

The Ferns of Brazilian Amazonia

Rolla M. Tryon (*)
David S. Conant (**)

Abstract

An annotated list of the pteridophytes of Brazilian Amazonia is presented, with the geographic occurrence of the species by States and Territories. The flora includes 12 families, 58 genera and 279 species, with only four species possibly endemic. Two new combinations are *Arachnoides macrostegia* (Hook.) Tryon & Conant and *Thelypteris juruensis* (C. Chr.) Tryon & Conant. Some general comments on the geography of Amazonian ferns are included as well as ecological studies presenting data on the local environmental preferences of six species.

There have been no general accounts of the fern flora of the Amazon Basin and few reports on fern ecology from the region. This paper presents an annotated, geographic list of the Pteridophyta of the States of Amazonas, Pará and Acre, and the Territories of Amapá, Rondônia and Roraima. Records from the Amazonian (northern) part of the State of Mato Grosso have not been included since there are so few collections from that region.

Detailed studies on tropical American fern ecology are limited and much more work is required even to establish such fundamental aspects as the relation of species to environment. Ecological studies were made in the vicinity of Manaus, as part of the Class on Pteridophyta, Curso de Botânica Tropical do INPA. These indicate a strong preference of each of the species analyzed for a portion of an environmental gradient.

GEOGRAPHIC COMMENTS

The most outstanding fact of Amazonian fern geography is that species endemism is either extremely low or entirely absent. The region is a very large and rather diversified one, yet only four species among 279 listed are

confined to the area. These are *Selaginella manausensis*, *S. Terezoana*, *Isoetes amazonica* and *I. triangula*. These species are known from so few collections that their actual distribution is not certain. Other, presently dubious, species may be added to this list. However, endemism among the Pteridophyta is exceptionally low, in contrast to the significant endemism in the flowering plants. For example, in 5 genera discussed by Prance (1973), *Licania*, *Hirtella*, *Tapura*, *Dichapetalum* and *Cariniana*, there is a total of 25 endemics in Brazilian Amazonia.

Most of the species we have listed may be considered as truly Amazonian ferns in the sense that they grow, rarely to commonly, in one or more of the habitats that are distributed through the Amazon Basin. A small element, however, enters our list only because of the political-geographic definition of the area. This is a clear Andean element known only in the State of Acre. It consists of about 15 species, for example, *Nephelea cuspidata*, *Adiantum platyphyllum*, *A. scalare*, *Diplazium marginatum*, *D. praestans*, and *Pteris pungens*.

The largest genera are *Selaginella* with 31 species, *Polypodium* with 30, *Trichomanes* with 27, *Lindsaea* with 22, and *Adiantum* and *Asplenium* with 16 species each. The large number of species in *Trichomanes* and *Lindsaea* is especially notable. In each genus they are predominantly species of the Guayana region to the north. Most, but not all, of the *Polypodium* species are widely distributed in tropical America. Their number reflects the large size of the genus in America when it is construed, as we do here, in the broad sense. The species of *Selaginella* also reflect the size of the genus, for there are about 130 species in tropical South America.

(*) — Department of Biology and Gray Herbarium, Harvard University.
(**) — Biological Laboratories, Harvard University.

Genera that are notably under-represented are *Thelypteris* (in the broad sense) with 12 species, *Elaphoglossum* with 9, *Pteris* with 6 (3 of them in the Andean element of Acre), and *Lycopodium* with 5 species. The reasons for the relatively few species in genera that are much better represented to the north, west and south, are not clear. Perhaps the absence of relatively cool and nearly constantly moist environments is a decisive factor in limiting their development in Amazonia.

ECOLOGY

Trichomanes arbuscula and *Elaphoglossum discolor* were studied on a densely wooded stream bank at km 130 on the Manaus to Caracaraí road. Ten 1 m by 1 m plots were laid out at 4 m intervals along the border of the stream, and each of these was extended up the bank by the addition of two 1 m² plots. All fern plants within these 30 m² were identified and counted. They included 176 plants of *Trichomanes arbuscula*, 76 plants of *Elaphoglossum discolor*, 3 plants of *E. glabellum* and 1 plant of *Lindsaea Schomburgkii*. The distribution of the two common species was analyzed with reference to their occurrence in the m² bordering the stream and the ones farther from the stream. The results are tabulated in Table 1.

TABLE 1.

Number of plants of two ferns in relation to a stream border.

Species	Meters from the stream.		
	0-1 m	1-2 m	2-3 m
<i>Elaphoglossum discolor</i>	58	7	11
	76%	9%	15%
<i>Trichomanes arbuscula</i>	71	79	26
	40%	45%	15%

Trichomanes arbuscula is a terrestrial filmy fern and *Elaphoglossum discolor* is a coriaceous leaved epiphyte. They both show a pronounced preference for proximity to the stream. An important aspect of the environmental gradient for both species is probably the increased light near the stream. The distribution of the *Trichomanes* is probably also

influenced by the more constantly wet soil on the lower slopes of the stream bank, partly due to seepage and partly due to seasonal inundation.

Two epiphytic ferns, *Elaphoglossum glabellum* and *Polypodium nanum*, were frequent in the campina forest at the Estação Experimental de Silvicultura Tropical at km 60 on the Manaus to Caracaraí road. A sample through this somewhat dry upland forest yielded 54 trees with one or both species growing on the trunk. Other vascular epiphytes were rare. Twenty trees had plants of both ferns, 30 had only *Elaphoglossum* and 4 had only the *Polypodium*. Data were obtained on the height above the ground that plants of each species occurred. A total of 249 plants of *Elaphoglossum glabellum* were measured and 125 of *Polypodium nanum*. The results are presented in Table 2.

TABLE 2.

Distribution of plants of two species of ferns growing on tree trunks.

Height above ground (cm).	a. Only <i>Elaphoglossum</i>	b. <i>Elaphoglossum</i> occurring with <i>Polypodium</i>	c. All plants of <i>Elaphoglossum</i>	d. Only <i>Polypodium</i>	e. <i>Polypodium</i> occurring with <i>Elaphoglossum</i>	f. All plants of <i>Polypodium</i>
221-500	5	4	9	0	2	2
201-220	9	0	9	0	0	0
181-200	3	9	12	0	2	2
161-180	2	12	14	0	4	4
141-160	10	13	23	0	5	5
121-140	12	15	27	0	6	6
101-120	6	8	14	0	15	15
81-100	19	15	34	0	10	10
61-80	13	17	30	0	5	5
41-60	7	10	17	1	13	14
21-40	16	15	31	0	19	19
0-20	21	8	29	9	34	43
Total plants	123	126	249	10	115	125

F values computed from raw data:

a compared with b = 2.35

b compared with e = 20.78

Polypodium nanum is a small species with thin leaves. It occurred most frequently on the lower 60 cm of the trunks and with clearly diminishing frequency above 120 cm.

This distribution may be based on a humidity gradient that is highest near the base of the trees.

Elaphoglossum glabellum is a somewhat larger species with narrow, coriaceous leaves. It occurred with considerable frequency up to 180 cm and then diminished in numbers above that height. The relatively even distribution of the *Elaphoglossum* through 180 cm of trunk does not suggest a gradient. It is a more xeromorphic species than the *Polypodium* and perhaps is well adapted to a broader range of moisture conditions. The F value computed from the data for both species when they were growing together shows a highly significant statistical difference between them. The F test result of 20.78 is much higher than the required 6.79 at the 1% level. This comparison indicates that each species has different environmental preferences which are expressed in their distribution on the tree trunks. Competition is not indicated as a part of the environment since the data on *Elaphoglossum*, when growing by itself, shows no statistically significant difference from the data when it was growing with the *Polypodium*. The F test result of 2.35 is well below the level of 6.79 which would indicate a significant difference for these sets of data.

Schizaea pennula and *Schizaea stricta* were frequent in the sandy soils of the campina at the Estação Experimental de Silvicultura Tropical, km 60 on the Manaus to Caracarái road. In the area where these species grew, there were small to rather large clumps of shrubs and small trees separated by irregular areas of open sand. Under the woody growth (Zone A) there is shade, considerable dry leaf litter, and a humus layer about 3-5 cm in depth. In the open sand areas (Zone C) there is shade for only a portion of a day, no leaf litter and no definite humus layer. Shade and soil conditions are intermediate in the areas shaded by peripheral branches (Zone B) beyond the trunks of the trees and shrubs. The temperature, light, and soil moisture conditions undoubtedly form a step-like, rather than a gradual gradient, with marked changes occurring over a distance of a few decimeters at the border of the zones. An analysis of the

distribution of the two *Schizaea* species in the three zones of the campina is shown in Table 3.

Schizaea pennula had a marked preference for the sites under the woody growth of the campina and *Schizaea stricta* for sites near its periphery. *Schizaea incurvata* also occurred in the campina. Six plants were seen, four of them in Zone B and 2 in Zone C. The areas of open sand had few *Schizaea* plants, only 10% of the 50 observed.

TABLE 3.

Number of plants of two *Schizaea* species in zones (see text) of the campina.

Species	Zone A	Zone B	Zone C
<i>Schizaea pennula</i>	13	2	0
<i>Schizaea stricta</i>	0	26	3

ANNOTATED LIST OF THE PTERIDOPHYTA OF BRAZILIAN AMAZONIA.

The following list of the Pteridophyta of the Amazon Region of Brazil and the distribution of the species by States and Territories has been obtained from field work and from studies of the extensive collections in the herbaria of the Instituto Nacional de Pesquisas da Amazônia, Manaus, the Museu Paraense Emílio Goeldi, and the Instituto de Pesquisas e Experimentação Agropecuária do Norte, Belém. A collection in one (or more) of these herbaria is indicated by an X under the appropriate geographic heading, or in the case of the State of Amazonas, species recorded from the Reserva Florestal Ducke have been indicated by a D and those from the Estação Experimental de Silvicultura Tropical by an E. This provides a checklist for the pteridophytes of these two reserves near Manaus that may be useful to botanists working at INPA. A total of 45 species is recorded from Ducke and 47 from the Estação Experimental.

Other records have been cited from modern monographs that include species of the region and, in addition, some other literature and an occasional collection in the Gray Herbarium, Harvard University. These sources are indicated under a geographic heading by a number that refers to the notes that follow

the list. Comments on certain species or on their names are also included in the notes and these are indicated by a number following the name of the species.

This list of 279 species includes all of the more common species and many of the rare

ones. Cases of doubtful identification, or questionable geographic records, have not been included. It is expected that further study and collecting will increase the number of species to over 300 and extend the range of many of the species.

LYCOPODIACEAE

Lycopodium alopecuroides L.

Lycopodium carolinianum L. ¹

Lycopodium cernuum L.

Lycopodium dichotomum Jacq.

Lycopodium linifolium L.

SELAGINELLACEAE

Selaginella amazonica Spring

Selaginella anomala Spring

Selaginella arenaria Baker

Selaginella asperula Spring

Selaginella brevifolia Baker

Selaginella Breynii Spring

Selaginella cladorrhizans A. Br.

Selaginella coarctata Spring

Selaginella deltoides A. Br.

Selaginella dendricola Jenm.

Selaginella epirrhizos Spring

Selaginella erythropus (Mart.) Spring

Selaginella exaltata (Kze.) Spring

Selaginella flagellata Spring

Selaginella fragilis A. Br.

Selaginella haematodes (Kze.) Spring

Selaginella homaliae A. Br.

Selaginella Kochii Hieron.

Selaginella Lechleri Hieron.

Selaginella manausensis Bautista

Selaginella Parkeri (Hook. & Grev.) Spring

Selaginella pedata Kl. ³

Selaginella producta Baker

Selaginella radiata (Aubl.) Spring ⁴

Selaginella revoluta Baker

Selaginella simplex Baker

Selaginella stellata Spring

Selaginella subarborescens Hook.

Selaginella sulcata (Desv.) Spring

Selaginella Terezoana Bautista

Selaginella tuberculata Baker

Amapá Pará Amazonas Roraima Rondônia Acre

X

X

X

X

X

X

X

X

X

X

2

E

2

E

2

2

2

2

X

X

X

2

X

X

2

2

X

X

D

E

2

X

2

2

E

2

X

X

2

X

X

X

X

X

2

E

2

E

2

2

2

2

X

X

X

2

X

X

2

2

X

X

D

E

2

X

2

2

E

2

X

X

2

(1) — Including var. *meridionale* (Underw. & Lloyd) Nessel & Hoehne.

(2) — Alston, A. H. G. The Brazilian species of *Selaginella*. *Fedde Rep. Spec. Nov.*, 40: 303-319. 1936.

(3) — Sometimes parts, or all, of an erect branch system bear small (ca 2 mm long) lateral leaves rather than those of the usual size (ca 3 mm long). These small leaves give a very unusual appearance in contrast to the coarser normal pattern (*Conant 1161, 1484*).

(4) — Including *Selaginella penniformis* (Lam.) Hieron.

ISOETACEAE

Isoetes amazonica Baker

5

Isoetes triangula Weber

6

OPHIOGLOSSACEAE

Ophioglossum ellipticum Hook. & Grev.

X

X

Ophioglossum macrorrhizum Kze. ⁷

X

X

Ophioglossum nudicaule L.f. var. *tenerum*

(Mett.) Claussen

X

Ophioglossum palmatum L.

X

MARATTIACEAE

Danaea elliptica J. E. Sm. ⁸

E

Danaea simplicifolia Rudge

X

E

Danaea trifoliata Kze.

D

SCHIZAEACEAE

Anemia buniifolia (Gardn.) Moore

X

Anemia ferruginea HBK. var. *ferruginea*

9

Anemia villosa Willd.

X

Lygodium micans Sturm

X

X

Lygodium venustum Sw. ¹⁰

X

X

X

X

X

Lygodium volubile Sw.

X

X

X

X

X

Schizaea elegans (Vahl) Sw. ¹¹

X

X

X

X

Schizaea fluminensis Sturm

X

X

D

Schizaea incurvata Schkr.

X

X

E

Schizaea pennula Sw.

X

X

E

X

Schizaea Poeppigiana Sturm

X

Schizaea stricta Lell. ¹²

E

Schizaea subtrijuga Mart.

X

MARSILEACEAE

Marsilea polycarpa Hook. & Grev. ¹³

X

X

SALVINIACEAE

Azolla microphylla Kaulf

X

X

Salvinia auriculata Aubl.

X

Salvinia oblongifolia Mart.

14

(5) — Baker, J. G. A synopsis of the species of *Isoetes*. *Jour. Bot.*, 18: 109. 1880.

(6) — Weber, U. Zur anatomie und systematik der gattung *Isoetes* L. *Hedwigia*, 63: 253. 1922.

(7) — *Ophioglossum nudicaule* var. *macrorrhizum* (Kze.) Claussen.

(8) — *Danaea Ulei* Christ from Amazonas is probably the same species.

(9) — Mickel, J. T. A monographic study of the fern genus *Anemia* subgenus *Coptophyllum*. *Iowa State Jour Sci.* 36: 429. 1962.

(10) — Formerly often under the name *Lygodium polymorphum* (Cav.) HBK., which properly applies to a species of the paleotropics. See Christensen, C., *Dansk Bot. Ark.* 9(3): 30. 1937.

(11) — Including *Schizaea amazonica* (Christ) Takeuchi, *S. elegans* var. *attenuata* (Sturm) Takeuchi, *S. flabellum* Mart., and *S. pacificans* Mart. See Lellinger, D. B. The Botany of the Guayana Highland — Part VIII. Schizaeaceae (Filicales). *Mem. New York Bot. Gard.*, 18: 2-11. 1969.

(12) — This identification is somewhat uncertain. *Conant 986*, among others, has the leaves 2-3 times forked and the fertile not much taller than the sterile. This differs from typical *Schizaea incurvata* which has the leaves 0-2 times forked. The 3-forked leaves relate the material to *S. stricta*, which has leaves 2-6 times forked. However, *S. stricta* typically has the leaves much taller than the sterile. Since the material can not be referred to either species with certainty, we prefer to use the name *S. stricta* to call attention to the problem of variation in the two species.

(13) — Material seen from near Manaus was sterile; it was in a floating mat and had spongy stems and large leaflets up to ca 3 cm long. Fertile plants are much smaller and probably occur only when the plants are rooted in mud.

(14) — Sota, E. R. de la, *Salvinia oblongifolia* Martius. *Darwiniana*, 12: 469. 1962.

	Amapá	Pará	Amazonas	Roraima	Rondônia	Acre
<i>Salvinia rotundifolia</i> Willd. 15		16	X			
<i>Salvinia Sprucei</i> Kuhn			X			
GLEICHENIACEAE						
<i>Dicranopteris pectinata</i> (Willd.) Underw.	X	X	X			
<i>Gleichenia remota</i> (Kaulf.) Spreng.			X	X		X
HYMENOPHYLLACEAE						
<i>Hymenophyllum abruptum</i> Hook.		X				
<i>Hymenophyllum hirsutum</i> (L.) Sw. 17	X	X	X	X		
<i>Hymenophyllum polyanthos</i> Sw.	X	X	DE	X		X
<i>Trichomanes angustifrons</i> (Fée) W. Boer 18		19	D			
<i>Trichomanes Ankersii</i> Hook. & Grev.		X	DE		X	X
<i>Trichomanes arbuscula</i> Desv.		X	X			
<i>Trichomanes bicornis</i> Hook.			X			
<i>Trichomanes cellulatum</i> Kl.			DE			
<i>Trichomanes cristatum</i> Kaulf.	X	X	DE			X
<i>Trichomanes diversifrons</i> (Bory) Sadeb.	X		X			
<i>Trichomanes Ekmanii</i> W. Boer			E			
<i>Trichomanes elegans</i> Rich.	X		D	X		X
<i>Trichomanes heterophyllum</i> HBK.		X	X	X		
<i>Trichomanes Hostmannianum</i> (Kl.) Kze. 20	X	X	X	X	X	
<i>Trichomanes Kapplerianum</i> Sturm 21	X	X	X			
<i>Trichomanes Krausii</i> Hook. & Grev.		19				
<i>Trichomanes lineolatum</i> (vdBosch) Hook.		19				
<i>Trichomanes macilentum</i> vdBosch			X			
<i>Trichomanes nummularium</i> (vdBosch) C. Chr.			19			
<i>Trichomanes pedicellatum</i> Desv.	X	X				
<i>Trichomanes pilosum</i> Raddi 22			E			
<i>Trichomanes pinnatum</i> Hedw. 23	X	X	DE		X	X
<i>Trichomanes polypodioides</i> L.	X					
<i>Trichomanes punctatum</i> Poir. 24	X	X	DE			X
<i>Trichomanes radicans</i> Sw.				X		
<i>Trichomanes Spruceanum</i> Hook. 25			X			
<i>Trichomanes tanaicum</i> Sturm			X			X
<i>Trichomanes Troillii</i> Bergdolt	X		DE	X		
<i>Trichomanes Tuerckheimii</i> Christ			X			
<i>Trichomanes Vittaria</i> Poir.	X	X	X	X	X	X
CYATHEACEAE 26						
<i>Cyathea Delgadii</i> Sternb. 27				X		X

(15) — Including *Salvinia minima* Baker, which appears to be only a small form of *S. rotundifolia* (Conant 958, Mitchell & Rodrigues 1243).

(16) — Drouet 2046 (GH).

(17) — Including *Hymenophyllum ciliatum* Sw.

(18) — Sometimes previously misidentified as *Trichomanes pusillum* Sw., a closely related species.

(19) — Boer, W. The New World species of *Trichomanes* sects. *Didymoglossum* and *Microgonium*. *Acta Bot. Neerland.* 11: 277-330. 1962.

(20) — *Trichomanes abruptum* Christ and *T. Huberi* Christ are synonyms.

(21) — Sometimes previously misidentified as *Trichomanes Hookeri* Presl, a species of the West Indies.

(22) — *Trichomanes Martiusii* Presl is a commonly used synonym.

(23) — Including *Trichomanes pennatum* Kaulf.

(24) — All Amazonian material evidently belongs to ssp. *labiatum* (Jenm.) W. Boer.

(25) — *Trichomanes amazonicum* Christ from Manaus is probably this species.

(26) — The genera follow Tryon, R. The classification of the Cyatheaaceae. *Contrib. Gray Herb.*, 200: 1-50. 1970.

(27) — An earlier name for the well known *Cyathea Schanschin* Mart.

	Amapá	Pará	Amazonas	Roraima	Rondônia	Acre
<i>Cyathea platylepis</i> (Hook.) Domin			X			
<i>Metaxya rostrata</i> (Willd.) Presl	X	X	DE	X	X	X
<i>Nephelea cuspidata</i> (Kze.) Tryon						X
<i>Shaeropteris cyatheoides</i> (Desv.) Windisch	X	28	E	X	X	
<i>Sphaeropteris hirsuta</i> (Desv.) Tryon	28	X	D			
<i>Sphaeropteris macrosora</i> (Baker) Windisch var. <i>reginae</i> Windisch			X			
<i>Trichipteris microdonta</i> (Desv.) Tryon	X	X	D			
<i>Trichipteris nigra</i> (Mart.) Tryon			29			
<i>Trichipteris procera</i> (Willd.) Tryon			29			
<i>Trichipteris pubescens</i> (Baker) Tryon				X		
POLYPODIACEAE						
<i>Acrostichum aureum</i> L.	X	X	X			
<i>Acrostichum daneaefolium</i> Langsd. & Fisch		X				
<i>Adiantum adiantoides</i> (J. Sm.) C. Chr.		X				
<i>Adiantum deflectens</i> Mart.		X			X	
<i>Adiantum glaucescens</i> Kl.		X		X		
<i>Adiantum hirtum</i> Splitgb.	X	X	DE		X	X
<i>Adiantum humile</i> Kze.	X	X	X	X	X	X
<i>Adiantum latifolium</i> Lam. ³⁰		X	X	X	X	X
<i>Adiantum Leprieurii</i> Hook.		X				
<i>Adiantum obliquum</i> Willd.	X	X	X			X
<i>Adiantum petiolatum</i> Desv.	X	X	X		X	X
<i>Adiantum platyphyllum</i> Sw.						X
<i>Adiantum pulverulentum</i> L.		X	X	X	X	X
<i>Adiantum scalare</i> Tryon						X
<i>Adiantum terminatum</i> Miq.	31	X		X		
<i>Adiantum tetraphyllum</i> Willd.	X		X	X		
<i>Adiantum tomentosum</i> Kl.			DE			X
<i>Adiantum serratodentatum</i> Willd.	X	X	X			
<i>Ananthacorus angustifolius</i> (Sw.) Underw. & Maxon	X	X		X	X	X
<i>Anetium citrifolium</i> (L.) Splitgb.	X		X			X
<i>Arachnoides denticulata</i> (Sw.) Ching ^{32, 33}			X			
<i>Arachnoides macrostegia</i> (Hook.) Tryon & Conant ³⁴		X	X			
<i>Asplenium abscissum</i> Willd.						X
<i>Asplenium angustum</i> Sw.		X	DE		X	X
<i>Asplenium auriculatum</i> Sw.			E			
<i>Asplenium auritum</i> Sw.	X	X	X	X	X	X

(28) — Windisch, P. G. The systematics of the group of *Sphaeropteris hirsuta* (Cyatheaceae). *Mem. New York Bot. Gard.* (in press).

(29) — Barrington, D. B. A revision of the genus *Trichipteris* (Cyatheaceae). Ph. D. Thesis, Harvard University. 1974.

(30) — A variation with larger, long-triangular and acute pinnules (**Rodrigues & Coelho 8384** (INPA), among others, has quite a different appearance than typical *Adiantum latifolium*).

(31) — **Irwin, Pires & Westra 47871** (GH).

(32) — The American species of *Dryopteris* subgenus *Polystichopsis* (J. Sm.) C. Chr. (**Dansk Vid. Selsk. Skr. 8 Række**, 6: 101-120. 1920) are here treated in the genus *Arachnoides*, Bl.

(33) — A small plant with relatively less dissected leaves (**Bautista & Araujo 12**, GH) is apparently a variation of this species.

(34) — *Arachnoides macrostegia* (Hook.) Tryon & Conant, comb. nov. *Nephrodium macrostegium* Hook. *Sp. Fil.*, 4: 148. 1862.

	Amapá	Pará	Amazonas	Roraima	Rondônia	Acre
<i>Asplenium cristatum</i> Lam. 35		X				
<i>Asplenium cuneatum</i> Lam.	X		X	X		X
<i>Asplenium Hallii</i> Hook.			X			
<i>Asplenium juglandifolium</i> Lam.			X			X
<i>Asplenium laetum</i> Sw. 36	X					
<i>Asplenium pediculariifolium</i> St.-Hil.						X
<i>Asplenium salicifolium</i> L.		X				
<i>Asplenium sanguinolentum</i> Kze.				X		
<i>Asplenium serra</i> Langsd. & Fisch. 37				X		
<i>Asplenium serratum</i> L.	X	X	DE	X	X	X
<i>Asplenium Spruceanum</i> Hieron.			X			X
<i>Asplenium Stuebelianum</i> Hieron.					X	
<i>Blechnum asplenioides</i> Sw.		X				
<i>Blechnum occidentale</i> L.						X
<i>Blechnum serrulatum</i> Rich.	X	X	X	X	X	
<i>Blechnum volubile</i> Kaulf.		X	D	X		
<i>Bolbitis crenata</i> (Presl) C. Chr.					X	
<i>Bolbitis Lindigii</i> (Mett.) C. Chr.						X
<i>Ceratopteris pteridoides</i> (Hook.) Hieron. 38		X	X			
<i>Ceratopteris thalictroides</i> (L.) Brongn. 39						
<i>Cheilanthes radiata</i> (L.) J. Sm.				X	X	
<i>Cochlidium linearifolium</i> (Desv.) Maxon	X	40				
<i>Ctenitis effusa</i> (Sw.) Ching		X				
<i>Ctenitis protensa</i> (Afz.) Ching 41	X	X	DE	X	X	
<i>Cyclopeltis semicordata</i> (Sw.) J. Sm.		X	X	X		X
<i>Dicranoglossum Desvauxii</i> (Kl.) Proctor	X	X				
<i>Dicranoglossum furcatum</i> (L.) J. S.	X	X	X	X		X
<i>Didymochlaena trurculata</i> (Sw.) J. Sm.	X	X		X		X
<i>Diplazium Lechleri</i> (Mett.) Moore			X			
<i>Diplazium marginatum</i> (L.) Diels						X
<i>Diplazium praestans</i> (Copel.) Morton						X
<i>Doryopteris collina</i> (Raddi) J. Sm.				X		
<i>Doryopteris ornithopus</i> (Hook. & Baker) J. Sm.		X				
<i>Doryopteris sagittifolia</i> (Raddi) J. Sm.				X		
<i>Doryopteris varians</i> (Raddi) J. Sm.		X				
<i>Doryopteris patula</i> (Sw.) Underw.	X	X			X	
<i>Elaphoglossum actinotrichum</i> (Mart.) Moore		X				
<i>Elaphoglossum apodum</i> (Kaulf.) Schott			DE			
<i>Elaphoglossum discolor</i> (Kuhn) C. Chr.		X	X			
<i>Elaphoglossum glabellum</i> J. Sm.	X		DE	X	X	
<i>Elaphoglossum laminarioides</i> (Bory) Moore		X	42			

(35) — *Asplenium cicutarium* Sw. is a synonym. See Morton, C. V. and D. B. Lellinger, The Polypodiaceae subfamily Asplenoideae in Venezuela. *Mem. New York Bot. Gard.*, 15: 1-49. 1966.

(36) — Including *Asplenium Hostmannii* Hieron.

(37) — Some material has been misidentified as *Asplenium Kapplerianum* Kze., which is a synonym of *A. juglandifolium* Kze.

(38) — Often misidentified as *Ceratopteris Richardii* Brong.

(39) — Lloyd, R. M. Systematics of the genus *Ceratopteris* Brong. (Parkeriaceae). II. Taxonomy. *Brittonia*, 26: 139-160. 1974.

(40) — Prance & Pennington 1705 (GH).

(41) — We have not distinguished the varieties of *Ctenitis protensa*.

	Amapá	Pará	Amazonas	Roraima	Rondônia	Acre
<i>Elaphoglossum nigrescens</i> (Hook.) Diels		X	X			
<i>Elaphoglossum plumosum</i> (Fée) Moore			E	X		
<i>Elaphoglossum raywaense</i> (Jenm.) Alston			42			
<i>Elaphoglossum rigidum</i> (Aubl.) Urban		X	DE			
<i>Elaphoglossum Schomburgkii</i> (Fée) Moore		X	DE			
<i>Gymnopteris rufa</i> (L.) Bernh.			X			
<i>Hecistopteris pumila</i> (Spreng.) J. Sm.		X	DE		X	
<i>Hemionitis palmata</i> L.		X				
<i>Hypolepis hostilis</i> (Kze.) Presl			X			
<i>Lindsaea arcuata</i> Kze.		X			X	
<i>Lindsaea coarctata</i> Kramer			43			
<i>Lindsaea cyclophylla</i> Kramer			43			
<i>Lindsaea divaricata</i> Kl.			DE			
<i>Lindsaea dubia</i> Spreng.			X			
<i>Lindsaea filipendula</i> (Rosenst.) Kramer		X	X			
<i>Lindsaea guianensis</i> (Aubl.) Dryand.	X	X	DE	X		X
<i>Lindsaea hemiptera</i> Kramer			43			
<i>Lindsaea javitensis</i> Willd.			43			
<i>Lindsaea lancea</i> (L.) Bedd. var. <i>lancea</i> 44	X	X	D	X		X
<i>Lindsaea lancea</i> var. <i>falcata</i> (Dryand.) Rosenst.		X	DE	X	X	X
<i>Lindsaea lancea</i> var. <i>remota</i> (Kze.) Kramer			43			
<i>Lindsaea latifrons</i> Kramer						X
<i>Lindsaea macrophylla</i> Kaulf.		43				
<i>Lindsaea meifolia</i> (HBK.) Kuhn			43			
<i>Lindsaea pallida</i> Kl.			43	43		
<i>Lindsaea quadrangularis</i> Raddi 45			X			
<i>Lindsaea portoricensis</i> Desv.			X		X	
<i>Lindsaea ridgiuscula</i> Lindm.			43			
<i>Lindsaea Schomburgkii</i> Kl.		X	X	X		
<i>Lindsaea semilunulata</i> (C. Chr.) C. Chr.			43			
<i>Lindsaea stricta</i> (Sw.) Dryand. var. <i>stricta</i>	43	X	X	X	X	
<i>Lindsaea stricta</i> var. <i>parvula</i> (Fée) Kramer	43	43	43			
<i>Lindsaea tetraptera</i> Kramer			43			
<i>Lindsaea Ulei</i> Hieron		43	43			
<i>Lomariopsis japurensis</i> (Mart.) J. Sm.	X		DE			
<i>Nephrolepis biserrata</i> (Sw.) Schott	X	X	D			
<i>Nephrolepis cordifolia</i> (L.) Presl		X	E			X
<i>Nephrolepis multiflora</i> (Roxb.) Morton 46	X	X	DE			
<i>Nephrolepis occidentalis</i> Kze.						X

(42) — Alston, A. H. G. The Brazilian species of *Elaphoglossum*. *Eol. Soc. Brot.*, 32: 1-32. 1958.

(43) — Kramer, K. U. A revision of the genus *Lindsaea* in the New World. *Acta Bot. Neerland.*, 6: 97-290. 1957.

(44) — The varieties of *Lindsaea* species have been identified only in *L. lancea* and in *L. stricta*.

(45) — Silva et al. 1432 (INPA 38513), is the rare 1-pinnate phase.

(46) — The following notes are offered to help distinguish four species of *Nephrolepis* that are often confused in herbaria. *N. multiflora* (Roxb.) Morton is Malaysian and sparingly adventive in tropical America, the upper surface of the pinna-costa is pubescent with short, stiff, brown trichomes. *N. hirsutula* (Forst.) Presl is also Malaysian and sparingly adventive in tropical America, the upper surface of the costa is moderately to densely invested with dissected scales, pubescence of true trichomes is lacking. *N. exaltata* (L.) Schott is primarily Caribbean but reaches Venezuela and possibly has escaped from cultivation in other parts of South America, the upper costa surface is glabrous to sparsely scaly. The native *N. biserrata* (Sw.) Schott has, in Brazilian collections such as Prance 15680 and Pires & Black 677, the costa with long, pale, flexuous trichomes often mixed with much dissected scales.

	Amapá	Pará	Amazonas	Roraima	Rondônia	Acre
<i>Nephrolepis rivularis</i> (Vahl) Mett.	X		X	X		X
<i>Oleandra articulata</i> (Sw.) Presl			X	X		
<i>Oleandra pilosa</i> Hook.	X	X	X	X		
<i>Pityrogramma calomelanos</i> (L.) Link var. <i>calomelanos</i>	X	X	DE		X	X
<i>Polybotrya caudata</i> Kze.		X	DE			X
<i>Polybotrya cervina</i> (L.) Kaulf.		X			X	
<i>Polybotrya osmundacea</i> HBK.			X			
<i>Polypodium angustifolium</i> Sw.		X	X			X
<i>Polypodium aureum</i> L.				X		
<i>Polypodium bombycinum</i> Maxon		47	E	47	X	X
<i>Polypodium Bolivari</i> Sota				X		
<i>Polypodium Caceresii</i> Sod. 48			X			
<i>Polypodium ciliatum</i> Willd	X	X	X	X		X
<i>Polypodium coarctatum</i> Kze.			X			
<i>Polypodium crassifolium</i> L.		X	X	X	X	
<i>Polypodium cultratum</i> Willd.				X		
<i>Polypodium decumannum</i> Willd. 49	X	X	X		X	X
<i>Polypodium duale</i> Maxon		X	DE	X		
<i>Polypodium fuscopunctatum</i> Hook.	X					X
<i>Polypodium lorentense</i> Maxon 50		X	DE	X		X
<i>Polypodium lycopodioides</i> L.	X	X		X		
<i>Polypodium monoides</i> Weath.		X				
<i>Polypodium megalophyllum</i> Desv.	X	X	X		X	X
<i>Polypodium nanum</i> Fée	X		DE			X
<i>Polypodium paradisae</i> Langsd. & Fisch.			X	X		X
<i>Polypodium percussum</i> Cav.	X	X	X	X	X	X
<i>Polypodium persicariifolium</i> Schrad.	X	X	X	X	X	X
<i>Polypodium phyllitidis</i> L.	X	X	X	X		X
<i>Polypodium plumula</i> Willd.			X	X		X
<i>Polypodium polypodioides</i> (L.) Watt var. <i>Burchellii</i> (Baker) Weath.	X	X	X	X	X	X
<i>Polypodium prominulum</i> Maxon 51	X	X	DE	X		X
<i>Polypodium repens</i> Aubl.	X			X		X
<i>Polypodium rigescens</i> Bory			X	X		
<i>Polypodium tectum</i> Kaulf.				X	X	
<i>Polypodium tepuiense</i> A. C. Sm.			E	X		
<i>Polypodium Thurnii</i> Baker			X			
<i>Polypodium triseriale</i> Sw.		X	D			X
<i>Polytaenium brasilianum</i> (Desv.) Benedict 52						X

(47) — Sota, E. R. de la, Revision de las especies Americanas del grupo "*Polypodium squamatum*" L. *Rev. Mus. La Plata*, n.s. sect. *Bot.*, 10: 69-186. "1966", 1967.

(48) — Sometimes confused with *Polypodium fraxinifolium* Jacq., which, however, has closely appressed rhizome scales rather than partly spreading ones as in *P. Caceresii*.

(49) — Often previously called *Polypodium leucatum* Poir., an earlier name, but Morton (*Contrib. U. S. Nat. Herb.* 38: 63. 1967) has pointed out that the type of Poiret's name is *Polypodium aureum* L.

(50) — Material has usually been determined as *Polypodium Lindbergii* Mett., a southern species with membranaceous leaves.

(51) — Specimens have frequently been misidentified as *Polypodium ciliatum* Willd. or as *Polypodium vacciniifolium* Langsd. & Fisch.

(52) — *Polytaenium* is a segregate from *Antrophyum*. See Tryon, R. Taxonomic Fern Notes. IV. Some American vittarioid ferns, *Rhodora* 66: 110-117. 1964, for a discussion of the genus and the proper application of some of the names.

	Amapá	Pará	Amazonas	Roraima	Rondônia	Acre
<i>Polytaenium cajenense</i> (Desv.) Benedict		X		X		X
<i>Polytaenium Feei</i> (Fée) Maxon 53	X					
<i>Polytaenium guayanense</i> (Hieron.) Alston	X	X	X	X		X
<i>Pteridium aquilinum</i> (L.) Kuhn var. <i>arachnoi-</i> <i>deum</i> (Kaulf.) Brade 54		X	X	X	X	X
<i>Pteris altissima</i> Poir. 55				X		X
<i>Pteris biaurita</i> L.	X					
<i>Pteris grandifolia</i> L.						X
<i>Pteris petiolulata</i> Tryon				X	X	
<i>Pteris propinqua</i> Aghard					X	
<i>Pteris pungens</i> Willd.						X
<i>Saccoloma elegans</i> Kaulf.		X	X	X		
<i>Saccoloma inaequalis</i> (Kze.) Mett.	X		X	X		X
<i>Stigmatopteris guianensis</i> (Kl.) C. Chr.	X	X				
<i>Stigmatopteris meniscioides</i> (Willd.) Kramer	X	X	DE			
<i>Stigmatopteris Sancti-Gabrieli</i> (Hook.) C. Chr.		X				
<i>Tectaria incisa</i> Cav. 56	X	X	X	X	X	X
<i>Thelypteris abrupta</i> (Desv.) Proctor		X				
<i>Thelypteris affinis</i> (Ettingh.) Morton			57			
<i>Thelypteris dentata</i> (Forssk.) E.P.St. John		X				
<i>Thelypteris Hostmannii</i> (Hook.) Morton			D			
<i>Thelypteris juruensis</i> (C. Chr.) Tryon & Co- nant 58	59		60			X
<i>Thelypteris Leprieurii</i> (Hook.) Tryon	61	X	D			
<i>Thelypteris longifolia</i> (Des.) Tryon			62			
<i>Thelypteris mollis</i> (Mett.) Tryon 63			D			
<i>Thelypteris patens</i> (Sw.) Small			X			
<i>Thelypteris quadrangularis</i> (Fée) Schelpe		64				
<i>Thelypteris serrata</i> (Cav.) Alston		X	X		X	X
<i>Thelypteris totta</i> (Thunb.) Schelpe 65	X	X	X			
<i>Vittaria graminifolia</i> Kaulf.				X		
<i>Vittaria lineata</i> (L.) J. E. Sm.	X	X	X		X	X
<i>Vittaria stipitata</i> Kze.	X					

(53) — Specimens of this species have been identified as *Polytaenium lanceolatum* (Sw.) Desv. and as *P. lineatum* (Sw.) J. Sm.

(54) — Small leaves usually do not have the characteristic free lobes on the leaf axes between ultimate and penultimate segments.

(55) — *Pteris Kunzeana* Aghard is a commonly used synonym.

(56) — *Tectaria martinicensis* (Spreng.) Copel. is a commonly used synonym.

(57) — Maxon, W. R. and C.V. Morton, The American species of *Dryopteris* sungenus *Meniscium*. *Bull. Torrey Bot. Club* 65: 347-376. 1938.

(58) — *Thelypteris juruensis* (C. Chr.) Tryon & Conant, comb. nov. *Dryopteris juruensis* C. Chr. *Dansk Vid. Selsk. Skr.* 7 Raekke 10: 256. 1913.

(59) — Irwin et al. 48031 (GH).

(60) — Christensen, C. A monograph of the genus *Dryopteris*. Part. I. The tropical American pinnatifid-bipinnatifid species. *Dansk Vid. Selsk. Skr.* 7 Raekke, 10: 55-282. 1913.

(61) — Egler & Irwin 46408 (GH).

(62) — Rodrigues & Monteiro 8566 (INPA 21515), Coêlho (INPA 6781).

(63) — *Dryopteris permollis* Maxon and Morton is the correct name under the genus *Dryopteris*.

(64) — Smith, Alan R. Systematics of the neotropical species of *Thelypteris* section *Cyclosorus*. *Univ. Calif. Publ. Bot.*, 59: 1-136. 1971.

(65) — *Thelypteris gongylodes* (Schkuhr) Small is a frequently used synonym.

ACKNOWLEDGEMENTS

We are indebted to the Directors of the Instituto Nacional de Pesquisas da Amazônia, Manaus, the Museu Paraense Emílio Goeldi, Belém, and the Instituto de Pesquisas e Experimentação Agropecuária do Norte, Belém, for the use of facilities and the opportunities for field studies during September and October, 1974. Dr. Paulo Cavalcante and Hortensia Bautista (MG) and Dr. Murça Pires (IPEAN) provided congenial aid for our herbarium studies and field work in Belém. We are especially indebted to Dr. Ghilleen T. Prance, New York Botanical Garden, Director of the Curso de Botânica Tropical do INPA for many kindnesses during our stay in Manaus, and to Dr. William A. Rodrigues for assistance in the INPA herbarium. Dr. Alice F. Tryon, Gray Herbarium, Harvard University and Paulo G. Windisch, Universidade de São Paulo, provided welcome aid in the field and herbarium studies. Students of the Curso de Botânica participated in the acquisition of field data.

RESUMO

Estudos ecológicos em seis espécies de pteridófitas indicaram fortes preferências destas espécies por uma porção de um gradiente ambiental. Uma lista das pteridófitas da Amazônia brasileira inclui 12 famílias, 58 gêneros e 279 espécies. Os maiores gêneros são *Selaginella* com 31, *Polypodium* com 30, *Trichomanes* com 27, *Lindsaea* com 22, e *Adiantum* e *Asplenium* com 16 espécies cada. Estes seis gêneros representam metade das espécies da região. A distribuição conhecida das espécies nos Estados do Pará, Amazonas e Acre e nos Territórios do Amapá, Rondônia e Roraima é apresentada, bem como alguns comentários sobre a nomenclatura e taxonomia das espécies. São feitas duas novas combinações: *Arachnoides macrostegia* (Hook.) Tryon & Conant, e *Thelypteris juruensis* (C. Chr.) Tryon & Conant. O aspecto marcante da biogeografia da flora pteridofítica da Amazônia é o endemismo muito baixo ou talvez ausente, numa área muito grande.

LITERATURE CITED

FRANCE, GHILLEAN T.

- 1973 — Phytogeographic support for the theory of Pleistocene forest refuges in the Amazon Basin, based on evidence from distribution patterns in Caryocaraceae, Chrysobalanaceae, Dichapetalaceae and Lecythydaceae. *Acta Amazonica*, Manaus, 3(3) : 5-28.