The Impact of Available Benthic Stream Habitat on Larval Lamprey Survival
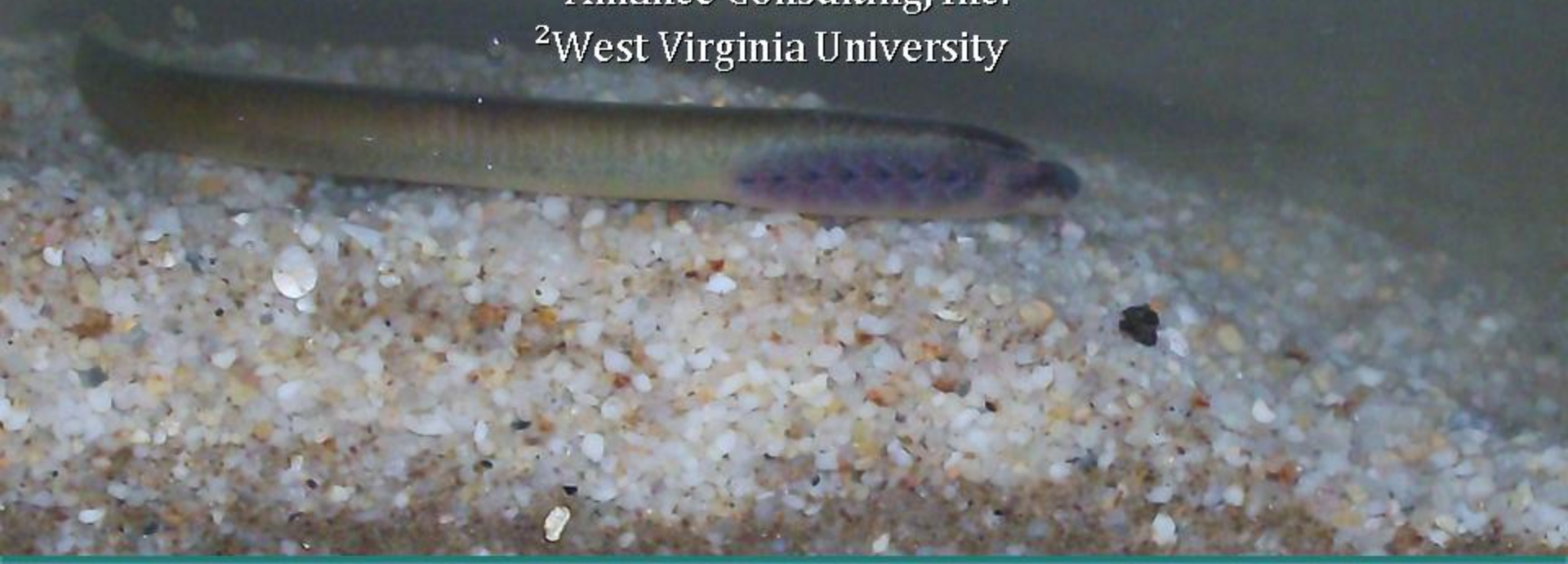
Dustin M. Smith[1], Dr. Stuart A. . Welsh[2], and Dr. Philip J. Turk[2]

[1] Alliance Consulting, Inc.
[2] West Virginia University

Introduction

- Ancient group of fishes

- Jawless, scaleless, no paired fins, etc.

- Parasitic and non-parasitic species

- Larval and adult life stages

- All lamprey species have larval phase in which they are known as ammocoetes

Introduction

- Ammocoetes live burrowing lifestyle

- Stabilize burrows by secreting mucous that cements substrate particles

- Filter feed on detritus, algae, and bacteria

- Stage lasts 3 – 7+ years before transforming into adults

Introduction

- ## Why should we care?

  - Many species in decline

  - Nutrient processors

  - Food source

Introduction

- Previous study indicated that ammocoetes of least brook lamprey (*Lampetra aepyptera*) are habitat specialists

- Ammocoetes significantly selected fine sand substrate as habitat more than other substrate types

- Ammocoetes significantly avoided silty clay substrate more than other substrate types

- Conducted new study examining relationship between available habitat type and survival

Introduction

- **Substrates from previous study ordered by preference:**
  - Fine sand – Selected For
  - Organic substrate – Selected For
  - Coarse Sand - Neither
  - Gravel - Avoided
  - Silt/Clay/Sand Mixture- Avoided
  - Silty Clay - Avoided

Introduction

- Theory that ammocoetes emerge at night to search for better habitat if current habitat is unsuitable

- If true, ammocoetes would spend more time free swimming and vulnerable to predators if there was an overabundance of unsuitable habitat

- Thus, available habitat type could be linked to ammocoete survival

Threats to Larval Lamprey Habitat

- **Sedimentation**
  - Increase in clay and silt

- **Channelization**
  - Coarsening of substrate

Study Justification

- Lack of research relating to ecology of lamprey ammocoetes

- Information on predator avoidance in lampreys virtually non-existent

- Continuation of previous study looking at relationship between ammocoetes and their habitat

Research Objectives

- Determine if link exists between available habitat type and predator avoidance in ammocoetes

- If link does exist, do results correlate with results of substrate selection study?

Methods

- Laboratory experiment
- 6 aquaria used
  - 3 Control (no predators)
  - 3 Treatment (predators)

- Different substrate type per aquarium
  - Fine Sand (0.125 – 0.5 mm)
  - Coarse Sand (0.5 – 1.4 mm)
  - Silty Clay (< 0.063 mm)
- Aquaria randomly assigned substrate type each trial

Methods

- Released 20 ammocoetes (100 mm TL) into each aquarium

- Allowed ammocoetes 24 hours to acclimate/burrow

- After 24 hours released 2 starved adult

  yellow bullheads (*Ameiurus natalis*, 300 mm TL) to serve as predators

- After 6 days determined number of surviving ammocoetes in
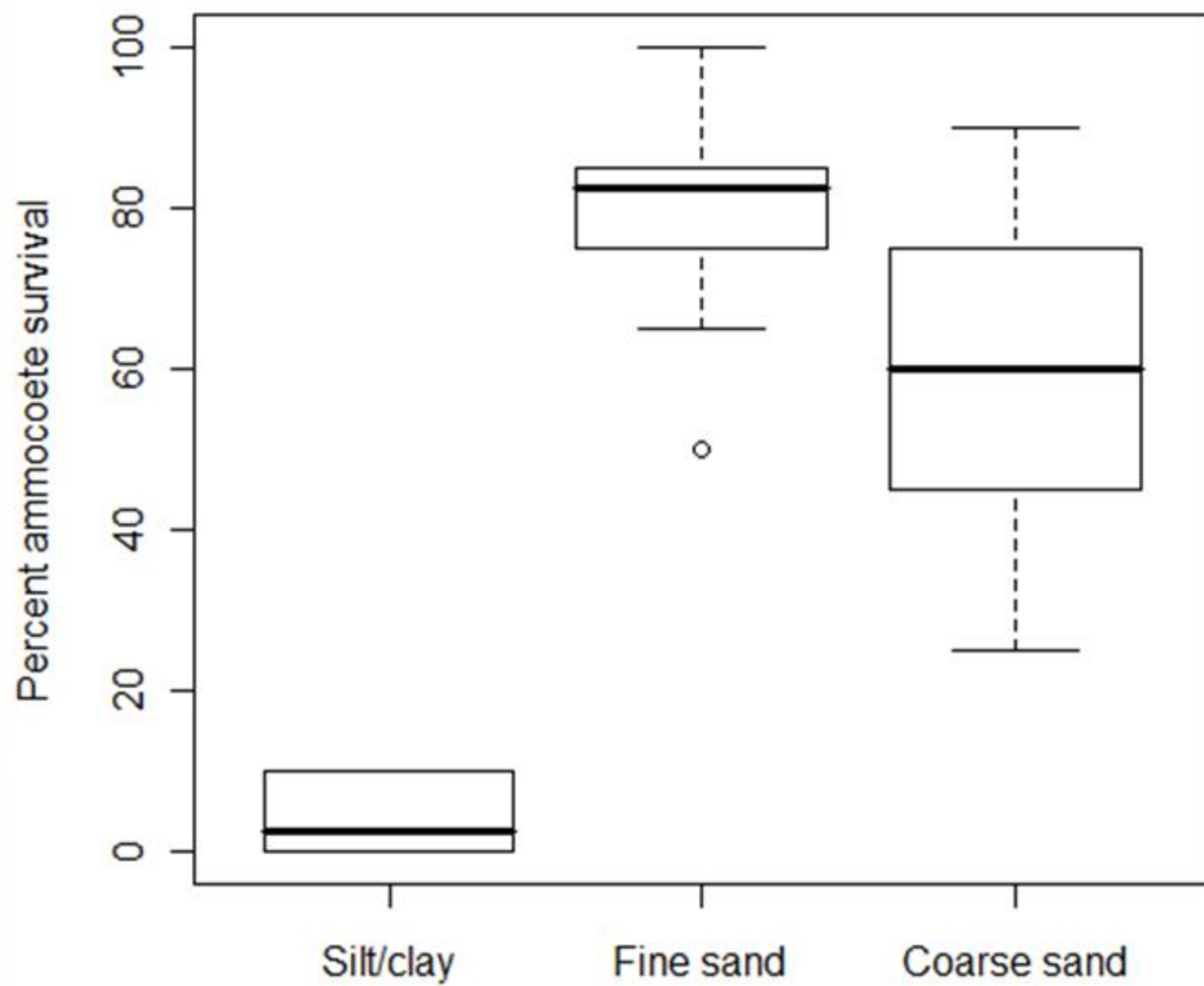
  each aquarium

Statistical Methods

- **Binomial Logistic Regression**

- **Calculation of odds ratios**
  - Odds of ammocoetes living or dying in a given habitat

- **Use logistic regression model to compare odds ratios between habitat types**

Results

Relationship between available substrate type and ammocoete survival
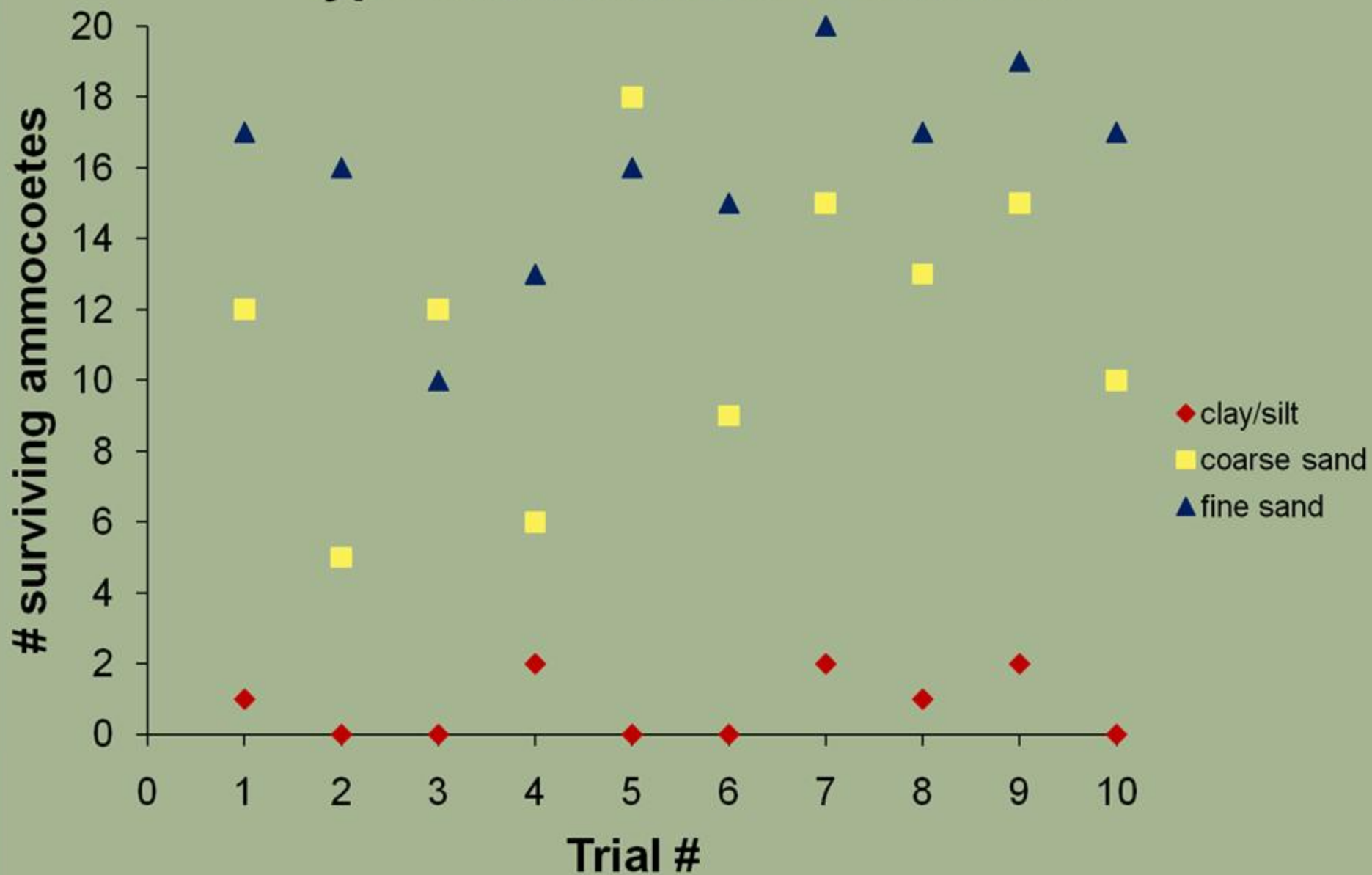
Habitat Type	Estimate	P-value	Odds ratio
Coarse Sand vs. Silty Clay	3.77	$\cong 0$	43.36
Fine Sand vs. Silty Clay	4.96	$\cong 0$	142.72
Fine Sand vs. Coarse Sand	1.19	$\cong 0$	3.29

Results

- All habitat comparisons were significantly different for ammocoete survival

- Ammocoete survival significantly greater in fine sand than in other habitat types

- Ammocoete survival significantly lower in silty clay than in other habitat types

Conclusions

- Results correlate positively with results of substrate selection study

- Significantly selected substrates correlate with higher predator avoidance in ammocoetes than significantly avoided substrates

Possible Explanations

- Catfish rooted out larvae better in silty clay habitat

- All larvae emerged regardless of substrate and burrowing time led to mortality

- Larvae in silty clay emerged more often

Conclusions

- Reduction in high quality fine sand habitat via sedimentation or channelization, could lead to decrease in predator avoidance and thus an increase in ammocoete mortality

- Fine sand habitat could be critical for persistence of lamprey populations

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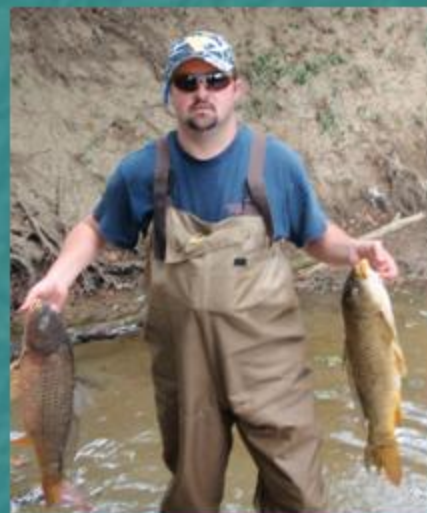
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Questions?