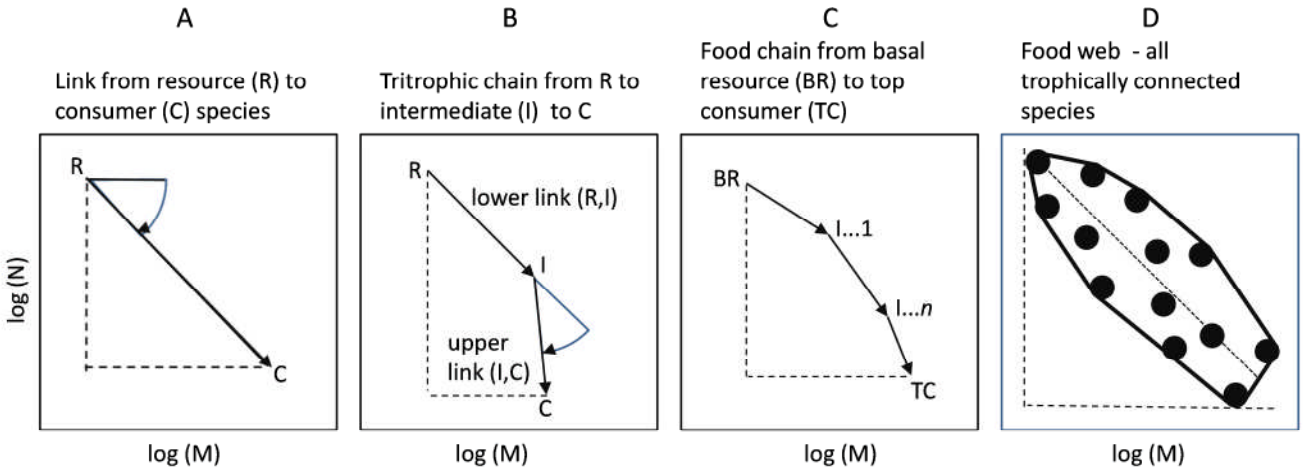
Supplementary Figure S1. Schematic depiction of measures of allometric scaling used at different levels of organisation within the food web.



Link angle: clockwise turn from horizontal to the link; depicted angle is negative.

Link length: total distance spanned on vertical (log N) and horizontal (log M) axes between R,C.

Between angle: turn from lower to upper link (clockwise gives negative angle [as depicted here]; counterclockwise gives positive angle).

Two-span: total distance spanned on vertical (log N) and horizontal (log M) axes between R,C.

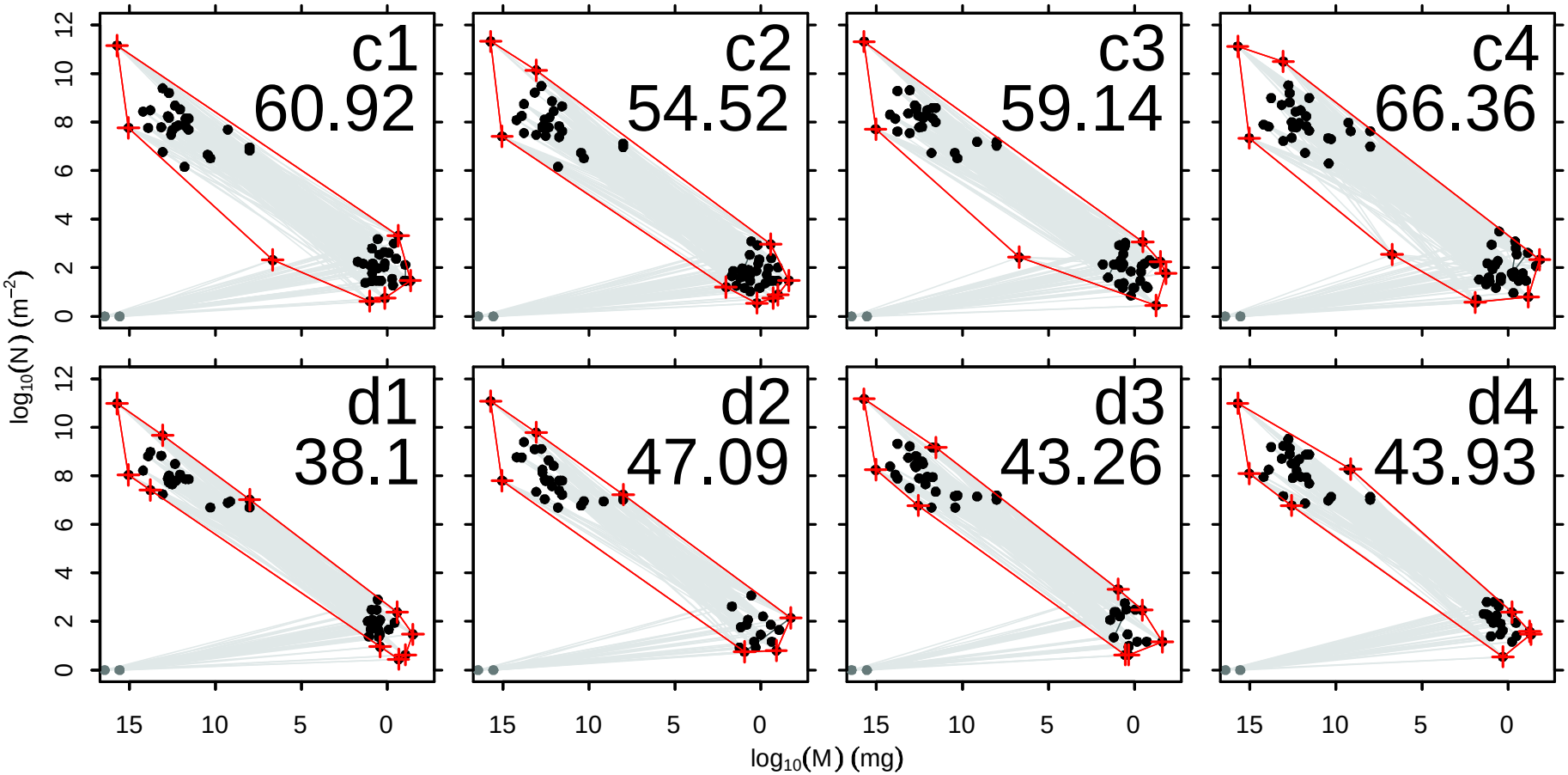
Chain span: total distance spanned on vertical (log N) and horizontal (log M) axes between BR,TC. I can represent 1 to *n* intermediate species.

Allometric slope: scaling coefficient of OLS regression of log N on log M

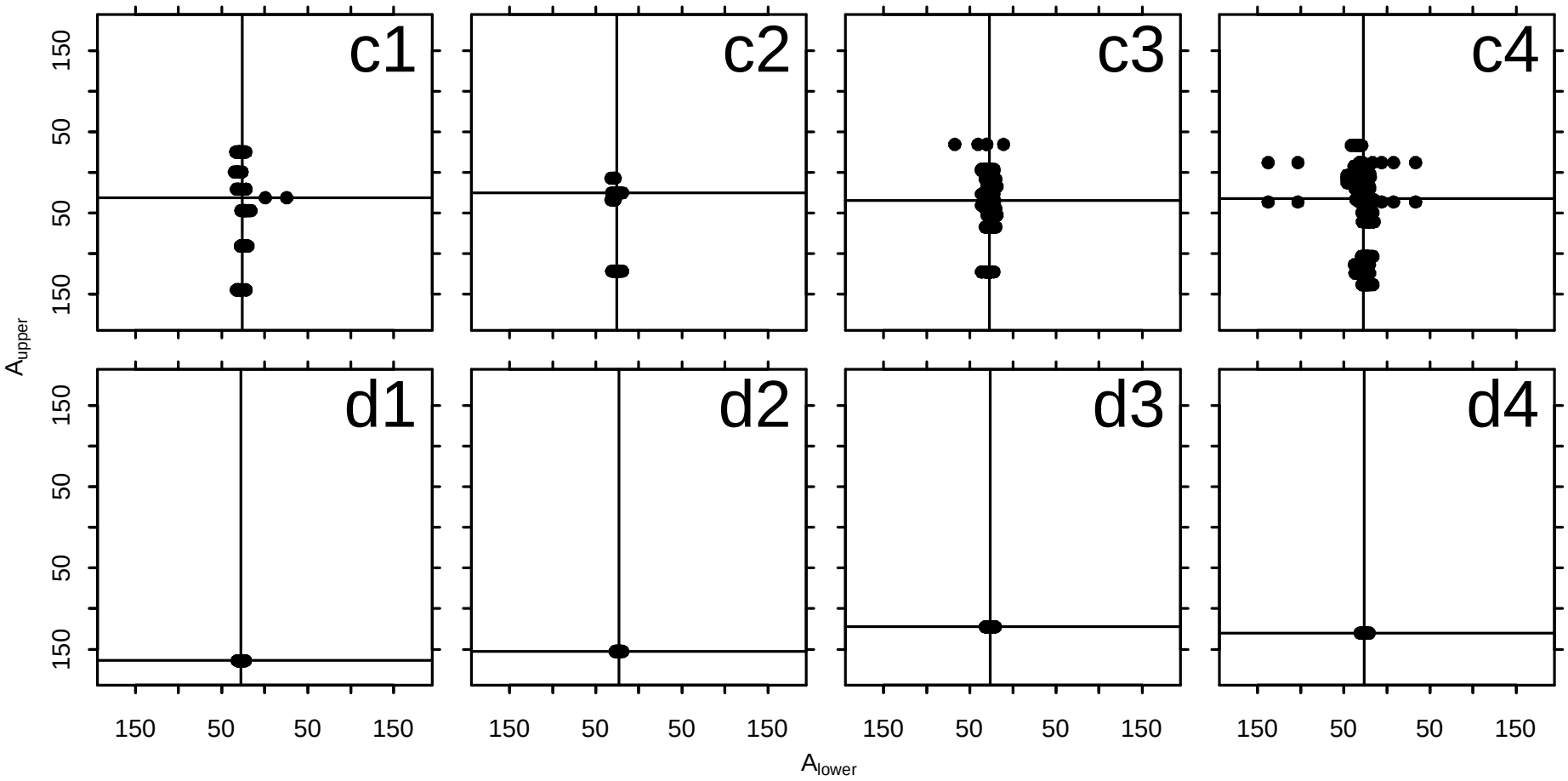
Community-span: total distance between rarest and most abundant species on vertical (log N) axes and smallest the largest species on horizontal (log M) axes.

Constraint space: convex hull area that bounds all connected species in the web.

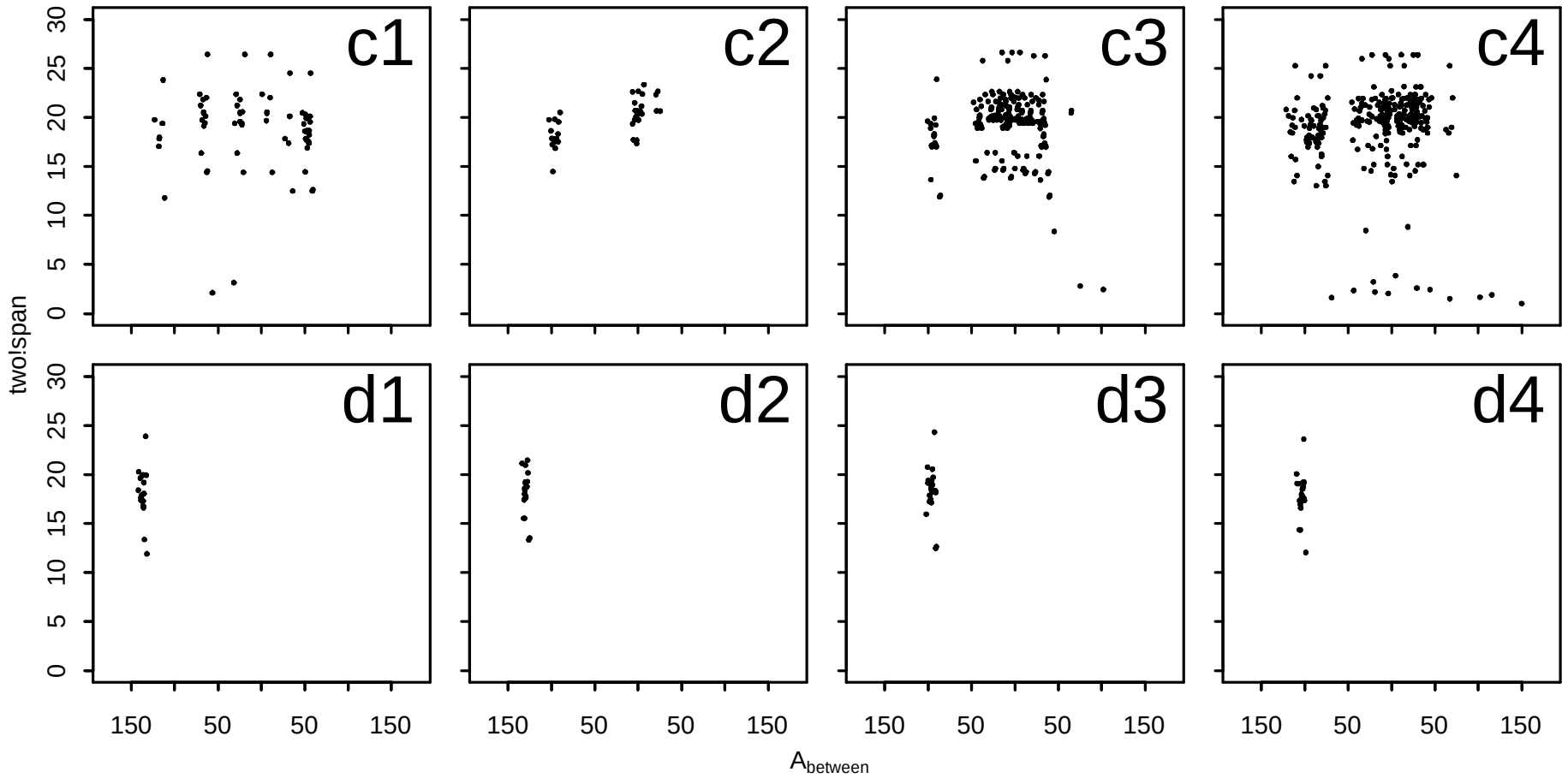
Supplementary Figure S2. Trivariate food webs, for monthly drought [d1-d4] versus permanent flow [c1-c4] treatments. Each node is plotted as a function of its body mass ($\log_{10}(M)$) and abundance ($\log_{10}(N)$). The polygonal convex hulls fitted to each web bound all interactions, excluding detritivorous feeding (note: detrital resources do not have a clearly defined individual mass and have therefore been placed in the bottom left hand corner of each web for illustrative purposes only).



Supplementary Figure S3. Upper angle A_{upper} versus lower angle A_{lower} of all 2-chains within each food web. Vertical and horizontal solid lines represent median lower and upper angles for all 2-chains (see Methods for details).



Supplementary Figure S4. Network substructure in control (c1-c4) and drought (d1-d4) treatments: two span as a function of upper angle $A_{between}$ within each food web (see Methods).



Supplementary Table S1. Parameters and test statistics from logistic regressions performed on the likelihood of species being lost from the food web on the basis of their body size ($\log_{10}M$) and rarity-at-size (residual; see Methods for details). Significance codes: '***' 0.001 '**' 0.01 '*' 0.05.

	Estimate	S.E.	z-value	*P* (>|z|)
Intercept	0.083	0.187	0.443	0.658
$\text{Log}_{10}M$	-0.22	0.036	-6.063	1.34e-09 ***
Residual	0.794	0.200	3.978	6.95e-05 ***

Table S1. Mean ±SE community structure measures for the control (c1-c4) and drought (d1-d4) treatments for (top rows per parameter) connected species within the food web. See Methods for details. Paired *t*-tests were performed to test for significance of mean differences (*d*) from zero. Results for additional scenarios (mid and lower rows per parameter) testing for indirect effects (see Methods) are given in Table S1.

	Control webs	Drought webs	*d*	*t*	*P*
Pairwise links, tritrophic interactions and food chains					
Median link *angle*	-27.17±0.24	-27.59±0.24	0.42	3.52	0.039
	-26.70±0.27	-27.59±0.24	0.89	14.3	0.001
	-26.70±0.27	-27.40±0.29	0.71	3.13	0.052
Mean link length	18.23±0.18	18.62±0.11	-0.40	-2.11	0.125
	18.23±0.09	18.62±0.11	-0.40	-4.55	0.020
	18.23±0.09	18.44±0.09	-0.21	-16.63	<0.001
Median A_{lower}	-26.67±0.40	-25.76±1.02	-0.91	-1.04	0.375
	-27.23±0.79	-25.76±1.02	-1.47	-1.85	0.161
	-27.23±0.79	-25.77±1.03	-1.46	-1.83	0.165

Median A_{upper}	-31.80±1.09	-142.30±9.67	110.5	10.46	0.002
	-106.2±24.4	-142.30±9.70	36.1	2.01	0.138
	-106.2±24.4	-142.30±9.70	36.1	2.01	0.138
Log_{10} number of tritrophic chains	2.05±0.20	1.29±0.01	0.77	4.05	0.027
	1.37±0.24	1.29±0.01	0.08	0.37	0.733
	1.37±0.24	1.28±0.02	0.09	0.41	0.710
Median $A_{between}$	-8.99±3.93	-116.53±9.78	107.5	13.40	0.001
	-77.7±24.50	-116.50±9.80	38.9	2.22	0.113
	-77.7±24.50	-116.50±9.80	38.8	2.22	0.114
Mean 2-span	19.2±0.19	18.05±0.11	1.11	6.21	0.008
	18.64±0.37	18.05±0.11	0.59	1.73	0.182
	18.64±0.37	18.05±0.11	0.59	1.75	0.178
Mean chain span	19.4±0.17	18.7±0.10	0.69	6.06	0.009
	18.66±0.19	18.68±0.10	-0.018	-0.08	0.941

	18.64±0.38	18.05±0.11	0.59	1.75	0.178
Mean food chain link count	1.49±0.17	1.09±0.01	0.39	2.32	0.103
	1.18±0.07	1.10±0.01	0.08	1.15	0.334
	1.18±0.07	1.12±0.01	0.06	0.93	0.423
Trophic level of apex predator (chain length)	2.53±0.05	2.16±0.04	0.37	7.64	0.005
	2.26±0.04	2.16±0.04	0.10	2.73	0.072
	2.26±0.04	2.16±0.04	0.10	2.73	0.072
Community scaling and whole-network properties					
Allometric slope	-0.50±0.006	-0.52± 0.002	0.017	3.71	0.034
	-0.49±008	-0.52± 0.002	0.025	4.04	0.027
	-0.49±008	-0.52± 0.004	0.022	4.65	0.019
Community span	28.1±0.17	27.7±0.08	0.33	1.94	0.148
	27.4±0.33	27.7±0.08	-0.30	-0.83	0.467
	27.4±0.33	27.5±0.23	-0.10	-0.22	0.842
Constraint space area (*MN* convex hull area)	60.23±2.45	43.09±1.86	17.14	4.76	0.018

	51.20±2.85	43.10±1.86	8.10	2.84	0.065
	51.20±2.85	41.52±2.13	9.67	2.70	0.074
S, the number of connected food web nodes	60±1.3	46.5±1.3	13.5	11.34	0.001
	43±1.8	46.5±1.3	-3.75	-5.00	0.015
	43±1.8	43±1.8	n/a	n/a	n/a
$\log_{10} L$, number of links	2.48±0.05	2.31±0.04	0.17	3.20	0.050
	2.24±0.07	2.31±0.04	-0.07	-1.51	0.229
	2.24±0.07	2.23±0.05	0.007	0.12	0.914
C, directed connectance	0.08±0.008	0.09±0.008	-0.01	-0.87	0.448
	0.10±0.01	0.09±0.008	0.002	0.17	0.876
	0.10±0.01	0.09±0.01	0.001	0.06	0.956
Proportion of top species	0.42±0.03	0.37±0.02	0.045	0.99	0.396
	0.33±0.03	0.37±0.02	0.041	-1.96	0.145
	0.33±0.03	0.35±0.02	-0.022	-1.37	0.264
Proportion of intermediate species	0.10±0.02	0.02±0.01	0.08	3.59	0.037

	0.04±0.02	0.02±0.01	0.02	1.47	0.237
	0.04±0.02	0.02±0.001	0.02	1.37	0.264
Proportion of basal species	0.48±0.008	0.61±0.02	-0.12	-4.50	0.020
	0.61±0.02	0.61±0.02	0.001	0.17	0.877
	0.61±0.02	0.60±0.02	0.013	0.46	0.676

Table S3. List of trophic elements in stream channel food webs. Numerical node identifiers (e.g. Fig. 2) are given in parentheses.

Basal resources

[1] Amorphous detritus (FPOM)

[2] Plant fragments (CPOM)

[3] Fungal spores

[4] Fungal mycelia

Primary producers

[5] *Psammothidium lauenburgianum* (Hustedt) Bukhtiyarova & Round

[6] *Planothidium lanceolatum* (Bréb. ex Kützing) Round & Bukhtiyarova

[7] Algal cysts

[8] *Amphora ovalis* (Kützing) Kützing

[9] *Amphora pediculus* (Kützing) Grunow in Schmidt

[10] *Chrococcus minor* (Kützing) Nägeli

[11] *Cymbella lanceolata* (Ehrenberg) Kirchner

[12] *Encyonema minutum* (Hilse in Rabenhorst) Mann

[13] *Cocconeis placentula* Ehrenberg

[14] *Cymatopleura solea* (Brébisson & Godey) W. Smith

[15] *Diatoma vulgare* Bory

[16] *Staurosira elliptica* (Schumann) Williams & Round

[17] *Staurosirella leptostauron* (Ehrenberg) Williams & Round

[18] *Fragilaria vaucheriae* (Kützing) Petersen

[19] *Gongrosira incrustans* Reinsch

[20] *Gomphonema olivaceum* (Hornemann) Brébisson

[21] *Gyrosigma* sp.

[22] *Melosira varians* Agardh

[23] *Nitzschia dissipata* (Kützing) Grunow

[24] *Navicula gregaria* Donkin

[25] *Navicula lanceolata* (Agardh) Ehrenberg

[26] *Navicula menisculus* Schumann

[27] *Nitzschia perminuta* (Grunow) M. Peragallo

[28] *Navicula tripunctata* (O.F. Müller) Bory

[29] *Rhoicosphenia abbreviate* Agardh) Lange-Bertalot

[30] *Surirella minuta* Brébisson in Kützing

[31] *Spirulina* sp.

[32] *Surirella brebissonii* Krammer & Lange-Bertalot

[33] *Synedra ulna* (Nitzsch) Ehrenberg

Consumers

[34] *Asellus aquaticus* (L.)

[35] *Eiseniella tetraedra*

[36] *Elmis aenea* (Müller)

[37] *Ephemera danica* Müller

[38] *Gammarus pulex* (L.)

[39] *Heterotrissocladius* sp.

[40] *Leuctra geniculata*

[41] *Limnius volckmari* (Panzer)

[42] Naididae

[43] Ostracoda

[44] *Oulimnius tuberculatus* (Müller)

[45] *Pisidium* sp.

[46] *Polypedilum* sp.

[47] *Prodiamesa olivacea*

[48] *Sericostoma personatum* (Spence)

[49] Simuliidae

[50] *Tipula montium* Egger

[51] Tubificidae

[52] *Ancylus fluviatilis* (Müller)

[53] *Athripsodes* spp.

[54] Baetidae

[55] *Brachycentrus subnubilus* Curtis

[56] *Brychius elevatus* (Panzer)

[57] *Cricotopus* sp.

[58] *Cryptochironomus* sp.

[59] *Radix balthica* (L.)

[60] *Microtendipes* sp.

[61] *Potamopyrgus antipodarum* (J.E.Gray)

[62] *Procladius* sp.

[63] *Synorthocladius* ap.

[64] *Theodoxus fluviatilis* (L.)

[65] *Tinodes waeneri* (L.)

[66] *Valvata piscinalis* (Müller)

[67] *Erpobdella octoculata* (L.)

[68] *Haliplus lineatocollis* (Marsham)

[69] *Hydropsyche* spp.

[70] *Macropelopia* sp.

[71] *Pentaneura* sp.

[72] *Platambus maculatus* (L.)

[73] *Polycentropus flavomaculatus* (Pictet)

[74] *Sialis lutaria* (L.)