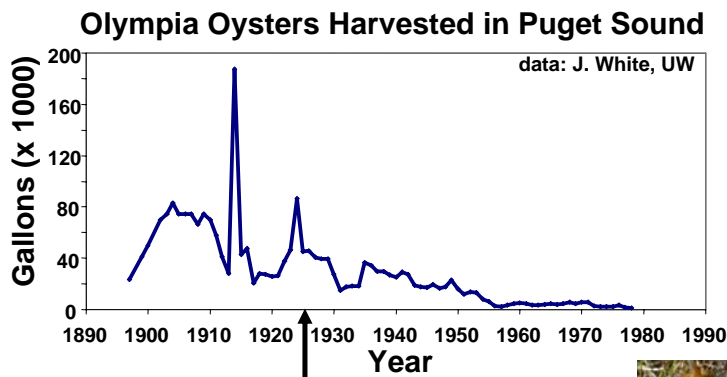


Impacts of Invasive Drills on Olympia Oysters in Puget Sound: Implications for Restoration



Native Oysters and Invasive Drills



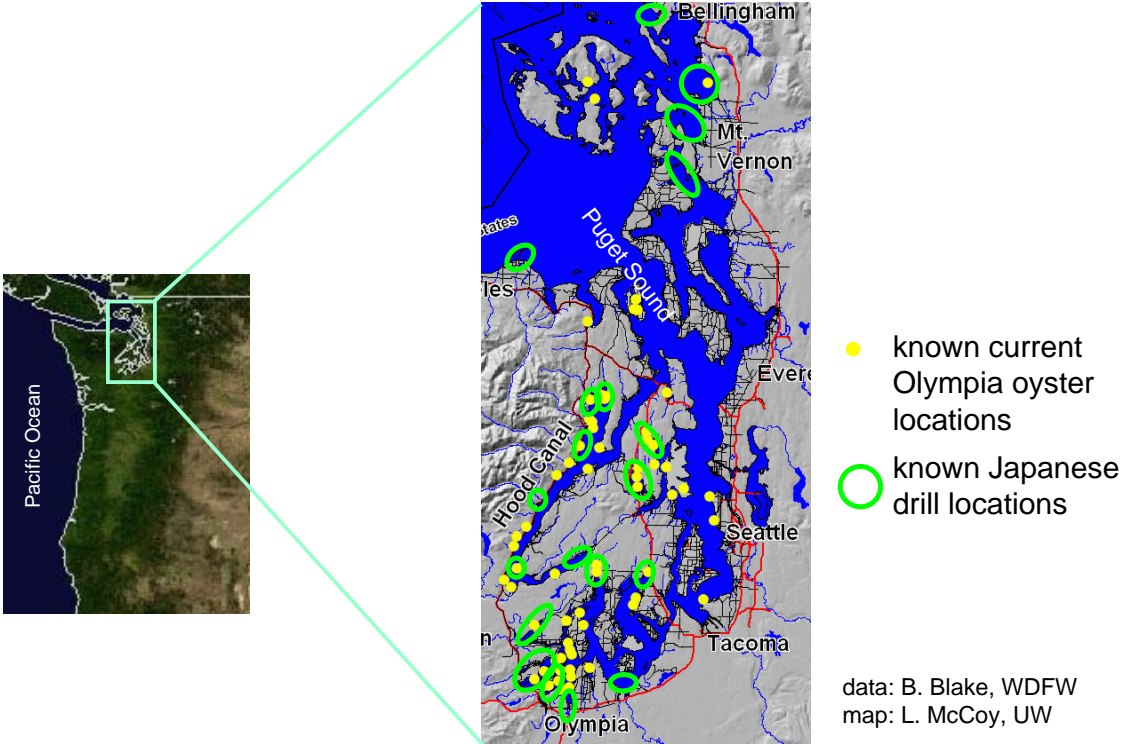
Olympia oyster
(*Ostrea conchaphila*)



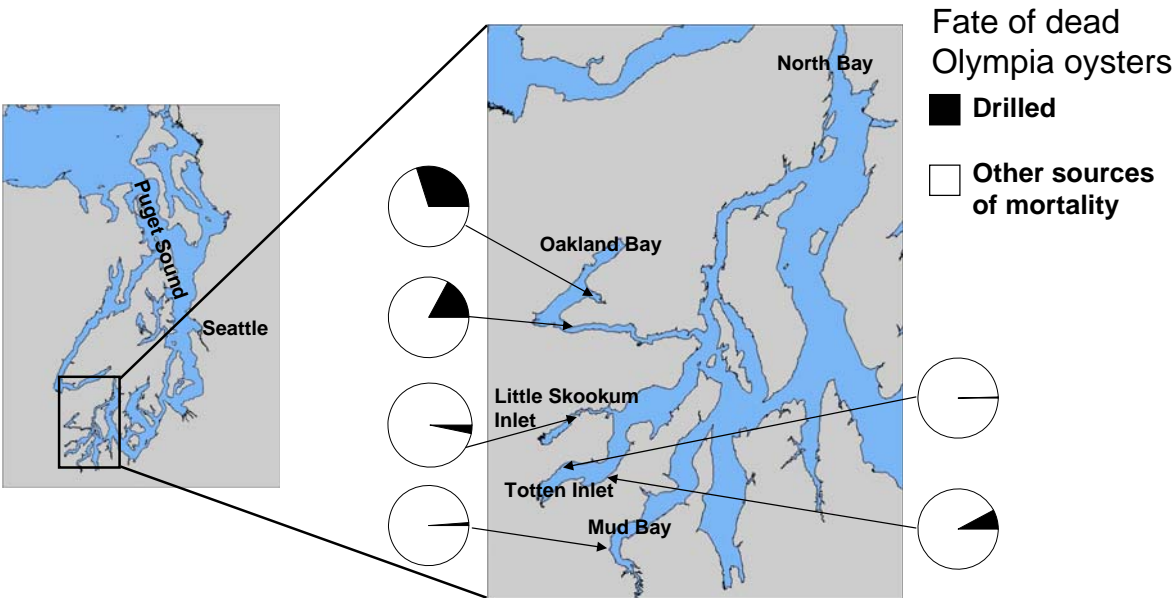
Japanese oyster drill
(*Ocenebrina inornata*)



Drills Overlap with Native Oysters

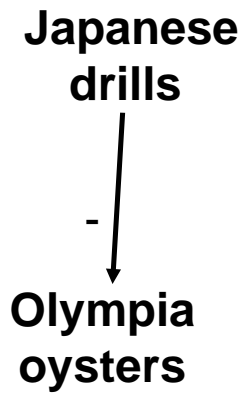


Drill Impact: Historical Data

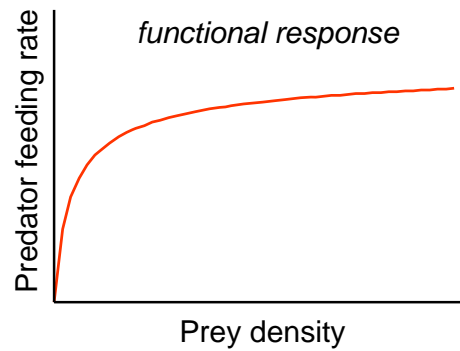
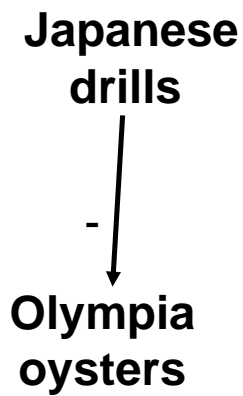


Chapman and Banner 1949, WA Dept Fisheries

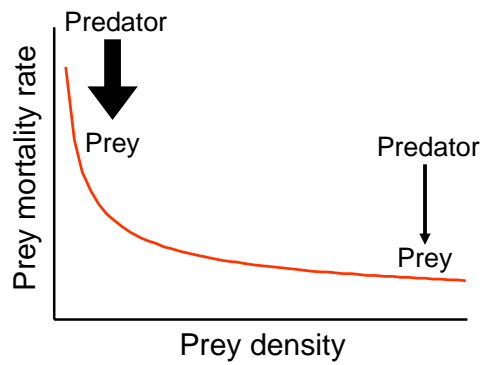
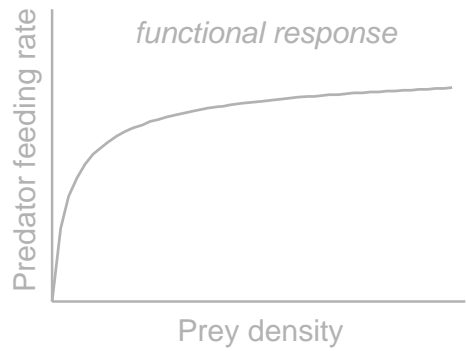
Why Might Drill Impacts Vary?



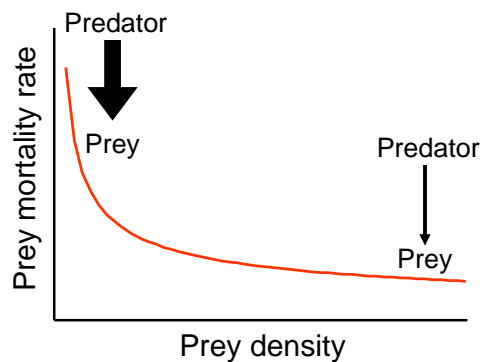
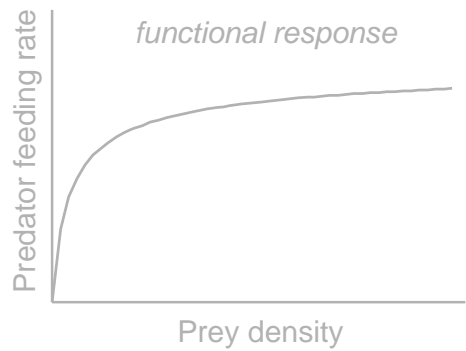
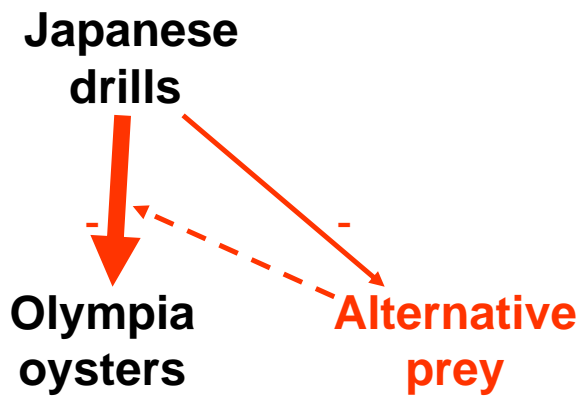
Why Might Drill Impacts Vary?



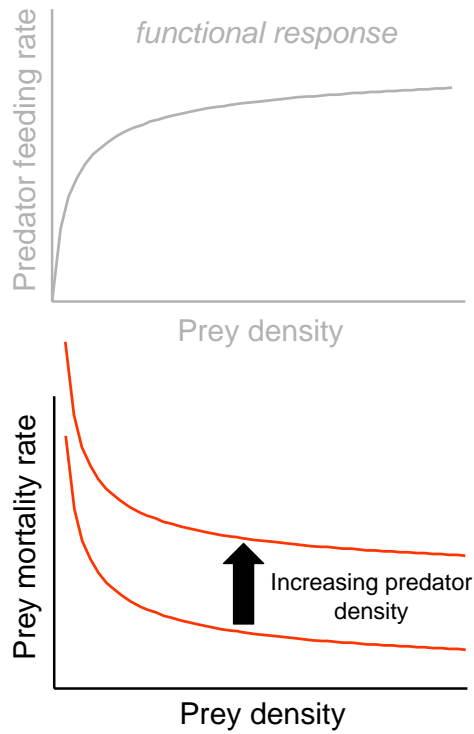
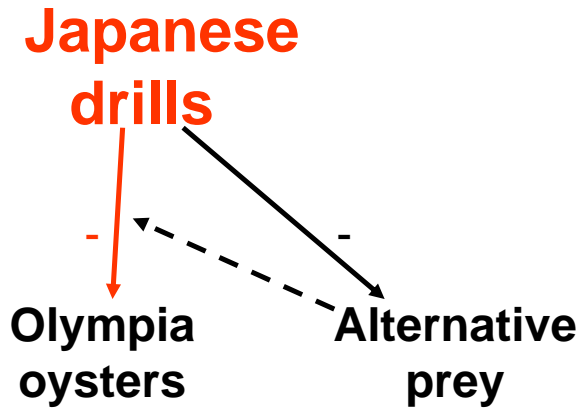
Why Might Drill Impacts Vary?



Why Might Drill Impacts Vary?



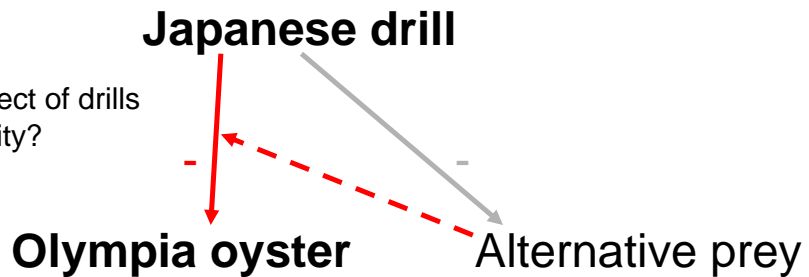
Why Might Drill Impacts Vary?



Study Questions

1. How does the impact of drills vary in space?
Is impact related to drill density?

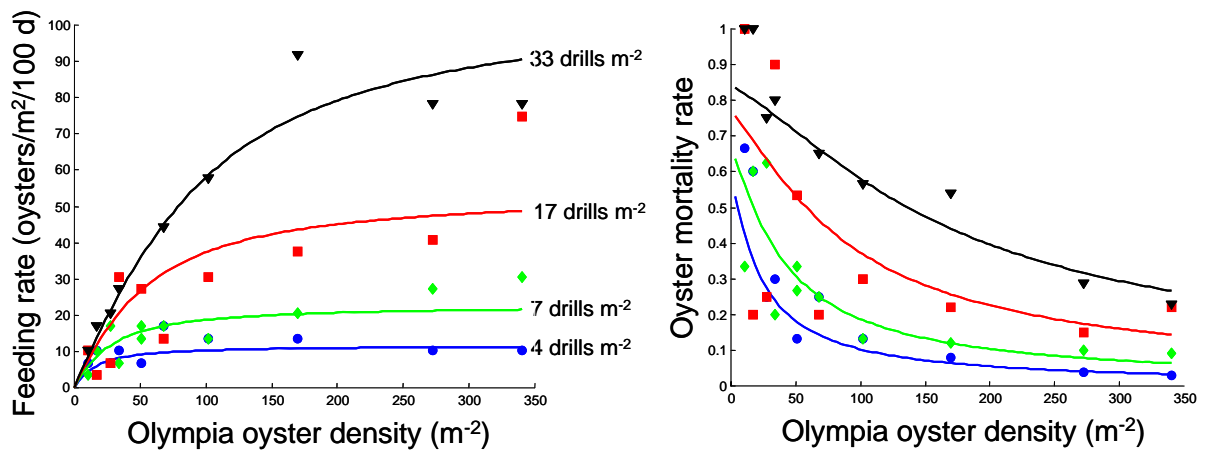
2. Does the per capita effect of drills depend on oyster density?



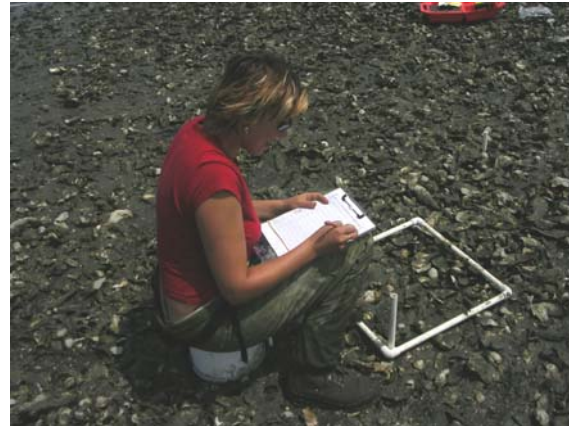
3. Does the per capita effect of drills depend on alternative prey density?



Enclosure Experiment: Drill Functional Response

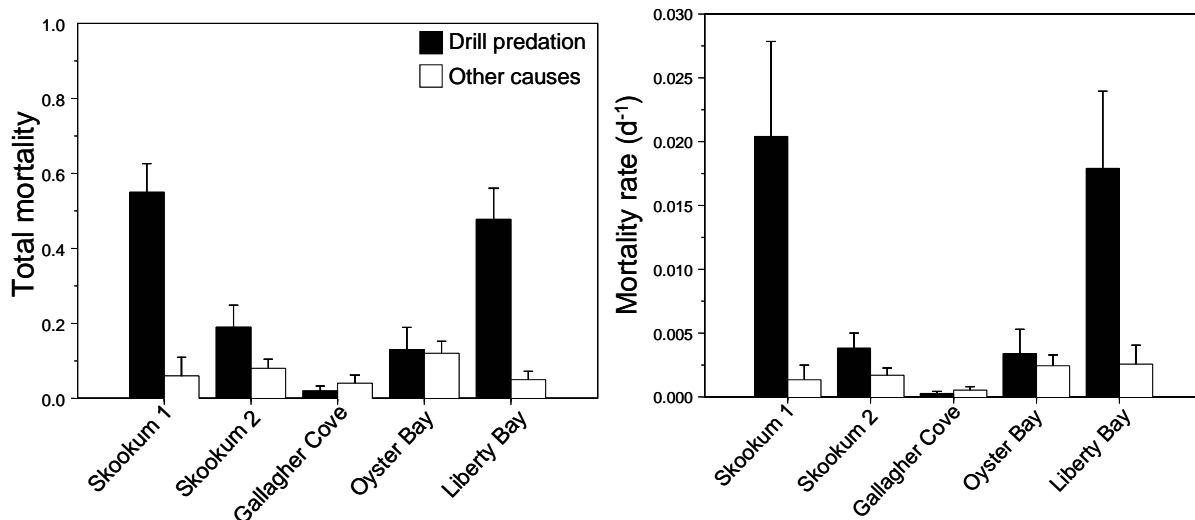


Measuring Drill Impact: Oyster Transplants

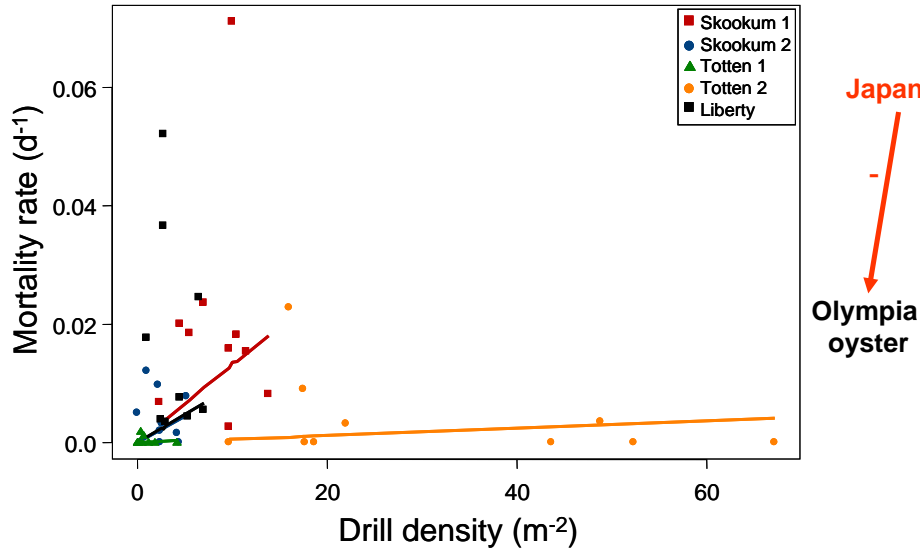


Measuring Drill Impact: Oyster Transplants

Olympia oyster mortality, June-Sept 2005



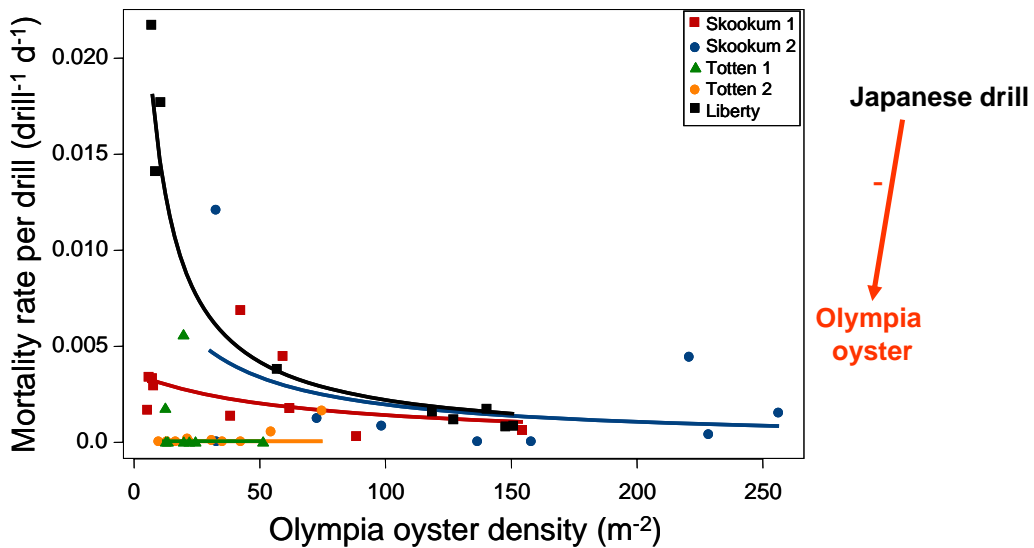
Impact Increases with Drill Density



Drill density only model: $\Delta AIC_c = 58.0$, $R^2 = 0.10$

$$\text{predation mortality rate} = c * \text{drill density}$$

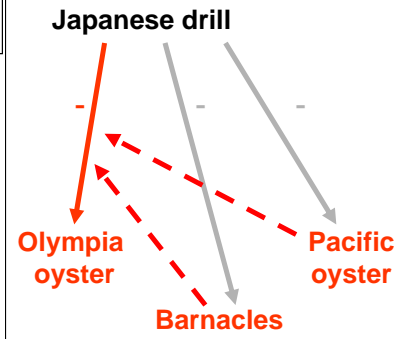
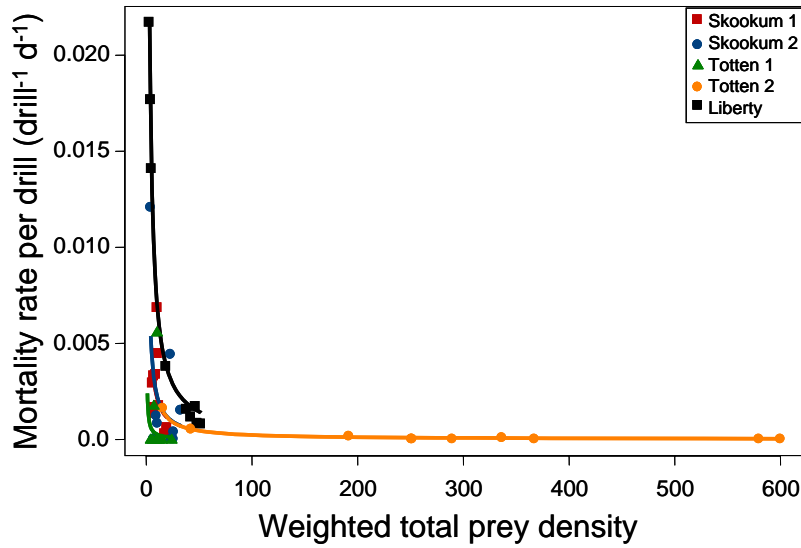
Per Capita Effect Depends on Prey Density



Drill & Olympia density model: $\Delta AIC_c = 48.2$, $R^2 = 0.83$

$$\text{predation mortality rate} = \frac{c * \text{drill density}}{1 + c * h * \text{Olympia density}}$$

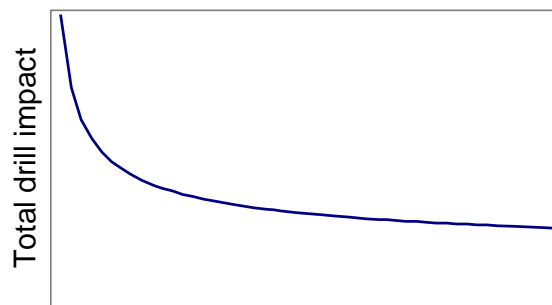
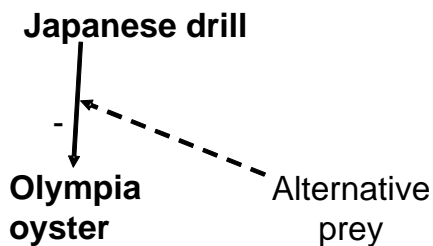
Per Capita Effect Depends on Prey Density



Drill, Olympia, barnacle, & Pacific model: $\Delta\text{AIC}_c = 0, R^2 = 0.96$

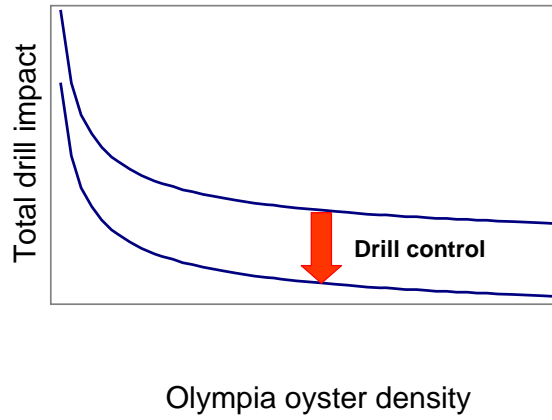
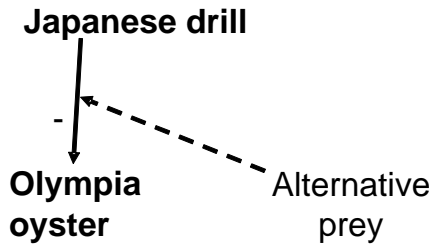
$$\text{predation rate} = \frac{c * \text{drill density}}{1 + c * h * \text{Olympia density} + b1 * \text{barnacle cover} + b2 * \text{Pacific density}}$$

Drill Impacts and Native Oyster Restoration

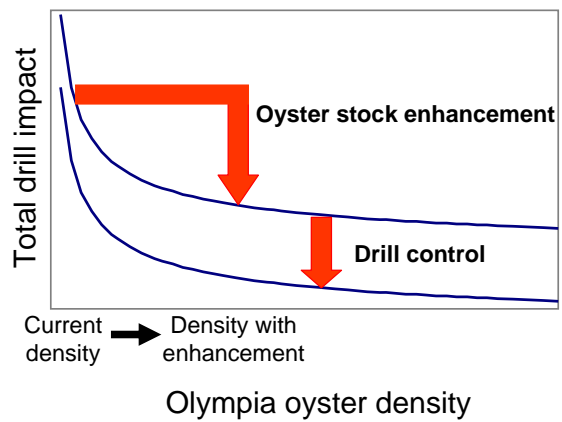
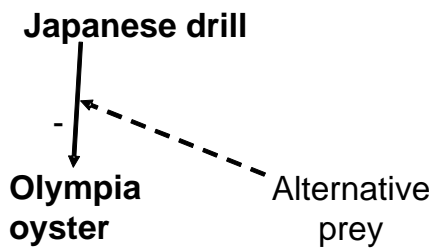


Olympia oyster density

Drill Impacts and Native Oyster Restoration



Drill Impacts and Native Oyster Restoration



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