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Conspicuous features of organic reefs

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Introduction

Cooperative studies of Pacific reefs, especially in the last 10 years, have brought together oceanographers, biologists, and geologists, each dependent on the work of others and each to some degree inconvenienced by the diversity of names used to denote parts of reefs. The nomenclature of even the conspicuous features of reefs has varied widely. Although the field is much too active for stabilization in detail to be practicable, agreement is desirable for those features of reef and lagoon that appear to be generally present and therefore especially important in reef studies. The following list is purely utilitarian and descriptive; it is not intended as a comprehensive terminology with established priority of usage.

The immediate stimulus to this paper was provided by D. P. Abbott, Marston Bates, F. M. Bayer, and R. R. Harry of the Pacific Science Board's 1953 Ifaluk Atoll team, who worked up a set of names and discussed them with Tracey at Ifaluk and Guam. Discussion of these and other terms by Tracey, Cloud, and Emery at Manila in November 1953 led to the circulation of a provisional draft of the present paper to 17 colleagues for review and criticism. The replies were generally favorable and the comments that were received on specific features and terms helped greatly in preparing the final revision.

The following list, then, sets forth what we consider to be the most widely distinctive zones or features of reefs, illustrated by a hypothetical cross-section of an atoll (fig. 1). The zonation of barrier reefs (which are separated by a lagoon from preexisting land) and of fringing reefs (which border preexisting land) is close enough to that of atoll reefs so that most of the names are generally applicable.

Discussion

An atoll consists of a ring-shaped organic reef that encloses a lagoon in which there is no preexisting land, and which is surrounded by the open sea. The primary distinctions to be drawn are between outer slope, reef, island, lagoon, and smaller reef structures within the lagoon.

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2/ U. S. Geological Survey, Washington 25, D. C.

3/ U. S. Geological Survey, University of Southern California, Calif.

Channels and passes between ocean and lagoon are also of primary importance. Most of the difficulty with names, especially for those who must rely on collections and data gathered by others, lies in boundaries between the principal zones. The following terms are suggested, with purposely broad definitions:

1. Outer slope.--the steeply descending outer slope of the reef below the dwindle point of abundant living coral and coralline algae, which is ordinarily at about 10 fathoms.

2. Reef front.--the upper seaward face of the reef, extending above the dwindle point of abundant living coral and coralline algae to the reef edge. This zone commonly includes a shelf, bench, or terrace that slopes to 8-15 fathoms, as well as the living, wave-breaking face of the reef. The terrace may be an eroded surface or may be veneered with organic growth. The living reef front above the terrace in some places is smooth and steep; in other places it is cut by grooves separated by ridges that together have been called groove and spur systems, forming comb-tooth patterns. If the terrace is broad and well defined it may be well to designate it a separate reef zone.

3. Seaward reef margin.--the seaward edge of the reef flat, marked in places by an algal ridge and cut by surge channels, which are the landward extensions of the reef-front grooves.

4. Reef flat.--the upper surface of the reef, commonly exposed or awash at lowest tide. The presence of islands on the flat modifies the ecology of the reef; therefore, an important distinction should be drawn between island reef flats, or flats seaward from islands, and inter-island reef flats or flats between islands.

   The reef flat is commonly divisible into outer and inner reef flats, or outer, central, and inner reef flats; but one "inner" or "outer" zone may not be the close ecologic equivalent of another "inner" or "outer" zone.

   On inter-island reefs, and on seaward reef flats adjoining islands, the outer zone is toward the ocean, the inner is toward lagoon or shore. In rare instances a broad reef flat on the lagoon shore of an island may be subdivided into an outer lagoon reef flat, near the lagoon reef edge, and an inner lagoon reef flat, near the island; but careful distinction should be made between its parts and those of reef flats that abut the open sea. If a reef flat is not present on the lagoon side of an island, its place may be taken by a lagoon shelf, on which detrital sediments predominate over organic growth.

5. Seaward beach.---the seaward-facing beach of reef islands.

6. Lagoon beach.---the lagoonward-facing beach of reef islands.

7. Lagoon reef margin.---the lagoonward margin of the reef; unlike the seaward reef margin, it is not necessarily defined by growth. In some places, especially where islands are present, there may be no lagoon reef margin at all. If the lagoon reef margin is well defined, a lagoon reef front may be present and even a lagoon terrace, comparable to the seaward reef front and terrace. If the lagoon reef margin is poorly defined, a lagoon shelf may separate lagoon slope from reef flat or lagoon beach (fig. 2).

8. Lagoon slope.---the border zone of the lagoon that slopes downward from the lagoon reef margin or lagoon beach to the lagoon floor.

9. Lagoon floor.---the undulating to nearly level floor of the lagoon.

Minor organic prominences on lagoon floors or slopes, all broadly related, range from small mounds or tall narrow pinnacles to large masses, hundreds of feet in diameter. Some prefer to use a single term for all such features, for example, coral knoll, bioherm, or patch reef. The considerable physical and organic variety of these features is ecologically significant, however, and should be indicated in some way. In general it seems preferable to use informal names that will describe both the dominant organism and the physical appearance. Examples are: algal knoll; coral-algal mound; millepore patch; Acropora thicket, etc.

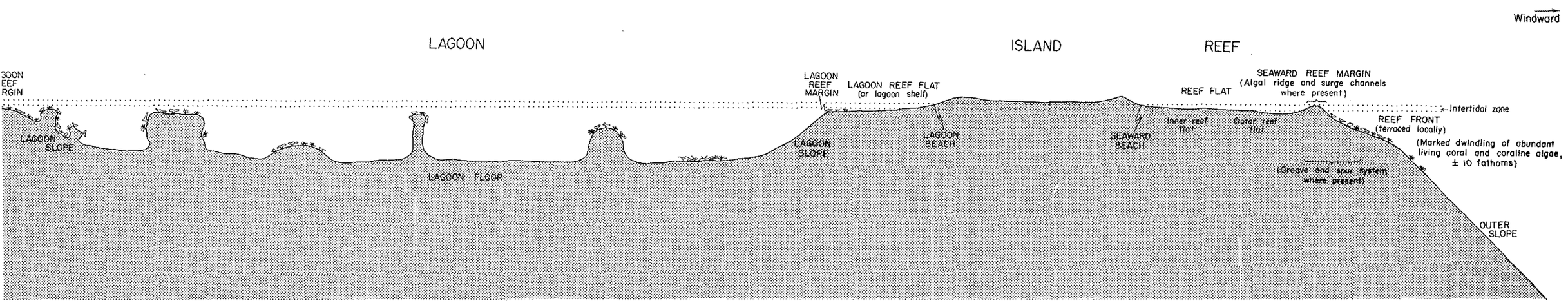
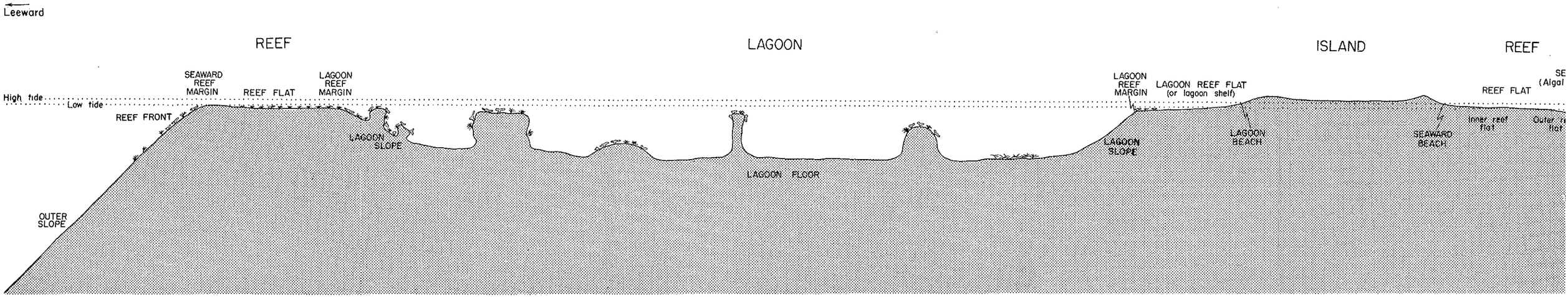


FIGURE I. CONSPICUOUS FEATURES OF AN ATOLL AND ITS PERIPHERAL REEF

Hypothetical section, not to scale, shows principal features by capital lettering; other features, subdivisions, and explanatory notes are indicated by lower case letters.



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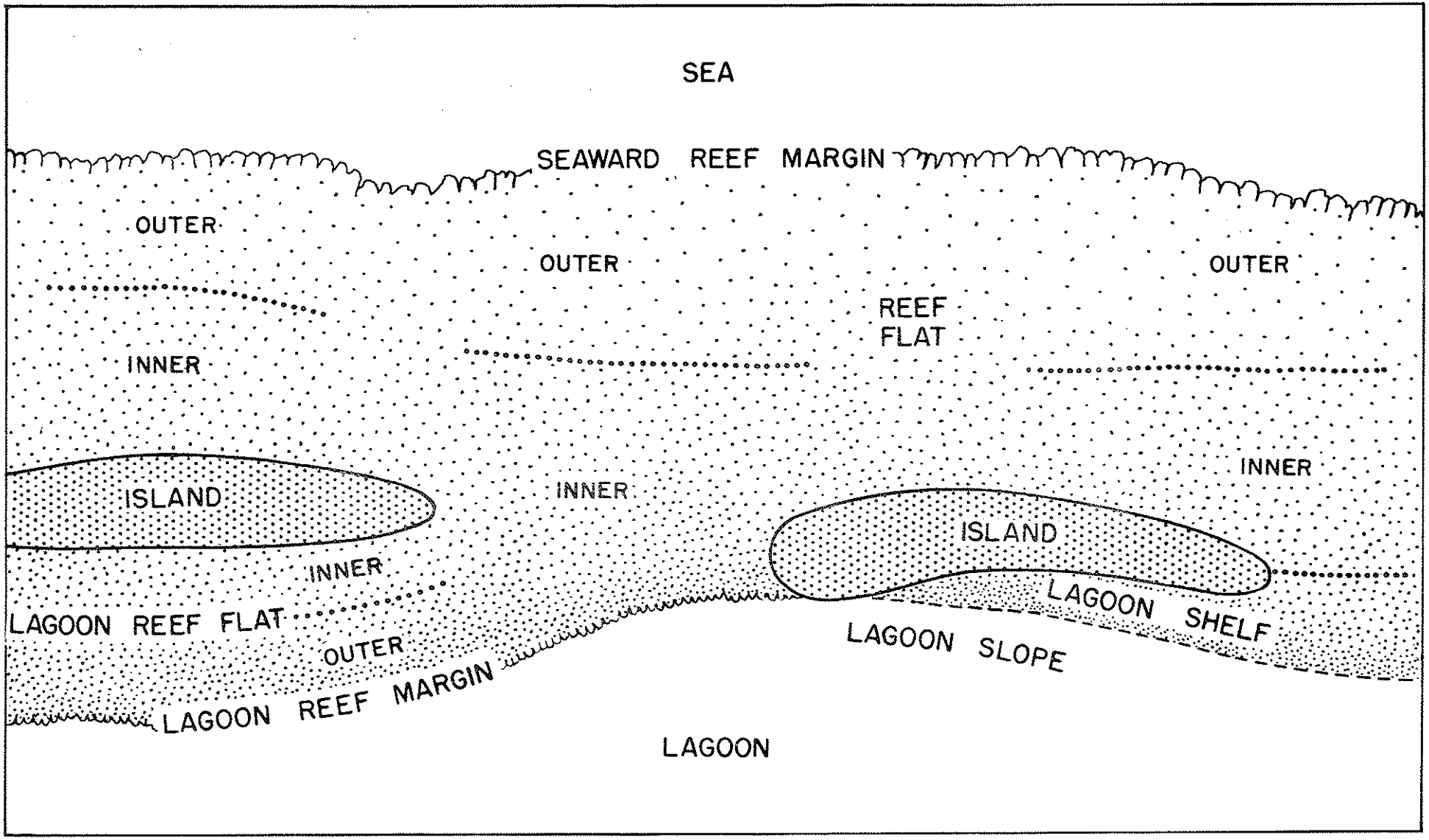

FIGURE 2. COMMON SUBDIVISIONS OF UPPER REEF SURFACE SEEN IN PLAN VIEW