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Distribution and population trends of the Sandwich Tern *Sterna sandvicensis* in the Baltic Sea

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At the beginning of the 20th century, the Baltic Sea did not form part of the breeding range of the Sandwich Tern. However, during the first half of the century the species expanded its range gradually to the northeast, colonising Skåne in 1911, and the Swedish east coast during the 1930s. Starting with the formation of a colony on the island Heuwiese (Germany, Mecklenburg-Western Pomerania) in 1957, the Sandwich Tern continued its range expansion to the southern coasts of the western and central Baltic, becoming a breeding bird in Estonia in 1962 and in Poland in 1977. The range expansion and positive population development in the Baltic during the 1950s/1960s happened at a time, when the North Sea population declined dramatically. This indicates that the colonisation of the Baltic Sea could have been a response to the worsening of environmental conditions there. The Baltic breeding population grew constantly and reached about 2,500 breeding pairs (bp) by the end of the 1970s. Since then, despite some fluctuations and frequent shifts of breeding sites, the population size can be considered as more or less stable. More detailed surveillance data from the mid-1990s until now reveal a population size fluctuating at 2,000–3,500 bp. The main conservation measure for the Sandwich Tern in the Baltic is the protection of suitable breeding sites. These are especially small islands covered by low grass vegetation, without human disturbances and predatory mammals. The presence of Black-headed Gulls is an essential condition for the choice of the breeding place.

Key words: Sandwich Tern *Sterna sandvicensis*, population size, distribution, Baltic Sea.

1. Introduction: European distribution and population size

The nominate subspecies of the Sandwich Tern *Sterna sandvicensis sandvicensis* colonises the coasts of the Atlantic Ocean (including North and Baltic Sea), the Mediterranean and Black Sea, and the Caspian Sea. In the Baltic Sea (central Sweden/Estonia), the species reaches its current northern range limit. As typical for seabirds, the breeding sites of the Sandwich Tern are restricted to the coast.

The Atlantic population of the Sandwich Tern amounts to about 55,300–57,000 breeding pairs (bp; numbers refer to 1996–2002; BirdLife International 2004; Wetlands International 2006). The range centre is the North Sea, where the species colonises the coasts of Great Britain (10,500 bp; including Isle of Man and Channel islands, but not Northern Ireland; Mitchell *et al.* 2004), the Netherlands (10,700–17,300; Stienen 2006), Belgium (46–1,550; Stienen 2006), Germany (7,700–10,100; Garthe & Flore 2007), and Denmark (2,900–4,100; only North Sea, Northern Kattegat, and inner Limfjord, without central Kattegat, Belt Sea and Sound; Gregersen 2006). France (6,800; BirdLife International 2004) as well as Ireland (3,700; Republic of Ireland and Northern Ireland; Mitchell *et al.* 2004) also host considerable breeding populations. The Spanish breeding colonies, however, are found at the coast of the Mediterranean Sea. In southern Norway, the Sandwich Tern breeds only sporadically with a few pairs (first breeding record in 1974, maximum number of breeding pairs five in 1990; Nehls 1982; BirdLife International/European Bird Census Council 2000).

In most recent times, the German North Sea population has declined from about 9,500 bp in 2002 to 4,700 bp in 2006 (Garthe & Flore 2007; B. Hälterlein & P. Potel, pers. comm.), but increased again in 2007 to 6,300 bp (B.-O. Flore, pers. comm.). The breeding pair numbers in the Netherlands and Belgium have increased from 13,400 in 1995 to 19,500 in 2004 (Stienen 2006). At the Danish North Sea, the Sandwich Tern has been about stable, fluctuating between 2,900 and 4,100 bp from 1993 to 2007 (Gregersen 2006 and unpubl.). The ecological reasons for changes and shifts of breeding pair numbers in the North Sea have been analysed by Stienen (2006).

The population of the Mediterranean and Black Sea is estimated at 20,270 – 65,670 bp, that of the Caspian Sea at about 6,500 – 10,000 bp (BirdLife International 2004; Wetlands International 2006).

The colonisation of the Baltic Sea area during the 20th century has to be seen as a range expansion of the Atlantic population of the Sandwich Tern, and the Baltic breeding birds may be considered as a geographical sub-unit of this population. For several Baltic countries, the development of breeding pair numbers has been published in the past as well as in recent years (e.g. Wieloch 1986; Gregersen 2006; Larsson 2006). However, since the Sandwich Tern is very flexible with respect to breeding site selection, the interpretation of these data is difficult. An analysis of the process of range expansion, the development of breeding pair numbers as well as the current status of the population requires a trans-boundary perspective covering the entire distribution area of the species in the Baltic. This article presents, for the first time, a comprehensive compilation of historical and actual data of the Sandwich Tern in the Baltic Sea area, providing a basis for a better understanding of the range expansion and colonisation process, the actual status of the population, and conclusions for conservation requirements.

2. Data base and Methods

The analysis and description of the historical development of the colonisation of the Baltic Sea area is based on a comprehensive compilation of published data and information, which is referred to in the corresponding sections of this article. A quite comprehensive overview has been given by Nehls (1982), however, this information had to be amended and updated.

The historical and recent population development has been published for Poland (Wieloch 1986), Denmark (Gregersen 2006), and Sweden (Larsson 2006). These authors also provided unpublished data in order to complete the figures until the year 2007. For the German Federal State Schleswig-Holstein, data have been published by Schulz (1947), Thiessen (1986), Knief *et al.* (1997, 1999, 2000, 2001), Erfurt & Dierschke (1992), and Berndt *et al.* (2003, 2005). Unpublished data for the most recent years have been provided by W. Knief. In Mecklenburg-Western Pomerania, the published data are rather fragmentary (e.g. Nehls 1977, 1987; Scheufler *et al.* 1982; Brenning 1983; Siefke 1993; Köppen 1997, 1998, 2000; Köppen & Graumann 1998). However, the breeding sites of the Sandwich Tern are, without any exception, situated in coastal bird reserves which have been protected and surveyed for several decades under the auspices of the "Working Group for Coastal Bird Conservation" (AG Küstenvogelschutz). This working group disposes a comprehensive long-term documentation of breeding bird numbers in the reserves, including complete data for the Sandwich Tern in Mecklenburg-Western Pomerania.

For Estonia, the information is rather fragmentary, continuous detailed data are not available. However, a general description of the population development since the first breeding of the species in 1962 can be given.

There is neither a coordination of breeding pair census between the Baltic countries nor a common, agreed methodology. The breeding pair numbers are usually based on nest counts in the colonies. For those colonies which are surveyed during the whole breeding season, usually the maximum number of breeding pairs is considered. This implies the possibility that birds which change the breeding site during the season are repeatedly counted. However, it is assumed that such double counts do not affect the results significantly.

3. Results

3.1. The colonisation of the Baltic Sea during the 20th century

During the first half of the 20th century, the Sandwich Tern was obviously not a very common breeding bird at the Baltic coasts of Denmark (central Kattegat, the Belt Sea and the Sound). According to Helms (1948), the Sandwich Tern was breeding on the North Sea coast (Thy, Ringkøbing Fjord), on some islands in the Kattegat, and "sparsely and scattered on other sites". Salomonsen (1963) mentioned that the Rødsand was colonised around 1950, which suggests that the species had not established larger and stable colonies on the southern Danish islands before. On the Swedish side of the Sound, the first breeding was recorded in 1911 on Falsterbo (SW Skåne). Later on, a colony with 200–250 bp (1939–1944) developed here.

The coasts of the south-western and central Baltic Sea were colonised gradually, starting in the 1930s on the Swedish east coast: The Sandwich Tern appeared first on Öland (1934) and a short time later on Gotland (1938). Blekinge was colonised in 1960, Småland, after first attempts in 1947 and 1960, starting from 1970. The most northern breeding record so far documented was in the Stockholm archipelago in 1975 (Fig. 1).

At the south-western and southern Baltic coast, during the first half of the 20th century the Sandwich Tern was a very sporadic breeding bird in Schleswig-Holstein (Oehe-Schleimünde, 1919–1921, 1930–1936, 1939, with a maximum of 92 bp) and at the Bold Vistula mouth (Śmiała Wisła) in Gdansk (1929 and 1932–1936, up to 3 bp). The development of larger and stable colonies in the south-western Baltic did not occur before the end of the 1950s, starting with the colonisation of the island Heuwiese near Rügen (Mecklenburg-Western Pomerania) in 1957.

At the beginning of the 1960s, the Sandwich Tern started to expand its range to the southern and eastern coasts of the central Baltic Sea (Poland and Estonia). In Estonia, the first breeding record dates from 1962. From then on, the population increased steadily. At the beginning of the 1970s, the first larger and stable colonies were formed on small islands at the west coast of Saarema. In Poland, the Sandwich Tern bred from 1977–1991 in the nature reserve Mewia Łacha (Gull Shoal) at the Vistula Cut mouth (Przekop Wisły) near Swibno/Mikoszewo with a maximum of 290–300 bp

(Nehls 1982; Leibak *et al.* 1994; Wieloch 1986; Tomiałojć & Stawarczyk 2003).

The expansion of the Sandwich Tern to the southwestern Baltic and the southern and eastern coasts of the central Baltic during the 1950s and 1960s occurred simultaneously with a strong decline of the breeding population in the southern and eastern North Sea (Wadden Sea and northern Kattegat). In the Netherlands, as a consequence of pesticide contamination of the North Sea from a chemical plant near Rotterdam, the population plummeted within a few years from 32,000 bp in 1957 to only 875 bp in 1965. At that time, the German North Sea population was also relatively small, fluctuating between 2,250 and 6,600 bp (Garthe & Flore 2007). The Danish population declined from about 10,000 pairs in the 1940s to a minimum of 2,500 bp in 1965. The large colonies on Hirsholmene, with about 4,000 bp during the 1940s, started to decline at the beginning of the 1950s and were abandoned at the end of the decade as a consequence of the occupation of the breeding islands by larger gulls (Herring Gull *Larus argentatus*, Lesser Black-backed Gull *L. fuscus*, Great Black-backed Gull *L. marinus;* Gregersen 2006). The year 1965 marked the all-time low of breeding pair numbers in the three countries (Garthe & Flore 2007).

The expansion of the Sandwich Tern into the Baltic Sea was probably a response to the worsening of the environmental conditions and subsequent abandonment of colonies in the North Sea and northern Kattegat. Unfortunately, trapping and ringing of adult Sandwich Terns was not carried out during the first years of the establishment of the colony on the island Heuwiese. Hence, there are no ringing data which might indicate the origin of the first breeding birds in Mecklenburg-Western Pomerania. Starting from 1965 breeding birds were caught on nests on the island Langenwerder, where a new colony had been established in that year. From 1965 to 1968, a total of 41 ringed breeding birds could be re-trapped (Nehls 1969). The majority of the birds (21) had been ringed between 1960–1965 as chicks on the island Heuwiese. A total of 15 birds had come from the southern Kattegat and Øresund (Denmark and Sweden), and five recoveries are evidence for the immigration of birds from the North Sea (England two; Netherlands, Lower Saxony, and Schleswig-Holstein one each).

3.2. Distribution and population development of the Sandwich Tern in the Baltic Sea

Denmark

In Denmark, the Sandwich Tern breeds at the North Sea coast (Nissum Fjord, Nissum Bredning, Ringkøbing Fjord, and Vadehavet), in the northern Kattegat (including Limfjord), as well as in the central Kattegat, the Belt Sea and the Sound (Øresund). Since movements of larger proportions of the population between the North Sea, the northern and central Kattegat, the Belt Sea and the Sound are rather common, it is not possible to distinguish between a North Sea and a Baltic population.

The Danish breeding population declined from about 10,000 bp in the 1940s to a minimum of 2,500 bp in 1965. Later on it increased again, but without reaching its former level (Grell 1998; Gregersen 2006). Fluctuating numbers of breeding pairs are characteristic. In 1972, for example, the breeding population was es-

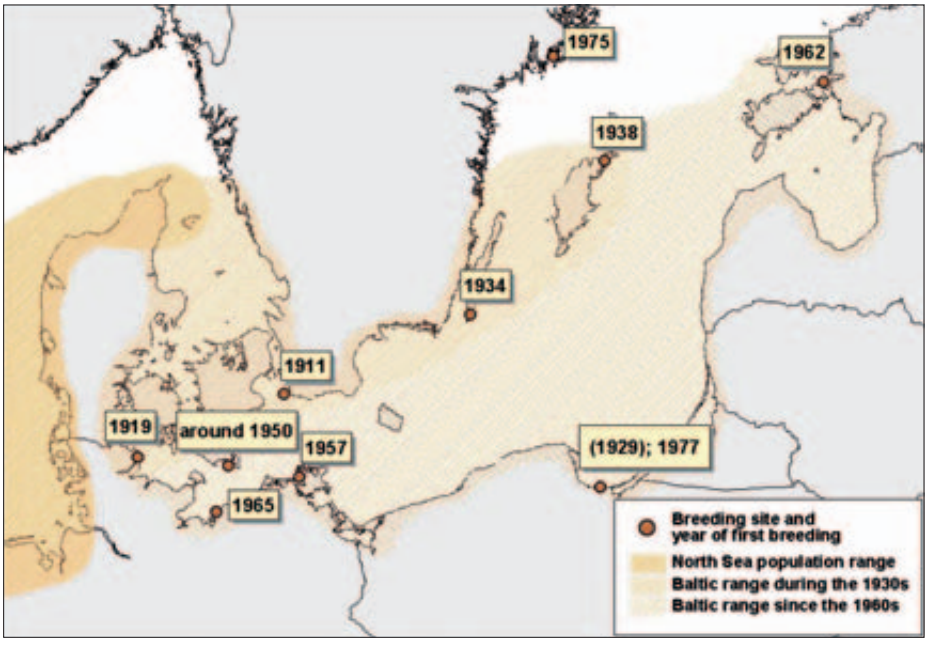

Fig. 1: The range expansion of the Sandwich Tern into the Baltic Sea area during the 20th century. – *Die Ausbreitung der Brandseeschwalbe im Ostseeraum im 20. Jahrhundert.*

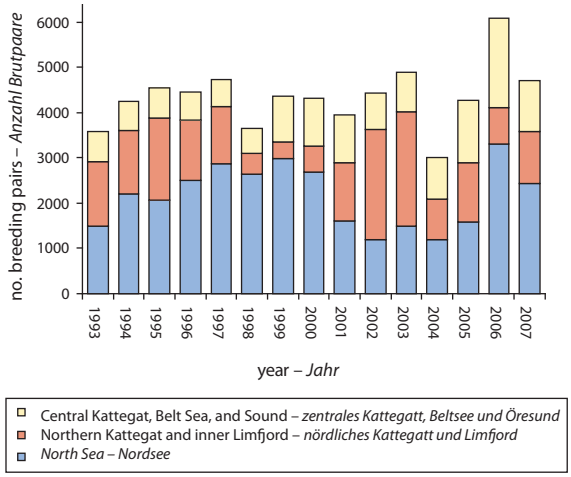

Fig. 2: The breeding population of the Sandwich Tern in Denmark 1993–2007. Data from Gregersen (2006 and unpubl.). The numbers for 2004 give minimum values only, since two colonies were not visited or counted. The total breeding pair number of that year is estimated at 4,000–5,000 bp (Nyegaard & Grell 2006). For the location of the colonies see Fig. 3. – *Der Brutbestand der Brandseeschwalbe in Dänemark 1993–2007. Angaben nach Gregersen (2006 und unpubl.). Die Zahlen für 2004 repräsentieren Mindestwerte, da die Brutbestände in zwei Kolonien nicht erfasst wurden. Der Gesamtbestand in jenem Jahr wird auf 4.000–5.000 BP geschätzt (Nyegaard & Grell 2006). Die Lage der Kolonien ist in Abb. 3 dargestellt.*

timated at about 2,500 pairs, one year later about 4,000 bp were recorded (Mardal 1974; Dybbro 1976). For the period 1978–1981, the population was estimated at 3,500–5,000 bp (Dybbro 1985), and for 1988 at 5,700 bp (Christensen 1990). Between 1993 and 2007, the breeding population was in the range between 3,600 and 4,900 bp in most years (Gregersen 2006 and unpubl. data; Fig. 2), without showing a distinguished trend. In 2006, the number was considerably higher (about 6,100 bp), which could be due to immigration of birds from the German Wadden Sea, where the number of breeding pairs declined from 5,900 in 2005 to 4,700 in 2006 (Garthe & Flore 2007; B. Hälterlein & P. Potel, pers. comm.).

The portion of the Danish population, which corresponds to breeding sites in the Baltic Sea area (central Kattegat, Belt Sea and the Sound), fluctuated between 550 and 2,000 bp during the years 1993–2007 (Gregersen 2006 and unpubl. data). These fluctuations are apparently a result of shifts between breeding sites in the Baltic Sea, the North Sea and the northern Kattegat, and do not reflect changes of the population size.

Sweden

The first breeding of the Sandwich Tern in Sweden was recorded in 1911, when two pairs built their nests on Måkläppen/Falsterbo (SW Skåne). The colony then grew to 200–250 bp in the 1940s, but disappeared in 1945. Already during the 1930s the Sandwich Tern had occupied another breeding site nearby at Foteviksområdet, which reached its maximum with 267 bp in 1965. Starting from SW Skåne, the Sandwich Tern spread to other areas along the Swedish coast: Öland was colonised in 1934, Gotland in 1938, east Skåne during the 1940s, Småland in 1947, Halland in 1956, and Blekinge in 1960. In 1975, the Sandwich Tern even reached the Stockholm archipelago. But this was rather an exceptional event; the breeding range of the species in Sweden does not extend further north than Gotland (Nehls 1982; Svensson 1999; Tjernberg & Svensson 2007).

The total breeding population of the Sandwich Tern in Sweden was about 1,100 bp in 1975 and 630 bp in 1988 (Gärdenfors 2005). From 1994–2007, the population fluctuated between 100 and 500 bp (Larsson 2006 and unpubl. data; Fig. 4). However, the survey was not complete in all years. There are gaps in reporting for some provinces in some years (e.g., Gotland 2004, Skåne 2005).

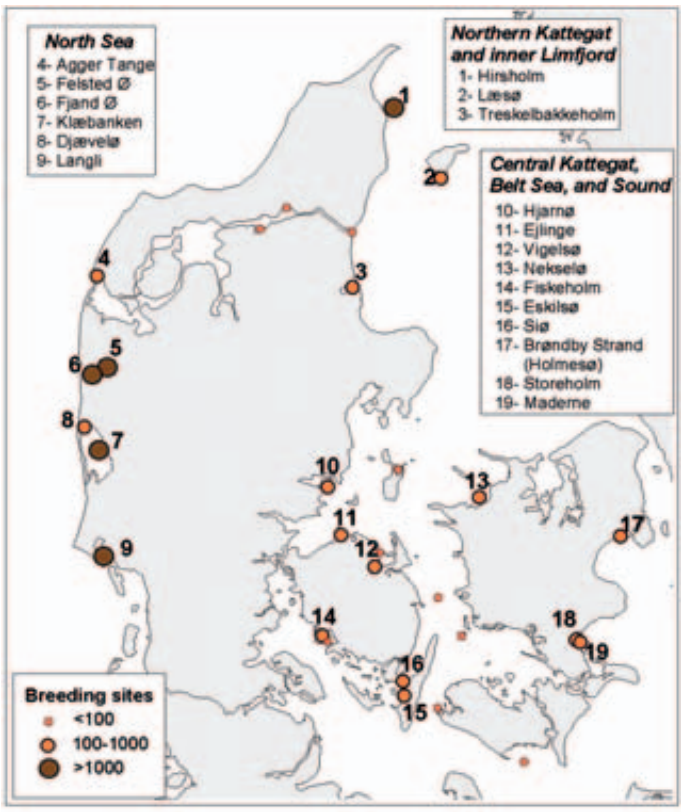

Fig. 3: Breeding sites of the Sandwich Tern in Denmark 1993–2007. – *Brutplätze der Brandseeschwalbe in Dänemark 1993–2007.*

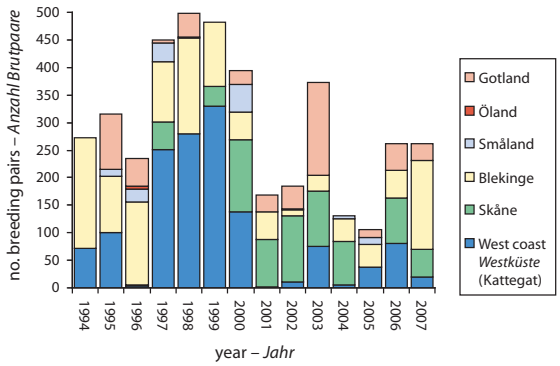

Fig. 4: The breeding population of the Sandwich Tern in Sweden 1994–2007. Data from LARSSON (2006 and unpubl.). For some years, the figures are incomplete. The "West coast (Kattegat)" comprises the provinces V. Götaland, Bohuslän and Halland. The most important breeding sites at the west coast are found in Halland, whereas in V. Götaland and Bohuslän the Sandwich Tern breeds only sporadically in low numbers (maximum 5 bp). *– Brutbestand der Brandseeschwalbe in Schweden 1994–2007. Zahlen nach LARSSON (2006 und unveröffentl.). In einigen Jahren waren die Erfassungen unvollständig. Die "Westküste (Kattegatt)" umfasst die Provinzen V. Götaland, Bohuslän und Halland. Alle wichtigen Brutplätze liegen jedoch in Halland, während die Brandseeschwalbe in V. Götaland und Bohuslän nur ein sporadischer Brutvogel mit maximal 5 BP ist.*

The largest colonies are located in northern Halland, eastern Skåne, Blekinge, and on Gotland. In Halland, the colonies are situated on Knarrskär with 30–325 bp, and Dammen with 7–75 bp. In Skåne, the main colony is found on Kristianskär with 30–131 bp. Since 1994, Blekinge has had three breeding sites which have succeeded each other: Kåsaskär (200 bp), Trollholmen (75–175 bp), and Norrören (7–120 bp). On Gotland, there have been several smaller colonies, the biggest one being Östergarnsholm with 80 bp.

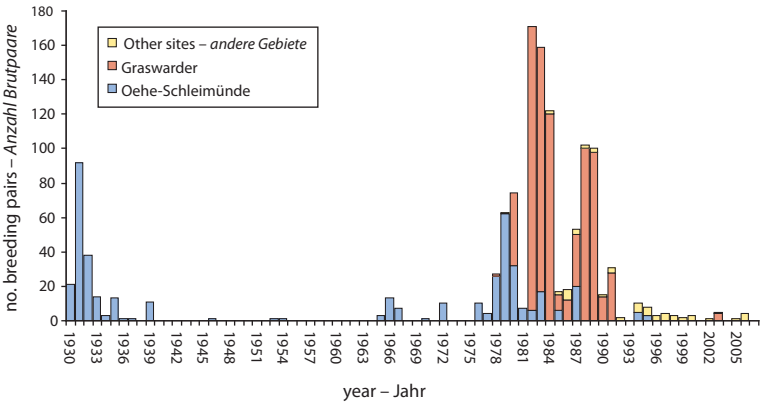

Fig. 5: The breeding population of the Sandwich Tern at the Baltic Sea coast of Schleswig-Holstein 1930–2007. Data from SCHULZ (1947); THIESSEN (1986); KNIEF *et al.* (1997, 1999, 2000, 2001); ERFURT & DIERSCHKE (1992); BERNDT *et al.* (2003, 2005). The situation of the most important colonies is shown in Fig. 7.*– Der Brutbestand der Brandseeschwalbe an der Ostseeküste Schleswig-Holsteins 1930–2007. Angaben nach SCHULZ (1947); THIESSEN (1986); KNIEF et al. (1997, 1999, 2000, 2001); ERFURT & DIERSCHKE (1992); BERNDT et al. (2003, 2005). Die Lage der wichtigsten Kolonien ist in Abb. 7 dargestellt.*

Germany: Schleswig-Holstein

In the 19th century, the Sandwich Tern was apparently a rare and very sporadic breeding bird at the Baltic Sea coast of Schleswig-Holstein. Breeding records are documented for the Möweninsel (Gull Island) Schleswig (1819 and 1824, NEHLS 1982) and the pilot island Oehe-Schleimünde, where it bred in small numbers for several years around 1820 together with Arctic Terns *Sterna paradisaea* and Little Terns *Sternula albifrons* (BENICKEN 1824). On Oehe-Schleimünde, the species also bred from 1919–1921 (2 bp in 1921), 1930–1937 (maximum 92 bp in 1931), and 1939 (11 bp) (BECKMANN 1922; SCHULZ 1947; ERFURT & DIERSCHKE 1992). During the following 25 years, only single pairs occasionally occured on the island, which in the late 1950s became a peninsula. From 1965 to 1995, although not in all years, Oehe-Schleimünde hosted a colony with up to 62 bp (1979). After 1995 the species has not been recorded breeding there. From 1980–1991, a larger colony with more than 100 bp in some years (maximum 165 in 1982) established on the peninsula Graswarder. In 1992, this colony disappeared. Later on the Sandwich Tern was only breeding in small numbers (never more than 10 bp, Fig. 5) at varying locations (Oehe-Schleimünde, Geltinger Birk, Schwansener See, Graswarder, Krummsteert, Wallnau, Grüner Brink, Salzensee/Fehmarn; THIESSEN 1986; KNIEF *et al.* 1997, 1999, 2000, 2001; BERNDT *et al.* 2003, 2005).

Germany: Mecklenburg-Western Pomerania

From the second half of the 18th century, the existence of a colony in the Greifswald Lagoon, on the island Grosser Stubber, is reported (OTTO 1777). But at the end of the 18th century and during the whole 19th century the Sandwich Tern was probably only a rare visitor on the coasts of Mecklenburg-Western Pomerania. At the beginning of the 20th century, a single breeding attempt on the island Poel in the western part of the region is reported. The Sandwich Tern only became a permanent breeding bird in Mecklenburg-Western Pomerania after the establishment of a colony on the island Heuwiese in 1957 (DOST 1958, 1959; NEHLS 1987). Since then, the species has formed larger colonies of more than 100 bp on several islands (Heuwiese, Beuchel, Liebitz, Kirr, Barther Oie, Langenwerder, and Pagenwerder). Shifts of colonies between these islands are typical, and none of the breeding sites have been occupied permanently. Beside these sites, breeding of smaller numbers (< 100 bp) has been recorded on

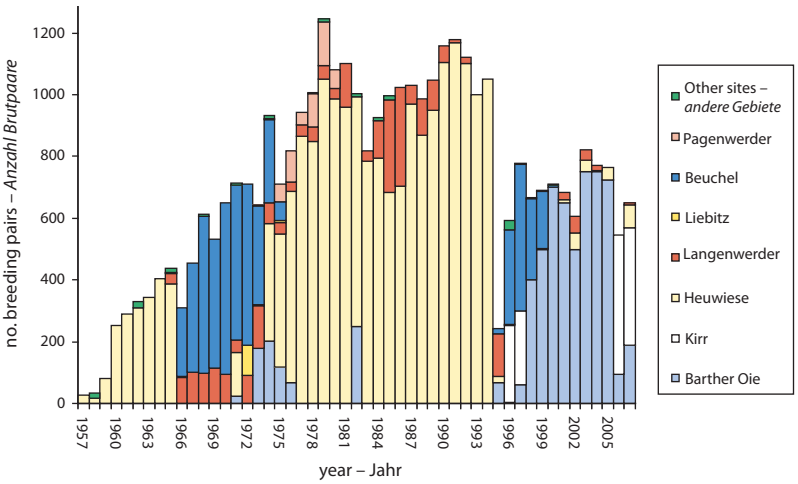

Fig. 6: The breeding population of the Sandwich Tern in Mecklenburg-Western Pomerania 1957–2007. Data from NEHLS (1977, 1987); SCHEUFLER *et al.* (1982); BRENNING (1983); SIEFKE (1993); KÖPPEN 1997, 1998, 2000; KÖPPEN & GRAUMANN 1998, and unpublished breeding reports from coastal bird reserves. The location of the most important colonies is shown in Fig. 7. – *Der Brutbestand der Brandseeschwalbe in Mecklenburg-Vorpommern 1957–2007. Angaben nach NEHLS (1977, 1987), SCHEUFLER et al. (1982); BRENNING (1983); SIEFKE (1993); KÖPPEN 1997, 1998, 2000; KÖPPEN & GRAUMANN 1998 und unveröffentlichten Brutberichten aus den Küstenvogelschutzgebieten. Die Lage der wichtigsten Kolonien ist in Abb. 7 dargestellt.*

After the establishment of the colony on the island Heuwiese in 1957, the population of the Sandwich Tern in Mecklenburg-Western Pomerania increased continuously and exceeded 1,000 bp for the first time in 1978. One year later it reached its all-time maximum of 1,245 bp (Fig. 6). During the following years, until 1994, the breeding pair numbers were more or less stable, fluctuating in the range of 800–1,200. In 1995, the largest colony on the island Heuwiese almost disappeared simultaneously with the breakdown of the Black-headed Gull *Larus ridibundus* colony. In that year, the lowest number of breeding pairs since 1960 was recorded. However, already the following year the Sandwich Tern formed large colonies on the islands Kirr and Beuchel. Since then, the population has fluctuated at a level between 600 and 800 bp. During the most recent years, the islands Barther Oie and Kirr in the Darss-Zingst Lagoon area were the most important breeding sites, whereas the island Beuchel was abandoned in 2001. Recently the Sandwich Tern has bred again in small numbers on the islands Langenwerder and Heuwiese.

the islands Fährinsel (1958, 1965, 1968), Gänsewerder (1971), Walfisch (1962/63, 1971, 1978, 1982, 1996–1998), Ruden (1975), Peenemünder Haken (1979), Ruschbrink (1982), Liebes (1984–1986), Werderinseln Riems (1996), Neuer Bessin/Hiddensee (1997, 1999, 2002, 2004), and Gustower Werder (2000) (NEHLS 1977, 1987; unpublished breeding reports of coastal bird reserves).

Fig. 7: Important breeding sites (> 50 bp at least in one year) of the Sandwich Tern at the German Baltic coast (Schleswig-Holstein and Mecklenburg-Western Pomerania). Abbr.: NR = nature reserve, LR = landscape reserve; NP = national park. – *Bedeutende Brutplätze (> 50 BP in mindestens einem Jahr) der Brandseeschwalbe an der deutschen Ostseeküste (Schleswig-Holstein und Mecklenburg-Vorpommern). Abkürzungen: NR = Naturschutzgebiet, LR = Landschaftschutzgebiet, NP = Nationalpark.*

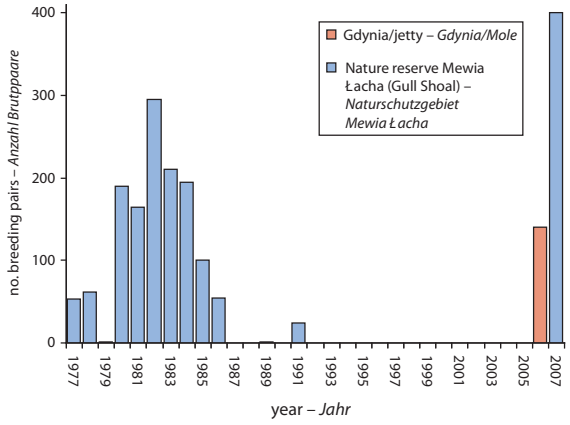

Fig. 8: Breeding pair numbers of the Sandwich Tern in Poland. Data from Wieloch (1986); Tomiałojć & Stawarczyk (2003), and G. Bela & A. Janczyszyn (pers. comm.). The location of the colonies is shown in Fig. 9. – *Brutbestand der Brandseeschwalbe in Polen. Angaben nach Wieloch (1986); Tomiałojć & Stawarczyk (2003) und G. Bela & A. Janczyszyn (pers. Mitt.). Zur Lage der Kolonien s. Abb. 9.*

Poland

In Poland, the Sandwich Tern bred with a few (up to 3) pairs during the years 1929 and 1932–1936 at the Bold Vistula mouth (Śmiała Wisła) at Gdansk (Schulz 1947). After these records, it did not occur again until the year 1977 when it formed a breeding colony of 53 bp in the nature reserve Mewia Łacha (Gull Shoal) at the Vistula Cut mouth (Przekop Wisły) (Pągowski 1979). This breeding site existed with fluctuating numbers until 1991. Breeding of Sandwich Terns was not recorded in every year and the species was not seen in 1987, 1988, and 1990. The highest numbers were recorded from 1980–1985, when 100–300 pairs were breeding (Fig. 8; Wieloch 1986; Tomiałojć 1990; Tomiałojć & Stawarczyk 2003). After 1991, the Sandwich Tern disappeared for several years as a breeding bird in Poland. In 2006, a new colony with 140 bp was formed on a jetty in the port area of Gdynia. Due to repair works on this jetty, in 2007 the birds returned to their traditional breeding place at the Vistula Cut mouth (nature reserve Mewia Łacha). The number of breeding pairs was 400 in 2007 (G. Bela & A. Janczyszyn, pers. comm., *http://www.kuling.org.pl/rybitwy/index.html*).

Fig. 9: Breeding places of the Sandwich Tern in Poland and the years of breeding. – *Brutplätze der Brandseeschwalbe in Polen und Jahre der Bruten.*

Ringing recoveries from Sandwich Terns caught on the nests or with mist-nets in the colony during the years 1979–1986 showed that the birds originated from southern Sweden (Skåne, 4 ind.), the Netherlands (1), Denmark (2), Germany (Mecklenburg-Western Pomerania, 7), and Estonia (2) (M. Wieloch, unpubl. data).

Estonia

The first record of two individuals dates from 19th July 1960 at Vaika Islands (western Estonia). In summer 1961, observations at the same place indicate that there was probably at least one territorial pair present in that year. In 1962, the first clutch was found on Papirahu Island in the Suur Väin Strait (Aumees & Paakspuu 1963). Since then, the Sandwich Tern is a regular breeding bird in Estonia. However, since the breeding sites move quite often, the surveillance of the population is incomplete and data are rather fragmentary.

At the beginning of the 1970s, the first stable colonies were formed on small islands on the west coast of Saaremaa. In 1974, a colony with 40 breeding pairs established on Linnusita Island (near Abruka, western Estonia). The next year, 181 nests were found on this site (Mänd 1982).

In 1978, about 300 pairs were breeding in several colonies around Saaremaa, on the Väinameri islands, and islands of the Matsalu Nature Reserve (Nehls 1982). At the beginning of the 1990s, at least five larger (100–200 bp) and several smaller colonies with a total of about 800 bp were recorded in the Western Archipelago (Leibak *et al.* 1994). For the years 1998–2002, Elts *et al.* (2003) give a population of 600–900 bp. According to Kuus & Kalamees (2003), the Estonian population consists of at least 600 bp, the main breeding sites being found in the Important Bird Areas (IBA) Väinameri (200–500 bp) and Pärnu Bay (350 bp).

4. Discussion

During the 20th century, the Sandwich Tern has gradually expanded its range to the south-western, southern and central Baltic Sea. For 1978/79, Nehls (1983) estimated the total population breeding in the Baltic Sea area at 2,500 bp. During the period 1994–2007 the breeding population was in the range of 2,000–3,500 bp (Fig. 10). This suggests that, despite some fluctuations, the population was more or less stable from the end of the 1970s until now.

The Sandwich Terns breeding in the Baltic Sea area may be considered as a geographical sub-unit of

the Atlantic population. Within this geographical range, shifts of breeding sites and exchange of birds between breeding places are common. Ring recovery data also supply evidence for a regular exchange between the Baltic breeding sites and the North Sea or northern Kattegat (Nehls 1969; Stienen 2006; unpublished ring recovery data from the Bird Ringing Centre Hiddensee). Even the immigration of individuals from the Black Sea has been proven by ringing recoveries (Møller 1981; Nehls 1982; Schmidt & Dost 1988).

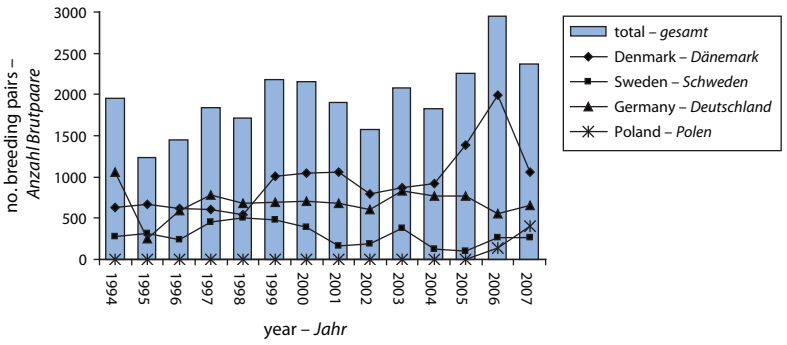

Fig. 10: The breeding population of the Sandwich Tern in the Baltic Sea area 1994–2007. Detailed data from Estonia are not available and hence could not be shown in the graph. About 600–900 bp from this country have to be added to the total. – *Brutbestand der Brandseeschwalbe in der Ostsee 1994–2007. Der estnische Brutbestand ist aufgrund des Fehlens detaillierter Daten in der Grafik nicht dargestellt. Zu der Gesamtzahl sind folglich noch etwa 600–900 BP aus Estland hinzuzurechnen.*

The Sandwich Tern breeds on seabird islands on grassland, occasionally also on dunes or gravel areas, in association with Black-headed Gulls.[1] Usually they prefer large Black-headed Gull colonies of several hundred to thousand breeding pairs, but occasionally they also may breed in association with a small number of Black-headed Gulls (e.g. Heuwiese: 140 bp Sandwich Terns, 50 bp Black-headed Gulls in 1971; 73 bp Sandwich Terns, 37 bp Black-headed Gulls in 2007). The fluctuation of gull colonies is one reason for the frequent changes of breeding sites. Even very large tern colonies may disappear from one year to the next, if the Black-headed Gulls abandon the site (Fig. 11: Heuwiese 1966, 1995; Island Beuchel 2000; Langenwerder 1996).

Another factor influencing significantly the breeding site selection is the presence of predatory mammals (especially Red Foxes *Vulpes vulpes*). If predatory mammals are present on a bird island, the site is abandoned by both Black-headed Gulls and Sandwich Terns (Kube *et al.* 2005).

The presence of predatory gulls (Herring Gull, Lesser Black-backed Gull, and Great Black-backed Gull) is tolerated at least to some extent (Fig. 11). Even on small islands, such as Heuwiese (13.5 ha) or Beuchel (4.1 ha), large colonies of Sandwich Terns and Black-headed Gulls did co-exist with several hundred breeding pairs of Herring Gulls. However, the colonies of the species are always spatially separated.

As the example Langenwerder shows, the vicinity of large numbers of Common Gulls *Larus canus* does not seem to have an influence on the choice of the breeding site. The main conservation measure for the Sandwich Tern is the protection of suitable breeding sites. These are small islands covered by low grass vegetation, without human disturbances and predatory mammals. The exclusion of human disturbances as well as predatory mammals (especially foxes, but also Feral Mink *Mustela vison*) from those islands is the main conservation measure required. The impact of the newly immigrated Racoon Dog *Nyctereutes procyonoides* on coastal bird colonies is not yet well investigated. The diet of this species and its recent occurrence on coastal bird islands should give reason to focus attention on its influence on coastal birds.

Measures to reduce numbers of gulls, especially larger gulls, have been practised in the past in several countries (Thiessen 1986; Kube *et al.* 2005; Stienen 2006). In the Netherlands, even Black-headed Gulls were controlled at major tern colonies until the 1970s since it was believed that they were a threat to the terns because they prey on eggs and chicks and rob the fish from the adult birds (Stienen 2006). Veen (1977) could show that predation and kleptoparasitism of the Black-headed Gulls did not have a critical impact on the reproductive output of the Sandwich Terns, whereas the protective function of the gulls was a significant advantage for them. These findings resulted in a halt of population control measures for Black-headed Gulls in the Netherlands (Stienen 2006).

There is no doubt that larger gulls locally may have a noticeable impact on breeding site selection and/or breeding success of other coastal bird species, including Sandwich Tern. Displacements of Sandwich Terns by large gulls have been observed in some cases, especially on small islands. However, there is no evidence that predation by gulls is a significant factor for any coastal bird species on a regional or bio-geographical level (Langgemach & Bellebaum 2005). The considerable increase of the Herring Gull in the Baltic Sea area during the last decades (Vauk & Prüter 1987; BirdLife International 2004) did not result in a decline of the

[1] The breeding on a jetty in Gdynia in 2006 on the first view seems to be exceptional. However, the breeding place had very similar characteristics to those found on small islands (low vegetation, no access for predatory mammals, breeding of Black-headed Gulls).

The Sandwich Tern colony on the island Heuwiese, Mecklenburg-Western Pomerania, May 1992. The formation of a colony on this island in 1957 was the beginning of the range expansion of the species to the southern coasts of the western and central Baltic Sea area. – *Die Brandseeschwalbenkolonie auf der Heuwiese, Mecklenburg-Vorpommern, im Jahr 1992. Die Bildung einer Kolonie auf dieser Insel im Jahr 1957 war der Beginn der Arealerweiterung der Art an die Südküsten der westlichen und zentralen Ostsee.*
Photo: H. W. NEHLS.

Sandwich Terns with chick on the island Langenwerder, Mecklenburg-Western Pomerania, May 1989. – *Brandseeschwalben mit Küken auf der Insel Langenwerder, Mecklenburg-Vorpommern, Mai 1989.*
Photo: H. W. NEHLS.

Breeding Sandwich Terns on the island Langenwerder, Mecklenburg-Western Pomerania, May 1989. – *Brütende Brandseeschwalben auf der Insel Langenwerder, Mecklenburg-Vorpommern, Mai 1989.* Photo: H. W. NEHLS.

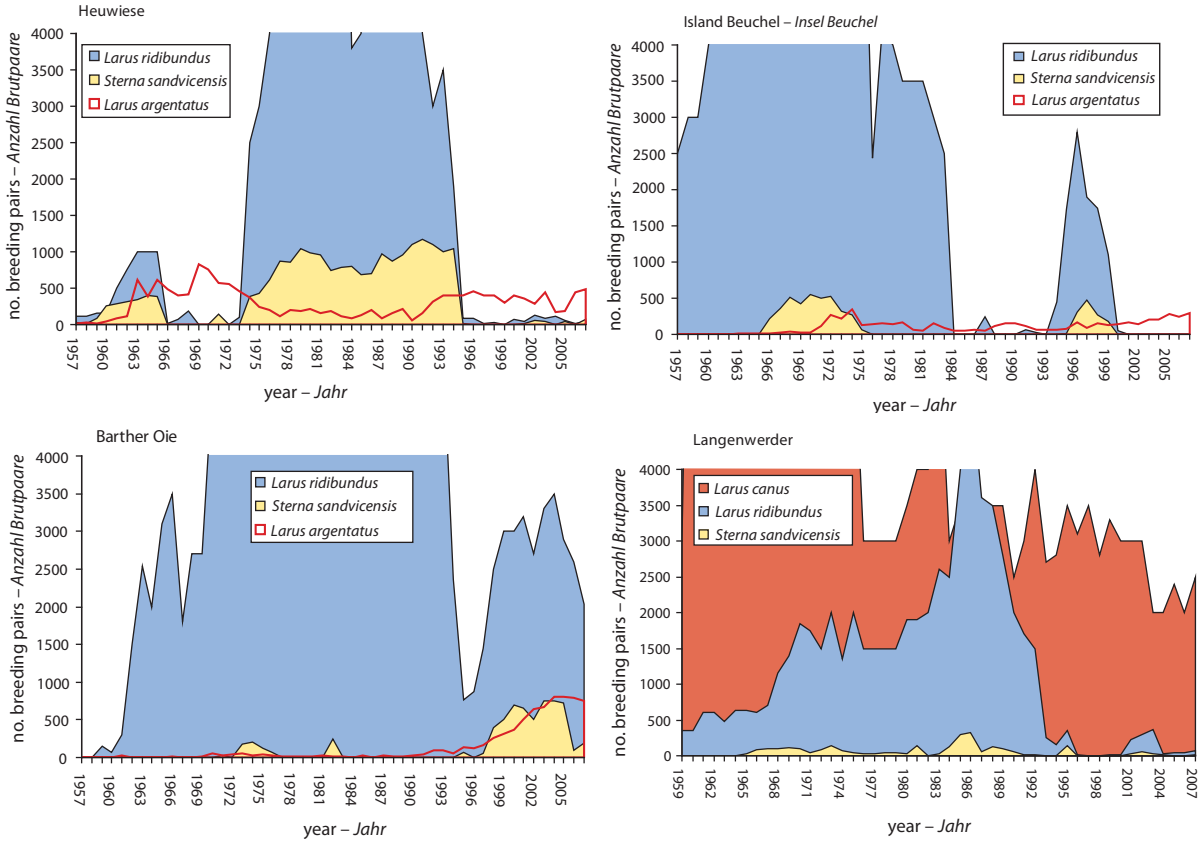

Fig. 11: The development of breeding pair numbers of the Sandwich Tern in relation to the presence of Black-headed Gull, Herring Gull, and Common Gull in four coastal bird colonies of Mecklenburg-Western Pomerania. The figures show, that the Sandwich Tern only forms colonies on breeding islands with presence of Black-headed Gulls. If a breeding site is abandoned by Black-headed Gulls, the Sandwich Tern also disappears (see Heuwiese 1966, 1995; Island Beuchel 2000; Langenwerder 1996). In 1971, the Heuwiese was colonised by 140 bp of Sandwich Terns, but also held 50 bp of Black-headed Gulls. – *Die Bestandsentwicklung der Brandseeschwalbe im Vergleich zu den Beständen von Lachmöwe, Silbermöwe und Sturmmöwe in vier Küstenvogelkolonien Mecklenburg-Vorpommerns. Die Abbildungen zeigen, dass die Brandseeschwalben sich nur auf Inseln ansiedeln, auf denen auch Lachmöwenkolonien bestehen. Bei Aufgabe einer Lachmöwenkolonie verlassen auch die Brandseeschwalben den Brutplatz (s. Heuwiese 1966, 1995; Insel Beuchel 2000; Langenwerder 1996). 1971 siedelten auf der Heuwiese 140 BP Brandseeschwalben, aber auch 50 BP Lachmöwen.*

Sandwich Tern. Consequently, regulation measures for larger gulls as a conservation strategy for coastal bird species are questioned or even strongly opposed by many ornithologists (Thiessen 1986; Langgemach & Bellebaum 2005; Kube *et al.* 2005).

Grazing by cattle is necessary for some breeding sites in order to maintain the short grass vegetation required by the terns. In Sweden, the overgrowth of breeding islands by bushes as a consequence of cessation of grazing actually turns to become an increasing problem. In Germany, grazing is a management requirement for some islands which otherwise would overgrow by reedbeds (e.g., islands Barther Oie and Kirr). The grazing management of these sites can be considered as secured. In Denmark, Poland and Estonia overgrowth of breeding sites is of less or no significance.

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5. Zusammenfassung

Herrmann, C., H. W. Nehls, J. Gregersen, W. Knief, R. Larsson, J. Elts & M. Wieloch 2008: Verbreitung und Bestandstrends der Brandseeschwalbe *Sterna sandvicensis* an der Ostsee. Vogelwelt 129: 35-46.

Zu Beginn des 20. Jahrhunderts war die Brandseeschwalbe in der Ostsee noch kein regelmäßiger Brutvogel. Im Laufe der ersten Hälfte des 20. Jahrhunderts erweiterte sie jedoch schrittweise ihr Verbreitungsgebiet nach Nordosten. Zunächst

wurden Schonen (1911) und ab den 1930er Jahren die schwedische Ostküste besiedelt. Beginnend mit der Bildung einer Kolonie auf der Insel Heuwiese (Deutschland, Mecklenburg-Vorpommern) im Jahr 1957 erweiterte die Brandseeschwalbe ihr Areal auch auf die Südküsten der westlichen und zentralen Ostsee. In Estland ist sie seit 1962 regelmäßiger Brutvogel, in Polen (mit Unterbrechungen) seit 1977. Die Arealerweiterung und Populationszunahme in der Ostsee in den 1950er/1960er Jahren erfolgte zeitgleich mit einem starken Rückgang der Nordseepopulation. Dies weist darauf hin, dass die Besiedlung der Ostsee vermutlich eine Reaktion auf die Verschlechterung der Umweltbedingungen in der Nordsee war. Die Zahl der Brutpaare im Ostseeraum nahm zunächst kontinuierlich zu und erreichte zum Ende der 1970er Jahre etwa 2.500. Seitdem ist der Brutbestand ungeachtet einiger Schwankungen und Verlagerungen von Brutplätzen weitgehend stabil. Genauere Erfassungen ab Mitte der 1990er Jahre ergaben für die Ostsee einen zwischen 2.000 und 3.500 BP schwankenden Bestand. Die wichtigste Schutzmaßnahme für die Brandseeschwalbe besteht im Erhalt geeigneter Brutplätze. Dies sind insbesondere kleine Inseln mit kurzgrasiger Vegetation, die frei sind von menschlichen Störungen und Raubsäugern. Die Anwesenheit von Lachmöwen ist eine Ansiedlungsvoraussetzung für die Brandseeschwalbe.

6. References

Aumees, L., & V. Paakspuu 1963: Uusi haudelinde Eesti faunas. Ornitoloogiline Kogumik 1963 (3): 195–205.

Beckmann, K. O. 1922: Ornithologische Beobachtungen aus der Landschaft Schwansen (Süd-Schleswig). Ornithol. Mber. 30: 73–78, 97–100.

Benicken, J. C. 1824: Beyträge zur nordischen Ornithologie. Isis von Oken 2: 877–891.

Berndt, R. K., K. Hein, B. Koop & S. Lunk 2005: Die Vögel der Insel Fehmarn. Husum Druck- u. Verlagsgesellschaft.

Berndt, R. K., B. Koop & B. Struwe-Juhl 2003: Vogelwelt Schleswig-Holsteins. Vol. 5, Brutvogelatlas. Wachholtz Verlag, Neumünster.

BirdLife International 2004: Birds in Europe. Population Estimates, Trends and Conservation Status. BirdLife Conservation Series 12. BirdLife International, Cambridge.

BirdLife International/European Bird Census Council 2000: European Bird Populations: Estimates and Trends. BirdLife Conservation Series No. 10. BirdLife International, Cambridge.

Brenning, U. 1983: Zur Entwicklung des NSG Langenwerder in den letzten 20 Jahren (1963–1982). Naturschutzarb. Mecklenburg 26: 78–83.

Christensen, J. O. 1990: Status for ynglebestande af måger og terner m.fl. i Danmark, 1988. Report, Dansk Orn. Foren., Copenhagen.

Dost, H. 1958: Brutvorkommen der Brandseeschwalbe auf Rügen. Falke 5: 18.

Dost, H. 1959: Die Vögel der Insel Rügen. A. Ziemsen Verlag, Wittenberg.

Dybbro, T. 1976: De danske ynglefugles udbredelse. Dansk Orn. Foren., Copenhagen.

Dybbro T. 1985: Status for danske fuglelokaliteter. Dansk Orn. Foren., Copenhagen

Elts, J., A. Kuresoo, E. Leibak, A. Leito V. Lilleleth, L. Luigujõe, A. Lõhmus, E. Mägi & A. Ots 2003: Status and Numbers of Estonian Birds 1998–2002. Hirundo 16: 58–83.

Erfurt, H.-J. & V. Dierschke 1992: Oehe-Schleimünde – Naturschutzgebiet an der Ostseeküste Schleswig-Holsteins. Seevögel 13, Sonderheft 1: 1–104.

Gärdenfors, U. 2005: The 2005 Redlist of Swedish Species. SLU, Uppsala.

Garthe, S. & B.-O. Flore 2007: Population trend over 100 years and conservation needs of breeding Sandwich Terns (*Sterna sandvicensis*) on the German North Sea coast. J. Ornithol. 148: 215–227.

Gregersen, J. 2006: Ynglebestanden af Splitterne i Danmark 1993–2005. Dansk Orn. Foren. Tidsskr. 100: 88–96.

Grell, M. B. 1998: Fuglenes Danmark. Dansk Orn. Foren., Gads Forlag, Copenhagen.

Helms, O. 1948: Danske Fugle ved Stranden. G.E.C. Gads Forlag, Copenhagen.

Knief, W., R. K. Berndt & W. Schwennesen 1997: Entwicklung der Küstenvogelbrutbestände an der schleswig-holsteinischen Ostseeküste von 1984 bis 1995. Seevögel 18: 82–93.

Knief, W., M. Otto & R. K. Berndt 2001: Ergebnisse der Brutbestandserfassung in den Naturschutzgebieten an der schleswig-holsteinischen Ostseeküste 1999. Seevögel 22: 39–40.

Knief, W., W. Schwennesen & R. K. Berndt 1999: Ergebnisse der Brutbestandserfassung in den Naturschutzgebieten an der schleswig-holsteinischen Ostseeküste 1997. Seevögel 20: 41–42.

Knief, W., W. Schwennesen & R. K. Berndt 2000: Ergebnisse der Brutbestandserfassung in den Naturschutzgebieten an der schleswig-holsteinischen Ostseeküste 1998. Seevögel 21: 71–73.

Köppen, U. 1997: Brutbestände der Küstenvögel in Schutzgebieten Mecklenburg-Vorpommerns 1995. Seevögel 18: 20–25.

Köppen, U. 1998: Küstenvogelschutz in Mecklenburg-Vorpommern heute – Organisation, Probleme und Konzepte. Seevögel 19, Sonderheft: 31–40.

Köppen, U. 2000: Brutbestände der Küstenvögel in Schutzgebieten Mecklenburg-Vorpommerns 1998. Seevögel 21: 54–57.

Köppen, U. & G. Graumann 1998: Brutbestände der Küstenvögel in Schutzgebieten Mecklenburg-Vorpommerns 1993, 1994 und 1996. Seevögel 19: 11–16.

Kube, J., U. Brenning, W. Kruch & H. W. Nehls 2005: Bestandsentwicklung von bodenbrütenden Küstenvögeln auf Inseln in der Wismar-Bucht (südwestliche Ostsee): Lektionen aus 50 Jahren Prädatorenmanagement. Vogelwelt 126: 299–320.

Kuus, A. & A. Kalamees 2003: Important Bird Areas of European Union importance in Estonia. Eesti Ornitoloogiaühing, Tartu.

Langgemach, T. & J. Bellebaum 2005: Prädation und der Schutz bodenbrütender Vogelarten in Deutschland. Vogelwelt 126: 259–298.

Larsson, R. 2006: Kentsk tärna i Blekinge 1996–2006 – Sammanställning av 10 års övervakning. Länsstyrelsen Blekinge län, Karlskrona, Report nr: 2006/14.

Leibak, E., V. Lilleleth & H. Veromann 1994: Birds of Estonia. Status, Distribution and Numbers. Estonian Academy Publishers, Tallinn.

Mänd, R. 1982: Tiirud. Valgus, Tallinn.
Mardal, W. 1974: Ternegruppen. Feldornithologen 16: 4–7.
Mitchell, P. I., S. F. Newton, N. Ratcliffe & T. E. Dunn 2004: Seabird Populations of Britain and Ireland. T. & A.D. Poyser, London
Møller, A. P. 1981: The migration of European Sandwich Terns *Sterna s. sandvicensis*. Vogelwarte 31: 74–94, 149–168
Nehls, H. W. 1969: Zur Umsiedlung, Brutortstreue und Brutreife der Brandseeschwalbe (*Sterna sandvicensis*) nach Ringfunden auf Langenwerder. Vogelwarte 25: 52–57.
Nehls, H. W. 1977: Brandseeschwalbe – *Sterna sandvicensis* Lath., 1787. In: Klafs, G. & J. Stübs (eds.): Die Vogelwelt Mecklenburgs, 1st edition: 195–197. G. Fischer Verlag, Jena.
Nehls, H. W. 1982: *Sterna sandvicensis* Latham 1787 – Brandseeschwalbe. In: Glutz von Blotzheim, U. N. & K. M. Bauer (eds.): Handbuch der Vögel Mitteleuropas. Vol. 8: 864–911. Akademische Verlagsgesellschaft, Wiesbaden.
Nehls, H. W. 1983: Studies on the Sandwich Tern *Sterna sandvicensis* population of the Baltic with special regard to the coast of the German Democratic Republic. Ornis Fennica, Suppl. 3: 79–80.
Nehls, H. W. 1987: Brandseeschwalbe – *Sterna sandvicensis* Lath., 1787. In: Klafs, G. & J. Stübs (eds.): Die Vogelwelt Mecklenburgs, 3rd, revised edition: 233–235. G. Fischer Verlag, Jena.
Nyegaard, T. & M. B. Grell 2006: Truede og sjældne ynglefugle i Danmark 2005. Dansk Orn. Foren Tidsskr. 100: 11–28.
Otto, B. C. 1777: Verzeichnis von Vögeln, die im Schwedischen Pommern beobachtet, geschossen und nach dem Linneischen System beschrieben sind. Neue Mannigfaltigkeiten 4: 443–452; 459–468.
Pągowski, Z. 1979: The actual record of Sandwich Tern breeding in Poland. Not. Orn. 20: 50–51.
Salomonsen, F. 1963: Oversigt over Danmarks Fugle. DOF, Munksgaard, Copenhagen.
Scheufler, H., A. Stiefel & E. Sturmhoefel 1982: Die Brutvögel des NSG „Inseln Oie und Kirr" und ihre Betreuung durch die Vogelwärter. Meer u. Museum 3: 24–32.
Schmidt, R. & H.-U. Dost 1988: Nachweis einer am Schwarzen Meer erbrüteten Brandseeschwalbe (*Sterna sandvicensis*) als Brutvogel in einer Kolonie der Ostseeküste der DDR. Beitr. Vogelkd. 34: 60.
Schulz, H. 1947: Die Welt der Seevögel. Verlag Anton Lettenbauer, Hamburg.
Siefke, A. 1993: Brutbestände der Küstenvögel 1989–1992 in den Schutzgebieten Mecklenburg-Vorpommerns. Seevögel 14: 37–41.
Stienen, E. W. M. 2006: Living with Gulls. Trading off food and predation in the Sandwich Tern *Sterna sandvicensis*. PhD thesis University of Groningen, The Netherlands, *http://dissertations.ub.rug.nl/faculties/science/2006/e.w.m.stienen/*
Svensson, S. 1999: Svensk Fågelatlas. Sveriges Ornitologiska Forening, Stockholm.
Thiessen, H. 1986: Zur Bestandsentwicklung und Situation von Möwen *Laridae* und Seeschwalben *Sternidae* in Schleswig-Holstein – sowie Gedanken zum „Möwenproblem". Seevögel 7: 1–12.
Tjernberg, M. & M. Svensson 2007: Artfakta – Rödlistade ryggradsdjur i Sverige [Swedish Red Data Book of Vertebrates]. ArtDatabanken, SLU, Uppsala.
Tomiałojć, L. 1990: Ptaki Polski. Warsaw.
Tomiałojć, L. & T. Stawarczyk 2003: Awifauna Polski. Rozmieszczenie, liczebnośći zmiany. – The Avifauna of Poland. Distribution, Numbers and Trends. Vol. I, Wroclaw.
Vauk, G. & J. Prüter 1987: Möwen: Arten, Bestände, Verbreitung, Probleme. Niederelbe Verlag, Ottendorf/Niederelbe.
Veen, J. 1977: Functional and causal aspects of nest distribution in colonies of the Sandwich Tern (*Sterna s. sandvicensis* Lath). Behaviour 20 (Supplement): 1–193.
Wetlands International 2006: Waterbird Population Estimates. Fourth Edition. Wetlands International, Wageningen.
Wieloch, M. 1986: A colony of terns at the mouth of the Vistula river and problems connected with their protection. Vår Fågelv. Suppl. 11: 239–340.

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