



Freshwater Fisheries Society of BC

gofishbc.com

Larval white sturgeon

Substrate rearing leads to improved growth, survival, and physiology



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Overview

- * Results of gravel rearing experiments
- * Considerations and challenges
- * How it applies to conservation aquaculture
- * Future options for research?

Why substrate?

- * Less swimming when rearing in substrate
- * Yolk supplies all energy for growth, development, and metabolism
- * Amount of yolk is finite
- * The more yolk resources that go to one process the less are available for others
- * **Larvae in substrates move less -> more yolk available for growth**

Experimental Setup

Two experiments:

1) Two temperature – gravel vs no gravel
Growth, survival, yolk utilization

2) Gravel vs Artificial substrate vs no substrate
Growth and physiology



Growth at 46 days post hatch

Gravel
17.5°C



Gravel
13.5°C



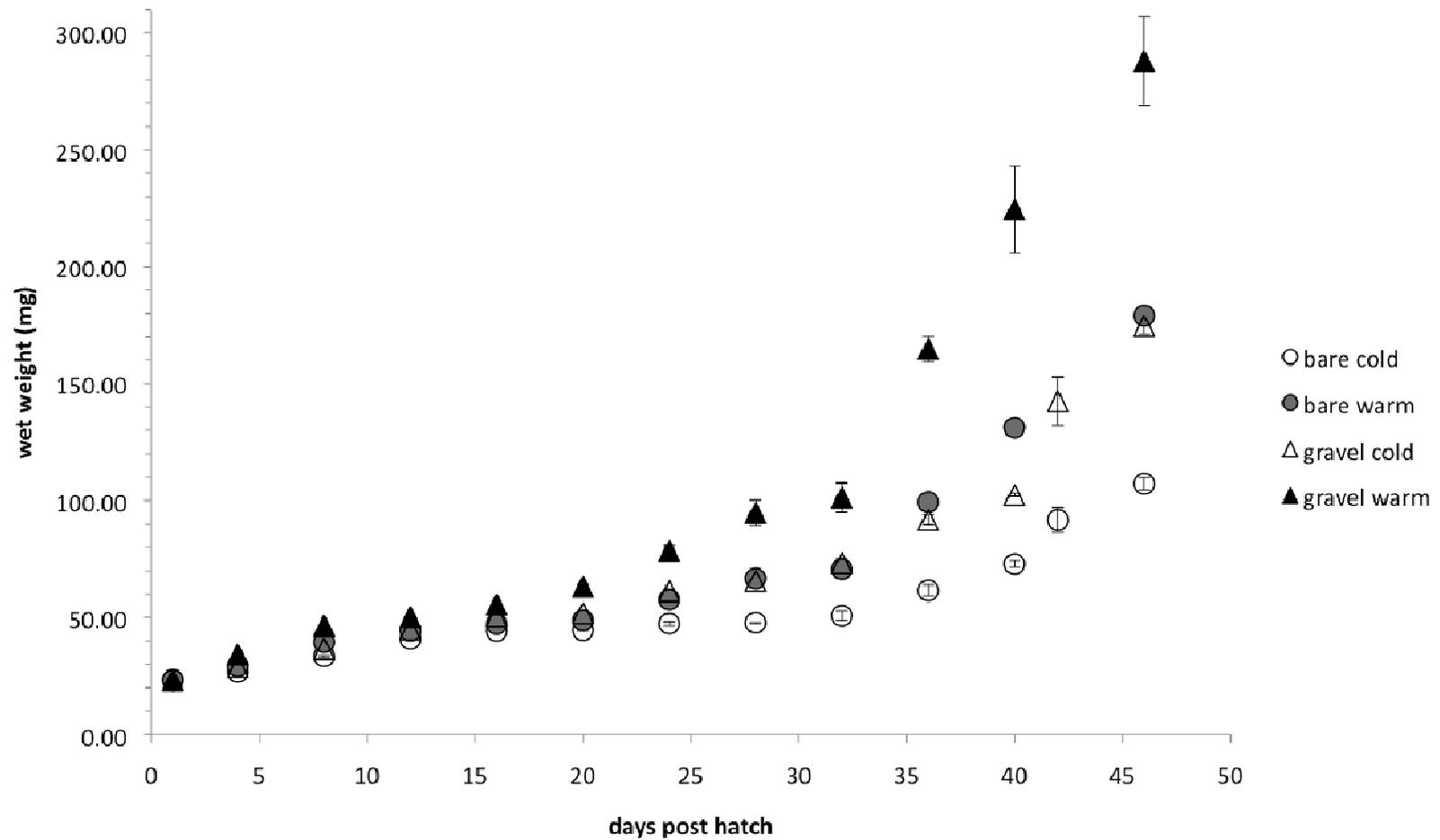
Bare
17.5°C



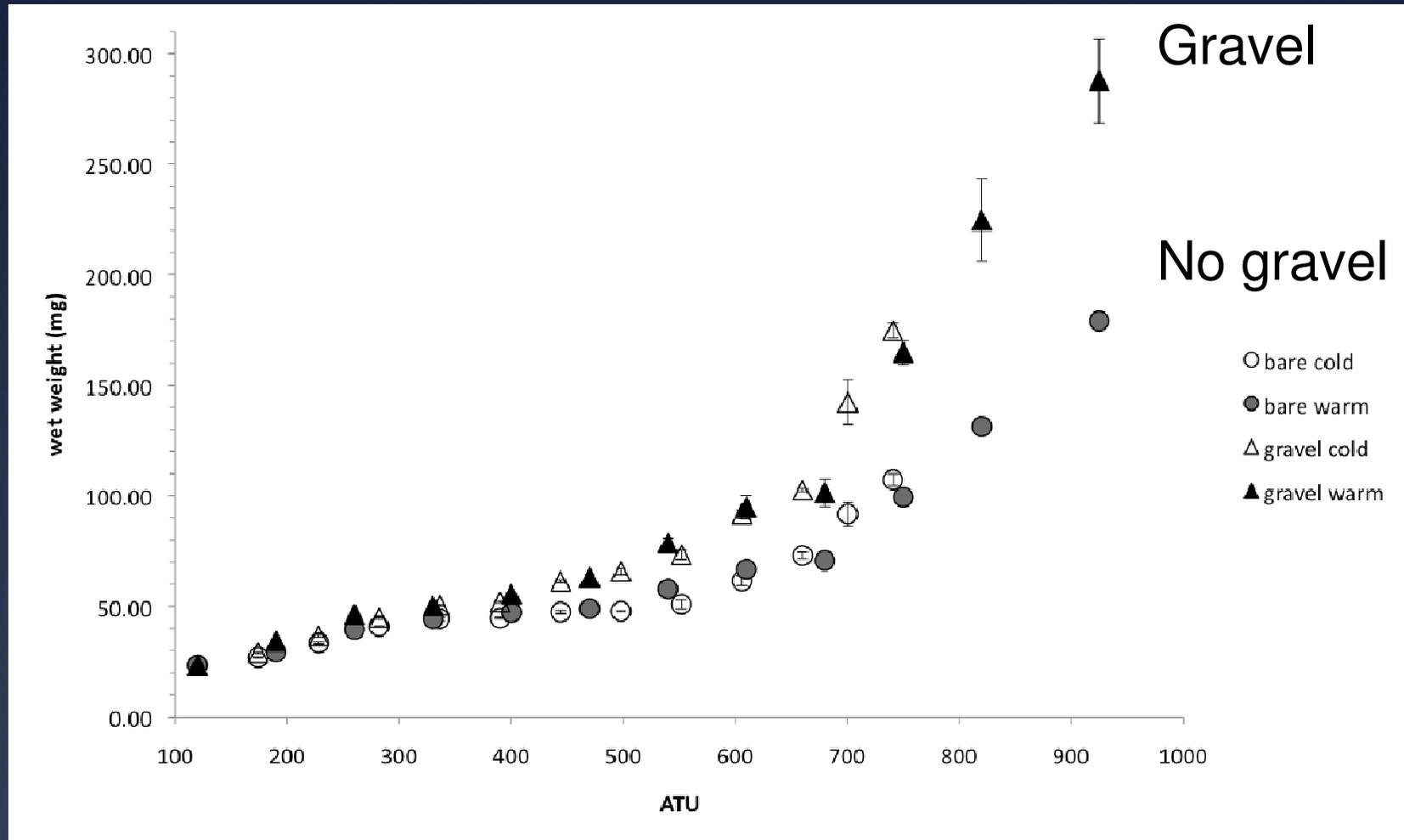
Bare
13.5°C



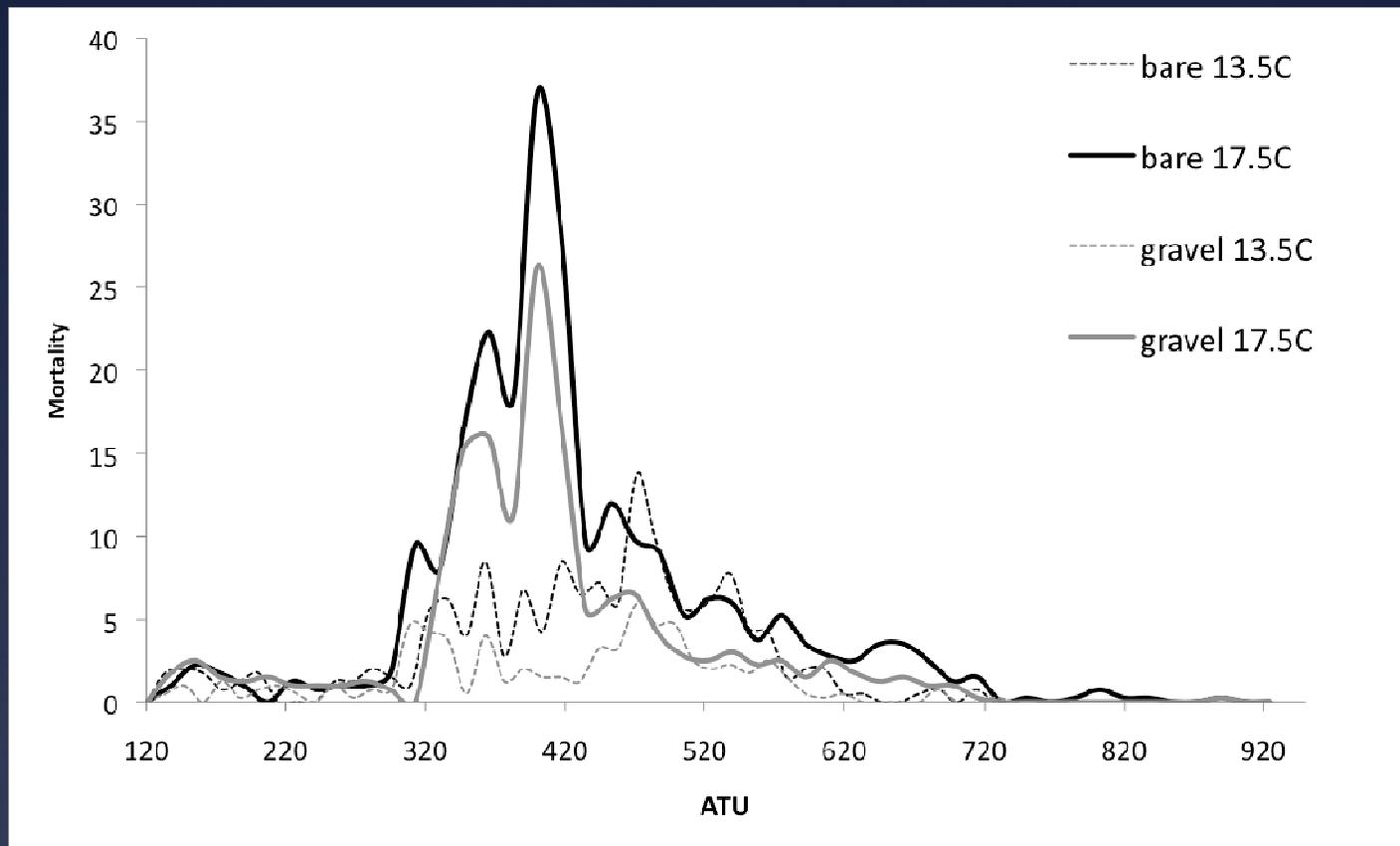
Growth



Growth

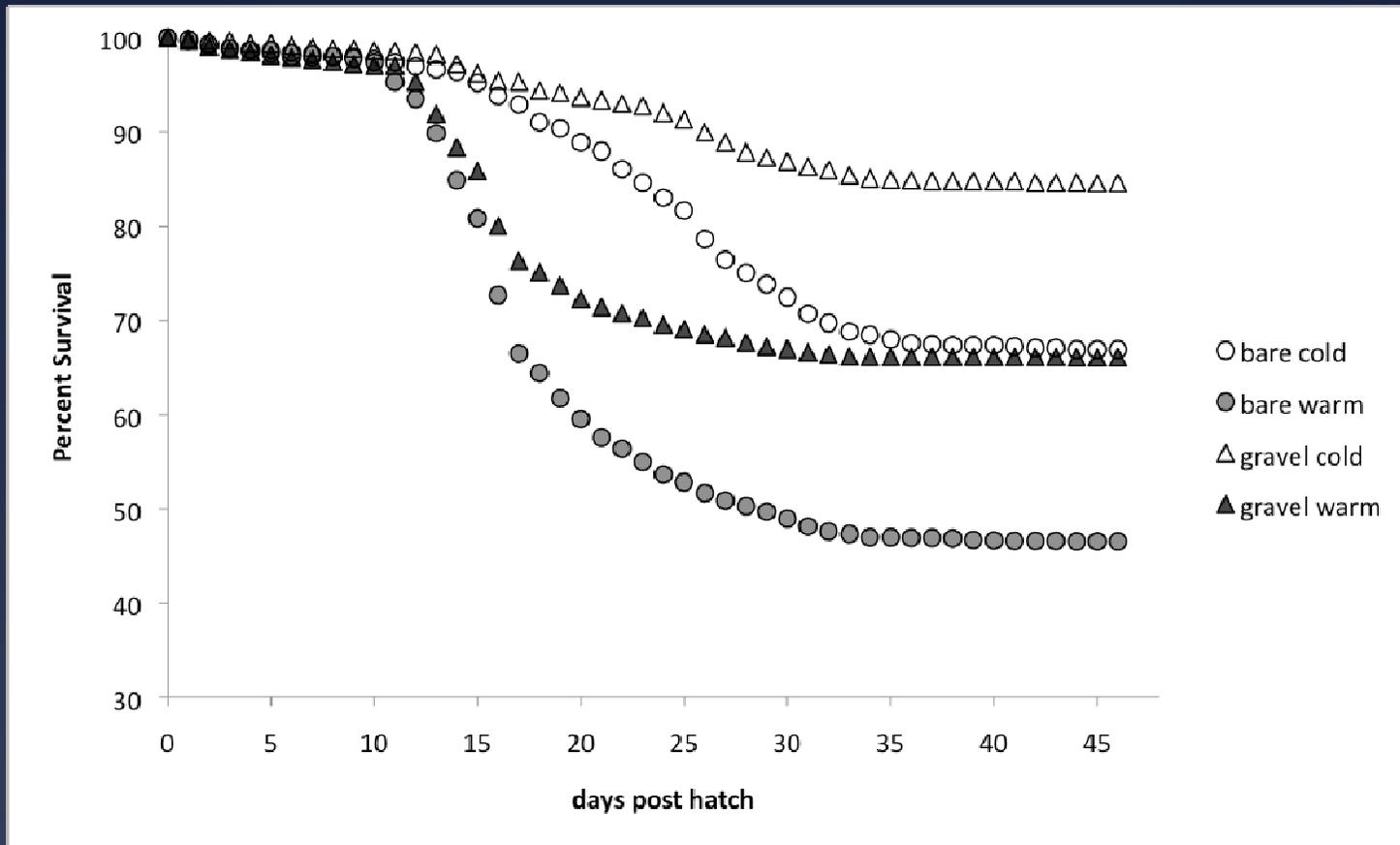


Mortality at first feeding



- Higher mortality at onset of feed – greater in warmer water

Survival



20% greater survival in gravel

Greatest survival at lower temperature in gravel

Physiology



Active

—



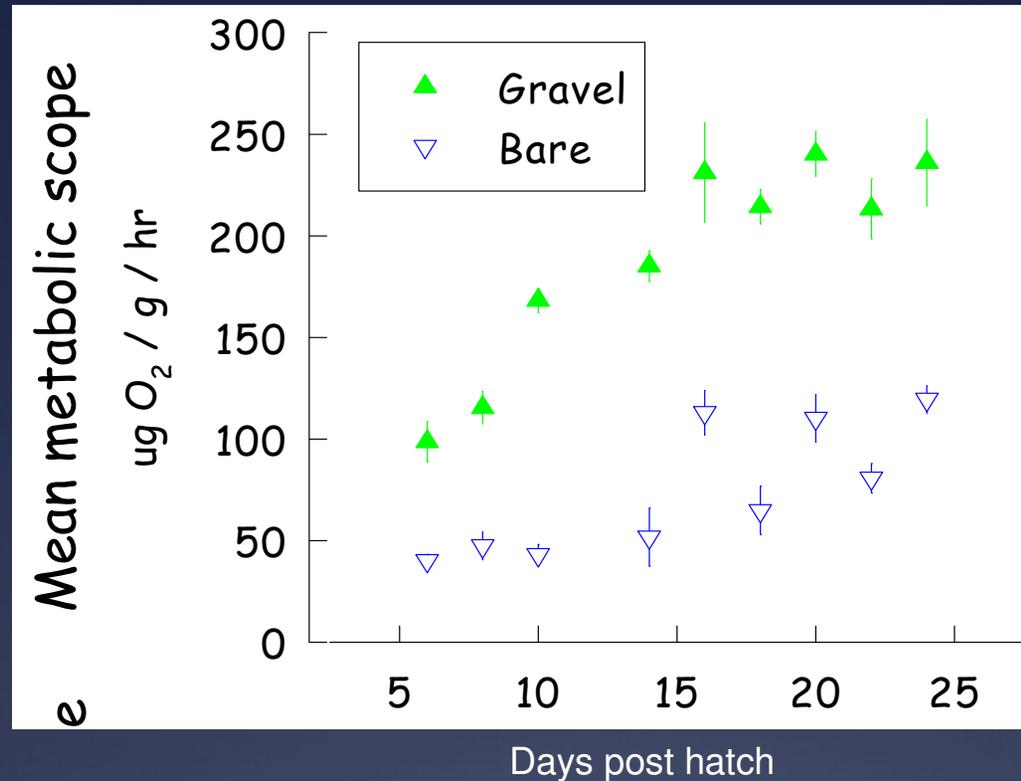
Rest

=

Metabolic
Scope

- * How much a fish can raise its metabolic rate to deal with a challenge
- * Capacity for growth and other energetic processes

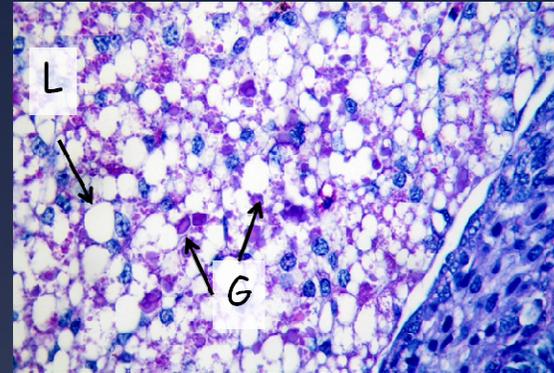
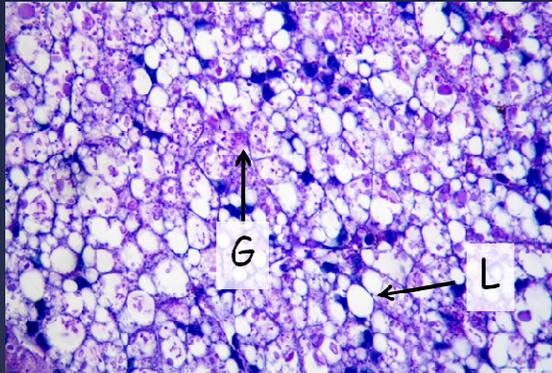
Physiology



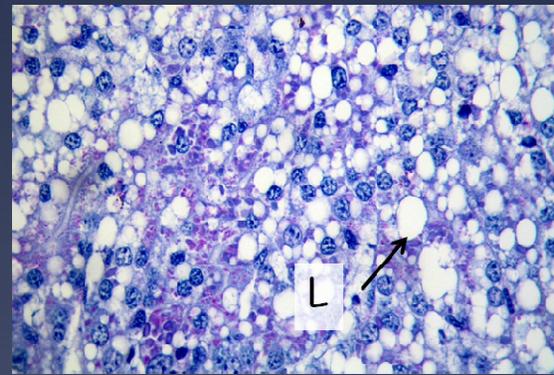
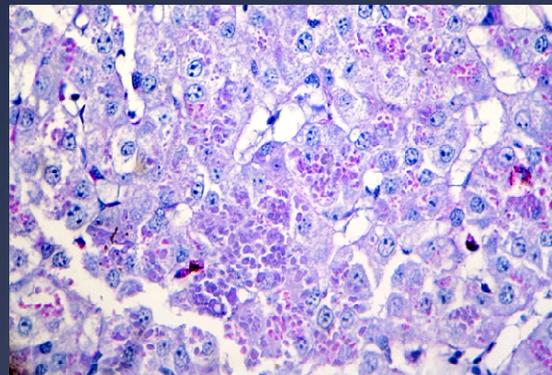
No substrate – lower capacity for growth and other energetic processes

Energy Reserves

Gravel



Bare



8 dph

16 dph

In short, fish reared without gravel were out of gas...

How does this apply to the hatchery?

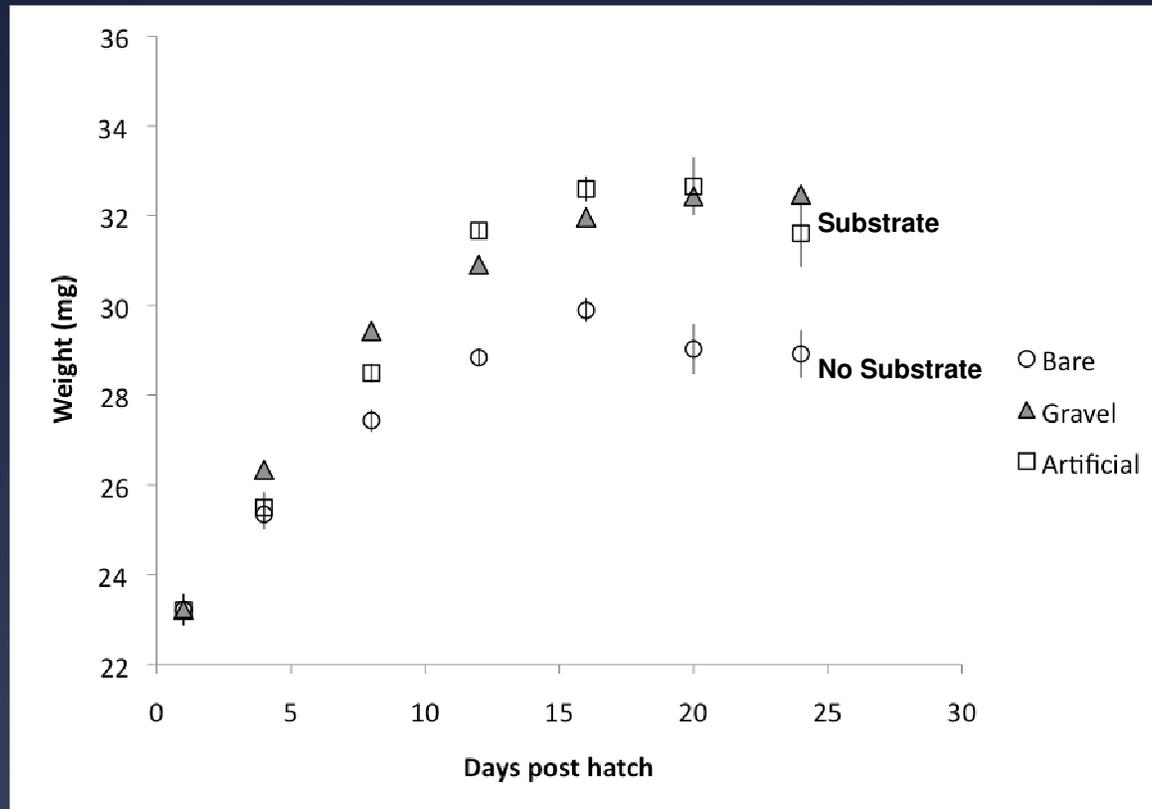
- * Substrate could be used to increase growth and survival
- * Gravel is not ideal for hatchery use!
- * What else is out there?

Artificial Substrate



1" sinking Bio-spheres

Artificial Substrate



- No difference between gravel and Artificial substrates
- Bio-spheres may be a suitable replacement for gravel

Benefits of Substrate

- * Faster growth
- * Lower mortality at first feeding
- * Greater overall survival
- * Improved physiological condition

Some considerations...

- * Using substrate is more time consuming
- * However, only rear in substrate for a short time (300-330 ATU)
- * **Much** less artificial substrate is required than gravel
- * Greater overall survival is not our goal
- * May reduce loss of some family groups = more genes released

Thanks!

Funding

BC Hydro

NSERC Industrial Postgraduate Scholarship program

Freshwater Fisheries Society of BC