Missouri River contributes much or most of the load of many pesticides present in the Mississippi River, even though the flow of the upper Mississippi at that location is only about one-fifth of that from the entire Mississippi River basin. High nutrient loadings have caused a number of adverse effects, including blooms of noxious algae. The export of nutrients (particularly nitrogen) from the upper Mississippi River basin has contributed to hypoxia and associated mortalities of biota in the Gulf of Mexico. Ammonia has been implicated in die-offs of fingernail clams (*Musculium transversum*), an important component of the benthic food web, in extensive reaches of the upper Mississippi River.

The modern river also receives inputs of hundreds of recently synthesized chemicals from multiple sources, and the behavior and potential ecotoxicological significance of many of these compounds are largely unknown. Emerging contaminants (e.g., perfluorochemicals, pharmaceuticals, personal care products) and recently discovered mechanisms of adverse biological effects (e.g., endocrine disruption) pose substantial continuing challenges for scientists and environmental managers concerned with the ecological health of this complex ecosystem.

The fish mercury project: monitoring to support adaptive water quality management and risk communication in the San Francisco Bay and Sacramento-San Joaquin delta region (USA)

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The San Francisco Bay-Sacramento/San Joaquin Delta (Bay-Delta) watershed in California includes thousands of miles of rivers and streams and thousands of lakes and reservoirs. This vast region supports a large and growing human population (currently over 9 million). Many of these people catch and eat fish from the watershed. Unfortunately, fish contamination in the watershed is a serious environmental and public health concern. Intensive gold and mercury mining across the watershed has left a legacy of mercury contamination, and many fish populations are tainted with mercury. In the Bay-Delta and surrounding areas, the contamination is among the most extensive in all of California. An additional cause for concern relates to the ambitious habitat restoration programs underway in the Bay-Delta ecosystem. Both California and U.S. agencies are investing considerable resources in restoring wetlands and other aquatic habitats, a process expected to provide substantial benefits for fish and wildlife populations. However, exacerbation of the existing mercury problem is a potential side effect of restoration activities because wetlands and newly flooded habitats could accelerate mercury uptake into the food chain.

A Mercury Strategy for the watershed has been developed to integrate mercury investigations, ecological restoration, management, and risk assessment. Monitoring of mercury in fish is a key element of the Strategy, providing an essential foundation for evaluating the effect of management actions and for reducing exposure in the near-term through providing guidance to the public on safe fish consumption. The Fish Mercury Project (www.sfei.org/cmr/fishmercury) is a three-year effort begun in 2005 to implement elements of the Mercury Strategy related to monitoring mercury in fish. The FMP is conducting the most extensive monitoring to date of mercury in sport fish in the Delta region. In 2005, the FMP and other smaller programs collected over 2000 fish from 22 species and 69 popular fishing locations. Mercury concentrations in fish varied significantly among species, locations, and with fish size. Overall, largemouth bass was the most contaminated of the target species, and bluegill and redear sunfish were the least. The least contaminated locations sampled in 2005 were mainly in the central and southern Delta. The most contaminated locations were along the mainstem and tributaries of the Sacramento and San Joaquin Rivers, as well as the Cosumnes River. For many species (including largemouth bass, Sacramento sucker, and Sacramento pikeminnow), larger and older fish had higher concentrations of mercury.

The FMP is also performing the most extensive monitoring ever conducted of small fish in the watershed. These “biosentinels” are effective indicators of fine-scale spatial and temporal variation in mercury uptake into the food web. Biosentinel fish were collected from 50 sites throughout the watershed, especially near large wetland restoration projects. Encouraging results were obtained from the Napa Marsh area, the site of some of the most extensive wetland restoration activities in the watershed, including projects initiated in 1995, 2002, and 2006. Biosentinel fish collected in 2006 from a Napa Marsh salt pond that was opened to tidal action earlier that year had the lowest mercury observed for the indicator species across the entire watershed. Fish from other locations in this area also had low concentrations in both 2005 and 2006. These findings indicate that some restoration projects may be associated with reduced, rather than increased, mercury accumulation in the food chain. Other significant findings from the biosentinel work to date include the observation that seasonal variation in mercury uptake seems associated with episodic flooding of normally dry soils, documentation of significant year-to-year variation, and an improved general understanding of the spatial pattern of accumulation across the watershed.

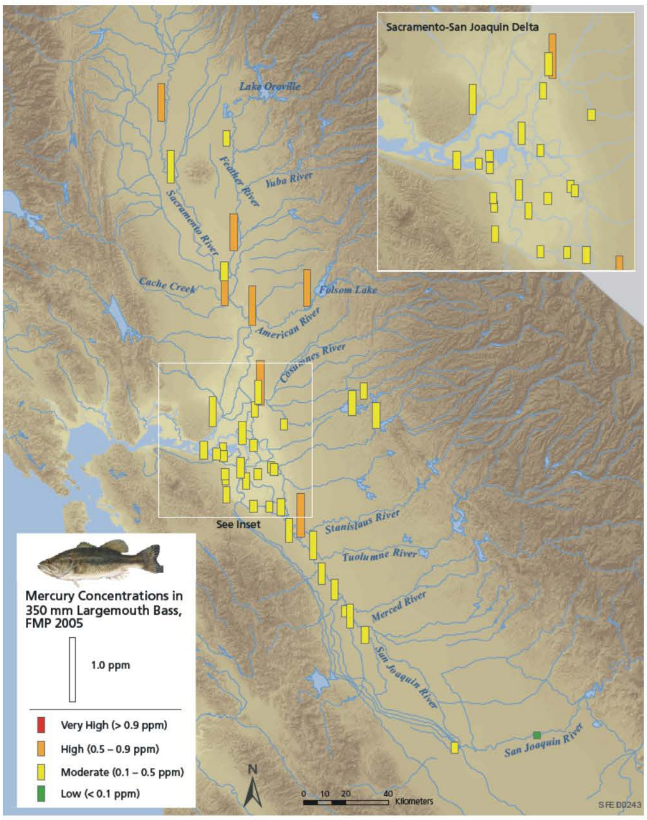

Fig. 1 Mercury concentrations in largemouth bass in the study area in 2005

Increased eutrophication in the northern coastal waters of the South China Sea revealed by sedim entary records

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The sedimentary organic matter in coastal areas mainly originates from primary and secondary production within the ecosystem, terrestrial inputs and bacterial production in the water and sediments. The relative significance of these sources is determined by local environmental factors, such as climate, hydrodynamic conditions and nutrient supply. Changes in any of these factors will result in the change of sedimentary organic matter. Algal blooms or/and red tides caused by eutrophication occurred at some given environmental condition and may imprint markers in the sedimentary records.

The total organic carbon (TOC), total nitrogen (TN) and stable isotope values (^{13}Corg and ^{15}N) from the dating sediment cores were analyzed. The profiles of TOC, TN, C/N, $^{13}C_{org}$ and ^{15}N indicate that terrestrial organic matter downs from 50% to 20% of TOC in the Pearl River estuary while Dapeng Bay has no obvious terrestrial organic matter input. The highest TOC occurred in middle part of the estuary because of high precipitation of terrestrial organic matter. Algal-derived organic carbon content increases with the time in Dapeng Bay. This kind of increase is caused by enhancement of primary marine productivity due to more nutrient input.

The sediment core taken from Dapeng Bay reveals that diatom and dinoflagellate productivity which is reflected in the biogenic silica (BSi) and dinosterol concentrations respectively, increased gradually starting in 1940 and accelerated after 1965, especially between 1980 and 2000, indicating that algal blooms and/or red tides caused by eutrophication increased during this time. The abundance of coprostanol, which reflects domestic sewage discharge, and the terrestrial biomarkers (long-chain fatty acids and fatty alcohols and sitosterol) exhibit similar temporal changes with the primary production, showing that the enhanced eutrophication resulted from increased anthropogenic activities in the northern coastal waters of the South China Sea (SCS) in recent decades.

Studying on formation dynamic mechanism of the freshwater zone near the MeiMaoSha in the Changjiang Estuary