

# ECOLOGY

The scientific study of the *interactions* between organisms and their *environment*. (Both *living* and nonliving.)

# SPECIES RELATIONSHIPS

- a. Autotrophs – (**Producers**) Organisms that use **energy** from the sun or energy stored in chemical compounds to **make** their own food. (**plants, algae**)
- b. Heterotrophs – (**Consumers**) Organisms that **depend** on autotrophs as their source of nutrients and **energy** (**Cannot** make their own food)



Does the bear directly or indirectly depend on the apple tree?

**BOTH**

# TYPES OF SYMBIOSIS

- ▶ Organisms live in close relationships for survival.
- ▶ Symbiosis – Close and permanent association between organisms of different species.
  1. Commensalism – Relationship in which one species **benefits** and the other species is neither **harmed** nor **benefited**.
  2. Mutualism – Relationship in which **both** species benefit
  3. Parasitism – Relationship in which one organism **benefits** and the other is **harmed** (It may harm the host, but usually does not **kill** it.) (ticks, **leeches**, tapeworms, **hookworms**)

# COMMENSALISM



Which organism(s) are benefiting?

# Mutualism



How is each organism benefiting from these relationship?

# Parasitism



What food source do these parasites depend on?

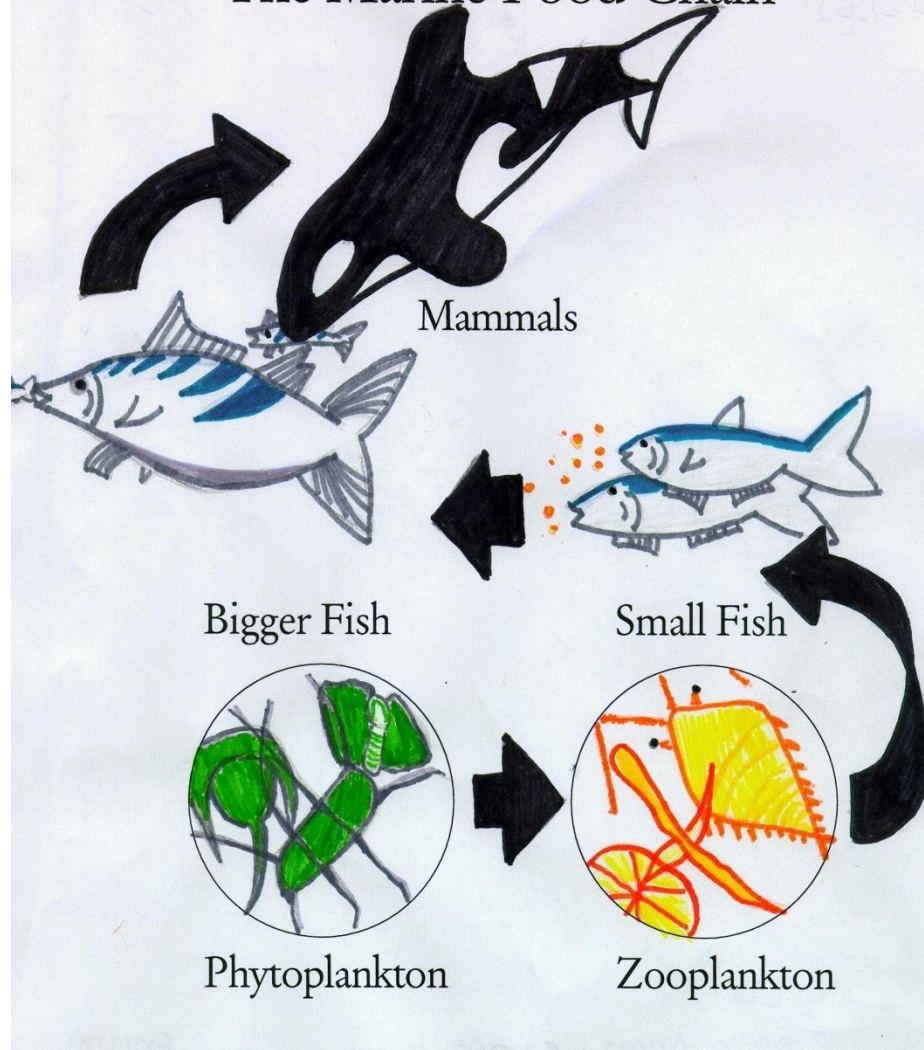
**Blood from their host.**

# Matter and Energy in Ecosystems

- Food chain – A simple model used to show how matter and energy move through an ecosystem (autotroph to heterotroph) pg. 69
- Food chains consist of 3 links, but have no more than 5 links due to the amount of energy decreasing
- Each organism in a food chain represents a feeding step (trophic level) in the passage of energy and materials

# Food Chains

## The Marine Food Chain



Name the 1<sup>st</sup> level consumers in this food chain.

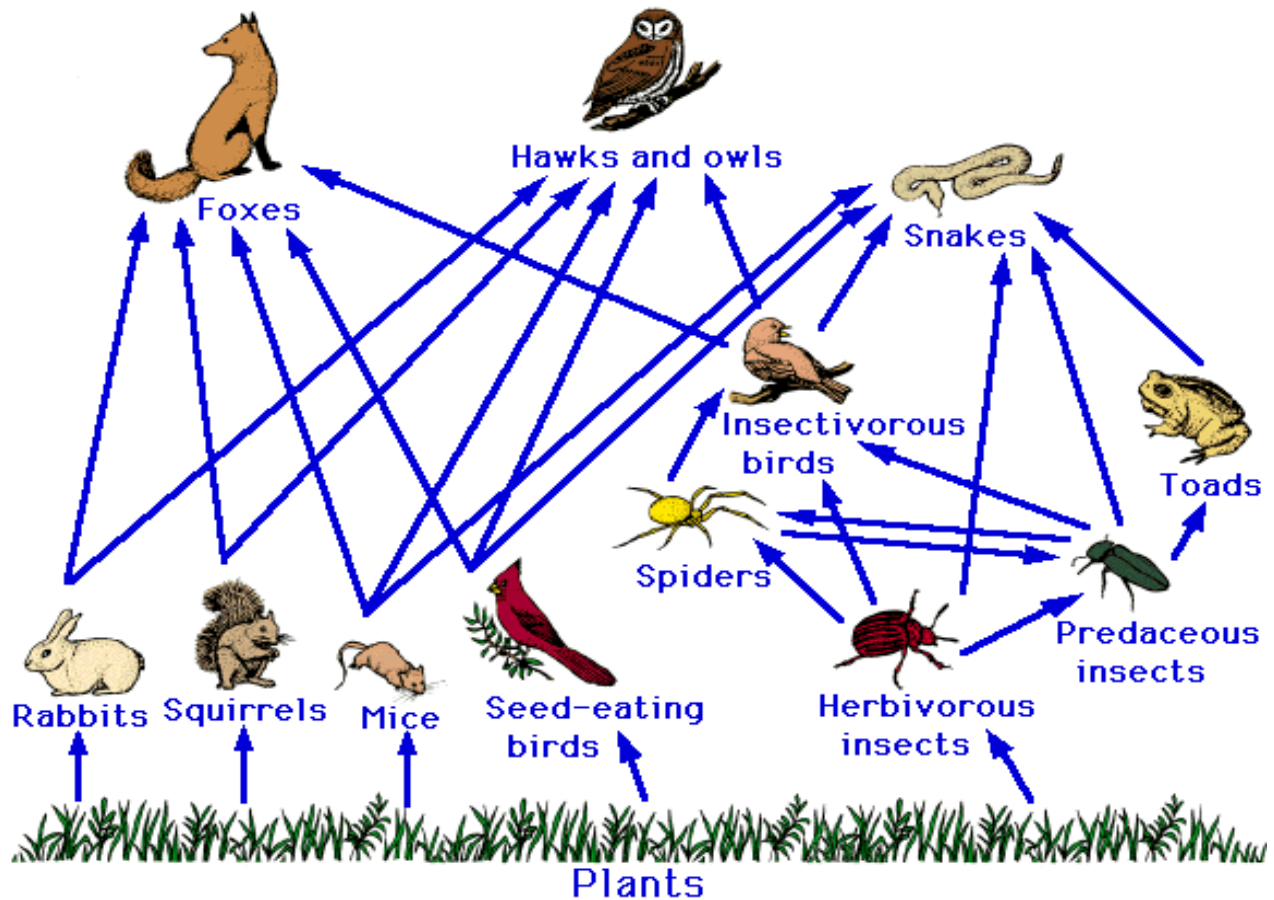
**Zooplankton**

# Food Webs

- Food web – expresses all of the **relationships** at each trophic level in the **community**

What trophic level do spiders belong to?

**2<sup>nd</sup> Level Consumers**



# Ecological Pyramid

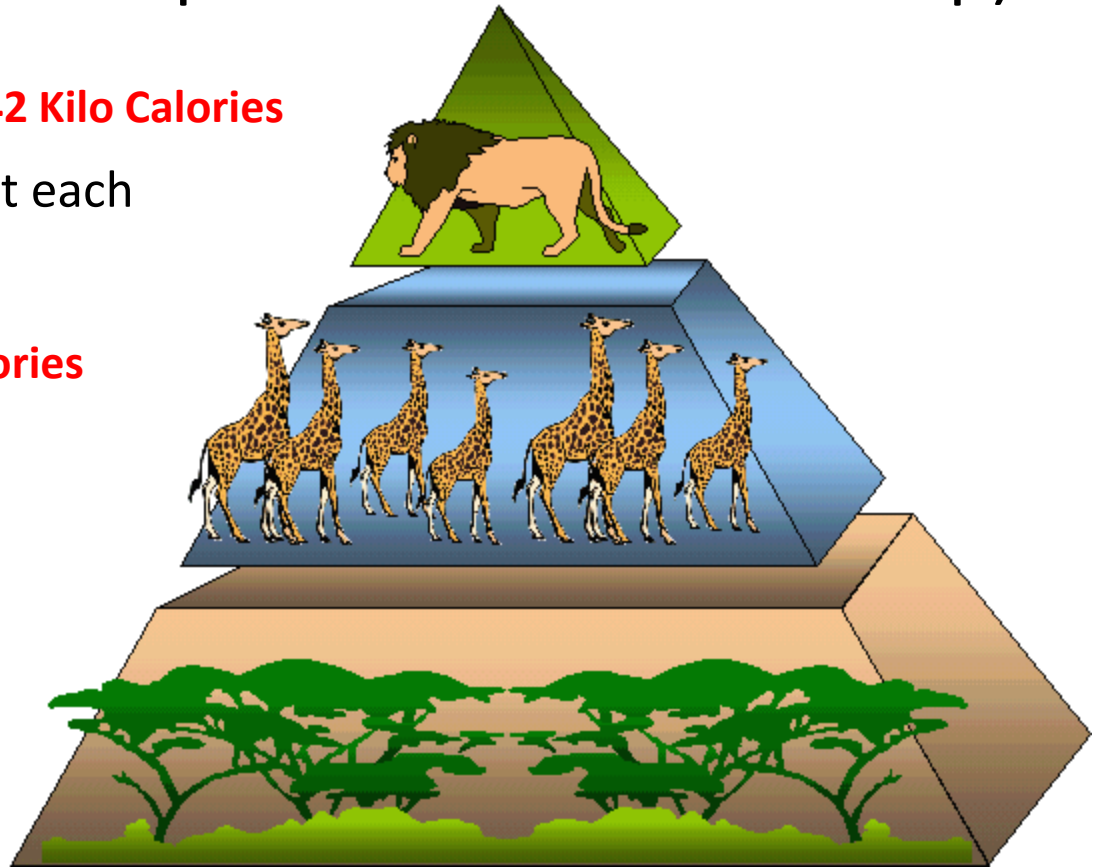
- Ecological pyramid-depicts (shows) energy conversions in an ecosystem (producers are on the bottom, higher trophic levels are on the top)

42 Kilo Calories

How much energy is available at each level?

420 Kilo Calories

4200  
Kilo Calories

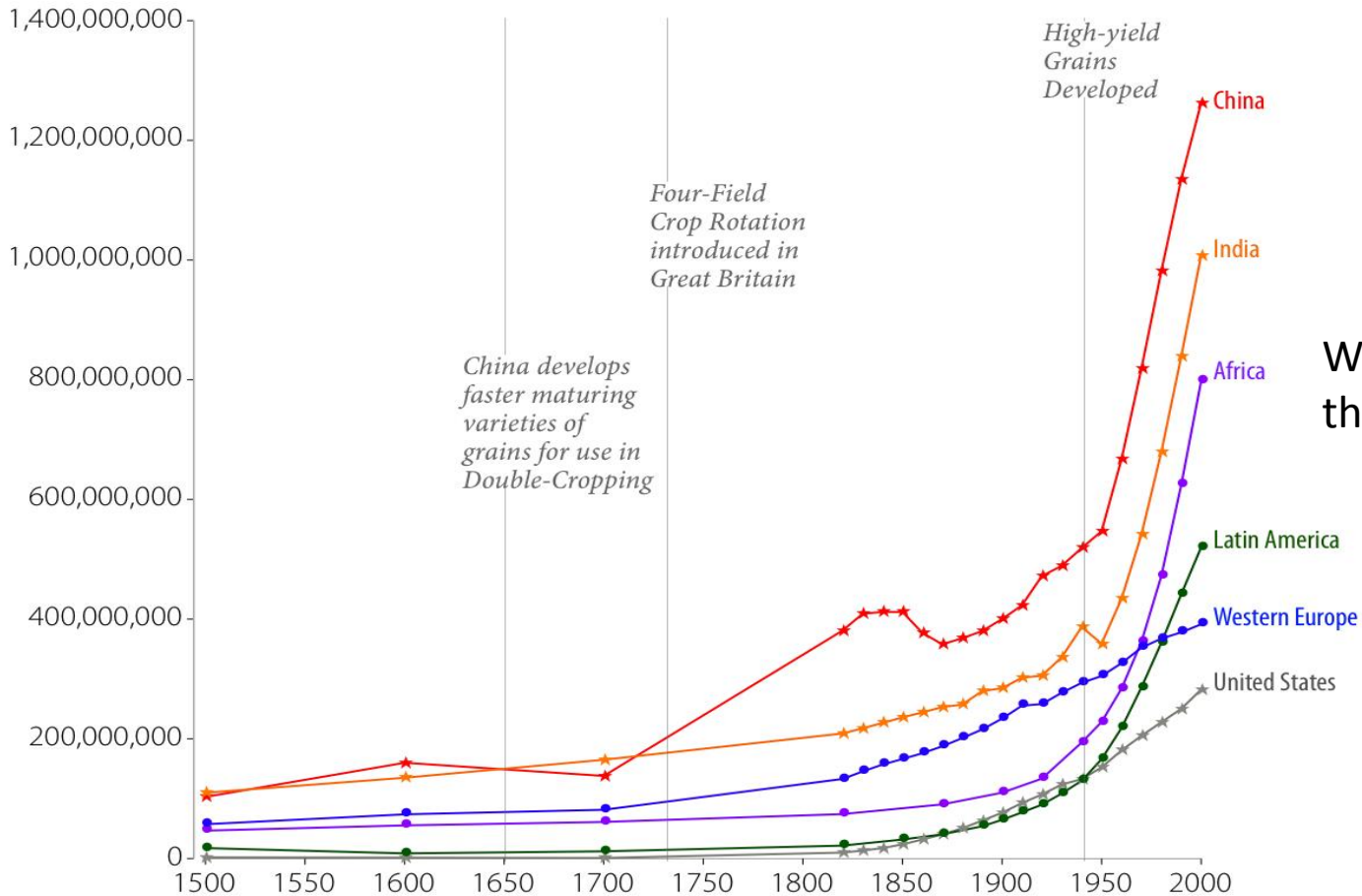


# Populations

- Exponential growth – of a population of organisms occurs when the number of organisms increases by an ever-increasing rate.
- Results in population explosion.
- J-shaped curve – under ideal conditions, a population's size would continue to increase indefinitely. This increase can be shown graphically and resembles the letter *J*.
- Fortunately, population size does have a limit.

## Population Growth over the Last 500 Years

China, India, Africa, Latin America, Western Europe, and United States



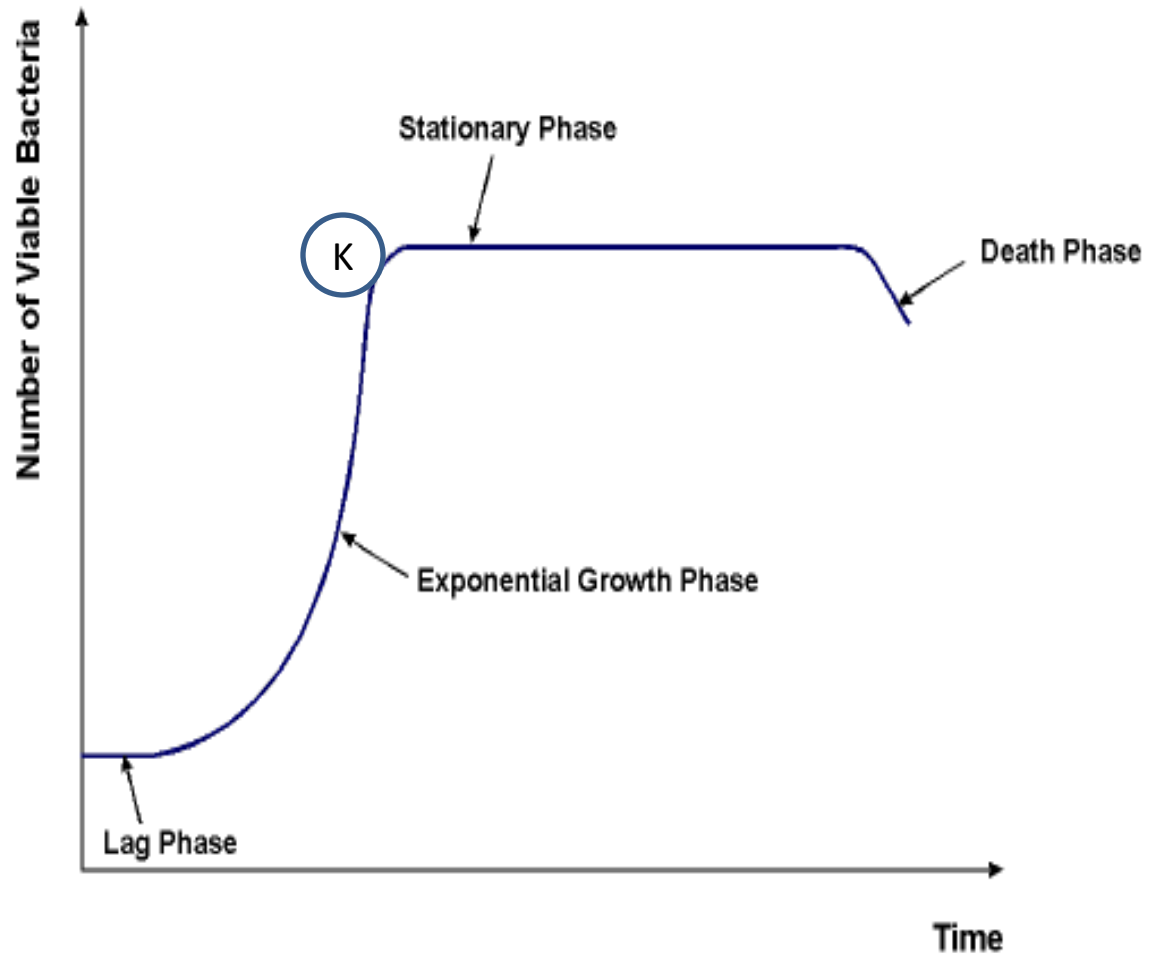
What type of curve are these?

**J - shaped**

# Populations

- Logistic Growth
- S-shaped curve – When population growth **levels** off at a carrying capacity (K) of the environment a **S** shaped curve will appear graphically.
- Carrying capacity – is the number of organisms of a population a particular **environment** can support over an indefinite period of **time**.

# S-Shaped Curve



What does the K represent?

# Populations

- Factors that limit population growth. (food availability, space, extreme temperature and even storms).
- 2 types of limiting factors
  1. Density-dependent factors – factors that limit population density; includes disease, competition, and parasites
  2. Density-independent factors – weather related occurrences affect populations; include floods, storms, temperature and droughts

# Populations



What if the guy in the circle had an extremely contagious airborne disease?

How many around him are going to contract the disease?

A lot of people will contract the disease because of the close proximity he is to others.

# Populations

- Populations are not limited only by environmental factors, but are also controlled by various interactions among organisms that share a community.
- **Predation** and crowding / stress can also affect populations.

How is the lion controlling the population of the wildebeest?

