

## Field Guide for Disease Response

**IMPORTANT:** Sterilize gear when leaving an infected site and entering a potentially “clean” site so as to avoid spreading the disease to unaffected sites.

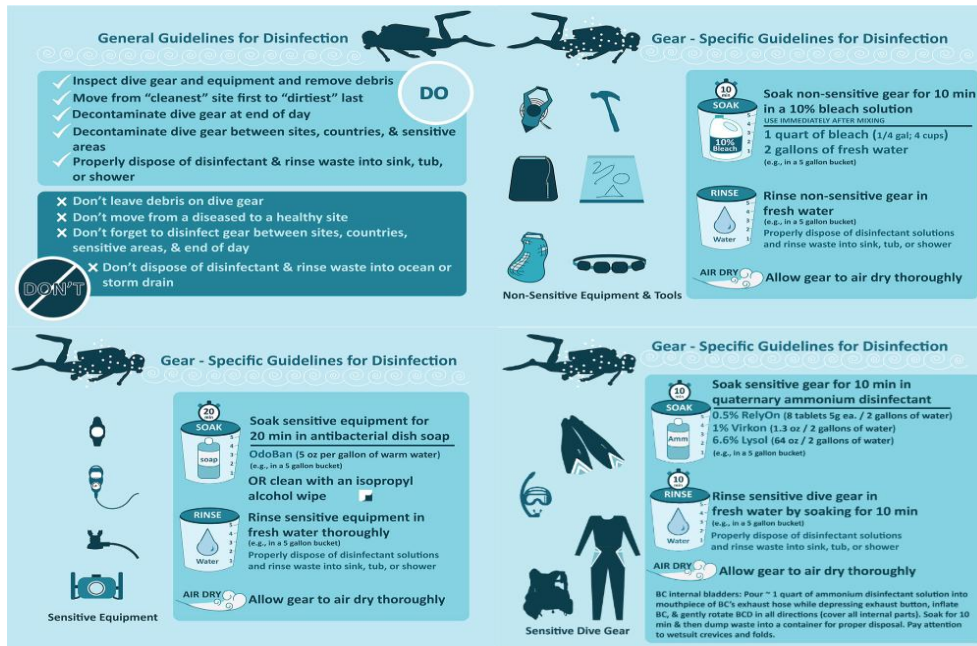
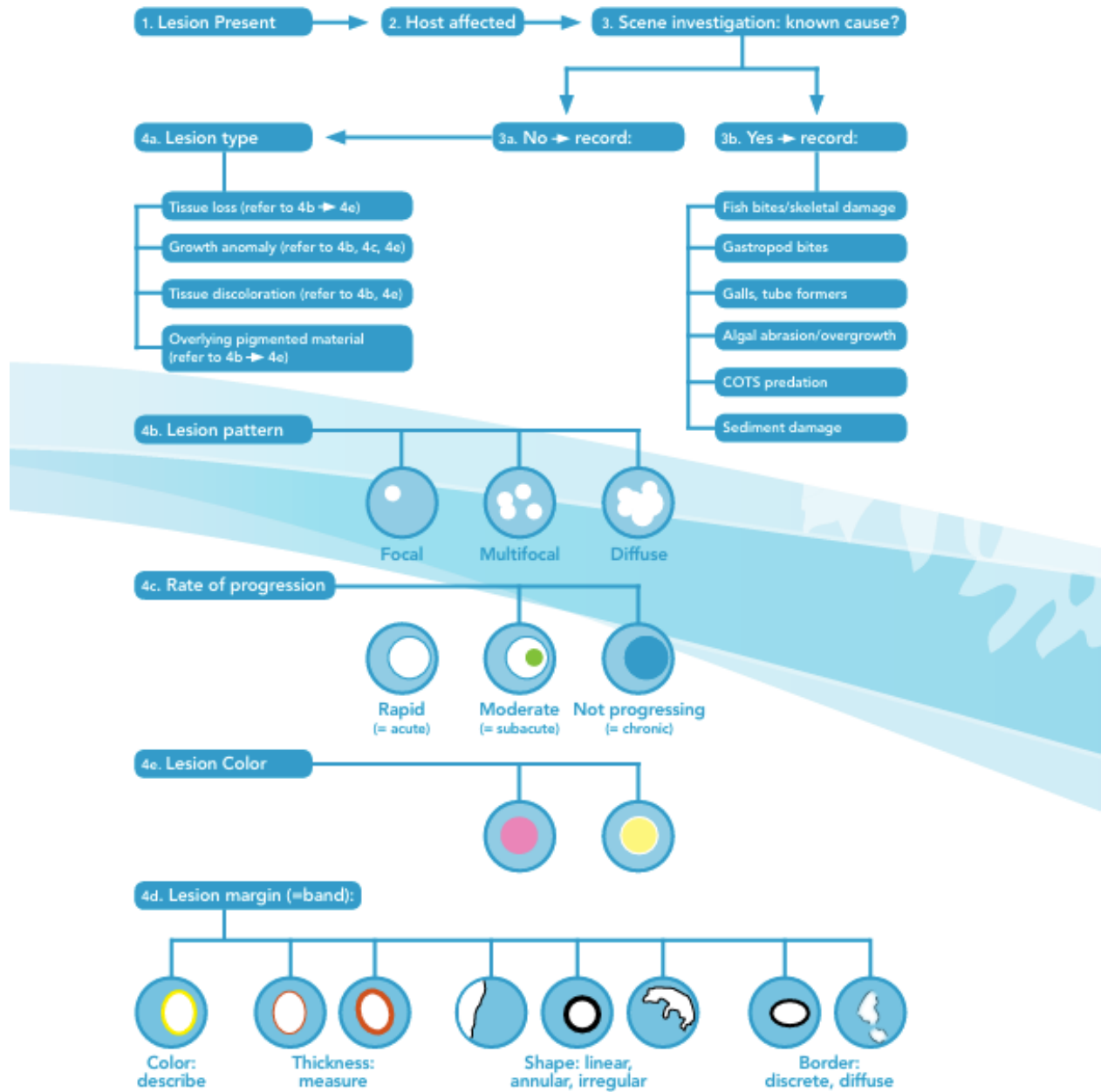


Figure 1. Credit: Athena Burnett/NOAA <https://flowergarden.noaa.gov/protection/preventcoraldisease.html>.

### Step 1 (Data Collection): Collect Information about the Disease and the Surrounding Environment

1. **Take photos** of affected colonies and close ups of the lesions. If possible, tag and photograph diseased colonies with a scale bar so that colonies can be revisited to determine progression.
  - a. Take samples when disease cannot be visually determined.
2. **Conduct a Tier 2 assessment** (see Appendix B) to collect information about the disease(s) at the site.
3. **Take GPS Waypoints** at each infected colony so that geographic extent of the disease at the site can be determined.
4. From the data collected during the assessment **develop a host list of all infected taxa and calculate prevalence at the site.**
5. An online ‘**Incident Report Form**’ is located on the CRAG website.
6. **Determine Range of Disease:** Depending on habitat type, conduct Tier 1 or Tier 2 assessments at sites radiating out from the initial outbreak site to determine range of the disease and identify any disease hot spots which may require more in depth assessments.



**Figure 2.1** A globally-relevant decision tree used to identify known causes of lesions and describe lesions of unknown cause. All lesions denoted as white represent bare, exposed skeleton; green symbolizes secondary algal colonization of bare skeleton. Other colors represent examples of commonly-encountered lesions or lesion margins characteristic of specific diseases.

Figure 2. Decision tree for field-based assessments from *A Coral Disease Handbook*.

### Step 2 (Data Analysis): Classify Event

Send any samples to Thierry Work in Hawai'i to analyze. Establish whether the disease exists at background levels or at outbreak levels.

*Table 1. Guidelines for Determining Disease Level.*

<b>Disease Level</b>	<b>Indicators</b>	<b>Next Steps</b>
Background	<ul style="list-style-type: none"><li>● Number of infected colonies are stable</li><li>● Less than 20% of colonies within the area are infected</li><li>● Low levels of mortality</li></ul>	Opportunistic monitoring at site to determine if infection rates are increasing.
Outbreak	<ul style="list-style-type: none"><li>● Number of infected colonies increasing at the site</li><li>● 20% of colonies or more within the site are infected</li><li>● High levels of mortality</li></ul>	<ul style="list-style-type: none"><li>● Develop regular monitoring schedule</li><li>● Assess potential management actions</li></ul>

### Step 3 (Intervention): Act to Reduce Disease Presence

Antibiotic treatment is the strategy used at CRAG to reduce disease load on infected colonies.

- Gather antibiotic paste and caulk gun applicator
- Identify the lesion
- Dig trench around active lesion using angle grinder or similar tool
- Apply paste to lesion (into trench and over lesion margin)
- Fix with jute rope if required to assist adherence

### Step 4 (Continuous Monitoring): Develop a Regular Monitoring Schedule

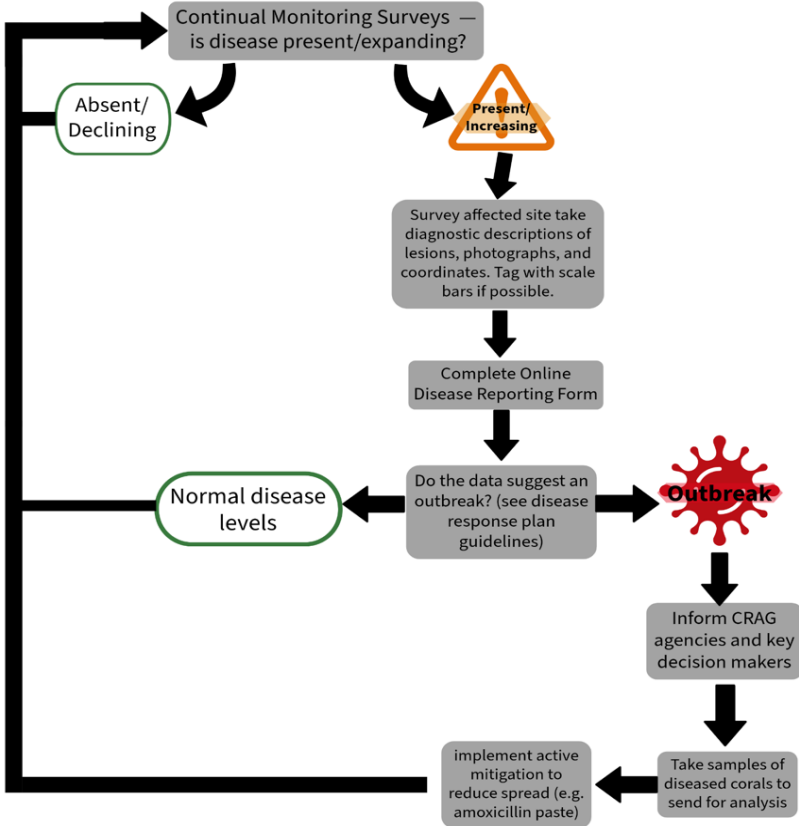
Once it is determined there is an active disease outbreak a regular monitoring schedule should be developed. Monitoring can be conducted at the original outbreak site, priority areas, and/or at any disease hot spots identified during previous assessments. Frequency of the monitoring should be based on the rate of disease progression and mortality. Where there are high rates of mortality sites should be revisited weekly or biweekly if possible.

These monitoring trips should (modified from the Coral Disease Handbook, 2008):

- Revisit tagged colonies to determine disease progression and note the health status of the colony (progressing, stasis, recovering, dead);
- Look for new lesions either on infected colonies or on previously uninfected colonies;
- Look for signs of recovery either through resheeting over the skeleton or through new coral recruits.

When possible, Step 1 should be repeated to see if the disease has spread to new sites.

# Coral Disease Outbreak Response Plan



Coral Disease Response Plan by Amanda Ho, CRAG Reef Resilience Coordinator (2024).

Figure 3. Flow chart depicting CRAG disease response protocol.

## Mitigation and Prevention Protocol

Local resource managers have a few intervention tools available to mitigate the spread of coral disease. For CRAG, antibiotic treatment is the preferred intervention method and it is described below.

1. Gather required materials
  - a. Caulk gun
  - b. Amoxicillin paste
2. Identify area for application
3. Apply to affected areas

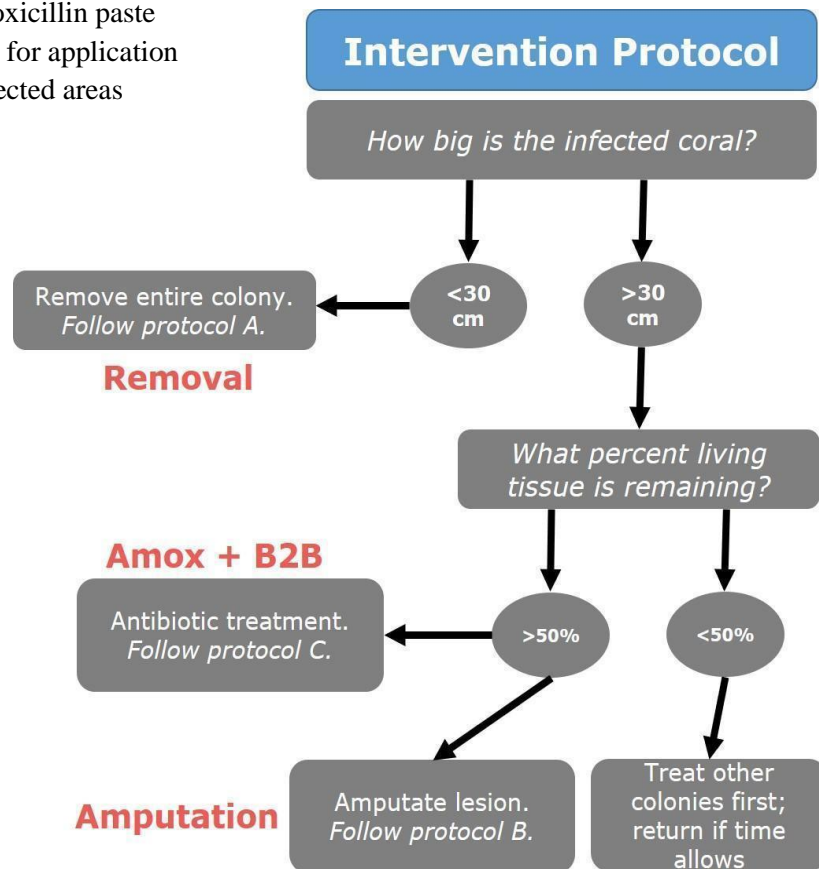


Figure 4. The Intervention flowchart is a visualization of the systematic approach used by managers to decide which method of intervention is most appropriate for a coral. See Appendix H for detailed protocols (taken from Warham & Bowman).


The following data sheet templates are taken from [A Coral Disease Handbook](#):

# Data sheet template – Lesion characterization data sheet

Recorder: \_\_\_\_\_ Site: \_\_\_\_\_ Transect: \_\_\_\_\_ Date: \_\_\_\_\_


Species	Col diam (cm)	Lesion #/col	Distribution F/M/C/D/L	Location B/M/A	Lesion Diam	Lesion Color	Margin (S/I)	Severity ml/md/s/x	Timing A/S/C	Diagnosis/Comments

**Distribution:**



focal    multifocal    coalescing    diffuse    linear

**Location:**



basal    medial    apical

<b>Margin:</b>	<b>Severity:</b>	<b>Timing:</b>
Smooth (S)	Mild <10%	Acute (current; bare skeleton)
Irregular (I)	Moderate 10-24%	Subacute (recent; green filamentous algae)
	Severe 25-49%	Chronic
	Extreme 50-100%	(epibiont community)

# Indo-Pacific data sheet template – Disease prevalence & compromised health states

Recorder: \_\_\_\_\_ Site: \_\_\_\_\_ Transect: \_\_\_\_\_ Depth: \_\_\_\_\_ Transect Position: \_\_\_\_\_ Date: \_\_\_\_\_

	Total Colony Count	Growth anomaly	BBD	BrB	WS	UWS	SEB	Patchy bleach	PR
<i>Acropora</i> tabular									
staghorn/bushy									
bottlebrush/digitate									
corymbose									
isopora									
<i>Anacropora/Astreopora</i>									
<i>Montipora</i>									
<i>Pocillopora</i>									
<i>Stylophora/Seriatopora</i>									
<i>Stylocoeniella/Madracis</i>									
<i>Porites</i> massive									
branching									
submassive									
<i>Goniopora/Alveopora</i>									
<i>Favia/Montastrea</i>									
<i>Favites/Echinopora</i>									
<i>Platygyra/Goniastrea</i>									
<i>Cyphastrea/Leptastrea</i>									
Other faviids (genera)									
Fungids (genera)									
<i>Galaxea/Simplastrea</i>									
<i>Pectinia/Oxypora</i>									
<i>Echinophyllia/Mycedium</i>									
<i>Lobophyllia/Symphyllia</i>									
other Mussids (genera)									
<i>Hydnophora</i>									
<i>Merulina</i>									
<i>Paraclav/Scapophyllia</i>									
<i>Pavona</i>									
<i>Leptoseris/Coeloseris</i>									
<i>Pachyseris/Gardinero</i>									
<i>Psammocora/Coscinarea</i>									
<i>Siderastrea/Pseudosider</i>									
<i>Euphyllia/Catal/Trachy</i>									
<i>Plerogyra/Physogyra</i>									
<i>Turbinaria/Tubastrea</i>									
<i>Helipora/Tubipora</i>									
<i>Millepora</i>									

Data sheets currently used for assessment and monitoring

Predation: **1Dr** (*Drupella*) **1Co** (*Coralliophila*) **1CT** (COT) **1F** (Fish) Algal overgrowth/abrasion: **2Cy** (cyanobacteria) **2Ma** (macroalgae) **2RF** (red filamentous) Silt smothering/abrasion: **S1**

# Indo-Pacific data sheet template – Line intercept transect data

Recorder:

Site:

Depth:

Date:

	T1	T2	T3	T4	T5	T6
<i>Acropora</i> tabular						
corymbose						
digitate						
bottlebrush						
staghorn/bushy						
Isoporan						
<i>Montipora</i>						
<i>Anacropora/Astreopora</i>						
<i>Pocillopora</i>						
<i>Stylophora/Seriatopora</i>						
<i>Porites</i> massive						
<i>Porites</i> branching						
<i>Porites</i> submassive						
<i>Goniopora/Alveopora</i>						
<i>Favia/Favites/Montastrea</i>						
<i>Platygyra/Goniastrea</i>						
<i>Cyphastrea/Leptastrea</i>						
other Faviids						
Fungids						
Oculinids/Pectinids						
Mussids/Merulinids						
Agariicid/Siderastreids						
Dendrophyllids						
Caryophyls, Trachyphyls						
Soft corals/Gorgonians						
<i>Heliopora/Tubipora/Millepora</i>						
macroalgae/fleshy algae						
rock with turfing algae						
sand/silt						
recently dead standing coral						
rubble						
other (sponges, ascidians)						