Sensitive barnacles:  
Quantifying life history processes of *Pollicipes polymerus* to inform sustainable harvest management

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**Introduction**

Gooseneck barnacles, *Pollicipes* spp., are overharvested under insufficient and belated management in Spain, Portugal and British Columbia. On the U.S. Pacific coast, harvesting of *Pollicipes polymerus* (Fig. 1) is increasing. Sustainable management needs to be implemented before overharvesting occurs there as well. I am investigating the life history of *P. polymerus* along the Oregon coast to inform sustainable harvest and the integration of ecosystem based and socio-economic management strategies. My study focuses on describing seasonal and regional variation in the reproduction, growth, recruitment & abundance of the species.

**Study System**

The nearshore waters of Oregon’s Cape Perpetua and Cape Foulweather are both highly productive. Nonetheless, upwelling/downwelling dynamics at the two capes are such that Cape Perpetua - characterized by more frequent upwelling and a wider continental shelf – exhibits higher nutrient availability, primary production, and larval retention.

**Hypotheses**

1. Strong seasonal fluctuation in recruitment and reproduction patterns across all sites.
2. Spatial variations of abundance, size, and seasonality correlate with regional variations of oceanographic patterns of productivity

**Methods**

- Field and laboratory observations (since April 2015)
- Bi-weekly and seasonal transect-quadrat surveys of *P. polymerus* populations at four sites within Cape Perpetua and Cape Foulweather (Fig. 2, 3a)
- Abundances estimated by quadrat photo analysis
- Individuals collected for dried weight and brooding activity assessment (Fig. 3b)
- Field experiment simulating complete harvest to quantify population recovery rates (Fig. 7, initiated June 2013)
- “Harvestable size” considered ≥ 1g individual dried weight

**Results**

1. Adult abundances higher in Cape Perpetua sites (p<0.005) (Fig.4).
2. Skewed weight distribution (Fig 5): recruits and juveniles dominate population.
3. Preliminary analysis suggests that brooding doesn’t vary during the months surveyed.
4. Average dry mass about 0.3g larger at Yachats than at all other sites (p<10^-5).
5. After two years, abundances after simulated complete harvest are less than 20% of natural abundances (Fig7). No individuals have reached harvest size.
6. Most recruitment has occurred around peduncles of adults. Harvest of adults removes recruits and juveniles as well.

**Discussion**

1. Cape-specific regional variation in abundance associated with higher oceanographic productivity in Cape Perpetua.
   - Site-specific variation in dry weight distribution and brooding activity patterns. Potentially driven by site-specific conditions (wave action, desiccation exposure, nutrient availability, and species interactions).
2. Harvest recovery is long-term: at least two years to re-establish abundances, longer before individuals are of harvest size.
3. Spatially-explicit design considering regional abundances and site-specific weight distributions.
4. Establish reference sites in high and low productivity regions to gauge harvest impacts and guide management decisions.
5. Consider high productivity sites for integration into existing Marine Reserve design to protect healthy populations with high reproductive output and recruitment potential.
6. Limit catch weight rather than individual size to prevent bycatch of recruits and juveniles attached to harvested individuals.
7. Prevent overharvest by establishing protected areas within a site and/or allowing long-term recovery after harvest.

**Literature Cited**


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