

Mercury in Small Fishes in Illinois: Historical Perspectives and Contemporary Issues



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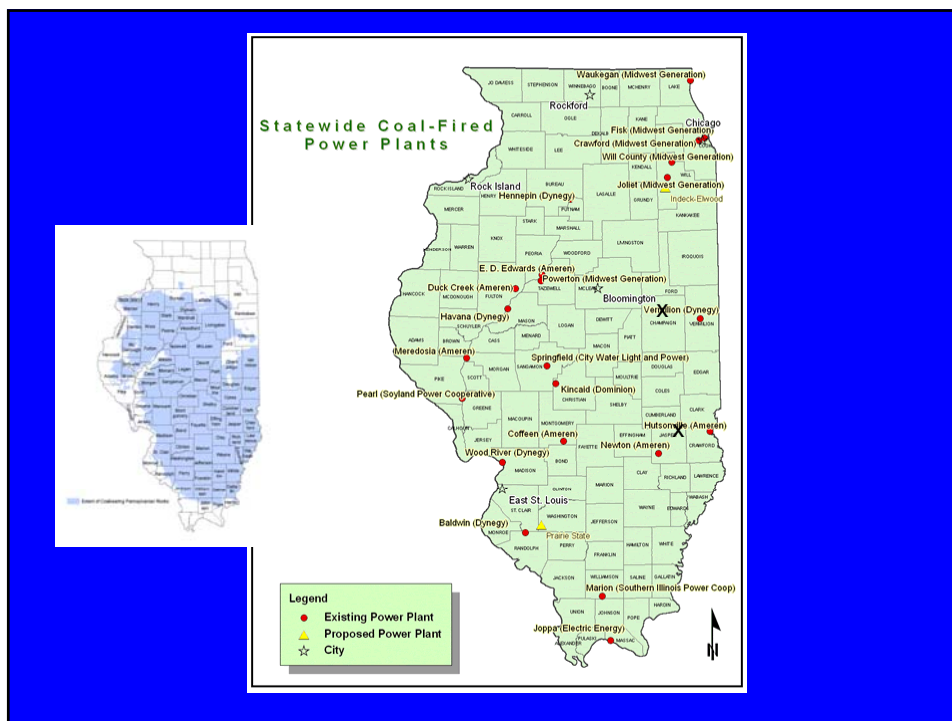
Special thanks to:

- IL Natural History Survey (INHS) -\$\$
- IL Sustainable Technology Center (ISTC) -Services
- David Thomas, INHS
- Marv Piwoni, ISTC
- INHS Fish Collection and Collectors

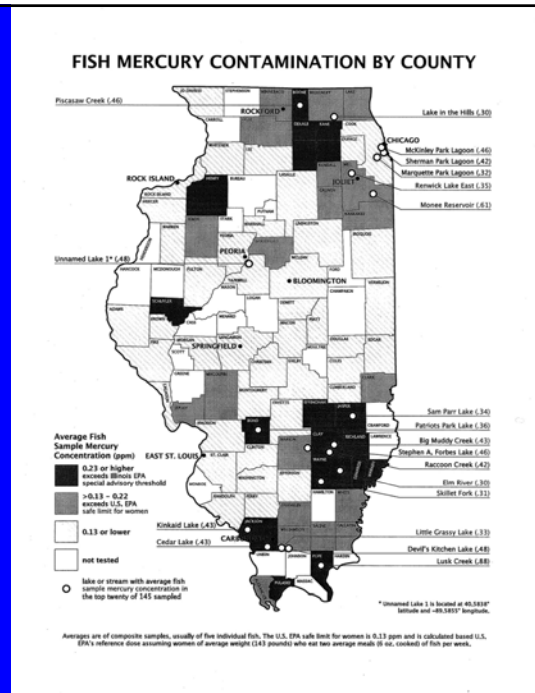
Sources of Mercury



- Natural- volcanoes, forest fires, weathering deposits, oceans
- Products- adhesives to wood preservatives
- Burning of coal! (concrete)
- Chlor-alkali; mining esp gold, silver, mercury; smelting; waste incineration



Muller 2006

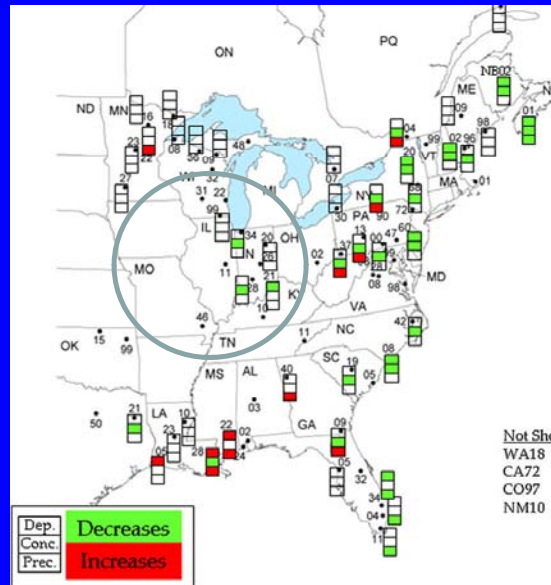


Illinois Fish Contaminant Monitoring Program

- Statewide advisory limiting consumption of predatory fish by children and pregnant or nursing women (≤ 1 meal/wk)
- More stringent advisories (≤ 1 meal/mo) for 17 water bodies



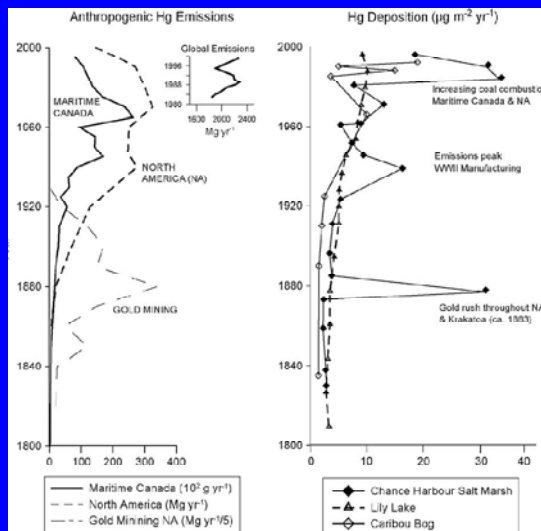
Trends in Hg deposition, concentration and precipitation 1996 to 2005
 Prestbo and Gay 2009



Mercury Reduction Laws Affecting Coal-fired Power Plants

- US EPA – 2005 Clean Air Mercury Rule to reduce emissions from CFPP by 47% 2010, 79% 2018
- In early 2006 Illinois Gov Blagojevich introduces proposed rule to cut Hg emissions from CFPP 90% by mid-2009; adopted IL Pollution Control Board and Admin Code later that year after public overwhelmingly in favor

Trends In Mercury Deposition

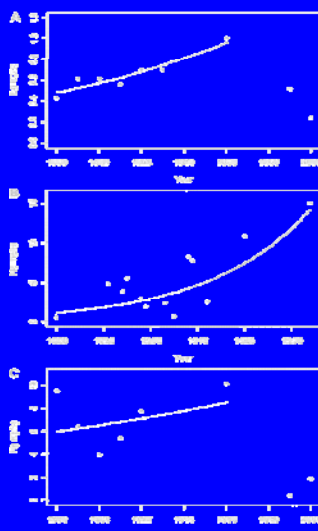


Sunderland et al. 2008

Est US/Canada contribute 28-33%

Trends in Mercury in Biota

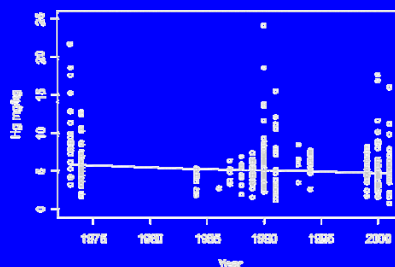
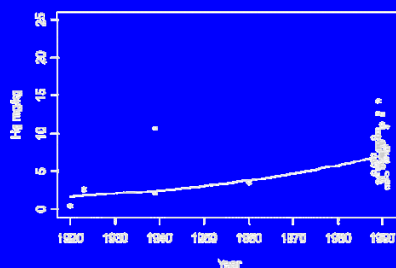
- Feathers of West Greenland birds of prey Dietz et al. 2006



Gyrfalcon 1880-2000

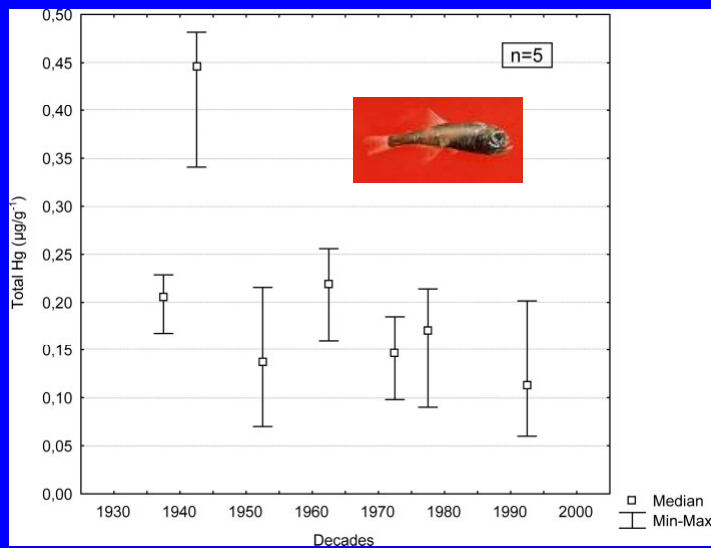
Trends in Mercury in Biota

- Hair Greenlandic polar bears - Dietz et al 2006



Trends in Mercury in Biota

Glacier lanternfish North Atlantic- Martins et al. 2006



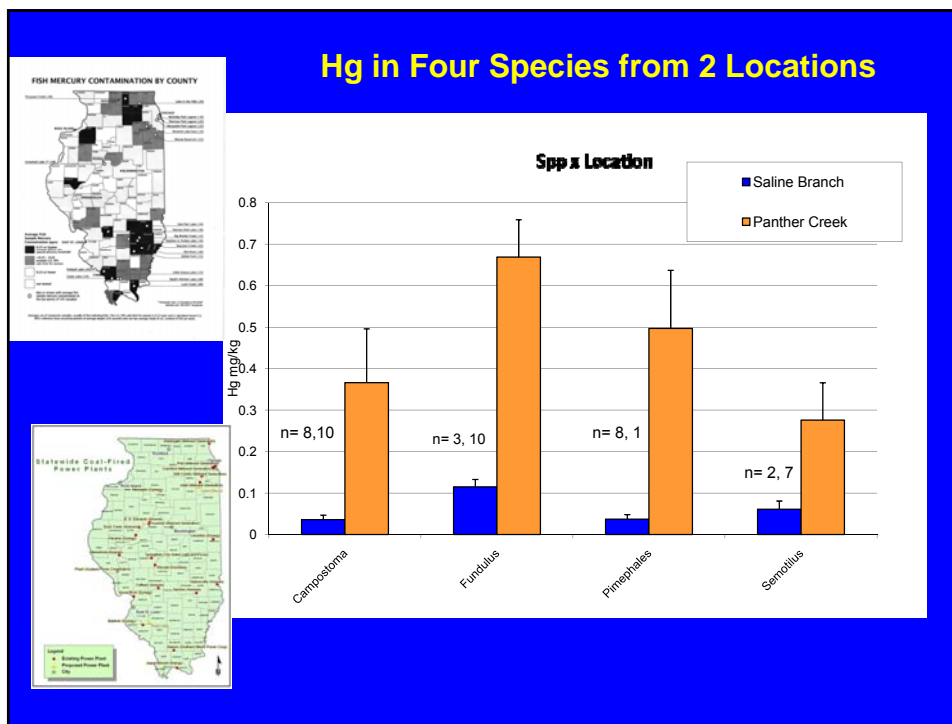
Trends in Mercury in Biota

- Mercury in deepwater marine fish- Barber et al. 1972
- Abyssal halosaur 1886 vs. 1971-72
- Blue antimora 1882 vs. 1971-72
- Concluded no differences in Hg in muscle of fish between time periods, and that deep ocean fish have naturally high tissue Hg levels



Hg in IL stream fishes

- Explore the use of preserved fish from INHS collection to examine long-term trends in Hg contamination in Illinois streams
- - Do mercury concentrations differ in small fish from streams within and outside of the "coal belt"?



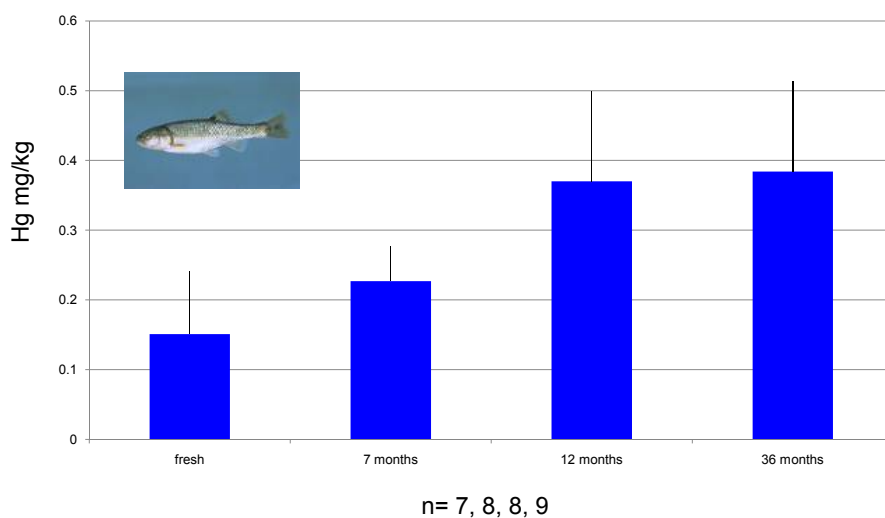
Hg in IL stream fishes

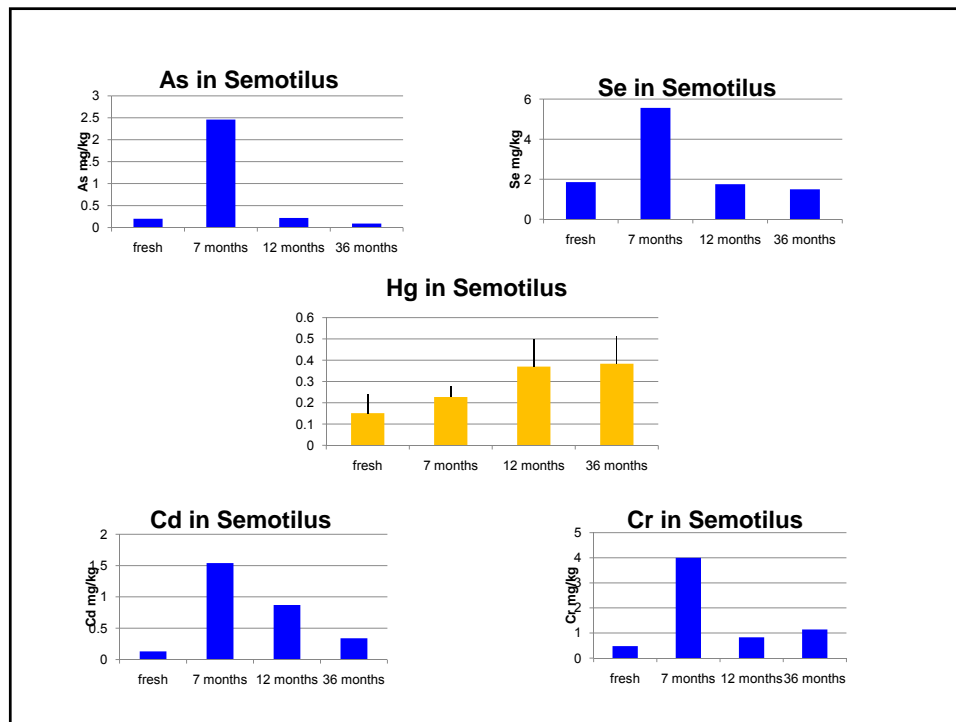
- Explore the use of preserved fish from INHS collection to examine long-term trends in Hg contamination in Illinois streams
 - Change in Hg concentration with preservation?

Changes in Mercury Concentrations with Preservation

- Gibbs et al. 1974
- Examined changes in metal concentrations in lanternfish from off Bermuda with fluid preservation
- Hg concentrations decreased after one month (extent of study)
- Hg concentrations in fluid (isopropyl alcohol) preserved specimens decreased 1958>1972

Hg in creek chubs- Panther Creek, Jasper Co., IL



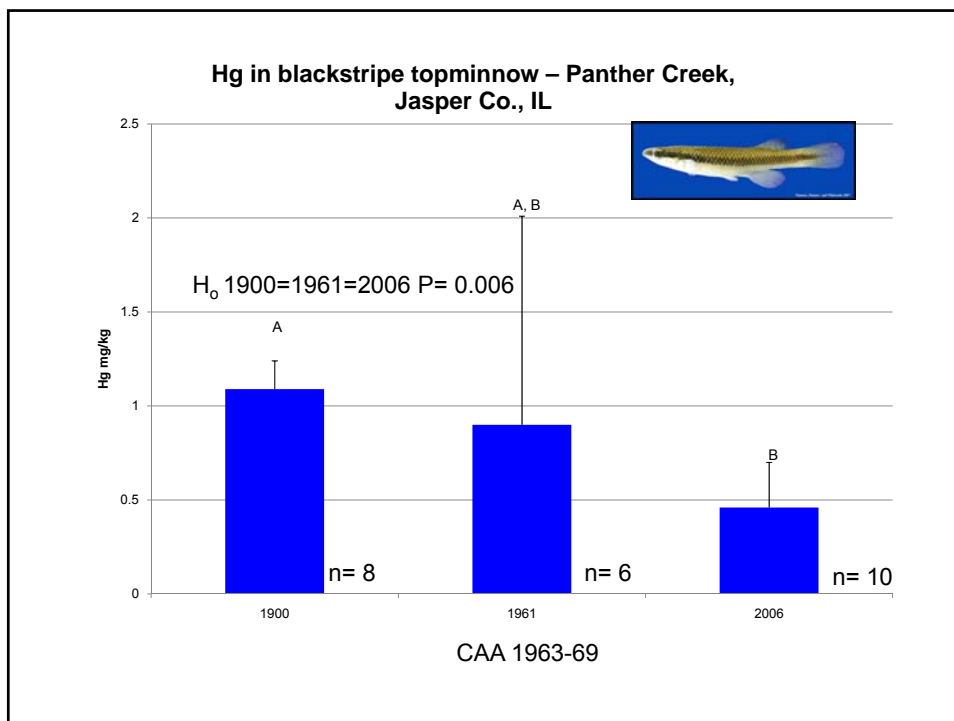


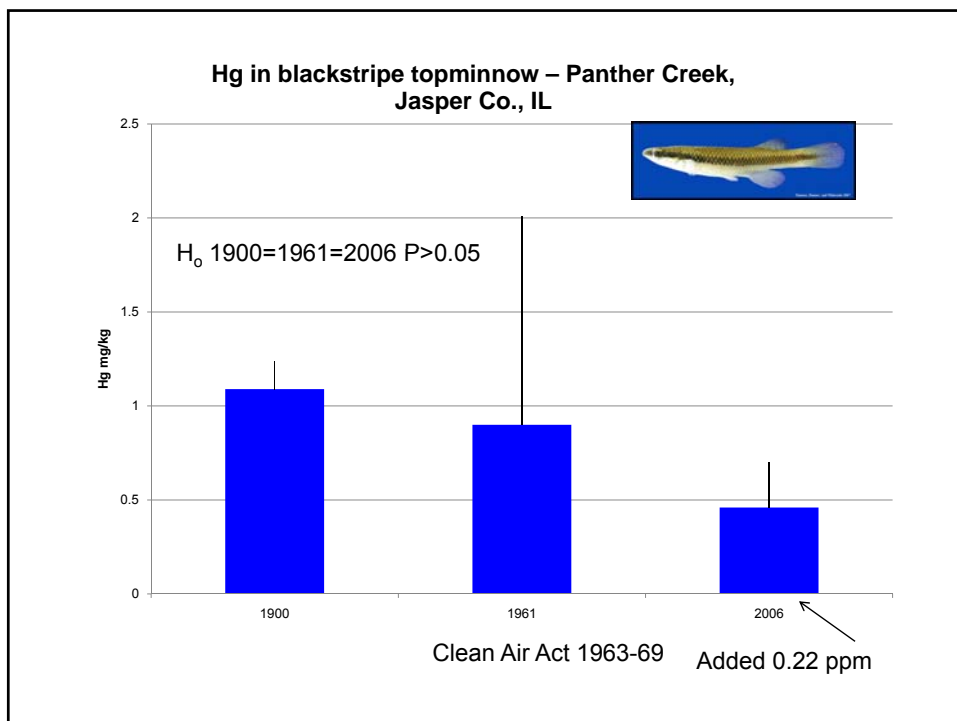
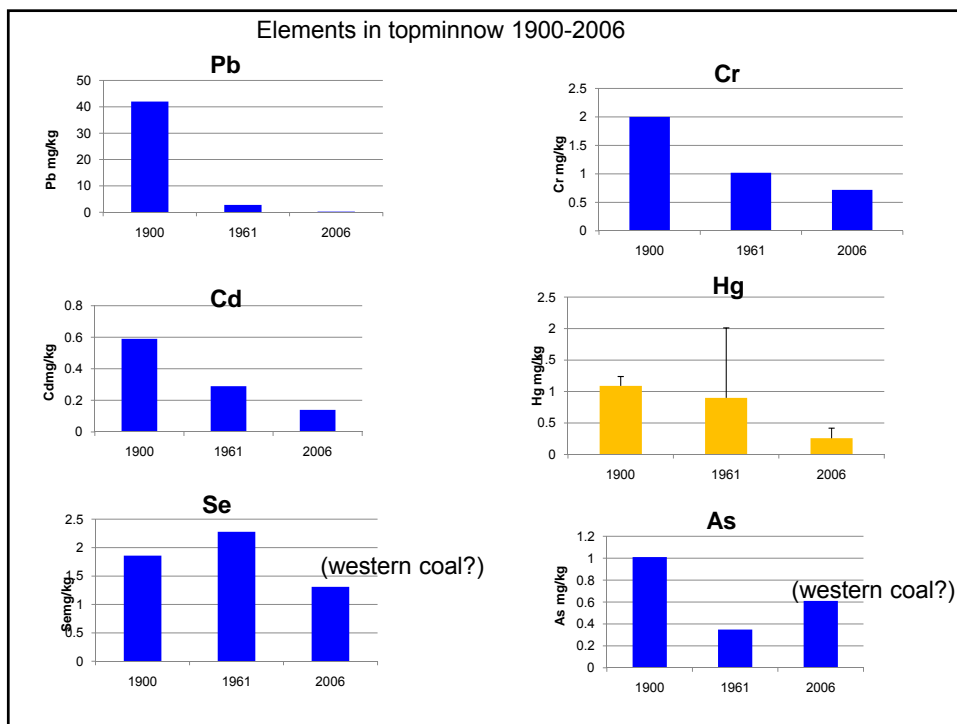
What's up with that?

- Fish change in mass with preservation
 - gain mass in formalin, lose mass in alcohol
 - Billy 1963- fish gained mass in formalin, then approached live mass after 65 days in alcohol
- Destruction of tissues with preservation
 - Loss of fatty and amino acids from fluid-preserved mammals

Hg in IL stream fishes

- Explore the use of preserved fish from INHS collection to examine long-term trends in Hg contamination in Illinois streams
 - Have mercury concentrations declined in small fish in IL streams?



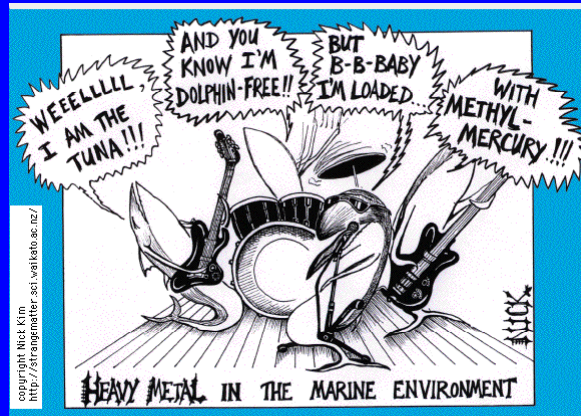


Conclusions

- Hg concentrations greater in 4 fish spp. from “coal belt”
- Hg concentrations in creek chubs increased to 12 months preservation, appeared to begin to level off
 - Trend in other elements similar to each other but not mercury
- Hg concentrations in blackstripe topminnow in Panther Creek decreased from 1900>1961>2006
 - Same trend apparent when adjusted for preservation, but means NSD
 - Trend similar to other elements, progressive decline except As and Se

Prospectus

- Additional studies of effects of preservation on Hg concentrations
- Examine historic trends in additional species, streams, time periods



(Gratuitous Cartoon)