

# ACUTE TOXICITY OF PERFLUOROOCTANE SULFONIC ACID ON EARLY LIFE STAGES OF *DAPHNIA MAGNA*, *SIRIELLA ARMATA*, *PARACENTROTUS LIVIDUS* SEA URCHIN, AND TURBOT (*SCOPHTHALMUS MAXIMUS* L.).

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## INTRODUCTION

Perfluorinated compounds are widespread pollutants of toxicological importance that have been detected in environmental matrices.

Perfluorooctane sulfonic acid (PFOS) is a persistent and ubiquitous environmental contaminant that has been detected in organisms worldwide.

PFOS is the final degradation product of many commercially used perfluorinated products. It is the predominant perfluorinated compound found in animal tissues in the wild. PFOS shows high bioaccumulation potential, resistance to breakdown processes and potential for toxicity. PFOS has been detected in a great diversity of wildlife (Beach et al., 2006 and Houde et al., 2006). Despite the widespread detection of PFOS in the environment, relatively little is known concerning the short-term toxicity of PFOS.

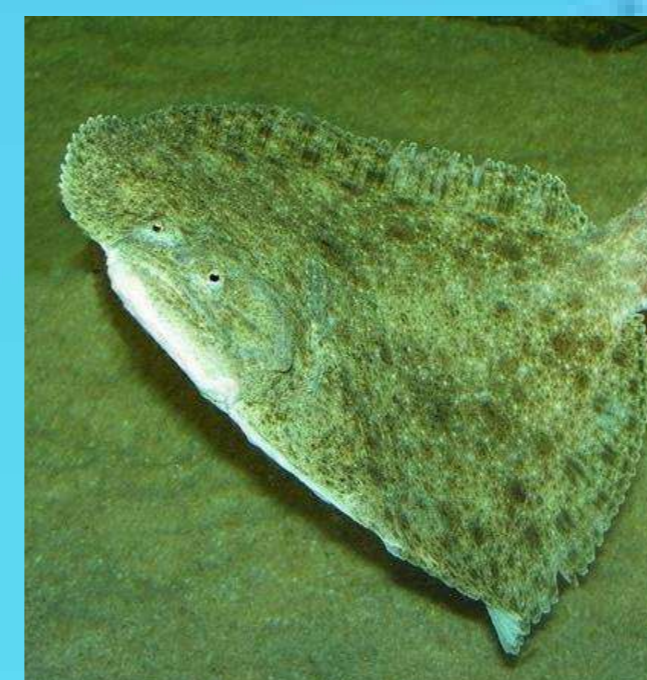
The objective of the present study, therefore, was to assess the acute toxicity of PFOS to two crustaceans (*Daphnia magna*, *Siriella armata*), sea urchin embryos (*Paracentrotus lividus*) and turbot (*Scophthalmus maximus* L.) embryos and larvae under laboratory conditions.

## MATERIALS AND METHODS

Four test species were used to evaluate toxicity: *Daphnia magna*, *Siriella armata*, *Paracentrotus lividus* and *Scophthalmus maximus*.

Table 1: Summary of test conditions for *Daphnia magna*, *Siriella armata*, *Paracentrotus lividus* and *Scophthalmus maximus*: acute toxicity tests.

	<i>Daphnia magna</i>	<i>Siriella armata</i>	<i>Paracentrotus lividus</i>	<i>Scophthalmus maximus</i>
Age of test organisms (h)	<24 hours	<24 hours	<0.5 hours	120
Test type	Static, no-renewal	Static, no-renewal	Static, no-renewal	Semi-static
temperature	20° C	20° C	20° C	18° C
Photoperiod	16 h light, 8 h darkness	16 h light, 8 h darkness	24 h darkness	dark
Nº. organisms per test chamber	10	1	400	50
Nº replicate chambers per concentration	20	4	4	4
Test solution volume	20 ml	2-4 ml	10 ml	500 ml
Feeding rate	No feeding	10-15 nauplii or metanauplii of <i>Artemia salina</i>	No feeding	No feeding
Test duration	48 hours	96 hours	48 hours	96 h
Endpoint	Mortality	Mortality	Growth	Mortality



## RESULTS

The result of the standardized laboratory bioassays for four species study exposed to PFOS are summarized in Table 1 and figure 1.

Tab.3. EC10, Median effective concentrations (EC50 mg/l) and their confidence intervals (95CI) and the lowest observed effect concentrations (LOEC mg/l) PFOS.

Species	EC10 (mg/L)	EC50 (mg/L)	NOEC (mg/L)	LOEC (mg/L)
<i>Daphnia magna</i>	45.21 (38.06-53.71)	87.46 (80.22-95.36)	50	75
<i>Siriella armata</i>	4.23 (4.14-4.32)	7.92 (7.82-8.01)	1.25	2.5
<i>Paracentrotus lividus</i>	10.0 (8.8-11.4)	30.1 (26.6-34.0)	5	10
<i>Scophthalmus maximus</i>	0.032 (0.016-0.045)	0.155 (0.133-0.188)	0.0375	0.075

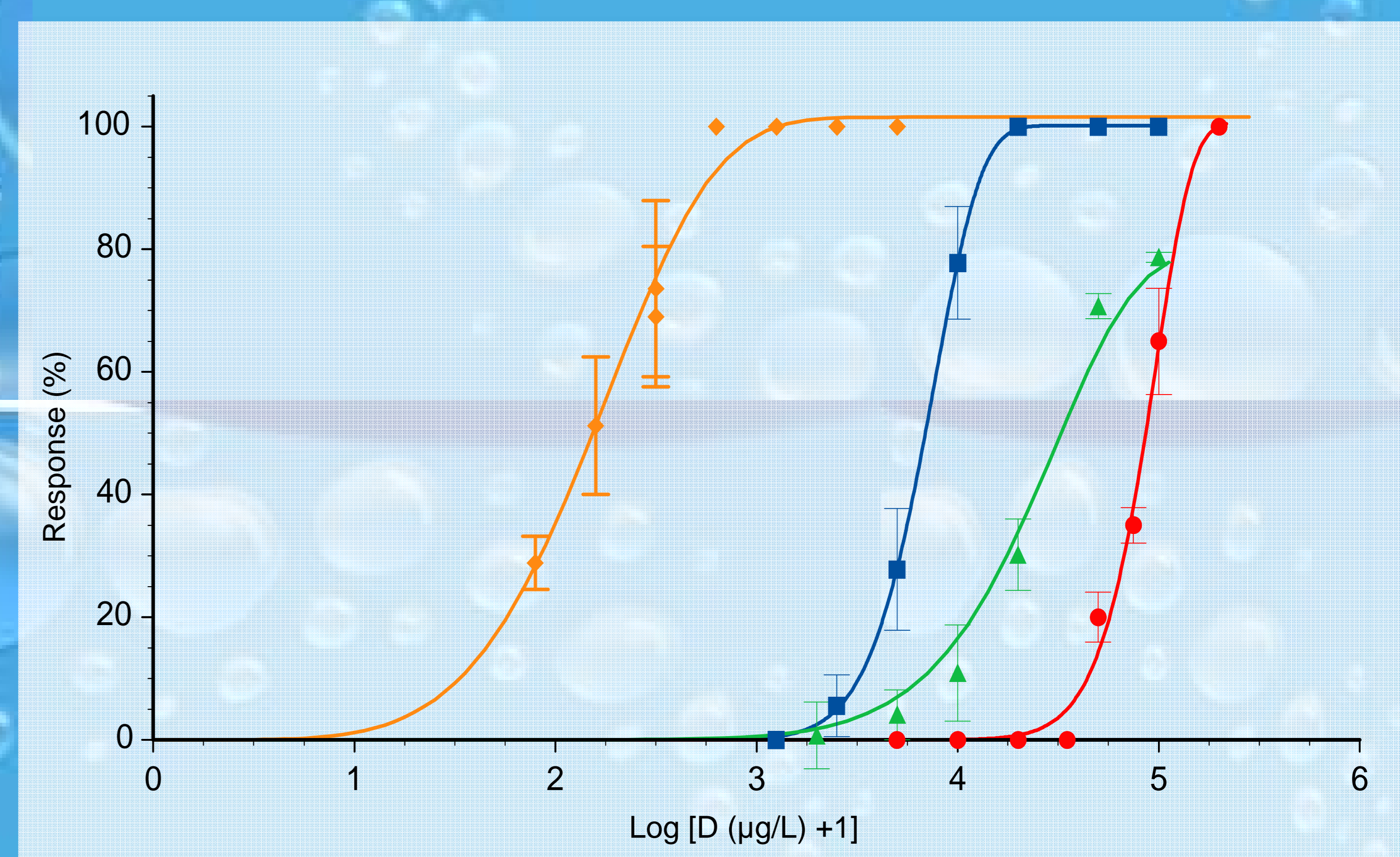


Fig.1. Percentage of response for *S. maximus* (♦), *S. armata* (■), *P. lividus* (▲) and *D. magna* (●) in each concentration as log [µg/L + 1] for PFOS.

## DISCUSSION AND CONCLUSION

The EC<sub>10</sub> and EC<sub>50</sub> values were calculated (Tab 2). NOEC and LOEC were estimated in all PFOS exposure and is summarized in table 2.

Compared to *D. magna*, *S. armata* and *P. lividus*, *S. maximus* was much more sensitive to PFOS compounds. The order of acute toxicity was: turbot > mysid > sea urchin > daphnid. This result highlights the importance of including a marine fish in the battery of species to describe the toxicity of these compounds. Considering the persistent nature of PFOS, more research is required to determine potential consequences of long-term exposure to these compounds in aquatic ecosystems.

In general, fish appear to be much more sensitive than invertebrates to chronic PFOS exposure. Acute data are available for the fathead minnow, *P. promelas*, exposed to 0.60 mg/L PFOS showed a significant decrease in hatchability, time to hatch, survival, and growth.

We demonstrated that low levels of PFOS in the aquatic environment (below 0.1 mg/L) have a significant acute effect on larval turbot.

The results of the present study provide the background for studies of risk assessment of perfluorinated compounds, and additional research is required to assess the potential adverse impacts of these compounds on aquatic systems in the long term.

## ACKNOWLEDGMENTS

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