# DIET OF THE PINTADO PETREL *DAPTION CAPENSE* DURING THE LATE INCUBATION AND CHICK-REARING PERIODS AT LAURIE ISLAND, SOUTH ORKNEY ISLANDS, ANTARCTICA, JANUARY–FEBRUARY 1995

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## SUMMARY

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The diet of the Pintado or Cape Petrel *Daption capense* was investigated at Mossman Hills, Laurie Island, South Orkney Islands in January–February 1995. Twenty stomach contents were sampled by water flushing during the late incubation and chick-rearing periods. The analysis of the samples showed that euphausiids were the main prey. Antarctic Krill *Euphausia superba* constituted the bulk of the diet, forming 97.2% by mass; 95% by frequency of occurrence, consistent with results reported in other studies conducted at breeding sites.

## INTRODUCTION

The Pintado or Cape Petrel *Daption capense* has a very extensive breeding and feeding range, and nests rather sparingly on the mainland and offshore islands of Antarctica, thence north to the Iles Crozets at 46°S (Warham 1990). Despite its relative abundance and wide range, few studies on the feeding habits of the Pintado Petrel have been carried out. Previous diet studies have usually involved relatively few birds of unknown status, collected at sea (Falla 1937, Bierman & Voous 1950, Mougin 1975, Ainley *et al*. 1984) and at breeding sites (Beck 1969, Green 1986, Ridoux & Offredo 1989, Arnould & Whitehead 1991, Creet *et al*. 1994, Ridoux 1994). The wide distribution and abundance of this fulmarine petrel suggests that they play a potentially important role as top consumers in pelagic marine systems. Because of their importance in Antarctic food webs, dietary studies of Pintado Petrels were started as part of a long-term project on this bird by Argentina in the Atlantic Antarctic Zone. Here we provide information on the diet of the species during the late incubation and chick-rearing periods at Mossman Hills, Laurie Island, and compare our results with those of previous studies.

## METHODS

A total of 29 Pintado Petrels was sampled from 2 January to 9 February 1995, from which 20 stomach contents were collected. Stomach contents weighing <1 g (usually with only a few krill eyes or fish flesh) were not included in calculations of food masses. All field work was carried out in a small colony of 58 breeding pairs of Pintado Petrels at Mossman Hills (60°45'S, 44°39'W), Laurie Island, South Orkney Islands, Antarctica (Fig. 1).

In this area, Pintado Petrels arrive ashore to breed in early September, eggs are laid in late November, chicks hatch in early January (in 1995 the first Pintado Petrel egg hatched on 10 January), and fledged in late February (N. R. Coria pers. obs.). Diet samples were only collected from adult petrels when they returned to the colony from foraging areas. The water-flushing technique (Wilson 1984) was used. Warm fresh water was pumped into each bird using a flexible polyethylene tube inserted into the stomach. When the stomach was considered full of water, the petrel was inverted over a bucket and the abdomen massaged to let the water and food remains be evacuated. After excess water was decanted, the stomach contents were preserved in 70% ethanol until analysis.

In the laboratory, diet samples were washed through sieves of 0.5-mm mesh, blotted dry and weighed to the nearest ±1 g. The material was sorted into fish, krill, amphipods, squid, or unidentified components using a binocular microscope. Prey species were rarely complete, requiring to count krill eyes and uropods in order to enumerate the prey. Since there were rather few whole euphausiid bodies, telson and uropod lengths were used to estimate body size. Sizes of consumed Antarctic Krill *Euphausia superba* were calculated using the regression formulas BL=11.86458+5.595021EL where BL=body length and EL=length of uropod exopodite and BL=10.05732+4.251469TL, where TL=length of telson (E. Marschoff pers. comm.).

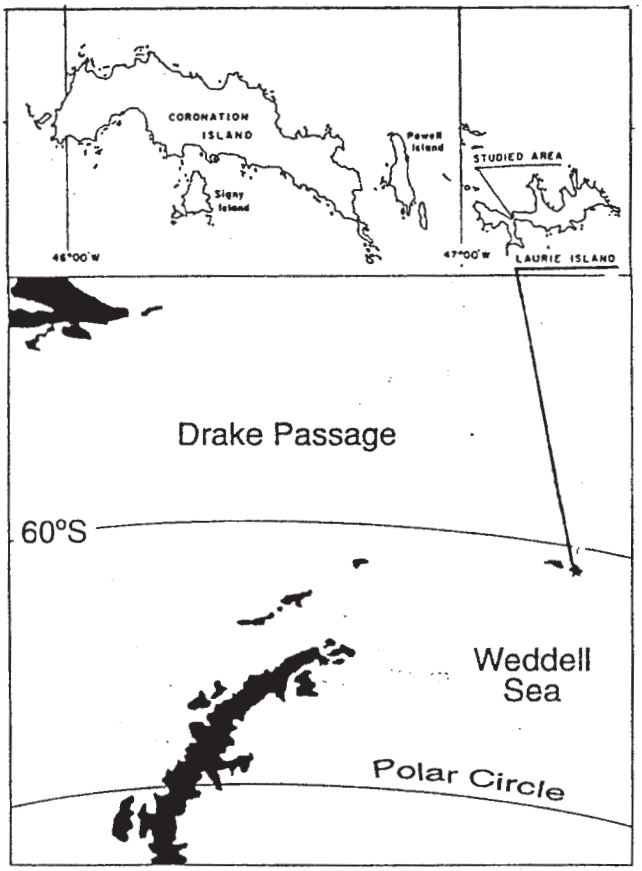


***Fig.1.*** *Mossman Hills study site, Laurie Island, South Orkney Islands, Antarctica.*

Diets are described as percentage ocurrence, percentage number and percentage mass. These data were calculated from pooled stomach samples.

## RESULTS

The complete stomach contents weighed on average 11.1 g (S.D.= ±11.4; range 1–43 g) and contained a mean of 17 prey individuals (S.D.= ±17.8; range 1–70). Antarctic Krill represented the bulk of the diet and occurred throughout the sampling period. Euphausiids represented the predominant prey in terms of frequency of occurrence, mass and number. Antarctic Krill was the only euphausiid species identified in all samples (Table 1). The mean body length of Antarctic Krill was 48.3 mm (S.D.= ±4.1; range 36.0–52.7 mm; n=26). Other crustaceans found in the stomach contents were 11 individuals of the amphipod *Themisto gaudichaudii*.

Fish remains were found in 20% of the samples but were not further identified. Rare items included one squid eye and one ascidean, which were found in different samples. Prey composition by frequency, number and mass is summarized in Table 1.

## DISCUSSION

The water-flushing technique has been shown to be very effective in studies of seabird diets (Wilson 1984, Ryan & Jackson 1986, Gales 1987, Montalti & Coria 1993). In agreement with Arnould & Whitehead (1991), Pintado Petrels appeared under stress when sampled . Because single flushing is 100% efficient with regard to mass of food retrieved in Pintado Petrels (Ryan & Jackson 1986) our birds were flushed only once. Arnould & Whitehead (1991) sampled adult Pintado Petrels with stomachs that appeared full when handled, and assumed that they were returning from feeding. We did not follow such a protocol, which may explain that nine stomach contents weighed less than 1 g.

Antarctic Krill was by far the most important food species in the diet of Pintado Petrel at Laurie Island (Table 1) and the estimated mean body length of this species was similar to that of Arnould & Whitehead's samples (1991). The mean wet mass of food was similar to those collected in previous studies (Table 2).

Cephalopods were represented in in our samples by one very large squid eye (diameter 10 mm), which would belong to a *c*. 40-cm minimum length squid (Arnould & Whitehead 1991). Several authors have suggested that moribund squid may be an important food source for seabirds (Imber & Berruti 1981, Lipinski & Jackson 1989). Squid beaks and offal arising from whaling activities were reported by Falla (1937) in the diet of the Pintado Petrel. Low percentages of fish components in the diet of the Pintado Petrel at Laurie Island were similar to Beck's (1969) at Signy Island, as recalculated by Croxall & Prince 1980).

Several other quantitative studies have been previously undertaken at various breeding localities (Bierman & Voous 1950, Beck 1969 recalculated by Croxall & Prince 1980, Ainley *et al.* 1984, Green 1986, Ridoux & Offredo 1989, Arnould & Whitehead 1991, Creet *et al.* 1994, Ridoux 1994, Table 2). All studies based on samples collected from Pintado Petrels captured at sea have indicated cephalopods as dominant prey items (Falla 1937, Bierman & Voous 1950, Ainley *et al*. 1984).

**TABLE 1**

**FREQUENCY OF OCCURRENCE, COMPOSITION BY NUMBERS AND COMPOSITION BY MASS OF PRINCIPAL PREY SPECIES IN THE PINTADO PETREL STOMACH CONTENT SAMPLES POOLED OVER THE STUDY PERIOD**

| Items | Frequency of occurrence % | Composition by numbers % | Composition by mass % |
|---|---|---|---|
| *Euphausia superba* | 95 | 94.8 | 97.2 |
| *Themisto gaudichaudii* | 5 | 3.4 | <0.5 |
| Fish | 20 | 1.2 | 1.8 |
| Others | 10 | 0.6 | 0.9 |

**TABLE 2**

**DIETS AND MEAN WET MASSES OF PINTADO PETRELS OVER THE STUDY PERIOD. COMPARISONS WITH PREVIOUS STUDIES ARE PROVIDED**

| Locality Ref. | Diet (% by mass) | | | | | Wet Mass (g) (SD) | |
|---|---|---|---|---|---|---|---|
| | Euphausiids | Amphipods | Fish | Squid | Others | | |
| Laurie Island | 97.2 | + | 1.8 | | 0.9 | 11.1 (11.4) | (1) |
| Weddell Sea | 1 | | 1 | 98 | | | (2) |
| Signy Island | 64 | | 15 | | 21 | | (3) |
| Ross Sea | 3 | | | 97 | | 5 | (4) |
| Princess Elizabeth Land | 76 | | 23 | | 1 | | (5) |
| Adélie Land | 64 | + | 29 | | + | 10.7 (8.7) | (6) |
| Prydz Bay | 85.5*a* | | 13.8 | 0.5 | 0.2 | 8.3 (3.5) | (7) |
| Isles Crozet | 34 | 17*b* | 2 | 2 | 45 | 10 | (8) |
| King George Island | 11 | 28 | 60 | + | | 22.3 (17.6) | (9) |

(1) This study, (2) Bierman & Voous (1950) recalculated by Ainley *et al.* (1984), (3) Beck (1969) recalculated by Croxall & Prince (1980), (4) Ainley *et al.* (1984), (5) Green (1986), (6) Ridoux & Offredo (1989), (7) Arnould & Whitehead (1991), (8) Ridoux (1994), (9) Creet *et al.* (1994). *a* Crustaceans. *b* Amphipods and other crustaceans (mostly copepods).

In contrast, all studies carried out at breeding sites have shown low amounts of squid and high amounts of euphausiids as measured in terms of mass (Beck 1969, Green 1986, Ridoux & Offredo 1989, Arnould & Whitehead 1991, Ridoux 1994); our results reflect broad similarity with these studies.

Conversely, other studies (van Franeker & Williams 1992, Creet *et al.* 1994) showed a predominance of fish in the diet of Pintado Petrels. Reasons for these differences in breeding diet of this fulmarine petrel are not quit clear. Discrepancies between different studies suggest that an appropiate long-term diet monitoring programme could provide very useful data on changes in food requirements of Pintado Petrel in the Southern Ocean.

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