Tiered approach for biota standards compliance assessment in freshwaters
The relevance of passive samplers
(RSP project - 2017-2020)

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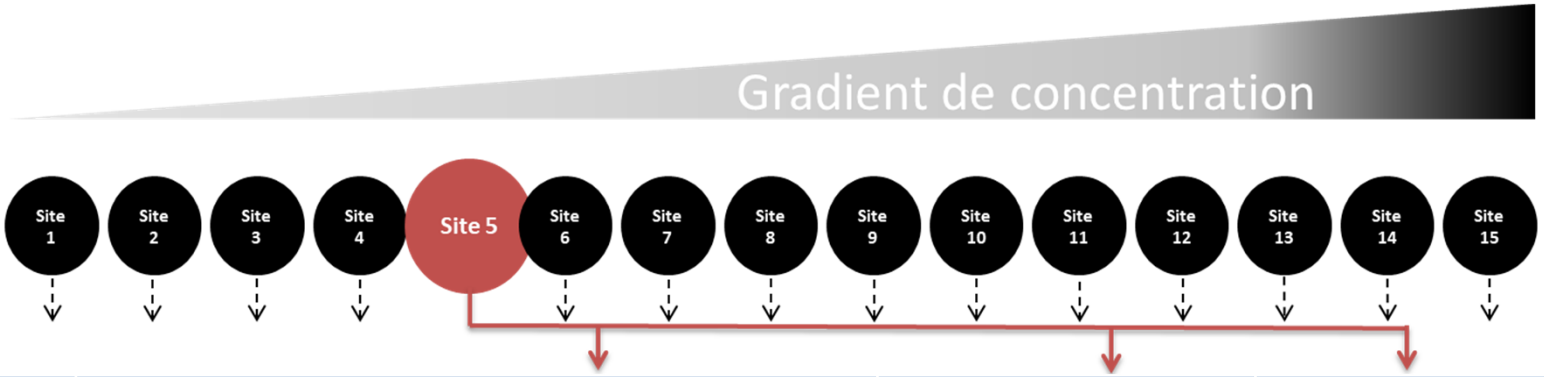
Research centre for toxic compounds in the environment

15 selected experimental sites

- Adequate abundance of native fish and gammarids
- Knowledge of the contamination gradient, widest possible concentration gradient
- Accessibility to the site, limiting the risk of vandalism, etc.

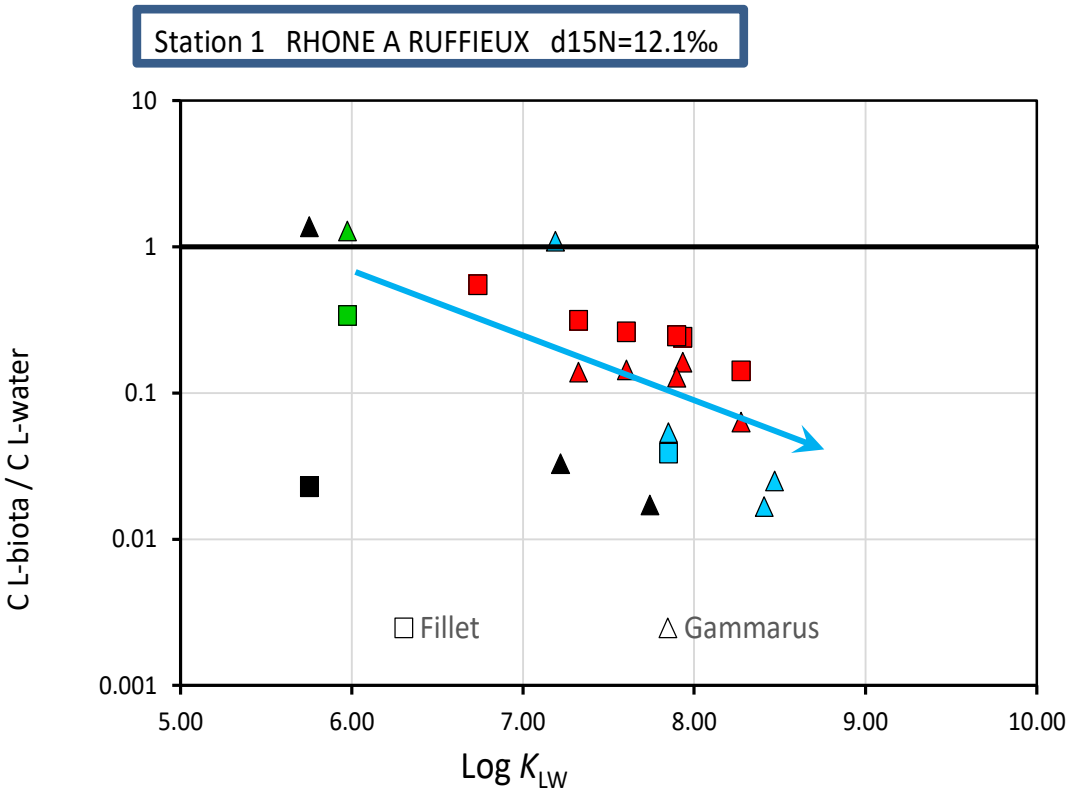
INRAE

Sampling strategy



	Passive samplers			Caged + native Gammarus	Fishes (chub or barbel or roach)
	DGT-Hg	PS-PFOS	PS-silicone		
Replicates	3	1	1	1 composite lot	1 composite lot (8 individuals with homogeneous size)
Exposure time	21 days	21 days	21 days + 3 months	21 days	/
Campaigns			X 3 (spring, summer, autumn)		1 fishing campaign per site (spring or autumn)
Priority substances	Hg	PFOS	HCB/BaP Fluoranthene/PBDE PCBi/HBCDD Heptachlor Heptachlorepoxide	Hg/PFOS/HCB/HCBD/BaP/ Fluoranthene/PBDE/PCBi/HBCDD/ Dicofol/Heptachlor/Heptachlorepoxide	
Metadata				Isotopic analyses, lipid and moisture	

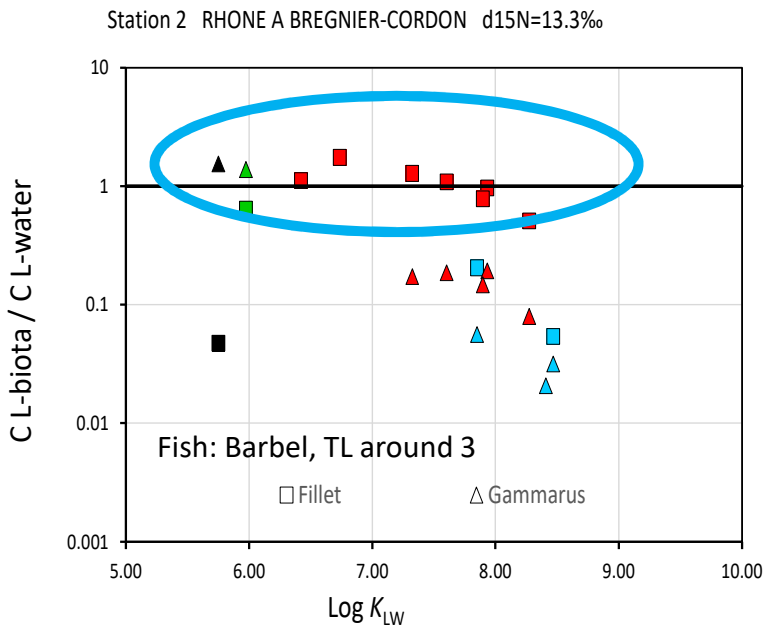
Comparison of lipid based concentrations between fishes, gammarus and waters

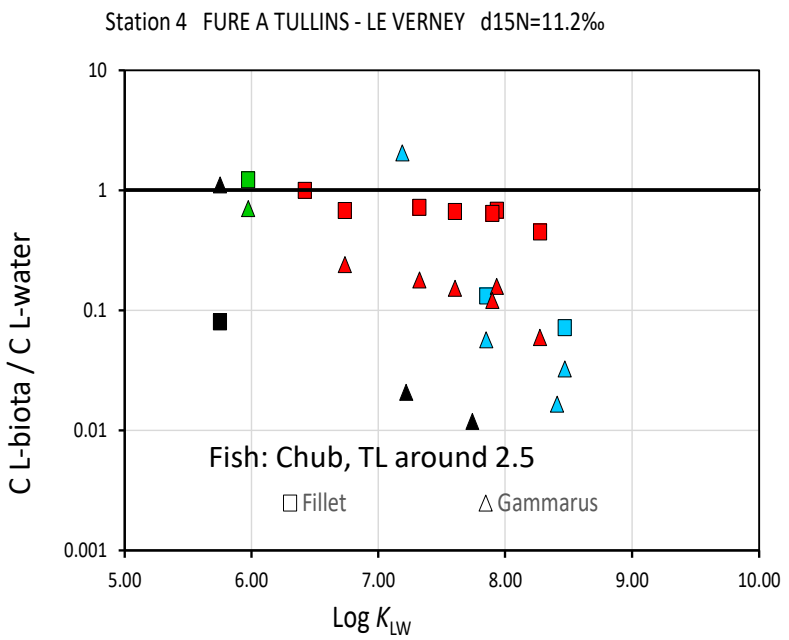


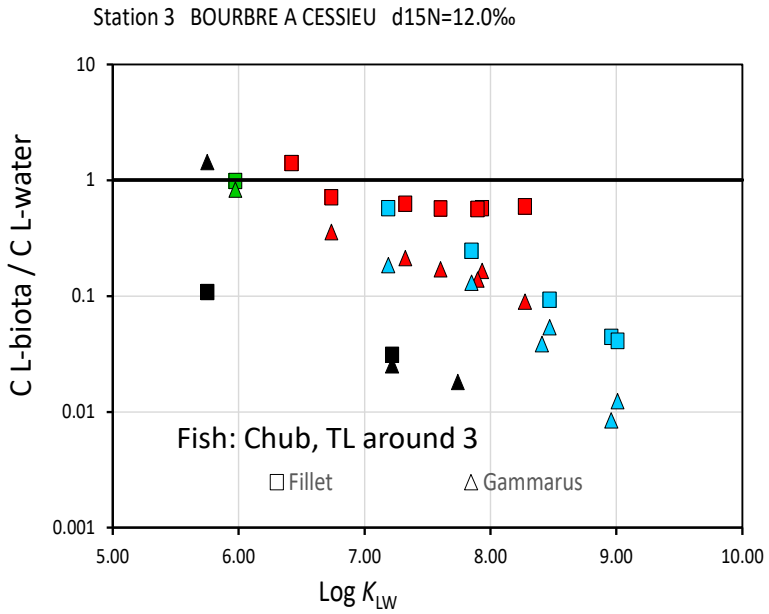
- **green is Hexachlorobenzene**
- **red are PCBs**
- **black are PAHs**
- **blue are PBDEs**

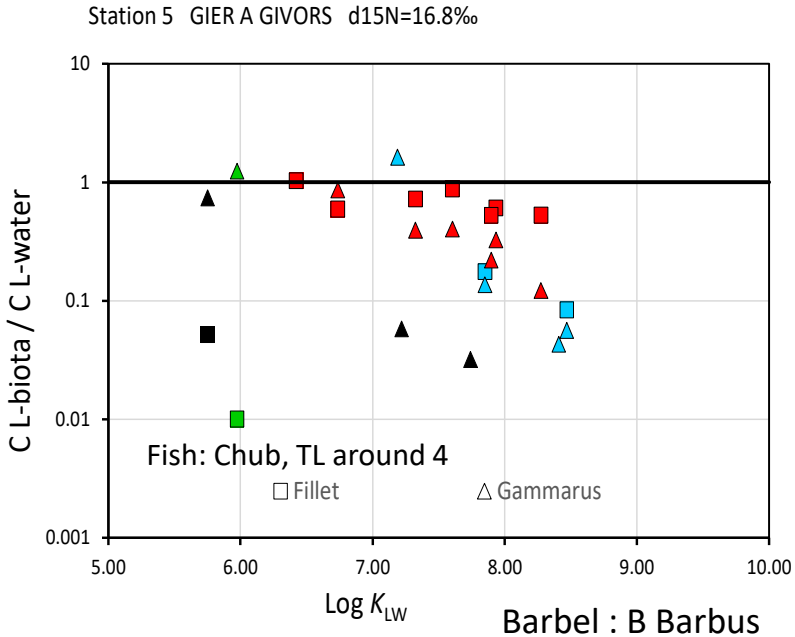
Fish: Chub (S cephalus), TL around 3

- ✓ All concentrations are expressed in a lipid common base
- ✓ **C L-water > C L-biota**, except for HCH
- ✓ The more the compounds are lipophilic, the less they are in equilibrium between biota and the water site

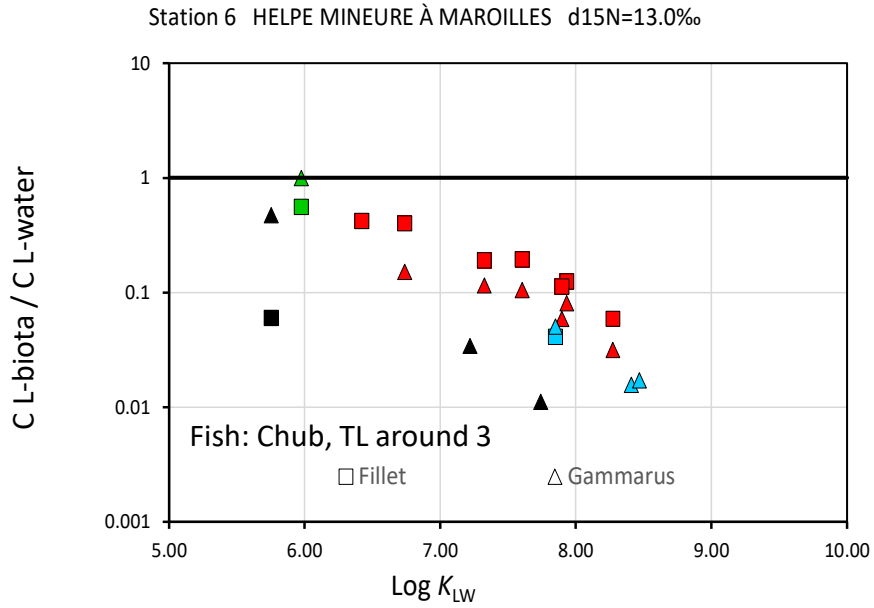


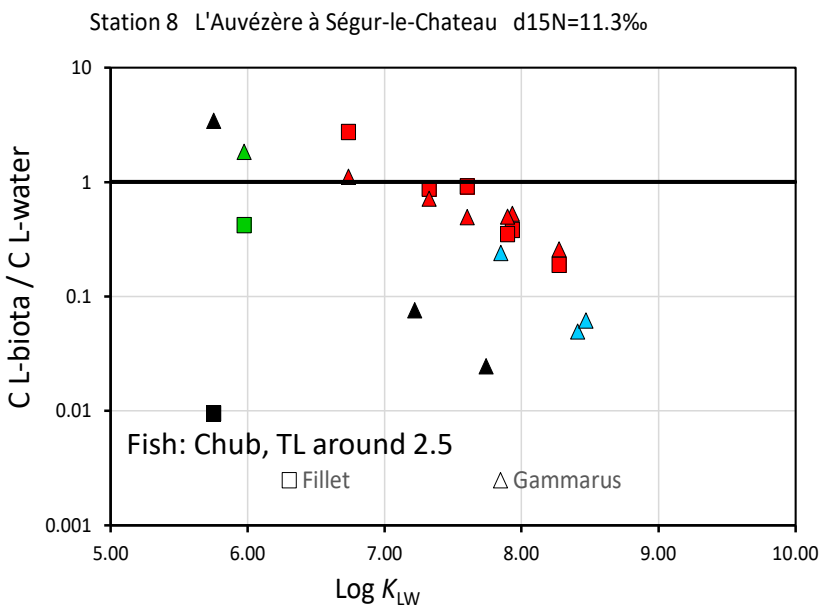


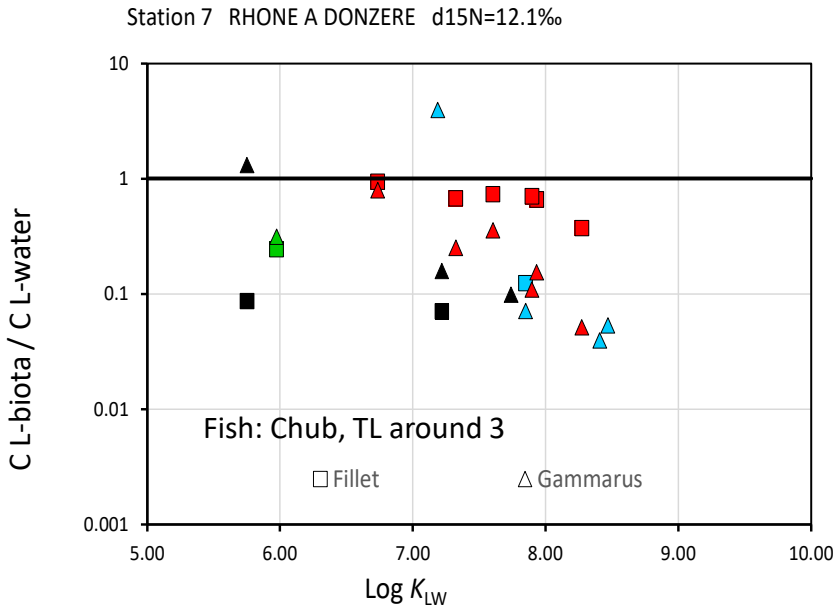


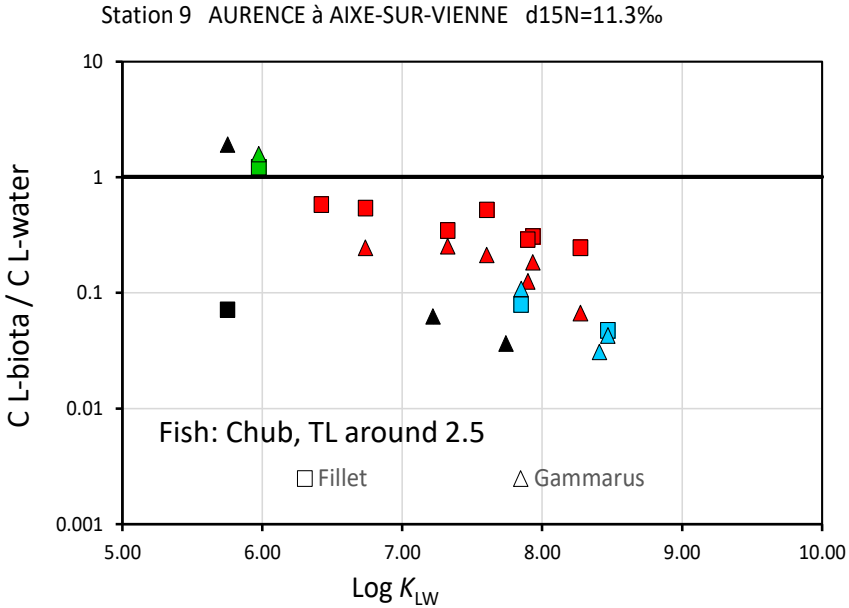


Barbel : B Barbus
Chub : S cephalus





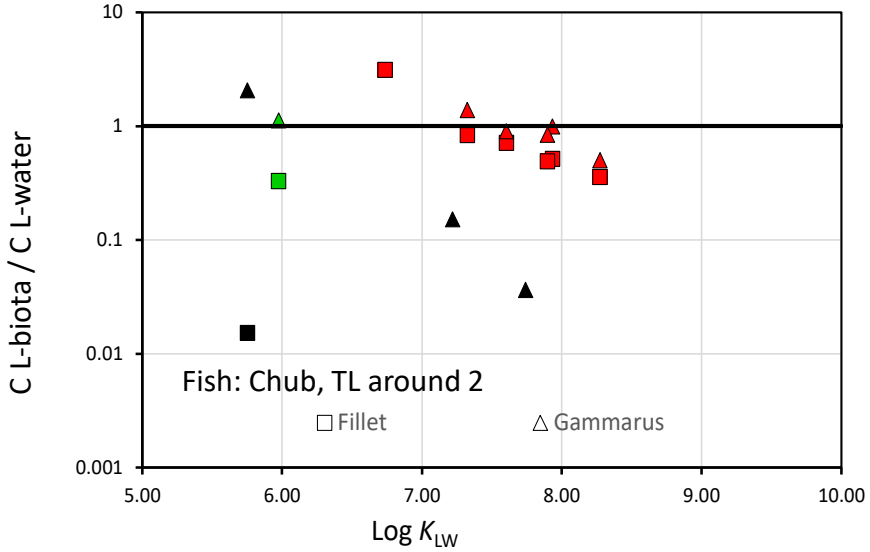




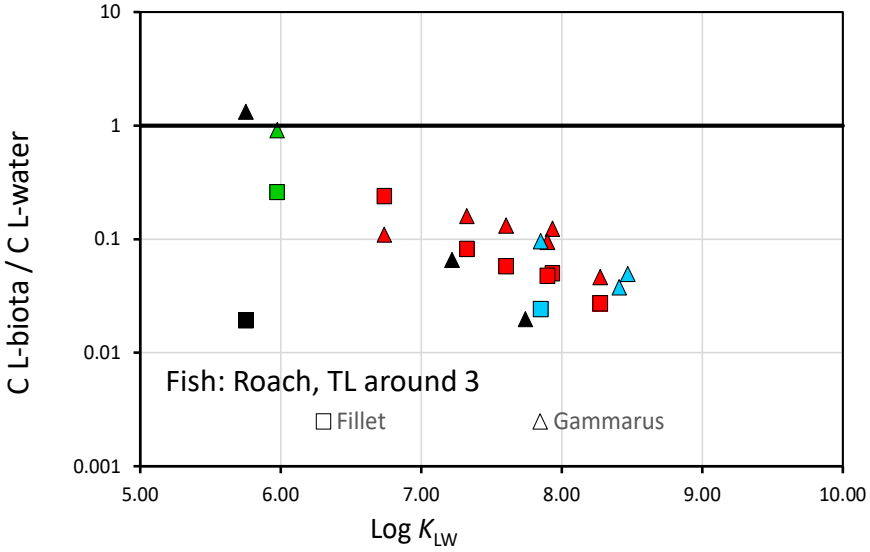
Chub: S cephalus

Chub: S cephalus
Roach : R rutilus

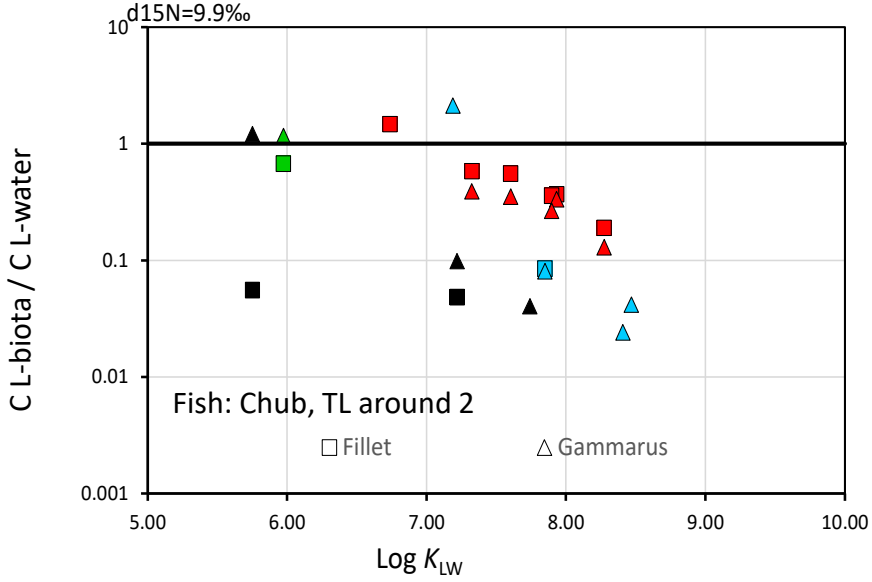
Station 10 TERNIN à CHISSEY-EN-MORVAN d15N=9.1‰



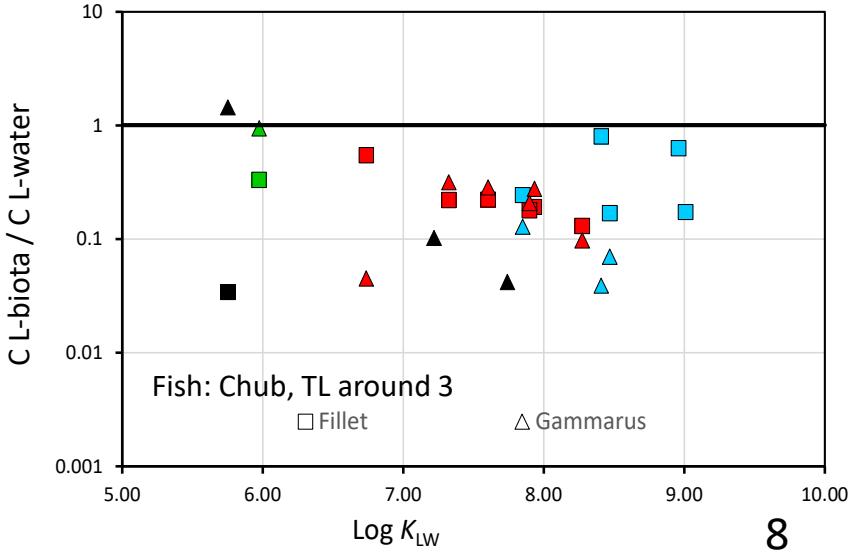
Station 12 LOIRE à DECIZE d15N=13.4‰

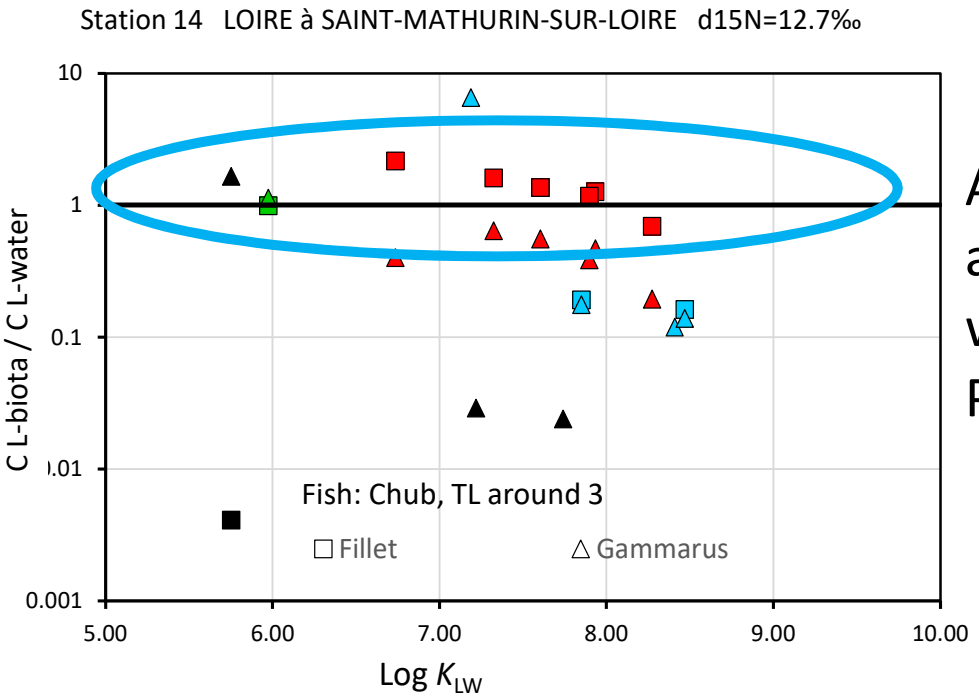


Station 11 MESVRIN à SAINT-SYMPHORIEN-DE-MARMAGNE d15N=9.9‰

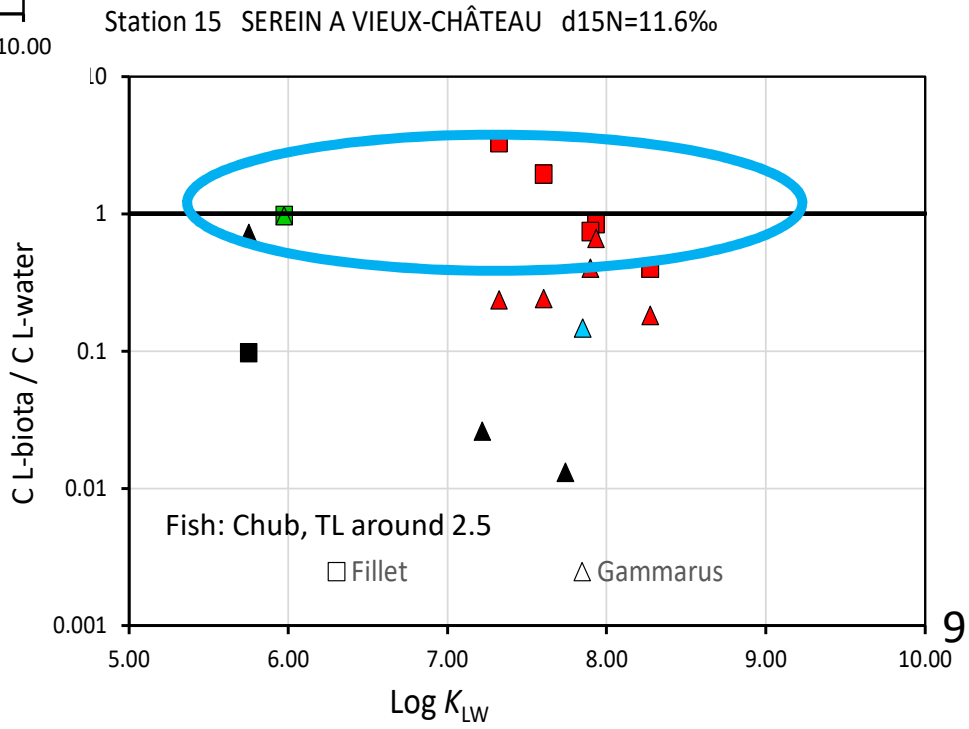


Station 13 ALLIER à VILLENEUVE-SUR-ALLIER d15N=13.3‰



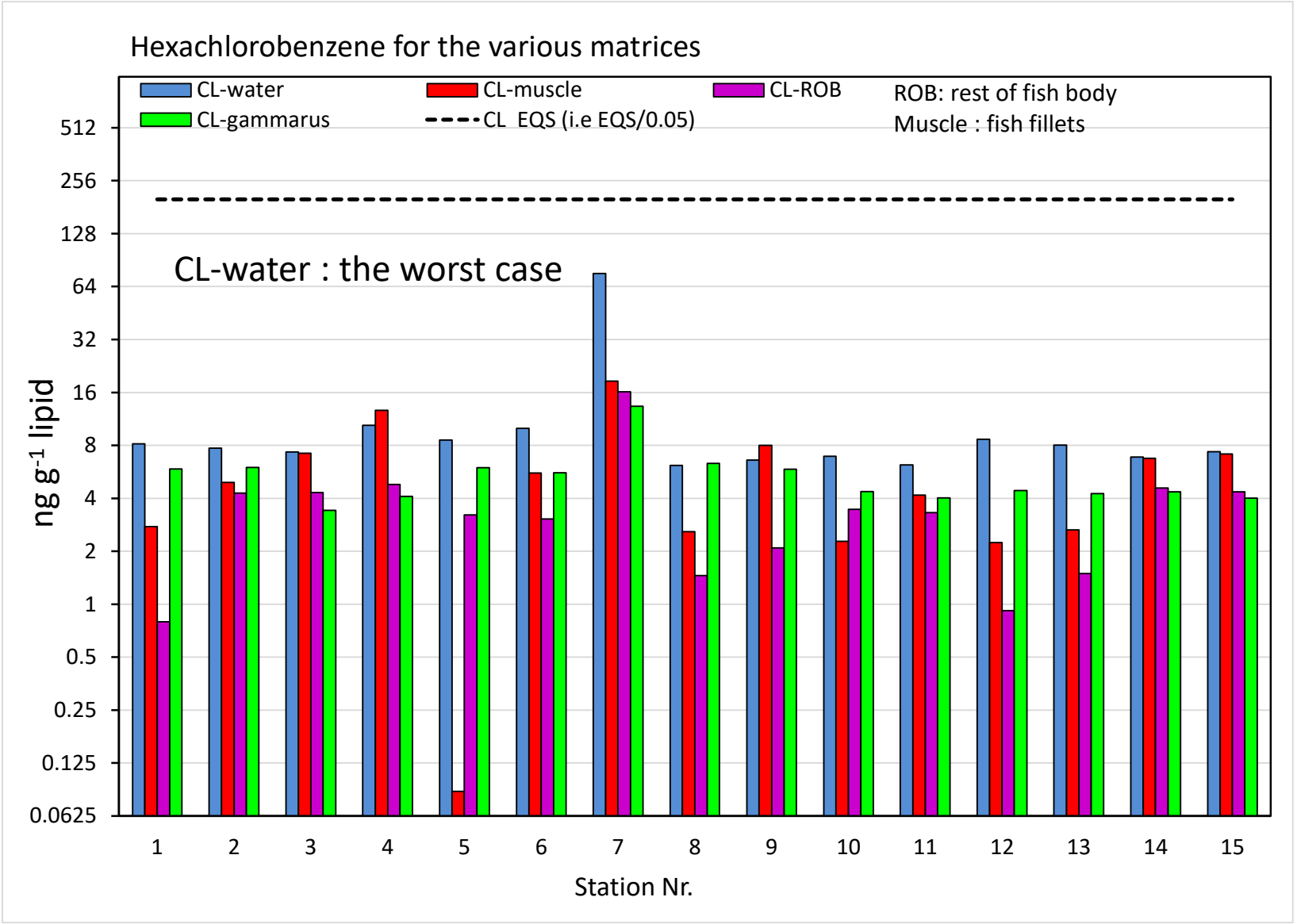


A tendency to have more substances at equilibirum between biota and water (for HCH, Fluoranthene, and PCB)



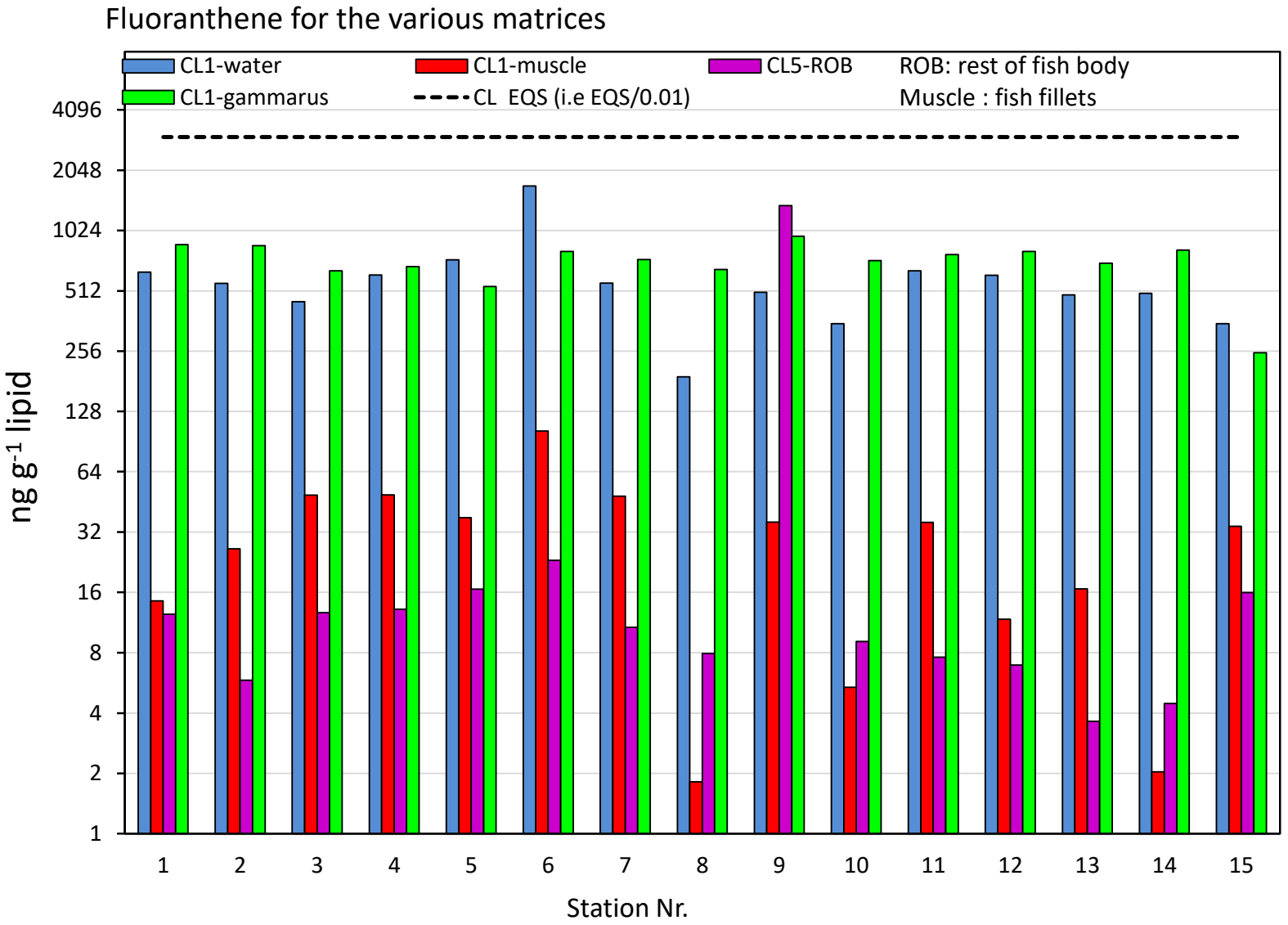
Comparison of lipid based concentrations to EQS for the 15 sites

Hexachlorobenzene -HCL



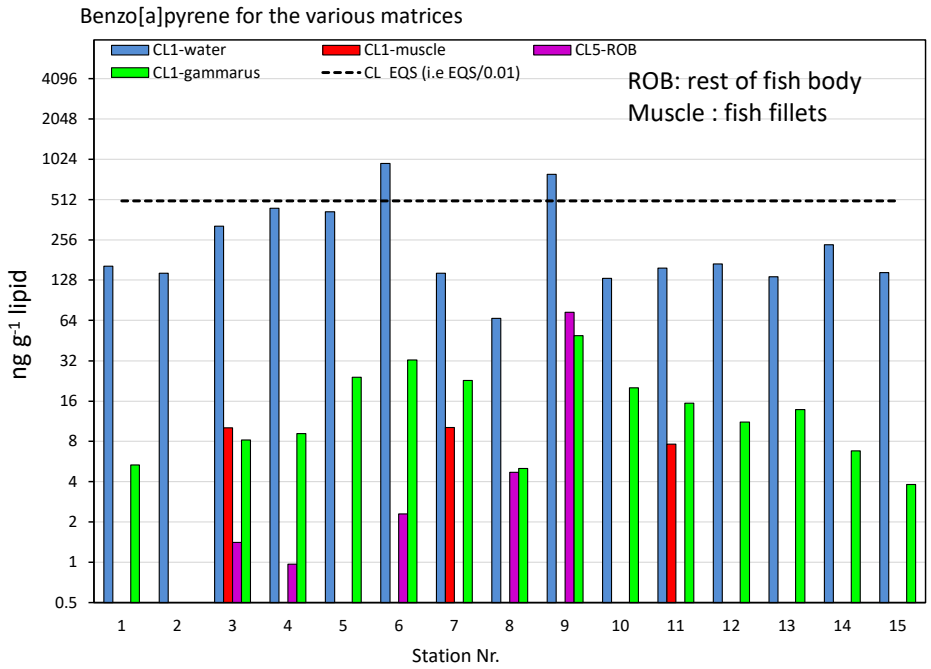
The EQS_{biota} has been converted to lipid basis - taking 5% lipid/wet weight (ref. fish)

Poly Aromatic Compound – PAH
Fluoranthene

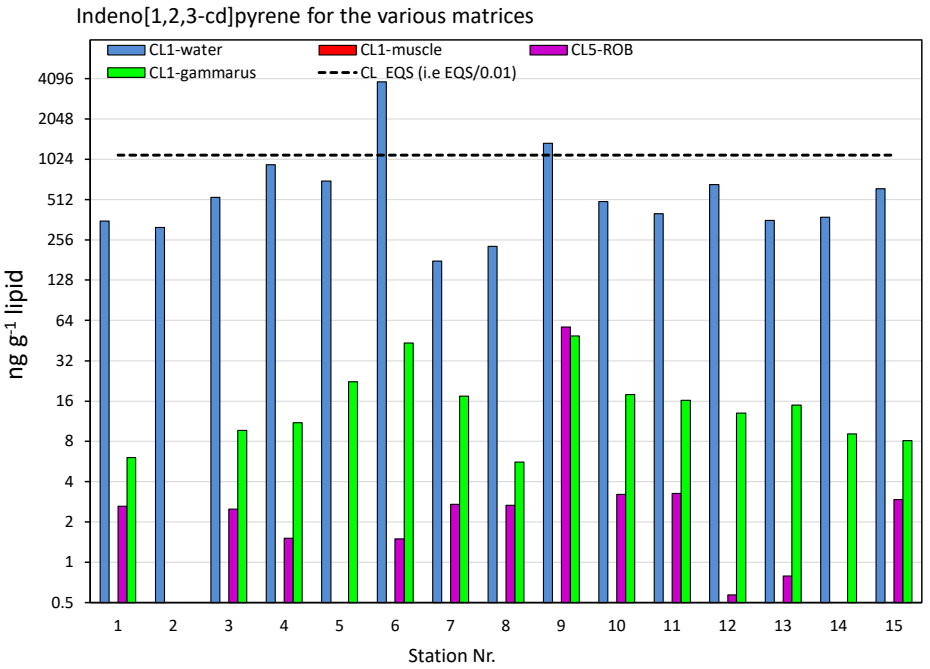


The EQS_{biota} has been converted to lipid basis - taking 1% lipid/wet weight (ref. invertebrates)

Benzo(a)pyrene

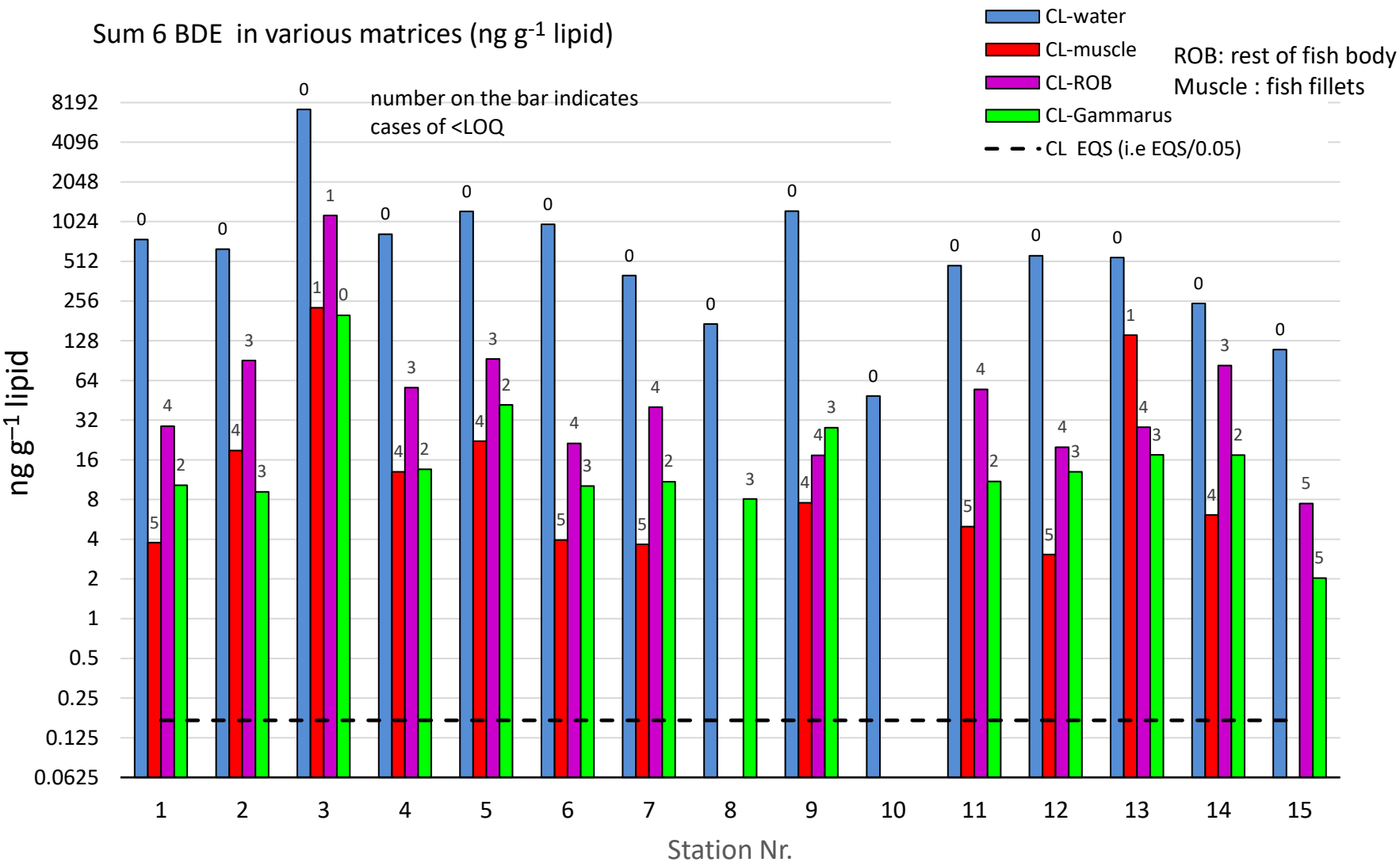


Indeno(123cd)pyrene



The EQS_{biota} has been converted to lipid basis - taking 1% lipid/wet weight (ref. invertebrates)

Sum 6 polyBromoDiphenylEthers - BDE

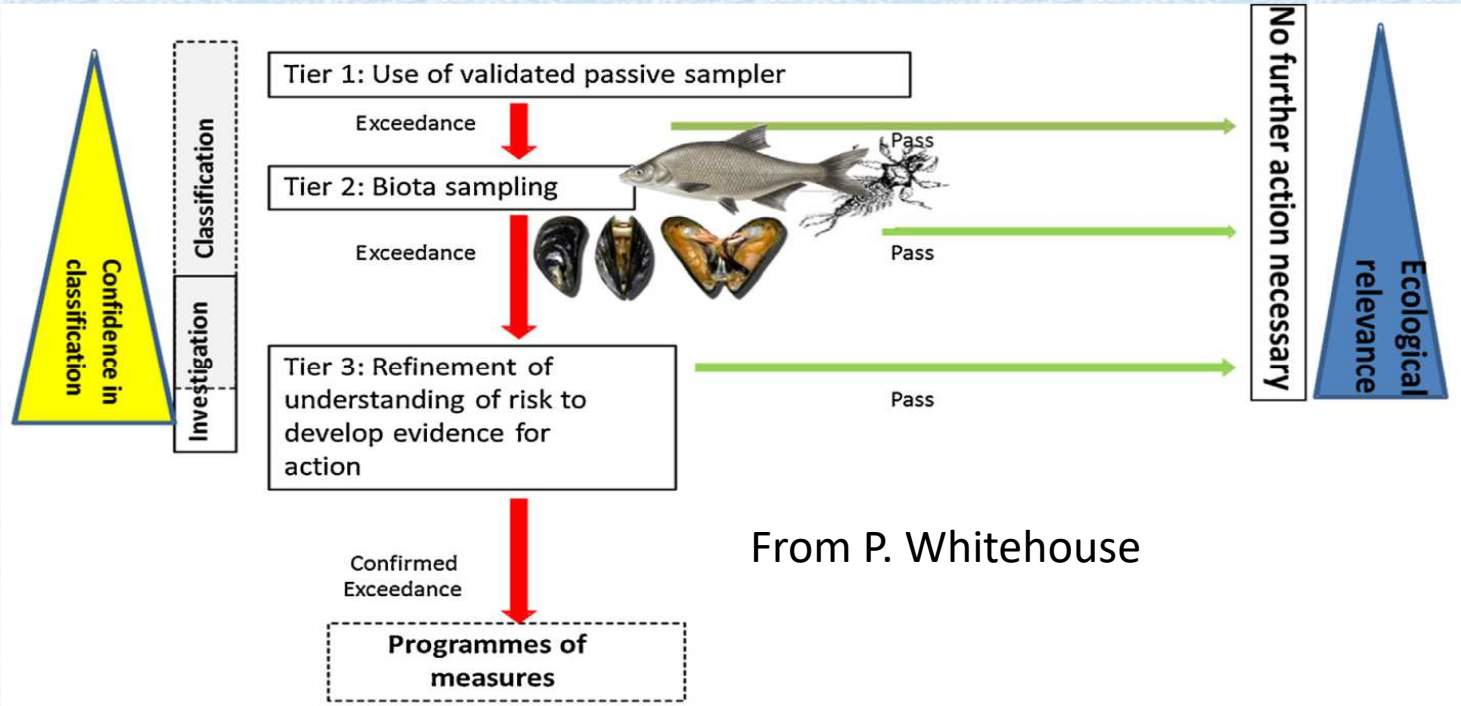


The EQS_{biota} has been converted to lipid basis - taking 5% lipid/wet weight (ref. fishes)

Passive samplers combined with biota supports to achieve the WFD biota monitoring strategy

According to the European guidance, **PS can be applied in a tiered approach** to identify or rank areas of potential biota EQS exceedance.

☛ threshold concentrations = EQS in biota recalculated in a lipid base (i.e., exceedance of which triggers the second tier => monitoring of biota).



From P. Whitehouse

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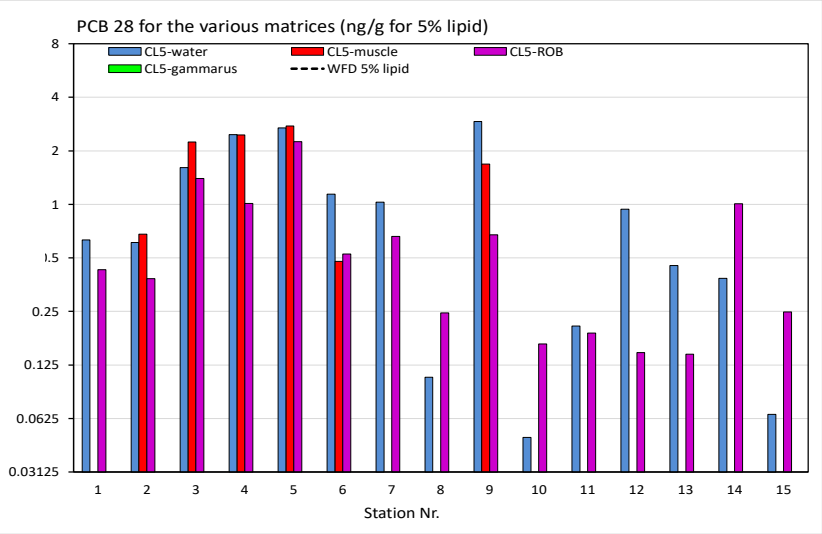
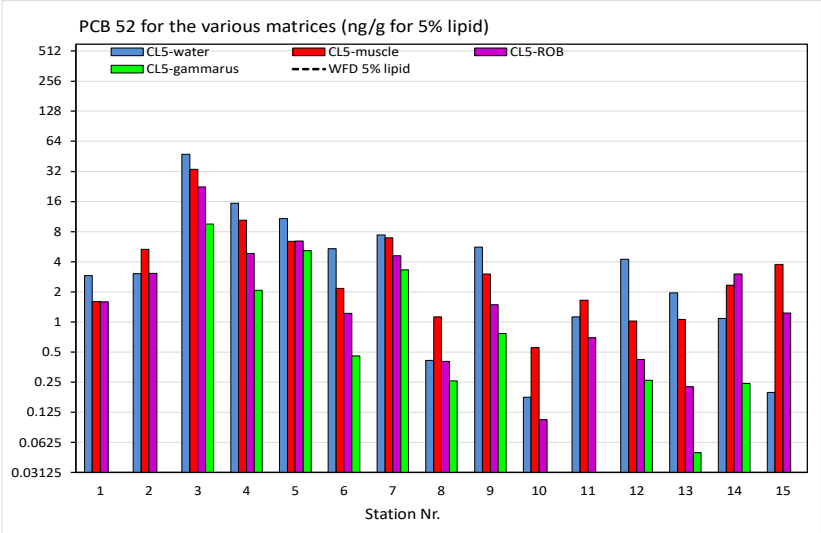
Other concrete actions and considerations within the AQUAREF consortium (FR)

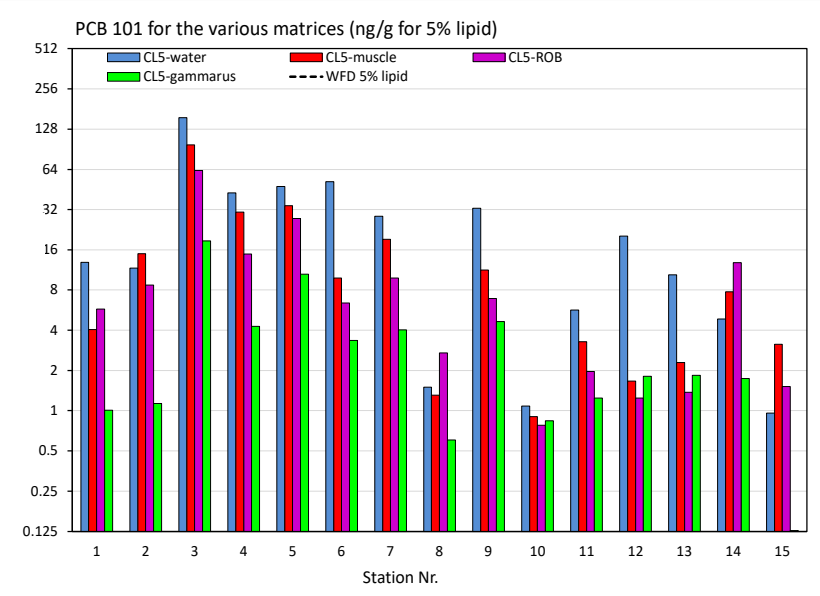
- Pilot training courses on the use of passive samplers
- Support for the establishment of a reglementary data bank for passive sampler
- Technical recommendation guides
- A need to adapt the national monitoring reglementary sites (protection against vandalism and flooding)

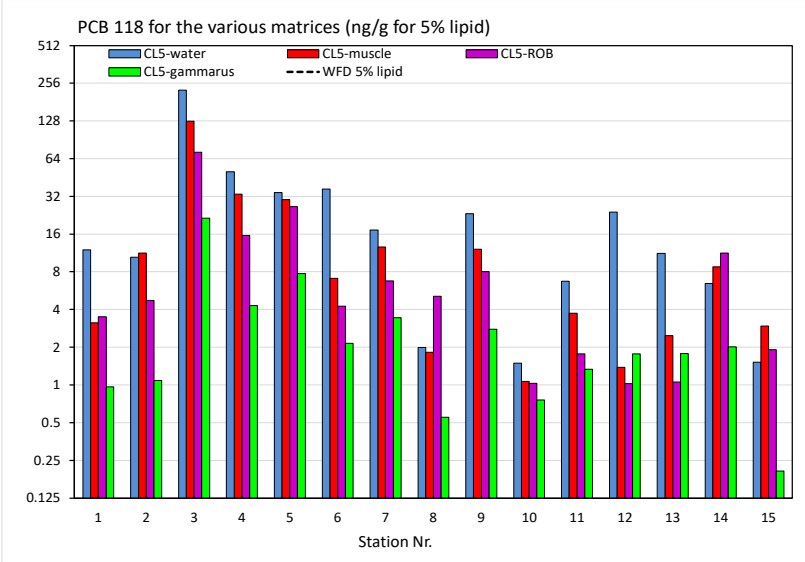
Thank you for your attention

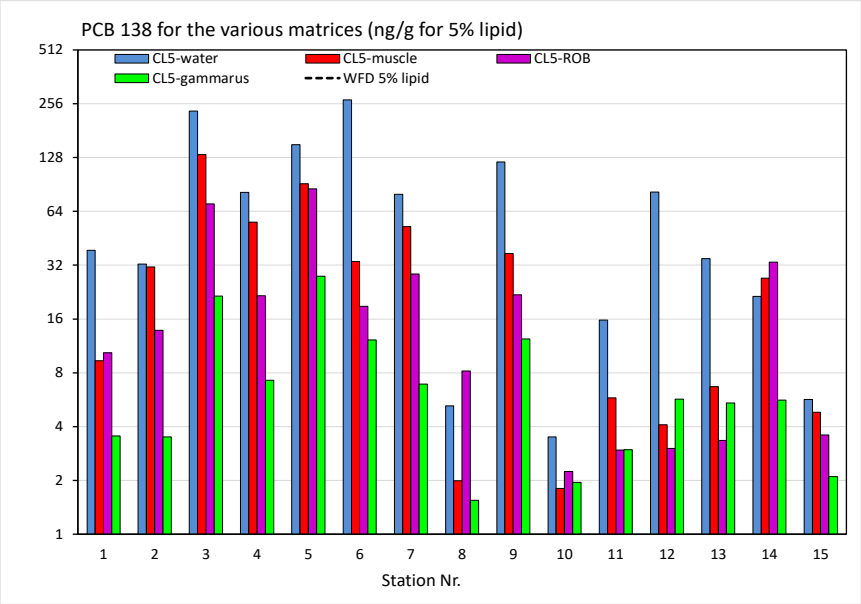
PolyChloroBiphenyls – PCB (7 indicators)

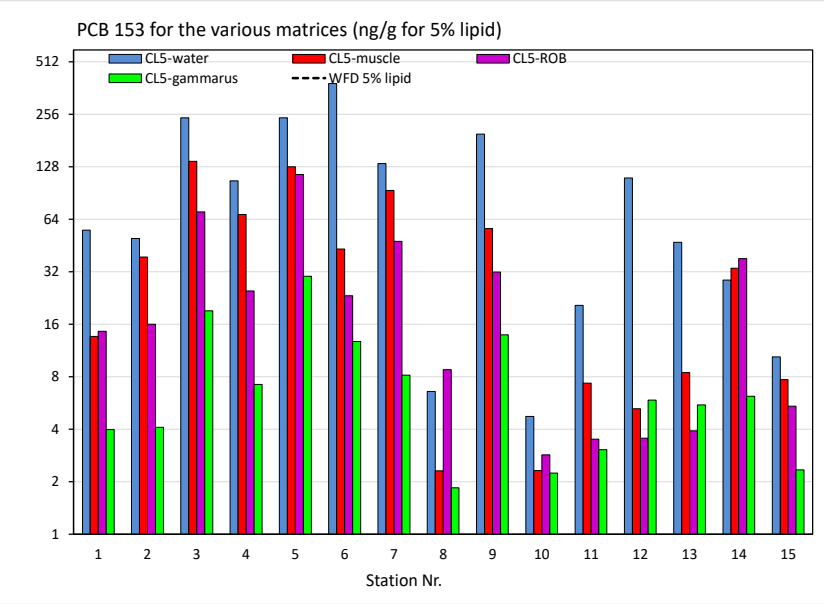


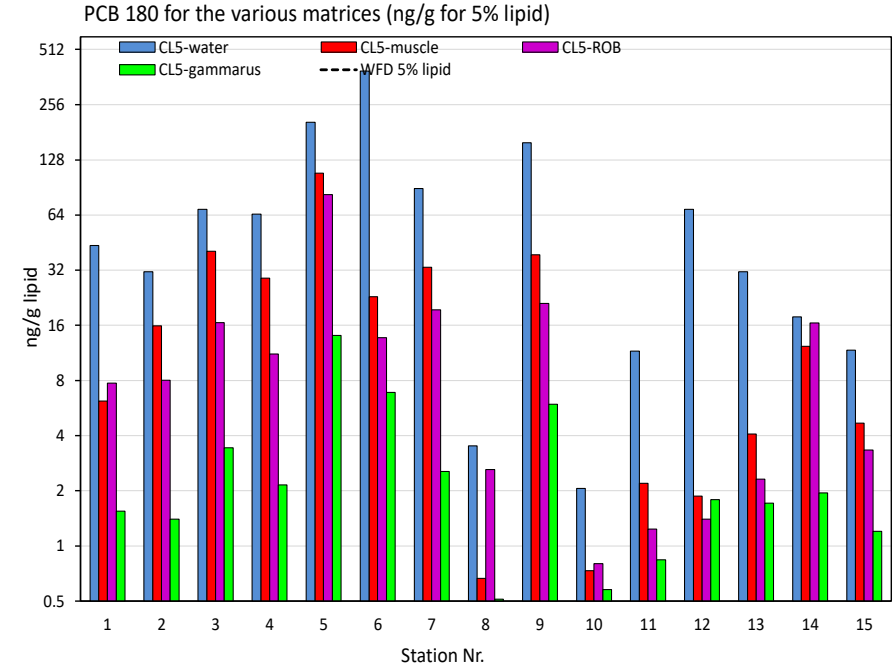







PCB 138 for the various matrices (ng/g for 5% lipid)
CL5-water
CL5-muscle
CL5-ROB
CL5-gammarus
WFD 5% lipid
512
256
128
64
32
16
8
4
2
1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Station Nr.


PCB 153 for the various matrices (ng/g for 5% lipid)
CL5-water
CL5-muscle
CL5-ROB
CL5-gammarus
WFD 5% lipid
512
256
128
64
32
16
8
4
2
1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Station Nr.


PCB 180 for the various matrices (ng/g for 5% lipid)
CL5-water
CL5-muscle
CL5-ROB
CL5-gammarus
WFD 5% lipid
ng/g lipid
512
256
128
64
32
16
8
4
2
1
0.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Station Nr.