

The effect of water velocity on adhesion and survival of lake sturgeon eggs in an experimental raceway.

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Background

- Currently in Year II of a 5 year lake sturgeon research program sponsored by Manitoba Hydro and NSERC
- Focus is on
 - relationship between habitat variables (substrate, depth, water velocity, turbidity etc) and spawning/hatching success
 - critical population parameters, habitat use, and behaviour of juveniles (0+ to 5+)
 - locomotory behaviour and performance in relation to upstream passage of juveniles and adults
 - stress physiology and calcium regulation
 - quantitative evaluation of hatchery supplementation

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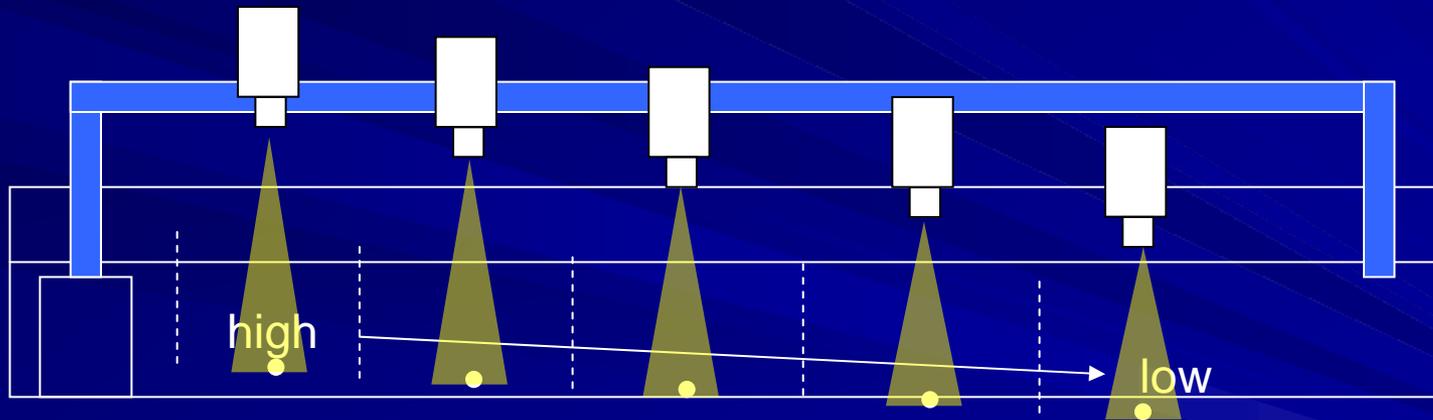
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Objective

- Determine drift patterns over time and causes of death for lake sturgeon eggs deposited on a smooth surface relative to water velocity

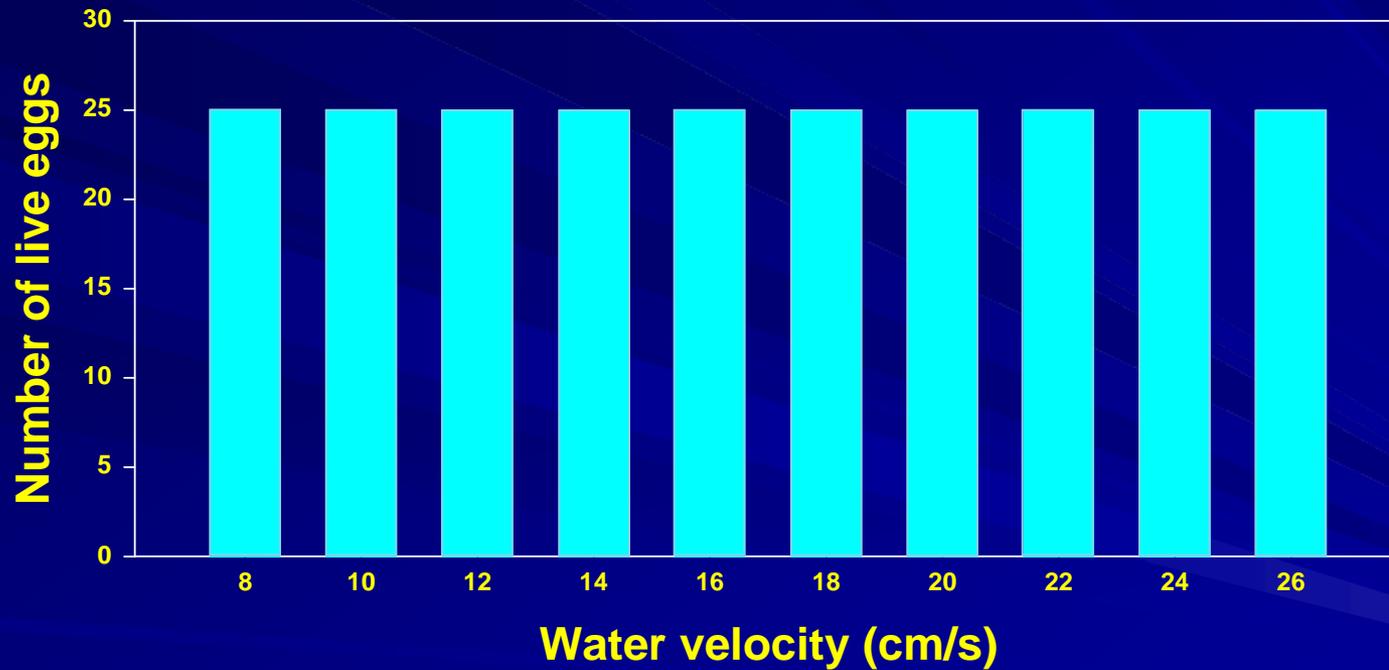
Experimental Set-up



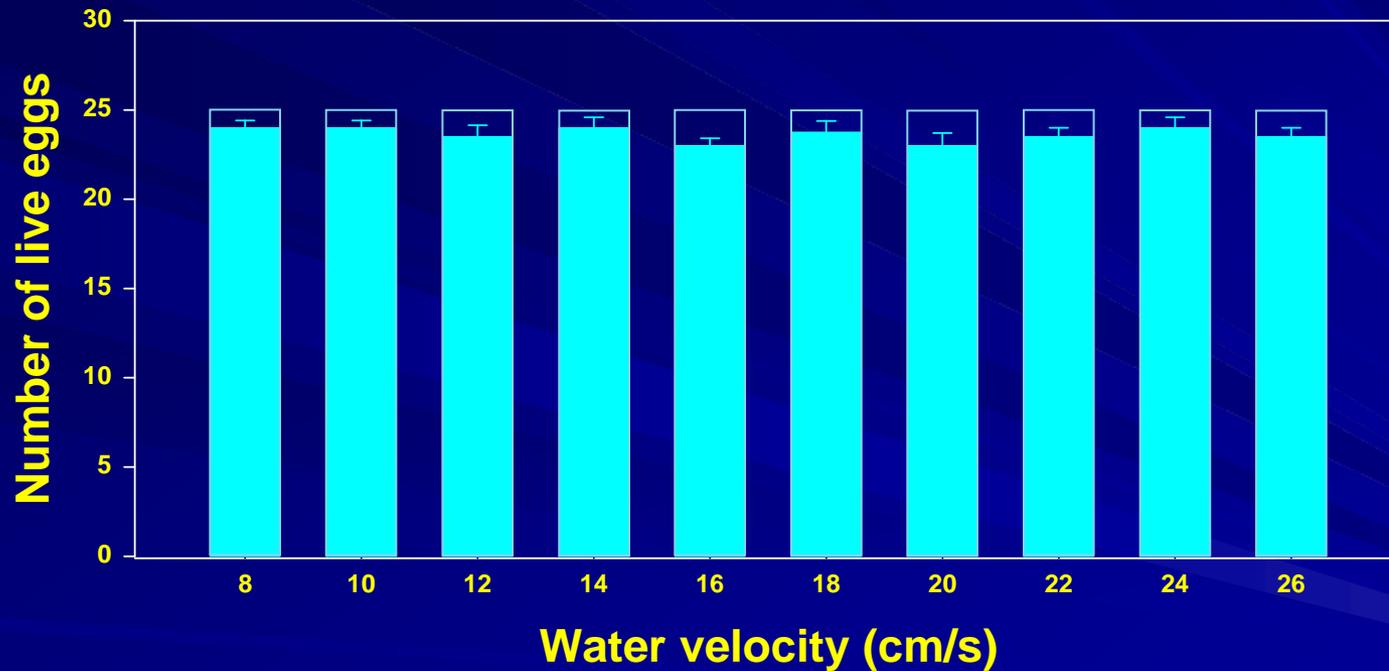
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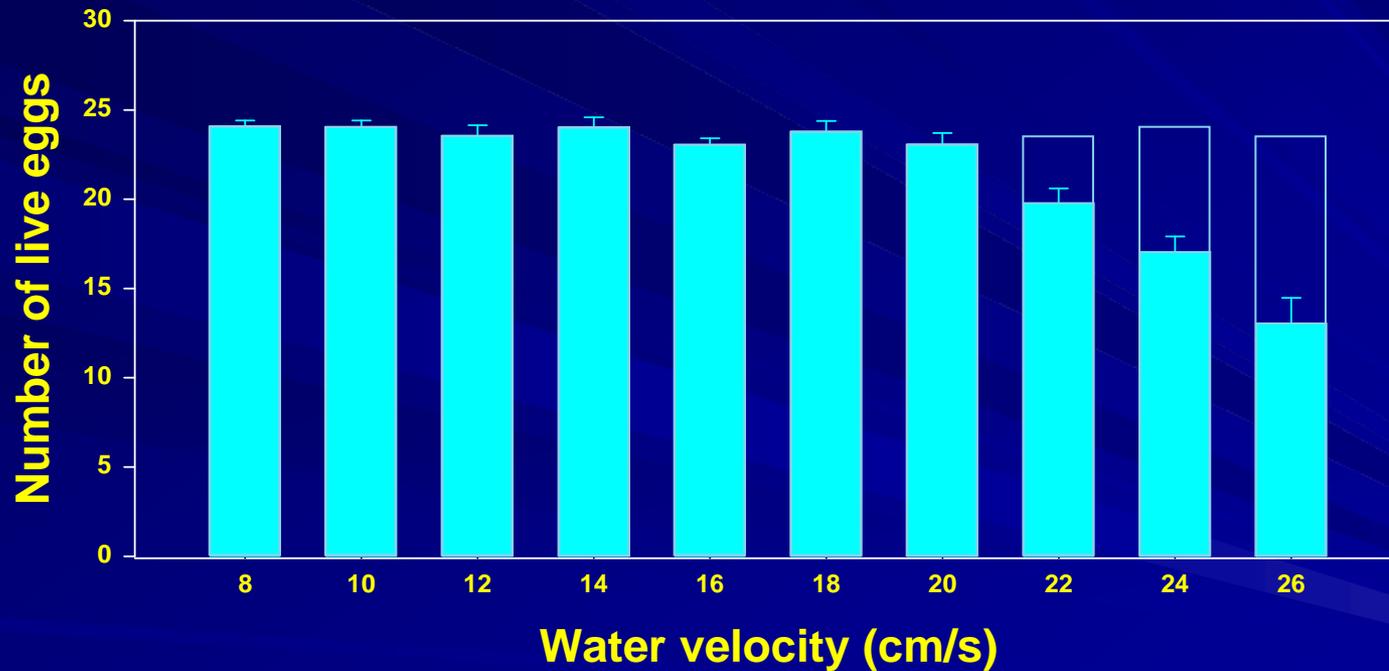
Egg numbers at initial distribution



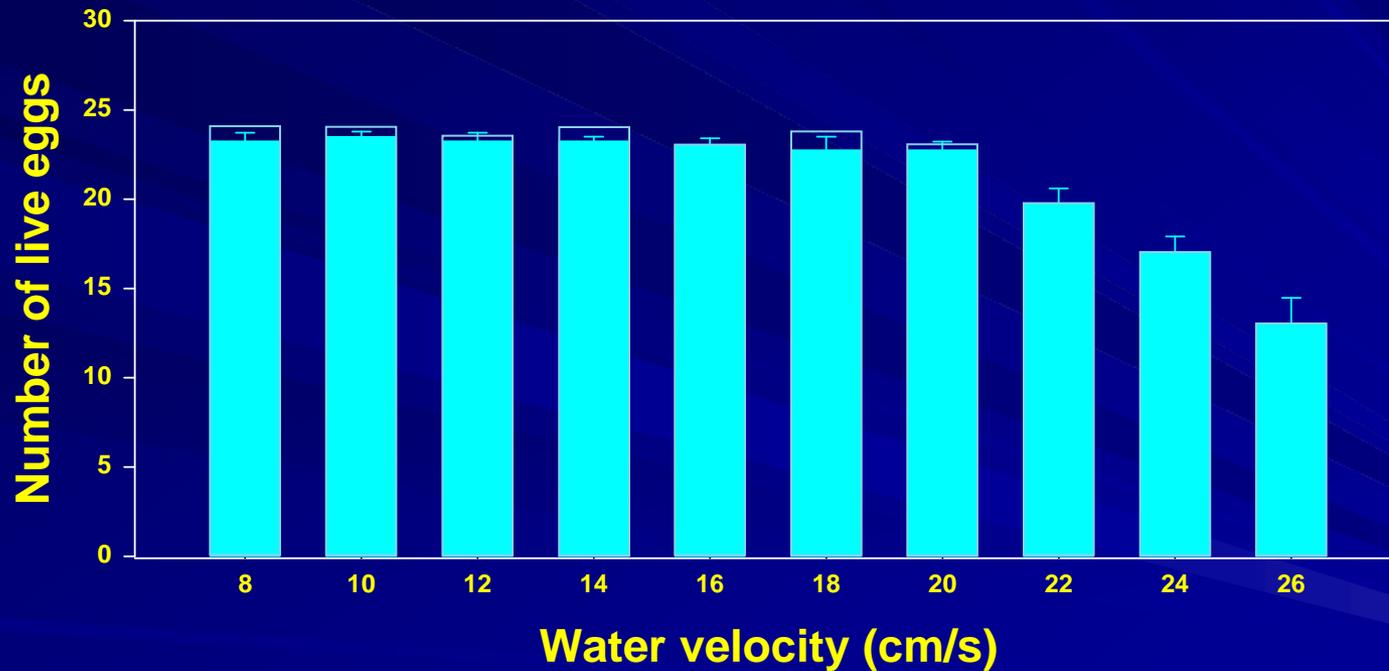
Egg numbers 15 min after initial distribution



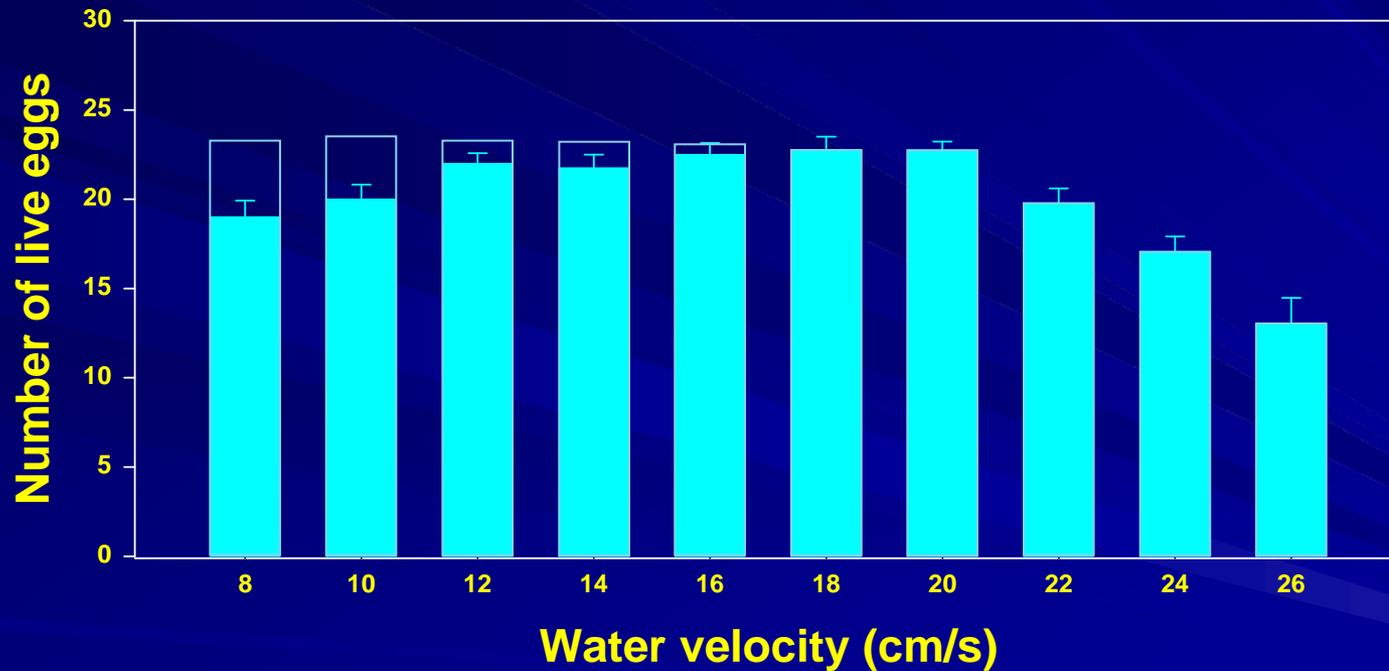
Egg numbers one day after initial distribution



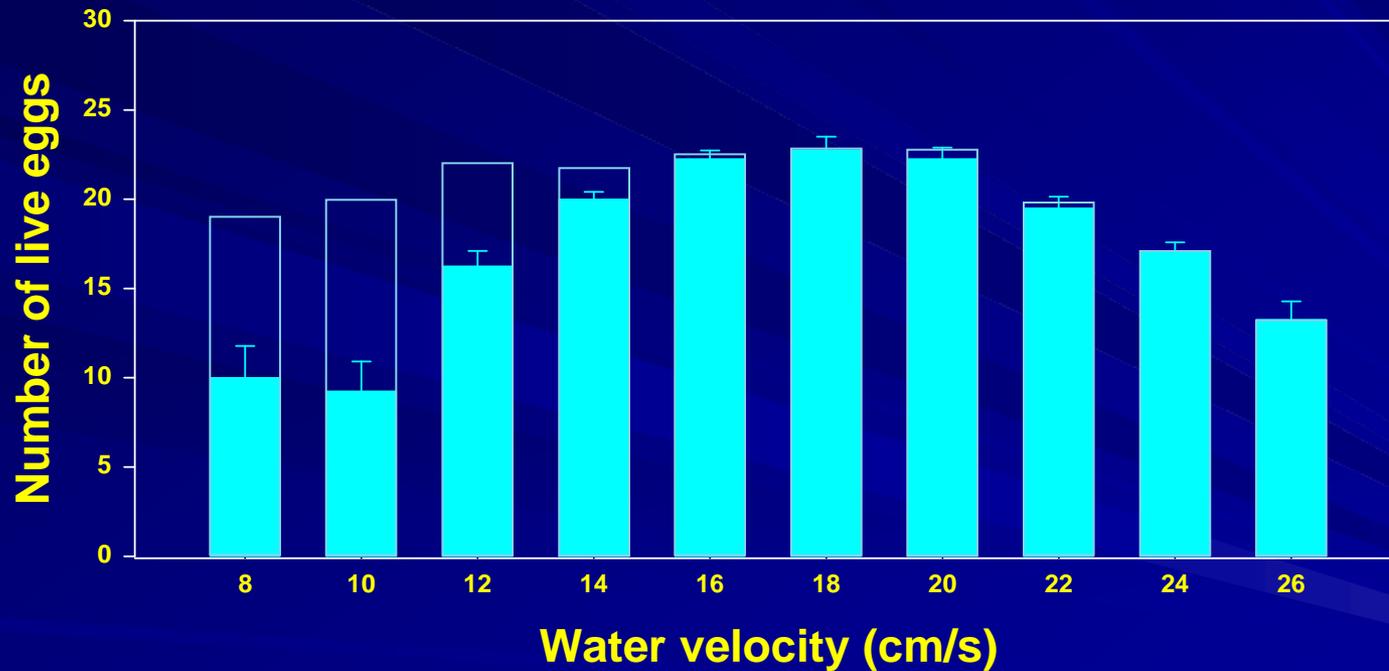
Egg numbers two days after initial distribution



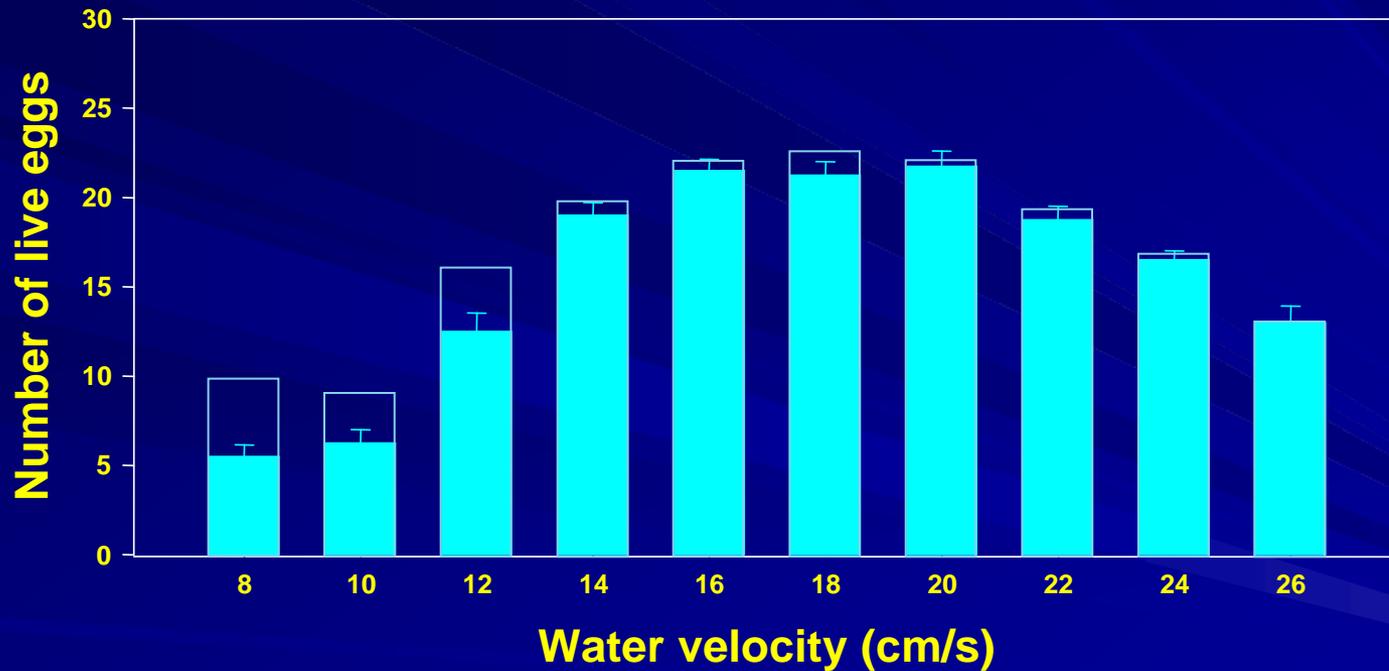
Egg numbers three days after initial distribution



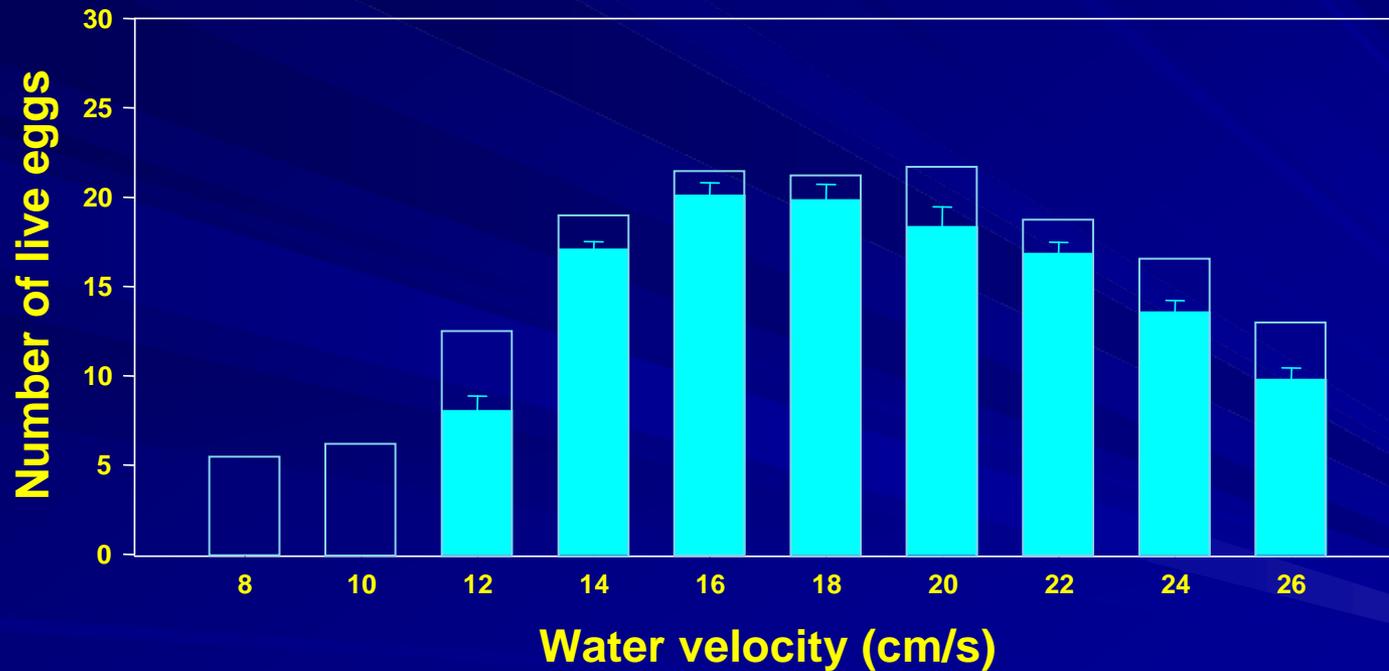
Egg numbers four days after initial distribution



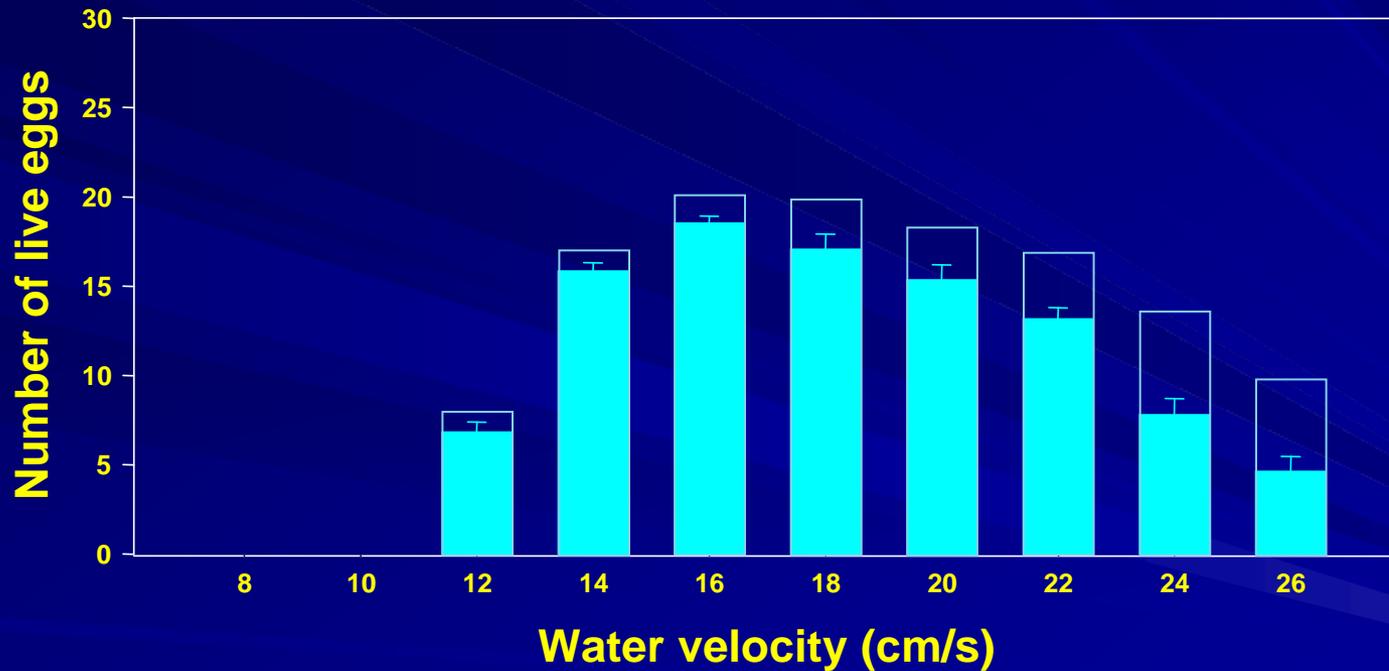
Egg numbers five days after initial distribution



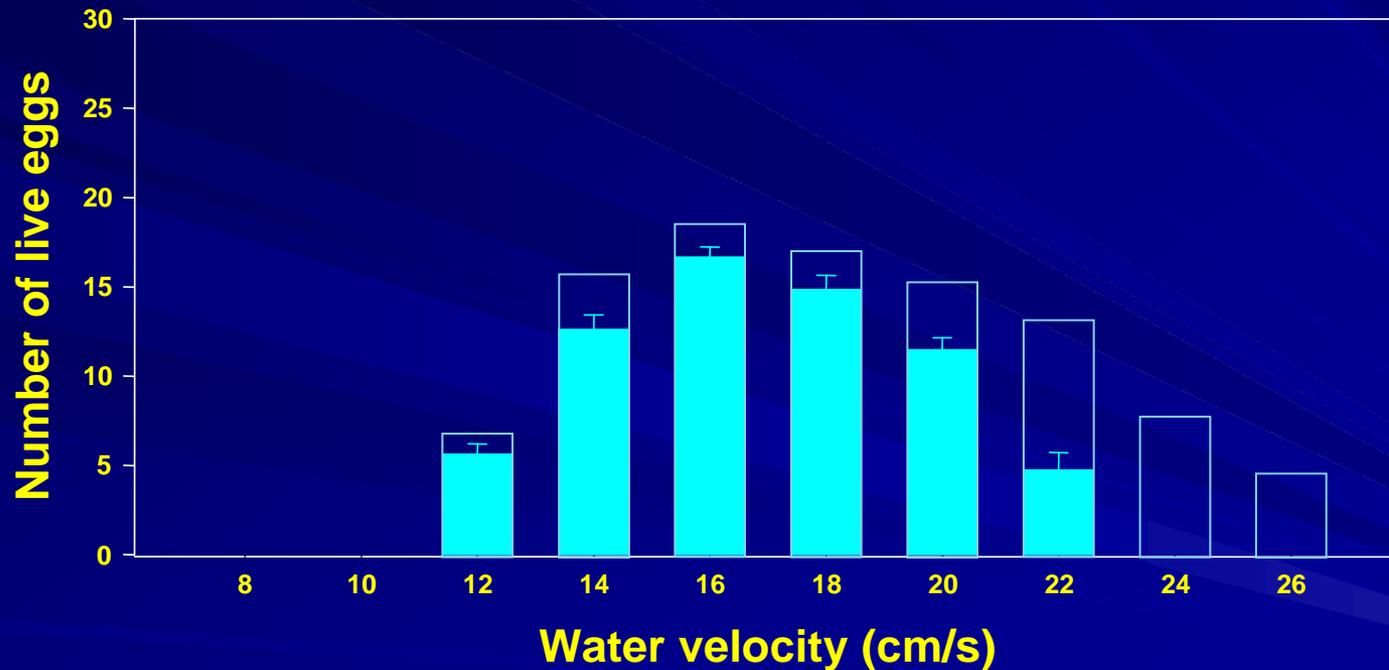
Egg numbers six days after initial distribution



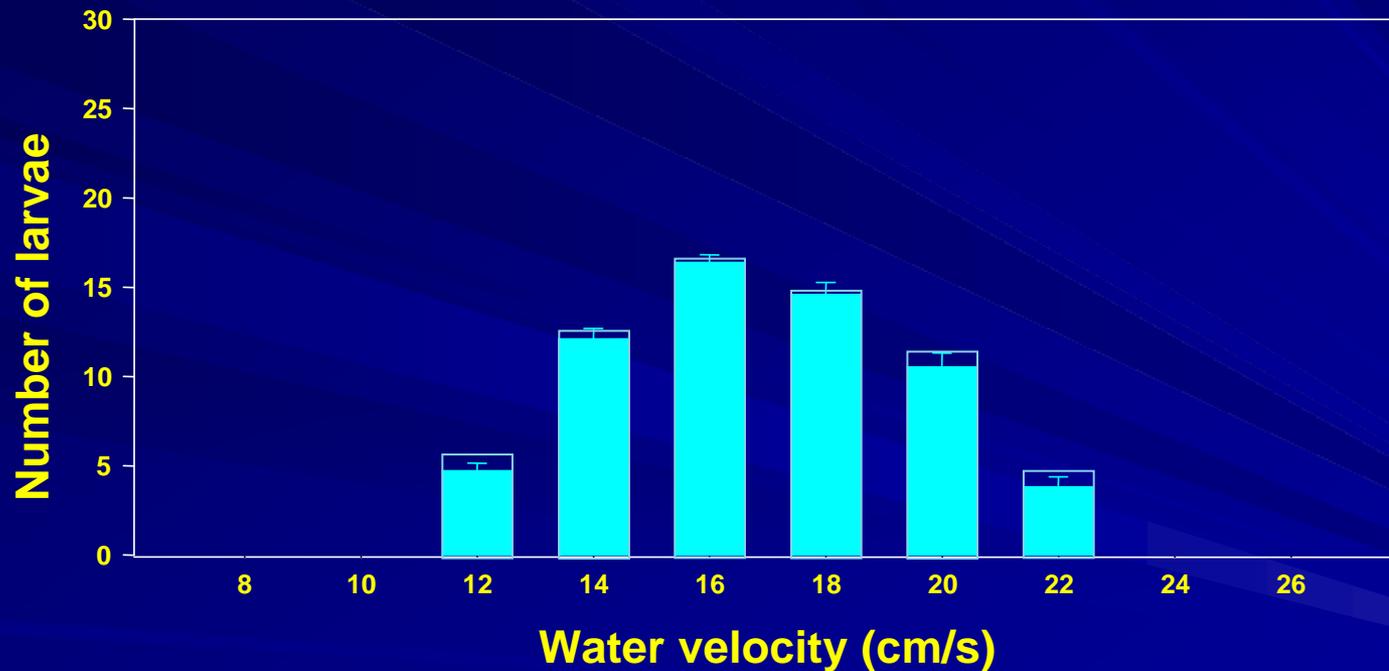
Egg numbers seven days after initial distribution



Egg numbers eight days after initial distribution



Numbers of eggs that hatched into live larvae



Summary

■ Eggs that did not adhere

- Drift occurred immediately after deposition
 - Unfertilized eggs
- Deaths evenly distributed across velocities

■ Eggs that adhered but were washed off

- Drift occurred
 - Within 1 day of deposition (fertilized and intact)
 - 6 to 8 days post-deposition (partially developed larvae – some inside a torn shell and some with no shell)
- Deaths occurred primarily at high velocities (>22 cm/s)

Summary

- Eggs that succumbed to fungal infection
 - Drift occurred 3 to 6 days after deposition
 - Fungus covered eggs
 - Deaths occurred primarily at low velocities (<12 cm/s)
- Eggs hatched when exposed to water velocities between 12 and 22 cm/s, with the optimal value being approximately 16 cm/s.

Implications

- Assuming conditions in the lab approximate those in the field, eggs deposited on smooth substrates may only hatch in a narrow range of water velocities (12-22 cm/s)
- It may be possible to get a rough indication of spawning habitat used by adults (and possibly habitat quality) by examining the developmental stages and timing of drift

Future Work

- Repeat this work using a variety of naturally occurring substrates
- Examine egg development and hatching in relation to interstitial spaces and internal water velocities
- Field-validate (or invalidate) predictive ability of models developed from drift

Acknowledgements

- Manitoba Hydro
 - Roy Bukowsky, Bernie Osiowy, R&D committee, Shelley Matkowski
- Natural Sciences and Engineering Research Council of Canada
- Manitoba Water Stewardship
- Staff at Grand Rapids and Whiteshell Fish Hatcheries
- Deep River Science Academy

Acknowledgements



Cam Barth



Holly Labadie



Laura Henderson



Ray Lafantasie

DRSA Students: Thomas Giroux
Megan Antsanen
Suzanne Gomes



20 5 2005