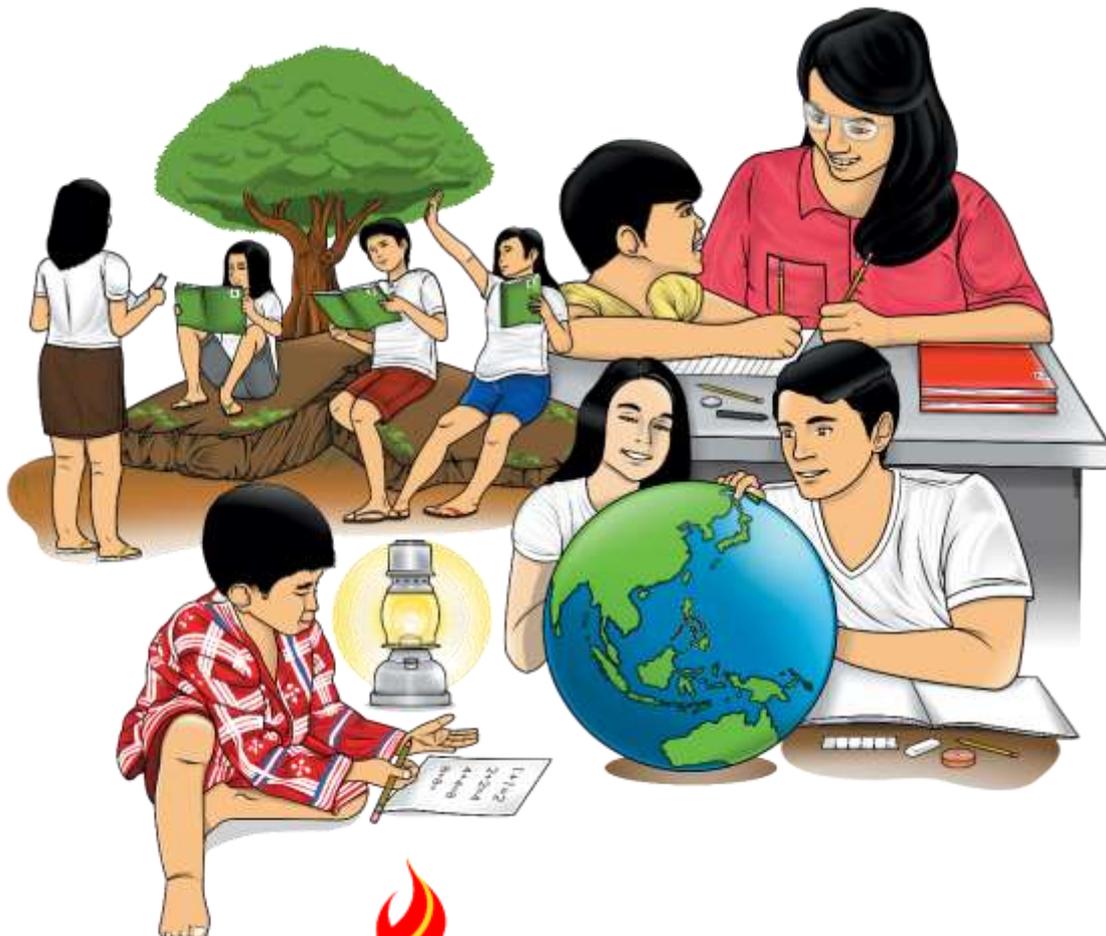


Science

Quarter 3 – Module 9: Population Growth and Biodiversity



10

Science

Quarter 3 – Module 9: Population Growth and Biodiversity

Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.



What I Need to Know

This module was designed and written with you in mind. It is here to help you master the nature of Biology. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

This module will take you to another exciting and yet relaxing tour to the environment that surrounds us. In Module 8, you have learned how evolution through natural selection can result in biodiversity. Now, you will learn about biodiversity and population growth.

Have you ever been in an overcrowded room? It's not an ideal situation. You will feel hot, stuffy, and very uncomfortable. Definitely, no one would want to try to live in overcrowded conditions. In Biology, plants, animals, other organisms, as well as weather and landscape, work together to form a sphere of life. The smallest interacting unit composed of living and non-living things is known as an ecosystem. Ecosystems function best when they have the appropriate number of organisms making up a population to utilize the resources available.

Biodiversity is the variety of life on Earth which includes all its forms and all its interactions. All species including humans, depend on each other to survive. Loss of biodiversity leads to the loss of services that nature provides which are essential to the functioning of our society and economy.

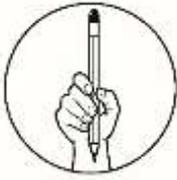
Humans affect biodiversity with their population size that demands use of resources causing damage to habitats of other species. Human activities that eventually lead to the decline in biodiversity also lead to demands for call for action for the elimination of threats to wildlife, which are often preservation and conservation policies. Thus, if proper actions are to be made, humans would be able to sustain life on earth longer.

The module presents concepts on Population, Population Growth, and Carrying Capacity.

After going through this module, you are expected to:

1. explain the relationship between population growth and carrying capacity **(S10LT - IIIi - 42)**.

Before going on, let us check how much you know about this topic. Answer the pretest on the next page in a separate sheet of paper.

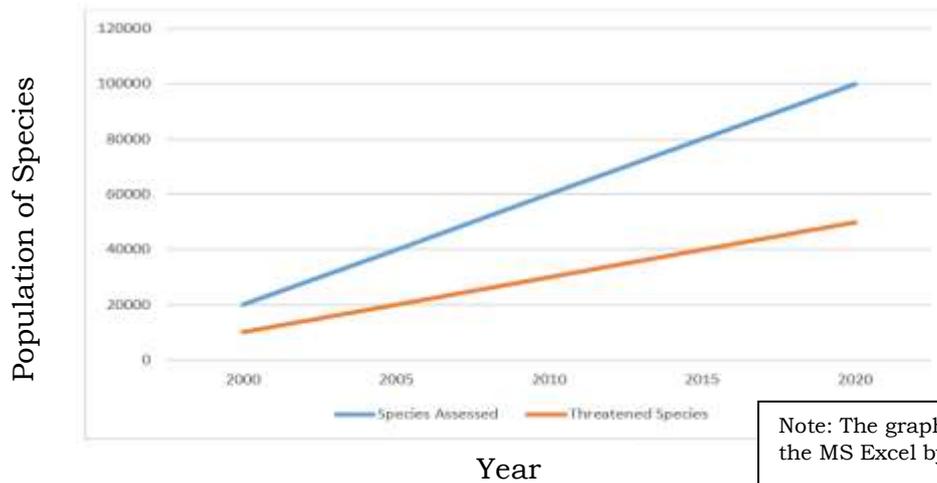


What I Know

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Manila's population in early 2021 is 14, 158, 573. Since 2015, its population has increased by 235, 121 which constitutes 1.69% annual change. Which of the following factors has the greatest impact on increasing population growth rate in Manila?
A. Climate
B. Employment
C. Mineral Deposits
D. Recreation
2. The carrying capacity of Mico's aquarium is for five fishes only but he placed ten fishes instead. Describe the effect on the resources if the population of fishes is above the carrying capacity.
A. Resources will be plenty.
B. Resources will be unlimited.
C. Resources will just be exact.
D. Resources will be insufficient.
3. What will happen if a population grows larger than the carrying capacity of the environment?
A. death rate may rise
B. birth rate may rise
C. population size will increase
D. carrying capacity will change
4. Last month, a pest that destroys palay (*Oryza sativa*) infested Barangay Maliwalas, which resulted to a decline in the palay population. What do you think would happen to the palay-eating bird population if the infestation would continue?
A. The bird population would infinitely increase.
B. The bird population would decrease.
C. The bird population would stay the same.
D. The bird population would be stable.
5. Ms. Aquino observes and records the rice bug (*Leptocorisa oratorius*) population in Barangay Matahimik. She noticed that at the end of the rainy season, the population became four times larger than what the habitat can support. Which is *least* likely to occur if rice bug population continues to increase?
A. There will be reduced yield.
B. There will be increase in rice bug population.
C. There will be decrease in rice bug population.
D. The rice bug will spread disease to other plants.

6. In the year 1990, the population of Butanding (*Rhincodon typus*) in Sorsogon started to decrease due to density-independent limiting factor. It is assumed that there is _____.
- competition on food among the population of Butanding
 - predation on smaller Butanding
 - bycatch incident increases
 - spread of disease in the population of Butanding
7. Out of 418 endangered animals in the Philippines, the Philippine Eagle (*Pithecophaga jefferyi*) is considered to be on the top of the list. Which among the following activities led to its endangerment?
- poaching
 - oil spills
 - bycatch
 - slash – and – burn farming
8. The graph below shows the threatened species from 2000 to 2020. Which of statements below could be used to describe the graph?



- There is an increase in the number of assessed species.
 - Not all species have been completely assessed.
 - The number of threatened species increase in number.
 - Some species have so little information available.
- I and II
 - II and III
 - II and IV
 - I, II, III, IV
9. Natural disasters such as storms, extreme heat or cold are physical factors of environment that affect the population. These environmental factors are classified as _____.
- Density – dependent
 - Disparity-dependent
 - Population density
 - Density – independent
10. Mang Kardo has a farm in Barangay Masagana. He is alarmed with the rapid urbanization of their barangay because the population increases from 2500 to more than 50,000 residents. Which of the following would *not* likely be the result of urbanization?
- There will be increase employment opportunities.
 - There will be overcrowding issues.
 - There will be high species diversity.
 - There will be water and sanitation issues

11. Which is the adverse effect of high fertility and rapid population growth?
- Over supply of job opportunities
 - Effects of large families on child development
 - Less urbanization and crowding
 - Increased equalities in education
12. The statement “250 individuals per square kilometer” most likely refers to _____.
- population
 - population density
 - population distribution
 - population growth
13. Which of the following causes a decreasing wildlife population in most of the places in our country?
- Loss of limiting factor
 - Loss of natural disturbances
 - Loss of habitat
 - Loss of carrying capacity
14. Based on the given statements, how will you describe the yearly percentage change of Philippine population growth in the last four years?
- The current population of Philippines in 2021 is **111,046,913**, a **1.34% increase** from 2020.
 - The population of Philippines in 2020 was **109,581,078**, a **1.35% increase** from 2019.
 - The population of Philippines in 2019 was **108,116,615**, a **1.37% increase** from 2018.
 - The population of Philippines in 2018 was **106,651,394**, a **1.41% increase** from 2017.
- The Philippine population growth is stable.
 - The Philippine population growth is decreasing.
 - The Philippine population growth increases rapidly.
 - The Philippine population growth increases slowly.
15. A limiting factor is an environmental condition that restricts the growth distribution of a population within an ecosystem. Which of the following limiting factors would increase due to the number of individuals in a population?
- increase temperature
 - disease
 - natural disaster
 - unusual weather

How did you find the pretest? What was your score? If you got 15 items correctly, you may skip the module. But if your score is 14 and below, you must proceed with the module.

Have fun learning!

Lesson

9

Population Growth and Biodiversity

Healthy ecosystems, interconnected webs of living organisms and their physical environment are all important to all life on earth. Our ecosystems supply us with clean air, fresh water, food, resources, and medicine. Humans greatly influence biodiversity with activities like use of land and resources causing great damage to habitats of other species.



What's In

In the previous modules, you were able to explain how species diversity increases the probability of adaptation and survival of organisms in changing environments. You were able to analyze how biodiversity affects the stability of an ecosystem and suggest ways on how local biodiversity can be protected and conserved in the community.

In the next activity, you need to arrange the letters to unscramble the word in order to get the correct word to complete the thought of the sentence. Hint: These are the important words that you have encountered in the previous modules. Write your answer in the table below.

Species may change over time. (1) **OFISSL** records, developmental and molecular biology and genetics may provide possible evidence for (2) **VOEUILONT**. Patterns in animal development suggest that some (3) **GAORINSMS** may share common (4) **CEANTSROS**. Morphological and molecular evidences in (5) **SACRURETU** and molecular studies suggests that organisms are related with one another.

(6) **MLARACK** proposed The Theory of (7) **EEDN**, The Theory of (8) **SUE** and (9) **ISDSUE** and The Theory of Acquired Characteristics. (10) **ARDINW** presented the Theory of (11) **VOETIONLU** based on (12) **ANUTARL** selection. Speciation increases (13) **IOBIDVREISYT**. Organisms struggle for existence in order to survive; they compete for (14) **OODF** and (15) **PSAEC**.

1.	6.	11.
2.	7.	12.
3.	8.	13.
4.	9.	14.
5.	10.	15.

*How many words did you get correctly? I know you were able to get them all.
Are you ready to learn more about biodiversity and population growth? Let's start!*



Notes to the Teacher

This module contains brief but substantial concepts of Biodiversity and Population Growth. Enrichment activities and assessments for the learners are provided.

The teacher will assist and guide the learners while going through this module.



What's New

Population, Population Growth, and Carrying Capacity

When we talk about population in Biology, it pertains to all the organisms of the same group or species who live in a particular geographical location and have the potential to interbreed. Populations grow over time.

In demographics, population is defined as the total number of humans who are currently living. As of March 2, 2020, the world population is 7.8 billion. The current population of the Philippines is 110,581,078 based on the Worldometer elaboration of the latest United Nations data. The Philippine population is equivalent to 1.41% of the world total population making it the 13th in the list of countries with the highest population.

When we talk about population, you need to know what population density is. According to the Philippine Statistics Authority (PSA), the total land area of the country is approximately 300,000 km², the population density in 2015 was reported at 337 persons per km². This constitutes an increase of 29 persons per km² (9.4 percent) from the population density of 308 persons per km² in 2010. In 2019, there are 363 people per square kilometer with an increase of 55 persons as compared to 2010.

In the next activity, you will understand the concept of population and population density. Let's start!

Activity 1: Population and Population Density in National Capital Region

Based on the 2015 Census of Population, the National Capital Region (NCR) is the most densely populated among the 18 administrative regions of the country having a population density of 20, 785 persons per square kilometer. *Population density* pertains to the number of individuals per square meter, per hectare, or per square kilometer. The table below, shows the 16 cities in NCR with the corresponding population, land area, population density, and population growth.

Directions: Take a closer look at the table presented below. Answer the questions that follow.

City	Population	Land Area (km²)	Population Density	Population Growth Rate (2010-2015)
Manila	1,780, 148	24.98	71, 263	1.43
Mandaluyong	386,276	9.29	41,580	3.12
San Juan	122,180	5.95	20,534	0.12
Makati	582,602	22	27,010	1.8
Pasig	755,300	48	15,586	2.3
Taguig	804,915	45	17,804	4.3
Pateros	63,840	10	17,804	0.1
Quezon	2,936,116	172	17,099	1.2
Marikina	450,741	22	20,945	1.2
Caloocan	1,583,978	55.80	28,387	1.18
Malabon	365,525	15.71	23,267	0.65
Valenzuela	620,422	47.02	13, 195	1.45
Las Piñas	588,894	33	18,014	1.2
Muntinlupa	504,509	40	12,692	1.8
Parañaque	665,822	47	14,297	2.4
Pasay	416,522	14	29,815	1.1

Table 1. Population size, land area, population density, and population growth rates of the Cities in National Capital Region Based on 2015 Philippine Statistics Authority Census

Source: <http://rssoncr.psa.gov.ph/ncr1>, <http://rssoncr.psa.gov.ph/ncr2>,
<http://rssoncr.psa.gov.ph/ncr3>, <http://rssoncr.psa.gov.ph/ncr4>,
<http://rssoncr.psa.gov.ph/ncr5>

**The 2015 census was the latest source of information used in the table above.*

Essential Questions

1. Based on the table, which city has the highest population size? least population size?
2. What happens to the population density as the population size increases? What is the relationship between population and population density?
3. What do you think are the factors affecting population density?



What is It

In Grade 7, you have learned about biotic and abiotic factors that are present in an ecosystem. These are the factors that influence the population size of a species. What are the important biotic factors that you can remember? How about abiotic factors?

In this module, you would be able explain the relationship between population growth and carrying capacity and be able to suggest ways on how to minimize human impact on the environment.

Population size is the total number of members of a population. What do you think causes a population size to increase? What causes a population size to decrease?

Population density is the average number of individuals in a population per unit of area or volume. To compute, you need to divide the population size by the size of the area. Thus, population density is equal to the number of individuals over the land area and expressed in mi^2 or km^2 .

$$\text{Population Density} = \frac{\text{Number of Individuals}}{\text{Land Area}}$$

Cities in the country with high population densities are considered to be overpopulated. *Overpopulation* refers to a situation where a population exceeds its sustainable size within a particular environment or habitat. Factors that contribute to overpopulation include increase in birth rate and decrease in mortality rate. Increase in population have important implications for resource consumption, with rapid increases in household numbers associated with loss in biodiversity.

There are always limits to population growth in an area. Populations cannot grow exponentially forever. Exponential growth of a population is characterized by continuous birth rate through time that is not hampered by insufficient food supply or the presence of disease. Increasing population size always reach a size limit brought by the shortage of one or more factors such as space, water, nutrients or by adverse conditions such as disease, drought, and extreme weather conditions.

In a specific area, the *carrying capacity* is referred to as the maximum number of species whose basic needs could be continually supported or sustained by the resources in their habitat without degrading and destroying the environment. This is determined by factors such as availability of food, space, and water. These key factors have the influence to limit or reduce a population size by lowering birth rates, increasing the death rates or even encourage migration such that these are referred to as *limiting factors*. We will look at many different limiting factors and classify them into density independent factors and density dependent factors in the next activity.

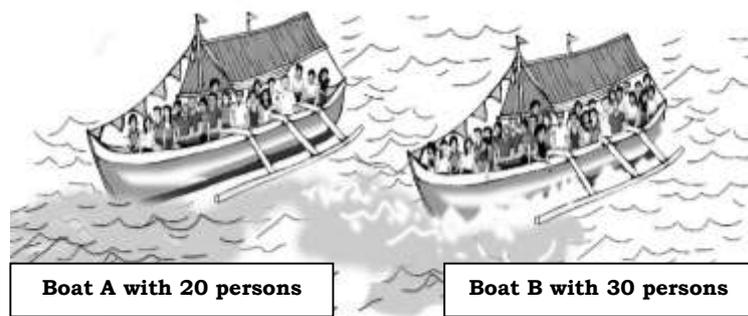
As the population size increases, the demand for resources also increases. The carrying capacity depends on biotic and abiotic factors. If there will be ample resources for these factors, the carrying capacity also increases. However, if the

factors become less abundant, the carrying capacity decreases. If resources are being used more rapidly than they are being restored, then the species has surpassed its carrying capacity. If this happens, the population will then decline in size.

An example of this is the coastal waters in Bolinao, Pangasinan that experienced environmental changes for the past years. One of the most significant major fish kill events was recorded in 2002. The bloom of a dinoflagellate *Prorocentrum minimum* was linked to the rapid increase of fish pens and cages to more than double the allowable limit of 544 units for Bolinao water (San Diego et.al, 2008). This overpopulation of fishes reduced the carrying capacity of the coastal waters since fishes competed over food and space. Due to scarcity of food, growers used commercial feeds to support fish growth. Unused feeds led to a buildup of organic material which causes to an extreme growth of weeds and algae.

Let us learn more about the beautiful places in the country as we relate the population with population density and carrying capacity.

For you to understand the concept of carrying capacity, let us examine the two pictures below.



Illustrator: Martha Theresa B. Esteban

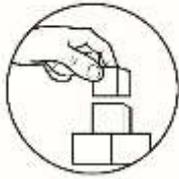
Imagine that your friends will take a boat ride to explore the island communities in one of the coastal provinces in the country. The boat's capacity is only 20 persons but 30 insist to have a ride. What do you think will happen to boat A? boat B? Which boat considered its carrying capacity?

The population density can be regulated by several factors, like biotic, abiotic factors, and population size. There are two categories of limiting factors on population growth density-independent and density-dependent limiting factors. Let us know more about these factors.

Density – dependent limiting factors are those whose influence population growth vary depending on population density (e.g. competition, diseases, predation, etc.). An increase in population density could lead deficiency in resources like food, shelter, and water that could lead to increased competition that often cause harm to individuals. Increase in population density could also increase the amount of waste produced by members of the population, which could lead to unhealthy living space that results to diseases. The previous examples show how decrease in population growth are affected by density-dependent factors.

Density - independent limiting factors affect populations regardless of their population size. These include natural disasters, unusual weather, seasonal cycles and certain human activities such as obstructing the rivers and cutting of trees

For you to learn more on the relationship between population growth and carrying capacity, you need to answer the three activities. Just go on! I know you can do it!



What's More

Activity 1: When Will it be Enough?

The two situations below represent the importance of considering the carrying capacity in order to sustain life both in natural and man-made ecosystem. Refer to the following statement when answering the next questions.

A. **“The carrying capacity of Makabuhay Lake equals 150 fish.”**

1. Can less than 150 fishes live in Makabuhay lake?
2. Can more than 150 fishes live in Makabuhay lake?
3. Let's say there are 140 fishes in Makabuhay lake when the amount of resources in this lake decreases and the carrying capacity drops from 150 to 100 fishes.

What will happen to this fish population? Why will this happen? (5 points)

B. Lito is excited to bring home his new aquarium with a capacity of 30 goldfishes (*Carassius auratus*). In it are one male and one female goldfish. These cute goldfishes mated and produced 45 offsprings. Describe this community in terms of food, oxygen, and space available for each organism. (5 points)

Activity 2: Walk in Two Worlds

A. Read the stories of a Grade 10 student who are living in two different environments. Provide three possible answers that could be experienced by the main characters in the story.

Situation 1: Pedro is a Grade 10 student from an urban place in the country. His family is living in a small room made of recycled materials, tarps, and cheap wood. Early in the morning as he goes to school, he needs to walk along a muddy “eskinita” since it rained hard the night before. This is common to their place since there is no proper drainage systems. On his way to school, he saw two kids peeing in pots because toilets are few and communal, and they sometimes need to pay for using it. Most kids in their area do not go to school anymore and their parents are always out working in the nearby factories, leaving their children unsupervised and most of the time unfed. This made the children malnourished and suffer respiratory problems and skin diseases. This is the usual Monday morning to Pedro. Despite all these things, Pedro is determined to finish his schooling and excited to reach all his future ambitions and plans.

Essential Questions

1. What are the problems that were described in the story? List three.
2. What are the effects of these problems in people's health, nutrition, and well-being?

Situation 2: Mona is a Grade 10 student in one of the islands in the country. As she goes to the nearest school in their barangay, breathtaking white sand beaches, lagoons, and caves are seen on her way. Their place is interesting and strikingly beautiful with hilly and mountainous terrain. Because of the terrain, the drainage is good and prolonged flooding is not a problem. She enjoys walking as she sees unique plant species in full bloom, and some are in the fruiting stage. This is possible in their area due to factors like appropriate climate and fertile soil. Diverse ecosystems of grasslands, rainforest, and coral reefs make Mona's travel to school more exciting. This diversity leads to abundance and variety in terms of the flora and fauna in the island. Along her way, she saw Mang Kardo and Mang Karding planting camote, gabi, and cassava in their wide land. Her long travel going to school always excites her, since the unspoiled beauty of the island and the peaceful lifestyle of the people are the wonderful postcard sceneries that serve as her companion as she took the steps in completing her school years.

Essential Questions

1. List three descriptions of the place.
 2. What are the effects of rich biodiversity in people's health, nutrition, and well-being?
- B. In the given situations, which do you think can sustain the basic needs of the organisms as the population growth and carrying capacity increases? Support your answer.

Activity 3: What's Dependent and Independent?

Read each situation in the table below, state if it is a density-independent limiting factor or a density-dependent limiting factor. Indicate the specific limiting factor that is occurring. Number one is done for you.

Situation	Limiting Factor	Density – independent or Density – dependent
1. African Swine Fever (ASF) is a fatal animal disease affecting pigs and wild boars with up to 100% case fatality rate. It is believed that the feeding of contaminated feed and food waste which are being used to supplement feed is one of the leading cause of infection. Affected provinces include Rizal, Bulacan, Pampanga, Pangasinan, Nueva Ecija, Cavite Provinces and Metro Manila (Caloocan, Malabon and Quezon Cities).	Disease causing African Swine Fever	Density-dependent Factor

<p>2. Aquatic microorganisms causing the paralytic shellfish poison (PSP), or red tide toxins were detected in the waters off Pangasinan and Pampanga. Conditions like warm sea surface temperatures and high nutrient content are the identified factors that are favorable to the rapid increase of this algae causing PSP. This prompts the Bureau of Fisheries and Aquatic Resources (BFAR) to impose a shellfish ban in the affected areas.</p>		
<p>3. Earthquakes are usual in the country due to its position along the Pacific Ring of Fire. A magnitude 6.5 earthquake rocked Central and Eastern Mindanao on Thursday, October 31, 2019, just two days after a strong tremor killed several people and hurt hundreds of others in the region.</p>		
<p>4. <i>Oil Spill in Guimaras</i> has adversely affected marine sanctuaries and mangrove reserves in three out of five municipalities in <i>Guimaras</i> Island and reached the shores of Iloilo and Negros Occidental. According to the report of Department of Environment and Natural Resources (DENR), the crisis damaged 1,500 hectares (more than 3,700 acres) of the local ecosystem consisted of mangroves, seagrass, and coral reefs.</p>		
<p>5. The country is considered as one of the most seriously deforested countries in the tropics. Deforestation led to extremely high rates of soil erosion and has likely contributed to the Philippines' high number of flood-related disasters, which kill hundreds on a near-annual basis.</p>		

Essential Questions

1. Based on the given situation, write at least two factors that affect the population.
 - a. density dependent factors
 - b. density independent factors



What I Have Learned

After understanding the concepts of biodiversity and population growth, you are now ready to summarize the things that you have learned from this module.

Choose the missing term/s from the words found in the parenthesis to complete the paragraph.

There are always limits to population growth in an area. Populations cannot grow exponentially forever. 1. (Increasing, Decreasing) population always reach a size limit brought by the shortage of one or more factors such as space, water, nutrients or by adverse conditions such as disease, drought, and extreme weather conditions.

As the population size 2. (increases, decreases) the demand for resources also 3. (increases, decreases). The maximum population size that an ecosystem can support is called 4. (carrying capacity, limiting capacity) that depends on biotic and abiotic factors.

Natural disasters like typhoon and earthquake can destroy resources in an ecosystem. If this happens, the ecosystem will not be able to support a large population. This causes the carrying capacity to (increase, decrease).



What I Can Do

Changes are said to be inevitable and you can easily prove this by looking at your environment. What changes have you observed in the past 5 years? What are the effects of these changes on the economic, environmental and social aspects of the country? In order to answer this question, provide at least three answers to complete the table below.

Flora/Fauna in the Country	Status of flora/fauna	Threats Faced by Local Biodiversity	Conservation Efforts	Proposed Possible Strategies
Rafflesia Flower	Endangered	Land clearing, ethnobotanical collecting	Conservation of land	Do not allow land clearing, and ethnobotanical collection if no proper documents are presented.

You are almost done! I would like to congratulate you for doing great in different activities. You will now take your posttest below.

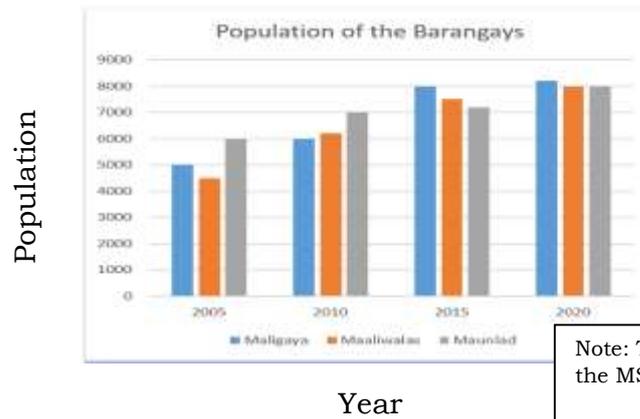


Assessment

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. As the population size increases, what will happen to the demand for resources in a community?
A. decreases
B. increases
C. remains the same
D. unpredictable
2. The Philippines is tagged as a global center for marine biodiversity, which the country struggles to protect against illegal activities like dynamite fishing. Which of the following is the result of dynamite fishing?
A. coral mining
B. constructs fragile coral colonies
C. source of livelihood
D. destruction of coral reefs
3. Which limiting factor is independent of the number of individuals in a given population?
A. competition
B. natural disasters
C. parasitism
D. stress
4. What will happen to the growth of the population, if the number of births is equal to the number of deaths in a population?
A. it will increase
B. it will decrease
C. it will fluctuate
D. it will stay the same
5. In computing for the population density, divide the number of individuals in a population by the _____.
A. area of the space they occupy
B. birth and death rates
C. carrying capacity
D. height of the space
6. COVID -19 may spread more rapidly in crowded areas. What type of limiting factor is presented by this?
A. density-dependent
B. density-independent
C. population crasher
D. population enhancer

7. The Philippine Eagle is an endemic bird in Davao which faces endangerment brought by human activities. Which activity is **NOT** included in the list of results of human activities?
- | | |
|------------------------|----------------------|
| A. habitat destruction | C. volcanic eruption |
| B. habitat degradation | D. forest fire |
8. Which of the following is **NOT** an action that could protect the environment?
- | | |
|------------------|----------------------------------|
| A. recycle | C. make better transport choices |
| B. eat more meat | D. produce less waste |
9. What causes the population to grow?
- The birthrate turns out to be higher than the death rate.
 - The birthrate remains the same, and the death rate rises.
 - The birthrate reduces than the death rate.
 - The birthrate and the death rate remain unchanged.
10. Which of the following would raise within the population when the population attains it's carrying capacity and resources become more insufficient?
- | | |
|----------------|------------------|
| A. birthrate | C. nesting sites |
| B. competition | D. nesting sites |
11. A pest destroying corn (*Zea mays*) infested Barangay Masagana last May. It strikes and harms hundreds of corn plants. What would happen to the corn borer population in the field?
- The corn borer population would infinitely increase.
 - The corn borer population would decrease.
 - The corn borer population would stay the same.
 - The corn borer population would be stable.
12. How does the following conditions relate to population density? (high crime rate, not enough transportation, and high number of patients in hospitals)
- benefit of high population density
 - benefit of low population density
 - challenge of low population density
 - challenge of high population density
13. The graph below shows the population of three barangays from 2005 to 2020. Examine the population growth of Barangay Maaliwalas, what does the graph tells you?



- A. Its population is growing slowly. C. Its population is growing rapidly.
 B. Its population is decreasing. D. Its population is not changing.

14. Which human activity would be most destructive to the Philippine biodiversity?

- A. The burning of wood in urban areas.
 B. The release of species of freshwater fish in lakes.
 C. The removal of plants from the food webs they are part of.
 D. The planting of trees in forest.

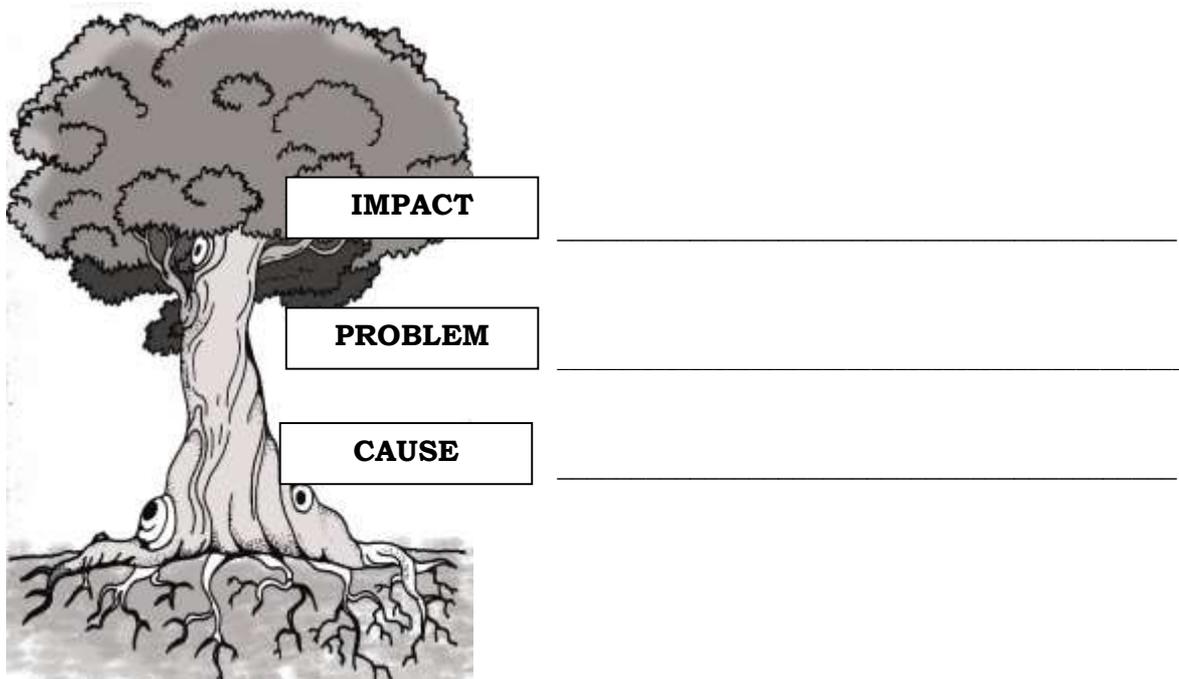
15. Above 1 million marine animals (comprising mammals, fish, sharks, turtles, and birds) are killed each year due to plastic waste in the ocean. Why is plastic dangerous for marine life?

- A. It makes them grow faster.
 B. It makes reproduction easier.
 C. They mistake it for food and cannot digest it.
 D. It's not dangerous because they use plastic waste for habitats.



Additional Activities

After doing the activities, you have learned different things about biodiversity, population growth, carrying capacity, and the human impact to the environment. To check your understanding on the lessons presented, use the problem tree template below. Think of a community problem (trunk) then identify the cause/s (roots) and list the impact of the stated problem (branches).



Illustrator: Martha Theresa B. Esteban

Essential Questions

1. Is there an existing ordinance in your barangay that provides solution in the problems that you identified? If none, what possible suggestions could you make?
2. What are the activities that a student like you could initiate to provide awareness to minimize the human impact on the environment?



Answer Key

<p>What I know (p. 2)</p> <p>1. B 2. D 3. A 4. B 5. C 6. C 7. D 8. D 9. A 10. C 11. B 12. B 13. C 14. C 15. B</p>	<p>What's In (p. 5)</p> <p>1. FOSSIL 2. EVOLUTION 3. ORGANISMS 4. ANCESTORS 5. STRUCTURE 6. LAMARCK 7. NEED 8. USE 9. DISUSE 10. DARWIN 11. EVOLUTION 12. NATURAL 13. FOOD 14. SPACE</p>	<p>What's New (p. 7)</p> <p>Activity 1 1. Quezon, Pateros 2. As the population increases the population density also increases. They are directly proportional to each other. 3. Answers vary (Possible Answers: Presence of Employment, Schools, Recreation Facilities, Parks/Malls)</p>
<p>What's More (p. 10)</p> <p>Activity 1 A. 1. Yes 2. No 3. The fish population will decrease to at least 100 fishes. This will happen because the carrying capacity has decreased due to one of the following factors: fewer resources available, larger population. B. Fishes will have limited space, food, and oxygen due to overpopulation.</p> <p>Activity 2A (Situation 1 p. 11)</p> <p>Essential Questions 1. Answers vary (Possible Answers: overcrowding, poor health and sanitation, housing problems, less parental guidance 2. These problems may lead to poor people's health and nutrition since there is scarcity of resources.</p> <p>Situation 2 Essential Questions 1. The place has rich biodiversity, has beautiful waterforms/landforms, has source of food supply. 2. Rich biodiversity could lead to healthy mind and body since the needs to survive are available.</p>		

What's More (p. 11)

1. disease/ASF - density-dependent
2. large number of aquatic organisms/PSP - density-independent
3. natural calamities/earthquake - density-independent
4. oil spill - density-independent
5. man-made activity - density-independent

Essential Questions (p. 12)

1. Density-dependent factor - competition, predation
2. Density-independent factors - severe weather and conditions like fire environmental factors like earthquake

Assessment (p. 14)

1. B
2. D
3. B
4. D
5. A
6. A
7. C
8. B
9. A
10. C
11. B
12. D
13. A
14. C
15. C

What I Have Learned (p. 13)

1. increasing
2. increases
3. Increases
4. Carrying capacity
5. decrease

What I Can Do (p. 13)

Sample answer is given in the table on page 13

Additional Activities (p. 17)

Answers may vary

Possible Answers:

Impact: Loss of lives/properties

Problem: Flooding

Cause: Illegal logging activities

Essential Questions:

1. Answers vary
2. Join in school clubs/barangay activities related to environmental campaign and awareness

References

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