Transfer of Four New Guinean *Rhus* Species to *Toxicodendron* (Anacardiaceae)

John D. Mitchell
The New York Botanical Garden, 2900 Southern Boulevard, Bronx, New York 10458, U.S.A.
https://orcid.org/0000-0001-6934-2461

Susan K. Pell
United States Botanic Garden, 125 First Street Southwest, Washington, D.C. 20515, U.S.A.
Susan.Pell@aoc.gov. https://orcid.org/0000-0002-7214-3225

Jun Wen
Department of Botany, National Museum of Natural History,
Smithsonian Institution, P.O. Box 37012, Washington, D.C. 20013-7012 U.S.A.
wenj@si.edu. https://orcid.org/0000-0001-6353-522X

Abstract. Four New Guinean species currently recognized in the genus *Rhus* L. (Anacardiaceae), *R. caudata* Lauterb., *R. lamprocarpa* Merr. & L. M. Perry, *R. lenticellosa* Lauterb., and *R. linguata* Slis, are transferred to *Toxicodendron* Mill. based on morphological and molecular data. All share the characteristic fruit of the poison ivy genus, clearly distinguishable by an exocarp separating from a white mesocarp that is striated with black resin canals. The inclusion of these species expands the known distribution of *Toxicodendron* eastward to New Guinea. The new combinations *T. lamprocarpum* (Merr. & L. M. Perry) J. D. Mitch., Pell & J. Wen, *T. lenticellosum* (Lauterb.) J. D. Mitch., Pell & J. Wen, and *T. linguatum* (Slis) J. D. Mitch., Pell & J. Wen are published. *Toxicodendron dalyanum* J. D. Mitch., Pell & J. Wen is published as a replacement name for *R. caudata*. A neotype is designated for *R. caudata*, and a lectotype for *R. lenticellosum*.

Key words: New combination, nomen novum, *Perrottetia*, poison ivy, sumac, typification.

Once recognized as a nearly cosmopolitan genus of more than 300 species, the genus *Rhus* L. (Anacardiaceae) has been segregated into several genera over the last 200 years (e.g., Engler, 1883; Barkley, 1937; Brizicky, 1963), and modern phylogenetic studies have supported these decisions (Miller et al., 2001; Pell, 2004; Yi et al., 2004, 2007; Weeks et al., 2014; Joyce et al., 2023). Once the largest genus in the Anacardiaceae, encompassing nearly half of the family, the original concept of *Rhus* included a huge geographic and morphological range of taxa. These include many closely and distantly related lineages from temperate, wet tropical, and arid habitats around the world. Examples include *Searsia* F. A. Barkley from Africa to Asia (Moffett, 2007; Yang et al., 2016), *Malosma* (Nutt.) Abrams from California and northern Baja California (Engler, 1883), *Metopium* P. Browne from North America and the Caribbean (Browne, 1756), *Cotinus* Mill. from North America and Eurasia (Brizicky, 1962), *Baronia* Baker from Madagascar (Pell et al., 2008), and *Toxicodendron* Mill. from the Americas to East and Southeast Asia (Gillis, 1971; Nie et al., 2009; Jiang et al., 2019).

The segregation of taxa from *Rhus* to other genera is incomplete, with species belonging to several of the split genera still in need of taxonomic correction. This manuscript addresses the remaining taxa in *Rhus* that clearly belong in *Toxicodendron*, but additional *Rhus* species appear to represent novel genera yet to be described. The separation of *Toxicodendron* from *Rhus* is supported by phytochemical, morphological, and molecular data (Table 1).

Phytochemical evidence includes the contact dermatitis–causing 3-alkyl and 3-alkenyl catechols in *Toxicodendron*, which have not been documented in the genus *Rhus* s. str. (Vogl & Mitchell, 2006; Teuscher & Lindequist, 2024). The exudate containing these compounds typically darkens to black as it oxidizes (Hou, 1978; Barfod, 1987; Mitchell & Mori, 1987; Barfod, 1988; Min et al., 2008; Pell et al., 2011; Mitchell et al., 2022). The resulting black spots on cut stems and surfaces in both fresh and dried collections provide a useful character to distinguish *Rhus* from *Toxicodendron*. *Rhus* exudate, when present, is clear or light in color and does not turn black.

Possibly the most easily identifiable character that differentiates the two genera is that in *Toxicodendron*, the exocarp separates from the rest of the drupe and

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Table 1. Key characteristics distinguishing *Rhus* L. and *Toxicodendron* Mill.

Taxon	Phytochemistry	Exudate	Trichomes on exocarp	Pericarp
Rhus	lack catechols; do not cause contact dermatitis	does not darken to black	glandular	exocarp remains attached to the mesocarp, which lacks dark resin canals
Toxicodendron	have 3-alkyl and 3-alkenyl catechols, which cause contact dermatitis	darkens to black when exposed to air	absent or nonglandular	exocarp separates from and exposes a mesocarp striated with black resin canals

exposes a mesocarp striated with black resin canals, whereas the exocarp of *Rhus* remains attached to the mesocarp, which lacks dark resin canals. The exocarp of *Rhus* also often has glandular hairs, which are not found in *Toxicodendron*, although that of *T. trichocarpum* (Miq.) Kuntze has minutely setaceous hairs (Min et al., 2008). In this manuscript, the four New Guinean species being transferred from *Rhus* share these morphological characteristics of *Toxicodendron*. The four species are also morphologically distinct from each other, as detailed in Table 2.

Molecular evidence distinguishing *Toxicodendron* from *Rhus* is substantial (Miller et al., 2001; Pell, 2004; Yi et al., 2004, 2007; Nie et al., 2009; Weeks et al., 2014; Jiang et al., 2019; Joyce, 2021). Only one of the taxa transferred in this publication is included in a molecular study: *R. lamprocarpa*, which is referred to as "*Toxicodendron lamprocarpum*" in Jiang et al. (2019). The taxon comes out in their "tropical" clade within *Toxicodendron*, along with the Neotropical *T. striatum* (Ruiz & Pav.) Kuntze, and the Asian *T. hookeri* (K. C. Sahni & Bahadur) C. Y. Wu & T. L. Ming var. *microcarpum* (C. C. Huang) C. Y. Wu & T. L. Ming, *T. wallichii* (Hook. f.) Kuntze var. *microcarpum* C. C. Huang ex T. L. Ming, *T. griffithii* (Hook. f.) Kuntze, *T. fulvum* (Craib) C. Y. Wu & T. L. Ming, *T. trichocarpum*, and *T. radicans* (L.) Kuntze subsp. *hispidum* (Engl.) Gillis (= *T. orientale* Greene subsp. *hispidum* (Engl.) Yonek.). The morphological characters that unite these species and the other species being transferred in this manuscript are compelling evidence that they are members of the same genus.

New Names and Combinations

1. Toxicodendron dalyanum J. D. Mitch., Pell & J. Wen, nom. nov. Replaced name: *Rhus caudata* Lauterb., Bot. Jahrb. Syst. 56(3): 362. 1920. TYPE: Papua New Guinea. Sandaun Prov. [formerly West Sepik Distr.]: Telefomin Distr., Oksapmin, 5°20′S, 142°15′E, 5200 ft., 14 Oct. 1968, *E. E. Henty, R. Isgar & M. Galore NGF 41529* (neotype, designated here, L!; isoneotypes, A!, BRI not seen, K not seen).

Notes. All *Rhus caudata* type specimens seem to have been destroyed in the Berlin herbarium fire. The name *Toxicodendron caudatum* is not available because *T. caudatum* C. C. Huang was previously published in the *Flora Yunnanica* for a different taxon; that name was later treated as a synonym of *T. acuminatum* (DC.) C. Y. Wu & T. L. Ming in the *Flora of China* (Min et al.,

Table 2. Key characters distinguishing the four transferred *Toxicodendron* Mill. species.

Taxon	*T. dalyanum* J. D. Mitch., Pell & J. Wen	*T. lamprocarpum* (Merr. & L. M. Perry) J. D. Mitch, Pell & J. Wen	*T. lenticellosum* (Lauterb.) J. D. Mitch, Pell & J. Wen	*T. linguatum* (Slis) J. D. Mitch, Pell & J. Wen
Habit	liana, shrub, or small tree up to 8 m tall; sometimes epiphytic	tree up to 15 m tall; not epiphytic	liana, shrub up to 5 m tall; not epiphytic	shrub up to 2.5 m tall; sometimes epiphytic
Leaflets	2 to 3 pairs (unifoliolate)	3 to 4(or 5) pairs	1 to 2 pairs or unifoliolate	unifoliolate or trifoliolate
Leaflet apices	caudate	acute or acuminate	caudate	caudate
Leaflet domatia	pitlike, glabrous	absent	pitlike, glabrous	pitlike, glabrous
Terminal petiolules	(0.5–)1.75–2.5 cm	0.5–1.5 cm	2.2–4 cm	up to 0.2 cm
Ovary	glabrous	pubescent	glabrous	glabrous

2008). Therefore, a replacement name using a new epithet is required.

The authors name this species after Douglas Daly, the B. A. Krukoff Curator of Amazonian Botany and former Director of the Institute of Systematic Botany at the New York Botanical Garden. Dr. Daly is a world authority on Burseraceae, the sister family to the Anacardiaceae. He is a frequent collaborator of the first two coauthors and participated in an expedition to Papua New Guinea with them in 2009. We honor him with this epithet for his more than 40 years of dedicated research and enthusiasm for the Anacardiaceae and Burseraceae.

2. Toxicodendron lamprocarpum (Merr. & L. M. Perry) J. D. Mitch., Pell & J. Wen, comb. nov. Basionym: *Rhus lamprocarpa* Merr. & L. M. Perry, J. Arnold Arbor. 29: 159. 1948. TYPE: Papua New Guinea. Morobe Prov.: Morobe, vic. of Kajabit Mission, 240–600 m, Aug.–Dec. 1939, *M. S. Clemens 10817* (holotype, A!; isotype, MICH!).

3. Toxicodendron lenticellosum (Lauterb.) J. D. Mitch., Pell & J. Wen, comb. nov. Basionym: *Rhus lenticellosa* Lauterb., Nova Guinea 8: 297. 1910. TYPE: Indonesia. Papua Prov.: s. loc., 15 June 1907, *Versteeg 1243* (lectotype, designated here, L!; isolectotypes, K!, KRB!).

Notes. The lectotype for *Toxicodendron lenticellosum* was selected from three Versteeg collections noted by Lauterbach: *Versteeg 1065*, *1243*, and *1766*. *Versteeg 1243* was chosen because duplicates were present in three different herbaria; the specimen at L was made the lectotype because it had fruit, while the others no longer had any drupes present. *Versteeg 1065* and *1766* are also in L.

4. Toxicodendron linguatum (Slis) J. D. Mitch., Pell & J. Wen, comb. nov. Basionym: *Rhus linguata* Slis, Nova Guinea 14: 97. 1924. TYPE: Indonesia. Papua Prov.: Hellwig Mtns., 4°30′S 138°42′E, 1400 m, 19 Nov. 1909, *L. I. A. M. von Römer 1126* (holotype, L!; isotype, K!).

Perrottetia caudata Ridl., Trans. Linn. Soc. Bot., ser. 2, 9: 31. 1916, non *Rhus caudata* Lauterb., Bot. Jahrb. Syst. 56(3): 362. 1920. TYPE: Indonesia (West New Guinea), s. loc., 2 June 1913, *C. B. Kloss s.n.* (holotype, K!; isotype, BM!).

Notes. We concur with Forman (1965) on placing *Perrottetia caudata* Ridl. as a taxonomic synonym of *Rhus linguata* Slis. As Forman (1965) noted, Ridley's 1916 specific epithet in *P. caudata* is earlier than that of Slis (1924). However, it cannot be transferred to *Toxicodendron* due to the prior existence of *T. caudatum* C. C. Huang (1979). Hence, *R. linguata* is the basionym for this taxon of *Toxicodendron*.

Literature Cited

Barfod, A. 1987. Anacardiaceae. Pp. 9–49 *in* G. Harling & L. Andersson (editors), Flora of Ecuador. University of Götenborg; Riksmuseum; Pontificia Universidad Católica del Ecuador, Göteborg, Stockholm, Quito.

Barfod, A. 1988. Inflorescence morphology of some South American Anacardiaceae and the possible phylogenetic trends. Nord. J. Bot. 8: 3–11.

Barkley, F. A. 1937. A monographic study of *Rhus* and its immediate allies in North and Central America, including the West Indies. Ann. Missouri Bot. Gard. 24: 265–498.

Brizicky, G. K. 1962. The genera of Anacardiaceae in the southeastern United States. J. Arnold Arbor. 43: 359–375.

Brizicky, G. K. 1963. Taxonomic and nomenclatural notes on the genus *Rhus* (Anacardiaceae). J. Arnold Arbor. 44: 60–81.

Browne, P. 1756. The Civil and Natural History of Jamaica. No. 2, printed for the author, London.

Engler, A. 1883. Anacardiaceae. Pp. 171–546 *in* A. P. De Candolle & A. C. De Candolle (editors), Monographie Phanerogamarum, Vol. 4. G. Masson, Paris, France.

Forman, L. L. 1965. The identity of *Perrottetia caudata* Ridley. Kew Bull. 19: 419.

Gillis, W. T. 1971. The systematics and ecology of poison ivy and the poison-oaks (*Toxicodendron*, Anacardiaceae). Rhodora 73: 72–159, 161–237, 370–443, 465–540.

Hou, D. 1978. Anacardiaceae. Flora Malesiana (Ser. 1) 8: 395–548.

Jiang, Y., M. Gao, Y. Meng, J. Wen, X.-J. Ge & Z.-L. Nie. 2019. The importance of the North Atlantic land bridges and eastern Asia in the post-Boreotropical biogeography of the Northern Hemisphere as revealed from the poison ivy genus (*Toxicodendron*, Anacardiaceae). Molec. Phylogen. Evol. 139: 106561.

Joyce, L. M. 2021. Evolution of the Northern Australian Flora: Role of the Sunda-Sahul Floristic Exchange. Ph.D. Dissertation, James Cook University, Queensland.

Joyce, E. M., M. S. Appelhans, S. Buerki, M. Cheek, J. M. de Vos, J. R. Pirani, A. R. Zuntini, et al. 2023. Phylogenomic analyses of Sapindales support new family relationships, rapid Mid-Cretaceous Hothouse diversification, and heterogeneous histories of gene duplication. Frontiers Pl. Sci. 14: 1063174.

Miller, A. J., D. A. Young & J. Wen. 2001. Phylogeny and biogeography of *Rhus* (Anacardiaceae) based on ITS sequences. Int. J. Pl. Sci. 162: 1401–1407.

Min, T., T. Ming & A. Barfod. 2008. Anacardiaceae. Pp. 335–357 *in* Z. Y. Wu, P. H. Raven & D. Y. Hong (editors), Flora of China, Vol. 11 (Oxalidaceae through Aceraceae). Science Press, Beijing; Missouri Botanical Garden Press, St. Louis.

Mitchell, J. D. & S. A. Mori. 1987. The cashew and its relatives (*Anacardium*: Anacardiaceae). Mem. New York Bot. Gard. 42: 1–76.

Mitchell, J. D., S. K. Pell, J. Bachelier, E. J. Warschefsky, E. M. Joyce, L. Calvillo Canadell, C. Luíza da Silva-Luz, et al. 2022. Neotropical Anacardiaceae (cashew family). Rev. Bras. Bot. 45: 139–180.

Moffett, R. 2007. Name changes in the Old World *Rhus* and recognition of *Searsia* (Anacardiaceae). Bothalia 37: 165–175.

Nie, Z., H. Sun, Y. Meng & J. Wen. 2009. Phylogenetic analysis of *Toxicodendron* (Anacardiaceae) and its biogeo-

graphic implications on the evolution of north temperate and tropical intercontinental disjunctions. J. Syst. Evol. 47: 416–430.
Pell, S. K. 2004. Molecular Systematics of the Cashew Family (Anacardiaceae). Ph.D. Dissertation, Louisiana State University, Baton Rouge.
Pell, S. K., J. D. Mitchell, P. P. Lowry II, A. Randrianasolo & L. E. Urbatsch. 2008. Phylogenetic split of Malagasy and African taxa of *Protorhus* and *Rhus* (Anacardiaceae) based on cpDNA *trnL-trnF* and nrDNA ETS and ITS sequence data. Syst. Bot. 33: 375–383.
Pell, S. K., J. D. Mitchell, T. Lobova & A. J. Miller. 2011. Anacardiaceae. Pp 7–50 *in* K. Kubitzki (editor), The Families and Genera of Vascular Plants, Vol. 10. Springer, New York.
Slis, W. 1924. Anacardiaceae. Nova Guinea 12: 97–99.
Teuscher, E. & U. Lindequist. 2024. Natural Poisons and Venoms: Plant Toxins: Polyketides, Phenylpropanoids and Further Compounds. De Gruyter, Berlin, Boston.
Vogl, O. & J. D. Mitchell. 2006. Oriental lacquer. 11. Botany and chemistry of the active components of poisonous Anacardiaceae. J. Macromol. Sci., Pt. A, 33: 1581–1599.
Yi, T. S., A. J. Miller & J. Wen. 2007. Phylogeny of *Rhus* (Anacardiaceae) based on sequences of nuclear *NIA-i3* intron and chloroplast *trnC-trnD*. Syst. Bot. 32: 379–391.
Yang, Y. Y., Y. Meng, J. Wen, H. Sun & Z. L. Nie. 2016. Phylogenetic analyses of *Searsia* (Anacardiaceae) from eastern Asia and its biogeographic disjunction with its African relatives. S. African J. Bot. 106: 129–136.

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