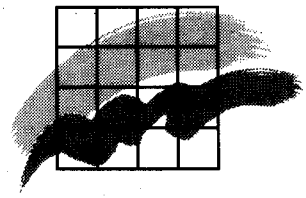

Waterbird Numbers in the Baltic Sea, Winter 1993

NERI Technical Report no. 145

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Department of Wildlife Ecology

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Ornis Consult A/S

Ministry of Environment and Energy
National Environmental Research Institute
December 1995

Data sheet

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Contents

Summary

During winter 1993, an almost complete survey of waterbirds was carried out in the coastal and offshore areas of the Baltic Sea from the southern coasts north to about 60°N. The coastal areas were surveyed by aerial and ground counts, whereas offshore waters were surveyed from ships and a few areas from aircraft.

Additional information based on results from previous midwinter counts was substituted for some uncovered parts of the Swedish area, freshwater sites in Poland and Germany and for the whole of Denmark.

The numbers of waterbirds wintering close to the coast were generally high and for most species exceeded previous estimates for the Baltic Sea.

In offshore areas, extensive seaduck wintering grounds were located in Riga Bay, in the area around Gotland and Øland in Sweden and in the Pomeranian Bay.

Seaduck species such as Scaup, Eider, Common Scoter and Red-breasted Merganser which mainly winter in the western part of the Baltic Sea were numerous, but the count results differed little from the current knowledge of the numbers of these species.

Seaducks which are concentrated mainly in the eastern or central parts of the Baltic Sea such as Long-tailed Duck and Velvet Scoter occurred in numbers that far exceed the current estimates for the Baltic Sea, adding so much to the totals that the flyway population estimates for these species are under revision.

Two species, Steller's Eider and Smew, which are scarce in Europe need particular attention in terms of monitoring and conservation, as a considerable proportion of these birds are concentrated in a few Baltic areas.

Dansk resume

I vinteren 1993 blev der foretaget en næsten fuldstændig optælling af vandfugle i Østersøen. Såvel den kystnære zone som åbne havområder fra den sydlige kyst op til 60°N blev dækket. Vandfuglene i kystområderne blev optalt fra fly eller fra land, mens de åbne havområder blev dækket fra skib med enkelte supplerende optællinger fra fly.

Yderligere data baseret på tidligere midvinteroptællinger blev inkluderet for udækkede områder i Sverige, ferskvandslokaliteter i Polen og Tyskland samt hele Danmark.

Antallene af kystnære vandfugle var generelt høje og for de fleste arter højere end tidligere anslået for Østersøen.

I de åbne havområder blev der lokaliseret meget betydelige overvintringsområder for havdykænder i Riga Bugt, farvandene omkring Gotland og Øland i Sverige samt Pommern Bugt.

Antallene af havdykandearterne Bjergand, Ederfugl, Sortand og Toppet skallesluger, der overvejende overvintrer i den vestlige del af Østersøen, var høje men afveg ikke væsentligt fra den hidtidige viden om disse fugles antal.

De to arter, Havlit og Fløjlsand, der overvejende overvintrer i de østlige eller centrale dele af Østersøen, blev optalt i antal, som langt overgår bestandsestimaterne for hele regionen. Der er således behov for at opdatere disse arters bestandsestimater for Nordvesteuropa alene på grund af resultaterne fra denne optælling.

To arter, Stellersand og Lille skallesluger, anbefales tildelt speciel opmærksomhed i forbindelse med overvågning og forvaltning, da en betydelig del af deres sparsomme og koncentrerede vinterkvarterer i Nordvesteuropa findes i Østersøen.

1 Introduction

The Baltic Sea contains a number of lagoons, sheltered bays, archipelagoes and shallow offshore areas which serve as excellent habitats for wintering waterbirds.

From the mid 1960s a number of ground counts and aerial surveys of coastal waterbirds have been carried out in most of the countries bordering the Baltic Sea (Denmark: Joensen 1974, Sweden: Nilsson 1975, 1991, former East Germany: Rutschke 1985, Latvia: Viksne & Stipniece 1988, Poland: Zyska et al. 1990, Estonia: Kuresoo 1992, Denmark: Pihl et al. 1992, Germany: Struwe & Nehls 1992, Lithuania: Svazas & Vaitkus 1992, Poland: Dombrowski et al. 1993, Finland: Hario et al. 1993, Denmark: Laursen et al. in prep). On this basis a large number of internationally important sites for waterbirds have been designated. However, no attempt has ever been made to coordinate these efforts into a total survey of waterbirds throughout the whole waterbody during a single winter.

Only a few offshore areas in the western part of the Baltic Sea have previously been surveyed (Nilsson 1980, Skov et al. 1987, Meissner 1993, Laursen et al. in prep.) before the initial total ship survey in 1992 (Durinck et al. 1993). Early radar studies in southern Finland (Bergman & Donner 1964) suggested that far higher numbers of seaducks passed through on spring migration than the midwinter counts in the Western Palearctic could account for, and Laursen (1989) suggested that extensive wintering grounds for seaducks might be present in the superficially covered areas from Estonia to Germany.

In 1987, the Nordic/Baltic Duck Survey Group was set up under the auspices of the International Waterfowl and Wetland Research Bureau (IWRB), its main aim being to stimulate and increase cooperation between all the Baltic countries to improve the coverage and the quality of the International Waterfowl Census under the IWRB. These censuses consist of an annual count of all waterbirds in as many waterbird sites as possible in the middle of January. The group consisted of the national IWRB coordinators responsible for the midwinter counts of waterbirds in their country and their contact organ was the IWRB Seaduck Bulletin published once or twice a year by the Department of Wildlife Ecology at the National Environmental Research Institute (NERI).

On the iniative of the National Forest and Nature Agency, NERI took the first steps in 1991 and 1992 towards the project: "Mapping of wintering diving ducks in the Baltic Sea" supported by a generous grant from the Nordic Council of Ministers (project no 33.07.-28.00 / AE). At the same time Ornis Consult A/S (OC) was planning a project: "Action preparatory for the Establishment of a Protected

Areas network in the Baltic Sea" (EPAS) under the European Union (EU DG XI ACE research contract no 2242/90-09-01). Co-operation between NERI and OC resulted in the joint project: "Baltic Task Force 1993".

The main aim of this joint project was to simultaneously survey coastal and offshore areas:

- to map the distribution of the waterbirds occurring in the Baltic Sea in midwinter
- to estimate the total population of wintering waterbirds, particularly the diving duck species
- to designate sites/areas of international importance for wintering waterbirds according to standards set by Rose & Scott (1994). A country was considered of international or regional importance for a species when at least 5% of the species' total in the Western Palearctic or the Baltic Sea respectively was counted or estimated in the country.

The joint project was based on coastal counts from the ground as well as from aircraft, coordinated by NERI and carried out by national coordinators under contract with NERI, and ship surveys coordinated and conducted by OC with the participation of observers from a number of Baltic countries.

After the survey was completed, the data was presented by the national coordinators, OC and NERI at a Seaduck Workshop held during the Baltic Birds 7 Conference in Palanga, Lithuania, 20-25 September 1993.

OC is currently in the process of reporting their part of the project. Important Marine Areas for Wintering Birds in the Baltic Sea (Durinck et al. 1994) was recently published and the technical report to the EU is in preparation.

Proceedings from the Seaduck Workshop published in a special issue of the IWRB Seaduck Research Group Bulletin constituted the first part of NERI's report. The present report is the second part. A final report to the Nordic Council of Ministers is in print (Pihl in print).

We wish to thank all the national coordinators including: Leif Nilsson (Sweden), Martti Hario (Finland), Andres Kuresoo (Estonia), Antra Stipniece (Latvia), Saulius Svazas (Lithuania and Kaliningrad, Russia), Genaij Grishanow (Kaliningrad), Wlodzimierz Meissner (Poland), Hans Wolfgang Nehls (Germany, Mecklenburg/ Forpommern), Jan Meissner and Bernd Struwe (Germany, Schleswig-Holstein) for their great and enthusiastic work during the surveys.

Tony Fox and Karsten Laursen are thanked for their valuable comments to an earlier draft of the report and for their inspiration to the project.

The coastal survey was funded by the Nordic Council of Ministers and the ship surveys were funded by the EU.

We thank volunteer observers in all the Baltic countries for providing large parts of the results to this study through their participation in the IWRB International Waterfowl Census. We also wish to thank the observers and crews on ships and aeroplanes who participated in the surveys.

2 Methods and material

2.1 Methods

The study area in the Baltic Sea included Kattegat and the Danish Straits in the west according to the demarcation lines proposed by the Helsinki Commission. The border between Skagerrak and the survey area was situated at 57°44N (Skagen, Denmark).

The Gulf of Bothnia north of 60°40N (Gävle, Sweden) and the Gulf of Finland east of 26°00E were excluded from the study area due to the severe midwinter conditions in these parts of the Baltic Sea and the correspondingly few waterbirds wintering within these areas (Fig. 1).

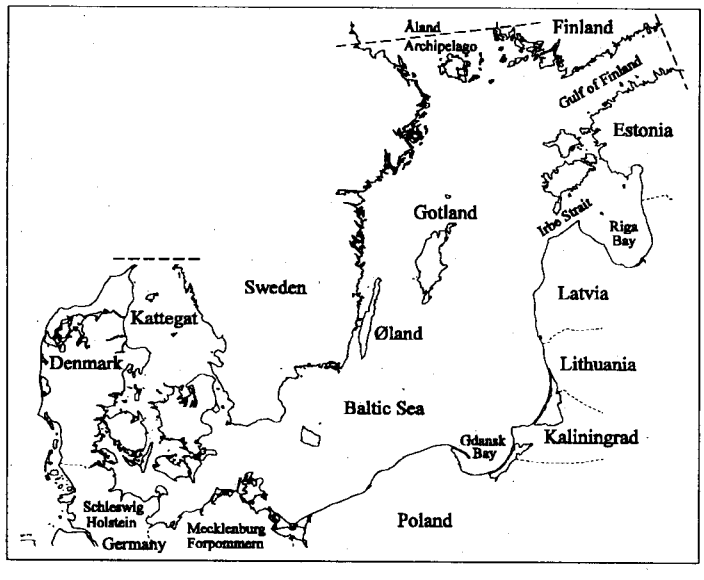

Figure 1. The Baltic Sea area surveyed for waterbirds during winter 1993.

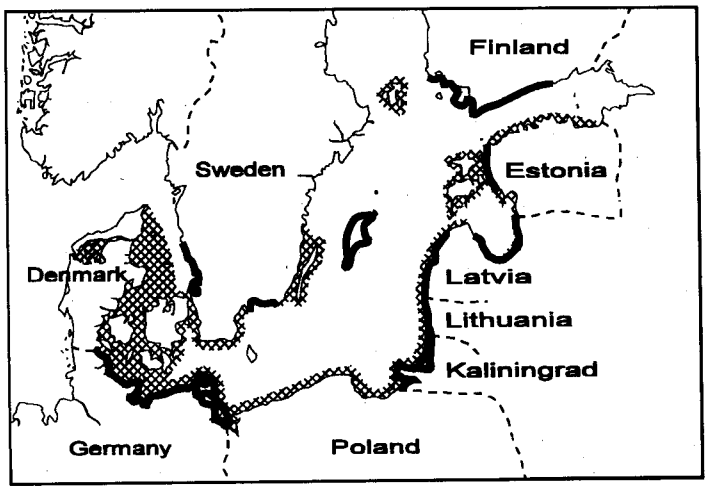

Figure 2. Coastal areas in the Baltic where aerial surveys (hatched) and ground counts (bold line) were performed in winter 1993.

Coastal waters included all brackish inlets and lagoons (including Limfjorden in Denmark). In addition, a large number of coastal lakes within a 50-km zone were surveyed to cover the waterbird species staging in the lakes in the daytime but feeding in the Baltic Sea at night.

The surveys were conducted as:

- aerial total surveys
- ship transect surveys
- ground counts
- aerial transect surveys

The aerial total surveys were mainly carried out in single-engine aircraft and followed standard methods as described by Pihl & Frikke (1992). The surveys generally covered shallow areas (0-20 m water depth) along the coasts and shallow banks (Fig. 2). The results comprise all the birds registered and will obviously always represent minimum numbers, particularly because complete coverage is impossible to obtain given currently existing methods. In general, ship surveys were conducted on chartered ships following standard methods as described by Webb & Durinck (1992). Almost complete coverage of the shallow offshore areas (0-30 m water depth) was obtained in both 1992 and 1993 (Fig. 3). The results are expressed as densities of birds based on which the total number of each species within the area is estimated. By summing these results, the overall national numbers of each species are estimated.

A large number of volunteers counted the waterbirds at small sites or coastal stretches from the ground in the middle of January as part of the International Waterfowl Census coordinated by the IWRB. The results from these censuses are included in the present report. In our experience, ground counts provide good coverage of the immediate coastal zone.

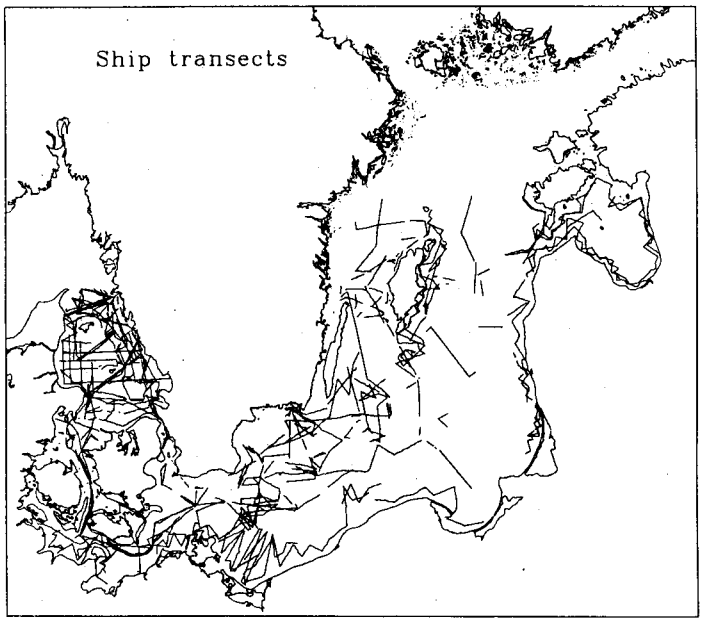

Figure 3. Ship transects (solid lines) surveyed for waterbirds during winter 1992 and 1993.

Aerial transect surveys were conducted in Polish, German and Danish offshore waters following standard methods as described by Pihl & Frikke (1992). The results are densities of birds in given areas from which the overall numbers of each species can be estimated based on area.

The estimates in this report are considered conservative for the following reasons:

- Some birds fly away and diving ducks often dive at the approach of a ship or an aircraft which results in underestimation compared to the true number of birds present in the area.
- Most diving duck species are daytime feeding, thus a varying proportion of the birds are below the water surface when the ship or aircraft passes.
- The breeding success in 1992 of most duck species that were legal game in Danish waters in 1992/93 was below average, particularly for Wigeon *Anas penelope*, Tufted Duck *Aythya fuligula*, Common Scoter *Melanitta nigra* and Long-tailed Duck *Clangula hyemalis* (Clausager 1993).

All waterbird species including gulls were recorded during the ship surveys whereas gulls were excluded from aerial surveys and most ground counts. This report deals with Cormorant *Phalacrocorax carbo*, Grey Heron *Ardea cinerea*, swans, ducks and Coot *Fulica atra*. Details on the numbers and distribution of seabirds (including divers, grebes, Fulmar *Fulmarus glacialis*, gulls and auks) are given in Durinck et al. (1994). Geese will be dealt with by the IWRB Goose Research Group Database to which the goose results from the 1993 Task Force have been reported.

2.1.1 Coverage

The coastal areas of the study area were extensively surveyed by aircraft and ground counts leaving out a few uncovered areas: the Kattegat coast of Sweden, the Stokholm Archipelago (Sweden) and the Kolka-Roja area (Latvia).

The inshore parts were surveyed by comprehensive ship transects from the south coast north to about 58°30N except for Scania and Blekinge (Sweden); the central parts of Riga Bay (Estonia and Latvia), the Kaliningrad waters and the Gdansk Bay with a water depth of more than 50 m were less extensively surveyed (compare Fig. 3).

2.1.2 Weather conditions

The winter of 1993 was mild to normal in the Baltic region; the cold sum of the winter this year was 39 compared to an average of 100 (Anon 1993). Within the study period, ice formation was limited to the archipelagoes of Sweden, Finland and Estonia and lakes in most countries except the southwestern part of the Baltic Sea. Hence, the birds were widely distributed over all coastal and shallow offshore areas.

2.1.3 Sections

Where the count areas are subdivided into sections these will be indicated separately in brackets in Chapter 3, Results.

2.2 Organisation of coverage by countries

2.2.1 Sweden

National coordinator: Leif Nilsson, University of Lund, Ecology Building, S-223 62 Lund, Sweden.

The Swedish waters include a wide variety of coastal habitats as well as extensive offshore shoals. Midwinter counts of coastal waters and freshwater sites have been carried out in Sweden since 1964, whereas the offshore waters have only been partly surveyed (Nilsson 1975, 1980, 1991).

The Swedish coastal survey in 1993 consisted of both an aerial survey of Scania, Kalmarsund and Öland (Fig. 4, section C, D, F, G, K) and ground counts of south Kattegat, Blekinge and Gotland (Fig. 4, section B, E, L). Due to unfavourable weather conditions, the Kattegat coast and the Stockholm archipelago were not surveyed (Fig.

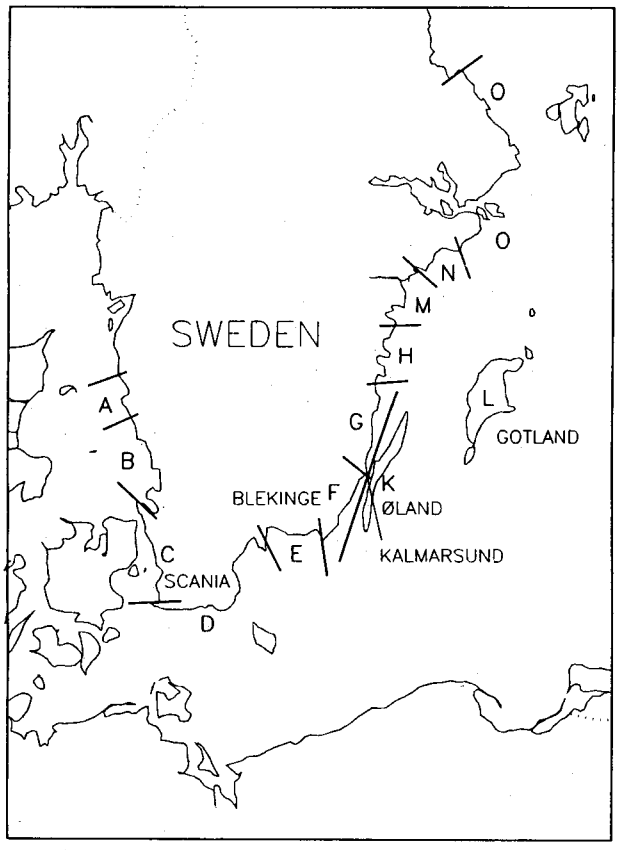

Figure 4. The Swedish coastal waters divided into count sections (A-O) used during the midwinter count of 1993.

4, sections A, H, M-O). The planned coverage of some offshore areas from aircraft was not carried out either.

Numbers of the most commonly occurring waterbird species in the uncovered coastal parts were estimated from the results of previous counts and the species index for 1993 (Nilsson 1994).

Comprehensive ship transects were carried out in Swedish offshore waters with a water depth of less than 50 m (55°15 - 58°30N).

2.2.2 Finland

National coordinator: Martti Hario, Finnish Game and Fisheries Research Institute, P.O. Box 202, FIN-00151 Helsinki, Finland.

Only the Åland Archipelago and the southwestern corner of the Finnish mainland are usually ice-free in winter. Midwinter waterbird counts have been conducted in southern Finland, particularly the Åland Archipelago since 1968 (Hario et al. 1993).

In 1993, the Finnish coastal surveys were intensified compared to previous years. Surveys were conducted as ground counts from 16

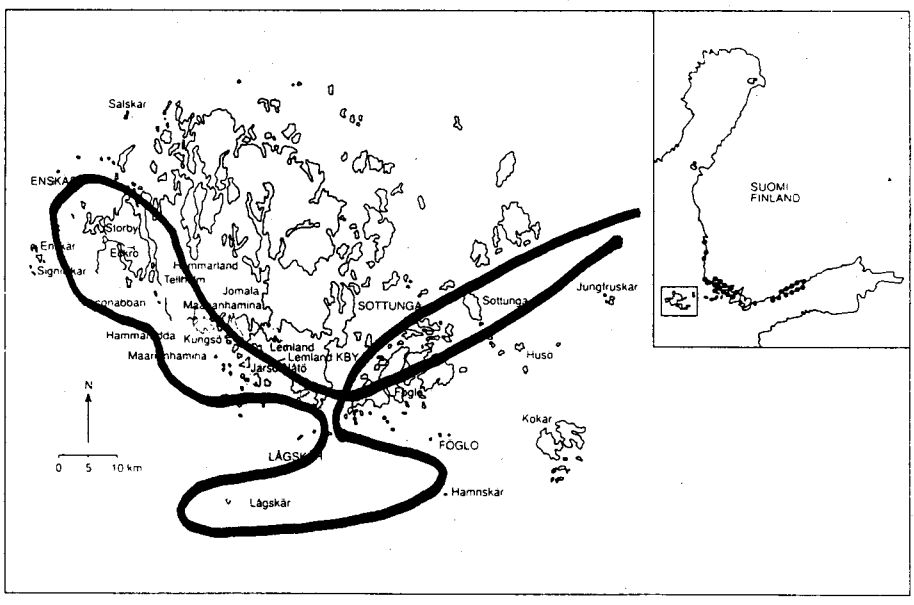

Figure 5. Aerial survey route (solid line) and location of ground point (shown on inset map) where counts were conducted in Finnish waters in winter 1993.

routes in the middle of January on the Åland Archipelago and 52 routes in the Archipelago Sea and the Gulf of Finland (Fig. 5). An aerial survey of the Åland Archipelago was conducted 10 February (Hario 1994).

The highest number counted in the Åland Archipelago from either the ground counts or the aerial survey was chosen for each species. Finnish offshore waters were not surveyed during this study.

2.2.3 Estonia

National coordinator: Andres Kuresoo, Institute of Zoology and Botany, Vanemuise St. 21, EE-2400 Tartu, Estonia.

The Estonian waters include a variety of coastal habitats as well as offshore shoals. Midwinter waterbird counts in Estonia have been conducted annually since 1989 (Kuresoo 1992).

In 1993, the midwinter counts in Estonia combined aerial surveys with ground counts. The majority of the coastal areas were surveyed from aircraft 20, 26 and 27 January (Fig. 6) in good to optimal weather conditions. Ground counts were conducted both inland and on the coast by 170 volunteer observers. The Estonian coastal waters were considered fully covered during 1993 (Kuresoo et al. 1994)

The offshore waters of Estonia were surveyed by extensive ship transects up to the north coast of Saaremaa (58°30N). The large offshore areas around Hiiumaa as well as the shoals south of Ruhnu Island in Riga Bay were not surveyed (compare Fig. 3).

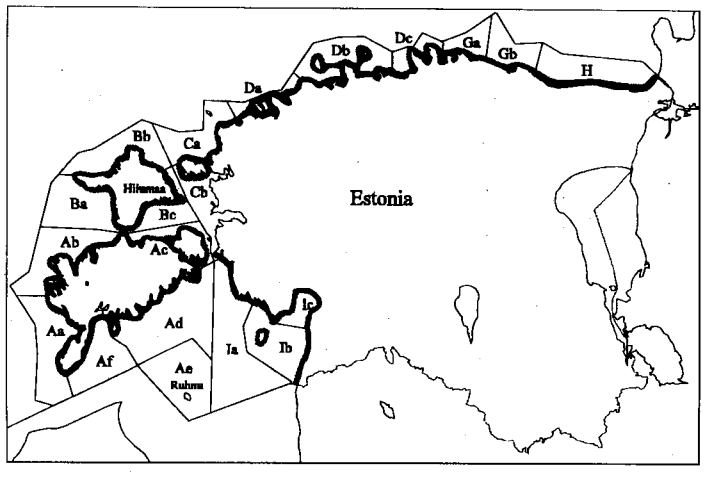

Figure 6. The Estonian waters divided into count sections (Aa-H) used during the midwinter count of 1993. Considerable ice formations were encountered in sections Ac, Bc, and Cb during the survey.

2.2.4 Latvia

National coordinator: Antra Stipniece, Institute of Biology, Miera Street 3, LV-2169 Salaspils, Latvia.

The Latvian coast is straight and homogenous, practically lacking islands and lagoons; the offshore waters include large shallow areas in Riga Bay (Fig. 7, I-VI). Midwinter waterbird counts were conducted in the period 1964-1974 and resumed in 1984 (Viksne & Stipniece 1988, Stipniece 1992). In 1993, the midwinter counts in Latvia combined aerial surveys with ground counts in most regions. The Ventspils region (Fig 7, III) was exclusively surveyed from aircrafts whereas the area from Roja to Riga (Fig. 7, V) was counted from the ground only. The Latvian inland waters were

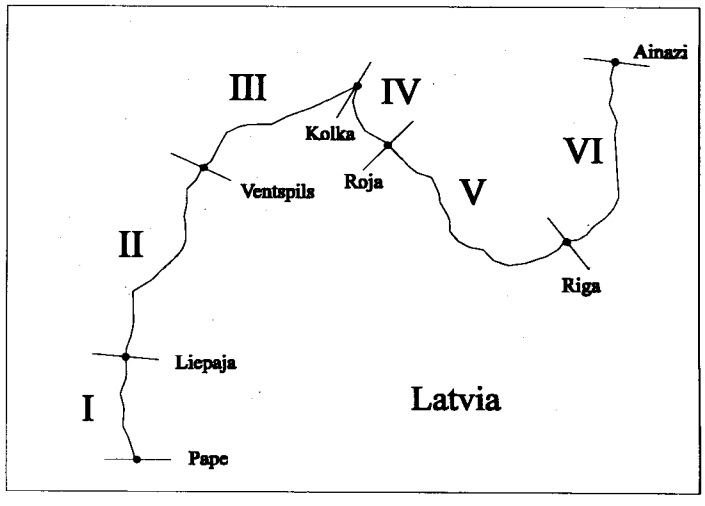

Figure 7. The Latvian coastal waters divided into count sections (I-VI) used during the midwinter count of 1993.

covered from the ground. Due to unfavourable weather conditions, the coastal waters of Latvia were only partly covered. The coastal section Kolka-Roja (Fig. 7, IV) was not covered, and the numbers here have been estimated from previous midwinter surveys in the area (Stipniece 1994).

Apart from the deeper parts of Riga Bay, the offshore waters of Latvia were well covered (compare Fig. 3).

2.2.5 Lithuania and Kaliningrad (Russia)

National coordinator: Saulius Svazas, Institute of Ecology, Akademijos 2, LT-2600 Vilnius, Lithuania.

Coordination Kaliningrad: Genadij Grishanov, Kaliningrad University, Universitetskaya 2, 236040 Kaliningrad, Russia.

The coastal waters of both Lithuania and Kaliningrad (Fig. 8) consist mainly of straight coasts and large sheltered lagoons; the offshore waters are deep. Regular midwinter waterbird counts have been carried out in Lithuania since 1987 (Svazas & Vaitkus 1992)

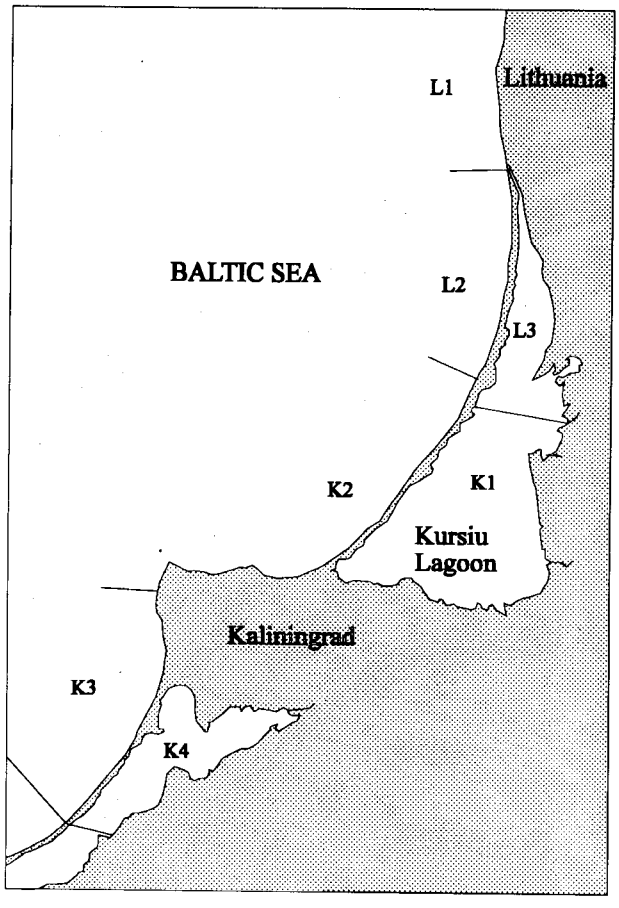

Figure 8. The Lithuanian and Kaliningrad (Russia) coastal waters divied into count sections (L1-K4) used during the midwinter count of 1993.

and in Kaliningrad waters in 1989 and 1990 (Raudonikis & Svazas 1990).

In January 1993, waterbirds were surveyed in all the Lithuanian coastal waters up to 6 km from the shore. Most of the Kaliningrad coastal waters were covered up to 2 km from the shore. The surveys were conducted simultaneously from aircraft and from the ground. The coastal areas of Lithuania were considered well covered in winter 1993, whereas the Kaliningrad region, particularly the Kaliningrad (Vistula) Lagoon, was only partly covered (Svazas et al. 1994).

The offshore waters of Lithuania was well covered by ship transects (compare Fig. 3), but it was not possible to obtain permission to survey the Kaliningrad offshore waters.

2.2.6 Poland

National coordinator: Wlodzimierz Meissner, University of Gdansk, Al. Legionow 9, PL-80-441 Gdansk, Poland.

The Polish coastal waters contain large lagoons shared with neighbouring countries, the shallow Gdansk Bay and a long straight coast; the offshore waters include two large shoals. Extensive surveys of the numbers of wintering waterbirds in Poland were carried out in 1985-1987 (Zyska et al. 1990) and 1988-1990 (Dombrowski et al. 1993).

During the midwinter counts of 1993, the entire Polish coast including the larger coastal lakes and offshore shoals (Fig. 9) were surveyed from aircraft (Meissner 1994). The middle and eastern parts and the Szczecin Lagoon were covered during 13-28 January; the

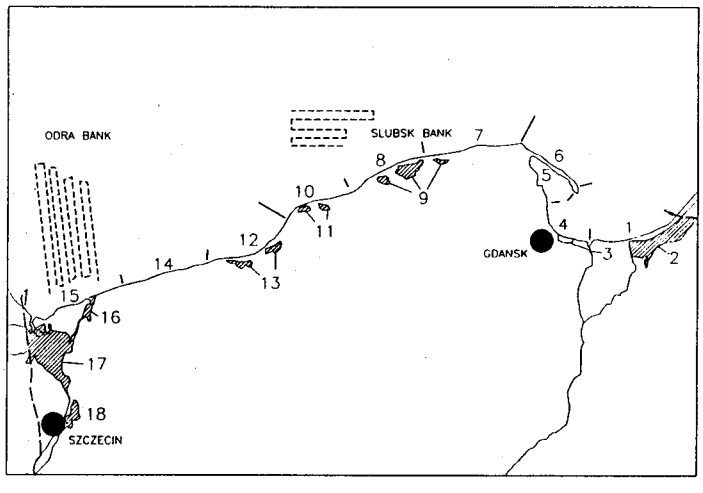

Figure 9. The Polish coastal waters divided into count sections (1-18) used during the midwinter count of 1993. The aerial transects on Slubsk and Odra Banks are indicated by dashed lines.

western part and Odra (Pomeranian Bay) and Slubsk Bank were covered 2-3 March. For a few uncovered sites in Poland, the numbers of waterbirds were estimated on the basis of previous results. The coastal areas of Poland were well covered in 1993. However, large numbers of birds including swans and diving ducks winter in interior Poland.

The offshore Polish waters were surveyed from ship in 1992 but not in 1993. The Gdansk Bay was only partly covered (see Fig. 3).

2.2.7 Germany (Mecklenburg-Forpommern)

National coordinator: Hans Wolfgang Nehls, Zoologisher Garten Rostock, Rennbahnallee 21, D-18059 Rostock, Germany.

The coastal waters of Mecklenburg-Forpommern consist of a huge lagoon system around the Rügen Island and vast offshore areas in the Mecklenburg Bay and the Pomeranian Bay. Since 1967 a scheme of total ground counts of the Mecklenburg-Forpommern coast has been carried out annually in the middle of January (Rutschke 1979, 1985). In 1990, a joint survey of the coasts of both Schleswig-Holstein and Mecklenburg-Forpommern was conducted (Struwe & Nehls 1992).

The midwinter waterbird count in 1993 was identical in method and coverage to previous coastal counts (Nehls 1994) and Mecklenburg-Forpommern was considered well covered. Offshore transect surveys from aircraft were conducted in the whole Mecklenburg-Forpommern sector of the Baltic Sea on seven days between 28 January and 23 February (Fig. 10). Additional offshore aerial surveys were conducted by NERI in 1993 (Pihl 1994).

Extensive ship transects were conducted in the Mecklenburg-Forpommern offshore areas (compare Fig. 3).

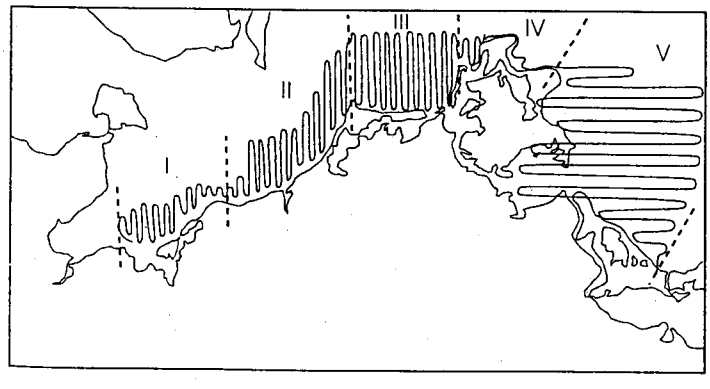

Figure 10. The Mecklenburg-Forpommern coastal waters divided into count sections (I-V) used during the midwinter count 1993. Aerial transects in offshore waters are indicated by the solid lines.

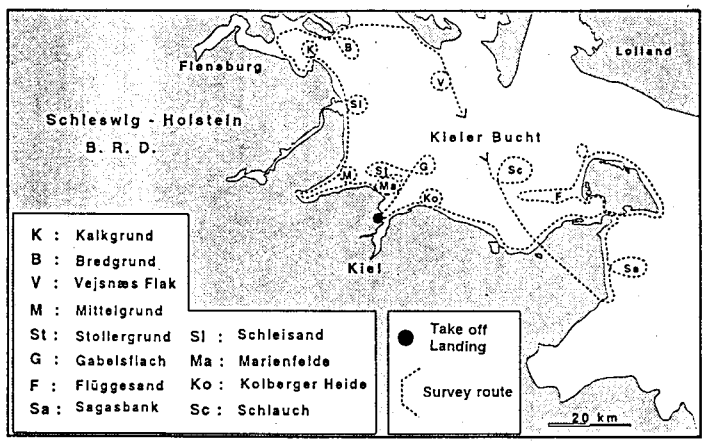

Figure 11. Aerial survey route (dotted line) in the Schleswig-Holstein waters in midwinter 1993.

2.2.8 Germany (Schleswig-Holstein)

National coordinator (aerial surveys): Jan Meissner, Brunsrade 3, D-24114 Kiel, Germany.

National coordinator (land counts): Bernd Struwe, Staatliche Vogelshutzwarte Schleswig-Holstein, Olshausenstrasse 40-60, D-24118 Kiel, Germany.

The Schleswig-Holstein coastal waters vary and include bays, islands, inlets, shoals and extensive offshore shallow areas. Since 1966-67 regular midwinter counts from the ground have been carried out at the Baltic Coast of Schleswig-Holstein (Berndt & Busche 1991, 1993, Struwe & Nehls 1992); since 1980 additional aerial surveys of seaducks in shallow offshore waters have been conducted (Meissner 1993).

In 1993, the midwinter counts combined ground counts of almost the entire coast and about 100 inland sites with aerial surveys of six shallow areas on 17 and 23 January (Fig. 11) following the count scheme of recent years (Meissner & Struwe 1994). Additional offshore aerial surveys were conducted by NERI in 1993 (Pihl 1994). Extensive ship transects were carried out in Schleswig-Holstein offshore waters (compare Fig. 3).

2.2.9 Denmark

National coordinator: Stefan Pihl, National Environmental Research Institute, Grenåvej 12, DK-8410 Rønde, Denmark.

The Danish coastal waters form a mosaic of inlets, sheltered bays, small archipelagoes and islands. The offshore waters are generally shallow. Countrywide surveys of waterbirds in midwinter were carried out in Danish waters during 1969-1973 (Joensen 1974), 1987-1989 (Laursen et al. in prep.) and 1991-1992 (Pihl et al. 1992).

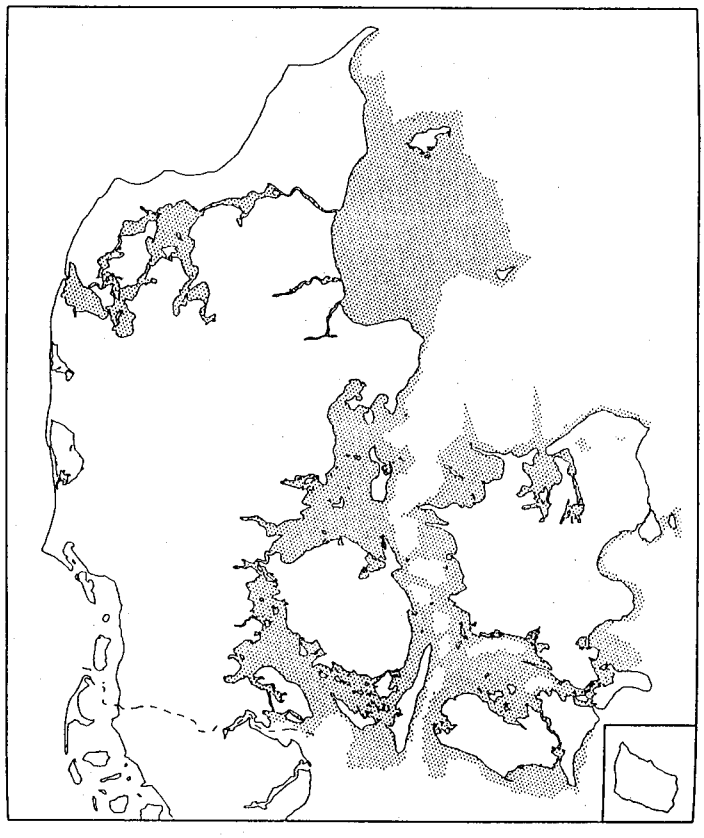

Figure 12. Countrywide aerial coverage (shaded areas) of Danish waters in midwinter 1992.

Due to the coordination tasks in connection with the midwinter counts in the Baltic area and offshore counts in the Western Baltic, no countrywide aerial survey was conducted in Denmark in 1993. However, a limited survey of key areas was carried out indicating that the numbers of most coastal waterbird species in 1993 were at the same level as in 1991 and 1992. The results from the country-wide aerial survey (Fig. 12) combined with additional counts in freshwater sites of waterbirds were used in the present report (see Pihl et al. 1992, Pihl & Laursen 1994 for details on data).

The Danish offshore waters were fully covered by ship transects (compare Fig. 3).

2.2.10 Offshore areas

Coordination: Jan Durinck and Henrik Skov, Ornis Consult Ltd., Vesterbrogade 140, DK-1620 København, Denmark.

The surveys of waterbirds in offshore areas were carried out from ship in winter 1992 and 1993 (Durinck et al. 1993, 1994). The areas inside the 50 m depth contour were extensively surveyed, whereas the deeper parts of the Baltic Sea were less extensively covered (see Fig. 3). The parts north of 58°N were not surveyed from ship. The offshore parts of the Baltic Sea had never before been surveyed for waterbirds.

3 Results

3.1 Country accounts

3.1.1 Sweden

In total, c. 225,000 waterbirds were identified in Sweden in the sections B-G, K and L during the coastal counts in 1993 (Table 1). Estimates of an additional 69,000 birds in the uncovered sections A, H and M-O were calculated from the results of the midwinter counts 1969-78 multiplied with the species index for January 1993 (Table 2). In offshore waters, an average of c. 1.5 million birds was estimated from ship transects in the winters of 1992 and 1993 (combine Tables 26-31). The coastal waters of Sweden were internationally important for Mute Swan *Cygnus olor*, Tufted Duck, Goldeneye *Bucephala clangula*, Red-breasted Merganser *Mergus serrator* and Goosander Mergus merganser and regionally important for Cormorant, Grey Heron, Wigeon, Mallard *Anas platyrhynchos*, Scaup *Aythya marila*, Smew *Mergus albellus* and Coot (Table 3). The Swed-

Table 1. Numbers of 22 waterbird species identified in the Swedish coastal sections (B-G, K, L, compare Fig. 4) in winter 1993, with indications of the method used; G = ground counts; A = aerial surveys.

/Section	B	C	D	E	F	G	K	L	Total
Species /Method	G	G,A	A	G	A,G	A,G	A	G	
Cormorant	3,278	1,507	570	1,190	109			1,277	7,931
Grey Heron	13	17	5	38	53	11	27	136	300
Mute Swan	225	2,708	882	1,251	1,234	1,467	2,137	3,393	13,297
Whooper Swan	22	21	47	86	12		24	250	462
Shelduck	7	192	20	1			3	12	235
Wigeon	75	1,924		1	1		30	2	2,033
Teal	7	8	7	4				19	45
Mallard	6,652	9,771	7,535	3,844	4,446	1,909	5,377	12,671	52,205
Pintail	4	20						3	27
Pochard		67	8	1,030	46	20	70	116	1,357
Tufted Duck	237	4,408	3,152	20,661	9,269	16,578	2,595	18,846	75,746
Scaup	59	491	2	156	39	20	72	6,970	7,809
Eider	4,577	298	233	11	47	16	84	206	5,472
Steller's E.					1			4	5
Long-tailed D.	16	5	1,246	281	-	-	-	7,349	8,897
Common Scoter	465		1		3				469
Velvet Scoter	364				1			2	367
Goldeneye	435	2,721	4,324	1,093	2,483	1,909	6,424	4,817	24,206
Smew		38	17	146	29	170	15	256	671
Red-br. Mergan.	157	108	102	29	37	52	21	838	1,344
Goosander	35	101	252	1,069	1,722	3,158	424	7,491	14,252
Coot	1	2,094	784	3,054	554	100		1,707	8,294

Table 2. Estimated numbers of 12 waterbirds species present in the uncovered sections (A,H, M-O) of the Swedish Baltic coast in winter 1993 based on results from previous midwinter surveys and species index for January 1993.

Species	Counted totals for 1969-78	Sect. B-G, Mean 1987-89	Sect. K, L Jan. 1993	Sect. mean A, H, M-O 1969-78	Species ndex Jan. 1993	Estimate A, H, M-O	Total estimate Jan. 1993
Cormorant	1,334	1,804	7,931	1,137	120	1,365	9,296
Mute Swan	5,512	7,801	13,297	1,760	312	5,492	18,789
Whooper S	993	739	462	27	124	34	496
Mallard	27,642	31,997	52,205	6,288	151	9,495	61,700
Pochard	334	721	1,357	31	349	109	1,466
Tufted Duck	52,500	53,740	75,746	22,667	126	28,561	104,307
Eider	3,102	1,840	5,472	528	218	1,152	6,624
Goldeneye	16,626	21.480	24.206	3,090	187	5,779	29,985
Smew	287	313	671	5	-	29	700
Red-b. Mer.	2,207	3,408	1,344	377	165	623	1,967
Goosander	3,583	4,716	14,252	4,567	167	7,627	21,879
Coot	13,128	1,719	8,294	5,800	152	8,816	17,110

Table 3. Distribution in percent of 20 waterbirds species wintering in the Baltic Sea based on results of the 1993 surveys. * indicates that more than 5% of the estimated numbers wintering in nortwestern Europe were recorded/estimated in the respective country.

	Sweden	Finland	Estonia	Latvia	Lithua.	Kalining.	Poland	Germany	Denmark
Cormorant	31	1						20	48
Grey Heron	10				1		2	26	61
Mute Swan	13*	1	8*	1			3	25*	49*
Whooper Swan	4	1	2				7	35*	51*
Shelduck	2							1	97*
Wigeon	5							50	45*
Mallard	16	1	6	5	1	1	5	29	36
Pochard	3						11	49*	37
Tufted Duck	20*						10*	36*	34*
Scaup	5						6	73*	16*
Eider	1						3	17*	79*
Steller's Eider		2	78*		20				
Long-t. Duck	35*		16*	12*	1		19*	14*	3*
Common Scoter							2	22*	76*
Velvet Scoter			21*	16*	4*		32*	17*	10*
Goldeneye	19*		8	2	1	1	10*	18*	41*
Smew	5						41*	49*	1
Red-b. Merganser	11*		4	3	1		13*	38*	30*
Goosander	17*	2	4	2	15*	5	29*	11*	15*
Coot	5						4	35*	56*

Table 4. Numbers of 17 waterbird species counted in the Baltic countries during winter 1993 including estimates of numbers in uncovered sections (1), the population estimate for 1993 (2), estimated minimum (3) and maximum (4) of 1993 the population estimate, and current estimate for the Baltic region (5).

	1	2	3	4	5
Mute Swan	147,125	160,000			180,000 (NW Europe)
Whooper Swan	14,709	28,000	24,000	32,000	25,000 (NW Europe)
Shelduck	18,026	18,000			250,000 (NW Europe)
Mallard	374,248	1,000,000	750,000		5 mill. (NW Europe)
Pochard	44,602	55,000	50,000	60,000	350,000 (NW Europe)
Tufted Duck	528,661	600,000	550,000	650,000	750,000 (NW Europe)
Scaup	156,143	175,000			310,000 (NW Europe)
Eider	921,813	1,100,000	1,000,000	1,300,000	3 mill. (Europe)
Stellers Eider	3,352	4,000	3,500	6,500	15,000 (NE Europe)
Long-tailed Duck	4,254,860	4,250,000	4,000,000	5,000,000	2 mill. (NW Europe)
Common Scoter	931,930	1,200,000	1,000,000	1,300,000	800,000 (NW Europe)
Velvet Scoter	931,951	950,000	900,000	1,000,000	250,000 (NW Europe)
Goldeneye	154,448	210,000	180,000	230,000	300,000 (NW Europe)
Smew	14,346	20,000			15,000 (NW Europe)
Red-breasted Merganser	44,797	65,000	50,000	90,000	100,000 (NW Europe)
Goosander	125,487	170,000	140,000	200,000	150,000 (NW Europe)
Coot	334,133	400,000	375,000	500,000	1,500,000 (NW Europe)

* from Rose & Scott 1994

Table 5. Numbers of 18 waterbird species identified in the Finnish coastal sections (compare with Fig. 5) and inland sites in winter 1993. The numbers in brackets are not included in the total.

	Archip. Sea	Åland		Gulf of Fin.	Total
	24 routes	16 routes	Aerial sur.	28 routes	
Cormorant			412		412
Mute Swan	90	(560)	1,427	276	1,793
Whooper Swan	4	50		80	134
Wigeon				1	1
Mallard	1,451	758	(568)	3,027	5,236
Pochard		3			3
Tufted Duck	4	1,699	(1,030)	4	1,707
Scaup		2		2	4
Eider	8	(7)	152	19	179
Steller's Eider			60		60
Long-tailed Duck		1,437	(625)	173	1,610
Common Scoter	1			2	3
Velvet Scoter		2			2
Goldeneye	73	422	(24)	63	558
Smew		1			1
Red-breasted Merganser	3	106	(27)	9	118
Goosander	516	(856)	1,270	961	2,747
Coot	1	356	(126)	13	370

ish offshore waters were of major international importance for Long-tailed Duck. Almost 75% of the current estimate of this species in northwesternEurope was estimated in Swedish offshore waters (Compare Table 4 with Table 26).

3.1.2 Finland

In total, 15,000 waterbirds were identified in Finland during the coastal counts in 1993 (Table 5). The Finnish offshore waters were not covered by the ship surveys in 1992 and 1993.

The Finnish waters were of little regional or international importance for waterbirds in winter (see Table 3).

3.1.3 Estonia

In total, almost 100,000 waterbirds were identified in Estonia during the coastal counts in 1993 (Table 6). It was estimated that c. 840,000 waterbirds occurred in Estonian offshore waters (combine Tables 26-31).The coastal waters of Estonia were the most important in the Baltic Sea for Steller's Eider *Polysticta stelleri*. Furthermore, they were of international importance for Mute Swan and of regional importance for Mallard and Goldeneye (see Table 3). The Estonian offshore waters were internationally important for Long-tailed Duck and Velvet Scoter *Melanitta fusca* (see Table 3).

Table 6. Numbers of 19 waterbird species identified in the Estonian coastal sections (compare Fig. 6) and inland sites in winter 1993. Numbers in brackets were not included in the calculation of the total results.

Species/Section	A	B	C	D	G	H	I	Landbased		Total
								Coast	Inland	
Cormorant	8	11	31	96				(75)		146
Mute Swan	7,914	879	523	1,232	525	85	577	(6,135)	27	11,762
Whooper Swan	(104)	(1)	(25)				(5)	250		250
Shelduck								31		31
Teal	5									5
Mallard	6,359	1,549	554	889	72	25	350	(6,405)	11,575	21,373
Pintail	4									4
Tufted Duck	(388)	(10)		(8)	(9)			556	7	563
Scaup								78		78
Eider	44	13	15				3	(24)		75
Steller's E.	2,467	164						(2,080)		2,631
Long-tailed D.	8,278	4,225	6,498	19,815	1,152	184	357	(6,880)		40,509
Common Scoter	78		3	57	54		22	(20)		214
Velvet Scoter	146	6	4	28	4		18	(145)		206
Goldeneye	6,157	2,968	939	1,126	107		366	(4,745)	125	11,788
Smew		(1)						154		154
Red-br. Mergan.	(201)	(17)	(49)	(8)	(4)		(53)	420		420
Goosander	2,008	487	442	515	564	50	1,253	(1,590)	155	5,474
Coot	(18)		(1)					239	18	257

3.1.4 Latvia

In total, c. 33,000 waterbirds were identified and more than 1,000 birds estimated in uncovered sections in Latvia during the coastal counts in 1993 (Table 7). The Latvian offshore waters were estimated to sustain c. 660,000 waterbirds (combine Tables 24-31).

Although the coastal waters of Latvia were less important for waterbirds (regional importance for Mallard), the Latvian offshore waters were internationally important for Long-tailed Duck and Velvet Scoter (see Table 3).

3.1.5 Lithuania

Coastal counts identified a total of c. 50,000 waterbirds in Lithuania during 1993 (Table 8). The Lithuanian offshore waters were estimated to sustain c. 64,000 waterbirds (combine Tables 26-28).

The Lithuanian coastal waters were particularly important for Steller's Eider, this being the only place outside Estonia holding large numbers of this species, and internationally important for Goosander (see Table 3). In offshore waters, large numbers of Velvet Scoter were observed. Steller's Eider is considered vulnerable due to its highly aggregating behaviour close to land.

Table 7. Numbers of 19 waterbird species identified in the Latvian coastal sections (compare Fig. 7) and inland sites in winter 1993, with indications of the methods used. G = ground counts; A = aerial surveys.

/Section	I	II	III	IV	V	VI	Inland	Total
Species /Method	G,A	G,A	A	G,A	G	G,A		
Cormorant					1			1
Grey Heron					1		11	12
Mute Swan	3	2			528	15	1,571	2,119
Whooper Swan					6	39		45
Wigeon							3	3
Teal							7	7
Mallard	200	32		20	268	282	16,716	17,518
Pintail					2		6	8
Pochard					1		2	3
Tufted Duck				2			18	20
Eider				1	1			2
Long-tailed D.	173	961	385	900	3,292	1,512	1	7,224
Common Scoter	31		60		2	2		95
Velvet Scoter	3	3			58	1		65
Goldeneye	2	3	1	100	1,978	1,127	294	3,505
Smew						11	58	69
Red-br. Mergan.	1	5			75	11		92
Goosander	22	31	2	5	271	484	1,366	2,181
Coot	10	5			8	15	425	463

Table 8. Numbers of 18 waterbirds species identified in the Lithuanian coastal sections (compare Fig. 8) and inland sites in winter 1993.

	L1	L2	L3	Inland	Total
Cormorant			12		12
Grey Heron			41		41
Mute Swan			100	60	160
Whooper Swan			15		15
Mallard	320		1,450	330	2,100
Pochard			20		20
Tufted Duck			170		170
Scaup		20			20
Eider	320	35			355
Steller's Eider	650		5		655
Long-tailed D.	5,100	1,060	50		6,210
Common Scoter	950	370			1,320
Velvet Scoter		17,640			17,640
Goldeneye	220		410	800	1,430
Smew			340		340
Red-breasted Merganser	380	80			460
Goosander	90		13,700	5,610	19,400
Coot			35		35

Table 9. Numbers of 10 waterbird species identified in the Kaliningrad (Russia) coastal sections (compare Fig. 8) in winter 1993.

	K1	K2	K3	K4	Total
Cormorant	3				3
Mute Swan	101	1	8	156	266
Whooper Swan				27	27
Mallard	376	760	29	1,100	2,265
Eider		54			54
Long-tailed D.		6,050	680		6,730
Velvet Scoter		220	350		570
Goldeneye	800	310	70		1,180
Goosander	5,072	292	240	180	5,784
Coot		102	12	12	126

3.1.6 Kaliningrad (Russia)

In total, c. 17,000 waterbirds were identified in Kaliningrad coastal waters during the 1993 counts (Table 9). It was estimated that there were 4,000 waterbirds in the Kaliningrad offshore waters (combine Tables 26-28).

During the present study, the Kaliningrad waters were of relatively little importance for waterbirds (regional importance for Goosander), although it should be emphasised that the coverage of both coastal and offshore waters was poor.

Table 10. Numbers of 19 waterbird species identified in the Polish coastal sections (compare Fig. 9) in winter 1993.

	Section 16-15	Section 12-15	Section 7-11	Sections 1, 3-6	Section 2	Total
Cormorant	3	2		3		8
Grey Heron		14	27	12	9	62
Mute Swan	319	168	109	3,091	231	3,918
Whooper Swan	165	90	102	151	40	548
Mallard	1,907	2,548	2,617	4,668	736	12,476
Wigeon				11		11
Pochard	3,550	220	1	565		4,336
Tufted Duck	42,093	234	104	8,471	695	51,597
Scaup	6,640	110		2,634		9,384
Eider		22	23	100		145
Steller's Eider				1		1
Long-tailed D.		543	1,135	10,167		11,845
Common Scoter		1,078	646	553		2,277
Velvet Scoter		1	22	266		289
Goldeneye	7,738	606	264	6,697	119	15,424
Smew	4,283	228	511	12	801	5,835
Red-br. Mergan.		86	23	57		166
Goosander	33,085	1,690	310	352	27	35,464
Coot	5,798	202	5	4,671		10,676

3.1.7 Poland

In total, c. 165,000 waterbirds were identified in the Polish coastal waters during the 1993 counts, with an additional c. 13,000 birds estimated from uncovered coastal lakes (Table 10). In Polish offshore waters, a further 1.1 million waterbirds were estimated to be present (combine Tables 24-31).

The coastal waters of Poland were the most important in the Baltic Sea for Goosander and possibly Smew. They were of international importance for Tufted Duck and Goldeneye and of regional importance for Whooper Swan *Cygnus cygnus*, Mallard, Pochard *Aythya ferina*, and Scaup (see Table 3). The Polish offshore waters were internationally important for Long-tailed Duck, Velvet Scoter and Red-breasted Merganser (see Table 3).

3.1.8 Germany

In total, 833,000 waterbirds were counted in the German coastal waters (431,000 in Mecklenburg-Forpommern and 402,000 in Schleswig-Holstein) during the counts in 1993 (Tabs. 11 and 12) Furthermore, 5,050 birds were estimated for uncovered coastal

Table 11. Numbers of 23 waterbird species recorded in the Mecklenburg-Forpommern (Germany) coastal sections (compare Fig. 10) in winter 1993.

Species / section	I	II	III	IV	V	Total
Cormorant	3,014	4		22	1,270	4,310
Grey Heron	47	72	87	67	186	459
Mute Swan	4,639	6,895	9,059	2,609	11,345	34,547
Whooper Swan	674	355	430	953	1,245	3,657
Bewick's Swan	1	16	3		5	25
Swan sp.	327	4,062	2,525	6	270	7,190
Shelduck	6	10	10		10	36
Wigeon	3,601	220	143	50	82	4,096
Gadwall	17					17
Teal	11	40				51
Mallard	13,928	9,227	7,218	6,171	21,781	58,325
Pintail	15		4		12	31
Pochard	3,633	7,423	348	3,054	695	15,153
Tufted Duck	61,847	15,545	8,223	26,023	10,268	121,906
Scaup	52,589	12,578	7,435	1,028	9,306	82,936
Eider	10,438	3		1	83	10,525
Long-tailed D.	3,831	9	90	16	973	4,919
Common Scoter	220				6	226
Velvet Scoter	66				6	72
Goldeneye	3,660	1,577	863	3,249	8,570	17,919
Smew	41	252	115	1,240	4,856	6,504
Red-br. Mergan.	1,969	65	498	373	2,119	5,024
Goosander	244	644	935	1,433	6,069	9,325
Coot	16,001	4,682	14,908	4,758	3,377	43,726

Table 12. Numbers of 24 waterbird species recorded in the Schleswig-Holstein (Germany) part of the coastal and inland sections (compare Fig. 11) in winter 1993.

	Coast	Inland	Total
Cormorant	922	578	1,500
Grey Heron	87	216	303
Mute Swan	1,844	419	2,263
Whooper Swan	1,040	493	1,533
Bewick's Swan	2	2	4
Shelduck	193	4	197
Wigeon	11,830	5,523	17,353
Gadwall	6	100	106
Teal	965	619	1,584
Mallard	21,426	29,245	50,671
Pintail	167	4	171
Shoveler		18	18
Pochard	4,104	2,111	6,215
Tufted Duck	29,361	32,304	61,665
Scaup	23,839	6,589	30,428
Eider	118,533	17	118,550
Long-tailed D.	5,121		5,121
Common Scoter	15,935	2	15,937
Velvet Scoter	4		4
Goldeneye	7,943	1,683	9,626
Smew	328	162	490
Red-br. Mergan.	1,574	6	1,580
Goosander	1,769	2,340	4,109
Coot	54,481	18,109	72,590

lakes in Mecklenburg-Forpommern (Table 11). 7,190 unidentified swans have been included in Table 11. Additionally, 108,000 ducks were not identified to species. Of these more than 100,00 were found in section I. In the German offshore waters, an estimated total of c. 966,000 (796,000 + 197,000) was estimated.

The Baltic, coastal waters of Germany were the most important area in the Baltic Sea for Scaup and perhaps Smew. They were of international importance for Mute Swan, Whooper Swan, Pochard, Tufted Duck, Goldeneye, Goosander and Coot, and of regional importance for Cormorant, Grey Heron, Wigeon and Mallard (see Table 3). The German offshore waters were internationally important for Eider *Somateria mollissima*, Long-tailed Duck, Common Scoter, Velvet Scoter and Red-breasted Merganser (see Table 3).

3.1.9 Denmark

On average, c. 2.3 million waterbirds were identified in the Danish coastal waters during the countrywide surveys in 1991 and 1992 (Table 13), with a further 158,000 estimated in offshore waters not covered by aerial surveys.

Table 13. Numbers of 14 waterbird species identified in the Danish part of the Baltic Sea (see Fig. 12) in winter 1991 and 1992, and the mean of the two winters.

	1991	1992	Mean 1991-1992
Cormorant	16,022	13,372	14,697
Grey Heron	1,840	1,758	1,799
Mute Swan	71,683	70,733	71,208
Whooper Swan	7,854	7,223	7,539
Bewick's Swan	176	103	140
Shelduck	16,207	18,847	17,527
Wigeon	16,219	21,843	19,031
Gadwall	0	20	10
Teal	1,733	2,831	2,282
Mallard	148,601	123,566	136,084
Pintail	93	173	133
Shoveler	59	28	44
Pochard	17,435	15,417	16,426
Tufted Duck	171,842	186,613	179,226
Scaup	23,187	27,781	25,484
Eider	729,030	729,777	729,404
Long-tailed Duck	5,837	3,787	4,812
Common Scoter	549,166	950,157	749,662
Velvet Scoter	10,127	121,812	65,970
Goldeneye	60,816	64,290	62,553
Smew	209	177	193
Red-breasted Merganser	10,772	14,637	12,705
Goosander	19,050	17,878	18,464
Coot	171,292	204,008	187,650

The Danish Baltic waters were the most important in the Baltic Sea for Mute Swan, Whooper Swan, Shelduck *Tadorna tadorna*, Eider, Common Scoter, Goldeneye and Coot, and of international importance for Tufted Duck, Scaup, Velvet Scoter, Red-breasted Merganser and Goosander. For Cormorant, Grey Heron, Wigeon, Mallard and Pochard the Danish parts of the Baltic Sea were of regional importance (see Table 3).

3.2 Species account

3.2.1 Cormorant *Phalacrocorax carbo*

Nearly half of the birds recorded occurred in the Danish part of the Baltic Sea (Table 14). Large numbers were also counted in Sweden and Germany, whereas very few birds were recorded along the sandy coasts of Latvia, Lithuania, Kaliningrad and Poland (Fig. 13).

The Cormorants wintering in the Western Baltic mainly belong to the North Atlantic race *P. c. carbo* (Cramp & Simmons 1977). The breeding population in the Baltic countries is of the continental race *P.c. sinensis* and is rapidly increasing in number (e.g. van Eerden & Zijlstra 1991).

Table 14. Numbers of Cormorant *Phalacrocorax carbo* counted in the Baltic countries in winter 1993 including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	7,931	1,365	9,296
Finland	412	-	412
Estonia	146	-	146
Latvia	1	-	1
Lithuania	12	-	12
Kaliningrad	3	-	3
Poland	8	-	8
Germany (east)	4,310	-	4,310
Germany (west)	1,500	-	1,500
Denmark	-	14,697	14,697
Offshore	-	170	170
Total			30,555

A marked increase in wintering numbers has occurred in Danish waters where the average midwinter count has risen from 2,224 birds during 1969-1973 to 10,838 during 1987-1992 (Laursen et. al. in prep, Pihl et al. 1992). In Swedish waters the average midwinter count has increased from 1,334 birds during midwinter counts in 1969-1978 to 1,804 in 1987-1989 (see Table 2).

The large increase in the western Baltic Sea and the more moderate increase in the northern part of the central sections may indicate that an increasing proportion of *P. c. sinensis* winters in the Baltic Sea instead of in the traditional Mediterranean sites. This is supported by observations and ringing recoveries in the Danish waters in winter (J. Gregersen pers. comm.).

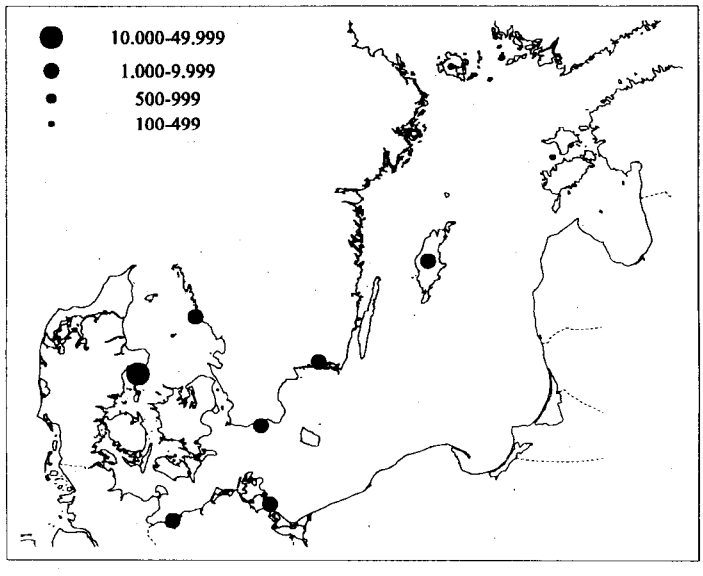

Figure 13. Numbers and distribution of Cormorant *Phalacrocorax carbo* in the Baltic region in midwinter 1993.

Table 15. Numbers of Grey Heron *Ardea cinera* counted in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	300	-	300
Finland	-	-	-
Estonia	-	-	-
Latvia	12	-	12
Lithuania	41	-	41
Kaliningrad	-	-	-
Poland	62	-	62
Germany (east)	459	-	459
Germany (west)	303	-	303
Denmark	-	1,799	1,799
Total			2,976

Given that a large proportion of the wintering Cormorants belongs to *P.c. sinensis*, considerable annual fluctuations in numbers might be expected to depend on winter severity.

The northwestern European population of *P. c. carbo* is estimated at 120,000 birds and that of *P. c. sinensis* at 200,000 birds (Rose & Scott 1994).

3.2.2 Grey Heron *Ardea cinerea*

The majority of birds were recorded in Sweden, Germany and Denmark (Table 15).

This species is found both inland and along the coast and was only partly covered by this study.

Most Grey Herons migrate south before winter and remain in winter only in the western part of the Baltic Sea (Cramp & Simmons 1977). The winter numbers are affected by the severity of the winter. In Denmark the number of Grey Herons in the latest severe winter was 21 compared to an average of 1,463 birds during 1988-1992 (Laursen et al. in prep.).

The European and North African population is estimated at 400,000-500,000 birds (Rose & Scott 1994).

3.2.3 Mute Swan *Cygnus olor*

The majority of birds recorded in the western Baltic Sea were registered in Danish waters, along the Scanian coast and in Mecklenburg-Forpommern (Germany), but large numbers were recorded east to the shallow Estonian waters (Table 16, Fig. 14).

Table 16. Numbers of Mute Swan *Cygnus olor* in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	13,297	5,492	18,789
Finland	1,793	-	1,793
Estonia	11,762	-	11,762
Latvia	2,119	-	2,119
Lithuania	160	-	160
Kaliningrad	266	-	266
Poland	3,918	300	4,218
Germany (east)	34,547	-	34,547
Germany (west)	2,263	-	2,263
Denmark	-	71,208	71,208
Total			147,125

In most Baltic countries the coverage was good and most of the numbers recorded were considerably higher than previous estimates. However, in Poland large numbers of Mute Swans winter on rivers which were not surveyed during 1993. The current estimate for the whole of Poland is 12,000-14,000 Mute Swans (Wieloch 1991). Hence, another 8,000 birds should be added to the results from this source for 1993.

In Mecklenburg-Forpommerm 7,190 unidentified swans were counted but not identified to species in 1993. The overall ratio of Mute Swan/Whooper Swan was 10:1 and it seems reasonable to assume that at least 5,000 of these unidentified swans in Mecklenburg-Forpommern were Mute Swans.

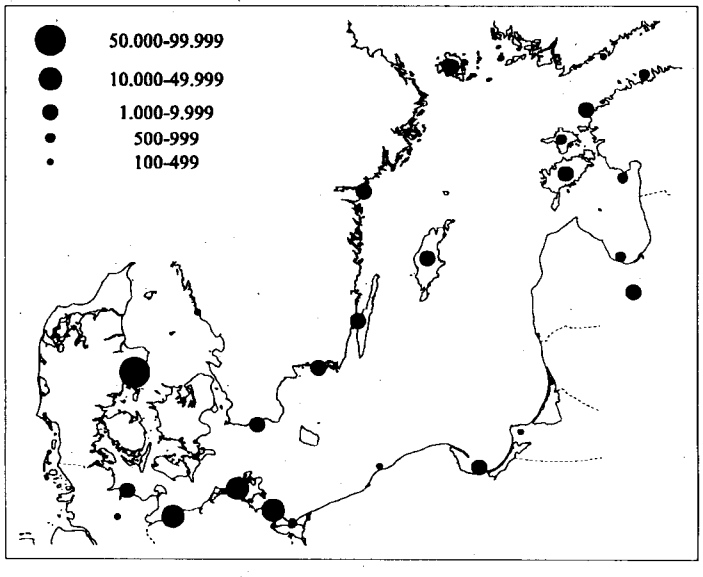

Figure 14. Numbers and distribution of Mute Swan *Cygnus olor* in the Baltic region in midwinter 1993.

In 1993, the number of Mute Swans in the Baltic region was estimated at about 160,000 birds assuming that Mute Swans were well covered during aerial and ground counts.

The population of Mute Swans in the Baltic region was estimated at 126,000 in 1989 excluding the Norwegian birds (Monval & Pirot 1989), and the current estimate of Mute Swan in winter in north-western Europe is 180,000 birds (Rose & Scott 1994).

Mute Swans suffer increased mortality during severe winters (Bacon & Andersen-Harrild 1989) which leads to considerable annual fluctuations in numbers at the wintering sites (e.g. Laursen et al. in prep.). After a series of six mild winters after the latest severe winter in the Baltic area in 1987, the population is at a high level at present. A serious decrease in numbers may be expected during and after the next severe winter in the Baltic area.

3.2.4 Whooper Swan *C. cygnus*
Bewick's Swan *C. bewickii*

The majority of Whooper Swans were recorded in the Western Baltic countries, i.e. Sweden, Poland, Germany and Denmark; 50% occurred in Danish areas (Table 17). In total, 29 Bewick's Swans were counted in Germany and about 140 in Denmark.

Whooper Swans and Bewick's Swans are not confined to coastal areas but are often found feeding on pastures and meadows inland, thus this study only covered a limited proportion of both species.

In Denmark, 7,300 Whooper Swans were estimated from aerial surveys in 1992, while simultaneous thorough land counts of all coastal and inland sites resulted in a total of more than 15,000 birds

Table 17. Numbers of Whooper Swan *Cygnus cygnus* counted in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	462	34	496
Finland	134	-	134
Estonia	250	-	250
Latvia	45	-	45
Lithuania	15	-	15
Kaliningrad	27	-	27
Poland	548	465	1,013
Germany (east)	3,657	-	3,657
Germany (west)	1,533	-	1,533
Denmark	-	7,539	7,539
Offshore	-	-	-
Total			14,709

(Laubek 1995). In 1993 similar numbers were recorded from ground counts in Denmark (Laubek 1995). Likewise, the total in Poland during aerial surveys in 1993 was 1,013 compared to an average of c. 2,800 recorded from ground counts during 1988-1990 (Dombrowski et al. 1993).

The coverage in Sweden and Germany was equal to that in Poland and Denmark and it seems reasonable to estimate the numbers present in the Baltic area in 1993 at 28,000 Whooper Swans (24,000-32,000 birds).

The northwest European winter population of Whooper Swan (excluding Icelandic birds) is estimated at 25,000 birds, Bewick's Swan in Europe is estimated at 17,000 birds (Rose & Scott 1994).

3.2.5 Shelduck *Tadorna tadorna*

In 1993, shelducks were almost confined to the Danish waters where more than 97% of all birds occurred (Table 18).

Being a cold-sensitive species (Ridgill & Fox 1990), the shelduck leaves the Baltic area in severe winters. Thus, no Shelducks were counted in the Danish parts of the Baltic Sea during the latest severe winter in 1987 (Laursen et al. in prep.).

The birds are conspicuous and easy to cover from both aerial surveys and ground counts. Therefore, the number observed is likely to be very close to the actual number, and the estimate of the Baltic population in 1993 is in accordance with the result of 18,000 birds counted during the midwinter counts.

The current estimate of Shelduck in northwest Europe is 250,000 birds (Rose & Scott 1994).

Table 18. Numbers of Shelduck *Tadorna tadorna* counted in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	235	-	235
Finland	0	-	0
Estonia	31	-	31
Latvia	0	-	0
Lithuania	0	-	0
Kaliningrad	0	-	0
Poland	0	-	0
Germany (east)	36	-	36
Germany (west)	197	-	197
Denmark	-	17,527	17,527
Total			18,026

Table 19. Numbers of Wigeon *Anas penelope* counted in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	2,033	-	2,033
Finland	1	-	1
Estonia	0	-	0
Latvia	3	-	3
Lithuania	0	-	0
Kaliningrad	0	-	0
Poland	11	-	11
Germany (east)	4,096	-	4,096
Germany (west)	17,353	-	17,353
Denmark	-	19,031	19,031
Total			42,528

3.2.6 Wigeon *Anas penelope*

The birds were confined to the western parts of the Baltic Sea including Sweden, Germany and Denmark, mainly in coastal areas (Table 19).

Being very sensitive to cold spells (Ridgill & Fox 1990), the wigeon is probably nearly absent from the Baltic countries in severe winters. Thus, only 9 Wigeons were recorded in Denmark in the latest severe winter in 1987 (Laursen et al. in prep.). Studies in Danish waters have shown that Wigeon is well covered from ground counts but somewhat underestimated from aircraft (probably about 10%; J. Madsen pers. comm.).

The estimated total of Wigeon in the Baltic Sea in winter 1993 was 45,000 birds including 10% that may have been overlooked in the aerial surveys.

The midwinter population of Wigeon in northwestern Europe is estimated at 750,000 birds (Rose & Scott 1994).

3.2.7 Mallard *Anas platyrhynchos*

Mallard was widespread throughout the Baltic Sea during the midwinter counts in 1993, being most numerous in the western part of the area (Table 20). Rather high numbers were recorded in the eastern parts as well and Mallard was the most numerous waterfowl species in Finland (Fig. 15).

Due to its dispersed distribution and occurrence on small inland sites, the midwinter counts in 1993 only partly covered the Mallard

Table 20. Numbers of Mallard *Anas platyrhynchos* counted in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	52,205	9,495	61,700
Finland	5,236	-	5,236
Estonia	21,373	-	21,273
Latvia	17,498	20	17,518
Lithuania	2,100	-	2,100
Kaliningrad	2,265	-	2,265
Poland	12,476	6,600	19,076
Germany (east)	58,325	-	58,325
Germany (west)	50,671	-	50,671
Denmark	-	136,084	136,084
Total			374,248

population. During Polish countrywide surveys in 1988-1990, an average of 373,000 Mallard was counted (Dombrowski et al. 1993), i.e. 350,000 Mallard more than found during the extended coastal surveys in this study. During 1974-1983 the average midwinter total in the previous GDR was about 215,000 in mild winters (Rutschke 1985) or about 160,000 more than found in the coastal survey in 1993. Nilsson (1975) found that only 78% of the birds counted during ground counts were observed during aerial surveys. It seems possible that an additional 100,000 birds have been overlooked in the areas surveyed from aircraft. If the inland birds in the Baltic countries and the underestimated number of birds counted during the aerial surveys were included, it would add up to an estimate of 1 mill. Mallards in the Baltic Sea in 1993.

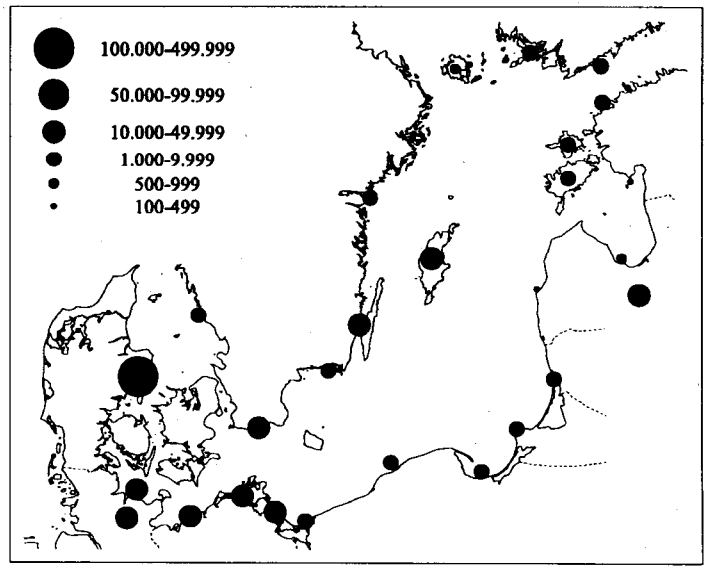

Figure 15. Numbers and distribution of Mallard *Anas platyrhynchos* in the Baltic region in midwinter 1993.

It is, however, estimated that only about 50% of Mallards are covered by aerial surveys and ground counts due to their dispersion to small ponds, rivers and other uncovered sites (Nilsson 1983, Rutschke 1985, Owen et al. 1986). An estimate of the total Mallard population in the Baltic countries in midwinter 1993 could thus be 2 mill. birds or 40% of the estimated total of 5 mill. birds for north-western Europe (Rose & Scott 1994). During the midwinter counts from 1977 to 1986, approximately 40% of the birds recorded were observed in the Baltic countries (Monval & Pirot 1989).

3.2.8 Other dabbling duck species

In total 4,474 Teals *Anas crecca*, 374 Pintails *Anas acuta*, 135 Gadwalls *Anas strepera* and 62 Shovelers *Anas clypeata* were recorded in the Baltic countries during midwinter 1993.

All four species are sensitive to cold weather (Ridgill & Fox 1990) but apparently remain in the Baltic region in very small numbers in mild winters.

3.2.9 Pochard *Aythya ferina*

The majority of the birds occurred in the southwestern part of theBaltic Sea (Table 21, Fig. 16).

The birds concentrated mainly in freshwater sites often in association with large flocks of Tufted Duck. Pochard tend to occur much more in inland areas far from the coast than Tufted Duck (Rutschke 1985). Polish counts during 1988-1990 resulted in a national average of 5,830 Pochard (Dombrowski et al. 1993) or 1,000 birds more than the results from Poland in 1993. The average in the previous GDR

Table 21. Numbers of Pochard *Aythya ferina* counted in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	1,357	109	1,466
Finland	3	-	3
Estonia	0	-	0
Latvia	3	-	3
Lithuania	20	-	20
Kaliningrad	0	-	0
Poland	4,336	540	4,876
Germany (east)	15,153	440	15,593
Germany (west)	6,215	-	6,215
Denmark	-	16,426	16,426
Total			44,602

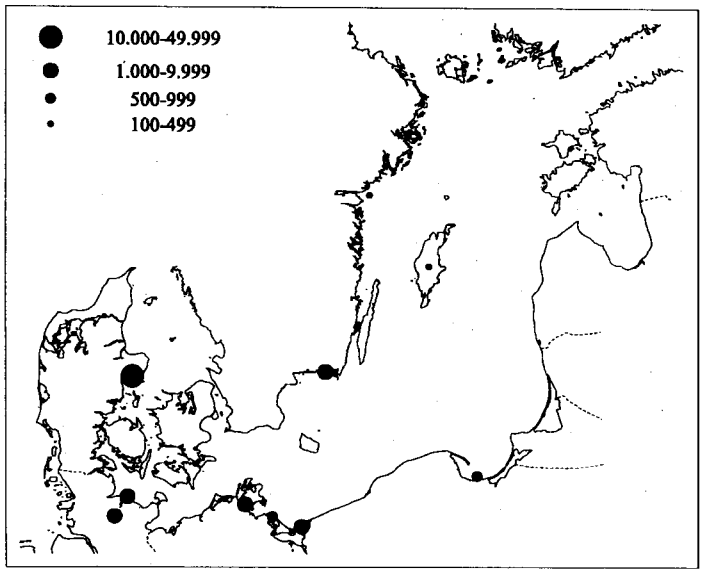

Figure 16. Numbers and distribution of Pochard *Aythya ferina* in the Baltic region in midwinter 1993.

during 1978-1983 after a period of increase was about 20,000 birds (Rutschke 1985) or 4,000 birds more than found in the present survey.

We believe that Pochard was well covered in the ground counts but to some extent overlooked during aerial surveys due to identification problems in mixed flocks of Pochard and Tufted Duck. Tufted Duck was well covered in aerial surveys (98%) compared with ground counts during Swedish surveys (Nilsson 1975).

It is our estimate that about 10% of the birds are either overlooked or not covered by the present survey making the current estimate for Pochard in the Baltic Sea 55,000 birds (50,000-60,000 birds) in winter 1993.

The population in northwest Europe is estimated at 350,000 Pochard (Rose & Scott 1994).

Table 22. Numbers of Tufted Duck *Aythya fuligula* counted in the Baltic countries in winter 1993 including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	75,746	28,561	104,307
Finland	1,707	-	1,707
Estonia	563	-	563
Latvia	18	2	20
Lithuania	170	-	170
Kaliningrad	0	-	0
Poland	51,597	3,300	54,897
Germany (east)	121,906	4,200	126,106
Germany (west)	61,665	-	61,665
Denmark	-	179,226	179,226
Total			528,661

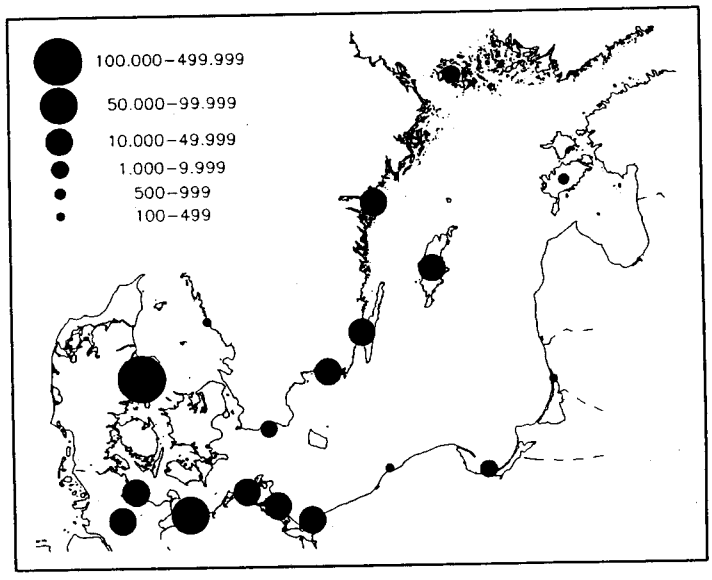

Figure 17. Numbers and distribution of Tufted Duck *Aythya fuligula* in the Baltic region in midwinter 1993.

3.2.10 Tufted Duck *Aythya fuligula*

The majority of the birds occurred in the Western part of the Baltic Sea (Table 22, Fig. 17).

Tufted Duck was easy to count due to its aggregating behaviour leading to concentrations in smaller freshwater sites and sheltered lagoons and the species was probably well covered during this study. Only few birds may be added to the totals obtained from inland sites far from the coast, as the great majority of birds probably feed in marine areas at night and choose daytime loafing areas close to their feeding grounds. Nilsson (1975) found almost equal numbers of Tufted Duck in ground counts and aerial surveys.

Some small coastal lakes may not have been surveyed, thus the numbers in the Baltic region in midwinter 1993 is estimated at 600,000 (550,000-650,000) Tufted Ducks. The current estimate of Tufted Duck in northwest Europe is 750,000 birds (Rose & Scott 1994).

3.2.11 Scaup *Aythya marila*

The majority of the birds occurred in the western part of the Baltic Sea with more than half of the birds occurring in Mecklenburg-Forpommern (Germany). The birds concentrated in large, dense flocks in bays and coastal lagoons within 1-3 km from the coast (Table 23, Fig. 18).

The species seems to be well covered in aerial surveys and the result of the midwinter survey is close to the actual numbers

Table 23. Numbers of Scaup *Aythya marila* counted in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal ccounts	Estimates	Total
Sweden	7,809	-	7,809
Finland	4	-	4
Estonia	78	-	78
Latvia	0	-	0
Lithuania	20	-	20
Kaliningrad	0	-	0
Poland	9,384	-	9,384
Germany (east)	82,936	-	82,936
Germany (west)	30,428	-	30,428
Denmark	-	25,484	25,484
Total			156,143

present. Scaup is, therefore, estimated at 175,000 birds in the Baltic region in the winter 1993.

The current northwest European estimate of Scaup is 310,000 birds (Rose & Scott 1994).

3.2.12 Eider *Somateria mollissima*

The majority of the birds occurred in the western part of the Baltic Sea with about 80% in Danish waters (Table 24, Fig. 19).

The majority of birds occurred in shallow areas close to the coasts,

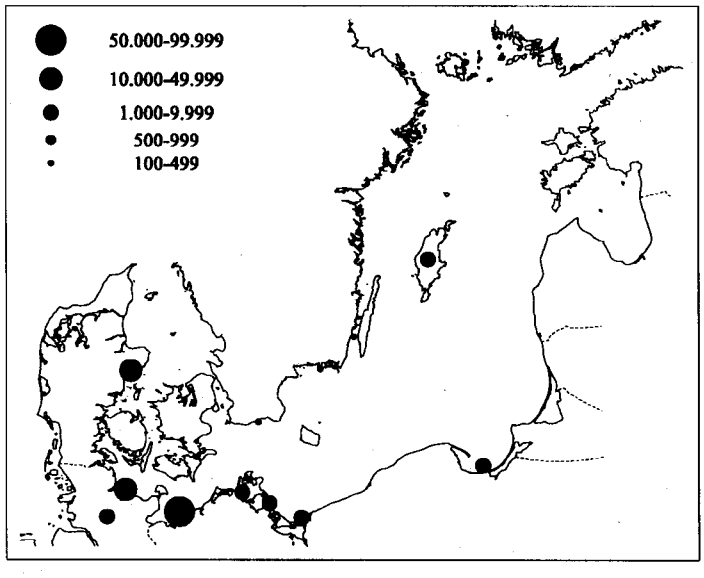

Figure 18. Numbers and distribution of Scaup *Aythya marila* in the Baltic region in midwinter 1993.

Table 24. Numbers of Eider *Somateria mollissima* counted in the Baltic countries inwinter 1993, including estimates for uncovered coastal and offshore sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Offshore estimates	Total
Sweden	5,472	1,152	-	6,624
Finland	179	-	-	179
Estonia	75	-	-	75
Latvia	1	1	400	402
Lithuania	355	-	-	355
Kaliningrad	54	-	-	54
Poland	145	-	23,500	23,645
Germany (east)	10,525	-	-	10,525
Germany (west)	118,550	-	32,000	150,550
Denmark	-	729,404	-	729,404
Total				921,813

though most often at distances that made them invisible during ground counts. In Sweden, 86% of the birds recorded from ground counts were also covered by simultaneous aerial surveys (Nilsson 1975). The present study was conducted near the coast and it is reasonable to assume that at least a similar proportion of the birds are overlooked in areas further from the coast. The numbers presented in Table 24 are mainly based on total aerial surveys. Including the 14 per cent that were overlooked in Nilsson's (1975) study, an estimated 1.1 mill. (1.0-1.3 mill.) eiders were present in the Baltic Sea in the winter of 1993.

The current European estimate of Eider in winter is 3 mill. birds (Rose & Scott 1994) of which 1 mill. are estimated in Iceland and the United Kingdom (Laursen 1989).

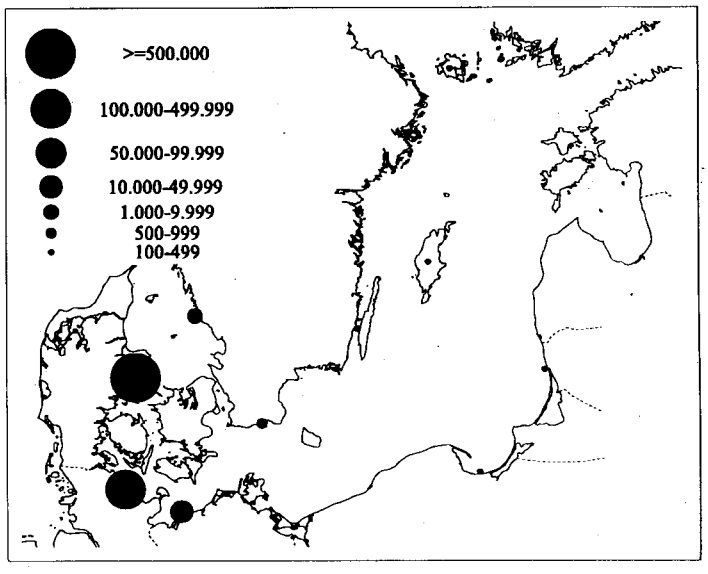

Figure 19. Numbers and distribution of Eider *Somateria mollissima* in the Baltic region in midwinter 1993.

Table 25. Number of Steller's Eider *Polysticta stelleri* counted in the Baltic countries in winter 1993, including additional estimates for uncovered sections.

	Coastal counts	Estimates	Total
Sweden	5	-	5
Finland	60	-	60
Estonia	2,631	-	2,631
Latvia	0	-	0
Lithuania	655	-	655
Kaliningrad	0	-	0
Poland	1	-	1
Germany (east)	0	-	0
Germany (west)	0	-	0
Denmark	-	0	0
Total			3,352

3.2.13 Steller's Eider *Polysticta stelleri*

The majority of Steller's Eider occurred in the eastern part of the Baltic Sea from Estonia to Lithuania with about 80% in the Estonian waters (Table 25, Fig. 20).

The coverage of coastal waters in the eastern Baltic Sea was less efficient than in the west and it seems probable that flocks could have been overlooked. The numbers of Steller's Eider wintering in Estonia have fluctuated with maximum numbers of 5,760 birds occurring in 1991 (Kuresoo 1994). The numbers in Lithuania seem to have stabilised at 570-670 since 1990 after an increase in the 1980s (Svazas et al. 1994).

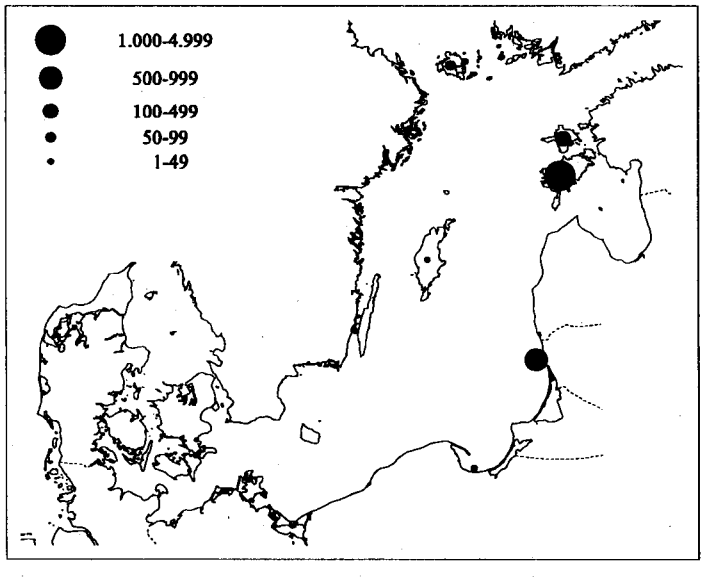

Figure 20. Numbers and distribution of Steller's Eider *Polysticta stelleri* in the Baltic region in midwinter 1993.

The total estimate for the Baltic Sea in midwinter 1993 is 4,000 birds, but the results from previous years suggest a winter population of 3,500-6,500 birds.

The current midwinter estimate for Steller's Eider in northeastern Europe is 15,000 birds (Rose & Scott 1994).

3.2.14 Long-tailed Duck *Clangula hyemalis*

The birds occurred most numerously in the eastern and central parts of the Baltic Sea, particularly in Riga Bay, Hoburgs Bank south of Gotland and the Pomeranian Bay, but the birds were widespread over large parts of the Baltic Sea (Table 26, Fig. 21). Long-tailed Duck was the only Anatidae species that occurred in large numbers in waters deeper than 20 m.

The numbers of birds are almost exclusively based on ship transects due to the birds' offshore occurrence. However, ship surveys were performed only up to 58°30N and did not cover several potentially suitable areas for Long-tailed Duck. In Estonia along the north coast of Saaremaa, the coasts of Hiiumaa, the entrance to the Finnish Bay and the shoals of the small island Ruhnu in Riga Bay (e.g. Ruhnu Island is situated close to the Irbe Strait where 700,000 Long-tailed Ducks were estimated); the archipelago areas of the Swedish east coast, the Gdansk Bay in Poland, and the Kaliningrad waters were not covered by ship transects.

The total estimate for Long-tailed Duck in the Baltic Sea in 1993 was 4.25 million (4-5 million) birds.

Table 26. Numbers of Long-tailed Duck *Clangula hyemalis* counted in the Baltic countries in winter 1993, including additional estimates for uncovered sections are included. For Denmark the total gives the average of midwinter counts in 1991 and 1992 and ship transects 1988-1993.

	Coastal counts	Coastal estimates	Offshore estimate	Total
Sweden	11,908	-	1,483,772	1,495,680
Finland	1,610	-	-	1,610
Estonia	40,509	-	641,400	681,909
Latvia	6,324	900	509,400	516,624
Lithuania	6,210	-	48,500	54,710
Kaliningrad	6,730	-	2,000	8,730
Poland	11,845	-	769,400	781,245
Germany (east)	4,919	-	490,100	495,019
Germany (west)	5,121	-	81,250	86,371
Denmark	-	4,812	128,150	132,962
Total				4,254,860

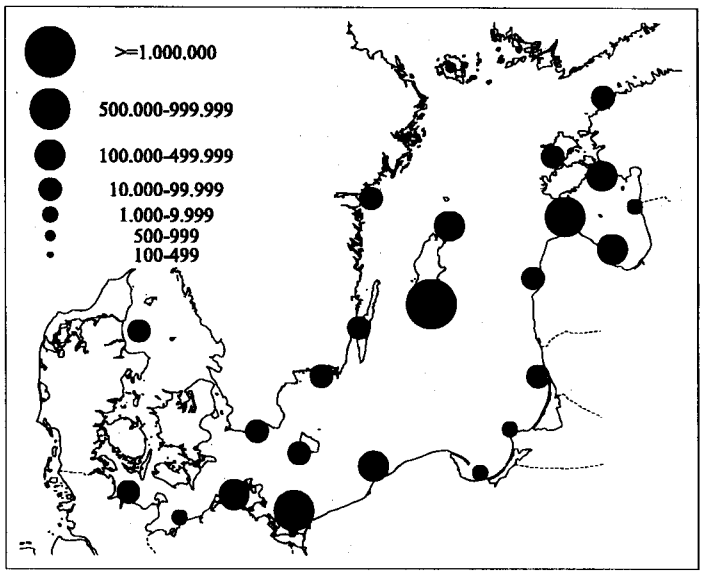

Figure 21. Numbers and distribution of Long-tailed Duck *Clangula hyemalis* in the Baltic region in midwinter 1993.

Due to the birds' dispersed distribution in offshore areas this species has been almost impossible to monitor. Isakov (1970) estimated the Soviet breeding population at 720,000 pairs (i.e. 2-3 million birds), but Uspensky (1970) estimated the Soviet post-breeding population at 5 million birds.

The current northwest European estimate in winter is 2 million including 115,000 birds wintering in the waters of Norway and Great Britain (Laursen 1989, Rose & Scott 1994). However, this estimate is based only on about 300,000 birds counted in Sweden, Finland, Estonia, Latvia and Lithuania, where the current study located 2.75 million birds.

Table 27. Numbers of Common Scoter *Melanitta nigra* counted in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Coastal estimates	Offshore estimates	Total
Sweden	469	-	-	469
Finland	3	-	-	3
Estonia	214	-	25	539
Latvia	95	-	5,005	5,100
Lithuania	1,320	-	-	1,320
Kaliningrad	0	-	-	0
Poland	2,277	-	16,800	18,277
Germany (east)	226	-	115,140	115,366
Germany (west)	15,937	-	81,600	97,537
Denmark	-	749,662	-	749,662
Total				988,273

3.2.15 Common Scoter *Melanitta nigra*

The majority of the birds occurred in the western parts of the Baltic Sea, particularly in Kattegat (Table 27, Fig. 22).

Counts from Denmark and Schleswig-Holstein in Germany were based on total aeroplane surveys, whereas in all other waters the numbers were estimated from results obtained in ship transects.

The results of the Danish midwinter counts in 1991 and 1992 varied greatly, probably due to a better coverage in 1992. In 1991, 554,801 birds were counted, compared to 950,274 birds in 1992 (Pihl et al. 1992).

The numbers of Common Scoters in the Baltic Sea in 1993 is estimated at 1.2 million (1.0-1.3 million) birds. In northwestern Europe this species is currently estimated at 800,000 at midwinter (Rose & Scott 1994). However, this estimate is based on 226,000 birds in Danish waters (Laursen 1989) or 500,000 less than the average results from 1991 and 1992.

3.2.16 Velvet Scoter *Melanitta fusca*

The majority of the birds occurred in three well-defined areas, i.e. the Irbe strait/Riga Bay, the Pomeranian Bay and Kattegat (Table 28, Fig. 23).

Counts from Denmark, Germany and Lithuania were based on total aerial surveys as well as ship transects, whereas numbers in all other waters were estimated from ship transects.

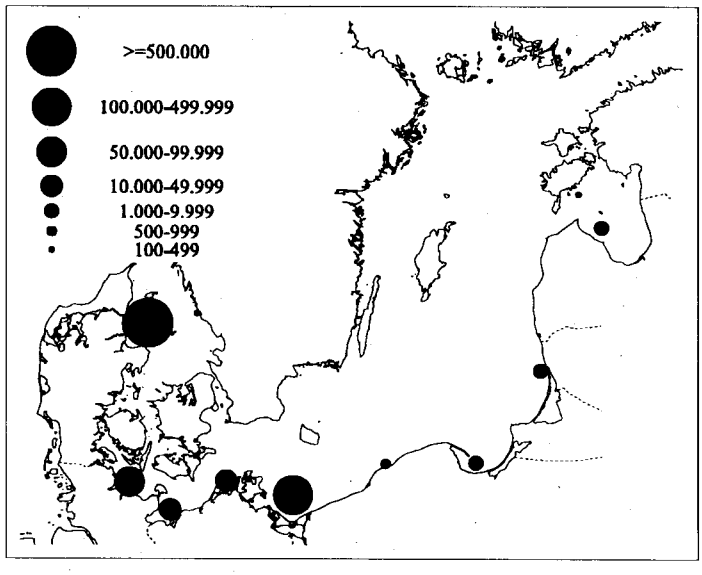

Figure 22. Numbers and distribution of Common Scoter *Melanitta nigra* in the Baltic in midwinter 1993.

Table 28. Numbers of Velvet Scoter *Melanitta fusca* counted in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Coastal estimates	Offshore estimates	Total
Sweden	367	-	-	367
Finland	2	-	-	2
Estonia	206	-	197,800	198,006
Latvia	65	-	144,270	144,335
Lithuania	17,640	-	15,300	32,940
Kaliningrad	570	-	2,000	2,570
Poland	289	-	302,560	302,849
Germany (east)	72	-	155,080	155,152
Germany (west)	4	-	920	924
Denmark	-	65,970	28,815	94,785
Total				931,930

Improved aerial coverage of Denmark in Kattegat in 1992 increased the numbers of Velvet Scoter counted as well as those of Common Scoter. In 1991, 10,195 birds were recorded in Danish waters, while 121,812 birds were recorded in 1992 (Pihl et al. 1992). During ship transects in midwinter 1988 Velvet Scoter was estimated at 124,000 birds in Danish waters.

The numbers of Velvet Scoters in the Baltic Sea in 1993 is estimated at 950,000 (0.9-1.0 mill.) birds.

In northwestern Europe the species is currently estimated at 250,000 in midwinter (Rose & Scott 1994). However, this estimate was based on the counts of less than 10,000 birds in the Baltic Sea outside Danish waters (Laursen 1989).

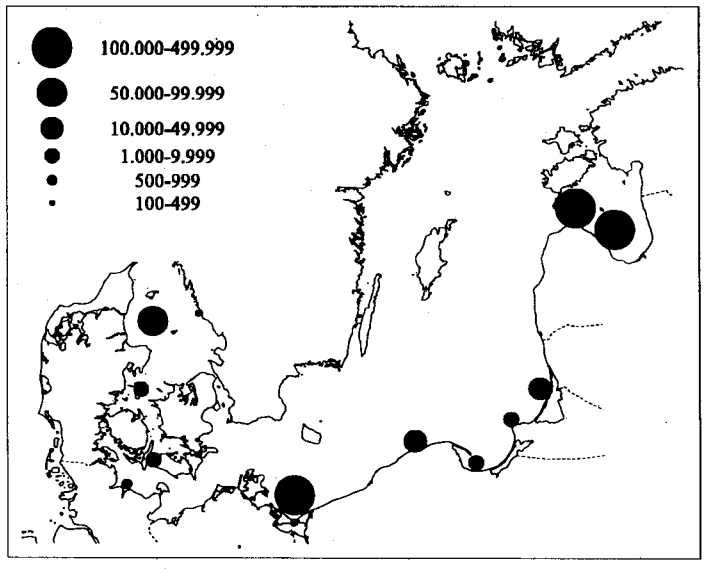

Figure 23. Numbers and distribution of Velvet Scoter *Melanitta fusca* in the Baltic region in midwinter 1993.

Table 29. Numbers of Goldeneye *Bucephala clangula* counted in the Baltic countries in the winter 1993, including estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	24,206	5,779	29,985
Finland	558	-	558
Estonia	11,788	-	11,788
Latvia	3,405	100	3,505
Lithuania	1,430	-	1,430
Kaliningrad	1,180	-	1,180
Poland	15,424	200	15,624
Germany (east)	17,919	280	18,199
Germany (west)	9,626	-	9,626
Denmark	-	62,553	62,553
Total			154,448

3.2.17 Goldeneye *Bucephala clangula*

The birds were widespread along all coasts in the Baltic Sea, particularly in the western part (Table 29, Fig. 24).The surveys probably covered this species well in coastal waters. However, Goldeneye also occur in inland waters, particularly in rivers. During Polish countrywide surveys in 1988-1990 an average of 31,000 Goldeneyes was recorded, i.e. 15,500 birds more than in 1993 or precisely the average numbers of eastern Poland which was not part of the survey area in 1993 due to the lack of coastal areas in this part of Poland. In Mecklenburg-Forpommern in Germany large numbers of Goldeneye might have been counted if the inland rivers had been covered.

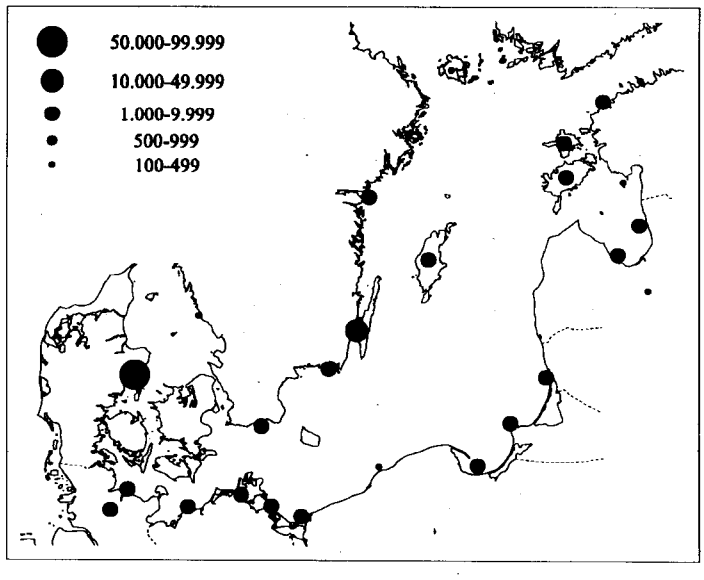

Figure 24. Numbers and distribution of Goldeneye *Bucephala clangula* in the Baltic region in midwinter 1993.

Nilsson (1975) estimated that 78% of Goldeneyes counted from the ground were detected by simultaneous aerial surveys.

Adding the missing and overlooked birds from Poland and Germany estimated at 32,000 birds and the 18,000 birds overlooked during aerial surveys in Denmark, the estimate of Goldeneye in the Baltic Sea in 1993 adds up to 210,000 (180,000-230,000) birds.

In northwestern Europe this species is currently estimated at 300,000 birds at midwinter (Rose & Scott 1994).

3.2.18 Smew *Mergus albellus*

The birds were mainly recorded in the shallow lagoons and bays along the southern Baltic coast from Lithuania to Germany particularly in those close to the Polish-German border (Table 30, Fig. 25).

The species was considered well covered by the surveys, even though large numbers may occur on inland waters. During countrywide surveys in Poland 1988-1990 an average of 2,420 Smews was recorded in the eastern part of Poland which was not covered in 1993 (Dombrovsky et al. 1993). In Poland large variations in numbers seem to have occurred in the Szczezin Lagoon. During the 1993, study 4,283 Smews were counted compared to 14,523 in 1992.

The numbers in the Baltic Sea in 1993 is estimated at 20,000 birds including the birds from eastern Poland and compensating for the variations in the Szczezin Lagoon.

The Smew population is currently estimated at 15,000 birds in northwestern Europe in winter (Rose & Scott 1994), but this estimate is based on less than 1,000 birds from Poland (Monval & Pirot 1989).

Table 30. Numbers of Smew *Mergus albellus* counted in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average from midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	671	29	700
Finland	1	-	1
Estonia	154	-	154
Latvia	69	-	69
Lithuania	340	-	340
Kaliningrad	0	-	0
Poland	5,835	60	5,895
Germany (east)	6,504	-	6,504
Germany (west)	490	-	490
Denmark	-	193	193
Total			14,346

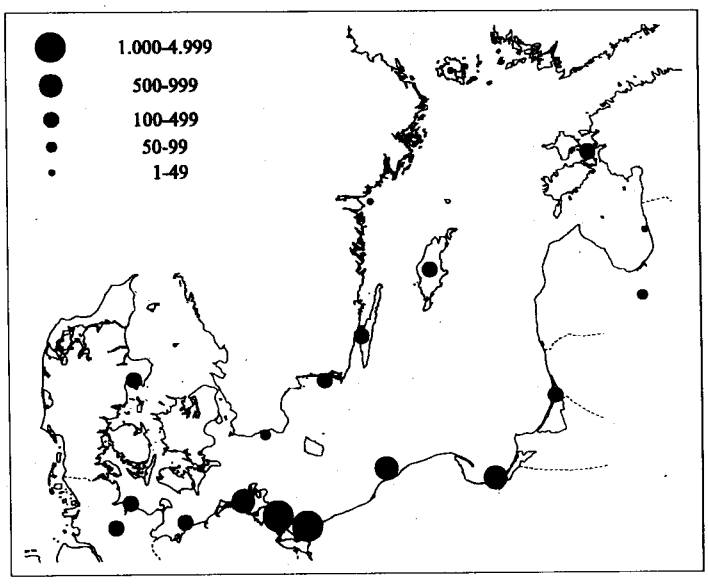

Figure 25. Numbers and distribution of Smew *Mergus albellus* in the Baltic region in midwinter 1993.

3.2.19 Red-breasted Merganser *Mergus serrator*

The birds were recorded from throughout the whole study area but particularly from German and Danish waters (Fig. 26). Half the birds were counted or estimated in near coastal sections and the other half were estimated from ship transects in offshore waters (Table 31).

The species is very difficult to survey due to its occurrence in the coastal zone extending too far from the shore to be adequately covered from aircraft and too close to be completely covered from

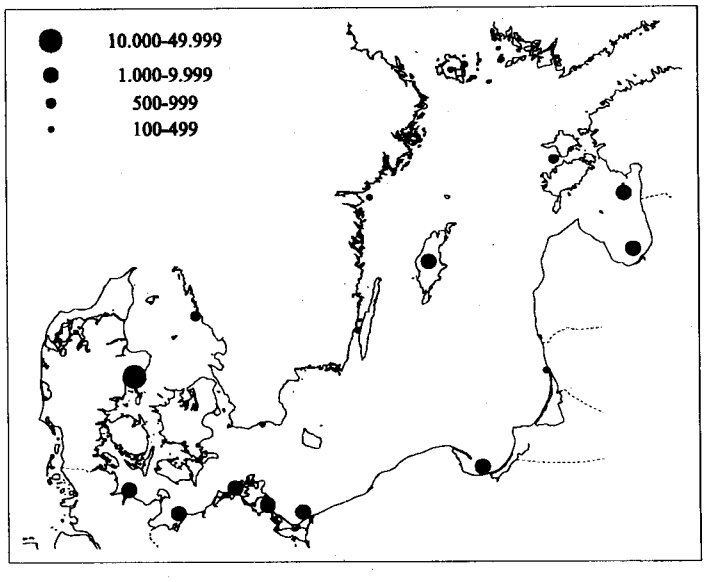

Figure 26. Numbers and distribution of Red-breasted Merganser *Mergus serrator* in the Baltic region in midwinter 1993

Table 31. Numbers of Red-breasted Merganser *Mergus serrator* counted in the Baltic countries in winter 1993, including estimates for uncovered sections. For Denmark the total gives the average from midwinter counts in 1991 and 1992 and ship transects during 1988-1993.

	Coastal counts	Coastal estimate	Offshore estimate	Total
Sweden	1,344	623	3,030	4,997
Finland	118	-	-	118
Estonia	420	-	1,440	1,860
Latvia	87	5	1,000	1,092
Lithuania	460	-	-	460
Kaliningrad	0	-	-	0
Poland	166	-	5,400	5,566
Germany (east)	5,024	-	8,800	13,824
Germany (west)	1,580	-	1,685	3,265
Denmark	-	12,705	910	13,615
Total				44,797

ship. In addition, the Red-breasted Merganser is probably the most difficult duck species in northwestern Europe to survey from aircraft. The birds most often occur in pairs or small flocks, they often dive or take off before they can be observed unless weather conditions are excellent. Nilsson (1975) estimated that only 39% of the birds covered from ground counts were counted during simultaneous aerial surveys. The efficiency of ship counts is unknown.

The Red-breasted Merganser was estimated at 65,000 (50,000-90,000) birds in the Baltic Sea in winter 1993 including 50% overlooked in the coastal surveys. The estimate range is wide due to the difficulties of surveying the species.

Red-breasted Merganser is currently estimated at 100,000 birds in northwestern Europe in winter (Rose & Scott 1994), but the number is based on counts of only 20,000-30,000 birds in the Baltic area (Monval & Pirot 1989).

3.2.20 Goosander *Mergus merganser*

The birds were mainly recorded in bays, shallow lagoons and coastal lakes. Goosanders occurred in all parts of the Baltic Sea with major concentrations in Sweden, Lithuania, Poland, Germany and Denmark (Table 32, Fig. 27).

The Goosander was only partly covered by this study. The birds occur in lakes and inland rivers away from the coast, particularly in mild winters like the one in 1993. During countrywide surveys in Poland during 1988-1990 an average of 2,500 Goosanders were recorded in the eastern part of Poland which was not covered in 1993 (Dombrovsky et al. 1993). To some degree, the birds may also

Table 32. Numbers of Goosander *Mergus merganser* counted in the Baltic countries in winter 1993, including additional estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden	14,252	7,627	21,879
Finland	2,747	-	2,747
Estonia	5,474	-	5,474
Latvia	2,181	-	2,181
Lithuania	19,400	-	19,400
Kaliningrad	5,784	-	5,784
Poland	35,464	480	35,944
Germany (east)	9,325	130	9,455
Germany (west)	4,109	-	4,109
Denmark	-	18,464	18,464
Total			125,437

have been overlooked in aerial surveys. Nilsson (1975) found that 64% of the birds counted on ground counts were covered by simultaneous aerial surveys.

In 1993, the estimate in the Baltic Sea in 1993 was 170,000 (140,000-200,000) Goosanders including birds from the inland parts of Poland and Germany and 25% overlooked in the aerial surveys.

The goosander population is currently estimated at 150,000 birds in northwestern Europe in winter (Rose & Scott 1994), but the number is originally presented without much confidence by the authors based on heavily fluctuating results of midwinter counts (Monval & Pirot 1989).

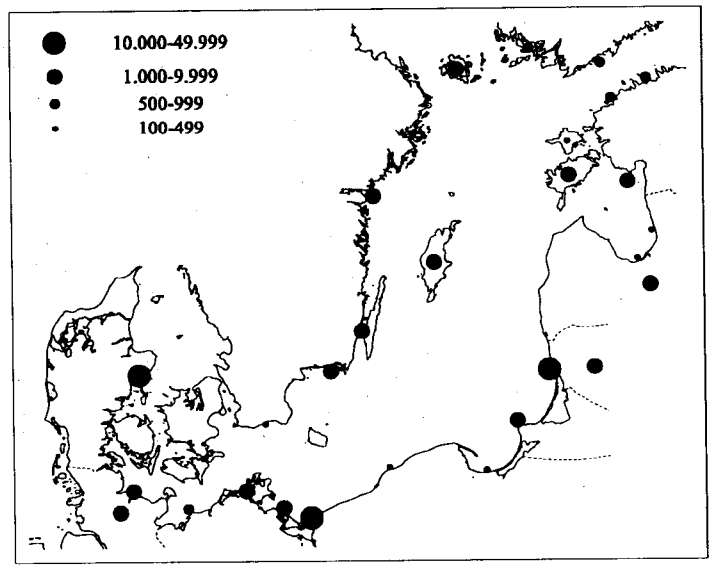

Figure 27. Numbers and distribution of Goosander *Mergus merganser* in the Baltic region in midwinter 1993.

Table 33. Numbers of Coot *Fulica atra* counted in the Baltic countries in winter 1993, including additional estimates for uncovered sections. For Denmark the total gives the average of midwinter counts in 1991 and 1992.

	Coastal counts	Estimates	Total
Sweden Total	8,294	8,816	17,110
Finland	370	-	370
Estonia	257	-	257
Latvia	463	-	463
Lithuania	35	-	35
Kaliningrad	126	-	126
Poland	10,676	1,130	11,806
Germany (east)	43,726	-	43,726
Germany (west)	72,590	-	72,590
Denmark	-	187,650	187,650
Total			334,133

3.2.21 Coot *Fulica atra*

The Coot was mainly recorded in dense flocks in bays, fiords and shallow lagoons and occurred most numerously in the Western parts of the Baltic Sea (Table 33, Fig. 28).

As Coots are widely distributed, like Mallard often at small inland sites, the species is only partly covered by this study. During countrywide surveys in Poland 1988-1990, an average of 55,000 Coots was recorded compared to about 12,000 in the coastal zone in 1993 (Dombrowski et al. 1993).

Coot was estimated at 400,000 (375,000-500,000) birds in the Baltic areas in winter 1993 including 40,000 birds from interior Poland

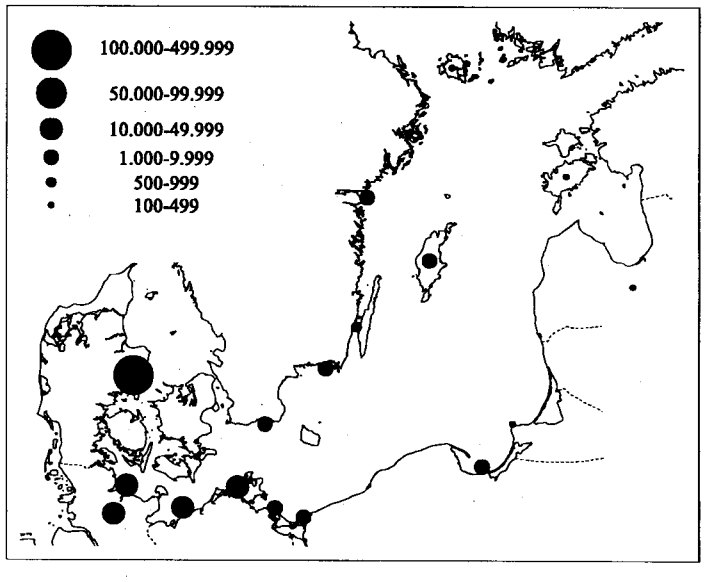

Figure 28. Numbers and distribution of Coot *Fulica atra* in the Baltic region in midwinter 1993.

and birds from interior Sweden, Germany and Denmark. This estimate is based on very little information about numbers in very small freshwater sites and the actual numbers are likely to be somewhat higher.

The Coot population is currently estimated at 1.5 mill. birds in northwestern Europe in winter (Rose & Scott 1994), based on fluctuating numbers in winter due to extensive movements and increased mortality in the Baltic area in severe winters (Monval & Pirot 1989, Nilsson 1984).

4 Conclusion

In midwinter 1993, the Baltic Task Force obtained almost complete coverage of the Baltic waters less than 30 metres deep when results from areas surveyed in previous years were included. Water areas deeper than 30 metres were well to moderately covered.

The 1993 winter was the sixth in a row of mild winters in the Baltic Sea which affected the results. Cold-sensitive species which mainly stay in Baltic waters (Nilsson 1984, Bacon & Andersen-Harild 1989) had not suffered increased mortality since the latest severe winter in 1987; accordingly the numbers recorded were high (e.g. Mute Swan, Mallard, Tufted Duck, Goldeneye, Goosander and Coot) (see Table 4).

The cold-sensitive species which move to milder areas during periods of prolonged ice cover (Ridgill & Fox 1990) were recorded in high numbers due to the mild weather conditions in 1993 (e.g. Cormorant, Grey Heron, Shelduck, Wigeon, Pochard and Smew) (see Table 4).

The species wintering in the western Baltic offshore waters were estimated in numbers that correspond well with the current knowledge of these species (e.g. Eider and Common Scoter) (see Table 4).

In the eastern Baltic offshore waters extensive wintering grounds for waterbirds were found and the numbers estimated were much higher than previously recorded. The numbers of birds present make it advisable to recalculate the species population estimates in the Western Palearctic for Long-tailed Duck and Velvet Scoter (see Table 4).

The current population estimates of wintering waterbirds in the Western Palearctic is generally based on Monval & Pirot (1989) and

Laursen (1989) which include data up to 1987. As these estimates are based on very little data from Estonia, Latvia, Lithuania and Poland, almost all of them are too low concerning the Baltic area. An exception to this pattern is Scaup whose population estimate was revised in Laursen et al. (1992) to a level that corresponds well with the results from this study.

The general pattern of waterbird wintering areas in the Baltic Sea tend to be that of increasing numbers going west. There are three clear exceptions to this pattern: Steller's Eider which is only distributed in the eastern Baltic south and west to Lithuania, Long-tailed Duck which is distributed in the whole Baltic Sea but with the largest concentrations in the eastern and central parts and Velvet Scoter of which large concentrations were recorded from Riga Bay in the east to Kattegat in the west, but which was most numerous in the east.

Two species, i.e. Steller's Eider and Smew, for which a large proportion of the northwest European population occurs in the Baltic Sea in winter must be given special attention in terms of monitoring and conservation.

Steller's Eider has a small population size (15,000 birds) in northwestern Europe of which a considerable part is concentrating on very shallow water in only two areas in the Baltic Sea: Saaremaa in Estonia and Palanga in northern Lithuania.

Smew has a similar small population size in northwestern Europe (15,000 birds), even though this might soon be updated to a higher level. The majority of Smews concentrate in a few large lagoons in Poland and Germany.

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The National Environmental Research Institute - NERI - is a research institute of the Ministry of Environment and Energy. NERI's tasks are primarily to do research, collect data and give advice on problems related to the environment and Nature.

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Publications:

NERI publishes professional reports, technical instructions, reprints of scientific and professional articles, Danish Review of Game Biology and an Annual Report.

Included in the Annual Report is a review of the publications from the year in question. The Annual Report and an up-to-date review of the year's publications are availble on application to NERI.