

# Diversity Paper Preliminary Plots

Mary Hunsicker

June 7, 2016

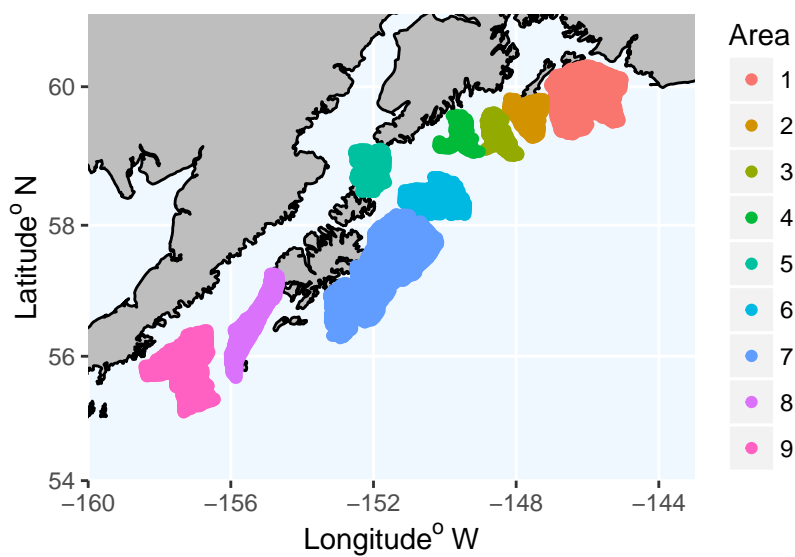


Figure 1: Locations of shallow areas (50-150 m) in Gulf of Alaska.

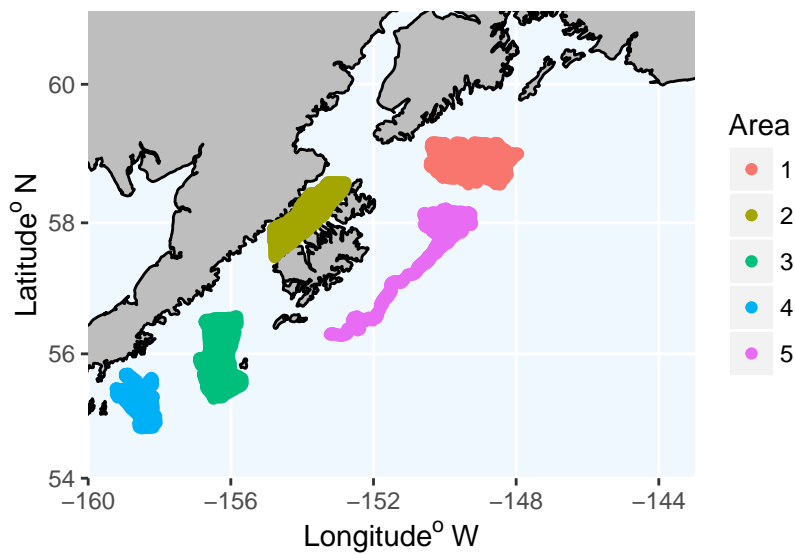


Figure 2: Locations of deep areas (>150-300 m) in Gulf of Alaska.

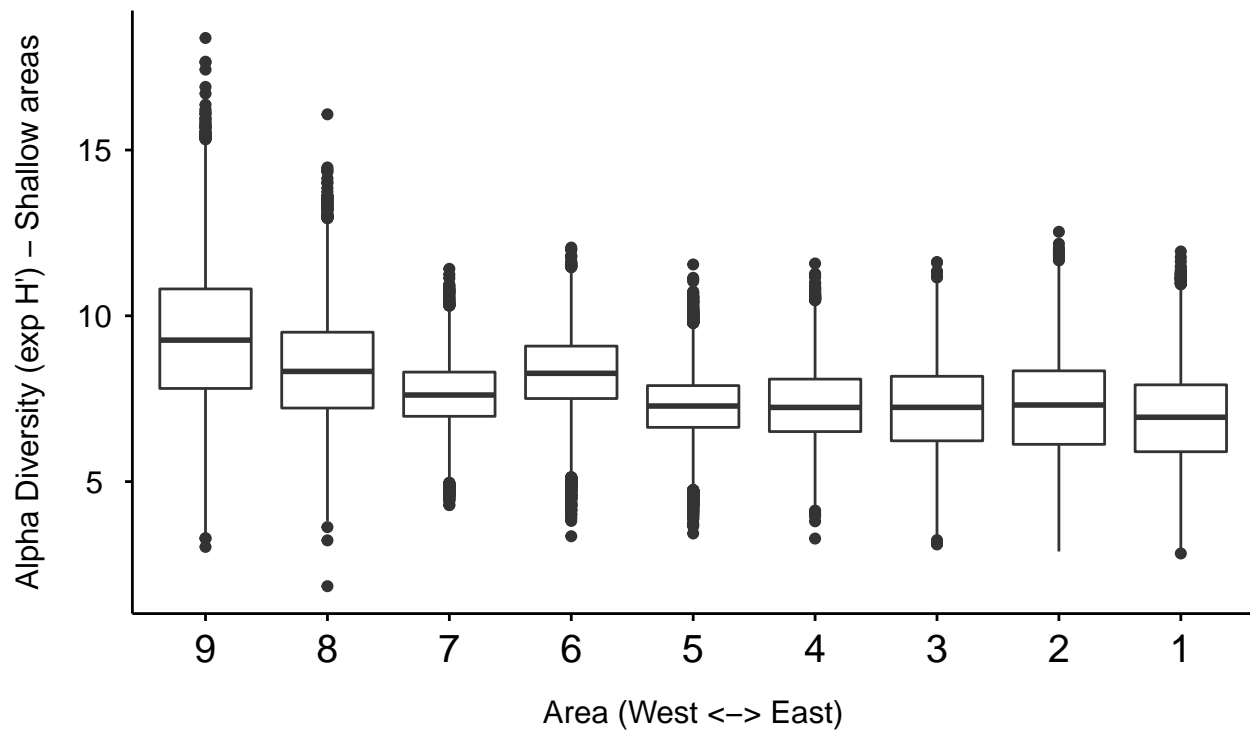


Figure 3: Alpha diversity (exp H') estimated for shallow areas (50-150m). Based on bootstrap sampling (n=1000).

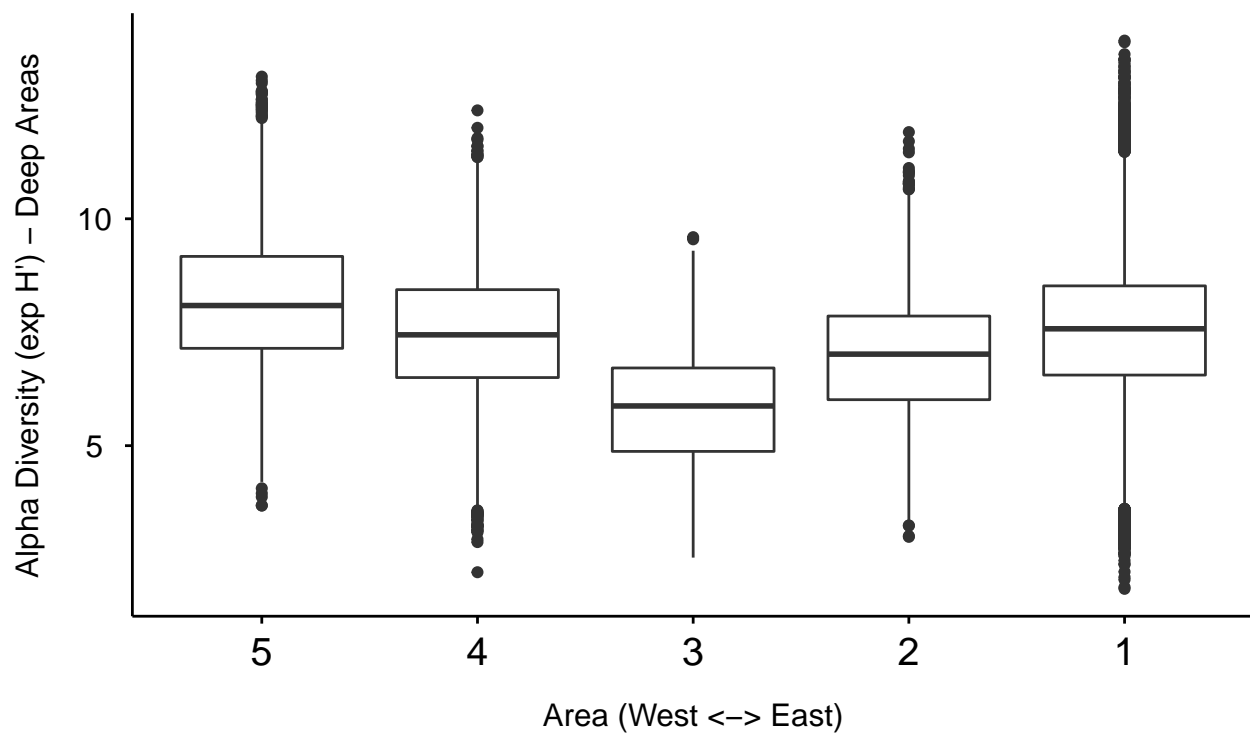


Figure 4: Alpha Diversity (exp H') estimated for deep areas (>150-300m). Based on bootstrap sampling (n=1000).

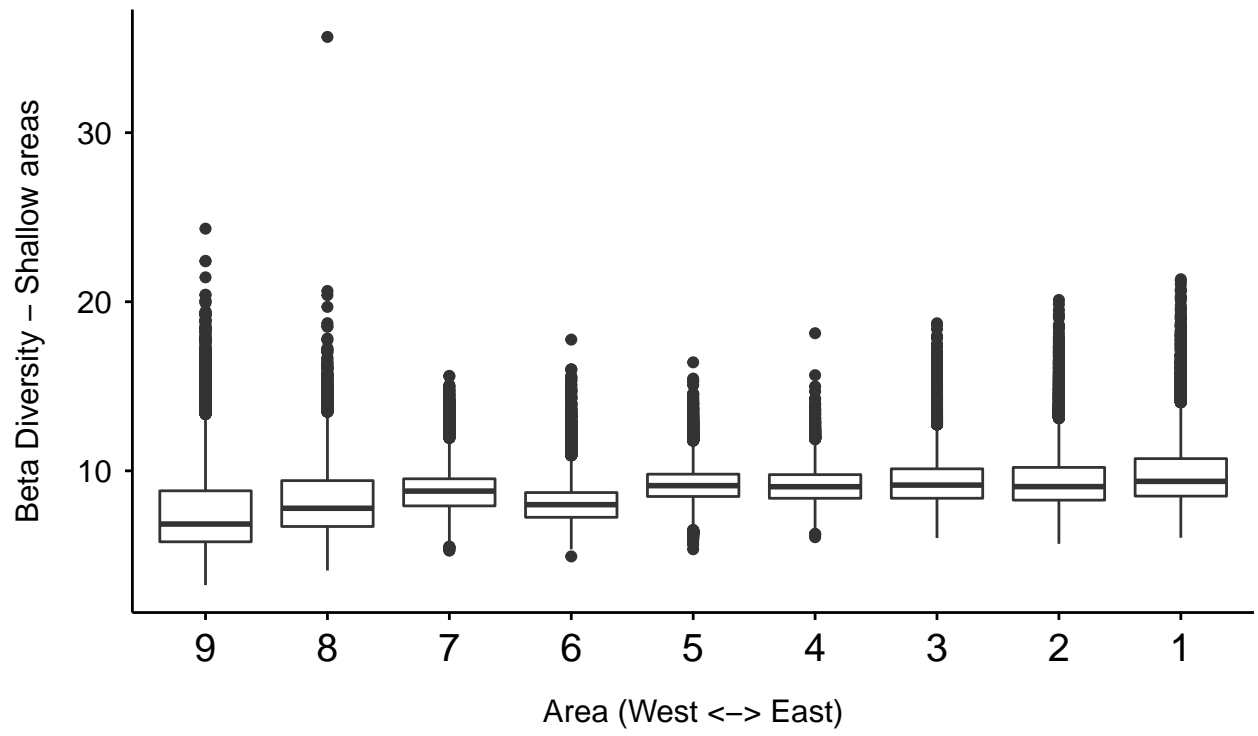


Figure 5: Beta Diversity estimated for shallow areas (50-150m). Based on bootstrap sampling (n=1000).

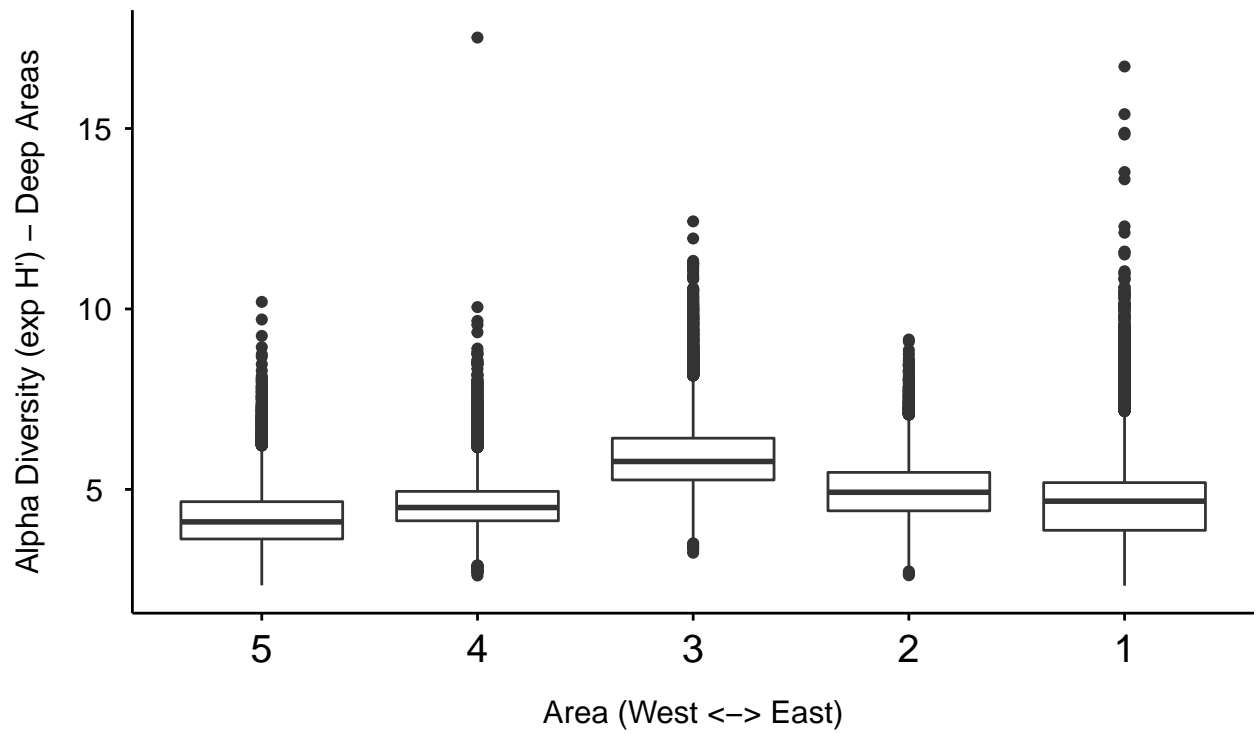


Figure 6: Beta Diversity estimated for deep areas (>150-300m). Based on bootstrap sampling (n=1000).

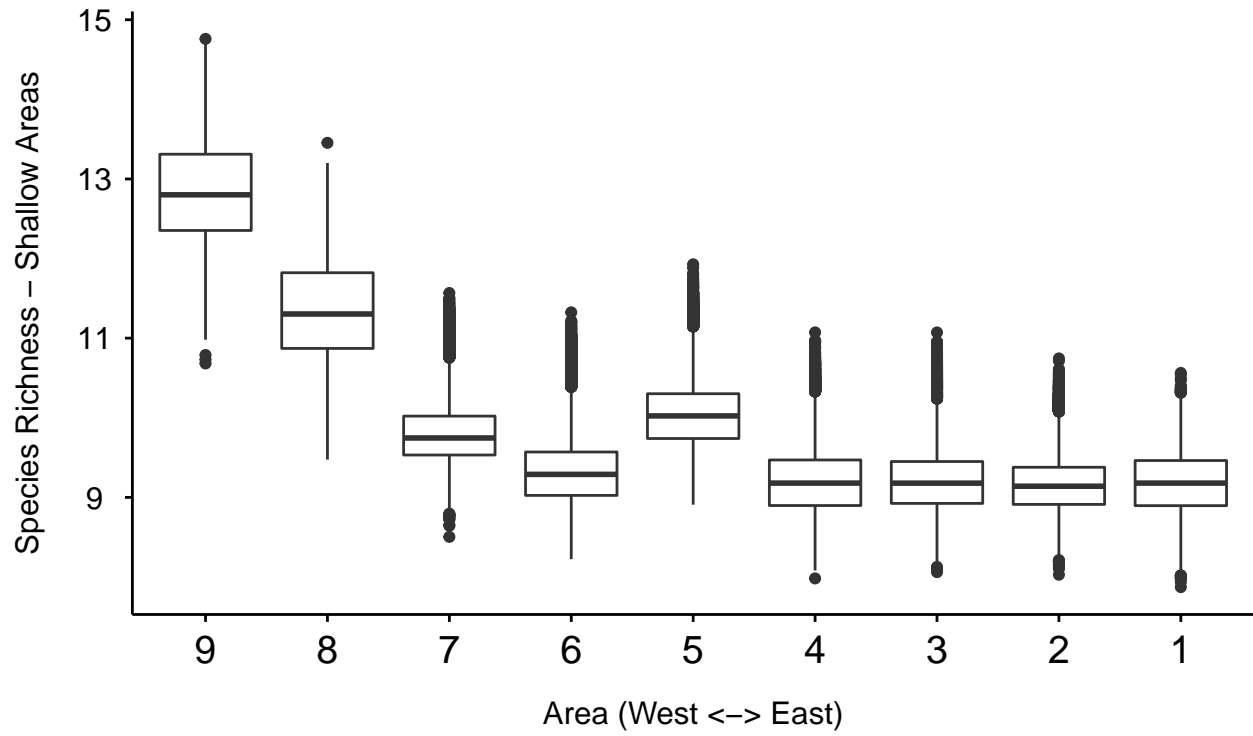


Figure 7: Species richness estimated for shallow areas (50-150m). Based on bootstrap sampling (n=1000).

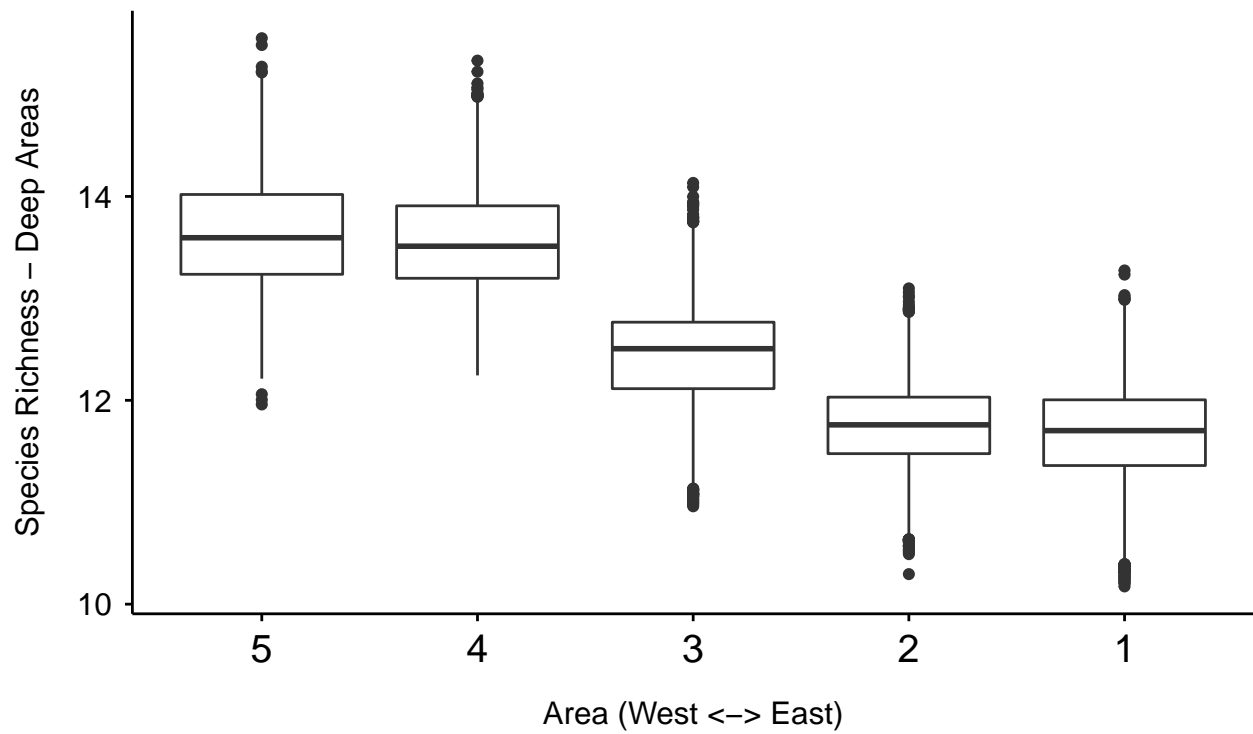


Figure 8: Species richness estimated for deep areas (>150-300m). Based on bootstrap sampling (n=1000).

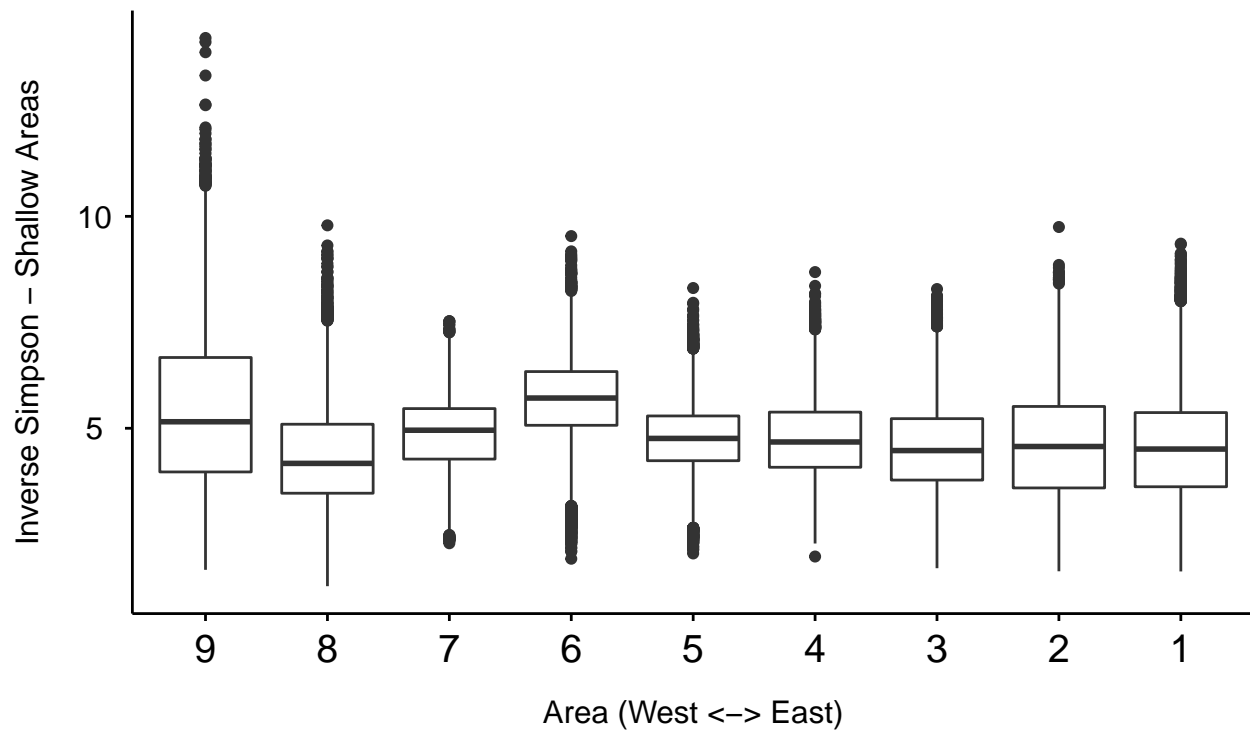


Figure 9: Inverse Simpson's diversity estimated for shallow areas (50-150m). Based on bootstrap sampling (n=1000).

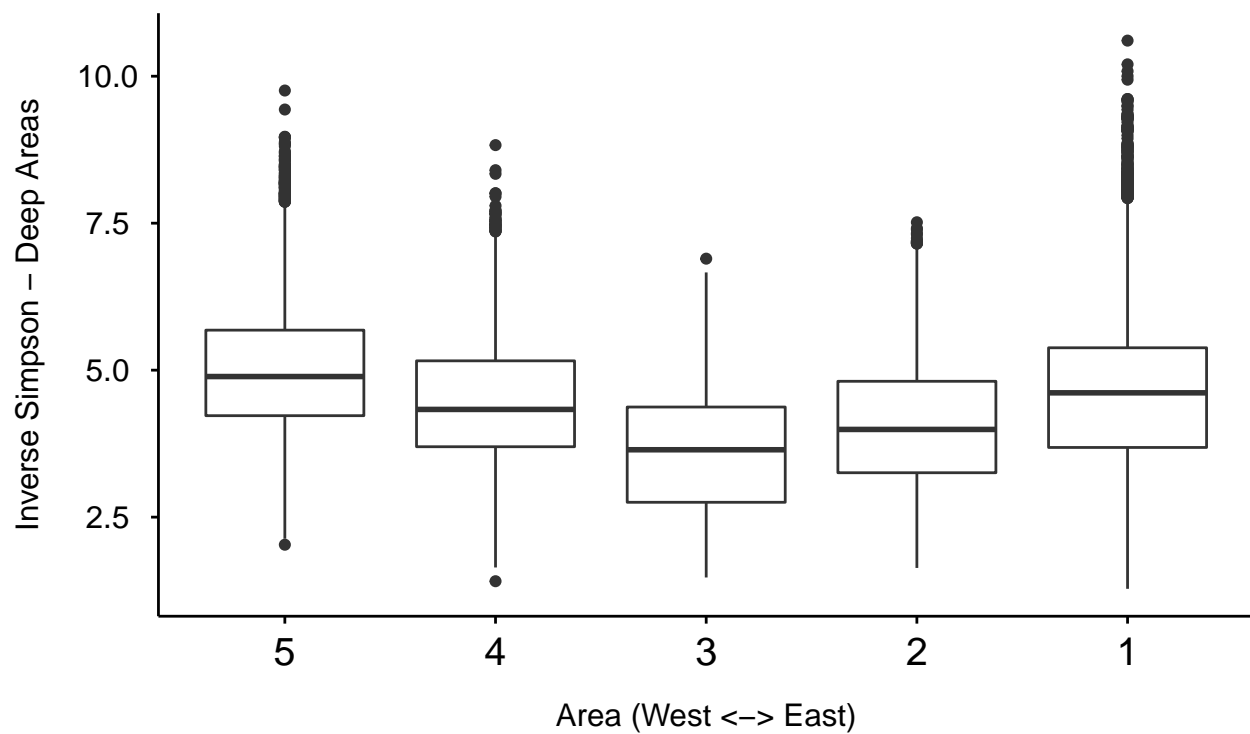


Figure 10: Inverse Simpson's diversity estimated for deep areas (>150-300m). Based on bootstrap sampling (n=1000).

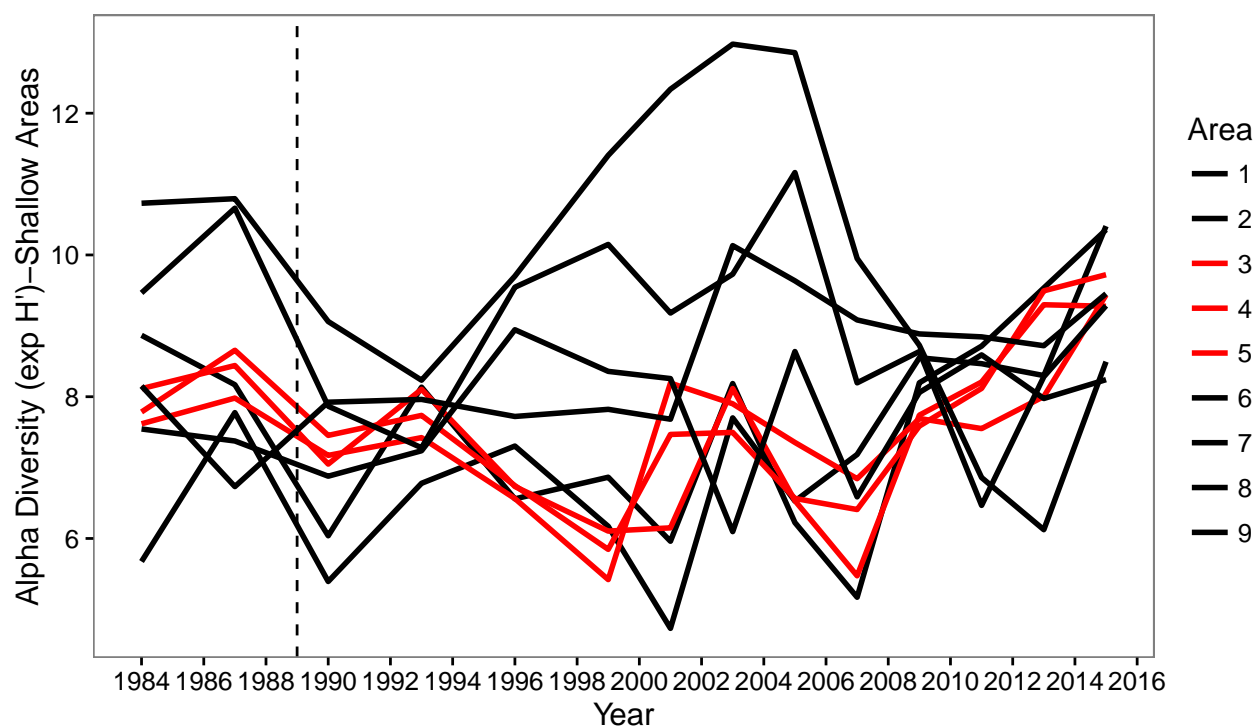


Figure 11: Time series of Alpha diversity for shallow areas (50-150m).

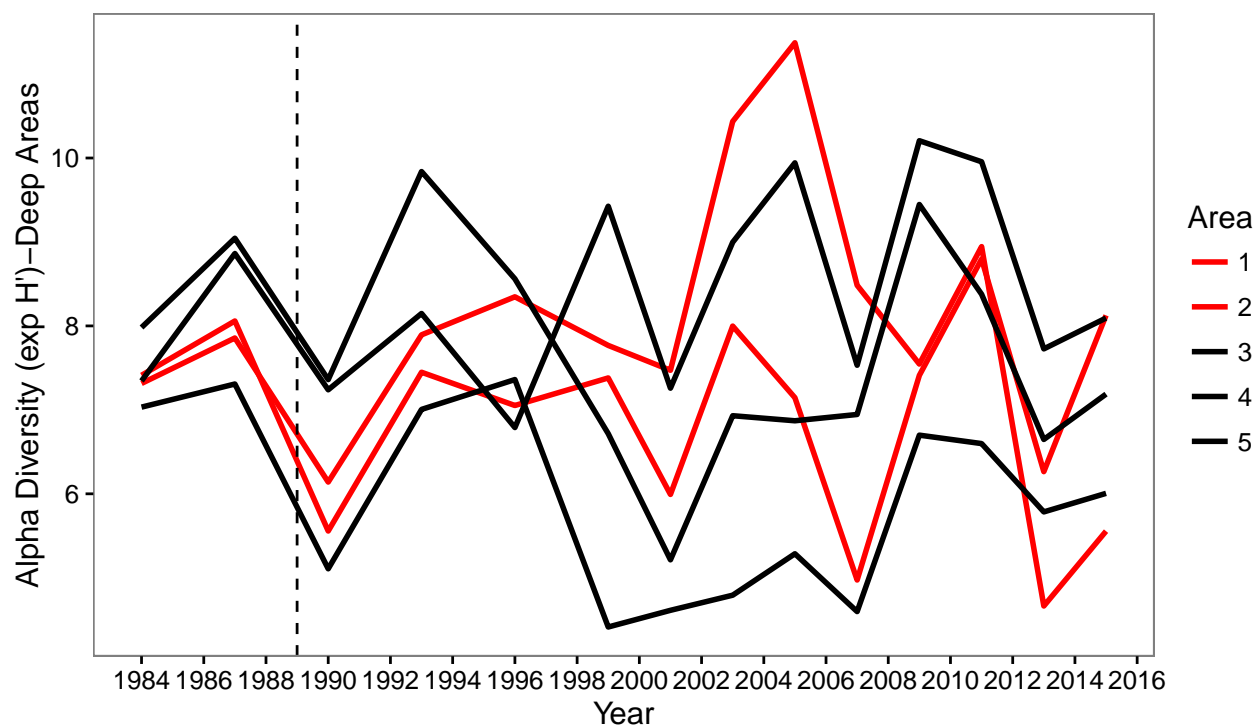


Figure 12: Time series of Alpha diversity for deep areas (>150-300m).

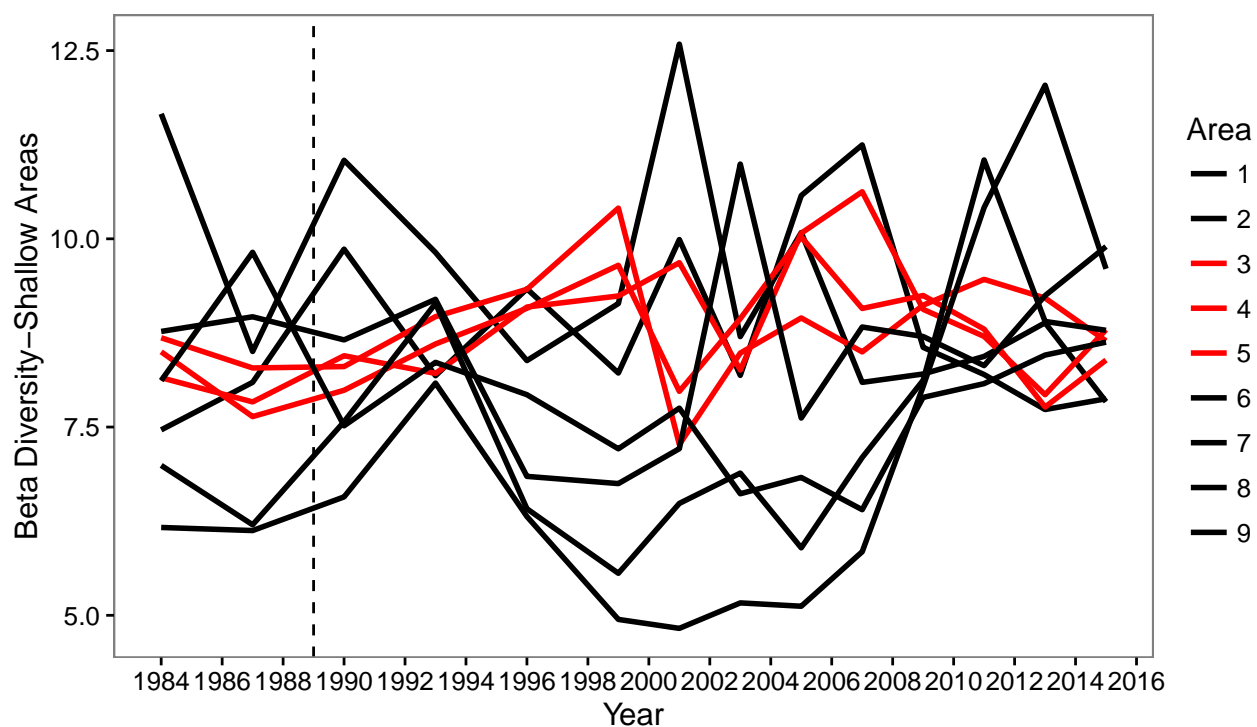


Figure 13: Time series of Beta diversity for shallow areas (50-150m).

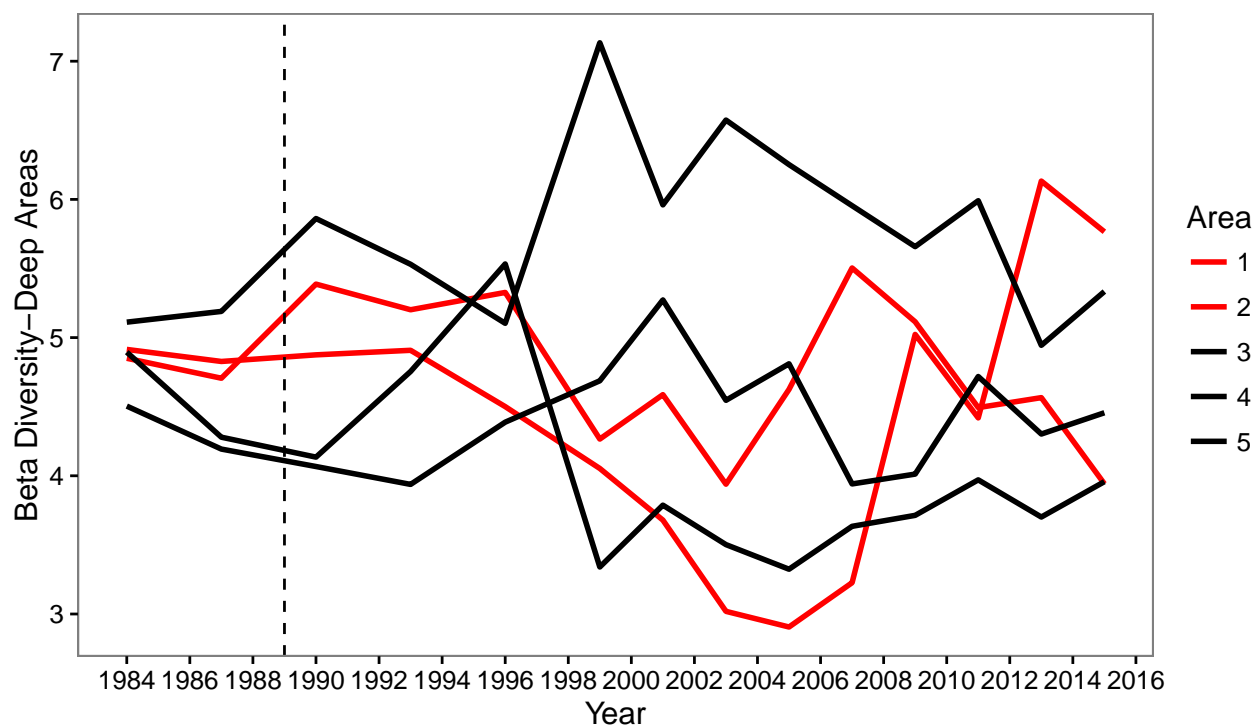


Figure 14: Time series of Beta diversity for deep areas (>150-300m).

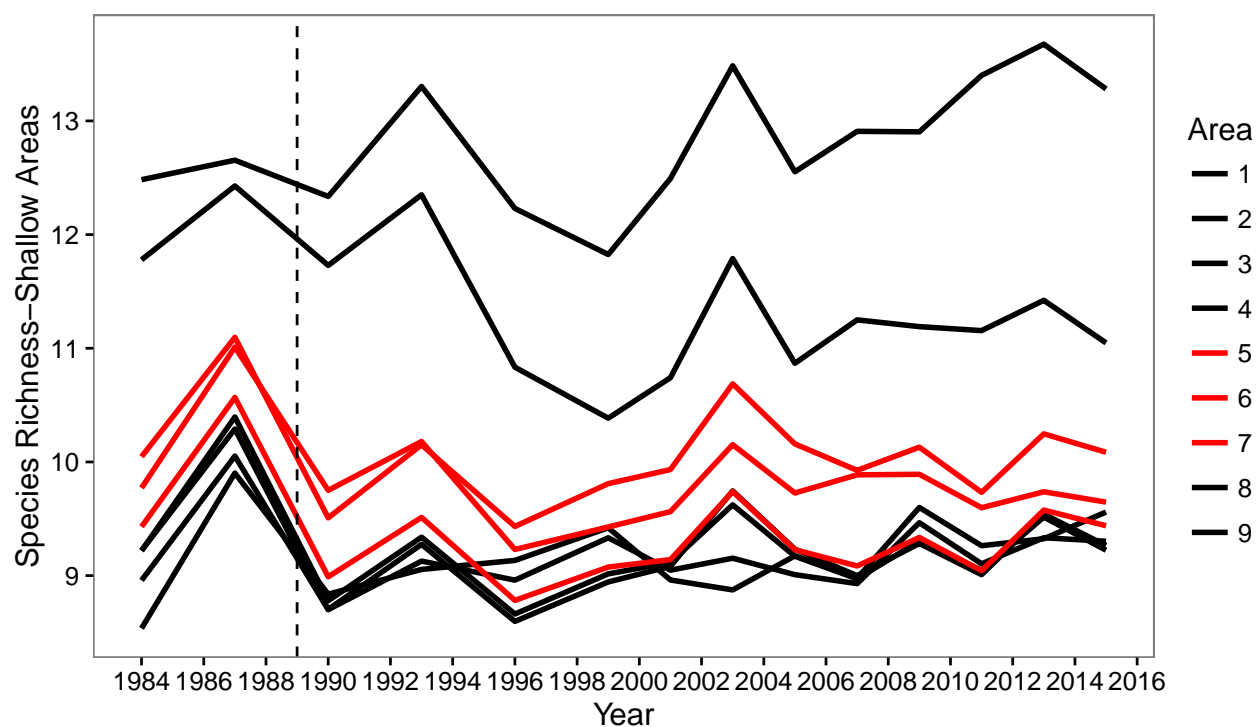


Figure 15: Time series of Species Richness for shallow areas (50-150m).

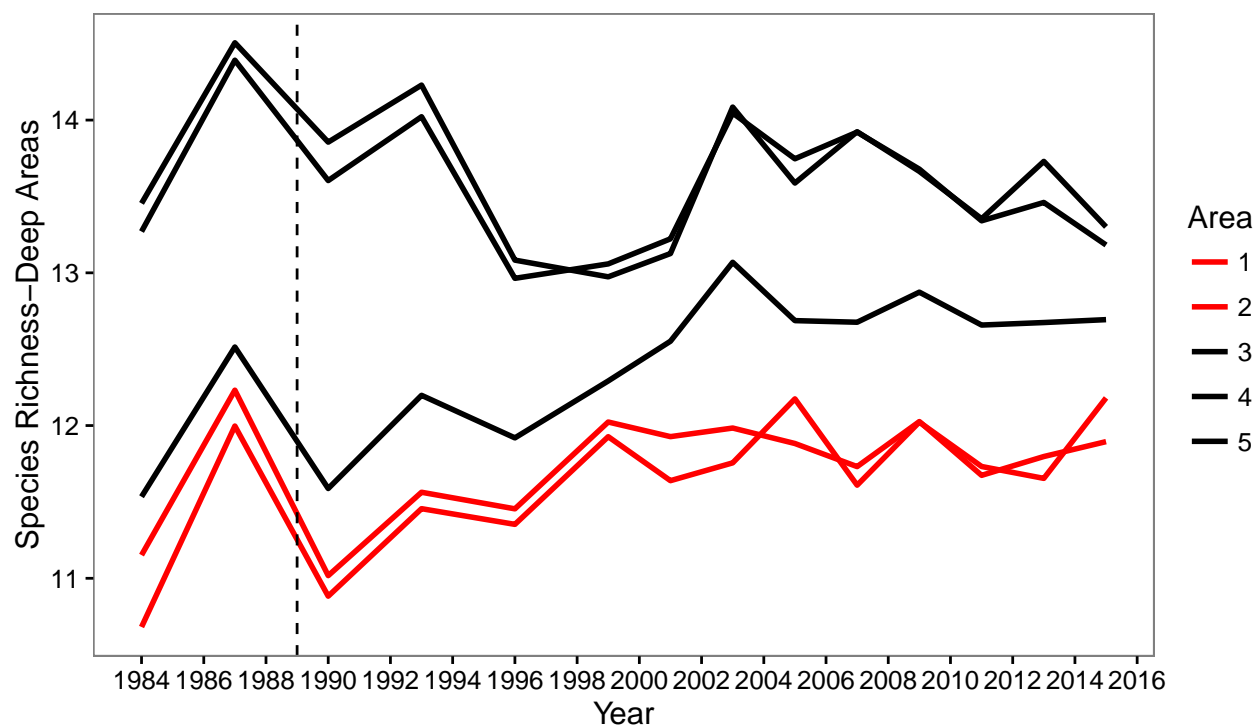


Figure 16: Time series of Species Richness for deep areas (>150-300m).



## References

- Anderson, P. J., and J. F. Piatt. 1999. Community reorganization in the Gulf of Alaska following ocean climate regime shift. *Marine Ecology Progress Series* 189:117-123.
- Chesson, P., R. L. E. Gebauer, S. Schwinning, N. Huntly, K. Wiegand, M. S. K. Ernest, A. Sher, A. Novoplansky, J. F. Weltzin. 2004. Resource pulses, species interactions, and diversity maintenance in arid and semi-arid environments. *Oecologia* 141:236-253.
- Gaichas, S., and R. C. Francis. 2008. Network models for ecosystem-based fishery analysis: a review of concepts and application to the Gulf of Alaska marine food web. *Canadian Journal of Fisheries and Aquatic Science* 65:1965-1982.
- Gaichas, S. K., K. Y. Aydin, R. C. Francis, and J. Post. 2011. What drives dynamics in the Gulf of Alaska? Integrating hypotheses of species, fishing, and climate relationships using ecosystem modeling. *Canadian Journal of Fisheries and Aquatic Sciences* 68(9):1553-1578.
- Hare, S. R., and N. J. Mantua. 2000. Empirical evidence for North Pacific regime shifts in 1977 and 1989. *Progress in Oceanography* 47(2-4):103-145.
- Hollowed, A. B., S. R. Hare, and Wooster, W. S. . 2001. Pacific basin climate variability and patterns of Northeast Pacific marine fish production. *Progress in Oceanography* 49:257-282.
- Hollowed, A. B., C. D. Wilson, P. J. Stabeno, and S. A. Salo. 2007. Effect of ocean conditions on the cross-shelf distribution of walleye pollock (*Theragra chalcogramma*) and capelin (*Mallotus villosus*). *Fisheries Oceanography* 16(2):142-154.
- Incardona, J. P., and coauthors. 2015. Very low embryonic crude oil exposures cause lasting cardiac defects in salmon and herring. *Scientific Reports* 5:13499.
- Jost, L. 2007. PARTITIONING DIVERSITY INTO INDEPENDENT ALPHA AND BETA COMPONENTS. *Ecology* 88(10):2427-2439.
- Lagerloef, G. 1983. Topographically controlled flow around a deep trough transecting the shelf off Kodiak Island, Alaska. *Journal of Physical Oceanography* 13:139-146.
- Logerwell, E. A., P. J. Stabeno, C. Wilson, and A. B. Hollowed. 2007. The effect of oceanographic variability and interspecific competition on juvenile pollock and capelin distributions of the Gulf of Alaska Shelf. *Deep Sea Research II* 54:2849-2686.
- Ono, K., and coauthors. 2015. Space-time investigation of the effects of fishing on fish populations. *Ecological Applications*.
- Schindler, D. E., J. B. Armstrong, and T. E. Reed. 2015. The portfolio concept in ecology and evolution. *Frontiers in Ecology and the Environment* 13(5):257-263.
- Schindler, D. E., and coauthors. 2010. Population diversity and the portfolio effect in an exploited species. *Nature* 465(7298):609-612.
- Shelton, A. O., J. T. Thorson, E. J. Ward, and B. E. Feist. 2014. Spatial semiparametric models improve estimates of species abundance and distribution. *Canadian Journal of Fisheries and Aquatic Sciences* 71(11):1655-1666.
- Smith, E. P., D. R. Orvos, and J. Cairns Jr. 1993. Impact Assessment Using the Before-After-Control-Impact (BACI) Model: Concerns and Comments. *Canadian Journal of Fisheries and Aquatic Sciences* 50(3):627-637.
- Stachura, M. M., and coauthors. 2014. Linking Northeast Pacific recruitment synchrony to environmental variability. *Fisheries Oceanography* 23(5):389-408.
- von Szalay, P. G., N. W. Raring, F. R. Shaw, M. E. Wilkins, and M. H. Martin. 2010 Data report: 2009 Gulf of Alaska bottom trawl survey. , volume 208. U.S. Dep. Commer. , Seattle, WA.
- Walline, P. D., C. D. Wilson, A. B. Hollowed, and S. C. Stienessen. 2012. Short-term effects of commercial fishing on the distribution and abundance of walleye pollock (*Theragra chalcogramma*). *Canadian Journal of Fisheries and Aquatic Science* 69:354-368.

Wilson, J. B. 2011. The twelve theories of co-existence in plant communities: the doubtful, the important and the unexplored. *Journal of Vegetation Science* 22(1):184-195.