



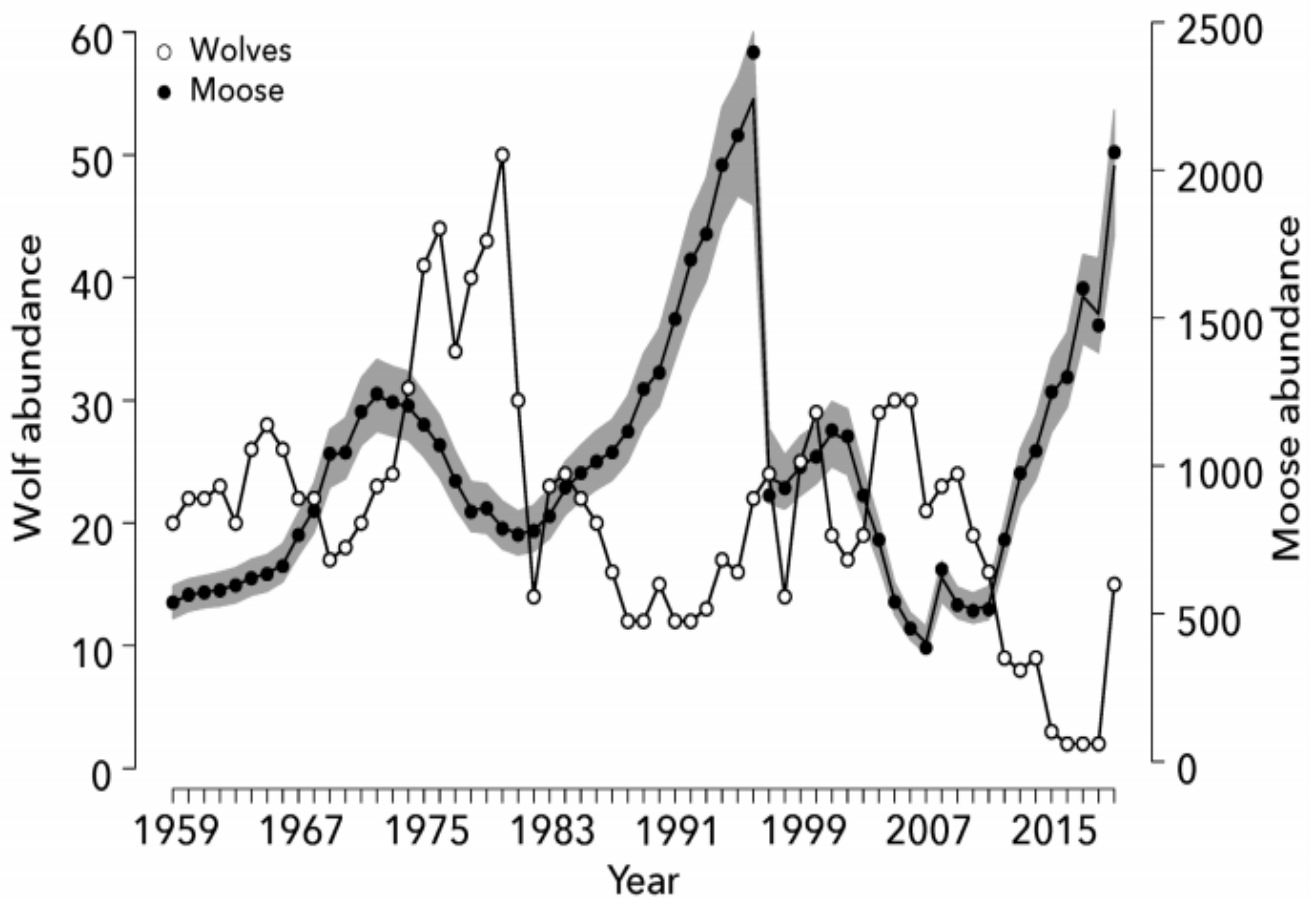
Biology

Part B - Population Ecology

Isle Royale Wolf & Moose Populations

This research project is the longest continuous study of any predator-prey system in the world.

Source - wolvesandmooseofisleroyale.org



Pause the video at 11:35.

Questions:

1. Looking at the graph, notice the wolf die off in 1980. Predict - What might have been the cause of this die-off?

2. Looking at the graph, notice the moose die off in 1996. Predict - What might have been the cause of this die-off?

Restart the video.

Pause again at 14:17.

Read the article, "Moose, Wolves Cling to Isle Royale".

Moose, Wolves cling to Isle Royale

By Anita Weier
The Detroit Free News
06/12/03

ISLE ROYALE -- Moose came to this remote island in Lake Superior at least 100 years ago, probably swimming from the mainland to enjoy a tree-filled paradise without predators. Then, in about 1949, timber wolves padded across the ice to join them on the 45-mile-long, 9-mile-wide island.

In 1958, U.S. Fish and Wildlife Service biologist Durward Allen launched a study to find out exactly how the two species would interact in an isolated environment. Would the wolves kill off the moose? Would the wolves survive? Would either species develop problems from interbreeding?

Rolf Peterson, a professor of wildlife ecology at Michigan Technological University, has continued the study since 1970, making lengthy visits to the island every year. Here is a little of what they have learned from what is probably the world's longest-running predator-and-prey research project. For some years, there was equilibrium between the species. The moose population would build to a high level and then crash if there was a very harsh winter. Wolves would proliferate for about 10 years after a moose peak, as the moose aged and became vulnerable to attack by wolf packs, Peterson explained.

But in the early 1980s, a dog was among the visitors to the island, though they are not allowed. The animal was the apparent source of parvovirus, a dangerous new virus that decimated the wolves, which are still struggling to replenish their numbers: There were 50 in 1980, but now there are only 19. A moose die-off occurred in 1996, when two-thirds of the 2,000 moose starved to death during an extremely bad winter.

Currently there are about 900 moose on the island, Peterson estimated. The moose will face problems when the balsam fir trees that provide most of their food die off. "Those old trees crash to the ground after 100 years," Peterson said. Moose are also being infested by tens of thousands of ticks per animal, which has caused many to rub off or bite off much of their hair.

The cow moose defend their offspring against wolves by swimming to smaller, nearby islands to give birth, so the calves are protected from wolves when they are vulnerable. If attacked, moose back up to a protected area and use their hooves. Wolves try to clamp onto a moose's back legs and latch on until the animal topples. Isle Royale wolves often have broken bones and other injuries from being kicked and bashed against rocks.

"That's how they get their ribs broken. It takes a lot to unclench their jaws," Peterson said of the wolves. But, on average, just one of every 19 wolf attacks succeeds, usually against the very old or young moose. The predators have better luck with beaver and other smaller creatures. Throughout the years, the researchers have watched for signs of deterioration in wolves or moose due to inbreeding. No new bloodlines have arrived, so all have common ancestors and are interrelated to some extent.

"Moose were isolated here 100 years ago. Most of the genes are still here, but they have a large enough population (to compensate). There are so few wolves that they have lost genetic variability. The scientific dogma suggests that they are not going to make it," Peterson said. Only 12 wolves were on the island in the 1990s, but three older females produced enough to keep the packs going.

The wolves have also been helped by natural selection along the way, because the least fit animals die while the strong reproduce. But a few abnormalities have occurred in wolves in the last two years, Peterson said. One had asymmetrical neck vertebrae, though the right and left vertebrae should be the same. And one had two fused toes on his two front feet."

3. What was the true cause of the wolf die off after 1980?

4. Based on the article, what was the true cause of the moose die off in 1996?

Finish the video.

Enrichment

Video - [Ameoba Sisters - Energy Pyramids](#)

Additional information on the ecology of the Isle Royale wolves and moose may be found in the annual reports, conducted by Michigan Technological University.

https://isleroyalewolf.org/wolfhome/ann_rep.html

Additional information on coral reefs and coral bleaching may be found in the following links;

Video from HHMI - [Coral Bleaching Animation](#)

Article from Science News - [Great Barrier Reef](#)

Read about coral species possible resistance to bleaching - [NOAA guidance](#)



Biology Activity 3 - Biodiversity and Population Ecology

LEARNING TARGETS

After today's lesson you should be able to;

- apply what you have learned about biodiversity to a real world example,
- examine a representative ecosystem and, based on data, predict what happens to populations in that ecosystem.

This worksheet is designed to complement the KCS@Home Biology Summer Content Activity 3.

Start the video. Then pause at 1:34 to complete the items below.

Part A - Biodiversity

As you read the article, "[Global Biodiversity](#)" complete the following items.

1. Describe the three types of biodiversity mentioned in the article.
 - a. Species biodiversity - **Species diversity is the abundance of different species living in an area.**
 - b. Ecosystem biodiversity - **Ecosystem diversity is the variety of ecosystems in an area.**
 - c. Genetic biodiversity - **Genetic diversity is the diversity of genes within individuals of the same populations.**

2. List the services provided by ecosystems written about in the article.

Are there others not listed, that you thought of?

Answers will vary. Possible answers - supply oxygen, supply and take in carbon dioxide, provide food for energy, clean water, shade, agriculture, prevention of soil erosion and flooding, tourism, fiber for clothing/paper, construction materials

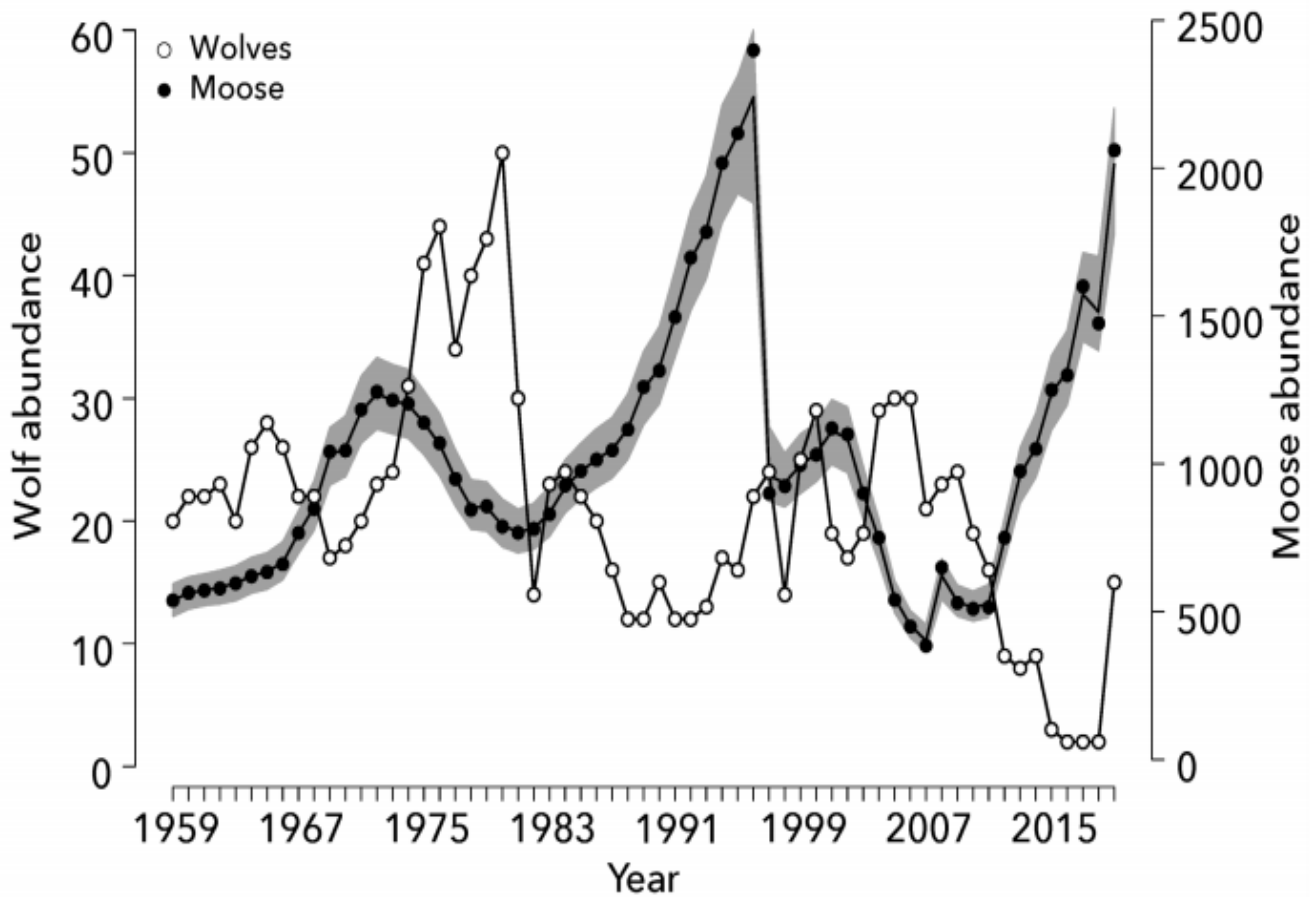
Restart the video.

Part B - Population Ecology

Isle Royale Wolf & Moose Populations

This research project is the longest continuous study of any predator-prey system in the world.

Source - wolvesandmooseofisleroyale.org



Pause the video at 11:35.

Questions:

1. Looking at the graph, notice the wolf die off in 1980. Predict - What might have been the cause of this die-off?

Answers will vary. Possible answers include - food, water, shelter, disease, parasites, weather extremes, natural disasters, competition, predation.

2. Looking at the graph, notice the moose die off in 1996. Predict - What might have been the cause of this die-off?

Answers will vary. Possible answers include - food, water, shelter, disease, parasites, weather extremes, natural disasters, competition, predation.

Restart the video.

Pause again at 14:17.

Read the article, “Moose, Wolves Cling to Isle Royale”.

Moose, Wolves cling to Isle Royale

By Anita Weier
The Detroit Free News
06/12/03

ISLE ROYALE -- Moose came to this remote island in Lake Superior at least 100 years ago, probably swimming from the mainland to enjoy a tree-filled paradise without predators. Then, in about 1949, timber wolves padded across the ice to join them on the 45-mile-long, 9-mile-wide island.

In 1958, U.S. Fish and Wildlife Service biologist Durward Allen launched a study to find out exactly how the two species would interact in an isolated environment. Would the wolves kill off the moose? Would the wolves survive? Would either species develop problems from interbreeding?

Rolf Peterson, a professor of wildlife ecology at Michigan Technological University, has continued the study since 1970, making lengthy visits to the island every year. Here is a little of what they have learned from what is probably the world's longest-running predator-and-prey research project. For some years, there was equilibrium between the species. The moose population would build to a high level and then crash if there was a very harsh winter. Wolves would proliferate for about 10 years after a moose peak, as the moose aged and became vulnerable to attack by wolf packs, Peterson explained.

But in the early 1980s, a dog was among the visitors to the island, though they are not allowed. The animal was the apparent source of parvovirus, a dangerous new virus that decimated the wolves, which are still struggling to replenish their numbers: There were 50 in 1980, but now there are only 19. A moose die-off occurred in 1996, when two-thirds of the 2,000 moose starved to death during an extremely bad winter.

Currently there are about 900 moose on the island, Peterson estimated. The moose will face problems when the balsam fir trees that provide most of their food die off. "Those old trees crash to the ground after 100 years," Peterson said. Moose are also being infested by tens of thousands of ticks per animal, which has caused many to rub off or bite off much of their hair.

The cow moose defend their offspring against wolves by swimming to smaller, nearby islands to give birth, so the calves are protected from wolves when they are vulnerable. If attacked, moose back up to a protected area and use their hooves. Wolves try to clamp onto a moose's back legs and latch on until the animal topples. Isle Royale wolves often have broken bones and other injuries from being kicked and bashed against rocks.

"That's how they get their ribs broken. It takes a lot to unclench their jaws," Peterson said of the wolves. But, on average, just one of every 19 wolf attacks succeeds, usually against the very old or young moose. The predators have better luck with beaver and other smaller creatures. Throughout the years, the researchers have watched for signs of deterioration in wolves or moose due to inbreeding. No new bloodlines have arrived, so all have common ancestors and are interrelated to some extent.

"Moose were isolated here 100 years ago. Most of the genes are still here, but they have a large enough population (to compensate). There are so few wolves that they have lost genetic variability. The scientific dogma suggests that they are not going to make it," Peterson said. Only 12 wolves were on the island in the 1990s, but three older females produced enough to keep the packs going.

The wolves have also been helped by natural selection along the way, because the least fit animals die while the strong reproduce. But a few abnormalities have occurred in wolves in the last two years, Peterson said. One had asymmetrical neck vertebrae, though the right and left vertebrae should be the same. And one had two fused toes on his two front feet."

3. What was the true cause of the wolf die off after 1980? The wolf population was impacted when parvovirus infected many of the wolves. Due to the population density at the time, the virus spread rapidly.

4. Based on the article, what was the true cause of the moose die off in 1996? The moose population was impacted due to an extreme weather during the winter. In addition, the moose were suffering the effects of an increased tick presence in the previous summer.

Finish the video.

Enrichment

Video - [Ameoba Sisters - Energy Pyramids](#)

Additional information on the ecology of the Isle Royale wolves and moose may be found in the annual reports, conducted by Michigan Technological University.

https://isleroyalewolf.org/wolfhome/ann_rep.html

Additional information on coral reefs and coral bleaching may be found in the following links;

Video from HHMI - [Coral Bleaching Animation](#)

Article from Science News - [Great Barrier Reef](#)

Read about coral species possible resistance to bleaching - [NOAA guidance](#)