



**“Strengthening Circular Economy
and Valorisation of side-streams
in RAS Aquaculture”
AQUALOOP International Conference**

Interreg  Co-funded by
the European Union

South Baltic

*aqua
loop*

Crustaceans in multitrophic freshwater RAS for sludge mitigation

Results from AquaLoop FISHVISA Pilot testing

Bremerhaven, Germany | 25 February 2026

Nerijus Nika, Gintautas Narvilas, Matas Čepulis, Gerda Petreikytė-Knašienė

@AquaLoop



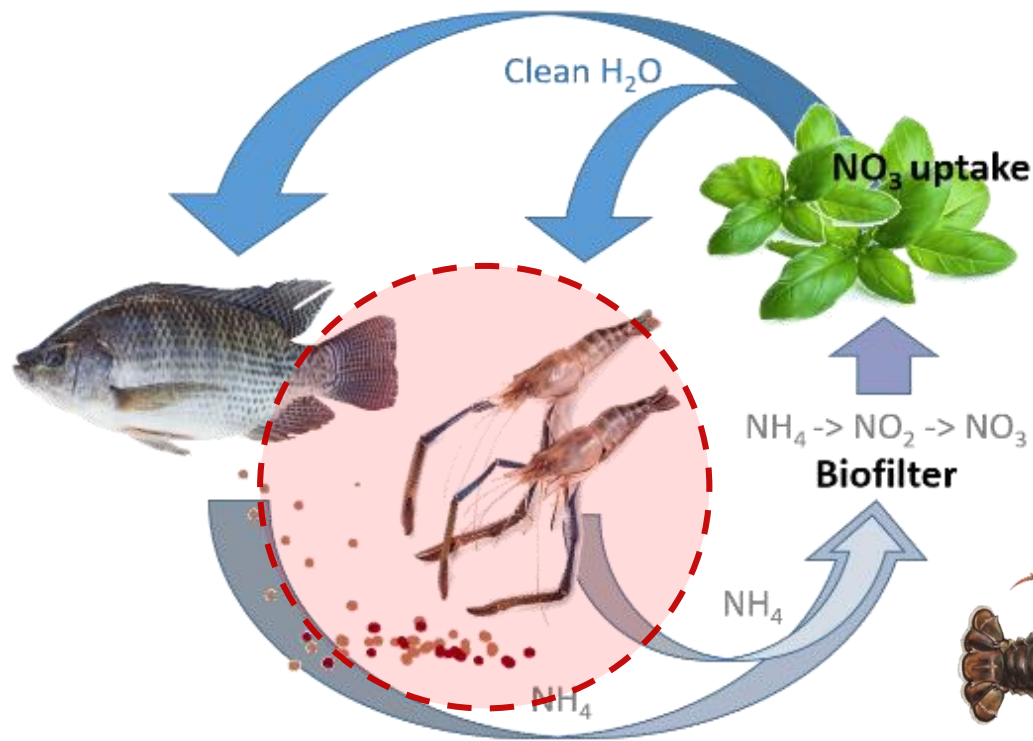
@AquaLoop Interreg SB



aqualoop.edu.pl

AquaLoop Pilot 3 – FISHVISA

Development of the Fish-SHrimp-Vegetables Integrated System of Aquaponics to showcase the potential of circular economy principles in RAS



- **Idea/hypothesis tested:**
 - crustaceans will consume sludge in the aquaponics system
 - sludge consumption will improve system performance
 - crustaceans will grow on sludge diet
- **Important issues:**
 - Should be freshwater species
 - Regionally important species
 - Easy access to stocking material



Noble crayfish
Astacus astacus



Narrow-claw crayfish
Astacus leptodactylus



Australian red-claw crayfish
Cherax quadricarinatus

AquaLoop Pilot 3 - FISHVISA

Development of the **Fish-SHrimp-Vegetables Integrated System of Aquaponics** to showcase the potential of circular economy principles in RAS

- 19 m² glasshouse with aquaponics system
- System volume – 3,5 m³
- Fish tank
- Crustacean tank
- Sedimentator
- Biofilter
- Mechanical backwash filter
- Three plant beds with dry clay
- Senect monitoring system
- LED lights



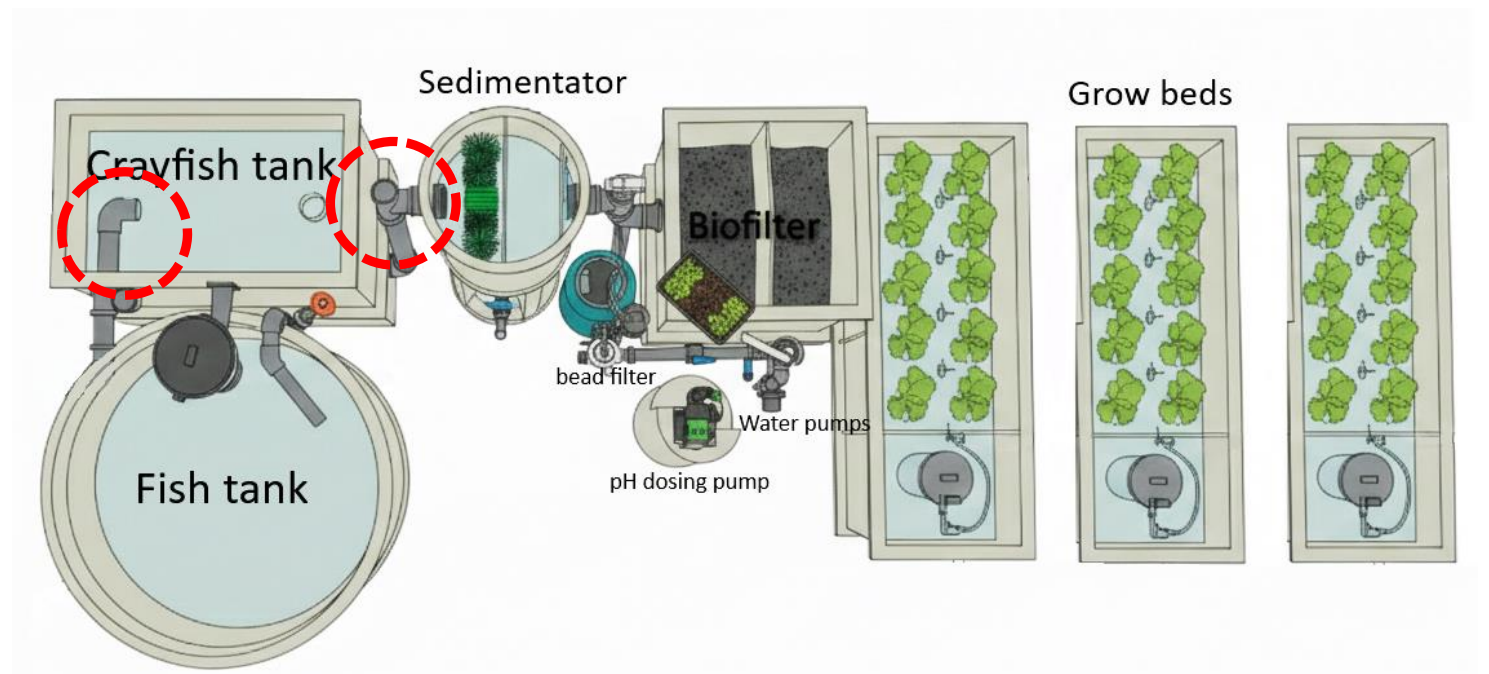
Experimental setup and Methods

Three experimental FISHVISA setups were planned:

- **Cold-water (16-20°C):** rainbow trout + noble crayfish + lettuce
- **Cool-water (20-24°C):** Siberian sturgeon + narrow-claw crayfish + basil
- **Warm-water (25°C):** Nile tilapia + Australian red-claw crayfish + basil

Parameters monitored:

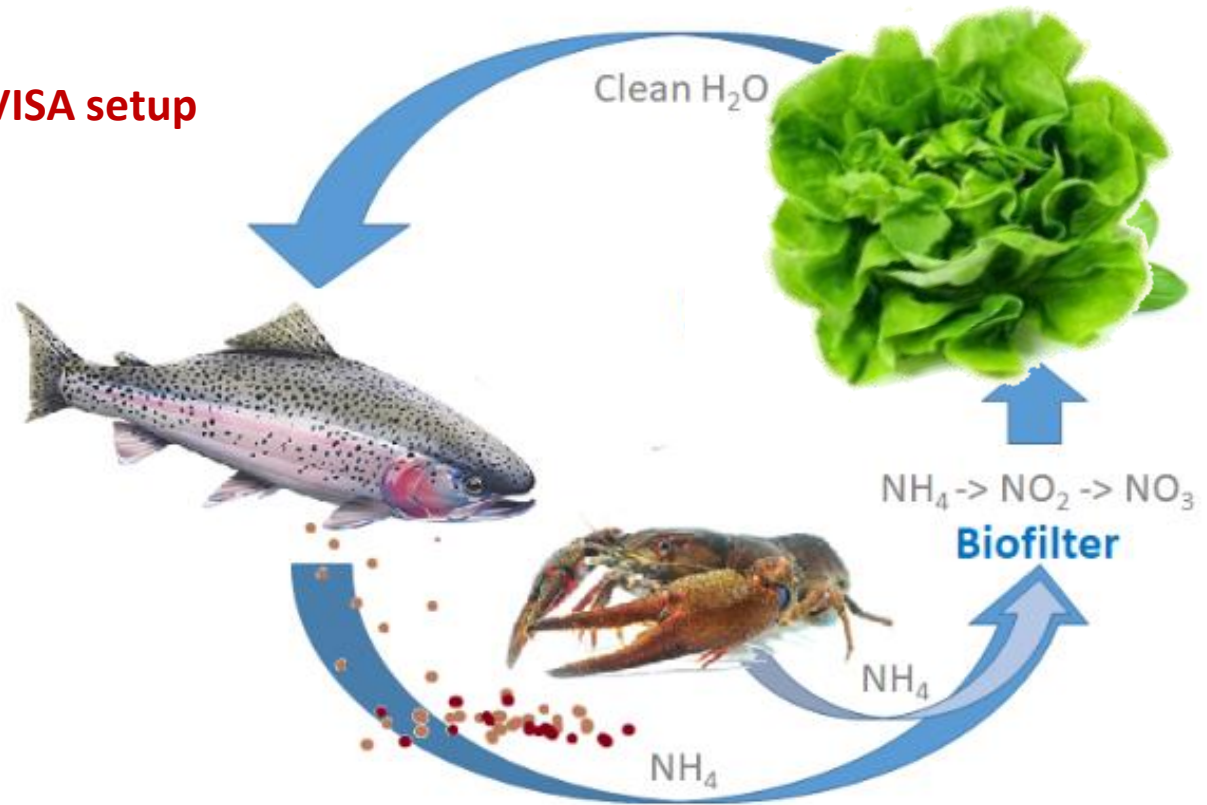
- System performance
- Water analysis (N, P, K, Ca, Mg, Fe
- Growth of fish and crayfish (W and L)
- Growth of plants (height, weight, leaf number, visual status)
- Collection of sludge
 - From fish tank
 - After crayfish tank



Cold-water FISHVISA setup

Rainbow trout + noble crayfish + lettuce

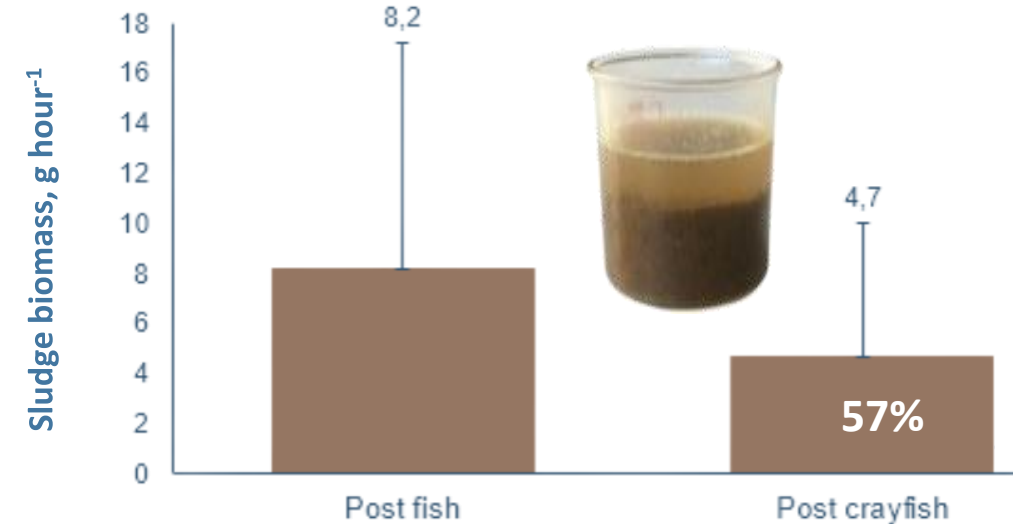
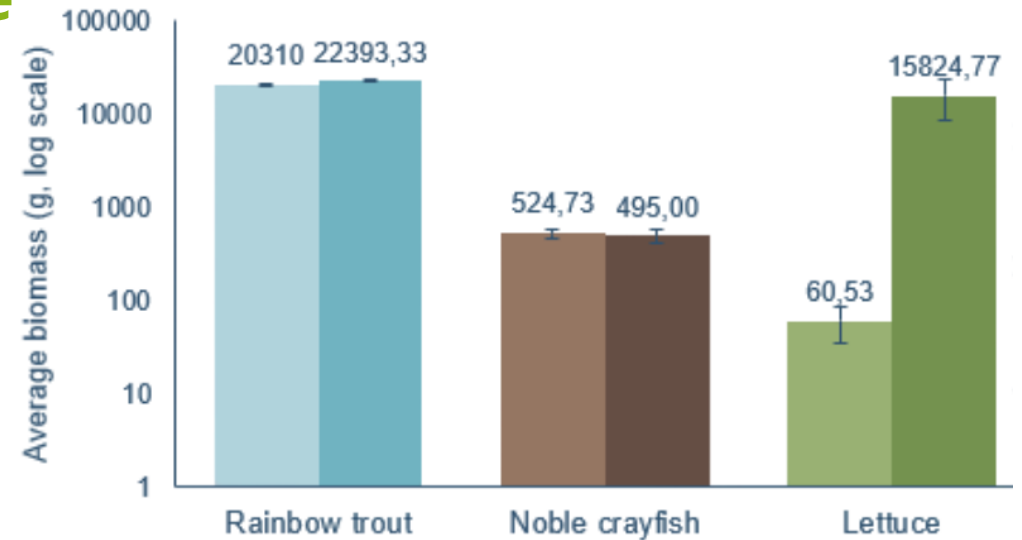
- 3x cycles with trout + lettuce – **control**
- 3x cycles with trout + crayfish + lettuce – **FISHVISA setup**
- 28-40 days of cultivation
- Fish density – 20-50kg/m³ or 40 fish/tank
- Plant density – 20 plant/grow bed (0,6m²)
- Lettuce varieties: Gelbus, Dark roden, Aficion



Cold-water FISHVISA setup

Rainbow trout + noble crayfish + lettuce

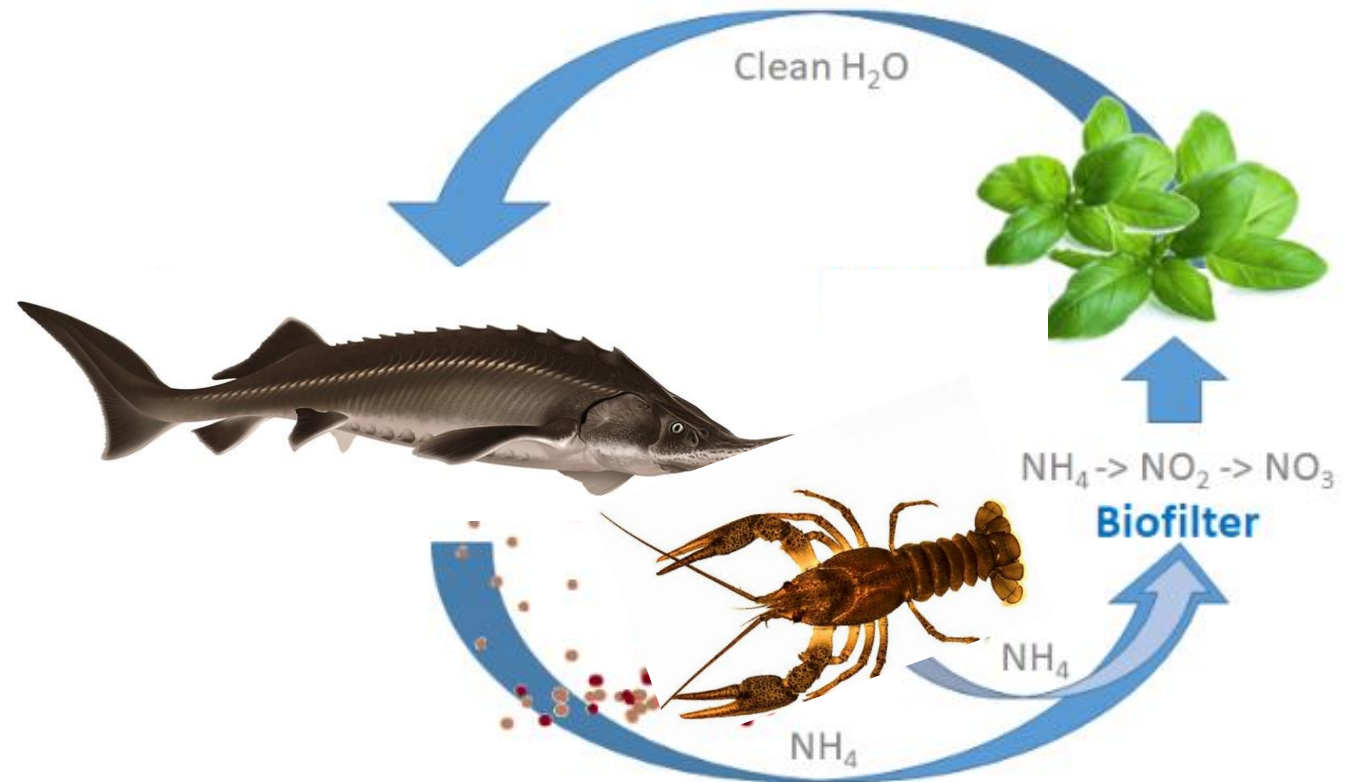
- Trouts were growing at 0.3 %/day SGR
- Plants were growing successfully
- Crayfish contributed to ~40 % of sludge removal, however...
- Crayfish were not growing



Cool-water FISHVISA setup

Siberian sturgeon + narrow-claw crayfish + basil

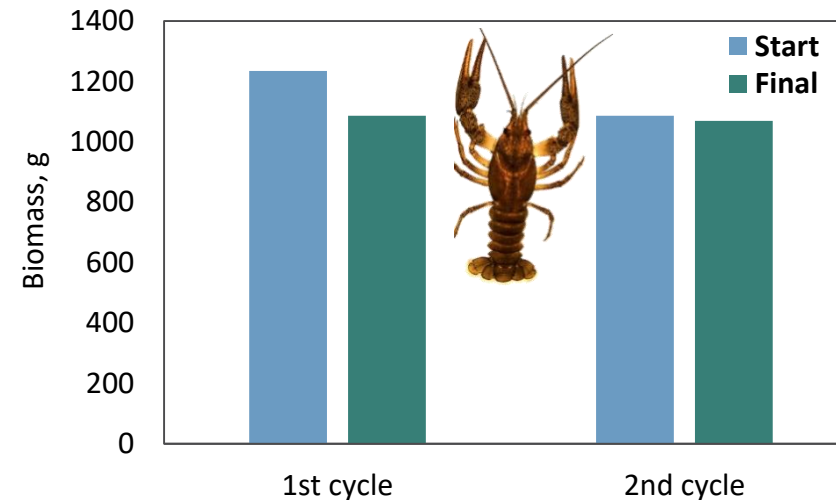
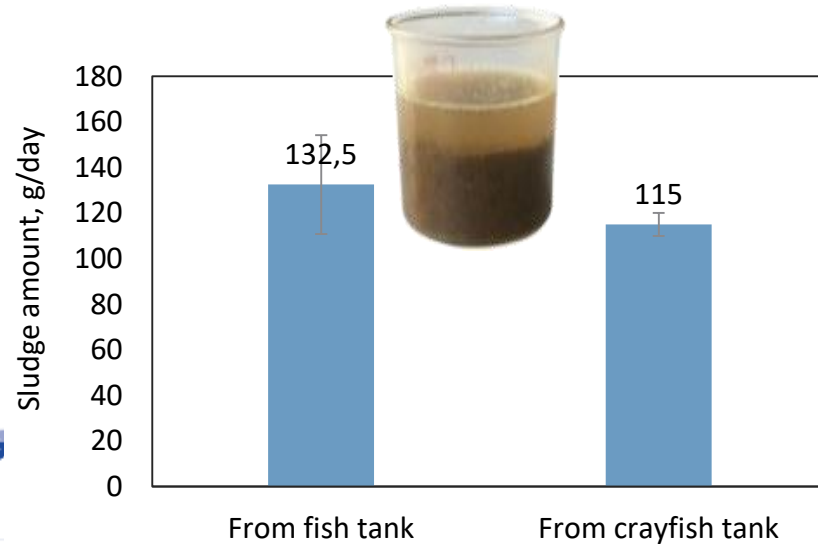
- 2x cycles completed, third is ongoing
- 3x cycles without crayfish awaits
- 30-35 days of cultivation
- Fish density – 10-15 kg/m³
- Crayfish density – 52 ind./m² (40 ind./tank)
- Basil density – 20 plant/grow bed (0,6m²)



Cool-water FISHVISA setup

Siberian sturgeon + narrow-claw crayfish + basil

- Sturgeons were growing at 0.6 %/day SGR
- Basil was growing successfully, reaching 7,51 kg biomass or 141±67 g/plant
- However, again, crayfish were not growing...
- ...and crustaceans removed insignificant amount of sludge



Does crayfish in fact eat aquaponics system sludge?

Narrow-claw crayfish feeding experiment

- Two feeding trials: wet sludge and dried sludge from aquaponics system
- Done by bachelor students and secondary school students
- Three individuals per box, 9 individuals per group
- Experiment duration: 30 days
- Feeding rate: 10% BW

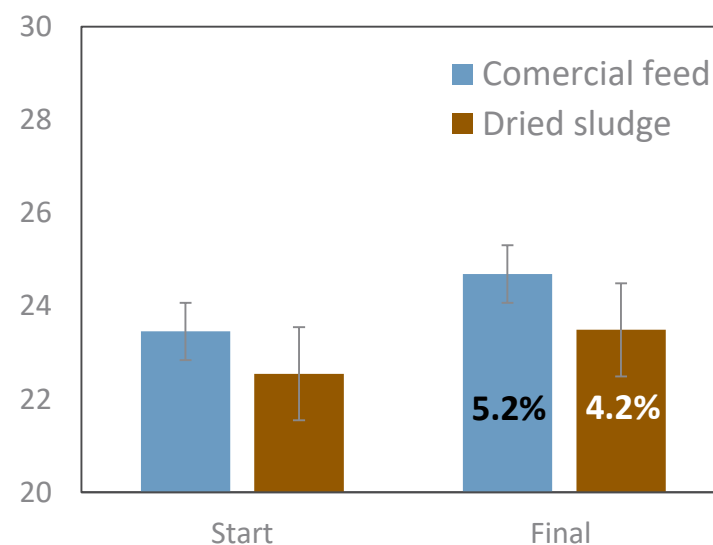
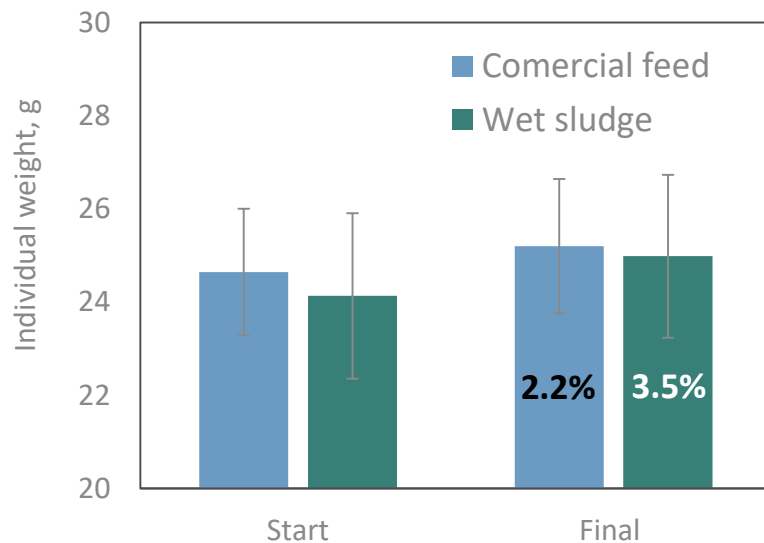


Does crayfish in fact eat aquaponics system sludge?

Narrow-claw crayfish feeding experiment

Crayfish was eating sludge, however:

- Wet sludge was difficult to handle and to measure
- Dried sludge flakes were stable in water for significant time, and
- Crayfish was eating dried sludge more efficiently
- Weight gain in one month trial was similar to commercial feed



Preliminary FISHVISA outcomes

- Noble crayfish affected positively the performance of the system and eliminated significant portion of system's sludge
- This was not evident for narrow-claw crayfish, no impact on sludge mitigation.
- In both cases crayfish (noble and narrow-claw) was not gaining weight and in most cases we were losing biomass.
- Sludge is of low caloric and energetic value for such animals as crayfish. Mixed feeding strategies should help increase feeding efficiency.
- From the other hand, significant removal of rainbow trout sludge by noble crayfish could be explained by better faeces composition and energetic value compared to sturgeon loose faeces and lower fat content in the feed.

Preliminary FISHVISA outcomes

- Fish and plants were growing normally with and without crayfish. Adding crayfish to the system not affected water quality and growth of standard aquaponics species
- Results support still scarce applications tests that RAS/aquaponics sludge is sufficient to sustain crayfish alive, but not caloric enough to provide growth of production.
- From the other hand, crustaceans may improve system work by contributing to sludge partial removal (reducing pressure on the system), mechanically decomposing and adding to mineralization of sludge, so enhancing plant production.



Thank You.

Nerijus Nika: nerijus.nika@ku.lt

Fisheries and Aquaculture Laboratory
Marine Research Institute
Klaipeda University

