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**Assessing the impacts of infectious disease
on reproductive success in New Zealand sea
lions (*Phocarctos hookeri*)**

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requirements for the degree of

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Sarah Anne Michael

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Abstract

Poor reproductive success is one factor that may be perpetuating the population decline of the threatened New Zealand (NZ) sea lion (*Phocarctos hookeri*). The species has a severely restricted distribution, with 99% of breeding occurring on the remote NZ sub-Antarctic islands and amongst the lowest expected reproductive outputs compared to other otariids. Infectious disease, particularly septicaemia caused by the bacterium *Klebsiella pneumoniae* is known to be a major mediator of early pup mortality, but the role of infectious disease in impairment of reproductive success has not been investigated.

This thesis aimed to fill this knowledge gap by investigating three areas of concern. Firstly, the role of infectious disease in stillbirth of NZ sea lion pups was examined with a histopathological study of archived necropsy tissues. Secondly, the seroprevalence of adult and juvenile NZ sea lions to *Toxoplasma gondii*, a known cause of reproductive failure, at several locations was evaluated. Finally, a survival analysis was conducted to model the long term survival and reproductive success of pups that were treated with ivermectin as pups, to assess ongoing benefits of early hookworm burden removal.

In contrast to the mass mortalities seen with bacterial disease in NZ sea lion colonies, at least in the topics covered in this thesis, the role of infectious disease contributing to poor reproductive success is apparently minimal. No specific infectious agents were identified to have caused the death of the stillborn pups examined, however pneumonia was diagnosed in four animals. A low seroprevalence to *T. gondii* was found in mainland but not sub-Antarctic colonies, however those animals with strongly positive titres showed no clinical signs and had reproduced normally. Finally, although the survival analysis was limited by small sample size and very poor juvenile survival, it depicted promising trends for improved survival for those pups treated with ivermectin as pups. All studies have generated areas for future research and recommendations for further conservation management of this vulnerable species.

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List of Marine Mammal Species Cited in this Thesis

Antarctic fur seal	<i>Arctocephalus gazella</i>
Australian fur seal	<i>Arctocephalus pusillus doriferus</i>
Australian sea lion	<i>Neophoca cinerea</i>
Baltic ringed seal	<i>Pusa hispida</i>
Bottlenose dolphin	<i>Tursiops truncatus</i>
California sea lion	<i>Zalophus californianus</i>
Grey seal	<i>Halichoerus grypus</i>
Harbour porpoise	<i>Phocoena phocoena</i>
Hawaiian monk seal	<i>Monachus schauinslandi</i>
Hector's dolphin	<i>Cephalorhynchus hectori</i>
Juan Fernandez fur seal	<i>Arctocephalus philippii</i>
New Zealand fur seal	<i>Arctocephalus forsteri</i>
New Zealand sea lion	<i>Phocarctos hookeri</i>
Northern fur seal	<i>Callorhinus ursinus</i>
Pacific harbour seal	<i>Phoca vitulina richardsi</i>
Risso's dolphin	<i>Grampus griseus</i>
South African fur seal	<i>Arctocephalus pusillus</i>
South American fur seal	<i>Arctocephalus australis gracilis</i>
South American sea lion	<i>Otaria flavescens</i>
Southern sea otter	<i>Enhydra lutris nereis</i>
Steller sea lion	<i>Eumetopias jubatus</i>
Subantarctic fur seal	<i>Arctocephalus tropicalis</i>