



Underwater Coral City

Understanding the World Through Corals



Key Learning Points

Overview

Through various interactive games, students will learn fundamental coral ecology, particularly their importance as ecosystem engineers in the marine environment. The session encourages students to reflect on the impact of human activities on corals, raising awareness of coral conservation and inspiring them to practice coastal protection.

Learning Objectives

1. Educate students on coral classification, structure, and biological traits
2. Introduce students to the interactions and ecological relationships between corals and other marine organisms
3. Reinforce the importance of corals in sustaining marine ecosystem stability
4. Encourage students to actively protect corals and their habitats in daily life

Values and Attitudes

Empathy, Responsibility, Commitment

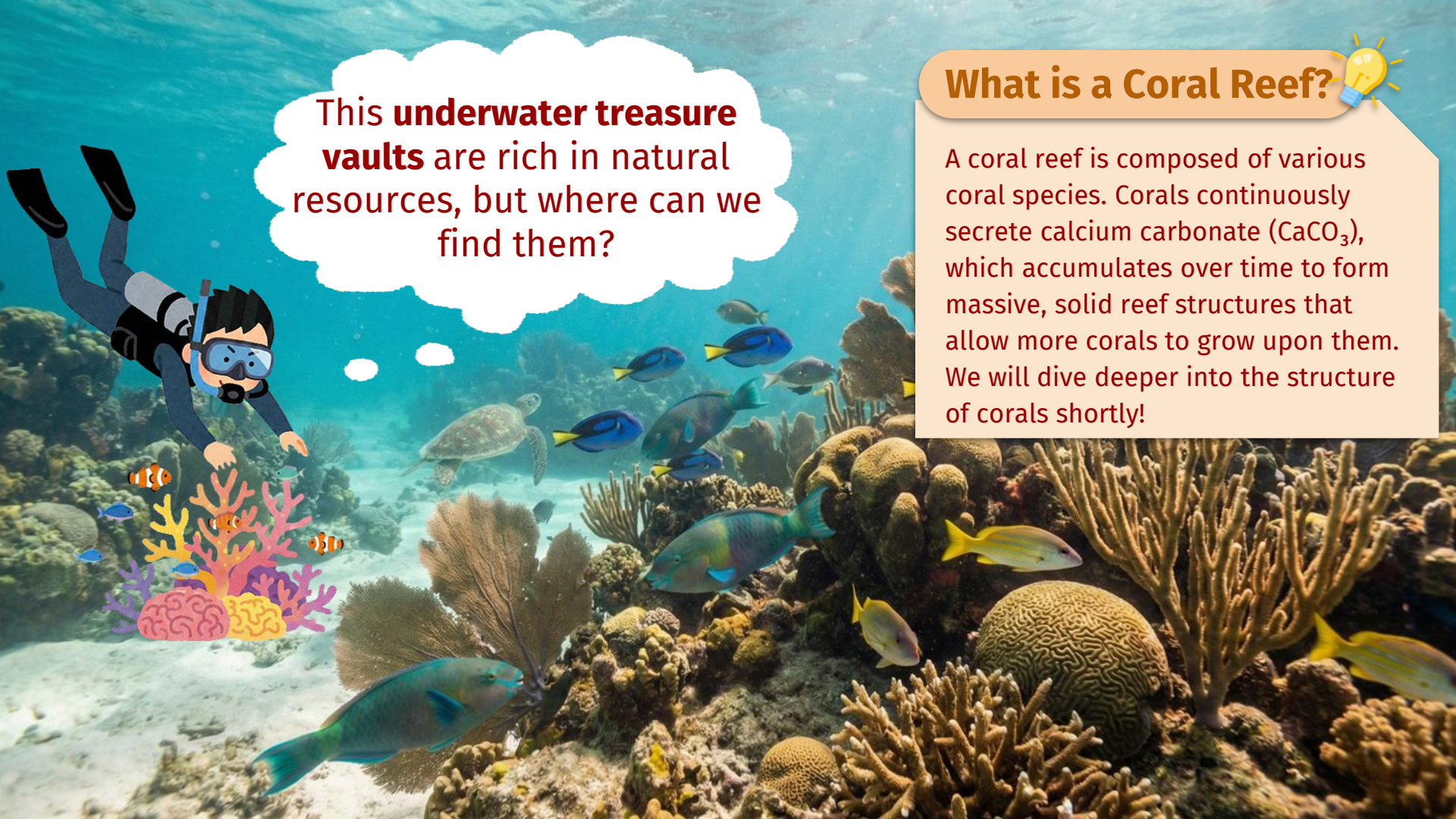
Lesson Duration

Two 40-minute lessons (80 minutes in total)



The background is a detailed underwater photograph of a coral reef. In the foreground, there are large, brownish-yellow coral structures, including a prominent brain coral. Several fish are visible, including blue tangs, yellow tangs, and a sea turtle swimming in the middle ground. On the left, a cartoon diver with a blue mask and snorkel is reaching out towards a cluster of colorful, stylized coral in shades of pink, yellow, and purple. A thought bubble originates from the diver's head.

Have you ever heard of
coral reefs? They are the
real-world **underwater
treasure vaults!**



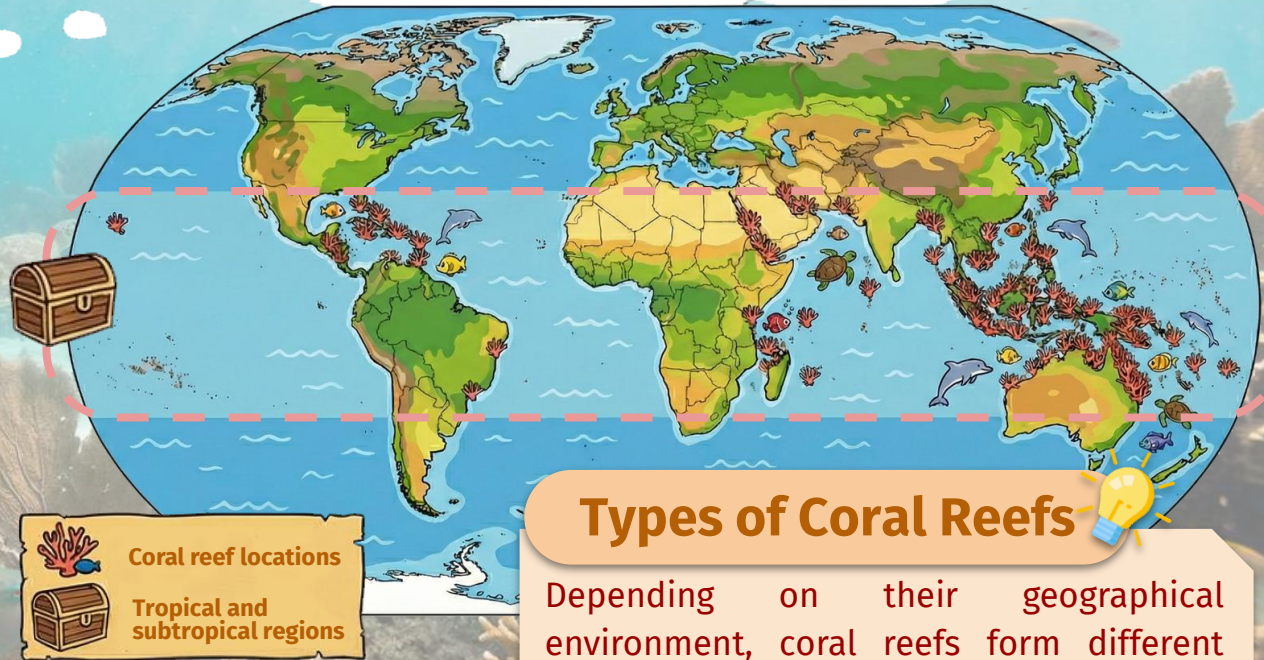
This **underwater treasure vaults** are rich in natural resources, but where can we find them?

What is a Coral Reef?



A coral reef is composed of various coral species. Corals continuously secrete calcium carbonate (CaCO_3), which accumulates over time to form massive, solid reef structures that allow more corals to grow upon them. We will dive deeper into the structure of corals shortly!

Coral reefs are generally distributed in **tropical and subtropical regions**. They thrive in **warm, shallow coastal waters** that are **clean** and **clear**.



Types of Coral Reefs

Depending on their geographical environment, coral reefs form different shapes and types, such as fringing reefs, barrier reefs, and atolls.

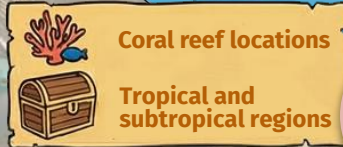
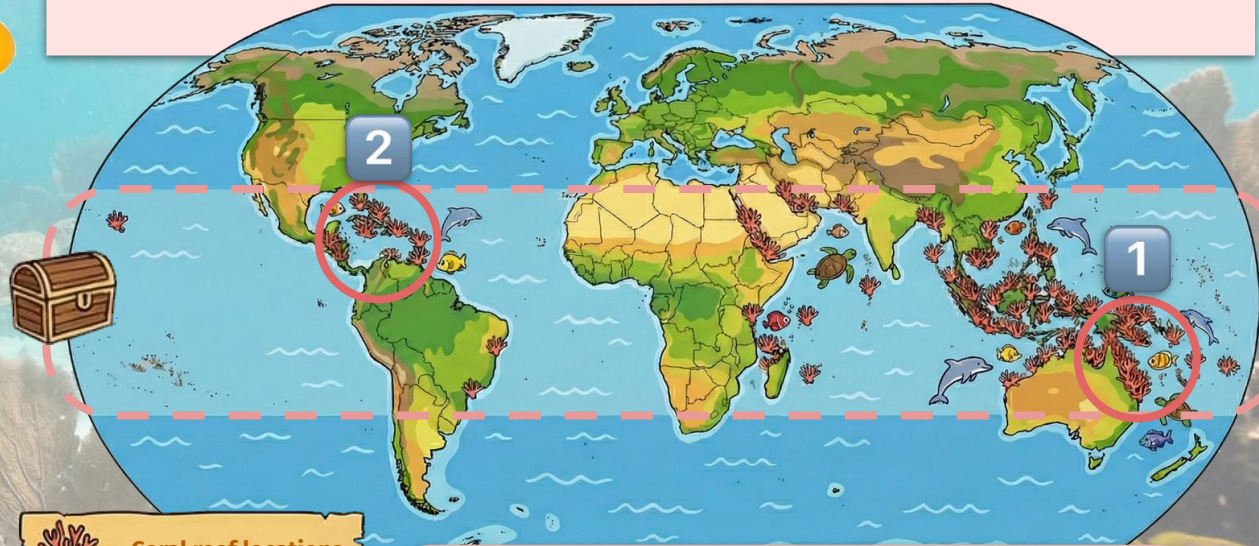
The world's largest coral reef by surface area is
1 The Great Barrier Reef on Australia's
northeast coast; The second largest is
2 The Belize Barrier Reef in the Caribbean Sea.



The Great Barrier Reef

The world's largest and longest coral reef ecosystem, covering an area of 348,700 square kilometres—equivalent to about 126 Hong Kongs!

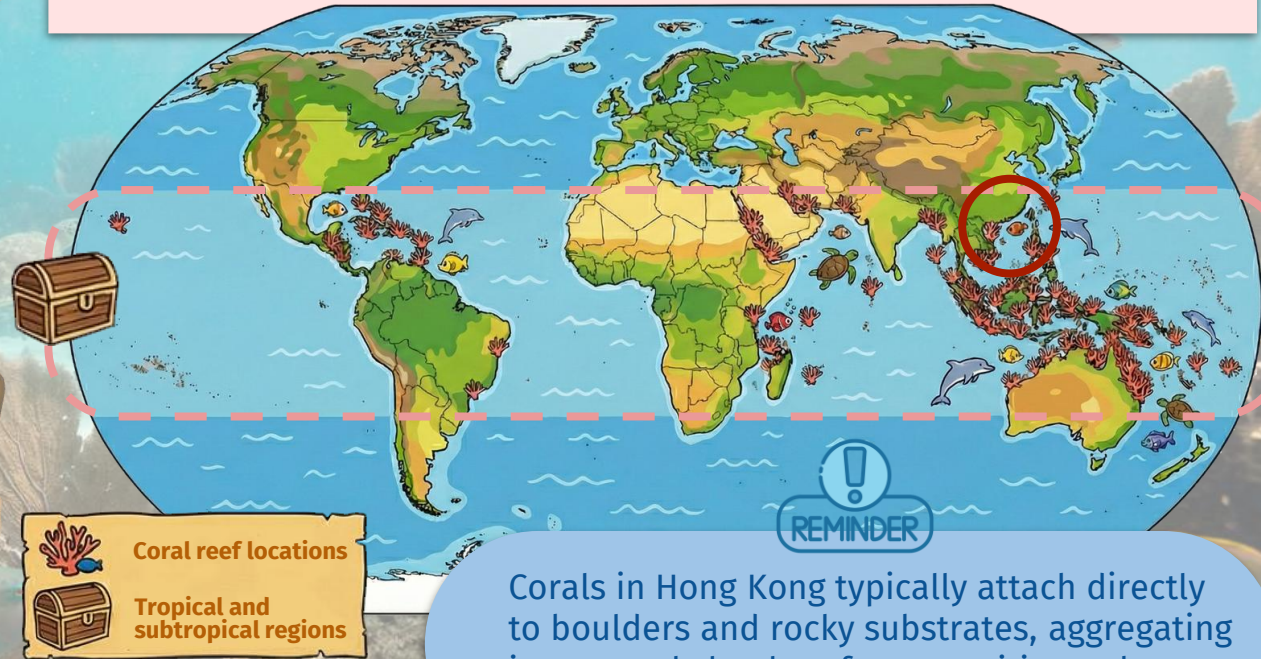
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1 The Great Barrier Reef on Australia's
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2 The Belize Barrier Reef in the Caribbean Sea.



Can you locate the distribution of coral
reefs in Hong Kong on the map?



Hong Kong lacks coral reefs, yet it supports diverse and flourishing **coral communities**.

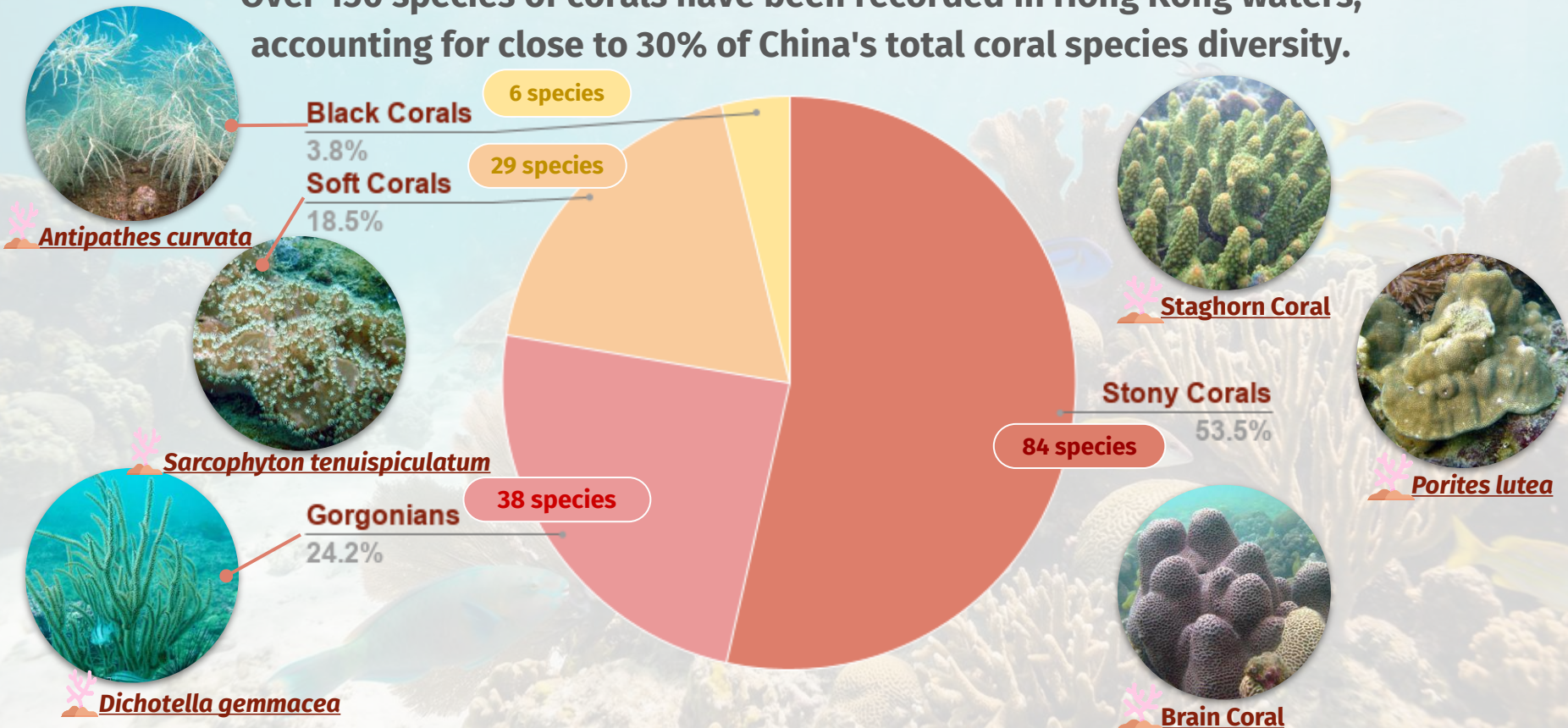


Corals in Hong Kong typically attach directly to boulders and rocky substrates, aggregating into non-skeletal reef communities rather than true reef structures.

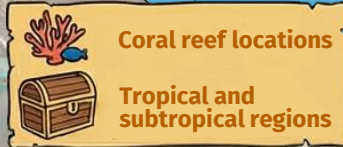
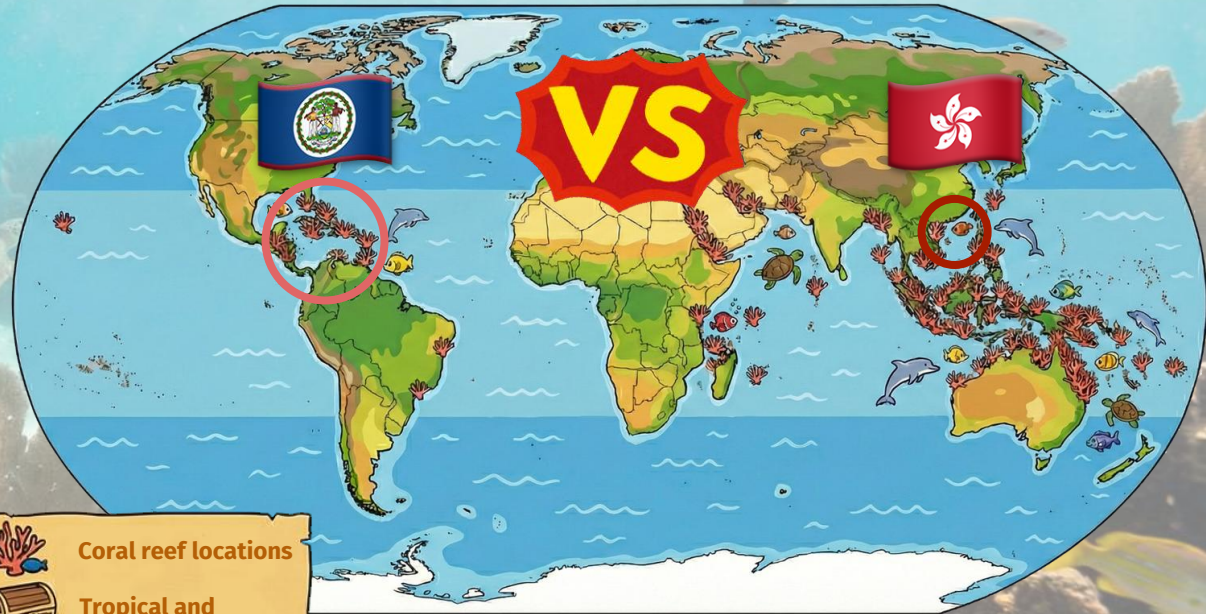
Corals in Hong Kong



Over 150 species of corals have been recorded in Hong Kong waters, accounting for close to 30% of China's total coral species diversity.



Between **the Belize Barrier Reef** and **Hong Kong's coral communities**, which one has more stony coral species?

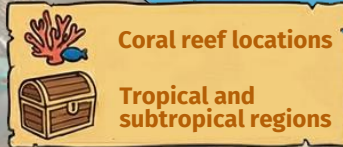


Between **the Belize Barrier Reef and Hong Kong's coral communities**, which one has more stony coral species?



Hong Kong's Coral Diversity

Although Hong Kong does not have vast barrier reefs, looking solely at one type of coral—stony corals—Hong Kong boasts 84 species. This even exceeds the 65 species found in the Belize Barrier Reef, the second-largest barrier reef in the world!



Where Are the Corals?



Hong Kong boasts rich coral diversity, yet corals cannot be found in all local marine waters.

Corals thrive only under specific environmental conditions:



Seawater temperature maintained at 25–28°C



Seawater salinity maintained at 32–35 ppt



Hard substrate seabed for attachment



Gentle ocean currents

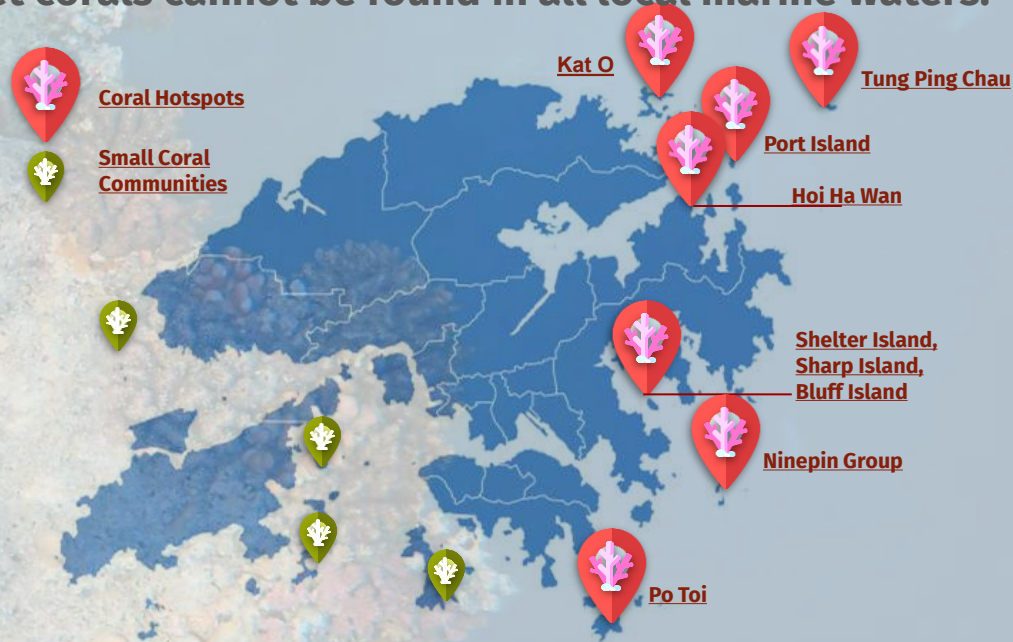


Shallow water areas no deeper than 30 meters

Where Are the Corals?



Hong Kong boasts rich coral diversity, yet corals cannot be found in all local marine waters.



Do you notice any distribution pattern among Hong Kong's corals?



Where Are the Corals?



Hong Kong boasts rich coral diversity, yet corals cannot be found in all local marine waters.



Pearl River Delta:

- Estuarine waters
- Fresh water from inland, with lower and unstable salinity

Coral Hotspots

Small Coral Communities

South China Sea

- Marine waters
- Higher salinity

They mostly grow along the coastal waters of eastern Hong Kong.



Eastern HK: Influenced by South China Sea currents; stable salinity of 32–35 ppt

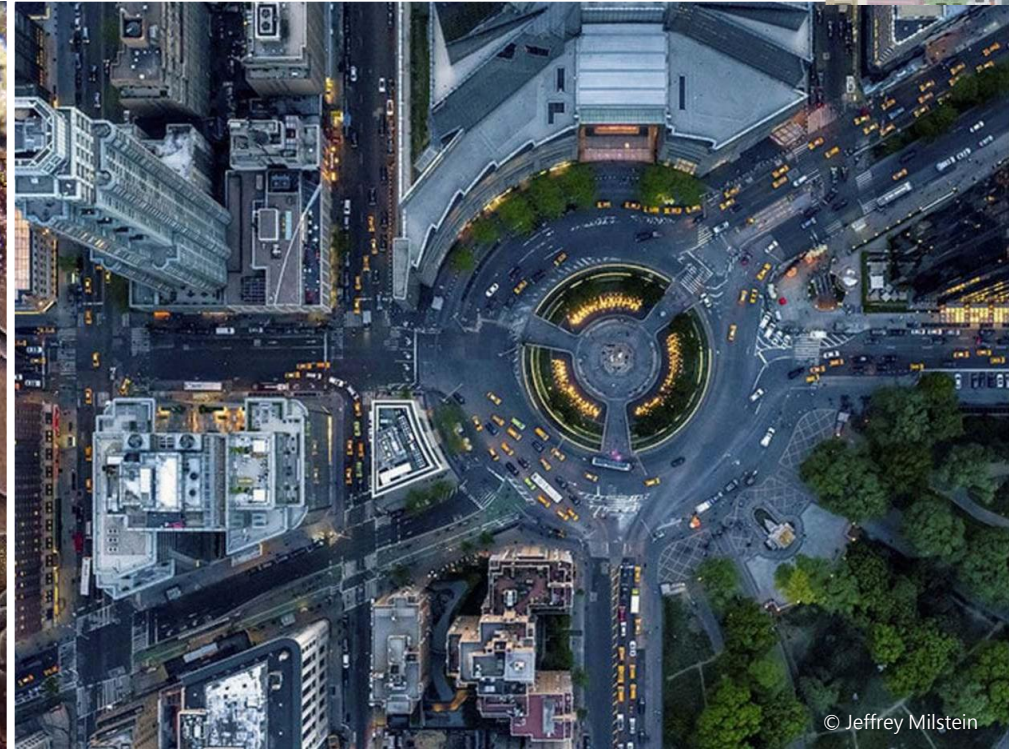


Depth: Restricted to shallow coastal zones under 30 metres

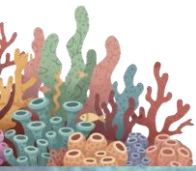




A coral reef ecosystem is very similar to a human city!



If the buildings in the photo represent corals,
what do the pedestrians and vehicles moving through them represent?



A coral reef ecosystem is very similar to a human city!



Let's start with the corals and explore the ecological environment of the entire coral community together!

If the buildings in the photo represent corals, what do the pedestrians and vehicles moving through them represent?

The "buildings" in the photo are called corals. What kind of organisms are they?

Try matching the following phyla with their corresponding characteristics and illustrations:



Phylum Cnidaria

Presence of stinging cells on the body surface



Phylum Annelida

Soft, unsegmented body plan



Phylum Arthropoda

Segmented body



Phylum Chordata

Spines and tube feet on the outer skin



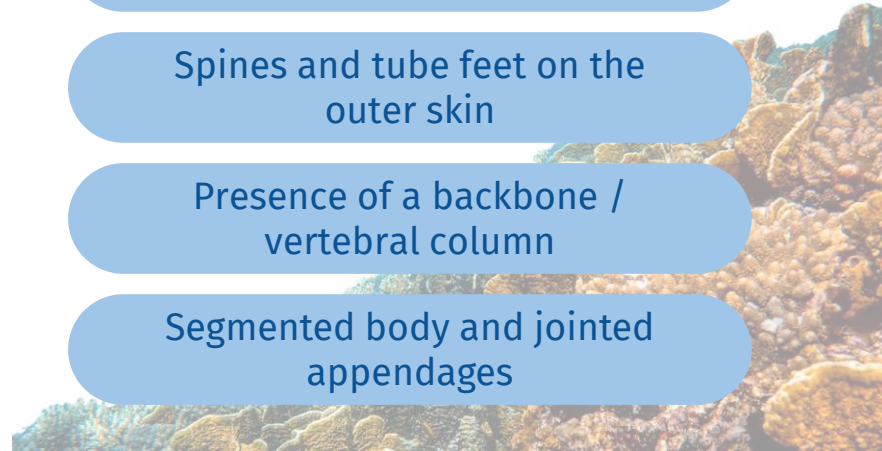
Phylum Echinodermata

Presence of a backbone / vertebral column



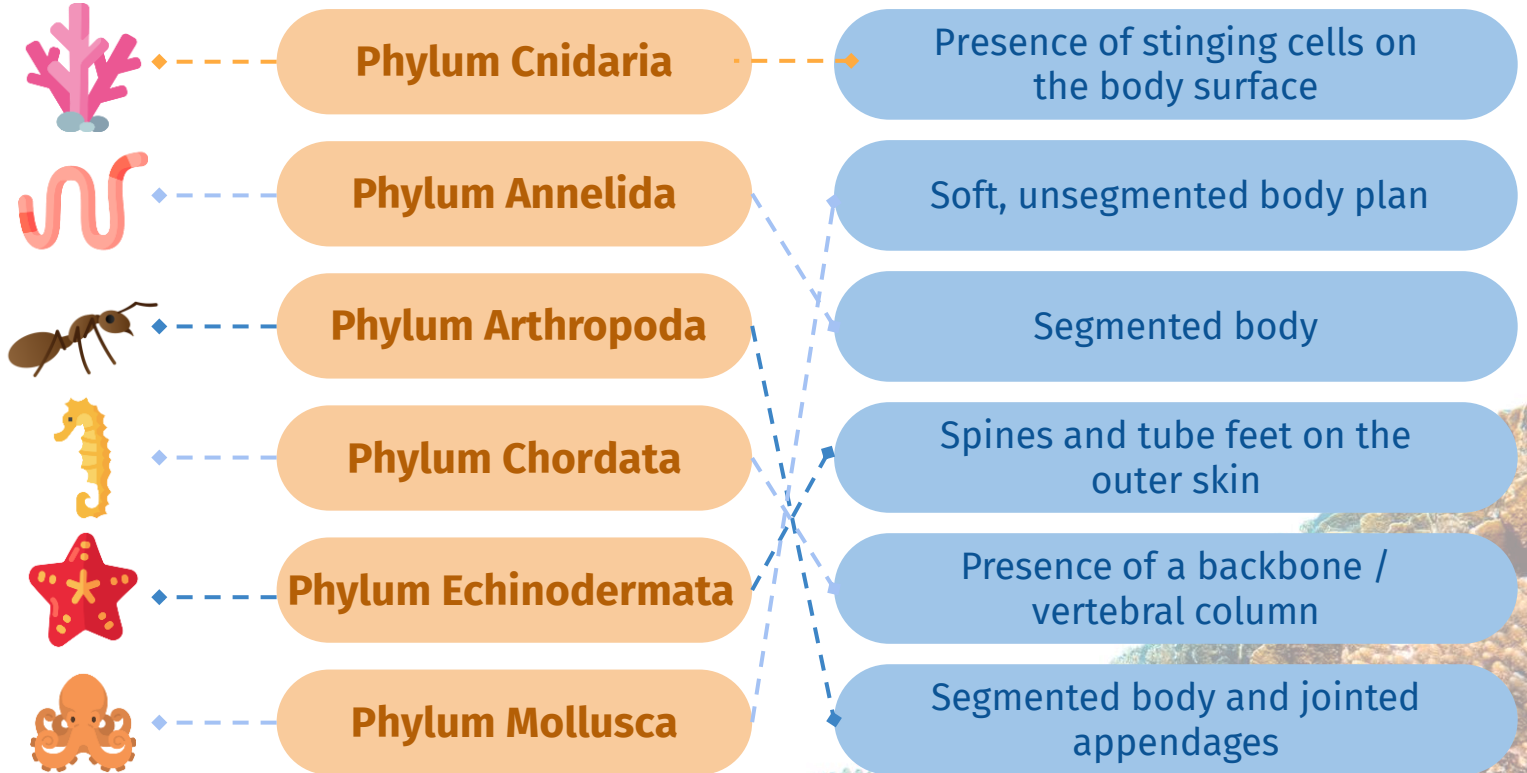
Phylum Mollusca

Segmented body and jointed appendages



The "buildings" in the photo are called corals. What kind of organisms are they?

Try matching the following phyla with their corresponding characteristics and illustrations:



Corals belong to the Phylum Cnidaria

In addition to stinging cells (cnidocytes), corals share several key characteristics:



Phylum Cnidaria

Presence of stinging cells on the body surface

Hollow gastrovascular cavity

Tentacles surrounding the mouth

Radial symmetry

Carnivorous diet

Aquatic lifestyle



© tohamina

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Aquatic lifestyle



Why don't corals look like the description?

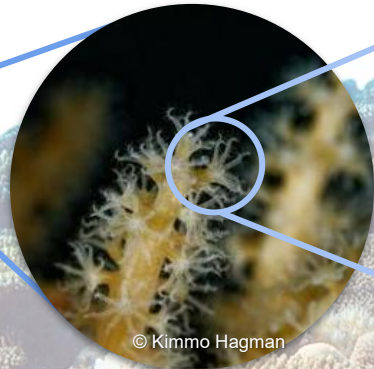


Corals Are Made of Coral Polyps



A coral polyp serves as the fundamental individual unit of a coral, and each polyp can survive independently.

Try checking if coral polyps possess the common traits of Phylum Cnidaria!



Coral Polyps



Structure of Coral Polyps

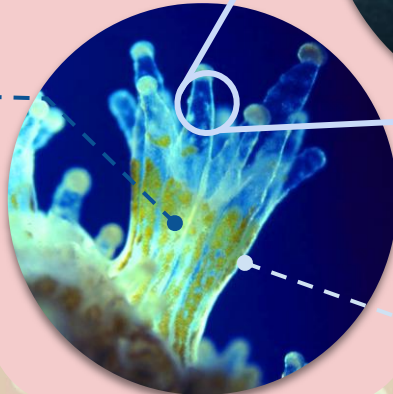


Presence of stinging cells on the body surface

Tentacles surrounding the mouth

Radial symmetry

Coral Polyps



Hollow gastrovascular cavity

Carnivorous diet

Aquatic lifestyle



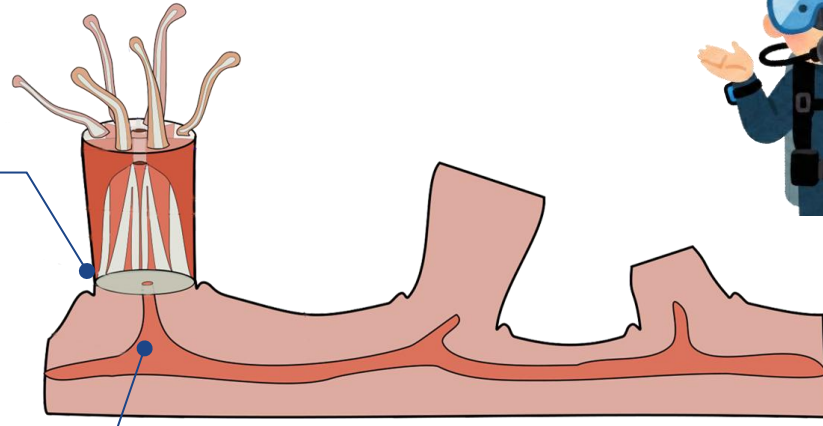
Coral Polyps, Assemble! 🍷🍷🍷🍷

Although individual coral polyps can survive on their own, coming together allows them to play a much bigger role in nature...



How do they
connect with
one another?

- The base of every coral polyp is firmly attached to a hard surface, like a solid calcium carbonate skeleton.
- The central gastrovascular cavities of individual coral polyps are interconnected through canals, sharing nutrients and fluids with neighbouring polyps.



Coral Polyps, Assemble!

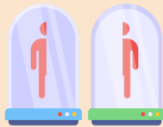
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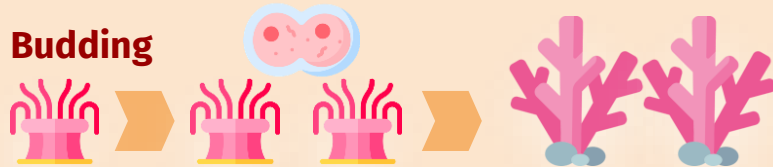
Asexual Reproduction

Coral polyps clone themselves using similar principles to produce the next generation. Corals opt for asexual reproduction in the following situations:

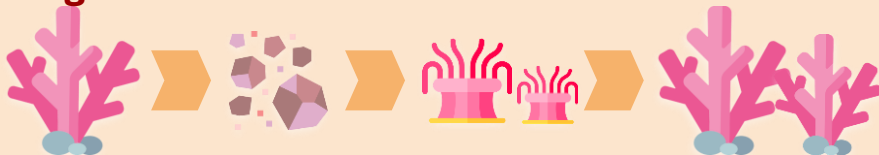
- Early development
- Wound repair
- Replacing dead corals
- Rapidly expanding the colony within a short timeframe



Budding



Fragmentation



Coral Polyps, Assemble! 🪸🪸🪸🪸

Although individual coral polyps can survive on their own, coming together allows them to play a much bigger role in nature...



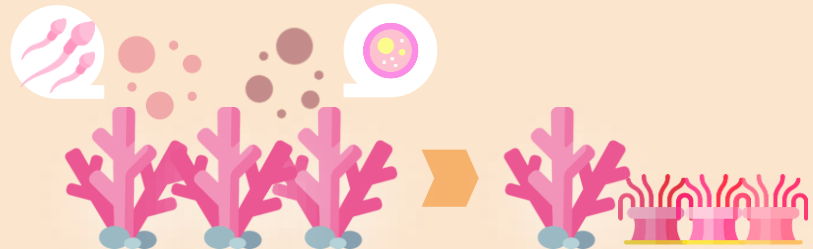
Sexual Reproduction 💡

Corals reproduce their next generation primarily through sexual reproduction. Every year, they synchronize to release vast amounts of eggs and sperm into the water column. The precise timing of this release depends on:

- Lunar phases
- Changes in magnetic fields
- Temperature shifts
- Chemical signals



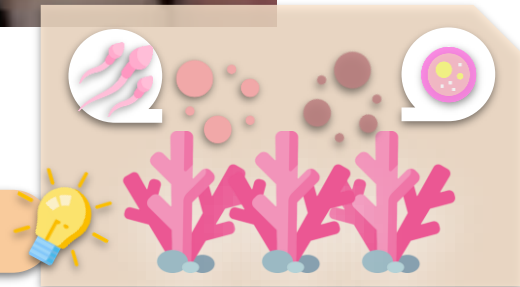
Broadcast Spawning



Coral embryos development

▶ Playback Time: 00:39 - 01:02

Broadcast Spawning





▶ Playback Time: 02:17 - 02:47

Coral Growth

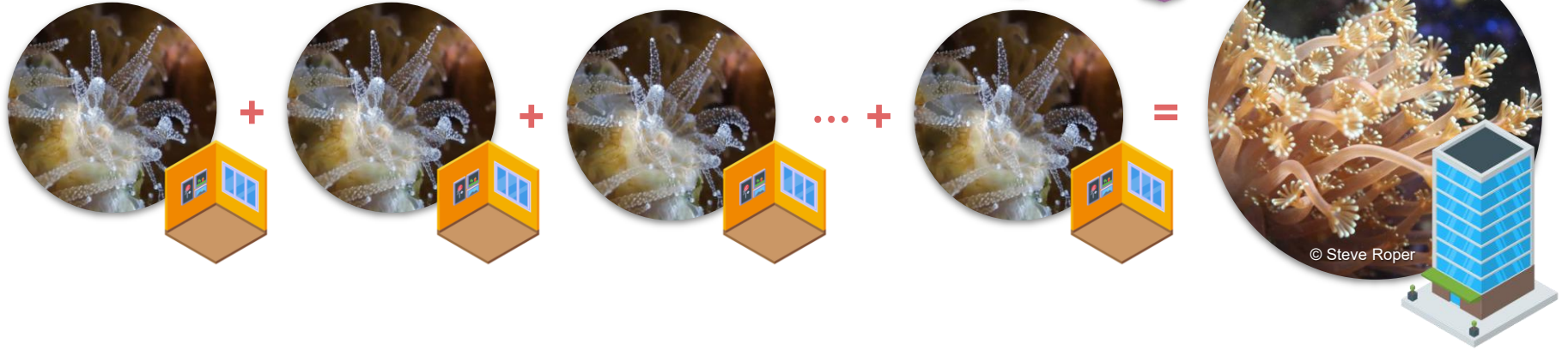


- In Hong Kong's marine environment, corals grow at an average rate of just one centimetre per year.
- A mature coral community takes thousands or even tens of thousands of years to fully form.



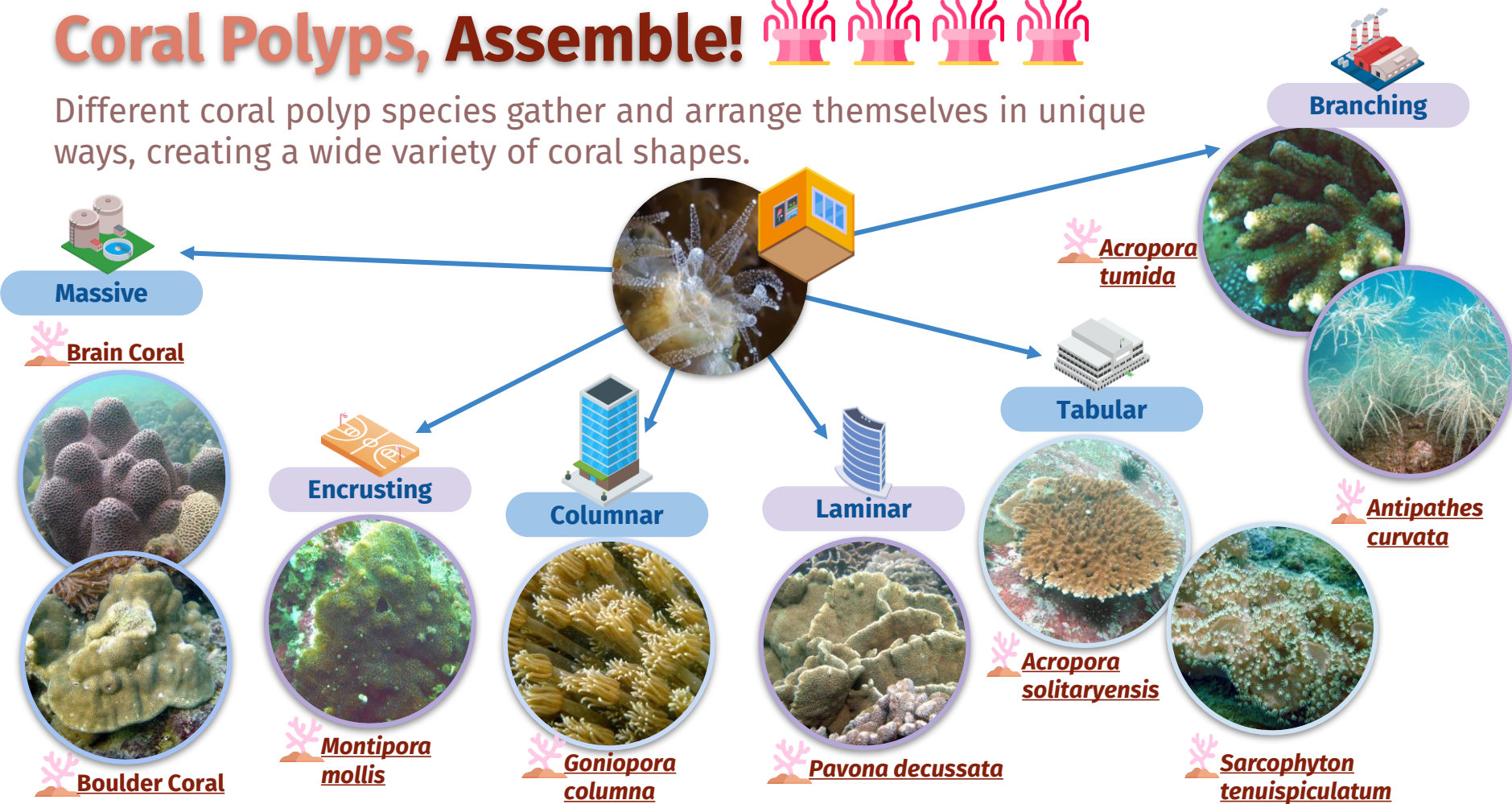
Coral Polyps, Assemble! 🪸 🪸 🪸 🪸

When coral polyps connect together,
they form a coral.



Coral Polyps, Assemble!

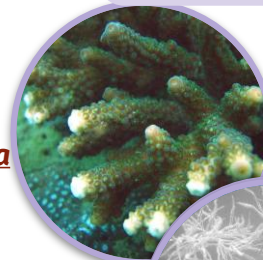
Different coral polyp species gather and arrange themselves in unique ways, creating a wide variety of coral shapes.



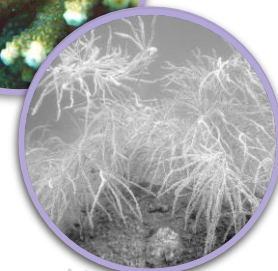
Coral Polyps, Assemble!



Branching



Acropora tumida



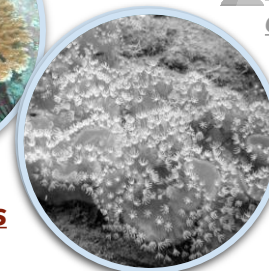
Antipathes curvata



Tabular



Acropora solitaryensis



Sarcophyton tenuispiculatum



Laminar



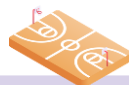
Pavona decussata



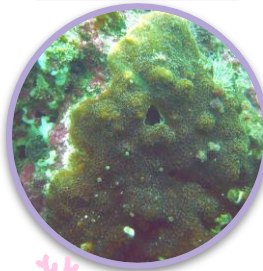
Columnar



Goniopora columna



Encrusting



Montipora mollis



Massive

Brain Coral

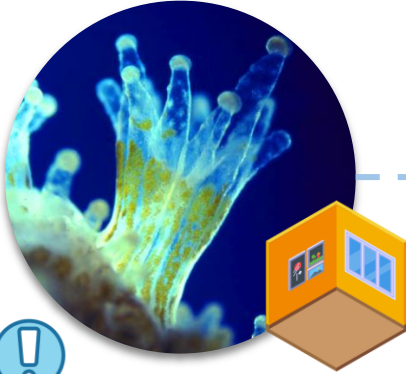


Boulder Coral

Most of the examples shown here belong to stony corals. Even corals within the same category can display completely different growth forms!

Daily Activities of Corals

How do coral polyps hunt for food?



Carnivorous diet



Predation



Actively capturing organic particles and plankton in the water using their tentacles

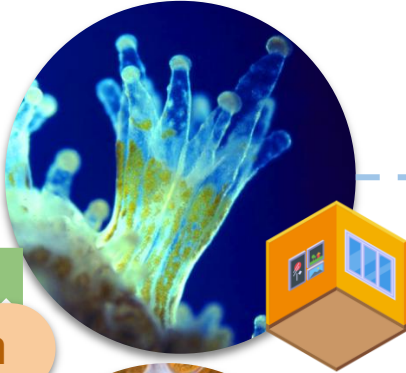


Daily Activities of Corals

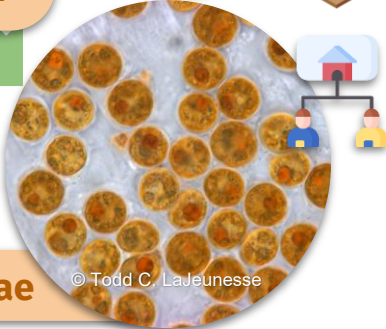
How do coral polyps hunt for food?



Mutualism



Zooxanthellae



© Todd C. LaJeunesse

Predation



Actively capturing organic particles and plankton in the water using their tentacles

Mutualism



- Some coral species have **zooxanthellae** living inside their cells.
- These two different organisms live together, relying on each other and mutually benefiting one another.

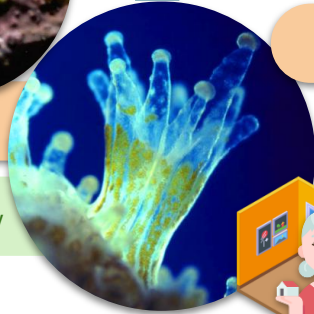
Daily Activities of Corals



How do coral polyps hunt for food?



Predation



Stable shelter

Mutualism



Photosynthesis

Oxygen + Food $\Rightarrow$ Carbon Dioxide + Energy

Sunlight
Carbon Dioxide + Water $\Rightarrow$ Oxygen + Carbohydrates

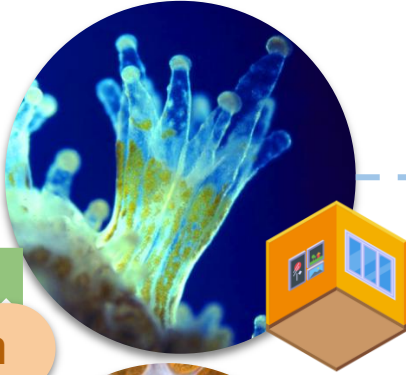
95% of organic food

Daily Activities of Corals

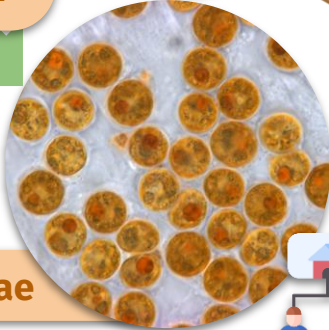
How do coral polyps hunt for food?



Mutualism



Zooxanthellae



Predation

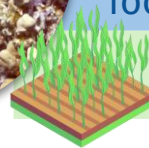


Actively capturing organic particles and plankton in the water using their tentacles

Photosynthesis



Performing photosynthesis using sunlight to produce their own food, making them self-sufficient



Sunlight
Carbon Dioxide + Water $\rightarrow$ Oxygen + Carbohydrates

Zooxanthellae

53.5%

Hong Kong
Coral Species

46.5%

Reef-Building Corals

- Mainly stony corals, whose calcium carbonate skeletons overlap to form complex structural frameworks
- Symbiosis with **zooxanthellae**
- Restricted to clear, shallow waters to ensure sufficient light penetration for **zooxanthellae** photosynthesis
- Efficient nutrient cycling to accelerate coral growth for reef formation

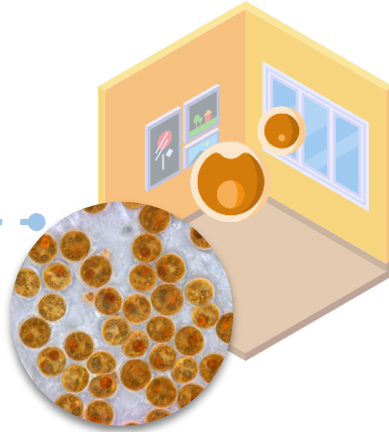
Non-Reef-Building Corals

- Lack symbiotic **zooxanthellae**
- Capable of surviving in low-light environments across a wide range of water depths
- Inability to form coral reefs

Corals Community



Besides zooxanthellae, what other good neighbours do coral polyps have?



Corals Community

Besides zooxanthellae, what other good neighbours do coral polyps have?

Coral communities establish complex ecological habitats that attract diverse marine organisms. What ecological resources do corals provide?

- Shelter and refuge from predators
- Courtship and breeding grounds
- Egg-laying sites
- Nursery grounds
- Cleaning stations



Chinese Spiny Lobster



Coral Fish



Bluestreak Cleaner Wrasse



Impatient Sea Cucumber

Commensalism

- Commensalism is a symbiotic relationship where one species benefits **while the host is neither helped nor harmed**.
- Various creatures **shelter** in complex coral structures without affecting or benefiting the coral host.



Corals Community



Besides zooxanthellae, what other good neighbours do coral polyps have?



Coral communities establish complex ecological habitats that attract diverse marine organisms. What ecological resources do corals provide?

- Diverse food sources



 Carnivorous

Yellow
Hawkfish



 Omnivorous

Hongkong
Butterflyfish



 Detritivorous

Banded Coral
Shrimp



 Herbivorous

Blue-Barred
Parrotfish



Corals Community



Besides zooxanthellae, what other good neighbours do coral polyps have?



Coral communities establish complex ecological habitats that attract diverse marine organisms. What ecological resources do corals provide?

- Diverse food sources**



© University of California

Parrotfish spend up to 90% of their time grazing on algae covering coral surfaces. This allows the symbiotic zooxanthellae to carry out photosynthesis more effectively, helping corals grow healthier.



Mutualism



Two different organisms live together, **relying on each other and mutually benefiting one another**

- Corals supply the primary food source for parrotfish.
- In return, parrotfish ensure the healthy growth of corals.



Herbivorous

Blue-Barred
Parrotfish

Corals Community



Besides zooxanthellae, what other good neighbours do coral polyps have?



Coral communities establish complex ecological habitats that attract diverse marine organisms. What ecological resources do corals provide?

- **Diverse food sources**



© Sisbro Studios

Parrotfish occasionally ingest coral skeletons, grinding them down into **sand** that form **part of the seabed**.



Ecosystem Engineers



Organisms that significantly modulate, maintain, and structure ecological habitats, exerting a huge impact on the ecosystem

- Parrotfish facilitate beach formation.



Herbivorous

Blue-Barred
Parrotfish



The Importance of Corals



Ecosystem Engineers



**Coral communities form a unique and
irreplaceable habitat.**

The Importance of Corals



Ecosystem Engineers



Coral communities form a unique and irreplaceable habitat.

They build an entire ecosystem all on their own!

The Importance of Corals



Ecosystem Engineers



Coral communities form a unique and irreplaceable habitat.

They build an entire ecosystem all on their own!

They support biodiversity by harbouring over 800,000 marine species.

The Importance of Corals



Ecosystem Engineers



Did you know?

Beyond their role as ecosystem engineers, corals provide essential socioeconomic ecosystem services to human society.



The Importance of Corals



Ecosystem Services

The **direct** and **indirect** benefits that humans get from nature, including:

- Natural resources & raw materials
- Climate & environmental regulation
- Culture & recreation, and more!

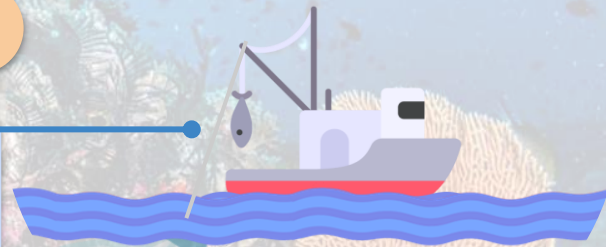


The Importance of Corals



Ecosystem Services

Despite occupying merely **0.09%** of the global seafloor area, coral ecosystems sustain approximately **10%** of global marine fishery resources.



The Importance of Corals



Ecosystem Services

Coral structures deposit calcium carbonate sediments that form beaches while stabilizing benthic substrates, serving as natural barriers against wave erosion and coastal degradation.



The Importance of Corals



Ecosystem Services

Bioactive compounds extracted from soft corals and gorgonians yield critical raw materials for anti-cancer pharmaceutical therapies.



The Importance of Corals



Ecosystem Services

Carbon Sink



Coral skeletons absorb carbon dioxide to build **calcium carbonate**, while their symbiotic zooxanthellae take in even more through **photosynthesis**. Together, they **store massive amounts of CO₂**, helping slow down global warming.

CO₂



The Importance of Corals



Ecosystem Services

Coral reef diving and snorkelling attract millions of visitors worldwide, generating substantial economic value through ecotourism.



Summary

- Corals belong to the **phylum Cnidaria**.
- Corals are made up of individual **coral polyps**—different species arrange themselves into distinct shapes and structures.
- Corals can only reproduce and build colonies under **specific environmental conditions and seasons**.
- Corals establish diverse **symbiotic relationships** (such as mutualism and commensalism) with various species.
- Corals function as **ecosystem engineers**, supporting ecosystem stability and providing essential services to human society.





Recap of Session 1



- Corals belong to the **phylum Cnidaria**.
- **Coral polyp** arrangements form diverse colony growth forms.
- Spawning requires precise **environmental conditions**.
- Corals establish diverse **symbiotic relationships** with various species.
- Corals function as **ecosystem engineers**, supporting marine and human life.

Do you still remember these key ecology terms?



Phylum Cnidaria

Photosynthesis

Mutualism

Commensalism

Ecosystem Engineers

Ecosystem Services



Recap of Session 1



- Corals belong to the **phylum Cnidaria**.
- **Coral polyp** arrangements form diverse colony growth forms.
- Spawning requires precise **environmental conditions**.
- Corals establish diverse **symbiotic relationships** with various species.
- Corals function as **ecosystem engineers**, supporting marine and human life.



But did you know? Corals around the world are sounding an alarm for us all!



Why did the coral in the photo turn white?



This is coral's
Stress Response!



What is Coral Bleaching?

 Environmental changes happen



Symbiotic algae leaves corals



Only transparent coral polyps and calcium carbonate skeletons remain



How Severe Is Coral Bleaching?



December 2014

February 2015



© XL Catlin Seaview Survey



Samoa

In 2015, local sea surface temperatures surged by up to 8°C within less than two months. This rapid thermal stress induced widespread bleaching in nearly 80% of the coral population, resulting in severe mortality.

How Severe Is Coral Bleaching?



Australia

2024



75% of the Great Barrier Reef region experienced coral bleaching.

2024



Hong Kong

73% of the corals at Sharp Island experienced coral bleaching.

What causes Coral Bleaching?



 **Environmental changes happen**



Symbiotic algae leaves corals

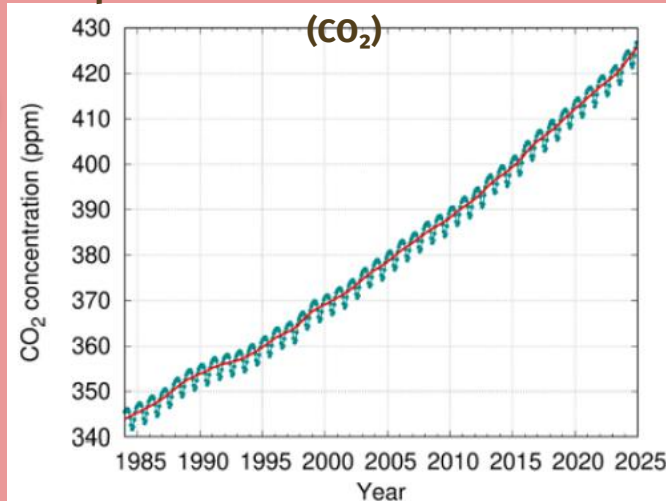


Only transparent coral polyps and calcium carbonate skeletons remain



pH change

Atmospheric concentrations of carbon dioxide



Increase in atmospheric CO₂



Increased absorption of CO₂ by surface ocean waters



Decline in ocean pH values



Ocean Acidification



Disruption of **calcification** processes in marine organisms

What causes Coral Bleaching?



 **Environmental changes happen**

 **Symbiotic algae leaves corals**

 **Only transparent coral polyps and calcium carbonate skeletons remain**

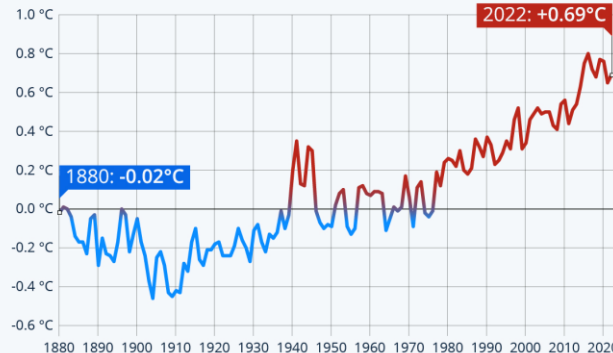
 **pH change**

 **Temperature change**

The Oceans Are Getting Warmer

Annual divergence of global ocean surf from 20th century average

statista



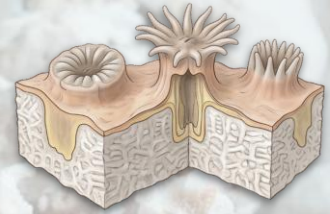
Increase in atmospheric CO_2

↓
Intensification of the greenhouse effect

↓
Elevation of sea surface temperatures

↓
Increased **Thermal Stress**  on corals

What causes Coral Bleaching?



Environmental changes happen



Symbiotic algae leaves corals

Each polyp is attached on one side to a calcium carbonate skeleton



pH change

- Ocean acidification drastically reduces carbonate ions for corals.
- Corals struggle to build new skeletons while old ones dissolve, shrinking the space for symbiotic algae.



Temperature change

- High temperatures inhibit photosynthesis in symbiotic algae.
- Stressed symbiotic algae release toxins, triggering coral rejection.



What causes Coral Bleaching?



 Environmental changes happen



Symbiotic algae leaves corals



Only transparent coral polyps and calcium carbonate skeletons remain



pH change



Temperature change



- Losing symbiotic algae fades the coral's vibrant colors, exposing its white skeleton.
- Deprived of their primary food source, corals grow increasingly weak.
- If environmental conditions continue to worsen, corals will starve to death and be covered by algae.



**Is this coral also
impacted by coral
bleaching?**



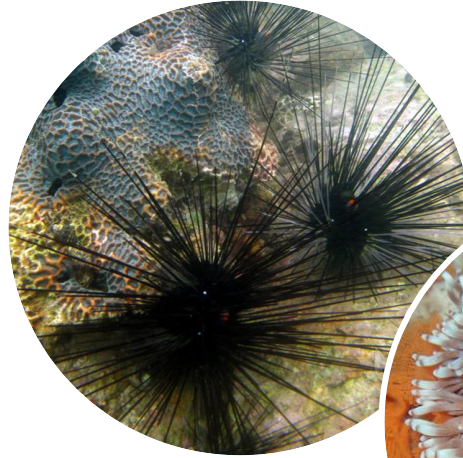
Bioerosion

- A naturally occurring ecological process
- Driven by the activities of bioeroding organisms, such as foraging and structural shelter excavation
- Inducing structural damage to calcium carbonate coral skeletons



Think About It!

Is bioerosion entirely harmful to corals with no benefits at all?



Bioerosion



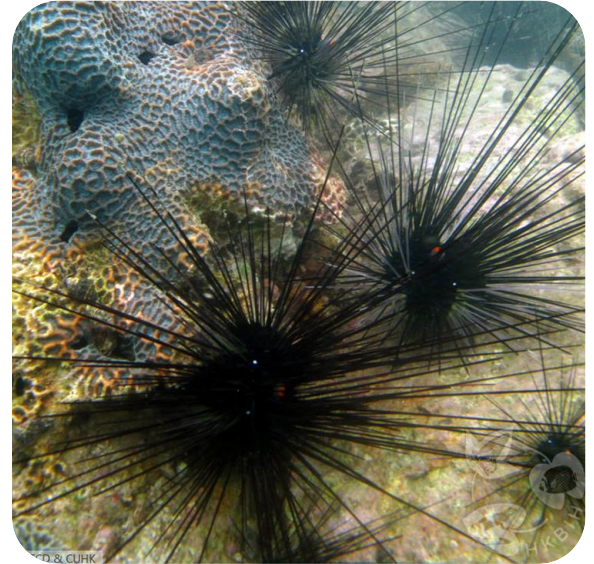
- Long-spined Sea Urchins (Diadema) function simultaneously as **bioeroders** and herbivorous grazers that **regulate algal populations**.
- As algae compete with corals for benthic substrate, sea urchins grazing **prevents algal overgrowth from covering coral colonies**.
- By **balancing** the competition between both sides, sea urchins play a vital role in maintaining coral reef health.



Only excessive bioerosion impacts coral skeletons!



Long-spined Sea Urchin





Environmental Change x Bioerosion

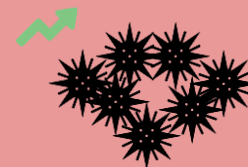


**Climate change
(e.g., rising temperatures)**



Sea urchins fail to adapt and
their numbers decline

Sea urchins adapt well,
gaining an advantage and
increasing in population



Algae populations rise

Intensified grazing behaviour on algal
substrates (excessive bioerosion)



Inhibits coral growth

Other Threats Faced by Corals



How is this related to human activities?

Human activities drive direct and severe threats to more than **60%** of coral reefs globally.



Environmental pollution

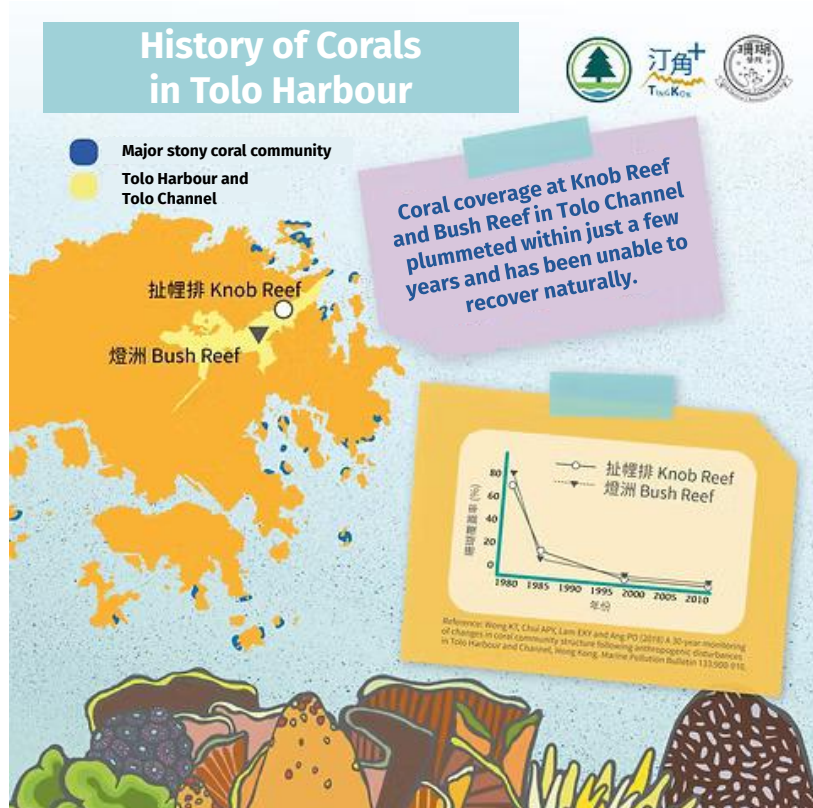


Fishing activities



Recreational activities

Environmental Pollution



- Coral coverage around Che Lei Pai (Knob Reef) in Tolo Harbour dropped drastically from **80%** in the 1980s to just **2%** in 2012.
- Urban development increases sewage discharge. Excess nutrients in sewage act like fertilizer for algae, which boosts their growth so they cover coral surfaces and compete with corals for living space.

Environmental Pollution



Eutrophication



An influx of nitrogen and phosphorus triggers explosive algal blooms, causing a chain of ecological problems.



© Pekka Tuuri

Impacts on Corals

- Direct smothering: Fast-growing algae blanket corals, blocking sunlight for zooxanthellae photosynthesis and preventing tentacle feeding.
- Recruitment failure: Rapid algal occupation of rock surfaces deprives free-swimming coral larvae of substrate, halting population growth.

Environmental Pollution

- Sunscreen ingredients like **oxybenzone** and **octinoxate (OMC)** accelerate coral bleaching and disrupt endocrine systems, causing abnormal skeletal growth.
- In 2021, Hawaii became the first region to legally ban the sale of specific reef-harming sunscreens.



Fishing Activities



Think About It!

**How does this fishing method
affect corals?**

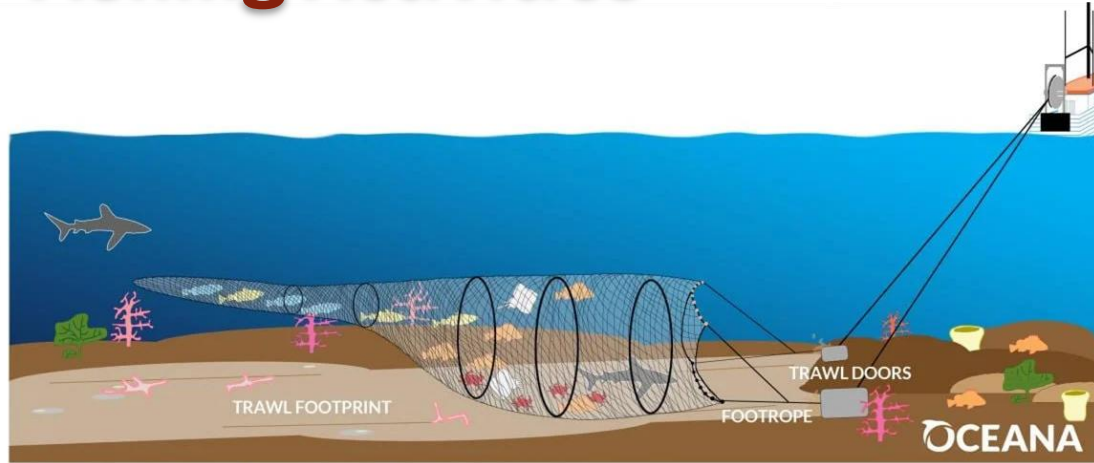
Bottom Trawler

Fishing Activities



 Playback Time: 00:00 - 01:50

Fishing Activities



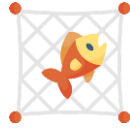
**Illustration is representative of gear used, not set to actual scale.*

Trawling is a **destructive** fishing method:

- Destroys the seabed, damaging corals and benthic ecosystems
- Stirs up sediment, blocking light and hindering coral photosynthesis



Ghost Nets



Ghost nets entangle corals and other marine life, and obstruct light penetration for photosynthesis.



"Ghost Nets":
Abandoned fishing gear
in the ocean



© David Poon



Copyright © Robert Delfs, 2007

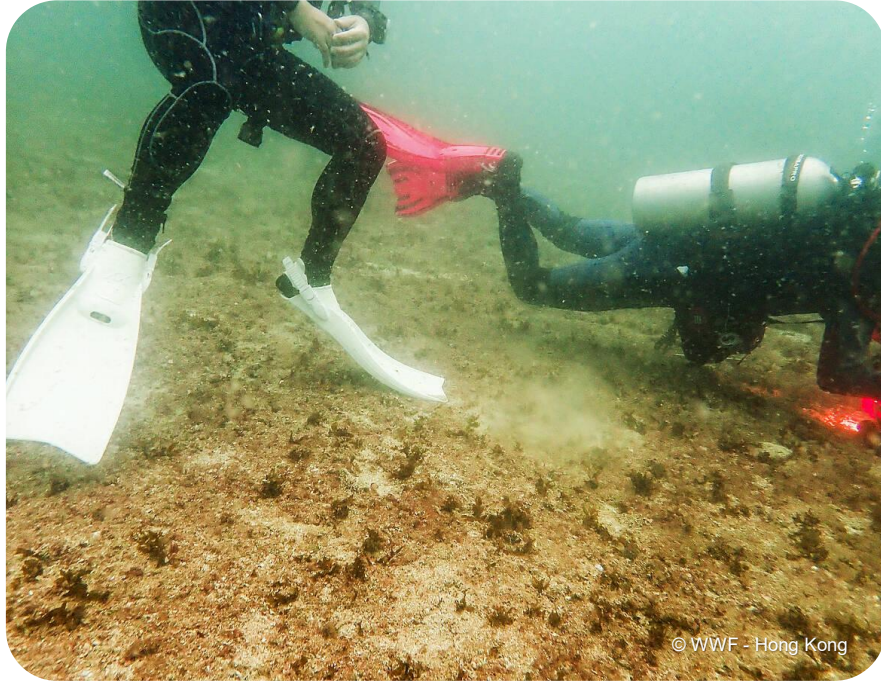
© Robert Delfs

Recreational Activities



Think About It!

What improper behaviour is demonstrated by the diver in the image?



Corals Conservation Efforts



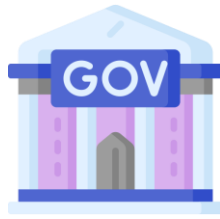
**Given the threats faced by coral reefs,
what actions can various stakeholders take to conserve coral ecosystems?**



Divers



Fishermen



Government



Scientists



General Public

Legal Protection



Marine Parks Ordinance (Cap. 476)



Regulates and enforces
activity management
within designated **Marine
Parks and Marine Reserves**

Legal Protection

Several Marine Parks & Marine Reserve were established specifically for coral conservation!



Cape D'Aguilar Marine Reserve



Rich biodiversity, housing stony corals, soft corals, and sea fans (gorgonians)



Hoi Ha Wan Marine Park



Contains one of the finest and healthiest coral communities in Hong Kong



Tung Ping Chau Marine Park



Features high stony coral diversity, high coral coverage, and species richness

Legal Protection

Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)



Regulates the import and export of corals; a license is required to possess **protected corals**

- Blue Coral
- Organ Pipe Coral
- Black Coral
- Stony Coral
- Fire Coral
- Lace Coral



Blue Coral



Black Coral



Stony Coral

Legal Protection

Amendments to Subsidiary Legislation under the Fisheries Protection Ordinance (Cap. 171)



Enforced on December 31, 2012, prohibiting **non-selective** fishing activities within Hong Kong marine waters



Hong Kong Biodiversity
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Ecology and Biodiversity of Benthic Marine Ecosystems Before and After the Trawling Ban in Hong Kong Coastal Waters

Fisheries resources in Hong Kong had been overexploited since the 1970s. Yet, approximately 400 bottom trawlers still operated in our coastal waters, accounting for 80% of the total fishing effort, nearly double the environmentally-sustainable level. These bottom trawlers capture fishes, shrimps and crabs unselectively, irrespective of their commercial or ecological value, and have demonstrably overexploited many stocks. The process of bottom trawling also leads to severe and repeated physical damage to marine benthic ecosystems, with negative effects on biodiversity. To mitigate these impacts, the Hong Kong SAR Government has imposed a territory-wide ban on bottom trawling from 31 December 2012; this is intended to allow recovery of the seabed and associated marine resources.

Our project team tested the overarching hypothesis that the trawl ban would result in the recovery of HK's benthic marine ecosystems and associated fisheries. The research team collected sediment samples with five replicates from each of 28 locations in Hong Kong waters in June 2012 (prior to the trawl ban) and two and a half years after the trawl ban, and then examined for physicochemical properties and macro-benthic animals.

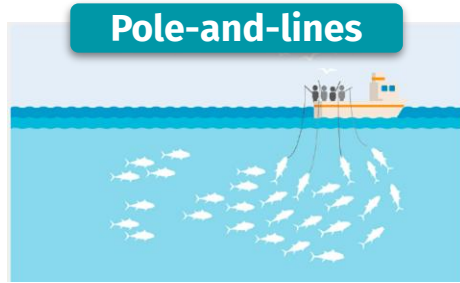
The results revealed significantly lower levels of suspended solids (SUS) in the water column and significantly higher levels of total organic matter (TOM) in the sediments two and a half years after the ban. Compared to the survey conducted in 2012, the average amount of SUS was reduced by 1.36 mg/L (~25%) in the water column while the average amount of TOM increased by 1.6 mg/L (~20%) in surface sediment after the ban, indicating decreased



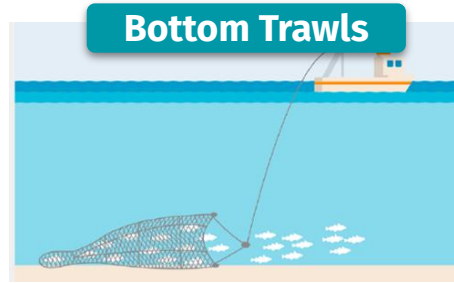
Non-selective Fishing Methods

This refers to fishing methods that **do not target specific species, size classes, or population limits, indiscriminately harvesting all marine life** within range.

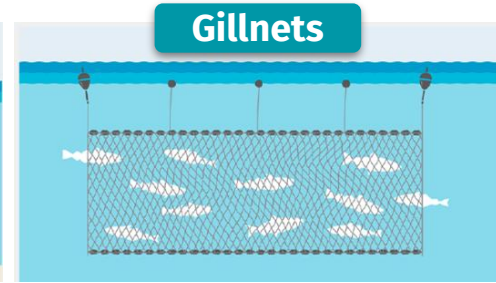
Compare the three fishing methods below. Which one is the most eco-friendly?



Fishermen utilize rods, lines, and hooks to selectively capture target fish species individually.



Vessels drag weighted, large-scale trawl nets along the benthic floor, indiscriminately harvesting all marine organisms in a single sweep.



Large panels of gillnets are deployed vertically to drift with ocean currents, entangling or wedging fish by their gills as they attempt to pass through the mesh.

Marker Buoys

Placed in core coral areas to advise mariners against anchoring within the zone



Coral Restoration



Sexual Reproduction

Collect **egg-sperm bundles** during coral spawning events



Provide artificial **settlement substrates** for the larvae

Asexual Reproduction

Collect **coral fragments**



Nurture the fragments in nurseries and attach them securely to **settlement substrates**



Nurture them in research centres until they reach an **appropriate size**



Transplant cultivated corals to designated restoration zones



Conduct regular **monitoring** and health check-ups

環境及自然保育基金資助
珊瑚復育大行動
Environment and Conservation Fund
Coral Restoration Action

認識香港珊瑚

及修復工作

Exploring Hong Kong Corals and Restoration Work



Playback Time: 02:35 - 04:49

3D-Printed Coral Reef Tiles



Think About It!

What innovative technology is used in this project?

What are the benefits of this maze-like structure?



Hong Kong Reef Check



- Initiated in 2000
- An annual event
- Co-organised by AFCD and HK Reef Check Foundation
- Carried out by teams of volunteer divers



Hong Kong Reef Check



What data does the survey collect?

Coral Coverage: Understand the local distribution, population trends, and health status of corals

Line Transect Form 樣線數據表

Site name 調查區名稱:

Team 隊伍:

TS 隊伍科學家:

Recorded by 記錄者:

Date 日期:

Time 時間:

Depth 深度:

Substrate Code 簡稱代碼:

HC hard corals 石珊瑚

SC soft corals 軟珊瑚 RKC recently killed coral 最近死亡的珊瑚

NIA nutrient indicator algae 營養指標海藻 SP sponges 海綿 RC rock 岩石

RB rubble 碎石 SD sand 沙 SI silt/clay 泥沙/黏土 OT others 其他

SEGMENT 1 第一節				SEGMENT 2 第二節				SEGMENT 3 第三節				SEGMENT 4 第四節			
0 - 19.5 m 米				25 - 44.5 m 米				50 - 69.5 m 米				75 - 94.5 m 米			
0		10	25		35		50		60		75		85		
0.5		10.5	25.5		35.5		50.5		60.5		75.5		85.5		
1		11	26		36		51		61		76		86		
1.5		11.5	26.5		36.5		51.5		61.5		76.5		86.5		
2		12	27		37		52		62		77		87		
2.5		12.5	27.5		37.5		52.5		62.5		77.5		87.5		
3		13	28		38		53		63		78		88		
3.5		13.5	28.5		38.5		53.5		63.5		78.5		88.5		
4		14	29		39		54		64		79		89		
4.5		14.5	29.5		39.5		54.5		64.5		79.5		89.5		
5		15	30		40		55		65		80		90		
5.5		15.5	30.5		40.5		55.5		65.5		80.5		90.5		
6		16	31		41		56		66		81		91		
6.5		16.5	31.5		41.5		56.5		66.5		81.5		91.5		
7		17	32		42		57		67		82		92		
7.5		17.5	32.5		42.5		57.5		67.5		82.5		92.5		
8		18	33		43		58		68		83		93		
8.5		18.5	33.5		43.5		58.5		68.5		83.5		93.5		
9		19	34		44		59		69		84		94		
9.5		19.5	34.5		44.5		59.5		69.5		84.5		94.5		
Coral bleaching / Diseases 珊瑚白化 / 疾病								0 - 19.5 m 米	25 - 44.5 m 米	50 - 69.5 m 米	75 - 94.5 m 米				
Bleaching 白化	No. of coral species 珊瑚品種數量														
	No. of colony / area (m ²) 個體數量 / 面積														
Diseases 疾病	No. of coral species 珊瑚品種數量														
	No. of colony / area (m ²) 個體數量 / 面積														

Other notes 其他記錄:

Hong Kong Reef Check



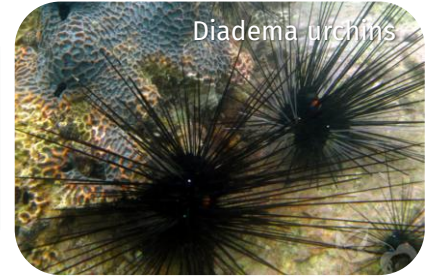
What data does the survey collect?

Indicator Species: Assess the biodiversity and overall health of the coral reef ecosystem

Examples:



Butterfly Fish



Diadema urchins



Nudibranch



Arabian Cowrie



Seahorse



Grouper

Coral Bleaching Sighting Report



If members of the public discover coral bleaching, they can notify AFCD via an online form for follow-up action.



香港珊瑚白化觀察報告

Coral Bleaching Sighting Report in Hong Kong

感謝閣下提供珊瑚白化的資料。這些資訊可協助我們掌握更多有關香港珊瑚白化的分布、程度、受影響的品種及面積等資料。

漁農自然護理署可就閣下所提交的資料作研究及教育之用，而您的個人資料亦只會作聯絡用途。如有任何疑問，歡迎透過電郵 mar_con_biodiv@afcd.gov.hk 或電話 3468 5465 聯絡我們。

請只提交在香港水域發現之珊瑚白化記錄，而每一份表格只能填寫一個發現地點之記錄。

Ghost Gear Monitoring



If members of the public discover "ghost nets" in Hong Kong waters, they can notify AFCD and WWF-Hong Kong via an online form.



WWF珊瑚守護者鬼網報告

為使各方對珊瑚礁普查地點及香港水址中的鬼網有更深入的了解，我們需要你的協助提供更多鬼網的資料。請瀏覽 wwf.org.hk/ghostgeardetective_zh 了解更多。

每份報告代表一件鬼網，每個小隊只需就每件鬼網提交一次報告。

你所提交的資料將給予WWF作研究用途。除個人資料以外，所提交的鬼網資料亦將即時轉發到漁農自然護理署。

你所提交的相片或影片將給予WWF作教育或宣傳之用。

如有疑問請電郵至 natalieleung@wwf.org.hk 或致電2161 9656聯絡 梁婧怡小姐。

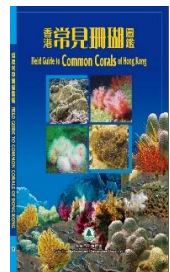
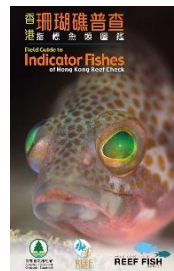
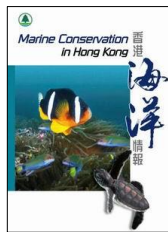
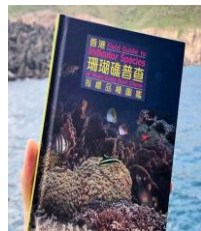
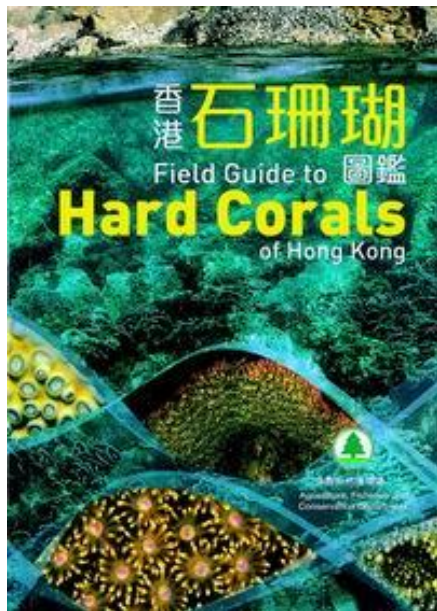
Education & Outreach - Posters



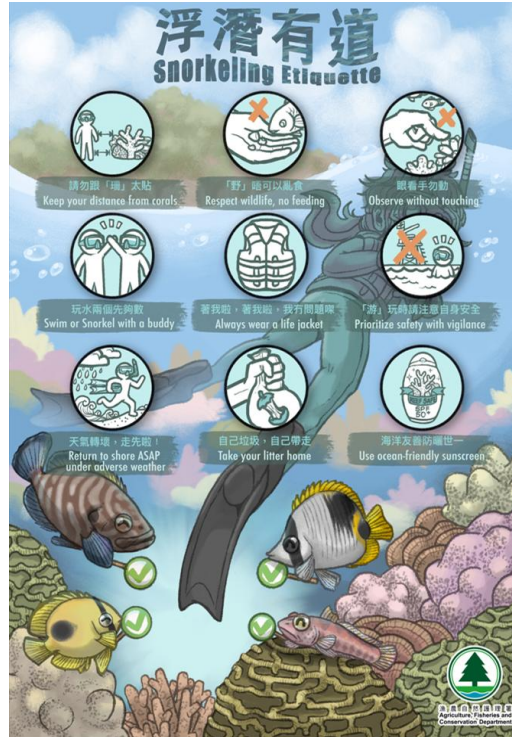
Education & Outreach - Field Guide



Borrow books from the library to learn more!



Education & Outreach - Guidelines and Codes



Promotional Clip



Education & Outreach – Hoi Ha Visitor Centre



Hong Kong's first visitor centre themed around marine parks, using diverse exhibits to showcase local Marine Protected Areas and marine biodiversity.



Guided Eco-tour



Hard Coral Specimens



Workshop

Our Actions

Choose “Ocean-Friendly” Sunscreen Products 



© iherb



© iherb



© iherb

Our Actions

Reduce carbon footprint in daily life



Reduce plastic consumption



Participate in coastal clean-up activities



Never disturb or catch marine creatures



Be a responsible diver



Take part in the Hong Kong Reef Check



Summary (1)

- Coral bleaching is a stress response in corals caused by environmental changes, such as shifting water temperatures and pH levels.
- Beyond climate change, corals face several major threats:
 - Environmental Pollution
 - Destructive Fishing Activities
 - “Ghost Nets”
 - Recreational Activities



Summary (2)

- Everyone in society can team up to protect our corals:
 - Legal Protections
 - Deployment of Marker Buoys
 - Scientific Research & Monitoring
 - Coral Restoration (asexual, sexual)
 - 3D-Printed Coral Reef Tiles
 - Hong Kong Reef Check
 - Coral Bleaching Sighting Report
 - Ghost Gear Record
 - Education & Public Outreach

