

CRUISE REPORT  
 CRUISE TR-079 ("ARC I")  
 1 March - 22 March, 1970  
 R/V TRIDENT

TRIDENT Cruise TR-079 spent 11 days in a transit of the North Atlantic Ocean and 10 days conducting geochemical and geological studies east of Guadeloupe, French West Indies.

Leg I 1 March - 11 March Dakar, Senegal to Fort de France, Martinique (11 days)  
 12 March Fort de France

Leg II 13 March - 22 March Fort de France, Martinique to operating area and return to Fort de France (10 days)

Scientific Party

|                        |               |   |
|------------------------|---------------|---|
| Dr. Jean-Guy Schilling | (Leg II)      | U.R.I. Chief Scientist, Geochemistry                              |
| Dr. L.K. Fink          | (Leg II)      | Univ. of Maine, Geology   |
| Dr. Yoshio Oji         | (Legs I - II) | U.R.I./Fukuoka Univ., Geology                                     |
| Dr. John Robinson      | (Leg II)      | U.R.I., Mathematics   |
| Thomas Johnston        | (Legs I - II) | U.R.I., Geology   |
| Mrs. Elizabeth Sekator | (Leg II)      | U.R.I., Oceanographic Technician                                  |
| Mrs. Helene Robinson   | (Leg II)      | U.R.I.  |
| Miss Diane Wolf        | (Leg II)      | U.R.I., Geology   |
| Miss Ann Gall          | (Leg II)      | U.R.I., Biology   |
| Pierre-Marie Thibaut   | (Leg II)      | Bureau of Geologic Research and Mines, Fort de France, Martinique |
| Timothy Kennard        | (Legs I - II) | U.R.I., Marine Technician   |
| Frank Rose             | (Legs I - II) | U.R.I., Marine Technician   |

Ship Personnel

|                                |   |
|--------------------------------|---|
| Barnes Collinson, Master       | Danny Green, Second Cook                |
| Clifford A. Sawyer, Chief Mate | John S. Symonds, Chief Engineer         |
| David La Casse, Second Mate    | George T. Gall, First Asst. Engineer    |
| Kyle Birk, Radio Officer       | Theodore Surette, Second Asst. Engineer |
| Henry Martin, Bos'n            | Harry Rougas, Electrician               |
| Peter I. Russell, A/B Seaman   | Wayne Shaw, Oiler                       |
| Jean Archimbault, A/B Seaman   | Reginald Francis, Oiler                 |
| Thomas Carter, A/B Seaman      | Thomas Plunkett, Oiler                  |
| Thomas Appleton, A/B Seaman    | Edwin Taquith, Ordinary Seaman          |
| Pat Neves, Steward             |   |

Purpose

Current theories of sea floor spreading and plate tectonics require that oceanic lithosphere descend along seismic planes beneath island arcs. Volcanic evolution of an island arc may involve melting of old oceanic lithosphere. The vast bulk of island arc material beneath sea level is of unknown composition, but may expose such old oceanic lithosphere or volcanic rock forming parts of the old volcanic edifice. TR-079 was undertaken to dredge along a profile across the Lesser Antilles Island Arc where these different geological units

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TR-079

may have been exposed. Chemical and physical properties of these materials will be investigated to better comprehend the geological evolution of this arc.

#### Method

An area east of the island of Guadeloupe was selected for the dredging effort on the basis of bathymetric and subbottom profile data kindly made available by L.K. Fink and E.C. Heezen. A TRIDENT subbottom profile survey was then run in the area to further define the best locations for dredging basement exposures.

#### Preliminary Results

Continuous bathymetric and magnetic profiles were recorded during transit of the Atlantic along latitude  $14^{\circ}27'N$  and while underway in the Lesser Antilles operating area. Five hundred and ninety kilometers of subbottom profile of excellent quality were obtained east of Guadeloupe. Three traverses down the east flank of the arc and three traverses across the Desirade Trough were made. Penetration exceeded 700 m of sediment in 4 Km of water. Outcrops of basement were observed at several locations on the Desirade Scarp, the ridge crest and flank, and on the ocean floor at the base of the arc.

The Desirade Scarp is a 10 Km section of the interior of the arc edifice exposed by left lateral faulting. Five dredge hauls along Desirade Scarp netted about 400 lbs. of greenstones, some very fresh and angular, others sheared or covered in part with thick manganese crusts. Six successful dredge stations, at locations on the arc crest and flank where the subbottom survey showed protruding basement, recovered weakly consolidated foraminiferal siltstone. This is believed to represent a veneer over the actual basement rock.

One camera station was made on the Desirade Scarp in the area of several successful dredge hauls.

Upon completion of the cruise, a field party collected rocks from thirty sites on Basse Terre, and thirteen sites on Martinique.

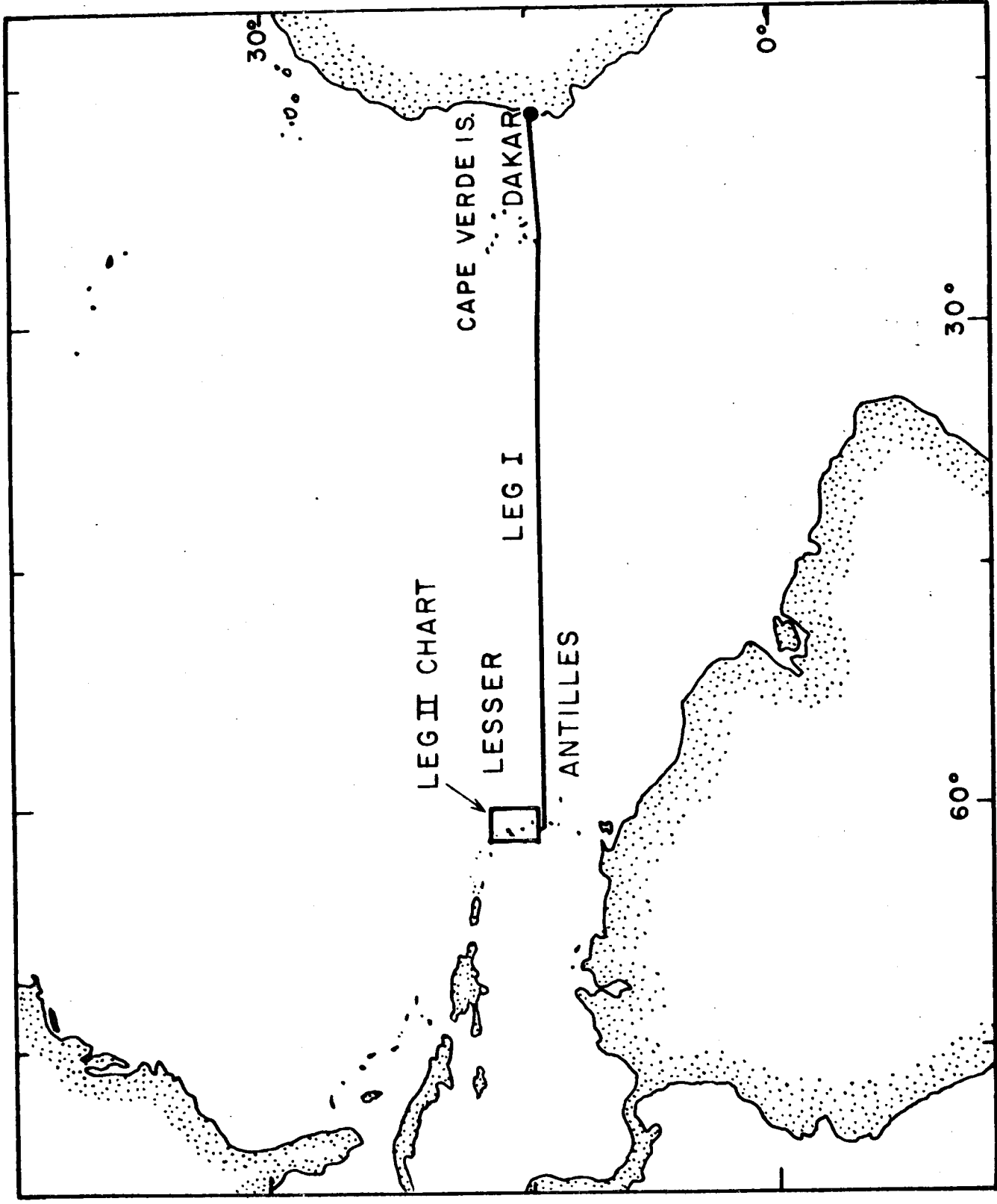
Laboratory investigation of dredged samples will include petrographic, rare earth, and major element analysis, magnetic properties and potassium-argon dating of key samples. The dredged rocks will be compared with samples from the islands and with oceanic basalts.

STATIONS TR-079

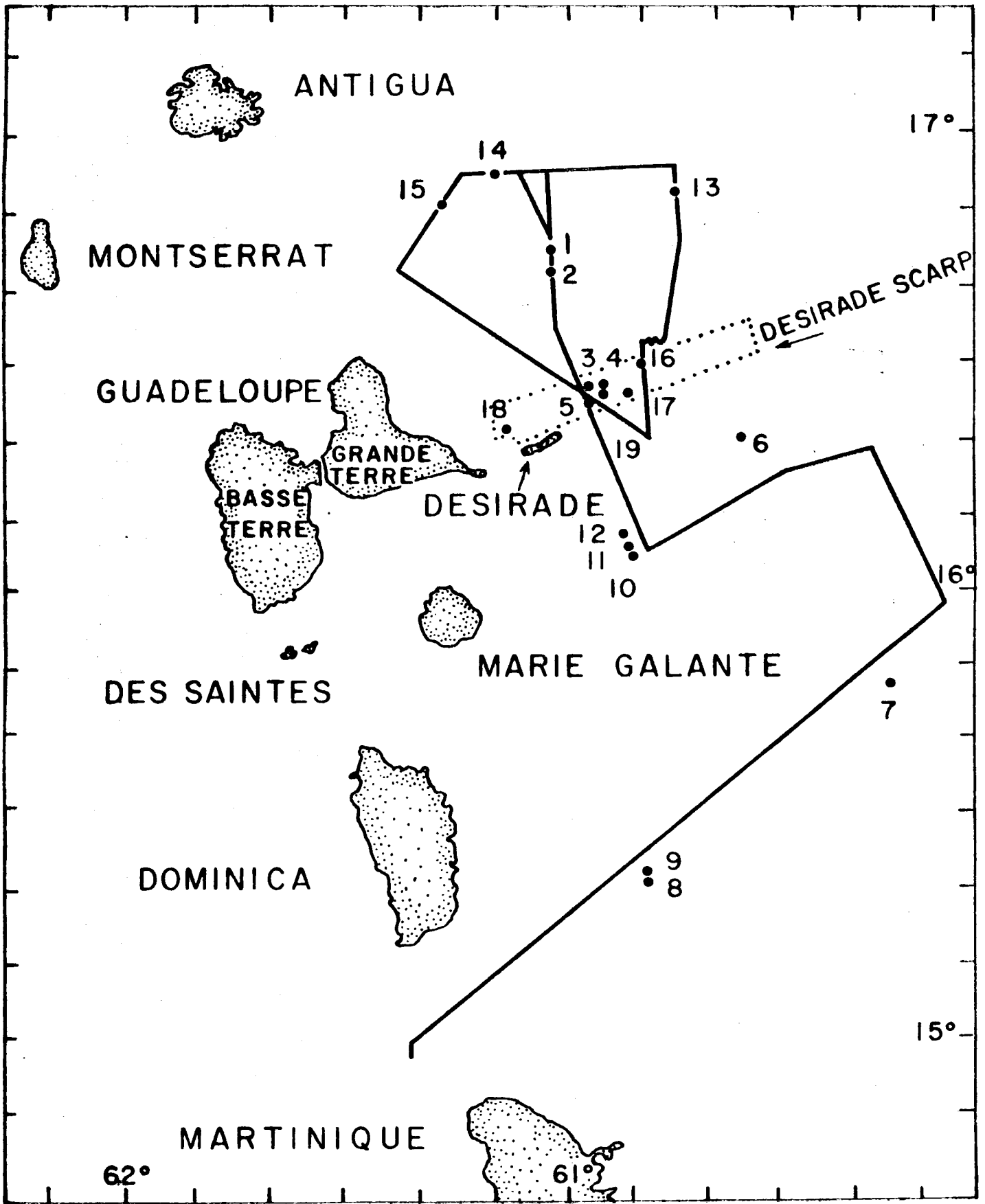
| Station #  | Type   | Date | Latitude (North) | Longitude (West) | Depth (m) |
|--|--------|------|------------------|------------------|-----------|
| 1  | Dredge | 3/15 | 16°45'           | 61°02'           | 3200      |
| Site: North flank of Desirade Trough<br>Samples recovered: 400 lbs. weakly consolidated foraminiferal siltstone with abundant dark mineral component |        |      |                  |                  |           |
| 2  | Dredge | 3/16 | 16°42'           | 61°02'           | 4400      |
| Site: North flank of Desirade Trough<br>Samples recovered: None  |        |      |                  |                  |           |
| 3  | Dredge | 3/16 | 16°27'           | 60°57'           | 1600      |
| Site: Desirade Scarp<br>Samples recovered: None  |        |      |                  |                  |           |
| 4  | Dredge | 3/16 | 16°27'           | 60°55'           | 2400      |
| Site: Desirade Scarp<br>Samples recovered: 300 lbs. fresh greenstone, including one 100 lb. block  |        |      |                  |                  |           |
| 5  | Dredge | 3/17 | 16°24.5'         | 60°57'           | 1250      |
| Site: Desirade Scarp<br>Samples recovered: 80 lbs. greenstones with light manganese coating - 100 lbs. foraminiferal siltstones                      |        |      |                  |                  |           |
| 6  | Dredge | 3/17 | 16°20'           | 60°36'           | 3000      |
| Site: East flank of arc<br>Samples recovered: 50 lbs. foraminiferal siltstone showing grain size sorting, dark component                             |        |      |                  |                  |           |
| 7  | Dredge | 3/17 | 15°47.5'         | 60°16'           | 4150      |
| Site: Atlantic floor at base of arc flank<br>Samples recovered: None   |        |      |                  |                  |           |
| 8  | Dredge | 3/18 | 15°21'           | 60°54'           | 1250      |
| Site: Crest of east flank of arc<br>Samples recovered: None  |        |      |                  |                  |           |
| 9  | Dredge | 3/18 | 15°22'           | 60°54'           | 1400      |
| Site: Crest of east flank of arc<br>Samples recovered: None  |        |      |                  |                  |           |
| 10   | Dredge | 3/19 | 16°04.5'         | 60°51'           | 1100      |
| Site: Arc crest<br>Samples recovered: Some calcareous mudstone and 1 holothurian   |        |      |                  |                  |           |

## STATIONS TR-079 (continued)

| Station #   | Type   | Date | Latitude (North) | Longitude (West) | Depth (m) |
|---|--------|------|------------------|------------------|-----------|
| 11  | Dredge | 3/19 | 16°06'           | 60°51'           | 860       |
| Site: Arc crest<br>Samples recovered: A few deep water corals   |        |      |                  |                  |           |
| 12  | Dredge | 3/19 | 16°07'           | 60°52'           | 900       |
| Site: Arc crest<br>Samples recovered: Calcareous mudstone and corals  |        |      |                  |                  |           |
| 13  | Dredge | 3/19 | 16°42'           | 60°46'           | 5300      |
| Site: Desirade Trough floor<br>Samples recovered: None  |        |      |                  |                  |           |
| 14  | Dredge | 3/20 | 16°55'           | 61°10'           | 2000      |
| Site: East flank of arc<br>Samples recovered: 30 lbs. foraminiferal siltstone with manganese coating  |        |      |                  |                  |           |
| 15  | Dredge | 3/20 | 16°41'           | 61°17'           | 1400      |
| Site: Arc crest<br>Samples recovered: 50 lbs. foraminiferal siltstone   |        |      |                  |                  |           |
| 16  | Dredge | 3/21 | 16°30'           | 60°50'           | 3100      |
| Site: Desirade Scarp<br>Samples recovered: 20 lbs. highly altered greenstones and calcareous siltstone, both with manganese coating up to 5 mm thickness                          |        |      |                  |                  |           |
| 17  | Dredge | 3/21 | 16°26'           | 60°51.5'         | 950       |
| Site: Desirade Scarp<br>Samples recovered: One 10 lb. block of fresh, well-jointed greenstone   |        |      |                  |                  |           |
| 18  | Dredge | 3/21 | 16°21'           | 61°08'           | 2150      |
| Site: Desirade Scarp<br>Samples recovered: Heterogeneous assortment of greenstones; a few quartz-rich samples; some white, very fine grained calcareous mudstone. 100 lbs. in all |        |      |                  |                  |           |
| 19  | Camera | 3/21 | 16°26'           | 60°55'           | 1000      |
| Site: Desirade Scarp  |        |      |                  |                  |           |



TRIDENT CRUISE TRO79 LEG I 1 MARCH - 11 MARCH 1970  
DAKAR, SENEGAL TO FORT DE FRANCE, MARTINIQUE.



TRIDENT CRUISE TRO79 LEG II 13 MARCH - 22 MARCH 1970 PAR PROFILE AND STATIONS -