

### TAXONOMIC FERN NOTES. III.

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The following notes include a new combination in *Alsophila*, a new species of *Doryopteris* and a new generic name for the ferns usually called *Lonchitis*. In addition to these new names, other matters are discussed, largely ones pertaining to my studies of Peruvian ferns. I am indebted to Mrs. Ruth Hsu Chen for her careful preparation of the illustrations.

#### 1. *ALSOPHILA MACARENENSIS* (ALSTON) TRYON, COMB. NOV.

*Dryopteris* (*Ctenitis*) *macarenensis* Alston, *Mutisia*, 7:5. 1952. TYPE: Sierra de la Macarena, Colombia, *Philipson* 2281 (BM), isotype: (COL!).

*Alsophila scopulina* Tryon, *Rhodora* 62:2, f. 2. 1960. TYPE: Cerro Isibukuri, Colombia, *Schultes & Cabrera* 13411, (GH).

The discovery that Alston's species is identical with the one I described eight years later requires the above new combination. It also considerably extends the range of the species and it may now be expected from others of the sandstone mesas of Amazonian Colombia. An additional collection from the Sierra de la Macarena is: *Idrobo & Pinto* 2190 (COL).

#### 2. A NEW SPECIES OF DORYOPTERIS AND AN OLD ONE

*Doryopteris Allenae* Tryon, spec. nov. Figs. 1-4

Rhizoma breviter repens paleis angustis curvatis ascendentibus medio obscuro semisclerotico vel sclerotico limbis dentatis pallidioribus (fuscis) cellulis longissimis quam latis, petiolus teres fasciculo vasculari uno, laminae steriles fertilesve monomorphae vel dimorphae, lamina sterilis oblongo-ovalis cordata vel 3-5 lobis latis venis areolatis areolis ad margem minoribus, venis marginalis plerumque connectentibus nonnullis liberis pagina superiore hydathodis nullis limbo membranaceo subalbulo vel subfusco, lamina fertilis oblongo-ovalis vel 3-7 lobis angustis, sporae perisporio brunneo modice inaequaliter papillato.

TYPUS: Gunong Idong, near Ipoh, Perak, Malaya, 450-500 ft., May 24, 1962, *B. Molesworth Allen* 4763 (GH). Paratypi: Gunong Tempurong, Perak, Malaya, 1,400 ft., Jan. 12, 1959, *B. M. Allen* 4103 (GH, US), Aug. 13, 1959, *B. M. Allen* 4393 (GH).

On mossy banks and in crevices of limestone rocks in forest; leaves pale bluish green.



*Doryopteris Allenae* is most similar in its general appearance to *D. cordifolia* of Madagascar. However, this resemblance seems to be a superficial one for in its technical characters it is most closely related to *D. ludens*.

It differs from *Doryopteris cordifolia* in the following characters: it has a terete, rather than a sulcate petiole, no hydathodes on the upper surface of the sterile lamina, the sterile lamina has a whitish to brownish, membranaceous border, rather than a red-brown to black, sclerotic one, and the areolae are smaller toward the margin, rather than nearly the same size as those near the costa.

*Doryopteris Allenae* is similar to *D. ludens* in its rhizome scales (both their structure and position), its terete petiole and its spores with perispore. It especially differs from *D. ludens* in having the rhizome short-creeping, rather than slender and long-creeping, and in having the sterile lamina with the marginal veins mostly joined, rather than mostly free, and without hydathodes on the upper surface.

Mrs. Allen has sent notes that indicate this species also grows at Batu Caves, Selangor. The ample material I have designated as the type was received after the illustrations were prepared. It differs from the Gunong Tempurong material in being larger and in having some dimorphic fertile leaves.

This species is named in honor of Betty Molesworth Allen who has contributed to our knowledge of Malayan ferns by her collections and publications on them and who obtained, at considerable effort, the material I have studied.

***Doryopteris papuana*** Copel. Phil. Jour. Sci. Bot. 6:86. 1911

In my revision of *Doryopteris*<sup>1</sup> I treated this name as a synonym of *Doryopteris ludens*. However, I have since then seen additional material from Papua and have come to the conclusion that, while *D. papuana* is a close relative of *D. ludens*, it is a valid species. It will key out to *D. ludens* in my revision but it may be separated as follows:

Rhizome scales somewhat spreading, curved-ascending to the upper side of the rhizome; dark sclerotic portion of the central costa extending well into the terminal lobe of the lamina ..... 25. *D. ludens*.  
Rhizome scales straight and closely appressed to the rhizome; dark sclerotic portion of the central costa not extending into the terminal lobe of the lamina ..... 25A. *D. papuana*.

<sup>1</sup>Contrib. Gray Herb. 143. 1942.



In addition to the above characters, there are more lobes on the fertile and sterile lamina in *D. papuana* than in *D. ludens*. The sterile lamina has 14-27 lobes and the fertile one 21-35 lobes. Specimens of *D. ludens* from the Philippine Islands have the sterile lamina with 0, 3 or 5 lobes and the fertile one with (3-) usually 5-7 (-8) lobes; while those from India, Burma, Indochina, Malay Peninsula and Java have the sterile lamina with (5-) 7-9 (-11) lobes and the fertile with (5-) 8-12 (-14) lobes.

*Doryopteris papuana* is, like *D. ludens*, a calciphile. It is represented in the Herbarium of the Arnold Arboretum by the following collections: PAPUA: Milne Bay District, Cape Vogel Peninsula, *Brass* 21623, 21853, *Hoogland* 4338.

### 3. THE GENERA LONCHITIS AND BLOTIELLA

The genus *Lonchitis*, although maintained by most authors, has sometimes been united with *Pteris*, for example, by Kuhn<sup>2</sup> and recently by Copeland<sup>3</sup>. Some of the authors who maintained it included in it several areolate-veined species and one or two free-veined ones, for example, Diels<sup>4</sup> and Christensen<sup>5</sup>. Others have restricted it to the areolate-veined species and treated the free-veined ones in *Pteris*, for example, Hooker and Baker<sup>6</sup> and John Smith<sup>7</sup>. More recently the free-veined ones have been placed in a separate genus, *Anisosorus*, for example, Maxon<sup>8</sup> and Christensen<sup>9</sup>.

Current treatments usually recognize *Pteris*, *Lonchitis* and *Anisosorus* as three related genera.

A study of the taxonomy has led me to this same conclusion, that the free-veined species and the areolate-veined species represent genera distinct from each other and from *Pteris*. However, the typification of *Lonchitis* has been confused and *Lonchitis* must be the name for the small genus of free-veined species (*Anisosorus*) while the larger genus of areolate-veined species requires a new name (*Blotiella*). Also there seems to be good evidence that while the free-

<sup>2</sup>Fil. Afr. 73-90. 1868.

<sup>3</sup>Gen. Fil. 60. 1947.

<sup>4</sup>Nat. Pflanz. 14: 295. 1899.

<sup>5</sup>Ind. Fil. xlv. 1905.

<sup>6</sup>Syn. Fil. 128, 160. 1867.

<sup>7</sup>Hist. Fil. 292, 297. 1875.

<sup>8</sup>Pterid. in Sci. Surv. Porto Rico & V. I. 6: 429. 1926.

<sup>9</sup>Ind. Fil. Suppl. 3, 11. 1934 and Verdoorn, Man. Pterid. 536. 1938.



veined species are related to *Pteris*, as usually stated, that the areolate-veined ones are related to *Hypolepis*. This latter relationship was suggested by Christensen<sup>10</sup> but it has not been firmly proposed.

Both genera have trichomes on the rhizome and in this character differ sufficiently from *Pteris* which has a paleate stem. The trichomes are a single cell in width but sometimes they are rather large and very flat so they may be mistaken for narrow scales. This erroneous interpretation is especially possible for toward the base they may adhere to one another. I believe that the several reports of scales in *Lonchitis* and *Blotiella* were based on misinterpretation of the indument. The basic chromosome number in *Pteris* is  $n=29$  in the considerable number of species counted<sup>11</sup> while it is  $n=ca. 50$  in *Lonchitis* and  $n=38$  in *Blotiella*.

*Lonchitis* L. Sp. Pl. 1078. 1753; Gen. Pl. ed. 5, 485. 1754. TYPE: *Lonchitis hirsuta* L.

*Antiosorus* Kuhn, Fests. 50 Jub. Reals. Berl. (Chaetopt.), 347. 1882, nomen nudum.

*Anisosorus* Trev. Atti Istit. Veneto s. 2, 2:166. 1851, nomen nudum; Maxon, Sci. Surv. Porto Rico & V. I. (Pterid.) 6:429. 1926, nom. superfl., illegit. TYPE: the same as that of *Lonchitis*.

Stem creeping, thick and fleshy, bearing large flattened trichomes (one cell wide), leaves produced singly; petiole with 2 vascular bundles near the base, each bent twice (Figs. 9, 10); the lateral ridges of the rachis continuous beneath (not interrupted by) the pinna stalks; veins free or casually areolate; sorus borne between the sinus and the apex of a segment (it may closely approach the sinus but does not extend around it except in very minor sinuses), indusium arising from the inner edge of a marginal flange; spores tetrahedral-globose, trilete, hardly marked; chromosome number  $n=ca. 50$ <sup>12</sup>.

The type species of *Lonchitis* has usually been considered to be *L. aurita* but since that name (see below) is not the name of a taxon, *L. hirsuta* must become the type. The only other species included in the genus by Linnaeus was *L. repens* and this was removed to *Hypolepis* by Presl where it still properly resides. Since the original diagnosis of *Lonchitis* applies better to *L. hirsuta* than it does to *L. repens*, there is no reason to question Presl's action.

<sup>10</sup>Verdoorn, Man. Pterid. 535 sub *Hypolepis*. 1938.

<sup>11</sup>Walker, T. G., Evolution 16: 27-43. 1962.

<sup>12</sup>Manton, I. Jour. Linn. Soc. Lond. (Bot. 56, Zool. 44): 89. 1958 and in Alston, Fl. West Trop. Africa, ed. 2, Suppl. 78. 1959.



The relation of *Lonchitis* is evidently, as commonly considered, with the genus *Pteris*. The tetrahedral-globose spores of *Lonchitis* are similar to those of *Pteris*, the sorus is substantially the same, the marginal flange of the fertile segments is similar to that found in many species of *Pteris* and the enlarged basiscopic pinnule of each basal pinna (seen especially in the smaller leaves of *Lonchitis*) is suggestive of the branching in many *Pteris* species.

There are two species, one American and one African: —  
1. *Lonchitis hirsuta* L. Sp. Pl. 1078. 1753. TYPE: Plumier, Fil. t. 20, from Martinique. The sori are not drawn accurately, but otherwise t. 20 is a good representation of the species. The Petiver, Pteri-graph. Amer. illustration (t. 4, f. 5), the only other element cited by Linnaeus is an almost exact but reversed copy of the Plumier plate; there is no specimen in the Linnaean herbarium.

*Lonchitis aurita* L. Sp. Pl. 1078. 1753, nomen illegit. (Art. 70). TYPE: Plumier, Fil. t. 17, from Martinique. The type is composed of two discordant elements (species) combined into one illustration. Although I am not sure that a name rejected under Art. 70 can be properly cited as a synonym, the only identifiable element is *L. hirsuta*, and it is convenient to place it here. The Petiver, Pteri-graph. Amer. illustration (t. 4, f. 4), the only other element cited by Linnaeus, is an exact but reversed copy of the Plumier plate; there is no specimen in the Linnaean herbarium.

*Pteris laciniata* Willd. Sp. Pl. 5:397. 1810. TYPE: Ind. Occ. ("India orientalis?"), Flügge 104 (Herb. Willd. 20013!, photo GH).

*Pteris lonchitoides* Desv. Mém. Soc. Linn. Paris 6:301. 1827. TYPE: "Peruvia". (See Weath. Contrib. Gray Herb. 114:33. 1936).

*Anisosorus hirsutus* (L.) Maxon, Sci. Surv. Porto Rico & V. I. (Pterid.) 6:429. 1926.

The identity of *Lonchitis aurita* has generally been uncertain and few authors have associated any plant material with the name. This is not surprising for the Plumier plate does not represent any known species. Jenman<sup>13</sup>, however, probably considering only the areolate venation and the erect rhizome depicted in the plate, did use the name for

<sup>13</sup>Bull. Bot. Dept. Jamaica 40: 10. 1893 and Bull. Misc. Inf. Bot. Dept. Trinidad 21. Appendix, 112. 1899.



Jamaican material of the species referred to below as *Blotiella Lindeniana* (*Lonchitis* Hook.). The following characters shown in Plumier, t. 17 are definitely those of *Lonchitis hirsuta* and are ones which distinguish it from *Blotiella Lindeniana*: 1) The enlarged basispic pinnule at the base of each basal pinna (this character is seen especially in smaller leaves of *L. hirsuta*), 2) the basal pinnae broadest at the base, and 3) the pinnae, above the basal pair, have the basispic pinnule closest to the rachis and shorter than the acroscopic one. In addition, *L. hirsuta* grows in Martinique, while *Blotiella Lindeniana* does not occur in the Lesser Antilles.

The areolate venation and the erect rhizome shown by Plumier are not characters of *Lonchitis hirsuta* and must have come from some other species. They could hardly have been drawn in error. There are several species of *Pteris* in Martinique that could furnish such characters and I think it most probable that it was one of these that was the source of the discordant elements in the illustration. Other characters depicted in the Plumier plate are not sufficiently decisive to be of value in establishing the identity of his material.

All of the Greater Antilles, general in the Lesser Antilles; Mexico to Bolivia.

2. *Lonchitis occidentalis* Baker, Syn. Fil. 128. 1867.

*Lonchitis Friesii* Brause, in Fries, Wiss. Ergebn. Schwed. Rhodesia-Kongo Exped. 1911-1912, Bot. 1:6. 1914.

*Anisosorus occidentalis* (Baker) C. Chr., in Perrier, Cat. Fl. Madagas. (Pterid.) 54. 1932.

Tropical Africa and Madagascar.

*Blotiella* Tryon, nom. nov. generis

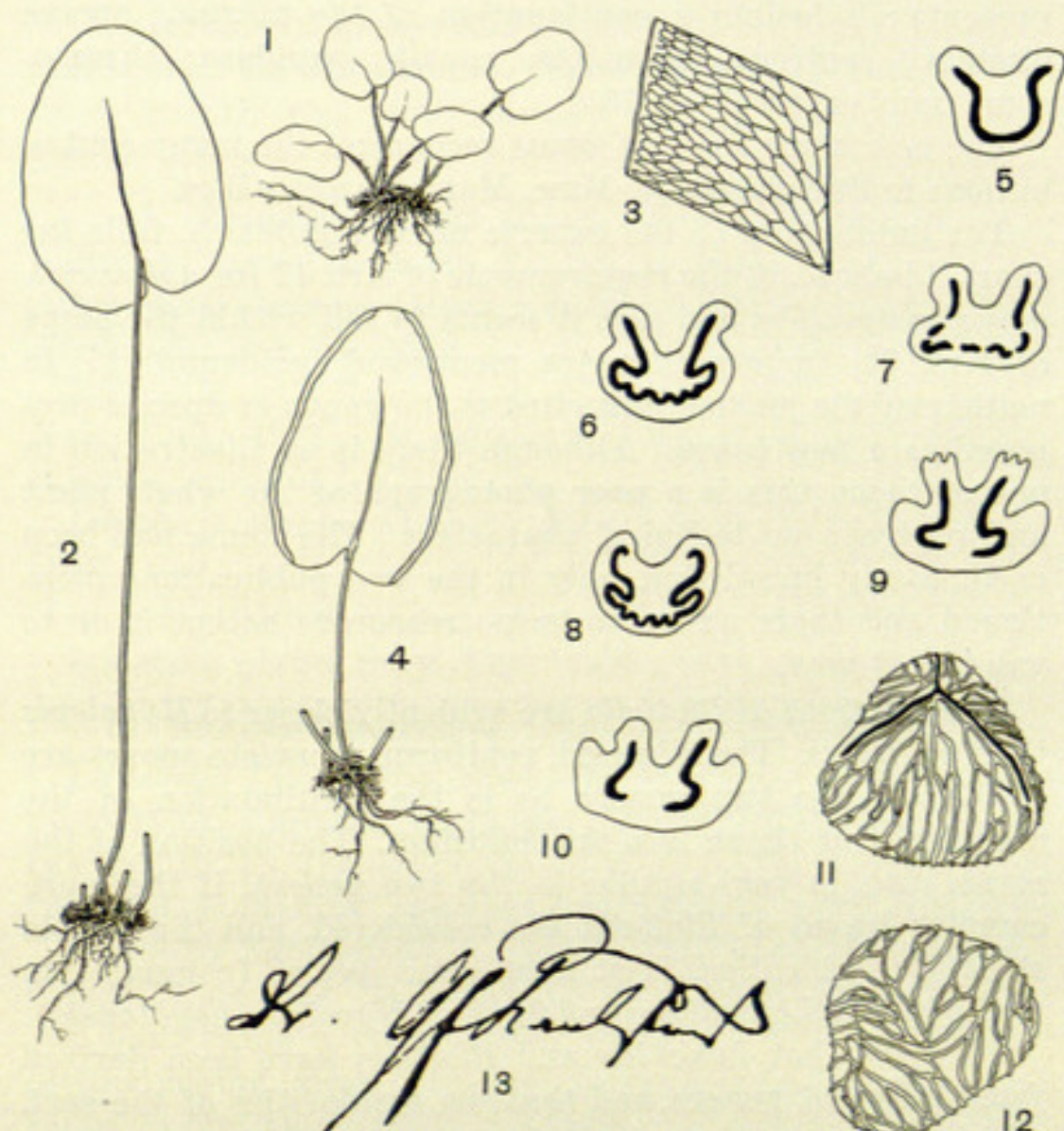
Based on *Lonchitis* sensu Kümmerle, Botanik. Köslem. 1915:168-169, not L. TYPE: *Lonchitis glabra* Bory.

*Compteris (Brazzaiana)* Hort "ex Linden", Gard. Chron. s. 3, 29: May, 25 Suppl.: 2. 1901; and Wein Illustr. Gart. Zeit. 26:196. f. 20, May, 1901, nomen invalid. (Arts. 34, 42).

Stem erect<sup>14</sup> to decumbent, hard, bearing trichomes, leaves produced in a definite or irregular crown; petiole with one

<sup>14</sup>Johnston, H. H., Kilima-njaro Exped. f. 51 on p. 231. 1886, figures a species of *Lonchitis* (identified as *L. pubescens*) as a tree fern and Chiovanda, Rac. Bot. Miss. d. Cons. nel Kenya, 148. 1935, cites a collection (of the same species) with a trunk 4.5 m. tall.





FIGS. 1-4, *Doryopteris Allenae*. 1, sterile plant,  $\times \frac{1}{2}$ , Allen 4103, GH. 2, sterile leaf,  $\times \frac{1}{2}$ , Allen 4393, GH. 3, venation of sterile lamina,  $\times 1$ , Allen 4393, GH. 4, fertile leaf,  $\times \frac{1}{2}$ , Allen 4103, GH.

FIGS. 5-10. Sections of petioles. 5, *Blotiella Lindeniana*,  $\times 4$ , Jamaica, Watt, NY. 6, *B. Lindeniana*,  $\times 2$ , Brazil, Brade 9390, NY. 7, *B. reducta*,  $\times 2$ , Liberia, Baldwin 6035, GH. 8, *Hypolepis bogotensis*,  $\times 2$ , Colombia, Tryon & Tryon 6117, GH. 9, *Lonchitis hirsuta*,  $\times 2$ , Honduras, Steeves & Ray 385, GH. 10, *L. occidentalis*,  $\times 2$ , Liberia, Harley F158, GH.

FIGS. 11-12. Spores of *Saccoloma elegans*, enlarged, Ecuador, Mexia 8429, GH. 11, apical view. 12, basal view.

FIG. 13. Signature of Dr. G. F. Kaulfuss.

vascular bundle (Fig. 5) which is much bent and contorted in large leaves (Fig. 6), or with several bundles forming, together, a similar pattern (Fig. 7); the lateral ridges of the rachis joining the pinna stalks; veins usually areolate; sorus continuous around the sinus (when present), either nearly confined to it or extending far on each side especially when the sinus is broad (rarely very long when no sinus is



present) ; indusium a continuation of the margin ; spores bilateral, reniform, monolete, usually papillose ; chromosome number,  $n=38$  or  $76^{15}$ .

The new name for this genus recognizes the many contributions to Pteridology by Mme. Marie Tardieu-Blot.

The publication of the generic name *Compteris*, falls far short, I believe, of the requirements of Art. 42 for a *descript. generico-specifica* and also it seems to fall within the scope of Art. 34 (names that are mentioned incidentally). In neither of the publications cited is the genus or species proposed as a new taxon. Although there is an illustration in one of them, this is a poor photograph of the whole plant and portrays no technical characters. The name has been used, to my knowledge, only in the two publications mentioned and there seems to be no reason to accept it or to validate it now.

The relations of *Blotiella* are evidently closer to *Hypolepis* than to *Pteris*. The bilateral, reniform, monolete spores are similar in the two genera as is the continuation of the marginal leaf tissue into the indusium. The position of the sorus, also, is very similar in the two genera, if the more complex leaves of *Blotiella* are considered, and the petiole structure is identical in at least some species (compare fig. 6 of *Blotiella Lindeniana* and fig. 8 of *Hypolepis bogotensis*).

I believe that *Lonchitis* and *Blotiella* have been derived from different genera and that the similarities of the sori, which have been the principal reason for uniting them, are the result of convergent evolution.

In these ferns with usually large leaves it is interesting to observe that the mechanical support that might be derived from fluting of the supporting petiole has been achieved in different ways. In *Lonchitis*, large petioles (Fig. 9) are strongly fluted. There may be as many as eight ridges and seven grooves on the adaxial half of the petiole. The vascular bundles, on the other hand, are relatively simple in their form. In *Blotiella*, the situation is quite different. In a large leaf of *B. Lindeniana*, for example, (Fig. 6) the adaxial half of the petiole has but two ridges and one median groove, while the vascular bundle is greatly contorted, mostly in the abaxial half of the petiole.

<sup>15</sup>Manton, I., Jour. Linn. Soc. Lond. (Bot. 56, Zool. 44): 89. 1958 and in Alston, Fl. West Trop. Africa, ed. 2, Suppl. 78. 1959.



One American species and perhaps 12-15 in Africa, Madagascar and the Mascarenes. The following species seem to be sufficiently well established to transfer them to the new generic name:

1. **Blotiella Currori** (Hook.) Tryon, comb. nov.

*Pteris Currori* Hook, Sp. Fil. 2:232. 1858.

*Lonchitis Currori* (Hook.) Kuhn, v. Decken, Reisen Ost.-Afrika, 3<sup>3</sup>: Bot. 10. 1879.

*Pteris Mannii* Baker, Syn. Fil. 168. 1867. (Ballard in Kew Bull. 1937:348 considers this name to represent juvenile leaves of *L. Currori*).

*Lonchitis Mannii* (Baker) Alston, Bull. Soc. Brot. 30:18. 1956.

2. **Blotiella glabra** (Bory) Tryon, comb. nov.

*Lonchitis glabra* Bory, Voy. 1:321. 1804.

3. **Blotiella Lindeniana** (Hook.) Tryon, comb. nov.

*Lonchitis Lindeniana* Hook. Sp. Fil. 2:56, t. 89A. 1851. LECTOTYPE: Caracas, Venezuela, *Linden 543* (K, photo GH; isotype, US!). The specimen cited in Herb. J. Sm. (BM), "ex Jard. de Plantes" becomes a paratype.

*Lonchitis Zahlbruckneri* Kümmerl. Mag. Bot. Lapok. 13:49, t. 2. 1914, ex char. TYPE: Brazil, *Warszewicz 30*, w.

I have made a considerable search to find a basis for distinguishing more than one American species but have failed to find any reliable characters. There is considerable variation in such characters as the density of pubescence, and its distribution, the color of the trichomes, the position in which they are borne and whether or not they are gland-tipped. I have not been able to establish correlations of characters with each other nor with geography. It must be admitted, however, that the available specimens are rather few and often incomplete, so that any conclusions based on such material must be tentative.

Costa Rica; Jamaica and Hispaniola; Venezuela to Colombia and south to Bolivia; Brazil.

4. **Blotiella madagascariensis** (Hook.) Tryon, comb. nov.

*Lonchitis madagascariensis* Hook. Sp. Fil. 2:58. 1851.

5. **Blotiella natalensis** (Hook.) Tryon, comb. nov.

*Lonchitis natalensis* Hook. Sp. Fil. 2:57. 1851.



6. *Blotiella pubescens* (Kaulf.) Tryon, comb. nov.*Lonchitis pubescens* Kaulf. Enum. Fil. 195. 1824.

Bory (Voy. 1:321. 1804) applied the name *Lonchitis hirsuta* L., probably to this species, and the African fern has sometimes erroneously been called "*Lonchitis hirsuta* Bory."

7. *Blotiella reducta* (C. Chr.) Tryon, comb. nov.*Lonchitis reducta* C. Chr. Fedde Rep. Spec. Nov. 9:370. 1911.

Most of the following names have been recently proposed for species that should fall into *Blotiella* but I have not seen material of them. The others have been considered as synonyms, by some authors, or their identity is in some doubt. Accordingly I do not wish to formally transfer any of them to the new generic name.

LONCHITIS CRENATA Alston, Bol. Soc. Brot. 30: 18. 1956.

LONCHITIS CORIACEA Tard. Mém. Inst. Sci. Madagas. ser. B, 6: 228. 1955.

LONCHITIS COURSI Tard. Bull. Mus. Paris, s. 2, 29: 293. 1957.

LONCHITIS GRACILIS Alston, in Exell, Cat. S. Tomé, Suppl. 7. 1956.

LONCHITIS × HIERONYMII Küm. Bot. Z. 1915: 174. Proposed as a hybrid of *L. Currori* and *L. natalensis*.

LONCHITIS ISALOENSIS Tard. Bull. Mus. Paris, s. 2, 29: 293. 1957.

LONCHITIS JAVANICA Desr. in Lam. Encycl. 3: 594. 1789.

This is evidently an African species of *Blotiella* and represents the earliest name for one of them. Although reported from Java, the genus does not occur there. Posthumus<sup>16</sup> does not mention it but he does discuss how a number of African ferns, collected on early voyages, had been erroneously ascribed to Java.

LONCHITIS POLYPUS Baker, Jour. Linn. Soc. Lond. 15: 414. 1876.

LONCHITIS SINUATA Alston, Bol. Soc. Brot. 30: 19. 1956.

LONCHITIS STENOCHLAMYS Fée, Mém. Fam. Foug. 5: (Gen. Fil.): 142. 1852.

LONCHITIS STIPITATA Alston, Bol. Soc. Brot. 30: 19. 1956.

LONCHITIS TISSERANTII Alston &amp; Tard. Mém. IFAN 28: 85. 1953.

LONCHITIS TOMENTOSA Fée Mém. Fam. Foug. 5 (Gen. Fil.): 143. 1852.

## 4. THE GENUS SACCOLOMA KAULF.

The genus *Saccoloma*, originally including only the single species, *Saccoloma elegans*, was later variously enlarged to some 6 species<sup>17</sup> or 8<sup>18</sup>.

<sup>16</sup>Verhand. Kon. Akad. Wet. Amsterdam (Tweede Sect.) 36<sup>5</sup>. 1937.<sup>17</sup>Diels, Nat. Pflanz. 1<sup>4</sup>.<sup>18</sup>Christensen, Ind. Fil.



Some of these, for example, *S. sorbifolium* (= *Cystodium*), *S. Wercklei* (= *Dennstaedtia*) and *S. Imrayanum* (= *Ormoloma*) have properly been removed to other genera. The remainder of the species were segregated from *Saccoloma* by Copeland in 1929 into two genera, *Orthiopteris* and *Ithycaulon*, leaving the genus again containing only *S. elegans*. Since then some new species have been described under *Orthiopteris* or *Ithycaulon* and some old species have been transferred to one or the other. Later, in his *Genera Filicum*, Copeland reduced *Ithycaulon* to *Orthiopteris*. He recognized, then, the single segregate genus *Orthiopteris* and this treatment, *Saccoloma* with one species and *Orthiopteris* with perhaps 11, has been generally followed by subsequent authors.

The purpose of this note is to point out that the principal difference between *Orthiopteris* and *Saccoloma* is not a valid one; and that there are significant similarities between it and *Saccoloma*. The rhizome of *Saccoloma* has been considered to be prostrate and thus different from the erect rhizome of *Orthiopteris*. However, it is actually erect (at least apically) in both genera. The two genera are identical in the important characters of the spores and there are a number of other similarities.

***Saccoloma*** Kaulf. Berl. Jahrb. Pharm. 1820:51. TYPE: *S. elegans* Kaulf.

*Orthiopteris* Copel. Bishop Mus. Bull. 59:14. 1929. TYPE: *Davallia ferulacea* Moore (*Davallia trichomanoides* Hook. Second Cent. Ferns, t. 64. 1861, not Blume, 1828).

*Ithycaulon* of authors, including Copel. Univ. Cal. Publ. Bot. 16:79. 1929, as to the taxon, but not as to the type, *Davallia moluccana* Bl. which is *Tapeinidium moluccanum* (Bl.) C. Chr. Gard. Bull. Str. Settl. 4:399. 1929.

In view of the obvious taxonomic and nomenclatural problems in some species, the following list of the species of *Saccoloma* is presented with reservation.

1. *S. elegans* Kaulf. (America), 2. *S. domingense* (Spreng.) C. Chr. (America), 3. *S. inaequale* (Kze.) Mett. (America), 4. *S. Henriettae* (Baker) C. Chr. (Madagascar), 5. *Orthiopteris Kingii* (Bedd.) Holtt. (*S. minus* (Hook.) C. Chr., *S. moluccana* of authors, not Blume) (Malaysia, Polynesia), 6. *Orthiopteris ferulacea* (Moore) Copel. (Fiji), 7. *Orthiopteris cicutarioides* (Baker) Copel.



(*Ithycaulon tenuisectum* C. Chr.) (New Guinea), 8. *Orthopteris trichophylla* Copel. Univ. Cal. Publ. Bot. 18:217. 1942 (New Guinea), 9. *Ithycaulon acuminatum* (Rosenst.) Copel. (New Guinea), 10. *S. caudatum* Copel. (New Guinea) and 11. *S. firmum* (Kuhn) C. Chr. (New Caledonia and New Hebrides).

My conclusions are based on an adequate study of the first eight species in the above list. They all have the following important characters in common:

The stem is radially symmetrical with leaves arising on all sides. It is typically erect, although in *Saccoloma elegans* it may be decumbent in age with only the apex erect, and it bears numerous dark, sclerotic scales at its apex. Although the stem of *S. elegans* has been persistently reported as prostrate or creeping, adequate material shows it to be erect or decumbent. Specimens such as Panama, *Prescott & Caylor* 4 (US), Ecuador, *Mexia* 8429 (GH, US) and Bolivia, *Tate* 421 (NY) show it to be quite erect and such collections as Peru, *Killip & Smith* 24574 (GH), 26072 (GH) and Brazil, *Mexia* 4964 (GH, US), with a small portion of the rhizome, are consistent with this interpretation. In Peru, *Killip & Smith* 26072 (US) and Brazil, *Black* 47-1736 (NY) the rhizome is decumbent.

The leaves are glabrous, or nearly so, throughout, the petiole, and sometimes the rachis, have two prominent lateral lines of pneumatic tissue, and the lamina (except in the 1-pinnate *S. elegans*) is acroscopically compound. The principal axes of the lamina are grooved on the adaxial side and the basiscopic ridge of a lesser axis is continuous with a ridge of the axis to which it is attached.

The sorus is davallioid to dennstaedtioid, terminal on a single vein, the outer lobe of leaf tissue being unmodified to definitely modified, the indusium is usually half-conical, to sometimes half cup-shaped, its outer margin is more or less even and entire to strongly rostrate.

The spores (figs. 11, 12) are tetrahedral-globose, light tan, translucent, the basal hemisphere is marked with long, low, narrow ridges that are sharply defined, well spaced, and anastomose irregularly, the commissural face is similar but less abundantly ridged and the ridges are somewhat parallel to one of the three commissural ridges.

The above characters combine to form a strong set of



similarities that all of the species have in common. The principal generic characters are the radial stem, erect at least at the apex, with scales, the davallioid or dennstaedtioid sorus and the characteristically ridged spores. An examination of the spores of some species of the following genera showed them all to be different: *Culcita*, *Davallia*, *Dennstaedtia*, *Humata*, *Hypolepis*, *Leptolepia*, *Leucostegia*, *Microlepia*, *Odontosoria*, *Oenotrichia* and *Sphenomeris*. The type species, *S. elegans*, differs from the others only in less important characters: the lamina is 1-pinnate, imparipinnate, with large entire pinnae and the sori are close together and have a broad indusium. There is no reason not to treat *S. elegans* in the same genus as the species with compound leaves. It is quite comparable to such species as *Dennstaedtia Wercklei* and *Microlepia Hookeriana* which are also 1-pinnate species of otherwise compound-leaved genera. The different soral characters of *S. elegans* are similar to those of the above species and seem best interpreted in all three as an adjustment to a long entire margin.

A synopsis and some comments on the American species follow: — 1. ***Saccoloma elegans*** Kaulf. Berl. Jahrb. Pharm. 1820:51. TYPE: none mentioned, but in Enum. Fil. 224. t. 1. 1824, Kaulfuss cites Brazil, *Sello* and this may be accepted as the type. A specimen of this collection at B!, photo GH is undoubtedly an isotype.

Lamina, 1-pinnate, imparipinnate, the pinnae entire; sori on adjacent vein ends, indusium more or less broadly lunate, shorter than the rather modified, entire to crenate, margin.

Guatemala to Panama; Cuba, Jamaica and Hispaniola; Trinidad, French and British Guiana, Venezuela, Colombia to Boliva, Brazil.

2. ***Saccoloma domingense*** (Spreng.) C. Chr. Ind. Fil. 612. 1906 (not Prantl, Arb. Bot. Gard. Breslau 1:21. 1892, as cited).

*Polypodium adiantoides* Aubl. Pl. Guiane 2:962. 1775. TYPE: Plumier, Fil. t. 7. Not *Polypodium adianthoides* Burm. Fl. Ind. 234. 1768.

*Davallia domingense* Spreng. Einleit. Krypt. Gewächse, 3:149, t. 4, f. 33. 1804. TYPE: Santo Domingo, "Ich habe es durch einen Freund. . ." (The Plumier, Fil. t. 7, also cited, is this species).

*Davallia adiantoides* Sw. Syn. Fil. 131. 1806, nom. superfl. (= *Davallia domingense* Spreng.).



*Dicksonia Plumieri* Hook. Sp. Fil. 1:72. 1846, based on *Davallia domingense* Spreng., not *Dicksonia domingense* Desv. Mém. Soc. Linn. Paris 6:317. 1827.

*Dicksonia Lindenii* Hook. Sp. Fil. 1:72, t. 25B. 1846. TYPE: Caracas, Venezuela, *Linden 166* (K, fragment NY!, BR, photo GH).

*Saccoloma adiantoides* Mett. Ann. Sci. Nat. IV, 15:80. 1861, nom. superfl. (= *Davallia domingense* Spreng.), epithet from *Davallia adiantoides* Sw.; the same name was also published by Urban, Symb. Ant. 9:318. 1925, nom. superfl. (= *Davallia domingense* Spreng.), with its epithet from *Polypodium adiantoides* Aubl.

*Ithyaulon domingense* (Spreng.) C. Chr. Ind. Fil. Suppl. 3:116. 1934.

*Orthiopteris domingense* (Spreng.) Copel. Gen. Fil. 50. 1947.

Lamina bipinnate, or more complex, coarsely cut into mostly large, entire to shallowly toothed ultimate segments, apex gradually reduced, pinnatifid, as is the apex of the larger pinnae; sori mostly on adjacent vein ends, indusium broadly cuneate, nearly equal to the short, somewhat modified, indusiform, marginal lobule. The characters of the sori of this species and the next were well brought out by Maxon<sup>19</sup>.

One basionym has syntypes that are certainly different species but I have not attempted to choose a lectotype since I do not have adequate information about one of the elements (the Raddi collection). If the Sloane table were chosen as lectotype, then the name would be a synonym of *Saccoloma domingense*. *Pteris Sloanei* Raddi, Pl. Bras. 1:49. 1825. Syntypes: Sloane, Hist. Jam. t. 47 (= *Saccoloma domingense*) and Raddi, t. 71 bis (or the original specimen) (= ?). *Davallia Sloanei* (Raddi) Jenm. Jour. Bot. 1886:37. A complete description is given of the specimen, Mount Diablo, Jamaica, Sloane in 1688 (BM, fragment NY!), from which Sloane, Hist. Jam. t. 47 was prepared. *Saccoloma Sloanei* (Raddi) C. Chr. Ind. Fil. 612. 1906.

All Greater Antilles; Dominica, Martinique and Guadeloupe; Venezuela, Colombia, Brazil.

Although most specimens of *Saccoloma domingense* and *S. inaequale* are very different in aspect, I have not been able to find reliable characters by which to separate them. Carl Christensen remarked that "The extreme forms of these two

<sup>19</sup>Sci. Surv. Porto Rico and V. I. (Pterid.) 6: 490. 1926.



species . . . look distinct enough, but several intermediate forms occur."<sup>20</sup> The characters of the complexity of the lamina, mentioned above, seem to be at least as reliable as those of the sorus brought out by Maxon. Usually the two sets of characters are closely correlated, but sometimes they are not, and the identification of an intermediate specimen may depend upon which character is principally employed.

It is difficult to interpret these intermediates as hybrids for they sometimes occur in areas well beyond the range of *Saccoloma domingense*. It is also difficult to consider that *S. domingense* might be a hybrid of *S. elegans* and *S. inaequale* for it occurs in the Lesser Antilles where *S. elegans* does not grow. I believe that *S. domingense* is a rather questionable species but I hesitate to suggest a change in its status without a better understanding of it.

3. *Saccoloma inaequale* (Kze.) Mett. Ann. Sci. Nat. IV, 15:80. 1861.

*Davallia inaequalis* Kze. Linnaea 9:87. 1834. Type: Yurimaguas, Maynas (now Alto Amazonas), Peru, Dec. 1830, Poeppig, Diar. 2113, probably at LZ, destroyed; isotype: GH!, B! photo GH.

*Davallia nigrescens* Kze. Bot. Zeit. 1850: 132. Syntypes: Brazil, Blanchet 2507, Martius 379, duplicate US!, Godet.

*Saccoloma Guentheri* Rosenst. Fedde Rep. Spec. Nov. 25: 58. 1928, ex char. Type: Bolivia, Buchtien 16.

*Ithyaulon inaequale* (Kze.) Copel. Univ. Cal. Publ. Bot. 16:80. 1929.

*Ithyaulon Guentheri* (Rosenst.) C. Chr. Ind. Fil. Suppl. 3, 116. 1934.

*Orthiopteris inaequalis* (Kze.) Copel. Gen. Fil. 50. 1947.

Lamina bipinnate or more complex, rather finely cut into mostly small, strongly toothed or lobed ultimate segments, apex gradually reduced, cut almost to the rachis, as is the apex of the larger pinnae; sori distant, indusium narrowly cuneate, shorter than the unmodified opposed margin.

I have not been able to establish the identity of *Dicksonia Eggersii* Prantl, Engl. Bot. Jahrb. 24:84. 1897, nomen nudum. The collection cited, Cuba, Wright 897, is represented by numerous specimens of both *Saccoloma inaequale* and *S. domingense*.

The following two names may belong to this species; an

<sup>20</sup>Kungl. Svensk. Vet.-Akad. Handl. 16<sup>2</sup>: 44. 1936.



examination of the type, in each case, will be necessary to determine if it is a *Saccoloma*, a *Microlepia* or perhaps a *Dennstaedtia*. The first name, if it represents *S. inaequale*, would furnish the earliest epithet for this species.

*Davallia distans* Kaulf. Enum. Fil. 222. 1824. TYPE: Brazil, Herb. Mertens (the collection is probably at LE).

*Microlepia brasiliensis* Pr. Tent. Pterid. 125, t. 4, f. 23. 1836. Commonly referred to *Microlepia Speluncae*. *Saccoloma brasiliense* (Pr.) Mett. Ann. Sci. Nat. IV, 15:80. 1861.

Southern Mexico to Panama; all Greater Antilles; Dominica, Martinique and Guadeloupe; French Guiana west to Colombia, south to Bolivia; Brazil.

## 5. THE TYPE SPECIMENS OF KAULFUSS

Georg Friedrich Kaulfuss described many new species of pteridophytes, most of them in his *Enumeratio Filicum* of 1824. In this book he described the novelties collected by Chamisso, on his voyage around the world, as well as new species from material obtained from other sources. Kaulfuss' herbarium was acquired by Count von Roemer of Dresden and the Roemer herbarium, in turn, was acquired by the University of Leipzig.

The collection at Leipzig was destroyed during the last war so that, unless Kaulfuss returned material to a correspondent, all of the holotypes of his names may be assumed to be lost.

The purpose of this note is to call attention to the location of some of the collections that may serve to replace the lost holotypes.

The most important single collection described by Kaulfuss is that of Chamisso. The *Index Herbariorum* indicates that the original set of Pteridophyta is at Paris. However, an incomplete survey of the Chamisso collections at Paris and at Leningrad, that I made in 1960, indicated that the original set of Pteridophyta is at Leningrad with the other Chamisso material. The labels at Leningrad say "Herb. Chamisso" and, in comparing the same collection, the label and the specimen are both more ample there than at Paris. The specimens at Paris are all in Herb. Bory and, at least among the species I searched for, the set was not complete.

Other specimens that may replace Kaulfuss' types should be sought especially at B, C, LE, P and W. For example, an



isotype of *Dicksonia rubiginosa* Kaulf. (Rio de Janeiro, Herb. Mertens) is at LE and one of *Saccoloma elegans* Kaulf. (Brazil, Sello) is at B. While these authentic specimens may be used to fix the application of the name, they should not receive any designation other than isotype until an adequate survey of other herbaria has established the specimen best qualified to serve as a neotype.

In this regard it is important to identify any annotations in Kaulfuss' hand and a specimen of his writing has kindly been furnished by Clive Jermy and J. A. Crabbe of the British Museum (Natural History). I have not been able to identify with certainty Kaulfuss' writing on any label. For the benefit of those who may have occasion to use it, I have reproduced Kaulfuss' signature in Fig. 13. — GRAY HERBARIUM, HARVARD UNIVERSITY.





Tryon, Rolla M. 1962. "Taxonomic fern notes. III." *Contributions from the Gray Herbarium of Harvard University* (191), 91–107.

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