DIELLIA AND ITS VARIATIONS

By

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Christ (5, p. 241)[1] remarks in describing Hawaiian ferns:

> The most striking genus in the Hawaiian flora is *Diellia,* very neatly quadripinnate, tufted ferns with stems gleaming like copper and kindred to those of *Lindsaya,* from which on the whole a habitual difference, rather than a difference founded really on the somewhat inserted sorus, separates them. With almost volcanic violence a type is here torn asunder into at least seven species, of which the simplest, *Diellia pumila,* delusively resembles our *Asplenium trichomanes,* and the most developed, *Diellia centifolia,* resembles a tripinnate *Odontosoria.*
>
> Brackenridge, Hillebrand, and Diels have striven to fix this group exactly. Here aesthetics seem to have been the guiding motive in the determination. But perhaps "have been" is not the right expression for a group that appears to the searcher to be still in confusion. They alone are worth a trip to that "Paradise of the Pacific."

In this statement Christ could not have meant *Diellia centifolia* (pl. 1, *A*), for this is once-pinnate, as illustrated by Diels and described by Hillebrand. It was probably *D. Knudsenii* variety or *D. Mannii* (pl. 2, *A*).

In a survey of the genus, preparatory to a morphological study of the young sporophyte, I faced so many uncertainties in nomenclature among collectors, so many variations in form in herbarium material, so many evidences of the fact that the genus is rapidly disappearing, that it seemed worth while to record what facts I could obtain from fresh material and from herbaria in Hawaii and elsewhere. (See Table 1.)

Hooker and Hillebrand include these species under *Lindsaya,* but Diels, Christ, Christensen, Bower, and Copeland place them in a separate genus, *Diellia.* Bower (2, pp. 26-28) gives from Diels and Christ these diagnostic features for maintaining it as a substantive genus: the leaf segments are not unilateral but obliquely triangular, and the indusium of *Diellia* is broadly adherent. Christensen (6, p. 25) says:

"Its systematic position is not settled. . . . I believe that only two or three really good species can be upheld. The eighth spe-

[1] Numbers in parentheses refer to Literature Cited, p. 15.

Table 1. Specimens of *Diellia* in Herbaria.

Examined in Herbaria	Diellia Mannii	Diellia Alexandri and varieties	Diellia Knudsenii and varieties	Diellia laciniata and varieties	Diellia centifolia			Diellia falcata erecta pumila
Bernice P. Bishop Museum	2	7	....	....	....			34
Brooklyn Botanical Garden	4	4	....	....	....			3
University of California	3-4	3-4	1	....	....			14
E. B. Copeland	....	....	...	....	....			6
Massachusetts State College	....	....	....	....	....			1
Missouri Botanic Garden	....	....	....	....	....			10
New York Botanical Garden	6[b]	7	2	3[c]	1			13
Sheffield Scientific School	4	3-4[d]	1[e]	....	1[f]			8
Smith College	....	4	....	....	....			3
F. G. Smith	....	....	....	....	....			29
E. LeRoy Topping	....	....	....	....	....			7
United States National Museum	1	1	1	....	....			13-15
Wellesley College	1	1	....	....	....			5
Total								146-148
Known from Lists						Diellia erecta	Diellia falcata	Diellia pumila
Amherst College	1	1	...	....		...	...	....
University of Berlin	....	7	6	3		6	5	2
Herbarium Bonaparte, Paris	....	6	....	....		4	8	3
Gray Herbarium	1	....	....	....		1	1	....
Kew Gardens	2	....	....	....		5[a]	7	3
Vassar College	....	1	....	....		....	1	1
University of Vermont	....	2	....	....		....	....	....
Total	25-26	47-49	11	6	2	16	22	9

[a] One is likened to *Diellia Boydii*; [b] six fragments, bits of pinnae; [c] one is called *D. Boydii*; [d] one may be *D. Knudsenii* or *D. Mannii*; [e] called *D. Knudsenii*, but answers to *D. centifolia*—one may be *D. Alexandri* or *D. Knudsenii*; [f] called *D. Knudsenii*, pictured by Diels, but not included in his list of species in the Berlin herbarium.

cies, . . . *D. Mannii,* is totally different from the other seven species and I place it in the genus *Loxoscaphe.*" Copeland (7, p. 74), on the contrary, says: "The genus seems to me to be a natural one and to include that species [*D. Mannii*], and to be related in its entirety to *Asplenium.*"

This group of ferns, whether a distinct genus or not, has been considered endemic in Hawaii since the discovery of the species *Diellia erecta, D. falcata,* and *D. pumila* by Brackenridge on the Wilkes Expedition (1838 to 1842). Species and varieties found later, mostly the result of Knudsen's collecting on Kauai, were recorded by Hillebrand (9) and the types deposited in the Museum of Berlin and illustrated by Diels (9).

An examination of the records of various herbaria shows few dates later than the one for the first collection of any species except *Diellia falcata, D. erecta,* and *D. pumila.* Specimens from Kauai bear the dates: *D. Knudsenii,* Knudsen, 1883; *D. centifolia,* 1879; *D. laciniata,* 1879?; *D. Mannii* (*Loxoscaphe*), 1879. *D. Alexandri* appears mostly in early collections (about 1879) from Maui; the exceptions are a specimen from Maui collected by Baldwin in 1892 and one from Molokai collected by Forbes in 1912.

In the winter and spring of 1928 and 1929 I collected ferns on the islands of Kauai, Oahu, Maui, and Hawaii. On Kauai in the region of Halemanu, where Knudsen recorded the finding of *Diellia laciniata, D. centifolia, D. Alexandri,* and *D. Knudsenii,* I found not a single plant of these species. From the reports by others of the same lack of success, I am inclined to think that these species have almost, if not quite, disappeared from Hawaii. At any rate, the specimens are too few and too fragmentary to draw conclusions regarding characteristics which are supposed to determine the species. Many specimens in herbaria are represented by only a bit of a frond. It is possible to speak with more assurance concerning *D. Alexandri* (pl. 3). I have seen 25 plants of this species and find enough differences in the amount of dissection of the fronds to explain all the varieties mentioned by Hillebrand.

Brown (4, pp. 46-47) describes a new species, *Diellia Brownii,* from the Marquesas, the first found outside Hawaii. It has anastomozing veins but is much larger than any other species, and the shorter sorus, in proportion to its width, reminds me of some of the

Aspleniums. Christensen makes the following comments on a specimen of *D. Brownii* examined by him in 1932:

> This is not a species of *Diellia* but very closely related to *Nephrolepis* (*Isoloma*) *acutifolia* (Desv.) Christ. It may [be] considered a variety of it or, if you like, a species, differing by the not confluent sori. The genus *Isoloma* Thn. (if available name) should probably be restored.

Diellia falcata, D. erecta, and *D. pumila* are well represented and appear in the herbaria of the United States and are still collected. Besides those listed in Table 1, I have examined 11 plants collected by Mr. LeRoy Topping on the mountains of Oahu (Kawaihapai), 6 from a different region on Oahu (Makaleha), and 12 plants and 8 extra fronds from the island of Lanai collected by Mr. G. C. Munro. In addition, I have a few fronds from Maui and one plant from Molokai, a gift from Mr. Otto Degener. In all, some 130 plants and extra fronds were available for study of variation.

Brackenridge (3) describes and figures *Diellia falcata* and *D. erecta* (pl. 1, *B*) and describes *D. pumila* (pl. 2, *B*). His type specimens, deposited in the United States National Herbarium, are from Puu Kaala (Oahu), western Maui, and Oahu, respectively. Since that time these species have been found on the other large islands of Hawaii, but several collectors call them "rare." Hillebrand (9, p. 621) remarks: "The distinctive characters of the three preceding species [*D. falcata, erecta,* and *pumila*] mark extreme forms which gradually approach each other." Bailey (1, p. 23) states:

> It seems marvellous that ferns so nearly alike as the last three species [*D. falcata, erecta,* and *pumila*], all of whose habits are much the same, and whose forms are very erratic, should be separated, while others of constant forms, but differing in habit as well as form, under the circumstances must be united.

Christensen (6, p. 25) thinks that of the whole genus "only two or three really good species can be upheld"; but he does not say which these may be. Descriptions of the three species (*D. erecta, falcata,* and *pumila*) as given by Brackenridge, Diels, and Bailey differ in a number of points. The length of the stipe as recorded by these four taxonomists is for *D. falcata* 1 to 4 inches (2.5 to 10.2 cm), which is 4 inches less than the shortest length given for *D. erecta,* 5 to 10 inches (12.7 to 25.4 cm). The stipe of *D. pumila* is shorter yet, 1 to 3 inches (2.5 to 7.6 cm). All of them emphasize the paleaceous stipe of *D. falcata* (pls. 1, *B;* 4, *A*). As described

by Brackenridge (3, pl. 219), the stipe is "terete, of a dull brown color, and densely chaffy with ligulate, membranaceous, entire, reticulated paleae" (fig. 1, *f*). Hillebrand (9, p. 620) says these paleae become narrower and acuminate toward the rachis, "which generally carries reddish fibrils" (fig. 1, *e*). Brackenridge writes that *D. erecta* has "reddish-brown," "nearly round" stipes with "a few stiff scales at the base," and that *D. pumila* is "naked." Hillebrand says that *D. pumila* has a few stiff dark scales at the base of the stipes.

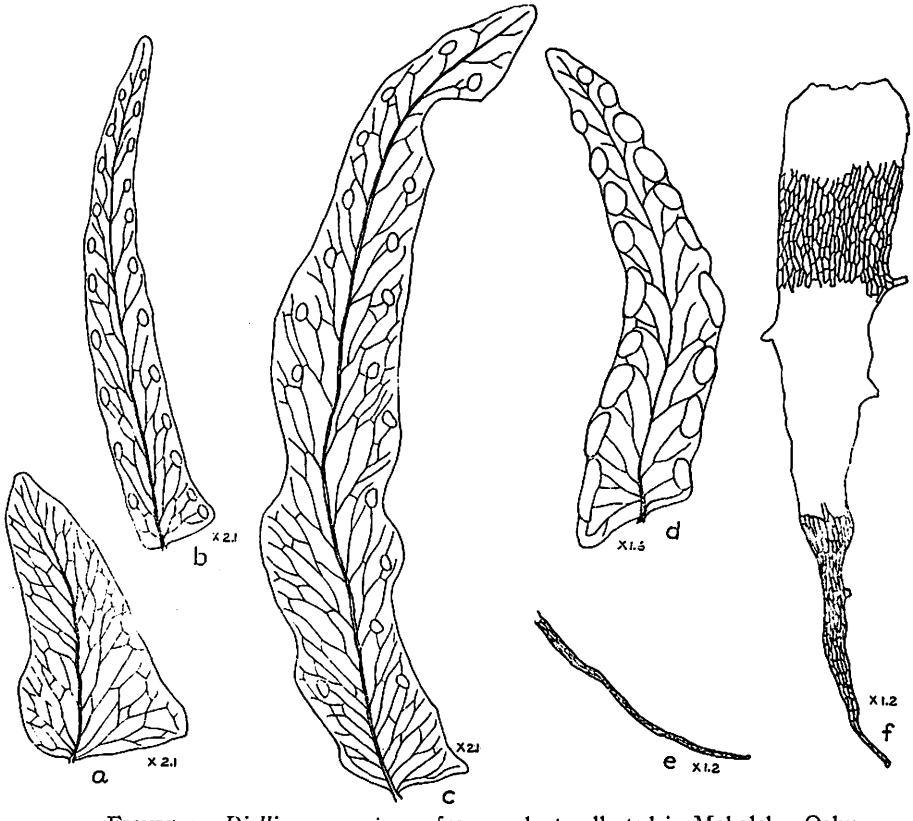

FIGURE 1.—*Dielliae: a-c,* pinnae from a plant collected in Makaleha, Oahu, showing variation in size, venation, and position of sori, auricles less pronounced than usual; *d,* typical pinna from a plant collected by G. C. Munro on Lanai, fusion of sori less than usual; *e,* fibril from one of the stipes on a specimen of *D. falcata* in Missouri Botanical Garden (compare with palea in fig. 1, *f*); *f,* palea from a plant collected in Makaleha, Oahu, February 1, 1931, probably *D. falcata,* center of palea composed of cells like base and tip.

The length of the frond differs in the species also. *D. falcata* is 12 to 18 inches (30.5 to 45.6 cm), *D. erecta* 7½ to 15 inches (19 to 38 cm), and *D. pumila* is 3 to 9 inches (7.6 to 22.8 cm). Brackenridge gives 3 inches (7.6 cm) as the length of the whole frond plus the stipe for *D. pumila.* I am unable to decide whether or not the length of the frond as given is exclusive of the stipe in all the descriptions.

The fronds are lanceolate in *D. falcata* and *D. erecta,* linear in *D. pumila.* Brackenridge gives the length and width of the pinnae in *D. erecta* as 2 inches by 3 lines (5.1 by 0.6 cm), Bailey as 1 inch by 3 to 4½ lines (2.5 by 0.6 to 0.8 cm). Hillebrand gives for *D. falcata* 1 to 3 inches by 2 to 6 lines (2.5 to 7.6 cm by 0.4 to 1.2 cm). Brackenridge pictures the pinnae of *D. falcata* as once and a half as long as those of *D. erecta. D. pumila* is consistently smaller, 3 to 8 lines by 1½ to 3 lines (0.6 to 1.6 cm by 0.3 to 0.6 cm). As suggested by their dimensions, the pinnae are more or less linear in *D. erecta* and *D. falcata;* in *D. pumila* ovate to triangular. All three have distinct auricles on the superior half and this part twice as broad as the inferior half. In addition, *D. falcata* is said to be falcate in shape, as the name implies, or ensiform. *D. erecta* has one or two pairs of lower pinnae about an inch apart, ovate rather than linear; *D. falcata,* according to Brackenridge, shows the pinnae approximate. In *D. pumila* the pinnae are crowded and at the base are orbicular. All authors describe the sori in *D. erecta* as intramarginal, but in *D. falcata* and *D. pumila* as marginal to submarginal, except *D. falcata* β variety, of Hillebrand, which is marginal. Brackenridge describes the tip of the frond of *D. falcata* as "short and hastate," and Hillebrand calls attention to the apex, "pinnatifid . . . with cultrate to cuneate segments." These features are not mentioned by either writer for *D. erecta* or *D. pumila.*

As to habits of growth, Brackenridge remarks: *D. erecta* has a "tufted" appearance and is found "in mountain forests of the western division of Maui"; *D. falcata* "on open and dry rocky ridges; rare. Rootstock short and globular. . . . Fronds few, tufted;" *D. pumila* in "crevices of the rocks; rare. . . . Caespitose." Bailey finds *D. pumila* "on the damp side of gulches." Applying the characteristics mentioned by Brackenridge, Hillebrand, Diels, and Bailey to the specimens of the three species which could be examined, *D. pumila* is the most easily recognized. It is a good species, according

to Brackenridge. The same can not be said of *D. falcata* and *D. erecta*. If, as Brackenridge suggests, the length and the paleaceous character of the stipe and the marginal or submarginal sori are the determining points, the length of the stipe and position of the sori are variable, even in the specimens most clearly like the type. If the paleaceous character be insisted upon, only about 15 specimens could be placed here (pl. 4, *A*). Removing from the group these 15 specimens of *D. falcata,* 11 which are quite surely *D. pumila* (3 or 4 others that may be *D. pumila* are too imperfect for identification) and 4 or 5 *D. erecta* (pl. 1, *B*), there are left about 100, which intergrade: they have the general appearance of *D. falcata,* but few or no scales, and a short stipe and the position of the sorus like *D. falcata.* Others resemble *D. erecta* but have too short a stipe and the sori marginal.

Dr. F. O. Bower suggested to me that possibly a study of the plants from the different islands might throw some light upon their variations; that from the separation of their habitats upon the mountain slopes there might come some special evolutionary peculiarities. It seemed possible to make a comparison of plants from Oahu, Molokai, and Lanai. From Oahu I studied one set of 11 plants, gathered at one time from the same place, Kawaihapai; a second set of 5 from Makaleha; and a single plant from Pohakea. Besides these I examined in the herbaria of other institutions a few more specimens whose locality was indicated clearly on the sheets. In this first set, collected January 27, 1929 (pl. 4, *B*), there is much variation in the length of the fronds, stipes, and pinnae; the fronds range from 5 to 13½ inches (12.7 to 33.5 cm) (*erecta*),[2] the stipes from 2¼ to 5 inches (5.7 to 12.7 cm) (*falcata*). This is more nearly the length of *D. falcata,* as most of the stipes are much less than 5 inches (12.7 cm) long. The pinnae were measured for width close to the point where they narrow beyond the auricle. The longest pinna is 2⅝ by 5/16 inches (6.7 to 1.1 cm), the shortest 1¼ by ⅜ inches (2.8 by 0.9 cm). The width is much greater, twice as much in some pinnae, but the length is slightly more than that given for the longest pinna of *D. erecta,* but much too short for *D. falcata.* The number of pinnae is less than that recognized for *D. falcata,* as Brackenridge (3, pl. 31) illustrates 37 for *D. falcata* and 28 to 30 for *D. erecta.*

[2] The use of *erecta* and *falcata* in parentheses indicates that the feature mentioned suggests one or the other species.

Most of the stipes are smooth, but a few show some slender fibrils (*erecta*). In some fronds, especially young ones, the sori have a distinctly intramarginal position; in others they project even beyond the margin (*erecta, falcata*). All agree in having lanceolate fronds, falcate pinnae, a difference in the two halves of the pinnae, and an auricle distinct but not always sharply so (fig. 1, *a-c*).

Besides the differences in the fronds of different plants, as great differences appear in the fronds on the same plant; differences in position of sori, of stipe length, and pinna shape (pl. 4, *B;* fig. 1, *a-c*). Brackenridge (3) defines the species: *Diellia falcata* "differs from the preceding species [*D. erecta*] in its shorter and paleaceous stipe; in the falcate fronds tapering at the base; and in having the indusium about equal with the margin." As a description of the plants studied, this sentence does not indicate a clearly defined species, though it applies better to *D. erecta* than to *D. falcata.*

Dr. W. R. Maxon has told me that there are in the United States National Herbarium 10 to 12 specimens of *Diellia* differing from *D. falcata* and *D. erecta,* but resembling them more than any other species, so that he had thought of making a new species. I can not see how the making of a new species would help to solve the problem presented by the plants which I have studied, for in many specimens two fronds on the same plant differ as widely as fronds on two plants.

The second set, from Makaleha, Oahu, collected by Mr. Topping, consists of smaller plants than the type, and several fronds of the youngest have scaly stipes with the lowest pinnae more deltoid and farther apart. The longest frond measures 9½ inches (24 cm) and its stipe 2½ inches (6.4 cm). The sori are marginal, but some of the fronds are evidently too young for sori. A study of this set alone might lead to the conclusion that scales are a juvenile characteristic, but in other specimens some old fronds have scales and some young ones are without them. In herbarium specimens from other places the following characteristics are noticed:

Makaleha: 2 or 3 plants, rather small, with fibrils only, stipes 1½ to 2½ inches (3.8 to 6.3 cm) (*falcata*), fronds 9 inches (22.8 cm) (*falcata*), intramarginal sori (*erecta*) to those projecting (*falcata*).

Mokuleia: 2 plants, all scaly stipes, 2 to 2¼ inches (5.1 to 5.7 cm) (*falcata*), fronds 15 inches (38.2 cm), pinnae 1¾ by ¼ inches (4.4 by 0.6 cm), sori submarginal to marginal with coenosori (*falcata*).

Waianae: 2 sheets, all fronds scaly, stipes 4 to 6 inches (10.1 to 15.2 cm)

(*erecta*), fronds 15 to 17 inches (38.2 to 43.2 cm), sori marginal (*falcata*), pinnae 2½ by 5/16 inches (6.3 by 0.8 cm) with coenosori occasionally.

The specimens from Makaleha, Mokuleia, and Waianae show even wider range of variation than those from other parts of Oahu, for there is some fusion of sori, and two sets are paleaceous.

From Molokai Bernice P. Bishop Museum has 11 specimens of *Diellia,* 7 of them collected by C. N. Forbes at Pukoo, 2 from Pelekunu Valley (pl. 5, *B*); 2 from Kaunakakai; 3 in the Missouri Botanical Garden, 2 from Pukoo; and 2 from Kahuaai Gulch collected by Mr. Otto Degener, one presented to the University of California and the other to me. A study of 16 of these plants showed the following features, listed, measured, and tabulated as before: length of stipes 1½ to 7 inches (3.8 to 17.2 cm) (*erecta*), of fronds 3½ to 24 inches (8.8 to 60.71 cm), with the longest stipes belonging to the longest fronds, 18, 18½, and 24 inches (45.6, 46.9, and 60.7 cm). Another group might be selected, with stipes ranging in length from 3 to 4½ inches (7.6 to 11.4 cm) and fronds from 7 to 13 inches (17.2 to 32.9 cm)—the shortest group with stipes 1½ to 3 inches (3.8 to 7.6 cm) belong to fronds from 3½ to 12 inches (8.8 to 30.4 cm), most of them less than 12 inches.

None of the 16 plants are paleaceous, a few have marginal sori, and the number of pinnae ranges from 16 to 42, according to the size of the plant. Most of these features indicate *D. erecta,* though some of the specimens are labeled *D. falcata.* But there is some disagreement, for though most of them have intramarginal sori, a few have marginal. The largest fronds have 37 pairs of pinnae, more than those of *D. erecta* or even *D. falcata.*

From Lanai Bernice P. Bishop Museum has two sheets of *Diellia,* not identified, with 6 fronds badly broken. They were collected by C. N. Forbes in 1917. The stipes are not paleaceous and are about 2½ inches (6.3 cm) long for an 11-inch (27.9 cm) frond. The fronds have very large sori, which in the dried condition almost touch across the frond. A third sheet, of unidentified plants, collected by Mr. G. C. Munro in Mahana Valley in a sea-water hole (pl. 6, *A*), shows 2 fronds, 12 and 15½ inches (30.5 and 39 cm) with stipes 2¾ and 3 inches (7 and 7.6 cm) long. They have 39 pairs of pinnae with large sori, confluent but not really marginal (fig. 2). The sori are so full that they touch across the vein. In a single sorus I

counted more than 200 sporangia. The frond resembles *D. falcata,* except for the lack of paleae. The amount of confluence of the sori is greater than in any other specimen, in some pinnae extending half their length and in many being most extended near the auricle.

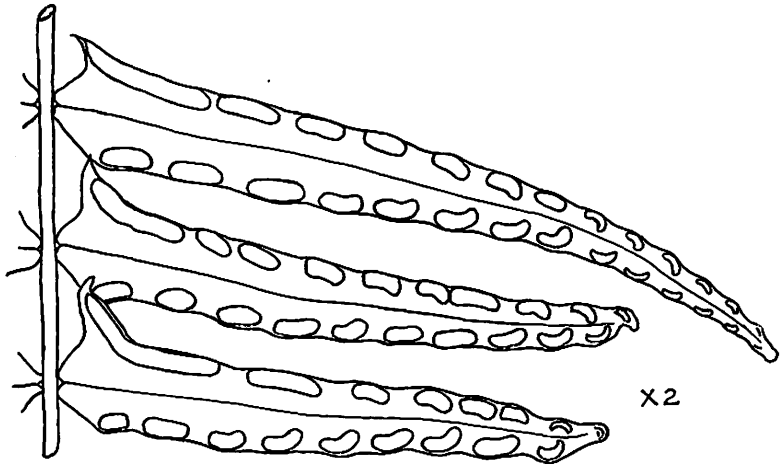

FIGURE 2.—Portion of central part of longer frond of *Diellia* illustrated on plate 6, *A,* showing coenosori.

A collection from Mahana Valley, July, 1929, sent me by Mr. Munro, consists of 12 plants and 8 separate fronds taken from different plants which had been left among the rocks. Munro's description of the habitat is as follows:

> Elevation 1960 feet, growing on a very steep valley side, on faces of rock, not decomposed sufficiently to be actively eroding but soft enough and with interstices enough to hold moisture, also in crevices of harder rock. Suffering at present from unusually dry conditions. Shade is fairly dense from the tops of large *Pisonia* and *Aleurites* trees but not dense enough to interfere with fern growth. This plant, however, seems to be confined to rock faces where it has least competition.

In the plants from Lanai (pl. 7), the stipes are grooved as usual. They measure 2 to 4½ inches (5.5 to 11.4 cm) in length; have at the base 5 or 6 very long scales or fibrils, which are more slender than in *D. falcata* (fig. 1, *f*). The pinnae are obtuse, 1¾ by ¼ inches (4.5 by 0.6 cm) long in the longest frond, which is 16 inches (40.5 cm) and the stipe 3 inches (7.6 cm) long. This is short for a typical *D. erecta.* The other loose fronds vary also in the width of

the pinnae; their shape is more like that of some *D. pumila,* especially in the younger and more delicate fronds where the sori are fewer. Sori of large size and confluent seem to be common (fig. 1, *d*).

From Maui, Kauai, and Hawaii I have seen only a few plants, not enough to compare as a set with those of the other islands (pl. 5, *A*).

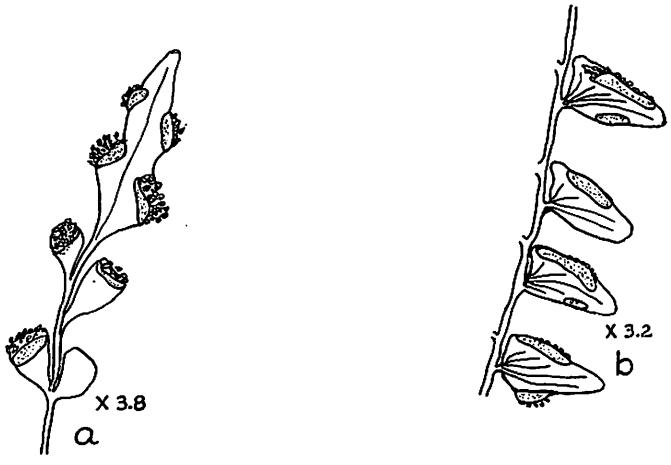

FIGURE 3.—Portions of *Diellia pumila* (?) illustrated in plate 6, *B: a,* tip of smallest frond, where sori are carried to tip in process of reduction of pinnae; *b,* a few pinnae near middle of largest frond—note size of sori, probable fusion, and small amount of anastomozing in veins.

A small plant recently sent me from Pohakea Pass, Oahu, is so much like *Asplenium Trichomanes* in its general appearance that H. Christ might have had it in his hands when he likened it to *Diellia pumila.* But while just one frond is like *Asplenium Trichomanes,* the others are more like *A. platyneuron,* with the pointed pinnae, auricles, and sori of *Diellia* (pl. 6, *B*). The species must be *D. pumila,* but the sori are fewer and nearer together (fig. 3, *b*). The veins anastomoze less, perhaps because the pinnae are so small; but a more unusual feature is the distinct fusion of sori (fig. 3, *a, b*), so that in a few pinnae there is a suggestion of *Lindsaya.* In different herbaria I have seen 3 or 4 specimens that exhibit these features. Obviously variation is not entirely lacking in *Diellia pumila,* which is the most constant species. In the fusion of the many sori the line extends to the blunt tip of the pinna (fig. 3, *a*).

In a study of species, plants should be compared in the field to note such special adaptations to the environment as lengthened stipe in shady situations, thinner fronds, and different size in different situations where the moisture content of the soil might affect the whole growth. Even the scaliness of the frond and stipe should be examined as to variations appearing in the different conditions of the habitat. I believe that variations may be definitely caused by ecological conditions and that on the different islands variations may be developing along certain lines which are related to ecological conditions. Besides this possibility of ecological species it should be remembered that Hawaiian plants, even aside from habitat causes, are noted for their great variation in every way. Such studies as this can be only suggestive, but unless botanists are very fortunate there will be even less material in the future than I have had for experimental work. For many plants I have not tried to determine the species, as I am more than ever inclined to the view of Hillebrand concerning the three species, *Diellia erecta, D. falcata,* and *D. pumila:* "Distinctive characters . . . mark extreme forms which gradually approach each other." That certain plants are clearly the ends of a series in which the middle members are much more numerous and less well defined is indicated by this comparison of *Diellia.*

I appreciate that conclusions drawn from such meager material may have little value, but lest there should not be an opportunity in the future for a study of a genus which is endemic in Hawaii and so rare that only a few plants have found their way into herbaria during the last 20 to 30 years, the few facts recorded here and the variations especially noted may not be without help for further study by a fortunate collector and investigator.

This study was begun in Hawaii during the winter and spring of 1929, when I was enjoying a Bishop Museum Fellowship from Yale University. To Mr. LeRoy Topping of Honolulu and to Mr. G. C. Munro of Lanai my thanks are due for collections of *Diellia;* to Mr. E H. Bryan, Jr., and to Miss Marie C. Neal for willing companionship on collecting trips; and to Dr. H. E. Gregory and the Trustees of Bernice P. Bishop Museum for a room and facilities in the Museum buildings.

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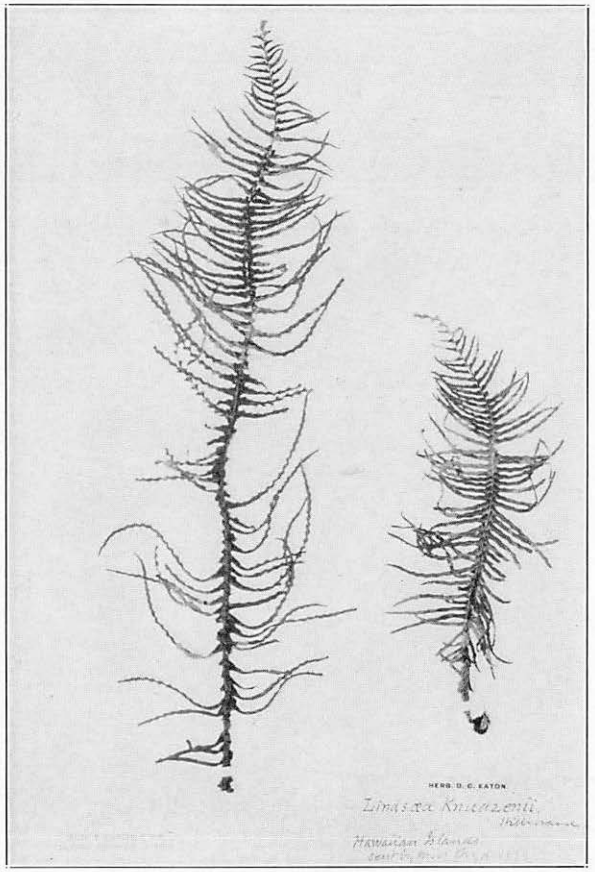
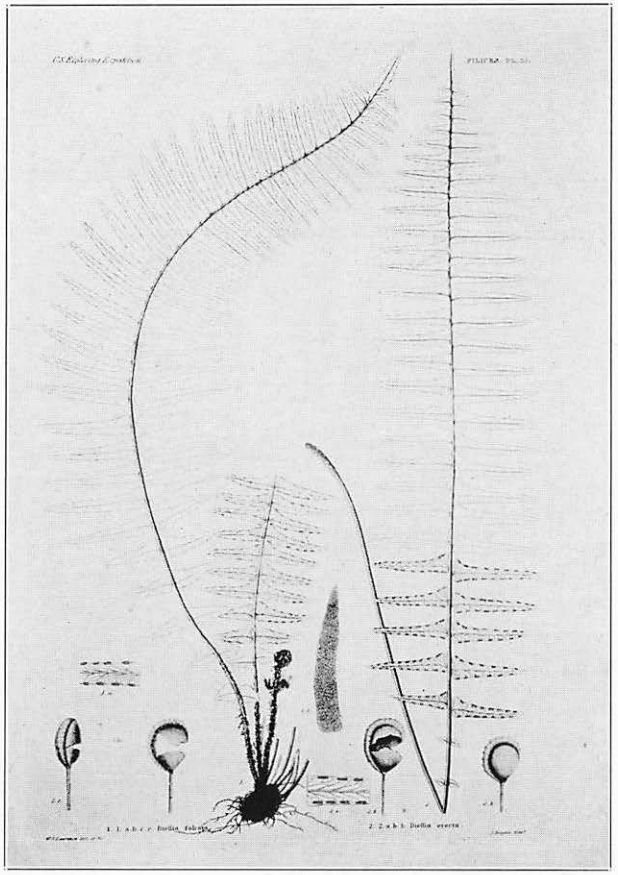


A

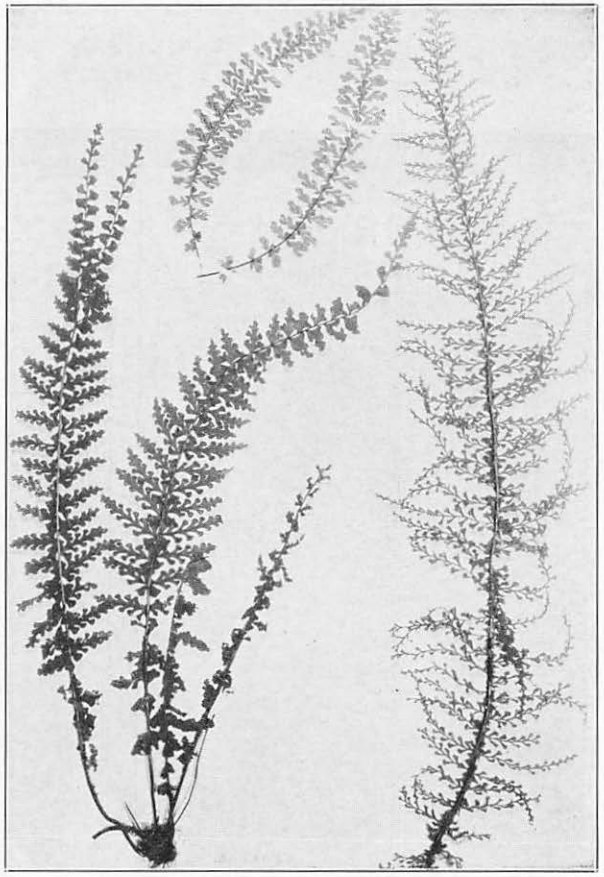


B

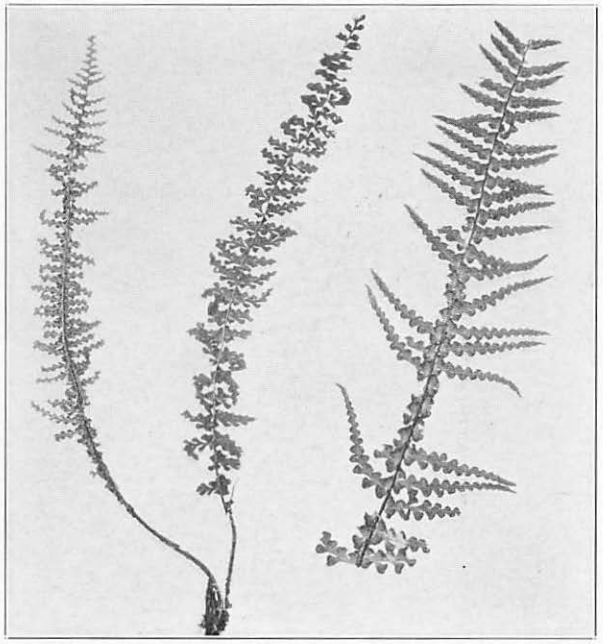
PLATE 1.—*Dicliae: A, Lindsaya Knudsenii* Hillebrand (so labeled) (features of *Lindsaya centifolia* Hillebrand as illustrated by Diels and described by Hillebrand), length of frond without stipe 13 inches, stipe 7 inches (Sheffield Scientific School); *B, Diellia falcata* Brackenridge (left), length of frond without stipe 16 inches, stipe 2-3 inches, and *Diellia erecta* Brackenridge (right), length of frond without stipe 12-15 inches, stipe 6-10 inches. (Reproduced from Brackenridge.)

A B

PLATE 2.—*Dielliae: A, Diellia Mannii* (Eaton) Robinson, Kauai, collected by Hillebrand and Lydgate, length of frond without stipe 16¼ inches, stipe 4¾ inches (B. P. Bishop Museum); *B, Diellia pumila* Brackenridge (lower right-hand corner) and *D. erecta* Brackenridge, length of longer frond of *D. pumila* without stipe 3¾ inches, stipe three quarters of an inch, length of frond of *D. erecta* (second frond from right) without stipe 8¾ inches, stipe 1¼ inches (B. P. Bishop Museum).



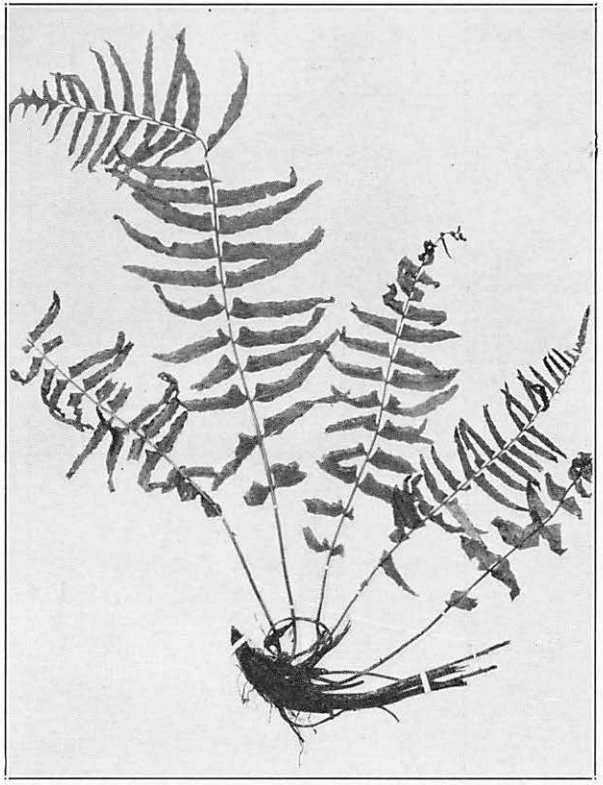
A



B

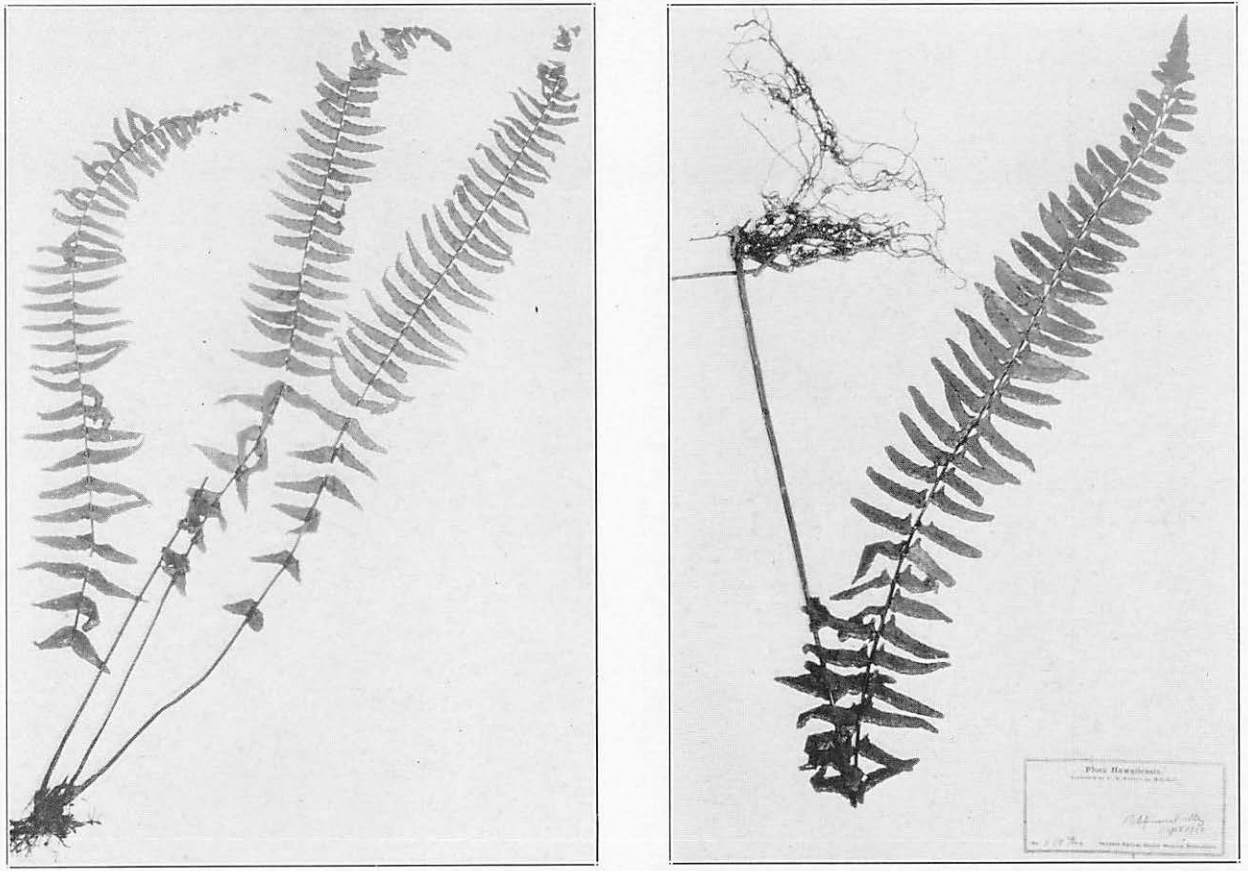
PLATE 3.—*Diellia Alexandri* (Hillebrand) Diels: *A*, length of frond in center of plant without stipe 11⅞ inches, stipe 1½ inches (B. P. Bishop Museum); *B*, unaccompanied by data, length of frond in center of plant without stipe 10½ inches, stipe 2½ inches (Smith College).

A



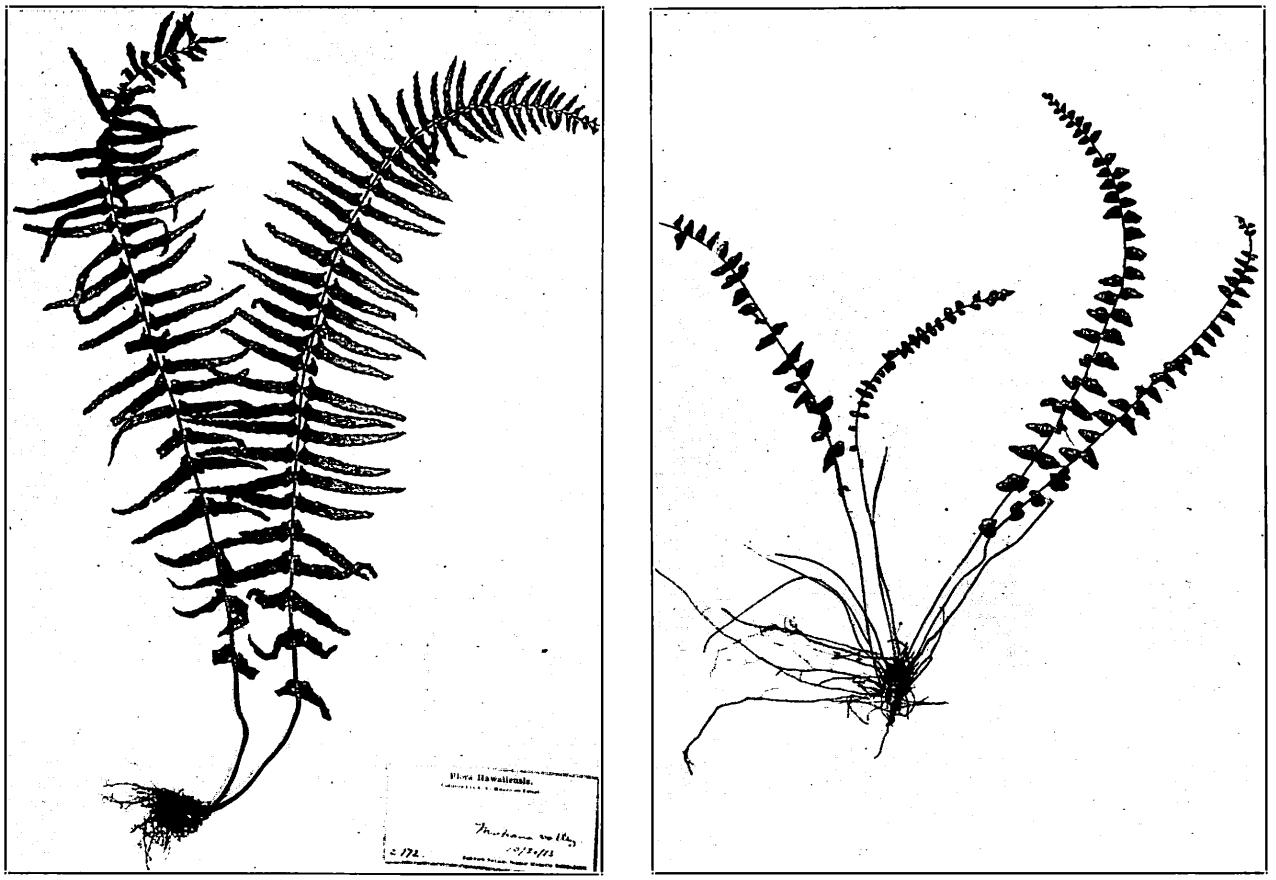
B

PLATE 4.—*Dielliae: A*, plant labeled "*Lindsaya falcata* Hook., Maui and Oahu," length of longest frond without stipe 13½ inches, stipe 2¼ inches (note difference in shape of pinnae of youngest and older fronds) (B. P. Bishop Museum); *B, Diellia* from Kawaihapai, Oahu, collected by LeRoy Topping, length of longest frond without stipe 10½ inches, stipe 4 inches (note difference in pinnae of youngest frond and one next to it) (Smith College).



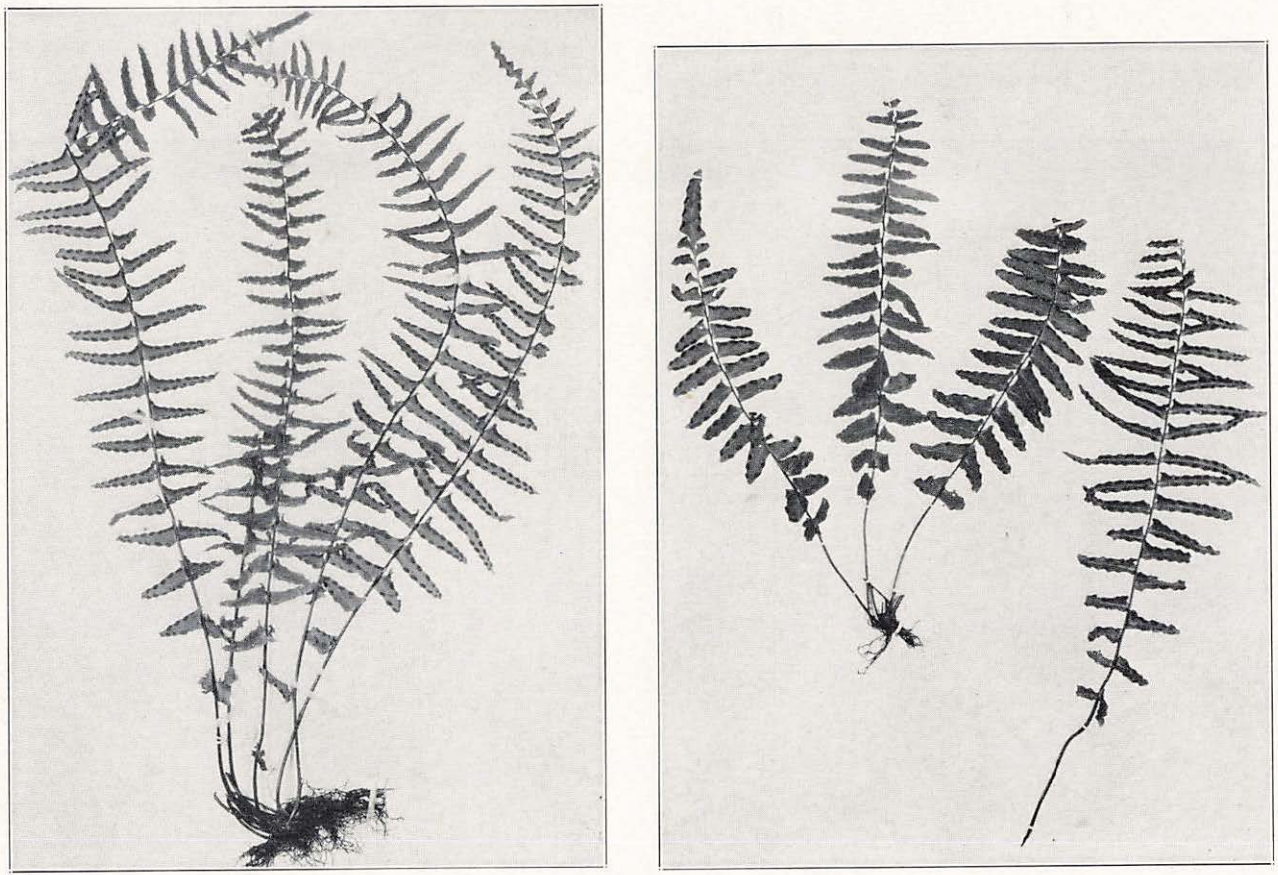
A *B*

PLATE 5.—*Dielliae: A*, plant from island of Hawaii (G. W. Russ, no. 36), probably *D. erecta*, not *D. falcata*, length of frond without stipe 12-13 inches, stipe 5 inches, no scales (B. P. Bishop Museum); *B*, plant from Pelekunu, Molokai, labeled "*Diellia falcata*" (Forbes, no. 584) but without scales and with too long a stipe for that species, length of frond without stipe 19½ inches, stipe 7 inches (B. P. Bishop Museum).



A B

PLATE 6.—*Dielliae: A*, plant from Mahana Valley, Lanai (G. C. Munro, no. 172) labeled *"Diellia"*, length of fronds without stipes 12¼ and 14½ inches, stipe of each 3¼ inches, note coenosori (B. P. Bishop Museum); *B, Diellia pumila* (?) from Pohakea Pass, Oahu, collected by LeRoy Topping, length of longest frond including stipe 7 inches (Smith College).



A B

PLATE 7.—*Diellia* from Lanai showing variation in fronds: *A*, length of longest frond without stipe 16 inches, stipe 3 inches, no scales evident in either specimen (Smith College); *B*, length of fronds without stipes 7-8 inches, stipes 2-2½ inches (Smith College).