Definition of population growth in ecology

Ecology | Population growth | Change in population growth | Range and density | Links To Ecology | Back in the top the previous chapters/units have been concentrated in the biology of individual cells, tissues, and the body. There are organizational levels above each organization that are the subject of this unit. Individual organisms are grouped into populations, which in turn form communities that form ecosystems. Ecosystems are made up of a biosphere that covers all life on Earth. If there's life on other planets, will we need another organizational level? Biosphere: A comparison of all living things with their environment. Essentially, where life takes place, from the upper elongation of the atmosphere to the upper part of the soil, to the top few meters of the soil, to the bottom of the oceans. The earth is divided into atmosphere (air), lithosphere (earth), hydrosphere (water) and biosphere (life). Ecosystem: The relationship of smaller groups of organisms to each other and their environment. Scientists often talk about the interconnected ity of living things. Since Darwin's theory is that organisms adapt to their environment, they have to adapt to other organisms in this environment. We can discuss the flow of energy through an ecosystem, from photosynthetic autotrophics to herbivores to carnivores. Community: Relations between groups of different species. For example, desert communities consist of rabbits, coyotes, snakes, birds, mice and plants such as the sahuaro cactus (Carnegia gigantea), ocotillo, creosote bush, etc. The community structure may be disturbed by things such as fire, human activity and overpopulation. Species: Groups of similar individuals who tend to mate and produce viable, fertile offspring. We often find species that are not described by their reproduction (biological species), but by their form (anatomical or form species). Populations: Groups of similar individuals who mate with each other in a limited geographical area. It can be as simple as an area of flowers, which is separated from another area on a hill or other area where these flowers do not occur. Individuals: One or more cells are characterized by a unique arrangement of DNA information. These can be single-celled or multicellular. The multicellular individual exhibits specialized cell types and work on the division of tissues, organs, and organ systems. Organ system: (in multicellular organisms). A group of cells, tissues and organs that perform a specific main function. For example, the cardiovascular system works in its bloodstream. Organ: (in multicellular organisms). A group of cells or tissues performing a general function. For example: the heart is an organ that pumps blood into the cardiovascular system. Tissue: (in multicellular organisms). A group of cells that perform a specific function. For example, the heart muscle tissue is located in the heart and its unique contraction properties aid the heart's function as a pump. . Cell: A the unity of living things. Each cell has some hereditary substance (or DNA or less commonly RNA), obtaining energy from chemicals, structures, etc. Organisms, by definition, need metabolic chemicals as well as a hereditary information molecule of nucleic acid. Organelle: A subunit of a cell, an organelle, is involved in a specific subcellular function, such as ribosomes (at the site of protein synthesis) or mitochondria (the place of ATP production in eukaryomies). Molecules, atoms and subatomic particles: Basic functional levels of biochemistry. Organizational life levels in graphical format. Images purves et al., Life: The Science of Biology, 4th Edition, Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Thus, it is possible to study biology on many levels, from the collection of organisms (communities) to the inner workings of the cell (organelle). Ecology is the study of how organisms interact with each other and their physical environment. These interactions are often quite complex. Human activity often interferes with living systems and affects these interactions. Ecological predictions, as a result, are often more general than we would like. Population growth | Back in the Top A population is a group of individuals of the same species living in the same geographical area. Studying the factors affecting growth, stability and population decline is the dynamics of the population. They go through three different stages of their life cycle: Population growth occurs when the resources available exceed the number of individuals who can take advantage of them. Reproduction is rapid and mortality rates are low, resulting in a net increase in population size. Population stability is often followed by collapse, as the growing population eventually exceeds the resources available. Stability is usually the longest stage in the life cycle of the population. The decrease in the number of species in the population and eventually leads to the extinction of the population. Factors influencing population growth Almost all populations tend to grow exponentially as long as resources are available. Most populations are able to expand at an exponential rate, as reproduction is usually a multiplying process. The two most fundamental factors influencing the rate of population growth are the birth rate and death rate. The internal rate of increase is the birth rate minus the death rate. There are two ways to grow your population. The exponential curve (also known as the J-curve) occurs when there is no limit to the size of the population. The logistic curve (also known as the S-curve) shows the effect of a limiting factor (in this case, the carrying capacity of the environment). Image Purves et al., Life: The Science of Biology, 4th Edition, sinauer associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. A potential is linked to life history Age this is the individual life cycle in which the body reproduces influences the rate of population growth. The life story refers to the age of sexual maturity, the age of death and other events affecting reproductive traits in an individual's life. Some organisms grow rapidly, multiply rapidly, and abundant offspring in each reproductive cycle. Other organisms grow slowly, multiply at late age, and have few offspring per cycle. Most organisms are intermediate to these two extremes. Population curves. (a) three hypothetical populations (marked I, II and III); (b), (c) and (d) three real populations. Remember that real curves are approximate to one of the three hypothetical. Images purves et al., Life: The Science of Biology, 4th Edition, Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. The age structure refers to the relative proportion of individuals in all age groups of the population. Populations of more than one person aged or before reproductive age have a pyramid-shaped age structure graph and can quickly expand as young mature and breed. The number of stable populations in each age group is relatively the same. Comparison of the population age ostrichtire in the United States and Mexico. Note the deographic bulge of the Mexican population. The effects of this bagpit will be felt for generations. Image Purves et al., Life: The Science of Biology, 4th Edition, sinauer associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. The Baby Boomers and Gen X. As the population bulge, the baby Boom was born after World War II, aged and began to make children of their own it created a secondary bulge called Generation X. What happens when generation X members have their own children? Image Purves et al., Life: The Science of Biology, 4th Edition, sinauer associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Human populations are in the growth phase. Since its development 200,000 years ago, our species has proliferated and spread on Earth. From 1650 onwards, the slow population growth of our species increased exponentially. New technologies in hunting and farming have made this expansion possible. It took 1,800 years to reach the total population of 1 billion, but in just 130 years it reaches 2 billion, and in just 45 years it reaches 4 billion. Despite technological advances, the factors influencing population growth will eventually limit the growth of the human population. These involve limiting physical and biological resources since the world's population grew to more than six billion in 1999. The population of 1987 was estimated at 5 billion. Human population growth over the past 10,000 years. Observe the effects of the worldwide disease (the black death) and technological advances in populatiuon size. Pictures purves et al., Life: The Science of Biology, 4th Edition, Sinauer Associates (www.sinauer.com) and WH (www.whfreeman.com), with his permission. The transition between populations between growth and stability limits may include food supply, location and complex interactions with other physical and biological factors (including other species). After the initial period of exponential growth, the population encounters a limiting factor that causes exponential growth to stop. The population enters a slower growth phase and can eventually stabilise within a fairly constant population size within certain fluctuations. This model fits the logistical growth model. Load capacity is the point at which population size decreases. The relationship between load capacity (K) and population density over time. Image Purves et al., Life: The Science of Biology, 4th Edition, sinauer associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Many basic controls regulate population size The environment is the ultimate cause of population stabilisation. Two categories of factors are often used: the physical environment and the biological environment. The three subunits of the biological environment are competition, predation and symbiosis. Physical environmental factors include food, shelter, water supply, space availability, and (the plants) soil and light. One such factor can severely limit the size of the population, even if the others are not so limited. The law at the minimum states that population growth limits the resource to the shortest supply. The biological role played by a species in the environment is called niche. Competing organisations/populations are on a slit that overlaps the scarce resources for which they compete. Competition exclusion occurs between two species, when competition is so intense that one species completely wipes the second species out of an area. In nature, this is quite rare. While owls and foxes can compete for a common source of food, alternative food sources are available. Niche overlap is said to be minimal. The population of paramecium aurelia is almost twice as large if you do not need to share your food source with a competing species. Competition emissions occur when the competing species is no longer present and the constraint on the size of the winning population is removed. Graphs showing competition between two species of paramecium. Since each population itself thrives (yop two charts) when the race situation of one species wins, the other loses (bottom graph). Images purves et al., Life: The Science of Biology, 4th Edition, sinauer associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission.. Predators kill and consume other organisms. Carnivores hunt animals, herbivores eat plants. Predators tend to limit the prey population, although in extreme cases prey can hit the brink of extinction. there are main reasons why predators rarely kill and eat all prey: prey species often evolve mechanisms such as camouflage, poisons, spikes, or large scales to deter the predator. Prey species often have shelters where predators do not reach them. Often the predator replaces its prey as the prey species fall richly: the change of prey. Fluctuations in populations of predator (wolf) and prey population (moose) over 40 years. Notice the decline in the wolf population in the late 1960s and again in the early 1980s in the moose population. Image Purves et al., Life: The Science of Biology, 4th Edition, sinauer associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Symbiosis came to all species of interactions besides predator and competition. Reciprocalness is a symbiosis where both sides benefit, for example, algae (zooxanthellae) within reef-building coral. Parasitism is a symbiosis where one species benefits while damaging the other. Parasites act more slowly than predators and often do not kill the host. Commensalism is a symbiosis where one species benefits and the other is not harmed and gains no advantage: Spanish moss in trees, barnacles in crab shells. Amenism is a symbiosis where members of one population inhibit the growth of another while not affecting themselves. The Real World has a complex interaction with population controls Natural populations are not regulated by a single control, but the combined effect of many controls simultaneously plays a role in determining population size. If two species of beetles interact in the laboratory, one result occurs; if a third species is introduced, a different result is formed. The latter situation is more like nature, and changes in one population can have a domino effect on others. In regulating population growth, if one factor is more important: physical or biological factors? Physical factors can play a dominant role and are called density-independent regulation, since population density is not a factor The other extreme has dominant biological factors and is called density-dependent regulation, as population density is a factor. It seems likely that one or the other extreme may dominate certain environments, most environments that have combined control. Population decline and extinction are the elimination of all individuals in a group. Local extinction is the loss of all the population. Species extinction occurs when all members and component populations of a species die out. Scientists estimate that 99% of all species that have ever existed are extinct. The ultimate cause of decline and extinction is environmental change. A change in one of the physical factors in the environment can cause decline and extinction; similarly, the fossil record indicates that some extinctions are caused by migration from a competitor. A dramatic decrease in the human population occurs regularly in response to an infectious disease. Bubonic plague infections killed half Between 1346 and 1350, it later plagued until 1700 killed a quarter of the European population. Smallpox and other diseases have decimated indigenous populations in North and South America. Human impact Human populations have continued to grow due to the use of technology that disrupts natural populations. Destabilisation of populations has potential consequences: population growth, as previous limits are removed from population decline, as new limits are imposed on agriculture and animal domestication as examples of population growth in favoured organisms. In England, more than 300,000 cats are killed every year, but before domestication, the wildcat's ancestors were rare and probably only occupied a small area in the Middle East. Pollution Pollutants are usually (unplanned?) emissions of substances into air and water. Many lakes often use nitrogen and phosphorus as limiting nutrients for aquatic and terrestrial plants. Runoff of agricultural fertilizers increases these nutrients, leading to runaway plant growth or eutrophication. Increased plant populations eventually lead to increased bacterial populations that reduce the oxygen levels of water, causing fish and other organisms to drown. The removal of pesticides and competition from a competing species can cause the ecological emissions of the population to explode in that species' competitor. Pesticides sprayed on wheat fields often result in secondary pest outbreaks, as pesticide species are more tolerant once less tolerant competitors are removed. Removing Predators release is common when people hunt, trap, or otherwise reduce predator populations, allowing prey populations to grow. The elimination of wolves and panthers has led to an increase in the number of deer, their natural prey. There are more deer in the United States than when the Europeans arrived. Large deer populations often cause more than grazing, which in turn leads to deer starvation. Introduction of new species The introduction of exotic or alien non-native species into new areas is perhaps the biggest factor affecting natural populations. More than 1,500 exotic insect species and more than 25 alien fish families have been brought into North America; more than 3,000 plant species have also been introduced. However, the majority of accidental introductions may be thwarted as soon as an introduced species settles, the population growth is explosive. Kudzu, a plant introduced to the Americas from southern Japan, has taken over large areas of the countryside. Kudzu, which is a building (left) and close-up of flowers and leaves (right). Pictures janthony/kudzu/, photos of Jack Anthony, with permission. Change in population growth | Back to Top People you can remove or change the limits on population size, with both good and bad consequences. On the negative side, around 17% of the 1,500 introduced insect species require pesticide Them. For example, African killer bees are expanding their population and migrating from North America. These killer bees are much more aggressive than natives and destroy indigenous bee populations. On the positive, man-made population explosions can provide the necessary resources for growing human populations. Agriculture now produces more food per hectare, which allows and sustains the growth of the human population. Human activity causes the extinction of species thousands of times the natural rate. Extinction is caused by a harmful change in the environment of the population. Habitat disruption is a disruption of the physical environment of a species, such as cutting forests or draining wetlands. Habitat disruption is currently the main cause of extinction. Changes in the biological environment occur in three ways. Species introduction: An exotic species pond in an area where there may be no predfators to control the population size or where they can gratly compete with native organisms. Examples include zebras leading into Lake Erie and lake trout released into Lake Yellowstone, where indigenous killer trout populations are threatened. Overhunting: If a predatory population grows or the killing of prey becomes more effective, the prey population may decline or die out. Examples today include large game hunting, which in many places has reduced the predatory (or in this case prey) population. In human history, mammoths and mastodons may have caused extinction due to increased human hunting ability. Secondary extinction: Loss of food species can cause the emigration or extinction of any species that depends to a large extent or only on that species as a food source. Exaggeration of shooting, trapping, or hunting a species is usually for sporting or economic reasons. Unfortunately, this can not eliminate pest species such as cockroaches and mice, as they have a large population and are able to reproduce faster than we can eliminate. However, many large animals have ceased to exist or their populations have decreased dramatically (such as tigers, elephants and leopards). The death of a species or population can cause the death or elimination of others, a process called secondary extinction. Destruction of bamboo forests in China, food for the giant panda, can cause the extinction of the panda. The extinction of the dodo bird caused by the Calviera tree will be able to reproduce since the dodo ate the fruit and processed the seeds of that tree. Giant panda eats an estere 10,000 pounds of bamboo per panda per year. Picture of a giant panda eating bamboo email protected]@/library.thinkquest.org/2988/e-animals.htm#Giant Panda. Populations have a minimum viable size Even if a number of species survive, the population size may become too small for the species to continue. Small populations They are susceptible to random environmental fluctuations and genetic drift, to a greater extent than larger populations. The chance of extinction increases exponentially with the declining size of the population. The minimum viable population (MVP) is the smallest population size that can avoid extinction for the two reasons listed above. If severe environmental flows do not develop for long enough, a small population will recover. The MVP largely depends on the reproductive rate of the species. Range and density | Back to top populations tend to have maximum density near the center of the geographic range. The geographical extent is the total area occupied by the species. External zones, where conditions are less optimal, include a zone of physiological stress (where individuals are rare) and, finally, a zone of intolerance (where individuals are not found). The environment is usually never uniform enough to support the even distribution of a species. The species thus have a dispersion pattern. Three samples were found, including uniforms, clumsy, and random. The geographical range of the species is dynamic and may contract or expand over time due to environmental changes or human activity. Often, a species will need the presence of another species, such as Drosophila from Hawaii. Species ranges can also expand due to human activities: brown trout are now found worldwide due to trout fishing. 100000 | Back to Top Tracking on the Genetic Effects of Global Warming: Drosophila and other model systems This online article looks at the spread and microevolution of the common fruit fly, Drosphilia and the potential relationahips of this speciation and global warming. A little technical in some places, but interesting to read. Kudzu, vine learn about this eastern import, which has taken over much of the southern United States. I remember my first views on kudzu when I moved to Central Georgia... green vines consisting of trees, houses, telephone lines. Invaders learn more about the occupiers that have already caused economic damage and ecological damage to surrounding areas in New Orleans, Louisiana, USA. USGS Scientists Find New Population of Asian Swamp Eels in South Florida This press release (3/00) of the U.S. Geological Survey details the population of Asian eels possibly occupying the Everglades. Salvinia molesta Water hyacinth seems harmless enough to plant, but choked waterways throughout the southern U.S., learn more about this pesky species on this U.S. Geological Survey site. All textual content ©1995, 2000, 2001, m.j. Farabee. Use for educational purposes is heartily encouraged. Back to table of contents E-mail: Last modified: Url of page:

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