Whiteleg shrimp RAS technology optimization

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EURO SHRIMP

Klaipeda University
Marine Research Institute

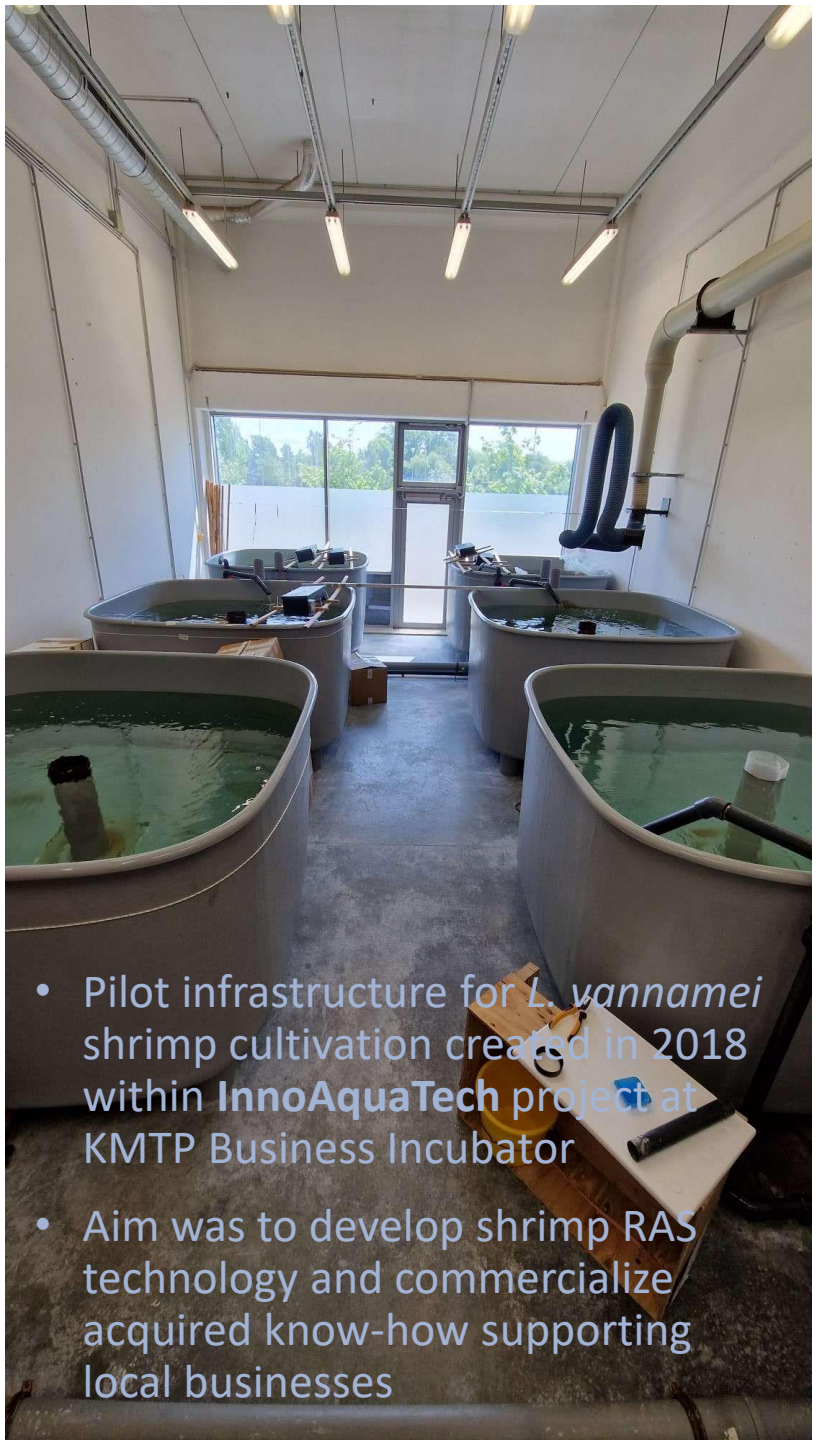
FISHERIES AND AQUACULTURE LABORATORY

RAS technology development

- Shrimp cultivation technology
- Geothermal resources in RAS
- Aquaponics

Pilot shrimp RAS in Lithuania

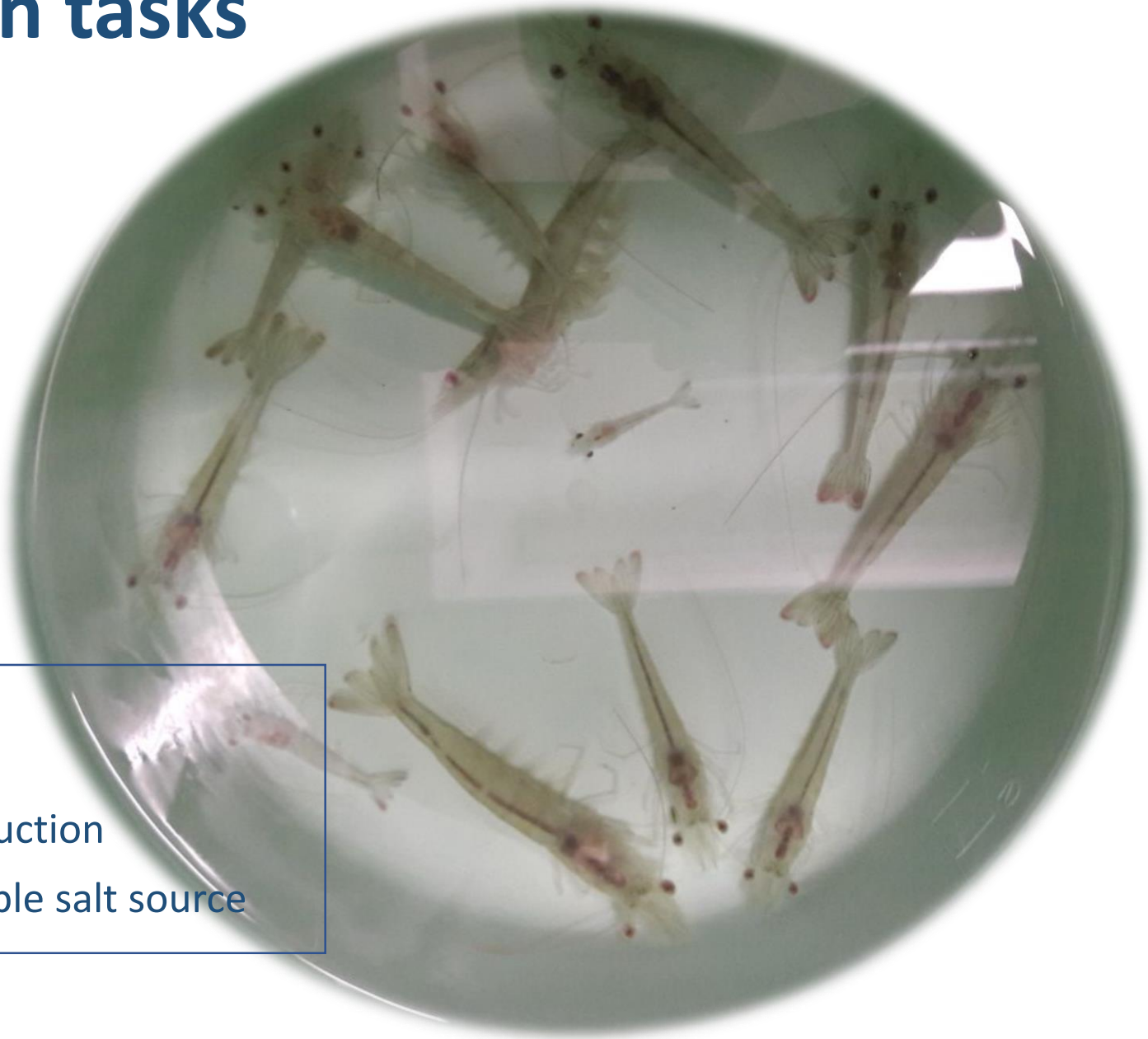
KLAIPĖDOS MOKSLO IR TECHNOLOGIJŲ PARKAS



- Pilot infrastructure for *L. vannamei* shrimp cultivation created in 2018 within **InnoAquaTech** project at KMTP Business Incubator
- Aim was to develop shrimp RAS technology and commercialize acquired know-how supporting local businesses

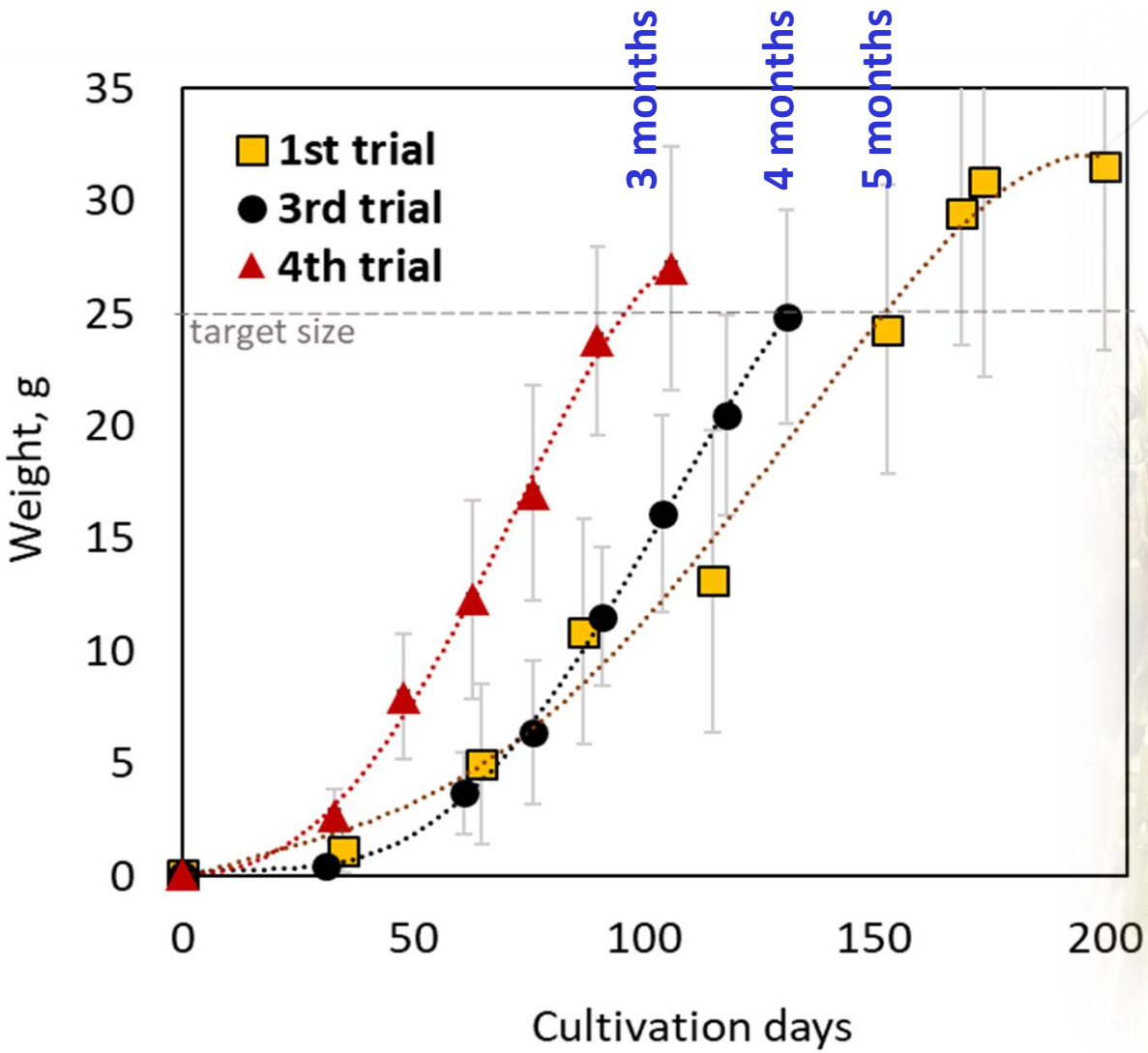
- Mechanical (drum) filter
- Biological filter
- Sump
- Protein skimmer
- Denitrification filter
- Oxygenation cone
- Heater
- UV
- Monitoring and control system
- Artificial seawater preparation system

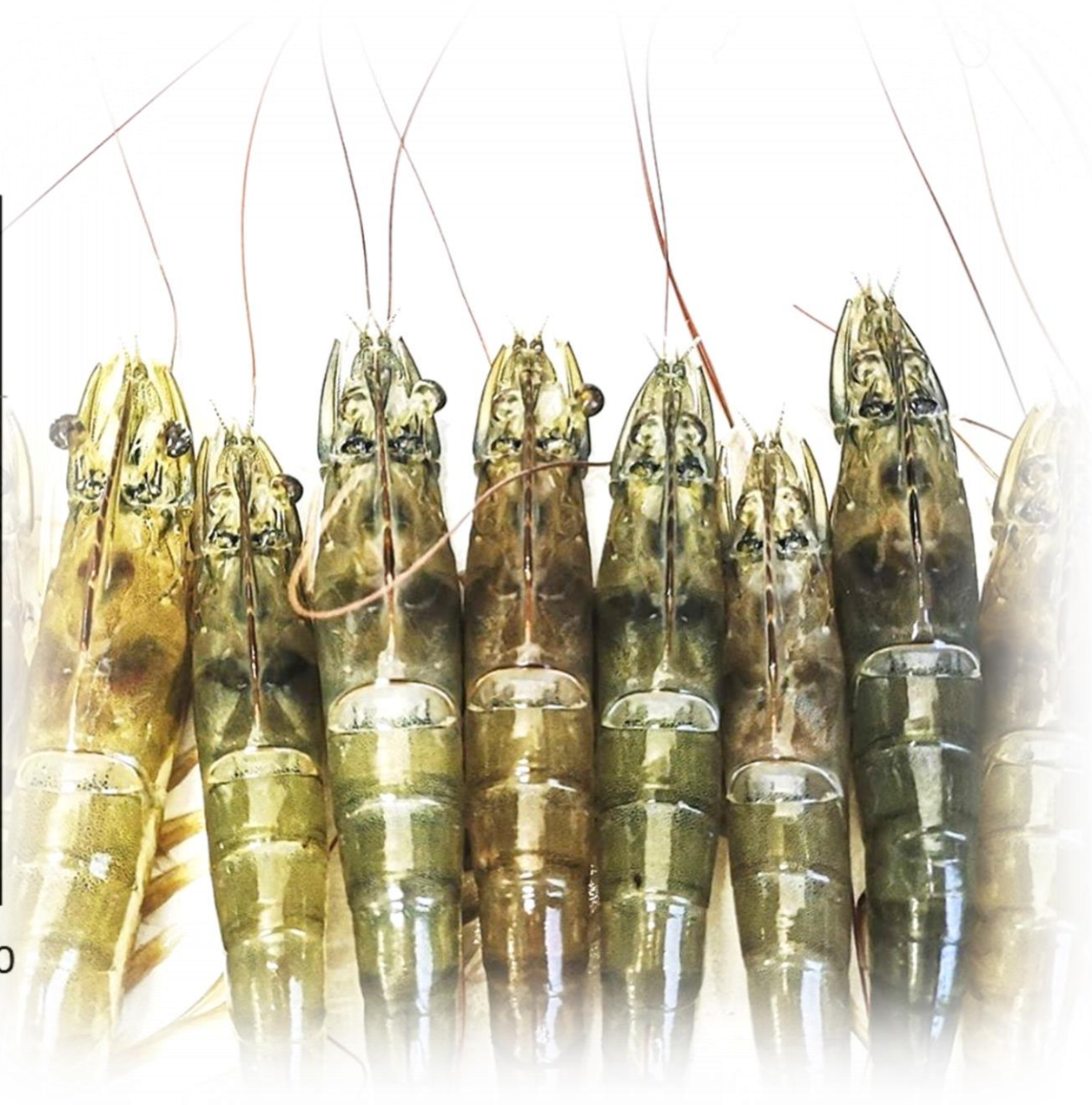
Technology optimization tasks



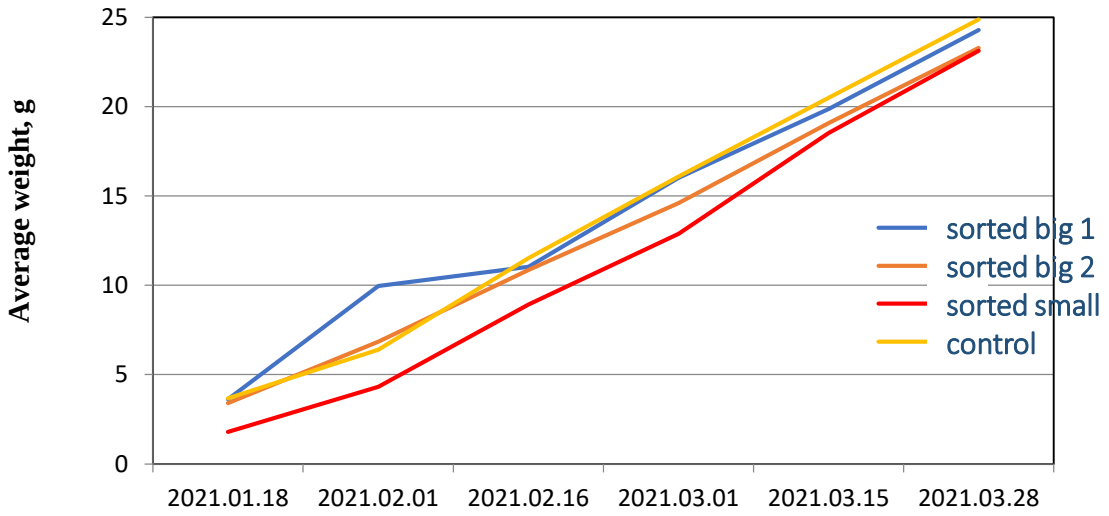
- Water quality optimization
- Feeding management
- Stress reduction
- Diseases?
- Unequal growth rate during first months
- Shrimp tank design – extra surface area
- Reduce early stage mortality – improve production
- Water preparation – alternative and sustainable salt source

Growth performance



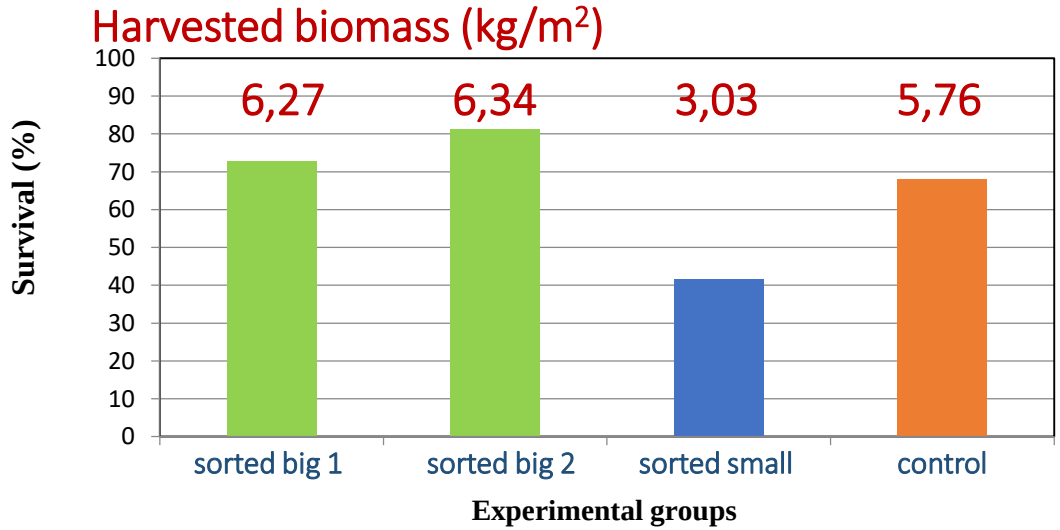


Sorting by size – to much effort for nothing?

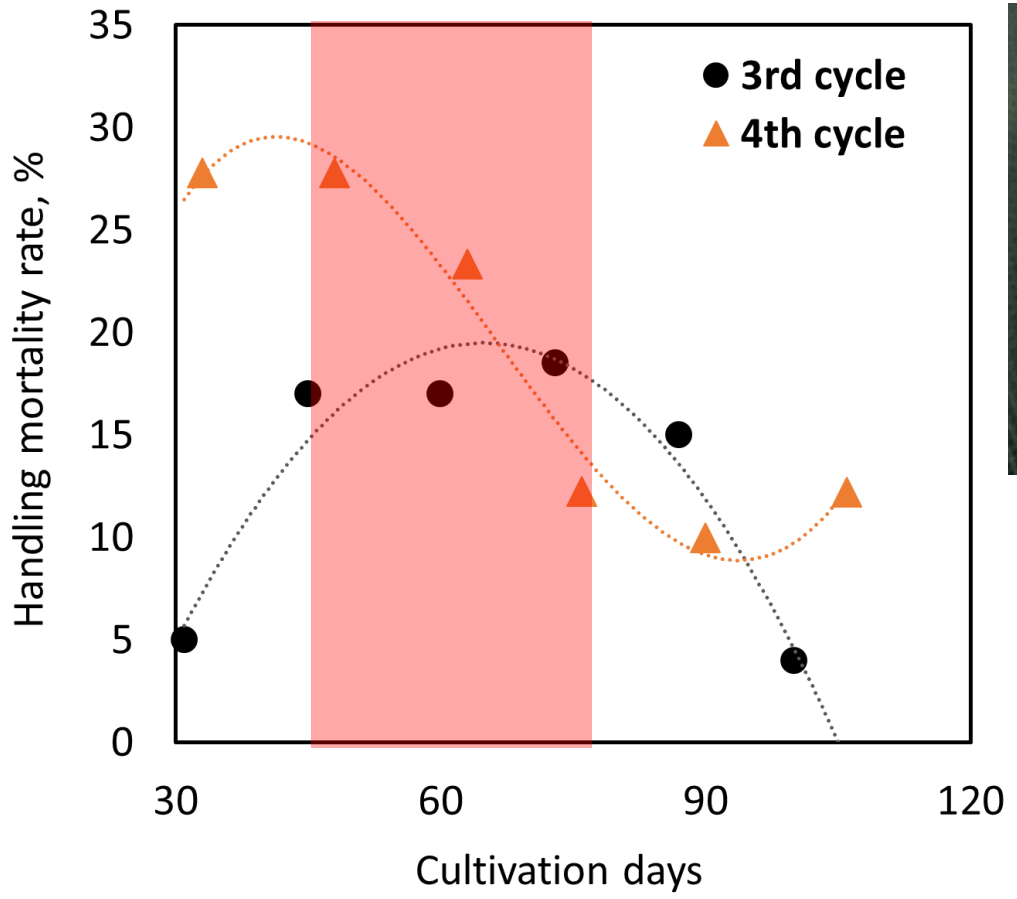


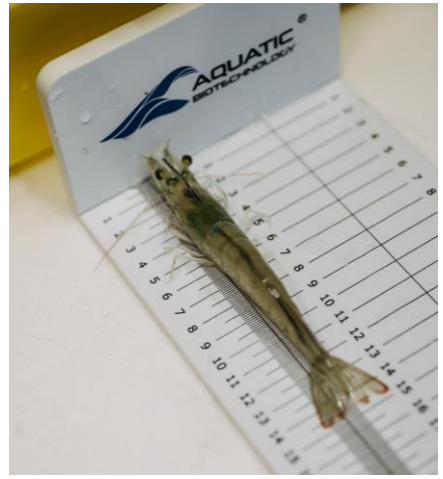
Sorting experiment (+feeding management)

- High growth rate sustained in all groups – market size in 4 months
- High mortality and compensatory growth in a group of small ones



Handling mortality

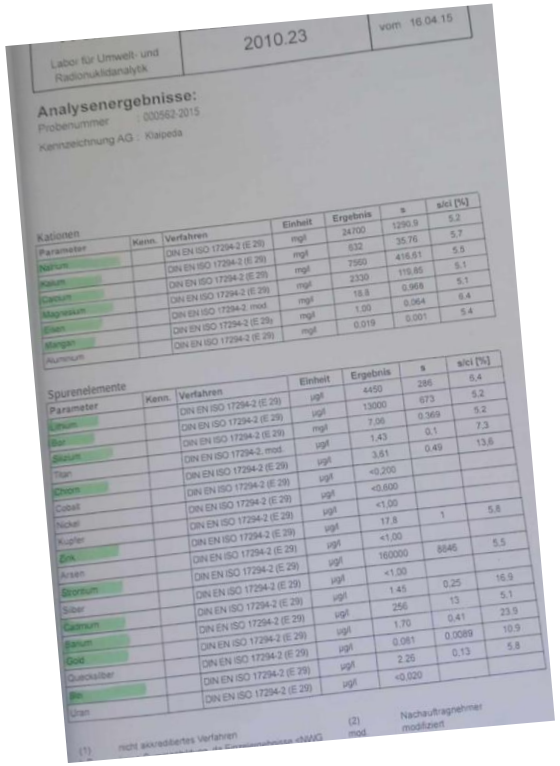




Handling stress related mortality rate was related to the age of animals, when the highest procedural mortality rate was recorded during the second-third month or at 5-15 g of individual weight.

Artificial marine water

- High operational costs for professional sea salt **~10 Eur/1m^3 16PSU water**
- Cheaper solution – Low cost salt mixture LCSM: (Na, Mg, Ca, K chloride, Mg sulfate)
- Geothermal brine of 110 g L^{-1} mineralization – sustainable source of salt for artificial marine water?


Labor für Umwelt- und Radionuklidanalytik 2010.23 vom 16.04.15

Analysenergebnisse:

Probenummer : 000562-2015

Kennzeichnung AG : Klaipeda

Kationen Parameter	Kenn.	Verfahren	Einheit	Ergebnis	s	s/c [%]
Natrium		DIN EN ISO 17294-2 (E 29)	mg/l	24700	1290.9	5.2
Kalium		DIN EN ISO 17294-2 (E 29)	mg/l	632	35.76	5.7
Calcium		DIN EN ISO 17294-2 (E 29)	mg/l	7560	416.61	5.5
Magnesium		DIN EN ISO 17294-2 (E 29)	mg/l	2330	119.85	5.1
Eisen		DIN EN ISO 17294-2 mod.	mg/l	18.8	0.968	5.1
Mangan		DIN EN ISO 17294-2 (E 29)	mg/l	1.00	0.064	6.4
Aluminium		DIN EN ISO 17294-2 (E 29)	mg/l	0.019	0.001	5.4

Spurenelemente Parameter	Kenn.	Verfahren	Einheit	Ergebnis	s	s/c [%]
Lithium		DIN EN ISO 17294-2 (E 29)	µg/l	4450	286	6.4
Bor		DIN EN ISO 17294-2 (E 29)	µg/l	13000	673	5.2
Silizium		DIN EN ISO 17294-2 (E 29)	mg/l	7.06	0.369	5.2
Titan		DIN EN ISO 17294-2, mod.	µg/l	1.43	0.1	7.3
Chrom		DIN EN ISO 17294-2 (E 29)	µg/l	3.61	0.49	13.6
Cobalt		DIN EN ISO 17294-2 (E 29)	µg/l	<0.200		
Nickel		DIN EN ISO 17294-2 (E 29)	µg/l	<0.600		
Kupfer		DIN EN ISO 17294-2 (E 29)	µg/l	<1.00		
Zink		DIN EN ISO 17294-2 (E 29)	µg/l	17.8	1	5.8
Arsen		DIN EN ISO 17294-2 (E 29)	µg/l	<1.00		
Strontium		DIN EN ISO 17294-2 (E 29)	µg/l	160000	8846	5.5
Silber		DIN EN ISO 17294-2 (E 29)	µg/l	<1.00		
Cadmium		DIN EN ISO 17294-2 (E 29)	µg/l	1.45	0.25	16.9
Barium		DIN EN ISO 17294-2 (E 29)	µg/l	256	13	5.1
Gold		DIN EN ISO 17294-2 (E 29)	µg/l	1.70	0.41	23.9
Quecksilber		DIN EN ISO 17294-2 (E 29)	µg/l	0.081	0.0089	10.9
Blei		DIN EN ISO 17294-2 (E 29)	µg/l	2.25	0.13	5.8
Uran		DIN EN ISO 17294-2 (E 29)	µg/l	<0.020		

(1) nicht akkreditiertes Verfahren (2) Nachauftragnehmer modifiziert

Chemical element		
Chlorine (Cl)	mg L-1	55192
Sodium (Na)		25989
Potassium (K)		570
Calcium (Ca)		7106
Magnesium (Mg)		2440
Iron (Fe)		<0,01
Boron (B)		9,87
Silicates (SiO2)		4,7
Lithium (Li)	µg L-1	3420
Aliuminium (Al)		1100
Barium (Ba)		300
Cadmium (Cd)		<0,3
Chrome (Cr)		<1
Manganese (Mn)		530
Lead (Pb)		<1
Zinc (Zn)		<40
Strontium (Sr)		170000

Western Lithuanian Geothermal Anomaly

Geothermal brine experiment

Interreg Baltic Sea Region
Co-funded by the European Union
BLUE ECONOMY TETRAS

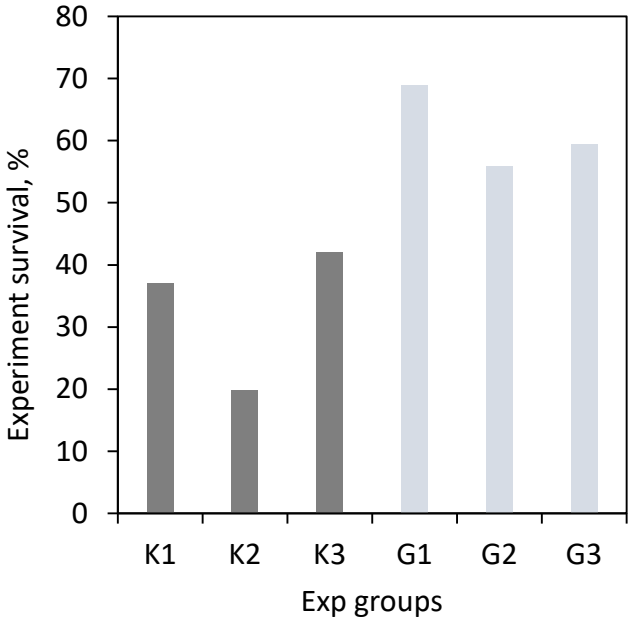
- Control group – with LCSM salting (16 PSU)
- Experimental group – with geothermal brine-based artificial marine water (16 PSU)

Geothermal brine experiment

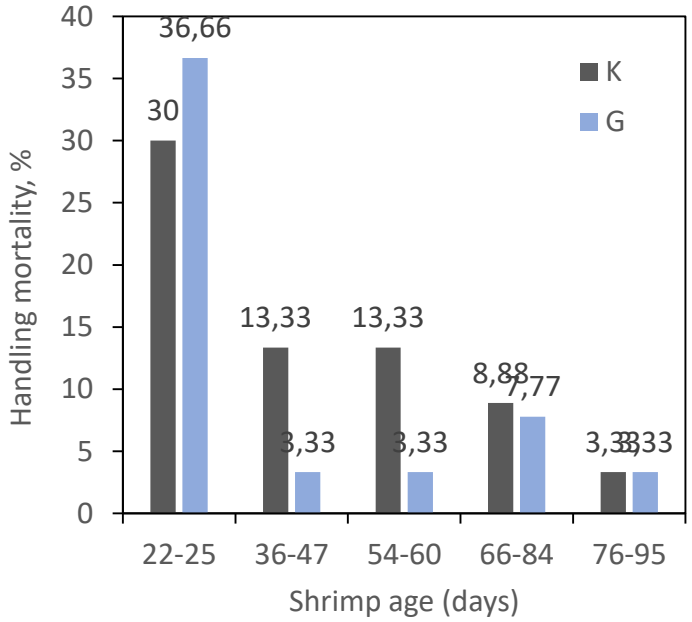
Interreg Baltic Sea Region
Co-funded by the European Union
BLUE ECONOMY TETRAS

- For the first time we **achieved close to 100% initial acclimation survival** (2 weeks)!
- Significant increase in total survival – higher then any previous cycle

- Control group (K) vs. geothermal group (G): **33±12% vs. 63±6 %**



- Lower handling mortality in most sensitive period (5-15g)



Extra surface area

Shrimp tower concept

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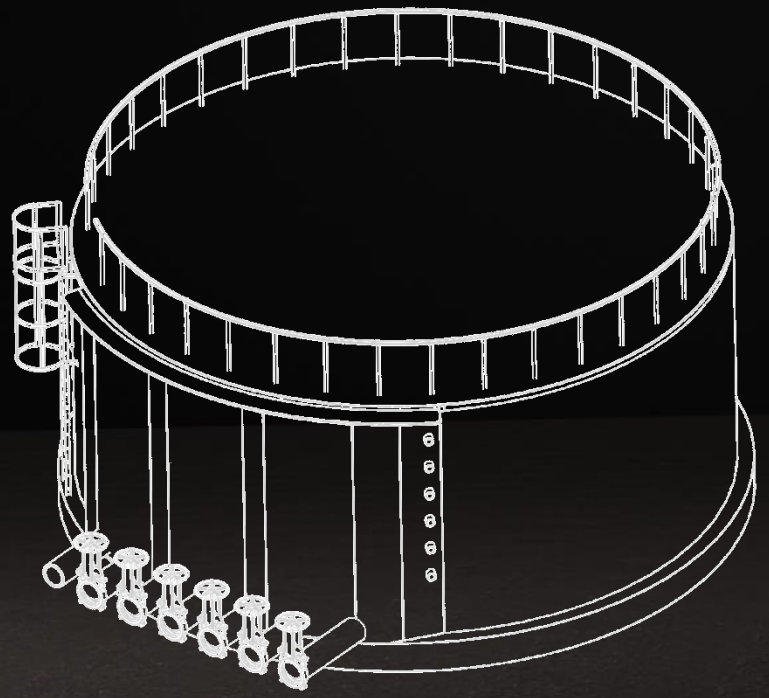

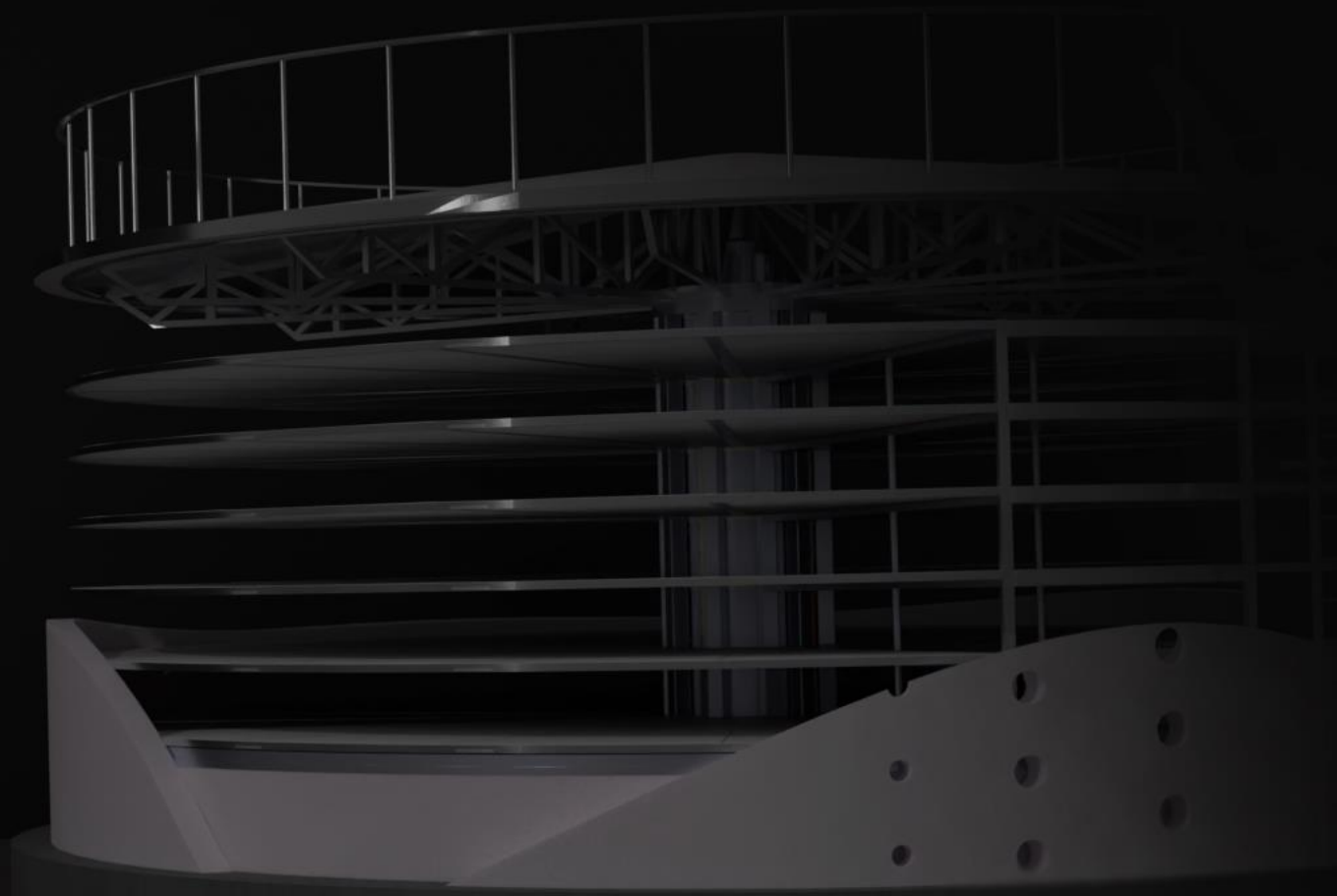

https://aquaqlt.com/

Thank You.

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