



Nomenclatural notes and typifications in Australian species of Paliureae (Rhamnaceae)

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Abstract: The nomenclature of the four species of *Ziziphus* Mill. and the one species of *Hovenia* Thunb. occurring in Australia is reviewed, including the role of the Hermann Herbarium for the typification of *Z. oenopolia* (L.) Mill. and *Z. mauritiana* Lam. Lectotypes are chosen for *Z. quadrilocularis* F.Muell. and *Z. timoriensis* DC. A key to species is provided, as well as illustrations for *Z. oenopolia*, *Z. quadrilocularis* and *H. dulcis* Thunb.

Keywords: Nomenclature, typification, *Hovenia*, *Ziziphus*, Rhamnaceae, Paliureae, Paul Hermann, Carolus Linnaeus, Henry Trimen, Australia

Introduction

Rhamnaceae tribe Paliureae Reissek ex Endl. was reinstated by Richardson *et al.* (2000b), after the first molecular analysis of the family (Richardson *et al.* 2000a). It consists of three genera, *Hovenia* Thunb., *Paliurus* Tourn. ex Mill. and *Ziziphus* Mill., which until then were assigned to the tribes Rhamneae Horan. (*Hovenia*) and Zizyphaeae Brongn. (= Paliureae; *Paliurus* and *Ziziphus*; Suessenguth 1953). This new tribal classification was confirmed in the analyses of Hauenschild *et al.* (2016, 2018). Two of the genera are present in Australia: *Hovenia* and *Ziziphus*.

The four species of *Hovenia* (POWO 2020) are distributed in south-east Asia from India, through Bhutan, Nepal and Myanmar to China, Japan and Korea. The genus was last reviewed by Kimura (1939) and Suessenguth (1953), followed by regional treatments, e.g. for China (Chen & Schirarend 2007), India (Sen Gupta & Safui 1984) and Japan (Noshiro 1999). The cultivated species *Hovenia dulcis* Thunb. is sparingly naturalised in Australia (Harden 1990).

Until recently, *Ziziphus* was regarded as a genus distributed throughout the tropics and warm dry regions of the world (Medan & Schirarend 2004). Islam & Simmonds (2006) recognised that there are two distinct clades of *Ziziphus*, one from the Americas and one from Europe, Africa and Australasia. Following a more detailed analysis, Hauenschild *et al.* (2016) reinstated *Sarcomphalus* P.Browne for the New World taxa and removed two species close to the unrelated *Condalia* Cav. (tribe Rhamneae) to the new genus *Pseudoziziphus* Hauenschild. The redefined *Ziziphus* is now a genus of c. 65 species (Mabberley 2017), occurring in Europe, Africa, south Asia, Melanesia and Australia. Three species are native to northern Australia, and one further species, *Z. mauritiana* Lam., is introduced. The

last worldwide overview of the genus was published by Suessenguth (1953). Since then, only regional treatments and revisions have been published, most notably by Johnston (1963, 1964, 1972), Bhandari & Bhansali (2000), Chen & Schirarend (2007) and Cahen *et al.* (in press). For Australia, the genus as a whole was last reviewed by Bentham (1863), with subsequent regional treatments by Wheeler (1992) and Rye (1997) for the Kimberley region, Western Australia, and Bailey (1899) and Stanley & Ross (1986) for Queensland.

In preparation for the *Flora of Australia* treatment of Rhamnaceae, the nomenclature and typification of the species of *Ziziphus* and *Hovenia* occurring in Australia are clarified and discussed in this paper.

The synonymies of the widespread species *H. dulcis*, *Z. mauritiana* and *Z. oenopolia* (L.) Mill. only list names that have been used in Australia (APC 2020; APNI 2020). All types have been examined, unless indicated by “*n.v.*”; those that were seen online via JSTOR Global Plants and other herbarium websites are indicated by “photo seen”.

The holotype designations by Johnston (1972) are here accepted if no other specimens of the type could be found; if there are several specimens then Johnston’s listing of a “holotype” is interpreted as lectotypification (an error to be corrected, according to Art. 9.10; Turland *et al.* 2018; see also McNeill 2014). These can be accepted, as Johnston (1972) clearly indicated that he accepted the type specimens; also, at the time of writing, Johnston was not required to state “here designated” after type designations (Art. 7.11).

Identification keys and notes on the five species are also provided, as well as line-drawings of *H. dulcis*, *Z. oenopolia* and *Z. quadrilocularis* F.Muell., a taxon that does not seem to have been illustrated before.

Key to genera of Paliureae in Australia

- 1. Leaves with 3 nerves, oblique; stipules persistent, often growing into spines; infructescence axes not thickened; fruit a dry-fleshed drupe **Ziziphus**
- 1: Leaves penninerved, symmetric; stipules caducous; infructescence axes thickened, fleshy; fruit a capsule **Hovenia**

Nomenclature

Rhamnaceae trib. Paliureae Reissek ex Endl.

Gen. Pl. 1095 (1840). — **Type:** *Paliurus* Mill.

Rhamnaceae trib. Zizypheae Brongn., *Enum. Pl. Mus. Paris* 122 (1843). — **Type:** *Ziziphus* Mill.

Ziziphus Mill.

Gard. Dict. abridg. ed. 4 [not paginated] (1754). — **Type:** *Z. jujuba* Mill., *nom. cons.*, *fide* Britton & P. Wilson, *Sci. Surv. Porto Rico* 5: 535 (1924). ≡ *Rhamnus zizyphus* L. ≡ *Ziziphus zizyphus* (L.) H. Karst., *nom. rej.* (see Kirkbride *et al.* 2006; Brummitt 2009; Wiersema *et al.* 2020).

Etymology. Derived from the Greek ζιζυφον (*zizyphon*), which originated from the Phoenician *zizuf* (Paclt 1999), the name for the lotus or jujube tree, *Ziziphus lotus* (L.) Lam.

The original spelling of the genus name is *Ziziphus*. A common and widely used orthographic variant of the name is “*Zizyphus*”, which “appears to be more correct philologically, [...] but it is not permissible under the Rules to make orthographic corrections based *solely* on philological grounds” (Sprague 1929: 52). The rejection of a recent proposal by Paclt (1999) to conserve the name “*Zizyphus*” with that spelling confirms this assessment (Brummitt 2000).

Note. *Ziziphus jujuba* Mill. has been recorded from Australia, but probably in error due to Lamarck’s synonym for *Z. mauritiana* (viz. *Z. jujuba* (L.) Lam., which has often been confused with *Z. jujuba* Mill.); it is widely cultivated throughout the drier tropics and is occasionally found in cultivation in Australia, but seems not to have naturalized.

1. Ziziphus oenopolia (L.) Mill.

Gard. Dict. ed 8 [not paginated] *Ziziphus* no. 3 (1768), as “*oenoplia*”. — *Rhamnus oenopolia* L., *Sp. Pl.* 194 (1753). — **Type citation:** “Habitat in Zeylonia ħ” Linnaeus also quotes the following references: “*Fl. Zeyl.* 88 *”, “*Burm. zeyl.* 131. t. 61”. **Lectotype:** Ceylon, *Herb. Hermann* 3: 46, no. 88 (BM000621972 & BM000621973; photos seen), *fide* Trimén, *J. Linn. Soc., Bot.* 24: 137 (1887), *non* P.I. Forster, *Austrobaileya* 3: 563 (1991), *nec* Wadhwa, *Revis. Handb. Fl. Ceylon* 10: 367 (1996).

Ziziphus celtidifolia DC., *Prodr.* 2: 20 (1825). — **Type citation:** “in ins. Timor”. **Holotype:** Timor (G-DC, annotated “Museum de Paris 1821”; photo seen, IDC Micro-Edition 500, fiche 277).

Ziziphus rufula Miq., *Fl. Ned. Ind.* 1(1): 643 (1856), as “*Zizyphus*”. — **Type citation:** “in Herb. Horsf.”, “Java, tusschen de struiken in Bogor”. **Type** not located (possibly K). Synonym *fide* Benth., *Fl. Austral.* 1: 412 (1863).

Ziziphus oligantha Merr. & L.M. Perry, *J. Arnold. Arbor.* 20: 338 (1939) (as “*Zizyphus*”). — **Type citation:** “British New Guinea: Western Division, Mabaduan, *Brass* 6488 (type), April, 1936”; the authors also state: “The types [...], unless otherwise stated, are deposited in the herbarium of the Arnold Arboretum” (p. 324).

Holotype: Mabaduan, Western Province, Papua New Guinea, Apr. 1936, *L.J. Brass* 6488 (A00051554). **Isotypes:** BM000838645, BRI-AQ0317638, G00440946, K000723081, L0013808; photos seen (see also P.I. Forster, *Austrobaileya* 3: 563, 1991).

Spelling & etymology. The original spelling of the name in the first edition of *Species plantarum* is “*Rhamnus oenopolia*” (Linnaeus 1753: 194), but in the 10th edition of Vol. 2 of *Systema naturae*, Linnaeus (1759: 938) spelt the epithet “*oenopia*”. In the second edition of *Species plantarum* (Linnaeus 1763: 282) and the 12th edition of *Systema naturae* (1767, vol. 2: 180), the author used the

Key to species of Ziziphus in Australia

- 1. Leaves distinctly discolourous, densely and closely greyish-pubescent beneath (W.A., N.T., Qld) 2. **Z. mauritiana**
- 1: Mature leaves ±concolorous, glabrous or sparsely pubescent beneath
 - 2. Young stems and buds with numerous prominent, pale lenticels; tall rainforest tree (Qld: Maccllwraith Range) 3. **Z. timoriensis**
 - 2: Young stems and buds without prominent lenticels; small trees, scrambling shrubs or lianes
 - 3. Leaves thin-textured; flowers in apparent lateral clusters; carpels 2; fruits 6–8 mm long (N.T., Qld, Torres Strait islands) 1. **Z. oenopolia**
 - 3: Leaves thick; flowers in distinct zig-zag rhipidia; carpels 3 or 4; fruits 14–26 mm long (W.A., N.T.) 4. **Z. quadrilocularis**

spelling “*oenoplia*”. This evolution of the spelling of the name has already been noted by Richter (1840). It is not clear whether Linnaeus intended to correct the spelling of the name, or if these are merely printers’ errors, which then were perpetuated. Subsequent editions, which were issued after Linnaeus’ death, continued to use the latter spelling. When Miller (1768) transferred the species to *Ziziphus*, he did it with the same spelling, as “*Ziziphus oenoplia*”; this is one of the main reasons for the continued use of the epithet “*oenoplia*”.

Gunawardena (1968: 54) and Quattrocchi (2012: 4013) state that the name is derived from the Greek *οἶνος* (*oinos*), wine, and *πλείων* (*pleion*), full, many. Trimen (1893: 280) states that “[I]t is difficult to conceive what Linnaeus intended by applying this term to the present species which has nothing vinous about it in any way.” Certainly, “*oenoplia*” would be a more correct way of forming a compound epithet from these two Greek words. However, classical and Renaissance Latin also uses the term “*oenopolium*” for a wine shop or tavern (Peck 1898; Berkowitz *et al.* 1994: 44), and it is not inconceivable that Linnaeus derived the specific epithet from that word. While the species certainly has dark berries that resemble grapes, it is not known if Linnaeus had actually seen fruiting specimens; hence the reasons for his choice of epithet remain uncertain.

Because of the uncertainties in the spelling of the name in Linnaeus’s own publications and because we can only speculate about the correct etymology of the name, the best option seems to be to continue to use the original spelling (see also Forster 1991).

Typification of *Rhamnus oenopolia*. Forster (1991) and Wadhwa (1996) both published lectotypifications of the name *Rhamnus oenopolia*. However, these authors overlooked the publication by Trimen (1887), who already designated a type for the name.

Linnaeus first described this species in *Flora Zeylanica* (1747), under the genus *Rhamnus* as no. 88, using a short diagnostic phrase, as this was before he applied the binomial system. In this book Linnaeus published the results of his examination of the herbarium of Paul Hermann, which was collected in Ceylon in the late 17th century. The herbarium is bound in five volumes and now held in the Natural History Museum, London (BM); other Hermann herbaria in Gotha (Rauschert 1970), Leiden (van Oostroom 1937) and Paris (Lourteig 1966) were not examined by Linnaeus (Jarvis 2007). In his *Species plantarum*, Linnaeus (1753) published the species under the name *Rhamnus oenopolia*. In both publications, he also quoted a plate from Burman (1737).

Trimen (1887) provided determinations for all specimens in the Hermann Herbarium, and noted that:

- In the Hermann Herbarium at the Natural History Museum, Linnaeus himself added to Hermann’s labels a reference to the species number in *Flora Zeylanica* (1747)

- In *Species plantarum* (1753), for species previously described in *Flora Zeylanica*, “Linnaeus was careful to quote under them the numbers of the ‘Fl. Zeylan.’ and thus *the specimens of Hermann’s Herbarium become types* for many of Linnaeus’s species” (Trimen 1887: 130; my emphasis)
- Trimen’s list of the Hermann Herbarium is in two columns: the first gives the species number in *Flora Zeylanica* and the binomial used for it in *Species plantarum*; the second column contained his “*determinations of the type specimen or specimens representing the species in Hermann’s herbarium*” (Trimen 1887: 133; my emphasis)
- In most cases the “Hermann *specimens* should determine what was the plant intended by Linnaeus rather than his book references” (Trimen 1887: 133).

This means that Trimen has effected lectotypification for those names for which only one gathering (even if more than one specimen) is being referred to (Art. 9.15, Turland *et al.* 2018; see also McNeill 2014). This corresponds with Jarvis (2007), where specimens or illustrations from the Hermann Herbarium are generally deemed to be types of names in Linnaeus’ *Flora Zeylanica*.

While Trimen is credited for providing a comprehensive list of the specimens in the Hermann collection, his indication of “types” of the species described by Linnaeus from that herbarium seems to have generally been overlooked (Jarvis 2007). However, there is no reason to disregard Trimen’s typifications, especially if other pre-type-method typifications are generally accepted, such as the typification of many genera and sections in Pfeiffer (1871–1875).

In the case of *Rhamnus oenopolia*, Trimen (1887: 137) states: “88. *Rhamnus* *Enoplia*, Sp. 194 . . . *Ziziphus* *Enoplia*, Mill.”. On p. 46 of Vol. 3 of the Hermann Herbarium there are two separate branches, each annotated “88”. They are glued to the pages of the book in such a way that the top specimen shows the upper surface of the leaves and the bottom specimen shows the lower surface. Tony Orchard, then Australian Botanical Liaison Officer at Kew, examined and photographed the *Ziziphus* specimens at BM. His conclusion was that the two branches were collected from the same plant at the same time, as they look very similar and are at the same stage of development. As such, the lectotypification of Trimen can be accepted.

Not being aware of Trimen’s publication, Forster (1991) lectotypified the species with a plate in Burman’s *Thesaurus Zeylanicus*, which Linnaeus referenced when describing the species. While Linnaeus describes the illustration as “*bona*”, i.e. well executed (Linnaeus 1747: 36), a specimen is preferable as type. Wadhwa (1996) indicated a specimen in Linnaeus’ Herbarium (LINN 262.33) as the type (with “type” being correctable to “lectotype”; Art. 9.10). Both are original material and possible syntype specimens, but Trimen’s publication has priority.



Fig. 1. A–D *Ziziphus oenopolia*: A habit $\times 0.7$; B lower surface of leaf $\times 4$; C flower $\times 8$; D fruit $\times 0.7$. E–H *Z. quadrilocularis*: E habit $\times 0.7$; F lower surface of leaf $\times 4$; G flower $\times 8$; H fruit $\times 0.7$. I–K *Hovenia dulcis*: I habit $\times 0.7$; J lower surface of leaf $\times 4$; K flower $\times 8$. — A–B W.E. Cooper 1444 (MEL2150696), C G.M. Wightman 4148 (MEL1603351), D C.R. Dunlop 8391 (MEL0227920), E–G G.J. Leach 2318 (MEL0221006), H J.H. Willis s.n. (MEL1534533), I–K H. Idzumi & M. Togashi s.n. (MEL2439813). Illustration by Anita Barley.

The two branches of the lectotype on p. 46 have later received separate BM numbers and barcodes. As they form part of the same gathering, both branches are here accepted as the lectotype (similar to a multi-sheet specimen; see Art. 8.3).

Note. *Ziziphus oenopolia* occurs in the Top End of the Northern Territory and on Cape York Peninsula from the Torres Strait islands south to Princess Charlotte Bay (Qld), in drier rainforests and vine thickets from sea level to c. 120 m. Outside Australia, it is distributed from India to south-east Asia and China. **Fig. 1A–D.**

2. *Ziziphus mauritiana* Lam.

Encycl. 3: 319 (1789). — **Type citation:** “Isle de France”. **Lectotype:** “Isle de France” [Mauritius], *P. Sonnerat s.n.* (P-LA; IDC Micro-Edition 6207, no. LM-128/18), *fide* M.C.Johnst., *Fl. Trop. E. Africa Rhamnaceae* 29 (1972). **Isolectotype:** G-DC (IDC Micro-Edition 500, fiche 277).

Rhamnus jujuba L., *Sp. Pl.* 1: 194 (1753); *Z. jujuba* (L.) Gaertn., *Fruct. Sem. Pl.* 1: 203 (1788), *nom. illeg.*; *Z. jujuba* (L.) Lam., *Encycl.* 3: 318 (1797), *nom. illeg.*, *non* Gaertn. (1788), *nec* Mill., *Gard. Dict. Ed. 8.* [not paginated] *Ziziphus* no. 1 (1768). — **Type citation:** “Habitat in India. h̄”. Linnaeus also quotes the following references: “*Fl. Zeyl.* 89*”, “*Pluk. alm.* 199. *Raj. dendr.* 44”. **Lectotype:** Ceylon, *Herb. Hermann 3.14 no. 89* (BM00621844 & BM00621845; photos seen), *fide* Trimen, *J. Linn. Soc., Bot.* 24: 137 (1887), *et* Wadhwa, *Revis. Handb. Fl. Ceylon* 10: 369 (1996). **Remaining syntypes:** BM00621466, BM00621467 & BM00621468 (photos seen).

Rhamnus mauritiana P.Willemet, *Herb. Maurit.* 20 (1796) & *Ann. Bot. (Usteri)* 18: 20 (1796). — **Type citation:** “Habitat in Mauritiae frequens in sylvis: au Pouce, aux plaines St Pierre, &c.”. **Type:** not located (the whereabouts of Willemet’s herbarium are unknown; Stafleu & Cowan, *Taxon. Lit. ed.* 2, 7: 314, 1988). Synonym *fide* Afr. Pl. Database (2020) & Arbonnier, *Arbres, Arbustes & Lianes Afr. Ouest ed. 4*, 762 (2019).

Ziziphus tomentosa Poir. in Lam., *Encycl. Suppl.* 3: 192 (1813); *Ziziphus poiretii* G.Don, *Gen. Hist.* 2: 26 (1832), as “*poiretti*”, *nom. illeg. & superfl.* — **Type citation:** “Ile de Saint-Domingue. h̄ (*V.s. in herb Desfont.*)”. **Lectotype:** “Santo Domingo I., Poiteau” (P, *n.v.*), *fide* M.C.Johnst., *Fl. Trop. E. Afr. Rhamnaceae* 29 (1972). **Isolectotype:** St. Domingue, *P.A. Poiteau* (G-DC; IDC Micro-Edition 500, fiche 277).

Ziziphus orthacantha DC., *Prodr.* 2: 21 (1825); *Ziziphus mauritiana* var. *orthacantha* (DC.) A.Chev., *Rev. Int. Bot. Appl. Agric. Trop.* 27: 477 (1947). — **Type citation:** “in Senegalia. Bacle.”. **Holotype:** Senegal, *C.H. Bacle s.n.* (G-DC, IDC Micro-Edition 500, fiche 277), *fide* M.C.Johnst., *Fl. Trop. E. Afr. Rhamnaceae* 29 (1972).

Ziziphus rotundata DC., *Prodr.* 2: 21 (1825). — **Type citation:** “h̄ in ins. Mauritiae sylvis [...] v.s. ex h. mus. Par.”. **Holotype:** Ile de France [Mauritius] et de Bourbon [Réunion], *s.coll.* (G-DC, labelled “Museum de Paris”; IDC Micro-Edition 500, fiche 277), *fide* M.C.Johnst., *Fl. Trop. E. Afr. Rhamnaceae* 29 (1972).

Ziziphus aucheri Boiss., *Diagn. Pl. Orient. sér. 1*, 2: 5 (1843). — **Type citation:** “Hab. In Persiâ australi circa Bouchir”, *P.M.R. Aucher-Eloy 4320*. **Lectotype:** “Iran, Bushir [Bouchir], *Aucher 4320*” (G, *n.v.*), *fide* M.C.Johnst., *Fl. Trop. E. Afr. Rhamnaceae* 29 (1972). **Isolectotypes:** FI006688, K01818560, P000681965 (photos seen). Synonym *fide* Afr. Pl. Database (2020) & Arbonnier, *Arbr. Arbust. & Lianes Afr. Ouest ed. 4*, 774 (2019).

Ziziphus jujuba var. *stenocarpa* Kuntze, *Rev. Gen. Pl.* 1: 121 (1891). — **Type citation:** “Cultivirt Delhi”. **Holotype:** India, Delhi, cult. h̄ 30’, 15 July 1875, *C.E.O. Kuntze 7241* (NY00415103, photo seen).

Ziziphus jujuba var. *fruticosa* Haines, *Forest Fl. Chota Nagpur* 270 (1910). — **Type citation:** “Singbhum, Manbhum, usually in waste open places, railway embankments, etc.”. **Type:** not located (possibly K, where the main part of H.H. Haines’ herbarium is deposited). Synonym *fide* M.C.Johnst., *Fl. Trop. E. Afr. Rhamnaceae* 29 (1972).

Paliurus mairei H.Lév., *Repert. Spec. Nov. Regni Veg.* 12: 535 (1913); *Ziziphus mairei* (H.Lév.) Browicz & Lauener, *Notes Roy. Bot. Gard. Edinburgh* 27: 281 (1967), *nom. illeg.*, *non* Dode, *Bull. Soc. Bot. France* 55: 649 (1909). — **Type citation:** “Yun-Nan: brousse, rives du fleuve Bleu, juillet 1912. 400 m (E.E. Maire)”. **Holotype:** Yun-Nan: brousse, rives du fleuve Bleu, altit. 400 m, July 1912, *E.E. Maire s.n.* (E00275332, photo seen). **Isotype:** A00249937 (photo seen; 3 leaves and 1 immature fruit with photo of holotype, distributed by E in 1928).

Ziziphus mauritiana var. *deserticola* A.Chev., *Rev. Int. Bot. Appl. Agric. Trop.* 27: 477 (1947). — **Type citation:** “Colonie du Niger : de Tahoua a Agades (Chev. n° 43 302) Type!”. **Type:** not located (possibly P). Synonym *fide* J.-P.Lebrun & Stork, *Enum. Pl. Fleurs Afr. Trop.* 2: 190 (1992).

Typification of *Rhamnus jujuba*. Jarvis (2007: 791) states that “Johnston (1972) indicated Herb. Hermann material (BM) as type. Although there is material in more than one volume, it appears to have been part of a single gathering. Consequently, this is accepted as the first typification (Art. 9.15) [now Art. 9.17; Turland *et al.* (2018)], with the choice subsequently restricted by Wadhwa [1996].”

While Johnston (1972: 29) indicated “*Hermann 89* (BM, holo!)” as the type, the same was already done by Trimen (1887), who wrote “89. *Rhamnus Jujuba*, Sp. 194 *Zizyphus Jujuba*, Lam.” and clearly indicated the type of the name to be no. 89 of the Hermann Herbarium in London (see explanation under *Z. oenopolia* above).

The following material of no. 89 is present in that herbarium: Vol. 1, p. 71, has three branches glued onto the page (labelled “a”, “b” and “c”); Vol. 3, p. 14, consists of two branches, which are glued on one sheet (together with *Nephrodium unitum* (L.) Bory and *Tragia involuocrata* L.; Jarvis 2016); Vol. 5, p. 99, is an illustration of the species.

Wadhwa (1996: 369) gave the type as “*Hermann* 3: 14. n. 89 (BM)”. As such, he published a second-step lectotypification, as explained by Jarvis (2007). Later the two branches have received separate BM numbers. As with *Z. oenopolia*, both branches are here accepted as the lectotype specimen. Note that, in error, Jarvis (2007) cites the barcode number of *Nephrodium unitum* (BM000594656) under *Rhamnus jujuba*. The other specimens and the illustration in Vol. 3 and Vol. 5 of the Hermann Herbarium are original material and syntypes of the name.

Note. *Ziziphus mauritiana* is introduced in Australia (Grice 2002), occurring scattered in woodlands and vine thickets in the drier parts of northern Australia from Derby (W.A.) to Maryborough (Qld), usually in disturbed areas adjacent to settlements; it is sometimes cultivated. The species is widespread from tropical Africa through the Middle East, India, south-east Asia and China; it is also present in the Caribbean and parts of the Americas.

3. *Ziziphus timoriensis* DC.

Prodr. 2: 20 (1825). — **Type citation:** “In insula Timor”. **Lectotype (designated here):** Timor, [1803,] *J.B.L.T. Leschenault de la Tour s.n.* (G-DC, with annotation: “Museum de Paris 1821”; IDC Micro-Edition 500, fiche 277). **Isolectotypes:** P00298039 (with annotation: “*Ziziphus timoriensis* DC. prod.”), P00298040 (photos seen).

Rhamnaceae sp. (=RFK/25814) B.Hyland & Whiffin, *Austral. Trop Rain Forest Trees* 1: 112, 129, 182, Code 1055 (1993).

Typification. Candolle (1825) only indicated where the type specimen was collected, but after consulting his herbarium in Geneva, it is clear that the species was described from a specimen collected by Leschenault, who was in Timor in Apr. 1803 (George 2009). Two other collections in Paris are most likely duplicates. The specimen from Candolle’s herbarium is in good condition and is chosen as the lectotype.

Note. The species occurs in the MacIlwraith Range, Qld, in rainforest at 250–400 m. It is also native to Timor, Sulawesi and the Moluccas.

4. *Ziziphus quadrilocularis* F.Muell.

Fragm. 3: 57 (1862) (as “*Zizyphus*”). — **Type citation:** “Ad ripas rupestres fluvii Victoriae. F.M.” — **Lectotype (designated here):** Victoria River, W.A., Jan. & Mar. 1856, *F. Mueller s.n.* (MEL712594, branch on left hand side). **Residual syntypes:** Victoria River, W.A., Jan. & Mar. 1856, *F. Mueller s.n.* (MEL712594, fruit and infertile branch). Upper Victoria River, W.A., Jan 1856, *F. Mueller s.n.* (K000723079).

Typification. The type specimen at MEL is clearly mixed, as two collection dates are listed on the label. Presumably the earlier collecting date (Jan. 1856) is for the flowering branch on the left hand side of the sheet, and the later date (Mar. 1856) refers to collection of

the fruit, which is present in the packet, and possibly the infertile branchlet on the right-hand side. The fruit is cut open and displays the 4-locular ovary that gave the species its name; however, both 3- and 4-locular ovaries are common in this plant. The flowering branch is selected as lectotype.

The syntype at the Royal Botanic Gardens, Kew, is only labelled with the earlier date (Jan. 1856), but contains two flowering branches and one fruiting branch, which must have also been collected later. It is not clear if this is a duplicate of the MEL sheet, as the location is slightly different.

Note. *Ziziphus quadrilocularis* grows in the western Kimberley region and from Mabel Downs (W.A.) to Arnhem Land (N.T.), in vine thickets and savannah woodlands from sea level to c. 360 m. **Fig. 1E–H.**

Hovenia Thunb.

Nov. Gen. Pl. 1: 7 (1781). — **Type:** *H. dulcis* Thunb.

Etymology. Named in honour of David ten Hoven, Dutch official of the City of Amsterdam and sponsor of Thunberg’s travels to Japan (Théis 1810).

1. *Hovenia dulcis* Thunb.

Nov. Gen. Pl. 1: 8 (1781). — **Type citation:** “Crescit prope Nangasaki”. **Lectotype:** Japan [Aug. 1775–Nov. 1776], *C.P. Thunberg s.n.* (UPS-THUNB V-005733; photo seen), *vide* Sengupta & Safui, *Bull. Bot. Surv. India* 26(1-2): 54 (1984). **Syntypes:** LINN-HS398-1 (labelled “Thunb. Japon.”; photo seen), S11-13034 (labelled “Habitat in Japonia. Specimen ibi lectum ex Upsalia misit Exp. DD. Thunberg, a. 1780”; photo seen), SBT12364 (labelled “e Japonia. Thunberg” and “*Hovenia dulcis*. Thunb. Fl. jap.” in Thunberg’s hand; photo seen). **Possible syntype:** LD1731646 (labelled “Jap.”; photo seen).

Typification. Thunberg’s own herbarium at Uppsala (UPS) is generally seen to be the source of his type specimens (Stafleu & Cowan 1986). Sen Gupta & Safui (1984), after carefully examining the microfiche edition of the herbarium, listed “*Thunberg s. n.* (UPS)” as location of the “holotype”. This is here accepted as lectotypification of the name, since only one specimen of *H. dulcis* is present in Thunberg’s herbarium (Juel 1918; Ebihara *et al.* 2015–).

There are also specimens in other herbaria, these are listed here as syntypes. While they look very similar, it cannot be ascertained if they are duplicates of the lectotype. The specimen at Lund (LD) is not labelled with the collector’s name but the LD database lists Thunberg as possible collector.

Note. The species is introduced in Australia and occasionally adventive on rainforest margins in New South Wales and possibly Queensland. It is native to China, Korea and Japan. **Fig. 1I–K.**

Acknowledgements

I am grateful to the late Gillian Perry (1943–2011; see Perry *et al.* 2013), who helped with the initial research for this paper. Tony Orchard is thanked for his advice on typifications and for examining specimens at BM during his term as Australian Botanical Liaison Officer (ABLO) at the Royal Botanic Gardens, Kew. Llywela Williams, Juliet Wege and Kevin Thiele have commented on drafts of this paper. Daniel Cahen and an anonymous reviewer are thanked for their feedback. The project “A new phylogeny of the Australian Rhamnaceae, revision of *Cryptandra* and *Spyridium*, and completion of the *Flora of Australia* treatment of the family” is supported through funding from the Australian Government’s Australian Biological Resources Study (ABRS) National Taxonomy Research Grant Programme. The line drawings were prepared by Anita Barley, also funded by ABRS.

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