

Species Extinction and Adaptation

Lesson

Remove Watermark Now

This lesson will relate species extinction to the failure of populations or organisms to adapt to abrupt changes in the environment.

Extinction happens when the last member of the species dies. A species becomes extinct if it can no longer adapt to changes in the environment and consistently compete with other organisms in its environment.

From the research entitled “Cause and Consequences of Species Extinctions” the authors Sodhi, Brook and Bradshaw (2014) concluded that, although extinctions are a normal part of evolution, human modifications to the planet in the last few centuries, and perhaps even millennia, have greatly accelerated the rate at which extinctions occur. Habitat loss remains the main driver of extinctions, but it may act synergistically with other drivers such as overharvesting and pollution, and, in the future, climate change. Large-bodied species, rare species, and habitat specialists are particularly prone to extinction as a result of rapid human modifications of the planet. Extinctions can disrupt vital ecological processes such as pollination and seed dispersal, leading to cascading losses, ecosystem collapse, and a higher extinction rate overall.

We are living in a dynamic changing environment and most species are dependent on it. There are organisms that can easily adapt to the changing environment depending on the resistant into it. There are organism that can adapt easily but others are not.

Now is the time to embrace change, because even in the pandemic, we are experiencing perhaps disappearance of living organisms that even human beings can not adapt . But creative innovations are everywhere, discover new approaches instead of just waiting for solutions and blaming others for mistakes. The only way to succeed over time is to exceed the effort of making the environment safe for everyone.

Learning Task 1: Write a simple paragraph about the changing environment in this time of pandemic. Cite at least three changes that you need to adapt in order to survive in the New Normal. Complete the paragraph below.

Adapting in the New Normal Life

There are three changes that I need to adapt in order to survive in the new normal.

These are _____

D

Learning Task 2: Complete the table to be familiarized with the extinct animals of the Philippines. Identify their common names. Use the pool of words below.

Extinct Animals in the Philippines common name / scientific

Description	Common name / scientific name	Period
1. Introduced in the 13th-16th? century from Sabah in the reign of the Sultanate of Sulu, and became extinct on Maguindanao or were transported back to Sabah. Bone fragments are the only proof left behind of their existence		
2. Once roamed in the plains of Luzon, Mindanao entire Philippine Archipelago. Unfavorable geographical conditions and human exploitation caused their extinction.		
3. Discovered in Palawan in 2011. The fossil has not yet been extracted from the rocks in fear of destroying the natural heritage caves of Palawan. Future technology in fossil extraction is the only way to get and identify the fossil.		
4. Excavations in Callao Cave, in the lowland (c. 85 m elevation) Cagayan River Valley of northeastern Luzon, Philippines, have produced the first fossils of any endemic genera of Philippine murinae rodents.		

Common name/scientific name	Period
<div>Asian elephant <i>Elephas maximus</i></div> <div>Fossil marines</div> <div><i>Stegodon luzonensis</i></div> <div>Cebu tamaraw <i>Bubalus cebuensis</i></div>	Pleistocene
<div>Palawan fossil <i>Sirenia Dugong sp.</i></div> <div>Tiger <i>Panthera tigris sp.</i></div> <div>Philippine rhinoceros <i>Rhinoceros philippinensis</i></div>	Holocene
<div>Philippine rhinoceros <i>Rhinoceros philippinensis</i></div>	Miocene

Extinct Animals in the Philippines common name / scientific

Description	Common name / scientific name	Period
5. Two articulated phalanx bones and another phalanx piece were found amidst an assemblage of other animal bones and stone tools in Ille Cave near the village of New Ibajay. From the stone tools, besides the evidence for cuts on the bones, and the use of fire, it would appear that early humans had accumulated the bones.		
6. Due to the lack of a complete skeleton, it lived during the Pleistocene era (2.588 million – 11,700 years ago) and that it was essentially the larger version of its modern cousin.		
7. Lived on the island of Cebu before becoming extinct in modern times, primarily due to habitat destruction and human exploitation. The subspecies was declared extinct in 2000, however, other warty pig subspecies still survive on other Philippine islands.		
8. Stood only 75 cm (2 ft 6 in) and weighed about 150 to 160 kg (330 to 350 lb). The species was smaller than the modern Mindoro tamaraw.		

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E

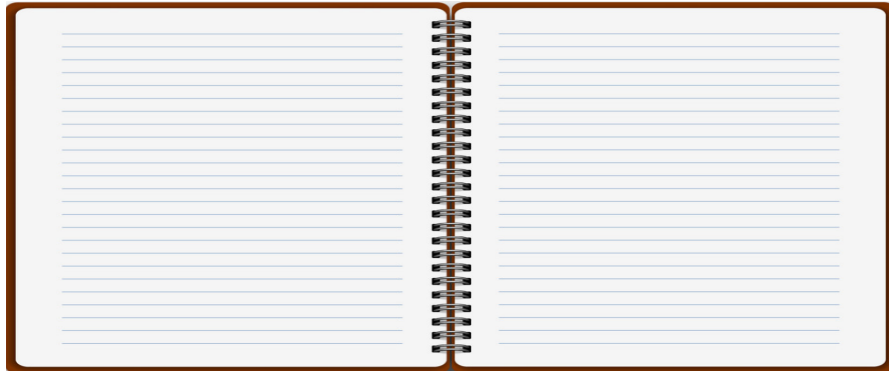
Learning Task 3: Read the words in both columns. Match column A with column B. Write your answer in your notebook.

A. Causes of Extinction of Species

Column A	Column B
A. Climatic Heating and Cooling	1. From John W. Williams' research, their findings indicated that "By the end of the 21st century, large portions of the Earth's surface may experience climates not found at present and some 21st century climates may disappear.
B. Changes in Sea Levels or Currents	2. Habitat loss and degradation affect 86% of all threatened birds, 86% of mammals and 88% of threatened amphibians.
C. Asteroids / Cosmic Radiation	3. Increase in population, destruction/fragmentation of habitat, pollution and climate change/global warming
D. Acid Rain	4. They use resources that the other species depend on. Once competition gets too great, the survival of the fittest plan will begin, and one of the species, usually the natural one, will die off.
E. Disease / Epidemic	5. This forms when sulfur dioxide and / or nitrogen oxides are put into the atmosphere. Increases the acidity of the soil which affects plant life. It can also disturb rivers and lakes to a possibly lethal level.
F. Spread of Invasive Species	6. Each species has defense mechanisms like immunities and the ability to fight disease. With the changing climate and landscape certain species are losing their ability to fend off disease. They are becoming more susceptible to disease and epidemics, which can lead to their eventual extinction.
G. Human Causes of Extinction	7. The biodiversity Earth can't keep up with the rapid changes in temperature and climate. The species are not used to severe weather conditions and long seasons.
H. Habitat Degradation	8. This is the result of melting freshwater. The denser, saltier water sinks and forms the currents that marine life depends on. Ocean floor spreading and rising also affects sea level.
I. Climate Change and Global Warming	9. The reverberations of their impact to Earth can be felt around the world. The impact site is completely destroyed. Radiation is being emitted from outer space and the sun. A supernova remnant is one source of cosmic radiation.

B. My Advocacy Board

You have learned from the previous activity that one of the causes of extinction of species is disease or epidemics. Relating it to our present situation do you think someday human beings will become extinct also because of diseases and pandemics? What program or projects you would like to propose to avoid the extinction of human beings to happen? Write your advocacy program or projects in your notebook.



A

Learning Task 4 : Answer the following questions. Prepare a simple proposal to show your thoughts on the issue.

Adaptation to Changing Environment

This activity increases your awareness and interest to do something for the changing environment. Below is the research entitled “The Conflict Between Adaptation and Dispersal in Maintaining Biodiversity in Changing Environments”. Make an analysis of the abstract of this research by identifying the objectives or purpose of the research, methodology or design, and findings.

Objective / Purpose

Methodology / Design

Findings

The conflict between adaptation and dispersal for maintaining biodiversity in changing environments

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Dispersal and adaptation both allow species to persist in changing environments. Yet, we have limited understanding of how these processes interact to affect species persistence, especially in diverse communities where biotic interactions greatly complicate responses to environmental change. Here we use a stochastic metacommunity model to demonstrate how dispersal and adaptation to environmental change independently and interactively contribute to biodiversity maintenance. Dispersal provides spatial insurance, whereby species persist on the landscape by shifting their distributions to track favorable conditions. In contrast, adaptation allows species to persist by allowing for evolutionary rescue. But, when species both adapt and disperse, dispersal and adaptation do not combine positively to affect biodiversity maintenance, even if they do increase the persistence of individual species. This occurs because faster adapting species evolve to hold onto their initial ranges (i.e., monopolization effects), thus impeding slower adapting species from shifting their ranges and thereby causing extinctions. Importantly, these differences in adaptation speed emerge as the result of competition, which alters population sizes and colonization success. By demonstrating how dispersal and adaptation each independently and interactively contribute to the maintenance of biodiversity, we provide a framework that links the theories of spatial insurance, evolutionary rescue, and monopolization. This highlights the expectation that the maintenance of biodiversity in changing environments depends jointly on rates of dispersal and adaptation, and, critically, the interaction between these processes.

environmental change (11). In contrast, when local adaptation is fast compared to dispersal, evolutionarily mediated priority effects can emerge. Also known as monopolization effects, these occur when early-arriving species adapt to the local conditions enough to prevent preadapted but later-arriving species from colonizing (12, 13). Such monopolization effects have been demonstrated to be strong drivers of community dynamics in simulated metacommunities experiencing environmental fluctuations and disturbances (14–17). Evidence of monopolization effects has also been found in a number of empirical studies (18–20). Urban et al. (10) applied this idea to changing climate by hypothesizing that monopolization effects could prevent species from tracking their climate niches. But they did not formalize this hypothesis, so it is unclear how strong this effect would be and how it should depend on rates of evolution and dispersal.

Our best expectations for how dispersal and evolution interact to affect the persistence of multispecies communities under climate change come from a model by Norberg et al. (21). These authors found that evolution minimized extinction rates and that this was greatest when dispersal rates were low. In contrast with predictions from the spatial insurance hypothesis (3, 23), they found that dispersal did not reduce extinction rates because it allowed competitively superior species to expand their ranges to the detriment of other species. Thus, reconciling these conflicting predictions is a priority for advancing our understanding of how dispersal and evolution contribute to the maintenance of biodiversity in changing conditions.

What is your realization on the results of the research?

Do you think we can adapt to abrupt changes in the environment?