

Effect Of Organism Interactions

Base your answers to questions 1 on the information below and on your knowledge of biology.

Since 1980, the vulture population in India has declined from 40 million to 60 thousand due to poisoning by a pain reliever used in cattle. If only 1% of the cattle carcasses fed on by vultures are animals that have been treated with the drug, it can lead to a drastic decline in the vulture population. The grim picture is that over 10% of the carcasses have been found to contain this drug.

Vultures feed exclusively on the carcasses of dead animals. This helps to prevent the spread of diseases such as rabies and anthrax among wildlife, livestock, and humans. Without as many vultures present, other scavengers such as dogs have moved in and taken advantage of the newly available food. The abundance of these other scavengers has led to an increase in the number of cases of human rabies and an outbreak of tuberculosis, anthrax, and foot-and-mouth disease. These diseases are not spread to humans by vultures.

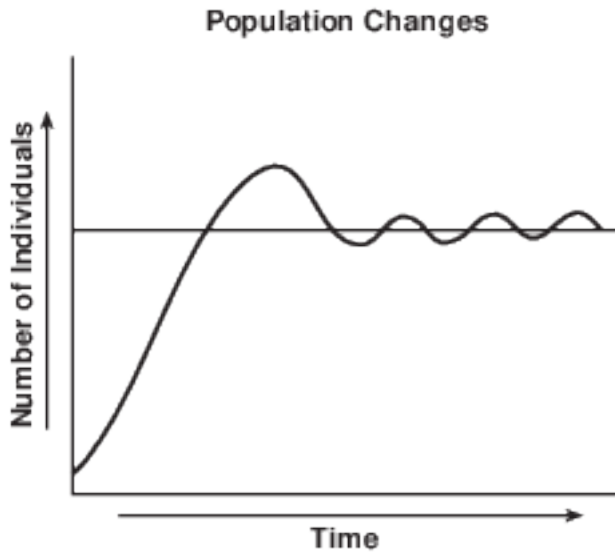
- 1 The best explanation for the increase in rabies, anthrax, and other diseases in humans is that the
 - (1) decrease in the number of vultures has upset ecosystem stability
 - (2) vulture population is being killed off by an increase in cases of human rabies
 - (3) vultures are changing their feeding role from scavenger to decomposer
 - (4) people are consuming scavengers that have eaten diseased vultures

- 2 Which statement best describes bat populations in a stable ecosystem?
 - (1) They are held in check by environmental factors.
 - (2) They are producers that rely indirectly on other producers.
 - (3) They are not limited by natural predators.
 - (4) They are not dependent on other species.

- 3 Which statement is an example of the inter- dependence of organisms?
 - (1) Owls hunt at night.
 - (2) Ants get food from insects and protect insects from predators.
 - (3) Ticks feed on the blood of animals and the ticks grow larger.
 - (4) Crows feed on dead mice.

- 4 Which statement best describes what is most likely to occur if an animal population grows larger than the carrying capacity of its environment?
 - (1) The birth rate will increase.
 - (2) Both the birth rate and death rate will decrease.
 - (3) The death rate will increase.
 - (4) Neither the birth rate nor the death rate will decrease.

- 5 The graph below represents some changes in the number of individuals in a particular population in a stable ecosystem over a period of time.



Which statement best describes the trend shown in this graph?

- (1) Ecosystem conditions will eventually cause a population to become extinct.
 - (2) In a stable ecosystem, the number of individuals in a population is usually maintained within a certain range.
 - (3) The interactions between a population and various factors in an environment are always predictable.
 - (4) In order for any ecosystem to maintain a balance, populations must be reduced to half their original number.
- 6 Rabbits produce large numbers of offspring during each reproductive season, yet the number of rabbits within a given population changes very little from year to year. The stability of the population size is most likely the result of
- (1) the development of mutations in young rabbits
 - (2) environmental factors that keep the population in check
 - (3) rabbits continuing to reproduce when the population is large
 - (4) the survival of more female rabbits than male rabbits

- 7 Each female housefly can lay approximately 500 eggs in a lifetime. She does this in several batches of about 75 to 150 eggs. Within a day, larvae (maggots) hatch from the eggs. They live and feed on organic material, such as garbage and feces. Scientists have calculated that a pair of flies beginning reproduction in April could be the ancestors of 191,010,000,000,000,000 flies by August.



Source: <http://www.publicdomainpictures.net/download-picture.php?adresar=10000&soubor+1-1220978631q1uO.jpg&id+1137>

Which statement best explains why this does not happen?

- (1) Mutations develop in the young flies.
 - (2) Environmental factors keep the population in check.
 - (3) Flies continue to reproduce in large numbers.
 - (4) More female flies survive than male flies.
- 8 In order for an ecosystem to remain stable there must be
- (1) drastic modifications to the environment
 - (2) interrelationships and interdependencies among organisms
 - (3) limited biodiversity
 - (4) gradual changes in the climate

- 9 One way humans can promote the survival of organisms in an ecosystem is to
- (1) decrease diversity in plant habitats
 - (2) introduce new consumers to control autotrophs
 - (3) release extra CO₂ into the atmosphere to help autotrophs
 - (4) learn about the interactions of populations

- 10 A fundamental concept of ecology is that living organisms
- (1) are independent and do not interact with each other or with the physical environment
 - (2) do not interact with other living organisms, but do interact with the physical environment
 - (3) interact with each other, but do not interact with the physical environment
 - (4) interact with other living organisms and interact with the physical environment

Base your answers to questions 11 on the information below and on your knowledge of biology.

Research has shown that plants might chemically change their environment. The roots of certain plants release many chemicals. Some chemicals made by plants can kill nearby plants or discourage herbivores from eating them. Other plant chemicals kill plant pathogens such as bacteria and fungi.

- 11 State two ways that the release of these chemicals is beneficial to these plants. [1]
- (1)
 - (2)

Base your answers to questions 12 on the information below and on your knowledge of biology.

Coral Reef Ecosystems

There are many ecological interactions that maintain the biodiversity present in coral reefs. In addition to coral, microscopic algae, seaweed, sea grasses, sponges and worms, and a variety of fish are among the organisms that live in reef ecosystems. Ocean currents often link different reef systems and move organisms from one reef area to another. This movement is a factor in repopulating a reef that has been damaged by environmental changes.

One environmental change involves an increased growth of seaweed. When the population of seaweed increases, the reef shifts from a coral-dominated ecosystem to a seaweed-dominated ecosystem. This change disrupts the relationships between the organisms that live there.

Studies have shown that, as the density of seaweed in a reef area increases, the number of fish that eat the seaweed in that area decreases. This may be due to the presence of more predators, or the taste of the more mature plants. The fish move to areas where there is less seaweed growth. As this trend continues, the reef areas are taken over by the seaweed. Once this happens, it is very hard to remove the seaweed and restore the reef to a healthy ecosystem.

In addition to this problem, temperature changes are threatening the ocean currents that connect the reef systems. A change in the currents would reduce the movement of fish larvae from one area to another. This contributes to the seaweed problem.

- 12 State one reason why it is important to maintain the stability of the coral reefs. [1]

Base your answers to question 13-14 on the information below and on your knowledge of biology.

Survey Finds Invasive Snail in St. Lawrence River That Could Threaten Waterfowl

New research has found a larger presence of faucet snails in the Great Lakes than previously recognized, including the northern parts of Lake Ontario and the St. Lawrence River. The invasive species can carry three types of intestinal parasites that can injure and kill waterfowl such as ducks. ...

...When the waterfowl eat the snails, the parasites attack internal organs, causing lesions [sores] and hemorrhage [uncontrolled bleeding]. Birds affected by the snail will fly and dive erratically before their eventual death. The university said that the snails are about 12 to 15 millimeters in height at full size, brown to black with a distinctive whorl of concentric circles on the shell opening cover that looks like tree rings. ...

...Mr. Kosnicki [an ecologist] said the spread of snails, along with other invasive species, shows the need for increased awareness of possible contaminants coming from boats and in runoff from land. ...

Source: Watertown Daily Times, Monday, January 19, 2015, by Gordon Block

13-14 Discuss how invasive species can harm an ecosystem. In your answer, be sure to:

- explain one negative effect that faucet snails have on the lake ecosystem [1]
- describe one human activity that can slow the spread of the faucet snail [1]

Base your answers to questions 15 on the passage below and on your knowledge of biology.

Indian Ocean Ecosystem in Danger

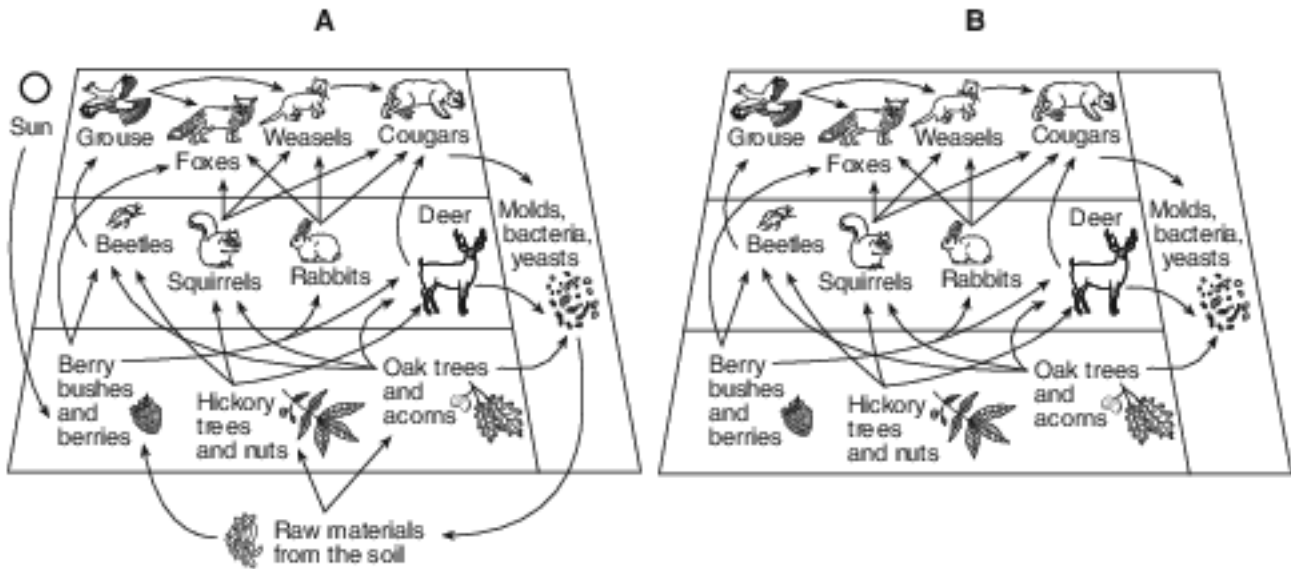
The Indian Ocean is under increasing environmental pressures. Until recently, this ocean was considered to have the least ecologically disrupted coastline. However, as the surface water temperatures have increased, there has been a reduction in the phytoplankton population (microscopic producers). This reduction in phytoplankton has been linked to a decline in some fish populations.

Also affecting the fish populations is the urbanization of coastal areas. As the human population grows in this area, more of the coastline region is being developed. In addition, the mining of natural resources has led to oil spills, the destruction of mangrove forests, and an increase in the area's acidity level.

Countries along the coast are trying to encourage development while, at the same time, trying to maintain a healthy coastal ecosystem.

15 Explain how a reduction in phytoplankton can lead to a reduction in fish populations in the Indian Ocean. [1]

Base your answers to questions 16 on the diagrams below and on your knowledge of biology. The diagrams represent how various populations interact in a forest environment.



- 16 State what would most likely happen to one other population in this food web if all the squirrels and rabbits were suddenly killed by a viral disease. Support your answer. [1]

Answer Keys

1 1

2 1

3 2

4 3

5 2

6 2

7 2

8 2

9 4

10 4

11 Allow 1 credit for two acceptable responses. Acceptable responses include, but are not limited to:

- — It will keep them from getting a disease.
- — It will keep them from getting eaten.
- — It protects them from pathogens.
- — It will give them a competitive advantage.
- — It keeps other plants from growing nearby.

12 Allow 1 credit. Acceptable responses include, but are not limited to:

- — in order to maintain the food webs that exist there
- — because many organisms depend on them for food or shelter
- — to maintain biodiversity
- — keep oceans healthy
- — to prevent extinction of reef species

13-14 The student's response to the bulleted items in the question need not appear in the following order.

- 13. Allow 1 credit for explaining one direct effect that faucet snails have on the lake ecosystem.
- Acceptable responses include, but are not limited to:
 - — The faucet snails can infect waterfowl with a parasite that kills the birds.
 - — The faucet snails can negatively affect the food web of the lake by causing the loss of the waterfowl.
 - — The faucet snails kill the ducks.
- 14. Allow 1 credit for describing one human activity that can be taken to slow the spread of the faucet snail. Acceptable responses include, but are not limited to:
 - — Clean the bottom of a boat when moving it from one body of water to another.
 - — Check your boat for snails before putting it in a new lake.
 - — Increase awareness of possible contaminants coming from boats.
 - — Remove the snails from the lake.

- 15 Allow 1 credit. Acceptable responses include, but are not limited to:
- — Phytoplankton is the beginning of the food chain/web in the ocean.
 - — If the amount of phytoplankton decreases in the ocean, there will be less food/oxygen available for the fish.
 - — Producers provide energy for all the other organisms in the ocean. A reduction in the number of producers will lead to a reduction in the number of fish.
 - — It disrupts the stability of the ecosystem because there is less food for the fish.
 - — It would lead to more competition for food.
- 16 Allow 1 credit for stating what would most likely happen to one other population in this food web if all the squirrels and rabbits were suddenly killed by a viral disease and for supporting the answer. Acceptable responses include, but are not limited to:
- — The fox/weasel/cougar population would decrease because of less food.
 - — The oak trees would increase because there would be more acorns.
 - — The deer population might increase due to less competition for available food.
 - — The deer population might decrease due to greater predation by cougars.
 - — There would be more competition among foxes/weasels/cougars because of a decrease in food.