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MIGRATION ROUTES OF THE SOUTH BRAZILIAN RAIN FOREST.

B. Rambo, SJ.

The South Brazilian Highlands come to an abrupt end between 28° SL at the western frontier of Rio Grande do Sul, and 30° at the Atlantic coast in the east. Before the advent of the non-Portuguese immigrants (1824), the whole of this slope was covered by a broad belt of subtropical rain forest, and so were the deeply eroded valleys of the rivers in the northern half of the State. Although heavily damaged by the slash and burn system of agriculture, the primitive features of this forest are still recognizable, not only as to its floristic and ecological aspects but even as to its former extension and area.

At first glance, this southernmost body of closed forest presents a rather uniform composition and structure: The same distribution through the narrow valleys and along the steep ravines of the Highlands; the same dominant hardwoods constituting the canopy of dull green foliage; the same vertical structure with six well defined types of life forms; and the same fertile soil alluring agriculture and thus causing reckless destruction of South Brazil's most valuable natural resources.

But, on closer sight, even pre-scientific observation discovers many well marked differences between the western and the eastern wing of the Riograndean rain forest. Among the tall trees, there are some dozens of species going through the whole of the area, for instance Piptadenia rigida Benth., the native «Angico»; the second group of high trees remains restricted to the great forest area of the Upper Uruguay River, like Peltophorum dubium (Spreng.) Taub., the «Canafistula» of the Brazilians; still another contingent is found at the eastern wing only, like Schizolobium excelsum Vog., the «Guarapuvú». The same phenomenon obtains with dozens and even hundreds of species forming the middle and the low stories of the forest, so that it must be acknowledged as a fact that there are ***three well definable elements in the Riograndean rain forest: general, eastern and western.***

The scope of the present paper is to give a concrete idea of what is common and what different throughout the 600 km long rain forest belt of Rio Grande do Sul; of what must be considered as the rational explanation of these several phenomena; and of what may be the implications, local and general, suggested by the facts.

May be the critical reader will not accept some or all of my deductions; then he may content himself with the first and purely factual chapter: it is the first and therefore tentative and incomplete analysis of the Brazilian rain forest at its southernmost border.

I. ANALYSIS OF THE SOUTH BRAZILIAN RAIN FOREST.

The phanerogamic flora of Rio Grande do Sul numbers no much more than one tenth of the flora of Brazil: about 4.300 species are cited in literature, of which 3.600 are present in my private herbarium. As all of the great genera (Baccharis, Eupatorium, Vernonia, Panicum, Paspalum, Mimosa, etc.) live, exclusively or predominantly, in the prairie (Campo), the upper limit of the rain forest element may be drawn near 1.000 species.

The following list comprises 844 species, of which more than 90% are well known to me from 30 years of floristic work in the area, and determined with the degree of certainty possible in so deficiently known a flora as the Brazilian one. Distributional data within the State, life forms, and ecological aspects have been almost exclusively given according to my own observations.

In order to give the reader the greatest possible amount of information, each name is preceded by two symbols, a figure and a letter; the figure refers to the life forms, as follows:

1 — herbs and low shrubs, up to 1 meter high.
2 — shrubs, rarely herbs, up to 3 meters high.
3 — small trees, up to 10 meters high.
4 — tall trees forming the canopy.
5 — climbers and half climbers.
6 — epiphytes and parasites.

The letter refers to horizontal distribution, as follows:
I — interior of the rain forest.
E — edge and glades.
R — riverside.

Moreover, each species is followed by its general distribution in Brazil and the neighboring countries; these data are taken from current literature.

1. SPECIES COMMON TO THE WHOLE OF THE RIOGRANDEAN RAIN FOREST.

Acanthaceae.
2 I Beloperone amherstiae Nees — Minas Gerais to Uruguay.
2 I Beloperone spathulata Nees et Mart. - Bahia to Uruguay.

Amarantaceae.
1 I Alternanthera micrantha R.E.Fr. — Paraná to RGS.
1 I Chamissoa acuminata Mart. — Minas Gerais to RGS.
5 I Chamissoa altissima (Jacq.) H. B. K. - Mexico to RGS.
1 E Iresine celosia L. — Mexico to Uruguay.

Anonaceae.
3 I Rollinia rugulosa Schl. — Sta. Catarina, Misiones to RGS.
3 I Rollinia salicifolia Schl. — Sta. Catarina to RGS.
3 I Rollinia silvatica St. Hil. — Minas Gerais to RGS.

Apocynaceae.
4 I Aspidosperma australe M. Arg. - Bolivia, Minas Gerais to RGS.
5 E Forsteronia glabrescens M. Arg. - Bolivia, S. Paulo to Uruguay.
5 I Forsteronia refracta M. Arg. — Venezuela to RGS.
5 I Forsteronia thyrsoidea (Vell.) M. Arg. — Rio de Janeiro to RGS.
5 I Mandevilla bridgesii (M. Arg.) Woods. — Peru to RGS.
5 I Mandevilla pentlandiana (A. DC.) Woods. — Bolivia to RGS.
5 I Peltastes malvaeflorus Woods. — Paraná to RGS.
3 E Tabernaemontana australis M. Arg. — Sta. Catarina to RGS.

Araceae.
6 I Philodendron selloum G. Koch — Minas Gerais, Paraguay to RGS.
6 I Philodendron ochrostemon Schott - Sta. Catarina to RGS.

Araliaceae.
4 I Didymopanax morototoni (Aubl.) Dcne - Antilles to RGS.
3 E Gilibertia cuneata (DC.) March. - Minas Gerais to RGS.
4 I Pentapanax warmingianus (L. March.) Harms — Minas Gerais to RGS.

Aristolochiaceae.
5 I Aristolochia triangularis Cham. — Minas Gerais, Paraguay to RGS.

Asclepiadaceae.
5 E Araujia sericifera Broth. - Rio de Janeiro, Misiones to RGS.
5 E Ditassa anomala Mart. - Minas Gerais, Misiones to RGS.
5 E Ditassa megapotamica (Spreng.) Malme - Paraná, Misiones to Uruguay.
5 I Exolobus patens (Dcne) Fourn. - Ceará, Misiones to RGS.
5 I Exolobus selloanus Forun. - Minas Gerais, Misiones to RGS.
5 I Fischeria martiana Dcne - Matogrosso, Misiones to RGS.
5 I Marsdenia montana Malme - Minas Gerais to RGS.
5 E Metastelma virgatum (Poir.) Dcne - Minas Gerais to Uruguay.
5 I Orthosia aphylla (Vell.) Malme - Minas Gerais, Misiones to RGS.
5 I Orthosia melantha (Dcne) Malme - Minas Gerais, Misiones to RGS.
5 E Oxypetalum appendiculatum Mart. et Zucc. - Minas Gerais to RGS.
5 E Oxypetalum molle Hook. et Arn. - Sta. Catarina to RGS.
5 E Oxypetalum mosenii (Malme) Malme - Bolivia, Misiones to RGS.
5 E Oxypetalum pannosum Dcne - Matogrosso, Misiones to Uruguay.
5 E Oxypetalum stipatum Malme - Misiones to RGS.
5 E Oxypetalum sublanatum Malme - Minas Gerais to RGS.
5 E Oxypetalum tomentosum Hook. et Arn. - Sta. Catarina, Misiones to RGS.
5 E Oxypetalum wightianum Hook. et Arn. - S. Paulo to RGS.

Basellaceae.
5 E Boussingaultia gracilis Miers - Minas Gerais to RGS.

Begoniaceae.
6 I Begonia fruticosa (Klotzsch) A. DC. - Rio de Janeiro to RGS.

Bignoniaceae.

5 I Adenocalymma marginatum P. DC. - Bahia, Misiones to RGS.
5 I Arrabidaea chica Verlot. - Colombia, Misiones to RGS.
5 I Arrabidaea corymbifera Bur. - Rio de Janeiro, Misiones to RGS.
5 I Arrabidaea rhodantha Bur. - Paraguay, Misiones to RGS.
5 I Bignonia unguis cati L. - Mexico to Uruguay.
5 I Clystostoma callistegioides Bur. - S. Paulo, Paraguay to RGS.
5 I Amphilophium vauthieri P. DC. - Pernambuco to RGS.
5 I Clystostoma noterophilum (Mart.) Bur. - Misiones to RGS.
5 I Cuspidaria pterocarpa P. DC. - Minas Gerais, Misiones to RGS.
5 E Dolichandra cynanchoides Cham. - Paraguay to Uruguay.
4 I Jacaranda semiserrata Cham. - Minas Gerais, Misiones to RGS.
5 I Macfadyena dentata K. Schum. - Entrerrios, Uruguay to RGS.
5 I Macfadyena mollis Seem. - Matogrosso, Paraguay to RGS.
5 I Pithecoctenium echinatum (Jacq.) K. Schum. - Central America to RGS.
5 E Pyrostegia venusta (Ker-Gawl) Miers - Ceará, Misiones to RGS.
4 I Tecoma alba (Cham.) Sandw. - Minas Gerais to RGS.
4 I Tecoma ipe (Mart.) Standl. - Bolivia, Argentina to RGS.

Borraginaceae.

4 I Cordia ecalyculata Vell. - Paraguay, Misiones to RGS.
3 I Cordia hermanniifolia Cham. - Piauí to RGS.
4 I Cordia trichotoma (Vell.) Arrab. - Amazonia to RGS.
4 I Patagonula americana L. - Argentina, Uruguay to RGS.
5 E Tournefortia breviflora DC. - Rio de Janeiro to RGS.
5 E Tournefortia paniculata Cham. - Pará to RGS.

Bromeliaceae.

6 I Aechmea calyculata (Morr.) Baker - Sta. Catarina, Misiones to RGS.
6 I Aechmea gamosepala Wittm. - Sta. Catarina to RGS.
6 I Billbergia nutans Wendl. - Minas Gerais to RGS.
6 I Billbergia zebrina (Herb.) Lindl. - Minas Gerais, Misiones to RGS.
6 I Tillandsia aeranthos (Lois.) L. B. Smith - Paraná to RGS.
6 I Tillandsia crocata (Morr.) Bak. - Bolivia to RGS.

6 I Tillandsia geminiflora Brongn. - Minas Gerais to Uruguay.
6 I Tillandsia pulchella Hook. - Antilles to RGS.
6 I Tillandsia recurvata (L.) L. - Tropical and subtrop. America.
6 I Tillandsia stricta Sol. - Trinidad to Uruguay.
6 I Tillandsia tricholepis Baker - Ceará to RGS.
6 I Tillandsia usneoides L. - USA to Patagonia.
6 I Vriesea platynema Gaud. - Antilles to RGS.
6 I Vriesea tucumanensis Mez - Minas Gerais, Paraguay to RGS.

Cactaceae.
5 I Peireskia aculeata Plum. - Antilles to RGS.
6 I Rhipsalis cassytha Gaertn. - Mexico to RGS; western Africa.
6 I Rhipsalis cereuscula Haw. - S. Paulo to Uruguay.
6 I Rhipsalis lumbricoides (Lem.) Lem. - Argentina, Uruguay to RGS.
6 I Rhipsalis teres (Vell.) Steud. - Minas Gerais to RGS.

Capparidaceae.
2 I Cleome viridiflora Schreber - Antilles to RGS.

Caprifoliaceae.
3 I Sambucus australis Cham. et Schl. - Minas Gerais to Uruguay.

Caricaceae.
3 I Carica quercifolia (St. Hil.) Solms - Minas Gerais to Uruguay.
4 I Jacaratia dodecaphylla A. DC. - Minas Gerais, Misiones to RGS.

Caryophyllaceae.
1 I Drymaria cordata (L.) Willd. - Almost pantropical.

Celastraceae.
3 I Maytenus aquifolium Mart. - Minas Gerais, Misiones to RGS.

Combretaceae.
5 I Combretum secundum Jacq. - Peru, Argentina to Uruguay.
3 R Terminalia australis Camb. - Paraná to Uruguay.

Commelinaceae.
1 E Tradescantia albiflora Kunth - Southern Brazil.
1 E Tradescantia crassula Link et Otto - Southern Brazil.
1 E Tradescantia fluminensis Vell. - Paraguay to RGS.

Compositae.
5 E Baccharis anomala DC. - Minas Gerais, Misiones to Uruguay.
5 E Baccharis trinervis (Lam.) Pers. - Mexico to RGS.
5 E Calea pinnatifida (R. Br.) Less. - Espirito Santo to Uruguay.
1 I Conyza notobellidiastrum Gris. - Minas Gerais, Misiones to Uruguay.
5 I Mikania apiifolia DC. - Minas Gerais, Paraguay to RGS.
5 I Mikania burchellii Bak. - Minas Gerais, Misiones to RGS.
5 E Mikania cordifolia (L. F.) Willd. - Trop. and subtrop. America.
5 E Mikania cynanchifolia Hook. et Arn. - Minas Gerais to RGS.
5 I Mikania glomerata Spreng. - Bahia to RGS.
5 I Mikania hirsutissima DC. - Bahia to RGS.
5 E Mikania micrantha HBK. - RGS.
5 E Mikania periplocifolia Hook. et Arn. - Matogrosso to Uruguay.
5 I Piptocarpha sellowii Baker - S. Paulo to RGS.
2 I Polymnia silphioides DC. - Paraguay-Uruguay.
5 I Vernonia balansae Hier. - Paraguay to RGS.

Convolvulaceae.
5 R Ipomoea alba L. - Mexico to Uruguay.

Cucurbitaceae.
5 I Apodanthera laciniosa (Schl.) Cogn. - S. Paulo to RGS.
5 E Cayaponia diversifolia (Cogn.) Cogn. - Minas Gerais to RGS.
5 E Cayaponia ficifolia (Lam.) Cogn. - S. Paulo to Uruguay.
5 E Cyclanthera hystrix Arn. - Bolivia to RGS.
1 E Melothria uliginosa Cogn. - S. Paulo, Paraguay to RGS.
5 I Sycidium gracile Cogn. - Rio de Janeiro to RGS.
5 R Sycios polyacanthos Cogn. - Goiás to RGS.
5 I Wilbrandia ebracteata Cogn. - Sta. Catarina, Paraguay to RGS.
5 I Wilbrandia hibiscoides Manso - Minas Gerais to RGS.

Cyperaceae.
1 I Carex sellowiana Schl. - Paraguay, RGS to Uruguay
1 I Scleria panicoides Kunth - Paraguay to RGS.
1 I Scleria arundinacea Kunth - West Indies to RGS.

Dioscoreaceae.
5 E Dioscorea campestris Griseb. - Amazonia to RGS.
5 I Dioscorea dodecaneura Vell. - Amazonia to RGS.
5 E Dioscorea furcata Gris. - Paraguay to Uruguay.
5 E Dioscorea gibertii R. Knuth - Paraná to RGS.
5 E Dioscorea guaranitica Chod. et Hassl. - Paraguay to RGS.
5 E Dioscorea lagoasanta Uline - Peru to RGS.
5 E Dioscorea quirogae R. Knuth - Misiones to RGS.
5 E Dioscorea sinuata Vell. - Pernambuco to RGS.

Ebenaceae.
3 I Maba inconstans (Jacq.) Gris. - Antilles to Uruguay.

Erythroxylaceae.
3 R Erythroxylum amplifolium (Mart.) O. E. Schulz - Minas Gerais to RGS.
3 R Erythroxylum myrsinites Mart. - Paraguay, Misiones to RGS.

Euphorbiaceae.
1 I Acalypha gracilis Spreng. - Minas Gerais to Uruguay.
2 I Acalypha striolata Lingelsh. - Minas Gerais to Uruguay.
3 I Actinostemon concolor (Spreng.) M. Arg. - Bahia to RGS.
4 I Alchornea triplinervia (Spreng.) M. Arg. - Venezuela to RGS.
2 I Bernardia pulchella (Baill.) M. Arg. - Minas Gerais to RGS.
5 E Dalechampia stenosepala M. Arg. - Panama to RGS.
5 I Dalechampia stipulacea M. Arg. - Bahia to RGS.
3 E Manihot tweedieana M. Arg. - Paraná to Uruguay.
1 R Phyllanthus montevidensis M. Arg. - Central Brazil to RGS.
2 R Phyllanthus sellowianus M. Arg. - Minas Gerais to Uruguay.
3 I Sapium petiolare (M. Arg.) Huber - Bahia to RGS.
3 I Sebastiania brasiliensis Spreng. - Bahia to Uruguay.
3 E Sebastiania klotzschiana (M. Arg.) M. Arg. - Guyana to Uruguay.
2 R Sebastiania schottiana (M. Arg.) M. Arg. - Minas Gerais to Uruguay.
3 I Stillingia oppositifolia Baill. - Minas Gerais to RGS.
5 E Tragia emilii Pax et K. Hoffm. - Paraguay to RGS.
5 E Tragia volubilis L. - Mexico to Uruguay; western Africa.

Flacourtiaceae.
1 R Aphaerema spicata Miers - S. Paulo to RGS.
3 E Banara parviflora Benth. - Rio de Janeiro to RGS.
3 I Banara tomentosa Clos - Paraguay, Misiones to RGS.
3 I Casearia decandra Jacq. - Amazonia to RGS.
3 E Casearia silvestris Swartz - Mexico to RGS.

Gesneriaceae.
6 I Corytholoma confertifolium Hanst. - Rio de Janeiro to RGS.
1 R Corytholoma selloi (Mart.) Fritsch - Paraná to RGS.

Gramineae.
2 I Chusquea ramosissima Lindm. - Paraguay to RGS.
2 I Chusquea tenella Nees - Sta. Catarina to RGS.
1 I Ichnanthus pallens (Swartz) Beauv. - Antilles to RGS.
2 I Lasiacis divaricata (L.) Hitchc. - Paraná to RGS.
5 E Melica sarmentosa Nees - Minas Gerais to Uruguay.
3 I Merostachys claussenii Munro - Paraná to RGS.
1 I Olyra humilis Nees - Goiás to RGS.
1 I Oplismenus hirtellus (L.) Beauv. - Antilles to RGS.
1 I Pharus glaber H. B. K. — Antilles to Uruguay.
1 I Pseudechinolaena polystachya (H. B. K.) Stapf - Paraná to RGS.
2 R Setaria poiretiana (Schult.) Hitchc. - Amazonia to RGS.
2 E Setaria lachnea (Nees) Kunth - Texas to RGS.

Hippocrateaceae.
5 I Elachyptera micrantha (Camb.) A. C. Smith - Rio de Janeiro to RGS.
5 I Pristimera andina Miers - Peru to RGS.

Labiatae.
2 I Salvia guaranitica St. Hil. - Minas Gerais to RGS.

Lauraceae.
3 E Nectandra grandiflora Nees - Colombia to RGS.
4 I Nectandra lanceolata Nees - Minas Gerais to RGS.
4 I Nectandra rigida Nees - Colombia to RGS.
4 I Nectandra tweediei Mez - Sta. Catarina to RGS.
4 I Ocotea puberula Nees - Mexico to Uruguay.

Leguminosae-Caesalpinioideae.
4 I Apuleia praecox Mart. - Bahia to RGS.
5 I Bauhinia langsdorffiana Bong. - Amazonia to RGS.
3 E Bauhinia pruinosa Vog. - Misiones to RGS.

Leguminosae-Mimosoideae.

5 I Acacia bonariensis Gill. - Paraguay to Uruguay.
5 I Acacia nitidifolia Speg. - Paraguay to RGS.
5 I Acacia recurva Benth. - Misiones to RGS.
5 I Acacia tucumanensis Gris. - Antilles to RGS.
5 I Acacia velutina DC. - Misiones to RGS.
4 I Arthrosamanea polyantha (A. Spr.) Burk. - Mexico to Uruguay.
3 R Calliandra selloi (Spr.) Macbr. - Piauí to Uruguay.
3 R Calliandra tweediei Benth. - S. Paulo to Uruguay.
4 I Enterolobium contortisiliquum (Vell.) Mor. - Ceará to Uruguay.
3 R Inga affinis DC. - Pernambuco to RGS.
3 E Inga marginata Willd. - Peru to RGS.
3 R Inga uruguensis Hook. et Arn. - Rio de Janeiro to Uruguay.
3 I Inga virescens Benth. - Misiones to RGS.
4 I Piptadenia rigida Benth. - Paraguay to Uruguay.

Leguminosae-Papilionatae.

5 E Canavalia bonariensis Lindl. - Paraná to RGS.
5 I Dalbergia variabilis Vog. - Misiones to RGS.
5 I Dioclea megacarpa Rolfe - Misiones to RGS.
4 I Erythrina falcata Benth. - Maranhão to RGS.
3 E Lonchocarpus leucanthus Burk. - Paraguay to RGS.
3 R Lonchocarpus nitidus (Vog.) Benth. - Sta. Catarina to RGS.
3 I Machaerium aculeatum Raddi - Pernambuco to RGS.
3 E Machaerium stipitatum (DC.) Vog. - Rio de Janeiro to RGS.
4 I Myrocarpus frondosus Fr. All. - Minas Gerais to RGS.
5 I Phaseolus appendiculatus Benth. - Minas Gerais to RGS.
3 E Poecilanthe parviflora Benth. - Misiones to Uruguay.

Liliaceae.

5 I Smilax brasiliensis Spreng. - Minas Gerais to RGS.

Loasaceae.

5 E Blumenbachia latifolia Camb. - Minas Gerais to RGS.

Loganiaceae.

5 E Strychnos brasiliensis (Spreng.) Mart. - Minas Gerais to Uruguay.
1 E Spigelia humboldtiana Cham. et Schl. - Mexico to Uruguay.
1 E Spigelia scabra Cham. et Schl. - Rio de Janeiro to Uruguay.

Loranthaceae.
6 I Phoradendron ensifolium (Pohl) Eichl. - Minas Gerais to RGS.
6 I Phoradendron piperoides (H. B. K.) Nutt. - Mexico to Uruguay.
6 I Phrygilanthus acutifolius (R. et P.) Eichl. - Bahia to Uruguay.
6 I Struthanthus uruguensis (Hook. et Arn.) G. Don - Paraguay to Uruguay.

Malpighiaceae.
5 I Dicella nucifera Chod. - Paraguay to RGS.
5 I Heladena multiflora (Hook. et Arn.) Ndz. - Paraguay to RGS.
5 E Heteropterys aceroides Gris. - Bolivia to RGS.
5 E Heteropterys hypericifolia Juss. - Bolivia to RGS.
5 I Heteropterys pauciflora (Juss.) Juss. - Minas Gerais to RGS.
5 I Heteropterys lechenaultiana Juss. - Minas Gerais to RGS.
5 E Heteropterys rufula Juss. - Minas Gerais to RGS.
5 E Heteropterys syringifolia Gris. - Paraguay to RGS.
5 E Janusia guaranitica Juss. - Bolivia, S. Paulo to RGS.
5 E Mascagnia psilophylla (Juss.) Gris. - Minas Gerais to Uruguay.
5 E Stigmatophyllum jatrophifolium (Lam.) Juss.) - Paraguay to Uruguay.
5 E Tetrapterys mollis Gris. - RGS.

Malvaceae.
2 E Abutilon molle (Ort.) Sweet - Peru to Uruguay.
3 I Abutilon striatum Dickson - Paraná, Misiones to Uruguay.
2 E Pavonia communis St. Hil. - USA to Uruguay.
2 E Pavonia sepium St. Hil. - Peru to Uruguay.
2 E Sida urens L. - Antilles to Uruguay.

Marantaceae.
2 E Maranta arundinacea L. - Mexico to Uruguay.

Melastomataceae.
1 I Leandra australis (Cham.) Cogn. - S. Paulo to RGS.

Meliaceae.
4 I Cabralea oblongifoliola C. DC. - Misiones to RGS.

4 I Cedrela fissilis Vell. - Amazonia to RGS.
3 I Guarea lessoniana A. Juss. - Sta. Catarina to RGS.
2 I Trichilia elegans A. Juss. - Rio de Janeiro to RGS.
3 I Trichilia triphyllaria C. DC. - Misiones to RGS.

Menispermaceae.
5 E Cissampelos pareira L. - Minas Gerais to Uruguay.
5 I Odontocarya tamoides (P. DC.) Miers - Pernambuco to RGS.

Monimiaceae.
3 I Hennecartia omphalandra Poiss. - Minas Gerais to RGS.

Moraceae.
4 I Chlorophora tinctoria (L.) Gaud. - Mexico to RGS.
1 I Dorstenia arifolia Miq. - Rio de Janeiro to RGS.
4 I Ficus anthelminthica Mart. - Pará to RGS.
4 I Ficus diabolica Hert. - Sta. Catarina to Uruguay.
4 I Ficus subtriplinervia Mart. - Goiás to Uruguay.
3 I Sorocea ilicifolia Miq. - Rio de Janeiro to RGS.

Myrsinaceae.
3 E Rapanea ferruginea (R. et P.) Mez - Mexico to Uruguay
3 I Rapanea quaternata Hassl. - Paraguay to RGS.
4 I Rapanea umbellata (Mart.) Mez - Bahia to RGS.

Myrtaceae.
3 I Acreugenia pungens (Berg) Kausel - S. Paulo to RGS.
4 I Campomanesia xanthocarpa Berg - Minas Gerais, Misiones to RGS.
3 I Myrcianthes gigantea (Legr.) Legr. - Misiones to Uruguay
3 I Phyllocalyx involucratus (DC.) Berg - Rio de Janeiro to RGS.
3 I Pseudomyrcianthes pyriformis (Camb.) Kausel - S. Paulo to RGS.

Nyctaginaceae.
5 I Pisonia aculeata L. - Minas Gerais to RGS.

Orchidaceae.
6 I Brassavola perrinii Lindl. - Rio de Janeiro to RGS.
6 I Bulbophyllum napellii Lindl. - South Brazil to RGS.
6 I Campylocentrum neglectum Cogn. - Minas Gerais to RGS
6 I Capanemia australis (Krzl.) Schl. - RGS.
1 I Chloidea decumbens Lindl. - Colombia to RGS.
6 I Cyrtopodium palmifrons Rchb. f. - Minas Gerais to RGS.

6 I Epidendrum paniculatum R. et P. - S. Paulo to RGS.
6 I Gomeza planifolia (Kl. et Rchb. f.) - Rio de Janeiro to RGS.
6 I Huntleya meleagris Lindl. - Bahia to RGS.
6 I Isochilus brasiliensis Schl. - Bahia to RGS.
6 I Maxillaria chrysantha R. Br. - Minas Gerais to RGS.
6 I Miltonia flavescens Lindl. - Minas Gerais to RGS.
6 I Oncidium pulvinatum Lindl. - Minas Gerais to RGS.
6 I Oncidium macronyx Rchb. f. - South Brazil to RGS.
6 I Oncidium pumilum Lindl. - Minas Gerais to RGS.
6 I Oncidium sphegiferum Lindl. - Rio de Janeiro to RGS.
6 I Pleurothallis riograndensis Rodr. - Rio de Janeiro to RGS
6 I Polystachya estrellensis Rchb. f. - Paraná to RGS.
1 I Wullschlaegelia aphylla Rchb. f. - Antilles to RGS.

Oxalidaceae.
1 E Oxalis liniflora Prog. - Paraguay to RGS.
1 E Oxalis regnellii Miq. - Minas Gerais to RGS.

Palmae.
4 I Arecastrum romanzoffianum (Cham.) Becc. - Minas to Uruguay.

Passifloraceae.
5 E Passiflora amethystina Mik. - Minas Gerais to RGS.
5 E Passiflora capsularis L. - Antilles to Uruguay.
5 E Passiflora coerulea L. - Ceará to Uruguay.
5 E Passiflora edulis Sims - Amazonia to RGS.
5 E Passiflora misera H. B. K. — Panamá to RGS.
5 E Passiflora suberosa L. - USA to Uruguay.
5 E Passiflora tenuifila Killip - Bolivia to RGS.

Phytolaccaceae.
1 I Petiveria tetrandra Gomez - Bahia to RGS.
4 I Phytolacca dioica L. - Minas Gerais to Uruguay.
1 I Rivina humilis L. - Texas to RGS.
5 I Seguieria parvifolia Benth. - Paraguay to RGS.

Piperaceae.
1 I Peperomia hispidula A. Dietr. - Antilles to RGS.
6 I Peperomia nummulariifolia H. B. K. - Antilles to RGS.
1 E Peperomia obtusifolia (L.) C. DC. - Venezuela to RGS.
6 I Peperomia reflexa (L. F.) A. Dietr. - Pantropical.
1 I Peperomia sellowiana Miq. - Mexico to RGS.
2 I Piper gaudichaudianum Kunth - Rio de Janeiro to RGS.
2 I Piper longipes C. DC. - Minas Gerais to RGS.
2 I Piper parthenium Mart. - Minas Gerais to Uruguay.

Polygalaceae.
1 E Polygala lancifolia St. Hil. - Minas Gerais to RGS.

Polygonaceae.
3 R Coccoloba cordata Cham. - Sta. Catarina to RGS.
3 I Ruprechtia laxiflora Meissn. - Minas Gerais to RGS.

Portulacaceae.
1 E Talinum paniculatum (Jacq.) Gaertner - USA to Uruguay.

Proteaceae.
4 I Roupala meissneri Sleumer - RGS.

Ranunculaceae.
5 I Clematis bonariensis Juss. - Paraguay to Uruguay.
5 I Clematis dioica L. - Antilles to RGS.
5 I Clematis hilarii Spreng. - Rio de Janeiro to Uruguay.

Rhamnaceae.
5 I Gouania ulmifolia Hook. et Arn. - Sta. Catarina to Uruguay.
4 I Scutia buxifolia Reiss. - Misiones to Uruguay.

Rosaceae.
3 I Prunus brasiliensis (Cham. et Schl.) D. Dietr. - Minas Gerais to RGS.
3 I Prunus sellowii Koehne - Minas Gerais to RGS.
3 E Prunus subcoriacea (Chod. et Hassl.) Koehne - Misiones to Uruguay.
3 E Quillaja brasiliensis (St. Hil. et Tul.) Mart. - S. Paulo to RGS.
5 E Rubus brasiliensis Mart. - Rio de Janeiro to RGS.
5 E Rubus erythroclados Mart. - Minas Gerais to RGS.
5 E Rubus sellowii Cham. et Schl. - Misiones to Uruguay.
5 E Rubus urticifolius Poir. - Colombia to RGS.

Rubiaceae.
5 I Chiococca brachiata R. et P. - Guyana to RGS.
1 E Coccocypselum lanceolatum (R. et P.) Pers. - Venezuela to Uruguay.
3 I Coutarea hexandra (Jacq.) K. Schum. - Antilles to RGS.
1 E Diodia polymorpha Cham. et Schl. - Mexico to RGS.
5 E Guettarda uruguensis Cham. et Schl. - Bahia to Uruguay.
5 E Manettia luteo-rubra (Vell.) Benth. - Minas Gerais to RGS.

2 I Psychotria brachyceras M. Arg. - Rio de Janeiro to RGS.
2 E Psychotria carthaginensis Jacq. - Peru to RGS.
2 I Psychotria leiocarpa Cham. et Schl. - Bahia to RGS.
2 I Psychotria subspathacea M. Arg. - Paraná to RGS.
3 E Randia armata (Sw.) DC. - Venezuela to RGS.
5 E Relbunium hypocarpium (L.) Hemsl. - Mexico to Uruguay.
2 I Rudgea parquioides (Cham. et Schl.) M. Arg. - Rio de Janeiro to RGS.
1 I Schenckia blumenaviensis Schum. — Paraná to RGS.

Rutaceae.
3 E Fagara hyemalis (St. Hil.) Engl. - Sta. Catarina to Uruguay.
3 E Fagara rhoifolia (Lam.) Engl. - Guyana to Uruguay.
4 I Fagara riedeliana (Engl.) Engl. - S. Paulo to RGS.
3 I Pilocarpus selloanus Engl. - Paraguay to RGS.

Salicaceae.
4 R Salix humboldtiana Willd. - Amazonia to Uruguay.

Sapindaceae.
4 I Allophylus edulis (St. Hil.) Radlk. - Amazonia to RGS.
3 I Allophylus guaraniticus (St. Hil.) Radlk. - Paraguay to RGS.
5 I Cardiospermum grandiflorum Swartz - Antilles to Uruguay.
5 E Cardiospermum halicacabum L. - Pantropical.
3 I Cupania vernalis Camb. - Minas Gerais to Uruguay.
4 I Matayba elaeagnoides Radlk. - Minas Gerais to RGS.
5 I Paullinia elegans Camb. - Pernambuco to Uruguay.
5 I Paullinia trigonia Vell. - Pernambuco to RGS.
5 I Serjania laruotteana Camb. - Bahia to RGS.
5 I Serjania meridionalis Camb. - Minas Gerais to RGS.
5 I Thinouia repanda Radlk. - Bolivia to RGS.
5 I Urvillea uniloba Radlk. - Paraguay to Uruguay.

Sapotaceae.
3 I Chrysophyllum gonocarpum (Mart. et Eichl.) Engl. - Rio de J. to RGS.
3 I Chrysophyllum marginatum (Hook. et Arn.) Radlk. - Bolivia to RGS.
3 R Pouteria gardneriana (A. DC.) Radlk. - Piauí to Uruguay.
3 R Pouteria salicifolia (Spreng.) Radlk. - Paraguay to Uruguay.

Simarubaceae.
2 E Picramnia parvifolia Engl. - Paraná to RGS.
3 I Picrasma crenata (Vell.) Engl. - Rio de Janeiro to RGS.

Solanaceae.
2 I Brunfelsia australis Benth. - Pará to RGS.
2 I Capsicum microcarpum Cav. - Amazonia to RGS.
2 I Capsicum schottianum Sendt. - Paraguay to RGS.
3 E Cestrum calycinum Willd. - Peru to RGS.
3 E Cestrum intermedium Sendt. - Misiones to RGS.
2 E Cyphomandra corymbiflora Sendt. - South Brazil to RGS.
3 E Dunalia breviflora (Sendt.) Sleumer - Paraguay to Uruguay.
3 I Solanum citrifolium Willd. - Misiones to RGS.
2 E Solanum hirtellum (Spreng.) Hassl. - South Brazil to RGS.
5 E Solanum jasminoides Paxt. - Minas Gerais to Uruguay.
5 E Solanum ramulosum Sendt. - South Brazil to RGS.
2 I Solanum trachytrichum Bitter - Paraguay to RGS.
3 E Solanum verbascifolium Kunth - Mexico to Uruguay.

Sterculiaceae.
2 I Buettneria australis St. Hil. - Sta. Catarina to RGS.
2 I Buettneria urticifolia K. Schum. - Misiones to RGS.
3 E Guazuma ulmifolia Lam. - Mexico to RGS.

Tiliaceae.
4 I Luehea divaricata Mart. et Zucc. — Minas Gerais to RGS.
2 E Triumfetta semitriloba L. - Antilles to RGS.

Ulmaceae.
5 I Celtis lancifolia (Wedd.) Planch. - RGS.
5 I Celtis sellowiana Miq. - RGS.
3 E Trema micrantha (Swartz) Blume - Central America to RGS.

Umbelliferae.
1 I Hydrocotyle callicephala Cham. - S. Paulo to RGS.
1 E Hydrocotyle leucocephala Cham. et Schl. - Minas Gerais to Uruguay.

Urticaceae.
2 I Boehmeria caudata Swartz - Antilles to RGS.
2 E Boehmeria cylindrica Willd. - USA to Paraguay and RGS.

2 E Phenax petiolaris Wedd. - South Brazil to RGS.
1 I Pilea pubescens Liebm. - Antilles to RGS.
3 I Urera baccifera Gaud. - Antilles to RGS.
5 I Urera caracasana (Jacq.) Gris. - Mexico to RGS.

Valerianaceae.
5 E Valeriana scandens L. - Mexico to Uruguay.

Verbenaceae.
3 E Aegiphila australis Mold. - Sta. Catarina to RGS.
5 I Aegiphila brachiata Vell. - Rio de Janeiro to RGS.
3 E Aegiphila sellowiana Cham. - Pará to RGS.
2 E Bouchea fluminensis (Vell.) Mold. - Amazonia to RGS.
3 E Citharexylum montevidense (Spreng.) Mold. - Minas Gerais to RGS.
3 E Citharexylum myrianthum Cham. - Bahia to RGS.
2 E Lantana brasiliensis Link - Piauí to RGS.
2 E Lantana camara L. - Antilles to Uruguay.
2 I Lantana chamissonis (D. Dietr.) Benth. - Colombia to RGS.
4 I Vitex montevidensis Cham. - Bahia to Uruguay.

Violaceae.
5 E Anchietea salutaris St. Hil. - Goiás to Uruguay.
2 I Hybanthus bigibbosus (St. Hil.) Hassl. - S. Paulo to RGS.

Vitaceae.
5 I Cissus gongyloides (Burch.) Planch. - Minas Gerais to RGS.
5 E Cissus sycioides L. - Antilles to Uruguay.
5 E Cissus striata R. et P. - Rio de Janeiro to Uruguay.

Summary:

1	(low herbs)	41	10%
2	(shrubs)	47	12%
3	(small trees)	77	19%
4	(high trees)	38	10%
5	(climbers and half climbers)	150	38%
6	(epiphytes and parasites)	45	11%
		398	
I	(interior)	249	62%
E	(edge and glades)	130	33%
R	(riverside)	19	5%
		398	

2. *SPECIES LIMITED TO THE EASTERN WING OF THE RIOGRANDEAN RAIN FOREST.*

Acanthaceae.
2 I Jacobinia pauciflora (Nees) Lindau - RGS.
5 I Mendoncia coccinea Vell. - Colombia to RGS.
5 I Mendoncia pubescens (Mart.) Nees - Colombia to RGS.
1 I Stenandrium tenellum Nees - Sta. Catarina to RGS.

Amarantaceae.
1 I Celosia brasiliensis Moq. - Rio de Janeiro to RGS.
5 E Gomphrena holosericea (Mart.) Moq. - Rio de Janeiro to RGS.

Anonaceae.
4 I Anona cacans Warm. - Minas Gerais to RGS.
3 I Guatteria australis St. Hil. - Paraná to RGS.
3 I Rollinia exalbida (Vell.) Mart. - Rio de Janeiro to RGS.

Apocynaceae.
5 I Forsteronia leptocarpa A. DC. — Pernambuco to RGS.
5 I Mandevilla atroviolacea (Stadelm.) Woods. - Minas Gerais to RGS.
5 I Prestonia coalita (Vell.) Woods. - Ceará to RGS.
5 I Temnadenia stellaris (Lindl.) Miers - Minas Gerais to RGS.

Araceae.
6 I Anthuriun scandens (Aubl.) Engl. - Central America to RGS.
6 I Anthurium willdenowii Kunth - Minas Gerais to RGS.
6 I Philodendron imbe Schott - Rio de Janeiro to RGS.

Araliaceae.
3 I Oreopanax fulvum E. March. — Minas Gerais to RGS.

Asclepiadaceae.
5 I Cyathostelma latipes (Dcne) Fourn. - S. Paulo to RGS.
5 I Gonolobus dutrae Malme - RGS.
5 E Jobinia connivens (Hook. et Arn.) Malme - S. Paulo to RGS.

Balanophoraceae.
1 I Helosis guyannensis Rich. - Antilles to RGS.

Begoniaceae.
1 I Begonia bidentata Raddi - Bahia to RGS.

Bignoniaceae.
3 E Cybistax antisyphilitica Mart. - Amazonia to RGS.
5 I Distictis glaziovii B. et K. Schum. - Rio de Janeiro to RGS.
5 I Paragonia pyramidata (Rich.) Bur. - Amazonia to RGS.
3 E Tabebuia pulcherrima Sandw. - Sta. Catarina to RGS.
3 E Tabebuia umbellata (Sond.) Sandw. - Minas Gerais to RGS.
5 E Tynnanthus elegans (Chom.) Miers - Minas Gerais to RGS.

Bromeliaceae.
6 I Aechmea platzmannii Wittm. - Espírito Santo to RGS.
6 I Aechmea recurvata (Klotzsch) L. B. Smith - RGS to Uruguay.
6 I Canistrum superbum (Lindm.) Mez - Rio de Janeiro to RGS.
6 I Nidularium innocentii Lem. - Rio de Janeiro to RGS.
6 I Nidularium procerum Lindm. - Rio de Janeiro to RGS.
6 I Tillandsia firmula Mez - Minas Gerais to RGS.
6 I Tillandsia gardneri Lindl. - Trinidad to RGS.
6 I Tillandsia mallemontii Glaz. - Rio de Janeiro to RGS.
6 I Vriesea carinata Wawra - Rio de Janeiro to RGS.
6 I Vriesea corcovadensis Mez - Rio de Janeiro to RGS.
6 I Vriesea erythrodactylon E. Morr. - Rio de Janeiro to RGS.
6 I Vriesea mosenii Mez - Rio de Janeiro to RGS.
6 I Vriesea neoglutinosa Mez - Rio de Janeiro to RGS.
6 I Vriesea philippo-coburgii Wawra - Rio de Janeiro to RGS.
6 I Vriesea platzmannii E. Morr. - Paraná to RGS.
6 I Vriesea psittacina (Hook.) Lindl. - Bahia to RGS.
6 I Vriesea reticulata Mez - RGS.
6 I Vriesea saundersii (C. Koch) Morr. - Bahia to RGS.

Cactaceae.
6 I Rhipsalis houlletiana Lem. - Minas Gerais to RGS.
6 I Rhipsalis myosurus (Salm-Dyck) Förster - Rio de Janeiro to RGS.
6 I Rhipsalis pentaptera Pfeiff. - South Brazil to RGS.
6 I Rhipsalis rosea Lagerh. - Sta. Catarina to RGS.
6 I Rhipsalis warmingiana Schum. - Minas Gerais to RGS.

Commelinaceae.
1 E Tradescantia anagallidea Seub. - South Brazil to RGS.

1 E Tradescantia cerinthioides Kunth — South Brazil to RGS.
1 E Tradescantia effusa Mart. - West Indies to RGS.

Compositae.
1 E Adenostemma brasilianum (Pers.) Cass. - Minas Gerais to Uruguay.
1 E Adenostemma verbesina (L.) O. K. - Antilles to RGS.
5 E Mikania involucrata Hook. et Arn. - S. Paulo to Uruguay.
5 E Mikania microcephala DC. - Minas Gerais to RGS.
5 I Mikania microlepis Hook. et Arn. - Mexico to RGS.
5 I Mikania paniculata DC. - Rio de Janeiro to RGS.
5 I Mikania trinervis Hook. et Arn. - Bahia to RGS.
5 I Mikania ulei Hier. - Paraná to RGS.
3 E Piptocarpha axillaris Bak. - Minas Gerais to RGS.

Cucurbitaceae.
5 I Cayaponia biflora Cogn. - Sta. Catarina to RGS.
5 I Cayaponia cabocla (Vell.) Mart. - Rio de Janeiro to RGS.
5 I Cayaponia martiana (Cogn.) Cogn. - Rio de Janeiro to Uruguay.
5 I Cayaponia trifoliolata (Cogn.) Cogn. - S. Paulo to RGS.
5 I Cayaponia ulei Cogn. - Sta. Catarina to RGS.
5 E Cyclanthera elegans Cogn. - Minas Gerais to RGS.
5 E Melothria cucumis Vell. - Colombia to RGS.

Cyclanthaceae.
5 I Asplundia polymera (Hand. Maz.) Harling - S. Paulo to RGS.

Cyperaceae.
1 I Pleurostachys gaudichaudii Benth. - Southeastern Brazil to RGS.
1 I Pleurostachys stricta Kunth - Southeastern Brazil to RGS.

Dilleniaceae.
5 I Davilla rugosa Poir. - Antilles to RGS.

Dioscoreaceae.
5 E Dioscorea monadelpha (Kunth) Pax - S. Paulo to RGS.

Elaeocarpaceae.
4 I Sloanea monosperma Vell. - Bahia to RGS.

Erythroxylaceae.
2 I Erythroxylum cuspidifolium Mart. - Espirito Santo to RGS.

Euphorbiaceae.
1 I Chiropetalum gymnadenium (M. Arg.) Pax et K. Hoffm. - Minas G. to RGS.
2 I Chiropetalum intermedium Pax et K. Hoffm. - South Brazil to Uruguay.
5 E Dalechampia sellowiana M. Arg. - S. Paulo to RGS.
4 I Hieronyma alchorneoides Fr. All. - Amazonia to RGS.
4 I Pachystroma ilicifolium M. Arg. - Minas Gerais to RGS.
3 I Pera glabrata Baill. - Trinidad to RGS.
3 I Sebastiania argutidens Pax et K. Hoffm. - Sta. Catarina to RGS.
3 E Tetrorchidium rubrivenium Poepp. et Endl. - Central América to RGS.

Gesneriaceae.
1 E Corytholoma latifolium (Mart.) Fritsch - S. Paulo to RGS.
1 E Corytholoma lindleyi (Hook.) Dcne - Rio de Janeiro to RGS.
6 I Hypocyrta radicans Kl. et Hanst. - Paraná to RGS.

Gramineae.
2 I Chusquea meyeriana Rupr. - Minas Gerais to RGS.
1 I Olyra latifolia L. - Amazonia to RGS.

Guttiferae.
3 I Rheedia gardneriana Planch. - Ceará to RGS.

Hippocrateaceae.
3 I Cheiloclinium serratum (Cam.) A. C. Smith - Minas Gerais to RGS.
5 I Peritassa calypsoides (Camb.) A. C. Smith - Rio de Janeiro to RGS.

Lauraceae.
3 I Ajouea saligna Meissn. - Minas Gerais to RGS.
4 I Cryptocarya moschata Nees - Minas Gerais to RGS.
3 I Endlicheria hirsuta (Schott) Nees - Ecuador to RGS.

Leguminosae-Caesalpinioideae.
3 I Cassia leptophylla Vog. - S. Paulo to RGS.
4 I Schizolobium excelsum Vog. - Rio de Janeiro to RGS.

Leguminosae-Mimosoideae.
4 I Inga sessilis (Vell.) Mart. - Minas Gerais to RGS.

Leguminosae-Papilionatae.
3 E Machaerium glabrum Vog. - South Brazil to RGS.

Liliaceae.
Smilax procera Gris. - Rio de Janeiro to RGS.

Loasaceae.
5 I Cajophora eichleri (Urb.) Urb. - Sta. Catarina to RGS.

Loranthaceae.
6 I Phoradendron bathyoryctum Eichl. - Ceará to RGS.
6 I Phoradendron chrysocladon A. Gray - Antilles to RGS.
6 I Phoradendron craspedophyllum Eichl. - S. Paulo to RGS.
6 I Phoradendron glaziovii Urb. - Rio de Janeiro to RGS.
6 I Phoradendron habrostachyum Eichl. - Minas Gerais to RGS.
6 I Phoradendron holoxanthum Eichl. - Rio de Janeiro to RGS.
6 I Phoradendron linearifolium Eichl. - Rio de Janeiro to RGS.
6 I Phoradendron microphyllum (Pohl) Trel. - Rio de Janeiro to RGS.
6 I Phoradendron selloi Eichl. - S. Paulo to RGS.
6 I Phoradendron ulophyllum Eichl. - Piaui to RGS.
6 I Struthanthus staphylinus Mart. - Amazonia to RGS.

Magnoliaceae.
4 I Talauma ovata St. Hil. - Minas Gerais to RGS.

Malpighiaceae.
5 E Heteropterys aenea Gris. - S. Paulo to RGS.
5 E Mascagnia exotropica Gris. - RGS.

Malvaceae.
2 I Abutilon inflatum Garcke et K. Schum. - South Brazil to RGS.
1 I Pavonia rosea Schl. - Antilles to RGS.

Marantaceae.
1 I Calathea zebrina (Sims) Lindl. - Bahia to RGS.
1 I Ctenanthe muelleri G. O. Pet. - Sta. Catarina to RGS.
2 E Maranta divaricata Roscoe - Mexico to RGS.

Marcgraviaceae.
5 I Marcgravia polyantha Delp. - Minas Gerais to RGS.

Melastomataceae.
2 I Leandra alterninervia Cogn. - Minas Gerais to RGS.
2 I Leandra dasytricha A. Gray - Rio de Janeiro to RGS.
2 I Miconia cinerascens Miq. - Minas Gerais to RGS.
3 I Miconia latecrenata Naud. - Piauí to RGS.

Meliaceae.
2 I Trichilia casaretti C. DC. - Sta. Catarina to RGS.

Menispermaceae.
5 I Hyperbaena domingensis (P. DC.) Benth. - Mexico to Uruguay.
5 I Disciphania peltata (K. Schum.) Diels - Rio de Janeiro to RGS.

Monimiaceae.
2 I Mollinedia elegans Tul. - Minas Gerais to RGS.
3 I Mollinedia floribunda Tul. - Minas Gerais to RGS.

Moraceae.
3 E Cecropia adenopus Mart. - Amazonia to RGS.
3 E Cecropia lyratiloba Miq. - Central Brazil to RGS.
4 I Coussapoa schottii Miq. - Rio de Janeiro to RGS.

Musaceae.
2 I Heliconia bihai L. - Mexico to RGS.

Myristicaceae.
4 I Virola bicuhyba (Schott) Warb. - Rio de Janeiro to RGS.

Myrtaceae.
4 I Blepharocalyx affinis Berg - Minas Gerais to RGS.
4 I Calyptranthes grandifolia Berg - Rio de Janeiro to RGS.
4 I Eugenia rostrifolia Legr. - RGS.

Nyctaginaceae.
3 E Pisonia nitida Mart. - Minas Gerais to RGS.

Ochnaceae.
2 I Ouratea salicifolia (St. Hil. et Tul.) Engl. - Ceará to RGS.

Orchidaceae.
6 I Amblostoma cernua Scheidw. - Minas Gerais to RGS.
6 I Aspasia lunata Lindl. - Minas Gerais to RGS.
6 I Barbosella australis (Cogn.) Schl. - RGS.

6 I Barbosella crassifolia (Edw.) Schl. - S. Paulo to RGS.
6 I Barbosella gracilis (Edw.) Schl. - RGS.
6 I Barbosella handroi Hoehne - S. Paulo to RGS.
6 I Bifrenaria harrisoniae (Hook.) Rchb. f. - Minas Gerais to RGS.
6 I Bifrenaria tetragona (Lindl.) Schl. - Minas Gerais to RGS.
6 I Brassavola lindleyana (Rolfe) Rchb. f. - Bahia to RGS.
6 I Bulbophyllum glutinosum (Rodr.) Schl. - Minas Gerais to RGS.
6 I Bulbophyllum regnellii Rchb. f. - Minas Gerais to RGS.
6 I Campylocentrum brachycarpum Cogn. - S. Paulo to RGS.
6 I Campylocentrum densiflorum Cogn. - Minas Gerais to RGS.
6 I Campylocentrum ornithorrynchum (Lindl.) Rolfe - Sta. Catarina to RGS.
6 I Campylocentrum parahybunense Rodr. - Minas Gerais to RGS.
6 I Campylocentrum sellowii (Rchb. f.) Rolfe - Minas Gerais to RGS.
6 I Campylocentrum ulaei Cogn. - Rio de Janeiro to RGS.
6 I Capanemia gehrtii Hoehne - Minas Gerais to RGS.
6 I Capanemia juergensiana (Krzl.) Schl. - RGS.
6 I Capanemia spathuliglossa Pabst - RGS.
6 I Capanemia uliginosa Rodr. - RGS.
6 I Catasetum atratum Lindl. - Minas Gerais to RGS.
6 I Catasetum fimbriatum Lindl. - Guyana to RGS.
6 I Catasetum mentosum Lem. - Sta. Catarina to RGS.
6 I Cattleya amethystoglossa Lindl. - Bahia to RGS.
6 I Cattleya guttata Lindl. - Bahia to RGS.
6 I Cattleya intermedia Graham - Minas Gerais to RGS.
6 I Cirrhaea dependens Rchb. f. - Rio de Janeiro to RGS.
6 I Cirrhaea saccata Lindl. - South Brazil to RGS.
6 I Cladobium ceracifolium (Rodr.) Schl. - Rio de Janeiro to RGS.
6 I Cladobium epiphytum (Rodr.) Schl. - Minas Gerais to RGS.
1 I Cranichis candida (Rodr.) Cogn. - Minas Gerais to RGS.
6 I Cryptophoranthus cryptanthus Rodr. - Minas Gerais to RGS.
6 I Cryptophoranthus juergensii Schl. - RGS.
6 I Cyrtopodium andersonii R. Br. - Antilles to RGS.
6 I Dichaea cogniauxiana Schl. - Central America to RGS.
6 I Dichaea pendula (Aubl.) Urb. - Mexico to RGS.
1 I Elleanthus brasiliensis Rchb. f. - Guyana to RGS.

6 I Encyclia gallopavonina (Rchb. f.) Dutra - Rio de Janeiro to RGS.
6 I Epidendrum alexandri Schl. - S. Paulo to RGS.
6 I Epidendrum burgeri Schl. - RGS.
6 I Epidendrum elongatum Jacq. - Antilles to RGS.
6 I Epidendrum faustum Rchb. f. - RGS.
6 I Epidendrum fragrans Swartz - Antilles to RGS.
6 I Epidendrum fulgens Brongn. - Trinidad to RGS.
6 I Epidendrum hatschbachii Schl. - Paraná to RGS.
6 I Epidendrum latilabre Lindl. - Antilles to RGS.
6 I Epidendrum pium Rchb. f. - Minas Gerais to RGS.
6 I Epidendrum pseudodifforme Hoehne et Schl. - S. Paulo to RGS.
6 I Epidendrum rigidum Jacq. - Mexico to RGS.
6 I Epidendrum rodriguesii Cogn. - Rio de Janeiro to RGS.
6 I Epidendrum variegatum Hook. - Antilles to RGS.
6 I Epidendrum vesicatum Lindl. - Bahia to RGS.
6 I Epidendrum widgrenii Lindl. - Minas Gerais to RGS.
6 I Eurystyles cotyledon Wawra - Antilles to RGS.
6 I Eurystyles lorentzii (Cogn.) Schl. - RGS.
6 I Gomeza crispa Klotzsch et Rchb. f. - Minas Gerais to RGS.
6 I Gomeza divaricata Hffmgg - Paraná to RGS.
1 I Govenia gardneri Hook. - Minas Gerais to RGS.
6 I Grobya bibrachiata Hoehne - S. Paulo to RGS.
1 I Hapalorchis micranthus (Rodr.) Hoehne - Minas Gerais to RGS.
6 I Laelia elegans Rchb. f. - Sta. Catarina to RGS.
6 I Laelia purpurata Lindl. - Sta. Catarina to RGS.
6 I Lamium avicula Benth. - Minas Gerais to RGS.
6 I Leptotes bicolor Lindl. - Minas Gerais to RGS.
1 I Liparis elata Lindl. - Mexico to RGS.
6 I Masdevallia zebrina Porsch - RGS.
6 I Maxillaria cogniauxiana Hoehne - Paraná to RGS.
6 I Maxillaria crassifolia Rchb. f. - Mexico to RGS.
6 I Maxillaria ferdinandiana Rodr. - Minas Gerais to RGS.
6 I Maxillaria heterophylla Hoehne - RGS.
6 I Maxillaria juergensii Schl. - RGS.
6 I Maxillaria madida Lindl. - Minas Gerais to RGS.
6 I Maxillaria marginata Fenzl - Ecuador to RGS.
6 I Maxillaria mosenii Krzl. - S. Paulo to RGS.
6 I Maxillaria paranaensis Rodr. - Paraná to RGS.
6 I Maxillaria picta Hook. - Minas Gerais to RGS.
6 I Maxillaria plebeia Rchb. f. - South Brazil to RGS.
6 I Maxillaria porphyrostele Rchb. f. - S. Paulo to RGS.
6 I Maxillaria vernicosa Rodr. - Minas Gerais to RGS.
6 I Maxillaria vitelliniflora Rodr. - Minas Gerais to RGS.

1 I Microstylis ovatilabia Schl. - Paraná to RGS.
1 I Microstylis sertulifera (Rodr.) Schl. - Minas Gerais to RGS.
1 I Microstylis warmingii Rchb. f. - Minas Gerais to RGS.
6 I Miltonia quadrijuga Krzl. - Paraná to RGS.
6 I Miltonia regnellii Rchb. f. - Minas Gerais to RGS.
6 I Neolauchea pulchella Krzl. - Paraná to RGS.
6 I Notylia longispicata Hoehne et Schl. - S. Paulo to RGS.
6 I Notylia pubescens Lindl. - South Brazil to RGS.
6 I Octomeria albina Rodr. - Rio de Janeiro to RGS.
6 I Octomeria fibrifera Schl. - RGS.
6 I Octomeria gracilicaulis Schl. - RGS.
6 I Octomeria gracilis Lodd. - Minas Gerais to RGS.
6 I Octomeria juergensii Schl. - RGS.
6 I Octomeria paucifolia Rodr. - Rio de Janeiro to RGS.
6 I Octomeria pinicola Rodr. - Minas Gerais to RGS.
6 I Octomeria pusilla Schl. - Sta. Catarina to RGS.
6 I Octomeria riograndensis Schl. - RGS.
6 I Octomeria sancti angeli Krzl. - RGS.
6 I Octomeria umbonulata Schl. - RGS.
6 I Octomeria unguiculata Schl. - RGS.
6 I Oncidium barbatum Lindl. - Central America to RGS.
6 I Oncidium batemanianum Parm. - Minas Gerais to RGS.
6 I Oncidium bifolium Sims - RGS to Uruguay.
6 I Oncidium concolor Hook. - Minas Gerais to RGS.
6 I Oncidium cornigerum Lindl. - Rio de Janeiro to RGS.
6 I Oncidium crispum Lodd. - Rio de Janeiro to RGS.
6 I Oncidium cruciatum Rchb. f. - Rio de Janeiro to RGS.
6 I Oncidium divaricatum Lindl. - Rio de Janeiro to RGS.
6 I Oncidium edwallii Cogn. - S. Paul to RGS.
6 I Oncidium flexuosum Sims - Bahia to RGS.
6 I Oncidium hecatanthum Krzl. - RGS.
6 I Oncidium loefgrenii Cogn. - S. Paulo to RGS.
6 I Oncidium longicornu Mutel - Minas Gerais to RGS.
6 I Oncidium longipes Lindl. - Minas Gerais to RGS.
6 I Oncidium micropogon Rchb. f. - Bahia to RGS.
6 I Oncidium nitidum Rodr. - Rio de Janeiro to RGS.
6 I Oncidium ottonis Schl. - Minas Gerais to RGS.
6 I Oncidium paranaense Krzl. - Paraná to RGS.
6 I Oncidium psyche Schl. - Matogrosso to RGS.
6 I Oncidium riograndense Cogn. - RGS.
6 I Oncidium raniferum Lindl. - Rio de Janeiro to RGS.
6 I Oncidium reisii Hoehne et Schl. - S. Paulo to RGS.
6 I Oncidium trulliferum Lindl. - Rio de Janeiro to RGS.
6 I Oncidium uniflorum Booth - Rio de Janeiro to RGS.

6 I Oncidium varicosum Lindl. - S. Paulo to RGS.
6 I Oncidium widgrenii Lindl. - Minas Gerais to RGS.
6 I Ornithocephalus brachystephanus Schl. - RGS.
6 I Ornithocephalus myrticola Lindl. - Rio de Janeiro to RGS.
6 I Phymatidium aquinoi Schl. - RGS.
6 I Phymatidium myrtophilum Rodr. - Rio de Janeiro to RGS.
6 I Phymatidium paranaense A. Sampaio - Paraná to RGS.
6 I Platyrrhiza juergensii Schl. - RGS.
6 I Pleurobotryum aquinoi Schl. - RGS.
6 I Pleurobotryum blumenavii (Rodr.) Cogn. - Rio de Janeiro to RGS.
6 I Pleurobotryum hatschbachii (Schl.) Hoehne - Paraná to RGS.
6 I Pleurothallis caespitosa Rodr. - Minas Gerais to RGS.
6 I Pleurothallis caroli Schl. - RGS.
6 I Pleurothallis crepiniana Cogn. - Paraná to RGS.
6 I Pleurothallis cuneifolia Cogn. - Rio de Janeiro to RGS.
6 I Pleurothallis depauperata Cogn. - Rio de Janeiro to RGS.
6 I Pleurothallis dryadum Schl. - S. Paulo to RGS.
6 I Pleurothallis exarticulata Rodr. - Rio de Janeiro to RGS.
6 I Pleurothallis glaziovii Cogn. - South Brazil to RGS.
6 I Pleurothallis grobyi Lindl. - Antilles to RGS.
6 I Pleurothallis hygrophila Rodr. - Minas Gerais to RGS.
6 I Pleurothallis juergensii Schl. - RGS.
6 I Pleurothallis lamproglossa Schl. - Paraná to RGS.
6 I Peurothallis leptotifolia Rodr. - Minas Gerais to RGS.
6 I Pleurothallis leucorrhoda Schl. - RGS.
6 I Pleurothallis lindleyana Cogn. - Central America to RGS.
6 I Pleurothallis linearifolia Cogn. - South Brazil to RGS.
6 I Pleurothallis macrophyta Rodr. - Minas Gerais to RGS.
6 I Pleurothallis mantiquirana Rodr. - Minas Gerais to RGS.
6 I Pleurothallis marginalis Rchb. f. - Guyana to RGS.
6 I Pleurothallis marmorata (Rodr.) Cogn. - Minas Gerais to RGS.
6 I Pleurothallis microtis Schl. - RGS.
6 I Pleurothallis modestiflora Schl. - Minas Gerais to RGS.
6 I Pleurothallis myrticola Rodr. - Minas Gerais to RGS.
6 I Pleurothallis nemorosa Rodr. - Minas Gerais to RGS.
6 I Pleurothallis picta Lindl. - Guyana to RGS.
6 I Pleurothallis rigidiuscula Cogn. - South Brazil to RGS.
6 I Pleurothallis rubens Lindl. - Minas Gerais to RGS.
6 I Pleurothallis ruscifolia Rodr. - Antilles to RGS.
6 I Pleurothallis saundersiana Rchb. f. - Rio de Janeiro to RGS.

6 I Pleurothallis saurocephala Lindl. - Minas Gerais to RGS.
6 I Pleurothallis serpentula Rodr. - Minas Gerais to RGS.
6 I Pleurothallis smithiana Lindl. - Rio de Janeiro to RGS.
6 I Pleurothallis sonderana Rchb. f. - Minas Gerais to RGS.
6 I Pleurothallis sparsiflora Schl. - RGS.
6 I Pleurothallis subpicta Schl. - S. Paulo to RGS.
6 I Pleurothallis tenera (Rodr.) Cogn. - Rio de Janeiro to RGS.
6 I Pleurothallis vellosoana Schl. - RGS.
6 I Pleurothallis ypirangae Krzl. - S. Paulo to RGS.
6 I Polystachya juergensii Schl. - RGS.
6 I Polystachya micrantha Schl. - RGS.
6 I Promenaea riograndensis Schl. - RGS.
6 I Psilochilus modestus Rodr. - Espirito Santo to RGS.
6 I Rodriguesia decora Rchb. f. - S. Paulo to RGS.
1 I Sauroglossum nitidum (Vell.) Schl. - Minas Gerais to RGS.
6 I Sigmatostalyx radicans Rchb. f. - Minas Gerais to RGS.
6 I Sophronitis cernua Lindl. - Bahia to RGS.
6 I Sophronitis coccinea (Vell.) Rchb. f. - Minas Gerais to RGS.
6 I Sophronitis pterocarpa Lindl. - Minas Gerais to RGS.
6 I Stanhopea insignis Frost - Rio de Janeiro to RGS.
6 I Stelis aquinoana Schl. - RGS.
6 I Stelis juergensii Schl. - RGS.
6 I Stelis miersii Lindl. - Rio de Janeiro to RGS.
6 I Theodorea gomezioides Rodr. - Minas Gerais to RGS.
6 I Vanilla chamissonis Klotzsch - Rio de Janeiro to RGS.
6 I Vanilla edwallii Hoehne - S. Paulo to RGS.
1 I Warrea tricolor Lindl. - Venezuela to RGS.
6 I Zygopetalum mackayi Hook. - Minas Gerais to RGS.
6 I Zygopetalum maxillare Lodd. - Rio de Janeiro to RGS.
6 I Zygostates aquinoi Schl. - RGS.
6 I Zygostates lindmanii (Krzl.) Schl. - RGS.

Palmae.
3 I Bactris lindmaniana Drude - Sta. Catarina to RGS.
3 I Euterpe edulis Mart. - Bahia to RGS.
2 I Geonoma schottiana Mart. - Minas Gerais to RGS.
2 I Geonoma weddelliana H. Wendl. - Amazonia to RGS.
4 I Trithrinax brasiliensis Mart. - Sta. Catarina to RGS.

Passifloraceae.
5 E Passiflora actinia Hook. - Rio de Janeiro to RGS.
5 E Passiflora elegans Mart. - Sta. Catarina to RGS.
5 E Passiflora violacea Vell. - Minas Gerais to RGS.

Piperaceae.
6 I Peperomia arechavaletae C. DC. - RGS to Uruguay.
1 I Peperomia caulibarbis Miq. - Antilles to RGS.
1 E Peperomia peireskiifolia (Jacq.) H.B.K. - Venezuela to RGS.
2 I Piper concinnum (Miq.) C. DC. - Minas Gerais to RGS.
2 I Piper corcovadense C. DC. - Maranhão to RGS.
2 I Piper geniculatum Swartz - Antilles to RGS.
2 I Piper jaborandi Vell. - Rio de Janeiro to RGS.
2 I Piper xylosteoides Steud. - Trinidad to RGS.

Polygalaceae.
5 E Securidaca sellowiana Klotzsch - Minas Gerais to RGS.

Rhamnaceae.
4 I Colubrina rufa (Mart.) Reiss. - Rio de Janeiro to RGS.

Rosaceae.
3 I Hirtella hebeclada Moric. - Minas Gerais to RGS.
2 E Rubus imperialis Cham. et Schl. - Minas Gerais to Uruguay.

Rubiaceae.
3 I Bathysa meridionalis Smith et Downs - Minas Gerais to RGS.
2 I Chiococca racemosa L. - Southeastern Brazil to RGS.
1 I Coccocypselum guyannense (Aubl.) Schum. - Mexico to RGS.
2 I Faramea marginata Cham. - Rio de Janeiro to RGS.
5 E Manettia ciliata Cham. et Schl. - Minas Gerais to RGS.
5 E Manettia ignita (Vell.) Schum. - Ceará to Uruguay.
5 E Manettia pubescens Cham. et Schl. - Minas Gerais to RGS.
5 E Manettia racemosa K. Schum. - Minas Gerais to RGS.
3 I Posoqueria latifolia (Rudge) R. et S. - Rio de Janeiro to RGS.
2 I Psychotria kleinii Smith et Downs - Sta. Catarina to RGS.
3 I Rudgea jasminoides (Cham.) M. Arg. - Paraná to RGS.

Rutaceae.
2 I Esenbeckia grandiflora Mart. - Minas Gerais to RGS.
3 I Fagara cheiloperone (Mart.) Engl. - S. Paulo to RGS.

Sapotaceae.
3 I Chrysophyllum inornatum Mart. - Rio de Janeiro to RGS.

Solanaceae.
2 I Dyssochroma longipes (Sendt.) Miers - Paraná to RGS.
1 I Solanum alatirameum Bitter - Paraná to RGS.
1 I Solanum arenarium Sendt. - Bahia to RGS.
5 I Solanum decorticans Sendt. - Rio de Janeiro to RGS.
2 E Solanum megalochiton Mart. - Minas Gerais to RGS.
5 I Solanum prunifolium Willd. - Venezuela to RGS.

Theaceae.
3 E Laplacea semiserrata Camb. - Venezuela to RGS.

Tiliaceae.
2 E Triumfetta abutiloides St. Hil. - Minas Gerais to RGS.

Ulmaceae.
5 I Celtis pubescens (Kunth) Planch. - Ecuador to RGS.

Urticaceae.
2 E Phenax angustifolius Wedd. - Southeastern Brazil to RGS.
2 I Urera armigera (Presl) Miq. - Rio de Janeiro to RGS.

Summary:

1	(low herbs)	32	8%
2	(shrubs)	30	8%
3	(small trees)	30	8%
4	(high trees)	15	4%
5	(climbers and half climbers)	49	12%
6	(epiphytes and parasites)	226	60%
		382	

I	(interior)	342	90%
E	(edge and glades)	40	10%
R	(riverside)	0	0%
		382	

3. *SPECIES RESTRICTED TO THE WESTERN WING OF THE RIOGRANDEAN RAIN FOREST.*

Acanthaceae.
2 I Cyrtanthera pohliana Nees - Minas Gerais to RGS.

5 E Poikilacanthus gilliesii (Nees) Lindau - Misiones to RGS.
5 E Poikilacanthus tweedieanus (Nees) Lindau - Misiones to RGS.

Achatocarpaceae.
3 I Achatocarpus bicornutus Schinz - Paraguay to RGS.

Amarantaceae.
5 E Chamissoa macrocarpa H.B.K. - Mexico to RGS.
5 E Pfaffia paniculata (Mart.) O. K. - Minas Gerais to RGS.
2 I Pseudoplantago friesii Ssgth - Misiones to RGS.

Apocynaceae.
5 I Condylocarpon rauwolffiae (A. DC.) M. Arg. - Piauí to RGS.
5 I Prestonia tomentosa R. Br. - Colombia to RGS.

Araceae.
1 I Asterostigma lividum (Lodd.) Spreng. - Minas Gerais to RGS.

Asclepiadaceae.
5 I Macroscepis aurea Fourn. - Minas Gerais to RGS.
5 E Roulinia ekmanii Malme - Misiones to Uruguay.
5 E Roulinia montevidensis (Spreng.) Malme - Matogrosso to RGS.

Begoniaceae.
6 I Begonia brasiliensis Klotzsch - Minas Gerais to RGS.

Bignoniaceae.
5 I Arrabidaea mutabilis Bur. et K. Schumann - S. Paulo to RGS.
5 I Clytostoma uniflorum K. Schum. - Sta. Catarina to RGS.
5 I Melloa populifolia (P. DC.) Bur. - Colombia to RGS.

Bombacaceae.
4 I Chorisia insignis H. B. K. - Amazonia to RGS.

Bromeliaceae.
6 I Aechmea bromeliifolia (Rudge) Bak. - Amazonia to RGS.
6 I Achmea distichantha Lam. - Minas Gerais to RGS.

Celastraceae.
2 I Schaefferia uruguayensis Speg. - Sta. Catarina to Uruguay.

Commelinaceae.
2 I Dichorisandra aubletiana R. et S. - Trinidad to RGS.

Dioscoreaceae.
5 E Dioscorea glandulosa Klotzsch - Colombia to RGS.
5 E Dioscorea grisebachii Kunth - Rio de Janeiro to RGS.
5 E Dioscorea lindmanii Uline - Colombia to RGS.

Euphorbiaceae.
2 I Acalypha hassleriana Chod. - Paraguay to RGS.
4 I Alchornea sidifolia M. Arg. - Minas Gerais to RGS.
2 R Croton urucurana Baill. - Minas Gerais to RGS.
2 I Julocroton ramboi Smith et Downs - Sta. Catarina to RGS.

Labiatae.
1 I Scutellaria uliginosa St. Hil. - Bolivia to RGS.

Leguminosae-Caesalpinioideae.
2 E Bauhinia candicans Benth. - Misiones to RGS.
3 I Gleditschia amorphoides (Gris.) Taub. - Misiones to RGS.
4 I Holocalyx balansae Mich. - Paraguay to RGS.
4 I Peltophorum dubium (Spreng.) Taub. - Pernambuco to RGS.

Leguminosae-Mimosoideae.
2 R Calliandra foliolosa Benth. - Paraguay to RGS.

Leguminosae-Papilionatae.
3 E Ateleia glazioviana Baill. - Misiones to RGS.
5 I Chaetocalyx nigricans Burk. - Misiones to RGS.
2 R Dahlstedtia pinnata (Benth.) Malme - Minas Gerais to RGS.
3 E Lonchocarpus muehlbergianus Hassl. - Misiones to RGS.

Liliaceae.
2 I Cordyline dracaenoides Kunth - Paraná to RGS.

Lythraceae.
2 R Lafoensia hummularioides St. Hil. - S. Paulo to RGS.

Marantaceae.
1 I Calathea lindbergii G. O. Pet. - Minas Gerais to RGS.
1 I Ctenanthe casupoides G. O. Pet. - Rio de Janeiro to RGS.

Melastomataceae.
2 I Miconia inaequidens Naud. - Rio de Janeiro to RGS.

Meliaceae.
3 I Guarea trichilioides L. - Antilles to RGS.
3 I Trichilia catigua A. Juss. - Minas Gerais to RGS.

Moraceae.
4 I Ficus eximia Schott - Minas Gerais to RGS.

Myrtaceae.
3 I Britoa sellowiana Berg - Minas Gerais to RGS.
3 I Plinia trunciflora (Berg) Kausel - Minas Gerais to RGS.

Orchidaceae.
6 I Cyrtopodium paranaense Schl. - Paraná to RGS.

Oxalidaceae.
1 E Oxalis barrelieri Jacq. - Rio de Janeiro to RGS.

Passifloraceae.
5 E Passiflora warmingii Mast. - Colombia to RGS.

Phytolaccaeeae.
5 E Microtea scabrida Urb. - Pernambuco to RGS.

Rubiaceae.
2 E Hamelia patens Jacq. - Mexico to RGS.
5 E Manettia cordifolia Mart. - Peru to RGS.

Rutaceae.
4 I Balfourodendron riedelianum (Engl.) Engl. - Minas Gerais to RGS.
3 E Helietta cuspidata (Engl.) Chod. et Hassl. - Paraguay to RGS.

Sapindaceae.
4 I Diatenopteryx sorbifolia Radlk. - Minas Gerais to RGS.
5 I Thinouia mucronata Radlk. - Minas Gerais to RGS.

Solanaceae.
1 I Solanum rantonnettii Can. - Paraguay to RGS.

Verbenaceae.
2 E Aloysia virgata (R. et P.) A. Juss. - Bolivia to RGS.

Violaceae.
2 E Hybanthus communis (St. Hil.) Taub. - Peru to RGS.
1 I Hybanthus paraguariensis (Chod.) S. K. Schultze - Paraguay to RGS.
1 I Hybanthus hasslerianus (Chod.) Hassl. - Paraguay to RGS.

Summary:

1	(low herbs)	7	11%
2	(shrubs)	16	25%
3	(small trees)	9	14%
4	(high trees)	7	11%
5	(climbers and half climbers)	21	33%
6	(epiphytes and parasites)	4	6%
		64	
I	(interior)	41	63%
E	(edge and glades)	19	31%
R	(riverside)	4	6%
		64	

General synopsis:

	Common		East		West		Total	
1 (low herbs)	41	10%	32	8%	7	11%	80	10%
2 (shrubs)	47	12%	30	8%	16	25%	93	11%
3 (small trees)	77	19%	30	8%	9	14%	116	14%
4 (high trees)	38	10%	15	4%	7	11%	60	7%
5 (climbers)	150	38%	49	12%	21	33%	220	26%
6 (epiphytes and p.)	45	11%	226	60%	4	6%	275	33%
	398		382		64		844	
I (interior)	249	62%	342	90%	41	63%	631	74%
E (edge and glades)	130	33%	40	10%	19	31%	190	23%
R (riverside)	19	5%	0	0%	4	6%	23	3%
	398		382		64		844	

Although incomplete and in many details probably erroneous, this first survey of the Riograndean rain forest flora gives a fairly exact idea of its real number of species and

their geographical distribution within the State; as floristic exploration proceeds, many more species will be found, especially on the eastern wing, but the general proportions as shown in the above summary are not liable to become substantially altered.

II. THE WAYS OF MIGRATION.

Initially, I must call attention to some major aspects of the foregoing list:

The real number of species occurring on the eastern wing (ubiquitous plus eastern proper) is 780, that of the western wing only 462, which means to say that 92% of all forest species can be found at the eastern slope of the Highlands (between the ocean and 53° WL); geographically speaking, the rain forest northeastern of Pôrto Alegre has almost twice as many species as that near the great bend of the Uruguay River.

Another striking difference is this: On the eastern wing, more than one half of the locally restricted species — 226 out of 382 — belong to the category of the epiphytes, mainly orchids (about 200); inversely, the category of climbers is relatively low in the east, 12%, against 38% throughout the State, 33% on the western wing, and 26% in the total of the forest.

From these and other facts, two consequences immediately follow:

There are, in southernmost Brazil, two main currents of immigration of the rain forest; and the western current is the most important and the oldest.

1. Two currents of immigration.

On the basis of the general analysis given in the first chapter, it is easy to separate the two waves of immigration:

a. The following genera ***belong to the eastern current:*** Mendoncia, Celosia, Anona, Guatteria, Temnadenia, Oreopanax, Cyathostelma, Jobinia, Helosis, Distictis, Paragonia, Tynnanthus, Canistrum, Nidularium, Asplundia, Pleurostachys, Davilla, Pachystroma, Pera, Tetrorchidium, Hypo-

cyrta, Rheedia, Schizolobium, Talauma, Marcgravia, Hyperbaena, Disciphania, Coussapoa, Heliconia, Virola, Ouratea, Aspasia, Catasetum, Cattleya, Dichaea, Encyclia, Gomeza, Govenia, Grobya, Hapalorchis, Laelia, Lamium, Leptotes, Liparis, Masdevallia, Microstylis, Miltonia, Neolauchea, Notylia, Pleurobotryum, Sophronitis, Stanhopea, Vanilla, Theodorea (and many other orchidaceous genera), Bactris, Euterpe, Geonoma; for the species, see the general list.

b. The following genera ***belong to the western current:*** Cyrtanthera, Poikilacanthus, Pseudoplantago, Achatocarpus, Condylocarpon, Asterostigma, Roulinia, Schistogyne, Melloa, Chorisia, Schaefferia, Dichorisandra, Julocroton, Gleditschia, Holocalyx, Peltophorum, Ateleia, Chaetocalyx, Dahlstedtia, Cordyline, Lafoensia, Britoa, Plinia, Microtea, Hamelia, Balfourodendron, Helietta, Diatenopteryx.

c. The two currents correspond to the ***two natural doors of immigration.*** On the Atlantic side, there is an entrance of no more than 30 km between the 1000 m high precipices of the Serra Geral and the ocean; at the great northwestern bend of the Uruguay River, the immigration wave coming from the river system of the Paraná found a much broader way to Rio Grande do Sul, not only for immigrating but also for spreading east along the valleys of the tributaries.

As a natural consequence, the exclusive elements, remain until today crowded near these primary entrances: the vicinities of Torres in the east, and the broad body of forest near the Upper Uruguay.

Facts of this category are not understandable without admitting the self-imposing evidence of two separate currents of immigration.

d. In order to be more easily understood by the reader not familiar with South Brazilian geography, I must stress, that there exists ***no open way of communication*** between the two currents until they reach the southern slope of the Highlands. Geologically, the Highlands are an immense tilted block of no much less than one million square kilometers, with its highest altitudes at the eastern rim near the ocean, and a gentle inclination to the west until about 300 meters in the valleys of the Paraná and Uruguay. Consequently, all rivers go to the west giving the western forest current numerous opportunities for spreading eastward, but, as there is no open way through the highlands from the basin of the Paraná to the Atlantic coast, the eastern current cannot mi-

grate in western direction. The steep and climatically hostile eastern rim of the Highlands precludes any contact between the two currents of immigration.

This situation obtains at least in Paraná, Sta. Catarina and northern Rio Grande do Sul where, moreover, the native prairie (Campo) occupies a broad strip separating the western current from any possible contact with the eastern one. In Rio Grande do Sul between 28° in the west and 30° in the east, the Highlands end abruptly by a slope 1000 to 300 meter high. It was ***along this natural corridor*** that the two currents could and did meet and intermingle; thus giving the Riograndean rain forest its peculiar composition and character.

e. Although there is much lack of sure information about ***the center of origin*** of the South Brazilian rain forest, one thing seems to be reasonably clear: The eastern current has its main source in the tropical rain forest of the Central Brazilian sea coast; and the western wave stems from formations coming down from Central Brazil and, ultimately, from Amazonia. Although intimately founded together in one only subtropical forest, especially on the eastern wing, the two currents retain their identity: The last representants of the eastern current, migrating along the Riograndean coast reach as far south as northern Uruguay; and the most advanced outposts of the western current, following the course of the Uruguay River, constitute the last but well recognizable society at Punta Lara near La Plata in Argentina.

f. Some few species present an direct ***demonstration of the way*** they took to the southernmost border of the Brazilian rain forest. There is, for instance, Philodendron selloum G. Koch, which is extremely common both at the Upper Uruguay River and near Torres, but missing along the slope of the Highlands: stemming from some common geographical source, the ancestors took to Rio Grande do Sul by the two available ways, but without meeting and completing the migration. Dioclea megacarpa Rolfe has exactly the same pattern of distribution.

Somewhat different but of the same fundamental behaviour are three tropical species at the eastern entrance near Torres: Cecropia adenopus Mart., Euterpe edulis Mart., Heliconia bihai L.; Heliconia stops near Pôrto Alegre, Cecropia near S. Leopoldo, and Euterpe near Sta. Cruz (center of the State). The same species belong to the western current, but their southernmost occurence is in the valley of the Iguassú

River, about 300 km from the northwestern immigration door into Rio Grande do Sul.

Thus, the last and decisive reason why the subtropical rain forest has immigrated into Rio Grande to Sul by two ways and in two floristic bodies lies in the geographical features of the country.

2. ***The western current is the most important.*** — At first glance, the eastern contingent seems to be the determinant element of the Riograndean rain forest; the number of species is only slightly inferior to that of the contingent common to the whole of the teritory (382 against 398), and together with this performs 92% of the whole rain forest flora. There are, however, not only some dangerous fallacies hidden in the raw material of the above statistics, but even a series of facts entirely reversing the situation.

a. The most outstanding feature of the eastern forest is its ***disproportionate amount of epiphytes:*** out of 382 species, 226 (60%) appertain to this group, against only 11% throughout the State, and 6% on the western wing; more than 200 species are Orchids.

Now, even a pre-scientific observer would easily concede, that the epiphytes, small gap fillers as they are, do not contribute much to the vegetational features of the forest. On the other hand, all other elements lie well below the normal percentage of the South Brazilian rain forest. This means that the forest, considering only its eastern elements, is much less harmonic and mature than in the center and the west, which, in turn, gives evidence to a much higher local age of the western current. In the following chapter, I shall come back to this argument.

b. There exists an enormous ***divergence in the affinities*** between the neighboring rain forests on both sides. In the west, one may advance as far north as the valley of the Iguassú River without discovering any major difference between the local flora and the Riograndean one; as far as my observations go, less than one hundred (73) species are absent from the rain forest common to the whole of the State.

Totally different is the composition of the coastal rain forest at approximately the same latitude (about 27º). For the surroundings of Brusque, the following random exam-

ples may illustrate the relationship of the local forest to that of the northernmost coast of Rio Grande do Sul (Torres):

Euphorbiaceae - Brusque	33	Riograndean forest	18	54%
Rubiaceae - Brusque...	49	Riograndean forest	20	40%
Bromeliaceae - Brusque	80	Riograndean forest	24	30%
Araceae - Brusque	15	Riograndean forest	5	33%
Nyctaginaceae - Brusque	5	Riograndean forest	1	5%

This gives an average of 35% forest species reaching from Brusque down to Torres; the correspondent percentage in the west (Iguassú River to the Upper Uruguay) is about 80.

A closely similar result obtains when one compares the natural associations of the rain forest near Brusque with the floristic composition of the forest near Torres: of the 76 species composing the association near the Arroio do Ouro (Brusque), only 25 (33%) are left in northeastern Rio Grande do Sul.

The same phenomenon underlies the behaviour of all tropical families, for instance that of the Myrtaceae. In the coastal strip of Sta. Catarina, more than 50 species of this family play an active role in the composition of the rain forest; in Rio Grande do Sul, the true rain forest Myrtaceae are less than 10.

Thus, it may be safe to state that the most important element in the composition of the Riograndean rain forest is that coming from the northwestern entrance door; 45 (75%) of all high trees, which are the most decisive element, come from the Upper Uruguay, and 15 (25%) from the coastal current. At least 60% of all eastern species are inconspicuous gap fillers without much importance for the structure and economy of the forest.

3. ***The western current is the locally oldest.*** — There is a way from space to time. The main reason why the two waves did not intermingle before reaching the central corridor of Rio Grande do Sul has to be sought for, as mentioned above, in the geological history of the South Brazilian Highlands; but, independently of any local geographical survey, the western current must be considered as the relatively oldest one in the area where the two are now intermingled, for the following reasons:

a. The western wave, although only slightly superior in species, goes through ***the whole of the territory;*** whilst the eastern wave, at its very entrance door near Torres, divides itself into two secondary streams, one going along the sea coast and completely thinning out in northernmost Uruguay, and the other following the slope of the Highlands rapidly losing strength and dwindling away towards the center of the State.

Now, there is no reason why the eastern current, in case it should be older or contemporary to the western one, would not have advanced in western direction until reaching the river system of the Uruguay and Paraná and freely intermingling with the western current. The distance from its entrance door at Torres to its actual end point near Sta. Maria is less than half of that between Torres and the big bend of the Uruguay River; nevertheless, even near Torres 50% of all species belong to the western wave, whilst at the Upper Uruguay the eastern element is reduced to nothing.

b. ***Nor can the climatic factor be invoked*** in order to explain these differences in distribution. Near the Atlantic coast, it is true, the climate is maritime, very hot in summer and moderately cold in winter, generally without frosts and of an high index of rainfall; at the Upper Uruguay River, the climate is more continental, very hot in summer and sometimes severely cold in winter, the rainfall being more or less the same as near the coast, if not slightly higher. But these differences lie well within the field of tolerance of most of the rain forest elements, as may be collected from the fact that the eastern sector of the southern slope of the Highlands, moderately hot in summer, severely cold in winter and with much lesser rainfall than the above cited regions, evidently gives excellent growing facilities for hundreds of species from both currents. In any case, no climatical factor can be made responsible for the presence of 50% of western species in the east, and for the absence of all eastern species in the west.

c. A feature that hardly can be overstressed in the composition of the eastern wave, is the already mentioned ***disproportion in favour of the epiphytes***, notably Orchids and Bromeliaceae. As to the Orchids, it may be true that a certain number of them can also be found in the western forests, where the general floristic survey has seemely been less intensive than in the more accessible coastal regions; but no future herborization will be able to efface the enormous difference in epiphytes of the two currents.

In some degree, this divergence stems from the fundamental heritage of the two currents; the eastern center of origin of the coastal rain forest must have been, as its very beginning, relatively well provided with the ancestors of its overwhelming number of Orchids, Bromeliads, Melastoms, Myrts, etc. which are incomparably less numerous in the west.

But this cannot be the last reason why the epiphytes of the eastern current are in an evident disharmony with the other forest elements. As we have seen, only one third of the species at 27° (Brusque) reach down to Torres (29°30'), more than half of them belonging to the epiphytic Orchids. From this situation, we immediately see what has happened and goes on happening every day: Whilst it was, and is in an increasing way, difficult for the other coastal rain forest elements to find a niche in an already constituted forest of western origin, the Orchids, due to their natural habitat on the branches of the upper third of the high trees, and their tiny flying seeds, are eminently fit to colonize an almost uninhabited land. The eastern current, as a repeated examination of the analysis shows, is greatly diminished in all other characteristic life forms of the South Brazilian rain forest, except for epiphytes, of which it has twice as much as the average.

I am well aware that by means of statistics almost every conclusion can be proved or disproved; and I am very far from claiming standard value for the above given proportional structure of the South Brazilian rain forest; but on the other hand, where there appears so evident a disharmony, some special reason must underlie this phenomenon; and this special reason is incompleted immigration into a much older and less rich type of rain forest.

d. As an external confirmation, I call attention to the opinion of the geologists that the South Brazilian coastal strip has been subjected to an ***upheaval in recent times,*** probably towards the end of the Tertiary period. If this be so, a great part of the coastal strip of Sta Catarina, more especially the whole of the present plain between the eastern wall of the Highlands and the ocean northern of Torres, would have lain under the surface of a shallow sea precluding the only way of immigration into Rio Grande do Sul. On the other hand, the river system of the Paraná and Uruguay in the west with its numerous tributaries is much older

providing a natural road system for migrating south and spreading east.

Thus, we way safely conclude that the natural forestation of the Riograndean area has be done in two currents, different in their geographical source of origin, their routes of immigration, their floristic composition, and their relative age of local presence; the longest way of migration, the greatest area covered, the oldest age, and the most harmonic features belong to the western current, which is therefore the most important element in the Riograndean rain forest.

III. COROLLARIES AND PROBLEMS.

The southward migration of the South Brazilian rain forest shows, in a gigantic scale, some general principles that govern, at least in the area under study, the great movements of formational units of vegetation.

1 ***Contact phenomena.*** — As I have shown in several other publications, the contact between the wandering rain forest and the locally older vegetation assumes three main aspects:

a. Where the rain forest touches the prairie (Campo), it preserves its identity as a closed body, slowly ***wandering over*** the prairie and exterminating it. Thousands and thousands of more or less deep penetrations into the former campos area, especially in the northwestern part of Rio Grande do Sul, are a living demonstration of this process which has been the most important tactics of the advancing rain forest.

b. Where the rain forst meets a silvatic formation of weaker constitution, it first loses its identity sending ***stray*** immigrants into the other formation. By means of increasing the number, bulk, and variety of these immigrants, the rain forest slowly chokes the original vegetation by ***wandering under*** it and crowding it out from below. This process can be observed, in a truly classical style, in the contact area of the rain forest and the Araucaria woods in western Sta Catarina and Paraná; or, in a varietal type, in the Riograndean campos area where there abund half-high gallery woodlets

or similar vegetational units exposed to the vicinity of the migrating rain forest.

c. Where there one current of rain forest meets another of the same general structure and requirements but of a strongly divergent floristic composition, neither suffers extermination, but a very significant ***intermigration and interpenetration*** takes place. This may go so far as to nearly duplicate the original number of species, as it is the case in the eastern wing of the Riograndean forest. This intermigration, however, is of a clearly differencial character, those elements being given preference for which there are empty niches left.

*2 **The relative local age.*** — The immigration of the rain forest into Rio Grande do Sul is only one episode in the long history of its vegetation. It is not the place here to repeat what I have already examined in various other publications; I simply would call attention to the fact that the relative local age of the formations can be ascertained by means of their relationship to migratory movements. Thus, it is immediately evident that the rain forest in Rio Grande do Sul is locally the youngest of all formations; and it is, moreover, possible to ascertain which of the two currents is locally older than the other.

This method seems to be of large applicability in a flora like the South Brazilian one, where no violent transformations have taken place since the end of the Mesozoic. The great outlines of the history of the South Brazilian vegetation seem to be already fairly well defined. In my opinion, the way from space to time, that is, the conclusion from the horizontal contact phenomena of the formations to their ***relative local chronology*** is the only safe method to elucidate, first the true stratification of the vegetation, and then the major problems connected with Plant History on the face of the Globe. What we badly need, is less laboratory and less speculation, and more, much more field observation and analysis.

*3. **Structural phenomena.*** — The migratory movements of the rain forest give us an deep and significant insight into its character; let us briefly examine the main features.

a. The rain forest owes its peculiar superiority to all other formations to its ***vertical structure in well defined*** layers or stories. It is not this or that floristic composition that gives the migrating forest its irresistibility, but precisely the dynamic integration of a well balanced unit of advance.

b. The most impressive advance is made where there the locally older vegetation permits the forest to ***preserve its identity,*** as it is the case with the contact zone of the prairie; but it must be held in mind, that the first advancing forest on former prairie is by no means identical to the older and more mature sections behind the advancing army. Two qualities enable the forest to spread over the prairie: The first is to thin out until a mere skeleton of the formation is left retaining, however, the essential dynamism of the vertical structure; the second is to actively transform the soil of the prairie adapting it to the following contingents of the mature forest. Nothing «mechanical» is observed.

c. Finally, the stray immigration shows a very ***strange quality*** of the rain forest elements: On the one hand, they evidently feel at their best when integrated in their natural formation and association; but, on the other hand, they are able to migrate into floristically entirely different societies provided these have a vertical structure similar to their home formation. The stray immigration which in some dim future will choke the Araucaria forest begins with some isolated rain forest element of the lower stories and ends with the full-fledged and victorius vertical structure in six stories. Again, nothing mechanical can be discovered here, but an intensely living and self regulating tendency, first to separate and to migrate, then to unite and to stay.

4. ***Problems.*** — Space prevents me from going deeper into conclusions like the adumbrated above; instead, let me call attention to some unsolved problems of the South Brazilian rain forest.

a. As we have seen, the two immigration currents differ in about two thirds of their floristic composition; if so, ***where did the one third of common species stem from?*** Two hypotheses are possible: Either they are true «westerners» wandering along the edge of the highlands in Rio Grande do Sul, and going along the sea coast in a northern direction; or they are originally common to both currents, belonging

to the ancient stock of the neotropical flora in general. The last answer seems to be the most acceptable.

b. What have may been the ***cause of this gigantic migration?*** Although there is a lamentable lack of information about late tertiary and early quaternary geology, a general increase of rainfall may have given the primary impulse to this wandering. The presence of about a quarter of a million square kilometers of prairie on the Highlands in an ever humid climate of more than 1.500 mm rainfall certainly is an anomaly, understandable only on the assumption that these campos are a relic of a much drier period. The general increase of rainfall may be explained by the recent upheaval of the Highlands creating a redistribution of the pressure areas and a long line of condensation along the southern and eastern rim.

c. What will be the ***final goal*** of the rain forest migration? The answer to this question must needs be an academical one because man will, in ever increasing intensity, preclude the natural development of forestation. If left to its own laws and resources and under the present physical circumstances, the subtropical rain forest would spread over most of the Campos and Araucaria forests. The western current would predominate, but an ever increasing number of eastern elements would migrate westward levelling out a great deal of the now prevailing divergence.

As a practical corollary may be said this: Southernmost Brazil has an almost ideal climate for practical forestry.

CONCLUSION.

The southward migration of the Brazilian rain forest affects the whole of South Brazil, an area scarcely less than one million square kilometers; I do not know whether there is another area on the Globe where the acompanying phenomena can be better observed than here. Whilst the great forest formations of the northern Hemisphere, Europe as well as North America, were ploughed over and over by the quaternary glaciers, the Brazilian rain forest could spread undisturbed over an immense area covered with steppe.

No doubt, there have been written many very useful books, some of them true classics of outstanding value, on the history of the Central European forests, and vegetation wandering during and after the Ice Period; but it must be strongly underscored that ***not all*** of the possible aspects are present in the countries from where the conventional plant geography took its beginning, and that it would be catastrophical to transfer its findings to circumstances unheard of in Europe.

There is much, if not nearly all, to be done in order to understand the history of the present vegetation, to which the horizontal relationship of the formations furnish the only reliable clue.

Porto Alegre, December 31th, 1960.

RESUMO.

O autor empreende um estudo da **floresta pluvial sulbrasileira sob o ponto de vista da imigração no Rio Grande do Sul.**

No primeiro capítulo, 844 fanerógamos silvestres são enumerados em suas respectivas famílias, sendo cada um caracterizada segundo seu lugar na hierarquia vertical e horizontal da floresta, e segundo sua distribuição geográfica geral.

A lista é subdividida em três partes:

Espécies existentes através de tôda a área florestal do Estado ..	398
Espécies limitadas à ala leste (Torres até Sta. Maria)	383
Espécies limitadas ao extremo noroeste (curva do Uruguai)	64

No segundo capítulo, são levantadas e provadas as seguintes teses:

Primeiro, há de fato duas correntes de imigração florestal: uma a partir da bacia fluvial do Paraná, entrando pelo Alto Uruguai no Rio Grande do Sul e seguindo ao longo dos vales fluviais para o sul e para o leste, e outra a partir da floresta costeira de Sta. Catarina, entrando no Rio Grande do Sul pela estreita Porta de Torres entre a Serra Geral e o oceano.

Segundo, contra a primeira aparência, a corrente mais importante é a do oeste que determina a fisionomia geral da floresta, de maneira absoluta no oeste até Sta. Maria, de maneira predominante no próprio leste, sendo que 50% de elementos ocidentais chegam até Torres, enquanto nenhum elemento oriental alcança o Alto Uruguai.

Terceiro, pelos motivos citados no capítulo anterior, pelos aspectos peculiares reinantes na interpenetração das duas correntes, e ainda por motivos de ordem geológica, a mesma corrente do oeste é a localmente mais antiga.

O último capítulo se ocupa com alguns corolários decorrentes da exposição acima, e aponta vários problemas sem aparente solução.

Entre os corolários, são de especial importância as observações sôbre os três aspectos de contato entre a selva pluvial e outras formações menos dinâmicas: Campo, pinhal e matinha de galeria; também o contato com formações equivalentes é analisado.

Em nexo com as migrações da floresta, é mencionado um método para determinar a cronologia local relativa das formações em migração.

Finalmente se chama atenção ao fato de a dinâmica migracional da floresta não residir, em primeiro lugar, no número e na natureza sistemática dos componentes, mas na sua estrutura vertical; a migração nada tem de mecânico, mas é altamente flexível e dinâmica.

Os problemas não solvidos são três: De que maneira os 33% de espécies comuns entre as duas correntes entraram no contingente costeiro do leste? Tendo em vista a separação, pràticamente, estanque fora do Rio Grande do Sul, o mais aceitável é que possua estes elementos por herança antiga comum a ambas as correntes.

Qual foi o motivo porque a floresta pluvial nos seus centros de origem, Brasil Central e litoral do meio, entrou em migração para o sul?

O mais plausível é o advento dum período de precipitações notàvelmente aumentadas, que dura até hoje; êste, por sua vez, seria causado pelo levantamento lento do planalto sulbrasileiro em virtude de movimentos eustáticos da costa.

Qual será a fase final da migração? Se o homem não inferisse, resultaria o aflorestamento natural da quase totalidade da área sulbrasileira com floresta subtropical de tipo predominantemente ocidental, com crescente mistura de elementos orientais.

Conclusão científica: Para os movimentos seculares de migração vegetacional no nosso ambiente não se podem simplesmente transferir os métodos e os resultados europeus ou americanos; novos processos devem ser excogitados, e novos resultados serão obtidos. Conclusão prática: O extremo sul do Brasil é uma área magnificamente predisposta para a silvicultura prática.

ZUSAMMENFASSUNG.

Der Verfasser stellt ich die Aufgabe, **die mit der Südwanderung des brasilianischen Regenwalds** zusammenhängenden Erscheinungen zu untersuchen. Da schon dem vorwissenschaftlichen Beobachter die grossen floristischen Unterschiede zwischen dem westlichen und dem östlichen Flügel dieses Waldes in Rio Grande do Sul auffallen, wird mehr als die Hälfte der ganzen Arbeit der statistischen Untersuchung dieser Gegensätze gewidmet. Das allgmeine Ergebnis ist in der Tabelle Seite 33 niedergelegt, die auch, neben der allgemeinen geographischen Verteilung in der Liste, die Stellung jeder Art in der senkrechten und waagrechten Gliederung des Waldes bringt.

Der wichtigste Schluss ist der zahlenmässige Beweis, dass es sich wirklich um zwei geographisch und floristisch getrennte Ströme handelt, die ausserhalb von Rio Grande do Sul nur etwa 33% gemeinsame Arten besitzen. Der Grund dieser ungewöhnlich scharfen Verschiedenheit liegt wesentlich in der Oberflächengestaltung Südbrasiliens: Zwischen dem Flussgebiet des Paraná, woher der westliche Einwandererstrom stammt, und der atlantischen Küste, entlang die der östliche Wanderweg führt, gibt es bis hinunter zum 30. Breitegrad keine durchgehende Verbindung. Die gewaltige Kippscholle des Hochlandes hat ihre höchste Höhe unmittel-

bar am Ostrand selbst, sodass alle Flüsse nach Westen gehen müssen, während sich etwaigen Wanderern aus dem Küstenland eine 1000-1800 hohe Steilwand entgegenstellt; zudem wird die Mitte es Hochlandes von einem von Paraná bis Rio Grande do Sul durchgehenden Campos-Gebiet eingenommen, in das nur die nach Westen offenen Täler spärliche Einwanderer hereinlassen. Erst am Südrand des Hochlandes, in Rio Grande Sul, kommt eine Begegnung und Durchdringung beider Ströme zustande. Aus dem Verhältnis der beiden Ströme zu ihren nördlichen Nachbar-und Ursprungsgebieten, aus den Verbreitungsverhältnissen beider in Rio Grande do Sul, und aus der eigenartigen Unausgeglichenheit des östlichen Stromes lässt sich schliessen, dass der westliche Strom nicht nur der wichtigste, sondern auch örtlich der älteste ist.

Das Schlusskapitel befasst sich mit einigen Schlussfolgerungen und bisher nicht gelösten Fragen.

Die erste Schlussfolgerung betrifft die Taktik des Wanderns in Berührung mit ortsälteren und weniger starken Formationen: Der Regenwald überwandert die Steppe, unterwandert den Araukarienwald und mischt sich in wechselndem Maass mit dem gleichwertigen Regenwald des anderen Stroms.

Die zweite betrifft die Feststellung, dass man mithilfe der Wanderung das relative Ortsalter der einzelnen Formationen festellen kann, was bei Einbeziehung aller Vegetationsschichten zur einer algemeinen relativen Chronologie der Vegetation führen kann.

Schliesslich zeigt vor allem die Unterwanderung von schwächeren Formationen, dass der Verband des Regenwaldes nichts Starres und Mechanisches ist, dass er sich viel mehr völlig auflösen und neu bilden kann, solange auch nur irgendwie sein senkrechter Aufbau gewahrt bleibt.

Die ungelösten Fragen sind folgende:

Wie kommen die 33% gemeinsamen Arten in beide Wanderströme hinein?

Am verständlichsten ist die Annahme, dass sie zum ältesten Erbe des subtropischen Waldes überhaupt gehören.

Wie kam die gewaltige Wanderung in Fluss? Höchst wahrscheinlich durch eine starke Zunahme der Niederschläge, die wiederum mit der in junger geologischer Zeit erfolgten Hebung des Hochlandes zusammenhängen.

Wo führt die Wanderung hin? Ohne die Dazwischenkunft des Menschen würde sie zu einer fast völligen Bewaldung Südbrasiliens führen; in diesem Walde würde immer noch der westliche Strom überwiegen, aber eine steigende Durchmischung mit östlichen Elementen vor sich gehen. Wissenschaftlich gesehen, muss Südbrasilien mit anderen Methoden behandelt werden als Europa oder Nordamerika; praktisch betrachtet, eröffnet es der Waldwirtschaft ein fast ideales Arbeitsgebiet.

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