

TRANSECT COUNTS OF PELAGIC SEABIRDS IN AZOREAN WATERS

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There is a dearth of data on pelagic distribution of seabirds in Macaronesian waters. This short paper summarises research in Azorean waters in early autumn as an annotated list with commentary on the more important findings. These include very large numbers of great shearwaters in 1990, soft plumaged petrel in 1992 and small but significant numbers of non-adult skuas in early autumn.

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Há uma escassez de dados sobre a distribuição de aves marinhas nas águas Macaronésicas. Nesta trabalho resumem-se informações sobre este assunto recolhidas nas águas dos Açores no início do Outono, apresentando-se as descobertas mais importantes numa lista anotada. Estas incluem grande número de pardelas-de-bico-preto em 1990, freiras em 1992 e pequeno, mas significante, número de moleiros não adultos no início do Outono.

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INTRODUCTION

Though the breeding biology of seabirds in Portuguese and Macaronesian water has been fairly well studied (BARCENA et al. 1984), (LE GRAND et al. 1984), the density of seabirds at sea is less well known. Almost nothing is known about their distribution during the prolonged non-breeding season. With increasing competition for marine resources, hunting, mortality in fishing gear, competition for a common resource and chemical pollution, there is an increasing toll being taken of seabirds at sea. Given that Portuguese-Macaronesian waters support very large populations of procellariids, for example up to 80% of the world's population of Cory's shearwater *Calonectris diomedea* (GRIMMETT & JONES 1989), then one of the first functions of sea-based surveys is to provide basic information about seabird distribution that may be used in assessments of environmental risk.

Between 1987 and 1992, as part of an ongoing research programme on seabird identification, distribution and ecology in Portuguese-Macaronesian waters, a series of transects was investigated between Continental Portugal, Azores and Madeira (see MOORE 1988).

Presented here is a brief summary of observations made in Azorean waters with comments on individual species. Species with a year-long inshore ecology are not included. All records of rare species have been accepted by the Comité Ibérico de Rarezas (JUANA 1992, 1993, 1994).

Though the underwater contours in these Azorean longitudes are basically abyssal across the transects, in many cases seabirds were not distributed at random over a preferred marine habitat (MOORE 1988). They tended to be

concentrated in areas where the water column was unstable: at oceanographic "fronts" (MOORE in press). Around the eastern approaches to the Azores only one such area exists - in the "rip-zone" east of Nordeste on S. Miguel. In similar areas elsewhere zooplankton is probably present in higher concentrations than usual (CUSHING 1971). It is probable, furthermore that the birds increase their foraging efficiency substantially when they feed on local concentration of prey such as these. A similar area of turbulent convergent tidal fronts exists at the eastern end of Madeira and is equally productive, - birds and breeding success nearby is sufficient to judge by (JOUAININ et al. 1979).

METHODS

In this small paper, the goal has been to express relative variation in bird numbers. The limitations of transient and rare inshore work prohibited calculation of absolute sizes of seabird populations but relative variation in numbers can be usefully compared with and interpreted in terms of the occurrence of physical and biological phenomena. Thus, sea birds numbers have been expressed here in two ways, relative density and birds per linear kilometre. Using the methods of BROWN et al. (1975) and POWERS (1982), the mean number of birds per ten minutes was calculated; adjustments for ship's velocity allowed numbers per linear kilometre to be calculated.

Observations were carried out from 8 m above sea level monitoring an arc of 180° from port to starboard using 10x50 binoculars. The wake was examined every hour but counts of birds seen there are not included in this paper. All the transects (Table 1) were traversed within Azorean waters between 38° and 39° N latitude, and usually only waters between Ponta Delgada and 20°W longitude are included. This latter coordinate marks the approximate eastern limit of the Azores Economic Exclusivity Zone and extends roughly 280 km east from Ponta de S. Miguel. The 'S. Jorge Canal in the central archipelago was traversed twice from west to

east, once on August 29th 1990 and once on July 17th, 1991. A standard record of visual meteorological conditions was made each hour and related to the remote synoptic data logger on board. Coordinates were calculated using shiptime against velocity. The weather in the study periods was dominated by the Azores subtropical pressure cell with light to moderate westerly breezes in the archipelago, regularly interrupted by the passage of weak fronts. Only in 1990 did noon air temperatures fluctuate markedly, being 0.6 °C above normal (data from Instituto Português de Meteorologia e Geofísica); water temperatures remained stable over the period.

Table 1

Day light transect data for Azorean waters -
Autumn 1990-1992

Year	Dates	Linear km of count data
1990	August 25-26	142.8
	August 31-Sept.	122.4
1991	July 14-15	244.8
	July 19-20	102.0
1992	August 16-17	122.4
	August 22	244.8

On only one occasion, 29th August 1990, the standard census was modified because of the unique observations being made (see under Great shearwater *Puffinus gravis* and Cory's shearwaters *Calonectris diomedea*). The density and degree of homogeneity of the flocks allowed the standard census to be verified by taking into account the forward velocity of the vessel (20.4 km/hr). Assuming uniform density, $6xy$ approximates the species number, where x is the number seen per 3.4 linear kilometers, and y is the number of hours of observation. As the only observer aboard, a hasty error figure was estimated from ten small sample flocks using eye and then binoculars. This 'error' was roughly 18% for great shearwater and 15% for Cory's shearwater.

Great shearwater (*Puffinus gravis*)

Over the three years, the species was located in three areas. The largest concentration was in the Canal de S. Jorge in 1990 but between 400 and 2000 were located each year off Nordeste, in the tidal race that stretches from P. de S. Miguel eastwards for about twenty kilometres. The third area was over the deep abyssal water between about 25° and 20° W. longitude. Here the bird was rare, annually yielding less than twenty birds.

The unusual concentration found in the Canal de S. Jorge on August 29th 1990 may be "unusual" only because rarely recorded. An estimate of the number suggests c. 28,000 birds were present (see methods section). Fortuitously the channel is 'narrow', about 15 km wide and runs eastwest between Ilhas de S. Jorge and Faial-Pico. Thus the birds were concentrated and feeding flocks tended to remain between the northern and southern 1000 m. bathymetric contours (ships soundings). A light western zephyr meant that the birds flew to windward on being disturbed, greatly reducing repeat observations. Eleven months later, in July 1991, only five birds were seen in the same place. No observations were made in the area in 1992.

This species breeds mainly in the S. Atlantic and winters in the N. Atlantic with adults arriving first off Newfoundland in June. Breeding birds return to Tristan da Cunha in August (GRÄFE 1973). Transparencies of the birds in August 1990 in the central archipelago confirm that at least some were still in wing moult, though normally the complete set of primaries is replaced in July (STRESEMANN & STRESEMANN 1970) - the gap left by the moulted inner primaries conspicuously changes the wing silhouette but it is probably impossible to estimate secondary moult in the field (WATSON 1971). About 6% of the Azorean birds showed active wing moult or about 1,600 birds: SALOMONSEN (1979) reported many seen in this condition off Greenland in August and it is suggested that these birds are subadults. Gonadal evidence from comparable Caribbean sightings suggest juvenile or subadult status. LE GRAND

(1983) reports the species as very rare but the present observations and others suggest that at least in early autumn the species may be regular - occasionally abundant. Indeed 28,000 birds constitutes the second largest number reported in the Northern Atlantic (see POWERS & VAN OS 1979). Though the coast of Greenland is known to hold moulting birds in enormous numbers, possibly sites in mid-Atlantic may constitute major staging-posts for these birds on their south-bound migration.

Cory's shearwater (*Calonectris diomedea*)

Like the previous species, Cory's shearwater was found in three main areas; deep abyssal sites, the tidal race off Nordeste, S. Miguel and in the Canal de S. Jorge. In the three years of observation, the species proved 'common' off Nordeste with up to 2000 birds each year. In 1990, about 12,000 were seen in the Canal de S. Jorge (see Methods section) on August 29th. The following year only five hundred were seen there in July. Unlike Great shearwater, Cory's shearwater appeared relatively commonly at sea between 20° and 25° W longitude with between 2-3 per linear kilometre. The impression, and no more, was that the species was not limited by the large distances between the Azores and mainland Europe and may be capable of long distance movement though with very frequent staging areas.

Little shearwater (*Puffinus assimilis*)

GRIMMETT & JONES (1989) cite around 800 pairs of this species in the archipelago (important bird areas only). This breeding density may explain the few observations made at sea. In forty eight hours only twelve were seen, always over abyssal water - about one per eighty kilometres. Interestingly, even less were seen between 20°W longitude and continental Portugal.

Madeiran storm petrel (*Oceanodroma castro*)

A rough estimate from GRIMMETT & JONES (1989) suggests a breeding population of about

400 pairs for the important bird areas within the archipelago. Azores is one of only four sites for breeding of Madeiran storm Petrel in the Northern Atlantic, the other three being in the Berlenga area (TEIXEIRA & MOORE 1983) in the Madeiran archipelago and in the Cape Verde islands (CRAMP & SIMMONS 1977). Despite its numbers it is classically a difficult petrel to observe at sea, being apparently a "blue water" species, solitary, shy of ships and probably given to nocturnal feeding. One was watched very closely in Azorean waters at 38° 34'N, 21° 18'W on 20th July 1991. So close was the observation that the swollen food filled gular pouch could be seen, a possible indication of a 300 km return journey to breeding sites on either S.Miguel or Sta.Maria.

One wonders if Azorean birds in their breeding behaviour and calendar, show the plasticity indicated by MOUGIN et al. (1990) for birds on Selvagem Grande.

White-faced storm petrel (*Pelagodroma marina*)

Within Azorean waters in 48 hrs. of observation, only two were observed, together, at 38° 36'N, 20° 59'W. Described as rare by LE GRAND (1983), they may occur further out to sea, and certainly I have recorded them annually since 1987 in sea areas between Portugal, Azores and Madeira. Given their presence at the latitude of the Azores (MOORE in press) and only 350 km off the tip of S.Miguel, it is possibly surprising that they have not yet been found breeding on the Azores. Apart from the Salvage Islands where they nest in large numbers, the race *hypoleuca* has also been found breeding in the Canary Islands (MARTIN et al. 1989).

Soft-piumaged petrel (*Pterodroma mollis/feae/madeira*)

On 22nd and 23rd August 1992, single birds were seen heading purposefully north at 37° 56'N 20° 48'W and at 38° 37'N 12° 37'W respectively. The second sighting has been accepted as the first continental Portuguese record of this

superspecies. The bird seen at 37°56'N; 20°48'W was only the second field sighting for the Azores; the form does not occur in the checklist of LE GRAND (1983).

Using VOOUS (1977) nomenclature, the northern Atlantic holds two races of *P. mollis*, namely *feae* which breeds on the Cape Verde Islands and the Desertas of Madeira, and *madeira* which breeds in tiny numbers in the Madeira highlands. BOURNE (1983) suggests three species should be recognised, namely *P. feae*, *P. madeira* and *P. mollis*. SIBLEY & MONROE (1990) recognise *feae* as the Cape Verde petrel. Certainly the present record clearly indicates *feae* or *madeira* given its pale tail, lack of complete breast band and darkish cap.

In the field the bird needed to be separated from other *Pterodroma* petrels and its race established. In fact the bird had several useful characteristics - it looked like an enormous adult Little gull *Larus minutus* because of its dark underwing and wing shape; from behind it was uncannily like a Pratincole *Pratincola* sp. with its characteristic pale tail. The bird was clearly not nominate *mollis*; it lacked the full breast band and had a contrasting pale rump/tail and a darker crown, most typical of *feae/madeira*, with which the observer has considerable experience. The pale undertail coverts ruled out Trindade petrel *P. arminjoniana* and the Pale tail Atlantic petrel *P. incerta*. The latter species also has a white belly patch with darker undertail coverts.

In June 1990 a *Pterodroma* was caught in the Azores (BIBBY & DEL NEVO 1991) which, apart from an anomalous tail length, resembled *feae*. Another was caught in September 1993, which was in all respects in agreement with *P. feae* (MONTEIRO & FURNESS in press). Given recent sightings in Britain (ROGERS 1992), Ireland and Holland (see TOVE 1993), the present Azorean record and the capture ashore of individuals, this species may be altering breeding status and sites.

Possibly some of the European records and those of North Carolina, U.S.A. (e.g. TOVE 1993) already reflect changes in this species distribution.

Bulwers petrel (*Bulweria bulwerii*)

GRIMMETT & JONES (1989) estimate only about 150 breeding pairs in the main seabirds sites and certainly, density at sea is low in comparison with Madeiran waters. Typically concentrations of about one bird per linear kilometre were commonly found between 37° 57'N, 22° 40' W and 38° 16' N, 20° 04' W over the three years. This area is blue, abyssal water, between 2 000 and 4 000 m deep and apparently oligotrophic, hence the paucity of birds. There appears to be no pattern of occurrence within the abyssal area. Interestingly, of all the pelagic species recorded during the six years of autumn transects in Macaronesian waters, only Bulwers petrel has been attracted to the ship at night. A total of six birds have been recovered after overnight "landings". None of these had brood patches.

Skuas

In the abyssal waters surrounding the greater Azores, a few skuas have been seen, totalling nine in all, two being subadult Pomarine skuas, *S. pomarinus*; two being Great skuas, *Catharacta skua*, and five being Long-tailed skuas, *S. longicaudus*. Their estimated ages and coordinates are given in Table 2. Nomenclature follows FURNESS (1987).

What is noticeable is the number of non-adult birds something which suggests that either immature skuas regularly over-summer in mid atlantic waters, or that they move southwards early before most adults (see FURNESS 1987). Given that probably they have had an unsuccessful breeding season especially if very immature, their early autumn return to wintering quarters would not be surprising. What has been surprising over the three years is the number of Long-tailed skuas and the apparent dearth of Arctic skuas *S. parasiticus*, although that would support the contention that Long-tailed skuas are by far the most pelagic of the four northern hemisphere skuas that breed in Eurasia.

Table 2

Estimated ages of observed skuas

Species	Age	Date	Coordinates
Long-tailed Skua	Adult	26.8.90	37°51'N, 24°47'W
	Adult	16.8.92	38°55'N, 20°15'W
	2nd summer (3rd cal. year)	17.8.92	38°00'N, 23°59'W
	1st summer (2nd cal. year)	16.8.92	38°00'N, 23°59'W
	1st summer (2nd cal. year)	16.8.92	39°01'N, 20°00'W
	subadult	17.8.92	38°36'N, 20°59'W
Pomarine skua	subadult	14.7.91	39°00'N, 19°05'W
Great skua	unknown age	17.8.92	38°00'N, 23°59'W
Great skua	unknown age	17.8.92	38°00'N, 23°59'W

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