

Problem Scenario: Arctic Fishery

Read the MPA problem scenarios below. As you read, complete the notetaking worksheet.

Geography and Physical Features

The Arctic Ocean is located in Earth's northern polar region and is the smallest of the world's four oceans. It has a surface area of just over 14 million square kilometers (8.7 million square miles), or about 2.8 percent of the Earth's surface.

This mostly-enclosed ocean has very little exchange of water with adjacent oceans. It is closely bordered by six countries (the United States, Canada, Russia, Norway, Greenland, and Iceland). Each of these nations controls smaller coastal seas within their jurisdictions, each of which may still be considered part of the greater Arctic.

According to the 1982 United Nations Convention on the Law of the Sea (UNCLOS), nations may claim the waters from their shores out to 200 nautical miles (370 kilometers) as an "exclusive economic zone," or EEZ. Within these EEZs (areas of jurisdiction), a nation has exclusive rights to the resources of the area. These resources include living (fish, shellfish, marine mammals) and non-living (oil, gas, minerals) resources. Nations must manage these areas accordingly. In the U.S. portion of the Arctic, these coastal seas include the Bering Sea, the Beaufort Sea, and the Chukchi Sea.

In addition to being the smallest of the world's oceans, the Arctic Ocean is also relatively shallow. In terms of bathymetry (depth of a body of water) the Arctic Ocean can be broken into three distinct zones.

The first of these zones is the continental shelf, the area closest to land. In the U.S. and Canadian portions of the Arctic, the continental shelf extends from the shore out to 100-200 kilometers (about 62-124 miles). Within the Russian and Norwegian portions of the Arctic, the continental shelf is much larger and extends out to 1,000 kilometers (621 miles) or more. On average, the waters over the continental shelf are between 100 and 200 meters (328-656 feet).

The next distinct zone is known as the shelf break, which forms the boundary between the continental shelf and the deep ocean basin. Depths at the shelf break average 300-500 meters (984-1,640 feet).

Seaward (away from shore) of the shelf break are the deep ocean basins. Within the Arctic there are two major deep ocean basins, the Eurasian and Amerasian. The average depth of these deep ocean basins is roughly 4,000 meters (13,123 feet), but in some areas the depth exceeds 5,000 meters (16,404 feet). The deepest depth recorded is 5,450 meters (17,881 feet). However, there are many places in the Arctic where depth "soundings" have not been taken, so it is very possible that parts of the Arctic are even deeper.

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The biggest influence on Arctic climate is latitude. Because the Arctic is so far north, it receives solar radiation for only about half the year. In the summer, the Arctic receives sunlight for nearly 24 hours. In fact, on the summer solstice, the sun does not set at all. In the winter the Arctic receives very little sunlight. On the winter solstice, the sun does not rise at all. In addition, because the Earth is spherical, the sunlight that does reach the Arctic is far less intense than the sunlight at the Equator. When combined with other atmospheric factors (wind patterns, air pressure, ocean currents, humidity, and precipitation), the overall effect is that the climate of the Arctic is bitterly cold.

Because very little warmer water is allowed to enter the Arctic Ocean from the south, dense ice has formed over much of the surface waters. In the central Arctic, this sea ice persists year-round, adding new layers each year. This persistent ice is known as multi-year ice. Closer to shore, the sea ice is a seasonal phenomenon, with dense ice in the winter and open seas during the summer.

While this may seem like a climate that would be inhospitable to living creatures, many animals, including humans, have learned to live in this harsh environment. They have come to depend on both the multi-year and seasonal ice.

Marine Animals

Marine mammals are probably the most well-known animals in the Arctic. While a number of different animals may visit the Arctic on a seasonal basis, there are seven species of marine mammal that inhabit the region year-round: bowhead whale, beluga whale, narwhal, ringed seal, bearded seal, walrus, and polar bear. They are dependent on the ice. The polar bear depends on other marine mammals for food. Whales, seals, and walruses depend on fish, shellfish, and other marine organisms for food.

In addition to these marine mammals, many species of fish, shellfish, and other invertebrates inhabit the waters of the Arctic. Recent scientific voyages to the Beaufort and Chukchi seas by scientists with the U.S. National Marine Fisheries Service documented 36 different species of fish and 174 species of invertebrates. Invertebrates make up the vast majority (about 94 percent) of the biomass. Commercially important Arctic cod, walleye pollock, Pacific cod, Bering flounder, Greenland turbot, and snow crab were among the fish and shellfish identified during these research cruises. Although these fish and crabs accounted for relatively little of the biomass, the presence of these species is something worth noting and may become more important over time.

People have lived in the Arctic since at least the last ice age. These inhabitants have become dependent on marine mammals, fish, shellfish, and birds in order to survive the harsh Arctic

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environment. This subsistence use includes use of these animals for food, clothing, shelter, and for ceremonial and cultural purposes. The unique culture of these northern people is intricately linked to the continued existence of the animals they depend on. Any threat to these creatures is a threat to a way of life that has endured in the Arctic for thousands of years. Communities such as Alaska's Barrow and Kaktovik on the Beaufort Sea and Point Hope and Kotzebue on the Chukchi Sea are particularly vulnerable to any disruptions in the Arctic ecosystem.

Threats

As Earth's atmosphere absorbs more carbon dioxide and other greenhouse gases (GHGs), it is less able to deflect heat that reaches the Earth via solar radiation. This increase in GHGs is a result of both natural and man-made causes. Human activity, primarily the burning of fossil fuels, is responsible for the recent rapid increase in GHG concentrations. As more heat is trapped within the atmosphere, the climate begins to gradually change.

The surface temperature of the Earth increased by an average of 0.74°C (1.3°F) during the 20th century. The resulting climate change is particularly acute in the Arctic. There temperatures have increased at least twice as fast as the global average.

Both the air and water in the Arctic Ocean are becoming warmer as a result of this climate change. Summer surface water temperatures in the Beaufort Sea were about 3°C (5.4°F) above average in 2008. As this warming occurs, the result is an influx of fresh water from melting sea ice and glaciers. Sea ice also decreases. This decrease occurs in multi-year ice, which is decreasing in extent (i.e., coverage) and thickness. The seasonal ice is also showing an earlier departure in the spring and a later arrival in the fall. These changes are already having significant impacts on the Arctic ecosystem. Projections are that these impacts will become more profound as climate change accelerates into the 21st century.

The Arctic will have a longer ice-free season in the summer and could be completely free of ice in the near future. Thus, there is a great interest in trying to determine what activities may occur under these new conditions. Increased commercial fishing, shipping, oil and gas exploration, tourism, and military activity are likely as conditions become more favorable in the Arctic. With this increase in potential uses of the Arctic, it becomes increasingly important to take precautions to safeguard the fragile environment. These safeguards should protect the animals and the people that live there.

Arctic Fishery Management Plan

The North Pacific Fishery Management Council (NPFMC) is the U.S. government agency responsible for managing fisheries in the waters (3-200 nautical miles) off the Alaska coast. This includes the Beaufort and Chukchi Seas adjacent to the Arctic Ocean. In 2006, the Council

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realized that changing conditions in the Arctic meant that commercial fishing interests might wish to expand operations there in the future. There is already some fishing occurring in state waters (up to 3 nautical miles) off Alaska, but these are primarily for subsistence purposes.

The U.S. and Russian fishing fleets have extensive commercial fisheries in the Bering Sea. Norway and Russia both fish in the Barents Sea as well. As conditions become more favorable in the Arctic, it is likely that species currently there will increase. Other species common to the Barents and Bering Seas (like cod, pollock, and crab) will migrate to higher latitudes. Scientists with the U.S. National Marine Fisheries Service say this is already happening to a limited extent.

However, there is very little scientific information about how these changing conditions will impact the ecosystems of the Arctic. This information is needed so that scientists and resource managers can determine whether or not commercial fisheries would have a negative impact on the Arctic environment.

In 2009, the NPFMC adopted the Arctic Fishery Management Plan (Arctic FMP). This plan does two things. First, it closes the Arctic portion of the U.S. EEZ (Arctic Management Area) to all commercial fishing. It does not affect the small subsistence fisheries that are already occurring. Second, it establishes a process for considering requests to develop future fisheries. This process will be based on the best available science, when that science is developed, but not before.

The Arctic Fishery Management Plan takes a precautionary approach to managing the marine resources of the Arctic both today and into the future. It says that until managers have sufficient information to make scientifically informed decisions, commercial fisheries cannot expand into the U.S. portion of the Arctic.

The United States Senate has also become involved in Arctic fisheries management with the passage of Senate Joint Resolution 17. This resolution has called on other Arctic nations to begin a dialog with the United States on ways to sustainably manage migratory fish that may cross international boundaries and jurisdictions. The concern is that other nations may not exercise the same precautionary approach that the United States has chosen to take. They may establish large-scale commercial fisheries in the Arctic before we have enough scientific information with which to make informed decisions.

The Arctic Fishery Management Plan and Senate Joint Resolution 17 do not establish traditional Marine Protected Areas. However, they do illustrate other ways that society can develop rules and governance structures that help to manage our resources in a sustainable way.

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