

tpo_27_passage_2

How do predators affect populations of the prey animals? The answer is not as simple as might be thought. Moose reached Isle Royale in Lake Superior by crossing over winter ice and multiplied freely there in isolation without predators. When wolves later reached the island, naturalists widely assumed that the wolves would play a key role in controlling the moose population. Careful studies have demonstrated, however, that this is not the case. The wolves eat mostly old or diseased animals that would not survive long anyway. In general, the moose population is controlled by food availability, disease, and other factors rather than by the wolves. When experimental populations are set up under simple laboratory conditions, the predator often exterminates its prey and then becomes extinct itself, having nothing left to eat. However, if safe areas like those prey animals have in the wild are provided, the prey population drops to low levels but not to extinction. Low prey population levels then provide inadequate food for the predators, causing the predator population to decrease. When this occurs, the prey population can rebound. In this situation the predator and prey populations may continue in this cyclical pattern for some time. Population cycles are characteristic of some species of small mammals, and they sometimes appear to be brought about by predators. Ecologists studying hare populations have found that the North American snowshoe hare follows a roughly ten-year cycle. Its numbers fall tenfold to thirtyfold in a typical cycle, and a hundredfold change can occur. Two factors appear to be generating the cycle: food plants and predators. The preferred foods of snowshoe hares are willow and birch twigs. As hare density increases, the quantity of these twigs decreases, forcing the hares to feed on low-quality, high-fiber food. Lower birth rates, low juvenile survivorship, and low growth rates follow, so there is a corresponding decline in hare abundance. Once the hare population has declined, it takes two to three years for the quantity of twigs to recover. A key predator of the snowshoe hare is the Canada lynx. The Canada lynx shows a ten-year cycle of abundance that parallels the abundance cycle of hares. As hare numbers increase, lynx numbers do too, rising in response to the increased availability of lynx food. What causes the predator-prey oscillations? Do increasing numbers of hares lead to overharvesting of plants, which in turn results in reduced hare populations, or do increasing numbers of lynx lead to overharvesting of hares? Field experiments carried out by Charles Krebs and coworkers in 1992 provide an answer. Krebs investigated experimental plots in Canada's Yukon territory that contained hare populations. When food was added to these plots (no food effect) and predators were excluded (no predator effect) from an experimental area, hare numbers increased tenfold and stayed there-the cycle was lost. However, the cycle was retained if either of the factors was allowed to operate alone: if predators were excluded but food was not added (food effect alone), or if food was added in the presence of predators (predator effect alone). Thus, both factors can affect the cycle, which, in practice, seems to be generated by the conjunction of the two factors. Predators are an essential factor in maintaining communities that are rich and diverse in species. Without predators, the species that is the best competitor for food, shelter, nesting sites, and other environmental resources tends to dominate and exclude the species with which it competes. This phenomenon is known as "competitor exclusion." However, if the community contains a predator of the strongest competitor species, then the population of that competitor is controlled. Thus even the less competitive species are able to survive. For example, sea stars prey on a variety of bivalve mollusks and prevent these

bivalves from monopolizing habitats on the sea floor. This opens up space for many other organisms. When sea stars are removed, species diversity falls sharply. Therefore, from the standpoint of diversity, it is usually a mistake to eliminate a major predator from a community.

question 1

In paragraph 1, why does the author discuss the moose and wolves on Isle Royale?

- A To provide an example of predators moving to new habitats by following migrating prey
- B To show that the interactions between predator populations and prey populations are not always what might be expected
- C To suggest that prey populations are more influenced by predation than food availability and disease
- D To argue that studies of geographically isolated populations tend not to be useful to naturalists

question 2

Paragraph 2 implies which of the following about experimental environments in which predators become extinct?

- A They may yield results that do not accurately predict changes of populations in the wild.
- B In these environments, the prey species is better adapted than the predator species.
- C These environments are appropriate only for studying small populations of predators and prey.
- D They are unrealistic because some predators are also the prey of other predators.

question 3

The word “generating” in the passage is closest in meaning to

- A producing

- B changing
- C speeding up
- D smoothing out

question 4

According to paragraph 4, all of the following are true of the food of snowshoe hares EXCEPT:

- A The preferred food for hares consists of willow and birch twigs.
- B High fiber food is the most nutritious for hares.
- C Depletion of the supply of willow and birch twigs causes low birth and growth rates.
- D The food supply takes two or three years to recover after a peak in hare population density.

question 5

According to paragraph 5, which of the following statements best characterizes the abundance cycle of the Canada lynx?

- A It closely follows the cycle of the snowshoe hare.
- B When the numbers of lynx fall, the numbers of snowshoe hares soon decrease.
- C When hare numbers decrease, lynx numbers increase.
- D It is not clearly related to the availability of lynx food.

question 6

The word "conjunction" in the passage is closest in meaning to

- A determination
- B combination

C alternation

D tranformation

question 7

According to paragraph 6, which of the following was true of the hare population cycle in Krebs' s experiment?

A The effects of providing food while at the same time introducing predators cancelled each other, so there was no cycle.

B The cycle existed when either the food supply was limited or there were predators.

C There was a cycle when there were no predators and food was supplied.

D If the hares had places to hide from the lynx, the hare population increased tenfold and then remained at that level.

question 8

According to paragraph 7, which of the following statements correctly characterizes the effect of sea stars on the ecosystem in which they are predators of bivalves?

A Bivalve populations are kept low, allowing species that compete with bivalves to survive.

B The numbers of most species of bivalves are greatly reduced, leaving the bivalve species that is the strongest competitor to dominate among the survivors.

C Biological diversity begins to decrease because many bivalve species disappear.

D Sea stars dominate at first but then die off because of the depleted food supply.

question 9

Look at the four squares [] that indicate where the following sentence could be added to the passage.

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these bivalves from monopolizing habitats on the sea floor. This opens up space for many other organisms. When sea stars are removed, species diversity falls sharply. Therefore, from the standpoint of diversity, it is usually a mistake to eliminate a major predator from a community.

question 10

Directions: An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some sentences do not belong in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage. This question is worth 2 points.

- A. Studies of the interactions between wolves and moose on Isle Royale in Lake Superior reveal that wolf predation is not the primary factor controlling the moose population.
- B. In predator-prey population cycles, predator populations increase or decrease following similar population changes in the species they prey on.
- C. Ecologists are interested in studying predator-prey population cycles because understanding how predators and prey interact will allow better wildlife management programs.
- D. A species' population tends to rise and falls in a cyclic pattern if the food supply for the population is limited, or if the population has a major predator.
- E. Predators help maintain biological diversity by limiting populations of a dominant competitor species, thereby preventing that species from excluding others.
- F. The removal of sea stars reduces the diversity of the community in which they are predators, and is therefore a bad idea.