



Overview of the life history, current status and trends of killer whale populations in coastal waters of the Northeastern Pacific



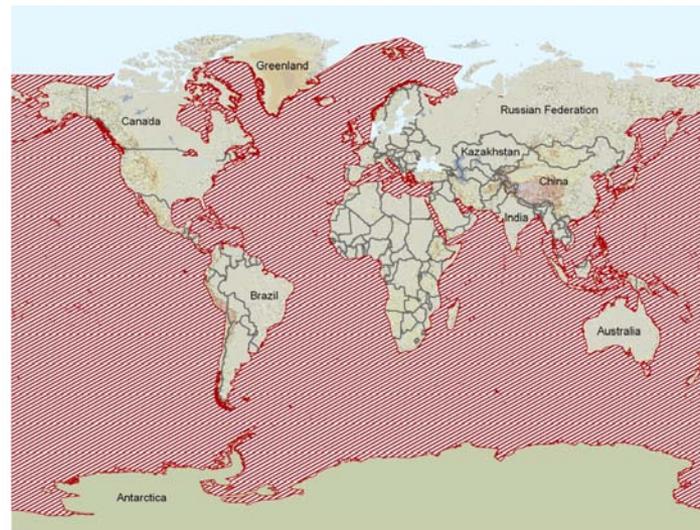
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Killer whales: global overview



- single species recognized, *Orcinus orca*
- may be multiple spp.; best described as a species complex
- cosmopolitan; most widely distributed non-human mammal
- highest densities in temperate or subarctic regions
- apex marine predator (non-human)



Ecological specialization in killer whales

- As a species, killer whales are generalists with > 150 prey species
- At the population level, diet and foraging behaviour highly specialized
- Foraging specializations represent fixed behavioural traditions



Argentina



Norway



Antarctic type 'B'



NE Pacific 'resident'

Killer Whales in coastal NE Pacific

- Important in First Nations' mythology and art, held in high esteem
- Little or no pre-historic exploitation



Whale memorial, Old Kasaan, 1898



Totem pole, Alert Bay, 1978

Killer Whales in coastal NE Pacific

- Attitudes changed with arrival of Europeans
- West coast 'blackfish' considered a nuisance or dangerous menace and threat to livelihood
- Directed shootings may have been significant source of mortality
- Extent of possible depletion unknown



Killer Whales in coastal NE Pacific

- Live-capture fishery for aquaria, 1962-1976
- Total of 68 individuals taken, mostly off S Vancouver Island and Puget Sound
- Fishery highly selective for physically immature animals
- No information on population abundance, productivity



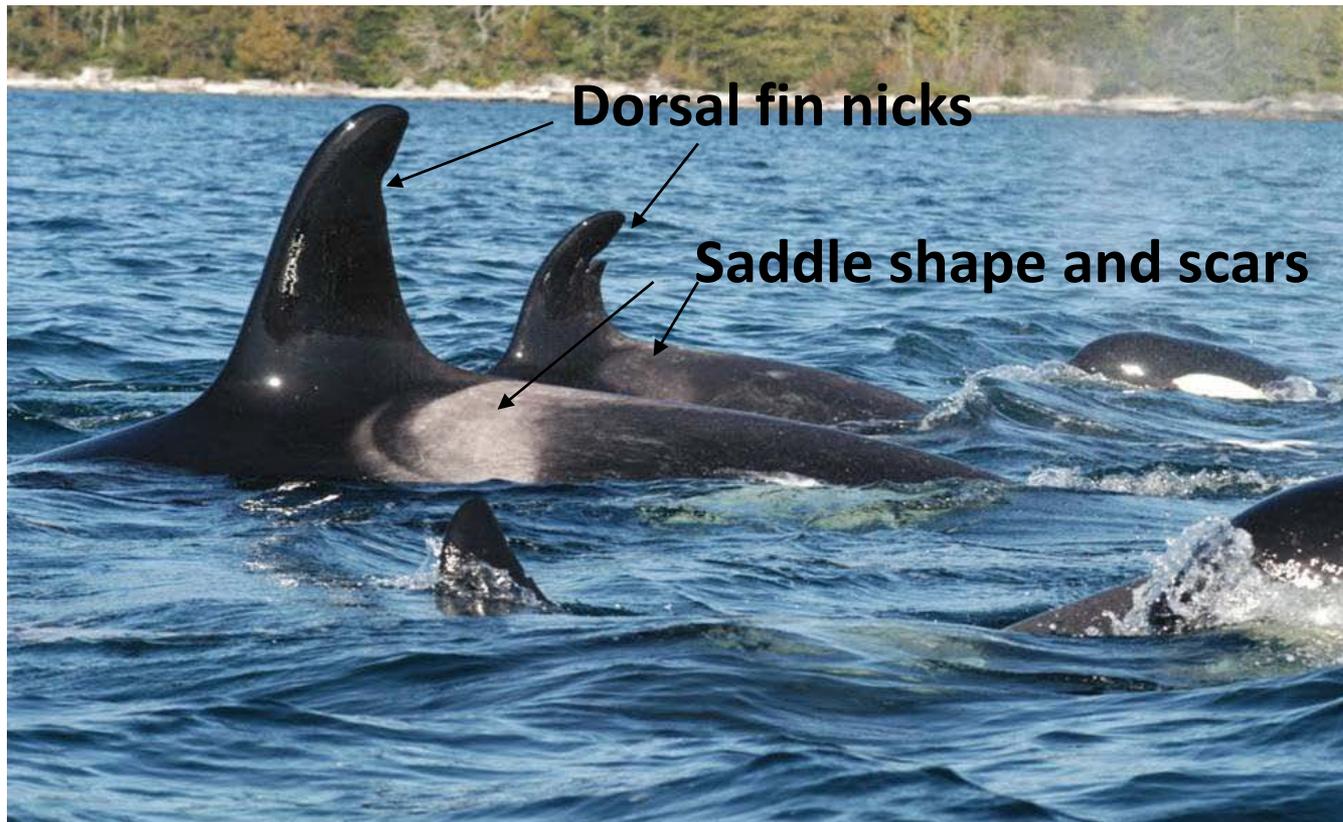
Beginning of scientific studies: 1971 onwards

- Management of live capture fishery required science advice
- Michael Bigg at Pacific Biological Station tasked with obtaining information on abundance, distribution, life history, etc



Innovation of photo-ID technique

- Bigg demonstrated that all individuals identifiable from photos of natural markings
- Photo-ID became primary field technique in 1973, and annual studies in Pacific Northwest have continued since



Killer whale ecotypes in northeastern Pacific

Residents: salmon specialists

- stable social structure
- travel in moderate to large groups
- seasonal movements related to salmon
- do not hunt mammals



Transients: mammal specialists

- dynamic social structure
- travel in small groups
- year-round presence in inshore waters
- do not feed on fish



Offshores: shark specialists?

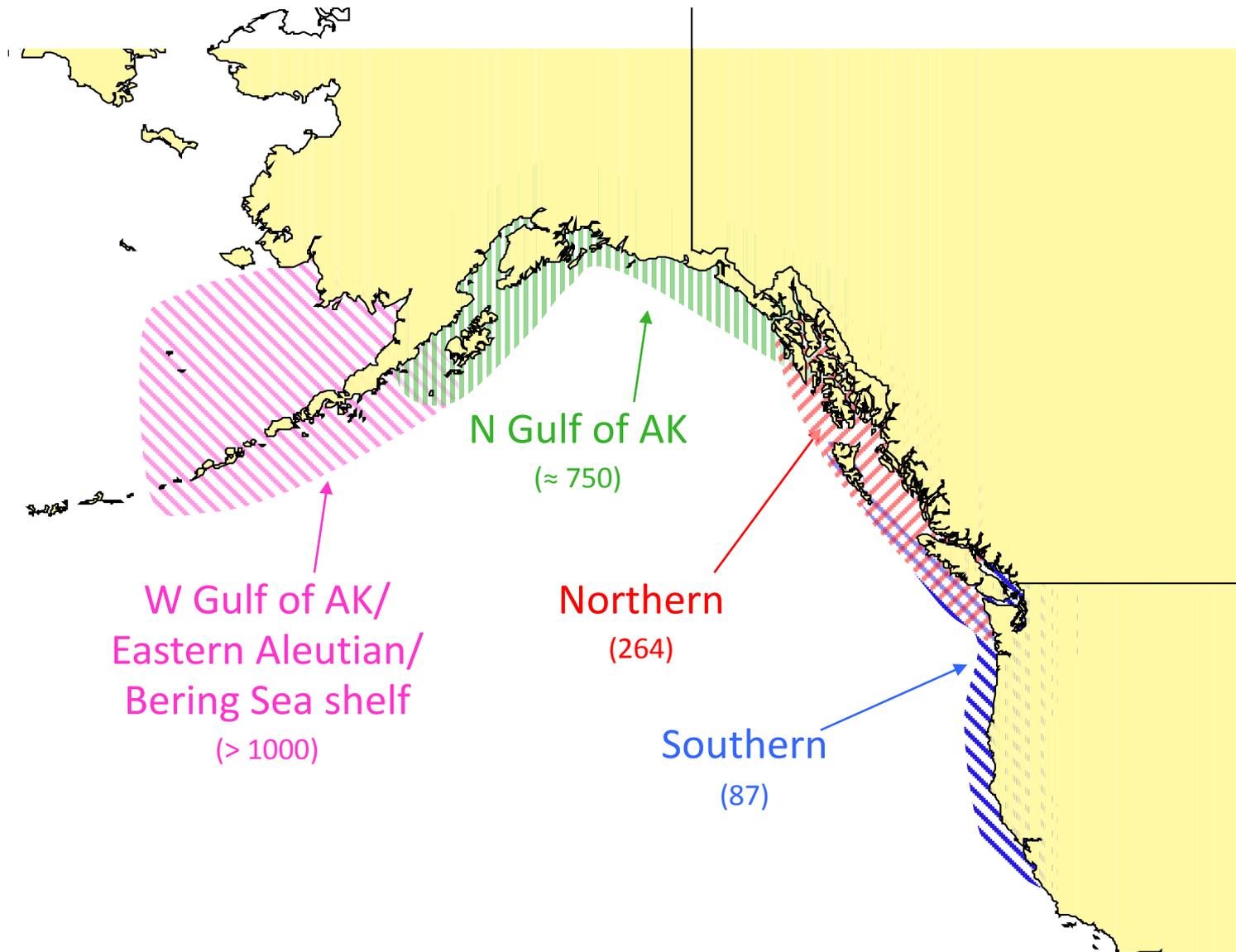
- travel in large groups
- wide ranging seasonal movements
- feed on deep-water and surface sharks, and some teleost fishes



'Resident' killer whales



Resident killer whale populations in coastal NE Pacific



Resident killer whales: features in common

- Populations mostly allopatric, overlap at range limits
- Populations maintain social and reproductive isolation even in sympatry
- Highly stable matrilineal social structure
- Have learned vocal dialects that reflect matrilineal ancestry
- Ecologically specialized: fishes, particularly salmon, squid

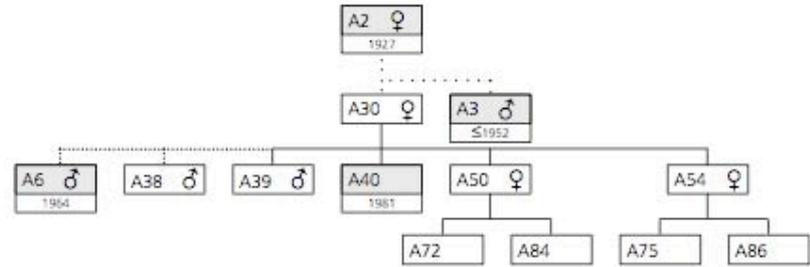


Matrilineal social structure

A1 Pod

A30 Matriline

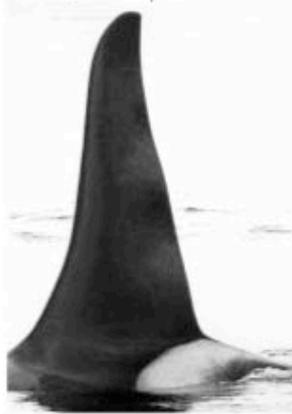
A30 ♀ 1947



A38 ♂ 1970



A39 ♂ 1975



A50 ♀ 1984



A54 ♀ 1989



A72 1999



A84 2005



A75 2001

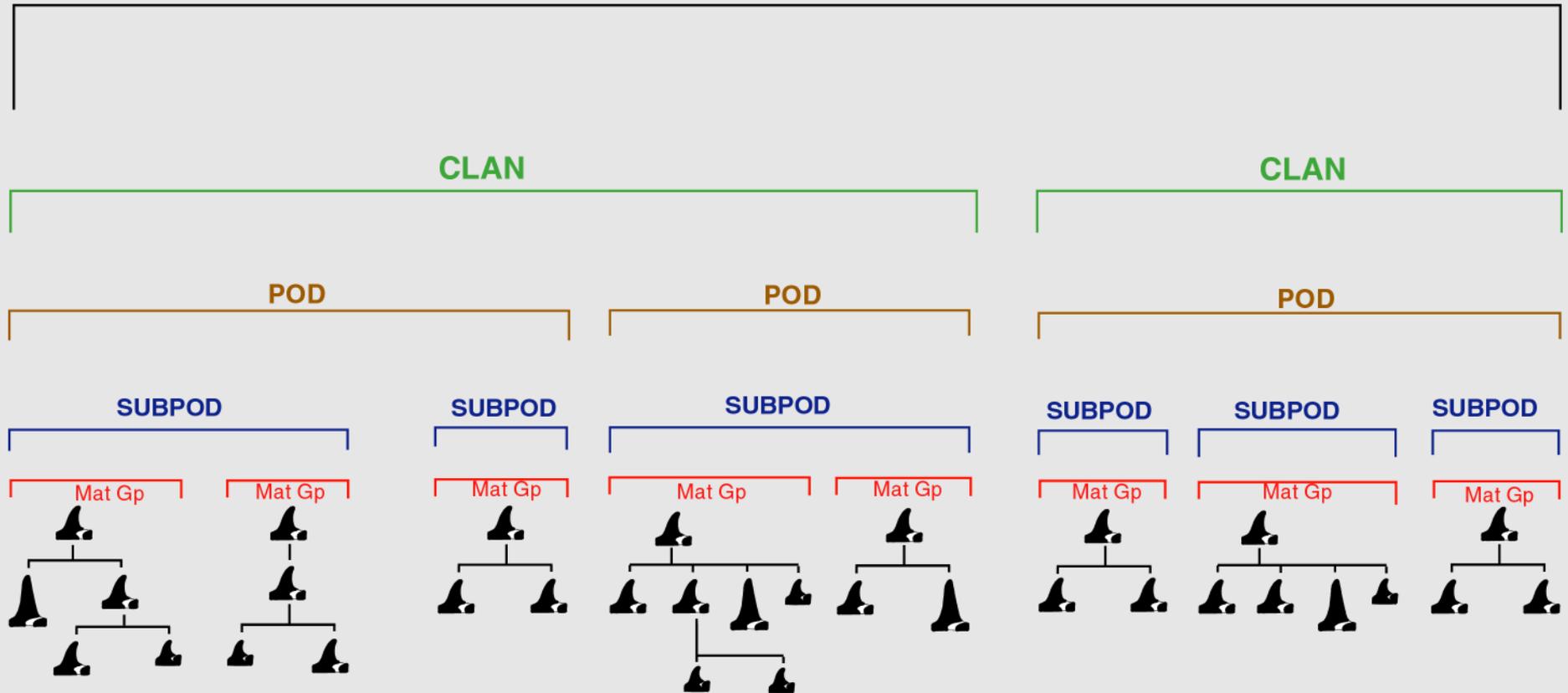


A86 2006



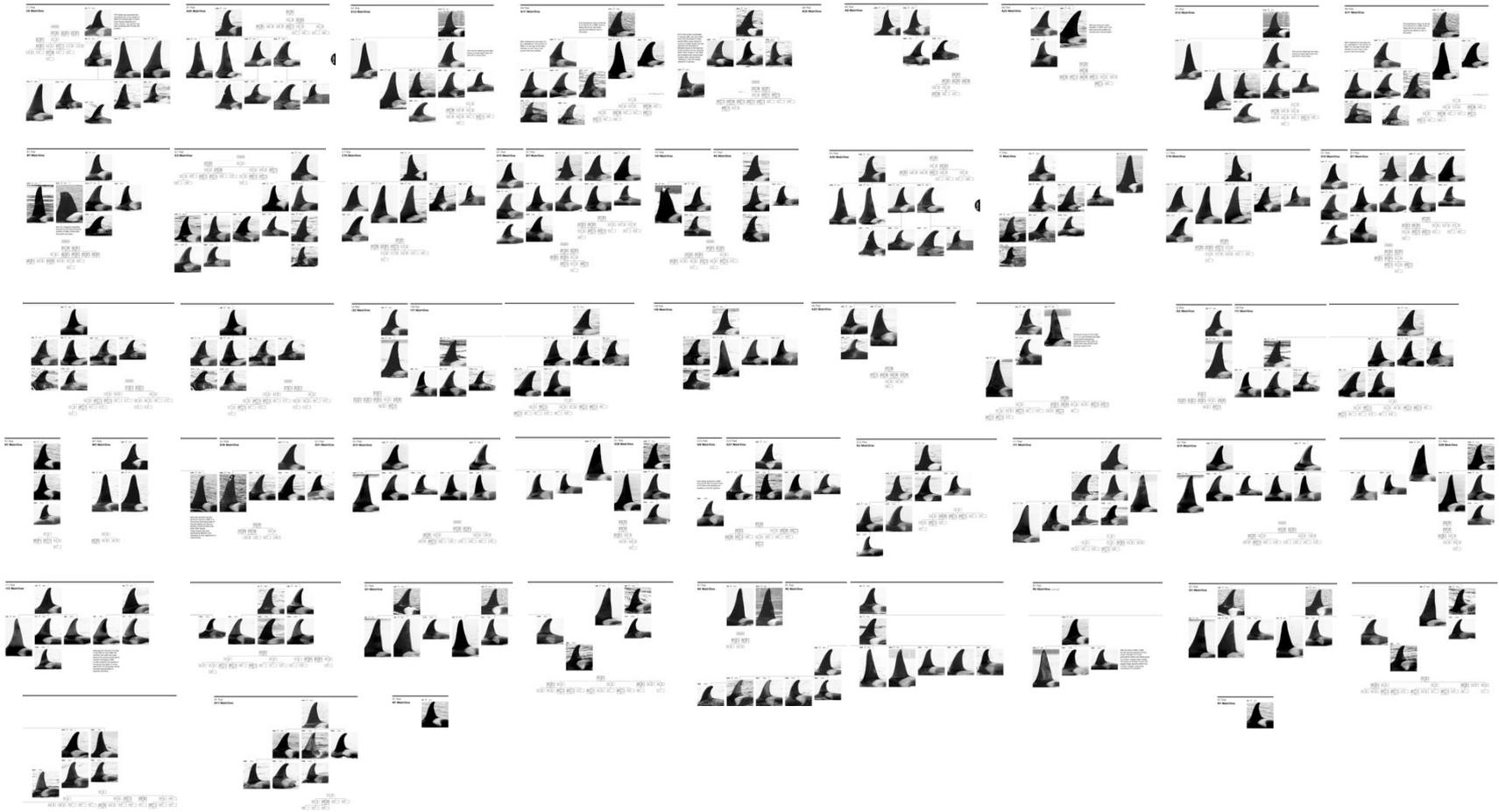
Resident Social Structure

COMMUNITY



Population dynamics of resident killer whales

- Stable group structure allows detailed demographic analyses
- Since 1973, 665 SR and NR whales identified and monitored; 351 alive today
- 85% of current SR and NR observed since birth



Life history parameters: Females

(during period of unrestrained growth 1974-96)

- Mean life expectancy: 46 years
- Maximum longevity: \cong 80 years
- First viable calf: average 14.1 years (range = 10-21 years)
- Gestation period: 16-17 months
- Calving period: diffusely seasonal, most in fall/winter
- Calving interval: typical 3 years, avg 4.9 years (range = 2-11 years)
- Calf production: avg 4.7 calves over 24 year reproductive lifespan
- Repro. senescence: 50% senescent at 38 years; 100% at 46 years



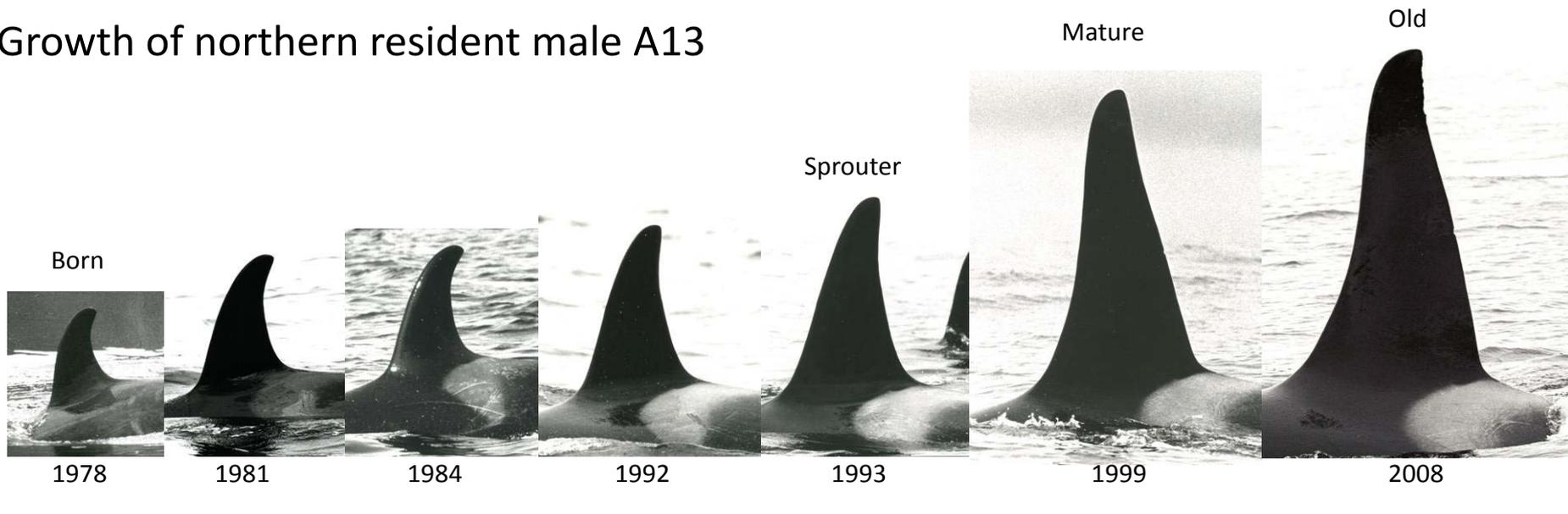
Life history parameters: Males

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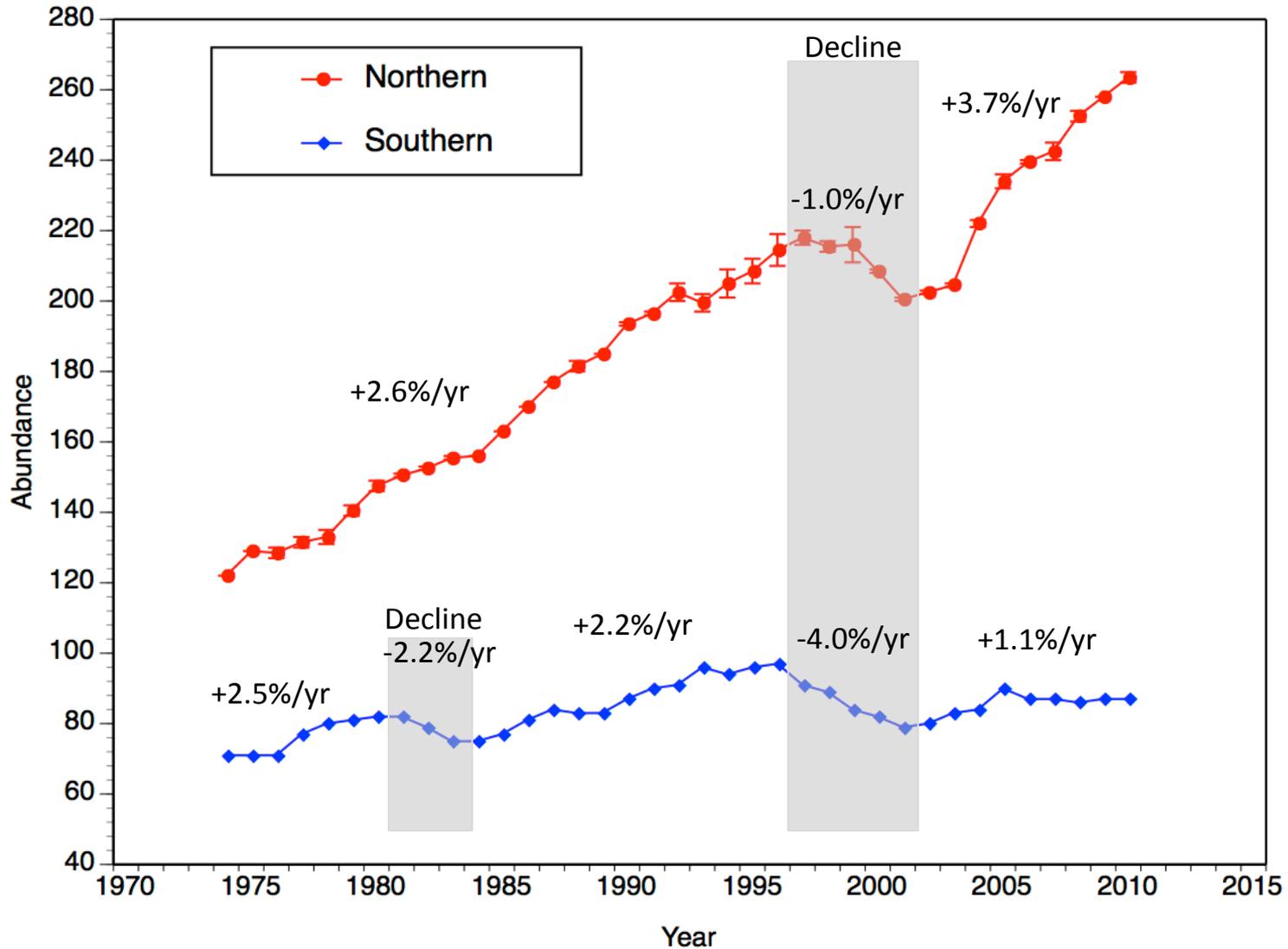
- Mean life expectancy: 31 years
- Maximum longevity: \cong 60-70 years
- Sexual maturity: average 13.0 years (range = 9-18 years)
- Physical maturity: average 18.5 years

Source: Olesiuk, Ellis & Ford 2005 CSAS Res Doc 2005/045

Growth of northern resident male A13

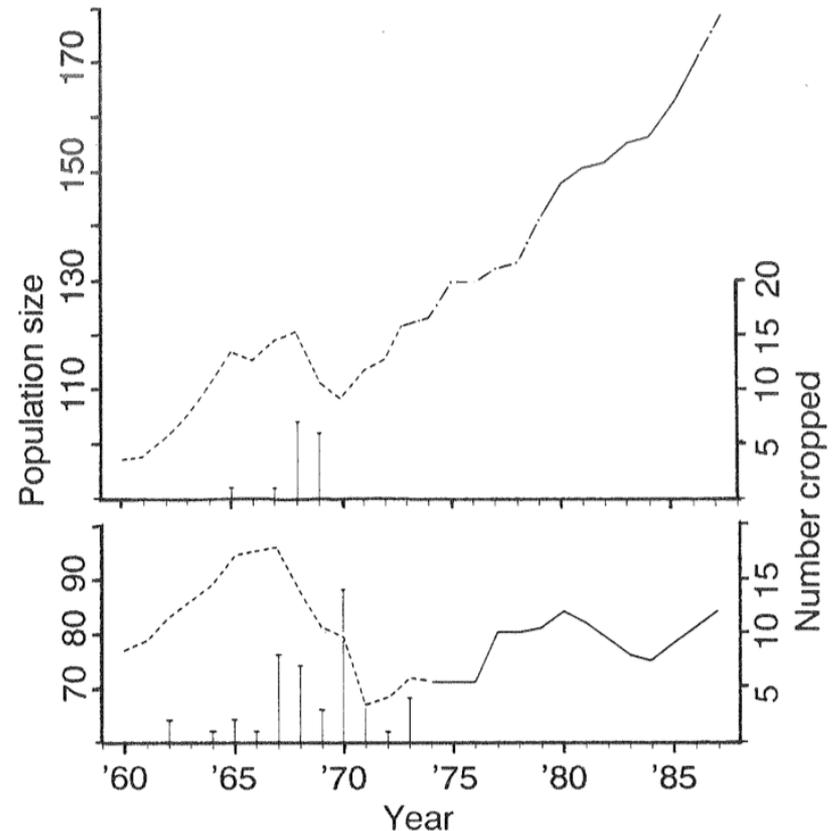


Abundance trends in Southern & Northern Residents

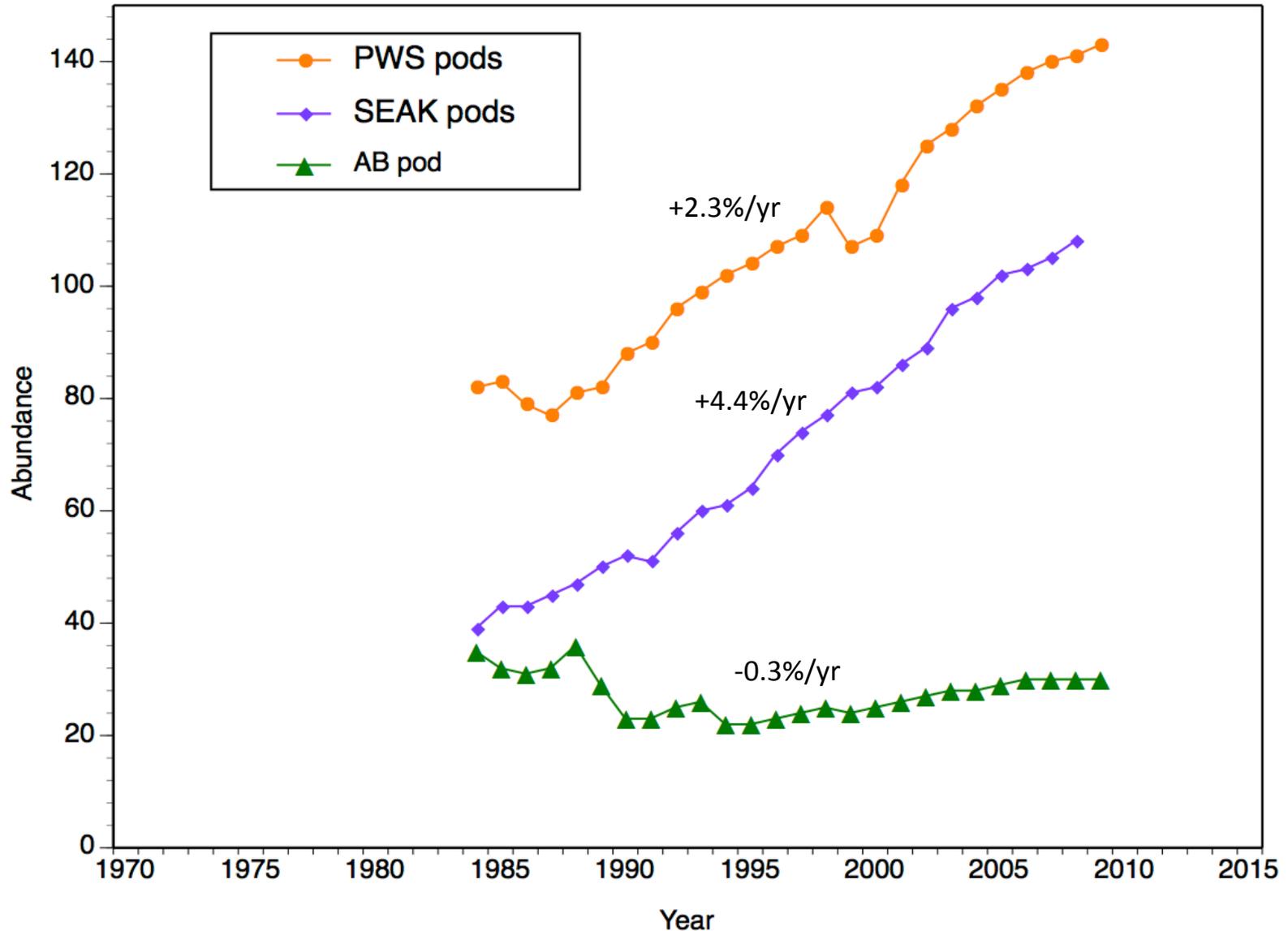


Back-projected trends in Southern & Northern Residents

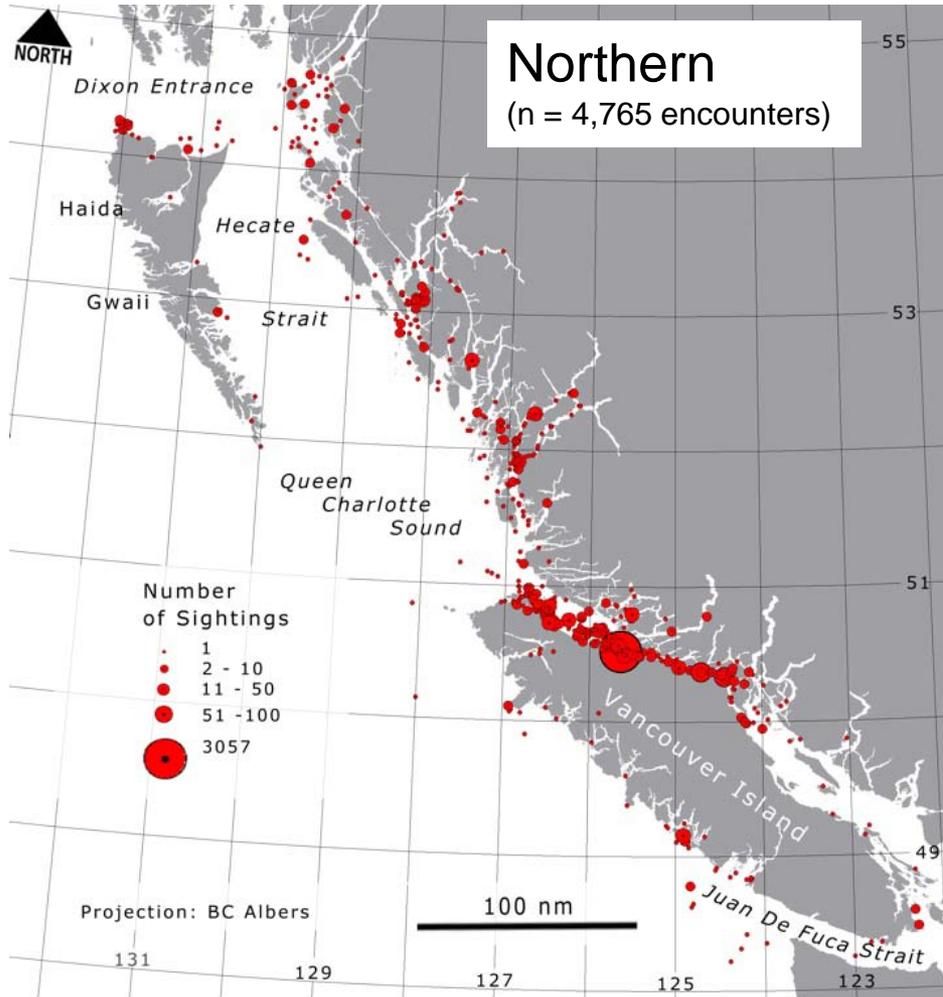
- Demographic modeling suggest both populations were increasing in late 1950s to early 1960s
- Cropping during 1960s & early 1970s removed:
 - NR: 15 (8 M, 7 F)
 - SR: 35 (23 M, 12 F)
- Recovery of SR likely hindered in 1970s & 80s by altered demographics



Abundance trends in N Gulf of Alaska residents



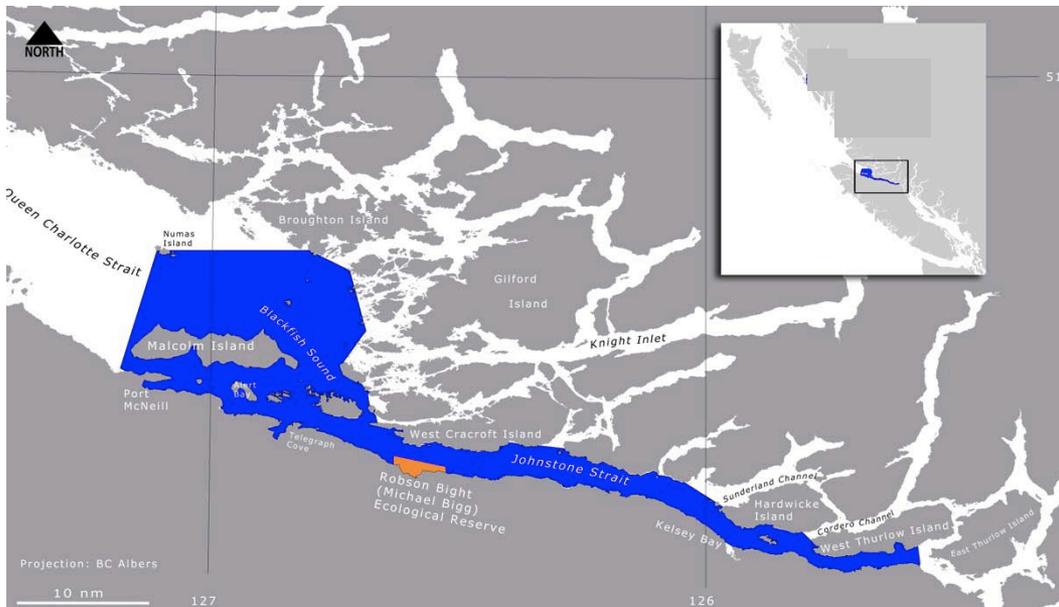
Distribution of Northern & Southern Residents



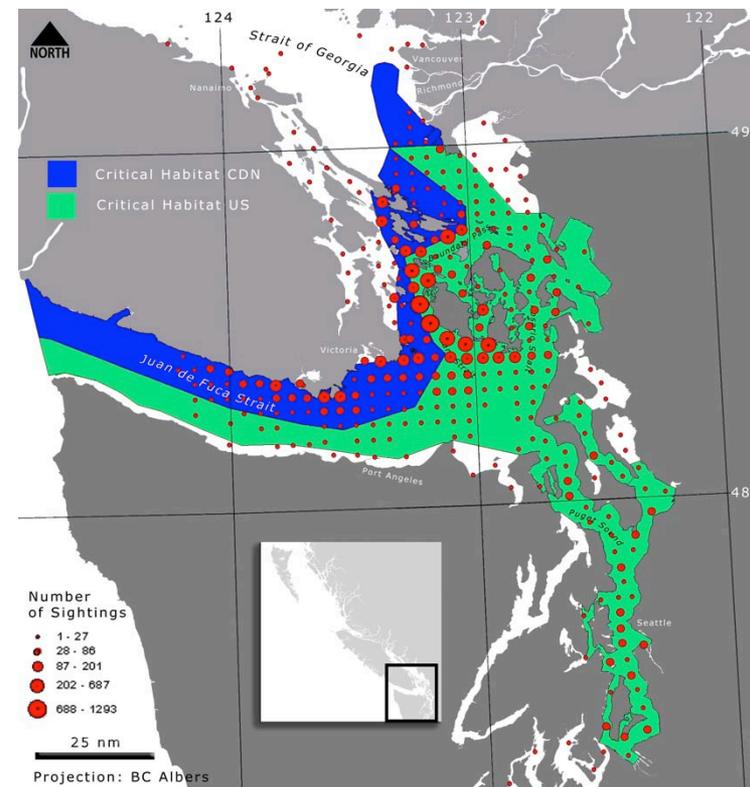
Critical Habitats designated under SARA and ESA

- Based primarily on summer occurrence
- Winter distribution poorly understood

Northern resident

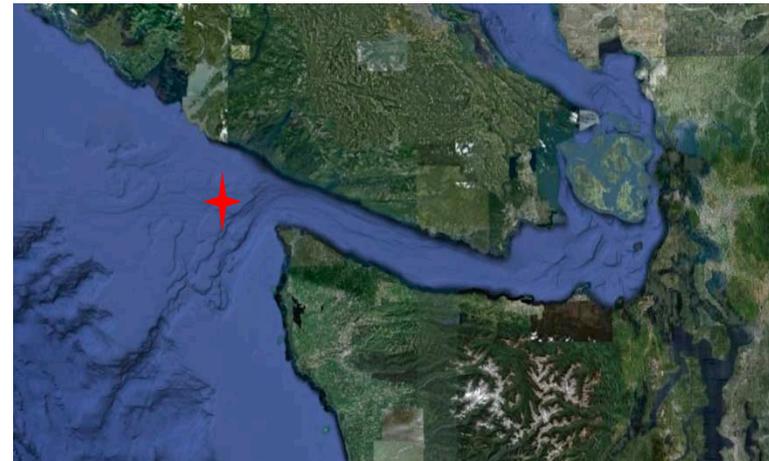
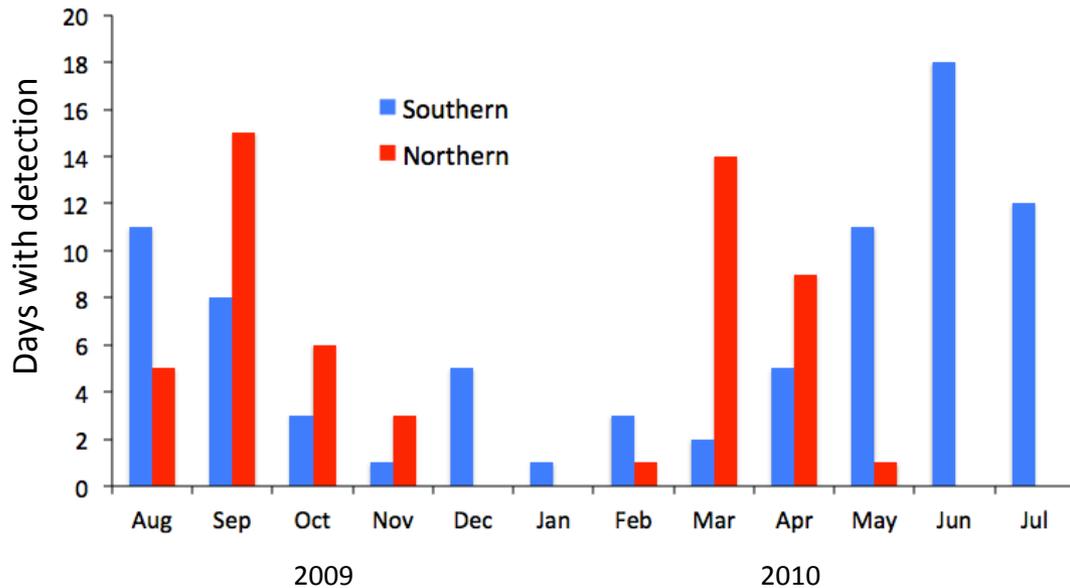


Southern resident



Acoustic monitoring: Swiftsure Bank

- Frequent year-round use suggests potential critical habitat for both Southern & Northern residents



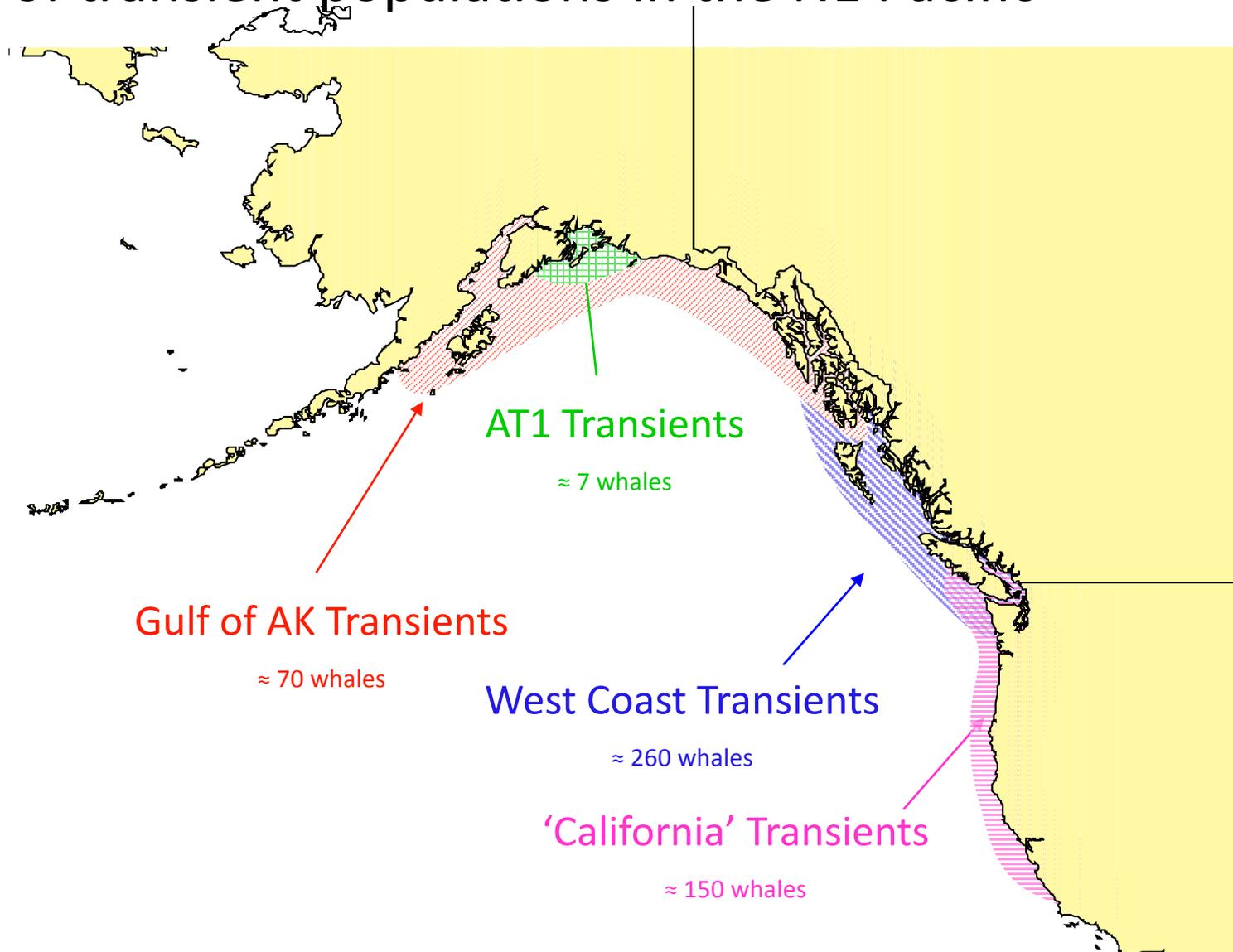
Source: Riera, Ford & Chapman. in prep.

'Transient' (or Bigg's) killer whales

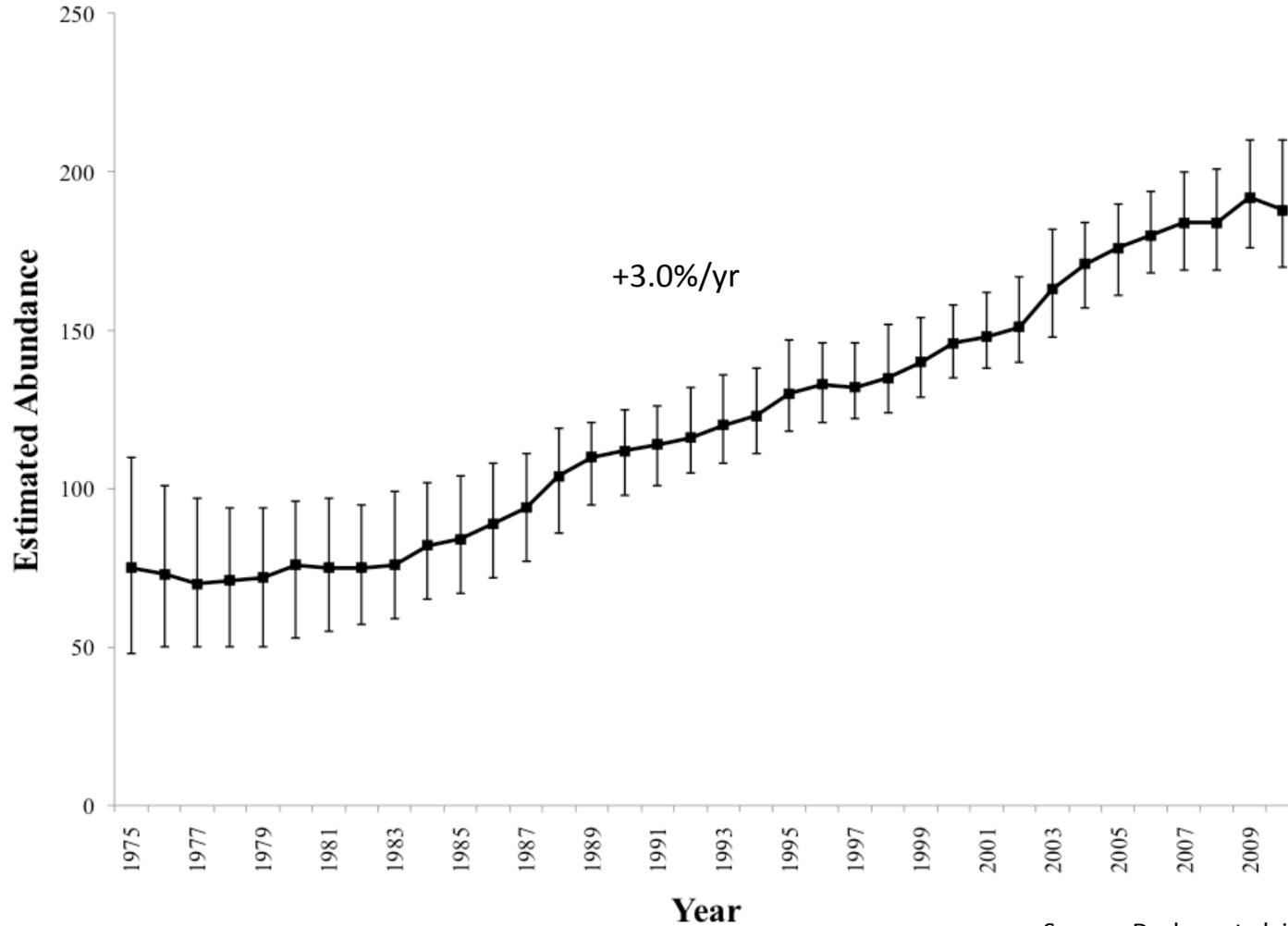


Jared Towers

Approximate ranges and sizes of transient populations in the NE Pacific

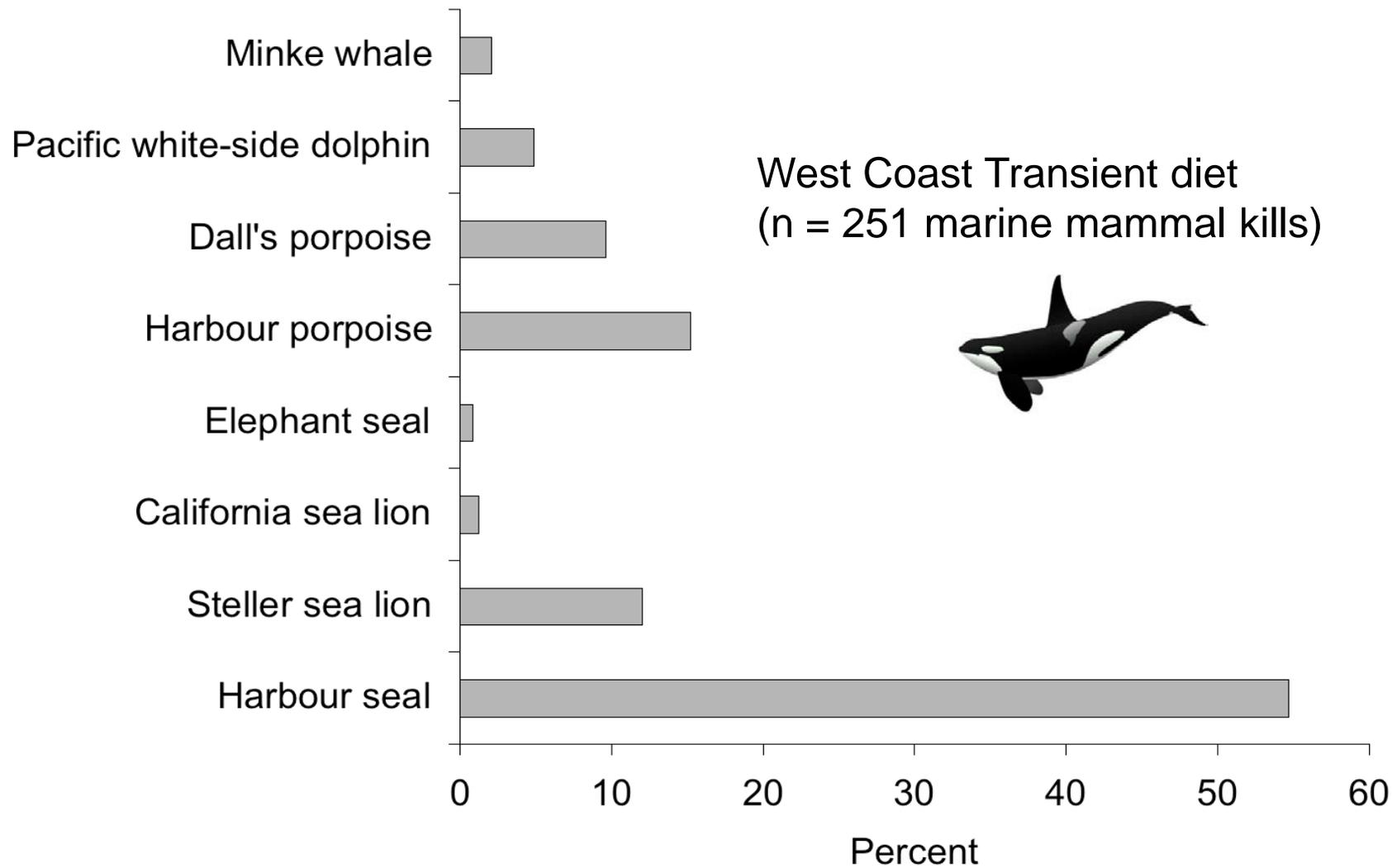


West coast transient killer whale abundance, 1975-2010



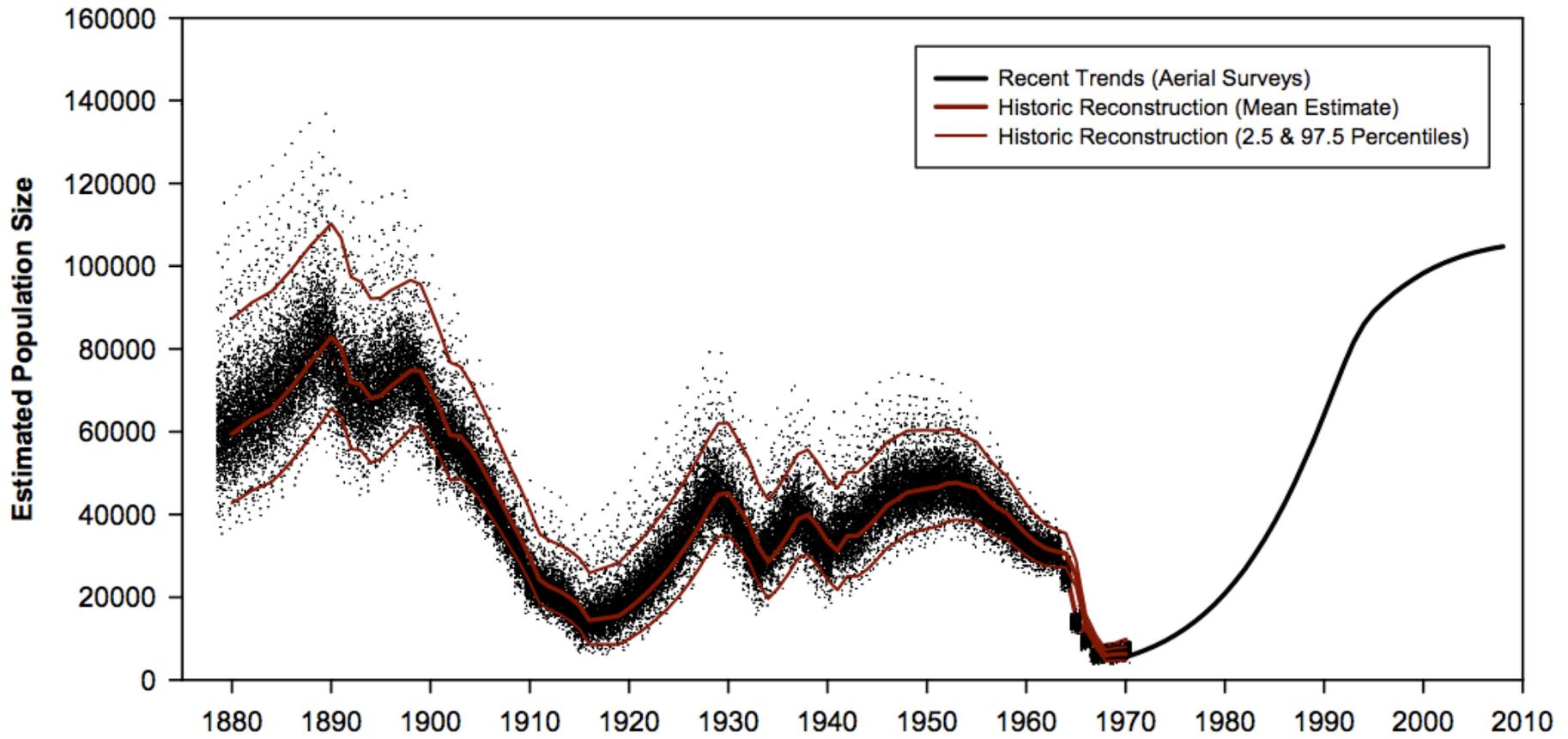
Source: Durban et al. in prep.

Harbour seal is most important prey species of transient killer whales



Long-term abundance trends of harbour seals in BC

- Transient population growth correlated with increasing harbour seal abundance



Conclusions

- Most killer whale populations in coastal NE Pacific are increasing in abundance
- Positive growth may be due to recovery from depletion (residents) or increasing carrying capacity (WC transients)
- Southern resident population is relatively small and vulnerable
- Potential factors affecting recovery of SRKW:
 - limited food resources
 - contaminants
 - noise/disturbance
 - inbreeding depression
- Synergistic effects of these stressors may be important

