Ecological Community

What is a community?

Community
= Biotic part of an ecosystem

- A group of populations
  - Of different species ✓
  - In the same ecosystem ✓
  - At the same point of time
  - Showing interactions among themselves
    - Direct
      - Bird & Seed of a plant
      - Bird & Some Insect
    - Indirect
      - Bird & Grass

Ecosystem = Community + Abiotic factors around the community

The concept

- British ecologist Charles Elton, in his foundational work "Animal Ecology" (1927), introduced several key concepts about
  1. communities
  2. Ecosystems
  3. the food chain.

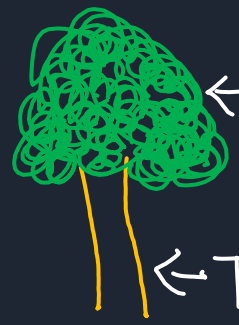
Types

2 types of tundra < Polar, Alpine (at high altitudes of mountains)

3 types of plants

(1) Herb
↳ no wood

(2) Shrub (W)
↳ Woody
↳ Low height
↳ Branching close to the ground

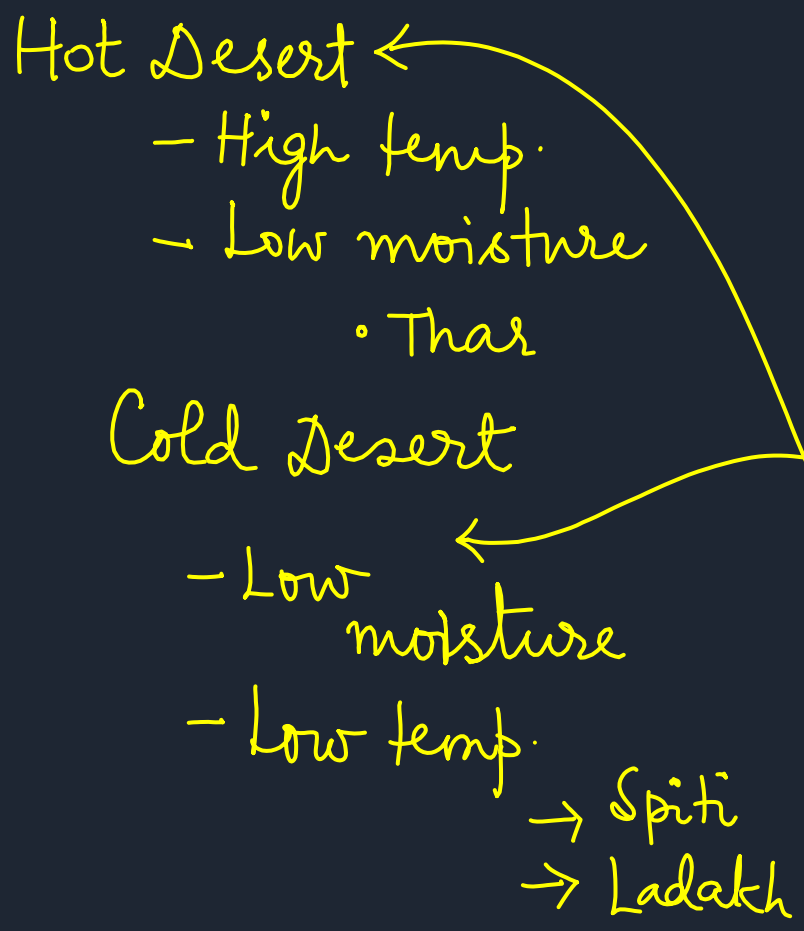


(3) Tree (W)
- Woody
- Clear trunk
- Clear canopy

Classification of Communities by Growth, Composition, and Habitat

- Forests: Dense woody vegetation and a variety of organisms.
- Deserts: Arid conditions with sparse vegetation and specific adapted organisms.
- Grasslands: Dominated by grass species and contain a variety of herbivorous organisms.
- Tundra: Exist in extremely cold climates with limited vegetation and hardy organisms.

Types



Classification of communities by water availability

- Hydrophytic communities exist in predominantly aquatic habitats.
- Mesophytic communities exist in moderately moist soils.
- Xerophytic communities exist in arid or dry conditions.

The attributes

1	**Species Composition**	Identity and variety of species in a community, determines structure and function.
2	**Species Diversity**	Richness (number of species) and evenness (distribution among species). Higher diversity leads to resilience against disturbances.
3	**Trophic Structure**	Organization based on feeding levels (producers, consumers, decomposers).
4	**Dominant Species**	Species with significant influence due to size, abundance, or impact.

The attributes

Functional Groups	Species with similar roles, not necessarily related (e.g., pollinators).
Interaction Strength	Degree of interaction between species, influencing community structure.
Spatial Distribution	Pattern of organism placement (random, uniform, clumped).
Successional Stage	Stage of community development due to disturbances or interactions.

Attributes

Keystone Species	Species with disproportionately large impact relative to abundance. Removal drastically alters the community.
Ecological Guilds	Groups of species exploiting resources in similar ways, regardless of taxonomic relationship.
Ecological Equivalents	Species in different geographic areas filling similar ecological roles.
Ecological Niche	Species' role within the environment, including resource use and interactions with other species.

Keystone species

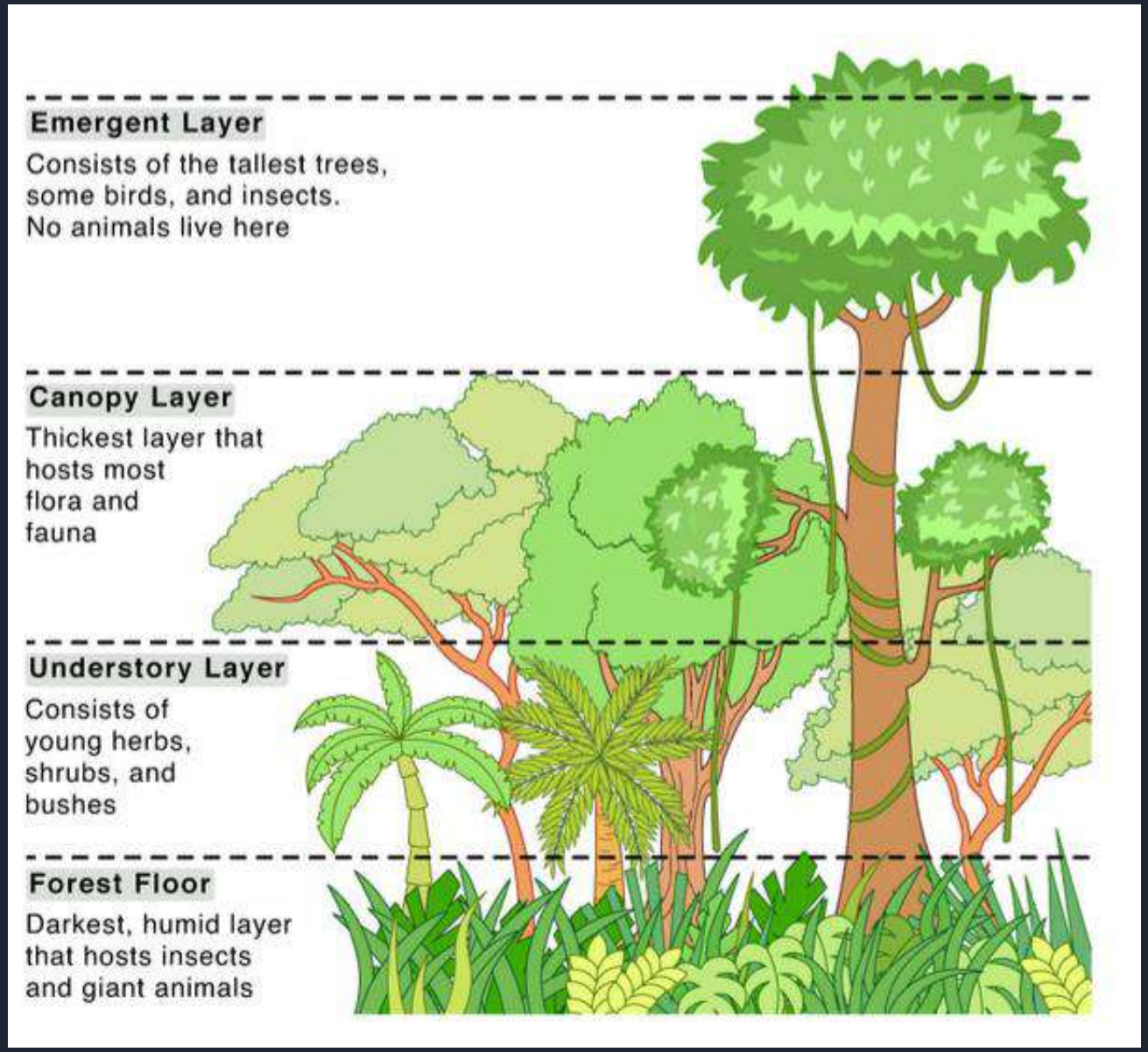
Keystone Species	Description of Role
Sea Otters	Control sea urchin populations, which helps maintain healthy kelp forests that provide habitat for many other species. → Brown Algae
Wolves	Regulate populations of herbivores like deer and elk, preventing overgrazing and protecting plant diversity.
Beavers	Create dams that form wetlands, increasing habitat diversity and supporting other species.
African Elephants	Uproot trees and create open areas in savannas, maintaining diverse plant and animal communities.
Fig Trees	Produce fruit year-round, providing a key food source for many animals during lean seasons

Some keystone animals

Sea Otter

Beaver

Stratification



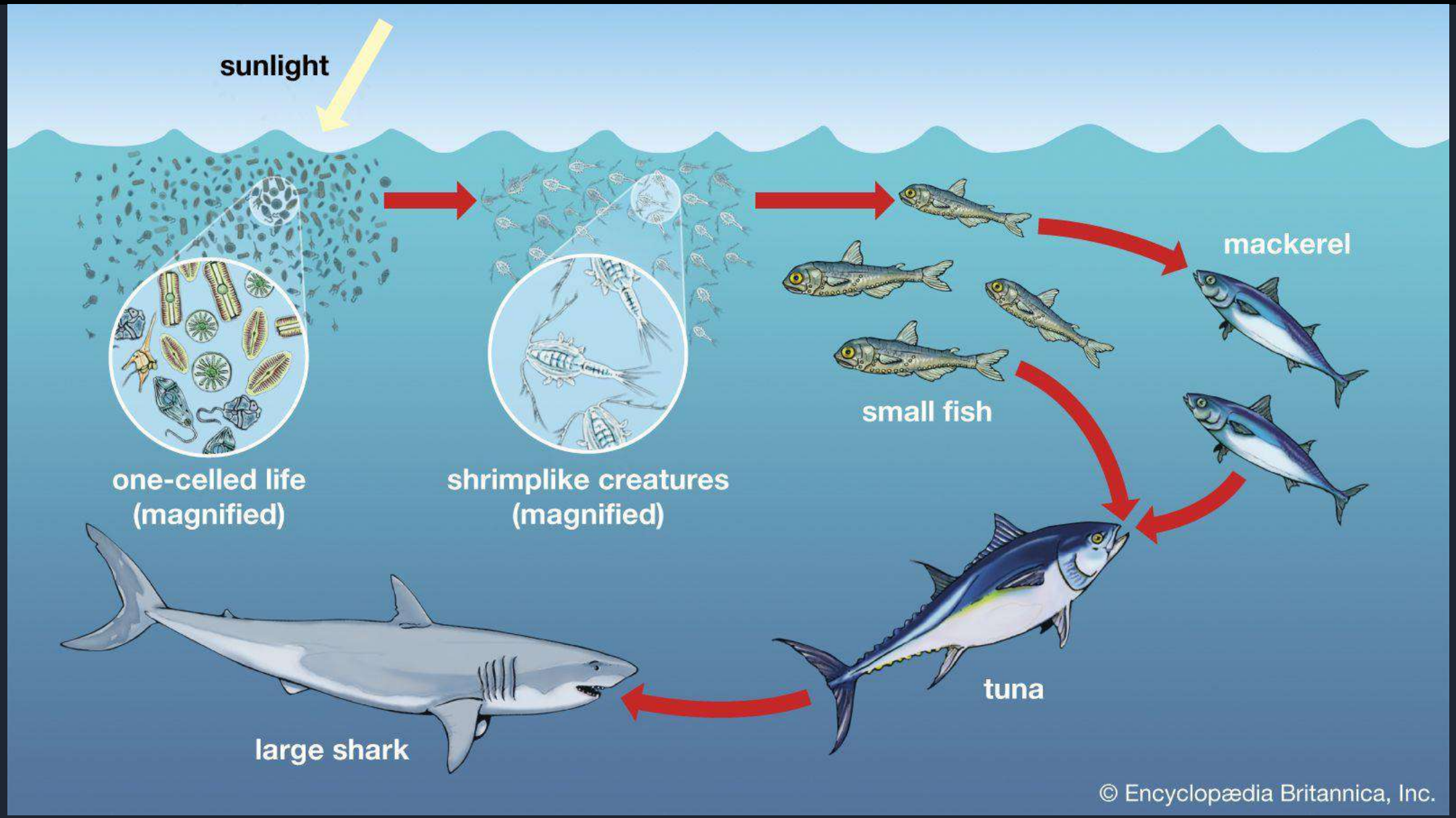
Inter-species relations

Neutralism	Neither population is affected by the other.	A desert tortoise and a desert bird that do not share resources.
Competition (Direct Interference Type)	Both populations actively inhibit each other.	Crows and starlings competing for nesting sites.
Competition (Resource Type)	Each population adversely affects the other indirectly in the struggle for resources.	Various grass species in a grassland competing for water.
Amensalism	One population is inhibited and the other is not affected.	A large tree shading out smaller plants beneath it.

Inter-species relations

Commensalism	One population benefits, but the other is not affected.	Barnacles attached to a whale; the barnacles benefit from transportation and food sources.
Parasitism	One population adversely affects the other by continuous attachment and slow withdrawal of food resources.	Tapeworms in humans.
Predation	One population adversely affects the other by direct attack for food.	A lion hunting a deer.
Protocooperation (Facultative Cooperation)	Both populations benefit by the association but can survive independently.	Honeybees pollinating flowers; both species benefit, but they can survive independently.

Food chain


sunlight
one-celled life
(magnified)
shrimplike creatures
(magnified)
small fish
mackerel
tuna
large shark
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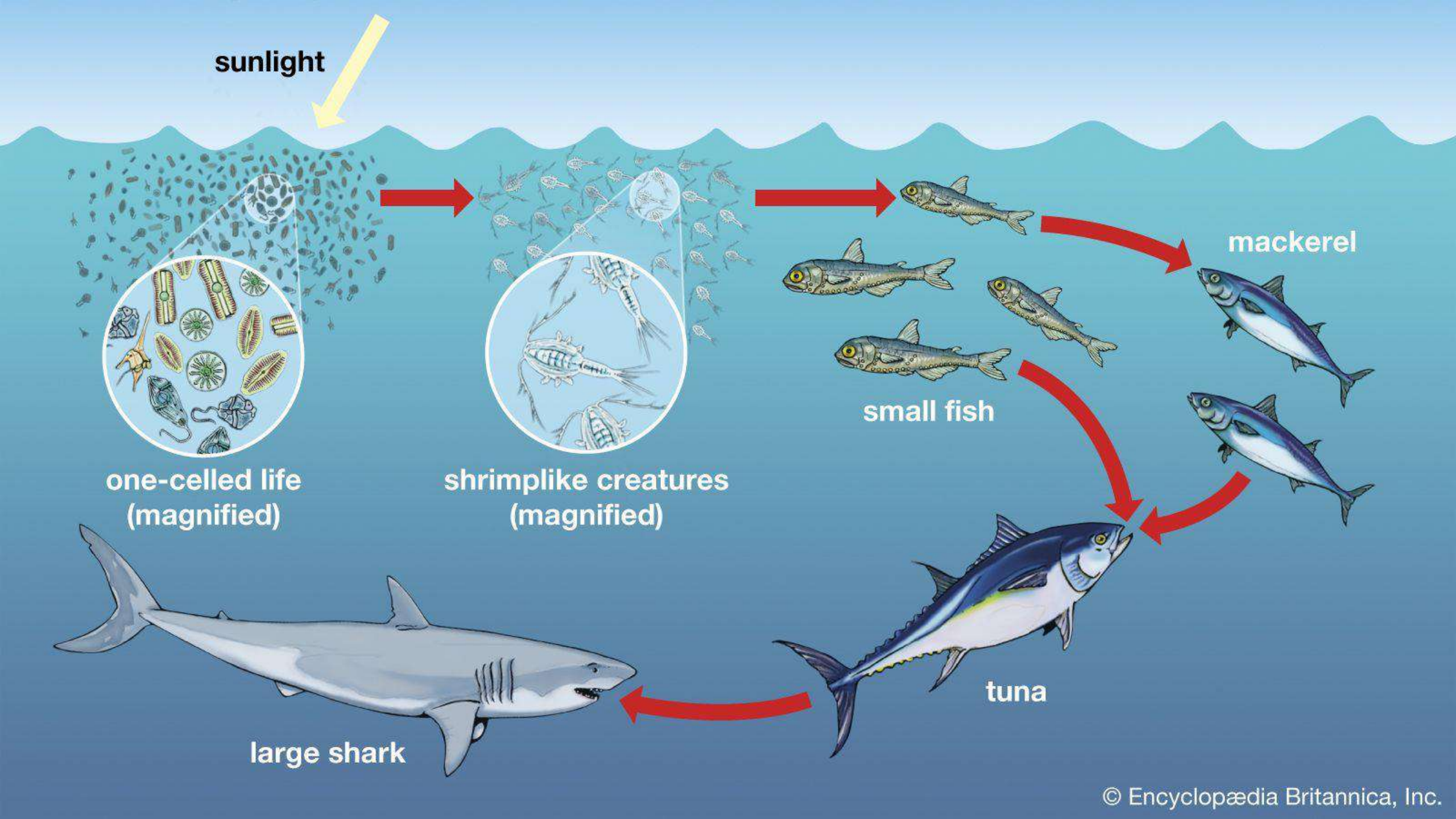

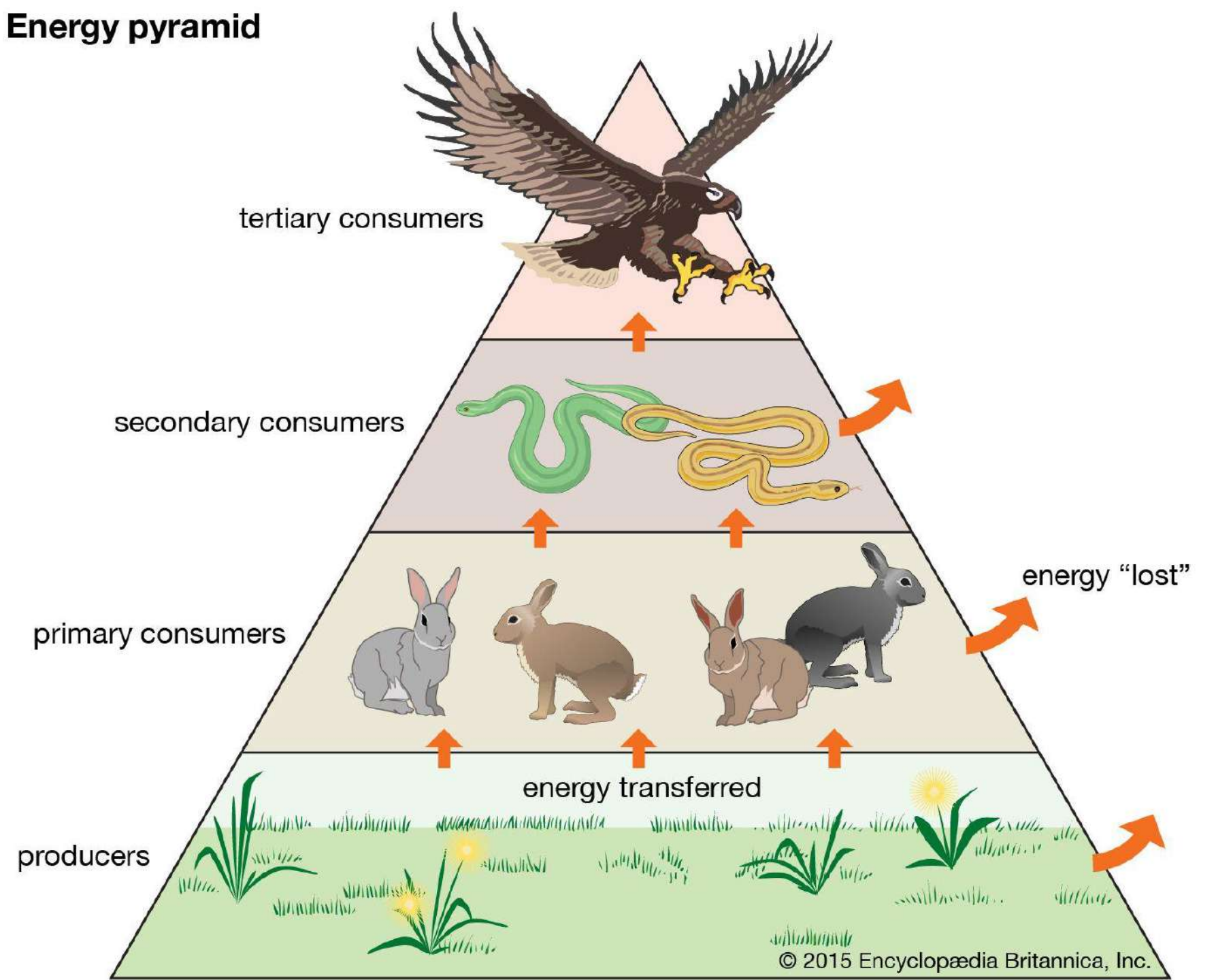
Energy pyramid
tertiary consumers
secondary consumers
primary consumers
producers
energy transferred
energy "lost"
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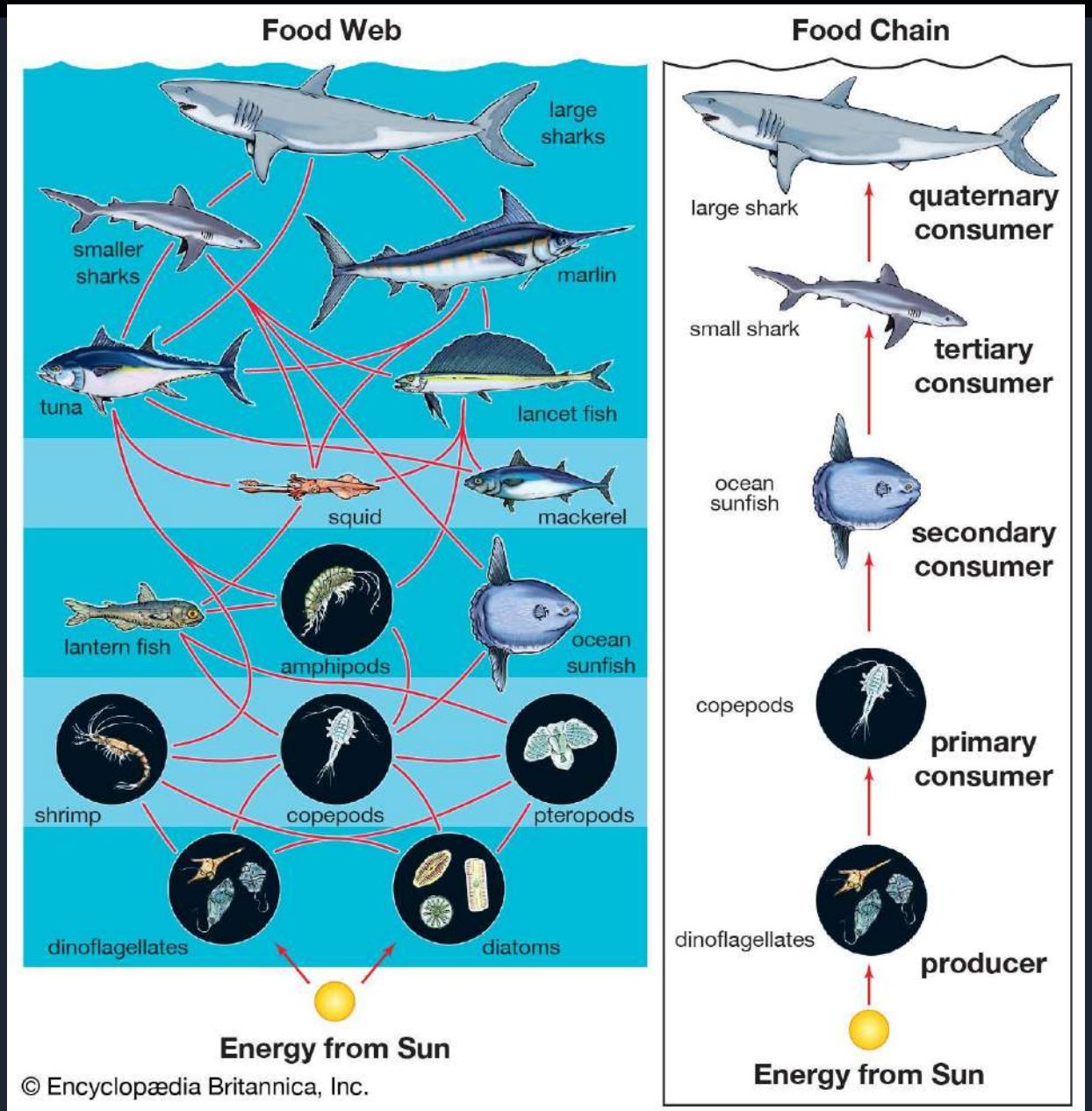
Food web


Food Web
large sharks
smaller sharks
marlin
tuna
lancet fish
squid
mackerel
lantern fish
amphipods
ocean sunfish
shrimp
copepods
pteropods
dinoflagellates
diatoms
Energy from Sun
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Food Chain
large shark
quaternary consumer
small shark
tertiary consumer
ocean sunfish
secondary consumer
copepods
primary consumer
dinoflagellates
producer
Energy from Sun

Thank you.