

Spatial and Temporal distribution of Southern Resident killer whales

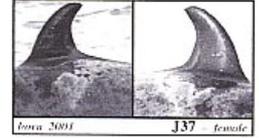
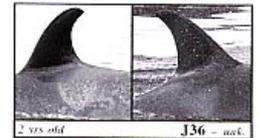
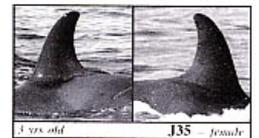
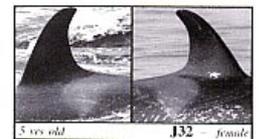
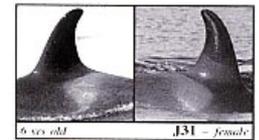
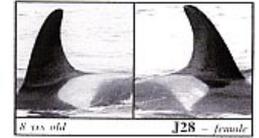
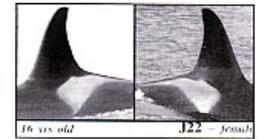
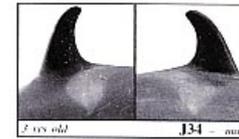
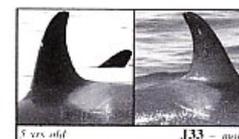
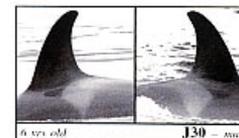
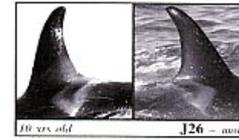
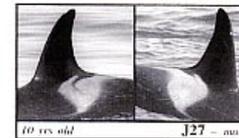
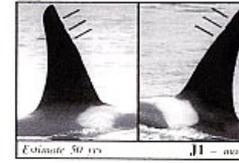
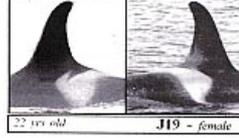
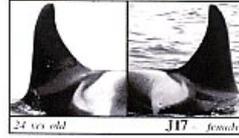
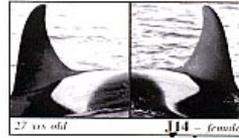
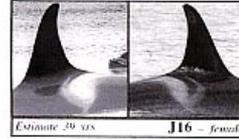
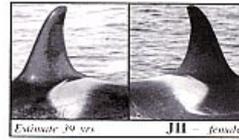
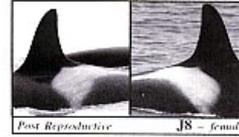
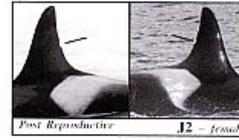
Brad Hanson
Candice Emmons



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The development of photo-ID allowed for differentiation of “resident” and “transient” type killer whales and thus monitoring of their occurrence

J-Pod quick look ID guide



Note: These whales attain puberty in their teens. Any whale born more recently than 1990 is not yet mature, and will be noticeably smaller in size. Reproductive senescence for females commences around age 40. Females give birth to a single calf at five year intervals on average.

© 2001, Center for Whale Research

ID catalog – Center for Whale Research

Methods

Pod-specific sightings of SRKW have been compiled since 1976

Sightings came from a wide variety of sources including the public, commercial whale watch operators, and researchers and were reported to the Whale Museum and Orca Network

54,961 sighting records of SRKWs in the database

A variety of analyses have been conducted on this data set to assess temporal and spatial occurrence of SRKW



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SRKW residency - Temporal assessment

Monthly Scale Pod Occurrence in the Inland Waters (1976-2010)

J, K & L-Pods Annual Monthly Arrivals and Departures from the Salish Sea												
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1976	?	?	?	J&K	J			J, K, & L			?	J
1977	?	?	?	?	?	?		J, K, & L				
1978		J	J&K		J			J, K, & L				J
1979		J						J, K, & L			J&K	J
1980		J						J, K, & L				J
1981		J		J&K	J			J, K, & L				J
1982		J				J&K		J, K, & L		J&K		J
1983		J				J&K		J, K, & L		J&K		J
1984		J				J&K		J, K, & L				J
1985		J				J&K		J, K, & L				J
1986		J			J&K			J, K, & L				J
1987		J			J&K			J, K, & L		J&K		J
1988		J			J&K			J, K, & L				J
1989		J	J&K	J				J, K, & L		J&K		J
1990		J						J, K, & L				J
1991		J			J&K			J, K, & L		J&K		J
1992		J			J&K			J, K, & L				J
1993		J			J&K			J, K, & L				J
1994		J						J, K, & L		J&L		J
1995		J						J, K, & L				J
1996		J						J, K, & L		J&K		J
1997		J						J, K, & L	Dyes Inlet	J&L	J&K	J
1998		J						J, K, & L		J&K		J
1999		J						J, K, & L				J
2000	J, K, & L	J						J, K, & L				J
2001	J, K, & L			J				J, K, & L				J
2002	J, K, & L	J	J, K & L ?	J				J, K, & L				J
2003	J, K, & L			J				J, K, & L				J&K
2004	J, K, & L			J	J&L			J, K, & L				J
2005	J, K, & L	J ?		J	J&L			J, K, & L				J&K
2006	J ?	J	J, K, & L	J				J, K, & L				J
2007	J ?			J		J&L		J, K, & L			J	J, K, & L
2008	J, K, & L	J&L			J			J, K, & L				J, K, & L
2009	J ?	J, K, & L	J	None	J&K			J, K, & L				J&K
2010	J	J&L	None	J	J&L			J, K, & L				J&K

(Compiled by TWM staff from records maintained by Orca Survey, C.W.R.(1976-82), The Whale Museum's Whale Hotline (1978-present), the Marine Mammal Research Group's Hotline (1985-2003); Bob Otis's Lime Kiln Lighthouse records (1990-present); Soundwatch field data (1993-present); SeaCoast Pager Records (1996-2007), Orca Network (2000-present); and the SPOT recorder data (2008-present).

J-Pod=	J&K-Pod=	J&L-Pod=	J, K & L-Pods=
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(Updated: 8/18/2011 (SBr))

J pod occurs in inland waters in almost all months

K and L pods summer months and fall months only some years

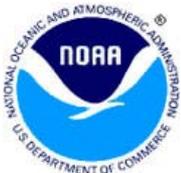
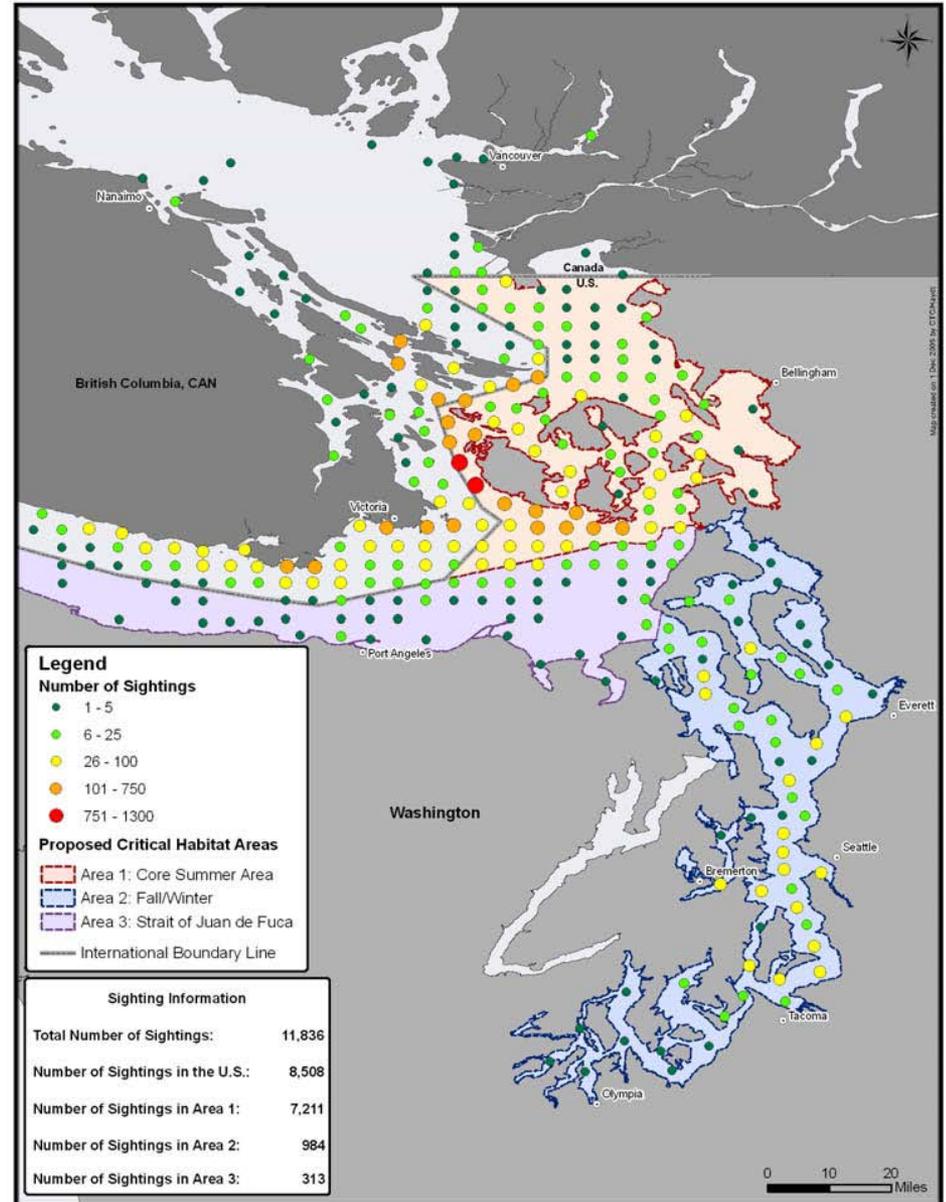
Whale Museum 2011, unpubl. rept.

SRKW residency - Pod Occurrence in the Inland Waters (1976-2005)

Spatial assessment of the sighting data were used to help define Critical Habitat

SRKW had been documented in nearly all all basins of Inland waters except Hood Canal

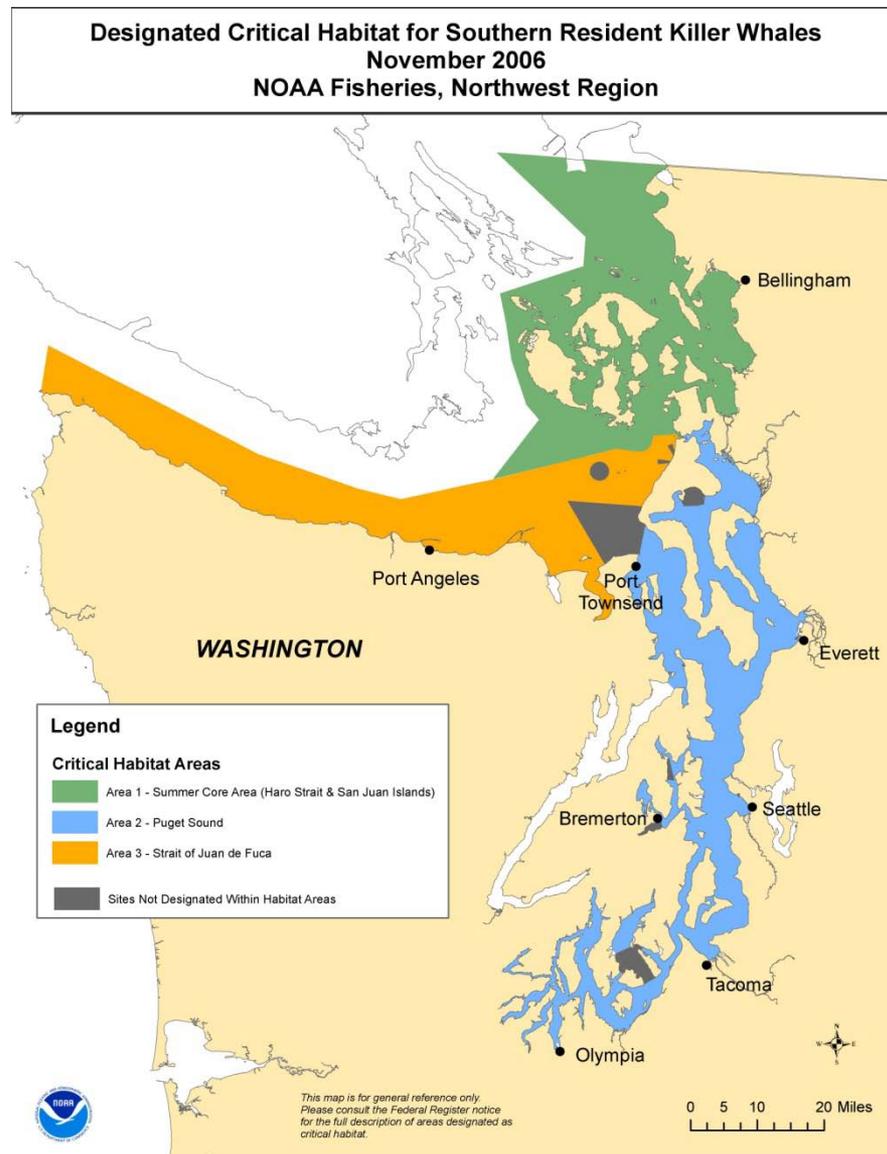
NWRO 2006,
Designation of Critical
Habitat for SRKW
Biological Rept.



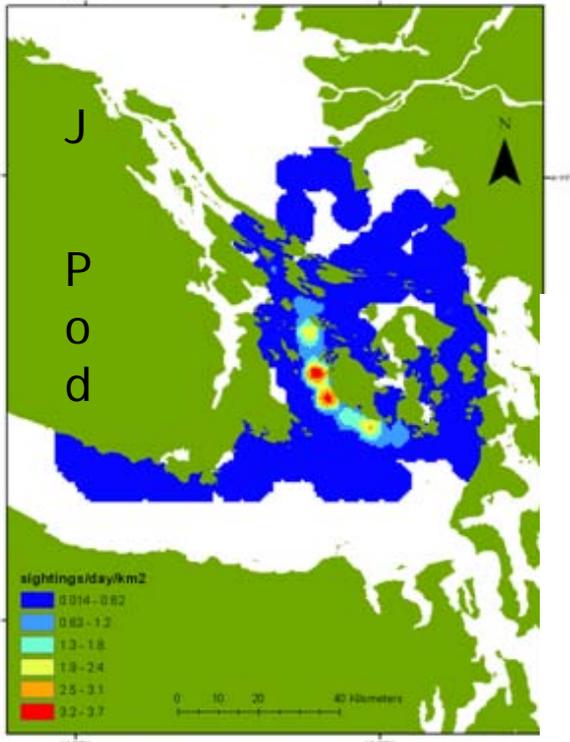
Final designation of SRKW Critical Habitat

Note that Critical Habitat Designation only included inland waters

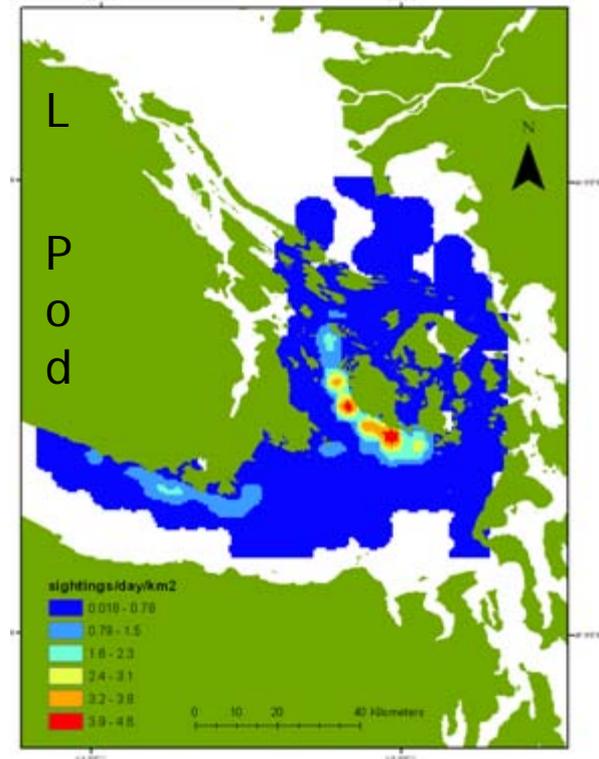
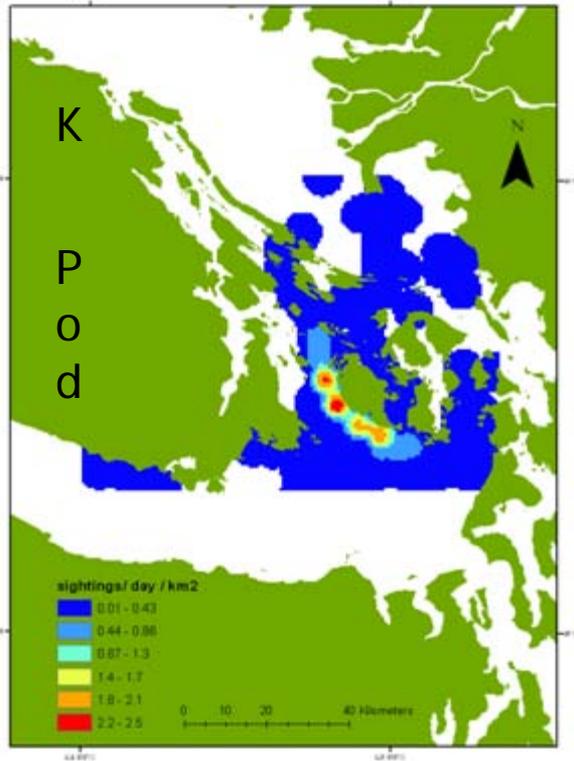
FR Notice 71 No. 229
2006



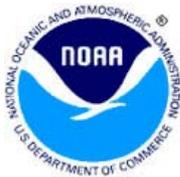
Additional spatial analyses have been conducted to identify areas of concentrated use in SRKW Summer Range



Primarily occur in the San Juan and Gulf Islands but highest density off the southwest side of San Juan Island



Hauser et al. 2007



Movement patterns of SRKW in their Summer Range relative to categorical indices of salmon abundance

McCluskey 2006

Space Use Patterns and Population Trends of Southern Resident Killer Whales (*Orcinus orca*) in Relation to Distribution and Abundance of Pacific Salmon (*Oncorhynchus* spp.) in the Inland Marine Waters of Washington State and British Columbia

“The TA and LSI values (space use indices) were lower in the first half of the 1990s, when overall abundance of chum and all salmon species combined was higher than in the second half of the 1990s. This result was consistent with the prediction that years of higher salmon abundance would correspond with years of lower search effort, quantified as lower TA and LSI values.

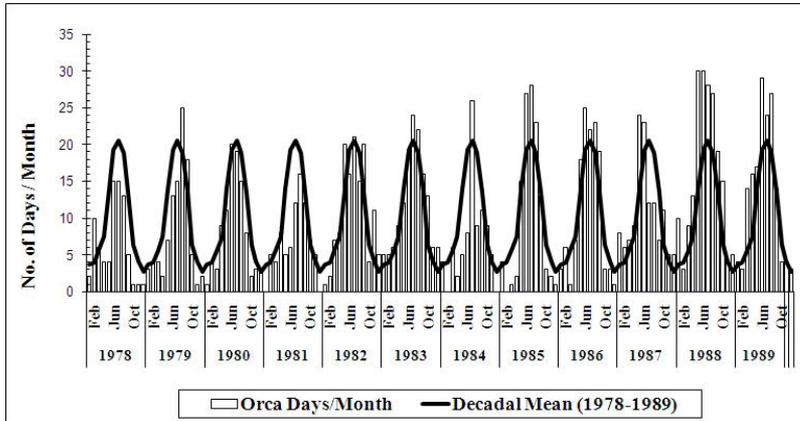
However, overall Chinook abundance did not have a clear distinction between the early and latter 1990s and, therefore, there was no clear association with movement behavior as hypothesized.”



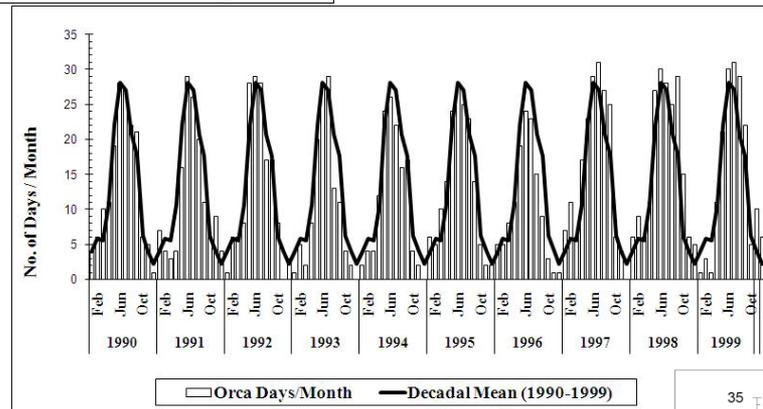
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SRKW residency - Temporal assessment

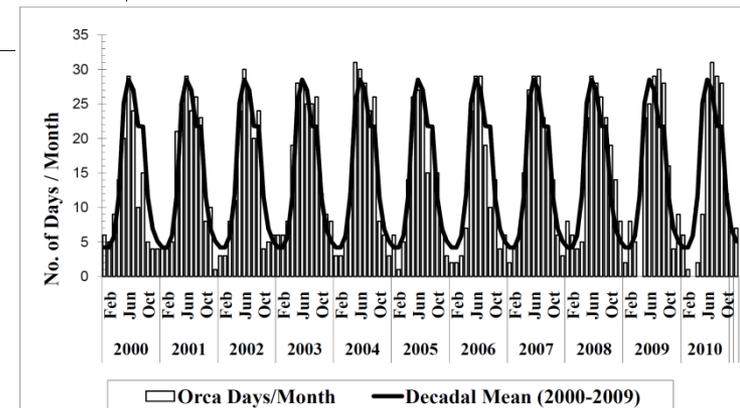
Monthly Scale Pod Occurrence in the Inland Waters (1976-2010)



Whale Museum 2010,
unpubl. rept.

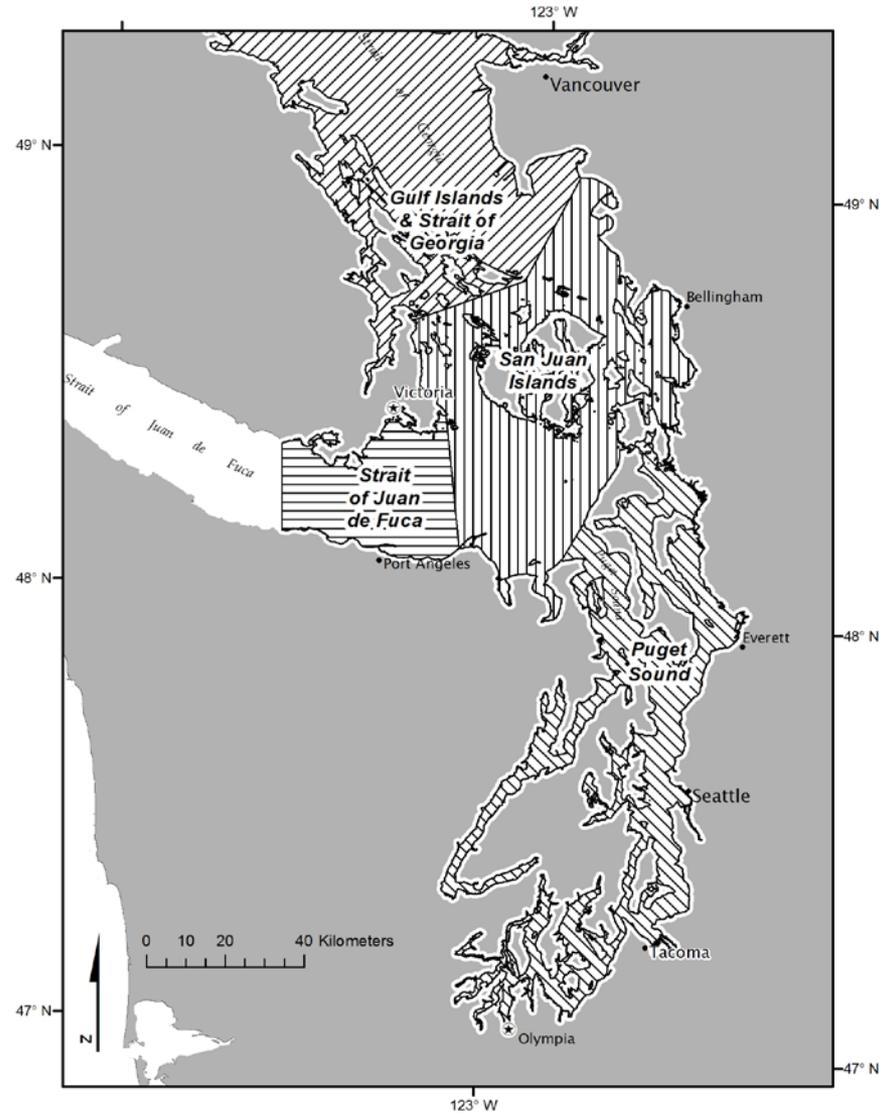


Occurrence peaks in the summer months
(June- September) in inland waters



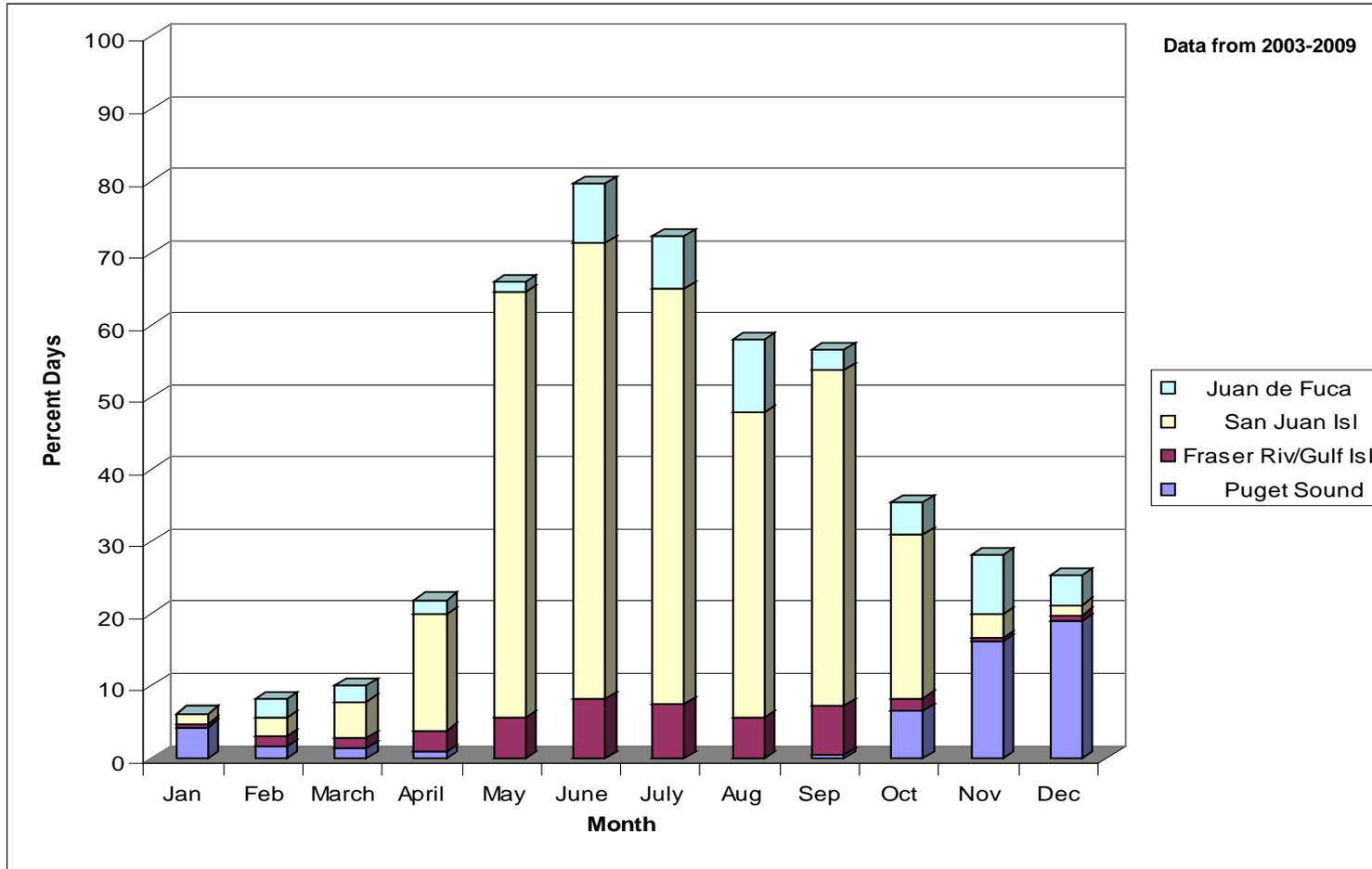
Recent SRKW residency patterns - spatial

Daily SRKW sightings from 2003-2009 were assigned to one of four areas of inland waters



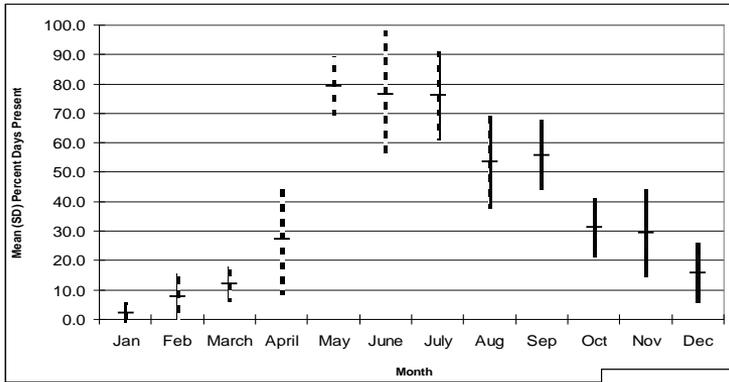
Recent SRKW residency patterns – spatial/temporal

Percentage of time any Southern resident killer whale pods were present in four areas of inland waters



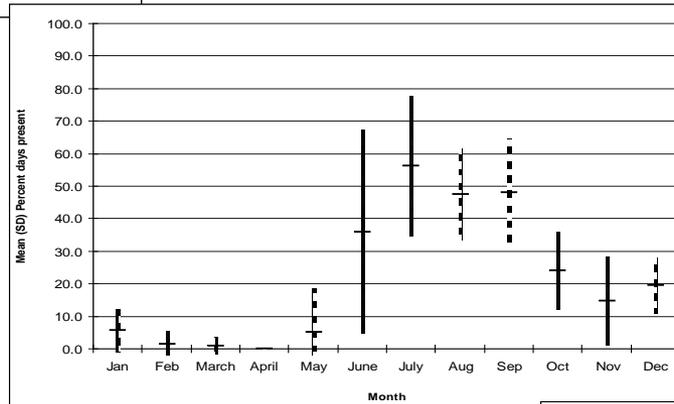
***SRKWs are present inland waters about 46% of days during the year
During June - September they are present 55-79% of the days***

Recent SRKW residency patterns – Pod specific temporal patterns

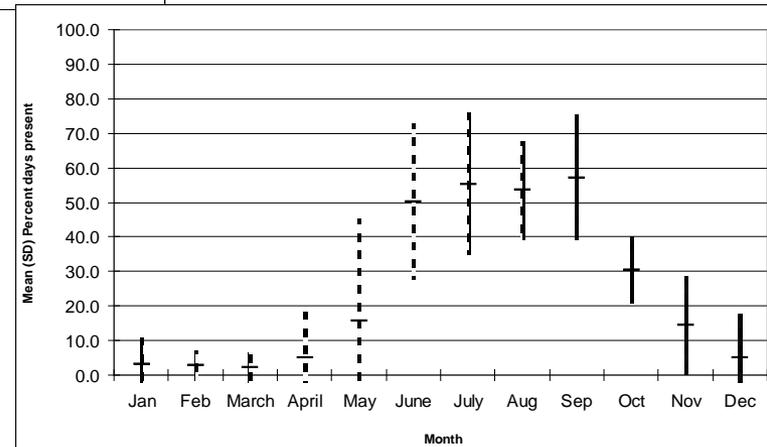


Mean monthly percent of time each Southern resident killer whale pod was present in four areas of inland waters

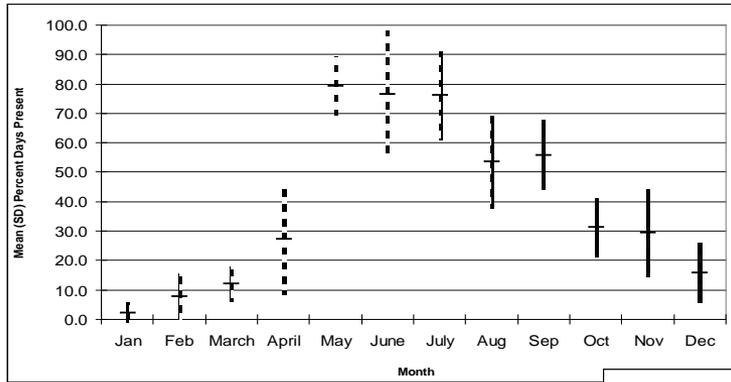
Data from 2003-2009



J pod is typically present the most frequently of the three pods from June-Sept - (55-80%) compared to K and L pod (>35-55%, and >50-55% respectively)

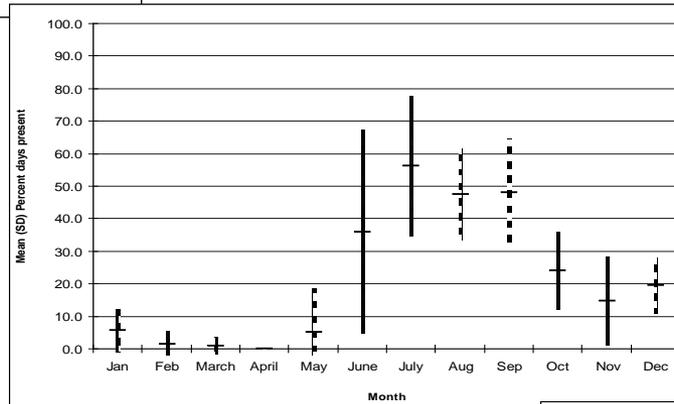


Recent SRKW residency patterns – Pod specific temporal patterns



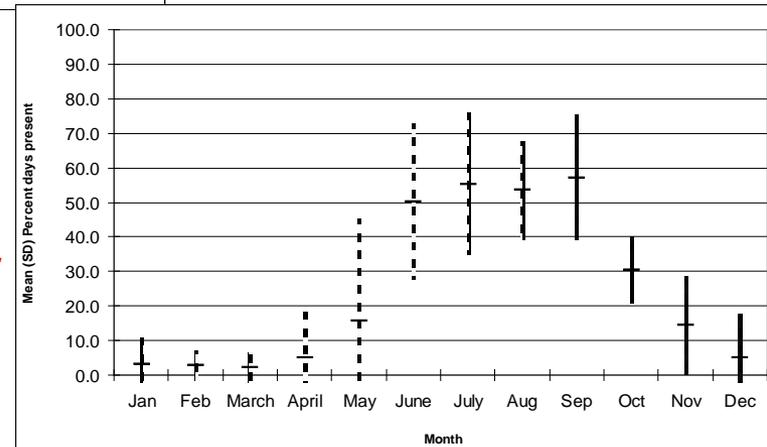
Mean monthly percent of time each Southern resident killer whale pod was present in four areas of inland waters

Data from 2003-2009

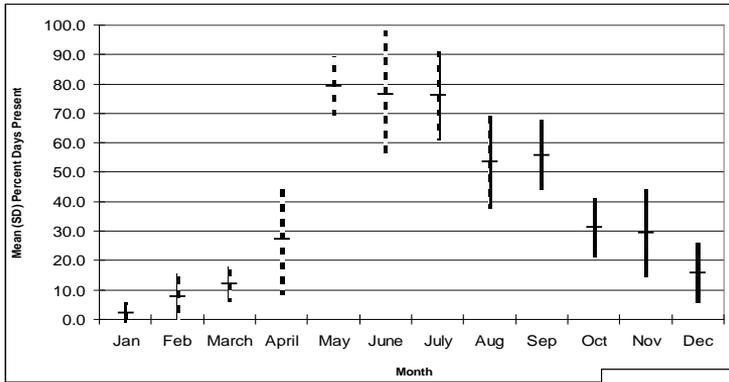


Where are the whales the rest of June - September?

Based on analysis of duration of excursions to the west in the Strait of Juan de Fuca and their average travel speed, it is estimated approximately 75-90% of the time that the whales are not in the San Juan Island area they are in the nearshore waters between Race Rocks and Cape Beale

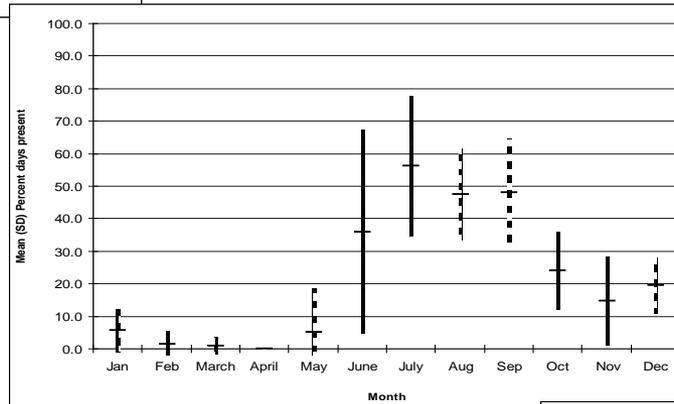


Recent SRKW residency patterns – Pod specific temporal patterns

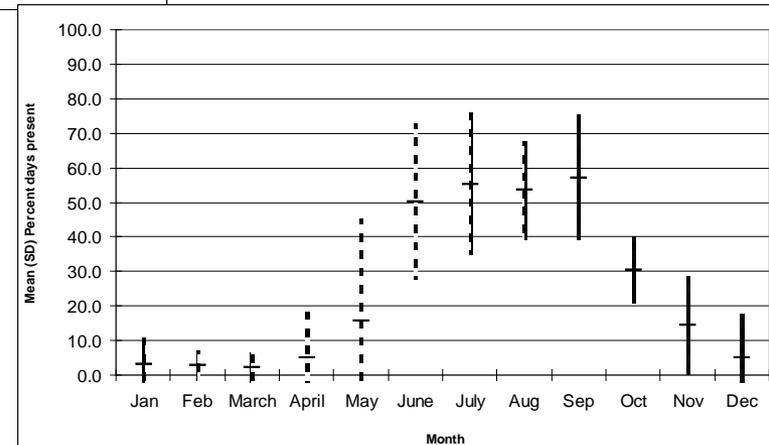


Mean monthly percent of time each Southern resident killer whale pod was present in four areas of inland waters

Data from 2003-2009

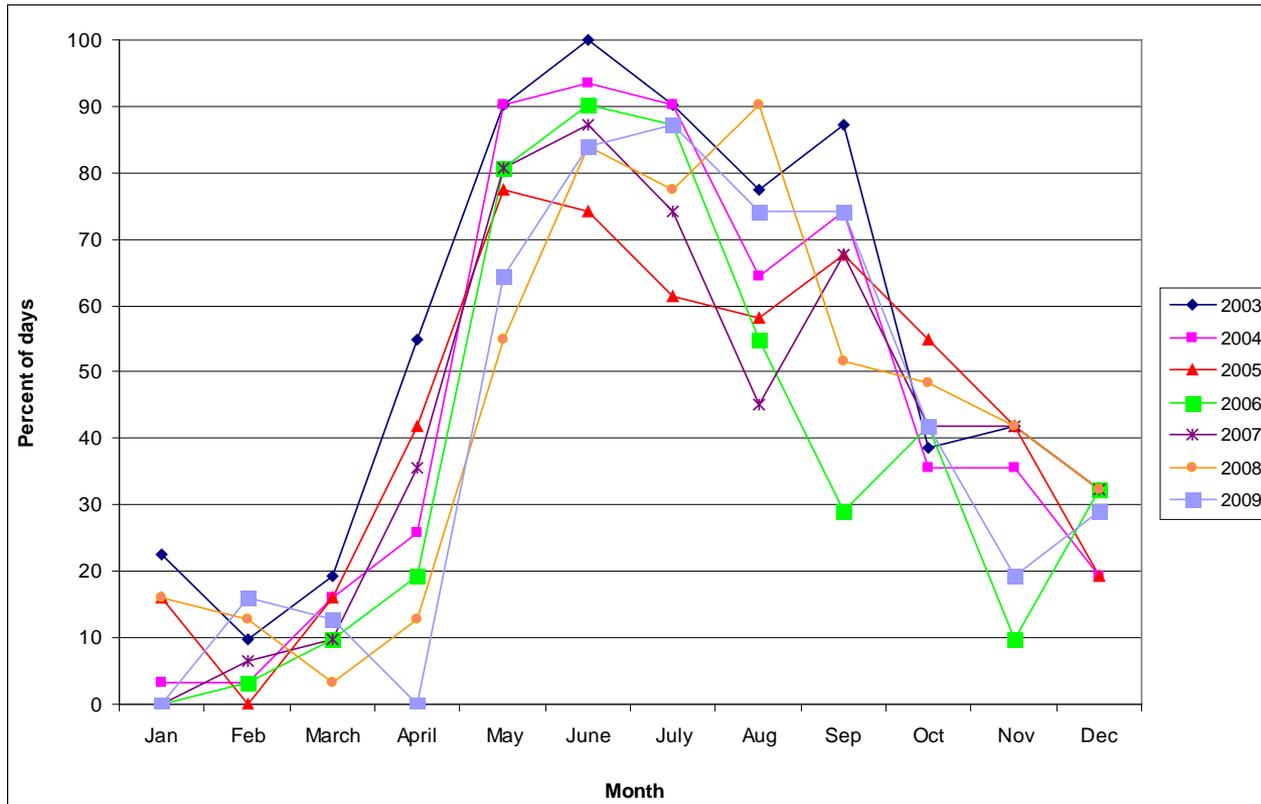


June typically has the most variability due to arrival timing of pods



Recent SRKW residency patterns

Percentage of days any Southern resident killer whale pods were present in four areas of inland waters showing interannual variability

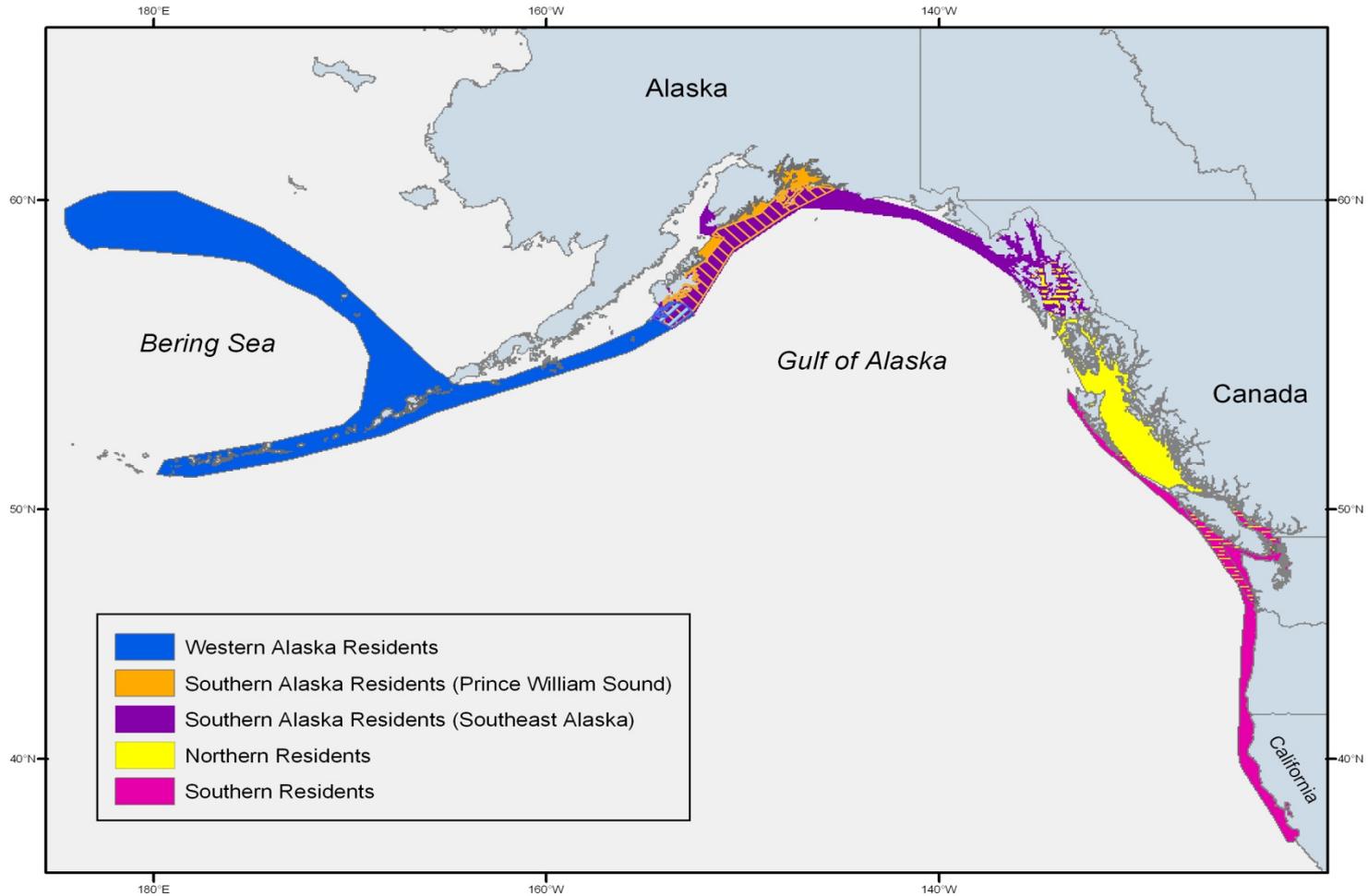


Note that 2008 and 2009 showed low occurrence in April-June
This pattern has continued in 2010 and 2011 – also have observed more pod fractionation



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Ranges of Resident-type Killer Whales



What data are available on SRKW coastal range? Known Range of Southern Resident Killer Whales

Through 2003 SRKW range was based on only 20 sightings collected over 30 years



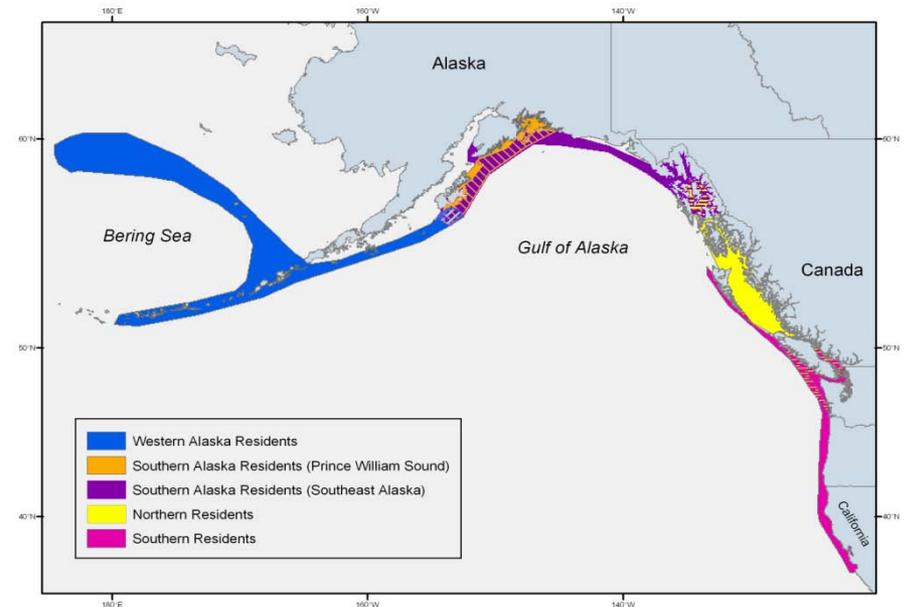
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Southern Resident Killer Whale Research Priorities

- Data Gaps
 - **Winter distribution**

Approaches to accurately determine the coastal range of Southern Resident Killer Whales

- Coastal sighting network
- Ocean-class vessel cruises
- Passive acoustic recorders
- **Satellite tagging**

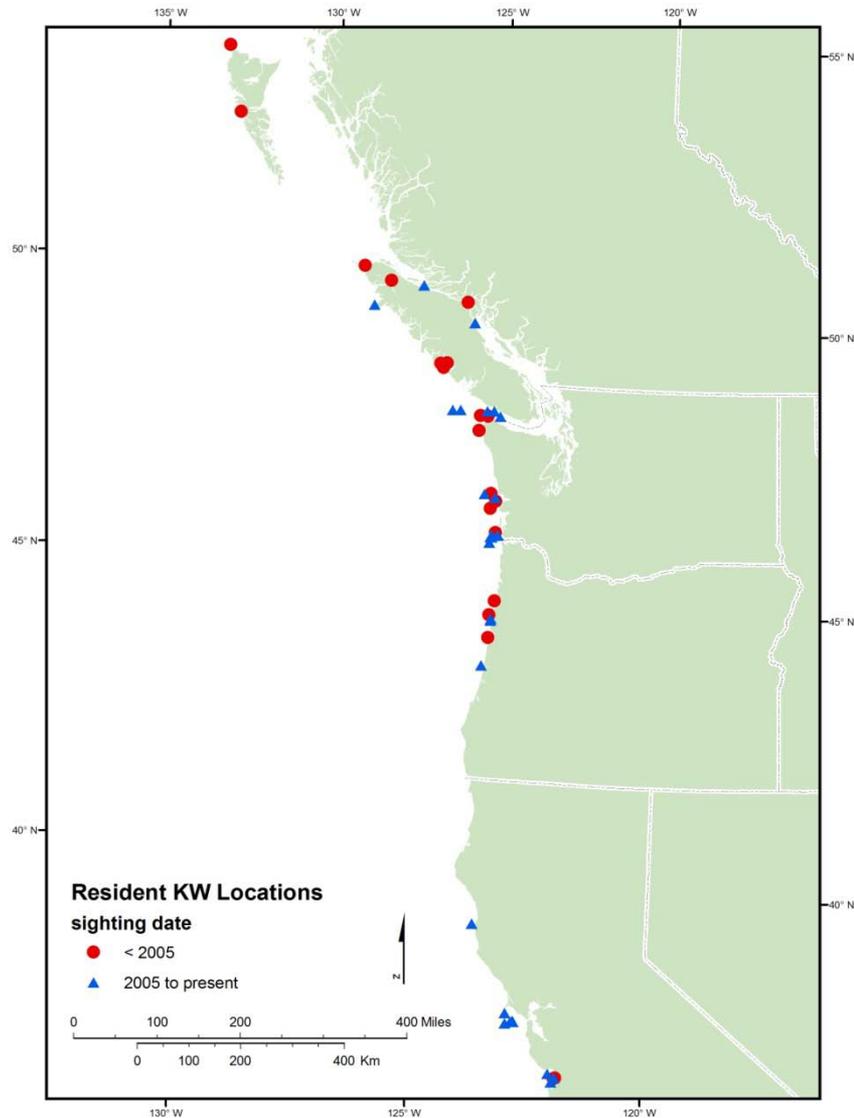


Southern Resident Killer Whale Research Priorities

- Data Gaps
 - Winter distribution
 - Coastal sighting network

Since 2005 the Center for Whale Research has developed a sighting network based on postering at marinas and establishing contact with vessel operators at all ports from Cape Flattery to Monterey Bay

15 additional sightings



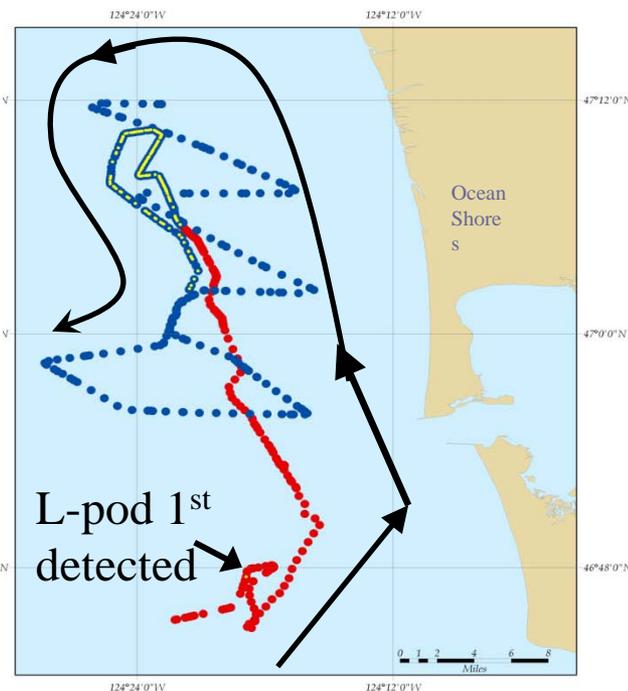
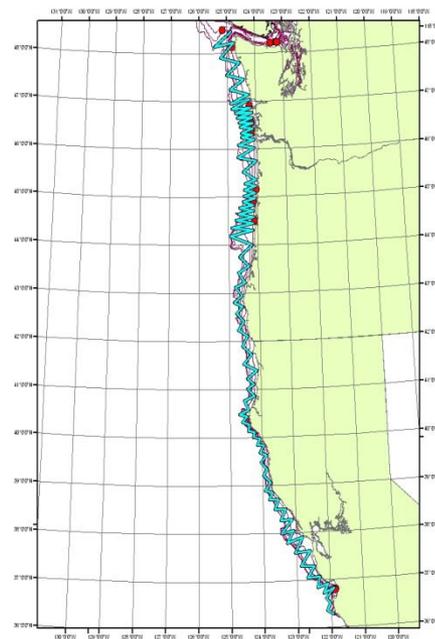
Southern Resident Killer Whale Research Priorities

- Data Gaps
- Winter distribution

- Ocean-class vessel surveys

Since 2004 the NWFSC has had five 8-21 day cruises on the McArthur II

SRKWs located on 4 of 5 cruises - 7 additional sightings since 2004 as well as short-term movement patterns and prey samples



L Pod track off Westport – 13 Mar 2004



Southern Resident Killer Whale Research Priorities

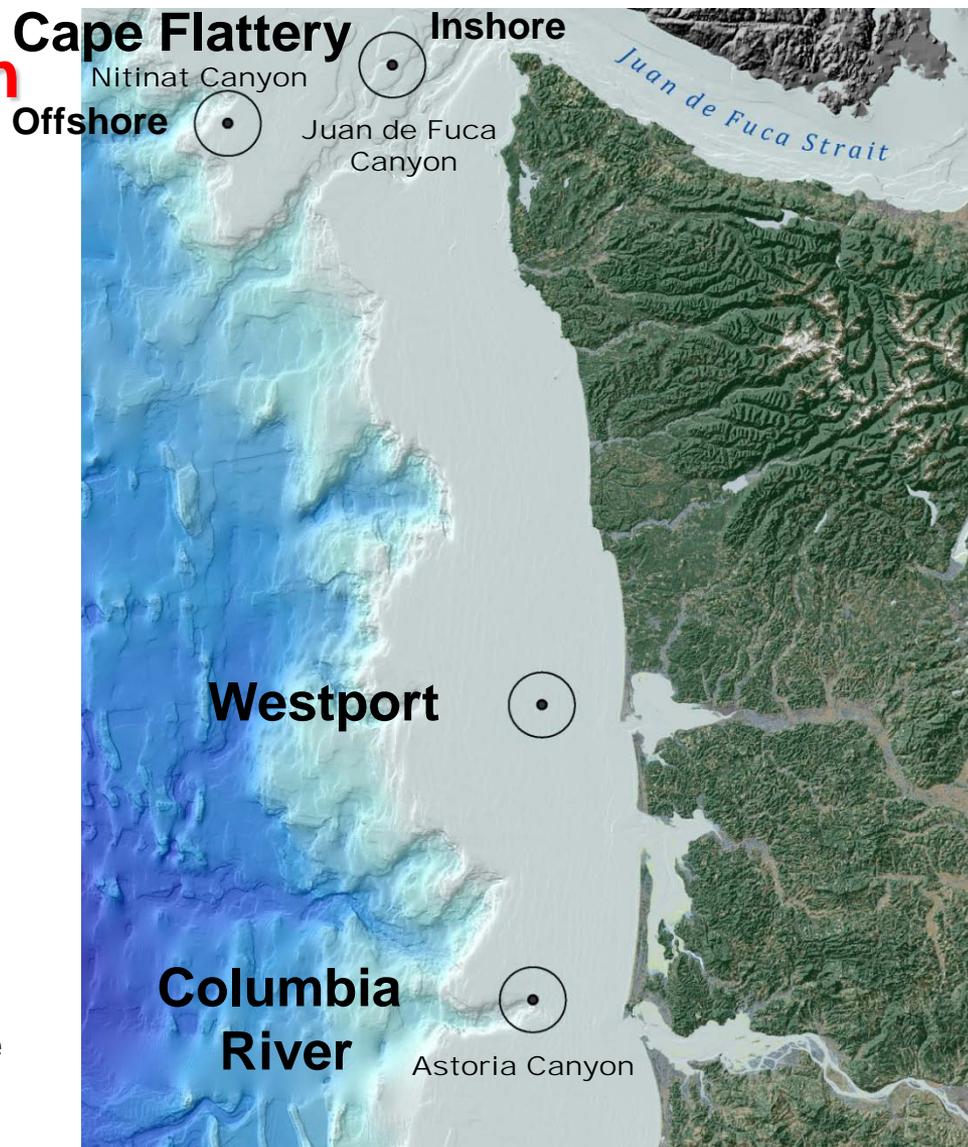
- Data Gaps

- **Winter distribution**

- **Passive acoustic recorders**

Recorders were primarily deployed at 4 sites off Washington and intermittently at 4 other sites in Oregon and California

Years deployed
2005 – 2011



Circles represent estimated 5 mile detection range



Southern Resident Killer Whale Research Priorities

- Data Gaps

- Winter distribution

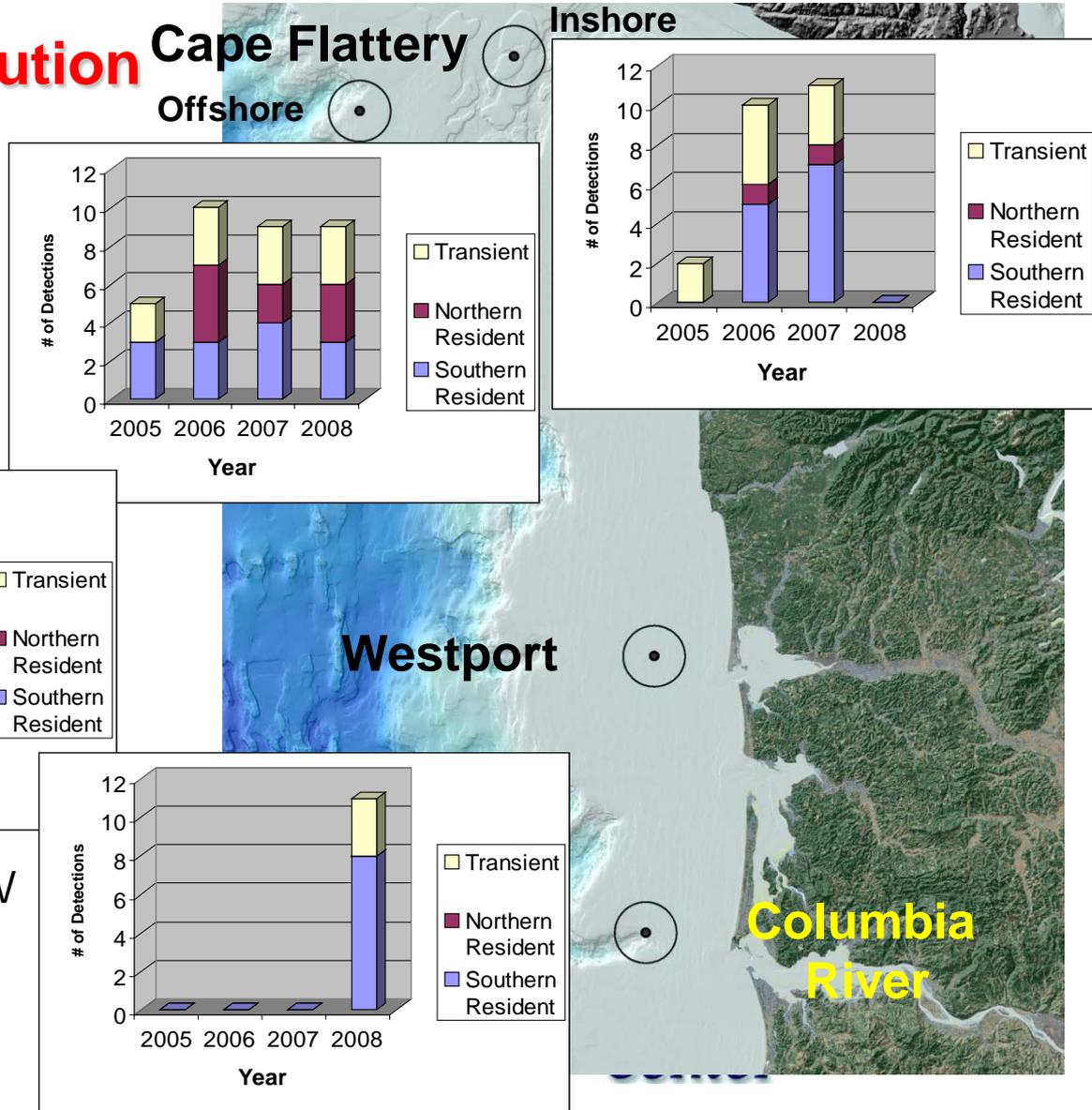
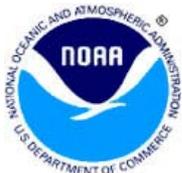
- Passive acoustic recorders

176 Total Detections

90 Total Detections identified to ecotype

47 SRKW Detections

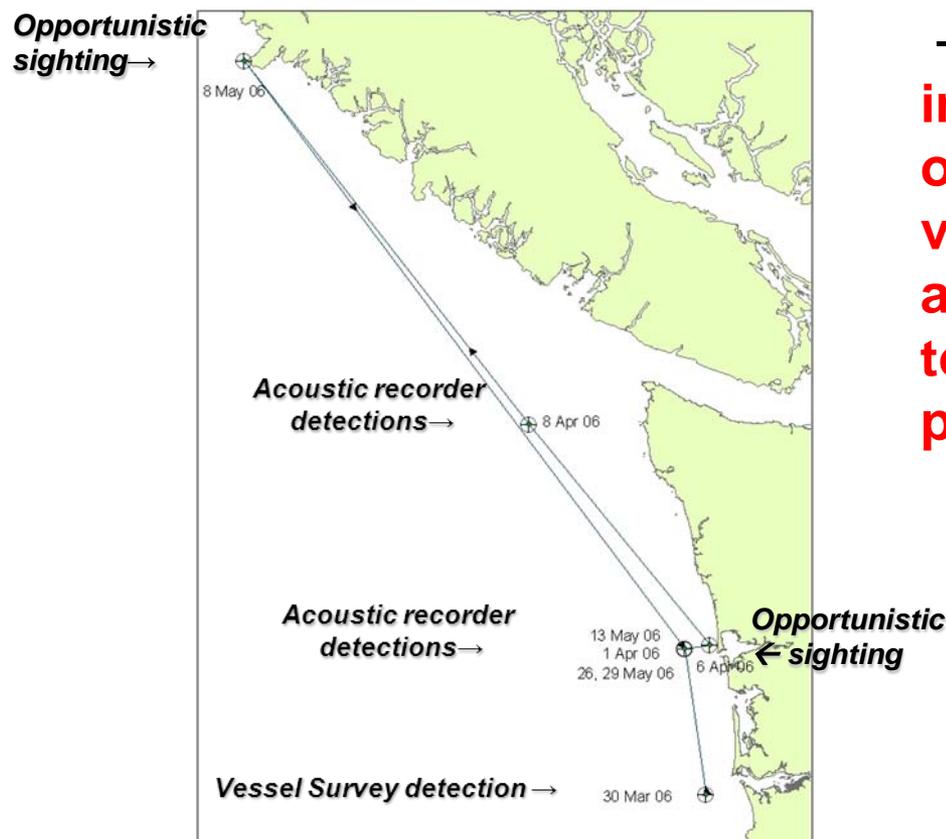
Additional 33 SRKW detections in 2009



Southern Resident Killer Whale Research Priorities

- Data Gaps

- Winter distribution



- Current efforts include coupling of opportunistic sightings, vessel surveys, and acoustic recorder data to infer movement patterns



Questions?



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