TEXT S1. ALTERNATIVE ANALYSES

Linear mixed-effects models with log-transformed data

The linear mixed-effects models (LMEMs) we present in the main text use raw (untransformed) lengths. While the residuals of these models indicated that the raw data satisfied the assumptions of a LMEM, we also repeated these analyses after applying a log transformation to the morphometric data (postoral rod length, stomach length, and body length) for consistency with Kacenas & Podolsky (2018). The ANOVAs and comparisons of estimated marginal means produced qualitatively similar results with the log transformed data as on raw data; all effects and pairwise comparisons that were significant with the raw data were significant with the transformed data, and vice-versa.

Linear mixed-effects models with body length interaction terms

A more exhaustive LMEM was run for both postoral rod length (PORL) and stomach length (SL) in each experiment. These models differ from those presented in the main text in including three extra terms for interactions with the covariate: the interaction between food ration and body length, the interaction between larval density and body length, and the three-way interaction between food ration, larval density, and body length. Type III ANOVAs were performed on all eight instances of this model (four experiments × two dependent variables: PORL and SL), and the body length interaction terms without a significant effect were progressively eliminated until only significant ones were left. In no case was the three-way interaction between the two fixed effects and the covariate significant – though for three models (*D. excentricus* Expt 2 PORL, *L. pictus* Expt 1 and 2 SL) the interpretation was complicated by a singularity – so this term was removed. Removing terms from singular models is suggested as an approach in the documentation of lme4 (Bates et al. 2015). The model for *L. pictus* Expt 2 SL was no longer singular after the removal of the three-way interaction term; singularities remained in the other two of these models (*D. excentricus* Expt 2 PORL, *L. pictus* Expt 1 SL), and in fact the equivalent models without any body length interaction terms (those presented in the main text) are also singular.

Five of the eight models could be simplified to remove all body length interaction terms, thus arriving at identical models to the ones we constructed to parallel Kacenas & Podolsky's (2018) analysis. For *D. excentricus* Expt 2 SL ($p = 0.010$), as well as *L. pictus* Expt 2 PORL ($p = 0.016$) and SL ($p < 0.001$), a significant interaction between food ration and body length remained (Table S1). Two of these models yield different results than their simplified equivalents: the food ration has a higher p-value in the *D. excentricus* Expt 2 SL model when the interaction term is included ($p = 0.064$; Table S1) than when it is omitted ($p < 0.001$; Table 1), whereas food ration has a lower p-value in the *L. pictus* Expt 2 PORL model when the interaction term is included ($p = 0.024$; Table S1) than when it is omitted ($p = 0.151$; Table 1). We present the results of the simple models in this paper for internal consistency and for ease of comparison with Kacenas & Podolsky's (2018) analysis, noting that more complex model provides a slightly different picture. ANOVA results for these more complex models are provided in Table S1.

Body length ratio models

To supplement the ANOVAs run on LMEMs, we also performed ANOVAs on per-beaker means of morphometric data (Table S2), controlling for overall larval size using ratios of PORL/BL and SL/BL rather than a BL covariate. Shapiro-Wilk tests revealed that the values of these dependent variables were not normally distributed in one or more treatments in several experiments (Table S3), possibly due to the presence of outliers (Table S4). Applying a log transformation did not change the results of any of the Shapiro-Wilk tests. However, ANOVAs are robust to violations of the assumption of normality (Harwell et al. 1992) and the assumption of homogeneity of variance was met for all data, so we accept the ratio ANOVA models as is.

The results of the ratio ANOVA models were again qualitatively similar to those of our original analysis (Table 1), with some differences in the effect of density. As in the LMEM, *L. pictus* Expt 1 PORL and Expt 2 SL showed a significant effect of density in the ANOVA, but unlike in the LMEM both these effects were reflected by significant *post-hoc* tests rather than only the latter of the two (Table S5). There was also an effect of density on *D. excentricus* Expt 1 SL, though no post hoc comparisons were significant (Table S5). Pairwise comparisons of relative morphometrics between high- and low-food treatments (Fig. S1) identify the same contrasts as significant as did the comparisons of estimated marginal means (Fig. 3, 4).

LITERATURE CITED

Bates D, Mächler M, Bolker BM, Walker SC (2015) Fitting linear mixed-effects models using lme4. J Stat Softw 67:1–48.

Harwell MR, Rubinstein EN, Hayes WS, Olds CC (1992) Summarizing Monte Carlo results in methodological research: The one- and two-factor fixed effects ANOVA cases. J Educ Stat 17:315–339.

Kacenas SE, Podolsky RD (2018) Density-dependent expression of plasticity in larval morphology: Effects of actual and apparent competitors. Mar Ecol Prog Ser 593:1–13.

Table S1. Type III ANOVAs for linear mixed-effects models of right postoral rod length (PORL) and stomach length (SL) of *Dendraster excentricus* and *Lytechinus pictus* using Satterthwaite's method, with significant interactions with the body length (BL) covariate retained (this was BL × Food in all cases). SS: sum of squares; MS: mean of squares; df_N: numerator degrees of freedom; df_D: denominator degrees of freedom. Significant results are in **bold:** *p < 0.05; **p < 0.01; ***p < 0.001.

	Experiment	Source	SS	MS	df_N	df_D	*F*	p	Sig.
PORL	*L. pictus* Expt 2	**BL**	**56379.581**	**56379.581**	**1**	**107.655**	**35.198**	**<0.001**	***
		Density	6230.909	3115.454	2	22.638	1.945	0.166	
		Food	**8393.966**	**8393.966**	**1**	**106.859**	**5.240**	**0.024**	*
		BL × Food	**9547.064**	**9547.064**	**1**	**107.655**	**5.960**	**0.016**	*
		Density × Food	499.367	249.684	2	22.6380	0.156	0.857	
SL	*D. excentricus* Expt 2	**BL**	**1409.508**	**1409.508**	**1**	**141.94**	**20.228**	**<0.001**	***
		Density	395.379	197.689	2	24.838	2.837	0.078	
		Food	243.509	243.509	1	141.998	3.495	0.064	
		BL × Food	**469.088**	**469.088**	**1**	**141.943**	**6.732**	**0.010**	*
		Density × Food	92.966	46.483	2	24.838	0.667	0.522	
	L. pictus Expt 2	**BL**	**4454.854**	**4454.854**	**1**	**83.882**	**24.860**	**<0.001**	***
		Density	**3321.568**	**1660.784**	**2**	**22.443**	**9.268**	**0.001**	**
		Food	**2374.712**	**2374.712**	**1**	**83.489**	**13.252**	**<0.001**	***
		BL × Food	**2884.063**	**2884.063**	**1**	**83.882**	**16.094**	**<0.001**	***
		Density × Food	153.185	76.592	2	22.443	0.427	0.657	

Table S2. ANOVAs for per-beaker means of ratios of right postoral rod length to body length (PORL/BL) and stomach length to body length (SL/BL) of *Dendraster excentricus* and *Lytechinus pictus*. SS: sum of squares, MS: mean of squares, df: degrees of freedom. Significant results are in **bold:** *p < 0.05; **p < 0.01; ***p < 0.001.

	Experiment	Source	df	SS	MS	*F*	p	Sig.
PORL/BL	*D. excentricus* Expt 1	Density	1	0.0093312	0.0093312	2.2861557	0.150	
		Food	**1**	**0.0646818**	**0.0646818**	**15.8471309**	**0.001**	**
		Density × Food	1	0.0018391	0.0018391	0.4505831	0.512	
	D. excentricus Expt 2	Density	2	0.0021751	0.0010875	0.5216948	0.600	
		Food	**1**	**0.1451990**	**0.1451990**	**69.6525234**	**<0.001**	***
		Density × Food	2	0.0070689	0.0035345	1.6954930	0.205	
	L. pictus Expt 1	**Density**	**2**	**0.0339103**	**0.0169551**	**5.2627821**	**0.013**	*
		Food	**1**	**0.0354046**	**0.0354046**	**10.9894014**	**0.003**	**
		Density × Food	2	0.0038172	0.0019086	0.5924128	0.561	
	L. pictus Expt 2	Density	2	0.0170868	0.0085434	1.1399914	0.337	
		Food	1	0.0107203	0.0107203	1.4304684	0.244	
		Density × Food	2	0.0101859	0.0050929	0.6795764	0.517	
SL/BL	*D. excentricus* Expt 1	Density	1	0.0003008	0.0003008	0.8041960	0.383	
		Food	**1**	**0.0313579**	**0.0313579**	**83.8424475**	**<0.001**	***
		Density × Food	1	0.0001710	0.0001710	0.4571212	0.509	
	D. excentricus Expt 2	**Density**	**2**	**0.0010119**	**0.0005060**	**3.4718812**	**0.047**	*
		Food	**1**	**0.0240845**	**0.0240845**	**165.2652774**	**<0.001**	***
		Density × Food	2	0.0001354	0.0000677	0.4644512	0.634	
	L. pictus Expt 1	Density	2	0.0028553	0.0014277	3.192952	0.059	
		Food	**1**	**0.0096155**	**0.0096155**	**21.505051**	**<0.001**	***
		Density × Food	2	0.0012659	0.0006329	1.415558	0.262	
	L. pictus Expt 2	**Density**	**2**	**0.0133158**	**0.0066579**	**19.297114**	**<0.001**	***
		Food	**1**	**0.0071006**	**0.0071006**	**20.580308**	**<0.001**	***
		Density × Food	2	0.0002179	0.0001090	0.315786	0.732	

Table S3. Problematic Shapiro-Wilk test results for per-beaker means of ratios of right postoral rod length to body length (PORL/BL) of *Dendraster excentricus* and *Lytechinus pictus*. Only treatments violating the assumption of normality ($p \leq 0.05$) are listed.

Experiment	Variable	Density (larvae ml^{-1})	Food (cells ml^{-1})	p
D. excentricus Expt 1	PORL/BL	0.050	5000	0.012
L. pictus Expt 1	PORL/BL	0.050	250	0.037
L. pictus Expt 1	PORL/BL	0.050	5000	0.048
L. pictus Expt 2	PORL/BL	0.015	5000	0.042

Table S4. Outliers in the per-beaker means of ratios of right postoral rod length to body length (PORL/BL) and stomach length to body length (SL/BL) of *Dendraster excentricus* and *Lytechinus pictus*. Outliers are defined as values greater than Q3 + 1.5 × IQR or less than Q1 - 1.5 × IQR, where Q1, Q3, and IQR are the first quartile, third quartile, and interquartile range of the per-beaker means within a treatment in a single experiment.

Experiment	Variable	Density (larvae ml^{-1})	Food (cells ml^{-1})	Value
D. excenctricus Expt 1	PORL/BL	0.250	250	1.45
D. excenctricus Expt 1	PORL/BL	0.250	250	1.30
D. excenctricus Expt 1	PORL/BL	0.250	5000	1.12
D. excenctricus Expt *2*	PORL/BL	0.015	5000	1.05
D. excenctricus Expt *2*	PORL/BL	0.015	5000	0.992
D. excenctricus Expt *2*	SL/BL	0.015	5000	0.354
D. excenctricus Expt *2*	SL/BL	0.050	250	0.309
D. excenctricus Expt *2*	SL/BL	0.050	250	0.324
D. excenctricus Expt *2*	SL/BL	0.050	5000	0.361
D. excenctricus Expt *2*	SL/BL	0.250	5000	0.338
L. pictus Expt 1	PORL/BL	0.050	250	0.839
L. pictus Expt 1	PORL/BL	0.250	250	0.940
L. pictus Expt 2	PORL/BL	0.015	5000	1.24
L. pictus Expt 2	PORL/BL	0.250	250	0.926
L. pictus Expt 2	PORL/BL	0.250	5000	0.923
L. pictus Expt 2	PORL/BL	0.250	5000	1.09
L. pictus Expt 2	SL/BL	0.015	250	0.322
L. pictus Expt 2	SL/BL	0.015	5000	0.393
L. pictus Expt 2	SL/BL	0.015	5000	0.357

Table S5. Tukey contrasts between density levels for per-beaker means of ratios of right postoral rod length to body length (PORL/BL) and stomach length to body length (SL/BL) of *Dendraster excentricus* and *Lytechinus pictus* which showed a significant effect of density in the ANOVA. Significant results are in **bold:** *p < 0.05; ***p < 0.001.

	Experiment	Contrast	Difference	Lower Bound	Upper Bound	p	Sig.
PORL/BL	*L. pictus* Expt 1	**0.05 vs. 0.015 ml^{-1}**	**0.0781865**	**0.0147957**	**0.1415774**	**0.014**	*
		0.25 vs. 0.015 ml^{-1}	0.0614918	-0.0018990	0.1248827	0.059	
		0.25 vs. 0.05 ml^{-1}	-0.0166947	-0.0800855	0.0466962	0.790	
SL/BL	*D. excentricus* Expt 2	0.05 vs. 0.015 ml^{-1}	0.0122095	-0.0012728	0.0256917	0.081	
		0.25 vs. 0.015 ml^{-1}	-0.0002188	-0.0137010	0.0132635	0.999	
		0.25 vs. 0.05 ml^{-1}	-0.0124282	-0.0259105	0.0010540	0.075	
	L. pictus Expt 2	**0.05 vs. 0.015 ml^{-1}**	**-0.0375389**	**-0.0589121**	**-0.0161657**	**<0.001**	***
		0.25 vs. 0.015 ml^{-1}	**-0.0515943**	**-0.0729675**	**-0.0302210**	**<0.001**	***
		0.25 vs. 0.05 ml^{-1}	-0.0140554	-0.0348585	0.0067478	0.230	

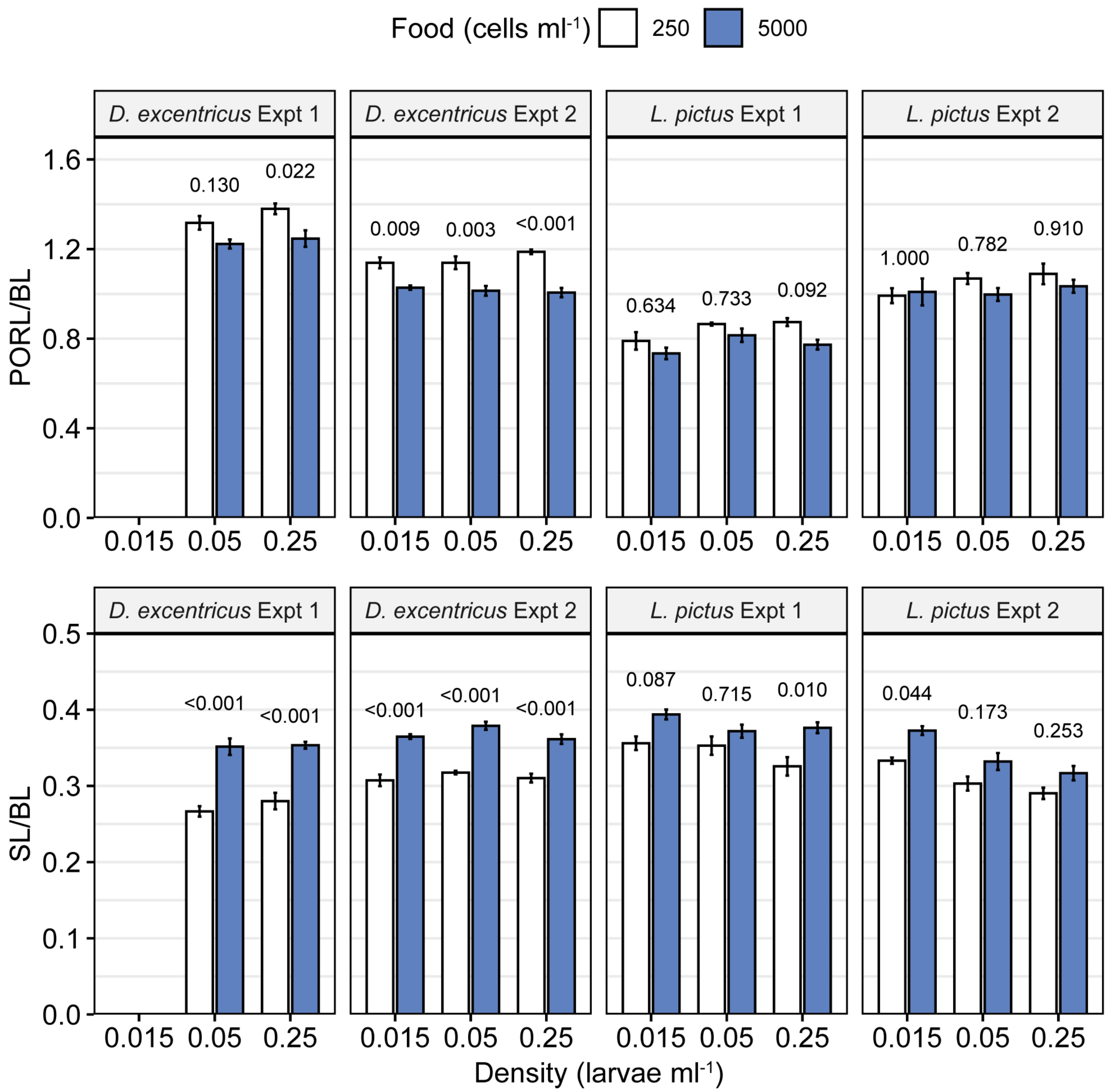

Fig S1. Per-beaker means for ratios of right postoral rod length to body length (PORL/BL) and stomach length to body length (SL/BL) of *Dendraster excentricus* and *Lytechinus pictus*. Error bars: ±SE. Numbers above a pair of bars: p-values from Tukey tests. No bars are shown for culture density of 0.015 larvae ml^{-1} in *D. excentricus* Expt 1 because this treatment did not exist in that experiment.