

# Aspects of the ecology of Antipodes Island Parakeet (*Cyanoramphus unicolor*) and Reischek's Parakeet (*C. novaezelandiae hochstetteri*) on Antipodes Island, October - November 1995

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## ABSTRACT

Aspects of the ecology of the Antipodes Island Parakeet (*Cyanoramphus unicolor*) and Reischek's Parakeet (*C. novaezelandiae hochstetteri*) were examined at the Antipodes Islands during October and November 1995. Significant differences in diet were detected between the species. Leaves of large tussocks formed the majority of the diet for Antipodes Island Parakeets, whereas tussock flowers comprised much of the diet of Reischek's Parakeet. Significant differences in the diet of these species between this and previous studies were thought to reflect temporal variations in food availability rather than any fundamental shift in dietary preferences. Observations were made of both parakeet species scavenging on bird corpses. Antipodes Island Parakeets were also recorded killing and eating Grey-backed Storm Petrels (*Oceanites nereis*). One Antipodes Island Parakeet nest was located; clutch size, physical characteristics of the nest and of behaviour during incubation are described.

**KEYWORDS:** Antipodes Island Parakeet, *Cyanoramphus unicolor*, Reischek's Parakeet, *Cyanoramphus novaezelandiae hochstetteri*, Antipodes Islands, diet, predation

## INTRODUCTION

Two parakeet species of the genus *Cyanoramphus* (subfamily: Psittacinae) occur sympatrically on the subantarctic Antipodes Islands. The parakeets form a distinct and significant part of an avifauna otherwise dominated by seabirds. The Antipodes Island Parakeet (*Cyanoramphus unicolor*) is the largest species of its genus and is endemic to the island group. Reischek's Parakeet (*C. novaezelandiae hochstetteri*) is also endemic to the Antipodes Islands, and is one of four other subspecies of the nominate Red-crowned Parakeet (*C. n. novaezelandiae*) found on other island groups in the New Zealand region.

The isolation of the Antipodes Islands and the expense of getting there have meant that there have been few systematic observations of the ecology of the two parakeet species (Taylor 1985). Visits to the Antipodes Islands in February 1969 and again November 1978 noted significant differences in the behaviour and ecology of the two species (Taylor 1975, 1985). Antipodes Island Parakeets preferred the leaves of tussocks and sedges with some berries and seeds, whereas Reischek's Parakeets favoured seeds with some flowers, berries and invertebrates (Taylor 1975,

1985). Ecological separation appeared to be further maintained by differences in breeding season, nesting sites and behaviours (Taylor 1975, 1985).

An expedition to the Antipodes Islands between 30 October and 26 November 1995 to search for Chatham Island Taiko (*Pterodroma magentae*), and to study Wandering Albatross (*Diomedea exulans*), Rockhopper Penguin (*Eudyptes chrysocome*) and Erect-crested Penguin (*E. sclateri*) provided an opportunity to examine further the ecology of both parakeets. Observations of diet, behaviour and breeding biology were recorded.

### STUDY AREA

The Antipodes Islands (49° 42' S, 178° 48' E) lie 722 km south-east of Bluff, New Zealand and are the most isolated of New Zealand's subantarctic island groups (Fig. 1). The group consists of Antipodes Island which has an area of 2,100 ha and rises to an altitude of 366 m (Mt. Galloway), two smaller islands (Bollons and Leeward), and a number of offshore stacks and islets. All islands are of volcanic origin and are surrounded by steep cliffs. Antipodes Islands lie within the west wind zone and the climate is cool, windy and wet, with prolonged periods of thick mist (Warham & Johns, 1975). The vegetation comprises rolling tussock-grassland dominated by *Poa litorosa*, with scattered areas of fernland (*Polystichum vestitum*), shrubland (*Coprosma rugosa*) and swamp/bog communities (Warham & Johns 1975, Godley 1989). Near the coast and at lower altitudes the vegetation is often tall and dense, making access difficult. At higher elevations and on the plateaus the vegetation is shorter, although numerous gullies and watercourses are often choked by dense ferns and shrubs.

### METHODS AND MATERIALS

Foraging observations for both species of parakeet were collected in a systematic and standardised format similar to that used by Taylor (1975, 1985). Following identification of each parakeet, the first feeding observation was recorded using one of seven discrete food types (leaves, flowers, berries, seeds, other vegetation, invertebrates, bird corpses (see Taylor 1975, Magrath & Lill 1983)). Observations were made throughout the island and in all habitat types, though more observations were made at the northern end of the island near the Reef Point base camp (Fig. 1). Breeding status was recorded for both parakeet species.

### RESULTS

#### Diet

Feeding observations of Antipodes Island Parakeets (n=107) during October-November 1995 showed that the leaves of large tussocks, particularly *Poa litorosa* and *Poa foliosa*, and sedges (*Carex appressa* and *Carex ternaria*) formed the majority of the diet (87.8%), with small quantities of flowers (2.8%), berries (0.9%), other vegetation (2.8%) and bird corpses (7.4%) also eaten (Table 1, Table 2).

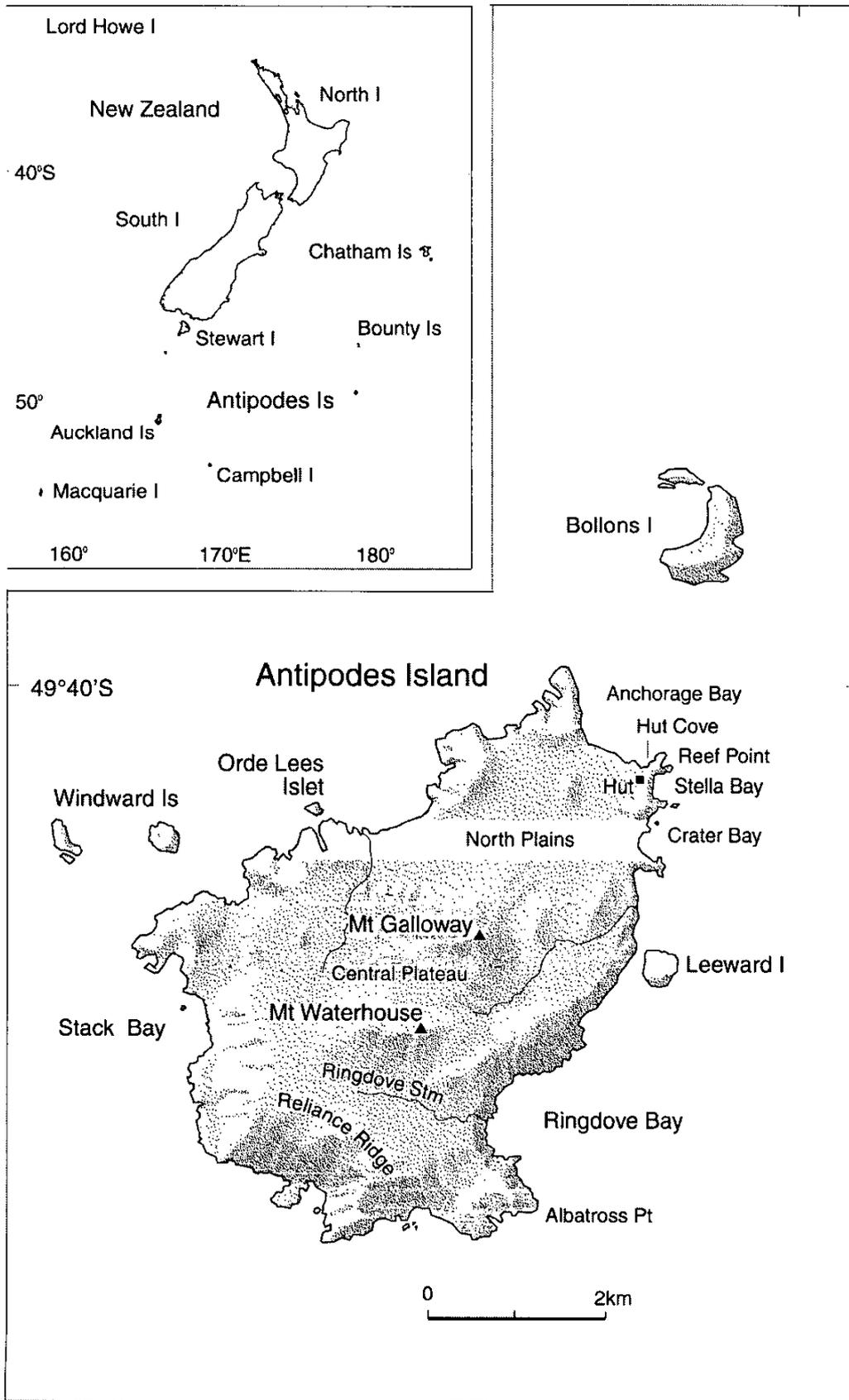


FIGURE 1 – Map of the Antipodes Islands showing locations mentioned in the text.

TABLE 1 - Percentage of food types consumed by parakeets on Antipodes Island

Food Type	Reischek's Parakeet		Antipodes Is Parakeet	
	This Study (n=205)	Taylor (1985)	This Study (n=107)	Taylor (1985)
Leaves	31.2%	0%	87.8%	70%
Flowers	50.7%	20%	2.8%	(#)
Berries	14.6%	9%	0.9%	(#)
Seeds	0.5%	55%	0	13%
Other Vegetation	1.4%	8%	2.8%	(#)
Invertebrates	0.5%	5%	0	0%
Corpses	0.9%	0%	7.4%	6%

# These food categories were pooled by Taylor (1985) giving a total of 10%.

In comparison, the diet of Reischek's Parakeet (n=205) was slightly more diverse (14 plant species seen eaten compared with 11 for *C. unicolor*), with a large proportion of the diet (46.7%) being the flowers of two tussocks (*P. litorosa* and *P. foliosa*) and one sedge (*C. appressa*) (Table 1, Table 2). A significant amount of leaf material was also consumed (31.2%), the most important component being the leaves of *P. litorosa* (18.6%) followed by small quantities of *Anisotome antipoda* (4.8%) and *Coprosma rugosa* (2.9%). The difference in diet (using food types) between the two parakeet species was highly significant ( $\chi^2=129.0$ ,  $P>0.001$ ).

Piles of chewed leaves were very obvious and frequently encountered on or around plants wherever parakeets were found. In some areas the effect of foraging by Antipodes Island Parakeets was particularly noticeable. Near the head of the Ringdove Stream (Fig. 1) the leaf tips of *Carex ternaria* had been cleanly trimmed to the same height over an area of several hectares. Distinctive feeding sign was also found on the fronds of *Blechnum durum* and was remarkably similar to that produced by Kakapo (*Strigops habroptilus*) on Little Barrier Island on similar species of fern (pers. obs.).

Only one observation of foraging on invertebrates was recorded. A Reischek's Parakeet was observed foraging on a beach on what appeared to be the larvae of a dipteran "kelp fly" amongst rotting kelp (J. Marris, pers. comm.).

Both parakeet species were observed feeding on the corpses of White-headed Petrels (*Pterodroma lessonii*) and Wandering Albatrosses. Observations of this nature were far more common for Antipodes Island Parakeets (7.4%) than Reischek's Parakeets (0.9%). Antipodes Island Parakeets in particular were observed chewing on the remains of White-headed Petrels killed by Brown Skuas (*Catharacta skua lonnbergi*) as well as dead Rockhopper Penguins (Tables 1 & 2).

### Predation

Of greater interest were observations of Antipodes Island Parakeets preying on Grey-backed Storm Petrels (*Oceanites nereis*). Although direct observations of

TABLE 2 - Food species consumed by Reischek's Parakeet and Antipodes Parakeet, October-November 1995 (Frequencies with percentage contribution of items in ( )).

Food Species	Reischek's Parakeet	Antipodes Parakeet
<i>Poa litorosa</i> - leaves	39 (18.6)	54 (50.4)
- flowers	28 (13.6)	-
<i>Poa foliosa</i> - leaves	2 (0.9)	2 (1.8)
- flowers	11 (5.3)	2 (1.8)
<i>Carex appressa</i> - leaves	1 (0.5)	22 (20.5)
- flowers	57 (27.8)	1 (0.9)
- seeds	1 (0.5)	-
<i>Carex ternaria</i> - leaves	-	9 (8.4)
- flowers	-	-
<i>Carex trifida</i> - flowers	2 (0.9)	-
<i>Coprosma rugosa</i> - leaf buds	6 (2.9)	1 (0.9)
- berries	17 (6.8)	1 (0.9)
<i>Coprosma pumila</i> - berries	1 (0.5)	-
<i>Coprosma ciliata</i> - berries	12 (5.8)	-
<i>Blechnum durum</i> - leaves	-	1 (0.9)
<i>Leptinella plumosa</i> - flowers	1 (0.5)	-
<i>Acaena minor</i> - leaves	3 (1.4)	1 (0.9)
<i>Stilbocarpa polaris</i> - stems	-	1 (0.9)
<i>Histiopteris incisa</i> - shoots	1 (0.5)	-
<i>Polystichum vestitum</i> - koru	-	1 (0.9)
- leaves	-	1 (0.9)
Lichen spp.	1 (0.5)	-
Liverwort thalli	1 (0.5)	1 (0.9)
<i>Antisotome antipoda</i> - leaves	10 (4.8)	2 (1.8)
- flowers	2 (0.9)	-
<i>Colobanthus apetalus</i> - leaves	3 (1.4)	-
- flowers	3 (1.4)	-
Kelp Fly (?) - larvae	1 (0.5)	-
Whiteheaded Petrel - corpses	1 (0.5)	4 (3.7)
Grey-backed St. Pet. - corpses	-	2 (1.8)
Rockhopper Penguin - corpses	-	2 (1.8)
Misc. Petrel Corpses	1 (0.5)	-

this behaviour were few ( $n=2$ ), close inspection of the resultant corpses and indirect observations from widely separate locations (Mt. Galloway to the northern edge of the North Plains, see Fig. 2) strongly suggested that several Antipodes Island Parakeets were actively hunting, killing and feeding on this storm petrel.

In one instance an Antipodes Island Parakeet was found in the open eating a Grey-backed Storm Petrel which was still bleeding and warm to the touch. On another occasion a parakeet was seen emerging from a burrow which, when investigated, contained the freshly killed (warm and bleeding) remains of a Grey-backed Storm Petrel and the crushed egg it had been incubating. Five other corpses of adult grey-backed storm petrels were found with almost identical injuries. These included trachea punctured or ripped out, ventral and dorsal surfaces skinned, underlying large muscle groups (dorsal and pectoral) chewed, and parts of the viscera eaten. Three of these birds were subsequently sexed by dissection and

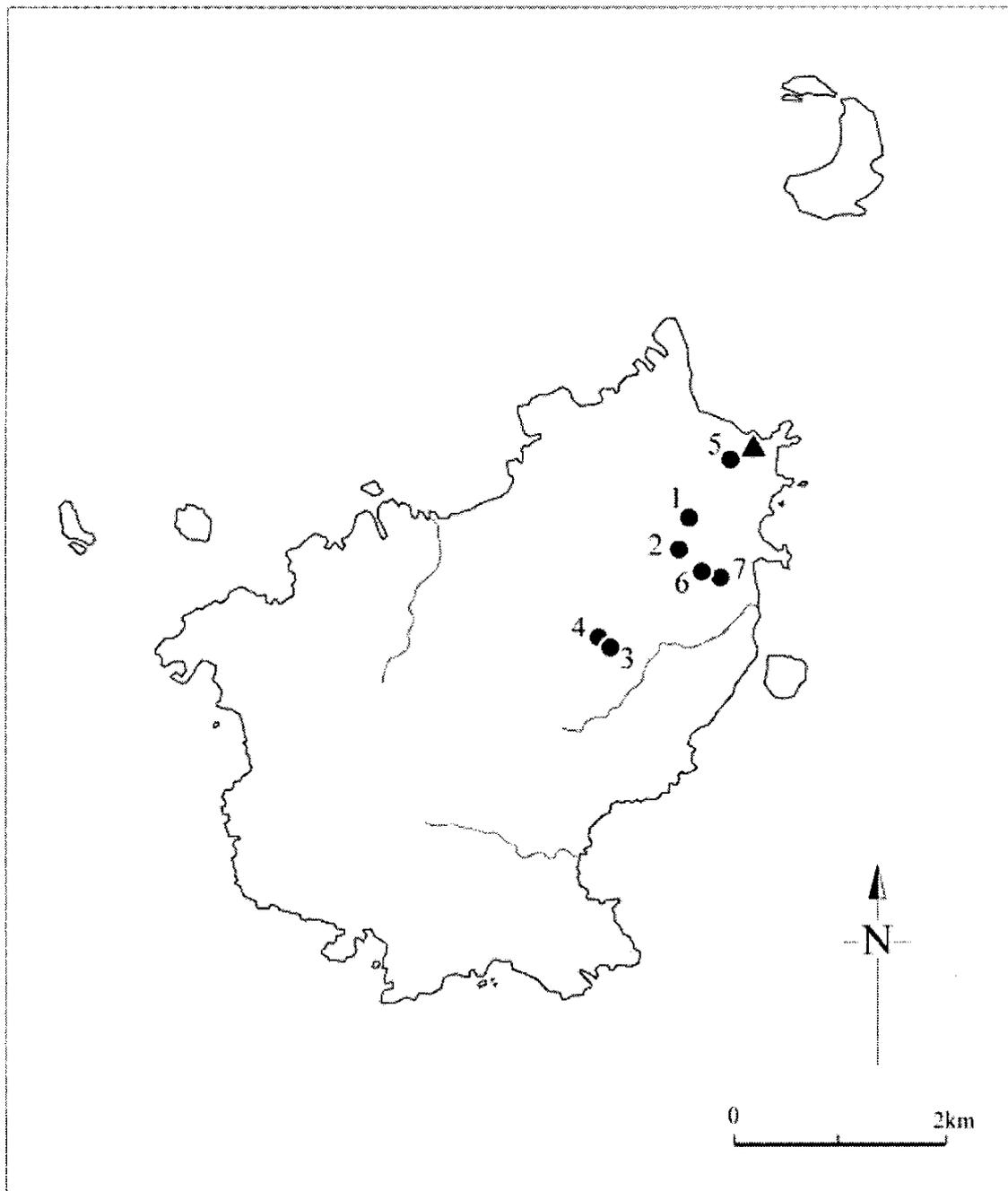


FIGURE 2 – Locations of Grey-backed Storm Petrel corpses (●) and Antipodes Island Parakeet nest (▲), Antipodes Islands, October - November 1995.

included two males and one female. Two much older corpses were also found with injuries similar to those described above.

Antipodes Island Parakeets appeared to visit systematically a number of holes in an area. The holes were investigated and, if large enough, entered, and the incubating adult storm petrel killed. Evidence suggests that if the hole was too small to enter some effort may be made to dig out the entrance to gain access (M.J. Imber, pers. comm.).

TABLE 3 - Egg Dimensions

Egg	Length x Width (mm)	Mass (g)
1	27.2 x 23.6	7.8
2	27.2 x 22.3	7.5
3	27.2 x 23.5	7.6
4	27.2 x 23.2	8.0
5	26.9 x 23.6	7.5

### Breeding

The only evidence of breeding activity by Reischek's Parakeets was a female captured with a well-developed brood patch. One Antipodes Island Parakeet nest was found on 20 November 1995 by locating the source of the loud begging calls of the female. Females of the genus make a distinctive call when soliciting food from their mates (Taylor 1985). These calls were not heard on any other occasion during the visit. The nest was at the head of a gully (approx. 40m above sea level) near Reef Point (Fig. 2). Vegetation in the immediate vicinity consisted of *Coprosma rugosa* scrub interspersed with low dense *Polystichum vestitum* and surrounded by taller *Poa litorosa* and *Carex appressa*. The nest was located in the base of a clump of *P. vestitum* and the burrow to it descended at a shallow angle to a nest chamber 58 cm from the entrance. Approach to the nest entrance by the parakeets was through thick cover. The nest entrance faced north west and measured 15cm in height and 10cm in width. Nest material comprised of fern-scales and rootlets chewed or stripped from the walls of the nest chamber which was estimated to be approximately 25cm in diameter. Five eggs were present when the nest was found and observed again six days later on the day of our departure, suggesting that the complete clutch had been laid prior to discovery. This is the first observation of clutch size for Antipodes Island Parakeets in the wild. Egg measurements are presented in Table 3.

Observations at the nest were made over 12 hours on six days. Only the female incubated the eggs. The male arrived at the nest to feed the female at intervals of between 59 and 189 minutes (mean=86.6 minutes, n=10). He called his mate from the nest, after which the pair flew a short distance before the male regurgitated food to the begging female. The time spent away from the nest by the female was brief ranging between one and seven minutes (mean=3.7 minutes, n=10).

### Captured parakeets

Three Antipodes Island Parakeets and four Reischek's Parakeets were captured, measured and banded (Table 4). All of the Antipodes Island Parakeets and three of the Reischek's Parakeets handled exhibited significant feather wear. Tail feathers were particularly worn with many of the remiges either broken or missing; one of the Antipodes Island Parakeets had only one very worn tail feather. No moult on the wings and tails of any of the captured birds was observed.

TABLE 4 - Measurements of captured parakeets.

Species	Sex	Body Mass (g)	Bill length (mm)	Bill width (mm)	Wing length (mm)	Tail length (mm)	Tarsus (mm)
Reischek's	Female	88.8	16.9	11.2	139	124	-
Reischek's	Female	94.5	15.7	10.8	128	138	-
Reischek's	Male	125.0	19.2	10.5	146	143	23.5
Reischek's	Female	102.0	14.9	10.1	135	126	24.1
Antipodes	Female	126.0	20.0	13.7	144	142	25.8
Antipodes	Female	126.0	20.0	13.8	147	123	25.8
Antipodes	Male	166.0	24.2	16.0	154	105	27.7

### DISCUSSION

The status and distribution of both parakeet species appears to have changed little since previous visits (Taylor 1975, 1985, Miskelly *et al.* 1990). During October and November 1995, Reischek's Parakeets were more abundant than Antipodes Island Parakeets in most habitats, particularly near the coast where few of the latter species were seen. A notable exception to this occurred on the large plateaus in the centre of the island where similar numbers of both species were observed.

Significant differences in diet of the two parakeets were evident, with 88% of the Antipodes Island Parakeet diet consisting of the leaves of three species of tussocks and sedges, and 51% of the more diverse diet of Reischek's Parakeet comprising of tussock flowers. Although Taylor (1975, 1985) also recorded significant differences in diet between the two species, the composition of the diet differed substantially for the two studies (Table 1.). These changes are most noticeable for Reischek's Parakeet, where leaves and flowers had almost completely replaced seeds as the most important foods. Similarly, the only significant change to the diet of Antipodes Island Parakeets was the complete absence of seeds. These variations in diet are probably the result of seasonal and annual changes in the availability of seeds and flowers rather than any fundamental shift in dietary preferences. This behaviour pattern of opportunistic sequential foraging as a result of food availability is a common feature in the diets of other *Cyanoramphus* species (Elliott *et al.* 1996, Greene 1998).

Although scavenging by Antipodes Island Parakeets on the eggs and corpses of penguins (Warham & Bell 1979) and the corpses of petrels and albatrosses has been recorded previously (Taylor 1975, 1985), observations of these parakeets hunting, killing and eating Grey-backed Storm Petrels are novel. Although the number of observations are few, the hunting of storm petrels by parakeets appears to be a relatively widespread and frequent behaviour during November (the behaviour was not seen during subsequent visits in January and February, G. Elliott, pers. comm.). It is likely that other storm petrel corpses killed by parakeets were incorrectly attributed by previous expeditions to skuas (M.J. Imber, pers. comm.). Skuas tend to swallow storm petrels whole and regurgitate feathers and bones as large pellets.

Parakeets, however, ate various muscles and organs before discarding the corpse. It is also possible that parakeet kills were obscured by skuas scavenging these corpses. Other storm petrel corpses were probably not seen, having been killed and consumed within burrows.

The appearance of corpses of the Grey-backed Storm Petrels in the middle of November corresponded to their peak egg laying period (O'Brien 1990) when large numbers of adults were incubating eggs. The timing of the predation by parakeets may have implications for the hunter as well as the hunted. Most of the other *Cyanoramphus* parakeets significantly increase the amount of protein they consume (usually invertebrates) prior to breeding (Greene 1998). It is therefore conceivable that storm petrels provide an important and seasonally reliable source of protein for Antipodes Island Parakeets immediately prior to breeding. Other potential prey include the Black-bellied Storm Petrel (*Fregetta tropica*) though it is significantly larger (54g) than the Grey-backed Storm Petrel (32g). Similarly Mice (*Mus musculus*), particularly young in nests, could also be eaten seasonally by Antipodes Island Parakeets.

The New Zealand Kea (*Nestor notabilis*) is the only other parrot known to hunt vertebrate prey (Forshaw 1989). Kea are known to hunt and eat the chicks of Hutton's Shearwaters (*Puffinus buttoni*), another colonial, burrow-nesting seabird. The discovery of such a similar behaviour in another, but significantly smaller, parrot is remarkable and warrants further investigation.

The only evidence of breeding by Reischek's Parakeet was a female captured on 21 November 1995 which had a fully developed brood patch. Nesting was confirmed during a visit in January-February 1996 when large numbers of nests and juveniles of this species were observed (G. Elliott, pers. comm.).

Despite considerable searching, only one nest of the Antipodes Island Parakeet was found towards the end of November, which contained a clutch of five eggs. In captivity, clutch size ranges from four to seven (J. Lobb, pers. comm.). The subsequent visit in January and February 1996 failed to locate further nests of this species and no juveniles were seen (G. Elliott, pers. comm.). Previous observations suggest that Antipodes Island Parakeets breed between October and February (Taylor 1985). This suggests that most of the population of Antipodes Island Parakeets failed to breed during the 1995/96 season. One explanation for this may have been the almost complete absence of a significant seed source on Antipodes Island during October-November 1995. Previous visits which noted Antipodes Island Parakeets breeding also recorded seed as a significant component of the species' diet (Taylor 1975, 1985).

Given the geographic isolation of the Antipodes Islands and the predominance of visits during spring and summer months, our understanding of the ecology and behaviour of Antipodes Island Parakeets and Reischek's Parakeets remains poor. This is highlighted by the discovery that Antipodes Island Parakeets prey on at least one species of storm petrel. Further assessment of the prevalence and significance of this unusual parakeet behaviour is clearly required, particularly the identity of

prey species. The potential impact of any attempt to eradicate mice from Antipodes Island on the endemic parakeet populations (i.e., the exposure to toxic baits) should also be carefully assessed.

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