

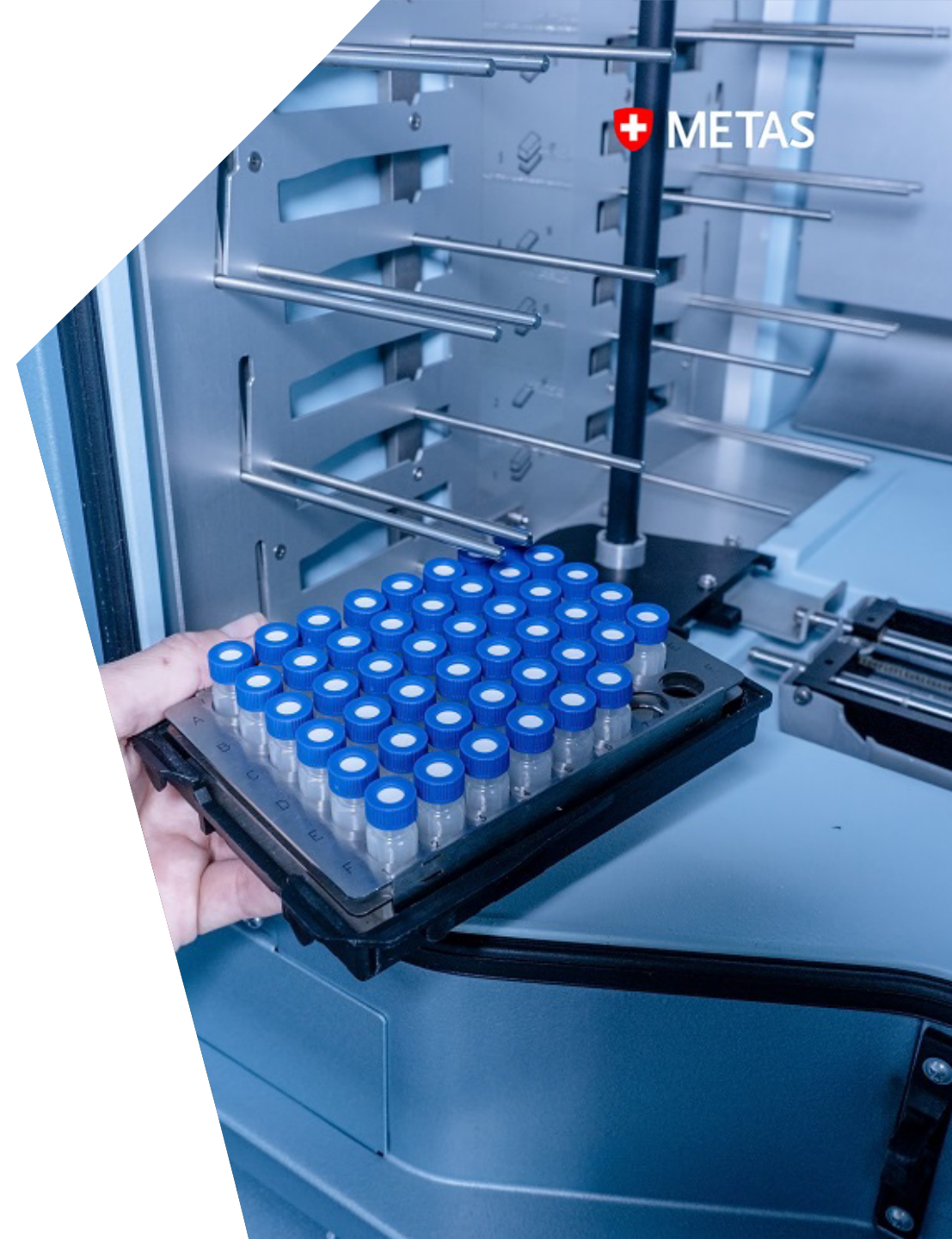
Publication - Trace Level Analysis of Per- and Polyfluorinated Substances in Fish from Various Regions in Switzerland

Alexandra Jaus

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Preliminary Remarks

- This work was entirely funded by the OSAV.
- Some of these results were already presented at PFAS-Austausch on 9. November 2021.





Communication

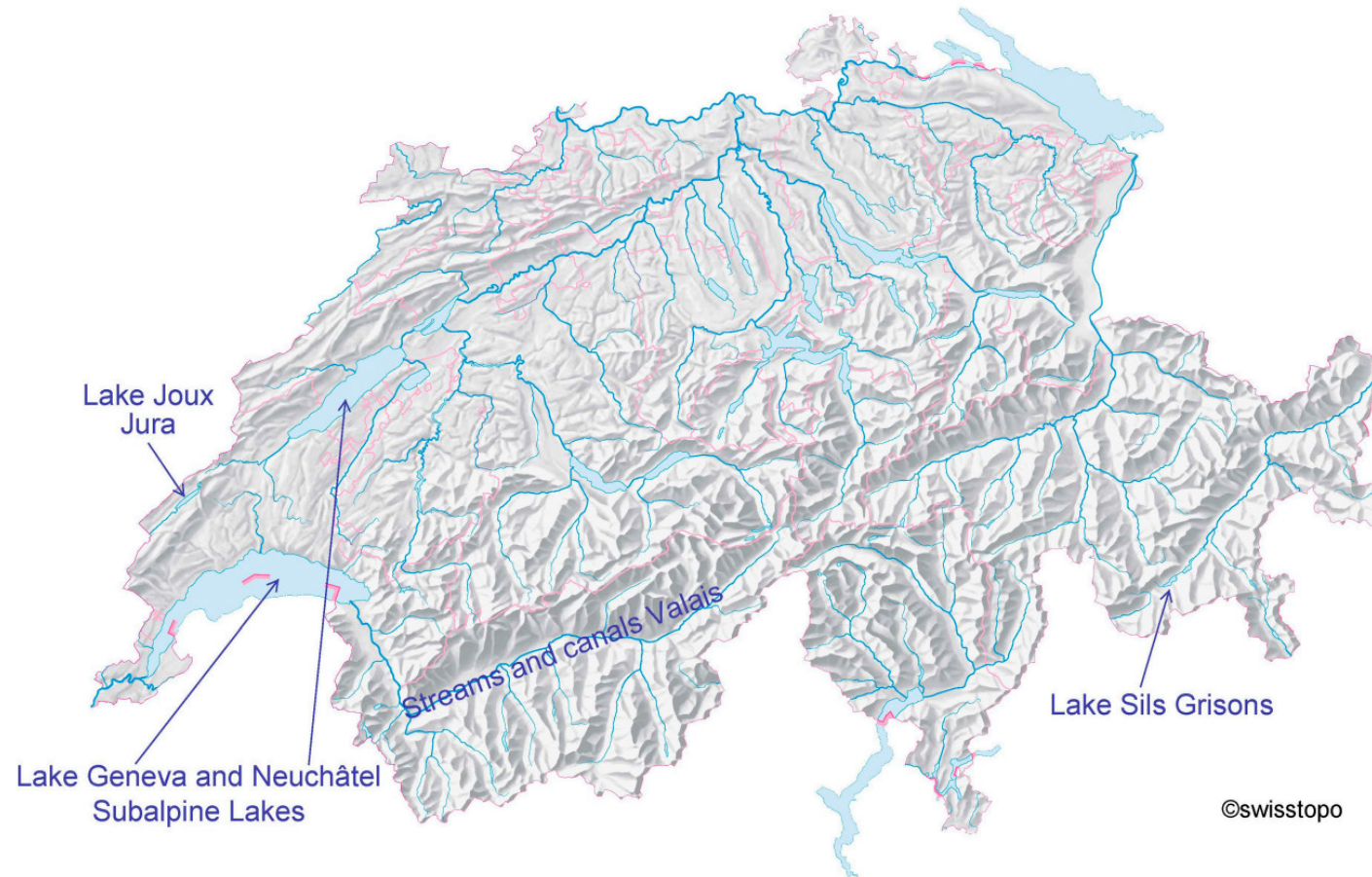
Trace Level Analysis of Per- and Polyfluorinated Substances in Fish from Various Regions in Switzerland

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<https://www.mdpi.com/2305-6304/11/11/909/html>



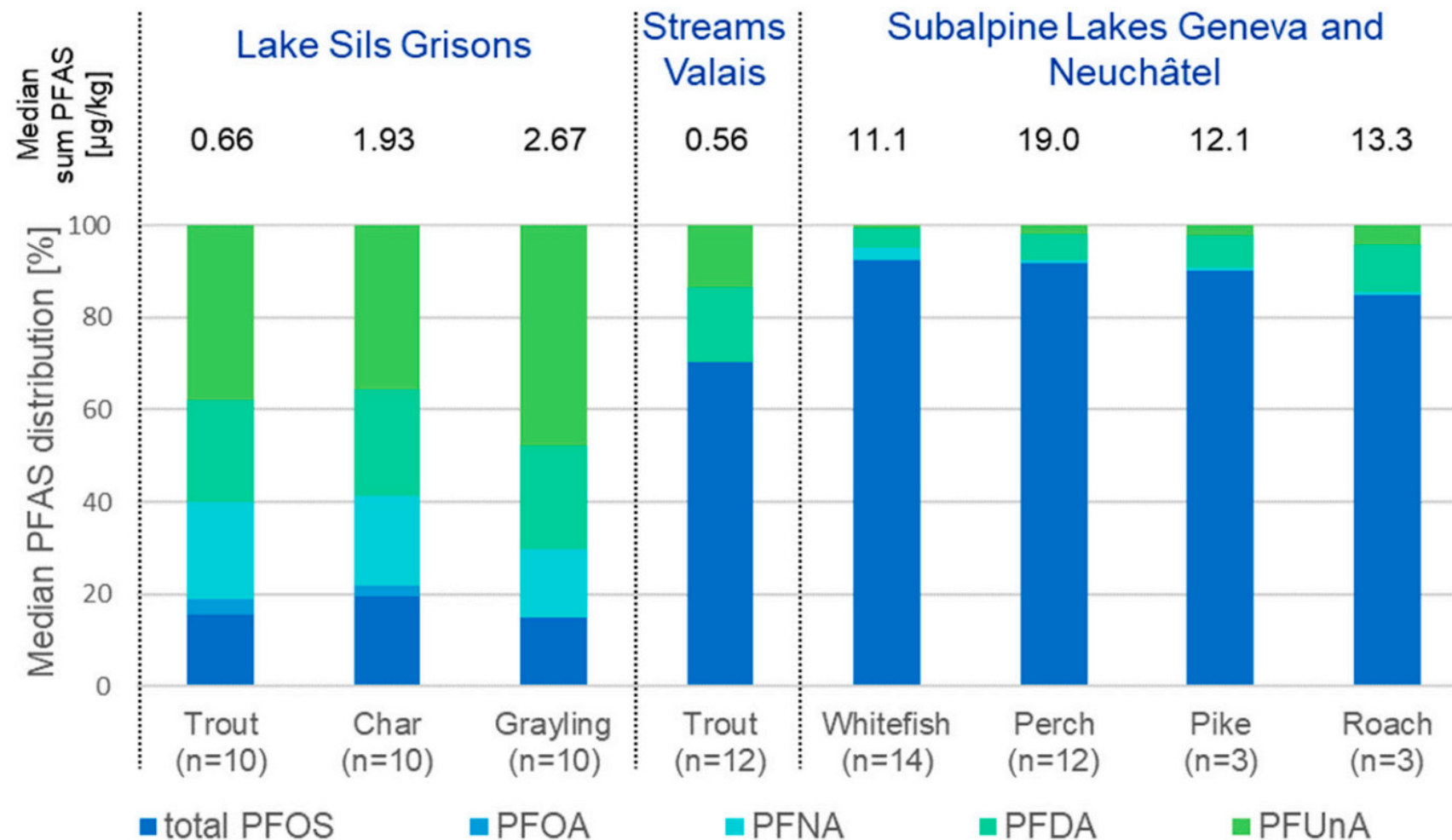
Sampling Regions



Detailed results

Sampling Region/ Fish Species		PFOA [µg/kg]	PFNA [µg/kg]	PFDA [µg/kg]	PFUnDA [µg/kg]	PFOS [µg/kg]	Sum PFASs [µg/kg]
Lake Sils, Grisons							
Trout, <i>Salmo trutta</i> (n = 10)	% >LOQ	60	100	100	100	100	100
	Median (range)	0.06 (<LOD-0.36)	0.42 (0.08–1.78)	0.43 (0.17–1.63)	0.75 (0.36–2.50)	0.31 (0.14–0.77)	1.93 (0.86–7.04)
Char, <i>Salvelinus umbla</i> (n = 10)	% >LOQ	50	90	90	100	100	100
	Median (range)	0.06 (<LOD-0.26)	0.52 (<LOD-1.16)	0.61 (<LOQ-1.27)	0.95 (0.07–1.73)	0.52 (0.09–0.82)	2.67 (0.19–4.82)
Grayling, <i>Thymallus thymallus</i> (n = 10)	% >LOQ	10	80	90	100	90	100
	Median (range)	<LOD (<LOD-0.10)	0.10 (<LOD-0.36)	0.15 (<LOQ-0.41)	0.32 (0.15–0.82)	0.10 (<LOQ-0.26)	0.66 (0.24–1.95)
Lake Joux, Jura							
Whitefish, <i>Coregonus</i> sp. (n = 1)		<LOD	<LOD	0.08	0.08	0.54	0.73
Perch, <i>Perca fluviatilis</i> (n = 1)		<LOD	0.06	0.51	0.46	3.62	4.65
Roach, <i>Rutilus rutilus</i> (n = 1)		<LOD	<LOD	0.23	0.29	1.44	1.96
Streams and canals, Valais							
Trout, <i>Salmo trutta</i> (n = 12)	% >LOQ	8	17	58	58	92	92
	Median (range)	<LOD (<LOD-0.07)	<LOQ (<LOD-0.10)	0.07 (<LOD-1.06)	0.06 (<LOD-0.32)	0.31 (<LOD-5.32)	0.56 (<LOD-6.95)
Chub, <i>Squalius cephalus</i> (n = 1)		<LOD	<LOD	0.18	0.40	2.38	3.01
Subalpine Lakes Geneva and Neuchâtel							
Whitefish, <i>Coregonus</i> sp. (n = 14)	% >LOQ	14	100	100	100	100	100
	Median (range)	<LOQ (<LOD-0.06)	0.34 (0.17–0.61)	0.55 (0.33–1.14)	0.09 (0.06–0.23)	12.1 (5.01–26.2)	13.3 (5.58–28.2)
Perch, <i>Perca fluviatilis</i> (n = 12)	% >LOQ	0	100	100	100	100	100
	Median (range)	<LOD (all <LOD)	0.13 (0.07–0.23)	1.10 (0.91–2.24)	0.36 (0.26–0.69)	17.3 (9.31–37.7)	19.0 (10.8–40.7)
Pike, <i>Esox lucius</i> (n = 3)	% >LOQ	0	100	100	100	100	100
	Median (range)	<LOD (all <LOD)	0.07 (0.05–0.09)	0.76 (0.52–1.29)	0.27 (0.16–0.43)	9.98 (6.86–22.7)	11.1 (7.61–24.6)
Roach, <i>Rutilus rutilus</i> (n = 3)	% >LOQ	0	66.6	100	100	100	100
	Median (range)	<LOD (all <LOD)	0.07 (<LOD-0.08)	1.08 (0.27–2.00)	0.44 (0.12–1.04)	8.96 (3.75–12.9)	12.1 (4.14–14.6)
Char, <i>Salvelinus alpinus</i> (n = 2)		both <LOD	0.08/0.11	0.25/0.87	0.09/0.21	7.39/22.8	7.81/24.0
Trout, <i>Salmo trutta</i> (n = 1)		<LOD	0.16	1.14	0.31	17.2	18.9
Pikeperch, <i>Sander lucioperca</i> (n = 1)		<LOD	0.21	0.20	0.28	0.46	1.15
Tench, <i>Tinca tinca</i> (n = 1)		<LOD	0.34	1.68	0.66	5.58	8.37

Median sum PFASs and percentage distribution



«Quick Assessment» of the Results

- EFSA 2020: TWI 4.4 ng/kg bw per week,
with bw = 60 kg “median fish from subalpine lakes Geneva and Neuchâtel” 15.2 µg/kg
17.4 g fish/week if only fish as source of PFASs

- Commission Regulation (EU) 2023/0915

4.2	Perfluoroalkyl substances	Maximum level (µg/kg)					Remarks
		PFOS	PFOA	PFNA	PFHxS	Sum of PFOS, PFOA, PFNA and PFHxS	The maximum level applies to the wet weight. PFOS: perfluorooctane sulfonic acid PFOA: perfluorooctanoic acid PFNA: perfluorononanoic acid PFHxS: perfluorohexane sulfonic acid For PFOS, PFOA, PFNA, PFHxS and their sum, the maximum level refers to the sum of linear and branched stereoisomers, whether they are chromatographically separated or not. For the sum of PFOS, PFOA, PFNA and PFHxS, maximum levels refer to lower bound concentrations, which are calculated on the assumption that all the values below the limit of quantification are zero.
4.2.2.1	Fish meat						Where fish are intended to be eaten whole, the maximum level applies to the whole fish.
4.2.2.1.1	Muscle meat of fish, except products listed in 4.2.2.1.2 and 4.2.2.1.3 <i>Muscle meat of fish listed</i>	2,0	0,20	0,50	0,20	2,0	
4.2.2.1.2	Muscle meat of the following fish, in case it is not intended for the production of food for infants and young children:	7,0	1,0	2,5	0,20	8,0	
4.2.2.1.3	Muscle meat of the following fish, in case it is not intended for the production of food for infants and young children: Anchovy (<i>Engraulis</i> species) Babel (<i>Barbus barbus</i>)	35	8,0	8,0	1,5	45	

- Subalpine lakes: **4 of 37 fish samples exceed maximum level of regulation**