found, but after that year small groups were found in all years, the highest count being 146 in January 2002. The majority of the Pintails were found at Foteviken and Falsterbo in the south-west.

Scaup *Aythya marila*
The Scaup was relatively sparse. Totals exceeding 400 birds were registered in only five winters. The species was more common during the first eight years than in the period 1972–1987, higher number also being noted in the last eleven years. No trend could be found over the forty-year period. Small numbers of Scaup were found at several sites, but there was a concentration to the major sites for larger flocks of Tufted Ducks in the southern part of the Öresund. Even if the Scaups were generally found together with Tufted Ducks, they showed a clear concentration to the Malmö area, Klagshamn, and Falsterbo canal.

Tufted Duck *Aythya fuligula*
The Tufted Duck is the commonest diving ducks in South Swedish inshore waters in winter. The species was distributed around most of the coast of the province, and the only areas without observations of the species were the sandy beaches on the east coast and the southeast corner. The largest numbers were found in the Öresund region, but big flocks were also found on the south coast and in the north-east. Through the years, the largest flocks were found in the Malmö region, between the harbour of Malmö and Klagshamn (Figure 5). Especially during the first years of counts more than 10,000 individuals were counted here. During the latter part of the study period, the south coast had a higher proportion of the regional total then during the first part of the study

During the study period the Tufted duck showed a significantly decreasing trend. The first decade was characterized by three winters with more than 20,000 individuals, which has never occurred later. From 1988 onwards a number of winters with less than 5000 Tufted Ducks were noted, which has not happened earlier. Most areas showed the same decreasing trend as the overall index (Table 1)

Pochard *Aythya ferina*
The Pochard is a regular winter visitor in the province, but the numbers seen were normally small,

not much higher than 100, but in some years a few hundred were counted, especially during the mild winters in the latter part of the study period. Due to the mild winters in the end of the study period the overall trend is significantly increasing. The Pochards were well distributed along the coast, mostly in the flocks of Tufted Ducks.

Goldeneye *Bucephala clangula*
The Goldeneye was the second commonest diving duck species in the inshore waters during the study period. The Tufted Duck was commoner during the first years, whereas the opposite was found in the latter part of the study period. Overall, the counts showed a significantly increasing trend, from totals around 6000 when the counts started to between 8000 and 10,000 during the last years in the study period. As in the other species a marked variation was found between the years and in the cold winter of 1987 close to 10,000 were counted. As shown in Figure 5, the proportion of the Goldeneyes using the two Baltic areas has been more or less the same through the four decades, whereas a higher proportion has used the areas in the southwest due to the prevalence of milder winters during the latter part of the survey period.

The Goldeneye was distributed around most parts of the coast with the exception of the sandy beaches in the east and southeast. The majority was found on the south coast and in the Öresund as was the case for the Tufted Duck, but the species was more evenly distributed over areas with suitable habitats.

Long-tailed Duck *Clangula hyemalis*
The Long-tailed Duck is the commonest diving duck species in Baltic offshore waters (Nilsson 1991). Flocks of Long-tailed Ducks were found at most inshore sites along the Scanian coast at least during some counts, whereas observations in the Öresund were much more irregular and only of single birds or small flocks. Recent boat counts in the southern part of the Öresund have, however, shown that smaller flocks are regular in the offshore water here (Green & Nilsson unpubl.).

The south coast (No 2 in Figure 1) is an important area for the Long-tailed Duck and a high proportion could be seen from the shore. The numbers were much smaller during the latter half than during the first part of the study period. Counts from the other areas are not included in the diagram as it was not possible to get a representative picture of the occurrence of Long-tailed Ducks in those areas from the shore.

Velvet Scoter *Melanitta fusca* and Common Scoter *Melanitta nigra*
The Scoters are typical off-shore species and are not possible to count accurately from the shore. Varying numbers of both species, up to a few hundred, were counted in some years. The flocks were found in the Hanöbukten area on the east coast and in Skäderviken in the northwest with only small numbers in the other areas.

Eider *Somateria mollissima*
The Eider is a typical west coast species in Sweden with only small numbers in the Baltic (Nilsson 1991). This was also seen in the local distribution of wintering Eiders in Scania, where there is a marked concentration to the northern part of the Öresund and Skälderviken, but Eiders were also seen in small numbers on open moraine coasts, especially at the south coast. The proportion of

Table 1. Trend analysis for the more common species in the different sub-areas at the coasts of Scania (see Figure 1). ***, **, and * denotes P<0.001, P<0.01 and P<0.05, respectively.
*Trend analys för de vanligaste arterna inom olika delområden efter den skånska kusten (se Figur 1). ***, ** och * betecknar P<0.001, P<0.01 respektive P<0.05.*

	1	2	3	4	5	6	7	8	9
Anas platyrhynchos	0.75***	0.58***	0.44*	0.42*	0.72***	0.01	0.44*	0.20	0.69***
Aythya fuligula	-0.51***	-0.89***	0.18	-0.50**	0.58***	-0.46**	0.16	-0.81***	-0.02
Bucephala clangula	0.72***	0.37*	0.44**	0.48**	0.33	-0.17	0.60***	-0.64***	0.24
Somateria mollissima	-0.45**	-	-0.59***	-	-0.79***	-0.86***	-0.98***	0.47**	0.99***
Mergus serrator	0.51***	0.68***	0.30	0.25	0.47**	0.56***	0.45**	0.24	-0.05
Mergus merganser	0.64***	-0.17	0.22	-0.5***3	0.59***	-0.23	-0.31	-0.37*	0.20
Cygnus olor	0.63***	0.16	0.39*	0.45**	0.51***	0.31	0.42**	0.44**	0.20
Phalacrocorax carbo	-	0.88***	0.99***	0..93***	0.77***	0.49**	0.74***	0.97***	-

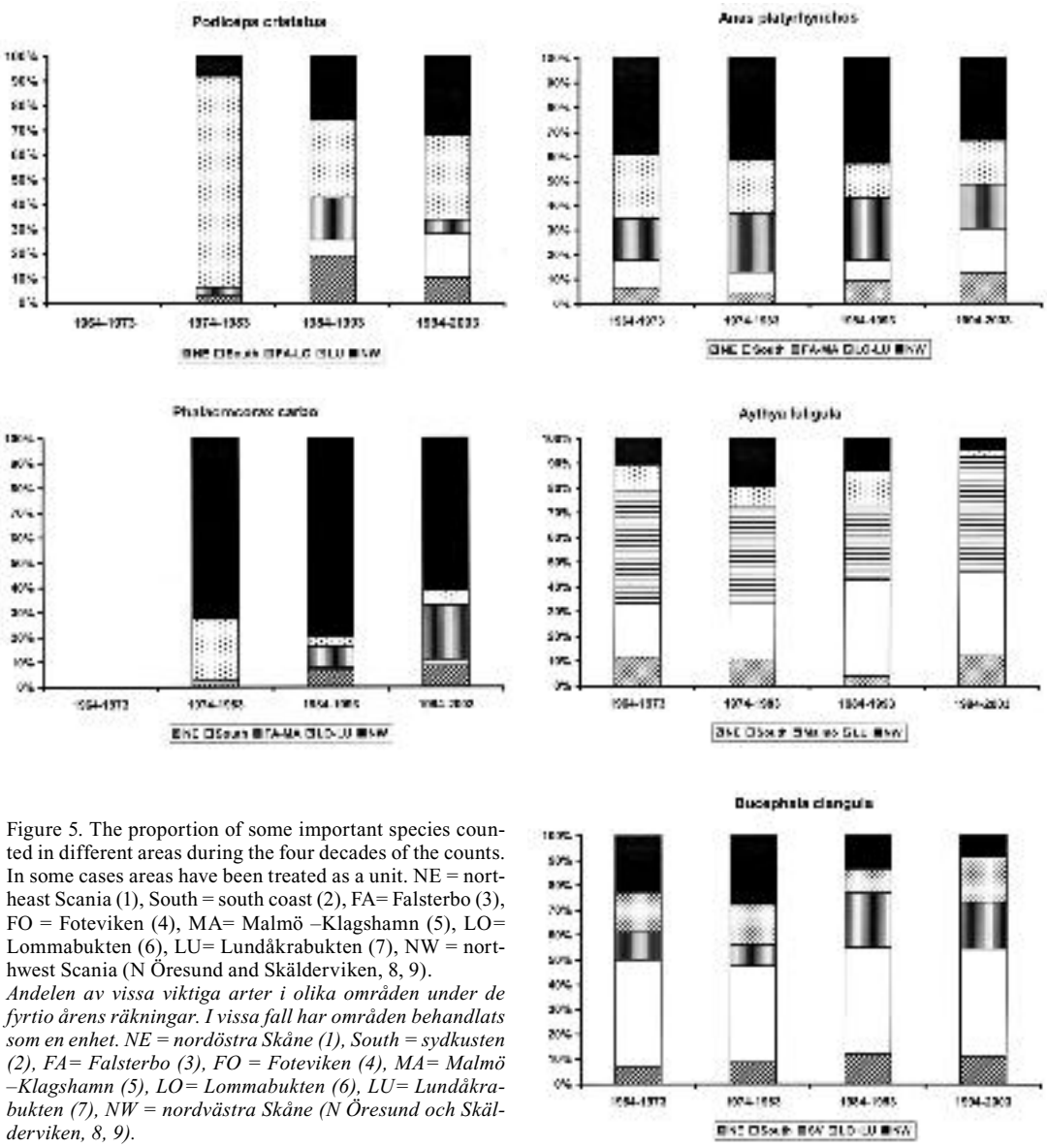
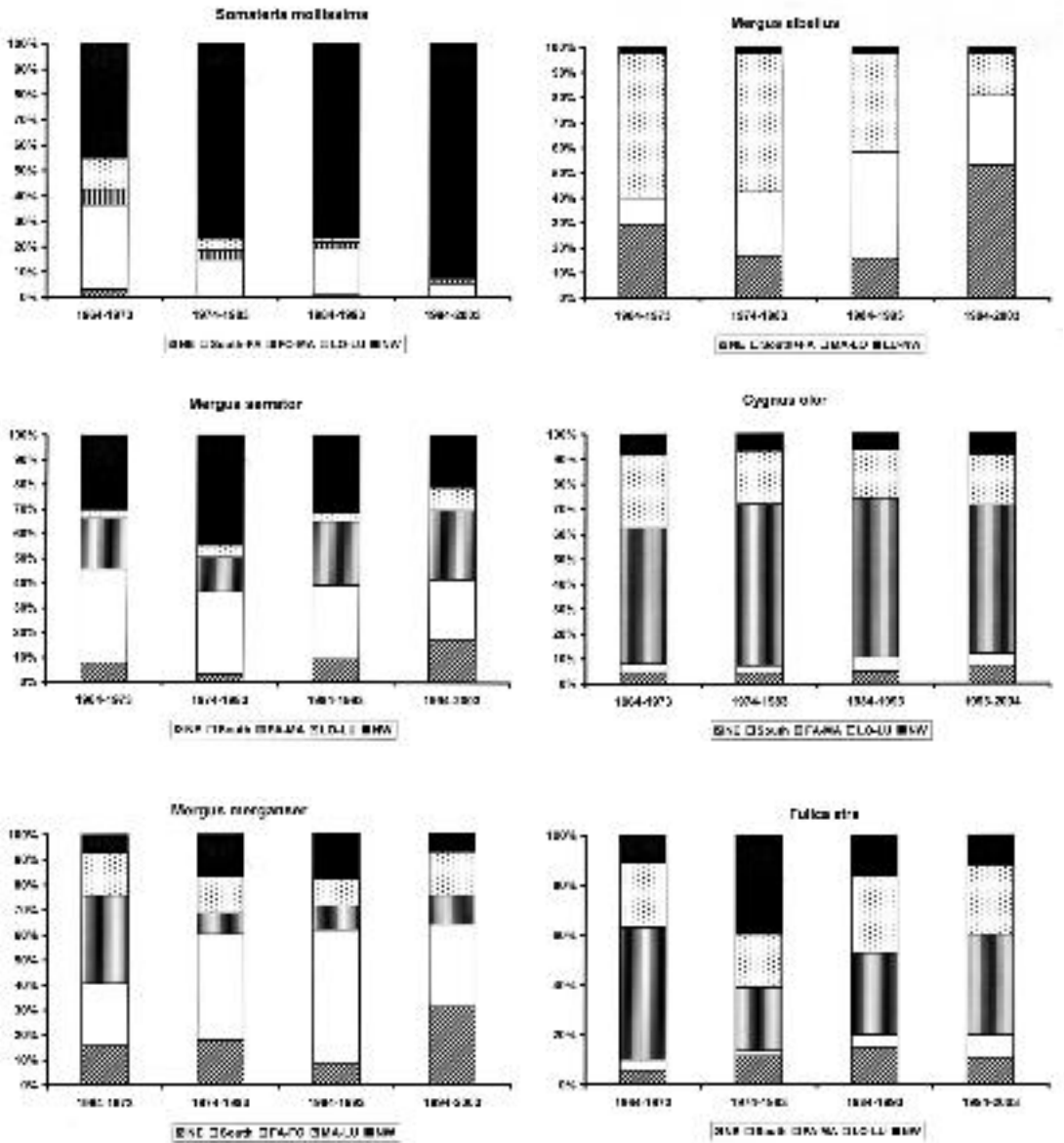


Figure 5. The proportion of some important species counted in different areas during the four decades of the counts. In some cases areas have been treated as a unit. NE = northeast Scania (1), South = south coast (2), FA= Falsterbo (3), FO = Foteviken (4), MA= Malmö –Klagshamn (5), LO= Lommabukten (6), LU= Lundåkrabukten (7), NW = northwest Scania (N Öresund and Skälderviken, 8, 9).
Andelen av vissa viktiga arter i olika områden under de fyrtio årens räkningar. I vissa fall har områden behandlats som en enhet. NE = nordöstra Skåne (1), South = sydkusten (2), FA= Falsterbo (3), FO = Foteviken (4), MA= Malmö –Klagshamn (5), LO= Lommabukten (6), LU= Lundåkrabukten (7), NW = nordvästra Skåne (N Öresund och Skälderviken, 8, 9).

the overall totals counted in NW Scania increased during the study period (Figure 5).

The number of wintering Eiders in the province was mostly low, normally less than 1500. Some years in the latter part of the study period showed higher totals. The overall data show a significantly increasing trend, but the pattern can more properly be described as two periods with higher counts with lower number seen in between during the 1980s. The two areas in the NW showed increasing trends, whereas trends were unclear or decreasing in the other areas, in line with the pattern shown in Figure 5.

Red-breasted Merganser *Mergus serrator*
The Red-breasted Merganser was found along most parts of the Scanian coast with the exception of the SE, where observations were less common.



Concentrations were found in the southwest and on parts of the south coast. This species also occurs far out at sea and the counts from the shore do not give a representative picture of the total number present in an area. This is illustrated by boat surveys in the southern part of the Öresund (in the offshore waters out of sites 4 and 5, Figure 1), where a few thousand mergansers have been found (Green & Nilsson unpubl.).

The Red-breasted Merganser on inshore waters showed a highly significant increasing trend, even if there was quite considerable variation in the counts between different years. Before 1987, more than 500 mergansers were only rarely seen in the nine areas, whereas counts of over 1000 were obtained in most of the recent years. Significantly increasing trends were found in five areas, the other areas also showing a positive tendency

or no trend (Table 1). No significant changes in the proportions counted in different areas were found between the four decades (Figure 5).

Goosander *Mergus merganser*
The Goosander is more of an inland species than the Red-breasted Merganser, mostly being seen in any numbers at the coasts first when the inlands waters are freezing. The distribution along the coasts of the province was very similar to that of the Red-breasted Merganser, wintering Goosanders being seen on most coasts except the open beaches on the east and southeast coast. A concentration of observations was noted to the southwest and the south coast (cf. also Figure 5).

The counts showed much variation over the years. The highest counts were found in 1970 and 1987, two extreme ice winters with very little open water in inland Sweden. Even if there is much variation between the years it is clear that the Goosander has been more sparse at the coast during the last 15 years compared to the first 25 years of midwinter counts, and the overall trend is slightly decreasing, whereas two sites showed increasing trends and two decreasing trends (Table 1).

Smew *Mergus albellus*
The Smew is an even more typical inland species than the Goosander. Most coastal flocks have been found in three areas: the northeast, the Falsterbo peninsula and Lommabukten, especially in the Malmö area (Figure 3 and 5). All these areas are characterized of protected areas at sea. Normally the number of Smews was small, with totals exceeding 100 only in few winters, four of the five in the last decade. A very high count of no less than >600 were noted in January 2003.

Shelduck *Tadorna tadorna*
Small numbers of Shelduck were regular, either wintering birds or newly arrivals. Numbers counted are normally low, and the majority of the birds are found in Foteviken – Falsterbo in the southwest and Skälderviken in the north-west.

Mute Swan *Cygnus olor*
The Mute Swan is a common winter visitor to the coasts of Scania. The distribution was markedly concentrated to the Öresund, especially to the Foteviken and Falsterbo areas, but also to Lundåkrabukten and Lommabukten (Figure 3 and 5). In most parts of the south and east coast only small numbers were counted with the exception of the northeast corner, where swan flocks were regular as in the Öresund.

The number of Mute Swans showed a marked increase during the study period and the overall trend is highly significant. A closer look at Figure 4 shows that the Mute Swans increased during the first ten years. Then followed a period of low counts and then numbers started to increase again during the 1980s. During the first years of midwinter counts normal totals on the nine sites included in this study were between 1000 and 2000 individuals to be compared to between 4000 and 5000 for the latter part of the study period. All areas showed the same increasing trend, the trend being significantly positive for six areas of nine (Table 1).

Whooper Swan *Cygnus cygnus*
The Whooper Swan showed a similar distribution as the Mute Swan, but it was even more concentrated to the Öresund and especially to some areas, whereas only small numbers were counted elsewhere with the exception of the northeast corner.

During the first eight years, more than 500 Whooper Swans were counted, with a maximum of about 1000 in the winter of 1969. In later years much lower numbers were counted and in some winters, such as 1993 and 1994, only very few. The overall trend was significantly decreasing. This coastal trend is in clear contrast to the general increasing trend of the Whooper Swan population. This contrast can be explained by the fact that an increasing proportion of the Whooper Swans are now using terrestrial areas for feeding instead of aquatic ones and were thus not covered by the counts (cf. Nilsson 1997).

Coot *Fulica atra*
The Coot was a common winter visitor to the coasts of Scania during the study period. It was mostly concentrated to the Öresund and the western part of the south coast, but some flocks were found in protected places on south and east coasts. In three of the four decades the majority of the Coots were counted between Lundåkrabukten and Falsterbo (incl.), but during 1974–1983 a much higher proportion was found in the NW than in the other decades (Figure 5).

When Coots were included in the counts in 1968, the total was about 1000 individuals, but numbers increased markedly and more than 8000 were counted in 1976. Numbers then decreased to a very low level in the ice-winter of 1982 and remained low for about ten years. Then a second

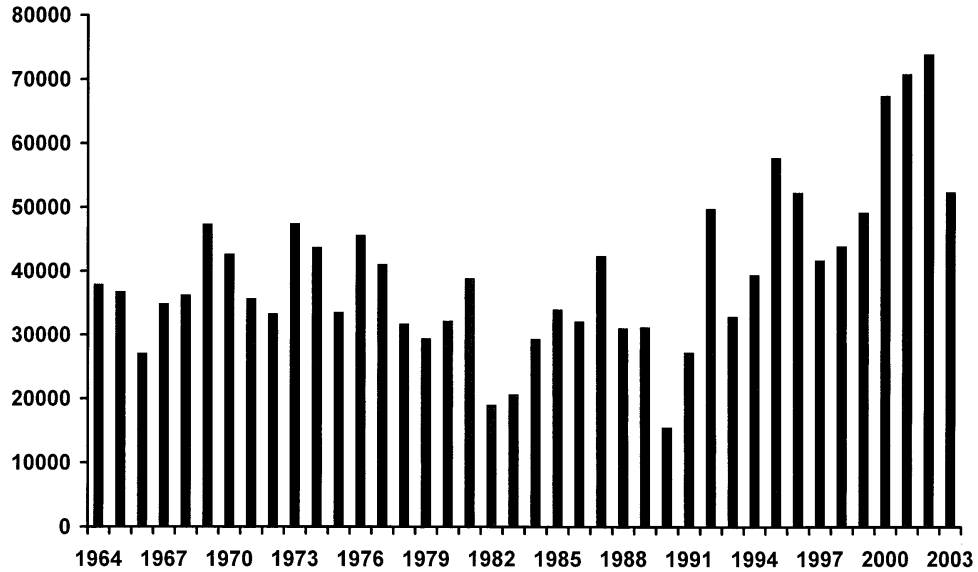


Figure 6. Total numbers of all waterfowl species counted in the nine areas (see Figure 1) in January 1964–2003.
Antal inräknade individ av samtliga vattenfågelarter i de nio delområdena (Figur 1) i januari 1964–2003.

increase started, but the peak counts in the last few years has been lower than during the 1970s. The counts in the different areas have shown much variation, but the general pattern has been the same in all sites, especially in the main areas of the Öresund.

Other species

In contrast to the other dabbling ducks, the Shoveler *Anas clypeata* has only been included in the counts in five of forty years, the highest total being 22 individuals. The Gadwall *Anas strepera* was only seen with single individuals on two occasions before 1991, but has after that been close to annual but still in small numbers. Single Steller´s Eider *Polysticta stelleri* were found in 13 of the forty years, whereas single individuals of King Eider *Somateria spectabilis* were reported in three years. Moreover, small numbers of Black-throated Divers *Gavia arctica* were counted in most years. Red-necked Grebes *Podiceps griseigena*, Slavonian Grebes *Podiceps auritus* and Little Grebes *Tachybaptes ruficollis* were counted in small numbers in most years since these species were included in the programme.

Discussion

The coasts of Scania is an important area for a number of wintering waterfowl species. The total counted in the nine study areas varied between about 20,000 and 75,000 in the different years (Figure 6), the lowest count being obtained during the cold ice-winter of 1982 and the highest count in the much milder winter of 2002. In the years with full coverage of all coastal areas of the Scanian coast, overall totals were generally about 5000 to 10,000 higher, excluding offshore Long-tailed Duck areas, the majority of the important inshore areas being included among the localities in the annual sample. Some of the areas even qualify as internationally important wintering areas based on the counts presented here, e.g. the Goldeneye on the south coast and the Mute Swan in the southern part of the Öresund (cf criteria presented by Delany et al. 1999).

Over the forty year period considered here significant trends were found for 13 out of 15 species with enough data to calculate trends (cf. Figure 4). In most cases the counts in the nine areas showed the same general trends as the regional indices, of which they form part, even if there were exceptions where some areas showed an opposite trend to the general picture, or more common that trends were found in some areas whereas other sites merely showed variations between years.

In several cases the time series could actually be broken down in different shorter series, which may show significant trends going in different directions in different time periods. A typical exam-

ple of this pattern is the Coot, which showed an increase over the first years to a peak in 1976, then a markedly decreasing trend to a very low count for a number of years, followed by an increasing trend during the last twelve years.

Among the 13 species showing significant trends over the forty years, 10 showed increasing trends, whereas only three showed a significantly decreasing trend. A number of other species were regularly counted in numbers during the latter part of the period, but was only seen in quite small numbers during the first part of the period. In the overall totals, numbers from 1964–1988 can actually more be described as fluctuations around a slowly decreasing trend, whereas there was a marked increase during the 1990s and during the first years of the 2000s (Figure 6).

This marked preponderance for increasing trends in the number of wintering waterfowl at the coasts of Scania can most certainly be related to the series of mild winters since the last really hard winter of 1987, whereas the earlier years of the counts were characterized by a series of cold winters with much ice: 1970, 1979, 1982 and 1985. Moreover the winter just before the counts started, 1963, was one of the coldest for a long period. The influence of weather factors on fluctuations in wintering waterfowl numbers will be adressed in another context also including data from other areas.

For the Goosander and the Coot the Scanian indices did not show any clear trend over the forty-year period. The same applies to the national indices for which Scania forms an important part. The Coot showed the same pattern in both the national and regional indices with a marked decrease in the late seventies followed by low indices for a decade and an increase again in the nineties. In the national indices this decrease was very clearly connected to the cold winter of 1979. The international indices showed the marked decrease noted in the Swedish national indices in the series form the entire Baltic, whereas there was no such trend for northwest Europe, nor for central Europe (Delany et al. 1999). The species is known to be sensitive for cold winters (Cave & Wisser 1985, Nilsson 1984).

Three species showed significantly decreasing trends in the regional indices. The number of Tufted Ducks wintering in Scania decreased, whereas the numbers wintering in other regions showed the opposite trend, the national indices showing a significantly increasing trend (Nilsson unpubl.). The international indices (Delany et al. 1999) show a significant increase for the Tufted Duck in the Baltic/Nordic and Central European regions, whereas the North-west European indices show a steady level. The changes in Sweden can thus be caused either of a general population increase in Europe or a redistribution in response to mild winters, or a combination of both factors.

In the Tufted Duck the local situation in Scania, and especially in the Öresund, can have influenced the numbers wintering here during different periods. The Tufted Ducks feed on different benthic animals, the blue mussel Mytilus edulis being of special importance (Nilsson 1972). During the 1960s, large flocks of feeding Tufted Ducks were regularly found close to sewage outlets in the southern part of the Öresund around Malmö. When new sewage treatment plants were installed, parts of the richest feeding areas disappeared and there were no more observations of really big flocks of Tufted Ducks in the area. This factor in combination with the milder winters, allowing the birds to stay further north, may explain the opposite trend in the regional indices.

The Whooper Swan also showed a decreasing trend at the coasts of Scania, whereas the national indices show a slightly increasing trend. In this case the decreasing trend for the coasts in Scania merely reflects a marked change in habitat choice in the Whooper Swan over the years from aquatic feeding to terrestrial feeding (Nilsson 1997, 2002). The overall international trend shows a significant and clear increase (Delany et al 1999).

For the third of the species showing decreasing trends, the Long-tailed Duck, there are no trend data from other parts of Sweden (or internationally) but it is probable that the decrease at the coasts of Scania reflects a change in the winter distribution in relation to the warmer winters.

In the other species, Cormorant, Mallard, Pochard, Goldeneye, Eider, Red-breasted Merganser and Mute Swan, the regional and national indices (Nilsson unpubl.) both show significantly increasing trends over the forty years.

In the Mute Swan, Goldeneye for the north-west and Baltic regions and the Red-breasted Merganser, the international indices show increasing trends, whereas the indicated level for the Pochard was more of a steady level. Increasing indices for the Cormorant reflect the very marked increase in the breeding population in the region in recent decades (Bregnballe et al. 2003).

In the Mallard, the international indices show a varying picture, even if the Nordic indices show an increased level during the last years, as is the

case of the Swedish national indices, which form an important part of the Nordic sample. There is no indication of a generally increasing trend in the international midwinter indices for the Mallard (Delany et al 1999), so the increase in national and regional Swedish indices is most probably an effect of an increasing tendency to stay for the winter during the recent milder winters.

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Sammanfattning

I januari 1964 genomfördes för första gången en heltäckande sjöfågelinventering av den skånska kusten (Nilsson1974, 1977, 1983, 1994). Inventeringarna startades som ett led i undersökningar över speciellt dykändernas uppträdande efter de svenska kusterna. När de internationella sjöfågelinventeringarna (IWC = Iterntional Waterfowl Census) startades 1967 kom de skånska inventeringarna att ingå som en viktig del i det svenska nätverket. Syftet med IWC som samordnas av Wetlands International är bl.a. att fastställa vattenfåglarnas populationsstorlek och utbredning samt att följa långtidsförändringar i bestånden och ge underlag för skydd av vattenfåglarna och deras habitat på en internationell nivå (Delany et al. 2002, Gillissen et al. 2002).

För att fullfölja syftet med IWC organiserades till en början landsomfattande inventeringar eller i varje fall eftersträvades så bra täckning som möjligt, så även i Sverige (Nilsson 1975), men det visade sig efter ett antal år inte vara fullt realistiskt att genomföra heltäckande inventeringar varje år, utan inventeringarna koncentrerades till ett standardiserat nätverk av lokaler, vilka inventerades varje år, och däremellan enstaka landsomfattande inventeringar (Nilsson 1991).

I denna uppsats sammanfattar jag resultaten från de första fyrtio åren av inventeringar längs de skånska kusterna och analyserar trender och fluktuationer i vattenfågelbestånden på en regional nivå. Tidigare lokala rapporter från Skåne (med mer heltäckande inventeringar) har publicerats tidigare (Nilsson 1974, 1977, 1983, 1994).

Inventeringarnas täckning

Hela den skånska kusten har delats in i 150 räkningsenheter, inkl. yttre havsområden, vilka inte diskuteras vidare i detta sammanhang. Under 1964–1976, 1978, 1979, 1982, 1987–1989 och 1993 inventerades nästan samtliga räkningsenheter, medan inventeringarna övriga år koncentrerades till 8 större områden mellan Torekov och Ystad samt ett större område i nordöstra Skåne (Figur 1), vilka i princip inventerats samtliga år. Inventeringarna har i huvudsak genomförts av landbaserade observatörer, men vid vissa av de heltäckande räkningarna har dessa kompletterats med flyg.

Väderlek och isförhållanden

Väder och speciellt isförhållandena i Skåne och inte minst i områdena norr om Skåne har stor betydelse för de övervintrande sjöfåglarna i området. Väder och isförhållandena har varierat en hel del under perioden, men i huvudsak har den senare halvan av inventeringsperioden varit betydligt mildare än den första (Figur 2). Fram till och med 1988 alternerade kalla och milda vintrar, men från och med 1989 har vintrarna varit milda med undantag för kortare kalla perioder i januari 1996 och 1997. Betydande isläggning efter de skånska kusterna, men även längre norrut i landet, förekom 1966, 1970, 1979, 1982, 1985, 1987, 1996 samt före en kort period 1997. I sammanhanget bör också nämnas att vintern innan inventeringarna startade, 1963, var en extremt hård och lång vinter.

Resultat och diskussion

De olika arternas uppträdande efter de skånska kusterna visas i utbredningskartor i Figur 3, medan de årliga summorna för de viktigaste arterna på de nio inventeringsområdena framgår av Figur 4. Utbredningskartorna baseras på det samlade materialet och inte enbart på inventeringarna inom de nio referensområdena. För de vanligaste arterna presentera dessutom fördelningen på delområden under de fyra olika decennierna i diagram (Figur 5).

Den skånska kusten utgör ett viktigt övervintringsområde för sjöfåglarna och antalet totalt inräknade individ inom de nio delområdena har varierat mellan 20.000 den kalla vintern 1982 och 75.000 den milda vintern 2002 (Figur 6). Hade hela kusten kunnat inventerats hade troligen totalsumman uppgått till 5000–10.000 fler fåglar.

Regionsummorna för de vanligare arterna visar signifikanta trender över de fyrtio åren för 13 av de 15 arter där sådan analys varit meningsfull. I flertalet fall har de olika delområdena visat samma trend, men i en del fall har skillnader kunnat konstateras mellan olika delområden.

I åtskilliga fall har den långa tidsserien kunnat brytas ner i mindre serier som visat olika trender. Ett exempel på detta är sothönan, som först ökade, sedan minskade speciellt efter den kalla vintern 1979 och sedan efter en period med låga jämna index åter ökade markant. I detta fallet kan mönstret förklaras av artens känslighet för kalla vintrar.

För de 13 arter där signifikanta trender kunnat konstateras, var trenden positiv i 10 fall, medan endast tre arter visade minskande trender. Den markanta dominansen för ökande trender kan säkert sättas i samband med serien relativt milda vintrar under den senare delen av undersökningsperioden, medan den första hälften kännetecknades av flera kalla vintrar.

En jämförelse mellan indexserierna för Skånekusten och de nationella midvinterindex, i vilka de skånska lokalerna ingår som en viktig del, visar en god överensstämmelse. För tre arter noterades minskande trender i de regionala index. Av dessa hade sångsvanen och viggen en ökande nationell trend, medan nationella index saknas för den tredje arten, alfågeln. För sångsvanens del kan skillnaden förklaras i ändrade furageringsvanor. Fler och fler sångsvanar har börjat söka föda på land, medan antalet sångsvanar vid kusterna minskat. Totalinventeringar (Nilsson 1997, 2002) har istället visat på klart ökande antal sångsvanar.

För viggens del kan den nedåtgående trenden i regionindex och den ökande trenden i det nationella index förklaras av en förändrad vinterutbredning till följd av mildare vintrar under den senare delen av inventeringsperioden. Dessutom har födounderlaget i södra Öresund försämrats sedan de rika musselbankarna vid utsläppspunkterna för avloppen från Malmö försvunnit i samband med utbyggnaden av reningsverken.

För storskarven, gräsanden, brunanden, knipan, ejdern och småskraken visar både de regionala och nationella indexserierna ökande trender. För knölsvanen, knipan och småskraken visar de internationella index för Östersjöområdet och nordvästra Europa ökande index (Delany et al 1999), medan de internationella index för brunanden visar en stabil nivå. De internationella gräsandindex visar betydande skillnader mellan regionerna även om Norden haft en ökande trend.