Patterns of invasive species community structure in Pacific Northwest estuaries

Abstract of a presentation to be made at the 2014 meeting of the Ecological Society of America

Background/Question/Methods

Pacific Northwest estuaries have been colonized by over 100 nonindigenous species (NIS), with benthic invertebrates comprising most of these taxa. The ecological and economic consequences of these NIS communities are unknown. Additionally, the risks associated with NIS are a continuing concern because introduction vectors, such as ballast water, are difficult to monitor and control. This study examined communities of 24 invasive invertebrate species in benthic macrofauna collected in three major intertidal habitats in four Pacific Northwest estuaries, with the goal of identifying recurring patterns of habitat usage that may aid in monitoring and controlling the introductions of NIS. Estuarine habitats investigated were areas dominated by native seagrass (*Zostera marina*) and the native burrowing shrimps *Upogebia* and *Neotrypaea*. We used the Bray Curtis similarity index in a permutational MANOVA (Permanova) analysis to identify whether invasive infauna communities exhibited consistent structure across habitats and estuaries. The statistical design was habitat crossed with estuary, year nested within habitat × estuary, and sample site nested within habitat, estuary, and year. Pairwise comparisons of estuaries within each habitat type were also done. We followed these analyses with the construction of ecological periodic tables to graphically illustrate the recurring patterns.

Results/Conclusions

We found that the NIS benthic macrofaunal communities were highly variable among estuaries and habitats, as shown by a habitat × estuary interaction term p value of 0.0017. The components of variance in NIS community composition explained were the fixed effects of estuary (16%), followed by habitat × estuary (14%) and habitat (13%). The random component year, nested in habitat × estuary, contributed 12% to the variation. The random component sample, nested within year × habitat × estuary, contributed 25%, indicating substantial small scale variation among NIS communities. The residual variation was 21% of the total. Pairwise comparisons of estuaries showed they frequently differed from one another within *Zostera*, *Upogebia*, and *Neotrypaea* habitats, with many p values < 0.01. However, some comparisons suggest that estuaries in closer spatial proximity have NIS communities that are similar to one another. The variability at both small and large scales will make detection of future NIS introductions difficult.