# Comments on DoC CSP Research Advisory Group meeting of 11 March 2014

## Jim Roberts NIWA, Mar 2014

**Summary of meeting notes**

**Suggested research projects:**

- Pup count Auckland Islands; resighting marked animals at the Auckland Islands
- Project(s) to determine diet, causes of mortality, winter variations in the population
- Assess the contribution of different causes of mortality to overall decline
- Pup count at Campbell Island; tracking project at Campbell Island

**Notes from meeting minutes:**

- Linkages between DOC and MPI projects
- Winter v summer diet
- Which aspects of species should be studied to fill current data gaps
- Development of NIWA demographic modelling
- Use of older data
- Effects of human interactions

**Presentation slide notes:**

- Pup count in 2014/15
- Resighting marked animals at the Auckland Islands
- Causes of mortality, diet, winter data
- Assess the contribution of different causes of mortality to overall decline (e.g. Klebsiella infection) and relate to TMP
- Pup count at Campbell Island
- Tracking Campbell Island (NIWA project)

**My comments**

**Mark-resighting at Auckland Islands and Campbell Island**

I strongly agree that pup counts and mark-resighting should continue at the Auckland Islands on an annual basis. For reasons of practicality and safety the largest sub-population at Dundas is subject to much lower resighting effort, though the number of days spent resighting at Dundas (<10 days and often ~5 days) are insufficient to confirm breeding status using strict definitions (minimum of 3 times with pup) for more than a handful of individuals. I think we should consider extending the number of days of resighting at Dundas relative to that at Enderby.

I also strongly agree that a pup census at Campbell Island in 2014/15 would be timely, given that the latest will then be 4 years old and pup mortality has been high in all four censuses conducted since 1997/98.

**Knowledge gaps**

There is no text in the meeting documentation relating directly to the discussion of knowledge gap identification. A comprehensive assessment of knowledge gaps is required (a workshop?) in order to efficiently prioritise field research activities.

I have made a list of key knowledge gaps that have been identified during the DOC NZ sea lion demographic modelling project (POP2012-02).

I. Dundas biology, ecology and population dynamics

Dundas is the largest breeding rookery in terms of pups born though we know much more about the Sandy Bay sub-population. We have estimated similar pup/yearling survival trends though with some differences since 2010 and differences in adult survival trends in the early to mid-2000s[1]. Previous studies have indicated rookery differences in foraging distribution[2] and size at age[3] that point to differences in foraging behaviour and nutritional status. Previous scat and regurgitate sampling has focussed on the Enderby sub-population. Some key questions:

- Which are the key prey species of the Dundas sub-population and is diet composition any different comparing the two largest rookeries of the Auckland Islands? **Collect scats & regurgitates whilst conducting resightings – minimum of 200 scats for 3 years, or indefinitely is preferential, with consistent sampling protocol to that used at Sandy Bay.**
- Is the condition of females at Dundas still below that of the Sandy Bay sub-population and why do we see differences when they occur? **Weigh random sub-sample of lactating females and Sandy Bay and Dundas. These data may already have been collected at Dundas?**
- Are pup mass estimates different from those of Sandy Bay and what are the causes of observed differenced? **Continue pup mass measurements at Sandy Bay and Dundas. Also at Campbell Island. Consider reweights to estimate pup growth rates to compare with estimates from 2001/02 to 2003/04[4].**
- **In addition we need more resighting effort for more accurate estimation of demographic rates at Dundas, particularly pupping rate (already mentioned above).**

II. Causes of low pupping rate

[1] Roberts J, *et al*. (2013) POP2012-02 Milestone 2 Report.
[2] Chilvers *et al*., (2011) Polar Biology 34: 565-574.
[3] Childerhouse SJ, *et al.* (2010) J. Mamm. 91: 165-176.
[4] Chilvers *et al.* (2007) Polar Biology 30: 459-469.

Demographic modelling studies indicate that reproductive rates of NZ sea lions are low for a pinniped species and we don't know why this is occurring. One of the key recommendations coming from the demographic modelling workshops was to investigate the prevalence and causes of skipped pupping.

- What are the proximate causes of low pupping rate (i.e. do they breed then not pup and presumably abort? **Development of demographic modelling assessment**
- Are mothers extending the suckling period to maximise survival of pups born in previous years? **Investigate prevalence of mothers sucking yearlings**
- How is the behaviour of non-pupping individuals different from puppers? **Investigate behaviour of non-pupping females – are they hauling out/copulating at non-breeding rookeries? Might some non-breeding individuals be missed for a number of consecutive years?**

III. Seasonal variation in diet, foraging and bio-energetics

We have a snapshot view of feeding ecology from summer/autumn months. With this incomplete view we do not know which prey species are most important for survival and breeding success.

- What do female sea lions eat in winter/spring? **Continuation of winter scat regurgitate diet study (already done in winter of 2010 and 2011[5])**
- What are the energetic costs of foraging in winter v summer? Previous study using 1996 and 1997 data indicated a switch to benthic foraging in winter months[6]. **Conduct new winter foraging study.**
- What are the energetic costs of lactation during the course of pup development up to the point of weaning? **Monitor milk quality and pup growth up to point of weaning**
- Which are the important prey species and at which time of year is low abundance of key prey most important? **Bioenergetic modelling comparing early and late lactation period and non-lactating females**

IV. Causes of elevated pup/yearling mortality

- Prevalence of bacterial infection and infection-related mortality in different sub-populations, and demographic groupings.
- Causes of infection-related mortality
- Pathway of bacterial infection
- Re-examine/re-analyse historical pup mortality samples/observations to produce consistent time-series of causes of mortality

[5] Lalas C, unpub. data
[6] Chilvers BL et al., (2013) NZ J. Mar. Fresh. Res. 47: 125-138.

- Develop an improved protocol for detecting pup mortality that extends beyond the regular tag-resighting period

V. A number of miscellaneous questions that could be answered with focussed demographic/population modelling studies

- Assess cohort effects on tag loss. **Demographic modelling assessment using PIT tag and branding observations to estimate cohort-specific tag loss rates**
- Pup mass effect on survival rates. **Link pup mass to flipper tag ID and estimate demographic rates for large versus small pups (probable cohort effects)**
- Do some mothers consistently produce pups with a low probability of survival and do they belong to a particular cohort/demographic?
- Male demographic assessment. **Rerun demographic modelling assessment with observations of males tagged as pups. Develop breeding status definitions.**
- What are the population consequences of low pup/yearling survival in recent years? **Simulation modelling study**

VI. Poor understanding of what data have already been collected

There is a generally poor understanding of which data have been collected in the field since 1979/80. Field data are held by a number of different individuals and are not readily available to project researchers:

- **Compile comprehensive list/database of all observational datasets that have been collected at different NZSL colonies;**
- **Compile datasets in single location;**
- **Develop protocol for obtaining access to these datasets**