

South Florida/Caribbean Network

National Park Service
Inventory and Monitoring Division



Standard Operating Procedure CR02

*Counting Long-Spined Sea Urchin, *Diadema antillarum*, on Coral Reefs—Version 2.1*

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Summary

This standard operating procedure (SOP) describes the steps to count the long-spined sea urchin, *Diadema antillarum*, along a sample transect to track trends in abundance of this regionally important herbivore. This invertebrate is an important marine herbivore and can have a substantial effect on the algal cover in coral reefs. Algal removal is a major step in the coral recruitment process. During the 1980s, this sea urchin suffered Caribbean-wide mortality at levels approaching 90%. Using this method, the number of all *Diadema* (adult and juvenile) found along a 1-meter (3.3 foot [ft]) belt transect on both sides of the sample transect used in the Coral Reef Monitoring protocol are counted during the sampling of the transect (filming with video camera). The long-spined urchin, *Diadema antillarum* is the only species of the *Diadema* genus endemic to the western Atlantic Ocean (Rodriguez et al 2013). Please reference Human et al. (2013) for a field description identification of *D. antillarum* and other sea urchin species in the region. Rodriguez et al. (2013) also provides a detailed morphologic description of this species. This SOP is used along with the SOP CR01 *Using Videography to Monitor Coral Reefs—Version 2.1* [SFCN 2025a]. An annual refresher/review is recommended among staff to ensure consistency. Divers must get very close to the reef when collecting *Diadema* data and need to exercise caution to not cause damage to the reefs being measured.

Revision Log

Revision Date	Author	Changes Made	Reason for Change	New Version #
2004	Jeff Miller	Initiated sea urchin (<i>Diadema antillarum</i>) monitoring at BK and YZ sites in 2m wide by 10m long transect centered on videography transect measuring tape.	The sudden crash in long-spined sea urchin populations in 1980s was a concern as an important herbivore of algae on coral reefs. This pilot tested whether adding this monitoring was feasible.	1.00
2005	Jeff Miller	Expanded annual sea urchin (<i>Diadema antillarum</i>) monitoring to all sites. Initially monitoring recorded as part of trip report.	Pilot showed adding monitoring was feasible, sea urchin added to annual coral videography monitoring site visits.	1.01
2015	Jeff Miller	SOP written to meet I & M program, organization and format requirements.	Tied to I & M 2.00 version of protocol.	2.0
2020	Jeff Miller	SOP name changed from 2 to CR02. Add steps for entering data into iPad.	Renamed according to regional guidance. iPad is now the primary data entry device.	2.1
2023	Mike Feeley	<i>Diadema</i> count pilot study and ongoing data quality assessment added.	Assess accuracy of single <i>Diadema</i> count.	2.1

Pilot Study on *Diadema* counts

The South Florida/Caribbean Network will collect double observer counts for one year of sampling by conducting a pilot study in 2026. The purpose of the pilot study and ongoing data quality assessment is to determine the accuracy of our single observer *Diadema* counts across a variety of coral reef habitat in Florida and the U.S. Virgin Islands. The pilot study will consist of recording total *Diadema* counts by two independent observers on all transects on all sites for one year. Following the pilot year, double observer counts will continue on 1–2 transects per site or a maximum of 10% of transects per site when one or more *Diadema* are detected on a transect. *Diadema* are often absent in surveys (i.e., many zero counts are encountered).

Equipment

No specialized equipment is necessary

- iPad in iDive with low pressure hose attached.
- One clipboard with pencil attached – backup in case iPad fails
- Pre-printed datasheet on waterproof paper – backup in case iPad fails
- Rubber bands (to hold paper to clipboard)
- 1 meter (3.3 ft) length of transect tape

Procedure

1. Slowly swim along the transect searching in various reef cracks and under ledges in a “belt” or swath, 1 meter (3.3 ft) wide directly adjacent and along each side of the transect.
2. If any part of the urchin body or spines is found within the 10×1 meter (32.8×3.3 ft) belt, it is counted. When a *Diadema* is found, there is no need to remove the urchin. Just identify and count its presence.
3. Continue along the transect searching the 1 meter (3.3 ft) wide belt until you reach the end (0 meter or 10 meter [32.8 ft]) of the transect.
4. Turn around (make a “U-turn”) then proceed along the opposite side of the transect (side unsearched previously in steps 1-3 above) conducting an intensive search for the *Diadema*, tallying their number when observed.
5. End the search at the end of the transect (0 meter or 10 meter [0 ft or 32.8 ft]).
6. Record the number of *Diadema* on the iPad (see SOP CR24 *iPad Preparation, Data Entry and Download—Version 1.0* [SFCN 2025b])).
7. If the iPad fails, or is not available for data entry, record the urchin number on the datasheet (Figures 1 and 2). Once back at the office, enter the *Diadema* data numbers into the iPad following SOP CR24 (SFCN 2025b).

Datasheets

Field versions of the datasheets are available in:

X:\SFCN\Vital_Signs\Marine_benthic_communities\CoralMonitoring\documents\Field_Documents\
Datasheet_templates

Note that the primary method for data entry for coral disease, species list, colony and urchin counts, and rugosity is the iPad in the iDive housing. The datasheets (Figures 1 and 2) are taken on a dive and used if the iPad or iDive fails.

SITE:				DATE:				OBSERVER:										
Disease data: BB=black band, CWS=Carib. white syndrome, DS=dark spots, WB=white band, WPL=white plague, WPX=white pox, YB=yellow band																		
Transect: _____				Transect: _____				Transect #										
Species List				Species List				Colony #										
								Length along transect (m)										
								Distance from transect (cm)										
								Is the colony < 4 cm (Y/N)?										
Stony Count				Fire Count				Disease										
								Species										
Notes:				Notes:				Length (cm)										
								Width (cm)										
								% discolored tissue										
								# of DS blemishes; >30=30										
Transect: _____				Transect: _____				Number of pictures taken										
Species List				Species List				TRANSECT NOTES:										
Stony Count				Fire Count														
Notes:				Notes:				Transect #										
								1										
								2										
								3										
								4										
								5										
								6										
								7										
								8										
								9										
								10										
								11										
								Rugosity (m)										
								Diadema										

Figure 1. Example of Coral disease, species list, *Diadema*, rugosity datasheet, page 1 of 2.

SITE:						DATE:						OBSERVER:					
Disease data: BB=black band, CWS=Carib. white syndrome, DS=dark spots, WB=white band, WPL=white plague, WPX=white pox, YB=yellow band																	
Transect #																	
Colony #																	
Length along transect (m)																	
Distance from transect (cm)																	
Is the colony < 4 cm (Y/N)?																	
Disease																	
Species																	
Length (cm)																	
Width (cm)																	
% discolored tissue																	
# of DS blemishes; >30=30																	
Number of pictures taken																	
TRANSECT NOTES:																	
SITE NOTES																	

Figure 2. Example of Coral disease, species list, *Diadema*, rugosity datasheet, page 2 of 2.

Literature Cited

Humann, P., N. DeLoach, and L. Wilk. 2013. Reef Creature Identification: Florida, Caribbean, Bahamas, 3rd Edition. New World Publications, Jacksonville, Florida.

Rodriguez, A., J.C. Hernandez, S. Clement, and S.E Coppard. 2013. A new species of *Diadema* (Echinodermata: Echinoidea: Diadematidae) from the eastern Atlantic Ocean and a neotype designation of *Diadema antillarum* (Philippi, 1845). *Zootaxa* 3636 (1): 144–170.

South Florida/Caribbean Network (SFCN). 2025a. Using videography to monitor coral reefs—Version 2.1. South Florida/Caribbean Network Standard Operating Procedure NPS/SFCN/SOP—CR01. South Florida/Caribbean Network, Palmetto Bay, Florida. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2309539> (last accessed April 2025).

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