

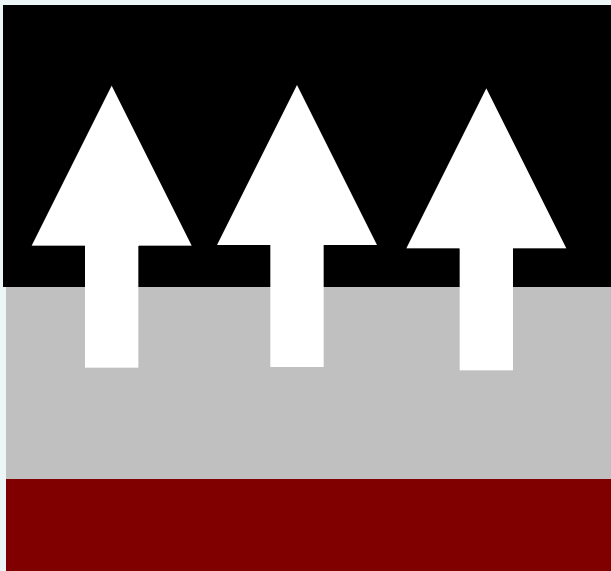
Problems of Shore Life



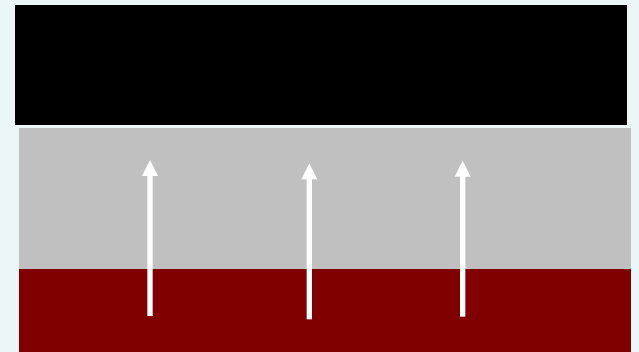
Exposure

The amount of wave energy dissipated
on a shore

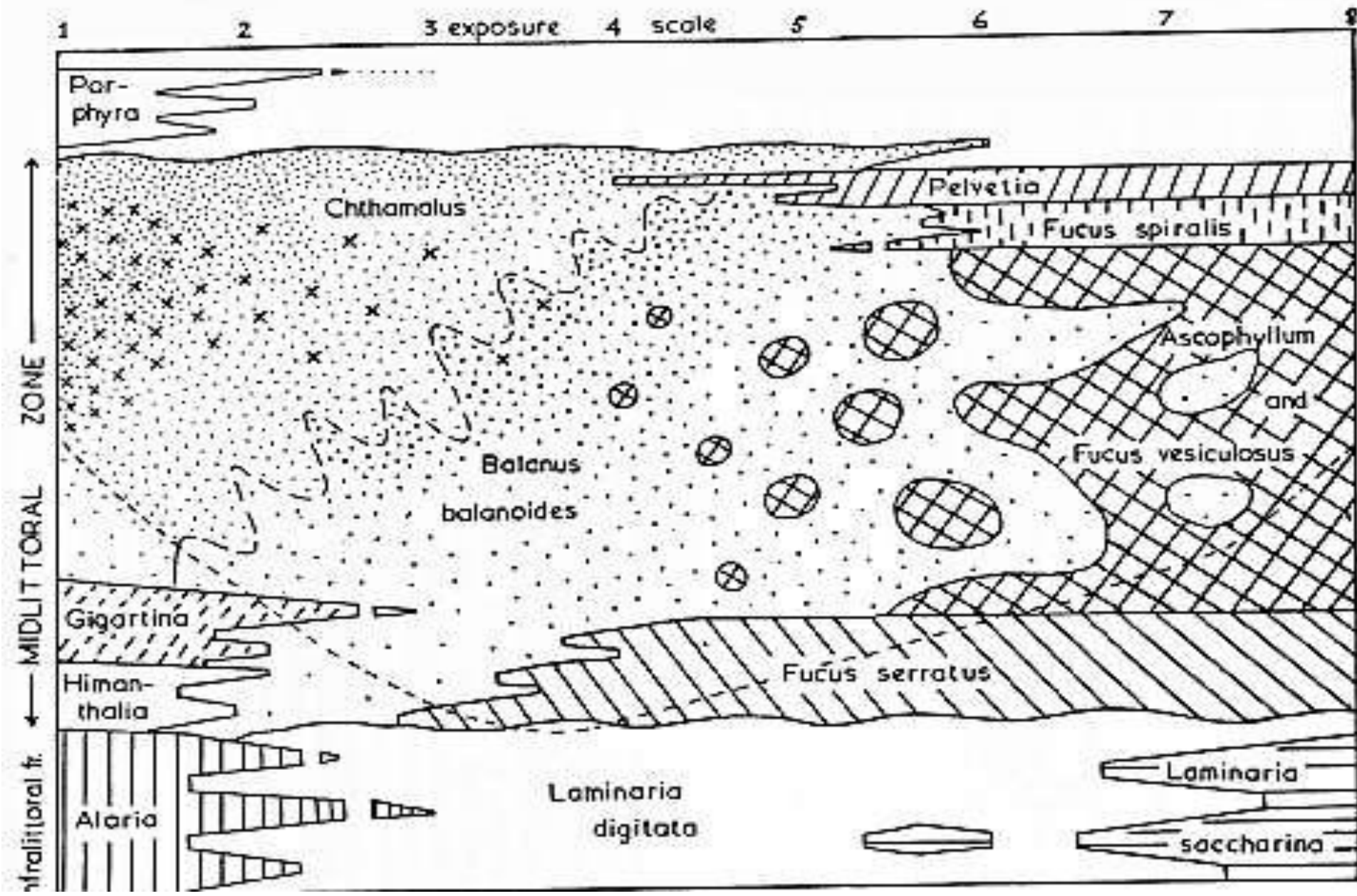
Exposed shores get lots of
wave action



Sheltered shores get little
wave action



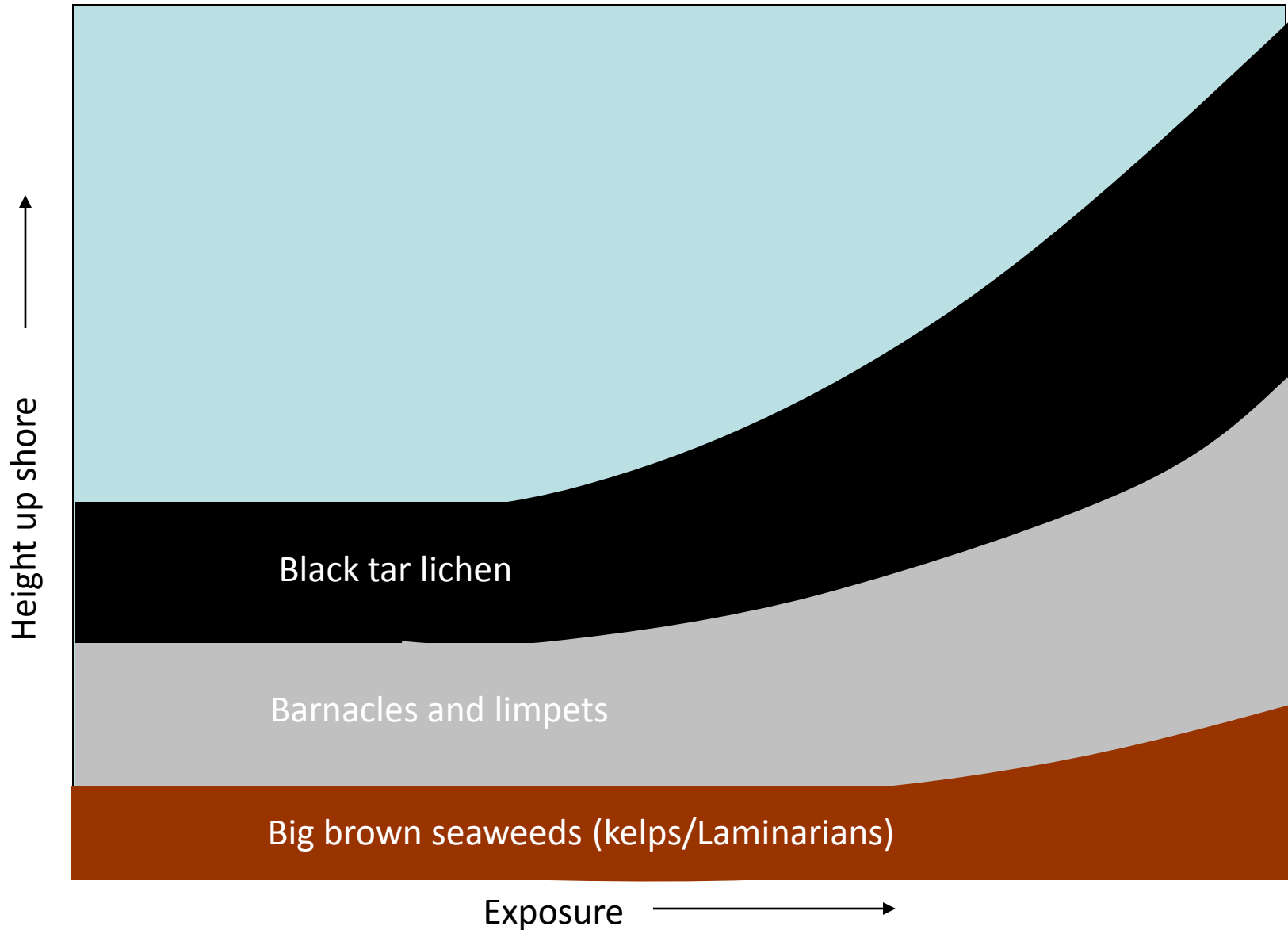
Ballantine's Exposure Scale



Exposed Shore



The Effects of Exposure on Zonation



Indicators of Exposure

Exposed Shores



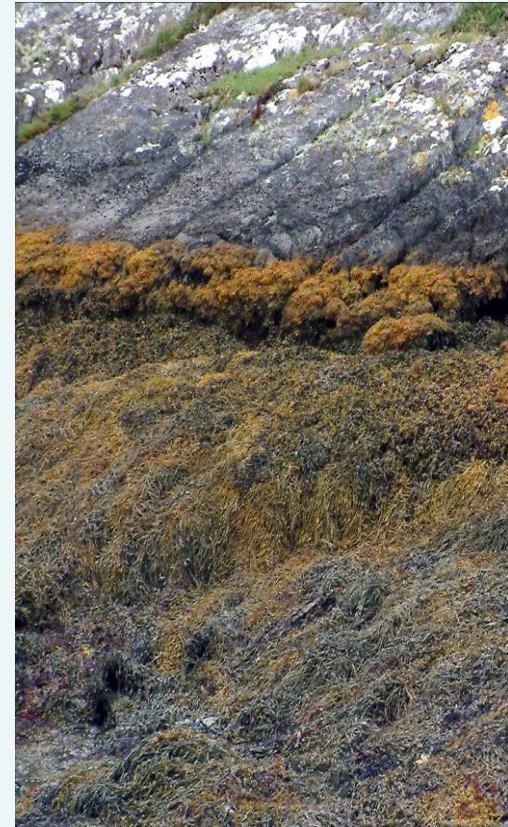
Few seaweeds

Lots of shelled
stuck down
sessile animals

Low diversity

Broad splash
zone

Sheltered Shores



Lots of
seaweeds

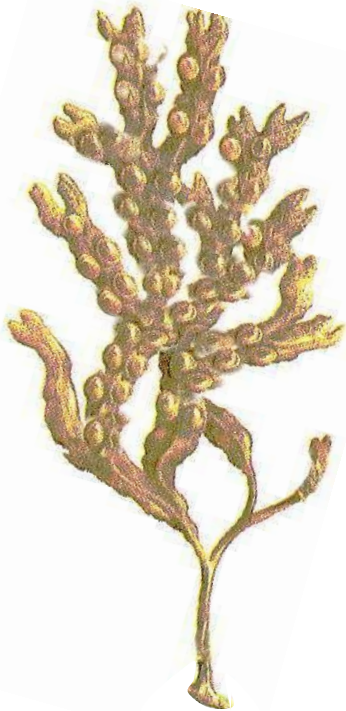
Lots of motile
and soft
bodied
animals

High diversity

Narrow splash
zone

Effects of Exposure

Fucus vesiculosus (bladder wrack)



Sheltered

Lots of vesicles

Long fronds

Long distance
between
dichotomies

Long thallus

Long stipe

Small holdfast

Few vesicles

Short fronds

Short distance
between
dichotomies

Shorter thallus

Short stipe

Big holdfast



Exposed

Effects of Exposure

Patella sp (Limpets)

Short, fat limpets

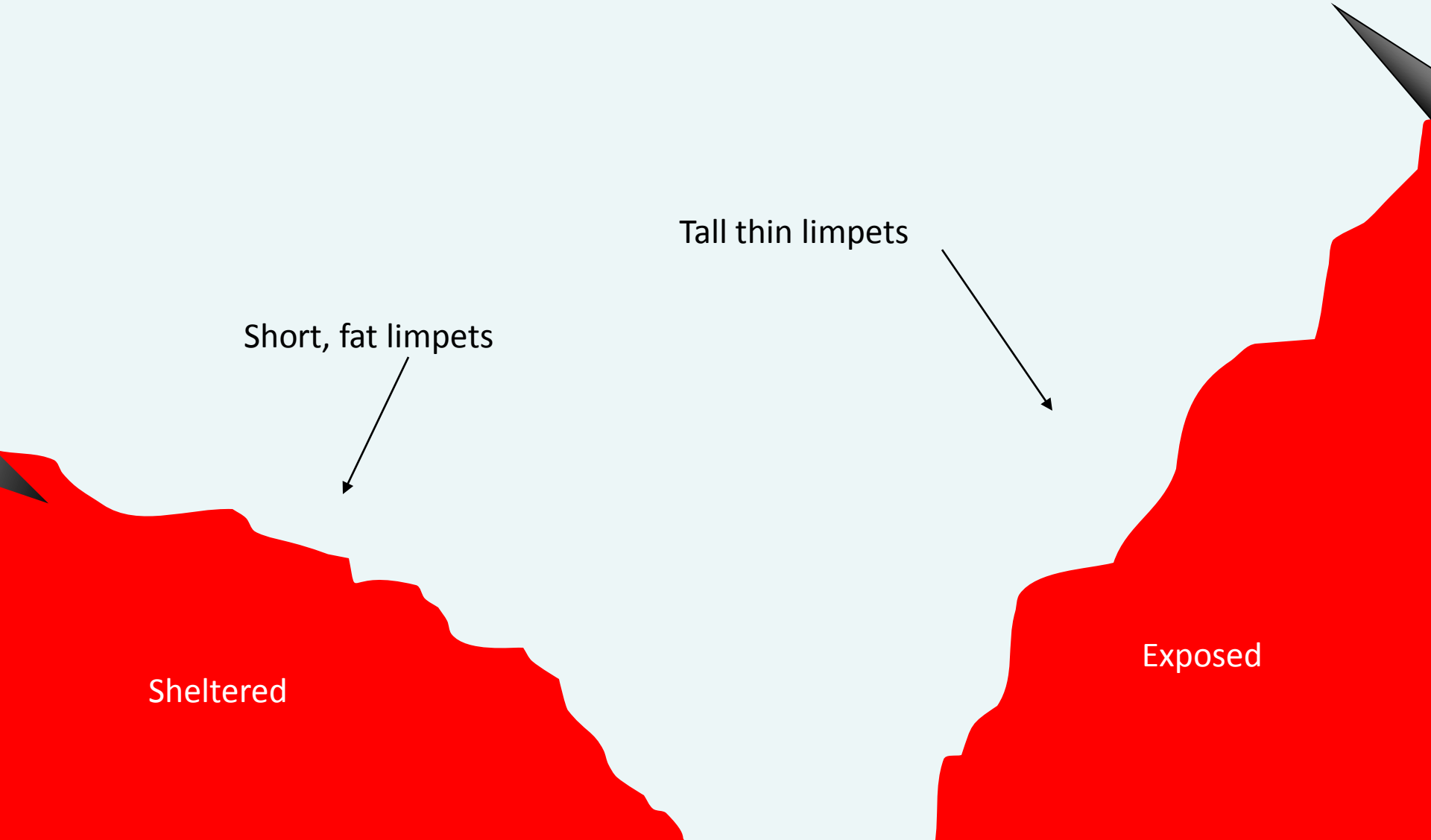


Tall thin limpets



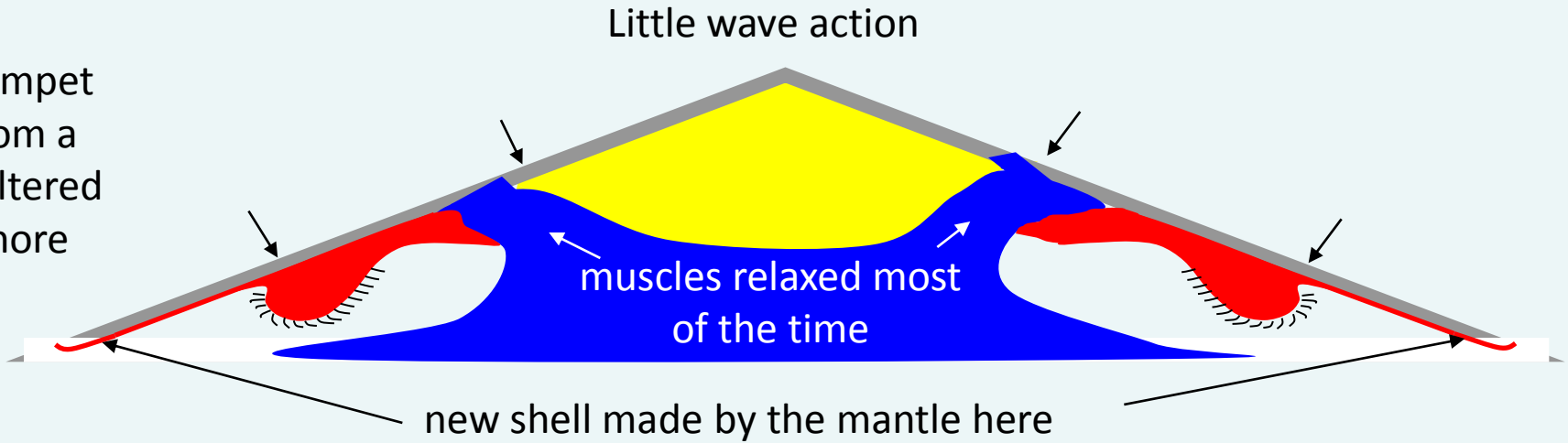
Sheltered

Exposed



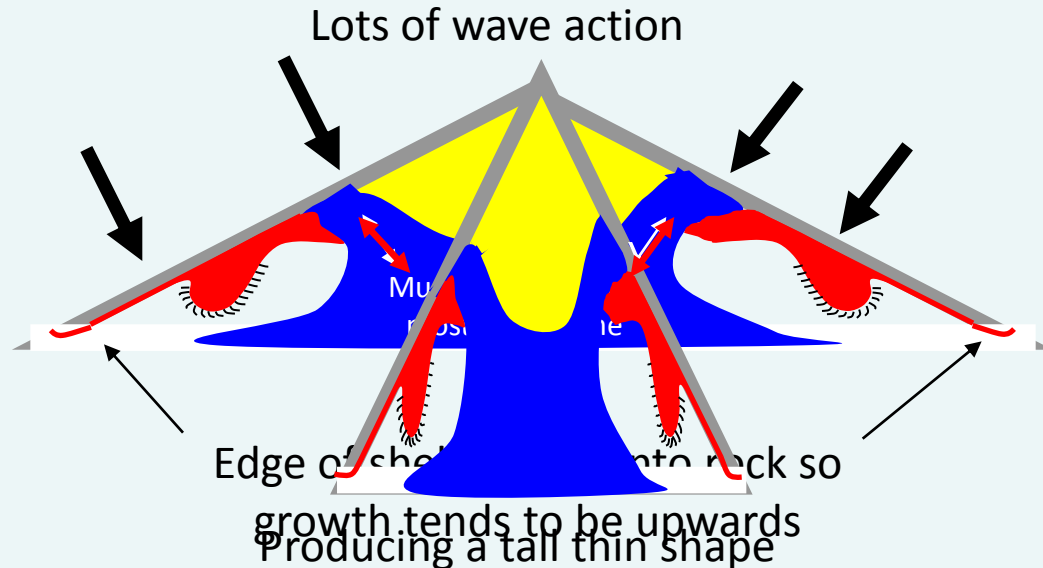
Why?

A limpet from a sheltered shore



Edge of shell is not being pulled onto rock so limpet grows outwards producing a broad flat shape

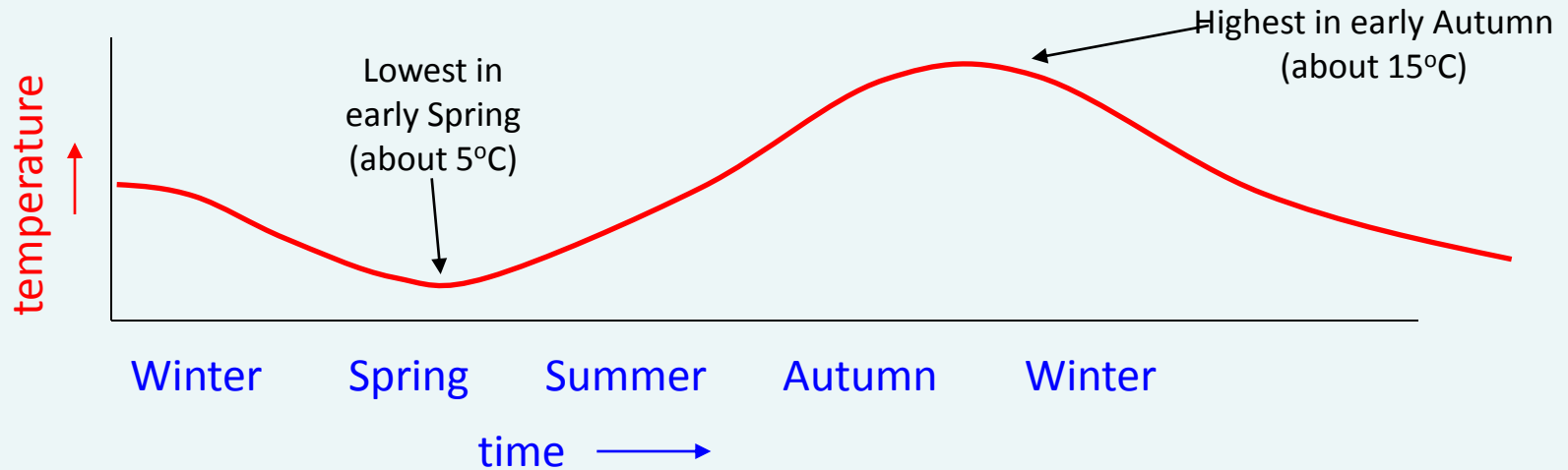
A limpet from an exposed shore



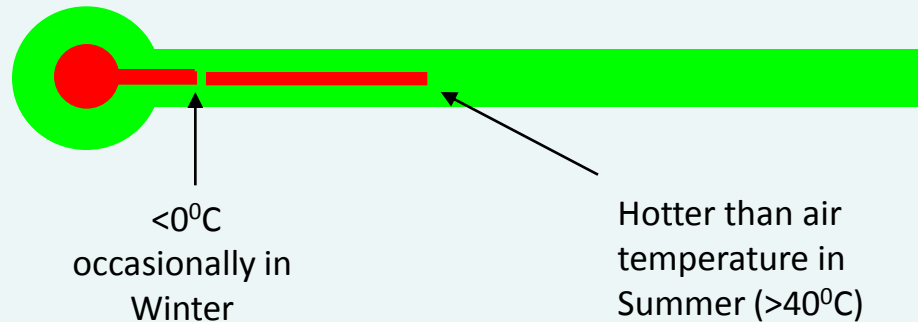
Temperature Fluctuations



Inshore Sea Temperature Near Dale



Rock temperature:



Salinity

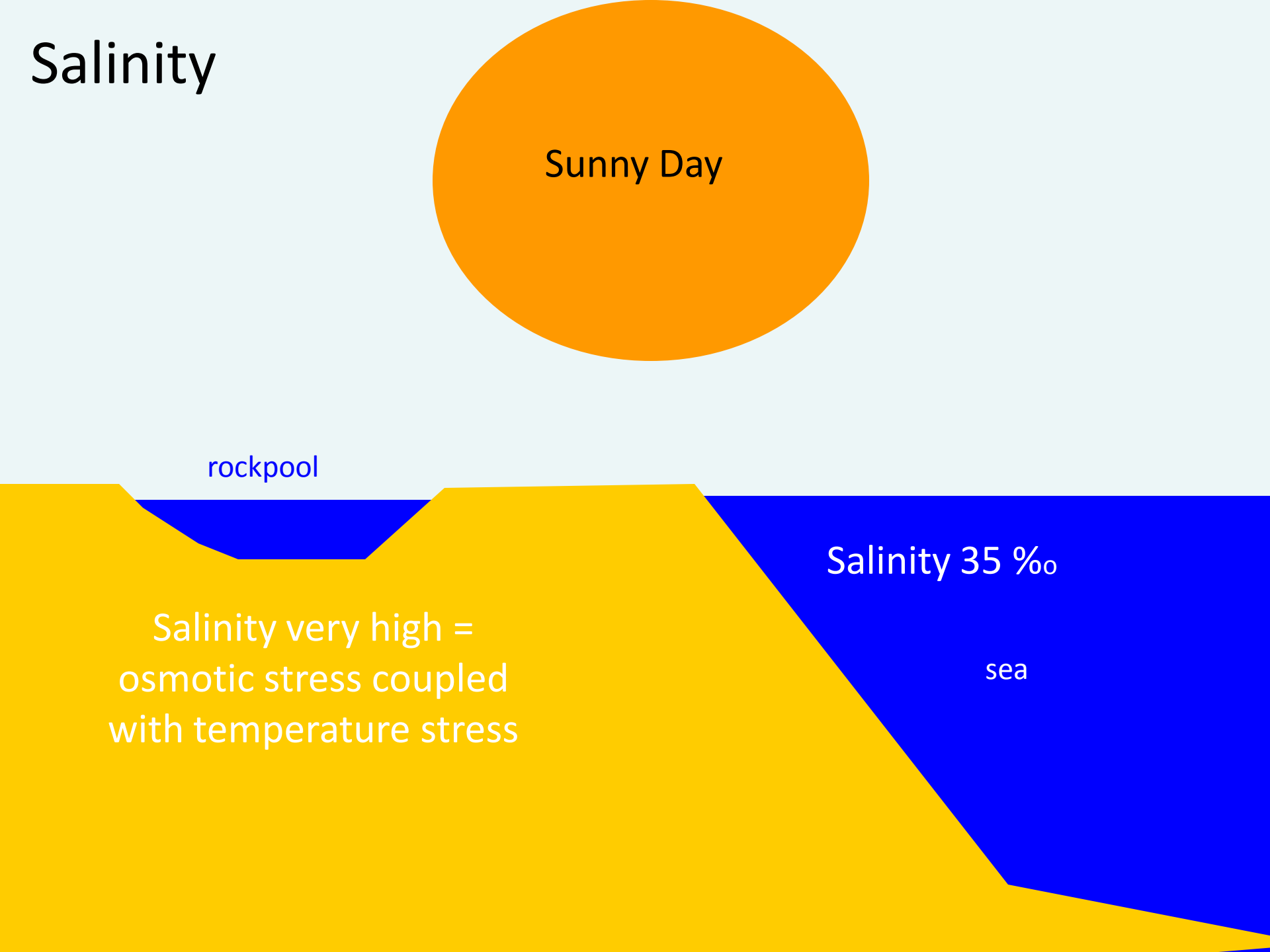
Sunny Day

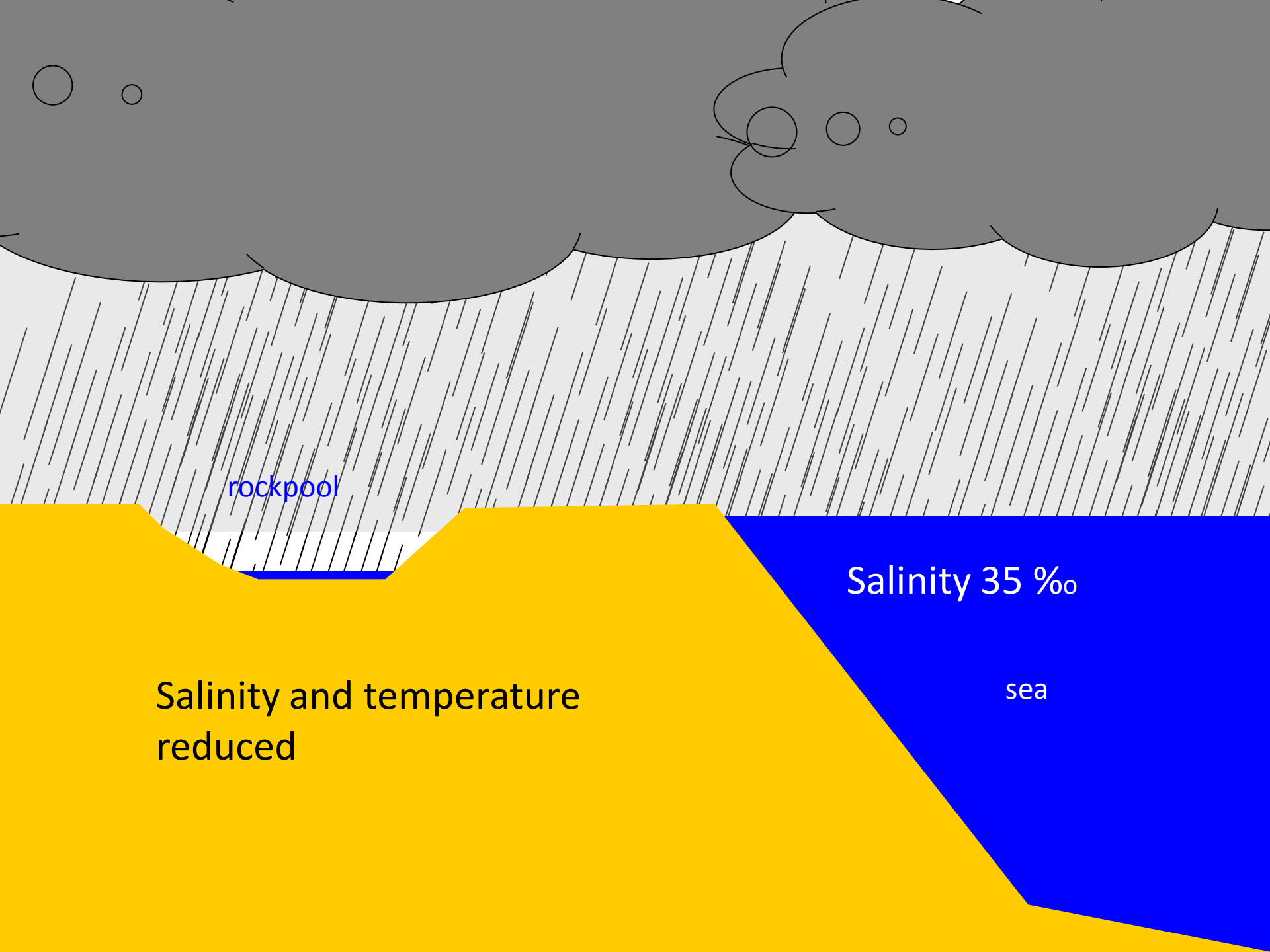
rockpool

Salinity very high =
osmotic stress coupled
with temperature stress

Salinity 35 ‰

sea





rockpool

Salinity 35 ‰

sea

Salinity and temperature
reduced

Water Loss (desiccation)

Avoiding the stress

- Hide in cracks and crevices (eg rough periwinkles)
- Live only on lower shore (eg grey top-shell)
- Live only on North-facing aspects or shores (eg *Catenella caespitosa*)
- Live under a moist blanket (of seaweed) (eg *Gammarus locusta* (sandhopper))

Tolerating the stress

- Have a shell (eg any winkles)
- Have an appropriate shape (small surface area : volume eg twisted wrack)
- Retract your dangly bits (eg beadlet anemone)
- Excrete something appropriate (eg uric acid, not ammonia)
- Tolerate massive water-loss (eg channelled wrack)

pH

Day

Photosynthesis: $6\text{CO}_2 + 6\text{H}_2\text{O} = \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ pH

Respiration: $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 = 6\text{CO}_2 + 6\text{H}_2\text{O}$ pH

rockpool

pH 7.8

sea



Night

Respiration: $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 = 6\text{CO}_2 + 6\text{H}_2\text{O}$ pH

rockpool



Carbonic acid

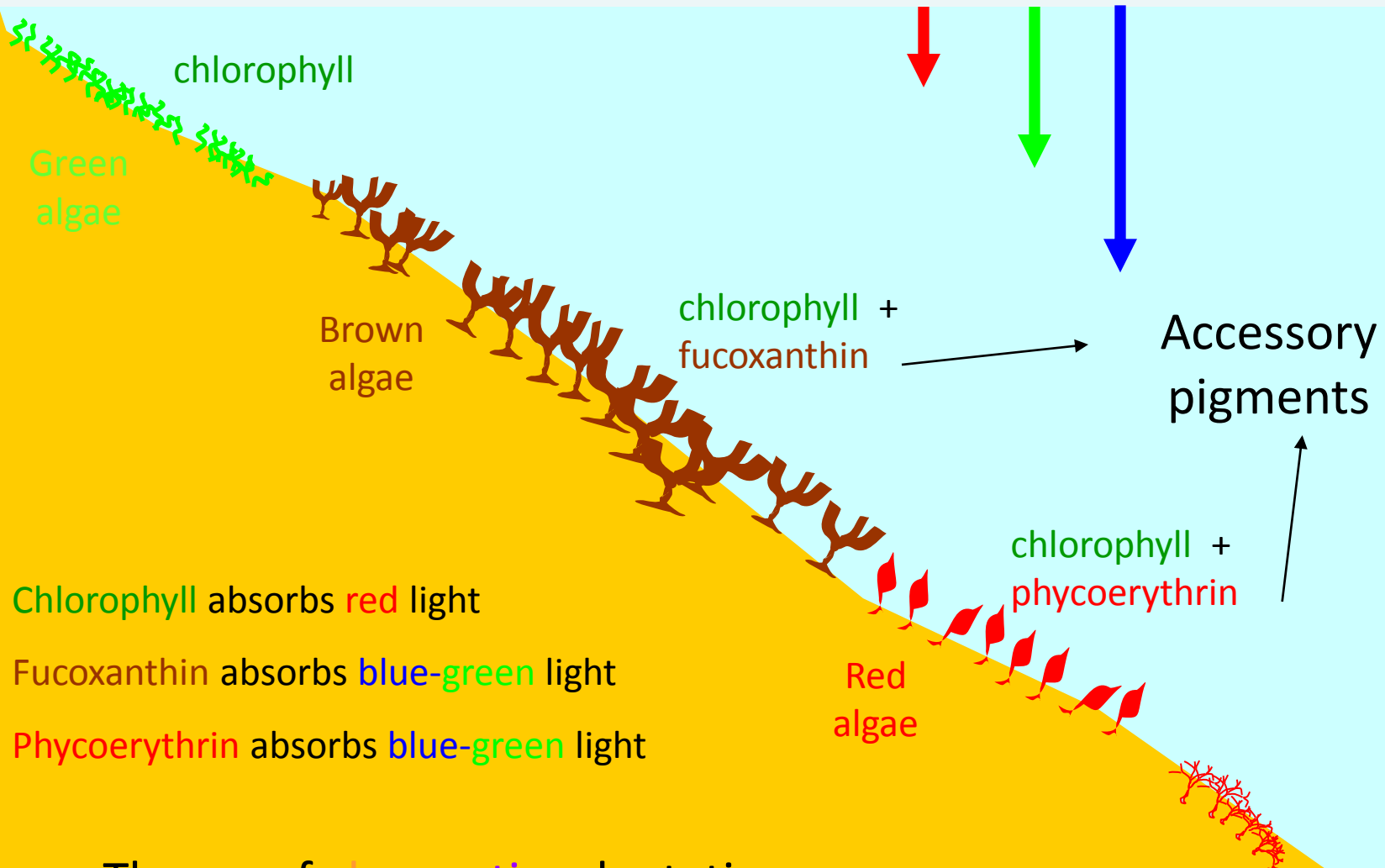
Dissolves calcium carbonate

pH 7.8

sea

What is made from calcium carbonate?

Light



Theory of chromatic adaptation

Quantity of light energy more important