Coral Reef Targeted Research & Capacity Building for Management

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Underwater Cards for Assessing Coral Health on

Indo-Pacific Reefs

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Assessing Coral Health on Indo-Pacific Reefs

Roger Beeden[1,2], Bette L. Willis[1], Laurie J. Raymundo[3], Cathie A. Page[1], Ernesto Weil[4].

Coral Disease

Coral reefs are under increasing stress globally from a number of causes, including climate warming, poor water quality and over-fishing. Disease outbreaks not only result in coral loss, but they also cause significant changes in community structure, species diversity and reef-associated organisms.

Coral diseases potentially impact both well-managed and unmanaged reefs. However, strategies for dealing with disease outbreaks are currently non-existent. The increasing frequency with which diseases influence and alter reef communities means they must be considered and incorporated into management plans.

The CRTR Disease Working Group

The CRTR *Disease Working Group* has been funded by the Coral Reef Targeted Research & Capacity Building for Management Program (CRTR) to advance understanding of coral disease in a number of key areas.

In particular, the CRTR *Disease Working Group's* research is providing a greater understanding of the ways in which coral diseases can alter reef function and the conditions under which outbreaks may occur. Documenting abundance and prevalence of disease and monitoring changes in disease through time are key steps in understanding how factors like ocean warming and deteriorating water quality may affect disease dynamics.

To assist with our objectives, the CRTR *Disease Working Group* has produced these Underwater Cards for Assessing Coral Health on Indo-Pacific Reefs so that recreational, professional and scientific divers can all assist with gathering information on the occurrence of coral diseases.

By using these cards, you can:

- Learn to identify Indo-Pacific coral diseases and survey techniques for measuring coral disease prevalence;
- Gather information on the distribution and abundance of coral diseases on local reefs;
- Monitor the health of local coral reefs and identify potential drivers of disease abundance;
- Contribute to a world-wide data base on coral disease;
- Help to conserve the world's coral reefs.

How to use these cards

These cards start with a decision tree for assessing the health status of Indo-Pacific corals. The decision tree is colour coded to assist with navigation through the cards. After reviewing all disease descriptions and images to gain an overview of the range of signs of disease and compromised health, the following steps will enable you to assess the health status of a coral. Note that a variety of factors other than disease (e.g. predation, grazing) cause lesions.

1. Decide if a coral shows signs of tissue loss (red section), tissue discolouration (blue section), anomalous growth (green section) or some other sign of compromised health (yellow section).
2. At each level in the key for the coloured section selected, decide which category best describes the signs observed.
3. Go to the appropriate coloured section in this card set to check disease images and descriptions.
4. Record your observations on the data sheet provided at the end of this card set.

How to use these cards

The CRTR Program is a partnership between the Global Environment Facility, the World Bank, The University of Queensland (Australia), the United States National Oceanic and Atmospheric Administration (NOAA) and approximately 50 research institutes and other third-parties around the world.

GEF

The University Of Queensland AUSTRALIA

ARC Centre of Excellence Coral Reef Studies

CRTR Program Project Executing Agency, Centre for Marine Studies, Gerhmann Building, The University of Queensland, St Lucia, Qld 4072, Australia
Telephone: +61 7 3346 9942 Facsimile: +61 7 3346 9987 Email: info@gefcoral.org Internet: www.gefcoral.org

[1] ARC Centre of Excellence for Coral Reef Studies and School of Marine and Tropical Biology, James Cook University, Townsville, Qld, 4811, Australia. [2] Great Barrier Reef Marine Park Authority, Townsville, Qld, 4810, Australia. [3] University of Guam, Guam. [4] Department of Marine Sciences, University of Puerto Rico, Puerto Rico.

Indo-Pacific Coral Health – Decision Tree

Tissue Loss – Predation 1
- 1a. Predation (PRD) – e.g. fish, snail, starfish feeding scars

Tissue Loss – Non-Predation – Coloured Band Diseases 2
- 2a. Skeletal Eroding Band (SEB)
- 2b. Black Band Disease (BBD)
- 2c. Brown Band Disease (BrB)

Tissue Loss – Non-Predation – No overlying band of coloured material 3
- 3a. Ulcerative White Spots (UWS) – focal tissue loss
- 3b. White Syndromes (WS) – irregular tissue loss
- 3c. Atramentous Necrosis (AtN) – grey-black material overlies irregular area of tissue loss

Tissue Discolouration – White 4
- 4a. Bleaching (BL) – environmentally induced partial or whole colony bleaching
- 4b. Focal Bleaching (FBL) – early stage of UWS or unexplained spots
- 4c. Non Focal Bleaching (NFBL) – unusual bleaching patterns, e.g. patches, stripes

Tissue Discolouration – Non White 5
- 5a. Pigmentation Response (PR) – coral response to a challenge (not a disease)
- 5b. Trematodiasis (TR)

Growth Anomalies 6
- 6a. Explained Growth Anomalies
- 6b. Unexplained Growth Anomalies

Compromised Health 7
- 7a. Pigmentation Response (see 5a. above)
- 7b. Unusual Bleaching Patterns (see 4c. above)
- 7c. Competition – Aggressive Overgrowth – e.g. cyanobacteria, *Terpios* and *Cliona* sponges, red filamentous algae
- 7d. Sediment Damage
- 7e. Flatworm Infestation

Diseases in Other Reef Organisms 8
- 8a. Examples for Crustose Coralline Algae & Gorgonians

Coral Reef Targeted Research & Capacity Building for Management

Indo-Pacific – Decision Tree

1a. Predation

Crown-Of-Thorns Starfish (COTS)

(*Acanthaster planci*)

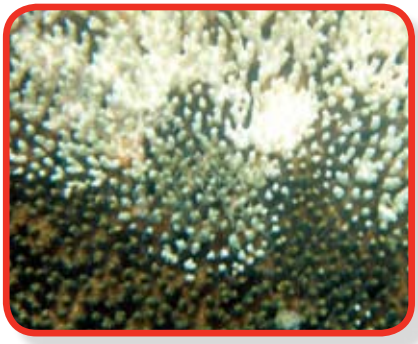
- Adult COTS are up to 80cm in diameter, covered in numerous sharp 4-5cm spines and have up to 21 arms;
- **Australia:** COTS are typically grey with tinges of red on their spines and body;
- **Asia Pacific:** COTS may be more brightly coloured – bright blue or purple varieties;
- COTS feed directly on living coral tissue;
- Feeding usually starts from the colony edge on plates or colony base on branches;
- Feeding causes rapid tissue loss, exposing large patches of white skeleton.

Key ID characteristics:

- Feeding scar often has a scalloped border on plate corals;
- Border may show visible strings of tissue and mucus;
- Starfish usually seen in area (check under nearby colonies);
- Feeding scars on neighbouring colonies.

Commonly confused with:

- White syndromes, which typically advance more slowly, so white areas smaller;
- Bleached areas, which still have tissue present;
- *Drupella* scars, which expose smaller areas of white skeleton.



1a. Predation

Drupella (*Drupella cornus*)

- *Drupella cornus* snails may vary in colour from pink (1) to dark red (2) when they are covered with encrusting coralline algae;
- Feeds at night from base of branches or edge of colony;
- Tissue loss typically slower than for COTS (*Acanthaster planci*) predation;
- Tissue loss from base upward, exposing small patches of white skeleton when snail densities are low;
- Typically prefers *Acropora* species.

Key ID characteristics:

- Feeding scar often has irregular border – shredded strings of tissue may be visible;
- *Drupella* snails usually shelter under colony or near base during day;
- *Drupella* snails are often found on neighbouring colonies if not immediately visible beside the feeding scars.

Commonly confused with:

- COTS scars, which are larger areas of white skeleton;
- Bleached areas, which still have tissue present;
- White syndromes, which tend to have more regular fronts.

1a. Predation

Coralliophila (*Coralliophila sp.*)

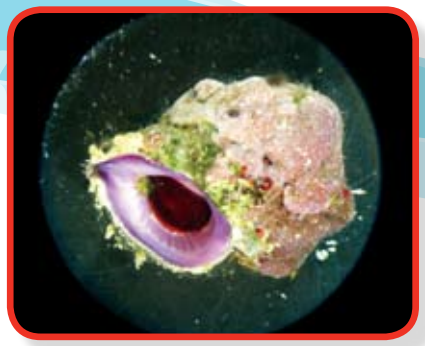
- *Coralliophila sp*. snails typically have a violet or purple aperature;
- Snails are typically sedentary and are firmly attached to the coral;
- *Coralliophila sp*. cause little coral tissue loss, but may drain energy resources required to heal the wound over extended periods of time;
- Feeding wounds may be a potential entry point for disease causing organisms.

Key ID characteristics:

- A characteristic small ovoid feeding wound is typically present if the snail is removed from the coral; 1
- Typically found feeding on *Porites*, particularly branching species.

Commonly confused with:

- *Drupella* snails, which move as they feed exposing areas of white skeleton.



1a. Predation/Grazing

Fish Bites

- Distinctive, regular scars: gouges, scrapes "bite" marks that may involve damage to coral skeleton;
- Scars typically white if relatively fresh;
- Scars may become colonised by algae.

Key ID characteristics:

Parrotfish scars

- Large scrapes sometimes focused along colony ridges or growth anomaly tissue; 1
- Common on massive *Porites*.

Trigger/Pufferfish scars

- Small regular, paired rectangular bite marks; 2
- Less damaging to coral than parrot fish bites.

Damselfish scars

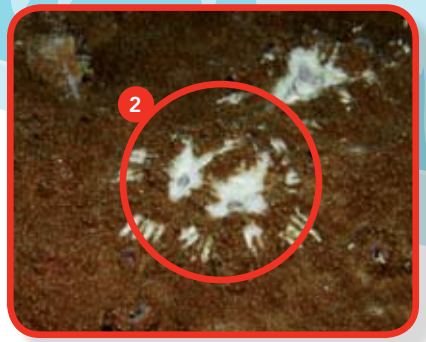
- Irregular patches of tissue loss colonized by algae farmed by damselfish; 3
- Common on branching *Acropora* species.

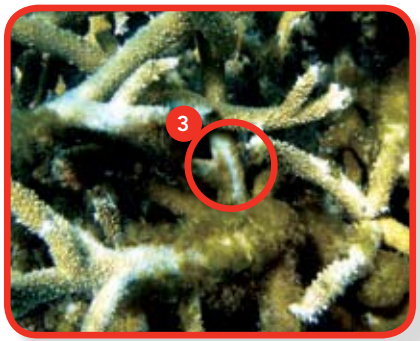
Butterflyfish scars

- Butterflyfish use their narrow elongated mouth to selectively remove coral polyps;
- Feeding scars may not be clearly evident;
- Butterflyfish may transfer diseases to the coral.

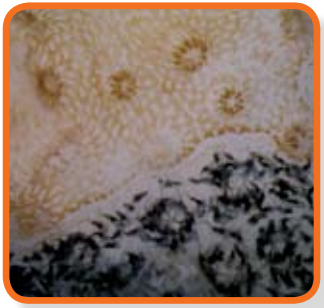
Commonly confused with:

- Usually easy to identify.





Coloured Band Diseases

	Colony	Branch	Polyp	Microscope
Skeletal Eroding Band (SEB)				
Black Band (BBD)				
Brown Band (BrB)				

Coloured Band Diseases

2a. Skeletal Eroding Band (SEB)

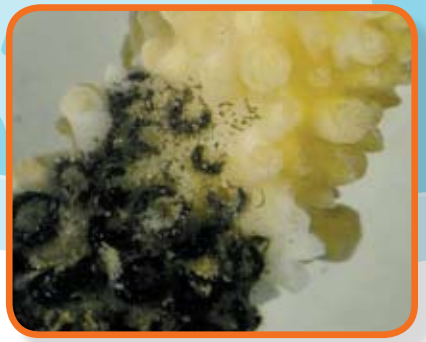
- Diffuse, speckled black or dark green band at tissue-skeleton interface;
- Exposed skeleton behind tissue front speckled by empty "housings" of the boring ciliate, ***Halofolliculina corallasia***;
- Exposed skeleton eroded in appearance;
- Diffuse, scattered patches of ciliates on bare skeleton without band formation may indicate secondary infection.

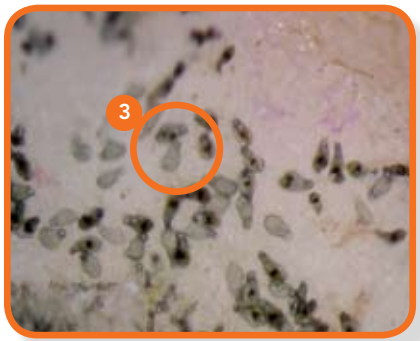
Key ID characteristics:

- Black "specks" often clustered within corallites; 1
- Sessile ciliates within "housings" comprise band;
- Microscopically, two "antenna-like" pericytostomial wings visible; 2
- Empty, black "housings" left behind as the disease front advances, creating speckling; 3
- Relatively slow rate of progression (~0-6mm/day);
- Common throughout the Indo-Pacific, affecting a wide range of coral families.

Commonly confused with:

- Black Band Disease, which does not have speckled appearance.





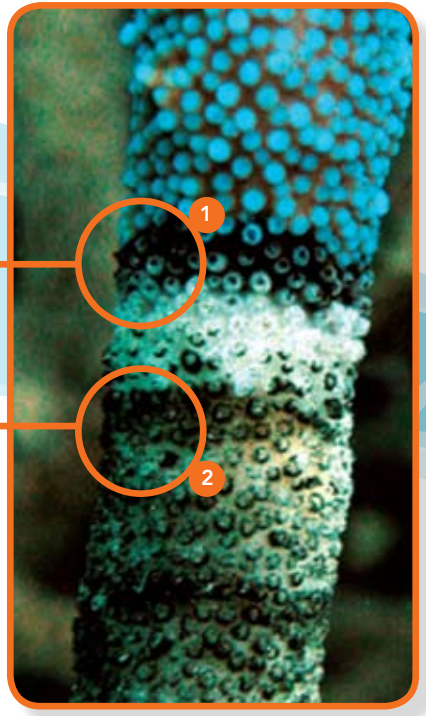
Coloured Band Diseases

2b. Black Band Disease (BBD)

- Discrete, dark band at interface between live tissue and exposed skeleton, at times directly overtopping live tissue; 1
- Band colour can vary from black to reddish-brown;
- Exposed skeleton is white (no speckling) behind band;
- Skeleton distant to tissue front becomes progressively brown as colonized by fouling community.

Commonly confused with:

- Skeletal Eroding Band (SEB), which is differentiated by speckled appearance of exposed skeleton; 2
- Dark bands between competing corals. 3



Key ID characteristics:

- Microscopically, thread-like cyanobacteria and bacteria comprise black band;
- Moderate rate of progression (~4-8mm/day on staghorns; ~1-4mm/day on plates);
- Common throughout the Indo-Pacific, affecting a wide range of coral families.

Coloured Band Diseases

2c. Brown Band Disease (BrB)

- Discrete brown band at interface between live tissue and extensive areas of exposed, white skeleton;
- Bands composed of ciliates and vary from light to dark brown with ciliate density;
- Narrow white band may be present between live coral tissue and brown band;
- Skeleton distant to tissue front becomes progressively brown as it is colonized by the fouling community; indicates progressive tissue loss.

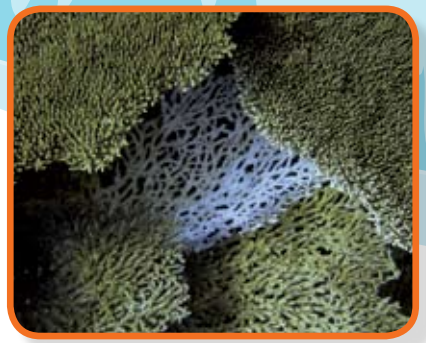
Key ID characteristics:

- Mobile ciliates (Class: Oligohymenophora; subclass: Scuticociliatia) visible under a microscope and may contain engulfed zooxanthellae giving brown appearance;
- Rapid rate of progression (20-100mm/day recorded);
- Affects a wide range of families throughout the Indo-Pacific, but commonly affects staghorn and plating species of *Acropora*.

Commonly confused with:

- White syndromes (WS) when ciliate densities are low. Check for brown tinges macroscopically or ciliates microscopically.







No Distinct Band (of overlying material) Focal Tissue Loss

3a. Ulcerative White Spots (UWS)

- Multifocal patterns of tissue loss that expose spots of bare white skeleton;
- Lesions typically small (<1cm diameter), regularly ovoid and may start as bleached spots; a coral may contain both bleached lesions and lesions devoid of tissue;
- Lesions may coalesce to create larger patches of tissue loss.

Key ID characteristics:

- No signs of associated micro-organisms at live tissue-bare skeleton interface;
- Commonly affects ***Porites***, but also ***Montipora, Echinopora,*** favids and ***Heliopora.***

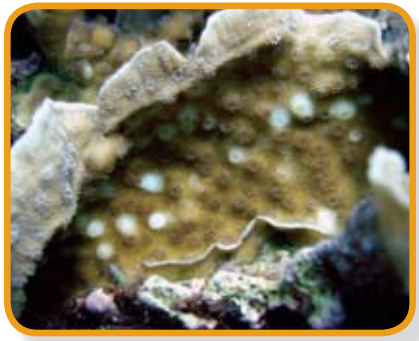
Commonly confused with:

- Focal bleaching, which is distinguished by the presence of tissue in white areas.

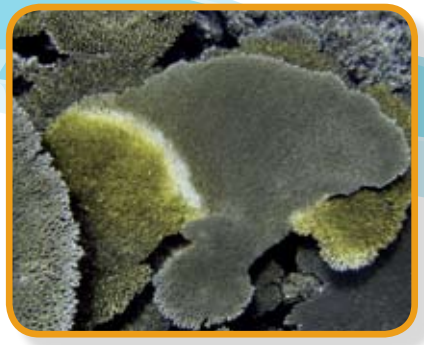
Irregular Tissue Loss

3b. White Syndromes (WS)

- Diffuse patterns of tissue loss that expose bands or patches of bare white skeleton abutting live tissue.





No Distinct Band

White Syndromes (WS) cont...

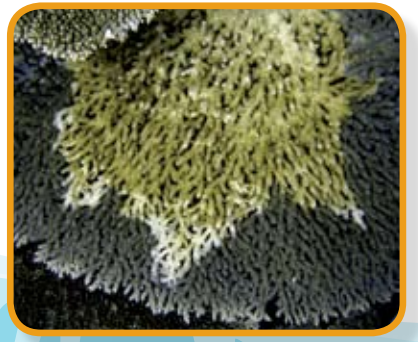
- Potentially caused by a range of pathogens and/or environmental stressors;
- May be visible colour gradient from bare white skeleton to brown as fouling community develops – indicates progressive tissue loss;
- Margins of lesions may be linear, irregular or annular (ring-like).

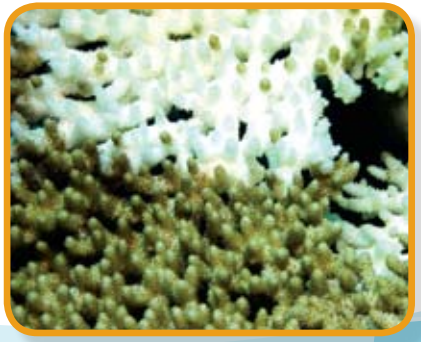
Key ID characteristics:

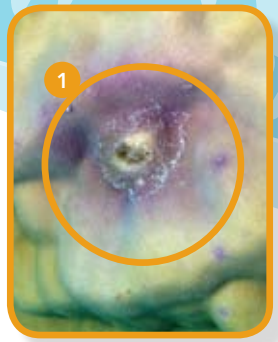
- No signs of associated micro-organisms at live tissue-bare skeleton interface;
- Apopotosis (programmed cell death) may be involved;
- Tissue loss may progress rapidly (≤20mm/day);
- Tissue bordering WS lesion may be coloured by coral pigmentation response; 1
- Commonly affects plate species of *Acropora* and a range of other genera.

Commonly confused with:

- Brown band (BrB), particularly when ciliate densities are low. Look for brown tinges;
- Bleaching, which is distinguished by the presence of tissue;
- Atramentous necrosis, which develops distinctive grey film;
- Ulcerative White Spots, on massive *Porites*, which are small, multi-focal lesions.







No Distinct Band Irregular Tissue Loss (with overlying material)

3c. Atramentous Necrosis (AtN) (Black Death)

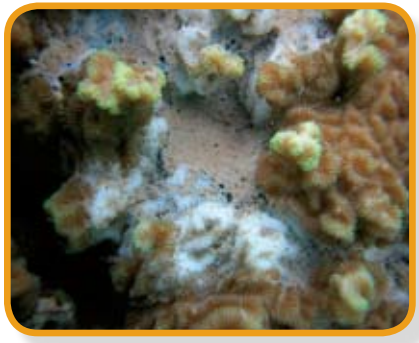
- Multifocal patterns of tissue loss that expose spots or patches of bare white skeleton subsequently colonized by a distinctive dark fouling community;
- Lesions typically start as small (<1cm diameter) bleached spots, which may coalesce to create larger patches of tissue loss; 1
- In the final stages, lesions may develop a white film overlying black deposits giving them a grayish appearance.

Key ID characteristics:

- Black sulphurous-smelling deposit accumulates under white film of bacterial filaments giving lesions a greyish-black appearance;
- Commonly affects *Montipora* but also recorded on *Acropora, Echinopora, Fungia, Merulina* and *Turbinaria*.

Early stages commonly confused with:

- Multifocal bleaching, which is distinguished by the presence of tissue;
- Ulcerative white spots, which do not result in characteristic grey-black lesions;
- White syndromes, which do not result in characteristic grey-black lesions.



4a. Bleaching (environmentally induced)

Partial/Whole Colony

- Colony to reef-wide loss of symbiotic algae (zooxanthallae);
- Associated with environmental stress (e.g. thermal, light, salinity).

4b. Focal Bleaching

Spots

- Multifocal patterns of bleaching scattered over colony;
- Borders between bleached patches and healthy tissue are often discrete;
- May be the first stage of Ulcerative White Spot or Atramentous necrosis;
- Commonly recorded on *Porites, Montipora* and *Acropora*.

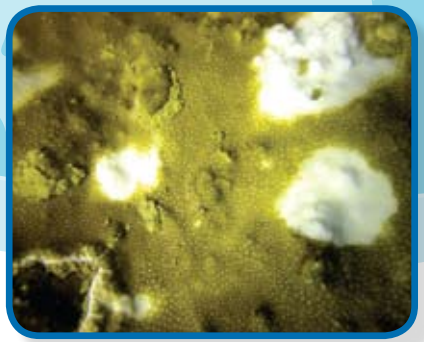
Key ID characteristics:

- Coral is alive, hence polyps visible;
- Skeleton is not eroded nor colonized by algae because tissue is present.

Commonly confused with:

- Ulcerative White Spot, which is distinguished by the absence of tissue;
- Atramentous necrosis (Black Death), which is distinguished in final stages by characteristic grey-black lesion.



4c. Non Focal Bleaching (unusual bleaching patterns)

Patches

- Unusual, diffuse patterns of bleaching that do not appear to be a specific response to thermal or other environmental stress;
- Borders between bleached patches and typically coloured tissue are often discrete;
- Recorded on massive species of *Porites*.

Stripes

- Unusual, diffuse patterns of bleaching that do not appear to be a specific response to thermal or other environmental stress;
- Borders between bleached stripes and tissue with typical colouration are often discrete;
- Recorded on *Pachyseris*.

Key ID characteristics:

- Coral is alive, hence polyps will be visible;
- Skeleton is not eroded nor colonized by algae because tissue is present.

Commonly confused with:

- White syndromes, which are distinguished by the absence of tissue in white areas.

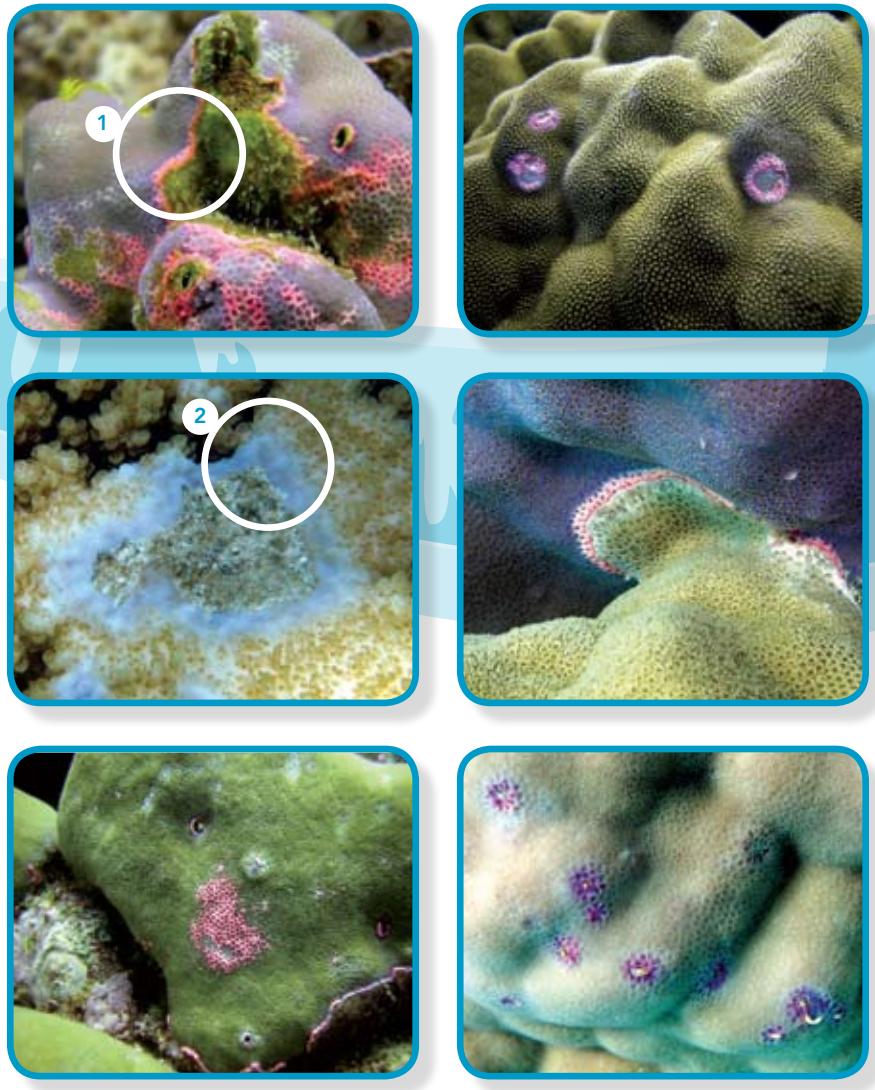
Tissue Discolouration Non-White

5a. Pigmentation Response

- Coral tissue bordering lesion is brightly coloured, typically:
  pink or purple in *Porites* sp.; 1
  blue in *Acropora* sp.; 2
- Lesion may be swollen or thickened;
- Pigmentation may form lines, bumps, spots, patches or irregular shapes depending on cause of lesion;
- Lesion may be caused by borers, competitors, algal abrasion, fish bites, breakages, etc.

Key ID characteristics:

- Pigmentation appears to be a type of "inflammation" response mounted by coral;
- Pigmented tissues typically associated with a healing response rather than progressive tissue loss;
- Suggests coral health is compromised, but is not itself a sign of disease.



Tissue Discolouration

Pigmentation Response cont...

Commonly confused with:

- Trematodiasis, which is distiguished by encysted trematodes.

5b. Trematodiasis

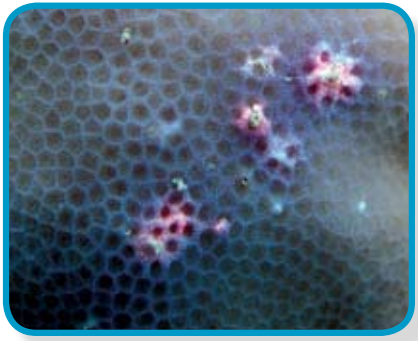
- Multifocal, distinct pink to white small (1-2mm) areas of tissue swelling;
- Swelling of one or a few polyps in response to encysted parasitic trematode; 1
- Trematode cysts are often clustered;
- Life cycle – Trematode cysts are eaten by butterflyfish then excreted and eaten by a gastropod which then infects the coral;
- Only recorded on *Porites* to date.

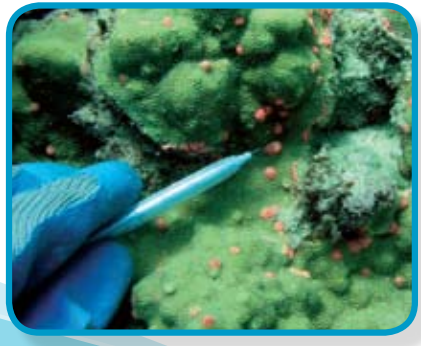
Key ID characteristics:

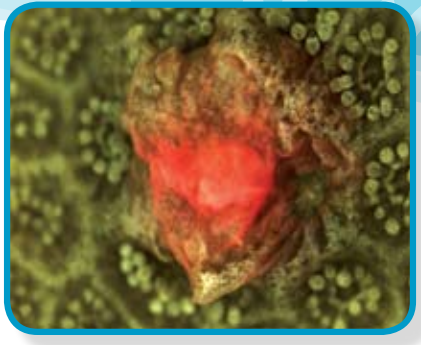
- Heavy infestations result in reduced growth and reproduction of the coral host.

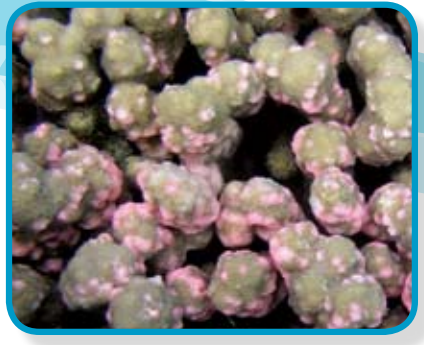
Commonly confused with:

- Pigmentation response, but distinguished by distinct small nodules of tissue swelling and presence of trematode cyst when examined microscopically.









6a. Explained Growth Anomalies

Invertebrate Galls

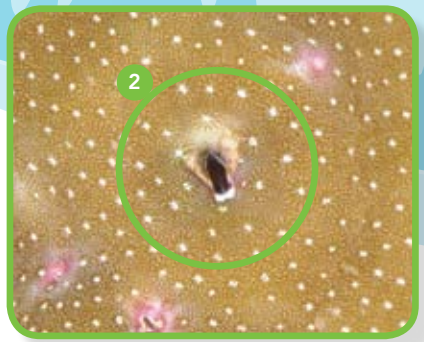
- Focal to multifocal skeletal deformations associated with an invertebrate
  e.g. crab, 1
  barnacle; 2
- Deformations are typically raised and caused by skeletal depositions around resident invertebrate in unusual patterns that are characteristic for each invertebrate.

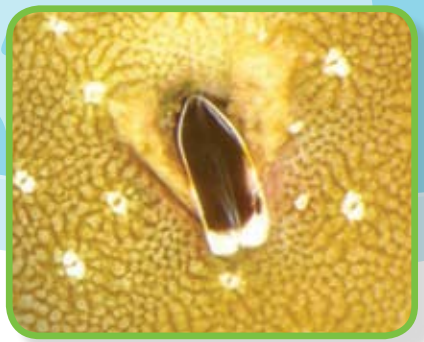
Key ID characteristics:

- Invertebrate may be present inside the gall or within the colony;
- Galls have characteristic shapes and features that are usually easy to identify;
- Crab galls are commonly observed on *Seriatopora* and *Stylophora*.

Commonly confused with:

- Other growth anomalies.





6b. Unexplained Growth Anomalies

Enlarged Structures

- Focal to multifocal, circular to irregularly shaped lesions comprising abnormally arranged, enlarged skeletal elements (corallites, ridges, valleys);
- Typically protudes above colony surface and surface rugosity visibly differs from healthy tissue;
- Pigmentation may be normal or slightly pale (suggesting reduced zooxanthellae densities);
- Tissue may die in irregular patches, and bare skeleton may be colonized by epibionts;
- Includes gigantism and areas of accelerated growth.

Irregular White Plaques

- Focal to multifocal, circular to irregularly shaped lesions comprising abnormally arranged, often highly disorganized skeletal elements (corallites, ridges, valleys);
- Pigmentation may be normal, lighter (reduced zooxanthellae) or completely absent (loss of zooxanthellae);
- Corallites smaller, fewer than in healthy tissues, or absent, resulting in structure resembling a white plaque;
- Includes chaotic polyp development.






7c. Competition – Aggressive Overgrowth

Live coral tissue overgrown by a vartiety of organisms

Cyanobacteria

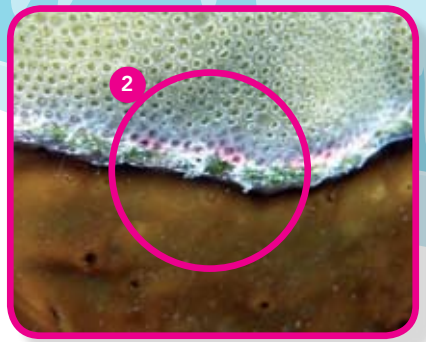
- Mats or tufts of fine algal filaments that attach to surface of coral and smother tissue;
- Algae (cyanobacteria) may vary widely in colour – dark grey, reddish orange and yellow;
- Bubbles of photosynthesis/respiration products may be present in the algal mats. 1

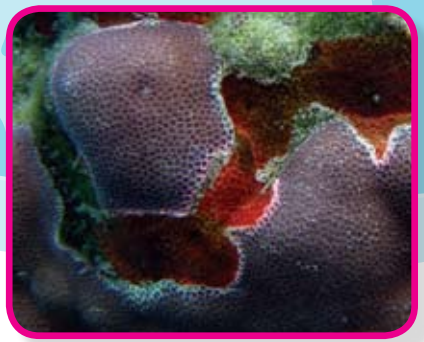
Sponges

- *Terpios* and *Cliona* sponges progressively kill and overgrow exposed coral skeleton;
- A zone of white exposed skeleton between sponge and coral may be evident. 2

Red Filamentous Algae

- Filaments embed in surface mucus and accumulate sediment;
- Tissue adjacent to filaments may bleach.





Multiple Compromised Health Signs

- Combination of algal filaments, pigentation response, surface mucus and accumulated sediment. 3

7d.Sediment Damage

- Diffuse area of tissue loss associated with fine sediment accumulating in hollows on coral surface and on coral polyps and tissue;
- Common in turbid water.

Key ID characteristics:

- Sediment deposition visible;
- May be accompanied by mucus secretion and pigmentation response.

Commonly confused with:

- Usually easy to identify.

7e.Flatworm Infestation

- Surface of coral covered by mobile, ovoid, brown flatworms, notably in the genus *Waminoa*;
- Brown colouration due to endosymbiotic dinoflagellates.

Key ID characteristics:

- Microscopically the brown flatworms are speckled white.

Commonly confused with:

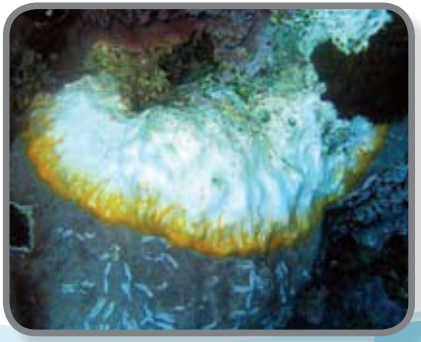
- Usually easy to identify.

8a. Diseases Affecting Other Reef Organisms

Crustose Coralline Algae

Coralline Lethal Orange Disease (CLOD)

- Characteristic orange band.

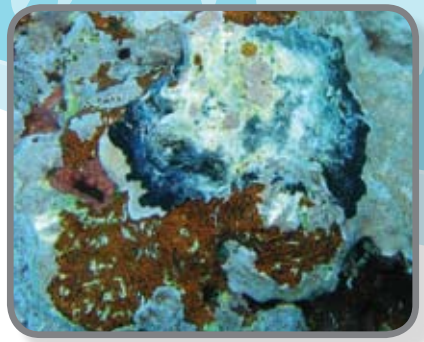


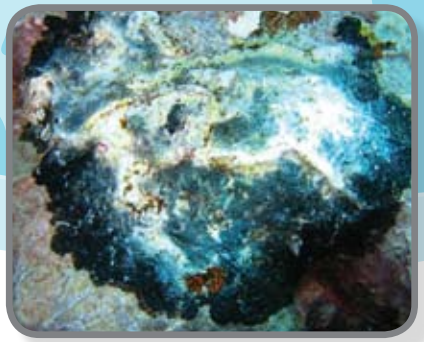
Crustose Coralline Algae (CCA)

Black Fungal Disease

Commonly confused with:

- Usually easy to identify.





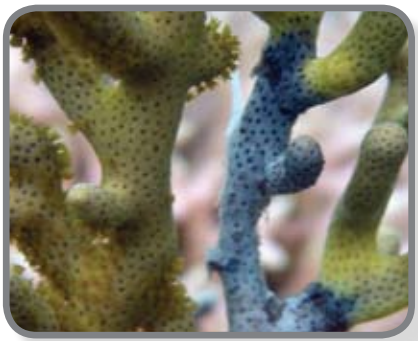
ISIS Gorgonians

Black necrosing syndrome

- Black/grey necrotic tissue;
- Tissue necrosis and loss;
- Skeleton exposed as necrotic tissue is lost.

Commonly confused with:

- Usually easy to identify.



Underwater Cards –
Options for Recording & Reporting Observations of Coral Disease

Qualitative observations of coral disease

At the simplest level, it is useful to photograph and / or record details of corals that are diseased or show signs of compromised health. The following data could be recorded:

Date & Recorder:

Site/Habitat/Depth:

Disease/compromised health sign:

Growth form/Genus/species of coral:

Photo name(s) & number(s):

Additional observations (e.g. #corals/species affected):

Quantifying observations of coral disease

Disease abundance: Recording the number of cases of disease per unit area without recording all healthy corals gives a measure of disease abundance. ***To quantify disease abundance:***

1. Select an appropriate area (e.g. 20m x 2m belt transect);
2. Select appropriate replication (e.g. 3 belt transects per site);
3. Record all corals showing signs of disease or compromised health on the data sheet at the end of this guide;
4. Calculate mean (± SE) number of disease cases per $40m^2$.

Disease prevalence: Recording the number of cases of disease and the total number of healthy corals per unit area gives a measure of disease prevalence. This is a better, but more time consuming way of quantifying disease.

1. Select an appropriate area (e.g. 20m x 2m belt transect);
2. Select appropriate replication (e.g. 3 belt transects per site);
3. Record all corals showing signs of disease or compromised health and all healthy corals on the following data sheets;
4. Calculate mean (± SE) percent of corals that are diseased per $40m^2$.

Disease incidence: Tagging and monitoring the number of diseased corals in a given area through time identifies the number of new cases of disease per unit time and gives a measure of disease incidence or spread throughout the population.

1. Select an appropriate area (e.g. 10m x 10m quadrat) ;
2. Select appropriate replication (e.g. 3 quadrats per site);
3. Tag all diseased colonies within quadrats;
4. Monitor quadrats regularly (e.g. monthly), tagging all new cases of disease;
5. Calculate mean (± SE) # of new disease cases per unit time.

Disease progression: Tagging and photographing corals through time enables rates of disease progression across corals to be calculated.

1. Tag replicate diseased corals at study site;
2. Photograph each diseased coral with a scale bar and at a standard angle;
3. Re-photograph tagged corals at regular intervals (e.g. weekly or monthly) ;
4. Measure linear spread of disease front or progressive area of tissue loss from images;
5. Calculate mean (± SE) rate of disease progression.

We are grateful to the following people for images reproduced in these Cards: David Abrego, Greta Aeby, Shelley Anthony, Roger Beeden, Doug Fenner, Mike Flavell, Great Barrier Marine Park Authority, Mohammed Mohammed, Cathie Page, Laurie Raymundo, Maria Rodrigues, Kathryn Rosell, Emily Smart (Fantasea Cruises), Yui Sato, David Stewart, Meir Sussman and Bette Willis. We thank Greta Aeby, Andy Bruckner, Drew Harvell and Thierry Work for invaluable discussions during the genesis of these Cards. We thank the CRTR Program for its support and for funding this publication, and the ARC Centre of Excellence for Coral Reef Studies for funding the majority of research underpinning these cards.

Product code: CRTR 002/2008

Name:

Date:

Reef:

			Tissue Loss										Tissue Discolouration			
			Known Predator/ Grazer				Non-Predation (i.e. Disease)						2. Bleaching			
			Fish Grazer	Drupella	Coralli-ophila	COTS	Coloured Band Diseases			No Distinct Band			Whole/ partial colony	Focal	Non-Focal (unusual patterns)	
Family	Genus	Colony Shape	FISH	DRU	COR	COTS	SEB	BBD	BrB	UWS	WS	AtN	%	Spots	Patches	Stripes
Acroporidae	*Acropora*	tabular (plates)														
		corymbose (pillows)														
		digitate (finger like)														
		bottlebrush														
		clumping														
		bushy														
		staghorn														
	Montipora	encrusting														
Pocilloporidae	*Pocillopora*	clumps – branches														
	Stylophora	blunt branches														
	Seriatopora	spiky branches														
Poritidae	*Porites*	massive														
		branching														
	Alveopora	(12 tentacles)														
	Goniopora	(24 tentacles)														
Faviidae	*Favia*															
	Montastrea															
	Favites															
	Echinopora															
	Platygyra															
	Goniastrea															
	Cyphastrea															
	Diploastrea															
(record other favids)	1															
	2															
Other (record genus if known & describe)																
Photo number(s)																
(Take 3 photos: colony, branch & close up)																

GPS coordinates:

Depth (m) Ave: m

Depth (m) Max: m

Timed Swim/Dive: mins

Name:

Date:

Reef:

			Non-White		Growth Anomalies			Compromised Health						
					Exp	Unexplained		Overgrowth						
			Pigment Response	Tremat-odiasis	Invert Galls	Enlarged structures	Irreg. white plaques	Cyanob-acteria	Sponges	Red. Filament Algee	Sediment damage	Flatworm Infestation		
Family	Genus	Colony Shape	PR	TR	IG	ES	IWP	CY	SP	RA	SD	RW	Healthy Coral	Unknown Scars
Acroporidae	*Acropora*	tabular (plates)												
		corymbose (pillows)												
		digitate (finger like)												
		bottlebrush												
		clumping												
		bushy												
		staghorn												
	Montipora	encrusting												
Pocilloporidae	*Pocillopora*	clumps – branches												
	Stylophora	blunt branches												
	Seriatopora	spiky branches												
Poritidae	*Porites*	massive												
		branching												
	Alveopora	(12 tentacles)												
	Goniopora	(24 tentacles)												
Faviidae	*Favia*													
	Montastrea													
	Favites													
	Echinopora													
	Platygyra													
	Goniastrea													
	Cyphastrea													
	Diploastrea													
(record other favids)	1													
	2													
Other (record genus if known & describe)														
Photo number(s)														
(Take 3 photos: colony, branch & close up)														

GPS coordinates:

Water temp: ˚C