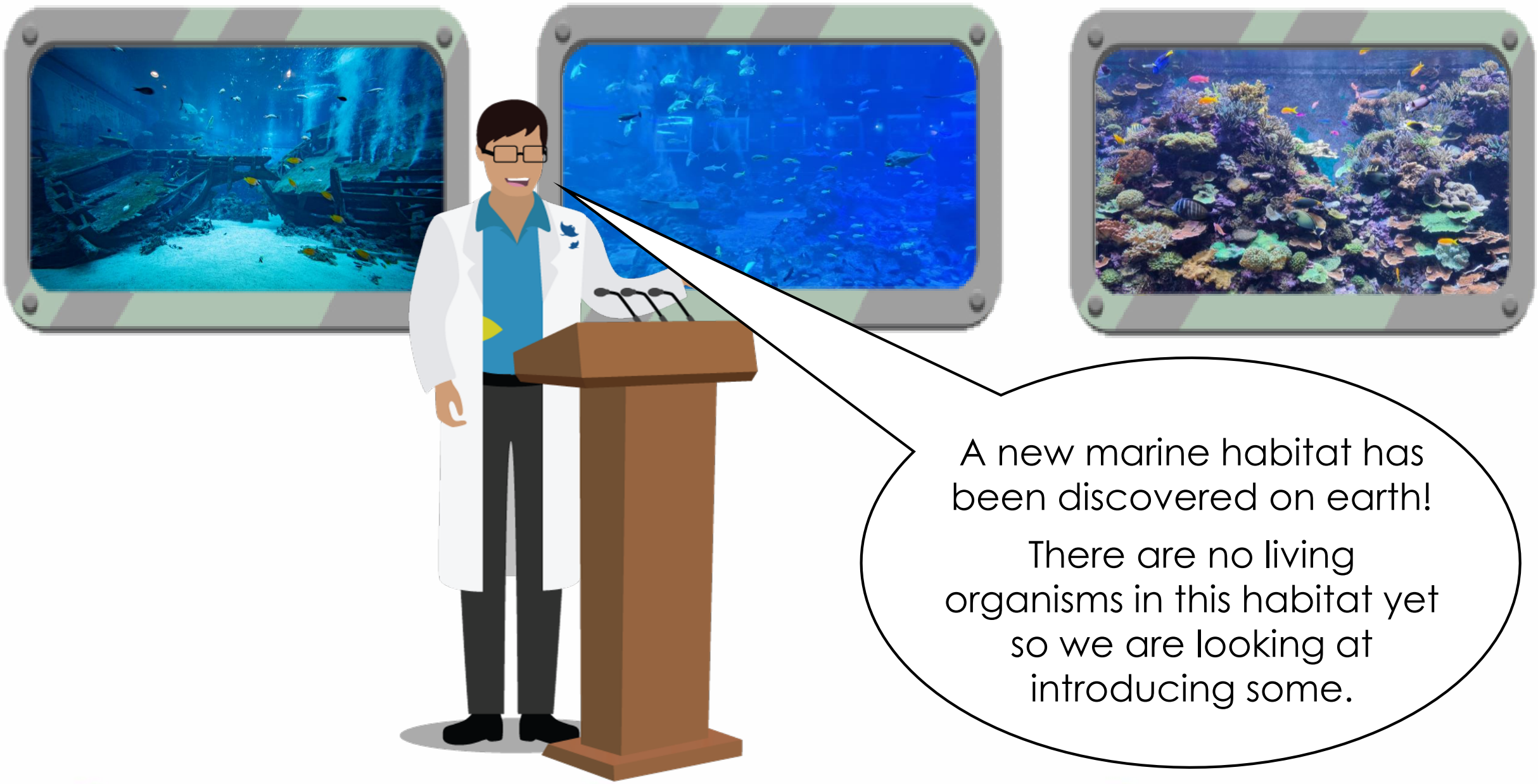
RESORTS WORLD™ SENTOSA
SINGAPORE

S.E.A. AQUARIUM

S.E.A. AQUARIUM EDUCATOR RESOURCES

SECONDARY SCHOOL

Create a Marine Organism


A new marine habitat has been discovered on earth!
There are no living organisms in this habitat yet so we are looking at introducing some.

M Invitation for Project: Create a Marine Organism
<createamarineorganism@email.com>

YOU ARE INVITED!

YOUR MISSION:

Create a marine organism best adapted to the habitat

REQUIREMENT:

1. Marine organism created must adapt to the habitat and any potential environmental changes.
2. Creation needs to pass a series of tests before submission.

Be creative and think out of the box!

Accept invitation

INVESTIGATE PHYSICAL FACTORS OF A MARINE HABITAT

DESCRIBE THESE PHYSICAL FACTORS IN THE FOLLOWING HABITATS

- Temperature
- Light availability
- Water clarity
- Oxygen availability
- Other features that may affect survival

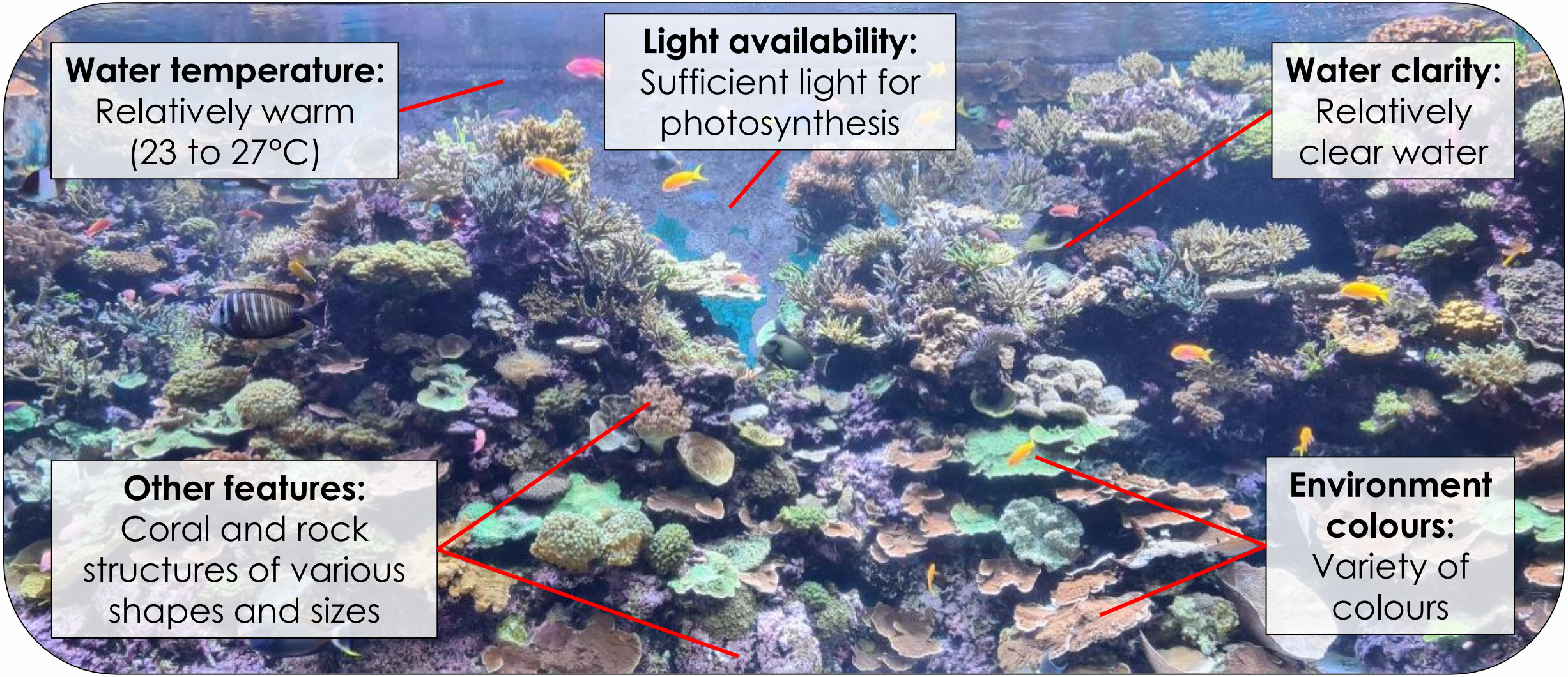
  (e.g. environment colours, vegetation cover)

CORAL REEFS

Describe the physical factors in coral reefs.

Hard corals habitat (S.E.A. Aquarium)

PHYSICAL FACTORS OF CORAL REEFS



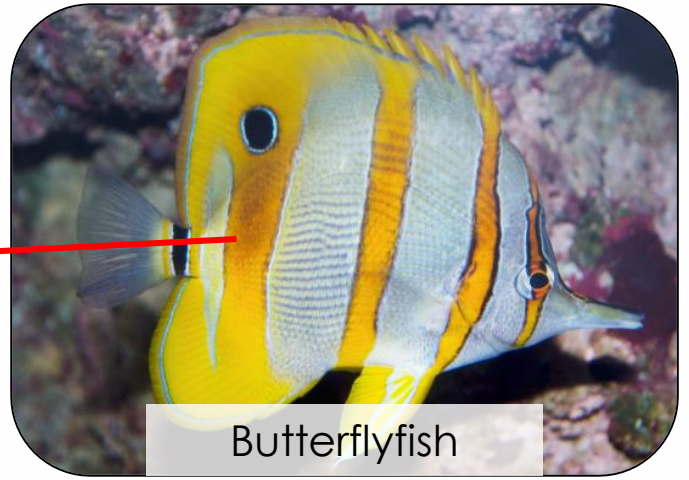
ANIMALS IN CORAL REEFS

How do these animals adapt to the physical factors in coral reefs?

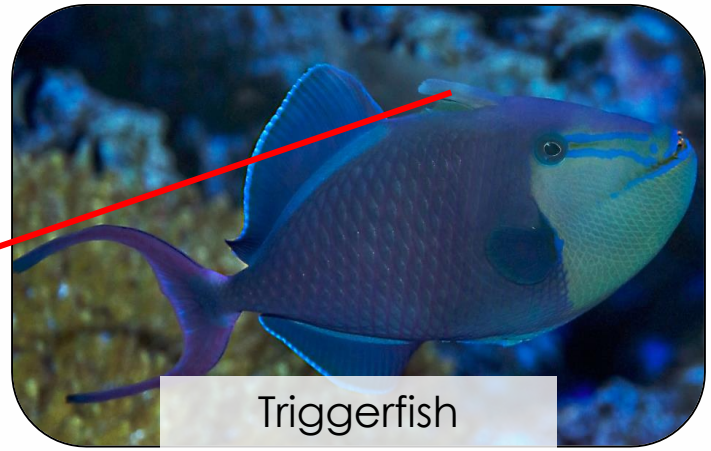
ANIMALS IN CORAL REEFS

Vibrantly-coloured body camouflage amongst corals


Surgeonfish


Butterflyfish

Spines to anchor in crevices


Triggerfish


Moray Eel

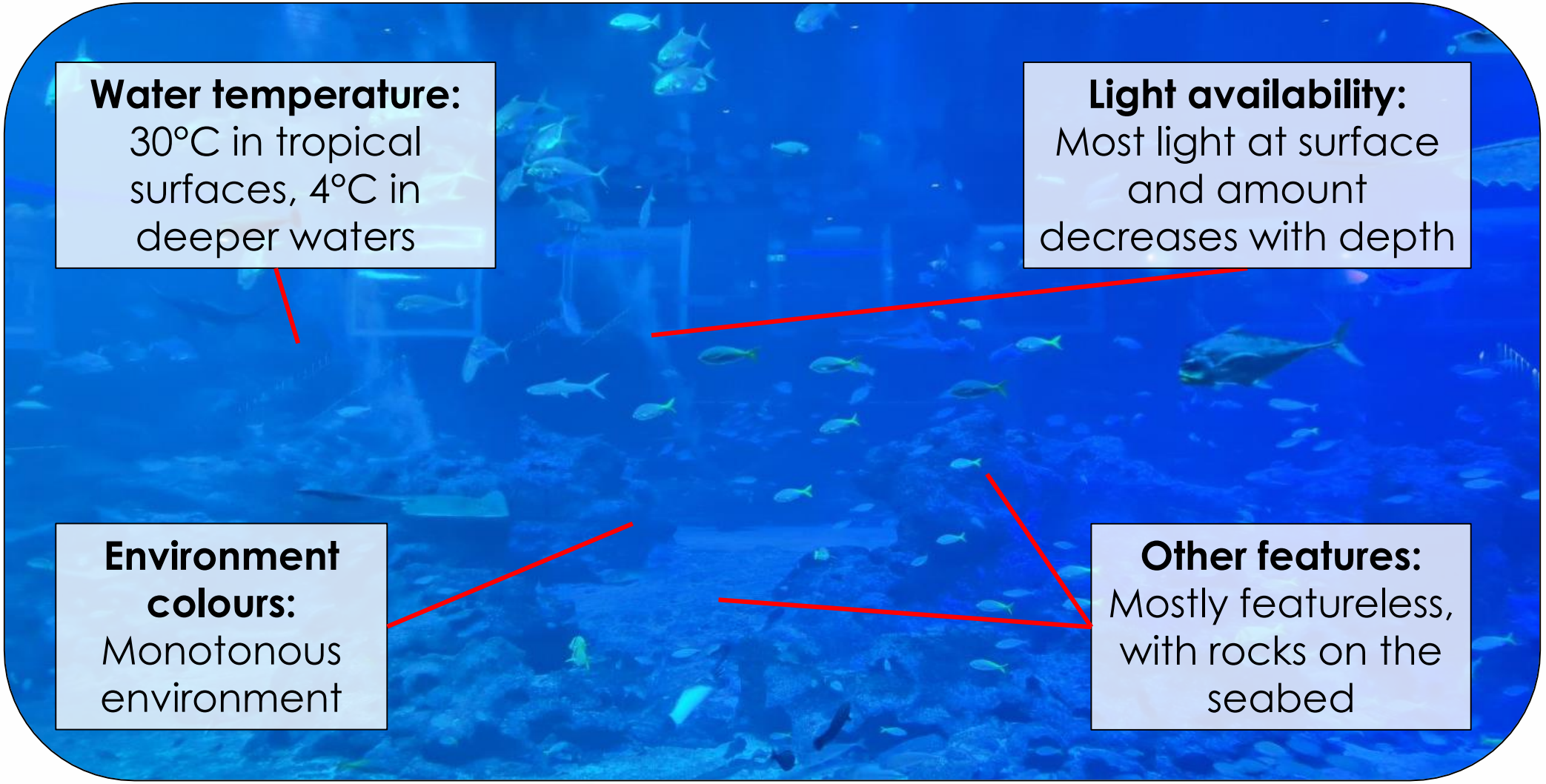
Layer of protective mucus on skin

OPEN OCEAN

Describe the physical factors in the open ocean.

Open Ocean Habitat (S.E.A. Aquarium)

PHYSICAL FACTORS OF OPEN OCEAN

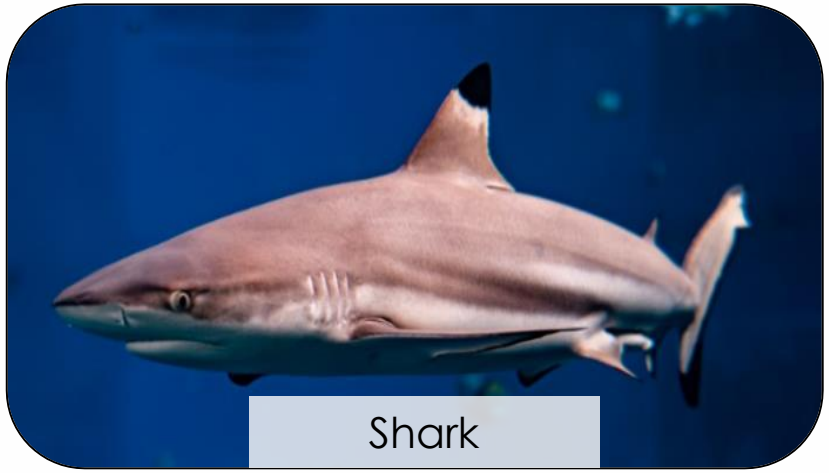


APADTATIONS IN OPEN OCEAN

How do these animals adapt to physical factors in the open ocean?

APADTATIONS IN OPEN OCEAN

Flat body, large pectoral fins and mouth located at the front



Dark and light body colouration for countershading

Dull-coloured body and hover motionlessly in water column and near the seabed

YOUR MISSION:

Examine the new habitat

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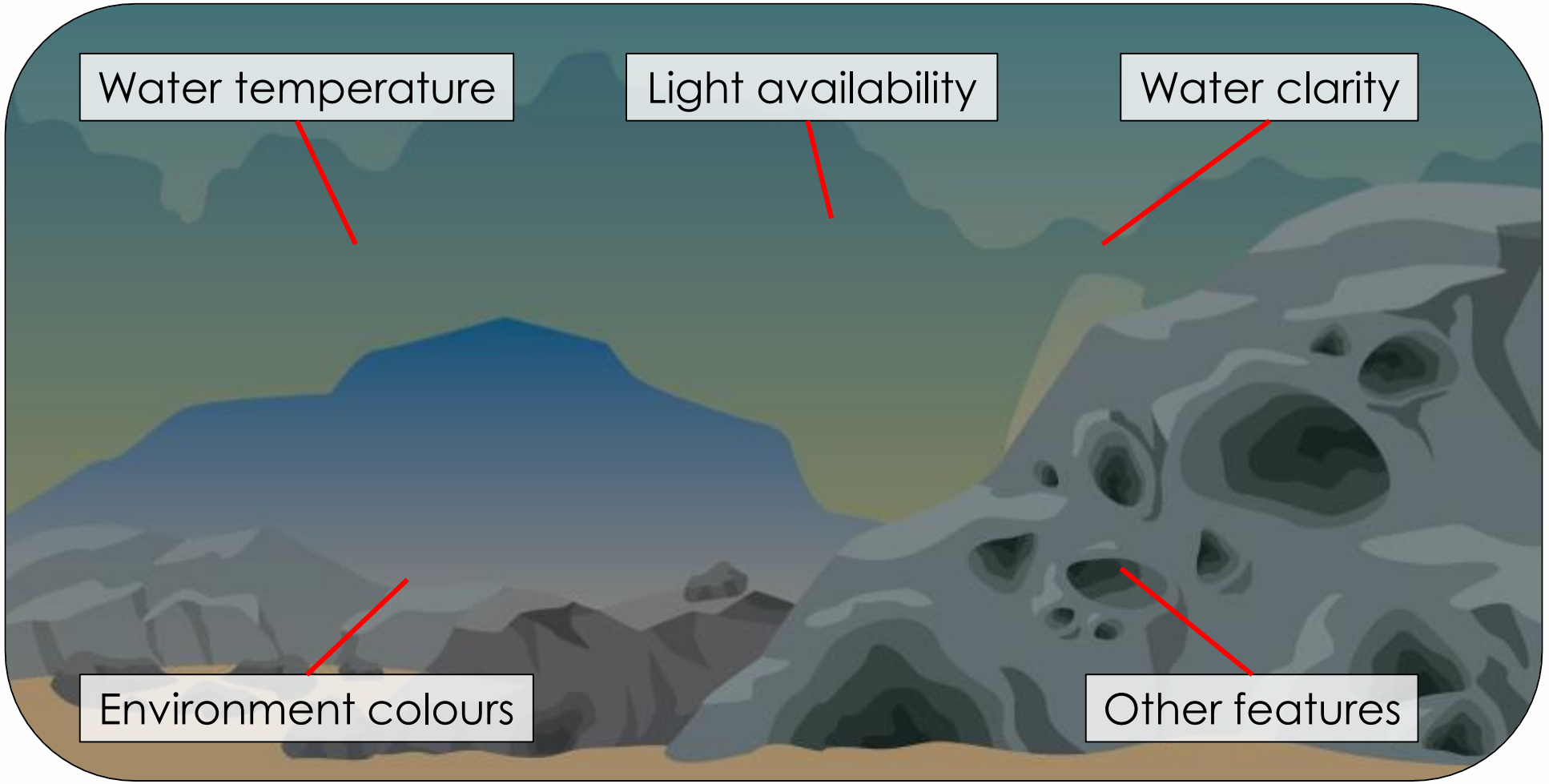
Examine the new habitat



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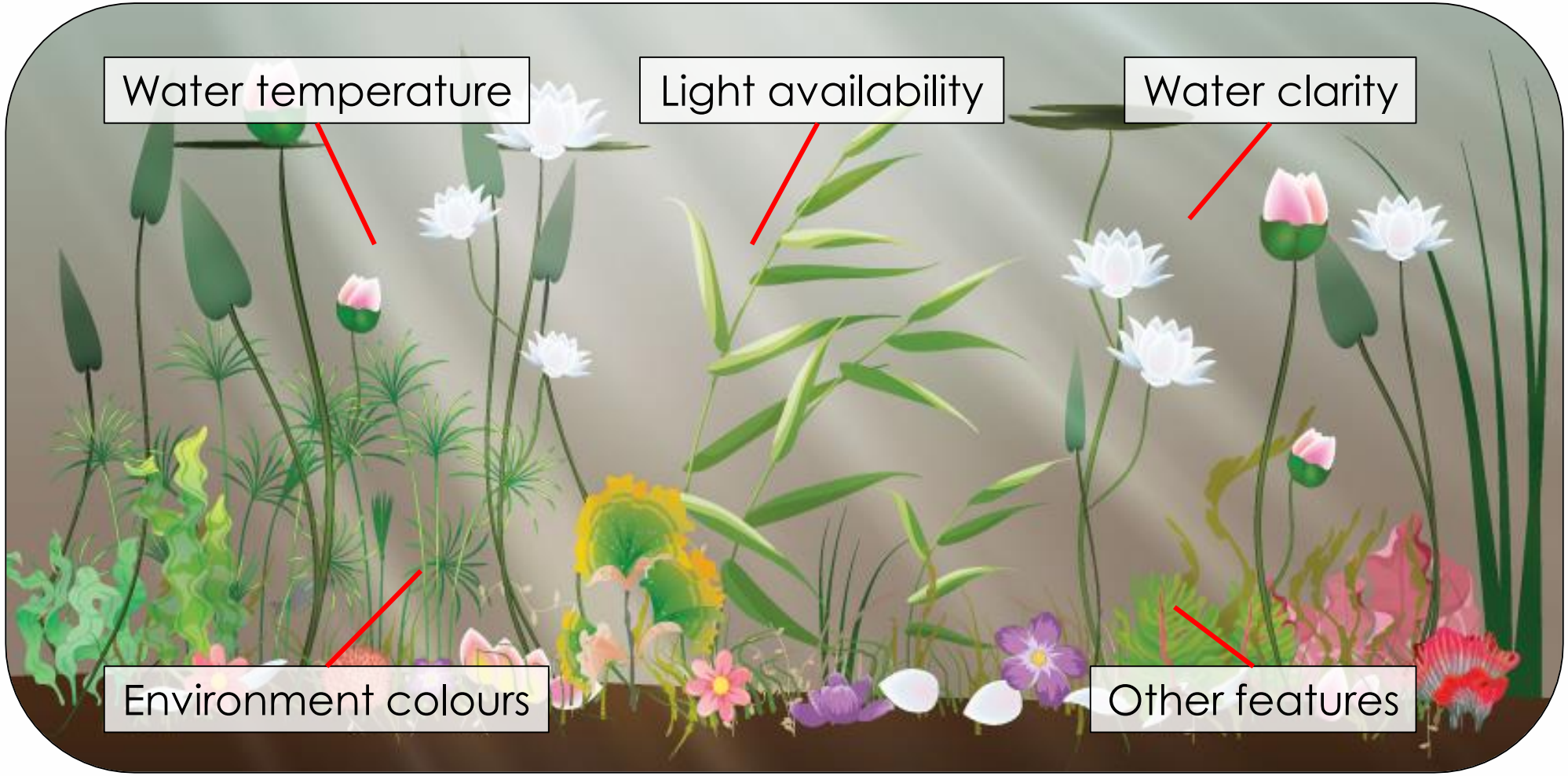


NEXT MISSION:
Create a marine organism

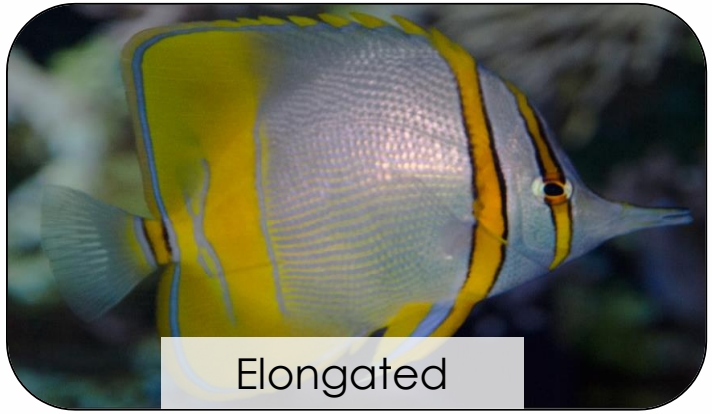
QUESTIONS TO CONSIDER

Why do living organisms require adaptations?

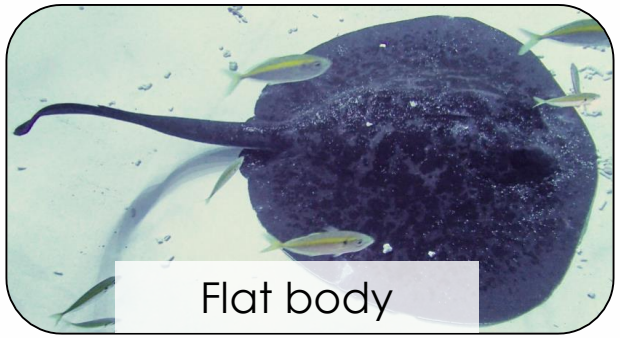
What are some adaptive traits that can help them to survive?

ADAPTIVE TRAITS

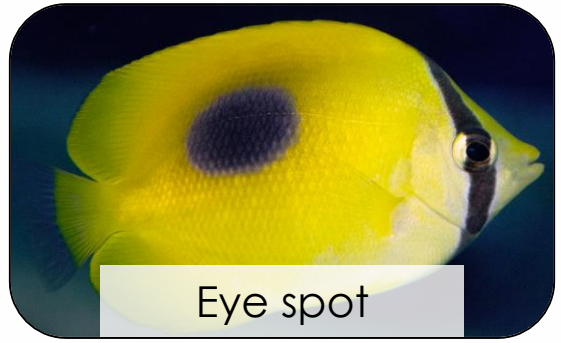
MOUTH TYPE



BODY SHAPE



BODY PATTERN



TIME FOR YOUR CREATION!

PLEASE INCLUDE THESE DETAILS FOR YOUR CREATION! ☺

- Name
- Type of organism (e.g. animal, microorganism, plant, algae)
- Size
- Location within habitat (e.g. in sediments, on vegetation, open ocean)
- Diet
- Fun fact
- Adaptive traits
- Labelled illustration

CAN YOUR MARINE ORGANISMS ADAPT WELL?

- Describe how your marine organism can adapt to the given physical factors.
- Assess the following environmental events and describe the corresponding changes in physical factors.

ENVIRONMENTAL CHANGES

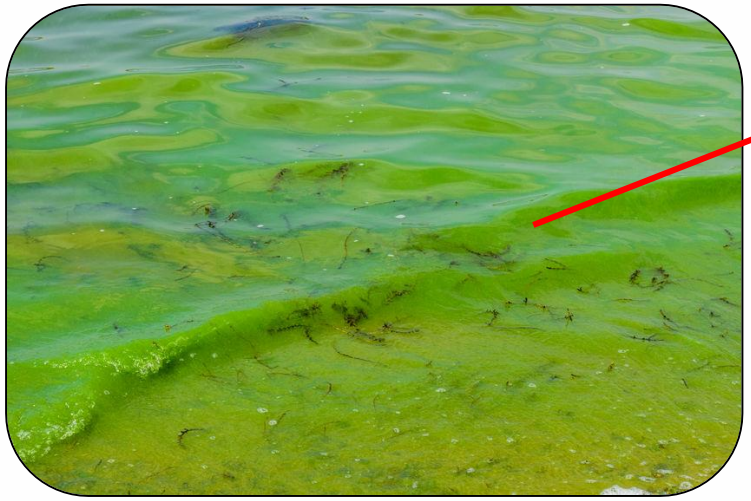
WATER POLLUTION

Water clarity

Light availability

Chemical composition

Vegetation cover



Oxygen availability

CHANGES IN PHYSICAL FACTORS

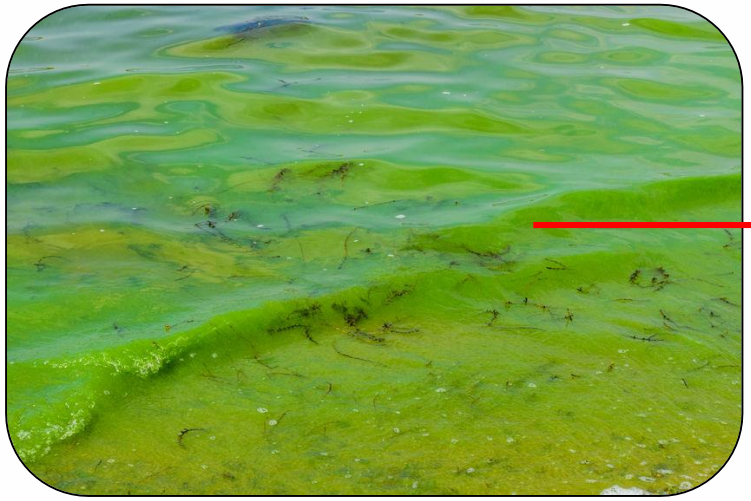
WATER POLLUTION

Water clarity: Reduce visibility

Light availability: Reduce light penetration

Chemical composition: Introduce toxic chemicals

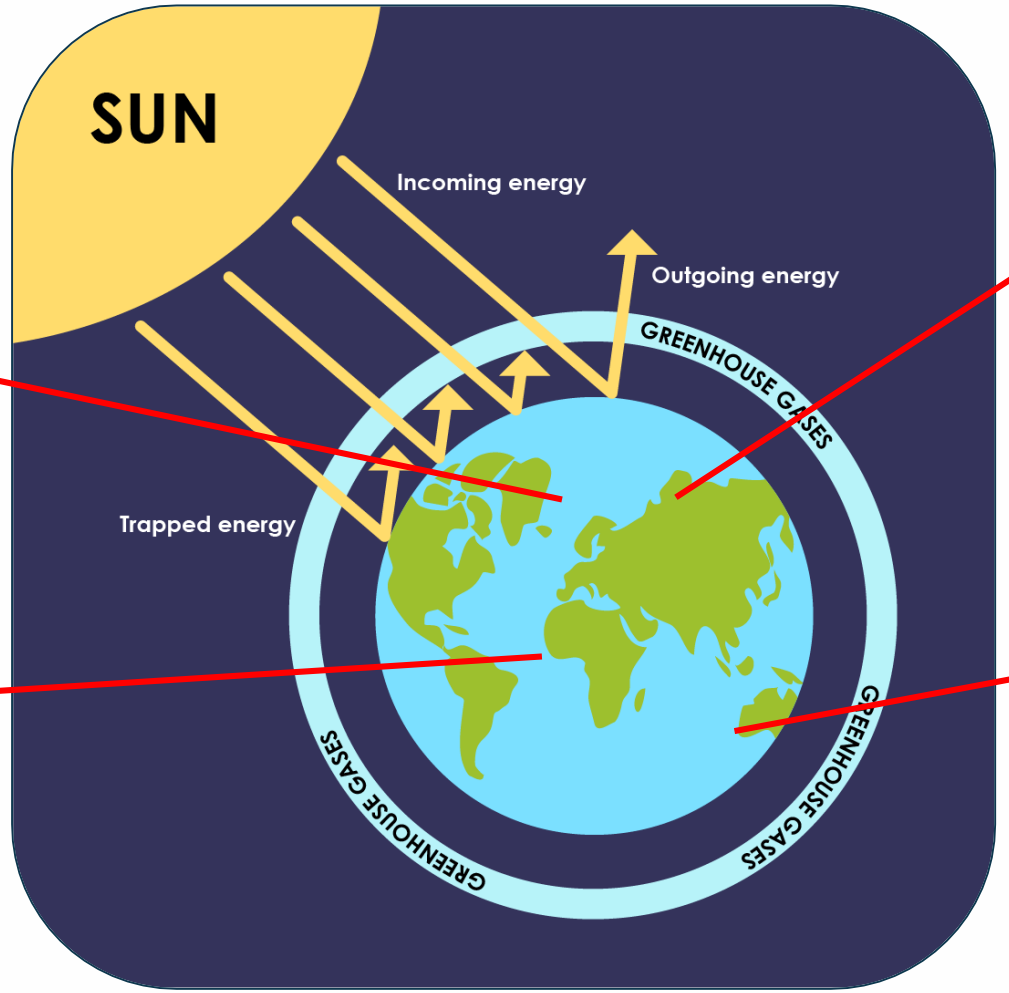
Vegetation cover: Reduce due to toxic components



Oxygen availability: Plankton bloom reduces amount of oxygen

ENVIRONMENTAL CHANGES

GLOBAL WARMING



Light availability

Temperature

Oxygen availability

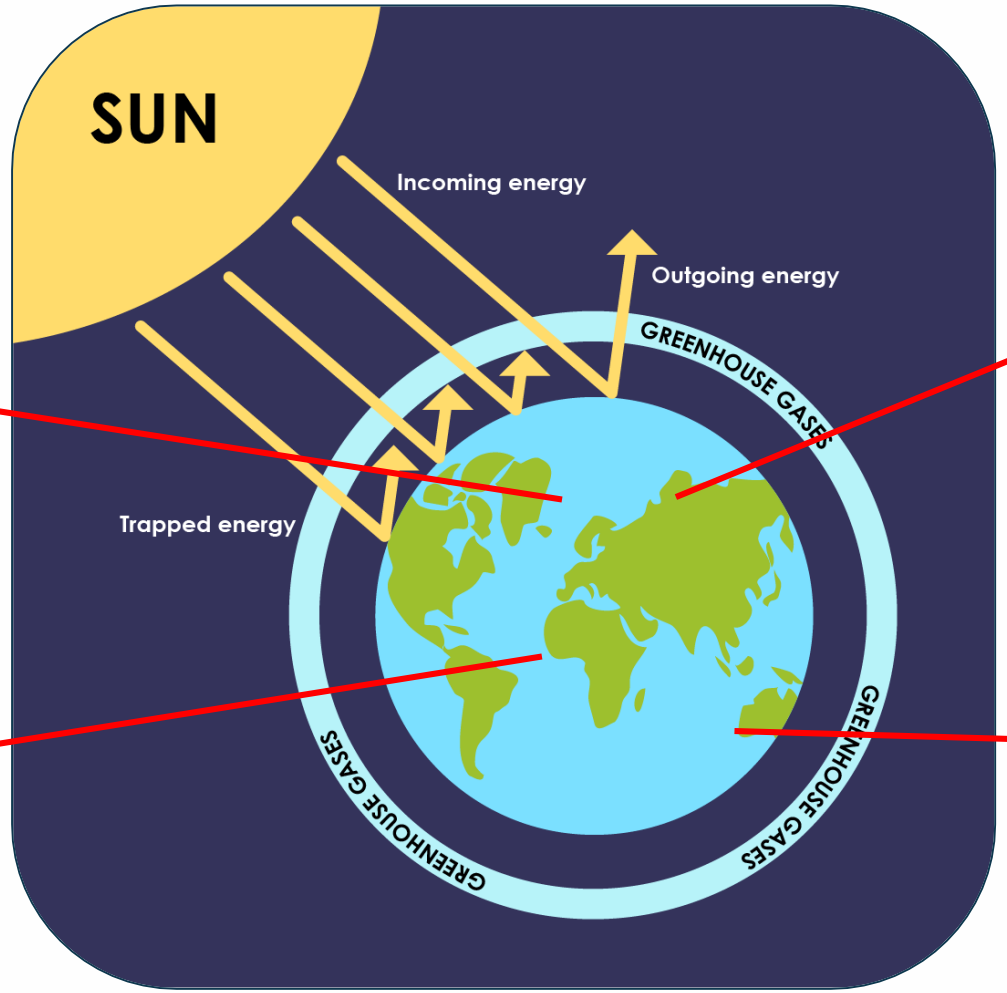
Environment colours

CHANGES IN PHYSICAL FACTORS

GLOBAL WARMING

Light availability:
Excessive amount of light

Temperature:
Increase in water temperature



Oxygen availability:
Excess plankton and algae leads to oxygen depletion

Environment colours:
Coral bleaching occurs as corals lose their colours

ENVIRONMENTAL CHANGES
OCEAN ACIDIFICATION

Other features

Acidity

CHANGES IN PHYSICAL FACTORS
OCEAN ACIDIFICATION

Other features:
Less coral structures for shelter

Acidity:
Increase weakens coral skeletons and animal shells

CAN YOUR MARINE ORGANISMS SURVIVE THE ENVIRONMENTAL CHANGES?

- Based on the changes in physical factors you have identified, can your organisms adapt and survive?
- How can they respond in order to adapt?
- How many of your creations can pass the tests and survive?

THINK ABOUT IT!

- Do you think the original adaptations you have thought of are still effective after the environmental changes?
- Do the environmental changes only affect certain organisms?

IMPORTANCE OF CONSERVATION

Think of a plan to protect the species that cannot survive!

- Why is conservation essential?
- How effective are conservation efforts?

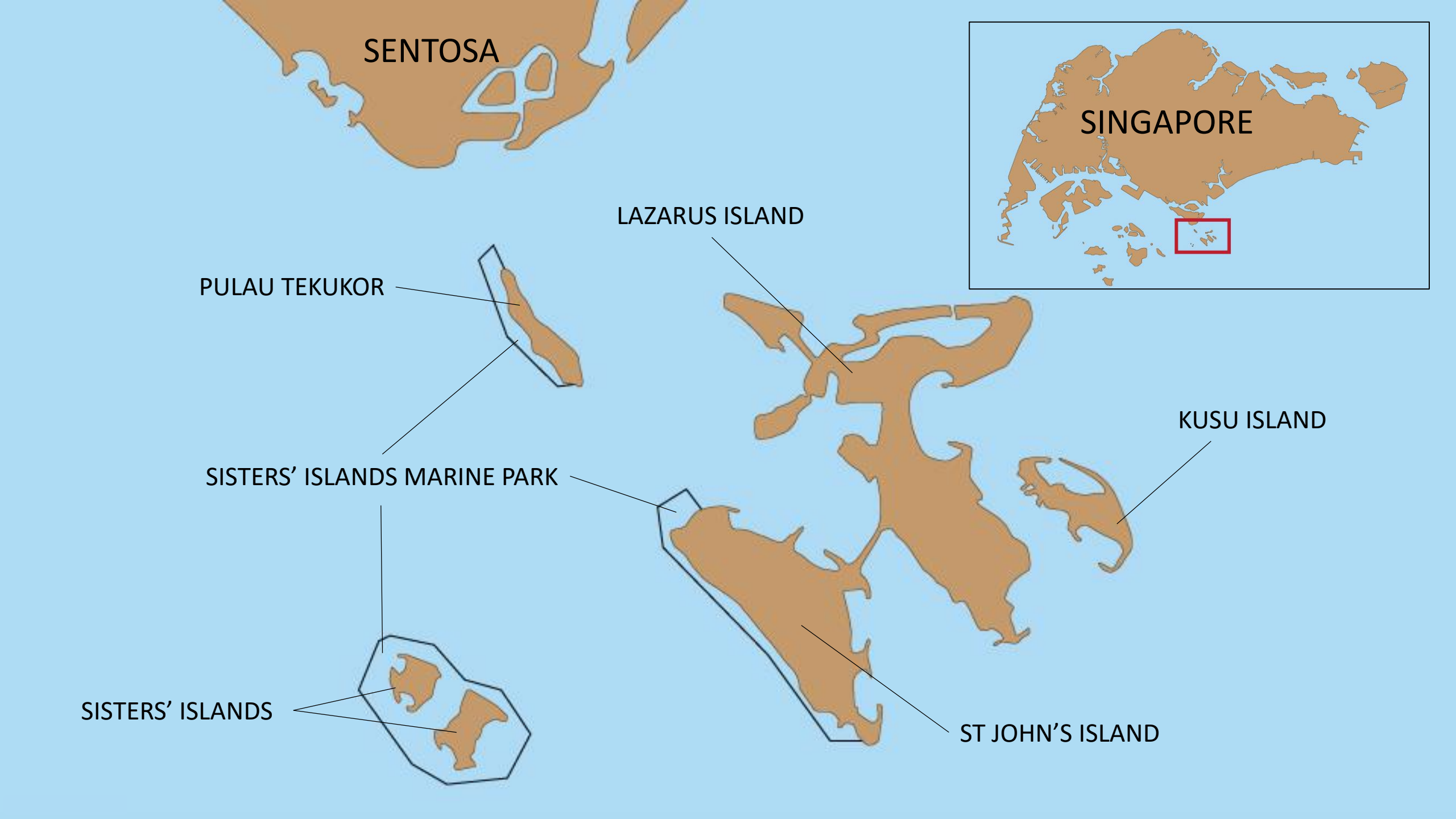
SANCTUARY
SISTERS' ISLANDS MARINE PARK

As Singapore's first marine park, the waters and reefs are legally protected.

A platform for researchers to monitor changes in the marine environment.

The protected area provides a safe refuge for marine biodiversity.

Photo credit: National Parks Board


SENTOSA
SINGAPORE
LAZARUS ISLAND
PULAU TEKUKOR
KUSU ISLAND
SISTERS' ISLANDS MARINE PARK
SISTERS' ISLANDS
ST JOHN'S ISLAND

POPULATION RESTORATION
SINGAPORE'S CORAL REEFS

Photo credit: The Straits Times

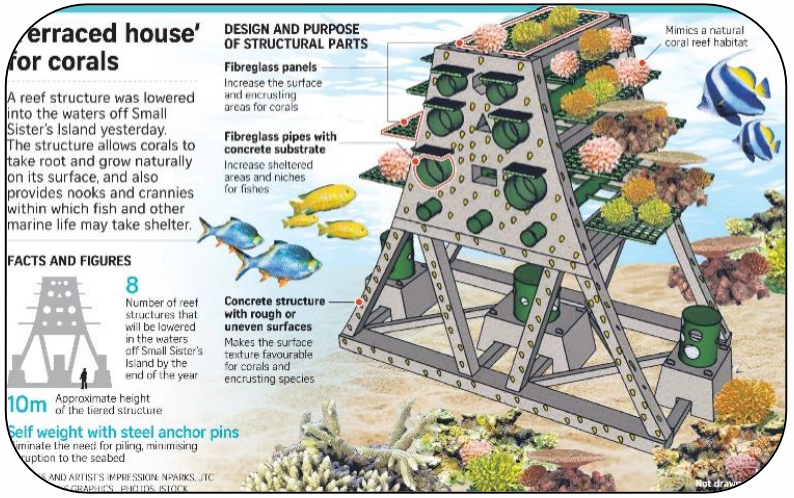


Photo credit: The Straits Times

Artificial structures were placed in the waters to encourage coral growth.

Just like coral reefs globally, Singapore corals are exposed to coral bleaching too.

Photo credit: National Parks Board

Corals are grown in an external nursery and transplanted to the structures when they are of suitable size.

BREEDING PROGRAMMES

Bowmouth Guitarfish

Corals

Aquariums provide safe and controlled environments for breeding.

Juvenile zebra shark

Juvenile zebra shark

Exchange with other aquariums after successful breeding ensures genetic diversity.

BREEDING PROGRAMMES

Polyp stage of sea jellies

Research on animals that are difficult to study in nature can be conducted.

Adult moon sea jellies

IMPORTANCE OF CONSERVATION

- What would happen to vulnerable species if these efforts are not initiated?

- If some species become extinct, what are the effects on other species and ecosystem?

MISSION COMPLETED

THIS ACKNOWLEDGES THAT

YOU

HAVE SUCCESSFULLY COMPLETED

CREATE A MARINE ORGANISM

THANK YOU FOR YOUR PARTICIPATION AND HELPING US TO INTRODUCE NEW MARINE ORGANISMS TO THIS NEW HABITAT!

ALL EXISTING HABITATS ARE HOMES TO MANY ORGANISMS TOO SO DON'T FORGET TO CONTINUE PROTECTING THEM!