Lit Review & Background

1. Compare characteristics with failed and successful establishment of fish in the Great Lakes
2. Rate of Spread then correlates to:
3. Level of impact (nuisance or non-nuisance)
Successful and Failed Introductions of Species in the Great Lakes based on growth, physiological factors (temp) and diet variability (number of taxa)
Methods

87 species analyzed based on:
- Establishment Status
- Adult trophic status
- Parental care
- Fecundity
- Physiological tolerance
- Propagule pressure

Hypothesis: Fecundity, physiological tolerance, and propagule pressure will be positively correlated to establishment.
Fathead Minnow

**Fecundity**- 1000-10,000 Eggs  
**Physiological Tolerance**- Extremely Tolerant  
**Propagule Pressure**- >10,000

Fatheads tend to grow between 2-3 inches in length, and have the ability to spawn in water temperature between 65 and 80 degrees Fahrenheit.

They are a popular bait fish, and became invasive due to this fact. Many anglers would release them if they were left over after a day spent on a pond, lake or river.

Found in every state of the Continental U.S., but only native to central and eastern parts.
Striped Bass

Fecundity - >100,000 Eggs
Physiological Tolerance - Moderately Tolerant
Propagule Pressure - 1000-10,000

1879, two shipments containing over 4,400 Striped Bass were released near San Francisco, within ten years they were all along the west coast.

Anadromous species, utilized for sport fishing and aquaculture.
Results: Tolerances

- Temperature
- Salinity
- Oxygen level
- Turbidity

<table>
<thead>
<tr>
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<th>Number of Species</th>
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<tr>
<td>Median: Phys Tolerance</td>
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<td>Est.</td>
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<tr>
<td>Median Phys Tolerance</td>
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<tr>
<td>Non-Est.</td>
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Physiological Tolerances and Establishment

- Non-Established
- Established

Tolerance Category (1-4)
Results: Fecundity

1. <100 eggs
2. 100-1000 eggs
3. 1000- 10,000 eggs
4. 10,000-100,000 eggs
5. >100,000 eggs

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<tr>
<th>Fecundity Classes (1-5)</th>
<th>Non-Established</th>
<th>Established</th>
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- Median Fecundity for All: 3
- Median Fecundity for Est: 3
- Median Fecundity for Non-Est: 2.5
## Results: Propagule Pressure

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<th>Median PP All</th>
<th>Median PP Est</th>
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**Number of individuals released**

1. <100 fish
2. 100-1,000 fish
3. 1,000-10,000 fish
4. > 10,000 fish

**Propagule Pressure and Establishment**

![Propagule Pressure Classes (1-4)](image-url)
Discussion

**Initial hypothesis:** Fecundity, physiological tolerance, and propagule pressure will be positively correlated to establishment.

Results: fecundity, tolerance & propagule pressure all have a positive correlation, as the number of offspring, tolerance level and number of individuals released increases, the likelihood of establishment increases.

Things to Consider:
- Where were these fish introduced?
- What is the accuracy of the ranges given?
- Where was the data in our trait chart taken from?
Bibliography & Questions

http://people.umass.edu/bethanyb/Kolar%20&%20Lodge,%202002%20Fish%20invasion.pdf

http://www.nature.nps.gov/water/marineinvasives/assets/PDFs/Morone_saxatilis.pdf

http://wdfw.wa.gov/ais/pimephales_promelas/
## Extra:

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<td>Median PC All</td>
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