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Zonation of corals on Japtan Reef, Eniwetok Atoll

by

Eugene P. Odum and Howard T. Odum

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by

Eugene P. Odum, University of Georgia, Athens

Howard T. Odum, Institute of Marine Sciences, Port Aransas, Texas

At the time of the publication of our paper "Trophic Structure and Productivity of a Windward Coral Reef Community on Eniwetok Atoll" (Ecol. Monogr., 25: 291-320. 1955) only tentative identifications of corals, mostly to genus, could be designated since our reference specimens, sent to the National Museum for study, had been returned with only partial identification of some specimens. Since exact identification to species was not necessary in our analysis of total structure and metabolism of the reef, code numbers were used in the text and tables of our paper, pending more complete determinations.

Upon his return from an overseas trip, Dr. John W. Wells of Cornell University, kindly consented to examine our collections during the summer of 1955. He has returned the material to us with his determinations of species. Since the Japtan Reef which we studied is located near the Marine Laboratory on Parry Island and may be frequently visited by workers at the laboratory it seems especially desirable to make available the final identifications. The Japtan reef, being relatively undisturbed, can serve as a "control" for studies of reefs more directly affected by nuclear weapons tests.

The series of corals was collected in a transect across the windward, inter-island reef about one-fourth mile north of Japtan (Muti) Island on Eniwetok Atoll, Marshall Islands. This reef, the physiographic zonation, and the location of sample quadrats have been fully described and pictured in the above mentioned paper. As shown in Figure 1, the reef at the study transect point exhibited 6 distinct zones. No collections could be made from the windward buttress zone. The other 5 zones are designated in Figure 1 and Table 1 as follows: A. Coral-algal ridge (breaker zone). B. Encrusting zone. C. Zone of small heads. D. Zone of large heads. E. Zone of sand and shingle with scattered large heads. The species of corals collected from these zones are tabulated in Table 1. Code numbers correspond to numbers listed in text and tables of the Ecological Monograph paper.

As would be expected, the gradients (from sea to lagoon) in depth of from about 6 inches to 30 feet and more and in current velocity from about 0.5 meter to less than 0.1 meter per second at "average" tide conditions result in sharp changes in species composition along the reef transect. The conditions at low spring tides are probably critical for many species since current velocities are greatly reduced; only a few inches of water may cover the windward zones and the large heads of Zone D may project a foot or more above water for several hours. Porites lobata appeared to tolerate the widest range of conditions as it could be found over most of the reef. Millepora platyphylla was the only species which appeared to exhibit a discontinuous distribution; it was an important species in Zones A and B and again in Zones D and E but not in Zone C. However, the growth forms or "ecotypes" of this species were quite different on the front and back reef; on the former, this coral was largely encrusting while in the deeper water zones the tall, branched finger-like form was prominent.

TABLE 1. Zonation of Corals on Japtan Reef, Eniwetok Atoll

SPECIES	Code Numbers	REEF ZONE				
		A	B	C	D	E
<u>Pocillopora danae</u> (E. and S.)	A-1	X				
<u>Acropora</u> sp. (Encrusting type)	B-1	X	X			
<u>Millepora platyphylla</u> H. and E.	B-2,E-1	X	X		X	X
<u>Favites halicora</u> (Ehrenb.)	B-4		X			
<u>Pocillopora verrucosa</u> (E. and S.)	B-7		X			
<u>Plesiastrea versipora</u> (Lam.)	B-3,B-5,C-2		X	X		
<u>Favia pallida</u> (Dana)	B-8,C-3		X	X		
<u>Porites lobata</u> Dana	B-6		X	X	X	
<u>Favites abdita</u> (E. and S.)	C-4			X		
<u>Cyphastrea chalcidicum</u> (Forsk.)	C-5			X		
<u>Porites lutea</u> M.-E. and H.	C-6			X		
<u>Pocillopora elegans</u> Dana	C-8			X		
<u>Acropora tubicinaria</u> (Dana)	C-9			X		
<u>Acropora conferta</u> (Quelch)	C-7			X	X	
<u>Acropora humilis</u> (Dana)	C-10,D-7			X	X	
<u>Echinopora lamellosa</u> (Esper)	C-11			X	X	
<u>Favia stelligera</u> (Dana)	C-13			X	X	
<u>Acropora corymbosa</u> (Lam.)	D-9				X	
<u>Acropora recumbens</u> (Brook) (?)	D-12				X	
<u>Montipora verrilli</u> Vaughan	D-3				X	
<u>Montipora foveolata</u> (Dana)	D-4				X	
<u>Goniastrea retiformis</u> (Lam.)	D-1				X	
<u>Stylophora mordax</u> Dana	D-8				X	
<u>Lobophytum pauciflorum</u> (Ehr.)	D-10				X	
<u>Millepora murrayi</u> Quelch	E-2					X
<u>Helipora coerulea</u> (Pallas)	E-3					X
<u>Turbinaria globularis</u> Bernard	E-4					X

As may be seen from Table 1, only three species were found along the breaker zone, which on the Japtan reef was largely covered by algae. On Zone B, the encrusting Acropora and Millepora and small "doughnut-shaped" heads of Porites, Favites, Plesiastrea and Pocillopora were most conspicuous. On Zone C the massive types of Favids and Porites (two species) were characteristic while in Zone D the branching Acroporas were conspicuous. Within the extensive "zone of large heads" there was a noticeable sub-zonation with the Acropora, Porites, Pocillopora and Stylophora in Zone D while Heliopora and the two species of Millepora formed a distinct zone lagoonward which is designated as "E". The scattered large heads on the lagoon edge were largely Turbinaria but we did not use the aqua-lung to investigate the deeper waters. Undoubtedly, there are other species beyond Zone E.

It should be pointed out that species B-3 which was designated as "Leptastrea" in Tables 1, 2, 3, 5 and Figure 7 of our monograph (Odum and Odum, 1955) should be Plesiastrea versipora. This species was of a special interest to us in having multiple bands of skeletal algae. Also of special interest were the two species of Favites (B-4, halicora and C-4 abdita) which had about twice the chlorophyll content per square centimeter of surface as any other species studied.

In addition to the species shown in Table 1, which were the ones actually collected along the study transect, the following additional species were picked up from other parts of the Japtan reef.

Astreopora myriophthalma (Lam.) (M-29)
Platygyra rustica (Dana) (M-19)
Montipora composita Crossland (M-3)
Distichopora irregularis Moseley (M-12)

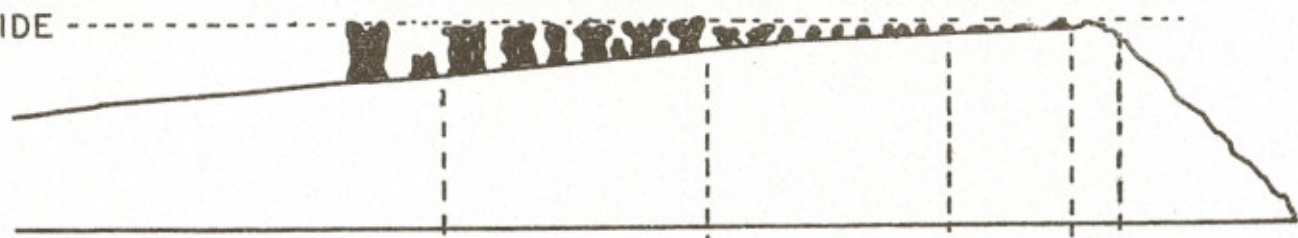
Finally, the species of Lobophyllia (R-1) which we used to determine polyp and algae biomass (see Table 1, Odum and Odum, 1955) has been determined to be L. corymbosa (Forsk.) by Dr. Wells. We did not find this species on Japtan but collected it on the leeward side of the atoll at Rigili Island. It was used because the large polyp size made possible dissection of components for comparison with the indirect methods used with other species.

Figure 1. Diagram of the Japtan reef transect, side view (upper) and aerial view (lower) showing zonation referred to in text and in table 1.

PHYSIOGRAPHIC
ZONES →

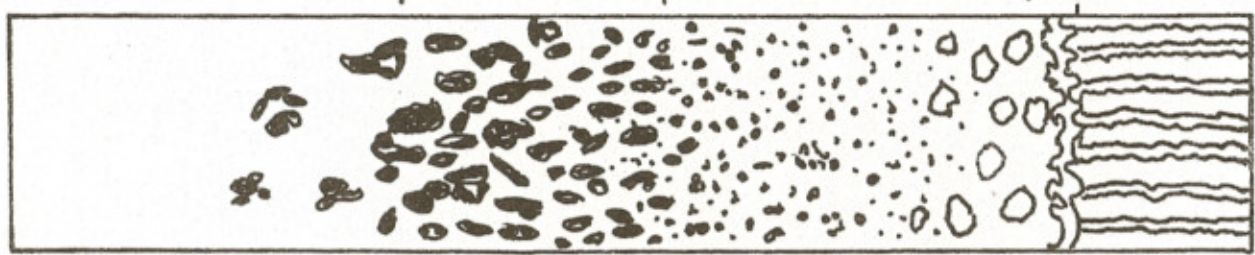
SAND-SHINGLE LARGE HEADS SMALL HEADS ENCRUSTING RIDGE BUTTRESS

LOW TIDE



CORAL
ZONES →

E D C B A



LAGOON

← CURRENT

SEA