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.

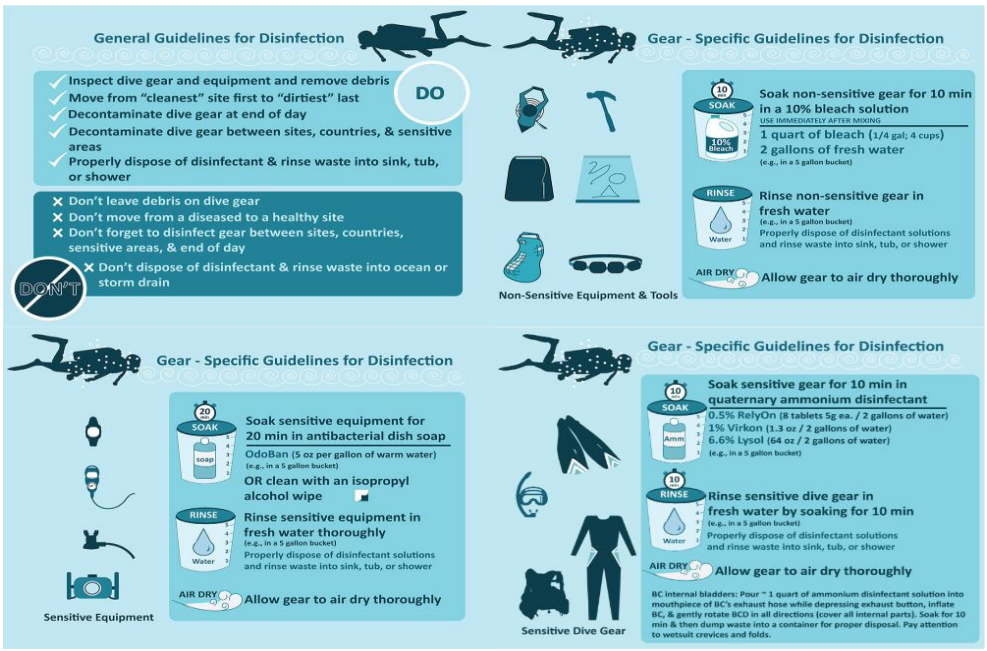


Figure 1. Credit: Athena Burnett/NOAA https://flowergarden.noaa.gov/protection/preventcoraldisease.html.

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.

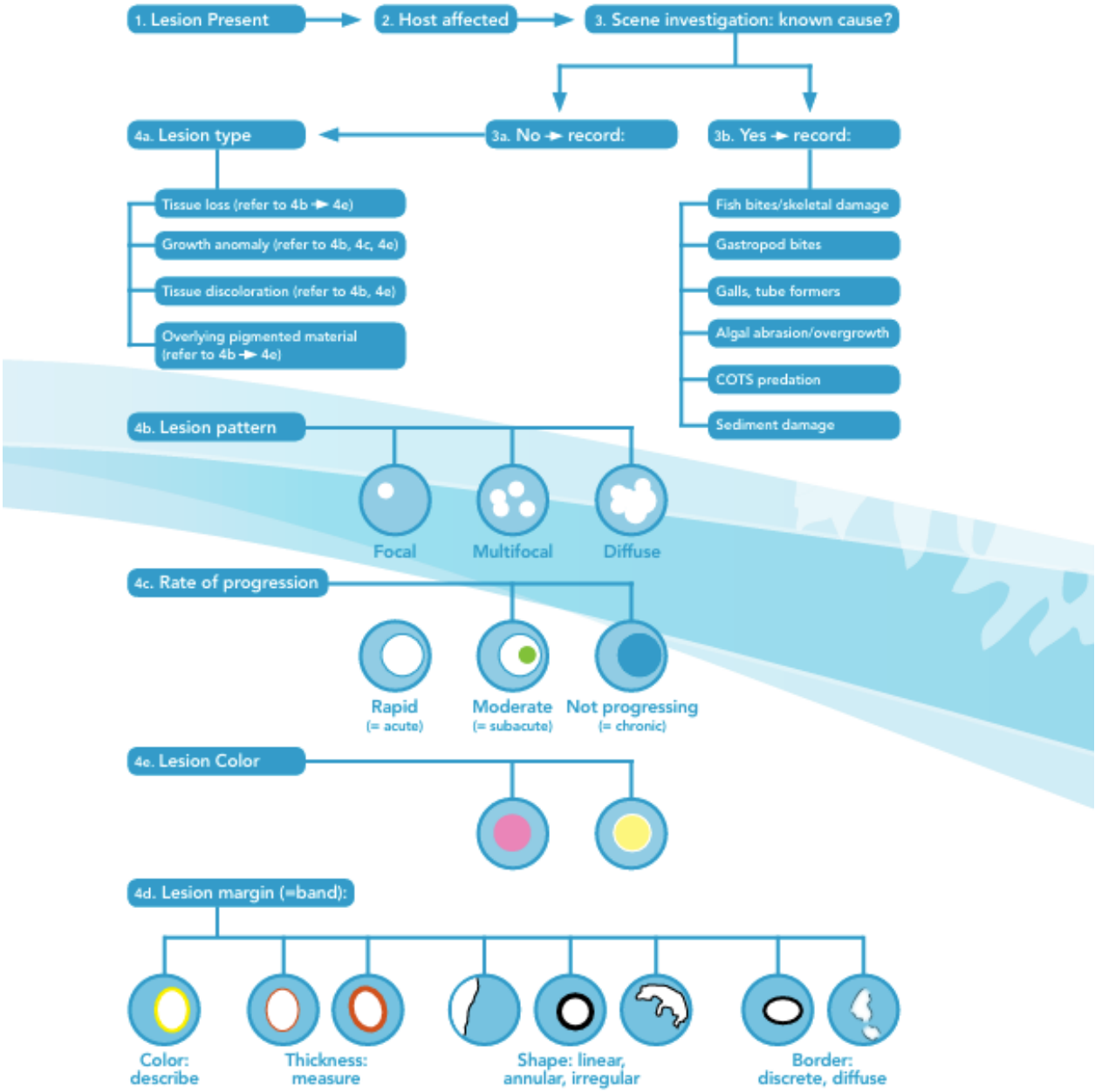


Figure 2.1 A globally-relevant decision tree used to identify known causes of lesions and describe lesions of unknown cause. All lesions denoted as white represent bare, exposed skeleton; green symbolizes secondary algal colonization of bare skeleton. Other colors represent examples of commonly-encountered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

Disease Level	Indicators	Next Steps
Background	● Number of infected colonies are stable ● Less than 20% of colonies within the area are infected ● Low levels of mortality	Opportunistic monitoring at site to determine if infection rates are increasing.
Outbreak	● Number of infected colonies increasing at the site ● 20% of colonies or more within the site are infected ● High levels of mortality	● Develop regular monitoring schedule ● Assess potential management actions

Step 3 (Intervention): Act to Reduce Disease Presence

Strategies used at CRAG to halt or slow the spread of disease:

- Removal techniques
    - Culling - removes disease load :) removes coral and hard coral substrate :(
    - Amputation - stats on success rates
    - Antibiotic treatment

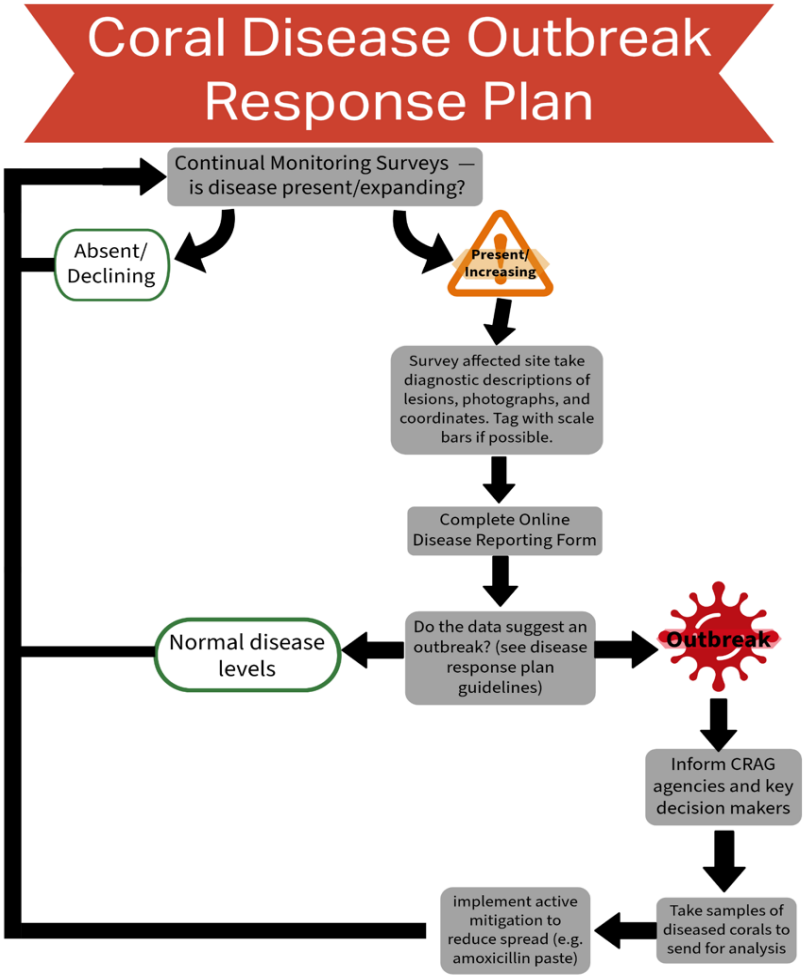
Step 4 (Continuous Monitoring): Develop a Regular Monitoring Schedule

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 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

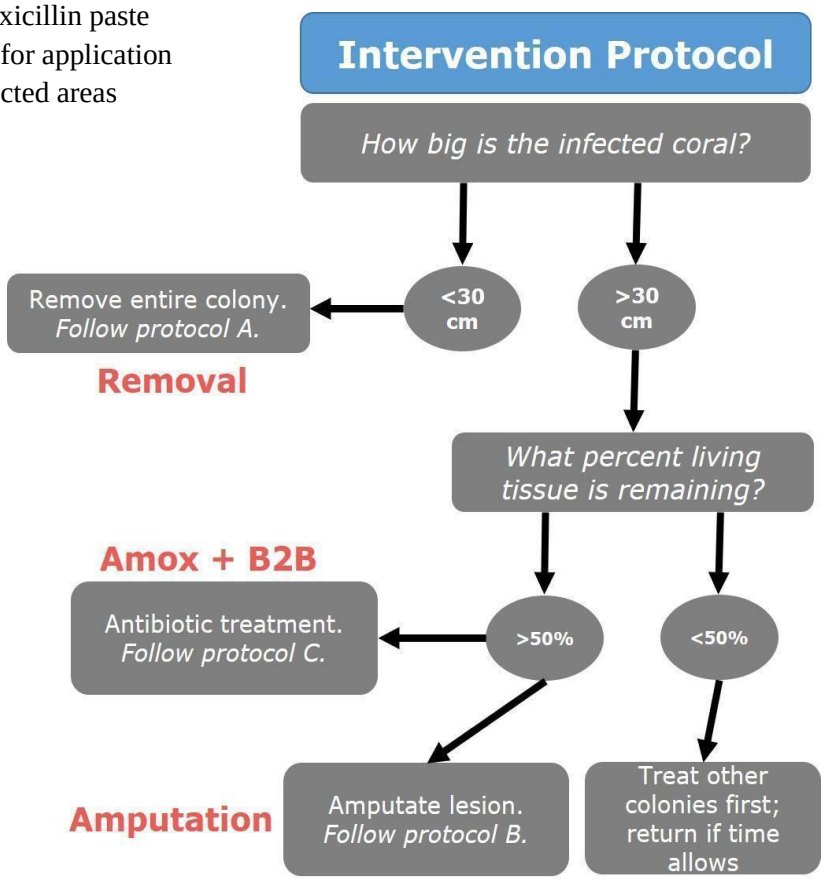


Figure 4. The Intervention flowchart is a visualization of the systematic approach used by managers to decide which method of intervention is most appropriate for a coral. See Appendix H for detailed protocols (taken from Warham & Bowman).

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

Margin:

Smooth (S)
Irregular (I)

Severity:

Mild	<10%
Moderate	10-24%
Severe	25-49%
Extreme	50-100%

Timing:

Acute (current; bare skeleton)
Subacute (recent; green filamentous algae)
Chronic
(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
Acropora tabular									
staghorn/bushy									
bottlebrush/digitate									
corymbose									
isopora									
Anacropora/Astreopora									
Montipora									
Pocillopora									
Stylophora/Seriatopora									
Stylocoeniella/Madracis									
Porites massive									
branching									
submassive									
Goniopora/Alveopora									
Favia/Montastrea									
Favites/Echinopora									
Platygyra/Goniastrea									
Cyphastrea/Leptastrea									
Other *faviids* (genera)									
Fungids (genera)									
Galaxea/Simplastrea									
Pectinia/Oxypora									
Echinophyllia/Mycedium									
Lobophyllia/Symphyllia									
other *Mussids* (genera)									
Hydnophora									
Merulina									
Paraclav/Scapophyllia									
Pavona									
Leptoseris/Coeloseris									
Pachyseris/Gardinero									
Psammocora/Coscinarea									
Siderastrea/Pseudosider									
Euphyllia/Catal/Trachy									
Plerogyra/Physogyra									
Turbinaria/Tubastrea									
Heliopora/Tubipora									
Millepora									

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

Data sheets currently used for assessment and monitoring

Indo-Pacific data sheet template – Line intercept transect data

Recorder: **Site:** **Depth:** **Date:**

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