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SHORT NOTE

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Foraging grounds of southern giant petrels (*Macronectes giganteus*) on the Patagonian shelf

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Abstract During the 1999 and 2000 breeding seasons we used satellite telemetry to track the foraging movements of four southern giant petrels (*Macronectes giganteus*) nesting on an island off the Argentine coast (45°08′, 66°03′). Three of the four individuals foraged east/southeast of the colony, over the middle continental shelf and the shelf break, between 43° and 51°S. The fourth individual remained in coastal areas to the south and lost the device after 15.5 days at sea. The maximum linear distance from the nest reached during a single foraging trip was 552 km. All birds were able to fly more than 400 km in 1 day, with a maximum of 513 km recorded. The maximum total distance covered in a single foraging trip was 2,540 km. Findings of this study emphasise the importance of the Patagonian continental shelf as foraging grounds for top predators in the South Atlantic Ocean.

Introduction

The southern giant petrel (SGP, *Macronectes giganteus*) is the largest avian predator-scavenger in the Southern Ocean ecosystem (Hunter 1985). Its circumpolar distribution includes colonies on the Antarctic Peninsula, many of the subantarctic islands, and the Patagonian coast in Argentina (Hunter 1984; Patterson et al. 2000). There are four colonies in Patagonia: two in Chubut province (45°S, 65°W) and two in Tierra del Fuego province (54°S, 64°W; Yorio et al. 1998). Despite its important ecological role as predator-scavenger in the South Atlantic ecosystem (Hunter 1985), basic aspects of the breeding biology and foraging ecology remain unknown for the Patagonian colonies.

This paper presents the first data on aspects of the foraging ecology, including foraging areas used by adult SGP breeding on islands in temperate waters off the Argentine coast.

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Materials and methods

Four SGP breeding at Gran Robredo Island (45°08′S, 66°03′W), on the Patagonian shelf, Argentina, in the South Atlantic Ocean, were tracked using satellite telemetry. Two unsexed individuals were tracked during the early chick-rearing period (January/February 1999) and two females were tracked during the late incubation period (November 1999/January 2000). Sex was determined by morphological measures (Hunter 1984; González-Solís et al. 2000). We followed Wilson et al. (1997) for bird handling and device attachment techniques.

Positions from the Argos system with low (> 1,000 m) or undetermined accuracy were excluded from the database when the estimated speed between two consecutive fixes exceeded the threshold value of 72 km/h, which corresponds to a maximum-possible speed a bird of this species could reach (Spear and Ainley 1997).

Due to the logistical problems associated with access to the island, and to avoid disturbance to the nesting birds (giant petrels are particularly sensitive to human disturbance), we were unable to record the presence or absence of instrumented birds on their nests between trips. However, by tracking the individuals for continuous periods of 23, 45, 59 and 55 days (bird nos. 1, 2, 3 and 4, respectively), we were able to identify typical patterns of nest-attendance and at-sea periods for bird nos. 2–4. Bird no.1 probably abandoned its chick since this alternating pattern was not observed. Therefore, data from this individual were omitted from all analyses.

Results

Birds 2, 3 and 4 flew consistently to the east-southeast and exhibited alternating nest-attendance periods with foraging trips at sea. Table 1 summarises the travelling performance for these three individuals. We recorded

Table 1 Distances travelled and flight speed of three southern giant petrels recorded during the study period

Bird	2	3	4
Total distance travelled (km)	6,331	8,933	9,314
Maximum daily distance (km)	497	513	492
Maximum foraging range (km)	463	518	552

one excursion only for bird no. 1 of 2,500 km in 15.5 days until the PTT was lost.

Individuals remained on the mid-continental shelf (bird nos. 2 and 4) and at the shelf break (bird no. 3) between 43° and 51°S. None of the three birds flew beyond the shelf break (Fig. 1). The foraging range (distance from colony) recorded was 463–552 km on a trip. Apparently, birds visited one or two patches during a single trip. All individuals were able to travel distances greater than 400 km in 1 day and the maximum observed was 513 km (Table 1). The mean distance travelled per trip was $1{,}341 \pm 441$ km ($n = 3$ birds). Bird no. 3 covered a maximum of 2,540 km during a single foraging trip.

Discussion

Our study presents the first at-sea records of one of the most long-range pelagic feeders off the Patagonian coast of Argentina. Most of the foraging areas used by the instrumented birds appear to be located on both the continental shelf and the shelf break, between 43° and 51°S. The at-sea distribution of SGP may be associated with rich, permanent local fronts of the shelf break and seasonal tidal fronts (Carreto et al. 1986; Glorioso 1987; Podestá 1990). Satellite images show that near-surface phytoplankton biomass remains high throughout the summer (when this study was carried out) in tidal front areas and along the shelf break only (Podestá 1990).

The SGP population size at Gran Robredo has increased by 52% between 1990 and 1995 (Yorio and Harris 1997; Yorio et al. 1998), while it has decreased or remained stable at other colonies (Patterson et al. 2000). The foraging effort for the Patagonian SGP, measured in terms of mean distances travelled to their feeding areas, is about 30% lower than that of the stable South Georgia population. Differences in population trends could be related, at least partially, to the proximity and productivity of the respective feeding areas or access to fisheries discards.

The Patagonian shelf waters are used extensively for migration and as a foraging habitat by several species of seabirds and marine mammals breeding both in temperate and subantarctic waters (for a review, see Croxall and Wood, in press). Findings of this study emphasise the importance of the Patagonian continental shelf as a foraging area of top avian predators of the southwestern Atlantic Ocean. As marine pelagic predators are threatened by commercial longline fisheries elsewhere (Brothers et al. 1999), knowledge of the Patagonian SGP

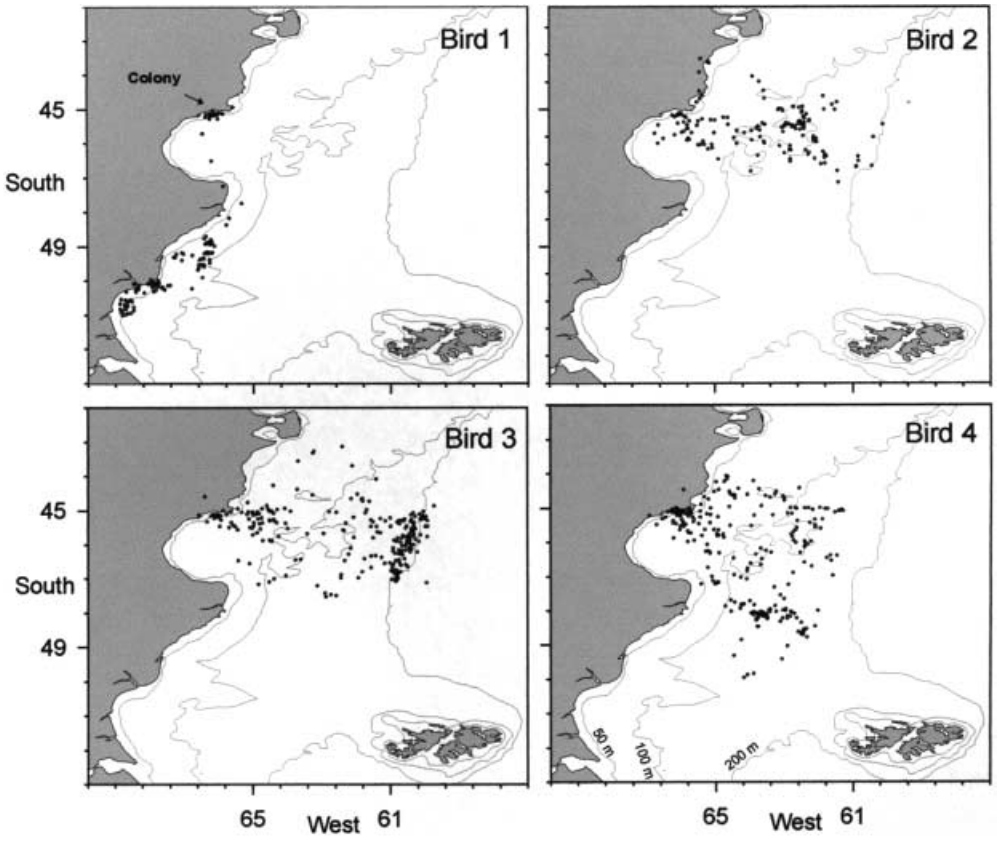

Fig. 1 Spatial distribution of four southern giant petrels breeding at Gran Robredo Island tracked with satellite telemetry during the 1999 and 2000 seasons. Birds 1 and 2, sex unknown; birds 3 and 4, females

foraging areas may help to pinpoint potential conservation issues.

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