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004 EPA STAR Graduate Fellowship Conference Next Generation Scientists—Next Opportunities

Persistent Organic Pollutants

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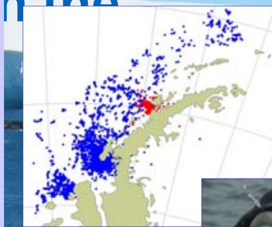
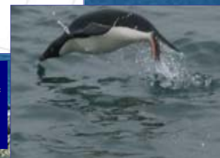
Persistent Organic Pollutants (POPs)

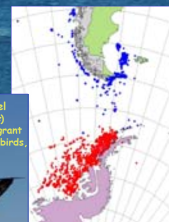
Anthropogenic toxins produced and used globally

- POPs reach polar regions by long-range atmospheric transport.
- In the Antarctic, POPs are taken up by phytoplankton and sea ice microbial communities (e.g. Chiuchiolo et al., 2003).
- POPs accumulate in organisms and biomagnify in higher trophic level animals
- POPs can interfere with endocrine system function in animals and may adversely affect reproduction leading to population level effects



A recent compilation of Adélie penguin satellite locations on the Antarctic peninsula.
- Red - summer breeding and feeding locations.
- Blue - winter feeding locations.





Most recent compilation of giant petrel satellite tag locations on the Antarctic peninsula and South America..
- Red - summer feeding/breeding locations
- Blue - winter feeding locations

Hypotheses

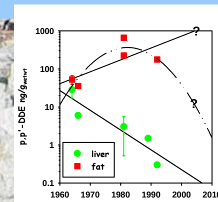
Antarctic seabirds are high trophic level predators that will integrate POP levels present in the marine food webs in which they forage.

Objectives

- establish baseline levels of POPs in three species of seabirds breeding on the West Antarctic Peninsula:
- verify the use of non-lethal sampling techniques (e.g. collection of blood and preen oil) as surrogates for determining POP levels in seabird tissues
- compare POP levels within the various bird species based on migratory patterns and trophic level
- determine the presence and level of brominated diphenyl ethers (BDEs) in seabirds
- establish long-term trends for DDT residues in Adélie penguins

Comparison of selected POPs in eggs from two Antarctic bird species.

BDEs were recently measured in phytoplankton and krill. Krill is a primary food source for seabirds.



DDT

p,p'-DDE, a derivative of DDT, appears to have declined in Adélie penguin livers from 1964-1992 with a half-life of ≈6 years, but p,p'-DDE levels in the fat of these animals increased over the same time period.

Methods

- Samples of fat, heart, liver, preening gland, and addled ggs of all species were collected from carcasses recovered ear Palmer Station.
- tissues samples will be extracted with high purity organic olvents using liquid-liquid or accelerated solvent extraction, eaned using acid and column chromatography and nalyzed via gas chromatography/negative chemical nization mass spectrometry to identify and quantify pecific POPs.

Expected results of this study:

- Help establish solid reasoning for policy change regarding pollutants currently produced and used in the U.S. such as BDEs
- To further understand the impacts of pollutants, such as DDT, on this fragile ecosystem
- Determine the global distribution and long-term trends of POPs

CFCs and DDT, well known POPs, have been phased out of use in some industrialized countries due to the environmental and human impact of these chemicals. We must continue to study the distribution and frequency of POPs in the environment, especially those currently in use, to pinpoint potentially dangerous levels of toxins.

laborators Advisors:

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References:

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