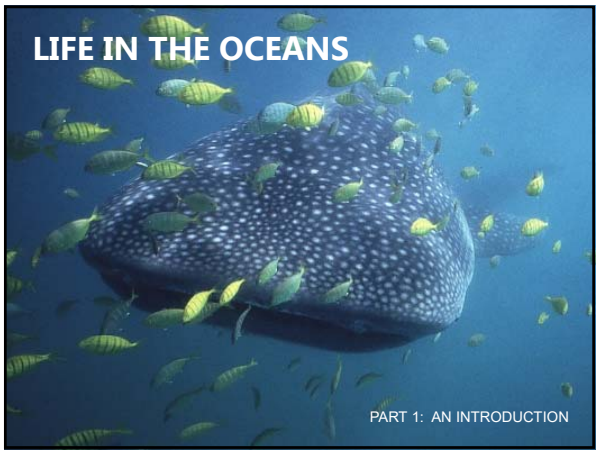
LIFE IN THE OCEANS



PART 1: AN INTRODUCTION

Learning Objectives

1. Describe global patterns of marine biodiversity
2. Compare marine and terrestrial biodiversity
3. Explain two ways that marine organisms cope with salinity
4. Compare and contrast abiotic conditions in the sea and on land, and animal adaptations to them
5. Name and define the major groups of marine organisms

Marine vs. Terrestrial Biodiversity

Biodiversity unknown: 250,000 – 10 million spp.

- **lower species diversity (<15,000 marine plants & algae; few Arthropods)**

Marine vs. Terrestrial Environments – Biotic

Biodiversity unknown: 250,000 – 10 million spp.

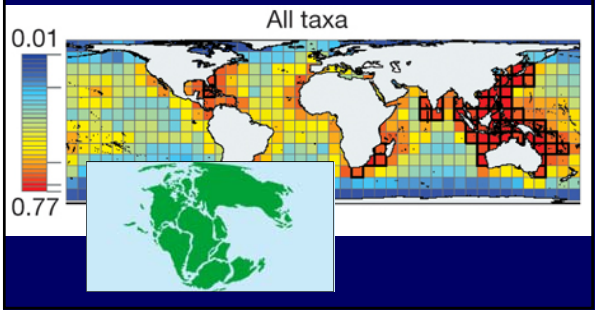
- **higher phylum diversity (32 of 33 marine, only 12 terrestrial)**
  - **Phylum Onycophora: the only exclusively terrestrial phylum**

velvet worm

Marine vs. Terrestrial Environments – Biotic

Biodiversity unknown: 250,000 – 10 million spp.

- **latitudinal & longitudinal gradient: reflects Indo-Pacific origins**



Marine vs. Terrestrial Environments – Biotic

Biodiversity unknown: 250,000 – 10 million spp.

- **few macroscopic autotrophs; food web based on plankton**

Marine vs. Terrestrial Environments – Biotic

Biodiversity unknown: 250,000 – 10 million spp.

- benthic environment is richest; sessile filter-feeders

A giant barrel sponge

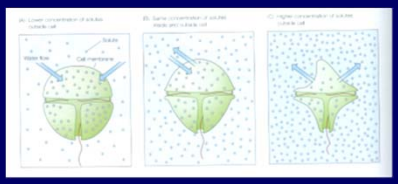
Marine vs. Terrestrial Environments – Biotic

Biodiversity unknown: 250,000 – 10 million spp.

- animal dispersal by motile larvae

Adaptations to Marine Environment

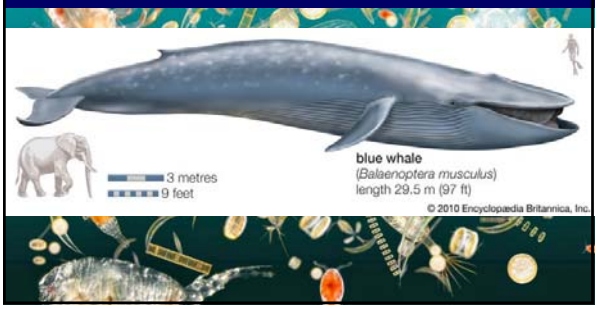
Dealing with Salinity



Terrestrial vs Marine Environments
Adaptation to Abiotic Conditions

Seawater:
is 800x denser than air

Thus:
organisms are buoyed (float)



Adaptations to Marine Environment

Seawater:
is 60x more viscous than air (drag)

Thus:
organisms are streamlined

A streamlined body [illegible] It is no coincidence that [illegible] shape.

Yellowfin tuna - *Thunnus albacares*

Adaptations to Marine Environment

Seawater:
conducts sound 4x faster than air

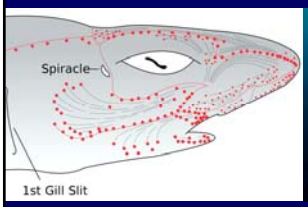
Thus:
sound important for communication

Click on article to be able to hear fish sounds!

Adaptations to Marine Environment

Seawater:
conducts electricity faster than air

Thus:
sensory adaptation for detection



Ampullae of Lorenzini in sharks

Adaptations to Marine Environment

Seawater:
absorbs more light than air

Thus:
productivity mostly near surface

Adaptations to Marine Environment

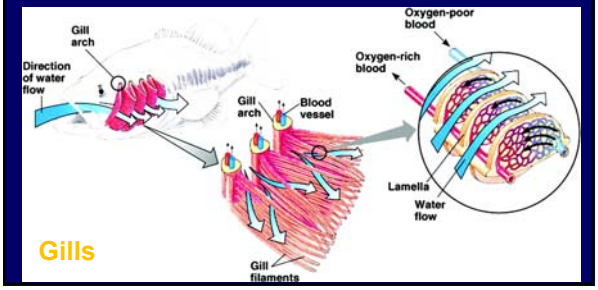
Seawater:
absorbs a great deal of CO2 from the air

Thus:
critters can make $CaCO_3$ skeletons

Adaptations to Marine Environment

Seawater:
contains much less O_2 than air

Thus:
high surface:volume for gas exchange (most critters are small)



Gills

Most marine organisms are small

1L of seawater typically contains:

- 0 fish
- 10 zooplankton
- 1000 diatoms
- 10000 dinoflagellates
- 1,000,000 nanoflagellates
- 100,000,000 cyanobacteria
- 1,000,000,000 prokaryotes
- 10,000,000,000 viruses

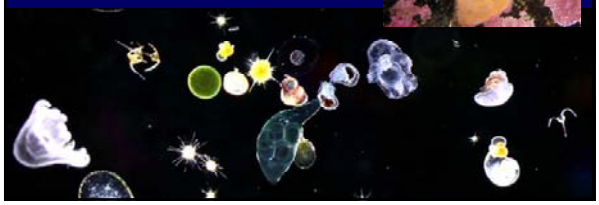
Adaptations to Marine Environment

Seawater:
is 800x denser than air
is 60x more viscous than air (drag)
conducts sound 4x faster than air
conducts electricity faster than air
absorbs more light than air
contains much more CO_2 than air
contains much less O_2 than air

Thus:
organisms can float
organisms are streamlined
sound important for communication
electrosensory adaptations
productivity mostly near surface
critters can make $CaCO_3$ skeletons
high surface:volume (& small size)

Marine vs. Terrestrial Environments

- food web based on tiny plankton & bacteria
- few macroscopic autotrophs
- rich benthic environment; many filter-feeders
- external fertilization is the norm
- dispersal often by planktonic larvae



Major Marine Life Forms

BENTHOS

Organisms that live in or on the bottom, either sessile or free-living

PLANKTON

marine organisms unable to themselves against the motion of water

NEKTON

marine organisms that can propel themselves against motion of water (swim)

Mola mola or Sunfish