OBSERVING CORALS and ALGAE:

MANTA TOW, SNORKEL SURVEY, and POINT-INTERCEPT TRANSECT

5

A. Manta Tow

Definition

A manta tow survey is the observation of an underwater area of good visibility by a snorkeler who is being pulled by a small boat.

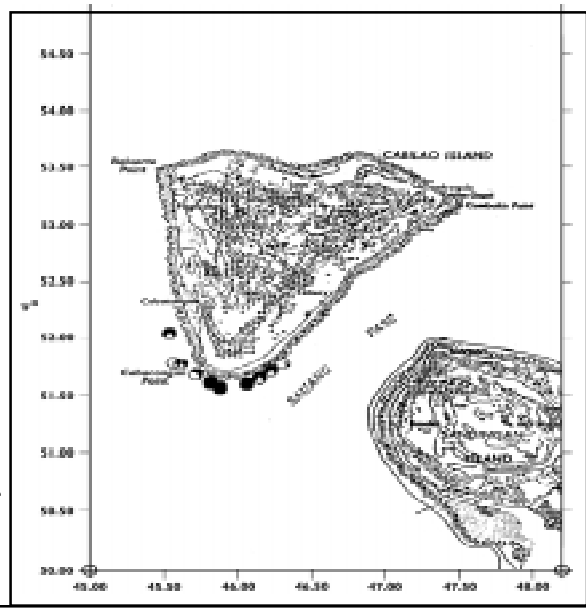
Purpose

Manta tows are used to get a general idea of the various types and amounts of habitat types and large obvious things in an area. This information may be used:

- ✓ to help in the selection of sites and numbers of samples for closer observation
- ✓ for comparison with local perceptions of the coastal area.
- ✓ in the detection of large-scale changes (e.g. due to storms or mass siltation)

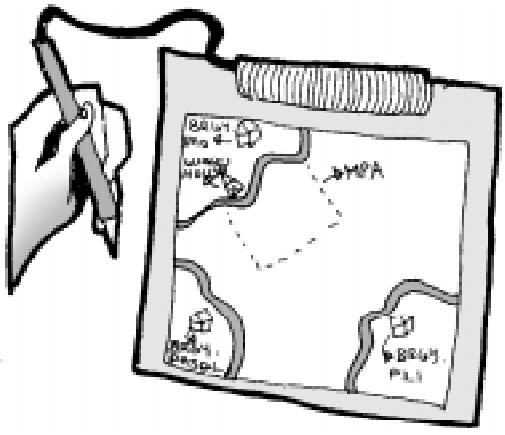
Requirements

- ❑ Small boat and fuel
- ❑ Mask and snorkel
- ❑ Manta board
- ❑ Map of the area
- ❑ Watch preferably showing the seconds
- ❑ 17-m rope (approx. 10 mm in diameter marked at 6-m and 12-m from one end)
- ❑ Geographic positioning system (GPS) or compass

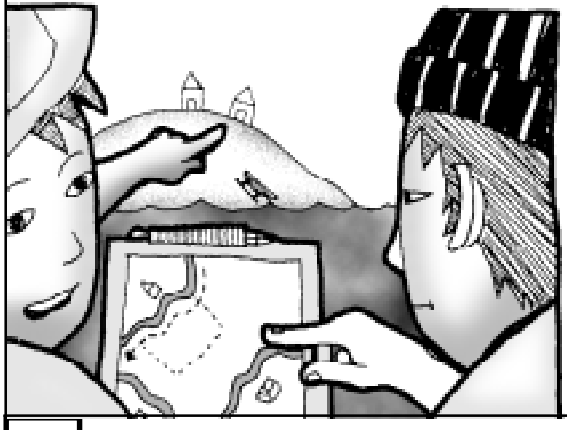


1 Copy a map of the area to be surveyed onto a slate.

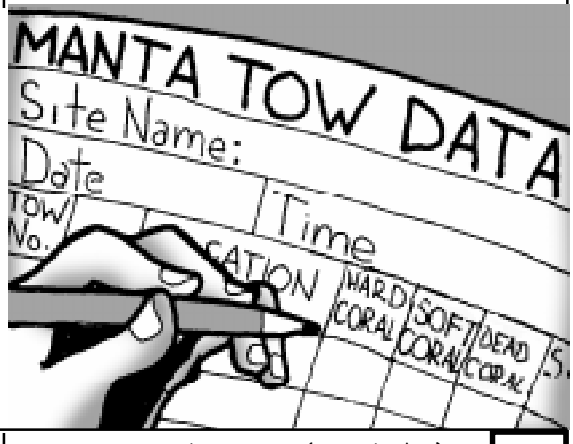
2 Mark features (landmarks and boundaries) and zones (uses and protection) on the map.



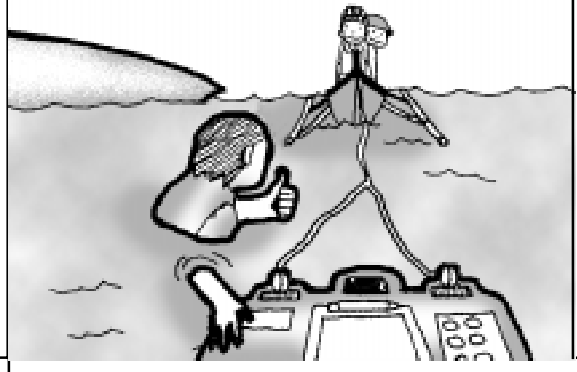
3 Plan and mark the tow survey path (usually along the reef perimeter or selected depth contour) on the map.



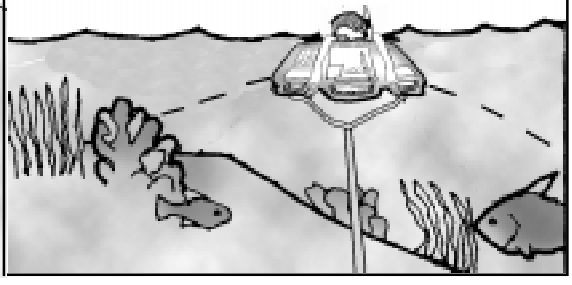
4 Choose 3 to 5 items (e.g. live hard coral, dead coral, soft coral, and sand/silt) to estimate.



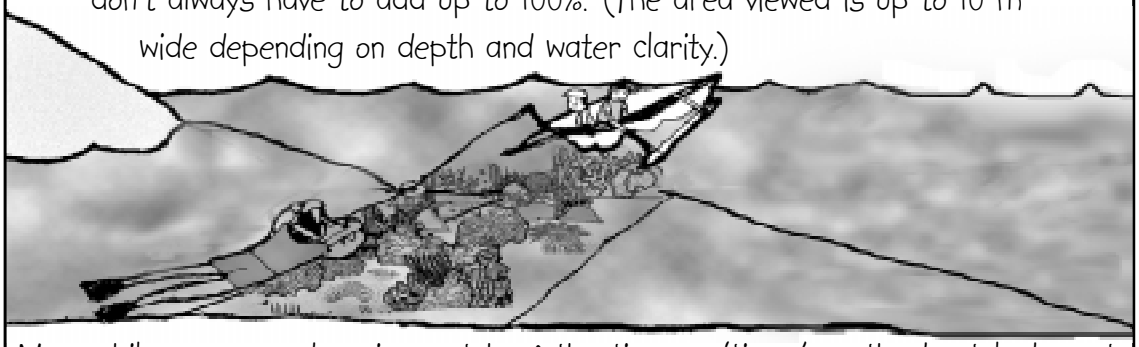
5 Attach a manta board to the boat using the rope.



6 When the observer (snorkeler) is ready and gives the "OK" signal, tow the snorkeler parallel and over the reef edge along the area to be surveyed.

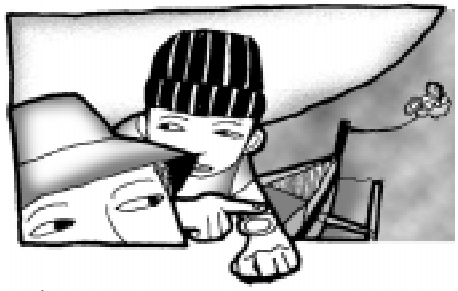


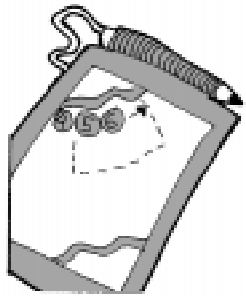
7 During each tow, the observer estimates the approximate percentage cover of the items chosen in step 4. Percentages of the various items don't always have to add up to 100%. (The area viewed is up to 10 m wide depending on depth and water clarity.)



Meanwhile, a person keeping watch of the time or 'timer' on the boat looks out for the observer's safety and directional signals and relays these to the driver.

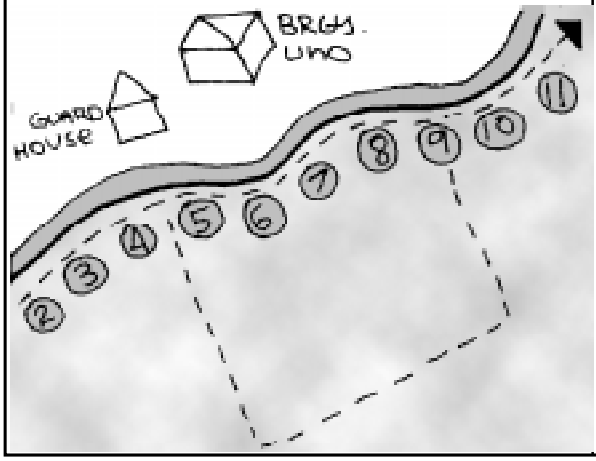
8 After 2 minutes of towing (around 100 to 150 m), the timer should inform the driver and the observer to pause and take notes (e.g. by tugging on the rope or using a whistle).



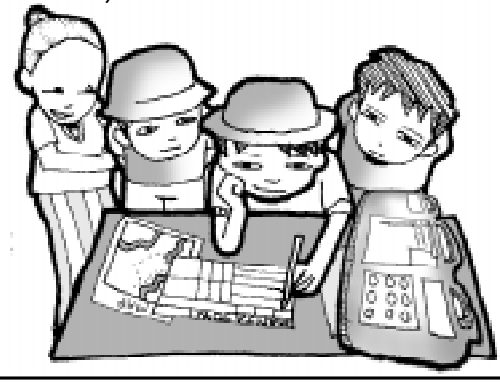


The observer then records onto the board the tow number and his/her observations of the last 2-minute tow while the driver or the timer marks the tow number at their current position on the map. One's current position on a map may be estimated by using a GPS, by using landmarks, and/or by triangulation with the help of a compass.

9 Repeat steps 6 to 8 until the entire planned tow path has been surveyed.



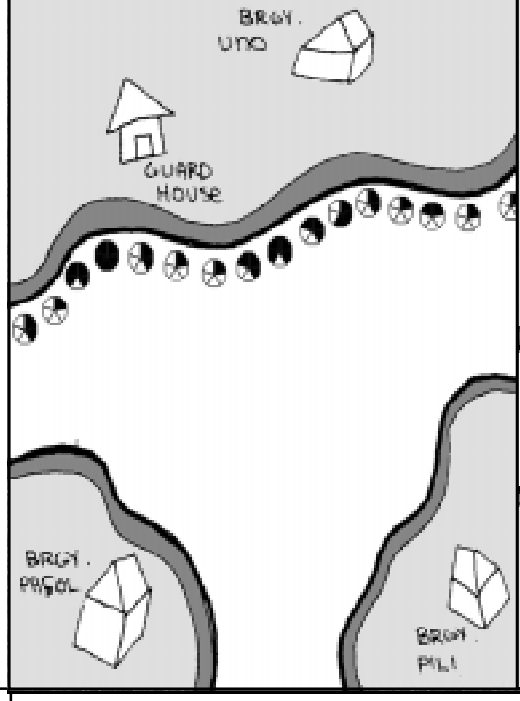
10 Copy the data onto the Data Form 3 and enclose a copy of the map (with tow numbers and path marked) with the raw data.



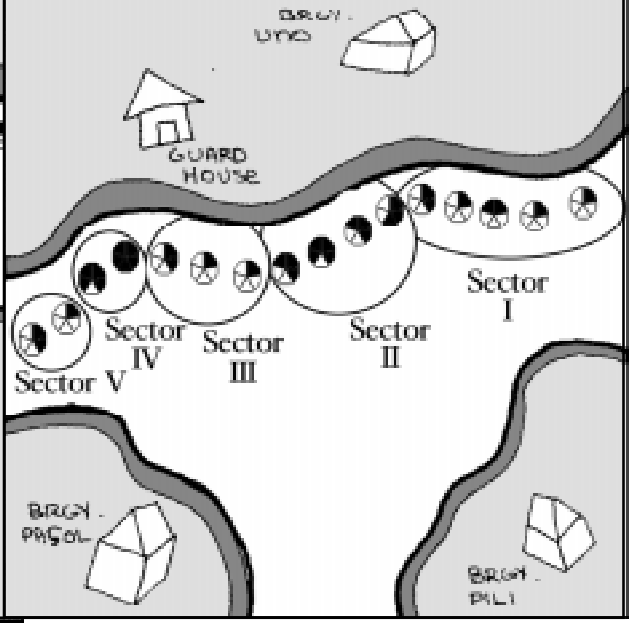
11 Convert the various percentage estimates of coral cover into its score on the five-point scale below:

Score	%Cover	Symbol
1	0-10%	
2	11-30%	
3	31-50%	
4	51-75%	
5	76-100%	

12 Plot scores on the map. Put the live hard coral scores for each tow segment on the corresponding position of the tow segment on the manta tow map.



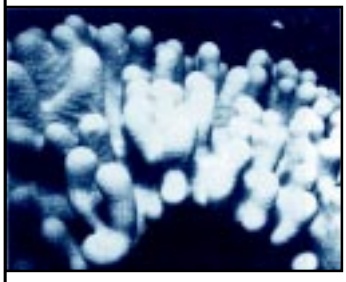
13 Use scores to group tow segment areas into sectors. Draw a circle around each set of continuous and similar hard coral scores on the map. You may also use the other scores (soft coral, dead coral, etc.) and observations to help group areas into sectors.



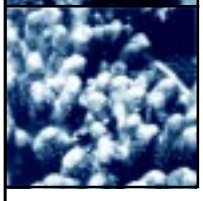
Tips:

Practice snorkelling, distinguishing, and estimating hard, soft, and dead coral in one spot before towing.

HARD coral (HC)



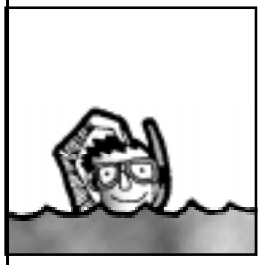
SOFT coral (SC)



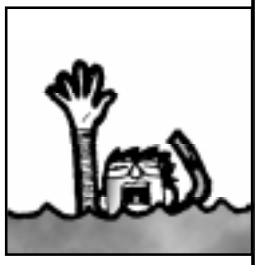
DEAD coral (DC)

DEAD coral with algae (DCA)

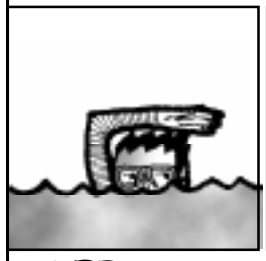
Agree on HAND SIGNALS



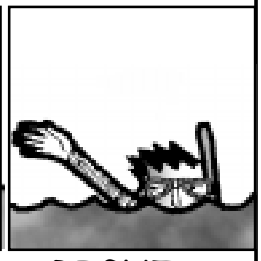
OK / start tow



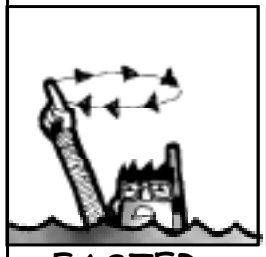
STOP towing



LEFT



RIGHT



FASTER

SLOWER

STRENGTH

Large areas can be observed in a short time.

LIMITATIONS

1. Method can only be used in areas of good visibility & during calm sea conditions.
2. Measurements are only approximate.
3. Can be tiring.

MANTA TOW DATA FORM

Form 3

Site Name: CABACONGAN **No.:** **Municipality & Province:** LOON, BOHOL

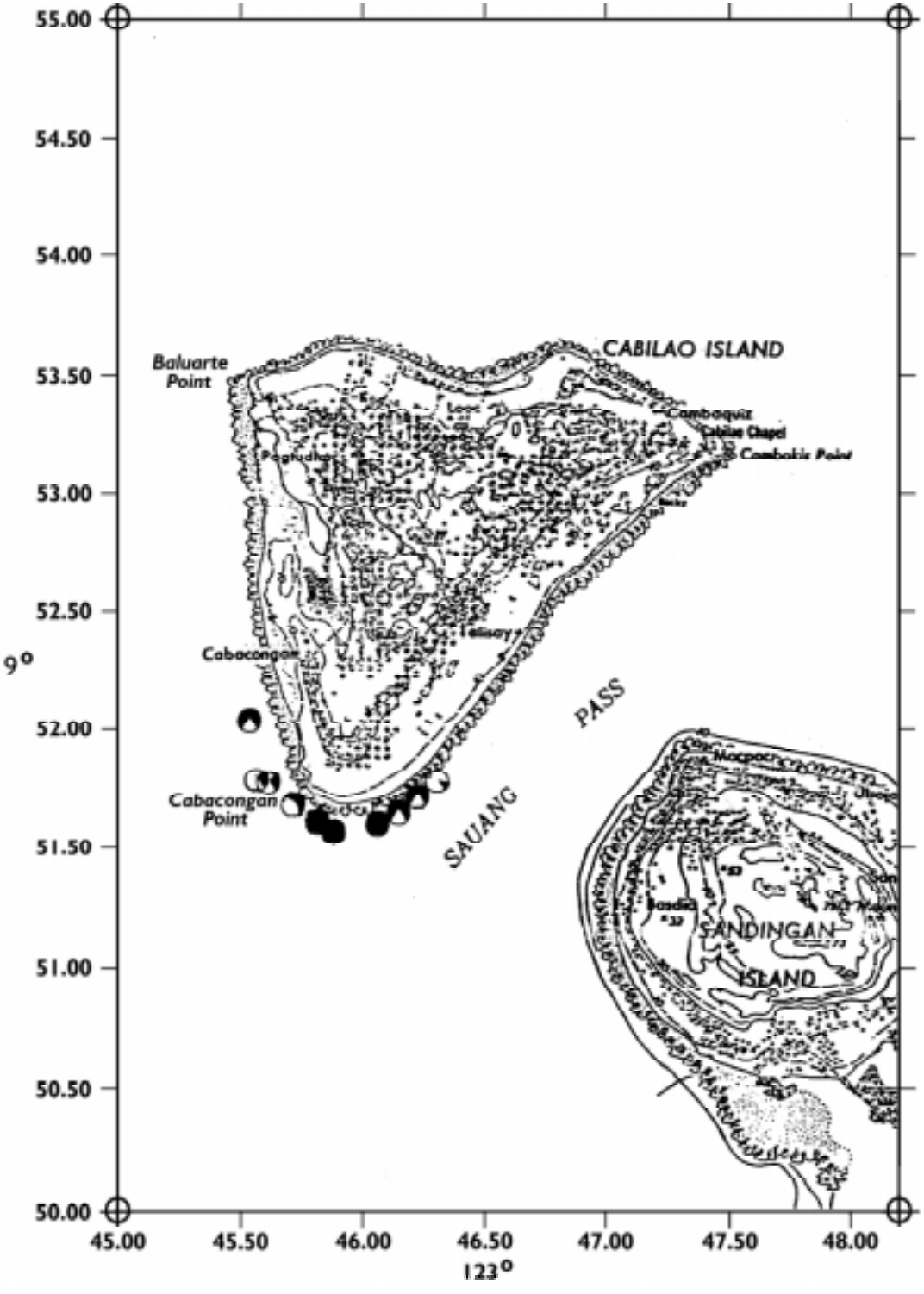
Date (month/day/year): 04/26/1999 **Time:** 4:00-5:00 PM **Observer:** Andre/Paulyn **Timer/Mapper:** Paulyn/Andre

Tow No.	Start Time	Location		Depth (m)	Estimate % substrate cover					Notes (e.g. crown-of-thorns starfish, *Diadema* urchins, algae, etc.)
		Latitude & Longitude/Compass Bearing/Landmarks			Hard Coral	Soft Coral	Dead Coral	DC w/ Algae	Sand/ Silt	
		Start	End							
1	16:07:25	9°51.873 123°46.484	9°51.793 123°46.404		10	5	0		30	Observer: AU
2	16:10:00	9°51.792 123°46.404	9°51.722 123°46.330		70	0	0		5	Observer: AU
3	16:12:50	9°51.717 123°46.327	9°51.655 123°46.240		70	0	0		0	Observer: AU
4		9°51.649 123°46.241	9°51.606 123°46.167		85	0	0		0	Observer: AU
5			9°51.570 123°46.063							none
6	16:26:35	9°51.570 123°46.063			85	0	0		0	Observer: PAG
7	16:29:00	9°51.566 123°45.997	9°51.612 123°45.907		80	0	0		5	Observer: PAG
8	16:32:00	9°51.617 123°45.895	9°51.683 123°45.801		35	0	0		0	Observer: PAG
9	16:34:30	9°51.692 123°45.791	9°51.780 123°45.747		30	5	0		0	Observer: PAG
10	16:37:00	9°51.790 123°45.743			30	0	0	50	0	Observer: PAG
11	16:40:15	9°51.932 123°45.712	9°51.932 123°45.712		60	0	0	20	<1	Observer: PAG

Sample Data for Form 3
Manta tow data form

Sample output map

Hard coral cover plotted on the map for Cabacongan Point, Loon, Bohol from the manta tow results



B. Snorkel Survey (for Snorkelers)

Definition

Snorkel survey is a method used by a snorkeler for estimating the relative abundance of living and non-living things on the reef bottom observed within a defined area.

Purpose

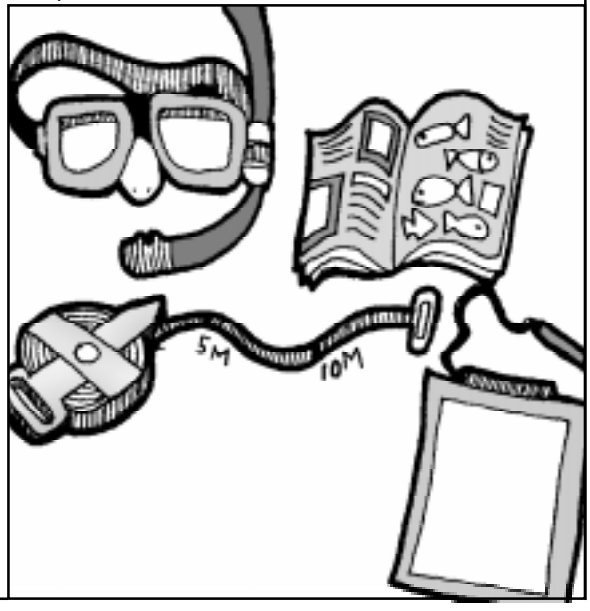
The snorkel survey estimates the abundance of hard corals, dead corals, algae, and various reef substrates which may reflect the health of the reef.

Requirements

- ❑ Picture book of the plant and animal types to be quantified (laminated guides would also be useful for training)
- ❑ Mask and snorkel
- ❑ 50-m transect line (marked every 5 m)
- ❑ Underwater slates with attached pencil

Optional

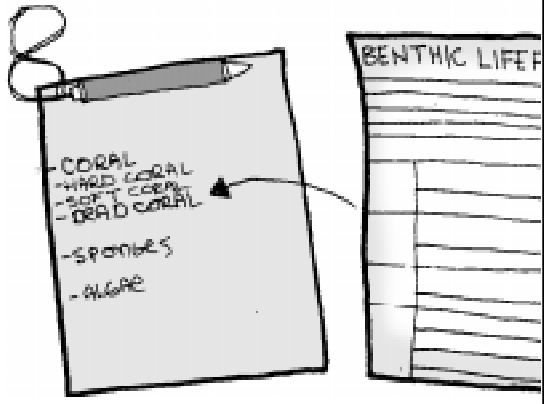
- ❑ Fins
- ❑ Life jacket



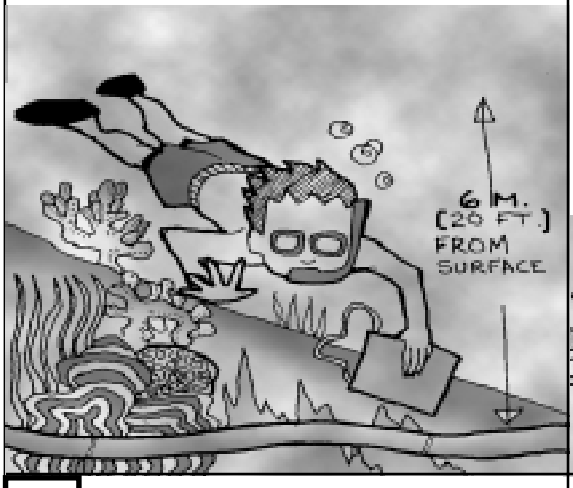
Look for the various lifeforms in the field and practice identifying other examples of those lifeforms in a given area prior to doing the actual assessments

1 Select representative sampling stations to be surveyed/monitored based on the manta tow results.

2 Copy the Data Form 4A (with the selected benthic lifeform types) onto the plastic slates used for writing underwater.

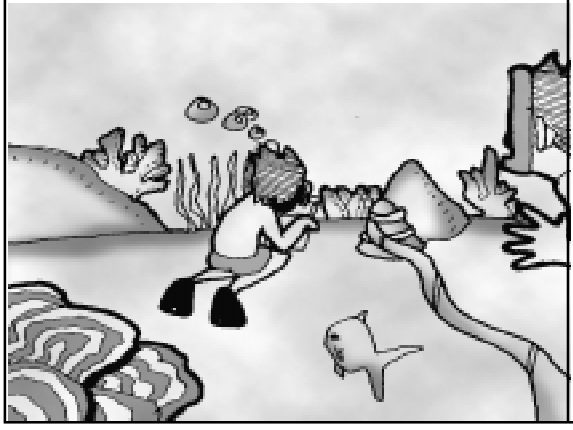


3 Lay the transect line on a constant depth contour. Record the depth.



4 Starting at one end of the transect line, the snorkeler swims over the transect estimating the % cover of each benthic lifeform within 2½ m on either side of the transect until the 5-m mark. The estimates of each 5x5 m quadrat should total 100%.

5 Similarly record each 5-m interval until the entire 50-m transect line has been observed.



6 Add the 10 readings for the transect and divide by 10.

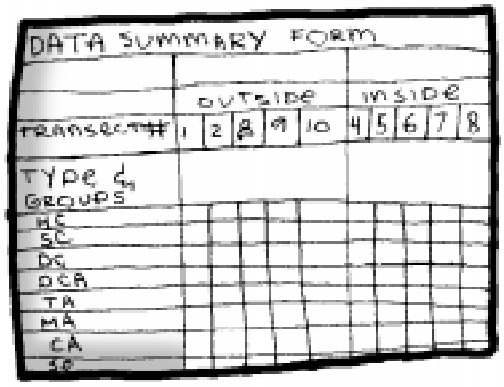
		TOTAL
HC	23+42+35+40+14+16+24+27+32+30	28.3

7 Classify the various transects according to your purpose for data summarization. For example:

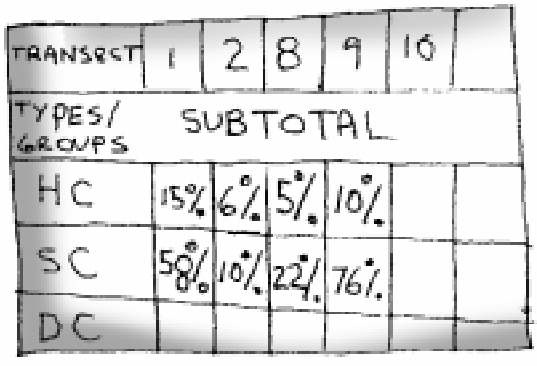
* reef zones or types (e.g. reef flat, reef slope, fringing reef, offshore reef, etc.),
* time of sampling (e.g. year 1/dry season, year 1/wet season, year 2/dry season, etc.)
* management or use zones (e.g. sanctuary, fishing grounds), and/or
* intensity of impacts (e.g. high pollution, medium pollution, low pollution)

List the transects by groups along the upper portion of the Summary Form.

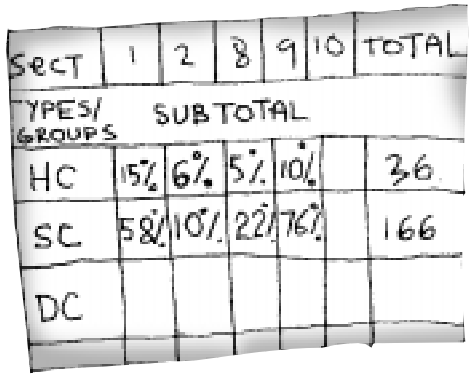
8 List the benthic lifeforms (by groups) along the left side of the Summary Form.



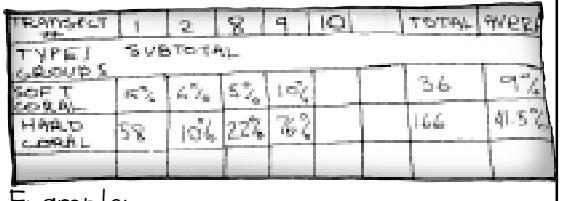
9 From the data sheets per transect copy the percentages of each type of lifeform to the Summary Form.



10 Sum sub-totals for each benthic lifeform for each transect group.



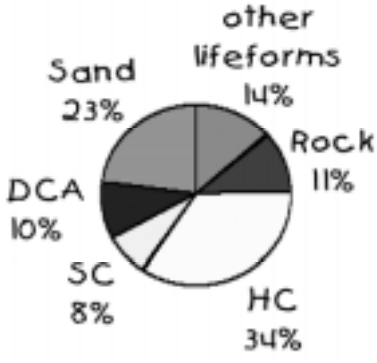
11 Standardize sub-total by sample size: Divide the total percentages by the number of transects actually observed. Write this on the column for averages.



Example:

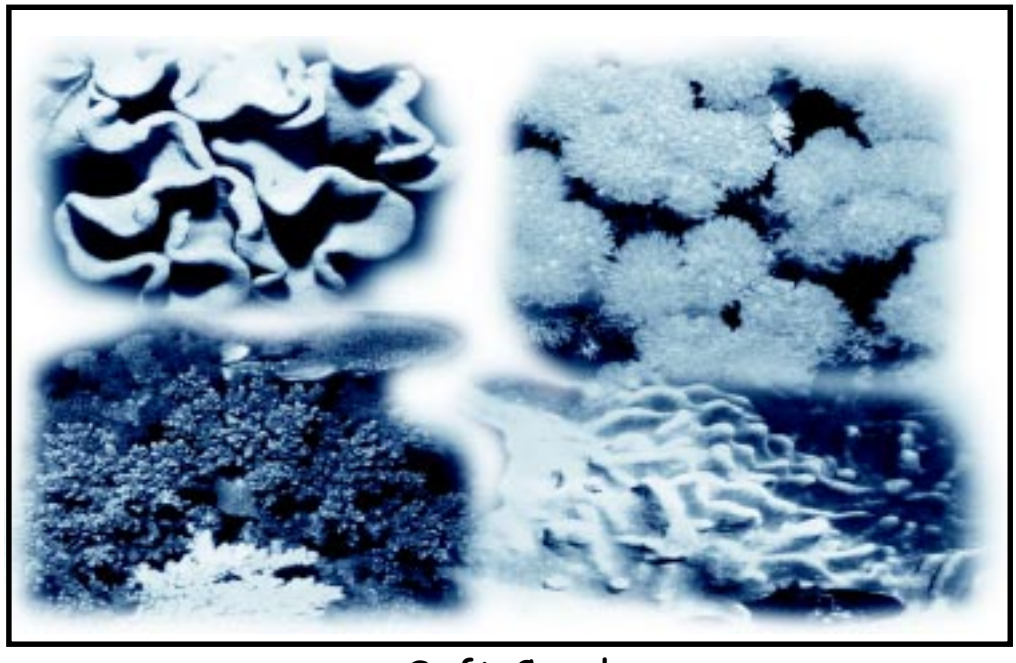
$$\frac{43\%+8\%+20\%+32\%+17\%}{5 \text{ transects}} = 24\%$$

12 Draw pie charts for the average percentages of each transect group on the Benthos Form 4D Graph.

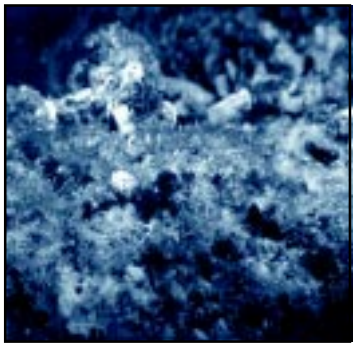


Common Benthic Lifeforms

Hard Coral
(HC)

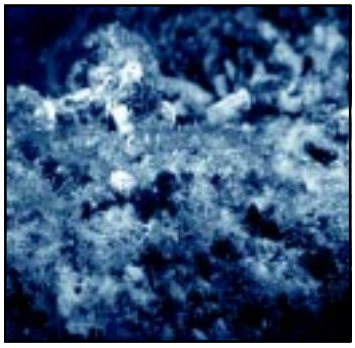


Soft Coral
(SC)



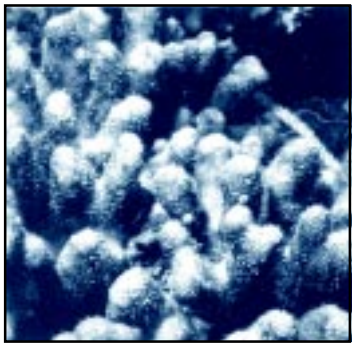
Turf Algae
(tiny filaments)

Dead Coral
(white with no living tissue)

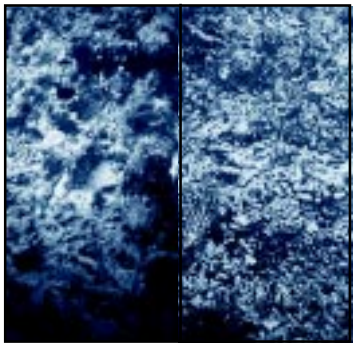


Sand/Silt

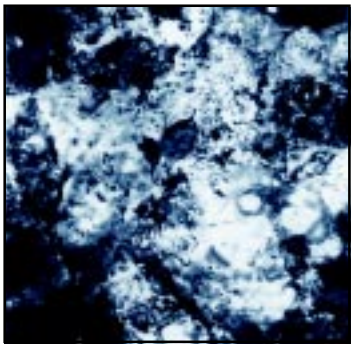
Macroalgae
(can be picked up with fingers)



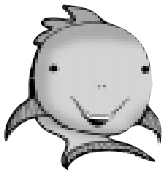
Dead Coral with Algae
(corallites still visible)



Rock/Rubble
(rubble: coral fragments)



Coralline Algae
(hard, pink or reddish crusts)



STRENGTH

The lifeform categories do not require knowledge of coral taxonomy.

LIMITATIONS

1. Sometimes there is confusion as to how to categorize some lifeforms (do standardization exercises with your trainer)
2. Without sufficient replication, it may be difficult to obtain precise information on changes through time.

C. Point-intercept Transect (for SCUBA divers)

Definition

Benthos point-intercept transect is a method used by SCUBA divers for estimating the relative abundance of living and non-living things on the reef bottom observed within a defined area.

Purpose

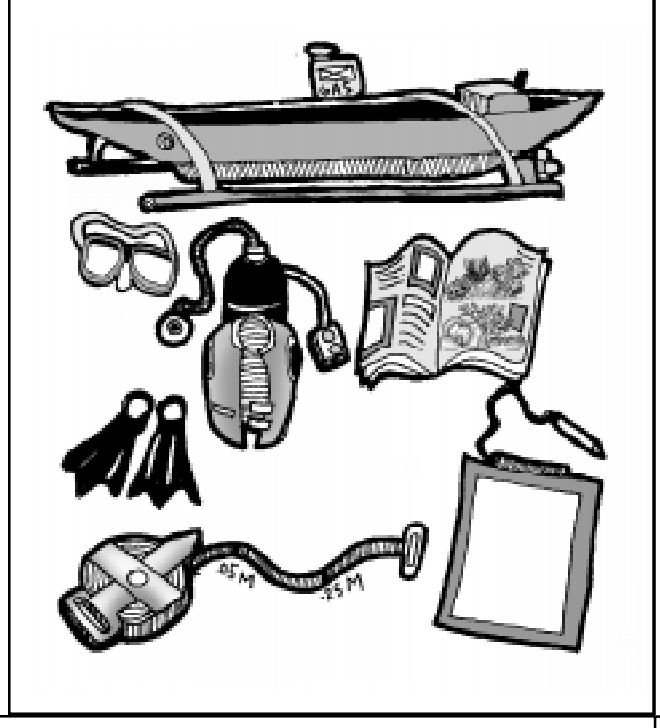
The point-intercept transect is used to more precisely estimate the abundance of hard corals, dead corals, algae, and various reef substrates which may reflect the health of the reef.

Requirements

- ❑ Picture book of the plant and animal types to be quantified
- ❑ SCUBA diving gear
- ❑ 50-m transect line (marked every 0.25 m)
- ❑ Underwater slates with attached pencil
- ❑ Properly-certified SCUBA divers

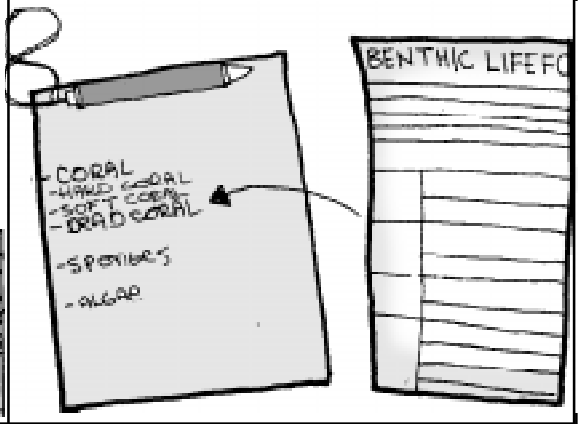
Optional

- ❑ Boat (depending on where the survey site is)



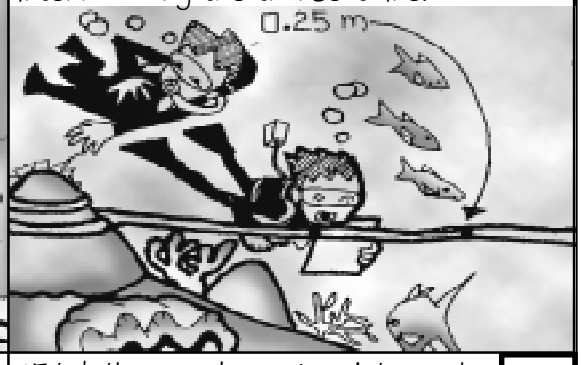
1 Select representative sampling stations to be surveyed/monitored based on the manta tow results.

2 Copy the Data Form (with the selected benthic lifeform types) onto the plastic slates used for writing underwater.

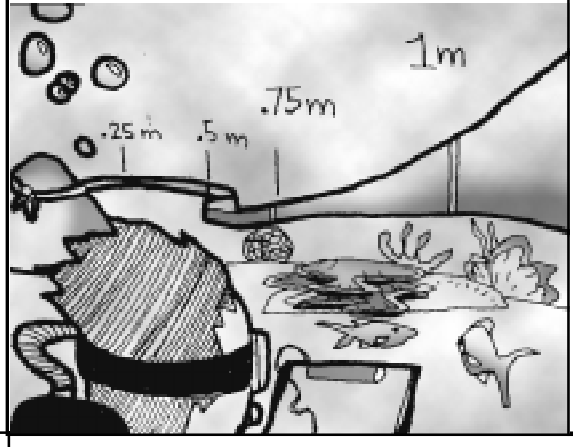


3 Lay the transect line on a constant depth contour. Record the depth.

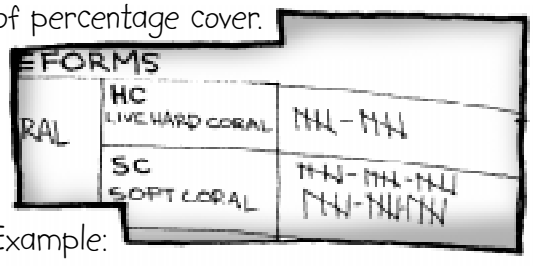
4 Starting at one end of the transect line, the observer identifies and tallies on the data form the benthic lifeform directly underneath each 0.25 m interval along the transect line.



5 Similarly, record the other stations in turn until all the planned stations have been observed.



6 Total the number of points under which each lifeform was observed and divide this by the total number of points observed to derive your estimate of percentage cover.



Example:

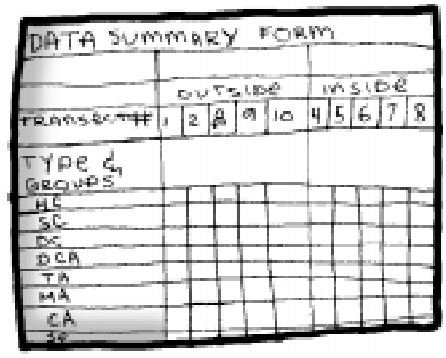
$$\frac{\text{30 soft coral points}}{\text{200 observed points}} = 15\% \text{ soft coral}$$

7 Classify the various transects according to your purpose for data summarization. For example:

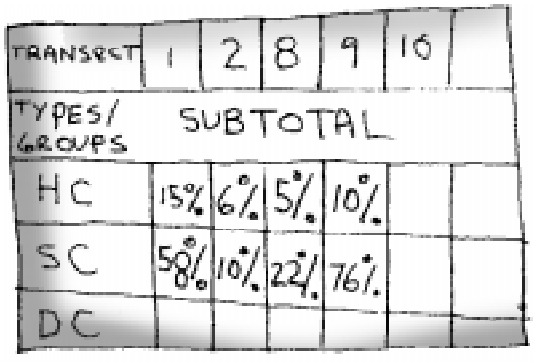
* reef zones or types (e.g. reef flat, reef slope, fringing reef, offshore reef, etc.),
* time of sampling (e.g. year 1/dry season, year 1/wet season, year 2/dry season, etc.)
* management or use zones (e.g. sanctuary, fishing grounds), and/or
* intensity of impacts (e.g. high pollution, medium pollution, low pollution)

List the transects by groups along the upper portion of the Summary Form.

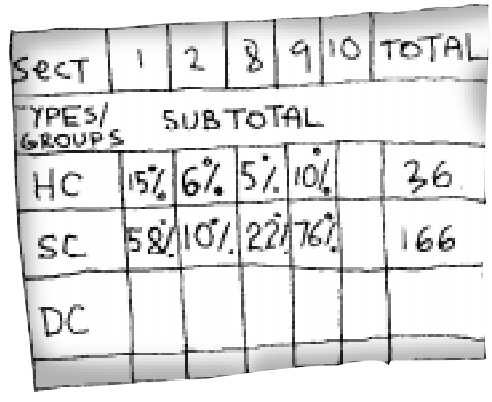
8 List the benthic lifeforms (by groups) along the left side of the Summary Form.



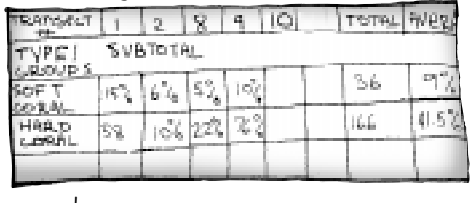
9 From the data forms per transect copy the percentages of each type of lifeform to the Summary Form.



10 Sum sub-totals for each benthic lifeform for each transect group.



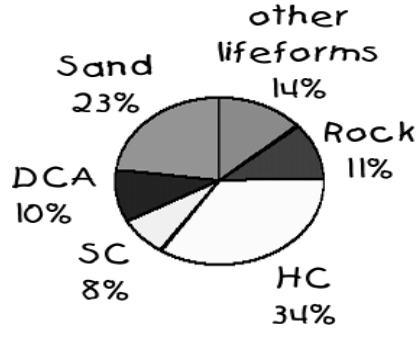
11 Standardize sub-total by sample size: Divide the total percentages by the number of transects actually observed. Write this on the column for averages.



Example:

$$\frac{15\% + 6\% + 5\% + 10\%}{4 \text{ transects}} = 9\%$$

12 Draw pie charts for the average percentages of each transect group on the Benthos Form 4D Graph.



Sample Data Form 4A showing results of a 50-m transect using the snorkel survey method

BENTHIC LIFEFORMS & INVERTEBRATES DATA FORM

Form 4A

Site Name: Gilutongan Marine Sanctuary	**Municipality & Province:** Cordova, Cebu
Transect No.: 1 **Scuba:** **Snorkel:** ✓	**Coordinates:** 10°12.701′ N, 123°59.301′ E
Date (mo/dy/yr): 11/4/99	**Benthos observer:** R. Amolo **Invertebrates observer:** A. Diola
Horizontal water visibility (m):	**Depth (m):** 3.5 m **Reef zone:** fore slope **Topography:** moderate **Slope:**
Habitat notes:	

BENTHIC LIFEFORMS		Tally number of points or est. % occupied by each lifeform e.g. ~~HH~~-~~HH~~-~~HH~~-II or 12%+34%+22%+...						Total Count	% Cover
coral	**HC** live hard coral	25	10	15	8	8	5	17	10	18	23	139	13.9%
	SC soft coral	0	10	0	15	0	5	5	0	0	0	35	3.5%
dead coral	**DC** white dead coral	0	0	3	0	0	0	0	5	0	0	8	0.8%
	DCA dead coral w/ algae	0	6	0	0	2	0	0	3	0	0	11	1.1%
other animals	**SP** sponges	0	0	0	0	0	0	0	0	0	0	0	0%
	OT other animals	0	0	0	0	0	0	0	0	0	0	0	0%
plants	**TA** turf algae	46	43	32	2	40	35	34	39	49	47	367	36.7%
	MA fleshy macroalgae	14	8	15	20	10	5	10	10	8	5	105	10.5%
	CA coralline algae	0	3	0	5	0	0	4	0	0	0	12	1.2%
	SG seagrass	0	0	0	0	0	0	0	0	0	0	0	0%
non-living	**R** rubble	0	0	0	0	0	20	0	15	0	15	50	5%
	RCK rock	0	5	10	5	0	5	0	3	5	0	33	3.3%
	S / SI sand/silt	15	15	25	45	40	25	30	15	20	10	240	24%
TOTAL												1000	100%

INVERTEBRATES	**# within 5-m width**
Diadema urchins; *tuyom*	45
Pencil urchin	0
Crown-of-thorns starfish; *dap-ag*	0
Giant clam; *taklobo*	0
Triton shell; *tambuli*	0
Lobster; *banagan*	0
Sea cucumber; *balat*	0
Banded coral shrimp	0
others	0

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

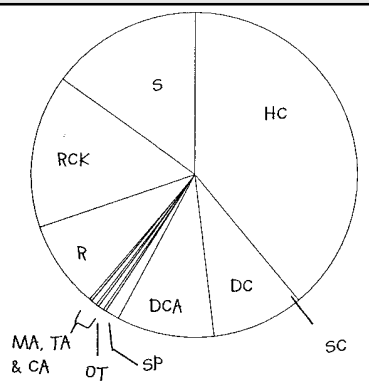
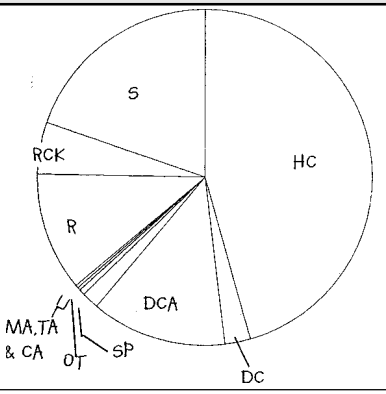
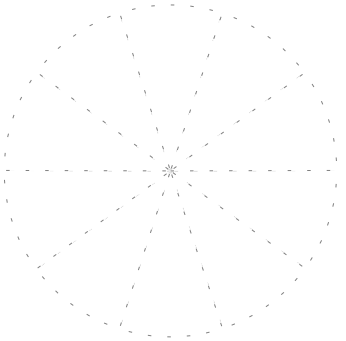
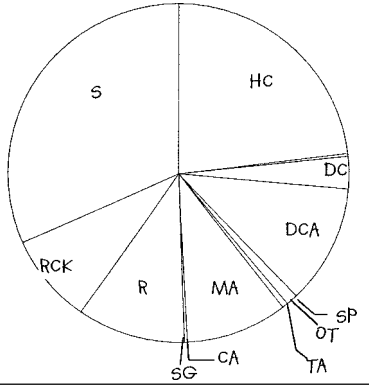
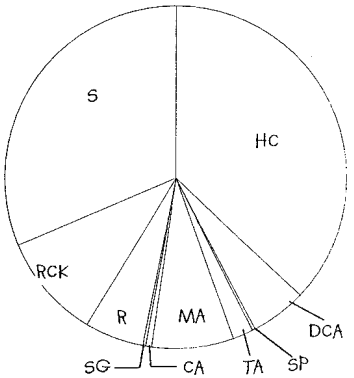
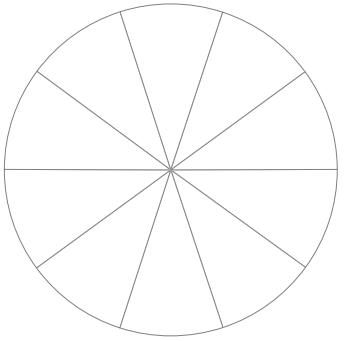
Form 4C

Site Name: Gilutongan Marine Sanctuary									**Municipality & Province:** CORDOVA, CEBU							
Zone/Sector:	Outside								Inside							
Month & year:	November 1999								November 1999							
Transect #:	1	2	3	9	10				4	5	6	7	8			
Types/groups	**Sub-total**						**Total**	**Avg.**	**Sub-total**						**Total**	**Avg.**
Live hard coral	44.0%	28.0%	56.5%	41.0%	15.3%		184.8	37%	65.0%	58.5%	24.1%	42.5%	38.5%		228.6	45.7%
Soft coral	0.0%	0.0%	0.0%	0.0%	0.5%		0.5	0%	0.5%	0.0%	0.0%	0.5%	0.0%		1.0	0.2%
White dead coral	0.0%	0.0%	0.0%	0.0%	0.0%		0.0	0%	0.0%	0.0%	4.0%	6.5%	1.0%		11.5	2.3%
Dead coral with algae	4.0%	5.0%	9.0%	7.0%	2.6%		27.6	6%	9.0%	12.0%	13.6%	18.0%	12.0%		64.6	12.9%
Sponges	0.0%	0.0%	0.0%	0.5%	0.5%		1.0	0%	2.0%	1.0%	1.5%	2.0%	1.0%		7.5	1.5%
Other animals	0.0%	0.0%	0.0%	0.0%	0.5%		0.5	0%	1.0%	0.0%	1.5%	0.0%	0.5%		3.0	0.6%
Turf algae	0.0%	0.0%	7.5%	0.0%	0.0%		7.5	2%	0.0%	0.0%	0.0%	0.0%	0.5%		0.5	0.1%
Fleshy macroalgae	11.5%	27.5%	0.0%	0.0%	0.5%		39.5	8%	0.0%	0.0%	0.0%	0.5%	0.0%		0.5	0.1%
Coralline algae	0.5%	0.0%	0.0%	0.0%	0.5%		1.0	0%	0.0%	0.0%	0.5%	0.0%	0.0%		0.5	0.1%
Seagrass	0.0%	0.0%	0.0%	0.0%	2.6%		2.6	1%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0	0.0%
Rubble	6.0%	9.5%	6.5%	5.0%	0.5%		27.5	6%	9.5%	9.5%	17.1%	9.5%	14.0%		59.6	11.9%
Rock	14.5%	15.0%	9.5%	4.0%	6.6%		49.6	10%	8.0%	7.0%	5.5%	3.0%	2.0%		25.5	5.1%
Sand/Silt	19.5%	15.0%	11.0%	42.5%	69.9%		157.9	32%	5.0%	12.0%	32.2%	17.5%	30.5%		97.2	19.4%
INVERTEBRATES																
Diadema	7	21	2	5	3		38	7.6	?	92	6	6	?		104	35
Sea cucumber	1	0	1	2	2		6	1.2	?	0	2	1	?		3	1

Sample summary data showing the results of 10 50-m transects using the point-intercept method

BENTHOS GRAPHING FORM

Form 4D

Site Name: Gilutongan Marine Sanctuary, Cordova, Cebu		**Municipality & Province:** CORDOVA, CEBU	
Month & year:	MARCH 1999	NOVEMBER 1999	
Zone/Sector			
INSIDE			
OUTSIDE			

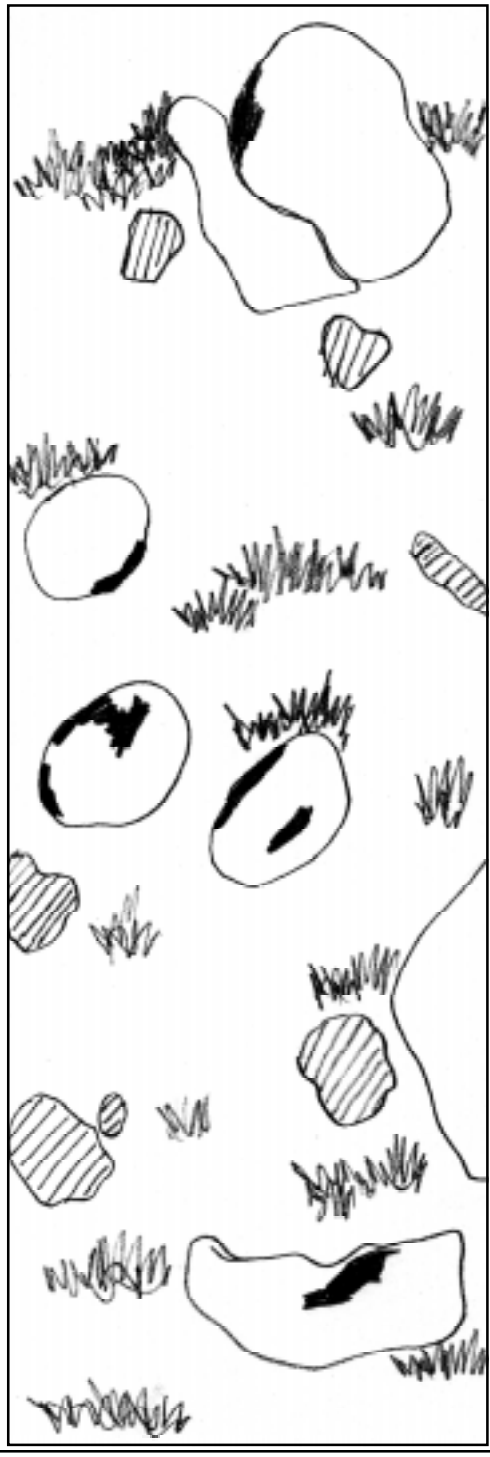
See explanation of acronyms on Form 4A, p. 34.

Sample graphs showing the results of 10 transects at Gilutongan Marine Sanctuary, Cordova, Cebu

Learning Laboratory

Using the sample pictures below, estimate the percentage of the area covered by each of the various things found within the transects. Use a ruler as your sample transect line to practice snorkel survey or point-intercept transect. Don't use a ruler/transect if practicing manta tow.

TRANSECT A



TRANSECT B

Trainer's Tips for Chapter 5

The method of estimating benthic cover while snorkeling described in the handbook is an untested hybrid of the manta tow developed and regularly used by the Australian Institute of Marine Science and the systematic snorkel developed and tested by White *et al.* (2000) with Earthwatch volunteers and other survey groups.

Transects are to be laid at a constant depth (except when one's particular interest is to have a cross-sectional sample through depths—even then it would be preferable to collect separate samples at different fixed depths). A depth contour is a line of constant depth on the bottom surface. If you encounter an obstacle when laying the line, go around (rather than above) it so as to keep the transect on a constant depth.

Review Questions

1. How do you tell the difference between a live hard coral and a dead hard coral?
2. How do you tell the difference between a hard coral and a soft coral?

Live hard corals are frequently pigmented. Dead hard corals are white and have no tissue. Hard corals with algae growing on them (not inside them) are almost always dead or dying.