

# HOW IS URBANIZATION EFFECTING POPULATION DYNAMICS OF THE GIANT PACIFIC OCTOPUS?

Alyssa Zawawi, Rubenstein School of Environment and Natural Resources,  
University of Vermont

## 1 Background



Figure 1. Giant Pacific Octopuses

Giant Pacific Octopuses have populations ranging in the temperate waters of the Pacific ocean. They are extremely intelligent mesopredators whose range is not currently well understood due to lack of documentation and analysis. Giant Pacific Octopuses are highly susceptible to environmental pollution and toxins, so they are at risk of impact from anthropogenic disturbances (Mann 1988).

Urbanization has led to severe changes in marine ecosystems, including sediment pollution, eutrophication, and additions of artificial structures. Additionally, marine urbanization can lead to chemical contamination, noise and light pollution, and changes in benthic community structure (Heery 2018). All of these changes to the ecosystem have the potential to alter Giant Pacific Octopus population dynamics.

## 2 Motivation

Giant Pacific Octopuses are incredibly intelligent animals with distinct personalities and social structures (Voss 2016). As mesopredators, they play a very important role in ecosystem health and wellness. It is very important to understand how human actions will play a role in the future health and development of this understudied population in the Pacific.

## 3 Hypothesis & Predicted Results

I hypothesize that increased levels of marine urbanization will have negative effects on Giant Pacific Octopus population sizes and distribution.

Because of their susceptibility to chemical pollutants and their reliance on both small and large prey, I would expect that any anthropogenic pollutant inputs would have the double detriment of directly impacting octopus function and potential food sources with bottom up control systems.

I predict that probability of occurrence in shallow and shallow-intermediate depths would decrease from the rates represented in the graph to the right (Heery 2018).

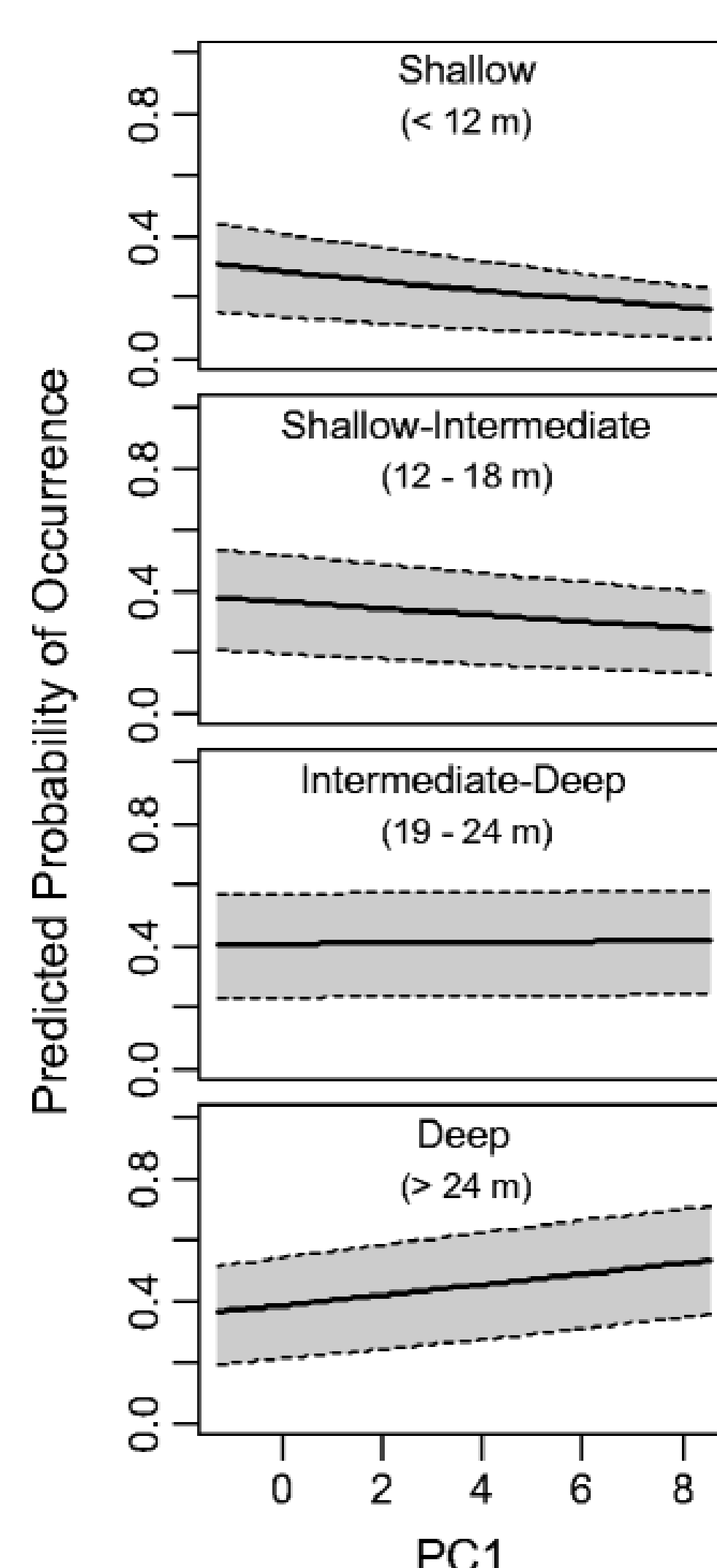


Figure 2. Predicted Population Distribution of Giant Pacific Octopus in Puget Sound

## 4 Study Design

Following the design of previous studies on marine urbanization, we can use high resolution spatial imaging to track levels of spatial land changes caused by human actions (Deng 2009). We can also track the distribution and movement of Giant Pacific Octopuses using both spatial imaging technology and transmitter locations which will help account for natural variability in octopus population movements. Areas for tracking will be chosen randomly to limit risk of analysis bias. Combining analysis of urbanization levels throughout the natural Giant Pacific Octopus range with data on octopus movement and population levels will give insight and comparison between marine urbanization and distribution, although it does not necessarily provide a solid conclusion on whether or not the octopuses are actually being effected on a biological level by anthropogenic disturbances.

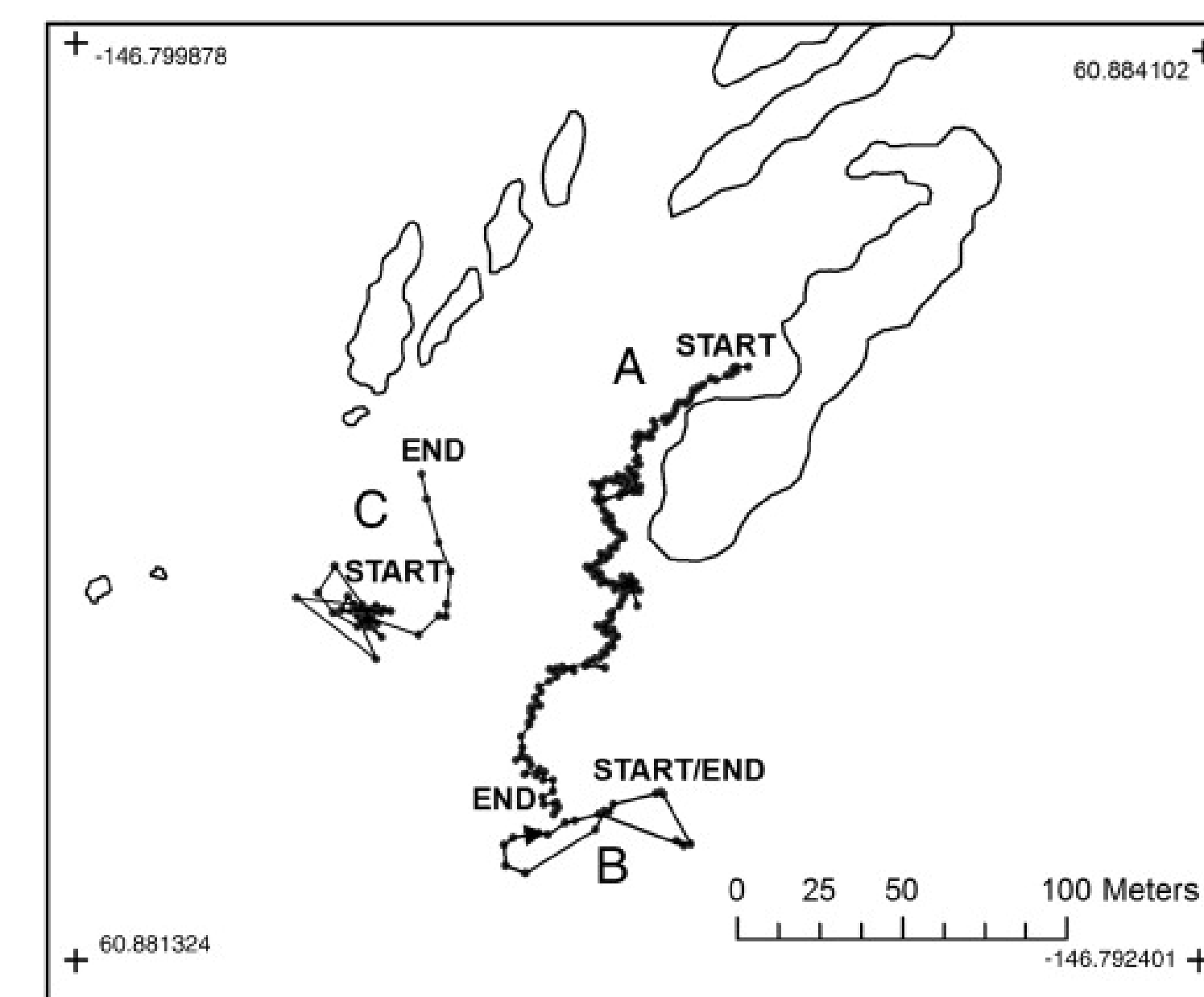


Figure 3. Example distribution of Giant Pacific Octopuses in Alaska

## 5 Intended Analysis

Independent Variable: Level of marine urbanization as determined by high resolution spatial imaging

Dependent Variable: Giant Pacific Octopus population size in standardized area units (accounting for natural variation in octopus movement seasonally and with tides)

Statistical Analysis: Because both variables here are continuous, I will test the statistical significance of results using a linear regression.



## 6 Literature Cited

D. Scheel, L. Bisson, Movement patterns of giant Pacific octopuses, *Enteroctopus dofeleini* (Wülker, 1910). *Journal of Experimental Marine Biology and Ecology*, Volumes 416-417, 2012, Pages 21-31.  
Heery, E.C., Olsen, A.Y., Feist, B.E. et al. Urbanization-related distribution patterns and habitat-use by the marine mesopredator, giant Pacific octopus (*Enteroctopus dofeleini*). *Urban Ecosystems* 21, 707-719 (2018). <https://doi-org.ezproxy.uvm.edu/10.1007/s11252-018-0742-1>  
Jin S. Deng, Ke Wang, Yang Hong, Jia G. Qi, Spatio-temporal dynamics and evolution of land use change and landscape pattern in response to rapid urbanization, *Landscape and Urban Planning*, Volume 92, Issues 3-4, 2009, Pages 187-198.  
Thaddeus Mann, Arthur W. Martin, Michael French, Entry of pollutants from seawater into the spermatophore and spermatozoa of the giant octopus of the North Pacific, *Marine Pollution Bulletin*, Volume 19, Issue 12, 1988, Pages 669-671.  
Voss, K. M. (2016). Influence of personality on giant Pacific octopus (*ORW1S34RfeSDcfxkd09rT2 enteroctopus dofeleini1RW1S34RfeSDcfxkd09rT2*) behavior (Order No. 10143321). Available from ProQuest Central, ProQuest Dissertations & Theses A&I. (1810963110). Retrieved from <https://search-proquest-com.ezproxy.uvm.edu/docview/1810963110?accountid=14679>