

Common Periwinkle (*Littorina littorea*) morphology



Energy

Periwinkles are primary consumers. Food source abundance may be different at different levels on the shore. This may affect growth rates and size. Feeding time may be shorter on shores with high levels of wave exposure.

Behaviour

Response to external stimuli- migrate to sheltered areas away from effects of wave action responding to direction of wave movement and light

Interaction with other species:

Higher density of crabs on wave sheltered shores therefore higher predation pressure. Selection for smaller aperture in relation to shell size to minimise crab predation.

Genotype / phenotype

Planktonic stage, therefore genetically distinct populations will not develop on shores in close geographical proximity, but environmental factors may influence variation: selection for shape best adapted to minimise effects of wave action, increased shell thickness and increased foot size for greater adhesion.

Periwinkle morphology:
Wave action

Distribution	Reproduction and growth	Limiting factors:	Adaptations
Mid-shore	Separate sexes, internal fertilisation, trochophore/veliger larvae, lives for 5+ years	<p>Desiccation:</p> <p>Feeding:</p> <p>Temperature tolerance:</p> <p>Behavioural:</p>	<p>Non porous shell, tight fitting operculum. Survival period in dry air (50% dead) 23 days. Uric acid content of nephridia (organs which carry excretory products) 1.5 mg g⁻¹ (Nicol, 1967). Lost 37.5% of original weight after 7 days at 18°C, with 70% mortality (Lewis, 1964).</p> <p>Micro-organisms, detritus, <i>Ulva</i>, <i>Enteromorpha</i>.</p> <p>Lethal temperature (50% dead) 46.0°C (Southward 1958).</p> <p>Response to light and water currents enables snails to maintain their position. (Little and Kitching, 1996).</p>

Methods

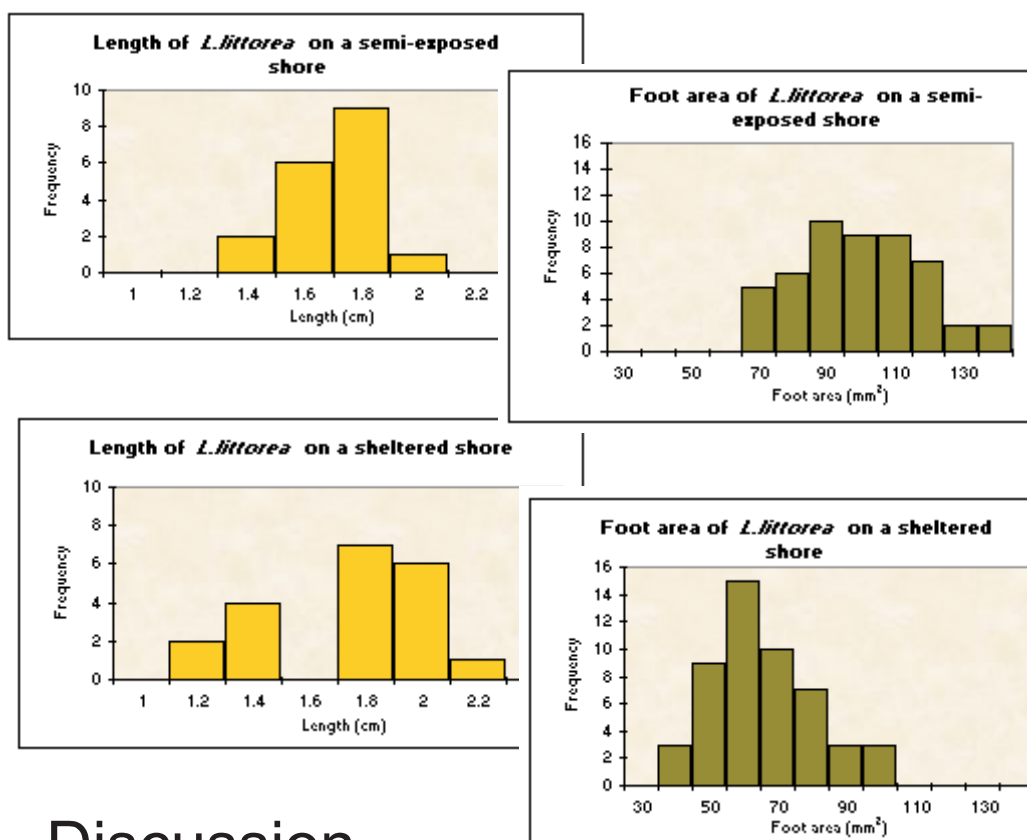
- hypothesis?
- justification of approach?
- what is the independent variable? the dependent variable?
- optimum sample size? calculate by running mean or standard deviation?
- sampling method? random or systematic sampling?
- statistical analysis?
- how to measure the size of periwinkles? the accuracy of the calipers?
- periwinkle shape? - can this be quantified?
- which shore level? - how to locate middle shore?
- how to assess wave exposure?
- how to minimise environmental variables? - e.g. if comparing shores of different wave exposure
- sampling needs to be at similar levels and in similar areas on each shore
- how can you control abiotic factors such as temperature, humidity and wind speed?

Typical investigations

Effect of wave exposure

- shell length
- shell width
- foot area
- aperture size

Typical results



Analysis

	Semi-exposed shore		Sheltered shore				
	Mean	S.D.	Mean	S.D.	calculated t-value	probability	H ⁰
Age	4.90	0.31	4.85	0.37	0.49	p>0.05	accept
Length (cm)	1.65	0.61	1.70	0.29	0.68	p>0.05	accept
Width (cm)	1.28	0.13	1.22	0.19	1.32	p>0.05	accept
Aperture length (cm)	1.17	0.12	1.11	0.14	1.36	p>0.05	accept
Length: aperture ratio	1.42	0.06	1.53	0.17	2.90	P<0.05	reject
Length: width ratio	1.28	0.06	1.40	0.17	2.75	P<0.05	reject

Discussion

- are Periwinkles significantly larger overall on sheltered or exposed shores?
- does exposure result in a Periwinkle with a relatively larger or smaller foot (or aperture)?
- what are the advantages of a larger foot size? (see Raffaelli, 1982) and others)
- what type of shell would reduce predation by crabs on Periwinkles? Where are crabs most common?
- what size and shape of shell is most advantageous on a wave exposed shore?