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Environmental Metabolism of Pyrene and 1-Methylpyrene by *Nereis diversicolor*

Linus Malmquist[1,2], Jan H. Christensen[2] and Henriette Selck[1]

Introduction

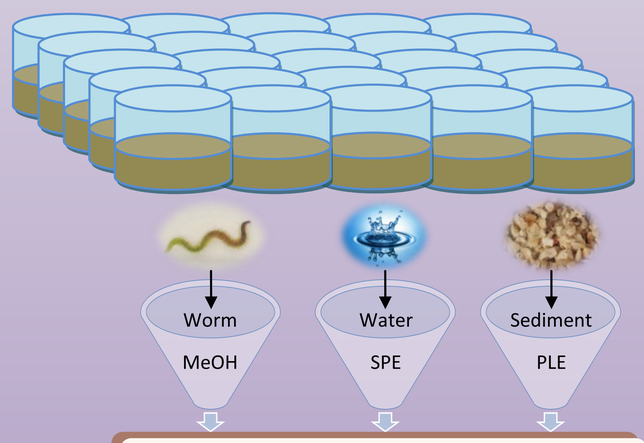
- Assessments of Polycyclic Aromatic Hydrocarbon (PAH) contaminations are often **limited** to consider only the "**USEPA 16 priority PAHs**", all non alkylated PAHs.
- Oil from spills contains however **magnitudes higher proportions of alkylated PAHs** relative to non alkylated.
- Despite this, fate and effects of **alkylated PAHs** has to our knowledge, **never been examined with respect to ecotoxicology**.
- The fate of an alkylated PAH, 1-Methylpyrene, in marine environments is studied through degradation by the benthic invertebrate *Nereis diversicolor*.
- 1-Methylpyrene degradation is compared to degradation of Pyrene, a non-alkylated PAH.

Experimental

Setup:
100 g dw aliquots of 500µm-sieved, frozen and thawed sediment and 650 ml 17 ‰ sterile filtered seawater. Exposure at 17°C in the dark, continuously aerated.

Exposure:
5 replicates of each exposure:

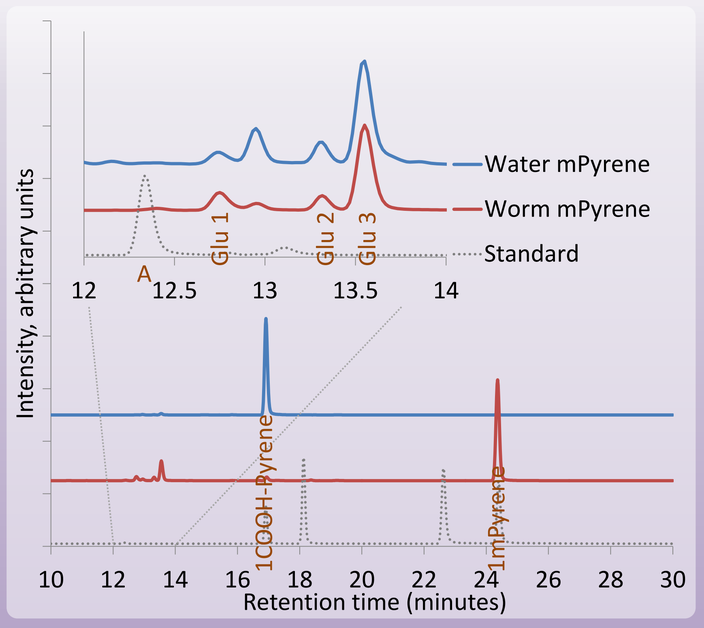
Pyrene	1mPyrene	Pyrene	1mPyrene	No toxicant
Worms	Worms	No worms	No worms	Worms



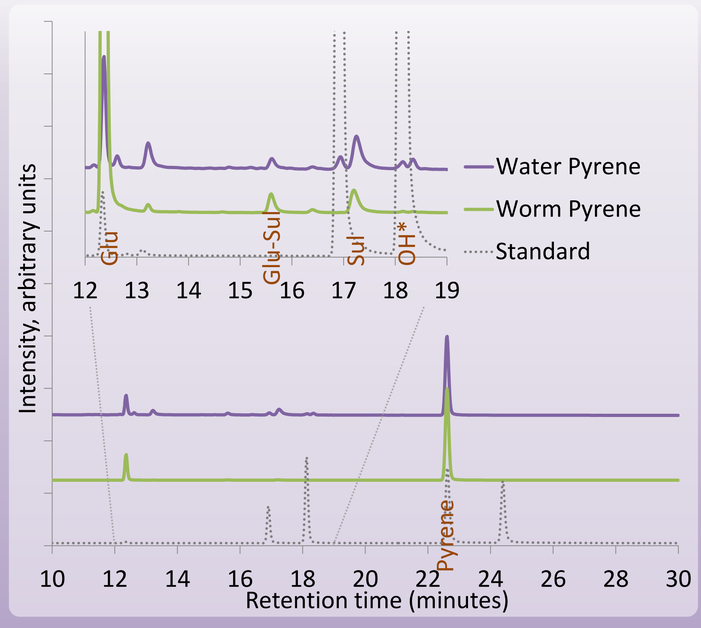
Chemical analyses:

Parent compounds:	UPLC-F/QToF and GC/MS
Phase I compounds:	UPLC-F/QToF and GC/MS
Phase II compounds:	UPLC-F/QToF

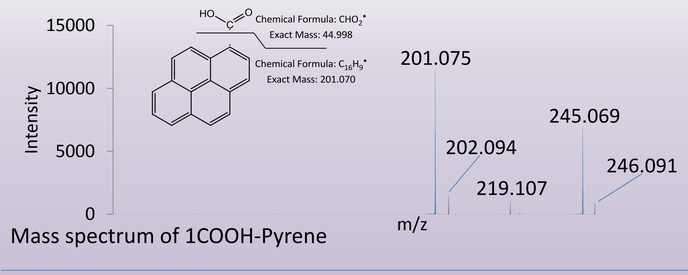
1-Methylpyrene Analysis



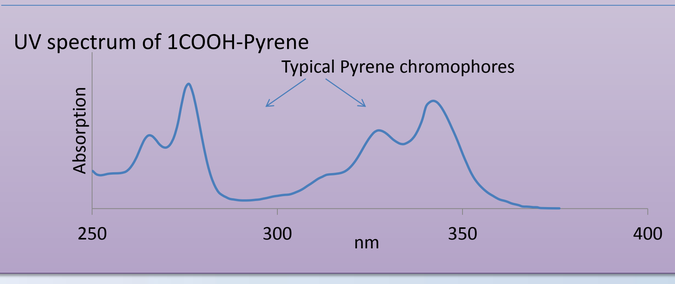
Pyrene Analysis



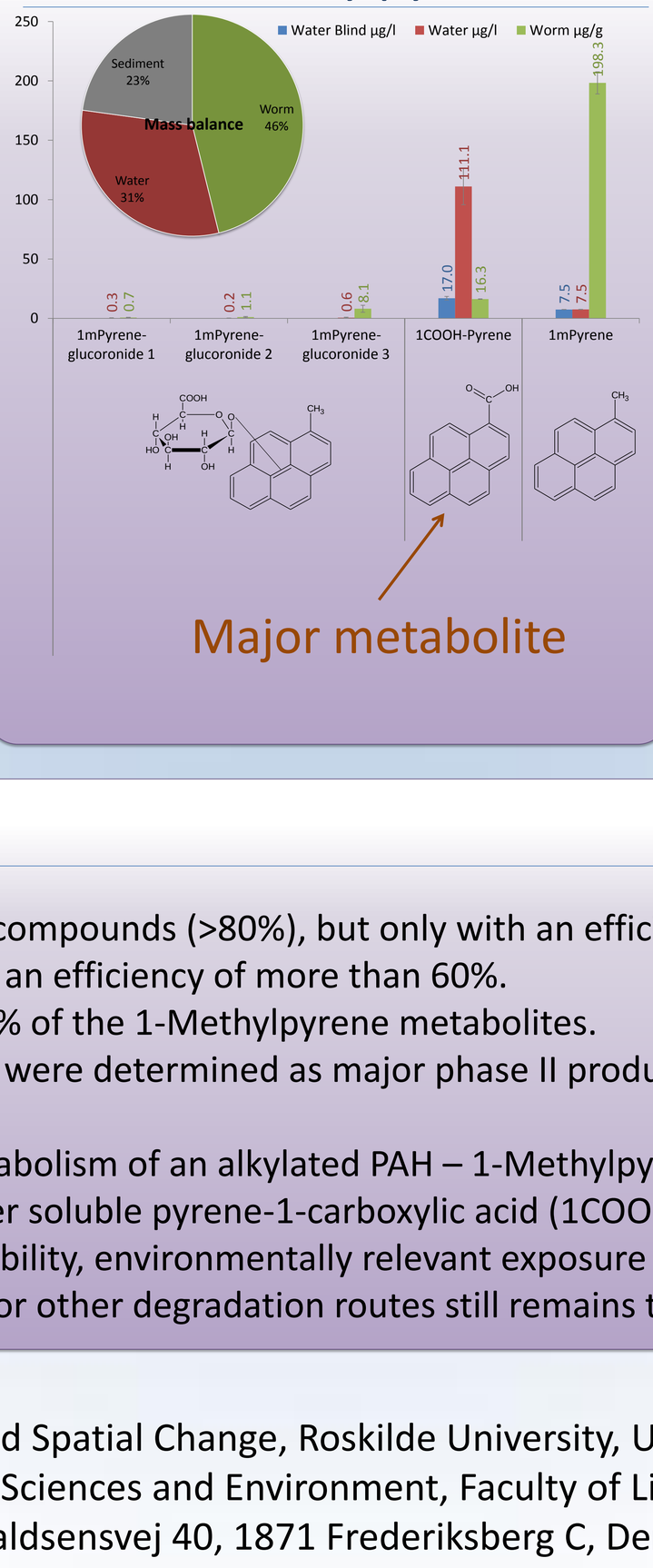
Analyte Qualifications



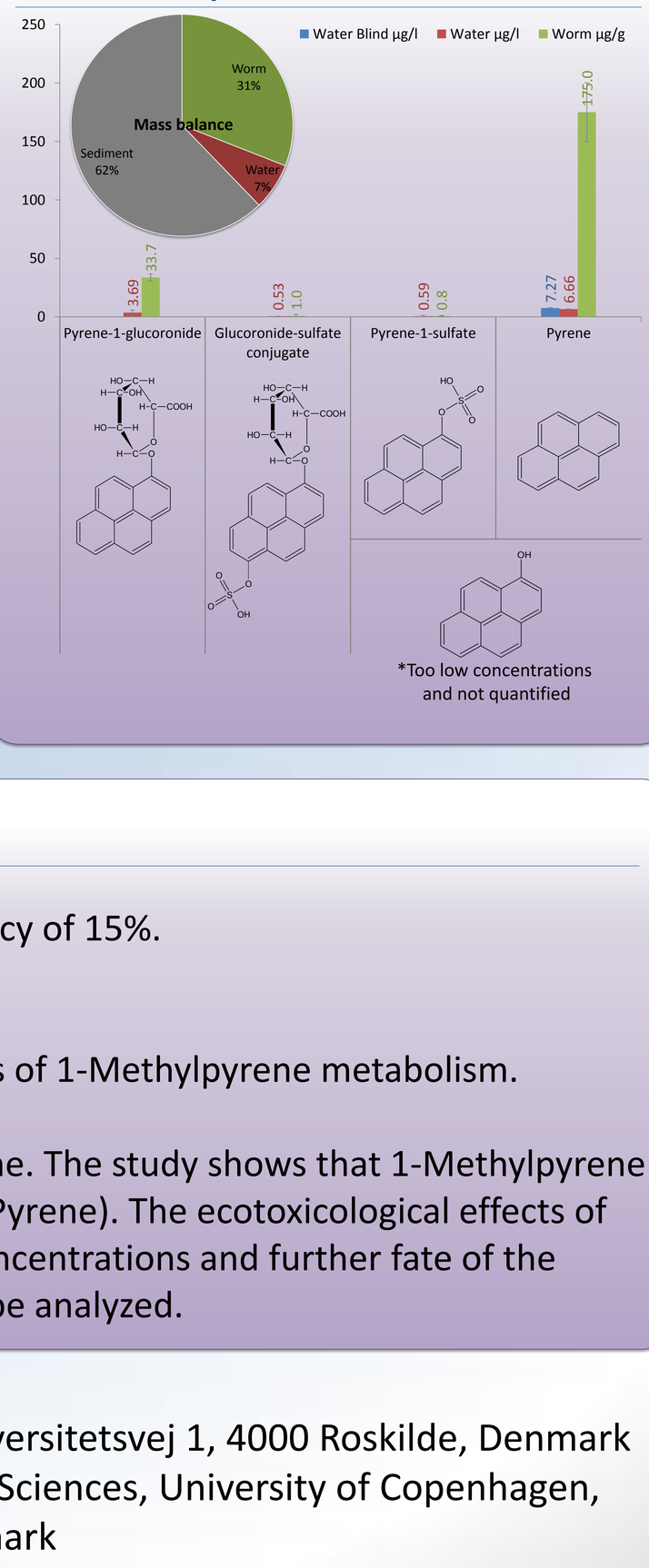
Mass spectrum of 1COOH-Pyrene



Fate of 1-Methylpyrene



Fate of Pyrene



Conclusions and Perspectives

- Pyrene is degraded primarily to phase II compounds (>80%), but only with an efficiency of 15%.
- 1-Methylpyrene is readily degraded with an efficiency of more than 60%.
- 1COOH-Pyrene represents more than 90% of the 1-Methylpyrene metabolites.
- Three isomers of glucoronide conjugates were determined as major phase II products of 1-Methylpyrene metabolism.

This work describes the environmental metabolism of an alkylated PAH – 1-Methylpyrene. The study shows that 1-Methylpyrene is effectively transformed to the highly water soluble pyrene-1-carboxylic acid (1COOH-Pyrene). The ecotoxicological effects of this metabolite, including the high bioavailability, environmentally relevant exposure concentrations and further fate of the compound, e.g. decarboxylation processes or other degradation routes still remains to be analyzed.

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