NF-06-03 Project Summary

Type of Survey: Benthic Habitat and Hydrographic

Project No. NF-06-03, S-1911-NF-06

Time Frame: March 21 – April 2, 2005

Localities

Buck Island, St. Croix, U.S.Virgin Islands

La Parguera, Puerto Rico

2006

Chief Scientist

Timothy A. Battista

Lead Hydrograher

Mike L. Stecher

NF-06-03 Project Summary

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March 21 – April 2, 2005

U.S. Virgin Islands & Puerto Rico

NOAA Ship NANCY FOSTER

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A. Area Surveyed

This was a joint mission with the National Park Service (NPS), the National Marine Fisheries Service (NMFS), and the U.S. Virgin Islands and Puerto Rican territorial governments. The mission explored and surveyed and mapped moderate depth bathymetry (30 – 1000 meters) with the NANCY FOSTER's Simrad EM1002 multibeam system for natural resource management and seafloor characterization. Multibeam bathymetry and backscatter was collected along with Remotely Operated Vehicle (ROV) underwater video. Surveyed areas for 2006 included the deep water portion of the Buck Island Reef National Monument north of St. Croix and the La Parguera region along the southwestern coast of Puerto Rico. Additional multibeam data was collected to merge with pre-existing shallow water bathymetry from previous CCMA cruises in the Buck Island vicinity. A total of 239 km of mainscheme multibeam survey were completed to ensonify 81 km^2 of seafloor in the Buck Island region. A total of 276 km of mainscheme multibeam survey were completed to ensonify 62 km^2 of seafloor in the La Parguera region. A comprehensive summery of the lines collected during the 2006 cruise will be included in Appendix V.

Fig 7: Completed 2006 bathymetry coverage, shown as 10m grid, La Parguera, SW Puerto Rico.

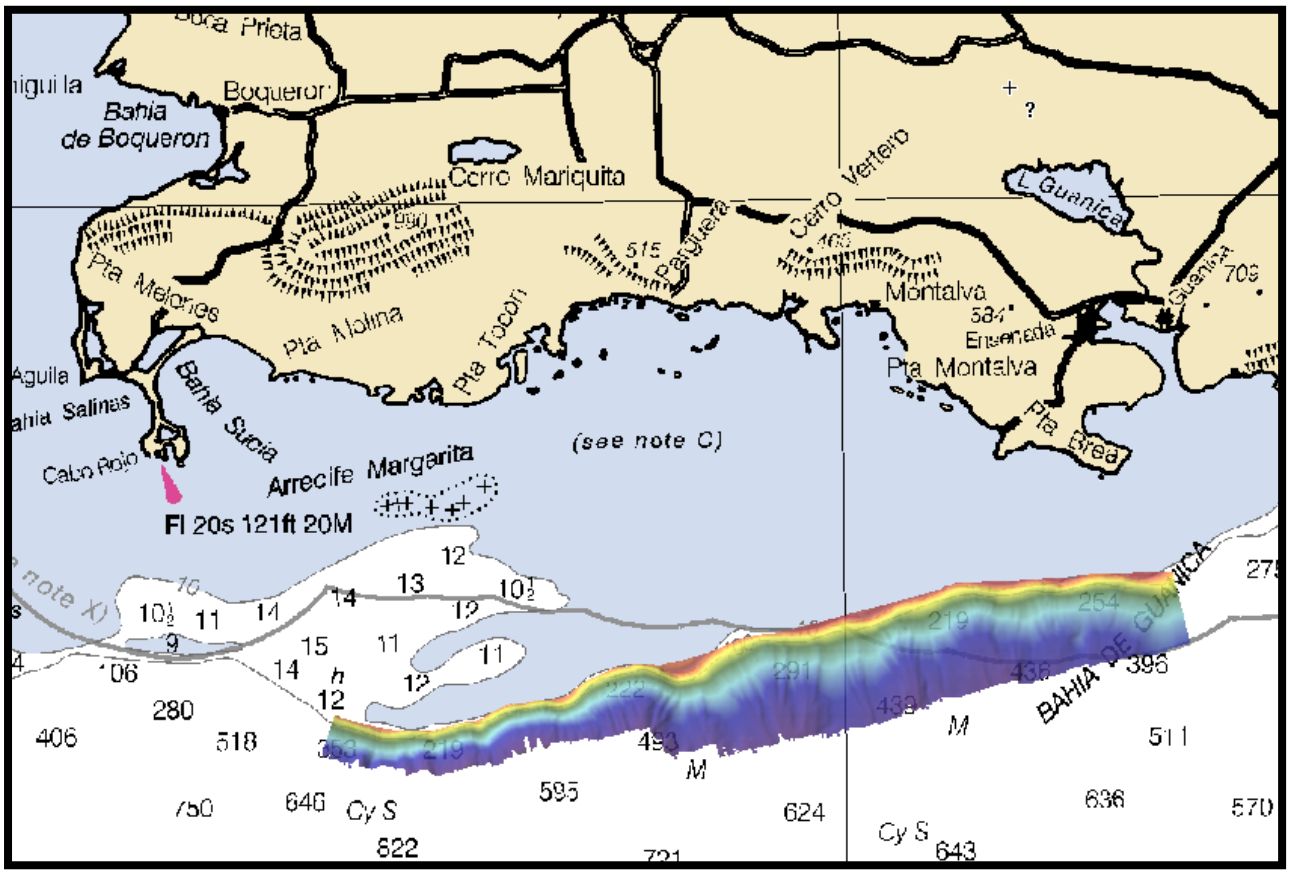
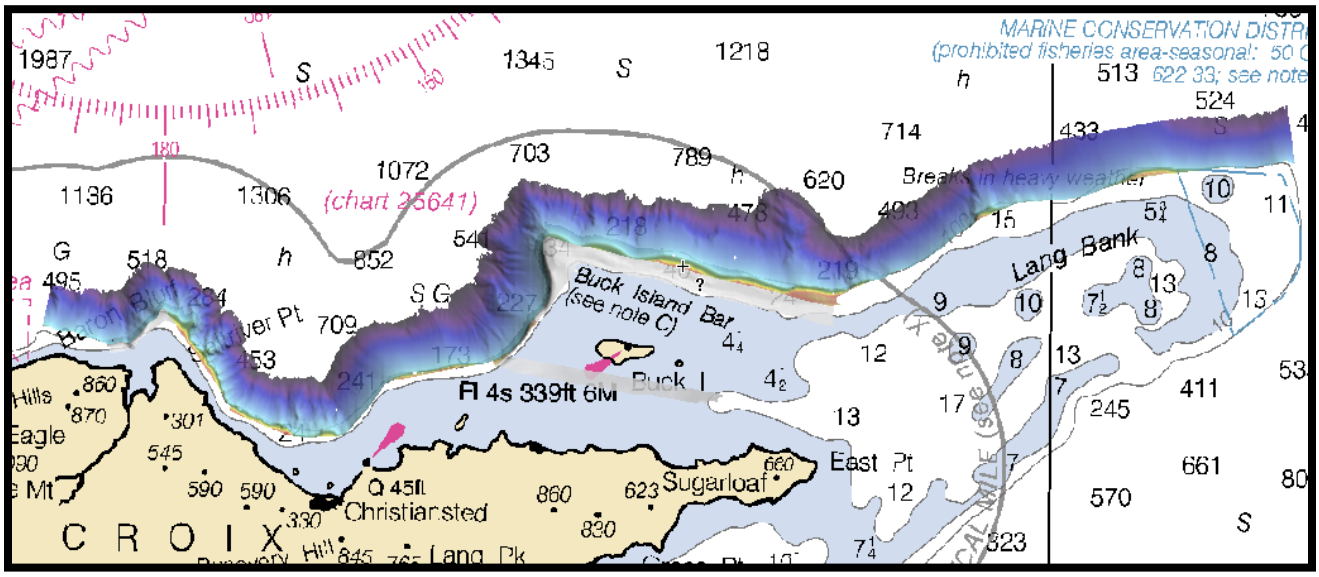


Fig 7: Completed 2006 bathymetry coverage, shown as 10m grid, La Parguera, SW Puerto Rico. Grey areas delineate data collected from the previous CCMA cruises 0f 2004 & 2005



B1. Equipment

Vessel

The NOAA Ship NANCY FOSTER (R352) is 57 meters in length, has a beam of 12 meters and draws approximately 3 meters of water. During the Charleston, South Carolina drydock period in November of 2005, numerous survey hardware and software installations were implemented by NOAA's Aviation and Marine Operations division (NMAO) to make multibeam data acquisition a more integral component of the ship's research support.

Sonar System

The Simrad EM1002 multibeam echosounder is permanently hull-mounted between two fiberglass hydrodynamic fittings starboard of the keel line, aft of the bow. The EM1002 is a 95-kHz system with a 150° swath consisting of 111 individually formed, electronically roll-stabilized 2° beams, at a maximum ping rate of 10Hz, depending on water depth. The EM1002 has three different automatically adjusted pulse lengths to maximize coverage in deeper waters at 0.2, 0.7 and 2 milliseconds respectively. A combination of phase and amplitude detection is used, resulting in measurement accuracy practically independent of beam angle. The system is compensated in real-time for sound velocity changes at the transducer array, to assist in the electronic beam steering capabilities of the EM1002.

Motion Reference Unit

The Applanix Model POS/MV Model 320 V4 (POS) is a GPS-aided inertial measurement unit (IMU) that generates attitude data in three axes. Measurements of roll, pitch and heading are all accurate to ± 0.02° or better, regardless of the vessel latitude. Heave measurements supplied by POS maintain an accuracy of 5% of the measured vertical displacement or ± 5cm (whichever is the larger) for periods of 20 seconds or less. The accuracy and stability of measurements delivered by the system remain unaffected by vessel turns, changes of speed, wave-induced motion, or other dynamic maneuvers. The IMU is located on the Hold Deck in the Forepeak Void.

Positioning System

The POS/MV Model 320 V4 obtains its positions from two identical dual frequency Trimble Zephyr GPS antennae. An ancillary Trimble DSM 132 DGPS system provided an RTCM data stream to the POS. The two POS antenna are located above the bridge deck on the starboard side. The DSM 132 received differential beacon transmittals from the U.S Coast Guard Continually Operating Reference Station (CORS) station Port Isabel, Puerto Rico frequency 295.0 kHz. Position updates were supplied from the POS/MV to the PU of the EM1002 system via serial communications at a frequency of 10Hz.

Sound Velocity

The NANCY FOSTER is equipped with a hull-mounted SBE 45 thermosalinograph (TSG), near the EM1002 transducer. The TSG measures near-surface conductivity and temperature in order to calculate sound velocity in real-time. The data from the TSG streamed to the EM1002's MERLIN acquisition and control software to aid in electronic beam steering. The primary instrument for determining sound velocity throughout the entire water column was a Seabird Electronics SBE-911 CTD instrument. An auxiliary SBE-19 was used for calibration verification and could be deployed in the event of a primary system failure. Sound velocity casts were deployed approximately every four hours during survey operations.

Acquisition System

The Kongsberg MERLIN V5.2.2 acquisition and control system is based on the Sun Microsystems Solaris 8 UNIX operating system. The data was logged in the *.all format. Coastal Oceanographics Hypack Max V.4.3A provided the navigation information to the helms display and was used to create line plans for the surveyed areas. Coverage BASE surfaces were created from 3m to 10m resolutions, depending on depth, in CARIS's 6.0 HIPS and SIPS (SP1 HF1-18) during data acquisition to verify coverage. The BASE surfaces were then exported in GEOTIFF format to the HYPACK PC to create holiday line plans and additional lines.

B2. Quality Control

To ensure that the data collected conformed to the IHO Level 1 & 2 standards, several quality assurance/quality control measures were implemented. The velocity of sound through the water column was derived from conductivity, temperature, and depth measurements (CTD casts) collected no more than 4 hours apart. A CTD cast was taken prior to the commencement of daily multibeam operations. Spatial variability was taken into account as well as temporal variability when determining the cast locations. The locations were recorded with each cast and were periodically compared to the previous cast to identify any significant changes in the water column. Turns were limited and vessel speeds were adjusted to ensure that no less than 3.2 beam foot prints, center-to-center, fell within 3 m, or a distance equal to 10 percent of the depth, whichever was greater, in the along track direction. System confidence checks prior to, and during, multibeam operations were also conducted. These included position checks and lead lines. Cross lines totaling at least 5% of main scheme were collected across each of the surveyed areas. Quality control reports generated by CARIS from the cross lines confirmed that the majority of soundings are in compliance with IHO level 1 & 2 standards.

Estimated ranges for the error budget components of the survey are discussed in detail in the Total Propagated Error (TPE) Report for the NOAA Ship NANCY FOSTER. These include measurement, draft, settlement and squat, sound velocity, heave and tidal error values and descriptions.

B3. Corrections to Echo Soundings

Corrections to echo soundings included draft, settlement and squat, sound velocity, vessel attitude and sonar alignment adjustments.

Static draft (waterline) observations were made from the pier the day of departure from St. Croix under full load and from the pier at the end of the cruise in Puerto Rico. A total loss of .213m was observed during the cruise, this value was divided into the 13 days of underway time (0.015m/day) and entered into the R352_MB.hvf vessel configuration file. The initial draft value was verified with a lead line observation while tied up at Frederiksted Pier, St. Croix.

Dynamic draft values for the NANCY FOSTER were performed during the Sea Acceptance Test (SAT) offshore of Charleston, South Carolina in March of 2006. Four-RPM levels were used to determine the dynamic draft: 790, 1000, 1300 and 1600. The observed changes in draft were negligible, with a maximum corrector of 0.041m. The values of the dynamic draft were entered into the R352_MB.hvf and were applied during the merge process in CARIS.

Sound velocity profiles were acquired using the NANCY FOSTER'S SeaBird Electronics SBE911 Conductivity, Temperature, and Depth (CTD) profiler. A back-up SBE 19 was used to verify the calibration coefficients of the primary sound velocity profiler. Raw CTD data was processed using NOAA's Velocwin software, which generated the sound velocity profiles required for real-time corrections in the MERLIN acquisition system. Casts were recorded to the full depth of the area being surveyed. Each unit had been calibrated prior to use for this survey.

Vessel motion was compensated for with the NANCY FOSTER's Applanix POS/MV V4 inertial GPS system's IMU. The heave, pitch, roll and heading data was used by the Simrad EM1002 sonar at 100Hz for beam steering and real-time attitude compensation.

The hydrographer performed the sonar biases calculations in the order described in the HSSD using CARIS HIPS's calibration tool. Nadir beams were observed first with an estimated 0.0 seconds of latency, which is typical of the POS/MV systems. A Pitch offset of -0.9°, a roll offset of -0.11°, a Yaw offset of -0.2° and an outer beam angle offset of –0.36 was identified and entered into the R352_MB.hvf

C. Vertical And Horizontal Control

The Vertical Datum for this survey was Mean Lower-Low Water (MLLW). Existing water level stations were used in conjunction with height and time correctors in a CARIS tide zone definition file (ZDF). Preliminary tides, adjusted to MLLW, and ZDFs were supplied by NOAA CO-OPS prior to the commencement of survey operations for both areas. The National Water Level Observation Network (NWLON) primary tide stations at, Magueyes Island, Puerto Rico (975-9110) and Lime Tree Bay, St.Croix (975-1401) served as the primary sources for water level reducers for this survey. Six-minute predicted tides were obtained from the CO-OPS home page (www.co-ops.nos.noaa.gov) and were applied during acquisition. Verified smooth tides and the estimated tidal errors were applied during post-processing.

The horizontal datums for this project is the North American Datum of 1983 Universal Transmercator Zone 19 and 20, Northern Hemisphere (NAD83 UTM19N & 20N). Differential GPS (DGPS) corrected positions were supplied to both the POS/MV and HYPACK systems. Both systems have visual alarms to notify the operator if the DGPS fix is lost or if HDOP values of 4.0 are exceeded; none were observed. Differential corrections were received from U.S. Coast Guard Continually Operating Reference Station (CORS) Isabel, Puerto Rico at a frequency of 295.0 kHz with the Trimble DMS 132 receiver.

Appendix IV
Tides and Water Levels*

***See Data Acquisition & Processing Report S-911-NF-06 APPENDIX J for full details**

APPENDIX V
Supplemental Survey Records

Comprehensive Line and Area Statistics

USVI Buck Island

Area
>100m 76.9 sq/kilometers
<100m 4.1 sq/kilometers
Total = 81.0 sq/kilometers

Line Kilometers
239.0 km of Mainscheme
11.9 km of XL's required
14.3 km of XL's surveyed

Depth Range
15.87m – 1000.10

USVI La Parguera

Area
>100m 58.4 sq/Kilometers
<100m 3.9 sq/Kilometers
Total = 62.3 sq/Kilometers

Line Kilometers
276 Kilometers of Mainscheme
13.8 Kilometers XL's required
15.3 kilometers of XLs surveyed

Depth Range
14.67m – 984.54

Comprehensive List of Survey Lines

R352_MB	2006-081	0002_20060322_063727
R352_MB	2006-081	0003_20060322_070727
R352_MB	2006-081	0004_20060322_073728
R352_MB	2006-081	0005_20060322_075947
R352_MB	2006-081	0006_20060322_081839
R352_MB	2006-081	0007_20060322_084839
R352_MB	2006-081	0008_20060322_091840
R352_MB	2006-081	0009_20060322_100926
R352_MB	2006-081	0010_20060322_103926
R352_MB	2006-081	0011_20060322_225117
R352_MB	2006-081	0012_20060322_231807
R352_MB	2006-081	0013_20060322_234451
R352_MB	2006-082	0014_20060323_002351

R352_MB	2006-082	0015_20060323_030451
R352_MB	2006-082	0016_20060323_033451
R352_MB	2006-082	0018_20060323_034922
R352_MB	2006-082	0019_20060323_041923
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R352_MB	2006-085	0079_20060326_080813
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Buck Island Log Daily Log Sheets

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Weather:_____

TIME UTC	KNTS	LINE	AZ	REMARKS
1500				Check draft using PROJ marks on STBD hull +/-12.10', Draft into Simrad -2.01
1530		CTD CAST		00012.06080091.160.asvp
		0001_20060321_155045		Leadline draft check from 02 deck lip below TBM02 18.73m
				Average reading to WL is 7.32m
				18.73m - 7.32m 11.41
1630				DEPART FOR BUCK IS SURVEY
1920				Standby for launch/svp retrival
2010				Verified backscatter imagery acquisition with test line
2030		CTD CAST		00013_06080152.359.asvp. Good down to projected 36m
2053	5	0001_20060321_204909	53.57	Patch test- Roll 1, OB 1
2108	5.2	0002_20060321_210809	233.57	Patch test- Roll 2 Roll value of -0.12 determined
2128	5.4	0003_20060321_212834	332.00	Patch test- OB 2a (bumpy crossing)
2147	4	0004_20060321_214726	153.00	Patch test- OB 2b (flat cross)
2200				Transit to pick up personel
2325		CTD CAST		00014_06080230.4608.asvp. Good down to projected 450m.
				Position check on 079
				logged DGPS pos/mv, and DGPS DMS132 independently
				Measure DMS132 Ant to granite block locations in ACAD DWG, offset 7.16m
				Measure obtained postitions in Hypack, offset 7m
				See hypack *.Log file

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Weather:__C/C_____

TIME UTC	KNTS	LINE	AZ	REMARKS
0000	3	0005_20060322_000559	132.95	Patch test- Upslope slow
0020	4.3	0006_20060322_002023	312.95	Patch test- Downslope offset slow
0029	7.4	0007_20060322_002922	132.96	Patch test- Upslope fast
0035	4.5	0008_20060322_003522	312.96	Patch test- Downslope slow, PATCH VALUES L:0.0, P: 0.9, R: -0.11, Y:-0.2, OB:-0.36
				Processing Patch Test while NF transits offshore
				Check outter beam coefficient w/new XL
0400		CTD CAST		00015_06081035.344.asvp. Good down to projected 36m
0421		0009_20060322_042103		Outer beam coefficient/ line check 1
0430		00010_20060322_043013		Outer beam coefficient/ line check 2, OBC value checks at -0.36
				Transit to deep water cast area
0530		CTD CAST		00016_06081050.9417.asvp. Good down to projected 700m
0615				**START BUCK IS SURVEY**
0615	4	0001_20060322_061521	285.00	Reject line sonar coverage at 45/45 deg.
0637	5	0002_20060322_063727	285.00	First line, w/current and wind…minimum speed effort @ 4.5 - 5.5knts, 850m
0707		0003_20060322_070727	285.00	
0745	3.2	0004_20060322_073728	285.00	Break line early, bad data. slow down, z-drive wash at the ducer
0759	4.9	0005_20060322_075947	281.00	950m max depth
0818	4.2	0006_20060322_081839	99.00	Begin line 2, 900m, 45/45 deg.
0848	4	0007_20060322_084839	99.00	
0929	4	0008_20060322_091840	99.00	End line 2
0945		CTD CAST		00017_06081093.3338.asvp, 250m
1009	6	0009_20060322_100926	286.00	Begin Line 3, 55m, 50/50 deg. For first 8 min then 45/45 deg.
1101	5.3	0010_20060322_103926	284.00	End line 3, run true heave 5 min post line, end logging
1130				Standby for ROV ops
2030				Survey crew coming on line
2100		CTD CAST		00018_06081205.9871.asvp, 750m
2200				Standby for fantail ops
2251	4.6	0011_20060322_225117	174.00	Begin Line 11, 45/45, switch to 50 to port

NF-06-03-USVI **DN 2006 081**

Survey Area St. Croix Page__2_of__2___

Weather:_____

TIME UTC	KNTS	LINE	AZ	REMARKS
2318	4.00	0012_20060322_231807	219.00	Begin Line, 50/45
2344	4.90	0013_20060322_234451	259.00	Begin Line, 50/45
2349				Opened swath to 55/45
				EOD

NF-06-03-USVI **DN 2006 082**

Survey Area St. Croix Page_1___of_1__

Weather:_____

TIME UTC	KNTS	LINE	AZ	REMARKS
0023	4.00	0014_20060323_002351	278	Begin Line, 50/45,
0136		CTD CAST		00019_06081205.9871.asvp
0304	3.5	0015_20060323_030451	100	Begin Line, 45/45
0334	3.5	0016_20060323_033451	100	
0342		0017_20060323_034218		Transit Line, too many curves
0349	4.3	0018_20060323_034922	039	Begin Line, 45/45
0419	3.8	0019_20060323_041923	038	
0450	4.4	0020_20060323_045048	215	Begin Line, 45/45
0520	4.3	0021_20060323_052048	219	
0603		CTD CAST		00001_0606254.9848.asvp, 750m
0653	4.1	0022_20060323_065308	223	Begin Line, 45/45
0740	4.6	0023_20060323_0740035	320	Begin Line, 45/45
0826	4.5	0024_20060323_082613	331	Begin Line, 45/45
0859	4	0025_20060323_085901	134	Begin Line, 45/45, deep
0929	4	0026_20060323_0092901	133	Begin Line, 45/45, deep
0947				Transit to ROV dive site, survey ops suspended
2200		CTD CAST		00020_06082213.6418.asvp
2238	4.80	0027_20060323_223837	260	Begin Line, 45/45, sansTH
2242				Change to 50/45
2315	4.40	0028_20060323_231539	212	Begin Line, 50/45,
2335	5.30	0029_20060323_233557	278	Begin Line, 50/45,
				EOD

NF-06-03-USVI **DN 2006 083**

Survey Area St. Croix Page_1___of__2__

Weather:_____

TIME UTC	KNTS	LINE	AZ	REMARKS
0005	4.50	0030_20060324_000558	278.00	Line continue
0027	4.5	0031_20060324_002746	323.00	Begin Line
0054	4	0032_20060324_005447	283.00	
0119	4	0033_20060324_011925	103.00	began line 50/45, switched to 45/45
0147		0034_20060324_014717		
0217		0035_20060324_021717		
0335		CTD CAST		00021_06082213.10925.asvp, 825m
0351	4	0036_20060324_035111	148.00	begin line 45/45
0423	4.8	0037_20060324_042345	328.00	begin line 45/45
0508	4	0038_20060324_050848	42.00	begin line 45/45
0543	4	0039_20060324_054348	77.00	begin line 45/45
0631	4	0040_20060324_061349	77.00	begin line 45/45
0620	4	0041_20060324_062049	257.00	begin line 45/45
0654	4	0042_20060324_065409	257.00	begin line 45/50
0707	4.5	0043_20060324_070742	80.00	begin line 45/50
0740		CTD CAST		00022_06083023.10473.asvp, 800m
0837	3.80	0044_20060324_083719	220.00	re-running line 0038
0922	4.40	0045_20060324_092210	39.00	begin line 40/40
0957	4.50	0046_20060324_095744	351.00	begin line 40/40
1027	4.00	0047_20060324_102745	206.00	begin line 40/40
1104	5.00	0048_20060324_110445	104.00	begin line 45/45
1134	5.00	0049_20060324_113445	103.00	55/55
1209	5.00	0050_20060324_120951	284.00	begin line 55/55
1300				Standby For ROV OPS
2130		CTD CAST		2006064_3001_7620.asvp
2219	5.50	0051_20060324_221928	114.00	Begin Line 55/55
		0052_20060324_223418		Do not use
2240	6.40	0053_20060324_224016	90.00	begin line 55/55

NF-06-03-USVI **DN 2006 083**

Survey Area St. Croix Page_2___of__2___

Weather:__________________

TIME UTC	KNTS	LINE	AZ	REMARKS
2250	6.50	0054_20060324_225024	270.00	Begin Line 55/55
2300	6.5	0055_20060324_230040	293.00	Begin Line 55/55
2308				Transit Offshore
				EOD

NF-06-03-USVI **DN 2006 084**

Survey Area St. Croix Page_1___of__1__

Weather:__Dark and a bit lumpy_

TIME UTC	KNTS	LINE	AZ	REMARKS
0115		CTD CAST		00023_06083192.11250.asvp
0133	4.5	0056_20060325_013327	284	Begin Line 45/45
0203	4.5	0057_20060325_020328	284	Line continues
0239	4	0058__20060325_023936	104	No usable data
0248	4.1	0059_20060325_024834	104	Begin Line 45/50
0318	4.1	0060_20060325_031835	104	Line continues
0356	4.8	0061_20060325_035642	061	Begin Line 45/55
0426	4.5	0062_20060325_042642	061	Line continues
0457	4.3	0063_20060325_045741	078	Begin Line 45/55
0527	4.5	0064_20060325_052742	80	Begin Line 45/55
0557	4.5	0065_20060325_055742	80	Begin Line 45/55
0625		CTD CAST		00024_06084011.9855.asvp, 750m
0722	4.8	0066_20060325_072227	260	Begin Line 55/55
0752	5	0067_20060325_075227	256	
0822	5.1	0068_20060325_082227	259	
0834	4	0069_20060325_083434	237	Begin Line 55/55
0904	4	0070_20060325_090434	237	
		line 0071 stopped		Reject
0928	3.9	0072_20060325_092801	66	Begin Line 45/45
0958	4	0073_20060325_095802	62	
1016				Transit to ROV site
				EOD

NF-06-03-USVI **DN 2006 085**

Survey Area St. Croix Page_1___of__1__

Weather:_____C/C_____

TIME UTC	KNTS	LINE	AZ	REMARKS
0000				Standby for ROV retrival
0440				ROV secured, transit to SVP site
0515		CTD CAST		00025_06084234.10167.asvp, 775m
0551	6	0074_20060326_055156	104.00	Begin Line 55/55, logging true heave
0621	6	0075_20060326_062156	104.00	55/55
0649	6	0076_20060326_064957	104.00	55/55
0719	6	0077_20060326_071957	104.00	55/55
0738	6	0078_20060326_073800	80.00	Begin Line 55/55
0808	5	0079_20060326_080813	260.00	Begin Line 45/45
0838	5	0080_20060326_083813	260.00	45/45
0908	5	0081_20060326_090814	260.00	45/45, short line
0926	4	0082_20060326_092605	283.00	45/45
0945				Transit to ROV area for daylight obs
1019		CTD CAST		00026_06085051.4595.asvp, 350m
1049	5.1	0083_20060326_104948	225.00	Begin Line, 55/55
1116	4.00	0084_20060326_111605	221.00	Begin Line, 60/60
1130				transit to ROV site for obs
2154				Recover ROV
				EOD

NF-06-03-USVI **DN 2006 086**

Survey Area St. Croix Page_1___of__2__

Weather:_____O/C Calm_____

TIME UTC	KNTS	LINE	AZ	REMARKS
0:05		CTD CAST		svp 00027_06085180.11104.asvp
00:08	5.00	0085_20060327_000833	160.00	xline
0:28	4.5	0086_20060327_002814	347.00	xline
1:11	4.5	0087_20060327_011041	188.00	xline
1:41	4.5	0088_20060327_014012	102.00	holiday
1:55	5	0089_20060327_015318	282.00	holiday
2:05	4.5	0090_20060327_020648	101.00	holiday
2:32	5	091_20060327_023144	338.00	xline
3:10	5	092_20060327_030822	172.00	xline
3:32	5	093_20060327_033155	80.00	holiday
3:54	5	094_20060327_035324	355.00	xline
5:35		CTD CAST		svp 00028_06086003.11163.asvp
6:40	5	0095_20060327_064026	200.00	holiday
7:05	5	0096_20060327_070552	292.00	holiday
719	5	0097_20060327_071930	325.00	holiday 55/55
0725	5.00	0098_20060327_072519	326.00	holiday 55/55
0735	5.00	0099_20060327_073551	146.00	holiday 55/55
0853	5.00	0100_20060327_080353	250.00	holiday 55/55
0832	5.00	0101_20060327_083254	250.00	holiday 55/55
0825	5.00	0102_20060327_085205	284.00	holiday 55/55
0908	5.00	0103_20060327_090833	86.00	holiday 45/45
9:52		CTD CAST		00029_06086041.9801.asvp
1023	5.00	0104_20060327_102345	153.00	xline
1042	5.30	0105_20060327_104251	244.00	holiday 55/55
1105	4.00	0106_20060327_110533	238.00	xline
1127	5.00	0107_20060327_112710	118.00	holiday 55/55
1145	5.00	0108_20060327_114506	111.00	holiday 55/55
1151	5.50	0109_20060327_115152	293.00	holiday 55/55

NF-06-03-USVI **DN 2006 086**

Survey Area St. Croix Page_1___of_2__

Weather:_________________

TIME UTC	KNTS	LINE	AZ	REMARKS
1207	5.50	0110_20060327_120714	53.00	holiday 55/55
1230				Transit to ROV site North of Buck Island
2210		CTD CAST		00030_06086170.3538.asvp
2246	4.00	0111_20060327_224537	189.46	xline
				END OF BUCK ISALND SURVEY
				TRANSIT TO PR
				EOD

NF-06-03-USVI BUCK ISLAND
CTD Cast Log

Date	Time (UTC)	Depth (m)	Cast	Latitude/Northing	Longitude/Easting
3/21/2006	1530	15	00012_06080091.160.asvp	Frederiksted Pier	
3/21/2006	2030	29	00013_060800152.359.asvp	1966085	337946
3/21/2006	2325	350	00014_06080230.4608.asvp	1967715	324843
3/22/2006	400	35	00015_06081035.344.asvp	1965931	337889
3/22/2006	530	700	00016_06081050.9417.asvp	1971481	334787
3/22/2006	945	250	00017_06081093.3338.asvp	1969508	334792
3/22/2006	2100	750	00018_06081205.9871.asvp	1972526	325041
3/23/2006	136	750	00019_06081205.9871.asvp	1967001	316575
3/23/2006	603	750	00001_0608254.9848.asvp	1969268	322470
3/23/2006	2200	600	00020_06082213.6418.asvp	1968999	323972
3/24/2006	335	825	00021_06082213.10925.asvp	1968750	317568
3/24/2006	740	800	00022_06083023.1073.asvp	1969298	322504
3/24/2006	1930	500	2006064_3001_7620.asvp	1966892	318072
3/25/2006	115	850	00023_06083192.11250.asvp	1971205	334674
3/25/2006	625	750	00024_06084011.9855.asvp	1975781	348723
3/26/2006	515	775	00025_06084234.10167.asvp	1970269	322761
3/26/2006	1019	350	00026_06085051.4595.asvp	1968851	324917
3/27/2006	0:05	850	00027_06085180.11104.asvp	1967495	319529
3/27/2006	535	850	00028_06086003.11163.asvp	1970269	322761
3/27/2006	952	750	00029_06086041.9801.asvp	1969366	313096
3/27/2006	2210	250	00030_06086170.3538.asvp	1969291	334530

LA Parguera Daily Log Sheets

NF-06-03-USVI **DN 2006 087**

Survey Area PUERTO RICO Page_1___of_1__

Weather:______c/c_________

TIME UTC	KNTS	LINE	AZ	REMARKS
1203				Arrive at first ROV transect in PR
2105		CTD CAST		start cast 00031_06087155.11045.asvp
2208		0001_20060328_220830	254	Reject Line, svprobe reset
2239	5.5	0001_20060328_223937	254	Begin Line
2309	5.5	0002_20060328_230938	254	Line continues
2339	5.5	0003_20060328_233938	254	Line continues

NF-06-03-USVI **DN 2006 088**

Survey Area PUERTO RICO Page_1___of__1__

Weather:_____c/c_____

TIME UTC	KNTS	LINE	AZ	REMARKS
0009	5.50	0004_20060329_000939	254.00	Line Continues
0019	4.50			Decreased speeds as we crossed into >800m
0032	4.5	0005_20060329_003227	74.00	Begin Line 45/45-
0102	4.5	0006_20060329_010227	74.00	Line Continues
0150		CTD CAST		0032_06087200.10524.asvp
0206	4.5	0007_20060329_020609	74.00	Line Resumes
0236	4.7	0008_20060329_023610	74.00	Line Continues
0306	5.3	0009_20060329_030610	74.00	Line Continues
0339	5.5	0010_20060329_033926	254.00	Begin Line 45/45-
0409	4.5	0011_20060329_040926	256.00	Line Continues
0439	4.5	0012_20060329_043926	256.00	Line Continues
0509	3.5	0013_20060329_050927	254.00	Line Continues
0600		CTD CAST		0003_06088004.10667.asvp
0708	3.5	0014_20060329_070828	75.00	Begin Line 45/45-
0738	4.5	0015_20060329_073828	75.00	Line Continues
0808	4.5	0016_20060329_080828	75.00	Line Continues
0838	4.5	0017_20060329_083828	75.00	Line Continues
0908	4.50	0018_20060329_090829	75.00	Line Continues
0951	4.50	0019_20060329_095124	266.00	Begin Line 45/45-
1021	5.50	0020_20060329_102124	266.00	Line Continues
1100				Onsite for ROV ops
				EOD

NF-06-03-USVI **DN 2006 089**

Survey Area PUERTO RICO Page_1___of_2___

Weather:_____c/c_____

TIME UTC	KNTS	LINE	AZ	REMARKS
00:10		CTD_CAST		00035_06088004.10667.asvp
00:37	4.50	0021_20060330_003341	85.00	50/45
01:07	5.50	0022_20060330_010341	85.00	Line Continues
01:26	5.00	0023_20060330_012546	266.00	55/55
01:56	5.00	0024_20060330_015546	266.00	Line Continues
02:15	5.00	0025_20060330_021546	254.78	
02:46	5.00	0026_20060330_024546	254.78	Line Continues
03:15	5.00	0027_20060330_031547	254.78	Line Continues
03:45	5.00	0028_20060330_034547	254.78	Line Continues
0430		CTD_CAST		00036_06088004.9894.asvp, 750m
503	5.00	0029_20060330_050352	75.00	Begin Line 50/45-----brk line, loss of steering
530	5.00	0030_20060330_053018	75.00	Resume Line
600	5.00	0031_20060330_060018	75.00	Line Continues
630	5.00	0032_20060330_063018	75.00	Line Continues
0700	5.00	0033_20060330_070019	75.00	Line Continues
0730	5.00	0034_20060330_073019	75.00	Line Continues
0739	5.00	0035_20060330_073956	255.00	Begin Line 45/50
0809	5.00	0036_20060330_080956	255.00	Line Continues
0839	5.00	0037_20060330_083957	255.00	Line Continues
0909	5.00	0038_20060330_090957	255.00	Line Continues
0948		CTD_CAST		00037_06089044.6549.asvp, 400m
1031	5.00	0039_20060330_103150	282.00	Begin Line 45/55
0700	4.50	0040_20060330_070019	102.00	Begin Line 55/45
1230				arrive at ROV transect
2130		CTD_CAST		00038_06089160.3953.asvp, 300m
2144	5.50	0042_20060330_214429	75.00	Begin Line 55/55
2214	5.50	0043_20060330_221429	75.00	Line Continues 55/55
2249	5.50	0044_20060330_224948	255.00	Begin Line 55/55

NF-06-03-USVI **DN 2006 089**

Survey Area PUERTO RICO Page_2___of__2__

Weather:_________________

TIME UTC	KNTS	LINE	AZ	REMARKS
2331	5.50	0046_20060330_233115	75.00	Begin Line 55/55

NF-06-03-USVI **DN 2006 090**

Survey Area PUERTO RICO Page_1___of__1__

Weather:_____

TIME UTC	KNTS	LINE	AZ	REMARKS
0001	4.50	0047_20060331_000115	75.00	Line Continues 55/55
				Created new True Heave file,2006_090_2 (090 original may be misnamed)
0009	4.5	0048_20060331_000928	87.00	Begin Line 55/55
0039	4.5	0049_20060331_003928	87.00	Continue Line; Fishing boat online at very end
0101	4.5	0050_20060331_010107	267.00	Begin Line 55/55; holiday to the south has a fishing boat in the way; denied
0112	4.5	0051_20060331_011230	87.00	Begin Line 55/55
0123	4.5	0052_20060331_012313	267.00	Line Continues 55/55
0205		CTD CAST		00039_06089203.5427.asvp
0231	4.5	0053_20060331_023115	267.00	Resume Line 55/55
0301	4.5	0054_20060331_030116	267.00	Line Continues 55/55
0309	4.5	0055_20060331_030925	87.00	Begin Line 55/55
0345	4.5	0056_20060331_034552	87.00	Begin Line 55/55
0358	6	0057_20060331_035806	267.00	Begin Line 55/55
0428	5.8	0058_20060331_042806	267.00	Line Continues 55/55
0439	4.5	0059_20060331_043957	254.00	Begin Line 55/55
0509	4.50	0060_20060331_050935	76.00	Begin Line 55/55
0533	4.50	0061_20060331_053341	255.00	Begin Line 55/55
0616		CTD CAST		00040_06090011.1994.asvp 150m
0652	6.00	0062_20060331_065255	254.00	Begin Line 55/55
0722	6.00	0063_20060331_072255	255.00	Continue Line
0748	6.00	0064_20060331_074807	71.00	Begin Line 60/60
0809	6.00	0065_20060331_080924	250.00	Begin Line 60/60
0827	4.50	0066_20060331_082740	80.00	Begin Line 60/60
0844	5.00	0067_20060331_084440	251.00	Begin Line 60/60
0906	4.00	0068_20060331_090650	80.00	Begin Line 60/60
0925	5.00	0069_20060331_092505	208.00	Begin Line 60/60
0945	5.00	0070_20060331_094511	72.00	Begin Line 60/60
1029	6.00	0071_20060331_102918	251.00	Begin Line 60/60

NF-06-03-USVI **DN 2006 091**

Survey Area PUERTO RICO Page_1___of__2__

Weather:_____

TIME UTC	KNTS	LINE	AZ	REMARKS
0035		CTD CAST		00041_06090190.4643.asvp
0050	4.8	0072_20060401_005012	74.00	Begin Line 55/55
0120	4	0073_20060401_011836	254.00	Begin Line 55/55
0137	5	0074_20060401_013738	260.00	Begin Line 55/55
0227	5	0075_20060401_022708	261.00	I Begin Line 55/55; started line early, because it's good
0256	5	0076_20060401_025654	240.00	Begin Line 55/55
0310	5	0077_20060401_031057		Begin Line 55/55
0332	5	0078_20060401_032941	269.00	Begin Line 55/55
0400	6	0079_20060401_035822	283.00	Begin Line 55/55
0421	6	0080_20060401_042126	184.00	55/55
0448		CTD CAST		00042_06090234.3978.asvp
0521	5	0081_20060401_052131		55/55
0617	5	0082_20060401_061715		55/55
0637	5	0083_20060401_063709	255.00	Rejected--needed to switche swath widths port/starboard
0657	5.5	0084_20060401_065720	84.00	Begin Line 45/60
0657	5	0085_20060401_065756	88.00	Begin Line 60/45
0713	5	0086_20060401_071347	122.00	Begin Line 60/45
0730	5.5	0087_20060401_073015	70.00	Begin Line 60/45
0744	5.5	0088_20060401_074444	75.00	Begin Line 55/55
0820	5	0089_20060401_082054	86.00	Begin Line 55/55
0833	5	0090_20060401_083333	88.00	Begin Line 55/55
0845	5	0091_20060401_084527	255.00	Begin Line 45/60
0901	5	0092_20060401_090110	281.00	Begin Line 45/60
0925		CTD CAST		911 malfunction
2140		CTD CAST		911 malfunction; 19 back up used- 00043_06091210.7900.asvp
2206	4.5	0093_20060401_220620	352.00	Begin Crossline
2245	4.5	0094_20060401_224456	164.69	Begin Crossline
2320	4	0095_20060401_232033	347.71	Begin Crossline

NF-06-03-USVI

DN 2006 091

Survey Area PUERTO RICO

Weather:_________________

TIME UTC	KNTS	LINE	AZ	REMARKS
2354	4.50	0096_20060401_235418	172.98	Begin Crossline

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DN 2006 092

Survey Area PUERTO RICO

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Weather:________________

TIME UTC	KNTS	LINE	AZ	REMARKS
0024	4.50	0097_20060402_002458	355.46	Begin Crossline
0050	4.5	0098_20060402_005003	88.33	Holiday
0100	4.5	0099_20060402_010054	87.77	Holiday
0114	4.5	0100_20060402_011438	265.86	Holiday
				End survey

NF-06-03-USVI

CTD Cast Log **SURVEY** **La Paguera**

Date	Time (UTC)	Depth (m)	Cast	Latitude/Northing	Longitude/Easting
3/27/2006	2105	850	00031_06087155.11045	17 51 56.6230	66 54 58.6255
3/28/2006	0150	800	0032_06087200.10524.asvp	1976019	710994
3/28/2006	0600	800	00033_06088004.10667.asvp	1974683	707595
3/29/2006	00:10	700	00035_06088004.10667.asvp	1978101	716451
3/29/2006	0430	750	00036_06088004.9894.asvp	1973965	698239
3/29/2006	0948	400	00037_06089044.6549.asvp	1973858	698142
3/30/2006	2120	300	00038_06089160.3953.asvp	1977226	706329
3/31/2006	0205	400	00039_06089203.5427.asvp	1979087	718878
3/31/2006	0616	150	00040_06090011.1994.asvp	1979715	715325
4/1/2006	0035	355	00041_06090190.4643.asvp	1978144	710645
4/1/2006	0448	300	00042_06090234.3978.asvp	1975198	699214
4/1/2006	0925	750	was not used	1977724	719928
4/1/2006	2140	780	00043_06091210.7900.asvp	1974583	707498