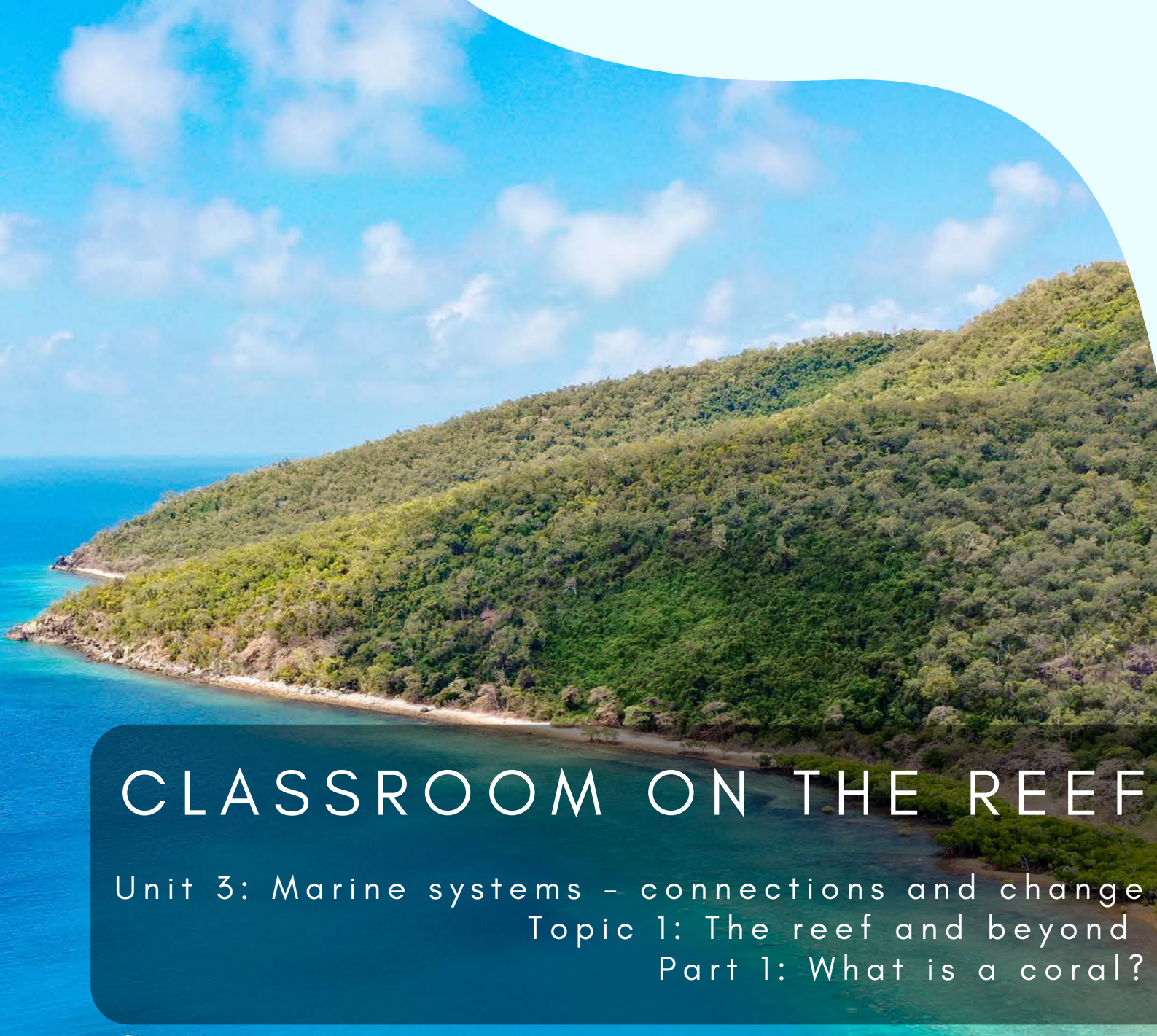


CLASSROOM ON THE REEF

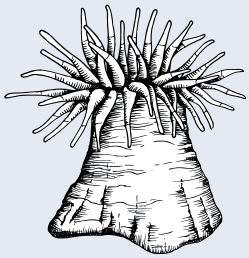
Unit 3: Marine systems - connections and change
Topic 1: The reef and beyond
Part 1: What is a coral?

OIRS
ORPHEUS ISLAND RESEARCH STATION

CORALWATCH

JCU

WHAT IS A CORAL?



Objective

Learn about corals as animals, and corals as the foundation species of coral reef ecosystems. We will also learn about the different types of reefs that corals can form, and the different coral reef habitats they create.

Background

Reef-building corals are benthic, sessile, marine invertebrates. Let's break that down: The corals that build reefs live on the sea floor, called the benthos, and are thus termed 'benthic.' Corals in general cannot move, and they are often attached to the seafloor and referred to as 'sessile' which just means attached to the substrate. Corals are animals without a central nervous system or backbone so they are classified as invertebrates. Corals also live in the ocean and require saltwater to build their calcium carbonate (limestone) skeletons, so we call them 'marine' organisms.

While corals are classified as animals, they also have an obligate symbiotic relationship with tiny single-celled microalgae (actually a protist, not a plant), commonly called *Symbiodinium*. *Symbiodinium* are the powerhouse of the coral because they produce lots of energy (through photosynthesis) which is transferred to the coral animal. This symbiotic relationship is essential to the success of corals as the builders of large reefs – because of these microalgae, corals are basically able to feed and acquire energy 24 hours a day, and that greatly contributes to their ability to create a skeleton and grow eventually forming a reef. In this section we'll spend time learning about what an individual coral polyp is, how coral polyps function together as a coral colony, and how they are able to form giant structures that are visible from space, like the Great Barrier Reef. **Let's dive in!**

Notable words

polyp, corallite, colony, nematocyst, microalgae, protist, *Simbiodinium*, symbiosis, brooding, spawning, fragmentation, budding, reef flat, reef crest, reef slope, atoll

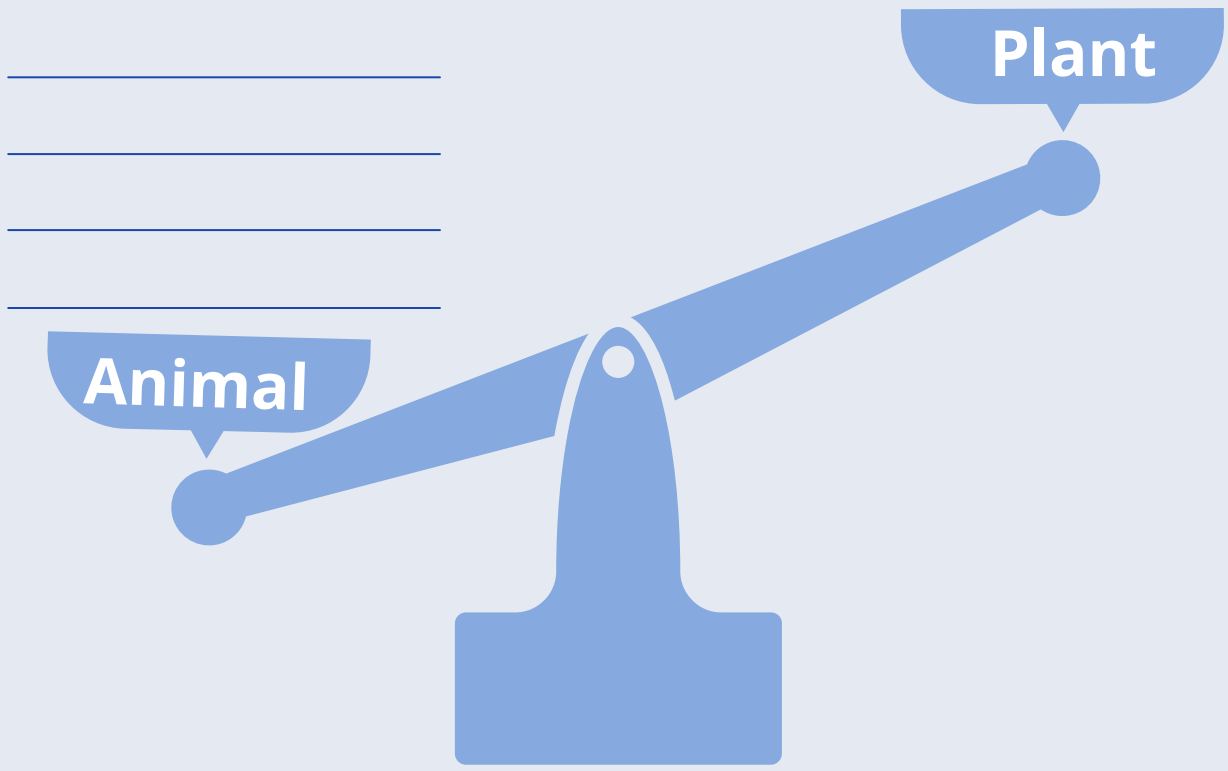
WHAT IS A CORAL?

Your Task - Complete questions 1-9 + extension questions (time permitting)

Why is a coral classified as an animal?

1. Individually - read the following article from the Conversation: These bizarre creatures defy what we think we know about plants and animals (https://theconversation.com/these-bizarre-creatures-defy-what-we-think-we-know-about-plants-and-animals-69316). **Using the diagram below, cunstruct a visual argument for why a coral is a plant or an animal by adding coral traits/characteristics to the 'balance' below - which argument did you find more support for? Follow-up your ideas with a class discussion on this topic.**

Questions to think about:
- Does it move?
- Is it alive?
- Does it require sunlight to make energy?
- Does it eat?



Coral Polyps - Close up

Examples of the diversity of coral polyp shapes and organisation within a colony.

What are coral polyps?

2. As a class, watch – What Exactly is Coral? (06:57 duration)
https://youtu.be/UkkfAzswGI8

Based on the video above, create a mind map to describe what a coral polyp is. Be as creative as you desire - you can include words, phrases, sketches, and use different colours to help construct your mind map in the space provided:

Coral Polyp

Corallites - Close up

Examples of corallite diversity from coral skeletons (corallites are the skeletal 'cup' a coral polyp sits within).

WHAT IS A CORAL?

3. Creating a scientific drawing is an essential skill of a scientist. As a class, watch – Let's Make a Scientific Drawing (01:23 duration) (https://www.youtube.com/watch?v=ublfinvxqHo).

Next, individually inspect the 3D printed polyp model (if at Orpheus Island), the anatomy of coral polyp/corallite figures that follow on pages 8 and 9, and play with an interactive coral polyp online: (https://www.livingoceansfoundation.org/education/portal/course/coral-anatomy/) **- scroll to the bottom of the page and press the play symbol to initiate. Then, to the best of your ability, sketch the basic anatomy of a coral polyp. Identify at least 5 of the following structures (bonus points for all). Next link the structures to their corresponding functions by drawing connecting lines between the first and second lists below:**

Structures

a. Mouth
b. Tentacles
c. Gut/stomach
d. Nematocysts
e. Coenesarc
f. Symbiodinium
g. Skeletal layer (basal plate)

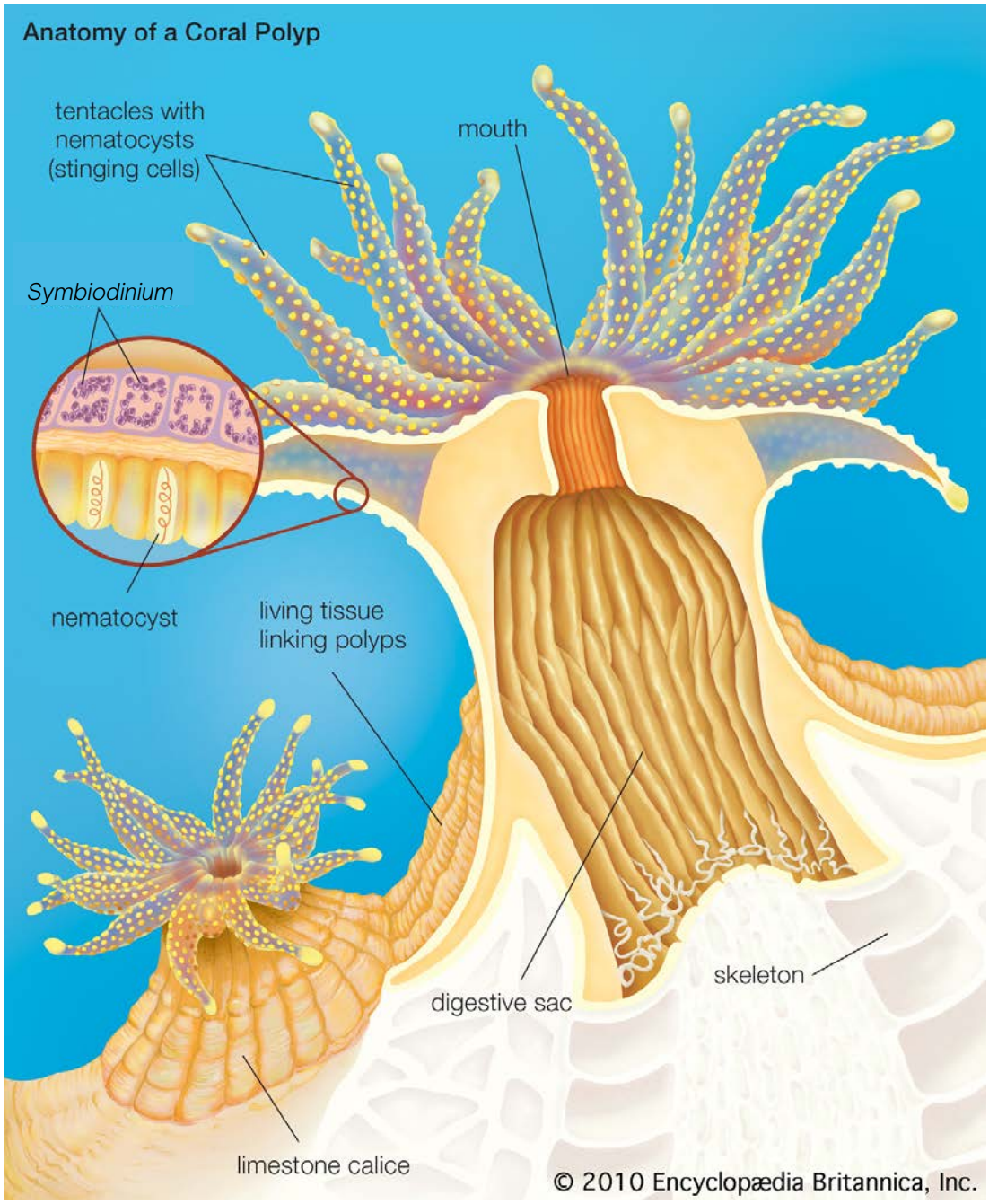
Functions

1. Photosynthesizes to acquire energy
2. Connective tissue between polyps
3. Stinging cells
4. For catching prey items / food
5. Where digestion occurs
6. Where food is taken for ingestion
7. Where skeleton is laid down

WHAT IS A CORAL?

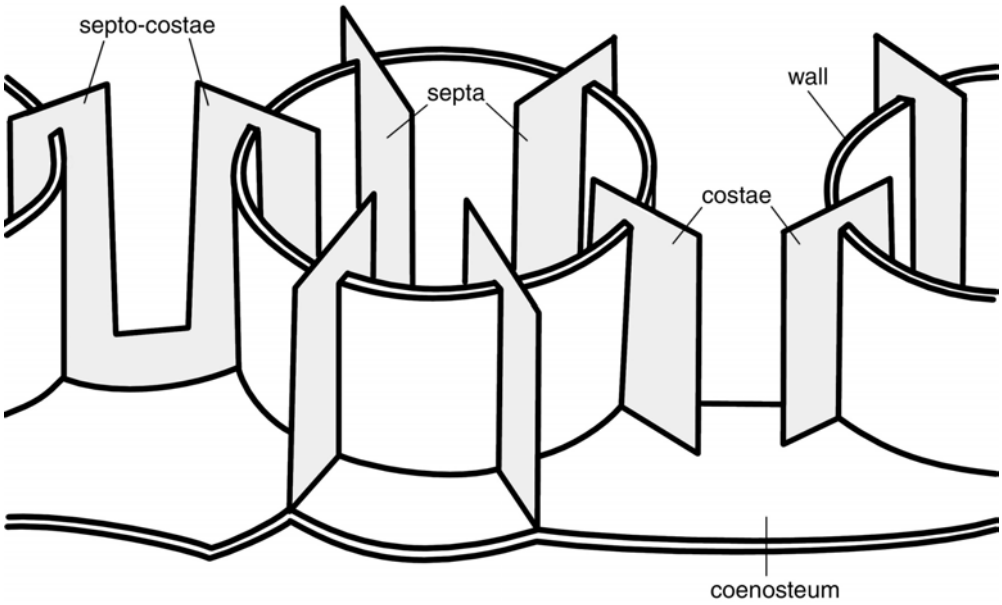
4. Demonstrate how coral polyps form a colony, and how do they grow? (2-4 sentences or sketch a diagram in the space provided)

Coral Polyp Anatomy

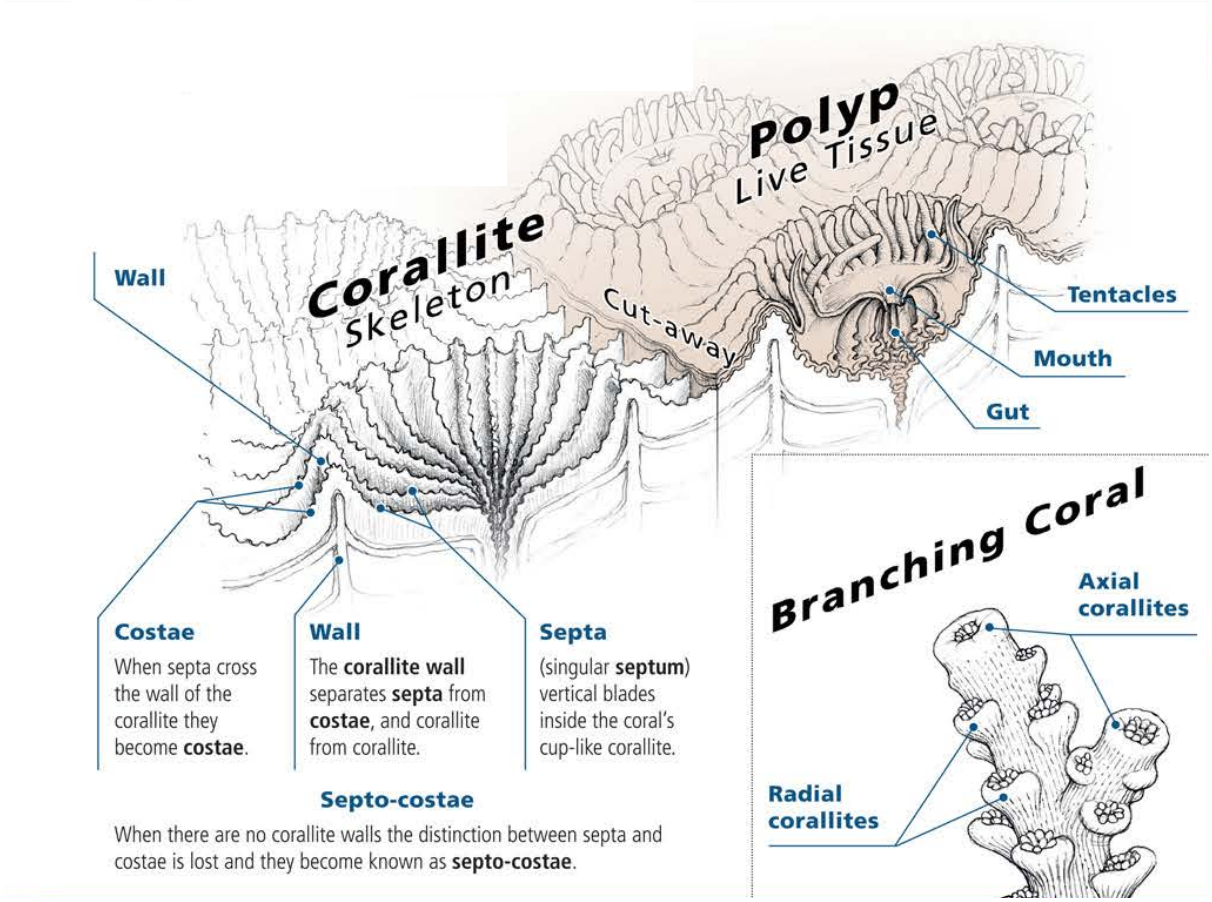


The external and internal anatomy of a coral polyp. Source: Brittanica https://www.britannica.com/science/polyp-zoology

Coral Corallite Structure



Schematic representation of the basic structural elements of a corallite. Source: Corals of the World http://www.coralsoftheworld.org/page/structure-and-growth/



Detailed structural features of a corallite with and without polyp tissue. Source: Coral Finder http://www.russellkelley.info/print/indo-pacific-coral-finder/

What do corals eat?

5. As a class, watch – Coral: What Does it Eat? (04:14 duration)
(https://youtu.be/tZuxZdG6TfM)

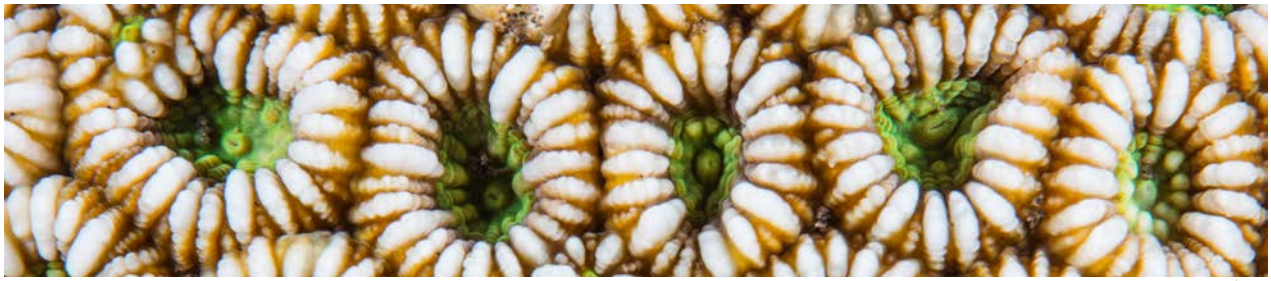
Next: Individually, read Reef-building Corals on pages 86-89 in: Coral Reefs and Climate Change (Second Edition) text book.

Explain how corals get their energy (e.g. do they eat it, or do they make it)? Describe how this process changes between day and night. (3-5 sentences)

Extension – Determine whether corals can eat each other, and justify why this ability might be useful for a coral? (3 sentences) Hint: watch these videos:

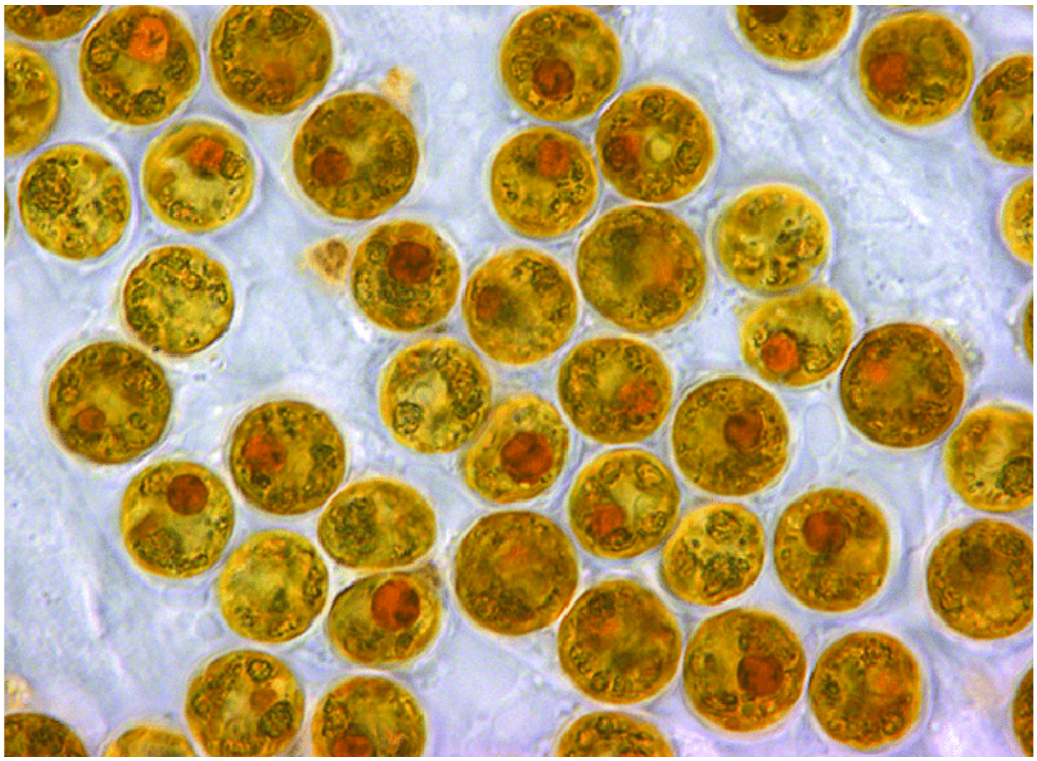
Coral Aggression - Cannibalism on the reef (01:05 duration)
https://youtu.be/5UHKFlig9qM

Coral Attack! (01:41 duration)
https://youtu.be/hED3Y_l488A



Coral Symbionts - *Symbiodinium*

Close-up of coral polyps revealing the brown microalgal cells (Symbiodinium) *within their tissue.*

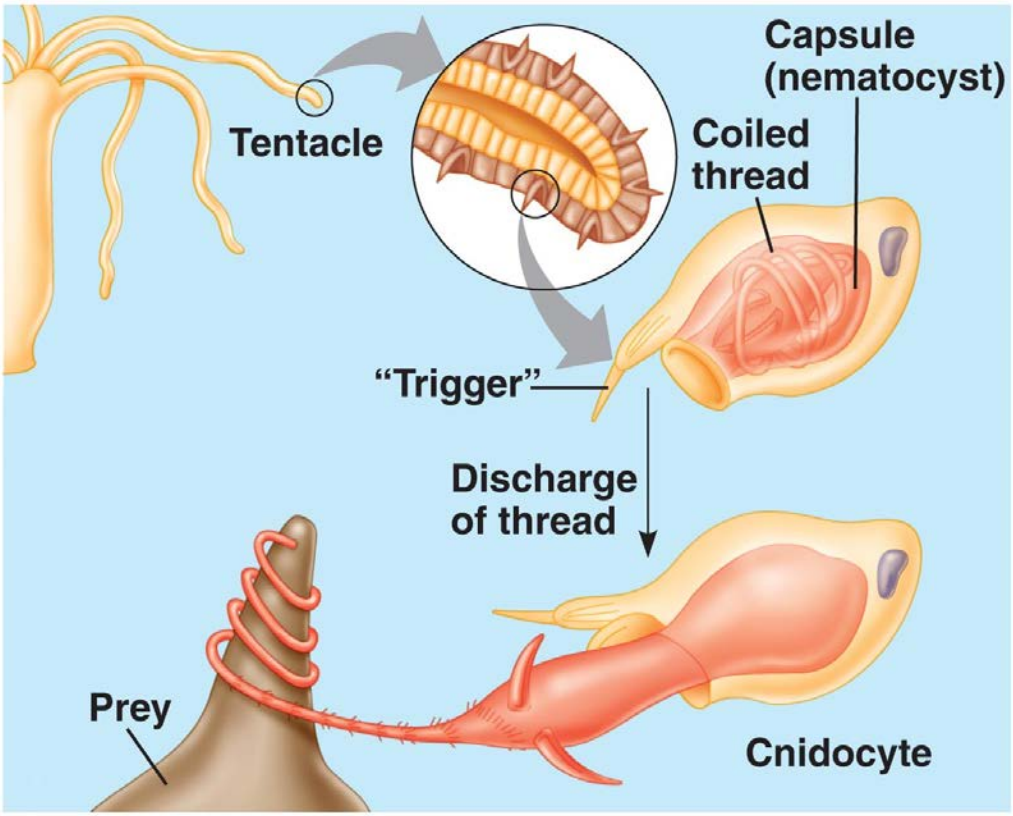


*Individual microalgae (*Symbiodiniu) *cells magnified under a microscope.*

WHAT IS A CORAL?

Extension – Hypothesise why nematocysts (stinging cells) and *Symbiodinium* (microalgae) found where they are in a coral polyp? Hint: Think about their function and how the coral might use them to achieve this. (3-5 sentences)

Coral Stinging Cells - Nematocysts



Structure and function of coral stinging cells (cnidocytes and nematocysts)
Source: Pearson Education 2009

Transverse section of a corallimorph showing stinging cells (nematocysts) as elongated pink coils under x20 magnification

How do corals reproduce?

8. As a class, watch – Corals: The Birds and the Bees (04:35 duration) (https://youtu.be/rpKSQM2cDk0)

Design a flow chart or mind map illustrating the myriad ways coral are able to reproduce. In your diagram be sure to include brooding, spawning, budding and fragmentation. Be as creative as you desire - you can include words, phrases, sketches, and use different colours to help construct your mind map in the space provided:

Coral Reproduction

Where do corals live?

9. As a class, watch – **Coral Reef Zones** (05:04 duration)
(https://youtu.be/1wMrB37_GvI)

List the most common reef zones and a challenge corals face in each zone: (1 sentence each)

1. _____

2. _____

3. _____

4. _____

10. As a class, watch – **Birth of an Atoll** (05:04 duration)
(https://youtu.be/pRD8ZwdPYsY)

Next: Individually, read Zones Across the Reef on pages 92-95 in: Coral Reefs and Climate Change (Second Edition) text book.

List and briefly describe the most common types of reefs, in order of how they develop: (1 sentence each)

1. _____

2. _____

3. _____

4. _____

11. Based on your learning, what kind of reef is the reef at Pioneer Bay? Explain why. (2 sentences)

_____

_____

_____

_____

Common Types of Coral Reef

Fringing reef (with spur and groove formation)

Barrier reef

Atoll

WHAT IS A CORAL?

12. Based on what you've learned about reef profiles, sketch a typical fringing reef profile (in the space below) identifying the different types of reef habitat you might find along it. Bonus: What types of coral colonies might you find in each zone (include these in your sketch). Be sure to include the following:

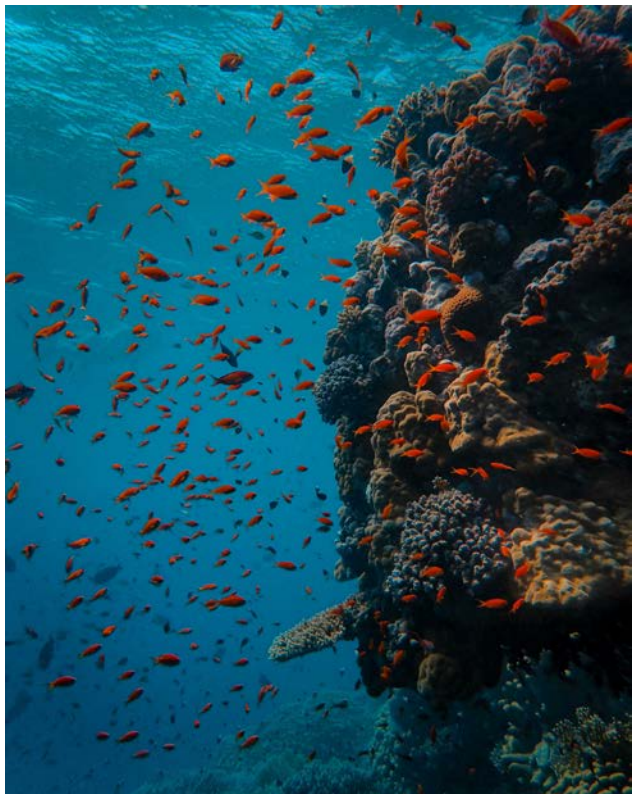
a. Reef Flat
b. Reef Crest
c. Reef Slope

Coral Reef Habitats

Reef flat (at low tide)

Reef flat

Reef crest



Reef slopes