Identifying Trends in Dungeness Crab Larval Abundance Across Puget Sound

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Background

- Dungeness crabs are critically important to ecosystems and fisheries in the Pacific Northwest.

- Populations are far more variable than expected under current fishery management strategies.

- Existing policies protect the spawning population while ignoring the effects of larval recruitment on future abundance.

- We need to understand the factors that influence larval abundance (Fig. 1) before predicting trends in future commercial catch.

Zoeae

Megalopae

Juvenile

Figure 1. Early life stages of Dungeness crab. © Natalie Renier

Research Question

How does the abundance of Dungeness megalopae vary spatially and seasonally across Puget Sound?

Internship and Methods

- I worked with Pacific Northwest Crab Research Group (PCRG) to monitor the abundance of Dungeness crab megalopae using a light trap at Shilshole Bay (Fig. 2).

- I obtained past PCRG data from four other sites in Puget Sound (Fig. 5) and created a series of generalized linear models to analyze patterns in abundance.

Figure 2. (A) Light trap used to catch crab megalopae at PCRG's Shilshole Bay site.
(B) Taylor and I sorting through a light trap sample on the dock.
(C) Two Dungeness megalopae (total body length = ~6-8 mm).

Results
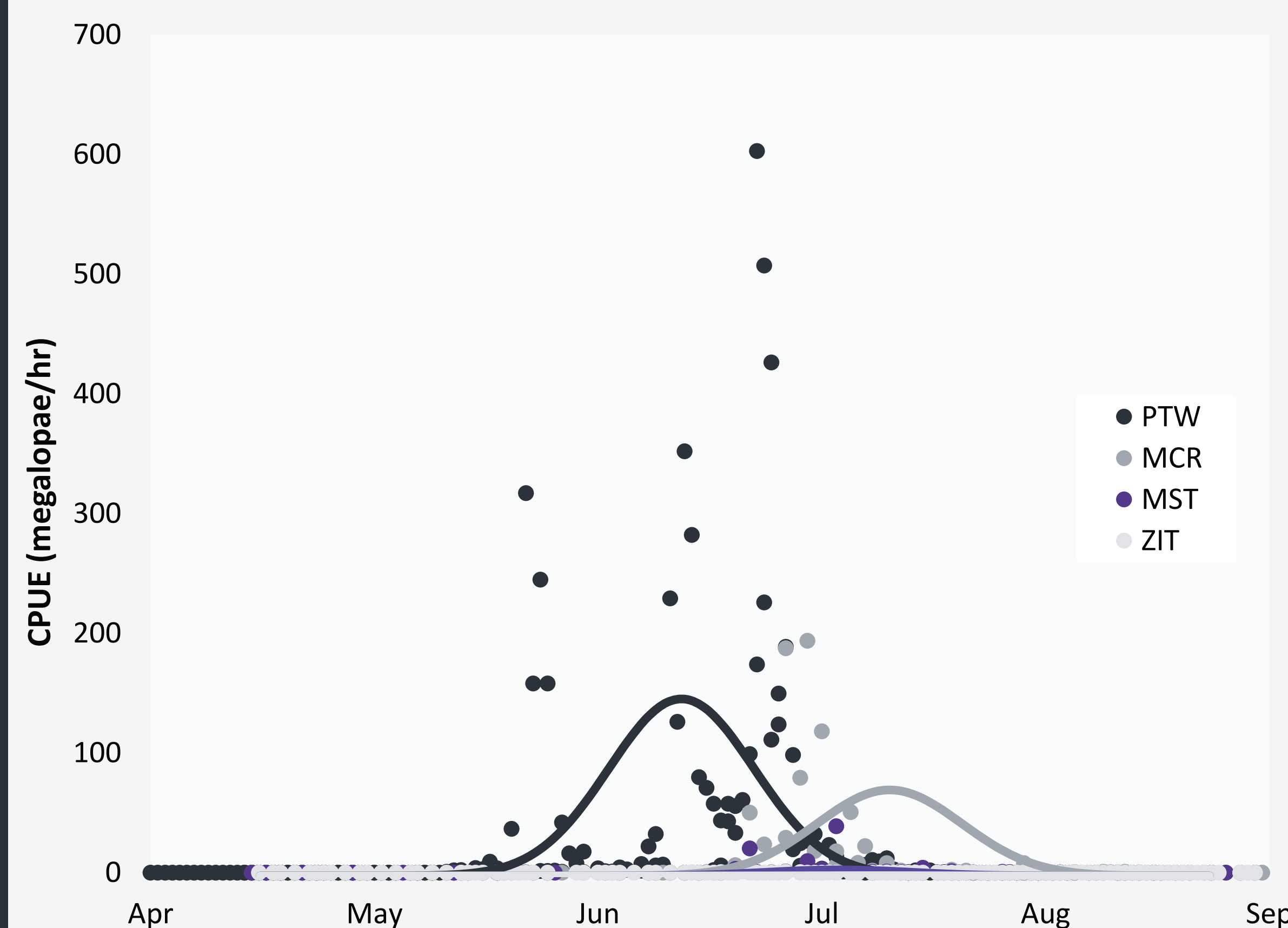
Spatial and Seasonal Variation

Figure 3. Plot of observed and model-predicted catch per unit effort (CPUE) over time for four PCRG larval monitoring sites. CPUE was calculated using the number of megalopae caught divided by the number of hours fished. Observed data is shown with data points; model-predicted data is shown with trendlines.

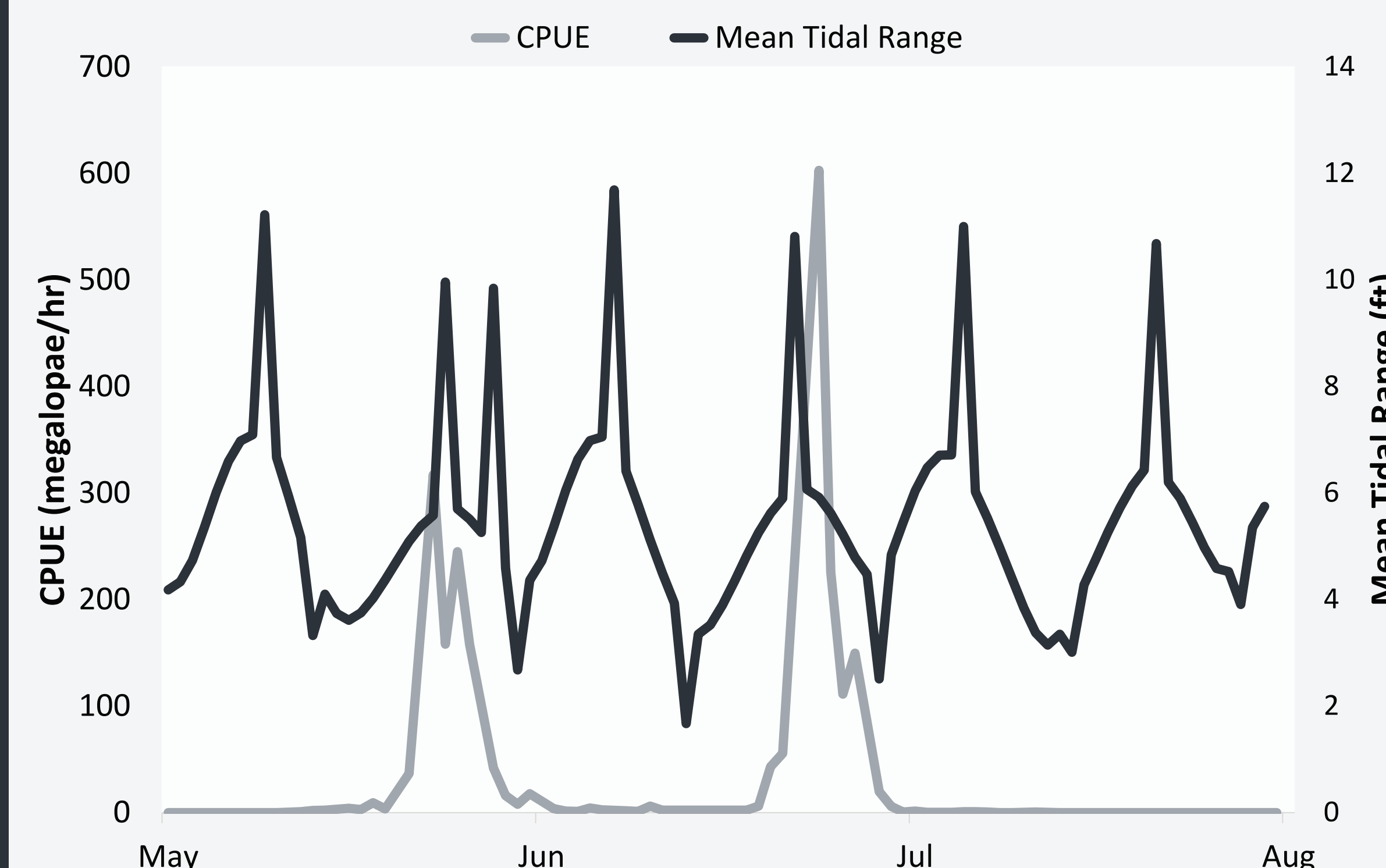### *Tidal Forcing as a Predictor Variable*

Figure 4. Light blue line shows CPUE (megalopae caught per hour) over time at PTW in 2020. Dark blue line shows mean tidal range (ft) over time relative to the mean lower-low water level (MLLW), taken from the NOAA Port Townsend monitoring station. Local maxima on the dark blue line represent spring tides; local minima represent neap tides.

Key Findings

- Larval abundance differs between sites, and peak catch occurs at different points throughout the season (Fig. 3).

- Within a single season, peaks in abundance covary with spring tides (Fig. 4).

- Sites closer to the Strait of Juan de Fuca have an earlier settlement period and higher overall abundance (Fig. 3, 5), suggesting an influx of oceanic megalopae into northern Puget Sound.

Significance

- Characterizing the abundance and transport patterns of Dungeness megalopae in Puget Sound makes it easier to understand variation in the adult population.

- Eventually, PCRG will use larval abundance data to predict commercial catch with a lead time of four years, but doing so will require data from an entire network of sites (Fig. 5) over a longer time series.
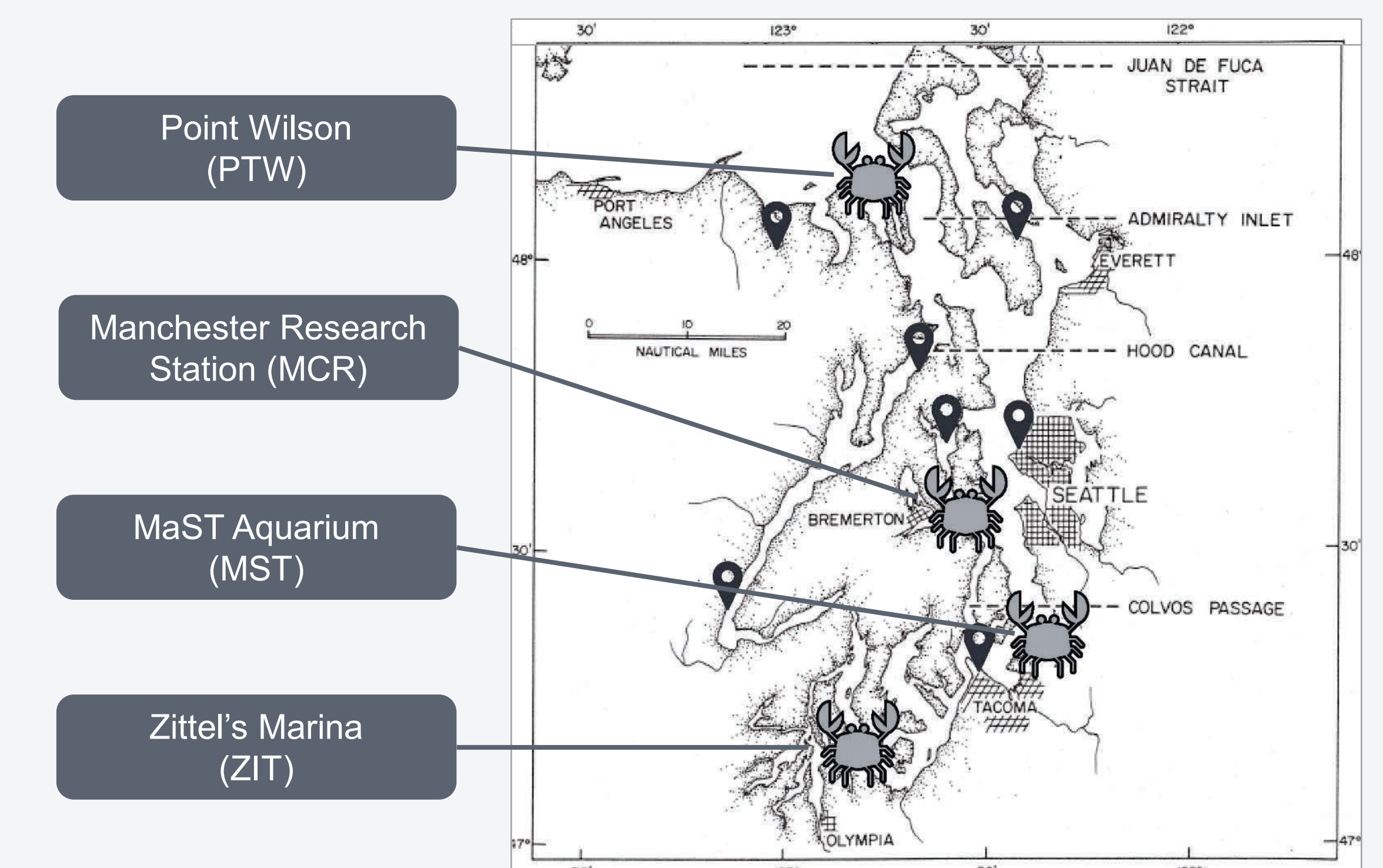
Point Wilson (PTW)

Manchester Research Station (MCR)

MaST Aquarium (MST)

Zittel's Marina (ZIT)

Figure 5. Map of Puget Sound showing the four Dungeness larval monitoring site locations used in my analysis (blue crab icons). Additional sites in the PCRG program are shown with dark blue markers.

Acknowledgments