

Coral Reefs



30 minutes to complete the guided tour.



Science, climate change, social conscience, biology

▶ Guided Tour Icons:



Answers



Information



Chat, discuss

Guided Tour Contents:

Introduction Slide

12 Text Info Slides

9 Interactive Panoramas

Vocabulary Slide

5 Review Slides

[Provide your feedback](#)

WHAT YOU'LL FIND INSIDE

There are three kind of slides: Learning objectives / information slides, panorama slides, and review slides.

As you and your students go through the guided tour you'll find **learning objectives slides** which are followed by immersive 360° panoramas that highlight examples of the relevant concepts, show coral reefs, and get students to engage with and think about related topics.

Each interactive panorama features clearly identified tasks and activities that students can easily navigate via buttons and instructions.

At the end of the Guided Tour you'll find a **"Can you define these concepts?"** slide, which allows your students to review those concepts covered in the Guided Tour. This Teacher's Guide contains definitions of the concepts.

The **review slides** contain multiple choice questions that students can use to check their understanding. Each question has three possible answers for students to select from. The selection box turns green when the correct answer is selected.

You can read each learning objective slide out loud to your class before letting them explore the panoramas on their own.

► Four Learning Objectives

Read each learning objective slide out loud for the class. Then, explore the panoramas after each learning objective to let your students embrace the ideas and concepts.

1. Identify different plants and animals in coral reef ecosystems - Slides: 4, 5 and 6

- Coral reefs are built by animals known as **coral polyps**.
- These animals can take many forms such as large reef colonies, flowing fans, or just small organisms.
- There are thousands of species of corals in our seas and they are responsible for the creation of one of the world's **most diverse ecosystems**.
- A single reef wall often contains a wider **variety of life forms** than an entire continent.
- Reef walls are home to between 35,000 and 60,000 species of fish, which is one third of all species of fish.
- They are also incredibly rich in phyla, with creatures as diverse as sea lilies, sponges, crabs, eels and sea anemones living together.
- How many species can you find in these coral reefs?

Start searching

2. The importance of Coral Reefs for our oceans and planet - Slides: 9 and 10

Coral reefs provide:

- **Protection** to coastlines from wave action and tropical storms.
 - **Shelter** and **suitable habitats** for marine organisms.
 - **Nutrients** to a wide range of marine organisms.
- Many fish spawn and young fish spend time in the coral reefs before going to the open sea, which is very useful for those involved in the **fishing industry**.
- Coral reefs can also help communities economically by creating opportunities for tourism and **tourism related activities**.

Let's Explore

3. Coral Reef Food Chain - Slides: 14, 15 and 16

A **food chain** is the process of **transferring nutrients** necessary for life. It starts with the sun, goes through plants, and finally moves to animals and ensures the survival of each.

- **Primary producers** create energy from the sun. That's why coral reefs need to live near the surface. Solar energy is transformed into chemical energy by the process of photosynthesis. Plankton and algae are two examples of primary producers.
- **Primary consumers** eat plants. Sea cucumbers, angelfish, sea sponges, snappers and shrimps are primary consumers. Primary consumers can be plant eaters (herbivore) or plant and animal eaters (omnivore).
- **Secondary consumers** eat primary consumers. They are usually larger fish like parrot fish, butterfly fish, and trigger fish, but also sea turtles and lobsters.
- **Tertiary consumers** eat secondary consumers. They are large carnivores (animals that eat meat) like reef sharks.

Let's find producers and consumers in the next panoramas

4. How climate change affects coral reefs - Slides: 19, 20 and 21

- Human activities increase **greenhouse gases**, which increases **climate change**. If the climate changes, oceans and seas change too.
- **Ocean acidification** is just one example: oceans consume carbon dioxide from the atmosphere and that drops the ocean's pH level.
- **Warmer waters** in our oceans lead to **diseases** in corals and thermal stress, which causes coral bleaching, making corals turn white when they eject algae living in their bodies.
- Other effects: sea level rise, changes in storm patterns, and changes in precipitation.

Let's Explore

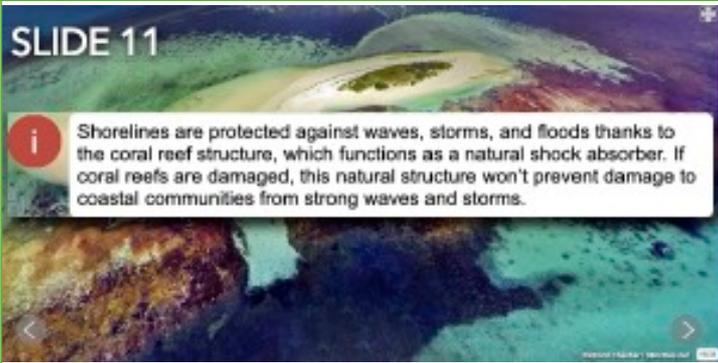
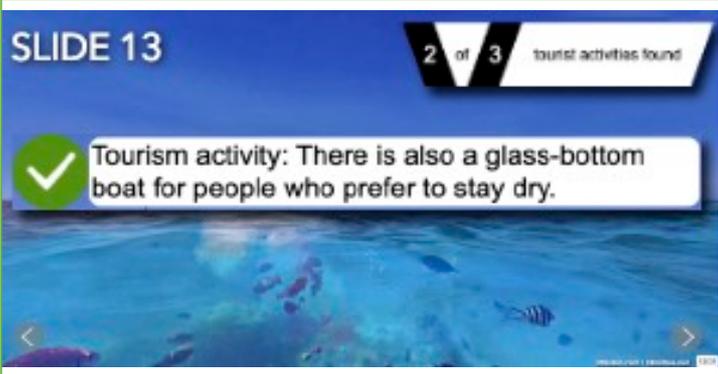
► **Things You Might Say**

We've listed the things your students will see in each panorama. You can use this information to encourage them to explore, spark a discussion, and point out certain things you all have observed.

► **LEARNING OBJECTIVE 1: Identify different plants and animals in coral reef ecosystems** - Slides: 4, 5 and 6

PANORAMA / SLIDE	COMMENTS
	<p>Pan around the panorama, zoom in/out and find the 3 species:</p> <ul style="list-style-type: none"> - Acropora cervicornis or staghorn coral - Bannerfish - Parrotfish or steephead parrotfish
	<p>Pan around the panorama, zoom in/out and find the 4 species:</p> <ul style="list-style-type: none"> - Triton attacks crown-of-thorns starfish. Charonia tritons, common name for the Triton's trumpet. - The crown-of-thorns starfish - Acropora cervicornis or staghorn coral - Microscopic Plankton: bacteria, archaea, algae, protozoa, etc.

► **LEARNING OBJECTIVE 2: The importance of Coral Reefs for our oceans and planet** - Slides: 9 and 10

PANORAMA / SLIDE	COMMENTS
<p>SLIDE 11</p> 	<p>Read the info box out of loud. Discuss and chat with your students about protecting the sea, coral reefs and shorelines.</p>
<p>SLIDE 12</p> 	<p>Pan around the panorama. Continue discussing with the class how we can behave responsibly towards our seas and oceans. Students can also write a short essay or create a mural.</p>
<p>SLIDE 13</p> <p>2 of 3 tourist activities found</p> 	<p>Find 3 tourist activities in this panorama:</p> <ul style="list-style-type: none"> - Snorkelling > People can rent or buy snorkel gear on the island. - There is also a glass-bottom boat for people who prefer to stay dry. - A cold drink, some snacks, and some fish for lunch sounds like a good plan. Do you think there are some beach bars or restaurants on the island?

► **LEARNING OBJECTIVE 3: Coral Reef Food Chain** - Slides: 14, 15 and 16

PANORAMA / SLIDE	COMMENTS
<p>SLIDE 17</p> <p>1 of 5 species found</p> 	<p>Find the 5 species and identify their food chain position based on their diet:</p> <ul style="list-style-type: none"> - Algae: primary producer - Plankton: primary producer - Turtle: secondary consumer - Angelfish: primary consumer - Parrot fish: secondary consumer



Find the single species and identify its food chain position based on its diet:
 - Shark: Both a carnivore and a tertiary consumer

► **LEARNING OBJECTIVE 4: How climate change affects coral reefs** - Slides: 19, 20 and 21

PANORAMA / SLIDE	COMMENTS
	<p>Discuss with your students how plastics and non-biodegradable wastes threaten marine ecosystems. What we throw to our oceans and seas come back to us.</p>
	<p>Finally, let's enjoy this wonderful panorama full of colors, fish, and corals. Don't forget this image, we have to be aware of what it means for us and for our planet.</p>

► Can you define these concepts?

► Coral Reef

"Coral reefs are some of the most diverse ecosystems in the world. [Coral polyps](#), the animals primarily responsible for building reefs, can take many forms: large reef building colonies, graceful flowing fans, and even small, solitary organisms. Thousands of species of corals have been discovered; some live in warm, shallow, tropical seas and others in the cold, dark depths of the ocean.", [NOAA](#).¹

► Ecosystem

"All the living things in an area and the way they affect each other and the environment.", [Cambridge Dictionary](#).²

► Importance of Oceans

"Covering 72 percent of the Earth and supplying half its oxygen, the ocean is our planet's life support system.", [National Geographic](#).³

► Climate Change

"Climate change is a change in the usual weather found in a place. This could be a change in how much rain a place usually gets in a year. Or it could be a change in a place's usual temperature for a month or season. Climate change is also a change in Earth's climate. This could be a change in Earth's usual temperature. Or it could be a change in where rain and snow usually fall on Earth. Weather can change in just a few hours. Climate takes hundreds or even millions of years to change.", [NASA](#).⁴

► Food Chain

"Food chain, in ecology, the sequence of transfers of matter and energy in the form of food from organism to organism. Food chains intertwine locally into a food web because most organisms consume more than one type of animal or plant. Plants, which convert solar energy to food by photosynthesis, are the primary food source. In a predator chain, a plant-eating animal is eaten by a flesh-eating animal.", [Encyclopædia Britannica](#).⁵

¹ Coral Reef Ecosystems." *Coral Reef Ecosystems* | National Oceanic and Atmospheric Administration, www.noaa.gov/education/resource-collections/marine-life/coral-reef-ecosystems.

² Meaning of ecosystem in The Cambridge English Dictionary, dictionary.cambridge.org/en/dictionary/ingles/ecosystem.

³ National Geographic Society. "Why the Ocean Matters." *National Geographic Society*, 9 Nov. 2012, www.nationalgeographic.org/media/why-ocean-matters/.

⁴ Dunbar, Brian. "What Is Climate Change?" *NASA*, NASA, 13 May 2015, www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-climate-change-k4.html.

⁵ The Editors of Encyclopaedia Britannica. "Food Chain." *Encyclopædia Britannica*, Encyclopædia Britannica, Inc., 25 Mar. 2020, www.britannica.com/science/food-chain.

► Review what you have learned

- These quiz/review questions are built into the student experience to enable them to evaluate themselves.
- You can also use these questions as discussion or writing prompts instead of or in addition to the quiz/review.

1. Why are coral reefs one of the most diverse ecosystems in the world?

- Because coral reefs are rocks and marine species can live inside them.
- **Because the variety of species living on coral reefs is greater than in any other shallow-water marine ecosystem.**
- Because fish eat coral reefs, which leads to a lot of fish hanging around.

2. Why are coral reefs important to our oceans?

- **Because marine organisms are provided with habitats, shelter, and nitrogen from coral reefs.**
- Because corals are food for herbivore marine species.
- Because coral reefs protect small fish from being eaten or caught by bigger fish and humans.

3. Why are coral reefs important to local human communities?

- Because local communities can develop their fishing industries by fishing as much as they want around coral reefs.
- Because people living close to coral reefs can create products from the coral reefs and sell them to tourists.
- **Because coral reefs help nearby communities and areas by providing social, tourism, and other economically beneficial activities.**

4. Who are primary consumers in coral reef ecosystems?

- Only herbivore animals.
- Plankton and algae which consume the sun's energy.
- **Herbivore and omnivore animals that eat plants and plankton.**

5. How does climate change affect oceans?

- Climate change does not affect oceans as it only affects land surfaces.
- **Climate change causes water to get warmer, which causes coral bleaching and diseases.**
- Climate change causes waters to get colder, which causes coral freezing.

► Other activities

 [Coral Reefs by National Geographic.](#) 3'52"

Description > What are coral reefs? Coral can be found in tropical ocean waters around the world. But how much do you know about reefs and the tiny animals—polyps—that build them? Learn all about coral and why warming waters threaten the future of the reef ecosystem.⁶



 [Why should we care about coral reefs? by World Economic Forum.](#) 2'21"

Description > Coral reefs are suffering - and we aren't going to save them through small-scale, feelgood actions like reusing our shopping bags or hotel towels. Kristen Marhaver is Postdoctoral Scholar at the University of California at Merced, working at the Caribbean Research and Management of Biodiversity (CARMABI) Research Station in the Netherlands Antilles. She explains why coral reefs matter, and what actions we need to take.⁷



⁶ National Geographic. 2017, November 7. *Coral Reefs 101* | National Geographic. Youtube. <https://www.youtube.com/watch?v=ZiULxLLP32s>

⁷ World Economic Forum. 2016, November 28. *Why should we care about coral reefs?*. Youtube. <https://www.youtube.com/watch?v=3kb0bz-3lWc>