

# How do penguins survive in a city?

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## Introduction

Although considered common, little penguins (*Eudyptula minor*) are vulnerable to various threats at land and sea such as nest destruction, introduced mammalian predators, oil spills and fishing nets. It is therefore surprising that one colony of little penguins lives only 5 km from a major city and forages within a busy shipping port.

Little penguins have lived at St Kilda since 1974<sup>1</sup>. They live on an artificially constructed breakwater, and probably colonised from the large Phillip Island population, 60 km away<sup>2</sup>. Since their discovery, the penguin population at St Kilda has steadily grown to an estimated 1000 individuals.

## Research question

My PhD study is investigating how this population of little penguins can not only survive, but grow, in such close proximity to marine and terrestrial human developments. In order to do this I am examining the relationships between their diet, foraging and breeding success.

## Methodology

I am examining the St Kilda penguin colony's diet, foraging behaviour and breeding success over two years.

Diet is measured monthly by two methods.

Samples of the penguins stomach contents are collected and their prey species identified primarily by otoliths (fish ear bones) or squid beaks.

Blood samples are also collected from the penguins, which are analysed for stable isotopes <sup>15</sup>N and <sup>13</sup>C. This study of stable isotopes complements the stomach sampling, in that it reflects the trophic level from which the birds are feeding from, and the foraging areas in which they are feeding. Stable isotope analysis gives an integrated measurement of the diet over the past three to four weeks, whereas stomach sampling reveals what birds have been eating on a particular day only.

Foraging behaviour is measured using two methods during the breeding season. Penguins regularly return to their nest whilst breeding in order to incubate eggs or feed their chicks, which allows for the attachment and removal of electronic devices.

Satellite transmitters are used to follow the penguins movements throughout the day and calculate their foraging zone.



A satellite transmitter designed for little penguins

Time-depth recorders measure depth and temperature every one second. They show the penguins' pattern of diving.

Reproductive success is measured by monitoring penguins in their nests. The number of chicks fledged per pair and the weights of these chicks are recorded over the breeding season, which occurs between approximately June and March at St Kilda.



Penguins nest amongst the rocks on the breakwater and use the vegetation that grows there as nesting material

## Key findings

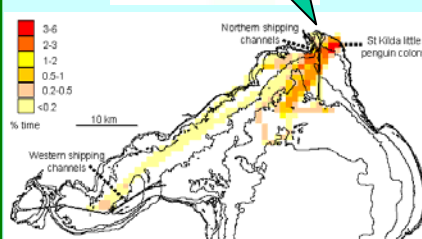
Preliminary results indicate that the penguins do not always have an easy life in the city. The breeding success of little penguins from St Kilda in 2006 was only 0.4 chicks per pair, well below the long term average of 1 chick per pair from Phillip Island<sup>3</sup>.



A pair of 3-day old penguin chicks

The reproductive success of penguins is most likely influenced by the availability of their preferred prey. The diet of penguins from St Kilda is mostly comprised of anchovy, with squid, garfish and pilchard sometimes consumed.

Satellite tracking shows that penguins search for their food mostly in the north of Port Phillip Bay.



Foraging area of 11 breeding penguins from St Kilda fitted with satellite trackers

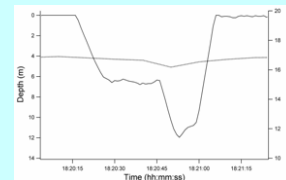
The maximum distance travelled from the colony by a penguin with a satellite transmitter was 51 km. This penguin spent 2 days at sea however, which is unusual for penguins feeding small chicks. All other penguins spent only 1 day at sea, and the maximum distance travelled from the colony was 22 km. The mean maximum distance travelled was 14.2 km, which is similar to the reported value of 14.8 km for penguins on 1 day foraging trips from Phillip Island<sup>4</sup>.

Time-depth recorders show that the penguins from St Kilda have an unusual pattern of diving. Penguins from this colony dive demersally, that is near the sea floor. They spend a large proportion of their dive searching for food in what is known as the bottom phase of the dive.

Colony	Bottom Phase	Dive Strategy
St Kilda VIC	50%	demersal
Penguin Is WA	47%	demersal
Oamaru NZ	34%	mid-water dives
Motuara Is NZ	32%	mid-water dives
Phillip Is VIC	22%	mid-water dives

Amount of time penguins from St Kilda spend in the bottom phase of the dive, compared with other little penguin colonies<sup>5</sup>

The shape of the penguins dives suggests that they probably use the sea floor, together with shipping channels that occur inside their foraging area, to trap their prey. Their apparent use of the man-made shipping channels illustrates the adaptation of these penguins to living in a highly modified environment.



Penguin dive showing pattern of travel near the sea floor, following it into a trench, possibly a shipping channel

Understanding how this colony survives so close to the city has important management applications, not only for penguins, but other for native urban fauna.

## References

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Photo Maurice Bourke