24 March 2009

TTI-160 Incident: Ecological Risk Assessment: Fish
Prepared by RPI, Inc. For NOAA's Office of Response and Restoration

Ecological Risk Assessment: Fish

Data on the concentration that would kill 50% of fish exposed to zinc (median LC50) were compiled from CAFÉ/EPA Ecotox database. The information included species, test duration (24, 72, 48 and 96 hours) and LC50 values. Multiple LC50 values for the same species were averaged for non-linear modeling analyses. Only values obtained from tests with freshwater species were used to assess potential toxicological risks from exposure to zinc. Data from 72h exposures were excluded because of relatively small sample size (n=<3). Figure 1 shows the 24, 48, and 96 hours LC50 values ranking freshwater fish according to their sensitivity to zinc (species sensitivity distributions; SSDs). There was an overall good data fit to a logistic curve (R^2>0.93 for all test durations).

The median LC50 fish "community" concentrations ranged between 3,162 and 10,000 ppb (3.162 and 10 ppm). Using logistic equations, the estimated LC50 for zinc protective of 95% of the species was as follows: 5,012 ppb (5.012 ppm) for 24 hours, 251 ppb (0.251 ppm) for 48 hours, and 126 ppb (0.126 ppm) for 96 hours (Figure 2). These trends indicate that exposures shorter than 24 hours would result in reduced acute toxicity (i.e., larger LC50 values) compared to longer exposures.

Based on analysis of currently available data, a 24-hour exposure of sensitive freshwater fish species to zinc at a concentration of 5 ppm would potentially cause acute toxicity to 2.5% of the exposed individuals. Shorter exposure periods would have even lower risks to exposed populations.

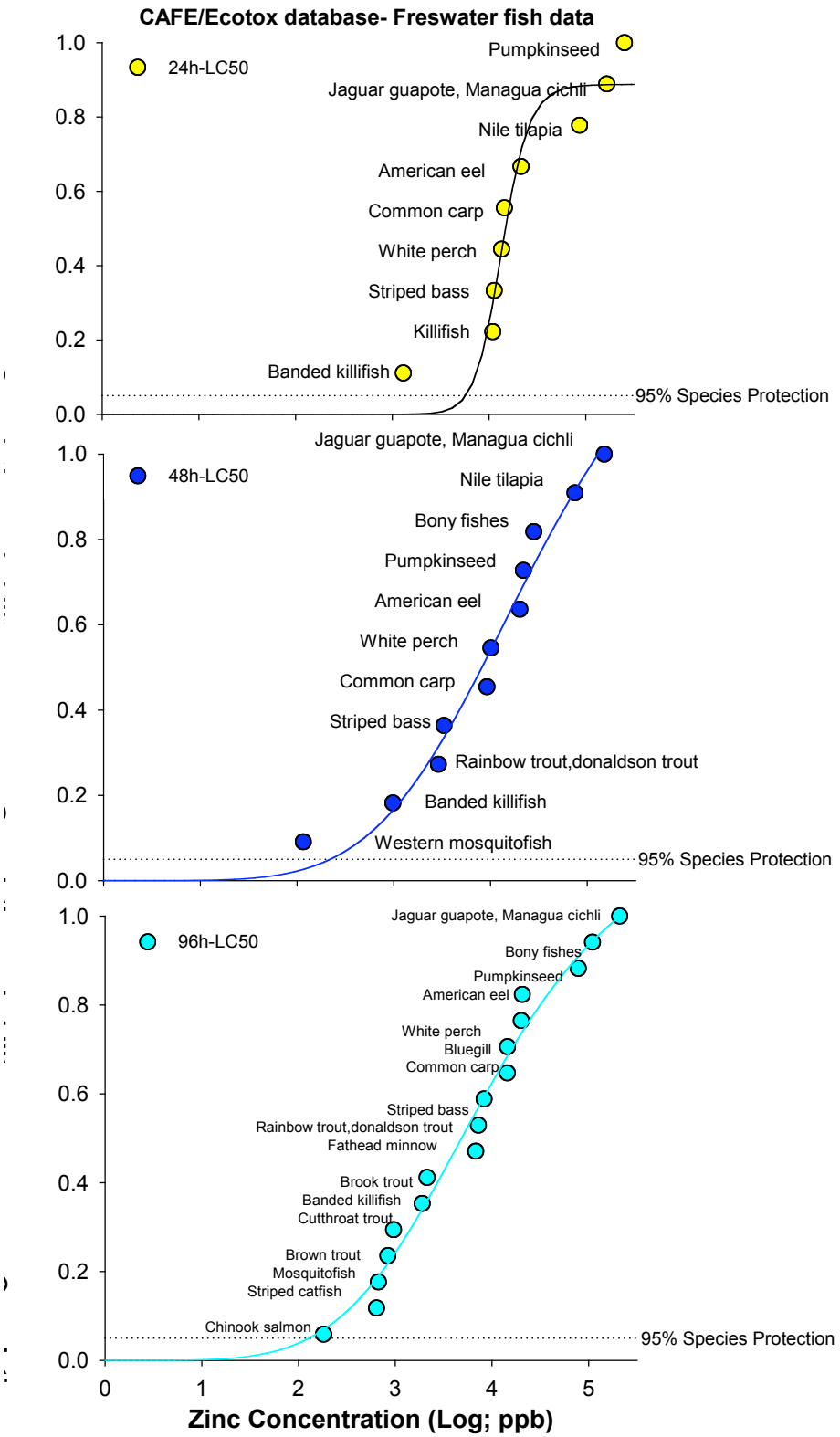

Figure 1. LC50 values for 24, 48, and 96-hour exposures to zinc. Data on freshwater fish are ranked according to species sensitivity to this metal, with cumulative probability from 0 to 1 representing more to least sensitivity to zinc. The dashed line on the bottom of each plot represents the LC50 value protective of 95% of the species.

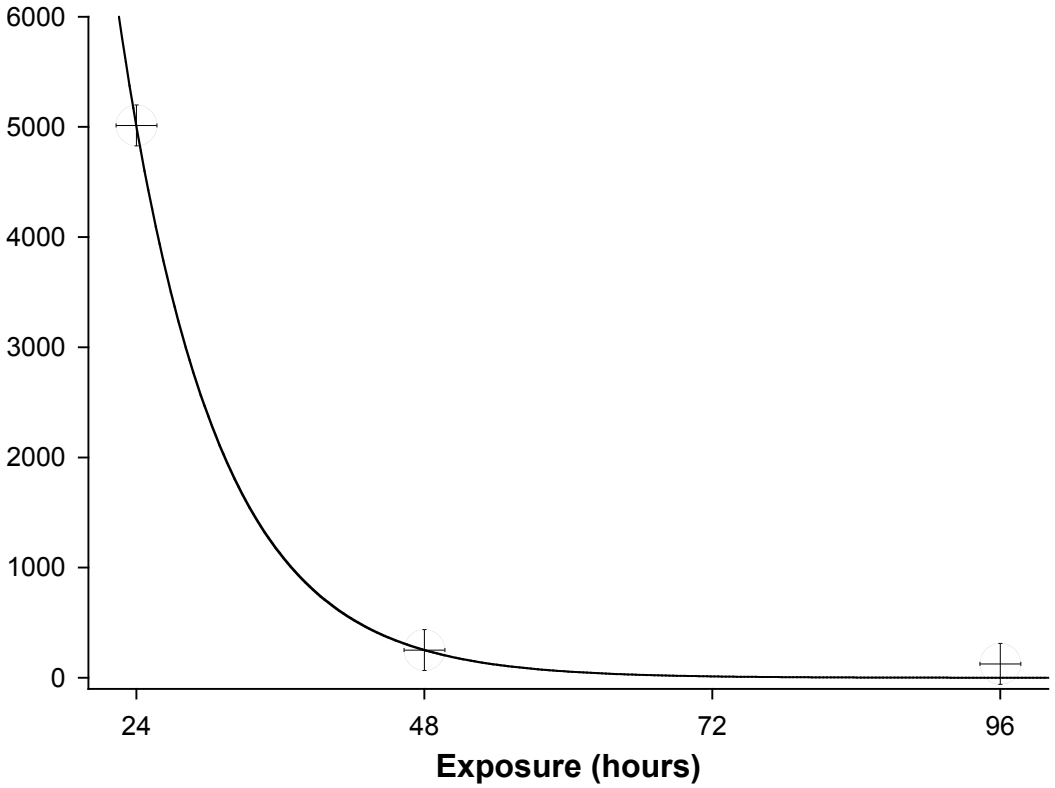

Figure 2. LC50 values for 24, 48, and 96-hour exposures to zinc protective of 95% of the exposed freshwater fish species.

The above information was prepared under contract to NOAA's Office of Response and Restoration at the request of the NOAA Scientific Support Coordinator. This information serves to better assess a risk level of concern related to a possible spill of a zinc-calcium bromide in the Mississippi River during proposed salvage operations. While it has not been extensively reviewed, it has been rviewed by other members of the NOAA Scientific Support Team.

Charlie Henry

NOAA Scientific Support Coordinator