Avoiding the crowds:

temporal stability of alternate foraging behaviours in adult female Australian sea lions

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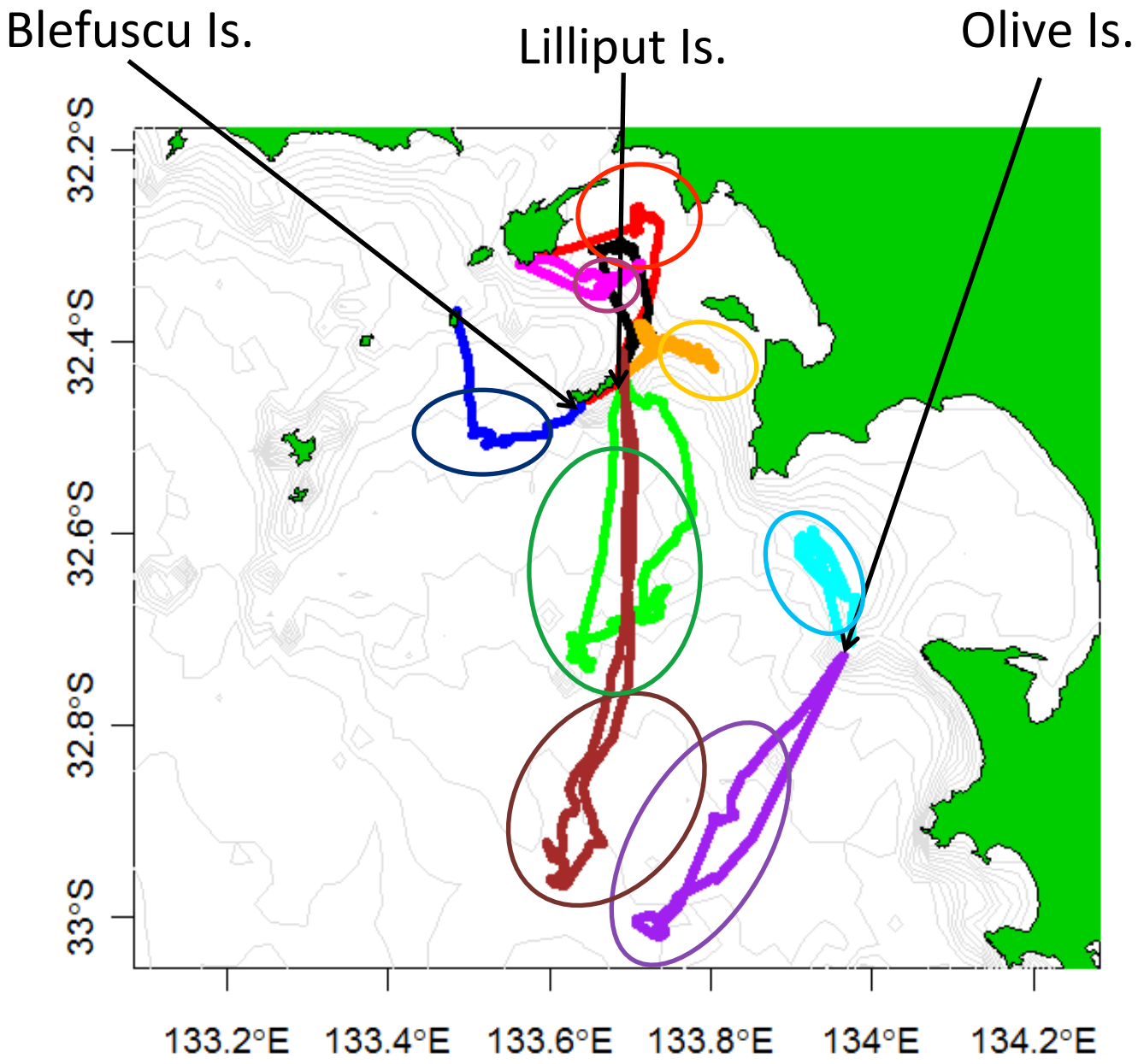
- Endemic to Australia
- Species estimate ~13,000
- Federal Govt listed (2005)
- IUCN Redlist (2008)
- 17-18mth breeding cycle

- Biologging restricted by molt state and migration
- Costly – small sample size
- Population-level inferences ?
- Inter-individual variation


Abrolhos Is.
Western Australia
South Australia
The Pages Is.
YOU ARE HERE
Lilliput Is.
Blefuscu Is.
Olive Is.
West Waldegrave
Liguanea
Seal Slide
The Pages Is.


Blefuscu Is.
Lilliput Is.
Olive Is.
32.2°S
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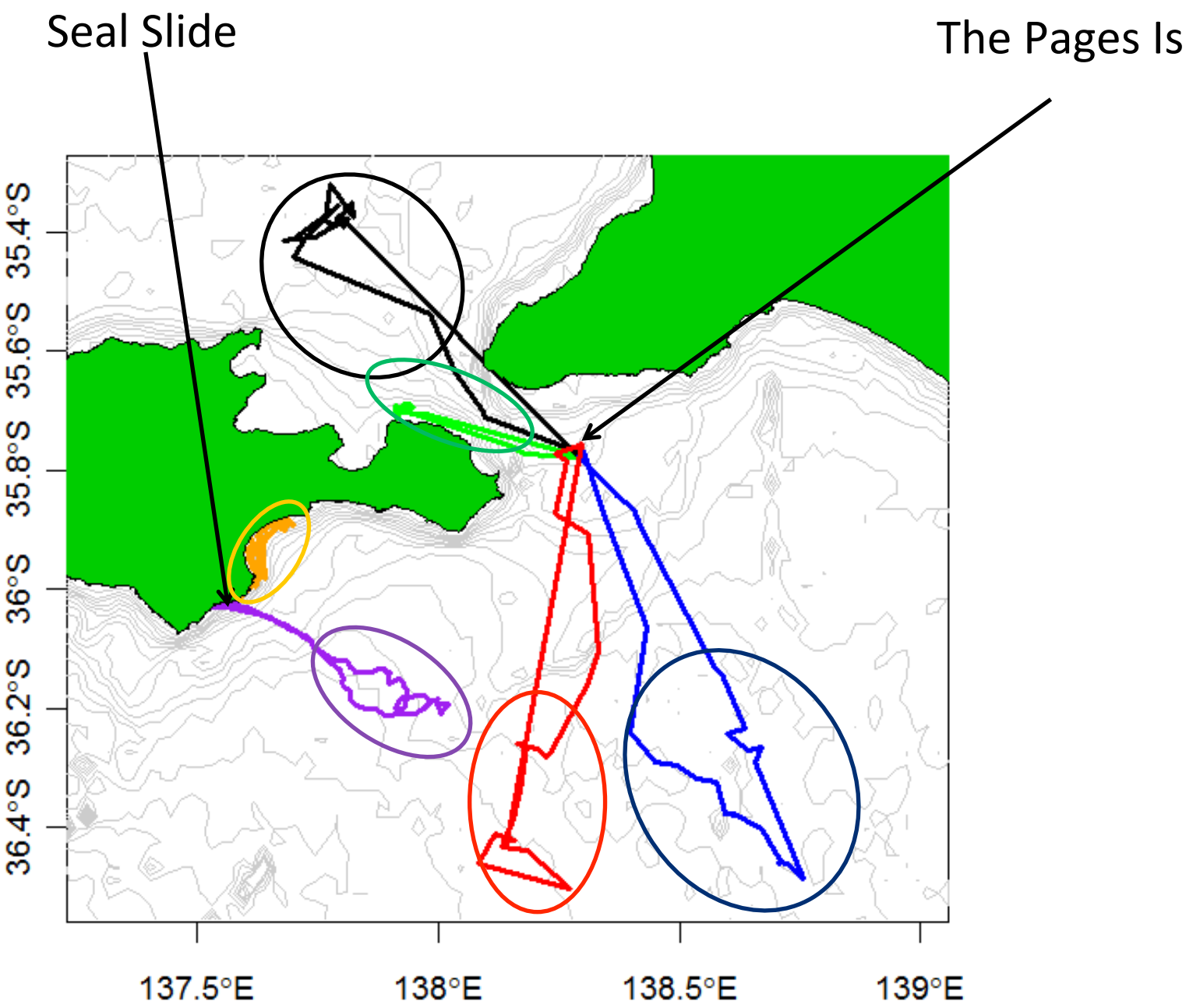
133.8°E
134°E
134.2°E


Seal Slide
The Pages Is
35.4°S
35.6°S
35.8°S
36°S
36.2°S
36.4°S
137.5°E
138°E
138.5°E
139°E

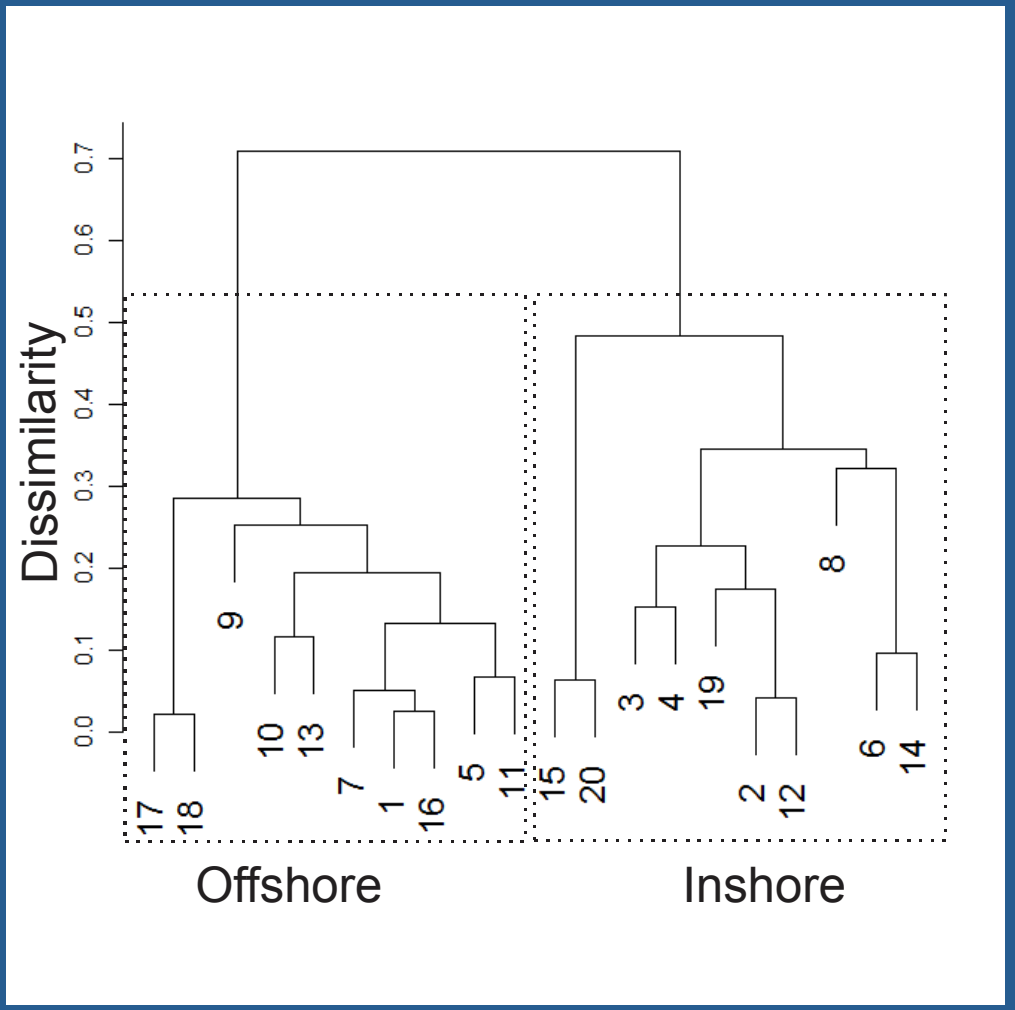
Alternate foraging ecotypes

- Model-based clustering

- Mean parameters across all trips for each individual:

  Distance from mainland at the foraging trip inflection point

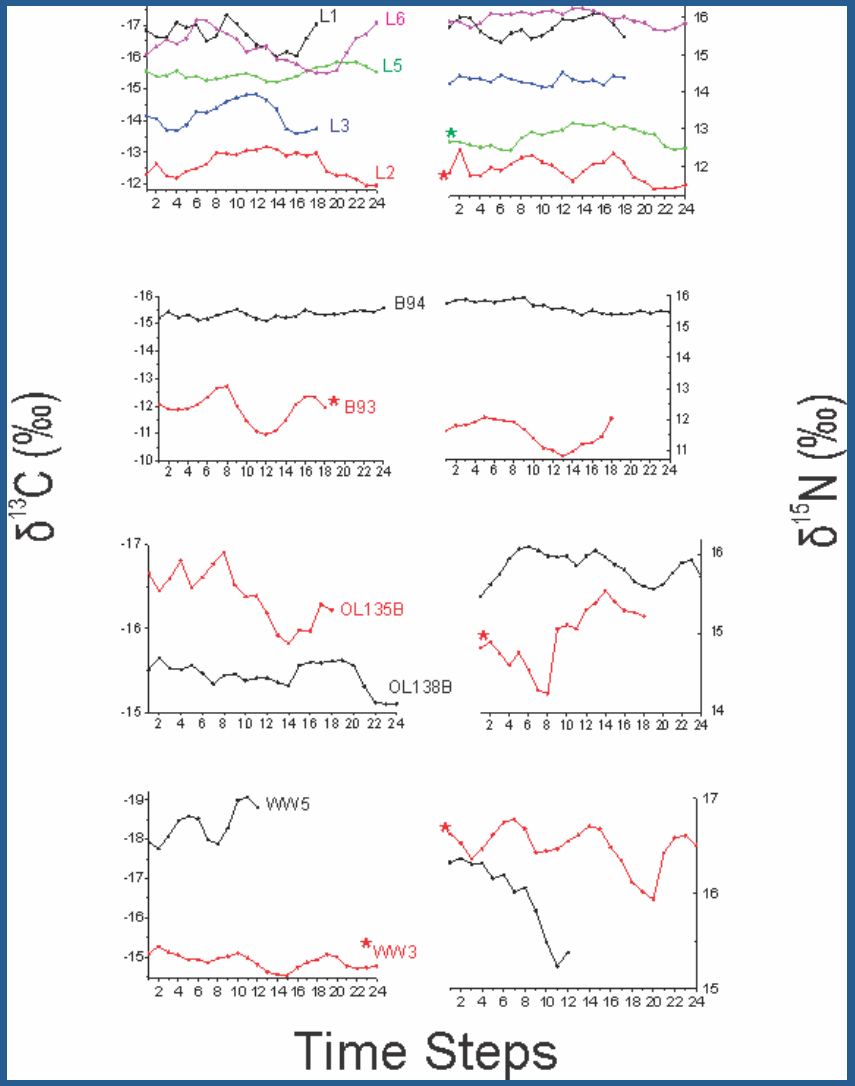
  Dive depth



(Leave-one-out-cross-validated classification certainty <1%)

Q. How stable are these behaviours ?

- Stable Isotopes ($\delta^{13}C$ and $\delta^{15}N$)
- Latitudinal variation = $\delta^{13}C$
- Trophic level of feeding = $\delta^{15}N$
- Adult female whisker segments
- Linear growth (~3mm / month)
- Temporal feeding history (up to 2 yrs)

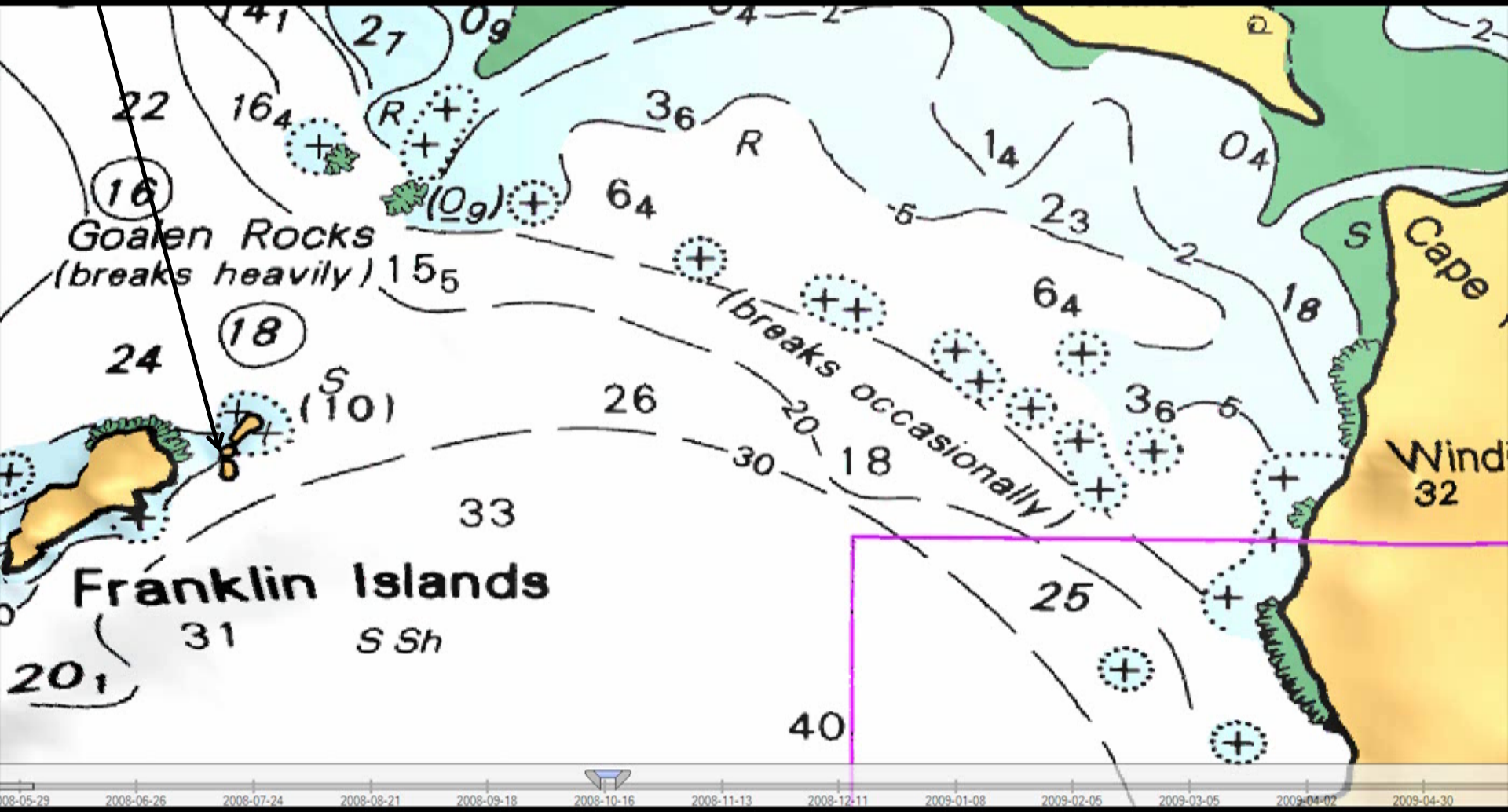


A. Very stable

(possibly the most boring otariid in the world)

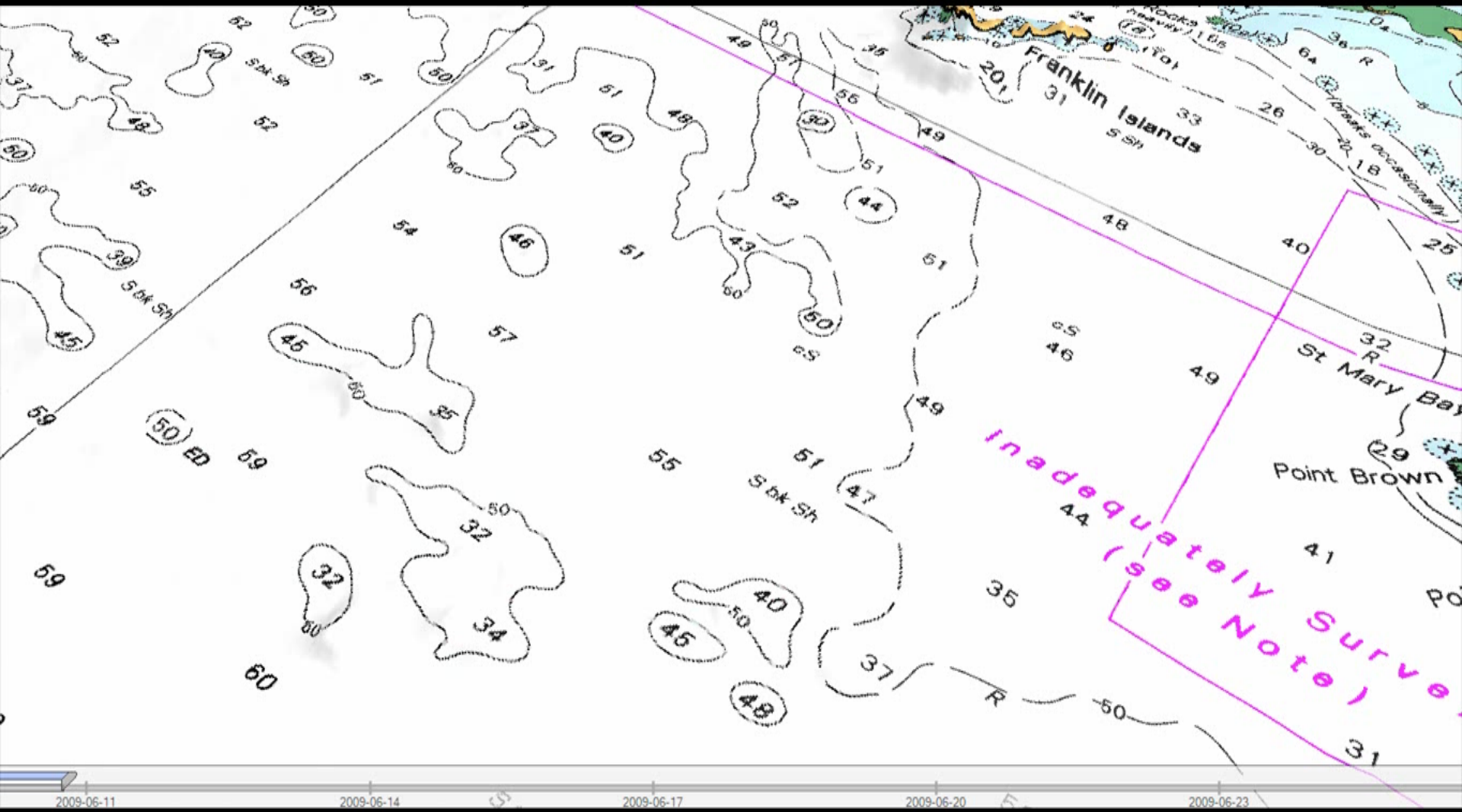
Inshore foraging adult female Australian sea lion

(October 2008 to June 2009)



(This girl hid from me for NINE MONTHS……..)

Offshore foraging adult female Australian sea lion



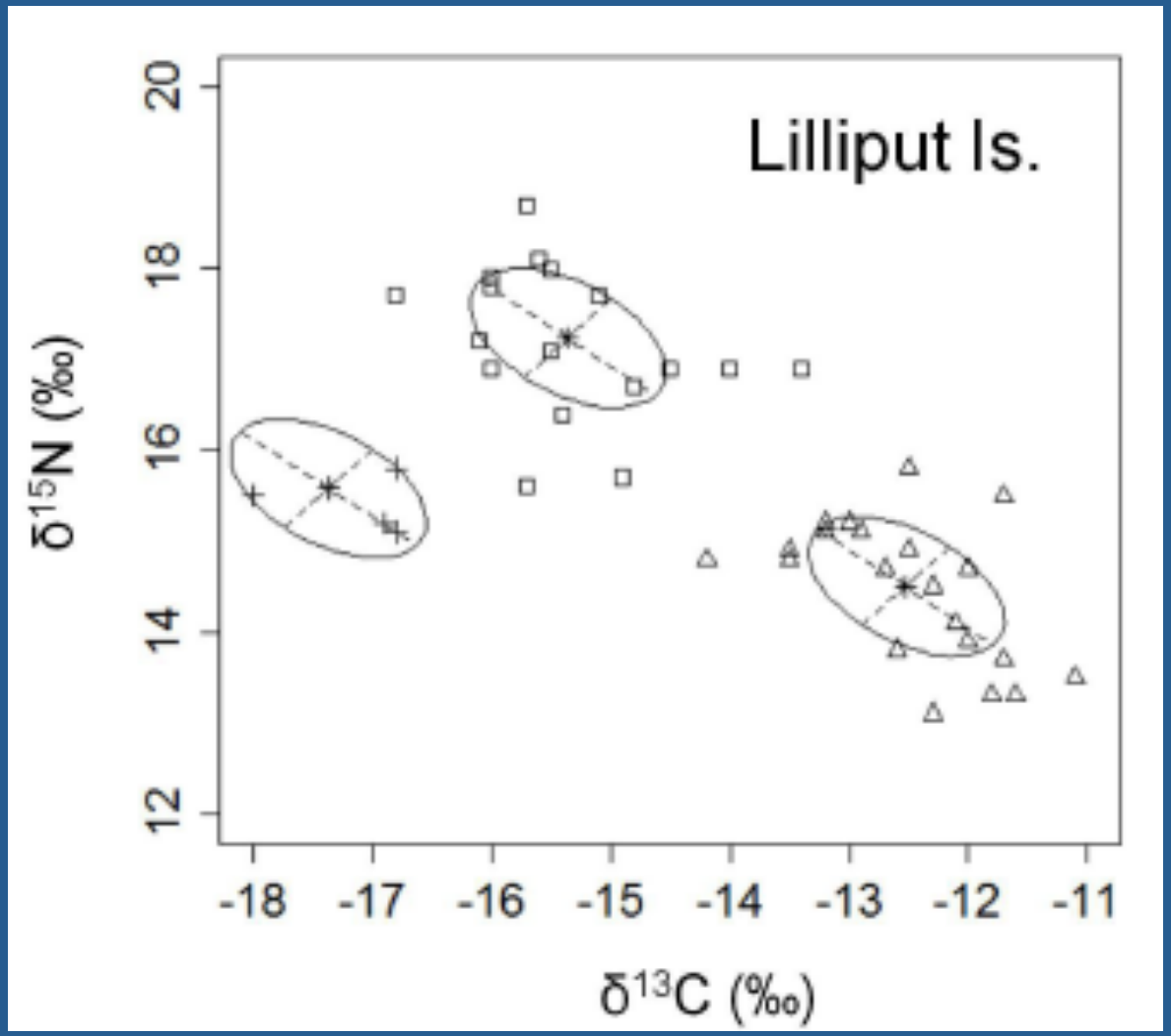
(Two foraging trips over two weeks – Lilliput Is.)

Great, but ……

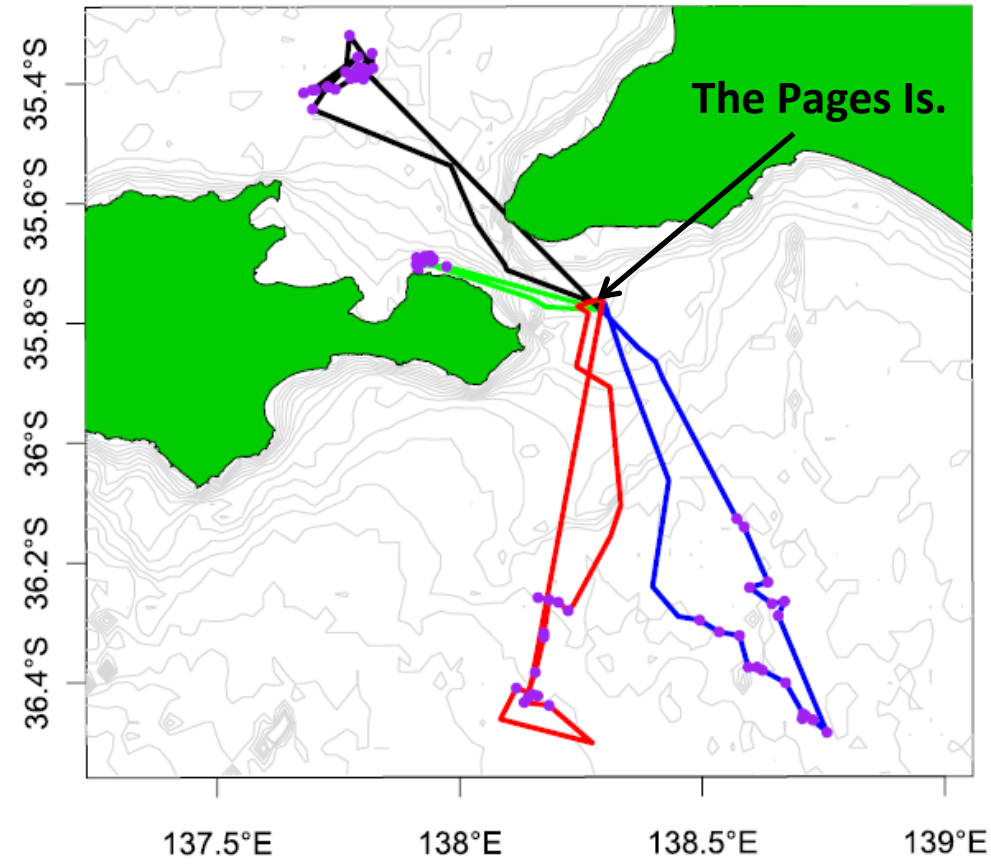
- Telemetry – expensive, limiting, but ‘you know where they are’.
- Inter-individual variation – a sign of evolutionary potential
- Stable isotopes – cost-effective and informative.
- But how……?

Pups – because they love it !

- <60% of all pups born across 16 colonies
- Validated mother-to-pup isotope fractionation values*



*(Lowther & Goldsworthy 2010)


The Pages Is.
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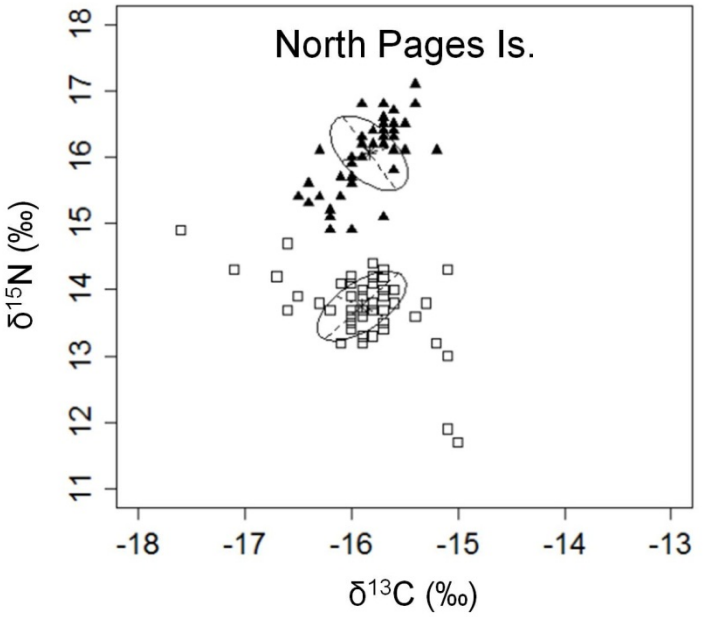
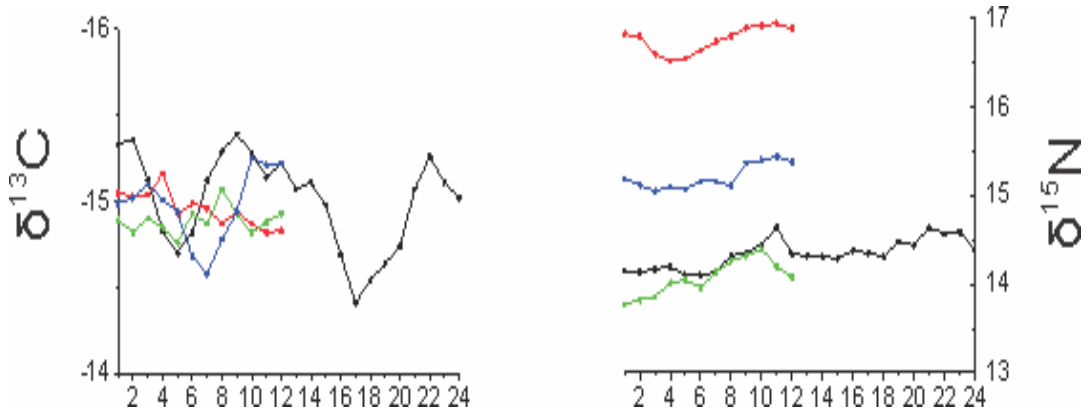
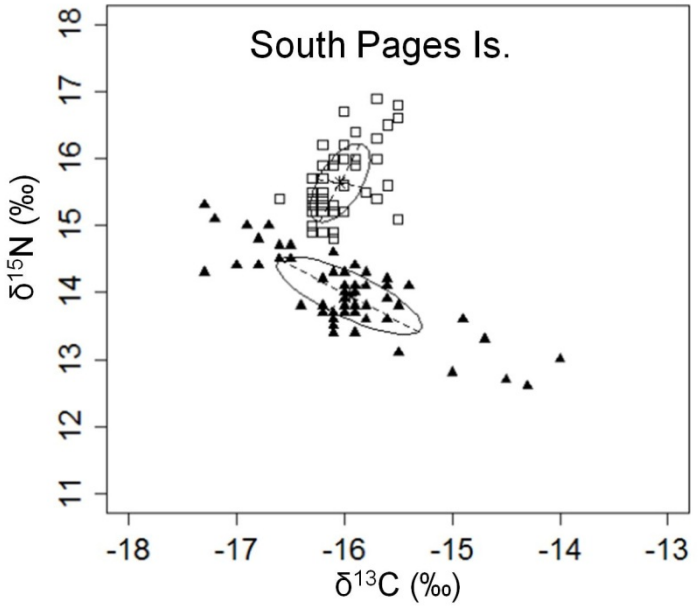
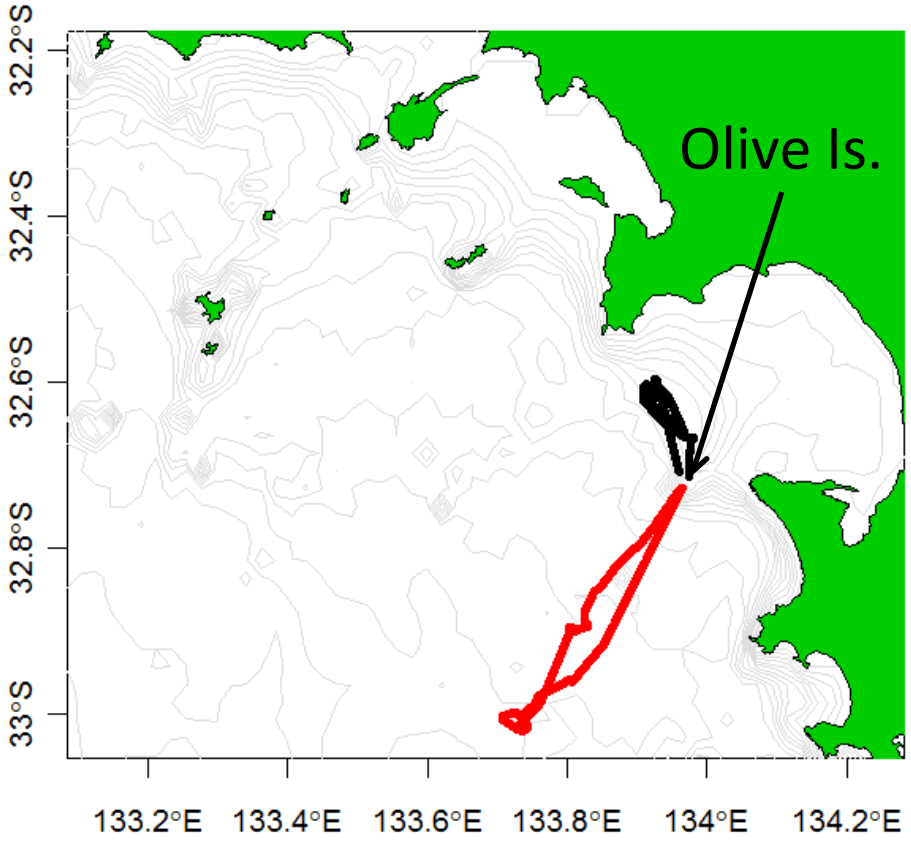
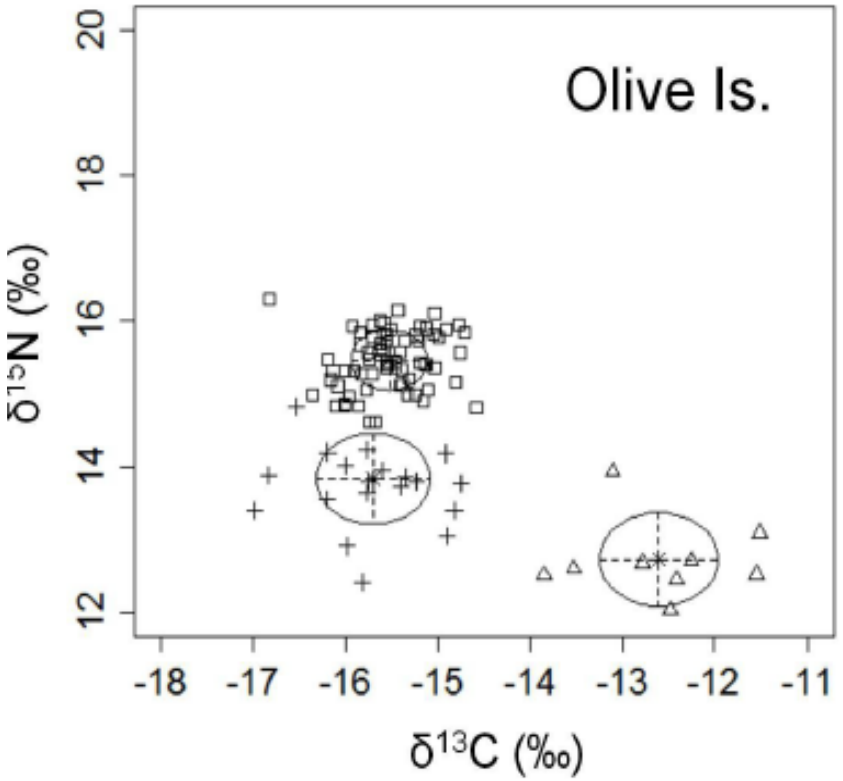
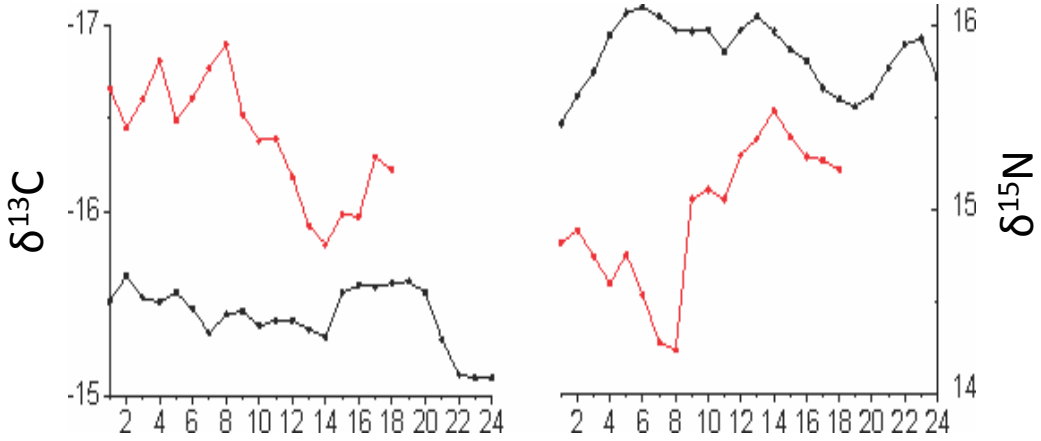

North Pages Is.
δ15N (‰)
δ13C (‰)


δ13C
δ15N
2 4 6 8 10 12 14 16 18 20 22 24


South Pages Is.
δ15N (‰)
δ13C (‰)







- Targeted tracking

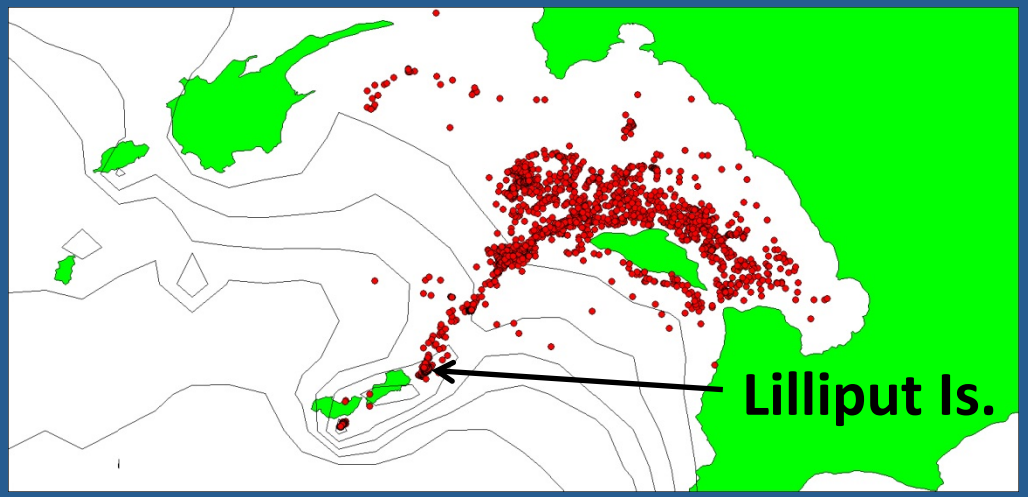
Anything else ?

- Ontogeny – when do these behaviours develop ?

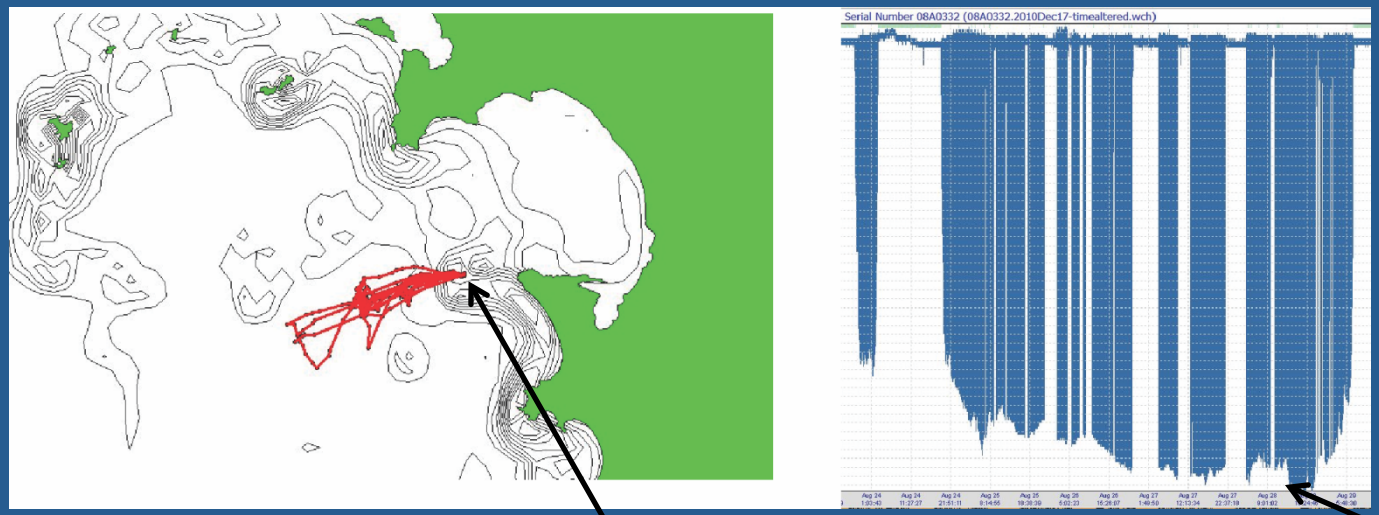
10 month-old pup

(nobody gets left out)

10 months tracking to two months post-weaning

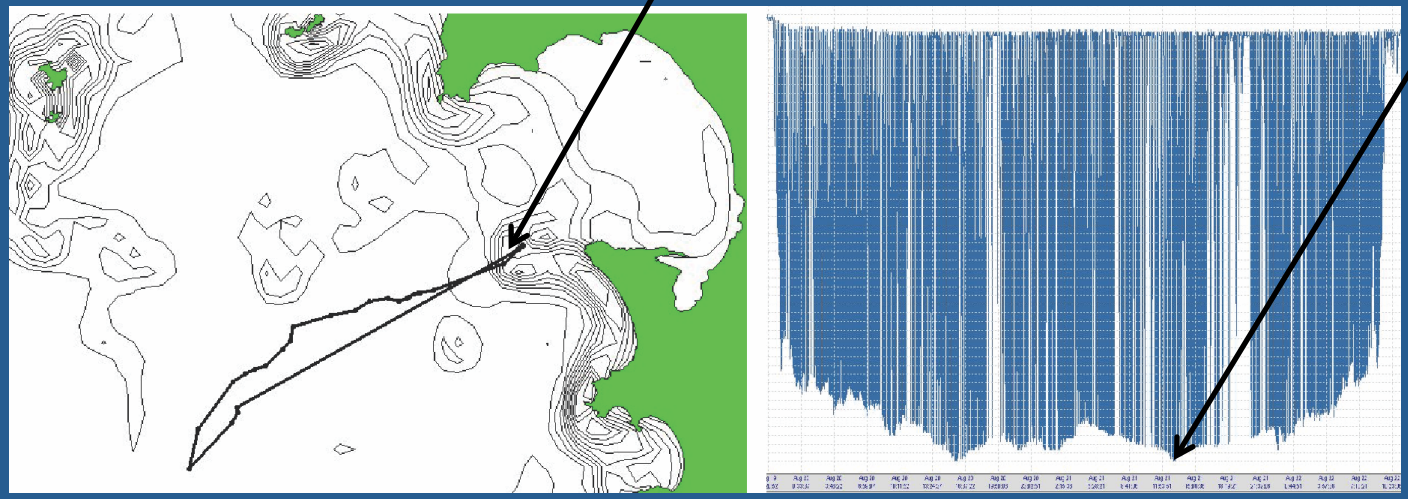


Weaners - they go offshore too !



Olive Island

~75 metres



Conclusions

- Biologging technology is extremely accurate
- Synergistic with biogeochemistry
- The ‘C’ word…… (climate change)
- Inter-individual variation -> evolutionary potential
- Repeatable and cost-effective
- Population-level inferences

Acknowledgments

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- South Australian Department for Environment and Heritage

Any questions ?