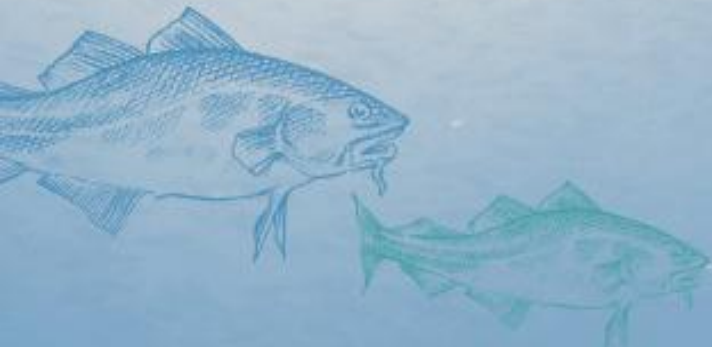




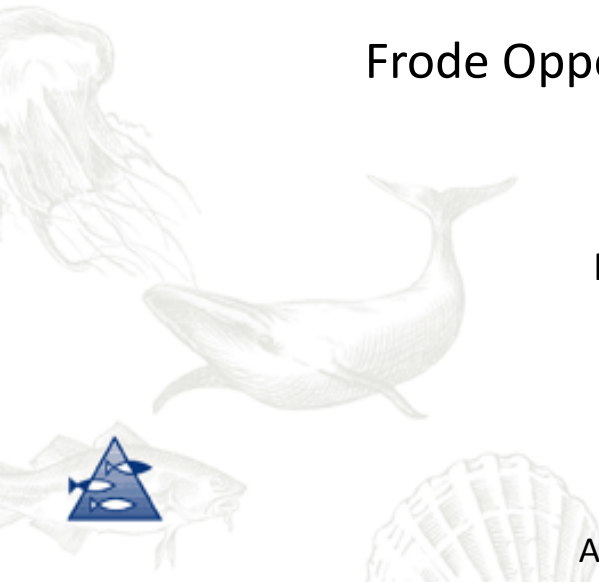
INSTITUTE OF MARINE RESEARCH
HAVFORSKNINGSINSTITUTTET



TOPICAL DELOUSING AFFECTS OXYGEN CONSUMPTION AND PHYSIOLOGY OF ATLANTIC SALMON, *SALMO SALAR* L., IN SEAWATER

Frode Oppedal, Thomas Torgersen and Rolf Erik Olsen

Institute of Marine Research, Norway
Norwegian Research funded: TOPILOUSE





Topical de-lousing

- a critical production point

Starvation

Handling

Disturbances

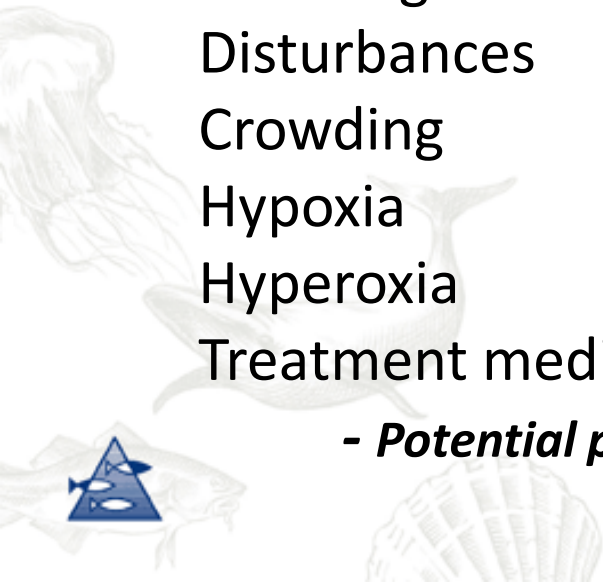
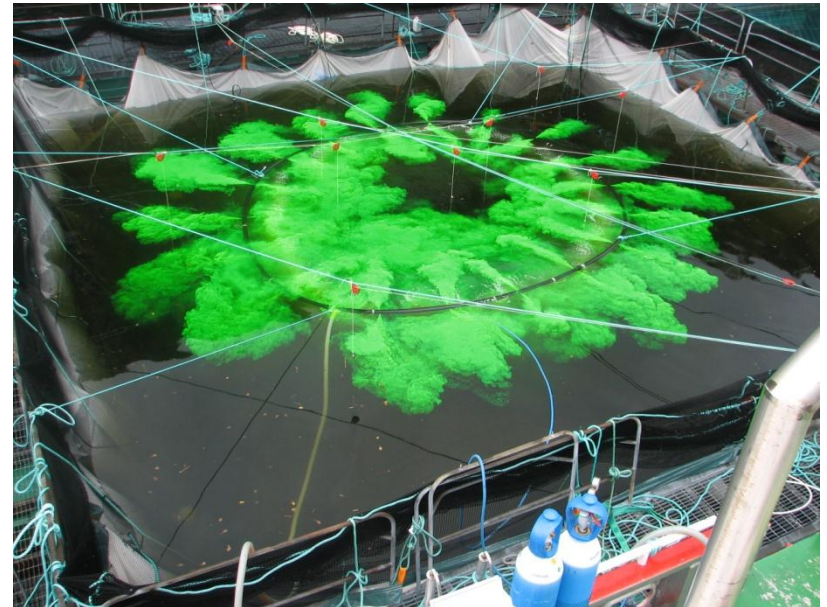
Crowding

Hypoxia

Hyperoxia

Treatment medicine - toxic

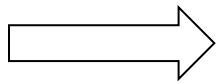
- **Potential poor performance**



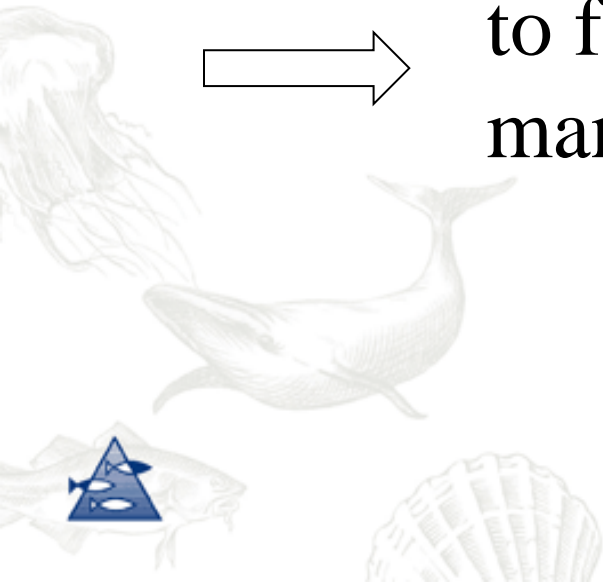
The aim:

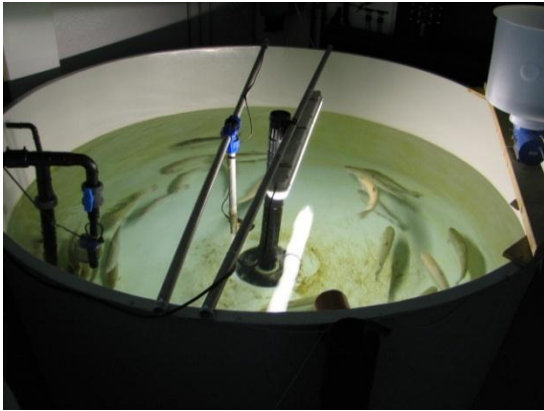
How topical delousing affects Atlantic salmon

- Oxygen consumption
- Behaviour
- Physiological responses



to facilitate improved oxygen management and fish well-being.





Material & methods

Tank Environmental Lab, IMR-Matre

Fish sizes 0.3 to 1.6 kg.

Acclimation

1. Pilot study
2. Chemotherapeutant (deltamethrin, cypermethrin, azamethiphos and hydrogen peroxide)
3. Temperature (2, 7, 12, 17 °C)
4. Control trials (disturbance or not)



Oxygen consumption was measured using flow-through respirometry.

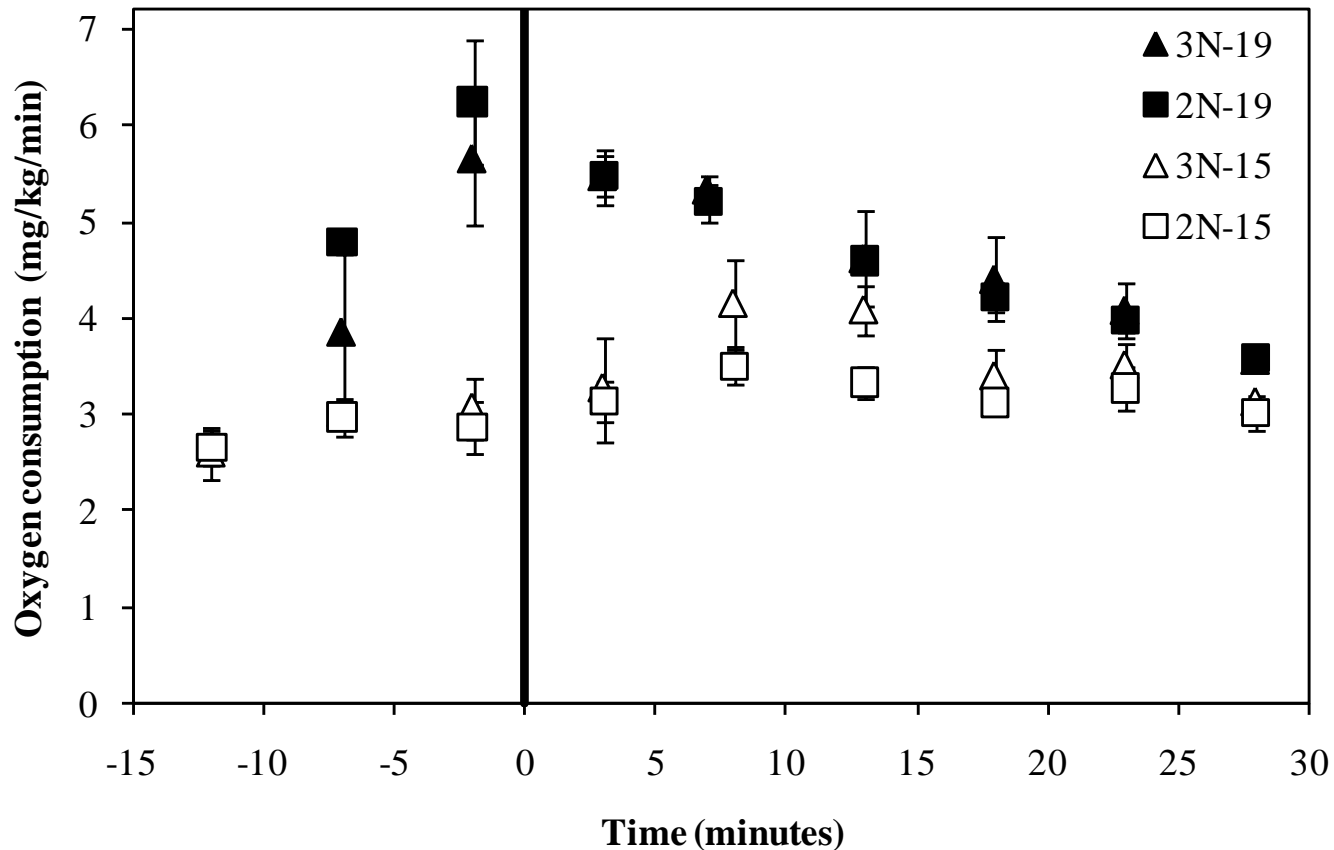
Behaviour was observed directly or through cameras

Physiology studied on blood samples

Pilot study, 2N/3N, 15/19 °C

Triploid (3N) and diploid (2N) salmon at 19 and 15 °C, 350 g,
Typically treated with deltamethrin at time 0.

Tank flow and water movement was reduced prior to addition, human presence.
Average of quadruple tanks (466L).



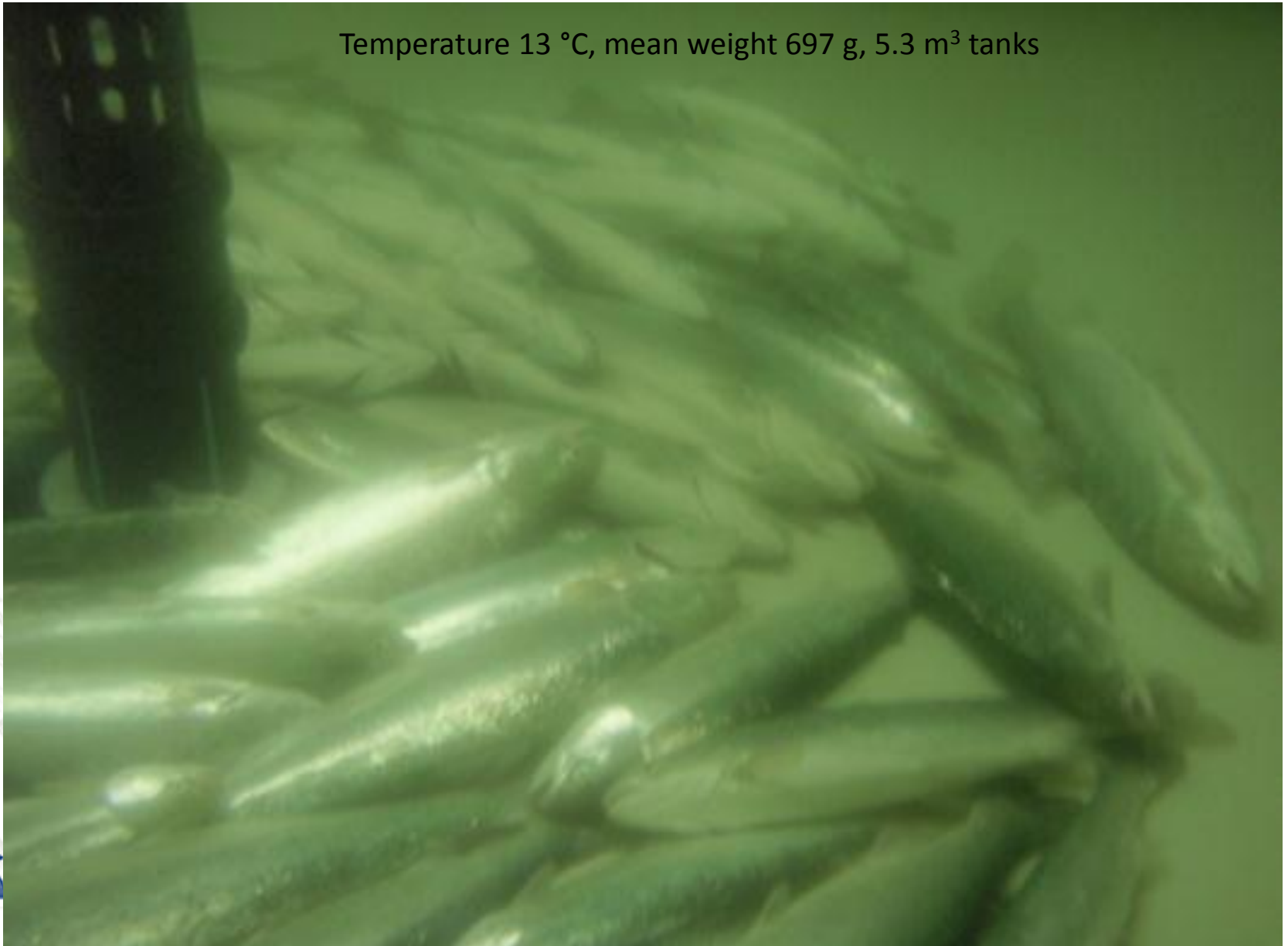
Behaviour: Shivering, uneven gill movements, unstable gill frequency, fish goes to the tank bottom, outrages/ shaking heads, strong body movements, some panic, more uncalm fish.



Chemoterapeutant trial

Hydrogen Peroxide (H_2O_2)

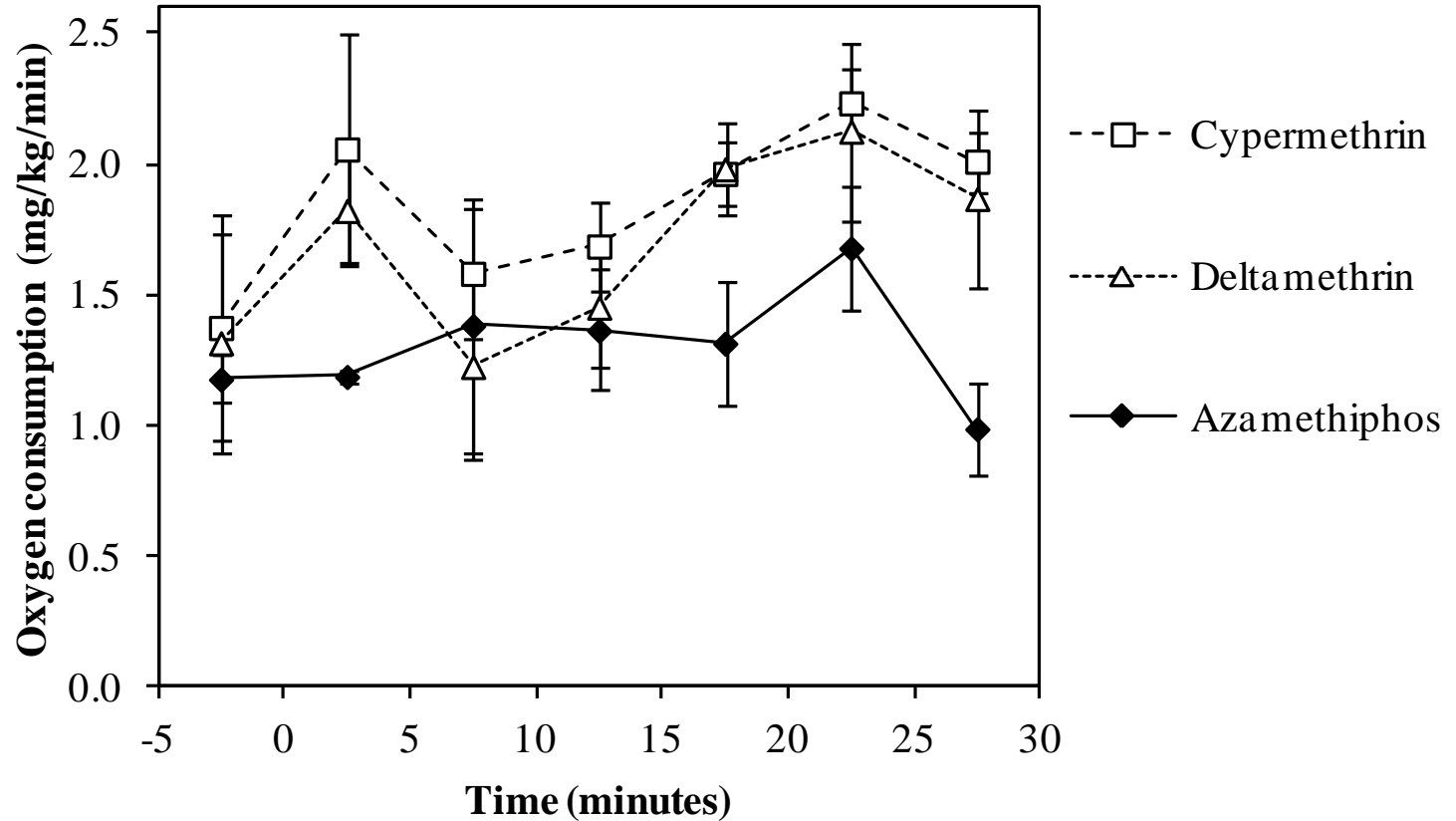
Temperature 13 °C, mean weight 697 g, 5.3 m³ tanks



Chemoterapeutant trial

Deltamethrin, cypermethrin, Azamethiphos, H₂O₂

13 °C, salmon, mean weight 697 g, 5.3 m³ tanks
Average ± s.e. are shown for triplicate tanks

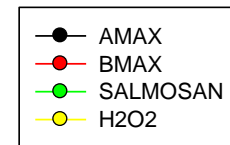
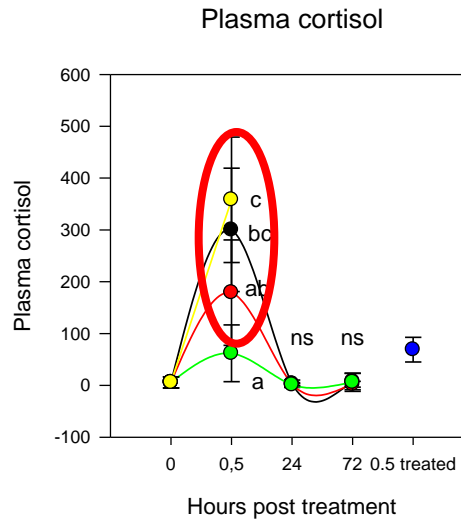
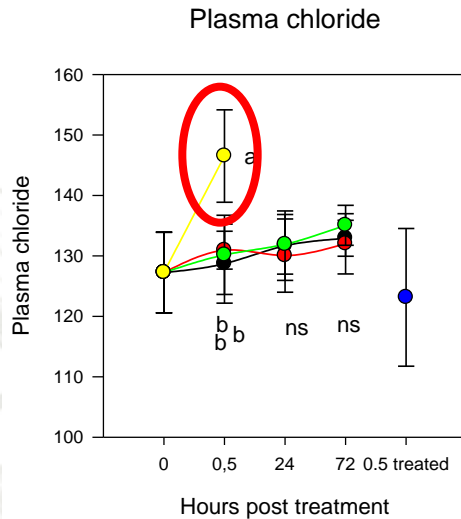
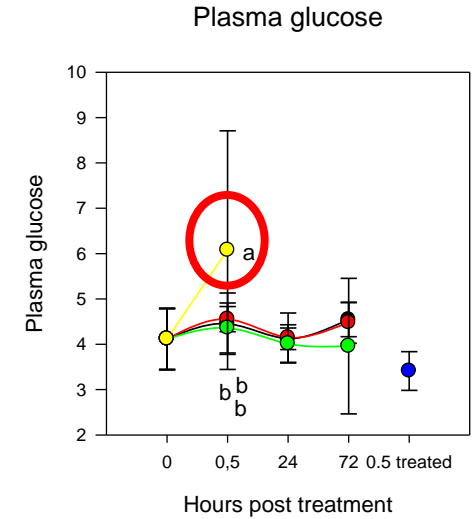
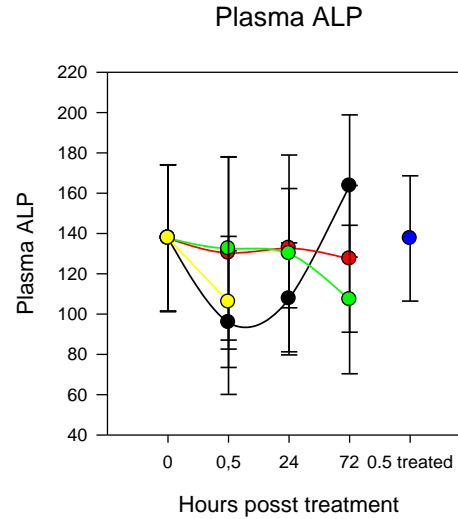
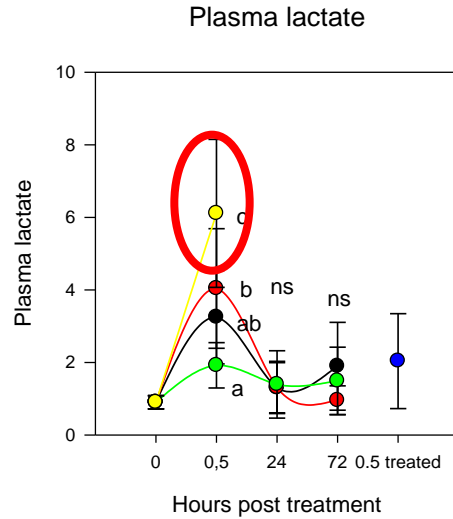


Behaviour: Too strong effect of add technique to pinpoint effect

Chemoterapeutant trial

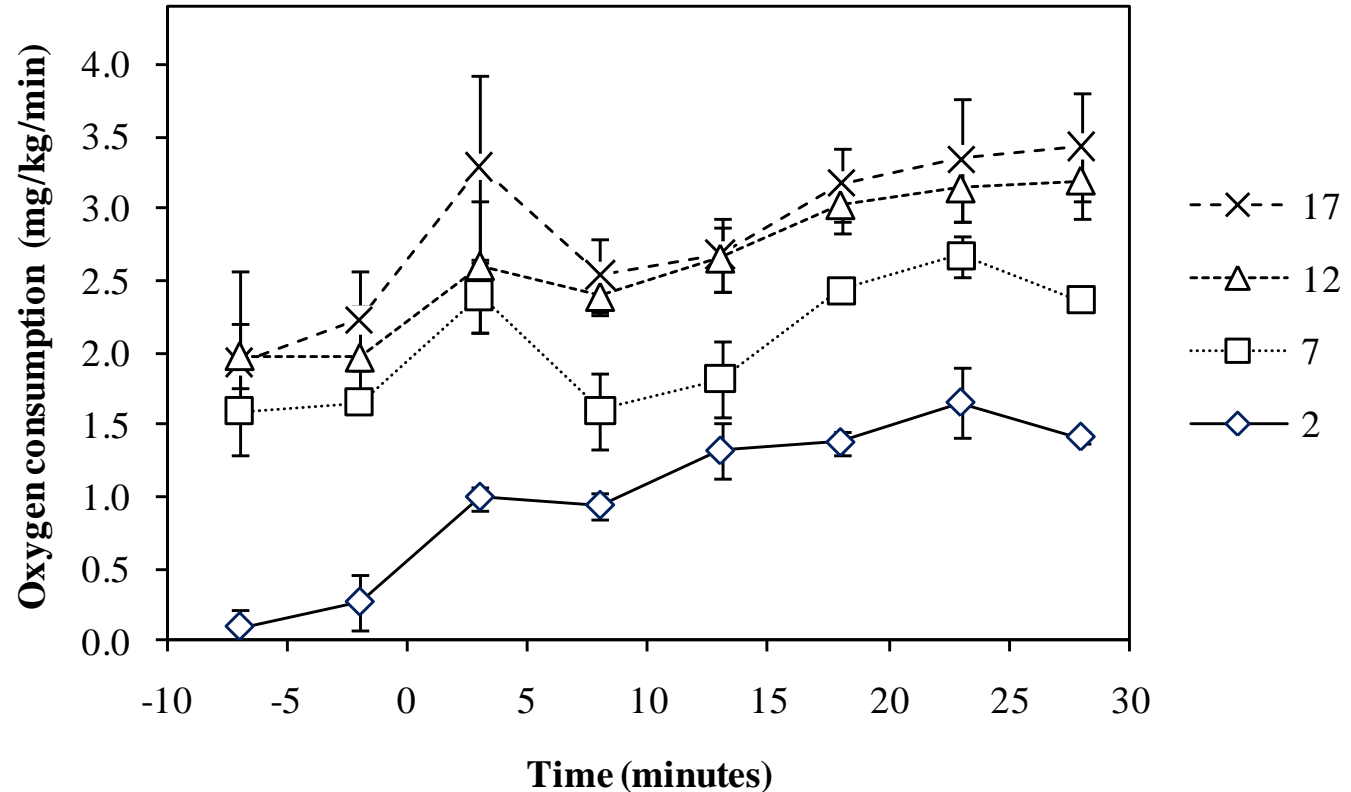
Deltamethrin, cypermethrin, Azamethiphos, H₂O₂

Alphamax, Betamax, Salmosan, H₂O₂, 13 °C salmon, 697 g



Temperature trial

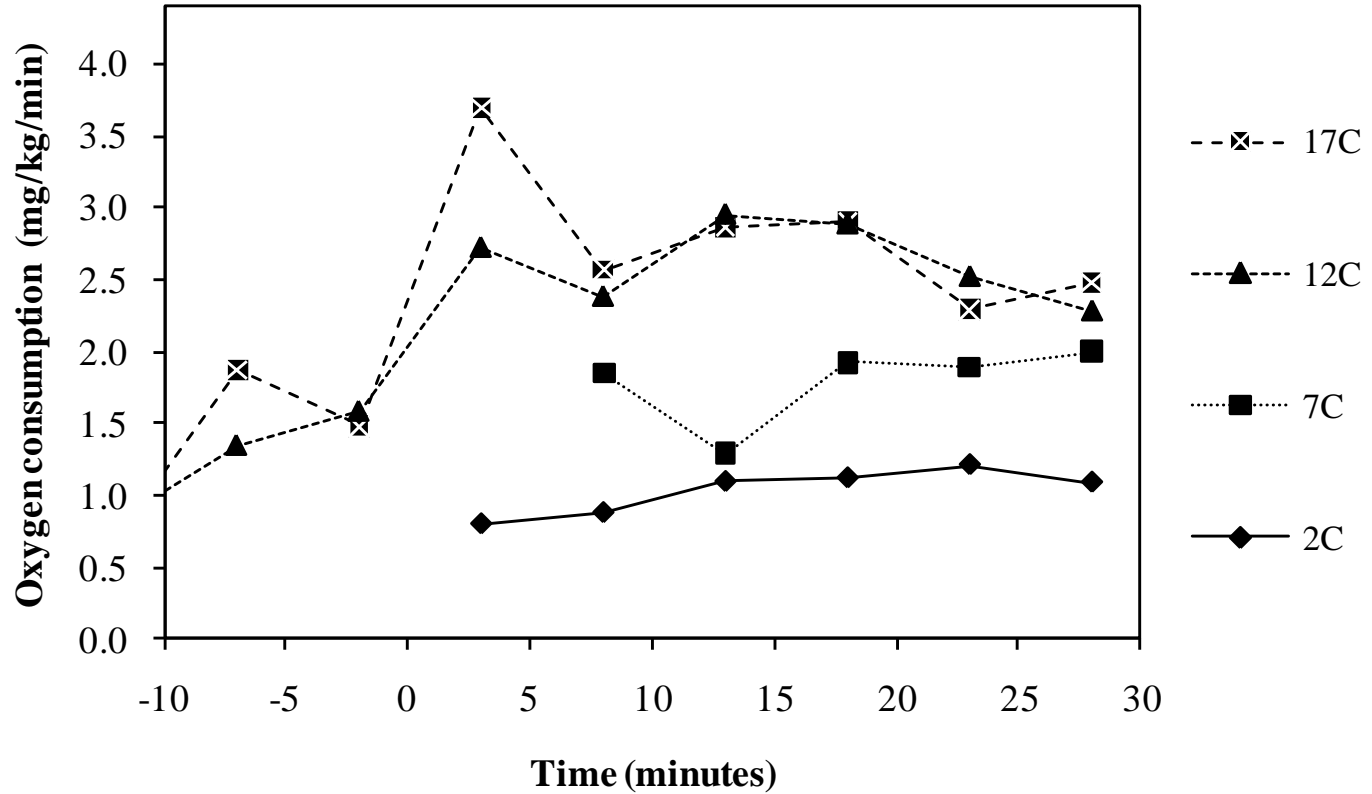
Salmon, 1591 g at 17, 12, 7 and 2 °C topically treated with deltamethrin at time 0.
Average \pm s.e. of triplicate tanks. 5.3 m³ tanks



Behaviour: Too strong effect of add technique to pinpoint effect

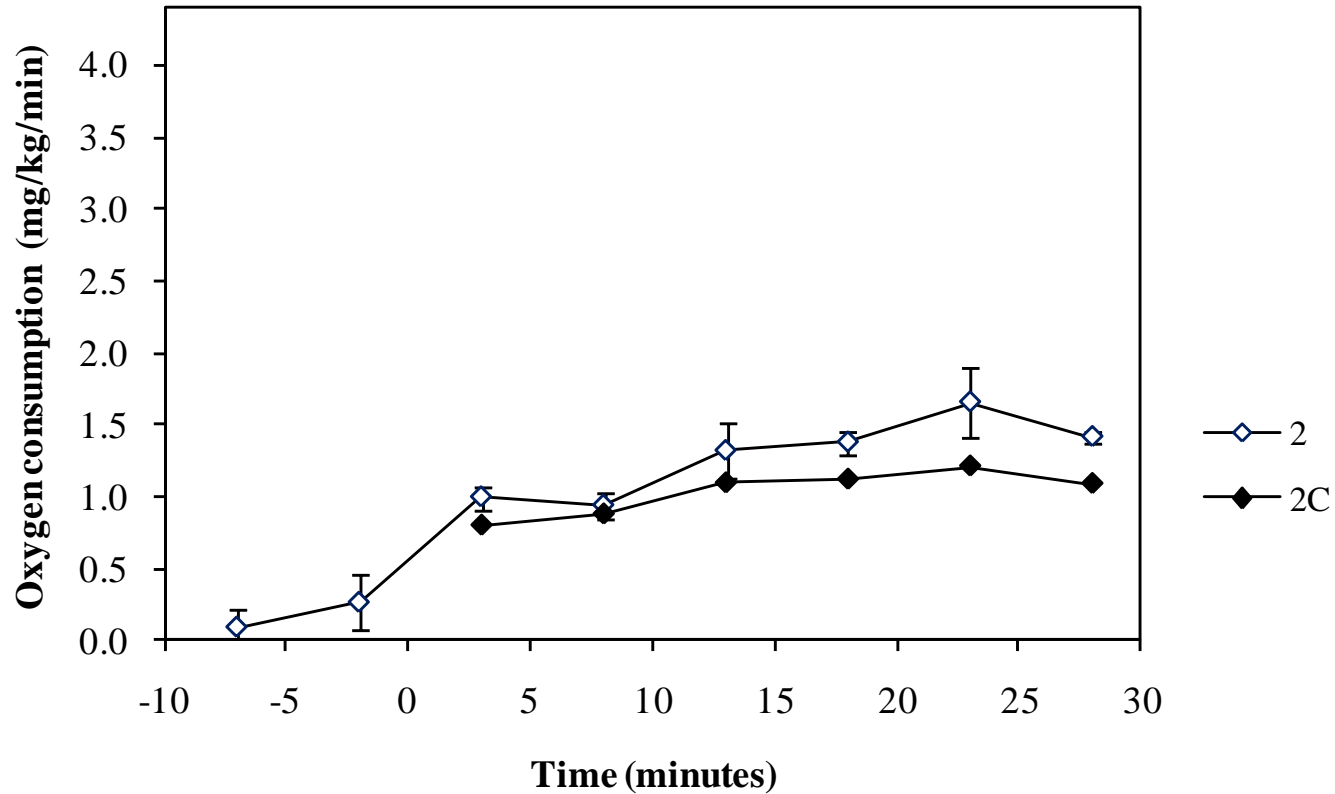
Temperature trial – controls (water added)

Salmon ,1591 g at 17, 12, 7 and 2 °C topically treated with deltamethrin at time 0.



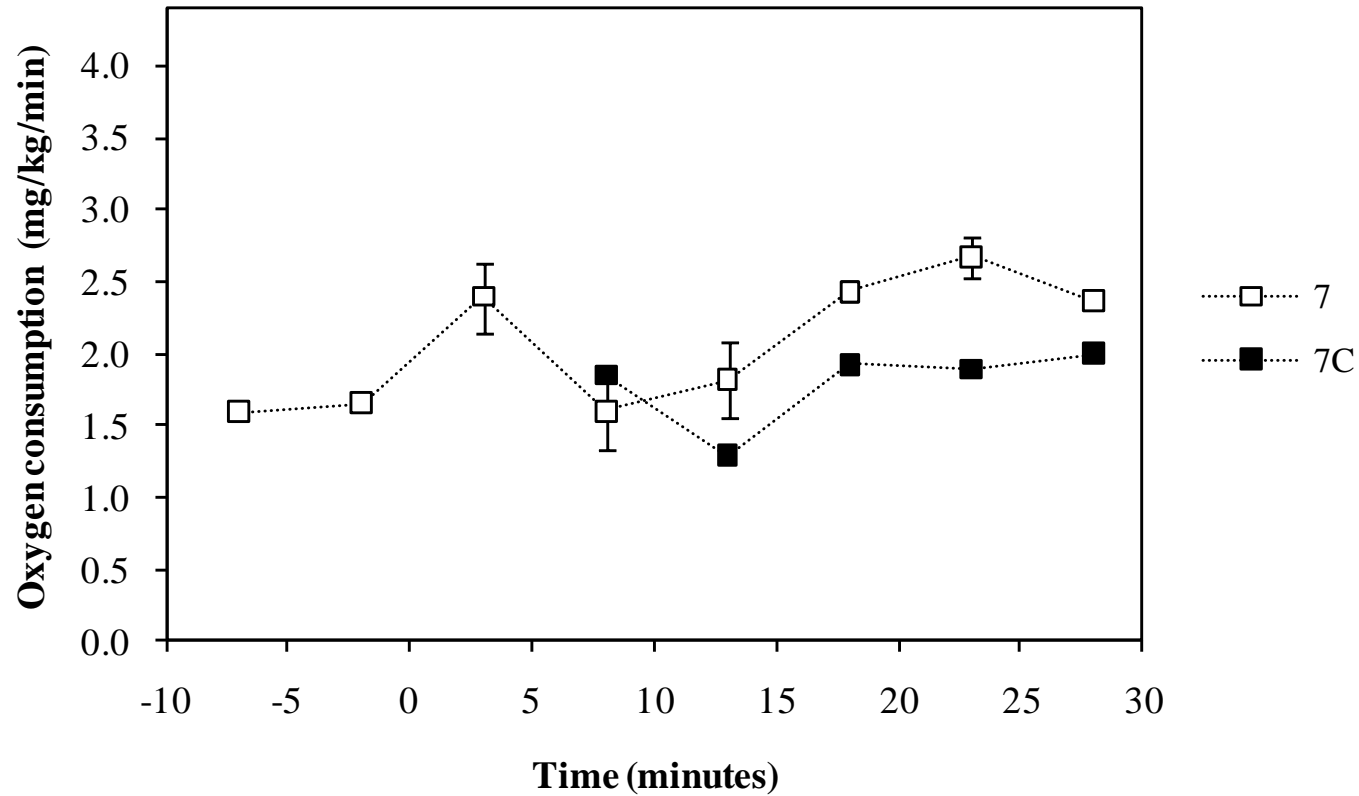
Temperature trial - 2 °C

Salmon, 1591 g at 17, 12, 7 and 2 °C topically treated with deltamethrin at time 0.
Average \pm s.e. of triplicate tanks



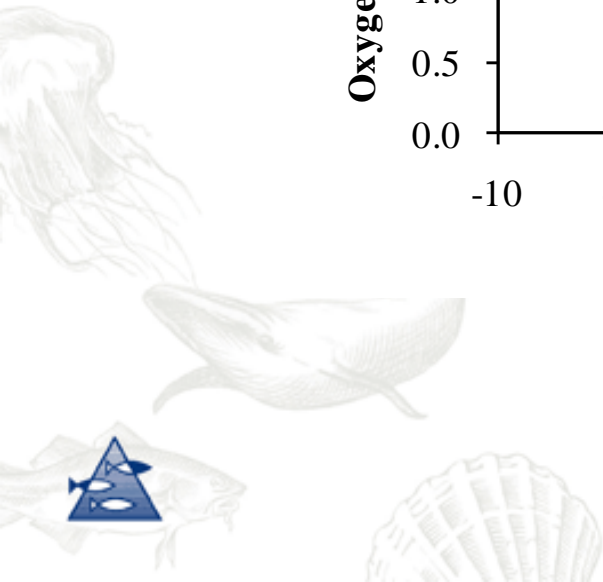
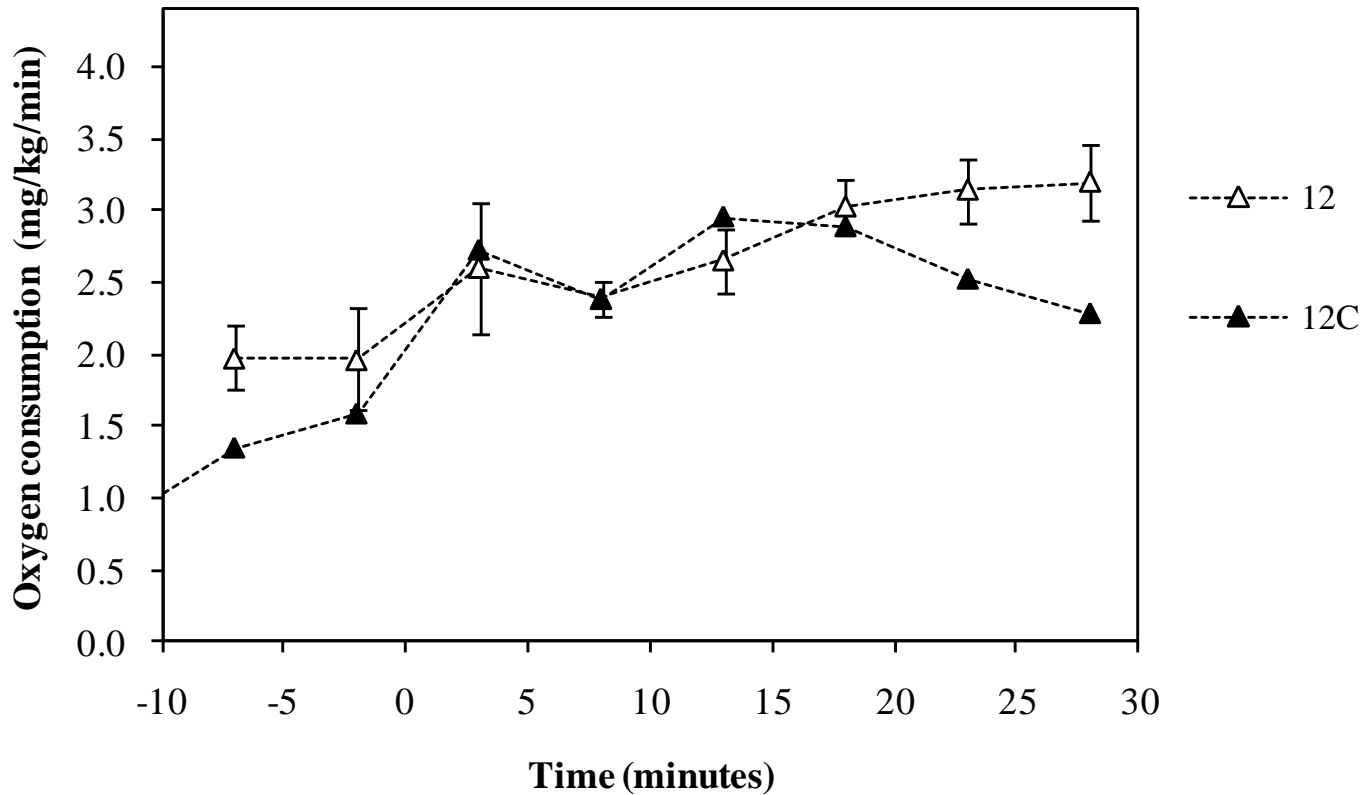
Temperature trial- 7 °C

Salmon ,1591 g at 17, 12, 7 and 2 °C topically treated with deltamethrin at time 0.
Average \pm s.e. of triplicate tanks



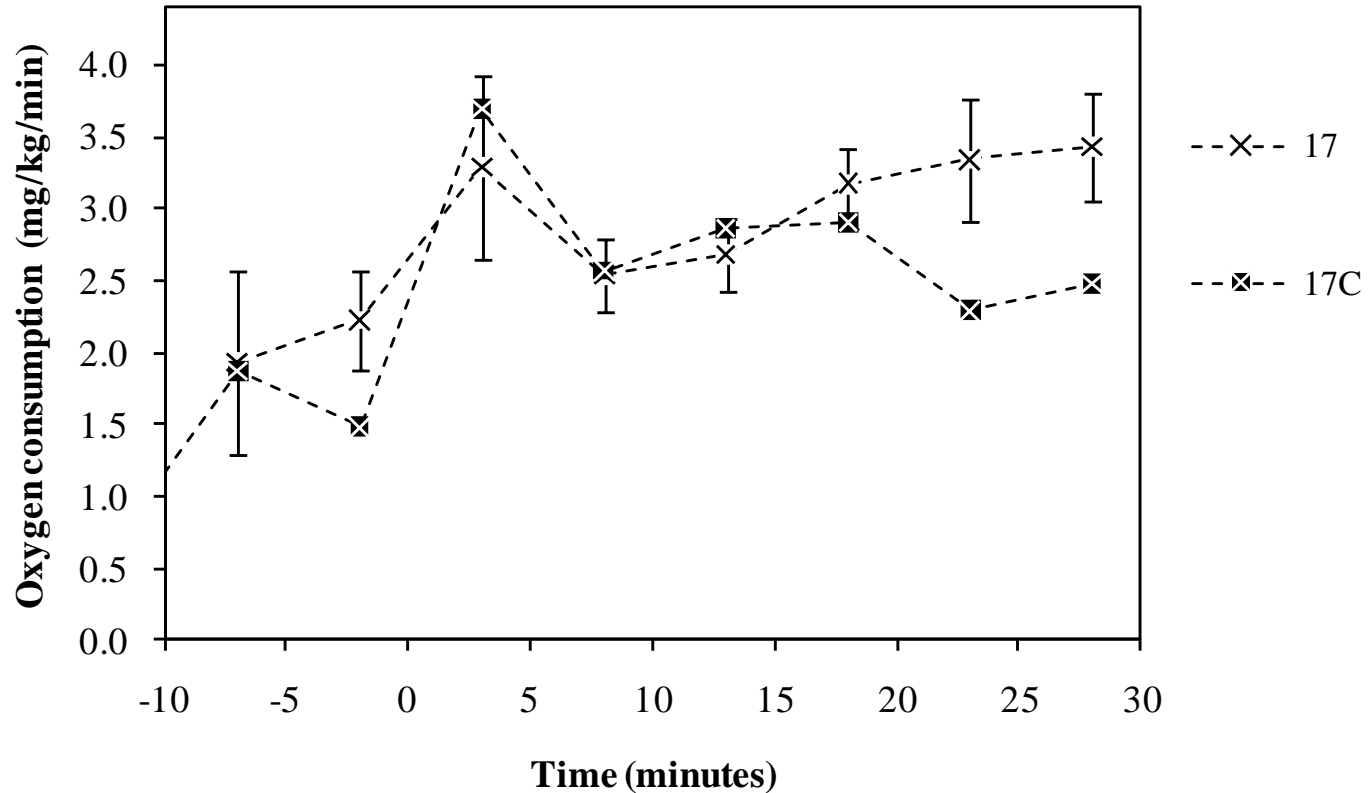
Temperature trial - 12 °C

Salmon, 1591 g at 17, 12, 7 and 2 °C topically treated with deltamethrin at time 0.
Average \pm s.e. of triplicate tanks



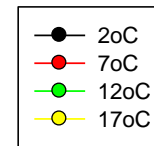
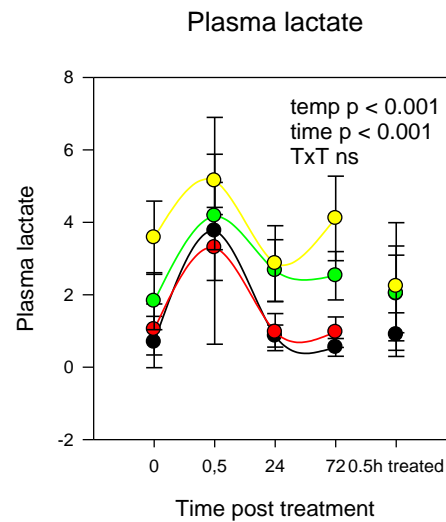
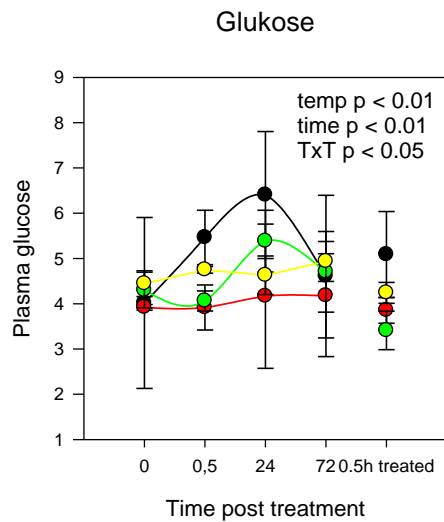
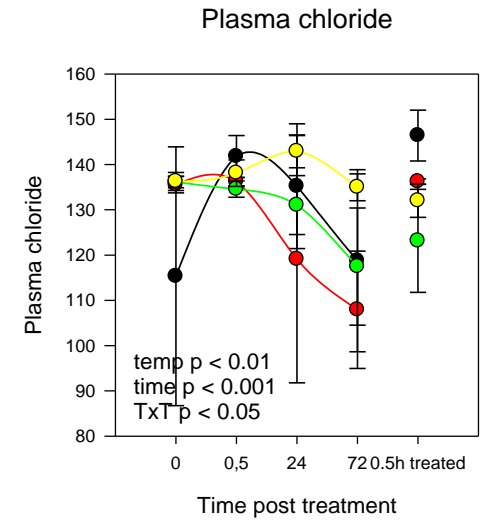
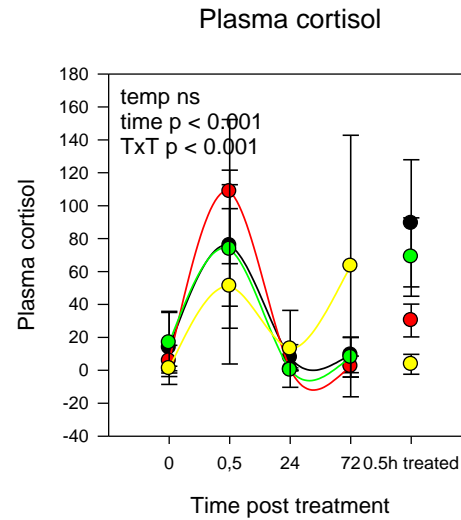
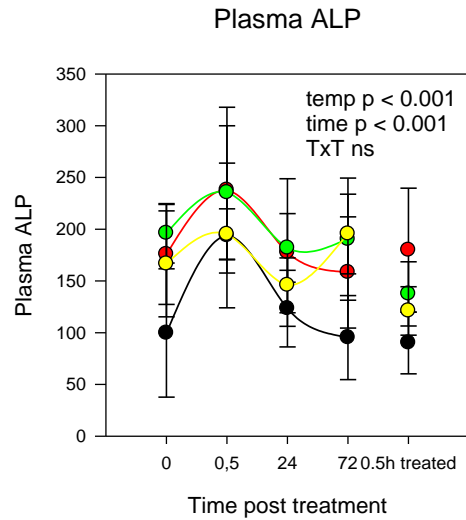
Temperature trial - 17 °C

Salmon, 1591 g at 17, 12, 7 and 2 °C topically treated with deltamethrin at time 0.
Average \pm s.e. of triplicate tanks



Temperature trial

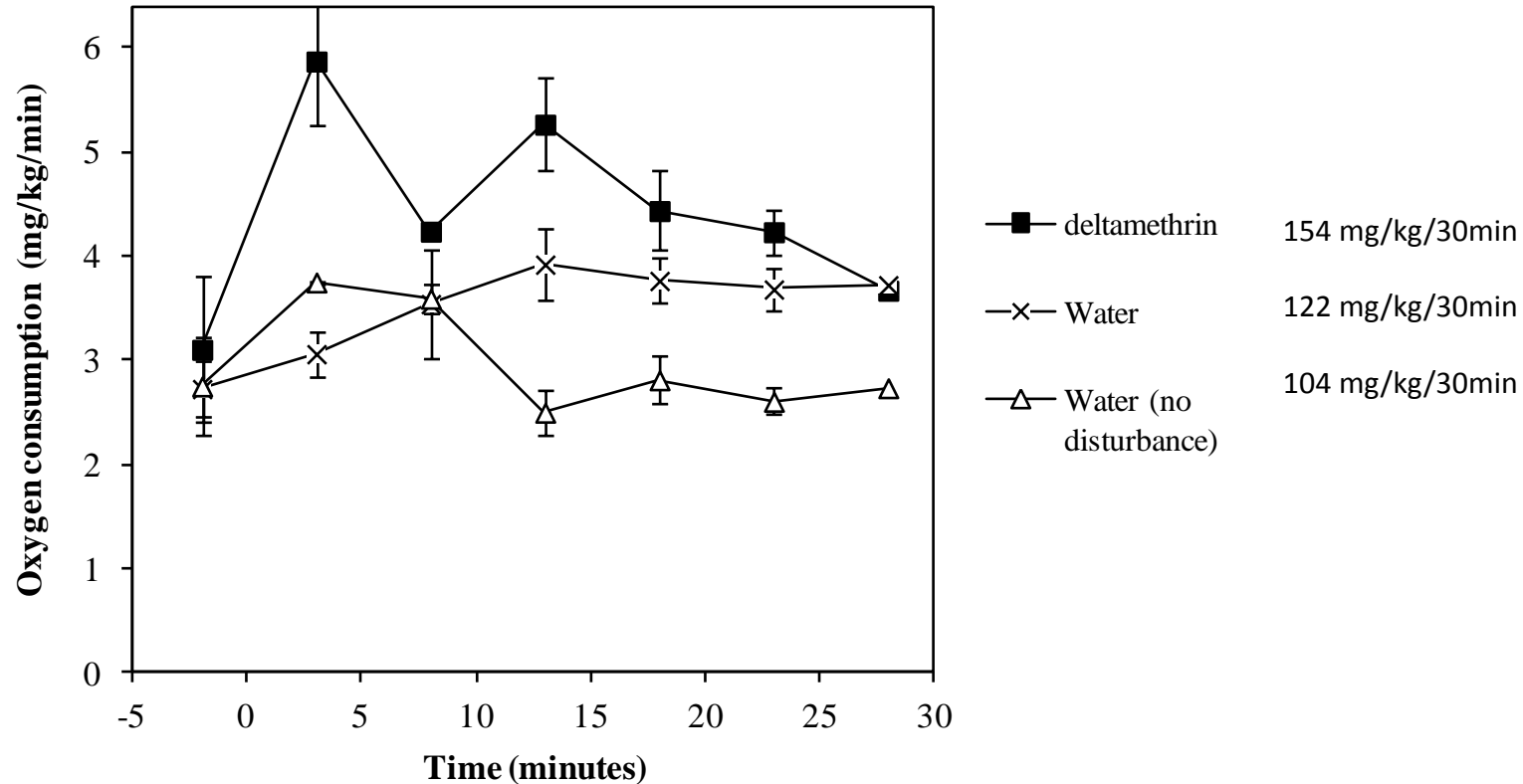
Salmon, 1591 g at 17, 12, 7 and 2 °C topically treated with deltamethrin



Control trial (undisturbed addition)

Salmon, 332 ± 78 g (mean \pm s.d.) at 12.5 °C topically treated with deltamethrin or water with or without simultaneous human presence at time 0. 5.3 m³ tanks

Average \pm s.e. of triplicate tanks

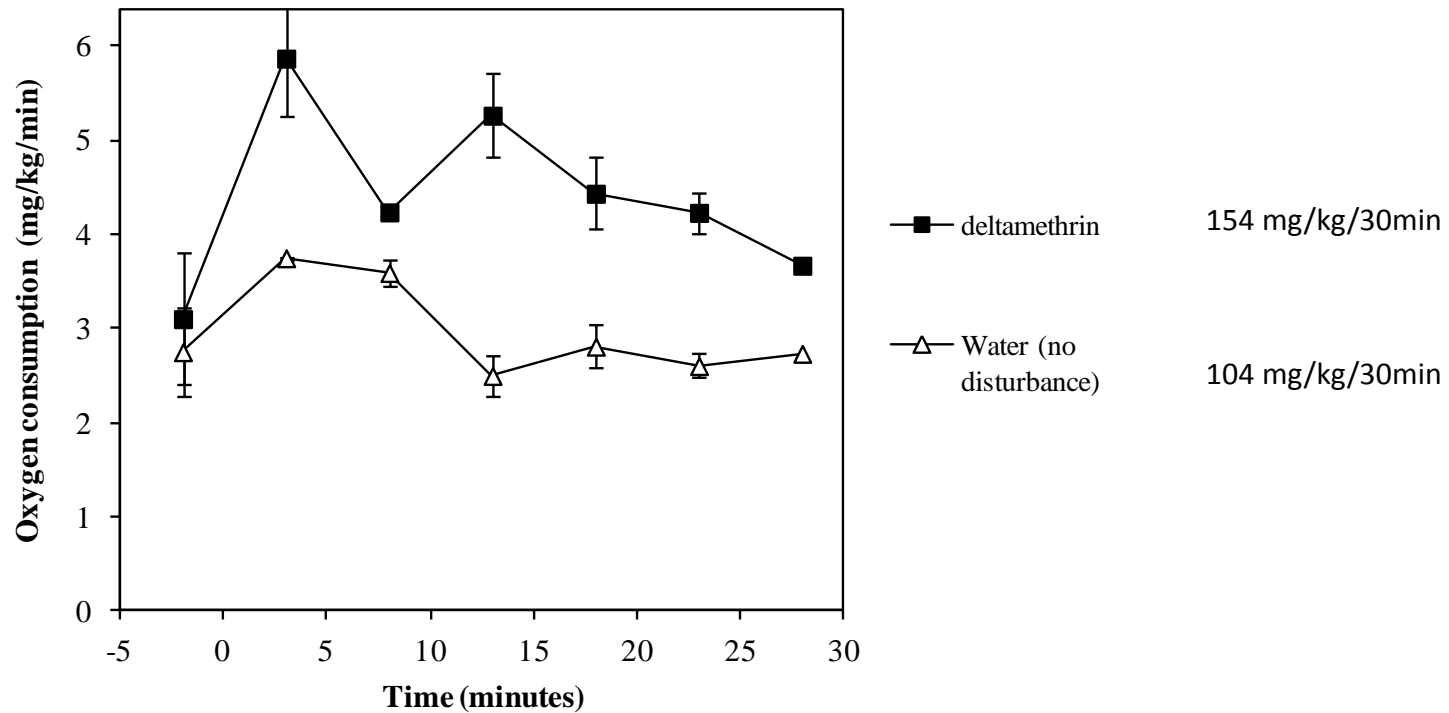


Behaviour: Fish to the bottom by both deltamethrin and lean over tank

Effect of treatment without disturbance

Salmon, 332 ± 78 g (mean \pm s.d.) at 12.5 °C topically treated with deltamethrin or water with or without simultaneous human presence at time 0

Average \pm s.e. of triplicate tanks



Summing up

V_{O_2} increase:

Human presence: 10 to 100 %

Chemotherapeutant: 10 to 48%

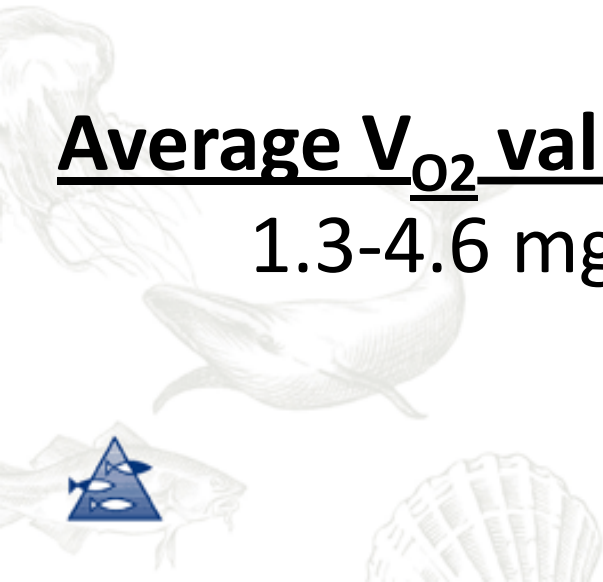
Pyretroids demand 40% higher than Azamethiphos

Temperature (>200% from 2 to 12°C)

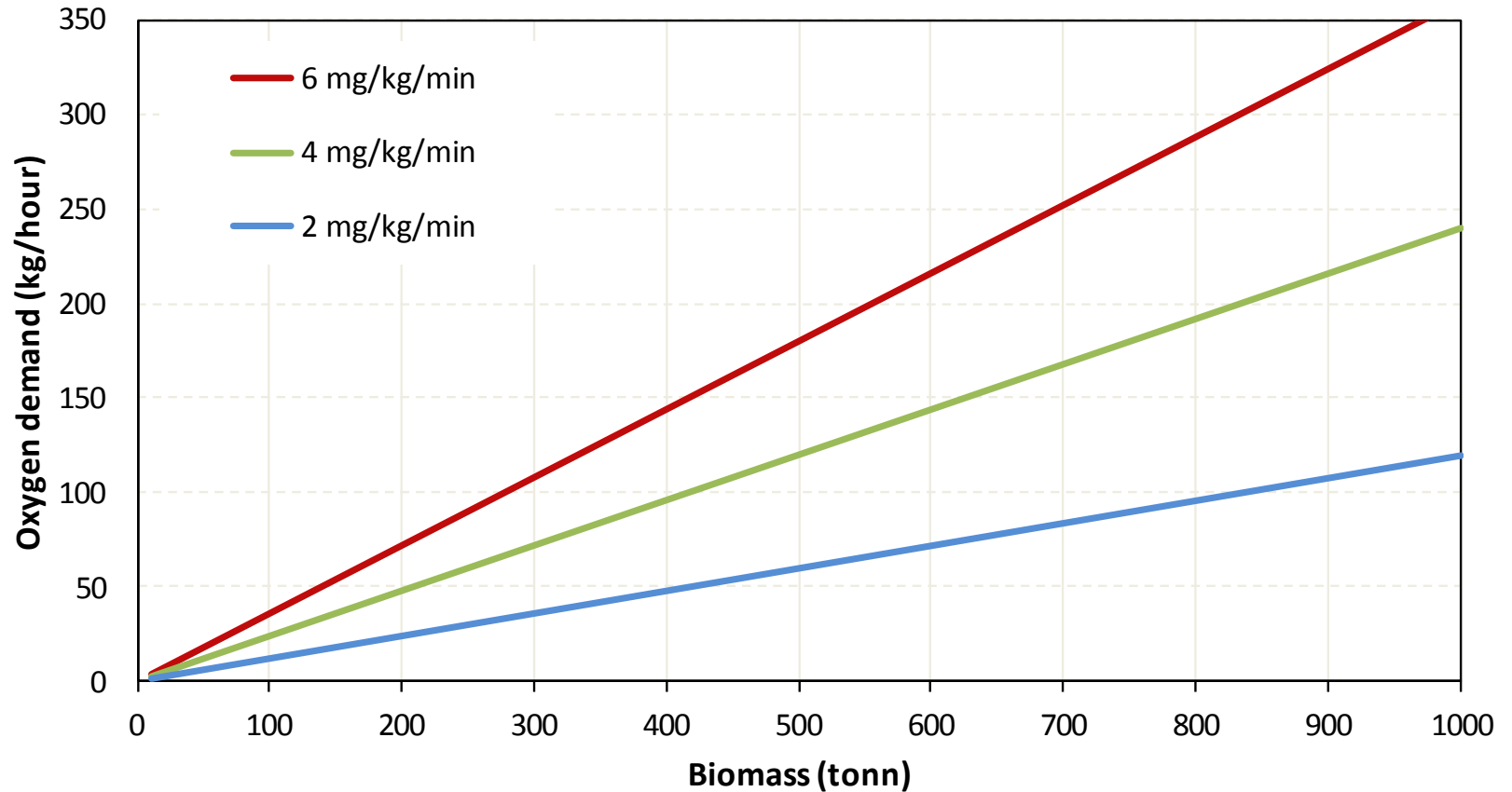
Small fish (> 30 % from 1.6 to 0.3 kg)

Average V_{O_2} values during treatment:

1.3-4.6 mg/kg/min



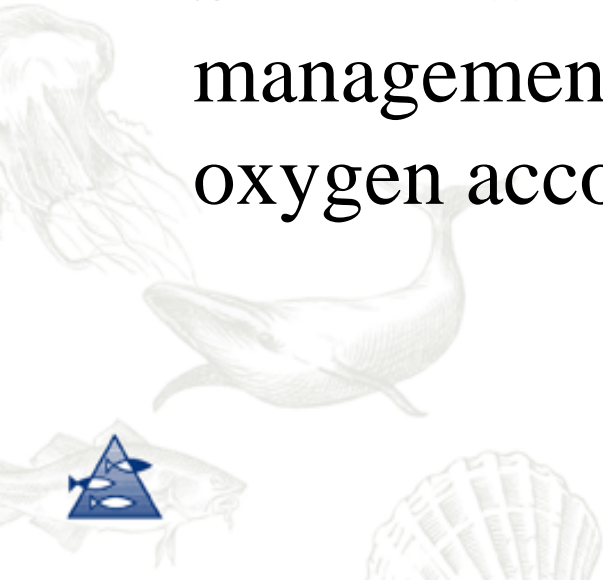
Oxygen demand and biomass



In conclusion

topical delousing affects oxygen consumption, behaviour and physiology.

Salmon welfare may be enhanced through management procedures of supplementary oxygen according to oxygen demands.





Thank you for your attention