Species Sensitivity Distribution (SSD) Approach in Fresh and Salt Water Microcosm

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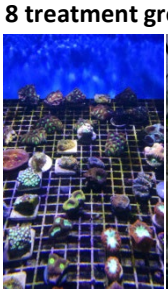
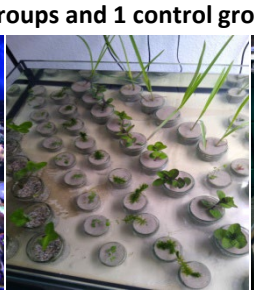
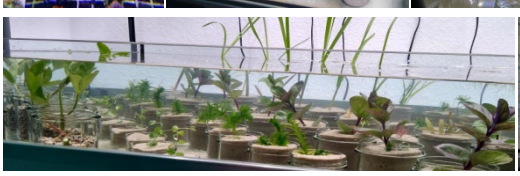
To understand and quantitatively assess the influence of chemicals in the environment is a complex topic. It becomes increasingly important to provide a refined and detailed risk assessment to predict potential risk for ecosystems. Higher tier studies that include non-standard test species are in the focus of regulation. An innovative test approach including Species Sensitivity Distribution (SSD) studies in fresh and saltwater microcosm systems is presented here. The basic idea behind this approach is to combine multi species tests with single species studies by introducing an exact number of replicates and test organisms per species. However, an interaction of species should be avoided e.g. by caging of herbivores and/or predators. Depending on the mode of action of the test substance a specific focus on plants, invertebrates or species living in symbiosis (e.g. corals) can be applied.

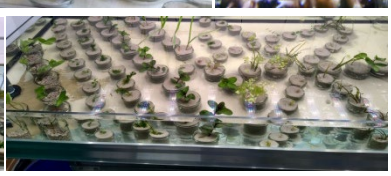
Proposal for Test Design

8 treatment groups and 1 control group; 10 species with 10 replicates



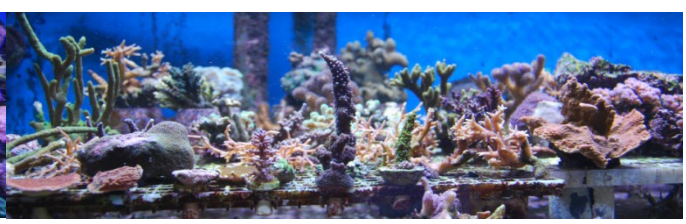
Evaluation of Test Design

Advantages:

- **No differences between pysico-chemical parameters for the selected species. Effects on different species are directly comparable and differences in sensitivity are related to the test item and not because of different culture conditions.**
- **Test can be performed under controlled lab conditions (no seasonal influence).**
- **Analytical effort can be reduced because the test design replaces 8-10 single species tests.**
- **Test can be run static, semi-static or under flow-through conditions and can be performed with artificial or natural test medium.**
- **Depending on the mode of action, specific species can be selected on demand for risk assessment.**
- **Introduction of new test species during testing is possible and different development stages can also be introduced in the test system.**
- **Longterm testing is possible.**

Possible concerns are:

- **Enclosure vessels can vary in size and shape and need to be adapted to accommodate test species. Test vessels should provide enough space and resources for species development. Cleaning of cages might be necessary.**
- **Variance of the controls should be as low as possible. Hence, high effort for generating uniform test material for all species is needed before test commences.**
- **Only test species with a comparable lifestyle and habitat could be tested in one run.**
- **In case of high differences in species sensitivity, the number of test item concentration levels has to be increased.**
- **In case of predators or concurrence of food, species should be caged to avoid interaction. Cages have to have enough water flow to avoid exposure differences between non-cage species.**
- **Sessile species are easier to test than moving species.**

Conclusion

Generated data by a combined microcosm/species sensitivity approach are directly comparable, because all species were exposed under the same test conditions at the same time and the same matrix, indicating a clear advantage compared to single species testing. This allows robust data evaluation by excluding uncertainties caused by timing issues and handling of different single species tests. In addition, identification of potential risk for only some species or the whole community is possible. Further, due to the exact number of introduced individuals per species, data can be evaluated for each tested species separately, similar to single species tests. Therefore, combined microcosm/species sensitivity studies are useful for a robust statistical evaluation and refined risk assessment.