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THE AMERICAN TREE FERNS ALLIED TO SPHAEROPTERIS HORRIDA

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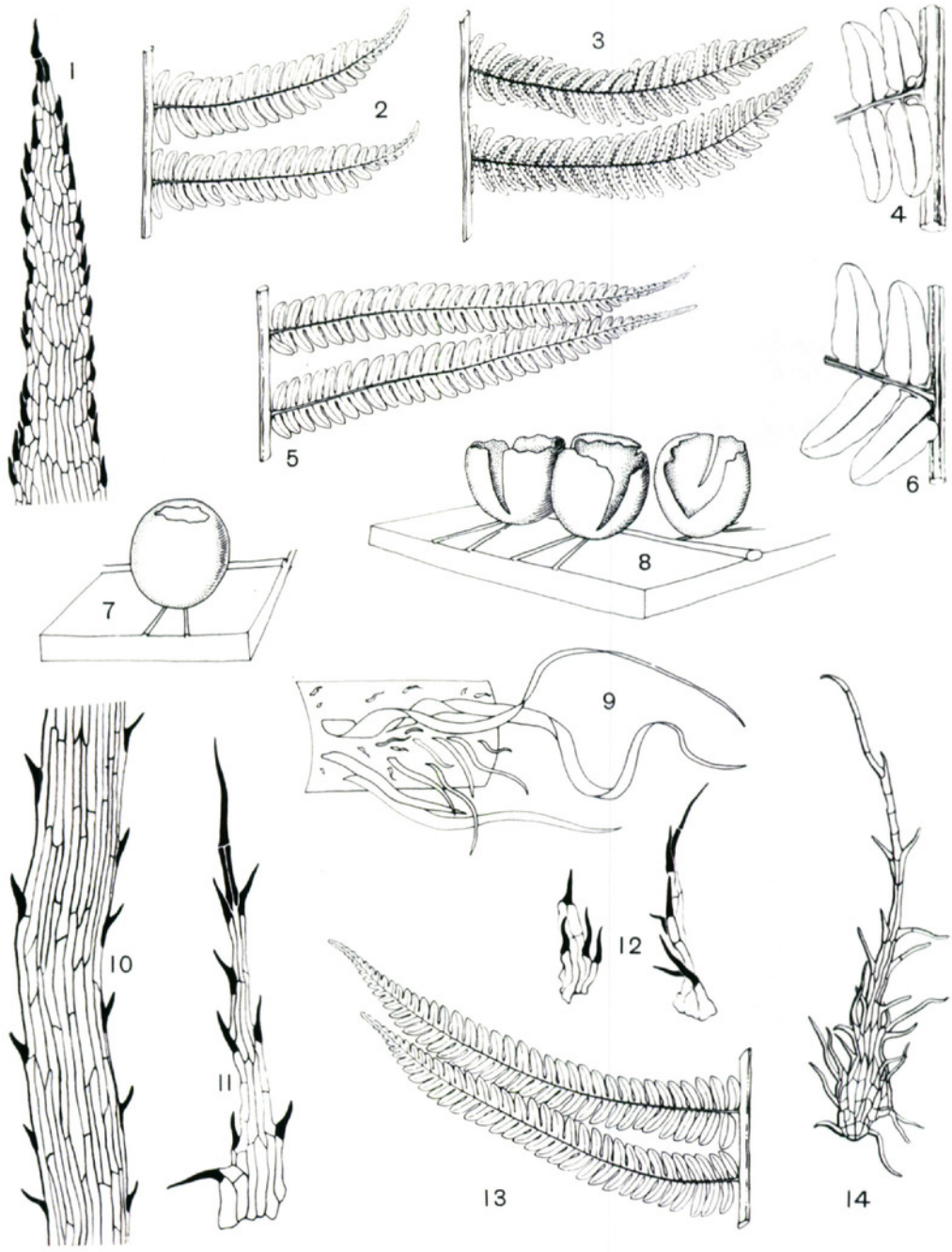
The genus *Sphaeropteris* of the Cyatheaceae contains about 120 species, most of them growing in the paleotropics from India and southeastern Asia eastward through the Pacific to Pitcairn Island. Holttum (1963, 1964, 1965) has treated these as *Cyathea* subgenus *Sphaeropteris*. The few American species, perhaps twenty in number, have never been dealt with as a group, nor until recently have their generic relations been satisfactorily known. In my treatment of the genera of the Cyatheaceae (Tryon, 1970) the subgenus *Sphaeropteris* of Holttum was recognized as a genus and slightly enlarged to include related American species that were not entirely like any of those of the paleotropics. The present revision is concerned with the only American element of the genus that does have clear relations to species of the paleotropics. This is a small group of species allied to *Sphaeropteris horrida (Cyathea princeps)*. The relation of the *Sphaeropteris horrida* group to species such as *Sphaeropteris medullaris* of New Zealand and *S. concinna* of New Guinea is so close that it must be accepted as a true (evolutionary) neotropic-paleotropic relationship. The group of *Sphaeropteris horrida* is a closely knit one of six species. It is readily distinguished from other groups and species among the American members of



Figs 1-4. *Sphaeropteris insignis.* 1. Apical portion of crozier scale, Jamaica, *Riba* 211, GH, × 32. 2. Central fertile pinnules of the usual form, Jamaica, *Maxon* 1463, US, × 0.4. 3. Central fertile pinnules of the form with lobed tertiary segments, Jamaica, *Riba* 211, GH, × 0.4. 4. Base of pinnule, Cuba, *Hioram* 7021, GH, (enlarged).

Figs. 5-8. *Sphaeropteris horrida.* 5. Central fertile pinnules, Guatemala, *Steyermark* 33432, US, × 0.4. 6. Base of pinnule, Mexico, *Purpus* 9197, GH (enlarged). 7. Immature indusium (somewhat dia-

the genus by the complete indusium that is a deep cup or urn or completely encloses the sorus. The other American species either lack an indusium or have a partially developed (hemitelioid) one. The following description provides a detailed summary of the characteristics of the group.

Stems up to 5- (in *S. horrida*) 15 m. tall and 15- (in *S. horrida*) 40 cm. in diameter, with more or less persistent scales similar to those of the petiole; leaf (in *S. Gardneri*) often 1, usually 2-3, or (in *S. horrida*) to 5 m. long; petiole usually thick, sometimes massive, ca. 30-100 cm. long, lacking spines, rather smooth except in *S. insignis* and *S. horrida* in which it may be muricate from the persistent scale bases; indument varied, represented by minute scales (squamulae) (these sometimes mixed with minute trichomes) that may intergrade with large, elongate scales to ca. 4 cm. long (Fig. 9), these of nearly uniform cellular construction (structurally conform) and with dark marginal teeth that are rather regular in their size, spacing and orientation (Fig. 10), the scales persistent basally or (in *S. Brunei* and *S. Cuatrecasaii*) often long-persistent along the whole petiole; lamina mostly bipinnate-pinnatifid to bipinnate-pinnatisect, rarely a portion tripinate-pinnatifid, the lower pinnae petiolulate, usually strongly so; pinnules with the basal segments excavated and sometimes auriculate, light colored (usually whitish) beneath partly from the glaucous surface and (perhaps) partly from the structure of the stomata guard cells; ultimate segments with scales and (or) trichomes, these more abundant on the abaxial surface of the fertile than the sterile segments

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grammatic), Guatemala, *Wilson* 218, F × 8. 8, Mature indusia (somewhat diagrammatic, receptacle not shown), same as 7.

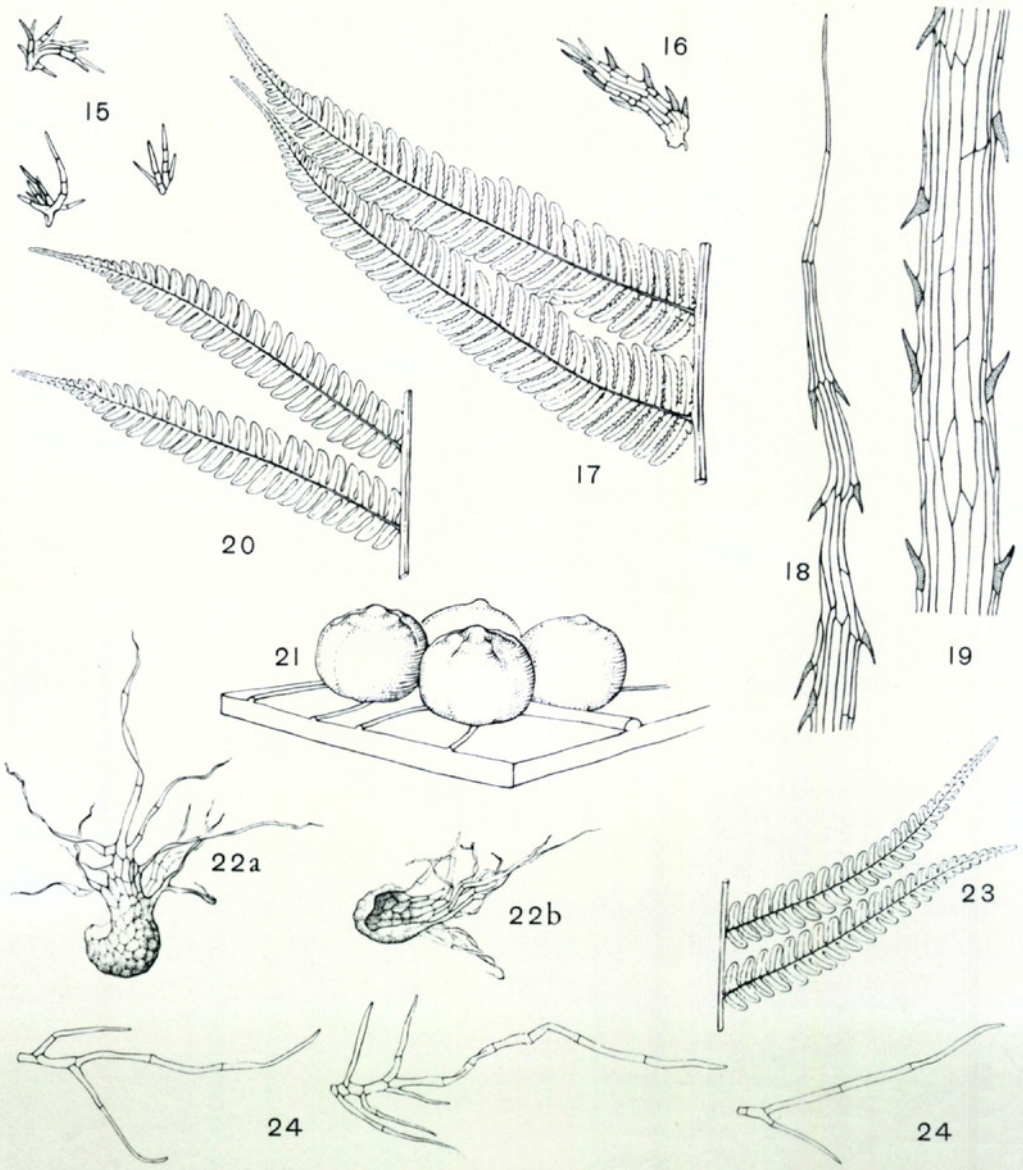
Figs. 9-14. *Sphaeropteris Brunei*. 9. Diagram of petiole surface with scales, Costa Rica, *Nisman* 114, GH (enlarged). 10. Central portion of large petiole scale, same as 9, × 32. 11. Small petiole scale, same as 9, × 32. 12. Squamulae of petiole, same as 9, × 32. 13. Central fertile pinnules, Costa Rica, *Gastony* 795 GH, × 0.4. 14. Scale of costule (beneath), Costa Rica, *Scamman & Holdridge* 7859, GH, × 32.

where they may be sparse or rarely nearly lacking, the adaxial surface glabrous or rarely with a few trichomes, the veins usually 1-forked, less often simple or 2-forked; indusium usually firm, brown or light-tan and opaque, with a minutely roughened suface, sometimes thinner and subopaque, rarely translucent, cyatheoid (a deep cup, Fig. 7) to sphaeropteroid (globose, Fig. 21) ; the sorus borne at the fork of the fertile vein, receptacle tall, more or less clavate, paraphyses numerous, long, with an enlarged apex; spores tetrahedral-globose, brownish, rather delicately (at ca. 400 ×) marked with low, usually close ridges with sharp prominences.

Juvenile plants of *Sphaeropteris horrida* and *S. Brunei* differ from adult ones (in addition to the expected characters of stem and leaf size, complexity of the lamina and a decumbent stem) by having a few large stout trichomes borne toward the apex of the ultimate segments on the adaxial surface and in having the indument of the lamina sparingly, if at all developed.

The species of the *Sphaeropteris horrida* group grow in forests, in wooded ravines and at forest borders in humid mountainous regions from ca. 600 to 2700 m. The distribution of the species (Map A) is from Hispaniola, Jamaica and Cuba to Mexico and Panama, Colombia to Bolivia and southeastern Brazil. This is a basic Cordilleran pattern of distribution that frequently occurs in plants, especially in a group of related species. Sometimes the pattern is more extensive with extensions into Puerto Rico and Venezuela, while in other examples it may be limited to the Andes and Central America.

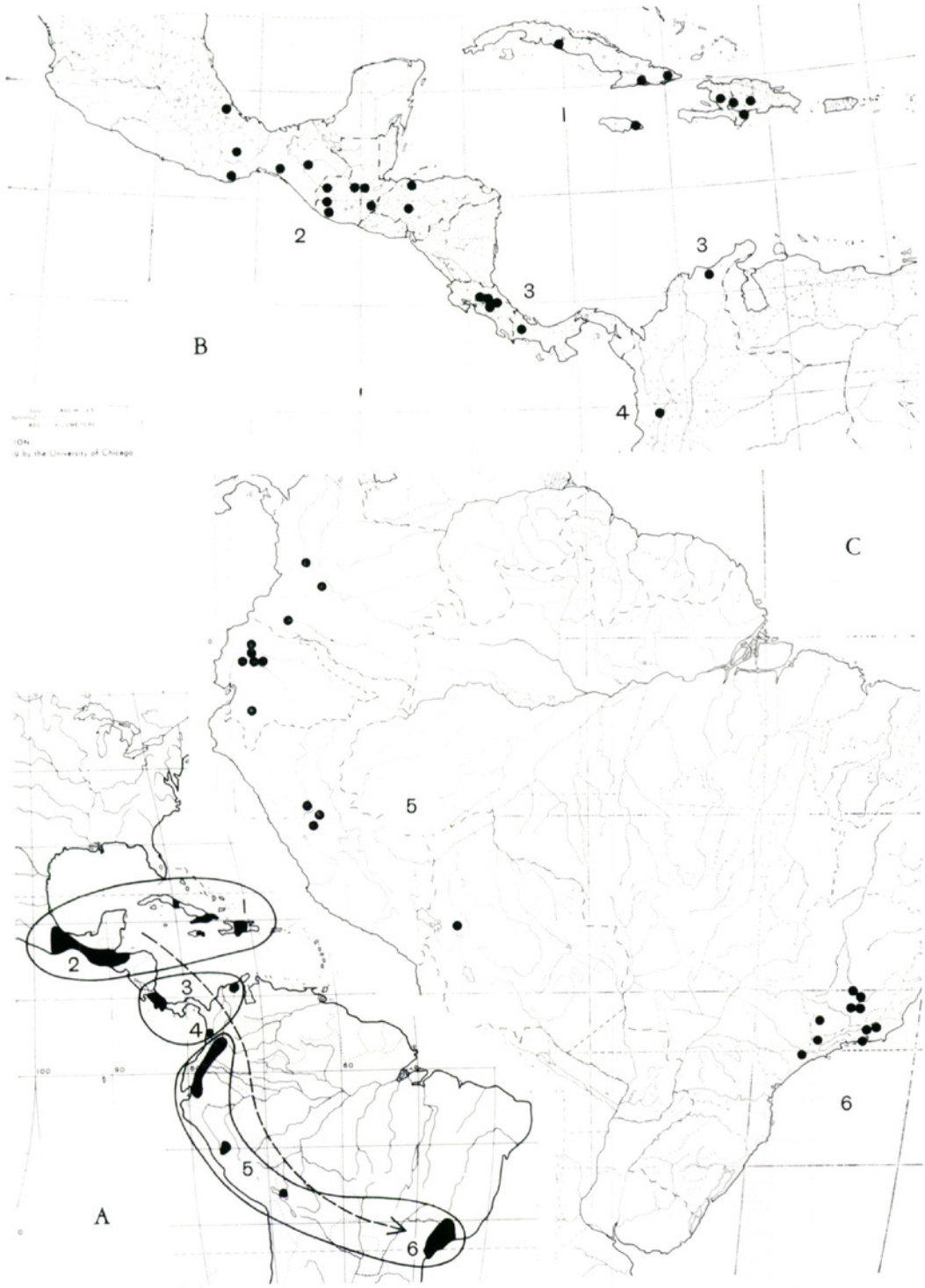
All of the species that are represented by a considerable number of collections exhibit significant variation and this is discussed especially in *Sphaeropteris Brunei* and *S. quindiuensis*. This variation may extend to the diagnostic characters, as in *Sphaeropteris insignis* and *S. horrida* where no single character is always distinctive, or as in *Sphaeropteris quindiuensis* and *S. Gardneri* where the characteristic indument of each species varies considerably in its abundance.



Figs. 15-17. *Sphaeropteris Cuatrecasasii.* 15. Squamulae of petiole, uniform dark color not indicated. Colombia, *Cuatrecasas* 22423, US, × 32. 16. Small petiole scale, same as 15. 17. Central fertile pinnules, same as 15 but F, × 0.4

Figs. 18-22. *Sphaeropteris quindiuensis.* 18. Apex of crozier scale, Ecuador, *Sparre* 16337, GH, × 32. 19. Same as 18 but below apex, showing transition from retrorse to antrorse teeth. 20. Central sterile pinnules, Ecuador, *Sparre* 16337, GH, × 0.4. 21. Immature indusium (somewhat diagrammatic), Ecuador, *Sparre* 16871, GH, × 8. 22. Bullate scales of the costule (beneath) — a) upper view, b) under view, Colombia, *Schultes & Villarreal* 7711, GH, × 32.

Figs. 23-24. *Sphaeropteris Gardneri.* Central fertile pinnules, Brazil, *Widgren* in 1844, GH, × 0.4. 24. Branched trichomes of costule and veins (beneath), Brazil, *Macedo* 2883, MO, × 32.



Map A. Distribution of the *Sphaeropteris horrida* group: species (in black), numbered as in Maps B and C, closely related species enclosed by an ellipse, arrow indicates proposed direction of phyletic advance and migration route of the group. Map B. Distribution of 1. *Sphaeropteris insignis*, 2. *S. horrida*, 3. *S. Brunei*, 4. *S. Cuatrecasasii*. Map C. Distribution of 5. *Sphaeropteris quindiuensis*, 6. *S. Gardneri*.

It is clear that the species have not yet evolved into highly distinctive taxa. I have chosen to treat them all as species because the present materials are neither extensive nor always complete and they do not provide an adequate basis for a more refined taxonomic interpretation of the taxa.

Sphaeropteris insignis and *S. horrida* may be considered as the most primitive species in the group on the basis of their open indusium (which also is sometimes deeply cleft) and their crozier scales which bear wholly antrorse teeth. The four other species are advanced with a fully closed (sphaeropteroid) indusium and with the scales borne at the top of the crozier with retrorse teeth apically. Among these species *S. Gardneri*, with a strong development of simple or branched trichomes on the abaxial surface of the ultimate segments, and *S. quindiuensis* with bullate scales on the costule, beneath, seem to be more specialized. *Sphaeropteris Brunei* and *S. Cuatrecasasii*, then, occupy an intermediate phyletic position. The species also find their closest relations at these phyletic levels so that they may be grouped into three pairs and arranged as follows: *S. insignis-S. horrida, S. Brunei-S. Cuatrecasasii* and *S. quindiuensis-S. Gardneri.*

The strong correlation of phyletic level and species relations suggests that the evolution and speciation are fully displayed in this group. As mentioned above, the species are not very strong ones so that there are no major gaps between them that might obscure their evolutionary history. The correlation of this history with the geography of the species indicates that geographic speciation has had a decisive role in the development of the group. This is illustrated in Map A where the related pairs of species are enclosed in ellipses and the correlated directions of phyletic advance and of migration is indicated.

Key to species

a. Indusium usually a deep cup to a deep urn (Fig. 7) (it may appear as sphaeropteroid when immature, but no apical umbo is present), splitting at maturity into 2-few segments (Fig. 8); or sometimes, especially the basal

indusia (and more often in *S. insignis*), narrowly to widely cleft on the side toward the margin of the segment, the margins of the indusium usually irregularly crenulate or ciliate; marginal teeth on the scales that are borne at the top of the fully coiled crozier all antrorse to patent (Fig. 1). b.

b. Petiole scales that are ca. 5 mm. long broadest well above the base; central pinnules of the central pinnae with the basiscopic costule arising from the costa or its expanded base (Fig. 4); segments of the split indusium irregularly disposed; Cuba, Jamaica, Hispaniola ..... 1. *S. insignis.*

b. Petiole scales that are ca. 5 m. long broadest at or near the base; central pinnules of the central pinnae with the basal basiscopic costule arising from the pinna-rachis (Fig. 6); segments of the split indusium nearly maintaining its original form (Fig. 8); Mexico, Guatemala, Honduras ..... 2. *S. horrida.*

a. Indusium sphaeropteroid, with an apical umbo (Fig. 21), splitting at maturity into 2-few segments, one of them retaining the umbo; marginal teeth at the apex of some of the scales that are borne at the top of the fully coiled crozier retrorse (Fig. 18), changing to antrorse below (Fig. 19). c.

c. Costules bearing trichomes (Fig. 24) or flattened scales (Fig. 14) beneath, no bullate scales present. d.

d. Costules bearing flattened scales beneath and also sometimes simple or branched trichomes, the scales predominent unless the indument is sparse and then they may be few or lacking. e.

e. Squamulae on the surface of the petiole (usually best seen beneath the persistent large scales) few to many, approximate to scattered, most with a definite body and marginal setae (Fig. 12); scales of the costule, beneath, mostly light colored basally and darker apically, or concolorous, usually with dark cilia; Costa Rica, Panama, northern

Colombia ..... *S. Brunei.*

e. Most squamulae on the surface of the petiole (usually best seen beneath the persistent large scales) minute, these forming a dense layer, substellately highly dissected into few arms (Fig. 15) ; scales of the costule, beneath, mostly dark colored basally and lighter apically, with light colored cilia; central Colombia .. .. 4. *S. Cuatrecasasii.*

d. Costule bearing numerous simple or branched trichomes beneath (Fig. 24), rarely a few flattened scales also present; southeastern Brazil .. .. 6. *S. Gardneri.*

c. Costules bearing some to many bullate scales beneath (Fig. 22), especially on fertile segments, rarely they may be absent on sterile segments, flattened scales or simple or branched trichomes may also be present; Colombia to Bolivia ... 5. *S. quinduiensis.*

1. **Sphaeropteris insignis** (D. C. Eaton) Tryon, Contrib. Gray Herb. 200: 20. 1970. Map B. Figs. 1-4.

Cyathea insignis D. C. Eaton, Mem. Amer. Acad. n.s. 8: 215. 1860. Holotype: La Guinea, eastern Cuba, Dec. 15, 1859, *Wright* 1064 YU. Isotypes (lacking locality and date) : B! GH! MO! NY! P!

Cyathea moniliformis Jenm. (as *moniliforme*) Bull. Misc. Inform. Roy. Bot. Gard. Trinidad no. 15 (vol. 3, part 7) : 59. 1898. Holotype: without collector or locality, I consider it to have been collected in Jamaica. Isotype or part of the Holotype: Botanic Gardens Herbarium (Trinidad), "no. 17, *Alsophila armata* Presl," TRIN!, photo and fragment, BM! photo GH; "Trinidad, W. Indies," Herb. Jenman, NY! photo GH.

Sphaeropteris insignis usually differs in several characters from the closely related *S. horrida.* However, all of these are variable and the range of variation in one species may overlap with that in the other. In addition to the differences mentioned in the key, the leaves of *S. insignis* are often smaller than those of *S. horrida,* the central pinnae

may be more elongate and the fertile segments are sometimes contracted and lobed (Fig. 3).

The apparently distinctive characters of *Cyathea moniliformis* — the prominent rounded lobes of the tertiary segments with strongly recurved margins, the strongly muricate pinna-rachises and the scales of the abaxial surface of the costules which have a whitish body and are strongly dissected into usually dark arms — are all present (although sometimes rare and not always as extreme) among the material I have examined of *Sphaeropteris insignis*. The spores of the two are alike. I believe that the provenance of the type specimen of *Cyathea moniliformis* was Jamaica and that it represents a variation of *Sphaeropteris insignis*. Figure 3 represents a specimen of *S. insignis* with lobed pinnules similar to those in *Cyathea moniliformis*.

The original description of *Cyathea moniliformis* includes characters of the size and disposition of the leaf that could not have been obtained from the type material cited above. The sheet at TRIN bears the apical portion of a pinna and at NY a central portion (perhaps of the same pinna); there are no notes with either sheet. This implies that Jenman had other materials and since these, if extant, might qualify as the holotype, the technical status of the specimens cited as types is in doubt.

Sphaeropteris insignis grows in the moist mountainous regions of Hispaniola, Jamaica and Cuba at ca. 750-1800 m. Additional specimens seen:

Cuba. LAS VILLAS (formerly Santa Clara): Buenos Aires, Trinidad Mts., *Hodge & Howard* 5242 (A), *León et al.* 14024, 14025, 14026 (NY), *Jack* 7271 (F, GH), *Morton* 4161 (GH, MO, NY, P, US); Sliguanéa, Trinidad Mts., *Ekman* 18516 (NY); Aguacate, Trinidad Mts., *Britton & Wilson* 5369 (NY, P). ORIENTE: El Cobre, Loma del Gato, Sierra Maestra, *Clèment* 1673 (US); Loma del Gato, *Hioram* 7021 (GH); Loma San Juan, *Hioram* 7310 (US). **Jamaica.** *Gilbert* 79 (NY); *A. Moore* in 1897 (MO); *Jenman* (NY). ST. ANDREW: Monkey Hill, above New Haven Gap, *Maxon* 2700 (US); above New Haven Gap, *Underwood* 3221 (NY, P); Moody's Gap, *Underwood* 1587, 2153 (NY). PORTLAND: St. Georges, *Jenman* (NY); Road to St. Georges, *Harris* 7622 (F), (probably *Harris*) 7722 (NY); Hardwar Gap and vicinity,

ca. 3/4ths mile south (air) of Green Hill, *Riba* 211 (GH, MEXU). ST. THOMAS: Portland Gap, *Underwood* 1443, 2478 (NY), *Maxon* 1463 (US). HISPANIOLA. **Haiti:** Morne la Selle, *Holdridge* 1968 (NY, US); Bazil, Morne Sal, *Cook* 32 (GH, US). **Dominican Republic:** LA VEGA: Constanza, *Ekman* H13891 (B, F, GH, NY); Constanza to Valle Nuevo, *Gastony et al.* 732 (GH, NY). SAN RAFAEL: Sierra de Neiba, near Haiti border, *Gastony et al.* 434 (GH, NY). BARAHONA: Noche Buena Berg, *Fuertes* 1058 (F, GH, MO, NY, P, US).

2. **Sphaeropteris horrida** (Liebm.) Tryon, Contrib. Gray Herb. 200: 20. 1970. Map B. Figs. 5-8.

Cibotium horridum Liebm. Vid. Selsk. Skr. V, 1: 279. 1849. Lectotype: Teotalcingo, Chinantla, Oaxaca, Mexico, 4-5000 ft. *Liebmann* 873 (Mex. Pl. 2086) Fol. Herb. C!, photo GH, US, fragment US! Paratype: Inter Trapide de la Concepción et Totontepec, Oaxaca, Mexico, 4-4500 ft., *Liebmann* (Mex. Pl. 2102) Fol. Herb. C! Not *Cyathea horrida* (L.) J. E. Sm. Mém. Acad. Turin 5: 416. 1793.

Cibotium princeps Linden ex. J. Sm. Ferns Brit. & For. 291. 1866, in synon.

Cyathea princeps J. Sm. Ferns Brit. & For. 291. 1866, nomen nudum.

Cyathea princeps E. Mayer, Gartenfl. 17: 10. 1868. Syntypes: Cult. Linden (Brussels) ex Volcán Tuxetla, Veracruz and Chiapas, Mexico. Authentic material has not been seen but there seems to be no doubt about the correct application of the name, providing that the material mentioned by Mayer from Costa Rica (probably representing *Sphaeropteris Brunei*) is excluded. Cultivated material identified as *Cyathea princeps* and dating from the decade of 1860 is accurately named.

Cyathea Bourgaei Fourn. Mex. Pl. 1: 135. 1872. Lectotype: Valle de Córdoba, Mexico, *Bourgeau* 2200. Isotypes: GH! NY! P! (several sheets but none from Herb. Fournier). The Bolivia collection, *Weddell* 4567 P! also cited by Fournier, is to be excluded.

Cyathea glauca Fourn. Mex. Pl. 1: 135. 1872, not Willd. Sp. Pl. 5: 493. 1810. Holotype: Orizaba, Mexico, *Bourgeau* 2794. Specimens of this number are commonly *Nephelea mexicana (Cyathea mexicana)* (P, GH, NY) but some are

Sphaeropteris horrida (P). I did not find this collection in Herb. Fournier at Paris (1969) and consequently there is uncertainty as to the identity of the original material. The description seems to indicate that *S. horrida* was the principal, or only, element included.

Cyathea Munchii Christ, Bull. Herb. Boiss. II, 7: 413. 1907. Syntypes: San Cristóbal, Chiapas, Mexico, *Münch* 64, 1986, Herb. Christ, not seen at P; fragment, *Münch* s.n. US!

This species was first collected in Mexico by Liebmann, who obtained large specimens now in the Folio Herbarium at Copenhagen. It was later introduced into cultivation by Linden and it soon received the name *Cibotium princeps* in the horticultural literature. The early association of the species with the genus *Cibotium* obviously was based on the prominent whitish undersurface of the leaf, especially evident in sterile materials. When plants from the Linden introduction became fertile John Smith placed the species in *Cyathea*.

This is the largest species of the group, with trunks to 15 m. tall and to 40 cm. in diameter. The leaves are up to 5 m. long with massive petioles. In Guatemala it is appropriately known as "Palma de Montaña" while in Mexico it is called "Rabo de Mico" from the furry appearance of the scaly crozier when it has an elongate petiole with the coiled lamina at the apex. The close relation of *Sphaeropteris horrida* and *S. insignis* has been mentioned under the latter species, as well as some frequently distinguishing characters not mentioned in the key. The indusium of *Sphaeropteris horrida* is often opaque but it rarely varies to translucent (*Brenkle* 47-103).

Sphaeropteris horrida grows in the moist mountainous regions of southern Mexico, Guatemala and Honduras at ca. 600-1800 m. Additional specimens seen:

Mexico. VERACRUZ: near Córdoba, *Spence* 125 (GH); Fortín, *Copeland* G (US); region de Orizaba *Bourgeau* 2794 (P, in part). OAXACA: Lavani to Tepinapa, *Reko* 4059 (US), vicinity of Cafetal Concordia (transplanted to hort. from Pluma Hidalgo), *Morton & Makrinus*

2681 (F, US). CHIAPAS: Hacienda Monserrate, (sw. of Cintalapa, near Oaxaca border), *Purpus* 9197 (F, GH, MO, NY). **Guatemala.** Salvin (GH). HUEHUETENANGO: between Ixcan and Finca San Rafael, Sierra de los Cuchumatanes, *Steyermark* 49402 (F, GH, US); Cerro Negro, 2 miles e. of Las Palmas, Sierra de los Cuchumatanes, *Steyermark* 51704 (F, GH, US). QUEZALTENANGO: Finca Chicabal, above Colomba, *Standley* 68044 (F); near Calahuaché, *Standley* 67096 (F); south facing slopes of Volcán Santa María, between Santa María de Jesús and Calahuaché, *Steyermark* 33178 (F), 33192, 33297, 33330, 33432 (F, US). SUCHITEPÉQUEZ: Volcán Santa Clara, 2 miles w. of Finca El Naranjo, *Steyermark* 46822 (F, GH, US); Volcán Santa Clara, above Chicacao, *Steyermark* 46771 (F, GH, US); Finca Naranjo, Chicacao, *Brenkle* 47-103 (F, NY). ALTA VERAPAZ: Finca Sapacueté, Senahú, *C. L. Wilson* 218 (F); Finca Seamay, Senahú, *Hatch & Wilson* 135 (F); vicinity of Secanqúin, *Cook & Doyle* 40 (US); between Tactic and Tamahú, *Standley* 90732 (US); Río Frio, s. of Santa Cruz, *Standley* 90175 (F, US); Cobán, *Turckheim* II 1545 (F, MO, P), in May, 1886 (J. D. Smith exsicc. 24) (B, GH, NY, P). CHIQUIMULA: Cerro Tixixi (Tishishi), 3-4 miles n. of Jocotán, *Steyermark* 31577 (F). **Honduras**: Atlántida: Lancetilla Valley, near Tela, *Standley* 53974 (F, US). COMAYAGUA: Barranco de Trincheras, 16 km. from Siguatepeque, *Molina* 7914 (US), Trincheras, n. of Siguatepeque, *Steeves & Ray* 484 (GH).

3. **Sphaeropteris Brunei** (Christ) Tryon, Contrib. Gray Herb. 200: 20. 1970. Map B. Figs. 9-14.

Cyathea Brunei Christ, Bull. Herb. Boiss. II, 4: 947. 1904. Holotype: Costa Rica, *Brune & Wercklé*, Herb. Christ, P! (a sterile pinna, the fertile material described by Christ, not seen). *Wercklé* in 1903, A!, NY! and *Wercklé* in 1901-1905, NY! ex Christ are doubtless authentic.

Cyathea caesia Christ, Bull. Herb. Boiss. II, 7: 272. 1907. Lectotype: La Palma, Costa Rica, 1500 m. 24 Nov. 1905, *Wercklé* (Herb. Instit. phys.-geog. nat. costarric. 17008), Herb. Christ, not seen at P. Isotype: (differing in date: 24, IX, 1905) P!

Sphaeropteris Brunei and the next species *S. Cuatrecasasii* are notable for the long-persistent large scales which may wholly conceal the petiole in mature leaves. This is somewhat variable in *S. Brunei*, however, and sometimes the scales are persistent only toward the base of the petiole. *Sphaeropteris Brunei* is variable in other characters, for

example, the petiole scales are usually whitish but sometimes they are brown, and sometimes are sparingly rather than freely dentate, the sterile segments are sometimes nearly devoid of indument, and the details of the indument on the lower surface of the segments are not always constant. The extent of this variation in the Costa Rica and Panama materials makes the taxonomic disposition of the collections from the Sierra Nevada de Santa Marta somewhat uncertain. The geographic isolation might imply that the Santa Marta material represents a separate taxon but it differs from most specimens from Central America in only two characters. These are the costule scales on the abaxial surface which are mostly light-colored and concolorous or nearly so and have light colored cilia, rather than being darker at the base and with dark colored cilia. However, two collections from Costa Rica, *Scamman* 7583 and *Molina et al.* 18085 have some scales very like those of the Santa Marta collections.

Sphaeropteris Brunei grows in the montane forest of Costa Rica and in one region of Panama, also in the Sierra Nevada de Santa Marta, Colombia, at altitudes of 800-2000 m. Additional specimens seen:

Costa Rica: *Wercklé* in 1907 (P); vicinity of Coliblanco, *Maxon* 332 (NY, P). HEREDIA: Cinchona, above the upper Sarapaquí valley, *Scamman* 7582 (GH). ALAJUELA: near Zapote, on road to Villa Quesada, *Scamman* 7583 (GH); Carilblanco, ca. 10 km. ne. of Volcán Poas, *Nisman* 114 (GH); Carrizal toward Cariblanco, *Gastony* 795 (GH). SAN JOSÉ: La Palma, *Maxon* 487 (NY, P); La Palma, *A. & C. Brade* (Rosenst. Fil. Costaric. Exsicc. 30) (A); above La Hondura, *Gastony* 768 (GH); Las Nubes, *Scamman & Holdridge* 7859 (GH); San Isidro El General, *Nisman* 41 (GH), *Molina et al.* 18085 (F). CARTAGO: on road up Turialba Volcano, nw. of Trinidad, *Lent* 559 (GH). **Panama.** CHIRIQUI: valley of the Río Caldera, El Boquete to the Cordillera, *Killip* 5242 (GH); Holcomb's Trail, 10 miles above El Boquete, *Killip* 5242 (US). **Colombia.** MAGDALENA: Sierra Nevada de Santa Marta; Alto de Cielo, Dec. 12, *H. H. Smith* 1122 (GH, NY), above Las Nubes, Feb. 6, *H. H. Smith* 1122 (NY), without precise locality, *H. H. Smith* 1122 (F, MO, NY).

4. **Sphaeropteris Cuatrecasasii** Tryon, spec. nov. Map B. Fig. 15-17.

Species *Cyathea Bruneo* valde affinis, differt squamulis minutis petioli rufis fortiter dissectis substellatis brachiolis paucis, squamis costulae subter basaliter brunneis versus apicem pallidioribus ciliis pallidis. — Caulis erectus 3 m. altus 15-20 cm. crassus, petiolus 1.25 m. longus dense persistenter squamatus squamis cellulis conformibus marginibus ordinatim fusci-denticulatis setulas fuscas ad apicem ferentibus, lamina 2.5 m. longa bipinnato-pinnatifida infra pallida, pinnulae segmentis basalibus plerumque auriculatis abrupte excavatis, costa et costula subter squamis fere planis, indusium globosum. Holotypus: Colombia. Valle del Cauca: Filo de la Cordillera Occidental, sobra Las Brisas, entre El Tabor y Alto de Mira (ca. 20 km. wnw. of Cartago), *Cuatrecasas* 22423, US. Isotypus: F.

Sphaeropteris Cuatrecasasii is especially distinguished by the covering of distinctive reddish squamulae (Fig. 15) of the petiole which are borne beneath the large scales and form a dense layer concealing the petiole surface. Characters of the costule scales are mentioned in the key but considering the variation among these in *Sphaeropteris Brunei* (where they are rarely nearly like those of *S. Cuatrecasasii*) they may well be found to be variable in *S. Cuatrecasasii* as additional materials of it become known. Squamulae similar to those on the petiole are also present on some of the abaxial surfaces of the pinna rachises where they are sparingly persistent on the mature leaf. A further character that is difficult to assess is that in *Sphaeropteris Cuatrecasasii* the surface of the larger petiole scales is quite dull (below their apical portion) due to the irregular surface. In *S. Brunei* the surface of the petiole scales is smooth or only slightly irregular and is shining.

The single collection was obtained at 2200-2300 m. in central Colombia.

5. **Sphaeropteris quindiuensis** (Karst.) Tryon, Contrib. Gray Herb. 200: 20. 1970. Map C. Figs. 18-22.

Cyathea quindiuensis Karst. Linnaea 28: 454. 1857. Holotype: Crescit in tractu montuoso Quindiuensi inter flumina

Magdalena et Cauca, Colombia, *Karsten*. Páramo Quindío, 7000 ft., *Karsten*, det. Karsten Herb. Mett. B! is authentic as may be Colombia, *Karsten*, fragment ex Rosenst. US!

Cyathea crassipes Sodiro, Rec. crypt. vasc. Quito 10. 1883. Lectotype: San Florencia, Ecuador, 5/1882, *Sodiro*. Isotypes: A! MO! P! US! (An apparently different collection, with the same data, is at NY). Paratypes: Nanegal, Ecuador, *Sodiro*; Santo Domingo, Ecuador, *Sodiro*.

Cyathea Bonapartii Rosenst. Fedde Repert. 7: 289. 1909. Holotype: Monte Canelos inter Río Verde et Mapoto, Ecuador, Oct. 1857, *Spruce*, Herb. Bonaparte 10049, P!, fragment ex Bonap. US!.

Cyathea yungensis C. Chr. Ark. f. Bot. 20A(7) : 10. 1926. Holotype: El Chaco, Prov. Sur Yungas, Dept. La Paz, Bolivia, ca. 2000 m., *E. Asplund* 1273, probably UPS. Isotype: Herb. Birger, S-PA! (det. C. Chr. with an unpublished name).

The bullate scales on the abaxial surface of the costules (Fig. 22a, 22b) serve to distinguish *Sphaeropteris quindiuensis*. It is a variable species in a number of characters, including the abundance of the bullate scales which may be few to many on a costule. The color of the petiole scales varies from usually whitish to lustrous brown and their margin varies from regularly to very sparingly dentate. The ultimate segments are usually approximate and adnate (Fig. 20) but (especially in Peru) they vary to rather widely spaced and subsessile toward the base of the pinnules. The scales on the costa, beneath, are variously bicolorous to multicolorous or rarely brown and concolorous (*Little* 8038) and the scales on the lower surface of the costules may be darker basally or darker apically, or concolorous, and they may or may not have a long trichomoid tip. A few simple or branched trichomes may be present on the under surface of the segments or they may be rather abundant (*Sparre* 16337).

Sphaeropteris quindiuensis grows in the Andes of Colombia, Ecuador, Peru and Bolivia, at ca. 1400-2700 m. Additional specimens seen:

Colombia. CALDAS: Old Quindío Trail, Laguneta to Magana, *Killip & Hazen* 9473 (GH); Quindío, *Triana* (P), fragment of *Triana* 185 (B). TOLIMA: El Aden to La Palmilla, *Killip & Hazen* 9622 (GH, NY, US). HUILA: Hacienda Balsillitas, Meta to El Cedral, *Little* 8038 (GH, US). PUTUMAYO: Sibundoy, *Schultes & Villarreal* 7711 (GH). **Ecuador.** PICHINCHA: Valle Lloa, *Mille* (P, US); Vulcán Corazón, *Sodiro* in May 1902 (A, NY, P); Monte Pichincha, *Sodiro* in Sept. 1900 (NY); Vulcán Atacatzo, *Sodiro* in July, 1907 (P); Chiriboga, *Sparre* 16990, 16995, 17390 (GH, S); Chillagallo to Chiriboga, *Sparre* 16871 (GH, S); Nono to Tandayápi, along Río Alambí, *Sparre* 19360 (GH, S). TUNGURAHUA: near Baños, *Sydow* 511, 702 (US); Baños, *Heinrichs* 254 (F); Vulcán Tungurahua, *Sodiro* in Dec. 1904 (F, US). ZAMORA-CHINCHIPE (Santiago-Zamora): Loja to Zamora, *Sparre* 16337 (GH, S). **Peru.** HUÁNUCO: Tingo María to Chinchao, Río Chinchao, *Soejarto* 1427, 1430 (GH); Playapampa, *Macbride* 4856 (F). PASCO (formerly in Junín): Oxapampa, *Soukup* 2336 (F, GH, USM).

6. **Sphaeropteris Gardneri** (Hook.) Tryon, Contrib. Gray Herb. 200: 20. 1970. Map C. Figs. 23-24.

Cyathea Gardneri Hook. Sp. Fil. 1: 21, *t.* 10A (cited as 10B). 1846. Lectotype: Arrial das Merces, Brazil, *Gardner* 5328 K!, fragment NY! Isotypes: F! (fragment ex P), P! US! Paratype: Morro Velho, Brazil, *Gardner* 5333, K!, fragment NY!

Cyathea incurvata Kze. Linnaea 22: 579. 1849. Holotype: Caldas, Minas Geraes, Brazil, *Regnell* I 477, fragment P! (Herb. Luerssen ex Herb. Lips. Kze.). Isotypes: B! P! US!

Cyathea mamillata Fée, Crypt. vasc. Brésil 1: 176, *t.* 63, *f.* 2. 1869. Holotype: Serra Carassa, Brazil, *Galeotti* 247. Isotype: P! (*s.n.* in Herb. Glaziou).

Cyathea Taunaysiana Fée, Crypt. vasc. Brésil 1: 178, *t.* 64, *f.* 2. 1869. Holotype: Tijuca, Brazil, *Glaziou* 1701 P! (Herb. Cosson), fragment ex Fee, NY! Isotypes: P! US!

Cyathea attenuata Fée, Crypt. vasc. Brésil 1: 178, *t.* 66, *f.* 1. 1869. Holotype: Minas Geraes, Brazil, *Weddell* 1062. Isotype: P!

Sphaeropteris Gardneri is often a small species, with leaves only about 1 m. long. The abundant simple or branched trichomes on the costules beneath (Fig. 24), are

especially characteristic of the species although they vary somewhat in their density. Scales are usually absent from the abaxial surface of the segments but rarely a few flattish ones may be present.

Glaziou 1701 is considered to be the holotype of Fée's *Cyathea Taunaysiana* on the basis of evidence that Cosson obtained portions of Fée's own herbarium. There is a complete set of the Glaziou collections of tree ferns, cited by Fée in his Crypt. vasc. Brésil., present in the Cosson Herbarium at Paris and some collections that have special parts of the plant have an obvious identity with the illustration published by Fée. Some of the sheets also have original pencil drawings attached that match the illustrations. I believe that Cosson acquired some parts of Fée's Herbarium, certainly the materials of the Brazilian Cyatheaceae, and probably all of those relating to his Brazilian work.

The several collections seen provide no information on the habitat or altitude but the localities are all from the mountainous regions of São Paulo, Rio de Janeiro and Minas Geraes. Additional specimens seen:

Brazil. *Burchell* 4703 (B, P). MINAS GERAES: *Widgren* in 1844 (GH, US), in 1845 (US); entre Sitio y Barbacena, *Glaziou* 11710 (B, NY, P); Saramento, *Macedo* 2883, 2885 (MO); Caldas, *Mosén* 2033 (B, P), 4588 (P); Barbacena, *Pohl* (P). RIO DE JANEIRO: Petropolis, *Spannagel* 434 (NY); Nova Friburgo, *Glaziou* 2282 (P); *Glaziou* 7329 (B, NY, P); *Glaziou* 981 in 1872 (GH, P) (not *Glaziou* 981 cited by Fée as *Alsophila ceropteris* Fée). SÃO PAULO: Santa Anna, *Brade* 5378 (NY); Ozaco, *Luederwaldt* 643 (NY), 1166 (B, NY).

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A SECOND RECORD FOR THE GIANT CHICKWEED, MYOSOTODON AQUATICUM, IN NEW HAMPSHIRE: In a moist meadow-pasture along the Connecticut River, one mile south of Monroe, northern Grafton Co., New Hampshire, I found on August 29, 1970 a large number of plants of the giant chickweed, *Myosotodon aquaticum* (L.) Moench. The plant reminded me strongly of *Stellaria pubera*, but I noticed the 5 styles. The only other record for New Hampshire is at Bristol, in extreme southeastern Grafton Co.; however, the plant has been found along the Connecticut River at Bradford, Vermont.

I suspect that the plant occurs in grassy meadows all along the Connecticut River. It is true, however, that forests, rocky banks, and towns come right down to the river at many places. Specimens are being sent to the herbaria of New England Botanical Club, University of New Hampshire, and the Pringle Herbarium, University of Vermont.

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