Name: _____

Ocean Ecosystems

Why are Marine Protected Areas created? The main reason is to protect the valuable ecosystems and habitats. Be it fish, marine mammals, sea birds or even humans, each species within an ecosystem plays an important role.

Section A) What is an ecosystem?

The more you observe the world around you, the more you will see that we are all connected. Everything and everyone is part of a bigger picture. When we study the way that different types of life are connected to each other and their environment, we are studying their ecosystem. The system is simply the way these things are linked as a unit.

There are many types of ecosystems. An ecosystem can be as small as a puddle, or as big as an ocean. It can be on land, in the air, in the water, or all these things combined.

When you take a picture with a camera, you can focus in on a small area or you can zoom out to include a bigger area. Similarly, when we study ecosystems, we can zoom in on a tiny ecosystem, like all the creatures that live in a puddle. Or we can study a larger ecosystem that includes all the living creatures in the ocean. The world can be seen as one big ecosystem, but it is so complex that we often break it down to study it in smaller parts.

An ecosystem contains both the living (biotic) and non-living (abiotic) elements. For instance, because all the fish living in a pond need water to survive, the pond water is part of their ecosystem.

Every ecosystem includes three types of biotic groups: producers, consumers, and decomposers. The ways that they interact (work together) make them dependent on each other – each type relies on the other two to survive. No one group is more important than the other.

Name: _____

Producers

Plants, and sometimes other types of organisms like bacteria, that gather energy and nutrients from the abiotic environment, such as sun, water and soil.

Consumers

Animals that eat producers or other consumers.

- *Consumers that eat plants are called herbivores.*
- *Consumers that eat animals are called carnivores.*
- *Consumers that eat both plants and animals are called omnivores.*

Decomposers

Break down waste and dead materials (or "organic matter") so nutrients are returned to the abiotic environment, such as water or soil. Many decomposers are microorganisms such as bacteria and some fungi, which means they are too tiny to see with our naked eyes. Other decomposers include snails, worms, and other fungi. Decomposers are nature's recyclers.

Name: _____

1. A World Without

   Can you imagine our world without producers, consumers or decomposers? Use your imagination to complete the thoughts below.

   i) Our world without producers would:

   ii) Our world without consumers would:

   iii) Our world without decomposers would:

Canon

Name: _____

2. Classify Canada

Put the following Canadian organisms in the correct categories:

- Maple tree
- Beaver
- Moose
- Rocky Mountains
- People
- Black fire beetle
- Great Lakes
- Cod
- Canada goose
- White pine
- Polar bear
- Mushroom

Biotic	Abiotic
Producer	
_____	_____
_____	_____
Consumer	
_____	
_____	
_____	
_____	
_____	
_____	
Decomposer	
_____	
_____	

Name: _____

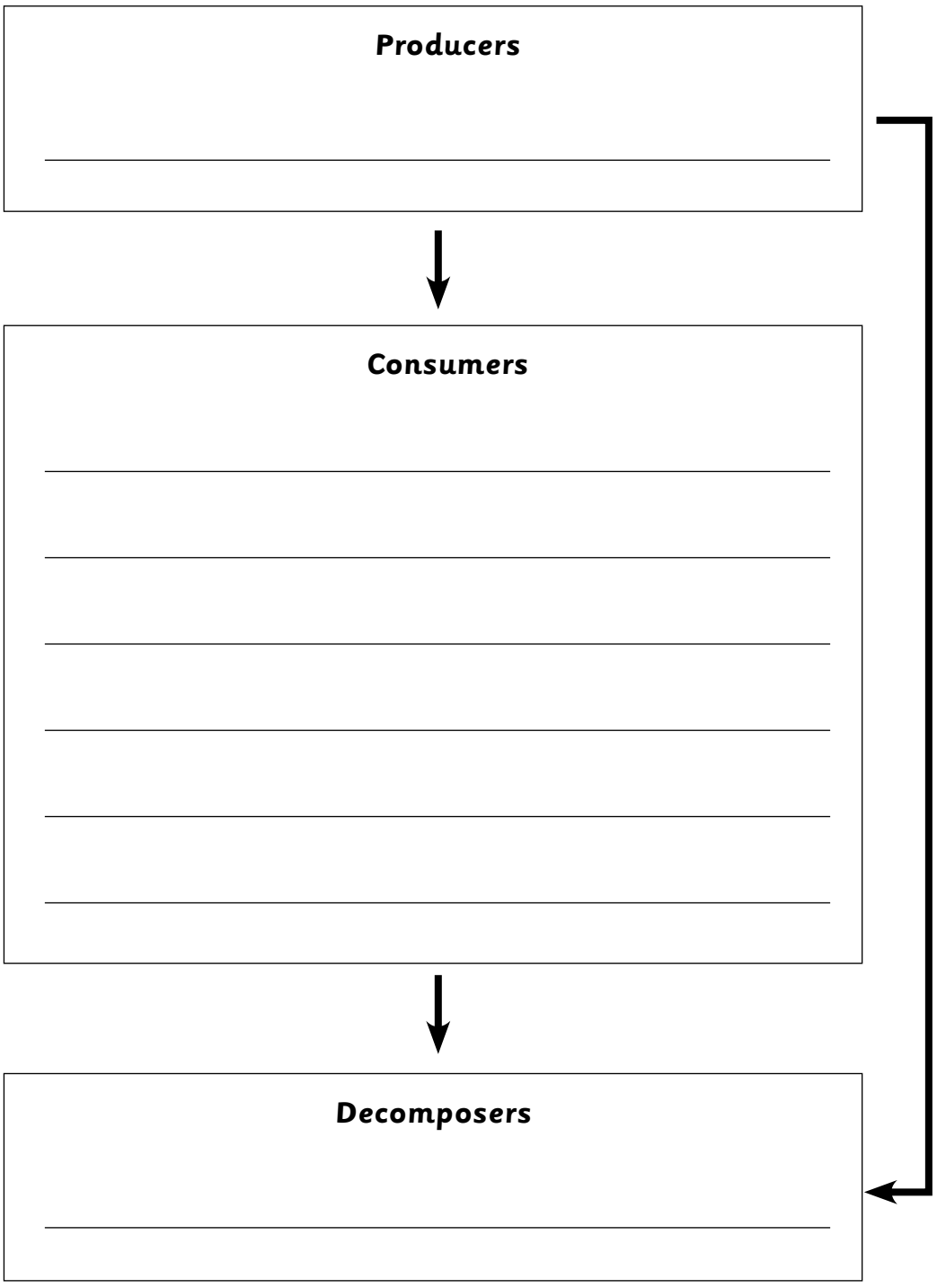
Section B) An Ecosystem: *Life in the Gully*

The ecosystem in the Gully is made up of many creatures. Each one has its own job. Some of the Gully's creatures and their jobs are described below.

- **Bottlenose whales** *dive deep into the Gully to hunt for squid.*
- **Cold water currents** *carry nutrients from the depths.*
- **Cold-water coral** *absorbs nutrients and feeds on zooplankton carried by ocean currents.*
- **Sunlight** *is the source of energy for algae and phytoplankton.*
- **Squid** *eat zooplankton and any fish or other sea creatures they catch in their tentacles.*
- **Bacteria** *break down the organic matter of other organisms and recycle nutrients back into the water.*
- **Phytoplankton** *are carried around by water currents and get energy from sunlight.*
- **Zooplankton** *are carried around by water currents and feed on phytoplankton.*
- **Lobsters** *crawl along the ocean floor in search of fish, worms, and crabs to eat.*
- **Salinity** *is the concentration of salt in the water.*
- **Larval halibut** *feed on zooplankton. Full-grown halibut eat almost any other smaller fish and crab they find on the coral or on the bottom of the ocean.*

Name: _____

1. *Fill in the boxes below to show which creatures living in the Gully are the producers, consumers and decomposers.*



Name: _____

2. What is one abiotic factor found in the Gully that these creatures depend on?

_____

3. Which of the creatures in the Gully are carnivores?

_____

4. Which creatures in the Gully are herbivores?

_____

5. Which creatures in the Gully are omnivores?

_____

Name: _____

Section C) Food Web: The Gully

A food web is a group of food chains that work together to make up the biotic parts of an ecosystem. When the chains are linked together, they look like a spider's web. Draw a food web of the Gully using the creatures listed. Don't forget to include humans in your food web.

Gully Creatures

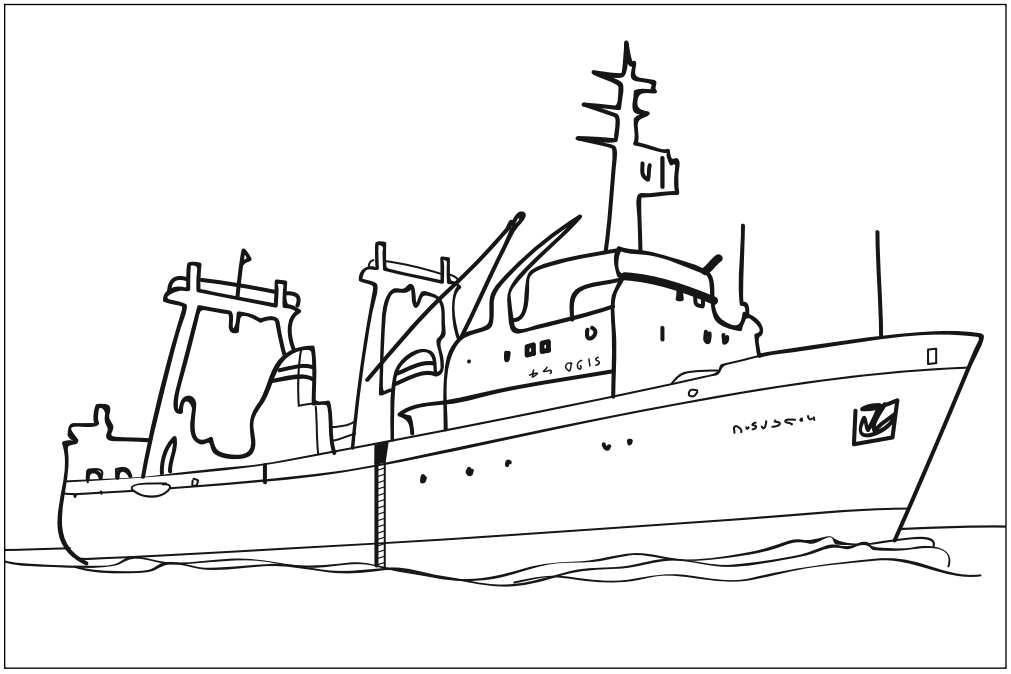
Bottlenose whale
Cold water currents
Cold-water coral
Sunlight
Squid
Bacteria
Phytoplankton
Zooplankton
Lobsters
Salinity
Laval halibut

sunlight

Name: _____

Section D) What happens when an element is removed from an ecosystem?

The ocean around Newfoundland was once so full of Atlantic cod that in 1497, explorer John Cabot said they almost blocked his ship. Cod has always been an important source of food and income for Canadians. Fishers from Eastern Canada traditionally fished close to shore, releasing their nets from small boats. Fish populations were so rich that Canadian fishers didn't need to travel very far to haul in full nets. Canadian fishers shared these abundant waters with Spain and Portugal, who had also been fishing in the northwest Atlantic since before Newfoundland was colonized.



Factory Trawler

In the 1950's larger ships, called factory trawlers, replaced smaller fishing boats. These large trawlers could travel across the deepest parts of the ocean, and could catch and process many more fish. Suddenly, more fishers came to the eastern Atlantic from countries all over the world to fish for cod. So many fish were caught that the cod population declined more and more every year.

Name: _____

By 1992 cod stocks off the east coast of Newfoundland were almost gone, forcing the Canadian government to close the fishery. Over 40,000 people lost their jobs. Scientists had warned us that we were overfishing cod before the industry collapsed. However, the Canadian government didn't restrict fishing because they were concerned about a loss of jobs for cod fishers in Atlantic Canada. Of course, this had devastating effects in the longer term – instead of some fishers losing their jobs, almost all of them did. Many communities couldn't recover from economic losses after the fishery closed. Damage to ocean ecosystems that included the Atlantic cod still have not recovered more than a decade later.

The collapse of the Atlantic cod population in Atlantic Canada taught Canadians a harsh lesson about what happens when we don't pay attention to how our actions damage the ecosystem.

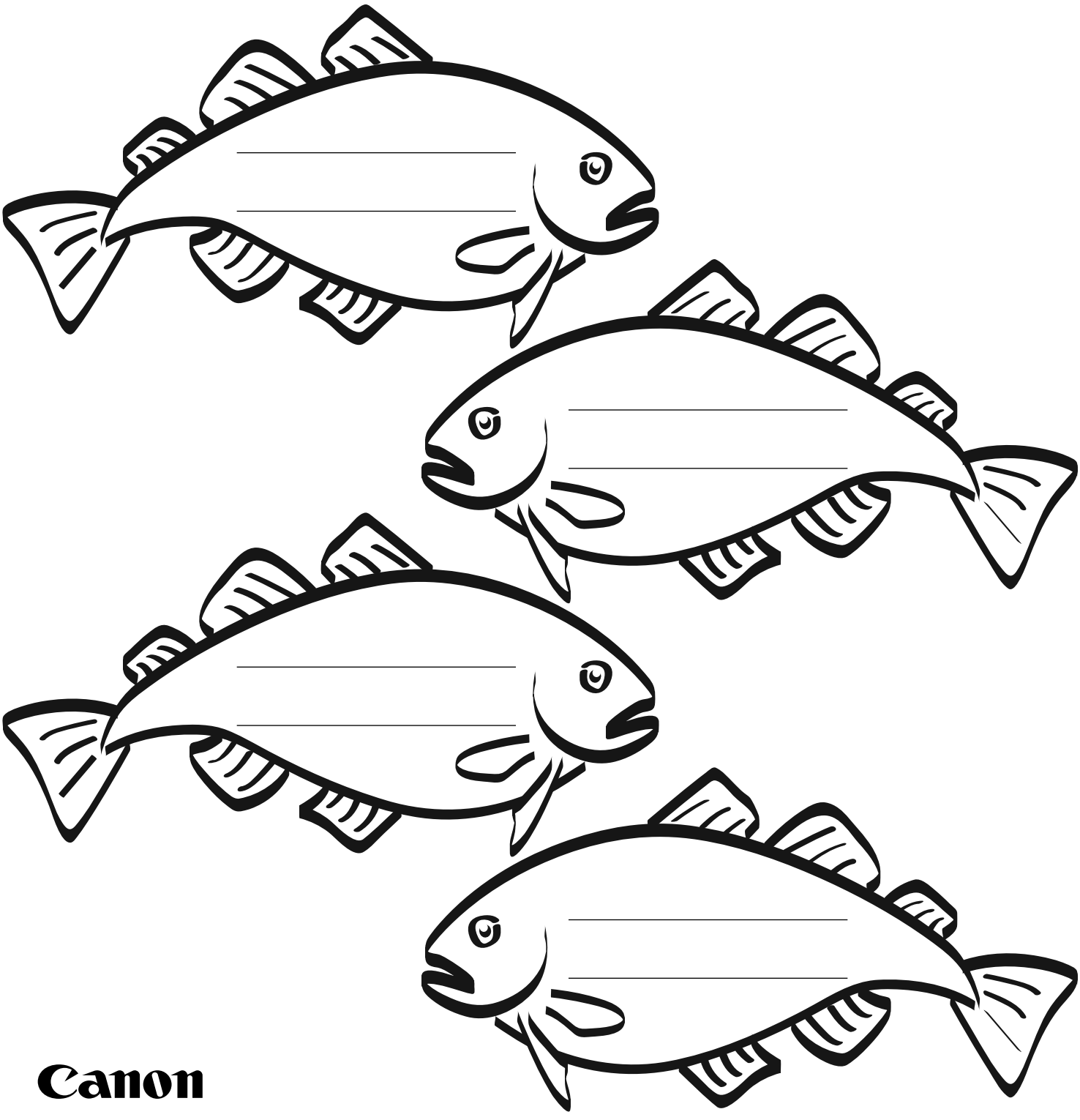
Name: _____

1. Research the life cycle of the Atlantic cod and draw a food web showing the biotic elements in its ecosystem – don't forget to include the fishing communities that relied on the Atlantic cod.

2. How would the food web you drew above change without the Atlantic cod? Redraw it, omitting the Atlantic cod.

Name: _____

3. *In the each of the fish below, use your research to write one way that overfishing the Atlantic cod has had a negative impact on other creatures in its ecosystem.*



Canon

Name: _____

4. A Cautionary Fish Tale

As a class, create a poster that tells the story of the effects that overfishing the Atlantic cod had on its ecosystem. On a large sheet of paper, draw an empty boat on the ocean in the middle of the page. Cut out your fish and tape them in a stack that fills the boat. In the water under the boat, take turns drawing some of the sea creatures that rely on the Atlantic cod. Include speech bubbles over their heads. What would they say about the effect of overfishing the Atlantic cod if they could speak?

Answers: Ocean Ecosystems

Section A) What is an ecosystem?

1. A World Without

   i) Open – Student should consider a world without plants or trees. No fruit or vegetables, no wood, no shade, loss of air purification, loss of habitat.

   ii) Open – Student should consider a world without humans, or other animals. We wouldn't exist at all.

   iii) Open – Student should consider a world where all dead plant and animal material builds up on the Earth's surface, like garbage. Also, a world where nutrients in dead matter does not get recycled, slowly reducing the Earth's energy resources.

2. Classify Canada

   Producer:

   - Maple tree
   - White pine

   Consumer:

   - Beaver
   - Moose
   - People
   - Cod
   - Canada goose
   - Polar bear

   Decomposer:

   - Black fire beetle
   - Mushroom

   Abiotic:

   - Rocky Mountains
   - Great Lakes

Answers: Ocean Ecosystems (continued)

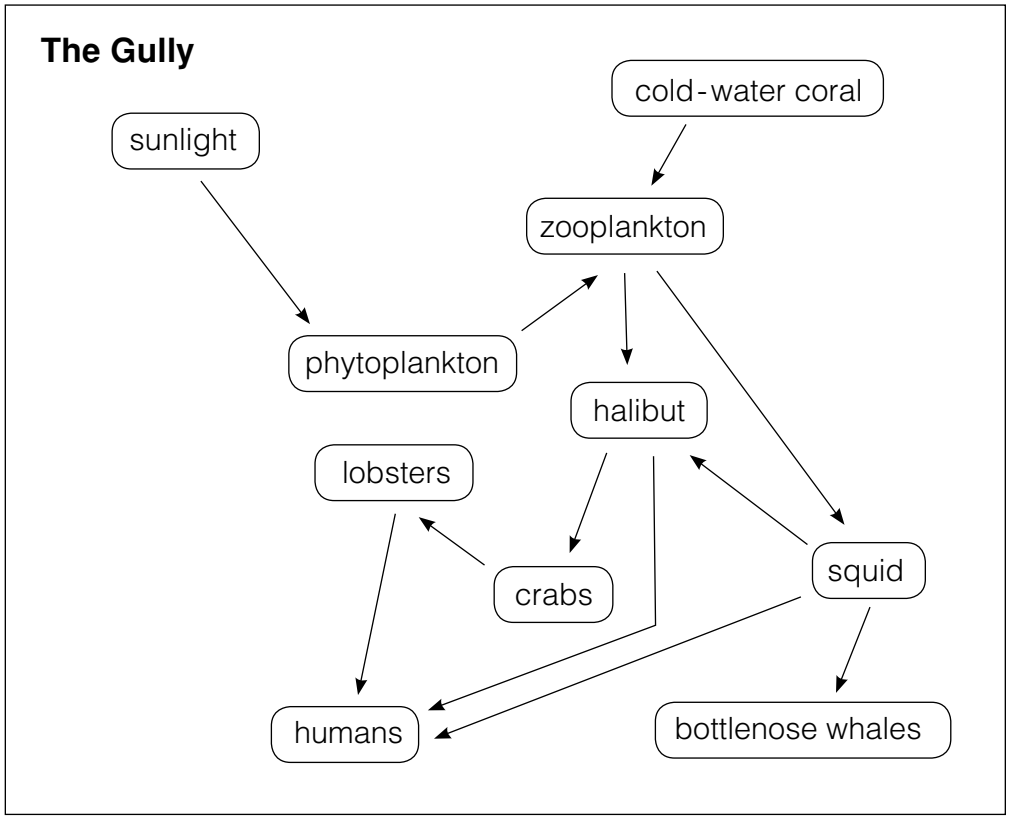
Section B) An Ecosystem: Life in the Gully

1.

Producers	Consumers	Decomposers
Phytoplankton	Bottlenose whales Cold-water coral Squid Zooplankton Lobsters Larval halibut	Bacteria

2. Cold water currents, sunlight
3. Bottlenose whales, squid, halibut
4. Zooplankton
5. Coral, lobster

Section C) Food Web: The Gully

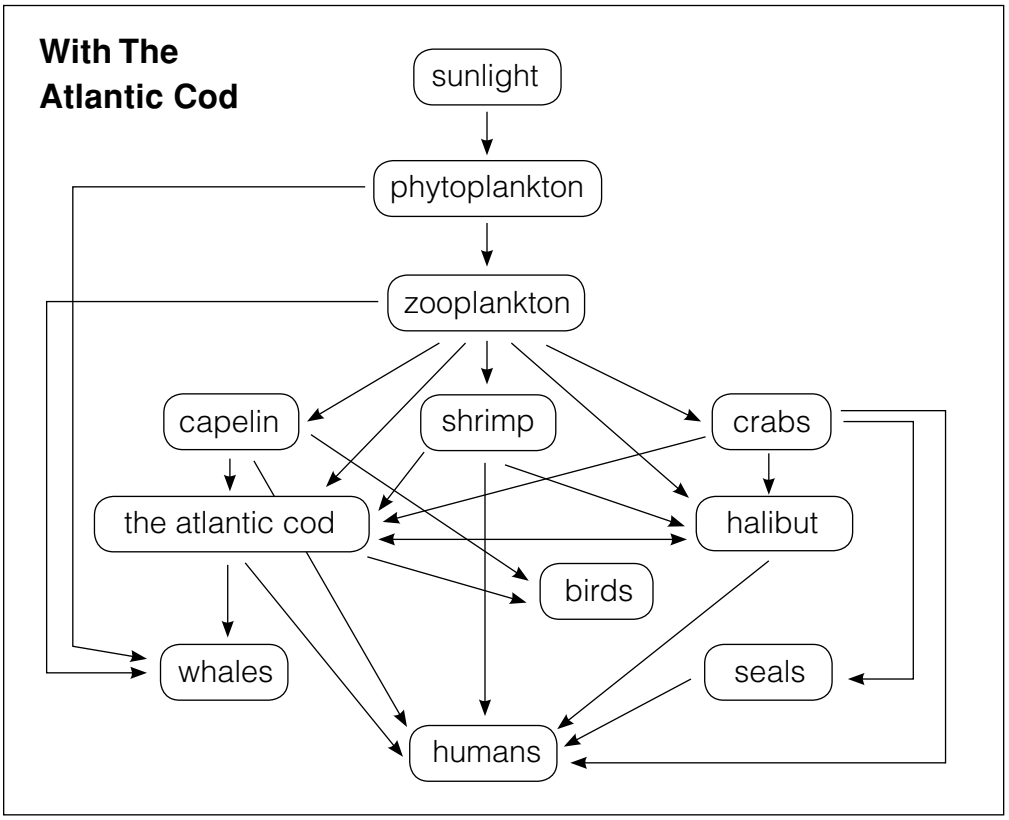


Canon

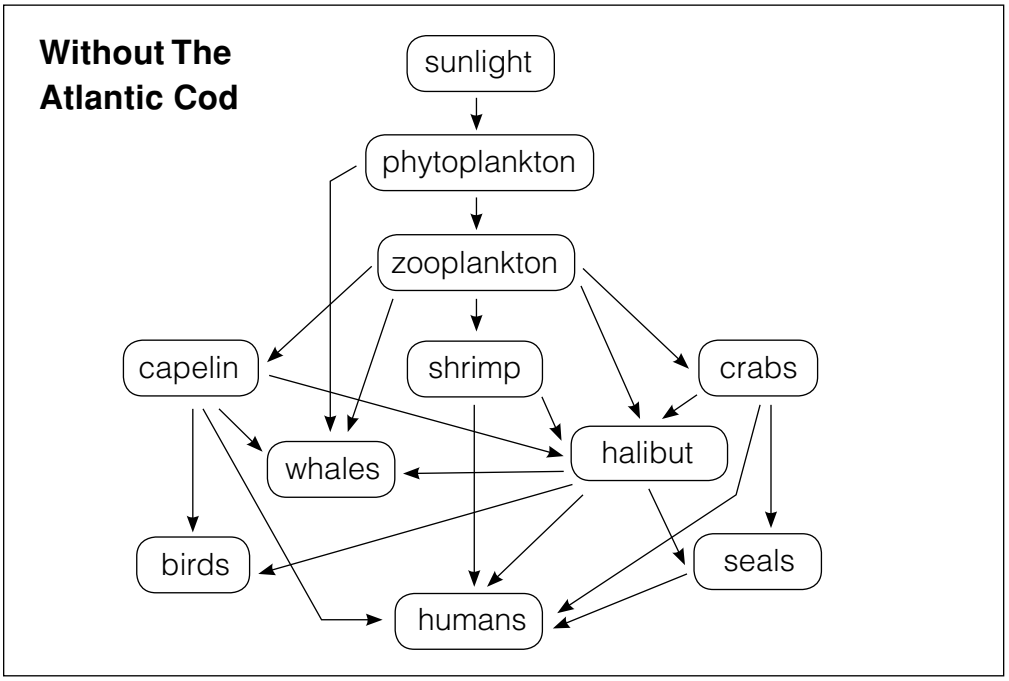
Answers: Ocean Ecosystems (continued)

Section D) What happens when an element is removed from an ecosystem?

1.



2.



Answers: Ocean Ecosystems (continued)

3. Open – based on student research about the life cycle of the Atlantic cod, and information in the reading passage.
   - Overfishing damages the ecosystem by removing a key element; remove an element and upset the delicate balance.
   - Factory trawlers removed the bulk of fish, we have very few Atlantic cod left. No cod upsets balance and reduces food up the web, and leads to larger populations of some species that cod used to eat.
   - Even after a decade of fisheries closures, Atlantic cod still haven't been able to recover from overfishing.
   - Because we overfished the Atlantic cod, fishers in Newfoundland lost their jobs.
   - Overfishing the Atlantic cod caused economic collapse in many Atlantic Canadian communities.
   - Removing too many Atlantic cod could mean an increase in prey species like capelin, shrimp and crabs, and less food for predators like halibut, whales, birds and seals.
4. Open – builds on previous exercise.
   - Loss of jobs for Atlantic fishers, in entire cod fishery.
   - Economic loss to communities who depended on the Atlantic cod fisheries.
   - Loss of culture and local way of life.
   - Depletion of the northern Atlantic cod species not recovered over a decade later.
   - Refusal to come to a global agreement that respects sustainability as integral to fishing practices. Without changes it will happen with other fish species.
   - Other endangered species who rely on Atlantic cod suffer.
   - Remove predators from the ecosystem, smaller fish, clams and shrimp populations increase. Since they, in turn, feed on plankton, those populations are reduced.
   - Coral provides a safe nursery for fish. Without healthy coral, fish have less shelter from predators.
   - Plankton is at the base of the ocean food chain; reducing or increasing its populations effects all other ocean life.

Answers: Ocean Ecosystems (continued)

- If phytoplankton populations decrease, there is less CO^2 uptake for photosynthesis, resulting in increased CO^2 in the atmosphere that could play a role in global warming.
- Unhealthy oceans affect all humans, even vegetarians.
- Change in structure of food web alters feeding relationships.

Canon