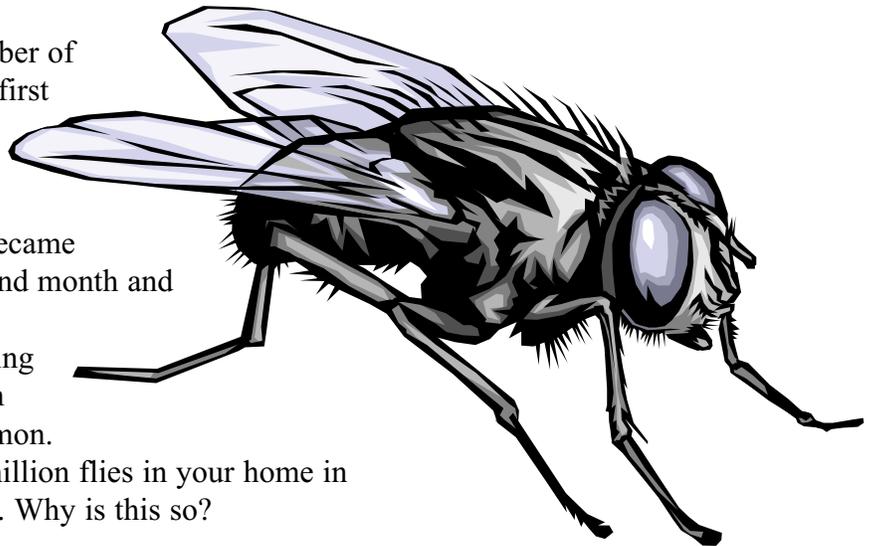




## Environmental Factors and Population Size

Imagine you notice a pair of houseflies in your warm house on a cold day in December. Assuming one of the flies is a female, and the other a male, you could expect them to reproduce. Houseflies lay up to 900 eggs at a time. If the house is warm (approximately 20°C), the eggs will hatch into larvae (a small worm-like stage of fly development) in about one day. The larvae go through several stages of development, and become mature houseflies in about a month. If the home remains warm, and the larvae find enough food to eat, there could be approximately 900 flies in the house by January (assuming that all the larvae survive until they become mature flies!). If all goes well, hundreds of pairs of these flies will lay hundreds of eggs each, producing approximately 400,000 new flies by late February. If this continues, you could have an additional 180,000,000 mature flies by the time you open your windows in late March (and maybe let some of the flies out).

As you can see, the number of flies increases slowly at first (in this example, 2 flies become 900 flies in the first month), then very rapidly (900 flies became 400,000 flies in the second month and 180,000,000 by the third month). Finding a breeding pair of flies in a house in December is not uncommon. Having a few hundred million flies in your home in March is highly unlikely. Why is this so?



What factors in the environment prevent a breeding pair of organisms from becoming a population numbering in the billions in a relatively short period of time? One reason is that resources are in limited supply. There may be enough food in a typical house for a few dozen flies, but there usually isn't enough for thousands of them. Also, there may be other insects in the house that compete with the flies for the little bits of food that humans leave behind. Many of the flies and their larvae starve to death. Some flies are eaten by other insects in the home (predators), while others die of "natural causes" (such as disease). If the home's heating system were to break down, and the temperature in the house were to drop to the freezing point, many flies and larvae would die due to lack of warmth. Although this doesn't usually happen in your home, it does happen outdoors where many organisms live. All these environmental factors help limit the population size of a particular organism.

Many environmental factors affect the population size of a particular organism. This is true in a “closed” environment such as a home, but also in an “open” environment such as the outdoors. Limiting factors may be categorized as density-dependent or density-independent. Density-dependent factors operate when a population is large and crowded, and density-independent factors operate regardless of the population density. Some limiting factors are

- availability of food and water
- availability of living space
- heat or cold
- predators
- disease
- overcrowding and stress

### Questions

1. How many flies were in the house in December?
2. How many new flies were added in January?
3. How many new flies were added in February?
4. How many new flies were added in March?
5. Why does the population grow slowly at first (in December and January), and much more rapidly later (in February and March)?
6. Suggest two other organisms that houseflies compete with for food in a home.
7. Which factor(s) changed when the window was opened in March?
8. From the list of limiting factors, identify those that are density-dependent.
9. From the list of limiting factors, identify those that are density-independent.
10. Would you consider drought to be a density-dependent or density-independent limiting factor? Explain your answer.
11. Would you consider competition for resources a density-dependent or density-independent limiting factor? Explain your answer.

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Adapted from *Locally Developed Grade 10 Science—Catholic* (Toronto, ON: Ministry of Education and Training, 2000), Appendix 2.5.9.