Toxicity assessment of contaminants of emerging concern (CECs) on marine zooplankton

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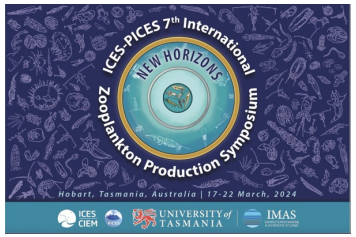
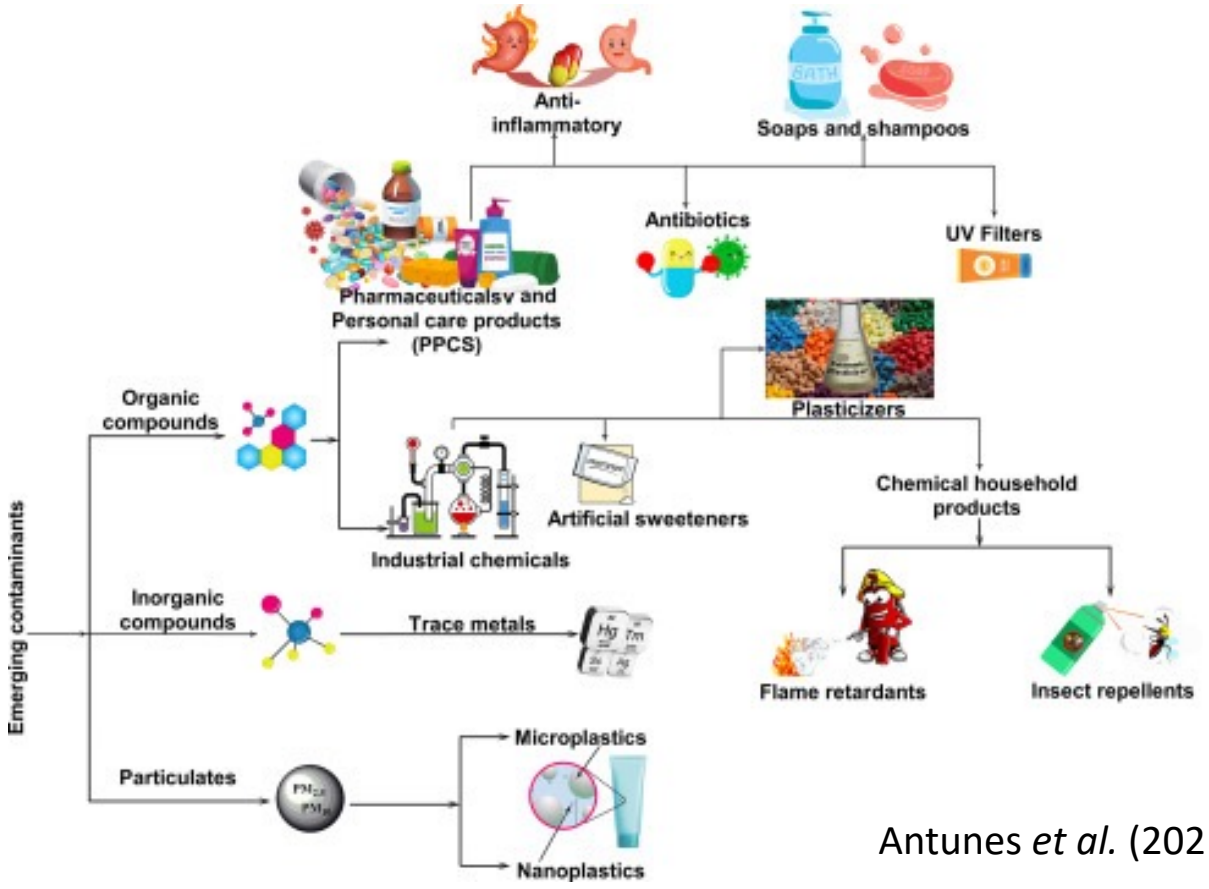


What are Contaminants of Emerging Concern (CECs)?

CECs are pollutants that have been detected in environmental monitoring samples, that may cause **ecological or human health impacts**, and typically are **not regulated** under current environmental laws.

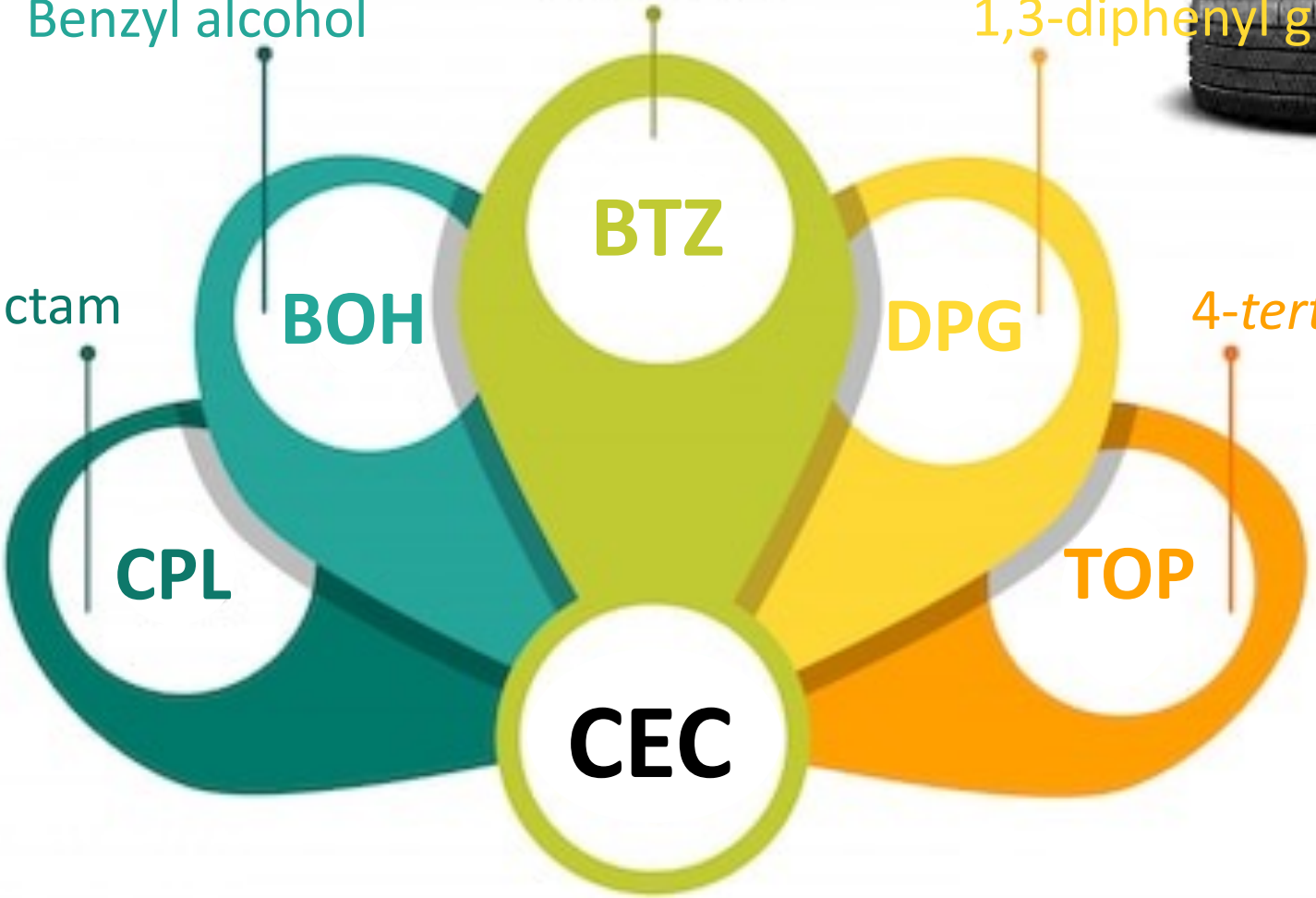


Antunes *et al.* (2021)

1H-Benzotriazole

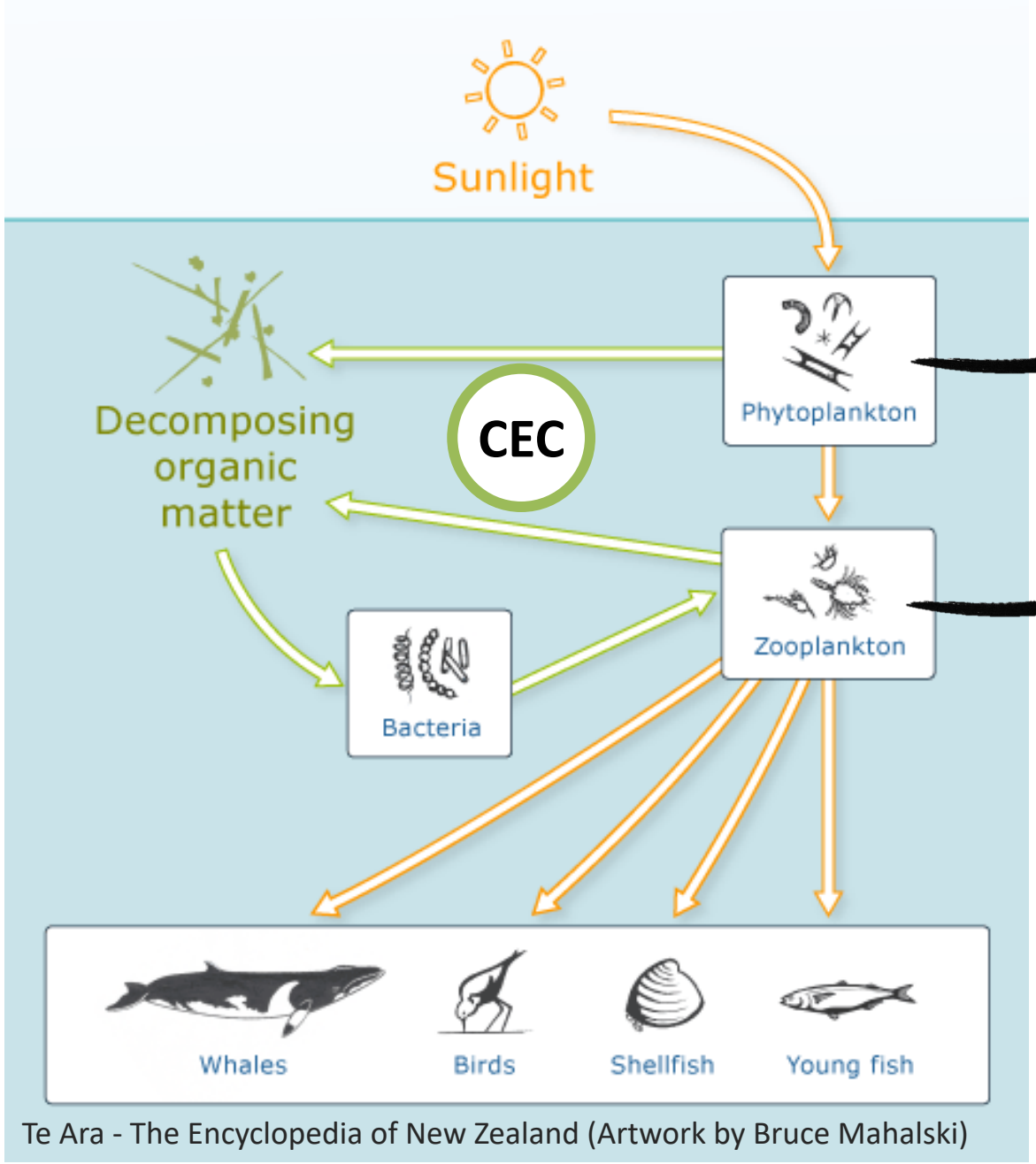
Benzyl alcohol

1,3-diphenyl guanidine



ε-Caprolactam

4-*tert*-Octylphenol

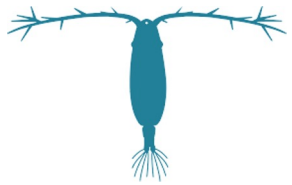


Te Ara - The Encyclopedia of New Zealand (Artwork by Bruce Mahalski)

Model species

Phaeodactylum tricornutum

Diatom



Acartia tonsa

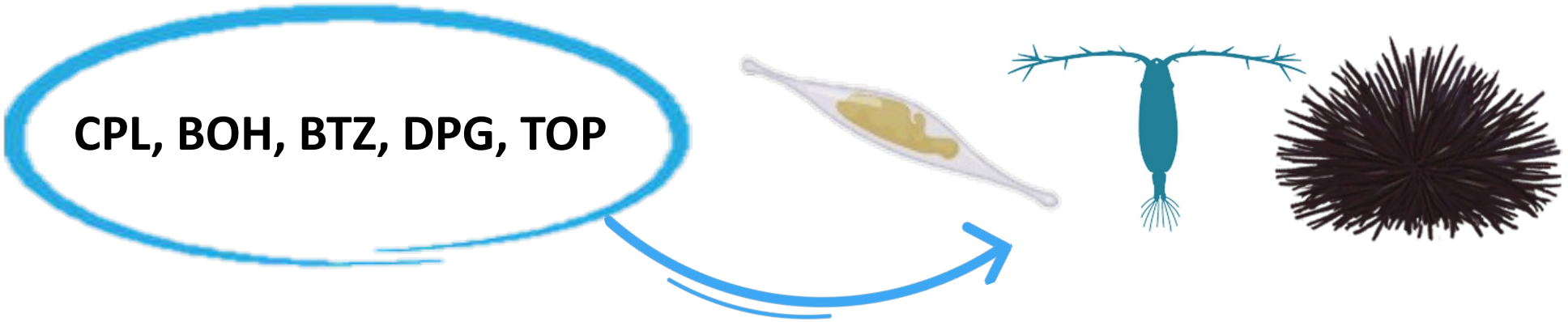
Adult
Holoplankton

Arbacia lixula

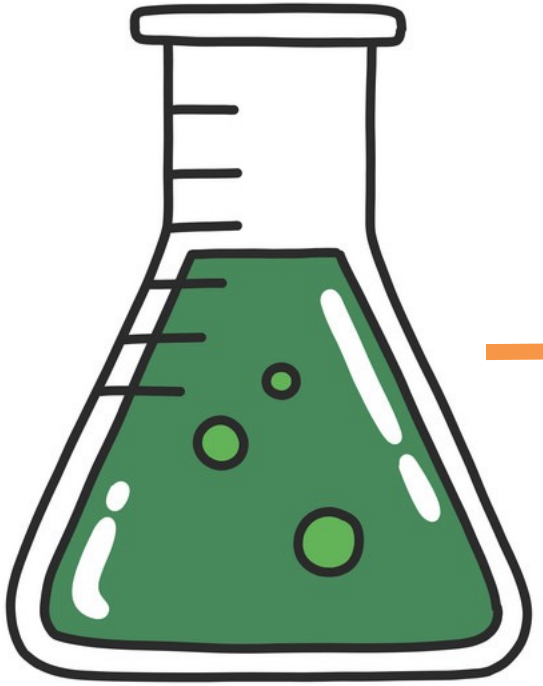
Embryos
Meroplankton

Objective

The objective of this research is a comprehensive investigation into the ecotoxicological impact of **five selected CEC on different trophic levels** within aquatic ecosystems.

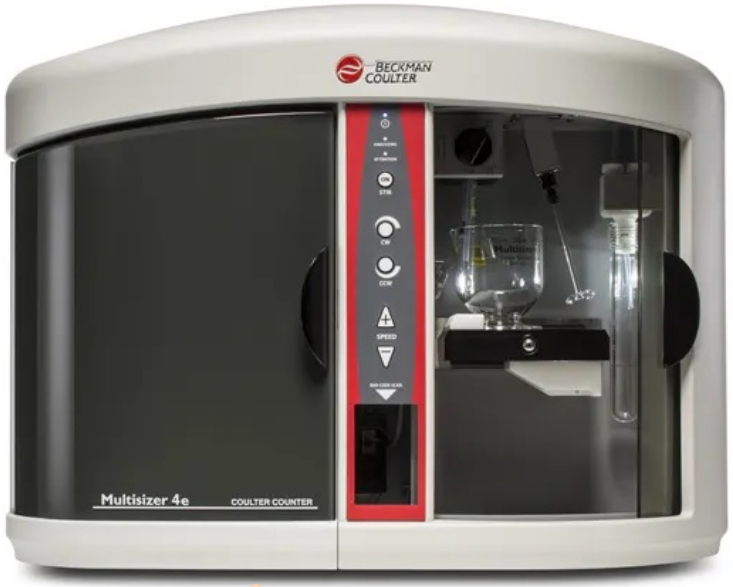


Methods · Microalgae *Phaeodactylum tricornutum*



20.000 cell/mL
in 25 mL

48
hours



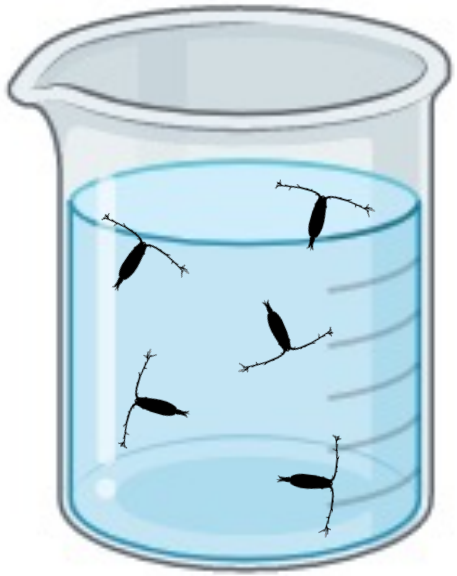
Coulter Counter Multisizer

Cells per milliliter

Endpoint: cell concentration

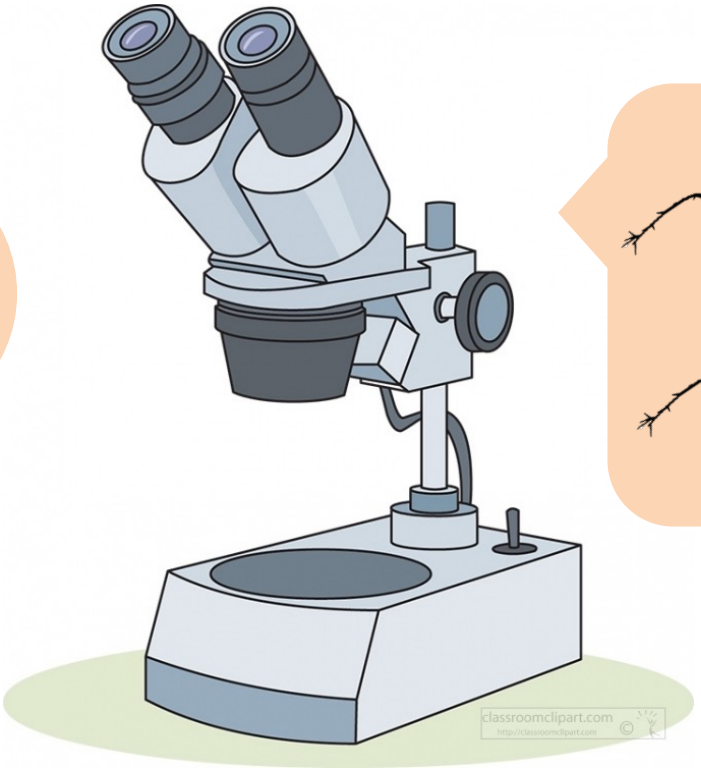
$$\textbf{\textit{Growth variation}}\ (\%) = 100 \cdot \frac{sample\ cells/mL}{control\ average}$$

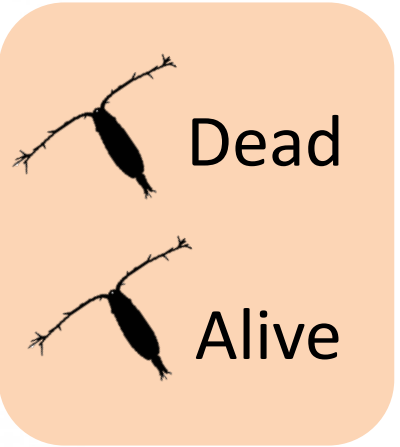
Methods · Copepod adults *Acartia tonsa*



20 copepods
in 25 mL

48
hours

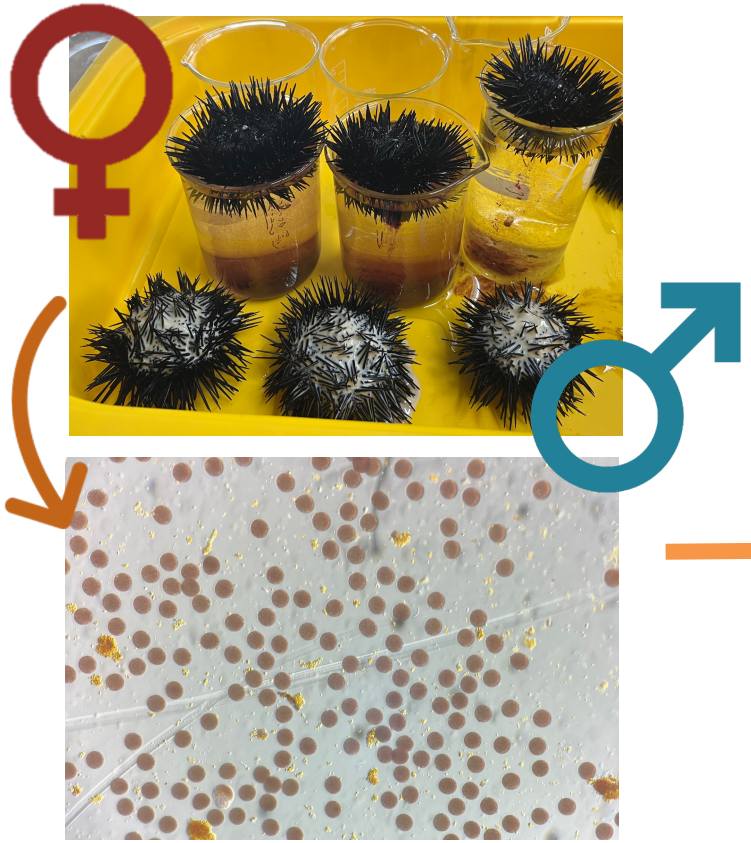




Endpoint: mortality

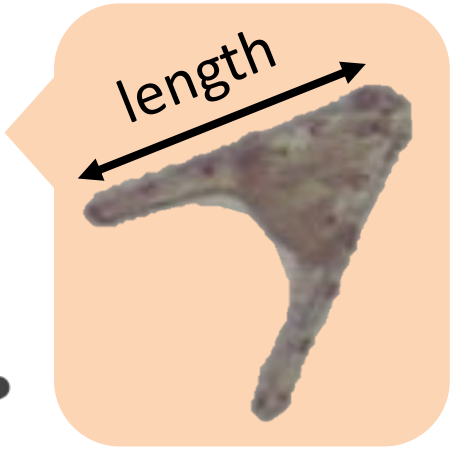
$$\textbf{\textit{Mortality rate}}\ (\%) = 100 \cdot \frac{dead}{total}$$

Methods · Sea urchin embryos *Arbacia lixula*



30 embryos per mL
in 3 mL

48 hours

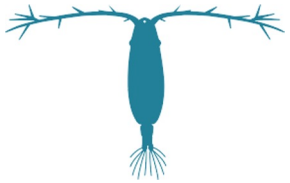


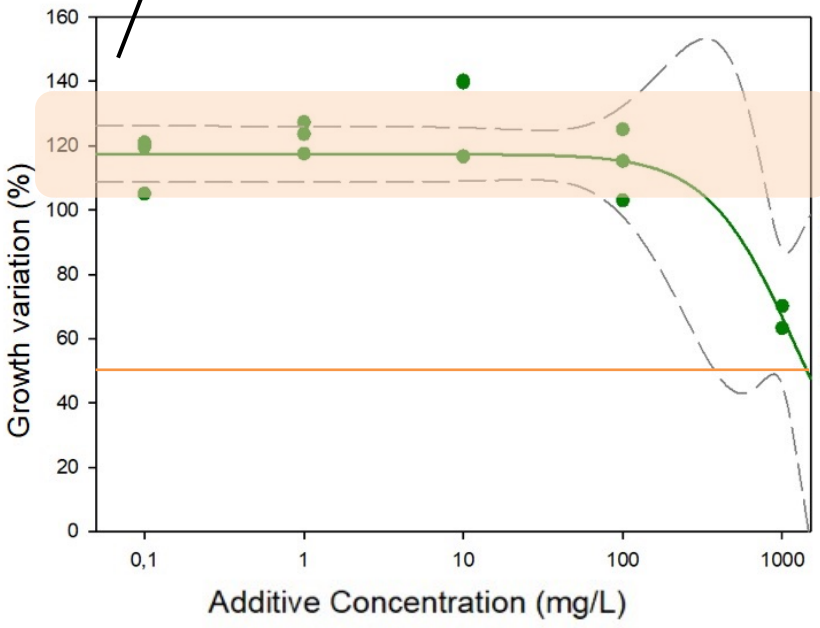
Endpoint: larval length

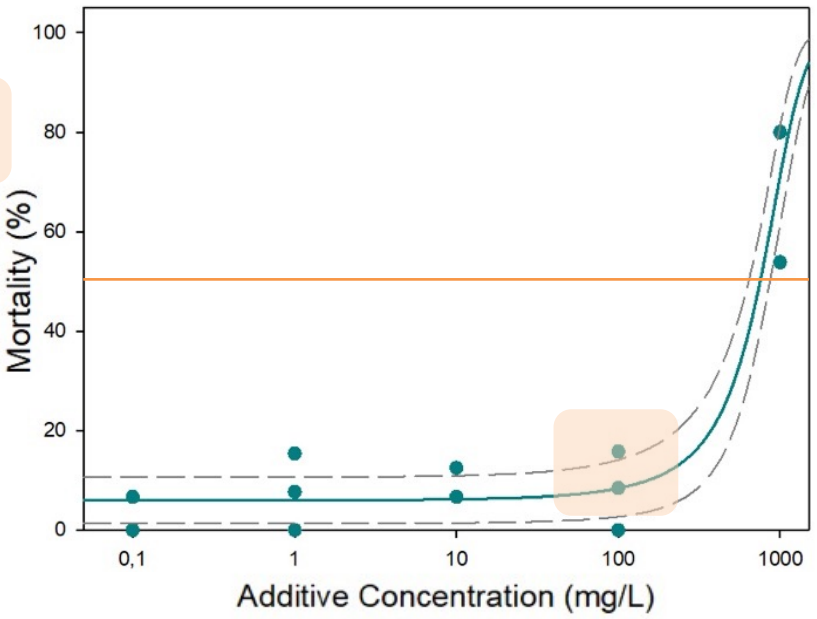
$$\textbf{\textit{Growth inhibition}}\ (\%) = 100 \cdot \frac{sample\ length}{control\ length}$$

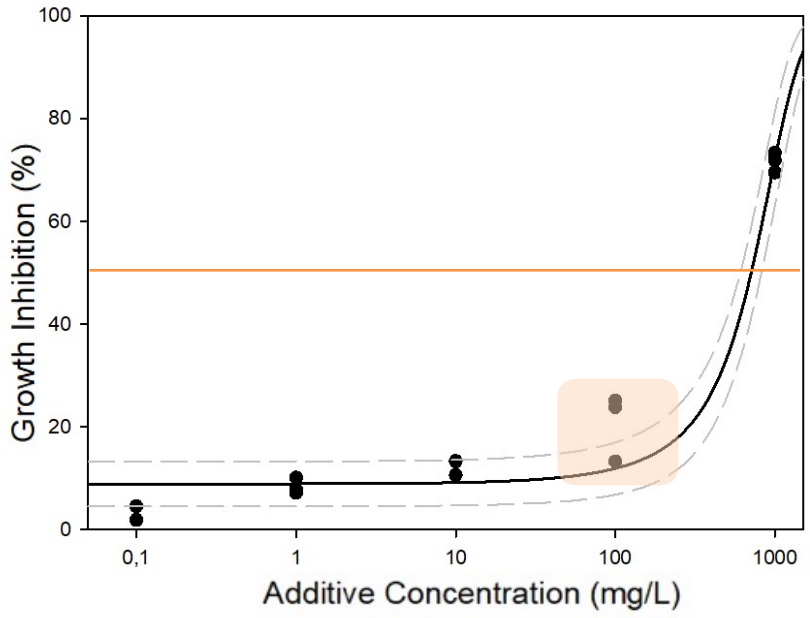
Results and Ecological implications

~20% more than in the control!









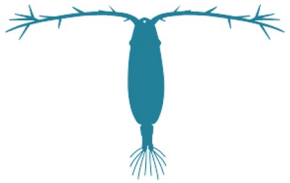
EC_{50} = 1185.20 mg/L

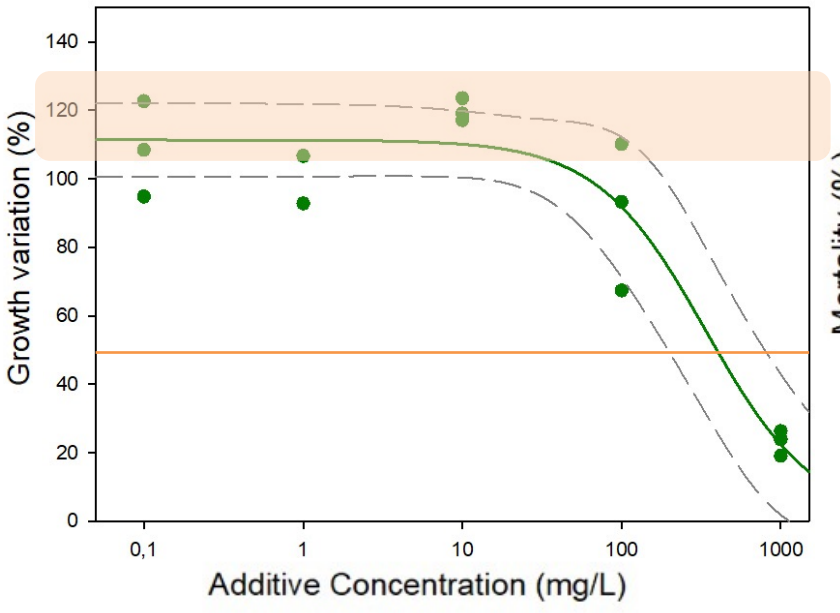
LC_{50} = 751.95 mg/L

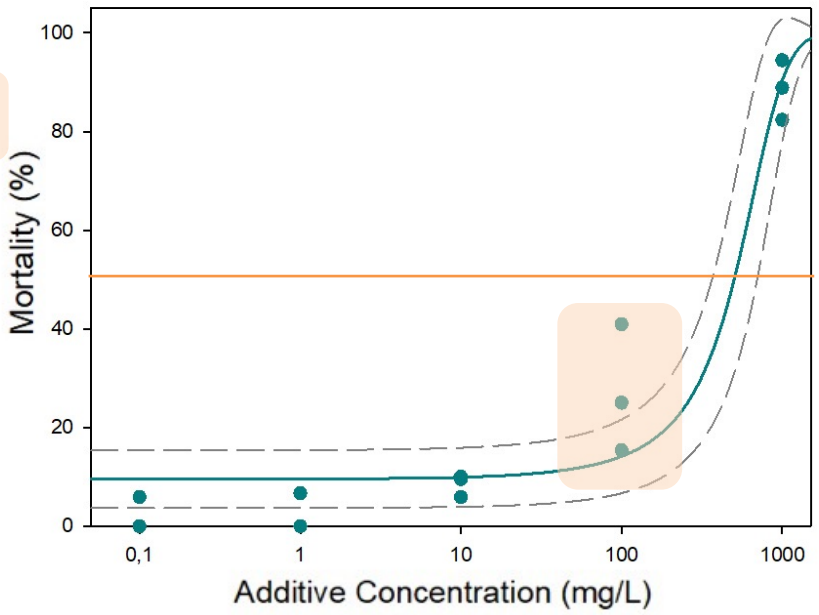
EC_{50} = 710.92 mg/L

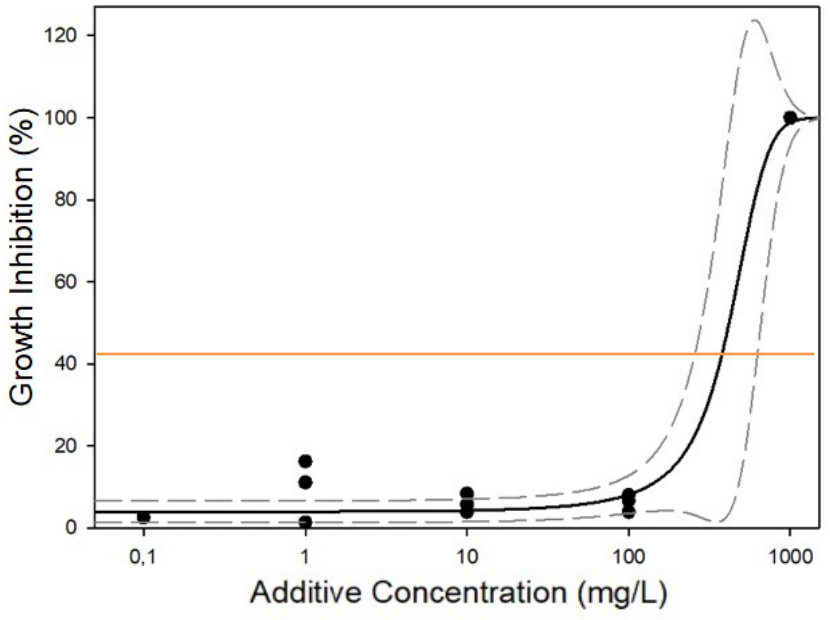
ε-Caprolactam (CPL)

Results and Ecological implications









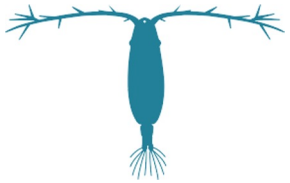
EC_{50} = 393.24 mg/L

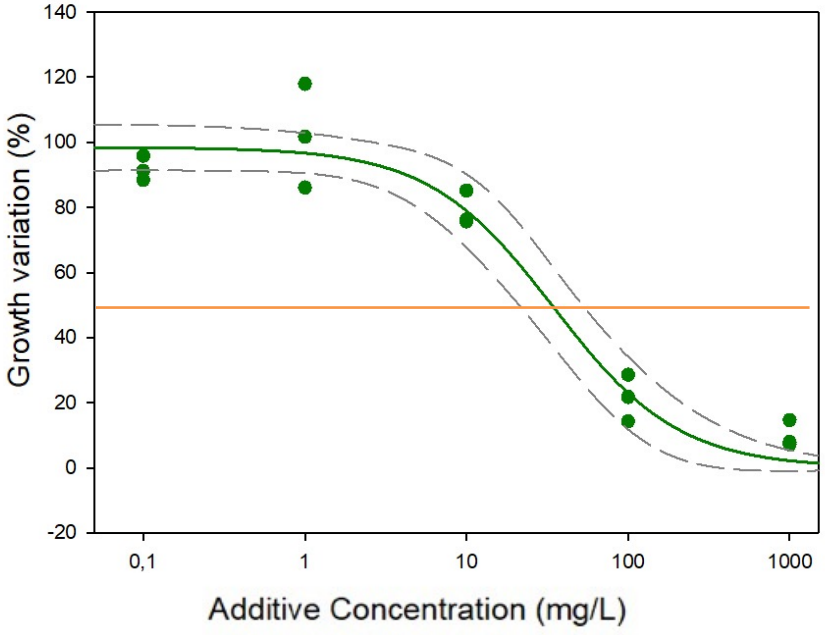
LC_{50} = 501.74 mg/L

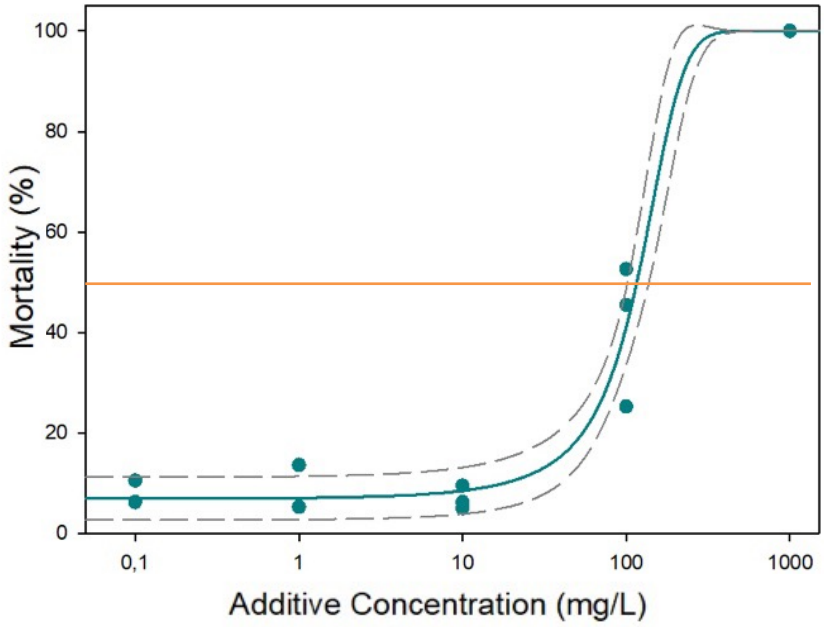
EC_{50} = 418.27 mg/L

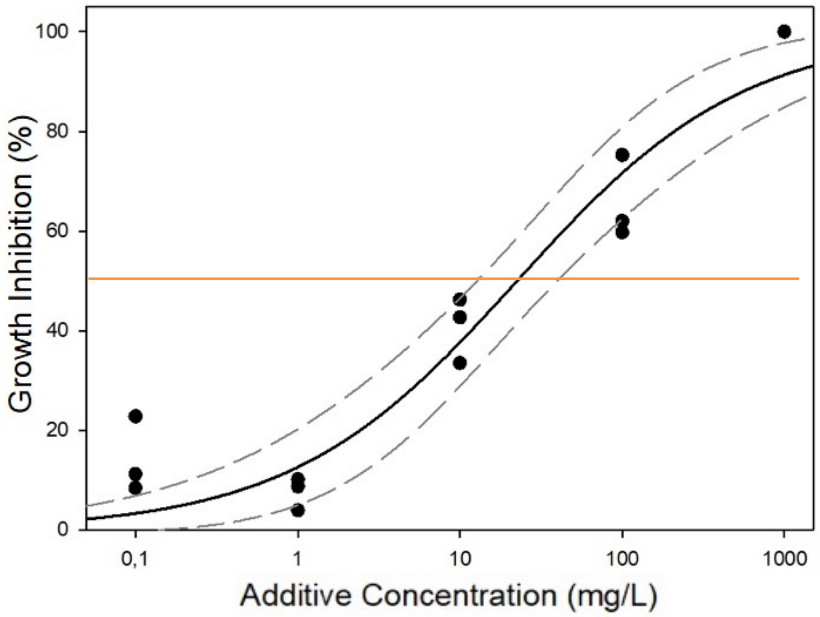
Benzyl alcohol (BOH)

Results and Ecological implications









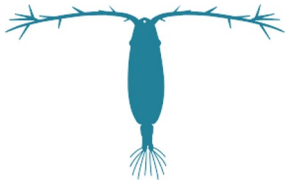
EC_{50} = 58.05 mg/L

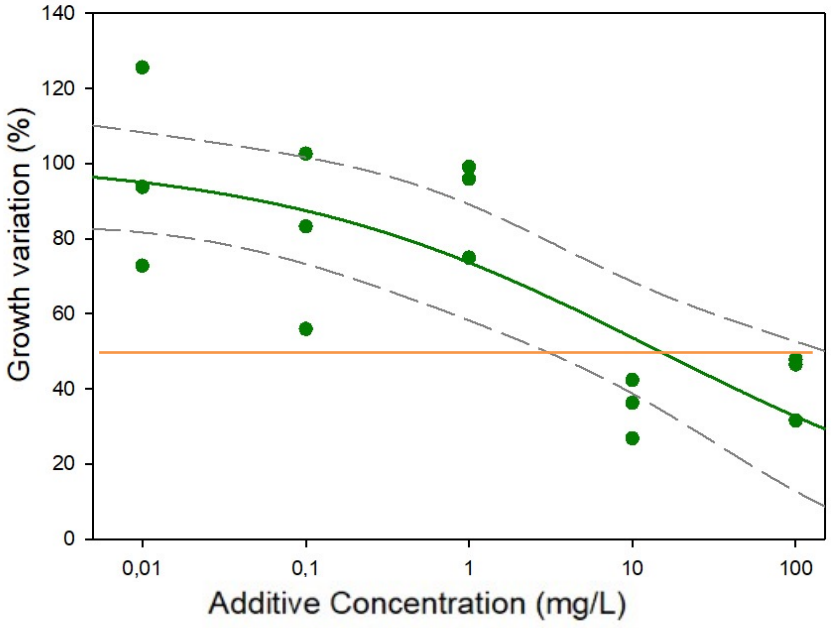
LC_{50} = 116.14 mg/L

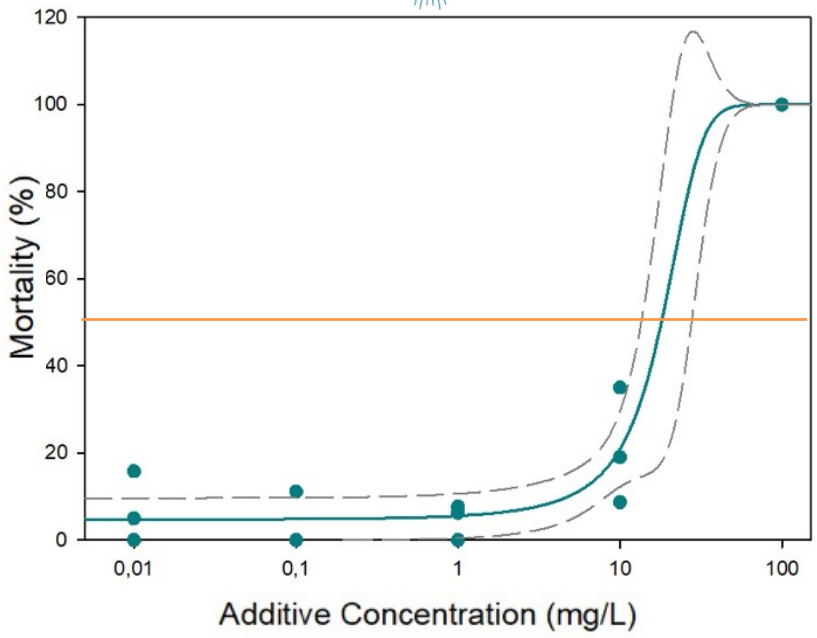
EC_{50} = 22.49 mg/L

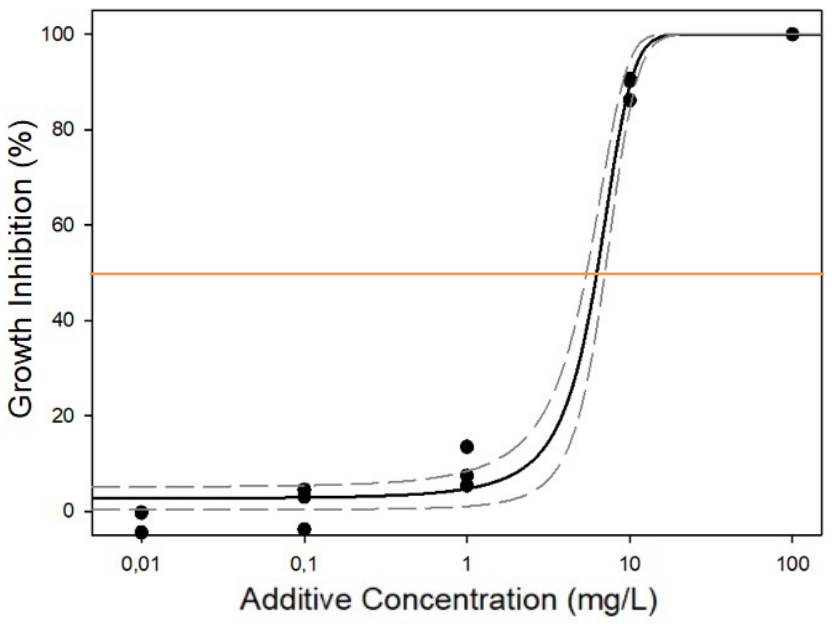
1H-Benzotriazole (BTZ)

Results and Ecological implications









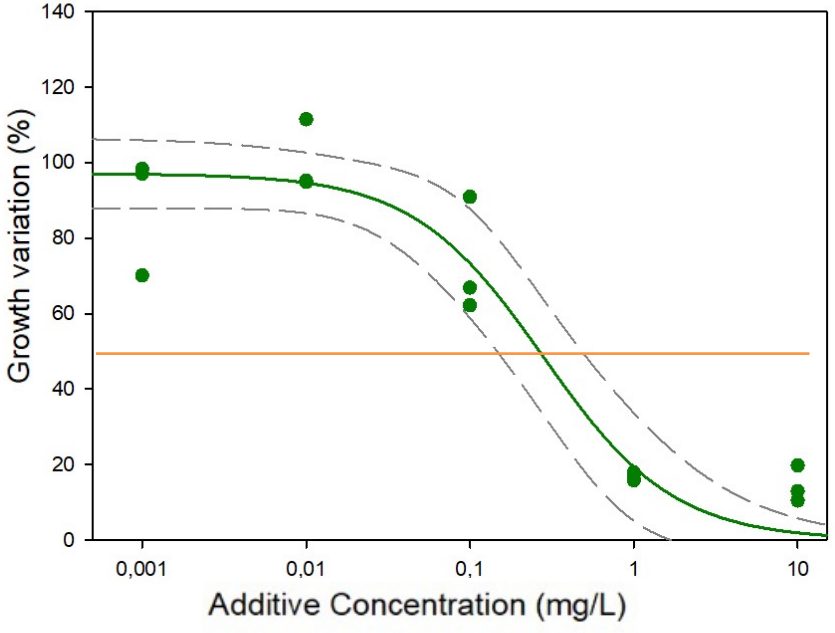
EC_{50} = 13.69 mg/L

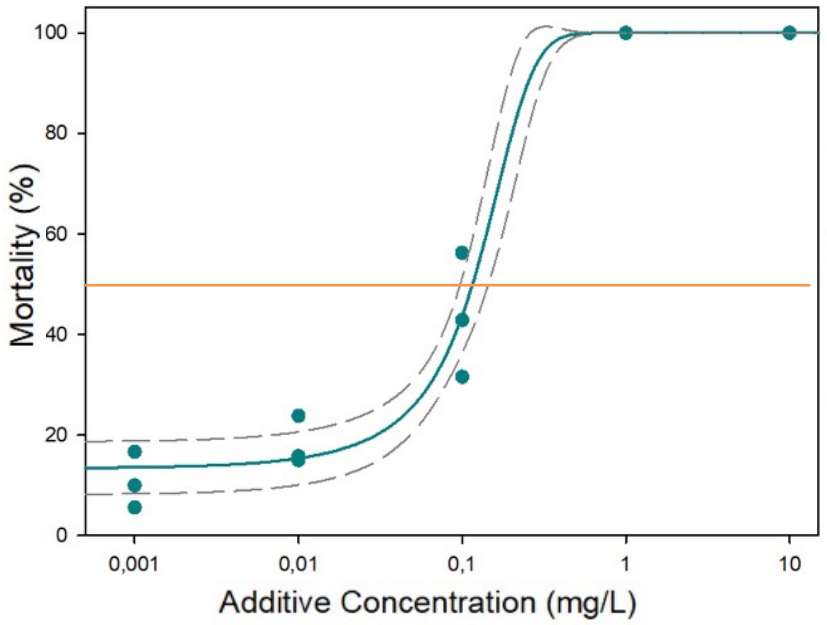
LC_{50} = 18.02 mg/L

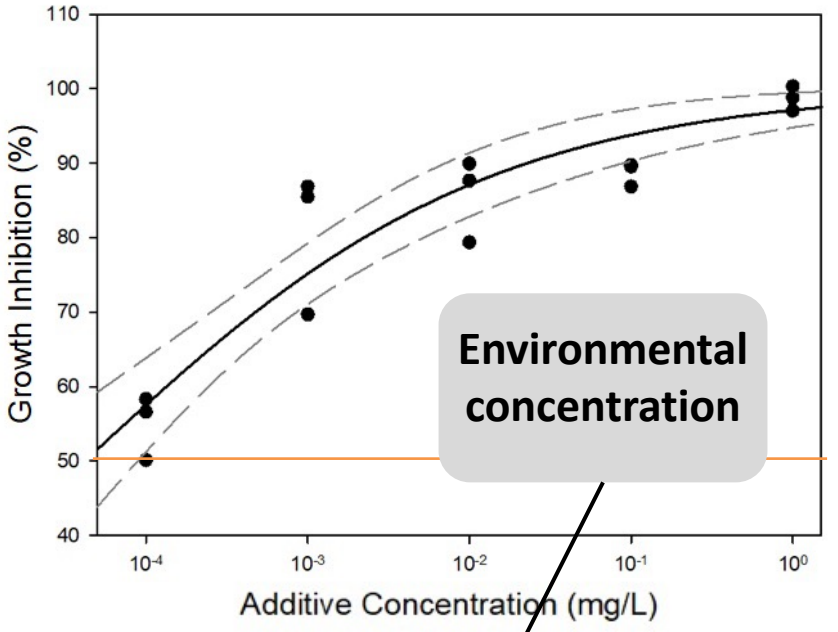
EC_{50} = 3.37 mg/L

1,3-diphenyl guanidine (DPG)

Results and Ecological implications







EC_{50} = 0.28 mg/L

LC_{50} = 0.12 mg/L

EC_{50} = 0.000042 mg/L

4-*tert*-Octylphenol (TOP)

Conclusions

ε-Caprolactam is the least toxic of the tested CEC and **4-*tert*-Octylphenol** the most toxic with environmentally relevant EC_{50}.

Sea urchin embryos were the most sensitive organisms whilst **copepod** were the least sensitive

An increase in the **microalgae** concentration with **CPL and BOH** could induce alterations of the **trophic web**

Better evaluation of the industrial aditives and **reduce the use** of highly toxic chemicals in the industry

Acknowledgements

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ECOAQUA

MICROPLEACH PROJECT

ULPGC
Universidad de Las Palmas de Gran Canaria

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN