BAND RECOVERIES AND JUVENILE DISPERSAL OF SOUTHERN GIANT PETRELS *MACRONECTES GIGANTEUS* MARKED AS CHICKS IN ANTARCTICA BY THE BRAZILIAN ANTARCTIC PROGRAM (1984–1993)

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SUMMARY

SANDER, M., GARCIA, S.A., CARNEIRO, A.P.B., CRISTOFOLI, S.I. & POLITO, M.J. 2010. Band recoveries and juvenile dispersal of Southern Giant Petrels *Macronectes giganteus* marked as chicks in Antarctica by the Brazilian Antarctic Program (1984–1993). *Marine Ornithology* 38: 119–124.

The Southern Giant Petrel *Macronectes giganteus* is circum-Antarctic in distribution, with breeding colonies found on sub-Antarctic islands and along the Antarctic continent. The objective of this study was to contribute to the body of knowledge regarding the post-fledging dispersal of this species outside of Antarctica through the analysis of band recovery data for chicks banded at eight different locations between latitudes 61°S and 68°S, and longitudes 55°W and 69°W. This project was carried out by the Antarctic Project UNISINOS (Aves Marinhas e Continentais da Antártica da Universidade do Vale do Rio dos Sinos [Marine and Continental Birds of Antarctica—University of Vale do Rio dos Sinos]), from 1983/84 to 1992/93. During this 10-year period, 7 503 chicks were banded, from which 68 recoveries outside Antarctica were reported, constituting the largest banding effort and recovery dataset used to examine Southern Giant Petrel post-fledging dispersal to date. The study presents information regarding these recoveries, with special attention to distance traveled from nest site, lapse of time between the banding period and recovery, direction and orientation of dispersal, condition of the birds when recovered and historical comparative analysis from the literature.

Key words: Antarctica, *Macronectes giganteus,* marine birds, migration and dispersal, Procellariidae, Southern Giant Petrel

INTRODUCTION

The Southern Giant Petrel *Macronectes giganteus* is a member of the family Procellariidae that occupies a predatory as well as a necrophagous niche, feeding on birds, mammals, krill, squid, fish and shellfish (Conroy 1972, Johnstone 1977, Hunter 1983). This species is circum-Antarctic in distribution, and breeds in colonies found on sub-Antarctic islands and on the Antarctic continent (Conroy 1972, Watson 1975, Harrison 1983, Hunter 1984a, Parmelee 1992, Patterson *et al.* 2008).

Until the late 1960s, the Northern Giant Petrel *Macronectes halli* and Southern Giant Petrel were considered a single species, and it was only after the taxonomic separation that great interest in understanding the distribution and migratory patterns of each species developed (Sladen & Tickell 1958, Bourne & Warham 1966). Subsequent research suggested that Southern Giant Petrels disperse great distances from their nesting localities outside of the breeding season, with some evidence to suggest that the post-breeding dispersal of adults and juveniles can differ (Sladen 1965, Harrison 1983, Hunter 1984a). It has been suggested that young Southern Giant Petrels, after leaving the nest, may carry out circumpolar movements following the dominant winds (Parmelee 1992, Trivelpiece & Trivelpiece 1998, Patterson & Hunter 2000). Furthermore, these authors suggest that fledging Southern Giant Petrels remain at sea, roaming the Southern Ocean for the first three years of life, primarily in the sub-Antarctic region. In the following years, considered the pre-nesting period, juveniles are more commonly seen around their natal colonies (Hunter 1984b, Voisin 1988). First reproduction can occur as early as four years of age (Parmelee 1992) but normally occurs between six and 10 years of age (Hunter 1984b, Voisin 1988, Parmelee 1992).

The ornithological activities of the Brazilian Antarctic Program (PROANTAR) began in the austral summer of 1981/82 and involved researchers from the University of Vale do Rio dos Sinos (UNISINOS). The aim of this research program was to study the biology and ecology of Antarctic birds that reach the Brazilian coast and, as such, part of this research involved the systematic banding of these species, including the Southern Giant Petrel. Bird marking with metal leg-bands is a common technique that can contribute to the biological and ecological knowledge of birds, especially their migration, distribution and longevity (Clapp *et al.* 1982, Klimkiewicz 1989). In the first years of UNISINOS's activities in Antarctica, the group co-operated with international programs such as the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) and the Bird Biology Subcommittee of the Scientific Committee on Antarctic Research (BBS-SCAR). In the austral summer of 1988/89, UNISINOS also contributed to the International Giant Petrel Banding Project with the goal of studying Giant Petrel dispersal (Hunter 1986, 1990). However, at the time of the analysis of this project, band recovery data for Giant Petrel chicks banded by UNISINOS researchers during 1989/99 was unavailable (Patterson & Hunter 2000). The National Banding System of the Research Center for the Conservation of Wild Birds (CEMAVE) calculated that a total of 8 922 Southern Giant Petrels (both chicks and adults) were banded in Antarctica between 1980 and 2000 (Filho *et al.* 2007a, b).

The objective of this current study is to examine band recovery data from locations outside of Antarctica from Southern Giant Petrel chicks banded by the UNISINOS Antarctic Project and PROANTAR from 1983/84 to 1992/93. This research aims to contribute to the body of knowledge surrounding the distribution and migration patterns of this species. We present here information regarding these recoveries, with special attention to distance traveled from nest site, lapse of time between the banding period and recovery, direction and orientation of dispersal, condition of the birds when recovered and a historical comparative analysis with data from previous studies.

METHODS

Between 1983/84 and 1992/93, the UNISINOS Antarctic Project banded Southern Giant Petrel chicks in their nests at eight different locations within latitudes 61°S and 68°S, and longitudes 55°W and 69°W (Table 1). Banding activities took place during the late chick-rearing period, when chicks had reached a mass of over 3.5 kg but before they began to fledge. We marked chicks with aluminum leg-bands (code size V; 15.0 mm internal diameter) supplied by CEMAVE, which were coded along the outside of the band with a unique five-digit number and the address: "Avise" (Call)—CEMAVE mail box 04/034 Brasilia-DF, following the standards recommended by the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA, 1994).

TABLE 1
Number of chicks banded at eight different locations in Antarctica from eight breeding seasons

Breeding season	Banding location	Latitude, Longitude	No. chicks banded
1983/84	King George Island	62°10′S, 58°50′W	37
	Penguin Island	62°00′S, 57°50′W	354
	Robert Island	62°20′S, 59°40′W	38
1985/86	Avian Island	68°00′S, 69°00′W	4
	Elephant Island	61°20′S, 55°20′W	650
	Nelson Island	62°10′S, 58°50′W	185
	Penguin Island	62°00′S, 57°50′W	38
1986/87	Elephant Island	61°20′S, 55°20′W	558
	Penguin Island	62°00′S, 57°50′W	212
1987/88	Elephant Island	61°20′S, 55°20′W	469
	Nelson Island	62°10′S, 58°50′W	0
	Penguin Island	62°00′S, 57°50′W	439
1988/89	Elephant Island	61°20′S, 55°20′W	485
	Nelson Island	62°10′S, 58°50′W	0
	Penguin Island	62°00′S, 57°50′W	335
1989/90	Elephant Island	61°20′S, 55°20′W	628
	King George Island	62°10′S, 58°50′W	106
	Penguin Island	62°00′S, 57°50′W	568
1991/92	Elephant Island	61°20′S, 55°20′W	846
1992/93	Ardley & Two Summit Islands	62°10′S, 58°50′W	38
	Elephant Island	61°20′S, 55°20′W	945
	King George Island	62°10′S, 58°50′W	104
	Nelson Island	62°10′S, 58°50′W	51
	Penguin Island	62°00′S, 57°50′W	413
Total			7503

Recoveries of Southern Giant Petrels banded by the UNISINOS Antarctic Project were reported directly to CEMAVE. Band recovery data included information on the time, location and condition of the bird upon recovery (alive or dead), and when possible, the cause of mortality. Using these data, we were able to describe several aspects of Southern Giant Petrel post-fledging dispersal. We calculated the linear distance and direction (angle of orientation relative to north) that juvenile petrels traveled after leaving the nest by comparing banding and recovery locations using Google Earth (Version 4.2). The number of days that lapsed between fledging and recovery was obtained by subtracting the recovery date from a standardized fledging date. This date was estimated as 115 days after hatching (Watson 1975), or approximately April 15th of each year for breeding colonies in the South Shetlands Archipelago.

Simple linear regression analysis was applied to test for temporal trends in band recovery rates. The relation between the distance traveled and the time spent was also analyzed using simple linear regression analysis. We tested for differences in the mean distances traveled by juvenile petrels among three banding locations (Nelson Island, Elephant Island and Penguin Island) using one-way analysis of variance (ANOVA). Data from Ardley Island were omitted from this analysis due to low sample size (one recovery). When necessary, data were log-transformed to achieve normality. The statistical package SYSTAT 12 was used for the statistical analysis. To carry out a comparative analysis, we used the studies of Sladen & Tickell (1958), Hunter (1984b), Voisin (1990), Parmelee (1992), Trivelpiece & Trivelpiece (1998), and Patterson & Hunter (2000).

RESULTS

From 1983/84 to 1992/93 we banded a total of 7 503 chicks at eight breeding localities (Table 1). Of these banded chicks, 68 (0.9%) were recovered from locations outside Antarctica. Recovery

TABLE 2
Number of chicks banded, number of bands recovered and recovery percentages from eight breeding seasons

Breeding season	No. chicks banded	No. recovered	% recovered
1983/84	429	6	1.40
1985/86	877	11	1.25
1986/87	770	9	1.17
1987/88	908	8	0.88
1988/89	820	6	0.73
1989/90	1302	6	0.46
1991/92	846	10	1.18
1992/93	1551	12	0.77
Total	7503	68	0.90

rates varied among cohorts, with values ranging from a minimum of 0.5% in 1989/90 to a maximum of 1.4% in 1983/84 (Table 2). Cohort recovery rates did not exhibit a significant linear trend over time ($F_{(1,6)} = 3.13$, $R^2 = 0.34$, $P = 0.127$)

Of the 68 recoveries, 45 bands were from the first year after fledging (Table 3). Of the 45 bands recovered within one year, the majority (40%) were recovered in July or approximately 60–90 days after fledging (Table 4). This was followed in rank by the months of August (22.2%), June and November (11.1%), September (6.7%) and October (4.4%). December and May both had one recovery while no bands were recovered in the months of January through April (Table 4). The location with the greatest number of recoveries was Australia (57.3%), followed by South America (17.6%), South Africa (13.2) and New Zealand (5.9%); Madagascar, Indian Ocean and East Sea together accounted for 5.9% of recoveries (Table 5). CEMAVE reported the information regarding the condition of the bird when recovered for only 48 of the total of 68 bird recoveries. Thus, for 48 recoveries reported, 35 (72.0%) birds were found dead, three (8.6%) as a result of commercial fishing activities. Thirteen of the birds (28.0%) were captured alive, rehabilitated or not, and released. One individual was captured and later released on three separate occasions at different locations within South Africa.

The average linear distance traveled by the birds after fledging was 8 030 km, and ranged from a minimum of 1 440 km to a maximum of 15 268 km. There were 56 recoveries of birds that traveled in the northeast direction, of which nine had a flight direction between 135°NE and 160°NE, and the other 47, a maximum flight inclination of 135°. The 12 recoveries of birds that had traveled in a northwest direction had a flight direction between 40°NW to 90°NW. A negative relation ($\beta = -0.44$, $P < 0.001$) between the distance from an individual banding location and the time since fledging was detected by the regression analysis ($F_{(1,64)} = 15.19$, $R^2 = 0.19$, $P < 0.001$). Older birds were more likely to be recovered in areas closer to their banding location, such as South America and South Africa, while younger birds were more likely to be recovered from areas farther away from their banding location, such as New Zealand and Australia. When examining recoveries of birds banded at three of our banding locations, we found no effect of breeding colony location on the distance traveled by juveniles after banding (ANOVA, $F_{(2,62)} = 0.35$, $P = 0.710$).

DISCUSSION

To our knowledge, this study represents the largest banding effort of Southern Giant Petrel chicks with the goal of examining post-fledging dispersal. Furthermore, Brazilian researchers likely banded the largest number of Southern Giant Petrels (adults and chicks) of any country-member of the Antarctic Treaty in the 1980s and early 1990s (Filho *et al.* 2007a, b). During the same period, several other national research programs also banded Southern Giant Petrels chicks, primarily as a part of the International Giant Petrel Banding Project (Patterson & Hunter 2000).

TABLE 3
Number (percentage) of band recoveries in the first four years; comparison with previous studies

Source	Year recovered after banding					
	Year 1[a]	Year 2	Year 3	Year 4	> 5 Years	Total
This study	45 (66.2)	13 (19.6)	5 (7.3)	3 (4.4)	2 (2.9)	68
Hunter 1984b	36 (92.3)	0	3 (7.6)	0	0	39
Trivelpiece & Trivelpiece 1998	14 (100.0)	0	0	0	0	14
Patterson & Hunter 2000	14 (73.6)	3 (15.7)	1 (5.2)	1 (5.2)	0	19
Total	109 (77.8)	15 (10.7)	9 (6.4)	4 (2.8)	2 (2.9)	140

[a] Year of the highest recovery rate for all studies.

TABLE 4
Number (percentage) of band recoveries in the months within the first year after being banded; comparison with previous studies

Study	Month of band recovery[a]									
	Apr.	May	Jun.	Jul.[b]	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Total
Current study	0	1 (2.2)	5 (11.1)	18 (40.0)	10 (22.2)	3 (6.6)	2 (4.4)	5 (11.1)	1 (2.2)	0	45
Sladen & Tickell (1958)	0	0	6 (21.0)	15 (54.0)	3 (11.0)	0	1 (4.0)	2 (7.0)	1 (4.0)	0	28
Hunter (1984b)	0	0	1 (3.0)	21 (58.0)	8 (22.0)	1 (3.0)	2 (5.0)	1 (3.0)	1 (3.0)	1 (3.0)	36
Parmelee (1992)	0	0	2 (11.0)	10 (53.0)	3 (16.0)	1 (5.0)	1 (5.0)	1 (5.0)	1 (5.0)	0	19
Trivelpiece & Trivelpiece (1998)	0	0	2 (14.0)	5 (36.0)	2 (14.0)	2 (14.0)	2 (14.0)	0	1 (7.0)	0	14
Patterson & Hunter (2000)	1 (7.1)	1 (7.1)	3 (21.4)	5 (35.7)	2 (14.3)	0	0	1 (7.1)	1 (7.1)	0	14
Total	1 (0.6)	2 (1.3)	19 (12.1)	74 (47.1)	28 (18.5)	7 (4.40)	8 (5.1)	10 (6.4)	6 (3.8)	1 (0.6)	156

[a] No recoveries in February or March.
[b] Month corresponding to the highest recovery rate for all studies.

The 68 recoveries in this study represent a recovery rate of 0.9% of the total chicks banded (Table 2), which is similar to results found by Hunter (1984b), Voisin (1990), Parmelee (1992), Trivelpiece & Trivelpiece (1998) and Patterson & Hunter (2000). Together, these findings suggest that the recovery rate of juveniles is very low, and rarely surpasses the 1% mark on average. Contrary to previous studies, which in some banding years did not obtain any returns (Hunter 1984b, Voisin 1990, Parmelee 1992, Trivelpiece & Trivelpiece 1998, Patterson & Hunter 2000), in our study all banding cohorts had returns. The larger number of chicks banded in our study, relative to others, likely facilitated this result. The return rates of juveniles across the eight cohorts banded varied from 0.5% to 1.4%, but did not exhibit a clear linear trend over time. However, the low return rates found in our study and others may limit our ability to examine trends in band recoveries over time.

The largest percentage of recoveries in our study was from individuals less than one year of age (66.2%), a trend also observed by Hunter (1984b), Trivelpiece & Trivelpiece (1998) and Patterson & Hunter (2000) (Table 3). Similar to these three studies and most others, recoveries within the first year after banding in our study ranged from a minimum of one month to maximum of nine months after fledging (Table 4). In all of the studies examined, including ours, the first July after fledging was the most common month for recoveries (Table 4). This time period, corresponding to between 60–90 days after fledging, might represent a bottleneck in juvenile survival for Southern Giant Petrels. Juvenile petrels could be driven into coastal regions during this time, exhausted by hurricanes or storms during the rough austral winters or lured by possible food resources from coastal fishing industries (Hunter 1984b, Bugoni *et al.* 2007).

A smaller percentage of recoveries in our study are from juvenile petrels more than two years of age (33.8%). Returns after one year of leaving the nest (from two to three years) were also reported by Hunter (1984b), Voisin (1990) and Parmelee (1992), but not by Trivelpiece & Trivelpiece (1998). However, the preponderance of data showed that these types of recoveries are uncommon relative to recovery from the first year after banding, suggesting that, after one year of age, juvenile petrels may leave coastal areas where recoveries are more likely and become more oceanic in their distribution (Hunter 1984a, Patterson & Hunter 2000).

Similar to all other published studies, the majority of band recoveries in our study were from Australia (57.3%; Table 5). Other researchers have hypothesized that this trend is due to a funneling effect by landmasses and prevailing weather patterns (Parmelee & Parmelee 1987, Voisin 1990, Trivelpiece & Trivelpiece 1998, Patterson & Hunter 2000). Furthermore, Hunter (1984b) points out that many birds are recovered in this region during the rough austral winters, which can act to increase dispersal and reduce forage activity, leading to stranding events. In addition, the high number of recoveries from Australia as well as New Zealand could be due, in part, to the educational campaigns in these nations about banding and the importance of gathering data (Trivelpiece & Trivelpiece 1998).

The second largest number of band recoveries in our study was from South America, including Brazil (Table 5). Both Northern and Southern Giant Petrels have been observed along the coastal and offshore regions of Brazil (Martuselli *et al.* 1995, Sick 2001, Belton 2003, Carlos *et al.* 2005). Petry & Fonseca (2002) reported recovering Southern Giant Petrel carcasses along the coastal region of Rio Grande do Sul, Brazil, during the months of July, October and November. A review by Olmos *et al.* (2002) found that Southern Giant Petrels banded as nestlings at South Orkney, South Georgia, Cormorant, Elephant Island and Macquarie Islands have all been recovered along the coast of Brazil, primarily during the later months of the first year of life.

A relatively high percentage of recoveries in our study were from South Africa, a result that agrees with the findings of Sladen & Tickell (1958). However, results from other studies detail the contrasting occurrences of recoveries from this location. Hunter (1984b) and Parmelee (1992) reported recoveries from this location, while Trivelpiece & Trivelpiece (1998) and Patterson & Hunter (2000) did not report any returns from South Africa. When examining trends over time, Trivelpiece & Trivelpiece (1998) suggested a reduction in band recoveries from South Africa from the 1940s to the 1980s. The relatively high percentage (13.2%) of bands recovered from South Africa during the duration of our study (1983/84 to 1992/93) does not support their hypothesis. However, it is important to note that Trivelpiece & Trivelpiece's (1998) analysis is based on recoveries during the first year of life and did not include data on recoveries after one year.

TABLE 5
Comparison of the number (percentage) of band recoveries after fledging with studies from other breeding locations

Breeding location *(Study)*	**Recovery location**					
	Australia[a]	**South Africa**	**New Zealand**	**South America**	**Other**[b]	**Total**
South Shetland Islands *(current study)*	39 (57.3)	9 (13.2)	4 (5.9)	12 (17.6)	4 (5.9)	68
Signey & Anvers islands *(Slanden & Tickell 1958)*	29 (69.0)	7 (16.7)	4 (9.5)	2 (4.8)	0	42
South Georgia *(Hunter 1984)*	24 (68.5)	1 (2.9)	10 (28.6)	0	0	35
Crozet Archipelago *(Voisin 1990)*	3 (75.0)	0	1 (25.0)	0	0	4
Anvers Island *(Parmelee 1992)*	15 (78.9)	1 (5.3)	2 (10.5)	1 (5.3)	0	19
King George Island *(Trivelpiece & Trivelpiece 1998)*	8 (57.1)	0	4 (28.6)	2 (14.3)	0	14
Total	113 (69.7)	15 (9.2)	24 (14.8)	8 (4.9)	2 (1.2)	182

[a] Location with the highest recovery rate for all studies.
[b] Other locations: Madagascar, Indian Ocean and East Sea.

When compared with the studies of Trivelpiece & Trivelpiece (1998) and Patterson & Hunter (2000), our study expands the area where banded Southern Giant Petrels have been recovered, both in latitude and longitude. The northernmost band recovery in our study was 03°S, while for Trivelpiece & Trivelpiece (1998) and Patterson & Hunter (2000) it was 20°S and 23°S, respectively. The easternmost longitude in our study was 176°E and for Trivelpiece & Trivelpiece (1998) and Patterson & Hunter (2000), it was 175°E and 174.07°E, respectively. When comparing our findings to the distribution map of this species in Harrison (1983), an expansion of the distribution area to the north of Brazil, Madagascar and Australia is apparent.

The location and timing of band recoveries, relative to banding location, in our study suggest that a northeasterly direction is the dominate dispersal trajectory (for 86.8% of recoveries). These results support the findings of previous studies, which have proposed that Southern Giant Petrels spend their first year undergoing a circumpolar dispersal with an easterly trajectory (Parmelee 1992, Trivelpiece & Trivelpiece 1998, Patterson & Hunter 2000). In addition, older birds in our study were more likely to be recovered in areas closer to their banding location, such as South America and South Africa. The birds recovered in these closer locations have likely already completed their circumpolar dispersion and have begun to return to the proximity of their colonies of origin. Similar to Trivelpiece & Trivelpiece (1998), we found no effect of breeding colony on the linear distance traveled by juveniles after banding or on their eventual recovery location, suggesting that patterns of post-fledging dispersal are consistent across multiple colonies in the South Shetlands Islands.

From the 48 recoveries in which the the birds' condition was reported, 35 (72%) were of birds found dead. Three of these confirmed mortalities (8.6%) resulted from commercial fishing activities. Interactions with fishing activities and the incidental capture of Southern Giant Petrels by longline fishing vessels have been recorded along the Patagonian coast and in coastal areas near Uruguay (Jiménez 2007, Copello & Quintana 2009). In addition, both Southern and Northern Giant Petrels along the Brazilian coast have been captured incidentally during fisheries activities (Bugoni *et al.* 2008). Otley *et al.* (2007) observed banded Southern Giant Petrels interacting with longline fishing activities around the Falkland Islands and Scotia Ridge, including two non-breeding adults banded at Bird Island, South Georgia, and a juvenile that had been banded ten months previously, before fledging from Isla Gran Robredo in Argentina.

The world population of Southern Giant Petrels, as of the 1999/2000 austral summer, has been recently estimated at 30 575 breeding pairs (Patterson *et al.* 2008). When comparing Patterson *et al.*'s (2008) population estimate with a previous estimate of approximately 38 000 pairs (Hunter 1985), there is evidence to suggest a possible recent decrease in global populations. However, because of differences in the availability and quality of data between these two studies (such as the lack of census data from some breeding colonies and infrequent or questionably timed censuses at other breeding localities), any inferred estimates of global population change should be viewed conservatively (Patterson *et al.* 2008). While global population trends are uncertain, there is evidence to suggest that Southern Giant Petrels have declined at some breeding localities (Patterson *et al.* 2008). It has been suggested that these localized declines have been influenced by disturbance due to human activities near breeding areas in the Antarctic Peninsula and continent, as well as the decline of carrion resources, such as declines in elephant seal *Mirounga leonina* pup production at some sub-Antarctic islands (Woehler 1991, Pfeiffer & Peter 2004, Patterson *et al.* 2008, Sander *et al.* 2009). In addition, as noted in our study and others, both adult and juvenile Southern Giant Petrels commonly follow fishing vessels and are susceptible to hook-related mortality from commercial longline fishing activities (Johnstone 1974, Jiménez 2007, Otley *et al.* 2007, Bugoni *et al.* 2008, Copello & Quintana 2009). However, it is difficult to estimate the effects of fisheries-related mortality on current population trends. Estimates from our studies and others suggest that roughly 10% of reported Southern Giant Petrel fledgling mortality can be directly linked to fisheries interactions (Hunter 1984a, Patterson & Hunter 2000). This is likely a conservative estimate of fisheries-induced fledgling mortality, as Trivelpiece & Trivelpiece (1998) suggest that many banded Southern Giant Petrels recovered after accidental death from fishing activities are likely unreported. Increased reporting of fisheries recoveries of Southern Giant Petrels would enhance knowledge of the biology of the species and consequently aid in decision-making regarding management of their local and global populations. Another, more recent concern is that Southern Giant Petrels and other migratory seabirds might act as vectors of avian disease such as avian influenza and West Nile virus, among others (Rappole *et al.* 2000, Leotta *et al.* 2003). Studies such as ours that provide knowledge of the migratory patterns of a widely dispersing bird like the Southern Giant Petrel can help in the environmental management of these bird species, especially in the case of disease pandemics (Petry *et al.* 2006).

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