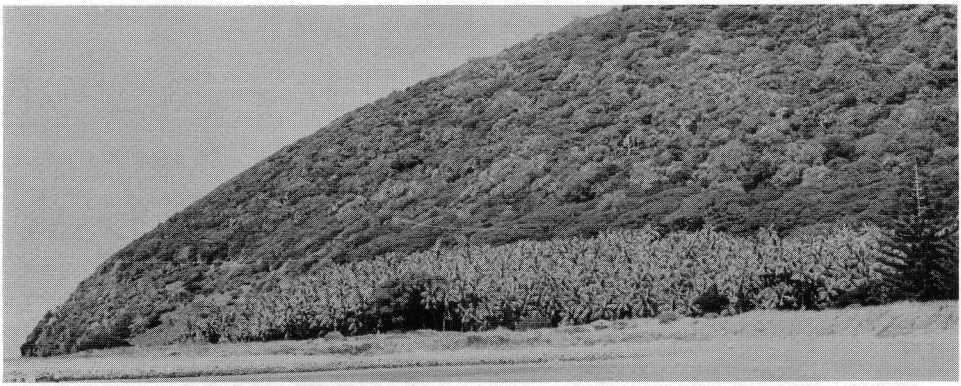


15. A grove of *Howeia Forsteriana*, North Beach at north end of island.

Max Shick which I learned to use on Lord Howe and which proved useful elsewhere in the Pacific, is obviously modelled after the climbing device to be seen in use on p. 119 of the National Geographic article mentioned.

Lord Howe Island deserves the adjectives used to describe it and is understandably a popular place for the vacationer who likes a quiet relaxed uncrowded place. For palm devotees it has its four palms found nowhere else to recommend it as well. One leaves Lord Howe with more than reluctance but the next step for me was the realization of a long-standing dream, a visit to New Guinea and the islands eastward to Fiji completing the palm circuit.

Dichotomous Branching in Palms?

P. B. Tomlinson and H. E. Moore, Jr.

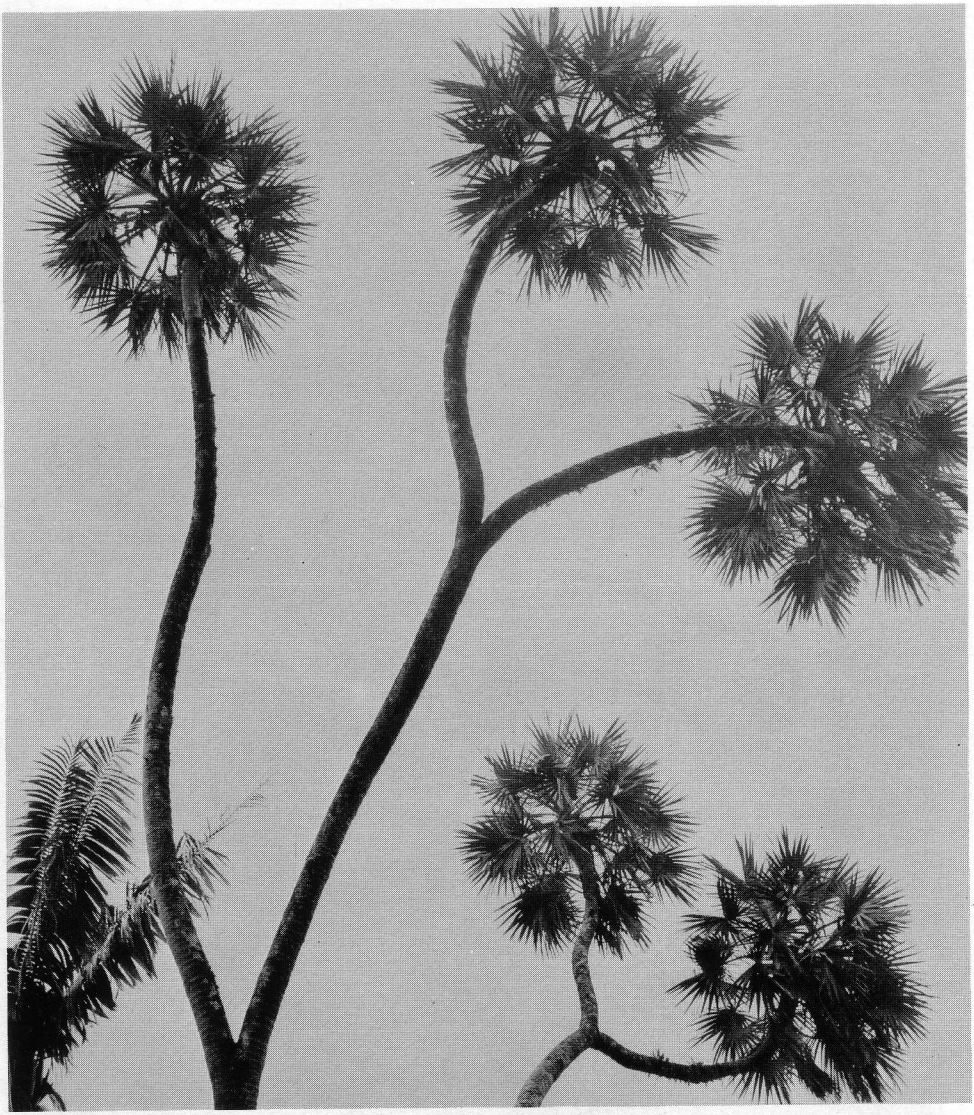
Palms are usually thought of as having solitary or clustered unbranched aerial stems each with a terminal cluster of leaves, though in fact some kind of branching does occur basally to produce clustered or colonial palms (Tomlinson, 1964).

A peculiar type of branching, however, occurs with regularity in some palms. This is an apparently equal forking of the axis which, for descriptive purposes, we refer to in this article as "dichotomy," though we are as yet unable to demonstrate whether it is a true dichotomy in the botanical sense or only an apparent dichotomy. The most striking and familiar example is found in some species of *Hyphaene* from Africa, Arabia and India. It is less widely known that several other palms show the same or a similar type of "dichotomous" branching. We would like to draw attention to some of these examples and to suggest the need for further observation among the palms as well as the need for detailed studies of development to determine the exact nature of the branching pattern or patterns. Because the term dichotomy has a very particular definition botanically, the word and its adjectival derivatives, are placed in quotes in the following paragraphs when used in a more general sense.

That this branching in *Hyphaene* may be a true dichotomy, resulting from an equal division of the crown, and not the result of a precocious development of a lateral branch, is suggested by the observations of a Dutch botanist, Schoute (1909). He had available for study only

1. *Nannorrhops Ritchiana*: early stage in "dichotomy" of crown from a specimen at Fairchild Tropical Garden. Photo by P. B. Tomlinson and M. V. Parthasarathy.

2. *Nannorrhops Ritchiana*: a well developed stem "dichotomy" in a specimen at Fairchild Tropical Garden. Photo by P. B. Tomlinson and M. V. Parthasarathy.



3. *Hyphaene thebaica*: branching stems of a single tree. Photo by W. H. Hodge.

a short segment of the stem of *Hyphaene thebaica* which included a single fork. Despite this limited material, Schoute concluded from a study of the arrangement of the leaves and particularly from the presence of a peculiar triangular scale-like structure at the level of the fork that in its development the bud had bifurcated equally at this level. However, neither Schoute nor any subsequent investigator has had material sufficient to show the development of the dichotomy.

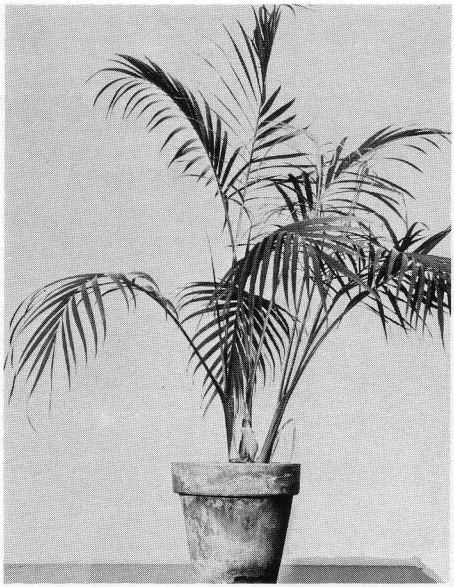
Truly dichotomous branching of the stem is not uncommon among some lower plants, including the seaweeds, hence is assumed to be a primitive feature in evolution. It is certainly rare in higher plants and it is unlikely that the "dichotomous" branching we see in palms is a primitive feature. Rather, it

seems to be a specialized feature occurring constantly in certain genera and species in four subfamilies. It must be emphasized that our records refer to a type of branching exhibited by individuals of a species as a normal property, rather than the occasional branching of isolated individuals of normally unbranched species which is probably always a response to some kind of injury or, as in *Chrysalidocarpus lutescens*, due to development of an axillary bud into a branch.

"Dichotomous" branching is now known from the following palms.

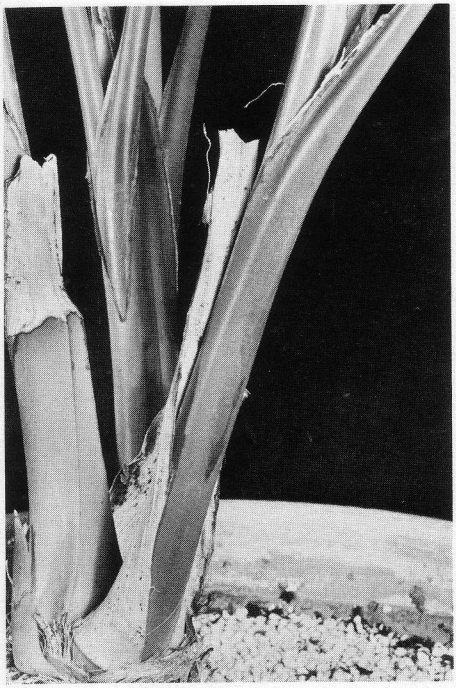
(1) *Nannorrhops Ritchiana* (subfamily Coryphoideae) (Figs. 1, 2). We have not seen this species in its native habitat in N.W. India where it apparently is of rather low growth, almost with the habit of *Serenoa*. We have seen it in the presumably more favorable growing conditions of South Florida where it tends to grow erect as does a wild plant illustrated (as *N. Ritchieana*) by Gupta (1960). This erect habit, incidentally, also occurs in *Serenoa* under certain circumstances. *Nannorrhops* branches profusely, producing suckers basally. The more vigorous aerial axes, however, branch in dichotomous fashion and we have watched the development of "dichotomy" in one specimen at the Fairchild Tropical Garden. "Dichotomy" appears to be equal but there is no triangular scale at the level of forking. In *Nannorrhops*, the resulting branches eventually behave differently. One proceeds to flowering, producing an inflorescence which terminates growth of the branch. The other branch may apparently fork again and repeat the process.

(2) *Hyphaene* (subfamily Borassoideae) (Fig. 3). Beccari (1924) listed 28 species in his monographic study of the genus. According to his key, the first 20 species have branching trunks. Among these are such familiar species as *Hyphaene thebaica*, *H. indica* and *H. Schatan*. Stems of *Hyphaene reptans*, an incompletely understood species from southern Arabia not included in the key, also fork. By contrast, unbranched and often swollen aerial trunks in clusters are usual for *Hyphaene ventricosa* and probably for the few species allied to it. The habit is inferred rather than known for a number of species to which branching is ascribed and it is clear that very considerable field study is required before we know as much about *Hyphaene* as we should.



4. *Chamaedorea cataractarum*: a male plant grown at Cornell University with twin stems at left, shoot dividing at right. Photo by M. V. Parthasarathy and N. Uhl.

(3) *Chamaedorea cataractarum* (subfamily Arecoideae) (Figs. 4-9). Branching of the horizontal rhizomatous axis of this palm was described and illustrated (as *C. Martiana*) by Velenovsky in 1913, presumably from specimens cultivated in greenhouses in Europe. More recently it has been possible to study *C. cataractarum* at Cornell University where plants, male and female, are cultivated in a greenhouse. There leaves



5. *Chamaedorea cataractarum*: close-up of same plant with twin stems in foreground, dividing shoot in background — note the unusual leaf sheath with solid center and two lateral channels surrounding new branches. Photo by M. H. Stone.

6. *Chamaedorea cataractarum*: close-up similar to Fig 5 but from opposite side with branching shoot in foreground. Photo by M. H. Stone.

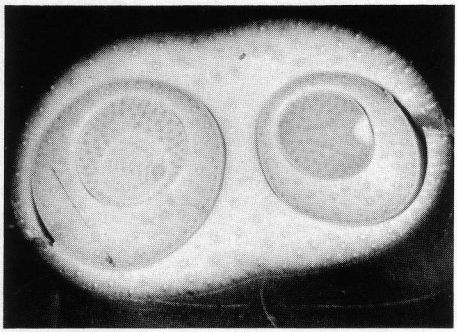
and inflorescences are produced in normal fashion for a time along a procumbent stem which eventually develops a single apparently terminal leaf with fasciated pinnae in the lower half of the blade (a feature noted by Wendland when he described *C. Martiana*). The sheath of this leaf is not tubular but has a solid center and two lateral channels from each of which develops a shoot (Figs. 5, 6, 9). These shoots are nearly equal and superficially almost mirror-images of each other. In the female plant, which had earlier branched into two parts, a third shoot was produced on one half, apparently in place of an inflorescence in the axil of the leaf or one of the leaves just below the locus of branching. The portion of the male plant illustrated (Fig. 8, 9) was dissected to obtain the apex for anatomical investigation of the phenomenon but detailed study has not yet been made nor does it seem likely that an answer will be obtained without the examination of many branched apices.

(4) *Vonitra* (subfamily Arecoideae) (Fig. 10). *Vonitra utilis* occurs infrequently in the remnant of the once extensive forest of Analamazoatra near Perinet, Madagascar. Though several juvenile single-trunked specimens were seen by the junior author, the only two in flower and fruit had each branched in two successive and apparently equal "dichotomies." A plant cultivated near the railroad station at Perinet, however, had flowered while the trunk was undivided. No attempt has been made to study the "dichotomies" other than in their gross aspect.

Vonitra Thouarsiana, a species more

7. *Chamaedorea cataractarum*: dividing shoot removed. The "terminal" leaf with fasciated pinnae in lower part of blade appears at left, leaves from daughter branches tied together at right. Photo by M. V. Parthasarathy and N. Uhl.

8. *Chamaedorea cataractarum*: close-up of shoot in Fig. 7. Note that leaves of branch at left are further developed than those at right. Photo by M. V. Parthasarathy and N. Uhl.



9. *Chamaedorea cataractarum*: cross-section of shoot in Fig 7 with same orientation as Fig 8 to show greater development of branch at left. Photo by M. V. Parthasarathy and N. Uhl.

frequent near the east coast of Madagascar, flowers while still unbranched but eventually does fork at least once, as noted in the wild and in plants cultivated (as *Dictyosperma fibrosum*) at the Botanical Garden in Peradeniya, Ceylon. *Vonitra crinita* is reported to branch but the fourth species of the genus, *V. nossibensis,* is said by Jumelle (1927) to have generally an unbranched trunk at maturity.

(5) *Nypa* (subfamily Nypoideae). The underground creeping stems of this palm form extensive stands in estuarine waters of the Far East. Leaves are spirally arranged, but each leaf base is asymmetric by unequal growth of its somewhat fleshy tissues so that all leaves grow erect at more or less the same angle. Inflorescences are lateral (axillary). Periodically, the creeping stem bifurcates. In our examination of the one shoot available for dissection, from specimens cultivated at the Coconut Grove Palmetum, Miami, Florida,* we could find no triangular scale at the

10. *Vonitra Thouarsiana*: a branched specimen cultivated in Madagascar. Photo by A. C. Langlois.

* We should like to express our thanks publicly to Mrs. A. R. Jennings who generously made available material of *Nypa* and to Mr. W. H. Schulz, Jr. of Polk Nursery Company, Inc. who provided plants of *Chamadorea*.

point of bifurcation corresponding to that seen by Schoute in *Hyphaene*. An interesting feature of this bifurcation is that the daughter axes have the leaves

arranged in contrasted spirals, mirror-images of each other. *Nypa,* in its native environment, grows in such abundance that it would be a favorable subject for detailed study. Our only caution is that the would-be-investigator will have to endure mud, sweat and blisters in digging out his specimens.

Quite clearly "dichotomous" branching is not a unique property of *Hyphaene* and it seems possible that it may be discovered in other groups of palms. Equally clearly, its nature needs investigation.

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Coccothrinax inaguensis — A New Species from the Bahamas

Robert W. Read

While collecting plants with the Allison Armour Expedition to the West Indies in 1932, Drs. David Fairchild and P. H. Dorsett found a *Coccothrinax* growing on rock and on sand dunes along the coast of Great Inagua Island, the southernmost island in the Bahamas. Seeds were sent to the United States Department of Agriculture Plant Introduction Station (Chapman Field) near Miami, Florida. Three individuals from the original introduction are still growing where they were planted many years ago. Mr. Harold F. Loomis, a past Director of the Station, recognized the plants as distinct from any he had seen and brought them to my attention several years ago. Attempts to identify them with known species of *Coccothrinax* have failed.

When it was learned that Dr. John Popenoe was making a collecting trip to Great Inagua in connection with his studies of Bahamian plants, he was asked to bring back specimens of any *Coccothrinax* found on the island. In May, 1964, he brough back leaves and infructescences of a *Coccothrinax* which matched the specimens growing at Chapman Field. It was indeed distinct from *C. argentata,* the only other species of the genus previously recognized from the islands. A month later, another specimen was collected by Dr. Robert Grimm of Florida Atlantic University while he was collecting algae with the research team of the Lerner Marine Laboratory. It too proved to be the same as the plants under study.

The plants grown from seed collected some thirty years ago on this remote island of the Bahamas as well as recent