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A proposal to distinguish several taxa in the Brazilian tree fern *Cyathea corcovadensis* (Cyatheaceae)

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Abstract

A proposal is made to recognize the following species within *Cyathea corcovadensis* as currently circumscribed: *Cyathea corcovadensis sensu stricto*, *C. feeana* and *C. miersii*. A common characteristic of the three species is a weak leaf dimorphism, which is most evident in *C. miersii* where it leads to a high variability of the dissection of the lamina. *Cyathea corcovadensis* and *C. feeana* are distinct from *C. miersii* and other Brazilian tree ferns in having entire pinnules and abruptly reduced, pinnule-like apices on the pinnae. Both species differ from each other in relative and absolute measures of pinnule size and the position of the sori. *Cyathea miersii* includes all material with pinnatifid pinnules and either abruptly or gradually reduced pinnae. The possibility that it may represent a hybrid complex of *C. corcovadensis* and/or *C. feeana* with the common *C. atrovirens* is discussed.

Introduction

Brazil is home to 34 species of scaly tree ferns (Cyatheaceae; Christenhusz *et al.* 2011), with 21 endemic species (Forzza *et al.* 2010). One of these endemics is *Cyathea corcovadensis* (Raddi 1819: 228) Domin (1929a: 262), the only Neotropical tree fern with bipinnate fronds that is both widespread and variable. It is a common species in the Mata Atlântica of southeastern Brazil and was one of the first tree ferns to be described from the New World (Raddi 1819). Barrington (1978) united several species as synonyms of *C. corcovadensis* making it one of the most variable tree fern species. Holttum & Edwards (1983) disagreed and recognized at least *C. corcovadensis*, *C. elegantula* Domin (1930: 113) and *C. miersii* (Hooker 1844: 38) Domin (1929a: 263) as defined by Hooker (1844). They further suspected that some taxa that Brade (1951) recognized in this complex might be valid, but they conceded that evidently extensive fieldwork is needed to elucidate the true number of natural taxa and their morphological variability.

This treatment aims to raise attention again to this interesting problem. Thanks to modern molecular techniques it may finally be resolved after it has been pointed out the last time three decades ago (Holttum & Edwards 1983). The presented short descriptions are meant as an aid for the daring field botanist who attempts its solution.

Material and Methods

Field trips to Brazil were made in May 2003 (ML: Estado Paraná) and in March/April 2013 (AW: Estados Pernambuco and Espírito Santo). 106 specimens of plants that were determined as *Cyathea corcovadensis* or one of its synonyms were studied. As we noted that another species, *Cyathea atrovirens* (Langsdorff &

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diameter, medial to supramedial, equidistant between midveins and margins (A-pattern), indusia absent; receptacles without subtending scales, globose to ellipsoid, 0.2–0.3 mm diameter; paraphyses numerous, fragile, hyaline, white to tan, of the same length as or a bit longer than the sporangia (0.2–0.4 mm) but distal parts often broken off; short paraphyses straight, longer ones often tortuous. Spores with exine finely pitted near laesura, otherwise entire, perine finely baculate (Gastony 1979).

Distribution and habitat:—Brazil, Paraguay, Argentina and Uruguay (Fig. 2A), in open forests and along river flood plains, common in road ditches, at 10–900(–1100) m.

Remarks:—*Cyathea atrovirens* is an adaptable and variable species; the variation in pinnule size and hairiness is evidently correlated to temperature and sun exposure. Hairy forms with small pinnules are mainly found in the southern range of the species (Paraguay, Argentina and the Brazilian Estados Paraná, Santa Catarina and Rio Grande do Sul); plants with upwards-turned pinnules are found in open habitats while those with all pinnules in more or less the same plane grow in forests. More glabrescent plants with large pinnules prevail towards the northern limit of the species in the Brazilian Mata Atlântica, mainly in the Estados São Paulo to Bahia. Within this range, neither the type of indument nor the general pinnule outline changes significantly; basing on these features, many species previously described (e.g., Sehnem 1978) may be accommodated within *C. atrovirens*. Plants with contracted blades may be mistaken for *C. villosa* Willdenow (1810: 495), while those with large, glabrescent pinnules are morphologically close to *C. pungens* (Willdenow 1810: 206) Domin (1929a: 263). The former had been described as *Cyathea compta* Mart. and *Alsophila radens* Kaulf., while the latter forms the basis for *Alsophila proceroides* Rosenst.; *Alsophila acantha* Sehnem is also almost identical to the latter form (Lehnert *et al.* 2008), judging from the description and the provided photograph (Sehnem 1978).

The orange-brown petiole scales and the yellowish veins help to distinguish *Cyathea atrovirens* from *C. dichromatolepis* and *C. praecincta* (Kunze 1839: 53) Domin (1929a: 263). The latter species have bicolorous petiole scales with dark brown centers and white margins, and rather dark brown, sometimes blackish veins. *Cyathea miersii* has the same petiole scales as *C. atrovirens*, but usually has short stalked, basally weakly cordate pinnules (sessile or if subsessile basally cuneate in *C. atrovirens*).

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Appendix 1. List of exsiccatae: (1) *Cyathea corcovadensis*; (2) *C. feeana*; (3) *C. miersii*; (4) *C. atrovirens*. Type specimens are in **bold face**, "?" behind a number marks aberrant or insufficient material that is tentatively attributed to the respective species; (?) marks material that has been previously determined as *C. corcovadensis*, but is here excluded because it probably represents material (*) of *Cyathea dichromatolepis*/*C. glaziovii* or putative hybrids (**) involving these species.

Andrade, S. 461 (2?)
Baber, K. KB460 (?*)
Badini, J. 164 (2?)
Balansa, B. **306 (4)**
Bovini, M.G. 2056 (1)
Brade, A.C. 5105 (4), **5106 (4)**, 5826 (4), 6291 (4), 10069 (3), 14075 (3), 14106 (1?), 15178 (3), 15556 (3), 15557 (3), 15557A (3?), 16445 (2?), 16886 (3), 20991 (2?)

Buttura, J. 645 (4)
Campos Porto, P. 3052 (3?)
Carauta, J.P.P. 2625 (4), 5345 (1), 5470 (1)
Carvalho, A.M.V. de 3576 (1)
Castro, R.M. 493 (1)
Chamisso, A. von **s.n. (4)**
Christenhusz, M.J.M. 4757 (1)
Claussen, A.M. 110 (?**)
Condack, J.P.S. 334 (3)
Damazio, L. 1178 (1), **s.n. (2),** s.n. (2?), s.n. (3)
Dombrowsky, L.T. 9337 (4), 11889 (4)
Dombrowsky, L.T. & Kuniyoshi, Y.S. 2378 (4)
Duarte, A.P. 2087 (2), 9074 (2)
Dusén, P. 14542 (4)
Engelmann, R.A. 191 (1), RE1254 (?*), RE1709 (1)
Farney, C. 304 (1?)
Fernandes, I.O. 1231 (1), 1235 (1), 1305 (1), 1307 (?**)
Fessmann, G. 335 (2?)
Fraga, C.N. 3237 (1)
Frenzel, A. s.n. (1)
Gauthier, H. s.n. (1)
Gerdes, 101a (4)
Glaziou, A. 382 (1), 1220 (1), 1702 (3), **1786 (3)**, **2299 (4)**, 2828 (2?), 3166 (1), **3582 (2)**, **7032 (3)**, **5244 (3)**
Gordon, s.n. (4)
Guedes, R. 2239 (1)
Gurgel, H. 22 (1)
Haerchen, F. 143 (4), 206 (4), 230 (4)
Handro, O. 1240 (4)
Hatschbach, G. 8040 (4), 27670 (4) 29622 (4), 30247 (4) 32156 (4), 32156 (4)
Hatschbach, G. 39995 (4), 46033 (4), 76717 (4)
Hatschbach, G., Schinini, A., & J.M. Silva 58571 (4)
Hatschbach. G., Silva, J.M., & Cruz, J.M. 69307 (4)
Herter, W.G. 4451 (4)
Hoehne, F.C. **s.n. (3)**
Jascone, C.E. 04 (1), 437 (1?)
Joly, A.B. 739 (1)
Jürgens, C. 218 (4), 228 (4), 264 (4)
Krapovickas, A. & Cristóbal, C.L. 40339 (4)
Klein, V.J. 1096 (?**)
Kuhlmann, J.G. s.n. (1)
Langsdorff, G.H. von s.n. (4)
Leite, P. s.n. (3?)
Lopes, M.S. & Pietrobom, M.R.S. 536 (?*)
Lüderwaldt, A. 907 (4)
Maas, P.J.M. & Carauta, P. 3279 (1)
Marchett, F. 589 (1)
Marques, M.C. 266 (1)
Marquete, R. 784 (1)
Martinelli, G. 2764 (3), 4374 (2)
Martius, C.F.P. **s.n. (2)**, **s.n. (4)**, 392 (4)
Mello-Barreto, H.L. 512 (1),1597 (1)
Mexia, Y. 5037 (1)
Miller, D. s.n. (1?)
Mori, S.A. & Thompson, C.B. 11013 (1)

Motta, J.T. 2129 (4), 2315 (4)
Occhioni, R. 25 (1)
Pereira, E. 4112 (1)
Piratininga, A. s/n (1?)
Raddi, J. **s.n. (1)**
Reineck, E.M. & Czermak, J. **36 (4)**
Reitz, R. C1861 (1), C917 (2), H254 (2)
Reitz, R & Klein, E. 17914 (4)
Ribas O.S., da Silva G.R., & M. Müller 6714 (4)
Rohr, J.A. 2 (1), 209 (1), 306 (1)
Saavedra, M.M. 694 (3?)
Schmalz, P. 64 (4)
Schwacke, P. 860 (3), 11603 (3), 13041 (1), 14775 (1), s.n. (1)
Sehnem, A. **3142 (4)**, 7472 (4)
Sellow, F. **s.n.[127] (4)**, 83 (4)
Silva Neto, S.J. 328 (2?)
Smith, L.B. 1911 (4), 1944 (4), 5676 (1), 7580 (1)
Spannagel, C. 233 (4), 348b (4)
Stival-Santos, A. 2763 (1?)
Sylvestre, L. 352 (1), 451 (1), 641 (1), 810 (1?)
Sylvestre, L., Costa, D.P., Gomes, J.C. & Mesquita, A.S. 496 (3)
Sylvestre, L., Souza Jr., S.J. & Silva Neto, S.J. 2058 (1)
Tamandaré 655 (2?)
Ulbricht, E. 81 (4), 81a (4)
Vanni, R., Ortiz, E. & Schinini, A. 323 (4)
Verdi, M. 2863 (1), 3584 (1), 4768 (1), 5143 (1)
Vieira, C.M. 50 (1), 224 (3?)
Vieira, F.C.S. 452 (1)
Windisch, P.G. 134 (4)
Zappi, D.C. 2550 (2)
Zardini, E. 5167 (4), 7404 (4), 7703 (4), 8062 (4), 15983 (4)
Zardini, E. & Aquino P. 33215 (4)
Zardini, E. & Benitez, A. 47446 (4)
Zardini, E. & Cardozo W. 45067 (4), 45067 (4), 45192 (4)
Zardini, E. & Chaparro, I. 48787 (4)
Zardini, E. & Guerrero, L. 43769 (4)
Zardini, E. & Hellmann, G. 49068 (4)
Zardini, E. & Velásquez, E. 15335 (4)
Zardini, E. & Zavala, S. 46734 (4)