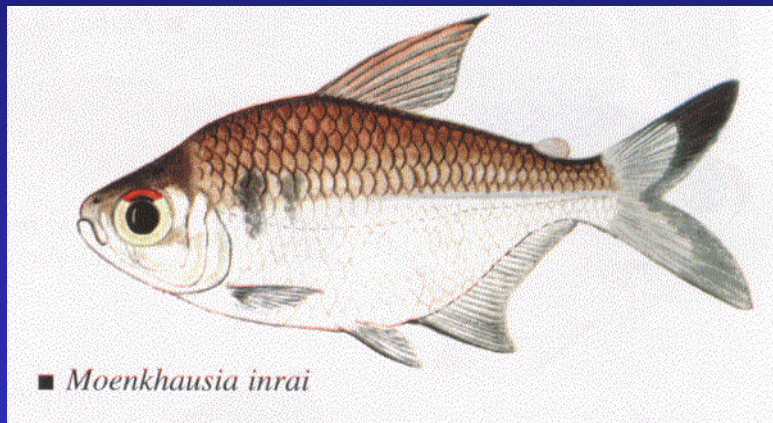


Fish Monitoring



by

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(Adapted from ESG 1999, Fish slides from Poissons de Guyana, 1997)

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Why Conduct Fish Surveys

- There can be a direct pathway between potential mining contaminants and the human population.
- Fish are permanent residents of the aquatic environment. Therefore changes in water quality can affect the fish communities.

Questions

- Are contaminants getting into the system?
- Are contaminants bioavailable?
 - Tissue metal levels
- Is there a measurable biological response?
- Are the contaminants causing the effect?

Components

- Site Characterization
 - Lake
 - Stream
 - River
- Study Design
 - Type of survey
 - Unaffected and affected areas

Fish Surveys

- Community Survey
 - Record all fish captured to determine fish community composition.
- Sentinel Species
 - Survey targets selected species. Detailed measurements obtained for these species.

Community Survey

- Determine species that are present in sufficient numbers to support a population survey. (selection of sentinel species)
- Relative abundance of fish species
- Presence/absence of rare or sensitive species

Sentinel Survey

Desirable Attributes of a Sentinel Species

- Bottom feeders and or top predator
- Abundant in receiving environment
- Medium longevity
- High fecundity
- Rapid growth and short age to maturation

Sentinel Survey

Number of Fish

- Two sentinel species
- 20 adult male and 20 adult female
 - Per sampling area
 - Per sentinel species

Sentinel Survey

Measurements on Sentinel Species

- Length
- Weight
- Age
- Gonad weight
- Egg size
- Fecundity
- Liver weight
- Sex
- Tissue metals
- External conditions

Sentinel Species

Comparison between sites

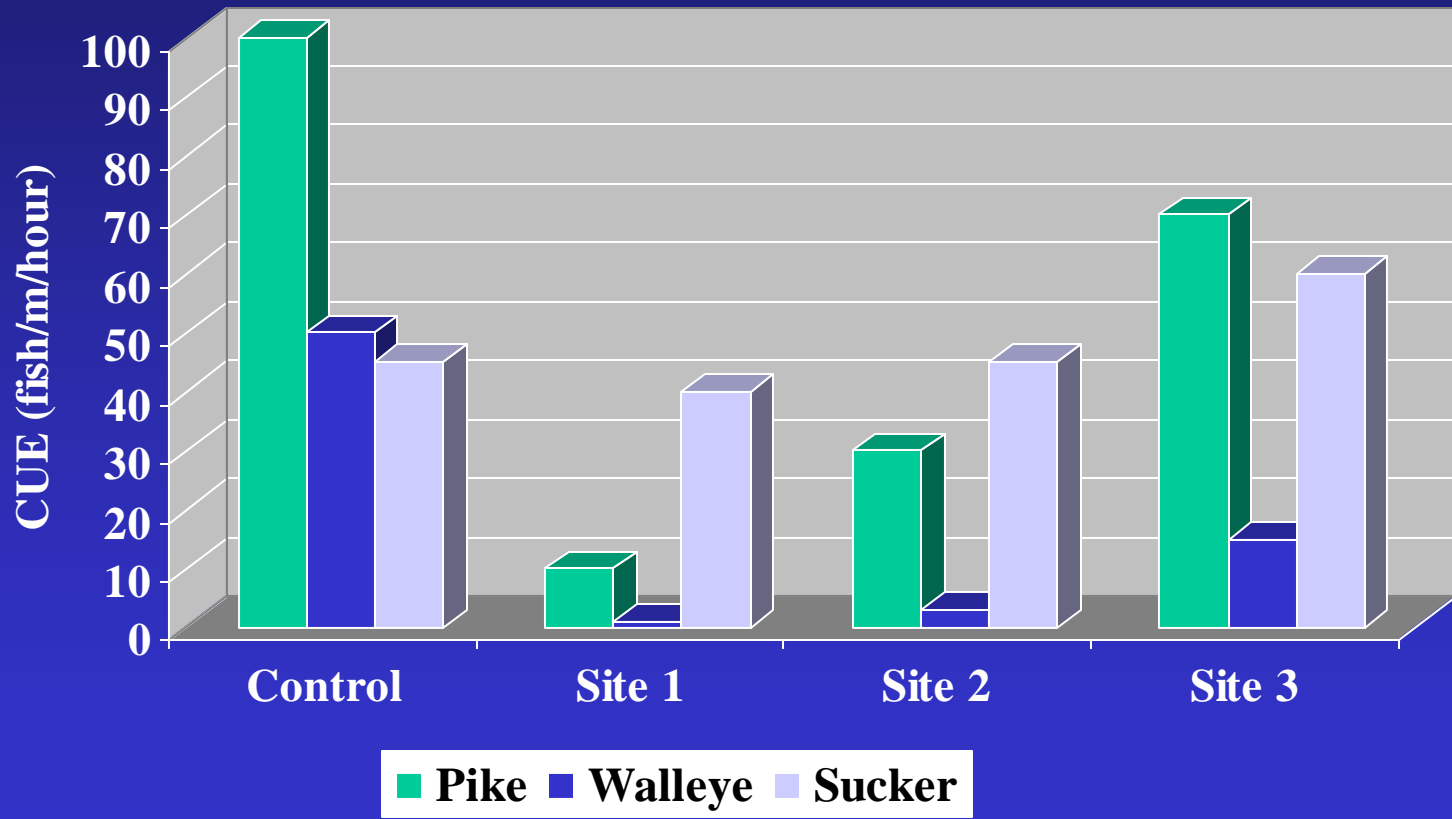
- Growth rates
- Reproduction
- Organ size
- Usability of fish

Data Analysis

Community Survey

- Catch Summary
- Relative abundance of each species
 - Catch per unit effort (CUE) by species

Catch per Unit Effort

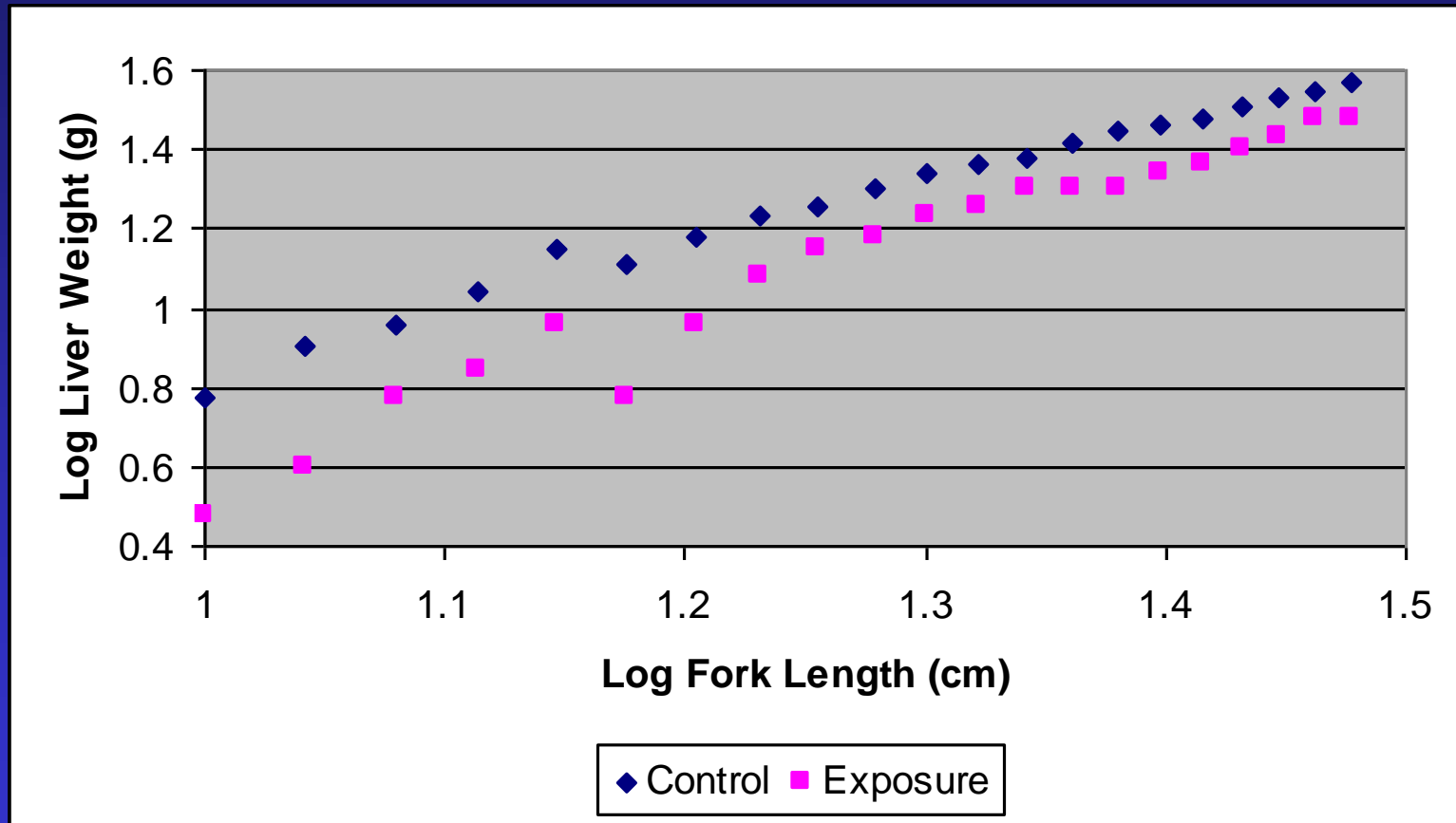


Sentinel Survey

Data Analysis

- Summary Statistics
 - Length, weight, gonad weight
- Liver
 - Weight at fish size
- Reproduction
 - Gonad weight at fish size, fecundity
- Age
 - Growth rates, age-at-maturity

Male Sucker – Liver Weight at Fork Length



Fishing Methods

- Fishing Method used is dependent on
 - Target species
 - Habitat types
 - Conditions at time of field survey
 - Water depth
 - Velocity
 - Water clarity

Gillnets

- Habitat
 - Deeper water and littoral zone
- Limitations
 - Minimum depth required is typically 1 to 2 m
 - Not suitable in swift currents
 - Must be checked frequently
 - Can cause high rates of fish mortality



Electrofishing

- Habitat
 - Shallow streams and rivers
- Limitations
 - Maximum depth approximately 1 m
 - Water clarity affect catching rates
 - Conductive affects catching rates

Seine Net

- Habitat
 - Shallow nearshore areas of lakes or slow moving rivers
- Limitations
 - Maximum depth set by net size
 - Bottom characteristics affect catching rates
 - Typically only catches small fish

What is an Effect

- An effect is defined as a statistically significant biological difference between sampling areas

Study Design Considerations

- Capturing sufficient numbers of fish
- Availability of suitable reference sites
- Mobility of fish
- Confounding factors (tributaries, other activities)

Summary

- Quality data require attention to site-specific conditions, study design and sound field practices