Supplementary material to: **Between lake variation in the trophic ecology of an invasive crayfish**

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Appendix A: *Stable isotope data*

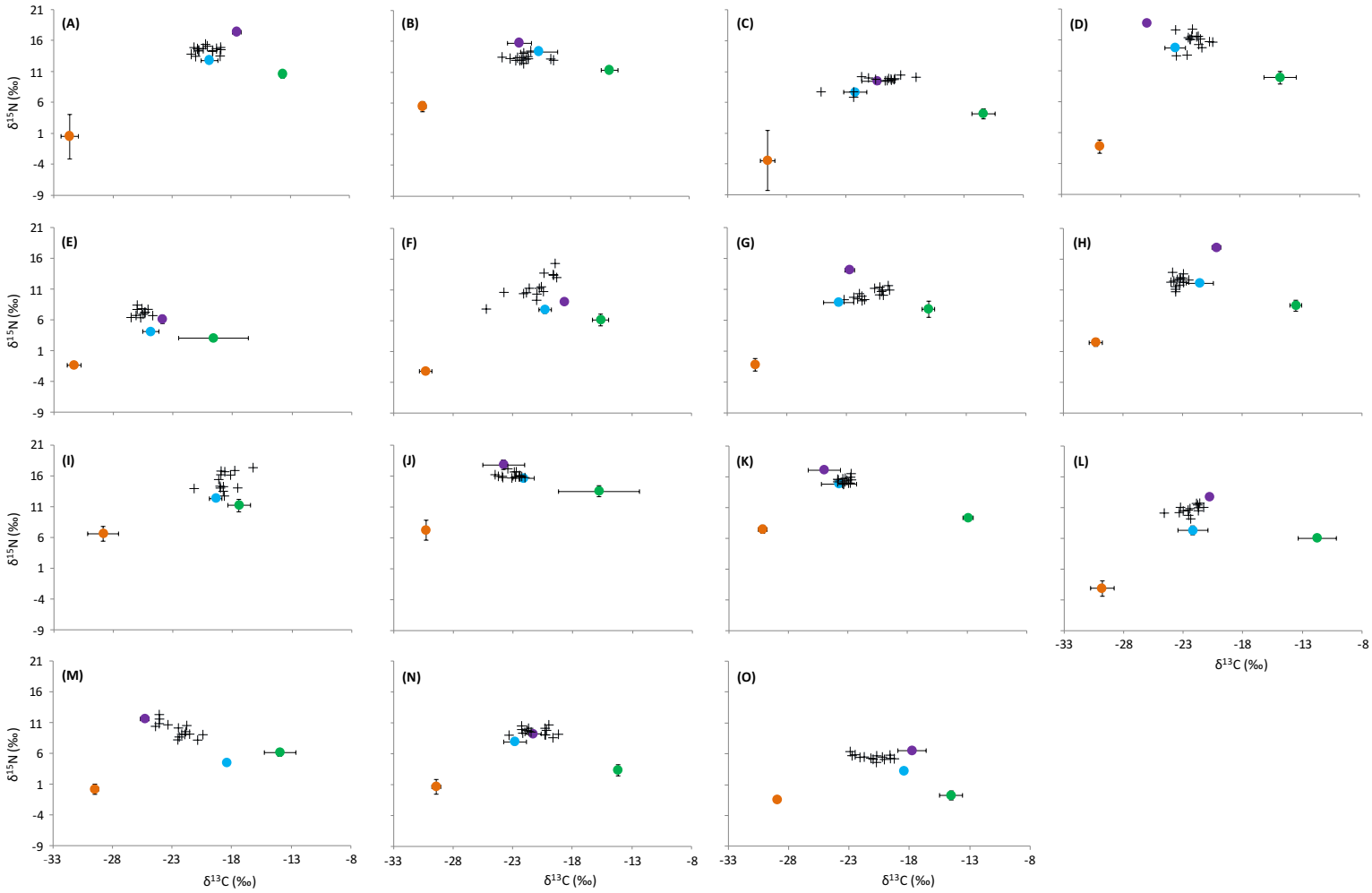

Figure A1 Uncorrected stable isotope values ($\delta^{13}C$ and $\delta^{15}N$; ‰) of individual *Procambarus clarkii* muscle tissue (cross) and putative prey (circle; mean ± SE, lipid-corrected $\delta^{13}C$ values) sampled in the 15 gravel pit lakes. Orange, green, blue and purple circles represent leaf litter, primary producers, invertebrates and fish, respectively.

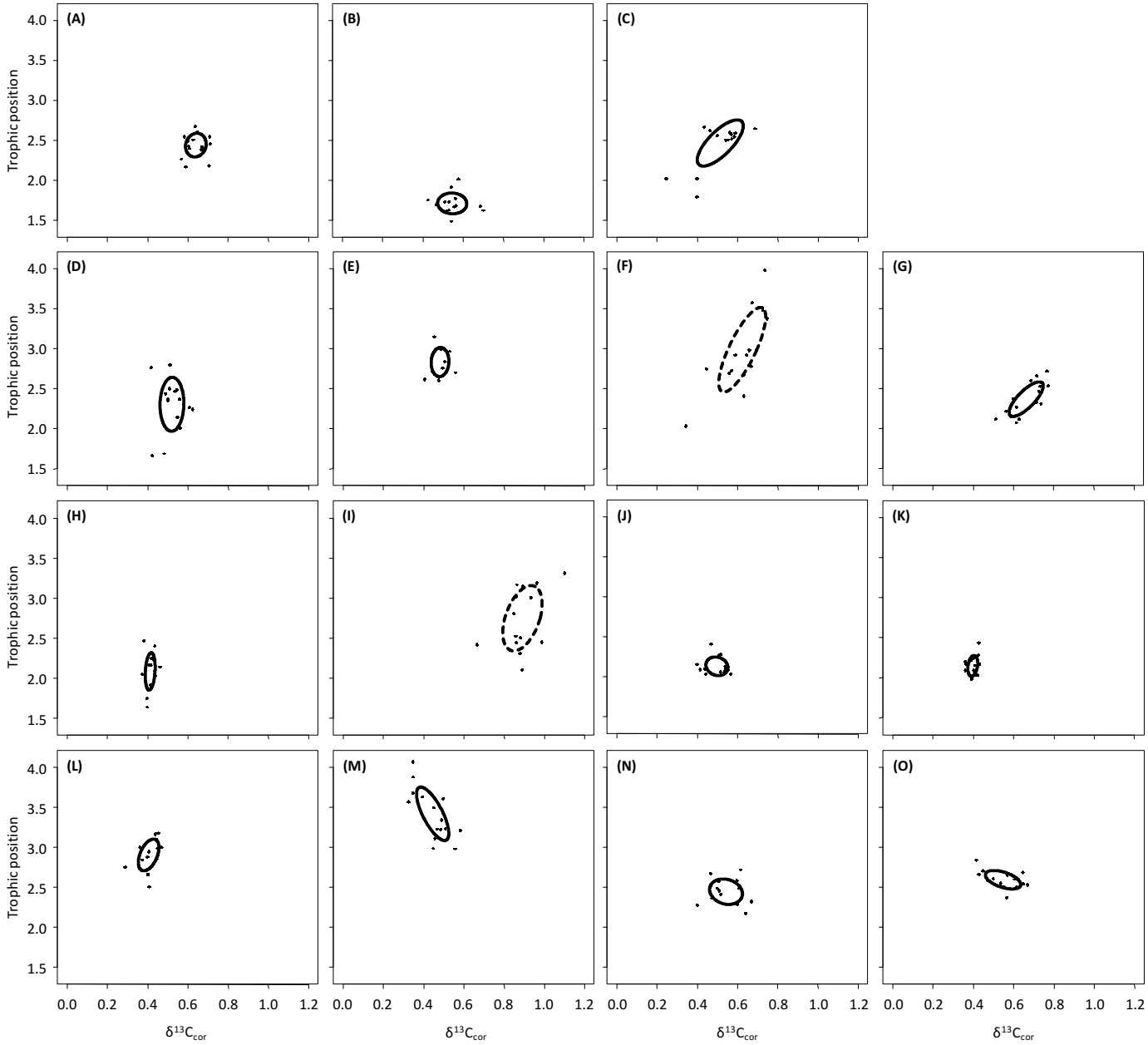

Figure A2 Isotopic bi-plots of trophic position and corrected $\delta^{13}C$ value ($\delta^{13}C_{cor}$) in each population of *Procambarus clarkii* (A - O). Each ellipse encloses the sample-size corrected standard ellipse area (SEA_c; Jackson *et al.* 2011) of *Procambarus clarkii* (black dots). Dotted ellipses represent population niche width removed from the analyses (see details in *Statistical analyses*).

Table A1 Crayfish carapace length (mm) and uncorrected stable isotope values ($\delta^{13}C$ and $\delta^{15}N$; ‰) for each individual in each lake.

Subject	Site	Carapace length (mm)	Sex	$\delta^{13}C$	$\delta^{15}N$	Subject	Site	Carapace length (mm)	Sex	$\delta^{13}C$	$\delta^{15}N$
1	A	45.78	M	-21.05	13.43	110	H	39.87	M	-23.24	13.09
2	A	52.78	M	-18.93	14.86	111	H	40.6	F	-23.02	13.00
3	A	45.54	M	-20.06	15.07	112	H	50.9	M	-23.60	11.62
4	A	51.59	M	-20.78	14.30	113	H	50.48	M	-23.63	10.80
5	A	38.41	M	-19.59	14.36	114	H	42.32	M	-23.49	12.80
6	A	46.36	F	-18.91	14.50	115	H	40.37	M	-22.97	12.30
7	A	57.66	M	-19.62	14.23	116	H	47.38	F	-23.65	11.20
8	A	50.36	M	-19.28	14.67	117	I	65.47	F	-19.03	16.29
9	A	39.8	M	-18.97	13.48	118	I	62.23	M	-19.00	16.88
10	A	43.98	M	-20.40	14.71	119	I	58.02	M	-19.21	15.51
11	A	56.09	M	-20.89	14.63	120	I	49.56	M	-17.62	14.14
12	A	50.26	F	-20.21	15.36	121	I	43.01	M	-18.82	14.35
13	A	49.67	F	-20.79	14.40	122	I	55.2	M	-16.32	17.44
14	A	40.81	F	-21.18	14.85	123	I	62.71	M	-18.21	16.24
15	A	49.87	M	-21.42	13.79	124	I	63.47	M	-17.86	16.97
16	B	43.71	M	-21.68	13.53	125	I	59.88	M	-19.07	14.12
17	B	45.56	F	-22.03	12.43	126	I	61.2	M	-18.70	16.77
18	B	45.31	F	-19.51	12.94	127	I	70.28	M	-19.09	14.42
19	B	47.05	F	-21.64	13.17	128	I	57.16	M	-21.27	14.04
20	B	50.75	F	-23.85	13.43	129	I	53.13	F	-18.83	13.60
21	B	47.52	F	-19.74	13.14	130	I	45.11	F	-18.73	12.83
22	B	50.12	M	-22.70	12.92	131	J	44.48	M	-22.32	16.03
23	B	45.12	F	-22.34	12.92	132	J	33.47	M	-24.29	16.05
24	B	44.95	M	-23.18	13.21	133	J	42.76	M	-22.50	15.99
25	B	46.55	M	-21.82	13.12	134	J	52.57	M	-23.49	17.28

26	B	39.11	M	-21.43	14.43	135	J	45.7	M	-23.96	16.06
27	B	45.5	M	-22.03	14.07	136	J	41.54	M	-24.55	16.32
28	B	54.91	M	-22.55	13.35	137	J	48.67	M	-23.92	15.85
29	B	43.99	M	-22.16	13.35	138	J	57.03	M	-22.95	16.77
30	B	38.6	F	-22.20	12.97	139	J	38.6	M	-23.15	15.78
31	C	49.73	F	-17.09	10.14	140	J	46.69	F	-22.53	15.94
32	C	50.83	M	-19.18	9.65	141	J	40.81	M	-22.06	15.85
33	C	46.94	M	-19.71	9.57	142	J	39.24	M	-22.78	16.79
34	C	51.26	F	-25.13	7.77	143	J	43.43	M	-22.51	16.20
35	C	48.01	M	-18.88	9.91	144	J	40.49	M	-22.85	15.95
36	C	47.72	M	-19.21	9.86	145	J	33.12	M	-22.47	16.06
37	C	43.67	M	-21.11	10.03	146	K	43.34	M	-23.29	15.28
38	C	39.94	M	-21.70	10.23	147	K	57.73	M	-23.91	15.70
39	C	37.51	M	-19.53	9.60	148	K	40.11	M	-23.42	14.87
40	C	34.77	M	-18.39	10.49	149	K	38.47	M	-22.78	16.61
41	C	24.36	F	-22.37	7.77	150	K	30.05	M	-23.14	15.53
42	C	51.8	F	-19.41	9.94	151	K	52.37	M	-23.51	15.03
43	C	47.91	F	-18.95	9.76	152	K	47.24	F	-23.00	15.07
44	C	35.23	F	-20.52	9.81	153	K	35.28	F	-23.86	15.58
45	C	38.55	M	-22.38	6.89	154	K	49.81	M	-22.83	16.02
46	D	44.41	M	-21.56	16.68	155	K	46.44	M	-23.28	15.87
47	D	38.82	F	-21.69	16.60	156	K	52.23	M	-23.42	14.94
48	D	32.45	M	-21.38	16.23	157	K	42.33	M	-22.86	15.08
49	D	42.2	M	-20.35	15.74	158	K	45.46	M	-22.76	15.60
50	D	44	F	-22.23	16.15	159	K	48.53	M	-23.48	15.78
51	D	40.51	M	-22.25	16.21	160	K	31.72	F	-23.91	15.28
52	D	44.5	F	-23.40	13.53	161	L	43.07	M	-22.42	9.26
53	D	42.47	M	-21.26	14.84	162	L	45.99	F	-21.93	11.77
54	D	45.67	F	-22.49	13.64	163	L	48.74	F	-23.05	10.54
55	D	46.41	F	-22.04	17.83	164	L	54.46	F	-22.64	10.69

56	D	43.66	M	-23.46	17.72	165	L	39.96	F	-21.66	11.80
57	D	39.18	M	-21.52	15.34	166	L	39.48	M	-24.64	10.19
58	D	42.69	F	-22.10	16.72	167	L	36.35	F	-21.33	11.13
59	D	40.24	F	-20.62	15.81	168	L	51.5	F	-21.84	11.52
60	D	39.88	F	-22.39	16.46	169	L	45.29	M	-21.78	10.59
61	E	56.75	M	-25.76	6.43	170	L	30.02	M	-22.48	10.92
62	E	46.16	F	-26.05	8.48	171	L	47.45	M	-23.28	11.13
63	E	53.84	F	-26.05	7.77	172	L	43.08	M	-23.37	10.27
64	E	43.1	F	-26.56	6.46	173	L	46.6	M	-21.75	11.07
65	E	45.45	F	-25.66	7.90	174	L	48.61	F	-22.59	9.83
66	E	56.53	F	-25.42	7.30	175	M	54	M	-24.43	10.47
67	E	41.44	F	-24.74	6.77	176	M	30.4	Juv	-22.45	8.74
68	E	33.53	F	-25.55	7.00	177	M	28.2	Juv	-22.56	8.28
69	E	50.82	F	-26.14	6.80	178	M	56.7	M	-24.12	12.38
70	E	59.12	M	-25.38	7.31	179	M	48.24	F	-21.81	10.60
71	E	50.2	F	-25.14	7.79	180	M	47.96	M	-23.39	10.73
72	F	40.88	M	-20.47	10.83	181	M	40.79	M	-22.23	9.19
73	F	51.94	F	-20.82	11.35	182	M	40.18	M	-20.90	8.24
74	F	53.43	M	-22.13	10.48	183	M	36.64	M	-22.51	10.20
75	F	51.27	M	-19.49	15.40	184	M	54.72	M	-24.13	10.90
76	F	44.52	M	-21.90	10.64	185	M	40.31	M	-24.10	11.65
77	F	49.74	M	-23.78	10.70	186	M	43.04	F	-20.46	9.11
78	F	47.18	M	-20.42	13.83	187	M	42.41	F	-21.57	9.20
79	F	55.17	M	-19.36	13.10	188	M	37.25	F	-21.91	9.60
80	F	54.69	F	-19.64	13.61	189	M	34.04	F	-21.98	9.15
81	F	43.85	M	-20.65	11.60	190	N	49	F	-19.20	9.23
82	F	45.44	M	-19.63	13.47	191	N	54	M	-21.72	10.21
83	F	46.17	M	-25.27	7.99	192	N	46	M	-22.29	10.59
84	F	48.4	M	-21.01	10.42	193	N	50	M	-20.32	10.21
85	F	52.09	M	-21.04	9.42	194	N	39	M	-20.35	9.16

86	F	60.7	F	-21.66	11.36	195	N	30	M	-20.21	9.87
87	G	47.68	M	-21.97	10.38	196	N	47	M	-20.01	10.76
88	G	48.12	M	-20.26	11.45	197	N	47.38	M	-22.20	9.42
89	G	52.2	M	-20.70	11.25	198	N	41.63	M	-23.35	9.08
90	G	45.33	M	-19.56	11.69	199	N	48.7	M	-20.29	9.12
91	G	44.49	M	-19.45	10.98	200	N	53.35	M	-21.84	9.88
92	G	54.25	M	-22.12	9.54	201	N	43.55	M	-21.69	9.74
93	G	49.77	M	-20.28	10.20	202	N	44.8	M	-22.28	9.99
94	G	50.84	M	-20.12	10.74	203	N	43.87	F	-19.66	8.67
95	G	50.95	M	-21.77	9.98	204	N	47.82	M	-21.50	9.60
96	G	47.41	F	-20.03	10.96	205	O	40.64	M	-22.14	5.51
97	G	38.57	M	-19.97	10.13	206	O	50.84	M	-20.29	5.56
98	G	51.67	F	-21.75	9.24	207	O	43.86	F	-22.95	6.45
99	G	42.04	F	-21.54	9.43	208	O	37.73	M	-21.05	5.21
100	G	38.62	F	-22.44	9.80	209	O	39.14	M	-20.78	4.70
101	G	34.77	F	-23.25	9.41	210	O	42.12	M	-20.76	5.76
102	H	36.2	F	-22.99	13.70	211	O	52.21	M	-19.30	5.29
103	H	40.75	M	-22.54	12.70	212	O	55.81	F	-19.62	5.35
104	H	42.54	M	-23.29	12.80	213	O	42.13	F	-22.80	5.79
105	H	51.1	M	-24.03	12.35	214	O	54.42	M	-21.24	5.37
106	H	43.88	F	-23.30	11.88	215	O	61.08	M	-19.65	5.88
107	H	45.3	F	-23.79	12.53	216	O	39.85	M	-21.79	5.58
108	H	41.31	F	-23.90	13.95	217	O	39.45	F	-22.54	5.94
109	H	46.55	F	-23.00	12.36	218	O	49.35	M	-20.12	5.18

Table B1 Top candidate models of population trophic niche width (SEA_b) with the Akaike information criterion corrected for small sample size (AICc), the log likelihood of those models (logLik), the ΔAIC_c (difference in AIC_c compared to the top-ranked model), as well as the Akaike weights (*w*).

Response variable	**Components models**	**df**	**logLik**	**AICc**	**ΔAIC_c**	***w***
Trophic niche width	Abundance	3	22.17	-35.67	0.00	0.31
	Predation + Abundance	4	24.00	-35.00	0.67	0.22
	Null	2	19.88	-34.56	1.11	0.18
	Predation + Lake productivity + Abundance	5	26.51	-34.44	1.23	0.17
	Lake productivity	3	21.29	-33.91	1.79	0.13

Table B2 Top candidate models of *Procambarus clarkii* trophic position and omnivory with the Akaike information criterion corrected for small sample size (AICc), the log likelihood of those models (logLik), the ΔAIC_c (difference in AIC_c compared to the top-ranked model), as well as the Akaike weights (*w*).

Response variables	Component models	df	logLik	AICc	ΔAIC_c	*w*
Trophic position‡						
	Carapace length+ Lake productivity + Abundance + Lake size + Abundance × Lake size	8	355.31	-693.93	0.00	0.17
	Carapace length + Abundance	5	352.04	-693.80	0.13	0.15
	Carapace length + Lake productivity + Lake size	6	352.92	-693.45	0.49	0.13
	Carapace length	4	350.75	-693.31	0.63	0.12
	Carapace length+ Lake productivity + Abundance + Lake size + Lake productivity × Lake size	8	354.79	-692.90	1.04	0.10
	Carapace length + Predation + Abundance	6	352.64	-692.89	1.04	0.10
	Carapace length + Lake productivity + Abundance + Lake size + Lake productivity × Lake size + Abundance × Lake size	9	355.81	-692.75	1.18	0.09
	Carapace length + Predation + Lake productivity + Abundance	7	353.41	-692.29	1.64	0.07
	Carapace length + Predation + Lake productivity + Abundance n + Lake size + Abundance × Lake size	9	355.54	-692.22	1.71	0.07
Trophic position†						
	Carapace length + Lake productivity + Abundance +	7	355.06	-695.59	0.00	0.29

	Carapace length × Lake productivity					
	Carapace length + Predation + Lake productivity + Abundance + Carapace length × Lake productivity	8	355.68	-694.68	0.92	0.18
	Carapace length + Lake productivity + Abundance + Carapace length × Lake productivity + Carapace length × Abundance	8	355.57	-694.45	1.15	0.16
	Carapace length + Abundance + Carapace length × Abundance	6	353.21	-694.01	1.58	0.13
	Carapace length + Abundance	5	352.04	-693.80	1.80	0.12
	Carapace length + Lake size + Lake productivity + Abundance + Carapace length × Lake productivity	8	355.15	-693.61	1.98	0.11
Index of omnivory						
	Carapace length	4	168.64	-329.09	0.00	0.20
	Carapace length + Lake size	5	169.67	-329.06	0.03	0.20
	Null	3	167.26	-328.41	0.68	0.14
	Lake size	4	168.25	-328.32	0.77	0.14
	Carapace length + Lake productivity	5	168.77	-327.26	1.83	0.08
	Carapace length + Abundance + Lake size	6	169.82	-327.24	1.85	0.08
	Carapace length + Lake productivity + Lake size	6	169.80	-327.20	1.89	0.08
	Carapace length + Abundance	5	168.71	-327.14	1.95	0.08

[‡]Model 1 and [†] Model 2, see details in *Statistical analyses*

Table B3 Results of the Likelihood Ratio Tests used to compare the averaged model and the null model (intercept only).

Response variable	Averaged model	df	X^2	*P*
Trophic position‡	Carapace length + Lake productivity + Abundance + Lake size + Abundance × Lake size + Lake productivity × Lake size + Predation	7	16.20	0.023
Trophic position†	Carapace length + Lake productivity + Abundance + Carapace length × Lake productivity + Predation Carapace length × Abundance + Lake size	7	16.43	0.021
Index of omnivory	Carapace length + Lake size + Lake productivity + Abundance +	4	5.21	0.266

‡Model 1 and † Model 2, see details in *Statistical analyses*

Table B4 Results of the linear models used to test the effect of carapace length (mm; $\log_{10}$ transformed) on trophic position ($\log_{10}$ transformed) within each population. Significant P values are in bold.

	Intercept			Carapace length		
Site	**Estimate (SE)**	**t**	**P**	**Estimate (SE)**	**t**	**P**
A	0.23 (0.23)	1.01	0.331	0.09 (0.14)	0.69	0.506
B	0.53 (0.36)	1.46	0.169	-0.18 (0.22)	-0.82	0.426
C	0.09 (0.26)	0.33	0.746	0.19 (0.16)	1.18	0.260
D	0.74 (0.76)	0.97	0.349	-0.24 (0.47)	-0.50	0.624
E	0.39 (0.20)	1.95	0.083	0.04 (0.12)	0.29	0.776
F	-0.03 (0.76)	-0.05	0.965	0.30 (0.45)	0.66	0.520
G	0.10 (0.30)	0.32	0.753	0.16 (0.18)	0.90	0.384
H	1.67 (0.32)	5.21	**< 0.001**	-0.83 (0.20)	-4.23	**< 0.001**
I	-0.57 (0.43)	-1.31	0.216	0.57 (0.25)	2.31	**0.040**
J	0.08 (0.14)	0.57	0.580	0.15 (0.09)	1.77	0.101
K	0.36 (0.14)	2.49	**0.022**	-0.02 (0.08)	-0.21	0.836
L	0.49 (0.21)	2.37	**0.035**	-0.02 (0.13)	-0.13	0.900
M	0.01 (0.14)	0.08	0.941	0.32 (0.09)	3.73	**0.003**
N	0.25 (0.20)	1.25	0.232	0.08 (0.12)	0.66	0.521
O	0.39 (0.13)	3.03	**0.010**	0.01 (0.08)	0.15	0.886

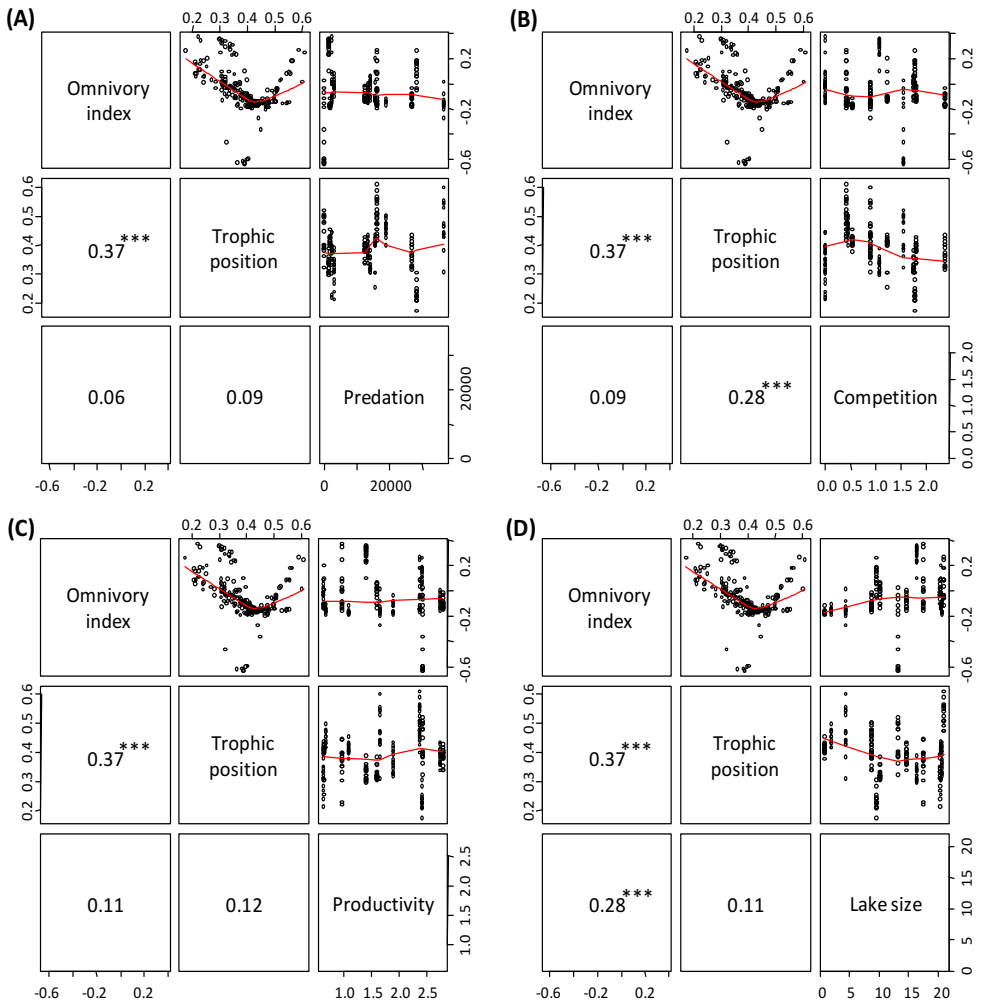

Figure B1 Pairwise scatter plots between response variables (omnivory index and trophic position) and **(A)** predation (g. fish predators), **(B)** competition (abundance; CPUE crayfish; ind.trap^{-1}.h^{-1}; square-root transformed), **(C)** lake productivity (Secchi disk depth; m) and **(D)** lake size (ha). Pairwise Pearson's r are indicated in the lower panels. *** $P < 0.001$.

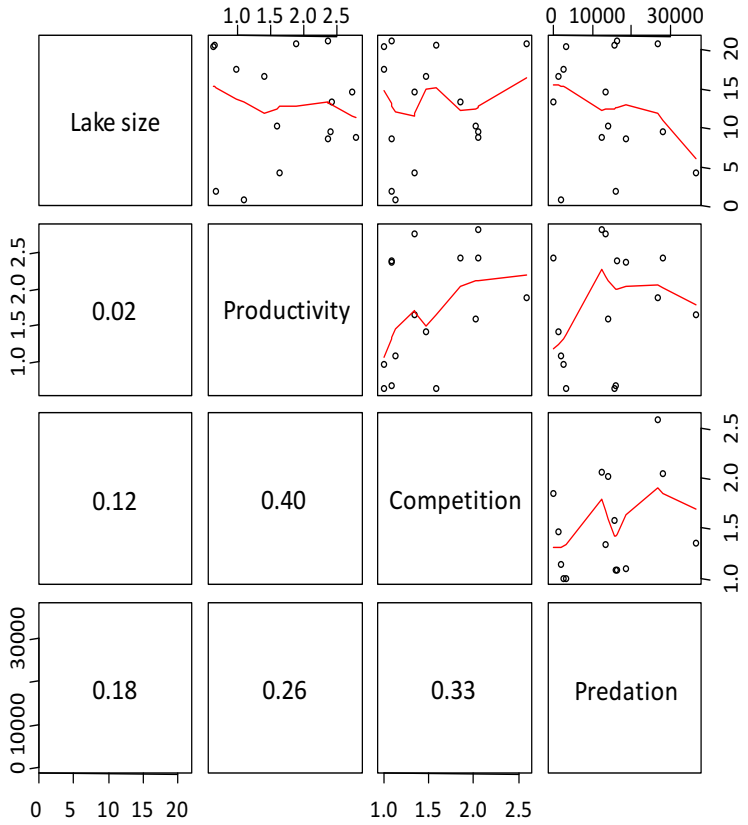

Figure B2 Pairwise scatter plots between all combinations of explanatory variables (predation [g. fish predators], competition [abundance; CPUE crayfish; ind.trap^{-1}.h^{-1}; square-root transformed], lake productivity [Secchi disk depth; m] and lake size [ha]). Pairwise Pearson's r are indicated in the lower panels.

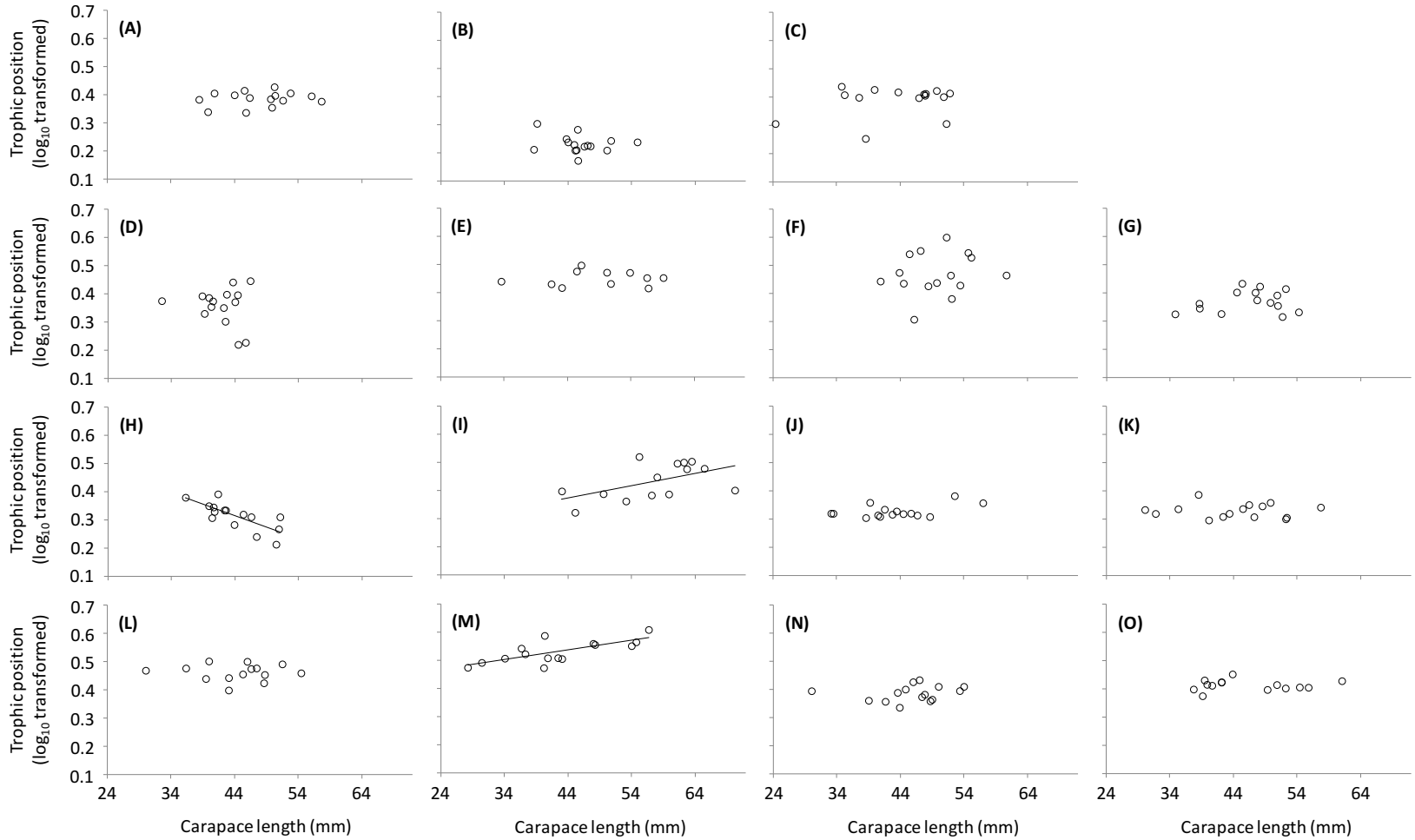

Figure B3 Relationship between carapace length (mm) and trophic position (log_{10} transformed) within each studied population of *Procambarus clarkii*. Significant relationships are displayed using regression lines.