



# **Intertidal ghost shrimp: enough for gray whales and a sustainable commercial harvest?**

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Research conducted by the DNR Aquatic Assessment and Monitoring Team with assistance from UW and Central Washington University faculty/students and Cascadia Research Collective

# Project Conception

- Concern that less whales had been returning to feed at specific beaches
- Anecdotal observations from locals indicating that the frequency of Gray whale feeding had diminished, and whales had been returning earlier and staying later.
- Attributed to commercial (*Neotrypaea californiensis*) harvest?
- Complete moratorium on commercial harvest until a study could be completed  
**April 2014**
- Lack of data – 1992 Laurie Weitkamp's Gray whale foraging on ghost shrimp (*Callinassa californiensis*) in littoral sand flats of Puget sound

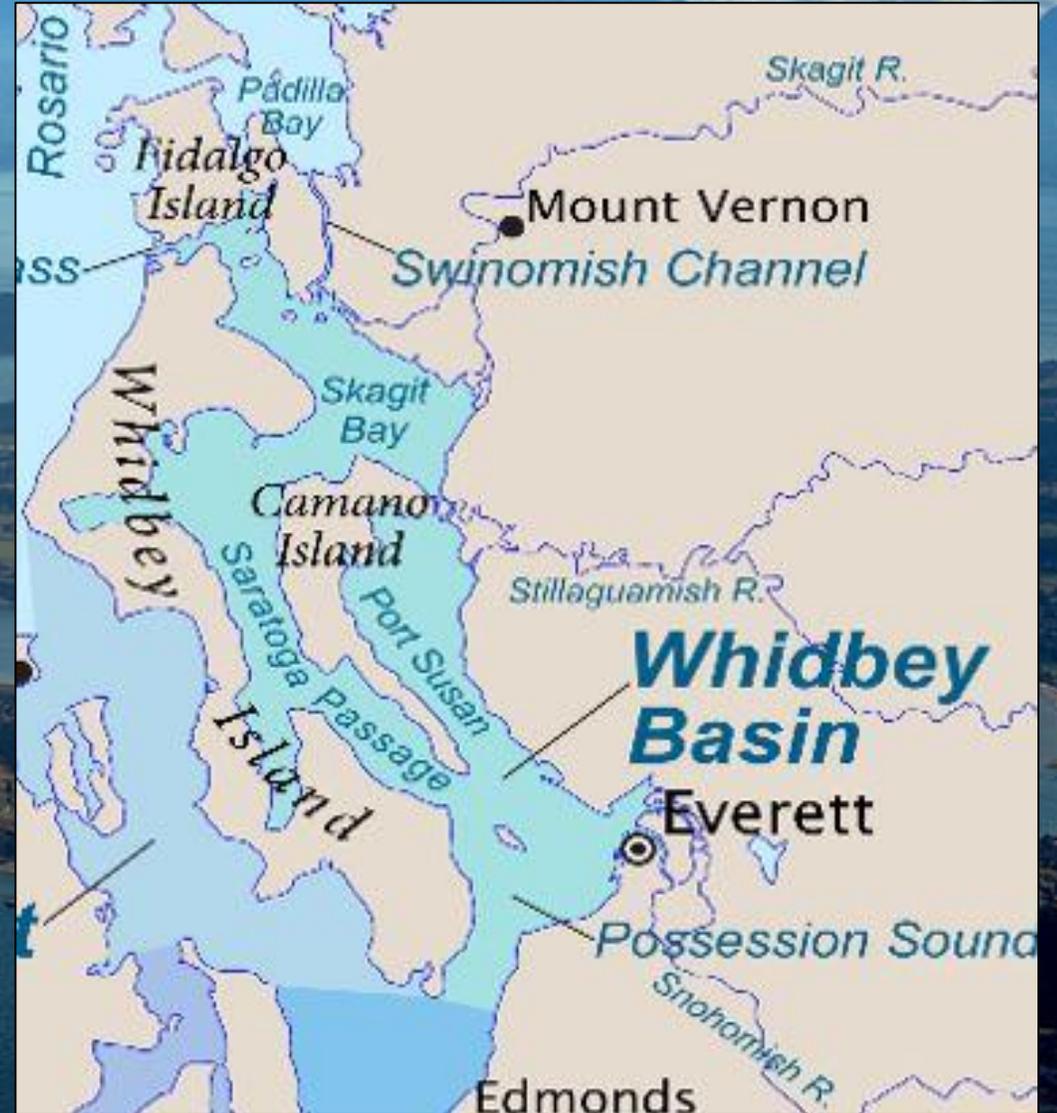
# Project Goals

**Determine whether commercial harvest competing with Gray whales for native Ghost shrimp (*Neotrypaea californiensis*)**

- 1) Determine most utilized regions in Whidbey basin by Gray whales
- 2) Estimate total standing stock of ghost shrimp in areas whales feed
- 3) Estimate yearly extraction of ghost shrimp by Gray whales
- 4) Estimate yearly extraction of Gray whales by harvest

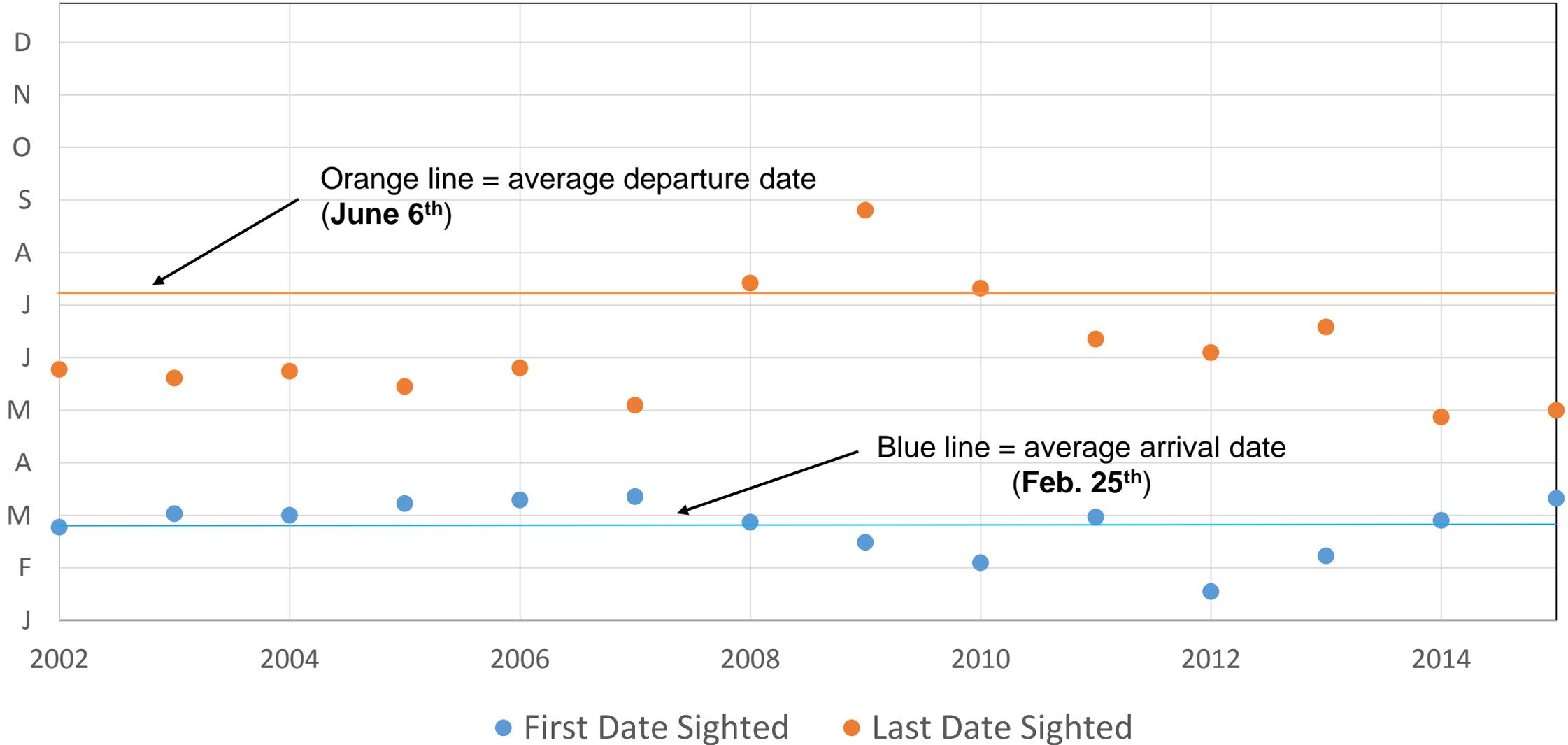


# Whidbey Basin, Puget Sound WA

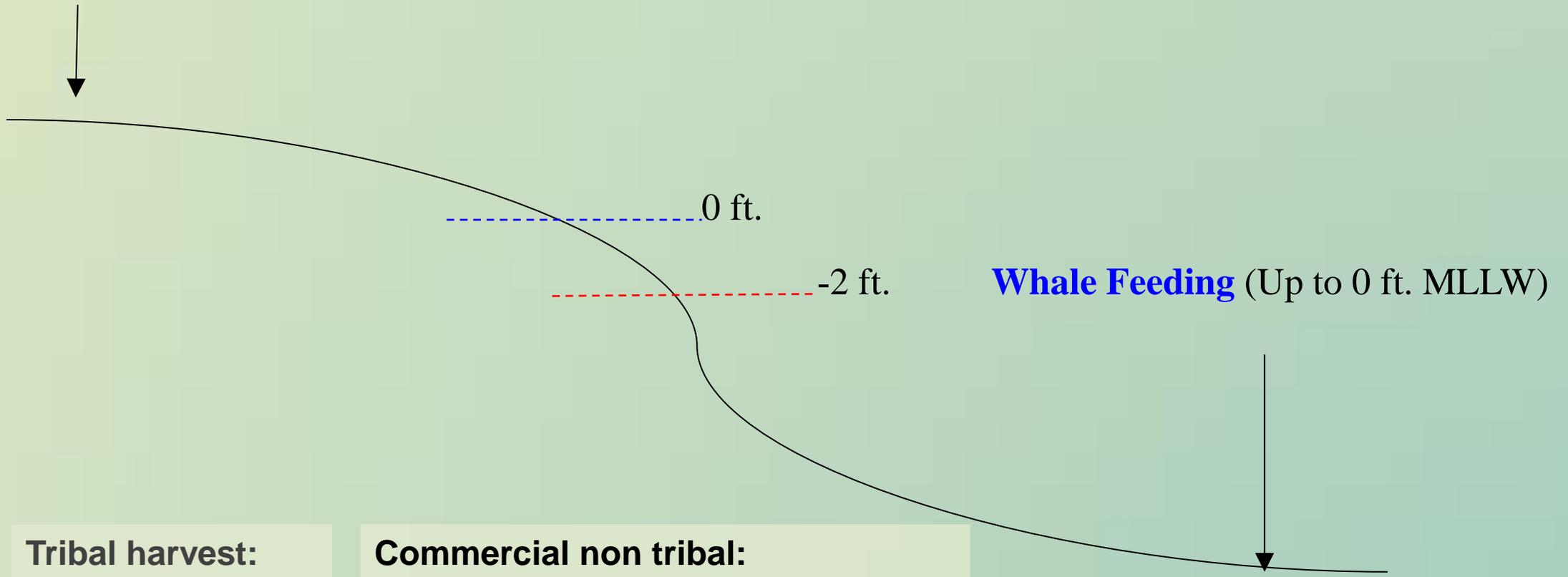




# Gray whale first and last sightings Whidbey Basin 2002 - 2015



**Harvest** (Down to -2 ft MLLW.)



**Tribal harvest:**

➤ Tribal Land

**Commercial non tribal:**

5 authorized Right Of Entries on State land  
3 commercial harvest operations

**Both:**

Operate on low tides ~ 0 ft. or lower throughout the year  
Catch records reported to WDFW  
Reported by the dozen

## Assessment of Ghost shrimp stock

12 beaches surveyed and mapped

3 site types: '1' *whale feeding*, '2' *harvest*, and '3' *no whale feeding or harvest present*.

Manual coring, 300 m long transects

Hydraulic pumping

## Whale extraction estimate

Samples taken inside and outside

Tagging of whales

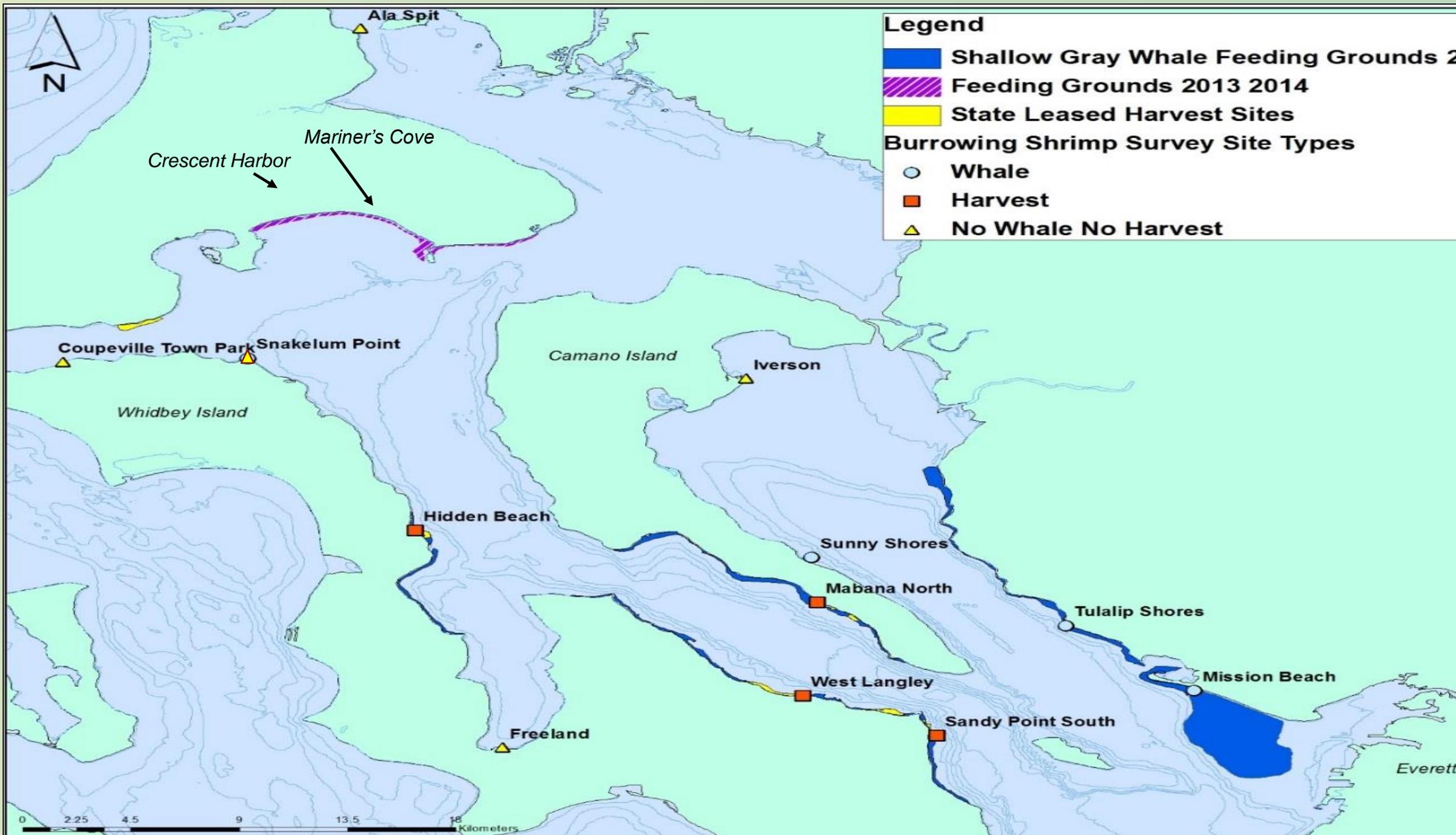
## Harvest extraction estimate

WDFW catch records: 2010 – 2015 tribal , 2010 – 2013 non tribal

# Harvest

An aerial photograph of a sandy beach. The sand is light brown and textured. Numerous circular burrows, likely belonging to crabs, are scattered across the surface. Each burrow has a dark, circular opening in the center. The burrows vary in size and are distributed across the entire frame.

- **Beaches Harvested from 90 – 130 times per year**
- **Mean yearly harvest Tribal: ~ 1 million shrimp or 7.83 metric tons**
- **Mean yearly harvest non- tribal: ~ 2 million shrimp or 12.72 metric tons**



# Standing Stock and Whale Pit Surveys

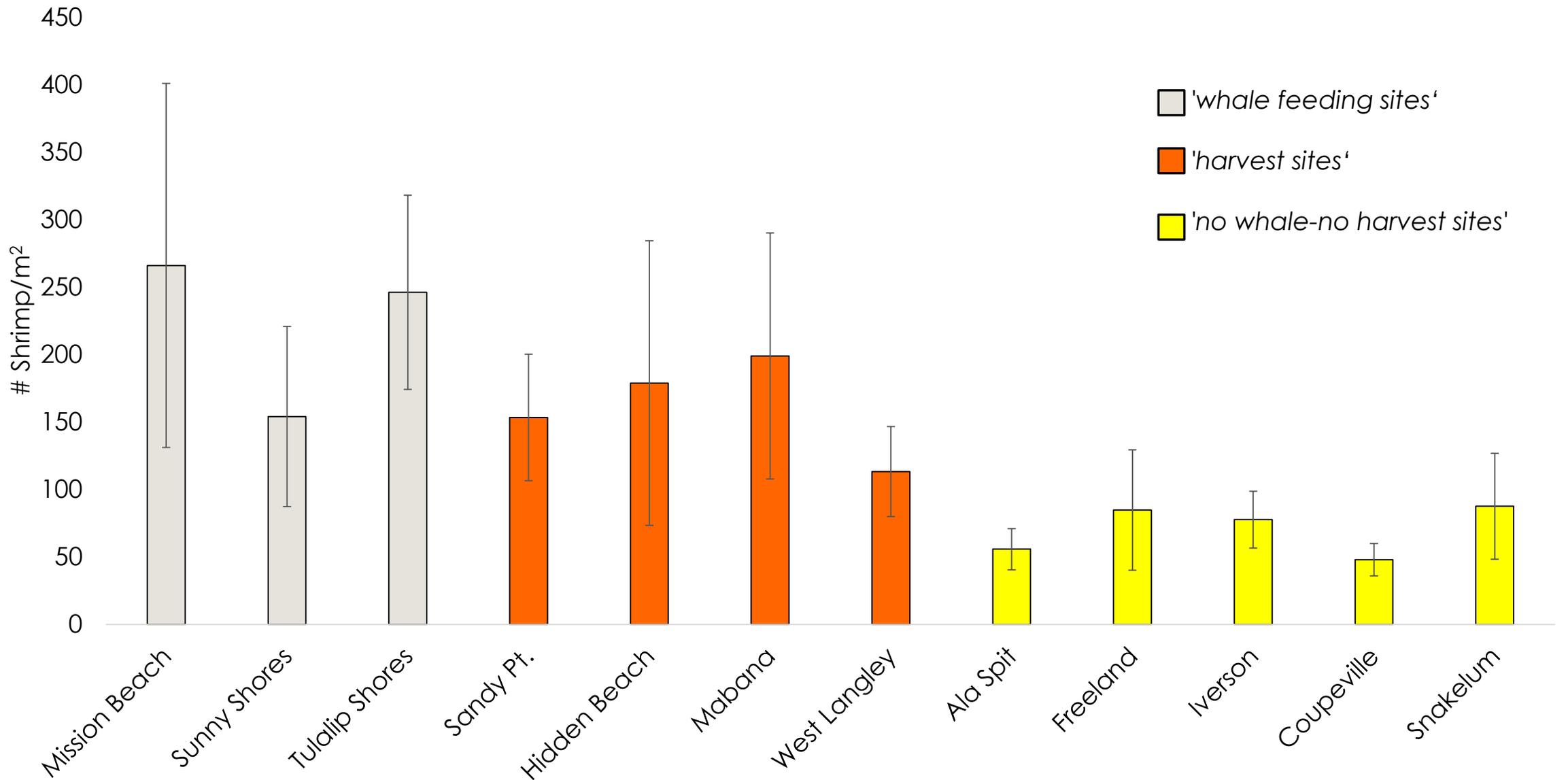
300 m transects



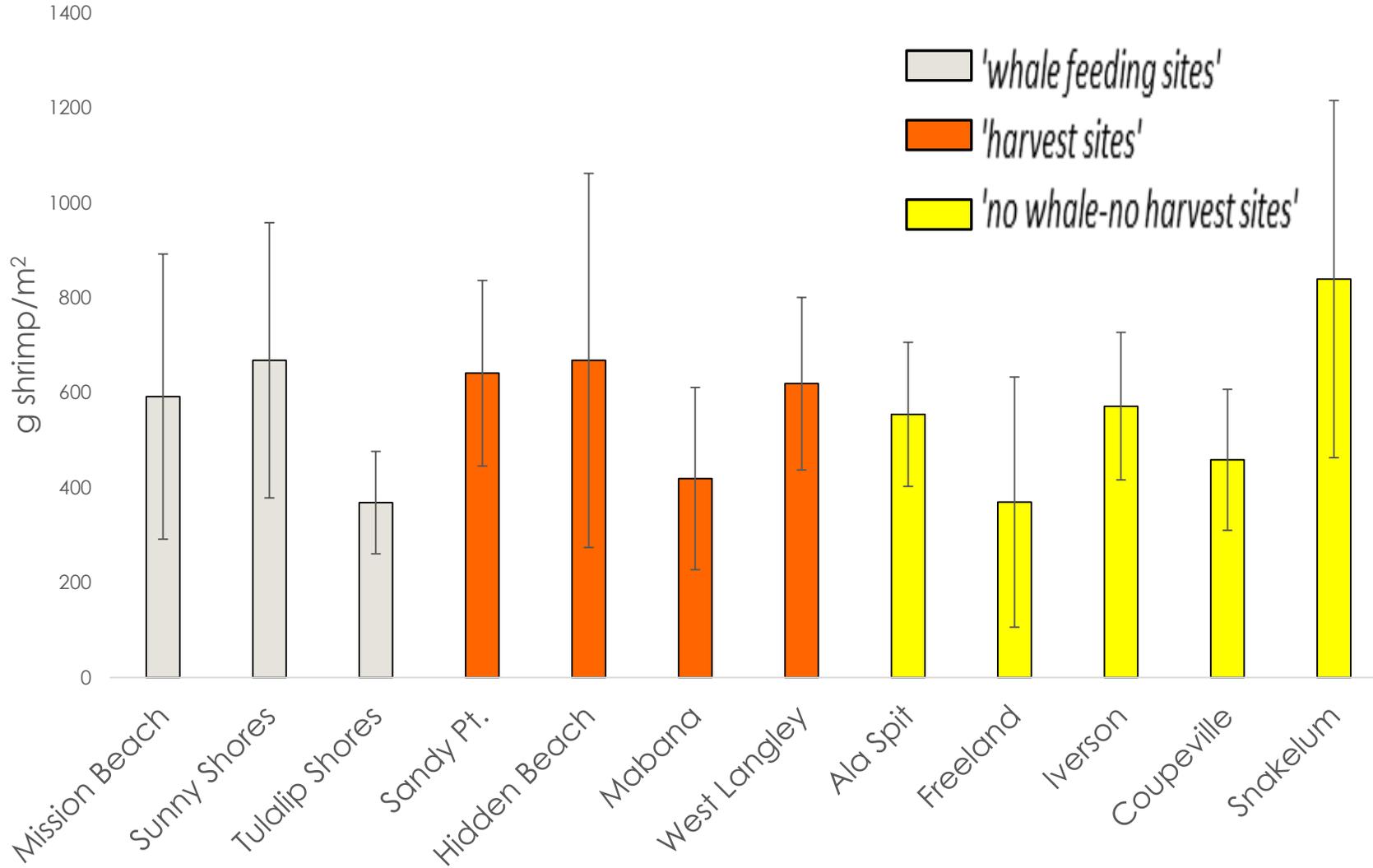
1/2 m<sup>2</sup> pumped cylinders to relate cores to actual biomass



# Shrimp density (Number of shrimp per square meter- all sites)

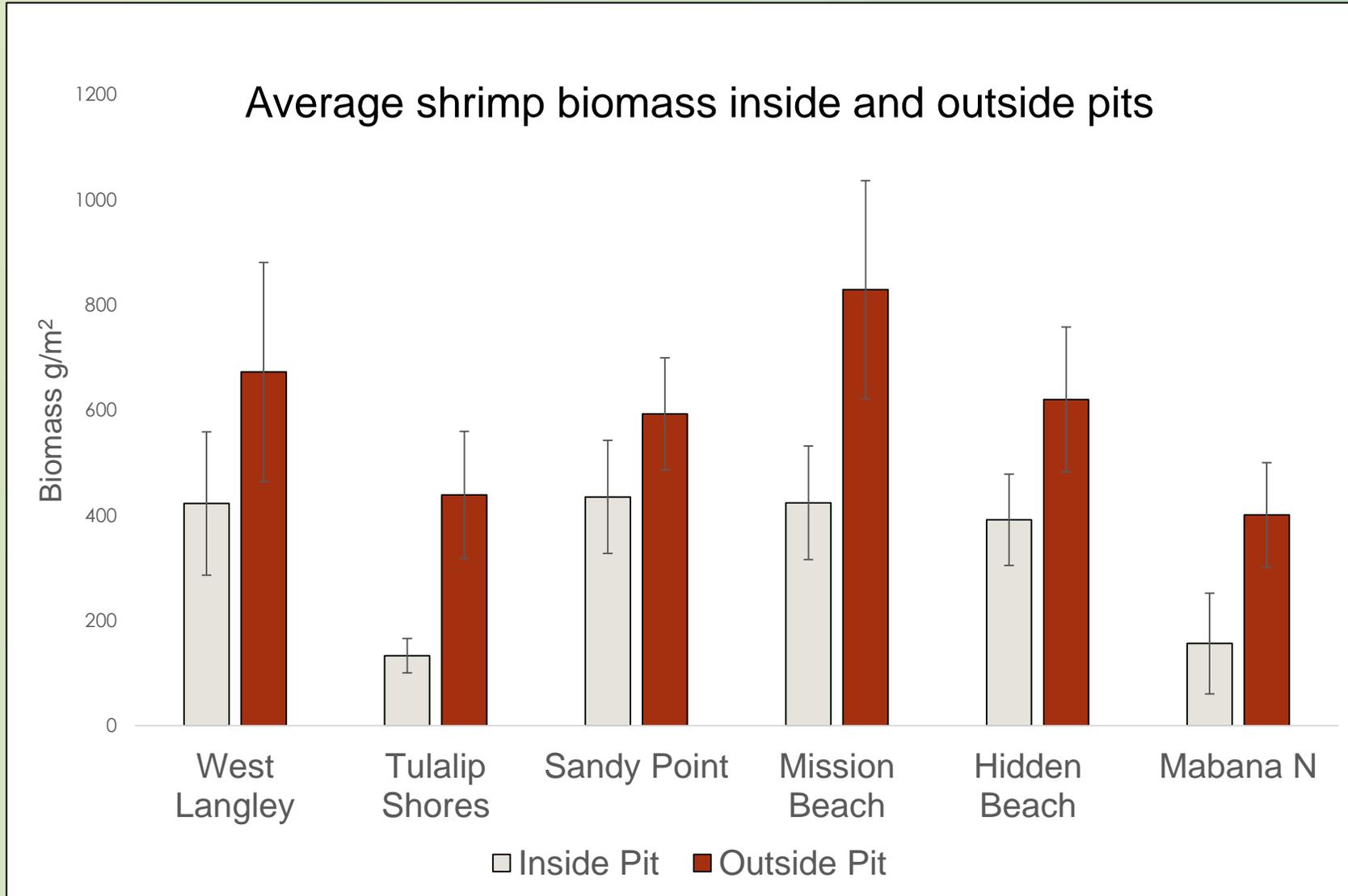


## Biomass all sites



- Whale: High density of 'ex. small' – 'medium' shrimp
- Harvest: High density of 'ex. small' – 'medium' shrimp
- No whale feeding or harvest present: Low density of 'large' shrimp

Inside  $130 \pm 58$  shrimp/m<sup>2</sup> Standard Pit Size: 8.4 m<sup>2</sup>  
Outside  $250 \pm 108$  shrimp/m<sup>2</sup>  
Difference  $120$  shrimp/m<sup>2</sup>, (273 g/m<sup>2</sup>)



## Total available shrimp stock 2015

(total available shrimp stock area  $\text{m}^2$ ) \* (average biomass at whale feeding sites  $\text{g}/\text{m}^2$ ) =

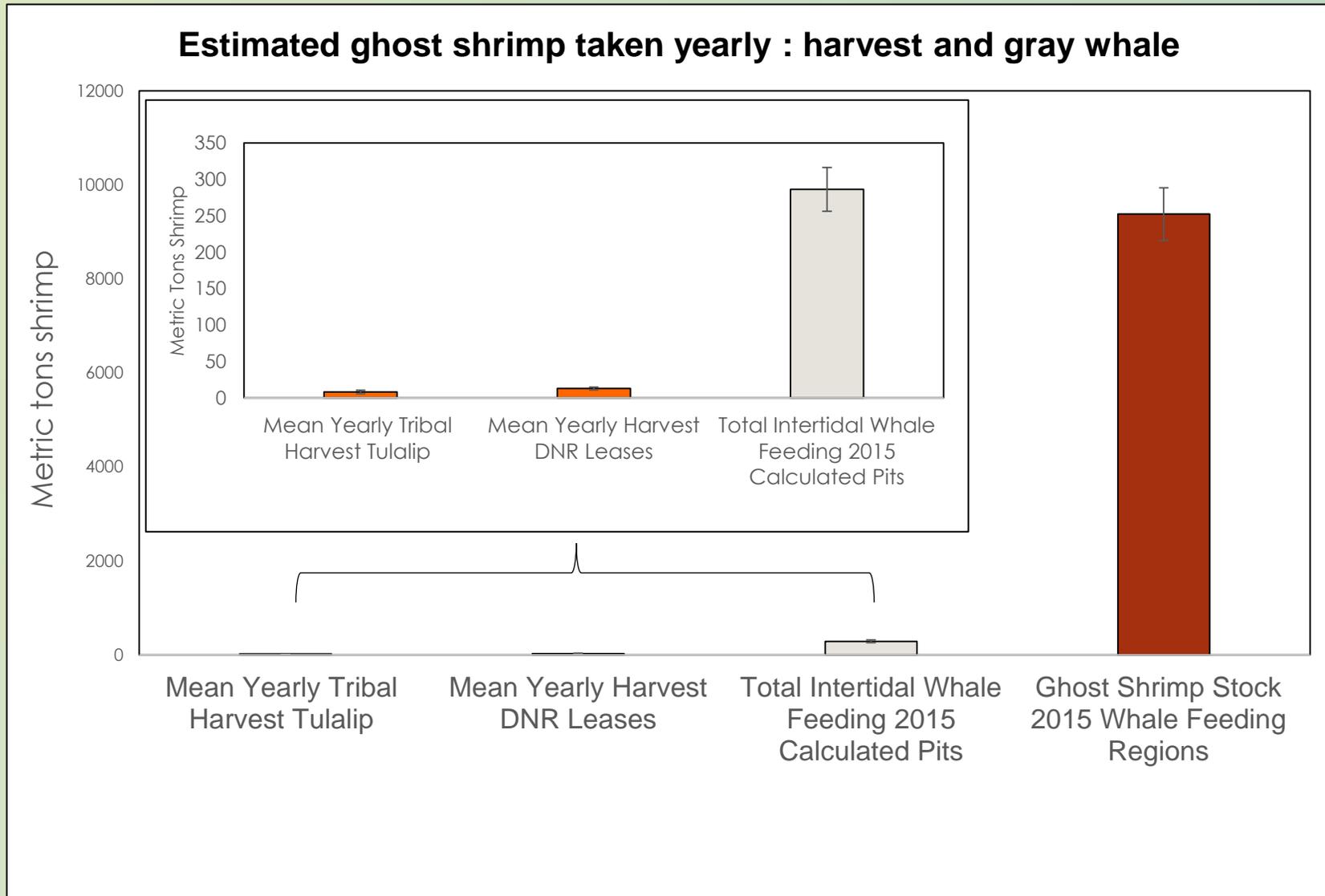


(Delineated area from -10 MLLW to start of cobble in all recorded areas of feeding 2015)

## Total shrimp stock extracted by whales 2015

(average difference inside and outside whale pit/ $\text{m}^2$ ) \* (# total whale pits counted 2015) =

- **Estimated Ghost shrimp standing stock ~ 30 times greater** than the yearly estimate of shrimp extracted from Gray whale feeding and harvest combined.



Biomass Estimated Taken Yearly From:	Total Biomass (Metric Tons)	St. Error
Mean Yearly Tribal Harvest Tulalip	7.83	2.43
Mean Yearly Harvest DNR Leases	12.72	2.00
Total Intertidal Whale Feeding 2015 Calculated Pits	286.29	30.03
Ghost Shrimp Stock 2015 Whale Feeding Regions	9377.31	562.49

# Findings

Harvested areas only make up ~8.2%

Snohomish Delta accounts for the majority feeding grounds (60%). These regions are inaccessible to commercial harvest

Yearly harvest accounts for <1/2% of the total estimated shrimp stock

Narrow overlap of harvest and whale feeding in space and time (0 ft. to -2 ft. MLLW and Feb. through June)



Photo: Dan Bates

# DNR to authorize entry to state owned tidelands for ghost shrimp harvest beginning June 2016

- ▶ Three year authorizations to same harvesters
- ▶ No fishing allowed February 1 through June 10
- ▶ No plans to expand fishery at this time

## Continued Monitoring

- ▶ Sampling of existing whale feeding and harvest beaches
- ▶ Recruitment surveys of newly settled shrimp
- ▶ Multibeam and video surveys to determine extent of subtidal pits
- ▶ Continued involvement with Cascadia Research



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