Synopsis of Washington State Exotics Expedition 2000

In the spring of 2000, the Washington State Department of Natural Resources conducted a rapid survey of exotic organisms in order to provide baseline information about marine invasions. The cooperative study brought together 22 scientists from diverse institutions to survey exotic species in a broad range of shallow water habitat types.

Three regions in Washington State were sampled in order to compare spatial patterns across a range of oceanographic conditions and patterns of human use: Elliott Bay and the Duwamish River estuary are located in the Central Basin of Puget Sound, near the City of Seattle. This is an area of intensive urban development and the site of a major international port, the Port of Seattle. Totten and Eld Inlets are relatively protected bays in the Southern Basin of Puget Sound. Aquaculture and residential land uses predominate in these inlets. The Port of Olympia, a small international port, is in adjacent Budd Inlet. Willapa Bay is Washington's largest outer coast estuary. It is the state's largest aquaculture center. Much of its shoreline is undeveloped. There is currently no commercial shipping in the bay.

The 2000 Expedition collected 40 exotic species during 7 days of sampling and taxonomic analysis. Most of the exotic species are native to the North Atlantic or the Northwestern Pacific region, and most were introduced to the Northeastern Pacific with oysters imported for aquaculture, as ship fouling organisms or in ballast water.

Among the three regions, Elliott Bay has experienced the most extensive physical alteration, and Willapa Bay the least. However, the apparent dominance by exotics was slightly greater in Totten/Eld Inlets than in Elliott Bay, and much greater in Willapa Bay. Thus the greatest number and extent of invasions was found in the least physically altered system. This pattern appears to contradict the common hypothesis that more disturbed habitats are more vulnerable to invasions.

The shipment and planting of oysters for commercial aquaculture is considered to be a possible mechanism responsible for introducing onto the Pacific Coast 35 of the 40 exotic species collected by the Expedition. In contrast, ballast water is considered a possible transport mechanism for 13 of the species, and all ship-associated mechanisms together (ship-fouling, solid ballast and ballast water) for 28 of the species. All of these mechanisms would also be effective at moving organisms between bays on the Pacific Coast.

A study of the causes of species introductions throughout North America found the same vectors, aquaculture and shipping, to be the predominant vectors associated with species introductions into marine communities throughout North America (Ruiz et al., 2000). However, the order of importance of the vectors was reversed; shipping was found to be the most important vector for introductions into North America. Beyond the predominance of these two vectors, there remains a great deal of uncertainty about the relative contribution of each mechanism.