Sex and seasonal differences in metals accumulation of selected tissues in red swamp crayfish from Lake Trasimeno (Umbria, Italy)

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Table1 Monthly values of morphometric parameters *of P. clarkii* (mean value ± standard deviation).

Month	Carapace length (mm)		Claw length (mm)		Total weight (g)		Muscle weight (g)		Hepatopancreas weight (g)	
	male	*female*	*male*	*female*	*male*	*female*	*male*	*female*	*male*	*female*
JUL	65.16 ± 14.01	52.23 ± 1.16	57.61 ± 5.01	33.89 ± 5.79	33.63 ± 3.69	30.00 ± 5.98	4.53 ± 1.14	5.73 ± 1.33	1.55 ± 0.55	1.97 ± 0.91
AUG	52.29 ± 1.56	54.08 ± 2.33	51.44 ± 6.43	35.16 ± 1.43	29.30 ± 4.95	30.23 ± 3.29	3.45 ± 0.78	4.97 ± 0.60	1.15 ± 0.07	1.67 ± 0.45
SEP	40.00 ± 1.38	49.88 ± 1.05	28.34 ± 0.89	32.51 ± 1.29	12.13 ± 2.03	24.47 ± 2.32	2.03 ± 0.42	3.43 ± 0.32	0.67 ± 0.15	1.47 ± 0.49
OCT	47.92 ± 2.87	47.83 ± 2.64	40.46 ± 3.63	31.06 ± 4.93	23.83 ± 5.71	21.13 ± 3.74	3.60 ± 0.53	2.77 ± 0.38	1.37 ± 0.21	1.33 ± 0.21
NOV	49.60 ± 1.14	54.05 ± 5.16	43.16 ± 0.51	36.76 ± 7.41	26.55 ± 1.34	31.37 ± 9.11	3.90 ± 0.28	5.23 ± 1.62	1.65 ± 0.35	1.90 ± 0.60
DIC	49.42 ± 8.46	51.86 ± 1.23	46.12 ± 12.11	34.26 ± 3.02	28.93 ± 16.04	26.30 ± 2.61	3.63 ± 1.16	3.80 ± 0.40	1.87 ± 1.27	1.87 ± 0.71
GEN	49.48 ± 4.75	50.80 ± 2.64	42.18 ± 6.36	32.03 ± 3.73	27.27 ± 10.52	26.17 ± 3.75	4.10 ± 0.79	3.97 ± 0.46	1.73 ± 0.59	2.00 ± 0.52
FEB	52.81 ± 3.03	49.84 ± 4.94	54.28 ± 3.36	31.18 ± 3.29	33.10 ± 4.48	25.80 ± 5.65	3.53 ± 0.15	4.03 ± 1.05	1.87 ± 0.47	2.10 ± 0.95
MAR	55.36 ± 3.17	56.07 ± 2.90	50.16 ± 0.89	42.27 ± 5.27	36.40 ± 5.03	36.27 ± 4.63	4.77 ± 0.67	5.90 ± 1.82	2.23 ± 0.51	2.43 ± 1.25
APR	53.41 ± 5.16	50.46 ± 3.13	53.58 ± 8.26	31.49 ± 2.22	34.37 ± 13.46	24.17 ± 3.45	4.43 ± 0.80	5.63 ± 0.74	1.70 ± 0.20	2.03 ± 0.31
MAY	56.50 ± 3.24	57.10 ± 3.25	56.09 ± 4.90	37.97 ± 5.40	40.13 ± 9.42	35.00 ± 6.66	4.77 ± 0.75	7.13 ± 1.02	1.97 ± 0.23	2.50 ± 0.40
JUN	60.30 ± 8.59	55.96 ± 3.25	57.18 ± 5.00	38.80 ± 3.07	40.57 ± 4.93	36.80 ± 3.55	4.60 ± 2.11	7.00 ± 2.43	1.63 ± 0.76	1.80 ± 0.50

Table 2 Male and female metals concentrations in hepatopancreas and abdominal muscle tissues of each *P. clarkii* sample (µg kg^{-1}, ww)

	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ag	Cd	Pb	Hg
Male											
Abdominal muscle											
M4-0718-M	6489	1038	n.d.	31	3702	4536	16011	10	17	87	0.03
M5-0718-M	3162	764	n.d.	22	1724	7081	13214	10	10	83	0.02
M6-0718-M	4865	1199	n.d.	62	3300	8137	14310	10	9	65	0.03
M7-0718-M	180	45	1387	2	82	681	1251	1	1	25	0.03
M2-0818-M	7292	668	n.d.	27	4098	7757	13681	8	1	6	0.07
M3-0818-M	24862	3481	n.d.	113	14939	9329	20219	12	2	6	0.07
M1-0918-M	257	572	13501	24	1529	4074	11956	8	5	19	0.02
M2-0918-M	407	818	23017	33	2431	4064	13045	9	6	31	0.02
M3-0918-M	2983	3193	123299	125	17450	6427	12028	12	6	26	0.02
M2-1018-M	57	867	5804	12	2453	5815	14883	28	18	241	0.03
M9-1018-M	113	815	8059	11	1362	7189	12396	17	11	167	0.03
M11-1018-M	115	643	7475	14	1024	5512	12633	9	8	93	0.03
M1-1118-M	206	513	10393	18	1336	5865	12294	14	4	33	0.04
M3-1118-M	331	1047	16316	40	2147	6281	12178	11	4	27	0.09
M1-1218-M	329	327	3151	10	308	4949	12925	22	1	31	0.03
M2-1218-M	196	498	3533	10	215	7631	10674	17	2	30	0.05
M3-1218-M	206	786	3071	13	296	5283	10806	12	2	34	0.03
M1-0119-M	61	960	5807	14	527	9173	14584	12	5	86	0.06
M2-0119-M	158	1873	11016	34	1117	3761	10873	12	20	148	0.03
M3-0119-M	88	788	7070	16	670	6596	11868	9	1	34	0.04
M1-0219-M	88	7026	6006	21	877	9188	12998	19	2	28	0.04
M2-0219-M	47	2124	5639	12	974	5546	12955	9	2	39	0.06
M3-0219-M	64	7988	6446	15	1207	6011	12002	8	3	50	0.03
M1-0319-M	260	506	3973	28	357	11556	13009	19	4	46	0.04
M2-0319-M	697	381	5363	13	714	8786	12981	19	3	45	0.02
M3-0319-M	187	307	2734	9	445	5507	13583	16	2	46	0.04
M1-0419-M	38	462	3939	18	359	9916	12813	11	1	31	0.03
M2-0419-M	43	959	5148	24	416	13087	13566	19	3	26	0.03
M3-0419-M	63	1476	7111	43	500	12803	17957	13	3	34	0.06
M1-0519-M	206	459	3382	9	483	6659	12729	15	2	193	0.04
M2-0519-M	359	748	4771	10	459	5901	12516	10	3	261	0.07
M3-0519-M	253	770	3741	31	615	7040	14484	13	4	284	0.04
M1-0619-M	701	15	6350	101	1505	8521	16804	27	5	45	0.03
M2-0619-M	979	9	7293	9	1113	9456	16735	28	4	45	0.05
M3-0619-M	162	76	4478	10	1471	4816	12161	18	7	42	0.04

Male
Hepatopancreas

E4-0718-M	29758	17954	n.d.	734	21305	5597	23723	14	186	18	0.001
E5-0718-M	49608	11390	n.d.	469	31471	5195	17356	9	128	748	0.001
E6-0718-M	137464	36517	n.d.	907	82775	11172	32157	12	173	286	0.001
E7-0718-M	12175	2449	n.d.	560	8189	7707	19039	12	134	34	0.000
E1-0818-M	10253	14646	n.d.	277	8680	6664	3764	7	75	24	0.008
E2-0818-M	8224	2107	n.d.	146	5216	4924	4589	6	16	7	0.004
E3-0818-M	37816	29780	n.d.	388	22276	10536	7642	16	150	36	0.01
E4-0818-M	29893	9747	n.d.	380	19220	7724	38759	9	143	23	n.d.
E1-0918-M	3985	6450	372655	398	24455	4321	8108	8	82	124	0.003
E2-0918-M	3063	5349	286821	414	18526	4882	9473	10	186	26	0.005
E3-0918-M	3662	11044	280300	341	22820	7256	4946	19	183	38	0.002
E2-1018-M	731	21692	203593	371	5557	6674	52899	19	355	174	0.01
E9-1018-M	1078	16209	351259	193	7622	6093	16839	17	350	177	0.01
E11-1018-M	2441	14802	471005	355	15240	7342	13346	13	276	157	0.01
E1-1118-M	8759	34108	809210	714	49754	15496	34204	44	127	88	0.03
E2-1118-M	2024	7546	431500	605	13349	10364	51631	48	79	48	0.02
E3-1118-M	739	12761	179731	574	4965	5460	36560	13	116	36	0.04
E1-1218-M	100	9644	140416	2348	37668	48961	15	168	<0.02	62	0.01
E2-1218-M	186	7795	132590	1957	58551	40985	49	431	<0.02	66	0.02
E3-1218-M	328	21880	114375	3415	38342	42518	14	220	<0.02	77	0.01
E1-0119-M	1260	26638	160440	374	7927	12068	29387	20	67	52	0.03
E2-0119-M	940	35912	168535	465	6923	7547	35545	19	75	58	0.01
E3-0119-M	353	17793	157329	603	3324	20968	56716	47	72	38	0.02
E1-0219-M	1126	48912	244047	514	7968	83159	36899	168	100	107	0.02
E2-0219-M	331	40609	323445	937	2855	12321	71676	24	91	44	0.02
E3-0219-M	384	16645	238788	502	4590	75532	47201	169	103	77	0.02
E1-0319-M	815	10328	153539	973	1614	71085	53517	227	109	84	0.02
E2-0319-M	4881	14474	141681	389	3608	34461	31815	123	166	87	0.02
E3-0319-M	3964	5289	175316	446	4743	9426	49259	19	50	80	0.02
E1-0419-M	124	5423	314667	1434	1171	13206	58126	16	84	44	0.01
E2-0419-M	780	14038	220509	453	5503	10568	22490	21	101	73	0.01
E3-0419-M	344	12780	97631	637	2697	7334	18501	9	51	36	0.01
E1-0519-M	1956	18487	188292	567	1670	13142	23136	42	400	176	0.02
E2-0519-M	395	37498	340946	858	1267	13170	45718	21	164	146	n.d.
E3-0519-M	1026	14874	59394	1217	4375	5576	35810	12	129	143	0.04
E1-0619-M	851	39	57940	1946	2221	9270	15202	18	152	37	0.02
E2-0619-M	4134	14	164002	160	2366	9013	13033	28	317	44	0.02
E3-0619-M	3994	47	272056	367	2407	15486	28341	27	741	54	0.01

Female

Abdominal muscle

M5-0718-F	3956	707	n.d.	26	2571	18336	16542	13	3	12	0.05
M6-0718-F	23118	2117	n.d.	94	13070	12468	13037	12	3	4	0.04
M7-0718-F	2293	1439	n.d.	44	1182	9690	13942	9	10	21	0.04
M1-0818-F	6965	673	32587	35	4246	4056	13993	8	2	11	0.03
M2-0818-F	9456	1116	41231	55	5572	2419	15089	6	5	9	0.08
M3-0818-F	3802	801	17645	19	2237	5084	15239	11	4	8	0.03
M1-0918-F	622	303	5121	11	489	2447	13055	4	9	52	0.04
M2-0918-F	3270	509	15543	16	2077	5208	12740	6	3	26	0.09
M3-0918-F	605	541	4621	16	641	5699	12724	11	6	70	0.05
M1-1018-F	1435	342	7856	9	1066	3646	11835	17	4	81	0.03
M2-1018-F	820	341	6149	12	728	4489	11668	19	6	99	0.03
M3-1018-F	605	345	4935	9	1737	5966	9706	6	11	47	0.04
M1-1118-F	1836	3220	11816	27	5069	10358	13703	22	6	87	0.07
M5-1118-F	553	4146	5089	27	5087	7129	11410	11	3	22	0.04
M12-1118-F	456	906	6911	23	4817	4820	13829	7	2	32	0.04
M1-1218-F	906	3137	13640	17	693	6885	11191	15	4	48	0.04
M6-1218-F	136	460	2686	9	209	6979	13363	20	3	37	0.03
M7-1218-F	1689	483	12150	12	936	5010	14024	11	4	33	0.07
M2-0119-F	404	458	4030	7	308	4589	10312	12	2	28	0.04
M4-0119-F	257	929	9275	10	315	5432	12172	9	1	37	0.06
M5-0119-F	211	533	4878	11	307	3083	12124	6	1	38	0.03
M3-0219-F	5816	862	26850	27	3216	7681	12213	10	2	77	0.05
M4-0219-F	5732	939	25525	39	3344	5066	13860	9	4	75	0.05
M7-0219-F	2140	611	14541	21	1632	4261	12763	7	2	104	0.05
M2-0319-F	314	670	6718	14	621	5461	15798	25	5	48	0.04
M3-0319-F	591	452	4812	12	950	8234	15202	25	6	43	0.04
M8-0319-F	982	496	7586	9	886	3210	15314	11	4	38	0.03
M2-0419-F	404	4832	n.d.	24	399	7280	4689	10	3	33	0.03
M5-0419-F	257	11150	n.d.	20	755	6621	10941	9	2	40	0.02
M7-0419-F	211	10915	n.d.	12	521	7570	10150	11	1	38	0.02
M1-0519-F	617	762	7817	18	722	3230	17905	5	8	268	0.03
M3-0519-F	726	1531	8128	12	584	8097	16124	14	6	112	0.05
M4-0519-F	841	961	5668	41	1029	10038	14804	13	6	106	0.04
M2-0619-F	2012	859	13206	22	nd	4964	18707	13	16	48	0.02
M3-0619-F	956	811	11291	21	735	5346	16955	11	6	46	0.01
M6-0619-F	411	1652	6068	8	390	4464	13389	11	7	34	0.01

Female Hepatopancreas											
E5-0718-F	4598	3492	n.d.	316	6727	24221	16900	43	213	13	0.02
E6-0718-F	11735	2728	n.d.	136	6839	9495	10914	10	96	11	0.01
E7-0718-F	10527	15450	n.d.	426	7174	10838	15846	12	159	18	0.02
E1-0818-F	8025	3188	201747	285	5466	6694	13348	17	309	16	0.03
E2-0818-F	18503	4646	165027	236	11221	2578	15924	9	446	21	0.03
E3-0818-F	7243	5322	574010	422	5917	4760	19613	11	642	44	0.03
E1-0918-F	7696	3704	254438	343	5638	3219	7076	7	128	34	0.01
E2-0918-F	4025	2163	127864	164	2944	4371	12992	5	590	47	0.04
E3-0918-F	9080	4990	127663	247	6242	4063	11283	9	197	32	0.01
E1-1018-F	12566	11265	177590	352	8028	5933	9626	8	156	85	0.01
E2-1018-F	5971	6232	78726	253	3820	6273	5130	12	426	67	0.01
E3-1018-F	30203	14291	542625	505	18636	5548	9755	8	498	74	0.01
E1-1118-F	3263	44363	92810	327	5147	19911	15310	81	410	35	0.03
E5-1118-F	13910	52483	189393	378	4122	4636	21028	8	70	30	0.01
E12-1118-F	3875	6010	199626	300	4846	5563	27405	13	63	29	0.02
E1-1218-F	3223	5837	128905	172	2707	3810	12834	8	185	49	0.01
E6-1218-F	2549	17001	93090	204	2486	6462	11659	20	45	38	0.01
E7-1218-F	3722	21185	123082	349	2647	6609	14464	13	555	49	0.01
E2-0119-F	5280	45371	112193	388	4256	8358	30438	25	451	44	0.04
E4-0119-F	2629	15427	34809	222	3016	40396	20472	89	144	34	0.02
E5-0119-F	2593	6900	67823	307	3105	31182	20473	79	57	45	0.02
E3-0219-F	469	8418	58655	411	2028	9535	27246	24	78	128	0.03
E4-0219-F	2237	5874	233761	366	1985	21822	18279	66	235	83	0.02
E7-0219-F	4681	13579	333381	530	4585	7384	22150	13	139	153	0.02
E2-0319-F	1605	9227	45953	336	2442	8801	19147	27	347	47	0.01
E3-0319-F	865	9151	72811	294	1217	6223	29452	23	253	53	0.01
E8-0319-F	3453	3484	281490	254	2186	66759	17760	89	213	55	0.02
E2-0419-F	5280	228761	547	438	2991	5292	221756	15	98	55	0.02
E5-0419-F	2629	8841	128227	319	2062	4477	24187	8	60	56	0.01
E7-0419-F	2593	47632	257	315	2694	7360	40739	13	72	39	0.01
E1-0519-F	3079	12962	160677	417	4685	4631	34325	8	284	304	0.03
E3-0519-F	428	1722	6546	8	384	4703	14180	11	5	38	0.02
E4-0519-F	556	14176	73917	620	5635	7634	21195	11	254	82	0.02
E2-0619-F	566	1011	69770	202	1067	7421	23438	23	832	50	0.005
E3-0619-F	1174	17039	30629	437	2225	7364	16929	15	338	36	0.002
E6-0619-F	4550	9864	78570	109	2805	9930	8737	14	227	32	0.01

Table S3. Male and female seasonal metals concentrations in hepatopancreas and abdominal muscle tissues of each *P. clarkii* sample (µg kg^{-1}, ww)

	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ag	Cd	Pb	Hg
Male											
Abdominal muscle											
JULY	3674	762	n.d.	29	29	5109	11196	7.6	9.34	65	0.027
AUGUST	16077	2075	n.d.	70	70	8543	16950	9.8	1.55	6	0.068
SEPTEMBER	1215	1527	53272	60	60	4855	12343	9.8	5.96	25	0.021
OCTOBER	**95**	775	7113	12	12	6172	13304	17.9	12.26	167	0.027
NOVEMBER	269	780	13355	29	29	6073	12236	12.8	3.96	30	0.063
DECEMBER	244	537	3251	11	11	5954	11468	16.9	1.92	32	0.033
JANUARY	102	1207	7964	21	21	6510	12442	11.0	8.59	89	0.043
FEBRUARY	66	5713	6031	16	16	6915	12652	12.0	2.31	39	0.042
MARCH	381	398	4023	17	17	8616	13191	18.0	3.02	45	0.037
APRIL	48	966	5399	28	28	11935	14779	14.4	2.67	31	0.038
MAY	273	659	3964	17	17	6534	13243	12.8	2.79	246	0.049
JUNE	614	33	6040	40	40	7598	15233	24.1	5.46	44	0.040
Hepatopancreas											
JULY	57251	17078	n.d.	668	35935	7418	23069	11.8	155.35	271	0.001
AUGUST	21547	14070	n.d.	298	13848	7462	13688	9.6	95.93	22	0.006
SEPTEMBER	3570	7614	313259	384	21934	5486	7509	12.1	150.47	63	0.003
OCTOBER	1417	17568	341953	306	9473	6703	27695	16.3	326.90	169	0.011
NOVEMBER	3840	18138	473480	631	22689	10440	40798	34.8	107.08	58	0.029
DECEMBER	204	13106	129127	2573	44854	44155	26	272.8	0.02	68	0.014
JANUARY	851	26781	162101	480	6058	13527	40549	28.5	71.49	49	0.017
FEBRUARY	614	35389	268760	651	5138	57004	51925	120.3	98.16	76	0.018
MARCH	3220	10030	156845	603	3322	38324	44864	123.2	108.31	84	0.019
APRIL	416	10747	210936	842	3123	10370	33039	15.4	78.76	51	0.010
MAY	1126	23620	196211	881	2437	10629	34888	25.1	231.07	155	0.030
JUNE	2993	34	164666	824	2331	11256	18859	24.3	403.11	n.d.	0.017

Female

Abdominal muscle											
JULY	9789	1421	n.d.	54	5608	13498	14507	11	5	12	0.041
AUGUST	6741	863	30488	37	4018	3853	14774	8	4	9	0.049
SEPTEMBER	1499	451	8428	14	1069	4451	12840	7	6	49	0.058
OCTOBER	953	343	6314	10	1177	4700	11070	14	7	76	0.032
NOVEMBER	948	2757	7939	26	4991	7435	12981	13	4	47	0.053
DECEMBER	911	1360	9492	12	612	6291	12859	15	4	39	0.045
JANUARY	291	640	6061	9	310	4368	11536	9	1	34	0.043
FEBRUARY	4563	804	22305	29	2731	5669	12945	9	3	85	0.048
MARCH	629	539	6372	12	819	5635	15438	20	5	43	0.037
APRIL	291	8966		19	558	7157	8594	10	2	37	0.025
MAY	728	1085	7204	24	778	7122	16278	11	6	162	0.038
JUNE	1126	1107	10188	17	562	4925	16350	12	10	43	0.013
Hepatopancreas											
JULY	8954	7224	n.d.	293	6914	14851	14553	22	156	14	0.017
AUGUST	11257	4385	313595	314	7535	4677	16295	12	465	27	0.027
SEPTEMBER	6934	3619	169988	251	4941	3885	10450	7	305	38	0.021
OCTOBER	16247	10596	266314	370	10161	5918	8170	9	360	75	0.009
NOVEMBER	7016	34285	160610	335	4705	10037	21248	34	181	31	0.022
DECEMBER	3165	14674	115026	242	2613	5627	12986	14	262	45	0.010
JANUARY	3501	22566	71608	306	3459	26645	23794	64	218	41	0.024
FEBRUARY	2462	9290	208599	436	2866	12914	22558	34	151	122	0.025
MARCH	1974	7287	133418	295	1948	27261	22120	47	271	52	0.012
APRIL	3501	95078	43011	358	2582	5710	95561	12	77	50	0.013
MAY	1354	9620	80380	348	3568	5656	23233	10	181	142	0.025
JUNE	2097	9304	59656	249	2032	8239	16368	17	466	40	0.007