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Session C7: An Evaluation of Eel Ladders as Traps for Migrating Sea Lampreys

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An Evaluation of Eel Ladders as Traps for Migrating Sea Lampreys



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My Objectives Today

1. Introduce eel ladders as a tool for trapping or passage of lampreys
2. Discuss possible causes and consequences of trapping bias

Traps Resemble Passage Devices

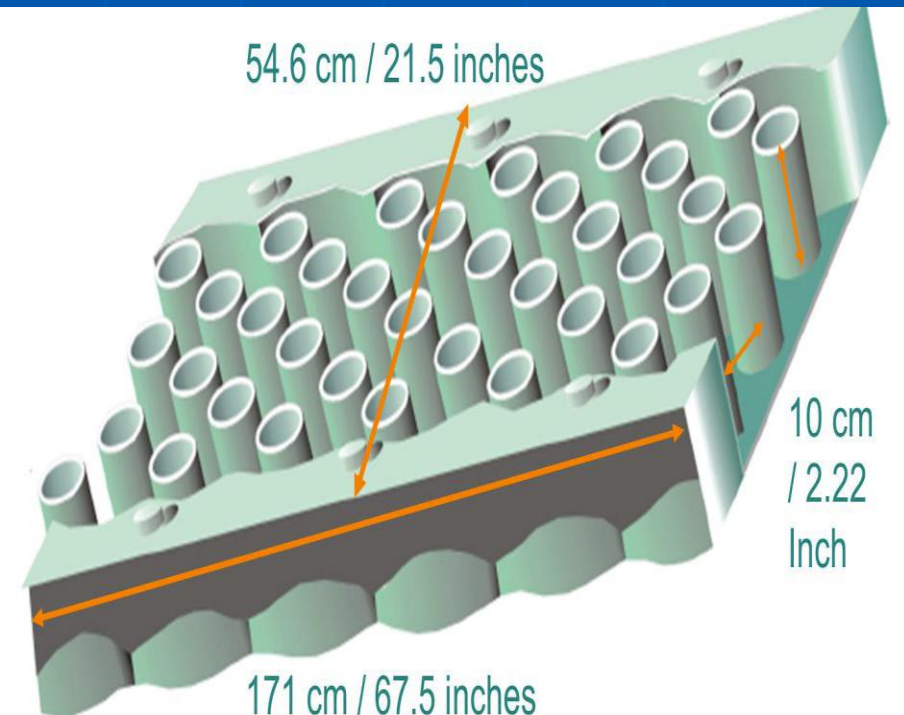
1. Both are passive: fish have to encounter them, get motivated to try entry, and be able/willing to complete entry/passage

Quick Background Info

A previous lab project found:

- Adult sea lampreys readily pass over eel-ladder-style ramps with limited flow(ELST)

A.k.a. “Studded Tiles”



Standard Funnel Trap used in the U.S.

Used for adult **population assessment** (mark-recapture estimate) and supply of **specimens** for research.

-Both assume unbiased capture



Funnel trap Cheboygan River

Research Objectives

- Evaluate ELST under field conditions. Compare efficiency with funnel traps, check for trapping bias, evaluate role of attraction flow rates. Analyze behavior via PIT tags and video.



Ocqueoc River Weir: paired traps on opposite banks.

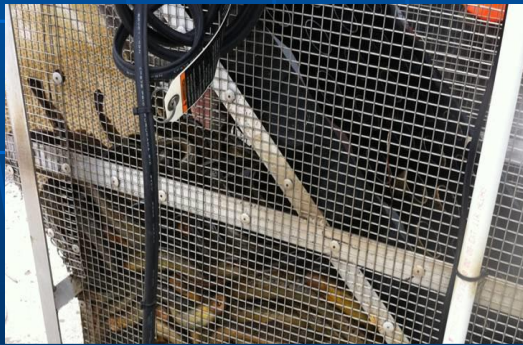


Cheboygan River Weir: side-side comparison, reference trap nearby

Results & Discussion-1

Catch and Retention ELST vs Funnel:

Location	Ocqueoc	Cheboygan
Catch 2012	31% in ELST	64 % in ELST
Catch 2013	31% in ELST	71% in ELST
24hr Retention	100% in both	100% ELST, 0-5% Funnel

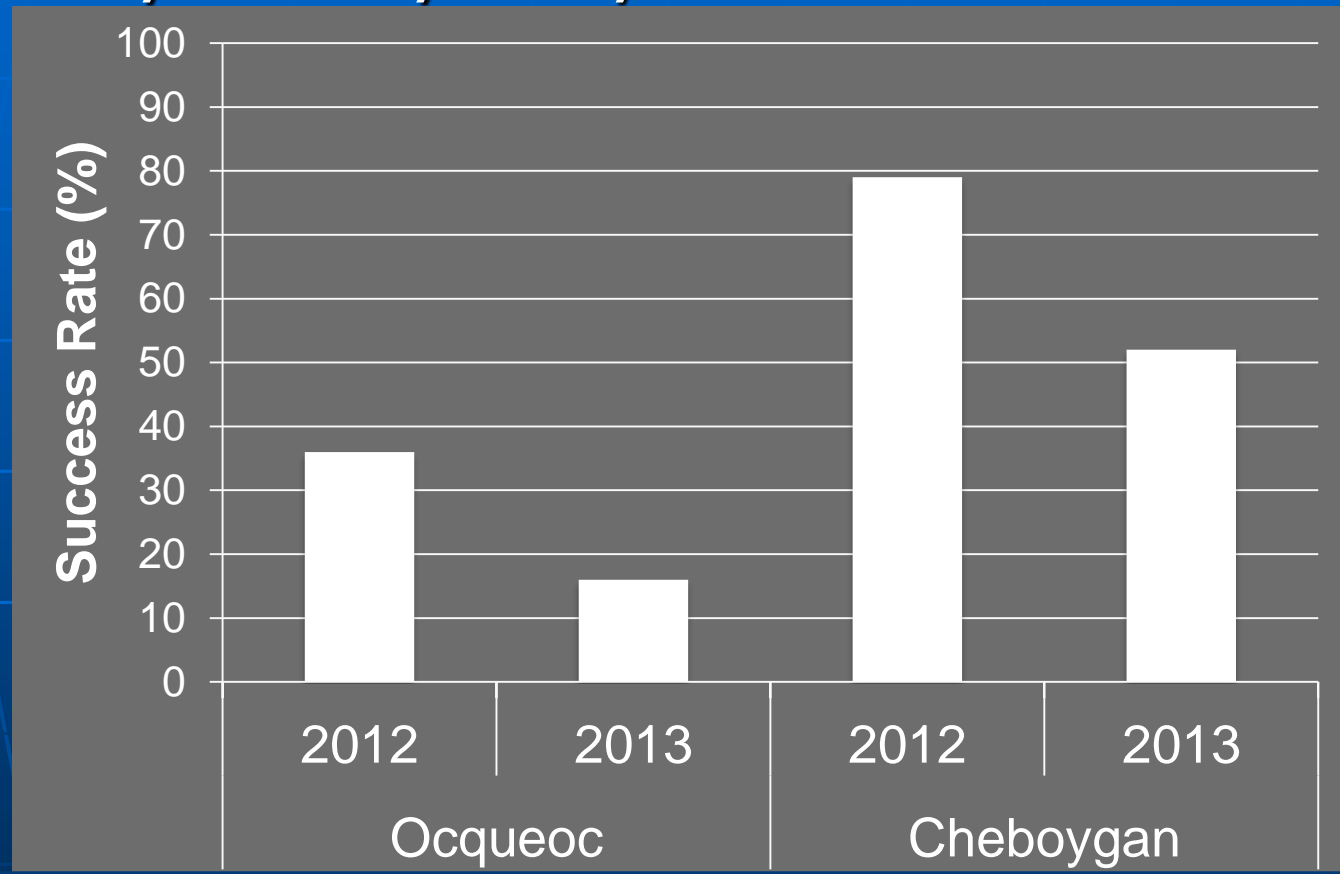


Total catch in 2 years:
13,000 in Ocqueoc River
and 10,000 in the
Cheboygan River. Catch
fluctuates daily.

Discussion: ELST is a viable alternative to the Funnel trap. Perfect retention and species selectivity. Tweaking of parameters (angle, flow, etc.) should improve catch rate further.

Results & Discussion-2

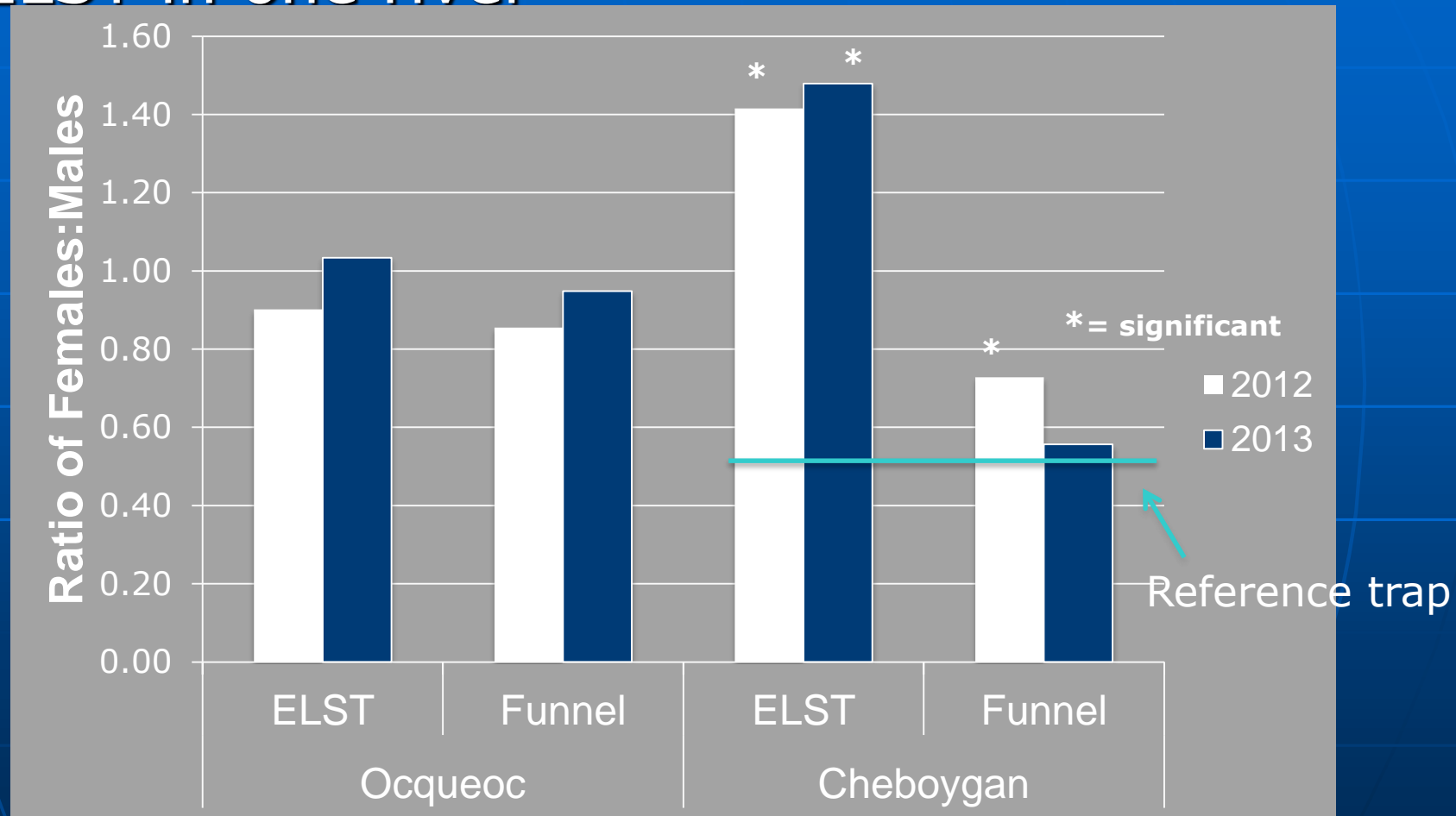
Success Rate of Lamprey climb on the ELST varies greatly from year-year and site-site



Discussion: Observation suggests that abortion of entry attempts is largely voluntary.
Motivation of lamprey to finish climb seems to

Results & Discussion-3

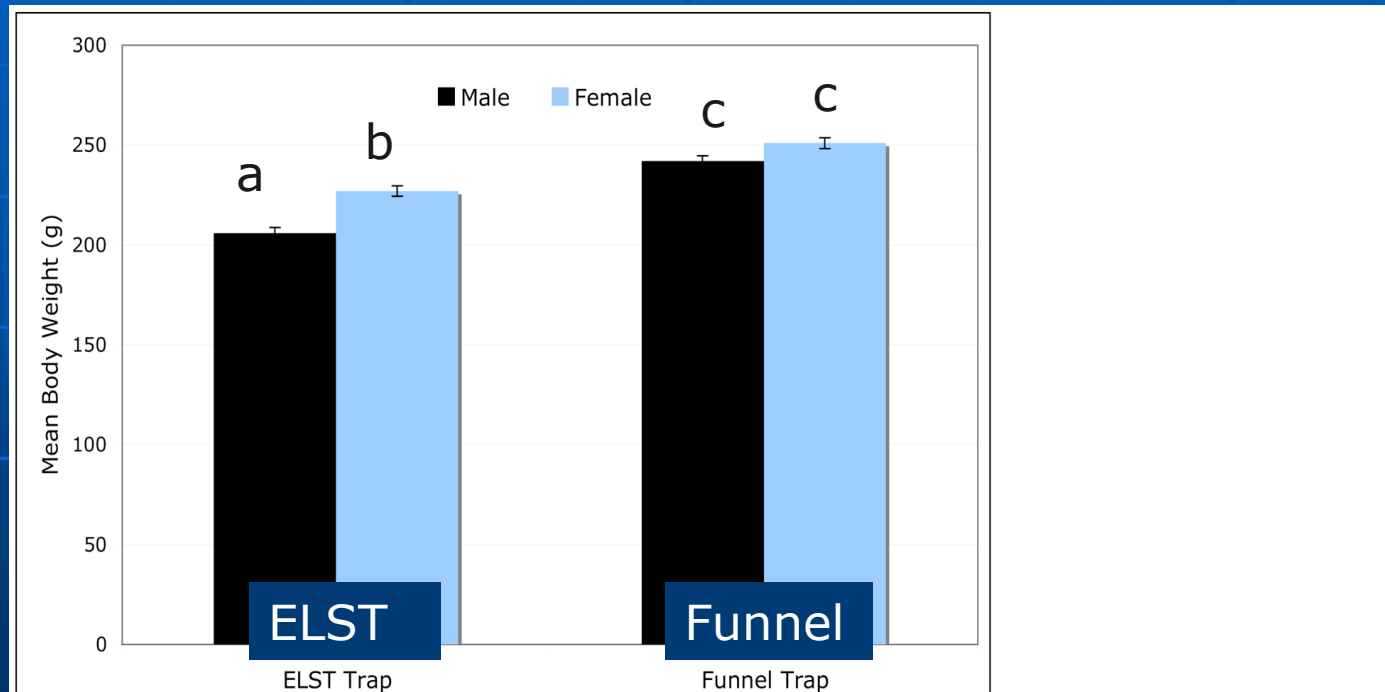
Sex Ratio in the Catch: females dominate catch by ELST in one river



Discussion: Reason for the sex skew is a mystery to us. Effect of sex-biased entry in trap or escape from

Results & Discussion-4

Only in the Cheboygan River: ELST caught fish are smaller (5-15% less weight) and have lower female maturity level (6% lower GSI)



Discussion: Size bias in the catch suggests lower motivation and/or lower ability of heavier individuals to climb the ELST ramp.

Results & Discussion-5

ELST-caught fish return at significantly higher proportion to the ELST. Funnel-caught fish showed only small increase (mean: +1.5% change).

Location/Year	Initial catch in ELST	Change in catch ratio after mark-recapture
Oc/2012	31%	+10%
Oc/2013	31%	+14%
Ch/2012	64%	+12%
Ch/2013	71%	+7%

Discussion: ELST-caught fish appear to become “**trap-happy**”. Mechanism could be memory of ELST (learned preference) or result of ELST-preferring behavioral type being enriched in the initial sample.

How Can Trap Happiness Arise from Animal Personality?

- Analogy: Imagine trapping people in Groningen for population size assessment ...



Example result:

Initial catch distribution: 35% church vs. 65% train station

Recapture of church-marked folks: 45% church vs. 55% train station: Trap Happiness

Possible reason for apparent trap happiness: people who live in the neighborhood

Summary and Conclusions:

- **Specific to Lamprey Management:**
 - Modified eel ladders are viable for trapping/passage
 - Gains in catch/passage may come from increasing motivation of lampreys to use the ladder
- **General consequences of trap bias**
 - Traps yield a biased sample of the population
 - Catch bias of the sort we found could cause:
 - Lower fecundity in the fish that passed upstream
 - Selective pressures
 - Wrong conclusions about the population (e.g. in CMR population estimates or sex ratio estimates)

Take-home Message

Don't assume you can
catch a representative
sample.



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