

## SHORT COMMUNICATION

### Diet of feral cats on subantarctic Auckland Island

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**Abstract:** Feral cats were trapped and cat scats collected at Port Ross, Auckland Island, during two weeks in winter 2007. Eleven cats were caught and 40 scats collected, including from upland tussock areas. Cats' diet predominantly consisted of birds (77.5% occurrence in scats) and mice (52.5% occurrence). The cats were relatively heavy and in good condition compared with other feral cats in New Zealand populations.

**Keywords:** Mice, birds, scats, gut contents

#### Introduction

Feral cats (*Felis catus*) have been introduced to many Southern Ocean islands where they have extirpated the burrowing seabirds that rely on the islands to breed (Nogales et al. 2004). Due to this impact cats are now the focus of attempts at eradication (Nogales et al. 2004). The largest successful operation to date has been on Marion Island (290 km<sup>2</sup>) in the southern Indian Ocean (Bester et al. 2002).

On subantarctic Auckland Island, cats were among the first mammals to be introduced, becoming established about 1820 (Taylor 1968). Mice (*Mus musculus*) were introduced between 1806 and 1840, probably about the time of the peak in sealing activity around 1822–1823 (Taylor 1971). Pigs (*Sus scrofa*) were introduced repeatedly after 1807 (Taylor 1968, 1971).

As part of a proposed eradication of cats and pigs on Auckland Island, a small group of staff from the Department of Conservation spent five weeks at Port Ross on the northern end of the island in June and July 2007 undertaking research, including work on the cats and their diet. The information gathered on the cats is the topic of this short note.

#### Methods

The Auckland Islands archipelago (50°45' S, 166°00' E) is the largest New Zealand subantarctic group, of which Auckland Island is the largest (50 000 ha). The islands are uninhabited, but since their discovery in 1806 have had a history of sealing, whaling, shipwrecks, scientific expeditions and a short-lived attempt at settlement. As a result of human activities, several terrestrial mammal species were introduced (Chimera et al. 1995), of which pigs, cats and mice remain on Auckland Island. All other introduced mammals have been eradicated from the archipelago (Torr 2002; Parkes 2005).

Cats were captured with Victor No. 1½ soft-catch traps (Woodstream Corporation, Lititz, USA) placed against the base of trees. Initially traps were lured with fish frames and later portions of pig flesh soaked in fish oil when the supply of fish frames was exhausted. The trap line was established within rātā (*Metrosideros*) forest on the north-western shoreline of Port Ross during the first week and was run for 15 days. It eventually comprised 33 traps over approximately 4.5 km. Traps were checked every morning. Any trapped cats were killed and dissected for information on sex, age (adult/juvenile), weight, body condition, sexual history, pelage, and stomach contents. Abundance is reported as cat captures per 100 trap-nights.

Cat scats were collected on an opportunistic basis in all vegetation types throughout the field trip. Scats were stored in separate 'Ziplok'

plastic bags and transported back to the mainland, where they were stored in a freezer. The scats were teased apart and any remains, mainly bones, feathers, exoskeletons or plant material, were identified and recorded. The prey composition from each scat was expressed as the frequency of scats containing a prey item. This measurement was used because it allows comparisons with other published cat diet studies from Southern Ocean islands (e.g. Jones 1977; Dilks 1979; Bloomer & Bester 1990; Harper 2005).

#### Results

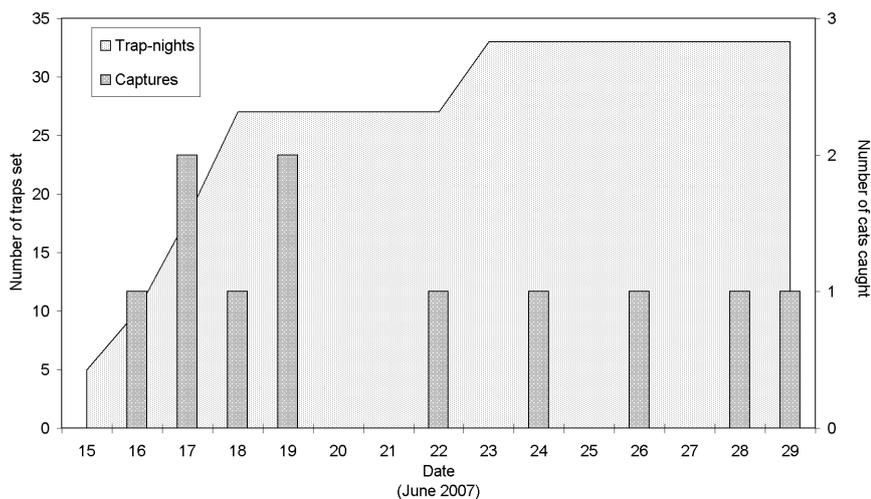
Eleven cats (adults: 4 M, 3 F; juveniles: 1 M; 3 F) were trapped over 399 uncorrected trap-nights (Fig. 1). With the correction for sprung traps (Nelson & Clark 1973) (mainly due to pigs eating the fish frames) this gave an abundance of 2.9 cats per 100 corrected trap-nights. The mean weight for adult (> 2 kg) male cats was 3.43 kg ( $n = 4$ ) and for females was 2.57 kg ( $n = 3$ ). Two males weighed over 4 kg (5.2 kg and 4.35 kg). The mean weight for the four juveniles was 1.8 kg. Of the 11 cats caught and one seen, 10 were black and two were blotched tabbies. The cats had relatively short tails; the mean tail length for adult male cats was 240 mm (range 190–280,  $n = 4$ ) and for adult female cats was 236 mm (range 220–250,  $n = 3$ ). These tail measurements are similar to those from cats caught on Herekopare Island, but shorter than cats caught on other New Zealand islands and mainland sites (Fitzgerald & Veitch 1985; Fitzgerald 1990). Eight (seven adults, one juvenile) of the 11 cats had substantial amounts of subcutaneous and mesenteric fat. Two of the three adult females had had kittens and showed two and seven uterine scars, respectively.

Five of the trapped cats had empty stomachs, and two had eaten bait. Five stomachs contained birds (blackbirds *Turdus merula* in two and a shag *Phalacrocorax colensoi* in one) and one also had mouse remains.

Forty scats were collected in all vegetation types. Of note were seven fresh scats collected in upland tussock, indicating cats were present above the shrubline during winter. Thirty-one (77.5%) of the scats had bird remains, including a single scat holding the remains of three bellbirds (*Anthornis melanura*). Details of the contents of the scats are shown in Table 1.

#### Discussion

The main prey of cats on Auckland Island in winter (this study) and summer (Taylor 1975) was birds and mice. The predominance of birds



**Figure 1.** Numbers of feral cats trapped in Port Ross, June 2007.

was expected as the alternative mammalian prey is solely mice. As small bird remains were found in 45% of the scats it appeared that cats were likely largely foraging for small ground-feeding passerines like redpolls (*Carduelis flammea*) (~12 g) and dunnocks (*Prunella modularis*) (~20 g), along with mice. As the mean size of mice in winter on Auckland Island is a little over 20 g (Harper in press), it is not surprising that mice and small birds comprise approximately equal frequency of prey for cats. In spite of this it is apparent these cats have to consume multiple prey items a day simply to satisfy their daily metabolic demands (Harper 2005). Indeed, if the average cat consumed 300 g of prey per day (Jones 1977), a cat on Auckland Island would need to catch 15 small passerines or mice daily. This conclusion suggests that cats on Auckland Island have to forage for substantially longer and further than most cats elsewhere to consume enough prey to subsist on.

Considering the constraints of their diet it was therefore surprising that feral cats on Auckland Island were in such good condition. Most of the cats had fat deposits and both males and females were relatively heavy compared with other feral cats in New Zealand (Gillies & Fitzgerald 2005), especially the two males over 4.3 kg. Although it appeared that mice had recently reached a seasonal peak in numbers (Harper in press) and cats may have built up fat reserves in autumn because of this plentiful food supply, this would not account for the large size of adults. A more readily available and less seasonally restricted food supply than assumed would be necessary for cats to attain such sizes. Cats were also readily trapped, which implied a higher density of cats than expected. One possible explanation for the cats' unexpected condition and density in June may be predation on breeding seabirds earlier in the year. Taylor (1975) recorded many prions (*Pachyptila* spp.) and a diving petrel (*Pelecanoides* spp.) in

their summer diet. Although very few seabirds breed on Auckland Island at present, excess breeding seabirds from the offshore islands may be attempting to breed on the main island, and falling prey to cats. Petrels were not recorded as diet items in the winter 2007 study.

The presence of fresh scats in the upland tussock at 460 m above mean sea level during winter suggests that either the cats had very large home ranges encompassing both the upland and coastal areas or they lived in the upland areas. The latter possibility seems unlikely as snow lies above 300 m for at least several days at times, making foraging virtually impossible. The remains of squid, shell and seaweed in scats and gut samples from lowland cats indicated that some cats were obviously scavenging on the shoreline. Opportunistic predation may explain the Auckland Island shag in a gut sample, although this may have been scavenged.

Although scat collection and cat trapping were conducted only over a short period in early winter, results indicate that cats on Auckland Island were in better condition than expected considering limited prey diversity and their wide foraging range, even in winter months. Explicit consideration of these factors may assist efforts to eradicate of cats from the island.

Eradication of both cats and pigs from Auckland Island would approximately double the area available for breeding seabirds that is free of large mammalian predators in the New Zealand subantarctic islands. This would help offset losses of seabirds caused by fisheries by-catch, climate change and invasive species on other Southern Ocean islands and needs to be actively pursued.

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**Table 1.** Frequency of diet items found in cat scats at northern Auckland Island, winter 2007.

Prey	Frequency (n = 40 scats)	% frequency of occurrence
Mammal		
<i>Mus musculus</i>	21	52.5
Bird	31	77.5
small	18	45.0
medium	6	15.0
large	3	7.5
Squid	2	5.0
Insect	2	5.0

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