

Supplementary Information

Evaluation of the Concentration of Cu, Zn, Pb and Cr in Different Fish Species from the São Gonçalo Channel in Pelotas-RS, Brazil

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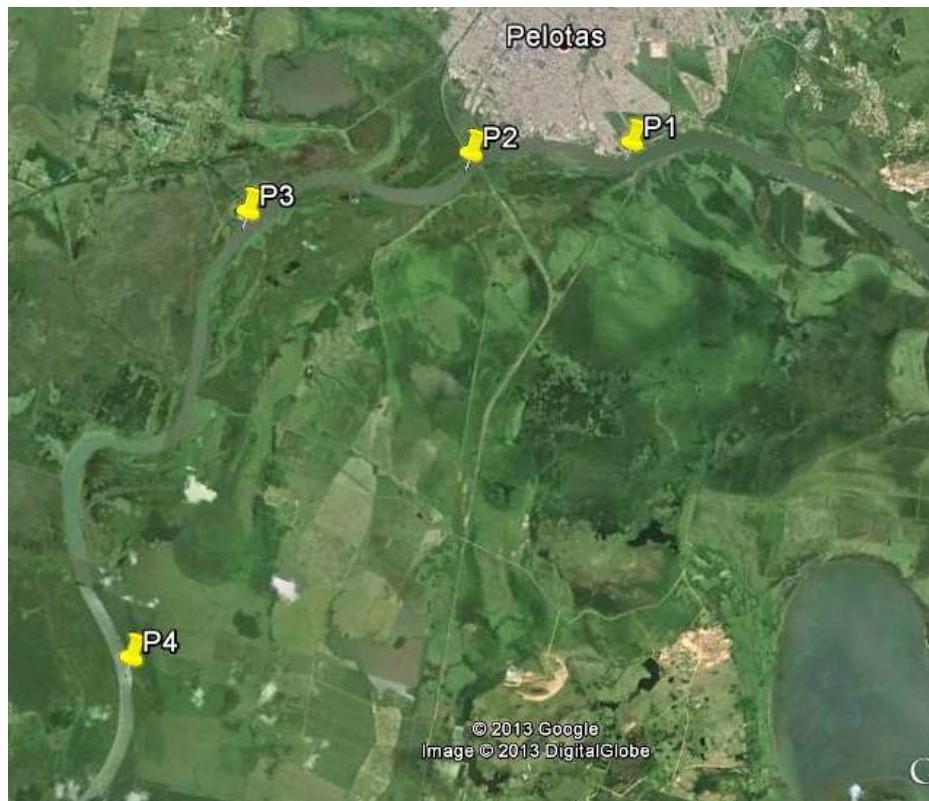


Figure S1. Collection points on São Gonçalo channel in Pelotas. Source: Google Earth.

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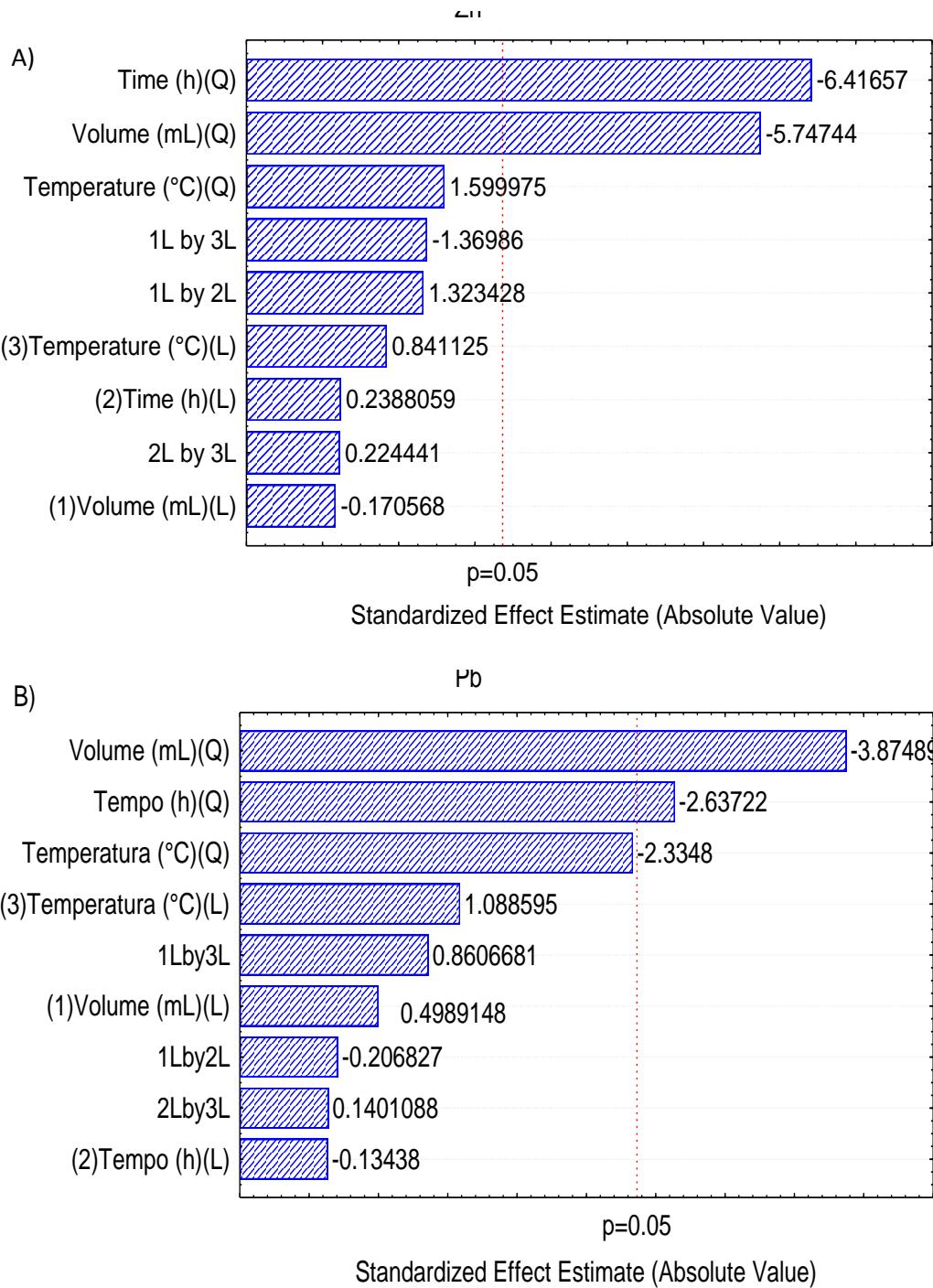


Figure S2. Pareto chart obtained by central composite design for the optimization of the variables for (A) Zn and (B) Pb determinations in fish samples.

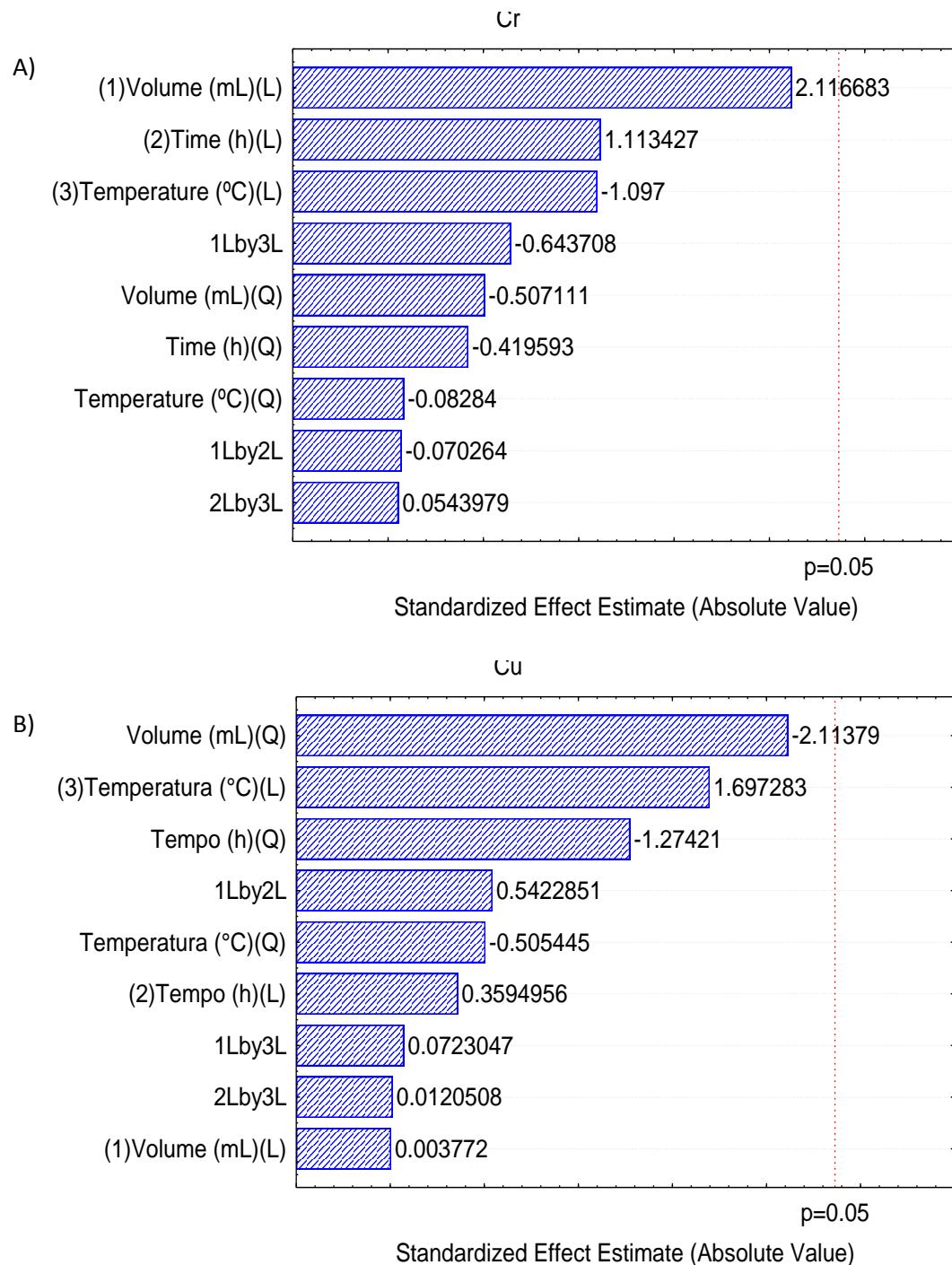


Figure S3. Pareto chart obtained by central composite design for the optimization of the variables for (A) Cr and (B) Cu determinations in fish samples.

Table S1. Temperature program of the graphite furnace for the determination of Pb and Cr in fish tissue samples

Step	Temperature / °C	Ramp / s	Hold / s	Argon flow rate / (mL min ⁻¹)
Drying	110	10	30	250
Drying	130	10	30	250
Pyrolysis	1500 ^a ; 1000 ^b	10	20	250
Atomization	2300 ^a ; 1800 ^b	0	5	—
Cleaning	2600 ^a ; 2200 ^b	1	3	250

^aCr; ^bPb.

Table S2. Factors and their respective levels in the central composite design

Factor	Levels				
	-1.68	-1	0	+1	+1.68
H ₂ O ₂ volume / mL	0.32	1	2	3	3.68
Decomposition time / h	0.32	1	2	3	3.68
Temperature of digester block / °C	100	120	150	180	200

Table S3. CCD matrix of the acid decomposition with reflux system for Cu, Zn, Cr and Pb in fish sample (n = 3)

Trial	Independent variable			Dependent variable			
	H ₂ O ₂ volume / mL	Decomposition time / h	Temperature / °C	Absorbance			
				Cu	Zn	Cr	Pb
1	1	1	120	0.096	0.168	0.1845	0.0861
2	3	1	120	0.093	0.168	0.2565	0.0801
3	1	3	120	0.095	0.159	0.1936	0.0896
4	3	3	120	0.097	0.167	0.2499	0.0865
5	1	1	180	0.103	0.176	0.1742	0.0871
6	3	1	180	0.100	0.164	0.2052	0.1000
7	1	3	180	0.102	0.167	0.1731	0.0987
8	3	3	180	0.104	0.167	0.2136	0.1025
9	0.32	2	150	0.103	0.155	0.1559	0.0920
10	3.68	2	150	0.104	0.156	0.1822	0.0991
11	2	0.32	150	0.107	0.146	0.1361	0.1153
12	2	3.68	150	0.110	0.159	0.2066	0.0979
13	2	2	100	0.109	0.186	0.1826	0.1103
14	2	2	200	0.117	0.188	0.1778	0.1083
15	2	2	150	0.111	0.187	0.2093	0.1233
16	2	2	150	0.109	0.180	0.1995	0.1231
17	2	2	150	0.109	0.179	0.2036	0.1227

Table S4. Regression coefficient for Zn

	Regression coefficient	Error	t(7)	p-Value
Average	0.181722	0.003	62.13	< 0.0001
(1) Volume (L) / mL	-0.000234	0.001	-0.17	0.8693
Volume (Q) / mL	-0.008689	0.001	-5.78	0.0007
(2) time (L) ^a / h	0.000328	0.001	0.24	0.8181
time (Q) ^a / h	-0.009700	0.001	-6.42	0.0004
(3) Temperature (L) ^b / °C	0.001155	0.001	0.84	0.4281
Temperature (Q) ^b / °C	0.002419	0.001	1.59	0.1536
1L, 2L	0.002375	0.002	1.32	0.2273
1L, 3L	0.002458	0.002	-1.37	0.2130
2L, 3L	0.000403	0.002	0.22	0.8288

^aDecomposition time; ^btemperature of digester block.

Table S5. Regression coefficient for Pb

	Regression coefficient	Error	t(7)	p-Value
Average	0.123763	0.006	20.26	< 0.0001
(1) Volume (L) / mL	0.001431	0.003	0.49	0.6331
Volume (Q) / mL	-0.012231	0.003	-3.87	0.0061
(2) time (L) ^a / h	-0.000385	0.003	-0.13	0.8968
time (Q) ^a / h	-0.008324	0.003	-2.64	0.0335
(3) Temperature (L) ^b / °C	0.003122	0.003	1.09	0.3124
Temperature (Q) ^b / °C	-0.007370	0.003	-2.33	0.0522
1L, 2L	-0.000775	0.004	-0.21	0.8420
1L, 3L	0.003225	0.004	0.86	0.4179
2L, 3L	0.000525	0.004	0.14	0.8925

^aDecomposition time; ^btemperature of digester block.

