J-G/FINK TR-096

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UNIVERSITY OF RHODE ISLAND
Graduate School of Oceanography

KINGSTON, R. I.
Narragansett Bay Campus

J-G/FINK

CRUISE REPORT
TR 096 (ARC II)
21 FEBRUARY - 28 MARCH 1971
R/V TRIDENT

The TRIDENT spent 35 days conducting marine geological and geophysical investigations in the northern part of the Lesser Antilles Island Arc. To make the most efficient use of ship time, the programs of Fink and Johnston (Schilling-sponsor) were combined over the length of the whole cruise.

SCHEDULE

Leg I	21 February - 10 March 1971	St. Thomas, V.I. to operating area, thence to Pointe-a-Pitre, Guadeloupe, F.W.I. (17 days)
	including 24 February - 1 March	in Pointe-a-Pitre for repairs
	11 March	Pointe-a-Pitre
Leg II	12 March - 28 March	Pointe-a-Pitre to operating area, thence to Fort-de-France, Martinique, F.W.I. (16 days)

SCIENTIFIC PARTY

Dr. L.K. Fink, Jr.	(Legs I-II)	Univ. of Maine	chief scientist, Leg I	USA
Thomas H. Johnston	(Legs I-II)	U.R.I.	chief scientist, Leg II	USA
Dr. Detmar Schnitker	(Legs I-II)	Univ. of Maine	micropaleontology	Germany
Dr. Michel Feuillard	(Leg I)	Univ. de Paris	seismology	France
Dr. Haraldur Sigurdsson	(Leg II)	Univ. of West Indies	geology	Iceland
C.K. Unni	(Leg I)	U.R.I.	geochemistry	India
David G. Johnson	(Leg II)	U.R.I.	geochemistry	USA
Charles Heinonen	(Legs I-II)	Univ. of Maine	geology	USA
Paul Rusanowski	(Legs I-II)	Univ. of Maine	botany	USA
James Martell	(Leg I)	George Washington Univ.	geochemistry	USA
Francois LeLann	(Leg I)	Bureau of Geologic Research & Mines, Orleans	geology	France
P-M. Thibaut	(Leg II)	BRGM, Fort-de-France	geology	France
Thomas Davis	(Legs I-II)		biology	USA
Art Buddington	(Legs I-II)	U.R.I.	marine technician	USA
Mark Weishan	(Legs I-II)	U.R.I.	marine technician	USA

SHIP'S COMPANY

C.W. Clampitt, master
R.W. Reusswig, chief mate
David LaCasse, second officer
Clifford Oatly, ordinary seaman
Pat Neves, steward
Oscar Ammons, second cook

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SHIP'S COMPANY (Continued)

Kyle Birk, radio officer
Henry Martin, bos'n
Robert Jenkins, AB seaman
Frederick Russell, AB seaman
John Stholberg, Jr., AB seaman
Barry McGuire, ordinary seaman
Peter Miller, ordinary seaman

J.P. Symonds, chief engineer
R.S. Martin, first engineer
Theo. Surette, second engineer
Harry Rougas, electrician
Joe Moscatelli, oiler
Neal Hovey, oiler

UNDERWAY OPERATIONS (Dr. L.K. Fink, Jr.)

Purpose

Previous geophysical investigations have revealed the relationship between the pre-Miocene and Miocene - Recent island arc ridges in the vicinity of Guadeloupe. This cruise was conducted to extend this detailed study to the entire northern half of the arc complex and to substantiate the continuity of this relationship. In addition the first studies to resolve the nature of the Aves Ridge and it's relationship with the Lesser Antilles Island Arc were initiated. It is recognized that detailed and closely spaced geophysical data are necessary to adequately define the complex associations of this area.

Method

To define these upper crustal structural relations, continuous seismic reflection profiles, and continuous bathymetric and magnetic profiles were obtained along the lines indicated in Fig. 1. These data were then utilized to determine the best dredging sites for obtaining samples of the rocks comprising the island arc ridge and the Aves Ridge.

Preliminary Results

The continuous seismic profiles were of exceptional quality, penetration was up to 2.5 seconds in such areas as the Grenada Trough. The acoustic basement was reached in most instances. A preliminary interpretation of the records suggests a young origin for the Aves Ridge accompanied by extensional rifting in the interarc basin. On the arc ridge crest the unconformity between the volcaniclastic products of the older and younger volcanic centers is clearly revealed.

The magnetic profiles are generally subdued everywhere in the area with the exception of the arc ridge crest where short wave length variations on the order of 100 to 500 gammas are associated with volcanic centers and minor faults in the acoustic basement.

The bathymetric data will be combined with other data on hand to produce a detailed bathymetric chart for the area north of Dominica. In general the existing bathymetric charts are a poor representation of the topography.

DREDGING OPERATIONS (T.H. Johnston)

This work has been carried out under the supervision of Dr. J-G. Schilling, U.R.I., and supported by his Office of Naval Research contract No. N00014-68-A-0215-0003.

Purpose

The subduction of oceanic lithosphere beneath island arcs is predicted by hypotheses of sea floor spreading and plate tectonics. Evolution of an island arc may involve melting of old oceanic lithosphere or spatially associated mantle at several levels. Dredging transverse fracture zones cross cutting the front of island arcs may expose either the basal part of such old volcanic edifice material or old oceanic crust.

Method

The dredging effort centered on the Desirade Scarp east of Guadeloupe. Five successful hauls here during TR 079 obtained greenstones, metagabbro, and quartz keratophyres. Further work was desirable to search for other rock types and possible layering by dredging along traverses at several depths. Along this scarp, the east flank of the arc edifice is offset, and a 40-km section of crustal interior exposed.

Preliminary Results

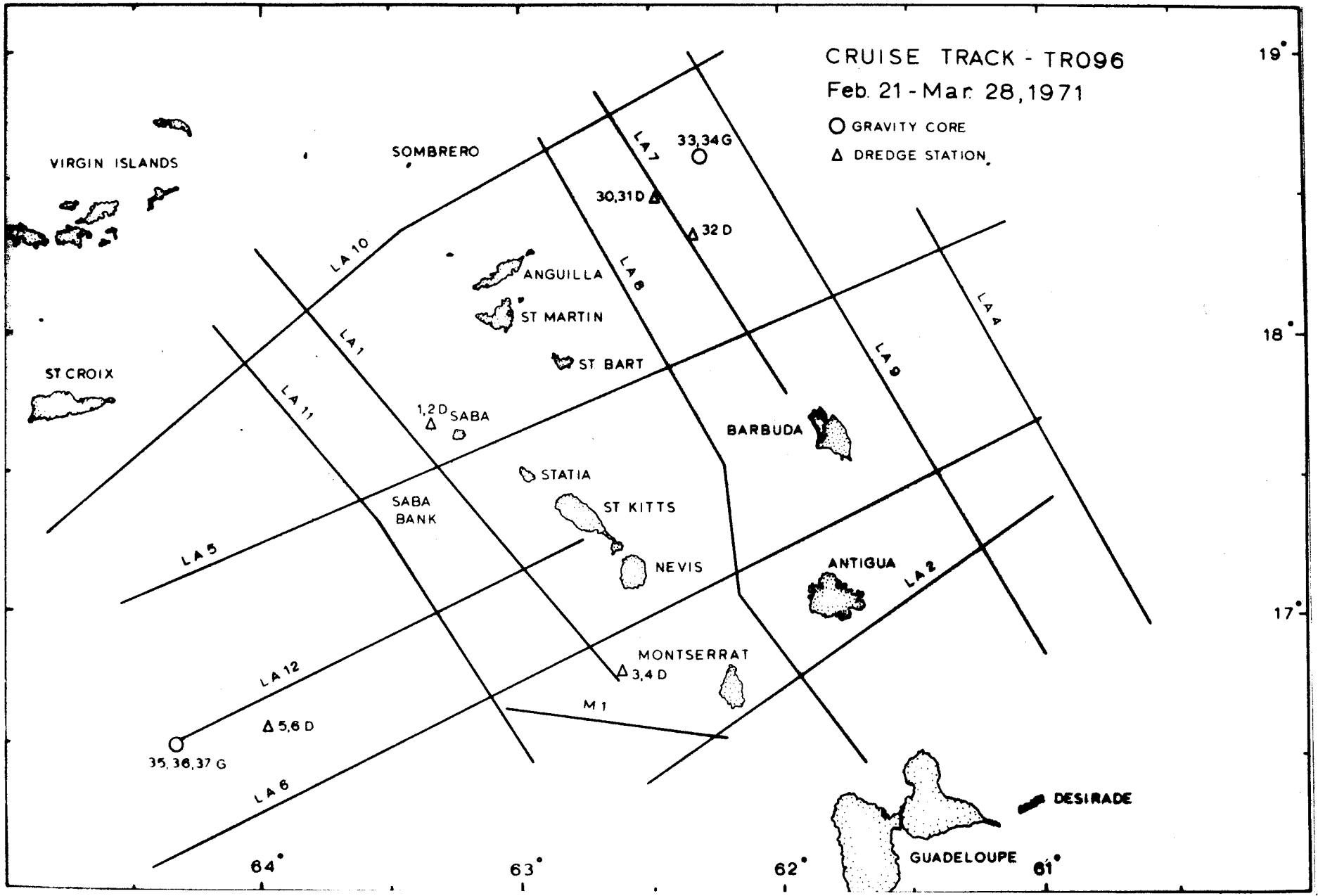
Five sub-bottom profiles (270 km) across the scarp were made, augmenting traverses obtained on TR 079. Nineteen dredge hauls were attempted on the scarp, of which 10 were successful, recovering a total of about 600 kg metamorphic and igneous rock. Rock types identified by preliminary inspection include greenstones, gabbros, basalts, and chert, some very fresh and others altered or sheared.

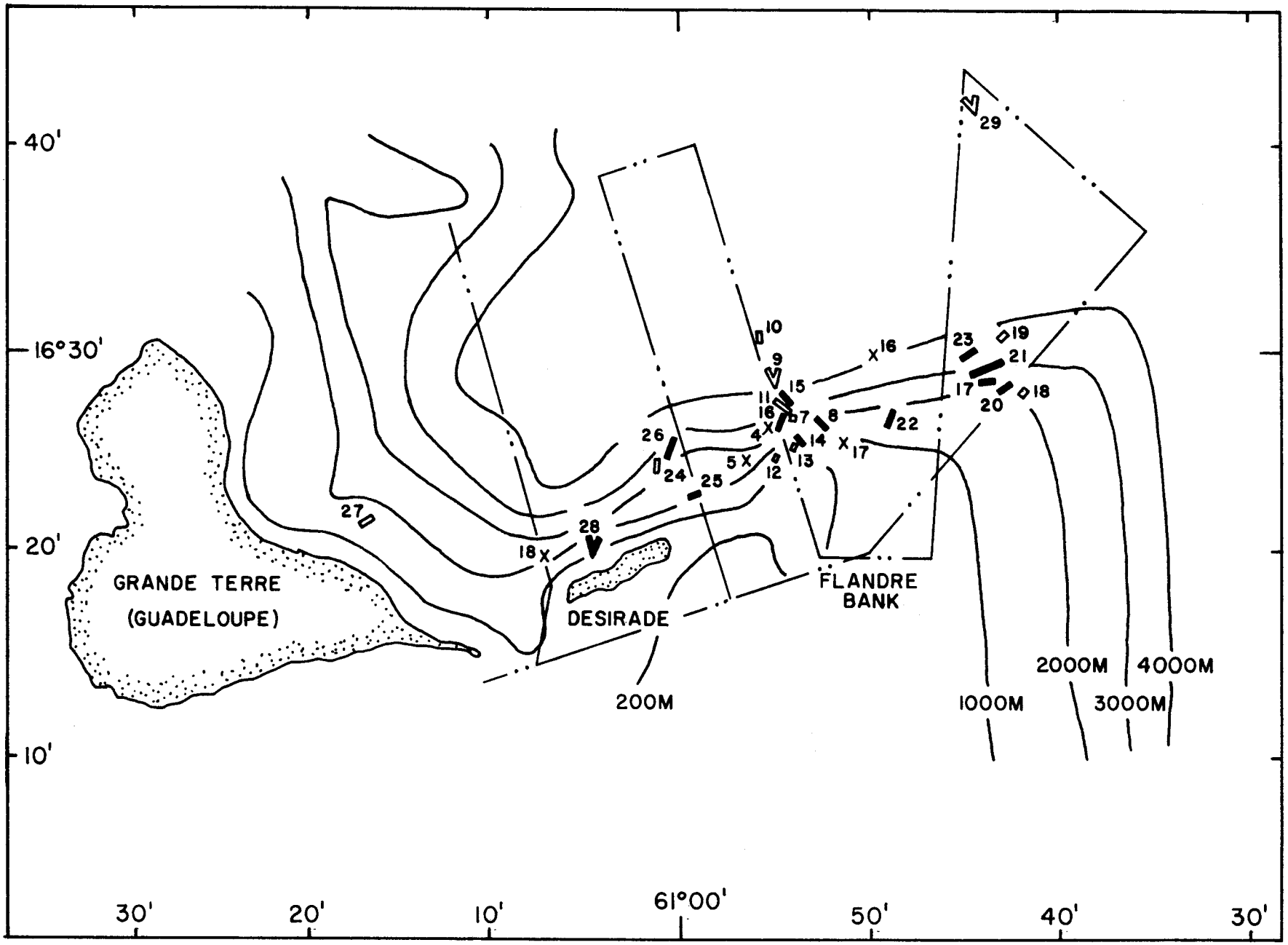
Three successful camera stations were completed, of which two cover sites dredged, and show the nature of outcrops on the scarp.

A one-day visit was made to Desirade Island. Samples related to those dredged were collected, and their field relationships observed.

Six successful dredge stations were completed near Montserrat and other locations in the Northern Lesser Antilles and Venezuela Basin, where the sub-bottom survey suggested exposed basement. Coquina and foraminiferal sediment were recovered, but not outcropping igneous rock.

Sediment cores were taken for benthic foraminifera studies at locations on the Atlantic floor and in the Venezuela Basin.


CRUISE TRACK - TR096
Feb. 21 - Mar. 28, 1971
O GRAVITY CORE
Δ DREDGE STATION
VIRGIN ISLANDS
SOMBRERO
33,34G
30,31D
32D
LA 7
LA 10
LA 8
ANGUILLA
ST MARTIN
ST BART
LA 1
LA 11
ST CROIX
1,2D SABA
LA 9
LA 4
BARBUDA
STATIA
SABA BANK
ST KITTS
NEVIS
LA 5
ANTIGUA
LA 2
MONTSERRAT
3,4D
LA 12
M 1
5,6D
35,36,37G
LA 6
DESIRADE
GUADELOUPE
19°
18°
17°
64°
63°
62°
61°



TRIDENT CRUISE TR096 LEG II 12 – 28 MARCH, 1971

▮ TR096 – SUCCESSFUL ▯ TR096 – OTHER x TR079 – SUCCESSFUL

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TR 096 STATIONS

Station	Type*	Date (1971)	Latitude (North)	Longitude (West)	Depth (meters)
1	D	2/22	17°39'	63°20'	500
Site	: Saba Bank, east flank				
Samples Recovered:	one rounded cobble of hornblende dacite, two crinoids, coral debris				
2	D	2/22	17°40'	63°20'	400
Site	: Saba Bank, NE flank				
Samples Recovered:	none				
3	D	3/2	16°48.5'	62°39.0'	700
Site	: Seamount, 25 mi west of Montserrat				
Samples Recovered:	coral debris, one pumice pebble				
4.	D	3/2	16°48'	62°37'	950
Site	: Seamount, 25 mi west of Montserrat				
Samples Recovered:	one tunicate, one glass sponge, some coral debris				
5	D	3/6	16°33.8'	63°54.3'	900
Site	: Seamount, 60 mi NW of Aves I.				
Samples Recovered:	20 kg fresh coquina, a few corals				
6	D	3/6	16°34.3'	63°52.4'	800
Site	: Seamount, 60 mi NW of Aves I.				
Samples Recovered:	100 kg shell and foraminiferal coquina				
7	D	3/14	16°27.0'	60°54.2'	1400
Site	: Desirade Scarp, central				
Samples Recovered:	none				
8	D	3/14	16°27.0'	60°52.8'	1600
Site	: Desirade Scarp, central				
Samples Recovered:	40 kg greenstones, metagabbros, and metabasalt				
9	D	3/14	16°28.4'	60°54.8'	3900
Site	: Desirade Scarp, central				
Samples Recovered:	none				
10	D	3/14	16°31.1'	60°55.7'	4800
Site	: Desirade Scarp, central				
Samples Recovered:	none				

*D=dredge, C=camera, G=gravity core

TR 096 STATIONS (continued)

Station	Type	Date (1971)	Latitude (North)	Longitude (West)	Depth (meters)
11	C	3/15	16°27.8'	60°55.2'	2500
Site	: Desirade Scarp, central, site of TR079 station 4D				
Photographs	: Camera failed to operate				
12	D	3/15	16°25.6'	60°54.8'	500
Site	: Desirade Scarp, central				
Samples Recovered:	none				
13	D	3/15	16°25.6'	60°53.7'	360
Site	: Desirade Scarp, central				
Samples Recovered:	none				
14	D	3/15	16°25.8'	60°53.5'	570
Site	: Desirade Scarp, central				
Samples Recovered:	3 kg greenstone and breccia				
15	D	3/15	16°27.8'	60°54.2'	3650
Site	: Desirade Scarp, central				
Samples Recovered:	50 kg fresh gabbro, greenstone				
16	C	3/16	16°27.0'	60°54.6'	2300
Site	: Desirade Scarp, central, site of TR079 station 4D				
Photographs	: about 500, rock outcrops				
17	D	3/16	16°28.9'	60°43.8'	2550
Site	: Desirade Scarp, east				
Samples Recovered:	300 kg sheared basalts				
18	D	3/16	16°28.3'	60°42.2'	1400
Site	: Desirade Scarp, east				
Samples Recovered:	none				
19	D	3/16	16°31.0'	60°43.2'	4400
Site	: Desirade Scarp, east				
Samples Recovered:	altered basalt fragments, foraminiferal ooze				
20	C	3/17	16°28.6'	60°42.5'	2200
Site	: Desirade Scarp, east, near station 17D				
Photographs	: about 400, rock outcrops, talus, and sediment				

Station	Type	Date (1971)	Latitude (North)	Longitude (West)	Depth (meters)
21	D	3/17	16°29.5'	60°43.5'	3500

Site : Desirade Scarp, east
Samples Recovered: 200 kg amygdaloidal basalt, gabbro, altered basalt, chert, and well lithified sediments

22	D	3/17	16°27.3'	60°48.7'	2300

Site : Desirade Scarp, east
Samples Recovered: 10 kg altered basalt, 20 kg mudstone

23	C	3/18	16°30.4'	60°44.4'	3450

Site : Desirade Scarp, east, near station 21D
Photographs : about 500, sediment bottom, a few fish.

24	D	3/18	16°25.1'	61°01.1'	2800

Site : Desirade Scarp, west
Samples Recovered: none

25	D	3/18	16°23.1'	60°59.5'	1500

Site : Desirade Scarp, west
Samples Recovered: 30 kg altered fine gabbro, 10 kg weakly consolidated foraminiferal siltstone

26	D	3/19	16°26.1'	61°00.6'	3400

Site : Desirade Scarp, west
Samples Recovered: 50 kg aphyric basalt, some amygdaloidal

27	D	3/19	16°21.7'	61°16.3'	850

Site : Desirade Trough, west
Samples Recovered: 5 kg chlorite mud

28	D	3/19	16°20.8'	61°04.7'	800

Site : Desirade Scarp, west
Samples Recovered: 25 kg trondhjemite, basalt breccia, and limestone

29	D	3/20	16°41.6'	60°43.8'	5400

Site : Desirade Trough, east
Samples Recovered: none

30	D	3/22	18°30.5'	62°28.5'	3200

Site : Anguilla Ridge, north scarp
Samples Recovered: none

TR 096 STATIONS (continued)

Station	Type	Date (1971)	Latitude (North)	Longitude (West)	Depth (meters)
31	D	3/22	18°28.0'	62°29.6'	2300

Site : Anguilla Ridge, north scarp
Samples Recovered: 25 kg tan foraminiferal ooze

32	D	3/23	18°21.5'	62°20.4'	2400

Site : Anguilla Ridge, south scarp
Samples Recovered: none

33	G	3/23	18°38.4'	62°17.9'	5970

Site : Atlantic floor, east of Anguilla
Samples Recovered: none

34	G	3/23	18°38.4'	62°18.4'	5600

Site : Atlantic floor, east of Anguilla
Samples Recovered: 1-1/2 meter light brown foraminiferal ooze

35	G	3/27	16°33.5'	64°19.7'	3475

Site : Venezuela Basin
Samples Recovered: none

36	G	3/27	16°33.5'	64°20.0'	3500

Site : Venezuela Basin
Samples Recovered: 2 meters light brown foraminiferal ooze

37	G	3/27	16°34.2'	64°20.5'	3525

Site : Venezuela Basin
Samples Recovered: 2 meters light brown foraminiferal ooze

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