

Food Chain Checkers

Name: _____

What's a food chain?

A **food chain** is a group of living things that depend on one another for energy. Energy is passed along the food chain. All living things need energy. They have different ways of getting the energy they need. The living things at one end of almost all food chains make their food using sunlight, water, and carbon dioxide (such as plants and algae). At the other end of food chains is a top predator, an animal that eats other animals and whom nothing else eats.

A simple food chain includes:

- **Producers:** A species that can make its own food, usually using sunlight, water, and carbon dioxide through a process called photosynthesis.
- **First-order consumers:** A species that eats only producers. It is also called an herbivore.
- **Second-order consumers:** A species that eats herbivores. It is a type of carnivore.
- **Third-order consumer:** A species that eats carnivores. If it has no predators, it is called a "top predator".

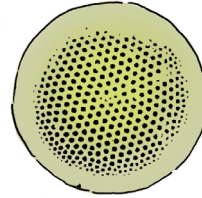
Some living things have different patterns of eating, such as eating both producers and animals (omnivores) or eating dead and decaying life (decomposers). Many types of bacteria and all types of fungi are decomposers.

In every food chain there are more individuals at the bottom than at the top. Each first-order consumer needs to eat several producers to survive. Each second-order consumer needs to eat several herbivores to survive. So the number of producers and herbivores must be higher than the number of second- and third-order consumers.

For example, in this food chain one meal for a whale would be approximately 5000 herring. Each of those herring has 6500 copepods in its stomach so that many herring would need 32,500,000 (32.5 million) copepods for a meal. Each copepod eats 130,000 diatoms, so that many copepods would need 4,225,000,000,000 (4.225 trillion) diatoms for a meal!

The Players

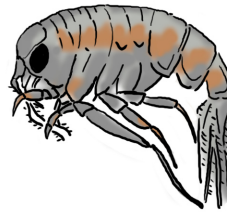
Diatoms



100 microns wide

These *producers* are some of the most abundant in the world's oceans. Diatoms are a type of algae and are a part of the phytoplankton. They float through the oceans and make their own food by photosynthesis.

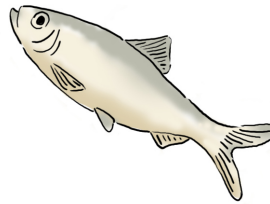
Copepods



1 - 2 mm long

These little animals are *first-order consumers* and a part of the zooplankton. They belong to a group of invertebrates called arthropods and are related to shrimp. Copepods are found in oceans worldwide.

Herring



14 - 35 cm long

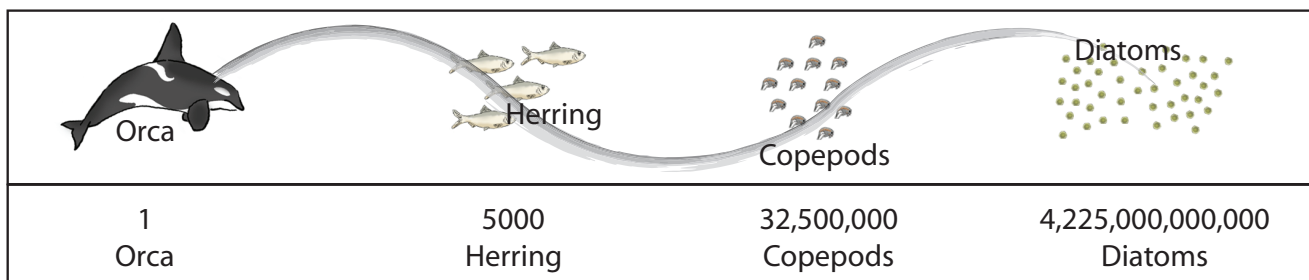
These fish are *second-order consumers*. They are common in the North Pacific and North Atlantic oceans. When eating, they swim with their mouths open to catch zooplankton like copepods from the ocean water.

Orca Whales



8 - 10 meters long

Orca whales are *third-order carnivores* and the top of this food chain. They eat herring (and many other animals). Because other animals do not eat them, Orcas would usually only die of natural causes (if they were not affected by humans.)



Food Chain Checkers: Directions for Round 1

Objective: Capture your prey! You do this by jumping over it.

To begin:

- First decide which player will represent diatoms, copepods, herring, and whales. Record this at the right.
- Each player puts six game pieces on the board in any squares he or she chooses. The diatom player gets to put his or her pieces on the board first, then the copepod player, then the herring player, and then the Orca player.

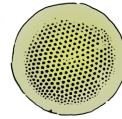
To move:

- During your turn, you can move ONE of your pieces to any adjacent open square (including diagonal ones) or jump over your prey in an adjacent square.
- You can move in any direction on the board. *(You are not trying to get to a specific location - just get your prey.)*
- You cannot jump pieces that are not your prey or move into a square if there is already someone there.

To capture your prey:

- Capture a prey piece by jumping it.
- Capturing food allows your species to reproduce, so take the prey that you jumped off the board and replace it with a piece from your reserve.
- *Note: If your prey is at the edge of the board, and to jump over it your piece is moved off the edge of the board, you can make the jump and then place your piece in any open space on the opposite edge. If there are no open spaces on the opposite edge, you can not make the jump.*

Record who is playing each species.



Name: _____

Will be **diatoms.**

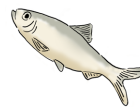
(Put 6 pieces on the board 1st.)



Name: _____

Will be **copepods.**

(Put 6 pieces on the board 2nd.)



Name: _____

Will be **herring.**

(Put 6 pieces on the board 3rd.)



Name: _____

Will be **Orca whales.**

(Put 6 pieces on the board 4th.)

Play for 10 minutes and answer these questions...

How is this game like a real food chain?

How is this game *not* like a real food chain?

How many do you have on the board after 10 minutes of play?

Diatoms	
Copepods	
Herring	
Whales	

How can you make it better? Suggest a way that you would change the rules of the game to better account for each of your items that you identified as missing above. In other words, how would you build a better game? In round two of the game, you will play according to your new rules.

Food Chain Checkers

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Graphing Populations Over Time

A population is the number of individuals of a species that live in an area.

Ecologists study changes in the size of populations of species over time to figure out if an ecosystem is in balance. Having balance is very important for ecosystems. More balanced ecosystems will often have populations that stay about the same size year after year. Ecosystems that are not balanced are more likely to have populations that grow or shrink year after year.

Do you think Round 1 of Food Chain Checkers is like an ecosystem in balance? What about Round 2?

In Food Chain Checkers,





- The area where our populations live is the game board.
- The number of individuals is the number of game pieces in play on the board.

By recording the total number of individuals of each species at several points during the game, you can figure out if this game is like an ecosystem in balance or if it is not balanced. *(Remember that this game is a simplified ecosystem, so the living things are only affected by this food chain.)*

Every time the first player (diatom) moves, record the number of individuals of each species that are on the board (number of diatom game pieces, copepod game pieces, etc.) Then graph the information on the next page.





Populations Over Time

Round 1 (basic rules)

				
Time	Diatom	Copepod	Herring	Whale
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

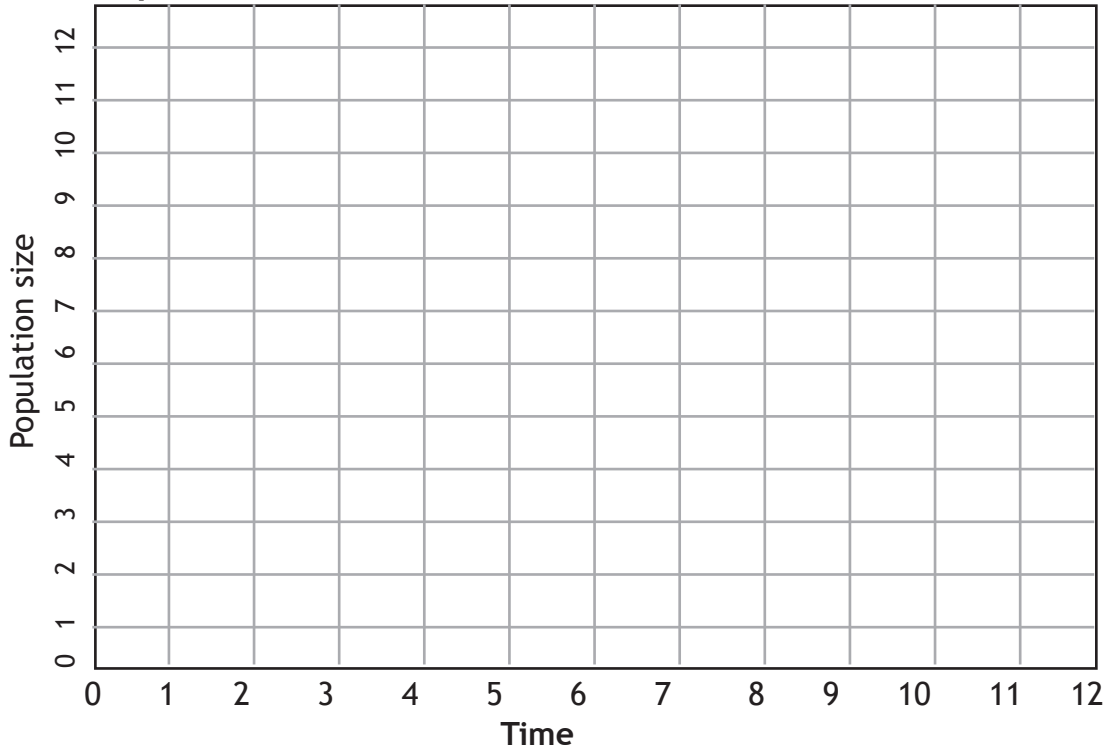
Populations Over Time

Round 2 (modified rules)

				
Time	Diatom	Copepod	Herring	Whale
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

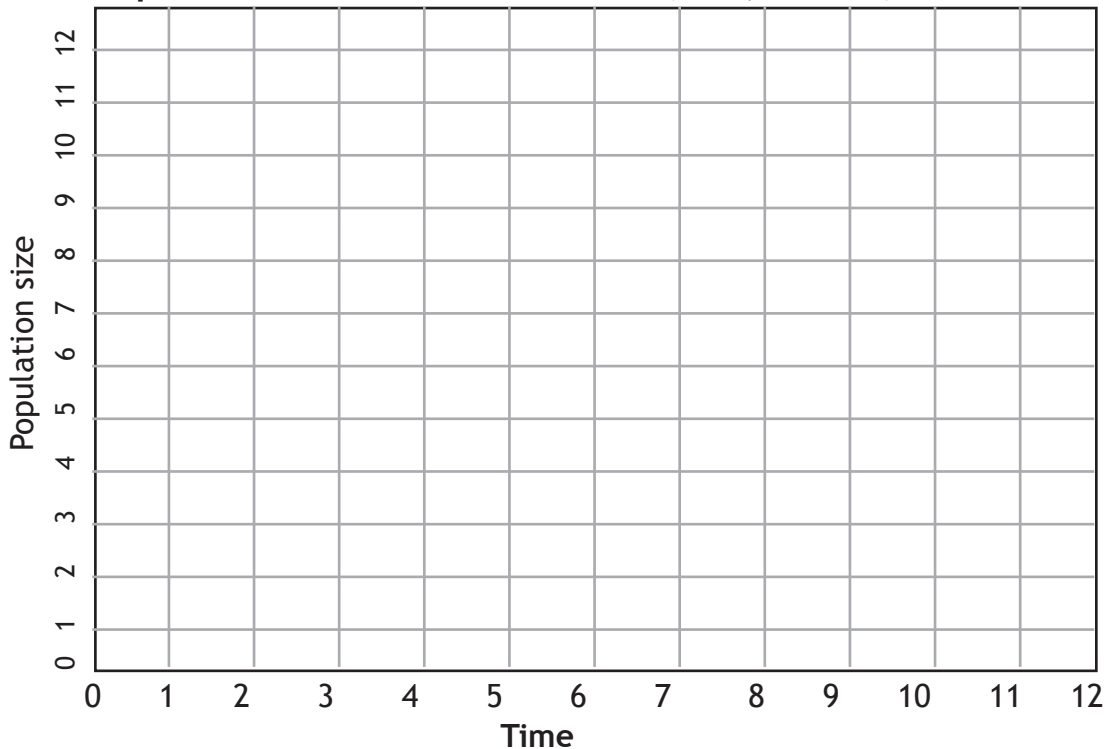
Graph your data from the previous page. Use a different color line to represent each population (diatoms, copepods, herring, and whales). Color the key at the bottom to show which color represents each species.

Populations Over Time: Round 1 *(basic rules)*



Is the Round 1 ecosystem in balance? Why or why not?

Populations Over Time: Round 2 *(modified rules)*



Is the Round 2 ecosystem in balance? Why or why not?

Key *(Color squares below to indicate which color line is for which population.)*

Diatoms

Copepods

Herring

Whales

Food Chain Checkers: Game Pieces

Directions: You will need two copies of this template page for each game. Cut pieces apart along gray lines. For a more durable set of pieces, print on cardstock and/or laminate pieces.

