Breeding Birds in the Wadden Sea in 1996

Results of a total survey in 1996 and of numbers of colony breeding species between 1991 and 1996

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Editorial Foreword

With the publication of this report, it is the second time that a complete breeding bird survey in the entire Wadden Sea is presented in the framework of the Trilateral Monitoring and Assessment Program (TMAP) by the Joint Monitoring Group of Breeding Birds in the Wadden Sea (JMBB). The results of the first complete survey of breeding birds of the entire Wadden Sea in 1990 were published in 1994 as the first issue of the publication series 'Wadden Sea Ecosystems' edited by the Common Wadden Sea Secretariat (CWSS).

The current report is the tenth issue of the Wadden Sea Ecosystem series and includes the results of the 1996 total survey and the comparisons with the first survey five years ago. Furthermore, for the colony nesting species, changes in distribution and abundance are given for the first time on an annual basis for the period between 1991 and 1996. The report reflects the fact that the joint breeding bird monitoring program has now been operational for a longer period of time, allowing for the analysis of long term-series. The evaluation consists of three main parts: firstly, an overview on the basic information regarding the study area and the methods used in the 1996 survey; secondly, the results, which are given separately for each of the concerned 31 species; and thirdly, the discussion chapter, which confirms the outstanding significance of the breeding bird fauna of the entire Wadden Sea. It is shown that the breeding bird monitoring provides a mechanism for evaluating the nature conservation actions and achievements in the Wadden Sea.

Considering the huge data set and the limited available time for a trilateral evaluation and the compilation of the report by the members of the JMBB, the publication of the results - only four years after the survey - can be seen as a great accomplishment. We would like to thank all those who contributed to the surveys and the report, such as the field workers and organizations involved, the authors and, in particular, Lars Maltha Rasmussen. Only his continuous work input and enormous effort in handling the huge data set, evaluating the data and compiling the numerous figures and most of the text, made this report possible.

Bettina Reineking
Common Wadden Sea Secretariat
June 2000

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This report was only possible through the collaborative effort of a large number of field workers and volunteers in the three countries. We would like to thank all the people who have participated in the surveys of breeding birds since 1991. A list of the field workers, organizations and institutions involved in the 1996 survey is given in Appendix D.

We would especially like to thank other members of the Joint Monitoring Group of Breeding Birds (JMBB) in the Wadden Sea: Rob Vogel and Lieuwe Dijksen, SOVON, The Netherlands. Thanks to Gerold Lüerßen, Common Wadden Sea Secretariat, for preparing the landscape map. We would also like to thank the people who commented on the draft text for their valuable contributions: Otto Overdijk, Eric Stienen, Cor Smit from The Netherlands and Ole Thorup, Denmark. Tony Fox, NERI, Denmark made valuable contributions to the text and checked the English, and Marijke Polanski, Common Wadden Sea Secretariat, corrected the English language.

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May 2000

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Summary

Denmark, Germany and The Netherlands co-operate to protect the Wadden Sea. Since 1990, when a "Joint Monitoring Project for Breeding Birds in the Wadden Sea" was initiated, coordinated counts of breeding birds have been carried out with the aim of monitoring changes in numbers and distribution of selected breeding birds, to provide a baseline for protection measures and conservation actions throughout the Wadden Sea. Under the framework of the overall Trilateral Monitoring and Assessment Program (TMAP), the present report on "Breeding Birds in the Wadden Sea in 1996" is the sixth publication of the Joint Monitoring Program for Breeding Birds in the Wadden Sea.

In this report, the results of the second total survey of breeding birds throughout the entire Wadden Sea from 1996 are presented and compared with the first complete count in 1991 (Fleet et al. 1994). Moreover, for the colony nesting species, changes in distribution and abundance are given on an annual basis for the period 1991-1996. The species accounts especially focus on the most important factors affecting population trends.

The report covers 31 typical breeding bird species, which inhabit coastal habitats, including all waders, gulls and terns, Great Cormorant, Eurasian Spoonbill, Hen Harrier, Shelduck, Common Eider, Red-breasted Merganser and Short-eared Owl. The results are presented with distribution maps of the species in 1996, trends in overall numbers and information on habitat choice, distribution, population size and changes. New trilateral guidelines for monitoring the populations involved have been implemented since 1995 (Hälterlein et al. 1995). These have improved the quality of the data that are collected under the program.

The report confirms the outstanding significance of the breeding bird fauna of the Wadden Sea. The Wadden Sea is of great importance for a number of coastal species supporting large proportions of the northwestern Europe breeding populations. More than 50% of the northwest European population of Gull-billed Tern, Eurasian Spoonbill and Avocet breed in the Wadden Sea (Appendix C).

The population trends for most species of gulls in the period 1991 to 1996 were stable or increasing. The population of Lesser Black-backed Gull increased 115% in the six-year period and the population of Herring Gull was markedly reduced in the western Wadden Sea. It is suggested that the fisheries in the southern North Sea affect the relative abundance of the two species.

For some colony breeding species, the data presented in this report show that exchange of breeding individuals takes place to a large extent across borders and even with populations outside

the Wadden Sea. It emphasizes that co-ordinated monitoring is necessary to explain changes in abundance of shared bird populations. The case of the Sandwich Tern demonstrates clearly that both short and long-term changes can only be understood if all colonies in the Wadden Sea are monitored annually. For some other species, it seems that decreases in some regions are compensated for by increases elsewhere. Black-headed Gull and Common Tern showed opposite trends in Niedersachsen and, large regional changes in the western Wadden Sea. The Wadden Sea population of both species remained stable over the period 1991-1996.

The data emphasize that the breeding bird populations represent a commonly shared resource that needs common protection. For several breeding populations, it is of crucial importance that appropriate protection measures are undertaken to maintain their natural distribution and favorable breeding success. For several species, protection measures could improve breeding conditions. The population of Little Tern increased for the first time in decades, possibly in response to better protection, although numbers breeding, especially in the western Wadden Sea, might remain very low due to lack of disturbance-free areas on beaches. Kentish Plover continued to decline due to loss of appropriate breeding sites through vegetation development in recently embanked areas, and lack of suitable alternative breeding habitats on the beaches exploited by tourists.

Two groups of non-colony breeding wader species can be identified showing opposite trends. Species that use mudflats as feeding habitat, such as Common Redshank and Oystercatcher, are generally stable or increasing, whereas most species dependent on terrestrial feeding in habitats with traditional farming practices, such as Ruff and Dunlin, are declining. The population of Oystercatcher in the Dutch Wadden Sea is declining in contrast to the rest of the Wadden Sea, a feature thought to be the result of over-exploitation of mussels. For the populations of Ruff and Dunlin, the declines are alarming, and protection measures are necessary to prevent the Dunlin and Ruff from becoming extinct as breeding birds in the Wadden Sea.

For other wader species, breeding in agricultural areas, like Northern Lapwing and Black-tailed Godwit, the Wadden Sea is of increasing importance. Inland populations have widely disappeared following intensification of farmland, and the larger, protected coastal wetlands and meadows now represent the last retreats. In The Netherlands, however, the inland meadows are still of much greater importance for Northern Lapwing and Black-tailed Godwit.

The Common Redshank has shown a remarkable increase in areas in Niedersachsen and Schleswig-Holstein where grazing has been reduced or stopped over large areas. In contrast, declines were reported from the Dutch Dollard area, where intensive grazing led to decreasing numbers.

So far, protection of the Wadden Sea has mainly focused on the marine habitats, such as tidal and intertidal areas, beaches and salt marshes, but the protection of terrestrial habitats, such as wet dunes, brackish meadows and permanent grassland in polders, clearly needs more attention. The development of the newly reclaimed areas shows that nature management behind the dikes cannot compensate for the loss of salt marshes and mudflats. Through intensive nature management, it is possible to improve conditions for some meadow bird species and roosting conditions for birds in the wetland areas in polders and behind the dikes. Nature restoration behind the dikes (by re-establishing high and varying water tables, permanent grasslands and swamps) could compensate for the loss of breeding habitat in the former transition zone between the Wadden Sea and the terrestrial habitats.

To be able to better understand the distribution patterns and trends of breeding birds in the Wadden Sea, it will be necessary to combine this information with the results of the future monitoring of a number of parameters, such as fishery, farming practice, tourism, habitat distributions, pollutants in birds eggs etc.. Knowledge about breeding success and mortality is also essential in order to understand the dynamics of individual species in the ecosystem and to be able to explain the observed trends, although data are still lacking for most species. The implementation of the breeding success program under the TMAP (Trilateral Monitoring and Assessment Program) is necessary to reach this goal.

This report proves a sound basis of ecological data relating to breeding birds in the Wadden Sea upon which to base conservation priorities and actions in the area. Monitoring is only possible through the help of many volunteers and the coordination of all efforts on the national and trilateral levels. This monitoring continues to provide an early warning system and a mechanism for evaluation of the nature conservation actions and achievements in the Wadden Sea.

Sammenfatning

Danmark, Tyskland og Holland samarbejder om at beskytte Vadehavet. Siden 1990 hvor et "Fælles overvågningsprojekt af ynglefuglene i Vadehavet" blev startet er der udført koordinerede optællinger af ynglefugle med henblik på at overvåge ændringer i antal og fordeling af udvalgte arter. Formålet er at tilvejebringe et grundlag for beskyttelse og fredningstiltag i hele Vadehavet. Inden for rammerne af det fælles overvågningsprogram "Trilateral Monitoring and Assessment Program" (TMAP) er nærværende rapport med den danske titel "Ynglefugle i Vadehavet 1996" den sjette publikation fra det fælles overvågningsprogram i Vadehavet (Joint Monitoring Program for Breeding Birds in the Wadden Sea).

I denne rapport præsenteres resultaterne af den anden dækkende optælling af ynglefugle i hele Vadehavet fra 1996, og resultaterne sammenlignes med den første optælling i 1991 (Fleet et al. 1994). Endvidere præsenteres ændringer i udbredelse og antal for de koloniynglende fugle i perioden 1991-1996. Artsgennemgangen beskæftiger sig især med de vigtigste årsager til ændringer i bestandsudviklingen.

Rapporten omfatter 31 arter af ynglefugle der er typiske for Vadehavets kystnære levesteder. De omfatter alle vadefugle, måger og terner, samt skarv, skestork, blå kærhøg, gravand, ederfugl, toppet skallesluger og mosehornugle. Resultaterne er præsenteret med udbredelseskort for arterne i 1996, bestandsudviklingen for de fire nationale regioner og Vadehavet som helhed, oplysninger om levested, udbredelse, bestandsstørrelse og ændringer. Der har siden 1995 været anvendt nye fælles retningslinier for optælling af ynglefugle (Hälterlein et al. 1995). Disse har forbedret kvaliteten af de indsamlede data til overvågningsprogrammet.

Vadehavets helt enestående store betydning for ynglefuglene bekræftes af de data der præsenteres i rapporten. Vadehavet er af afgørende betydning for en række arter der yngler ved kyster, og huser væsentlige dele af den nordvesteuropæiske ynglebestand af disse. I Vadehavet yngler mere end 50% af bestanden i Nordvesteuropa af sandterne, skestork og klyde (Appendix C).

Bestandsudviklingen er stabil eller positiv for de fleste arter af måger. Bestanden af sildemåge steg 115% i perioden på seks år fra 1991-1996, medens bestanden af sølvmåge blev væsentligt reduceret i den vestlige del af Vadehavet. Fiskeriet i den sydlige del af Nordsøen kan tænkes at påvirke den relative fordeling af de to arter.

For nogle af de koloniynglende arter viser de præsenterede data, at der sker en udveksling af individer i ynglebestanden på tværs af landgrænser og endda med bestande uden for Vadehavet. Dette understreger betydningen af en koordineret overvågning for at kunne forklare ændringer i hyppighed af bestande der er fælles for et stort område. Eksemplet med splitterne viser klart at ændringer både på kort og lang sigt, kun kan forstås hvis alle kolonier i Vadehavet optælles årligt. For nogle arter synes en nedgang i antallet i én del af Vadehavet at kompenseres for ved en fremgang i en anden del. Hættemåge og Fjordterne udviste modsatte bestandsudviklinger i hhv. Nedersaksen og Holland og store regionale ændringer i den vestlige del af Vadehavet. I Vadehavet som helhed var bestandene imidlertid stabile i perioden 1991-1996.

Resultaterne understreger at bestandene af ynglefugle er en fælles naturressouce som kræver fælles beskyttelse. For adskillige arter af ynglefugle er det yderst vigtigt at der træffes passende foranstaltninger for at opretholde deres naturlige udbredelse og en gunstig ynglesucces. For en hel del arter vil beskyttelsesforanstaltninger kunne forbedre deres ynglemuligheder. Bestanden af dværgterne steg i undersøgelsesperioden for første gang i årtier, formentlig pga. en bedre beskyttelse.

Antallet i den vestlige del af Vadehavet er dog stadig temmeligt lav pga. manglen på forstyrrelsesfri områder på strandene. Hvidbrystet præstekrave fortsætter med at falde i antal efterhånden som inddigede områder bliver mindre egnede som ynglepladser pga. vegetationsudviklingen. Samtidig mangler der alternative ynglemuligheder på de turistudnyttede strande.

To grupper af territorialt ynglende (ikke koloniynglende) fugle viser modsatrettede bestandsudviklinger. Arter der benytter vadeflader som fourageringsområder, f.eks. rødben og strandskade, har generelt stabile eller stigende bestande, medens der er registreret tilbagegang for de arter der er afhængige af at søge føde på strandenge og i marsken i områder med traditionel græsningsdrift, f.eks. almindelig ryle og brushane. For de to sidstnævnte arter er tilbagegangen alarmerende og det er nødvendigt med beskyttelsesforanstaltninger for at forhindre at almindelig ryle og brushane helt forsvinder som ynglefugle i Vadehavet.

Vadehavet er af stigende betydning for andre arter der yngler i områder med landbrugsdrift, f.eks. vibe og stor kobbersneppe. Bestande af disse i indlandet er i vid udstrækning forsvundet eller stærkt reducerede som følge af en intensivering af landbruget, og de sammenhængende og ofte bedre beskyttede kystnære vådområder udgør nu disse arters vigtigste yngleområder. I Holland er enge i indlandet dog stadig af meget større betydning for vibe og stor kobbersneppe.

Rødben er steget bemærkelsesværdigt i Nedersaksen og Slesvig-Holsten, hvor græsning af strandenge er reduceret eller helt ophørt i store områder. Derimod rapporteres om et faldende antal i den hollandske del af Dollard som følge af en mere intensiv græsning.

Hidtil har beskyttelsesbestræbelserne i Vadehavet overvejende været koncentrerede om marine levesteder som vadeflader og dyb, strande og strandenge. Beskyttelse af levesteder i klitter, brakvandsenge og vedvarende græsarealer i kogene kræver tydeligvis større opmærksomhed. Udviklingen i store inddigede områder fra 1970erne og 1980erne viser at naturbeskyttelse og genopretning ikke kan kompensere for tabet af strandeng og vadeflader. Det er dog muligt at forbedre ynglebetingelserne for nogle arter af engfugle og rastemuligheder for fugle i vådområder. Naturgenopretning bag digerne (genskabelse af høj og varierende vandstand, vedvarende græsarealer og vådområder) kan kompensere for tabet af yngleområder i den tidligere så udbredte overgangszone mellem Vadehavet og det tørre bagland.

For bedre at kunne forstå dynamikken i udbredelsen og antallet af ynglefugle i Vadehavet, vil det være nødvendigt at kombinere disse oplysninger med de kommende resultater af overvågning af en række parametre som fiskeri, landbrugsdrift, turisme, fordeling af levesteder, miljøbelastningen af æg osv. En viden om fuglenes ynglesucces er grundlæggende nødvendig for at kunne forklare de observerede ændringer i antal og fordeling, men sådanne oplysninger mangler stadig for de fleste arter. For at kunne nå dette mål, vil det være nødvendigt at iværksætte et fælles program til måling af ynglesucces under TMAP (Trilateral Monitoring and Assessment Program).

Denne rapport giver med de mange oplysninger om ynglefuglenes økologi, et godt grundlag for at prioritere beskyttelsesindsatsen i Vadehavet. Overvågning i dette omfang er kun muligt med indsatsen af mange frivillige og koordination af indsatsen nationalt og trilateralt. Overvågningsprogrammet vil fortsat fungere som et system til tidlig advarsel om miljøændringer og til at kunne vurdere indsatsen af naturbeskyttelsen i Vadehavet.

Zusammenfassung

Die drei Wattenmeeranrainerstaaten Dänemark, Deutschland und die Niederlande arbeiten beim Schutz des Wattenmeeres eng zusammen. Seit 1990, dem Beginn des "Joint Monitoring Project for Breeding Birds in the Wadden Sea", werden koordinierte Brutvogelerfassungen durchgeführt. Ziel dieses Monitorings ist es, Veränderungen bei den Bestandsgrößen ausgewählter Brutvogelarten und ihrer Verteilungen im Wattenmeer zu beobachten und so eine Grundlage für Schutz- und Erhaltungsmaßnahmen zur Verfügung zu stellen. Im Rahmen des "Trilateral Monitoring and Assessment Program" (TMAP) ist die vorliegende Publikation die sechste Veröffentlichung von Ergebnissen der Vogelerfassungen im Wattenmeer.

Mit diesem Bericht werden die Ergebnisse der 1996 durchgeführten zweiten flächendeckenden Erfassung der Brutvögel des Wattenmeeres vorgelegt und mit den Ergebnissen der ersten Gesamterfassung 1991 verglichen (Fleet et al. 1994). Die Populationsentwicklung der Koloniebrüter kann darüber hinaus für den Zeitraum 1991-1996 auf der Basis jährlicher Zählungen dargestellt werden. Die Ausführungen zu den einzelnen Arten konzentrieren sich im wesentlichen auf die wichtigsten Faktoren zur Erklärung der aktuellen Populationstrends.

Der Bericht behandelt 31 typische Brutvogelarten der Küste, das heißt alle Watvögel, Möwen und Seeschwalben, Kormoran, Löffler, Kornweihe, Brandente, Eiderente, Mittelsäger und Sumpfohreule. Als Ergebnis werden Informationen zur Habitatwahl, Verbreitung, Populationsgröße und –entwicklung vorgelegt und anhand von Karten der Verbreitung 1996 sowie Grafiken der Populationsentwicklung veranschaulicht. Die 1995 eingeführte trilateral einheitliche Anleitung zur Brutbestandserfassung der Küstenvögel hat zu einer wesentlichen Verbesserung der Datenqualität geführt (Hälterlein et al. 1995).

Der Bericht bestätigt die herausragende Bedeutung der Brutvogelfauna des Wattenmeeres. Das Wattenmeer ist für eine Reihe von Küstenvogelarten von überragender Bedeutung ist, da es einen großen Anteil ihrer biogeographischen Brutpopulationen beherbergt. So brüten mehr als 50% der nordwest-europäischen Populationen der Lachseeschwalbe, des Löfflers und des Säbelschnäblers im Wattenmeer (Appendix C).

Die meisten Möwenarten zeigen im Zeitraum 1991 - 1996 einen stabilen oder zunehmenden Populationstrend. Der Brutbestand der Heringsmöwe nahm in den sechs Jahren um 115% zu, während der der Silbermöwe deutlich abnahm. Es ist anzunehmen, dass die relative Häufigkeit dieser beiden Arten von der Fischerei beeinflusst wird.

Die Ergebnisse zeigen für einige koloniebrütenden Arten, dass in großem Maße ein Austausch von Individuen über die Ländergrenzen hinweg stattfindet, sogar mit Populationen, die außerhalb des Wattenmeeres brüten. Das unterstreicht die Notwendigkeit eines koordinierten Monitorings, um Bestandstrends innerhalb von großräumig zusammenhängenden Vogelbeständen zu erklären. Am Beispiel der Brandseeschwalbe wird deutlich, dass sowohl kurz- als auch langfristige Änderungen nur verstanden werden können, wenn alle Kolonien im Wattenmeer jährlich erfaßt werden. Bei einigen anderen Arten scheinen Abnahmen in einigen Regionen durch Zunahmen in anderen kompensiert zu werden. So zeigten Lachmöwe und Flußseeschwalbe gegenläufige Trends in Niedersachsen und den Niederlanden und große regionale Änderungen im westlichen Wattenmeer. Insgesamt blieb die Wattenmeerpopulation beider Arten jedoch im Zeitraum 1991-1996 konstant.

Die Ergebnisse unterstreichen, dass Brutvogelpopulationen ein gemeinsames Gut sind, das gemeinsamer Anstrengungen zu ihrem Schutz bedarf. Für einige Brutpopulationen sind angemessene Schutzmaßnahmen von entscheidender Be-

deutung um ihre natürliche Verbreitung zu erhalten und einen günstigen Bruterfolg zu gewährleisten. Die Zwergseeschwalbenpopulation im Wattenmeer nahm das erste Mal seit Jahrzehnten wieder zu – sicher auch wegen des verbesserten Schutzes. Obwohl die Brutpaarzahlen besonders im westlichen Wattenmeer nach wie vor sehr niedrig sind, da geeignete Bruthabitate an störungsfreien Strandgebieten oftmals fehlen. Der Seeregenpfeiferbestand nahm dagegen weiterhin ab. In den neu eingedeichten Gebieten gingen geeignete Brutgebiete aufgrund der fortschreitenden Vegetationsentwicklung verloren und alternative Bruthabitate stehen auf den von Touristen genutzten Stränden nicht in ausreichendem Maße zur Verfügung.

Bei den nicht in Kolonien brütenden Watvogelarten sind zwei Gruppen zu erkennen, die gegenläufige Trends zeigen: die Bestände von Arten, die Wattflächen als Nahrungshabitat bevorzugen, wie Rotschenkel oder Austernfischer, sind generell stabil oder nehmen zu, während solche abnehmen, die zur Nahrungsaufnahme auf Grünland mit traditioneller Landnutzung angewiesen sind, wie Kampfläufer und Alpenstrandläufer. Die Austernfischerpopulation im niederländischen Wattenmeer nimmt im Gegensatz zu der im übrigen Wattenmeer ab, möglicherweise infolge der Miesmuschelüberfischung. Die Abnahmen der Kampfläufer und Alpenstrandläufer sind so alarmierend, dass die Wattenmeerpopulationen nur durch intensive Schutzmaßnahmen vor dem Aussterben bewahrt werden können.

Für andere Watvogelarten wie Kiebitz und Uferschnepfe erlangt das Wattenmeer eine zunehmende Bedeutung. Infolge der Intensivierung der Landwirtschaft sind die Binnenlandpopulationen stark reduziert oder sogar weitgehend verschwunden und die größeren, geschützten Feuchtgebiete und Wiesen stellen die letzten Rückzugsgebiete dar. Dagegen sind in den Niederlanden die binnenländischen Grünlandgebiete immer noch von viel größerer Bedeutung für Kiebitz und Uferschnepfe.

Der Rotschenkel zeigte eine bemerkenswerte Zunahme in niedersächsischen und schleswig-holsteinischen Gebieten, in denen die Beweidung reduziert oder ganz eingestellt worden ist. Im Gegensatz dazu führte im niederländischen Dollart-Gebiet eine intensive Beweidung zu abnehmenden Bestandszahlen.

Bislang konzentrierte sich der Schutz des Wattenmeeres hauptsächlich auf marine Habitate wie Wattgebiete, Strände und Salzwiesen, aber der Schutz der terrestrischen Habitate wie feuchte Dünentäler, Ästuargebiete und binnendeichs gelegenes Feuchtgrünland verlangt deutlich mehr Aufmerksamkeit. Die Entwicklung in neu eingedeichten Gebieten zeigt, dass durch eine intensive Landschaftspflege der Verlust von Salzwiesen und Wattflächen nicht kompensiert werden kann. Dagegen ist es möglich, den Verlust von Brutgebieten in der ehemaligen Übergangszone zwischen Wattenmeer und Land auszugleichen, indem im angrenzenden Binnenland wieder ein hoher und veränderlicher Wasserstand zugelassen wird: Extensiv genutztes Dauergrünland und Feuchtgebiete würden sowohl die Brut- als auch die Rastbedingungen für Wiesenvögel und andere Arten verbessern.

Zur Erklärung von Verteilungsmustern und Trends der Brutvögel im Wattenmeer wird künftig auch auf notwendige andere Parameter aus dem TMAP, z. B. Fischerei, Landnutzung, Tourismus, Biotop(typen)verteilung, Schadstoffe in Vogeleiern, zurückgegriffen werden müssen. Ebenso wesentlich für das Verständis der Dynamik einzelner Arten und der beobachteten Trends ist die Kenntnis des Bruterfolges und der Mortalität, diese Daten fehlen noch immer für die meisten Arten. Es ist daher vordringlich, die Erhebung des Parameters "Bruterfolg" in das TMAP aufzunehmen.

Der vorliegende Bericht liefert eine solide Basis ökologischer Daten über die Brutvögel des Wattenmeeres, mit der Schutzprioritäten und Maßnahmen begründet werden können. Monitoring ist nur mit der Unterstützung vieler Freiwilliger möglich und bedarf der Koordination auf nationaler und trilateraler Ebene. So kann es weiterhin als Frühwarnsystem dienen und die Bewertung von Naturschutzmaßnahmen ermöglichen.

Samenvatting

Denemarken, Duitsland en Nederland werken samen om de Waddenzee te beschermen. Sinds de start van het "Joint Monitoring Project for Breeding Birds in the Wadden Sea" in 1990, worden gecoördineerde broedvogelinventarisaties uitgevoerd met het doel over goede monitoring-gegevens te kunnen beschikken. Om een betere bescherming van het gebied mogelijk te maken zijn gegevens noodzakelijk die inzicht verschaffen in de aantalsontwikkelingen en de ruimtelijke verspreiding van een aantal geselecteerde soorten die kenmerkend zijn voor de Waddenzee. Binnen het raamwerk van het "Trilateral Monitoring and Assessment Program" (TMAP) is het onderhavige rapport "Breeding Birds in the Wadden Sea in 1996" de zesde publicatie in het samenwerkingsproject waarin Deense, Duitse en Nederlandse vogeltellers participeren.

In dit rapport worden de resultaten van de tweede integrale broedvogelkartering van karakteristieke broedvogels in de internationale Waddenzee gepresenteerd. De gegevens van de tweede integrale broedvogelkartering zullen worden vergeleken met de eerste complete telling uit 1991 (Fleet et al. 1994). Daarnaast zullen voor de kolonievogels en zeldzame soorten als Blauwe Kiekendief en Velduil gegevens over verspreiding en aantalsontwikkeling in de periode 1991-96 worden gepresenteerd. In de soortteksten zal, waar mogelijk, worden ingegaan op de factoren die van belang zijn voor de soort.

Van de 31 soorten die als karakteristiek voor de Waddenzee worden beschouwd (steltlopers, meeuwen en sterns, Aalscholver, Lepelaar, Blauwe Kiekendief, Bergeend, Eider, Middelste Zaagbek en Velduil) wordt informatie over habitatkeuze, verspreiding, populatieomvang en (lokale) aantalsveranderingen gegeven. Sinds 1995 wordt gewerkt met een verbeterde versie van de veldhandleiding hetgen er toe heeft bij gedragen dat de kwaliteit van het hier gepresenteerde materiaal is verbeterd (Hälterlein et al. 1995).

Uit de hier besproken gegevens wordt het uitzonderlijke belang van de broedvogels duidelijle. Voor een aantal kustbroedvogels herbergt de internationale Waddenzee een substantieel deel van de NW-Europese populatie. Meer dan 50% van de NW-Europese populatie van Lachstern, Lepelaar en Kluut komt als broedvogel voor in de Waddenzee (Bijlage C).

De populatieontwikkeling van meeste meeuwensoorten in de periode 1991-96 is stabiel of toenemend. Het aantal Kleine Mantelmeeuwen nam in een periode van zes jaar toe met 115%. De Zilvermeeuw nam als enige soort af. Mogelijk heeft de visserij in het zuidelijk deel van de Noordzee effect op de aantalsontwikkeling van beide soorten.

Bij enkele soorten kolonievogels blijkt dat aantalsfluctuaties goed corresponderen met ontwikkelingen buiten de Waddenzee. Dit benadrukt het belang van gecoördineerde broedvogeltellingen buiten de internationale Waddenzee. De Grote Stern is een voorbeeld van een soort waarvan trendgegevens in de internationale Waddenzee alleen begrepen kunnen worden indien we kunnen beschikken over complete reeksen. Voor een aantal andere soorten blijkt dat afnames in bepaalde regio's worden gecompenseerd door een toename elders. Kokmeeuw en Visdief laten tegengestelde trends zien in Nederland en Niedersachsen. De populaties van beide soorten lijken stabiel in de gehele internationale Waddenzee in de periode 1991-96.

De gegevens geven aan dat de broedvogelpopulaties een goede bescherming nodig hebben. Voor een aantal soorten is het van cruciale betekenis dat een adequate bescherming wordt gegarandeerd waarbij de natuurlijke verspreiding en het reguliere broedsucces moet worden gewaar-

borgd. Voor een aantal soorten moeten beschermingsmaatregelen worden genommen teneinde het broedsucces te verbeteren. De Dwergstern is een voorbeeld van een soort waarbij het broedsucces door bescherming van het broedsucces lijkt te zijn verbeterd. Dit geldt met name voor de situatie in de Westelijke Waddenzee (Texel), waar getracht wordt verstoring bij kolonies te minimaliseren. Het aantal broedende Strandplevieren blijft afnemen omdat het aantal gebieden waar zonder verstoring gebroed kan worden snel vermindert. Alternatieve gebieden zijn nauwelijks aanwezig terwijl de stranden door een toenemend aantal toeristen minder geschikt worden voor deze kwetsbare soort.

Twee groepen steltlopers laten een tegenovergestelde trend zien. Het aantal territoria van soorten die normaliter op de wadplaten foerageren (Tureluur, Scholekster) toont in het algemeen een stabiele of toenemende trend, terwijl soorten die niet of nauwelijks een relatie met wadplaten hebben (Kemphaan en Bonte Strandloper) onveranderd afnemen. Het aantal broedende Scholeksters in de Nederlandse Waddenzee nam in de periode 1991-96 af terwijl de trend in de Duits-Deense Waddenzee positief is. Het is zeer aannemelijk dat de overexploitatie van schelpdieren in de Nederlandse Waddenzee hier debet aan is. Beschermingsmaatregelen zijn noodzakelijk om te voorkomen dat Kemphaan en Bonte Strandloper op korte termijn zullen uitsterven.

Voor een aantal steltlopers die kenmerkend zijn voor agrarische landschappen (Kievit, Grutto) is de Waddenzee van toenemende betekenis. Door een achteruitgang van deze soorten in het binnenland neemt het belang van beschermde wetlands en weilanden in het waddengebied toe. Dit geldt met name voor Denemarken en Duitsland; in Nederland is het belang van de eilandpolders minder groot.

De Tureluur laat een opmerkelijke toename zien in gebieden in Niedersachsen en Schleswig Holstein. In deze Duitse deelstaten is op grote schaal begrazing gereduceerd of zelfs gestopt waardoor het aantal broedende Tureluurs hier sterk is toegenomen. In contrast hiermee staat de ontwikkeling in het Nederlandse deel van de Dollard, waar intensieve begrazing plaatsvindten, het aantal broedende Tureluurs lijkt af te nemen.

Tot dusverre was het beschermingsbeleid in de Waddenzee in sterke mate gericht op mariene biotopen zoals getijdegebieden, stranden en kwelders. De bescherming van terristische biotopen zoals natte duinen, brakke weilanden en polders behoeft meer aandacht. De ontwikkelingen in nieuwe binnendijkse natuurgebieden kan op termijn niet het verlies van kwelders en wadplaten compenseren. Een betere bescherming is noodzakelijk om de omstandigheden te verbeteren voor zowel een aantal weidevogels als vogels die er overtijen. Natuurcompensatie achter de dijk zou een bijdrage kunnen leveren tot compensatie van het verlies van broedgebieden in het overgangsgebied tussen de Waddenzee en de binnenlandse broedgebieden.

Om de processen die noodzakelijk zijn om de trends van broedvogels te begrijpen, is het noodzakelijk de monitoring in de toekomst voort te zetten. Van belangrijke activiteiten zoals de visserij, landbouw, toerisme, veranderingen in habitat, milieuvreemde stoffen in eieren etc. is het nodig de vinger aan de pols te houden. Kennis over broedsucces en sterfte is nodig om de dynamiek te begrijpen die aan de aantalsontwikkelingen ten grondslag liggen. Momenteel zijn van deze parameters nauwelijks goede cijfers bekend zodat de onderliggende oorzaken van de gevonden trends niet altijd bekend zijn. Binnen het kader van het TMAP is het noodzakelijk om gerichte kennis omtrent broedsucces en sterfte te verzamelen.

Dit rapport geeft een actueel overzicht van de broedvogels in de internationale Waddenzee en vormt hopelijk de aanzet tot een betere bescherming van soorten die kenmerkend zijn voor het gebied. Deze grootschalige monitoring is uitsluitend mogelijk omdat vrijwilligers en professionele vogeltellers de handen ineen slaan. Internationale samenwerking binnen het raamwerk van het Common Wadden Sea Secretariat is noodzakelijk om de opgestarte reeks voort te kunnen zetten. Het opgezette monitoring-systeem zal in de toekomst belangrijke informatie opleveren die noodzakelijk is om vroegtijdig negatieve trends te kunnen ontdekken en om evaluaties van natuurbeheer-maatregelen uit te kunnen voeren.

Photo 1:
In 1991, all Great Cormorant colonies in the Wadden Sea were on artificial structures. This colony in the outer Weser estuary was located on an old disused lighthouse on 'Meyer's Legde'.
Photo: P. Südbeck.

Photo 2:
Avocets mainly breed in colonies in salt marshes with short vegetation. Smaller colonies are found on islands in clay ponds. Embanked areas such as 'Beltringharder Koog', 'Hauke-Haien-Koog', 'Katinger Watt' and 'Margrethe Kog' were colonized by large populations of Avocets a few years after construction. These sites have become less attractive as breeding areas following the natural vegetation succession. The overall numbers were stable or decreased during the period 1991-1996.
Photo: L. M. Rasmussen.

Photo 3:
The Kentish Plover is adapted to a very dynamic environment and prefers a primary habitat such as barrier beaches, primary dunes or shell banks as breeding sites. On Rømø, the population increased from 10 pairs in 1991 to 69 pairs in 1999, reflecting the decrease in the population in Schleswig-Holstein.
A female on the beach of Rømø.
Photo: L. M. Rasmussen.

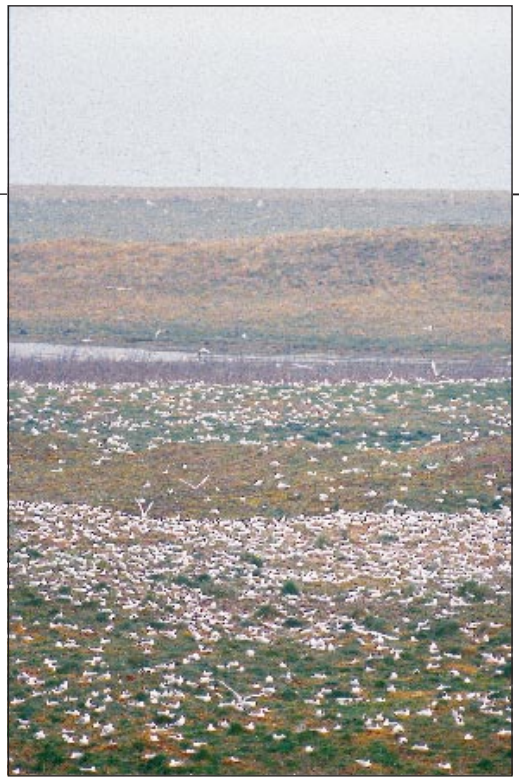


Photo 4:
The Sandwich Tern breeds in a few colonies in all parts of the Wadden Sea. The situation of the Sandwich Tern demonstrates clearly that both short and long-term changes can only be understood if all colonies in the Wadden Sea are monitored annually. A Sandwich Tern colony in Denmark, established in 1992 on Langli in the northernmost part of the Wadden Sea. Photo: L. M. Rasmussen.

Photo 5:
For the population of the Dunlin, the decline is alarming, and immediate protection measures are necessary to prevent the species from becoming extinct as a breeding bird in the Wadden Sea. The last regular breeding sites in the Wadden Sea area are found on the Danish Friesian islands Rømø and Fanø. Male Dunlin on Rømø, June 1999. Photo: L. M. Rasmussen.

Photo 6:
The population of the Little Tern in the Wadden Sea increased for the first time in decades during the period 1991- 1996, possibly in response to better protection, although the numbers breeding, especially in the western Wadden Sea, might remain very low due to a lack of disturbance-free areas on beaches. Photo: H. Hut.

Photo 7:
Counting of nests in colonies of gulls is one of the commonly agreed methods used to measure the numbers of gulls and Sandwich Terns. This method is used in areas that cannot be counted from a distance. A high number of counters helps to minimize the time spent in the colony. Here Common Gulls are counted on Langli the northernmost island in the Wadden Sea.
Photo: L. M. Rasmussen.

Photo 8:
On beaches and primary dunes as well as on some outer sands, there are conflicts between the recreational use and the effective protection of breeding birds. This is especially the case for the Little Tern, Kentish Plover and Great Ringed Plover. In some of their main breeding habitats, the recreational use is so intense that there is an impact on their total Wadden Sea population. The bathing beach on the island Borkum in Niedersachsen.
Photo: P. Südbeck.

Photo 9:
De Boosplaat on the Dutch island Terschelling is an important breeding site for the Eurasian Spoonbill. This area is one of the largest natural salt marshes in the Wadden Sea. Large colonies of Herring Gull and Lesser Black-backed Gull dominate the breeding bird fauna. In 1999, a few pairs of Kentish Plover were found breeding here.
Photo: H. Hut.

Photo 10:
The Punt van der Reide in the Dutch part of the large brackish estuary of the Dollard is an important breeding site for meadow birds such as Common Redshank and Lapwing. In both 1995 and 1996, breeding attempts of Dunlins were registered in this area.
Photo: H. Hut.

Photo 11:
The intensity of grazing pressure on salt marshes affects the number, density and nesting success of breeding birds. To restore the natural salt marsh vegetation, management has been reduced or stopped in large parts of Niedersachsen and Schleswig-Hosltein. In Schleswig-Holstein, 46% of the salt marshes were not grazed in 1996. In Niedersachsen, 60% of the total salt marsh area is not used at all. In Denmark there are no programs to extensify grazing.
Photo: P. Südbeck.

Photo 12:
In the Dollard area, part of the area has not been grazed since 1981. This area is important for breeding Common Redshanks. Photo: H. Hut.

1. Introduction

In 1989, the "Joint Monitoring Project for Breeding Birds in the Wadden Sea" was initiated under the Trilateral Co-operation for the Protection of the Wadden Sea. The objectives of the current program for the breeding bird monitoring in the framework of the overall Trilateral Monitoring and Assessment Program (TMAP) are:

- To map the distribution and abundance of breeding bird populations throughout the entire Wadden Sea and to detect population trends (TMAG 1997);
- To detect and assess the effects of climate changes on the bird populations;
- To detect and assess the effects of fisheries on the occurrence and structure of natural bird communities;
- To detect and assess the effects of recreational activities on the occurrence and abundance of species (including population size, growth and reproduction of species);
- To detect and assess the effects of grazing on salt marshes on natural breeding habitats of birds.

Besides these objectives, it is necessary to monitor population changes and the conservation status of the species to be able to fulfil the demands of international responsibilities regarding protection of the species.

The Joint Monitoring Program for Breeding Birds in the Wadden Sea (Fleet et al. 1990) covers 31 bird species, which are considered typical of the Wadden Sea region and whose changes in population size can function as indicators of the state of the Wadden Sea environment. There have been some minor changes of the species list since the original list was compiled. The final current list is given in Appendix F.

The program includes annual complete surveys of colony breeding species in the Wadden Sea Area. Every five years all 31 bird species are covered throughout the entire Wadden Sea. In addition to complete surveys, a sample site program of some 80 census areas was established at the beginning of the program. Annual counts are carried out in these census areas. The objective is to assess annual population trends for common bird species in the Wadden Sea. Results from the first years of the survey are given by Melter et al. (1997) and van Turnhout (1999) has made an initial evaluation of the coverage of the census areas.

The implementation and co-ordination of the survey in 1996 was carried out as follows: in The Netherlands the counts were co-ordinated by the association SOVON Vogelonderzoek Nederland under contract of the Ministerie van Landbouw, Natuurbeheer en Visserij. ICC Natuurbeheer. In the three concerned German federal states bordering the Wadden Sea, the Seabird Protection Association (Arbeitsgemeinschaft Seevogelschutz) co-ordinates the breeding bird surveys, which are published on an annual basis. The surveys in Niedersachsen and Hamburg are co-ordinated by the Staatliche Vogelschutzwarte, Niedersächsisches Landesamt für Ökologie in Hannover, and, in Schleswig-Holstein, by the Wadden Sea National Park authorities in Tönning. In Denmark, the counts are co-ordinated by the Danmarks Miljøundersøgelser of the Energi- og Miljøministeriet and the Dansk Ornitologisk Forening.

In this report, the results of the second total survey of the entire Wadden Sea in 1996 are presented and compared with the 1991 situation (Fleet et al. 1994). Moreover, for the colony nesting species, the changes in numbers and distribution are given on an annual basis for the whole period 1991-1996. The species accounts especially focus on the most important potential factors explaining the trends in populations.

2. Study Area and Methods

The study area in 1996 was equivalent to the Trilateral Co-operation Area, the so-called Wadden Sea Area. This represents an extension to the total area in comparison to the 1991 survey (see Figure 1: Landscape types in the Wadden Sea and regions used as basis for the distribution maps; see enclosed colored double page).

This study area includes the total surface of the islands and Halligen (marshy islands in the Wadden Sea of Schleswig-Holstein) with their habitats and on the mainland all salt marshes, dunes, and beaches. Behind the dikes recently embanked areas as well as clay extraction ponds were covered (see Figure 1). The area is divided into 56 regions, which represents the level of data presentation. The mainland polders in Denmark were not part of the 1991 survey but were included in the survey in 1996, since they were a part of the Trilateral Co-operation Area. In Denmark, for practical reasons, it was necessary to add additional five regions, include several sites, and to subdivide large sites. In Niedersachsen, areas outside the dikes in the river estuaries of Ems and Weser were included and two new regions added. They have been monitored annually but data were not presented before.

The total study area is very large and covers an area of about 155,000 ha in the entire Wadden Sea. Appendix E provides information on the counting sites defined within the overall study area.

Regions and Area Landscape Types

The study area has been divided into 56 regions to display the breeding distribution of the selected species within the Wadden Sea. The main landscape types and regions are shown in Figure 1. The size and coverage of the sites are listed in Appendix E. At the national level, these sites might be subdivided into two or more sub-sites.

Mainland polders are represented in the study area in Denmark. In Schleswig-Holstein, newly embanked areas are also included. Within the landscape types one or more habitat types, are represented. For example, in island polders, the habitat type could be arable land, fresh water meadows, and salt marshes can either be low *Pucinellia* or high *Festuca* salt marsh etc..

Bird Species Surveyed

The monitoring of breeding birds in the Wadden Sea focuses on 31 selected species. They include Great Cormorant, Eurasian Spoonbill, three duck species, 13 wader species, seven gull species, six tern species, Hen Harrier and Short-eared Owl. A list of the species is displayed in Appendix F.

The selection of species was made according to their importance within the Wadden Sea ecosystem, or because their center of distribution is in the Wadden Sea (Wadden Sea Area) where they inhabit typical coastal habitats.

Survey Methods

Although methods were similar in all countries, there were no agreed common standard methods for counting breeding birds from the start of the program. Since 1995 onwards, the use of agreed trilateral guidelines has been implemented in all of the Wadden Sea countries (Hälterlein et al. 1995). For some non-colony breeders, the number of pairs estimated during surveys for a given site was influenced by the introduction of new methods. This is certainly the case for Common Redshank in Denmark and for Common Redshank and Oystercatcher in Niedersachsen, where the new methods introduced in 1996 led to a higher estimate of the population than in 1991.

The methods and guidelines are presented and discussed in Melter et al. (1997). An evaluation of the census methods used during the surveys in the census areas 1991-1996 is given by van Turnhout (1999), while Grünkorn (1998) and Rasmussen & Thorup (1998) give proposals for an improvement of the guidelines.

The methods used to count colony-breeding species have changed since 1991. In Niedersachsen, aerial surveys have been implemented for Great Cormorant, Sandwich Tern, Black-headed

Gull, Herring Gull and Lesser Black-backed Gull. Grünkorn (1998) described methods used in the aerial survey and provided a calibration between the two methods. The overall main aim is to always use the same method for each colony and species in all years. But in the course of recent years, there have been considerable changes in methods at some colonies depending on

- the development and implementation of a new method (Hälterlein et al. 1995);
- the local situation regarding the organization of the counts;
- weather conditions (aerial surveys were not always possible);
- reductions in nest counts especially in tern colonies (for conservation reasons).

The major difference in the counting techniques has been the change to counting individuals instead of 'pairs' or 'nests'. In general, a factor of 0.7 is applied to the number of individuals to calculate the number of pairs (Hälterlein et al. 1995). The counting of nests is often very time-consuming and results in greater disturbance to the colonies. Compared to nest counts, the counting of individuals can often provide a better estimate of the breeding population size, especially in cases with reduced breeding success. Counting of individuals, however, demands practice, especially in very large colonies.

The use of new methods might have produced slightly larger population estimates than before, but these differences should not be considered as reflecting changes in population size. Because of common methods, we shall, in future, be able to detect trends in all parts of the Wadden Sea and produce reliable population estimates and changes in distribution.

Coverage

In general, very good coverage was achieved in 1996, throughout the total survey, with more than 95% of the known numbers of colony breeding bird species covered. For the territorial breeding bird species, an estimated 80% of most of the species were covered. In the following, species-account problems regarding the coverage of particular species are covered in detail. Appendix E shows coverage and extent of the main counting sites in the Wadden Sea.

In The Netherlands, coverage was almost complete in most areas. On Schiermonnikoog, all colony-breeding species were counted, but dune areas with breeding populations of Common Eider, Oystercatcher and Eurasian Curlew were not covered. On Texel and Terschelling, it was not possible to organize a complete count of the extended polders. The 1996, numbers for the meadow species are estimated based upon good counting results obtained in 1995.

The coverage for the colony-breeders was good in the period 1994-1996. There were some problems covering Herring- and Black-headed Gull on Texel and Vlieland in the years before. On Terschelling, Black-headed Gull, Common Tern and Avocet were not fully covered in the polders. De Hond was counted for the first time in 1993.

In Niedersachsen, two additional regions were included in the outer Ems (region 55) and outer Weser (region 56). These areas have been counted for colony breeding birds since 1991, but were not reported as a part of the Wadden Sea in the 1991 report. In all years more than 90% of the total population of the colony breeding species in Niedersachsen have been counted. Therefore, the coverage of these species was quite high and representative numbers could be produced. The total count in 1996 had high coverage as well, some missing values were added from counts in 1995.

In Schleswig-Holstein, coverage was almost complete, but Oystercatcher, Lapwing and Common Redshank were covered outside the traditional bird reserves only in 1991 and 1996. In the Meldorfer Speicherköge in Dithmarschen the coverage was not complete in 1992-1994. Data from Nordstrandischmoor are missing from 1996. Furthermore, in the polders of Pellworm and Nordstrand, representative study plots were covered only in 1991, 1992 and 1996. For some years, coverage is not available for some areas from the outer sands (tidal flats above normal high tide level, without vegetation) and in the eastern parts of the Eider estuary.

In Denmark, the study area was enlarged compared to the 1991 survey when only approximately 11,800 ha on the islands and foreshore were covered. Five more regions (50 to 54) were included in the mainland polders, where the border to the east follows the border of the designated Ramsar and EEC-Bird-Directive area. In 1996, within the Danish Wadden Sea Co-operation Area, 34,713 ha were covered. A further 7,662 ha were not covered. These include settlements, summerhouse areas and plantations where the program species are not likely to breed. In areas with intense farmland a selection of species were counted. For these minor areas, the numbers were estimated using densities from similar areas elsewhere. The most important parts of the mainland polders were covered at least once in 1996. On Mandø, Common

Eider was not covered. On Fanø and Rømø, populations of Shelduck and Common Snipe were only partly covered.

In 1996, the total covered area extended to 18,429 ha of foreland and land on the islands, which is 3,500 ha more than in 1991, as well as 16,233 ha marshland behind the dikes on the mainland.

The coverage of the colony breeders in Denmark was not complete in the years 1992 to 1994, when some colonies of gulls and terns were not counted on Mandø and Rømø. Also, a colony of Black-headed Gull was not counted at a mainland site in these years. Data for these colonies have been estimated, using data from the years before or after.

Extensification of Grazing

The intensity of grazing pressure on salt marshes affects the number, density and nesting success of breeding birds. Therefore, recent management practices on salt marshes influence the numbers of birds breeding there.

To restore natural salt marsh vegetation, management has been reduced in The Netherlands. Cattle grazing has been reduced to lower stocking levels. In the Dollard area, this kind of management began in 1981, in the salt marsh area of Friesland, it started in the mid 1990s. In the Dollard area, only small parts of the salt marshes were not grazed.

In Schleswig-Holstein, a program to reduce agricultural land-use on the Hallig islands was initiated in 1986. The program included subsidies for lower grazing pressure, late mowing and compensation for damage from grazing geese. Later, also grazing pressure on the mainland salt marshes was included in the program (Stock et al. 1992). In 1989, only 1% of the salt marshes was not grazed. This increased to 22% in 1991 and 46% in 1996 (Stock 2000).

In Niedersachsen, a similar program was implemented, but only small changes resulted in the extent of grazing in the period 1991 to 1996: 60% of the total salt marsh area is not used at all, 64% of polders were intensively grazed in the summer and only 6% were without grazing (Niedersächsisches Landesamt für Ökologie, unpublished).

In Denmark, there are no programs to extensify grazing. Since 1990, there have been yearly counts of grazing animals in the Trilateral Conservation Area, however, these data have not been published.

Weather Conditions

The weather condition is one of the most important factors influencing the numbers of breeding birds in the Wadden Sea in a given year. Melter et al. (1997) analyzed the effects of the weather on birds in more detail for the period 1990-1994.

Whereas weather conditions in the breeding season can affect the counting efficiency, very cold winters lead to higher mortality and directly influence breeding populations. In the 1991 breeding season, prevailing rain and cold weather in May and June greatly affected the observation and counting possibilities. In 1996, the cold and very dry preceding winter and early spring had a negative effect, especially on meadow birds.

Winter conditions

Populations of some species that breed in the study area are resident, at least in the western part of the Wadden Sea, for almost the whole year (Meltofte et al. 1994). Therefore, severe winter conditions can directly affect winter mortal-

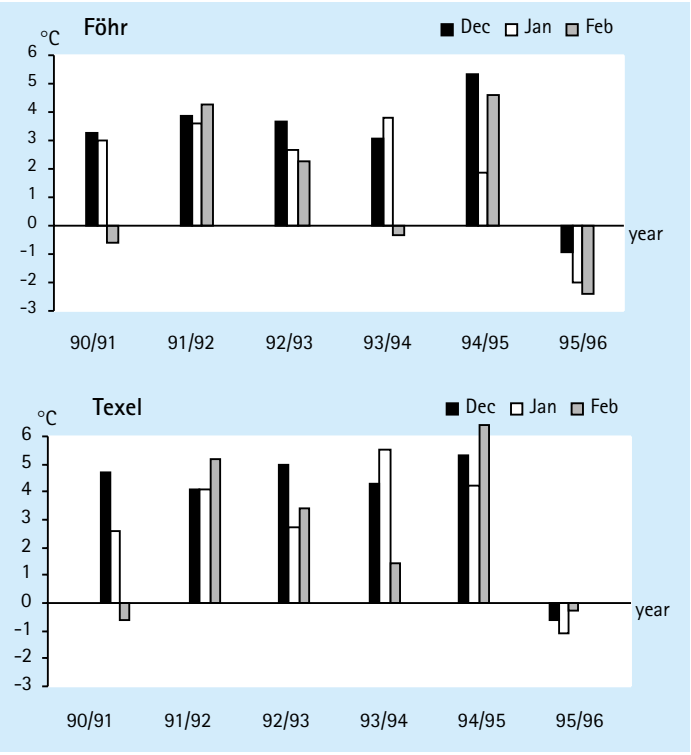


Figure 2: Mean monthly temperatures in the northern Wadden Sea (Föhr, Schleswig-Holstein, Germany) were about 1–2°C below levels in the western Wadden Sea (Texel, The Netherlands).

Den gennemsnitlige månedlige temperatur på Föhr (Nordfriesland, Slesvig-Holsten) var 1–2°C lavere end på Texel (den vestlige del af Vadehavet).

Die Monatsmitteltemperaturen auf Föhr (Nordfriesland, Schleswig-Holstein) waren 1–2°C niedriger als auf Texel (westlichstes Wattenmeer).

Gemiddelde maandtemperaturen in het noordelijke deel van de Waddenzee (Föhr, Schleswig-Holstein) zijn 1–2 graden Celsius lager dan in het westelijk deel van de Waddenzee (Texel, Nederland).

ity of those birds and result in reduced numbers of breeding birds in the following spring or in subsequent breeding. Generally, the winter periods were comparatively mild during the study period from 1991 to 1995, but the winter in 1995/96 was very cold (see Figure 2).
The differences are quite normal between the colder north and the more Atlantic climate in the southwestern part of the Wadden Sea. Longer periods of severe weather conditions occurred at the end of the winters in Feb. 1991 and 1994, when the average monthly temperatures were below 0°C.

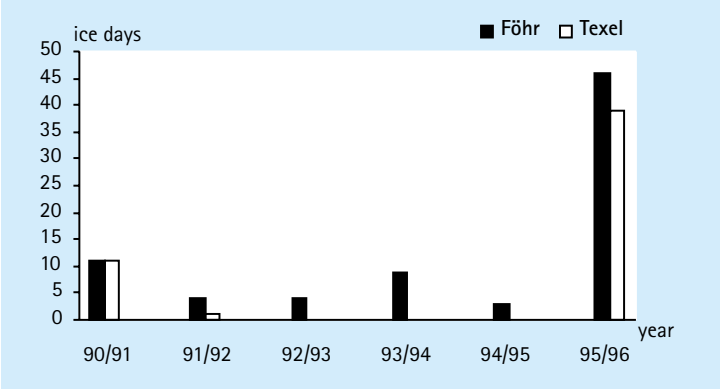


Figure 3: Number of ice-days (days with maximum temperature below 0°C) on Föhr, Schleswig-Holstein, Germany, and Texel in The Netherlands in the winters 1990/91 to 1995/96.

Antallet af isdage (dage med maksimumstemperaturer under 0°C) på Föhr og Texel i vintrene 1990/91 to 1995/96.

Anzahl von Eistagen (Tagen mit Maximumtemperaturen unter 0°C) auf Föhr und Texel in den Wintern 1990/91 bis 1995/96.

Het aantal ijsdagen (dagen met een temperatuur onder 0 graden Celsius) op Föhr en Texel in de periode 1990-91 t/m 1995/96.

The winter 1995/96 was particularly cold, with 46 ice-days (daily maximum below 0°C) on Föhr (see Figure 3). By comparison, there were eleven ice-days on Föhr in February 1991 and eight in February 1994. It is likely that the severe weather conditions in February 1991 and 1994, and certainly in January and February 1996, reduced the survival of wintering birds. The Oystercatcher winters in large numbers in the western Wadden Sea, so the extreme cold winter in 1995/96 had a measurable negative effect on the breeding population in the following breeding season (Smit & Koks 1997).

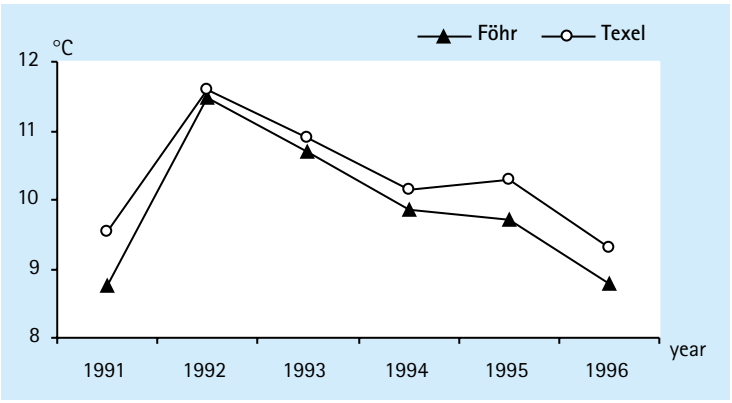


Figure 4: Cumulative average-temperature values in 10-day periods in the northern (Föhr, Schleswig-Holstein, Germany) and western part (Texel, The Netherlands) of the Wadden Sea during the breeding season April, May and June during 1991 to 1996.

Summen af gennemsnitstemperaturen i 10-dages perioder i den nordlige (Föhr) og vestlige del (Texel) af Vadehavet i ynglesæsonerne i månederne april til juni 1991 til 1996.

Summen der Dekadenmitteltemperaturen in den Monaten der Brutzeit (April, Mai und Juni) 1991 bis 1996 im nördlichen (Föhr) und westlichen Wattenmeer (Texel).

De cumulatieve gemiddelde temperatuur in 10-daagse perioden in het noordelijke deel (Föhr) en het westelijke deel van de Waddenzee tijdens het broedseizoen (april t/m juni) in de periode 1991-96.

Breeding season temperatures

During the breeding seasons, temperatures were quite similar between the northern and western parts of the study area (see Figure 4). In general, the weather was unusually cool in the breeding season of 1991 and warm in 1992. Conditions in other years were intermediate. Short warm periods were recorded in early spring and during breeding season in the years 1993, 1994 and 1995. In contrast, the 1996 season was cold and late after a hard winter.

Precipitation

Precipitation varied considerably between sites in the northern and western Wadden Sea; in general, precipitation was lowest on the islands and increased inland (see Figure 5).

April 1991 was not only cold but also very wet on Föhr, although the same month was much drier on Texel. Cold weather at the beginning of the breeding season can delay and reduce territory settlement and therefore result in lower numbers of breeding and territorial pairs being recorded. As the survey period was fixed for each species, delayed territory settlement might have influenced the result of the counts significantly if many birds settled after the defined survey period. The breeding phaenology for the Oystercatcher and Common Redshank breeding inland was delayed in Denmark in 1996.

The survey period June 1991 was very wet at both stations, with particularly high precipitation at the end of the breeding (see Fleet et al. 1994). The 1996 winter was very dry and April 1996 was exceptional so.

Flooding

Flooding caused by high tides can affect both the number of breeding pairs and their breeding success. Extreme high tide can cause loss of all clutches, and, late in the season, also of young. Flooding events early in the season may also lead to displacements, especially of colony breeders like Avocets and terns.

Due to differences in the height of census areas above sea level and the hydrological circumstances, flooding at any one site does not necessarily mean that other sites are affected. However, data from the northern and southern Wad-

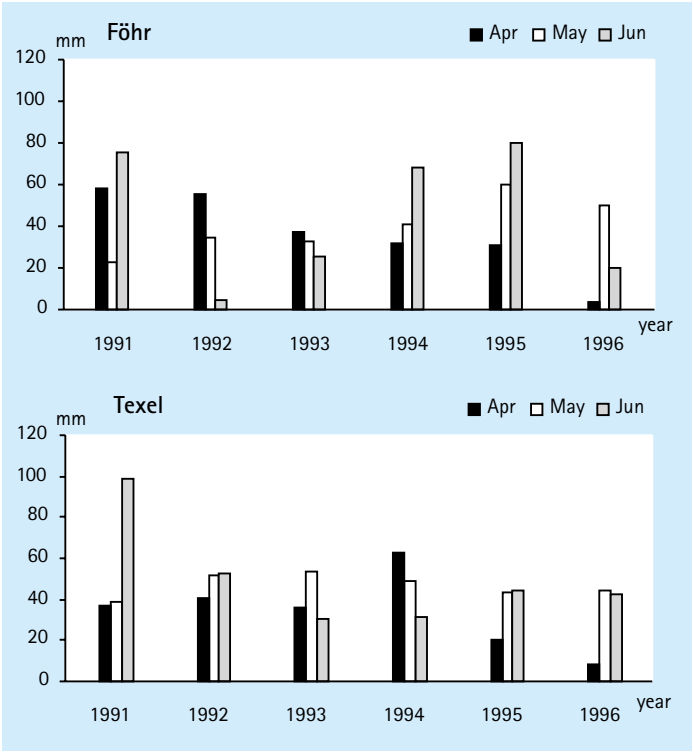


Figure 5: Accumulated precipitation in the northern (Föhr, Schleswig-Holstein, Germany) and western part (Texel, The Netherlands) of the Wadden Sea during the breeding season April, May and June during 1991 to 1996.

Den samlede nedbør i den nordlige (Föhr) og vestlige del (Texel) af Vadehavet i ynglesæsonen i månederne april til juni 1991 til 1996.

Niederschlagssummen im nördlichen (Föhr) und westlichen Teil des Wattenmeeres (Texel) während der Brutzeit von April bis Juni zwischen 1991 und 1996.

De gemiddelde neerslag in het noordelijke deel (Föhr) en het westelijke deel van de Waddenzee tijdens het broedseizoen (april t/m juni) in de periode 1991-96.

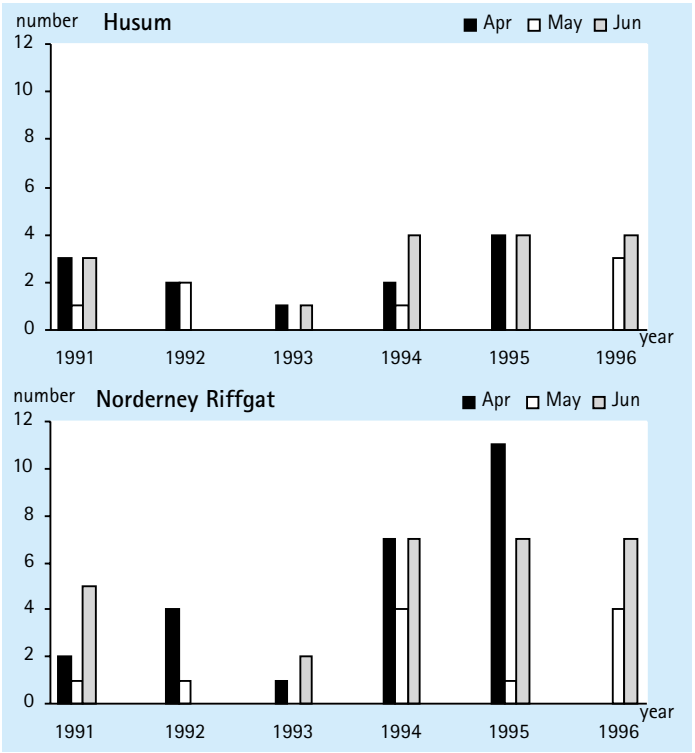


Figure 6: The number of flooding events measured as water levels +55 cm above Mean High Tide in the northern (Husum, Schleswig-Holstein, Germany) and western part (Norderney, Niedersachsen) of the Wadden Sea during the breeding season April, May and June between 1991 and 1996.

Antallet af oversvømmelser målt som vandstande over 55 cm over gennemsnitligt højvande i den nordlige (Husum) og vestlige del (Norderney) af Vadehavet i ynglesæsonen i månederne april til juni 1991 til 1996.

Anzahl von Überflutungsereignissen, gemessen als Wasserstand von mindestens +55 cm oberhalb Mitteltidehochwasser im nördlichen (Husum) und westlichen Teil des Wattenmeeres (Norderney) während der Brutzeit (April bis Juni) von 1991 bis 1996.

Het aantal overstromingen (+55 cm. boven de gemiddeld gemeten hoogwaterstanden) in het noordelijke deel (Husum) en westelijke deel van de Waddenzee tijdens het broedseizoen (april t/m juni) in de periode 1991-96.

den Sea clearly indicate extraordinary high water levels for specific regions and therefore can be used as flooding indices (see Figure 6). The Norderney, Niedersachsen data is probably indicative for much of the western part of the Wadden Sea, as is Husum for the North Sea coast of Schleswig-Holstein and Denmark. Early high spring tides were recorded relatively often at Husum and Norderney in 1994 and at Husum in 1991. In 1996, a large flooding event was recorded in late June in the northern Wadden Sea causing loss of clutches among terns that were still hatching at that time. In the southern Wadden Sea, two larger floods were recorded on 5th May and again in late June, probably affecting some breeding Avocets, Black-headed Gulls and Common Terns.

Recreation

There is no comprehensive overview of the recreational use of the Wadden Sea. On beaches and primary dunes, as well as some outer sands there are conflicts between the recreational use and the effective protection of breeding birds. This affects locally the distribution and numbers of breeding birds. This is especially the case for Little Tern, Kentish Plover and Great Ringed Plover. In their main breeding habitats, the recreational use is so intense that there is an impact on their total Wadden Sea population.

In The Netherlands, the mainland salt marshes in Friesland and the northern part of Groningen are open to public use and recreational activities are increasing there.

3. Results

The main output of this report, the 1996 population size of the 31 selected species of breeding birds in the four regions and the entire Wadden Sea, is displayed in Appendix A. Appendix B shows the annually numbers of colony breeders in the period 1991-1996.

In the following, species account information about the habitat, distribution, abundance and trends during the period 1991-1996 is presented for each of the 31 species of Wadden Sea breeding birds of the monitoring program. Compared with 1991, Little Ringed Plover is not covered in this report, since it is not considered a coastal breeding species typical for the Wadden Sea. A summary of the numbers in the entire Wadden Sea in 1991 and in 1996 is presented. '1996(a)' refers to totals of the 49 regions that were covered in 1991. The new Wadden Sea totals (including regions 50-56) are referred to as '1996(b)'. Where there is only one number for 1996 (a) and (b), these values were equal. The totals for 1991 are different for some species compared with the earlier ones published by Fleet et al. (1994). These have been changed by the national co-ordinators based upon additional information or corrections. Most 1991 estimates have not been changed significantly, but a few are important.

The red list status for species in the entire Wadden Sea is based on the analysis of Rasmussen et al. (1996). The red list status in the Wadden Sea for the birds in this report is as follows:

IRR – International responsibility for residents, when at least 5% of the northwestern European breeding population is found in the Wadden Sea.

SU – Susceptible: Eurasian Spoonbill and Little Gull.

VU – Vulnerable: Red-breasted Merganser, Great Ringed Plover, Black-tailed Godwit, Common Redshank, Common Tern and Arctic Tern.

En – Endangered: Kentish Plover, Sandwich Tern, Little Tern and Short-eared Owl.

CR – Critical: Dunlin, Ruff, Turnstone and Gull-billed Tern.

The national red list status for the various species involved is, in most cases, different from their entire Wadden Sea status. For each of the species with red list status, potential threats and the degree of need for protection are described in the text.

For each species, a description is given of habitat requirements in the Wadden Sea. The distribution is described with emphasis on important concentrations in regions, the distribution between the mainland and islands, and the relationship with habitat availability. The northern and western Wadden Sea refers in the text to the Wadden Sea north and west respectively of the river Elbe. Coverage is discussed where it might have had an influence on the results.

Describing the changes in abundance, it is focused on the survey period 1991-1996 where data from the entire Wadden Sea are available. Although there are annual data of colony breeding birds from the whole period, for the most common species of non-colony breeders only data from the 1991 and 1996 total surveys are compared. In both cases trends are presented in the form of graphs showing the changes in national numbers. Where relevant, information about trends from the census areas is discussed based on Melter et al. (1997) and van Turnhout (1999). For the Oystercatcher, Great Ringed Plover and Common Redshank, graphs indicate the trend in the census areas. The calculation of trends in the census areas is described in detail in van Turnhout (1999). The changes in numbers until 1991 are discussed in more detail in Fleet et al. (1994).

To illustrate the distribution of breeding populations in 1996, maps are included for the 31 species. The maps display the total number of pairs in 1996 in each of the 56 regions. The data used as basis for the distribution maps and tables on total numbers are presented in Appendix A and B, and the regions are defined in Figure 1.

National reports have been compiled and published regularly in the three countries, and these form the basis of this report. The national reports are for The Netherlands Koks & Hustings (1998), for Niedersachsen and Schleswig-Holstein Hälterlein & Südbeck (1998) and for Denmark Rasmussen & Thorup (1998).

Great Cormorant

Phalacrocorax carbo

NL: Aalscholver **D: Kormoran** **DK: Skarv**

Status 1991: **274 pairs**
Status 1996: **838 pairs**
Red List status: **None**

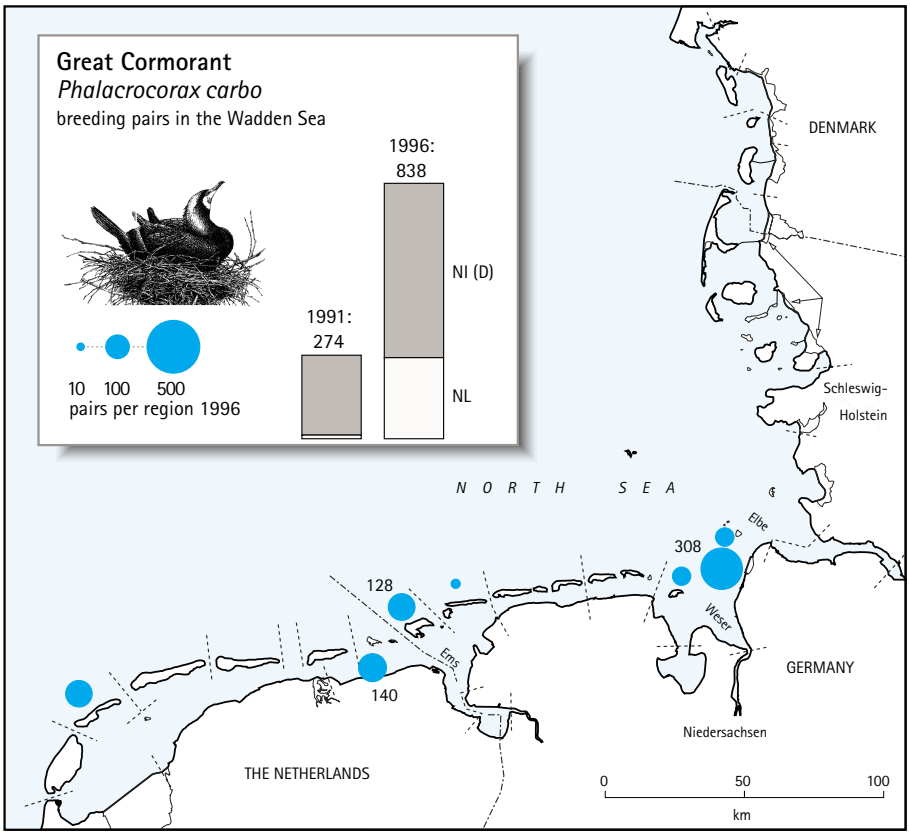


Figure 7: Breeding distribution of Cormorant in the regions of the Wadden Sea, 1996.

Habitat

In 1991, all colonies in the Wadden Sea were on artificial structures such as an old disused lighthouse (outer Weser estuary) a concrete block used to measure gas pressure (De Hond in The Netherlands) and an old wreck (near Mellum in Niedersachsen). Cormorants have colonized natural islands in the Wadden Sea since 1991. Most nests are on the ground in the vicinity of gull colonies. The Dutch cormorants breeding on De Hond were found to feed on a variety of salt water and fresh water fish, and also Stickleback was an important prey.

Coverage

The coverage of this species is probably almost 100% in all parts of the Wadden Sea.

Distribution

In Northwestern Europe, a large number of Cormorants breed inland, in The Netherlands and in the Baltic Sea in Denmark and Schleswig-Holstein and in the Kattegat in Denmark. In Denmark the steady population growth that started in the 1970s peaked in 1996, and since than, the central colonies around Storebælt have decreased. This has led to a growth on colonies in northern and western Denmark, but not to a successful establishment in the Danish Wadden Sea (Eskildsen 1997).

There were two colonies in the Dutch Wadden Sea in 1996. The island De Hond in Groningen was possibly colonized in 1974. Another colony in the Kroon's polders on Vlieland was established in 1994. In Niedersachsen, the number of colonies grew from three in 1991 to seven colonies in

1996, with the main distribution around the Weser Estuary and the island Borkum. Breeding success was very high in the Wadden Sea colonies (van Rijn et al. 1998). Ringing recoveries proved that the Wadden Sea was colonized by birds from both Dutch and Danish birds.

In Niedersachsen, there were seven colonies in the Wadden Sea area holding more than 70% of the population in Niedersachsen. The decrease in 1996 compared to 1995 was followed by another increase in 1997 (Südbeck & Hälterlein in prep.). In 1996, there were colonies on two natural dune islands, which are not inhabited by man. Both have colonies of Herring and Lesser Black-backed Gulls as well. In addition, two lighthouses hold colonies, two wracked ships and another colony is situated on Nigehörn, an artificial island in the outer Elbe estuary.

In Niedersachsen, Cormorant breeding numbers are still increasing (Südbeck 1997). The small inland population, which constitutes one third of the total Niedersachsen population, is of only limited importance, since illegal disturbance occurs and the building up of new colonies is prevented at some sites. In this sense, breeding Cormorants still use the Wadden Sea as a refuge. In total, the increase has more or less stopped since the middle of the 1990s with decreases in some larger colonies and a slight expansion of range (see Knief 1996, 1997 for an overview of the German population).

In Schleswig–Holstein, there were about 2,500 breeding pairs in the Baltic area until 1996, and here the population increased until 1993 (Knief 1996). Since then it has been stable.

The Cormorant did not breed within the Schleswig-Holstein part of the Wadden Sea Co-operation Area in the period 1991-1996. In 1997, Cormorants settled on Trischen, and this colony numbered 235 pairs by 1999.

There were unsuccessful breeding attempts in the Danish Wadden Sea in 1994 and 1995 on the small island of Jordsand. There were no breeding attempts after 1995. Illegal egg collection on Jordsand probably contributed to the two unsuccessful breeding attempts in 1994 and 1995.

Populations size and development

The Wadden Sea population has increased threefold in the period 1991-1996, growing from 269 to 894 pairs and doubled the number of colonies from four to nine. The Wadden Sea population is still very small compared with the mainland populations especially in The Netherlands and Denmark. The Netherlands held 18,474 pairs in 1996 (van Dijk et al. 1998), Germany had 14,213 pairs (Knief 1997) and in Denmark 41,090 pairs bred in 1996 (Eskildsen 1997). In the western Wadden Sea, in particular, the Cormorant is expanding on the islands where about 43% of the population bred in 1996. Two larger colonies in Niedersachsen decreased from 1995 to 1996, but a further increase in population size and number of sites can be expected in the coming years.

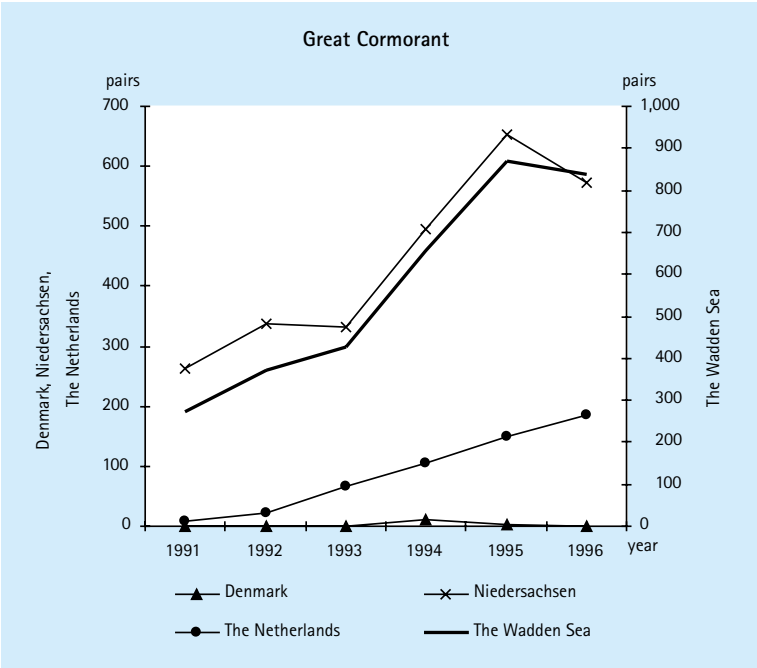


Figure 8: Number of pairs of Cormorant in the four countries and in the entire Wadden Sea during 1991 to 1996.

Eurasian Spoonbill

Platalea leucorodia

NL: Lepelaar **D: Löffler** **DK: Skestork**

Status 1991: **217 pairs**
Status 1996: **592 pairs**
Red List status: **SU, IRR**

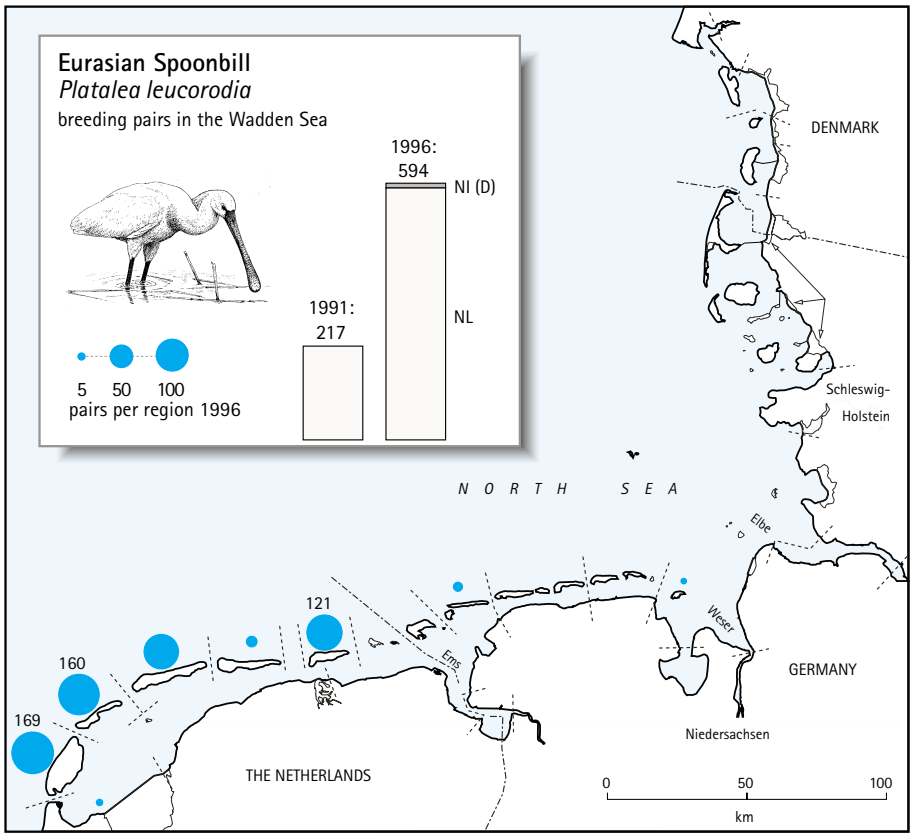


Figure 9: Breeding distribution of European Spoonbill in the regions of the Wadden Sea, 1996.

Habitat

The breeding sites are in both high and low salt marshes, reed beds at lakes, in wet dune slacks or dunes, all on islands that were free of mammal predators. All colonies are in protected areas, and some are wardened to reduce disturbance. The new colonies occur in places with Herring Gull and Lesser Black-backed Gull colonies, and almost certainly benefit from the presence of these species.

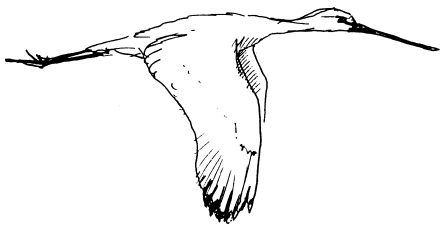
The feeding habitat in the breeding season on the islands are largely gullies on the mudflats were the Eurasian Spoonbill feeds on shrimps and small flatfish (van der Have & Osieck 1997). Sticklebacks found in ditches in mainland polders are important as food before the breeding season. Eurasian Spoonbills breeding on the Wadden Sea islands regularly feed on mudflats at the mainland coast or in brackish or freshwater wetlands behind the dikes (e.g. Leybucht, Niedersachsen), which are more than five km away from the colonies.

Distribution

Within northern Europe, the Eurasian Spoonbill breeds primarily in the Dutch Wadden Sea. In 1996, 70% of the Dutch population bred in the Wadden Sea. The most important Wadden Sea island in 1996 was Texel with 169 pairs in three colonies. In 1995, the Niedersachsen part of the Wadden Sea was also colonized by this species, with two colonies in 1996.

Population size and development

The Dutch Wadden Sea population grew steadily in the period 1991-1996. From 1995 to 1996, the



population increased from 345 pairs to 581 pairs. The expansion of the population in the Wadden Sea in 1996 coincided with the total desertion of the former largest Dutch colony on the mainland at Oostvaardersplassen (Otto Overdijk pers. comm.). In The Netherlands, the total population doubled from 661 pairs in 1994 to 1,270 in 1998. The Wadden Sea population increased further to 740 pairs in 1998 (Overdijk 1999). The expansion in the Wadden Sea was followed, in 1995, by breeding attempts on other Dutch islands.

On Memmert in Niedersachsen, three pairs bred unsuccessfully in 1995 (Südbeck & Hälterlein 1997). In 1996, the island Mellum was colonized. This is now the easternmost Eurasian Spoonbill colony in the Wadden Sea. There are several ringing recoveries indicating that the birds in Niedersachsen have connections with the larger Dutch population.

Pairs and small groups of birds have been seen in Denmark since 1994, but during the summer 1996, they were observed in several places in the northern parts of the Wadden Sea, although, they did not stay to breed. In Limfjorden, 200 km north of the Wadden Sea in the northern part of Denmark, one pair of Eurasian Spoonbill bred in 1996, for the first time since 1960s, and was successful. They bred again in 1997 and 1998 with four and three pairs respectively (J. Gregersen pers. comm.). Several color-ringed birds from Dutch Wadden Sea islands were seen in Limfjorden showing that the expansion came from the Wadden Sea. Why the breeding population of Spoonbill is increasing so fast is not clear (Overdijk 1999). But in 1999 there was a decline of the total population in The Netherlands.

There may be possibilities for further expansion on the East Friesian islands, the mainland coast and in Schleswig-Holstein. Despite more records of Eurasian Spoonbills in the Danish Wadden Sea area, it is not expected that a breeding population will settle here because of the lack of suitable breeding sites free of foxes.

The Eurasian Spoonbill is dependent on well-protected breeding sites free of human disturbance. At the beginning of the breading season, the Eurasian Spoonbills are particularly sensitive to disturbance by humans. Ground predators are an important threat to the breeding birds and the breeding success. On Texel, nests were, on one occasion, partially predated from stoats (*Mustela putorius*) (van der Have & Osieck 1997).

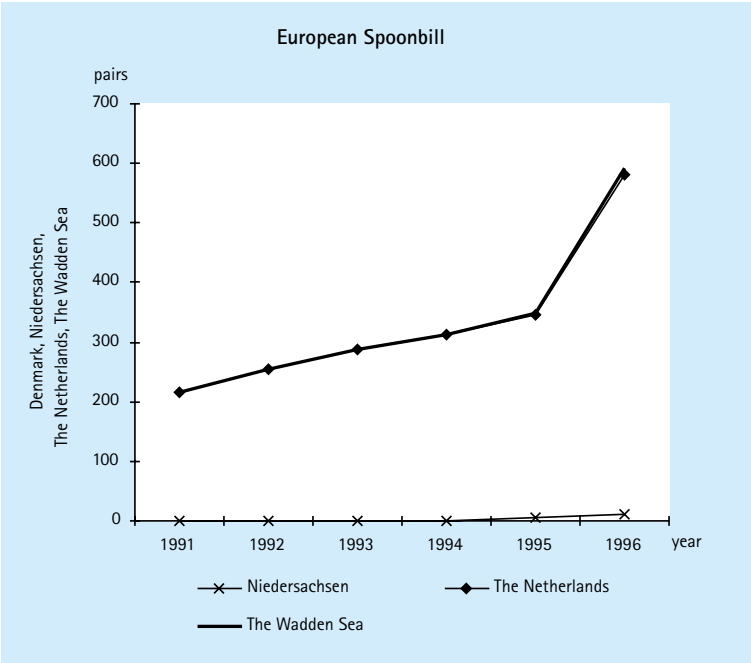


Figure 10: Number of pairs of European Spoonbill in the four countries and in the entire Wadden Sea during 1991 to 1996.

Shelduck

Tadorna tadorna

NL: Bergeend **D: Brandente** **DK: Gravand**

Status 1991: **4,413 'pairs'**
Status 1996(a): **4,722 'pairs'**
Status 1996(b): **4,982 'pairs'**
Red List status: **IRR**

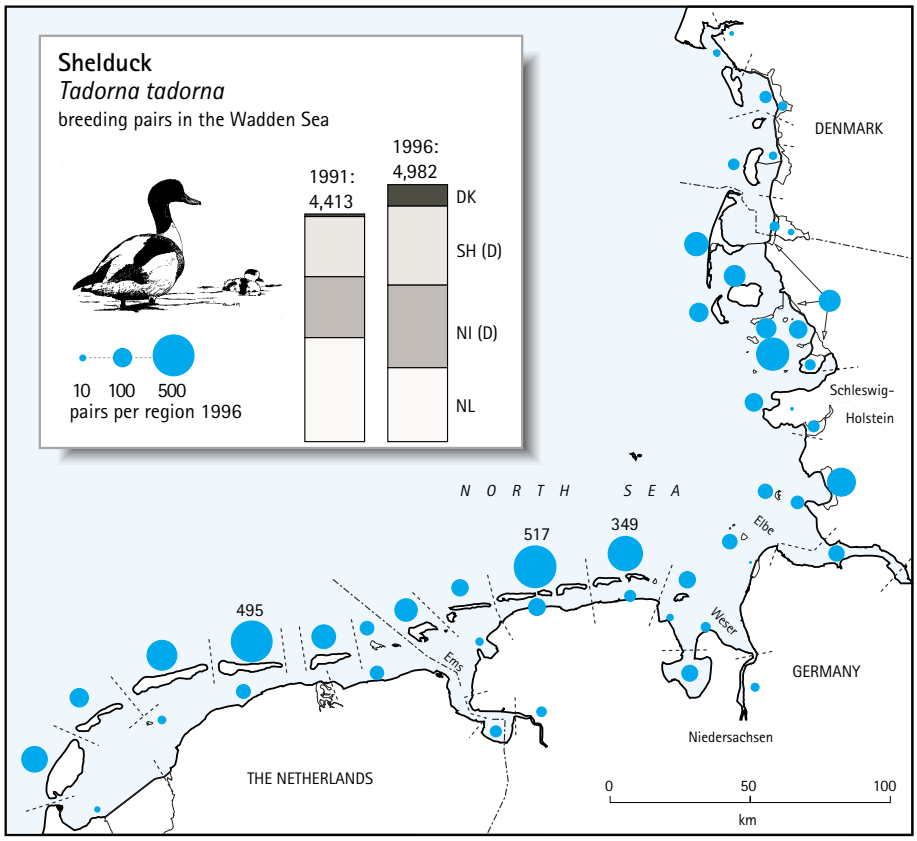


Figure 11: Breeding distribution of Shelduck in the regions of the Wadden Sea, 1996.

Habitat

Nests are often placed in fox or rabbit burrows, under debris washed to the shore or in dense vegetation. In 1996, 30% of the population were found in The Netherlands. Rabbit holes are the most important nesting place on the islands. On the Dutch mainland, many pairs breed near farms. In Niedersachsen, most islands except Spiekeroog and Langeoog have populations of rabbits. In the Danish Wadden Sea, rabbits are only found on Fanø.

The foraging habitats are on mudflats, mainly in silty areas, which occur primarily on the mainland coast. For this reason, optimal nesting and feeding habitats do not necessarily occur in close proximity.

Coverage

It is difficult to count breeding Shelduck. Many non-breeding birds spent all year in the Wadden Sea and large numbers come to moult in certain areas. Hence, a variable proportion of the population in different parts of the Wadden Sea and over time might be non-breeding birds. The number of breeding pairs and their trend in numbers are therefore very difficult to determine.

According to the trilateral guidelines, Shelduck are not counted systematically outside the census areas. In Denmark, the population was not counted systematically, and the population is higher than the presented numbers would suggest. In Schleswig-Holstein, coverage was nearly complete. In Niedersachsen, most breeding sites

were counted in 1996 according to the trilateral guidelines. In The Netherlands, coverage was good except on Schiermonnikoog, which was not counted. For this region, 400 pairs were estimated (434 in 1991).

Distribution

Shelducks breed in all parts of the Wadden Sea. The largest numbers are found on the islands. This probably suggests that nesting possibilities on the islands are generally better. The Shelduck also breeds on inland localities away from the coast on sites that were not counted. Pairs bring young to the mudflats over long distances. The population registered along the mainland coast partly originates from pairs breeding behind the dikes. The distribution in the Danish part of the Wadden Sea is not clear, but the density might be lower than found further south.

Population size and development

Because of the difficulties in counting this species, it was not possible to detect trends in the period 1991-1996. The small difference in total numbers between 1991 and 1996 does, therefore, not provide any confidence to detect trends in the population. The census areas show large annual variations and no clear trend. In census areas in The Netherlands, there were fewer pairs in 1996 compared with 1995, influencing the total number counted in the Wadden Sea as a whole. On the other hand, there were unusually large numbers of Shelduck recorded on the Groningen coast in 1991. In the 1970s, the total population was estimated at 3,500 (Smit & Wolf 1981). However, that population estimate was based on counts in a smaller part of the entire Wadden Sea and probably less accurate than the present. The methods recommended in the trilateral guidelines for monitoring do not produce very accurate population estimates. It is very time consuming to obtain better estimates and they cannot be calculated from study plots (Bergmann et al. 1999). It would therefore only be fair to say that better population estimates cannot be obtained from the current program.

The Shelduck is mentioned as a responsibility IRR category on the Red list, but based on the available data, the species does not appear to be threatened, at present, in the Wadden Sea.

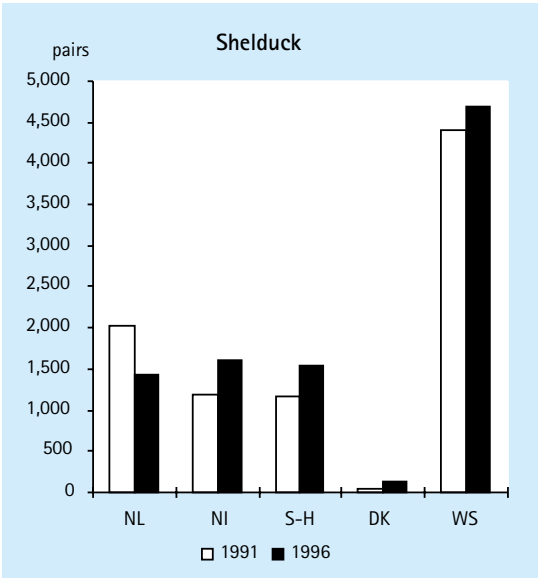


Figure 12: Number of pairs of Shelduck in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

Common Eider

Somateria mollissima

NL: Eidereend **D: Eiderente** **DK: Ederfugl**

Status 1991: **8,404 pairs**
Status 1996: **11,534 pairs**
Red List status: **None**

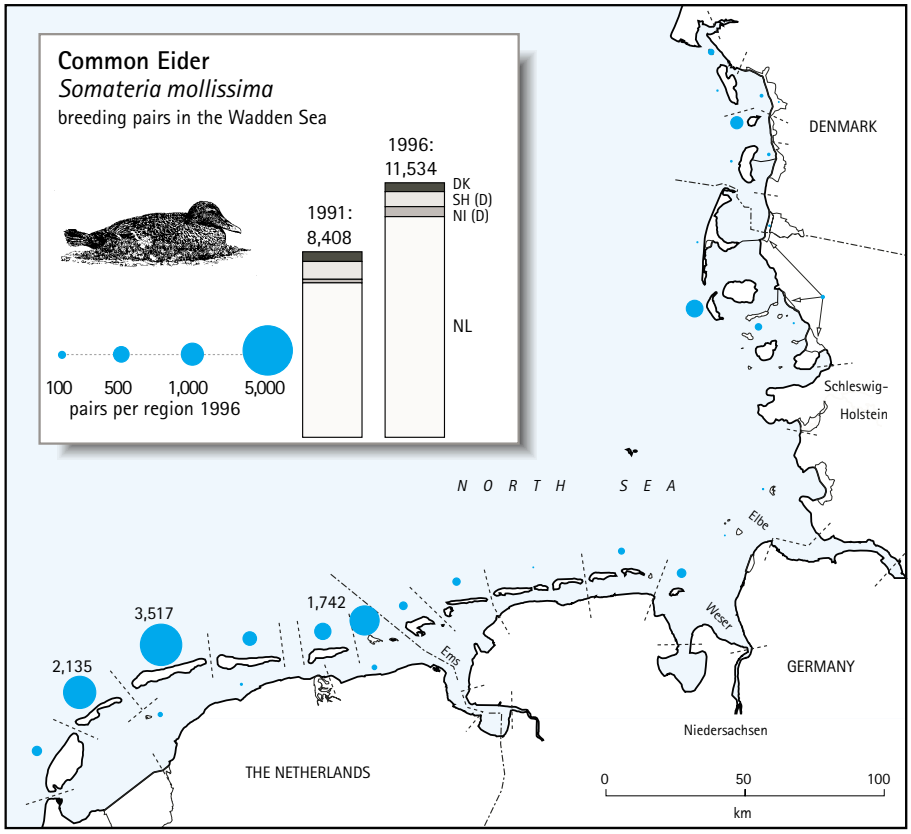


Figure 13: Breeding distribution of Common Eider in the regions of the Wadden Sea, 1996.

Distribution

The Common Eider breeds throughout the Wadden Sea, but 84% of the population breed in the Dutch sections. On the islands, the Common Eiders breeds in colonies of varying size, often in colonies of Herring and Lesser Black-backed Gull. A few single pairs breed on the mainland making up only about 1% of the population.

Coverage

According to the common guidelines, the Common Eider is not counted systematically outside the census areas. Considering that the Common Eider is a species largely dependent on fluctuations in mussel biomass, more effort should be made in the future to achieve good population estimates for this species. The presently recommended guidelines (based on counts of individuals) are much less labor intensive than using nest counts, but still enables monitoring of the population. Nest counts should be avoided since that method underestimates breeding numbers and because disturbed nests are very often abandoned.

In The Netherlands, the methods used for counting Common Eiders varied considerably in the years before and after 1995. Since 1995, the estimates have been based on counts of males from the end of April to mid May. This produces more reliable higher estimates of the breeding population. Therefore, the new revised 1991 estimate of the Dutch breeding population is 7,000 pairs, which is 40% more than the previous estimates for 1991 (Fleet et al. 1994, Koks & Hustings 1998). On Schiermonnikoog alone, 2,188

breeding females were counted in 1992. From this island, there was a count of at least 3,000 pairs. The coverage of Common Eider in The Netherlands was not complete.

In Denmark, the largest colony on Mandø has not been counted since 1991. This makes a reliable population estimate for Denmark uncertain. It is assumed that the population had the same level as in 1991 (400 pairs). But a recent count (1999) produced about 700 pairs. Because of the differences in methods it is not possible to compare this with the previous count.

Population size and development

Although 8,033 pairs were counted in 1996 the total population for the Dutch Wadden Sea is estimated to be 10,000 pairs. Compared with the 1991 estimate, the Dutch Wadden Sea population increased over 40% from 1991 to 1996, but a realistic comparison between the Dutch population in 1991 and 1996 is not possible anymore. Since the Dutch population accounted for 87% of the total Wadden Sea population in 1996, the methodological problems and problems associated with coverage affects the possibility to assess the trend of the total Wadden Sea population.

The comparatively small population that started breeding regularly in Niedersachsen in1981 (Behm-Berkelmann &. Heckenroth 1991), has continued growing significantly since 1991 (Hälterlein & Südbeck 1996a,b).

In Schleswig-Holstein, the colony on Amrum held the majority of the regional population, and here the number decreased from 684 to 570 in the period 1991 to 1996. Despite the population increases during the 1990s in smaller colonies on Norderoog the total population in Schleswig-Holstein decreased.

The population size and trend for the comparatively small Danish population is uncertain since there were no counts of the most important colony from 1991 to 1999.

The Common Eider could be threatened in the future by the over-exploitation of the mussel beds in the Wadden Sea. Intensive fishing in the Dutch Wadden Sea in the late 1980s and in 1990, combined with hard winters and low spatfall led to an almost complete disappearance of intertidal mussel beds (Smit et al. 1998). In Niedersachsen, Schleswig-Holstein and Denmark, the fishery pressure on blue mussel stocks increased dramatically in the mid 1980s as a result of the declining Dutch stocks. In the last 10 years, the fishery effort throughout the Wadden Sea was much larger than

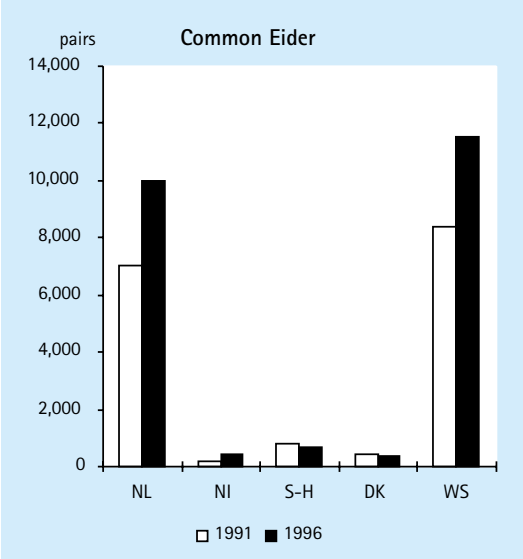
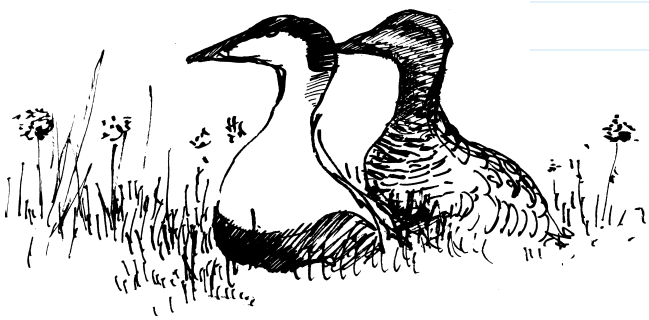


Figure 14: Number of pairs of European Eider in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

previously (Dahl et al. 1994, unpubl. data). In the Dutch Wadden Sea, mortality of wintering Eiders due to food shortage tripled in the 1990s (Camphuysen 1996, Smit et al. 1998). How increasing food shortage effects the breeding populations are, however, not clear. In 1999, there was a sharp decline on the island of Terschelling.

Oil pollution is a risk for local breeding populations in the Wadden Sea, where they winter near the breeding grounds. This was emphasized by the 'Pallas' disaster in the Schleswig-Holstein Wadden Sea in November 1998, where more than 7,300 dead Eiders were found as victims of the oil pollution (Fleet et al. 1999). Ringing recoveries suggests that a majority of the birds were from the wintering Baltic population . Hence, the breeding numbers and success on Amrum was not negatively affected the following season.



Red-breasted Merganser

Mergus serrator

NL: Middelste Zaagbek **D: Mittelsäger** **DK: Toppet Skallesluger**

Status 1991: **13 pairs**
Status 1996: **41 pairs**
Red List status: **VU**

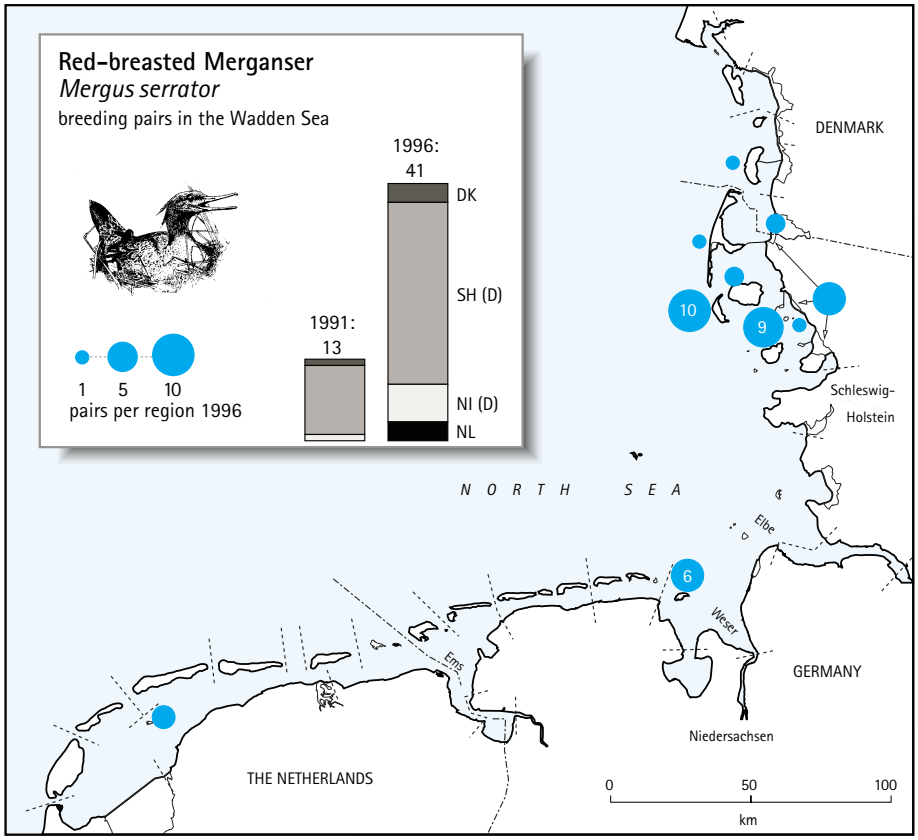


Figure 15: Breeding distribution of Red-breasted Merganser in the regions of the Wadden Sea, 1996.

Habitat

The Red-breasted Merganser is a typical coastal breeder that prefers shallow coasts, and avoids the most exposed coasts. Breeding is also found on lakes in wetlands behind the dikes in Schleswig-Holstein and in the Margrethe Kog in Denmark.

Coverage

It is possible that some pairs were not counted. This species often breeds very late compared to most other species. Young often hatch in July, a month after many areas are visited to monitor other species. Because the species is still rare as a breeding bird in the western part of the Wadden Sea, pairs present during the breeding season are often not considered as breeding birds when not seen with young (Brenninkmeijer et al. 1996).

Distribution

The species has expanded its breeding range southwards in the last twenty years. Since the end of the 1970s, the Dutch Delta area has been colonized and the population here was between 20 and 26 pairs in 1994 to 1996 (Meininger et al. 1997). In Niedersachsen, a small breeding population exists far inland on small rivers in the northern Harz Foreland (Zang & Kunze 1996).

Population size and development

From 1995 onwards, a few pairs bred annually in the Dutch Wadden Sea. In Niedersachsen, six pairs bred in 1996 on the island of Mellum, and they seem to have bred regularly there in recent years. In Schleswig-Holstein, where it is concentrated in the northern part of the region, the population

more than doubled from 1991 to 1996. In Denmark the population has remained stable since 1991. All in all there was an increase in the population.

The Red-breasted Merganser is listed as vulnerable on the red list, indicating that the population is low, being on the edge of its distribution. The population is expected to increase further in the future.

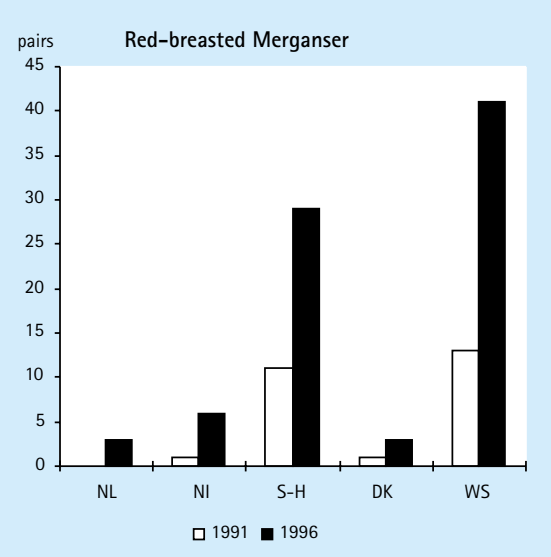
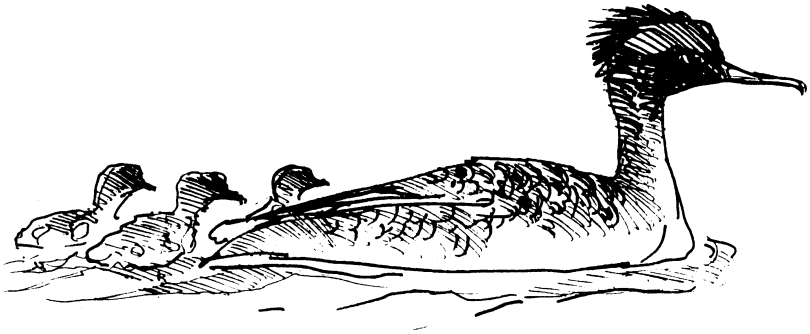


Figure 16: Number of pairs of Red-breasted Merganser in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.



Hen Harrier

Circus cyaneus

NL: Blauwe Kiekendief D: Kornweihe DK: Blå Kærhøg

Status 1991: **124 pairs**
Status 1996: **142 pairs**
Red List status: **IRR**

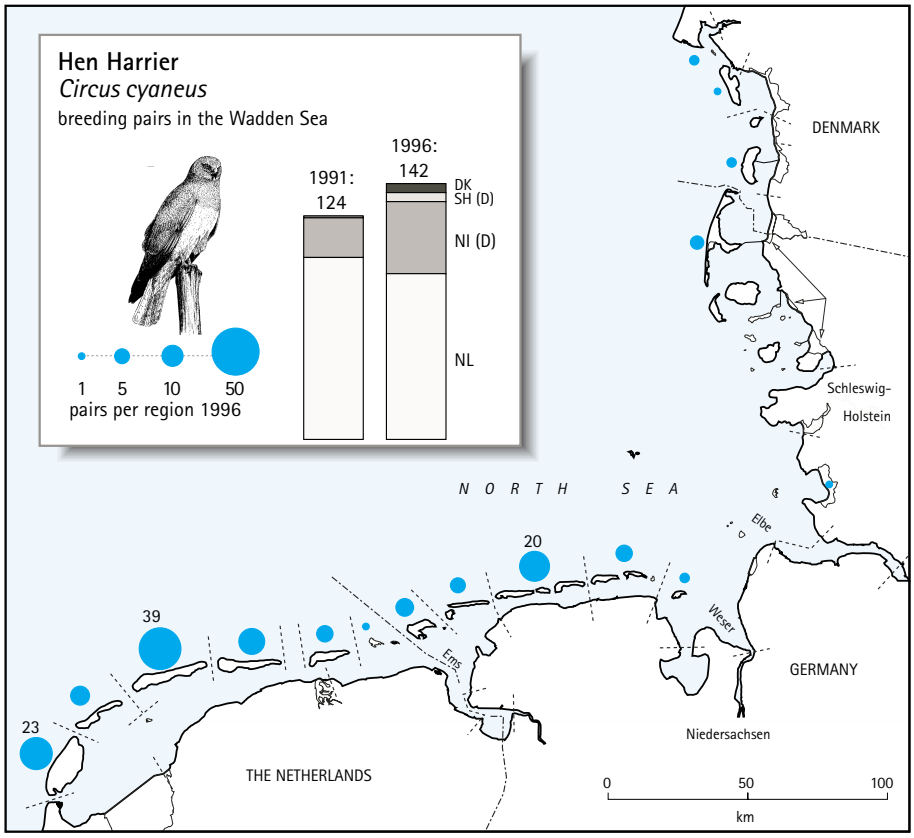


Figure 17: Breeding distribution of Hen Harrier in the regions of the Wadden Sea, 1996.

Habitat

Hen Harrier breeds mainly in dunes on the islands where nests are placed in dune valleys with some vegetation. The nesting site is most often in wet dune slicks, older dunes and reed beds (van der Wal et al. 1999). Breeding has only recently occurred on the island polders (Dijksen 1996). Feeding habitats are dunes and salt marshes on the islands, as well as salt marsh and agricultural land on the mainland coast.

Distribution

The Hen Harrier is widespread on the Wadden Sea islands west of the river Elbe. Since 1989, the species has spread to Schleswig-Holstein and Denmark. In Denmark, the most regular breeding places were on a mainland site.

Coverage

Hen Harriers need special census efforts, and achieving a good coverage is very time consuming. In The Netherlands and Denmark, the coverage was good. In Niedersachsen, a good coverage of Hen Harrier breeding populations could be achieved because the main breeding islands are wardened by nature conservation staff during the breeding season.

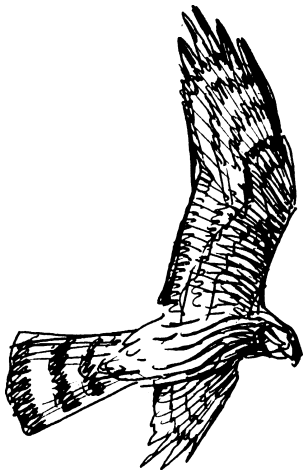
Population size and development

The total Wadden Sea population increased due to enlargement of the distribution area and increasing numbers in Niedersachsen, despite the slight decrease in The Netherlands, the important part of the Wadden Sea population.

The Dutch Wadden Sea population of Hen Har-

rier, was stable or decreased slightly during the period 1991-1996. The largest population on Terschelling decreased from 49 in 1994 to 39 in 1996, were fledging success decreased in recent years (van der Wal et al. 1999). The poor success is possibly a result of both food and nest site competition with Marsh Harrier *Circus aeruginosus*, which have increased significantly since 1990. There is some evidence that Marsh Harrier pressed the Hen Harrier into less favorable breeding sites (van der Wal et al. 1999; Koks & Hustings 1998). On Terschelling, 69 pairs of Marsh Harrier bred in 1996. Deliberately human disturbance contributed to this development (Koks & Hustings 1998). The large population on Texel increased from 18 pairs in 1991 to 23 in 1996 (Dijksen 1996). It is also thought that prey availability declined as a result of an increasing vegetation cover (Bijlsma 1999).

In Niedersachsen, the population almost doubled during the period 1991-1996. The largest densities were found on the islands of Langeoog (ten pairs), Norderney (eight pairs) and Borkum (seven pairs). In the last five-year period, all East-Friesian-islands have been colonized which means a real expansion of the Hen Harrier distribution area. The islands function as refuge areas for the re-established Hen Harrier breeding populations in other parts of Germany. Most of former inland breeding places have been abandoned in recent years. On the islands, a good food supply (voles, rabbits and birds) coincides with suitable breeding opportunities nearly free of disturbance and direct persecution. These factors in combination are able to explain the heavy population increase in recent years for this medium-sized bird of prey (Südbeck & Hälterlein 1999).



On Sylt in Schleswig-Holstein, were the first breeding occurred in 1989, the Hen Harrier consolidated its position as breeding bird with four pairs in 1996. Also on the mainland in the southern part, one pair has possibly bred since 1992.

The Wadden Sea holds the only regular breeding sites in Denmark. With the increase of the population in the western Wadden Sea, the species spread to the northern part. Since 1992, when the first breeding attempt occurred on a mainland site in Ho Bugt, between two and five pairs have bred in the Danish Wadden Sea area. The breeding attempts were all unsuccessful in 1996 probably due to predation. Since 1996, the Hen Harrier has bred irregularly in the Danish Wadden Sea followed by one unsuccessful breeding attempt by two pairs in 1998.

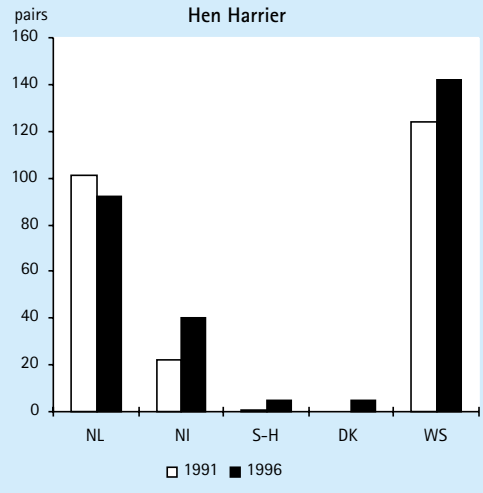


Figure 18: Number of pairs of Hen Harrier in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

Oystercatcher

Haematopus ostralegus

NL: Scholekster **D: Austernfischer** **DK: Strandskade**

Status 1991: **37,156 pairs**
Status 1996(a): **45,995 pairs**
Status 1996(b): **46,360 pairs**
Red List status: **IRR**

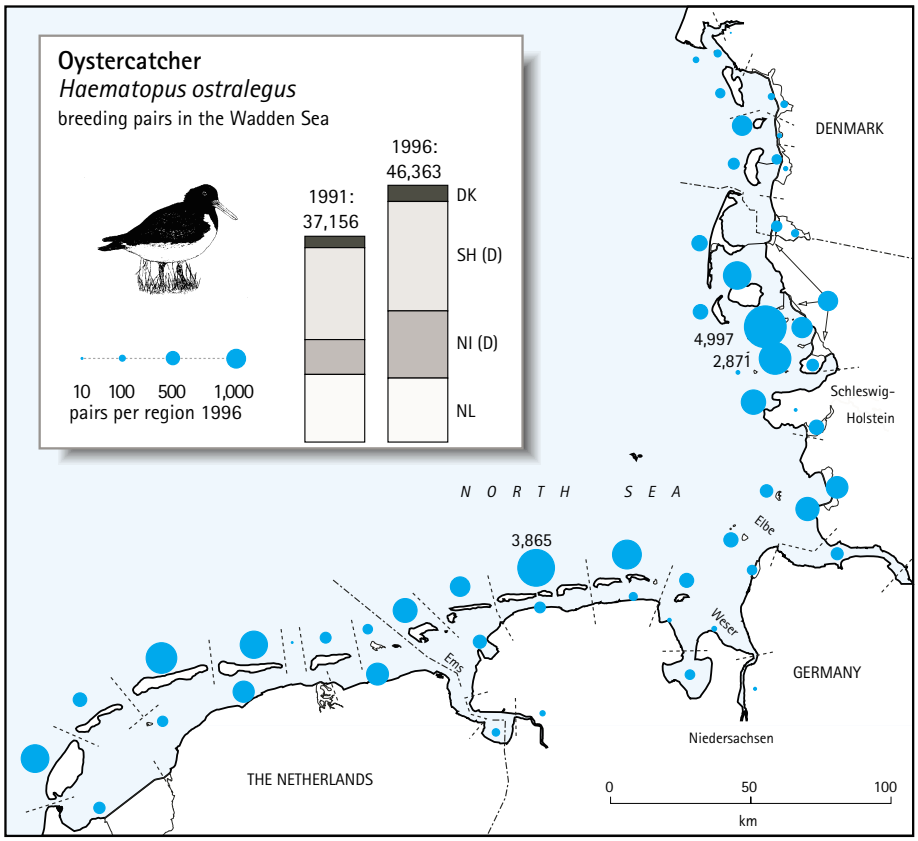


Figure 19: Breeding distribution of Oystercatcher in the regions of the Wadden Sea, 1996.

Habitat

The Oystercatcher is the most common and widespread wader species in the Wadden Sea. It breeds in many different coastal habitats as well as on inland habitats such as meadows and arable land. The highest population densities are reached on small islands or Halligen in the Wadden Sea. On the Schleswig-Holstein Halligen and on Trischen, the average population densities were found to be 17 pairs/10 ha with a maximum of 167 pairs/10 ha (Hälterlein 1996). In Denmark, a large population on the salt marsh on Mandø had an average density of 25 pairs/10 ha. On mainland salt marshes densities are lower. In the southern parts of the Schleswig-Holstein mainland, the average density is seven pairs/10 ha with a maximum of 20 pairs/10 ha. In Denmark, the mainland salt marsh density is often lower than two pairs/10 ha.

Wetlands behind the dikes are often densely populated. On Danish wetlands, densities between three and six pairs/10 ha are found. On the farmed mainland polders in Denmark, densities are low ranging from 0.1 to 0.4 pairs/10 ha.

In Denmark, where also most of the mainland polders were counted, these made up only 10% of the total population. Wetlands behind the dikes holding 15% of the total Danish Wadden Sea population were quite important considering their limited area. Dunes and outer sands are sparsely populated holding 7% of the population (Rasmussen & Thorup 1998). The wetlands behind the dikes on the mainland coast have on average higher population densities than the mainland salt marshes. In most places the Danish mainland salt

marshes are very intensely grazed.
In Schleswig-Holstein, only 3% of the population were found in dunes and on beaches, but 26% on inland areas on the islands (Hälterlein 1996).

Coverage

The introduction of the common guidelines (Hälterlein et al, 1995) has probably produced higher but more realistic numbers from the islands in Niedersachsen between 1992 and 1994 (Hälterlein & Südbeck 1996a,b). In The Netherlands and in Schleswig-Holstein, changes as a result of changes of census methods were not found. However, since coverage was not as good in The Netherlands in 1991, the population decreases here between then and 1996 was probably larger than the data suggest. The taller vegetation (as a result of extensive grazing) makes counting of the species more difficult. The 1991, the breeding season had suffered unfavorable weather conditions, this led to underestimation of the size of the breeding population compared to data from the census areas in 1990 and 1992 (Melter et al. 1997). The increase is therefore smaller when taking 1990 as a base line year. However, results from the census areas show a steadily increasing population. In Schleswig Holstein, the populations on the islands Pellworm, Föhr and Nordstrand were estimated from counts on study plots covering about 20% of the whole area.

Distribution

The Oystercatcher is widespread and breeds in a variety of habitat types. On the smaller islands almost colony breeding may occur. It also breeds in adjacent polders on the mainland in decreasing densities with distance to the sea dikes. In Niedersachsen, more than 80% and in Denmark, about 70% of the population breed on the islands.

In the western Wadden Sea, Oystercatchers are widespread inland as well. The population in the western Wadden Sea is just as large as north of the Elbe. The population densities are highest in the Schleswig-Holstein Wadden Sea, especially on the Halligen.

Population size and development

The population of Oystercatcher has increased in all parts of the Wadden Sea during the last 50 and maybe 100 years (Hälterlein 1996, Behm-Berkelmann & Heckenroth 1991). In places with very high population densities the growth rate has now declined, and locally populations declined during the 1980s. Many areas still have a potential for a growth based on the increase in eutrophication of the coastal waters following an increase in benthic fauna biomass and consequently more food stocks for the species. Also the availability of potential breeding sites increases in response to more extensive grazing management (Hälterlein 1996). Since 1991, the total population has increased by 14%. However, the pattern of population change differs markedly in the different parts of the Wadden Sea.

In The Netherlands, during the years 1990-1995, the Wadden Sea population fluctuated and perhaps decreased. After the severe winter 1995/96, the population decreased significantly by approximately 20% from 1995 to 1996. The intertidal mussel banks in the Dutch Wadden Sea did not recover from the effects of intensive fishing and the severe weather of the late 1980s (Smit et al. 1998). Wintering Oystercatchers suffered especially in the severe winter of 1995/96. At least 10,000 to 12,000 Oystercatchers were found dead in the Dutch Wadden Sea that year (Smit & Koks 1997), and possibly another 4,000 - 5,000 individuals could have been shot in France. These also included birds from Germany and Scandinavia. This high winter mortality is thought to be an effect of food shortage, especially mussels, combined with severe winter weather in the Dutch Wadden Sea. The mainland breeding population in The Netherlands was also affected. The populations declined more in dunes and agriculture areas than on salt marshes. In the following breeding season (1997), the mainland population decreased and the Wadden Sea population was stable.

In Niedersachsen, the population almost doubled from 1991 to 1996. In the census areas,

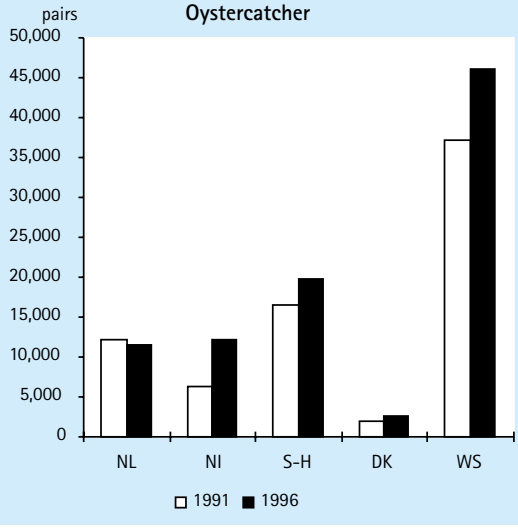


Figure 20: Number of pairs of Oystercatcher in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

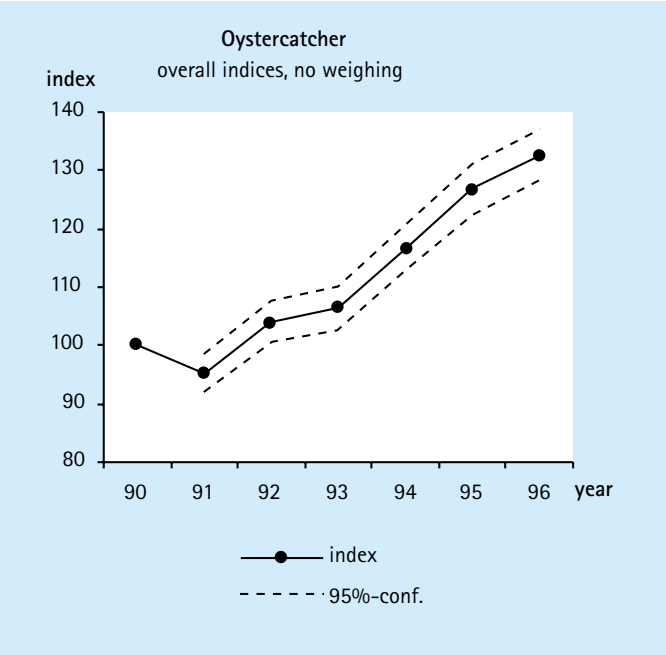


Figure 21: Index of Oystercatcher in the entire Wadden Sea 1990 to 1996 (1990 =100).

the population decreased from 1990 to 1992 followed by an increase since 1992. The hard winter in 1996 did not have a negative influence on the breeding population, though many Oystercatchers were also found dead in the Wadden Sea in Niedersachsen (Reuter 1997). The inland population of Oystercatchers was the only meadow bird species that increased in Niedersachsen during the period 1985 to 1995 (Melter et al. 1998).

In Schleswig-Holstein, the population continued to increase and a new maximum was reached in 1996. Only in the regions covering salt marshes in Nordfriesland and on Amrum, there were fewer pairs in 1996 than in 1991. On the salt marshes in Dithmarschen, the population increased by 55%. It is quite remarkable that the Schleswig-Holstein population is still increasing considering the very high population densities in most places. In some places though, the population is leveling off or has slightly fallen, but the general trend is still upwards. Salt marshes without management generally support higher breeding densities of Oystercatchers and other breeding bird species than grazed or mowed salt marshes (Ruschke 1998, Thyen et al. 1998, Hüppop & Hüppop 1995, Stock et al. 1992).

In Denmark, 2,543 pairs were counted, and the population was estimated to 2,813 pairs including the mainland population. Despite reduced populations on Rømø and Fanø, the population increased on Mandø thus compensating in all for lost numbers.

The overall indices in the census areas show a steady increase since 1991. The development is quite similar for the islands and the mainland (see Figure 21).

It is remarkable that only the population in the Dutch part of the Wadden Sea suffered from the severe winter weather (van Turnhout 1999). In the other regions of the Wadden Sea, the populations increased from 1995 to 1996. This suggests that food shortages in the Dutch Wadden Sea could be an important contributory factor for the extraordinary winter mortality in 1996. A potential explanation could be that Dutch breeding Oystercatchers are more likely to winter in the Wadden Sea than those breeding further north in the area, which partly migrate to France. Further information relating to movements of marked individuals from different breeding and wintering sites of the population during strong weather are required to confirm this explanation.

The Oystercatcher population in the Wadden Sea might be threatened by over-exploitation of mussels and cockles, especially in the Dutch Wadden Sea, where the fishery effort is much larger than in the rest of the Wadden Sea (Dahl et al. 1994). The fact that the Dutch Oystercatchers show different trends compared to those in the rest of the Wadden Sea acts as warning signal for the state of the Wadden Sea ecosystem in that region.

Avocet

Recurvirostra avosetta

NL: Kluut **D: Säbelschnäbler** **DK: Klyde**

Status 1991: **11,990 pairs**
Status 1996(a): **10,340 pairs**
Status 1996(b): **10,617 pairs**
Red List status: **IRR**

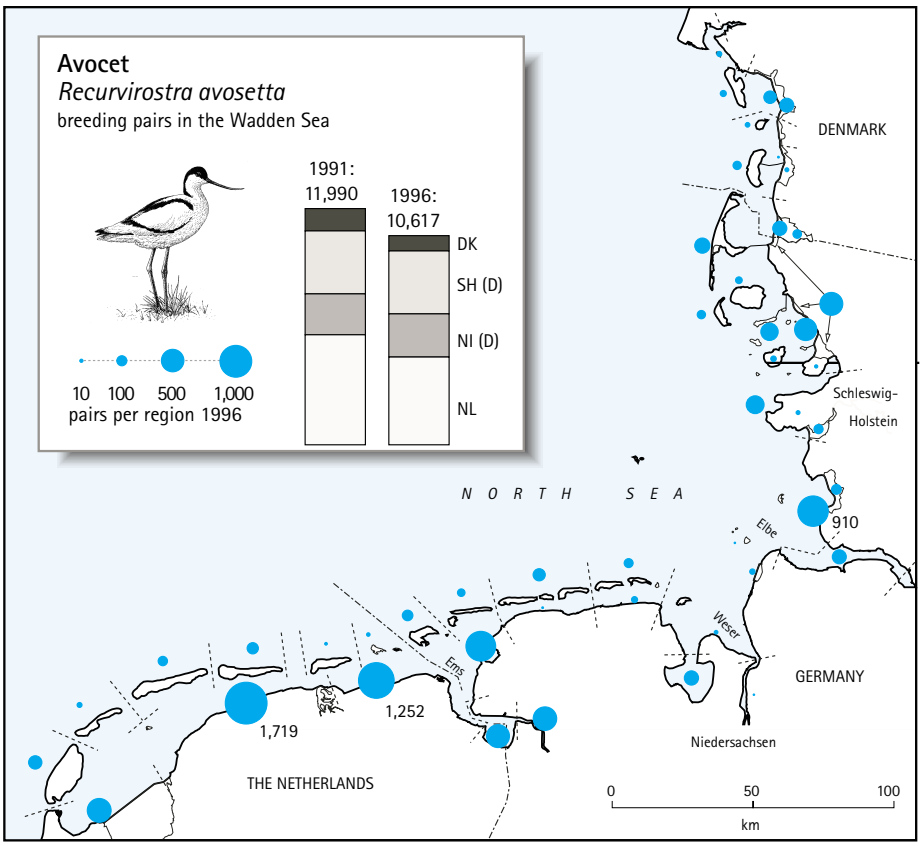


Figure 22: Breeding distribution of Avocet in the regions of the Wadden Sea, 1996.

Habitat

Avocets are mainly breeding in colonies in salt marshes with short vegetation. Smaller colonies are found on the islands in clay ponds, in short grazed polders on the Dutch islands, and on arable land throughout the Wadden Sea. The largest colonies are all connected with feeding areas in silty mudflats.

Distribution

In 1996, almost 20% of the breeding colonies of Avocet were found on the islands compared to 12% in 1991. The most important breeding sites are still mainland salt marshes and coastal wetlands.

Population development

The Wadden Sea population decreased by 16% in the period 1991-1996. In The Netherlands, there was a sharp decline of the population in the salt marsh of the Friesian coast. In Groningen, the numbers were stable. This decrease could not be compensated for by a slight increase in the island population.

The population in Niedersachsen was generally stable from 1991 to 1996, increasing slightly until 1993 followed by a slight decline since (see Südbeck & Hälterlein 1999). The islands have been colonized in greater numbers in recent decades and on the mainland coast, some very large colonies have shown significant reductions. Causes for these changes can be found in the decreasing im-

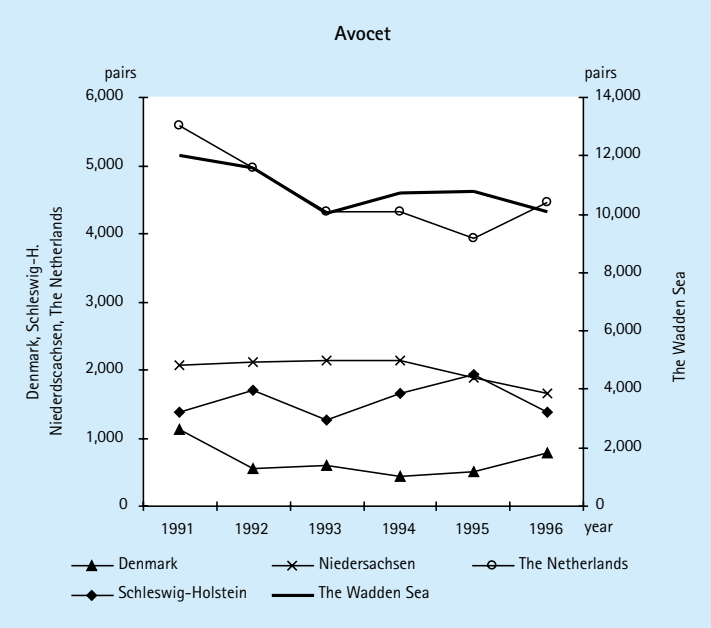


Figure 23: Number of pairs of Avocet in the four countries and in the entire Wadden Sea during 1991 to 1996.

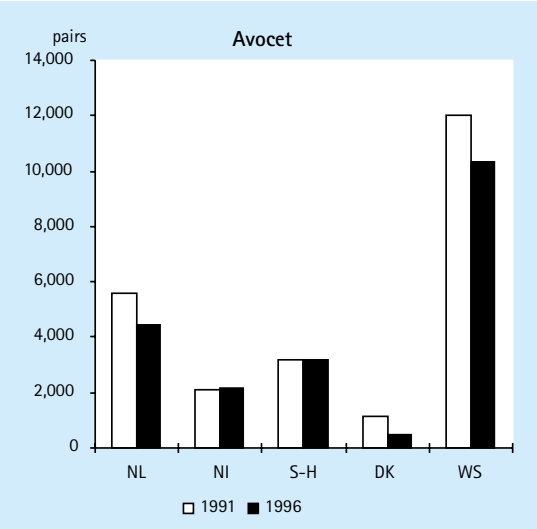


Figure 24: Number of pairs of Avocet in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

portance of newly created habitats, such as new polders or embankments. In Niedersachsen, the significance of the Leybucht, as the largest breeding site over years, has been reduced due to completion of construction works in large parts of the area and the end of grazing regimes on parts of the salt marshes.

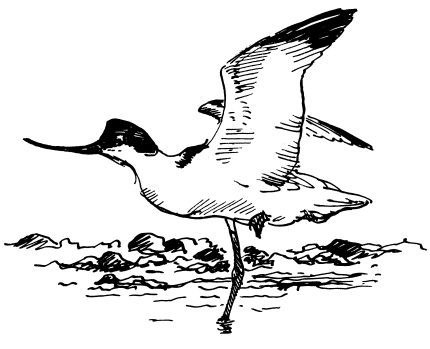
These patterns are generally found throughout the Wadden Sea except in Denmark, where both mainland and island colonies have declined. The pattern is similar for another colony breeding species with a preference for mainland habitats, the Black-headed Gull.

Embanked areas, such as Beltringharder Koog, Hauke-Haien-Koog, Katinger Watt in Schleswig-Holstein and Margrethe Kog in Denmark were colonized by large populations of Avocets a few years after construction. These sites have become less attractive as breeding areas following the natural vegetation succession (Hötker & Kölsch 1993, Rasmussen 1998). The total population in Schleswig-Holstein showed large fluctuations without any clear trend in the period 1991-1996.

Another reason for the decline is probably increasing predation on the mainland colony sites. Predation plays an important role limiting hatching success in some mainland areas in Denmark and Schleswig-Holstein, where fox populations have increased in the marsh near dikes and in newly embanked areas (Rasmussen & Thorup 1998, H. Bruns pers. comm.). On the Dutch mainland, predators were not relevant in that period. Bad weather conditions are often much more important in limiting the fledging success than predation.

Despite the fact that breeding habitats on the islands offer better protection from ground predators, the foraging habitats on the islands seem less attractive than the more silty mainland mudflats. On several Dutch islands, the breeding success approaches zero, but it is not clear if predation or poor food supply is the main cause (Koks & Hustings 1998). On the island of Vlieland rats *Rattus norwegicus* are an important predator of eggs (Duiven & Zuiderwind 1995). The small island populations in Denmark have decreased mainly as a result of predation by ground predators.

In the Dollard, many nests have been crushed by grazing cattle. In the same area, an inland population up to 200 pairs on arable land has been destroyed every year by farming activities.



Great Ringed Plover

Charadrius hiaticula

NL: Bontbekplevier D: Sandregenpfeifer DK: Stor Præstekrave

Status 1991: 1,367 pairs
Status 1996(a): 1,314 pairs
Status 1996(b): 1,367 pairs
Red List status: VU, IRR

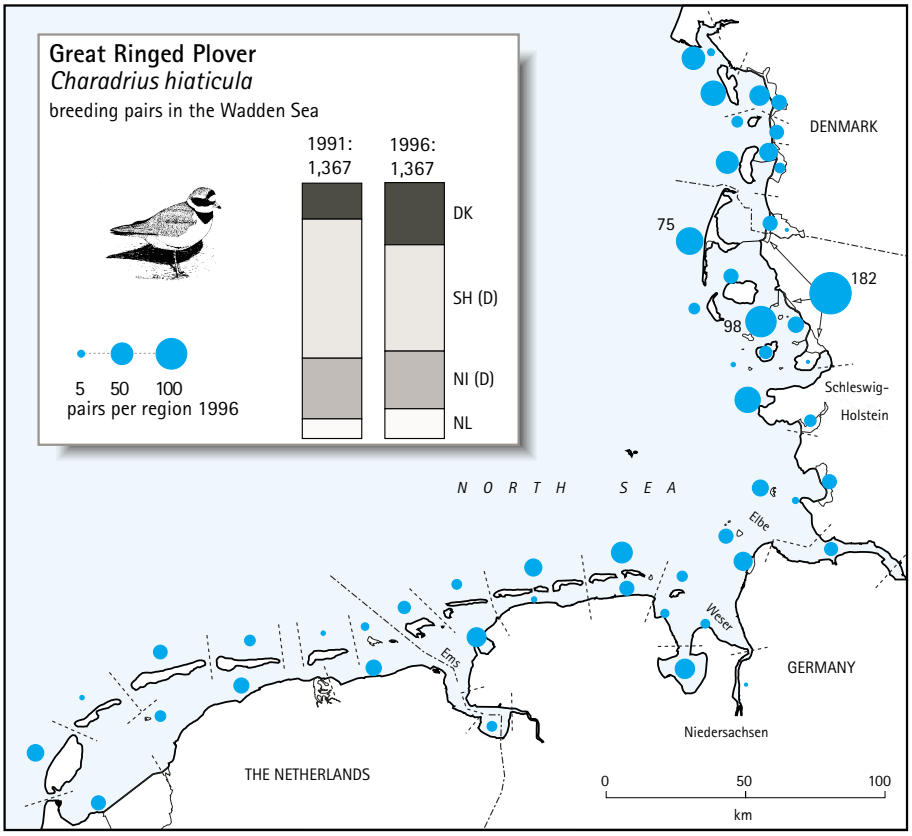


Figure 25: Breeding distribution of Great Ringed Plover in the regions of the Wadden Sea, 1996.

Habitat

The Great Ringed Plover inhabits a variety of open habitats with sparse vegetation. Beaches, sand flats and low dunes are the most commonly used. It is also common in newly embanked areas and on sparse vegetated industrial areas in harbors. At lower density it inhabits intensively grazed salt marshes and fields that are sown in spring with corn, beet, spring barley etc. (Hälterlein 1996). The species sometimes nests in small groups associated with tern colonies (L. M. Rasmussen unpubl.).

Distribution

Great Ringed Plover breeds regularly on all Wadden Sea islands, and on the mainland where the habitat is suitable. Niedersachsen was not colonized until the 1930s and 1940s (Behm-Berkelmann & Heckenroth 1991). Compared with 1991, where a smaller area was counted, the part of the population breeding in the western part was 37% in 1996 and 30% in 1991, if the larger area is considered. Former large populations settled in newly embanked areas, like Beltringharder Koog, were less significant in 1996.

Coverage

The Great Ringed Plover is considered an easy detectable species due to its obvious and conspicuous behavior (Melter et al. 1997). This is especially true for the census areas, which are counted more frequently. However, the breeding season is very long, often including two clutches and not all pairs will be territorial at the same time. There-

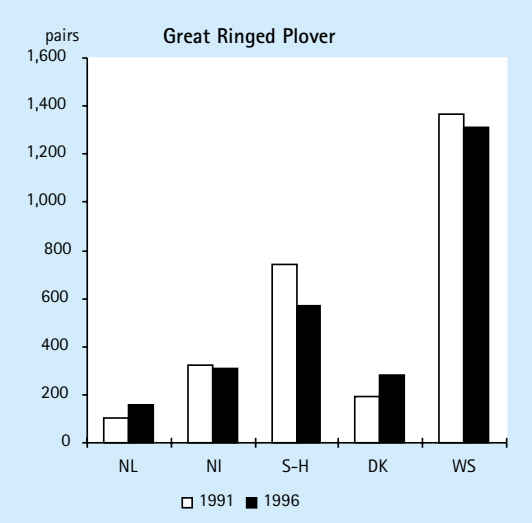


Figure 26: Number of pairs of Great Ringed Plover in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

fore, few restricted numbers of visits could possibly underestimate numbers in areas with high densities. In areas where the nesting habitat is distant from feeding habitats, which is often the case on the mainland, pairs might be overlooked because they spend most of the time in the feeding area when they are off duty (Cramp & Simmons 1983). Nests are often flooded or disturbed by humans. After a clutch is lost or after hatching, the birds might disappear out of the nesting habitat spending time in a feeding habitat. In neighborhood groups of two to five pairs, some pairs are likely to be overlooked. The numbers given are therefore likely to represent an underestimation.

In The Netherlands, the coverage was better in 1996 than in 1991. Also weather conditions were better, which could have led to a larger number being counted. In Niedersachsen, coverage in 1996 was similar to 1991. In some regularly counted areas, such as Griend, the increase was considered to be real. In Denmark, there was a better coverage in 1996 mainly due to more counts in the same areas, but some important coastal areas and large areas behind the dikes were not covered, and 42% of the total population were estimated numbers.

Population size and development

In total 1,367 pairs were counted in the Wadden Sea in 1996. Only the Dutch Wadden Sea population increased in the period 1991-1996 (see also Feddema & Kuipers 1996). On Texel, Griend, and especially on the Friesian mainland coast, more pairs were recorded. This is in contrast to the Dutch Delta area, where the numbers fell in the same period (Koks & Hustings 1998). In 1997, a study on Terschelling, Griend and Vlieland observed lower breeding success on the exposed coasts compared to the salt marshes. A combination of food availability and disturbance was the most likely cause of the low survival rates of young on the beach (Tulp 1998). On a single site in the northern Dutch Wadden Sea, the salt marsh breeding population increased (Feddema & Kuiper 1996).

The numbers in Niedersachsen fell slightly between 1991 and 1996. Since the beginning of the 1980s, the population here has fluctuated between 300 and 425 pairs. Prior to the 1970s, the total was less than 100 pairs (Behm-Berkelmann & Heckenroth 1991). It was thought that in 1991, bad weather contributed to a low count (Melter et al. 1997). In 1990 and 1992, there were 443 and 415 breeding pairs in Niedersachsen. Since then, numbers have continued to decrease.

In Schleswig-Holstein, the population declined by more than 20%, mainly due to reductions in the Meldorfer Speicherkoog, and on salt marshes in Nordfriesland.

In the areas that were counted in Denmark in 1991, more Great Ringed Plovers bred in 1996. But as mentioned above, the total change in numbers is not possible to determine. On Fanø, the population seemed to have increased.

In the census areas, 1991 was clearly a bad year in the western part of the Wadden Sea, holding significantly fewer pairs than the years before and after. This was not true for the northern part of the Wadden Sea (van Turnhout 1999). Population trends in the census areas were negative in the period 1992-1996 (see Figure 27).

On the mainland coasts of Schleswig-Holstein and Niedersachsen, grazing was reduced or ceased on large areas of the salt marshes. This seems to have had an effect on breeding numbers of Great Ringed Plover in both countries. In the Jadebusen in Niedersachsen, the population was reduced by more than 50% in the period 1991 to 1996. It is well known that the natural vegetation success associated with recently embanked areas is unfavorable for this species. This has caused reductions in the overall breeding numbers in the Meldorfer Speicherkoog and in the Beltringharder Koog in Schleswig-Holstein and on Niedersachsen sites such as the Leybucht and the Unterelbe. In the Jadebusen area, where more than 50% of the pairs have disappeared, intensive tourist activities (e.g. camping site as breeding sites) may be the cause of this dramatic decline.

In The Netherlands and Denmark, the numbers were higher in 1996 compared with 1996. At least

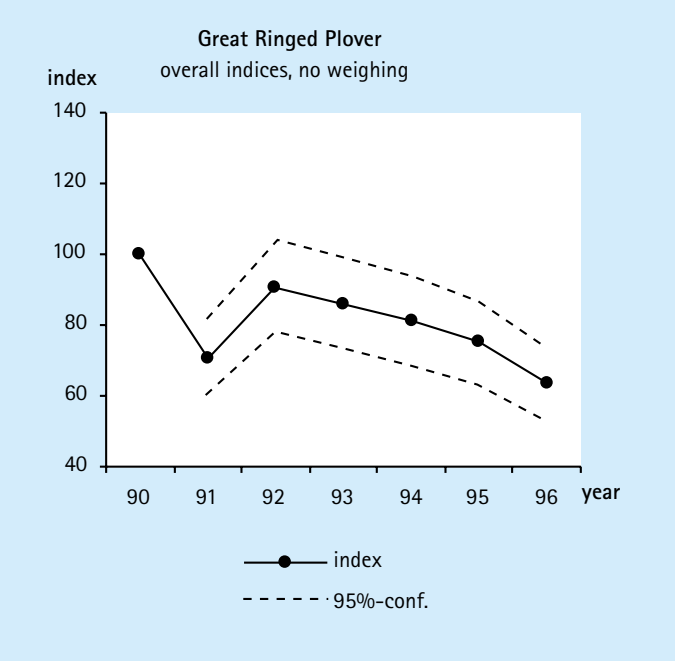
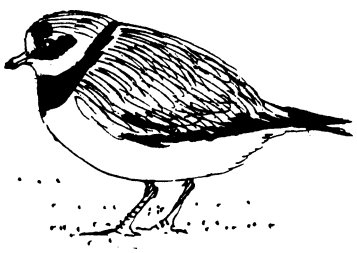


Figure 27: Index of Great Ringed Plover in the entire Wadden Sea, 1990 to 1996 (1990 =100).

in Denmark, this is partly a result of improved coverage in 1996. Due to unfavorable weather conditions in the 1991 breeding season, it is possible that the recorded numbers in that season were too low, and the total Wadden Sea population of Great Ringed Plover might have declined more in the period 1991-1996 than shown in the counts.

The Great Ringed Plover declined in previous decades in the Wadden Sea. In Schleswig-Holstein a 20% reduction was due to natural development of vegetation in the polders. Human disturbance seems to be the most serious factor in other parts of the Wadden Sea. In The Netherlands, Tulp (1998) found hatching success sufficient but young survival was low due to disturbance and de Boer (1998) found extremely low reproduction rates on the Dutch mainland due to predation and disturbance. Human disturbance prevented young from feeding in the most favorable areas along the water line on the exposed coasts. On the more sheltered coasts, pairs had better young survival. A substantial number of suitable potential breeding sites are no longer available because of current levels of human disturbance.



Kentish Plover

Charadrius alexandrinus

NL: Strandplevier D: Seeregenpfeifer DK: Hvidbrystet Præstekrave

Status 1991: 567 pairs
Status 1996: 521 pairs
Red List status: EN, IRR

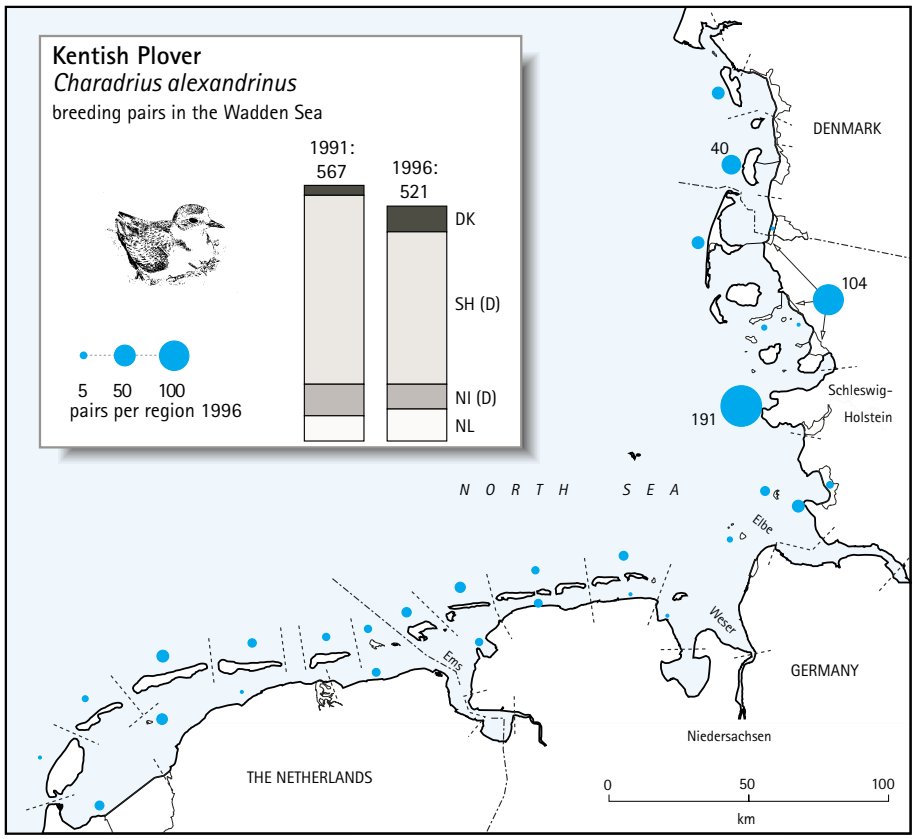


Figure 28: Breeding distribution of Kenitsh Plover in the regions of the Wadden Sea, 1996.

Habitat

The Kentish Plover prefers primary habitats as breeding sites such as barrier beaches, primary dunes or shell banks. These habitats are mainly confined to the islands. A decreasing proportion of the population breeds in embanked areas on the mainland coast.

Distribution

The Kentish Plover is widely distributed in the Wadden Sea where suitable breeding habitat is available. However, 57% of the population breed at two mainland sites in Schleswig-Holstein, in a natural habitat on the Eiderstedt peninsula, and in the embanked Beltringharder Koog. In The Netherlands, Niedersachsen and Denmark, the Wadden Sea islands are most important as breeding sites, but here are often conflicts with disturbance due to recreational activities. On the Afsluitdijk in The Netherlands, there were also a few pairs.

Coverage

In The Netherlands, there was incomplete coverage on Texel and Vlieland in the years 1992-1994. In Denmark on the most important sites on Rømø, the coverage was not complete in 1992 to 1994. Numbers from these years therefore underestimate the total population.

Kentish Plovers were subject to increased attention in Niedersachsen because of the declines in numbers. The species may have been overlooked before 1993 because of the low breeding density in this part of the Wadden Sea (Flore 1998).

Population development

In The Netherlands, the population might not have increased in the period 1991 to 1996, since 1991 bad weather conditions has lead to poor coverage in 1991. On Griend, a population of 13 pairs has settled since 1991. On Texel, the breeding population was estimated to be around 150 pairs in the beginning of the 20th century (Meininger & Arts 1997). In 1996, only one pair was found breeding. Habitat loss due to coastal protection measures and disturbance of the beaches by tourists are here thought to be the cause of the decline .

In Niedersachsen, the serious population decline has accelerated in recent years (Flore 1998, Potel et al. 1998). With the exception of short phases of population recovery due to suitable habitat creation by embankments or dike construction works, a steady population decrease has occurred since 1950. At that time, Flore (1998) estimated the population size at about 1,000 pairs, but no more than 600 pairs were actually counted in the mid 1950s. In 1996, only 55 pairs were found, an absolute minimum of Kentish Plover numbers in the Wadden Sea of Niedersachsen. In the following years, the serious decline was accelerated once again.

Compared to most other colony breeders (except the Avocet) there are often large annual fluctuations in the population of Kentish Plover at the different sites. In 1996, there was a strong decrease in the population in Schleswig-Holstein. The total Wadden Sea population has fluctuated in parallel with the very large population in Beltringharder Koog in Schleswig-Holstein. Here, the 1991 population of 98 pairs increased to 180 pairs (256 pairs in a special study) in 1994 and dropped again to 79 pairs in 1996. This negative trend continued during 1997 to 1999. The population of Kentish Plover has not increased correspondingly in other parts of Schleswig-Holstein, with the possible exception of the salt marsh areas in southern Dithmarschen.

From 1991 to 1996, the population on Rømø in Denmark increased from 10 to 40 pairs and to 69 pairs in 1999. More than half of this increase occurred in a brackish meadow with very little disturbance and suitable breeding habitat. In this period, the protection of the mixed breeding colonies of Little Tern and Kentish Plover on the beach has improved. Since the foraging areas on the beach are heavily disturbed by human activities, there is some doubt whether the breeding success here is sufficiently high to sustain the local population. The steady growth on Rømø could be linked with the declining population in Schleswig-Holstein.

It seems that a part of the population in the western part of the Wadden Sea is shifting from year to year between breeding sites in The Netherlands and Niedersachsen, since population trends are often inversely related, but clear evidence from recoveries of ringed birds are lacking. The reasons for the large fluctuations in the western part of the Wadden Sea are not known. Low breeding success could not explain the population decrease, but disturbance by tourism is probably the most important single factor affecting availability of suitable breeding habitats (Flore 1997, 1998).

Recent studies in the Dutch Wadden Sea showed the reproduction rates of both Kentish and Ringed Plover were too low to compensate for mortality (Tulp 1998, de Boer 1998). Hatching success was within the range of other studies. The bottleneck in this study was the young survival until fledging, which was considered to be low due to disturbance. Visitors on the beach pre-

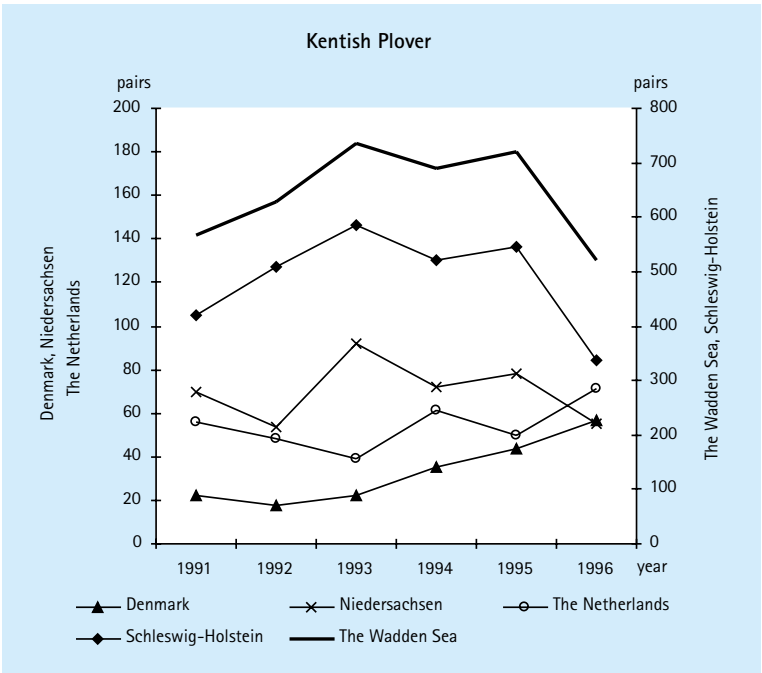
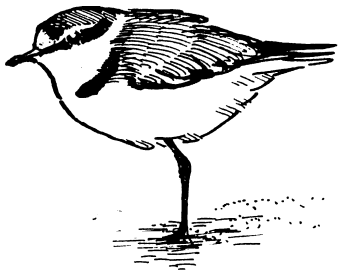


Figure 29: Number of pairs of Kentisch Plover in the four countries and in the entire Wadden Sea during 1991 to 1996.

vented the young from feeding on the best places. A study in the largest natural breeding site in the Wadden Sea at St. Peter in Schleswig-Holstein proved disturbance from tourists to be the most important factor in distribution of the population within the suitable habitat, and responsible for a low reproduction rate as a result of increasing egg predation and low young survival (Schulz 1991, 1998).

The Kentish Plover is adapted to a very dynamic environment and responds quickly to the alterations in availability of suitable breeding habitats that follow changes in the areas like primary dune development, and embanking of areas. Almost half the population bred in such man-made areas in the past 25 years. At the same time, tourism and human activities increased significantly on the beaches (Potel et al. 1998). It is important that naturally developing breeding habitats are available for colonization by birds, which desert other sites because natural succession has made them less attractive for breeding. It is well known that predation increases with natural developing succession in primary dune areas (Schulz 1998). To allow for a positive population development of Kentish Plover in the Wadden Sea, well-protected areas on the beaches are necessary (Meininger & Arts 1997). The protection measures must be flexible to meet the dynamic environment and frequent changes of colony sites (Schulz 1998, Potel et al. 1998).



Northern Lapwing

Vanellus vanellus

NL: Kievit **D: Kiebitz** **DK: Vibe**

Status 1991: **8,753 pairs**
Status 1996(a): **9,832 pairs**
Status 1996(b): **11,336 pairs**
Red List status: **None**

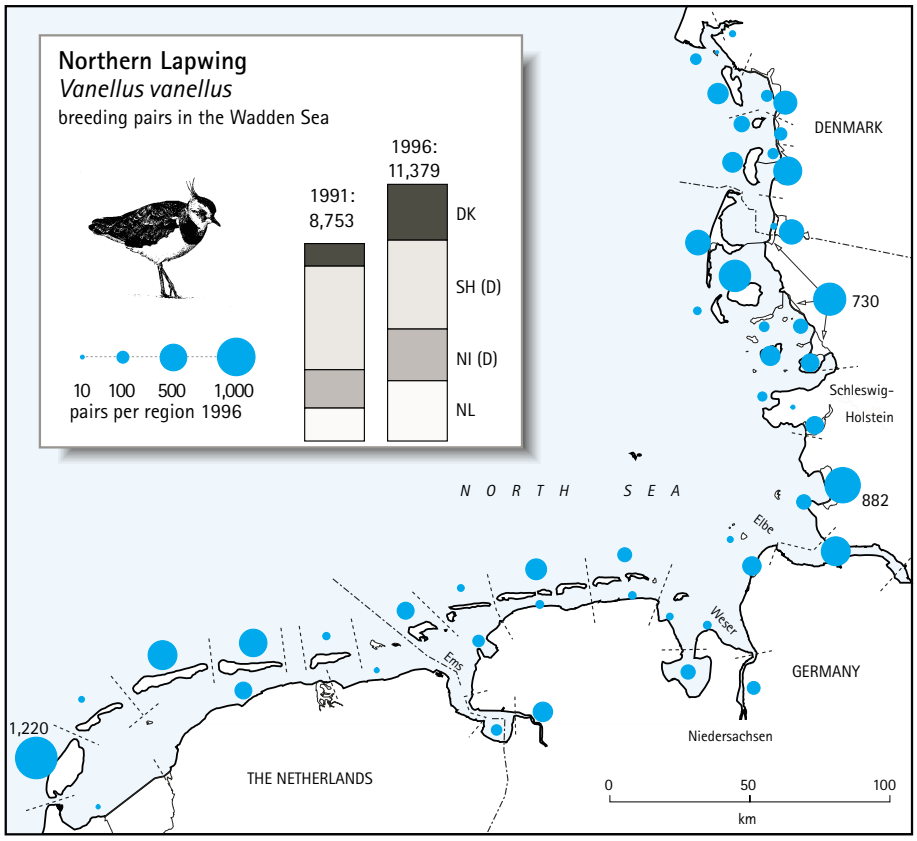


Figure 30: Breeding distribution of Northern Lapwing in the regions of the Wadden Sea, 1996.

Habitat

The Northern Lapwing breeds in a variety of open habitats characterized by short vegetation. High densities are found on grassland on the islands. Large, but usually less dense populations, are found on the mainland in summer polders and wetlands behind the dikes. In salt marshes, there are increasingly important populations. In the salt marsh, the breeding phaenology might be two to four weeks later than in polders and on the dryer farmland. The breeding success is particularly low on farmland (Hälterlein 1996, Nehls 1996, 1998), and breeding birds move to a large extent from farmland to salt marsh habitats during spring to produce replacement clutches.

Distribution

The Northern Lapwing is widely distributed in the whole Wadden Sea. The largest concentrations are found in the polders on Texel. Other substantial numbers are found in mainland wetlands in Schleswig-Holstein and Denmark. Larger populations are still found on grassland in mainland polders in Niedersachsen and in The Netherlands (Melter et al. 1998, Koks & Hustings 1998).

Coverage

In The Netherlands, the important islands Texel, Terschelling and Ameland were incompletely covered in 1991. In 1996, the islands were almost completely covered, except on Texel and Terschelling where a large part of the agricultural area was not counted. Population estimates from good counts in 1995 were used for substitution. In 1996, there were no complete data from Schiermonnikoog.

A very important area in the Unterelbe in the

Niedersachsen estuary was not completely counted in 1996. For this area, breeding numbers were estimated. In Schleswig Holstein, the numbers on the islands Pellworm, Föhr and Nordstrand were estimated from counts on study plots covering about 20% of the whole area.

The Danish mainland polders were not covered in 1991. In 1996, 1,477 pairs were found in the polders. The most important areas were counted only once in 1996. Numbers in areas that were not covered were calculated using densities in similar areas.

Population size and development

The change in numbers in the Dutch Wadden Sea cannot be judged from the counts in 1991 and 1996, since the 1991 count was incomplete. In the Dutch census areas, numbers decreased during the period 1991-1996. This is in contrast to the rest of The Netherlands, where populations were quite stable in that period (Koks & Hustings 1998).

In the Niedersachsen Wadden Sea, the population generally increased. Regional differences could be detected. On the islands, the population doubled, but on the mainland, numbers decreased. On the mainland outside the co-operation area, the numbers decreased dramatically (Melter et al. 1998). Additionally, areas around the rivers Elbe and Weser, which were not covered in 1991, held a total population of 383 pairs in 1996.

In the Schleswig-Holstein Wadden Sea, populations both in wetlands on the mainland and the islands decreased in the period 1991-1996. This is probably partly due to the natural vegetation development in the large wetlands in the Beltringharder Koog and the Meldorfer Bucht, as well as a result of the extensification of grazing on the salt marshes. The largest reductions were found in the wetlands on the mainland. Intensified agriculture and increased predation are the main reasons for this development (Nehls 1998). In the salt marsh, the population was stable.

In the Danish Wadden Sea, the island population was stable during the period 1991-1996. The mainland population decreased by 20%. The highest concentrations were found in brackish salt marshes on the islands. The Danish mainland population declined significantly, at least in the Tøndermarsken. In 1986, there were more than 1,700 pairs breeding in the polders in the Tøndermarsken, which were reduced to only 421 pairs in 1996 (Rasmussen & Gram). In another important polder at Ballummarsken, the population seems to have fluctuated around the same level in the 15 years until 1990 (Falk et al. 1991), but has declined since then. The change of spring crops to winter crops is important, because the vegetation growth is too rapid in spring for breeding Northern Lapwings.

The indices from the census areas show a similar population development on the mainland as in the total population. The island populations did not show the same negative trend as the mainland populations in 1991-1996.

One of the reasons why populations of Northern Lapwings are decreasing on inland sites is loss of clutches due to intensive farming practice. Increasing vegetation growth and cover follows drainage. Disturbance and destruction of nests are caused by increasing densities of grazing livestock and earlier grazing time (Beintema & Müskens, 1987, Nielsen 1996, Rasmussen 1999). Nehls (1996) found less replacement clutches in intensively managed grassland, where mortality of young was also high. This leads to an increasing effect of predation. A major shift towards winter wheat and rape, instead of spring sown cultures, have had a negative effect on the breeding success and numbers in the cultivated farmland (Grell 1998).

The increasing importance of the Wadden Sea population is due to the declines experienced amongst inland breeding populations. The overall trend for the population of Northern Lapwing in the census areas was downwards in the period 1990-1996. Conservation measures should aim at restoring wet, extensively grazed meadows in all parts of the Wadden Sea, especially in areas behind the dike.

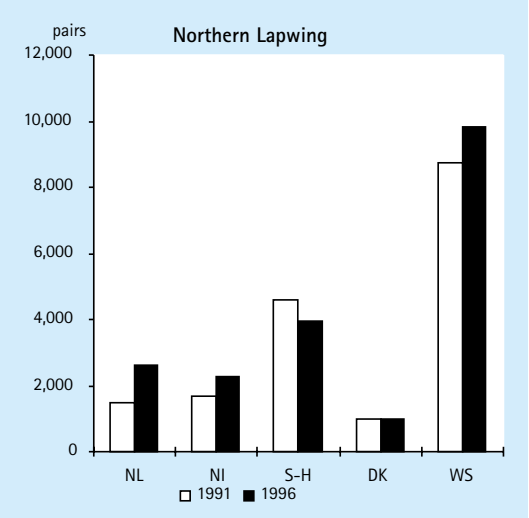


Figure 31: Number of pairs of Northern Lapwing in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

Dunlin

Calidris alpina schinzii

NL: Bonte Strandloper **D: Alpenstrandläufer** **DK: Almindelig Ryle**

Status 1991: **50 pairs**
Status 1996: **39 pairs**
Red List status: **CR**

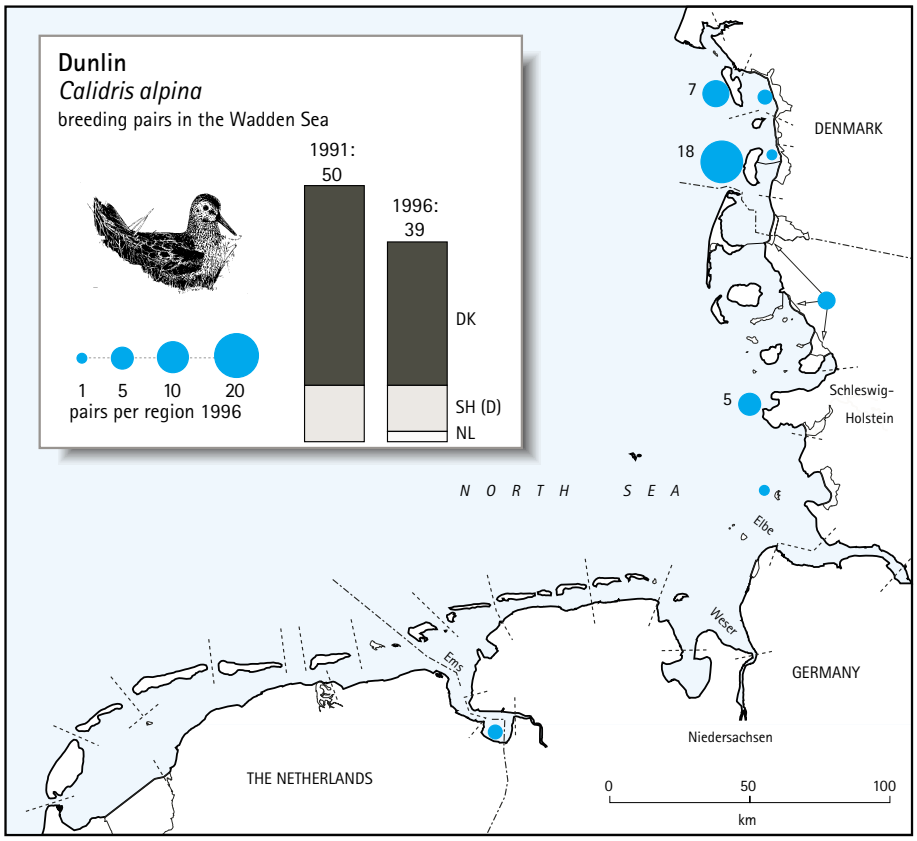


Figure 32: Breeding distribution of Dunlin in the regions of the Wadden Sea, 1996.

Habitat

The Dunlin breeding in the Wadden Sea is the subspecies *C. a. schinzii*. The birds breeding in the Wadden Sea and the Baltic Sea are sufficiently isolated and with a different migration pattern that they might form different subspecies. In the remaining breeding sites, coastal habitats in upper salt marshes on sandy soils are used. The preferred terrain is a miniature mosaic of diverse habitats and vegetation, with patches of low grazed and tufted grass, interspersed with pools of standing or flowing water. The presence of surface water and short grass is essential. Nests are placed in a tuft of grass. The areas are unfertilized, with a moderately high grazing pressure. In Schleswig-Holstein, the most important site was in the salt marsh at St. Peter on the Eiderstedt Peninsula.

In the Wadden Sea, relatively wet habitats with little drainage, no use of fertilizers and a long history of stable, late grazing or hay harvesting has become very rare.

Coverage

Dunlin is a difficult species to monitor. Single breeding pairs can easily be overlooked because of their secretive behavior. The pairs are most obvious when associated with young at the end of May and in the first half of June. In the trilateral guidelines, counts on the meadows are not recommended in this period. Most pairs are found when counting Common Redshanks from the end of April to 10 May. In Denmark, the coverage was good in 1996. In 1997 and 1998, more pairs were found on Rømø but fewer on Fanø. Because it is a

difficult species to monitor, the populations might be underestimated in areas that were only counted once or twice. In The Netherlands, single pairs might have been overlooked in 1991.

Distribution

The Dunlin bred on many Wadden Sea islands before 1900. Breeding birds were observed on Texel, Terschelling, Borkum, Langeoog, Wangerooge, Süderoog, Pellworm, Nordstrand and in the Eider estuary (Boere & Smit 1981). On the Dutch mainland, Dunlins also bred regularly (Cramp & Simmons 1983). Now, Dunlins only breed regularly in the northern part of Wadden Sea. In 1996, Dunlins were found breeding on nine sites in the Wadden Sea, including two pairs found breeding in the Dutch Dollard area.

Population size and development

The Southern Dunlin subspecies *C. a. schinzii* comprises breeding populations around the Baltic Sea, Denmark, the Wadden Sea, Britainny and Ireland and Iceland (Clark & Gromadzka 1997). The Wadden Sea Southern Dunlin is part of the declining Baltic population. The Baltic population has a distinct geographical distribution and breeding phenology (Jönsson 1988).

In the 19th century, the Dunlin bred regularly inland as well as along the coast of The Netherlands. Since 1940, it has nested only irregularly never exceeding five pairs (Cramp & Simmons 1983). Since a possible breeding attempt at the Lauwersmeer in 1986, the first probable breeding attempt in The Netherlands was at the Dollard and at the Lauwersmeer in 1995, where one pair was seen in both places. At the Dollard, two pairs were found again in 1996 (Koks & Hustings 1998), but none was seen in 1997.

There was indication of island breeding in Niedersachsen on Spiekeroog (probably two pairs) in 1982, whereas mainland breeding was last observed in the Unterelbe estuary in 1985 (Zang 1995). No breeding attempts were reported in 1996 or 1997.

In the 1960s, the population at St. Peter in Schleswig-Holstein was, however, much higher than today, numbering 60 to 80 pairs, but numbers declined in the early 1970s to about 20 pairs (Hälterlein 1996). In the last 20 years, the population in Schleswig-Holstein has been stable around ten pairs. During the period 1991-1996, there were only two sites with more than one pair: At St. Peter Ording, where the population has been stable at six pairs in 1991 and five pairs in 1996 and at Beltringharder Koog, where three pairs bred in 1996. In 1997, only three breeding pairs were recorded: in St. Peter Vorland two pairs and one on Trischen.

The Danish population has declined dramatically since 1900. At that time the breeding population might have been as high as 50,000 to 100,000 breeding pairs (Thorup 1998). In 1970, the population was estimated at 600 pairs concentrated at three sites, all in the western part of Denmark, and several smaller sites (Dybbro & Jørgensen, 1971). By 1980, the population had declined to 460-520 pairs (Hansen 1985). Since then, a large number of sites holding up to ten pairs has ceased to be regular breeding sites and all regular inland populations have disappeared. During the 1980s, the total population showed a moderate increase at the three most important Danish breeding sites, Tipperne, Vejlerne and Harboøre Tange, all in the Western part of Denmark (Grell 1998, Thorup 1997). Here, management has been especially directed toward wet meadow breeding communities. On Tipperne, the population increased from only 10-25 pairs around 1980 to 125-160 pairs in the beginning of the 1990s. Outside the three Danish main sites, the largest remaining populations are in the Wadden Sea. On Rømø, there where 18 pairs in 1996 breeding on two sites (21 pairs in 1998). On Fanø, a small population of seven pairs persisted in 1996 (four pairs in 1999). On Mandø, up to eight pairs were found breeding in the 1970s, but in the 1990s one or two pairs bred sporadically (Rattenborg 1987). Mainland breeding sites were already few and irregular by 1970. In 1996, three pairs bred on the mainland, but there are no longer regular breeding sites here.

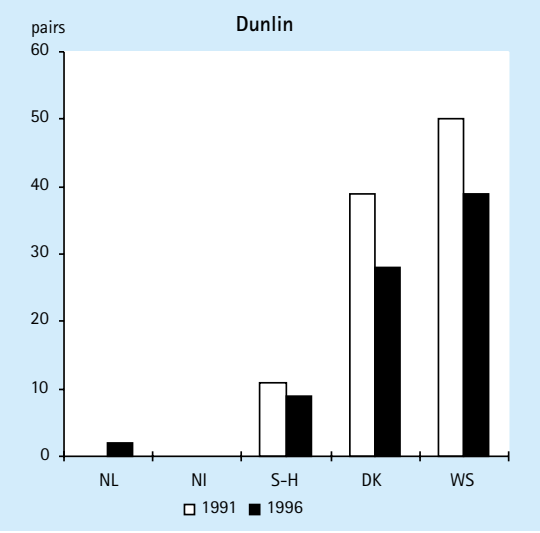


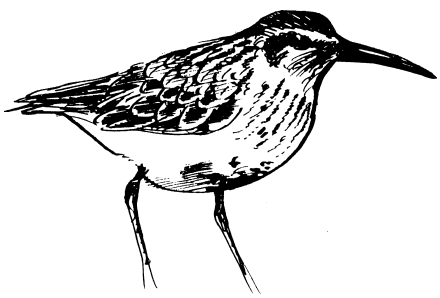
Figure 33: Number of pairs of Dunlin in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

On the Danish Friesian islands, three sites held breeding Dunlins in 1996: Grønningen on the northernmost part of Fanø and Rømø Nørreland and Rømø Sønderland respectively north and south on Rømø. Since these three sites support the last important breeding concentrations in the entire Wadden Sea, they are described in more detail here. The numbers on these sites decreased from 39 pairs in 1991 to 28 pairs in 1996. The decrease might have been larger than indicated by the numbers, since 1991 was a very bad breeding season for the Dunlin due to cold and dry weather. On Fanø, the population varied between ten pairs in 1991 and 19 pairs in 1992, to only five to seven pairs in 1995-1998. Grønningen on northern Fanø, a 300 ha salt and brackish meadow holds a small but declining population of Dunlin. Through the area, a channel drains the larger parts of the brackish meadows. In practice only ten ha out of the total area is suitable breeding habitat for Dunlin. On Rømø Nørreland, the effects of drainage has gradually become more pronounced during the period 1991-1996. The population declined from 20 pairs in 1991 to nine to ten pairs in 1996-1998, reflecting low breeding success. At none of the three sites, management is aimed at protecting breeding birds. On all three sites early grazing seems to be a problem. On Rømø Sønderland, the population increased from six pairs in 1991 to eleven pairs in 1998. The total population on Rømø Sønderland is estimated to be 20 pairs in 1998. Here, stocking rates seem to have increased in the period 1991-1996 and even more in 1998-1999 leading to a decrease in numbers of breeding pairs.

The management on Tipperne (Thorup 1998) shows that it is not too late to improve breeding conditions for the populations on Rømø and Fanø. A management plan specifically directed toward protecting Dunlin, should include stopping the effects of surface drainage through several ditches. Also the start of grazing in core areas should be delayed until 15 June with one to two cattle per two ha. The grass should also be kept low by maintaining high water tables and by hay cutting and grazing (Thorup 1998).

Predation is an important cause of low breeding success of the Dunlin (Jönsson 1988, Thorup 1998b), but this is very difficult to quantify. Predation by Common Gull was the most often cause of clutch losses on Tipperne. In areas with early grazing, loss of nests due to trampling could be the most important cause of loss of clutch. On Tipperne, the population did not increase until grazing over large parts of the area was delayed until late in the season, and vegetation was kept low through hay harvest.

The red list status of the Dunlin in the Wadden Sea is critical, which means that there is a very real danger of the species becoming extinct in the near future. The Dunlin is already extinct in the western part of the Wadden Sea, and it is very close to extinction in Schleswig-Holstein, where only three pairs bred in 1997. The decline in the Baltic populations seems to be a result of either agricultural intensification or the decrease or cessation of coastal grazing (Jönsson 1988). In Denmark, the Dunlin has the largest populations in the western part of the country, where special efforts at habitat management has improved breeding conditions and benefited the species (Grell 1998).



Ruff

Philomachus pugnax

NL: Kemphaan **D: Kampfläufer** **DK: Brushane**

Status 1991: **240 'pairs'**
Status 1996: **77 'pairs'**
Status 1996a: **82 'pairs'**
Red List status: **CR**

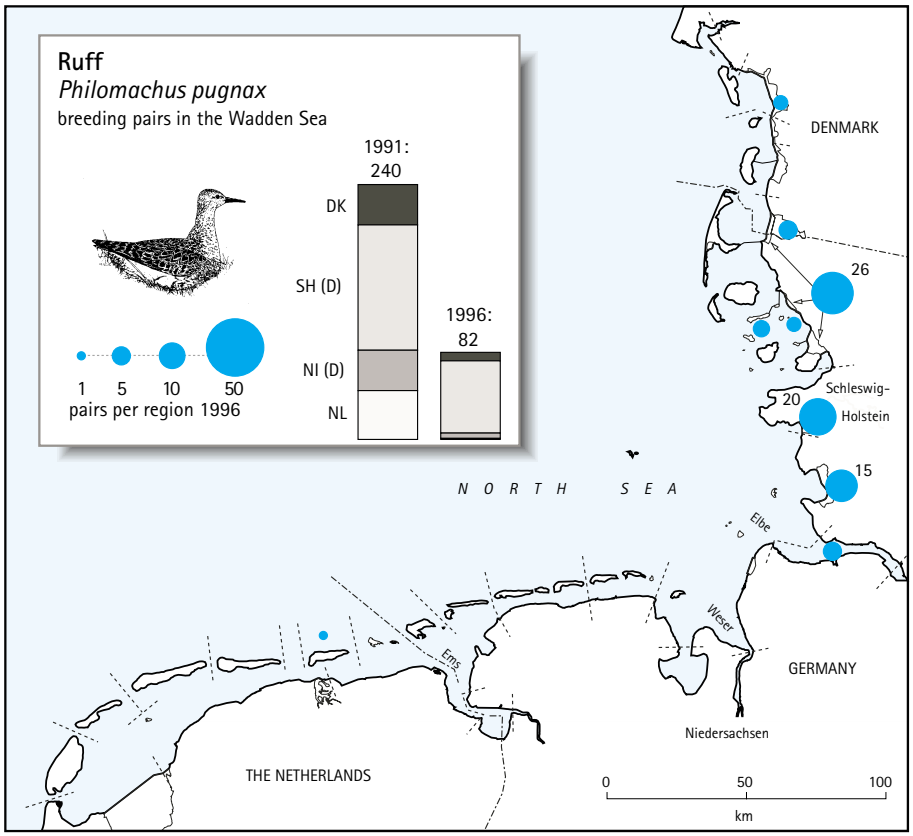


Figure 34: Breeding distribution of Ruff in the regions of the Wadden Sea, 1996.

Habitat

The Ruff breeds in fresh or slightly brackish habitats. In the Wadden Sea, the preferred habitats are swampy or wet meadows with shallow pools and ditches and areas with short grass vegetation.

Distribution

The Ruff is breeding in a few places in the northern Wadden Sea. The largest remaining populations are found in embanked areas in Schleswig-Holstein, where 83% of the population were found in 1996.

Coverage

It is not possible to monitor breeding Ruffs without intensive counting schemes. Large numbers of Ruffs migrate through the Wadden Sea in April and May, when most meadow birds are monitored. The number of lekking males does not directly link to the number of breeding females. Because Ruffs do not form pair bonds, the number of 'pairs' actually refers to the number of breeding females. Counts of females in a short period after the migrants have left are the method used as a basis for data in this report.

In The Netherlands, coverage was almost complete although in 1995-96 some breeding birds have probably been overlooked (Koks & Hustings 1998).

In Denmark, coverage was incomplete on Rømø, where it probably bred, as it was found breeding in 1997 and 1998.

The main breeding site of Ruff in Niedersachsen (the Unterelbe estuary) was not covered completely in 1996. Nevertheless, the very low population size reflects a serious decline during the last years.

Population size and development

Only one female was found in The Netherlands on Schiermonnikoog in 1996. On Texel, six pairs were recorded in 1995, and there might have been breeding birds on Ameland, where four were found in 1994. Since 1994, breeding has not been proved on Ameland. Overall, the Dutch Wadden Sea population might number 30 to 35 females (Koks & Hustings 1998). In Lauwersmeer, a population of 350-400 pairs in the early 1980s dropped to 20 pairs in 1995. The total Dutch population was estimated 300 to 400 pairs in 1994 and is decreasing rapidly.

In Niedersachsen, only five females were recorded breeding in the traditional breeding areas in the marshes and polders at the Unterelbe estuary (Hullen, Nordkehdingen). In 1997, two were found breeding in the Leybucht. A dramatic population decline at this last major breeding site in Niedersachsen started in the 1960s, when a population estimate for only a small fraction of the region totaled about 500 breeding places. This decline has accelerated since the end of the 1970s when large embankments in the estuary were finished. Since then, only a few breeding females have been observed (Melter 1995). Drainage, intensification of agriculture and changes to arable land are the most important factors responsible for this decline.

In Schleswig-Holstein, the most important breeding sites were at the Eider near Tönning, where 19 pairs were found. Other important areas were the Rickelsbüller Koog and the Meldorfer Speicherköge with 17 and 15 pairs respectively. Three pairs were found on salt marshes on the mainland, and four pairs on the Hallig Langeness were the only ones on the islands. Patterns in numbers in Schleswig-Holstein have been dominated by changes in the embanked areas since 1980. These areas all experienced an initial peak after a few years and then populations declined as the vegetation developed. In Hauke-Haien-Koog, up to 60 pairs bred in the late 1970s, but the population here became extinct after 1995. In the Rickelsbüller Koog, maintenance of high water levels had a positive effect. Breeding numbers rose after low numbers during the period 1989 to 1993.

In Denmark, eigth females were found in all at two mainland sites. Since the most suitable sites on Rømø were not well covered, the total population might have been somewhat higher than 10-12 breeding females in 1996. In the Tøndermarsken, three populations of 20, 30 and 35 females in 1986 were reduced to five pairs in 1996 and all had disappeared in 1997. Habitat degradation is thought to be the main reason for this development. Increasing grazing intensity in terms of earlier grazing time and increasing stock densities are the most important contributory cause, but improved surface drainage has also caused declines in numbers of all meadow waders in the Tøndermarsken (Gram et al. 1990, Rasmussen & Gram 1997, Rasmussen 1999). On Mandø, a population of 12 pairs disappeared in the period 1991-1996.

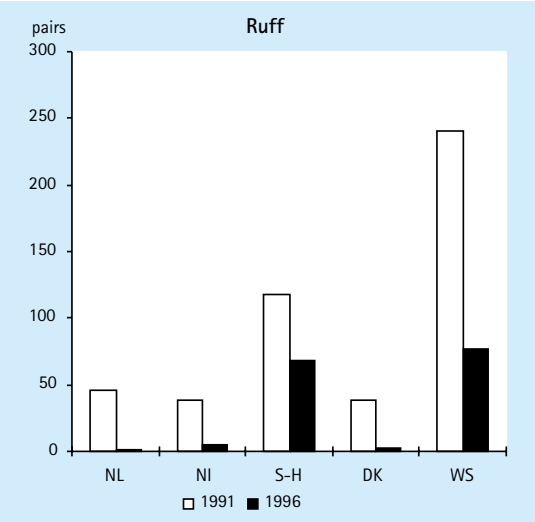


Figure 35: Number of pairs of Ruff in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

The population of Ruff has declined dramatically not only in the Wadden Sea in recent decades, but also in most other inland areas in the three countries. The decline has almost certainly accelerated in the Wadden Sea during the period 1991-1996. In most areas, this development has been linked to degradation of the habitat, especially through drainage (Cramp & Simmons 1983). The recent changes in population suggest that the species will probably disappear as a breeding bird from the Wadden Sea within the near future unless effective management is initiated now.

On Tipperne, in western Denmark, the population increased from 25-50 females in 1975 to 300 females around 1990, after a successful habitat restoration (Thorup 1998b). Similarly, the Ruff managed to colonize the newly embanked areas in the Margrethe Kog and the Beltringharder Koog

in the 1980s. Recently, nature conservation management, aimed specifically at protecting breeding Ruffs in The Netherlands were successful in reversing the negative trends (Geld & Leguijt 1996).

Ruffs that breed in temperate areas have also been found to breed in arctic areas (Cramp & Simmons 1983). This suggests that effective wetland management retains individuals, which are used to migrate very long distances during their annual cycle. Effective wetland management might therefore be able to attract breeding Ruffs to areas where they disappeared completely.

The threats against the Ruff are quite similar to those of the Dunlin. Habitat demands are somewhat similar, and the two species often breed on the same sites. Very few sites nowadays fulfil the habitat demands of the species. The grazing management is important for the hatching success, and management by cutting hay is a useful tool to improve breeding habitats (Thorup 1998b). It is also important that there are many areas with open water slowly drying up during the breeding season, especially in May and June (Geld & Leguijt 1996). Habitat management in larger areas directed towards Dunlin will therefore also potentially benefit the Ruff.

Common Snipe

Gallinago gallinago

NL: Watersnip **D: Bekassine** **DK: Dobbeltbekkasin**

Status 1991: **500 pairs**
Status 1996(a): **536 pairs**
Status 1996(b): **645 pairs**
Red List status: **None**

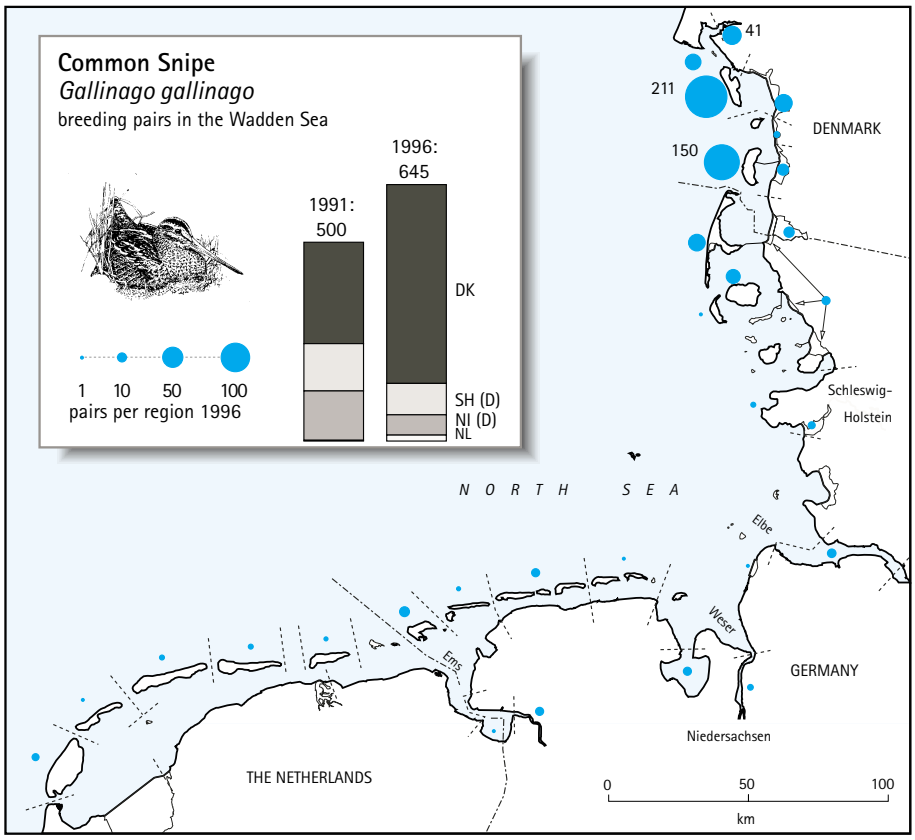


Figure 36: Breeding distribution of Common Snipe in the regions of the Wadden Sea, 1996.

Habitat

The breeding habitat is characterized by permanent grassland with a high water level and a low farming intensity. A large part of the population is found in natural wetlands. The Common Snipe is only found in freshwater habitats. Pairs are also recorded in fresh water habitats on the mainland forelands and especially in mainland wetlands. The grass vegetation is often rough and there may even be bushes in the breeding area.

Coverage

The Common Snipe is difficult to count. Most of the breeding populations are found in areas where few other waders are found. The activity is high early and late in the day, so special attention is needed to produce good counts of this species. It is likely that larger populations are underestimated.

The 1991 count did not cover the population well, and the 1991 population was certainly larger than the survey results indicated. In The Netherlands, the species was hardly covered. This is also the case for the 1996 survey. The comparatively large Danish population was only patchily covered, with the two most important sites Fanø and Rømø not well covered. Here, 255 pairs were counted in 1991, only 92 pairs were recorded in 1996. The 1996 population was roughly estimated to be 320 pairs. The population is probably lower in dry years such as 1996.

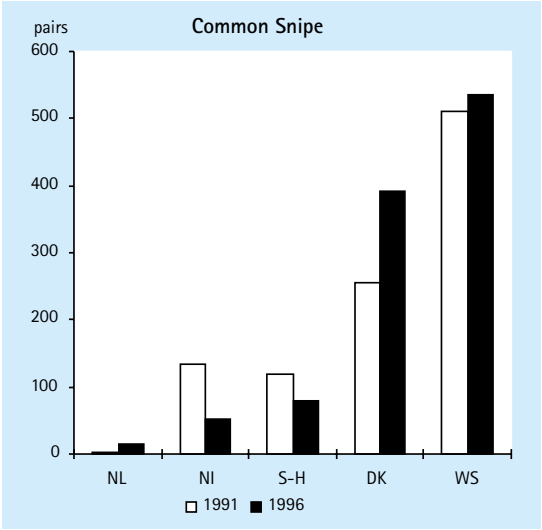


Figure 37: Number of pairs of Common Snipe in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

Distribution

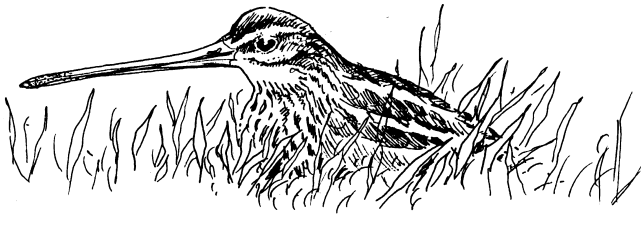
The Common Snipe is distributed throughout all parts of the Wadden Sea. The largest populations breed in the northern parts of the Wadden Sea. The distribution probably did not change in the period 1991-1996, but a few more pairs were found in the western Wadden Sea. The largest populations are present on Fanø and Rømø in the northernmost Wadden Sea. In a Danish context, the populations on Fanø and Rømø support the largest concentrations in the country (Grell 1998). There are smaller numbers in wet meadows along the Danish rivers, in brackish marshes around the large rivers. In the western Wadden Sea, breeding Common Snipes can be found behind the dike in areas outside this survey.

Population size and development

In The Netherlands, the Common Snipe used to be more common on the islands. On Texel, the population has fluctuated between 20 and 30 pairs until the mid 1980s. Then the population dropped to the present level (six pairs in 1996). It also used to be a common bird in the farmland of Texel, but disappeared when the polders where drained in the 1930s (Dijksen 1996). This development is characteristic for most of the Dutch Wadden Sea islands.

Despite incomplete coverage in suitable habitat in 1991, we have little doubt that the population of Common Snipe declined in the period 1991-1996. Even including the rather large element of estimated numbers from Denmark, the Wadden Sea population decreased considerably. In a 2,000 ha mainland polder in Tøndermarsken, Denmark, the population of 100 pairs in 1980 decreased to only six pairs in 1996 and the Common Snipe had disappeared complete as a breeding bird in 1998. In Denmark, the total population has fallen by more than 50% in the past 15 years (Grell 1998), and the largest reduction occurred in the south-western part of the country. In Niedersachsen, a very large inland survey of 126,000 ha showed a reduction of the population of more than 50% from the period 1985-1990 to the period 1991-1997 (Melter et al. 1998).

The reason for the steady decline of the breeding population of Common Snipe is thought to be intensification of farming practices. The most dramatic changes involve conversion of permanent grassland to arable land, but on a large part of the permanent grassland drainage, followed by increased fertilization and intensive grazing, change the habitat in ways which are not favorable for the Common Snipe. The large population on Fanø is threatened bydrainage of wet dune slacks as a result of expansion of summerhouse areas.



Black-tailed Godwit

Limosa limosa

NL: Grutto **D: Uferschnepfe** **DK: Stor Kobbersneppe**

Status 1991: **2,117 pairs**
Status 1996(a): **2,791 pairs**
Status 1996(b): **2,956 pairs**
Red List status: **None**

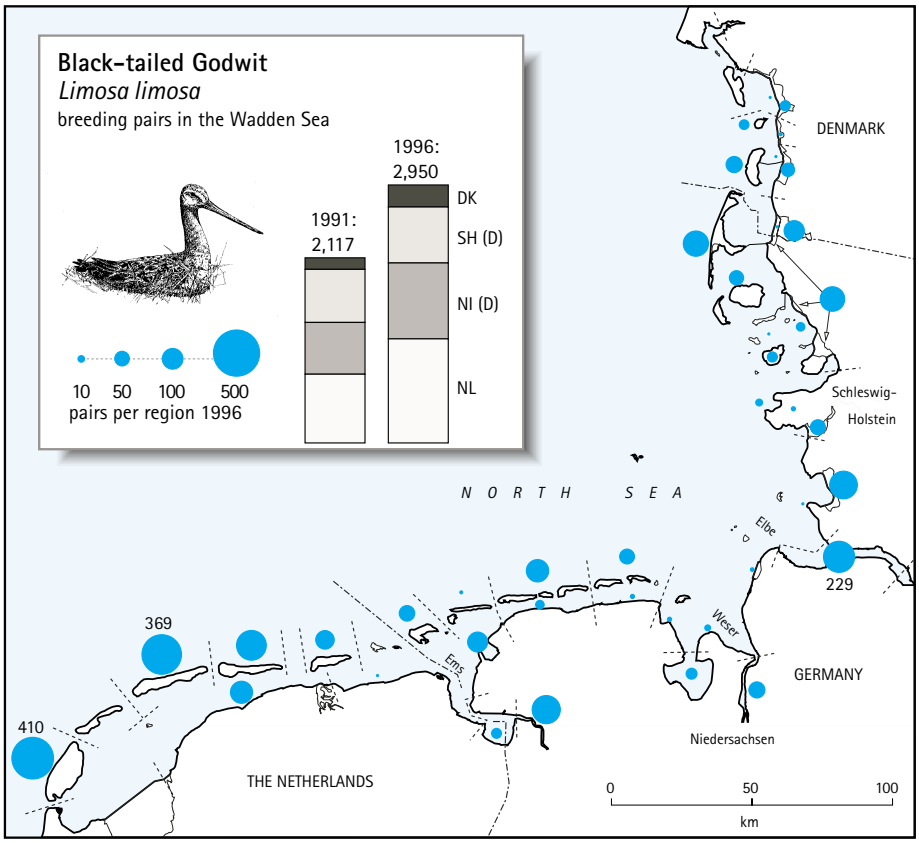


Figure 38: Breeding distribution of Black-tailed Godwit in the regions of the Wadden Sea, 1996.

Habitat

The Black-tailed Godwit breeds in grassland. Wet grassland used for hay cutting and extensive grazing is preferred. The highest densities are found in the polders on the islands, especially in the western part of the Wadden Sea. The Black-tailed Godwit breeds sparsely on the higher salt marsh. Recently increasing numbers of Black-tailed Godwits have bred in ungrazed salt marshes in Schleswig-Holstein.

Coverage

The coverage in 1996 was good. In The Netherlands, important populations on Texel, Terschelling and Ameland were not fully covered in 1991. The increase in population size from 1991 to 1996 was therefore probably not as high as the numbers indicate. In Niedersachsen, the two areas around the rivers Weser and Ems that were covered in 1996 had an additional 248 pairs, but important areas in the Unterelbe estuary were not counted. In the Danish polders, not covered in 1991, 165 pairs were counted in 1996.

Distribution

The Black-tailed Godwit is widely distributed in the Wadden Sea, with most of the population in the western part. It neither breeds in the northern part of the Danish Wadden Sea on Fanø, nor in the Ho Bugt area. Larger populations are found around the large rivers and on the mainland wetlands, especially in Schleswig-Holstein. Inland populations are much larger and widespread, es-

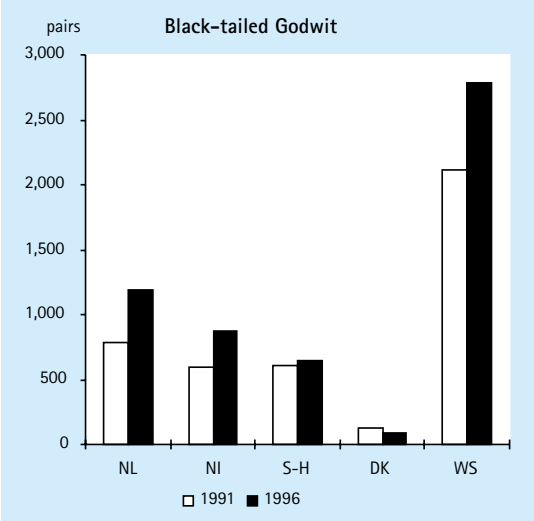


Figure 39: Number of pairs of Black-tailed Godwit in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

pecially in Niedersachsen and in The Netherlands (Heckenroth & Laske 1997, Melter et al. 1998, SOVON 1987).

Population size and development

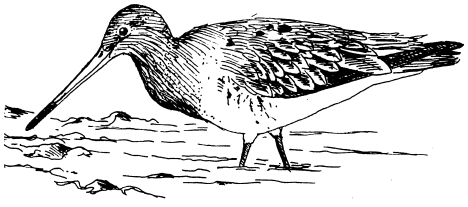
The coverage in the Dutch Wadden Sea was not complete in 1991. The population in the Dutch census areas was stable or decreasing with higher numbers in 1993 and 1994. In the most important area on Terschelling, an estimated 249 pairs were counted in 1991 (incomplete count) and 369 pairs in 1995.

In Niedersachsen, the total Wadden Sea population slightly increased during the period 1991-1996. Numbers on the islands more then doubled from 91 pairs in 1991 to 229 pairs in 1996. This might be partly due to better counting methods, partly as a result of displacement of Black-tailed Godwits from inland sites, where the population and range had been reduced drastically due to intensive farming (Melter et al. 1998). On the mainland the populations decreased on most sites except in the Leybucht.

In Schleswig-Holstein, the island population was stable and increased on Sylt from 106 pairs in 1991 to 150 pairs in 1996. There are two different trends in population development on the Schleswig-Holstein mainland. In the wetlands and polders, the populations decreased significantly, but increased in the ungrazed salt marshes.

In Denmark, the small island populations on Rømø and Mandø decreased by 25%. On the mainland polders (not covered in 1991), 252 pairs were counted in 1996. In the Tøndermarsken, the most important area in the Danish Wadden Sea, the population declined from 241 pairs in 1983 to 95 pairs in 1996. In the northern part of the Danish Wadden Sea, a small population disappeared in the mid 1980s. In general, most populations decreased in the period 1991-1996.

The population in the census areas in the entire Wadden Sea was stable or increased slightly in the years from 1991-1994. In the 1990s, the inland numbers decreasedsignificantly in all countries bordering the Wadden Sea. The reduction on inland numbers is thought to be due to intensification of agriculture and increasing numbers of foxes.



Eurasian Curlew

Numenius arquata

NL: Wulp **D: Grosser Brachvogel** **DK: Stor Regnspove**

Status 1991: **782 pairs**
Status 1996: **632 pairs**
Red List status: **None**

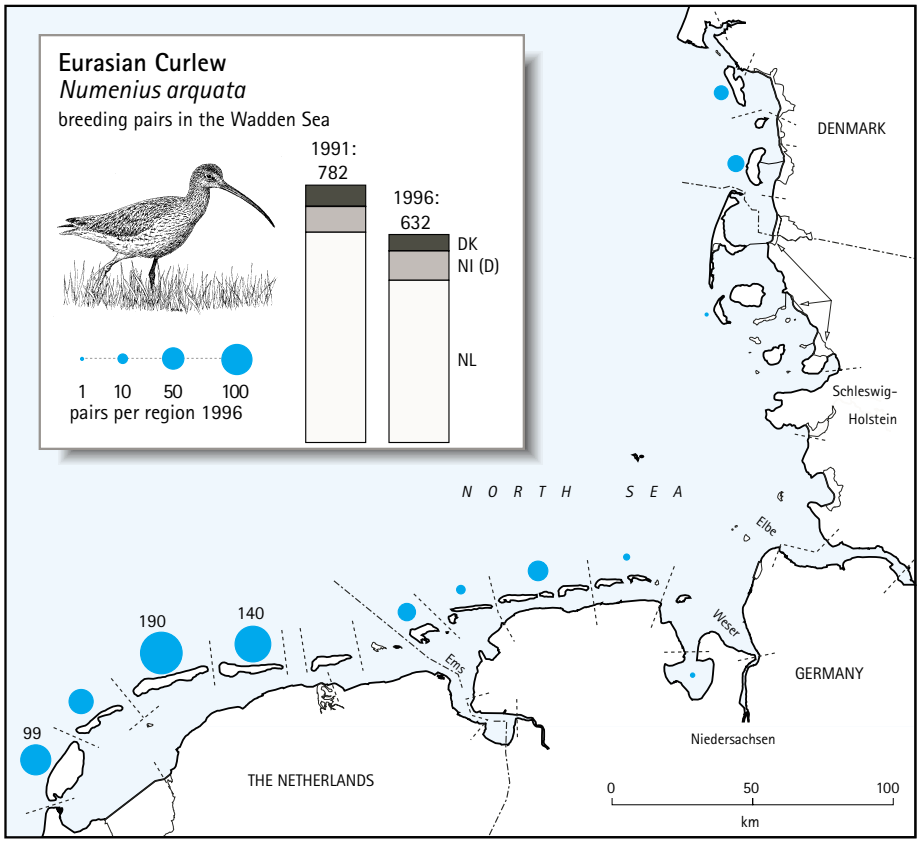


Figure 40: Breeding distribution of Eurasian Curlew in the regions of the Wadden Sea, 1996.

Habitat

The breeding habitat for the Eurasian Curlew in the Wadden Sea is heather and dune habitats on the islands, which is a natural habitat for this species. Adjacent to this habitat type, used primarily for nesting, pastures and polders are used as feeding habitat. On the mainland, two pairs were found breeding in brackish marsh in the Jadebusen, and in 1995, there was a pair in the Dutch part of the Dollard.

Distribution

The majority of the population bred on the Dutch islands Terschelling and Ameland. Other important breeding grounds were found on Texel and Vlieland. The total Dutch population was estimated at 2,400 - 3,100 pairs in 1989 (Koks & Hustings 1998).

In Niedersachsen, there are small populations on larger islands. The mainland population in the Wadden Sea was seven pairs in 1991. In Schleswig-Holstein, only one pair was found on Amrum. Only 8% of the population was found in the northern Wadden Sea on the Danish islands Rømø and Fanø.

Coverage and methods

In the trilateral guidelines (Hälterlein et al. 1995), the counting period is 1-31 May. In Denmark, the Eurasian Curlew is found to be more territorial in April, behaving more inconspicuously in May when brooding, and again more obvious when protecting young in June. In Denmark, territorial pairs produced better numbers in April than in May and June, these numbers were used in this report.

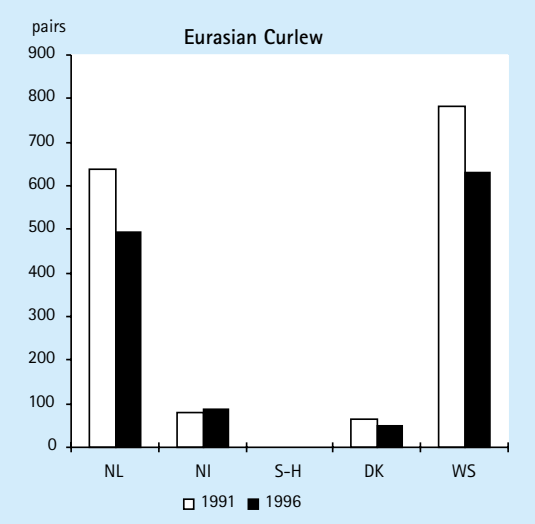


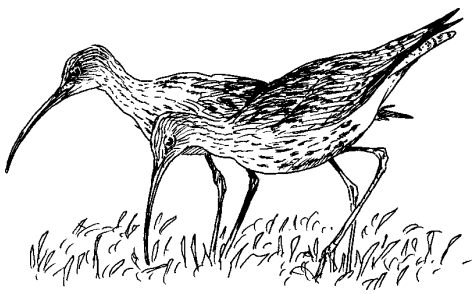
Figure 41: Number of pairs of Eurasian Curlew in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

Population size and development

The entire Wadden Sea population is dominated by the Dutch population that declined by 30% in the period 1991-1996. Also, the population in the Dutch census areas declined with 10-20%. The Danish population declined by 25%. Only in Niedersachsen, the numbers increased presumably because of better conservation measures in dunes.

In The Netherlands, the Eurasian Curlew declined seriously in the larger dune areas south of the Wadden Sea. Important breeding habitat disappeared because of the spread of willow trees. Recreational pressure also increased reducing breeding possibilities (Dijksen 1996). The reasons here are thought to be drying out of dunes and maybe taller vegetation plays also a role. Human disturbance and intensive grazing are also negative factors, and in Denmark, recreation is also important. On Fanø, the construction of a windmill park and golf course in the most important breeding area for the Eurasian Curlew reduced the population locally.

In Niedersachsen, the small mainland population in brackish marshes almost disappeared, declining from seven pairs in 1991 to two pairs in 1996.



Common Redshank

Tringa totanus

NL: Tureluur **D: Rotschenkel** **DK: Rødben**

Status 1991: **12,082 pairs**
Status 1996(a): **12,571 pairs**
Status 1996(b): **12,835 pairs**
Red List status: **VU, IRR**

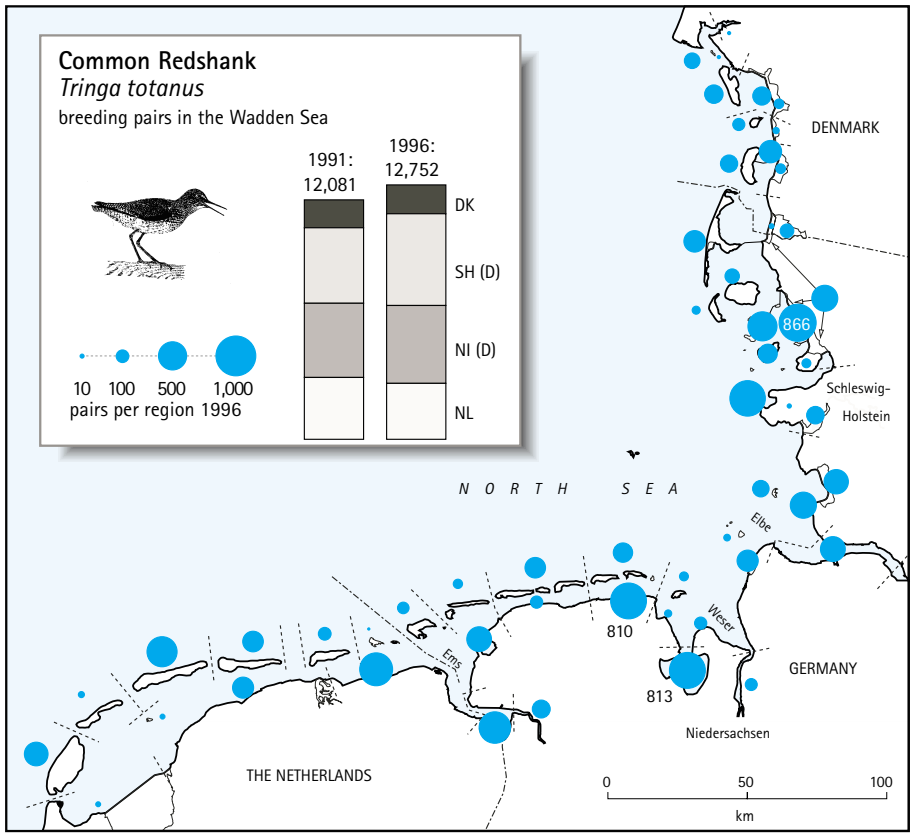


Figure 42: Breeding distribution of Common Redshank in the regions of the Wadden Sea, 1996.

Habitat

The Common Redshank breeds in a variety of habitats. Large breeding populations are found in mainland salt marshes near sheltered and silty mudflats. The grazing regime is a very important factor for the population size and breeding densities for this species. The highest densities are reached in areas without grazing and with a long coastline along a large feeding area on mudflats. Especially attractive are such areas with a mosaic of depression and gullies with patches of short grass and tufts for concealment of the nests. On the Hallig Langeness, 16 pairs on ten ha were found as a maximum (Hälterlein 1996).

Coverage and methods

The Common Redshank is counted when establishing territories through to early breeding from 21 April to 10 May. We know that the number of pairs is grossly underestimated when using a factor 0.7 when calculating the number of pairs from individuals (Dallinga 1993, Hälterlein et al. 1995), hence the true population could be two to three times larger. So far, we do not have sufficient data to use a different factor, so the factor 0.7 has been applied for the Redshank in this report.

The methods in Schleswig-Holstein, Niedersachsen and The Netherlands did not change significantly in the period 1991-1996. In Schleswig Holstein, the populations on the islands Pellworm, Föhr and Nordstrand were estimated from counts in study plots covering about 20% of the whole area.

In Denmark, the methods have improved since 1995, where individuals are counted early in the breeding season. A much higher population was estimated for the Danish Wadden Sea in 1996, using a factor 2.4 when calculation breeding pairs from individuals (Rasmussen & Thorup 1998).

Distribution

The Common Redshank is widely distributed in the Wadden Sea. About 53% of the population are counted in the western Wadden Sea. The mainland population makes up 68% of the total population. The distribution in the Wadden Sea probably reflects the grazing regime, showing low densities of birds in entirely grazed areas.

Dense populations are found on the sheltered side of the islands. Behind the dikes both on the islands and mainland, breeding populations are found in decreasing numbers with increasing distance from the dike. These breeding pairs raise their young in intertidal habitats of the Wadden Sea.

Population size and development

In The Netherlands, highest densities are now found in parts of the Dollard and the northern salt marshes of Groningen. The trends differ in many areas. In the period 1991-1996, there was no clear trend in the Dutch Wadden Sea population.

In Niedersachsen, the Redshank population was stable between 1991 and 1996 with some fluctuations in single regions but no trend. This holds true regarding the results from surveys in census areas (Melter et al. 1997). The effects of

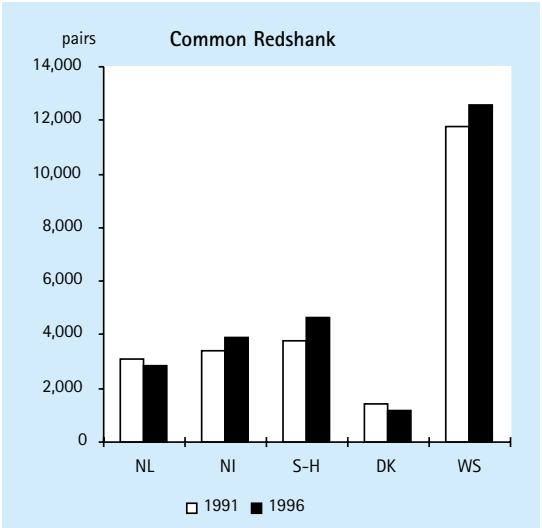
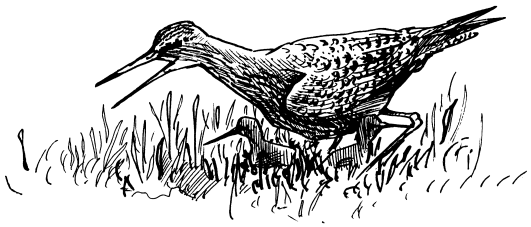


Figure 43: Number of pairs of Common Redshank in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.



extensification of salt marshes in Niedersachsen did not show any corresponding trend in Redshank numbers because the main change in salt marsh management started in the 1980s. Hence, the main breeding areas have been ungrazed before 1991 (Jadebusen, Elisabeth-Außengroden). In recent years, the intensity of grazing has been considerably reduced in the Leybucht area, where Redshank numbers increased about 35% in the period 1991 to 1996.

In Schleswig-Holstein, the population increased by 10%. Especially, on salt marshes in Dithmarschen and Nordfriesland, the population increased remarkably from 474 pairs in 1991 to 1,296 pairs in 1996, a 273% increase, due to changes in grazing on the salt marsh in these areas. The same pattern was found on the Halligen. On wetlands in Nordfriesland, especially in the Beltringharder Koog the populations increased due to changes in vegetation.

In Denmark, the 1991 population was estimated at 1,408 pairs, although a different counting period was used compared to 1996. It is difficult to compare the counts directly but the population seems to have declined in the period 1991-1996. In Danish census areas, numbers have also declined. Rasmussen & Thorup (1998) estimated the total Danish Wadden Sea population at about 5,000 pairs arguing that a factor 2.4 found by Dallinga (1993) and confirmed by a study on Tipperne in western Denmark by Thorup (Rasmussen & Thorup 1996) is a better basis for estimating the population size of this species. However, more studies will allow for more accurate population estimates of this species in the future. Most of the Danish salt marshes are far from optimal for breeding Common Redshanks. Only in a few ungrazed areas, high densities of breeding Common Redshank can be encountered. There is no grazing management specifically for breeding waders in the Danish part of the Wadden Sea.

The overall indices from the census areas show a stable population in the period 1991-1996 (see Figure 44). In 1996, the total Wadden Sea population is estimated at 12,752, which is 671 more than in 1991. Considering that the Danish and

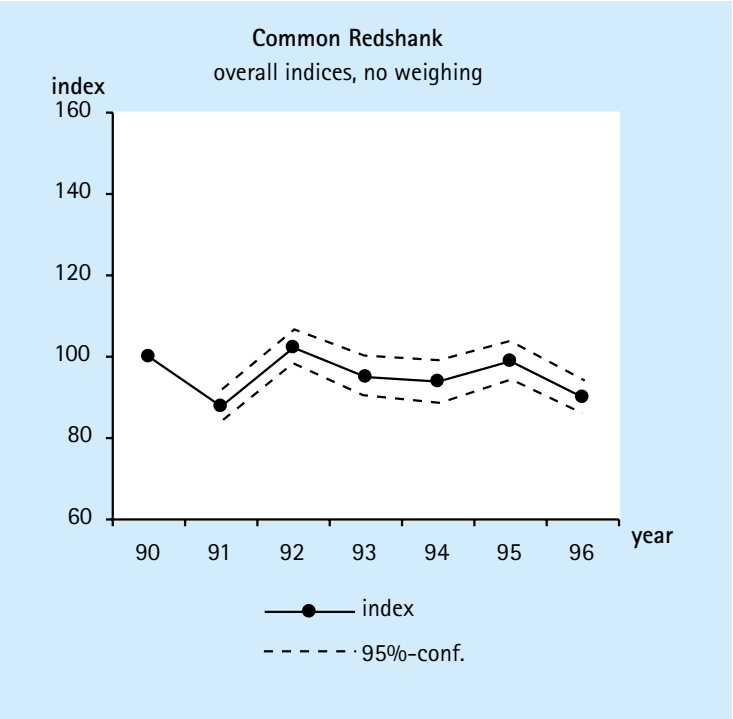


Figure 44: Index of Common Redshank in the entire Wadden Sea, 1990 to 1996 (1990 =100).

Dutch populations most likely decreased in the period 1991-1996, it seems that the total Wadden Sea population was in all stable. The Wadden Sea populations are increasingly important, as most inland populations declined dramatically in the past 30 years (Beintema et al. 1995, Hälterlein 1996, Melter et al. 1998). Norris et al. (1998) found that heavy grazing is a significant threat to salt marsh habitats and its breeding Common Redshanks. Thyen (1998) found that hatching success was greater in ungrazed areas than in grazed ones. The increase in numbers in the population in the German Wadden Sea where grazing has ceased, might improve the status for the species so much that its status as vulnerable in the Wadden Sea could change in the future.

Turnstone

Arenaria interpres

NL: Steenloper **D: Steinwälzer** **DK: Stenvender**

Status 1991: **3 pairs**
Status 1996: **2 pairs**
Red List status: **CR**

Habitat

The breeding habitat is mainly on exposed beaches and primary dunes (Hälterlein 1996). Also very short grazed areas are preferred. Breeding is most often associated with colonies of terns and Black-headed Gulls (Grell 1998).

Distribution

Turnstones breeding in the northern Wadden Sea are the southern outposts of the arctic breeding range for this species (Hildén & Vuolanto 1997). In The Netherlands, breeding has never been confirmed, but observations in 1995 indicate a breeding attempt on a salt marsh in Groningen (Koks 1998a).

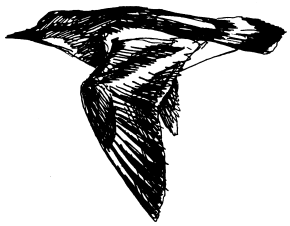
In Schleswig-Holstein and Denmark, there was a Wadden Sea breeding population in the 1800s. This population disappeared but there had been occasional sporadic breeding records until 1982. Since then a few pairs have bred regularly on the Eiderstedt peninsula and on some islands in Schleswig-Holstein (Hälterlein 1996).

In the Danish Wadden Sea breeding has not been recorded in the 20th century until confirmed on Mandø in 1994. Breeding also occurred here in 1995, but was not confirmed in 1996. In 1998, two pairs were found here. It may have been overlooked in the years between.

Breeding in the Wadden Sea can be very difficult to verify, because many migrants are present in May and do not leave the Wadden Sea until the beginning of June. On Langli, in the northern Wadden Sea, for a few Turnstones, summer and autumn migration already starts around the 20th of June. Turnstones may display on the roosting places. Therefore, reliable breeding records can be obtained only when nests or young ones are found. Unsuccessful breeding pairs are not possible to record. It is therefore likely that more pairs breed, including some sites from where breeding is recorded (Hälterlein 1996).

Population size and development

The population numbered between four and seven pairs in the period 1991-1996, but, as mentioned above, may comprise a few more pairs. From the 1980s to 1993, the number of pairs and breeding sites in Schleswig-Holstein increased, but there are still only a few pairs. Breeding seems to be regular in the Danish Wadden Sea. Little is known about the possible threats to this small population, but disturbance is mentioned as a problem in the red list (Rasmussen et al.1996).

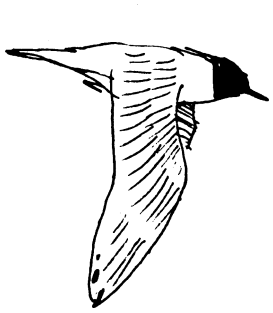


Mediterranean Gull

Larus melanocephalus

NL: Zwartkopmeeuw **D: Schwarzkopfmöwe** **DK: Sorthovedet Måge**

Status 1991: **2 pairs**
Status 1996: **5 pairs**
Red List status: **None**



Habitat

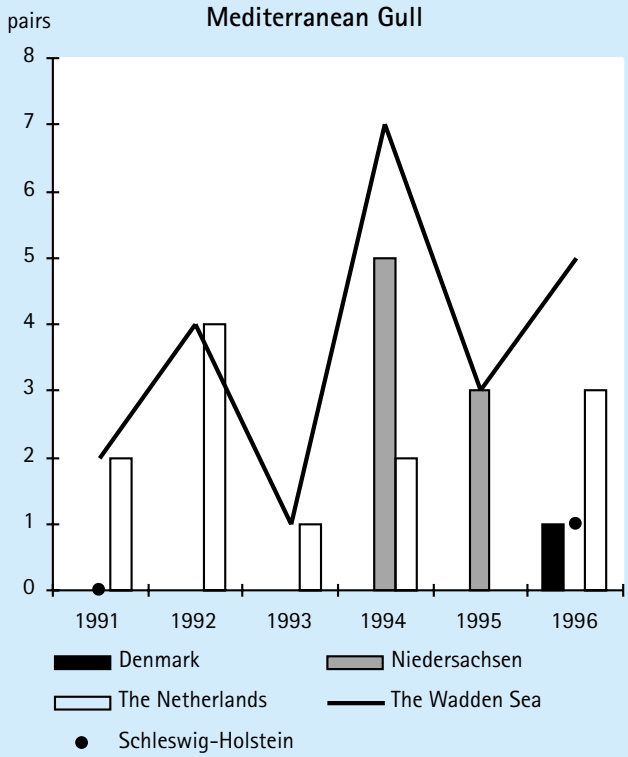
The majority of breeding Mediterranean Gulls is found in colonies of Black-headed Gulls (Meininger & Flamant 1998), and tend to nest near this species in mixed colonies. In the Wadden Sea, the colonies are most often on salt marshes.

Distribution

The Mediterranean Gull has its main distribution in the northern Black Sea, but a slow westward expansion started during the 1950s (Bekhuis et al. 1997). A small colony has built up on a small island with a large Common Gull colony in the Elbe estuary just outside the Wadden Sea area since the end of the 1960s (Hälterlein 1996) and numbered ten pairs in 1993. A major expansion started in the Dutch and Belgian Delta area in the 1980s. In 1992, the Delta population numbered 61 pairs growing to 303 pairs in 1996, and more than 410 pairs in 1998 in the Dutch Delta area (van Dijk et al. 1998, Hustings & van Winden 1998).

In the Wadden Sea, the first breeding attempt took place on Texel in 1986 (Meininger & Bekhuis 1990). During the period 1991-1994, there were one or two breeding pairs annually in the Dutch Wadden Sea, except 1995, but the species has not yet established a more permanent colony. In the Schleswig-Holstein Wadden Sea, there were breeding attempts on Helmsand (one pair in 1992/93) and on Trischen (one and two pairs 1997/98).

In the Wadden Sea area of Niedersachsen, two breeding sites occurred in the period 1991-1996. Three pairs bred in the Unterelbe estuary (Hullen) in 1994 and 1995, near the above mentioned colony in the Elbe, and another breeding pair was observed at the Lower Ems estuary (Petkumer Deichvorland) in 1995. Both places held larger gull colonies (Black-headed and Common Gull) at that time.



In 1996, there was an unsuccessful breeding attempt in a colony of Black-headed Gulls breeding in a clay ditch on the mainland cost in the Danish Wadden Sea. The Mediterranean Gull is expected to establish colonies and to grow further in size following a spread from the Dutch Delta. The overall Dutch population still seems to be increasing (Hustings & van Winden 1998, Meininger & Flamant 1998).

Figure 45: Number of pairs of Mediterranean Gull in the four countries and in the entire Wadden Sea during 1991 to 1996.

Little Gull

Larus minutus

NL: Dwergmeeuw **D: Zwergmöwe** **DK: Dværgmåge**

Status 1991: **3 pairs**
Status 1996: **2 pairs**
Red List status: **SU**

Habitat

The Little Gull was primarily found in newly and sparsely vegetated polders as in the embanked Lauwersmeer in The Netherlands from the 1970s to 1990 (Koks 1998b). In the 1980s, regular breeding occurred behind the Danish-German dike in the Margrethe Kog and Rickelsbüller Koog, and on single occasions in Hauke-Haien-Koog and Beltringharder Koog. Usually the breeding attempts were near colonies of Black-headed Gull. The above mentioned sites were newly embanked areas. In later years, when the Lauwersmeer population disappeared, a few pairs were found in salt marshes along the Friesian and Groningen Wadden Sea coast, also breeding near Avocets and Common Terns (Koks 1998b).

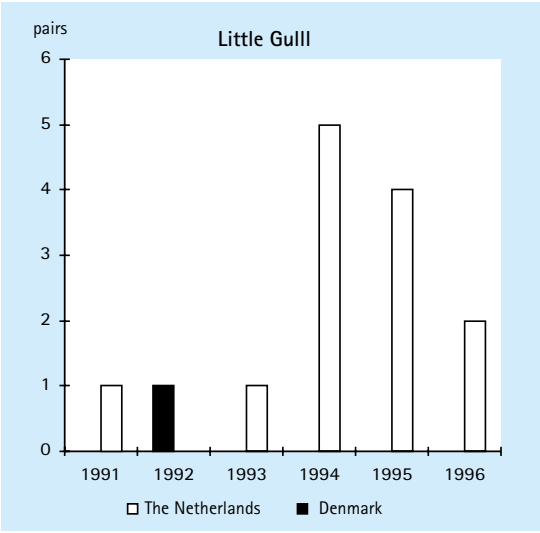


Figure 46: Number of pairs of Little Gull in the four countries and in the entire Wadden Sea during 1991 to 1996.

Distribution

The Little Gull is very rare as a breeding gull in the Wadden Sea, at its western edge of its breeding range. After a small colony disappeared from Lauwersmeer in the Dutch Wadden Sea, pairs bred annually in the region. In 1992, breeding was not confirmed in the Dutch Wadden Sea but there were several birds sighted. There was a single unsuccessful breeding pair in Margrethe Kog in Denmark. In 1994, two pairs bred at the Friesian coast and three at the Groningen coast. Single pairs might have been overlooked by the annual counts in the Dutch Wadden Sea (Koks & Hustings 1998). There were breeding pairs in the Dutch Delta area in most years in that period. From Niedersachsen and Schleswig-Holstein, there are no recent breeding records.

Population development

Numbers varied in the period 1991-1994 between one and five pairs. Single pairs might have been overlooked in the large colonies of Black-Headed Gulls and terns in the Wadden Sea. The Little Gull is a rare species on the edge of its breeding range, rather sporadic in nature, and special protection measures seem not realistic.

Black-headed Gull

Larus ridibundus

NL: Kokmeeuw **D: Lachmöwe** **DK: Hættemåge**

Status 1991: **139,594 pairs**
Status 1996: **133,182 pairs**
Red List status: **IRR**

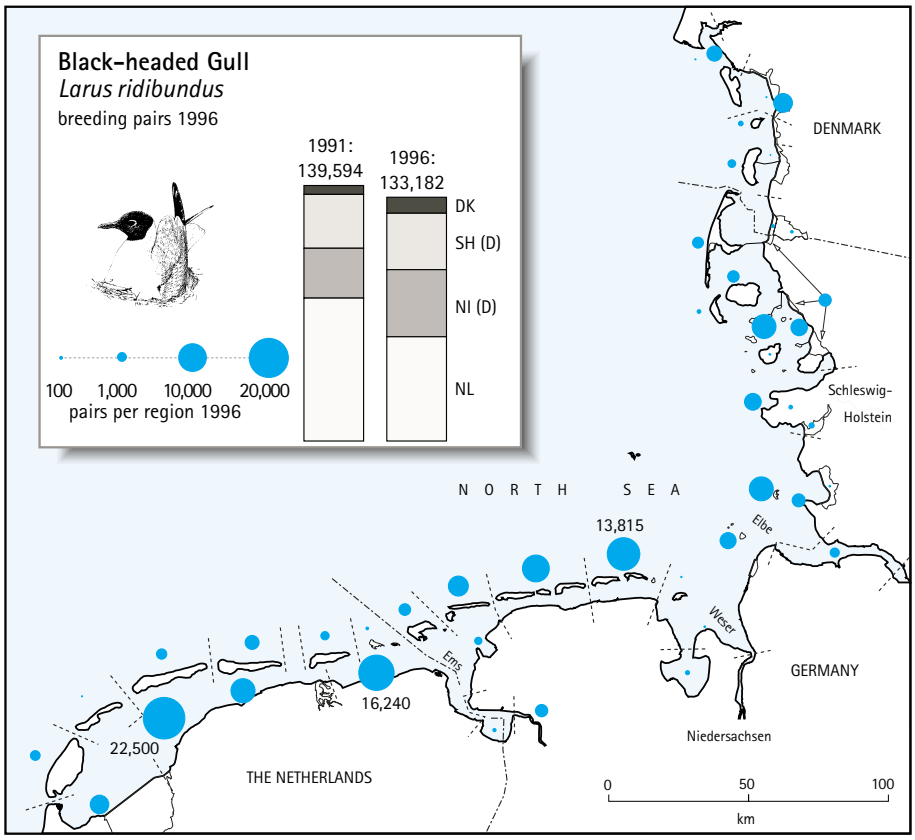


Figure 47: Breeding distribution of Black-headed Gull in the regions of the Wadden Sea, 1996.

Habitat

Salt marsh habitats are most commonly used as breeding habitat, but wetlands behind dikes are also important mainland breeding sites. Some colonies are also found in wet dune valleys.

Distribution

The Black-headed Gull is distributed in colonies throughout the Wadden Sea on both islands and along the mainland coast. More than 62% of the Wadden Sea population breeds west of the River Elbe, where by far the largest colonies are present. The largest colony is on the island of Griend in The Netherlands, numbers fluctuated between 22,500 and 28,500 during 1994-1998. In 1991, the population was equally distributed between the islands and the mainland, but by 1996 almost two thirds of the population bred on the islands.

Coverage

In Niedersachsen, there was a good coverage between 1991 and 1996 with more than 95% of the pairs counted every year. Since 1995, the counting effort has been good in Denmark. Lacking data for some colonies in the previous years were estimated using data from counts in the years before.

Populations size

The Black-headed Gull is the most numerous breeding bird species in the Wadden Sea. The total Wadden Sea population of Black-headed Gulls, was 136,475 in 1996. This is about 5% of the estimated northwest European population thought to number more than 1.7 mill pairs 1997 (Scott & Rose 1997).

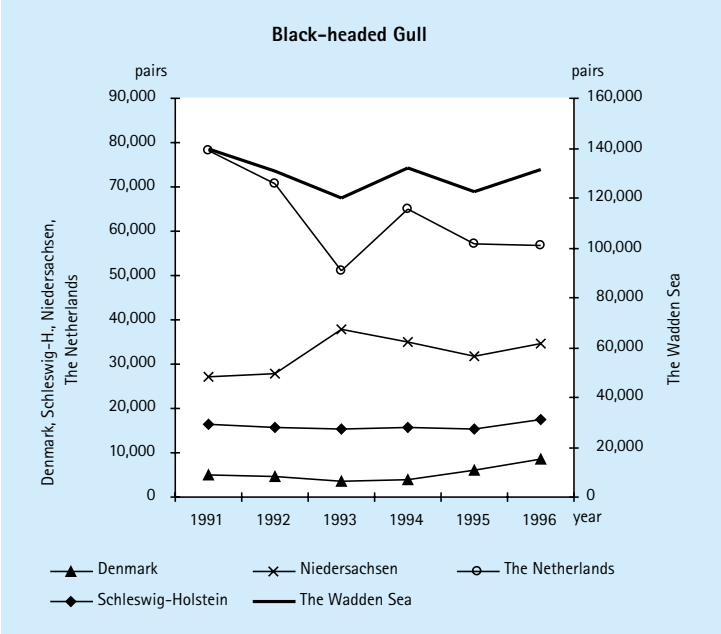


Figure 48: Number of pairs of Black-headed Gull in the four countries and in the entire Wadden Sea during 1991 to 1996.

Population development

During the period 1991-1996, the Wadden Sea population fluctuated between 120,000 and 140,000 pairs. Some fluctuations in the large Dutch Wadden Sea population might result from poorer coverage in 1992-1994, although all the important colonies were covered.

There is no clear general population trend during the period. In 1992, west of the river Elbe, the mainland colonies have mainly decreased from totally 52,000 to 30,000. The Dutch island population has been stable, but on the westernmost islands Texel, Vlieland and Terschelling the numbers have decreased. On Griend, the population was stable around 22,000 to 25,000 pairs in 1991-1996.

In Niedersachsen, the population increased in the period 1991-1996, continuing the growth in numbers since the 1960s (Behm-Berkelmann & Heckenroth 1991). The increase on the Niedersachsen islands totals from 20,000 to 33,000 pairs during this period, this partly matched the reduction in those of the Dutch mainland. Most of the mainland colonies were abandoned during this period, and on the islands, numbers were concentrated up to a few very large colonies. The island of Langeoog had lost more or less all Black-headed Gull colonies by 1996, whereas on Wangerooge the colony increased from 3,000 pairs in 1991 to more than 9,000 pairs in 1996.

After a steady growth since the 1960s, the Schleswig-Holstein Wadden Sea population of Black-headed Gulls has been stable around 30,000 pairs since the beginning of the 1900s with a tendency to shift toward the islands in recent years. In the southern part of Schleswig-Holstein (Dithmarschen), there have been opposite trends, where the species has moved from the island Trischen to the mainland salt marshes. On the German Baltic coast, however, populations decreased dramatically from 34,748 pairs in 1989 to 13,114 pairs in 1995 (Knief et al. 1997, Köppen 1997) which increased the importance of the Wadden Sea breeding population.

In Denmark, numbers at single mainland and island sites (Sneum and Langli) increased and almost doubled overall from less than 5,000 to 8,700 pairs in the period. In 1992-1995, colonies in other areas suffered from heavy predation, mainly by foxes.

Except at Dithmarschen, mainland colonies declined in size in all parts of the Wadden Sea. This suggests that increasing predation by the Red Fox and other mammal predators could play an important role (Hälterlein 1996). Foxes have increased very much along the Wadden Sea coast in Denmark (Rasmussen & Thorup 1998), in Schleswig-Holstein (H. Bruns pers. comm.), in Niedersachsen and in The Netherlands (Koks & Hustings 1998).

Based on a study of breeding success in 1996 and 1997 (Thyen et al. 1998) in the German Wadden Sea, hatching success was higher in colonies on the islands of the German Wadden Sea than on the mainland. All but one colony of Black-headed Gulls had higher hatching and fledging success in 1997 than in 1996. Reduced benthic food supply following the ice-winter in spring in 1996 in comparison to 1997 could have had an effect on the breeding performance that year.

In the Dutch Wadden Sea, a study of breeding success was initiated in 1997 (Stienen et al. 1998a). Inland colonies hatched fewer young and fledged few or no young. At these colonies, young were fed with a large proportion of insects and invertebrates. On Griend in the Wadden Sea, there was a very good production of young. Here, food only comprised marine prey. Stienen et al. (1998a) suggest that a reason for the population decline could be bad breeding success due to lack of food in the chick rearing period.

Common Gull

Larus canus

NL: Stormmeeuw **D: Sturmmöwe** **DK: Stormmåge**

Status 1991: **6,118 pairs**
Status 1996: **10,442 pairs**
Red List status: **None**

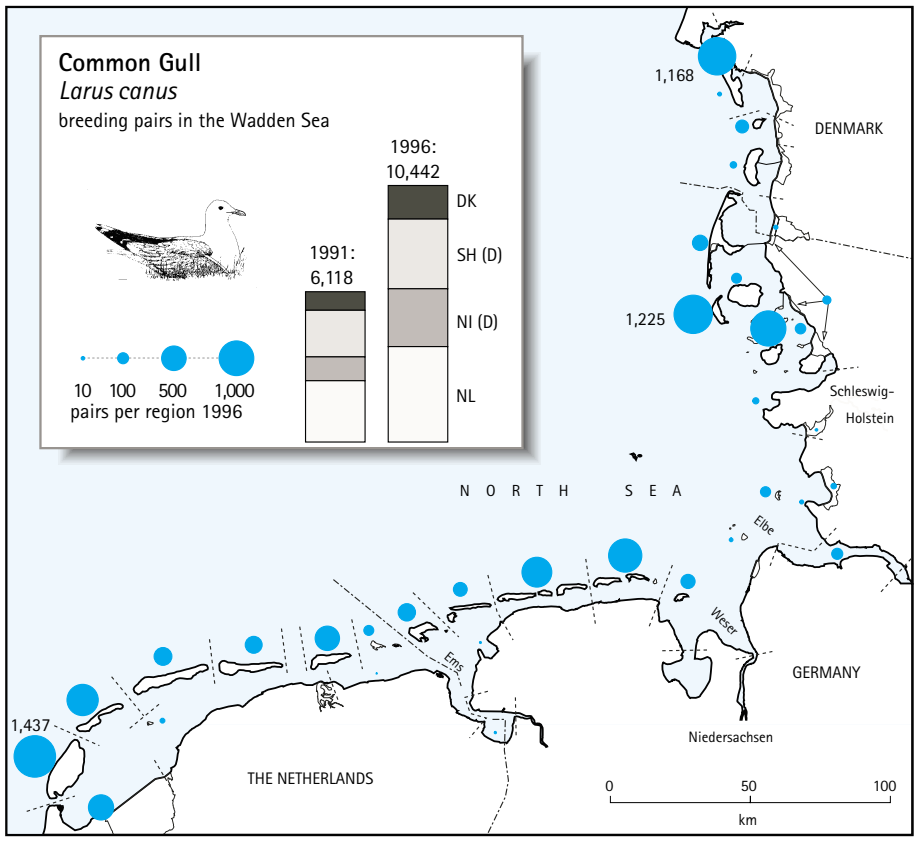


Figure 49: Breeding distribution of Common Gull in the regions of the Wadden Sea, 1996.

Habitat

The largest colonies are on the islands in well-protected areas. On Vlieland and Terschelling, many colonies are, however, not protected (Koks & Hustings 1998). On many islands, dunes are used as nesting habitat.

Distribution

Common Gull colonies are quite evenly distributed along the Wadden Sea islands. In 1996, 47% of the Wadden Sea population bred in only four regions: Texel, Amrum, Langli and the Halligen in Schleswig-Holstein. On the mainland, only small colonies were present making up approximately 8% of the total population. Distribution along mainland parts of the Wadden Sea was mainly determined by predation pressure by ground predators such as the fox.

Coverage

Coverage in The Netherlands was good in all areas except on Vlieland, where the coverage was only good in 1995.

In Niedersachsen, coverage of colonies was high, because the comparatively small colony size of this species makes an accurate count achievable.

In Denmark, smaller colonies on Mandø and Rømø were not fully covered from 1992 to 1994, for which years, the lacking data have been estimated.

Populations size and development

In The Netherlands, the numbers fluctuated greatly during the period 1991-1996. This was mainly due to the fluctuations on Texel and Vlieland. The large

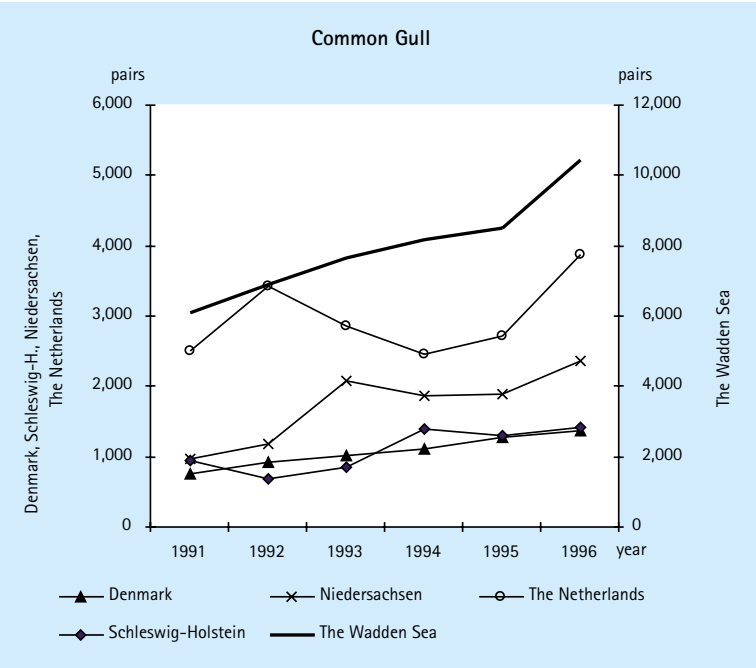
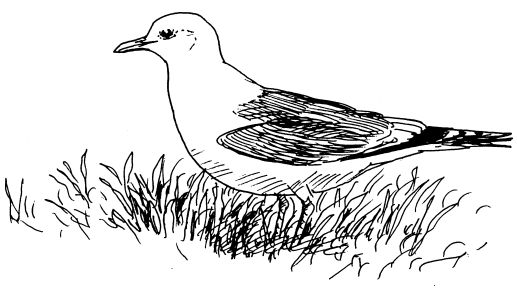


Figure 50: Number of pairs of Common Gull in the four countries and in the entire Wadden Sea during 1991 to 1996.

increase in the population on Vlieland from 1995 to 1996 might have resulted from better coverage, but most important were the increases on Texel and in Balgzand. Balgzand is a mainland area where the population increased from 104 to 529 pairs from 1991 to 1996. This area is still free of foxes. In the dune areas in The Netherlands south of the Wadden Sea, the population has decreased since 1985 because of foxes (Keil & Arts 1998).

In Niedersachsen and Schleswig-Holstein, the population on the islands increased rapidly during the study period. This increase is more or less evenly distributed over the East Friesian islands. Along the mainland, only one small colony exists in the Unterelbe estuary (Hullen). The largest colony in Niedersachsen (about 2,000 pairs) is found on an island in the Elbe Estuary just outside the study area (Südbeck & Hälterlein 1999).

The four regions holding almost half the population in 1996 (see above) has increased by 50% whereas colonies elsewhere have increased by 93%. Fluctuations in the small mainland population will hardly affect the overall population trend. In the period 1991-1996, the numbers of the Common Gull have increased by 70%. The total Wadden Sea population is steadily increasing, but some of the populations have shown large fluctuations, suggesting large-scale movements between colonies in the western part of the Wadden Sea. Predation in colonies of the Common Gull by the Marsh Harrier *Circus aeruginosus* has been observed on several sites on the Dutch islands (Koks & Hustings 1998). On the isle of Vlieland, predation by rats might displace colonies. On both Vlieland and Terschelling, many colonies are disturbed by grazing livestock and egg collectors.



Increasing food availability in the Wadden Sea resulting from fishery activities may have contributed to reduced winter mortality and hence increased the numbers. Improved protection of breeding colonies on the islands in the Wadden Sea is important, although the protection status of the Dutch Wadden Sea islands has not improved. Fleet et al. (1994) mention nest competition with Herring Gulls as a possible factor that might influence the population of the Common Gull negatively as a result of displacement into less favorable sites.

Another factor that might have had a positive influence on the Common Gull population size is the ability of this species to use agricultural (arable) land as feeding habitat throughout the year. This flexibility may cause lower winter mortality and a reduced dependence on fluctuating benthic food supply. But, as Kubetzki (1997) has shown, the benthic fauna is still of great significance in the food of Common Gulls in the Wadden Sea in the breeding season. Only those birds breeding in colonies away from the mudflats used inland food sources to a greater extent. At the Baltic coast of Schleswig-Holstein, the Common Gull population declined just as much as it increased at the Wadden Sea (Knief et al. 1997). At the Baltic coast in Mecklenburg-Vorpommern, Germany and in Denmark, the population was relative stable in the 1990s (Grell 1998, Köppen 1997).

Lesser Black-backed Gull

Larus fuscus

NL: Kleine Mantelmeeuw **D: Heringsmöwe** **DK: Sildemåge**

Status 1991: **17,380 pairs**
Status 1996: **37,294 pairs**
Red List status: **IRR**

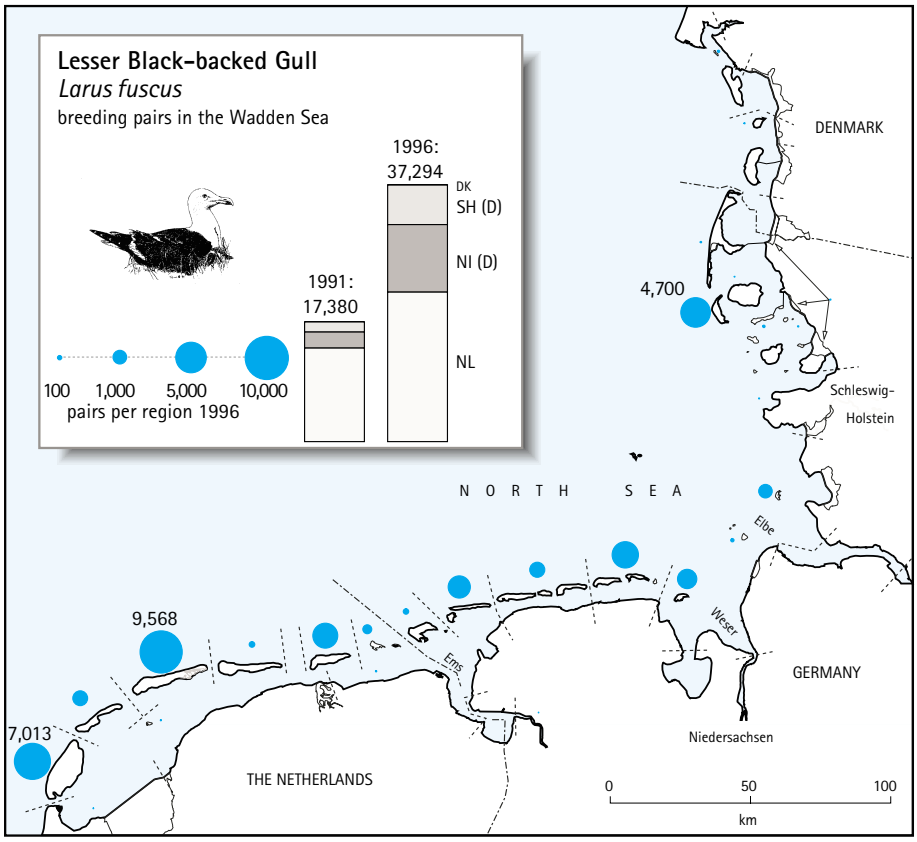


Figure 51: Breeding distribution of Lesser-Black-backed Gull in the regions of the Wadden Sea, 1996.

Habitat

Lesser Black-backed Gulls use the same breeding habitat as Herring Gulls and are often found in mixed colonies. In Dutch mixed colonies, the Lesser Black-backed Gull tend to breed in the more flat or vegetated parts of dunes and salt marshes than the Herring Gull (Spaans 1998a).

Distribution

The Lesser Black-backed Gull is widely distributed in the western part of the Wadden Sea, where there are breeding colonies on most islands. The most important colonies in this area are on the Dutch islands Terschelling and Texel. In 1996, 85% of the total population bred in the southern Wadden Sea. In the northern Wadden Sea, the population was concentrated in the two large colonies on Amrum and Trischen. In Denmark, a small colony on Langli has become established.

Population size and development

In the Dutch part of the Wadden Sea, the population increased further during the period 1991-1996, despite a reduction of the largest colony on Terschelling from 12,761 pairs in 1995 to 9,568 pairs in 1996. In 1996, the population was lower than in 1995, and the breeding success was also low. In other colonies elsewhere in the Dutch Wadden Sea, numbers increased more.

The colony on Amrum in the northern part of Schleswig-Holstein increased by 300% during the period 1991-1996.

There was a dramatic increase on the islands in Niedersachsen as well. The total number nest-

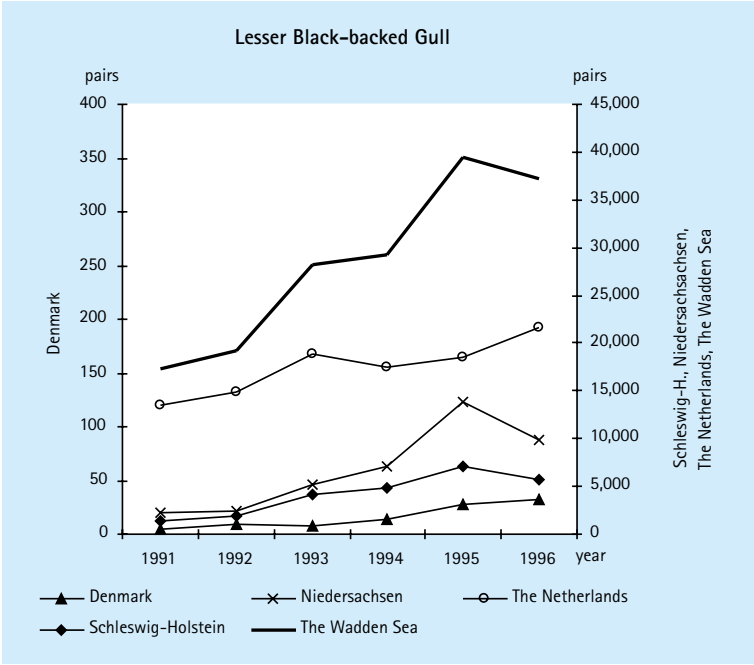


Figure 52: Number of pairs of Lesser Black-backed Gull in the four countries and in the entire Wadden Sea during 1991 to 1996.

ing in Niedersachsen grew by more than 300%, on some of the islands the Lesser Black-backed Gull is now more common than Herring Gulls (e.g. Spiekeroog). All in all, this species shows by far the largest rate of increase of all gull species in the Wadden Sea.

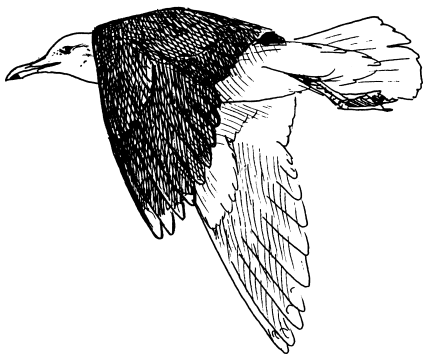
In the Danish part of the Wadden Sea, a single colony established in 1990 on the island of Langli. This colony increased from 27 pairs in 1996 to 289 pairs in 1999.

The population in the Wadden Sea increased by 115% during the period 1991-1996. This increase is a continuation of the population development that started in the beginning of the 1970s in the westernmost parts of the Wadden Sea, continued in the 1980s in Niedersachsen and in the 1990s in Schleswig-Holstein (Hälterlein & Südbeck 1996a,b). Increased food availability through eutrophication and fishery discard and perhaps better wintering conditions along the West African coast may all have contributed to this increase. Discard from the offshore fishery is the main important factor for the increase of the Lesser Black-backed Gull (Garthe 1996).

It is argued that the Lesser Black-backed Gull can profit from fishery discards to a larger extent than other gull species breeding in the Wadden Sea, due to their better flight ability allowing them to follow the trawlers over larger distances away from the breeding colonies (Noordhuis & Spaans 1992, Freyer 1995).

The large numbers breeding on Terschelling have not increased since the beginning of the 1980s (Spaans 1998a), although the increase continues in other parts of the western Wadden Sea. Since fishery effort seems to have changed considerably in West Africa leading to larger stocks of small fish (O. Overdijk pers. comm.), this change could possibly have improved wintering conditions contributing to the population increase in the Wadden Sea.

Increased foraging by hundreds or even thousands of birds on farmland has been observed in recent years not only in The Netherlands (Koks & Hustings 1998) but in all parts of the Wadden Sea and this might indicate a new trend in habitat use.



Herring Gull

Larus argentatus

NL: Zilvermeeuw **D: Silbermöwe** **DK: Sølvmåge**

Status 1991: **89,577 pairs**
Status 1996: **77,250 pairs**
Red List status: **IRR**

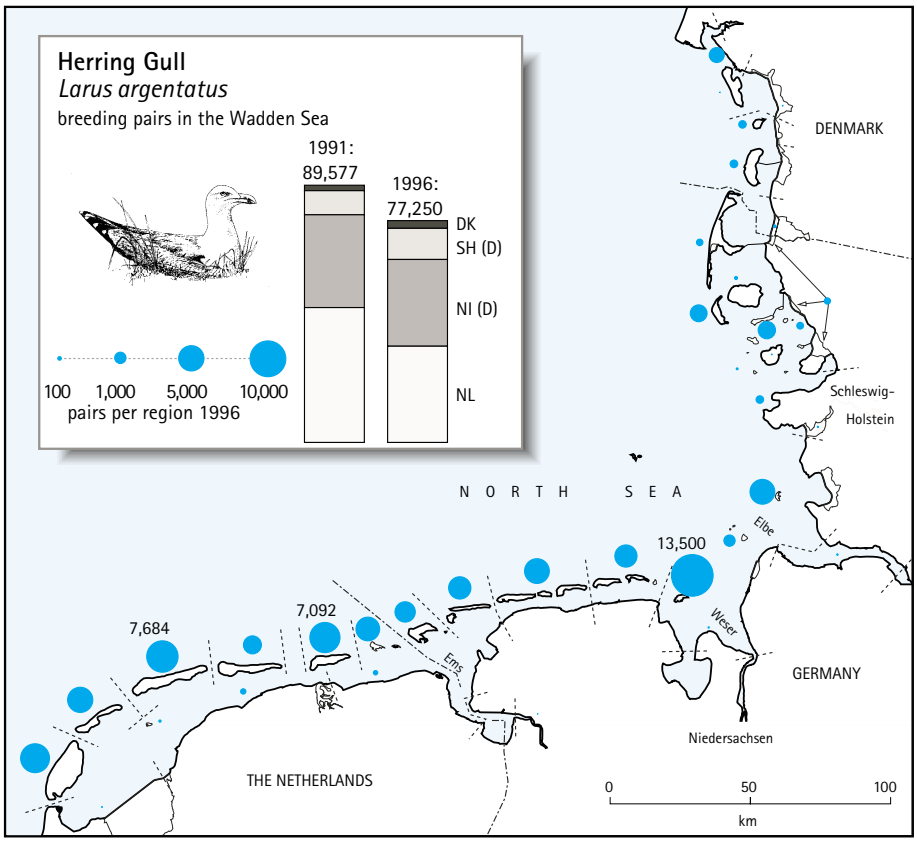


Figure 53: Breeding distribution of Herring Gull in the regions of the Wadden Sea, 1996.

Distribution

The western part of the Wadden Sea held 82% of the Herring Gull population in 1996. The mainland population was about 2% of the total population. The breeding habitat is mainly dunes but also salt marshes on the islands. The four largest colonies were on the islands of Mellum (13,500 pairs). Terschelling (7,684 pairs), Schiermonnikoog (7,092 pairs) and Texel (6,503 pairs). In Schleswig-Holstein, the largest colony was on Trischen (4,783 pairs) and in Denmark on Langli (1,742 pairs).

Population development

In the western part of the Wadden Sea, numbers fell by 20% during the period 1991-1996 (Spaans 1998b). Numbers felt especially in The Netherlands, where Herring Gull numbers declined almost as much as the population of Lesser Black-backed Gull increased.

In Niedersachsen, the population peaked in the mid 1980s. Here the population decreased substantially in the western part, but increased on Mellum, where the largest colony in the Wadden Sea is found. A study found that high breeding density restricted breeding success, but this was still sufficient to maintain the population (Wilkens & Exo 1998). Locally the breeding population size is probably limited by food availability. Food items were mainly mussels (*Mytilus edulis* and *Macoma balthica*) but also pellets with remnants of earthworms and miscellaneous refuge from the mainland were found.

In the northern Wadden Sea, numbers are still increasing. In the Danish Wadden Sea, national

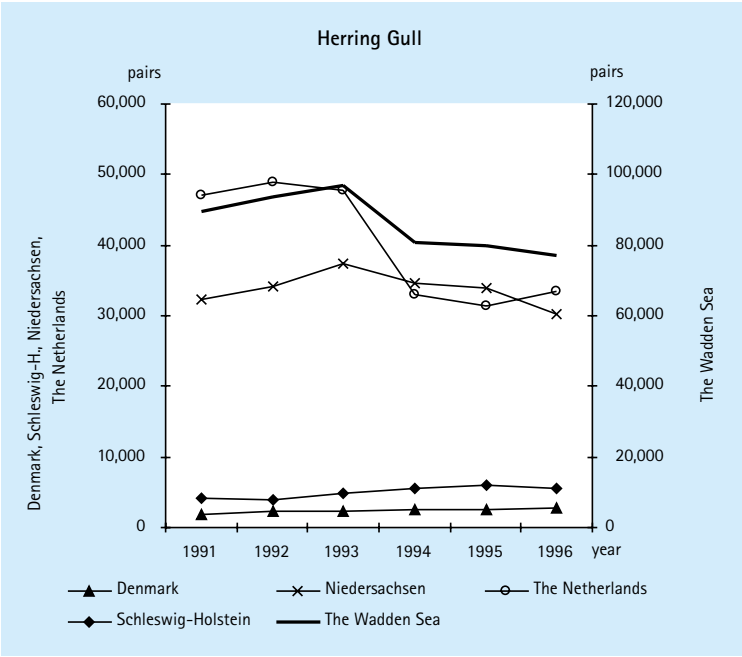
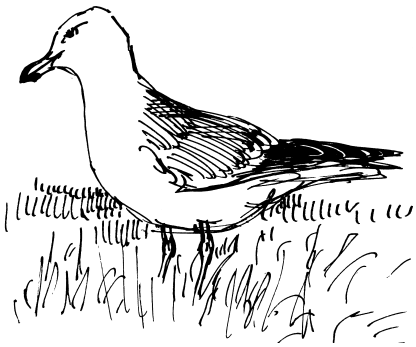


Figure 54: Number of pairs of Herring Gull in the four countries and in the entire Wadden Sea during 1991 to 1996.

numbers are totally dependent on changes at the Langli colony, which doubled in the period 1991-1996. This increase occurred since foxes have failed to reproduce on the island since 1989.

The reproduction in the Dutch colonies has been very low for several years, because of food shortage and possibly competition for nest sites with Lesser Black-backed Gulls. The Herring Gull numbers are influences by changes in the fishing efforts. In Niedersachsen, the species is the most numerous gull following shrimp fishing boats profiting from their discard (Walter & Becker 1994). A considerable amount of discarded undersized shrimps and other benthic organisms (estimated at 25,000 t during April-August 1993) might represent an important food resource for Herring Gulls in the western Wadden Sea. Camphuysen (1995) suggested that reduced fishery effort in the near shore areas has reduced feeding opportunities here, and he found that the feeding range of Herring Gull was much smaller than that of the Lesser Black-backed Gull.

More effective control of refuse dumps maybe a contributing reason for the population decline of the Herring Gull, if this has reduced winter survival especially of the first year birds.



Great Black-backed Gull

Larus marinus

NL: Grote Mantelmeeuw D: Mantelmöwe DK: Svartbag

Status 1991: 6 pairs
Status 1996: 15 pairs

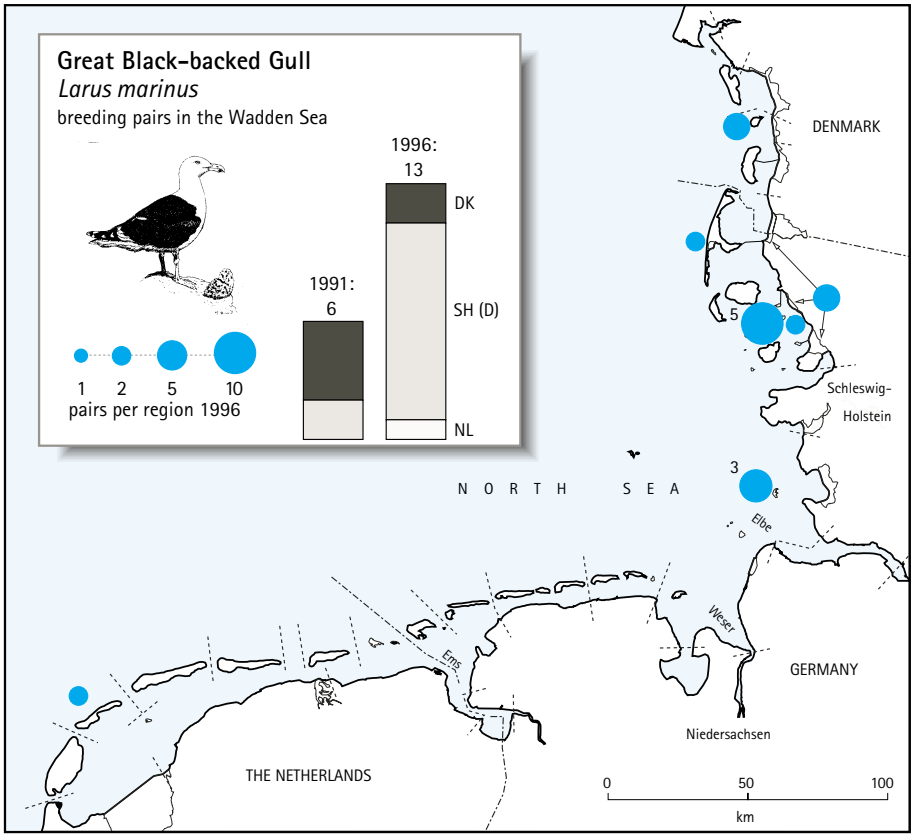


Figure 55: Breeding distribution of Great Black-backed Gull in the regions of the Wadden Sea, 1996.

Distribution

The Great Black-backed Gull has extended its range in Denmark and France after a range expansion (Kilpi 1997).

The Danish and Schleswig-Holstein Wadden Sea was colonized by single pairs in 1987 and 1988 respectively. In 1998, up to 11 pairs bred on Trischen. The first breeding attempt in Niedersachsen took place on Memmert in 1985, followed by two pairs in 1995. The first breeding attempt in the Dutch Wadden Sea was recorded in 1994 after the first breeding attempt was recorded in the southwest of the country in 1993. At the initial breeding site, a pair bred in 1994, 1995, 1997 and 1998, but not in 1996.

In 1998, the first successful case of breeding was found in the Dutch Wadden Sea (Koks & de Boer 1998). The colonization of the Wadden Sea is most likely the result of a southwestward expansion of the population (Vercruijsse & Spaans 1994, Koks & Jongenelen 1998).

Regular breeding occurs now in the Wadden Sea in Denmark, Schleswig-Holstein and The Netherlands. A further increase and spread to Niedersachsen in the coming years can be expected.

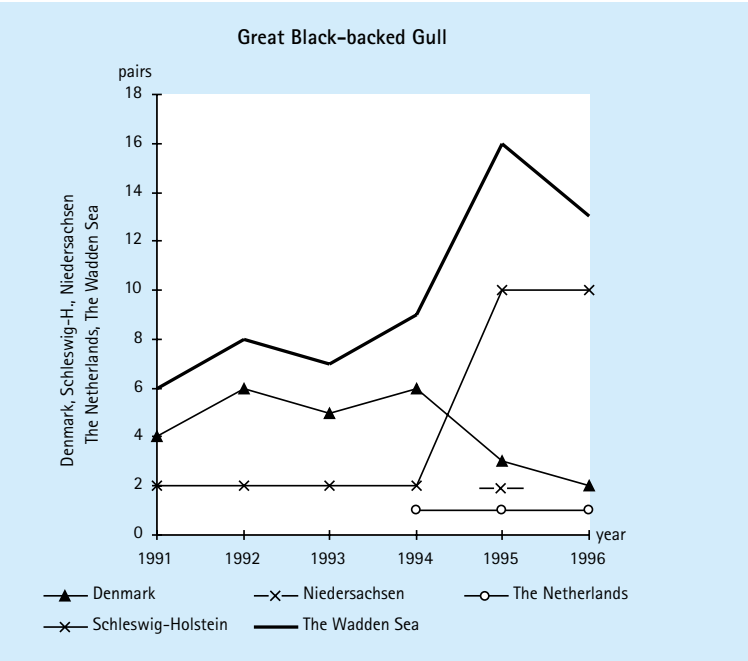
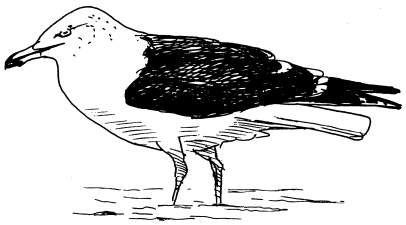


Figure 56: Number of pairs of Great Black-backed Gull in the four countries and in the entire Wadden Sea during 1991 to 1996.



Gull-billed Tern

Gelochelidon nilotica

NL: Lachstern **D: Lachseeschwalbe** **DK: Sandterne**

Status 1991: **28 pairs**
Status 1996: **86 pairs**
Red List status: **CR, IRR**

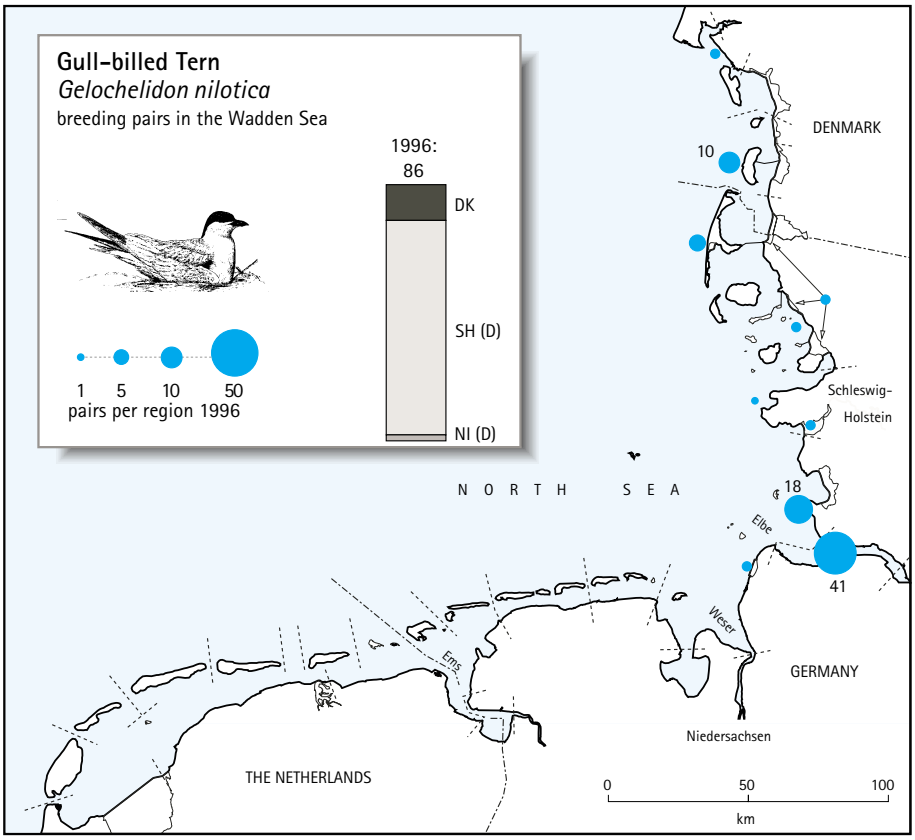


Figure 57: Breeding distribution of Gull-billed Tern in the regions of the Wadden Sea, 1996.

Habitat

Colonies of Gull-billed Terns are mainly found in association with Black-headed Gull and Common or Arctic Tern colonies both on the islands and the mainland coast. Feeding is confined to terrestrial habitats where the species feeds on small mammals, lizards and insects.

Distribution

The isolated northwest European population of Gull-billed Terns is now confined to the Wadden Sea, with the main concentration at the river Elbe in Schleswig-Holstein and Niedersachsen. The European population is scatteredly distributed and the nearest breeding grounds are in the Camargue in southern France (Bieber 1997). The largest colony supporting the majority of breeding pairs was situated on the Elbe during the period 1991-1996, breeding in colonies of Common Tern and Black-headed Gull. There are still regular colonies elsewhere in Schleswig-Holstein and Denmark.

Population development

Numbers were particularly low in 1991, when a large part of the population did not breed. In previous years, the Wadden Sea supported between 60 and 70 pairs (Hälterlein 1996). In 1996, the number of pairs reached a new peak of 86 pairs. This has been the highest number recorded in the Wadden Sea since the 1930s, when there were 130 pairs on Langli in 1933 (Møller 1975). During the period 1975-1996, numbers were stable or slightly decreasing. Since 1996 the population has decreased in the entire Wadden Sea to about 30 pairs in 1999. In The Netherlands, there has been

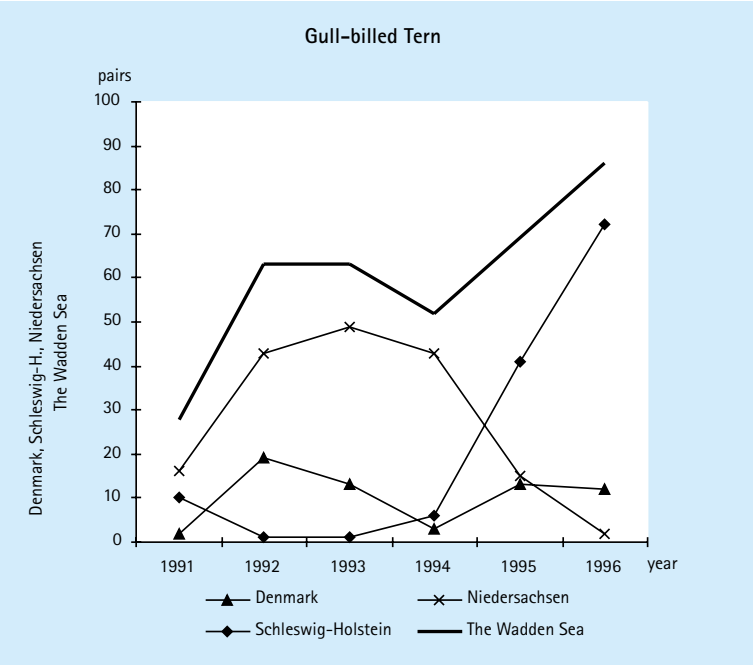


Figure 58: Number of pairs of Gull-billed Tern in the four countries and in the entire Wadden Sea during 1991 to 1996.

an increase in summer records at several locations during the 1990s.

In Schleswig-Holstein and Niedersachsen, the Gull-billed Tern bred regularly from 1960 following the decrease in the Danish population (Hälterlein 1996). From 1974 to 1990, the main colony was in the Meldorfer Speicherköge in Dithmarschen. The low numbers recorded in 1991 were the result of the break up of this colony. From 1992, the main colony settled at the southern side of the Elbe in Niedersachsen where, in 1993, 49 pairs were recorded (Südbeck & Hälterlein 1995). In 1995, the main colony moved to the northern shore of the Elbe into a large Common Tern colony.

The Danish breeding population decreased from 200-500 pairs in the first half of the century to 13 pairs in 1974 (Møller 1975), and about 10-15 pairs in 1980 (Fischer 1992). Since the end of the 1980s, the last strongholds in Limfjorden and Nissum Fjord in Denmark have all been abandoned, and the Danish part of the population now only breeds in the Wadden Sea. In the Danish Wadden Sea, regular breeding may have occurred since 1976, on sites on the northern and middle part of Rømø. Regular counts did not take place before 1991.

A colony on the new island of Keldsand east of Fanø (which had ten pairs in 1990) was abandoned because of foxes. The low number of breeding pairs recorded in Denmark in 1991 was largely the result of the abandonment of this colony. A new colony was established on Mandø in 1992, where sheep stocking densities has been blamed for disturbing the birds or destroying the nests (Rasmussen & Fischer 1997). Seven pairs of Gull-billed Terns bred in 1996 in a new colony of Arctic Terns on Rømø. The colony was flooded shortly before hatching. From 1995 to 1999, two to seven pairs bred annually on Langli, but never successfully.

The Danish colonies were not very successful in the period 1991-1996. Only nine young fledged during this period, and in the years 1993, 1994 and 1996 no young fledged. In recent years the shift between colonies, years with few pairs settling and low reproduction has occurred more often than before. Predation by foxes, human disturbance and nest destruction by grazing livestock are amongst the causes of a low reproductive success leading to shifts between colony sites and a low reproduction (Gloe 1992, Hälterlein 1996, Rasmussen & Fischer 1997). The role played by feeding conditions in these patterns is not known at present.

Despite the relatively high number of pairs in 1996, the population is still threatened. In recent years, the Wadden Sea population has decreased probably because of poor reproductive success. Problems with predation seem to be increasing along the mainland coast throughout the Wadden Sea, which had the effect of forcing other colony species to the islands. A complete shift to the islands might not be possible for the Gull-billed Terns since foraging there is significantly less profitable than in agricultural areas on the mainland.

The suggested factors responsible for declines in numbers seem directly or indirectly linked to human activity. To conserve this species, it is important to ensure effective protection against disturbance from people. Where sites are grazed, animals should be fenced out of potential nesting areas from mid April until the end of July.

To improve conditions for the Gull-billed Tern, it is necessary to direct special conservation attention toward this species. Preparing a management plan for the species by Danish and German authorities would be a potential solution. Such a plan should set up guidelines for active protection of breeding sites for Gull-billed Terns, and it should include an intensive monitoring of the population to obtain data on breeding success and causes of breeding failure. An understanding of these processes could ensure that the endangered population of Gull-billed Tern maintains its northwest European population. Because of the long distance between other nearest colonies of the species, it is very unlikely it would re-colonize this area if it disappeared.

Sandwich Tern

Sterna sandvicensis

NL: Grote Stern **D: Brandseeschwalbe** **DK: Splitterne**

Status 1991: **16,981 pairs**
Status 1996: **17,285 pairs**
Red List status: **EN, IRR**

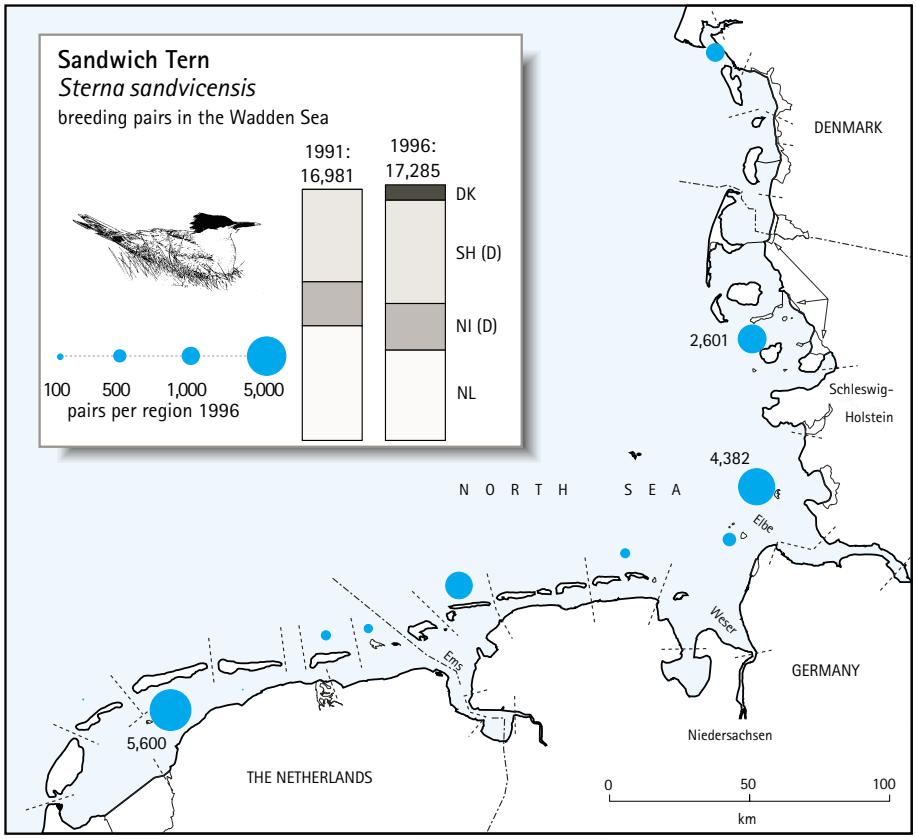


Figure 59: Breeding distribution of Sandwich Tern in the regions of the Wadden Sea, 1996.

Distribution

The Sandwich Tern breeds in a few colonies in all parts of the Wadden Sea. In the period 1991-1996, there were between seven and nine colonies numbering more than ten pairs. Most of the population breeds in colonies on uninhabited islands in undisturbed and protected areas. In the Danish part of the Wadden Sea, a new colony was established in 1992. This has been the first regular breeding in this part of the Wadden Sea since the 1920s.

Population development

Between 1938 and 1956 up to 38,000 pairs bred in the Wadden Sea, with 90% of the population in The Netherlands (Brenninkmeijer & Stienen 1992, Hälterlein 1996, Van der Have & Osieck 1997). The Dutch Wadden Sea population has still not recovered from the total breakdown of the population in the 1960s, after pollution with pesticides (Brenninkmeijer & Stienen 1992). The serious pollution with pesticides that caused the collapse of the population is no longer reducing the population size of the species.

The single large colony on the Dutch island Griend supported 40-46% of the Wadden Sea population between 1991 and 1996. The size of this fluctuated between 6,600 and 9,000 from 1988-1995. In 1996, the colony was reduced to only 5,600 pairs and was even lower in 1997. In 1998, the colony recovered to 7,000 pairs. The decline in 1996 coincided with the collapse of the local sandeel *Hyperroplus lanceolatus / Ammidytes tobianus* (Stienen & Brenninkmeijer 1998a, Tienen & Baarspul 1998), which suggests that food avail-

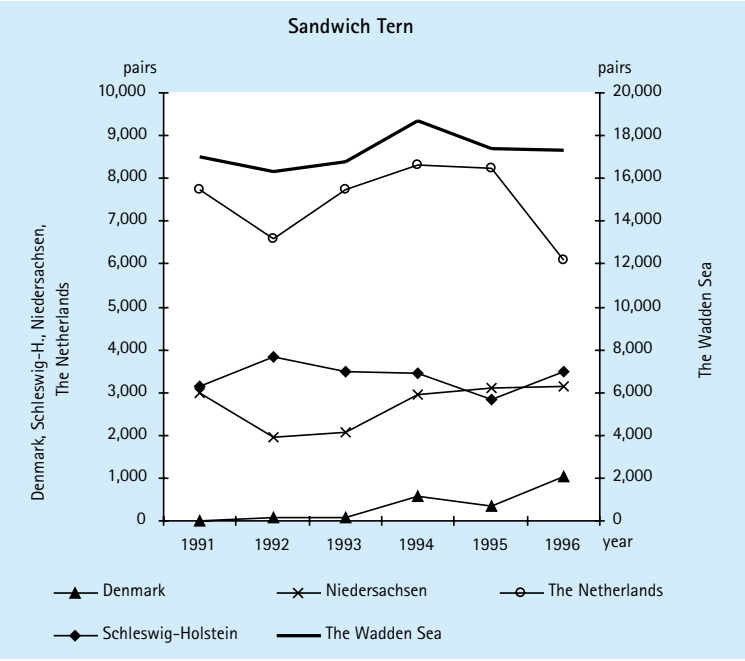


Figure 60: Number of pairs of Sandwich Tern in the four countries and in the entire Wadden Sea from 1991 to 1996.

ability may play a key role in the regulation of the number of nesting Sandwich Terns. A colony settled on Rottumerplaat in 1996, were the terns had bred for the first time since 1983 (Lutterop and Kasemir 1996), and breeding attempts in two other places with a few pairs were observed. The newly established colony on Schiermonnikoog in 1995 grew to 1,000 pairs in 1997 and disappeared again in 1998. This coincided with the time when the colony on Rottumerplaat numbered 2,335 pairs.

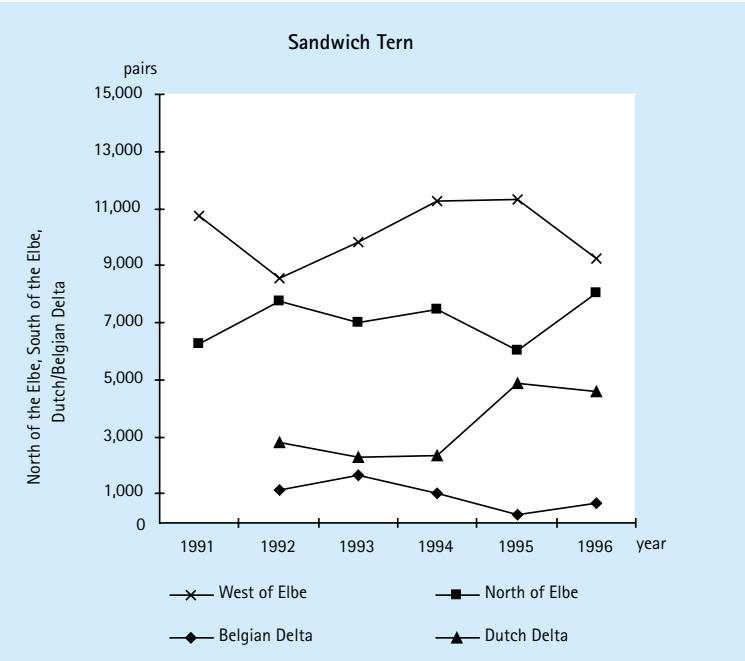


Figure 61: Number of pairs of Sandwich Tern west and north of the Elbe from 1991 to 1996 and in the Dutch and Belgian Delta area from 1992 to 1996.

Since mid 1970s, the Niedersachsen population varied between 2,500 and 5,000. Despite a reduction in numbers in the colonies on Scharhörn and Wangerooge in Niedersachsen in 1996, the numbers in Niedersachsen were stable around 3,000 pairs during the period 1991 to 1996. In 1994, a new colony was established on the island of Juist in the Niedersachsen Wadden Sea. This is the second island, which is inhabited by man and colonized by Sandwich Tern in the Wadden Sea. Here, 2,370 breeding pairs were recorded in 1996.

In Schleswig-Holstein, the population increased from the 1970s up to 1992, where a maximum of 7,682 pairs was reached. It is estimated that more than 50,000 pairs bred in Schleswig-Holstein in the 19th century (Rohweder 1878, in Hälterlein 1996).

In Denmark, a Sandwich Tern colony settled on Langli in the northernmost part of Wadden Sea in 1992 when the colony of Black-headed Gull, settled in 1990, had grown to more than 600 pairs. The Sandwich Terns did not breed successfully the first two years, probably because of a very late egg laying. Both in 1992 and 1993, the colony was left in the middle of July before eggs hatched. In 1994 and the following years, the colony established much earlier, and had a high breeding success. In 1995, the number was probably estimated too low. In 1999, this colony had increased to 1,529 pairs.

Summing up, the total Wadden Sea numbers and the Dutch Delta population (Meininger et al. 1997) show a slightly positive trend. This trend suggests large scale movements throughout the entire Wadden Sea and an exchange with the Delta area, with parts of the Sandwich Tern population moving

between breeding colonies in the western Wadden Sea and northern Wadden Sea as well as the Delta area on both sides of the Dutch/Belgian border. These movements may also link up with the colonies in Denmark and Germany north and east of the Wadden Sea. This is also reflected in the large number of immigrants present at Griend (Stienen & Brenninkmeijer 1998a). This report shows that the species might be able to respond very quickly to smaller changes in the environment or on the breeding grounds by moving to colonies in other parts or outside the Wadden Sea.

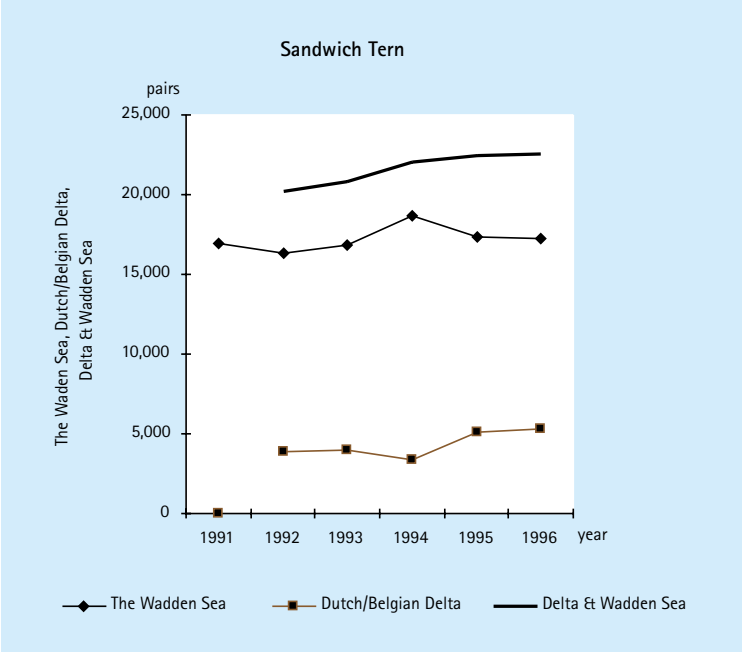


Figure 62: Number of pairs of Sandwich Tern in the Wadden Sea from 1991 to 1996 and in the Dutch and Belgian Delta combined from 1992 to 1996.

The Sandwich Tern is listed as endangered in the Red List of the Wadden Sea because of its very scattered distribution and because of past serious declines from which the species has not yet recovered. Why the population has not yet recovered remains an open question. The role of the intense fishery in the North Sea is not clear. The terns are mostly feeding seawards of the islands in the North Sea (Garthe & Kubetzki 1999). However, there is no information about the fish populations that comprise the preferred food items, but the abundance of herring *Clupea harengus* seems important for Sandwich Terns on Griend (Stienen & Brenninkmeijer 1998a). Eutrophication could affect the population either by reducing visibility or increasing food availability. Sandwich Terns feed within 25-30 km of the colony (Veen 1977). Another factor of unknown strength is the catching of terns along the West-African coast. Stienen et al. (1998b) believe that tern catching is still an important contribution to the annual mortality.

The present number of suitable breeding colonies might limit the numbers, since large colonies are so widespread. A protection of potential breeding colonies from disturbance could lead to the establishment of more colony sites, which would decrease the overall vulnerability of the species. The formation of more new colonies in the last years is encouraging in this respect and might be a consequence of better protection of suitable sites in the Wadden Sea.

Common Tern

Sterna hirundo

NL: Visdief **D: Flussseeschwalbe** **DK: Fjordterne**

Status 1991: 13,859 pairs
Status 1996: 13,461 pairs
Red List status: VU, IRR

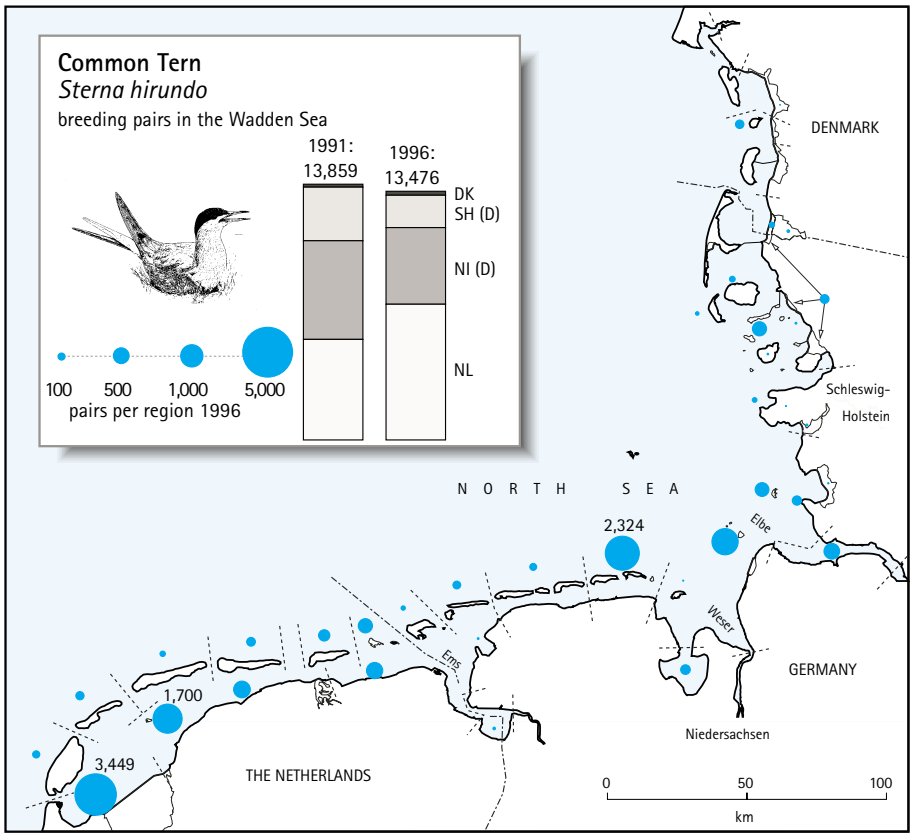


Figure 63: Breeding distribution of Common Tern in the regions of the Wadden Sea, 1996.

Distribution

The Common Tern is mainly distributed along the western Wadden Sea coast from the Elbe where 85% of the total Wadden Sea population nests. Large colonies with more than 1,000 pairs were found during 1991-1996 on Griend and Van Ewijcksluisschor, at the Balgzand area ten km south of the Closure Dam in the Dutch Wadden Sea, Minsener Oog in Niedersachsen, Trischen and at Neufeld in the Elbe Estuary in Schleswig-Holstein.

The mainland element of the breeding population increased from 25 to 30% in the years from 1991 to 1994 and to 42% in 1996. The increasing numbers at the Closure Dam in the Dutch Wadden Sea and the reduced colony on Trischen contributed largely to this shift.

Coverage

The Common Tern is difficult to distinguish from Arctic Terns when the two species breed in mixed colonies. Before 1994, up to 15% of the total population of the two species were not distinguished in the field, but reported combined as so-called "Commic Terns". For the period 1991 to 1996, the number of Arctic and Common Terns has been calculated from the number of Commic Terns for each site taking into consideration the ration of numbers in previous years or at neighboring colonies (Hälterlein & Südbeck 1996a,b).

Population development

The population of Common Tern has shown quite large annual fluctuations during the period 1991-1996 in the Dutch Wadden Sea that are reflected

in the total Wadden Sea numbers. The co-ordinated count in 1991 was thought to produce a comparatively lower number than "normal" due to bad weather (Fleet et al. 1994) but this was not considered an important problem.

The population in the Dutch part increased from 1991 to 1996. The increase was particularly strong in the western part of the mainland coast. In this region, the population increased from 1,018 to 3,449 pairs in the period 1991-1996. In the same period, colonies near the border of the IJsselmeer declined, but numbers here were much smaller (van Dijk et al. 1998). Breeding success in most Dutch colonies seemed poor. In the large colony on Griend, an overall low reproductive success due to starvation of the young occurred during a longer period (Stienen & Brenninkmeijer 1998a).

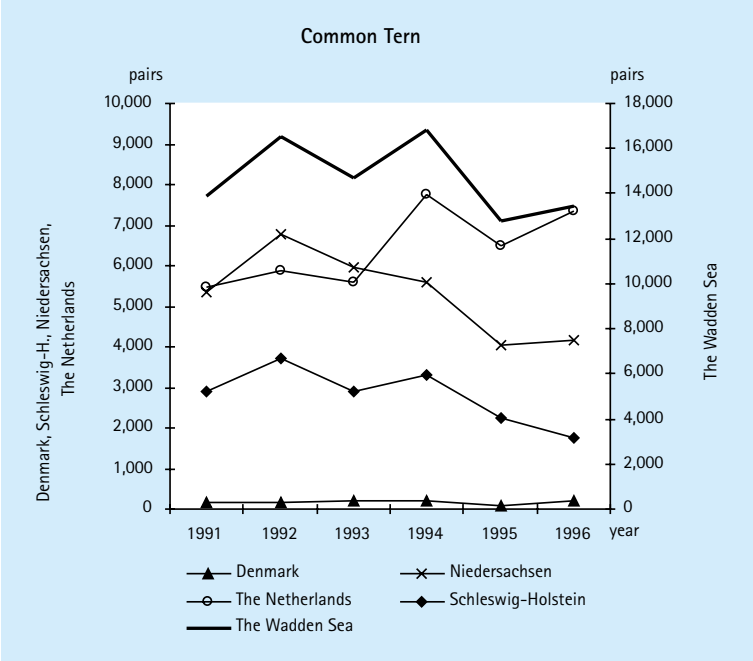


Figure 64: Number of pairs of Common Tern in the four countries and in the entire Wadden Sea from 1991 to 1996.

In Niedersachsen, the population peaked in 1992 but dropped thereafter by almost 40%. The decrease was reflected in most areas in Niedersachsen, but especially pronounced in the Elbe estuary (Hullen, Scharhörn). Reasons for this decline are difficult to find. Feeding ecology seems of great importance in this respect, the availability of small fish prey during poor weather conditions can be a limiting factor (see discussion in Südbeck et al. 1998, Thyen et al. 1998). Declining suitable breeding habitats in young dune and salt marshes, due to coastal protection measures and predation in some colonies, may have accelerated decreases in Common Tern numbers in Niedersachsen.

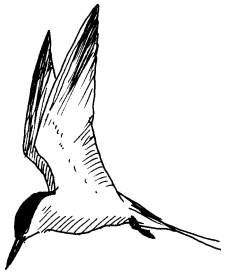
The very important colony on Trischen, holding 73% of the Schleswig-Holstein total, declined from 2,125 pairs in 1991 to only 380 pairs in 1996. Common Terns from Trischen resettled on the Neufelder Vorland on the northern shore of the Elbe estuary, where the population increased from 339 in 1991 to 1,341 in 1995. The decline on Trischen is probably associated with a series of years with very poor breeding success, because of nest competition with and predation by the larger species of gulls on the island (Hälterlein 1996, Südbeck & Hälterlein 1997). In 1993-1995, this colony produced no young because of predation by gulls in combination with limited food supply (Becker et al. 1997).

In Schleswig-Holstein and Niedersachsen, the numbers of Common Terns declined during the period 1991-1996. The Dutch increase matched the decrease in Niedersachsen, and it seems likely that these areas exchange individuals. The declining colonies of Schleswig-Holstein were not compensated for elsewhere, hence, overall there has been a small decline in the total Wadden Sea numbers.

In Denmark, the population is comparatively small. The most important colony on Mandø (up to 143 pairs) showed large annual variations but seems to have increased over the period 1991-1996.

Predation by mammals and larger gulls can locally be important as, for example, on Trischen (Hälterlein 1996, Becker et al.1997). Disturbance by humans at some sites can exacerbate this effect (Südbeck et al. 1998). Human disturbance is probably a major factor influencing the distribution of the colonies (Hüppop & Hüppop 1995), since most colonies are now in nature protected areas. A long-term study in Niedersachsen found that concentrations of many common pollutants in eggs of Common Terns was generally low in the Wadden Sea, and had significantly declined from 1981 to 1996 except for DDE (Becker et al. 1998).

The Common Tern is the only common colony nesting species, which bred in increasing numbers on the mainland coast during the period



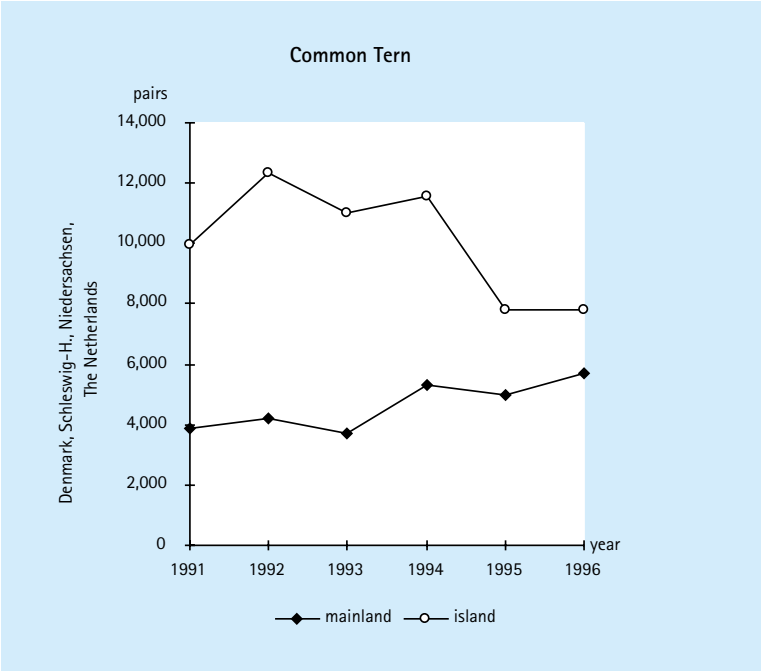


Figure 65: Number of pairs of Common Tern breeding on mainland or island sites respectively from 1991 to 1996.

1991-1996. The decline in overall numbers of Common Terns is matched by the growth in the Arctic Tern population. The reasons for the differences in population trends in these species may relate to the different feeding ecology: Arctic Terns generally take greater amounts of invertebrate food, for example shrimps *Crangon crangon*, which allows them to compensate for a lower supply or availability of small fish stocks (Südbeck et al. 1998, Stienen & Brenninkmeijer 1998a, Becker et al. 1997). The limited number of sites protected as breeding areas for this species may restrict numbers breeding in the Wadden Sea, but at least locally the present population size might also be limited by the food availability (Stienen & Brenninkmeijer 1998a).

Arctic Tern

Sterna paradisaea

NL: Noordse Stern **D: Küstenseeschwalbe** **DK: Havterne**

Status 1991: **5,586 pairs**
Status 1996: **8,955 pairs**
Red List status: **VU**

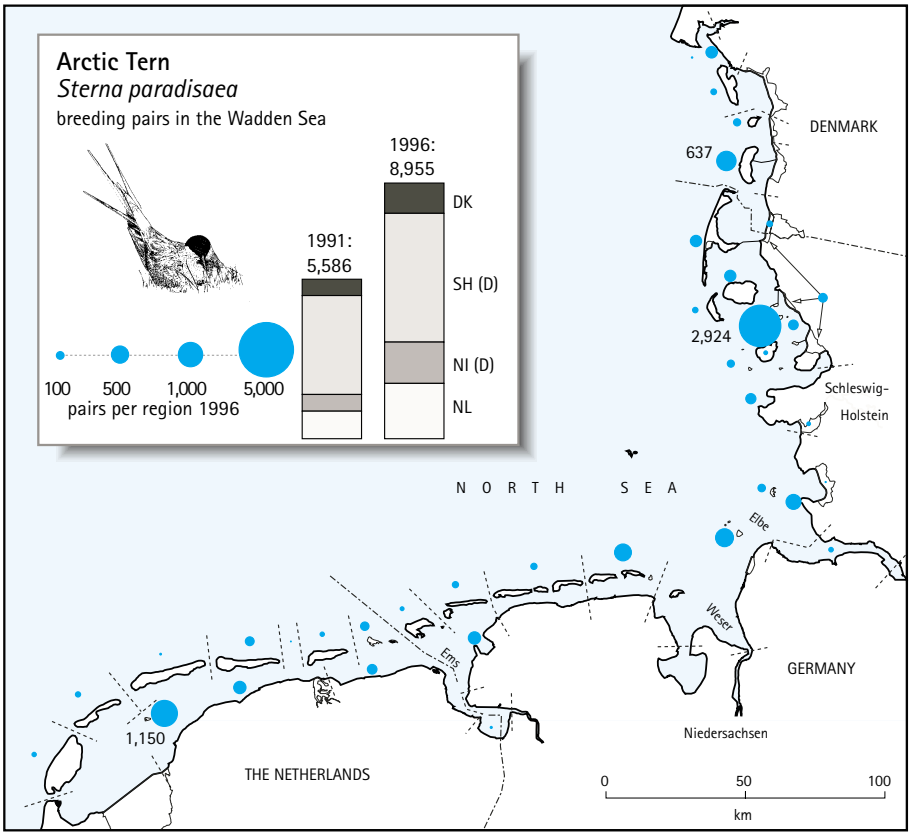


Figure 66: Breeding distribution of Artic Tern in the regions of the Wadden Sea, 1996.

Distribution

The Arctic Tern primarily breeds on islands along the entire Wadden Sea coast. In contrast to the Common Tern, the Wadden Sea north of the Elbe supports most of the total population. About 20% of the Arctic Terns that bred in 1996 were in colonies on the mainland. Arctic Terns do not breed south of the Wadden Sea except for a small population in the Dutch Delta area (Meininger et al.1996). In all, there were only 37 pairs in The Netherlands outside the Wadden Sea area in 1996 (Koks & Hustings 1998).

Coverage

Concerning confusion with the Common Tern see chapter Common Tern, coverage. In Denmark, there was incomplete coverage on Rømø in 1993 and 1994.

Population development

As mentioned for the Common Tern there were some methodological problems in separating the two species in mixed colonies. However, it is considered that the general population trend for the Arctic Tern during the period 1991-1996 is not affected by these problems.

During the period 1991-1996, the population increased by 41%. This increase occurred in all parts of the Wadden Sea. Numbers on the mainland were stable or increased while island populations expanded in most areas, especially west of the Elbe in Niedersachsen and The Netherlands. Hence, recent increases can be seen as an extension to range or an increase in areas close to the edge of the distribution range.

In The Netherlands, the colony on Griend grew from 410 pairs in 1991 to 1,150 pairs in 1996,

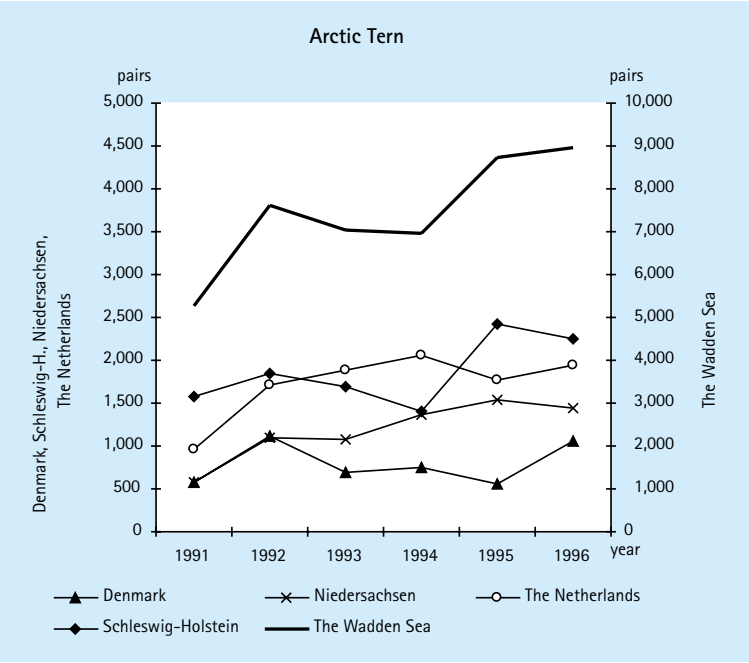


Figure 67: Number of pairs of Arctic Tern in the four countries and in the entire Wadden Sea from 1991 to 1996.

Figure 68: Number of pairs of Arctic Terns breeding on mainland or island sites respectively from 1991 to 1996.

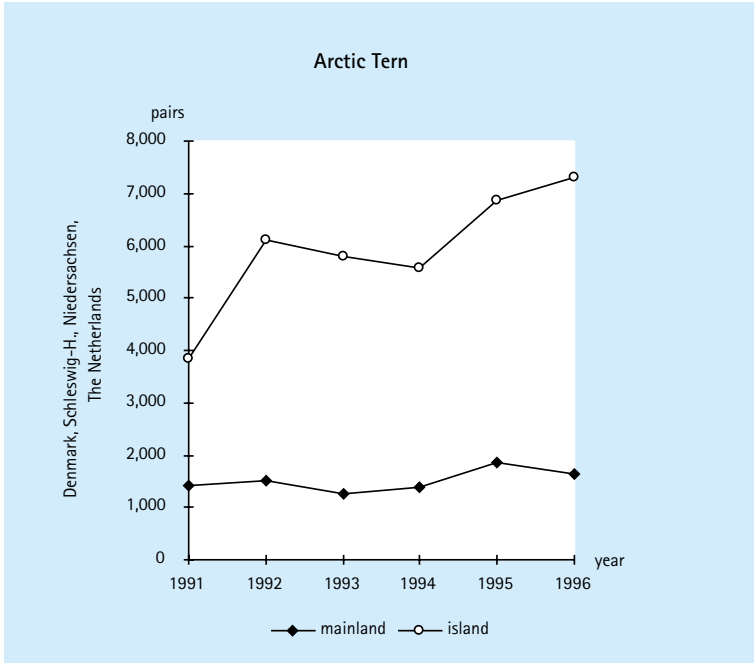
and there were increases on Ameland and on the mainland coast. Numbers decreased only on Texel and Rottummeroog, and only slightly increased on the mainland coast of Friesland and Groningen.

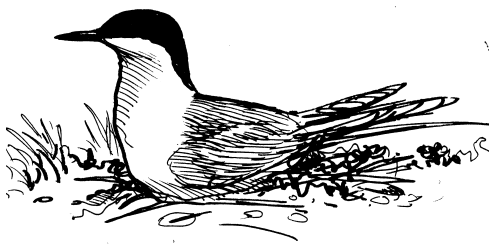
In Niedersachsen, numbers increased in the two regions holding most Arctic Terns: Spiekeroog / Wangerooge / Minsener Oog and Scharhörn. In the Leybucht, favorable breeding conditions have been created in the course of embankment activities. This colony is only expected to persist a short while due to succession of vegetation. Numbers have recovered to their levels in the early 1980s after a decrease during the 1980s to less than 600 pairs (Behm-Berkelmann & Heckenroth 1991).

In Schleswig-Holstein, numbers on the Halligen doubled during the period 1991-1996, but elsewhere numbers decreased, especially on Trischen.

In Denmark, there have been large fluctuations in the breeding numbers. On Rømø, for example, 396 pairs established a colony on the beach in 1996, and this colony was not established the following year. In 1996, 60% of the breeding Arctic Terns in the Danish part of the Wadden Sea where found on Rømø. Large annual variations were typical in all parts of the Danish Wadden Sea, except on Langli.

Most of the existing Arctic Tern colonies are in protected areas. Outside these areas the Arctic Tern population in the Wadden Sea is threatened by activities such as human disturbance and lack of suitable breeding sites. Coastal protection works that restrict geomorphological processes and sand transport on the islands also restrict natural creation of new potential nesting areas. Predation, pollution and food supply may locally also limit breeding numbers.





Little Tern

Sterna albifrons

NL: Dwergstern **D: Zwergseeschwalbe** **DK: Dværgterne**

Status 1991: **661 pairs**
Status 1996: **983 pairs**
Red List status: **EN, IRR**

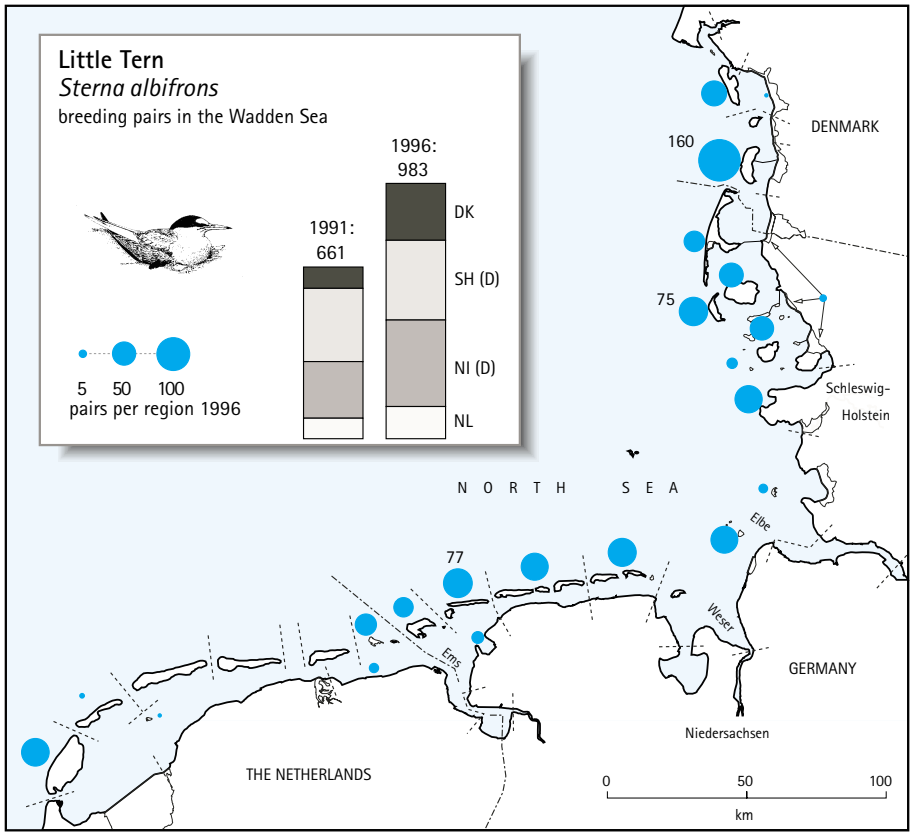


Figure 69: Breeding distribution of Little Tern in the regions of the Wadden Sea, 1996.

Distribution

Little Terns breed primarily on sandpits, beaches and primary dunes on the islands but may also use artificial habitats near harbors and in newly embanked areas. Only 11% of the population bred on mainland sites in 1996. The species was absent from several large islands in the Dutch Wadden Sea. The nesting habitat was quite similar to that of the Kentish Plover, but the Little Tern is more widely distributed. Most colonies number 10 to 20 pairs, and usually not more than 50 pairs. The colonies are often exposed to a high level of disturbance from recreational activities.

Population development

In The Netherlands, more than half of the Wadden Sea population breeds on Texel, and the increase in numbers of Little Terns here are partly due to improved protection measures (Witte 1997). There are no breeding pairs on Vlieland, Terschelling and Ameland where suitable breeding habitat is available, but public pressure on potential breeding habitat is high (Koks & Hustings 1998).

In Schleswig-Holstein and Niedersachsen, several colonies are protected from disturbance, a feature thought to contribute to the increase in numbers since the mid 1980s on islands such as Juist, Langeoog and Sylt (Potel et al.1998, Hälterlein 1996, Flore 1997). The western German Wadden Sea seems to be an important post-breeding area for this species. In Niedersachsen, up to 2,100 Little Terns where counted at nocturnal roosting sites in August 1994 (Flore & Baumann 1998). These birds may have originated from breeding grounds in the Wadden Sea or the Baltic

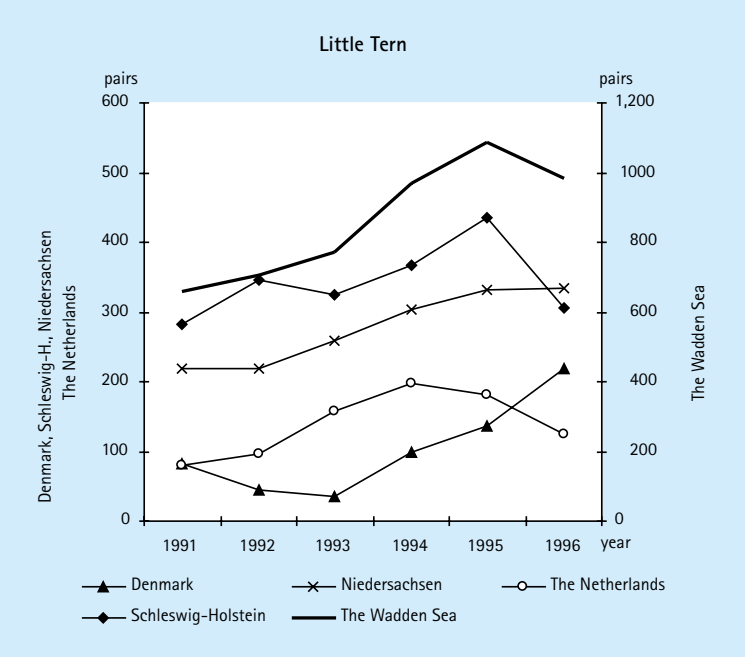


Figure 70: Number of pairs of Little Tern in the four countries and in the entire Wadden Sea from 1991 to 1996.

Sea. Similar counts of non-breeders have not been done in other areas of the Wadden Sea.

In Denmark, trends in numbers are not known from Rømø before 1991-1996. Numbers varied very much here, but were probably underestimated in 1991 (three pairs) and some birds where probably missed here in 1992. But there is no doubt that the numbers increased significantly with the implementation of better protection of colonies on the beach from 1994 onwards.

In the Wadden Sea as a whole, the number of Little Terns increased during the period 1991-1996. Highest numbers were recorded in 1995 when 1,085 pairs bred in the Wadden Sea. Protection of colonies from disturbance throughout the Wadden Sea is a priority for the future. Tourism seems to be the single most important negative factor for the species because it blocks the use of potential breeding sites (Flore 1997, 1998).

Breeding sites in these dynamic habitats are often used for very few years, or even just a single year, depending on erosion or deposition after winter storms, hence a substantial part of the population seems to move annually between sites. On Rømø, the number increased in 1995. Birds were maybe displaced from the northern Schleswig-Holstein and benefited from better protection.

It is important to continue and improve protection measures, but the same flexible strategy is required as mentioned for Kentish Plover. In suitable areas, where Little Terns d not breed, sufficiently large undisturbed areas should be protected. This protection should be combined with information campaigns to inform visitors.

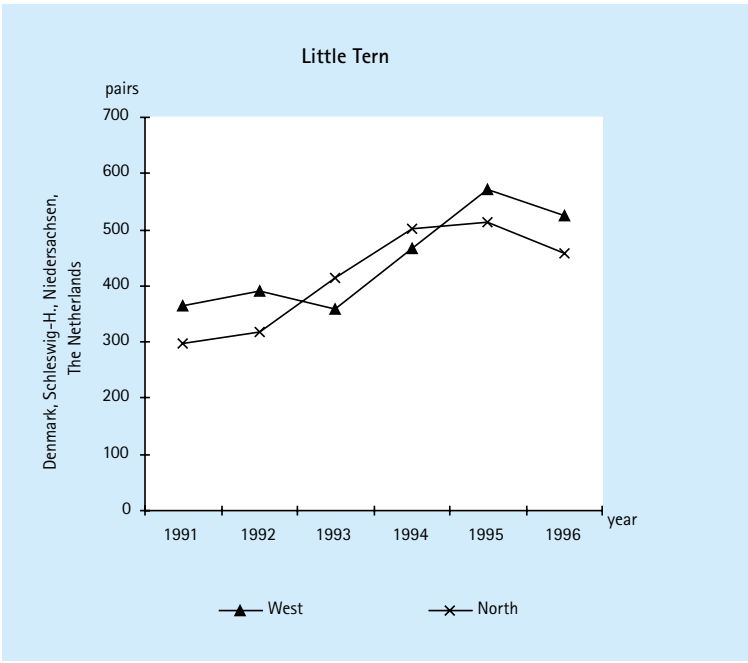


Figure 71: Number of pairs of Little Tern breeding on sites in the West and the North respectively from 1991 to 1996.

Short-eared Owl

Asio flammeus

NL: Velduil **D: Sumpfohreule** **DK: Mosehornugle**

Status 1991: **59 pairs**
Status 1996(a): **113 pairs**
Status 1996(b): **114 pairs**
Red List status: **EN**

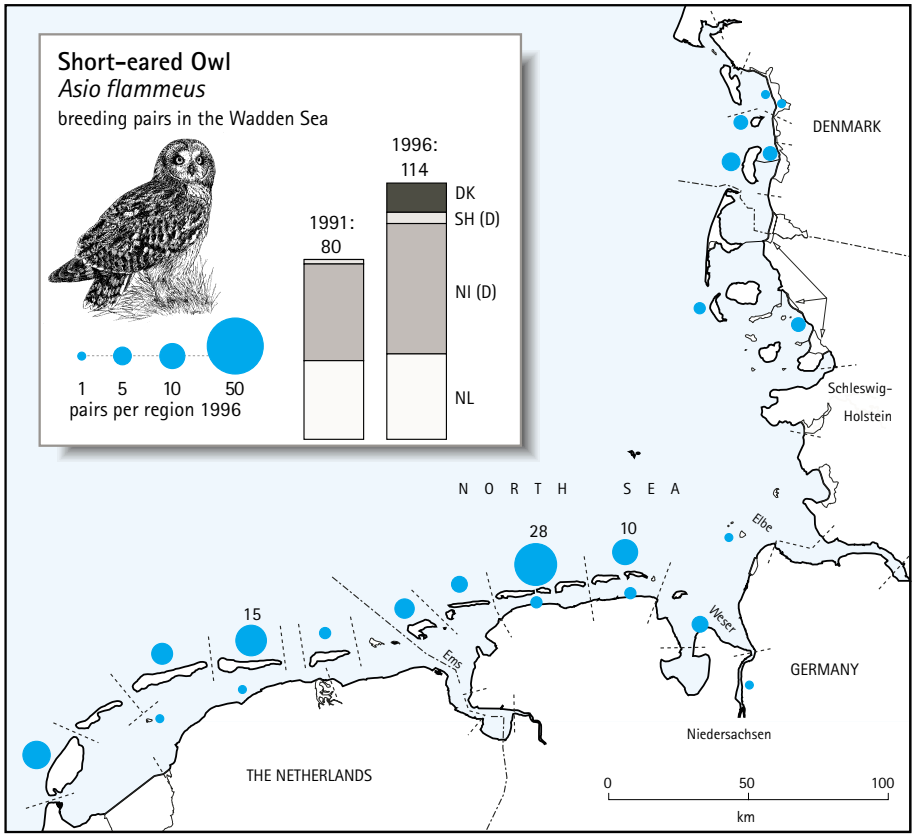


Figure 72: Breeding distribution of Short-eared Owl in the regions of the Wadden Sea, 1996.

Habitat

The breeding habitat on the islands is mainly open ungrazed areas in dunes or heather adjacent to large open permanent grassland or salt marshes. On the mainland, ungrazed salt marshes and set-a-side fields are also used. On Schiermonnikoog (as elsewhere in the Wadden Sea), island-nesting birds are observed flying to the mainland to feed, because voles are not found on the island (Broekhuizen et al.1992).

Distribution

Short-eared Owl breed regularly on the Friesian island west of the Elbe. In the northern Wadden Sea, breeding is more irregular. The largest numbers are found on Ameland in The Netherlands. Mainland breeding occurs in smaller numbers. In 1996, 85% of the pairs bred on the islands.

The distribution is closely related to the food supply. In the Wadden Sea, voles *Microtus arvalis* and *M. agrestis* are the dominant prey (Koks & Hustings 1998, Fleet et al. 1994). An exception is the breeding pair of Griend, where waders form an important food supply. Also in Niedersachen, the Short-eared Owl has been observed as predator of young ones of Common Terns and adult waders (Sudmann et al. 1994).

Population size and development

In the 1991 census, the recorded numbers were low. This was probably a poor breeding year. Ameland held 40-60% of the Dutch Wadden Sea

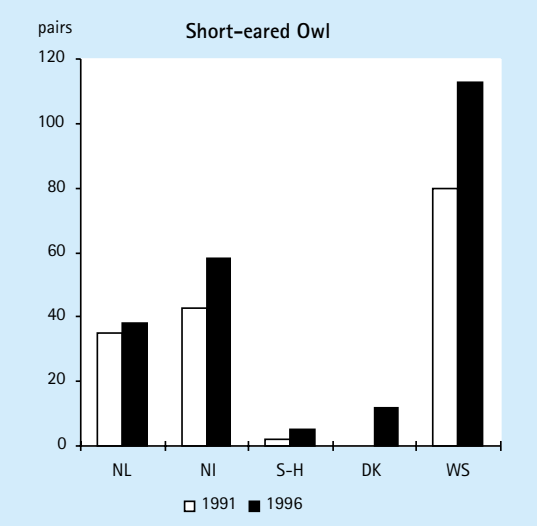


Figure 73: Number of pairs of Short-eared Owl in the four countries and in the entire Wadden Sea (WS) in 1991 and 1996.

population during the period 1990-1996 (Koks and Hustings, 1998). The population here varied in the period between 11 and 35 pairs (Versluys et al. 1997). On Ameland, 21 pairs bred in 1991 (not 11 pairs as previously published by Fleet et al. 1994). The 1991 population has been adjusted accordingly. The population of Short-eared Owl fluctuates greatly from year to year according to the abundance of voles (Versluys et al. 1997). This is also the case in the northern Wadden Sea (Grell 1998).

In the salt marshes of the Friesian coast, a pair bred in 1996 (Feddema & Kuipers 1996), although 1996 was not a good year for voles in The Netherlands.

In Niedersachsen, numbers increased from 46 to 57 pairs during the period 1991-1996.

In Denmark, the 1996 population was much higher than in the previous years due to high numbers of mice that season (Grell 1998). During the period 1991-1995, only one to three pairs were found on Mandø. In the 1980s, the most important breeding site was on Rømø, but breeding is probably irregular here. The few Danish sites with most regular breeding Short-eared Owls in Denmark are all found in the Wadden Sea.

The Wadden Sea is of increasing importance for the Short-eared Owl population of the Wadden Sea countries. The mainland populations have seriously decreased mainly due to habitat destruction of mires, fens and heather and conversion of grassland into arable land (Grell 1998, Südbeck & Hälterlein 1999). In the Wadden Sea, important threat factors are disturbance on the breeding grounds (dunes), habitat loss and predation. Nevertheless, due to diet flexibility and on ability to use young birds as alternative food sources, the Short-eared Owl seems to be able to compensate for their fluctuating small mammal food supply better in the Wadden Sea than in other parts of the range. This might be a key factor to explain the better conservation status of the species in the Wadden Sea compared to other regions. Nevertheless, large fluctuations in numbers occur in the Wadden Sea as well, which may reflect large-scale changes in year-to-year distribution of the Short-eared Owl in northwestern Europe (Hagemeijer & Blair 1997).

4. Discussion

Population Size Estimates

To assess the international importance of breeding birds of the Wadden Sea, the 1996 populations are compared with the national population estimates of the Wadden Sea countries and those of northwestern Europe (namely: Belgium, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Norway, Poland, Russia around the Gulf of Finland and Kaliningrad, Sweden, Switzerland and United Kingdom).

The sources of the population estimates used here are in The Netherlands: Koks & Hustings (1998), van Dijk et al. (1998); Germany: Witt et al. (1996); Denmark: Grell (1998); Northwestern Europe: Hagemeijer & Blair (1997); Rose & Scott (1997), van Dijk et al. (1998). Estimates in Rose & Scott (1997) are given as individuals and when comparing the populations in pairs, it is calculated that breeding populations hold three times as many individuals as breeding pairs.

The accuracy of the population estimates varies between the species, being best for colony breeding species such as the Great Cormorant, Eurasian Spoonbill and for terns. Estimates for northwestern Europe are average values in case of an estimation range.

The 1996 survey confirms the outstanding significance of the breeding bird fauna of the Wadden Sea. For 22 species, the Wadden Sea holds more than 1% of the northwestern European populations (Appendix C). For twelve of these species, the Wadden Sea holds more than 5% of the total northwestern European populations and these should be considered as species on the red list of the Wadden Sea, for which the area has special responsibility (Rasmussen et al. 1996).

Holding more than 50% of the northwestern European population, the Wadden Sea is of crucial importance for the Gull-billed Tern, Eurasian Spoonbill and the Avocet. The entire northwest European population of Gull-billed Tern now breeds in the Wadden Sea. Other nearest breeding grounds are in the Mediterranean (Hagemeijer & Blair 1997). The Eurasian Spoonbill has become increasingly important in recent years after the collapse of important mainland colonies in The Netherlands. The Avocet still has a very large population in the Wadden Sea despite a recent negative trend.

Assessment

This chapter assesses the significance of the Joint Monitoring Program for Breeding Birds in the Wadden Sea and the results of this, the second report of a total count of breeding birds, as well as the results of the first six years of annual counts of colony breeding species in the Wadden Sea.

The results of the 1996 total survey were considerably more comprehensive than the first total survey in 1991. Important here is the improved coverage and the formulation and standardization of survey methods, which have been agreed trilaterally and implemented since 1995 (Hälterlein et al. 1995). The new methods, at least for some species, have led to higher numbers of breeding birds, which are considered more reliable, based on comparison between these and the earlier methods (Hälterlein 1996). In this way we are more confident about basic data now available on breeding bird populations in the Wadden Sea. This has been one of the most important aims of the program since the beginning, a prerequisite for effective nature conservation monitoring and a vital basis for the development and implementation of conservation management measures.

Both complete surveys in 1991 and 1996 were influenced by unfavorable weather conditions. In 1991, very low temperatures in May and a high precipitation rate in June led to reduced numbers of birds being counted. Many potential breeders could not be counted because they did not breed at all. The breeding season in 1996 suffered from unfavorable weather conditions mainly because of the severe and dry winter before. This year was characterized by low numbers of meadow bird

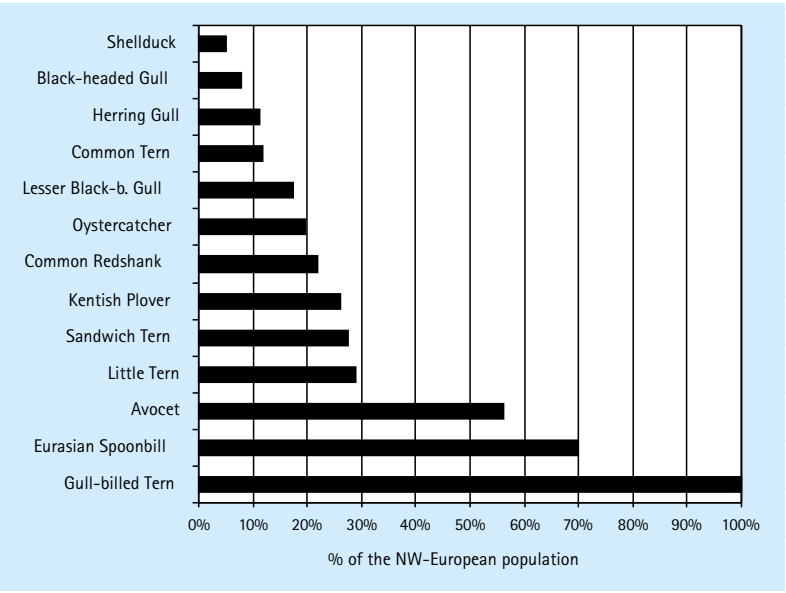


Figure 74: Species breeding in the Wadden Sea in 1996 holding more than 5% of the northwest European population (Common Redshank* population of Tringa totanus totanus).

species and an increased winter mortality for those species wintering in the Wadden Sea, such as the Oystercatcher and a bad food supply, especially benthos (Thyen et al. 1998). Despite the shortcomings of the earlier lack of common methods and the weather conditions in the two seasons of 1991 and 1996, it would appear that most Wadden Sea breeding species are showing rather increasing than decreasing trends.

For the colony breeders, it is possible to document regional changes in the distribution of breeding birds in the Wadden Sea in a way that is only feasible through international collaboration. Total overall counts can be influenced by international Wadden Sea and local/regional effects. The case of the Sandwich Tern clearly demonstrates that short and long-term changes in the overall breeding numbers can only be understood if all colonies in the Wadden Sea are annually monitored, using the same techniques. Despite annual fluctuations in different parts of the Wadden Sea the total population has been increasing. The Black-headed Gull and Common Tern showed opposite trends in Niedersachsen and The Netherlands but showed almost stable population trends in the Wadden Sea, despite large regional changes in the western part.

The data from this report demonstrates that exchange of breeding individuals can take place to a large extent across national borders and even with populations outside the Wadden Sea. It emphases that co-ordinated monitoring is necessary to provide explanations for local changes in bird numbers. The results of the census show that the breeding bird populations are a commonly shared resource that needs common protection.

Issues of Concern

The most important issues of concern raised by the results of the survey from the overall TMAP-program in this report can be summarized as follows:

Climate change

Due to the recent initiation of the program, changes in climatic conditions have yet to become evident in breeding bird numbers. Predicted first effects are likely to be a reduction factor of the breeding success, especially in low laying salt marshes, due to increased rates of tidal inundation. Hence, breeding success is not monitored within this program. Further steps would be changes of the distribution range for some species.

Fisheries

Fisheries for shrimps, mussels and fish produce huge amounts of discard, most of which is eaten by gulls (Garthe 1996). The population trends during the period 1991 to 1996 for gulls are almost all stable or increasing. The most significant increase in terms of numbers occurred in the population of Lesser Black-backed Gulls that increased by 115% from about 17,000 to 37,000 in a six-year period. In contrast the population of Herring Gulls was reduced considerably in the western Wadden Sea. Lesser Black-backed Gulls profit, to a large extent, from fishery activities far off the coast, which has supported a larger population in recent years (Garthe et al. 1999).

There are no regulations aimed at reducing the bycatch of shrimp fisheries, in which the quantity of the bycatch normally exceeds the target catch. Therefore, many scavenging birds have access to a large additional food supply because of the current shrimp fishery activities. Zones free of shrimp fishery are still very small and restricted especially in the western Wadden Sea, and this fishery will therefore continue to influence the breeding gull populations.

An important outcome from the results of the survey is the Oystercatcher decline in The Netherlands in contrast to the rest of the Wadden Sea. This points to the very serious local impact of the Dutch mussel fishery on the food supply of Oystercatchers which probably has also affected the Eider as well (Hulscher et al. in press., Smit et al. 1998).

Disturbance

The Wadden Sea is of considerable importance for recreational activities, most of which are concentrated on the beaches and in the dunes. It is to be expected that those species depending on these habitats show the greatest relationship with such activities. The level of disturbance is likely to be the single most important factor determining the population size and distribution of the Kentish Plover, Little Tern and Great Ringed Plover. Other colony breeding birds suffer from intensive tourism as well. The main factor seems to be direct loss of suitable breeding habitats, but increasing predation rates as a consequence of disturbance due to human activity can be a problem as well. The serious declines in numbers of the Kentish and the Great Ringed Plover demonstrate the potential effects of threats. In the western parts of the Wadden Sea, the Kentish Plover and Little Tern have especially small populations, which gives cause for concern.

Species breeding in dynamic habitats nowadays have only limited access to newly created natural habitats. Artificial coastal management restricts the geomorphological processes on the

islands that inhibit the creation of primary dunes and sand spits, which are their normal breeding sites. Therefore, to protect these species, human activities, which may disturb birds on breeding sites, may be banned by denying access to potential sites, and thus not restrict the creation of new breeding habitat.

To simply protect the geomorphological dynamics of the islands is an appropriate measure to safeguard a number of the most sensitive breeding bird species. The population of Little Tern increased for the first time in decades possibly as a response to improved protection of the habitat. Specific colonies can be protected by various measures such as fencing, wardening and public information, but despite such measures, the numbers especially in the western Wadden Sea, still seem to be very low. For the Kentish Plover, the situation has become acute in the last few years, as the relatively large populations established in the embanked areas (especially in Schleswig-Holstein) have declined as a result of natural vegetation succession processes. However, these birds are unable to find suitable alternative breeding habitats on beaches due to human activities on potential breeding sites as a result of tourism. The more dispersed breeding Great Ringed Plover needs more space on the beaches and the primary dunes, to be protected effectively. Therefore, it is important to create disturbance free breeding areas in suitable and potential primary habitats to allow for the species to retain natural breeding populations.

Agriculture

Large parts of the Wadden Sea ecosystem are subject to agricultural use, including salt marshes, polders and wetlands behind the dikes. Therefore, the nature and intensity of agriculture is an important factor affecting locally the breeding bird numbers. This is of increasing importance within the Wadden Sea, because the ecological function of inland agricultural areas is degrading. So the salt marsh habitat of the Wadden Sea is of increasing importance for typical meadow birds, such as the Northern Lapwing, Black-tailed Godwit and the Redshank. However, species depending on terrestrial feeding in habitats with traditional farming practices such as the Ruff and Dunlin are declining internationally and are also declining in the Wadden Sea.

Within the Co-operation Area the Dunlin and Ruff are seriously threatened with extinction. Appropriate agricultural management of salt marshes and the grassland behind the dikes belonging to the Co-operation Area could improve the protection status of these two species. The developments in the newly reclaimed areas show that nature restoration behind the dikes can be achieved successfully and conditions can be improved for the meadow birds. So far, protection of the Wadden Sea has mainly focussed on the marine habitats. However, there is a growing responsibility for the protection of meadow birds, and it is becoming clear that the protection of terrestrial habitats needs a higher priority.

In general, the conditions for breeding birds on the mainland are less suitable than on the islands. Most of the populations have decreased along the mainland coast. The colony breeding species suffer from increasing predation, especially from foxes. Non-colony breeding waders are under pressure from intensified agriculture in many areas. The cessation of grazing on salt marshes has contributed to a considerable increase in Redshank numbers, a species, which has lost large areas of inland habitat due to intensification of agriculture. The Common Redshank has shown a remarkable increase in areas in Niedersachsen and Schleswig-Holstein where grazing has been reduced or ceased.

Evaluation of existing protection measurements

In the last five-year period, some conservation measures have been successful in terms of increasing population sizes. Among these, the protection of colonies (Little Tern, Arctic Tern, Eurasian Spoonbill), the appropriate management of the protection of salt marshes in the German Wadden Sea (Redshank), and the reduction of pollutants (Common Tern, Sandwich Tern) have been discussed in the species accounts.

Conclusions and recommendations

It is concluded that:

- the report confirms the outstanding significance of the breeding bird fauna of the Wadden Sea. The Wadden Sea is of great importance for a number of coastal species supporting large proportions of the northwestern European breeding populations;
- for some colony breeding species, the data presented in this report show that exchange of breeding individuals takes place, to a large extent, across borders and even with populations outside the Wadden Sea;
- species that use mudflats as feeding habitat, such as the Common Redshank and Oystercatcher, are generally stable or increasing (except Oystercatcher in the westernmost Wadden Sea). The fact that the Dutch Oystercatchers show different trends to those in the rest of the Wadden Sea acts as warning signal for the state of the Wadden Sea ecosystem in that region;
- most species dependent on terrestrial feeding in habitats with traditional farming practices are declining;
- for the populations of Ruffs and Dunlins, the declines are alarming, and protection measures are necessary to prevent the Dunlin and Ruff, from becoming extinct as breeding birds in the Wadden Sea;
- for wader species, breeding in agricultural areas, like the Northern Lapwing and Black-tailed Godwit, the Wadden Sea is of increasing importance;
- this report proves a sound basis of ecological data relating to breeding birds in the Wadden Sea upon which conservation priorities and actions in the area can be based;
- the data emphasize that the breeding bird populations represent a commonly shared resource that needs common protection;
- for several species, protection measures could improve breeding conditions.

It is recommended that:

- the financial and organizational support to continue the survey and processing of data as a long-term monitoring program should be ensured in all the countries. The required effort to support the data handling and analysis will increase with increasing amounts of data as well as the increasing demands of the overall TMAP (Trilateral Monitoring and Assessment Program);
- a breeding success program under the TMAP should be implemented to obtain knowledge about breeding success and mortality which is essential in order to understand the dynamics of individual species in the ecosystem and to be able to explain the observed trends;
- to better understand the distribution patterns and trends of breeding birds in the Wadden Sea, this information should be combined with the results of the future monitoring of a number of parameters such as fishery, farming practice, tourism, habitat distributions, pollutants in birds eggs etc.;
- additional information should be provided on the mortality of different age groups of the breeding birds and on numbers and distributions in wintering grounds in the Wadden Sea and along the migration routes. For most species, these data are only fragmentary at the moment. Studies of these parameters would provide additional information for the interpretation of the bird monitoring in the Wadden Sea;
- co-ordinated protection measures, especially directed towards the Dunlin and Ruff, should be taken immediately to prevent these two species from becoming extinct as breeding birds in the Wadden Sea in the near future;
- disturbance-free breeding areas should be created in suitable and potential primary habitats to allow for the Little Tern, Kentish and Great Ringed Plover to retain natural breeding populations;
- more research should be carried out to understand the effects which the fisheries for shrimps, mussels and fishes have on the relative abundance of gulls, terns and Oystercatchers especially in the western Wadden Sea.

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Appendix A

Breeding Bird Numbers in the Wadden Sea 1996

Number of breeding pairs in 56 regions (see Figure 1) of the entire Wadden Sea.

Oversigt over antallet af ynglefugle i 56 regioner (se Fig. 1) i hele Vadehavet i 1996.

Anzahl der Brutpaare in 56 Regionen (s. Fig. 1) des gesamten Wattenmeeres.

Het aantal vastgestelde paren van de projectsoorten in 56 regio's (Figuur 1) in de internationale Waddenzee in 1996.

	Region	Great Cormorant	Eurasian Spoonbill	Shelduck	Common Eider	Red-breasted Merganser	Hen Harrier	Oystercatcher	Avocet	Great Ringed Plover	Kentish Plover
1	Texel	0	169	194	175	0	23	2,195	174	29	1
2	Vlieland	126	160	100	2,135	0	8	525	24	2	4
3	Griend	0	0	17	36	3	0	300	0	12	13
4	Terschelling	0	116	264	3,517	0	39	2,688	86	20	16
5	Ameland	0	11	495	377	0	15	2,128	125	12	8
6	Engelsmansplaat-Rif	0	0	0	0	0	0	9	0	0	0
7	Schiermonnikoog	0	121	166	541	0	6	336	7	2	6
8	Rottumeroog R. Plaat	0	0	55	1,742	0	1	256	12	6	6
9	Noord Hollandse Kust	0	4	8	0	0	0	363	560	21	9
10	Friese Kust	0	0	57	8	0	0	1,285	1,719	24	1
11	Groningse Kust	140	0	53	43	0	0	1,376	1,252	25	7
12	Dollard-Aussenems	0	0	24	0	0	0	96	496	6	0
	Dutch Wadden Sea total	**266**	**581**	**1,409**	**8,574**	**3**	**92**	**11,461**	**3,959**	**153**	**71**
12	Dollard-Aussenems	0	0	12	0	0	0	62	20	4	0
13	Leybucht	0	0	16	0	0	0	490	871	38	6
14	Borkum-Lütje Hörn	128	0	149	120	0	7	1,634	110	16	10
15	Juist-Memmert	15	8	79	109	0	5	1,087	56	10	12
16	Norderney-Baltrum-Langeoog	0	0	517	1	0	20	3,865	146	31	6
17	Norderland-Harlingerland	0	0	84	0	0	0	330	3	3	7
18	Elisabeth-Aussengroden	0	0	36	0	0	0	182	36	21	1
19	Spieker./Wanger./Minsener Oog	0	0	349	72	0	6	2,383	79	46	9
20	Mellum	60	3	79	150	6	2	560	0	11	0
21	Aussjade	0	0	12	0	0	0	36	0	7	1
22	Jadebusen	0	0	75	0	0	0	262	199	40	0
23	Butjadingen	0	0	24	0	0	0	65	13	8	0
24	Wurster Küste	308	0	1	0	0	0	254	28	35	0
25	Neuwerk-Scharhörn	61	0	62	1	0	0	574	2	21	3
26	Elbe Estuary Niedersachsen	0	0	60	0	0	0	245	82	16	0
55	Ems	0	0	27	0	0	0	77	544	0	0
56	Weser	0	0	19	0	0	0	25	2	1	0
	Niedersachsen total	**572**	**11**	**1,601**	**453**	**6**	**40**	**12,131**	**2,191**	**308**	**55**
26	Elbe Estuary Schleswig-Holstein	0	0	9	0	0	0	166	110	2	0
27	Wetlands in Dithmarschen	0	0	231	0	0	1	1,338	94	21	5
28	Salt Marshes Dithmarshen	0	0	47	0	0	0	1,540	910	4	16
29	Trischen	0	0	60	3	0	0	439	0	27	2
30	Eider Estuary	0	0	36	0	0	0	590	82	14	0
31	Nordstrand polders	0	0	30	0	0	0	385	10	1	0
32	Outer sands in Nordfriesland	0	0	0	0	0	0	39	0	2	0
33	Wetlands in Eiderstedt	0	0	2	0	0	0	21	15	0	0
34	Wetlands in Nordfriesland	0	0	131	21	6	0	1,061	515	182	104
35	Salt Marshes in Eiderstedt	0	0	91	0	0	0	1,700	312	68	191
36	Salt Marshes in Nordfriesland	0	0	90	2	1	0	1,171	483	25	1
37	Halligen	0	0	110	83	9	0	4,997	295	98	3
38	Pellworm	0	0	308	0	0	0	2,871	30	16	0
39	Amrum	0	0	100	570	10	0	600	68	12	0
40	Föhr	0	0	127	0	2	0	2,163	44	21	0
41	Sylt	0	0	160	2	1	4	671	226	75	16
	Schleswig-Holstein total	**0**	**0**	**1,532**	**681**	**29**	**5**	**19,752**	**3,194**	**568**	**338**
42	Margrethe Kog wetland-Koldby	0	0	24	4	2	0	304	196	21	1
43	Rejsby-Ballum Salt Marshes	0	0	16	12	0	0	248	3	33	0
44	Ribe-Darum Salt Marshes	0	0	37	15	0	0	106	153	40	0
45	Ho Bugt coast Skallingen	0	0	0	0	0	2	87	0	54	0
46	Langli	0	0	12	59	0	0	141	24	5	0
47	Fanø	0	0	0	3	0	1	241	36	63	16
48	Mandø	0	0	0	301	0	0	1,086	21	12	0
49	Rømø-Jordsand	0	0	33	5	1	2	342	67	51	40
50	Tøndermarsken	0	0	9	0	0	0	143	72	1	0
51	Ballummarsken	0	0	0	0	0	0	50	15	10	0
52	Rejsby- og Brønsmarsken	0	0	0	0	0	0	48	0	20	0
53	Ribe- og Tjæreborgmarsken	0	0	21	1	0	0	122	190	22	0
54	Varde Ådal	0	0	4	0	0	0	2	0	0	0
	Denmark total	**0**	**0**	**156**	**400**	**3**	**5**	**19,752**	**777**	**332**	**57**
	Wadden Sea Total	**838**	**592**	**4,698**	**10,108**	**41**	**142**	**63,096**	**10,121**	**1,361**	**521**

	Region	Northern Lapwing	Dunlin	Ruff	Snipe	Black-tailed Godwit	Eurasian Curlew	Common Redshank	Turnstone	Mediterranean Gull	Little Gull	Black-headed Gull
1	Texel	1,220	0	0	6	410	99	353	0	0	0	1,220
2	Vlieland	23	0	0	1	0	64	23	0	0	0	5
3	Griend	0	0	0	0	0	0	15	0	0	0	22,500
4	Terschelling	588	0	0	3	369	190	571	0	0	0	1,370
5	Ameland	533	0	0	3	209	140	268	0	0	0	2,526
6	Engelsmansplaat-Rif	0	0	0	0	0	0	0	0	0	0	0
7	Schiermonnikoog	37	0	1	2	81	0	102	0	0	0	884
8	Rottumeroog R. Plaat	0	0	0	0	0	0	3	0	0	0	86
9	Noord Hollandse Kust	12	0	0	0	0	0	15	0	1	0	4,464
10	Friese Kust	199	0	0	0	115	0	280	0	1	1	7,532
11	Groningse Kust	17	0	0	0	1	0	682	0	1	1	16,240
12	Dollard-Aussenems	43	2	0	0	11	0	511	0	0	0	126
	Dutch Wadden Sea total	**2,629**	**0**	**1**	**15**	**1,185**	**493**	**2,312**	**0**	**3**	**2**	**56,827**
12	Dollard-Aussenems	34	0	0	1	12	0	113	0	0	0	0
13	Leybucht	93	0	0	0	94	0	385	0	0	0	666
14	Borkum-Lütje Hörn	202	0	0	12	57	33	84	0	0	0	1,749
15	Juist-Memmert	32	0	0	2	2	8	54	0	0	0	5,167
16	Norderney-Baltrum-Langeoog	305	0	0	8	118	42	266	0	0	0	9,373
17	Norderland-Harlingerland	43	0	0	0	17	0	94	0	0	0	0
18	Elisabeth-Aussengroden	40	0	0	0	4	0	810	0	0	0	0
19	Spieker./Wanger./Minsener Oog	136	0	0	1	52	4	236	0	0	0	13,815
20	Mellum	0	0	0	0	0	0	50	0	0	0	18
21	Aussjade	31	0	0	0	4	0	32	0	0	0	0
22	Jadebusen	143	0	0	8	28	2	813	0	0	0	210
23	Butjadingen	42	0	0	0	8	0	94	0	0	0	30
24	Wurster Küste	240	0	0	1	3	0	283	0	0	0	0
25	Neuwerk-Scharhörn	25	0	0	0	0	0	28	0	0	0	3,329
26	Elbe Estuary Niedersachsen	543	0	5	6	221	0	295	0	0	0	337
55	Ems	267	0	0	8	187	0	202	0	0	0	1,969
56	Weser	116	0	0	4	61	0	90	0	0	0	0
	Niedersachsen total	**2,292**	**0**	**5**	**51**	**868**	**89**	**3,929**	**0**	**0**	**0**	**36,663**
26	Elbe Estuary Schleswig-Holstein	46	0	0	3	8	0	94	0	0	0	730
27	Wetlands in Dithmarschen	882	0	15	0	181	0	374	0	0	0	29
28	Salt Marshes Dithmarshen	146	0	0	0	1	0	430	0	0	0	2,186
29	Trischen	0	1	0	0	0	0	171	0	1	0	7,450
30	Eider Estuary	217	0	20	6	53	0	193	0	0	0	346
31	Nordstrand polders	220	0	0	0	0	0	50	0	0	0	0
32	Outer sands in Nordfriesland	0	0	0	0	0	0	0	0	0	0	0
33	Wetlands in Eiderstedt	11	0	0	0	4	0	11	0	0	0	171
34	Wetlands in Nordfriesland	730	3	26	8	142	0	425	0	0	0	1,938
35	Salt Marshes in Eiderstedt	58	5	0	3	11	0	794	0	0	0	3,626
36	Salt Marshes in Nordfriesland	141	0	3	0	17	0	866	0	0	0	3,527
37	Halligen	65	0	4	0	1	0	533	2	0	0	7,368
38	Pellworm	260	0	0	0	24	0	225	0	0	0	30
39	Amrum	40	0	0	1	0	1	40	0	0	0	171
40	Föhr	696	0	0	24	48	0	131	0	0	0	1,696
41	Sylt	429	0	0	34	150	0	291	0	0	0	1,555
	Schleswig-Holstein total	**3,941**	**9**	**68**	**79**	**640**	**1**	**4,628**	**2**	**1**	**0**	**30,823**
42	Margrethe Kog wetland-Koldby	24	0	0	0	1	0	14	0	0	0	100
43	Rejsby-Ballum Salt Marshes	73	1	0	0	1	0	315	0	0	0	2
44	Ribe-Darum Salt Marshes	84	2	0	0	1	0	209	0	0	0	11
45	Ho Bugt coast Skallingen	78	0	0	30	0	0	153	0	0	0	12
46	Langli	6	0	0	0	0	0	6	0	0	0	2,926
47	Fanø	291	7	0	211	0	21	215	0	0	0	0
48	Mandø	166	0	0	0	22	0	92	0	0	0	277
49	Rømø-Jordsand	275	18	0	150	62	28	187	0	0	0	756
50	Tøndermarsken	417	0	5	13	97	0	117	0	0	0	81
51	Ballummarsken	555	0	0	15	42	0	59	0	0	0	0
52	Rejsby- og Brønsmarsken	106	0	0	4	2	0	24	0	0	0	0
53	Ribe- og Tjæreborgmarsken	373	0	3	36	24	0	57	0	1	0	4,578
54	Varde Ådal	26	0	0	41	0	0	6	0	0	0	0
	Denmark total	**2,474**	**28**	**8**	**500**	**252**	**49**	**1,455**	**0**	**1**	**0**	**8,743**
	Wadden Sea Total	**11,336**	**37**	**82**	**645**	**2,945**	**632**	**12,324**	**2**	**5**	**2**	**133,056**

	Region	Common Gull	Lesser Black-b. Gull	Herring Gull	Gr. Black-b. Gull	Gull-billed Tern	Sandwich Tern	Common Tern	Arctic Tern	Little Tern	Short-eared Owl
1	Texel	1,437	7,013	6,503	0	0	0	102	32	71	12
2	Vlieland	815	1,180	4,942	1	0	2	135	46	2	0
3	Griend	19	5	38	0	0	5,600	1,700	1,150	1	1
4	Terschelling	264	9,568	7,684	0	0	0	58	5	0	7
5	Ameland	238	168	2,523	0	0	0	152	132	0	15
6	Engelsmansplaat-Rif	0	0	0	0	0	0	0	1	0	0
7	Schiermonnikoog	496	3,340	7,092	0	0	276	255	32	0	2
8	Rottumeroog R. Plaat	82	427	4,358	0	0	226	405	121	42	0
9	Noord Hollandse Kust	529	2	2	0	0	0	3,449	0	0	0
10	Friese Kust	0	0	218	0	0	1	557	258	0	1
11	Groningse Kust	1	9	150	0	0	0	529	157	8	0
12	Dollard-Aussenems	4	0	0	0	0	0	13	4	0	0
	Dutch Wadden Sea total	**3,881**	**21,712**	**33,510**	**1**	**0**	**6,105**	**7,342**	**1,934**	**124**	**0**
12	Dollard-Aussenems	0	0	0	0	0	0	0	3	0	0
13	Leybucht	3	0	0	0	0	0	6	259	13	0
14	Borkum-Lütje Hörn	251	157	3,216	0	0	0	37	25	35	6
15	Juist-Memmert	158	2,648	3,873	0	0	2,370	121	65	77	4
16	Norderney-Baltrum-Langeoog	742	1,216	4,779	0	0	0	95	66	68	28
17	Norderland-Harlingerland	0	0	0	0	0	0	0	0	0	2
18	Elisabeth-Aussengroden	0	0	0	0	0	0	0	0	0	2
19	Spieker./Wanger./Minsener Oog	921	3,729	3,828	0	0	266	2,324	484	73	10
20	Mellum	166	2,000	13,500	0	0	0	2	0	0	0
21	Aussjade	0	0	0	0	0	0	0	0	0	0
22	Jadebusen	0	0	0	0	0	0	186	0	0	0
23	Butjadingen	0	0	12	0	0	0	0	0	0	4
24	Wurster Küste	0	0	0	0	2	0	0	0	0	0
25	Neuwerk-Scharhörn	11	58	985	0	0	519	1,382	545	67	1
26	Elbe Estuary Niedersachsen	102	0	16	0	0	0	0	0	0	0
55	Ems	0	1	1	0	0	0	0	0	0	0
56	Weser	0	0	0	0	0	0	0	0	0	1
	Niedersachsen total	**2,354**	**9,809**	**30,210**	**0**	**2**	**3,155**	**4,153**	**1,447**	**333**	**58**
26	Elbe Estuary Schleswig-Holstein	0		0	0	41	0	490	35	0	0
27	Wetlands in Dithmarschen	25	0	0	0	0	0	3	2	0	0
28	Salt Marshes Dithmarshen	13	0	0	0	18	0	172	380	0	0
29	Trischen	85	982	4,783	3	0	4,382	380	95	6	0
30	Eider Estuary	5	0	13	0	2	0	7	23	0	0
31	Nordstrand polders	0	0	0	0	0	0	0	0	0	0
32	Outer sands in Nordfriesland	0	0	26	0	0	0	0	86	10	0
33	Wetlands in Eiderstedt	0	0	0	0	0	0	1	0	0	0
34	Wetlands in Nordfriesland	54	5	302	2	2	0	155	127	4	0
35	Salt Marshes in Eiderstedt	31	4	440	0	1	0	44	176	69	0
36	Salt Marshes in Nordfriesland	91	7	348	1	2	0	6	157	0	3
37	Halligen	1,031	31	2,337	5	0	2,601	401	2,924	51	0
38	Pellworm	0	0	3	0	0	0	5	24	0	0
39	Amrum	1,225	4,700	2,200	0	0	3	25	50	75	2
40	Föhr	81	2	70	0	0	0	64	215	53	0
41	Sylt	196	10	326	1	6	0	0	216	39	0
	Schleswig-Holstein total	**2,837**	**5,741**	**10,848**	**12**	**72**	**6,986**	**1,753**	**4,510**	**307**	**5**
42	Margrethe Kog wetland-Koldby	14	0	51	0	0	0	57	54	0	0
43	Rejsby-Ballum Salt Marshes	0	0	0	0	0	0	0	0	0	3
44	Ribe-Darum Salt Marshes	0	0	0	0	0	0	0	0	1	1
45	Ho Bugt coast Skallingen	0	0	0	0	0	0	0	3	0	0
46	Langli	1,168	27	1,742	0	2	1,039	0	224	0	0
47	Fanø	12	0	1	0	0	0	0	55	58	0
48	Mandø	138	5	437	2	0	0	143	87	0	3
49	Rømø-Jordsand	34	0	449	0	10	0	0	637	160	5
50	Tøndermarsken	0	0	0	0	0	0	14	0	0	0
51	Ballummarsken	0	0	0	0	0	0	0	0	0	0
52	Rejsby- og Brønsmarsken	0	0	0	0	0	0	0	0	0	0
53	Ribe- og Tjæreborgmarsken	0	0	2	0	0	0	1	0	0	1
54	Varde Ådal	0	0	0	0	0	0	0	0	0	0
	Denmark total	**1,366**	**32**	**2,682**	**2**	**12**	**1,039**	**215**	**1,060**	**219**	**13**
	Wadden Sea total	**10,438**	**37,294**	**77,250**	**15**	**86**	**17,285**	**13,463**	**8,951**	**983**	**76**

Appendix B

Colony Breeders in the Wadden Sea 1991–1996

The annual number of pairs of colony breeding species in the regions of the entire Wadden Sea in the period of 1991 to 1996.

Det årlige antal par af koloniynglende fugle i perioden 1991 til 1996 i regionerne i hele Vadehavet.

Jährliche Bestandsgröße von koloniebrütenden Vogelarten 1991 bis 1996 in den einzelnen Regionen des gesamten Wattenmeeres.

Het aantal broedparen van kolonie broedvogels in de periode 1991-96 in de afzonderlijke regio's in de internationale Waddenzee.

	Cormorant						Spoonbill					
Region	1991	1992	1993	1994	1995	1996	1991	1992	1993	1994	1995	1996
1							114	111	116	116	127	169
2				7	77	126	53	74	75	92	103	160
3												
4							47	56	75	78	65	116
5										2	2	11
6												
7							3	13	21	22	47	121
8										1		
9										1	1	4
10												
11	12	32	94	142	135	140						
12	12	31	30	54								
13												
14			30	46	167	128						
15					13	15					5	8
16												
17												
18												
19												
20	5	44	53	66	57	60						3
21												
22												
23												
24	245	263	220	292	313	308						
25				37	103	61						
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49				11	3							
50												
51												
52												
53												
54												
55												
56												
Total	**274**	**370**	**427**	**655**	**868**	**838**	**217**	**254**	**287**	**312**	**350**	**592**

	Avocet						Kentish Plover					
Region	1991	1992	1993	1994	1995	1996	1991	1992	1993	1994	1995	1996
1	113	*	42	157	161	174	1			2		1
2	3	*	32	37	9	24	2				1	4
3		*							4		7	13
4	55	*	479	38	69	86	12		1	19	15	16
5	77	*	75	64	95	125	2			2	10	8
6		*										
7	22	*	25	29	1	7	13		8	14		6
8		*		1	6	12	6		10	8	5	6
9	406	*	556	614	246	560	17		13	14	9	9
10	3,012	*	1,759	1,545	1,539	1,719			1	1		1
11	1,897	*	1,364	1,834	1,795	1,252	3		2	1	3	7
12	57	40	47	14	69	516	2	2	8	1	2	
13	1,115	1,030	958	973	812	871	1	8	8	6	7	6
14	155	43	119	141	70	110	3	2	11	13	14	10
15	27	15	21	63	80	56	13	7	17	18	15	12
16	149	175	226	215	204	146	2	2	4	6	10	6
17	54	25	17	15	13	3			2	3	5	7
18	45	165	134	228	173	36	6	8	7	1	2	1
19	36	82	78	91	49	79	20	9	16	16	16	9
20		13					2		4	1	2	
21							2	2	1	1	1	1
22	247	245	177	144	200	199	1	1				
23	24	17	20	18	24	13						
24		14	5	17	20	28	2	1		1	1	
25						2	13	8	8	5	3	3
26	309	404	470	363	319	192	4	4	7	2		
27	250	155	50	22	253	94	55	7	5	2	5	5
28	357	787	470	998	902	910	8	15	28	26	27	16
29							2			1		2
30	148	290	206	153	71	82	1	2	1			
31						10						
32												
33	10	7	7	12	15	15		2	1		1	
34	785	1,151	781	1,112	1,325	515	122	260	291	310	275	104
35	351	386	316	381	535	312	207	213	243	175	235	191
36	757	755	727	700	860	483	4	3	9	3	2	1
37	201	158	94	135	121	295	3	3	3	2		3
38	27	16	35	14	22	30						
39	18	9	28	48	72	68	2	2		1	2	
40	43	40	29	37	60	44						
41	107	71	73	87	108	226	14	2	2			16
42	302	197	482	248	226	196	2				3	1
43	248	100	18	2		3						
44	336	32	23	38	191	153						
45	2		1		3					1	1	
46	13	31	18	20	52	24						
47	205	165	37	99	11	36	10			19	21	16
48	14	14	12		6	21						
49	13	19		34	7	67	10	18	22	15	19	40
50						72						
51					13	15						
52												
53			15			190						
54												
55	27	37	327	466	551	544		2	1	1		
56					1	2	1					
Total	**12,017**	**6,688**	**10,353**	**11,207**	**11,359**	**10,617**	**568**	**583**	**738**	**691**	**719**	**521**

	Mediterranean Gull						Little Gull					
Region	1991	1992	1993	1994	1995	1996	1991	1992	1993	1994	1995	1996
1	1	1		2								
2					1							
3												
4	1	3	1									
5												
6												
7												
8												
9						1					1	
10						1			1	2		1
11						1	1			3	3	1
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26				5	3							
27												
28												
29						1						
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42								1				
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53						1						
54												
55												
56												
Total	**2**	**4**	**1**	**7**	**4**	**5**	**1**	**1**	**1**	**5**	**4**	**2**

	Black-headed Gull						Common Gull					
Region	1991	1992	1993	1994	1995	1996	1991	1992	1993	1994	1995	1996
1	8,200	8,428	6,109	6,474	3,109	1,220	1,126	1,485	1,215	854	896	1,437
2	50	35	50	22	2	5	473	650	600	413	399	815
3	22,000	21,000	16,000	25,500	24,500	22,500	5	23	15	19	26	19
4	2,857	2,836	2,557	2,558	1,875	1,370	313	342	130	226	201	264
5	159	130	172	702	1,291	2,526	130	163	165	193	283	238
6												
7	148	197	95	45	385	884	256	582	478	358	337	496
8	9	5	8	36	48	86	88	91	102	114	112	82
9	7,133	8,161	5,347	5,156	4,867	4,464	104	87	150	266	456	529
10	22,590	16,450	13,424	12,242	7,853	7,532						
11	14,946	13,437	7,286	12,357	13,341	16,240	1	3	4	4	10	5
12	19	16	22	20		126						
13	2,695	1,913	1,997	1,249	469	666			4	4	1	3
14	2,929	2,040	4,917	1,673	1,204	1,749	32	93	178	117	150	251
15	1,938	3,028	4,293	3,991	3,837	5,167	93	184	204	184	180	158
16	7,175	9,886	8,887	9,616	8,023	9,373	386	429	489	802	581	742
17	2				2							
18	2				2							
19	5,496	6,360	9,523	10,788	10,422	13,815	216	273	905	366	613	921
20	100	25	40	30	8	18	180	122	224	220	270	166
21												
22	376	387	397	246	362	210	1	1	1			
23	27	40	35	49	47	30						
24												
25	2,140	2,380	2,968	2,912	3,072	3,329	2	2	1	5	6	11
26	4,333	1,938	4,768	4,350	4,658	1,067	60	77	75	172	95	102
27	1,450	3			5	29	66	20	14	7	4	25
28	3,883	3,771	3,258	2,202	2,571	2,186	10	10	11	13	15	13
29	4,200	5,000	7,080	7,350	7,640	7,450	90	91	87	97	87	85
30	418	565	59	124	284	346	2	5	3	2	2	5
31												
32							1	1	3			
33	627	521	265	315	124	171						
34	2,036	2,425	1,630	1,627	1,420	1,938	8	15	22	41	92	54
35	2,485	3,015	2,113	2,631	2,311	3,626	13	15	27	39	7	31
36	2,512	1,834	2,044	5,315	3,288	3,527	92	95	103	96	178	91
37	7,893	7,025	6,821	5,585	6,569	7,368	525	560	679	709	855	1,031
38	50	47	113	275	73	30	2			1	1	
39	78	298	520	512	43	171	964	422	620	1,302	1,120	1,225
40	2,465	2,210	2,102	1,268	1,422	1,696	52	56		303	107	81
41	1,323	923	1,164	1,003	1,354	1,555	72	97	112	154	120	196
42	446	1,196	547	94	60	100	4	8	9	9	12	14
43	138		2			2						
44	2,254	700	860	1,280	3,219	11						
45	700				92	12	7				2	
46	56	609	1,697	2,261	2,170	2,926	614	632	918	1,020	1,051	1,168
47	536	605	500	111			56	45	33	30	17	12
48	141	769		150	153	277	35	65	50	30	181	138
49	579	848	30	122	212	756	39	174	5	12	14	34
50		24				81						
51												
52												
53						4,578						
54												
55						1,969						
56												
Total	139,594	131,080	119,700	132,241	122,387	133,182	6,118	6,918	7,636	8,182	8,481	10,442

	Lesser Black-backed Gull						Herring Gull					
Region	1991	1992	1993	1994	1995	1996	1991	1992	1993	1994	1995	1996
1	678	187	1,877	422	3,529	7,013	8,878	11,135	10,162	3,541	6,385	6,503
2	1,007	1,050	1,000	248	745	1,180	9,907	8,000	8,500	257	2,466	4,942
3				2	3	5	7	30	30	136	102	38
4	10,200	11,469	13,350	12,312	12,761	9,568	12,585	13,791	14,880	14,032	11,614	7,684
5	50	106	109	141	180	168	3,440	3,550	2,558	2,620	2,413	2,523
6												
7	1,428	1,941	2,271	4,001	825	3,340	5,175	5,496	5,415	6,230	2,867	7,092
8	219	212	260	290	392	427	6,705	6,627	5,781	5,682	5,227	4,358
9		1		1	3	2	5		2	8	2	2
10							82	253	296	310	290	218
11	3	1	8	13	9	9	184	150	165	145	91	150
12												
13										1		
14	30	22	144	93	123	157	1,085	1,475	2,061	2,088	2,804	3,216
15	1,013	1,104	1,220	3,000	4,222	2,648	12,607	11,632	11,281	7,221	5,429	3,873
16	315	606	1,326	1,646	2,293	1,216	5,851	6,951	7,120	7,913	6,006	4,779
17							4					
18												
19	846	407	2,434	2,097	5,409	3,729	2,341	3,800	4,108	4,617	5,225	3,828
20	120	215	114	170	1,831	2,000	10,000	10,000	12,100	12,100	13,464	13,500
21												
22							15	19	19	19		
23							14	13	14	2	22	12
24												
25	5	13	23	24	26	58	392	356	615	599	891	985
26							8	17	17	6	6	16
27	1						655	11			2	1
28							4	21	1	1	39	
29	260	420	783	783	966	982	2,500	3,110	5,065	4,360	4,490	4,783
30							122	43	5	15	15	13
31												
32					5		3	40	1		32	26
33								1	1	7		
34					2	5	41	91	136	233	251	302
35			1	4	7	4	44	39	20	408	301	440
36		1	2	2	5	7	353	311	321	263	296	348
37	13	16	21	25	23	31	2,091	2,474	2,241	2,522	3,148	2,337
38							1			8	1	3
39	1,181	1,400	3,300	3,987	5,996	4,700	2,247	1,444	1,520	2,660	3,092	2,200
40				10	13	2	11	17	12	105	79	70
41	6	8	6	12	8	10	321	305	395	312	381	326
42							19	16	5	36	42	51
43												
44								1			1	
45							3				1	
46	3	7	8	10	25	27	911	1,049	1,098	1,594	1,748	1,742
47	2	3					400	475	350	20		1
48				4	3	5	31	130	235	300	398	437
49							535	636	607	510	417	449
50												
51												
52												
53												2
54												
55												
56												
Total	**17,380**	**19,189**	**28,257**	**29,297**	**39,404**	**37,293**	**89,577**	**93,509**	**97,137**	**80,881**	**80,038**	**77,250**

	Great Black-backed Gull						Gull-billed Tern					
Region	1991	1992	1993	1994	1995	1996	1991	1992	1993	1994	1995	1996
1												
2						1						
3												
4												
5												
6												
7												
8												
9												
10												
11				1	1							
12												
13							1					
14												
15					1							
16												
17												
18												
19												
20					1							
21												
22												
23												
24										1	1	2
25												
26							15	43	50	42	48	41
27	1						7					
28											2	18
29	1		1	1	4	3						
30												2
31												
32					2							
33												
34			1	1	1	2		1		5	5	2
35					2							1
36						1						2
37		1				5	1					
38												
39												
40		1										
41					1	1	2			1		6
42							1				2	
43			1									
44												
45												
46	1	1	2	1	1						2	2
47		1										
48	2	2	2	5	2	2	1	10	12		5	
49	1	2						9	1	3	4	10
50												
51												
52												
53												
54												
55												
56												
Total	**6**	**8**	**7**	**9**	**16**	**15**	**28**	**63**	**63**	**52**	**69**	**86**

	Sandwich Tern						Common Tern					
Region	1991	1992	1993	1994	1995	1996	1991	1992	1993	1994	1995	1996
1	750						142	149	82	202	155	102
2						2	84	90	130	55	82	135
3	7,000	6,600	7,600	8,300	8,100	5,600	1,900	2,200	2,500	3,300	2,600	1,700
4			140				36	130	42	44	158	58
5							30	43	41	45	81	152
6												
7					119	276	120	73	67	78	24	255
8						226	231	181	233	369	288	405
9							1,018	1,701	1,378	2,154	1,853	3,449
10						1	1,195	570	634	944	634	557
11							694	730	497	580	596	529
12							21			15	11	13
13							63	30	55	32	13	6
14		1		1			8	23	77	54	38	37
15	320	250	200	700	1,071	2,370	489	410	216	113	151	121
16							80	85	121	212	88	95
17												
18												
19	1,458	620	878	1,777	1,038	266	2,284	2,646	2,129	2,270	1,878	2,324
20							25	40				2
21								1	1	1		
22							235	264	188	226	193	186
23							2					
24												
25	1,200	1,100	974	474	991	519	1,800	2,903	2,868	2,510	1,493	1,382
26							339	503	558	1,028	1,341	490
27										1		3
28							12	62	15	34	50	172
29	1,540	3,773	3,682	4,261	3,200	4,382	2,125	2,900	2,050	1,930	340	380
30							48	83	41	15	10	7
31												
32										1		
33							8	15	6	6		1
34							48	149	141	174	172	155
35							127	24	35	1	36	44
36							9	21	12	23	48	6
37	4,705	3,900	3,264	2,600	2,500	2,601	357	237	265	122	244	401
38										1	5	5
39	8	8	2	3		3	27	32			18	25
40		1					136	89	98	123	131	64
41							7	5	3	1	9	
42							62	40	124	56	44	57
43												
44											2	
45							7				1	
46		71	78	568	350	1,039		1	1	1	3	
47							3					
48							37	100	81	120	24	143
49							50	11		14	3	
50												14
51												
52												
53												1
54												
55												
56												
Total	**16,981**	**16,324**	**16,818**	**18,684**	**17,369**	**17,285**	**13,859**	**16,541**	**14,689**	**16,855**	**12,817**	**13,476**

	Arctic Tern						Little Tern					
Region	1991	1992	1993	1994	1995	1996	1991	1992	1993	1994	1995	1996
1	109	66	16	63	35	32	32	66	75	142	103	71
2	11	25	40	21	35	46	2		6		2	2
3	410	800	1,100	1,200	1,000	1,150	23					1
4	2		27	2	2	5			1	1	3	
5	26	68	4	47	212	132		2				
6				5	6	1						
7	6	28	8		18	32		1				
8	129	263	214	235	125	121	19	28	64	48	71	42
9							3		8	2		
10	218	394	394	388	244	258						
11	54	68	73	96	94	157			3	4	3	8
12	5	10				7		2		2	2	
13	32	65	92	98	91	259			1		1	13
14	5	2	27	48	49	25	39	30	49	57	45	35
15	84	126	200	295	246	65	58	59	72	76	100	77
16	70	182	57	83	71	66	54	54	29	64	48	68
17		1	1									
18												
19	156	234	325	418	581	484	52	56	69	79	88	73
20								2				
21												
22	2	1	1	1								
23												
24												
25	210	459	370	416	493	545	15	17	38	26	47	67
26	21	18	13	10	10	35						
27						2						
28	7	83	138	176	436	380			1			
29	250	400	450	280	75	95	10	23	5	5	9	6
30	96	75	59	42	45	23						
31												
32		5	2	1	6	86		1	1		16	10
33				8				1				
34	140	151	119	217	262	127	21	28	25	43	39	4
35	549	227	37	136	283	176	69	66	62	67	99	69
36	290	403	297	172	370	157						
37	1,336	1,764	1,765	1,265	2,791	2,924	26	34	41	46	55	51
38		11	26	26	34	24						
39	30	54			55	50	49	66	62	81	90	75
40	260	144	141	251	222	215	45	25	23	27	36	53
41	207	379	361	222	268	216	62	102	104	99	92	39
42	8	17	34	41	17	54						
43	3											
44	3											1
45						3	41	11		14	25	
46	77	233	213	283	273	224						
47	136	350	40	123	10	55	38	18	6	45	31	58
48	235	267	203	300	164	87						
49	109	250	201	6	99	637	3	15	29	40	80	160
50												
51												
52												
53												
54												
55												
56												
Total	**5,286**	**7,623**	**7,048**	**6,975**	**8,722**	**8,955**	**661**	**707**	**774**	**968**	**1,085**	**983**

Appendix C

The Importance of the Wadden Sea for Breeding Birds

The actual Number of 31 bird species in the Wadden Sea in 1996 compared with the estimated numbers of breeding pairs in the three Wadden Sea countries and Northwest Europe and their international importance.

Antallet af 31 arter af ynglefugle i Vadehavet sammenlignet med bestandsvurderinger i de tre lande i Vadehavet og i Nordvesteuropa samt Vadehavets internationale betydning.

Bestandsgröße von 31 Vogelarten des Wattenmeeres im Vergleich zu Bestandsschätzungen in den drei Wattenmeerstaaten sowie Nordwest-Europas mit Angabe der internationalen Bedeutung.

Het aantal broedparen van de projectsoorten in de drie Waddenzee-landen in 1996 vergeleken met het geschatte aantal broedparen elders in NW-Europa.

Species	Netherlands	Germany	Denmark	NW-Europe	Wadden Sea(b)	Importance	%
Great Cormorant	16,567	14,473	36,000-41,000	85,000	838	+	1
Spoonbill	1,126	11	2	845	592	+++	70
Shelduck	6,000-9,000	3,840-4,270	2,500	100,000	4,982	++	5
Common Eider	10,000	1,305	20,000-24,000	1,000,000	11,534	+	1
Red-breasted Merganser	27	590	2,000-3,000	330,000	41	-	0
Hen Harrier	115-120	63	2-5	8,900	142	+	2
Oystercatcher	88,500-111,000	40,000	7,000-8,000	235,000	46,360	++	20
Avocet	7,100-7,200	6,000	5,000	18,900	10,617	+++	56
Great Ringed Plover	380-390	1,200	2,000	93,000	1,367	+	1
Kentish Plover	330-340	400	50-61	2,000	521	+++	26
European Lapwing	226,000-278,000	80,000-100,000	30,000-50,000	830,000	11,336	+	1
Dunlin*	0-2	30	450	1,000	39	+	4
Ruff	300-400	120-150	300-500	79,000	82	-	0
Common Snipe	2,400-3,100	?	2,500-3,000	72,000	645	-	1
Black-tailed Godwit	78,000-102,000	7,000-8,000	600-800	123,000	2,956	+	2
Curlew	6,900-8,800	4,000-5,000	300	133,000	632	-	0
Common Redshank*	25,700-34,000	10,000-12,000	10,000-15,000	59,000	12,835	++	22
Turnstone	0-3	3	40	18,000	2	-	0
Mediteranean Gull	247	20	0-1	327	5	+	2
Little Gull	6	0-2	0	12,000	2	-	0
Black-headed Gull	162,000	200,000-250,000	150,000	1,700,000	133,182	++	8
Common Gull	6,000	15,000	25,000-30,000	475,000	10,442	+	2
Lesser Black-backed Gull	40,700	16,000	4,400	215,000	37,294	++	17
Herring Gull	34,000	45,000	55,000-58,000	685,000	77,250	++	11
Great Black-backed Gull	6	11	1,500-1,600	107,000	15	-	0
Gull-billed Tern	0	70	15-16	86	86	+++	100
Sandwich Tern	13,171	11,000	4,500	63,000	17,285	+++	27
Common Tern	16,500	12,000	1,000	113,000	13,476	++	12
Arctic Tern	1,850	6,300	8,000-9,000	449,000	8,955	+	2
Little Tern	385	800	400-600	3,400	983	+++	29
Short-eared Owl	35-40	200-500	0-5	?	114	-	

Dunlin*: *Baltic schinzii* population
Common Redshank*: *Tringa totanus totanus*

NW-Europe: Belgium, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, Luxembourg, The Netherlands, Norway, Poland, Russia around Gulf of Finland and Kaliningrad, Sweden, Switzerland and UK.

International importance:
+++ = at least 25% of NW-European population is breeding in the Wadden Sea
++ = 5-25% of NW-European population is breeding in the Wadden Sea
+ = 1-5% of NW-European population is breeding in the Wadden Sea
- = less than 1% of NW-European population is breeding in the Wadden Sea

The sources of the population estimates are: The Netherlands: Koks & Hustings 1998; van Dijk et al. 1998. Germany: Witt et al. 1996. Denmark: Grell 1998. Northwestern Europe: Hagemeijer & Blair 1997; Rose & Scott 1997; van Dijk et al 1998.

Appendix D

List of Field workers, Organizations and Institutions

Liste over deltagere i optællingerne, organisationer og institutioner.

Liste der Mitarbeiterinnen und Mitarbeiter, Organisationen und Institutionen.

Lijst van veldmedewerkers en organisaties.

The Netherlands

Fieldworkers

Theo Bakker, Harry Blijleven, Martin Birkenhäger, Freek Blom, Peter de Boer, C. Boersma, M.T. Boom, Leo Bot, André Boven, Eelco Brandenburg, Allix Brenninkmeier, IJme Brijker, Cees Bruin, Piet de Bruin, Cees Boot, Gerrit Boot, Jan Bunnink, Kees Camphuysen, Hillebrand van Dijk, Jan van Dijk, Klaas van Dijk, Koen van Dijken, Adriaan Dijksen, Lieuwe Dijksen, mevr. Drijver, Eddie Douwma, Piet Duiven, Edwin van Egmond, Hans Eikhoudt, Ricus Engelmoer, Fokko Erhart, Jaap Feddema, Marten Geertsema, Fred Geldermans, Rob Halff, Jan Harthoorn, Dik Heg, W. van der Heide, Trinus Hek, L. Hemrica, H. Hiemstra, H. Horstman, Harry Horn, Hans Hut, Justin Jansen, Jan de Jong, Joop de Jong, Oene de Jong, D. Imhoff, Giny Kasemir, Leon Kelder, Richard Kiewiet, Henk Koffijberg, Kees Koffijberg, Pim. de Kock, Ben Koks, Laurens van Kooten, Eduard Koopman, Mark Koopmans, Anton Kraus, Johan Krol, Gerrit Krottje, Dirk Kuiper, Robert Kuipers, D. Lautenbach, Gradus Lemmen, Date Lutterop, Dirk Maas, Frank Majoor, Jan Mey, Harry Miedema, Hannes Milder, W. Mud, E. Mulder, Bake Mulder, Theo Mulder, Martin Olthoff, A. Oosterdijk, Orangewoud BV, Meindert Otter, Frits Oud, Arie Ouwerkerk, Otto Overdijk, Bert Oving, Wim Penning, Leon Peters, Arnoud van Petersen, Bart Jan Prak, L. de Ree, Richard de Ree, S. Rienks, wijlen Rein Rollingswier, Jan Piet Rijf, Karel Sars, Kees van Scharenburg, Erik Schothorst, Dick Schut, Cor Smit, Harry Smit, Cees Soepboer, Bernard Spaans, E. van der Spek, Aart van der Spoel, W. Spoelstra, J. Sijtsma, Eric Stienen, Maarten Stoepker, Menno van Straaten, Hester Straatsma, Wim Swart, Johan Taal, Auke Talsma, Teun Talsma, Pieter Tepper, Piet van Tienen, Wim Tijsen, Lex Varkevisser, Jan Veen, Dick Veenendaal, Ronnie Veldkamp, Jaap Vink, Jan Vis, Erik Visser, Piet Visser, Kees de Vries, C.A. van der Wal, Tj. Walda, Gerrit Visch, Rob Vogel, Jan Jaap Werkman, Jacob Westerhuis, George Wintermans, Teun de Wit, Giel Witte, Marco Witte, Willem Witte, Jan Zorgdrager, Carl Zuhorn, J. Zuidewind, Christhof Zijm, Mart Zijm, Freek Zwart.

Organisations/Institutions

Wadvogelwerkgroep van de FFF, VWG Texel, Vogelwachten Nes-Buren en Hollum-Ballum, VWG Wierhaven, VWG Den Helder, Staatsbosbeheer, SOVON, Stichting het Noord-Hollands Landschap, It Fryske Gea, Natuurmonumenten, IBN-DLO, Nederlandse Aardolie Maatschappij (NAM), Prof. H.C. van Hall-Instituut te Leeuwarden. Vereniging Avifauna Groningen, Provincie Noord-Holland.

Germany: Niedersachsen

Fieldworkers

P. Adam, L. Adorf, S. Ahlers, J. Albrecht, W. Andresen, U. Appel, L. Bach, P. H. Becker, R. Beckmann, N. Behrmann, B. Berg, G. Berg, H. Besemann, H. Blindow, W. Böckelmann, J. Bocher, F. Bock, I. Bormann, E. Brahms, N. Bruns, G. Busch, G. Cihlars, T. Clemens, H. Culmsee, B. Daehne, G. Dahms, J. Dannemann, J. Djuren, M. v.d. Driesch, M. Eggert, G. Eilers, F. Esser, I. Feldmann, J. Feldmann, M. Fetz, M. Fichtler, W. Fischer, B.-O. Flore, P. Folkens, M. Folkerts, D. Frank, E. Fredrich, K.-R. Freitag, T. Frenzel, L. Frers, D. Friedrichs, J. Fröhling, C. Froitzhuber, E. Fuhrken, J. Furken, H. Garrelts, J. Gebauer, J. Geipel, E. Gentsch, K. Gerdes, S. Gödderz, K. Goslar, K. Grebe, J. Grünig, D. Gueffroy, T. Haase, R. Hadjitarkhani, D. Haese, P. Halve, N. Hampel, G. Hardekopf, E. Hartje, T. Hasse, P. Heimlich, U. Hemmerling, H. R. Henneberg, B. Herhaus, E. Herrmann-Brunke, C. Heuermann, B. Heyen, E. Hicken, M. Hintze, B. Hochfeld, M. Holzweg, F. Hopf, S. Hotes, M. Jacob, K. Jankowski, A. Janssen, C. Jauch, C. Jones, B. Jürgens, K. Jürgens, V. Kahlert, R. Kasten, U. Kasten, P.Kerber, C. Ketzenberg, D. Kirsch, G. Klauberg, H.-W. Klose, J. Knödel, L. Knödl, D. Köllmann, F. Kösters, I. Kolaschnik, M. Kolbe, M. Korsch, J.-C. Kranefeld, G. Kraus, R. Kreja, H. Krethe, M. Kriewen, T. Krüger, L. Krzywanski, R. Kubica, K. Kukatz, I. Latendorf, R. Lau, D. Legler, T. Lehmberg, J. Lempert, M.A. Lessing, J. Leyrer, T. Lissner, T. Lobinger, J. Ludwig,

J.-D. Ludwigs, T. Maren, L. Mayer, T. Meenken, S. Meier, T. Meinrenken, D. Meisel, W. Menger, W. Menke, T. Mennebäck, A. Mensching, U. Meyer, F.-O. Müller, M. Müller, U. Müller, D. Nannen, F. Nannen, N. Neumann, N. Niedernostheide, G. Nikolaus, L. Nilsson, M. Nuss, H. Obendorf, D. Oldenburg, S. Olearius, F. Oltmanns, K. Osburg, W. Pappel, M. Pattmann, K. Pawliczek, M. Petermann, R. Petri, C. Pott, F. Rabenstein, B. Rackoll, E. Raddatz, V. Rahn, F. Rasche, B. Rau, G. Reinders, H. Reiner, D. Renken, M. Reuter, K. Richter, H.-J. Ropers, R. Roth, D.-H. Rückamp, U. Satorius, G. Scheiffarth, W. Schießberg, P. Schmal, E. Schmidt, S. Schmidt, M. Scholze, H.-A. Schoof, R. Schopf, A. Schramm, U. Schramm, W. Schütz, A. Schulz, C. Schwennesen, J. Seehausen, U. Siebolts, G. Stauch, P.J. Stegmann, B. Steinborn, S. Stoepper, J. Teerling, M. Temme, O. Tschetsch, M. Timmermann, B. Trede, T. Trinkl, S. Uhlmann, N. Unger, K. Veentjer, E. Voß, T. Voßhage, U. de Vries, M. Wagner, R. Wahlhäuser, B. Waschkowski, F.-W. Wegener, R. Wehking, J. Weinbecker, G. Wietfeld, G. Wilken, H. Wilkens, S. Wilkens, A. Wilms, S. Wolff, J. Zellerhoff.

Organisations/Institutions

Nds. Landesbetrieb für Wasserwirtschaft und Küstenschutz (NLWK), Betriebsstelle Norden, ehemals: Staatliches Amt für Insel- und Küstenschutz (StAIK), Norden; Verein Jordsand zum Schutz der Seevögel und der Natur e.V.; Der Mellumrat e.V., Oldenburg; Wissenschaftliche Arbeitsgemeinschaft für Natur- und Umweltschutz e.V. (WAU), Jever; Ornithologische Arbeitsgemeinschaft Oldenburg (OAO); Arbeitsgemeinschaft Biologische Station Osterholz, Osterholz-Scharmbeck; Landkreis Stade / Naturschutzstation Unterelbe der Bezirksregiering Lüneburg; Kreisgruppe Unterweser; Naturschutzbund Deutschland Landesverband Niedersachsen.

Germany: Schleswig-Holstein

Fieldworkers

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Organisations/Institutions

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Appendix E

Survey Areas and Coverage in the Wadden Sea 1996

Information about size and coverage of counting sites for breeding birds in the Wadden Sea.

Oplysning om areal og dækning af tælleområderne for ynglefugle i hele Vadehavet.

Übersicht über die Größe und Erfassungsgrad von Brutvogelzählgebieten im Wattenmeer.

Informatie over omvang en dekking van telgebieden voor broedvogels in de Waddenzee.

Region: No. 1 – 56 (see Figure 1)

Coverage:

C = Counted / optalt / gezählt / geteld
P/C = Partly counted / delvist optalt / teilweise gezählt / gedeeltelijk geteld
E = Estimated / estimeret / geschätzt / geschat
0 = Not covered / ikke optalt / nicht gezählt-keine Daten / niet geteld

The Netherlands

Region	Site code	Site name	Size in ha	Coverage
1	11010190	Texe, island	3,191	
1	11010280	Texel, polders	7,500	
1	11010390	Noorderhaaks	350	
2	12020490	Vlieland	801	
2	12020590	Richel	330	
3	12030621	Griend	75	
4	12040790	Terschelling, island	5,538	
4	12040880	Terschelling, polder	1,800	
5	12050990	Ameland	2,677	
5	12051080	Ameland, polders	1,000	
6	12061191	Engelsmanplaat	200	
6	12061290	Rif	50	
7	12071390	Schiermonnikoog	3,279	
8	13081490	Rottumeroog	200	
8	13081591	Rottumerplaat	600	
9	11091650	Afsluitdijk	100	
10	11101710	Friesland	2,572	
10	12101850	Lauwersmeer	4,972	
11	13111910	Groningen	903	
11	13112010	Punt van Reide	150	
12	13112130	Dollard	8,500	
Total The Netherlands			**44,788**	

Niedersachsen

Region	Site code	Site name	Size in ha	Coverage
12	2608	Rysumer Nacken	35	C
12	2609	Dollart	380	C
13	2408	Leybucht	1,325	C
13	2508	Pilsum-Manslagter	330	C/E
14	2306	Borkum	3,000	C
14	2407	Lütje Hörn	50	E
15	2307	Juist West	660	C
15	2307	Memmert	620	C
15	2308	Juist Ost	680	C
16	2208	Norderney Ort	80	C
16	2209	Norderney West	1,000	C
16	2209	Norderney Ost	1,210	C
16	2210	Baltrum	650	C
16	2210	Langeoog West	980	C
16	2211	Langeoog Nord	420	C
16	2211	Langeoog Ost	600	C
16	2211	Langeoog Süd	250	C
17	2309	Altendeich bis Hilgenriedersiel	190	C
17	2309	Hilgenriedersiel bis Neßmersiel	520	C
17	2310	Neßmersiel bis Dreihausen	160	C
17	2310	Dreihausen bis Dornumersiel	105	C
17	2311	Dornumersiel bis Bensersiel	135	C
17	2311	Bensersiel bis Neuharlingersiel	15	C
18	2212	Neuharlingersiel	60	C
18	2212	Harlesiel	160	C
18	2213	Elisabeth-Außengroden West	390	C
18	2213	Elisabeth-Außengroden Ost	460	C
19	2212	Spiekeroog West	720	C
19	2212	Spiekeroog Ost	980	C
19	2213	Wangerooge West	280	C
19	2213	Wangerooge Ost	410	C
19	2214	Minsener Oog	195	C
20	2214	Mellum	700	C
21	2314	Horumersiel (Wangersiel)	555	C
22	2414	Wilhelmshaven Süd	1	C
22	2415	Jadebusen Nord	180	E
22	2514	Jadebusen West	440	C
22	2514	Jadebusen Südwest	330	C
22	2515	Jadebusen Ost	330	E
22	2515	Jadebusen Süd	210	C
22	2515	Jadebusen Südost	530	C
23	2315	Langwarder Deich	290	C
23	2416	Burhave	120	C
23	2416	Waddenserdeich	50	C
23	2417	Langlütjen	300	E
24	2116	Knechtsand	10	C
24	2117	Cuxhaven-West	130	C
24	2117	Spieka Nord	970	C
24	2217	Spieka Süd	320	PC
24	2217	Dorumer Neufeld Süd	90	C
24	2316	Wremen Nord	110	C
24	2216	Süd Eversand	1	C
24	2317	Wremen Süd	90	C
25	2016	Scharhörn	15	C
25	2017	Neuwerk	205	C
26	2118	Cuxhaven Ost	80	C
26	2119	Otterndorf West	80	C
26	2119	Otterndorf bis Oste	910	C
26	2120	Nordkehdingen West	1,120	PC
26	2120	Hullen	550	PC
26	2121	Nordkehdingen Mitte	650	PC
26	2121	Nordkehdingen Ost	640	PC
26	2121	Allwördener Außendeich	670	PC
55		Ems	1,050	
56		Weser	2,105	
Total Niedersachsen			**26,111**	

Schleswig Holstein

Region	Site code	Site name	Size in ha	Coverage
26	ES12	Vorl.St.Margarethen	286	
26	VD52	Vorl. Neufelder Koog	369	
27	FD	Feuchtgebiete Dithmarschen	4,280	
28	VD1	Vorland Eider-Büsum	244	
28	VD2	Speicherkoog Außen	55	
28	VD3	Vorl. Friedrichsk.-N	476	
28	VD4	Vorl. Dieksanderkoog	966	
28	VD51	Vorland Kai.Wil.Koog	237	
29	IT	Trischen	215	
30	EE1	Katinger Watt	609	0
30	EE2	Eider südl. Tönning	323	
31	MN6	Nordstrander Marsch	3,872	A
32	SN	Außensände NF	2,427	
33	FE	Feuchtgeb.Eiderstedt	76	
34	FN1	Rickelsbüller Koog	460	
34	FN2	Vordeich. Fahretoft	7	
34	FN3	Hauke-Haien-Koog	336	
34	FN4	Vordeichung Ockholm	20	
34	FN6	Beltringharder Koog	2,072	
35	VE1	Husum-Everschopsiel	263	
35	VE2	Vorl.Norderheverkoog	423	
35	VE3	Westerhever	468	
35	VE4	Tümlauer Bucht	404	
35	VE5	St.Peter Vorl.& Sand	1,545	
35	VE6	St.Peter bis Eider	125	
36	VN1	Vorland Rickelsb.Koog	74	
36	VN2	Hind.Damm-Dagebüll	590	
36	VN3	Dagebüll-Schlüttsiel	183	
36	VN4	Schlüttsiel-Ham.Hallig	339	
36	VN5	Hamburger Hallig	519	
36	VN6	Hamburger Hallig-Nordstrand	171	
36	VN7	Nordstrand West	19	
36	VN8	Nordstrand Süd	415	
36	VN9	Schobüller Bucht	237	
37	IH1	Langeneß	1,006	
37	IH2	Oland	204	
37	IH3	Gröde	230	
37	IH4	Habel	6	
37	IH5	Nordstrandischmoor	180	0
37	IH6	Hooge	580	C
37	IH7	Norderoog	11	
37	IH8	Süderoog	54	
37	IH9	Südfall	51	
38	IP1	Pellworm-Salzw.	145	C
38	IP3+4	Pellworm Marsch & wetlands	3,200	A/C
39	IA	Amrum	2,530	C
40	IF1	Föhr Vorländer Nord	231	
40	IF3	Föhr Godel & Bruk	200	
40	IF5	Föhr Marsch	4,110	A/C
40	IF6	Föhr Geest	1,000	A
41	IS1	Sylt Seeseite	143	
41	IS2	Sylt Königshafen	112	
41	IS3	Sylt Watt Nordost	543	
41	IS4	Sylt Watt Südost	487	
41	IS5	Sylter Dünen	2,386	
41	IS6	Sylter Marschen	1,282	
Total Schleswig Holstein			**41,796**	

Denmark

Region	Site code	Site name	Size in ha	Coverage
42	FV	Det Fremskudte Dige	140	C
42	KV	Dagligreservoiret	125	C
42	KV	Saltvandssøen	265	C
42	FV	Emmerlev Koldby S+C168kræntkyst	48	E
43	FB	Astrup Forland	198	C
43	FB	Ballum Forland	265	C
43	FB	Bådsbøl-Ballum Kyst	81	E
43	FB	Rømødæmningen	848	PC
43	FX	Brøns Rejsby Forland	627	PC
44	FR	Ribe Digets Forland	551	PC
44	FS	Måde Enge	280	C
44	FS	Sneum Forland	69	C
44	FX	Brøns Rejsby Forland	40	E
45	EV	Tarphage Enge	160	PC
45	FH	Ho Enge	160	PC
45	FH	Nyeng	67.33	C
45	FH	Skallingen	1,734	C
45	EV	Skødstrup Enge	480	PC
45	FH	Marbæksøerne	28	C
45	FH	Skallingen Strand	507	C
45	FE	Esbjerg Havn	352	0
45	FH	Sædding til Marbæk Strand	55	0
46	IL	Langli	80	C
47	IF	Fanø Strandeng	592	C
47	IF	Fanø Strand	283	C
47	IF	Langejord	47	0
47	IF	Peter Meyers Sand	267	0
47	IF	Fanø indland	4,034	PC
47	IF	Fanø Klitter	634	PC
47	IF	Søren Jessens Sand	381	C
48	IM	Mandø Forland	270	C
48	IM	Koresand	966	o
48	IM	Mandø Koge	610	C
49	IR	Rømø strandeng	1,259	PC
49	IR	Lakolk Sø	92	C
49	IR	Rømø strand	308	C
49	IJ	Jordsand	3	C
49	IR	Rømø Indland	3,910	PC
49	IR	Havneby Kog	116	C
49	IR	Juvre Enge	538	C
49	IR	Havsand	793	C
49	IR	Juvre Sand	1,154	C
49	IR	Rømø strand	1,359	C
49	IR	Bolilmark	202	o
49	IR	Juvre	201	C
50	KV	Hasberg Sø	23	C
50	KV	Klæggrave i Margrethe Kog	26	C
50	KV	Gammel Frederikskog	629	C
50	KV	Indre Koge	2,961	PC
50	KV	Magisterkog	884	C
50	KV	Margrethe Kog	731	C
50	KV	Ny Frederikskog	933	C
51	KB	Ballum Enge	3,366	C
52	KX	Brøns Enge	571	E
52	KX	Rejsby Enge	1,391	C
53	KR	Ribe Marsken Klæggrave	152	C
53	KS	Sneum Klæggrav	59	C
53	KR	Rejsby Enge	175	PC/E
53	KR	Ribe Marsken	4,442	PC
53	KS	Sneum Enge	673	PC
54	EV	Varde Ådal	1,489	PC
Total Denmark		**43,684**		

Appendix F

Species List

List of the species in the Joint Monitoring Program for Breeding Birds in the Wadden Sea and their native language names.

Euring	English name	Scientific name	Nederlandse naam	Deutscher Name	Dansk navn
720	Great Cormorant	Phalacrocorax carbo	Aalscholver	Kormoran	Skarv
1440	Eurasian Spoonbill	Platalea leucorodia	Lepelaar	Löffler	Skestork
1730	Shelduck	Tadorna tadorna	Bergeend	Brandente	Gravand
2010	Common Eide	Somateria mollissima	Eidereend	Eiderente	Ederfugl
2210	Red-breasted Merganser	Mergus serrator	Middelste Zaagbek	Mittelsäger	Toppet Skallesluger
2610	Hen Harrier	Circus cyaneus	Blauwe Kiekendief	Kornweihe	Blå Kærhøg
4500	Oystercatcher	Haematopus ostralegus	Scholekster	Austernfischer	Strandskade
4560	Avocet	Recurvirostra avosetta	Kluut	Säbelschnäbler	Klyde
4700	Great Ringed Plover	Charadrius hiaticula	Bontbekplevier	Sandregenpfeifer	Stor Præstekrave
4770	Kentish Plover	Charadrius alexandrinus	Strandplevier	Seeregenpfeifer	Hvidbrystet Præstekrave
4930	Northern Lapwing	Vanellus vanellus	Kievit	Kiebitz	Vibe
5120	Dunlin	Calidris alpina	Bonte Strandloper	Alpenstrandläufer	Almindelig Ryle
5170	Ruff	Philomachus pugnax	Kemphaan	Kampfläufer	Brushane
5190	Common Snipe	Gallinago gallinago	Watersnip	Bekassine	Dobbeltbekkasin
5320	Black-tailed Godwit	Limosa limosa	Grutto	Uferschnepfe	Stor Kobbersneppe
5410	Eurasian Curlew	Numenius arquata	Wulp	Grosser Brachvogel	Stor Regnspove
5460	Common Redshank	Tringa totanus	Tureluur	Rotschenkel	Rødben
5610	Turnstone	Arenaria interpres	Steenloper	Steinwälzer	Stenvender
5750	Mediterranean Gull	Larus melanocephalus	Zwartkopmeeuw	Schwarzkopfmöwe	Sorthovedet Måge
5780	Little Gull	Larus minutus	Dwergmeeuw	Zwergmöwe	Dværgmåge
5820	Black-headed Gull	Larus ridibundus	Kokmeeuw	Lachmöwe	Hættemåge
5900	Common Gull	Larus canus	Stormmeeuw	Sturmmöwe	Stormmåge
5910	Lesser Black-backed Gull	Larus fuscus	Kleine Mantelmeeuw	Heringsmöwe	Sildemåge
5920	Herring Gull	Larus argentatus	Zilvermeeuw	Silbermöwe	Sølvmåge
6000	Great Black-backed Gull	Larus marinus	Grote Mantelmeeuw	Mantelmöwe	Svartbag
6050	Gull-billed Tern	Gelochelidon nilotica	Lachstern	Lachseeschwalbe	Sandterne
6110	Sandwich Tern	Sterna sandwichensis	Grote Stern	Brandseeschwalbe	Splitterne
6150	Common Tern	Sterna hirundo	Visdief	Flussseeschwalbe	Fjordterne
6160	Arctic Tern	Sterna paradisaea	Noordse Stern	Küstenseeschwalbe	Havterne
6240	Little Tern	Sterna albifrons	Dwergstern	Zwergseeschwalbe	Dværgterne
7680	Short-eared Owl	Asio flammeus	Velduil	Sumpfohreule	Mosehornugl

General landscape types and regions in the Wadden Sea Area used as a basis for the breeding birds distribution maps

(Data sources do not meet scientifc requirement, therefore, the map should not be used for assessment.)

Algemene landschapstypen en regio's in het Samenwerkingsgebied Waddenzee die als basis dienen voor de verspreidingskaarten

Allgemeine Landschaftstypen und Regionen im Wattenmeergebiet, die als Basis für die Karten über die Verbreitung der Brutvögel dienen

Generelle landskabstyper og regioner i Vadehavsområdet, som danner grundlag for udbredelseskortene

	Legend	Legenda	Legende	Legende
	Salt marsh	Kwelder	Salzwiese	Saltmarsk
	Polder	Polder	Koog/Polder	Kog
	Wetland area behind the dikes	Wetland binnen de dijk	Feuchtgebiet binnendeichs	Vådområde bag dige
	Geest	Geestgronden	Geest	Gest
	Dune	Duin	Düne	Klit
	Beach	Strand	Strand	Strand
	Outer sand	Zandplaat	Aussensand	Højsand
	Tidal area	Wadplaat	Watt	Vadeflade
✳	Anthropogenic structure	Kunstmatige installatie	Künstliche Struktur	Kunstigt anlæg
	Wadden Sea Area	Samenwerkingsge-bied Waddenzee	Wattenmeer-gebiet	Vadehavsområdet
	National boundary	Landsgrens	Staatsgrenze	Landegrænse
	Border line between region	Regiogrens	Gebietsgrenze	Grænse mellem regioner
42	Region number	Regionummer	Gebiets-Nummer	Nummer på region