

NOTES ON THE WINTER-BREEDING GREATWINGED PETREL *PTERODROMA MACROPTERA* AND  
GREY PETREL *PROCELLARIA CINEREA* AT MARION ISLAND

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SUMMARY

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Greatwinged Petrels *Pterodroma m. macroptera* and Grey Petrels *Procellaria cinerea* are the only two winter-breeding petrels at the Prince Edward Islands. Information is given on aspects of the breeding biology of the two species, collected incidentally to other studies. The introduction of feral Domestic Cats *Felis catus* to Marion Island has apparently led to a very low breeding success. The conservation of Greatwinged and Grey Petrels is discussed in relation to cat predation.

INTRODUCTION

The Greatwinged Petrel *Pterodroma m. macroptera* and the Grey Petrel *Procellaria cinerea* are winter-breeding burrowing petrels (Procellariidae) that inhabit islands on, and to the north of, the Antarctic Polar Front (Watson 1975, Harrison 1983). They breed sympatrically at the Prince Edward Islands in the southern Indian Ocean (Cooper & Brooke 1984, Williams 1984). The breeding biology of Greatwinged Petrels has been studied at Marion Island (46 38S, 37 57E) by Schramm (1983, 1986). However, little is known of the rarer Grey Petrel at Marion Island, except of its vocalizations (Brooke 1986). In recent years, both species have suffered from predation by introduced feral Domestic Cats *Felis catus* at Marion Island (van Aarde 1980, van Rensburg 1985, van Rensburg & Bester 1988a) and,

as a consequence, have been listed as vulnerable in the South African Red Data book (Brooke 1984).

This paper brings together observations from several sources on aspects of the breeding biology of the Greatwinged and Grey Petrels at Marion Island in the Prince Edward Island group. For the former species, only parameters not given by Schramm (1983) are presented here. The data were collected incidentally to other studies and offer only an incomplete account of the two species' breeding biologies. However, because of their vulnerability to cats, it is considered worthwhile publishing the little that is currently known.

METHODS

Burrows were opened and provided with removable

earth plugs, allowing inspection of nest chambers (Sinclair 1981).

#### *Greatwinged Petrel*

During July - November 1982 the nest contents of 53 occupied Greatwinged Petrel burrows were checked by IPN at 5-d intervals until chicks were about 20 d old, and subsequently at about 10-d intervals until close to fledging, when the frequency of checks was increased. Chicks were weighed on Pesola spring balances and measured (exposed culmen, tarsus and tail to the nearest 0,1 mm with Vernier calipers, wing (maximum chord) with a stopped rule to the nearest 1 mm) during nest checks. In 1984 and 1985 C.R. Brown and B.G. Visser made observations at 35 and 28 burrows, respectively, and recorded information on laying dates and incubation.

#### *Grey Petrel*

The nest contents of six burrows occupied by Grey Petrels were checked at about two-week intervals during May - October 1982 and information on growth rates recorded, as described above for Greatwinged Petrels. In April - June 1984, 12 nests were located and studied by N. J. Adams and M. de L. Brooke and information on adult dimensions, egg size and hatching and chick data obtained. Information collected by M. Schramm in May and June 1979 is also included.

## RESULTS

#### *Greatwinged Petrel*

In 1985, the mean laying date of 27 eggs in nests checked after 17 May was 28 May (range 18 May - 10 June). However, one nest contained an egg that was laid prior to 18 May. Two incubation periods of 57 d were recorded in 1984.

The mean hatching date at 34 Greatwinged Petrel nests checked after 7 July 1982 was 19 July (range 8 July - 1 August). In addition, two nests were found

containing chicks which had hatched prior to 8 July. In 1984, the mean hatching date at 15 nests was 19 July (range 10 - 31 July). In 1982, the departure dates of 10 chicks were between 6 October and 28 November.

In 1982 breeding success was 20,5%. This figure is likely to be an over-estimate since some eggs may have been lost prior to excavation of burrows. Many eggs and chicks disappeared, presumably as a result of predation. Ten (28%) chicks were found in their burrows partially eaten by feral cats. In 1984, hatching success was 62,5%, but again some early egg failures were probably missed. No chicks survived to fledging in 1984, with predation by feral cats being implicated in most cases.

Growth parameters of the ten Greatwinged Petrel chicks which successfully fledged in 1982 are given in Figs. 1-3. Peak mass was c. 640 g at 90-100 d. Wing growth continued up to fledging, whereas growth of culmen and tarsus were completed well before fledging.

#### *Grey Petrel*

The masses and linear dimensions of 12 Grey Petrel eggs and 18 unsexed adults from Marion Island are given in Table 1.

In 1979, two eggs hatched on 11 and 18 May, whereas a third was still being incubated on 15 June, after which it disappeared. In 1982, two eggs hatched between 31 May and 9 June, and a third burrow contained a recently hatched, unattended chick on 31 May. In 1984, two eggs hatched on 10 and 20 May, six others hatching between 18 May and 3 June. On 15 May a nest was found with a chick already present.

In 1982, three chicks, out of six nests studied, departed between 28 August and 11 October. In 1984 no chicks fledged. Growth of measured parameters of the three Grey Petrel chicks which successfully fledged in 1982 are given in Figs. 4-6.

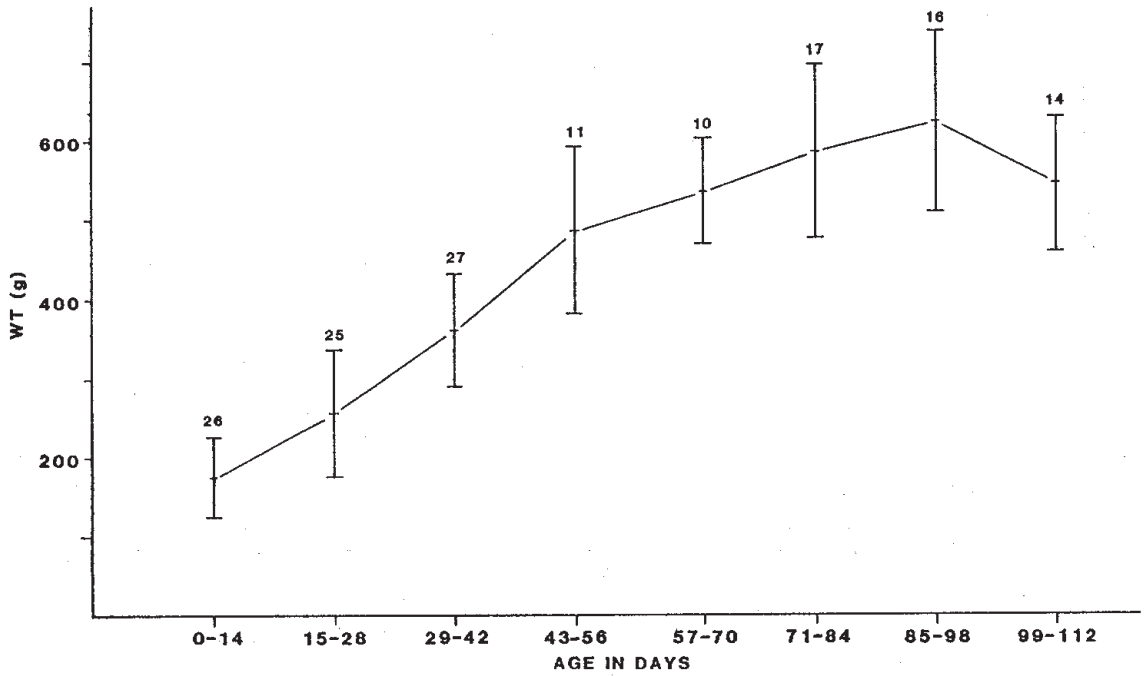


Figure 1

Increase in mass (mean  $\pm$  1 s.d.) of 10 Greatwinged Petrel chicks which successfully fledged. Numbers above bars indicates sample size (number of individual measurements)

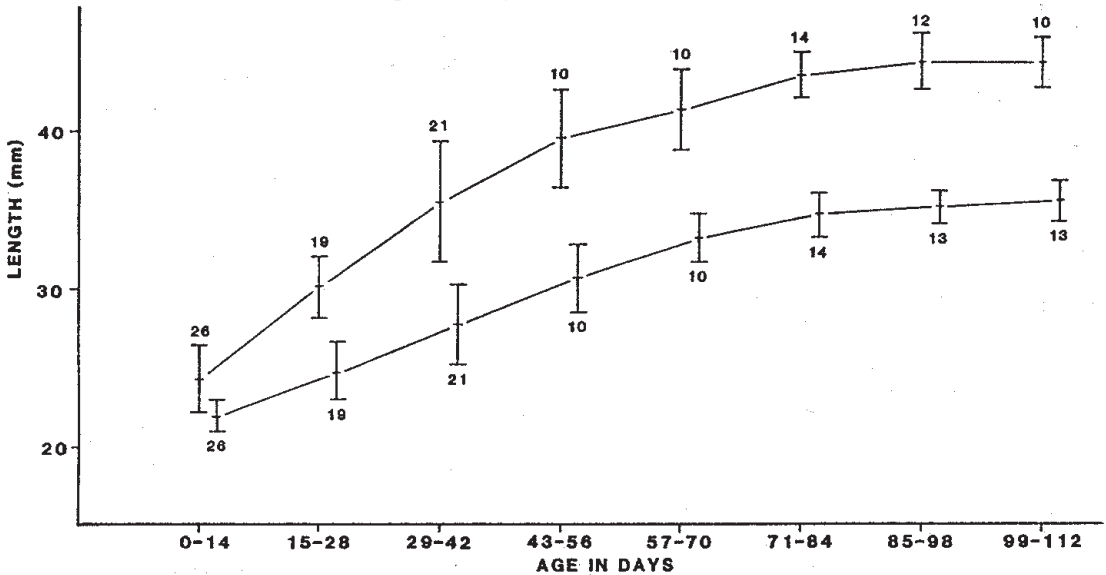


Figure 2

Increase in length (mean  $\pm$  1 s.d.) of tarsus (upper curve) and culmen (slightly offset to right) of 10 Greatwinged Petrel chicks which successfully fledged. Numbers above bars indicates sample size (number of individual measurements).

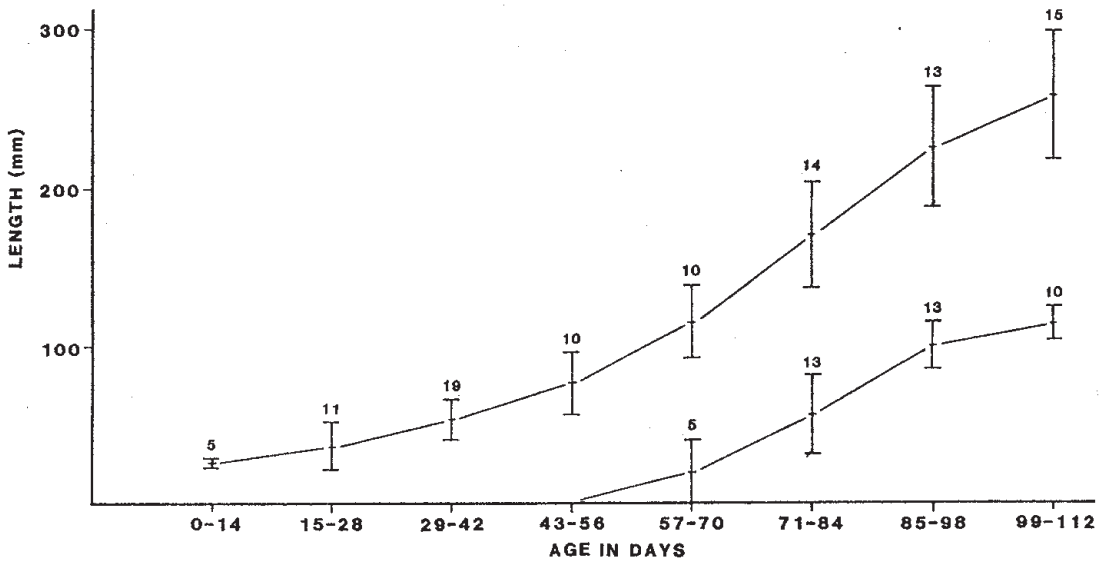


Figure 3

Increase in length (mean  $\pm$  1 s.d.) of wing (upper curve) and tail of 10 Greatwinged Petrel chicks which successfully fledged. Numbers above bars indicates sample size (number of individual measurements).

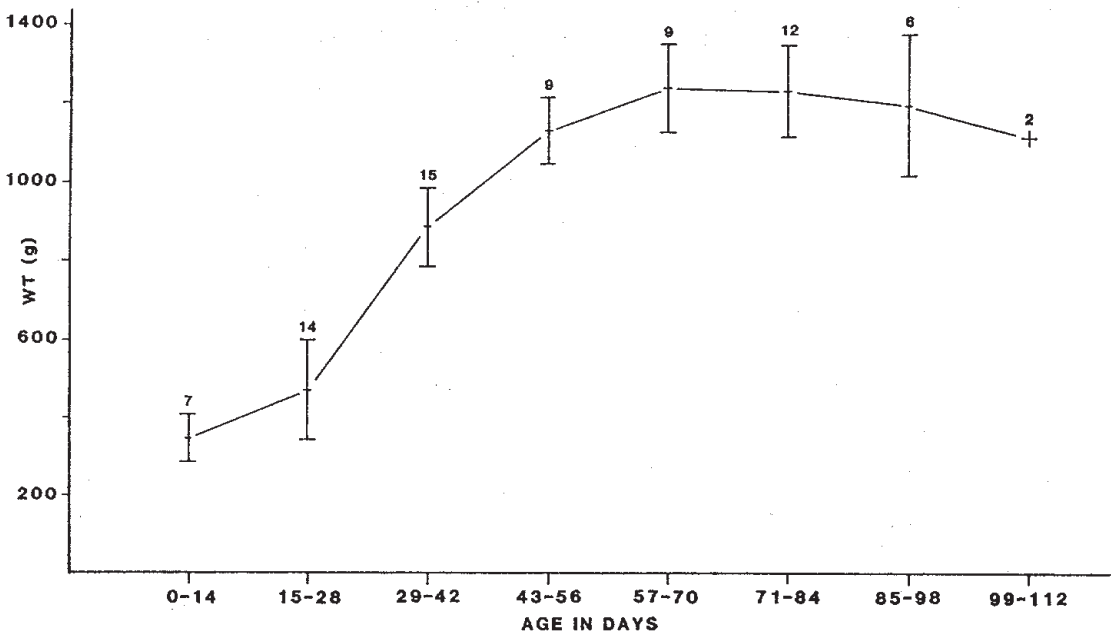


Figure 4

Increase in mass (mean  $\pm$  1 s.d.) of three Grey Petrel chicks which successfully fledged. Numbers above bars indicate sample size (number of individual measurements).

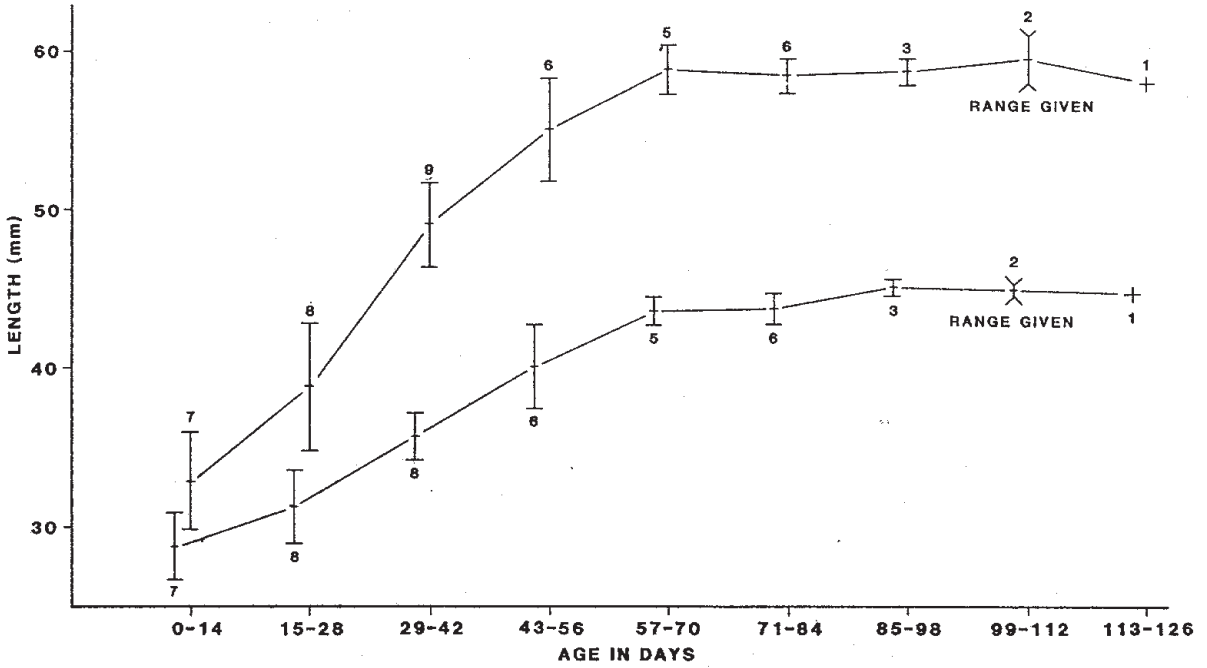


Figure 5

Increase in length (mean  $\pm$  1 s.d.) of tarsus (upper curve) and culmen (slightly offset to left) of three Grey Petrel chicks which successfully fledged. Numbers above bars indicate sample size (number of individual measurements).

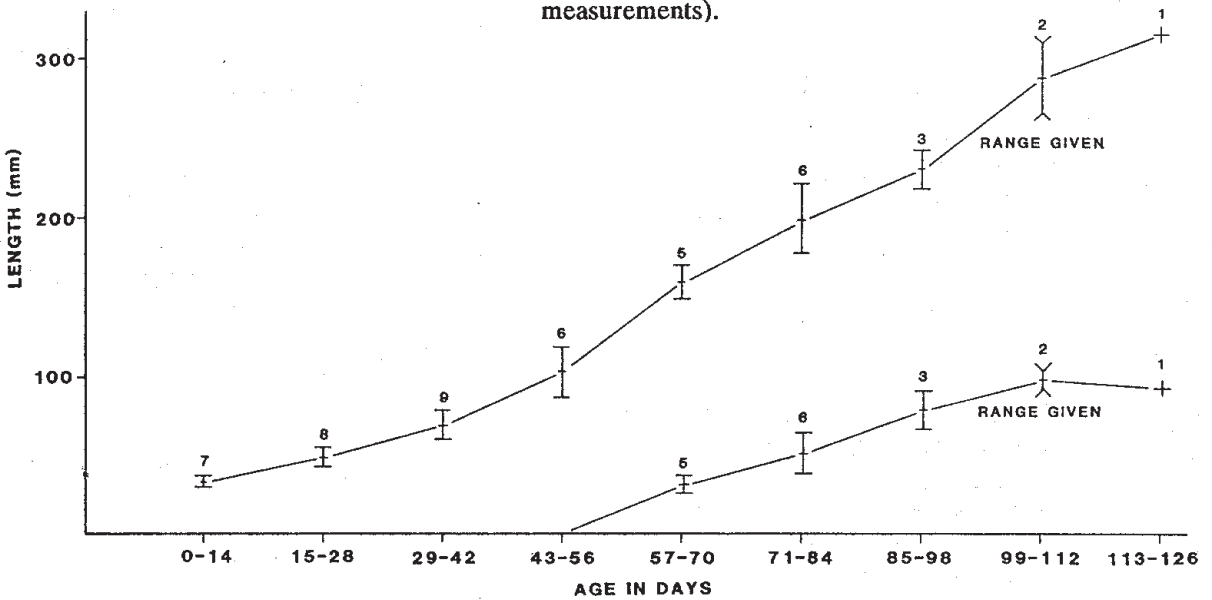


Figure 6

Increase in length (mean  $\pm$  1 s.d.) of wing (upper curve) and tail of three Grey Petrel chicks which successfully fledged. Numbers above bars indicate sample size (number of individual measurements).

## DISCUSSION

*Greatwinged Petrel*

Greatwinged Petrels at Marion Island, and at Prince Edward Island (Cooper & Brooke 1984), breed earlier than do those at Tristan da Cunha and Gough Island (Elliott 1957, Richardson 1984) and also earlier than conspecific Greyheaded Petrels *P.m. gouldi* on New Zealand islands (Falla 1934, Imber 1976). However, breeding in western Australia (Warham 1956) and at îles Kerguelen (Weimerskirch *et. al.* 1989) occurs at a similar time to Marion Island. Data presented here on growth rates at Marion Island complement that of Schramm (1983), who was not able to follow chicks through to nest departure, because of a 100% mortality level due to cats. Growth of chicks at Marion Island was variable, with some chicks taking a month longer to fledge than others. A large range in the chick-rearing period has been noted by Imber (1976) for the Greyheaded Petrel at Whale Island off New Zealand.

Chicks departed at 80-100% of adult mass, similar to the 80-103% reported by Imber (1976). Wing length was approximately 90% of adult size on departure, although the slowest growing chick fledged with a wing length only 75% of adult size (and with down still present, as also reported by Imber, 1976).

*Grey Petrel*

Egg and adult dimensions of Grey Petrels at Marion Island are similar to those given by Barrat (1974) for îles Crozet and Kerguelen. Crawford (1952) and Rand (1954) present measurements for three Grey Petrels (including two masses of females) from Marion Island, similar to those reported here.

Birds at Marion Island have a similar breeding schedule to those at îles Crozet and Kerguelen (Barrat 1974, Weimerskirch *et. al.* 1989). At Tristan da Cunha and Gough Islands freshly laid

eggs have been recorded from March to July, hatching eggs in June and July and nest departure in September and early October (Elliott 1957, Elliott 1970, Richardson 1984). Cooper & Brooke (1984) report an apparently freshly incubated egg of the Grey Petrel on Prince Edward Island on 22 March 1984.

*Conservation*

Greatwinged and Grey Petrels are the only winter-breeding petrels at the Prince Edward Islands. This makes them particularly vulnerable to predation by feral cats. Their relatively large burrows allow access so that both chicks and adults are killed (Brooke 1984, Williams 1984, van Rensburg & Bester 1988a). Breeding success of Greatwinged Petrels at Marion Island in 1979 (n=17) and 1980 (n=39) was nil in both years (Schramm 1983). In 1982 breeding success was 20.5% but was again nil in 1984 (this study). Schramm (1983) found that 33% (n=30) of fresh Greatwinged Petrel burrows at cat-free Prince Edward Island contained chicks in September 1979, compared to only 1% (n=109) at Marion Island.

Schramm observed five nests of the Grey Petrel at Marion Island in 1979-1980 but no chicks fledged (Brooke 1984). Three out of six studied nests resulted in chicks successfully fledging in 1982, but no chicks fledged from 12 observed nests in 1984, showing that the breeding successes of both species at Marion Island is very low.

Van Rensburg & Bester (1988a) also obtained very low (<2% at time of fledging) "breeding success" figures (expressed as a percentage of actively used burrows during an inspection period of the total number of monitored burrows) for Greatwinged Petrels in 1982-1983 at Marion Island, but obtained significantly higher figures (>50% at time of fledging) for birds breeding within a cat-free enclosure. Greatwinged Petrels in cat enclosures also had a higher "breeding success" than that obtained in 1982 by this study.

Van Rensburg & Bester (1988a) did not observe Grey Petrels in their study but the species only occurs at very low densities at Marion Island (Schramm 1986). Based on observations made in 1952, soon after the introduction of domestic cats (Van Aarde 1980), Rand (1954) considered it "not common", so it may always have been rare at Marion Island.

Van Aarde (1980) estimated that 47 987 Greatwinged Petrels were killed by cats (estimated cat population  $2\ 139 \pm 290$  individuals) at Marion Island in 1975. Subsequent to a control programme (Van Rensburg *et al.* 1987) it was estimated that, in 1982, the reduced cat population (estimated as  $615 \pm 107$  individuals) killed 12 951 birds (Van Rensburg 1985).

Van Aarde (1980) did not record Grey Petrels in the diets of feral cats in his 1975 study, presumably because of their relative rarity (Brooke 1984, Schramm 1986). Van Rensburg (1985) recorded Grey Petrel remains in only two stomachs (1.4%) of cats shot in 1982.

Whereas Greatwinged and Grey Petrels had a zero breeding success in 1979 and 1980 (Schramm 1983, Brooke 1984) they did manage to fledge some chicks in 1982, probably because studied nests were in an area kept cat-free by experimental hunting (P. J. J. van Rensburg pers. comm.). The release of a cat with a radio collar in this area was quickly followed by the loss of several chicks.

A secondary cat control measure (night shooting) commenced in the 1986/1987 summer season, initially to run for three consecutive summers (Van Rensburg & Bester 1988b). By the end of August 1989, 862 cats had been killed and the programme has been extended to a fourth summer. (M.N. Bester *in litt.*). It remains to be seen whether this programme has come in time to save the Greatwinged and Grey Petrels from extinction as breeding species at Marion Island. Cats have been held responsible for the extinction of the Grey Petrel at Macquarie Island (Jones 1977, 1980). If

local extinction does occur, then it is feasible in the long term that recolonization could take place from nearby cat-free Prince Edward Island, where the Greatwinged Petrel at least, occurs at greater breeding densities and has a higher breeding success (Schramm 1983, 1986). A prerequisite of such a recolonization is the eradication of cats from Marion Island.

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TABLE 1

## MEASUREMENTS OF GREY PETREL EGGS AND ADULTS AT MARION ISLAND

Parameter (mm)	Mean	Standard deviation	Range	N
Egg length	80,5	3,0	72,9 - 86,1	12
Egg breadth	55,6	2,0	52,0 - 60,2	12
Culmen	46,4	1,3	44,1 - 49,2	18
Tarsus	60,7	1,5	58,5 - 63,0	18
Wing length	335	6	328 - 347	18
Mass (g)	1070		898-1183	3