

The Relationship Between Predator and Prey

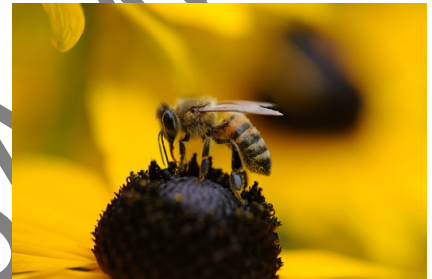
Whether it is a dolphin hunting for shrimp, a group of lions attacking an antelope, or just Tom and Jerry chasing each other through the house, the dynamics between prey and predators are



Dolphins are predators in their communities.

ubiquitous. Every animal seeks food to grow and survive, but many are also on the menu of another animal.

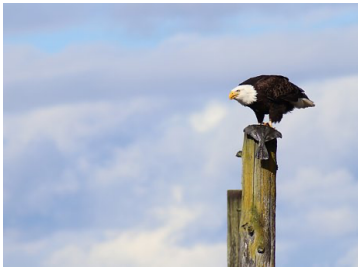
There are five ways that species can interact with other species. (1) **Commensalism** is a relationship in which one organism benefits from the other and the other is unaffected. One example is the Remora, a fish that rides on sharks and other large fish, eating scraps from the larger fish's meals. (2) **Mutualism** benefits both species and includes such collaborations as bees and flowers.



The relationship between bees and flowers is a mutualism.

(3) **Parasitism** occurs when only one benefits from the relationship and the other is harmed, like ticks on dogs (although some researchers classify this relationship as prey-predator). (4) **Competition**, when multiple organisms fight for the same resources, like a squirrel and a deer trying to collect acorns. And finally, (5) **predation**, in which species feed on other species, typically by killing them. It is this type of relationship into which we are going to dive a little deeper.

Counting sheep – and much more



The relationship between predators and prey is an important aspect of natural communities.

Predation is an important and powerful evolutionary force. The relationship between prey and predator determines the mortality of the first and the birth rate of the latter. Natural selection favors the most effective predators. On the other side of the relationship, easily-captured prey will be eventually eliminated – establishing the pattern of evolution on Earth for millennia. Because these

relationships are so important, researchers have developed mathematical models to grasp the effects on specific populations. In 1925, an American researcher named Alfred Lotka developed equations to explain oscillating chemical reactions. In 1926, an Italian mathematician named Vito Volterra derived nearly the same equations to prey relations in the Adriatic Sea. Thus, the **Lotka-Volterra model**, used by ecologists to this day, was born. It is based on the idea that when prey

are numerous, the predator population will increase. This will eventually reduce the prey population, which will, in turn, cause the number of predators to decline. Eventually, the prey population will recover and increase, which will start a new cycle.

Interestingly, the increase in predators usually doesn't result in the extinction of the prey. Prey can hide and defend themselves, allowing enough to survive for

the population to recover. In addition, a smaller prey population will be less densely distributed in the environment and thus harder for predators to locate. The availability of alternative prey can also stabilize the cycle, because predators can switch between the different species, giving populations a chance to recover.



The Lotka-Volterra model is based on the idea that abundant prey allow for abundant predators.

Getting a bit more complex

Ecobottle Sample



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The basic assumptions of the model make it somewhat unrealistic for natural populations. For example, it assumes unlimited food resources for prey, unlimited predator appetite, and a static environment that does not change to favor one species over the other. However, modifications can be made to the equations to better model real systems.



The concept of a keystone species is rooted in architecture. Without the oddly shaped center piece of this arch, the keystone, the arch would collapse.

As you can see, this model is complex and involves many different interactions. Real wildlife dynamics are even more complex. For example, many systems include keystone species, which have a disproportionate, stabilizing effect on the rest of the community. Keystone predators keep competing prey species in check and often sit at the top of the food chain (apex predators). Loss of keystone species can allow one of its prey species to out-compete the others

and dominate the ecosystem, reducing biodiversity.

A little out of balance

Ecobottle Sample



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Humans represent another important influence on natural systems. As we consider ourselves to be on top of the food chain, we try to manipulate the prey-predator balance. Sometimes, our interference is positive. We work to preserve and increase populations of endangered species and so attempt to restore lost balance. But manipulation often has negative effects. We hunt down

some predator species because we are in competition with them for the same prey. And we are better competitors. Because of the massive human population, every form of hunting – for fun, consumption, fur or land clearing – has an enormous impact on the balance between prey and predators. This impact is multiplied when we target keystone species. In such cases, human interference can be immensely influential on the (loss of) biodiversity.

Reading Comprehension Questions

1. Name the five relationships between species.
2. What
3. How can the availability of alternative prey stabilize the cycle?
4. What
5. What
6. Name two ways in which invasive species can enter the environment.

Extension Questions

7. Take the mathematical Lotka-Volterra model. Suppose that the prey (H) are baboons and the predators (P) are cheetahs. Interpret in words the model that is depicted.
8. Take the case of the pythons

Ecobottle Sample



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TWF READING

References

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