Supporting Information

Title: The optimal combination of standard metabolic rate and aerobic scope for somatic growth depends on food availability

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Appendix S1 Equations used to calculate rations for each of the 3 food levels

The three ration levels – low, intermediate, and *ad libitum* – were determined using equations from Elliott (1976) that describe the growth of brown trout as a function of caloric intake, temperature and initial body size. We used published values of the energetic content of the trout pellets (Inicio Plus from BioMar Ltd, Grangemouth, UK) to convert Elliott's estimates of caloric intake into trout pellets (mg) and thereby derive the daily ration (mg trout pellets) for each fish as a function of its body mass (W, g) and the water temperature (T, C) for the 3 food levels as follows: low food = $2.04W^{0.73}\, e^{(0.10T)}$, intermediate food = $2.91W^{0.737}\, e^{(0.154T)}$, and *ad libitum* food = $4.29W^{0.767}\, e^{(0.21T)}$.

The weight of each daily ration was divided by two to determine the ration for each meal, further divided by 7 mg (the approximate weight of each pellet) to determine the total number of pellets for each meal, and then rounded up to the nearest integer value. Using the equation above, the low food ration predicts a food quantity that is roughly 10% below that required for maintenance metabolism, but because we rounded up our values when determining pellet numbers, the final ration we fed the low food fish was approximately 5% above the maintenance levels predicted by Elliott (1976) and ranged from 0.2-0.44 % of body weight per day depending on fish size. The *ad libitum* food ration ranged (again depending on body size) from 2-4% body weight per day and was determined by pilot experiments that estimated the maximum amount of food that a fish of a given size could consume in one hour.

Maximum food consumption varied considerably among individuals in our pilot study, so the intermediate food level was set at a level halfway between the low ration level and the maximum food level for the lowest 10% of the fish (i.e. the poorest eaters); it ranged from 0.8-1.2% body weight per day depending on body size.

Appendix S2 Description of respirometry system used to measure standard metabolic rates.

Water in an upper bin was aerated by an air stone and pumped through individual tubes to each of 16 respirometry chambers (volume 400 ml) arranged in parallel and submerged in a lower water bath, then past an oxygen sensor (robust probe; PyroScience GmbH, Aachen, Germany) in a small sealed glass chamber connected by a short length of oxygen-impermeable Tygon tubing (Cole Parmer, London, UK) to the downstream section of each respirometry chamber. A peristaltic pump (Cole Parmer, London, UK) on the downstream side of the respirometry and oxygen sensor chambers pumped water through the system at a constant rate and was used to adjust the flow rate through each chamber. Water in the system was pumped through a UV sterilizer (v2 Vecton 600, Tropical Marine Centre, Bristol, UK) and then a chiller (Teco Tr5, Ravenna, Italy) before being returned to the upper aerated water bin. The UV sterilizer served to minimize background respiration rates, while the chiller maintained the water bath at 11.5 ± 0.5 ºC. The water bath containing the respirometry chambers was enclosed in sheets of insulation on all sides that served to maintain a constant water temperature and to prevent light from penetrating the water bath and thereby keep fish activity to a minimum.

Oxygen levels in the chambers were recorded every 2 seconds using FireSting software version 3.0 (PyroScience) by four multichannel oxygen meters (FireStingO2, PyroScience), each of which had four channels and thereby permitted measures of oxygen in four chambers. Temperature was recorded by a sensor positioned directly downstream from

an oxygen sensor within each group of four chambers; this allowed for continuous temperature compensation of oxygen concentration calculations. Oxygen sensors were calibrated using fully aerated water before each batch of fish was put in the chambers.

Appendix S3. Data used in analyses of metabolic rates and growth

Stream	Batch	Fish ID	Food Level	Body mass (g)	SMR (mg O_2 h^{-1})	MMR (mg O_2 h^{-1})	Initial length (mm)	Final Length (mm)
1	1	1	Ad libitum	11.54	0.86	5.74	89.5	96.5
1	1	2	Low	8.822	0.853	4.65	90.62	93.1
1	1	3	Low	10.693	1.109	6.51	96.77	99.5
1	1	4	Ad libitum	12.785	1.054	5.95	93.73	100.6
1	1	5	Ad libitum	9.379	0.666	4.69	87.16	91.7
1	1	6	Low	8.167	0.725	3.35	89.08	90.8
1	1	7	Intermediate	10.004	0.815	5.34	90.54	95.2
1	1	8	Ad libitum	10.209	0.966	5.45	89.29	94.9
1	1	9	Low	8.028	0.875	5.03	86.73	88.8
1	1	10	Ad libitum	12.515	0.831	5.55	91	99.3
1	1	11	Intermediate	10.344	1.071	4.96	91.89	95.9
1	1	12	Intermediate	14.776	1.227	5.36	102.64	106.1
1	1	13	Intermediate	9.267	0.85	5.25	88	92.8
1	1	14	Intermediate	10.883	0.994	5.97	92.38	98
1	1	15	Low	10.161	1.032	6.75	94.31	97.2
1	2	16	Ad libitum	13.63	0.907	7.61	94.4	102.4
1	2	17	Intermediate	11.553	0.904	5.58	94.78	99.6
1	2	18	Low	10.497	1.039	6.58	97.22	100.4
1	2	19	Ad libitum	9.042	0.773	4.07	86.7	91.7
1	2	20	Intermediate	11.048	0.775	4.51	93.51	99.7
1	2	21	Low	7.13	0.756	4.34	83.82	85.8
1	2	22	Low	7.381	0.476	4.08	85.76	87.6
1	2	23	Ad libitum	8.229	0.663	3.97	86.83	90.6
1	2	24	Low	10.165	0.9	7.28	93.4	95.9
1	2	25	Ad libitum	8.366	0.826	4.05	82.94	89.9
1	2	26	Ad libitum	13.881	0.923	6.15	96.21	103.2
1	2	27	Intermediate	8.487	0.516	3.96	85.11	88.8
1	2	28	Intermediate	7.996	0.56	4.53	83.18	86.8
1	2	29	Low	8.595	0.874	5.21	88.2	90.8
1	2	30	Intermediate	9.922	0.481	4.76	87.65	93.4
1	3	31	Low	13.313	1.12	7.19	103.18	106.9
1	3	32	Ad libitum	10.156	0.743	4.8	87.28	94
1	3	33	Intermediate	12.299	0.803	5.89	96.68	100.8

1	3	34	Intermediate	10.697	0.899	5.41	91.09	97.8
1	3	35	Intermediate	12.151	1.087	7.57	95.42	97.5
1	3	36	Intermediate	9.968	0.729	5.11	90.04	94.3
1	3	37	Ad libitum	13.592	0.81	6.77	97.33	104.1
1	3	38	Low	8.909	0.771	4.51	90.48	93.2
1	3	39	Low	9.204	0.698	5.51	92.15	94.4
1	3	40	Low	5.483	0.525	3.97	80.72	81.8
1	3	41	Ad libitum	16.12	0.949	7.15	102.71	110.8
1	3	42	Ad libitum	14.231	0.788	6.3	96.71	105.3
1	3	43	Low	8.221	0.792	5.36	87.82	89.9
1	3	44	Intermediate	8.745	0.716	4.22	84.44	89.7
1	3	45	Ad libitum	8.433	0.683	4.69	82.88	86.5
1	4	46	Low	8.591	0.945	4.31	86.44	89.2
1	4	47	Intermediate	10.657	0.829	5.93	90.39	96.7
1	4	48	Ad libitum	14.642	1.116	6.16	96.86	105.1
1	4	49	Low	10.173	0.942	5	91.54	94.2
1	4	50	Low	8.638	0.783	4.58	88.34	91.9
1	4	51	Low	10.089	0.847	5.05	92.58	94.3
1	4	52	Ad libitum	7.995	0.663	4.57	82.89	87.2
1	4	53	Intermediate	11.674	0.832	5.38	94.45	99.6
1	4	54	Ad libitum	12.372	0.901	5.14	94.83	101.1
1	4	55	Low	7.831	0.669	4.83	86.59	88.5
1	4	56	Intermediate	8.504	0.801	4.1	84.81	89.2
1	4	57	Ad libitum	11.836	0.929	5.1	92.59	98.5
1	4	58	Ad libitum	10.094	0.739	5.05	85.68	92.2
1	4	59	Intermediate	6.762	0.66	3.67	79.32	83
1	4	60	Intermediate	9.865	0.839	5.38	88.2	93
2	5	61	Intermediate	11.088	0.949	4.92	91.24	96.3
2	5	62	Low	8.77	1.074	6.05	91.09	93.8
2	5	63	Ad libitum	9.557	0.892	3.99	85.85	92.1
2	5	64	Low	5.887	0.571	4.49	82.3	83.1
2	5	65	Ad libitum	13.554	1.091	6.74	95.7	103.2
2	5	66	Low	10.079	1	5.84	93.37	95.4
2	5	67	Low	10.909	1.064	6.26	96.5	99.2
2	5	68	Intermediate	9.253	0.866	5.08	85.75	91.2
2	5	69	Intermediate	11.633	1.053	5.32	93.75	98.4
2	5	70	Ad libitum	13.376	1.124	6.3	99.44	103.4
2	5	71	Intermediate	11.986	0.883	5.43	94.06	99.9
2	5	72	Intermediate	14.035	1.015	6.9	100.55	106.7
2	5	73	Ad libitum	14.058	0.958	6.49	95.72	103.2
2	5	74	Ad libitum	12.93	0.599	5.95	93.08	99.7
2	5	75	Low	10.646	0.971	6.53	96.38	98.8
2	6	76	Intermediate	11.269	0.95	7.68	94.75	97.4
2	6	77	Intermediate	11.634	0.913	5.71	93.71	99.8
2	6	78	Intermediate	10.451	0.782	4.83	89.08	95.2
2	6	79	Ad libitum	10.526	0.812	5.53	86.92	93.3

2	6	80	Low	11.776	1.023	6.65	99.03	100.9
2	6	81	Ad libitum	12.318	0.789	5.45	92.5	98.6
2	6	82	Ad libitum	14.051	1.012	6.16	95.16	102.5
2	6	83	Ad libitum	14.043	0.913	5.71	96.2	102.4
2	6	84	Low	8.749	0.76	4.73	86.22	88.3
2	6	85	Low	9.791	0.756	5.27	91.77	95.4
2	6	86	Intermediate	10.181	0.654	4.72	89.04	95.9
2	6	87	Ad libitum	7.263	0.648	4.11	84.4	86.5
2	6	88	Low	10.666	0.946	5.65	98.01	100
2	6	89	Low	9.78	0.943	6.45	93.38	96.6
2	6	90	Intermediate	13.441	1.1	6.16	97.44	102.4
2	7	91	Low	10.625	0.953	5.89	96.98	98.7
2	7	92	Ad libitum	12.377	0.916	6.73	91.31	99.1
2	7	93	Low	10.327	1.011	5.45	95.88	97.7
2	7	94	Ad libitum	10.347	0.929	4.82	90.71	95.9
2	7	95	Ad libitum	11.516	0.833	5.17	90.53	96.1
2	7	96	Low	8.548	0.836	5.37	89.89	91.9
2	7	97	Intermediate	9.671	0.879	5	90.73	93.3
2	7	98	Low	6.762	0.596	4.11	81.97	82.7
2	7	99	Ad libitum	11.148	0.823	4.81	88.15	94.9
2	7	100	Intermediate	9.787	0.83	5.58	88.75	93.5
2	7	101	Intermediate	11.621	0.96	6.25	93.9	98.4
2	7	102	Ad libitum	12.968	1.033	5.52	93.53	99.7
2	7	103	Intermediate	8.261	0.719	3.78	87.71	90.5
2	7	104	Low	7.891	0.814	4.68	85.4	87.1
2	7	105	Intermediate	10.557	0.922	6.44	92.79	97.3
2	8	106	Low	6.394	0.752	4.02	81.34	84.2
2	8	107	Intermediate	9.016	1.007	5.09	86.16	90.8
2	8	108	Ad libitum	15.128	1.269	6.52	98.62	106.6
2	8	109	Ad libitum	10.376	0.791	6.08	84.22	90.8
2	8	110	Low	6.069	0.541	4.92	78.53	79.8
2	8	111	Intermediate	9.878	0.917	5.35	88.55	93.5
2	8	112	Intermediate	9.578	0.961	5.73	89.23	94.3
2	8	113	Ad libitum	9.381	0.949	5.4	88.99	91.8
2	8	114	Ad libitum	10.058	0.962	6.12	90.8	95.9
2	8	115	Intermediate	11.278	0.988	6.09	94.56	99
2	8	116	Ad libitum	14.784	1.102	6.73	97.86	105.2
2	8	117	Intermediate	12.313	0.869	6.97	97.34	101
2	8	118	Low	11.078	1.134	6.73	98.06	101.4
2	8	119	Low	10.038	1.254	8.73	95.31	97
2	8	120	Low	11.688	1.414	7.64	99.4	101.1

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