

Supplementary Materials: Article Title: Interactive Effects of Endogenous and Exogenous Nutrition on Larval Development for Crown-Of-Thorns Starfish

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Table S1. Results of mixed model hierarchical ANOVA for diameter and volume of oocytes from female starfish under four maternal diet treatments: **Acr** = *Acropora*, **Mix** = mixed diet, **Por** = *Porites*, **Stv** = starved.

Source	df	F	p	ECV ¹	Post Hoc
Oocyte Diameter					
Maternal Nutrition	3	34.88	<0.0001	60%	Acr = Mix > Por = Stv
Female (Maternal Nutrition)	8	14.82	<0.0001	5%	
Error	1188			36%	
Oocyte Volume					
Maternal Nutrition	3	40.17	<0.0001	63%	Acr = Mix > Por = Stv
Female (Maternal Nutrition)	8	15.15	<0.0001	5%	
Error	1188			32%	

¹ ECV = estimates of components of variation

Table S2. Analysis of deviance for binomial generalized linear models (GLMs) testing the effects of maternal nutrition and larval feeding treatments on the proportion of normally developing larvae and larvae at brachiolaria stage after 8 days; and normally developing and larvae at mid-to-late brachiolaria stage after 16 days. Maternal Diet: **Acr** = *Acropora*, **Mix** = mixed diet, **Por** = *Porites*, **Stv** = starved; Algal Food Concentration (cells ml⁻¹): **Hi** = 10⁴, **Lo** = 10³, **No** = 0.

Source	df	χ^2	p	Post Hoc
Day 8				
% Normal				
Maternal Nutrition	3	57.82	0.0001	Acr = Mix = Por > Stv
Larval Nutrition	2	4.63	0.4242	
Maternal Nutrition x Larval Nutrition	6	6.38	0.8834	
% Brachiolaria				
Maternal Nutrition	3	201.75	<0.0001	Acr = Mix > Por > Stv
Larval Nutrition	2	137.35	<0.0001	Hi = Lo > No
Day 16				
% Normal				
Maternal Nutrition	3	69.38	<0.0001	Acr = Mix > Por > Stv
Larval Nutrition	2	172.19	<0.0001	Hi = Lo > No
Maternal Nutrition x Larval Nutrition	6	6.66	0.6557	
% Mid-Late Brachiolaria				
Maternal Nutrition	3	133.90	<0.0001	Acr = Mix > Por > Stv
Larval Nutrition	1	1.14	0.5853	Hi = Lo; No = 0

Table S3. Results of two-way ANOVA testing the main and interactive effects of maternal nutrition and larval feeding treatments on different morphometric measurements taken 4 days after the onset of larval feeding. Maternal Diet: **Acr** = *Acropora*, **Mix** = mixed diet, **Por** = *Porites*, **Stv** = starved; Algal Food Concentration (cells ml⁻¹): **Hi** = 10⁴, **Lo** = 10³, **No** = 0.

Source	df	F	p	Post Hoc
Maximum Length (ML)				
Maternal Nutrition	3	212.72	<0.0001	Acr>Mix>Por>Stv
Larval Nutrition	2	0.45	0.6415	
Maternal x Larval Nutrition	6	0.62	0.7116	
Maximum Width (MW)				
Maternal Nutrition	3	211.44	<0.0001	Acr=Mix>Por>Stv
Larval Nutrition	2	0.07	0.9333	
Maternal x Larval Nutrition	6	0.68	0.6686	
Posterior Width (PW)				
Maternal Nutrition	3	267.41	<0.0001	Mix>Acr>Por>Stv
Larval Nutrition	2	0.36	0.6978	
Maternal x Larval Nutrition	6	0.89	0.5089	
Ciliated Band Length (CBL)				
Maternal Nutrition	3	93.62	<0.0001	Mix=Acr>Por>Stv
Larval Nutrition	2	0.46	0.6327	
Maternal x Larval Nutrition	6	0.87	0.5254	
CBL : ML				
Maternal Nutrition	3	50.76	<0.0001	Mix>Acr=Por>Stv
Larval Nutrition	2	0.32	0.7299	
Maternal x Larval Nutrition	6	0.92	0.4866	
CBL : MW				
Maternal Nutrition	3	26.95	<0.0001	Mix>Acr>Por=Stv
Larval Nutrition	2	1.40	0.2544	
Maternal x Larval Nutrition	6	1.12	0.3600	
Gut Area				
Maternal Nutrition	3	43.66	<0.0001	Mix>Acr>Por>Stv
Larval Nutrition	2	0.36	0.6993	
Maternal x Larval Nutrition	6	1.00	0.4319	

Table S4. Results of two-way ANOVA testing the main and interactive effects of maternal nutrition (**Acr** = *Acropora*, **Mix** = mixed diet, **Por** = *Porites*, **Stv** = starved) and larval feeding (**Hi** = 10^4 , **Lo** = 10^3 , **No** = 0 cells ml⁻¹) treatments on different morphometric measurements taken at day 10 after onset of larval feeding ability.

Source	df	F	p	Post Hoc
Maximum Length (ML)				
Maternal Nutrition	3	125.45	<0.0001	Hi: Acr = Mix > Por > Stv; Lo: Mix = Acr > Por > Stv; No: Acr = Mix > Por = Stv
Larval Nutrition	2	184.04	<0.0001	Acr: Hi = Lo > No; Mix: Hi = Lo > No; Por: Hi > Lo > No; Stv: Hi = Lo > No
Maternal x Larval Nutrition	6	7.80	<0.0001	
Maximum Width (MW)				
Maternal Nutrition	3	164.86	<0.0001	Hi: Mix > Acr = Por > Stv; Lo: Mix > Acr > Por > Stv; No: Mix > Acr = Por > Stv
Larval Nutrition	2	127.38	<0.0001	Acr: Hi = Lo > No; Mix: Hi = Lo > No; Por: Hi > Lo > No; Stv: Hi = Lo > No
Maternal x Larval Nutrition	6	3.80	0.0028	
Posterior Width (PW)				
Maternal Nutrition	3	62.92	<0.0001	Hi: Acr = Mix > Por = Stv; Lo: Mix > Acr = Por > Stv; No: Mix > (Acr = Stv, Acr > Por, Stv = Por)
Larval Nutrition	2	60.62	<0.0001	Acr: Hi > Lo > No; Mix: Lo = Hi > No; Por: Lo = Hi > No; Stv: Hi = Lo, Hi > No, Lo = No
Maternal x Larval Nutrition	6	4.31	0.0011	
Ciliated Band Length (CBL)				
Maternal Nutrition	3	235.85	<0.0001	Hi: Mix = Acr > Por > Stv; Lo: Mix = Acr > Por > Stv; No: Mix > Acr > Por > Stv
Larval Nutrition	2	133.23	<0.0001	Acr: Lo > Hi > No; Mix: Lo > Hi > No; Por: Lo = Hi > No; Stv: Lo > Hi > No
Maternal x Larval Nutrition	6	3.53	0.0046	
CBL : ML				
Maternal Nutrition	3	224.28	<0.0001	Hi: Mix = Acr > Por > Stv; Lo: Mix = Acr > Por > Stv; No: Mix > Acr > Por > Stv
Larval Nutrition	2	106.62	<0.0001	Acr: Lo > Hi > No; Mix: Lo > Hi = No; Por: Lo > Hi = No; Stv: Lo > Hi > No
Maternal x Larval Nutrition	6	2.86	0.0162	
CBL : MW				
Maternal Nutrition	3	175.38	<0.0001	Hi: Acr = Mix > Por > Stv; Lo: Acr = Mix > Por > Stv; No: Mix = Acr > Por > Stv
Larval Nutrition	2	114.34	<0.0001	Acr: Lo > Hi > No; Mix: Lo > Hi = No; Por: Lo > No = Hi; Stv: Lo > Hi > No
Maternal x Larval Nutrition	6	6.54	<0.0001	
Gut Area				
Maternal Nutrition	3	62.51	<0.0001	Hi: Acr = Mix > Stv, Acr > Por = Stv, Mix = Por; Lo: Acr = Mix > Por > Stv; No: Mix = Acr = Por > Stv
Larval Nutrition	2	425.75	<0.0001	Acr: Lo > Hi > No; Mix: Lo > Hi > No; Por: Lo > Hi > No; Stv: Lo > Hi > No
Maternal x Larval Nutrition	6	4.57	0.0007	

Table S5. Results of permutational multivariate ANOVA (PERMANOVA) testing the main and interactive effects of maternal diet and larval feeding treatments on larval morphology. Maternal Diet: **Acr** = *Acropora*, **Mix** = mixed diet, **Por** = *Porites*, **Stv** = starved; Algal Food Concentration (cells ml⁻¹): **Hi** = 10⁴, **Lo** = 10³, **No** = 0.

Source	DF	pseudo-F	P(perm)	ECV ¹	Post Hoc
Day 4					
Maternal Nutrition	3	123.91	<0.0001	66.2%	Acr ≠ Mix ≠ Por ≠ Stv
Larval Nutrition	2	0.37	0.8525	4.1%	
Maternal x Larval Nutrition	6	0.82	0.6503	4.4%	
Residual	60			25.3%	
Day 10					
Maternal Nutrition	3	141.63	<0.0001	37.5%	Hi: Acr = Mix ≠ Por ≠ Stv Lo: Acr ≠ Mix ≠ Por ≠ Stv No: Acr ≠ Mix ≠ Por ≠ Stv
Larval Nutrition	2	175.23	<0.0001	38.9%	Acr: Hi ≠ Lo ≠ No Mix: Hi ≠ Lo ≠ No Por: Hi ≠ Lo ≠ No Stv: Hi ≠ Lo ≠ No
Maternal x Larval Nutrition	6	3.92	<0.0001	9.7%	
Residual	60			13.9%	

¹ ECV = estimates of components of variation.