



# Assessment of Potential Food Limitation in Resident Killer Whales: How, When and Where



John Ford

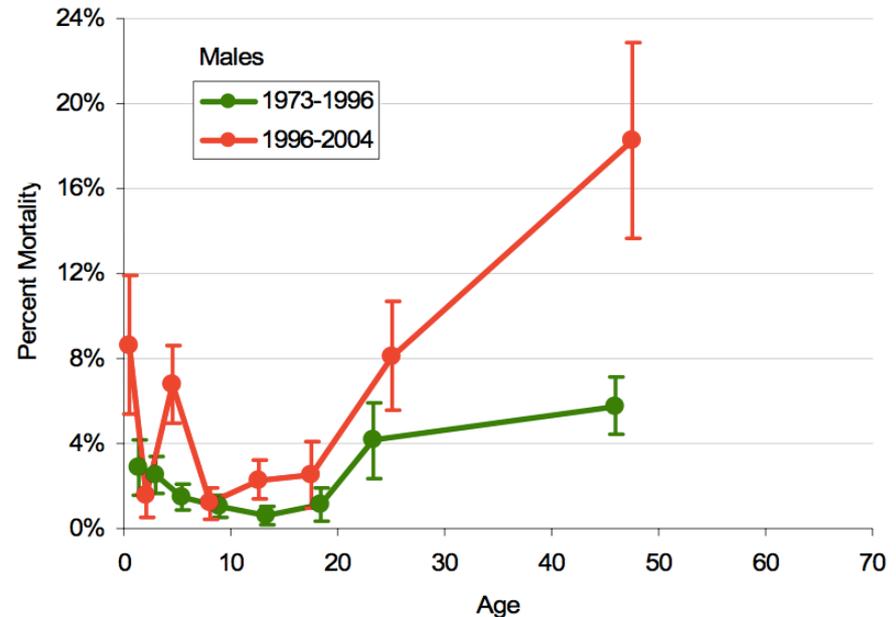
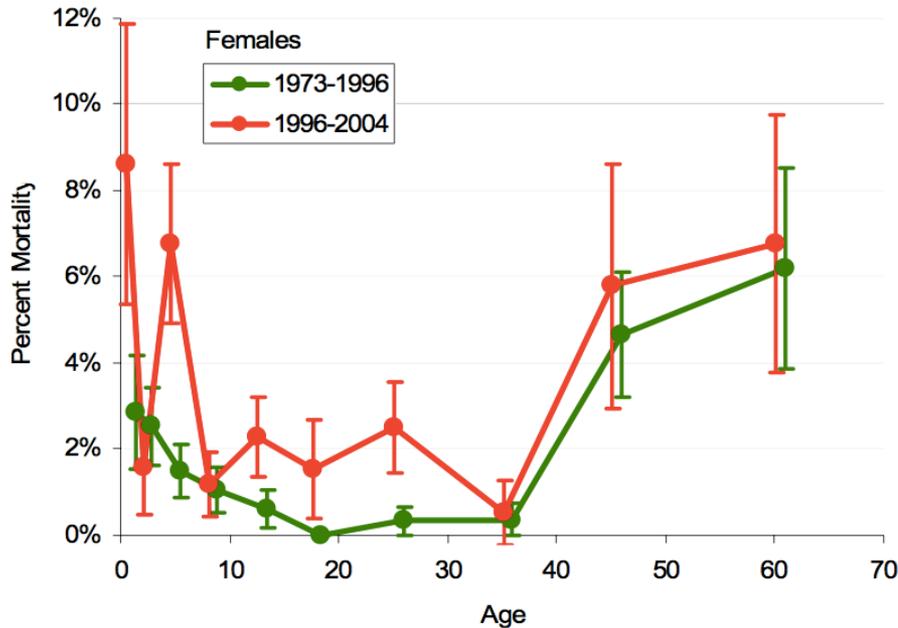
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# Potential indicators of food limitation/nutritional stress

- Population dynamics

- broad changes in survival and fecundity
- changes in other vital rates, e.g. calving interval, age at maturity, longevity



# Potential indicators of food limitation/nutritional stress

- Physical/physiological
  - changes in body growth rates
  - seasonal changes in condition (e.g. girth, 'peanut head' syndrome, through photogrammetry)



Robust



Thin

# Potential indicators of food limitation/nutritional stress

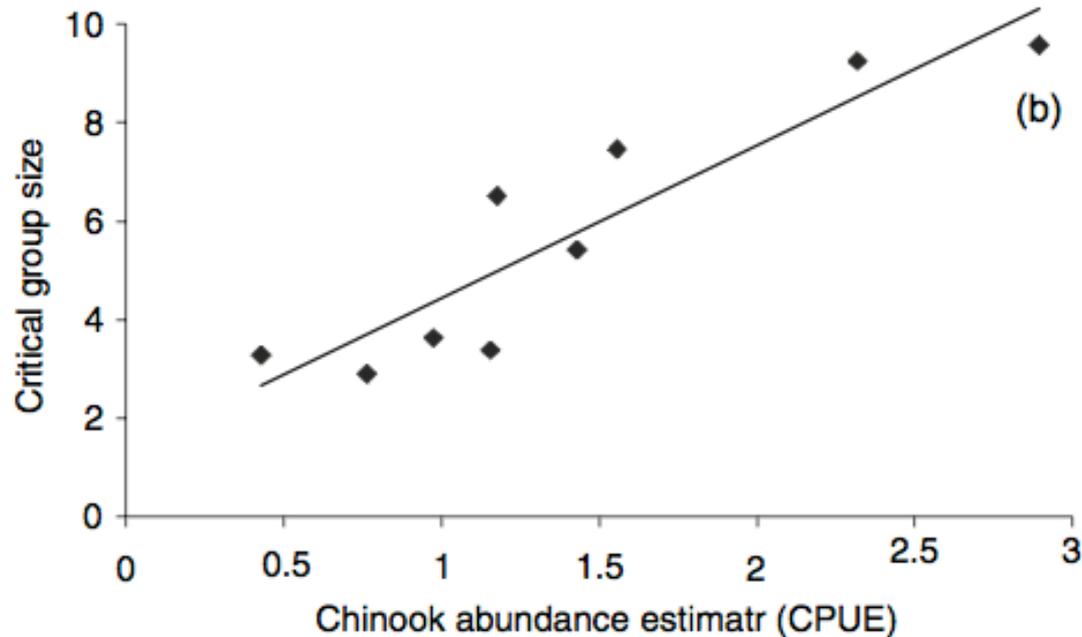
- Physical/physiological cont'd...
  - changes in hormone levels in fecal samples
  - changes in lipid content in blubber
  - genomics/gene expression

# Potential indicators of food limitation/nutritional stress

- Behavioural indicators:
  - activity budget (proportion of time spent foraging, socializing, resting, travelling)
  - movement patterns (frequency and duration of excursions outside of regular feeding areas)
  - dispersion (increase when prey density is low)
  - association strength or group size
  - foraging success (lower CPUE when prey availability low)
  - prey switching (increased predation on alternative prey if Chinook density low)
  - depredation levels

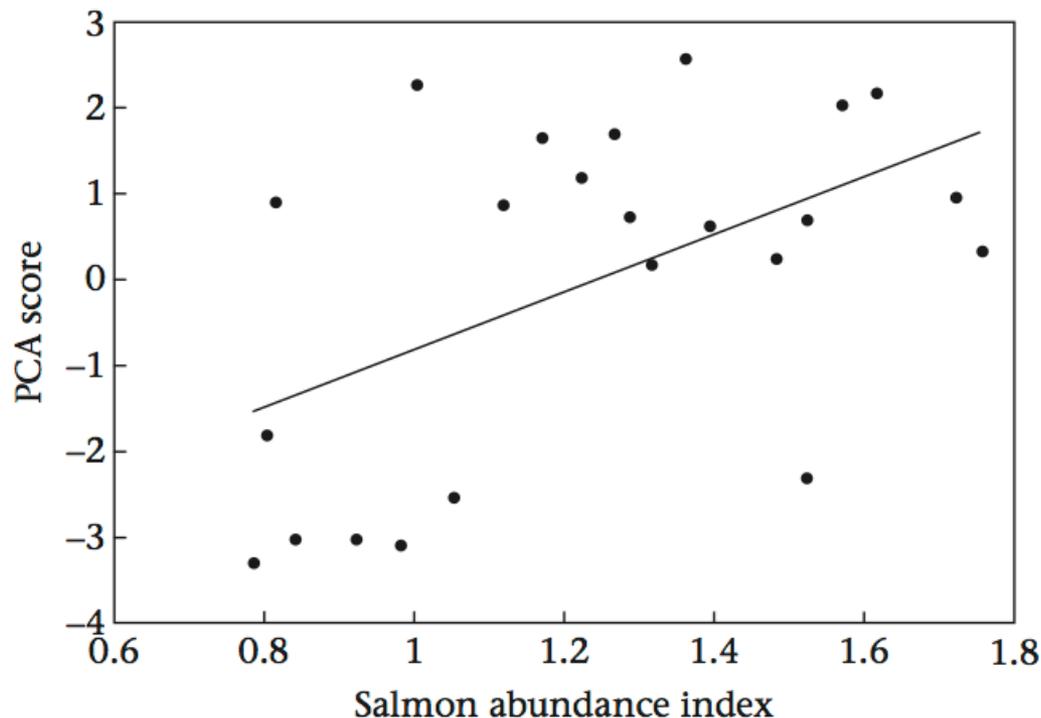
# Social dynamics vary with Chinook abundance

Lusseau et al. (2004) found a significant relationship between 'critical group size' and Chinook CPUE (test fishery) in Johnstone Strait, 1995-2003



# Social dynamics vary with Chinook abundance

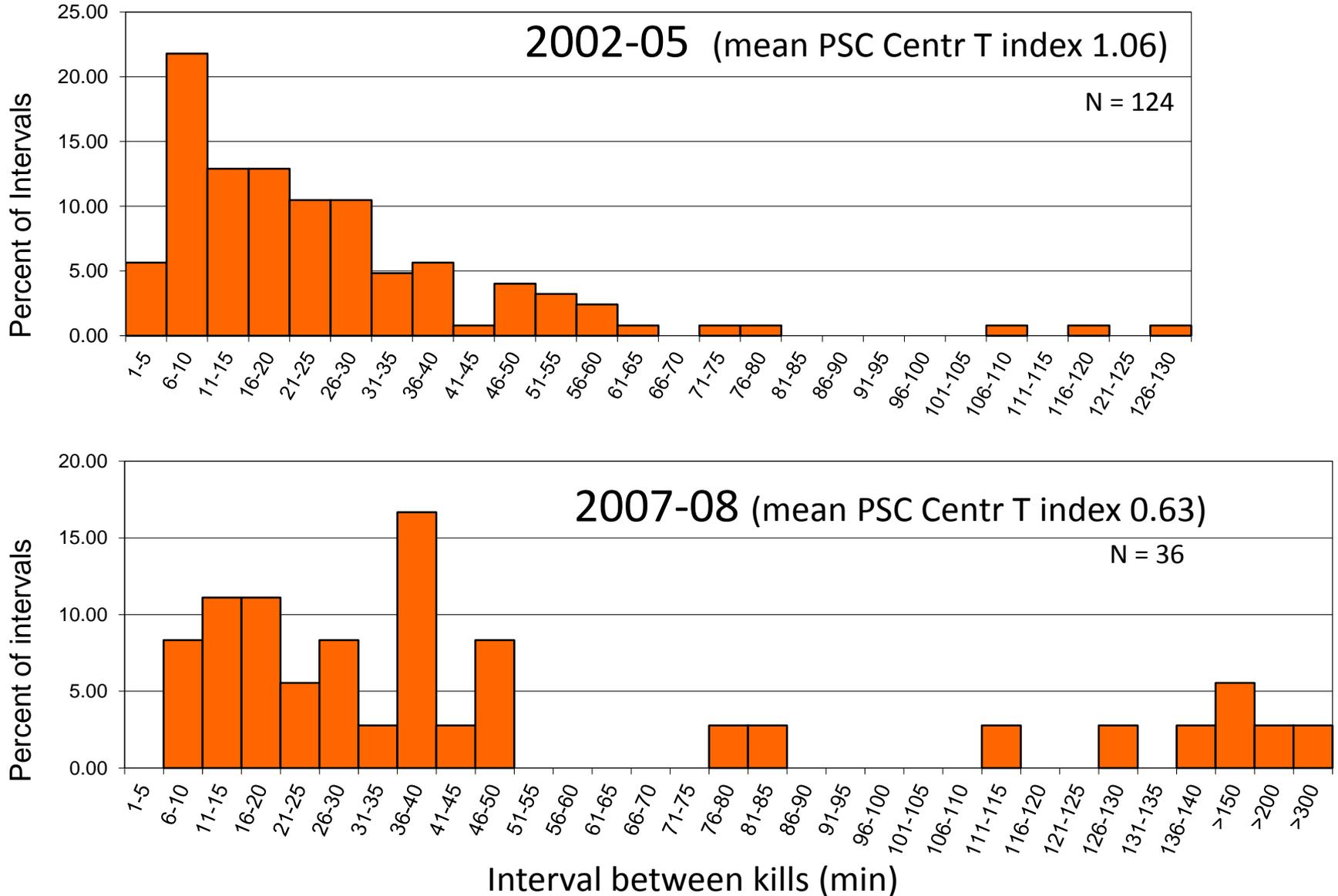
Foster et al. (in press) found social bond strength (greater cluster coefficient, group size) in SRKW's increased with Chinook abundance (aggregate PSC index), 1984-2006



Foster, E. A., et al., in press. Social network correlates of food availability in an endangered population of killer whales, *Orcinus orca*, *Animal Behaviour* (2012), doi:10.1016/j.anbehav.2011.12.021

# Does CPUE vary with Chinook abundance?

Time intervals between kills during foraging bouts by focal NRKW



# Does CPUE vary with Chinook abundance?

	2002-05	2007-08	<i>p</i>
Mean CTC Index for Central BC troll	1.06	0.63	
Mean duration of foraging bout	1.45 h (± 0.43 SE, n = 37)	2.60 h (± 0.48 SE, n = 14)	<i>p</i> < 0.05
Interval between kills	Median = 20 min Mean = 26 min (± 1.8 SE, n = 124)	Median = 37 min Mean = 60 min (± 11.6 SE, n = 36)	<i>p</i> < 0.001
Mean no. of kills/bout	4.35 (± 0.43 SE, n = 37)	3.57 (± 0.37 SE, n = 14)	<i>p</i> = 0.46 (NS)

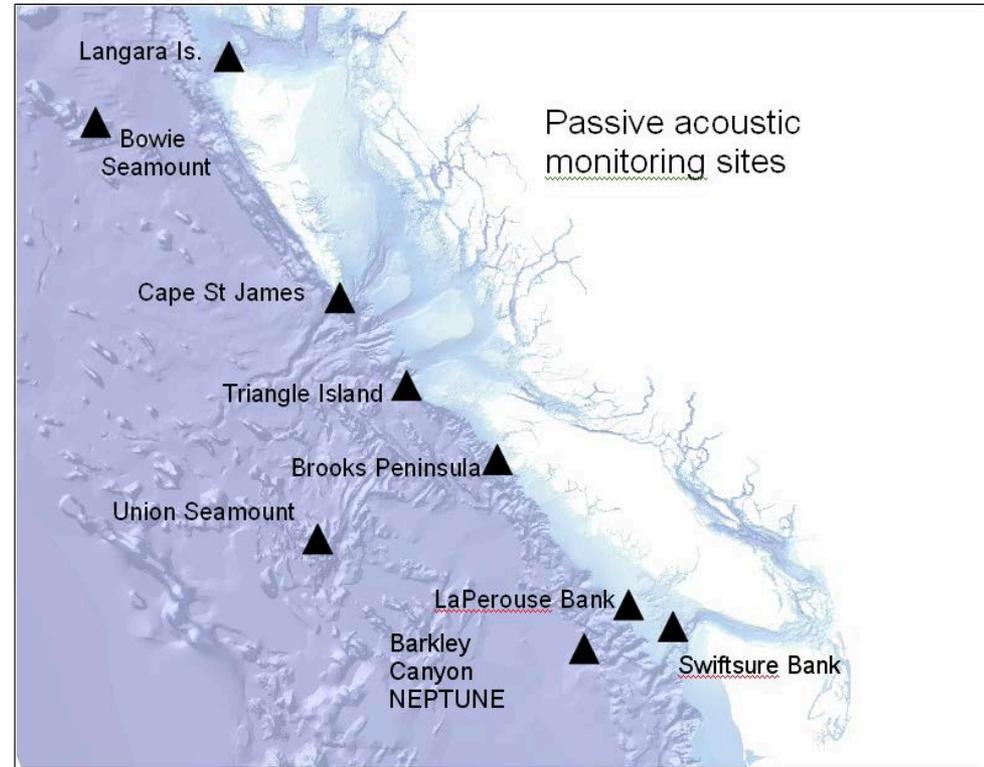
## When might RKW be food limited?

- Chinook densities low in winter, other salmonids not available
- Most likely period for nutritional stress
- Distribution in winter still poorly known



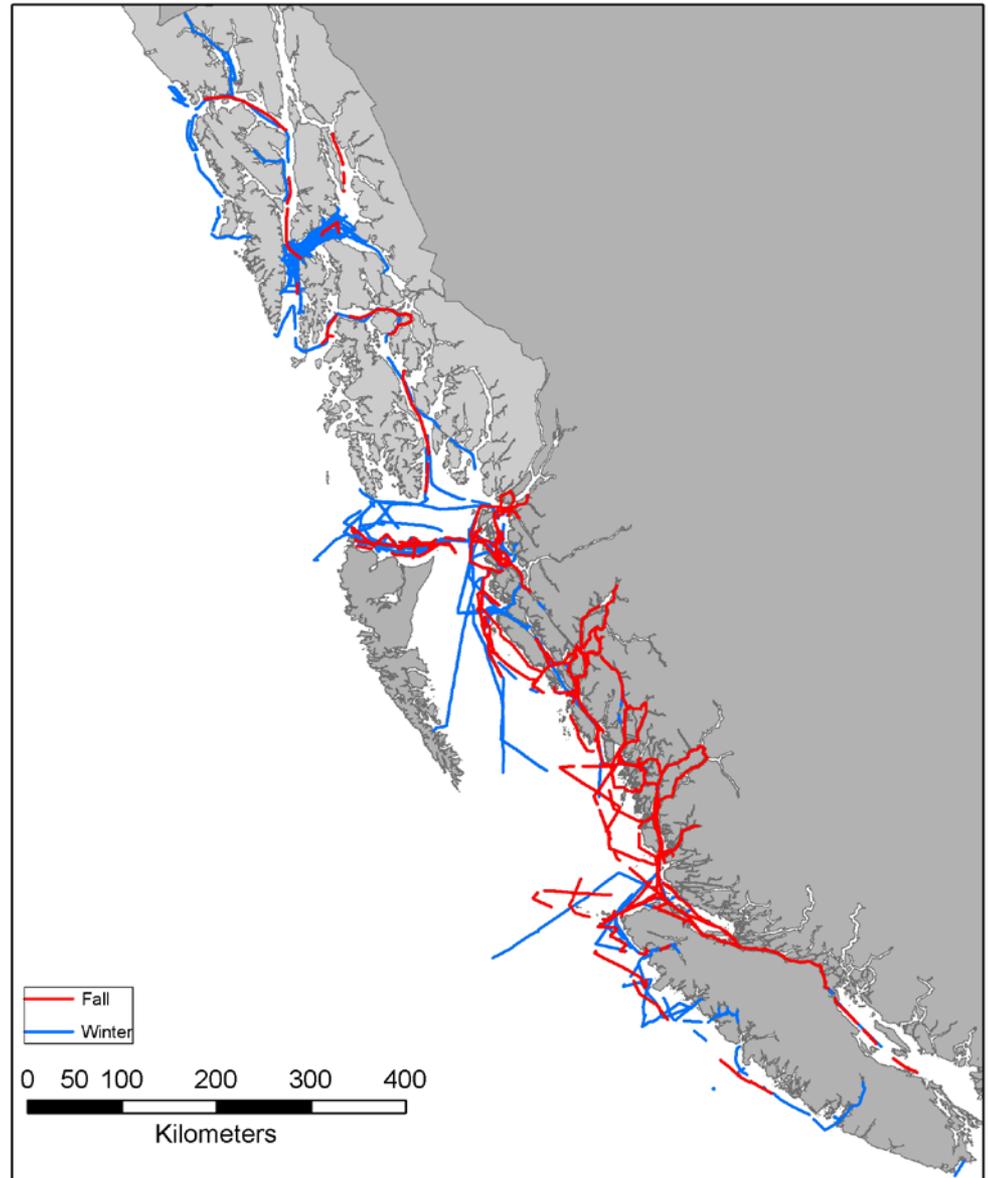
# DFO efforts to study winter occurrence of RKWs

- Passive acoustic monitoring from cabled arrays & moorings

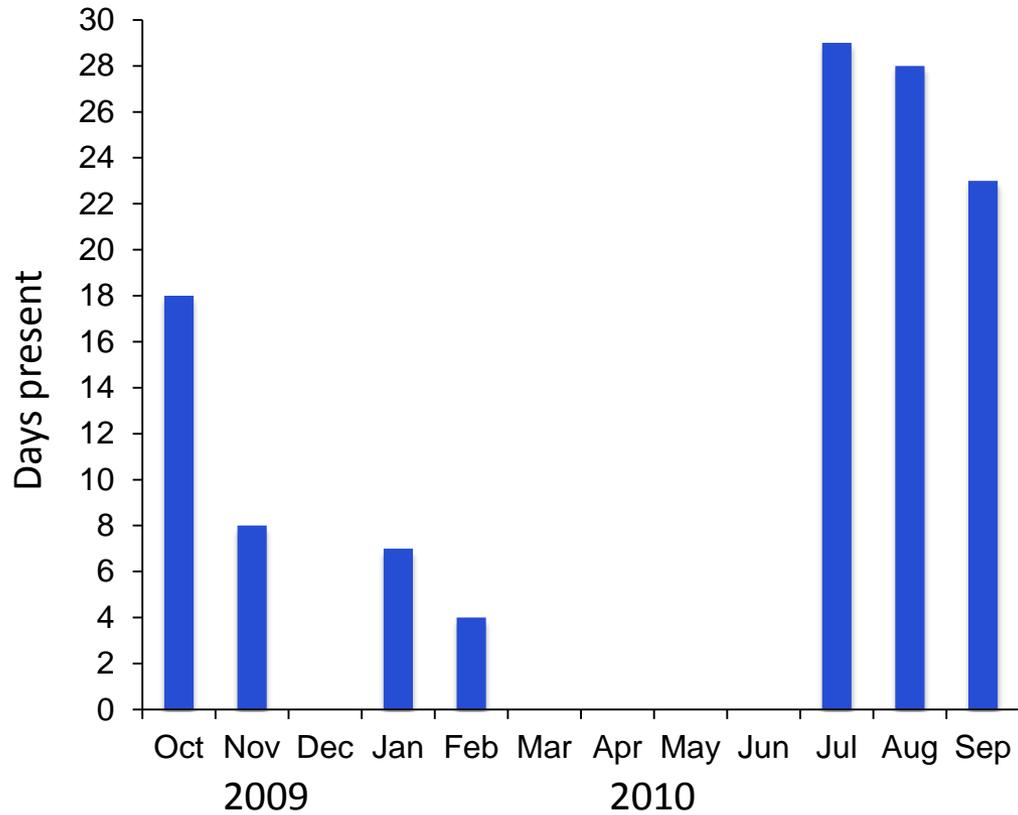


# DFO efforts to study winter occurrence of RKWs

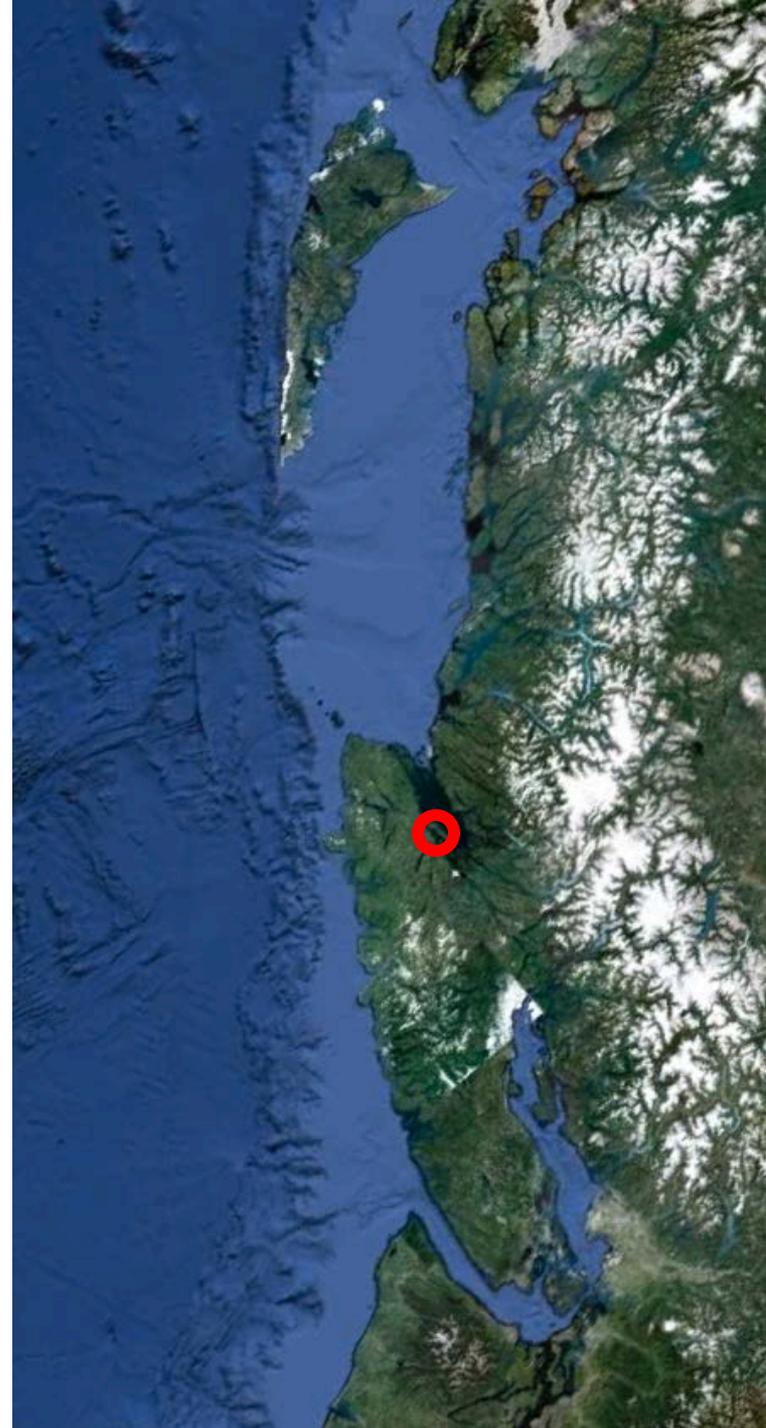
- Ship surveys



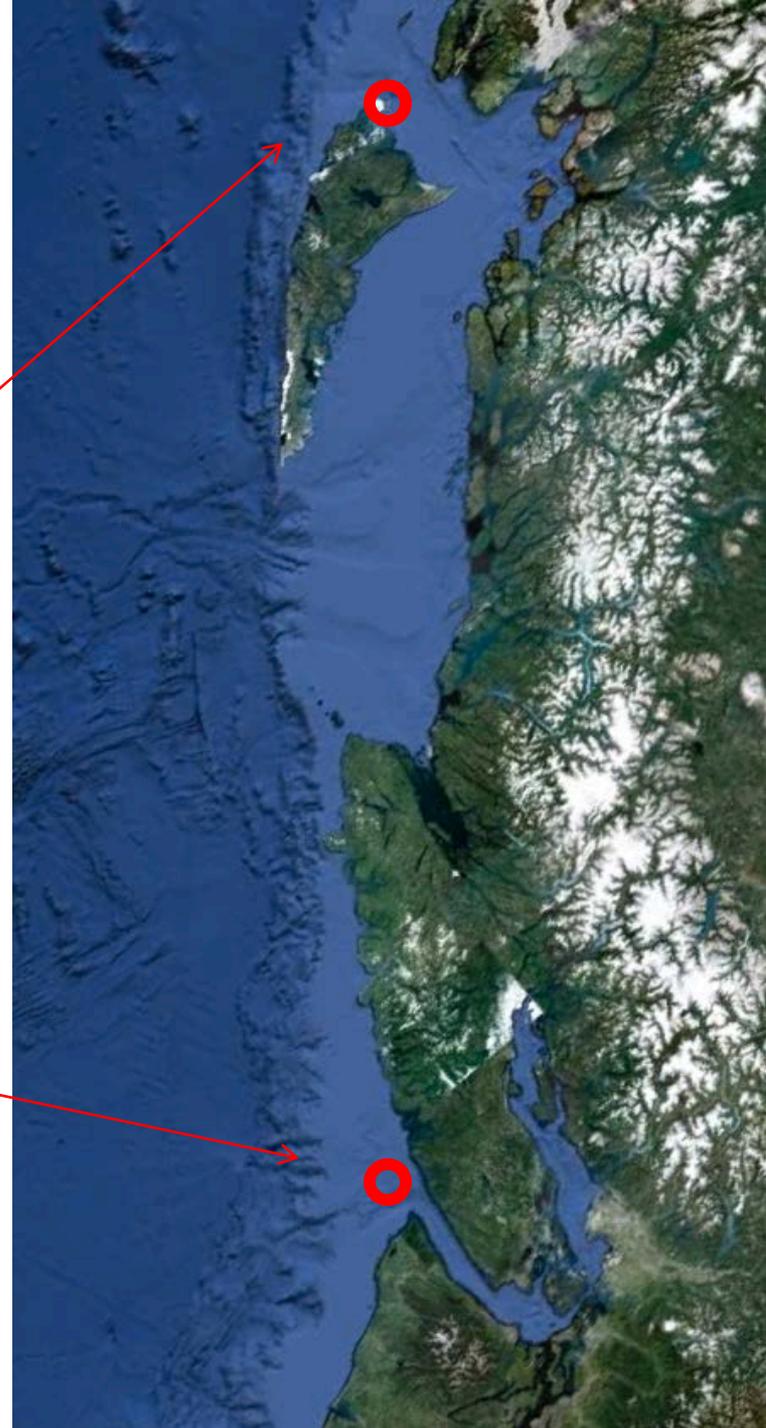
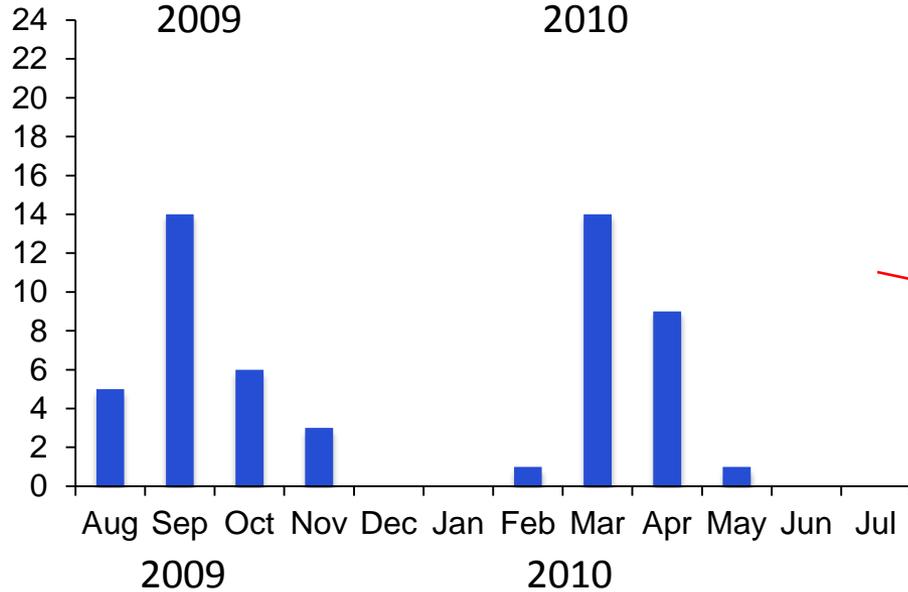
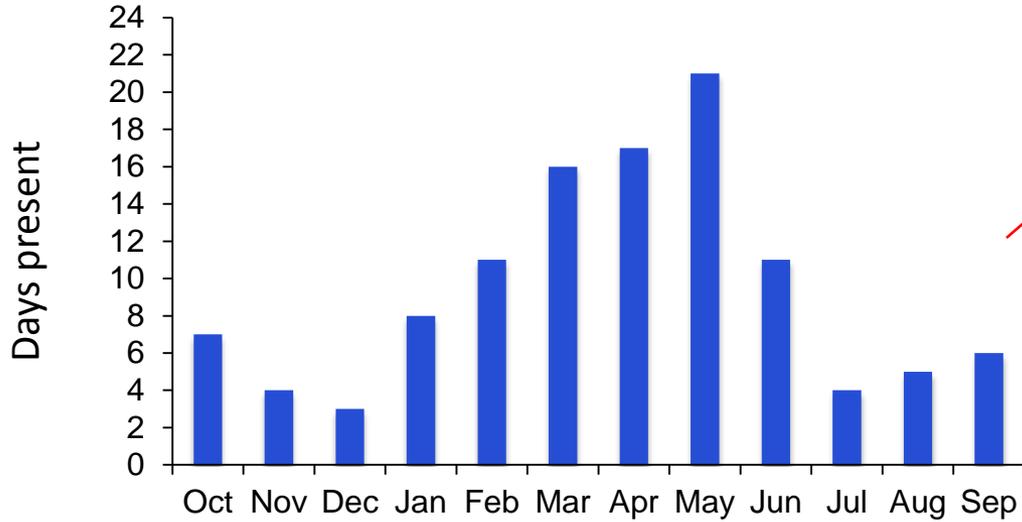
# NRKW occurrence in Johnstone Strait 2009-10



Data source: OrcaLab

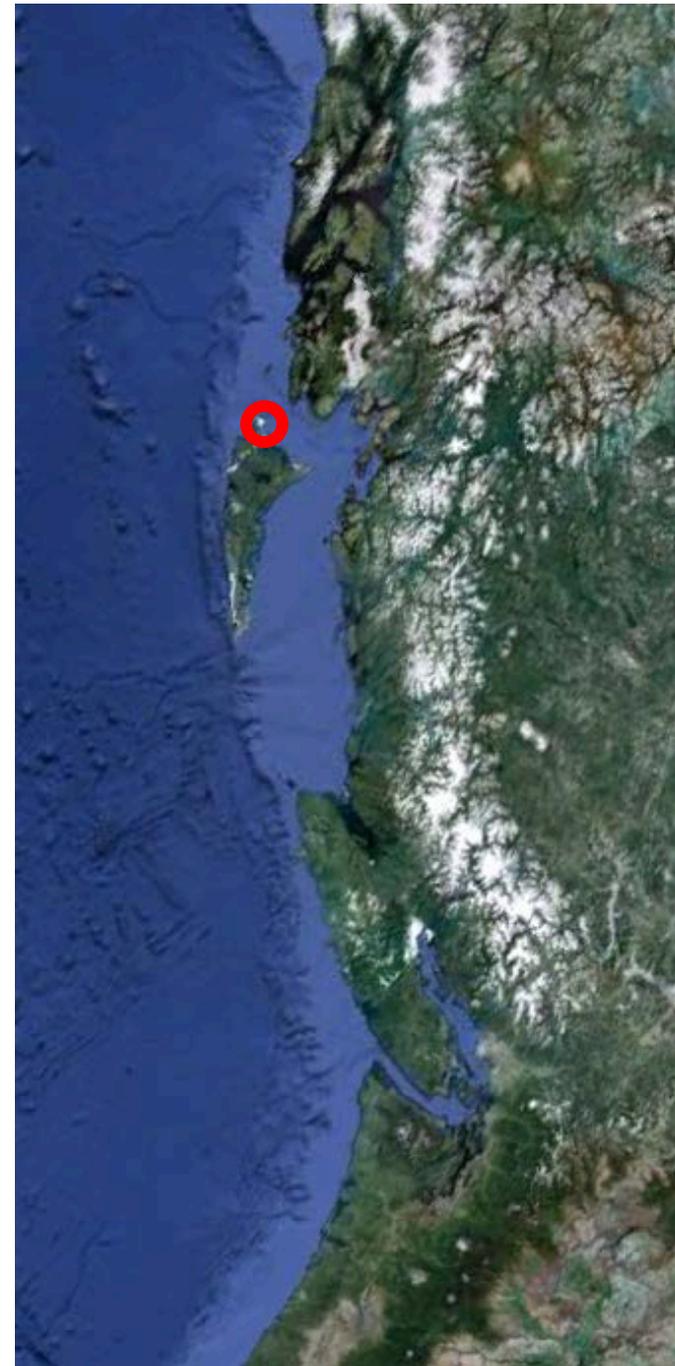


# NRKW occurrence at Langara and Swiftsure, 2009-10



## *Winter – Spring Occurrence of L pod*

- Photo-identified, 28 May 2003
- Detected acoustically, 13 Jan 2007



## *Winter – Spring Occurrence of L pod*

- L pod encountered in Chatham Strait, Alaska, 1 June 2007 (Pt. Ellis, 56° 34'N, 134° 23'W)
- Sighted off Victoria, inbound, 9 June (1300 km minimum in 8 days)
- Extends known range of SRKW 275 km to the north
- Overall coastal range now 2500 km



Dennis Rogers

