
Marine Life
Communities

# *Habitat, Population, Community, Niche*

- Every marine organism lives in a unique set of physical conditions within a given region of ocean, termed its *habitat*.
- A group of marine organism of the same species living together within the same local habitat is termed a *population*.
- A number of different populations living together within the same local habitat is termed a *community*.
- Every marine organism has a unique lifestyle within its community, defined by its trophic level, specific place of residence, movement style, feeding, defense, and reproductive strategies – its community relations - termed its *niche*

# Marine Communities

## *Main Concepts*

- Marine communities consist of populations of different species that live and interact together in a unique habitat

- Every species within a community is specifically adapted to its habitat, having a unique lifestyle and interactive relationship with the rest of the community

1) Shared limiting physical factors
   - ✓ Light, temperature, nutrients, food, protection, bottom conditions

2) Complex organism interactions
   - ✓ Competition, predation, mutualism, symbiosis

# Everything is Connected to Everything Else

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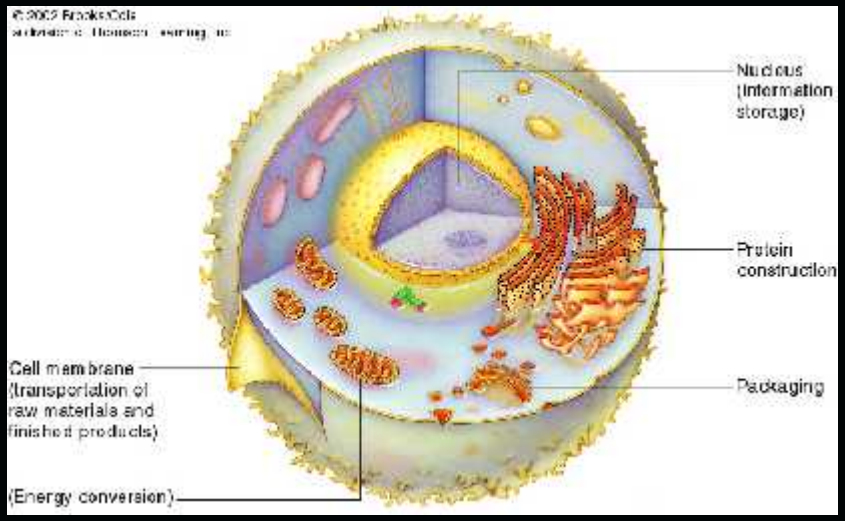


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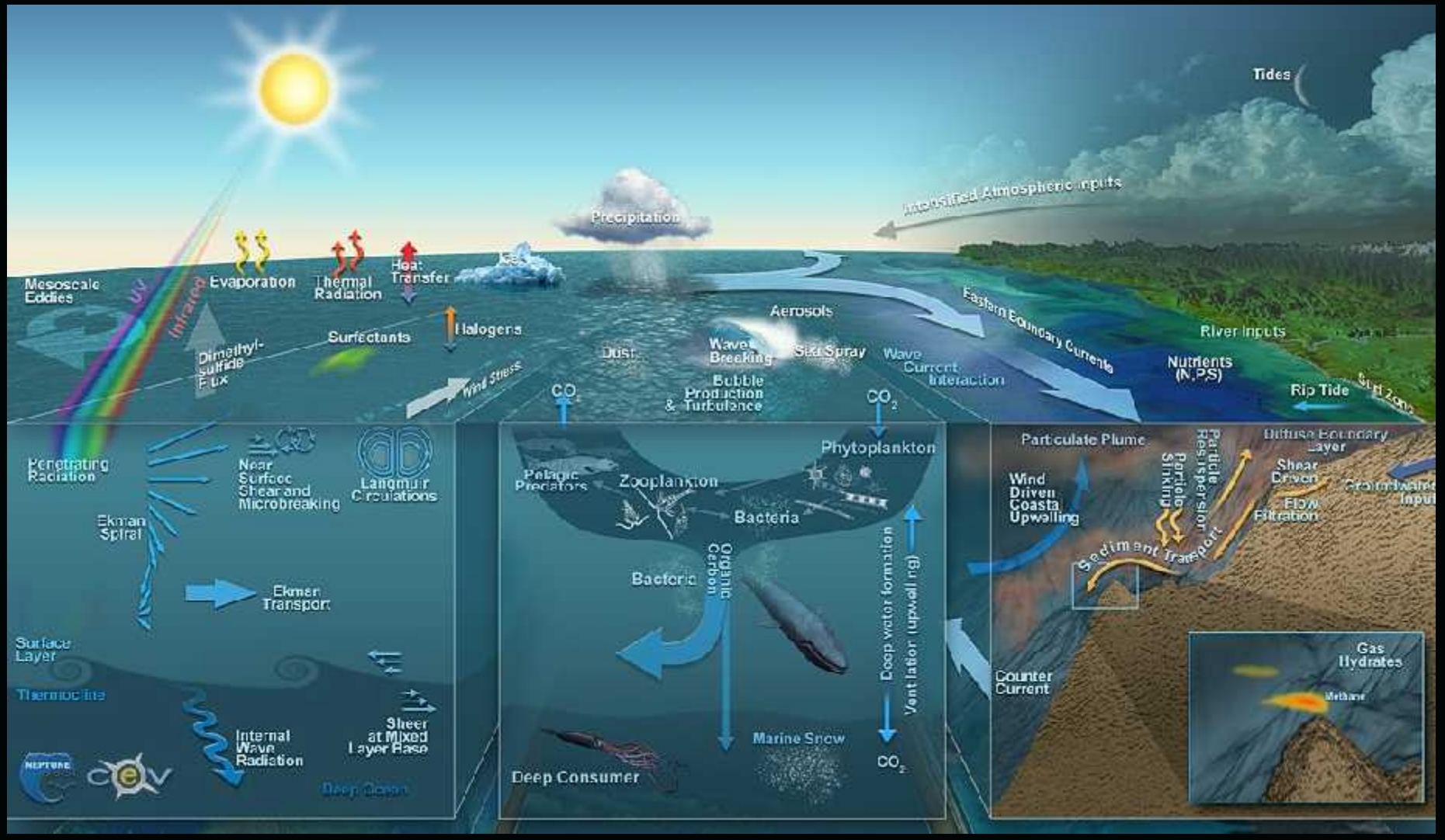
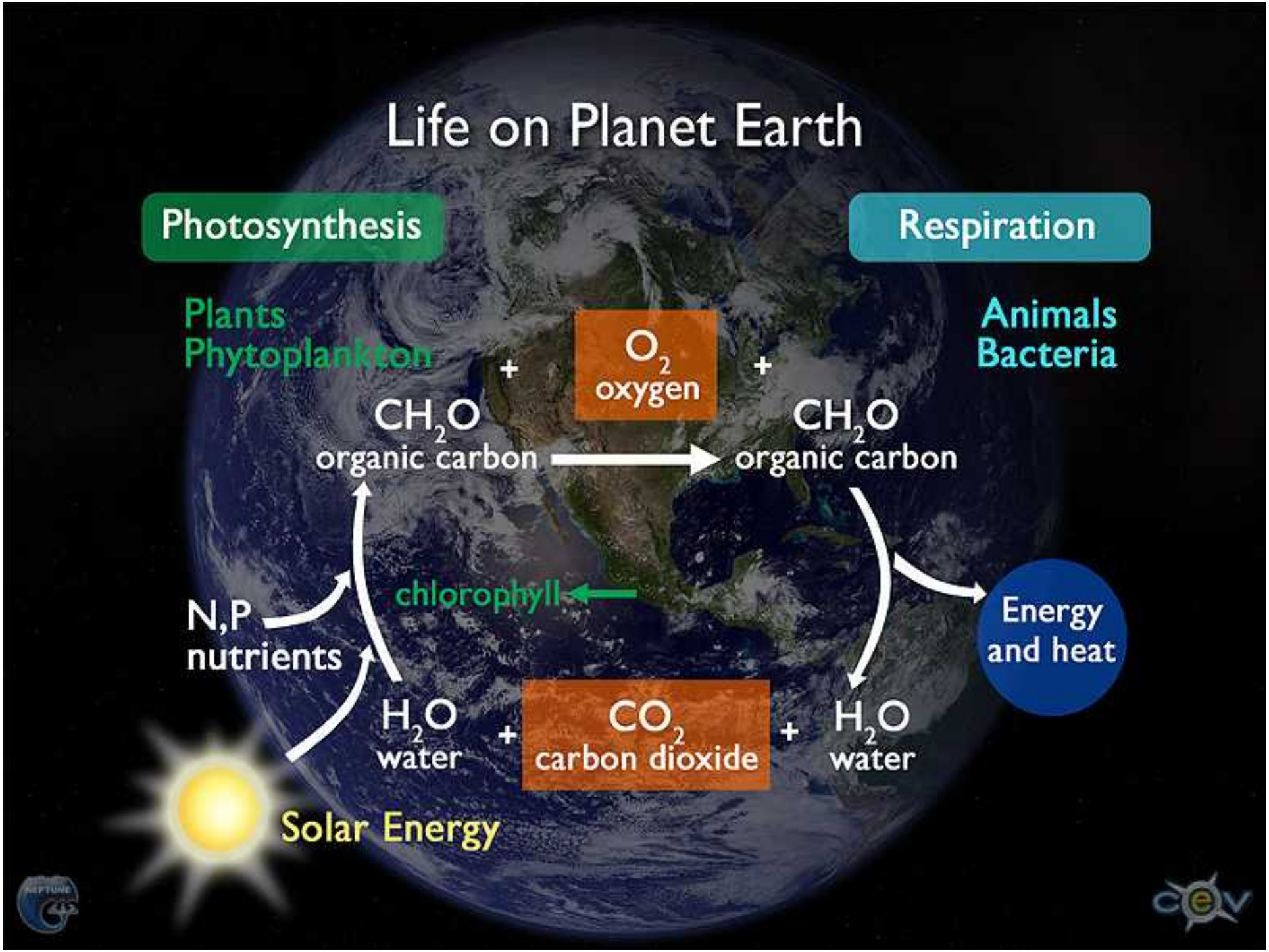
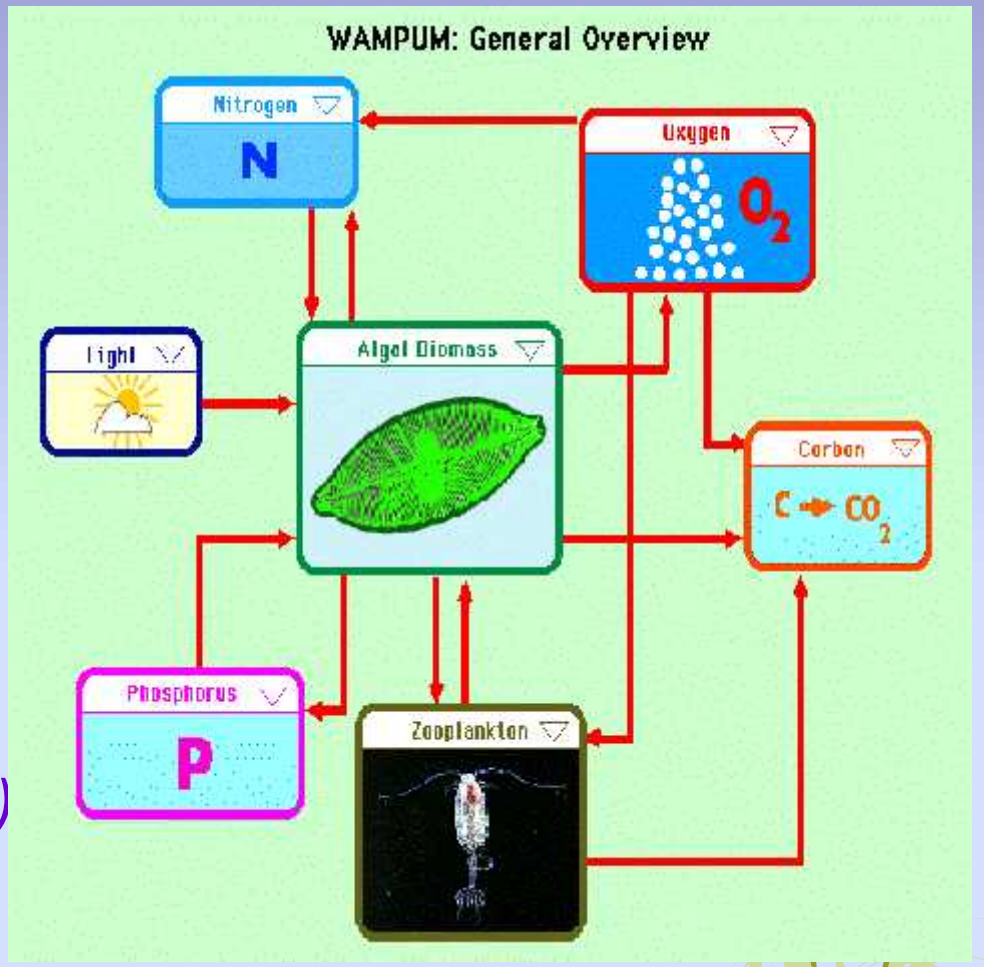



*There is an intimate relationship between the living and nonliving world on earth – essential to life in the ocean*


Life on Planet Earth
Photosynthesis
Respiration
Plants
Phytoplankton
Animals
Bacteria
+
$O_2$
oxygen
+
$CH_2O$
organic carbon
$CH_2O$
organic carbon
chlorophyll
N,P
nutrients
Energy
and heat
$H_2O$
water
+
$CO_2$
carbon dioxide
+
$H_2O$
water
Solar Energy

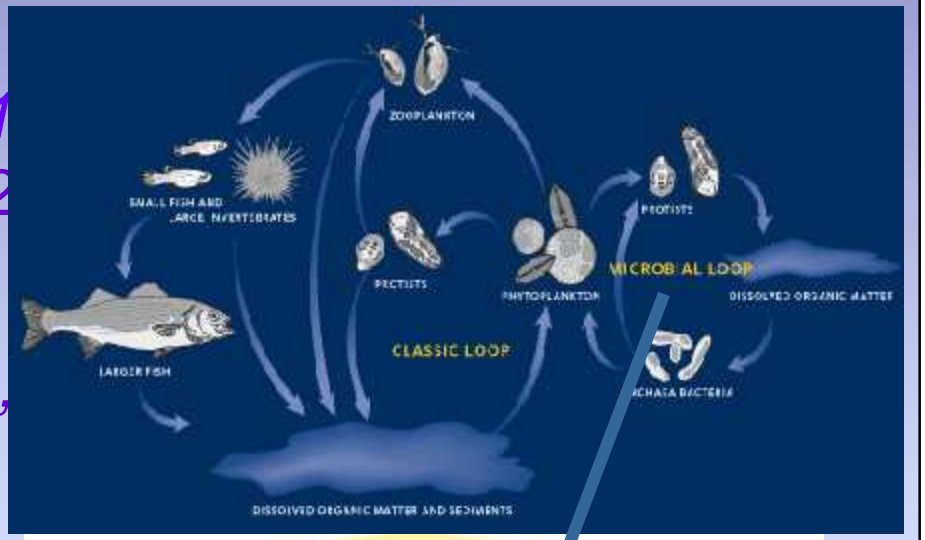
# Plankton and the Nutrient Cycles

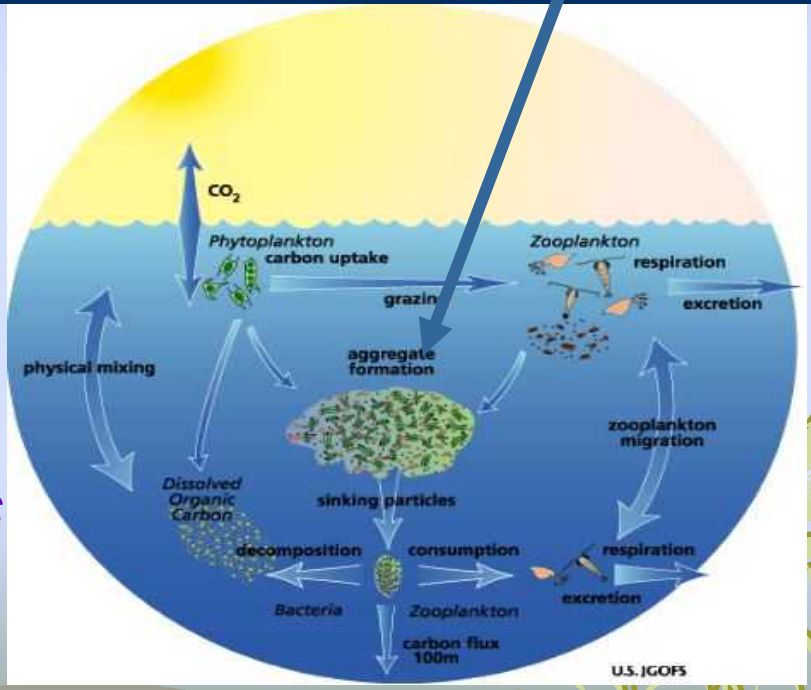
- *The plankton in the marine food webs are important in driving the nutrient cycles*
- *Both living and nonliving components make up the nutrient cycles*
- *Bacteria also play a key role in the nutrient cycles as decomposers of organic matter (dead bodies and fecal material) back into reusable nutrients.*



# Marine Life Food Cycles

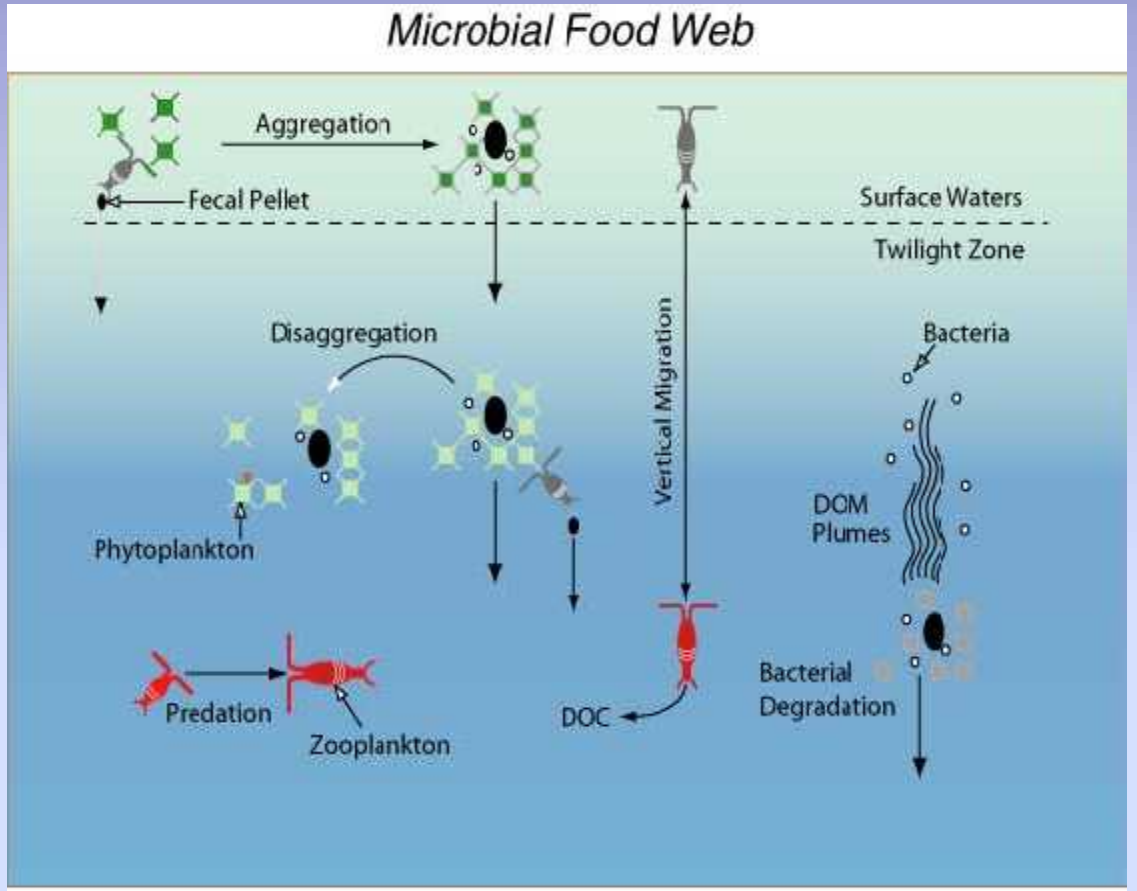
- *Two overlapping food cycles in the marine world*
  - *1 "Classic" loop*
  - *2 "Microbial" loop*
- *"Classic" loop includes nutrients, phytoplankton and herbivores.*
- *"Microbial" loop includes phytoplankton, bacteria, micro-herbivores and organic matter.*
- *"Classic" loop depends on the "microbial" food loop*
- *"Microbial" loop is also known as the "oceanic biological pump"*



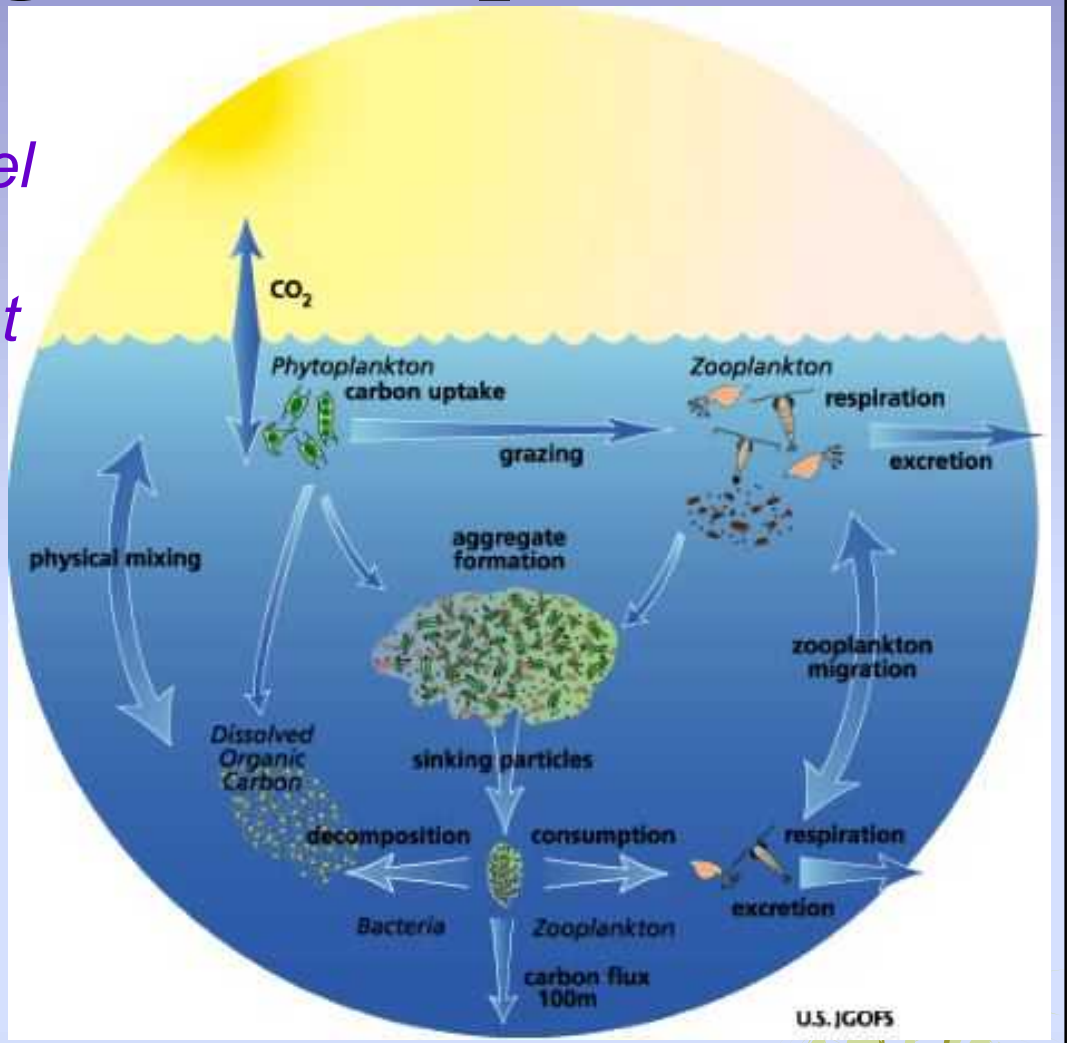
# The Ocean's Microbial Food Web

- The most important biological activity in the ocean occurs at the microbial level = the plankton organisms
- The players include the primary producers, the primary consumers, and the decomposers
- All three players are critical to the entire marine food web and the nutrient cycles

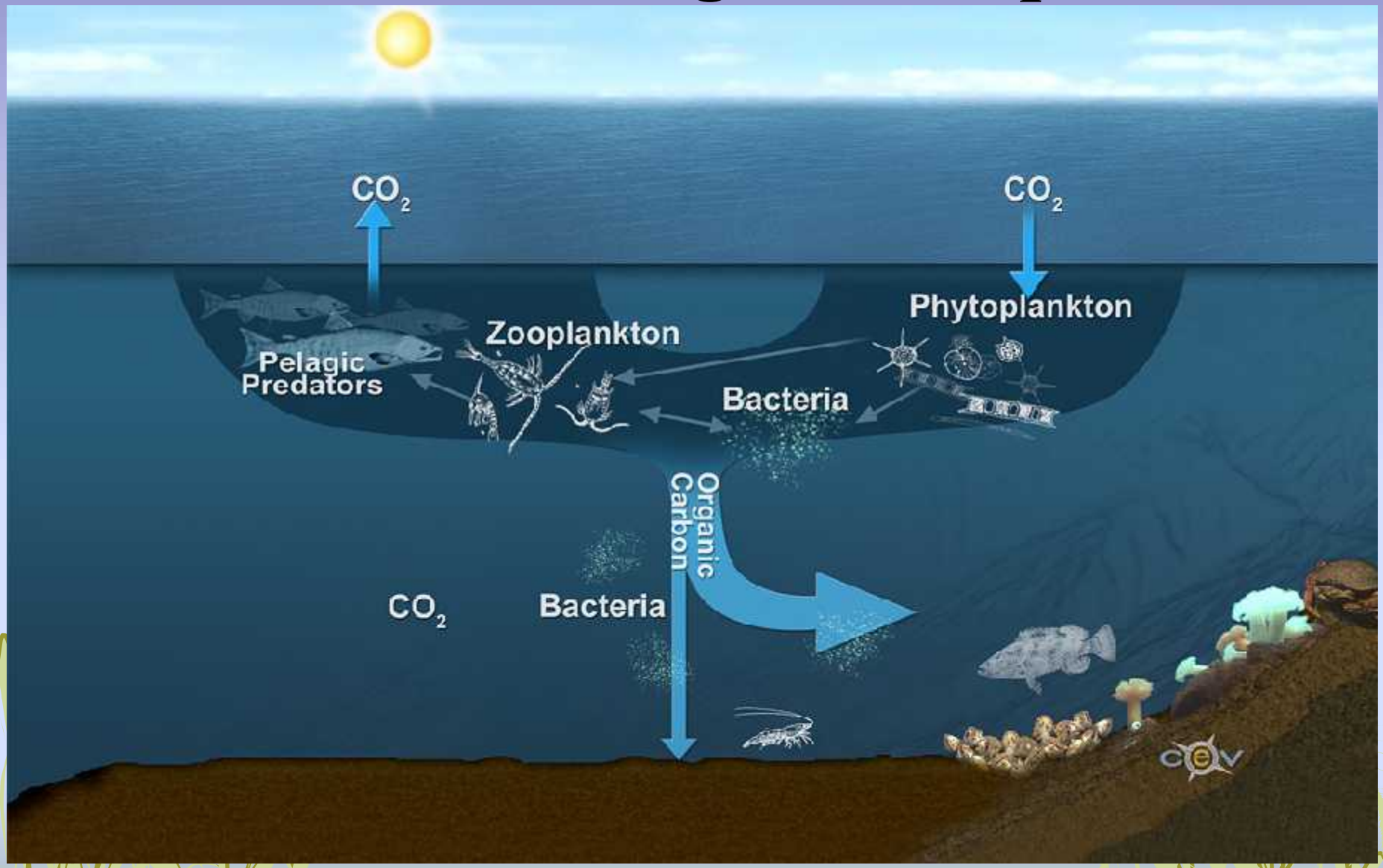


# Ocean's Biological Pump

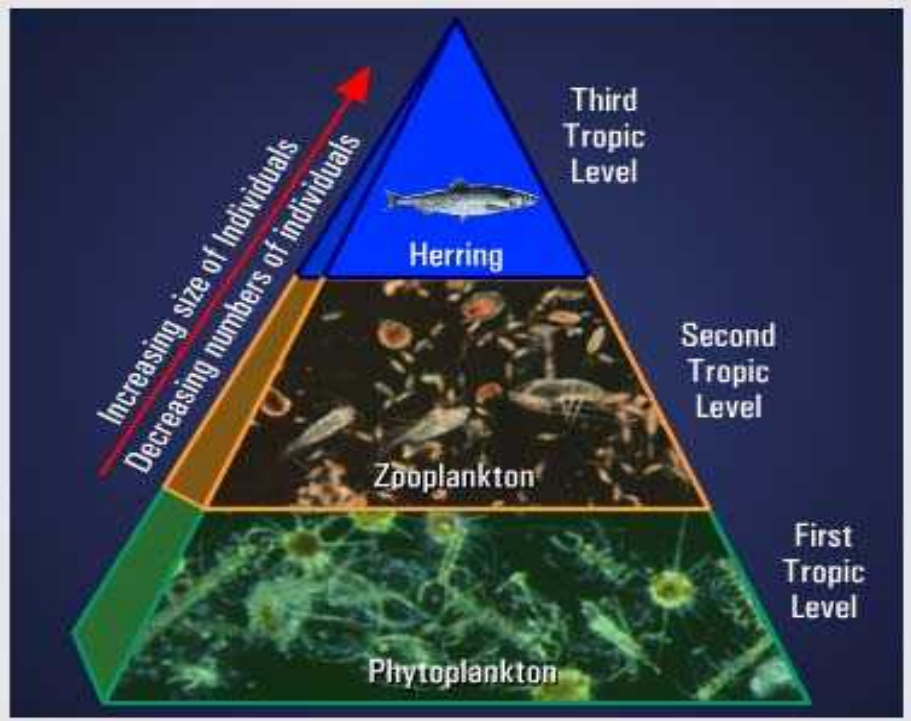
- *The ocean's "biological pump" is the foundational level in the complete marine food web and in driving the nutrient cycles*
- *Both living and nonliving components are in dynamic exchange within the ocean's biological pump*
- *The ocean's biological pump is crucial for all life on Earth*
- *The ocean's biological pump affects Earth's climate*

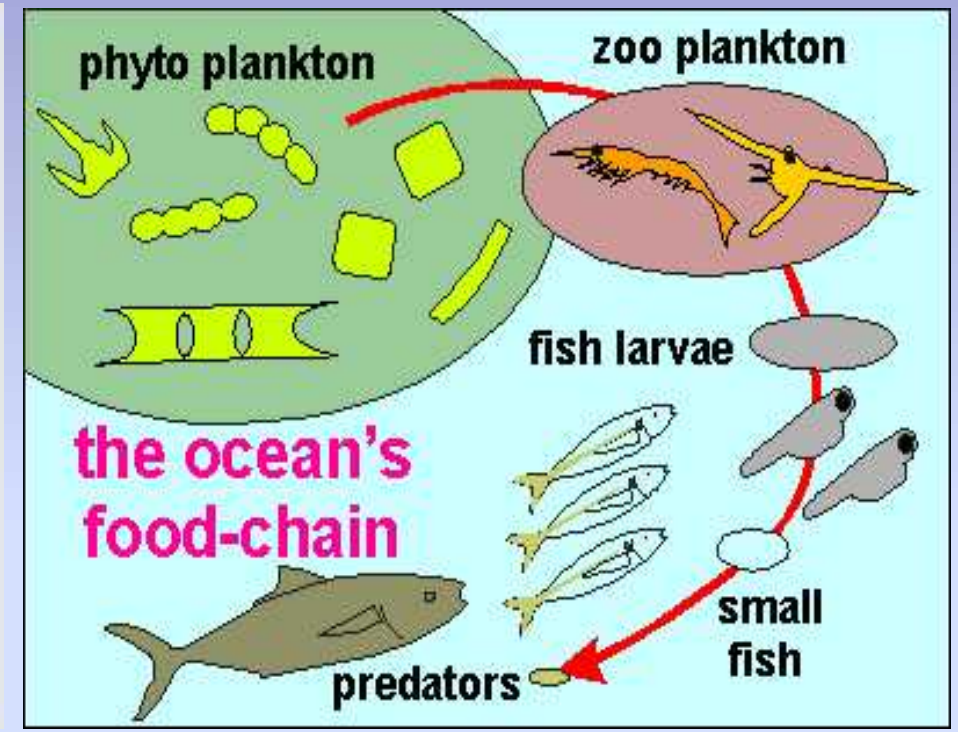


# The Ocean's Biological Pump



# Trophic Levels in Marine Communties




- Marine food chains are arranged into tropic levels with the phytoplankton at the bottom (first tropic level), which has the greatest numbers of individuals and greatest total biomass - more than all the other tropic levels put together.

- It takes roughly 10 grams of phytoplankton to make 1 gram of zooplankton, and 10 grams of zooplankton to make 1 gram of tiny fish…and so on up the food chain.

# Types of Marine Communities

## A. Intertidal Communities

- ✓ Rocky
- ✓ Beach
- ✓ Mud Flat
- ✓ Salt Marsh and Estuary

## B. Coastal Offshore Communities

- ✓ Kelp Forest
- ✓ Coral Reef
- ✓ Subtidal Shelf

## C. Open Ocean Pelagic Communities

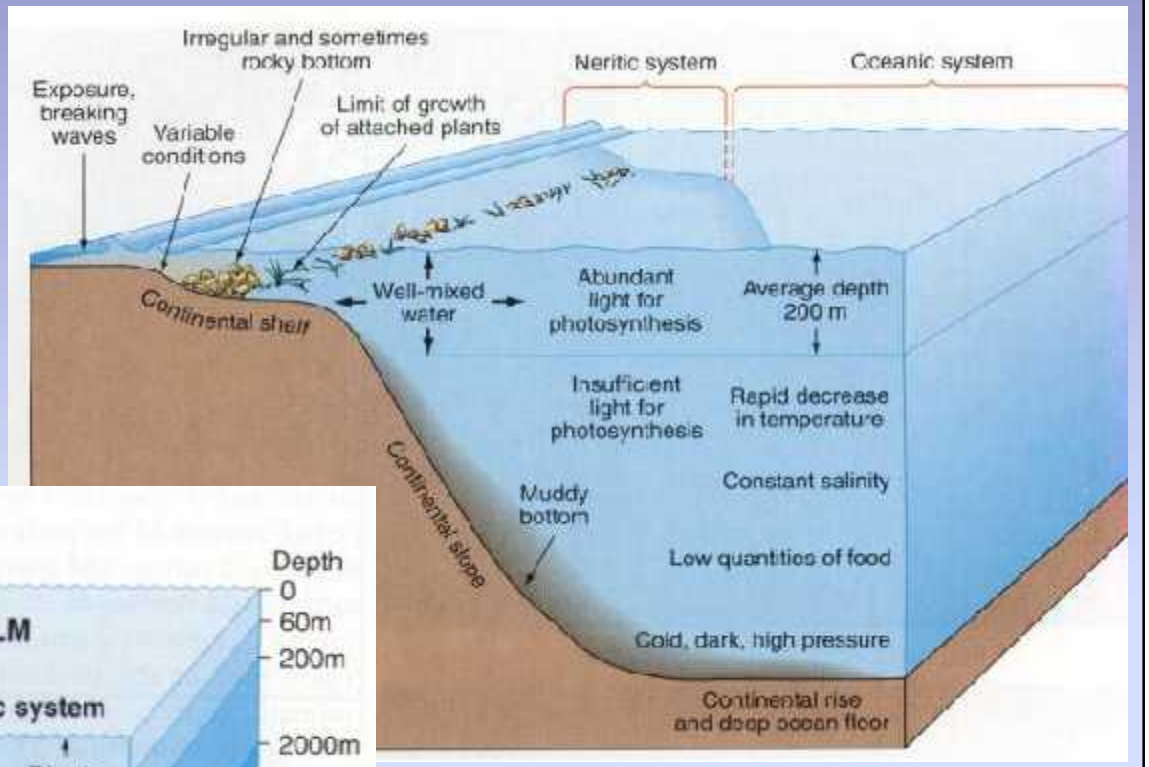
- ✓ Shallow Pelagic
- ✓ Deep Pelagic
- ✓ Very Deep Pelagic

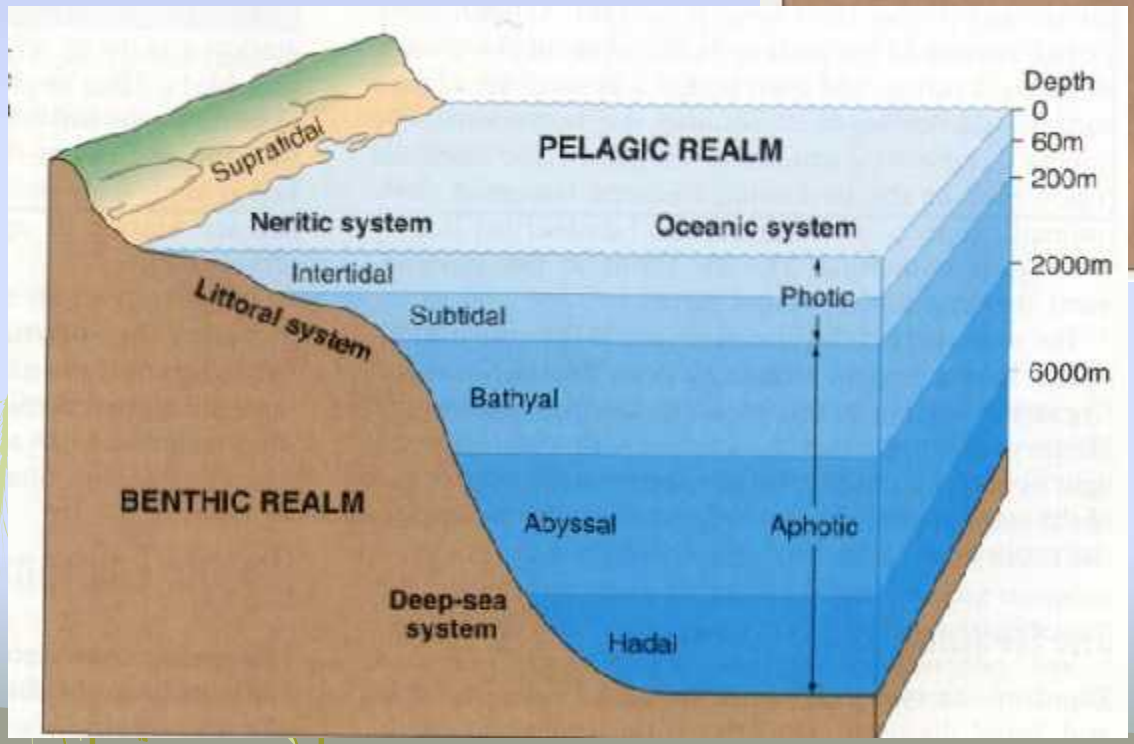
## D. Open Ocean Benthic Communities

- ✓ Abyssal
- ✓ Hydrothermal Vent
- ✓ Whale Carcass

# Living Conditions in Marine Habitats

- Most hospitable in shallow ocean close to land
- Least in deep, dark ocean
- More nutrients close to land
- Least nutrients far from land

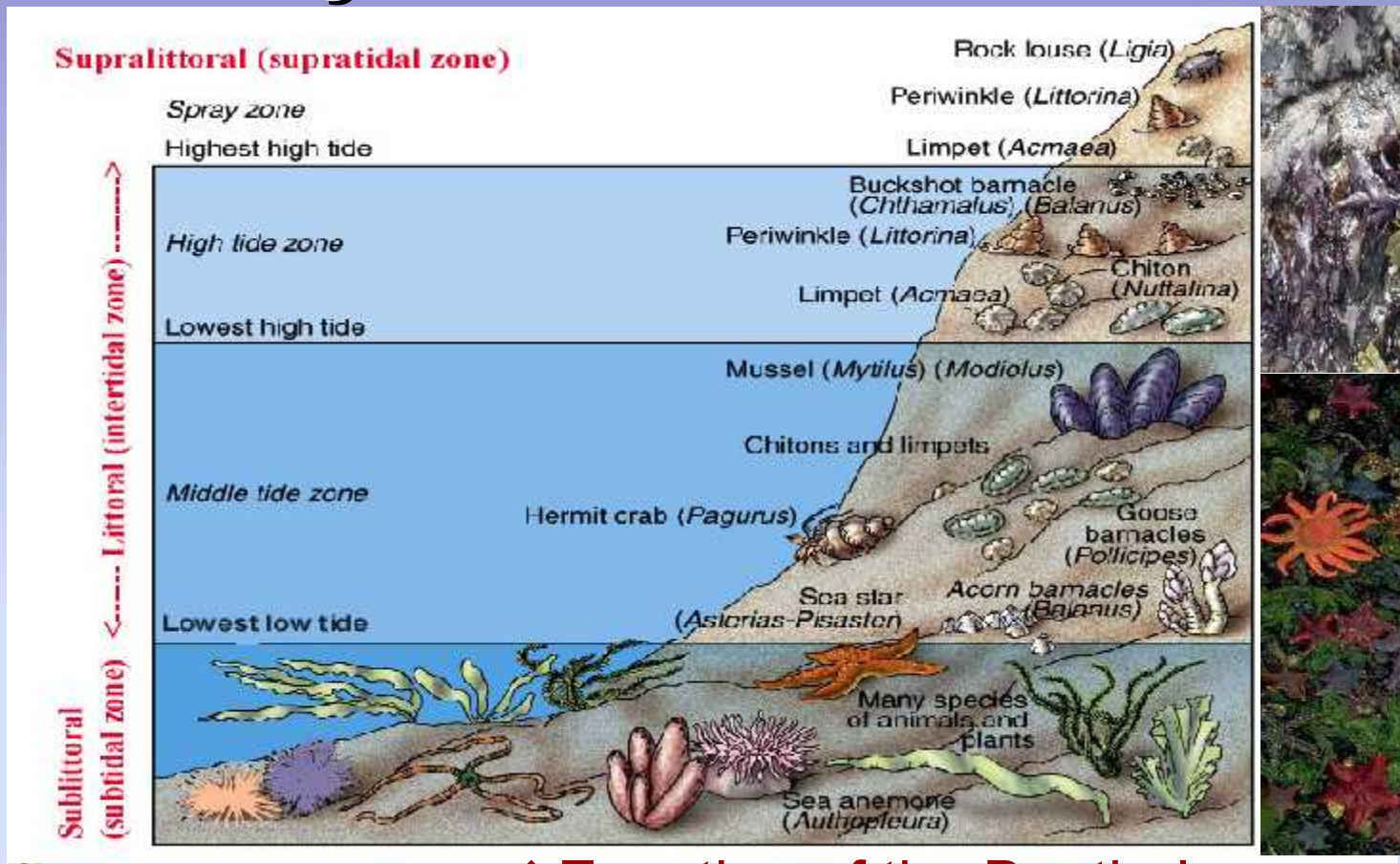


# Rocky Intertidal Communities

- ✓ Intertidal communities live within one of the ocean's most dynamic habitats – the shoreline
- ✓ Limited protection from waves and tides comes from purchase to a rocky substrate
- ✓ Vertical and lateral shifts in species assemblage occur within a community as a function of tidal influence

# Rocky Intertidal Communities




## ❖Zonation of the Benthal

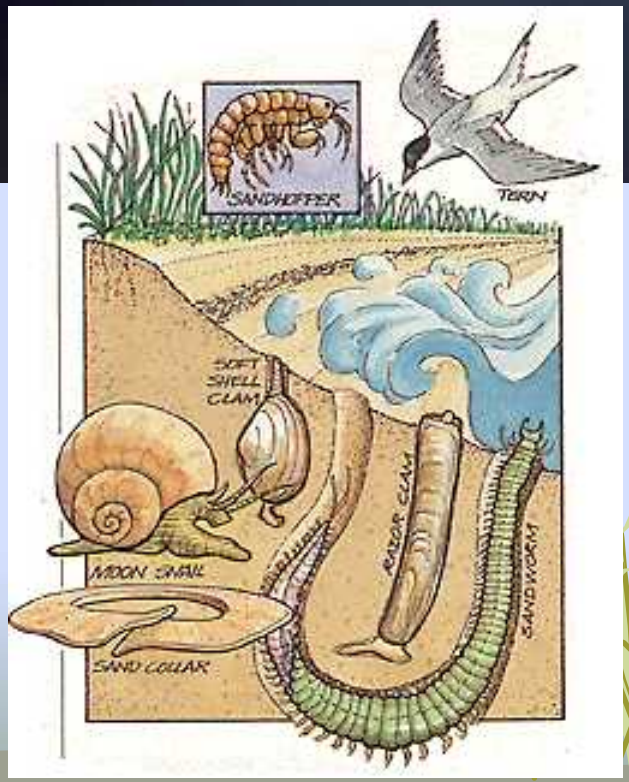
- ❖ Supralittoral: area just above high water mark, only submerged during storms; otherwise ocean spray
- ❖ Littoral: intertidal zone between low and high water marks
- ❖ Sublittoral: subtidal zone below low water mark, permanently submerged; extends down to the continental shelf break (~200 m)

# Rocky Intertidal Communities


# Sand and Cobble Beach Intertidal Communities

✓ Beach organisms must deal with perhaps the harshest of all marine conditions

✓ Pounding surf, shifting sand and gravel, out-of-water exposure, and limited food supplies

# Salt Marsh and Estuary Communities

✓ Salt marshes and estuaries are the most productive and biodiverse of all the marine communities

✓ Calm, nutrient-rich waters, protective habitat, and plenty of sunlight make for optimal living conditions

✓ Many open ocean organisms come here to spawn and nest

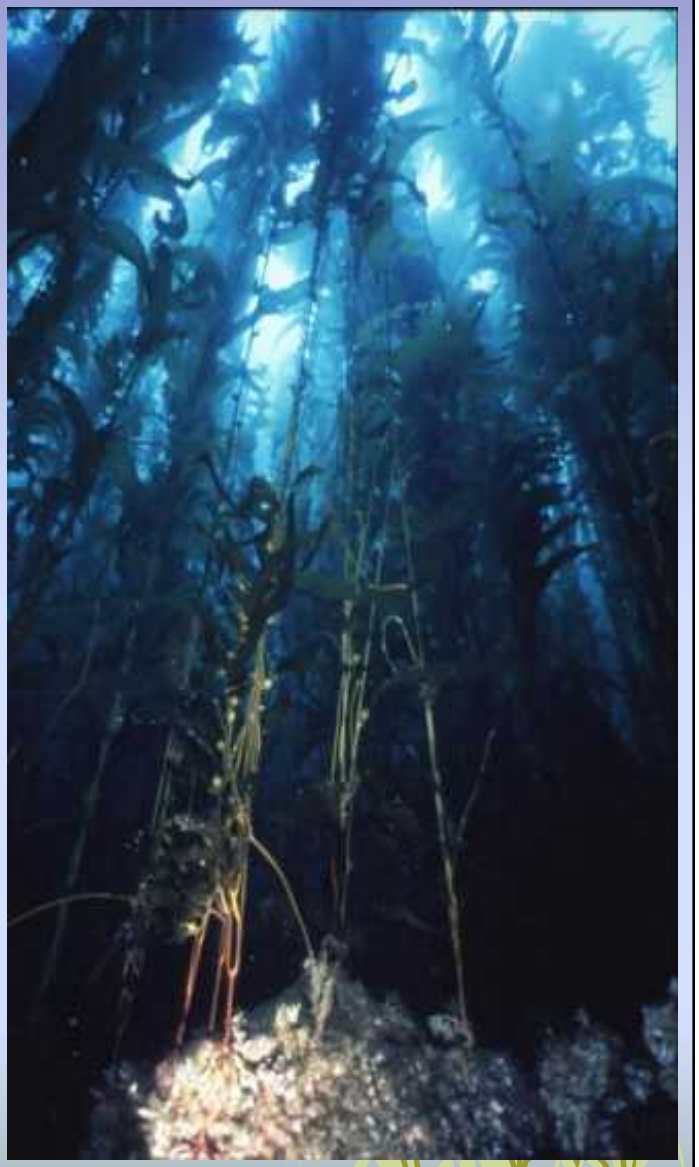
✓ Tidal flux and salinity are the two key dynamic factors

# Salt Marsh and Estuary Communities

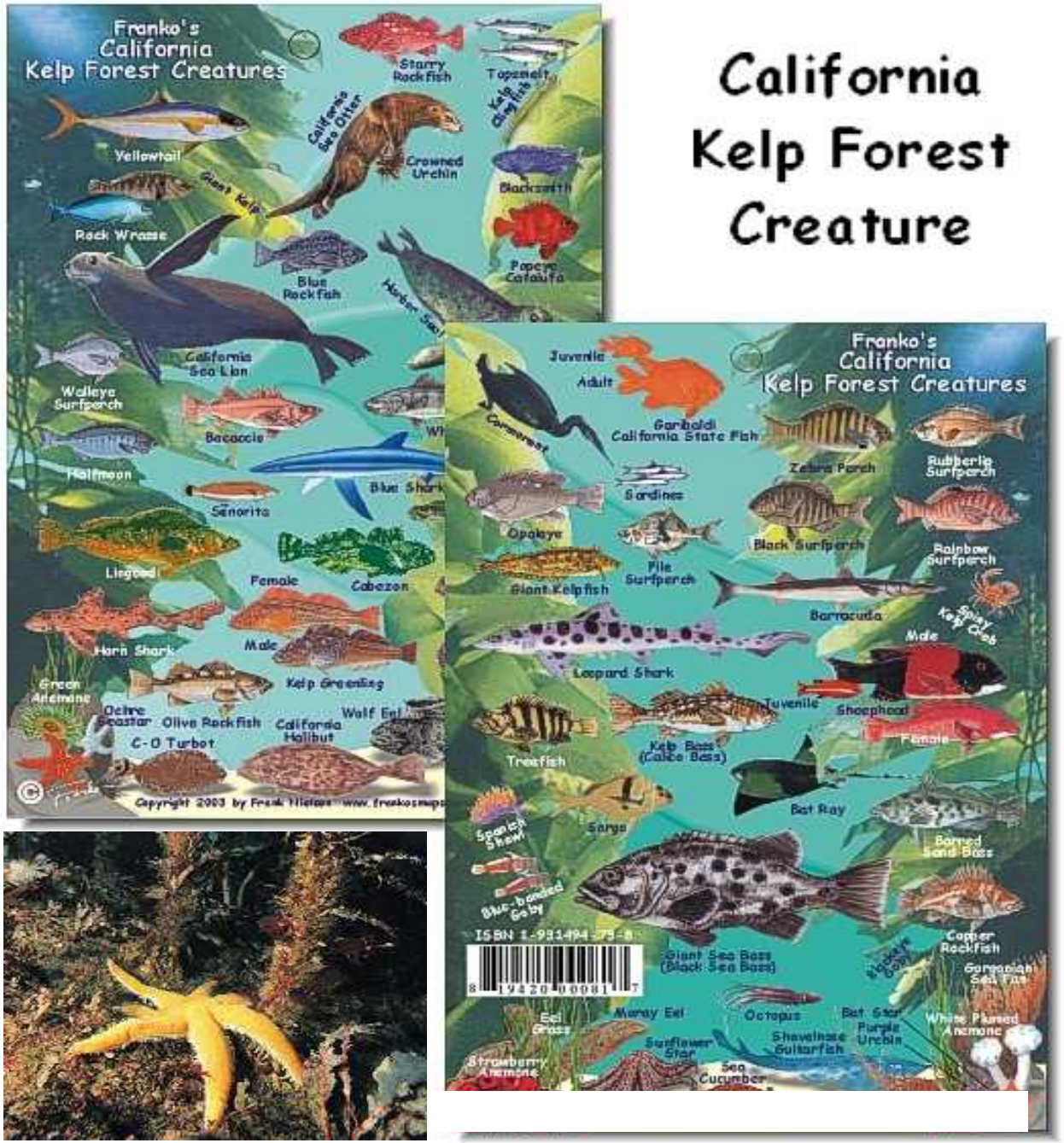

# Kelp Forest Communities

- ✓ Kelp turns an otherwise barren offshore area into a haven for both pelagic and benthic organisms
- ✓ Kelp forests are very productive and support areas of high plant biomass and animal biodiversity.
- ✓ Kelp thrive best in cold, nutrient rich shallow waters up to 100 meters deep.

# Kelp Forest Communities

# California Kelp Forest Creature



# Diving in Kelp Forest Communities

# Coral Reef Communities

✓ Coral reefs have the highest biodiversity of any region found in the world ocean

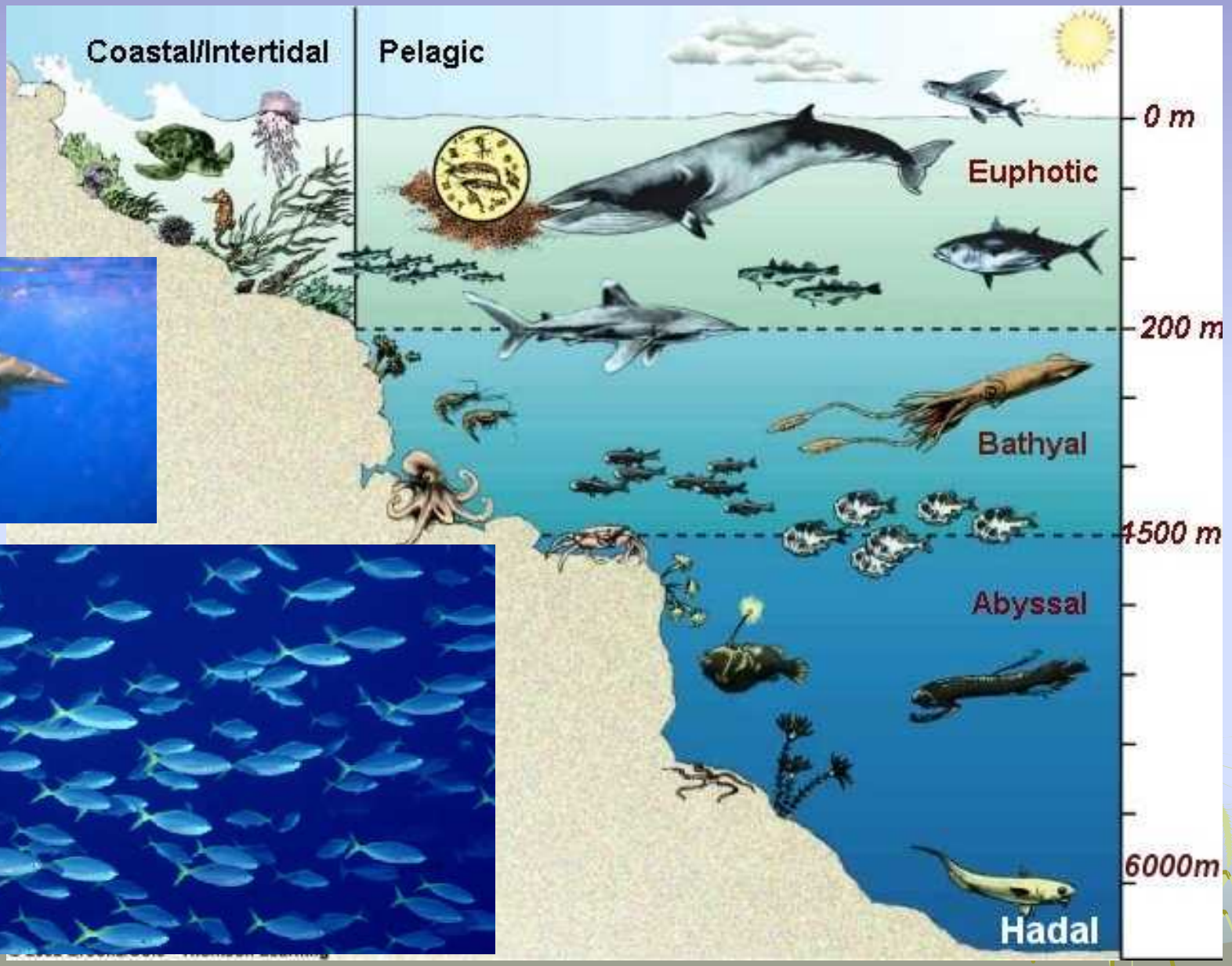
✓ Corals, and the reef complexes that they build, provide both a food base and protection for an amazingly-wide variety of both invertebrates and fish.

✓ Corals reefs are limited to warm, clear, shallow tropical waters.

✓ Coral reefs are very sensitive to environmental pressures.

✓ Currently 80% of all the world's coral reefs are in trouble (bleaching)

# Open Ocean Pelagic Communities



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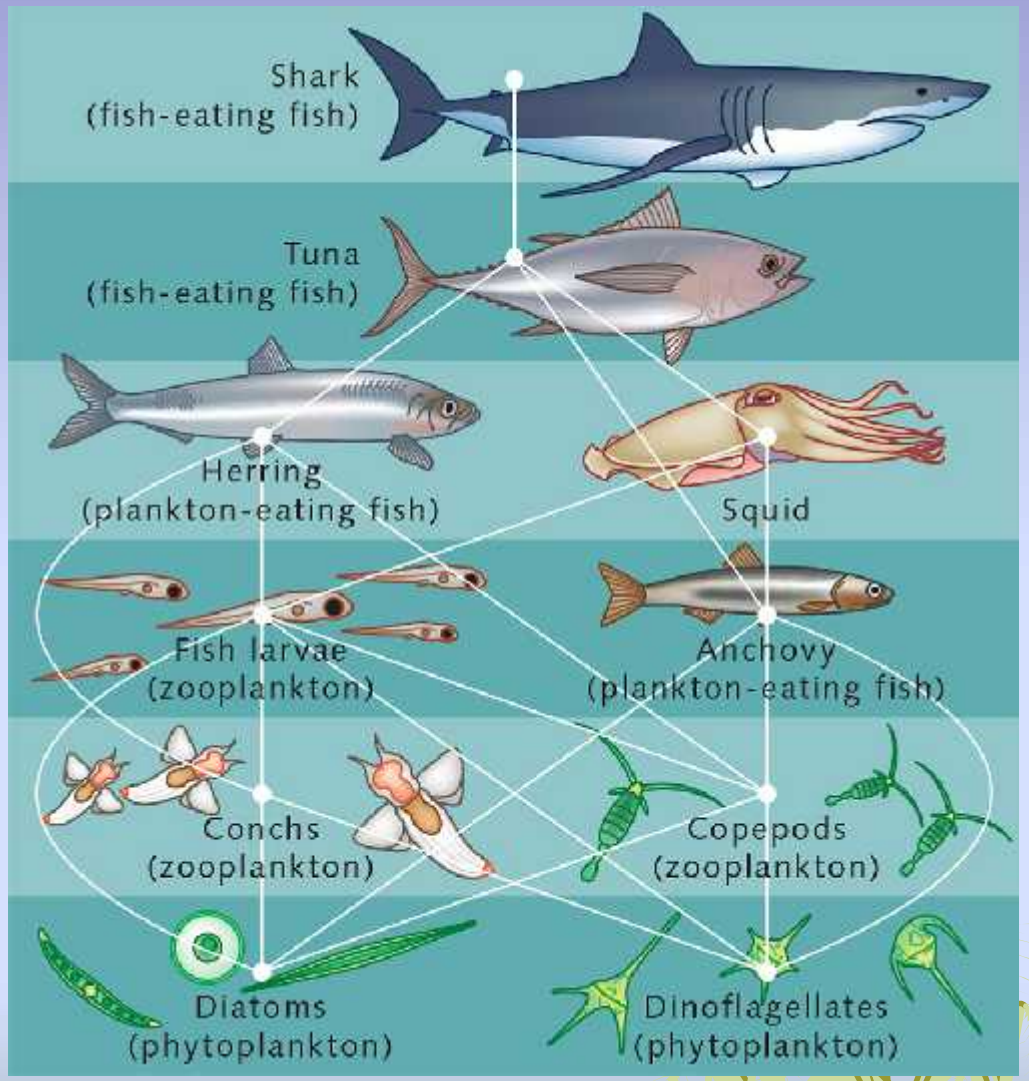


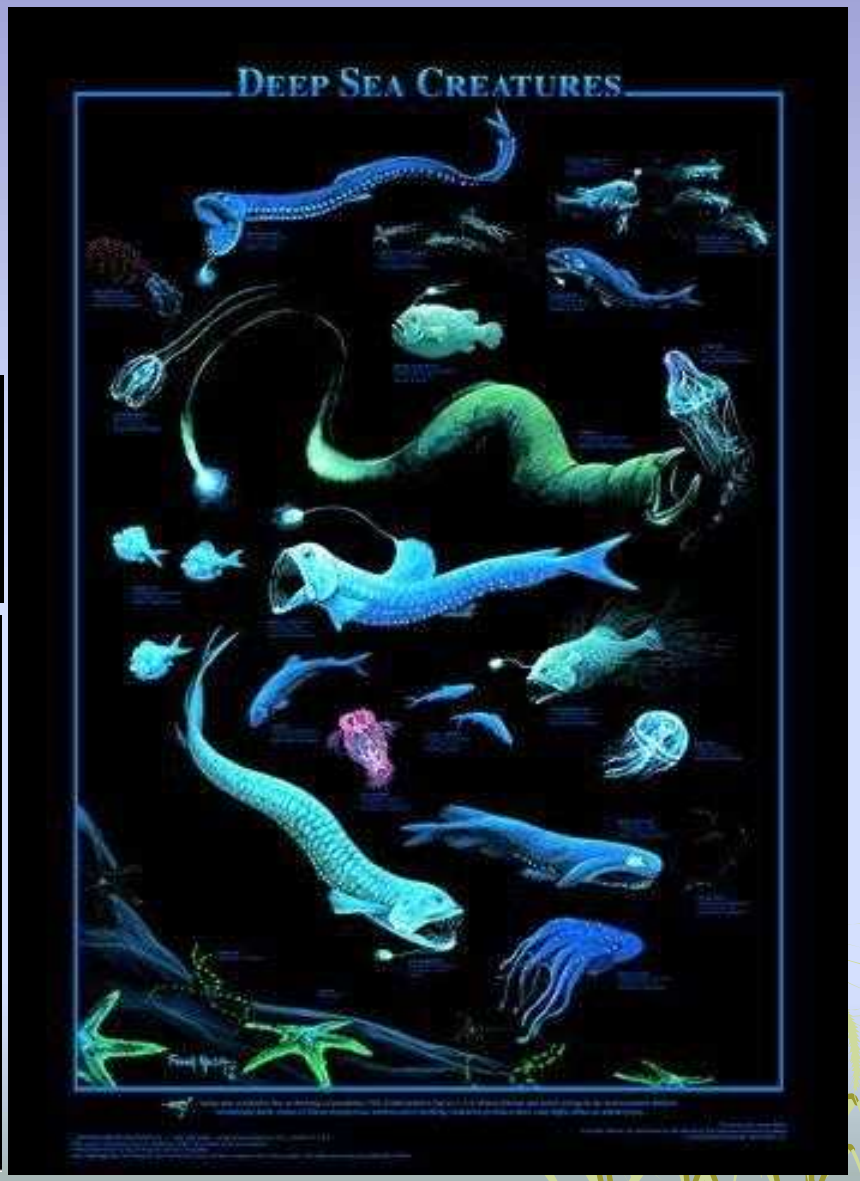

**Pelagic Marine Food Web**

# Pelagic Deep Sea Communities

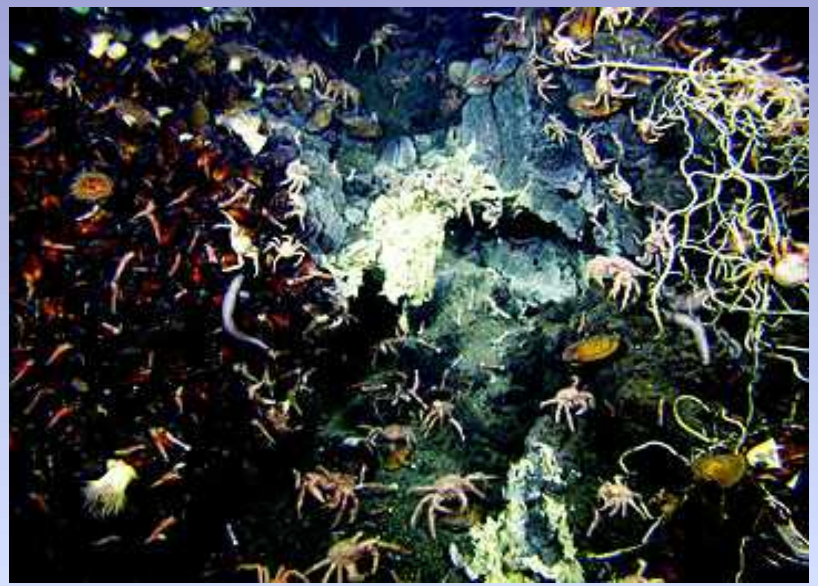
*1)* Deep ocean organisms live in a very cold, high-pressure, pitch-black world.

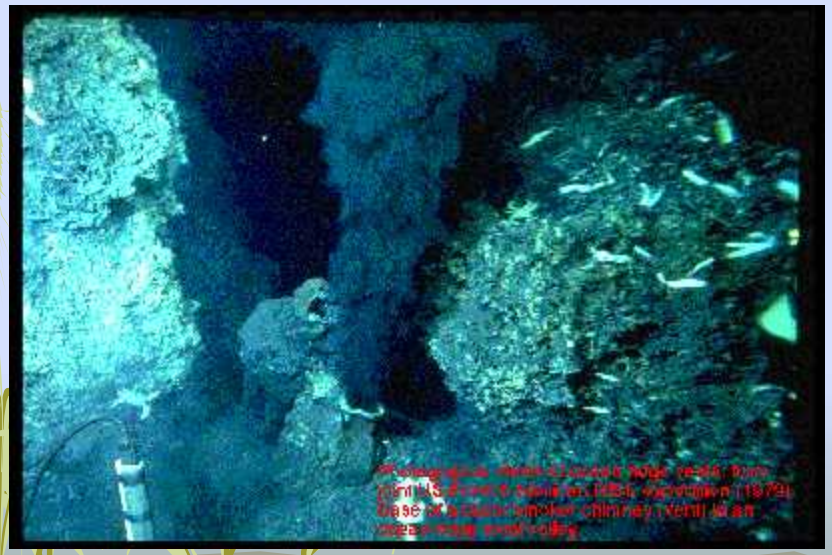
*2)* Food and mates are very scarce, so deep-sea organisms have developed amazing feeding and mating strategies to deal with such harsh conditions.

*1)* Deep ocean organisms live in a very cold, high-pressure, pitch-black world.



# Hydrothermal Vent Communities





# Discussion