



Fig. S1. *Nematostella* is able to maintain a constant oxygen consumption rate over a large range of oxygen concentrations during light phases (A-B) and dark phases (C-D). Day and night were analyzed separately, as our studies indicated changes in respiration rate between light and dark phases. A, C: Continuous measurements of oxygen concentration vs zeitgeber time. Each line represents oxygen concentration in a chamber containing a single anemone. B, D: Rate of oxygen consumption vs. percent oxygen saturation. Oxygen consumption rate was calculated over 1 minute intervals using a sliding window approach. Data were subsampled every 2.5 minutes so data from distinct animals (different shades of grey) could be visualized. Line represents linear curve fit; slopes not significantly different from zero. None of our experiments fell below 25% oxygen saturation so further data points were excluded from our analysis, but there are suggestions that below 25% there is a decline in respiration rate (not shown).

Table S1: Analyses of covariance (ANCOVA) for Experiment 1 with the log of the oxygen consumption rate as the dependent variable and the log of dry mass as the covariate. Tests for the homogeneity of regression slope and homogeneity of variances (Levene's test) were satisfied. Assumption of normality was not met for either the log transformed respiration rate or the log transformed dry mass (Shapiro test); inspection of a QQ plot indicated moderate deviation from normality (not shown). Asterisks indicate statistical significance ($p < 0.05$).

Data Included	Covariate and Factors	F value	p
DD only	log(dry mass)	2.176	0.160
	Geophysical Day/Night	0.011	0.917
LD and DL only	log(dry mass)	7.012	0.0101*
	Feed	0.389	0.535
	Light/Dark	6.200	0.0152*
	Geophysical Day/Night	0.011	0.918
	Feed:Light/Dark	0.168	0.683
	Feed:Geophysical Day/Night	0.008	0.930
	Light/Dark:Geophysical Day/Night	0.124	0.726
	Feed:Light/Dark:Geophys.Day/Night	0.350	0.556

Table S2: Analyses of covariance (ANCOVA) for Experiment 2 with the log of the oxygen consumption rate as the dependent variable and the log of dry mass as the covariate. Data were normally distributed and met the assumption of the homogeneity of regression slopes; however, homogeneity of variances was violated (Levene's test). Asterisks indicate statistical significance ($p < 0.05$).

Data Included	Covariate and Factors*	F value	p
All	log(dry mass)	18.014	9.73e-05*
	Time	4.307	0.00251*
	Light Cycle	0.320	0.5742
	Time:Light Cycle	0.779	0.56961