COLLABORATIVE RESEARCH: PERSISTENT ORGANIC POLLUTANTS IN THE ANTARCTIC MARINE FOOD WEB: IMPACT OF CLIMATE CHANGE AND INSIGHTS INTO THE FEEDING ECOLOGY OF APEX PREDATORS – R. DICKHUT (VIMS); R. FALCONER (CHATHAM); R. LOHMANN (URI)

The goals of our project are to use chemical signals in Antarctic marine organisms to:

(a) trace the movement of persistent organic pollutants (POPs) stored in glacier ice into the Antarctic marine food web, and

(b) provide insight into the dietary preferences and feeding ecology of Antarctic seabirds and marine mammals using POPs and stable isotopes.

POPs such as ΣDDT (p,p'-DDT + p,p'-DDE) have not declined in Adélie penguins (*Pygoscelis adeliae*) that reside along the western Antarctic Peninsula (WAP) since the 1970's. Therefore, we hypothesize that glacier melting is currently the major source of relic POPs to the marine food web of the WAP. If so, relic POPs may be useful tracers of glacier meltwater influx to coastal waters in western Antarctica. Moreover, because POPs are long-lived in animal tissues and biomagnify through dietary uptake, combined measurements of POPs and stable isotopes (C, N) provide information that reflects the long-term diet of animals; information that is not acquired through predation observations and stomach content or feces analyses. Therefore, we will use POPs and stable isotopes to evaluate the feeding ecology of top Antarctic predators.

In order to link contaminants in glacier meltwater to those in the Antarctic marine food web, we will sample phytoplankton and zooplankton along the WAP within the region where surface waters have been shown to be regularly influenced by glacier meltwater influx. Specifically, scientists in the Palmer Long-Term Ecological Research (LTER) program have found that a plume of glacier meltwater disperses annually to ~100 km offshore of the WAP, stabilizing the water column allowing for phytoplankton blooms. Surface salinities less than that for typical winter surface water are strongly correlated with increased chlorophyll throughout the region, and it is suggested that surface salinities ≤33.5 psu are indicative of glacier meltwater impact. We will evaluate the movement of relic POPs from glacier meltwater through the WAP marine food web by comparing fractional concentrations of unmetabolized, relic POPs in the WAP food web to those in the Amundsen Sea and Ross Sea food webs.

To further distinguish POPs currently undergoing atmospheric transport to and deposition in Antarctica from those entering coastal waters along with glacier meltwater, we will also collect high-volume air samples and snow samples from sea ice floes for POPs analysis. Air samples will be collected in collaboration with H. Kylin (Swedish University of Agricultural Sciences).

Additional plankton, fish, benthic macrofauna, and penguin tissue samples from the WAP region will be obtained through collaborations with the Palmer LTER research group and D. DeMaster. Penguin egg and tissue samples will also be obtained from the Ross Sea region courtesy of D. Ainley. Marine mammal samples will be obtained courtesy of T. Harkönën (Swedish Museum of Natural History).