THE MIGRATION OF THE SANDWICH TERN
RESULTS OF BRITISH RINGING*

BY
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I.—THE DATA.

DURING the period 1909-1942 young of the Sandwich Tern (Sterna s. sandvicensis) were ringed in the British Isles to the number of 17,987. Three colonies on the north coast of Norfolk have together made the largest contribution to this total, followed in order of importance by the Farne Isles, off the coast of Northumberland, and by two localities a few miles apart—Ravenglass in Cumberland and Walney Island in the north of Lancashire. Smaller numbers have been marked at various places on the east coast of Scotland, from the Firth of Forth to Aberdeenshire, and in northern Ireland.

Up to the time of writing, 317 of these birds have been recovered, making 1.76 per cent. Of these records about a third merely reflect infant mortality: the remainder all involve some degree of movement, and the proportion from abroad—and indeed from Africa alone—is high. Most of the records of individual interest have been listed at one time or another in these pages, by the Editor of British Birds or by the Hon. Secretary of the Bird-Ringing Committee of the British Trust for Ornithology. A summary map by Miss Leach appeared in 1941 in The Handbook of British Birds, Vol. v.

The purpose of the present paper is to analyse the data in detail. It may be said at the outset that this analysis has yielded less additional information than might have been expected in view of the number of records. The statistics of ringed birds of this species appear to be very much affected by chance or by disturbing factors. The fact that of 81 recoveries of birds over a year old one has fallen in February may be taken as illustrating mainly the effect of pure chance. On the other hand, the absence of records from some parts of the African coast-line which must obviously be traversed by the birds may be chiefly due to factors which influence reporting. The most important gap is from Agadir to Dakar, some fifteen degrees of latitude, but this stretch is sparsely inhabited. More remarkable, at first sight, is the entire absence of records from Nigeria, as compared with nearly fifty from the Gold Coast and over fifty from Angola further south. Bannerman in Birds of Tropical West Africa (Vol. ii, 1931, p. 256) makes no mention of this species in Nigeria, but he has since (personal communication) obtained information about its occurrence there in small numbers at all times of year. His informant, Sir Bernard Bourdillon, points out that the length of coast in Nigeria suitable for these birds is relatively short, and that this shore is not readily accessible to human beings: these facts doubtless explain the lack of records.

*Publication of “The British Trust for Ornithology.”
II.—Preliminary Dispersal.

Young Birds.

There are 102 records of young birds recovered at their native localities in the season of ringing—45 in June, 46 in July, 8 in August, 2 in September, and 1 in October. Several of the later records mention that the birds had been long dead when found, and in other cases there is no definite indication that they had survived until about the date of report. The whole of this group of records is therefore excluded from further consideration: most, and possibly almost all, may be taken as relating to the flightless period.

Pre-Migratory Dispersal of Young Sandwich Terns.
Recoveries of Norfolk-bred birds in July and August of first year.
Black spots represent recoveries; small arrows indicate native localities.
(Drawn by Margaret Rees, B.Sc.)

Next come 31 records from parts of the British Isles more or less distant from the respective localities, and falling in July, August and September of the first year. With these may be taken 11 records (7 in August, 3 in September, and 1 in October) from neighbouring continental coasts. These records together indicate a pre-migratory
dispersal, but where the direction is southward it is not possible to
differentiate this movement clearly from the beginning of definite
migration.

In many cases the first movement is northerly in trend. A bird
ringed in Fife on June 29th was recovered in Aberdeenshire, 65 miles
to the north, on July 1st, showing that a bird may move away as
soon as it can fly. Before the end of July a Cumberland bird reached
Perthshire (155 miles northward and inland), and a Norfolk bird
reached Angus (285 miles northward): on the other hand, an Irish
bird from Co. Down reached Co. Waterford (170 miles southward).
The other two July records show much shorter journeys.

In August, for which there are 26 records, Norfolk birds have
been found as far north as Aberdeen and Nairn (305 and 365 miles)
and as far south as the Normandy coast in Calvados (250 miles): one
was reported from Amrum in the East Frisian Islands (340 miles
in a north-easterly direction), the only record in the whole series
from the other side of the North Sea. The absence of records from
the south coast of England is noteworthy, but may be due to fewer
birds being shot—as most of the French birds were. Birds from the
Farne Islands have been found as far north as Banff and Moray
(145 and 155 miles) and as far south as Norfolk, in the neighbourhood
of one of the colonies there (200 miles). A Cumberland bird was
reported from Portrush in Northern Ireland (135 miles north-west),
and a Fife bird from Yorkshire (135 miles south).

In early September there are two records of Norfolk birds still
north of their native localities—one on the 2nd in Co. Durham and
the other on the 4th in East Lothian (145 and 255 miles)—and even
later in the month some remain at short distances to the south or on
the Channel coast of France. Definite migration begins during the
month, however, as will be noted below.

Table I shows the distribution of first year records during July and
August in relation to point of origin, and the map shows the actual
recovery localities of Norfolk young birds during the same period.

TABLE I.

RECOVERIES DURING FIRST JULY AND AUGUST OF YOUNG
SANDWICH TERNS RINGED IN BRITISH ISLES.

(Excluding records from birthplace mostly attributable to the
flightless period.)

<table>
<thead>
<tr>
<th>Distance from birthplace (miles)</th>
<th>Northerly directions</th>
<th>Southerly directions</th>
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<tr>
<td>0—100</td>
<td>9</td>
<td>6</td>
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<tr>
<td>100—200</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>200—300</td>
<td>1</td>
<td>1</td>
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<tr>
<td>300—400</td>
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The data faintly suggest that the dispersal may have a northerly
bias—but the number of birds taking this direction is only slightly
greater, but some of the distances covered are longer than any of
those recorded towards the south at early dates.
There are 8 records of recovery in Great Britain subsequent to the first year of life. Only one of these suggests a northerly movement after the breeding season such as is performed by some young birds, but with so small a total negative evidence is of little value.

III.—Migration.

Young Birds.

In addition to the records dealt with above, there are 92 recoveries during the first year of life (reckoned arbitrarily to the end of May) which trace the course of the southward migration. This follows the Atlantic seaboard of France, Spain, Portugal and the African continent. It branches, also, into the western Mediterranean with single records from south-eastern Spain, eastern Spain, Spanish Morocco, Algeria and the western tip of Sicily. The West African records are from Morocco, Senegal, French Guinea, Sierra Leone, Ivory Coast, Gold Coast (numerous), French Equatorial Africa, Angola (numerous), South-west Africa and Cape Province.

As already mentioned, definite migration of young birds becomes evident in September, although some are still dispersed on British coasts: a Farne Islands bird has been recorded from the extreme south of Portugal by the end of the month. Before the end of October two birds have been recorded from the Gold Coast and one from southern Angola, but there is still a record in the middle of the month from the English Channel.

In November, records from the Gold Coast and Angola predominate, although there are still records from southern Spain and Portugal. In December all the records are from the tropics. Early in January there is a record from Port Elizabeth, Cape Province: that is also the month of the Sicilian recovery already mentioned, and there is one from the north coast of France that must be regarded as aberrant. The records for February, March, April and May are nearly all from West Africa—-from Senegal to South-west Africa— the exceptions being a bird from near Barcelona in March and one from Algeria in mid-May.

(Continuing into the second year, it may be said that the 4 records for June and 3 for July are all from the tropics. If it were not for a single August record from Great Britain itself, and a September one from the French coast of the English Channel, there would indeed be no evidence of a return migration on the part of birds one year old).

Table II gives a month by month analysis of the latitudinal distribution of first year records, including both the dispersal and the migration phases. A point of interest is that until February records from the northern tropics (especially Gold Coast) are more numerous than those from the southern tropics (especially southern Angola), but that in March and April the position is reversed: this may indicate a southward shift late in the season, which again suggests that few birds perform a northward migration at this age.
(For the purposes of the table, one "Jan. or Feb." record has been allotted to January and one "Mar. or Apr." to March—both from the northern tropics; two "winter" records, from the northern and southern tropics respectively, have been entered under January. "Native Area" includes the British Isles and the continental coasts of the North Sea and English Channel: the figures for the North Temperate Zone are exclusive of those for the Native Area).

**TABLE II.**

**Recoveries during First Year of Life of Sandwich Terns Ringed in British Isles.**

(Excluding records from birthplace mostly attributable to the flightless period.)

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</thead>
<tbody>
<tr>
<td>Native Area</td>
<td>-</td>
<td>7</td>
<td>26</td>
<td>8</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>North Temperate</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>North Tropical</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>14</td>
<td>14</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>South Tropical</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>South Temperate</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
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<td>-</td>
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<tr>
<td>Total (134)</td>
<td>-</td>
<td>7</td>
<td>26</td>
<td>12</td>
<td>7</td>
<td>11</td>
<td>9</td>
<td>21</td>
<td>15</td>
<td>10</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>

**Older Birds.**

There are 81 records of birds more than one year old, including 8 records in Great Britain which will be considered further below.

In comparison with those for young birds, the chief point of interest in the migration records is the larger proportion of reports from south of the Tropic of Capricorn. Out of a smaller total there are seven as against one. Moreover, they extend the migration range round the Cape of Good Hope and northwards up the east coast to Natal. The distribution is:—South-west Africa 1, Cape Province 3, Natal 3. There is thus some ground for supposing that there is a tendency for older birds to travel further at the extremity of the migration, but this may be due to extended wandering on the part of individuals which have been absent for more than a year from their native latitudes.

**TABLE III.**

**Recoveries after First Year of Life of Sandwich Terns Ringed in British Isles.**

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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Area</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>North Temperate</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>North Tropical</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>South Tropical</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>South Temperate</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total (81)</td>
<td>6</td>
<td>9</td>
<td>15</td>
<td>5</td>
<td>4</td>
<td>12</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

That many birds do remain in the south during what should be their breeding season is clear from the records, and this applies to birds of all ages. Table III gives a month by month analysis of the latitudinal distribution of the recoveries of birds upwards of one year old. The separate figures are too small, however, to permit of
more than quite general inferences, such as are obvious from inspection.

Speed of Migration.

It is necessary to refer to a previously published interpretation with which, under this head, the present writer is unable to agree. In a pleasing and interesting book by G. & A. Marples (Sea Terns or Sea Swallows, London, 1934; at p. 80) the British ringing data for terns, and it seems particularly for the Sandwich Tern, are cited in support of a hypothetical probability that the further the birds travel the faster they fly. It is suggested not merely that the average speed of the longer journeys is higher, but that this is due to an acceleration of the pace of travel as the distance from the starting point increases: the reason for preferring the latter view is not clear, but the argument appears to be inadequate in either case. The calculations of average rate of travel are based, firstly, on the explicit assumption that migration begins thirty days after ringing. Actually, many of the young birds are still within the preliminary dispersal area, and sometimes north of their native localities, much later than this. There is also no evidence that the birds ringed in early June begin definite migration sooner than those ringed in mid-July. On another and perhaps more likely assumption, the examples given in the book can be made to yield a contrary result. Secondly, there seems to be an implied assumption that a bird recovered at a distance has just arrived at that point—which is quite unwarranted. It is therefore safer to conclude that the data provide no reliable basis of calculation in this regard.

IV.—Return to Native Area.

There are only 8 records of recovery in the British Isles in years subsequent to that of ringing. This small number may indicate that the breeding season is, except for young birds, the time of the lowest mortality. The age distribution is as follows:—

Second year ... 1 Fifth year ... 4
Third year ... 2 Sixth year ... 1

The figures are small, but having regard to the age distribution of the records in general (given below), the single record of a yearling does suggest that the proportion of birds returning to the breeding area at that age is smaller than the proportion returning at later ages. There is in addition, for what it may be worth, a sight record reported by the late H. W. Robinson (British Birds, 1910, vol. iv, p. 88) of a ringed bird said to have been seen on its nest at Ravenglass one year after the first marking of this species in the British Isles.

One of the fifth year birds was stated to have been shot in December, possibly due to delay in reporting: the other records fall in June, July and August. One fifth year bird was reported from its native colony, and the second year bird from the near neighbourhood of its birthplace. In three other cases the distance from the point of origin was less than 40 miles. These records suggest that return is often exact.
A change of colony, however, appears to have been made by a bird ringed in July, 1914 on the Farne Islands and found dead on July 15th, 1919 at Ravenglass—a breeding place 112 miles distant in a south-westerly direction and on the opposite side of England. The remaining two records are equivocal, in view of the possibility that adults as well as young disperse widely after the breeding season: both birds were ringed on the Farne Islands and were recovered in mid-August of the third year, one in Ross-shire (170 miles northward) and the other in Norfolk (200 miles southward).

There are no records definitely suggesting that the return is ever to parts of the breeding range outside the British Isles. There are, however, three July records from France—a Lancashire bird in its third year and a Norfolk bird in its sixth year from the Channel coast, and a Norfolk bird in its seventh year from Dept. Aude on the Mediterranean: none of the localities is in a known breeding area. Records from France from August onwards, and again in April, may well refer to migration. There is a record of a Norfolk bird from Algeria on August nth of its second year, which is equivocal because of the early date and the fact that the species breeds in Tunisia and Sardinia.

V.—Ages of Recovered Birds.

As already noted, 134 records fall in the first year of life, reckoned to the end of May, not counting 102 recoveries of young birds before they had left their native localities. The age distribution of the remaining 81 cases is as follows:

<table>
<thead>
<tr>
<th>Year of life</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
<th>6th</th>
<th>7th</th>
<th>9th</th>
<th>14th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>37</td>
<td>15</td>
<td>16</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The details of the two oldest birds are:—ringed Lancashire, June 1927, recovered Gold Coast, May 1936; ringed Cumberland, June 1917, recovered Luderitz, South-west Africa, February 1931.

VI.—Birds Ringed Abroad.

Sandwich Terns have also been ringed in some numbers in Holland, north-west Germany, Denmark, and southern Sweden. The published records indicate a migration which is, from the Straits of Dover to South Africa, similar to that of the British birds: in addition there are naturally recoveries from nearer the respective places of origin, and these include one of a Danish bird from inland Germany, near Leipzig.

Three Danish birds have been recovered on the east coast of England in the late summer of the year of marking, either on migration or during preliminary dispersal. A record of a bird ringed in Holland and recovered in Norfolk early in August of its fifth year may possibly indicate a change of breeding locality—of no great extent—in the particular instance.

There is also one known record of a Russian bird, ringed on the Black Sea coast of the Ukraine and recovered next spring off the east coast of Tunisia. No ringing data are available relating to the birds which reach the Red Sea, Arabian Sea and Persian Gulf in
winter: they not improbably come from the breeding places in the Black Sea and Caspian Sea areas.

The allied American race is not considered in this paper.

VII.—Conclusions.

The following conclusions can be drawn from the recovery records of Sandwich Terns ringed in the British Isles as young birds:—

(1) Some young birds leave their native localities as soon as they can fly. A dispersal begins in July, develops in August and persists to some extent in September. The movement takes place along the coasts of the British Isles, and in the case of Norfolk birds extends to the French coast of the English Channel: easterly movement across the North Sea also occurs, but probably only to a slight extent.

(2) This dispersal of young birds has possibly a slight northward bias.

(3) There is little evidence from this source either for or against a possible similar dispersal on the part of older birds after the breeding season.

(4) Migration follows the Atlantic coasts of Europe and Africa southwards to the Cape of Good Hope, and then continues eastwards and northwards as far as Natal. There is also a movement into the western Mediterranean as far as Sicily.

(5) Definite migration of young birds supersedes dispersal in September, and the south of Portugal is reached by some birds by the end of the month. Southern Angola is reached by some birds by October: the only record of a first-year bird from Cape Province is for early January.

(6) Some of these first year birds remain in the North Temperate Zone into November, and many probably never cross the equator as there are records from the North Tropical Zone throughout the winter. There is, however, an indication of some southward shift, from the North Tropical to the South Tropical Zone, as late in the season as the end of February.

(7) There is an indication that older birds more often reach Cape Province than do birds in their first year, and that possibly only old birds reach Natal.

(8) Some birds, of all ages from one year upwards, remain in the Tropics throughout the breeding season instead of migrating northwards.

(9) Others return to their native area. The return is sometimes (probably often) to the exact native locality, but there is one record in this series of an apparent change of colony—from the east to the west coast of England. There is no evidence that return is ever to parts of the breeding range other than the native area, although there are a few equivocal records.

(10) Return to the breeding range is probably less frequent at the age of one year, although it does occur, than at later ages.

(11) Ages up to 13½ years are known to be attained.