

## Nota sobre nidificación de Petreles (Procellariiformes) en isla Ardley, Shetland del Sur

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### RESUMEN

Gran esfuerzo se ha concentrado en estudiar las colonias de pingüinos que nidifican en isla Ardley (Shetland del Sur), dejando un poco de lado otros grupos de aves marinas que son muy numerosas en el área. Este es el caso particular de los Procellariiformes. Cuatro especies de este Orden se reproducen en la isla (*Macronectes giganteus*, *Daption capense*, *Oceanites oceanicus*, y *Fregatta tropica*). De otras tres especies (*Fulmarus glacialisoides*, *Pagodroma nivea*, y *Pachyptila desolata*), se tienen antecedentes que nidifican en islas adyacentes a las Shetland del Sur, pero no se ha comprobado que nidifiquen en Ardley.

En el presente trabajo se entrega información reproductiva de las cuatro especies de Procellariiformes nidificantes en Ardley. Especial énfasis se le da a *Oceanites oceanicus* por ser la especie más abundante. Se localizaron 71 nidos, los que fueron caracterizados y controlados durante 14 días.

## Notes on Petrels (Procellariiformes) breeding on Ardley Island, South Shetland Islands

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### ABSTRACT

Ardley Island, a small island off the Fildes Peninsula, King George Island, South Shetland Islands, was searched for nesting procellariiform seabirds from 23 January to 6 February 1986. We located seven nests of *Daption capense*, 13 nests of *Macronectes giganteus*, and 71 nests of *Oceanites oceanicus*. In addition, *Fregatta tropica* almost certainly breeds on the island and a possible nest site was located. An estimated 600 pairs of *O. oceanicus* nest on Ardley Island, a major breeding colony on the Fildes Peninsula. The variety of crevices occupied and the distribution of nests sites suggest that the breeding population of *O. oceanicus* may be limited by available snow-free nest sites. Numbers of breeding *D. capense* and *M. giganteus* are not limited by nest sites and appear more susceptible to human disturbance than *O. oceanicus*, particularly during the early phases of the breeding season. Three other species of procellariiforms (*Fulmarus glacialisoides*, *Pagodroma nivea*, *Pachyptila desolata*) are known to nest either on the South Shetland Islands or adjacent areas of the Antarctic Peninsula, but apparently do not nest on Ardley Island.

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## INTRODUCTION

Ardley Island is a breeding site for a variety of Antarctic seabirds: three species of pygoscelid penguins (*Pygoscelis papua*, *P. adeliae*, and *P. antarctica*), South polar skua (*Catharacta maccormicki*), Southern black-backed gull (*Larus dominicanus*), Antarctic tern (*Sterna vittata*), and several species of petrels (Order: Procellariiformes). The island is of particular scientific value because it is located within 1-2 km of the three major Antarctic stations on the Fildes Peninsula, King George Island: Teniente Marsh (Chile), Bellingshausen (Soviet Union), and Great Wall (China). The airstrip at Marsh Base offers year round access to the area by long-range aircraft. This relative accessibility of Ardley Island has resulted in frequent human visits with the associated potentiality for disturbance of breeding seabirds. The level of human disturbance on Ardley Island is increasing and is likely to continue to do so as existing stations expand, new stations are built, and tourism increases. Thus, Ardley Island offers a unique opportunity to monitor the impact of human disturbance on breeding success in Antarctic seabirds.

While penguin populations on Ardley Island are the subject of continuing research (Valencia and Sallaberry 1983; Leyton *et al.* 1984, Yáñez *et al.*, 1984), little has been published on the biology of the procellariiform seabirds that breed there. Bannash and Odening (1981), and Bannash and Lundberg (1984) gathered information during three years of field work concerning the distribution and breeding biology of avifauna on the Fildes Peninsula.

This paper reports our preliminary findings for Ardley Island as a site for the study of reproductive biology in Wilson's storm petrel (*Oceanites oceanicus*) (Project e.14 of INACH), the smallest Antarctic seabird and the only storm-petrel (Hydrobatidae) to breed in Antarctica. This survey was unavoidably interrupted by logistic factors that forced us to leave in the middle of the study. Nevertheless, we obtained some new information on the breeding biology of this species in the study area.

## STUDY AREA AND METHODS

Ardley Island (62°13'S.; 58°55'W.) is a small, nearly ice-free island, approximately 1.8 km long, with a maximum elevation of 53 m.a.s.l. At low tide the island can be reached on foot from Fildes Peninsula via a gravel isthmus. The island supports a lush growth of lichens and mosses compared with adjacent areas of Fildes Peninsula (Redon, 1985), apparently because of its location in a sheltered bay in the lee of the peninsula. Nevertheless, snowbanks persist on some south-facing slopes throughout the summer and snow can fall throughout the year. Colonies of breeding penguins, totalling approximately 2,800 pairs, are restricted to the eastern third of the island and are dominated by the sub-Antarctic Gentoo penguin (*P. papua*) (Valencia and Sallaberry, 1983).

Field work on Ardley Island was conducted from 23 January to 6 February 1986. We searched the entire island for nests of procellariiforms (Fig. 1). Crevices in talus slopes were searched using a flashlight (23,000 candle power) and by moving surface rocks carefully. Crevice nests were marked with surveyor's tape. Some additional information for this report was collected during previous field work in the study area by the second author.

## RESULTS

Three species of procellariiforms were found on Ardley Island and a fourth species almost certainly nests there, although no proof was obtained.

*Macronectes giganteus*, Southern Giant Fulmar (Petrel), Petrel Gigante del Sur:

On Ardley Island this species nests only on exposed, and windy ridges in the interior. Nests were composed of pebbles shaped into a shallow cup. During a careful search of the island on 25 January, we located 13 active nests (Fig. 1). Average nest cup measurements were 878 mm, 390 mm, and 68 mm, for external diameter, internal diameter, and depth respectively, of four nests. Twelve nests contained a single chick with an adult in attendance and one nest contained an egg that was being incubated. Nests occurred either singly (4 cases), in pairs (2 cases), or larger aggregations (1 case of five). All nests were rechecked and nestlings weighed on 2 February. At that time, the eggs found on 25 January had disappeared and no adult was in attendance. The average body mass of the remaining chicks was 1.74 kg (SD = 1.86, n = 11, range = 0.4-2.5 kg; Pesola scale, 10 kg capacity). Six of the chicks were attended by an adult and three of these were being brooded. In close proximity to the active nest we found 19 empty nests. Non-breeders (either subadults or failed breeders) were present near the active nests on both occasions when nests were checked.

*Daption capense*, Cape Pigeon, Petrel moteado.

Only a single small colony of this species, consisting of seven nests, was located on Ardley Island. The colony was on a rocky promontory on the northeastern shore of the island (Fig. 1). Four of the nests were on cliff ledges on the south-facing side of the promontory and the others were on ledges in steep talus on the north-facing side. On 4 February, the seven nests each contained a single, nearly full-grown chick that was completely down-covered except for the head.

*Oceanite oceanicus*. Wilson's Storm-Petrel, Golondrina de mar.

This is by far the most abundant species of Procellariiform breeding on Ardley Island. A total of 71 nests were found in suitable rock crevices nearly throughout the island, but highest densities

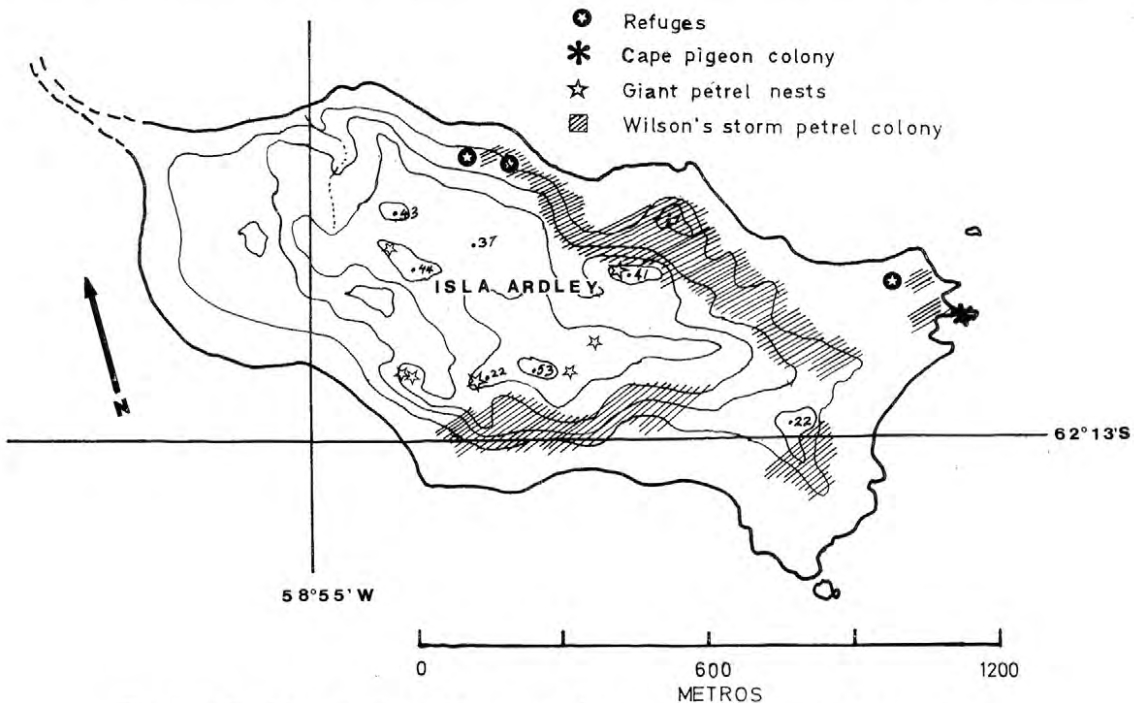


Fig. 1. Ardley Island map on which are noted the places where are located the petrel's nest.

were in north-facing talus slopes in the eastern part of the island (Fig. 1). The western third of the island is mostly covered with gravel moraine and offers few nest sites. Nests were not found in south-facing slopes adjacent to persistent snow fields, presumably because crevices became snow-free too late in the breeding season. Some nests were found as close as 4 m from the shoreline while others were on the higher ridges in the interior of the island. A few nests were found in crevices on vertical cliffs, while others were under boulders resting on level ground. Several nests were found in the midst of penguin colonies where the adult petrels had excavated sufficient penguin excrement from under rocks to afford a nest site.

The distribution of active nests appeared to be dictated more by the availability of nest sites than by social tendencies. Some nests were located as much as 50 m from the nearest nest, while on certain talus slopes nests were spaced less than a meter apart. North-facing talus slopes with material ranging from 0.5 to 1.0 m in diameter supported the highest densities of nesting pairs. No nests were found in burrows excavated in moss banks, as described by Roberts (1940) in the Argentine Islands. The depth of nests varied from 15 to 84 cm, but some deeper nests probably were undetected. Nest material varied from virtually nothing to well-formed cups of lichen, moss, and penguin feathers.

At the time of our arrival on Ardley Island (23 January) some nests contained chicks whose estimated age was as much as 9 days post-hatching. Some nests still contained eggs when we departed (6 February), but the peak of hatching was apparently during the last week of January. This is earlier than the peak of hatching on Signy Island in the South Orkneys (Beck and Brown, 1972) and similar to the Argentine Islands (Roberts, 1940). From the average incubation period of 44 days (Beck and Brown, 1972), the first eggs were laid on Ardley Island on about 1 December. This is earlier than any previously published laying date for this species, with the exception of birds breeding on the Antarctic continent where some eggs were laid as early as the last week of November (Lacan, 1971; Copestake and Croxall, 1985). However, the second author found only eggs of this species on Ardley Island during January 1983. This suggests that breeding phenology on Ardley Island during the 1985-1986 season was unusually early. This conclusion is supported by the observation of Núñez and Yáñez (pers. comm.).

The concealed nest sites used by Wilson's Storm-Petrel make estimation of breeding populations particularly difficult. Although only 71 nests were found on Ardley Island, many areas with suitable nest sites were searched only briefly. While searching for nests we occasionally heard adults calling from deep in the talus where we were unable to locate the nests. Thus even in areas that we searched thoroughly, some nests were undetected. On the basis of these considerations and the extent of suitable nesting habitat on Ardley Island, our best estimate of the breeding population is 600 pairs. We feel certain that the population is not less than 300 pairs and that it probably does not exceed 1000 pairs. Ardley Island appears to be a major breeding area for Wilson's Storm Petrel on Fildes Peninsula. Similar-sized breeding populations are known from other localities on King George Island at Tres Hermanos (62°15'S.; 58°38'W.; Araya and Arrieta, 1967) and Admiralty Bay (A. Myrcha, pers. comm.).

During a storm on 5 February, several centimeters of snow accumulated on Ardley Island, and drifts as deep as 0.5 m were formed on the west-facing slope. Some storm-petrel nests were completely buried, preventing access by adults incubating eggs or feeding nestlings. Wilson's Storm-Petrel embryos are known to tolerate extended periods of chilling (Pefaur, 1974), but young chicks probably can not survive long while entombed alone in nests. We were forced to leave Ardley Island before we could assess the extent of chick mortality as a result of the storm, but Beck and Brown (1972) documented snow accumulation as a major mortality factor for nestling in two of the three years of their study.

*Fregatta tropica*, Black-Bellied Storm-Petrel, Golondrina de mar de vientre negro.

We were not successful in locating a nest of this species on Ardley Island, but it is known to breed along the shores of nearby Admiralty Bay (Bannash and Lundberg, 1984; A. Myrcha, pers. comm.). We heard this species calling at night (Beck and Brown, 1971) from talus slopes on both Ardley Island and adjacent areas of the Fildes Peninsula. We suspected a nest in boulders near the shoreline just in front of the Chilean shelter on Ardley Island, where an adult was heard calling on several occasions (Fig. 1). An adult was also seen flying in that vicinity at dusk on one occasion. In addition, we discovered a dead adult on the shore 300 m to the east with its legs completely entangled in nylon fishing line.

## DISCUSSION

Numbers of breeding *Macronectes giganteus* and *Daption capense* on Ardley Island are small compared with total breeding populations of the Fildes Peninsula. There is no evidence that numbers of breeding pairs are limited by available nest sites and the many unused nest sites of *M. giganteus* suggest that this species formerly bred in larger numbers on Ardley Island. *M. giganteus* nests in the most remote and undisturbed portions of the island, perhaps reflecting a greater sensitivity to human disturbance than other species. The numbers of active nests of both *M. giganteus* and *D. capense* are readily determined and should be monitored in the future.

Unlike *M. giganteus* and *D. capense*, the breeding population of *Oceanites oceanicus* on Ardley Island may be limited by suitable nest sites. The wide variety of nest sites utilized and our discovery of three eggs laid on the surface of talus slopes suggests that intra-specific competition for snow-free nest sites during the pre-laying period may be intense.

Our ability to detect population fluctuations in this species is constrained by the same factors that make estimations of population size so difficult. Nevertheless, it would be useful to select an area of high nesting density, permanently mark nest sites, and monitor nests over a period of several years as an indicator of breeding success and overall population trends. The low breeding success of this species in some years (Roberts, 1940; Lacan, 1971; Beck and Brown, 1972) suggests a large variability in annual recruitment. It remains to be determined whether this results in fluctuations in breeding populations of this long-lived seabird.

Nests of *Fregatta tropica* will probably be found on Ardley Island in the near future. It should be possible to locate some nests of this species by surveying the island on calm nights when the repetitive, whistled call of the adults can be heard. We found that some adults will continue to call from the presumed area of the nest even when approached to within a few meters; after which crevices can be searched with a flashlight.

Several other species of procellariiforms are known to breed on the South Shetland Islands or on adjacent areas of the Antarctic Peninsula, but have not been discovered nesting on either Ardley Island or King George Island. These include *Fulmarus glacialis* (Southern Fulmar, Petrel plateado), *Pagodroma nivea* (Snow Petrel, Petrel de las nieves), and *Pachyptila desolata* (Antarctic Prion, Petrel paloma antártica). *F. glacialis* is known to nest on only two small islands in the South Shetlands (Clarence and Gibbs island; Watson, 1975) and is not numerous in the waters surrounding the South Shetlands. Although *P. nivea* breeds on the South Orkney Islands and the Antarctic Peninsula (Watson, 1975), it is strangely absent from the South Shetland Islands as a breeding species, perhaps because of the scarcity of pack-ice and bergs. *P. desolata* breeds on the South Orkney Islands and Elephant Island (Watson, op. cit.), the northernmost island in the South Shetlands. This latter species is extremely vulnerable to predation by skuas

(Tickell, 1962) and may require complete darkness to return to the nest in some degree of safety. The lack of total darkness in late December at the latitude of King George Island may preclude successful nesting by *P. desolata*. Nevertheless, these three species of procellariiforms should be looked for both on Ardley Island and Fildes Peninsula.

#### ACKNOWLEDGEMENTS

We wish to thank the Instituto Antártico Chileno and the University of Pennsylvania for financial support (Project e 14 INACH). We are grateful to the Fuerza Aérea de Chile and the Armada de Chile for logistic support. The following individuals were particularly helpful to us during the course of this study: Luis Arias, Patricio Eberhard, Alberto Foppiano, Siegfried King, Antonio Mazzei, Rubén Scheihing, José Valencia, José Yáñez, and Gao Yaoting. We also are indebted to the biologists under the direction of Dr. Martin Rauschert from the German Democratic Republic (DDR), who kindly shared with us their knowledge of the avifauna of the Fildes Peninsula. We also wish to express our gratitude to José Valencia for translating the German publication and commenting on an earlier draft of this manuscript.

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