

Introduction

This module provides details of the coral impacts to record in the 360° survey (5 metre radius circle) section of the Rapid Monitoring from.

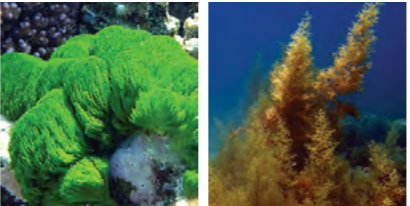




Key points

The key points explored in this module include:

- » Recognising and recording coral reef health impacts
- » Reef health impact details
- » Recording other things of interest

360° survey (One 5 metre radius circle) → See over page for information guide and survey methodology

BENTHOS		CORAL IMPACTS (Complete 1, 2 and 3 below. Circle Y or N)	
Insert % for each benthos type to total 100%			
Macroalgae			
Live coral			
Recently dead coral (white)			
Live coral rock			
Coral rubble			
Sand			
Total	100 %		
PHOTOS TAKEN (Please provide details e.g. image no./name, what it is, and a description)			

1 Is any coral white? Y / N

Is living coral tissue present? Y / N If yes: **BLEACHING**

Is coral being eaten? Y / N If yes: **PREDATION**

If yes, by what? How many seen?

Crown-of-thorns starfish

Juveniles (size of hand or smaller) _____

Adults (larger than size of hand) _____

Drupella snails (all sizes) _____

Is coral banded in appearance? Y / N If yes: **DISEASE**

Is coral competing with something else? Y / N If yes: **COMPETITION**

2 Is any coral broken or damaged? Y / N

If yes: **What is the likely main cause?** (Circle one)

Storm Animal Vessel Anchor Divers Snorkellers

Unknown Other: _____

3 Is any rubbish present? Y / N

If yes: **Number of pieces in survey area:**

Fishing line _____ Plastic _____

Netting _____ Rope _____

Other (please specify)

IMPACT DETAILS
 (How much bleaching, predation, disease, damage? Other impacts?)

OTHER THINGS OF INTEREST?
 (Mating, spawning, behaviour, etc.)

Coral impacts decision tree

When you do the 360° survey, follow these steps.

Step 1:
 Complete the **Benthos** section (see module 3).

Step 2:
 Complete the **Coral Impacts** section. You need to answer each question in this section by circling Y (Yes) or N (No). Questions 2 and 3 also ask for extra information.

Step 3:
 Complete the **Impact Details** section by writing a general description of how extensive the impacts are.

Step 4:
 Record any **Other Things of Interest** you see, such as mating or spawning.

CORAL IMPACTS (Complete 1, 2 and 3 below. Circle Y or N)

1 Is any coral white? Y / N

Is living coral tissue present? Y / N If yes: **BLEACHING**

Is coral being eaten? Y / N If yes: **PREDATION**

If yes, by what? How many seen?

Crown-of-thorns starfish

Juveniles (size of hand or smaller) _____

Adults (larger than size of hand) _____

Drupella snails (all sizes) _____

Is coral banded in appearance? Y / N If yes: **DISEASE**

Is coral competing with something else? Y / N If yes: **COMPETITION**

2 Is any coral broken or damaged? Y / N

If yes: **What is the likely main cause?** (Circle one)

Storm Animal Vessel Anchor Divers Snorkellers

Unknown Other: _____

3 Is any rubbish present? Y / N

If yes:

Number of pieces in survey area:

Fishing line _____ Plastic _____

Netting _____ Rope _____

Other (please specify)

IMPACT DETAILS
 (How much bleaching, predation, disease, damage? Other impacts?)

OTHER THINGS OF INTEREST?
 (Mating, spawning, behaviour, etc.)

The next pages go into more detail about identifying coral impacts to help you complete this part of the form.

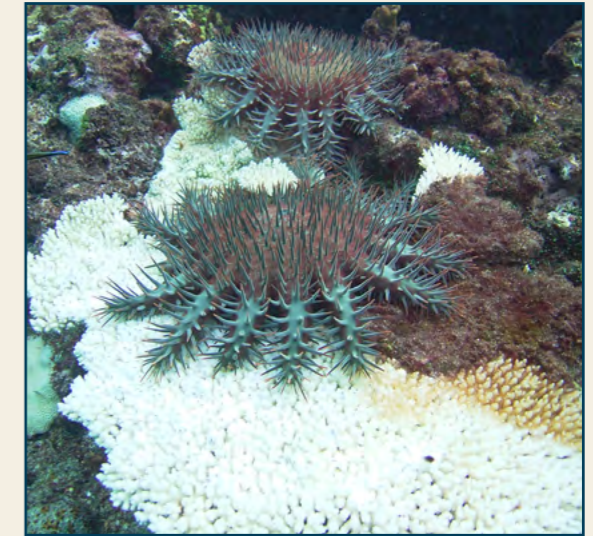
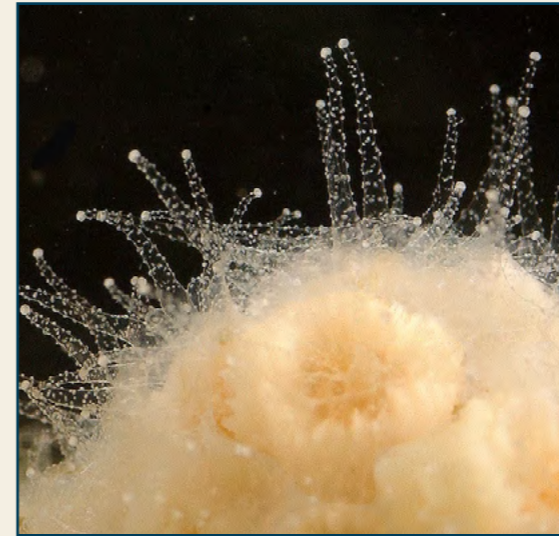
Impacts overview

Most coral polyps have clear bodies and the coral skeletons beneath are white. It is the zooxanthellae present in the coral polyps that provide the colours.

If coral is white, this can indicate that there are:

- no zooxanthellae present, which means the white coral skeleton is visible through the clear polyps (no tissue loss)
- no coral polyps present which leaves the coral skeleton exposed (tissue loss).

The purpose of the question: **Is any coral white?** is to identify white coral, then work through further questions to help identify why the coral is white – from bleaching, predation, disease or competition.



CORAL IMPACTS (Complete 1, 2 and 3 below. Circle Y or N)

1 Is any coral white? Y / N

Is living coral tissue present? Y / N If yes: **BLEACHING**

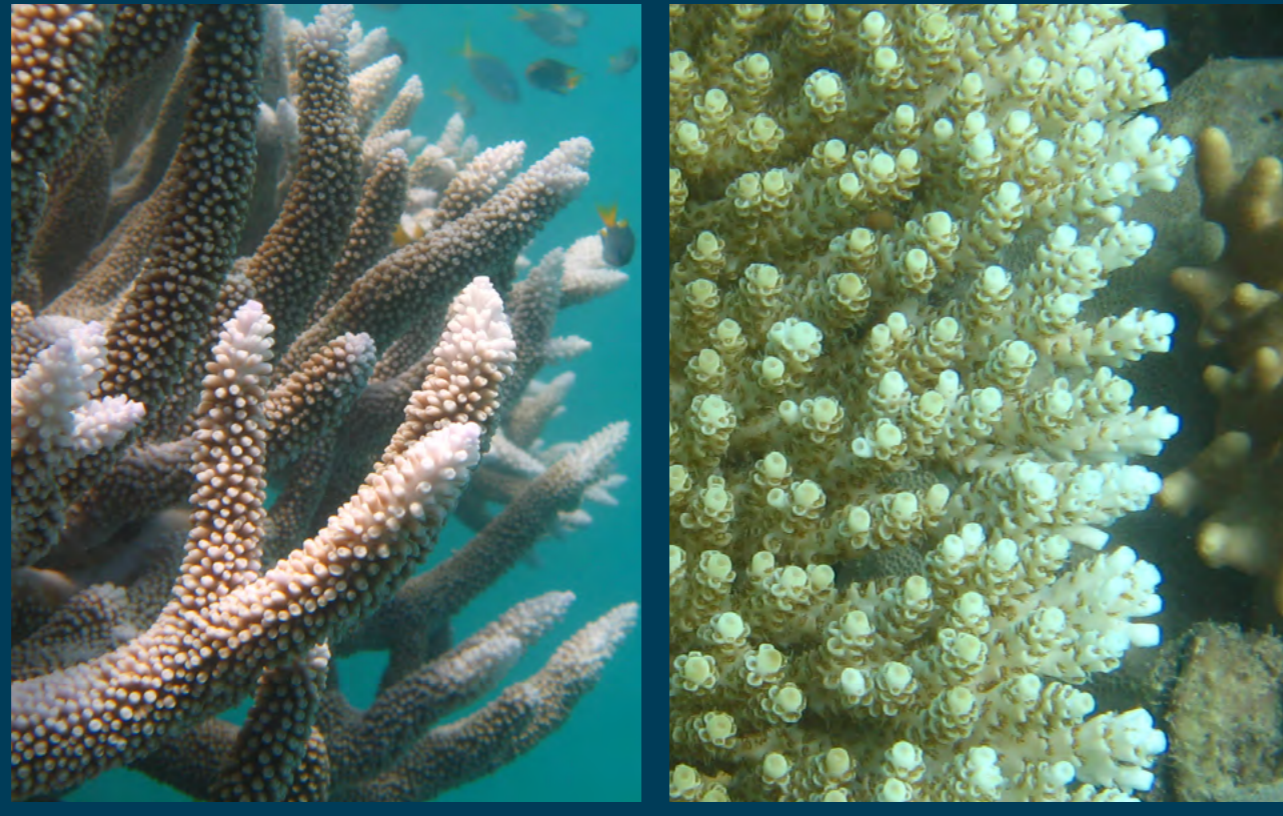
Recognising coral impacts

Some white coral does not reflect a coral impact.

Do not record:

- corals that are naturally white, such as some soft corals with their polyps retracted
- the growth tips of fast-growing corals which are also naturally white, as the zooxanthellae within has not yet occupied the newly formed coral polyp.

White growth tips of fast-growing coral



Naturally white coral



Bleaching

If coral that is white still has living tissue present this may indicate bleaching.

Coral bleaching is a result of environmental stress such as changes in temperature, salinity and light.

This stress causes corals to lose the symbiotic algae (zooxanthellae) that normally live inside the coral tissue, and provide the coral with its colour – hence the term ‘coral bleaching’. This stress response may be limited to individual colonies, or affect entire reefs.

A ‘bleached’ coral colony still retains its layer of live tissue, and therefore does not become covered with algae.

It is possible for corals to regain their zooxanthellae and recover from bleaching events, provided environmental conditions return to favorable levels within a few weeks.

Roll your mouse over each photo to see a large version.

CORAL IMPACTS (Complete 1, 2 and 3 below. Circle **Y** or **N**)

1 Is any coral white? Y / N

Is living coral tissue present? Y / N If yes: **BLEACHING**

Predation: Crown-of-thorns starfish (COTS)

Adult COTS may grow up to 1 metre in diameter, covered in numerous sharp spines and have 10 to 26 arms. The spines are covered with skin filled with venomous glands. The toxins produced by these glands are extremely painful to humans.

COTS are typically grey with tinges of red on their spines and body. They feed directly on living coral tissue – usually during the night, and seek shelter during the day.

Feeding usually starts from the edge of the coral colony on plate corals, or from the base of the colony on branching corals. Once COTS have started feeding, they generally remove coral tissue fairly rapidly, exposing large patches of white skeleton.

The feeding scar often has a scalloped border on plate corals. This border may show visible strings of tissue and mucus.

If you come across a bright white feeding scar, the COTS will usually not be far away, hiding under nearby coral colonies or in crevices. If you see any COTS, circle 'Y' for Predation.

Roll your mouse over each photo to see a large version.

Is coral being eaten?	Y / N	If yes: PREDATION
↓	<i>If yes, by what?</i>	
	<i>How many seen?</i>	
	Crown-of-thorns starfish	
	Juveniles (<i>size of hand or smaller</i>)
Adults (<i>larger than size of hand</i>)	
<i>Drupella snails (all sizes)</i>	

Corals can also be eaten by other animals, so only record the COTS you see.

Recognising coral impacts



Predation:

Drupella (*Drupella cornus*)

Drupella snails are usually covered with encrusting coralline algae and therefore are pink to dark red in colour.

They feed at night from the base of branches or the edge of coral colonies. *Drupella* use specialised mouth parts (radula) to scrape off the live tissue. When viewed closely, the feeding scars often have an irregular border with visible strings of tissue.

The tissue loss is from the base of the colony upward and exposes small patches of white skeleton. When *Drupella* are present in large numbers, the white scars will be larger and look similar to Crown-of-thorns starfish scars.

Drupella usually shelter under the coral colony or near the base during the day. If you see any *Drupella*, circle 'Y' for Predation.

Roll your mouse over each photo to see a large version.

Is coral being eaten?		Y / N	If yes: PREDATION
If yes, by what?		How many seen?	
		Crown-of-thorns starfish	
		Juveniles (size of hand or smaller)	-----
		Adults (larger than size of hand)	-----
<i>Drupella</i> snails (all sizes)		-----	

Corals can also be eaten by other animals, so only record the *Drupella* you see.

Disease

If the white coral shows tissue loss and there are no *Drupella* or Crown-of-thorns starfish visible, this may indicate the presence of disease.

A common indication of disease is the presence of a band of colour between the live coral and the dead coral.

There are several diseases that cause banding. You don't need to be able to identify the specific disease, just distinguish it from bleaching or predation. If you see a band, circle 'Y' for Disease.

Diseases progress gradually over time, unlike predation which can occur rapidly in large areas. This means that some areas affected by disease may show a gradual change in colour from white to green / brown, due to algal growth. Look for the coloured band in the area between the algal growth and the live coral.

Roll your mouse over each photo to see a large version.

Is coral being eaten? Y / N If yes: PREDATION	
▼	
If yes, by what?	How many seen?
Crown-of-thorns starfish	
Juveniles (size of hand or smaller)	-----
Adults (larger than size of hand)	-----
Drupella snails (all sizes)	-----
▼	
Is coral banded in appearance? Y / N If yes: DISEASE	

Pigmentation response

Pigmentation appears to be a type of ‘inflammation’ response mounted by corals. It is a condition commonly confused with disease. You can tell it is not a disease because there is no white coral present.

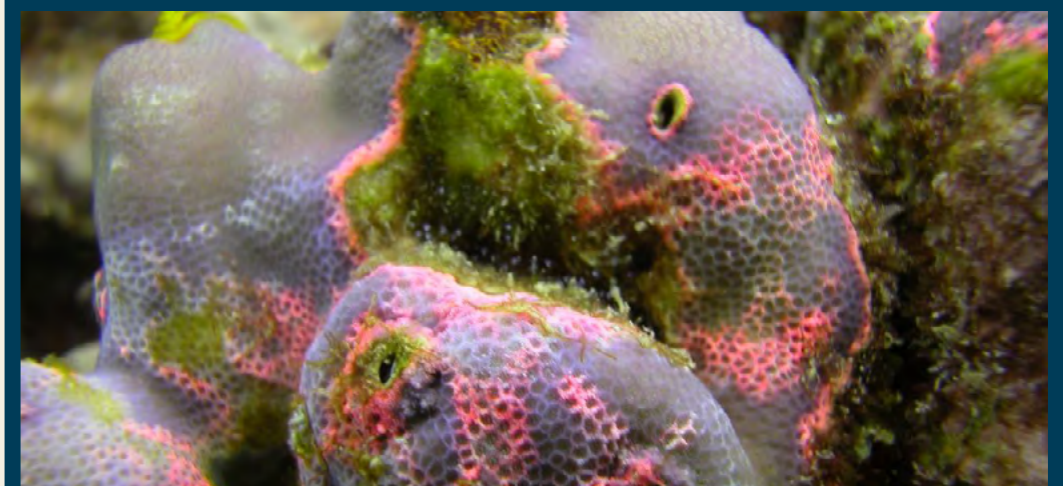
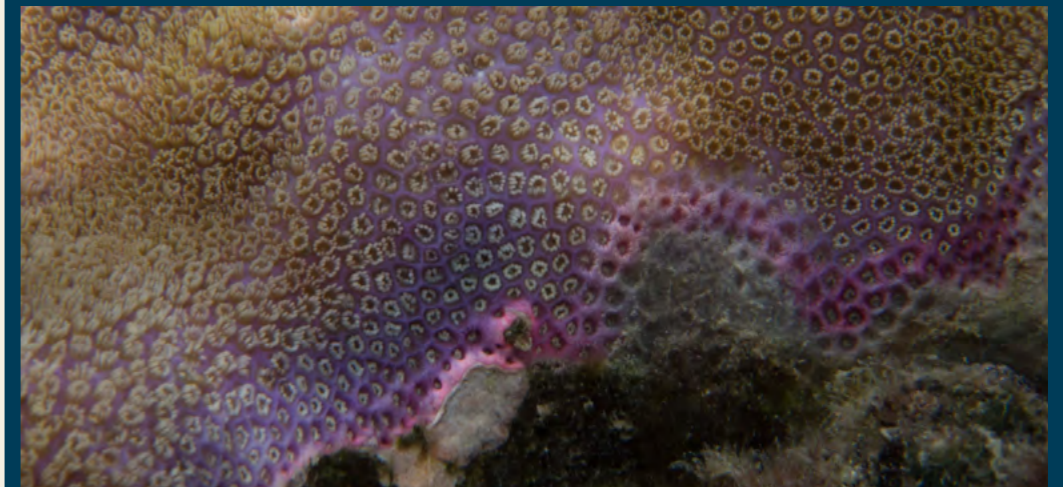
It is typically associated with a healing response rather than tissue loss, and suggests the coral’s health is compromised. It may be caused by borers, algal abrasion, fish bites and breakages. It can also be an indicator of coral competition, with pigmentation of the tissue at the competing edges.

Coral tissue bordering the affected area is brightly coloured. This may be pink or purple in *Porites* and blue in *Acropora*.

The affected area may be swollen or thickened and the pigmentation may form lines, bumps, spots, patches or irregular shapes, depending on the cause of the lesion.

You do not need to record instances of pigmentation response on the Rapid Monitoring form. However, where you see pigmentation response, check for associated coral competition.

Pigmentation response



Coral competition

Sometimes coral competes with other coral for space and light. This can be especially noticeable in faster growing corals such as branching and plate corals.

What might seem like the coloured band of disease is actually the result of coral either defending itself from encroaching coral, or attempting to invade the territory of another coral.

Pigmentation response can be an indicator of coral competition. Sometimes when two corals compete, the result is pigmentation of the tissue at the competing edges as the corals are damaging each other.

If you see coral competition, circle 'Y' for Competition.

Roll your mouse over each photo to see a large version.

Is coral banded in appearance? Y / N If yes: **DISEASE**



Is coral competing with something else?

Y / N If yes: **COMPETITION**

Impact summary



Bleaching

- Live coral tissue is present.
- The coral polyps are still alive, and algae cannot grow over the area.



Predation

- Live coral tissue is not present.
- Coral skeleton is freshly exposed.
- Crown-of-thorns starfish or *Drupella* are present in the surrounding area.



Disease

- Live coral tissue is not present.
- Coral skeleton is exposed.
- There is a gradual change in colour from white to green / brown, due to algal growth.
- Often there is a band of colour between the live coral and the dead coral.



Competition

- Two different coral colonies compete for space and light.
- Algal growth is not present.

Coral damage

If any part of the coral is broken or the whole coral is displaced this is categorised as coral damage.

Causes of damage can include storms, animals, vessels, anchors, divers and snorkellers.

- Minor damage such as broken colony edges or branch tips may be caused by divers' or snorkellers' fins and hands. This damage may also be caused by animals.
- Partial or whole colony damage may be caused by vessels or anchors.
- Damage to the reef structure can be the result of cyclones or other storms. These events can cause extensive structural damage as well as large rubble deposits.

If you see this, circle 'Y' for question 2: 'Is any coral broken or damaged?'

Roll your mouse over each photo to see a large version.

② Is any coral broken or damaged? Y / N

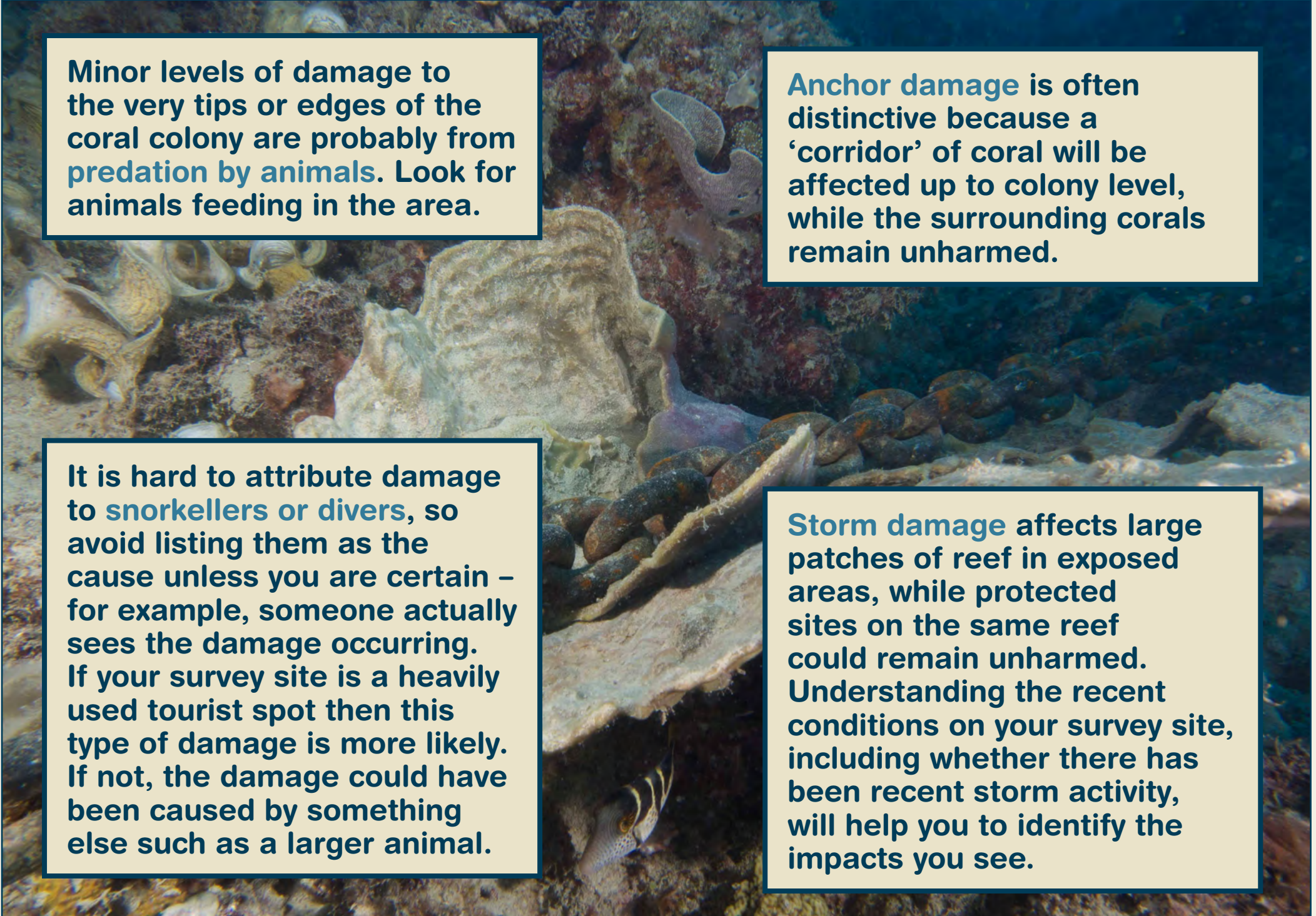
If yes: ▼

What is the likely main cause? (Circle one)

Storm Animal Vessel Anchor Divers Snorkellers

Unknown Other:

What caused the damage?



Minor levels of damage to the very tips or edges of the coral colony are probably from predation by animals. Look for animals feeding in the area.

Anchor damage is often distinctive because a 'corridor' of coral will be affected up to colony level, while the surrounding corals remain unharmed.

It is hard to attribute damage to snorkellers or divers, so avoid listing them as the cause unless you are certain – for example, someone actually sees the damage occurring. If your survey site is a heavily used tourist spot then this type of damage is more likely. If not, the damage could have been caused by something else such as a larger animal.

Storm damage affects large patches of reef in exposed areas, while protected sites on the same reef could remain unharmed. Understanding the recent conditions on your survey site, including whether there has been recent storm activity, will help you to identify the impacts you see.

Rubbish

Rubbish

Common items of rubbish include fishing line, plastic, netting and rope. Record the number of pieces you see for each category.

If you are going to collect rubbish, make sure you undertake the precautions necessary to protect yourself. Make sure you do not remove fishing line unless you have been trained to do so.



3 Is any rubbish present? Y / N

If yes: ▼

Number of pieces in survey area:

Fishing line _____ Plastic _____

Netting _____ Rope _____

Other (please specify)



Impact details

In this section, write a general description of how extensive the impacts are.

For example:

- Half of the area was affected by bleaching
- The whole area was affected by COTS.
- COTS have eaten six large plate corals.
- Half the area was broken coral.

The purpose of this section is to describe the scale of any impacts.

IMPACT DETAILS

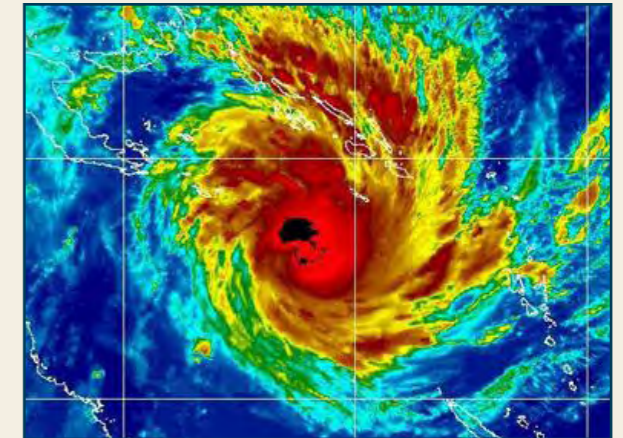
(How much bleaching, predation, disease, damage? Other impacts?)

Other things of interest

In this section, add any other relevant information about the site or the survey.

This can include:

- site conditions
- recent storms
- sightings of protected species
- behaviour such as mating or spawning.



OTHER THINGS OF INTEREST?

(Mating, spawning, behaviour, etc.)

Interactive Rapid Monitoring form

CORAL IMPACTS *(Complete 1, 2 and 3 below. Circle Y or N)*

1 *Is any coral white?* Y / N

▼

Is living coral tissue present? Y / N *If yes: BLEACHING*

▼

Is coral being eaten? Y / N *If yes: PREDATION*

▼

<i>If yes, by what?</i>	<i>How many seen?</i>
Crown-of-thorns starfish	
<i>Juveniles (size of hand or smaller)</i>	_____
<i>Adults (larger than size of hand)</i>	_____
Drupella snails (all sizes)	_____

▼

Is coral banded in appearance? Y / N *If yes: DISEASE*

▼

Is coral competing with something else? Y / N *If yes: COMPETITION*

2 *Is any coral broken or damaged?* Y / N

If yes: ▼

What is the likely main cause? (Circle one)

Storm Animal Vessel Anchor Divers Snorkellers

Unknown Other: _____

3 *Is any rubbish present?* Y / N

If yes: ▼

Number of pieces in survey area:

Fishing line _____ Plastic _____

Netting _____ Rope _____

Other (please specify)

IMPACT DETAILS
(How much bleaching, predation, disease, damage? Other impacts?)

OTHER THINGS OF INTEREST?
(Mating, spawning, behaviour, etc.)

Review questions

Review questions

Once you are familiar with the content of this module, test your knowledge with the Module 4 review questions.

When you have passed these review questions, complete the final exam.

