



The genus *Dicksonia* (Dicksoniaceae) in the western Pacific

SARAH NOBEN^{1*} & MARCUS LEHNERT^{1,2}

¹ Nees Institut für Biodiversität der Pflanzen, Rheinische-Friedrich-Wilhelms Universität Bonn, Meckenheimer Allee 170, 53115 Bonn, Germany.

² Staatliches Museum für Naturkunde Stuttgart, Abt. Botanik, Am Löwentor, Rosenstein 1, 70191 Stuttgart, Germany.

Email: marcus.lehnert@smns-bw.de, mlehnert@uni-bonn.de

*Author for correspondence: sarahnoben@gmail.com

Abstract

A revision of *Dicksonia* (Dicksoniaceae) in the western Pacific led to the recognition of five species. On New Caledonia, we recognize *D. munzingeri* and *D. perriei* as new to science, and the previously described *D. baudouini* and *D. thyrsopteroides*. *Dicksonia baudouini* is easily distinguished from the other species on the island by its persistent spreading hairs on petioles and frond axes. *Dicksonia thyrsopteroides*, *D. munzingeri* and *D. perriei* are mainly distinguished by the characteristics of their petioles but also by the extent of hemidimorphism and the persistence of dead fronds at the trunk. *Dicksonia brackenridgei* from Fiji, Vanuatu and Samoa matches *D. thyrsopteroides* in most morphological characters (e.g. hemidimorphism, morphology of fertile segments, petiole) but has similarities to *D. baudouini* (stalked pinnae, scabrous petioles and axes) as well.

Introduction

The monophyletic genus *Dicksonia* (Dicksoniaceae) (Korall *et al.* 2006) represents one of the most conspicuous fern taxa in forests of the southern hemisphere (Tryon & Gastony 1975, Moran *et al.* 1995) and currently comprises 21 recognized species (Kramer & Green 1990). They occur in perhumid and rather cool habitats in the Neotropics from Meso- to South America including the Juan Fernandez Islands and the Palaeotropics from Sumatra to the Melanesian region as well as Australia and New Zealand. The genus is not recorded in Africa except for the small Atlantic island of St. Helena (Kramer & Green 1990). *Dicksonia* is characterized by erect or trunk-like rhizomes (occasionally prostrate in *D. lanata* Colenso ex Hooker 1844: 69), and densely hairy petioles; fronds are either monomorphic or dimorphic and reach several meters in length; sori are located at the segment margins and indusia are unevenly bivalved. Species are easy to determine in their natural environment, but may be very difficult to distinguish in cultivation, because species originating from different continents may exhibit nearly the same morphology. Tryon and Lugardon (1991) reported two types of tetrahedral-globose spores, which might help to overcome this determination problem. However, a taxonomic revision of the whole genus has not been realized so far. The last comprehensive account was done by Christ (1897), who revised a large number of pteridophytes but treated the genus *Dicksonia* very briefly. Since then, further morpho-taxonomical studies on the genus treated only single geographical regions (Allan 1961, Holttum 1963, Brownlie 1969, 1977, Mickel & Beitel 1988, Lellinger 1989, Marticorena & Rodríguez 1995, Jones 1998, Cronk 2000). Having amassed an ample data pool from specimens and field observations across the larger part of the biogeographic range of the genus, we attempted a global revision of all species of *Dicksonia*, focusing on unresolved species complexes (Holttum 1963, Lellinger 1989). We found strong morphologic differences between New Caledonian specimens that had been determined as *D. thyrsopteroides*. Photographs and first-hand observations of these plants in the field by colleagues subsequently supported our first suspicion that these may represent species new to science. We here summarize our findings.

Acknowledgments

We thank Michael Kessler (Z) and Michael Sundue (VT) for comments on an early version of the manuscript as well as two anonymous reviewers for their efforts. We are indebted to Leon Perrie (WELT), who shared his samples and field observations with us and Lara Shepherd for generating sequences on the newly described species. We thank our Fijian colleagues Senilolia Heilala, Marika Tuiwawa and Alifereti Naikatini for their help in organizing research permits and field trips. Karin Wolf-Schwenninger (STU) kindly prepared SEM photographs of the spores. We thank the curators of UC, MO and STU for the loan of herbarium specimens. This research was enabled by a grant from the German Research Foundation (DFG grant LE 1826/3-1).

Literature cited

- Allan, H.H. (1961) *Flora of New Zealand. Volume I*. Government Printer, Wellington, 1085 pp.
- Brownlie, G. (1969) Pteridophytes, *Flore de la Nouvelle-Calédonie et dépendances* 3: 1–307 pp.
- Brownlie, G. (1977) *The pteridophyte flora of Fiji*. J.Cramer (Vaduz Liechtenstein), 397 pp.
- Christ, H. (1897) *Die Farnkräuter der Erde*. G. Fischer, Jena, 388 pp.
- Cronk, Q.C.B. (2000) *The endemic flora of St Helena*. Anthony Nelson Ltd, 88 pp.
- Fournier, E.P.N. (1873) Filices Novae-Caledoniae. Enumeratio monographica. *Annales des Sciences Naturelles, Botanique* V, 18: 253–360.
- Heads, M. (2008). Panbiogeography of New Caledonia, south?west Pacific: basal angiosperms on basement terranes, ultramafic endemics inherited from volcanic island arcs and old taxa endemic to young islands. *Journal of Biogeography* 35: 2153–2175.
<http://dx.doi.org/10.1111/j.1365-2699.2008.01977.x>
- Holttum, R.E. (1963) Cyatheaceae. *Flora Malesiana series II*: 65–176.
- Hooker, W.J. (1844) *Species filicum I (2)*. William Pamplin, London, pp. 65–128.
- Hooker, W.J. & Baker, J.G. (1874) *Synopsis Filicum*, 2 ed. R. Hardwicke, London, 559 pp.
- Jones, D.L. (1998) Dicksoniaceae. *Flora of Australia Volume 48*: 187–191.
- Keppel, G., Navuso, J.C., Naikatini, A., Thomas, N.T., Rounds, I.A., Osborne, T.A., Batinamu, E. & Senivasa, E. (2005) Botanical diversity at Savura, a lowland rain forest site along the PABITRA Gateway Transect, Viti Levu, Fiji. *Pacific Science* 59: 175–191.
- Korall, P., Pryer, K.M., Metzgar, J.S., Schneider, H. & Conant, D.S. (2006) Tree ferns: monophyletic groups and their relationships as revealed by four protein-coding plastid loci. *Molecular Phylogenetics and Evolution* 39: 830–845.
- Kramer, K.U. & Green, P.S., vol. eds. (1990) *Pteridophytes and Gymnosperms*. In: Kubitzki, K. (ed.). *The Families and Genera of Vascular Plants*, vol. 1. Springer-Verlag, Berlin, 635 pp.
- Kunze, G. (1834) *Thyrsopteris*, eine neue FarnGattung. *Linnaea* 9 : 506–508.
- Lellinger, D.B. 1989. The ferns and fern-allies of Costa Rica, Panama, and the Choco. Part 1: Psilotaceae through Dicksoniaceae. *Pteridologia* 2: p.333–364.
- Lellinger, D.B. (2002) A modern multilingual glossary for taxonomic pteridology. *Pteridologia* 3: 1–263.
- Martcorena, C. & Rodríguez, R. (1995) *Flora of Chile*. Volume 1: Pteridophyta-Gymnospermae. Universidad de Concepción, pp.147–149.
- Matsumoto, S., Iwashina, T., Sugimura, K., Hashimoto, T. & Nakamura, T. (1998) A list of pteridophytes herbarium specimens from Vanuatu, collected in 1996 and 1997. *Annals of the Tsukuba Botanical Garden* 17: 75–100.
- Mettenius, G.H. (1861) Filices Novae Caledoniae. *Annales des Sciences Naturelles, Botanique* 4, 15: 55–91.
- Mickel, J.T. & Beitel, J.M. (1988) Pteridophyte flora of Oaxaca, Mexico. *Memoirs of the New York Botanical Garden* 46: 1–568.
- Moran, R.C., Churchill, S.P., Balslev, H., Forero, E. & Luteyn, J.L. (1995) *The importance of mountains to pteridophytes, with emphasis on Neotropical montane forests*. In *Biodiversity and conservation of Neotropical montane forests*. Proceedings of a symposium, New York Botanical Garden, 21–26 June 1993, pp. 359–363.
- Pintaud, J. C., Jaffré, T. & Puig, H. (2001) Chorology of New Caledonian palms and possible evidence of Pleistocene rain forest refugia. *Comptes Rendus de l'Académie des Sciences-Series III-Sciences de la Vie* 324: 453–463.
- Tryon, A.F. & Lugardon, B. (1991) *Spores of the Pteridophyta: surface, wall structure, and diversity based on electron microscope studies*. Springer-Verlag, pp. 230–232.
- Tryon, R.M., & G.J. Gastony (1975) The biogeography of endemism in the Cyatheaceae. *Fern Gazette* 11: 73–79.
- Whistler, W. A. (1998) A study of the rare plants of American Samoa. *Report prepared for the US Fish and Wildlife Service, Honolulu* 1, 18: 1–125.