

# Dog Whelk (*Nucella lapillus*) morphology

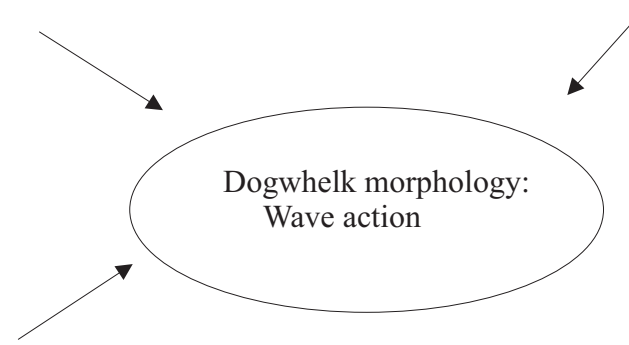


## Energy

Dogwhelks are secondary consumers. Food source may be different on shores of different exposure e.g. barnacles or mussels may dominate. Different foods have different nutritional quality and may influence size. Prey density may differ on different shores.

## 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

No planktonic larval stage, eggs laid on shore therefore genetically distinct populations may develop.

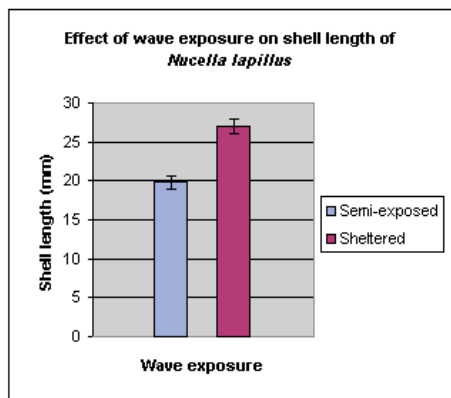
**Environmental factors influence variation:** selection for shape best adapted to minimise effects of wave action and increased foot size for greater adhesion

Distribution	Reproduction and growth	Limiting factors:	Adaptations
Mid to low shore.	Separate sexes, internal fertilisation, egg capsules laid on shore hatch directly to crawling young, lives for 5+ years.	Desiccation: Temperature tolerance: Feeding:  Wave exposure:  Predation:	Non porous shell. Water loss after 7 days at 18°C as a % of original: 37.2, 100% mortality. Lethal temperature (50%) 40°C (Evans, 1948) Feeds on barnacles and mussels by physical and chemical means, secretes an enzyme to soften the shell and the prey is injected with a narcotic. Morphology varies with wave action: on sheltered shores have narrow thick shells, on exposed shores have wide thin shells. In exposure larger feet gives protection from wave action, in shelter thick shells gives protection from crab predation. Production of 'teeth' protects against crab predation.

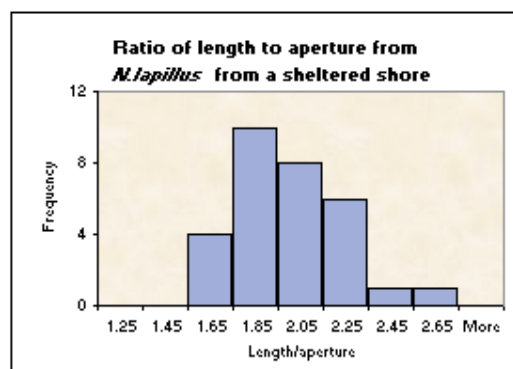
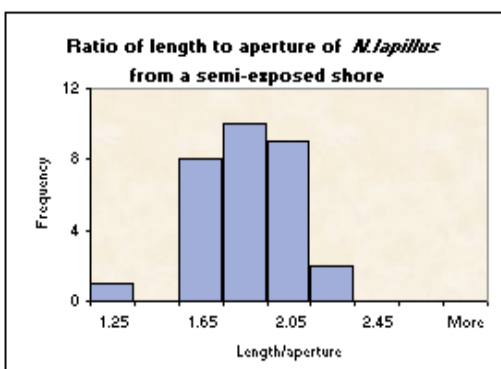
## Methods

- 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 Dogwhelks? the accuracy of the calipers?
- Dogwhelk shape? - can this be quantified?
- which shore level? - how to locate middle or lower 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 results



## Analysis



	Semi-exposed shore		Sheltered shore		t-value	probability	H <sup>0</sup>
	Mean	S.D.	Mean	S.D.			
Length (mm)	19.8	2.2	27.0	2.5	11.75	P<0.001	reject
Width (mm)	12.2	1.1	14.9	1.5	7.86	P<0.001	reject
Aperture (mm)	11.2	1.2	14.4	2.3	2.53	P<0.05	reject
Length: Aperture ratio	1.78	0.23	1.90	0.22	2.11	P<0.05	reject
Length: Width ratio	1.62	0.12	1.82	0.14	5.90	P<0.001	reject
Thickness (mm)	1.32	0.62	0.95	0.49	2.53	P<0.05	reject

## Discussion

- are Dogwhelks significantly larger overall on sheltered or exposed shores?
- does exposure result in a Dogwhelk with a relatively larger or smaller foot (or aperture)?
- what are the advantages of a larger foot size? Can relationships between foot size, shell size, aperture size and wave exposure in other species e.g. Littorinids (see Raffaelli, 1982) and others be used to infer relationships in Dogwhelks?
- what type of shell would reduce predation by crabs on the Dogwhelk? Where are crabs most common?
- what other factors might reduce desiccation on wave exposed shores?
- what size and shape of shell is most advantageous on a wave exposed shore?