

Food Chain Contamination in Rustavi

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Persistent Pollutants in Free Range Chicken Eggs from Hot Spots in Three

Persistent Organic

in Free
Range
Chicken Eggs
from Hot
Spots in
Three



[https://www.researchgate.net/publication/332594125 Persistent Organic Pollutants in Free Range Chicken Eggs Report from Africa](https://www.researchgate.net/publication/332594125_Persistent_Organic_Pollutants_in_Free_Range_Chicken_Eggs_Report_from_Africa)

[https://www.researchgate.net/publication/315045221 Persistent Organic Pollutants in Chicken Eggs from Hot Spots in China](https://www.researchgate.net/publication/315045221_Persistent_Organic_Pollutants_in_Chicken_Eggs_from_Hot_Spots_in_China)

[https://www.researchgate.net/publication/315098247 Persistent Organic Pollutants in Free Range Chicken Eggs from Western Balkan Countries Bosnia and Herzegovina Montenegro and Serbia 2014 - 2015](https://www.researchgate.net/publication/315098247_Persistent_Organic_Pollutants_in_Free_Range_Chicken_Eggs_from_Western_Balkan_Countries_Bosnia_and_Herzegovina_Montenegro_and_Serbia_2014_2015)



Rustavi – sampling 2024



- In September 2024, a total of 44 environmental and food samples were collected in and around the city of Rustavi, including Tazakendi village
- 8 pooled egg samples (7 from free-range hens and 1 from a supermarket for reference),
- 12 fish samples (mostly pooled),
- 2 slag samples,
- 11 soil samples (including 7 collected at children's playgrounds)
- 4 sediment samples, and
- 5 road dust samples.



POPs in Rustavi – eggs



TABLE 4.1: RESULTS OF THE POPS ANALYSES IN POOLED FREE-RANGE CHICKEN EGG SAMPLES FROM TAZAKENDI VILLAGE AND RUSTAVI IN COMPARISON WITH REFERENCE SAMPLE, COMMERCIAL EGGS BOUGHT IN SUPERMARKET IN RUSTAVI, AND WITH TWO FREE RANGE CHICKEN EGG SAMPLES FROM UKRAINE (DNIPRO-PRYDNIPROVSK) AND BELARUS (GATOVO).

POPs in Rustavi – eggs



TABLE 4.1: RESULTS OF THE POPs ANALYSES IN POOLED FREE-RANGE CHICKEN EGG SAMPLES FROM TAZAKENDI VILLAGE AND RUSTAVI IN COMPARISON WITH REFERENCE SAMPLE, COMMERCIAL EGGS BOUGHT IN SUPERMARKET IN RUSTAVI, AND WITH TWO FREE RANGE CHICKEN EGG SAMPLES FROM UKRAINE (DNIPRO-PRYDNIPROVSK) AND BELARUS (GATOVO).

Locality	Units	Tazakendi	Tazakendi	Tazakendi	Rustavi	Rustavi	Rustavi	Rustavi	Rustavi	Dnipro - Prydniprovska	Gatovo
Sample ID		GE-R- EGG-1	GE-R- EGG-2	GE-R- EGG-3	GE-R- EGG-4	GE-R- EGG-5	GE-R- EGG-6	GE-R- EGG-7	GE-R-EGG- SUP	L-48-EGG	LN 272/14
PCDD/Fs		3.7	2.5	1.4	1.7	1.7	7.4	4.4	0.216	5.8	4.3
di-PCBs	pg TEQ/g fat	15.2	10	10.9	5	11.5	28.3	8.9	0.027	8.3	11.3
PCDD/F/di-PCBs		18.9	12.5	12.3	6.7	13.2	35.7	13.3	0.24	14.1	15.6
PBDD/Fs		NA	11.3	NA	NA	NA	NA	NA	NA	NA	< LOQ
6 PCBs	ng/g fat	37	20	18	107	33	102	11	5.7	NA	53
Σ of HCH		9.6	6.1	61	20	10	23	1.6	<0.1	NA	5
Σ of DDT	ng/g fw	62	87	279	7,120	375	672	15	2.2	NA	231
7 UV stabilizers	ng/g fw	0.49	0.71	0.59	<0.01	5.67	0.32	1.04	<0.01	NA	NA

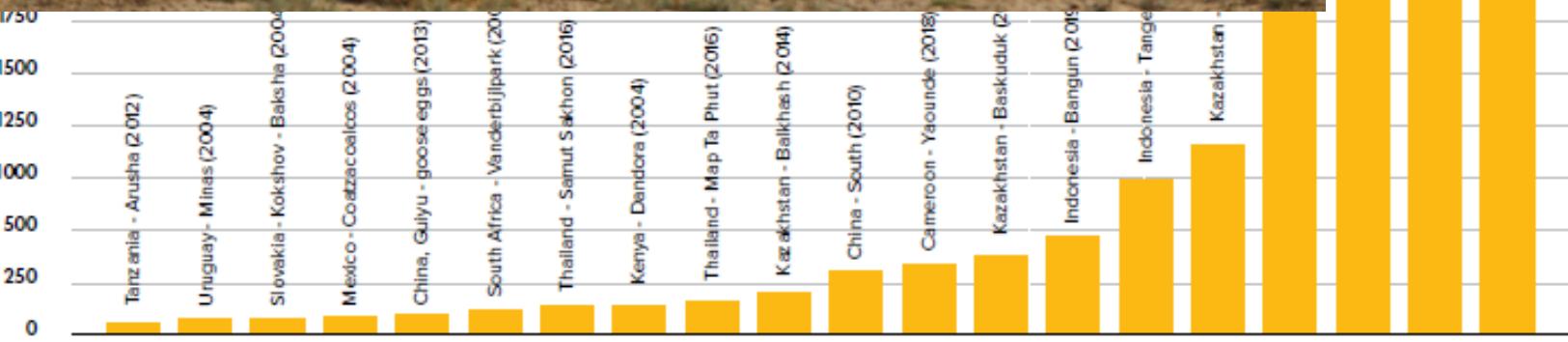
POPs in Rustavi – eggs



**TABLE 4.1: RESULTS OF THE POPs ANALYSES IN POOLED FREE-RANGE CHICKEN EGG SA
IN COMPARISON WITH REFERENCE SAMPLE, COMMERCIAL EGGS BOUGHT IN SUPERMA
CHICKEN EGG SAMPLES FROM UKRAINE (DNIPRO-PRYDNIPROVSK)**




Rustavi	Rustavi	Rustavi							
GE-R-EGG-4	GE-R-EGG-5	GE-R-EGG-6							
1.7	1.7	7.4							
5	11.5	28.3							
6.7	13.2	35.7							
NA	NA	NA							
107	33	102							
20	10	23	1.6	<0.1	NA	5			
Σ of DDT	62	87	279	7,120	375	672	15	2.2	NA
7 UV stabilizers	ng/g fw	0.49	0.71	0.59	<0.01	5.67	0.32	1.04	<0.01



Kazakhstan, Balkhash – Rembaza (2014)

Nigeria, Abuja (2016)

Indonesia, Tangerang (SEM-E-1), (2019)

Tanzania, Kwanzaefu (2012)

Thailand, Samut Sakhon (2016)

Kenya, Nairobi – hospital (2024)

China, Wenling (2011)

Kenya, Nairobi – Dandora (2021)

Thailand, Phuket (2022)

China, Wenling – duck eggs (2011)

China, Wuhan (2014)

Georgia, Tazakendi (GE-REGG2), (2024)

Ghana, Agbogbloshie (2018)

Indonesia, Bangun (2019)

China, Taizhou (2011)

China, Taizhou | 2012-2013

China, Quingyuan, Guangdong (2013)

China, Quingyuan, Guangdong (2016)

China, Guiyu - goose eggs (2013)

China, Quingyuan, Guangdong (2010)

Indonesia, Tropodo (2019)

China, Guiyu (2013)

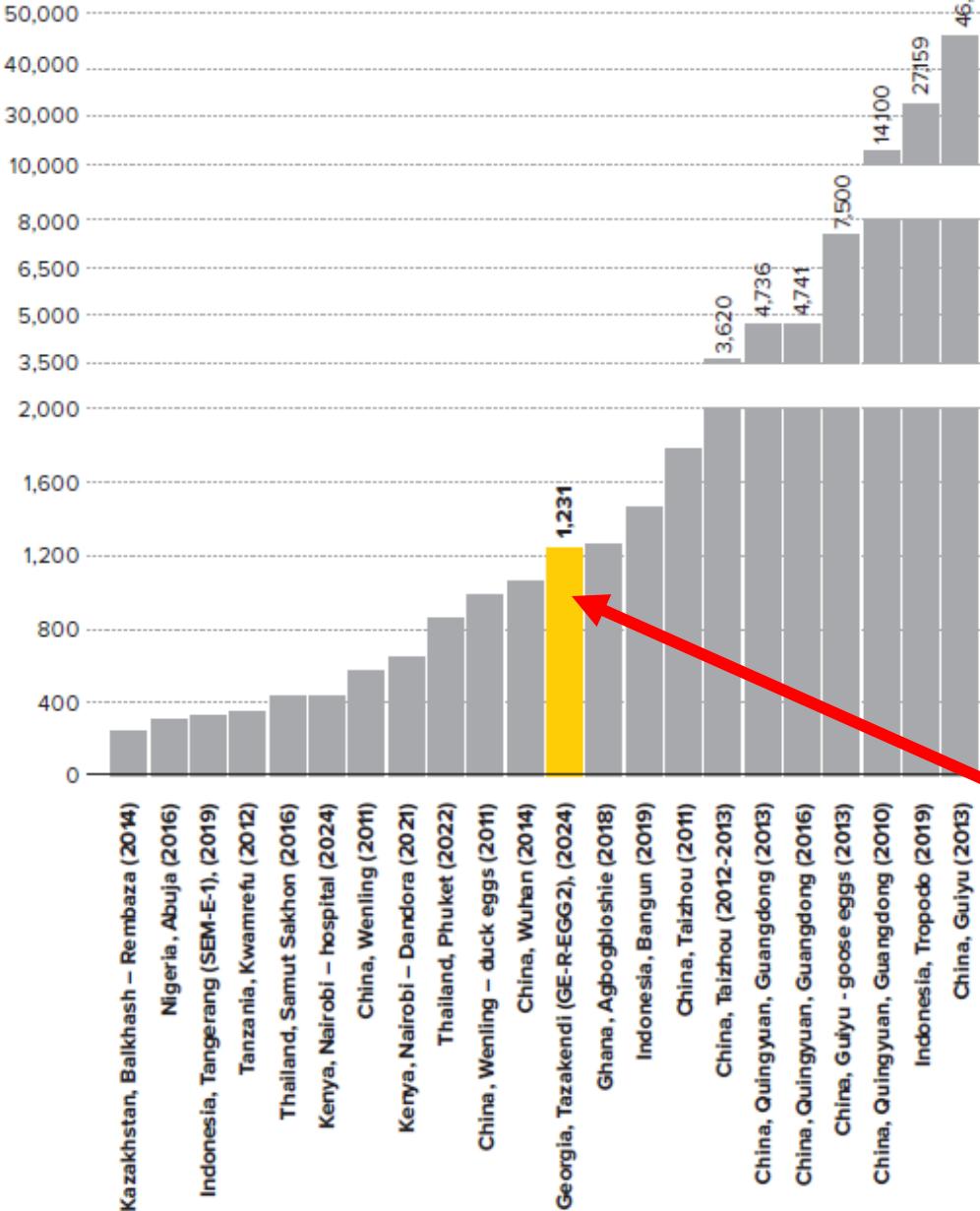
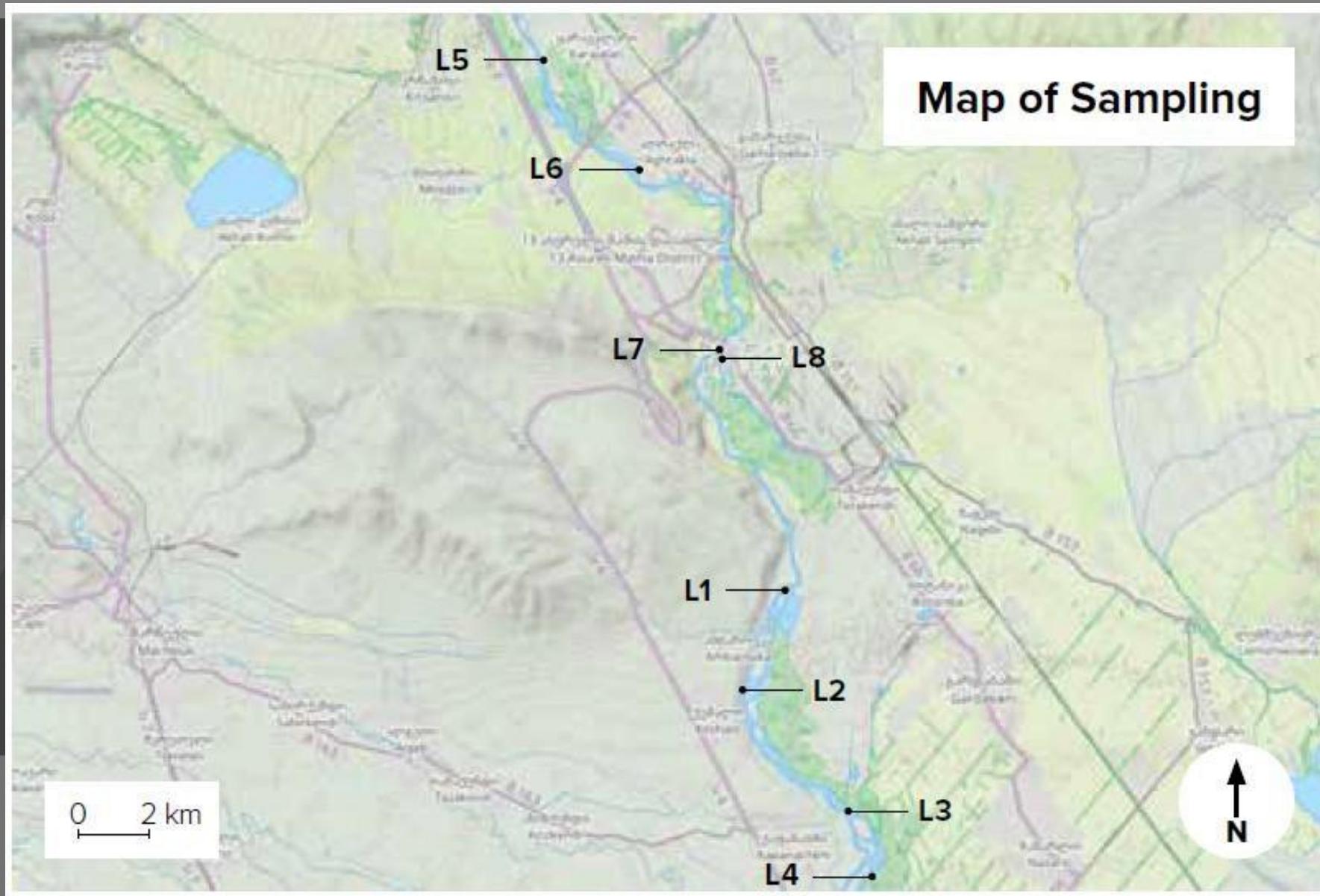


Figure 4.4: Highest levels of PBDEs measured in free range poultry eggs globally (in ng/g fat). Sources of information see Table 4.3.



Rustavi – fish sampling



POPs in Rustavi – fish



TABLE 5.1: BASIC DESCRIPTION OF FISH SAMPLES TAKEN FROM THE RUSTAVI AREA.

Sample ID	Fish length (cm)	Estimated age (years)		Species		Locality	
	Total / Fork	- by fishermen in Rustavi	- laboratory. Prague	Common name	Latin name	No.	Specification
GE-RF-1	11.5/9.5	4-5	4	top mouth gudgeon	<i>Pseudorasbora parva</i>	Loc 1	Gardabani-upper
GE-RF-2/1-2	12.3/10.2; 16.2/13.2	8 months, 1+	N/A	mursa	<i>Luciobarbus mursa</i>	Loc 1	Gardabani-upper
GE-RF-3/1-3	16.2/13.5; 17.1/14.3; 15.6/13.1	1	N/A	mursa	<i>Luciobarbus mursa</i>	Loc 3	WWTP-upper
GE-RF-4/1-2	18/14.7; 22.8/19.3	1+	1.5-2	bulatmai barbel	<i>Luciobarbus capito</i>	Loc 3	WWTP-upper
GE-RF-5	13.5/11.2	N/A	2	European chub	<i>Squalius cephalus</i>	Loc 4	WWTP-lower
GE-RF-6	14.1/11.5	N/A	1.5-2	common bleak	<i>Alburnus alburnus</i>	Loc 4	WWTP-lower
GE-RF-7/1-2	14.7/12.1; 20.2/16.4	N/A	N/A	mursa	<i>Luciobarbus mursa</i>	Loc 4	WWTP-lower
GE-RF-8	35/28.5	3	3-4	bulatmai barbel	<i>Luciobarbus capito</i>	Loc 4	WWTP-lower
GE-RF-9/1	67/62.5	2.5	N/A	wels catfish	<i>Silurus glanis</i>	Loc 6	Karajalari-lower
GE-RF-9/2-3	49.2/45.5; 44.8/41.5	1-1.5	N/A	wels catfish	<i>Silurus glanis</i>	Loc 6	Karajalari-lower
GE-RF-10/1-2	50/46.2; 41/38	1-1.5	N/A	wels catfish	<i>Silurus glanis</i>	Loc 7	Near „park“ - river
GE-RF-11/1-4	27.2/22; 29.2/24; 26.8/22.1; 29.8/22.3	3+	4+; 5+; 5; 4+	crucian carp	<i>Carassius carassius</i>	Loc 8	Central Park Lake

POPs in Rustavi – fish



TABLE 5.2: RESULTS OF THE ANALYSES OF FISH FOR POPs AND HEAVY METALS FROM BROADER RUSTAVI AREA.

Locality	L1	L1	L3	L3	L4	L4	L4	L6	L6	L7	L8			
Sample ID	GE-RF-1	GE-RF-2/1-2	GE-RF-3/1-3	GE-RF-4/1-2	GE-RF-5	GE-RF-6	GE-RF-7/1-2	GE-RF-8	GE-RF-9/1	GE-RF-9/2-3	GE-RF-10/1-2	GE-RF-11/1-4		
Species Name	topmouth gudgeon	mursa	mursa	bulatmai barbel	European chub	common bleak	mursa	bulatmai barbel	wels catfish	wels catfish	wels catfish	crucian carp		
	Units											EU limit		
Age	Years	4	0.8-1+	1	1.5-2	2	1.5-2	N/A	3-4	2.5	1-1.5	1-1.5	4-5+	NA
Fish in sample	N	1	2	3	2	1	1	2	1	1	2	2	4	NA
Lipid	%	1.5%	5.6%	4.6%	3.3%	0.6%	3.3%	6.1%	3.0%	1.7%	2.5%	4.0%	2.6%	NA
PeCB		<0.005	0.10	0.09	0.05	<0.005	0.08	0.09	0.04	0.02	0.02	0.03	0.03	NA
HCB		0.33	0.61	0.51	0.24	0.12	0.30	0.57	0.28	0.21	0.08	0.33	0.33	NA
HCBD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA
7 PCB	ng/g fw	15.7	21	13.6	4.5	3.8	6.8	18	6.4	5.7	3.2	8.7	8.8	NA
6 PCB		13.0	18	11.6	3.9	3.2	5.9	15.4	5.5	4.9	2.7	7.7	7.7	125
Σ HCH		0.63	0.90	0.78	0.52	0.14	0.53	0.90	0.43	0.34	0.31	0.39	0.50	10
Σ DDT		47	86	42	12.8	13.9	26	48	19	17	30	22	28	50
4 DDT		45	82	39	12.1	13.7	25	44	18	15.7	29	20	26	NA

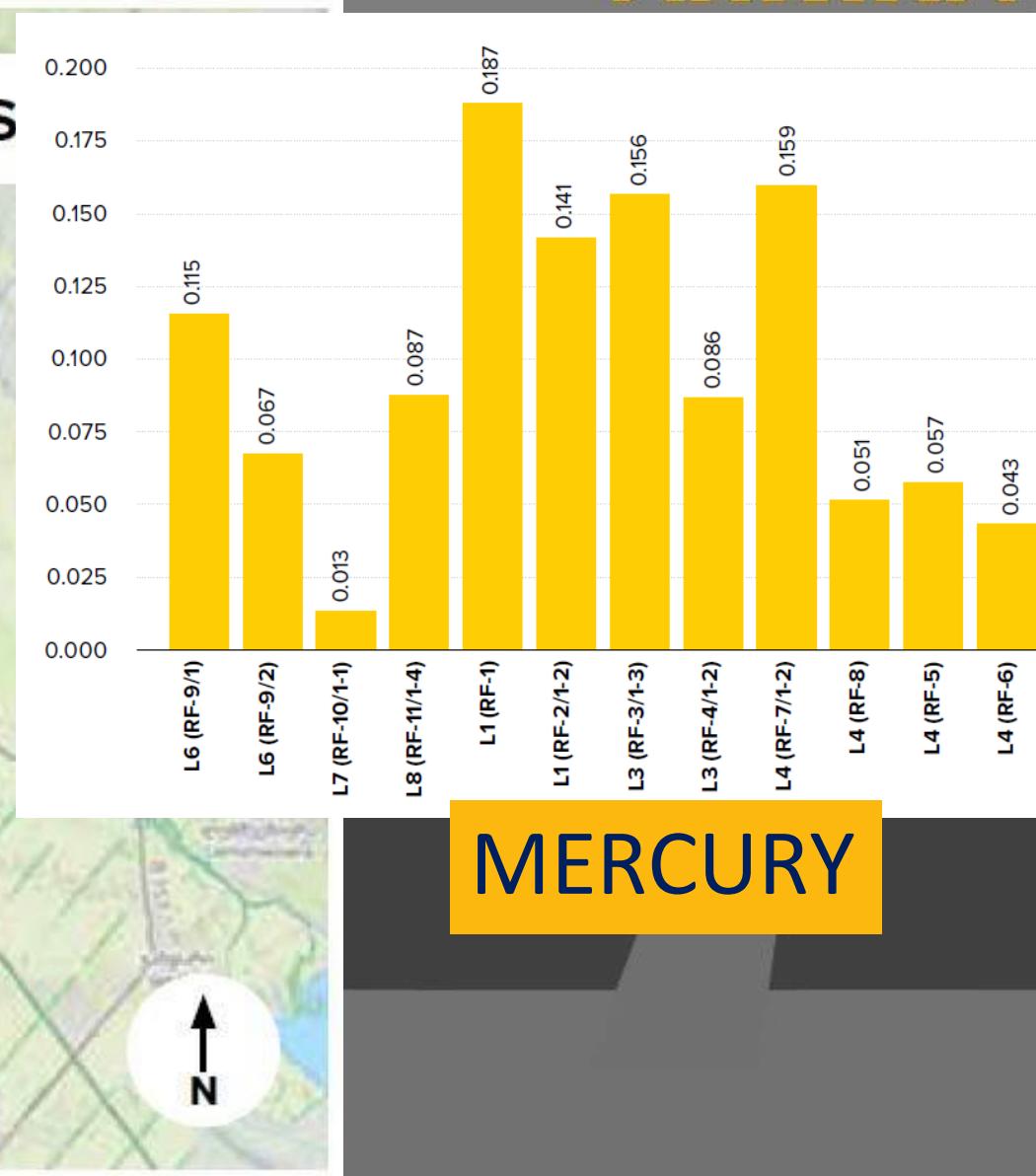
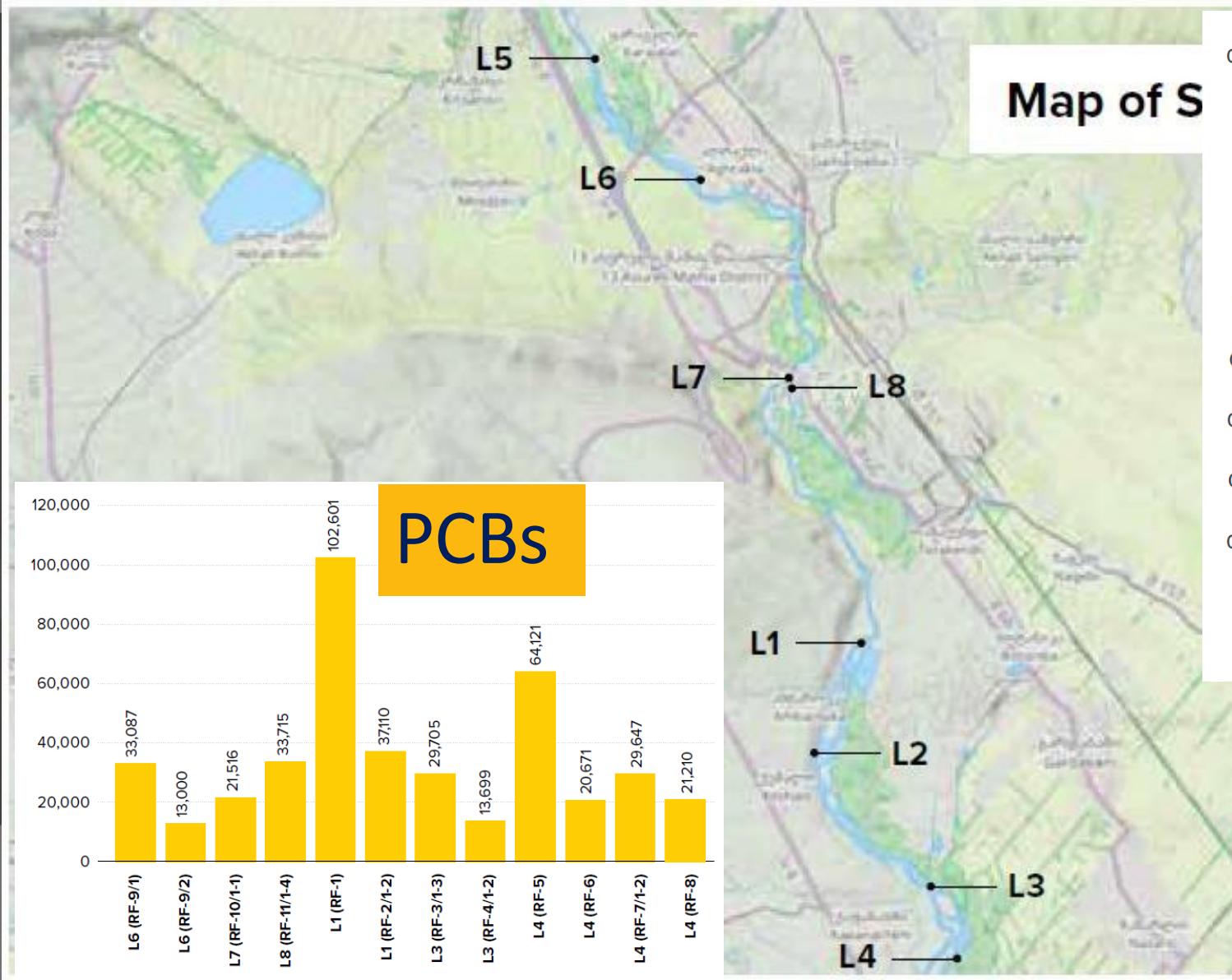
Heavy metals in Rustavi – fish



TABLE 5.2: RESULTS OF THE ANALYSES OF FISH FOR POPS AND HEAVY METALS FROM BROADER RUSTAVI AREA.

Locality		L1	L1	L3	L3	L4	L4	L4	L6	L6	L7	L8		
Sample ID		GE-RF-1	GE-RF-2/1-2	GE-RF-3/1-3	GE-RF-4/1-2	GE-RF-5	GE-RF-6	GE-RF-7/1-2	GE-RF-8	GE-RF-9/1	GE-RF-9/2-3	GE-RF-10/1-2	GE-RF-11/1-4	
Species Name		topmouth gudgeon	mursa	mursa	bulatmai barbel	European chub	common bleak	mursa	bulatmai barbel	wels catfish	wels catfish	wels catfish	crucian carp	
Units													EU limit	
Age	Years	4	0.8–1+	1	1.5–2	2	1.5–2	N/A	3–4	2.5	1–1.5	1–1.5	4–5+	NA
Fish in sample	N	1	2	3	2	1	1	2	1	1	2	2	4	NA
Mercury	mg/kg fw	0.187	0.141	0.156	0.086	0.057	0.043	0.159	0.051	0.115	0.067	0.013	0.087	0.5
Lead		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	0.3
Cadmium		0.006	0.011	0.009	<0.005	0.005	<0.005	0.007	<0.002	<0.002	<0.002	<0.002	<0.002	0.05
Copper		0.59	1.82	1.39	0.30	0.53	0.93	1.24	0.41	0.11	0.14	0.50	0.11	NA
Zinc		35	28	15	8.4	22	16	23	9.3	5.3	6.6	19	7.2	NA
Arsenic		0.040	0.070	0.070	0.030	0.020	0.060	0.080	0.040	<0.01	<0.01	0.020	<0.01	NA

Mercury and PCBs in fish from Rustavi



POPs in food chain - Rustavi



- **PCBs:** Data on ndl-PCBs in Rustavi's eggs and fish show serious local food contamination, likely related to industrial activity.
- **DDT:** The Rustavi egg samples point to particularly high exposures. Even in Bangladesh, with lower DDT intake, researchers urged reduced exposure in women of reproductive age.
- Compared to commercial eggs, free-range eggs from Rustavi pose a substantially higher dietary exposure to multiple POPs.

POPs in food chain - Rustavi



- **FISH:** Similarly, even moderate fish consumption from the Mtkvari River contributes significantly to PCB and DDT exposure. Considering parallel exposures from local eggs and environmental sources, **the cumulative risk for Rustavi residents consuming local food cannot be ignored.**



Thank you

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