10

SCIENCE
QUARTER 3
Week 8

CapSLET

Capsulized Self-Learning Empowerment Toolkit

Schools Division Office of Zamboanga City
Region IX, Zamboanga Peninsula
Zamboanga City

"Unido, Junto avanza con el EduKalidad *Cree, junto junto puede!"*

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CapSLET

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SUBJECT & GRADE/LEVEL	Science 10	QUARTER	3	WEEK	8	DAY	dd/mm/yyyy
TOPIC	The Ups and Downs of Population Growth						
LEARNING COMPETENCY	12. Explain the relationship between population growth and carrying capacity. **(S10LT-IIIi-42)**						

IMPORTANT: Do not write anything on this material. Write your answers on a separate sheet. **Do not forget to answer all the Self-Assessment Questions (SAQs).**

UNDERSTAND

The Ups and Downs of Population Growth

Why Study Population Growth?

A ***population*** is a group of organisms of the same species – plant, animals, and other organisms – that live in a certain area at the same time.

Is it possible for any one population to grow so large it takes over the planet? In this lesson, you will learn the answer to that question. You will learn about the limiting factors of population growth and how it controls population numbers.

Studying how and why populations grow (or shrink) helps scientists make better predictions about future changes in population sizes and growth rates. Populations that are growing or diminishing can be indicators of potential problems in the organisms' environment, and such conditions alarm the ecologists if something is going wrong. Why is a population's size increasing or decreasing?

Figure 1. Penguin Population

There are many factors that can cause a population's size to change. But first, you must understand the basic reasons behind why a population increases or decreases.

Any population, whether it will be that of humans, animals, the mold growing on bread, or the bacteria living in your intestines, will grow if more organisms are being developed (Genetically modified organisms), or born, than are dying.

What is population density?

While population would probably to continue to grow in size, a population of organisms cannot grow forever–its growth will be limited, or stopped, at some point, and the death rate will be greater than the birth rate. A population's growth is limited by two general factors: density-independent factors and density-dependent factors.

Population density refers to the number of organisms per unit area. If a population's density is very high, that means there are a lot of organisms crowded into a certain area. If a population's density is low, that means there are very few organisms in an area.

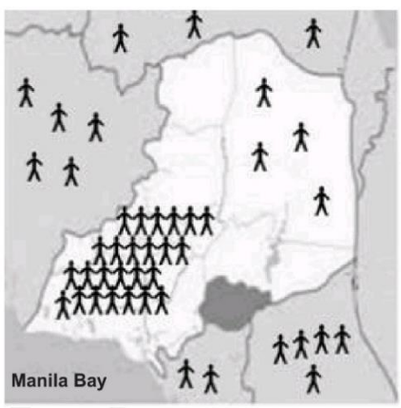

Figure 2.
Sample of Population density of people in a certain community

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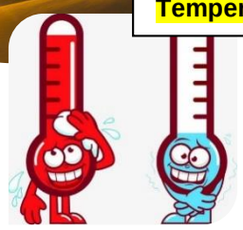
A factor that regulates a population's growth and is influenced by population density is called ***density-dependent limiting factor***. If the population's density does not directly influence changes in population's growth, then it is called ***density-independent limiting factor***.

Density-independent limiting factors

Natural disasters will stop a population from growing no matter how many organisms are living in a certain area.

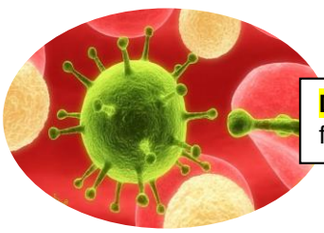
Sunlight

Temperature



Human activities that alter the environment will also decrease the number of organisms in a population.

Density-dependent limiting factor



Diseases and Parasites – infectious diseases and parasites spread faster in densely populated areas.

Predation – plenty of prey available, predators will be able to eat sufficiently and to reproduce, but the population of their prey will begin to decrease. The drop in food availability in turn causes a drop in predator population.

Competition for resources – organism with better adaptations to obtain (food) resources will be able to reproduce more often, and its population will grow.

Emigration – occurs when a population approaches its carrying capacity, and individual organisms leave and go to a new area to find resources for survival.

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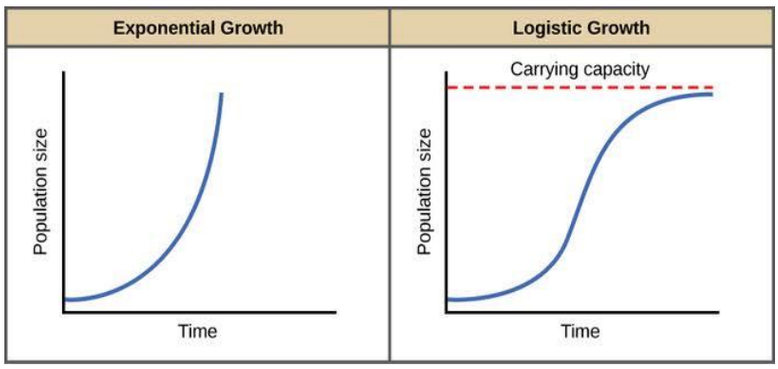
Before a population reaches its carrying capacity, it experiences a period of rapid growth. This period of growth is called ***exponential population growth***. During this period, there are plenty of resources available for all organisms, so more births are recorded than deaths in organisms.



When resources are unlimited, population exhibit exponential growth, resulting in a J-shaped curve. When resources are limited, populations exhibit logistic growth. In logistic growth, population expansion decreases as resources become scarce, and it levels off when the carrying capacity of the environment is reached, resulting in an S-shaped curve.

Source: http://cnx.org/content/m47780/1.1/

A population stops growing when it reaches the maximum number of organisms that can be supported or "carried" by the environment. This number is known as the population's ***carrying capacity*** *in a particular environment.*

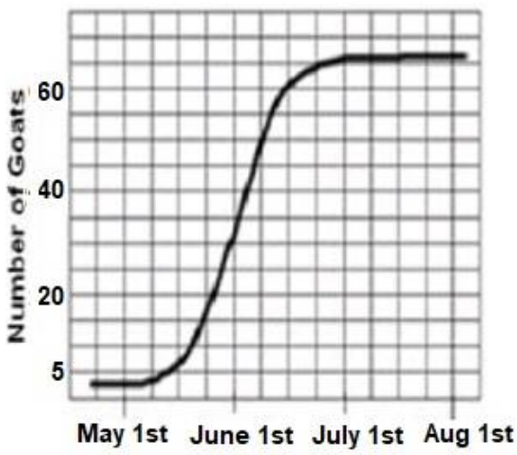
SAQ-1: *What are the limiting factors that affect population growth?*
SAQ-2: *What do you think will happen if the human population reaches its carrying capacity?*

Let's Practice!

(Write your answer on the separate sheets)

PART 1.

Below is the graph of a habitat of a goat population that has reached its carrying capacity.



1. What is the carrying capacity of the goat population?

   _____

   Why? _____

   _____

2. What have you noticed with the population of goat between mid-May and mid-June?

   _____

   _____

   _____

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PART 2. Cause and Effect

Read the following situation on the left side of the chart then, predict and write the effect in terms of carrying capacity on the right side of the table. The first one is done for you.

Situation	What will be the effect of this in terms of carrying capacity?
1. Statistics show that the number of babies born per day doubles the number of death per day.	*There will be a decrease in population since there are more deaths than babies born.*
2. Palawan government creates more improvised breeding areas for the endangered marine turtle and coral reef fishes in the area.	
3. Sharks are hunted and killed for their fins.	
4. The oil spill in Cavite harmed many aquatic organisms in the vicinity.	
5. A new strain of corona virus breaks out and affects the global population.	
6. Super typhoon Yolanda caused many residents to leave Leyte.	
7. Rampant deforestation affects the population of wild boar in Negros.	
8. An increase in population of house lizard in Barangay Himpot causes a decrease in Dengue cases.	

REMEMBER

Key Points

- ✓ A factor that regulates a population's growth and is influenced by population density is called ***density-dependent limiting factor*** such as natural disasters, temperature, sunlight, and the activities of human environment.
- ✓ If the population's density does not directly influence changes in population's growth, then it is called ***density-independent limiting factor*** such as diseases and parasites, competition for resources, predation, and emigration.
- ✓ A population's ***carrying capacity*** is the maximum number of organisms that can be supported or "carried" by the environment.
- ✓ When resources are unlimited, population exhibit ***exponential growth***, resulting in a J-shaped curve.
- ✓ When resources are limited, populations show ***logistic growth***, population expansion decreases as resources become scarce, and it levels off when the carrying capacity of the environment is reached, resulting in an S-shaped curve.

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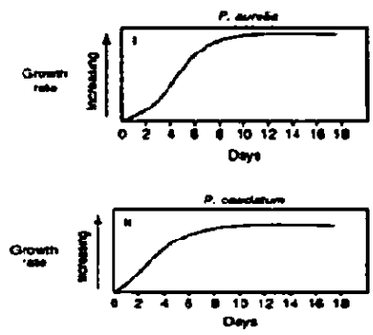
TRY

Directions: Encircle the letter of the correct answer.
(Answer on the Learner's Activity and Assessment sheets)

1. What type of population growth is shown in the graph?



   a. normal growth
   b. exponential growth
   c. logistic growth
   d. none of the above

2. When a population grows past the ecosystem's carrying capacity, what happens to the population?

   a. Continues to grow
   b. The population starts to die off to return to carrying capacity
   c. The population will go extinct due to lack of resources
   d. The individuals in the population may begin to search for resources elsewhere

3. A person breeds guinea pigs in a cage. After a few generations, the breeder observes that the guinea pigs are more aggressive towards each other, the young are less healthy and more young guinea pigs die. What do you think will happen to the population of the guinea pigs?

   a. The population will remain the same.
   b. The population will increase.
   c. The population will decrease.
   d. The population is not affected.

4. If a disease destroying barley plants in a field swept through an ecosystem, what would happen to the barley-eating bird population in the field?

   a. The bird population would stay the same.

6. If the amount of food or resources available increases, the carrying capacity for an animal:

   a. stays the same
   b. increases
   c. decreases
   d. fluctuates

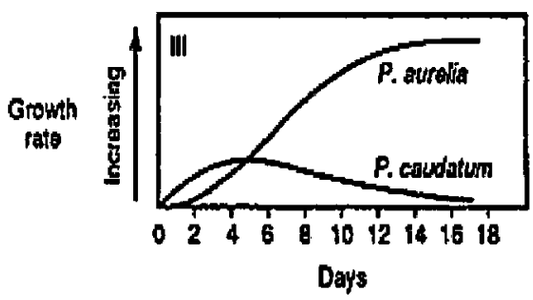
7. An S-shaped growth curve shows that the population _____.

   a. grew quickly at first and then slowed down
   b. grew slowly at first and then grew faster
   c. goes to chaotic cycles
   d. has gone extinct

8. Why do new populations have such high growth?

   a. resources are not as limited
   b. resources are more limited
   c. there are no established predators yet
   d. there are not enough diseases yet

For question no. 9-10, study the graph that shows the growth rate of two micro-organisms:



9. Which of the two microorganism is better adapted to competition?
   a. P. aurelia
   b. P. caudatum
   c. both of them
   d. None of them

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b. The bird population would infinitely increase.
c. The bird population would decrease.
d. Neither will the bird population increase or decrease.

5. Which of the following causes a decreasing wildlife population in most of the places in our country?

a. loss of limiting factor
b. loss of natural disturbances
c. loss of habitat
d. loss of carrying capacity
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10. What can you infer about the graph?

a. The population of P. caudatum increases while the population of P. aurelia decreases when they are grown together.
b. The graph is an example of a density-dependent limiting factor.
c. The graph is an example of density-independent limiting factor.
d. The graph shows than an increase in population of the protest P.aurelia causes a decrease in the population of P. caudatum when they are grown together.
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Acosta, Herma D, Liza A Alvarez, Dave G Angeles, Ruby D Arre, Ma. Pilar P Carmona, Aurelia S Garcia, Arlen Gatpo, et al. Science Learner’s Material. Pasig City: REX Book Store, Inc., 2015

An Introduction to Population Growth. (n.d). Nature News. Nature Publishing Group. Accessed June 20, 2020. https://www.nature.com/scitable/knowledge/library/an introduction-to-population-growth-84225544/

The Limiting Factors of Population Growth. (n.d). Study.com. Accessed June 21, 2020. https://study.com/academy/lesson/the-limiting-factors-of-population-growth.html
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