

*The following supplement accompanies the article*

## **Latitudinal and local scale variations in a rocky intertidal interaction web**

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*Marine Ecology Progress Series 534: 39–48 (2015)*

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### **Supplement.**

#### *Maintenance of experimental treatments*

The number of limpets was generally larger within Control and PC plots than within Exclusion plots. Limpets were also generally more abundant at southern sites than at northern sites (Table S1). At northern sites, ANOVA detected a significant interaction among the three factors at Time 1 ( $F_{\text{Site} \times \text{Herb} \times \text{Barn}}=7.81$ ,  $p<0.01$ ), but SNK tests did not reveal any consistent pattern; at Time 2 analyses detected a significant effect of the removal treatment ( $F_{\text{Herb}}=7.29$ ,  $p<0.01$ ; SNK: C=PC>Excl). At southern sites, no significant effect was detected at Time 1. This was probably due to the fact that several small-sized limpets entered the Exclusion cages (Table S1). The removal treatment was more effective at Time 2 ( $F_{\text{Herb}}=3.89$ ,  $p<0.05$ ); however, SNK test was not able to detect a consistent pattern among levels of the factor Herbivore (Table S2). Percentage covers of *Chthamalus* spp. in the different treatments did not vary significantly during the study period; importantly, relative differences among levels of the barnacles treatment were maintained until the end of the experiments (Table S1).

Table S1. Mean number of individuals of *Patella* spp. (A) in the different levels of factor ‘Herbivore’ at each time of sampling and mean percentage cover of *Chthamalus* spp. (B) in the different levels of factor ‘Barnacles’ at the end of the experiments (Time 2)

A)		Time 1		Time2	
		Mean	SE	Mean	SE
North	Control	1.6	0.52	1.06	0.25
	Exclusion	0.1	0.1	0.06	0.06
	PC	0.72	0.28	1.28	0.43
South	Control	6.61	2.02	11.89	3.64
	Exclusion	2.44	0.83	1.44	0.35
	PC	4.33	2.42	5.5	2.38

B)			Time 2		
			Expected	Mean	SE
North	Site 1	100%	59	63.02	3.91
		50%	29.5	26.91	4.32
		0%	0	1.74	0.61
	Site 2	100%	74	71.53	2.41
		50%	37	43.23	2.63
		0%	0	1.22	0.35
South	Site 1-2	100%	47	51.91	2.53
		50%	23.5	25.69	2.33
		0%	0	3.39	1.22

Table S2. ANOVAs on mean number of **limpets**, separately for northern and southern sites, and for Time 1 and Time 2. \*, p<0.05, \*\*, p<0.01. When interaction terms were significant, only SNK tests of interest were reported.

Source of Variation	North					South					Den
	df	Time 1		Time 2		df	Time 1		Time 2		
Site	1	0.004	0.02	0.08	0.34 <sup>b</sup>	1.260	1.24 <sup>b</sup>	0.062	0.05 <sup>b</sup>	Res	
Herbivore =He	2	1.982	21.23*	1.776	7.29 <sup>b**</sup>	2.584	2.54 <sup>b</sup>	4.458	3.89 <sup>b</sup>	Site x He	
Barnacles = Barn	2	0.095	0.21	0.380	0.69	1.073	0.81	3.135	0.99	Site x Barn	
Site x He <sup>a</sup>	2	0.093	0.36	0.010	pooled	0.064	pooled	0.715	pooled	Res	
Site x Barn	2	0.452	1.72	0.547	2.25 <sup>b</sup>	1.321	1.30 <sup>b</sup>	3.168	2.76 <sup>b</sup>	Res	
He x Barn	4	0.042	0.06	0.141	0.35	1.536	2.21	1.345	1.13	Site x He x Barn	
Site x He x Barn	4	0.710	2.70*	0.397	1.63 <sup>b</sup>	0.695	0.68 <sup>b</sup>	1.186	1.03 <sup>b</sup>	Res	
Residual = Res <sup>a</sup>	36	0.263		0.257		1.072		1.170			
<sup>a</sup> pooled factors	38			0.244		1.019		1.146			
Cochran's test		0.30, ns		0.23,ns		0.18,ns		0.15,ns			
Transformation		Ln(x+1)		Ln(x+1)		Ln(x+1)		None			

<sup>b</sup> tested on pooled factors

**SNK tests**

*Site x Herb x Barn:*

SN1

100%: Contr= PC =Excl

50%: Contr> PC ,  
(Excl not ranked)

0%: PC =Contr=Excl

SN2

100%: Contr= PC =Excl

50%: PC =Contr=Excl

0%: Contr>Excl,  
(PC not ranked)

**SNK tests**

*Herbivore:*

Contr= PC >Excl

**SNK tests**

*Herbivore:*

Contr= PC >Excl

Table S3. ANOVAs on **total MPB biomass** ( $F_{0\text{TOT}}$ ), separately for northern and southern sites, and for Time 1 and Time 2. \*,  $p < 0.05$ . When interaction terms were significant, only SNK tests of interest were reported.

Source of Variation	North					South					
	df	MS	F	MS	F	df	MS	F	MS	F	Den
Site	1	718864	0.86	8011184	0.01	4254300	4.81*	2431170	2.41	Res	
Herbivore = He	2	1822848	0.19	3248812	0.18	6955460	0.56	3873950	0.77	Site x He	
Barnacles = Barn	2	1543060	10.06	1273360	82.26*	2431550	0.17	7148576	0.02	Site x Barn	
Site x He	2	9479832	1.53	6280616	1.26	9096640	0.83	5064100	0.95	Res	
Site x Barn	2	8893336	4.33*	4763380	0.59	8718080	1.26	8936060	1.02	Res	
He x Barn	4	7708776	2.65	4864072	0.35	9988420	0.33	2941120	0.61	Site x He x Barn	
Site x He x Barn	4	3252900	0.27	1329660	0.54	8995580	1.49	1865220	0.58	Res	
Residual = Res	36	4976063		9340229		6671860		8924680			
Cochran's test	0.21, ns		0.19, ns		0.25, ns		0.13, ns				
Transformation	none		none		none		None				
	<b>SNK tests</b>			<b>SNK tests</b>			<b>SNK tests</b>				
	<i>Site x Barnacles:</i>			<i>Barnacles:</i>			<i>Site:</i>				
	SN1: 100% > 0%,			100% > 50% > 0%			SS1 > SS2				
	(50% not ranked)										
	SN2: 100% > 50% = 0%										

Table S4. ANOVAs on **MPB biomass** ( $F_{0\text{ROCK}}$ ) **per unit area of rock** surface (24 mm<sup>2</sup>), separately for northern and southern sites, and for Time 1 and Time 2. \*, p<0.05, \*\*\*, p<0.001.

Source of Variation	North					South					Den
	df	MS	Time 1 F	Time 2 MS	F	df	MS	Time 1 F	Time 2 MS	F	
Site	1	48367.30	3.41	0.19	0.00§	2325076.93	3.45	1011334.91	3.26	Res	
Herbivore =He	2	53290.44	51.70*	10683.34	4.79	319045.55	0.64	199663.92	0.73	Site x He	
Barnacles = Barn	2	138975.52	2.31	46301.83	9.33§***	246822.75	0.30	34221.71	0.09	Site x Barn	
Site x He	2	1030.69	0.07	2229.40	0.45§	496708.51	0.74	274528.67	0.89	Res	
Site x Barn <sup>a</sup>	2	60070.11	4.23*	4271.13	pooled	835117.79	1.24	364181.70	1.18	Res	
He x Barn	4	1437.77	0.28	3250.76	0.65	360411.31	0.36	117053.25	0.61	Site x He x Barn	
Site x He x Barn <sup>a</sup>	4	5210.10	0.37	1537.52	pooled	1011733.15	1.50	191312.98	0.62	Res	
Residual = Res <sup>a</sup>	36	14204.26		5383.98		673624.66		1309863.67			
<sup>a</sup> pooled factors	42			4964.66							
Cochran's test		0.28, ns		0.31,ns		0.22,ns		0.15,ns			
Transformation		none		none		none		None			

§ tested on pooled factors

**SNK tests**

*Herbivore:*

Control=Exclusion < PC

**SNK tests**

*Barnacles:*

100% > 0% = 50%

*Site x Barnacles:*

Site 1: 100% > 0%

(50% not ranked)

Site 2: 100% > 0% = 50%

Table S5. ANOVAs on **mean MPB maximum photosynthetic efficiency** ( $F_m/F_{0\text{ MEAN}}$ ), separately for northern and southern sites, and for Time 1 and Time 2. \*,  $p < 0.05$ , \*\*\*,  $p < 0.001$ .

Source of Variation	North					South				
	df	MS	F	MS	F	MS	F	MS	F	Den
Site	1	0.0085	4.17*	0.0154	5.81*	0.0679	18.97***	0.0061	1.74	Res
Herbivore = He	2	0.0024	0.46	0.0009	0.45	0.0031	3.61	0.0130	2.90	Site x He
Barnacles = Barn	2	0.0017	0.27	0.0062	2.71	0.003	1.06	0.0038	0.65	Site x Barn
Site x He	2	0.0053	2.59	0.0019	0.72	0.0009	0.24	0.0045	1.27	Res
Site x Barn	2	0.0063	3.07	0.0023	0.86	0.0029	0.80	0.0058	1.63	Res
He x Barn	4	0.0025	0.66	0.0025	2.36	0.0018	1.18	0.0049	3.56	Site x He x Barn
Site x He x Barn	4	0.0037	1.82	0.0011	0.41	0.0015	0.43	0.0014	0.39	Res
Residual = Res	36	0.002		0.0026		0.0036		0.0035		
Cochran's test		0.14, ns		0.28, ns		0.32, ns		0.16, ns		
Transformation		none		none		none		none		
		<b>SNK tests</b>		<b>SNK tests</b>		<b>SNK tests</b>				
		<i>Site:</i>		<i>Site:</i>		<i>Site:</i>				
		SN2>SN1		SN1>SN2		SS1>SS2				

Table S6. ANOVAs on mean percentage covers of **erect algae** at southern sites, separately for Time 1 and 2. \*\*\*, p<0.001. When interaction terms were significant, only SNK tests of interest were reported.

Source of Variation	South					
	df	Time 1		Time 2		Den
Site	1	29.606	23.19***	11.864	15.32***	Res
Herbivore =He	2	0.551	1.49	0.520	2.62	Site x He
Barnacles = Barn	2	0.544	0.43	0.455	0.48	Site x Barn
Site x He	2	0.371	0.29	0.199	0.26	Res
Site x Barn <sup>a</sup>	2	1.271	1.00	0.943	1.22	Res
He x Barn	4	0.468	1.45	0.185	0.96	Site x He x Barn
Site x He x Barn <sup>a</sup>	4	0.322	0.25	0.194	0.25	Res
Residual = Res <sup>a</sup>	36	1.277		0.775		
Cochran's test		0.20, ns		0.24,ns		
Transformation		Ln(x+1)		Ln(x+1)		
		<b>SNK tests</b>		<b>SNK tests</b>		
		<i>Site:</i>		<i>Site:</i>		
		SS2>SS1		SS2>SS1		

Table S7. ANOVAs on mean percentage covers of **encrusting cyanobacteria** at Time 2, separately for northern and southern sites. \*\*, p< 0.01, \*\*\*, p<0.001. When interaction terms were significant, only SNK tests of interest were reported.

Source of Variation	Time 2					
	North			South		
	df	MS	F	MS	F	Den
Site	1	36.876	57.36***	0.820	1.90	pooled factors
Herbivore =He	2	0.475	4.94	0.322	0.73	Site x He
Barnacles = Barn	2	3.100	0.77	0.192	1.28	Site x Barn
Site x He	2	0.096	0.15	0.442	1.03	pooled factors
Site x Barn	2	4.036	6.28§**	0.151	0.35	pooled factors
He x Barn	4	0.683	1.06	1.057	2.45	Site x He x Barn
Site x He x Barn <sup>a</sup>	4	0.144	pooled	0.177	pooled	
Residual = Res <sup>a</sup>	36	1.277		0.459		
<sup>a</sup> pooled factors	40			0.431		
Cochran's test		0.20, ns			0.24,ns	
Transformation		Ln(x+1)			Ln(x+1)	
§ tested on pooled factors		<b>SNK tests</b> <i>Site x Barnacles</i> SN1: 100%=50%=0% SN2: 100%>50%=0%				



Table S8. ANOVAs on the mean number of **littorinids**, separately for northern and southern sites, and for Time 1 and Time 2. \*, p<0.05, \*\*, p<0.01, \*\*\*, p<0.001.

Source of Variation	df	North				South				Den
		Time 1		Time 2		Time 1		Time 2		
	MS	F	MS	F	MS	F	MS	F		
Site	1	9949.80	9456§***	6.78	6.48*	422.24	8.26**	689.80	9.65**	Res
Herbivore =He	2	49.13	0.13	1.37	0.95	68.07	0.58	37.02	0.54	Site x He
Barnacles = Barn	2	82.46	0.25	1.28	1.61	93.46	0.44	130.24	0.29	Site x Barn
Site x He	2	387.46	3.68§*	1.44	1.37	117.85	2.31	68.35	0.96	Res
Site x Barn	2	335.02	3.18§	0.80	0.76	214.02	4.19*	448.02	6.27**	Res
He x Barn	4	93.46	0.89§	0.33	0.46	33.80	1.11	39.99	0.81	Site x He x Barn
Site x He x Barn <sup>a</sup>	4	17.69	pooled	0.74	0.70	30.46	0.60	49.49	0.69	Res
Residual = Res <sup>a</sup>	36	114.94		1.05		51.11		71.50		
<sup>a</sup> pooled factors	40	105.22								
Cochran's test		0.27, ns		0.14,ns		0.25,ns		0.23,ns		
Transformation		none		Ln(x+1)		none		None		
§ tested on pooled factors										
		<b>SNK tests</b>		<b>SNK tests</b>		<b>SNK tests</b>		<b>SNK tests</b>		
		<i>Site x Herbivore:</i>		<i>Site:</i>		<i>Site x Barnacles:</i>		<i>Site x Barnacles:</i>		
		SN1: Contr=Excl= PC		SN1>SN2		SS1: 100%=50%>0%		SS1: 100%=50%>0%		
		SN2: Contr>Excl				SS2: 100%=50%=0%		SS2: 100%=50%=0%		
		(PC not ranked)								