

Effects of the decline of the alga *Fucus serratus* at the rear edge of its range on benthic assemblages and trophic linkages

Linney Duarte*, Francesca Rossi, Cristina Docal, Rosa M. Viejo

*Corresponding author: linney.duarte.mora@urjc.es

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Table S1. PERMANOVA for the effects of Date, Location and Site on macroalgal assemblages, $n = 4$. *A posteriori* comparisons for differences between Locations per Date, and Location per Site are also shown. Monte Carlo asymptotic p-value was used both for the Location term in PERMANOVA and the pairwise comparisons. Nv = Novellana, Cd = Cadavedo, AL = Area Longa, SP = San Pedro.

		Density			
Source	df	MS	F	p	
Date, D	1	3284.6	1.84	0.124	
Location, L	3	11623.2	4.00	0.003	
Site (L)	4	2919.3	6.03	0.001	
D x L	3	3870.4	2.17	0.049	
D x S (L)	4	1787.2	3.69	0.001	
Residual	48	483.7			

<i>A posteriori</i> comparisons D x L					
		October		July	
		t	p	t	p
Within areas	SP vs AL	0.97	0.469	1.31	0.263
	Nv vs Cd	0.86	0.557	1.19	0.318
Between areas	Nv vs SP	3.30	0.041	2.34	0.082
	Nv vs AL	2.56	0.074	2.19	0.084
	Cd vs SP	2.84	0.048	1.58	0.204
	Cd vs AL	2.26	0.074	1.40	0.259

<i>A posteriori</i> comparisons D x S (L)					
		October		July	
		t	p	t	p
Sites within	SP	1.30	0.208	1.39	0.126
	AL	2.20	0.015	1.29	0.186
	Cd	2.07	0.023	3.01	0.004
	Nv	1.93	0.021	2.69	0.006

Table S2. Macroalgal species contributing to approximately the first 50% of cumulative percentage of the average dissimilarities between central and marginal locations in October, and between Novellana and the group of Cadavedo and central locations in July (SIMPER analyses, *Fucus serratus* excluded). The percentage cover, mean and SE, and the order and percentage of contribution of each species are indicated.

Species	October				July			
	Central SP, AL Mean (SE) n = 16	Marginal Nv, Cd Mean (SE) n = 16	contribution Order	Cd, SP, AL %	Cd, SP, AL Mean (SE) n = 24	Nv Mean (SE) n = 8	contribution Order	%
<i>Ceramium</i> spp.		22.99 (3.86)	1	14.8	2.69 (0.98)	11.42 (1.96)	3	6.1
<i>Ulva clathrata</i>	0.20 (0.11)	15.35 (3.30)	2	11.4	0.27 (0.13)	4.91 (2.00)	5	5.5
<i>U. rigida</i>					1.81 (0.54)	12.01 (4.26)	2	6.5
<i>Phymatolithon</i> spp.	4.32 (0.92)		3	8.6	8.38 (3.95)	2.04 (0.79)	8	5.0
<i>Corallina</i> spp.	52.24 (4.51)	12.58 (2.37)	4	6.5	35.13 (5.94)	27.31 (5.20)	4	5.6
<i>Cladosthephus spongiosus</i>	5.91 (1.37)	3.15 (1.07)	5	5.7	3.54 (1.24)	6.30 (2.65)	6	5.5
<i>Osmundea pinnatifida</i>	0.64 (0.15)	3.37 (0.61)	6	5.3				
<i>Leathesia difformis</i>					0.38 (0.21)	4.92 (1.12)	1	6.9
Soft crustose species					6.86 (2.33)	2.47 (1.26)	7	5.4
Cumulative average % dissimilarity				52.3				46.4

Table S3. Invertebrate species contributing to approximately the first 50% of cumulative percentage of the average dissimilarities between Novellana and the central locations (SIMPER analysis of dry weight, data from different dates were pooled). The dry weight (mean and SE), and the order and percentage of contribution of each species are indicated. Locations abbreviations as in Fig. 1, n = 10 in Nv; 20 in the group SP and AL.

Species	Dry weight (g/ 90 cm ²)			Contribution	
	SP, AL Mean (SE)	Nv Mean (SE)		Order	%
<i>Ocenebra erinaceus</i>	2.14 (0.60)	0.07 (0.03)		1	9.4
<i>Rissoa</i> spp.	3.94 (1.48)	0.09 (0.08)		2	8.2
<i>Gibbula</i> spp.	4.43 (0.60)	0.70 (0.35)		3	7.6
<i>Nassarius</i> spp.	0.43 (0.06)	0.05 (0.02)		4	5.6
<i>Tricolia pullus</i>	0.18 (0.06)	0.01		5	4.5
<i>Patella</i> spp.	0.14 (0.05)	0.08 (0.04)		6	4.1
<i>Acanthochitona</i> spp.	0.56 (0.31)	0.15 (0.06)		7	4.0
<i>Dynamene bidentata</i>	0.06 (0.02)	0.01		8	3.8
<i>Barleeia unifasciata</i>	0.53 (0.01)	0.09 (0.04)		9	3.7
Cumulative percentage of dissimilarity					49.20

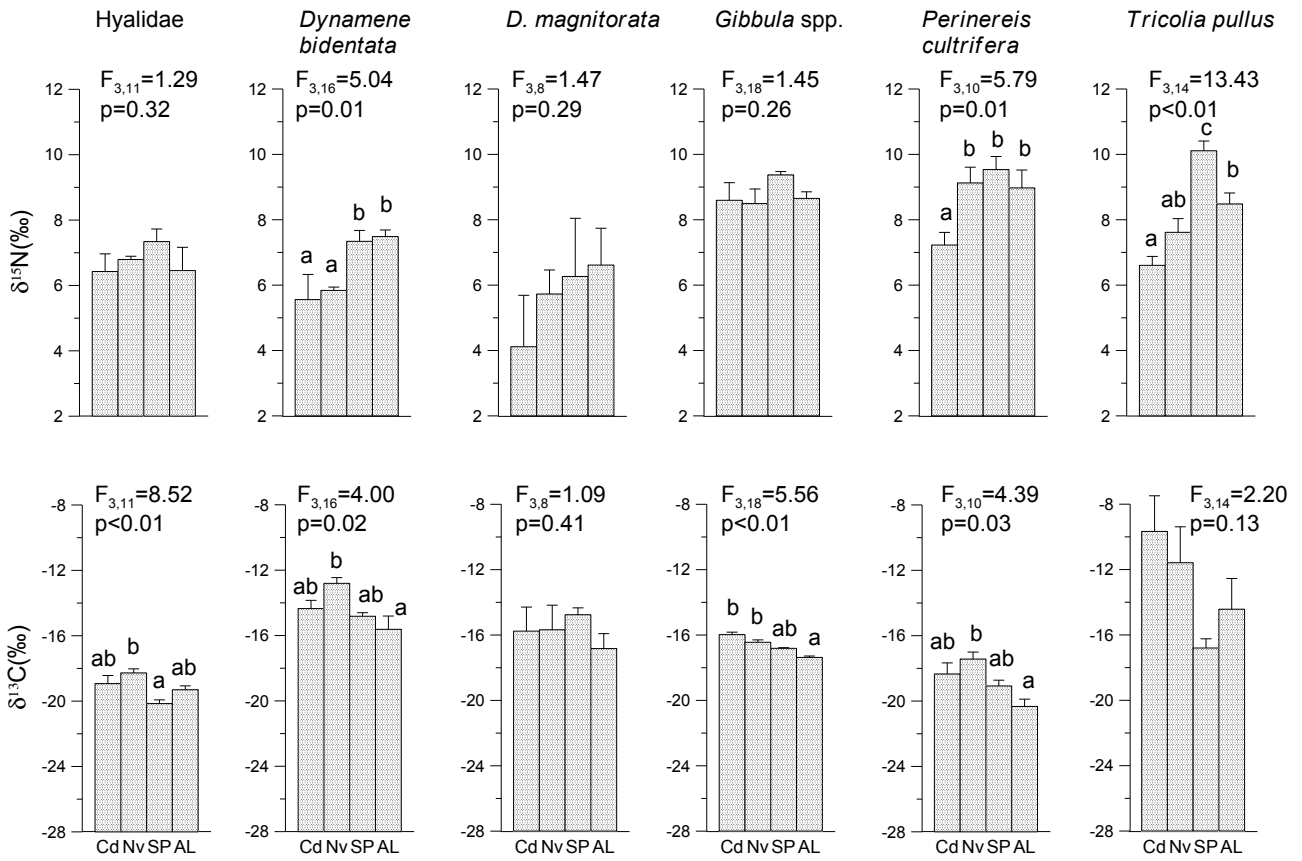


Fig. S1. $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values (mean \pm SE) for different consumers in the studied locations (October data). Locations abbreviations as in Fig. 1. The results of the ANOVA are shown. Means sharing lower case letters do not differ significantly based on SNK tests.

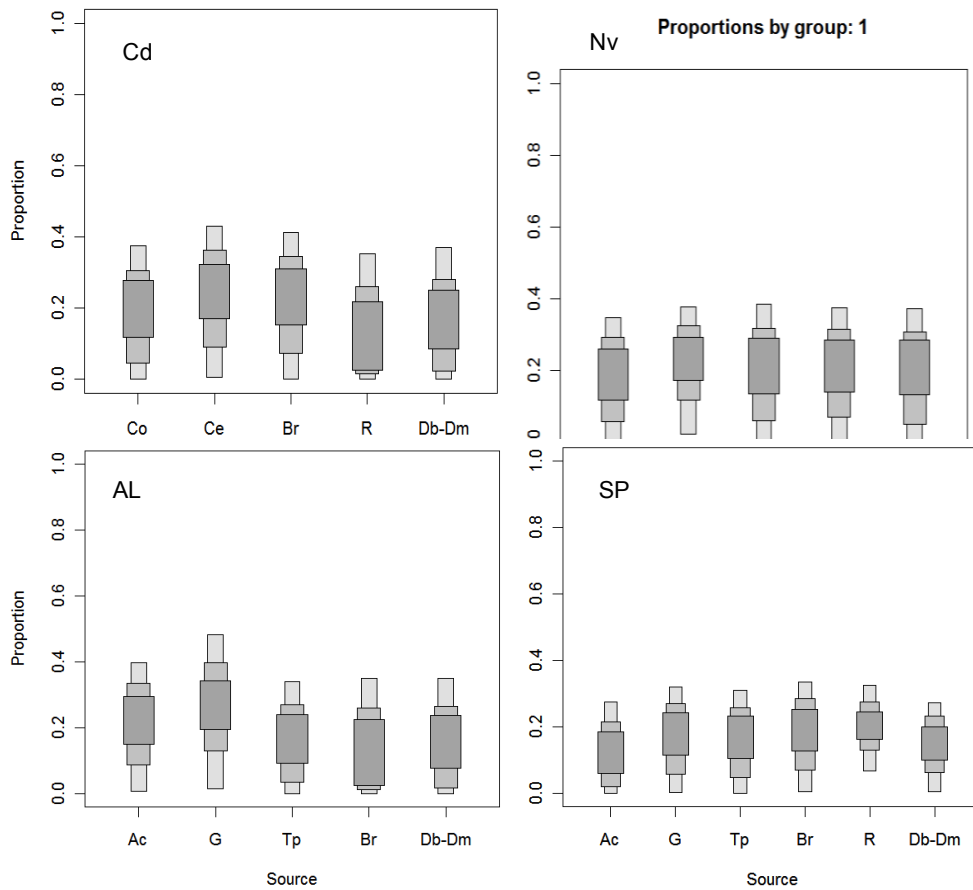


Fig. S2. Contributions of potential food sources to the diet of the crab *Pirimela denticulata* as determined by the Bayesian mixing models SIAR. The 50, 75 and 95% credible intervals (dark to light boxes) are shown in marginal (Cadavedo, Cd; Novellana, Nv) and central (Area Longa, AL, San Pedro, SP) locations. Data from October. See Table 1 for species abbreviations. Db-Dm: data from those two species of isopods were pooled before running the analyses.