

DRM Methodology

This portion of the training will review the methodologies of navigating to and evaluating a site, in-water survey protocols, and an introduction to the underwater datasheet.

Please review the **FRRP DRM in-water protocol** available on the DRM website under the 'Surveyor Trainings and Resources' page before you begin your surveys.
(<http://ocean.floridamarine.org/FRRP/Home/About>)

DRM Methodology Overview

- Random sites generated and assigned to teams
- Navigate to site and assess for coral habitat
- Four (4) 1 x 10m belt transects per site
- Enter data online
- QAQC data and mark as Complete!

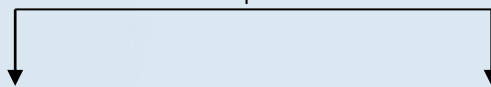


Navigating to a Site

Primary Site (aka **1000's**)



Is reef or hardbottom present?



Yes

No

(Survey the site)

(Search 25m radius area)

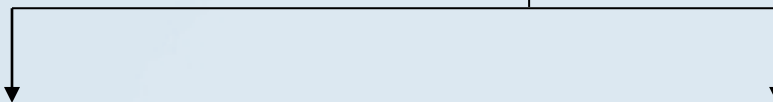


Yes

No

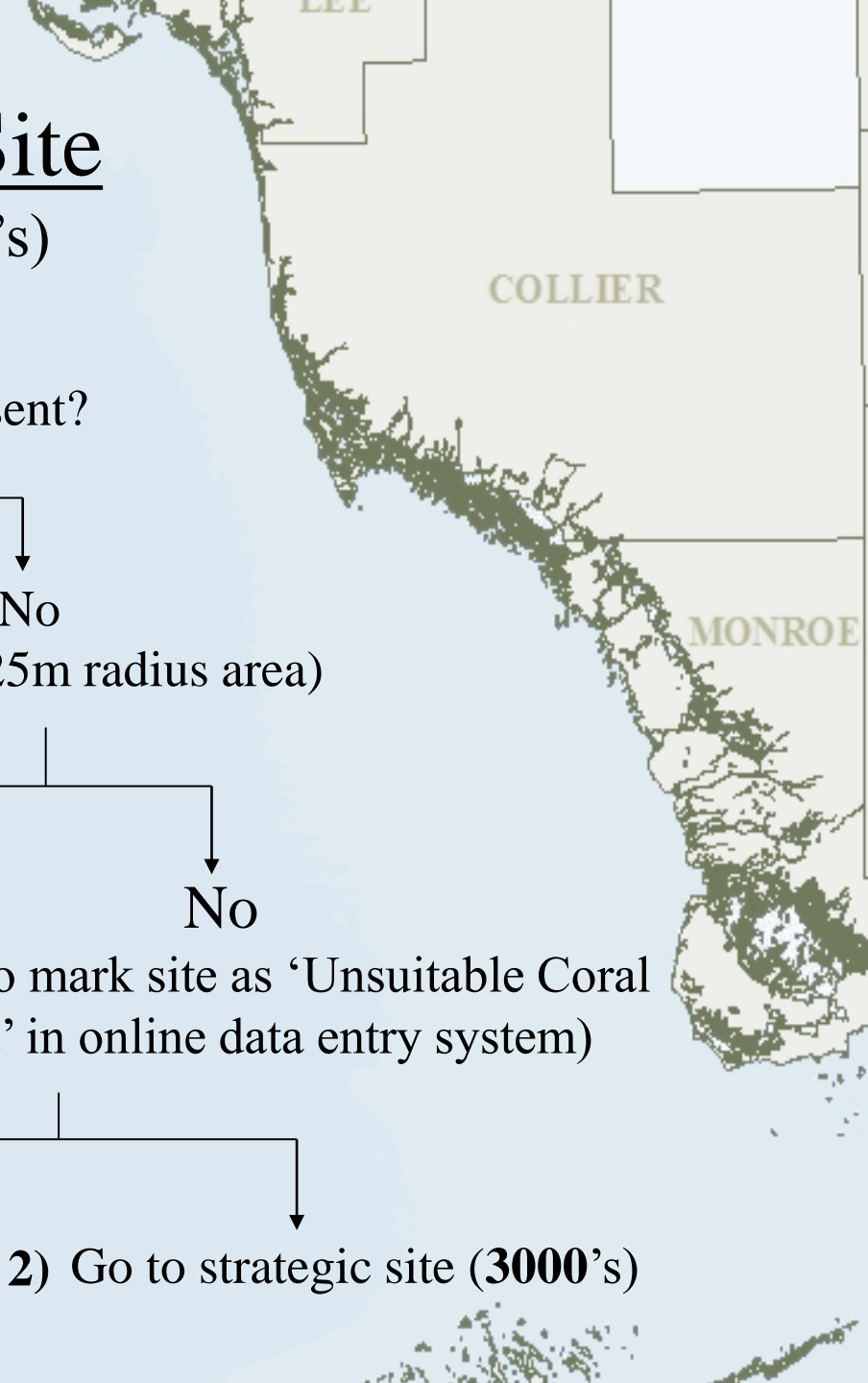
(Survey the site and
collect new coordinates)

(Be sure to mark site as 'Unsuitable Coral
Habitat' in online data entry system)



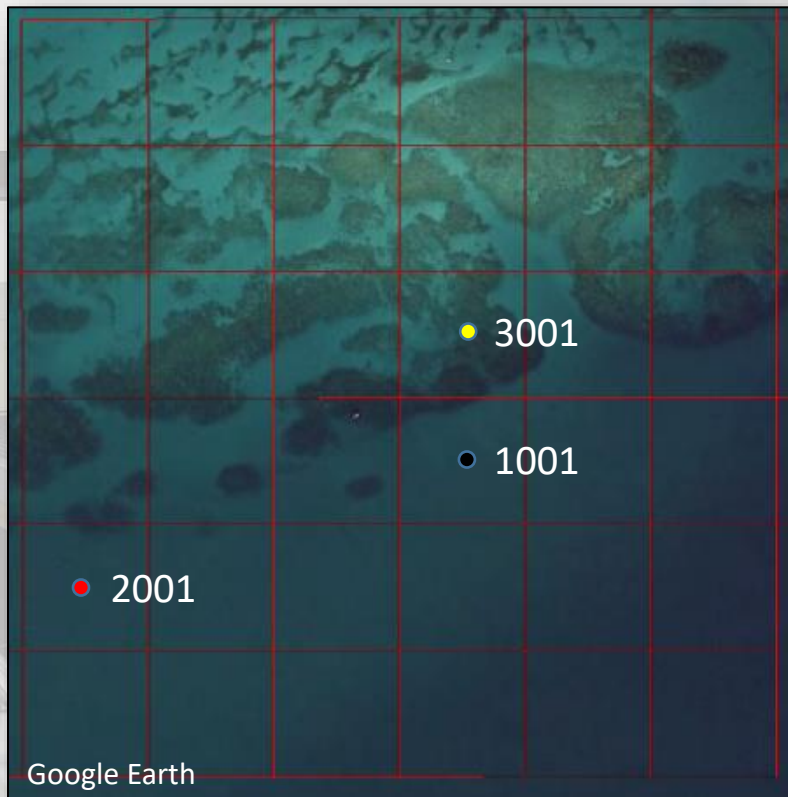
1) Go to alternate site (2000's)
(Repeat procedure)

2) Go to strategic site (3000's)



Strategic Sites

If suitable survey habitat is not found within the 25m radius at either the **primary** or the **secondary** site, you may choose an area known to have hardbottom/reef and survey it as a 'Strategic Site'. Surveyors should try to find appropriate habitat for the strategic site as close as possible to the original site location in an effort to stay in the same reef strata or zone. Once suitable survey habitat is identified at a site, record the GPS coordinates of the site. If your survey site is $> 25\text{m}$ from an assigned site, you will enter it as a 'Strategic Site'.



If you are not sure how far your new coordinates are from the original site, the data entry system will prompt you to let you know when your coordinates are $> 25\text{m}$ away. The data entry system will then ask you to enter in your data as a 'Strategic Site' and mark the original site as 'Unsuitable Habitat'.

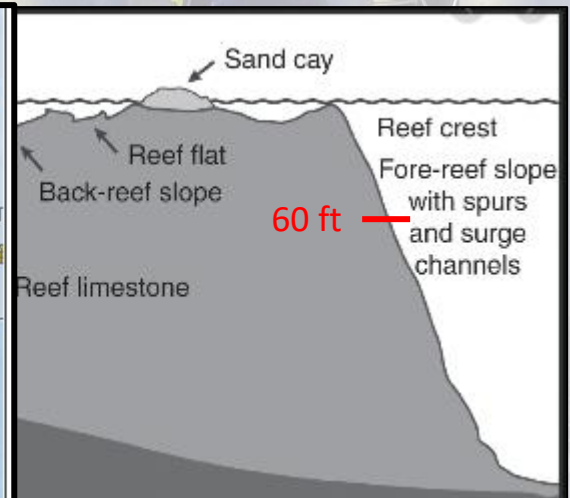
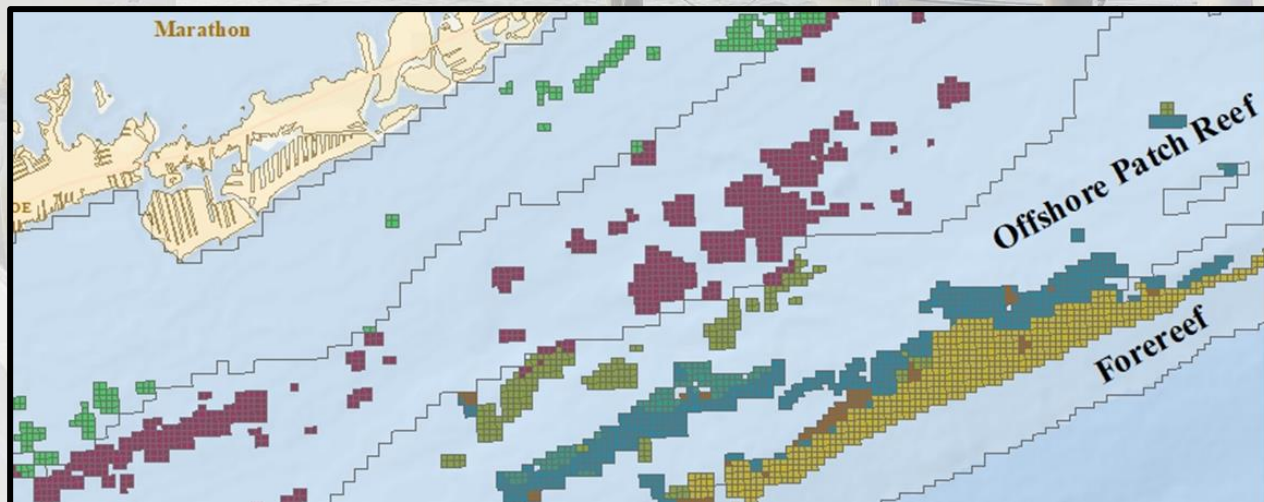
Depth Limit

DRM sites are selected from strata that are ~ 60 ft or less. However, the grid framework may not be entirely accurate when surveying the outer reef or forereef areas.

If you descend on a site or drive over a site with your depth finder and discover that it is > 60 ft, you can either swim to a more suitable depth if it is in visible range or you can skip the site and move on to your secondary site.

Often the substrate at a site may be quite rugose and variable therefore, the 60 ft depth limit is not a hard line. One surveyor may be at 58 ft while the other is at 62 ft. This is still an acceptable survey depth.

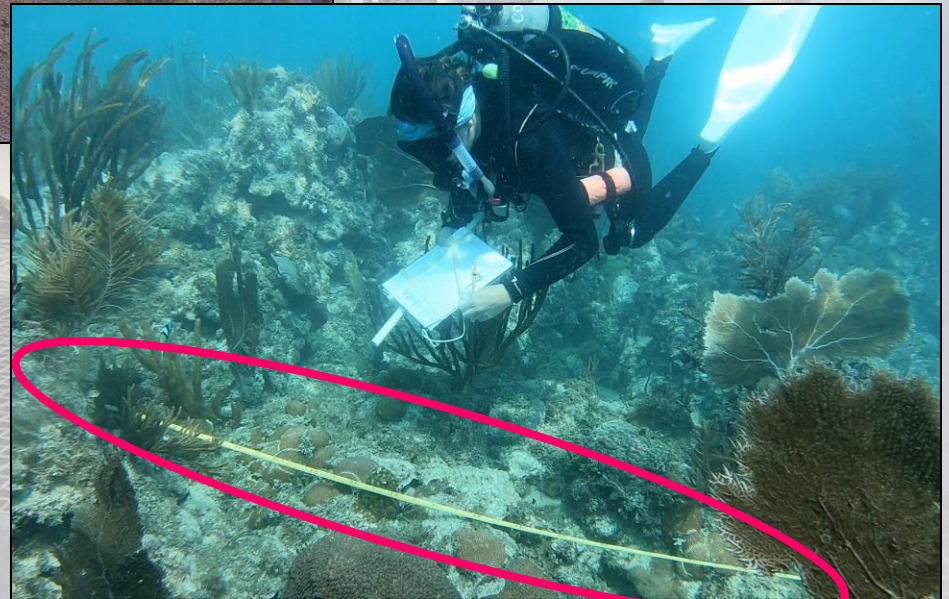
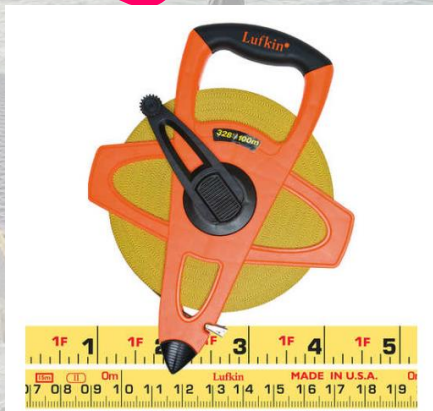
We ask that surveyors try to maintain a depth of around 60 ft, never exceed your certified depth limit, and only survey a site if you are comfortable with the conditions. Use your best judgment!



Equipment Needs

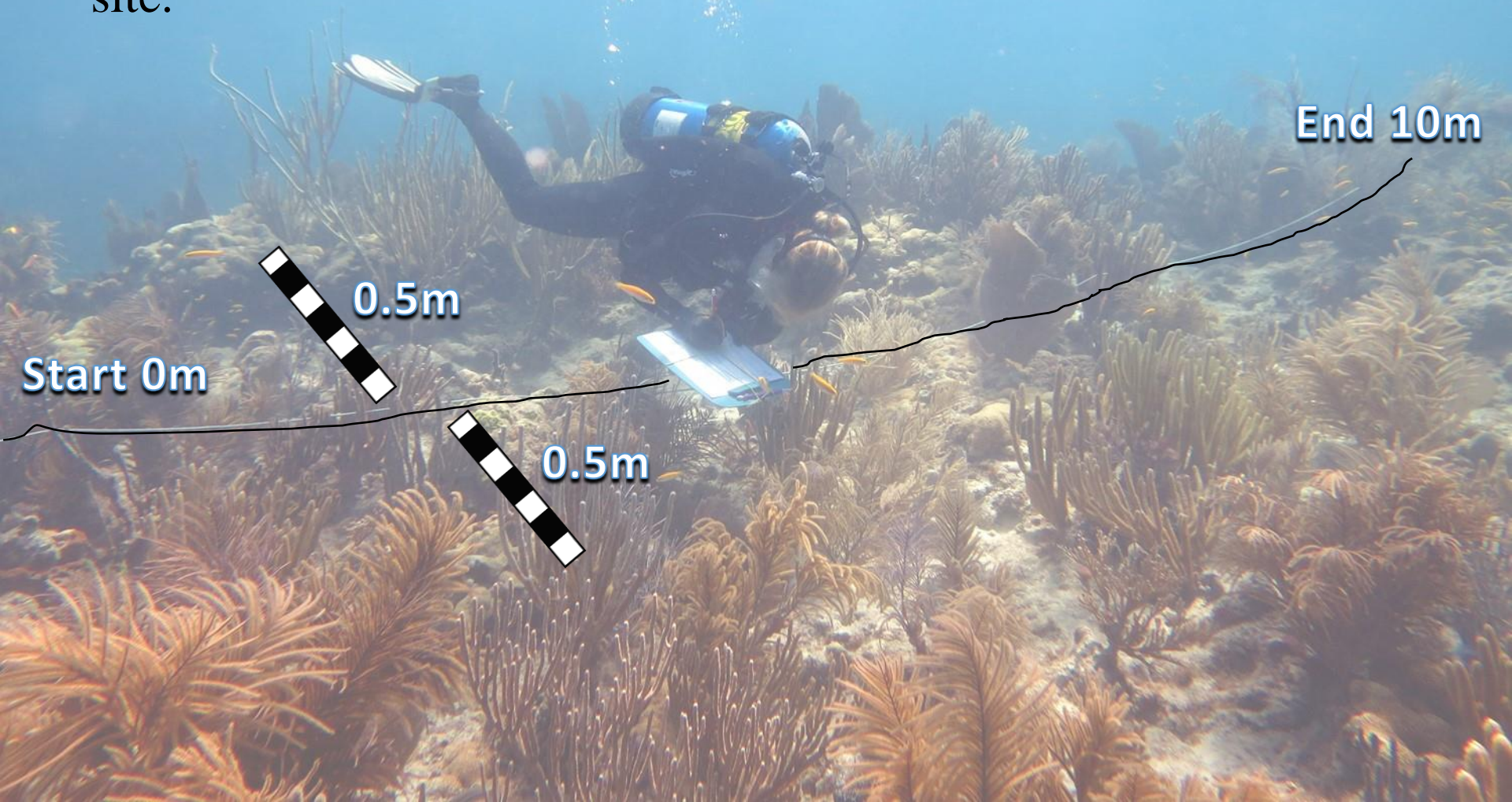


- Assigned Site Coordinates
 - Primary & Secondary
- GPS
- Dive Slate & Pencil
- Underwater Datasheet
- Rigid Coral Measuring Device
- Metered Tape or Line
- Camera (optional)



DRM Transect Survey

If coral habitat is present at a site, complete four (4) 1m x 10m belt transects. Be sure to avoid overlap between the transects at each site.



Is data collection the same along all four transects?... NO.

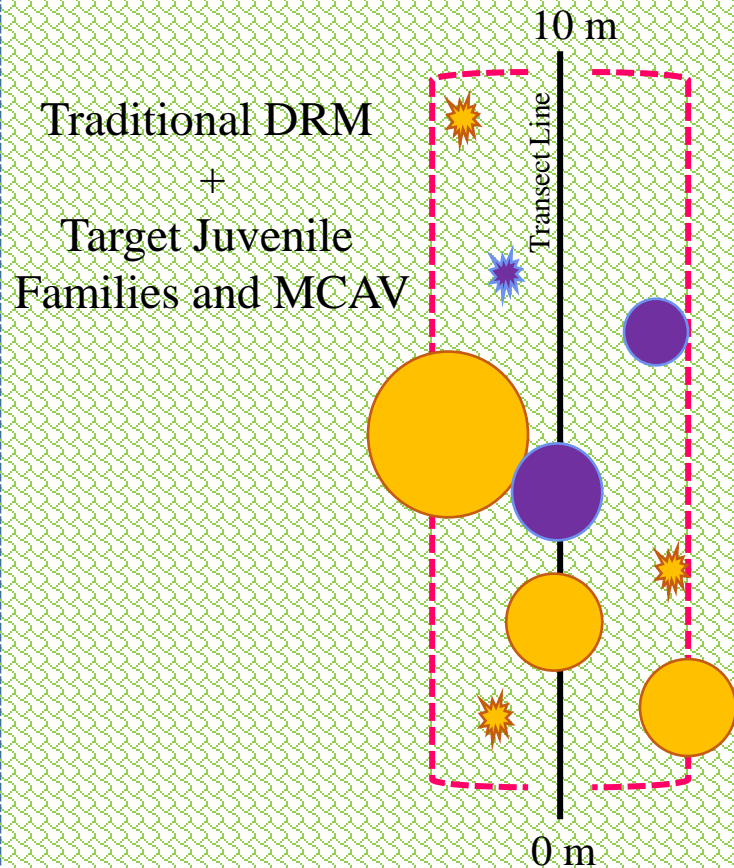
TRANSECTS 1 & 2: Record demographic and condition data for any coral (>4cm) that falls within 1/2m on each side of the transect that has any portion of live tissue or recently dead areas on the colony. In addition, tally all juvenile corals (<= 4cm) of the three target coral families as well as the species *Montastraea cavernosa* that fall within 1/2 m on each side of the transect.



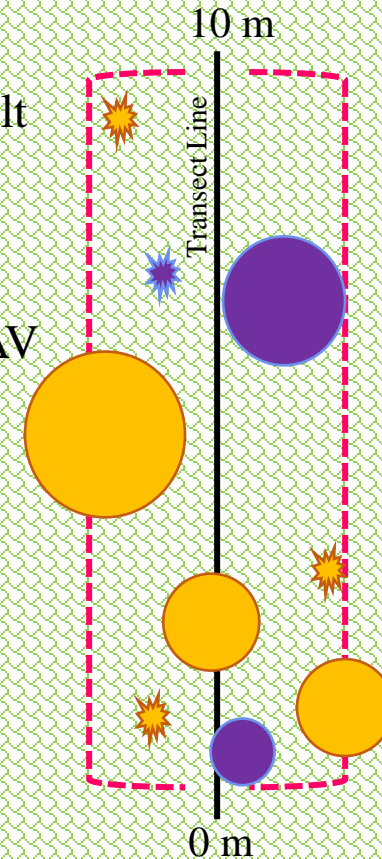
TRANSECTS 3 & 4: Record demographic and condition data for **ONLY** 10 target coral species (>4cm) that fall within 1/2m on each side of the transect that has any portion of live tissue or recently dead areas on the colony. In addition, tally all juvenile corals (<= 4cm) of the three target coral families as well as the species *Montastraea cavernosa* that fall within 1/2 m on each side of the transect.

Diagram of Transect 1 / 2

Diagram of Transect 3 / 4



ONLY Target Adult
Species
+
Target Juvenile
Families and MCAV



 ALL Adult Coral Species (YES)

 Target Adult Coral Species
(YES – included with ALL)

 Non-Target Juv. Corals (**NO**)

 Target Juv. Corals (YES)

 ALL Adult Coral Species (**NO**)

 Target Adult Coral Species (YES)

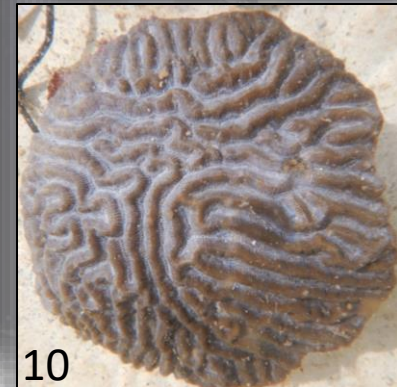
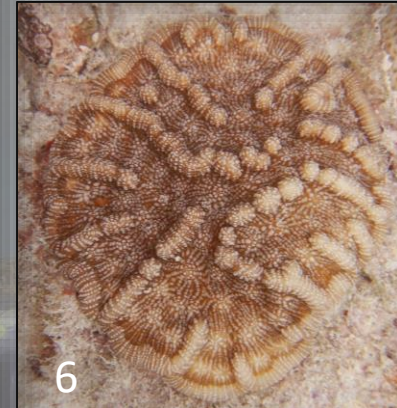
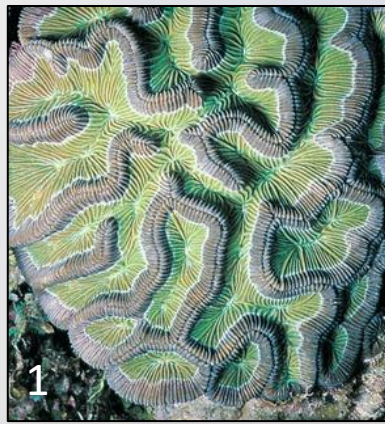
 Non-Target Juv. Corals (**NO**)

 Target Juv. Corals (YES)

Transect 3 and 4

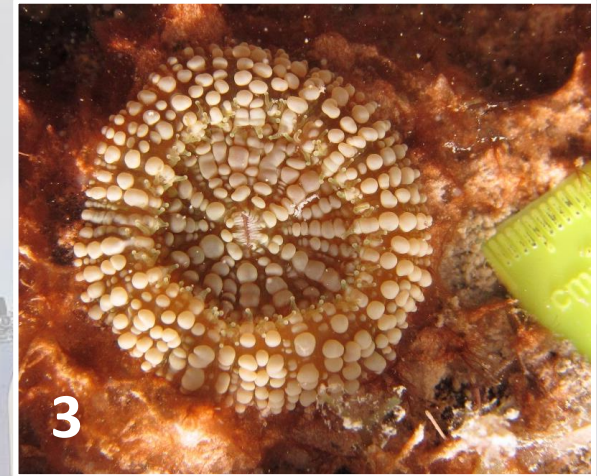
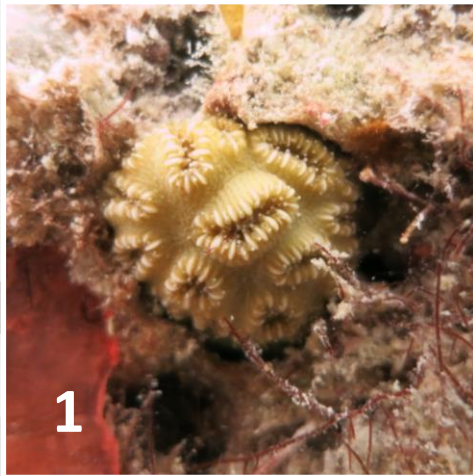
Target Adult Coral Species

1. *Colpophyllia natans*
2. *Dichocoenia stokesii*
3. *Diploria labyrinthiformis*
4. *Meandrina meandrites*
5. *Mussa angulosa*
6. *Mycetophyllia aliciae*
7. *Mycetophyllia ferox*
8. *Mycetophyllia lamarckiana*
9. *Pseudodiploria clivosa*
10. *Pseudodiploria strigosa*



Transects 1, 2, 3, and 4 - Target Juvenile Coral Families

1. Family **Meandrinidae**: includes *Dendrogyra*, *Dichocoenia*, *Eusmilia*, *Meandrina*
2. Subfamily **Mussinae**: includes *Isophyllia*, *Mussa*, *Mycetophyllia*, *Scolymia*
3. Subfamily **Faviinae**: includes *Colpophyllia*, *Diploria*, *Favia*, *Manicina*, *Pseudodiploria*
4. Species *Montastraea cavernosa*



Juveniles are grouped at the family/subfamily level due to the difficulty in identifying juvenile colonies to the genus and species level in the field with the exception of *Montastraea cavernosa*. **No other juvenile coral families or species will be tallied during the survey.**

Identifying the above juvenile corals will be covered in LESSON 8 – Target Juvenile Coral ID training.

Millepora spp. are **NOT** recorded along any of the DRM belt transects



DRM Datasheet Part I

<u>DRM Code:</u>			<u>Transect:</u>			<u>Rugosity Msmts:</u>			<u>P/A</u>	<u>Habitat:</u>	
<u>Surveyor:</u>			1 / 2 / 3 / 4			1.	2.	3.	H.Diad.	Isolated Reef	
<u>Lat:</u>						4.	5.	6.	D.Diad.	Contiguous Reef Spur and Grv.	
<u>Long:</u>			<u>Shared?</u> Y / N			7.	8.	9.	ACER	Contiguous Reef Other	
<u>Date:</u>			<u>Buddy:</u>			10.			APAL	Reef Rubble	
						Tissue Loss Disease			DCYL		
Species Code	Width (cm)	Height (cm)	Bleaching P, PB, BL	% Old Mort	Other % Recent Mort	Disease % Recent Mort	TL Rate Fast, Slow	Disease Conditon(s)	Other Condition(s)	Scientific Name Transect 3 & 4 in Grey	Sp. Codes
1										<i>Colpophyllia natans</i>	CNAT
2										<i>Dichocoenia stokesii</i>	DSTO
3										<i>Diploria labyrinthiformis</i>	DLAB
4										<i>Meandrina meandrites</i>	MMEA
5										<i>Mussa angulosa</i>	MANG
6										<i>Mycetophyllia aliciae</i>	MALI
7										<i>Mycetophyllia ferox</i>	MFER
8										<i>Mycetophyllia lamarchiana</i>	MLAM
9										<i>Pseudodiploria clivosa</i>	PCLI
10										<i>Pseudodiploria strigosa</i>	PSTR
11										<i>Acropora cervicornis</i>	ACER
12										<i>Acropora palmata</i>	APAL
13										<i>Agaricia agaricites</i>	AAGA
14										<i>Agaricia lamarchi</i>	ALAM

Site and Transect Data

- Be sure to fill in **ALL** fields at the top of your datasheet before you leave a site.
- Keep latitude/longitude in decimal degrees or convert later if you collect a new coordinate.
- Identify which transect you are surveying so you can distinguish between them during data entry.
- Write down if (Y or N) and who (Buddy) you shared your transect with.

DRM Code: 1000 Surveyor: JEST Lat: DD.DDDD Long: DD.DDDD Date: 9/15/2022			Transect: <input checked="" type="checkbox"/> 1 / 2 / 3 / 4 Shared? <input checked="" type="checkbox"/> Y / N Buddy: LHUB			Rugosity Msmts: 1. 10 2. 35 3. 17 4. 15 5. 105 6. 45 7. 25 8. 20 9. 20 10. 100			P/A H.Diad. <input checked="" type="checkbox"/> D.Diad. ACER APAL DCYL		Habitat: <input checked="" type="checkbox"/> Isolated Reef Contiguous Reef Spur and Grv. Contiguous Reef Other Reef Rubble	
Depth: 25						Tissue Loss Disease						
Species Code	Width (cm)	Height (cm)	Bleaching PB, BL	% Old Mort	Other % Recent Mort	Disease % Recent Mort	TL Rate Fast, Slow	Disease Conditon(s)	Other Condition(s)	Scientific Name Transect 3 & 4 in Grey	Sp. Codes	
1 SSID	10	5	PB	10	2				PRD	<i>Colpophyllia natans</i>	CNAT	
2 SINT	15	10								<i>Dichocoenia stokesii</i>	DSTO	
3 MCAV	45	40				10	SL	STL		<i>Diploria labyrinthiformis</i>	DLAB	
4 CNAT	61	30	P	55					OGI	<i>Meandrina meandrites</i>	MMEA	
5 SSID	25	10		5						<i>Mussa angulosa</i>	MANG	
6 DSTO	15	8	P	2		5	FA	STL		<i>Mycetophyllia aliciae</i>	MALI	
7										<i>Mycetophyllia ferox</i>	MFER	
8										<i>Mycetophyllia lamareckiana</i>	MLAM	
9										<i>Pseudodiploria clivosa</i>	PCLI	
10										<i>Pseudodiploria strigosa</i>	PSTR	
11										<i>Acropora cervicornis</i>	ACER	
12										<i>Acropora palmata</i>	APAL	

Note: Depth measurements should be collected in feet (ft) NOT meters (m).

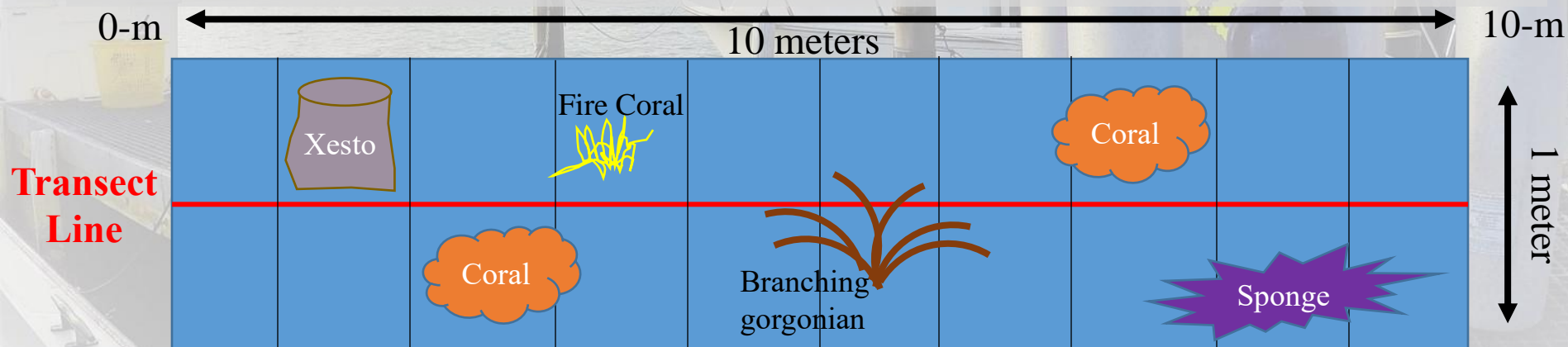
How to Measure Rugosity

RUGOSITY IS ONLY MEASURED ALONG TRANSECTS 1 AND 2

One of the passes along your transect will be to collect 10 rugosity measurements within each square meter of your belt transect. (This can also be done while rolling up the transect line if desired.)

The entire transect is subdivided into ten 1m x 1m subplots. Within each 1m x 1m subplot, measure the **height from the top of the highest relief feature** to the lowest point using your measuring device to the nearest **cm**. This does not include “soft complexity” features such as branching gorgonians, sponges, and fire corals. Note: Giant Barrel Sponges (*Xestospongia muta*) **are** considered a hard-relief feature.

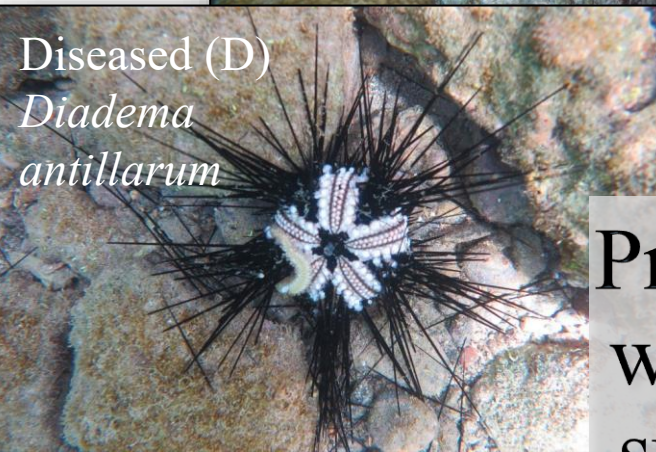
The 10 rugosity measurements are recorded at the top of your datasheet.



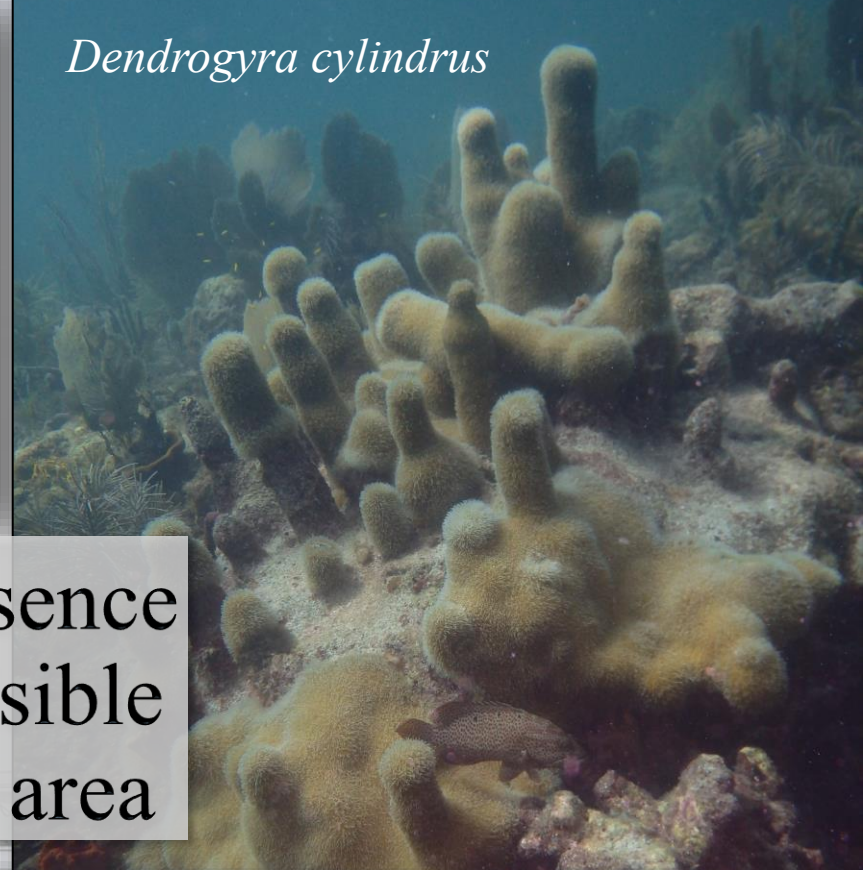
Yes – Corals; Hard substrate; Barrel Sponge No – Branching gorgonians; Other Sponges; Fire Coral



Healthy (H)
*Diadema
antillarum*



Diseased (D)
*Diadema
antillarum*



Dendrogyra cylindrus

Presence/Absence
within the visible
surrounding area

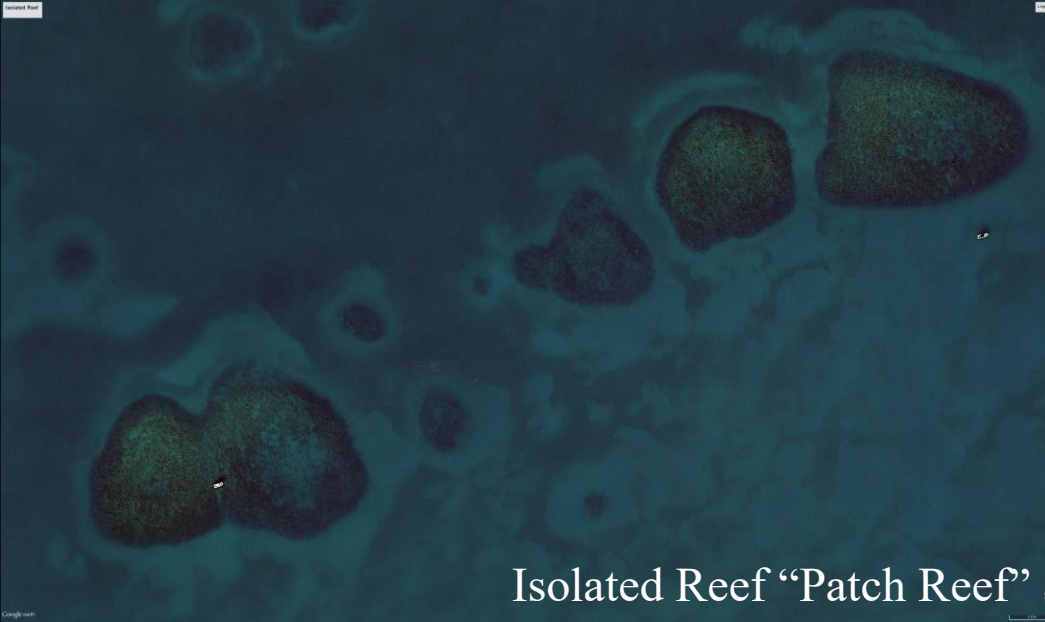


Acropora cervicornis

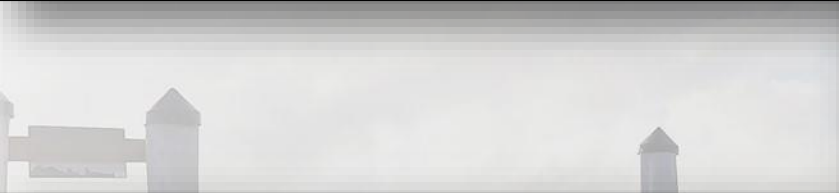


Acropora palmata

What Habitat are you surveying?



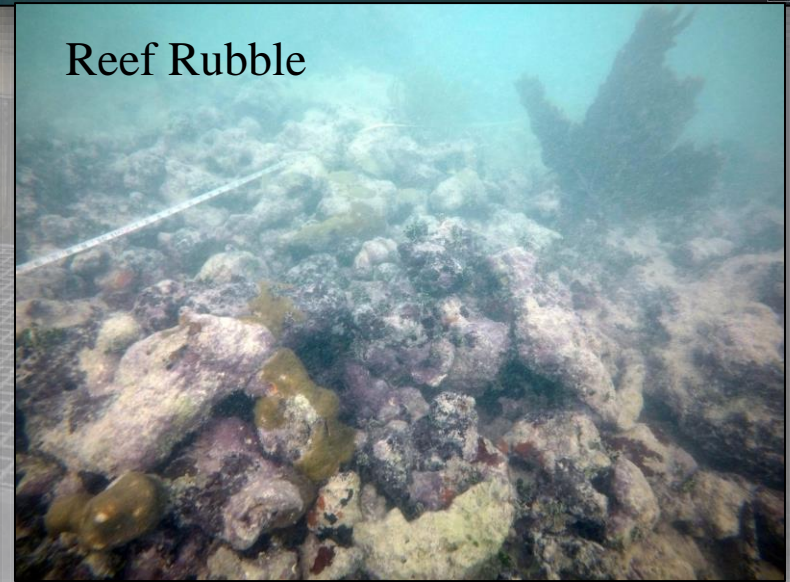
Isolated Reef "Patch Reef"



Contiguous Reef Spur and Groove



Contiguous Reef Other



Reef Rubble

Transects 3 and 4

- The only data required at the top of your datasheet for Transects 3 and 4 include the following:
 - Site, Surveyor, Lat/Long, Date; Transect #, and if you shared your transect.
- All other site and transect data are **NOT required** at Transects 3 and 4. Information not required include:
 - Depth, Rugosity Measurements, P/A, and Habitat identification.

DRM Code: 1000 Surveyor: JEST Lat: dd.ddddd Long: dd.ddddd Date: 8/29/2020			Transect: 1 / 2 / 3 / 4 Shared? Y / N			Rugosity Measurements: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.		P/A: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.		Habitat: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	
<div style="text-align: center;"> Tissue Loss Disease </div>											
Species Code	Width (cm)	Height (cm)	Bleaching P, PB, BL	% Old Mort	Other % Recent Mort	Disease % Recent Mort	TL Rate Fast, Slow	Disease Condition(s)	Other Condition(s)	Scientific Name Transect 3 & 4 in Grey	Sp. Codes
1 CNAT	65	39	PB	5						<i>Colpophyllia natans</i>	CNAT
2 DSTO	10	7		2	10			DC	OGI	<i>Dichocoenia stokesi</i>	DSTO
3 DLAB	15	10		20	5	50	FA	STL	CLN	<i>Diploria labyrinthiformis</i>	DLAB
4 PSTR	20	10	P	10						<i>Meandrina meandrites</i>	MMEA
5 DSTO	5	5		10		20	FA	STL		<i>Mussa angulosa</i>	MANG
6 MMEA	25	16	BL							<i>Mycetophyllia aliciae</i>	MALI
7										<i>Mycetophyllia ferox</i>	MFER
8										<i>Mycetophyllia lamareckiana</i>	MLAM
9										<i>Pseudodiploria clivosa</i>	PCLI
10										<i>Pseudodiploria strigosa</i>	PSTR
11										<i>Acropora cervicornis</i>	ACER
12										<i>Acropora palmata</i>	APAL
13										<i>Agaricia agaricites</i>	AAGA

All species in grey are the target corals for transects 3 and 4.

DRM Datasheet Part II

At the base of your datasheet is where you will record your juvenile coral tallies ($\leq 4\text{cm}$) of *Montastraea cavernosa* and the three target coral (sub) families Mussinae, Faviinae, and Meandrinidae. Listed beside each family on the datasheet is the list of genus and species codes that fall within that family.


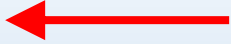


36										<i>Siderastrea siderea</i>	SSID
37										<i>Solenastrea bournoni</i>	SBOU
38										<i>Solenastrea hyades</i>	SHYA
39										<i>Stephanocoenia intersepta</i>	SINT
40										Unidentified coral	UNKN
Mussinae: ISOP, MANG, MYCE, SCOL					Tally:					Other Site Notes:	
Faviinae: CNAT, DLAB, FAVI, MARE, PSTR, PCLI					Tally:						
Meandrinidae: DCYL, DSTO, EFAS, MMEA					Tally:						
<i>Montastrea cavernosa</i> : MCAV					Tally:						
Bleaching Severity - Pale (P); Partially Bleached (PB); Bleached (BL) Tissue Loss Rate - Fast >1 cm bare skel. (FA); Slow <1 cm bare skel. (SL)					Disease Cond.s - Unknown Disease (UNK); Diseases (STL, WPL, WBD, WPX, RTL, DSD, YB, BB/RB); Discolored (DC) Other Cond.s - Predation (PRD); Overgrowth and Interaction (OGI); Abrasion (ABR); Sediment Cover (SC); Clonid sp. (CLN); Mucus sheathing (MUC); Other Unknown (OUK)						

Please note that **all data entry codes for adult coral colony conditions** are listed at the base of the datasheet for your reference and a list of species codes along the right side. Again, be aware that this list is not a comprehensive list of coral species found in Florida.

Lastly, there is a small area provided for transect or site notes that may benefit the surveyor when entering data or organizing datasheets. This data is not used in any analyses.


Transect Survey

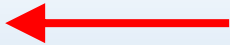
Transects 1 and 2 can be surveyed by making several “**passes**” of the transect line as follows:

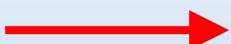
- 0-m  10-m : Record DEPTH (ft) and circle HABITAT.
Then, lay out transect.
- 0-m  10-m : Scan transect and area within visual range
for *Diadema*, *Acropora* spp. and *Dendrogyra*
- 0-m  10-m : Record all corals >4cm (sp., dimensions,
conditions); Tally target juvenile colonies.
- 0-m  10-m : Record rugosity measurements (cm)
while rolling up the transect line.

Transect Survey

Transects 3 and 4 can be surveyed by making a few “**passes**” of the transect line as follows:

0-m  10-m : Lay out transect.



0-m  10-m : Record target corals >4cm (sp., dimensions, conditions); Tally target juvenile colonies.

0-m  10-m : Roll up transect (No Corals? – **Make Note**)

You may not record anything at all on these transects depending on the habitat you are surveying.

If so, you must mark this somewhere so you can remember to mark it in the online data entry system. ****VERY IMPORTANT****

The data entry system will be covered in Lesson 6.

Datasheet Example

How to collect coral demographic and coral condition information and how to record it on your datasheet will be covered in LESSONS 4 and 5.

DRM Code: 1000			Transect: 1 / 2 / 3 / 4			Rugosity Msmts:			P/A		Habitat:	
Surveyor: JEST			Shared? Y / N			1. 10 2. 35 3. 17			H.Diad.		Isolated Reef	
Lat: DD.DDDD			Buddy: LHUB			4. 15 5. 105 6. 45			D.Diad.		Contiguous Reef Spur and Grv.	
Long: DD.DDDD						7. 25 8. 20 9. 20			ACER		Contiguous Reef Other	
Date: 9/15/2022						10. 100			APAL		Reef Rubble	
Depth: 25									DCYL			
Species Code	Width (cm)	Height (cm)	Bleaching P, PB, BL	% Old Mort	Other % Recent Mort	Disease % Recent Mort	TL Rate Fast, Slow	Disease Condition(s)	Other Condition(s)	Scientific Name	Sp. Codes	
1 SSID	10	5	PB	10	2				PRD	<i>Colpophyllia natans</i>	CNAT	
2 SINT	15	10		15						<i>Dichocoenia stokesii</i>	DSTO	
3 MCAV	45	40		40		10	SL	STL		<i>Diploria labyrinthiformis</i>	DLAB	
4 CNAT	61	30	P	55	5				OGI	<i>Meandrina meandrites</i>	MMEA	
5 SSID	25	10		5						<i>Mussa angulosa</i>	MANG	
6 DSTO	15	8	P	2		15	FA	STL		<i>Mycetophyllia aliciae</i>	MALI	
7										<i>Mycetophyllia ferox</i>	MFER	
8										<i>Mycetophyllia lamarckiana</i>	MLAM	
9										<i>Pseudodiploria clivosa</i>	PCLI	
10										<i>Pseudodiploria strigosa</i>	PSTR	
11										<i>Acropora cervicornis</i>	ACER	
12										<i>Acropora palmata</i>	APAL	
13										<i>Agaricia agaricites</i>	AAGA	

36										<i>Siderastrea siderea</i>	SSID
37										<i>Solenastrea bourmoni</i>	SBOU
38										<i>Solenastrea hyades</i>	SHYA
39										<i>Stephanocoenia intersepta</i>	SINT
40										Unidentified coral	UNKN
Mussinae: ISOP, MANG, MYCE, SCOL						Tally: III				Other Site Notes: Took images of D.Diad. NO CORALS ON TRANSECT 3	
Faviinae: CNAT, DLAB, FAVI, MARE, PSTR, PCLI						Tally:					
Meandrinidae: DCYL, DSTO, EFAS, MMEA						Tally: I					
Montastrea cavernosa : MCAV						Tally: +++ ++ II					
Bleaching Severity - Pale (P); Partially Bleached (PB); Bleached (BL) Tissue Loss Rate - Fast >1 cm bare skel. (FA); Slow <1 cm bare skel. (SL)						Disease Cond.s - Unknown Disease (UNK); Diseases (STL, WPL, WBD, WPX, RTL, DSD, YB, BB/RB); Discolored (DC) Other Cond.s - Predation (PRD); Overgrowth and Interaction (OGI); Abrasion (ABR); Sediment Cover (SC); Clionid sp. (CLN); Mucus sheathing (MUC); Other Unknown (OUK)					