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Feeding ecology of the New Zealand sea lion (*Phocarctos hookeri*)

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Abstract

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The New Zealand (NZ) sea lion *Phocarctos hookeri* is the only pinniped endemic to NZ with a population of approximately 12,000 individuals. Its breeding range is currently restricted to NZ sub-Antarctic islands, and it has failed to recolonise its pristine distribution around the NZ main islands despite its protection since 1881. The current hypothesis is that the population growth of this pinniped is limited by the distribution of suitable prey on the Auckland Islands (50°30'S, 166°E) shelf, and by the direct and indirect pressure exerted by the arrow squid *Nototodarus sloani* fishery. However, this hypothesis has not been fully tested to date as there has been limited information on the diet of the NZ sea lion and their potential prey. The objective of this thesis is to analyse the diet of NZ sea lions over several years with particular emphasis on the most reproductively important segment of the population: lactating females.

This thesis provides the first quantification by percentage mass of the diet of NZ sea lion using a combination of stomach content analysis, qualitative fatty acid (FA) analysis, and quantitative FA signature analysis (QFASA). Stomach contents and blubber FAs were analysed from 121 individuals incidentally caught (by-caught) in the southern arrow squid fishery from the years 1997 to 2006. The blubber FAs of 78 free-ranging lactating females captured at Enderby Island, Auckland Islands, were also examined during January and February of 2000 to 2005.

Data obtained from both stomach analysis and QFASA indicate that arrow squid, rattails Macrouridae, hoki *Macruronus novaezelandiae* and red cod *Pseudophycis bachus* are key prey species for NZ sea lions in the Auckland Islands region. Because these prey species live mostly at depths greater than 200 m, lactating females must undertake long foraging trips and dive regularly to greater depths than other sea lion species. Data from QFASA indicates that this foraging pattern is conducted over an extended period through the summer and autumn. The daily food requirement of a lactating female was estimated by a simple energetic model to be greater than 20% of its body mass. During years of low arrow squid recruitment such as 1999 and 2001, the

amounts of squid required by the NZ sea lion population may have been similar to the amount harvested by the fishery, suggesting that resource competition is likely to occur between the arrow squid fishery and NZ sea lions in years of low squid abundance.

Half of the fishing activity of the southern squid fishery occurs in the north of the Auckland Islands shelf where NZ sea lions forage, leading to incidental captures every year. This research emphasises that management of the NZ sea lion must not only consider the direct interactions with the arrow squid fishery, but also the likelihood of food resource competition between the fishery and NZ sea lions.

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List of Abbreviations

CC	Calibration coefficient
FA	Fatty acid
FAMES	Fatty acid methyl esters
Im	Immature
K-W	Kruskall Wallis (test)
LF	Lactating female
Ma	Male
MUFA	Monounsaturated fatty acid
M-W	Mann Whitney (test)
NLF	Non-lactating female
NZ	New Zealand
PUFA	Polyunsaturated fatty acid
QFASA	Quantitative fatty acid signature analysis
SAFA	Saturated fatty acid
TAG	Triacylglycerol

Table of Contents

List of Tables

(the first number refers to the chapter's number)

List of Figures

(the first number refers to the chapter's number)