

WFD and biota monitoring

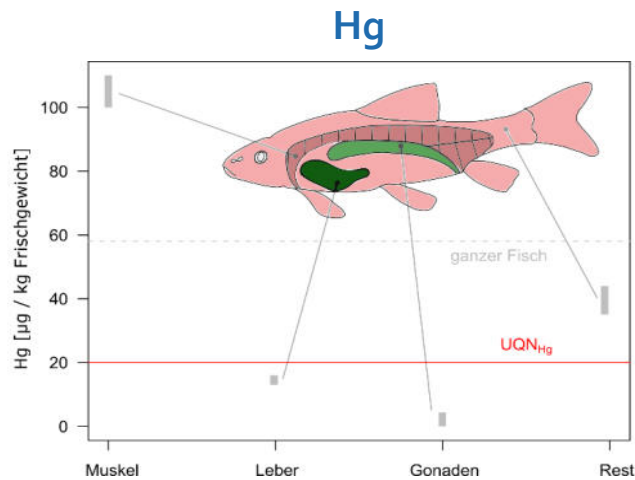
An Austrian perspective

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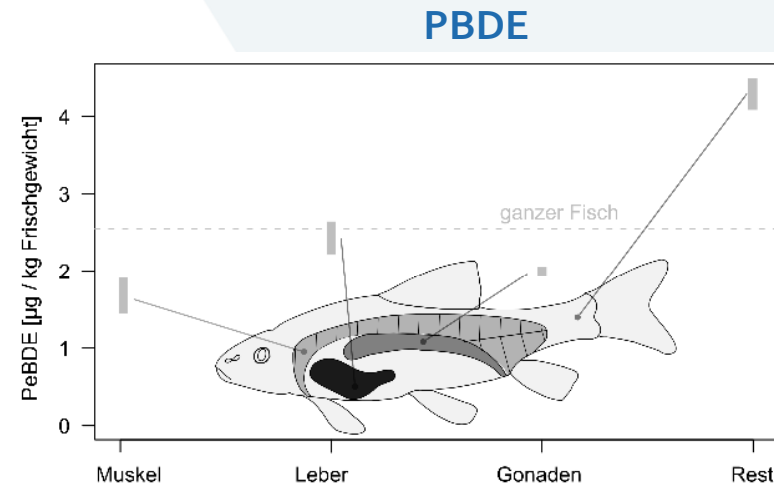
Starting

- 2007 Study for developing a monitoring strategy i.a. on biota monitoring (Fraunhofer Institute; Rüdell et al.)
 - Preferred species: chub
 - Using whole fish for analysis
- 2010 Feasability study (UBA Vienna, Uhl et al.)
 - Testing the recommendation on 5 sites
 - Distribution of contaminants between fish organs, influence of age, sex, different species

Distribution of contaminants between fish organs, example chub (UHL et al. 2010)



- Highest concentration in muscles (filet)
- Ratio: concentration whole fish/muscle < 1 (example ~ ca. 0,7)



- Highest concentration in offcut („Restfisch“) (skin, bones, nerval system, remaining viscera) - skin as lipophilic surface
- Ratio: concentration whole fish/muscle > 1 (example ~ 1,3)

Biota Monitoring in Austria since 2010

- Since 2010 - trendanalysis
- 2013 – Fish on surveillance monitoring sites (rivers, lakes)
- 2020 operational monitoring
 - fish: PFOS, Dioxins
 - mussels/crustaceae: PAH

AT - general criteria – fish

- Species:
 - depends on fishregion to reflect the local situations (e.g. for predators)
 - Rivers in meta- and epirhithral (about 65% of the Austrian rivers) - typsecific fish only trout (+ bullhead) TL 3,... → trout
 - Fishregion Potamal und Hyperrhithral – variety of fish, mostly TL 3-4 → preferred fish chub
 - Trendmonitoring at large rivers – sitespecific
- Preferred age 3 – 5 years

WFD and biota monitoring – An Austrian perspective/Karin Deutsch

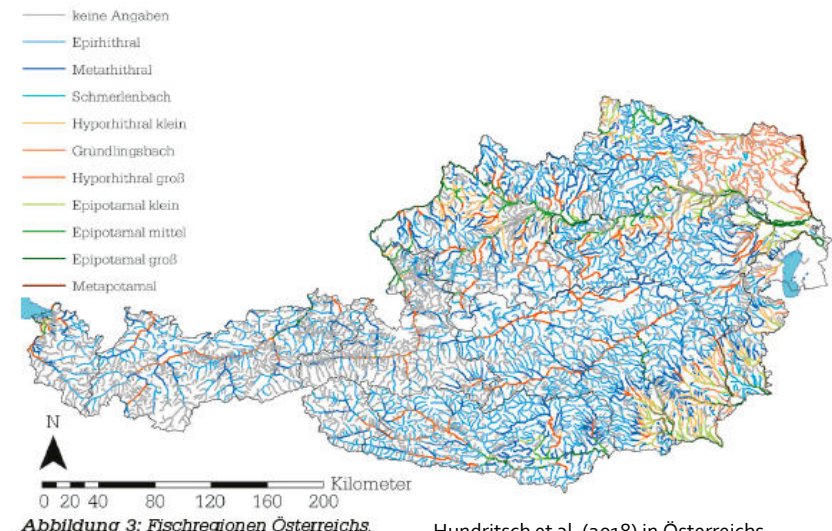


Abbildung 3: Fischregionen Österreichs.

Hundritsch et al. (2018) in Österreichs Fischerei 71,301-317)

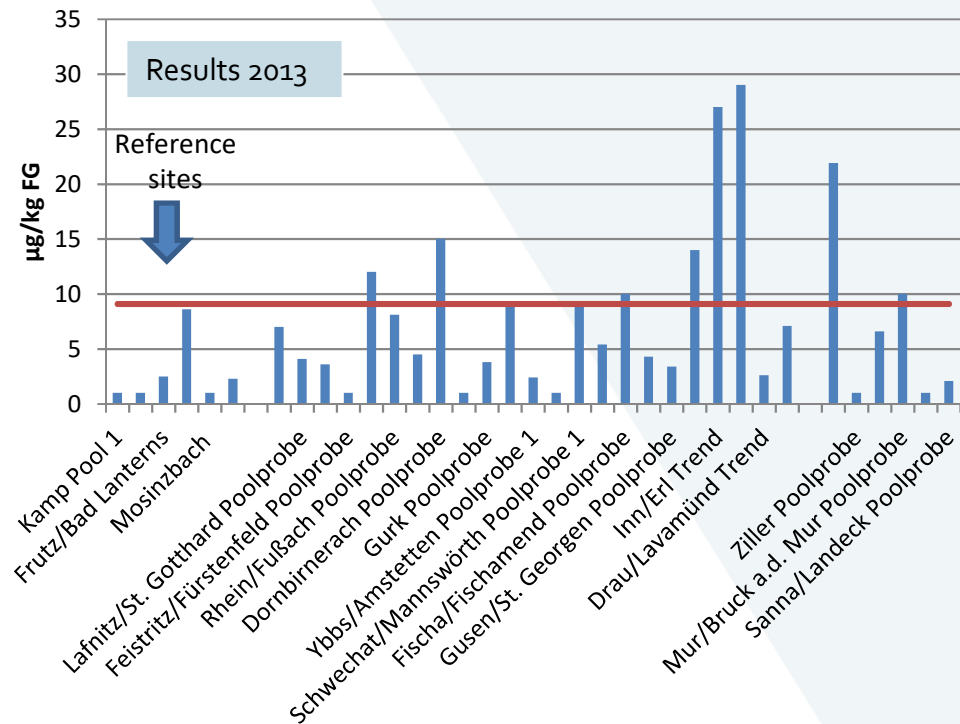
Situation in Austria

- Assessment based on results - whole fish
 - Protection goal sec pois – direct
 - Protection goal – human consumption
 - lipid related compounds “overestimation of risk”
 - protein bound compounds (e.g. PFOS) → risk “underestimation”?
- Most of compounds clear results

substance	DIRECTIVE 2013/39/EU				Protect goal	Surveillance monitoring biota 2013			
	AA-EQS	MAC-EQS	EQS	taxon		sites	min conc	max conc	sites > EQS
	Inland surface waters		Biota			n	µg/kg w.w	µg/kg w.w	n
	µg/l	µg/l	µg/kg w.w						
Mercury and its compounds		0,07	20	fish	sec	35	22	290	35
Hexabromocyclododecane (HBCDD)	0,0016	0,5	167	fish	sec	35	< LOD (50)	< LOQ (100)	0
Dicofol	0,0013		33	fish	sec	35	< LOD (2)	< LOD (2)	0
Hexachlorobutadiene		0,6	55	fish	sec+hh	35	< LOD (2)	94	1
Brominated diphenylethers		0,14	0,0085	fish	hh	35	0,044	7,9	35
Hexachlorobenzene		0,05	10	fish	hh	35	< LOD (2)	34	1
Heptachlor and heptachlor epoxide	2 × 10 ⁻⁷	0,0003	0,0067	fish	hh	35	< LOD (0,85)	< LOD (0,85)	0
PFOS	0,00065	36	9,1	fish	hh	35	< LOD (1)	35	8
Dioxins and dioxin-like compounds		0,0065 µg.kg ⁻¹		fish	hh	35	0,0001	0,01	1
Fluoranthene	0,0063	0,12	30	crustaceans,molluscs					
Benzo(a)pyrene	0,00017	0,27	5	crustaceans,molluscs					

PFOS (1)

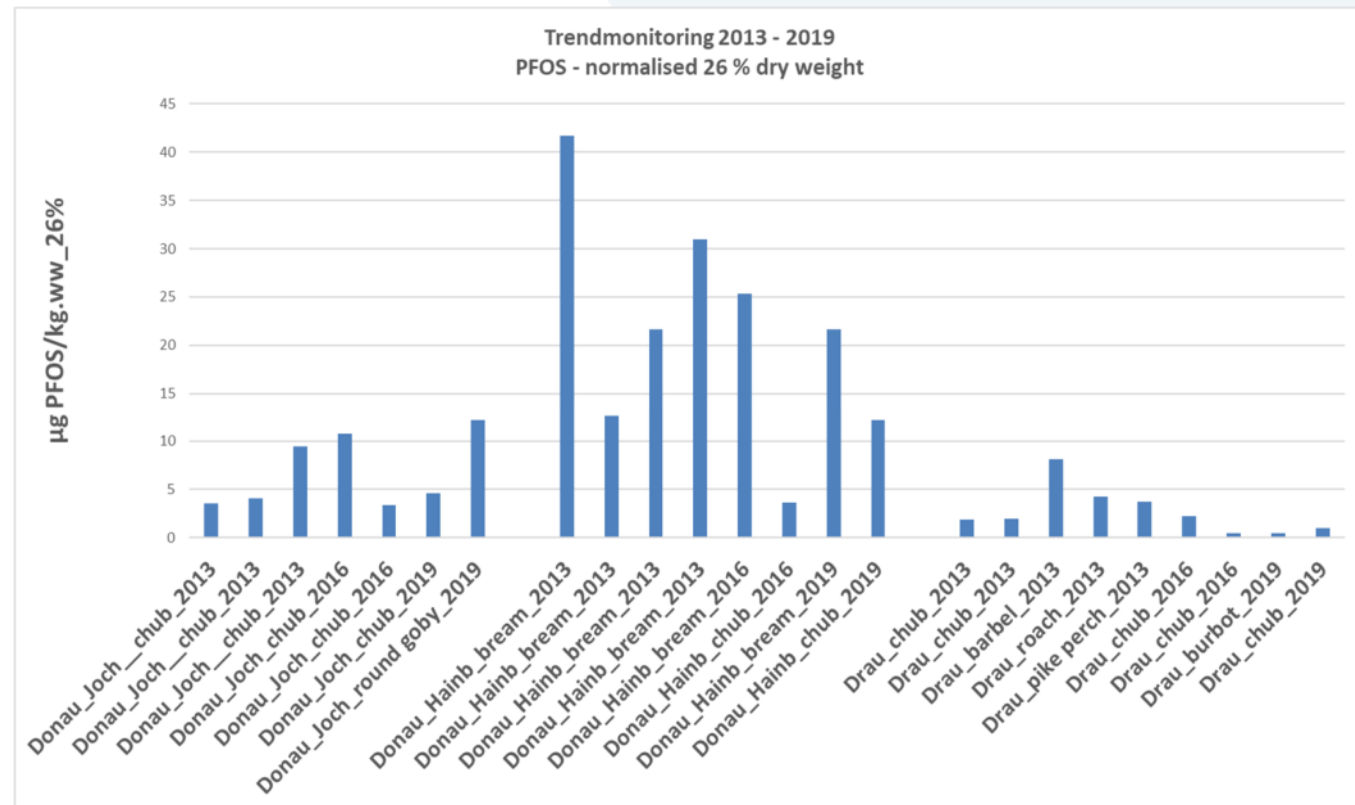
- Results whole fish – up to now used for status assessment
- Chub, trout, rainbow trout ...
- Broad ranges
- Evaluation of relationship data on fillet foreseen in 2021



PFOS (2)

- Influence of species
- Chub – bream
- TL – age ?

→ Trend sites
- clear principles for
each site!



PAH

- Mussels, crustaceae - only very limited availability of not-protected species in AT
- No infrastructure/experience for using caged biota (active biomonitoring) available
- Monitoring programme 2020
 - Feasibility study using wild-caught biota
 - Comparison of different taxa – use of Neozoa
 - Comparison of assessment based on water and biota

substance	DIRECTIVE 2013/39/EU			taxon
	AA-EQS	MAC-EQS	EQS	
	Inland surface waters		Biota	
	µg/l	µg/l	µg/kg w.w	
Fluoranthene	0,0063	0,12	30	crustaceans, molluscs
Benzo(a)pyrene	$1,7 \times 10^{-4}$	0,27	5	crustaceans, molluscs



Signalirets
 #signalirets #signalirets #signalirets



Amy Benson - U.S. Geological Survey

PAH – Results 2020 (1)

- Comparison different biota taxa

	% water content			fluoranthene (µg/kg.ww)			benzo(a)pyrene (µg/kg.ww)		
EQS				30			5		
LOQ				0,3-0,9			0,4-1		
LOD				0,09-0,25			0,09-0,25		
	mussel	shrimp	crayfish	mussel	shrimp	crayfish	mussel	shrimp	crayfish
site	Dreissena, Corbicula	Gammaridae	Pacifastacus, Orconectes	Dreissena, Corbicula	Gammaridae	Pacifastacus, Orconectes)	Dreissena, Corbicula	Gammaridae	Pacifastacus, Orconectes)
Thaya	84,3			34			1,7		
March	83,8	82,3		25	5,2		< 0.78	0,64	
Dornbirner Ach			58,6			6,4			7,5
Drau	91,1	80,6	82,8	3,6	1,3	< 0.37	< 0.43	n.n.	n.n.
Kainach			81,1			< 0.41			n.n.
Mürz			80,5			0,47			n.n.
Mur			77,3			< 0.49			n.n.

→ Normalisation required?

→ Interpretation (resulting in measures?)

PAH – Results 2020 (2) – water/biota

- Comparison assessment based on water/biota

			fluoranthene		benzo(a)pyrene		
		AA-EQS water (µg/l)	0,0063		0,0002		
		EQS Biota (µg/kg.ww)	30		5		
Site	analysed in	Biota % ww	mean	mean/EQS	mean	mean/EQS	
Thaya	water		µg/l	0,018	2,9	0,0082	48,1
	Dreissena	84,3	µg/kg.ww	34	1,1	1,7	0,3
March	water		µg/l	0,0205	3,3	0,0084	49,4
	Gammaridae	82,3	µg/kg.ww	5,2	0,2	0,64	0,1
	Corbicula	83,8	µg/kg.ww	25	0,8	< 0.78	<0,2


- Ratio (mean/EQS) of biota and water
 - Fluoranthene – small differences in assessment (factor around 3)
 - Benzo(a)pyrene – large differences in assessment (> 50)
 - BiotaEQS and water EQS – same level of protection?

PAH - questions

- Status assessment based on water – probability of exceedance higher than assessment based on biota
- In cases where no wild biota (mussels/crustaceae) available
 - assessment based solely on water?
 - active biomonitoring?
- Crayfish – normalisation ??

Final remarks

- Assessment of point sources – evasive behaviour of fish has to be considered
- Costs of biota monitoring
Fishing, lyophilisation, additional parameters (age, lipid ...) - approx. costs of 2.000-3.000 € per site are possible - analysis costs usually lowest

A close-up photograph of water splashing over rocks and a piece of driftwood. The water is clear and bubbly, creating a dynamic scene. A teal rectangular box is overlaid on the center of the image, containing the text "Thank you for your attention!" in white, bold, sans-serif font.

**Thank you for your
attention!**