THE GREAT RIVERS NEWSLETTER

United States Environmental Protection Agency

EPA/620/N-06/002 Vol. 2 No. 2 March 2006

THE ENVIRONMENTAL MONITORING AND ASSESSMENT PROGRAM FOR GREAT RIVER ECOSYSTEMS (EMAP-GRE)

EMAP-GRE highlights, updates, and other goings on

- The Great Rivers Ecosystems Field Operations Manual is now electronically published at the EMAP website. Please use this version for future work. http://www.epa.gov/emap/greatriver/fom.html
- EMAP-GRE training will be held in St. Louis, MO at the Holiday Inn Riverport, June 20-21, 2006. Crew leaders and members are asked to attend this event. More details to follow
- **Information Management Tidbits**

  2004 crew-verified data for all rivers except Lower Missouri River fish is now in SWIM. Remember this is still considered raw data, and therefore, not acceptable for publication use.

  2005 data verification is underway, and should be posted end of April.

  2004 water chemistry, sediment nutrients, fish tissue, sediment toxicity and chemistry, and invertebrate lab data is nearly validated and expected to be posted to SWIM soon.

  Data validation and restructuring is also underway by the indicator leads. We expect a structured data set by autumn, in time for data workshops.

Fish Genetic Analyses Provide Information on Ecological Condition

John Martinson (NERL/ORD/USEPA)

During the 2005 field season for the EMAP Great Rivers Project, small fish (<12 cm) and fin clips from larger fish were collected from a limited number of sites for genetic analysis. Over 2000 samples representing approximately 75 species were collected. The samples will have selected genes sequenced in order to provide information that can be used to enhance the EMAP Great Rivers Study. Initially a sub-sampling of the collected fish will be analyzed to provide a quantitative method for validating the quality of EMAP field identifications, and to look for evidence of cryptic species within the EMAP samples. Preliminary results from an analysis of the *cyt b* gene in 61 specimens indicate very good agreement with reference sequences for two species, shorthead redhorse and river shiner. Sequence alignment for a shorthead redhorse sampled from a study site showed near perfect homology with reference (GenBank) sequence. In total, 891 of 895 bases matched perfectly, providing confirmation of the shorthead redhorse's taxonomic classification. There were, however, a few anomalies. One fish morphologically identified as a river shiner and two fish identified as golden shiners were genetically divergent from reference sequences and may represent other (possibly cryptic) species.

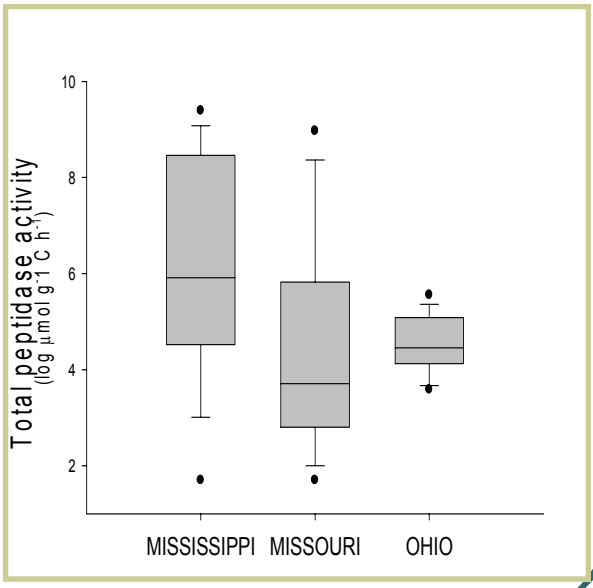
It was proposed at the recent GRE Technical meeting that genetic methodologies be used to address the incidence of hybridization for the 2006 samplings. Genetic data are extremely important for evaluating instances of hybridization, as morphological clues to hybrid status are often ambiguous. Hybridization rates may provide useful indicators of environmental quality if hybrid individuals are found to be associated with disturbed habitats, as has been hypothesized.

Sediment Enzyme Activity In the Great Rivers of the Central Basin

Brian Hill (NHEERL/ORD/USEPA)

Surface water quality in aquatic ecosystems is determined by interactions with base geology, soils, transported materials, and the atmosphere. It is often significantly deteriorated by agriculture, industry, mining, urbanization, and other human activities. Water quality monitoring is often constrained by logistical and economic considerations, and the scope of water quality sampling varies with site conditions and research objectives.

The purpose of this research was to compare the extracellular enzyme activity (EEA) of the sediment microbial assemblage in their processing of organic carbon, as related to nutrient chemistry in the Great Rivers of the Central United States. We compared a suite of hydrolytic enzymes produced by sediment microbial assemblages with measured nutrients in those sediments and the overlying waters in the Missouri, Upper Mississippi, and Ohio Rivers. Our underlying premise is that organic matter processing by sediment microbial assemblages is so tightly governed by C:N:P ratios that carbon processing rates are directly controlled by nutrient availability. Hence, EEA should directly reflect not only the activity of the microbial community, but also the nutrient status of the environment. EEA was significantly different between rivers (MS>MO>OH), and was correlated with chemistry, nutrient ratios, and atmospheric N deposition.



Fish Contaminant Data Shows Presence of PCBs and Fire Retardant Chemicals

Dan Tettenhorst et al. UES Services

Whole fish composites from the Ohio, Lower Missouri, and Upper Mississippi Rivers were analyzed for environmental contaminants as part of the USEPA's Environmental Monitoring and Assessment Program for Great Rivers Ecosystems (EMAP-GRE). Two hundred forty-seven (247) samples were assayed for 22 organochlorine pesticides, 20 PCB congeners, and 6 PBDEs by GC-µECD. The median concentration and its nonparametric 95% confidence interval were calculated for each analyte within each river and fish size group.

Results revealed statistically higher concentrations of total PCBs, total PBDEs, ∑chlordanes (∑CHL), and ∑DDT for the Ohio River samples than the Missouri River and Upper Mississippi River samples (Figure 1). There were few significant differences in the analyte concentrations between the samples collected from the Upper Mississippi and Lower Missouri Rivers. The dominant contaminants in all three rivers were PCB congeners #153 and #138, PBDE congener #47, trans-nonachlor, cis-chlordane, dieldrin, and p,p'-DDE. The predominance of PBDE #47 out of all PBDE congeners, (Figure 2), is different than the congener ratio of the commercial flame retardant formulations. This can be explained by information from recent literature that shows PBDE #47 has a higher uptake, and is more efficiently absorbed within fish.

There were significant concentration differences for certain analytes between large fish and small fish samples with the exception of chlordanes on the Mississippi River and PBDE #47 on the Ohio River. PBDE #99 had the only significant difference between large and small fish samples on the Missouri River. Small fish can be used to assess risk to piscivorous wildlife, whereas large fish are more sensitive to contaminants in the total environment. Small fish, being ubiquitous, may be a more representative sample at the site. Large fish, being more mobile, represent contamination from a broader area. Results presented here reflect the samples collected and do not necessarily reflect the entire river system.

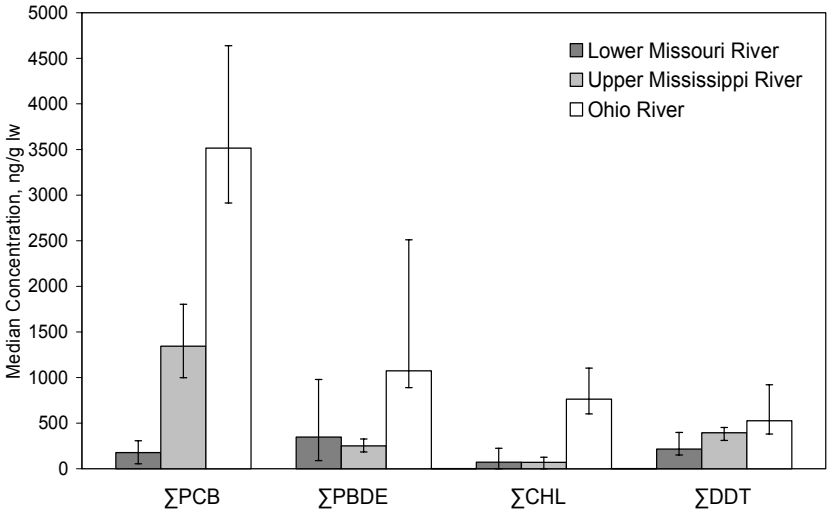


Figure 1. Total PCB congeners (∑PCB), total PBDE congeners (∑PBDE), total chlordanes (∑CHL), and total DDTs (∑DDT) median concentrations for large fish samples from the Ohio, Upper Mississippi and Lower Missouri Rivers.

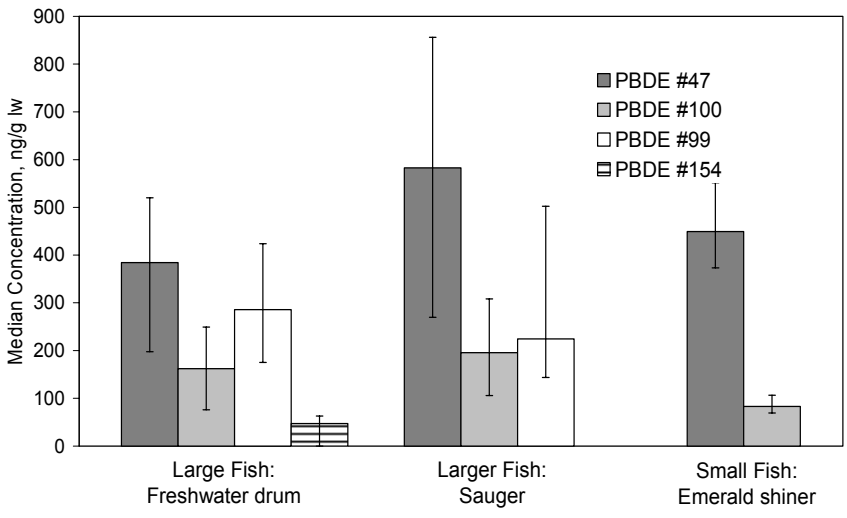


Figure 2. Median conger-specific PBDE concentrations and the 95% confidence intervals for two large fish and one small fish species (with n>9) collected from the Ohio River.

The Great Rivers Newsletter is periodic publication of the EPA's Mid-Continent Ecology Division in Duluth, MN. The newsletter is designed to disseminate timely information about the EMAP-GRE project among EPA investigators; state, federal, and tribal collaborators; and other stakeholders. Contact Mark Pearson, editor (pearson.mark@epa.gov; 218-529-5205) to obtain copies of the newsletter. The newsletter and other EMAP information can be found on this website : **www.epa.gov/emap/greatriver**