

## Impressions of the Ferns of Porto Rico

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On a first visit to the West Indies a botanist of the northern United States would be most impressed, I think, by the palms and ferns. In the fall of 1913 the writer spent about two months in Porto Rico studying and collecting the grasses of the island. The ferny by-products of this trip have proved to be of some interest.

Save a narrow strip along most of the coast Porto Rico is all hills and hollows. Except along the dry south coast, ferns are in evidence almost everywhere from sea level to the highest summits, becoming more plentiful the greater the altitude. My first day in the highlands was October 23 at Maricao, which we reached about half-past seven, after two hours' ride up the winding road through the cool morning mists, past coffee and banana groves, the roadside banks in places completely covered with ferns. After café at the fonda we set out, following up the Rio Maricao, scrambling over the rocks and in and out of the water most of the way. Maricao is 1500 feet high and we ascended some five hundred feet only in the five or six miles we made up river. The beauty of that rocky stream of clear rushing water, its banks hung with strange trees and shrubs and gorgeous flowers, with ferns everywhere they could find a foothold, on rocks, on the trunks and branches of trees, was intoxicating. I met my first tree ferns here. One, some 25 feet high, a species of *Alsophila*, was collected in fruit. It has fronds six or eight feet long, the stout woody stipes beset with spines like a blackberry cane. On its trunk were growing *Polypodium asplenifolium* L., its long narrow fronds drooping over on their slender fuzzy stipes, and *Trichomanes*

*scandens* L., a lovely filmy with lacy fronds twelve to fifteen inches long. Two other filmies, *Hymenophyllum polyanthes* Sw., with lacy fronds six to ten inches long, and *Trichomanes arbuscula* Desv., with erect, tufted, relatively dense fronds two to four inches high, the latter in turn affording foothold to a minute liverwort, were also collected here. Three species of *Elaphoglossum* with entire fronds, the fertile ones smaller and soft pinkish brown, found space on the tree trunks; also *Polypodium piloselloides* L. and *Rhipidopteris peltata* (Sw.) Kaulf., with solitary fronds evenly spaced along slender wide-creeping rhizomes which cling by numerous rootlets to the tree, weaving in and out among the other occupants. The *Rhipidopteris* has sterile fronds in shape much like an attenuated leaf of *Viola pedata*. The fertile fronds, raised on long stipes, are little peltate affairs about half an inch across. It is surprising how many species and individuals can find accommodation on one tree trunk. A single tree may bear several species of ferns, big and little, various orchids, peperomias, and bromeliads. *Polystichum adiantiforme* (Forst.) J. Sm., with great fronds two to three feet long, spaced upon a twining, chaffy, rope-like rhizome, was perched high up on a trunk along with its small relatives. Two other species of *Polypodium* also were collected: *P. angustifolium* Sw., with long, narrow, simple, leathery fronds, and *P. duale* Maxon, a very delicate little moss-like plant with tiny saw-toothed fronds like a fairy's scroll saw. *Pteris altissima* Poir., even more gigantic than our own brake, grew on the banks of the Maricao.

The following day I made a trip to Monte Alegrillo, reaching a higher altitude, and seeing mountain palms and more tree ferns, especially the common, but none the less lovely, *Cyathea arborea* (L.) Sm., with great plummy fronds and a nest of fiddle-heads, three or four

feet long. On an open grassy hilltop overlooking the southwest corner of the island I collected *Botrychium Jenmani* Underw., the first record of this species from Porto Rico. I rejoiced more, however, over finding here in abundance the hitherto little known *Paspalum portoricense*.

The higher mountains, rich in quality, but poor in quantity of grasses, afforded time for collecting ferns which were always abundant where grasses were scarce. Filmy ferns were found on all the dense moist forested upper slopes. A species of *Trichomanes* with fronds about a quarter of an inch long was found on moist rocks by a waterfall on the Arecibo road to Utuado, but nowhere else. Alta de Bandera, east of Adjuntas, was the ferniest place I have yet seen, with the possible exception of El Yunque. Three species of *Hymenophyllum* were here, two with tiny fronds suggesting thalli of *Riccia fluitans* strung along a thread, the other *H. microcarpon* Desv., with fronds three to six inches long. With these were *Trichomanes scandens* the lovely, *T. crispum* L., and *T. capillaceum* L., the latter a species with fronds emaciated to the last degree, with nothing left of them but the nerves—all fairly common on the wet, jungly mountain side. *Asplenium Serra* L. & F., *A. salicifolium* L., *A. cristatum* Lam., *Diplazium arboreum* (Willd.) Presl., and *Vittaria lineata* (L.) Smith were also found here. *Olfersia cervina* (L.) Kunze with large pinnate sterile fronds, with entire firm pinnae as much as eight inches long and two inches wide, and bipinnate fertile fronds reduced to a skeleton, was strikingly unlike anything I had ever seen before. But the strangest fern I ever saw was *Hymenodium crinitum* (L.) Fée, with a cluster of sterile fronds in shape and size like the leaves of skunk cabbage. The fertile frond is of like shape, but much smaller, about six inches long. The stipes are densely clothed with coarse black hairs.

These hairs (or more properly scales) with enlarged bases and attenuate tips are sparsely scattered over the under surface of the sterile frond. Facing in all directions they look absurdly like infant tadpoles with their enlarged heads and long wavering tails.

On El Yunque, in the luxuriant mountain palm forest, every stump and tree and stone was covered with ferns. In one slightly open spot was a lovely grove of tree ferns, the finest I saw anywhere. Among species I had not before collected were *Polypodium cultratum* Willd., *Trichomanes rigidum* Sw., *Vittaria remota* Fée, and a species of *Pleurogramma*, the latter resembling *Vittaria*, but with the sporangia down the center instead of along the margins. A beautiful *Selaginella* found in most of the wet forests was abundant here.

Most of the *Lycopodiums* of Porto Rico are very different from any of our species. *Lycopodium reflexum* Lam., found growing on wet rocks on Alta de Bandera, reminds one of *L. lucidulum*, but the other species, growing high up on trees and hanging in great tassels two or three feet long appear strange to northern eyes. *Lycopodium linifolium* L. and *L. taxifolium* Sw. have linear leaves half an inch to an inch long, crowded and imbricate in the second species. In *L. aqualupianum* Spring the crowded leaves are elliptical, about a centimeter long, the slender terminal fertile branches with small scale-like leaves. *Lycopodium setaceum* Lam., a common species, has minute, oblique, scale-like leaves throughout, these lax, but resembling those of our own *L. clavatum*.

*Polystichum rhizophyllum* (Sw.) Presl, with the habit of our walking fern, is found about mountain passes in the center of the island.

On the limestone cliffs of the northern and western coast the ferns were mostly those with compact habit and more or less leathery fronds. In pockets in lime-

stone cliffs, somewhat sheltered by brush, grew *Sphenomeris clavata* (L.) Maxon, well named, for the sterile pinnae are wedge-shaped and the fertile club-shaped. *Anemia adiantifolia* (L.) Sw. and *Asplenium dentatum* L. grew in like places.

*Polypodium exiguum* Hew. and *Adiantum melano-leucum* Willd. grew in shaded places on the limestone cliffs. A peculiar fern ally, suggesting *Gnetum* in appearance, *Psilotum nudum* (L.) Griseb., braved the sun on the open cliffs.

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### Seed-bearing Ferns.

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The prevailing belief of three centuries ago as regards the mysterious process supposed to surround reproduction in ferns was well voiced by Shakespeare when he says: "We have the receipt of fern seed; we walk invisible."

Now, since the compound microscope and an improved technique has put us in the possession of the intricate details of reproduction and development in the ferns, it is not much to be wondered that it then seemed so shrouded in mystery. But, complicated as the process is known to be, it is only a step in the history of the evolution of the great group of ferns.

Until a few years ago we rested secure in the belief that the dominant types of living plants—the flowering plants—were dominant because they had developed the seed-bearing habit. Within the past dozen years, however, it has been demonstrated that in the oldest land flora of which we have any knowledge, namely, that which lived in early and middle Devonian time, there was a great group of plants, which, while still