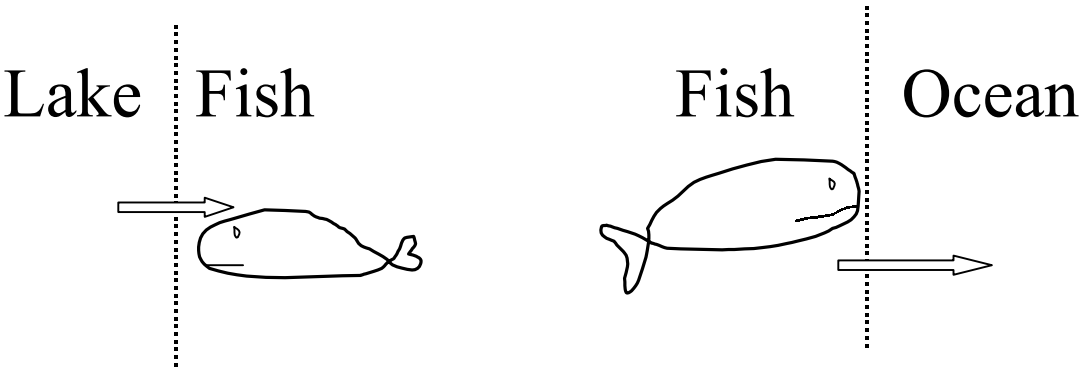
What are the problems that need to be solved for life in the ocean?
or
What is different about these animals and plants?

SALT	BUOYANCY
TEMPERATURE	PRESSURE
LIGHT-COLOR	CIRCULATION

Can we drink salty water?

OSMOSIS

Fresh water **Ocean water**



Not salty Slightly salty Salty

Osmosis driving force is to dilute.

It occurs through a semipermeable membrane

Animals in the fresh water

- saltier inside than the lake
- receive water through their skin

Animals in the ocean

1. Salinity of their body = ocean salinity
(very small organisms with large surface to volume ratio; sharks, rays, sea cucumbers and sponges)

2. Salinity of body ≤ ocean salinity

A. to compensate for the lost water they drink constantly and chemically separate water and salt (good kidneys)

B. Water proof skin (impermeable)
e.g. whales
eat salty organisms from the first group (plankton)

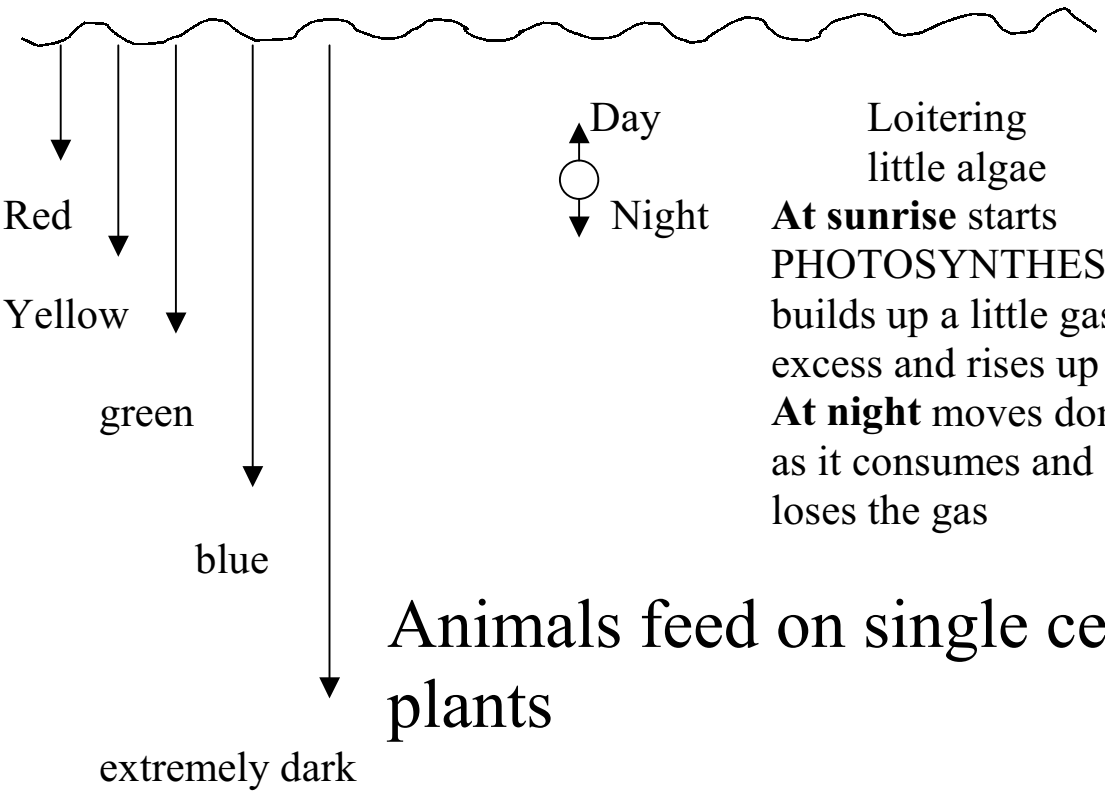
TEMPERATURE

Other than tropical waters – extremely cold

1. Stay in water you like
   e.g. corals, tropical fish

2. Many animals don't care
   - e.g. sharks
   - 4°C is about minimum for many species
   - cod fisheries very sensitive to T-change (below 2°C they migrate to warmer water)
3. Warm blooded animals
   - must generate lots of heat to maintain the body T constant
      a. Eat a lot (killer whales – prefer eating warm blooded animals)
      b. Blubber (immense amount of insolating material)

LIGHT AND COLOR



Loitering little algae

At sunrise starts PHOTOSYNTHESIS builds up a little gas excess and rises up

At night moves done as it consumes and loses the gas

Animals feed on single cell plants

Close to the surface → big feeding point at night (animals from deeper water don't get hurt by sunlight)

Colorful animals in shallow water
Grayish below the light penetration depth
Bioluminescence – fluorescence

BUOYANCY

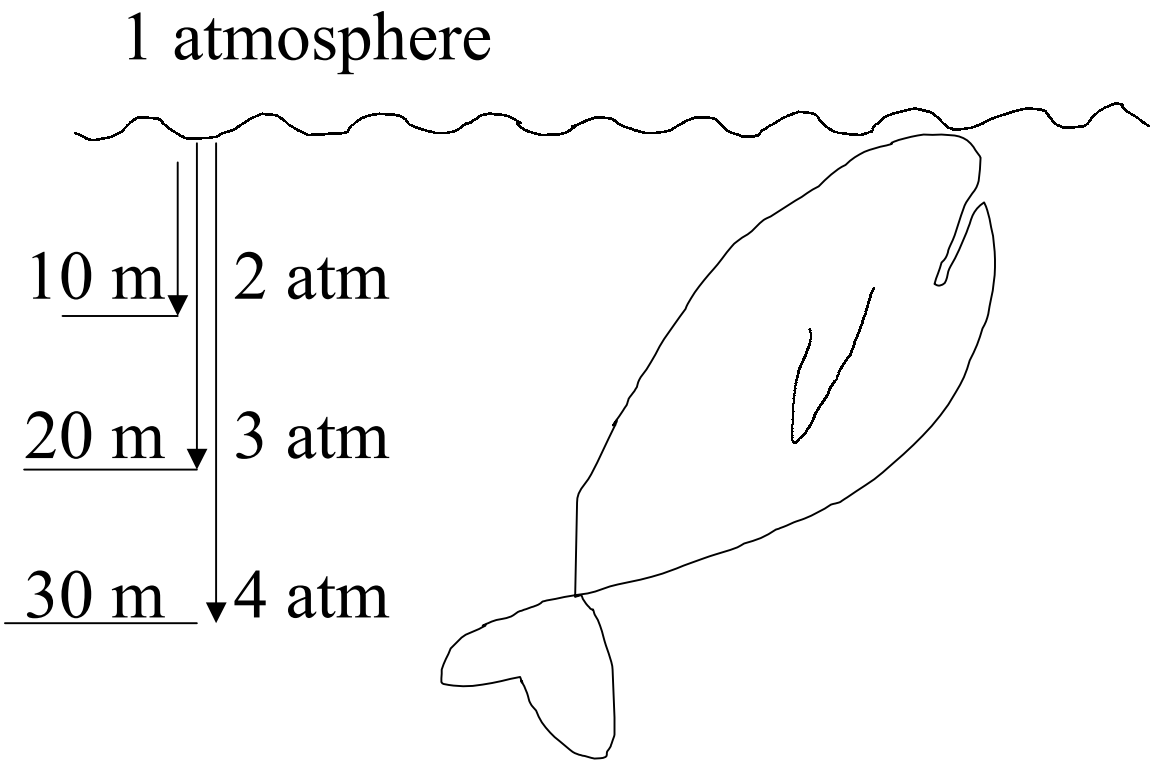
If buoyant, they don't have to spend energy swimming

1. Body density = ocean water density (single cell organisms have spines, ruffles and other feathery appendages just to fight the currents)

2. Adjustable density
→ buoyancy and flotation
- swim bladders, compartments in "the house" filled with gas (snails, nautilus)

3. Swimmers with streamlined body shape

PRESSURE



How deep can we breath-hold-dive?

105m = 347 feet
penguins ~ 250 m
killer whale ~ 250 m
beluga whale ~ 650 m
some seals > 1500 m
sperm whale > 2000 m

total oxygen capacity of the body (in blood and muscles)