

Thinking Outside the Box: Is Automated Feeding Doable for Large Zebrafish Facilities?

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Large Zebrafish Facilities are becoming common

- As the zebrafish grows as a biomedical organism, institutions are moving towards one large centralized core zebrafish facility.
- Larger core facilities require dedicated fish staff to care for the fish.
- Husbandry chores can be important but time consuming.



Credit: Aquarienbau Schwarz

Issues with Feeding Large Zebrafish Facilities

- Zebrafish feeding is often done inefficiently.
 - It takes either large amounts of time and/or a large group of people to feed.
 - In the Zon facility, we feed 3000 tanks twice a day taking approximately 21 hours feeding/week.
 - Not equal distribution of food per tank.
- Brine shrimp encrusted on lids after feeding, often leads to citations from Animal Care Institution (IUCUC).
 - Unsanitary and a potential for problems.



Issues with Feeding Large Zebrafish Facilities

Large variability is found within and between those who feed



Our Facility Set-Up

Off-gassing

Cartridge filters and UV lights



Header Tank



Cartridge filters and UV lights



Tanks



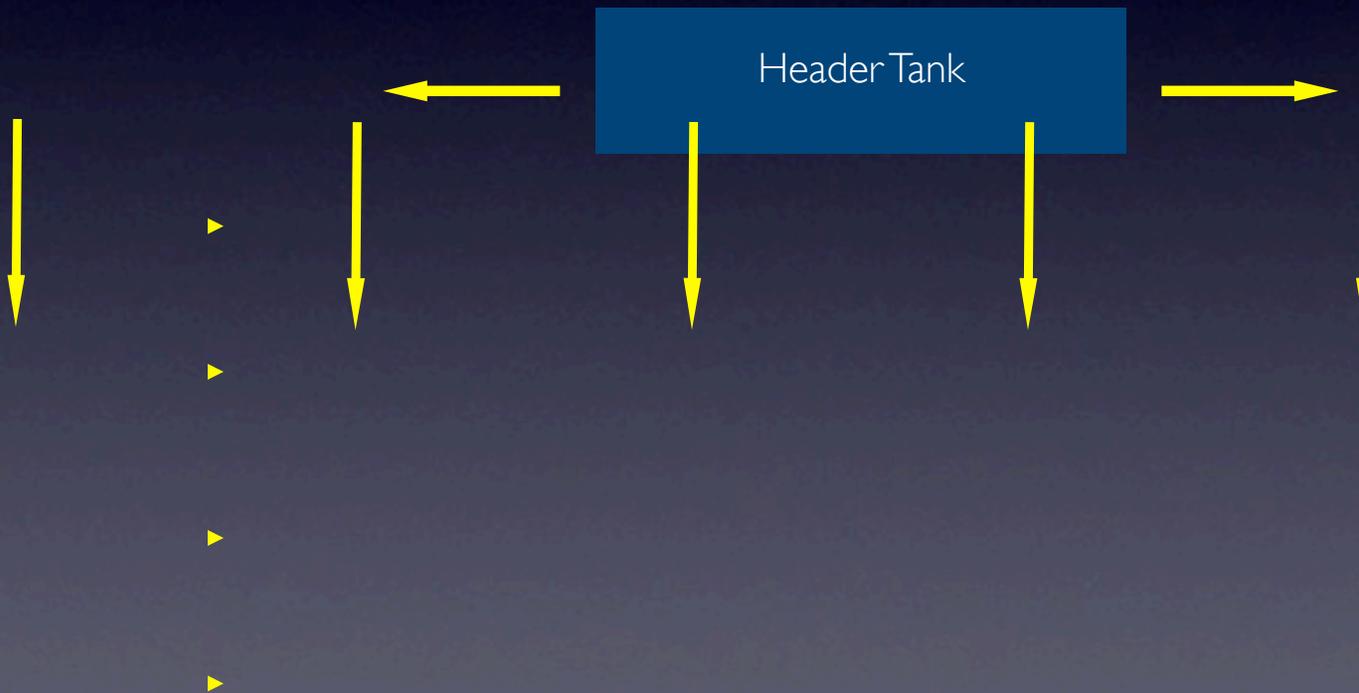
Sump Reservoir



Pumps



Could the header tank be used to automatically feed our tanks?



Reasons for feeding through the header tank

- Decrease the time spent feeding.
- Increase the feeding frequency per day.
- Decrease the variability of feeding.
- Prevent brine shrimp on lids.
- Could the header tank deliver feed to each tank efficiently?
 - Quickly.
 - Little variability between tanks.
 - Few problems with the system.
 - Equal growth rates.
 - Equal eggs produced.

Methods

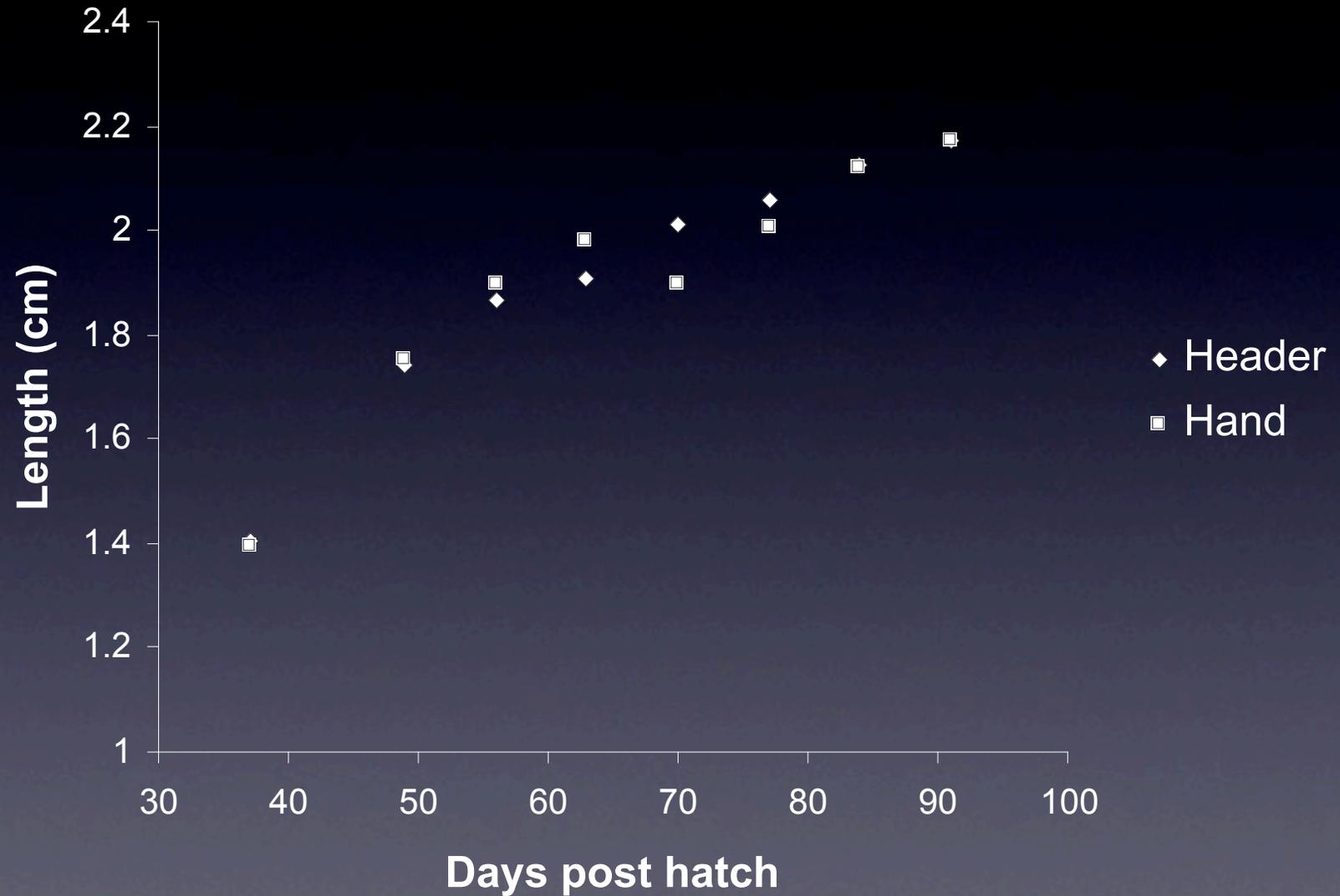
- Collected embryos from same genetic line born on the same day (4 tanks total).
- Raise fish in nursery for 5 weeks then moved into the 10L tanks.
- 2 tanks were placed in system 7, which was only fed through header tank, except on weekends.
- 2 tanks placed in systems 5 & 6, which were fed by hand via squirt bottles.
- All tanks were fed twice a day.

Methods

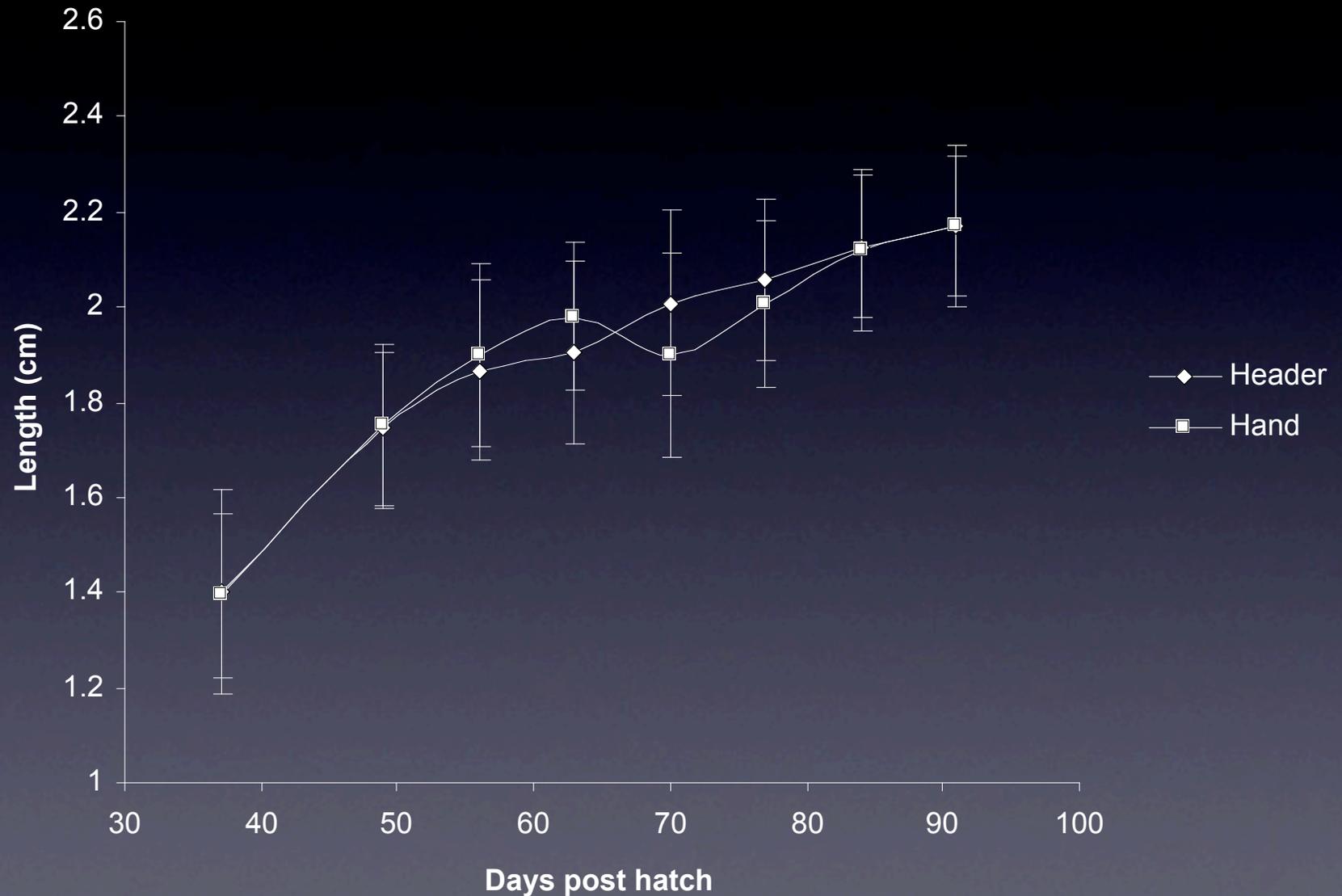
- The amount of food which was added had been calculated based on dry weights.
- Pictures were taken weekly for 2 months and growth rates were measured.
- Fish were set-up via pairwise matings and embryos were pooled and counted to find the total embryos per feeding group.



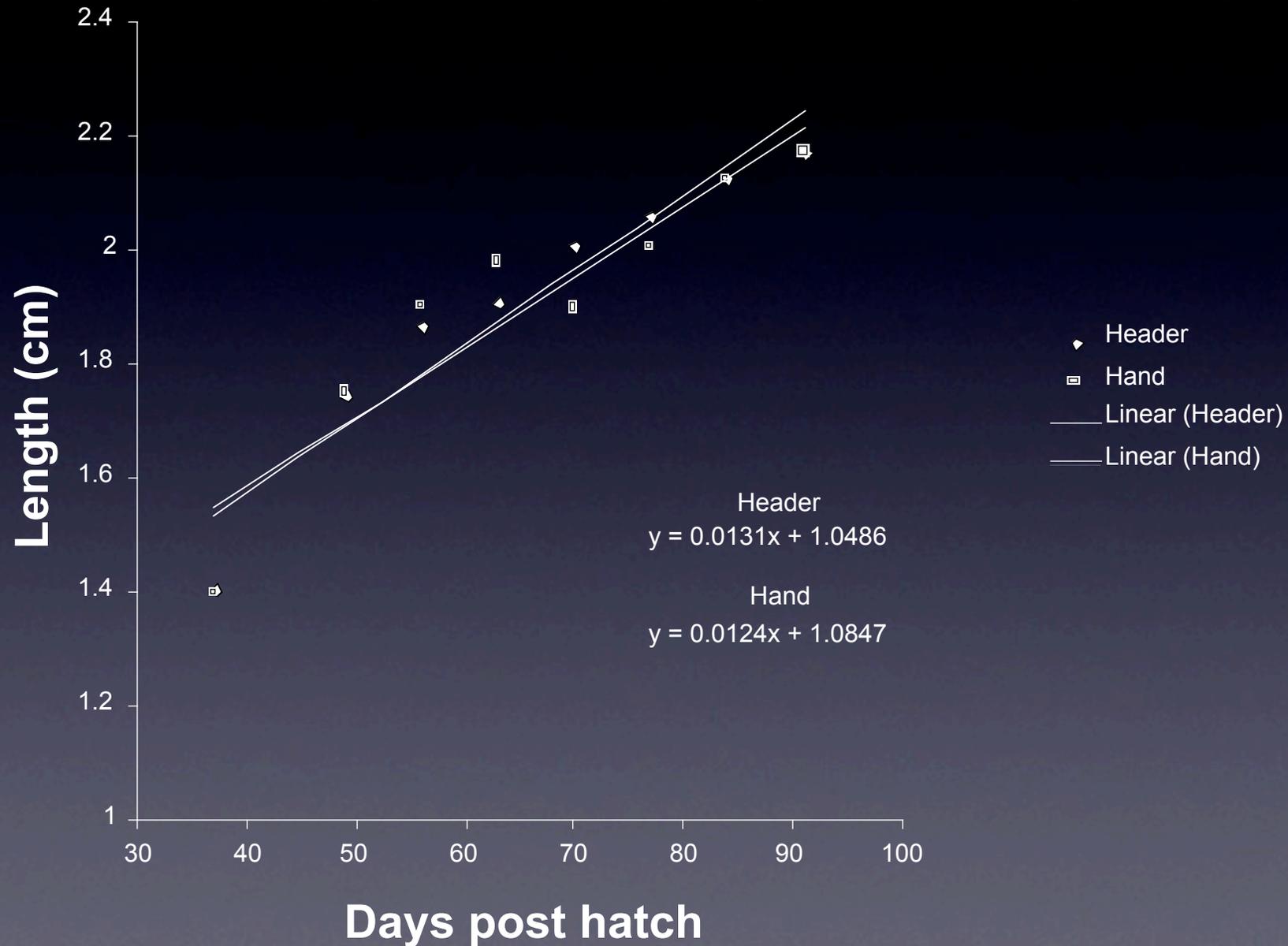
Results - Growth Rates



Results - Growth Rates

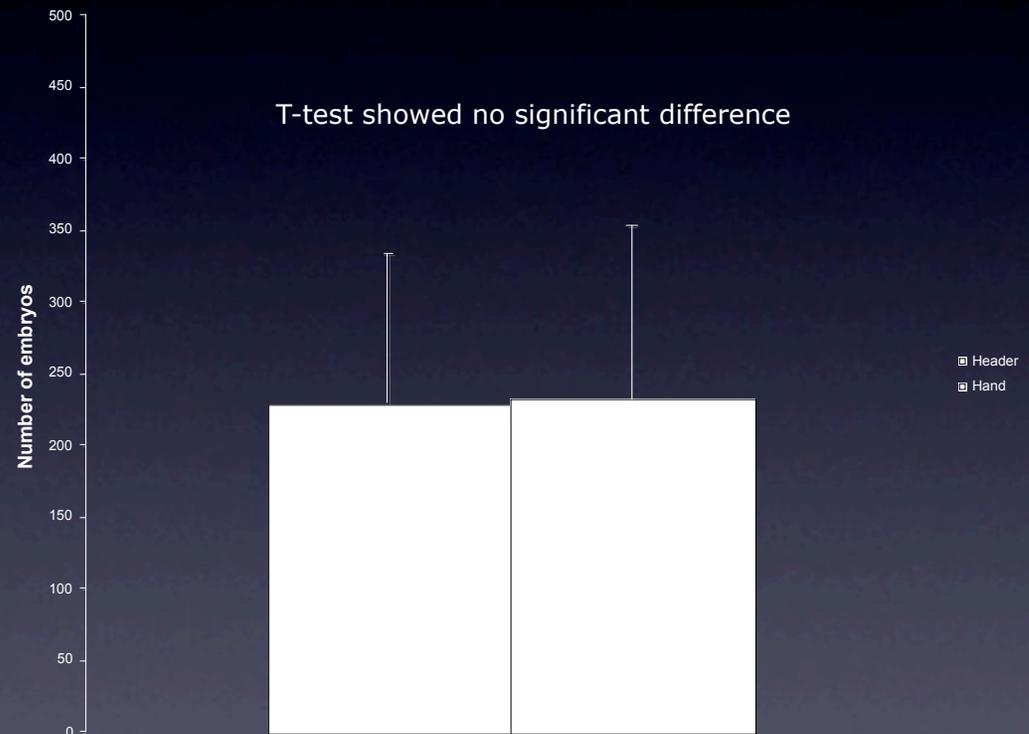


Results - Growth Rates



Results - Egg Counts

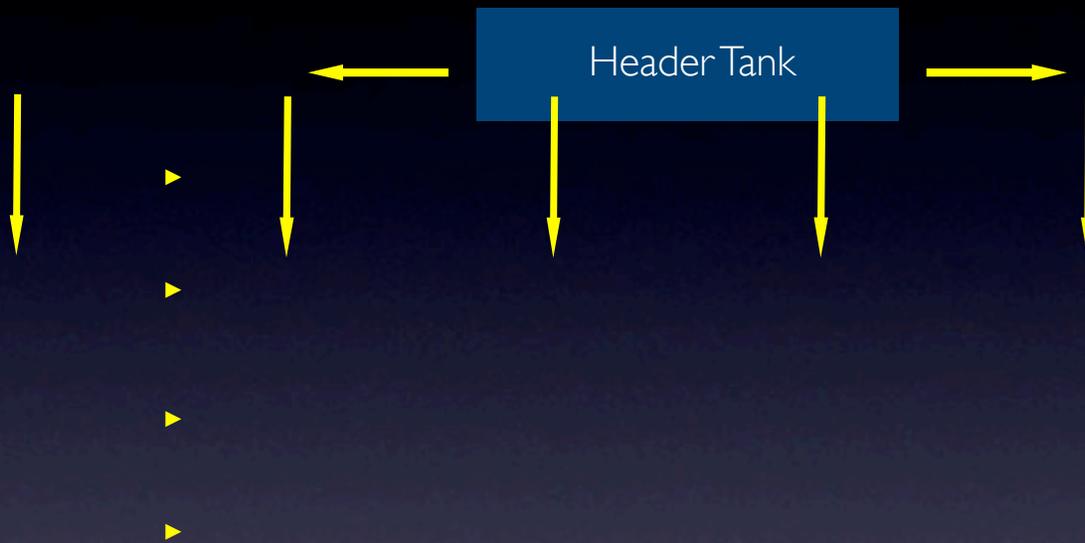
- Fish were set-up pairwise overnight, then eggs were collected from all pairs and pooled.
- Pictures of eggs were taken for each treatment and counted.
- Unfertilized eggs were not included in the counts.



Water quality has not changed by feeding through the header

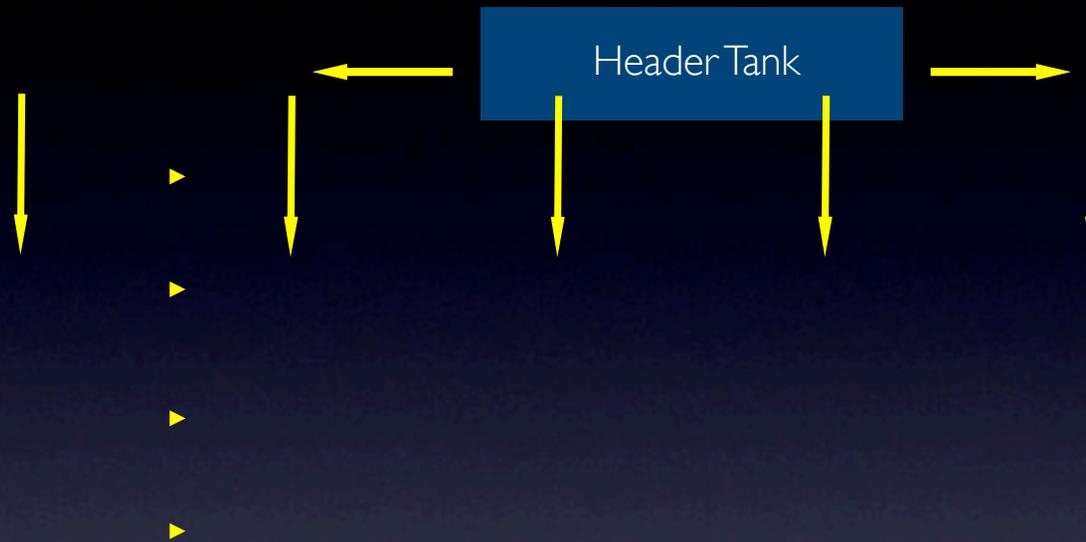
- pH has not significantly changed since implementing feeding through the header.
- Nitrate, nitrite, and ammonia levels have not significantly changed.
- We change 20% of system water per day.

Issues with feeding through the header tank



- Variation between tanks in feed amounts.
 - Flow rates differ between top and bottom of systems as well as left and right.
 - Adjustable regulators and no regulators can make feed amounts more uniform.

Issues with feeding through the header tank



- Tubes becoming clogged with feed if too much food put into the header tank.
- Dead end tubes cause food to build up.
 - A potential problem if harmful organism begins to grow in the tube ends.
- Increased cleaning of tubes to ensure feeding occurs.

Issues with feeding through the header tank

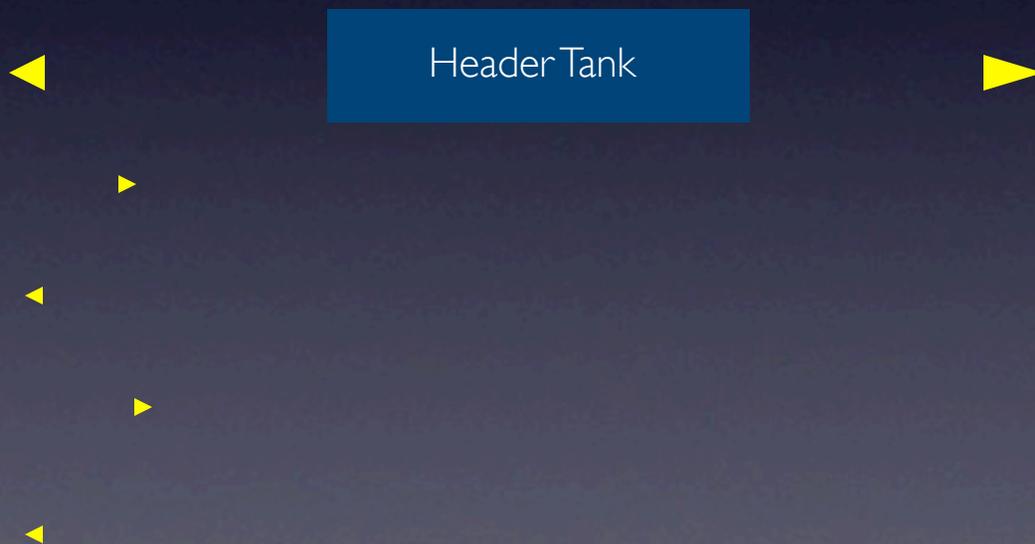
- Overflow tubes in header tank send food into the sump, which requires siphoning.
 - We're looking at sponges to act as a plug to minimize food in the sump.
- No one to check each tank every feeding, which could increase the chance sick or dead fish going unnoticed.



http://neilperkin.typepad.com/only_dead_fish/images/dead_fish_2.jpg

An Ideal Header Feeding System?

- No dead end tubes.
- No place for food to get caught.
- Equal amounts of food into each tank.
- Little maintenance work on the system.

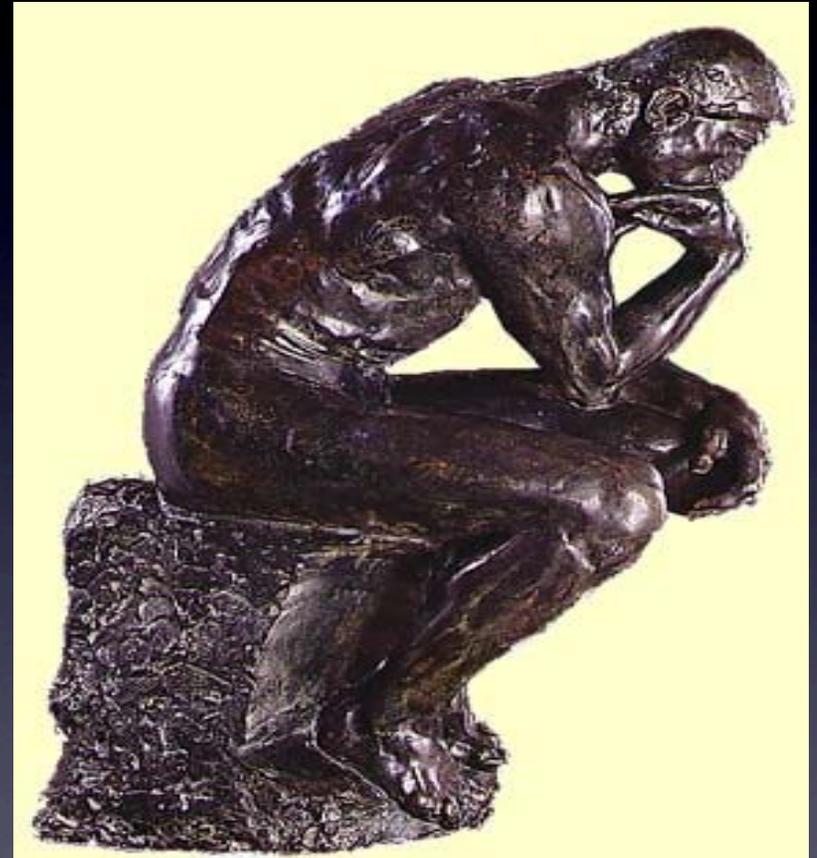


Did We Achieve Our Goal?

- Feeding through the header tank was quick and much less time is dedicated to feeding.
- Fish are growing at a similar rate.
- Fish did produced the same numbers of embryos.
- The lids of systems fed through the header tank are cleaner.
- Still variability in the amount of food delivered to each tank.
- Yes, I think we achieved the goal, but the system can still be optimized.

A Call for Thinking Outside the Box

- As zebrafish husbandry personnel we are in a good position to try and improve the current systems.
- This requires us to assess what we do and ask if there is a more efficient way.
- Don't be afraid to make suggestions about procedures on which you work.
- Keep asking questions and trying new ideas.



http://kara.allthingsd.com/files/2007/10/thinking_man2.jpg

Acknowledgements

- Isaac Adatto
- Len Zon
- Chris Lawrence