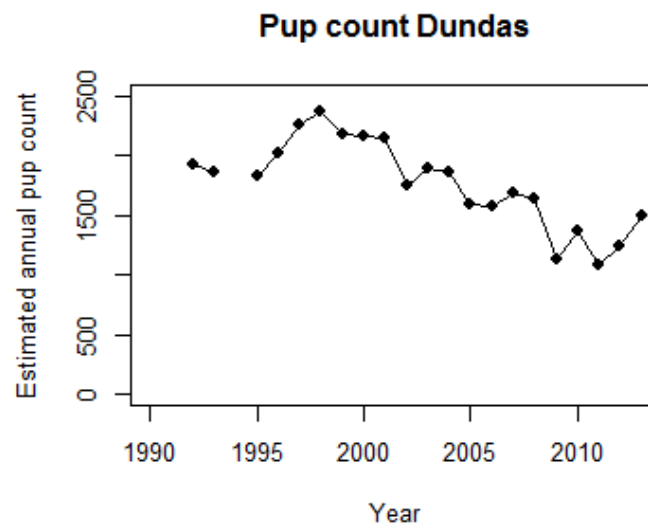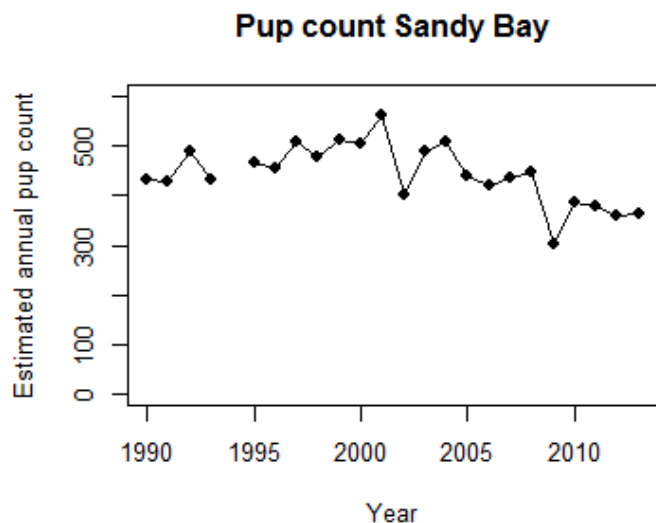# POP2012-02

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

(Presentation 1 – demographic assessment)

Jim Roberts, Dan Fu, Ian Doonan, Chris Francis

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

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POP2012-02 Project components
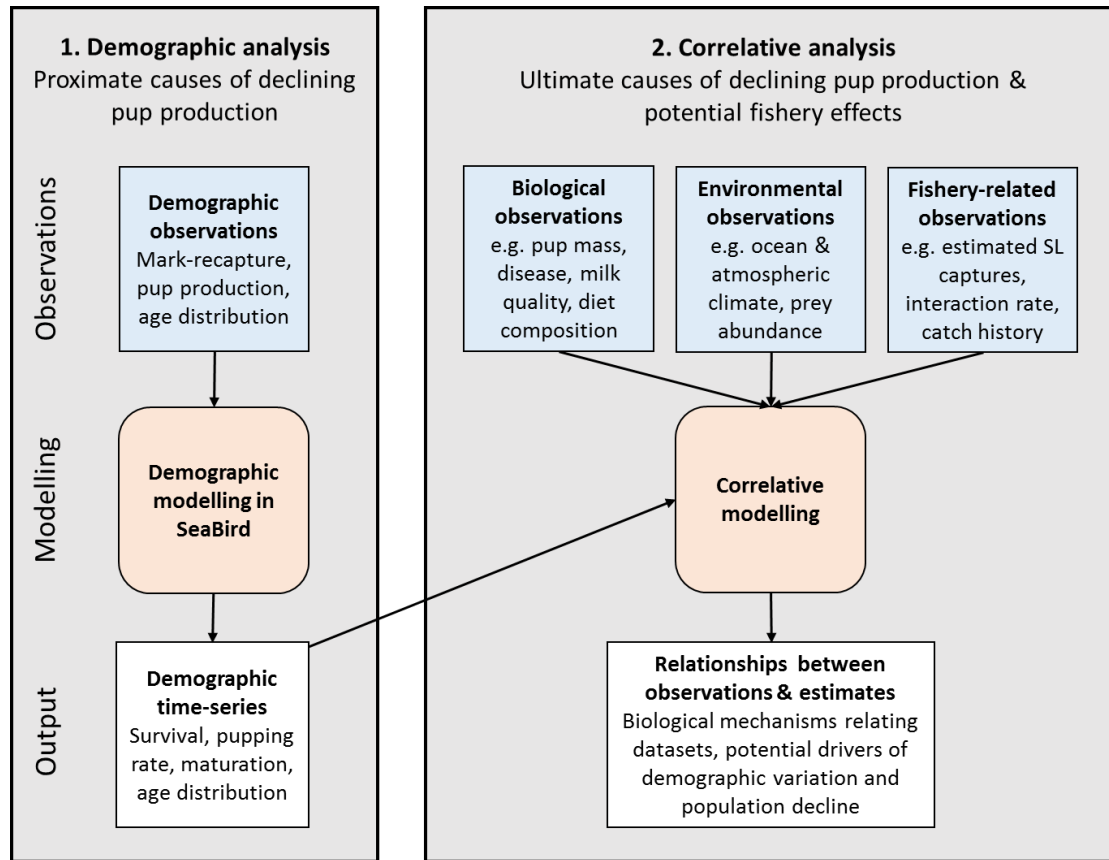
1. **Demographic assessment of female NZ sea lions at the Auckland Islands**

2. Correlative assessment relating demographic rates to candidate drivers of population change
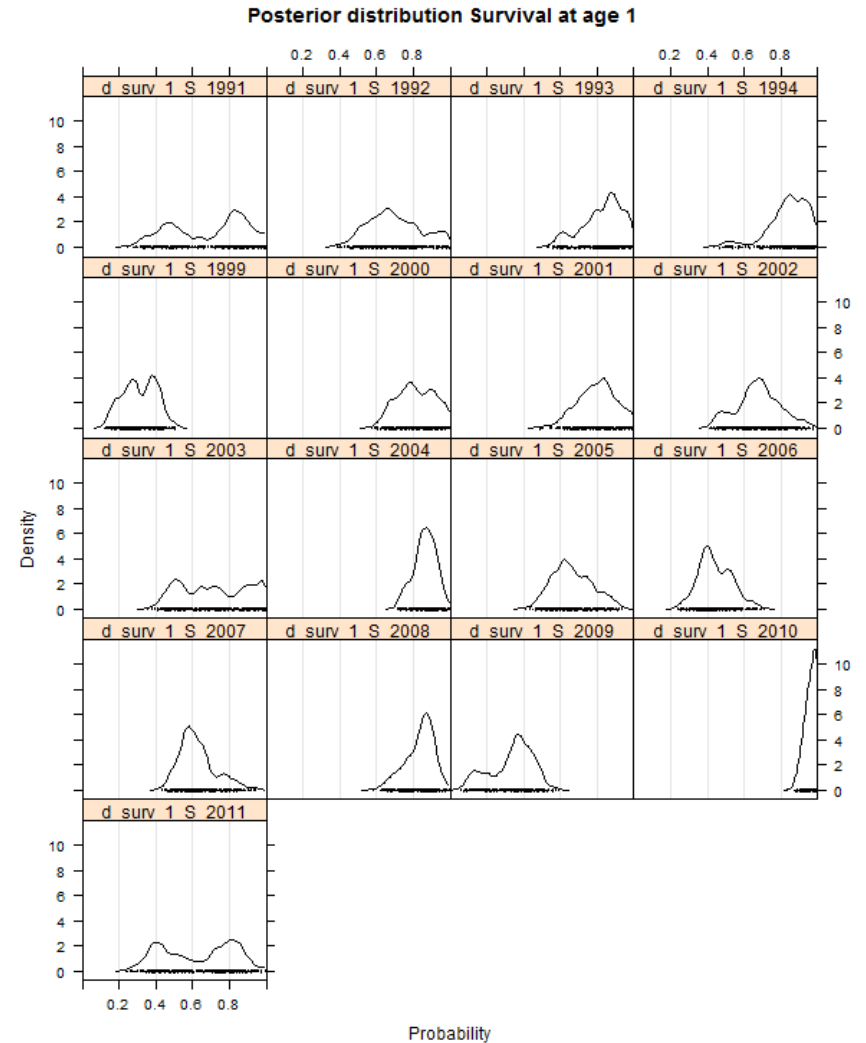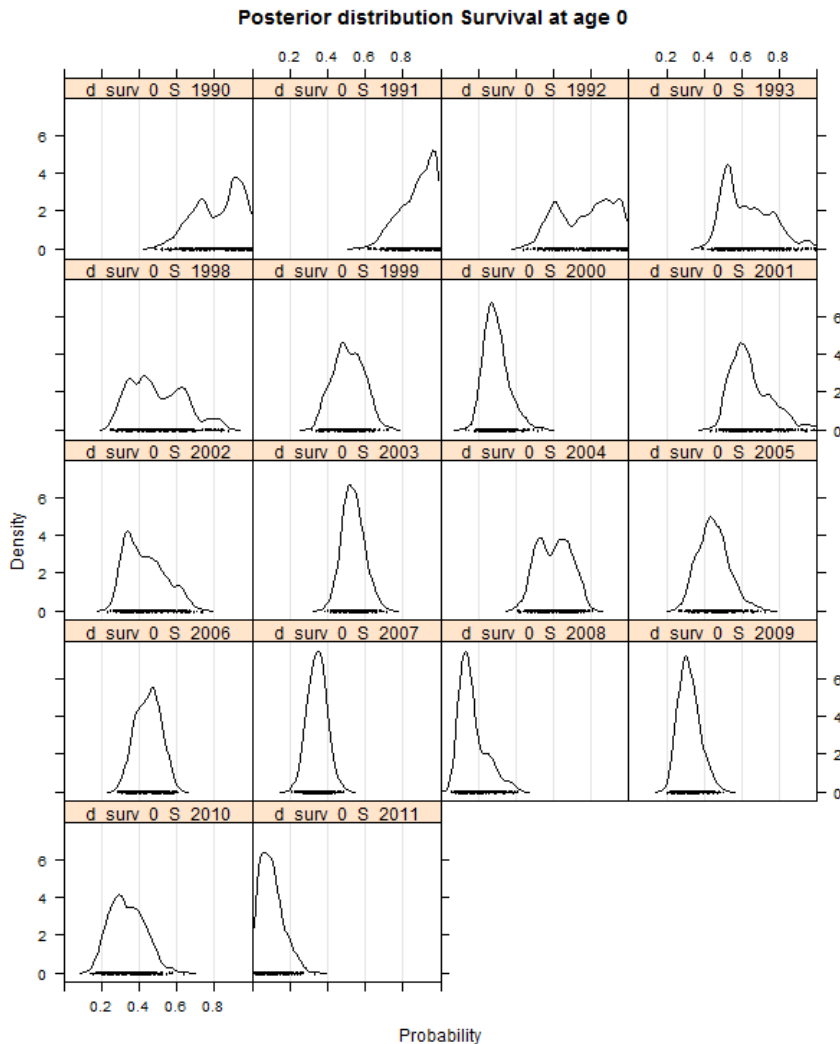
Updated demographic assessment

- MCMC run for Sandy Bay and Dundas models

- Posterior distributions of all parameters

- Assessment of correlation between estimated parameters

- Further development of model parameterisation

- Breakpoint analysis

- Estimates carried forward to demographic assessment
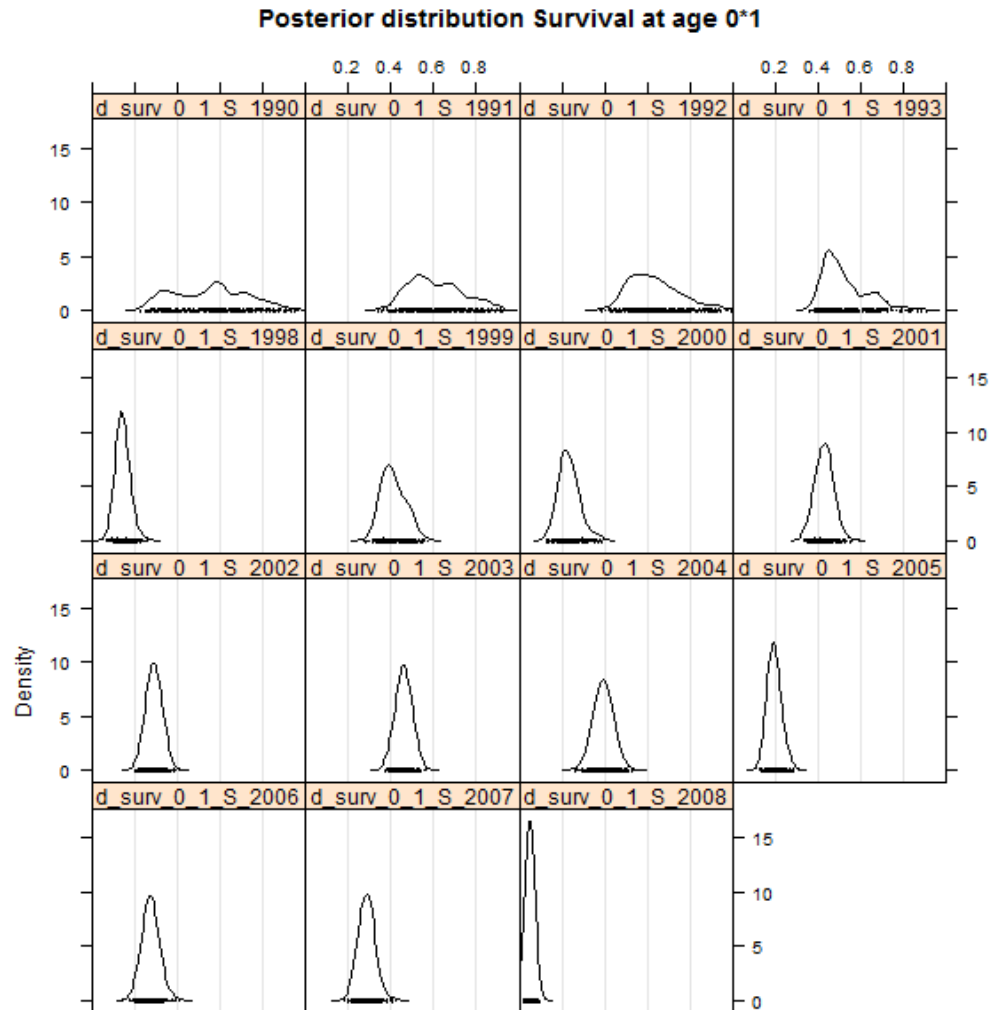
Additional model development

- Posteriors for Sandy Bay model run 7a (previous "optimal" model)

- Some weakly identifiable parameters

  - Age at first pupping prior to 2001 (used year block 1998-2002)

  - Survival at ages 0, 1 and 2-5 pre-1998 (presented cohort survival to age 2/5)

  - Resighting probability age 6 and 7 (made year-invariant)

- Generated new MCMC samples (n = 500) for Sandy Bay (model run 8)

- Also MCMC samples for Dundas (model run 9) using similar model parameterisation as run 8:

  - different partitioning (Type III), as Type I though without breeding status

  - No estimation of pupping parameters (pupping rate or age of first pupping)

NIWA
Taihoro Nukurangi

Posterior distributions
Sandy Bay model (run 8)

Sandy Bay model (run 8) - posterior distributions

Posterior distribution Survival at age 0

Posterior distribution Survival at age 1

Sandy Bay model (run 8) - posterior distributions

Posterior distribution Survival at age 0*1

Sandy Bay model (run 8) - posterior distributions

Posterior distribution Survival 6-14 (adult 1) & 15+ (adult 2)
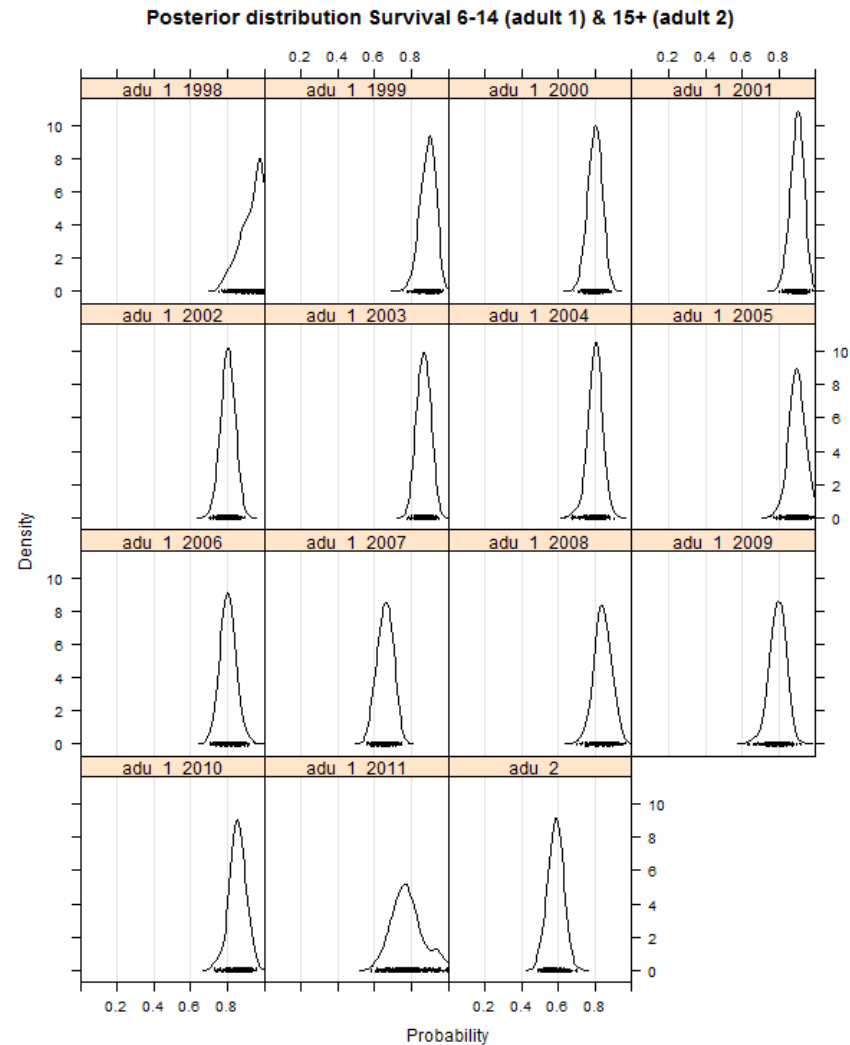
Sandy Bay model (run 8) - posterior distributions

Posterior distribution probability of puppers in yr pupping in yr+1
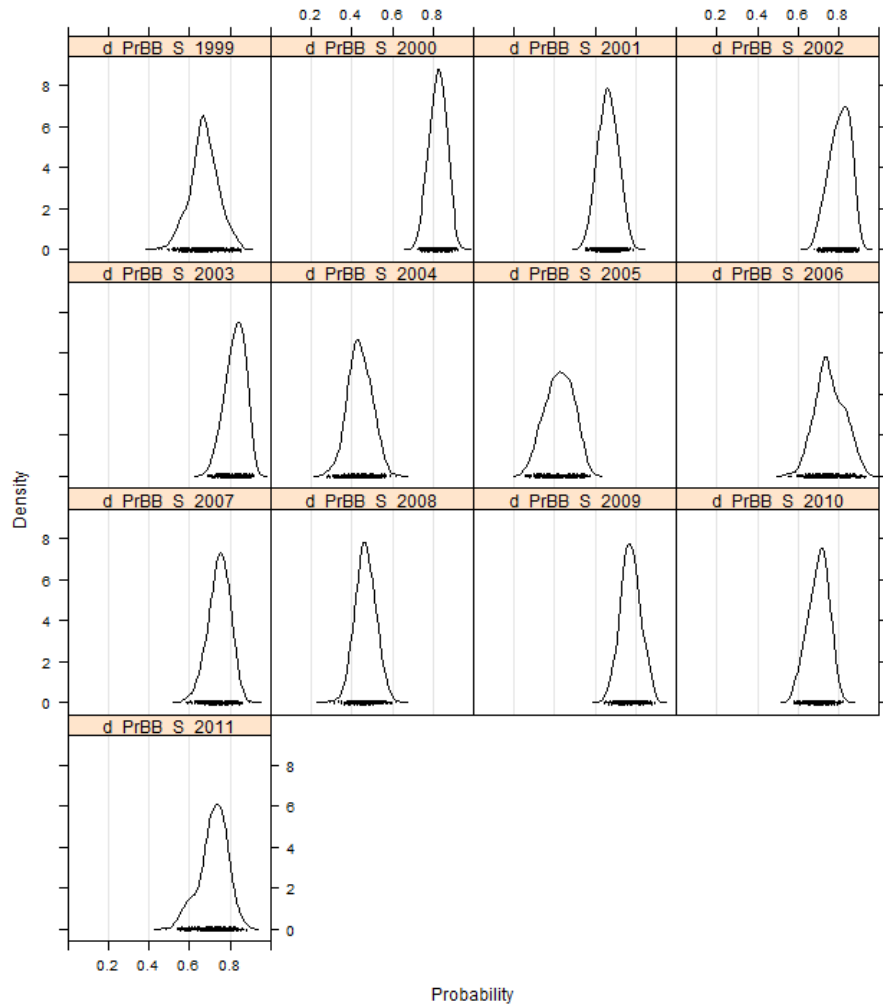
Posterior distribution probability of non-puppers in yr pupping in yr+1
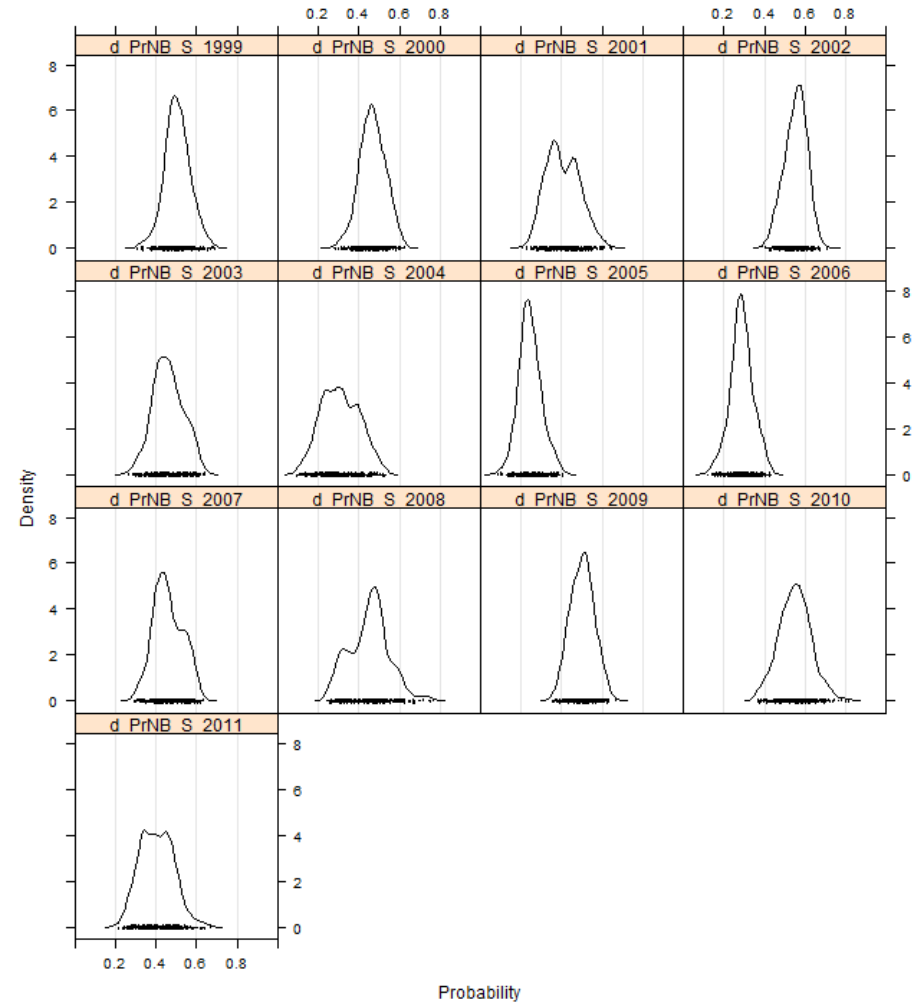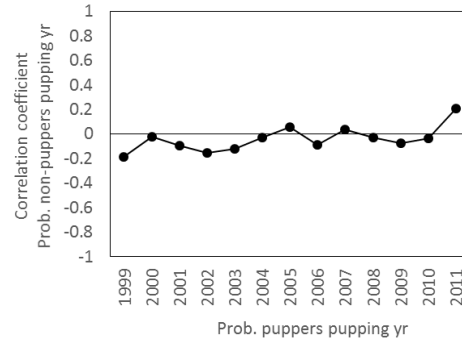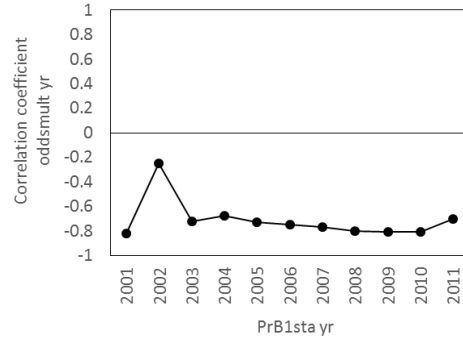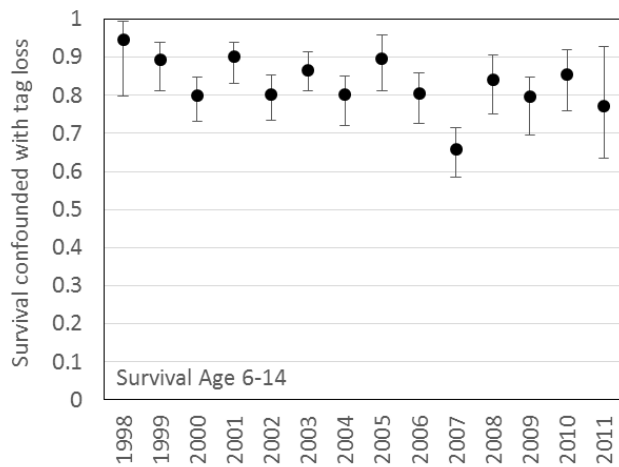
Parameter correlation analysis
Sandy Bay model (run 8)
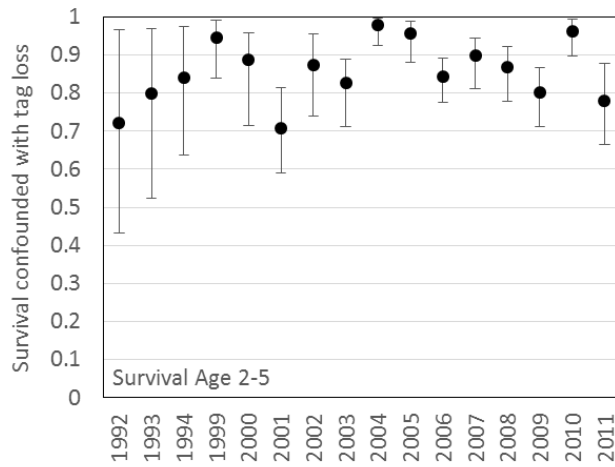
Sandy Bay model (run 8) – parameter correlation analysis
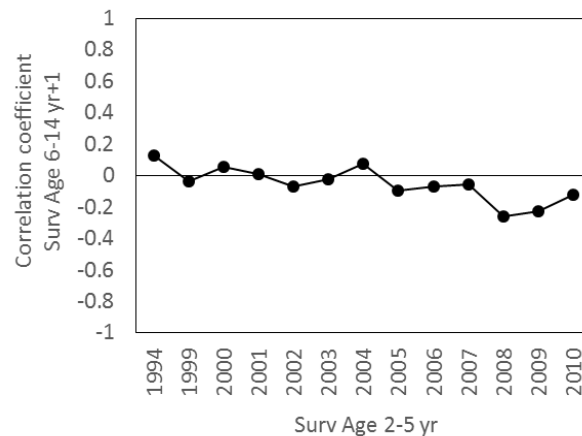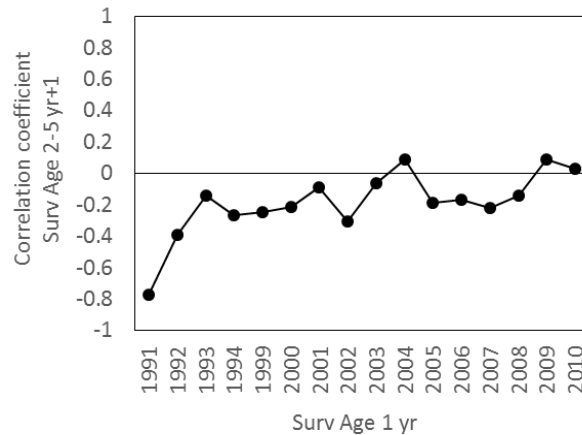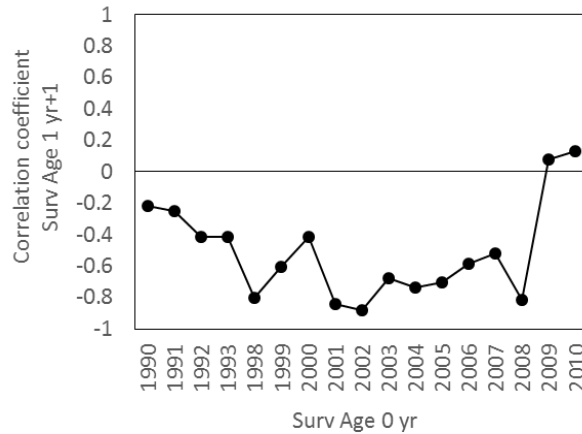
Sandy Bay model (run 8) – parameter correlation analysis
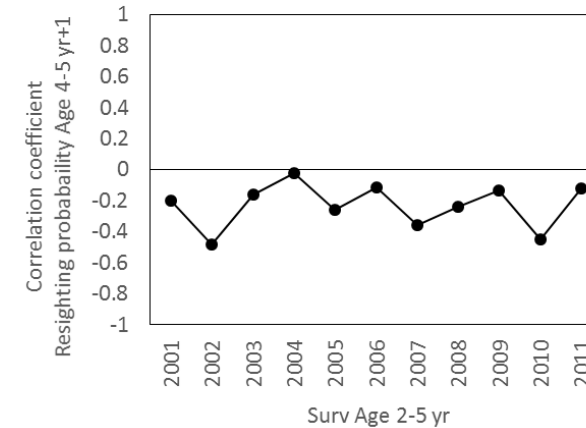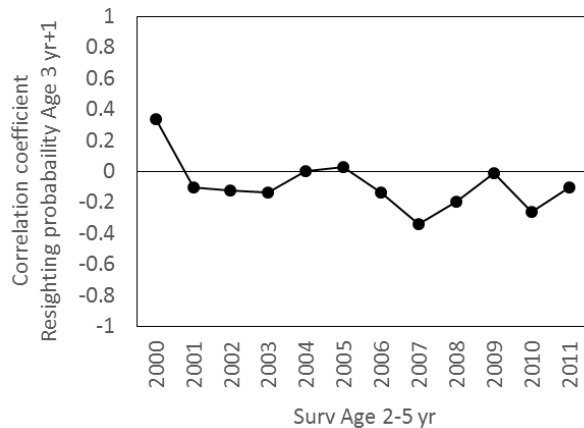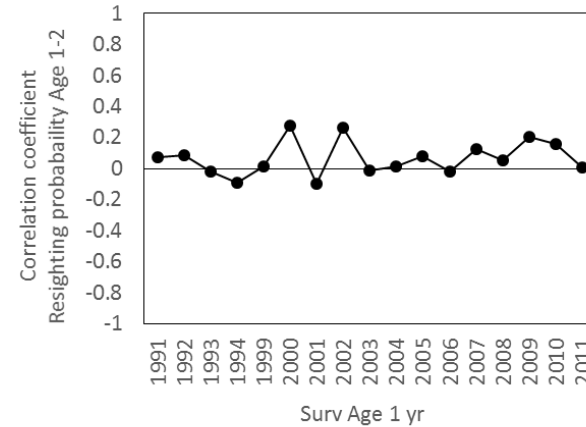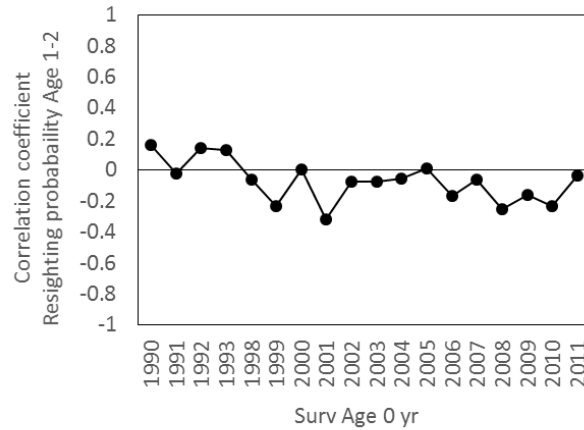
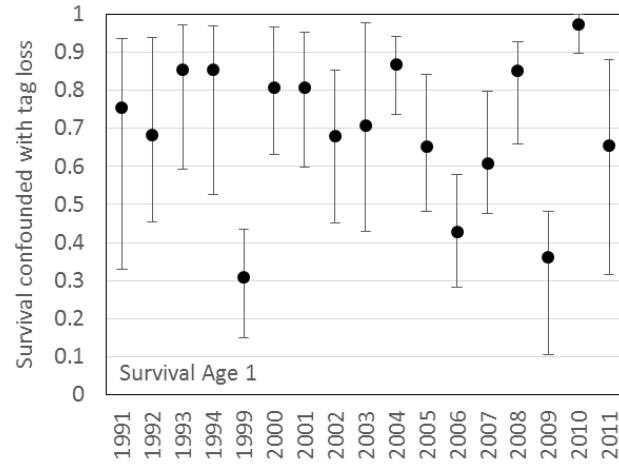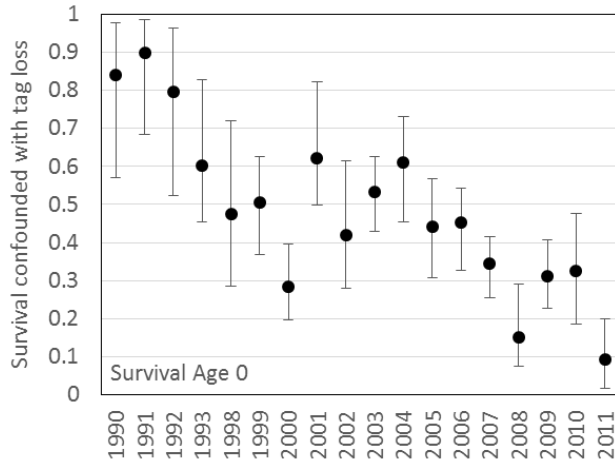# Sandy Bay model (run 8) – parameter correlation analysis
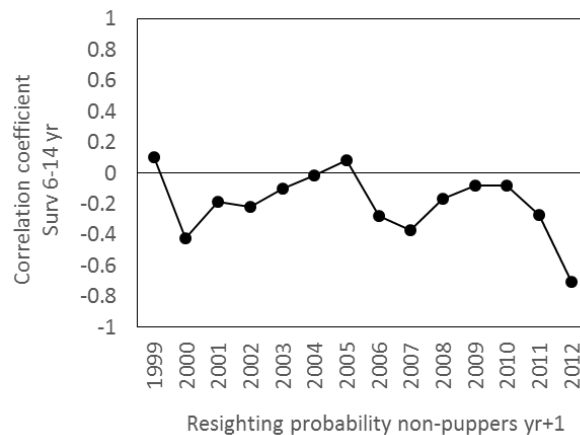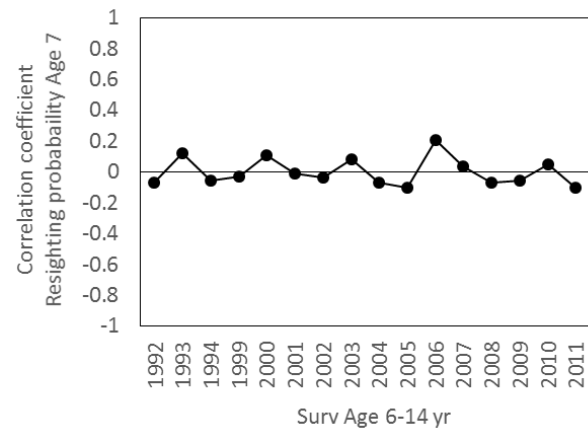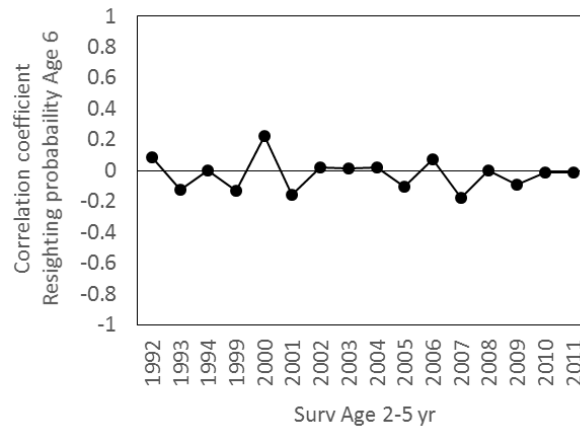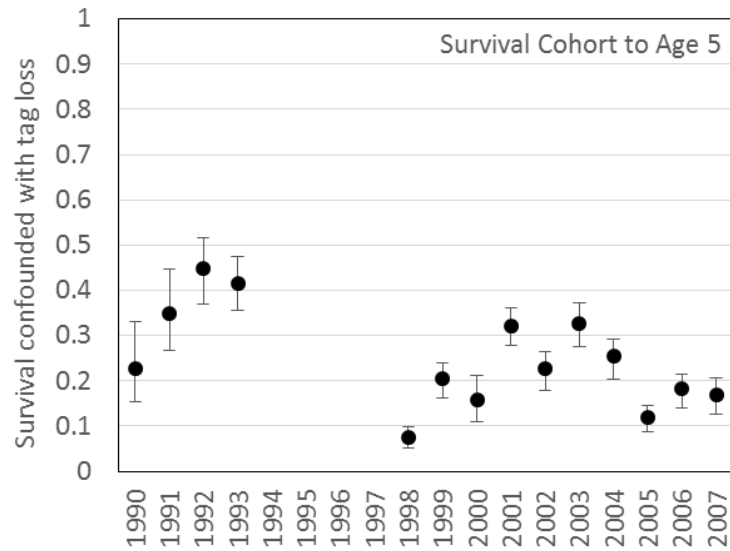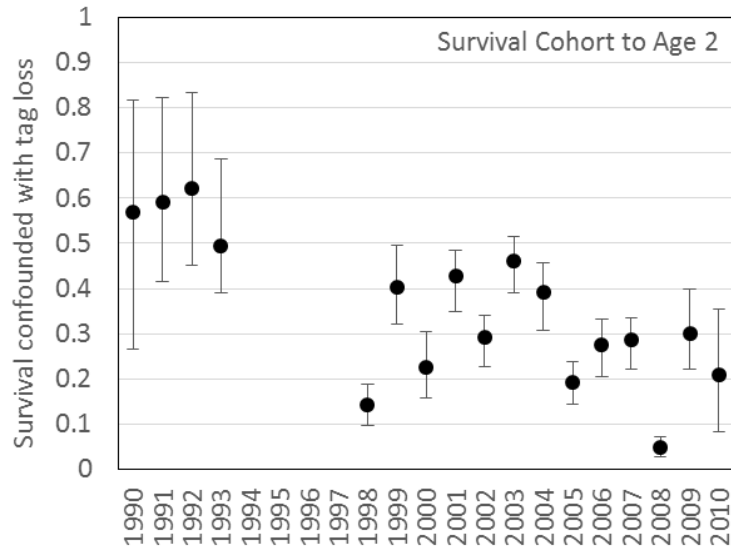
Sandy Bay model (run 8) – parameter correlation analysis
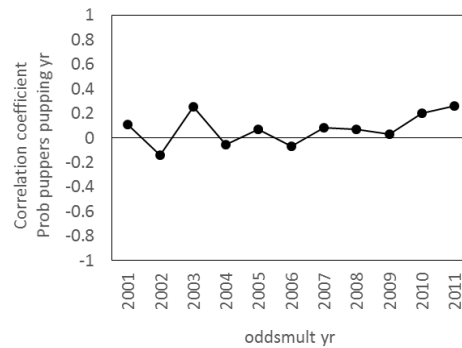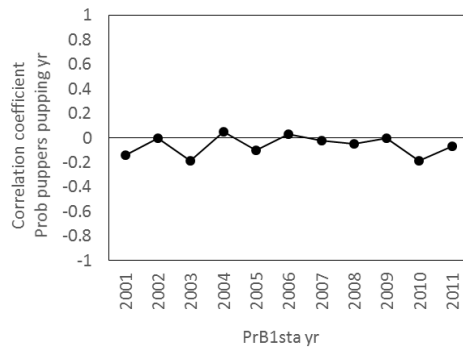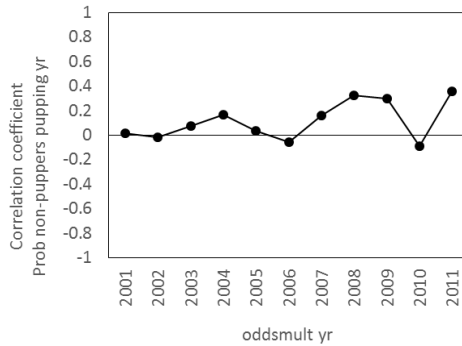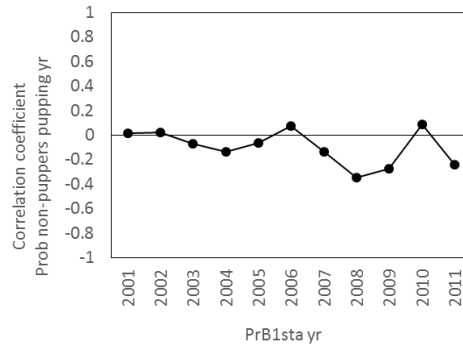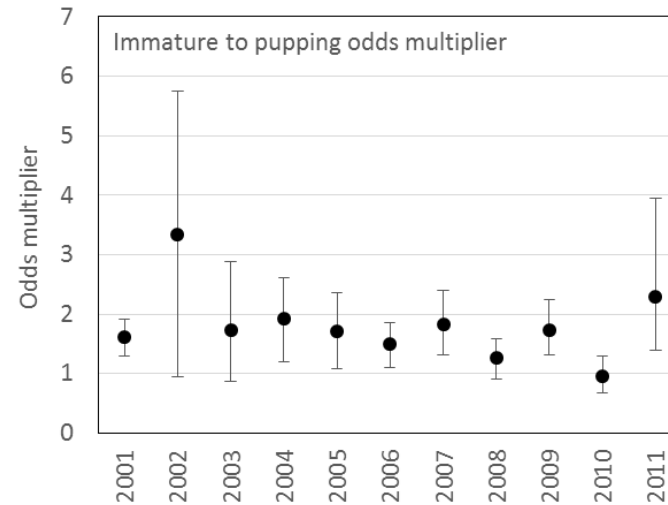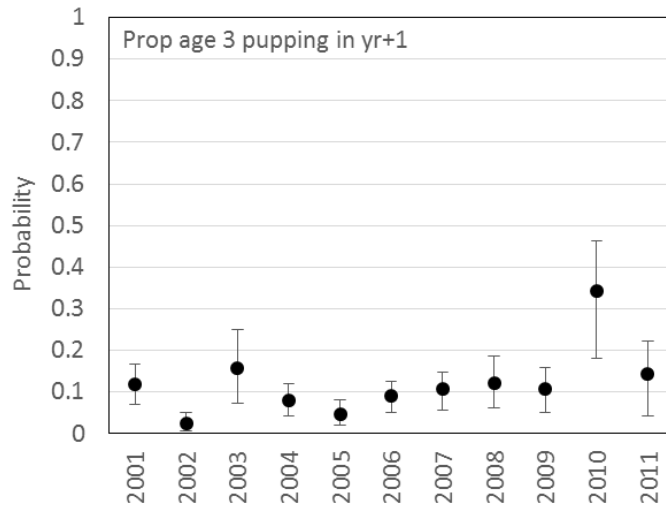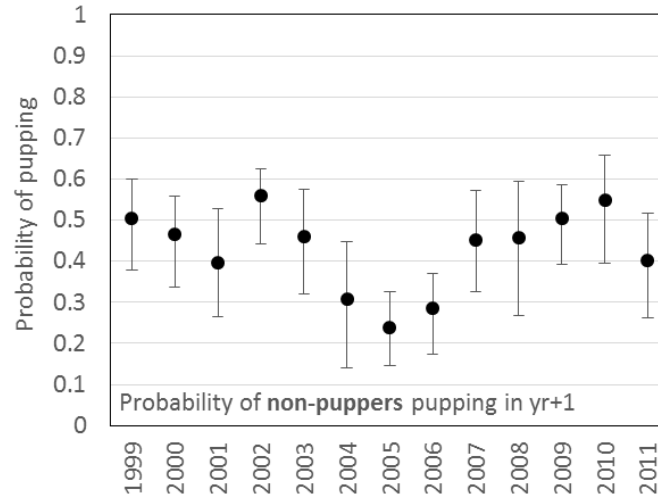
Parameter estimates
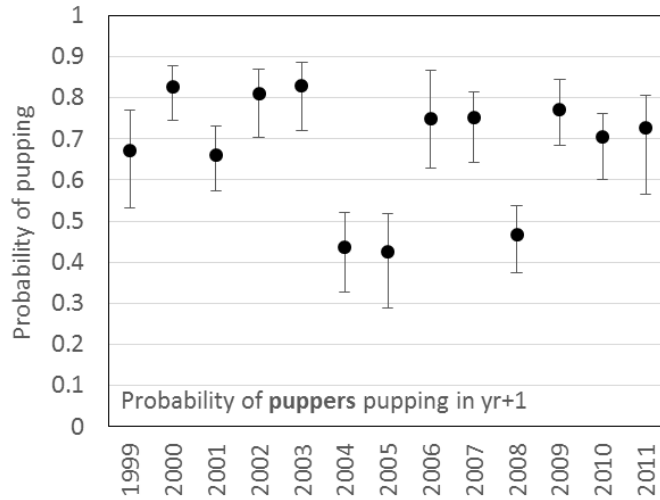# Sandy Bay model (run 8)

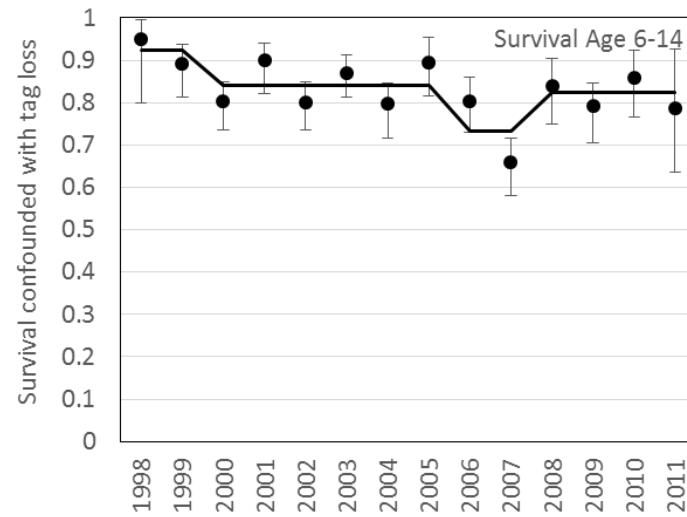# Survival estimates Sandy Bay (model run 8)

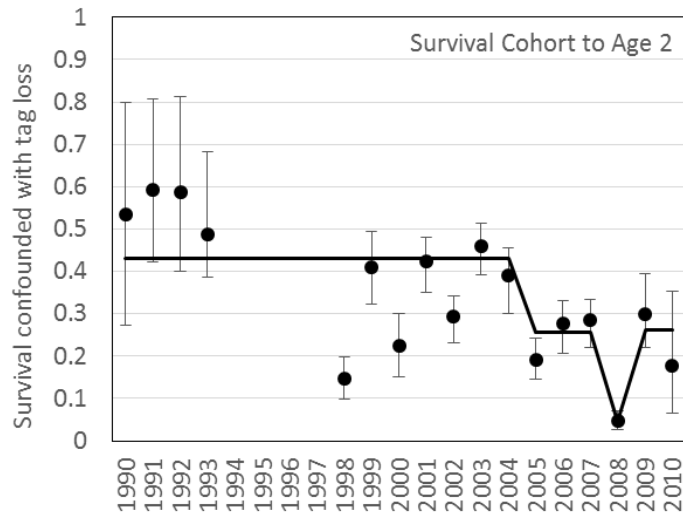# Survival estimates Sandy Bay (model run 8)

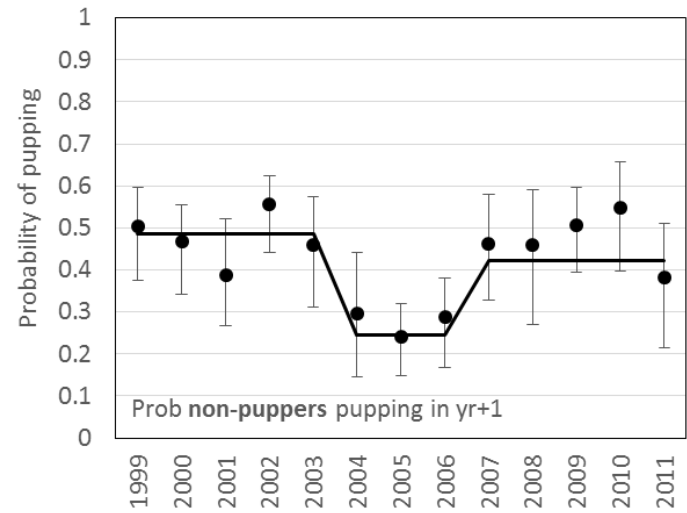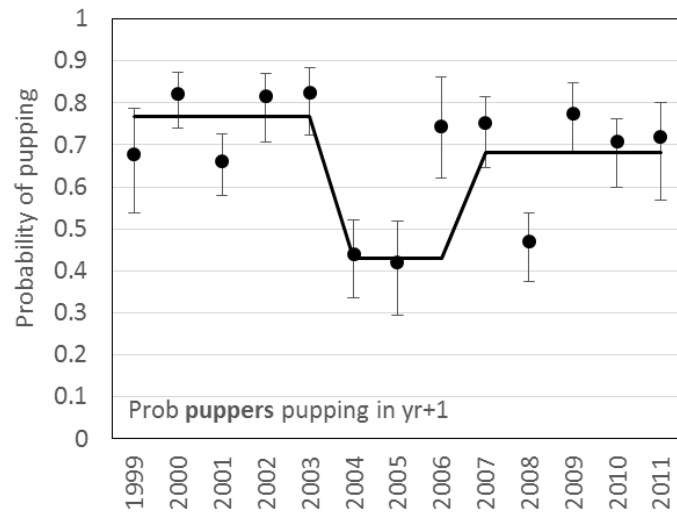# Pupping estimates Sandy Bay (model run 8)

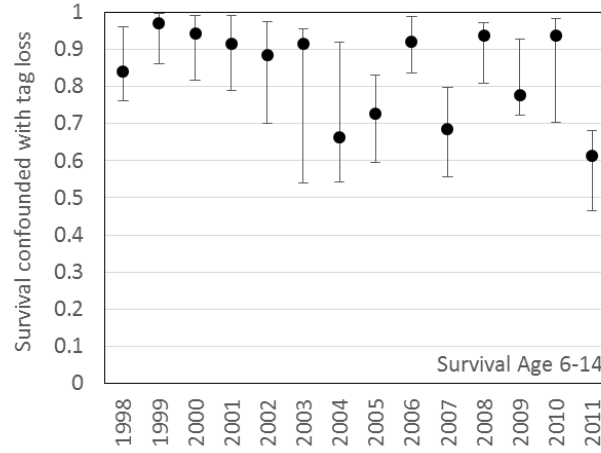# Breakpoint analysis
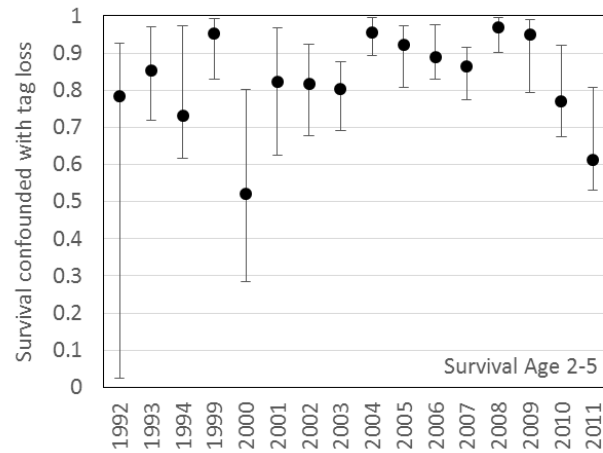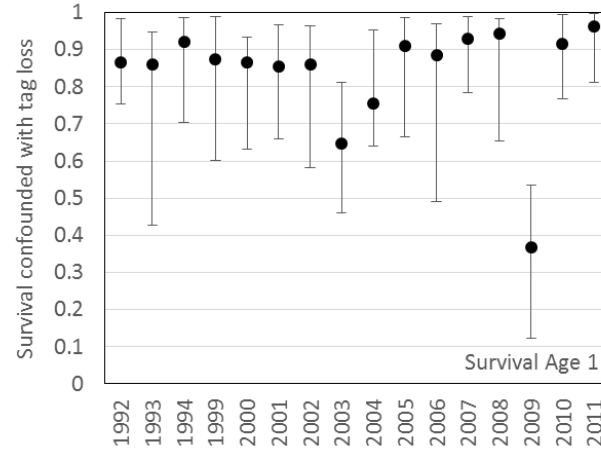# Sandy Bay model (run 8)
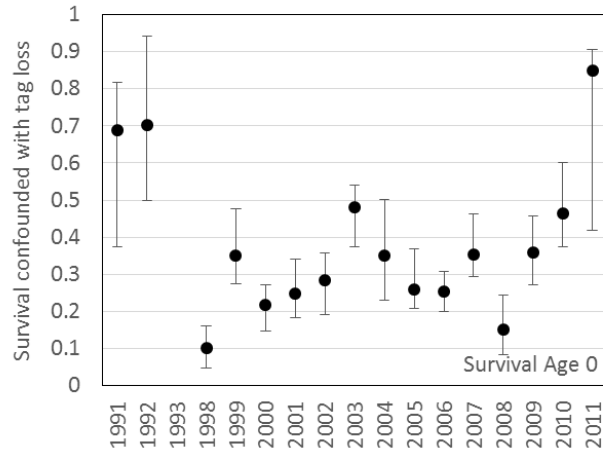
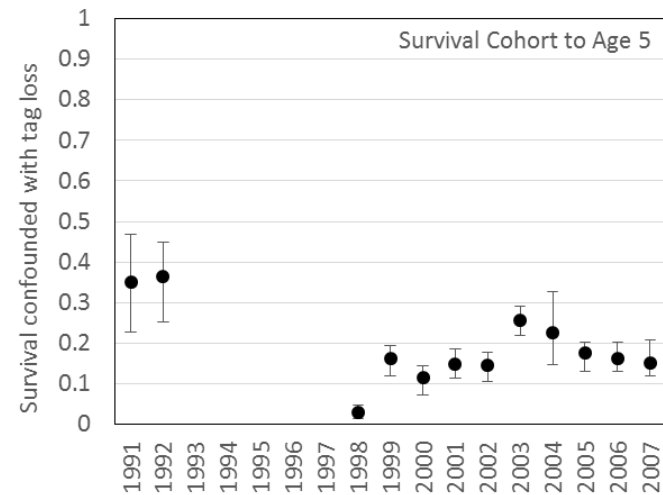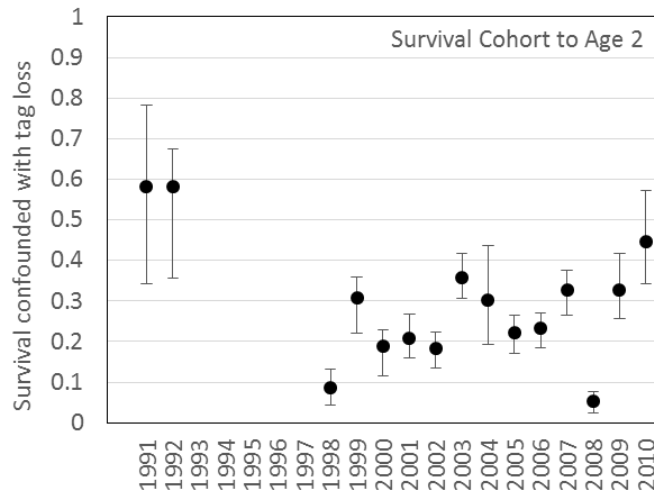# Breakpoint survival Sandy Bay (model run 8)

Breakpoint pupping Sandy Bay (model run 8)

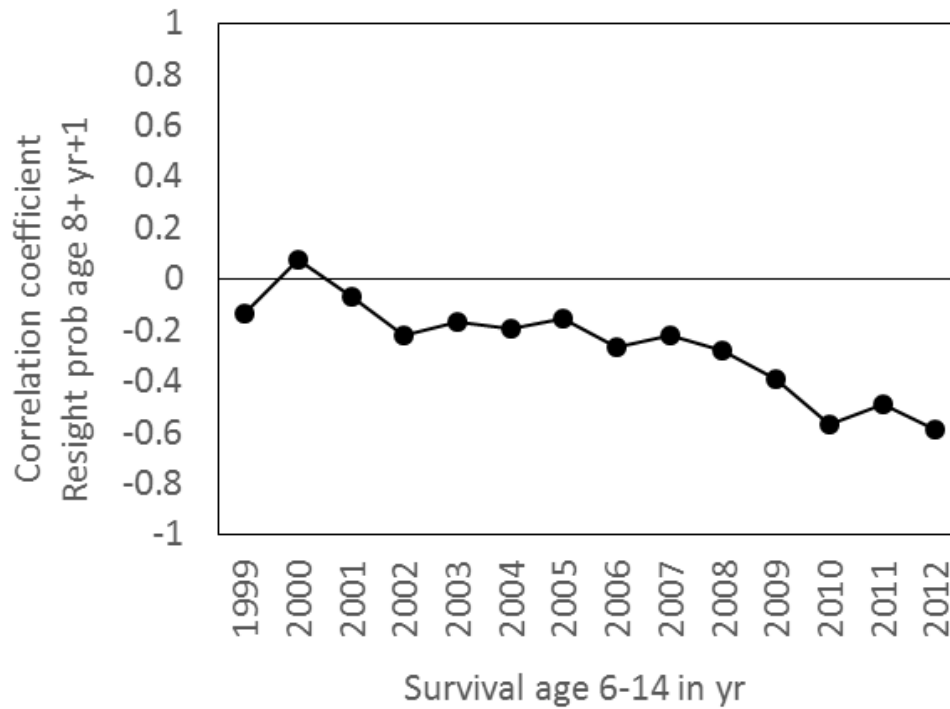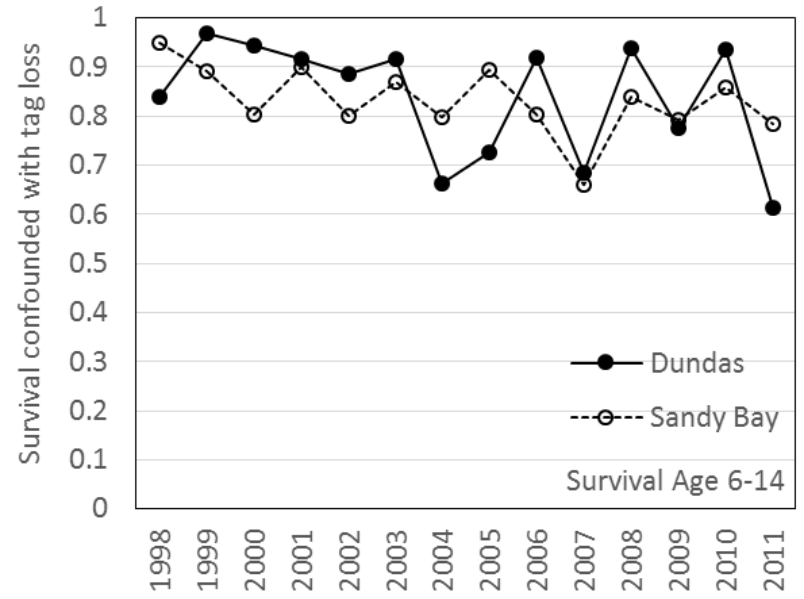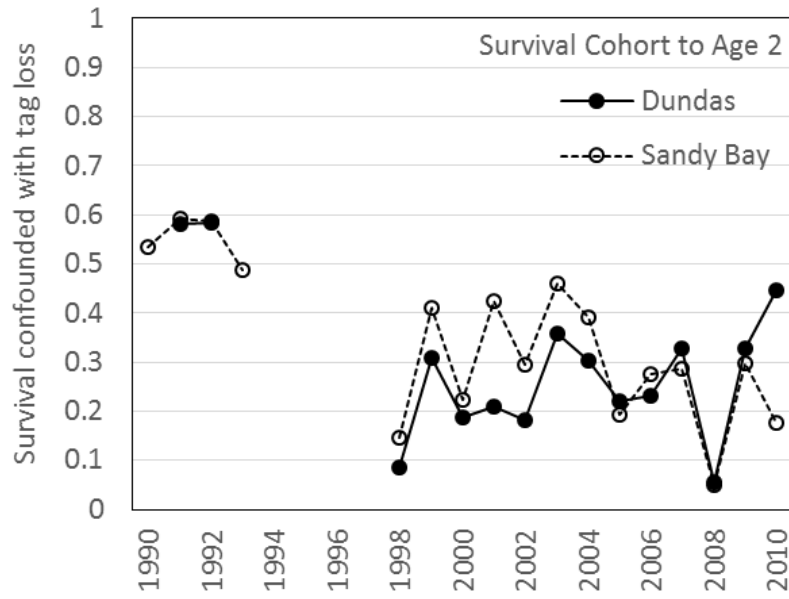Dundas model (run 9)

Survival estimates Dundas (model run 9)

Survival estimates Dundas (model run 9)

Parameter correlation
Dundas model (run 9)

Dundas v Sandy Bay

Summary

Sandy Bay model

- Change in parameterisation to deal with weakly identifiable parameters

- Cohorts born 1991-1993 likely to be relatively strong

- Breakpoint analysis

  - low pup/yearling survival 2005 to 2010

  - Higher adult survival 1998 to 1999; low adult survival 2006 to 2007

  - Low pupping rate 2005 to 2006

- Estimates carried forward to correlative assessment

Summary

Dundas model

- Similar time series of estimates to Sandy Bay

- Parameter correlation survival and resighting probability

- Dundas estimates <u>not</u> carried forward to correlative assessment

End of presentation 1