APPENDIX 1

Resources for training in reef monitoring skills

Suggested training plan

The entire training course can actually be taught in a week's time. However, it is recommended that the training be spread over the course of 3 years in order to allow the team sufficient time to practice under supervision and to allow the study area to actually change in response to management activities enough to be observed. If a community is being trained by external trainers, at least two visits by them should be planned for each year. The trainees should be encouraged to collect data 2 to 4 times a year (i.e. once per season) together with their local development workers.

Year & Season	Scheduled Activities	Ongoing Activities
Year 1. Season 1. (e.g. Nov.-Mar.)	Introduce the idea of participatory monitoring & evaluation to key community leaders. Check the site for appropriate biophysical and socioeconomic conditions, logistics, and counterpart arrangements and offer to conduct the training.	
Year 1. Season 2. (e.g. Apr.-May) 3-4 days	Review of basic reef ecology and management. Teach Chapters 1-4 and the data collection and recording steps of Chapters 5-9. Have trainees practice collecting data while experienced people collect baseline data (on the benthos, reef fishes, and invertebrates). Intro to Monitoring & Evaluation of Coral Reefs (1 hr talk) Observing Corals and Algae [data collection] (1 hr talk/ 1 day fieldwork) Observing Reef Fishes [data collection] (1 hr talk/ 1 day fieldwork) Monitoring Fish Catch [data collection] (1-2 hr talk & planning) Human Activities & Natural Disturbances (1 hr talk) Drawing Up a Monitoring Plan (1-2 hr talk & planning)	
Year 1. Season 3. (e.g. Jun.-Oct.) 2-3 days	Trainees and their local development workers collect data (on the benthos, reef fishes, and invertebrates) again. If data collection skills are good by this point, local development workers can begin teaching the data summarization steps of	Trainees continue collecting data on fish catch and human activities

Year & Season	Scheduled Activities	Ongoing Activities
	Chapters 5-9. Otherwise, these may be taught the following season.	
Year 2. Season 1. 2-3 days	Trainees and local develoment workers collect data (on the benthos, reef fishes, and invertebrates) together.	
Year 2. Season 2. 2-3 days	Review the data collection and recording steps of Chapters 5-9 and quiz trainees on this knowledge. Trainees, local development workers, and external trainers collect data (on the benthos, reef fishes, and invertebrates) together. Drawing Up a Monitoring Plan (review & revision of plan) (½-1 hr) Observing Invertebrates (½ hr) Human Activities & Natural Disturbances (review) (½ hr)	
Year 2. Season 3. 2-3 days	Trainees and local development workers collect data (on the benthos, reef fishes, and invertebrates) together. Trainees use the data collected during the previous monitoring exercises to practice data summarization under the supervision of external trainers. Observing Corals & Algae [summarization & graphing] (1 hr) Observing Reef Fishes [summarization & graphing] (1 hr) Monitoring Fish Catch [summarization & graphing] (1-2 hr)	
Year 3. Season 1. 2 days	Trainees collect data (on the benthos, reef fishes, and invertebrates).	
Year 3. Season 2. 2-3 days	Trainees, local development workers, and external trainers collect data (on the benthos, reef fishes, and invertebrates) together. Supervise data summarization by trainees. Teach Chapters 10-11 especially using the past 3 years' monitoring data. Interpreting Observations (1 hr) Evaluation & Action (1 hr)	
Year 3. Season 3. 3 days	Trainees collect data (on the benthos, reef fishes, and invertebrates). A contest-conference amongst various trainee teams may help teams share insights with each other.	

IMPORTANT

Volunteers are rarely able to participate for more than 2 straight days. So, it would be best to spread out each season's monitoring and training activities within a week's time.

No matter when you decide to formally teach Chapters 10 & 11, facilitators must always feedback monitoring results and discuss management implications at least once per season. Monitoring team members should also regularly (e.g. 2 to 4 times a year) present their findings to their organization and community for validation and comments. Encourage the community to discuss the possible implications of the data and plan for appropriate action. Graphs of the results may be displayed on a billboard near the monitoring station. This billboard should be updated regularly.

Trainers tips

Things to consider when planning a training:

- ✓ Who is the target audience?
- ✓ How many teachers will be needed?
- ✓ Who is in charge of first-aid?
- ✓ How much time is available for the training?
- ✓ Who will provide meals and snacks?

* Prepare and review before the actual training. Practice what you teach.
* Repeat and/or summarize key points after each talk. To facilitate understanding, assign participants to summarize.
* Understand what motivates your trainees and address their particular concerns.
* Time is usually scarce: keep talks short and simple; train through actual monitoring.
* Laminated identification guides for underwater use are especially helpful for training.
* Organize trainees into teams and assign transects and organisms to be assessed to each team.
* Assign one person to fill out Form 2 and collect all data forms from the team members. All data forms must be complete and in one place at the end of the monitoring period.
* Encourage trainees to ask questions and participate actively. Be open to ideas (especially indigenous methods) from trainees.

Training effective reef monitors requires that the trainer helps the trainee learn accurate and effective monitoring techniques through education, practice, testing, and quality checking. Appendix I provides materials useful to assist trainers in educating and developing effective reef monitors. The resources and their uses are:

1. Evaluation form for simple reef monitoring for management. This form may be used to assess each team member and the team as a whole in their ability to apply the various techniques explained in the guide. Under each monitoring technique are listed important points of knowledge or procedures that each trainee should master and understand. The form provides a means of rating the proficiency of each trainee or group in the various techniques and their attributes.

2. Evaluation guide. The evaluation guide provides a means of assigning points and quantification to various behavioral objectives that the trainee should master to be a good reef monitor. How to assess the behavioral traits of the trainee is explained so that points can be assigned to different levels of proficiency. This evaluation guide can be used to rate trainees or groups. It covers:
    a. Demo teaching
    b. Benthos observation
    c. Fish visual census
    d. Invertebrate census
    e. Interpretation and evaluation.

3. Comparison of reef monitoring methods. This sheet helps us decide on the level of detail required in doing reef monitoring in relation to the time and effort required. Table 1 shows the level of detail possible in relation to the level of effort where 3 is the highest level of effort. Table 2 compares four reef survey protocols. Level 3 coincides with the Global Coral Reef Monitoring Network methods of English *et al.* (1997) and requires the most effort. It is noted that the simple method of this guide collects data on most of the parameters of the other 3 methods but lacks detail in several categories such as identifying coral and fish to genera or species level.

I. Evaluation form for simple reef monitoring for management

Site Name: Municipality & Province:

Team member: Name of team:

Reef Monitoring and Evaluation Training

	Year 1	Year 2	Year 3
I. General knowledge			
▪ Value of monitoring & evaluation to adaptive management			
▪ Components of the monitoring program			
▪ Monitoring (through time), inside/outside, replication, representative			
II. Manta tow			
▪ Procedure (2-minute segments, timer keeps close watch on observer)			
▪ Estimate % cover			
▪ Distinguish between live hard, dead hard, live soft coral			
▪ Depict hard coral cover onto map			
III. Fish visual census			
▪ Procedure (lay transect on depth contour, 5-m to each side, count, size class, 50-m length, 1x/season)			
▪ Recognize and name the 18 reef families on Data Form 5			
▪ Conduct on-site (doesn't splash about, damage coral, poach or throw litter)			
▪ Summarization (total count per fish type per transect, average count per fish type per area)			
▪ Graphing (convert average into log score, draw picto-table)			
IV. Invertebrate census			
▪ Procedure (5-m to each side, count, 50-m length)			
▪ Recognize & name: *Diadema* urchins, crown-of-thorns starfish, giant clams			
V. Fish catch monitoring			
▪ Procedure (records weekly; records date, fishing gear, fishing ground, catch quantity, effort)			
▪ Recognize and name the major fishing gear			
▪ Can map fishing effort (at peak time) on gridded map			
▪ Understands: CPUE x total effort = total catch			
▪ Summarization (total sampled effort, total sampled catch)			
▪ Graphing (CPUE per month or area, est. total effot or total catch per month or area)			
VI. Interpretation and evaluation			
▪ Understands the concept of correlation			
▪ Can suggest relevant causes of observed trends			

Symbol	Definition
✓	Okay
~	needs improvement or practice
x	has not yet been taught
?	not assessed

This form may be used to assess each team member and to assess the team as a whole. Copies of assessments may be made for the individual team member, for the team leader and for the trainer.

2. Evaluation guide

2. Evaluation Guide	Demo Teaching: 200 points	
Behavioral Objective Trainee should be able to...	Method of assessment	Scoring/ Quantification
Discuss the different aspects of the following topics: • Why monitor reefs? • Drawing up a monitoring plan* • Manta tow • Fish visual census • Invertebrate census • Observing human activities & natural disturbances • Fish catch monitoring • Interpreting observations* • Evaluation & action (based on the lectures and the handbook) * choose either of these if you are only evaluating one team & time is only sufficient to test one of the above topics	Demo teaching by each team Evaluator poses the scenario: "After having been trained in reef monitoring methods, it is now your turn to train others. Discuss your given topic in the most creative manner you can think of." Trainees draw lots to determine their topic for presentation. Trainees are given time (2-3 hours) to prepare their presentation. Each team is evaluated according to the following criteria: • Organization and coherence of presentation (discusses points in a logical manner) • Clear presentation of the objective at the start and a summary at the end of the presentation • Completeness and accuracy of details • Creativity in presentation: extra points given to team that presents topic in a form other than straight lecture • Accuracy and clarity of visual aids (if any) • Speed or pace of presentation If trainees miss some points in their presentation, the evaluator asks questions to check if the trainee simply forgot or really does not know that detail.	Objective (15 points) Logical order of presentation (25 points) Major points of the topic (60 points) Pace (15 points) Visual aids (20 points) Summary (15 points) Total: 150 points
Display understanding beyond "factual" level	In-depth questioning by evaluator(s) and audience. These require insight and application of the facts as described in this guidebook into a context or situation (e.g. to a particular area being monitored).	Total: 50 points

2. Evaluation Guide	Benthos observation: 125 points	
Behavioral Objective Trainee should be able to...	Method of assessment	Scoring/ Quantification
Identify the different life forms	On-site identification of 5 lifeforms pre-marked by evaluator. Items to be tagged: • Hard coral • Soft coral • Dead coral / dead coral with algae • Rubble • Macroalgae	Five (5) points per lifeform correctly identified. Total: 25 points
Practice the basic procedure of the manta tow	Actual conduct of manta tow. Evaluator notes whether the following are practiced by the trainee: • Correct hand signals (left, right, ok, speed up, slow down, stop) • Towing done over the reef crest • Towing done in two-minute intervals • Mapping of landmarks	Five (5) points per observed correct behavior. Total: 20 points
Estimate the percent cover of each lifeform accurately	Evaluator tows along with the trainees then computes the accuracy of each trainee's estimates using his/her estimates. Three tows with HC, SC, DC/DCA and S recorded for each tow. *% Cover bracket ranges from (English *et al.* 1997): % cover — Cover category 0 — 0 1-10 — 1 11-30 — 2 31-50 — 3 51-75 — 4 76-100 — 5	For each of the estimates, points may be assigned according to the scale below: Within the same % cover bracket* (5 points) Difference of 1 bracket (3 points) Difference of 2 brackets (1 point) Difference of >2 brackets (0 point) Total: 60 points
Plotting the tow results on the map	Observe the trainees plot their tow results on the map	Ten (10) points for plotting the proper tow number on the right place on the map. Another ten (10) points for drawing the proper pie pictographs Total: 20 points

2. Evaluation Guide	Fish Visual Census: 210 points	
Behavioral Objective	Method of assessment	Scoring
Identify the major fish families	Identification. Evaluator shows each team a set of 15 pictures and asks them to identify the family of the fish in each picture (local names may be used instead of scientific names). Select the families to be tested by selecting the most common 15 fish families in the area from the list of 18 in the data form.	Two (2) points per fish family correctly identified. Total: 30 points
Practice the basic procedure of the fish visual census	Actual conduct of fish visual census. Evaluator notes whether the following are practiced by the trainee: • Laying the transect on a constant depth contour • Waiting 10-15 minutes before censusing • Swimming side by side • Minimal movement	Five (5) points per observed correct behavior. Total: 20 points
Estimate 5-m width from the transect	On-site testing by evaluator. 15 plastic fishes are laid inside and outside a 5-m width transect belt. Instruct trainees to "census" the plastic fishes as they normally would. Purposely set 5 of the fishes outside the 5-m width. Determine from their data whether or not they can properly estimate 5-m width.	Three (3) points for every "inside" fish correctly identified; subtract five (5) points for every "outside" fish recorded (improperly identified as "inside"). You may also have the trainees estimate the size of the plastic fish as part of the 3 points to be gained per "inside" fish Total: 30 points
Estimate size class and number of fish per family accurately.	Evaluator censuses a pre-selected set of 9 fish families together with the team, then computes the accuracy of each team's estimates using his/her estimates. Log5 abundance brackets: Fish count — Log5 abundance 0 — 0 >0-5 — 1 >5-25 — 2 >25-125 — 3 >125-625 — 4 >625 — 5	For each of the estimates of pre-selected fish families, points may be assigned according to the scale below: Within the same log5 abundance bracket* (10 points) Difference of 1 bracket (5 points) Difference of 2 brackets (2.5 points) Difference of >2 brackets (0 point)
Data summarization and graphing	Observe the trainees summarize and chart their results	Ten (10) points for each correct set of sums, averages, selection of families to depict, & proper conversion of abundances into pictographs Total: 40 points

2. Evaluation Guide	Invertebrate Census: 15 points	
Behavioral Objective Trainee should be able to...	Method of assessment	Scoring
Identify the important invertebrate indicators	Identification. Evaluator shows pictures and asks the trainees to identify each picture (local names may be used instead of scientific names): • *Diadema* urchins • Crown-of-thorns starfish • Giant clams	Five (5) points per invertebrate type correctly identified. Total: 15 points
	Site Details: 50 points	
Properly record details of the monitoring site	Evaluator observes the area being monitored and checks whether the data form describing the site and the human activities & natural disturbances therein have been properly filled out. • Site description form • Fisheries • Pollution • Other stresses & disturbances • Management	Ten (10) points per section of the form correctly estimated. Total: 50 points
	General Behavior: 50 points	
Work well with fellow trainees	Observation by evaluator Each team will be judged according to the following criteria: • Respect and cordiality shown to fellow trainees • Initiative in performing task at hand • Level of participation in discussions with fellow trainees	Total: 70 points
Anticipate and organize things needed for the field work	Observation by the evaluator	Thinks through and prepares the materials and facilities needed for monitoring ahead of time Total: 30 points
Show respect and care for the environment	The "secret" test (offer cigarettes and candy - watch that trainee doesn't throw butts or wrappers into the water)	Total: 50 points

2. Evaluation Guide	Interpretation & Evaluation: 150 points	
Behavioral Objective Trainee should be able to...	Method of assessment	Scoring/ Quantification
Copy the data of the proper time and place from the summary forms into the correlation form	Evaluator observes the trainees filling out the correlation form	Twenty (20) points for copying the various data types properly aligned (by times and places) on the data form. Total: 20 points
Identify trends	Evaluator observes the trainees filling out the correlation form	Ten (10) points each for correctly identifying things with increasing trends, decreasing trends, and things without trends. Total: 30 points
Identify problems based on observed trends	Evaluator discusses the trends with the trainees and helps them relate this to potential problems.	For potential problems correctly identified: 30 points for the top problem 20 points for the next most important problem Total: 50 points
Identify solutions relevant to potential problems		For each set of appropriate solutions correctly identified: 30 points for the top problem 20 points for the next most important problem Total: 50 points

3. Comparison of Reef Monitoring Methods

The reef monitoring methods described in this guide generally collect the simplest type of data with which changes can be detected. More detailed data may be collected for indicators of particular interest. The tables below outline how these methods may collect more detailed information as well as what levels of detail are collected by other monitoring systems. The greater the desired level of detail, the more time you will need for the observations.

Table 1. Level of detail required for reef monitoring.

	Level			
	0	**1**	**2**	**3**
Manta tow survey				
Number of variables estimated	3	3-5	3-5	3-5
Horizontal visibility estimated?	no	no	no	yes
Estimation scale	5-pt scale	5-pt scale & =	%	%
Fish visual census				
Taxonomic detail	family	family	genus	species
Butterflyfish species counted?	no	no	yes	yes
Size estimate	estimated	10-cm size classes	10-cm size classes	estimated to the closest cm
Number of invertebrate types counted	none	Acanthaster, Diadema	several	several
Benthos transect				
Taxonomic detail				
Number of lifeforms	~12	~12	28	28+
Coral genera identified?	no	no	no	yes
Number of points sampled per meter	% est. per 5 m	2	4	100

Table 2. Comparison of various reef survey protocols.

	Protocol			
	GCRMN	Reef Check	Aquanaut	This Guide
Manta tow survey				
Variables estimated	HC, SC, DC			HC, SC, DC
Number of tows	Min. 9			Min. 9
No. & location of detailed transects				
Number of areas	1 to 3		2	2+
Quality of areas to be sampled	Representative	Best except drop-offs	Representative	Representative
Quality of optional areas to be sampled		Moderate and heavy impacts		
Depth of transects	3 to 6 m (& 10 m optional)	2-6 m and >6-12 m	3, 5, 8 and 10 m	6 m
Transect position relative to the shore	Parallel	Parallel	Parallel	Parallel
Photos/videos		Recommended		Recommended
Site description		Yes		Yes

	Protocol			
	GCRMN	Reef Check	Aquanaut	This Guide
Fish visual census				
Number of transects per depth per area	3	4	2	5
Transect length	50 m	20 m	5 m	50 m
Transect width & height	5 m	5 m	2 m	10 m
# Seasons sampled	Pref. 2	1		1-3
Monitoring interval	1x/1-2 yr	1x/yr		1x/season
Taxonomic detail	Species	Groupers & 4 other sp.	None	Family
Butterflyfish species	Identified and counted	Species counted	As part of fishes	Counted
Size estimate	Food fishes	Groupers only		All to size categories
Types of invertebrate counted				
Banded coral shrimp		Y		Y
Diadema urchin		Y		Y
Sea fans			Y	
Echinometra/pencil urchins		Y	Y	Y
Acanthaster planci		Y	Y	Y
Sea cucumber		Y	Y	Y
Giant clams		Y	Y	Y
Triton		Y		Y
Lobster		Y		Y
Conch/whelk			Y	
Benthos transect				
Number of transects/area	5	4	2	5
Transect length	20 m	20 m	5 m	5 m
Taxonomic detail: number of lifeforms	28	HC, SC, DC, FS, SP, RCK, R, S, SI, OT	HC, SC, DC, FS, SG, RCK, R, S, SI, OT	HC, SC, DC, DCA, MA, TA, CA, RCK, R, S, SG, SI, SP, OT
Coral genera identified?	Pref. species	No	No	No
Points sampled per m	100	2	2	% est. per 5 m

Legend: FS = fleshy seaweed; SG = seagrass

APPENDIX 2

Blank data forms used in this guide

The following pages contain blank data forms referred to in this guide. In addition, several new forms are included that are not explained in this guide that may be useful for more specialized reef monitoring activities by persons trained in those techniques. These new forms are self-explanatory for those who may wish to use them. All the forms are reproduced here in full size so that they can be photocopied for reef monitoring activities.

Titles of the forms that follow are:

Form 1: Data Checklist Form
Form 2A: Survey Site Description and Details Form
Form 2B: Human Activities & Natural Disturbances Form
Form 3: Manta Tow Data Form
Form 4A: Benthic Lifeforms & Invertebrates Data Form
Form 4B: Benthic Lifeforms & Invertebrates Data Form with coral lifeforms
Form 4C: Data Summary Form
Form 4D: Benthos Graphing Form
Form 5A: Fish Abundance Data Form
Form 5B: Data Summary Form
Form 5C: Fish Graphing Form
Form 5D: Butterflyfish Species Checklist Form
Form 6A: Gear Survey Form
Form 6B: Fish Catch Monitoring Form for data collection teams
Form 6C: Fish Catch Monitoring Form for individual fishers
Form 6D: Fish Catch Monitoring Summary Form
Form 7: Correlation Table

DATA CHECKLIST FORM

Form 1

Question, issue or problem	Possible indicator(s)	What may cause change	Where to monitor	When to monitor	Monitoring method	Materials needed	Person(s) assigned	Target dates & # days needed

Prepared by:

Agreed by:

SURVEY SITE DESCRIPTION AND DETAILS FORM

Form 2A

Site Name:	Municipality & Province:				
Reason for choosing to monitor this site:	Overall Documentor:				
Transect No.	[ ]	[ ]	[ ]	[ ]	[ ]
Fish abundance observers					
Benthic lifeforms observers					
Start date (mo/day/year)					
Start time (am/pm)					
Latitude (e.g. 9°23.012')					
Longitude (e.g. 112°34.781')					
Transect orientation (e.g. N, NE, ...)					
Depth (in m)					
Reef zone (e.g. fore slope, flat, etc.)					
Is the site sheltered or exposed?					
Approx. steepness of site (angle of slope)					
Topographic compexity (in m)					
Horizontal visibility (in m by transect line)					
Vertical visibility (in m by secchi depth)					
End date (mo/day/year)					
End time (am/pm)					
Weather:	Sunny [ ] Cloudy [ ] Rainy [ ] Windy [ ]				
Temperature:	Air [ ] Water surface [ ] 3-m depth [ ] 10-m depth [ ]				

Sketch map of reef and coastline showing transect locations and other features

Coordinates from
map [ ] or GPS [ ]

If GPS, specify map datum:

HUMAN ACTIVITIES & NATURAL DISTURBANCES FORM

Form 2B

A. FISHING	% or #	Notes
# fishing boats observed w/in 500 m		
# aquarium fishers w/in 500 m		
# invertebrate gleaners w/in 500 m		
# blasts heard during the dive		
% area used for mariculture w/in 500 m		

B. POLLUTION	% or #	Notes
Distance to nearest pop. center (in km)		
Population of pop. center (in thousands)		
# factories per km of adjacent coast		
Distance to nearest river (in km)		
% farmed area of coastline		
% forested area of coastline		
# mines within sight		
# items of floating trash observed		
# items of trash observed underwater		
# fish nets left as trash		

C. OTHER STRESSES & THREATS	% or #	Notes
# boats anchoring within 500 m		
# divers observed within 500 m		
# dive shops within 10 km		
Years since last typhoon (>100 kph)		
# large ships within sight		
% of coast built-up with structures		
Years since last mass bleaching		
% bleached coral area		
% diseased coral area		

MANAGEMENT OF AREA	Is this a legally protected area?
Name of Marine Protected Area:	Organization responsible:
Describe restrictions herein:	
Ordinance no. & year:	Start date of protection by law:
Date boundaries were marked:	Date patrols/enforcement began:
Coordinates of protected area boundaries:	

MANTA TOW DATA FORM

Form 3

Site Name:	No.:	Municipality & Province:	
Date (month/day/year):	Time:	Observer:	Timer/Mapper:

Tow No.	Start Time	Location			Estimate % substrate cover					Notes (e.g. crown-of-thorns starfish, *Diadema* urchins, algae, etc.)
		Latitude & Longitude/Compass Bearing/Landmarks		Depth (m)	Hard Coral	Soft Coral	Dead Coral	DC w/ Algae	Sand/ Silt	
		Start	End							
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										

BENTHIC LIFEFORMS & INVERTEBRATES DATA FORM

Form 4A

Site Name:	Municipality & Province:		
Transect No.: Scuba: Snorkel:	Coordinates:		
Date (mo/day/yr):	Benthos observer: Invertebrates observer:		
Horizontal water visibility (m):	Depth (m):	Reef zone:	Topography: Slope:
Habitat notes:			

BENTHIC LIFEFORMS		Tally number of points or est. % occupied by each lifeform e.g. 𝍸 or 12%+34%+22%+...	Total Count	% Cover
coral	**HC** live hard coral			
	SC soft coral			
dead coral	**DC** white dead coral			
	DCA dead coral w/ algae			
other animals	**SP** sponges			
	OT other animals			
plants	**TA** turf algae			
	MA fleshy macroalgae			
	CA coralline algae			
	SG seagrass			
non-living	**R** rubble			
	RCK rock			
	S / SI sand/silt			
TOTAL				**100%**

INVERTEBRATES	# within 5-m width
Diadema urchins; *tuyom*	
Pencil urchin	
Crown-of-thorns starfish; *dap-ag*	
Giant clam; *taklobo*	
Triton shell; *tambuli*	
Lobster; *banagan*	
Sea cucumber; *balat*	
Banded coral shrimp	
others	

Causes of coral damage:

Put x if found on corals. Circle the box of the dominant cause

- ☐ sediment
- ☐ blasting patterns
- ☐ anchor damage
- ☐ other breakage
- ☐ bleaching
- ☐ black band disease
- ☐ white band disease
- ☐ other coral disease
- ☐ seaweed overgrowth
- ☐ coral-eating snails
- ☐ crown-of-thorns starfish
- ☐ plastics
- ☐ other trash
- ☐ other causes (specify): _____

BENTHIC LIFEFORMS & INVERTEBRATES DATA FORM WITH CORAL LIFE FORMS

Form 4B

Site Name:	Municipality & Province:		
Transect No.: Scuba: Snorkel:	Coordinates:		
Date (mo/day/yr):	Observers:		
Horizontal water visibility (m):	Depth (m):	Reef zone:	Topography: Slope:
Habitat notes:			

BENTHIC LIFEFORMS		Tally number of points or est. % occupied by each lifeform e.g. ~~𝍸~~ ~~𝍸~~ ~~𝍸~~ || or 12%+34%+22%+...	Total Count	% Cover
coral	**HC** live hard coral			
	branching (CB)			
	massive (CM)			
	flat/encrusting (CE)			
	foliose/cup (CF)			
	SC soft coral			
dead coral	**DC** white dead coral			
	DCA dead coral w/ algae			
other animals	**SP** sponges			
	OT other animals			
plants	**TA** turf algae			
	MA fleshy macroalgae			
	CA coralline algae			
	SG seagrass			
non-living	**R** rubble			
	RCK rock and block			
	S / SI sand/silt			
TOTAL				

INVERTEBRATES	# within 5-m width
Diadema urchins; *tuyom*	
Pencil urchin	
Crown-of-thorns starfish; *dap-ag*	
Giant clam; *taklobo*	
Triton shell; *tambuli*	
Lobster; *banagan*	
Sea cucumber; *balat*	
Banded coral shrimp	
others	

Causes of coral damage:

Put x if found on corals. Circle the box of the dominant cause

- ☐ sediment
- ☐ blasting patterns
- ☐ anchor damage
- ☐ other breakage
- ☐ bleaching
- ☐ black band disease
- ☐ white band disease
- ☐ other coral disease
- ☐ seaweed overgrowth
- ☐ coral-eating snails
- ☐ crown-of-thorns starfish
- ☐ plastics
- ☐ other trash
- ☐ other causes (specify): _____

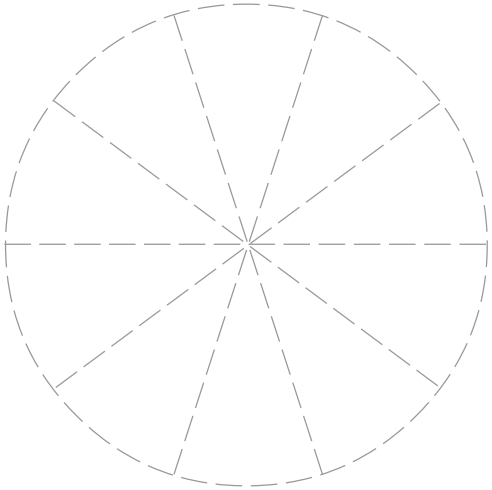
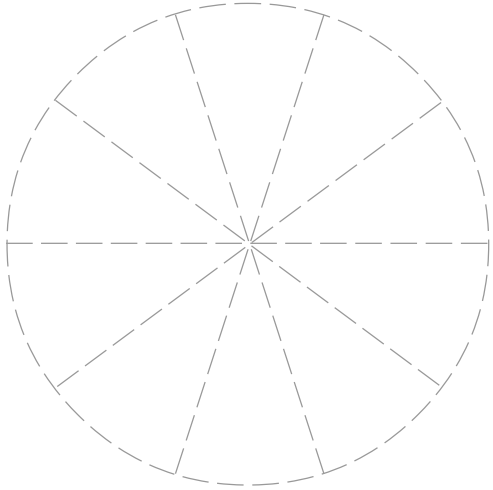
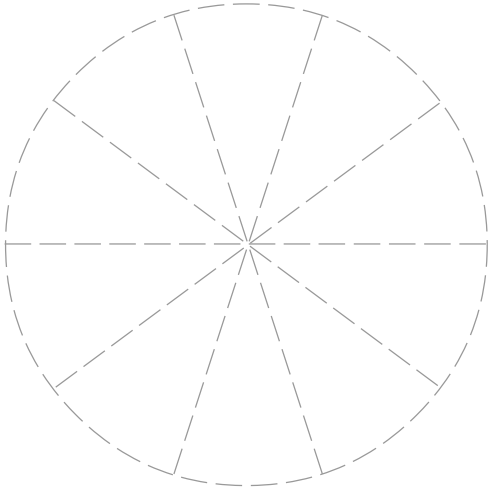
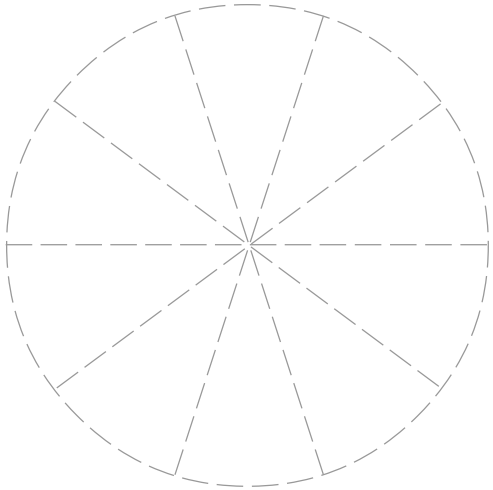
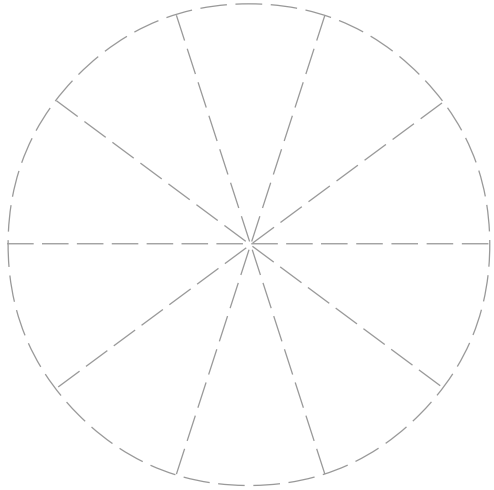
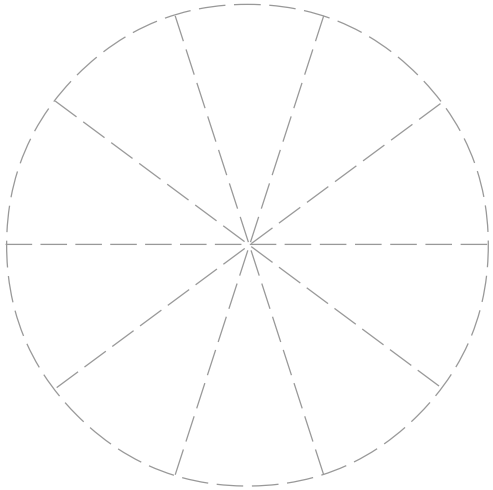
DATA SUMMARY FORM

Form 4C

Site Name:									Municipality & Province:								
Zone/Sector																	
Month & year																	
Transect #																	
Types/groups	**Sub-total**						**Total**	**Avg.**	**Sub-total**						**Total**	**Avg.**

BENTHOS GRAPHING FORM

Form 4D

Site Name:		Municipality & Province:	
Month & year			
Zone/Sector			
			
			

FISH ABUNDANCE DATA FORM

Form 5A

Site Name:		Municipality & Province:		
Transect No.:	Depth (m):	Coordinates:		
Date (mo/day/yr):	Time:	Left observer:	Right observer:	
Habitat notes:		Horizontal visibility (m):	Angle of slope:	Transect orientation:

FAMILY	**Species**	Record number of fishes per size class			
		1-10 cm	11-20 cm	21-30 cm	specify sizes for >30 cm
<EPINEPHELINAE>* groupers; *lapu-lapu*					
	Barramundi cod; *señorita*				
<LUTJANIDAE>* snappers; *maya-maya*					
<HAEMULIDAE>* sweetlips; grunts; *lipti*					
<LETHRINIDAE>* emperors; *katambak*					
CARANGIDAE* jacks; trevallies; *talakitok*					
CAESIONIDAE* fusiliers; *dalagang-bukid; solid*					
NEMIPTERIDAE* coral breams; *silay*					
MULLIDAE* goatfishes; *timbongan*					
BALISTIDAE triggerfishes; *pakol*					
CHAETODONTIDAE butterflyfishes; *alibangbang*					
POMACANTHIDAE angelfishes; *adlo*					
LABRIDAE wrasses; *labayan*					
	Humphead wrasse; *mameng*				
[SCARIDAE]* parrotfishes; *molmol*					
	Bumphead parrotfish; *taungan*				
[ACANTHURIDAE]* surgeonfish; *indangan*					
[SIGANIDAE]* rabbitfishes; *kitong*; *danggit*					
[KYPHOSIDAE]* rudderfishes; *ilak*					
POMACENTRIDAE damselfishes; *palata*					
ANTHIINAE fairy basslets; *bilong-bilong*					
Zanclus cornutus	Moorish idol; *sanggowanding*				
sharks					
rays					
sea turtles					
others: e.g. tunas					

Legend: <fishes> = major reef carnivores; [fishes] = major reef herbivores, **fishes** = fishes which are indicators of hard corals, * = fishery target families

DATA SUMMARY FORM

Form 5B

Site Name:									Municipality & Province:								
Zone/Sector																	
Month & year																	
Transect #																	
Types/groups	**Sub-total**						**Total**	**Avg.**	**Sub-total**						**Total**	**Avg.**

FISH GRAPHING FORM

Form 5C

Site Name:					Municipality & Province:			
Zone/Sector								
Month & Year								
Types/groups								

BUTTERFLYFISH SPECIES CHECKLIST FORM

Form 5D

Observer	Site Name
Date (mo-day-yr)	Coordinates

Species	Common Name	1		2	
		Present	No	Present	No
1. *Chaetodon adiergastos*	Philippine butterflyfish				
2. *C. auriga*	Threadfin butterflyfish				
3. *C. baronessa*	Eastern triangular butterflyfish				
4. *C. bennetti*	Bluelashed butterflyfish				
5. *C. citrinellus*	Speckled butterflyfish				
6. *C. ephippium*	Saddle butterflyfish				
7. *C. kleinii*	Klein's butterflyfish				
8. *C. lineolatus*	Lined butterflyfish				
9. *C. lunula*	Raccoon butterflyfish				
10. *C. melannotus*	Blackback butterflyfish				
11. *C. mertensii*	Merten's butterflyfish				
12. *C. meyeri*	Meyer's butterflyfish				
13. *C. ocellicaudus*	Spottail butterflyfish				
14. *C. octofasciatus*	Eightband butterflyfish				
15. *C. ornatissimus*	Ornate butterflyfish				
16. *C. oxycephalus*	Spot-nape butterflyfish				
17. *C. plebeius*	Blueblotch butterflyfish				
18. *C. punctatofasciatus*	Spotband butterflyfish				
19. *C. rafflesi*	Latticed butterflyfish				
20. *C. reticulatus*	Mailed butterflyfish				
21. *C. selene*	Yellowdotted butterflyfish				
22. *C. semeion*	Dotted butterflyfish				
23. *C. speculum*	Mirror butterflyfish				
24. *C. trifascialis*	Chevron butterflyfish				
25. *C. trifasciatus*	Melon butterflyfish				
26. *C. ulietensis*	Pacific doublesaddle butterflyfish				
27. *C. unimaculatus*	Teardrop butterflyfish				
28. *C. vagabundus*	Vagabond butterflyfish				
29. *C. xanthurus*	Pearscale butterflyfish				
30. *Chelmon rostratus*	Copperband butterflyfish				
31. *Forcipiger flavissimus*	Longnose butterflyfish				
32. *F. longirostris*	Longnose butterflyfish				
33. *Hemitaurichthys polylepis*	Pyramid butterflyfish				
34. *Heniochus acuminatus*	Pennant coralfish				
35. *H. chrysostomus*	Threeband pennantfish				
36. *H. singularius*	Singular bannerfish				
37. *H. varius*	Horned bannerfish				
38. *Parachaetodon ocellatus*	Sixspine butterflyfish				
39. *Coradion chrysozonus*	Goldengirdled coralfish				
40. *Coradion melanopus*	Twospot coralfish				
Total number of Species/Site					

GEAR SURVEY FORM

Form 6A

Site Name:	Municipality & Province:
Date (month/day/year):	

Type of fishing gear	# of persons in village using gear type	# of motor boats using gear type	Typical # of persons per boat	Months when gear is typically used	Hours when gear is typically used	Fishing grounds (use grid letter in map)	Where is catch sold (which market)	Type(s) of fish usually caught	# of persons from whom information was collected

FISH CATCH MONITORING FORM FOR DATA COLLECTION TEAMS

Form 6B

Name: Village/Barangay:

Collect catch data once per week. Be sure to record the trip even if nothing was caught (record '0' in the weight).

Type of fishing gear	# of fishers in boat	Fishing ground (use grid letter in the map)	Time and date of departure	Time and date of arrival	Number of gear units	Use one line per kind of fish. Use more than one line per fishing trip if needed.	
						Kind of fish caught	Weight (kg)

FISH CATCH MONITORING FORM FOR INDIVIDUAL FISHERS

Form 6C

Site/Village/Barangay:	Month & Year/Buwan at Taon:

List down at least 5 fishing days per month (e.g. once per week). Be sure to record the trip even if nothing was caught (record '0' in the weight). Magtala ng hindi bababa sa limang araw ng pangingisda sa bawat buwan. Siguraduhin na magtala pa rin kahit walang nahuli sa paglaot [magtala pa rin ng '0' sa timbang (kilos)].

		Record catch per fishing trip				
		1	2	3	4	5
Date & time of leaving *Petsa at oras ng paglabas*						
Fishing gear *Uri ng pamamalakaya*						
# of fishers in boat *Bilang ng tao sa bangka*						
Fishing ground (use grid letter on map) *Lugar na pinangisdaan*						
Weather condition, tide, and sea state *Kumusta ang panahon, hunas/taob, at alon*						
Date & time of return *Petsa at oras ng pagbalik*						
CATCH *Huli*	Kinds of fish caught *Mga uri ng nahuli*	Weight *Timbang*	Weight *Timbang*	Weight *Timbang*	Weight *Timbang*	Weight *Timbang*
TOTAL CATCH (kilograms) *Pangkalahatang huli (kilos)*						

Circle each date that you went out to fish. *Bilugan ang bawat petsa na ikaw ay nangisda.*

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

FISH CATCH MONITORING SUMMARY FORM

Form 6D

Site Name:							Municipality & Province:								
Zone/Sector															
Month & Year															
	Total kg	Total gear unit-days or fishing-hours	kg/ unit effort	Total kg	Total gear unit-days or fishing-hours	kg/ unit effort	Total kg	Total gear unit-days or fishing-hours	kg/ unit effort	Total kg	Total gear unit-days or fishing-hours	kg/ unit effort	Total kg	Total gear unit-days or fishing-hours	kg/ unit effort
Fishing Gear															

CORRELATION TABLE

Form 7

Site Name:	Municipality & Province:
Period covered (mo/day/yr):	Zone/Sector:

INDICATORS	units	potential problem if...	Year I			Year II			Year III			Trend observed
			a	b	c	a	b	c	a	b	c	
FISH (Carangidae+Caesionidae)	average count	decrease										
FISH (Lutj+Leth+SEpin+Haem)	average count	decrease										
LOBSTER	average count	decrease										
GIANT CLAMS	average count	decrease										
TRITON	average count	decrease										
CROWN-OF-THORNS	average count	increase										
OVERHARVESTING/OVERFISHING	no. of fishers obs.	increase										
CORALS (Hard & Soft)	average % cover	decrease										
FISH (Chaetodontidae)	average count	decrease										
DEAD CORAL (w/ or w/o ALGAE)	average % cover	increase										
RUBBLE	average % cover	increase										
DESTRUCTIVE FISHING	evidence of blasts	increase										
ANCHOR DAMAGE	overturned corals	present										
STORMS	no. of strong ones	high										
TOURISM	no. of resorts	>med or inc.										
ALGAE (turf+macroalgae)	average % cover	increase										
FISH (Balistidae+Tetradontidae)	average count	decrease										
FISH (Scar+Acan+Kyph)	average count	decrease										
URCHINS	average count	large change										
ALGAL OVERGROWTH	occurrence	common										
AGRICULTURAL/FARMED AREA	% of coastline	> low or inc.										
POPULATION		high										
TRASH/GARBAGE (total)	no. observed	present										
MARICULTURE	% area	high										
SAND/SILT	average % cover	increase										
RIVER	distance	near										
VISIBILITY (horizontal & vertical)	in meters	decrease										
FORESTED AREA	% of coastline	decrease										
COASTAL STRUCTURES BUILT-UP	% of coastline	> low or inc.										
SHIPPING	no. of large ships	> 3-5										
MINING POLLUTION	no. observed	present										
INDUSTRIAL POLLUTION	no. of factories	> low or inc.										
MASS BLEACHING	% cover	> 20%										
DISEASED CORALS	% cover	> 20%										
FISH KILLS & other mass deaths		present										
Crown-of-thorns, algae, urchins,...	average count	rapid inc.										
OTHER REMARKS:												