

Supporting Information for

Quantifying differences in responses of aquatic insects to trace metal exposure in field studies and short-term stream mesocosm experiments

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Number of pages: 7

Number of figures: 3

Number of tables: 3

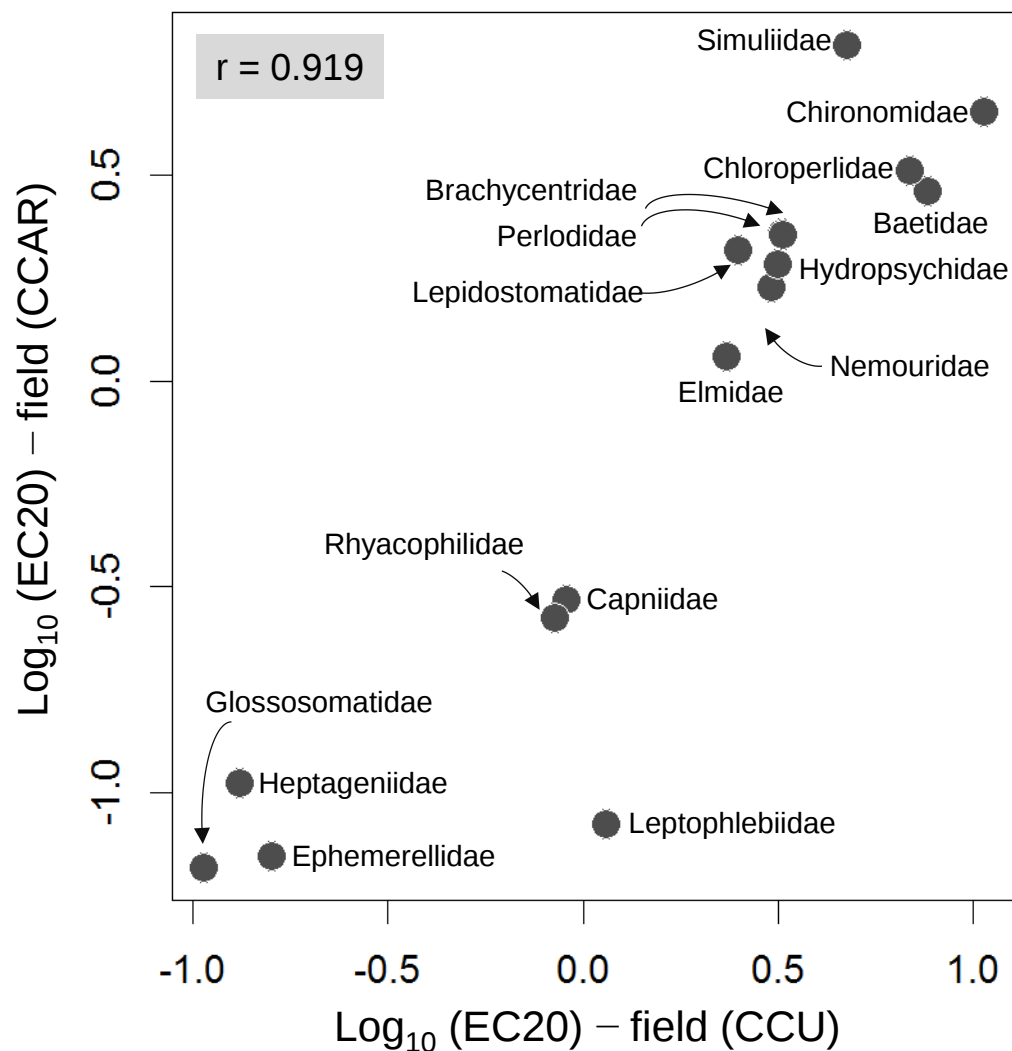
Figure S1

Figure S1. Relationship between field-derived EC20s estimated using the cumulative criterion unit (CCU) and the chronic criterion accumulation ratio (CCAR)⁶. EC20s were estimated from quantile regression modeling at the quantile of 0.9.

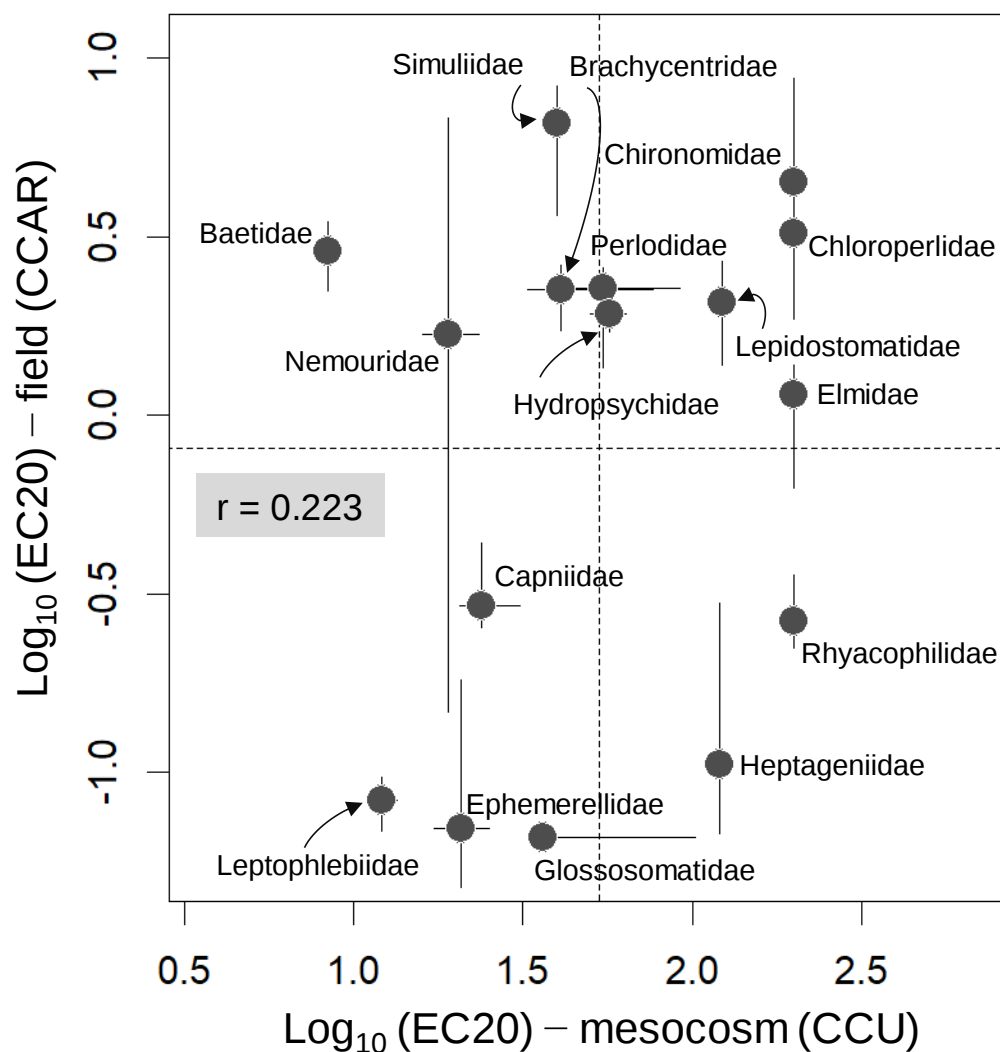
Figure S2

Figure S2. Relationship between effect concentrations of 20% (EC20s) for 16 insect families estimated from field and mesocosm data. To estimate EC20s, chronic criterion accumulation ratio (CCAR) and cumulative criterion unit (CCU) were used for field and mesocosm data, respectively. EC20s were estimated from quantile regression modeling at the quantile of 0.9. Error bars indicate 50% confidence intervals estimated by bootstrapping. The dotted lines indicate mean values of $\log_{10}$ -transformed EC20s from field and mesocosm data.

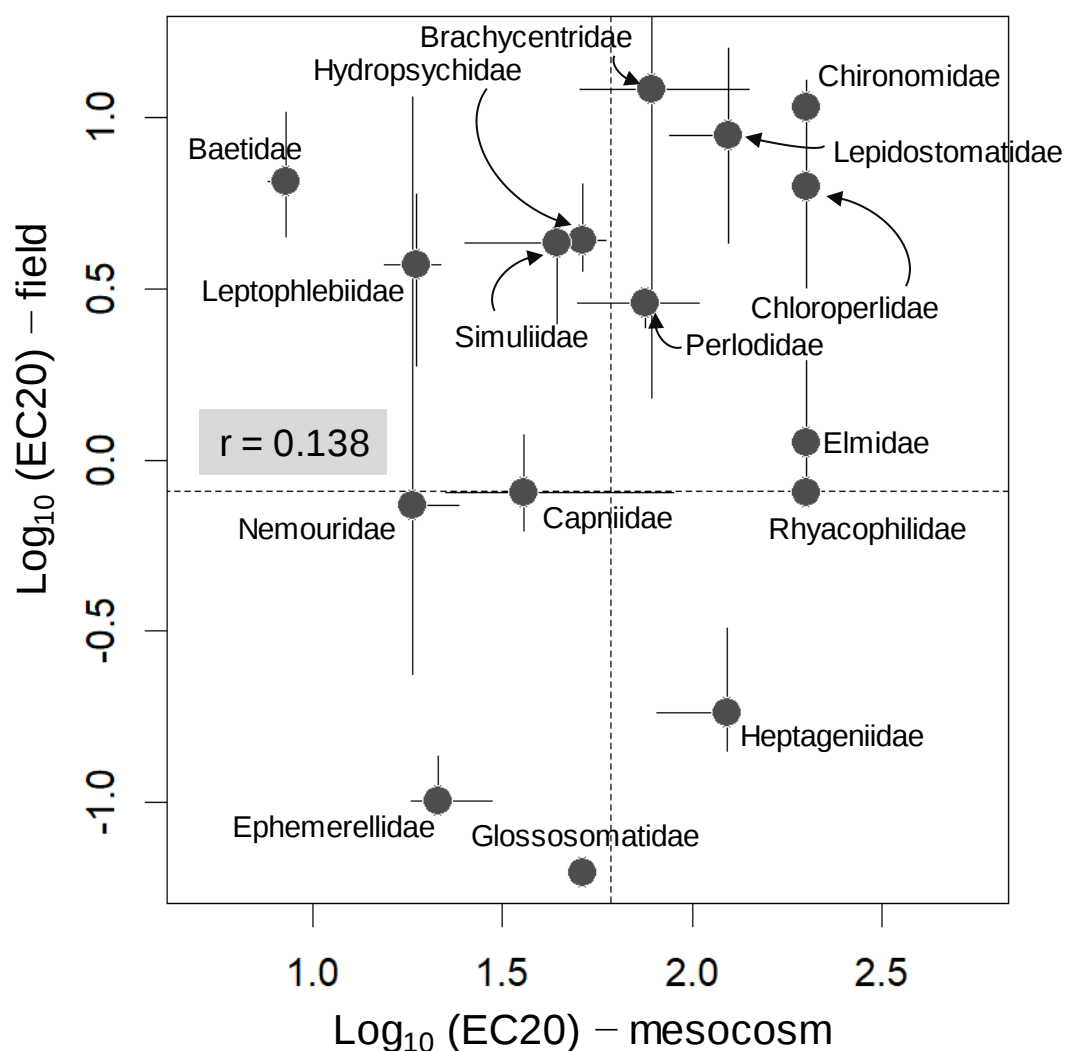
Figure S3

Figure S3. Relationship between effect concentrations of 20% (EC20s) for 16 insect families estimated from field and mesocosm data. EC20s were estimated from quantile regression modeling at the quantile of 0.8. Error bars indicate 50% confidence intervals estimated by bootstrapping. The dotted lines indicate mean values of log_{10} -transformed EC20s from field and mesocosm data.

Table S1. Summary results of model selection and estimated parameters for four quantile regression models (null, linear, threshold, piecewise models; see text for more details) in field surveys.

Family	AIC				Null model		Linear model		Threshold model			Piecewise model		
	Null	Linear	Threshold	Picewise	Intercept	Intercept	Slope	Intercept	Breakpoint	Slope, b	Intercept	Slope, b1	Breakpoint	Slope, b2
Baetidae	-731.10	-729.50	<u>-784.75</u>	-782.67	2.179	2.179	-5.799.E-02	2.204	0.7986	-1.675.E+00	2.209	-7.890.E-06	0.796	-1.675.E+00
Ephemerellidae	-705.84	-730.54	-739.78	<u>-743.89</u>	1.773	1.656	-3.686.E-01	1.880	0.7328	-1.361.E+00	1.729	-2.091.E-01	1.048	-1.206.E+00
Heptageniidae	-783.91	-829.00	-843.78	<u>-860.34</u>	1.921	1.830	-2.957.E-01	1.941	0.7817	-1.456.E+00	1.850	-2.405.E-01	0.988	-1.191.E+00
Leptophlebiidae	-763.60	-790.65	<u>-792.73</u>	-789.84	0.558	0.465	-2.358.E-01	0.663	-0.2700	-2.986.E-01	0.604	0.000.E+00	-0.189	-2.973.E-01
Capniidae	-741.59	-771.92	<u>-794.07</u>	-792.02	1.245	1.138	-4.205.E-01	1.359	-0.2069	-5.854.E-01	1.358	-1.437.E-03	-0.206	-5.839.E-01
Chloroperlidae	-814.55	-826.57	<u>-876.00</u>	-874.22	1.636	1.568	-1.371.E-01	1.647	0.7723	-1.268.E+00	1.623	-2.754.E-02	0.808	-1.238.E+00
Nemouridae	-748.66	-753.18	-769.82	<u>-770.98</u>	1.470	1.450	-1.152.E-01	1.503	0.9183	-1.257.E+00	1.500	-4.811.E-02	0.942	-1.190.E+00
Perlodidae	-802.30	-805.74	<u>-837.33</u>	-835.33	0.918	0.837	-2.180.E-01	0.933	0.3539	-5.761.E-01	0.933	-1.951.E-05	0.354	-5.764.E-01
Brachycentridae	-684.21	-698.19	<u>-706.88</u>	-704.88	0.685	0.771	-3.645.E-01	0.901	0.3539	-5.565.E-01	0.901	-2.633.E-04	0.354	-5.559.E-01
Glossosomatidae	-711.52	<u>-748.30</u>	-746.37	-744.30	0.754	0.593	-3.007.E-01	0.958	-1.2224	-2.996.E-01	0.593	-3.007.E-01	3.000	-2.415.E+00
Hydropsychidae	-665.53	-663.70	<u>-691.30</u>	-689.30	1.050	1.061	-1.091.E-01	1.156	0.3541	-7.138.E-01	1.155	-3.990.E-06	0.354	-7.134.E-01
Lepidostomatidae	-695.84	-713.97	<u>-722.81</u>	-720.02	0.635	0.692	-3.272.E-01	0.900	0.2056	-5.094.E-01	0.862	-4.301.E-02	0.206	-4.419.E-01
Rhyacophilidae	-766.44	-811.26	<u>-831.13</u>	-829.35	1.492	1.371	-4.757.E-01	1.660	-0.2872	-6.581.E-01	1.638	-3.691.E-02	-0.280	-6.182.E-01
Chironomidae	-762.58	-769.20	<u>-787.05</u>	-784.92	2.486	2.466	-2.401.E-01	2.554	0.9705	-1.042.E+00	2.548	-1.024.E-03	0.973	-1.036.E+00
Simuliidae	-559.93	-560.13	<u>-581.15</u>	-579.10	2.210	2.320	2.006.E-01	2.264	0.6091	-1.504.E+00	2.266	-1.076.E-04	0.609	-1.510.E+00
Elmidae	-652.20	-663.04	<u>-703.44</u>	-701.51	1.964	1.825	-5.495.E-01	1.989	0.2887	-1.181.E+00	1.972	-5.834.E-02	0.319	-1.122.E+00

Underline indicates the model with the smallest value of Akaike's information criterion (AIC).

Table S2. Summary results of model selection and estimated parameters for four quantile regression models (null, linear, threshold, piecewise models; see text for more details) in mesocosm experiments.

Family	AIC				Null model		Linear model		Threshold model			Piecewise model		
	Null	Linear	Threshold	Picewise	Intercept	Intercept	Slope	Intercept	Breakpoint	Slope, b	Intercept	Slope, b1	Breakpoint	Slope, b2
Baetidae	-1027.07	<u>-1136.23</u>	-1134.23	-1132.23	2.057	2.169	-1.227.E-02	2.165	0.2828	-1.226.E-02	2.168	-1.149.E-02	0.262	-7.744.E-04
Ephemerellidae	-1213.97	-1278.66	<u>-1279.01</u>	-1276.95	2.173	2.339	-7.157.E-03	2.286	9.4031	-7.299.E-03	2.292	-5.668.E-05	6.934	-7.140.E-03
Heptageniidae	-1184.70	-1187.53	<u>-1196.81</u>	-1183.89	2.420	2.467	-9.175.E-04	2.432	138.1481	-4.052.E-02	2.461	-6.492.E-08	11.057	-1.141.E-03
Leptophlebiidae	-990.02	<u>-1034.08</u>	-1033.67	-1030.51	1.491	1.739	-8.820.E-03	1.671	8.6801	-8.893.E-03	1.694	-5.660.E-03	8.827	-2.338.E-03
Capniidae	-1013.23	<u>-1026.11</u>	-1025.58	-1023.56	1.591	1.787	-4.481.E-03	1.742	10.0055	-4.471.E-03	1.745	0.000.E+00	8.555	-4.439.E-03
Chloroperlidae	<u>-1481.87</u>	-1480.56	-1478.56	-1476.56	1.580	1.591	-1.298.E-04	1.591	0.9654	-1.300.E-04	1.591	-1.277.E-04	0.960	-2.065.E-06
Nemouridae	-1167.91	<u>-1196.56</u>	-1194.60	-1192.60	1.114	1.208	-5.236.E-03	1.204	0.8533	-5.238.E-03	1.204	-4.355.E-06	0.864	-5.234.E-03
Perlodidae	-1141.97	-1149.07	<u>-1149.14</u>	-1147.09	1.531	1.635	-2.806.E-03	1.633	25.9468	-3.913.E-03	1.628	-8.837.E-05	26.112	-3.783.E-03
Brachycentridae	-1127.54	<u>-1131.81</u>	-1130.06	-1127.96	1.863	1.936	-2.896.E-03	1.892	41.3864	-3.420.E-03	1.929	-2.196.E-03	41.383	-8.067.E-04
Glossosomatidae	-1449.48	<u>-1453.71</u>	-1448.31	-1448.23	0.477	0.479	-9.578.E-04	0.502	0.0002	-1.121.E-03	0.500	-2.454.E-03	170.000	0.000.E+00
Hydropsychidae	-1091.15	-1099.07	<u>-1101.61</u>	-1095.07	1.908	1.984	-3.021.E-03	1.929	26.7856	-3.909.E-03	1.984	-3.021.E-03	64.219	0.000.E+00
Lepidostomatidae	-1066.50	-1065.26	<u>-1074.26</u>	-1068.93	1.380	1.401	-4.887.E-04	1.380	118.2457	-2.042.E-02	1.444	-1.302.E-03	120.720	-1.997.E-02
Rhyacophilidae	<u>-1246.16</u>	-1244.78	-1242.92	-1240.91	1.301	1.349	-4.610.E-04	1.342	41.3826	-6.538.E-04	1.342	-3.294.E-07	41.385	-6.586.E-04
Chironomidae	<u>-1054.80</u>	-1053.15	-1050.80	-1046.44	3.009	2.983	5.021.E-04	3.015	78.1088	0.000.E+00	3.005	-3.268.E-04	30.289	-2.470.E-04
Simuliidae	-1192.78	-1217.16	<u>-1221.71</u>	-1216.68	0.903	1.045	-5.622.E-03	1.000	24.2887	-6.190.E-03	1.027	-3.043.E-03	27.505	-2.888.E-03
Elmidae	<u>-1205.49</u>	-1204.12	-1201.49	-1199.43	1.477	1.462	3.545.E-04	1.483	70.1933	0.000.E+00	1.485	-3.794.E-05	6.992	-4.283.E-07

Underline indicates the model with the smallest value of Akaike's information criterion (AIC).

Table S3. Estimated effect concentrations of 20% (EC20s) and 50% confidence intervals (CIs) for 16 insect families estimated from field and mesocosm data. An EC20 corresponds to a CCU value where a 20% reduction is predicted.

Family	Mesocosm		Field	
	EC20s	50% CIs	EC20s	50% CIs
Baetidae	8.39	7.88–8.8	7.68	5.85–10.22
Ephemerellidae	20.85	17.38–25.09	0.16	0.11–0.35
Heptageniidae	120.52	118.4–128.14	0.13	0.11–0.17
Leptophlebiidae	12.08	10.97–13.47	1.15	0.53–2.19
Capniidae	23.95	20.59–31.02	0.91	0.75–1.35
Chloroperlidae	Null model	NA	6.90	6.15–7.29
Nemouridae	19.07	16.03–23.58	3.05	0.65–9.85
Perlodidae	54.41	43.51–92.2	3.23	2.97–3.56
Brachycentridae	40.81	32.57–76.64	3.26	2.55–3.68
Glossosomatidae	36.31	35.26–101.74	0.11	0.1–0.11
Hydropsychidae	56.99	50.21–63.62	3.17	2.72–3.5
Lepidostomatidae	122.11	112.59–125.22	2.51	2.04–2.96
Rhyacophilidae	Null model	NA	0.85	0.71–2.7
Chironomidae	Null model	NA	10.65	5.3–11.57
Simuliidae	39.85	36.9–42.94	4.74	4.19–10.46
Elmidae	Null model	NA	2.33	1.43–2.5

NA = not available because the null model was selected as best.