POP2012-02

MS5 Demographic assessment NZ sea lions at Auckland Islands - draft final report

(Presentation 2 – correlative analysis)

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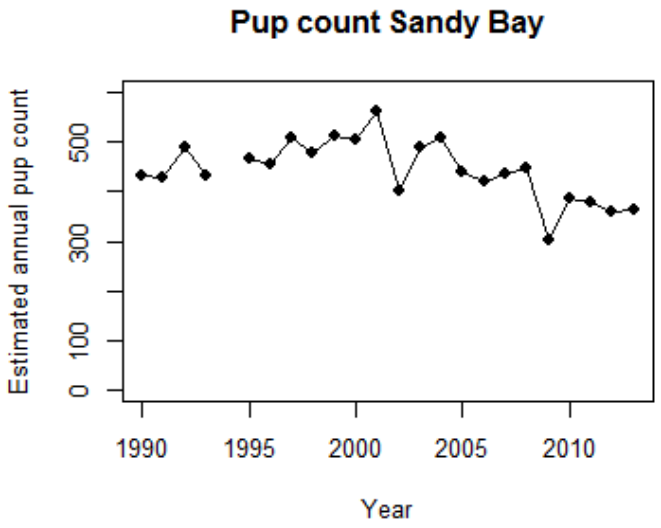
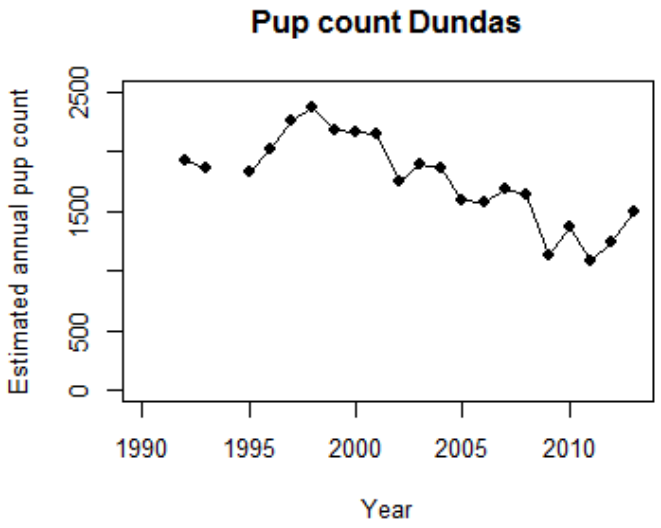
DOC CSP, August 2014

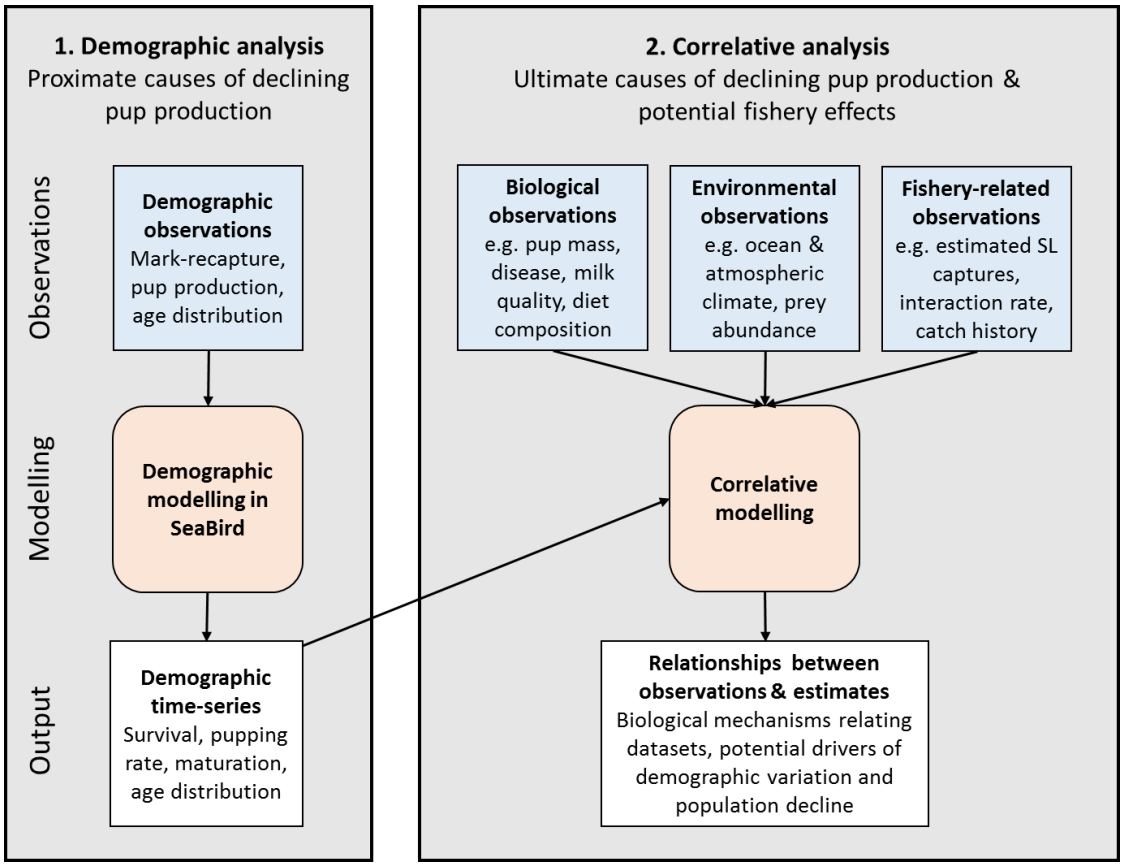
POP2012-02 Project objectives





- Identify demographic causes of population decline at Auckland Islands.
- Identify potential demographic mechanisms through which direct and indirect effects of fishing can impact on population size at the Auckland Islands, or increase susceptibility to these effects.

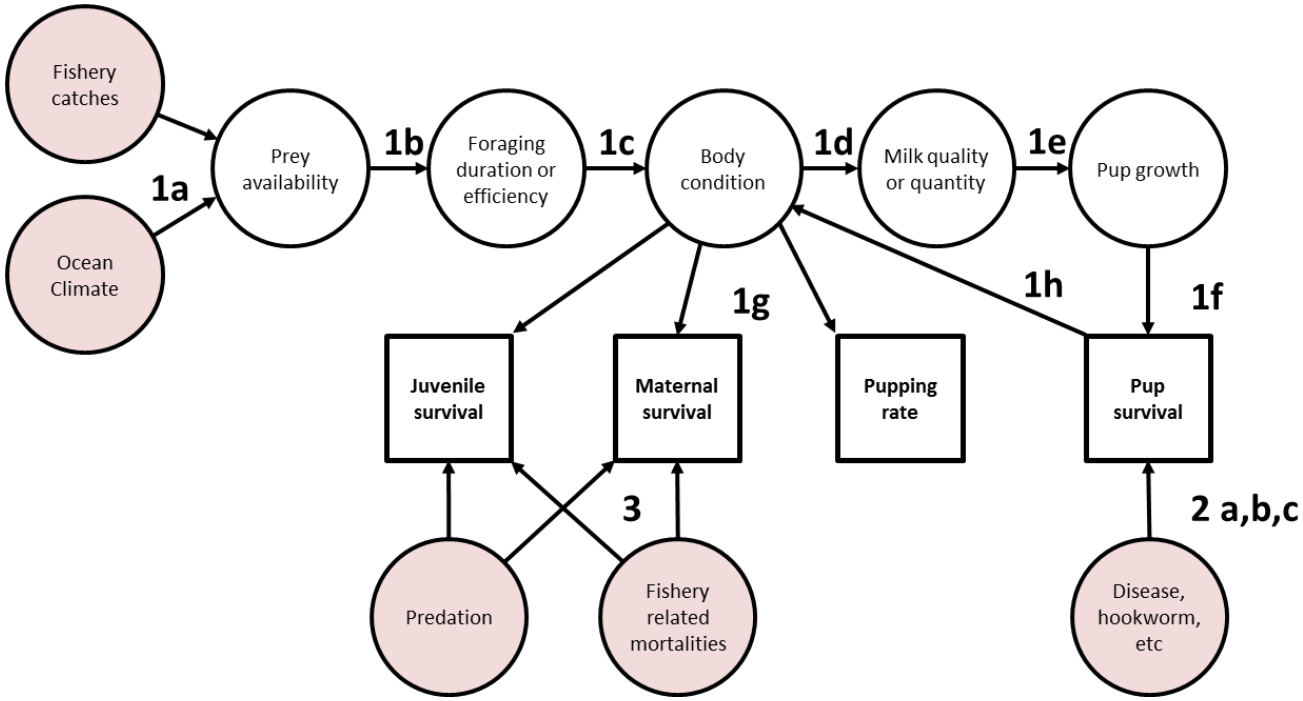
POP2012-02 Project components



1. Demographic assessment of female NZ sea lions at the Auckland Islands
2. **Correlative assessment relating demographic rates to candidate drivers of population change**

Hypothetical model

- Framework for testing relationships between demographic rates and candidate drivers of population change
- Based on established biological/demographic responses from expert consultation (incl. two project workshops) and lit. review



Selected candidate drivers of population change

- Relationships 1a-1h related to changes in nutritional status in response to prey availability and energetic costs of reproduction
- Relationships 2a-c relate to pup mortality rates by diagnosis
- Relationship 3 relates to adult mortality/interactions with the commercial trawl fishery

- No attempt to assess predation effects
- Assessed climate relationships with prey abundance and diet though not commercial fishery extractions

Updated correlative assessment

- Updated demographic rate estimates from model run 8 (Sandy Bay females)
- Revised body condition index (BCI) analysis
- Reassess relationships
- Sensitivity with/without 1998 & 2008 cohort survival to age 2 (poor tags)

Body condition analysis

Maternal body condition observations

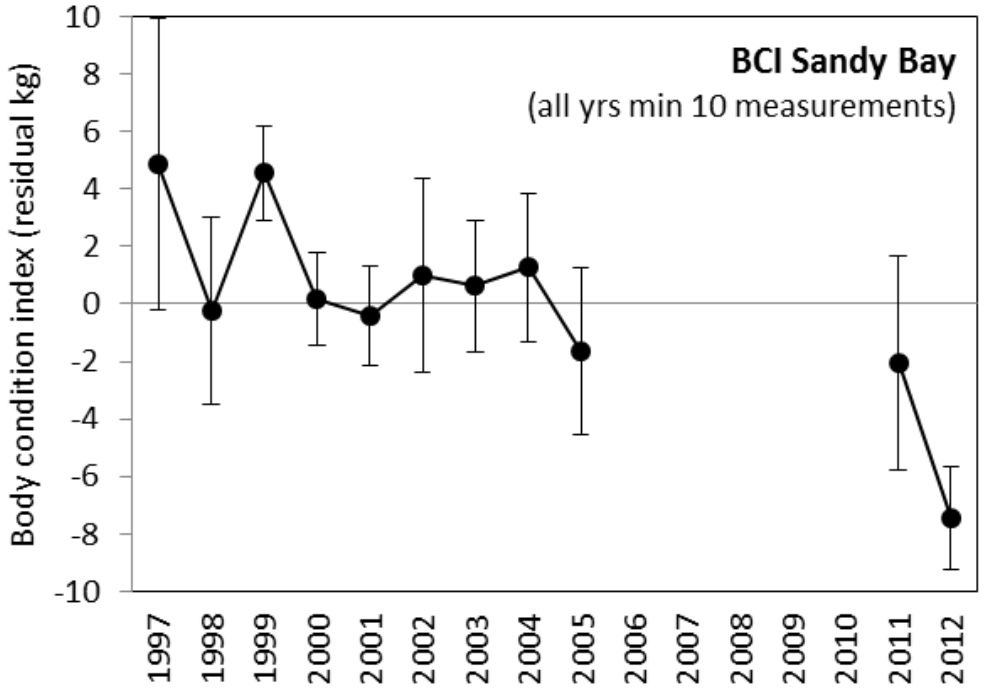
Previously used:

- Federico Riet-Sapriza maternal condition & milk quality at Sandy Bay 1997-2005 (Riet-Sapriza et al., 2012)

Additional:

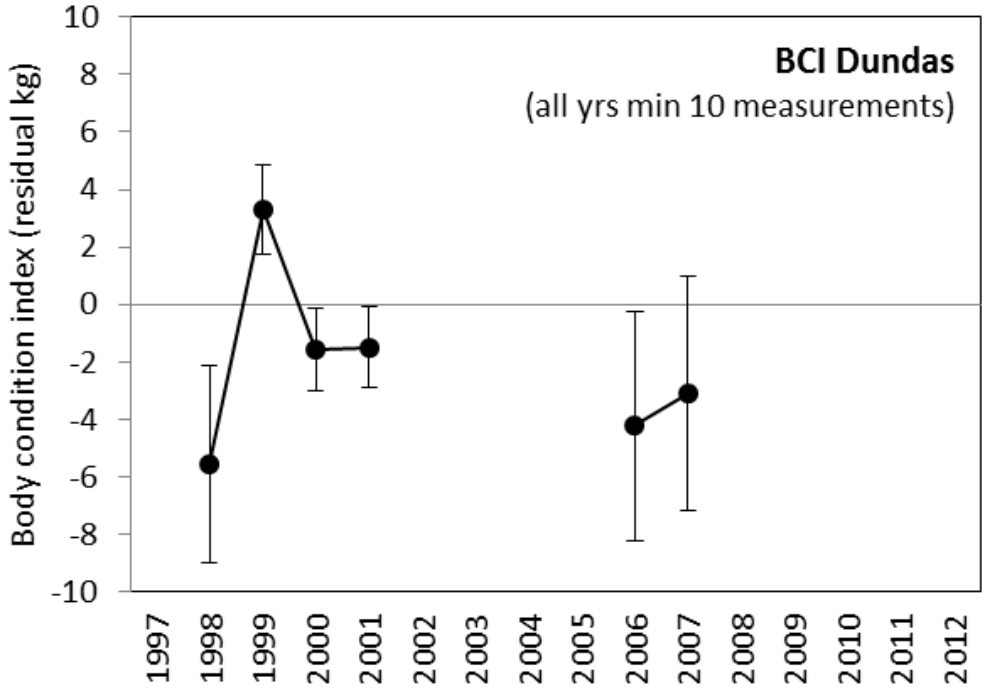
- Simon Childerhouse growth study at Sandy Bay & Dundas 1999-2001 (Childerhouse et al., 2010)
- Louise Chilvers measurements for different projects including telemetry Sandy Bay & Dundas 1997-2012
- Only presented/used annual estimates from minimum of 10 measurements

BCI estimates – Sandy Bay



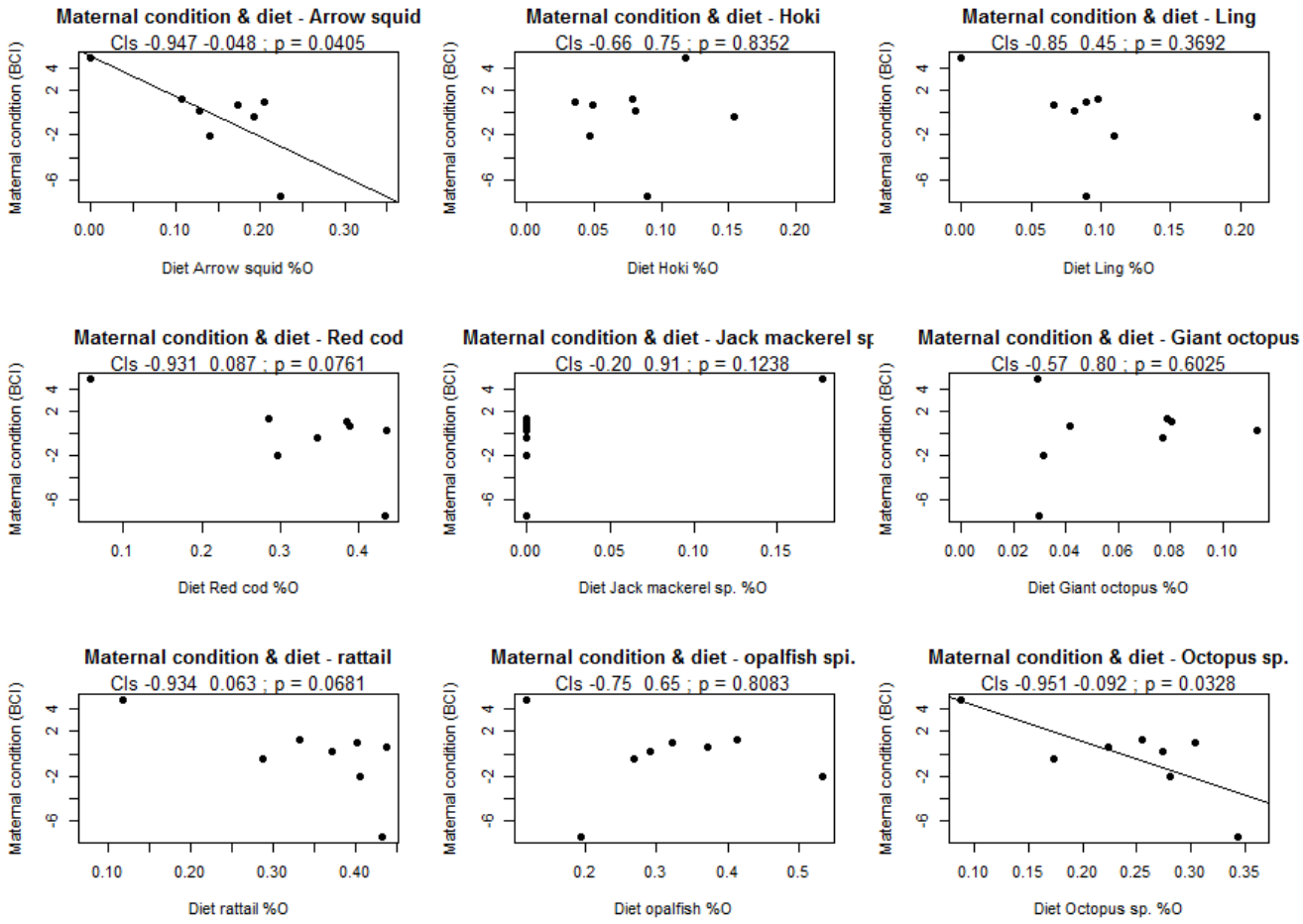
- Approx. 5kg decline in BCI after 1999
- Three lowest estimates at Sandy bay after 2004

BCI estimates - Dundas



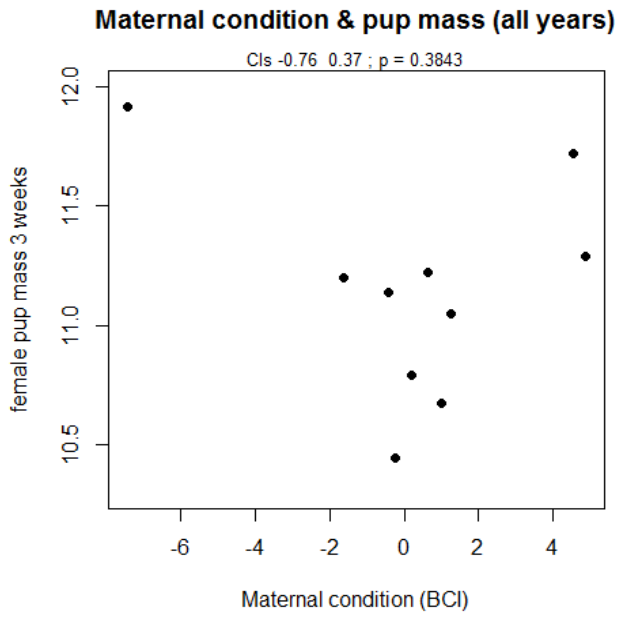
- Approx. 5kg decline in BCI after 1999
- Three lowest estimates at Dundas - 1998, 2006 & 2007

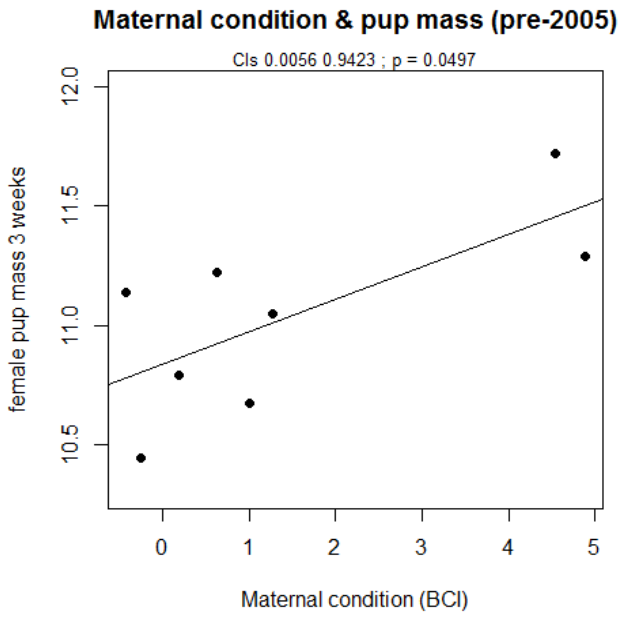
Diet and BCI



- Negative correlation between arrow squid/*Octopus campbelli* and maternal BCI
- Need to compare with board diet composition (e.g. PCA, energy, prey-size)

BCI and pup mass

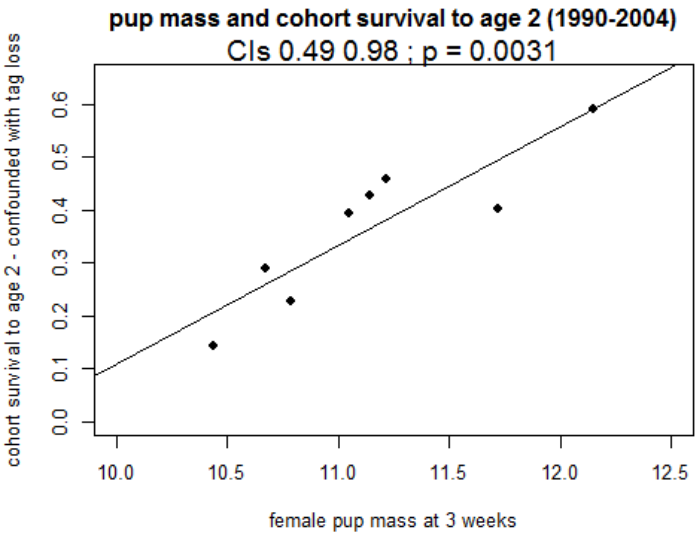


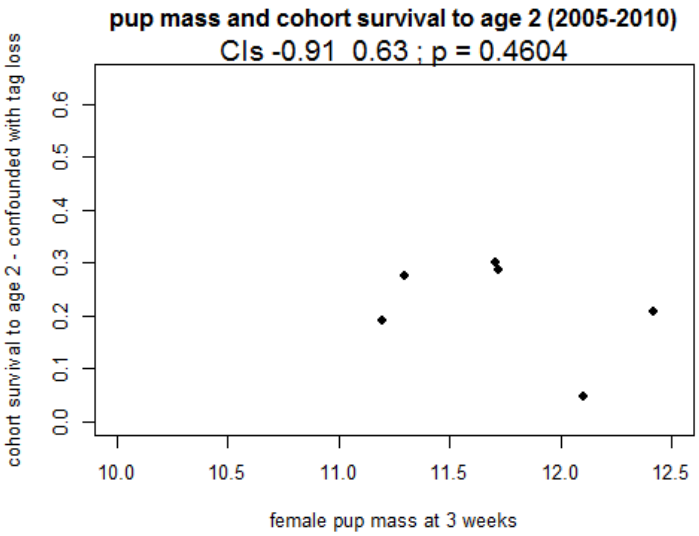


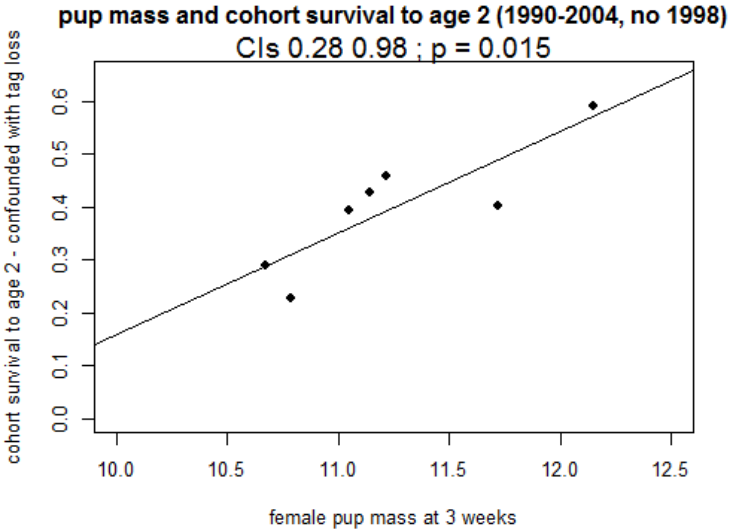
- Positive correlation with 3-week pup mass though only in 1998-2005 period
- Year with low BCI and high pup mass in later period

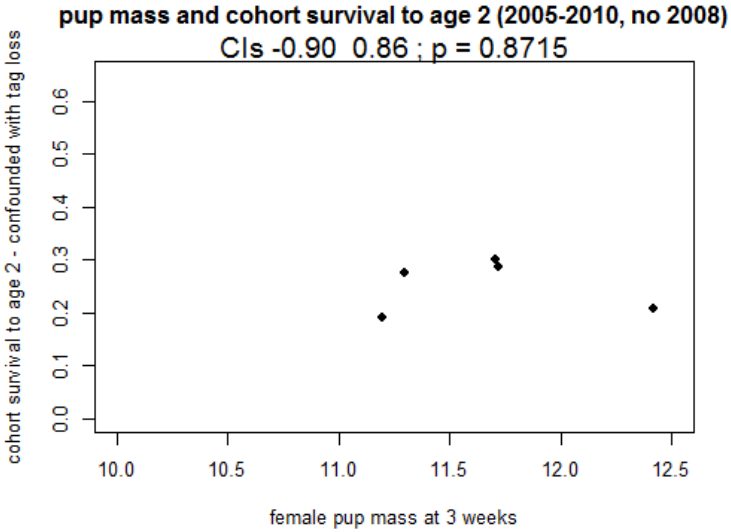
Effect of omitting 1998 and 2008 pup/yearling survival

Pup mass and cohort survival to age 2

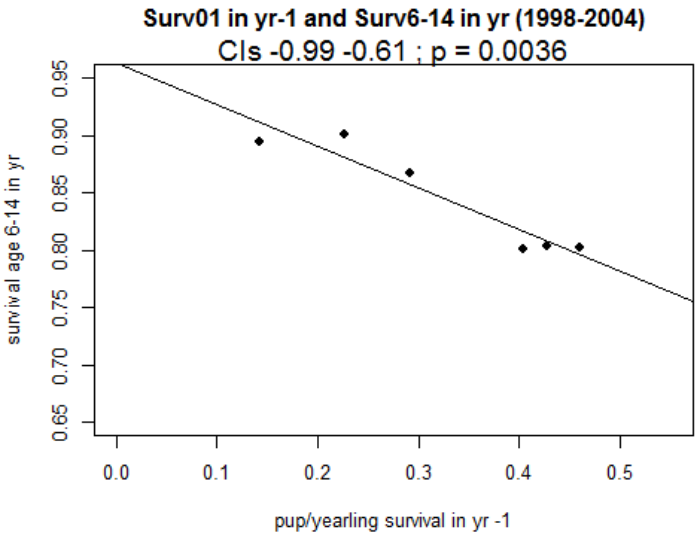


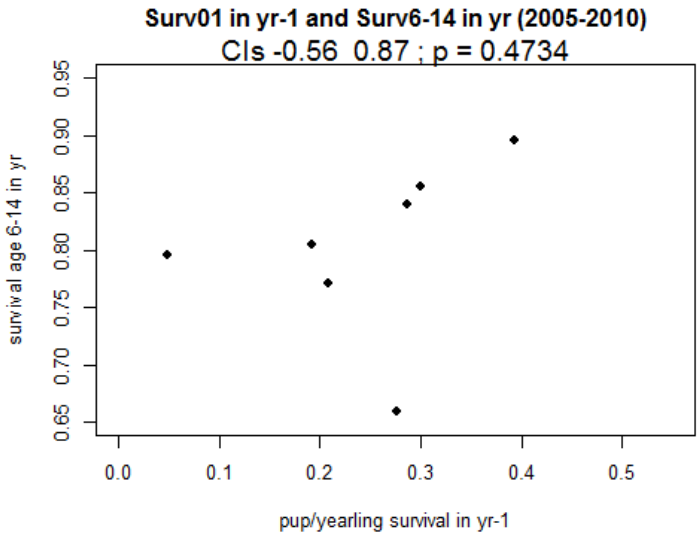


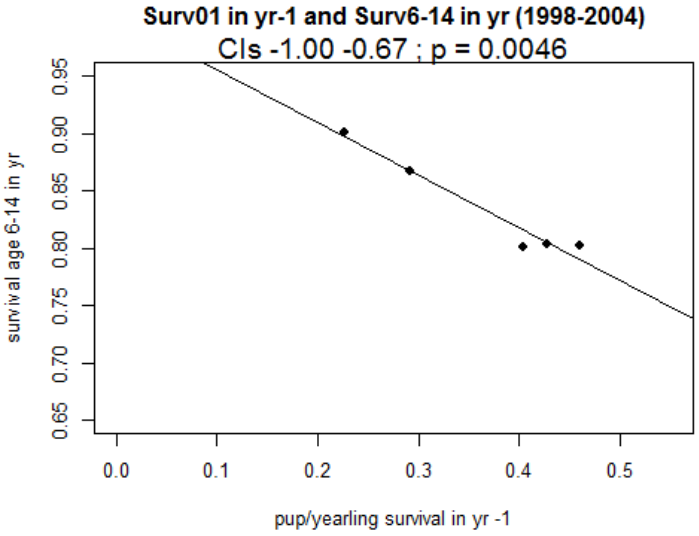


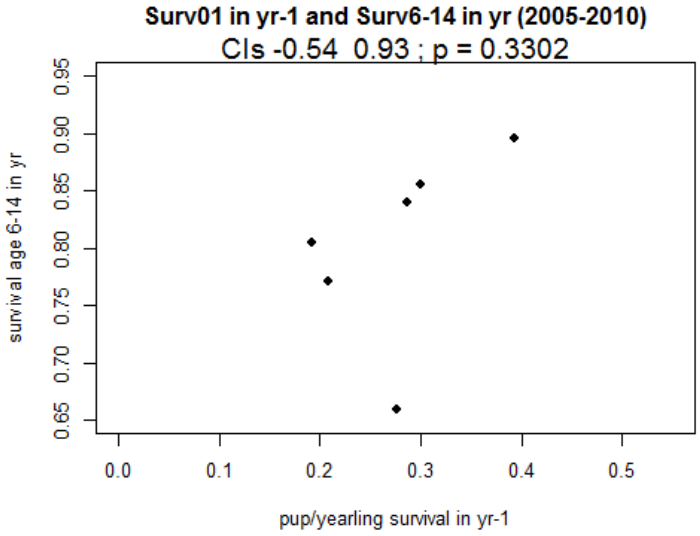


Cohort survival to age 2 and Age 6-14 survival yr+1









Summary

- Revised demographic rate estimates had minimal effect on relationships with correlates
- No change in original conclusions:
  - Strong relationship between climate indices (e.g. IPO and SSH) and occurrence of key prey in diet
  - Pup mass a good predictor of cohort survival to age 2, though not from 2005-2010 when pups were large and survival was low
  - Low pup/yearling survival in this later period correlated with disease-related mortality rate towards the end of the field season
  - No correlation between fishery-related captures/interactions and survival estimates of vulnerable age classes
  - Short time series in most cases; longer time series required to establish causative relationships

Summary

- Extended BCI series:
  - Longer time-series of maternal body condition index (BCI) estimates
  - Approx. 5kg reduction in mean BCI after 1999, evident at both Sandy Bay and Dundas
  - Positive correlation with pup mass prior to 2005, though not with whole time series
  - Correlations with occurrence of some prey, though need index of diet composition

Acknowledgements

Simon Childerhouse, Laureline Meynier and Louise Chilvers for providing additional maternal biometric observations

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Daryl Mackenzie for an extremely helpful review of both the demographic and correlative assessments

End of presentation 2