Impacts of Antifouling paint on *Hemigrapsus oregonensis* and their stress physiology response

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Background

01 H. oregonensis

- Hairy shore crab
- Model organism
- Native species in the puget sound

02 Biofouling

- Accumulation of microorganisms, plants, algae, and small animals on unwanted surfaces (boats, buoys, markers)

Antifouling Paint 03

- Prevents microorganisms from attaching to surfaces
- Contains heavy metals (Cu, Pb, Zn)

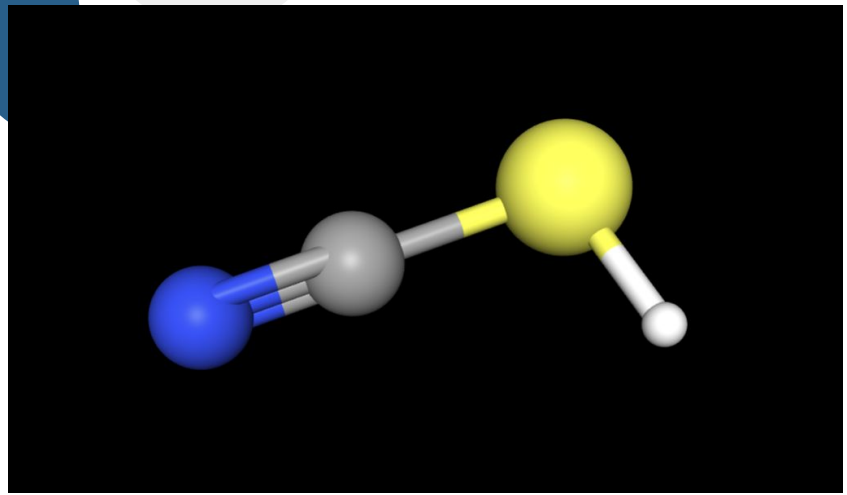
Impacts of Trace Metals 04

- Copper and zinc concentrations disrupt ion regulation, impair growth and reproduction in marine organisms

02

How does antifouling paint impact crab ecophysiology?

The Chemistry



National Center for Biotechnology Information (2025). PubChem Compound Summary for CID 11029823, Copper(1+);thiocyanate. Retrieved April 14, 2025 from https://pubchem.ncbi.nlm.nih.gov/compound/Copper_I_-thiocyanate.

Trace Metal Impacts

- Trace metals find their way into organisms from absorption through gills and skin, or from consuming sediment
- Trace metals over concentration thresholds have been found to impair osmoregulation, growth, and regulation, and in extremely high concentrations, trace metals induce death
-

Borkow, G., & Gabbay, J. (2005). ***Copper as a Biocidal Tool*****.** ***12*****(18), 2163–2175.**

Cima, F., & Varello, R. (2023). Potential disruptive effects of copper-based antifouling paints on the biodiversity of coastal macrofouling communities. *Environmental Science and Pollution Research*, *30*(4), 8633–8646. https://doi.org/10.1007/s11356-021-17940-2

03

Hypothesis

Null

There will be no changes to crab ecophysiology in response to antifouling paint

Alternative

There will be an increase in the righting time, lactate levels and triglyceride levels with crabs exposed to increasing amounts of antifouling paint.

04

Experimental Design

Trilux® 33 Aerosol

Active ingredient: Cuprous Thiocyanate biocide

Chemical Formula: CuSCN

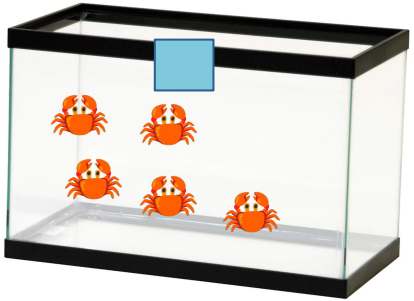
Model Experiment

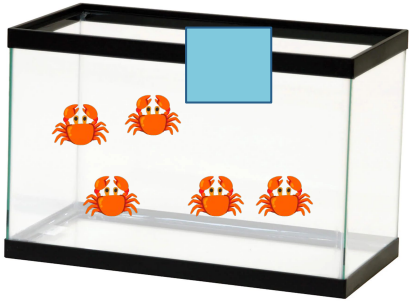
A simple bioassay with *Artemia* larvae to determine the acute toxicity of antifouling paints

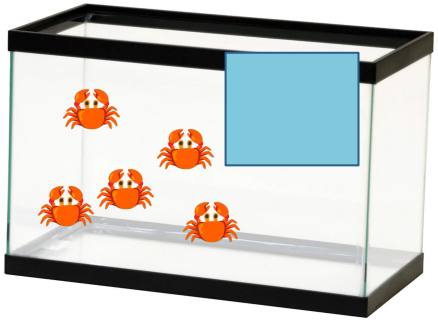
by Persoone, G. & Castritsi-Catharios, J.

- Set the base for toxicity testing of paints that are used on submerged surfaces
- Used surface area to volume ratio as metric for how to increase paint concentration

Control







Surface Area: 4 cm^2 16cm^2 64cm^2 25cm^2

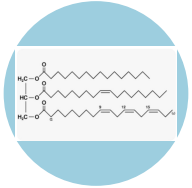
= Aluminum Foil Sprayed with antifouling paint

*Crabs left in conditions for one week

Measured Parameters

Righting time

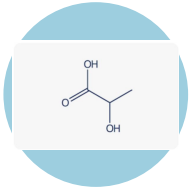
- The amount of time it takes for the crab to flip over after being placed on its back
- Longer righting times indicate increased stress



Triglycerides

- A lipid form of energy reserve
- Increased stress will result in the increase of triglycerides to get energy

Lactate



- Lactate is a byproduct in anaerobic respiration
- Under stressful conditions the crabs will increase use of anaerobic respiration resulting in the buildup of lactate in the hemolymph

✧ Stress induces the release of crustacean hyperglycemic hormone, increasing lipids within the hemolymph (Lorenzon et al., 2008). ✧

Questions?

Persoone, G., & Castritsi-Catharios, J. (1989). A simple bioassay with *Artemia* larvae to determine the acute toxicity of antifouling paints. *Water Research*, 23(7), 893–897. https://doi.org/10.1016/0043-1354(89)90014-6

Lorenzon, S., Giulianini, P. G., Libralato, S., Martinis, M., & Ferrero, E. (2008). Stress effect of two different transport systems on the physiological profiles of the crab Cancer pagurus. *Aquaculture*, 278(1–4), 156–163.

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