Innovations in marine toxicity testing:
Fish embryo and mysid tests as replacements for larval test

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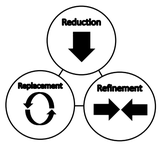
Introduction

Oil spills and oil refinery effluents can release potentially-toxic oil byproducts associated with crude oil, like phenanthrene, into marine ecosystems.

Legislation requires testing of the effluents released into marine environments to protect environmental health.

The current marine toxicity test developed by the US EPA uses larval fish that are capable of experiencing pain and distress.



In light of newer legislation, there is a need to identify new toxicity testing strategies that promote animal welfare.

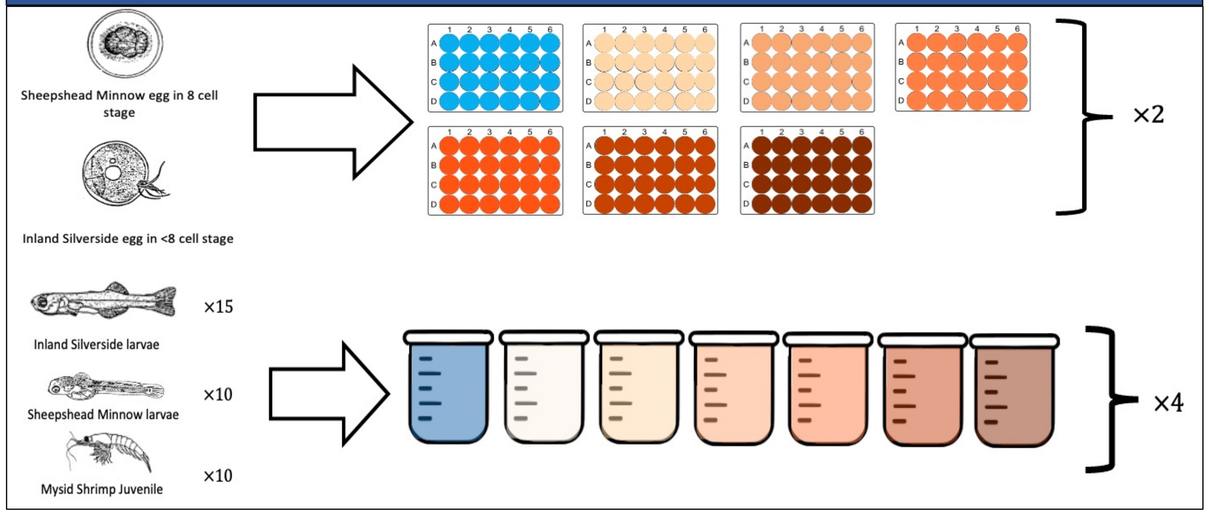
Goal

To improve animal welfare using alternative marine toxicity testing methods.

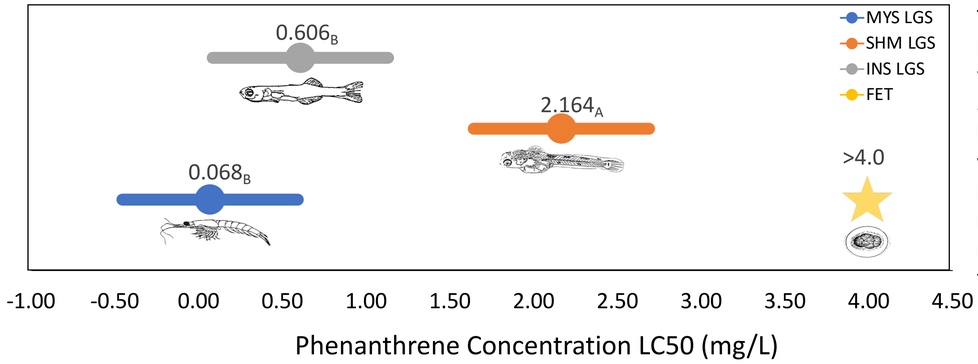
Objective

To determine if the fish embryo toxicity test and/or the mysid survival and growth test are alternative methods for the larval growth and survival test.

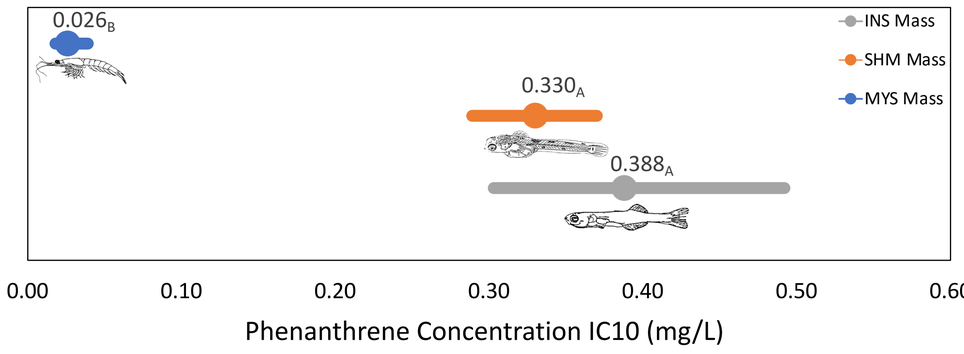
Methods



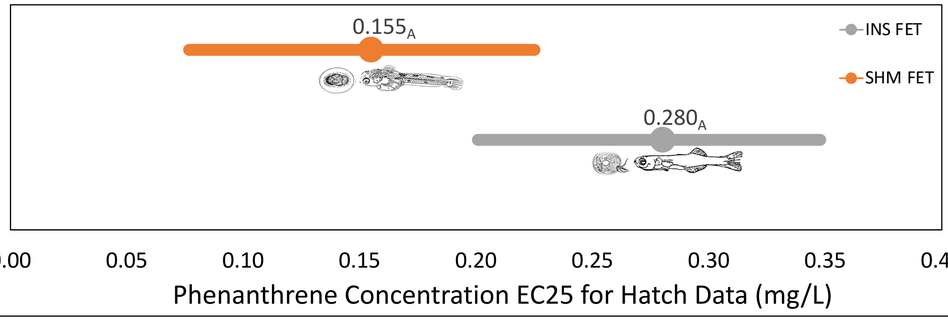
Results and Discussion



The LC50 values from the mysid and silverside LGS tests were equivalent to one another and significantly lower than those generated via the sheepshead minnow LGS and FET tests. This indicates that the mysid test may be a viable alternative to the LGS tests.



The IC10 values for mass generated via mysid test were significantly less than those derived from the LGS tests. This suggests that the inclusion of mass as a mysid test endpoint improves sensitivity.



The EC25 values for hatch success generated via the FET tests were equivalent to one another. When included as FET test metrics, hatch increased FET test sensitivity.

Conclusion

Of the three alternative test types evaluated, the mysid test was the most sensitive indicating that it may be a viable and more protective alternative to the current LGS tests. Though the FET test was less sensitive than all other test types, inclusion of hatch as a test endpoint improved its sensitivity suggesting that a modified FET test featuring additional endpoints may also be a viable alternative to the LGS tests.