DeWitt[1], T.H., A.F. D'Andrea[2], C.R. Brown[1], and P.M. Eldridge[1]

[1.] U.S. Environmental Protection Agency, National Health and Ecological Effects Research Laboratory, Western Ecology Division, Newport, Oregon, USA. (dewitt.ted@epa.gov)
[2.] Oregon State University, College of Atmospheric and Oceanic Science, Corvallis, Oregon, USA

Impact of Burrowing Shrimp Populations on C, N Cycling and Water Quality in Western North American Temperate Estuaries

Thalassinid burrowing shrimp (predominantly, *Neotrypaea californiensis* and *Upogebia pugettensis*) inhabit large expanses of tide flats in North American Pacific estuaries, from British Columbia to Baja California. Feeding, burrowing, and burrow irrigation by burrowing shrimp can increase the remineralization rates of organic material (OM) and the interfacial solute fluxes. By virtue of their great abundance, wide distribution, and impacts on sediment geochemistry, burrowing shrimp have the potential to significantly affect the fate of OM and fluxes of nutrients on a whole-ecosystem scale in these estuaries. In this contribution, we summarize recent studies at the US Environmental Protection Agency to quantify the impacts of burrowing shrimp populations on OM fate and nutrient flux from the sediment to the water column, as part of a larger research program to understand the effects of nutrient enrichment on estuarine food webs. This work includes mapping burrowing shrimp populations in two Oregon estuaries (Yaquina and Salmon), measurement of OM remineralization and nutrient flux in shrimp-dominated sediments, and modeling to estimate the contribution of benthic-derived nitrogen to water-column nitrogen relative to other sources (i.e., the Pacific ocean and the watershed, including human inputs). Burrowing shrimp occupied >80% of the euryhaline and mesohaline intertidal flats in both estuaries, and covered >600 ha of tide flats over a distance of 17 km upriver in the Yaquina estuary. Aerial coverage for both species was similar within the Yaquina, though *Upogebia* dominated tide flats in the lower estuary and *Neotrypaea* dominated upriver. In contrast, *Neotrypaea* dominated >95% of the Salmon estuary tide flats and *Upogebia* was virtually absent. Dissolved inorganic nitrogen (DIN = ammonium and nitrate) flux from sediments to overlying water increased with *Upogebia* population density. At mid and high *Upogebia* densities, nitrate became proportionally more important to DIN efflux from the sediments indicating a potential density-dependent increase in nitrification. DIN efflux is higher in *Neotrypaea*-dominated sediments than in shrimp-free sediments, although we have not yet fully characterized the effect of population density on fluxes for this species. Coupling the population distribution data to nutrient flux measurements, we estimate that shrimp-dominated tide flats are the second largest source of DIN to the water column during the summer (exceeded by the ocean).