ORIGINS, OCCURRENCE AND MOVEMENTS OF SANDWICH TERN *THALASSEUS SANDVICENSIS* IN SOUTHERN AFRICA

A.J. TREE

Research Associate, Department of Zoology, Nelson Mandela Metropole University, Box 77000, Port Elizabeth, South Africa, 6031 (tony@zeane.com)

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SUMMARY

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The Sandwich Tern *Thalasseus sandvicensis* occurs throughout the coastal regions of southern Africa but tends to favour major bays, coastal lagoons and suitable river mouths. There is a great disparity in counts at any one locality from year to year. Overall austral summer population was estimated at 10 000–15 000 in a good year and probably <10 000 in a poor year. Banding recoveries indicated origins in western Europe (354 birds recovered) and, rarely, from the Black or Caspian seas (two birds recovered). Movements occur continuously within the sub-region of southern Africa throughout summer, as indicated by varying counts and two within-season recoveries. The oldest bird recovered was in its 28th year. Recoveries of birds in their first year (23%) varied as to source: the highest recovery rates were for birds originating in Germany and Denmark, while the lowest rates were for birds originating in Britain (England/Scotland) and the Netherlands. The recovery rate increased from the second year of life. Most recoveries were of dead birds, with the majority of records indicating "found dead" with no further details. Band recoveries have varied in frequency over the last 80 years along different sections of coastline. Arrivals occur along the west coast from September to November for adults, but may continue through to March for young birds, with the last presumed breeding birds departing by early April. Small numbers of nonbreeders, up to 5 years old, may overwinter on the west coast, but very few were found at this time on south and east coasts. Migration is nocturnal or diurnal, inshore and normally at altitudes varying from 100 m to 300 m but may be much higher. Mass gains vary from about 25% to 45%, indicating short- to medium-hop migration. Within southern Africa there are a series of recognised staging localities that are used mainly for resting with limited, if any, feeding observed at most of them.

Key words: Sandwich Tern, *Thalasseus sandvicensis,* southern Africa, counts, distribution, band recoveries, roost sites, migrations

INTRODUCTION

The Sandwich Tern *Thalasseus sandvicensis*, syn. *Sterna sandvicensis* (Bridge *et al.* 2005) is a fairly common nonbreeding visitor from Europe to the coasts of southern Africa from Namibia through to southern Mozambique, although tending to concentrate along selected stretches of coastline. Small numbers overwinter in southern Africa, mainly along the west coast (Tree 2005a). There is only one record from an inland station (Hofmeyer & Krone 1995), although birds regularly penetrate for a few kilometres up broader estuaries when feeding (pers. obs.) or visit coastal lakes (Cyrus & Robson 1980). The large majority come from colonies on the west European Atlantic seaboard and the Baltic Sea, with fewer birds from the Mediterranean and rare visitors from the Black and Caspian seas (Underhill *et al.* 1999, South African Bird Ringing Unit (SAFRING) databank safring.adu.org.za). The southern African austral summer population has been roughly estimated at 10 000 to 30 000 birds (Underhill *et al.* 1999). The Sandwich Tern is essentially an inshore feeder, feeding mainly within two kilometres of the coastline or in the mouths of larger estuaries (Tree 2005b). Few appear to reach the offshore islands, although some may fly out to join nocturnal roosting assemblages of other tern species, especially Swift Terns *Thalasseus bergii*. Earlier analyses of Sandwich Tern recoveries in the sub-region have appeared in Elliott (1971), Morant *et al.* (1983), Vandewalle (1988) and Underhill *et al.* (1999), but the larger dataset recently gathered (SAFRING) allows for a more detailed analysis. Comparison is also made with a detailed earlier study on the migration of Sandwich Tern from a European perspective (Møller 1981a, 1981b). The aims of this paper are to describe the origins, occurrence and movements of Sandwich Terns in southern Africa using long-term datasets of both counts and banding information.

METHODS

Observations and counts were made with the aid of binoculars (10 × 42) and a telescope (20–60× zoom), the latter a necessity when counting tightly packed flocks of mixed species of terns. Counts were made at a variety of sites in the Eastern Cape since 1995 by the author and a team of observers. On the west coast of the Western Cape, Keith Harrison has carried out regular counts at several sites since June 2003. Infrequent counts were made at a variety of other sites, mainly in the southwestern and southern Western Cape Province and Namibia. Use was also made of the Co-ordinated Wildfowl Count (CWAC) data stored at the Avian Demographic Unit of the University of Cape Town and of the equivalent scheme based in Namibia and stored at the Ministry of Environment and Tourism in Windhoek. These counts are made principally in January/February and July but in some cases in other months of the year. Some information was obtained from the literature for KwaZulu-Natal and Mozambique regions for which limited data are available. Trapping was carried out with mist-nets set over water or wet sand, on a concrete harbour pier, or along the dividing banks between salt-works ponds and in both tidal and

non-tidal environments (A.J. Tree & M. Boorman, pers. obs.). In Namibia, intense tern trapping and observations were carried out from late January to early March 1998 (Tree 1998), February/March 1999 (Tree 1999) and late October to early December 2005 (Tree & Boorman 2006) with ongoing trapping by M. Boorman since December 1999.

Band recovery information was obtained from the SAFRING databank with an additional search made of overseas banding schemes. Records missing from the SAFRING databank were largely from earlier years. Most recoveries were of birds found dead or dying, usually by members of the public, but small numbers were controlled (recaptured) by banders either through mist-netting or by reading the band numbers in the field with the aid of a telescope. The term "recovery" is used to include birds controlled except where otherwise stated. The term "controlled" indicates birds recaptured away from the place where they were ringed.

Data for Sandwich Terns recovered in Angola from four banding schemes are included for comparison: 226 birds were banded through the British Trust for Ornithology (BTO) (180 from Britain [England and Scotland], 46 from Ireland), 56 were banded through a Danish scheme, 42 through a Helgoland, Germany, scheme and six through a Swedish scheme. However, 46 of the BTO recoveries could not be used for ageing purposes, as at least six dates appeared to be those of mass reporting rather than dates of recovery. In several more instances reported on the same six dates, but where it was obvious that a bird must have been in its first year, these records were included. This may also have applied to other British as well as some Danish and Helgoland records, as there were several duplications of recovery dates, but these were not as obvious and were included.

The coast has been subdivided into zones, to enable closer analysis of the recoveries, following Underhill *et al.* (1999). These are Namibia (Zone 1), Orange River mouth to Cape Agulhas (Zone 2), Cape Agulhas to Cape St Francis (Zone 3), Cape St Francis to the KwaZulu-Natal border (Zone 4), KwaZulu-Natal and Mozambique (Zones 5/6) (see Fig. 1). Zones 1 and 2 lie alongside the cold Benguela Current while the remainder fall along the coastline warmed by the Mozambique Current, with its cooler inshore counter-current running along the south coast.

Age was determined using the following criteria: a first-year bird (1y) was from date of hatching until 30 June of the following calendar year; a second-year bird (2y) from 1 July of the second calendar year to 30 June of the third calendar year, provided they could still be recognised later in the season; otherwise, birds were treated as immature (undesignated pre-adult) or adult. The majority of older birds were considered adult because differentiation from immatures of varying years is very difficult in winter quarters; however, a portion could be aged using primary wing moult.

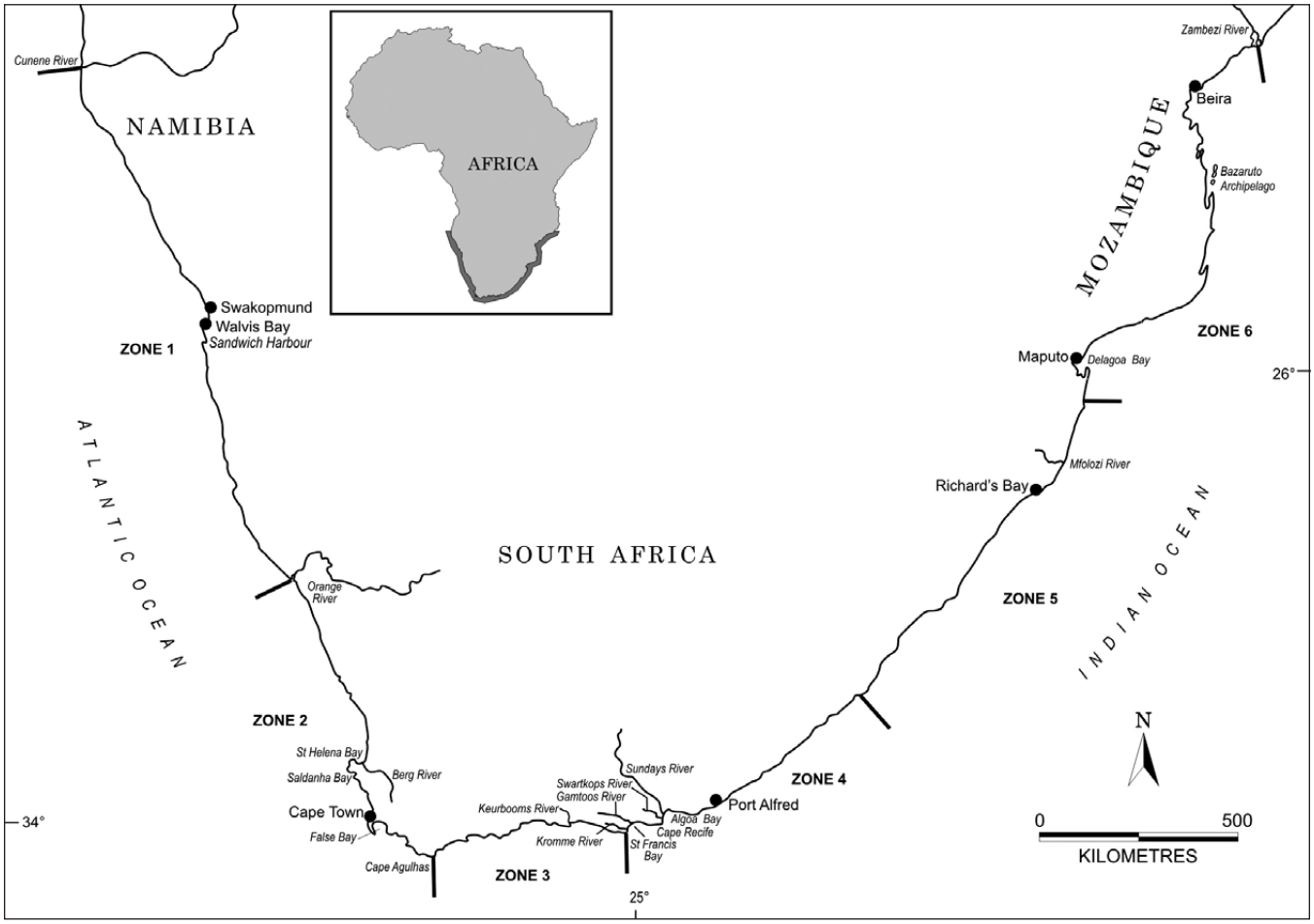

Fig. 1. Map of coastal southern Africa showing major sites and the zones mentioned in the text.

RESULTS

Counts and occurrence

The distribution of peak monthly counts for each zone is shown in the Appendix available on the Web site. Each month or group of months is given a count limit within each zone, over which all available counts have been shown. This appears in some detail for the better-covered areas and also gives some indication of how numbers at any one site may vary between years, with sites appearing for some years, yet absent in others. For example, high counts occurred in False Bay in December of 1986, 1987, 1988 and 1999 but not in other years. Similarly, in Namibia the peak counts occurred in January of 1994, 1996, 2004 and 2005. In the Eastern Cape the highest counts occurred in November 2000 and January 2004. The only peaks reflected at more than one site in the same season were in January 2004; this may reflect a season of peak numbers in southern Africa. This variable seasonal distribution presumably indicates trends in food availability.

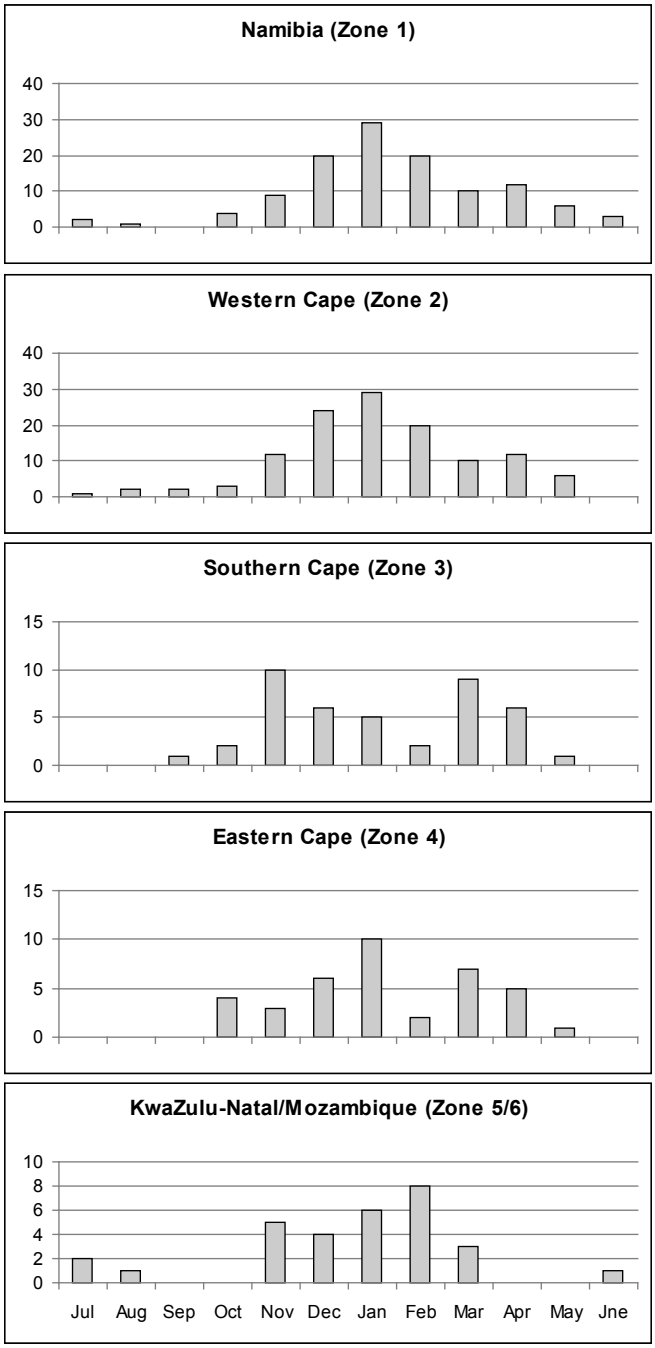

Fig. 2. Recoveries of European-banded Sandwich Terns in southern Africa from 1918 to 2008, by zone and month.

Major concentrations of Sandwich Tern in southern Africa occur within the more sheltered bays such as Walvis Bay and Sandwich Harbour (Namibia), St Helena, Saldanha and False bays (Western Cape Province), St Francis and Algoa bays (Eastern Cape Province), Richards Bay (KwaZulu-Natal), Delagoa Bay (Mozambique) or at coastal salt-works such as Mile 4, outside Swakopmund. However, large concentrations may be found anywhere, especially when terns are in transit. Intermediate concentration points are mainly at river mouths and suitable rocky points. The main staging/gathering localities at present appear to be those on St Francis Bay (Zone 4), St Helena Bay (Zone 2) and the central Namibian coast (Zone 1). Feeding is mainly inshore and diurnal, hence the low numbers recorded on offshore islands during the day (pers. obs.).

Even at highly favoured sites abundance varied both within season and between seasons, which is evident from the counts (see Appendix). The largest concentrations were recorded in Namibia and the Western Cape but only in certain years. In Namibia nearly 3800 were recorded on 24 January 2004 at Sandwich Harbour, with a further 567 at Walvis Bay; the following year, the corresponding figures were 5400 and 1807 (for the end of January/beginning of February 2005). In marked contrast, in 2003 there were only 55 and 263, respectively, at these two sites in mid-January. The highest counts in the southwestern Cape were made much earlier at Strandfontein sewage ponds, with 3027 on 15 December 1986, 2620 on 15 February 1984 and 2200 on 8 December 1999. More recent counts at this site were much lower.

Band recoveries

A total of 339 recoveries in southern Africa up to 2008 are available for analysis from the SAFRING databank, representing the banding schemes of the United Kingdom and Ireland (174 recoveries), the Netherlands (43), the Helgoland (west, 37) and Hiddensee (east, 9) schemes of Germany, Denmark (33), Sweden (11), Belgium (10), Italy (9), Estonia (6), France (5) and Crimea, Ukraine (former Soviet

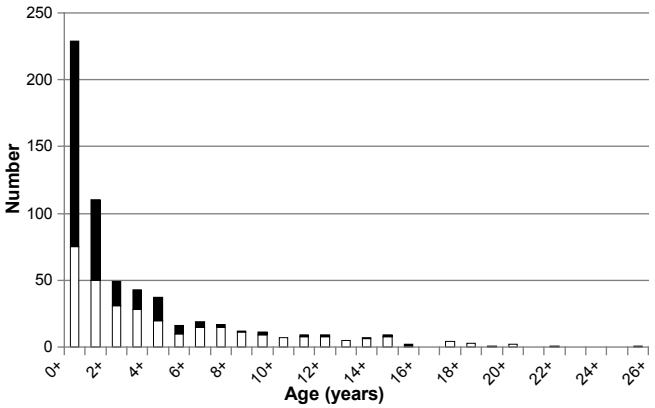

Fig. 3. Age at recovery of Sandwich Tern ringed in their first year, prior to their first migration south. White bars indicate records from southern Africa, and black bars, records from Angola.

Republic) and Turkmenistan (former Soviet Republic) — 1 each (Fig. 2). Two of the birds banded in Denmark were subsequently found on migration through Italy. Fewer than 450 birds have been banded in southern Africa, of which 14 were recovered in Europe: in the Netherlands (5), Denmark and England (2 each), France, Belgium, Ireland, Sweden and Poland (1 each). Most birds ringed as chicks were recovered in their first five years of life. The oldest bird recovered was in its 28th year (Fig. 3). Numbers of recoveries increased over the study period, although numbers in Zones 2 and 4 decreased since the 1970s (Fig. 4). The distribution of age groups in each coastal zone is shown in Table 1, while Table 2 indicates the percentage recovery in southern Africa of different age classes banded as pulli or newly fledged young by source country and Table 3 shows the source country of recoveries found in each Zone.

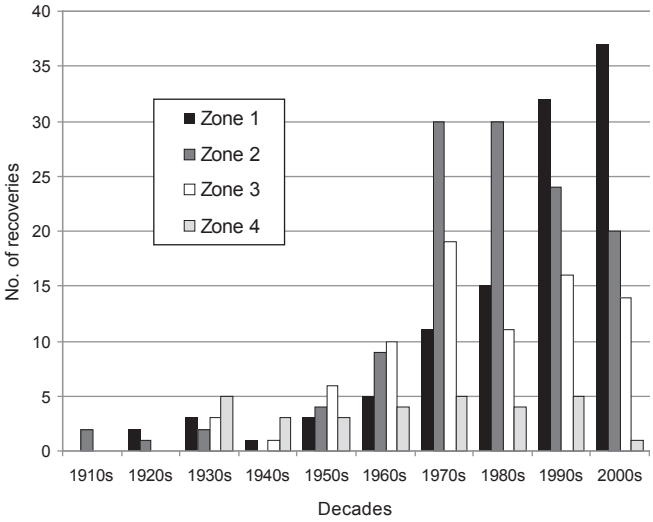

Fig. 4. Recoveries of Sandwich Tern shown by zones and decades: 1 = Namibia; 2 = Orange River mouth to Cape Agulhas; 3 = Cape Agulhas to Cape St Francis; 4 = Cape St Francis to the KwaZulu-Natal border.

TABLE 1
Age groups of Sandwich Tern by coastal zone (see Fig. 1 for zones)

	Recovery zone in southern Africa; number (%) of Sandwich Terns in age range				
Age	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**
0–1 year	33 (42.3)	16 (20.5)	11 (14.1)	11 (14.1)	7 (9.0)
1–2 year	16 (28.1)	19 (33.3)	4 (7.0)	9 (15.8)	9 (15.8)
2–3 year	8 (44.4)	18 (56.3)	1 (3.1)	3 (9.4)	2 (6.3)
3+ years	51 (29.8)	67 (39.2)	26 (15.2)	15 (8.8)	12 (7.0)

TABLE 2
Recovery at different ages of Sandwich Tern ringed as pulli or newly fledged young and recovered in southern Africa (not including Angola) and in Angola

		Tern age; number (%) of Sandwich Terns recovered from each country				
Source country/ region	**Total**	**0–1 year**	**1–2 years**	**2–3 years**	**3+ years**	**Oldest (years)**
Recovered in southern Africa (not including Angola)						
Britain	103	14 (13.6)	18 (17.5)	12 (11.7)	59 (57.3)	27+
Ireland	70	16 (22.8)	14 (20.0)	6 (8.6)	34 (48.6)	19+
Netherlands	43	5 (11.6)	4 (9.3)	5 (11.6)	29 (67.4)	21+
Helgoland, Germany	37	15 (40.5)	4 (10.8)	3 (8.1)	15 (40.5)	14+
Denmark	33	10 (30.3)	8 (24.2)	2 (6.1)	13 (39.4)	21+
Belgium	10	5 (50.0)	1 (10.0)	-	4 (40.0)	7+
Sweden	9	2 (22.2)	2 (22.2)	2 (22.2)	3 (33.3)	8+
Hiddensee, Germany	8	2 (25.0)	-	1 (12.5)	5 (62.5)	10+
Estonia	6	1 (16.7)	-	1 (16.7)	4 (66.7)	13+
France	5	3 (60.0)	1 (20.0)	-	1 (20.0)	6+
Italy	5	3 (60.0)	-	-	2 (40.0)	6+
Crimea, Ukraine	1	1 (100.0)	-	-	-	0+
Turkmenistan	1	-	-	-	1 (100.0)	3+
Recovered in Angola						
Britain	226	121 (53.5)	33 (14.6)	15 (6.6)	14 (6.2)	16+
Helgoland, Germany	42	18 (42.9)	8 (16.7)	5 (11.9)	11 (28.6)	6+
Denmark	56	23 (41.1)	16 (28.6)	3 (5.4)	14 (25.0)	8+
Sweden	6	2 (33.3)	2 (33.3)	1 (16.7)	1 (16.7)	4+
Hiddensee, Germany	0	-	-	-	-	-

The most northerly recovery of a ringed bird on the east coast was in Mozambique (bird banded in England and found in January in its ninth year near Inhambane at 23°45'S)

There were two long-distance movements from within southern Africa documented, both in the same season. One bird ringed in the Eastern Cape (Zone 4) on 11 January was recovered 18 days later 850 km northeast in northern KwaZulu-Natal (Zone 5) and the other ringed in the southwestern Cape (Zone 2) in mid-December was controlled 565 km east in the Eastern Cape at the end of the following March.

Small numbers of birds are found along the east and south coast with occasional concentrations of up to 250 found on the west coast of the Western Cape and in central Namibia during the austral winter. This is supported by band recoveries between 15 April and the end of August, of which 86% (19) were made along the west coast (Western Cape and Namibia) with the remaining 14% (3, all in their first year) in the Eastern Cape and KwaZulu-Natal. The majority of the west coast birds found were in the first three years of life, with two in the fourth year and one in the fifth (found in Namibia). Two birds in their fifth year reported on the same day in mid-May 1918 from the Western Cape probably died earlier; since the date shown is likely that of reporting, they were not used in this analysis. A bird recovered in its ninth year in May in the Eastern Cape either had been dead a long time or had a recovery date that was in fact a reporting date.

Multiple recordings have been rare. An adult caught in Italy in April 2005 was reported in Namibia in January 2007 and back in Italy again in April 2009; another banded as a juvenile in August 2006 and reported in Namibia in January 2007 was seen again in Italy in August 2008. A bird initially banded in Denmark in August 1982 was recaptured in Italy in August 1997 and then found dead in the southwestern Cape (Zone 2) in January 1998, and another banded in June 2007 was recaptured in Namibia in February 2009 and then later in Italy in September of that year. Two pulli banded in the Netherlands were caught four and five years later in Namibia and found a further year later back in their original banding localities. A bird banded as a pullus in eastern Germany in June 1999 was controlled near Cape Town in December 2007, and its band then read in the field in Poland in July 2009.

Cause of recovery is often ill-defined, as the majority of records simply indicate "found dead" (182 records) with no further details. A few indicate that the bird had been dead for varying periods of time. The second largest group are of those controlled on purpose either through reading the ring numbers in the field with the aid of telescope or by mist-netting (72 records). Birds found sick or injured usually have few following details as to whether the bird was left to its fate or was taken into care and subsequently died or was released (33 records). Several were killed by vehicles, presumably driving on the beach, while some birds flew into fences or telephone/electricity lines, but how two were killed by fire is difficult to understand (14 records). Those trapped unintentionally were usually caught in nets or fishing line lying on the beach while some may have been caught while diving for anglers' bait (16 records); some of these may have been released unharmed. A few birds were shot for museum specimens, but the remainder seem to have been shot for sport (13 records). The few reports of death due to weather, drowning, oiling, red tide or predator (9 records) is surprising, but presumably many of those in the first category would belong here.

Roost sites

Terns form mixed roosts at both diurnal and nocturnal sites. They tend to concentrate at certain points along the coastline, mainly in more sheltered bays, salt and sewage works and larger river mouths. Of these, Sandwich Harbour, Walvis Bay, together with Mile 4 salt-works, the Berg estuary in St Helena Bay and the False Bay sites may be the most important sites in southern Africa in certain years, followed by St Francis and Algoa bays.

TABLE 3
Source and recovery zones of Sandwich Terns recovered in southern Africa (see Fig. 1 for locations of zones)

	Recovery zone in southern Africa; number (%) recovered per country				
Source country/ region	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5/6**
Britain	22 (21.4)	40 (38.3)	15 (14.6)	14 (13.6)	11 (11.7)
Ireland	22 (31.4)	26 (37.1)	7 (10.0)	9 (12.9)	6 (8.6)
Netherlands	23 (53.5)	10 (23.3)	6 (14.0)	3 (7.0)	1 (2.3)
Helgoland, Germany	9 (24.3)	13 (35.1)	3 (8.1)	5 (13.5)	7 (18.9)
Denmark	10 (30.3)	15 (45.5)	5 (15.2)	2 (6.1)	1 (3.0)
Belgium	6 (60.0)	2 (20.0)		2 (20.0)	
Sweden	2 (20.0)	4 (40.0)	2 (20.0)	1 (10.0)	1 (10.0)
Hiddensee, Germany	3 (33.3)	4 (44.4)	2 (22.2)		
Estonia	4 (66.7)	1 (16.7)	1 (16.7)		
France	1 (20.0)	2 (40.0)		1 (20.0)	1 (20.0)
Italy	5 (55.5)	3 (33.3)			1 (11.1)
Crimea, Ukraine			1 (100.0)		
Turkmenistan	1 (100.0)				

The favoured daytime sites at Mile 4 and Walvis Bay salt-works are on the tops of poles in the oyster-rearing ponds. There are thousands of these poles available, used by all tern species present but dominated by the larger birds. The Sandwich and Swift terns are the first species to gather at a nocturnal site, assembling up to an hour-and-a-half before dark. They then form a gathering point for other later-arriving species. The assembly point is either at or close to the final roost site. In tidal areas the birds remain restless, with the majority preferring to sit on the damp sand left exposed by the receding tide. When the tide is flowing they may sit further up the beach, and when there is spring tide, on sand dunes. Birds drift in to diurnal loafing/roost sites throughout the morning, and there is minimum feeding activity from midday to about 14h00.

DISCUSSION

Counts and occurrence

Owing to the continuing movements of this species during its stay in the sub-region, it is very difficult to arrive at an overall figure of occurrence, and this may vary annually. I would suggest that at peak occurrence a figure of 10 000–15 000 birds would be a fair estimate for the sub-region but that in poor years there may be fewer than 10 000 present. The western European population is estimated at 166 000 to 171 000 birds (Delany & Scott 2006); therefore, at peak the birds wintering in southern Africa constitute less than 10% of the overall. Counts suggest that the distribution of the Sandwich Tern around the southern African coastline shows a changing emphasis both from year to year and even decadally. The factors involved are likely to be food-related but this not at all clear at this stage.

Roost sites

The availability of suitable roost sites is of prime importance to all species of terns. Few major sites have yet been located for the Sandwich Tern but this species will probably join any coastal or estuarine tern roost, especially if Swift Terns are present. Although movements of terns at night are variable, numbers of birds are rarely static. Birds may arrive at a roost site in the middle of the night (pers. obs.), possibly following disturbance at another site, after nocturnal fishing or during migration.

Band recoveries

The recovery of banded birds in southern Africa is influenced by a variety of factors such as abundance along a stretch of coastline; human population density, which at resort areas peaks in mid-summer; the level of education or prosperity of the local inhabitants; numbers of birds ringed in the breeding areas; and the presence of scavengers, such as jackals and hyenas, on the shoreline (Underhill *et al.* 1999). To this may be added the effect of reduced reporting due to the escalating cost of postage.

Recoveries of all ages of banded birds in each of the zones show a markedly varying pattern (Fig. 2). In Namibia this clearly indicates the through passage of the majority of birds, with peaks in November and March. In the Western Cape, an important oversummering area, recoveries peak in December and January, whereas those for the southern Cape, a stretch of coastline not generally favoured by terns, show a strong transient pattern. The low number of recoveries in February in the Eastern Cape is strange, as this is one of the peak months of occurrence in that zone, while those for KwaZulu-Natal/Mozambique indicate the major months of presence at the end-point of migration.

As has been previously indicated (Møller 1981b, Cramp 1985), the proportion of first-year birds penetrating as far as southern Africa is lower than for the Common Tern, which I estimate at about 31% from band returns (and 28% of all birds captured); the equivalent figures for first-year Sandwich Tern in the review area are about 23% (and 24%) (M. Boorman & A.J. Tree, pers. obs.). This is not directly comparable with the figure of 45% given by Møller (1981b) for Sandwich Tern band returns, as he considered "southern Africa" to encompass Nigeria and all territory to the south. This latter figure is obviously influenced by the large numbers of young birds found from Angola northwards (Fig. 3). However, the picture varies considerably between zones (Table 1) and different source areas (Table 2). The highest proportion of banded first-year birds recovered is from Namibia (30.6%), as would be expected, but with only slightly lower figures for Zones 3, 4 and 5, whereas Zone 2, with its sometimes very large mid-summer numbers, shows by far the lowest proportion (13.4%). The oldest bird recorded under the SAFRING scheme was ringed as a pullus in Scotland and found almost 27 years and 5 months later in the Western Cape. This compares well with the oldest known bird, aged 30 years and nine months (Staav 2001).

When looking at the source country of the different age groups, a complex picture emerges. The large majority of first-year birds from Britain and the Netherlands evidently spend their formative year to the north of southern Africa, whereas higher numbers of birds from Ireland, Sweden and Estonia reach southern Africa. The highest percentages of first-year birds reaching southern Africa come from Germany and Denmark. Considering that there is much movement of birds between western colonies (Cramp 1985), this result seems somewhat surprising. The numbers of recoveries from other source countries are too low for analysis. For the four schemes for which I have data (Denmark, western Germany, Sweden and Britain/Ireland), a higher percentage of first-year birds, especially those from Britain/Ireland and Denmark, obviously remain to the north in Angola, although care needs be taken in interpreting this, as tern hunting along Angolan beaches was common during Portuguese rule, with the more naive youngsters falling most easily to the gun. By the time birds have reached an age of over three years, the proportions remaining to the north have dropped considerably, while the proportions of birds from Britain and the Netherlands visiting southern Africa have peaked. The overall sample is small, and these findings are tentative. Cognisance needs to be taken of colour band sightings made in 1998 and 1999 in Namibia. A study by Eric Stienen (pers. comm.) led to a large number of young being banded/colour-banded, with a year and site code, at Griend in the Netherlands from 1995 to 1997. The Namibian sightings in 1998 were 17 (71%) from 1995, 5 (21%) from 1996 and 2 (8%) from 1997, and in 1999 were 21 (52.5%) from 1995, 9 (22.5%) from 1996 and 10 (25%) from 1997 (Tree 1999). These give an indication of the proportions of the age groups subsequently sighted. The very low proportion of first-year birds seen in 1998 reflects the low figure shown for this age group from the Netherlands in Table 2, and the increasing proportions from second year show the changing distribution with age.

In Table 3, the banding source country and zone in which recovery occurred show certain differences. Birds from most countries are fairly evenly spread around the coastline. In the case of birds

banded in Belgium, the Netherlands, eastern Germany and Estonia, there is a greater tendency for birds to stay in Namibia and further south along the west coast. The sample size from Italy is small, but only one has penetrated beyond Zone 2. The relatively high proportion of birds banded in western Germany and recovered in Zone 5, although these records are old, is inexplicable but may reflect a changing pattern of distribution around the coastline.

When examined on a decadal basis, there has been a changing emphasis in recoveries in each of the zones from the 1910s to the 2000s (Table 4). This may indicate long-term changes in tern distribution around the coastline. For instance, there appears to have been a decline in recoveries from Namibia from the 1920s, reaching a nadir during the 1950s until the 1970s, then increasing steadily until the present time. To a certain extent, this later increase has been facilitated by a large increase in banding activity from 1999 to date, but there also appears to have been a large increase in numbers sighted over the latter period. In Zone 2 there was a peak in the proportion of recoveries during the 1970s and 1980s with a subsequent decline, despite increased banding activity there during the 2000s. In Zone 3 there was a gradual increase in the proportion of band recoveries up to the 1990s, with a big drop in the 2000s. This reflects a definite decline in numbers on that stretch of coastline. After a bumper period from the 1930s to the 1970s, the proportion of recoveries from Zone 4 declined substantially during the 1980s and 1990s with an upswing during the 2000s, facilitated to a certain extent by increased banding activities. In Zone 5 there has been a continuing decline in recoveries from the 1940s to date. This probably reflects a genuine decline in the number of birds visiting the east coast.

Migration

The Sandwich Tern is a west coast migrant, with adults arriving from early September in western South Africa and reaching the Eastern Cape by late in that month or by early October (Tree 2002). Some of these continue through to KwaZulu-Natal or Mozambique. Arrival of adults in the sub-region continues until November, and probably later, while birds-of-the-year continue to arrive until March. The earliest recovery of a banded first-year bird was in Zone 3, on 6 October, but this was exceptional this far south. Otherwise, the earliest recoveries were 5 October for Angola, 16 November for Zone 1, 30 November for Zone 2, 10 December for Zone 4 and 25 November for Zone 5 (the latter as far back as 1951). Many first-year birds likely continue to arrive into their second calendar year, as the rate of recovery of this age group increases with time and as there is an upsurge in numbers of immatures in Namibia during February and March (pers. obs.). Movement is continuous throughout the birds' stay in southern Africa. Departure from the east begins in January, with peak numbers in the Eastern Cape occurring in February and the majority of presumed breeding birds departed by mid-March. In the Western Cape some birds five years of age or more continue to pass through until the end of the first week of April. There is considerable passage along the Namibian coast from February to April, with numbers fluctuating considerably on a daily basis. Nonbreeders wander more slowly onto the west coast, where concentrations of up to 250 birds may result during the austral winter, with very small numbers remaining along the east and south coast. There is a faint possibility that a few birds from the eastern populations may reach southern Africa via the east coast as, to date, there are some 23 records, mostly singletons, from coastal Tanzania (N. Baker pers. comm.). This could account for the occurrence of the two birds from the Black and Caspian seas but it is more likely that both followed a west coast route. Black Sea birds winter mainly in the Mediterranean, with small numbers penetrating down the west coast to about the Ivory Coast, whereas birds from the Caspian Sea winter mainly in those waters or the northwest Indian Ocean (Cramp 1985). The bird from Crimea, Ukraine, was found in Zone 3 nine months after banding and more likely followed a west coast route. The bird from Turkmenistan was found at Oranjemund, in southern Namibia, just over three-and-a-half years later; it had likely shifted to a more westerly population and was now following the normal migration route of those birds. This is not unprecedented as a Caspian-born bird was later found in a colony of birds in Denmark (Møller 1981b). Two birds, initially ringed as pulli in Denmark and subsequently found in southern Africa, were recorded in Italy on southward migration in August and September, indicating a limited overland migration from the Baltic to the Mediterranean and thence to the Atlantic.

The extreme mobility of birds throughout the season is demonstrated by the two within-season recoveries in southern Africa. January is usually considered the best month to count Palaearctic migrants in nonbreeding quarters; yet a bird banded in the Eastern Cape in January 1986 was recovered dead 849 km to the northeast in KwaZulu-Natal only 18 days later.

The Sandwich Tern migrates almost exclusively along the coasts of Europe and Africa rather than heading out to sea (Møller 1981a & b). In Africa the strategy of migration is poorly known, but Møller suggests that in Europe they normally travel in small groups, although occasionally in flocks of several hundred, just above the surface of the sea and within a few hundred metres of the coast. He also suggests that migration is leisurely, averaging much less than 100 km per day. Departure may start as early as June with maximum movement late August/early September and with few remaining by October. For southward migration we have little evidence in Africa, either visually or from weight data, as to whether birds are short-, medium- or long-hop migrants. For northward migration the limited indications from the weight data show that they do not accumulate much weight; gains before departure may be no more than 25–45% (pers. obs.). This would be indicative of medium-hop movements along the coast. The gains shown on the central Namibian coast, for example, could carry a proportion of the birds to Luanda, Angola, in one flight, a distance of about 1450 km. However, birds are also known to stage at sites such as the Cunene mouth (about 670 km north of Walvis Bay) on migration, so they presumably make shorter movements, but it would appear that sites such as this are purely for resting and that limited or no feeding takes place. In such cases it is unknown whether the birds depart from the central Namibian coastline or bypass it, travelling from some point further south such as the Orange River mouth. The birds arrive in north European waters from mid-March and reach their breeding grounds in large numbers from the end of April into May, with immatures arriving into June (Møller 1981a & b, Cramp 1985). Birds apparently make a fairly leisurely journey northwards, so migration is probably short- and medium-hop with favoured stopping-off points all along the coast. Stopover and flight periods are not known. In southern Africa arrivals and departures appear to occur in both the morning and evening, so migration is both diurnal and nocturnal, although Møller (1981a) states that this tern is a typical diurnal migrant but often commences migration at nightfall. Departure is usually easier to detect than arrival, as the behaviour of the birds is often different, with excited and noisy calling upon departure.

During the 1999 expedition to Namibia, information on migration was collated (Keijl 2003). Of four departures noted, three were in the evening and one in the morning. There were two evening records of either arrival or through migration, which could have been from Sandwich Harbour to the south. Some of these indications of active migration were discovered by chance, and many more must have passed by unnoticed as the fluctuating numbers of birds at different sites gave the impression of continuous turnover. These records, however, provide evidence that migration in the south takes place at some altitude and not normally at sea level. There is additional supporting observations from the Eastern and Western Cape. On 5 March 2005 at the Kromme estuary, a large-scale departure of more than 100 birds was noted at about 08h30 hours, with excited and noisy calling drawing one's attention to the event (pers. obs.). Lambert's Bay, situated on the open west coast well away from major tern haunts, is an ideal site to record tern migration. Birds turn over daily, and daytime numbers are generally quite low except when passage is taking place. The nocturnal tern roost forms toward and just after dark. With this normal early arrival of birds, birds arriving late at night have already travelled some distance to reach such a staging point. Terns leaving the Orange River mouth in the late afternoon/ evening should be able to travel the 460 km to Lambert's Bay in 7–8 hours. On the night of 18/19 November 2003, a small arrival (11 birds caught) of Sandwich Tern was noted between 23h30 and 02h30, none being recorded earlier at the roost site. It was only late on the following night that visible tern migration was witnessed, with Common Tern passing over from 23h00 at altitudes between 100 and 300 m. During the period 8–14 April 2007, visible diurnal migration was recorded daily at Lambert's Bay. Birds arrived between 07h50 and 10h00 hours, rested for a while and had departed again by 11h00. The Sandwich Tern occurred in small numbers (<90 each day) among the much larger numbers of migrating Common Tern, arriving from the south at altitudes between 100 and 300 m. On departure the mixed flocks headed north. Only Common Tern was seen departing in the afternoon. Numbers of Sandwich Tern diminished rapidly after 9 April and by the 14 April only one or two were being seen daily (M. Boorman & A.J. Tree pers. obs.). During this period no Sandwich Terns were found at night.

CONCLUSION

As with all species of terns in southern Africa, much has yet to be learned about the Sandwich Tern. Unfortunately, this species has proved difficult to capture in significant numbers during mist-netting activities, and daytime use of cannon-nets would probably result in much greater returns. Further, with such a mobile group as terns, it is very difficult to recapture birds, especially within one season, to gather information on individuals' movements throughout a season. The use of alphanumeric bands, which are easily read in the field with the aid of a telescope, is probably the best method of tracking the individuals. Alphanumeric banding has recently been instituted in Italy, doubling in one year the number of recoveries of birds banded in Italy in southern Africa. However, successful recovery of birds requires widespread observations at regular intervals. We hope the contribution in this paper will provide more understanding of the Sandwich Tern in its southernmost nonbreeding quarters in Africa.

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