Question 4

(a) Identify the five-year period during which the greatest rate of decline in the fish harvest took place. For that five-year period, calculate the rate of decline in the fish harvest, in metric tons per year. Show clearly how you determined your answer.

(2 points possible)

One point is earned for correctly identifying the time period, and 1 point is earned for showing the calculation. The student may earn the second point by describing in words how he or she arrived at the final answer.

Time period of greatest decline: 1965–1970

$(700 \times 10^3$ metric tons $- 200 \times 10^3$ metric tons) / 5 years = 100,000 metric tons/year

Acceptable range: 100,000–102,000 metric tons/year (no credit earned for 1970 value $< 190 \times 10^3$ metric tons)

(b) Choose any TWO commercial fishing practices from the list below. For each of your choices, describe the practice and explain the role it plays in the depletion of marine organisms.

(4 points possible)

One point is earned for each description, and 1 point is earned for a brief explanation of how the practice contributes to depletion. Each bulleted contribution in the table below is an acceptable answer.

Question 4 (continued)

Method	Description of Practice	Contribution to Depletion
Bottom trawling	Drag a net along ocean bottom ***OR*** Drag a line with hooks along bottom	• Catches many nontarget species* (bycatch) • Benthic habitat destruction
Long-line fishing	Fishing line with many hooks, extending for long distances and allowed to drift ("towed" not credited)	• Catches many nontarget species (bycatch) • Ghost fishing (continue to catch even when untended)
Nets -Drift nets/Gill nets OR---------- -Purse seines	Large nets, stretching for miles and set out and allowed to drift ("towed" not credited) ---------- Large nets are drawn up like a drawstring purse to capture fish in large schools near the ocean surface ("towed" not credited)	• Mesh size may selectively deplete certain size/age class • Catches many nontarget species (bycatch) • Ghost fishing (continue to catch in untended net) ---------- • Catches large quantities of fish (whole schools) • Catches many nontarget species (bycatch)
Sonar	Sound waves used to locate fish or to "see" the bottom	• Allows ships to locate large schools relatively quickly • Targets specific species

* *Nontarget species* include noncommercial species;
individuals of illegal size or age; species caught out of season

Question 4 (continued)

(c) Identify one international regulation or United States federal law that applies to the harvesting of marine food resources and explain how that regulation or law helps to manage marine species.

(1 point)

Point can be earned for naming a specific, relevant international regulation or federal law and for a brief explanation of how it helps manage marine species.

A number of specific international regulations and federal laws are acceptable if the law cited relates to the harvesting of marine resource. The student must provide a correct explanation of how the regulation or law helps manage marine species. The most common answers are given below.

Note*: Abbreviations alone are acceptable only for the Endangered Species Act (ESA) and the Convention on International Trade in Endangered Species (CITES).*

Endangered Species Act/ESA—prohibits the harm or harvesting of endangered species; protects habitats

Marine Mammal Protection Act—protection and conservation of marine mammals

Convention on International Trade in Endangered Species/CITES—prevents trade of threatened or endangered marine species

Magnuson-Stevens Fisheries Management and Conservation Act (Magnuson Act)—establishes Regional Fisheries Management Councils that set quotas, size limits, and seasons; establishes 200-mile fishing area; protects essential habitat; rebuilds overfished stocks; minimizes bycatch

UN Law of the Seas—individual countries have jurisdiction over Exclusive Economic Zones (200 miles off shore) and sovereignty over the sea bed 12 miles offshore; allows for Individual Transferable Quotas (ITQs) in which allocated quotas can be sold to others

International Whaling Commission/International Convention for the Regulation of Whaling—regulates the species that can be harvested and sets quotas on the number of cetaceans that can be harvested

Other U.S. and International Laws and Regulations Accepted:

The Oceans Act of 2000—establishes a presidential commission to examine federal ocean policies and programs; promotes protection of marine environment and prevention of marine pollution

U.S. Whale Conservation and Protection Act—prohibits the harvesting of whales in U.S. waters

Marine Sanctuaries Act—protects the habitat for marine organisms and protects the animals from being harvested in that area

Question 4 (continued)

Fur Seal Act of 1966—prohibits taking of fur seals or use of U.S. ports and harbors for vessels illegally taking fur seals; allows for subsistence hunting by native people; manage fur seal rookeries in the Pribilof Islands

Lacey Act of 1900—prohibits sale of illegally harvested species; forces fisherman to harvest legally

(d) The oceans of the world are often referred to as a commons. Give an example of one other such commons, explain how human activities affect that commons, and suggest one practical method for managing that commons.

(3 points possible)

One point can be earned for correctly identifying a commons. One point can be earned for briefly explaining how a human activity affects the specific commons. The student can earn 1 point for citing a practical method of management linked to the identified commons.

ACCEPTABLE COMMONS: ***1 point***

- Atmosphere/Air
- Groundwater/Aquifers
- National Forests/National Parks
- Antarctica
- Estuaries
- Great Lakes
- Rivers and Streams
- A variety of other resources may be accepted as a commons ***IF*** the student clearly demonstrates that it is a public resource being used privately

HUMAN ACTIVITIES: ***1 point—must be linked to the chosen commons***

- A human activity and brief explanation of how that activity degrades the selected commons can be accepted (e.g., fossil-fuel combustion increases greenhouse gases in the atmosphere).

PRACTICAL MANAGEMENT METHODS: ***1 point—must be linked to the chosen commons***

- Any specific management suggestion that is practical and linked to the chosen commons can be accepted.

Some answers that may apply to many commons:

- Education of the public—must relate to a specific problem (e.g., teaching about forest fire prevention).

- Regulations, enforcement, agencies—must be directed at a specific problem.

4a. The greatest decline took place between 1965 and 1970.

700,000 metric tons - 200,000 metric tons = 500,000 metric tons

500,000 metric tons / 5 years = 100,000 metric tons per year

The groundfish harvest depleted by approximately 100 thousand metric tons per year between 1965 and 1970.

4b. Bottom trawling is the act of scraping the bottom of a fishing area with a large net in order to catch fish. The net, however, catches more than the intended product. The nets destroy the bottom vegetation, catch unwanted animals, and stir up silt and debris. The bottom is important because benthos dwelling organisms make their homes there and scraping it kills them or their habitats. The unwanted catch (called bycatch) is thrown back but it is usually dead or dying. Finally, the silt that the net stirs up gets suspended in the water column and it blocks the sun. Primary production and photosynthesis cannot occur without sun so the ecosystem cannot recover.

Long line fishing is another method

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of fishing. It involves setting up lines with thousands of hooks on them over many miles in the ocean. The lines and the hooks, like the net, catches more than they need. Many marine organisms such as dolphins and sea turtles get caught on these nearly invisible ~~[illegible]~~ hooks and die.

4c. The endangered species act applies to the ocean and harvesting food sources. This law states that endangered species cannot be disturbed. Ocean animals whose numbers are depleting may not be hunted such as some species of whales. This act and others like it make sure that fishermen dont harm the habitats and the animals that are dwindling ~~in the~~ during the act of catching food.

4d. Another commons is the rangeland in the western United States. This federally owned land is open for grazing public and privately owned cattle and other livestock.

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Overgrazing in these areas is a huge problem. Everyone wants to use them but when everyone does the grass cannot grow back fast enough, the soil dries out, and desertification ensues. The government should regulate this rangeland. They could divide it into sections and assign specific places that aren't overgrazed. The government could also prohibit grazing ~~[illegible]~~ on the lands during drier months.

STOP

END OF EXAM

THE FOLLOWING INSTRUCTIONS APPLY TO THE COVERS OF THE SECTION II BOOKLET.

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a) 1965-1970 declined 500,000 tons over 5 years

~~5000~~ 5.0×10^5 $1.0 \times 10^{\text{tons}}$

$\frac{5.0 \times 10^5}{5}$

100,000 metric tons/year

b) Bottom trawling uses a large net that is dragged along the bottom of the ocean from a boat. Bottom trawling is very detrimental to molluscs, coral, vegetation, starfish, and shellfish which live on the bottom of ocean. Those organisms which are not caught for food are thrown away as bycatch & usually don't survive. Bottom trawling has had a major impact on the depletion of coral reefs because of its major destruction of coral, which acts as a habitat for hundreds of single sea organisms.

Drift nets are carried by a boat in the mid-depth area of open ocean, and are usually a few miles long. The net is designed to catch a fish's gills so it cannot escape. Drift nets ~~to~~ catch a large amount of bycatch, & play a major role in the depletion of shrimp, sea turtles, dolphins, whales, & shark. Because of its way

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of trapping marine organisms, drift nets often ~~eath~~ catch more bycatch, which is thrown back into the ocean dead, than it does of the fish it is aiming to catch.

c) The ban put on the harvesting of ~~Hard~~ female Maryland Blue Crab in the Chesapeake Bay has had a major impact on the revival of the species. Because of the rapid harvesting which was causing the species to be at risk of becoming endanged, a law was created that it is illegal to harvest female Maryland Blue Crab. This has allowed the species to easily reprodke, which has brought the population of the species up by noticable amounts.

d) Another example of commons is the air & atmosphere, which is shared by everyone. The burning of fossil fuels, decomposition of landfills, & use of motors in automobiles and other appliances all ~~cau~~ contributes to the pollution of the air. To manage these commons, worldwide regulations need to be set on the amount of these pollution causing practices that are allowed. Because air is circulated worldwide, regulations must be set everywhere in order to

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properly manage the safety of this common.

STOP

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A) The five year period during which the decline rate in the fish harvest was the greatest was between 1965 and 1970. During this five year period fish harvest went from 700 thousand metric tons in 1965 to 200 thousand in 1970. This is a difference of 500 thousand metric tons with the average rate of decline in fish harvest at 100 thousand metric tons per year.

700 - 200 = 500 ÷ 5 = 100 thousand metric tons per year

B) Many commercial fishing practices are harmful to marine organisms and play a large role in their depletion. Two of these harmful practices are bottom trawling and using sonar. When commercial fishers practice bottom trawling they release large nets. These nets pick up the species they are trying to capture but also collect types of fish and other marine organisms that they were not after. The grand majority of the time these animals are not released and end up dying and then being disposed of. This becomes a serious problem when endangered animals, like sea turtles, get caught in the nets. Bottom trawling is dangerous for marine organisms. Another harmful method used by commercial fishing practices is the use of sonar. Sending the sonar waves

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into the ocean is harmful, and sometimes dangerous, to marine life. Whales have been strongly negatively effected by sonar waves. Commercial fishing practices are generally very harmful to marine life as a whole and depletion of ~~these~~ marine organisms is largely do to commercial practices.

C) The United States ~~has~~ has different laws that regulate the harvesting of marine life. I believe the most important ones are the ones that regulate the amount of a species that can be taken and the seasons that different species can be fished. Setting these regulations is important because it protects reproduction rights of animals and minimizes the risk of overfishing and forcing an species into extinction. The laws set to regulate and manage marine species are vital to the success of ~~thier~~ species.

D) Another "commons" such as that of oceans are rainforests. Both of these climates are highly productive and biologically diverse. Humans often take advantage

4C3

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and disrespect both of these climates. A big problem with rainforests caused by humans is the rapid deforestation rate. In many countries around the world forests are cut down for agricultural use or for livestock grazing. People are also developing the rainforests with urbanization. If we do not slow the deforestation rate by increasing regulation of reduction laws the rainforests will dissapear and with it will go the thousands of plant and animal species that can only prosper there.

STOP

END OF EXAM

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2006 SCORING COMMENTARY

Question 4

Overview

This question required data interpretation, knowledge of specific content (commercial fishing methods, impacts, and regulations), and understanding of the "commons" concept. In part (a) students were asked to demonstrate graph-reading skills and to use the information given on a graph to calculate the rate of decline in fish stocks over a five-year period. Part (b) asked students to demonstrate specific knowledge of some commonly employed commercial fishing methods and how commercial fishing relates to the depletion of marine organisms. Part (c) required knowledge about the regulation and management of marine resources. Part (d) tested students' understanding of commonly held resources and their management.

Sample: 4A
Score: 10

Part (a): Two points were earned: 1 point for correctly identifying 1965–1970 as the five-year period with the greatest decline in catch, and 1 point for showing both the correct setup of the calculation and the correct answer of 100,000 metric tons per year.

Part (b): Four points were earned. One point was earned for correctly describing bottom trawling, and 1 point for stating that the practice contributes to depletion by catching unintended species. One point was earned for the correct description of long-line fishing, and 1 point for stating that nontarget species are caught.

Part (c): One point was earned for identifying a specific law and for explaining that it contributes to the management of marine species by protecting the habitats of endangered species.

Part (d): Three points were earned. The student correctly states that federally owned (public) rangeland used for private grazing is an example of a commons. A second point was earned for the explanation of how a human activity (overgrazing) affects that commons (grass does not grow back, desertification); the third point was earned for giving a practical management solution that is specific and appropriate (the government regulates time and location of grazing).

Sample: 4B
Score: 6

Part (a): Two points were earned: 1 point for correctly identifying 1965–1970 as the five-year period with the greatest decline in catch, and 1 point for showing both the correct setup of the calculation and the correct answer of 100,000 metric tons per year.

Part (b): Three points were earned. One point was earned for correctly describing bottom trawling, and 1 point for stating that the practice contributes to depletion by catching unintended species. No point was earned for describing drift nets, but 1 point was earned for stating that drift nets catch nontarget species.

Part (c): No points were earned in this part because no international regulation or United States federal law is identified.

Part (d): One point was earned for identifying the atmosphere as a commons.

Question 4 (continued)

Sample: 4C
Score: 3

Part (a): Two points were earned: 1 point for correctly identifying 1965–1970 as the five-year period with the greatest decline in catch, and 1 point for showing both the correct setup of the calculation and the correct answer of 100,000 metric tons per year.

Part (b): One point was earned. The description of bottom trawling is too vague to earn a point, but the student did earn 1 point for stating that the practice contributes to depletion by catching unintended species. No points were earned for mentioning sonar; the response does not describe how it is used in commercial fishing or how it contributes to depletion.

Part (c): No points were earned because no international regulation or United States federal law is identified.

Part (d): No points were earned. The student describes rainforest deforestation but does not clearly demonstrate understanding of the rainforest as a public resource being exploited for private gain (i.e., the rainforest as a commons).