# Tadpole Shrimp in an Antibiotic Soup: Are We Creating Monsters?

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Society of Freshwater Science

# How To Combat Hunger?

- Antibiotic growth promoters to the rescue!
  - Decrease disease
  - Animals grow bigger
  - Animals grow “stronger”
- Not regulated in U.S.

# Antibiotics and Nature: What Happens?

- Too much antibiotics= CHAOS
- 70-90% of antibiotics are unmetabolized and excreted (Kemper et. al. 2008)
- How does this affect nearby ecosystems?

# Freshwater Ecosystems

- Cattle grazing near ponds excrete antibiotics
- We know they're there, but what happens?
  - Ephemeral ecosystems (Colorado)
  - Pilot study
  - Chronic Toxicity Tests

# Meet the *Triops*:

- Crustacea – Notostraca – *Triops* (Tadpole Shrimp)

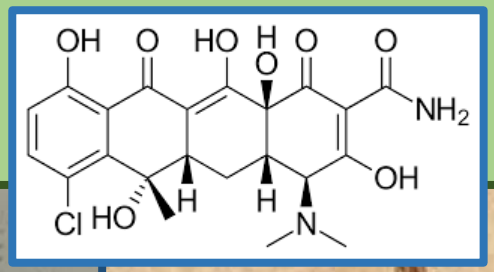
- Herbivore to detritivore to predator
- Freshwater
- Live 2 weeks – several months
- Comes in a variety of sizes

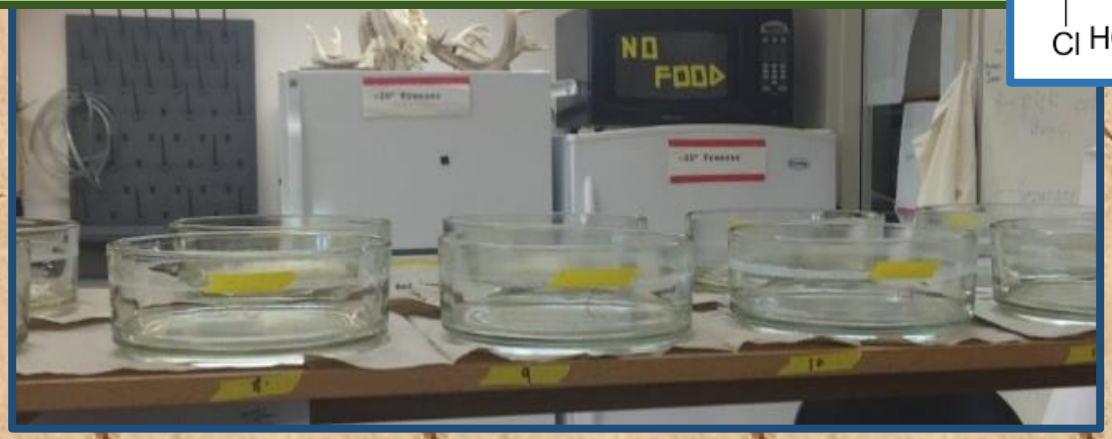
# Our Hypothesis:

- The antibiotic will:
  - Increase shrimp growth
  - Decrease survival (shrimp collected)
  - Decrease number of shrimp hatched

# Materials


- 12 Small 1.5-Liter Bowls
- Dozens of Triops raising kits containing:
  - Triops eggs
  - Triops baby food (dried algae)
  - Triops adult food (protein-nutrient dry mixture)
  - Calcium-limestone pebbles
- Spring water
- Chlortetracycline



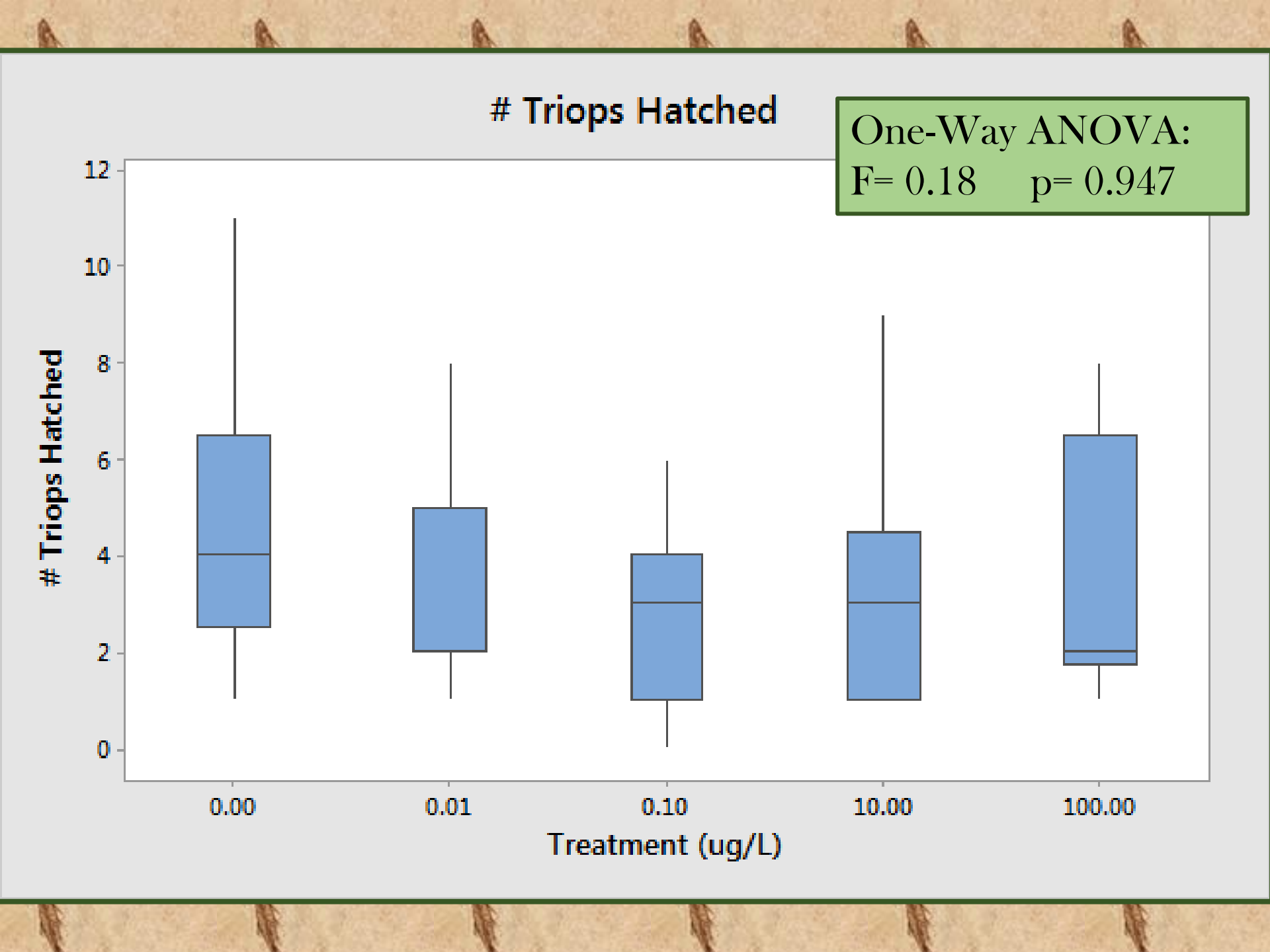



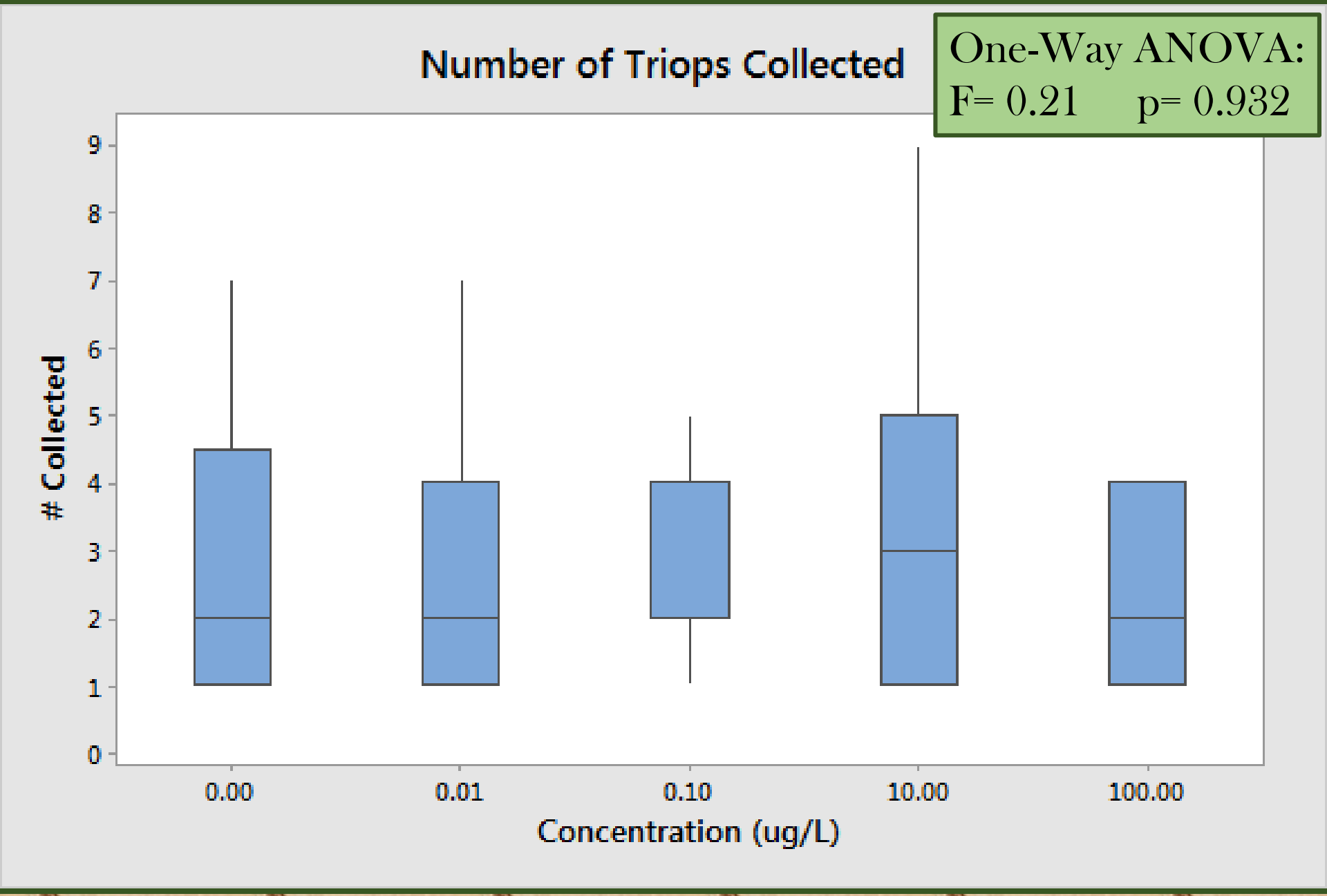
# Procedure:

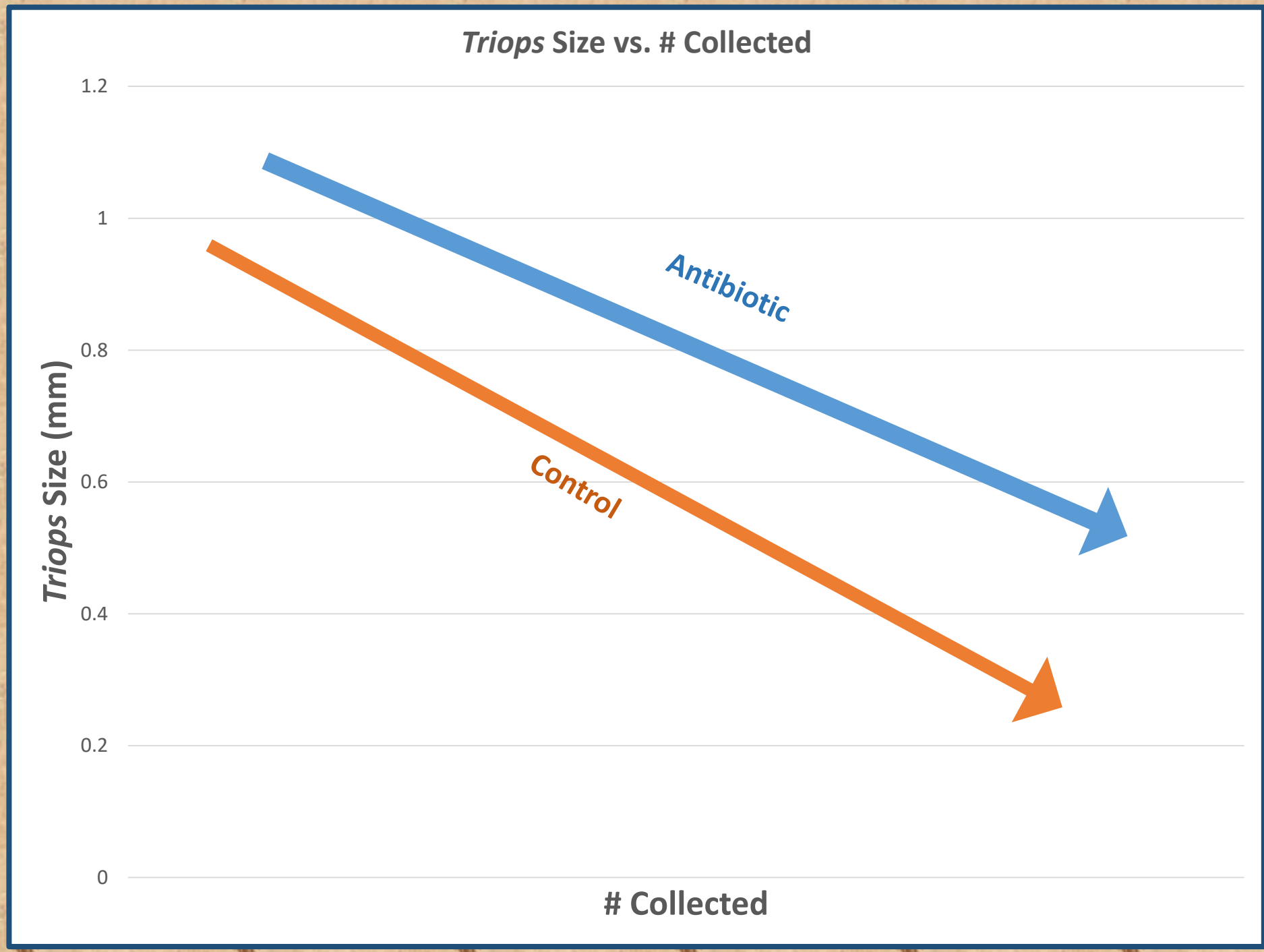
- Solutions of various concentration made
- Care for shrimp for two weeks
- Collect shrimp
  - Examine
  - Measure
  - Weigh

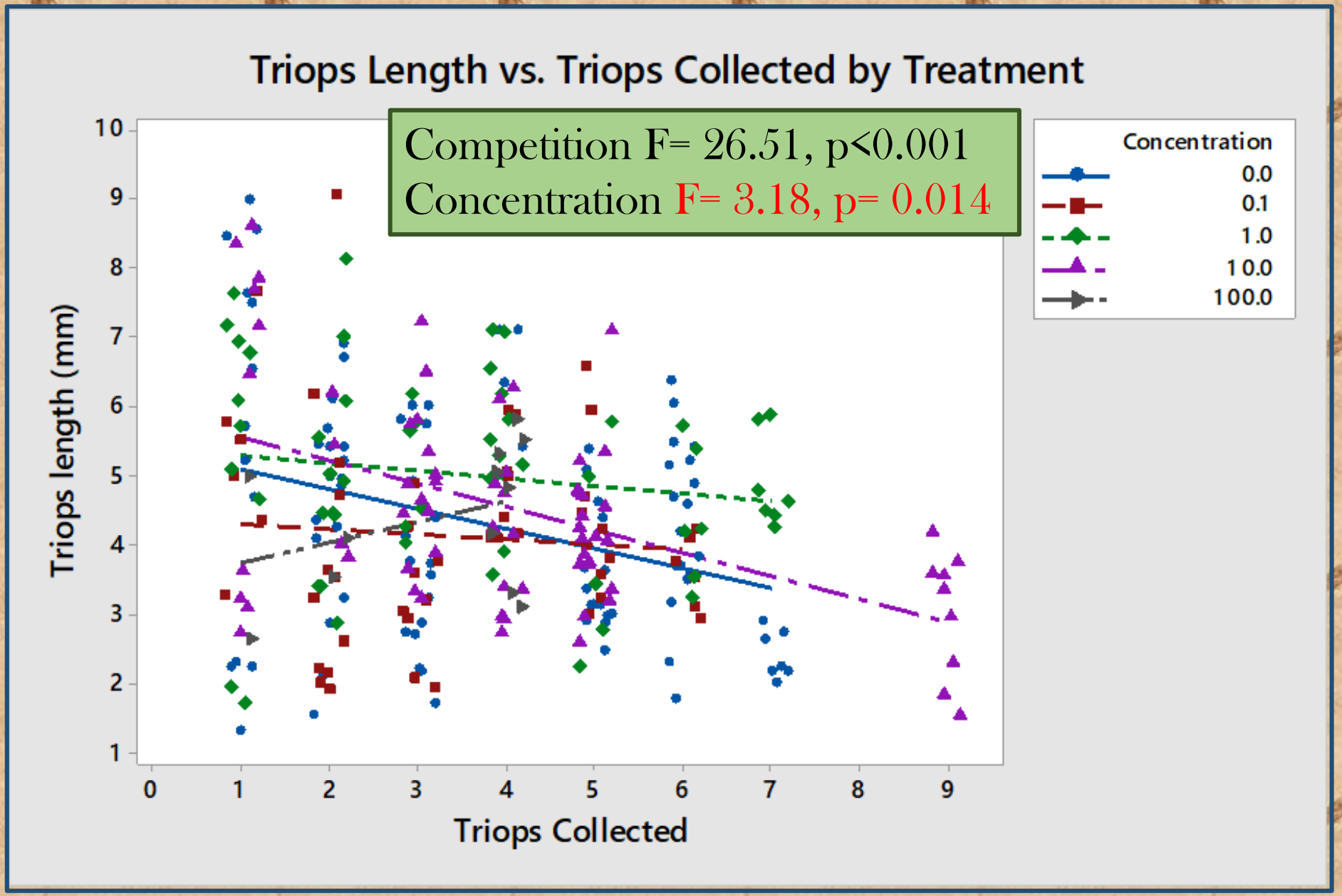

# General Results

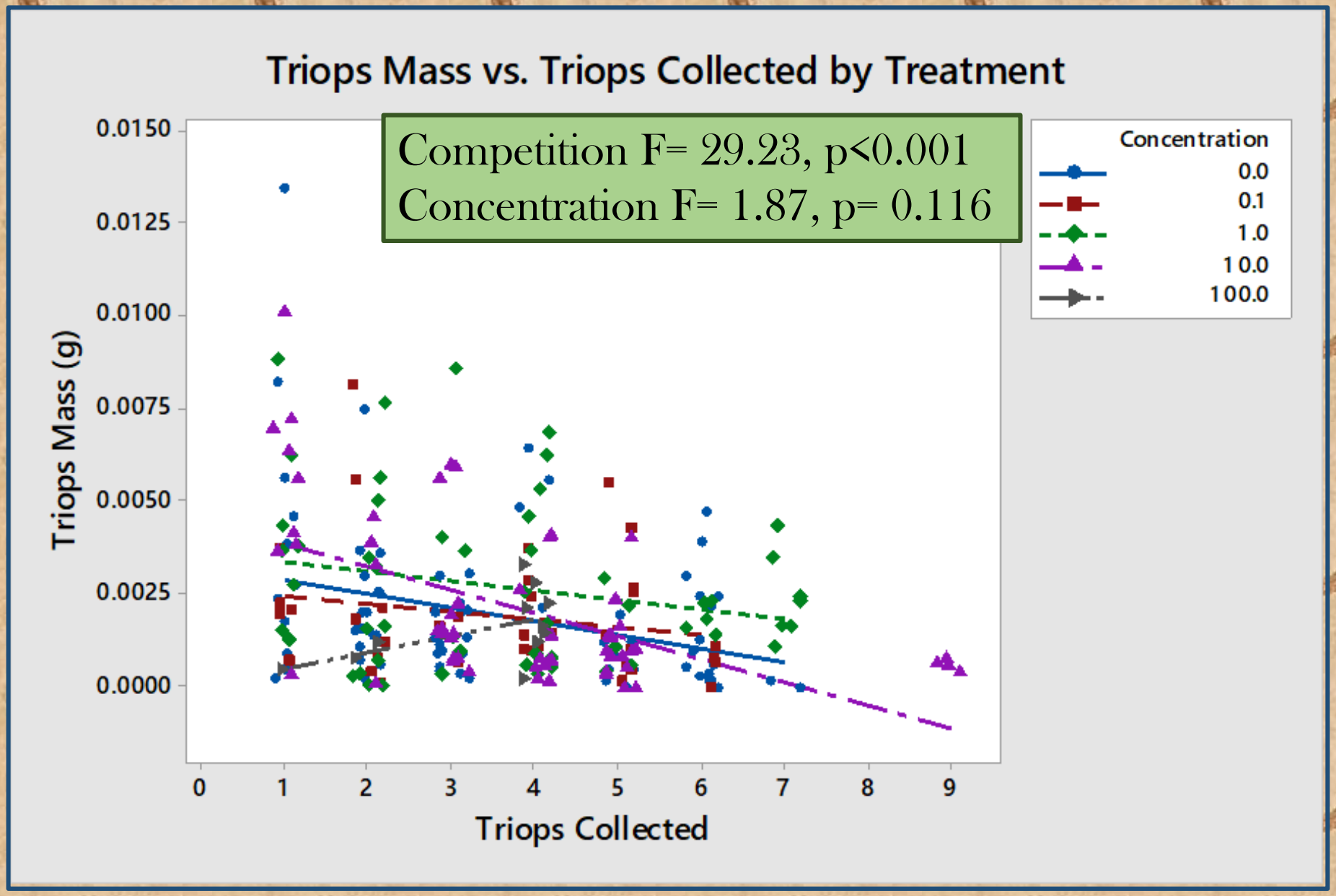
- 15 Generations
- Five concentrations:
  - 0.1 µg/L
  - 1 µg/L
  - 10 µg/L
  - 100 µg/L
  - 1 g/L
- 276 individual shrimp collected


# Triops Hatched
One-Way ANOVA:
F= 0.18 p= 0.947
# Triops Hatched
12
10
8
6
4
2
0
0.00
0.01
0.10
10.00
100.00
Treatment (ug/L)


Number of Triops Collected
One-Way ANOVA:
F= 0.21 p= 0.932
# Collected
0
1
2
3
4
5
6
7
8
9
0.00
0.01
0.10
10.00
100.00
Concentration (ug/L)


*Triops* Size vs. # Collected
1.2
1
0.8
0.6
0.4
0.2
0
*Triops* Size (mm)
Antibiotic
Control
# Collected

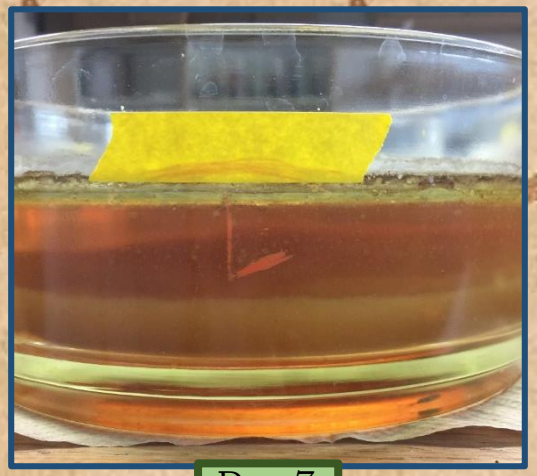

Triops Length vs. Triops Collected by Treatment
Competition F= 26.51, p<0.001
Concentration F= 3.18, p= 0.014
Concentration
0.0
0.1
1.0
10.0
100.0
Triops length (mm)
Triops Collected
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
6
7
8
9


Triops Mass vs. Triops Collected by Treatment
Competition F= 29.23, p<0.001
Concentration F= 1.87, p= 0.116
Concentration
0.0
0.1
1.0
10.0
100.0
Triops Mass (g)
0.0150
0.0125
0.0100
0.0075
0.0050
0.0025
0.0000
0
1
2
3
4
5
6
7
8
9
Triops Collected

# A *Triops*' Worse Nightmare

- 10,000X the concentration!
  - 1 g/L – completely unrealistic in nature
- Only the controls survived

Day 1


Day 7


Day 14

- Overall, antibiotic is not affecting *Triops*
- *Triopses* are living and reproducing normally!
- **<u>BUT</u>** – Do concentrations increase at end of hydroperiod?
  - Where is our MATC?

No Effect Concentration (NOEC)

MATC

LOEC

Low

High

Ecologically Relevant

No Effect

Effect

0.1 | 1 | 10 | 100 | ? | ? | 1 g/L

µg/L

# In The Future...

- Conduct studies in the field

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