KEW BULLETIN
DOI 10.1007/S12225-024-10162-Y

ISSN 1874-933X (print)
ISSN 0075-5974 (electronic)

A new species of *Lasjia* (Proteaceae) from Sulawesi: *Lasjia griseifolia* Utteridge & Brambach

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Summary. *Lasjia griseifolia* Utteridge & Brambach, a member of the Proteaceae, is described and illustrated as a new species from the Indonesian island of Sulawesi. The new species is similar to *L. erecta*, also from Sulawesi, and morphological differences between the taxa are discussed; a line illustration and detailed notes on the conservation status are provided.

Key Words. *Macadamia*, Malesia, Proteales, ultramafic, Wallacea.

Introduction

Proteaceae Juss. comprises 81 genera and c. 1650 species of trees and shrubs distributed mainly in the southern hemisphere with centres of species diversity in southern Africa and Australia (Weston 2006). Members of the family often have conspicuous inflorescences with a 4-merous, brightly coloured perianth and the stamens are opposite the perianth members; several species are cultivated as ornamentals.

The family was treated in *Flora Malesiana* by Sleumer (1955b) who recognised nine genera and 80 species. In South-East Asia, there have been several taxa described since the *Flora Malesiana* account, including new species in *Helicia* Lour. and *Heliciopsis* Sleumer (e.g., Chung 1998; Takeuchi 2014; Malabrigo *et al.* 2023) as well as a single new species in *Macadamia* F.Muell. (McDonald & Ismail 1995). The island of New Guinea has the highest diversity in Malesia having seven genera and c. 65 species currently recorded; *Helicia* is the most diverse genus with at least 53 species (Jennings & Utteridge 2021).

Phylogenetics has improved subfamilial classification and generic limits in the family. Relatively recently, the classification of the family was updated by Weston & Barker (2006) with the re-circumscription and description of subfamilies, tribes, and subtribes (see also Weston 2006). Further work redefined the limits of *Macadamia* and the genus *Lasjia* P.H.Weston & A.R.Mast was described to accommodate the tropical members, i.e. Malesian and northern Australia, of a previously broad, and paraphyletic, *Macadamia* (Mast *et al.* 2008).

In South-East Asia, *Lasjia* is restricted to the Indonesian island of Sulawesi, with currently two species: *L. hildebrandii* (Steenis) P.H.Weston & A.R.Mast, and *L. erecta* (J.A.McDonald & R.Ismail) P.H.Weston & A.R.Mast. Sulawesi, as an island of four peninsulas, was formed from the joining of paleo-islands within the last 5 million years (Nugraha *et al.* 2022). Endemism often reflects these paleo-islands, suggesting a legacy of geological history upon the current fauna and flora (Evans *et al.* 2003; Trethowan *et al.* 2019; Struebig *et al.* 2022). Conservation prioritisation also suggests wider protection of these regions that are rich in endemics (Pusparini *et al.* 2023).

During identification work toward vegetation classification in Sulawesi (Trethowan *et al.* 2020), we surveyed several specimens of the common 'macadamia', *Macadamia hildebrandii* Steenis (now treated as *Lasjia hildebrandii*). However, one specimen, from Sulawesi's central-eastern area of endemism, did not match any described species of Proteaceae in Malesia in having a combination of whorled leaves, 'terminal' inflorescences and very dense indumentum on all parts. The specimen is described as a new species here and, on account of the whorls of five, simple and entire leaves, the terminal inflorescences and the sessile flower pairs, is best placed in the genus *Lasjia*.

Materials and Methods

This study is based on physical or digital examination of material deposited in A, B, BO, CEB, F, GOET, K, KYO, L, P and SING (acronyms follow Thiers 2023, continuously updated). Keys and descriptions in the relevant taxonomic literature were studied for comparative purposes (van Steenis 1952; Sleumer

Accepted for publication 2 January 2024.

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1955a, b; Gross 1995; McDonald & Ismail 1995). Terminology follows Beentje (2016), Systematics Association Committee (1962) and Hewson (2019); where possible, the format of the description follows that of *Panopsis* Salisb. ex Knight published by Edwards & Prance (in Prance *et al.* 2007: 75 – 117). The conservation metrics were calculated using GeoCAT (Bachman *et al.* 2011).

Key to Malesian *Lasjia* species

1. Leaves densely and persistently hairy on the abaxial surface (plant densely hairy throughout); petioles subsessile to 9 mm long; inflorescences terminal, persistently densely hairy; pedicels less than 3.5 mm long……..**Lasjia griseifolia**
   Leaves initially densely appressed hairy, glabrescent, glabrous at maturity; petioles subsessile to 2 cm long; inflorescences terminal or lateral, initially moderately to densely hairy, becoming moderately hairy to glabrous at maturity; pedicels 4 – 7.5 mm long……..2
2. Leaves in whorls of 4 – 5 (– 6); inflorescences erect to 10 cm long, moderately hairy ……**Lasjia erecta**
   Leaves in whorls of 5 – 7 (– 8); inflorescences pendulous to 40 cm long, moderately hairy to glabrous……**Lasjia hildebrandii**

New species description

Lasjia griseifolia *Utteridge & Brambach* **sp. nov.** Type: Indonesia, Sulawesi, Eastern Central Sulawesi [Central Sulawesi Province], Morowali Province [Morowali Utara Regency], Mount Tambusisi, 1°45'S, 121°25'E, 2000 m, 30 March 1980 (fl.), *Lack & Grimes* 1766 (holotype K!).

http://www.ipni.org/urn:lsid:ipni.org:names:77335483-1

Shrub 2 – 3 m tall. Indumentum of simple matted hairs, pale grey, reddish to red-orange to ginger-brown initially becoming grey in time and/or on drying. *Stems* terete, branching c. 4 times per node, densely hairy (tomentose *sensu* Hewson 2019), epidermis rusty or grey, with longitudinal cracks and ridges; internodes c. 1.5 – 3 cm long. Axillary buds usually present, hairy, pale grey. *Leaves* coriaceous, verticillate in whorls of (4 –) 5, subsessile, hairy, often along leafless shoots with a cluster of leaves at the apex. Petioles 0 – 9 mm long. Lamina (4.5 –) 6.2 – 9 × 3.2 – 4.8 cm, obovate to elliptic; base cuneate to rounded; apex retuse to emarginate; margins entire, planate or slightly enrolled in the lower half; venation obscure (especially below due to the dense indumentum), lateral veins slightly raised below, brochidodromous; midrib planate adaxially; lateral veins 6 – 8 pairs, leaving midrib at angle of c. 80°; adaxial lamina densely hairy with pale grey matted hairs (tomentose *sensu* Hewson 2019), becoming sparsely hairy to glabrous and then with distinct tubercles (hair bases), adaxial midrib remaining densely hairy ('hoary' *sensu* Hewson 2019); abaxial lamina densely hairy with ginger-brown matted hairs ('felted' *sensu* Hewson 2019), abaxial midrib densely hairy with dark brown matted shorter hairs ('tomentose' *sensu* Hewson 2019). *Conflorescences* axillary, each subtended by a foliage leaf (or scar if leaf fallen), simple and unbranched, 4 – 6 cm long, up to 2.5 mm in diam. during anthesis; indumentum densely hairy with dark brown matted hairs ('felted' *sensu* Hewson 2019). Pedicels 3 – 3.5 mm long at anthesis, densely hairy with dark brown matted hairs ('felted' *sensu* Hewson 2019). *Flowers* 6 – 9 mm long, perianth white to creamy-white, clavate in bud, with a scarcely curved tube, outer surface covered in densely ginger-brown matted hairs, inner surface glabrous; free filament tip 4 mm long attached above the base of the perianth, anthers 1 – 1.2 mm long, connective apex apiculate; hypogynous nectary shortly tubular, 0.7 – 1 mm long; ovary densely hairy with erect ginger-brown hairs ('hirsute' *sensu* Hewson 2019); style 5 – 6 mm long, clavate distally. *Fruits* n.v. Figs 1, 2.

RECOGNITION. Recognised in the genus *Lasjia* by the combination of the following characters: indumentum of persistent simple matted hairs throughout the plant (on the hardened stems, mature leaves, inflorescence axes, pedicels and abaxial tepal surfaces) and the very short pedicels less than 3.5 mm long; in addition, the new species usually has whorls of 5 leaves, obovate to elliptic laminas and a retuse to emarginate apex, and erect inflorescences to 6 cm long.

DISTRIBUTION. Endemic to the Indonesian island of Sulawesi. Note, for the coordinates given on the label of the type collection, we assume these are 'rounded' generalised coordinates for the collecting trip as they indicated a point of c. 500 m asl at approximately 13 km south of Mt Tambusisi; we have mapped the type collection using the elevation of 2000 m (see further information in Map 1 caption).

HABITAT. 'In shrub forest on mountain ridge.' *Lack & Grimes* 1766; ' in c. 15 m tall mossy forest dominated by Myrtaceae' and 'Flowering shrub in open

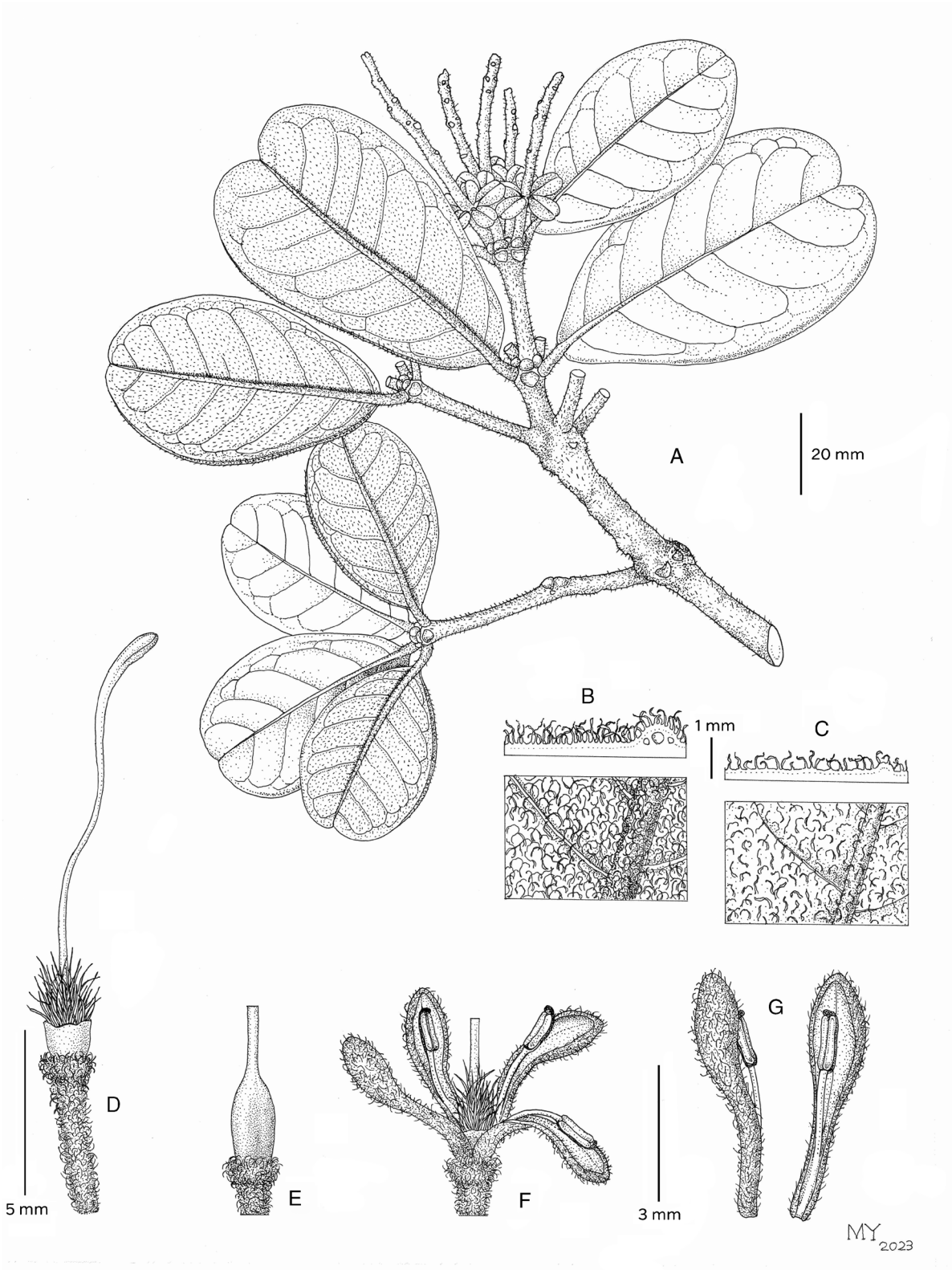


Fig. 1. *Lasjia griseifolia*. **A** habit, showing erect, terminal inflorescences (all flowers fallen and detached); **B** lower leaf surface, showing very dense 'felted' indumentum; **C** upper leaf surface, showing dense 'tomentose' indumentum; **D** flower with perianth removed, showing tubular disk gland surrounding the ovary and style; **E** ovary with disk glands and hairs removed; **F** flower with perianth attached; **G** perianth lobes, ab- and adaxial views. DRAWN BY M. YAMANAKA.

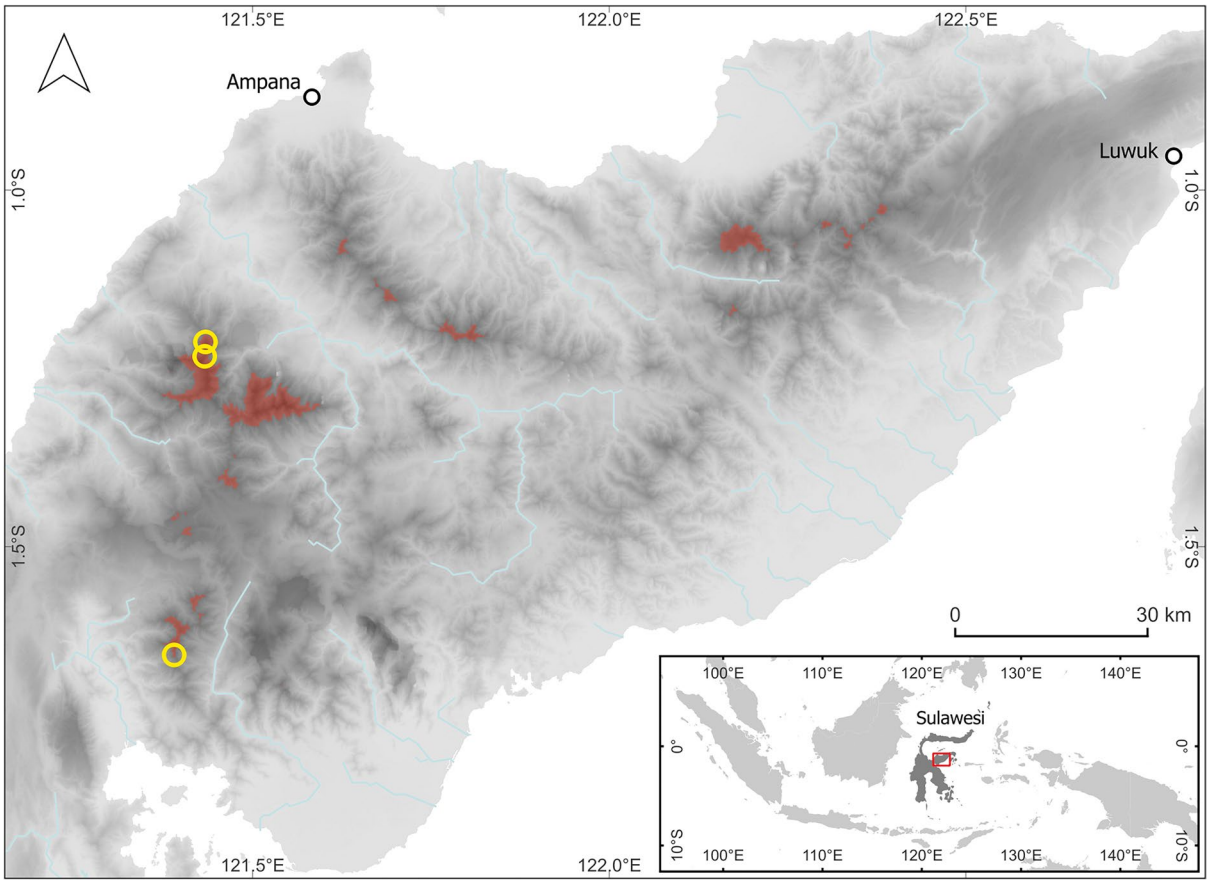
Fig. 2. *Lasjia griseifolia*. **A** habit, note the number of leaves per whorl and the grey adaxial surface; **B** abaxial leaf surface, note the persistent ginger-brown matted hairs; **C, D** axillary conflorescences and creamy-white perianth. PHOTOS: FABIAN BRAMBACH.

elfin forest (max. 8 m tall) near ridge, surroundings dominated by *Dacrycarpus steupii* (Wasscher) de Laub. and *Leptospermum*' *Brambach pers. obs.*; 2500 – 2600 m a.s.l. (Map 1).

ADDITIONAL FIELD OBSERVATIONS. Indonesia, Sulawesi Tengah Province, Kabupaten Tojo Una-Una, Kecamatan Ulubongka, trail from Desa Mire to the peak of Gunung Katopas, near post 9, c. 2600 m a.s.l., sterile understorey shrub c. 3 m tall in c. 15 m tall mossy forest dominated by Myrtaceae, 6 Sept. 2014 (st.), *Brambach pers. obs.* [photograph series 2285] (Figs 2A & 2B); ibid., near post 11, Flowering shrub in open elfin forest (max. 8 m tall) near ridge, c. 2500 m a.s.l., 6 Sept. 2014 (fl.), *Brambach pers. obs.* [photograph series 2325] (Figs 2C & 2D).

CONSERVATION STATUS. Currently known only from the type specimen collected on Gunung Tambusisi and direct observation on Gunung Katopas in central Sulawesi's eastern peninsula. It is thought to be restricted to areas above 2,000 m asl in upper montane 'elfin' forest overlying ultramafic geology (Map 1, red-shaded areas).

The size of this species' fruit fall within the range known to be transported by several mammal groups, as well as fruit doves (*Ptilinopus spp.*) and imperial pigeons (*Ducula spp.*) (Corlett 1998), the latter being estimated



Map 1. Distribution of *Lasjia griseifolia* on Sulawesi's eastern peninsula. Yellow circles indicate the known occurrences, red shaded areas the potential habitat of the species, i.e. areas over ultramafic bedrock above 2000 m a.s.l. elevation. Map created with QGIS (QGIS Development Team 2023), extent of ultramafic based on a lithology database developed by the SE Asia Research Group, Department of Geology, Royal Holloway University of London (R. Hall, unpublished data). Note, for the type collection, we estimated the coordinates as (based on the 2000 m locality): 1°23.4'S, 121°39.1'E.

to be able to disperse seeds over 10 km from the parent individual (Corlett 2009; see also Utteridge & Rustiami 2022 for a discussion of the different species of *Ducula* in the region). It is plausible that the species could be more widely dispersed across Sulawesi's eastern peninsula, and to account for this uncertainty the extent of occurrence has not been calculated, however, its association with high elevation ultramafic sites would exclude it from large areas. As such, pending further research, its currently known area of occupancy of 12 km^2 is viewed as representative, falling within the threshold values for Endangered under criteria B2 with two threatened locations. The total population size is unknown, as Gunung Tambusisi has not been surveyed since the collection of the type specimen in 1980, however, at least 20 individual plants were observed on Gunung Katopas in 2014 (Brambach *pers. obs.*).

All the known occurrences are in areas covered by the Indonesian forest moratorium and Gunung Tambusisi is within the Morowali Nature Reserve (UNEP-WCMC & IUCN 2023). While mining activities appear to be taking place within the reserve and nearby areas (Rainforest Rescue 2012; ESDM One Map 2023), remotely sensed data do not show evidence of habitat degradation at the collection locality. An extremely large landslide (c. 13 km long) is visible in satellite imagery on the eastern slopes of Gunung Katopas. It is estimated that 10% of which affected areas within this species' known elevation range (Brambach *pers. obs.*). This landslide is at least 10 years old (Brambach *pers. obs.*) and while this may have led to a small population decline, this is currently unquantifiable and has ceased. There is no further evidence in remote sensed data of a continuing decline in habitat in the surrounding area. Landslides pose a potential threat across this species' range due to the rugged topography of the region, however, these are thought unlikely to affect this species' extinction risk in a short time period.

Further research at its known localities and surrounding environs is required to assess the population

status, as is the collection of germplasm for *ex situ* conservation. Based on current data we preliminarily assess this species as Least Concern.

FIELD NOTES. 'Shrub to 2 m. Leaves very grey. Fruit green.' *Lack & Grimes* 1766.

ETYMOLOGY. Named for the grey leaves in the field (see fieldnotes and Fig. 2A)

NOTES. *Lasjia griseifolia* may be distinguished by the combination of characters outlined in the diagnosis. It is unlikely to be confused with other species in *Lasjia* which is a small genus of only six species (when including the new species described here): three in Sulawesi and three in northern Queensland, Australia. In Sulawesi, there are two other species of *Lasjia* but the distinction between them is not entirely clear. The most widely distributed taxon is *L. hildebrandii* known from c. 50 collections across the island, but the other species, *L. erecta*, is known from the type collection on Kabaena Island, off Sulawesi's south-eastern peninsula, and five collections from Lore Lindu National Park, however several specimens currently placed in *L. hildebrandii* are potentially *L. erecta*, especially those from western Central Province and Toraja region (Brambach *pers. obs.*).

Compared to *Lasjia griseifolia*, both species usually have glabrous leaves and petioles at maturity — although some specimens can be sparsely to moderately pubescent on the petioles and leaves, they are not persistently covered with dense hairs on all parts. In addition, *L. hildebrandii* has much larger leaves (up to 40 cm long) and long pendulous inflorescences up to 40 cm, whilst *L. erecta* usually has 4-whorled leaves and appressed pubescent inflorescences with longer pedicels (6 – 10 mm long). In the new species, we have sometimes seen nodes with only 4 leaves per whorl, but these were where one of the leaves had fallen (Brambach *pers. obs.*); additional specimens and/or observations are needed to clarify if *L. griseifolia* always has 5 leaves per whorl. Outside of Sulawesi, all of the Australian species have larger leaves (all up to 20+ cm long): *L. claudiensis* (C.L.Gross & B.Hyland) P.H.Weston & A.R.Mast has glabrescent leaves which are ovate or obovate with acute to acuminate apex; in *L. grandis* (C.L.Gross & B.Hyland) P.H.Weston & A.R.Mast the leaves are narrowly elliptic with an acute apex; and the final species, *L. whelanii* (F.M.Bailey) P.H.Weston & A.R.Mast, has ovate leaves with an acute to acuminate apex.

The new species is described from a specimen collected during 'Operation Drake', a round-the-world voyage which explored the Morowali area of Sulawesi in January to April 1980 (Jacobs 1982: 3734). Plant collections in Morowali were made by botanists from Herbarium Bogoriense (BO; Dedy Darnaedi and Ari Budiman) and Andrew Lack (University of Swansea) and Geoff Grimes (K); unfortunately, we have not yet been able to locate a duplicate of this collection in BO (Rustiami *pers. obs.*) and hence designate the K specimen as the holotype.

Acknowledgements

We thank Helen Hartley for advice on epithet endings and Masumi Yamanaka for the illustration. We warmly thank the reviewers for their encouraging comments and constructive suggestions.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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