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CARIBBEAN DREDGE HAUL COMPILATION: SUMMARY AND IMPLICATIONS

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ABSTRACT

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The locations of 400 dredge hauls from the Caribbean have been compiled from published and unpublished sources. The following information on them is listed: location, depth, rock types recovered and age, and a literature reference or institution to contact for further information.

The rocks recovered provide information about the Caribbean crust along the northern border of the Caribbean from Central America to Guadeloupe; and under the Beata and Aves Ridges. They also provide evidence for extensive vertical motion (up to several thousand meters) in the Neogene throughout the northern and eastern Caribbean.

Many of the dredge hauls already collected have been examined in a selective fashion only. We could significantly increase our knowledge of the Caribbean crust and Neotectonics through more systematic team investigations. There are no dredge hauls from the southern and southwestern Caribbean margins. Suggestions for five localities are made.

INTRODUCTION

At the second Caribbean Geological Conference in Mayaguez, Puerto Rico, HEEZEN (1959) proposed that deeper layers of the Caribbean crust could be sampled by dredging steep escarpments and that rocks recovered from these layers could then be compared with seismic-velocity horizons within the Caribbean.

Heezen and his students from Lamont-Doherty began such a program in 1966 aboard Duke University's *R.V. Eastward.* The program continues today and has been an unqualified success.

Since 1960, many individuals and about a dozen institutions have done dredging in the Caribbean although none on quite so continuous a program as Heezen. The sum of all these efforts is a much greater understanding of rock types in submarine structures, their relationship to land geology and to the seismic-velocity structure of the basins. This data, combined with that provided by the thousands of deep piston cores, gravity cores, surface grab samples and the few Deep Sea Drilling holes form a tremendous information bank which has been tapped only surficially. With specific reference to the dredge hauls, it is well known by those of us that have gathered the samples, that only the rocks of special interest to a particular investigator have been examined in any detail. Unfortunately, the results of these initial investigations are scattered in numerous publications.

Compilation status and format

A compilation of dredge haul data seemed needed and was begun by the senior author during the winter of 1975. The locations of 400 dredge hauls (many of them unpublished) have been plotted as an overlay to the U.S. Naval Oceanographic Office 1:2,500,000 bathymetric map which accompanies the Preliminary Geologic-Tectonic map of the region compiled by CASE & HOLCOMBE (1975). A 65 page table has also been assembled which lists the following information on each dredge haul: location, depth, rock types recovered and age, and a literature reference or institution to contact for further information. The compilation is not yet available to the general public although we hope to arrange for publication in the near future.

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COMPILATION SUMMARY

The combined dredge hauls of all workers have told us a great deal about the Caribbean crust along the northern border from Central America to Guadeloupe; and under the Beata and Aves Ridges. We cannot summarize all the data in our tables in a short paper, but will restrict ourselves to a few comments on the older rocks.

Rock types recovered in the northwest Caribbean (Yucatan Channel area) include a great variety of metasediments, phyllites, and marbles (PYLE ET AL., 1973; VEDDER ET AL., 1973) which could be the equivalent of the Paleozoic rocks found in several wells in southwestern Honduras. Radiometric age determinations on these rocks, which scatter between 50-90 my, certainly have led to debate; probably reflect several metamorphic events, and certainly do not represent the time of initial formation of the rocks. PYLE ET AL.(1973) felt that the mineralogy of their rocks is closer to the San Cayetano Group in Cuba (Jurassic) rather than to Central American Paleozoic rocks, but VEDDER ET AL. (1973), although not ruling this idea out, suggest rocks from their dredge hauls might be older. Paleozoic ages cannot be ruled out. The oldest radiometric ages reported on rocks from a dredge haul within the Caribbean are 205 my and 207 my from a metasediment on the Yucatan escarpment (HEEZEN ET AL., 1974). Many of the rocks from both groups could be cross checked by radiometric methods other than K-Ar.

FOX & SCHREIBER (1970) reported on granodiorites from the eastern Cayman Trough, and EGGLER ET AL. (1973) recovered some ultramafic rocks from the central Cayman, but the bulk of the information from the Cayman region comes from the papers by PERFIT (1977) and PERFIT & HEEZEN (in press). The oldest radiometric age is 83 my (K-Ar) on a tonalite from the eastern Cayman and there are several granodiorites from the Cayman Ridge which yielded ages around 60 my. HEEZEN & PERFIT (unpublished) have recovered an astonishing variety of sedimentary, igneous and metamorphic rocks from the Cayman region. It is quite probable that the old question of whether or not the Greater Antilles are linked to Central America could be answered by comparative studies of the suites already recovered from the Yucatan Channel, Cayman Ridge and Nicaraguan Rise.

In 1977, PERFIT reported on an oceanic sequence of ultramafic, mafic and sedimentary rocks from the purported Mid-Cayman Spreading Center. This sequence has been confirmed by recent ALVIN dives.

FOX & HEEZEN (1975) review much of the dredge haul data from the Beata Ridge, Aves Ridge, Lesser Antilles and the Puerto Rico Trench through 1973. Interest in rocks from the Puerto Rico Trench has been continuous since the earlier study of BOWIN ET AL. (1966) reported a sequence of serpentinites, basalt, Cretaceous limestones and volcanic sediments from the north wall. Since 1973, PERFIT ET AL. (1974) have reported dredged greenschist, serpentinite and marble as far east as the eastern tip of Puerto Rico along the south wall of the Puerto Rico Trench; an apparent continuation of the northern Hispaniola metamorphic belt. More recently, HEEZEN ET AL. (1976) have used the ALVIN in dives off the Samana Peninsula into the Puerto Rico Trench and discovered marble in continuous outcrop from 2,600-3,600 m.

FOX ET AL. (1970), also reviewed in FOX & HEEZEN (1975), give the most complete reports on the Beata Ridge dredge hauls. Of particular interest are the basalts and dolerites recovered, similar to those later intersected by Deep Sea Drilling Leg XV in the Caribbean basins.

Dredging done prior to the Deep Sea Drilling Project activities on the Aves Ridge yielded a variety of volcanic rocks, volcanic sediments and limestones from seamounts, pedestals and escarpments (FOX ET AL., 1971; NAGLE, 1972; MARLOWE, 1971; PETER, 1972; FOX & HEEZEN, 1975). These rocks are very similar to those found on the Lesser Antilles. Some of the deepest dredges in the Aves region come from the southern end of the ridge where granitic, basaltic, doleritic and metabasalts have been reported. K-Ar age determinations on four of the granitic samples and one dolerite give ages ranging from 60-90 my. The suggestion made by Hess many years ago that the Aves Ridge represents a submerged island arc is no longer in doubt.

In the Lesser Antilles region most of the dredging effort has been in areas north of Guadeloupe. From a major escarpment immediately north of Desirade, basalts, metabasalts and intrusive rocks similar to the suite on Desirade have been recovered (JOHNSTON & SCHILLING, 1974; JOHNSTON ET AL., 1971). These rocks could represent an early island arc suite or slices of oceanic crust piled up against the arc.

North of Desirade, our compilation contains mostly dredge hauls reported by FOX & HEEZEN (1975) and unpublished dredge haul information from the University of Miami recovered from various escarpments. Most of the dredged rocks in this region are volcanic sediments and limestones. FOX & HEEZEN (1975) report Upper Cretaceous radiolaria in volcanic sediments from several localities and suggest that there may have been active volcanic centers along the Lesser Antilles in the Late Cretaceous.

South of Guadeloupe, the only dredge hauls in our compilation are alkali olivine basalts from the Kick'em-Jenny region north of Grenada (SIGURDSSON & SHEPHERD, 1974).

Several areas of the Caribbean are virtually unsampled by dredging. We note the following as particularly good dredging targets:

(1) The southern Nicaraguan Rise.
(2) The southern margin of the Caribbean.
(3) The southern Lesser Antilles.
(4) The southern coast of Haiti.
(5) The Windward Passage area.

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