Supplementary Materials and Methods

Proximate Analysis

Frozen fish remains were homogenized using a Fisher Brand Bead Mill 24 and subsamples of the homogenate were weighed and freeze dried (Labconco Lyophilizer). *Protein:* Protein content was estimated in triplicate (intra-assay CV% <10%) using a BCA assay with a 72% TCA precipitation (Pierce BCA kit, ThermoFisher Scientific, MA, USA), where absorbance was measured at 562 nm. *Lipids:* Lipid content was estimated using a chloroform:methanol extraction as described in Mann and Gallager, 1985 and Johnson et al, 2017. Lipids from 50 mg of freeze-dried homogenized sample were extracted using 100 ul milliQ water and 1.5 ml chloroform:methanol (1:2) (vortexed, incubated at 4°C, centrifuged at 4000 rpm for 5 min). The supernatant was removed and remaining sample was re-extracted in 1.5 ml chloroform:methanol (2:1). The supernatants were pooled, mixed with 950 ul NaCl (0.7%), incubated at 4°C for 30 min, then centrifuged (4000 rpm, 5 min), and the volume of the bottom layer was measured. Dried subsamples of the bottom layer were used to extrapolate lipid content to the entire sample. *Ash Content:* Ash content was determined by drying freeze-dried samples overnight at 100°C to account for any moisture that returned during sample storage. Samples were then weighed (~30 mg) before being combusted in a muffle furnace at 450°C for 12 h and then re-weighed.

Table S1. Dietary and whole-body Proximate composition (% wet weight)

Dietary Proximate composition (% wet weight)				
	Experiment 1		Experiment 2	
	Ulva	*Artemia*	*Ulva*	*Artemia*
% Moisture	82.04 ± 1.63	87.48 ± 0.91	75.33 ± 3.81	86.83 ± 0.38
% Protein	1.47 ± 0.27	4.75 ± 0.51	1.95 ± 0.88	5.59 ± 0.62
% Lipid	0.42 ± 0.05	1.23 ± 0.14	0.55 ± 0.10	1.84 ± 0.08
% Ash	10.71 ± 1.87	1.44 ± NA	9.93 ± NA	1.78 ± 0.04
Whole body Proximate composition (% wet weight)				
	12°C		20°C	
	Carnivorous	Omnivorous	Carnivorous	Omnivorous
% Moisture	70.15 ± 1.15	72.25 ± 1.40	72.98 ± 0.74	71.79 ± 0.45
% Protein	13.40 ± 1.09	13.91 ± 1.21	12.61 ± 1.45	10.76 ± 0.85
% Lipid	3.88 ± 0.41	3.08 ± 0.25	3.70 ± 0.63	3.93 ± 0.16
% Ash	5.45 ± 0.84	4.31 ± 0.50	4.60 ± 0.60	5.26 ± 0.60

Represented are means and standard error values for dietary proximate composition in *Ulva* sp., *Artemia* sp., and proximate body composition from whole opaleye from experiments 1 and 2. Proximate body composition were statistically analyzed using 2-way ANOVA and no significant differences were found between treatment groups. When sample size <3 standard error was not calculated and is listed as NA.

Table S2. AIC Outputs for Polynomial Curves.

AIC outputs for warm ABT test f_{hmax} polynomial curves				
Model	**Formula**	**df**	**AIC**	**ΔAIC**
Model 1	poly(acute_temp, 3) * diet * temp + (1 ǀ fish_id)	18	5282.61153	0
Model 2	poly(acute_temp, 3) * temp + diet + (1 ǀ fish_id)	11	5295.12706	12.515531
Model 3	poly(acute_temp, 3) * temp + (1 ǀ fish_id)	10	5297.84122	15.2296905
Model 4	poly(acute_temp, 2) * diet * temp + (1 ǀ fish_id)	14	5331.73874	49.1272062
Model 5	poly(acute_temp, 3) * diet + temp + (1 ǀ fish_id)	11	5425.26489	142.653365
Model 6	poly(acute_temp, 4) + temp + diet + (1 ǀ fish_id)	9	5427.25882	144.64729
Model 7	poly(acute_temp, 4) + temp * diet + (1 ǀ fish_id)	10	5428.15216	145.540635
Model 8	poly(acute_temp, 3) + temp + diet + (1 ǀ fish_id)	8	5429.2756	146.664069
Model 9	poly(acute_temp, 3) + temp * diet + (1 ǀ fish_id)	9	5430.17554	147.564011
Model 10	poly(acute_temp, 3) + temp + (1 ǀ fish_id)	7	5432.27141	149.659875
Model 11	poly(acute_temp, 3) + diet + (1 ǀ fish_id)	7	5433.3873	150.775766
Model 12	poly(acute_temp, 3) + (1 ǀ fish_id)	6	5435.91176	153.300235
Model 13	poly(acute_temp, 2) + temp + diet + (1 ǀ fish_id)	7	5491.9684	209.356872
Model 14	poly(acute_temp, 2) + temp * diet + (1 ǀ fish_id)	8	5492.77923	210.167701
Model 15	acute_temp + temp + diet + (1 ǀ fish_id)	6	5742.45159	459.840058
Model 16	acute_temp + temp * diet + (1 ǀ fish_id)	7	5743.27212	460.660589
Model 17	acute_temp + temp + (1 ǀ fish_id)	5	5745.43438	462.822848
Model 18	acute_temp + diet + (1 ǀ fish_id)	5	5749.62894	467.017406
Model 19	acute_temp + (1 ǀ fish_id)	4	5751.89944	469.287913
AIC outputs for cold test f_{hmax} polynomial curves				
Model	**Formula**	**df**	**AIC**	**ΔAIC**
Model 1	poly(acute_temp, 4) + diet + (1 ǀ fish_id)	8	1620.06402	0
Model 2	poly(acute_temp, 4) * diet + (1 ǀ fish_id)	12	1623.74238	3.67835332
Model 3	poly(acute_temp, 3) + diet + (1 ǀ fish_id)	7	1636.74603	16.6820023
Model 4	poly(acute_temp, 3) * diet + (1 ǀ fish_id)	10	1639.36915	19.3051258
Model 5	poly(acute_temp, 3) + (1 ǀ fish_id)	6	1640.02832	19.9642973
Model 6	poly(acute_temp, 2) * diet + (1 ǀ fish_id)	8	1640.27173	20.2077023
Model 7	poly(acute_temp, 2) + diet + (1 ǀ fish_id)	6	1641.6658	21.6017758
Model 8	acute_temp + diet + (1 ǀ fish_id)	5	1992.02421	371.960185
Model 9	acute_temp + (1 ǀ fish_id)	4	1994.25531	374.191287

Represented are model formulas as input into R and AIC output results. df = degrees of freedom, AIC = Akaike Information Criterion ΔAIC = AIC(model)—AIC(min AIC value), acute_temp = acute temperature, fish_id = individual fish.

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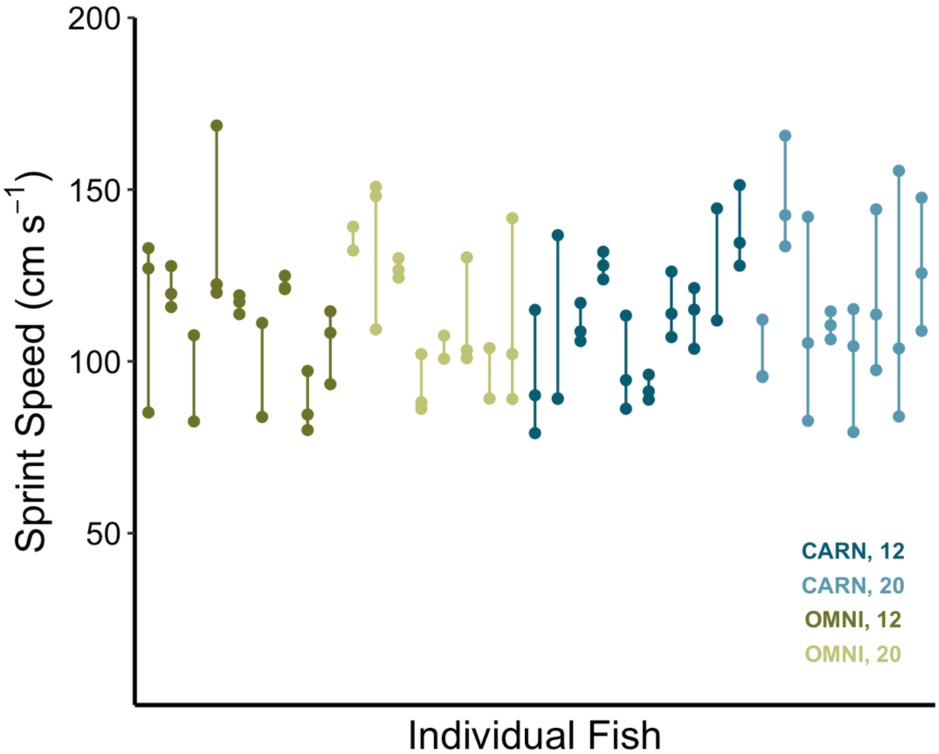

Fig. S1. Figure illustrating repeatability of sprint performance across individuals. Each dot indicates a max sprint performance (cm s^{-1}) calculated from an individual sprint trial. Colors indicate treatments with dark blue (carnivorous diet at 12°C), dark green (omnivorous diet at 12°C), light blue (carnivorous diet at 20°C), light green (omnivorous diet at 20°C).

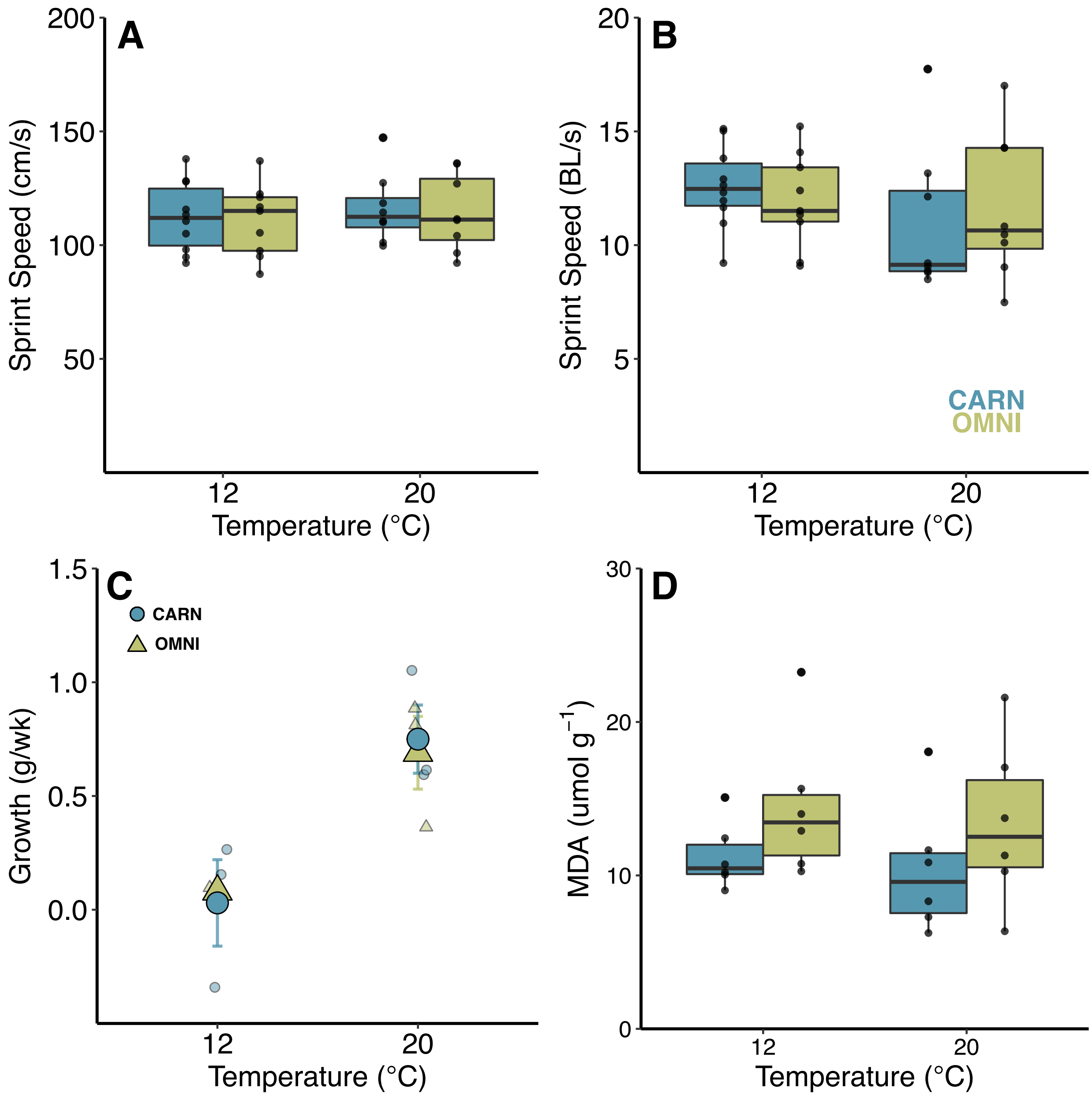

Fig. S2. Performance in opaleye acclimated to 12°C or 20°C and fed either a carnivorous (blue) or omnivorous (green) diet. Presented are **A)** sprints measured as speed in cm s^{-1} and **B)** sprints measured as speed in BL s^{-1}, **C)** Growth rate (average fish mass (g) gained per week per tank) **D)** Lipid Peroxidation (LPO) in liver tissue measured as malondialdehyde concentration (MDA) in µmol $gram^{-1}$ of liver tissue. In panel A, B, D box plots represent interquartile ranges (boxes and whiskers), median values (solid lines) and outliers (> 1.5 beyond interquartile range) are plotted as data points outside the whiskers. In panel C, large circles and triangles indicate mean (± SEM) values for the carnivorous (*Artemia* sp.) and omnivorous diet treatments (*Artemia* sp. and *Ulva* sp.), respectively.

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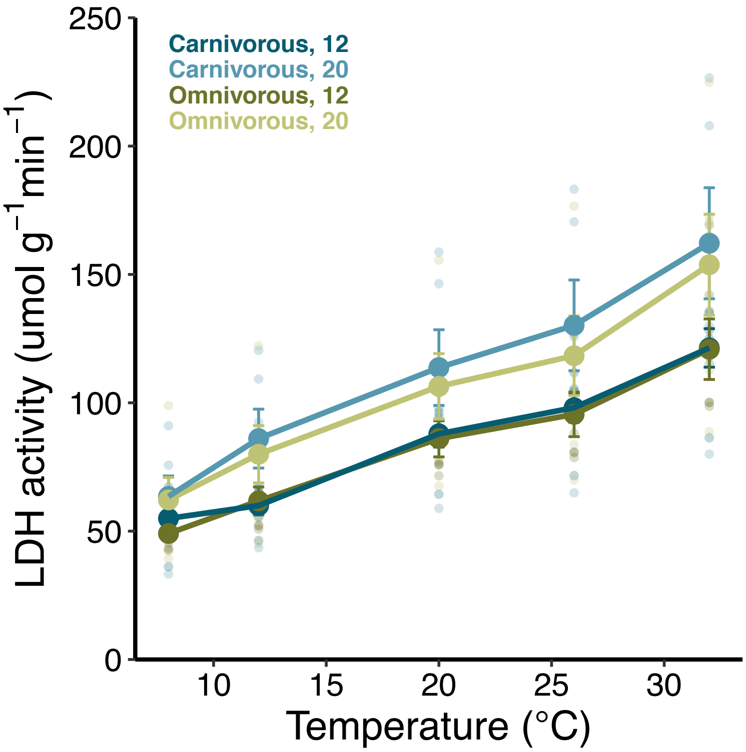

Fig. S3. Lactate dehydrogenase (LDH) activity in μmol per gram wet white muscle tissue weight in opaleye acclimated to 12°C (dark colors) or 20°C (light colors) and fed either a carnivorous (*Artemia* sp., represented as blues) or omnivorous diet (*Artemia* sp. and *Ulva* sp., represented as greens). Circles represent mean values and error bars indicate SEM**.** For each sample, LDH activity was measured at 5 different temperatures (8, 12, 20, 26, 32°C). Lactate dehydrogenase activity was higher at 20°C compared to 12°C but did not differ across diets. Lactate dehydrogenase activity also increased with acute temperature exposure. Acute temp: df = 4, χ^2 = 1061.711, p<0.001; acclimation temp: df = 1, χ^2 = 5.132, p = 0.023; diet: df = 1, χ^2 = 0.172, p = 0.679; acute temp × acclimation temp: df = 4, χ^2 = 22.526, p < 0.001.

References

Johnson, J.S., Clements K.D., and Raubenheimer, D., (2017). The Nutritional Basis of Seasonal Selective Feeding by a Marine Herbivorous Fish. *Mar. Biol.* **164,** 201.

Mann, R., and Gallager, S.M., (1985). Physiological and biochemical energetics of larvae of Teredo navalis L. and Bankia gouldi (Bartsch) (Bivalvia: Teredinidae). *J. Exp. Mar. Biol. Ecol.* **85**, 211-228.