

## V. FLORA AND VEGETATION OF CORAL ATOLLS

The flora of atolls is best discussed under several major headings. These are 1) Vascular plants, 2) Bryophyta, 3) Fungi, 4) Soil flora, 5) Marine algae.

1. The vascular flora of atolls is known in a general way, but as much from inference as from actual collections and observations. It is known that it is limited in numbers and that its most striking components are from the pan-tropic strand flora, with some admixture of more mesophytic elements in localities where conditions permit. Of the several hundred atolls and low islands known, we may say that the floras of Bikini, Rongelap, Rongerik, Eniwetok, Arno, Kapingamarangi, Satowan, Pingelap, the Hawaiian atolls, Rose, the Pacific Equatorial Islands, and Johnston Island are fairly thoroughly known. Those of most of the other Marshall Islands, Flint, Vostok, Caroline, Tubai, Maria, certain of the Tuamotus, Funafuti, Canton, Wake, Nomwin, Ant, Mokil, Ulithi, Woleai, Nukuoro, Cocos Keeling, Maldives, Laccadives, Chagos, and Alacran Reef, are more or less known, having been collected by more than casual visitors. The remainder, possibly the majority, are either not known at all or only very casually.

Recent intensive collecting on a few atolls has dispelled the idea that atoll floras are so uniform that they are not worth bothering with. Differences have emerged which suggest that if the floras of all of them were thoroughly known very significant patterns might well emerge. Certainly understanding might develop as to the effect of distance and habitat on the effectiveness of dispersal. The idea has also been suggested that if a large number of sea level atolls and those elevated ones known were thoroughly collected, statistical treatment of the results might yield evidence on the putative recent eustatic shift in sea level.

2. Only a few scattered bryophytes are known from atolls. On some of the dryer atolls there obviously are none. But very few collectors have been on any atoll long enough to bother about hunting for mosses. It may be safely stated that the bryophyte flora of atolls is essentially unknown.

3. The fungus flora is dealt with separately in a paper added by Dr. Rogers.

4. Notwithstanding its obvious importance, the microflora of the soil is scarcely known for any atoll. The work on the collections of Dr. Taylor from Bikini and neighboring atolls is the only exception. It has shown that there are at least notable floras of Chytridiales and Actinomycetales in atoll soils. Dr. Baas Becking's investigations on the blue green algae in the soil crust suggest that here is a field of great interest awaiting investigation.

5. The marine algae are also dealt with separately in the attached paper by Dr. Taylor.

The vegetation of atolls is even less well-known than their flora. Superficially the vegetation of most of them is rather similar, which has given rise to the notion that there are no significant variations in atoll vegetation. It is, however, obvious that there is a perfectly graded series from extremely dry and barren to very wet and lush atolls. Their surface features, land areas, and history of human occupation add other very striking variations. And it is very obvious that the role of hurricanes and typhoons in determining the vegetation is an important one.

Though superficial descriptions of atoll vegetation are many, careful, detailed ones are almost lacking. Millspaugh's paper on the vegetation of Alācran Reef, the descriptive parts of the Funafuti report, Rock's paper on Palmyra, Setchell on Rose Atoll, Christophersen's papers on the Central Pacific and Hawaiian atolls, descriptions of one or two atolls in the U. S. Commercial Company reports, and Taylor's recent book on Bikini are about all that are available. Taylor's book deserves further comment. Never before has such a thorough work on either the flora or the vegetation of an atoll been written. From now on it will be a basic point of orientation and comparison for all future studies.

Obviously, with such vast gaps in our information on both floras and vegetation of so many atolls, no opportunity should be neglected for further collecting and observation. Emphasis might well be laid on longer visits than the hit-and-run type so common in the past. This is especially necessary if significant descriptions of vegetation are to be prepared. Furthermore, no adequate picture of the cryptogamic flora, especially of the parasitic forms, the minute soil inhabiting plants, and the marine algae will be obtained without specific efforts being made toward these ends.

Another obvious task that should be undertaken is the preparation of a flora of coral atolls. This should be planned to include the plants recorded from atolls in the literature, records available in herbaria, and all new information that is accumulated during the course of the investigations carried on by this project, the Bikini project, etc. It could be carried in card-catalog form for several years, then brought together for publication. At least three people should be concerned with its preparation, one for vascular plants and bryophytes, one for fungi, and one for algae. These could obtain such collaboration as would be necessary from specialists of their acquaintance. The main centers of deposit of atoll plant specimens are the Bishop Museum, Honolulu, the U. S. National Herbarium, Kew, and the Paris Natural History Museum. These would have to be visited and combed for material.

F. R. Fosberg

V. (a) FUNGI

The fungi of the atolls have been little collected, and there are almost no published reports on them of any consequence. The German and Japanese students who gave occasional lists of fungi of the Pacific islands from the early 1800's into the 1940's seem to have devoted most of their attention to high islands. What fungi were reported from atolls seems to have been specimens picked up in passing by collectors seeking vascular plants, and they are all large fleshy or woody species. Except for the Marshall Islands, atoll fungi remain almost unknown. From that group only 16 fungi had been reported up to 1947. The recent book by Taylor, and the lists begun by Rogers, indicate that fungi are considerably more numerous in this group. Together these authors list 43 species; but since of their collections the Ascomycetes, the most abundant groups of Basidiomycetes, and the whole mass of foliicolous forms remain mostly unnamed, it is certain that in this best-studied archipelago the majority of fungi - at least three quarters of the species - remain unknown.

The gaps in present knowledge are such that no recommendation for an area of concentration is possible. Economic fungi - those causing disease of man and of higher plants, and those causing decay of timber and fabric - are almost completely unknown even from the Marshalls; distribution of species among atolls, and the relation of atoll to high-island fungi, are equally unknown.

D. P. Rogers