Name_____ Date_____

Reproductive Success through Adaptation

Many plants and animals have survived by changing one or more of their characteristics. Plants and animals may have survived through a change in colour, a change in behaviour, or many other possibilities. Changes that continue to exist are those that are successful in keeping the species alive.

The environment can become hostile, predators can become more numerous or more adept at catching their prey and food can be more difficult to find. Mating is a part of reproduction in complex organisms. Mating can be the most dangerous time for plants and animals, so they often develop mating habits that have built in security features. We will explore some of these adaptations in more detail.

A brief list of some forms of adaptations that enhance reproductive success is shown below.

Behaviour

Animals that fertilize internally demonstrate more care for their young than animals that fertilize externally. The embryo remains in the female parent until it reaches a level of maturity that ensures greater success for survival. Once the offspring is born the parents make an effort to protect the young until they can feed and protect themselves. The time it takes for that level of maturity can range from a few days to a few years.

Appearance

Plants, like many animals, have internal fertilization of eggs. However, unlike animals, plants cannot move about and seek a suitable mate. They must somehow bring female and male together without moving, so they use wind, water, and mobile animals to aid in their reproduction

As flowering plants were developing, insects and animals that could pollinate these flowering plants were developing as well. In fact, flowering plants and the insects and animals that pollinate them--their pollinators--seem to have developed in such a way that they both help each other to survive.

Birds are flowering plant pollinators. All birds see colours, but especially prefer red and other bright colors. A bird looking for nectar would choose brightly coloured flowers rather than white flowers, and would choose flowers which are large enough for it to fit its beak into. As the bird feeds on the pollen, pollen sticks to its body and is carried to other flowers. Birds with long beaks would have more success in feeding on nectar than short-beaked birds. So long-beaked birds would survive and reproduce, and the number of long-beaked birds would increase. In a similar process, because the brightly coloured flowers attract these long-beaked birds, they would also survive and reproduce because the long-beaked birds would choose them and therefore pollinate them. Over time, both the population of long-beaked birds and brightly coloured flowers would increase because they help each other to survive. Because flowers and their pollinators help each other survive, over time, their numbers would increase and they would grow and flourish everywhere. In this example, both the bright colours of the flowers and the long beaks of the birds are adaptations, which affected the natural selection of these organisms as survivors.

If you look closely, you can tell what characteristics of other flowers and their pollinators have been helpful to their survival.

Butterflies have long, slender tongues, and will pollinate long, narrow flowers. However, butterflies still need a place to land while they are feeding on the flower's nectar, so these same flowers usually grow straight up and have clustered petals that give the butterfly a landing platform. In addition, butterflies seem to choose white, cream, yellow, pink and blue flowers in pastel colours. Length of a species of orchid that grows in the same area--they help each other survive.

Many insects also prefer flowers that have nectar guides on the flower petals. These guides lead the insect to the source of the nectar, and different flower have very distinctive nectar guides. Many of these guides can only be seen under an ultraviolet light, a wavelength of light that can be seen by insects.

Hummingbirds are the most common bird pollinators. They choose large, tube-shaped flowers to match their long beaks. They choose flowers with lots of nectar because the hummingbirds need lots of food energy to survive. The flower's anthers stick out above the petals so they are more likely to brush against the hummingbird and pick up pollen. Hummingbirds see red and yellow well, but have an underdeveloped sense of smell, so they often choose bright flowers with little fragrance.

Mating calls

Mating calls are universal. Mating calls have several characteristics in common for all types of animals.

1) Mating calls attract females.

2) Mating calls can indicate the desirability of the calling male.

3) Mating calls can establish territories, allowing only the strongest males to mate.

4) Mating calls can identify species in order to reduce energy lost in attempting mating with another species for which there will be no offspring.

The mating calls of whales are song-like and can be melodic and elaborate. Prairie chickens use their wings to make a booming sound. Elephants make extremely low frequency sounds that only other elephants can hear. Elk make the famous bugling sound that is such a part of the Canadian wilderness.

Chemical cues

Animals are capable of producing chemical hormones called pheromones that are responsible for sending messages to another animal of the same species. There are receptors in the nose which are capable of detecting the presence of the hormone. Research indicates the detection of pheromones is unconscious but a pathway from the nose to the brain means the presence of pheromones has an impact on animal behaviour.

Pheromones where first isolated in experiments with silk moths. Pure pheromones were placed near a silk moth causing it to begin a vigorous flutter dance which was a mating ritual for the species.

It seems that pheromones are responsible for stimulating a mating response from males when they receive even a small amount of the hormone. Pheromones are also responsible for creating social and aggression cues in groups of the same species.

Pheromones are now used as a natural insecticide. A pheromone spray placed over a crop will cause its natural predators to become confused. The confusion results in low reproduction rates with the species population diminishing in size.

Some companies have begun advertising their pheromone-based scents that guarantee the attractiveness of the user to the opposite sex. Research, however, has shown that humans are considerably more complex than silk worms and the advertising claims have not yielded their promise to the disappointment of users.

Courtship behaviour

The courtship behaviour of the Ruffed Grouse contains the basic elements of courtship behaviour in many animals.

The Ruffed Grouse cups its wing and moves it rapidly through the air causing a booming sound. The grouse performs this ritual while standing on an old log. The courtship ritual is thought to have two functions.

1) The male grouse attracts female grouse that are ready to mate

2) The male grouse is letting other males know that this is his territory and they had better leave.

Number of Offspring Produced

Plants and animals that are capable of producing a large number of offspring do not spend effort in protecting the young, either before or after birth. The large number of offspring ensures that some will survive. More advanced plants and particularly animals that spend time with their offspring teaching them survival techniques will produce less offspring as their potential for survival is greatly increased.

Summary

Reproductive success is enhanced by sexual or asexual reproduction depending on the type of plant or animal, the environmental conditions and the complexity of the organism.

Plants and animals respond to changing conditions, usually environmental, by adapting to the conditions around them. Those plants and animals best able to modify their behaviour, appearance or even their environment are most likely to survive.