



Deltares

Enabling Delta Life



Research centre
for toxic compounds
in the environment

Predicting concentrations in biota from passive samplers

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NORMAN Inter-Laboratory Study (ILS) on passive sampling of emerging pollutants
DG Joint Research Centre, 29 – 30 October, 2012, Ispra, Italy

Can we predict concentrations in biota?

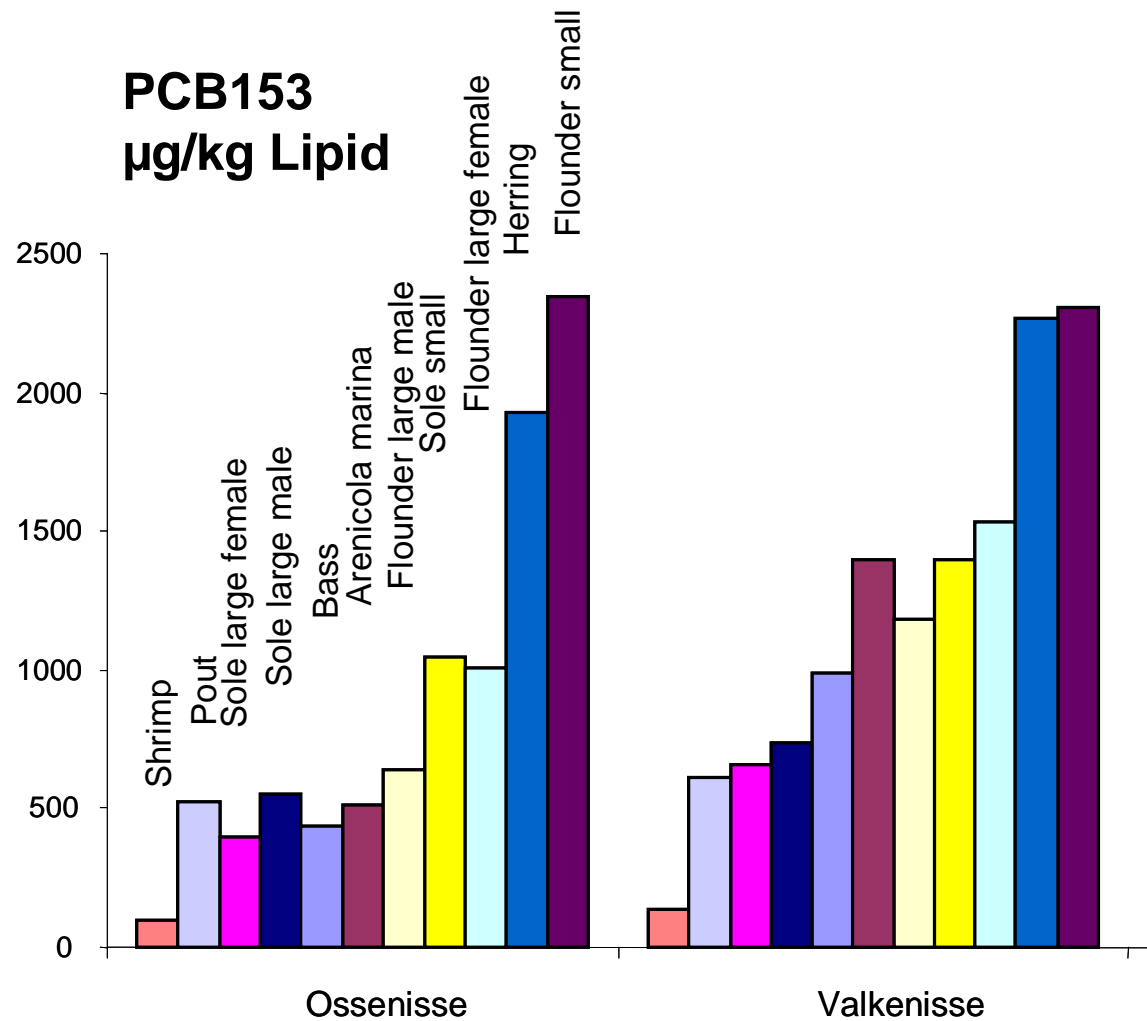
NO

Predictions with passivesampling
will never catch
the variable and/or different
concentrations in biota
(natural variability)



Lipid based concentrations in different biota species

Two station in the Western Scheldt



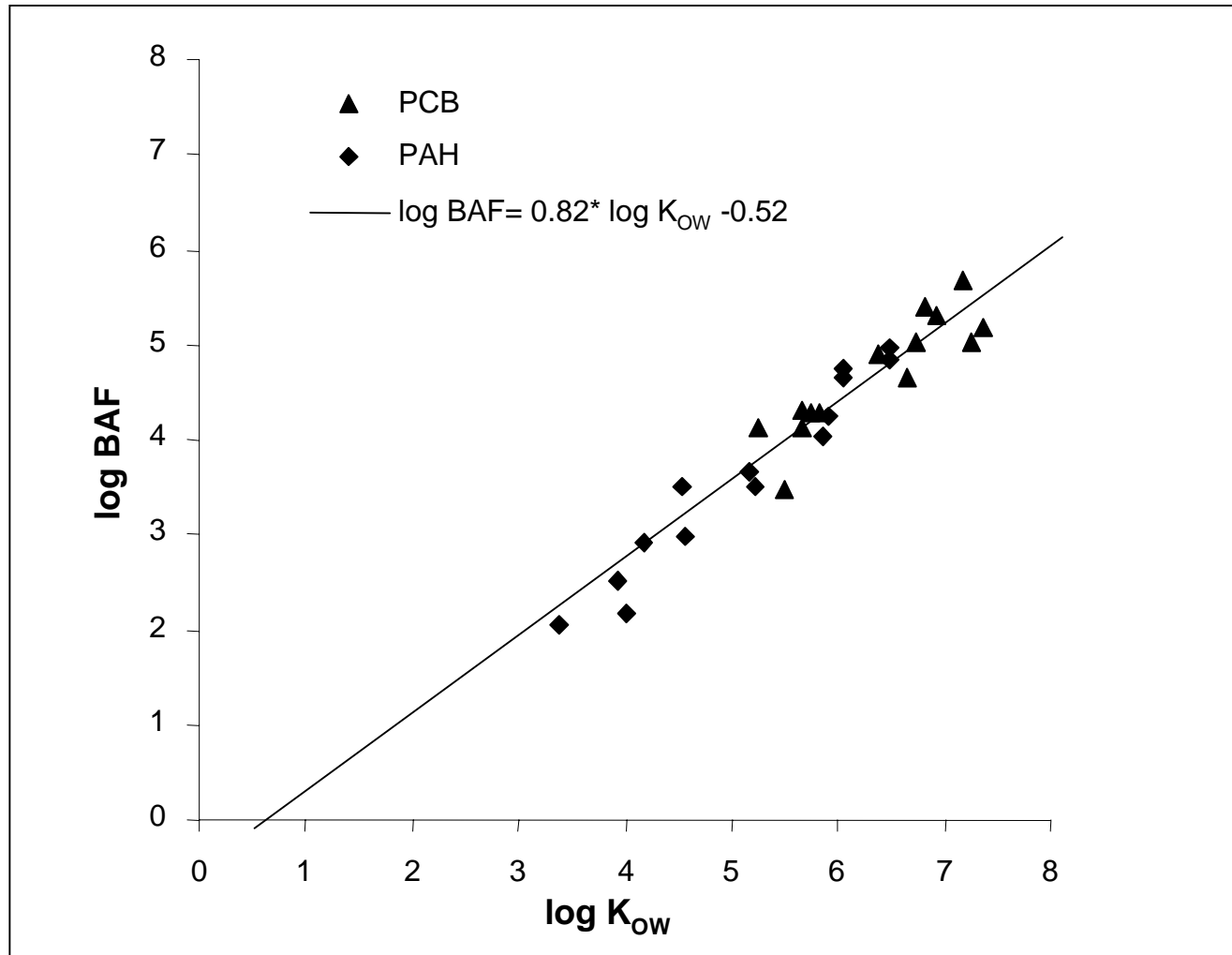


Can we predict concentrations in biota?

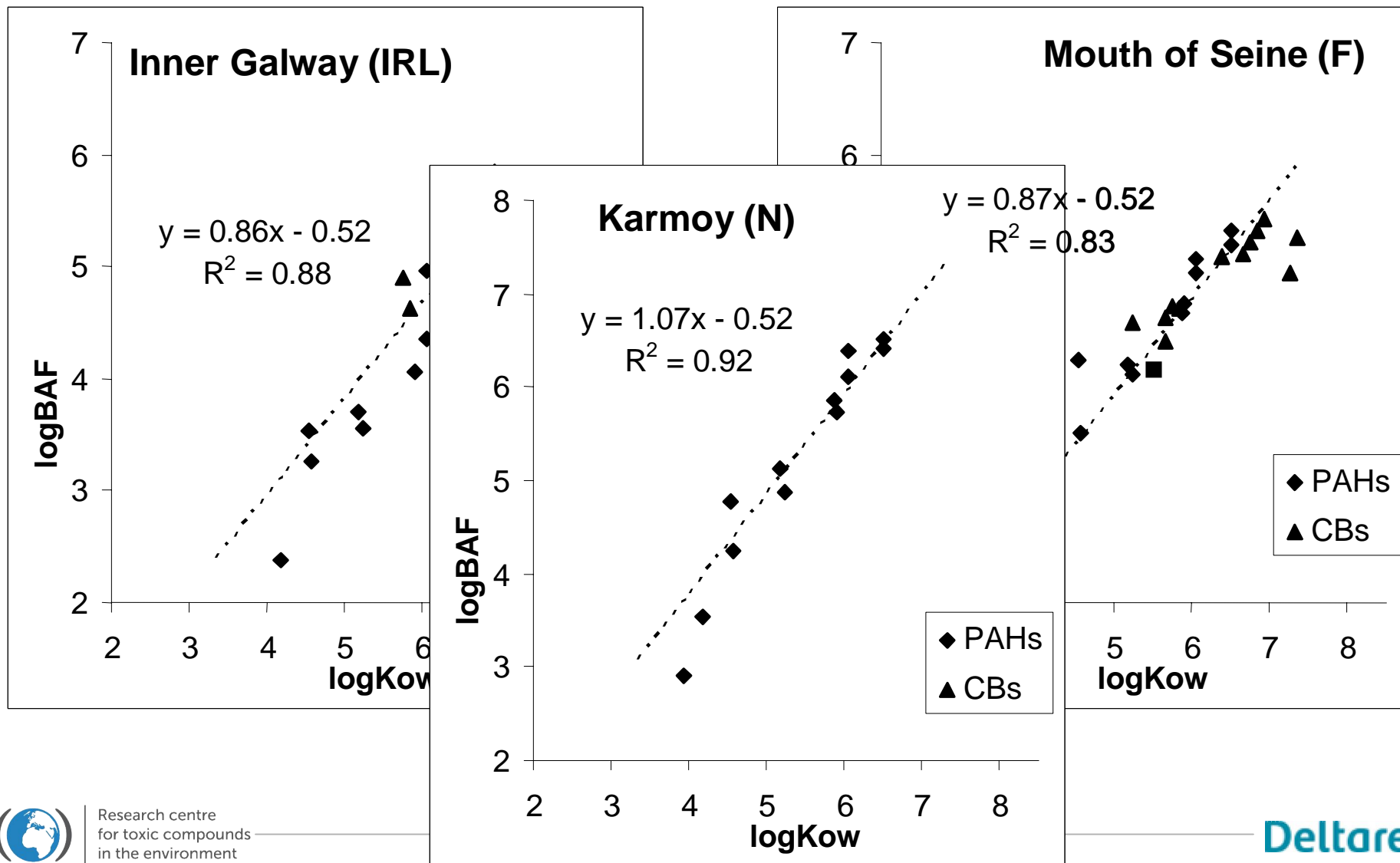
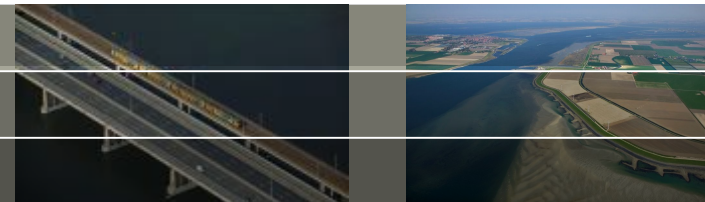
So No,
But passive sampling can give
a good measure for it



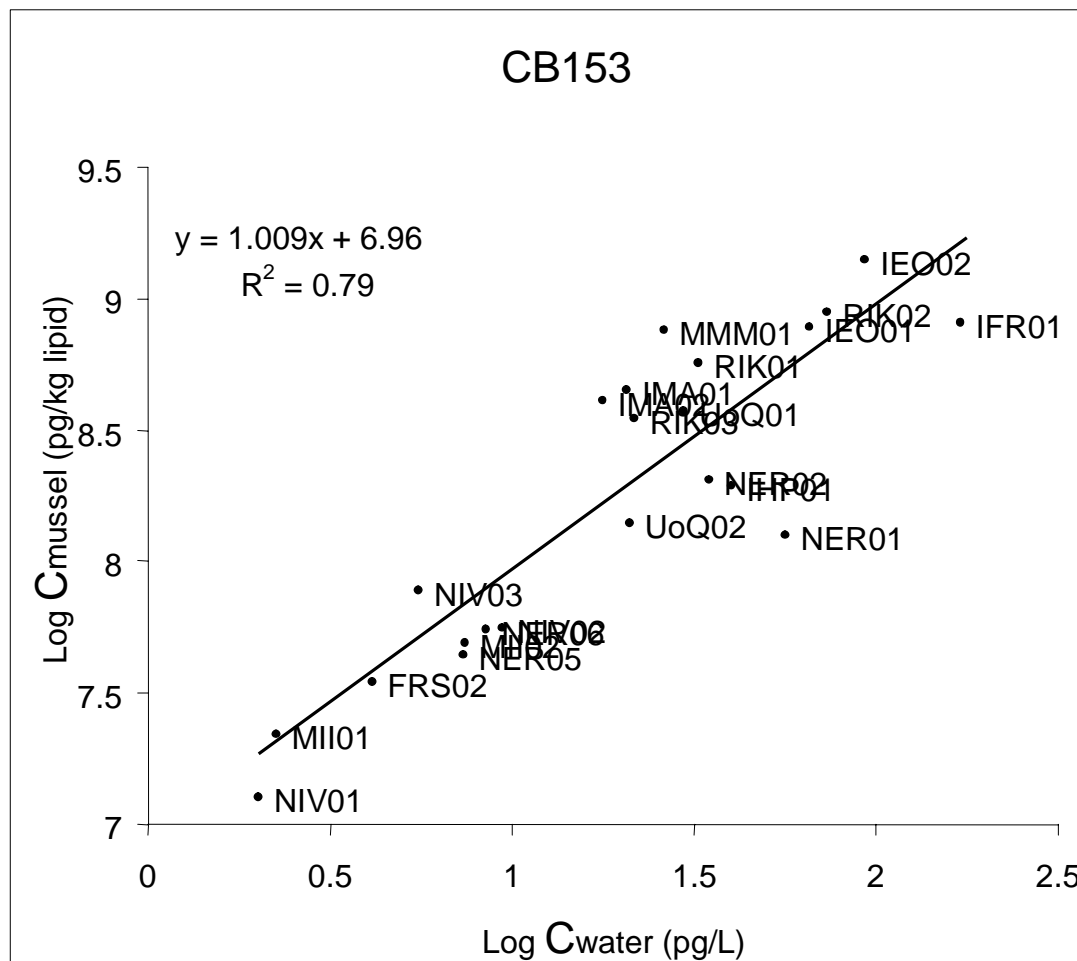
BAF (dw) Average of all PSTS data



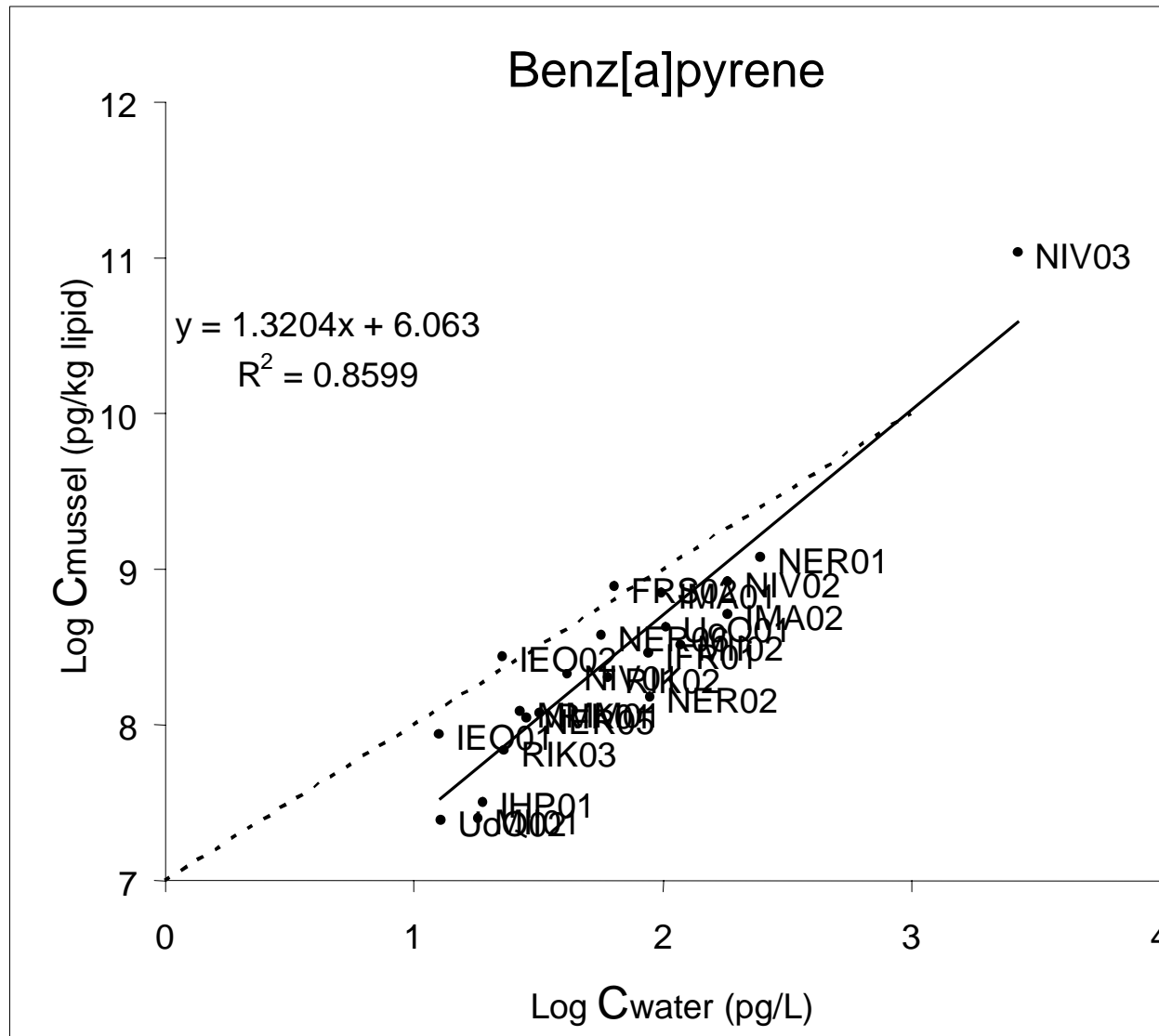
BAF Individual Stations



PSTS individual: C_L in mussels versus C_{water}



PSTS individual: C_L mussels versus C_{water}



Results from a decade monitoring with PS from 2001 - today

1. Silicone rubber 55x90x0.5 mm (SRPS) –(400-600cm²).
2. Deployed mussels (100) from a single source (eastern scheldt)

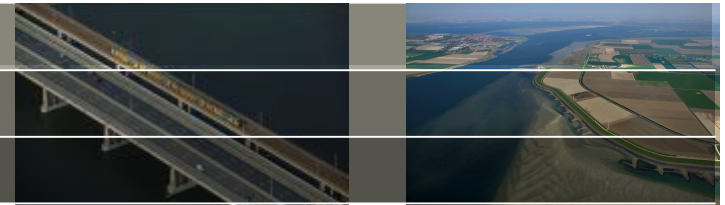
8 marine stations in 2001

6 weeks deployment around November and February
(only November from 2011)

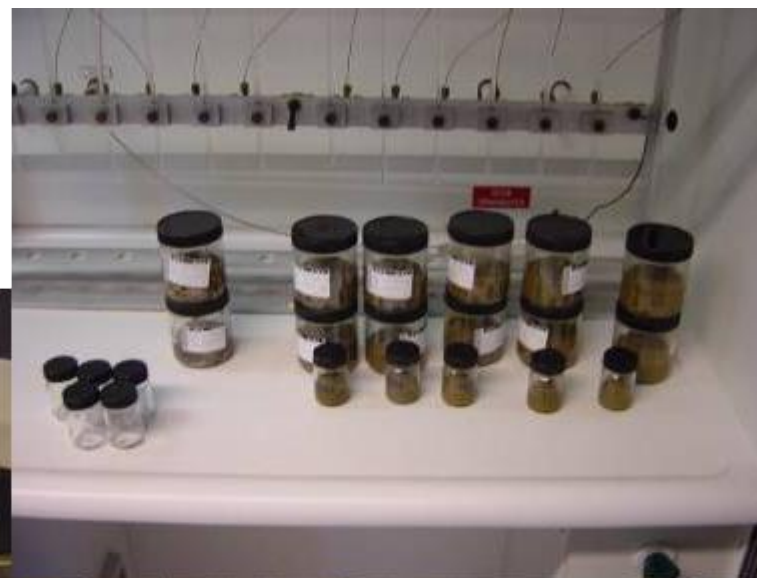
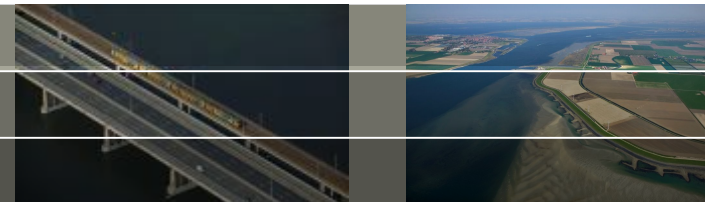
Monitoring programme by passive sampling was initiated by the :
National Institute for Coastal and Marine Management
(RIKZ), The Netherlands,
(dissolved in the Centre for Water Management in 2008)



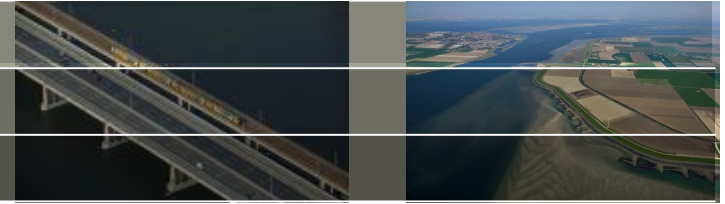
Mussels



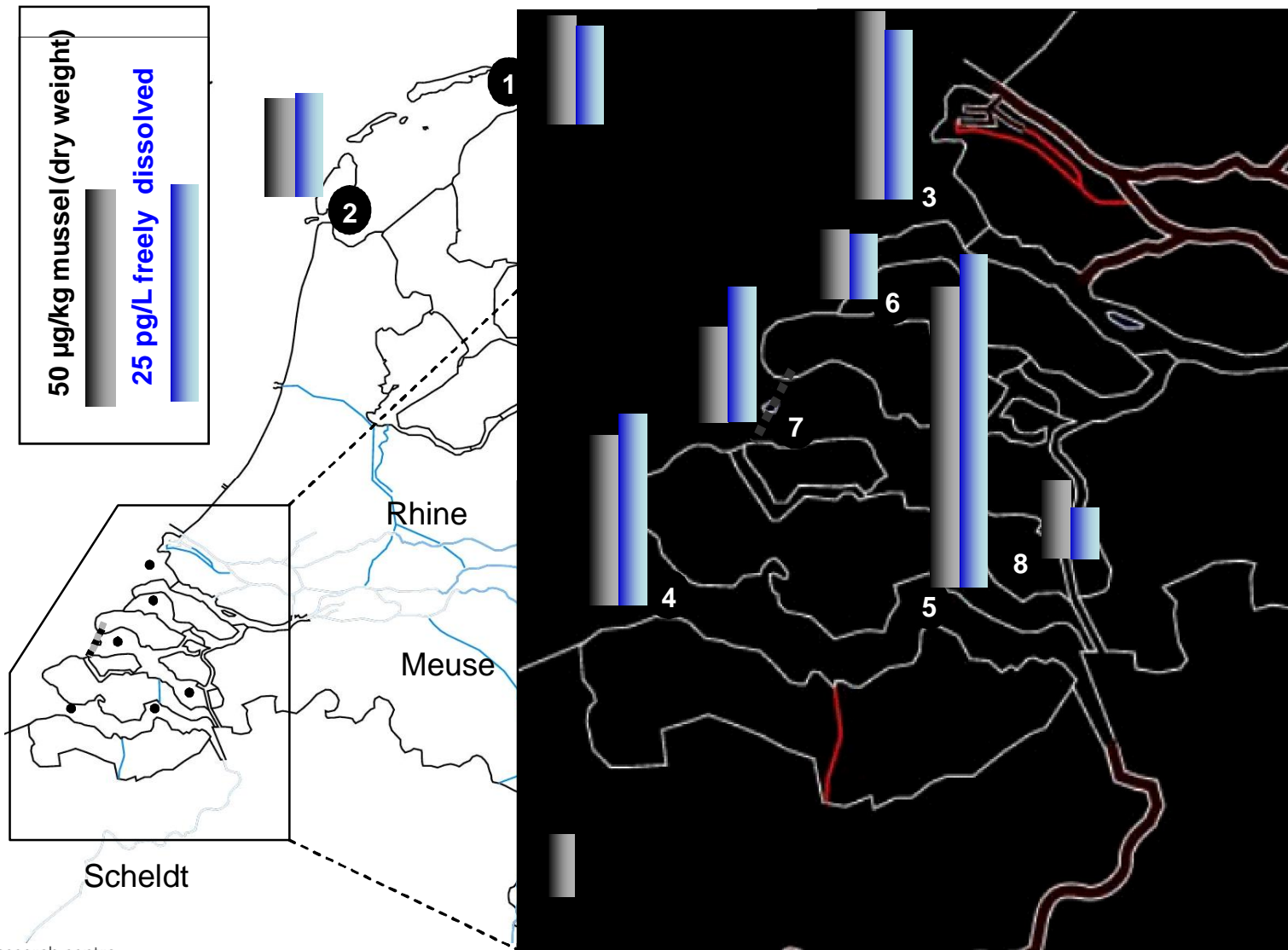
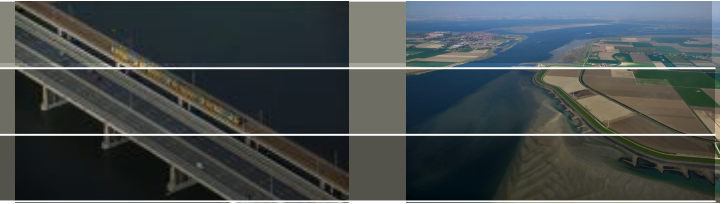
Processing of mussel samples



Field - Mussel Frame



PCB 153 in mussels and water



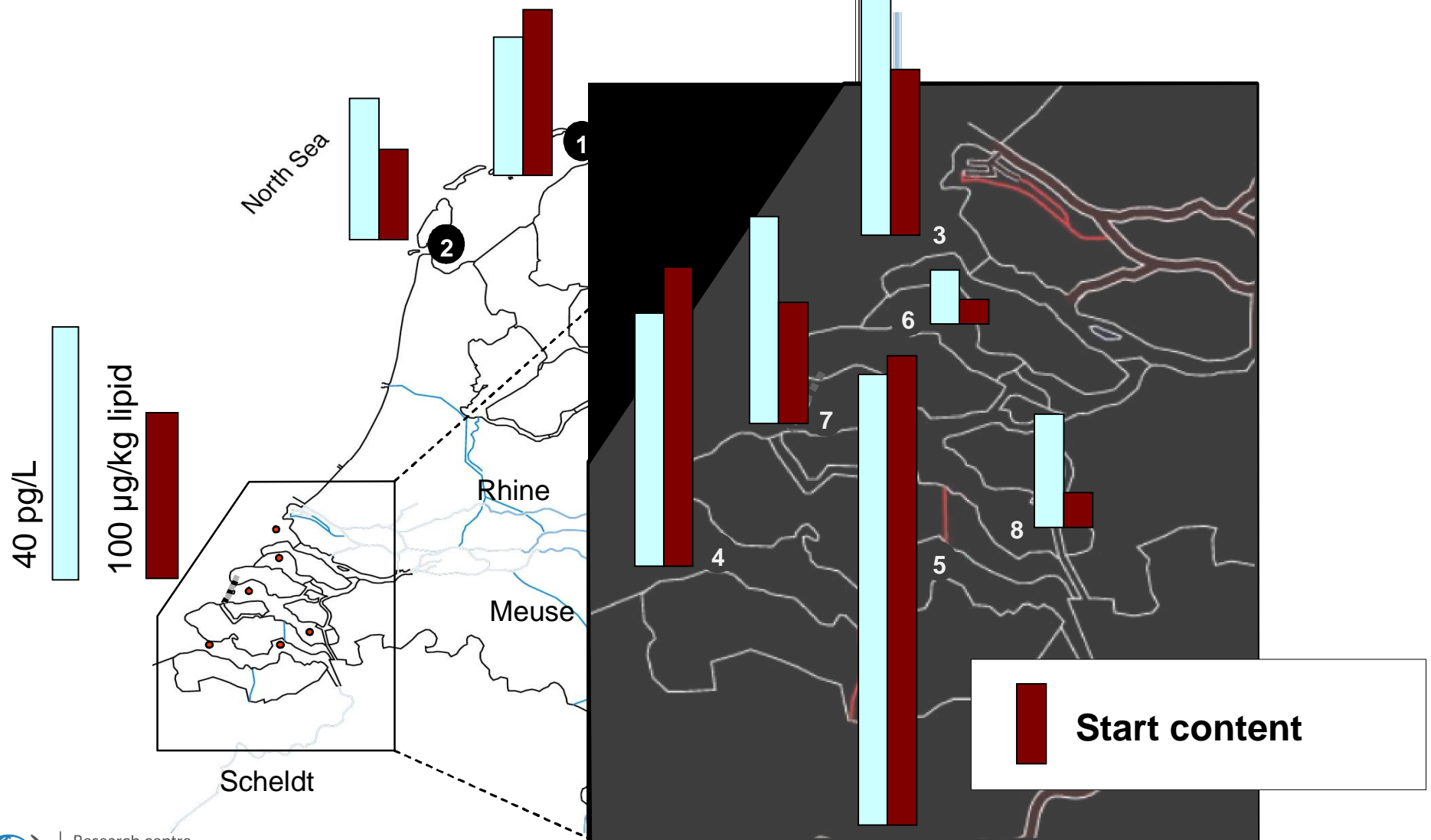
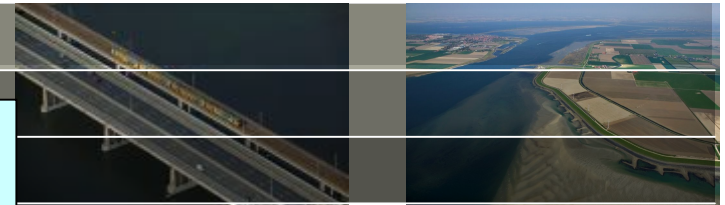
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in the environment

Norman ILS, DG JRC Ispra, Italy

29-30 october 2012

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Benz(a)pyrene (winter 2006)

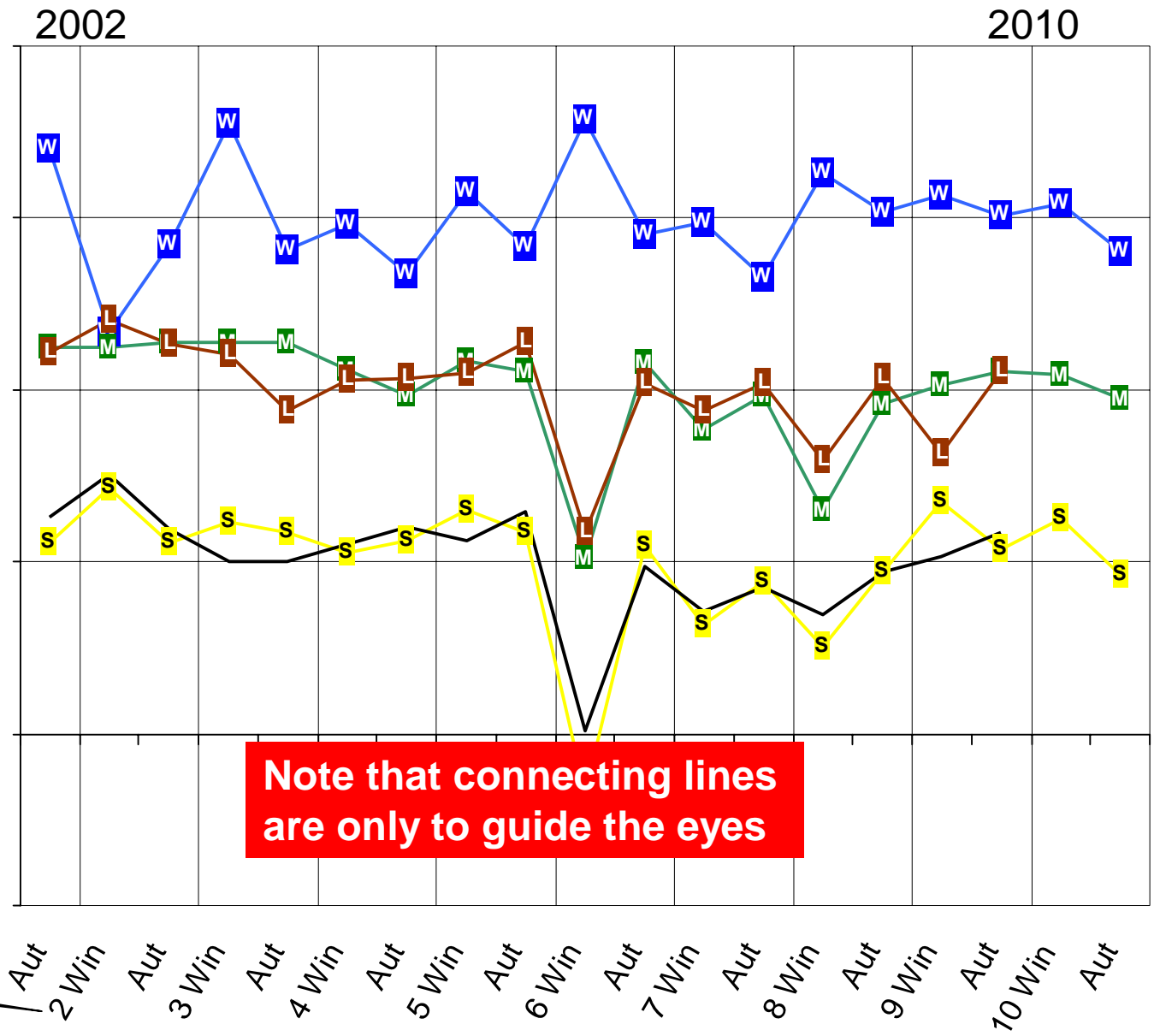


Research centre
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in the environment

PCB 153: Mouth Western Scheldt (Vlissingen)

- log scale
- average normalised
- gridlines at a factor 2

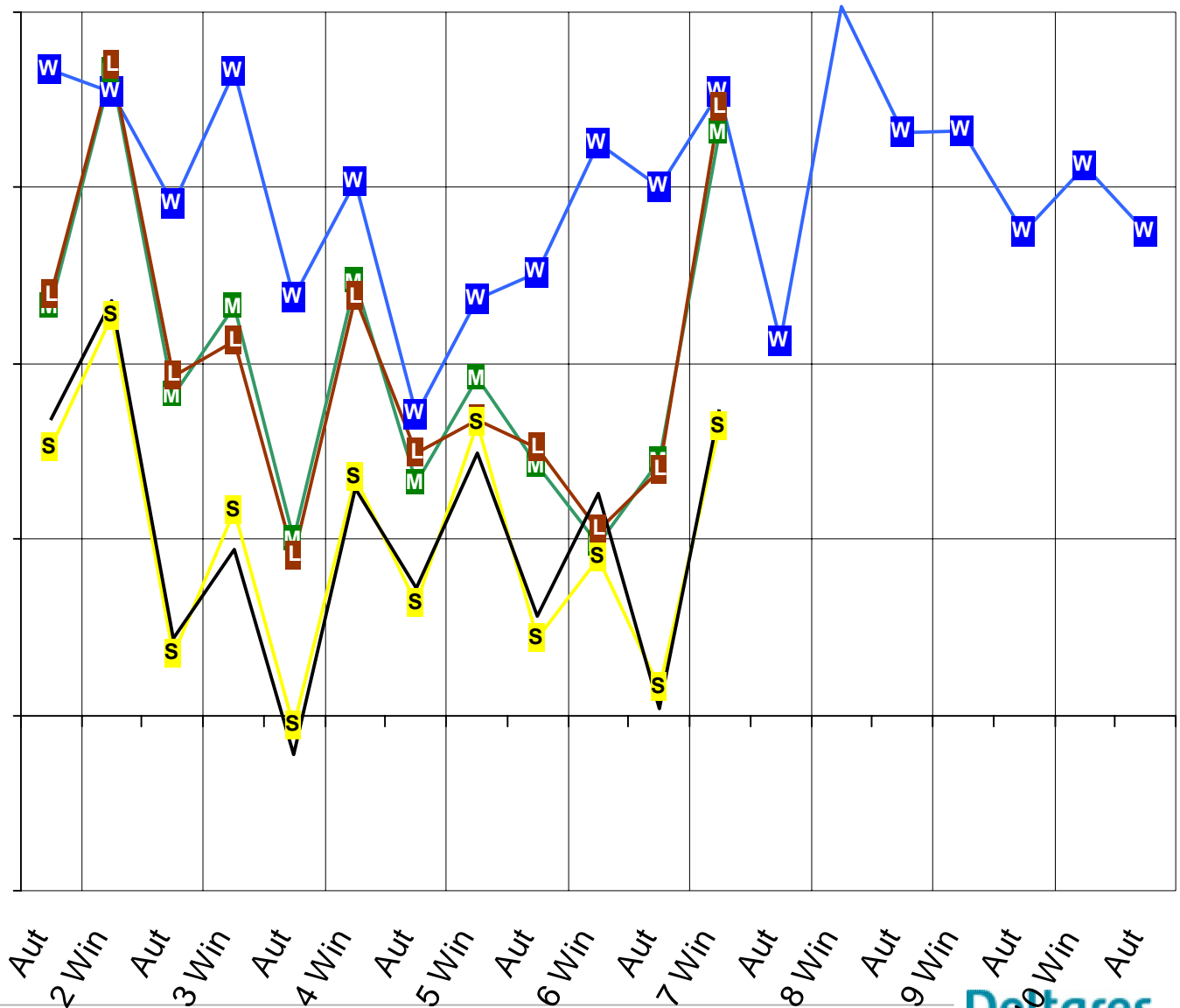
- W** Conc in water
- M** Conc in mussel
- L** On lipid basis
- S** Initial Conc; On lipid basis



Benz(a)pyrene: Mid Western Scheldt (Hansweert)

- log scale
- average normalised
- gridlines at a factor 2

W Conc in water
M Conc in mussel
L On lipid basis
S Initial conc;
— On lipid basis



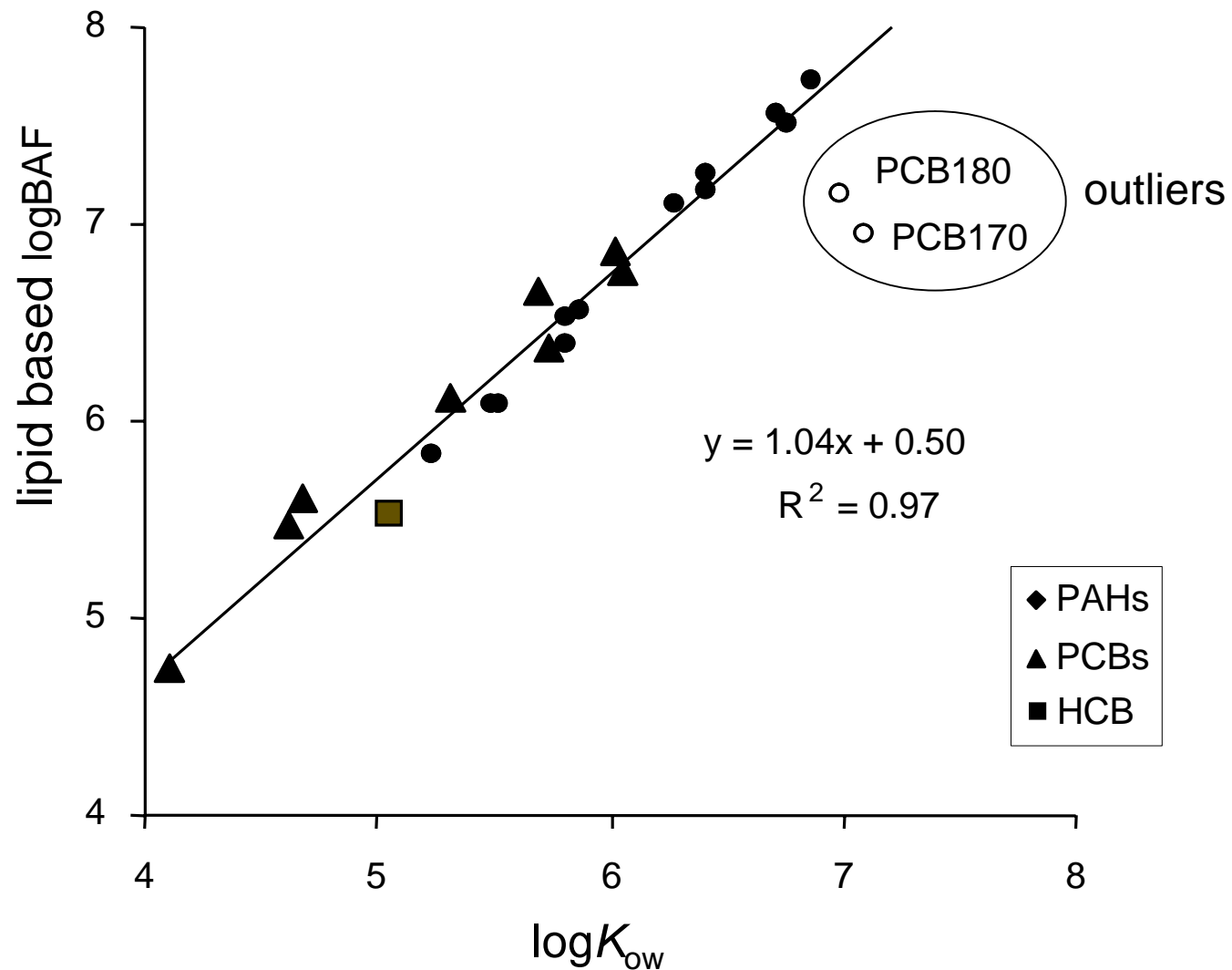
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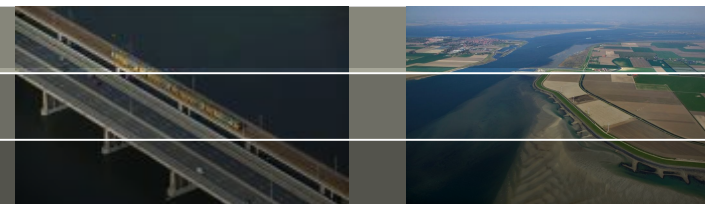
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Lipid based log BAFs versus log K_{ow}



End so on



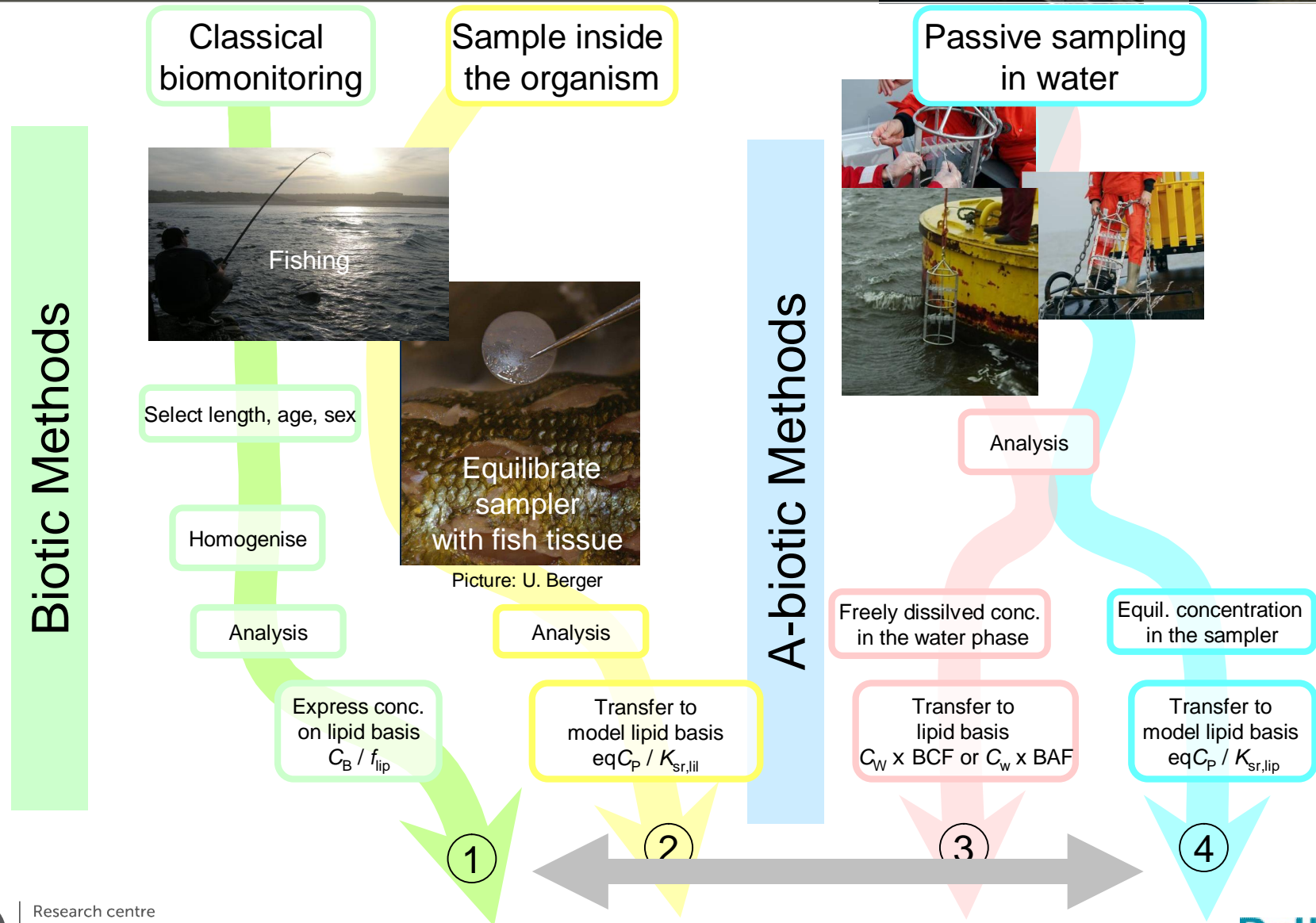
It looks great but we still
look at a log scale

Predictions would still need to use
(variable) literature BCF or BAFs !!

How to get around that?



Several ways to lipid based concentrations



Sampler-lipid partition coefficient (K_{SL})

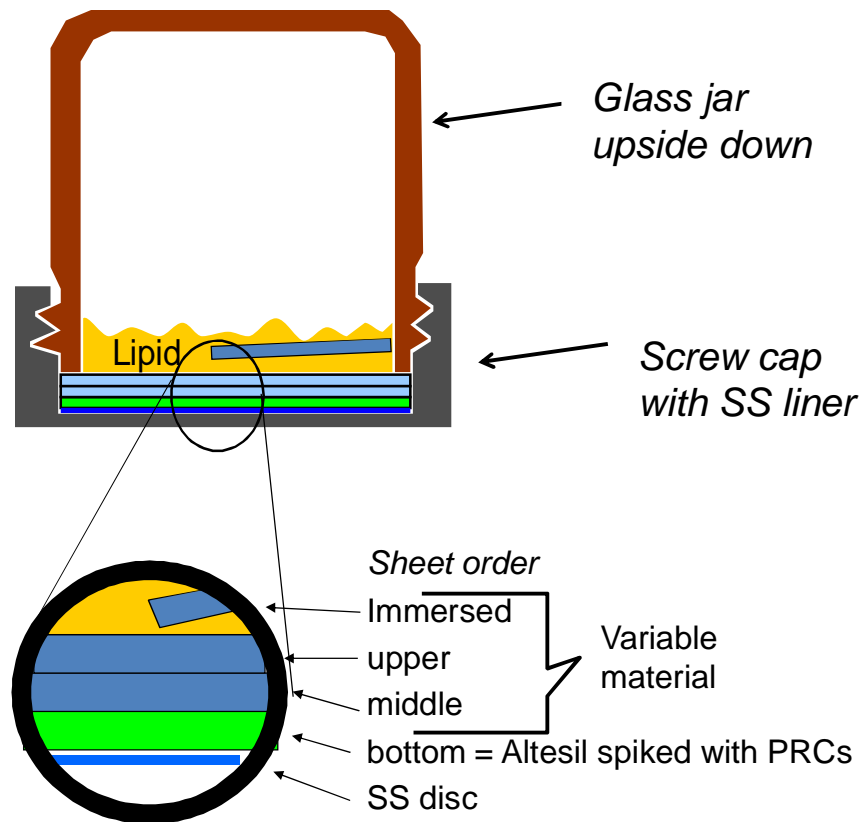
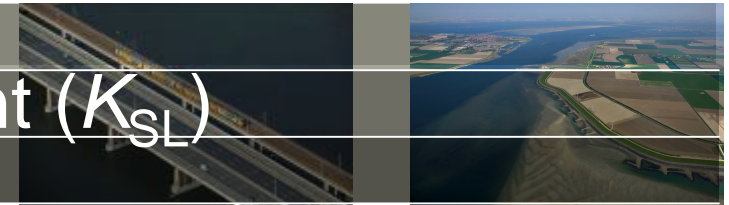


Fig 1. Setup of partitioning experiments

Very accurate

Not dependent

- Temperature

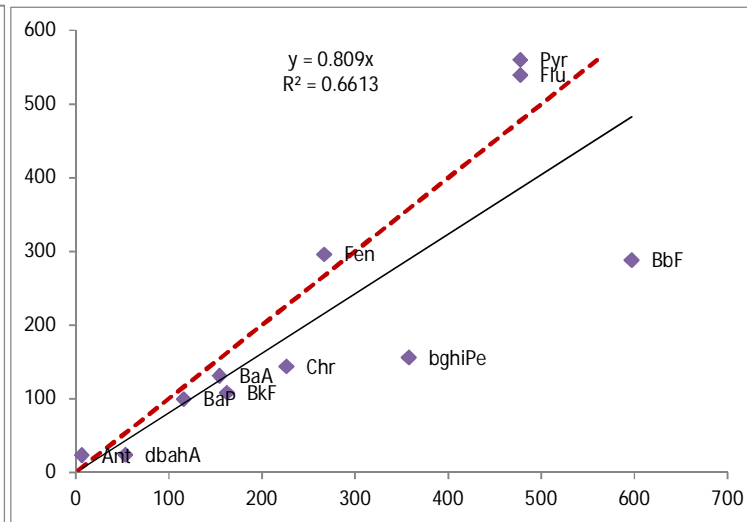
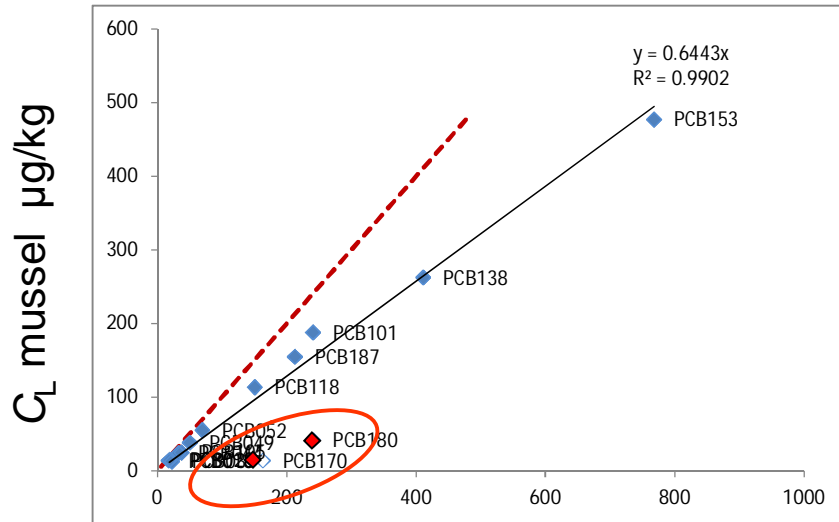
- Lipid type

Lipid in sampler!

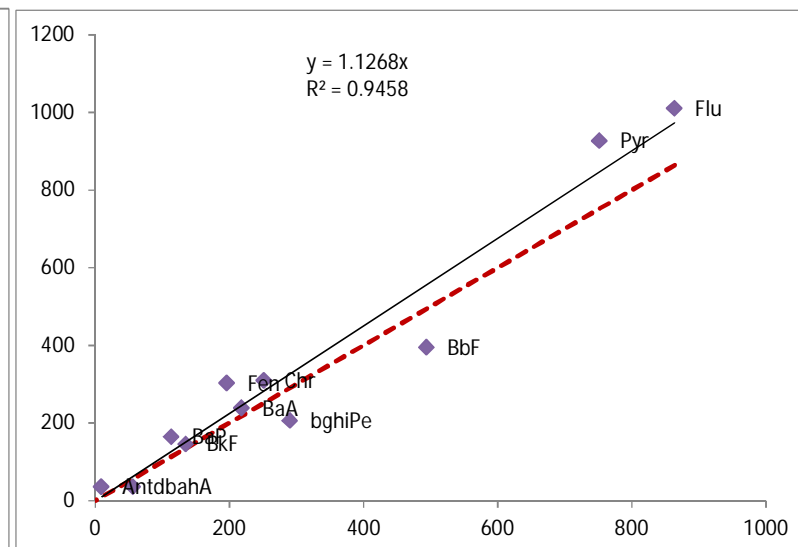
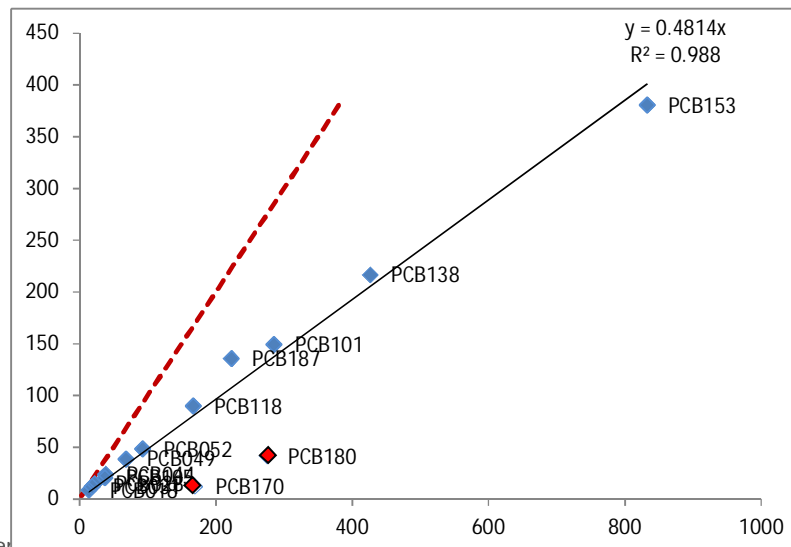


Method 4 A-biotic C_L versus C_L mussel,

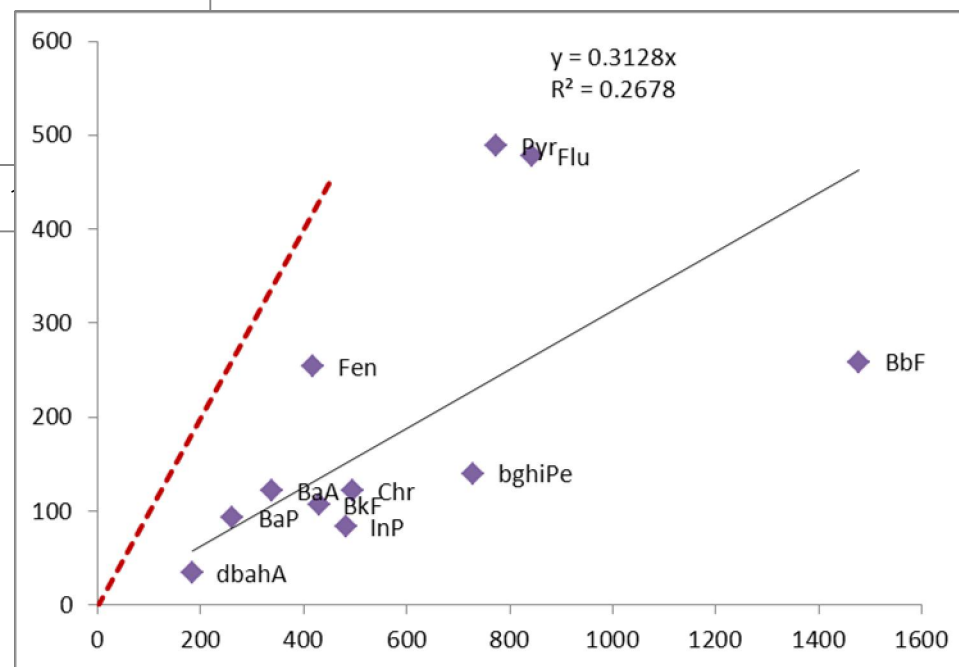
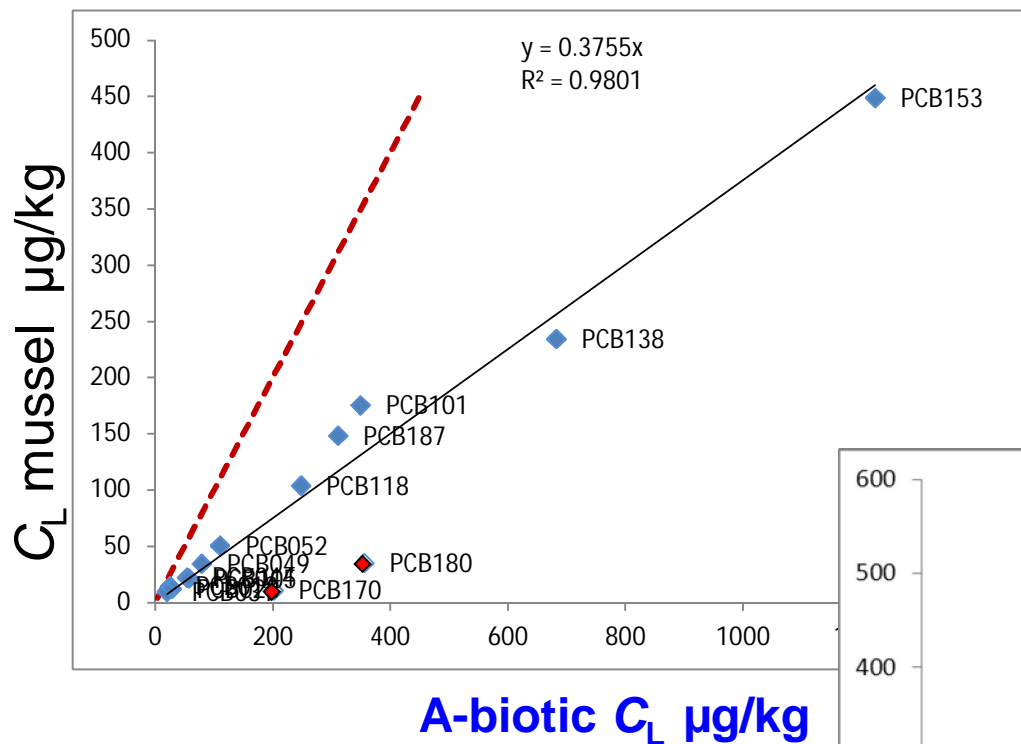
Top panels: autumn average bottom is winter average



A-biotic C_L $\mu\text{g/kg}$



A-biotic C_L versus C_L mussel Autumn 2006





A-biotic C_L is not so bad

Agrees with biotic C_L within a factor two

**Does it make sense to
monitor A-biotic instead of Biotic**

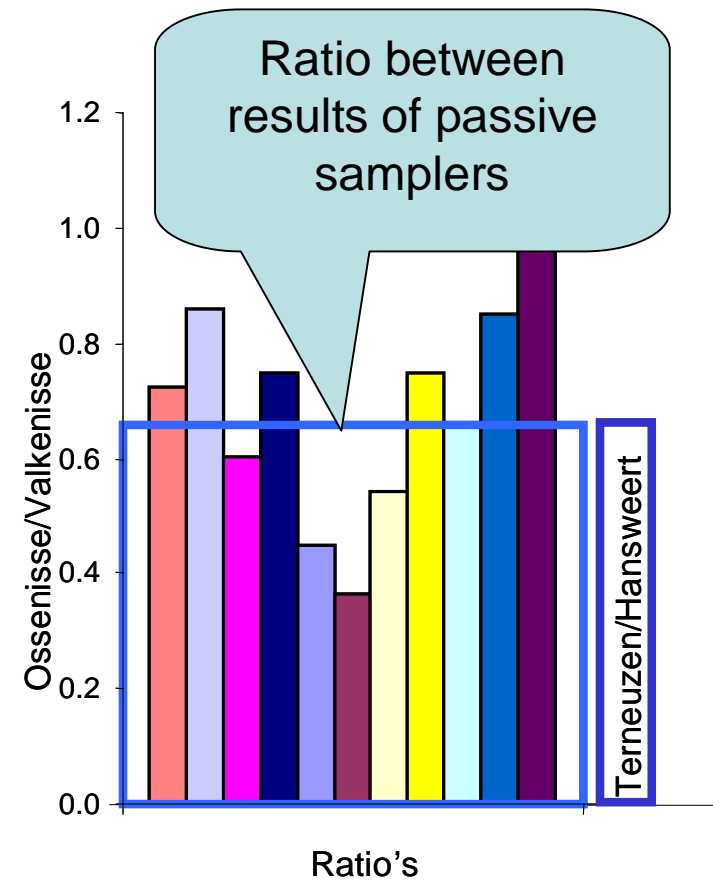
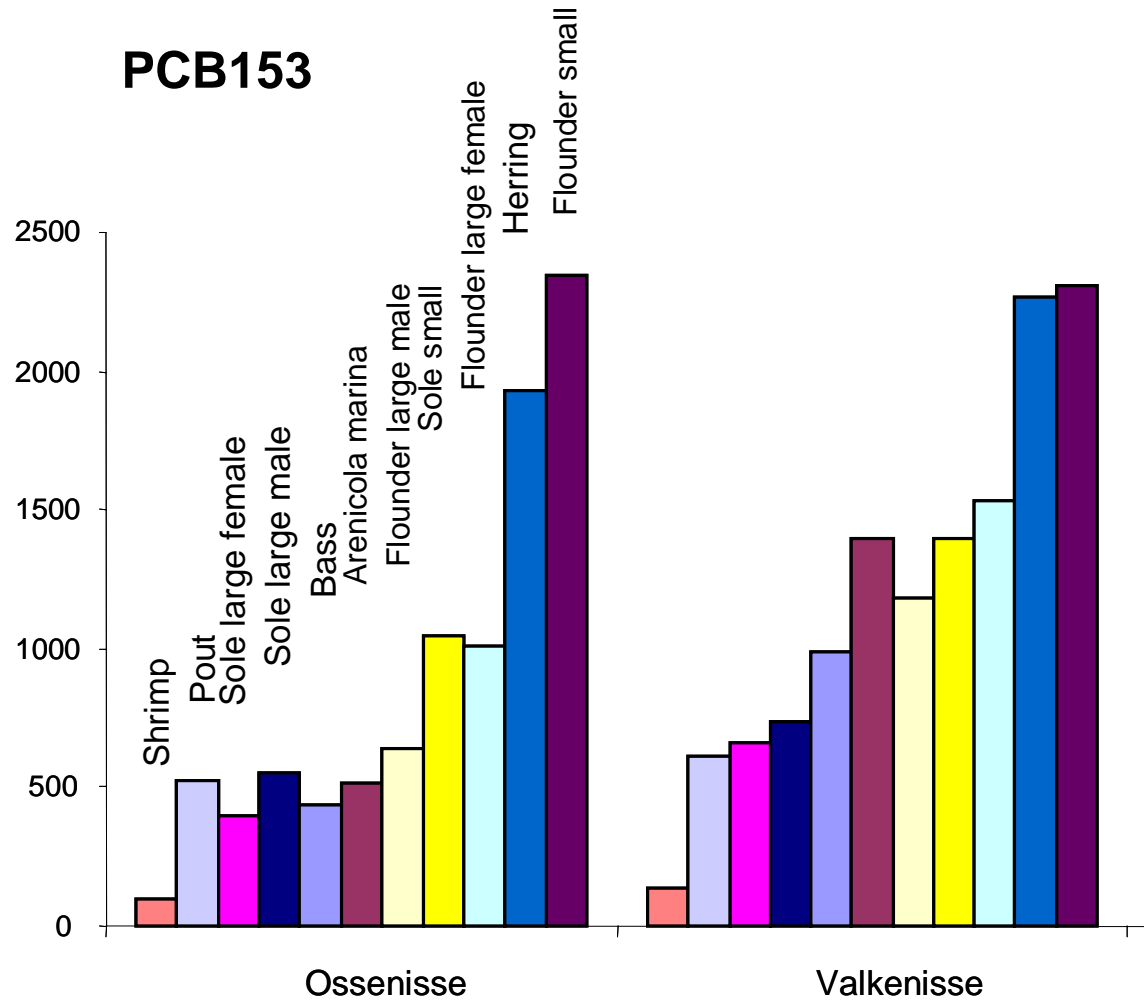


Lipid based concentrations in biota

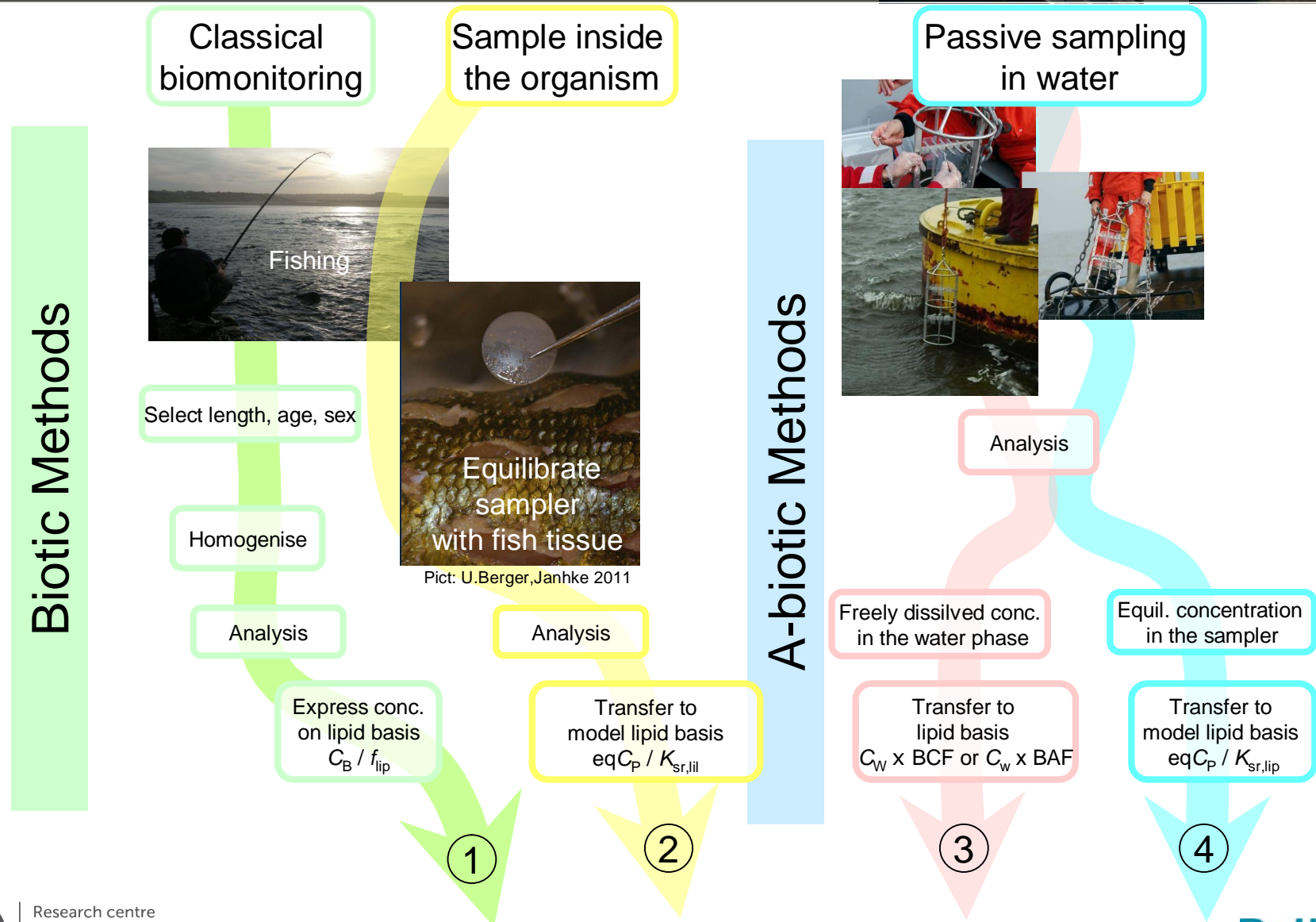
Two station in the Western Scheldt

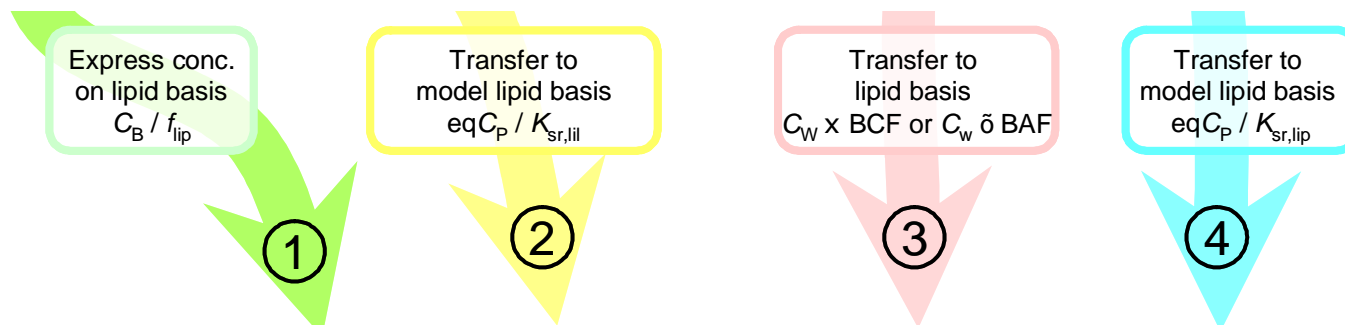


PCB153



Several ways to lipid based concentrations





| | | | | |
|----------------------------------------|----------------------------|--------------|-------------------|-----|
| Availability | Not always | | Good | |
| Animal welfare | Not really | | Yes | |
| Stationary | No guarantees | | Yes | |
| Immortal | No | | Yes | |
| Equal for species, age, sex, size | No | | (No) ^b | Yes |
| Independent of stress? | No | | Yes | |
| Proxy for exposure (chemical activity) | More or less, not for lean | Yes | (Yes) | Yes |
| Includes compounds that metabolize? | No | | No | Yes |
| Quality standards available? | Yes | Yes (biota?) | Yes (biota?) | |

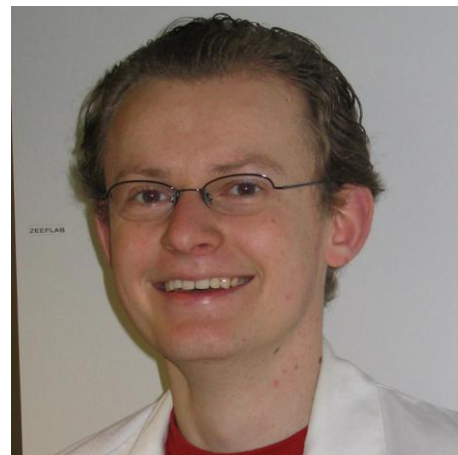
Is there a future for an A-Biotic exposure level

Advantages

- ✓ Worldwide comparability
- ✓ Different waters
Fresh and saline water, toxic, anoxic, porewater
- ✓ Relevant for ~~uptake~~ exposure for organisms
- ✓ Do not metabolize
- ✓ Not mortal

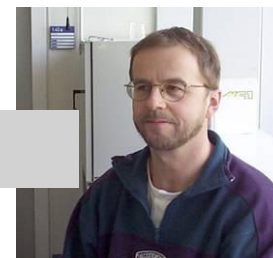


The RIKZ team



René
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Wubbo
Wilts



Grietje
Nummerdor



Theo
Siderius



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