



Whale predation on winter herring Part 2: How many whales are feeding on herring?

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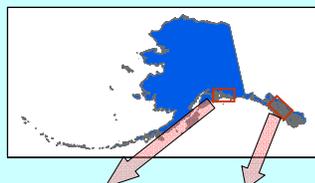
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Background

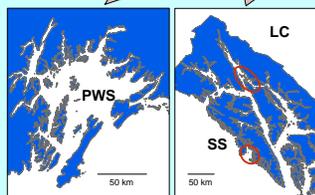
PROBLEM: Humpback whale predation during the fall and winter months may be limiting the recovery of depressed herring populations in Prince William Sound (PWS) and in Lynn Canal (LC).

OBJECTIVES FOR PART 2: Estimate the number of whales present during the fall and winter months (Sept. 15th- March 15th) in two regions with reduced herring populations (PWS and LC) and one region with robust herring populations (Sitka Sound (SS)).



CHALLENGES:

- Winter weather in Alaska is not conducive to Ship-based surveys.
- Winter in Alaska is dark and survey time is limited.



Methods

SHIP-BASED SURVEYS Allowed Us To Obtain:

- Counts of Whales
- Identify Individuals Whales
- Mark/Recapture Population Estimates (from individual IDs)



Humpback whales can be identified by their flukes.



A seasonal trend was fitted to counts and scaled to mark/recapture estimates.

The area under the modeled curve equals the “whale use days” needed to calculate herring consumption rates (Part 5).

Unique whale IDs provide an independent minimum population estimate.

Results



Humpback whale blows in southeastern Alaska. Large shoals of whales can be difficult to count.

Effort in hours of survey time and kilometers traveled during humpback whale surveys.

	PWS		LC		SS	
	km	hours	km	hours	km	hours
2007/2008	1708	119	1695	156	300	41
2008/2009	3167	206	604	33	693	37

CONCERNS:

- Heterogeneity – With humpbacks there tends to be a bias towards under estimating population.
- Movements and Migration with a year.
- Incomplete survey coverage.

Late-season humpback whale population estimate (excluding calves), (upper and lower 95% confidence intervals in parenthesis), generated by the Huggins Closed-Capture Models in Program MARK.

*Both time an area covered increased in 08/09 in PWS. ** The decline in whales during 08/09 reflects movements out of LC and reduced effort.

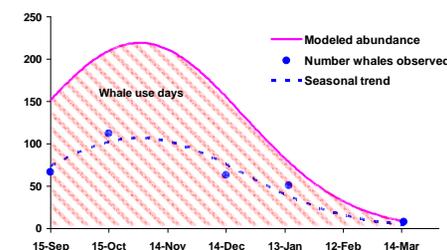
	PWS*	LC**	SS
2007/2008	57 (49,69)	48 (45,54)	78 (73,85)
2008/2009	129 (123,136)	29 (26,36)	88 (79,98)

Number of late-season whales (excluding calves) individual identified. *not all whales were included in this analysis, e.g. in PWS a total 199 individuals were identified during this study.

	PWS*	LC	SS
2007/2008	22	38	53
2008/2009	111	21	45

Late-season “whale use days” feed into the model described in **Humpback Whale Predation on Herring Part 5: Impacts of Whale Foraging on Three Herring Populations in Alaska.**

Estimation of “whale use days” for PWS during the fall and winter of 2008/2009.



Take home message: Prince William Sound has a lot of late-season humpback whales.

Summary of whale use days.

	PWS	LC	SS
2007/2008	30,000	8,700	14,000
2008/2009	23,500	5,300	16,000



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