The Australian

BIRD BANDER

The Migration of the Arctic Tern

A. M. GWYNN

It is an extraordinary fact that out of 15 Arctic Terns (*Sterna macrura*) reported from Australia, three had been banded at the opposite extreme of the globe. It seems therefore appropriate to present here a brief review of the migrations of this remarkable bird in an attempt to see where these Australian recoveries fit in.

Ten years ago, K. A. Hindwood (1958) was able to collect seven Australian records (a total of eight birds); two of these were old records. Since then I have been able to ascertain published and unpublished records of seven additional birds, two of which were banded. The latest of these banded birds was recovered at Bega, on the New South Wales coast, in December, 1966 (see Recovery Round-up, on p. 63 of our September, 1968 issue). This was a bird in its first year, banded as a nestling in Britain in the previous June.

The other reason for a review at this time is that Finn Salomonsen (1967), a Danish ornithologist, has recently published a major study of the migratory movements of the Arctic Tern in the Southern Ocean. It is unfortunate that Salomonsen's paper appears in a publication to which few Australian ornithologists have access, so no apology is made for drawing freely on Salomonsen's article for the benefit of Australian readers. Though Salomonsen has apparently never sailed in Antarctic waters, he has consulted nearly all the available literature and presents a comprehensive account of all that is known about the movements and distribution of the Arctic Tern in southern waters.

The annual migration of the Arctic Tern is one of the most fascinating stories in the annals of bird migration. This tern is a common breeding species in the northern hemisphere, occurring in large numbers especially in high latitudes, on both sides of the North Atlantic. About September it vacates its breeding areas, but till a little over 30 years ago, what happened then was a major ornithological mystery. It was known that the same, or a very similar species, occurred in large numbers in the Antarctic pack-ice during the Antarctic summer, but even ornithologists of the stature of Robert Cushman Murphy hesitated to believe that these could be the missing migrants from the Arctic. Apart from the stupendous extent of the migration, there was an almost complete lack of observations from the intervening oceans. Besides which, terns of the genus *Sterna* are not strictly oceanic birds; they are essentially coastal birds seemingly ill-adapted to a pelagic life, and do most of their feeding fairly close inshore. Another factor which added to the confusion was the existence of an Antarctic Tern (*Sterna vittata*), a quite different species, relatively sedentary in its habits, which lives in comparatively small colonies on subantarctic islands and around the Graham Land Peninsula. It is not known to occur in the pack-ice, but early visitors to the Antarctic were understandably confused, and believed that the terns they saw there were Antarctic Terns.

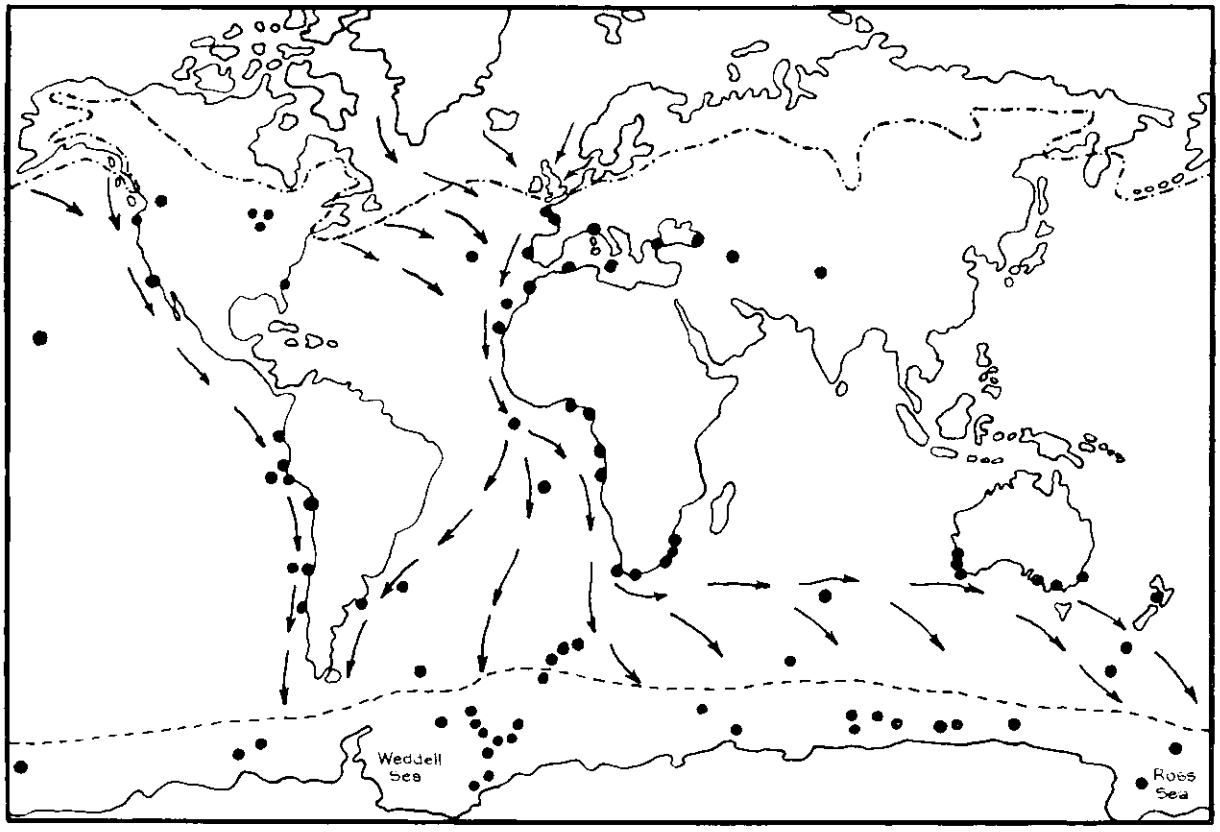

Figure 1. *Map showing the southern breeding limits of the Arctic Tern (- - - - - - -), the northern limits of Antarctic pack-ice (— — — —), and records of the species outside of the breeding ground (solid circles). Inferred routes of the southward migration are indicated by arrows.*

(After Storr, 1958)

It was the observations of R. A. Falla (1937) on the BANZARE[1] cruises which more than anything convinced the ornithological world that the moulting terns which he saw in great numbers in the pack-ice of East Antarctica were indeed Arctic Terns.

In the 30 years since the publication of Murphy's "Oceanic Birds of South America" and of Falla's BANZARE report, much of the picture has been filled in about the first part of the journey, as far as South Africa, and is substantiated by a considerable number of banding recoveries; but there is still a good deal of uncertainty about its final stages. Salomonsen has now marshalled the available information about these final stages with great thoroughness, but on some points uncertainty still remains.

It is a truism of evolutionary theory that the migratory pattern is developed because it confers some advantage on the species concerned, although there is plenty of evidence that a species can incur great losses along its migration routes without apparently endangering its survival. As regards the Arctic Tern, various writers have pointed out that through its migration it enjoys more hours of daylight than any other living creature, except perhaps Wilson's Storm Petrel (*Oceanites oceanicus*), which undertakes a rather similar migration in the reverse direction. Birds from the more northerly breeding colonies move from an area with almost continuous day-

[1]British, Australian and New Zealand Antarctic Research Expedition, which undertook voyages in the Australian and New Zealand Antarctic Sectors in 1929-30 and 1930-31.

light in June and July, to an area with almost continuous daylight in December and January. And the pack-ice at least is an area with an extremely abundant food supply. It should be emphasised that this migratory pattern is a basic characteristic of the species. There are occasional records of overwintering birds at intermediate locations, but these are the "dropouts". Though some of them may complete their moult and survive to rejoin their fellows, it is unlikely that these are numerically of any importance for the survival of the species. Most are probably birds in their first year, and some first-year birds apparently spend their first independent summer in such places, delaying their return to the breeding range till the end of their second year; Salomonsen suggests that the Humboldt Current may be important as a summer quarters for non-breeding first-year birds. A striking aspect of the Arctic Tern's adaptation to this particular pattern of migration is its moult sequence, which differs from that found in other related terns.

I have mentioned that the first stages of the migration are now fairly well understood. The Arctic Tern is circumpolar in distribution, but it is believed that the southward migration takes place along two main routes. One, probably the lesser stream of which little is known, passes down the eastern side of the Pacific, and is presumably used by birds from Eastern Siberia and Alaska. The other stream, quite well documented, begins in the large Arctic Tern population of eastern North America. Birds from here first take a course almost due east, in the westerly air stream of the North Atlantic. Off the west coasts of Northern Europe it is joined by the Arctic Tern population of that region and Northern Russia, and the combined migratory stream passes southward, skirting the Iberian Peninsula and the west coast of Africa. This part of the route is shared with the Common Tern (*Sterna hirundo*), but whereas the Common Tern winters off the coast of South Africa, where it is apparently a common visitor during the northern winter, the Arctic Terns (except for a few first-year birds which may overwinter here) press on into the Southern Ocean.

The number of Arctic Terns taking part in this migration must be very great, but as they are small white birds, moving singly and in small parties, they are rarely noticed from the ships they pass, and once they leave Africa behind, they are in waters little used by shipping. It is from this point that Salomonsen attempts to unravel their movements.

There is evidence of a southerly passage of Arctic Terns off the Argentine coast in October, showing that some of them have at this latitude crossed back to the east side of the Atlantic, and in 1946 Kullenberg proposed a migration map for the Arctic Tern showing part of the stream crossing from West Africa to Brazil, and thence south to Argentina, while another stream turned south-easterly from South Africa, towards the Weddell Sea. This plan was widely accepted, but Salomonsen considers that there is no evidence for a passage off the coast of Brazil, and that the numbers passing Mar del Plata in Argentina are probably small. He regards Kullenberg's suggestion as intrinsically improbable, but it was not till 1958 that G. M. Storr put forward a very different map (Figure 1) which took into consideration the known distribution of Arctic Terns in the Southern Ocean. Salomonsen accepts Storr's proposal as being probably close to the truth and his paper is, in essence, an elaboration of Storr's brief communication.

A large part of Salomonsen's paper is devoted to explaining his proposed migration pattern of the Arctic Terns in terms of the cyclone trajectories which sweep down through the Southern Ocean towards the Antarctic Continent. The facts are that the main overwintering population of Arctic Terns are found in the Antarctic pack-ice in a zone between about 150° E. (that is, about the longitude of Sydney, or in terms of Antarctic geography, about 20° west of the Ross Sea) and the eastern side of the Weddell Sea. Falla found Arctic Terns abundant between about longitude 150° E. and 55° E.; this has been confirmed by many subsequent observers, and this is probably where the main body of the species rests during the northern winter. The only recovery of a banded Arctic Tern from Antarctic waters has been from about the middle of this area (a bird banded in Denmark). These birds probably arrive from South Africa via the South African and Kerguelen cyclonic trajectories.

One of the best authenticated facts about the proposed route is that at Heard Island, in the main path of the Kerguelen trajectory, Arctic Terns may be seen on passage every year between October and December. This was established by observations made by Australian National Antarctic Research Expedition parties

during three consecutive seasons (Downes, 1952; Downes *et alii*, 1959). But a growing list of Australian and New Zealand records shows that a considerable number of birds must be carried on downwind in the westerlies for thousands of miles. The problem which arises is, are these storm-driven derelicts, hopelessly lost from the established routes of their species, or are they casualties from a thin but regular stream which passes south of the Australian continent, on the fringe of a normal migratory dispersal? Most of the records are West Australian, as one would expect if these are birds which have drifted downwind across the Indian Ocean, but what should one make of the records from Tasmania, New Zealand and its subantarctic islands? Data from Auckland, Campbell and Macquarie Islands suggest that the Arctic Tern occurs regularly in this area, but in spite of the presence of ANARE parties at Macquarie Island for the last 20 years, the evidence for this is still scanty.

The only firm record for Macquarie Island is of a specimen (one, not two as stated by Salomonsen) obtained by N. J. Favaloro in 1950 (Downes, 1952). Bailey and Sorensen (1962) present convincing evidence of its presence at Campbell Island in December, 1942, in December, 1943, and on 8th January, 1958, and refer to two specimens and sight records from Auckland Island. Some authors have postulated a western Pacific stream to account for these and the few records for the Ross Sea, and this is why the Bega recovery is critical. This bird could only have come by way of South Africa.

Besides the Bega recovery, there are two other Australian records of banded Arctic Terns, both from Western Australia (Dunnett, 1956; Serventy, 1963). Both these birds were recovered about 12 months after being banded as nestlings (in Arctic Russia and Sweden), and are assumed by Salomonsen to have been on their return migration. However, elsewhere Salomonsen shows that some Arctic Terns in their first year may not reach Antarctic waters, but overwinter in an intermediate location, and that some birds may not return to the Northern Hemisphere till they are two years old. The possibility that these were birds which had overwintered off the Australian coast therefore cannot be excluded. The fact that three out of 15 Arctic Terns recorded from the whole of Australia were banded, must mean that these birds were recognised for this reason, and that many more Arctic Terns must have reached the Australian coast during these years.

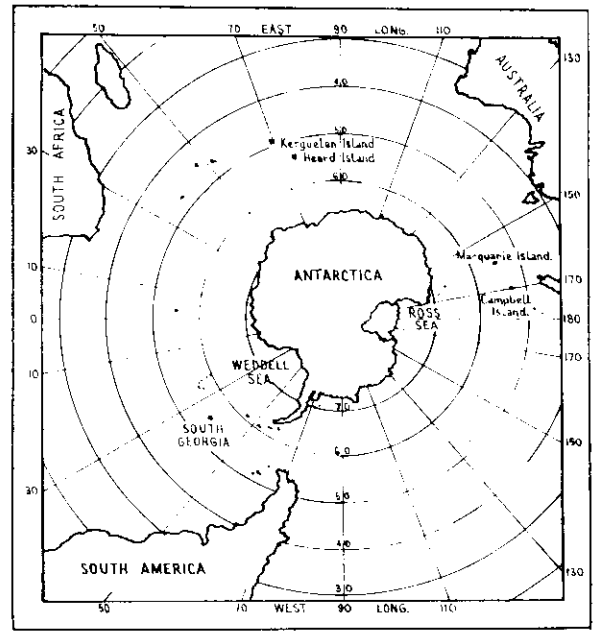

Figure 2. *Map showing Antarctic Regions.*

How then do birds which have wandered so far achieve the incredible navigational feat of finding their way back to their natal colonies? Salomonsen suggests that some birds may continue in an easterly direction till they reach the Weddell Sea, where, having circumnavigated the Antarctic Continent, they link up with the main body of Arctic Terns for the return migration up the eastern side of the Antarctic Ocean. But this is not the place to take up a discussion of the evolutionary, navigational and instinctive problems raised by the known migrations of the Arctic Tern. Enough has been said to explain why the movements of this species are of particular interest to students of migration. The picture is still far from complete, and the elucidation of the final details must depend on accurate observation and further banding recoveries.

Acknowledgements

I should like to thank Mr Keith Hindwood for putting at my disposal his information on Arctic Terns reported since his 1958 paper, and to Mr Warren Hitchcock for drawing my

(*Continued on next page*)

Age/Plumage Relationship of Rufous Whistlers

S. G. LANE

Observations indicate that Rufous Whistlers *(Pachycephala rufiventris)* in 'female' plumage are more common than those in male plumage. Relatively few individuals of this species have been banded as they are not found in large numbers although widely distributed.

Of the 67 Rufous Whistlers banded by me, 30 were in male plumage and 37 were in 'female' plumage. ('Female' used in this manner indicates that birds in this plumage may be females or immature and juvenile males.)

P. J. Spurge has provided the following figures from two seasons' banding near Sydney.

Birds in male plumage (or partial male plumage)	7
Birds in 'female' plumage	24
Total banded	31

In three years at Mount Isa, Queensland, W. Horton banded 4 males and 19 'females', while S. J. Wilson, between 1960 and 1968 in the A.C.T. banded 38 males and 75 'females'. These figures provide a total of 79 males and 155 'females'.

Juvenile and some immature Rufous Whistlers can be identified by plumage, skull ossification, soft pale gape, eye colour and also probably by the colour of the legs and feet. The eye colour is dark brown. (In adults it is a bright reddish-brown).

To date there is no positive method known to me of differentiating between the adult female and most immature (or sub-adult) male plumages until the males show signs of the adult plumage—unless the eye colour is positively diagnostic. At various times observers have reported two 'females' at a nest and no 'male' present. A. H. Chisholm informed me that he had recorded this occurrence and H. J. de S. Disney had a similar experience near Woy Woy, New South Wales, on 6 December 1964. Both birds attending a nest containing two nestlings about eight days old, were in 'female' plumage. One of the birds had a rufous wash on the breast.

A Rufous Whistler nested in my garden in December 1961. No whistler in male plumage

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attention to an additional published record; also to Dr Glen Storr for permission to copy his map showing Arctic Tern records and movements in the Southern Hemisphere, and for confirming the absence of additional records from Western Australia, apart from the Madora Bay recovery.

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