

Insect Success

Insects are one of the most successful groups of living organisms on earth

?Why Insects are so successful

- Insects comprise about 95% of all known animal species. Actually it is insects instead of human (nor mammal) who dominate this planet. Why Insects can be so success? The answers can be very complicated and there are a lot of factors. However, we can see two obvious factors which contributed to the success of insects.
- http://www.geocities.com/brisbane_insects/InsectSuccess.htm

- insects have one of the widest distributions on the globe. Insects are found almost everywhere on the planet earth. Insect species live in deserts. Other species are found in hot springs, where temperatures reach 180°F, others are found on mountains at an elevation of 18,000 feet. Insects are very abundant in tropical rain forests, and still other species are found in the arctic, where temperatures drop to -40°F.
- <http://www.ent.iastate.edu/dept/courses/ent201/success/start.html>

Insect diversity leads to success

- Because of their great diversity, insects provide an understanding of the adaptability of animal systems and biological mechanisms that survive the physical and biological challenges necessary to exist in these environments.

Reasons for Success

- Why have insects been so successful?
- Several ideas, most of which are interrelated, have been proposed to explain the success of insects.
- One explanation for their great diversity and abundance is based on their high reproductive capacity. Most insects produce huge numbers of offspring and many species produce several generations each year. This large reproductive capacity is related to insects' adaptability to a wide range of environmental factors.
- <http://www.ent.iastate.edu/dept/courses/ent201/success/0610whysucc.html>

Small Size

1. OK, so insects can produce a lot of young. What else do they have going for them?
2. A second factor relates to their small size. There are several advantages to being small:
3. Individuals require less energy and time to complete development
4. Insects easily can hide from predators by using microhabitats
5. Again because of the use of microhabitats, more habitats are available for use by insects compared to larger animals
6. The muscle system of insects is similar to vertebrates, but due to their small size, muscular action is more efficient
7. Solar radiation is used by insects to warm their bodies
8. Because of their small size, insects can be moved by the wind. This movement may be over long distances or short distance random movements.

■ **Water Loss**

- One drawback of small size is the potential for water loss due to an increased surface area/volume ratio. Think of the following analogous example. If you have a glass of water and the same amount of water spread out in small droplets on a table, which will evaporate faster? The smaller droplets will, because you are making more surface area for the same amount of volume. This increased rate of water loss is related to the surface area/volume ratio. Insects are relatively small and thus have relatively high surface-area-to-volume ratios. Thus, they may lose water rapidly due to evaporation.
- How do insects cope with the problem of water loss? Pause for a moment and think of how you would solve this problem if you were that small .
- Insects have several mechanisms to reduce water loss. One structural mechanism is the waxy coating over the exoskeleton of insects. In addition, most insects do not excrete liquid water; they reabsorb water from their waste products.

Special Appendages

- Insects have different types of appendages (for example, legs, wings, and mouthparts). Insect species possess various forms of mouthparts that are used to feed on a wide variety of substances.
- Most plants and animals are fed upon by at least one species of insect. Many serve as hosts to a wide variety of insect species.

Legs

- Insects have diverse leg types which function in a variety of ways. For example, grasshoppers and fleas have legs adapted for jumping. Many aquatic insects have legs which are modified for swimming. And many species of predaceous insects have modified front legs which are used to catch and hold prey.

Wings

- Many insect species have wings, which increase their ability to disperse within habitats and between habitats .
- Can you think of any other invertebrate animal that has wings ?
- Insects are the only invertebrate animals which have wings and these structures have been advantageous for insect survival. An additional adaptation found in certain types of insects is the ability to fold up the wings and protect these delicate structures under wing covers.

Development

- Another reason for the success and diversity of insects is related to the type of development shown by most insect species. As an insect grows it goes through life stages that may be very different in structure and function.
- Many insect species are found in one type of habitat in the immature stages and another habitat in the adult stage. For example, a caterpillar feeds on plant matter while an adult butterfly feeds on nectar.
- For many insect species, the immatures and adults feed on different foods and do not compete with each other for food: clearly an advantageous adaptation!

■ **Diverse Development**

- One additional factor contributing to the success of insects is the tremendous variety of developmental patterns. Insects show a diversity in developmental patterns that is so great that humans have great difficulty identifying a given species through its complete life cycle. Only a tiny fraction of all insect species has ever been reared through a single generation .
- <http://www.ent.iastate.edu/dept/courses/ent201/success/700variety.html>

Why beetles are so success?

- The ways that we classified all different species of beetles as one order may be not fair. When comparing beetles with other orders of insects, I think we put too many different families into one Coleoptera Order. We put every insects with hard forewings into Coleoptera Order. If we put grasshoppers, stick insects, mantids and cockroaches in different orders, why do we put ladybird beetles, scarab, longhorn, weevil in one order?
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Why beetles are so success?

- Beetle specialized in food and live in isolated environment. After long time of separations, different group of beetles become different species .

Why beetles are so success?

- Beetles are among the first group of insect who gain the benefit of complete metamorphosis, i.e., they develop from eggs, larva, pupa to adult. They have two completely different body shape and there are a lot of advantages. Those include adults and larvae not necessary to compete for the same food and living resources, adapt to different conditions due to seasonal changes, and to avoid predators in different stage