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Woods Hole Oceanographic Institution

STATION LOCATIONS FOR ATLANTIS II-73,
ATLANTIS II-77, AND KNORR-42 CRUISES AND ALVIN
DIVE TRACKS IN THE FAMOUS AREA

By

James R. Heirtzler and Helen C. Hays

February 1977

TECHNICAL REPORT

*Prepared for the National Science Foundation
under Grants OCE 73-09736A03 (formerly
IDO 73-09736 and GX 36024), DES 74-01543
(formerly GA 41694), DES 73-06421 (formerly
GA 35976) and NOAA Grant 04-3-158-17.*

WOODS HOLE, MASSACHUSETTS 02543

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ABSTRACT

Lists and positions of stations on cruises ATLANTIS II-73, ATLANTIS II-77, KNORR-42 and ALVIN dives on the Mid-Atlantic Ridge during Project FAMOUS are given. Station lists include those for camera, water temperature, rock drill, dredges, heat flow and coring. The location of these stations are shown on 12 charts.

INTRODUCTION

During Project FAMOUS many research cruises were made to a relatively small axial section of the Mid-Atlantic Ridge. These cruises were made by ships of many different institutions in the United States, Canada, England and France. The planning for this Project did not include the issuing of standardized cruise reports. In fact the bathymetric charts, which formed the base of much station work, were being completed when the stations were being undertaken. Accordingly, the comparison of station locations from one cruise to another is not always a simple task.

The question of navigational accuracy was one of foremost concern during Project FAMOUS and cannot be given full discussion in a brief report such as this. Suffice it to say that the location of objects a few tens of meters in size was a thing that had been rarely done before on the deep sea floor.

There were four cruises by ships of the Woods Hole Oceanographic Institution: ATLANTIS II-73 in 1972, KNORR-31 and ATLANTIS II-77 in 1973 and KNORR-42 in 1974 when the ALVIN dives took place. All of these cruises collected underway as well as station data. The KNORR-31 cruise undertook extensive deep tow operations which is valuable to correlate with the data of stations given here. Other precisely navigated station data was obtained by other ships. The bathymetric base chart used in this report is that compiled by Fleming and Phillips in four sheets at a scale of 1:36,457, printed in late 1976 and expected to be published in 1977. The primary data used in that compilation was the bathymetric data produced by the U.S. Naval Oceanographic Office with special ships equipped with a multiple narrow beam echo sounding system. This system is called the SONARRAY system and the resulting charts, with a 5 to 15 fathom contour interval, are called P-Charts. Data for these charts was taken in March, 1973, and preliminary versions of them were available for cruises in 1973 and 1974.

During the course of Project FAMOUS an acoustic transponder navigation system was developed and used for the submersible ALVIN, for surface ships and for towed instrument packages. The movable vehicle, in this system

is located relative to transponders fixed on the seafloor. The movable vehicle can be located to accuracy of a few tens of meters with respect to the fixed transponders. The acoustic transponder net was located with respect to the bathymetric charts by first making a local bathymetric survey using the transponders, then making a pattern match of this bathymetric chart to the existing bathymetric chart. Since the ATLANTIS II-73 and ATLANTIS II-77 station locations had to be placed on the final bathymetric base chart some time after the stations were made they probably have somewhat greater relative positional error than the KNORR-42 or ALVIN tracks.

There are some stations, such as those for sonobuoys, ocean bottom seismographs, preliminary acoustic transponder drops, etc. which are not given here because of lack of space. Likewise there were camera, dredge, etc., stations that were made on these cruises that fell outside of detailed charts shown here. This report, however, does give the location of most of the stations that require correlation in the inner rift valley and adjacent fracture zones.

ACKNOWLEDGEMENTS

The authors of this report are responsible for assembling the material but have greatly benefited by previous projects that assembled parts of the data. Editing of digital data for acoustically navigated stations on ATLANTIS II-73 and KNORR-42 was done by Christine Wooding and on ATLANTIS II-77 by Christopher Tapscott. Kenneth Green and David Williams devoted much effort to finalizing the location of heat flow stations. Joseph Phillips and Wilfred Bryan were co-chief scientists on ATLANTIS II-73 and 77 and assisted in several aspects of this compilation. Many other persons, too numerous to identify individually here, assisted in the station instrumentation, ship and ALVIN instrumentation, and data acquisition.

TABLE 1
ATLANTIS II-73 Camera Stations

Station Number	Camera Lowering	Photographs exposed/printed*	Chart No.	DDL Tape/File # Ship, Fish	Date	Comments
3	1	0/0			11/19/72	Test lowering; no useful acoustic navigation obtained
9	2	1,562/952	II-D		11/24/72	Fish frame badly damaged; no useful acoustic navigation obtained
11	3	434/152	II-III-E	ZAGF#4, Z998#1	11/25/72	Frame slightly damaged
15	4	489/368	II-III-E	ZAGF#5, Z998#2	11/25/72	
17	5	504/203	II-III-E	ZAGF#5, Z998#3	11/26/72	
25	6	0/0	II-D	ZAGF#6, Z998#4	11/27/72	
37	7	1,125/584	II-III-IV-'I'	ZAGG#1, Z998#5	12/6/72	Compass lost
40	8	2,059/653	II-III-IV-'I'	ZAGG#3, Z998#6	12/6/72	
43	9	1,740/915	II-III-IV-'I'	Z998#10, Z998#7	12/8/72	Strobe power cable sheared; due to bottom impact?
46	10		II-III-IV-'I'			

TABLE 2
ATLANTIS II-77 Camera Stations

Station Number	Camera Lowering	Photographs exposed/printed*	Chart No.	DDL Tape/File # Ship, Fish	Date	Comments
15	1	0/0				Test lowering; no useful acoustic navigation obtained
20	2	2,226/1,025	III-IV-K II-III-H	ZAQL#15, ZAQQ#10	8/11/73	
24	3	2,005/1,395	III-IV-K II-III-H	ZAQL#16, ZAQQ#11	8/13/73	
29	4	1,509/1,132	III-IV-K	ZAQL#17, ZAQQ#12	8/14/73	
34	5	2,229/1,333	II-III-E II-D	ZAQL#19, ZAQQ#14	8/18/73	
44	6	2,249/1,827	III-IV-K II-III-H	ZAQL#18, ZAQQ#13	8/20/73	
49	7	2,279/1,463	II-III-H	KP65-1, KP70-3, KP73-6	8/21/73	No useful fish nvgn.; Data not DDL processed; tape is raw data.
59	8	0/0		KP67-2, KP74-2	8/23/73	Flooded strobe; no use. fish nvgn.; Data not DDL proc.; tape is raw data.
64	9	1,789/821	IV-L	ZAQL#20, ZAQQ#15	8/25/73	Fish framework dredged up about 20kg pillow lavas; leak in camera housing
71	10	99/25	IV-L	ZAQL#21, ZAQQ#16	8/27/73	Fish framework dredged up about 20kg pillow lavas; leak in camera housing
75	11	213/118	IV-L	ZAQL#22, 23	8/28/73	Bottom finding pinger failed

* Photographs printed generally reflect only those of high quality. The total number of useful, good photographs is probably much higher than those presently printed.

TABLE 3

KNORR-42 Camera and Water Temperature Stations

Station Number	Lowering No.	Depth (uncor. fms.) Start	Photos printed	Chart No.	DDL tape file no. Original	DDL tape file no. Edited	1974 Date	Comments
13	1							Test
18	2	1280	675	II/D	JF08/1	JF34/1	June 27/28	Across Median Valley
23	3	1525	1883	I-II/A-B			29	FZ"A" west side of scarp
30	4	1130	273	II/D	JF12/2	JF34/2	30	Median Valley-Mt. Pluto
34	5	1600	---	I-II/A	JF13/4		July 2	FZ"A" N-S across scarp
40	6	1210	1968	I-II/C-D	JF14/3 JF16/1	JF34/3	3	Median Valley opposite Mt. Jupiter
57	7	1250	1682	I-II/C-D	JF19/2	JF34/4	16	Western edge Median Valley
64	8	1185	1437	II-III/G	JF20/1	JF31/1 JF32/1	16	FZ"B" W-E-S-N of slot--2 crossings
73	9	1390	1976	II/D	JF20/3	JF34/5	18	Center of Median Valley-Mt. Pluto
82	10	980	2125	II-III/G	JF21/4	JF31/2 JF32/2	19	FZ"B" N.W. crossing slot
92	11	1118	2058	II-III/G	JF22/2	JF31/3 JF32/3	20	FZ"B" N.W. slot crossing S.E./N.E. 2 crossings
95	12	1470	2198	II-III-IV G-J			21	FZ"B" western portion
100	13	1080	2113	II/D	JF23/1	JF34/6	22	S.W. of Mt. Pluto-N.E. to E. wall
109	14	1100	1899	II/D	JF23/4	JF34/7	23	Median Valley-west plateau
116	15	1320	1317	II/D	JF24/3	JF34/8	24	West side-Median Valley
133	16	1400	2125	II/D	JF26/2	JF34/9	Aug. 4	Median Valley-east of Pluto & Venus
134	17	1128	2192	II-III-IV G-J	JF26/4	JF31/4 JF32/4	4	FZ"B" Southern hill
140	18	1270	1511	I-II/A-3			6	FZ"A" North to South
148	19	1440	1611	off charts			6	FZ"A" West to East

TABLE 4

ALVIN Dives (Camera and Sampling)

Dive No.	Chart No.	Samples					Camera		1974 Date	Time on Bottom	Pilot	Science Divers
		Station No.	No. Kg. Rock	No. Water Samples	No. Scoops	No. Cores	Expos. ext.	Expos. Hand-held				
							LEG 1			(Local)		
518	II-D	4	56	3	2	2	350	70	6/30	1214-1538	Wilson/Shumaker	Ballard
519	II-D	5	33	5	0	2	1000	140	7/1	1110-1622	Donnelly	Ballard/Moore
520	II-D	3	5.5	3	2	2	700	80	7/2	1138-1534	Shumaker	Moore/van Andel
521	II-D	4	43	4	0	2	850	216	7/3	1220-1600	Wilson	van Andel/Ballard
522	II-D	2	4.5	2	2	1	706	85	7/4	1227-1605	Foster	Bryan/Moore
523	II-D	4	5.5	4	1	0	1200	80	7/5	1041-1337	Donnelly	Bryan/Ballard
							LEG 2					
524	II-D	6	20	2	0	0	780	0	7/15	1009-1327	Wilson	Bryan/van Andel
525	II-D	5	3.5	4	0	2	772	3 rolls	7/16	1054-1443	Shumaker	Ballard/van Andel
526	II-D	7	18	6(5?)	1(?)	1	846	5 rolls	7/17	1125-1753	Donnelly	Bryan/Moore
527	II-D	6	45	4	1	1	880	5 rolls	7/18	1200-1621	Shumaker	van Andel/Bryan
528	II-D	4	30	4	0	1	835	5 rolls	7/19	1048-1449	Donnelly	Moore/Keller
529	II-D	5	21	4	1	1	801	7 rolls	7/20	1049-1527	Foster	Ballard/Heirtzler
530	II-D	4	7.5	3	0	3	1224	10 rolls	7/21	1107-1552	Wilson	Heirtzler/Ballard
							LEG 3					
532	II-D	10	31	3	1	2	1250	108	8/3	1055-1530	Donnelly	Bryan/van Andel
533	II-D	6	28	6	1	5	1250	72	8/4	1047-1529	Foster	Ballard/Keller
534	II-D	4	45	4	1	1	1250	108	8/5	1129-1535	Wilson	Bryan/van Andel
535	II-D/C	2	0	2	0	2	1250	144	8/6	1011-1530	Donnelly	Keller/Ballard

TABLE 5

KNORR-42 Rock Drill Stations

Station Number	Rock Drill No.	Chart No.	Lat.	Long.	DDL Fish/Ship Tape	1974 Date	Comments
29	1	II/D	36°49.0'	33°17.7'	JF12/1	6/30	10 cm core
72	2	II/D	36°49.9'	33°17.5'	JF20/2	7/17	Mud-unoriented gravel
81	3	II/D	36°47.4'	33°14.2'	JF21/3	7/18-19	Nothing
88	4	II/D	36°47.2'	33°16.8'	JF22/1	7/20	10 cm.-unoriented pillow glass on top
94	5	II/D	36°49.6'	33°18.5'	JF22/3	7/20-21	8 cm. feldspar; phenocyst basalt
14	6	II/D	36°49.6'	33°15.6'	JF24/1	7/24	41 cm.-oriented basalt

TABLE 6

ATLANTIS II-73 Dredge Stations

Station Number	Dredge	Weight of Rocks Dredged (kg.)	Chart No.	DDL Tape/File # Ship, Fish	Date	Comments
7	1		II-III-E	Z832#1	11/24/72	Lost dredge
10	2	10	II-III-E		11/24/72	No DDL proc. perf.; only graphic x/y plotter record avail.; About 10 kg of slightly weathered, coarsely vesicular basalt.
12	3	> 1	II-III-E		11/25/72	No DDL proc. perf.; only graphic x/y plotter record avail. One small piece of porphyritic basalt.
14	4	60	II-III-E		11/25/72	No DDL proc. perf.; only graphic x/y plotter record avail. About 60 km of fresh porphyritic basalt.
16	5	8	II-III-E	ZAGF#5, Z832#2	11/25/72	No DDL proc. perf.; only graphic x/y plotter record avail.; About 8 km basalt, as follows: 2 basalt pillow lava fgmts slightly weathered, 6 pcs. tubular, lobate fragments.
18	6	15	II-III-E		11/26/72	No DDL proc. perf.; only graphic x/y plotter record avail.; lobate or tubular basalt fgmts. very fresh, w/glassy crust and abundant plagioclase phenocrysts.
23	7				11/26/72	No DDL proc. perf.; only graphic x/y plotter record avail.; dredge empty.
24	8	> 1	II-III-E II-D		11/27/72	No DDL proc. perf.; only graphic x/y plotter record avail. One small fgmt. of calcareous breccia.
38	9	15	II-III-IV-'I'	ZAGG#2, Z832#3	12/6/72	Very weathered rock; 2 lg. pcs. contain fresh cores of gray basalt.
41	10		II-III-IV-'I'	ZAGG#4, Z832#4	12/6/72	Dredge empty
44	11		II-III-IV-'I'	ZAGG#6, Z832#5	12/8/72	Lost dredge bag
47	12	25	II-III-IV-'I'	ZAGG#7, Z832#6	12/9/72	Weathered serpentinite and foraminiferal sandstone.
50	13	20			12/9/72	No DDL proc. perf.; beyond rng. of acoustic transponders no use. data obtained. (This site in axial trough so. of Fracture Zone B & isn't shown on acoustic nvgn. plots.)

TABLE 7

ATLANTIS II-77 Dredge Stations

Station Number	Dredge	Weight of Rocks Dredged (kg.)	Chart No.	DDL Tape/File # Ship, Fish	Date	Comments
14	1				8/10/73	Lost entire dredge
19	2	5		ZAQL#24	8/11/73	Recovered material constns. of 3 sm. bags mud & 1 pc. consol. calcareous ooze.
23	3	1	III-IV-K II-III-H	ZAQL#25	8/13/73	One keystone-shaped pillow fgmts.
26	4	4			8/14/73	No DDL proc. perf.; no useful nvgt. obtained; 3 pillow fgmts. and 4 pcs. of clinker (discarded steamship ash?)
28	5	> 1	III-IV-K	ZAQL#26, ZAQQ#17	8/14/73	One keystone shaped pillow fgmt., porphyritic w/large plagioclase crystals.
37	6	91	II-III-E II-D	ZAQL#29	8/19/73	3 lg. pillow fgmts., 4 pcs. assem. into 1 vy. lg. pil., 6 sm. pil. pcs., 2 pcs. coral.
38	7	55	II-III-E	ZAQL#30	8/19/73	9 pcs. tubular lava, 2 lg. lava pil. fgmts. 22 fgmts of lava pil.
45	8	7			8/20/73	No DDL proc. perf.; beyond rng. of acoustic transponders; 1 pil. lava fgmts.
48	9	23	II-III-H	ZAQL#27	8/21/73	13 pil. lava fgmts., 17 fgmts s. basalt & greenstone, 4 bags small basalt fgmts., 1 drawer filled w/ calcareous mud.
52	10	114	III-IV-K II-III-H	ZAQL#28, ZAQQ#18	8/22/73	17 bags of small rock fgmts., 1 lg. pc. of greenstone breccia. Includes greenstone, basalt, serpentine, and greenstone breccia.
58	11	28	IV-L	ZAQL#31, ZAQQ#19	8/23/73	6 pcs. basalt, 1 bag mud, 1 bag rock fgmts., 1 lg. pc. of basalt.
62	12	> 1			8/24/73	No useful acoustic nvgt. obtained; 1 lg. pc. of basalt.
63	13	14			8/24/73	21 small basalt fgmts., 1 lg. pillow fgmt.
64	9	> 2	IV-L	ZAQL#20, ZAQQ#15	8/25/73	(Camera station) 1 lg. pillow fgmt.
67	14	34	IV-L	ZAQL#32	8/26/73	2 (?) lg. basalt fgmts., 5 smaller basalt fgmts.
70	15	36	IV-L	ZAQL#33	8/26/73	4 pcs. of basalt, 1 pc. of coral.
71	10	> 2	IV-L	ZAQL#21, ZAQQ#16	8/27/73	(Camera) 2 lg. pcs. of basalt.
76	16	114	IV-L	ZAQL#34, ZAQQ#20	8/28/73	Lg. collection of fresh & weathered basalt, pillows and fgmts.

TABLE 8

KNORR-42 Dredge Stations

Station #	Dredge #	Weight of Rock Dredges (Kg.)	Chart No.	DDL Tape/Fish # Ship, Fish		1974 Date	Comments
				Original	Edited		
15	1	----	off charts	JF05/1		6/26-27	No sample
20	2		I-II/A-B			6/28	Chain bag ripped out
25	3	2	I-II/A	JF10/1		6/29-30	One manganese coated rock
28	4	50	I-II/A-B	JF10/4		6/30	Moderately fresh to weathered pillow lava and greenstone
33	5	50	I-II/A-B	JF13/3		7/2	Lithified lumps of calc ooze with burrows
35	6	2	I-II/A	JF14/1		7/3	2 lumps white calc ooze with worm burrows
41	7	----	I-II/A-B	JF15/1		7/4	No samples
51	8	70.53	II-III/ F-G	JF18/4	JF33/1	7/15	2.27 kg. rocks; 68.26 kg con. calc ooze
68	9	18.2	off chart			7/17	18.2 kg. basalt; 1 piece coral
70	10	----	I-II/C			7/17	Lost dredge-weak link broke
77	11	227.5	II-III/ F-G	JF20/4		7/18	227.5 kg. basalt & sediment
86	12	136.5	II-III/F			7/19	136.5 kg. fresh pillow basalt
93	13	----	I-II/C			7/20	No sample
96	14	----	off charts			7/21	Dredge damaged-no returns
101	15	----	I-II/C			7/22	No sample
102	16	50.46	I-II/C-D			7/22-23	50.46 kg. manganese encrusted coral
108	17	18.2	I-II/C			7/23	18.2 kg. rocks-1 piece con. sediment
110	18	?	off chart			7/24	1 rock-misc. limestone
112	19	?	off chart			7/24	1 rock
117	20	?	off chart			7/25	2 rocks & coral
121	21	1021.5	II-III/G	JF25/2	JF33/2	8/3	1021.5 kg.-rocks, breccia, sandy sediment
122	22	90.8	II-III/ F-G	JF25/3	JF33/3	8/3	90.8 kg. conglomerate
123	23	4.54	II/D	JF25/4		8/3	4.54 kg. rocks
129	24	6.81	II-III/G	JF25/6	JF33/4	8/3	6.81 kg. basalt, indurated sediment & coral
130	25	34.05	II-III-IV F-G-J	JF25/7	JF33/5	8/4	34.05 kg.-lithified sediment, basalt, large coral
131	26	20.43	II-III-IV G-J	JF26/1	JF33/6	8/4	20.43 kg. ferrogenous breccia, weathered basalt, greenstone, large tree-like coral
137	27	27.24	off chart			8/5	27.24 kg. lithified sediment, coral, starfish
138	28	----	----			8/5	Lost dredge
145	29	45.4	III-IV/J	JF27/1	JF33/7	8/6	45.4 kg.-one large rock, small hard & soft rock
146	30	181.6	III-IV/J			8/6	181.6 kg. sepientine, basalt, white sediment rock

TABLE 9

ATLANTIS II-77 Heat-flow Stations

Station Number	Depth (Meters)	Heat-flow Probes Number of Measurements	Chart	DDL Tape/File # Ship, Fish	Date	Comments
12	3,674	0		ZAQL#1,	8/10/73	Test lowering
21	2,468	6		ZAQL#2, ZAQQ#1	8/12/73	
22	2,833	4	II-III-H	ZAQL#3, ZAQQ#2	8/12/73	
41	2,669	2	III-IV-K	ZAQL#4, ZAQQ#3	8/19/73	
42	2,742	2	III-IV-K	ZAQL#5, ZAQQ#4	8/20/73	
43	2,833	3	III-IV-K II-III-H	ZAQL#6,	8/20/73	
46	2,788	8	III-IV-K II-III-H	ZAQL#7, ZAQQ#5	8/21/73	
47	2,833	3	III-IV-K II-III-H	ZAQL#8, ZAQQ#6	8/21/73	
50	2,833	3	III-IV-K II-III-H	ZAQL#9, ZAQQ#7	8/22/73	
51	2,705	8	II-III-H	ZAQL#10, ZAQQ#8	8/22/73	
65	2,175	4	IV-L	ZAQL#11	8/25/73	
66	4,204	0	IV-L	ZAQL#12	8/26/73	Insufficient probe penetration into sediment to measure heat flow
77	3,509	0	IV-L	ZAQL#13, ZAQQ#9	8/28/73	Insufficient probe penetration into sediment to measure heat flow
78	4,204	0	IV-L	ZAQL#14	8/28/73	Insufficient probe penetration into sediment to measure heat flow

TABLE 10

KNORR-42 Heat-flow Stations

Station #	Heat Flow #	Water Depth Uncorr. fms.	# of Measurements Probes	Chart #	DDL Tape/Fish, Ship, Fish (original)	Date	Comments
14	1	1590/1480	12	I-II/A	JF04/1 JF05/1	6/26	Severe bend-h.f. instrument trouble
17	2	1570/1400	9	I-II/A	JF06/2	6/27	
21	3	1455/1590	6	I-II/A		6/28-29	Severe bend-instrument malfunction
26	4	1555/1482	5	I-II/A	JF10/2	6/30	
27	5	1575/1561	3	I-II/A	JF10/3	6/30	
31	6	1654/1570	3	I-II/A	JF13/1	7/1	
32	7	1590/1620	5	I-II/A	JF13/2	7/1-2	
36	8	1585/1570	6	I-II/A	JF14/2	7/3	
42	9	1620/1660	4	I-II/A	JF15/2	7/4	
43	10	1420/1375	3	I-II/A	JF17/1	7/5	
80	11	1144/1214	2	II-III/G	JF21/2	7/18	Hard bottom-no penetration

TABLE 11

KNORR-42 Coring and Hydrocast Stations

Station #	Core #	1974 Date	Chart #	Lat.	Long.	DDL Tape/Fish, Ship, Fish (original)	Comments
22	1	6/29	II/D	36°48.9'	33°16.7'		P.D. and 3 Van Dorns
52	2	7/15	II-III/G	36°34.3'	33°33.5'		Gravity Ph.
71	3	7/17	I-II/C	36°51.8'	33°21.4'		Ph.
78	4	7/18	II-III/G	36°36.9'	33°27.8'	JF20/5	Gravity and Ph. in FZ'B'
87	5	7/19	II-III/F	36°36.5'	33°21.8'		Sediment cores
97	6	7/21	---	36°50.3'	33°32.9'		Gravity and Ph.
99	7	7/22	II/D	36°48.5'	33°17.0'		Hydrocast-Van Dorn
103	8	7/23	II-III/G	36°36.5'	33°29.2'	JF23/2	Gravity-no core
111	9	7/24	II-III/G	36°36.5'	33°33.0'		Gravity 6"
113	10	7/24	II/D	36°49.5'	33°21.0'		Gravity-no core
115	11	7/24	II/D	36°48.3'	33°18.0'	JF24/2	Van Dorn
118	12	7/25	---	36°51.0'	32°54.0'		Gravity 2 ft.
120	13	8/2	II-III/G	36°35.7'	33°36.0'		Hydrocast 4 1/2 ft.
124	14	8/3	---	36°33.8'	33°18.9'		Gravity 4 ft.
125	15	8/3	---	36°34.3'	33°22.0'		Gravity 14"
139	16	8/5	I-II/A	36°56.8'	33°11.3'		Gravity 4.5 ft.
144	17	8/6	---	36°49.8'	33°08.3'		Gravity-sand, coral
147	18	8/6	---	36°34.8'	33°38.9'		Gravity 5 ft. Hydrocast
153	19	8/7	II-III/G	36°37.1'	33°28.7'		Gravity
154	20	8/7	II-III/G	36°36.6'	33°28.8'		Hydrocast-2 samples

33°10'W

33°05' A

36°
55'N

36°
50'N

33°20'W

33°15'

C

36°
40'N

-18-

36°
35'N

33°25'W

33°20'W

F

36°
35'N

33° 35' W

33° 30' W

J

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