



Monitoring and screening of WFD compounds in Finland

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Contaminant monitoring under WFD in Finland

- Operational monitoring: "Polluter pays"
 - Mainly operators according to their environmental permits
 - Exception: farmers don't have to monitor pesticides
- Surveillance monitoring: regional authorities & SYKE
 - In legislation: the 15 regional authorities (Centre for Economic, development, transport and the Environment) are responsible to monitor inland waters and Finnish Environment institute (SYKE) marine areas
 - SYKE carries out screening campaigns
- Investigative monitoring
 - If needed (e.g. diuron case in river Vantaa 2011-2012)
- EU watch list screenings: SYKE
 - SYKE co-ordinates to fulfill the EU minimum requirements (9 sites, 1 time/y)
- All data => into the national databases => available for WFD

History

- National screenings on the occurrence of EU priority substances in 2004-2006 to help future monitoring
 - samples from rivers, waste water treatment plants, sediment, biota
- 2012 – 2013 screening campaigns in selected sites (mainly rivers)
- 2012 – 2016 monitoring of Hg and POPs in perch (herring in marine areas)
- Metals monitored in the mouth of big rivers (total>dissolved>bioavailable)
- Pesticides (& biosides) have been monitored in 2007–2014 within MaaMet-project in agricultural rivers (5-15 rotating sites/year).

WFD reporting 2015

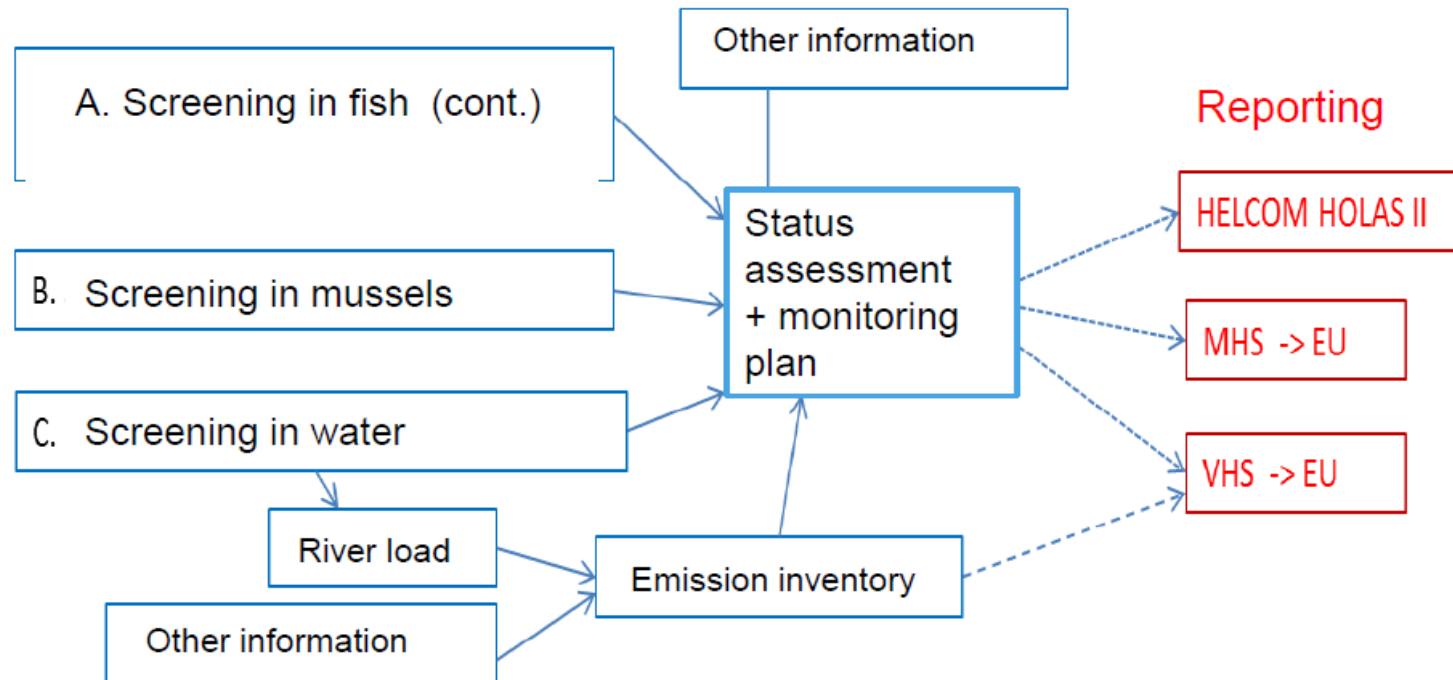
- Classification based on all available information (at 2013 + Hg data from 2014)
 - SYKE proposed expert assessment for each chemical
 - 6806 WB X about 50 compounds => over 300 000 assessments
 - Except metals (Ni & Cd) in acid sulfate soil areas (->regional authorities)
 - For Hg a simple grouping model based on water body type and latitude
 - The preliminary classification was automatically uploaded into the national reporting system for all water bodies.
 - For those WBs having some measured data in the national data bases, SYKE suggested data-based assessment.
 - They were uploaded into to reporting system (by overwriting the previous)
 - Regional authorities corrected and fulfilled the classification
 - Hg was reported to EU separately and with the other compounds
 - The inventory of emissions, discharges and losses (2008/105/EC; article 5) was reported to EU at the same time
 - co-operation between SYKE and regional authorities

	Hg	Cd	Ni	TBT	Sum
Number of EQS-exceedings	3 427	48	23	6	3503 (3440 WB)
Measured exceedings (+due to uncertainty of Hg measurements)	128	29	18	3	
Exceeding according to site specific expert judgement (e.g. based on limited measured data)	12	19	5	3	
Exceeding based on expert judgement due to long-distance transport + natural conditions (Hg grouping model)	3 287	(no)	(no)	(no)	

- Pollution due to mining structures: 8 Cd and 10 Ni exceedings.
- The TBT exceedings were based on human activity in past (use as antifouling compound) => polluted bottom sediments in harbors
- Indirect human activity: drainage of the acid sulphate soils (historical sea bottom) caused 40 Cd and 13 Ni exceedings.
- Some single EQS exceedings for former pesticides were found, but if there was data from several years, the last year data was used.

On-going

- "UuPri" 9/2016 – 3/2018
- <http://www.syke.fi/hankkeet/uupri>



Hg - fish

-perch
-herring

A dot if an average of 10
separately analysed
fishes

Hg 2010-2017 (mg/kg w.w.)

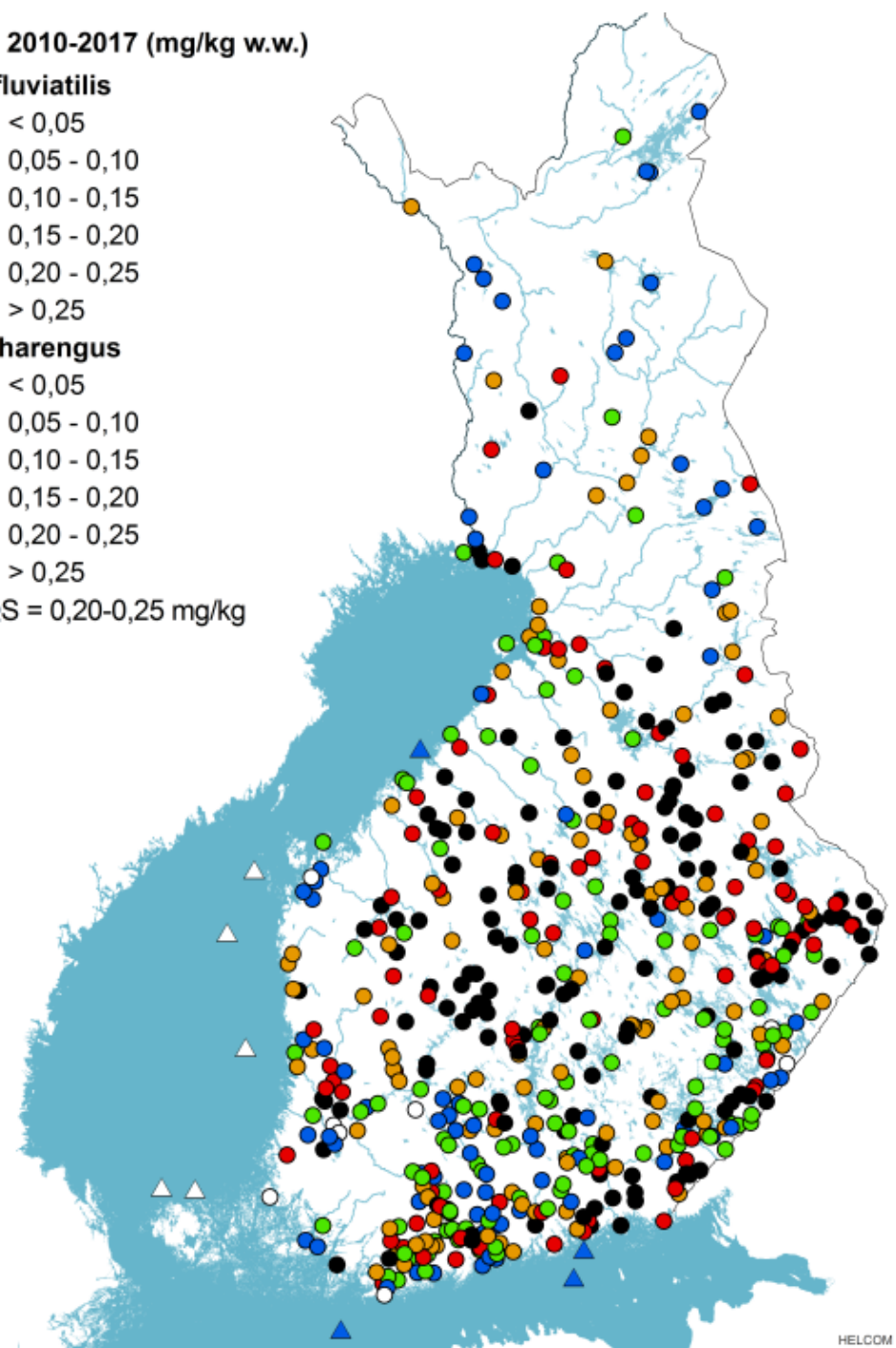
P. fluviatilis

- < 0,05
- 0,05 - 0,10
- 0,10 - 0,15
- 0,15 - 0,20
- 0,20 - 0,25
- > 0,25

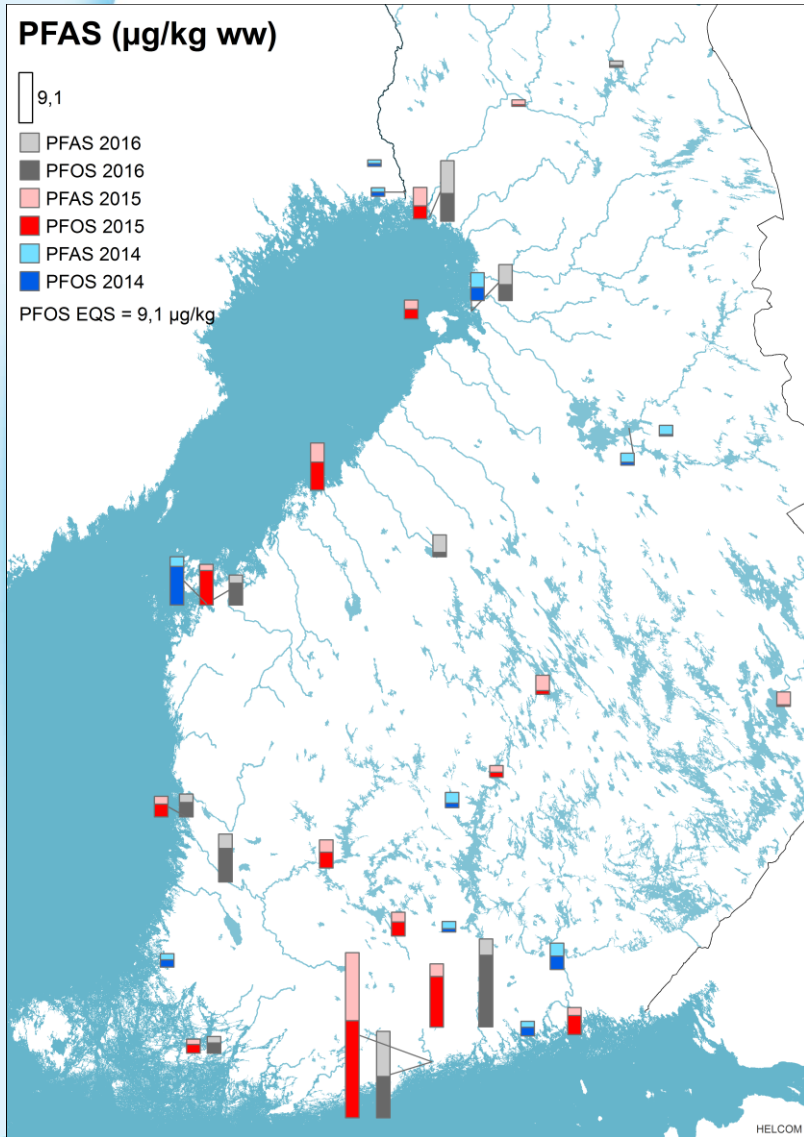
C. harengus

- △ < 0,05
- ▲ 0,05 - 0,10
- ▲ 0,10 - 0,15
- ▲ 0,15 - 0,20
- ▲ 0,20 - 0,25
- ▲ > 0,25

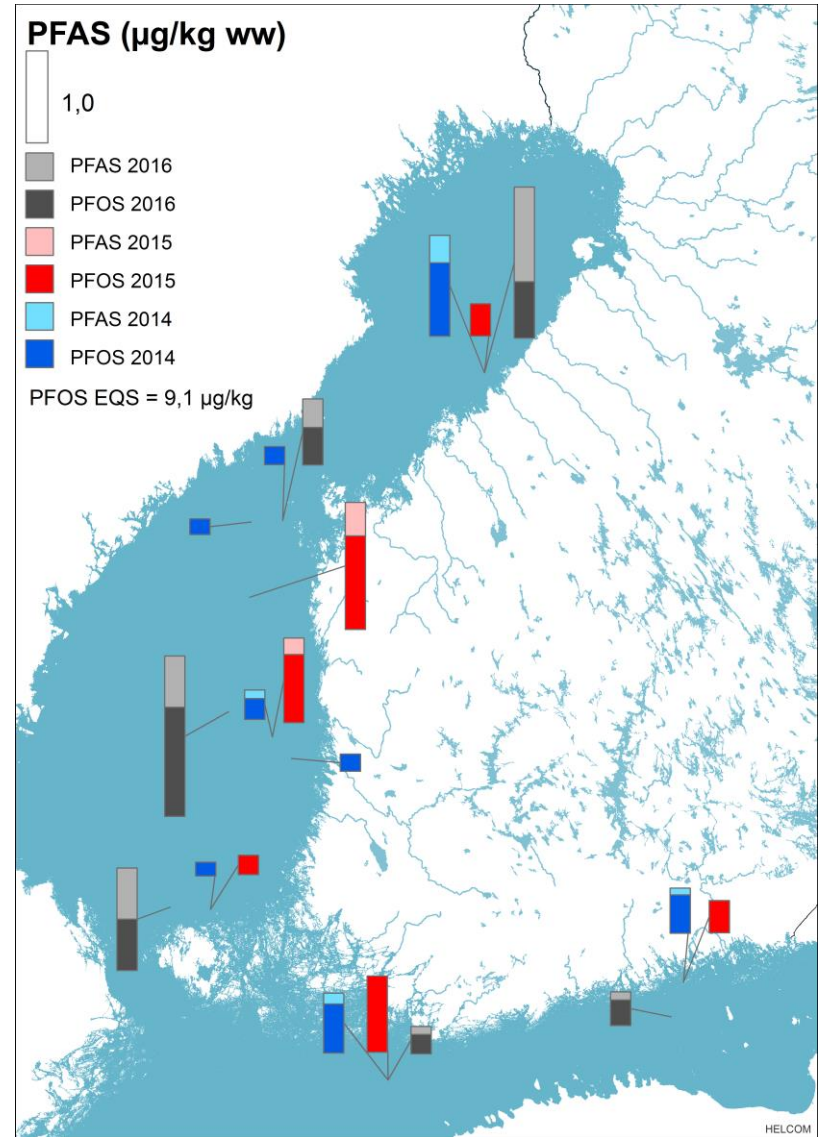
EQS = 0,20-0,25 mg/kg



Fish: PFOS (darker) and the sum of other PFAS compounds 2014 - 2015



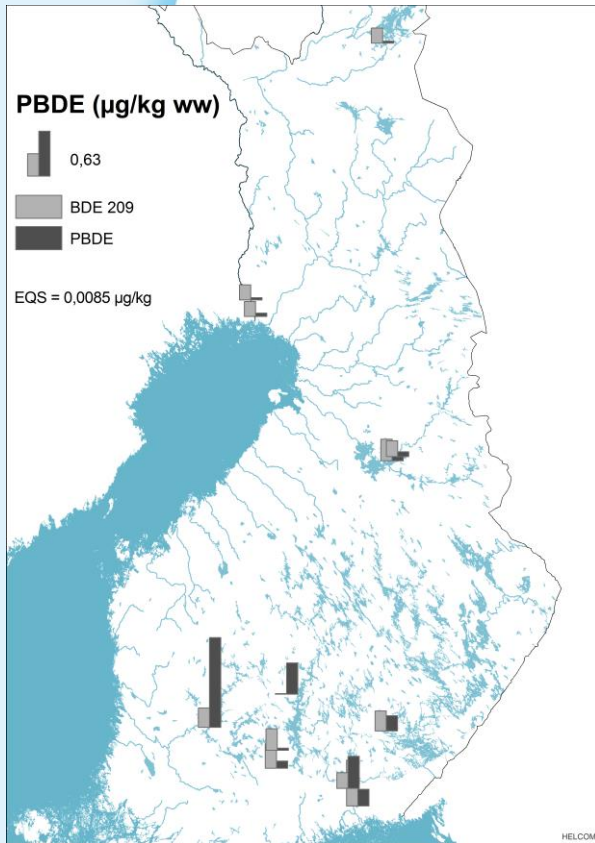
Perch



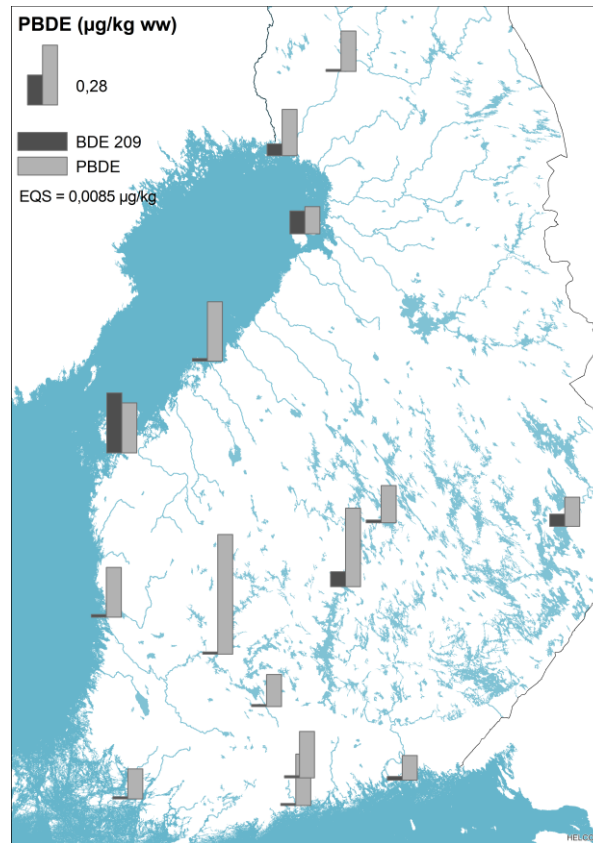
Herring

Note the different axes

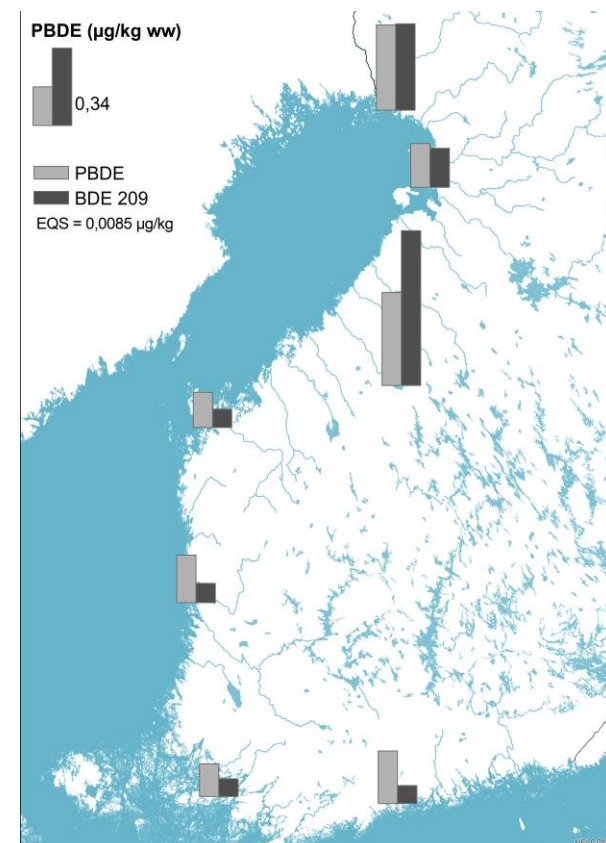
2014



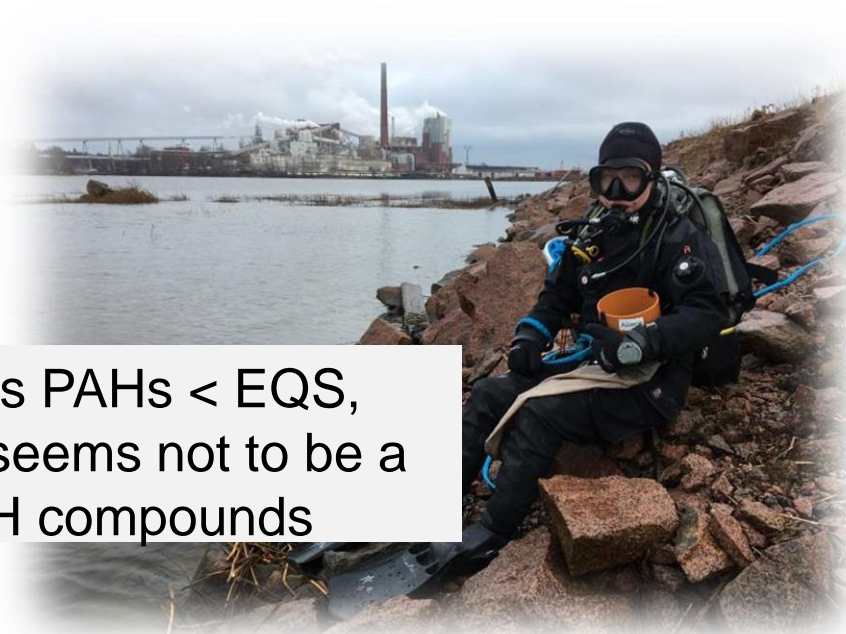
2015



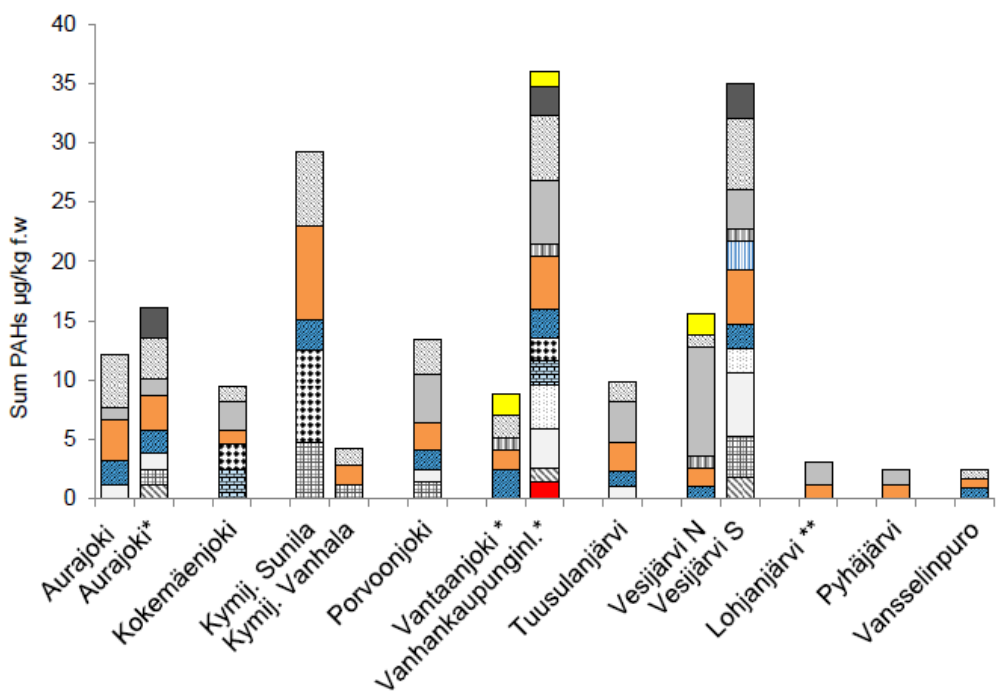
2016



PBDE >> EQS everywhere



In freshwater mussels PAHs < EQS,
but benzo(a)pyrene seems not to be a
good indicator of PAH compounds



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PAHs in freshwater mussels in Finland

- Concentrations of polycyclic aromatic hydrocarbons (PAHs) were used for the chemical classification of water bodies.
- PAHs are an important group of organic pollutants (192 polycyclic aromatic hydrocarbons and related PAH derivatives).
- Both mussels (*Dreissena polymorpha*) and river otters (*Lutra lutra*) were used as sample species.
- Mussels were collected from 11 freshwater sites and river otters from 10 sites.
- Mussels' tissues (dry weight) of these mussels (*Dreissena polymorpha*) were analysed for 192 PAHs and 192 related PAH derivatives.
- Altogether 18 different PAH compounds were found out of the 21 analyzed.

- Anthracene
- Trifenylylene
- Pyrene
- Perylene
- Naphtalene
- Chrycene
- Fluoranthene
- Phenanthrene
- Indeno[1,2,3-cd]
- Dibenzo[a,h]ant
- Benzo[ghi]peryl
- Benzo[e]pyrene
- Benzo[b]fluoran
- Benzo[a]anthracene
- Benzo[a]pyrene

* *U. pictorum*
 ** *A. cygnea*

Figure 1. Sum of PAH concentrations in mussel soft tissues.

River screening 2016 – 2017

- 11 rivers x 8 times
- 2 reference sites x 4 times
- Analysed compounds
 - PFAS (23 substances)
 - data needed for river loading calculations; the main matrix is fish
 - High concentrations e.g. in river Vantaa (Helsinki)
 - Pesticides (240 substances)
 - About 50 compounds found
 - No EQS exceedance for priority substances, but some other interesting results (e.g. dinoterb detection; it is in the candidate list of PIC)





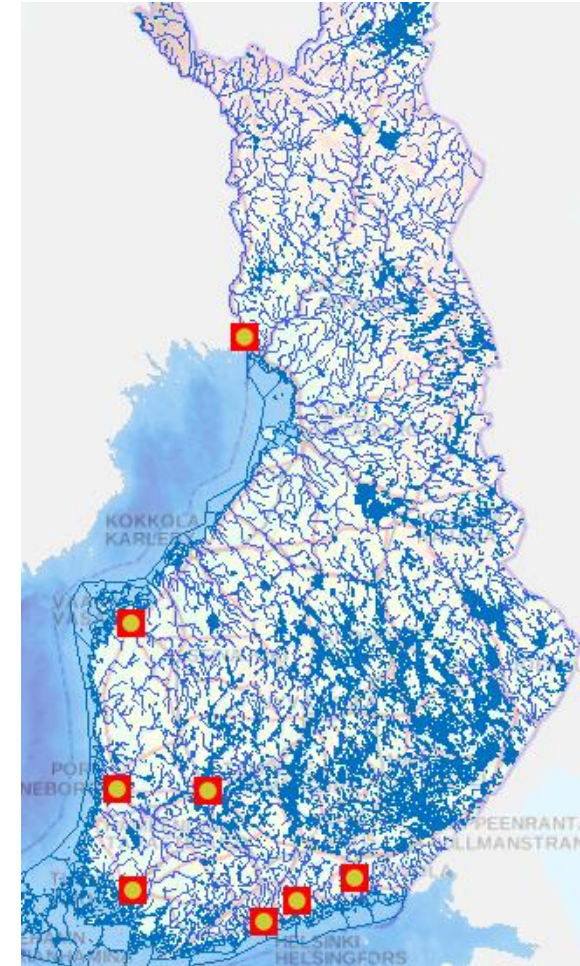
Pesticide monitoring

- 2007 – 2014 mainly to fulfill the WFD
 - Chemical status in agricultural rivers
 - Changing sites to cover as many WBs as possible
 - WFD surveillance monitoring requirements:
 - 12 times per year but only for one year during the 6 year period => if no risk found and no changes in pressures => the next monitoring after 18 years
 - No information about pesticide use etc. => difficult to utilize the results in risk mitigation planning
 - A GIS based pesticide pressure indicator under preparation
- => Monitoring in 2016–2017 (+2018?) in a small watershed where other on-going studies as well
- Similar to Swedish and Norwegian pesticide monitoring catchments



Watch list

- 9 sites for Finland from directive (2015):
 - 7 rivers: both reference and highly loaded & a lake (2 depths)
 - Surface water from Päijänne tunneli
 - more quality control samples than usually
- 2016: the rivers and the lake (8 sites)
 - 2017: will be carried out as in 2015 + sediment for UV-compounds; if ministry gives us the money => should be reported in Dec 2017 to EU
- Results from 2015 & 2016 demonstrates possible problems with EE2, E1, dichlofenc and neonicotinoids in some agricultural sites



A consulting laboratory in Lahti (part of Eurofins since spring 2017) has a method to analyse E1, E2 and EE2 with the required determination limit.

Shortly

- The national monitoring has been carried out in individual projects (more screenings than continuous monitoring)
- SYKE is preparing a national monitoring plan for WFD substances. The plan should be ready by 3/2018.
 - How to take it into practice? (and who pays?)
 - Sediments (several depths) are going to be included to analyse concentration trends (only few sites per year)
 - Biota (another trophic level?)
 - Passive samplers have been tested
 - Possibility to use in WFD in future?

Thank you!

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