Populations: foundation

A population primer

Very few things on this planet live alone. That's why it's important to study populations: to understand how groups of people, animals, plants, bacteria and other living things survive and behave in the real world.

We study populations to learn how diseases spread, how we can stop rare animals becoming extinct, how we are related to one another and how humans and other species are affected by environmental change.

When we talk about populations, we might be grouping together all the individuals of a species, as in 'the global population', or we might be talking about a group living in a particular ecosystem or environment. You can even refer to the populations of bacteria living on your toothbrush.

The group or its habitat (where it lives) can be big or small, but typically the term population only ever refers to one species. So you will have a number of different populations of bacteria living on your toothbrush, each from a different species. These different populations form a larger community of bacteria that, together with the environment provided by your toothbrush, create a miniature ecosystem right there in your bathroom – just like in woodland or on a coral reef. Some species of bacteria might be unique to your toothbrush, while others might be related to populations of bacteria in your back garden or at the bottom of the ocean.

Scientists often try to understand patterns within populations or differences between them. They might look at human population growth in China or differences between populations of salmon in separate rivers. It's not always obvious what causes change or variation between populations, because in the real world there are so many factors to consider. But that's what makes studying populations so fascinating.

Studying populations in place

In ecology, scientists are concerned with understanding what determines population size and how populations of different species interact within ecosystems. Pond ecology, for instance, could involve studying algae to understand how algal population growth affects water quality in ponds, and how that in turn affects the survival of fish and other animals.

Biodiversity, an important concept for ecologists, measures the diversity of life – usually the number of different species in a given area.

Using stats to study populations

Demography looks at changes in birth rates and death rates, which determine how fast populations grow or decline. Human population studies rely heavily on demography.

Demographers also analyse populations by age group, using population pyramids, to visualise this breakdown.

Epidemiology looks at a population's health

Epidemiology is the study of health and disease in populations, human or otherwise. It covers mapping an outbreak of flu, to predicting how badger populations will respond to vaccination against tuberculosis, to comparing rates of lung cancer in populations of smokers and non-smokers.

By looking at patterns of disease, epidemiologists try to understand risk factors and provide information that will help public health authorities prevent and respond quickly to outbreaks of infectious disease.

Studying populations through genetics

Population genetics looks at the inheritance of genes at the population level, which is at the heart of evolution.

Researchers in this field examine both the frequency and the interaction of genes and their variants (alleles) in a population. This information can be used, for example, to understand why one population is more or less susceptible to a disease than another.

Finding life where you least expect it

Life creeps into just about every corner of our planet, meaning you'll find thriving populations in places that seem almost uninhabitable.

Over 30 years ago a reactor at the Chernobyl nuclear power station in Ukraine exploded. Most humans were evacuated from the contaminated areas, but wildlife has moved back in, and populations of birds, horses, wolves and trees, to name but a few, are now studied for the lasting effects of radiation.

Populations depend upon one another, forming communities – so where you find one you're sure to find another. At deep-sea vents, which spout volcanically heated water from cracks in the seafloor, there is no light and plants cannot grow. Yet even in this hostile environment, populations of microbes called chemosynthetic bacteria survive by utilising energy from chemicals in the hot fluid.

Higher up the food chain, animal populations, including worms and shrimp, depend on these microbes for their own energy. Meanwhile, vent crabs scavenge, eating both microbes and dead animals.

Other odd places for populations and communities include shipwrecks and the underwater components of offshore wind turbines, which can act like reefs for mussels and fish, the International Space Station, which hosts a very small population of astronauts, and Antarctic islands, which are home to ancient mosses and even worms that can be brought back to life in a lab after having been frozen for thousands of years.

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