V. REMOVAL OF FINE SEDIMENTS FROM ISLETS

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Sand and soil are nearly absent on Jabor and Mejatto Islets, both of which were awash during Typhoon OPHELIA. That such sediments formerly constituted significant parts of the surfaces of these islets is indicated by the prevalence of sand and soil on other islets, e.g. Pinlep and Majurirek, which were not flooded, and on the unflooded northern end of Mejatto Islet. Not only has sand that presumably once formed beaches along these islets largely been removed, but also sand and soil appear to be thoroughly winnowed out from among the cobbles and pebbles that now form a gravel sheet across much of these islets.

The destination of fine materials removed from the islets by storm waves has been determined by investigations of two types. First, a study has been made of sediments from the lagoon shore outward to determine the present position of various size-grades of material. Second, a comparison has been made of offshore geomorphic features of 1944 with those of 1958 through a comparison of aerial photographs.

The lagoon area off Jabor Islet was selected for examination of bottom sediments because it represents a place in which storm intensity and islet flooding had reached a maximum. Analyses of samples at 100- to 200-foot intervals from the shore outward and from depths down to 60 feet were made (Fig. 14). These show only coral gravel from the shore line outward 180 feet, poorly sorted lime-sand between 180 and 1000 feet, and an accumulation of leaf-like and branch-like coral fragments (Montipora sp. and Acropora sp.) beyond 1000 feet. This distribution is attributed to Typhoon OPHELIA. The lagoon beach with its lack of sand is in contrast with lagoon beaches developed by normal wave and tidal action. Poor sorting of the offshore sands and a lack of progressive decrease in median size with depths and distance outward suggest rapid deposition with consequent mixing. In those respects they differ considerably from offshore sediments reported from Kapingamarangi Atoll formed under conditions of normal sedimentation(McKee, Chronic, and Leopold, 1959, figures 5, 7, 8, and 9).

Additional features of the lagoon floor off Jabor Islet attributed to Typhoon OPHELIA are an offshore sand bar or ridge, parallel to the shore at 400 feet out, and a large accumulation of Pandanus trees from the land that rest on the sand floor at the 50-foot level, immediately beyond a steep drop-off 600 feet from shore (Fig. 14).* Thus the storm has left a record offshore consisting of poorly sorted fine sediments and land-derived materials which, if buried and preserved, will appear very different from the normal offshore deposits.

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* See Banner's remarks, pp. 77-78.

Pinlep and Majurirek Islets, where the typhoon effects were great but where flooding of the land did not develop as on Jabor, were also studied from the standpoint of lagoon sediments. Relatively little fine sediment was removed from these islets. Nevertheless, the offshore sands are poorly sorted (figure 18) as on Jabor, and seem to indicate a considerable amount of mixing as far out as samples were taken, 600 to 700 feet, and at depths as great as 15 to 25 feet. In contrast, lagoon beaches on these islets were formed of sand, analyses of which show good to fair sorting similar to that of beaches developed under normal conditions of reworking by waves and tides.

Constituents of offshore sand in the Jaluit Lagoon are shown by sample counts to consist largely of broken and worn pieces of coral, although mollusk shell fragments are also very common in all size grades. The tests of foraminifers, relatively uniform in size, make up more than 50 percent of the particles in the coarse-grain size, but are scarce in other size grades. Other contributions, including sea urchin spines and sections of Halimeda, are quantitatively unimportant. Comparison of these sediments with those accumulated at Kapingamarangi Atoll in similar locations but under normal conditions of waves and currents, suggest that the proportionately smaller amount of foraminifera in the very near-shore waters and their correspondingly greater numbers far out from shore at Jaluit are direct results of redistribution by the typhoon (McKee, Chronic, and Leopold, 1959). The relatively larger amount of coral debris may also be a result.

Studies of bottom sediments on seaward sides of islets on Jaluit Atoll were attempted for comparative purposes. On Jabor and Mejatto Islets sand was absent, probably having been removed by the storm waters that swept from these reef flats entirely across the islets. On Pinlep and Majurirek Islets, where storm effects were less intense, fine sediment of the reef flat was poorly sorted and relatively coarse, median diameters being greater than sand size (figure 18). The sediment was composed largely of coral fragments, contained some broken mollusk shells and Halimeda segments, but no foraminifers. Apparently most of the fine sand, if formerly present, had been removed.

Sand beaches are at present non-existent along much of the lagoon side of Jabor and Mejatto Islets. Aerial photographs taken since Typhoon OPHELIA reveal that a considerable area formerly occupied by beaches on these islets is now scoured to reef rock surface and sand deposits currently form loops, or bars in the offshore waters, each bar appearing as a half circle, convex outward. This pattern is especially well developed and forms a conspicuous feature along the middle part of Mejatto Islet (Fig. 16). Gentle lagoonward slopes and steeper shoreward sides on these bars, as seen in the photographs, are believed to result from gradual reworking of the sand masses by incoming waves off the lagoon.

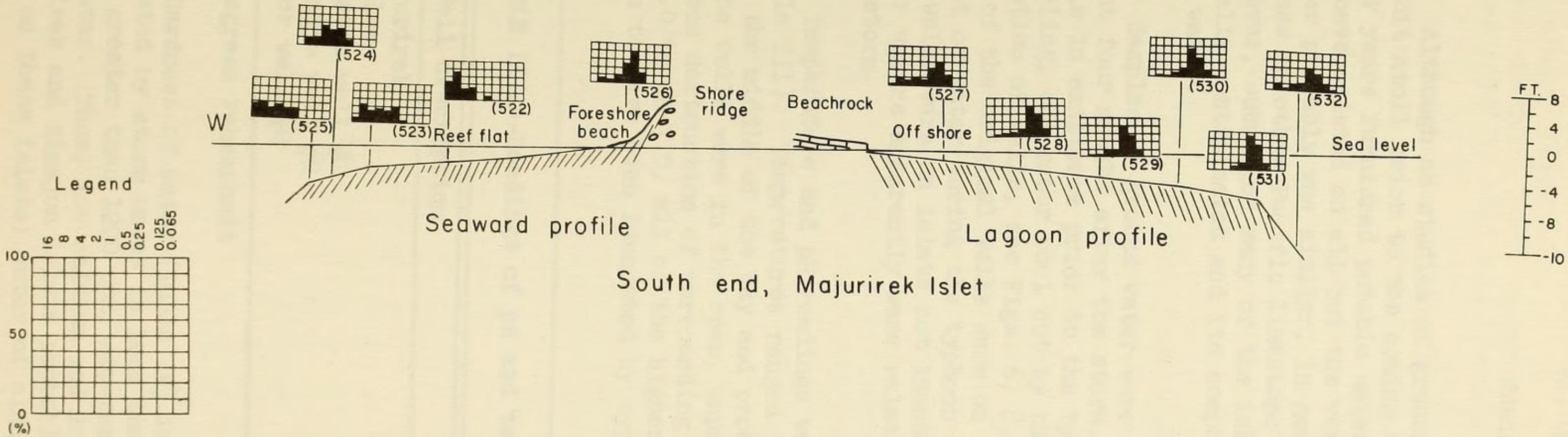
Legend
16
8
4
2
1
0.5
0.25
0.125
0.065
100
50
0
(%)
W
(524)
(525)
(523)
(522)
Reef flat
(526)
Foreshore beach
Shore ridge
Beachrock
(527)
Off shore
(528)
(529)
(530)
(531)
(532)
Sea level
Seaward profile
Lagoon profile
FT.
8
4
0
-4
-8
-10
South end, Majurirek Islet
SW
(502)
(501)
(500)
(499)
Reef flat
Foreshore
beach
(503)
Shore ridge
Sea level
(491)
Back shore
(490)
Foreshore
(492)
Off shore
(493)
(494)
(495)
(496)
(497)
(498)
NE
Seaward profile
Lagoon profile
FT.
8
4
0
-4
-8
0
100
200
FEET
Middle, Pinlep Islet

FIGURE 18