

Coastal Habitat Restoration Through Watershed Stabilization

Marine Monitoring Progress Report

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The University of San Diego marine monitoring team (headed by Sarah Gray and including volunteers and field assistants from the Coral Bay community) collected sediment samples at 6 locations within Coral Bay, US Virgin Islands over seven sampling periods (mostly 25-26 days) from August 2009-February 2010 (Figure 1). Two of the locations were outside of the mangroves in Coral Bay Harbor, two were along the southwest shore of Coral Bay near gut outfalls below the Reliance Housing development (Calabash Boom) and the Shipwreck Landing restaurant (Shipwreck). Two were deployed on coral reefs near the mouth of Coral Bay (Figure 1).

For each of the collection periods, marine sediments collected in three of the four sediment collection tubes at each sediment trap array (Figure 2) were rinsed, dried and weighed to determine three replicate sediment flux rates for each sampling period, which were averaged to determine a mean sediment flux rate (in mg/cm²/day) (Table 1). Sediment in the 4th collection tube was frozen for further chemical and geological analysis. Following processing of samples at the VIERS (Virgin Islands Environmental Resource Station) laboratory, dried and frozen sediment samples were sent to the University of San Diego for further chemical and geological analyses. The proportion of organic matter in the sediment samples was determined by measuring weight Loss on Ignition (LOI) at 550 degrees C after 3 hours. The proportion of carbonate (and terrigenous/siliceous) sediment was calculated from the weight LOI at 950 degrees C after 3 hours.

The preliminary marine sediment flux results from August 2009-February 2010 show a range of sediment flux rates for the 60 cm traps of 0.5 ±0.1 mg/cm²/day for the South Reef site to 72.1±11.1 mg/cm²/day for the Shipwreck site (Table 1). The highest sediment flux rates were measured at all locations during the 12/2/09-12/29/09 sampling period. The highest sediment flux rates for the field season were found at the Shipwreck shore site, followed by the North and South Mangrove sites in Coral Bay Harbor and Calibash Boom shore. Sediment flux rates recorded at the two Coral Bay reef locations (<8 mg/cm²/day) were below flux rates that have been shown to cause severe sedimentation stress to corals (50 mg/cm²/day) and comparable to flux rates recorded in reef areas of the Virgin Islands National Park (Tectite and Yawzi Reefs in Lameshur Bay).

Sediments at the Shipwreck shore and North and South Mangrove sites were predominantly composed of terrigenous sediment (trap mean: 72.2-75.4%) (Table 1). Sediments at the North and South reef sites contained mostly carbonate grains (trap mean: 64.4-72.6%) with variable proportions of terrigenous material. Generally the proportion of terrigenous sediment in at the North Reef (trap mean 26%) was higher than at the South Reef (trap mean: 16%). The proportion of organic matter in the sediment was highest at the North and South Mangrove and Calibash Boom Shore sites (trap mean: 17.1-17.6%) (Table 1).

For two of the monitoring sites, Calabash Boom Shore and Shipwreck Shore, sediment trap arrays were placed at two different heights above the substrate (30 cm and 60 cm). Comparison of sediment flux data between the short (30 cm) and taller (60 cm) trap arrays shows that the short traps are trapping a greater amount of sediment due to re-suspension of sediment from the bay floor.

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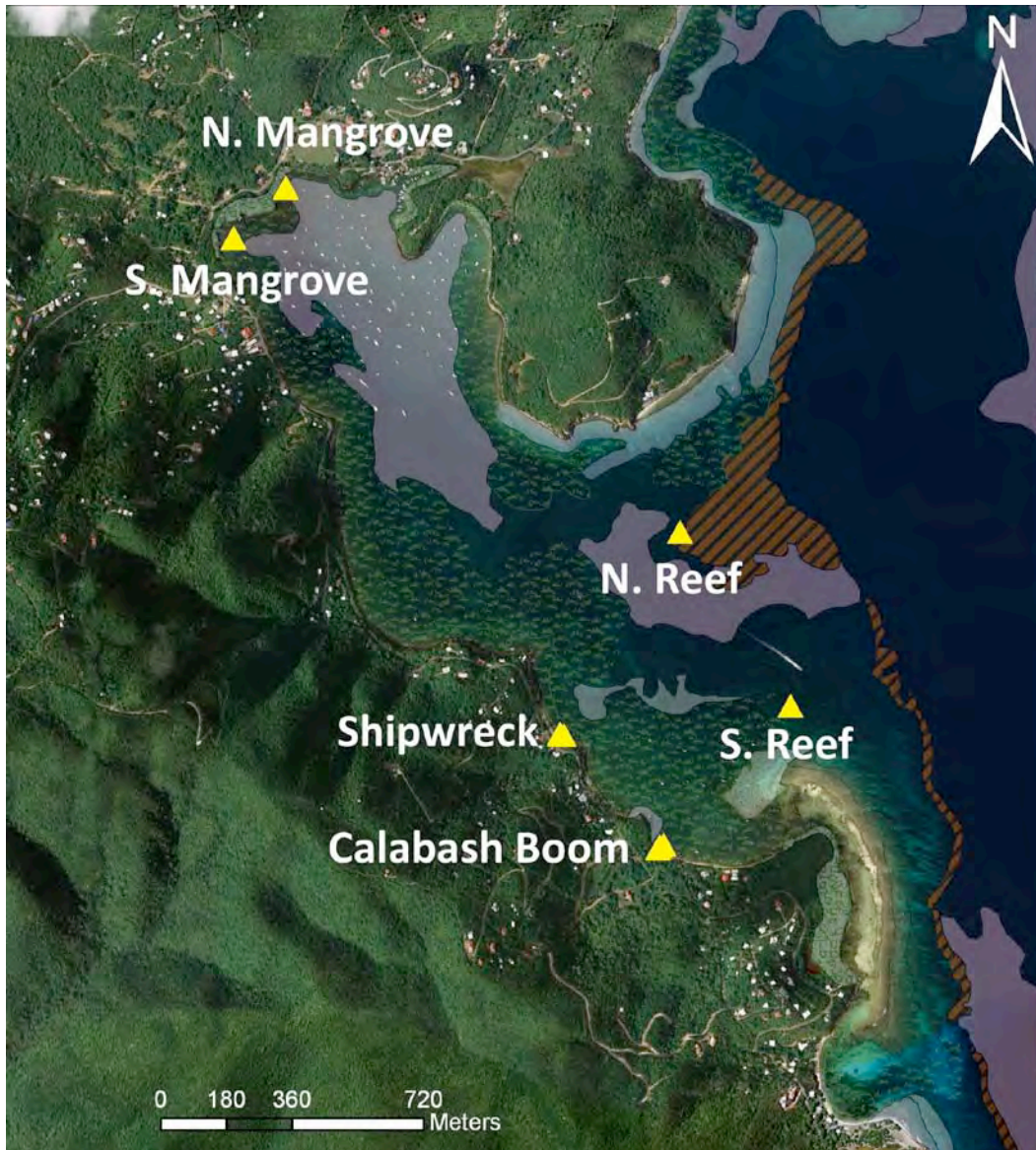


Figure 1. Map of Coral Bay showing the approximate locations of ARRA marine monitoring sites.



Figure 2. Marine sediment trap arrays are constructed by attaching four PVC tubes to a post (left); Coral Bay community volunteer field assistant (Phil Strenger) snorkels to collect samples near the sediment trap array (right).

Table 1. Preliminary marine sediment flux rates and sediment composition measurements for sampling periods from 8/22/09 through 2/19/10. The trap mean bulk sediment flux rate was calculated by averaging sampling periods of at least 25 days (10/12/10-2/19/10). (Abbreviations: Org. is organic sediment; Carb. is calcium carbonate sediment; Terr. is terrigenous [siliceous] sediment; SD is standard deviation of the bulk sediment flux based on measurements from three of the four sediment collection tubes).

Date Collected (no. of days)	Bulk Sed. Flux (mg/ cm ² / day)	SD	Org. (%)	Carb. (%)	Terr. (%)	Org. Flux (mg/ cm ² / day)	Carb. Flux (mg/ cm ² / day)	Terr. Flux (mg/ cm ² / day)
Calabash Boom Shore (30 cm trap)								
9/2/2009 (9)	78.8	2.5	29.0	44.4	26.6	23.4	35.8	21.4
9/16/2009 (14)	192.7	25.5	12.1	54.4	33.5	22.0	98.9	60.8
10/12/2009 (26)	20.9	1.3	18.4	44.5	37.1	3.7	8.9	7.4

11/7/2009 (26)	22.8	1.0	21.8	39.9	38.3	5.2	9.6	9.2
12/2/2009 (25)	29.5	12.9	11.8	49.7	38.5	1.8	7.6	5.9
12/29/2009 (27)	239.6	12.6						
1/24/2010 (26)	150.9	4.8						
2/19/2010 (26)	259.4	12.4						
Trap mean*	120.5	111.5	18.6	46.6	34.8	11.2	32.1	20.9
Calabash Boom Shore (60 cm trap)								
9/2/2009 (11)	15.2	0.5	19.0	52.3	28.7	3.0	8.2	4.5
9/16/2009 (14)	15.9	2.9	17.2	50.2	32.6	3.2	9.4	6.1
10/12/2009 (26)	1.8	0.3	12.8	69.0	18.2	0.3	1.4	0.4
11/7/2009 (26)	2.3	0.3	21.2	44.6	34.2	0.5	1.1	0.8
12/2/2009 (25)	3.3	1.5	18.0	26.3	55.7	0.9	1.3	2.7
12/29/2009 (27)	19.0	0.3						
1/24/2010 (26)	9.0	1.1						
2/19/2010 (26)	9.9	2.2						
Trap mean*	7.6	6.6	17.6	48.5	33.9	1.6	4.3	2.9
Shipwreck Shore (30 cm trap)								
9/2/2009 (11)	765.5	61.2	4.7	19.7	75.6	34.6	144.2	554.2
9/16/2009 (14)	665.0	31.4	6.0	19.2	74.8	37.7	120.8	470.2
10/12/2009 (26)	261.9	18.2	8.5	17.1	74.5	23.8	48.0	209.4
11/7/2009 (26)	92.2	1.6	7.7	14.1	78.2	7.2	13.2	73.2
12/2/2009 (25)	303.2	27.8	11.9	9.8	78.2	32.8	27.0	215.1
12/29/2009 (27)	434.6	46.9						
1/24/2010 (26)	387.8	24.2						
2/19/2010 (26)	515.7	40.4						
Trap mean*	332.6	148.8	7.8	16.0	76.3	27.2	70.6	304.4
Shipwreck Shore (60 cm trap)								
9/2/2009 (11)	39.2	0.6	8.8	25.2	66.0	3.5	9.9	26.0
9/16/2009 (14)	42.5	1.2	10.1	20.2	69.7	4.4	8.8	30.3
10/12/2009 (26)	8.3	0.1	10.3	17.6	72.1	0.9	1.5	6.0
11/7/2009 (26)	5.4	0.1	11.3	18.0	70.6	0.6	1.0	3.9
12/2/2009 (25)	32.9	4.7	9.0	5.4	85.7	3.2	1.9	31.0
12/29/2009 (27)	72.1	11.1						
1/24/2010 (26)	36.6	1.2						
2/19/2010 (26)	15.8	2.6						
Trap mean*	28.5	24.8	9.9	17.3	72.8	2.5	4.6	19.5
Coral Bay North Mangrove (60 cm trap)								
9/16/2009 (11)	8.9	0.1	19.7	6.0	74.3	1.8	0.5	6.6
10/12/2009 (26)	5.6	0.2	17.9	9.2	72.9	1.1	0.5	4.3
11/7/2009 (26)	5.2	0.2	16.0	10.4	73.6	0.8	0.5	3.7
12/2/2009 (25)	17.3	1.1	14.7	4.4	80.9	2.4	0.7	13.2
12/29/2009 (27)	25.2	1.6						
1/24/2010 (26)	8.3	1.0						
2/19/2010 (26)	12.5	0.7						
Trap mean*	12.3	7.8	17.1	7.5	75.4	1.5	0.6	7.0
Coral Bay South Mangrove (60 cm trap)								

9/16/2009 (11)	10.6	0.7	18.4	12.4	69.2	2.1	1.4	7.8
10/12/2009 (26)	10.8	0.2	17.3	13.2	69.5	1.9	1.4	7.6
11/7/2009 (26)	10.3	5.2	17.9	10.8	71.3	2.3	1.4	9.0
12/2/2009 (25)	14.5	0.4	15.7	5.6	78.7	2.3	0.8	11.6
12/29/2009 (27)								
1/24/2010 (26)	6.9	1.1						
2/19/2010 (26)	14.0	10.4						
Trap mean*	11.3	3.1	17.3	10.5	72.2	2.1	1.3	9.0
Coral Bay North Reef (60 cm trap)								
9/16/2009 (9)	3.0	0.1	9.2	65.0	25.9			
10/12/2009 (26)	1.6	0.0	9.5	65.8	24.8	0.2	1.1	0.4
11/7/2009 (26)	2.2	0.2	9.6	63.8	26.6	0.2	1.4	0.6
12/2/2009 (25)	2.9	0.0	9.9	63.2	26.9	0.3	1.8	0.8
12/29/2009 (27)	5.9	0.3						
1/24/2010 (26)	2.8	0.8						
2/19/2010 (26)	5.1	0.1						
Trap mean*	3.4	1.7	9.5	64.4	26.0	0.2	1.4	0.6
Coral Bay South Reef (60 cm trap)								
9/16/2009 (9)	0.5	0.1						
10/12/2009 (26)	1.8	0.2	11.5	73.4	15.1	0.2	1.2	0.3
11/7/2009 (26)	1.5	0.6	11.2	73.0	15.8	0.2	1.4	0.3
12/2/2009 (25)	2.3	0.1	11.6	71.5	17.0	0.2	1.5	0.4
12/29/2009 (27)	7.1	1.4						
1/24/2010 (26)	3.0	0.1						
2/19/2010 (26)	5.5	0.2						
Trap mean*	3.5	2.2	11.4	72.6	16.0	0.2	1.4	0.3