

Orientation in a keystone grazer: interactions between habitat and individual identity drive patterns of resting behaviour

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Supplement 1. Additional Methods

Does labelling a resting site modify reoccupation frequencies and patterns of orientation?

Methods

To examine patterns of resting site reoccupancy and the orientation of individuals within those resting sites it is important to ensure that the method of identifying resting sites does not interfere with the ability of individuals to locate or position themselves in those sites. Gluing labels made of waterproof paper next to resting sites to identify them is a cheap and reliable method but limpets may be deterred by the glue/paper or be blocked from occupying the resting site. Alternatively if labels are placed over a limpet's mucus trail this may decrease the probability of individual limpets locating that particular resting site by using their own trail, or that laid by a conspecific. The effect of gluing waterproof paper labels to identify resting site locations on either the frequency of resting sites being reoccupied or the orientation of reoccupants within that resting site was tested in a pilot study done during September 2011 at Cape Banks. Labels were glued adjacent to each limpet using Selleys® Araldite epoxy adhesive or a control mark of nail enamel was painted next to the limpet (Figure S1), which has previously been shown to have no effect (Chapman 1994). The head orientation of each resting site occupant was measured as described previously (Fraser et al. 2010; Fraser et al. 2014). After three days the occupation status of each resting site and the orientation of all limpets in previously occupied resting sites were recorded. A G test of independence with William's correction (Sokal and Rohlf 1995) was done to test the null hypothesis that the frequency

of limpets occupying and orientating in the same direction was independent of whether the site was labelled by a waterproof label or only an enamel mark.

Results

As 63/124 resting sites were reoccupied when labelled with waterproof paper and 35/61 resting sites reoccupied when labelled by nail enamel, the presence of the waterproof paper as a label did not affect the probability of a resting site being reoccupied ($G_{adj} = 0.70$, $df = 1$, ns). The frequency of a limpet orientating in the same direction in that resting site was also not affected by the presence of the waterproof paper label (with label 39/63, without label 18/35 limpet occupants orientating in the same direction) ($G_{adj} = 0.99$, $df = 1$, ns).

References

- Chapman MG (1994) Small scale and broad scale patterns of distribution of the upper shore Littorinid *Nodilittorina pyramidalis* in New South Wales. *Aust. J. Ecol.* 19,83-95
- Fraser CML, Coleman RA, Klein JC (2010) Up or down? Limpet orientation on steeply sloped substrata. 11,91-98
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Figure S1. Limpet labelled with a) Waterproof paper, b) shellfish tag and c) nail enamel

Supplement 2.

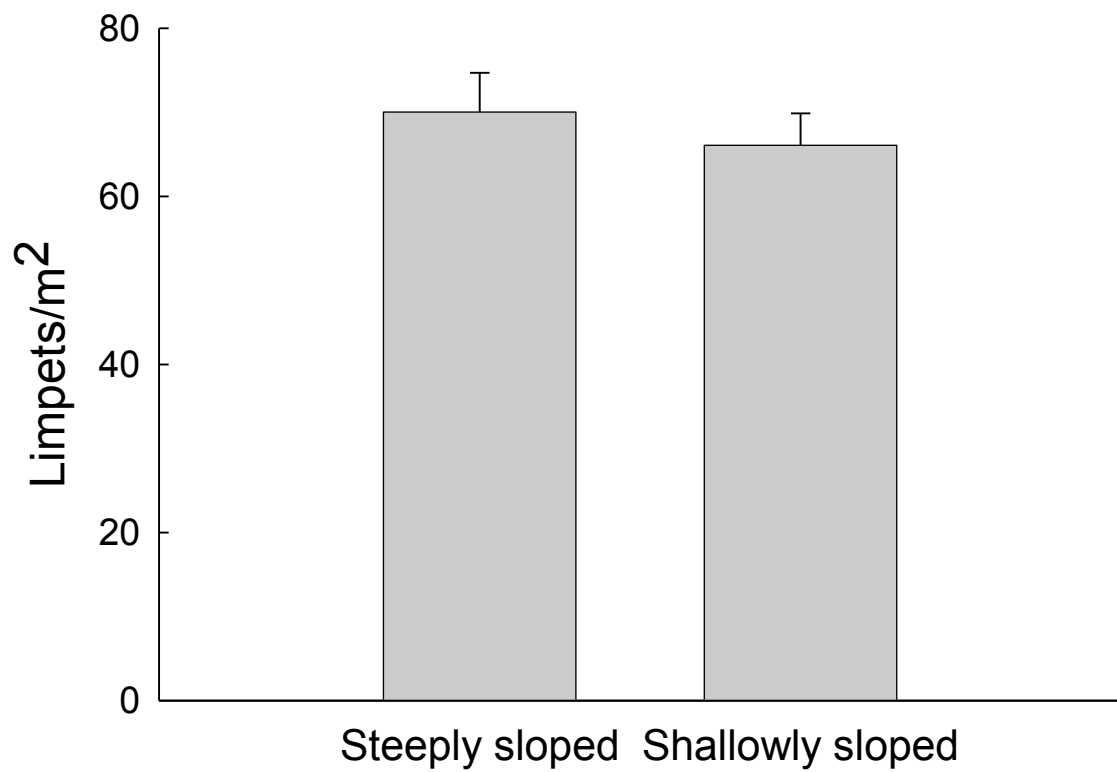


Figure S2. Comparison of the mean (+ s.e.) density of limpets on steeply sloped (>60°) and shallowly sloped substrata (<30°)

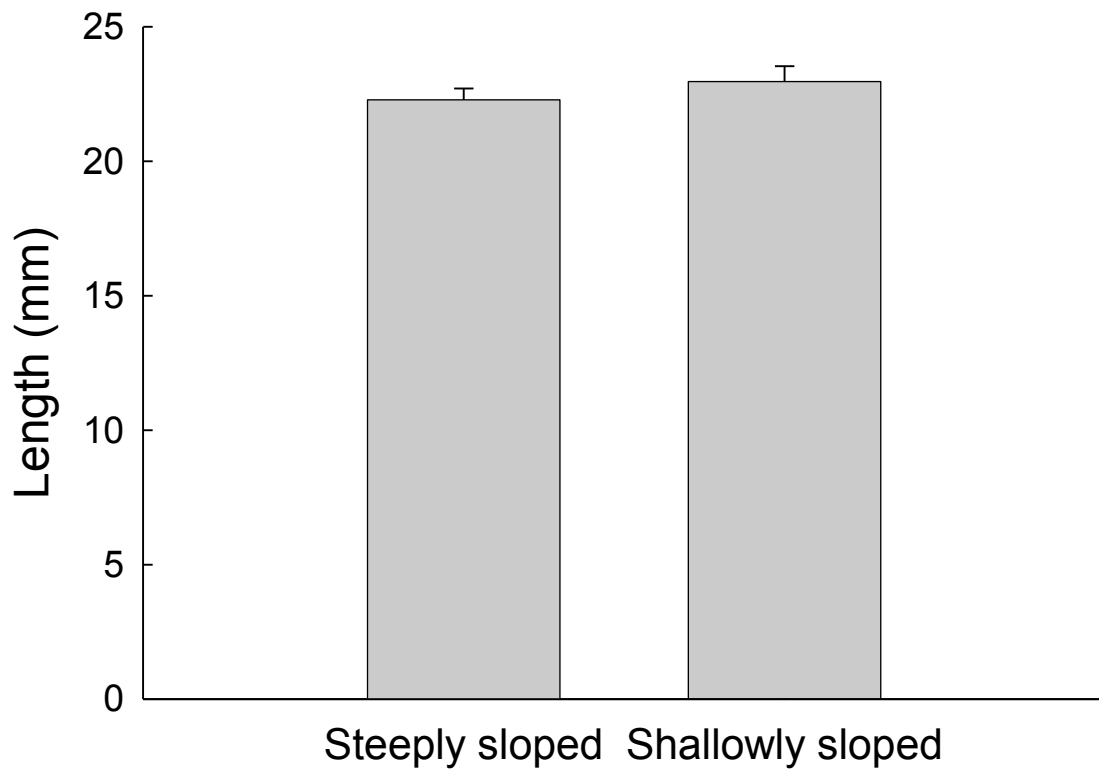


Figure S3. Comparison of the mean (+ s.e.) size of limpets on steeply sloped (>60°) and shallowly sloped substrata (<30°)

Table S1. Testing the null hypothesis that there is no difference in the mean density of limpets (limpets/m²) on shallowly sloped and steeply sloped substrata (n=72). There was no significant levels of heteroscedasticity (Cochran's test C=0.60)

Source	df	MS	F	p
Substrata	1	565.34	0.43	> 0.50
Residual	142	1305.74		

Table S2. Testing the null hypothesis that there is no difference in the mean size of limpets on shallowly sloped and steeply sloped substrata (n=89). There was significant levels of heteroscedasticity (Cochran's test C=0.65) but this is not a problem as type I error could not have occurred (the null hypothesis was accepted).

Source	df	MS	F	p
Substrata	1	21.06	0.96	> 0.05
Residual	176	22.02		

Table S3. Testing the null hypothesis that there is no difference in the mean number of times a resting site is occupied between “downwards facing resting sites” and other resting sites. There was no significant levels of heteroscedasticity (Cochran's test C=0.20)

Source	df	MS	F	p
Patch Pa	3	14.94	3.36	< 0.05
Resting site RS	1	0.72	0.09	> 0.78
Pa x RS	3	8.15	1.83	> 0.14
Residual	192	4.44		