



Notes on the taxonomy of Australian *Lindernia* subg. *Didymadenia* (Linderniaceae)

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Abstract: Names are formalised as a precursor to more detailed taxonomic and evolutionary accounts of *Lindernia* subg. *Didymadenia* in Australia for five newly founded sections (*Prolatae* W.R.Barker, *Didymadenia* (W.R.Barker) W.R.Barker, *Scapigerae* W.R.Barker, *Heterandrae* W.R.Barker and *Hemiarrhena* (Benth.) W.R.Barker) and 22 new species (*L. prolata* from the near-coastal regions of central eastern Australia, *L. cyanoplectra* and *L. porphyrodinea* from the Kimberley region, Western Australia, with *L. dunlopii* extending into Northern Territory, and *L. atrata*, *L. murfetiana*, *L. dierythra*, *L. scopularis*, *L. petrensis*, *L. tiwiensis*, *L. leucochroa*, *L. thyridostoma*, *L. scutellata*, *L. pustulosa*, *L. brennanii*, *L. lucrusmiana*, *L. venustula*, *L. enypniastina*, *L. acrandra*, *L. pronanthera*, *L. robyniae* and *L. calliandra* from northern Northern Territory). Some of the new species are established as a result of the typification of several existing names through examination of types or type photographs. The misapplication of *L. lobelioides* (F.Muell.) F.Muell. and the partial misapplications of *L. scapigera* R.Br. and *L. plantaginea* (F.Muell.) F.Muell. are corrected, *L. mitrasacmoides* (O.Schwarz) W.R.Barker and *L. grossidentata* O.Schwarz are resurrected as names of two common Northern Territory species and the separation of *L. tectanthera* W.R.Barker from *L. lobelioides* is clarified.

Keywords: Australia, new species, infrageneric classification, subg. *Didymadenia*, *Lindernia*, Linderniaceae

Introduction

Linderniaceae in Australia, segregated relatively recently from the now dismantled broadly circumscribed traditional Scrophulariaceae (e.g. Rahmzadeh *et al.* 2005), has been, until the last six years, represented by two genera, the subshrub *Artanema* D.Don, represented by a single north-east Australian species, and the genus *Lindernia* All. In the 1800s, Brown (1810) initially placed Australian species in *Artanema*, *Lindernia* and *Torenia* L., but later authors (Bentham 1846, 1868; Mueller 1859; Bentham & Hooker 1876) included the Australian species, many of them today known to be endemic, in globally widespread genera such as *Bonnaya* Link & Otto, *Vandellia* P.Browne ex L. and, less often, *Ilysanthes* Raf. Ultimately Mueller (1867, 1882, 1889) followed Brown's lead and placed all Australian species, except *Artanema fimbriatum* (Hook. ex Graham) D.Don, in *Lindernia*.

In the 20th century, the widespread genera *Vandellia*, *Bonnaya* and *Ilysanthes* were subsumed in a widely circumscribed *Lindernia* as subgenera or sections in the works of Pennell (1935, 1943a, 1943b) on north-east American, Himalayan and New Guinean species, Philcox (1968) on Malesian species, and Yamazaki (1978a, 1978b, 1980, 1981, 1985, 1990) on Asian species.

Hemiarrhena Benth. (1868), a monotypic Australian genus of doubtful tribal affinities, was universally

maintained as a distinct genus. Originally described by Bentham as a phyletically isolated member of the tribe Rhinanthae Lam. & DC., a view adopted in other works on the Scrophulariaceae (e.g. Wettstein 1891–1893), it was always maintained in the *Lindernia* alliance by Mueller (1889), who viewed it and other species of *Lindernia* in the field and described it from his own collections. In the late 1900s it was returned to *Lindernia* in Australian works, starting with Barker (1983) and Dunlop (1987), with Barker (1990) including it in his new subg. *Didymadenia*, which he established for the main Australian radiation of *Lindernia*.

A recent molecular study by Fischer *et al.* (2013) reconstituted *Lindernia*, giving it a narrow circumscription covering the type and allied species, and resurrecting the globally widespread genera *Bonnaya* and *Vandellia*. Apart from some wide-ranging tropical species placed in *Bonnaya*, they removed all Australian species from *Lindernia* to *Vandellia*, although their approach was based on limited evidence (Biffin *et al.*, in press).

In an analysis of new molecular sequence data (Biffin *et al.*, in press), the bulk of Australian species have been returned from *Vandellia* to *Lindernia*. The following genera of Linderniaceae are now recognised in Australia: *Artanema*, *Bonnaya*, *Lindernia*, *Torenia* and an unpublished genus established in Biffin *et al.* (in press). Three subgenera of *Lindernia* are confirmed, the type *L. procumbens* (Krock.) Philcox in subg. *Lindernia*, east

Australian *L. hyssopioides* (L.) Haines in a subgenus based on the generic name *Ilysanthes* (Biffin *et al.*, in press), and the main radiation of Linderniaceae restored to subg. *Didymadenia* W.R.Barker.

The establishment of a firm generic framework has been critical to publishing the following taxonomic changes and additions which further expand the known diversity of Australian Linderniaceae and particularly its subg. *Didymadenia* (Barker 1990, 1992a, 1992b, 1998, 2000; Wannan 2013, 2016). More detailed taxonomic advances (Barker, in prep.) and an evolutionary study (Barker & Biffin, in prep.) of the genus in Australia are well-advanced towards publication.

Diagnostic attributes

Hair types

Glandular hairs 0.2–1.0 mm long with multicellular uniseriate stalks are evident in many species across the family. Their presence or absence and relative length on vegetative parts and in the inflorescence can be of diagnostic value at the species or infraspecific

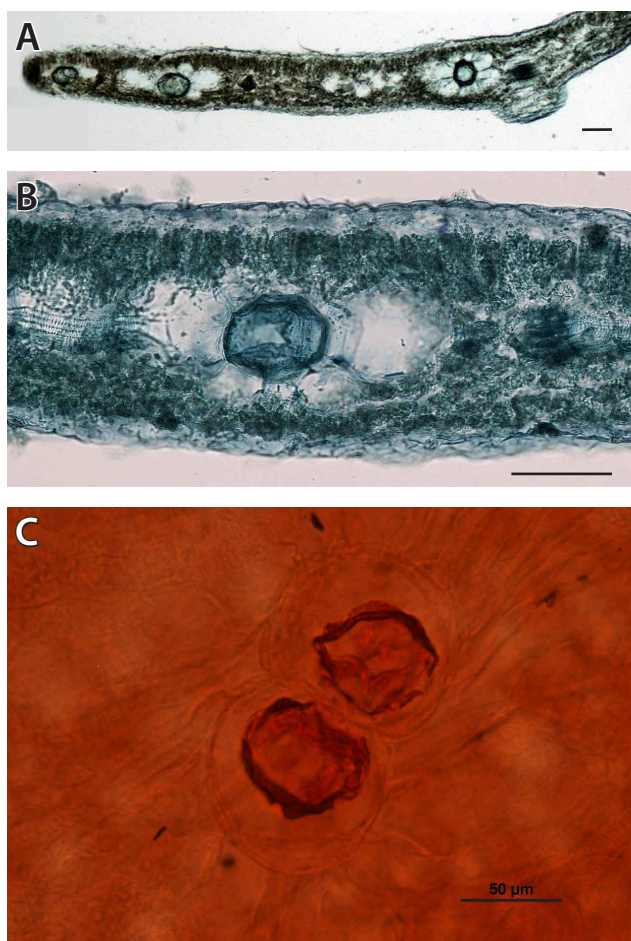


Fig. 1. The subepidermal gland in *Lindernia* subg. *Didymadenia*. **A, B** Transverse section of leaf of *Lindernia mitrasacmoides* (W.R. Barker 7045, AD), stained in Toluidine Blue O. **C** View through top of leaf of *Lindernia dunlopii* (R.M. Barker 284, AD), cleared with KOH and stained with Sudan IV. — Scale: A, B = 100 µm; C = 50 µm.

level. Other hairs are of diagnostic value outside the subgenus. These tiny hairs, terminated by four-celled glands c. 15–30 µm in diameter, occur across the family; such hairs have been seen, for example, in samples of *Bonnaya* and the subgenera *Lindernia* and *Didymadenia* of *Lindernia*. Apparently homologous hairs occur widely across the families of the traditional Scrophulariaceae (Barker, pers. obs.). Antrorse narrow deltoid single-celled eglandular hairs occur on leaf, bract and sepal margins in many genera of Linderniaceae; they are absent from subg. *Didymadenia* although a few species in sect. *Hemiarrhena* (Benth.) W.R.Barker bear probably homoplasious soft antrorse eglandular hairs along the sepal margins.

Subepidermal glands

Lindernia subg. *Didymadenia* is defined by 2-celled glands, elliptic in outline, which are found midway between upper and lower surfaces of the leaves (Fig. 1), on stems and branches, bracts and sepals and sometimes the corolla and capsule. While always embedded in the cellular matrix below the cuticle, they are often evident externally, through the cuticle. On occasions (e.g. in *L. dunlopii* and *L. pustulosa*) the surface of green parts of the plant (e.g. leaves, bracts and sepals) is raised above each gland, or in other species these parts and the capsule surface are 'spotted' arising from the visibility of the glands through the epidermis. The descriptive term 'blister glands' is proposed for these instances.

Seeds

Seed morphology is a promising area of study for establishing synapomorphies for defining genera and infrageneric groups in the Linderniaceae (Biffin *et al.*, in press).

While seeds in the newly erected sect. *Didymadenia* have four longitudinal ribs (Barker 1990, 1992a), they can be more variable in other sections of subg. *Didymadenia*, with some species having up to 8-ribbed seeds. The concavities between the ribs are generally relatively deep furrows, but in some species of sect. *Hemiarrhena* the seeds are almost circular in transverse section. The ribs are bridged by finer transverse ridges, varying in number from about four to 20, which are in some species confined to the intervening furrows, while in others they connect across the longitudinal ribs.

Scent

Some of the Australian species of subg. *Didymadenia* are noticeably scented. The source of the scent is likely to be the 2-celled subepidermal glands, although whether they contain aromatic oil still has to be proven.

Herbarium material examined

Specimens from PERTH, DNA and AD form the principle basis of this paper, supplemented by observation of material on visits to BRI, MEL and CANB and examination of specific specimens by staff or associates in PERTH, MEL and NSW. The

specimen citations reference only duplicates that have been examined for this study.

The material of *L. grossidentata* O.Schwarz and *Ilysanthes mitrasacmoides* O.Schwarz used in the protologues (Schwarz 1927) was sent to Berlin by Darwin-based collector F.A.K. Bleeser. Many of the Berlin collections were destroyed in World War II, including the B syntypes of these species, while Bleeser's own herbarium was destroyed after a cyclone (McKee 1963; Willis 1966; George 2009). Their absence from the B collection has been confirmed by Dr R. Vogt (pers. comm., 9 Apr. 2018). Herbarium web sites have been searched for type material. Duplicates of Bleeser collections survive, principally in MEL, NSW and K, with some secondarily in DNA. The Australasian Virtual Herbarium (2017) provides details of 230 Bleeser collections, mainly in MEL and NSW, while an on-line search of the specimen image database on JSTOR Global Plants (2017) revealed 27 types collected by Bleeser, including some duplicates, mostly in MEL and NSW, as well as K, B, BM and WIS, but no syntype material, identifiable by annotations by Schwarz, has been located. Fortunately, isosyntypes of *Ilysanthes mitrasacmoides* are housed in NSW and DNA.

Taxonomy

Lindernia subg. *Didymadenia* W.R.Barker

J. Adelaide Bot. Gard. 13 (1990) 79. — **Type:** *L. chrysopectra* W.R.Barker

Hemiarrhena Benth., *Fl. Austral.* 4 (1868, as 1869) 518; Benth., *Hooker's Icon.* Pl. 11 (Ser. 3: 1) (1870) 46, pl. 1059. — **Type:** *L. plantaginea* (F.Muell.) F.Muell.

Bradshawia F.Muell., *Proc. Linn. Soc. New South Wales*, Ser. 2, 6 (1892) 473, *nom. prov.*, based on *L. macrosiphonia* (F.Muell.) W.R.Barker.

Annuals, rarely perennial herbs; subepidermal glands present in the stems, leaves, sepals and often capsule wall. *Vestiture:* leaf, bract and calyx margins not scabrous from antrorse robust aculeate eglandular hairs, rarely with scattered soft eglandular hairs. *Stamens:* two pairs inserted on the abaxial and adaxial side of the corolla tube, sometimes one of the pairs lost or reduced

to staminodes; lower filaments bearing a lateral spur, rarely the spur reduced to a knob or absent; anthers with two confluent opposed, sometimes obliquely so, cells, sometimes 1-celled through reduction or loss of a cell. *Stigma* 2-lobed. *Capsules* narrow obloid-ellipsoid to globular; seeds many, longitudinally 4–8-ribbed, with a few to many transverse secondary ridges across the intervening furrows.

Distribution. Mostly confined to northern and northeastern tropical and subtropical Australia; two species, *L. subulata* and *L. scapigera*, extend to southern New Guinea.

Note. Five sections within this subgenus are defined below.

A. Lindernia sect. *Prolatae* W.R.Barker, sect. nov.

Typus: *L. prolata* W.R.Barker

Annuals; stems and branches erect or narrowly ascending, terminated by open erect racemes. *Leaves* sessile and subulate or subpetiolate, narrow to broadly ovate. *Pedicels* erect to widely spread. *Corolla* regular, without internal longitudinal flaps; tube narrow, elongated, conspicuous, as long or longer than the limb; upper lip porrect, emarginate. *Stamens* 4, the abaxial filaments with a cylindrical spur; anthers 2-celled. *Capsules* ovoid to subglobular; seeds with 4–8 longitudinal ribs and c. 6–20 secondary transverse ridges.

Distribution. A section spread from the Dampier Peninsula near Broome, Western Australia, across tropical and subtropical northern Australia and eastern Australia as far as the north coastal region of New South Wales. This matches the geographical range of *Lindernia* in Australia.

Note. The section includes *L. subulata* R.Br., *L. beasleyi* Wannan, *L. stantonii* Wannan and the species newly described here.

Etymology. The epithet of the type species (q.v.) was chosen in part as the resultant sectional name reflects the broad geographical distribution of the section.

Key to sections of *Lindernia* subg. *Didymadenia*

1. Perfect anthers 4
 2. Anthers 2-celled
 3. Corolla tube and hood not infolded, the stamens and style evident from below
 4. Leaves entire, subulate and sessile or ovate and sessile or subsessile **A. sect. *Prolatae***
 - 4: Leaves entire through sinuate to dentate, subpetiolate, ovate or broadly so **C. sect. *Scapigerae***
 - 3: Corolla tube infolded, the adaxial filaments and style positioned above the folds . . . **B. sect. *Didymadenia***
 - 2: Anthers of adaxial pair 2-celled, of abaxial pair 1-celled **D. sect. *Heterandrae***
- 1: Perfect anthers 2, 1- or 2-celled, with or without a pair of abaxial staminodes **E. sect. *Hemiarrhena***

Key to species of *Lindernia* sect. *Prolatae*

1. Inflorescence (rachis, bracts, pedicels and sepals) glabrous
2. Leaves ovate to \pm circular **1. *L. prolata***
- 2: Leaves narrow linear to subulate
3. Sepals red- to black-lined; middle lobe of the lower corolla lip white with two blue-purple blotches . . . **2. *L. atrata***
- 3: Sepals not lined; corolla not as above
4. Pedicels more than 10 mm long
5. Corolla lobes spotted; ovary glandular pubescent ***L. subulata***
- 5: Corolla lobes not spotted; ovary glabrous ***L. beasleyi***
- 4: Pedicels less than 10 mm long ***L. stantonii***
- 1: Inflorescence glandular hairy
6. Corolla white to blue without red spotting; lower corolla lip with a green blotch
7. Glandular hairs in inflorescence 0.01–0.025 mm long **3. *L. cyanoptera***
- 7: Glandular hairs in inflorescence 0.1–0.15 mm long **4. *L. murfetiana***
- 6: Corolla yellow with red spots **5. *L. dierythra***
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1. *L. prolata* W.R.Barker, sp. nov.

Holotypus: *R.W. Jobson 1291*, 1 Oct. 2011, Kingaroy, Queensland (NSW 885850). **Isotypi:** AD 279775, BRI.

L. sp. Tingoora (A.R. Bean 10311) Queensland Herbarium: N.Fechner in Bostock & A.E.Holland, *Census Queensland Fl. 2007* (2007) 188.

Multi-branched ?annual herb, the main branches c. 3.5–19 cm long, decumbent to ascending, rooting at basal nodes. *Leaves* ovate to \pm circular, 3–10 mm long, sessile, narrow cuneate, sometimes subpetiolate. *Inflorescences* open erect terminal racemes; pedicels erect, sometimes spreading in fruit, much longer than the bracts. *Corolla* (4.0–) 6–8.5 mm long along upper side, blue to blue-purple, rarely white; lower lip with a white mid lobe, with dark blue-purple base and two blotches. *Stamens* 4; abaxial spur exserted, cylindrical, pale blue or bluish-white; anthers 2-celled. *Capsule* obloid-ovoid to globular, 2.5–3.5 mm long, glabrous; seeds (*Johnstone 2355 & Orme*) obloid-ellipsoid, rarely broadly so, 0.35–0.45 (–0.5) mm long, with 6 sharp longitudinal ribs.

Distribution. In eastern Australia in regions neighbouring coastal south-eastern Queensland and north-eastern New South Wales. In seasonally inundated areas.

Etymology. The adjectival epithet derives from the Latin adjective *prolatus*, extended or elongated, alluding to the very long pedicels at flowering time; also influenced by resultant sectional name (q.v.).

Selected additional specimens

QUEENSLAND: 7.2 km along Dangore Mtn road, WSW of Tingoora, 21 May 1996, *A.R. Bean 10311* (AD); 33 km NNE of Chinchilla, 1 Oct. 1993, *M.E. Ballingall 2733* (AD); Hellhole Creek, near Auburn Road in Barakula Forestry [Reserve], 6 Mar. 1984, *V. Hando s.n.* (AD 98413060).

NEW SOUTH WALES: C. 2 km (direct) E of Coopernook along Spring Hill Road, 30 Apr. 2008, *R. Johnstone 2355 &*

A.E. Orme, (NSW, as photo, AD, seeds only); 20 km W of Wooli, 23 Nov. 1987, *R. Bates 12879* (AD).

2. *L. atrata* W.R.Barker, sp. nov.

Holotypus: *I.D. Cowie 12020*, 22 Apr. 2008, Limmen National Park, c. 24 km S of Ranger Station, Northern Territory (AD 246363). **Isotypi:** DNA (*n.v.*), B (*n.v.*).

Erect glabrous single-stemmed annual, 12–50 cm tall. *Leaves* deltoid-linear to filiform, the longest on a stem 5–12 mm long, sessile, entire. *Inflorescences* open simple terminal racemes of 1–7 or more flowers; pedicels longest at lowest node, ascending, 5–22 mm long, much longer than the subulate bracts. *Corolla* 5–8 mm long along the upper side, mid blue throughout, sometimes with fine red-purple striations, with two mid yellow blotches, one behind the other, on the lower side of the mouth and throat and with two deep purple blotches at base of lowest lobe. *Stamens* 4; abaxial spur exserted, cylindrical, white; anthers 2-celled. *Capsule* ellipsoid to globular, 2–2.3 mm long, glabrous; seeds obloid, 0.25–0.28 mm long, c. (?5–) 6 longitudinal sharp ribs, with 9–10 fine secondary ridges across intervening furrows.

Distribution. In the Limmen region of Northern Territory, on the west coast of the Gulf of Carpentaria, south of Arnhem Land.

Etymology. from the Latin adjective *atratus*, dressed in black, derived from *ater*, black, dark, and the suffix *-atus*, meaning provided with, alluding to the conspicuous red- to black-lined margins of the sepals.

Selected additional specimens

NORTHERN TERRITORY: Limmen National Park, c. 12 km SW of Nathan River Ranger Station, Site 70, 18 Apr. 2008, *P.S. Short 5513* (DNA); Cox River Station, 30 June 1977, *T.S. Henshall 1568* (DNA).

3. *L. cyanoplectra* W.R.Barker, sp. nov.

Holotypus: *B.J. Carter 679*, 6 Sep. 1993, Taylors Lagoon, c. 76 km ENE of Broome, Western Australia (PERTH 3234320). **Isotypus:** AD 270009.

Annual, 7–10 cm high, with erect to decumbent branches, with the inflorescence covered by tiny glandular hairs to c. 0.02 mm long. *Leaves* sessile, subulate, 3–15 mm long, dilated at the base. *Inflorescence* an open terminal raceme, with pedicels much longer than the subulate bracts. *Corolla* 4.5–6.5 mm long along upper side, light to mid blue, the lower lip with a green blotch. *Stamens* 4; abaxial spur long, exerted, blue; anthers perfect, blue, 2-celled. *Capsule* broadly ellipsoid, 1.8–2.8 mm long, glabrous; seeds (*Carter 679*) ellipsoid, c. 0.3–0.35 mm long, with 4–5 (–?6) longitudinal ribs.

Distribution. South and east of the Dampier Peninsula, northern Western Australia, in seasonally inundated areas.

Etymology. The adjectival epithet derives from the Greek *kyanos*, dark blue, and *plektron*, a tool for plucking or spur, alluding to the colour of the conspicuous staminal spurs of this species.

Selected additional specimens

WESTERN AUSTRALIA: C. 75 km E of Broome, just S of highway to Fitzroy Crossing, 26 June 2007, *D. Coultas & B. Taylor Opp 10* (PERTH); Edge of Nemila Creek near Blina Swamp, 21 Mar. 2010, *D. Murfet 6786 & A. Lowrie* (AD); 55 km E of Broome, just S of highway to Fitzroy Crossing, 27 June 2007, *Woodman & K. Greenacre Y1S11-01* (PERTH).

4. *L. murfetiana* W.R.Barker, sp. nov.

Holotypus: *W.R. Barker 9129 & K. Brennan*, 19 May 2013, on vehicular track c. 250 m SE of Litchfield Park Road, c. 1.2 km direct S of Finnis River Crossing, Northern Territory, Darwin & Gulf District (AD 268115). **Isotypi:** BRI, CNS, CANB, DNA, PERTH.

L. sp. Hann River (M. Lazarides 9167) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Erect, rarely decumbent, annual herb, (10–) 20–25 cm tall, glabrous but for the moderately dense to dense glandular hairs in the inflorescence. *Leaves* sessile, filiform to narrow ovate-caudate, near base of plant 3–8 mm long but much shorter distally. *Inflorescence* a terminal few-flowered raceme. *Corolla* 9–10.5 mm long along the upper side, white, yellow or blue, with green blotches on the lower lip. *Stamens* 4, with abaxial spurs exerted from the corolla mouth, cylindrical, long; anthers white, 0.8–1.0 mm long, 2-celled. *Capsule* broad ellipsoid to globular, 2.3–2.5 mm long, glabrous; seeds ellipsoid-obloid to obloid, 0.2–0.3 mm long, with 6–8 longitudinal ribs.

Distribution. Mainly in the Darwin to Litchfield area of northern Northern Territory, with outliers further west in Arnhem Land; in seasonally inundated areas.

Etymology. Named after Denzel Murfet, an avid collector associated with the State Herbarium of South Australia, whose many collections and associated floral photographs from Northern Australia have been valuable in the unravelling of the taxonomy of *Lindernia*.

Selected additional specimens

NORTHERN TERRITORY: Howard Springs, S side of ephemeral lagoon area (Sect. 3950), over fence bordering Sections 3953 and 3954, ca. 1 km E of Dutchies Lagoon, c. 100 m N of Corella Avenue, 29 May 1997, *W.R. Barker 7735 & R.M. Barker* (AD); 300 m from Cox Peninsula Road and Bynoe Harbour road, 6 July 2008, *D.E. Murfet 6054* (AD); Edge of McMinn's Lagoon, 26 June 1968, *D. Wheelwright 45* (AD, DNA); 19 km NNW of Twin Falls, 3 June 1980, *M. Lazarides 9167* (CANB, DNA).

5. *L. dierythra* W.R.Barker, sp. nov.

Holotypus: *W.R. Barker 7873 & K. Brennan*, 16 Apr. 1999, near Lost City [precise locality withheld for conservation reasons], Litchfield National Park, Northern Territory (AD 268129). **Isotypi:** B, BRI, CANB, CNS, DNA, K, MEL, MO, NSW, PERTH.

L. sp. Litchfield (I.D. Cowie 5725) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Erect, finely glandular-pubescent, annual herb, 3.5–17 cm high, often a simple single stem. *Leaves* sessile, narrow linear, longer at higher nodes, the longest 8–15 mm long. *Inflorescence* an open terminal raceme or appearing paniculate when upper branches are present; pedicels longer than the bracts, usually reflexed in fruit. *Corolla* 6.5–8 mm long along upper side, bright yellow with red spots on the lower lip. *Stamens* 4, the abaxial spurs short, cylindrical, yellow; anthers 0.7–0.8 mm long, 2-celled. *Capsules* broad ovoid, c. 3.5 mm long, glandular-pubescent; seeds obloid or broadly so, c. 0.4 mm long, with 4 blunt longitudinal ribs.

Distribution. Near The Lost City, Litchfield National Park, Northern Territory in grassy herbfield on sand.

Note. As observed by I.D. Cowie (5725), this species mimics taxa such as *Uvedalia linearis* R.Br. var. *lutea* (Benth.) W.R.Barker & Beardsley in the rare attribute of having yellow flowers with prominent red spotting on the lower side of the corolla.

Etymology. The epithet *dierythra* is an adjective meaning spotted or variegated with red (Brown 1956), alluding to the red-freckled corolla mouth; it is derived from the elision of the Greek *dia-*, a prefix for indicating separation, and *erythros*, red.

Additional specimen examined

NORTHERN TERRITORY: Near Lost City, 16 Apr. 1995, *I.D. Cowie 5725* (AD, DNA).

B. *Lindernia* sect. *Didymadenia* (W.R.Barker)**W.R.Barker, stat. nov.**

Lindernia subg. *Didymadenia* W.R.Barker, *J. Adelaide Bot. Gard.* 13 (1990) 79, basionym. — **Type:** *L. chrysoplectra* W.R.Barker

Annuals or short-lived perennials; stems and branches erect or narrowly ascending, terminated by open erect racemes, or prostrate, procumbent or pendent (from rock faces) with terminal inflorescences not strongly demarcated through the foliose bracts. *Leaves* subpetiolate, narrow to broadly ovate to obovate. *Pedicels* erect or ascending, in fruit sometimes deflexed, rarely elongating and extending into rock crevices. *Corolla* regular or resupinate, invaginated on either side into a pair of internal flaps; tube usually conspicuous, rarely much shorter than the limb; upper lip porrect or upturned, emarginate. *Stamens* 4, or 2 with 2 adaxial (abaxial in resupinate flowers) staminodes; abaxial filaments with a cylindrical or reduced spur, rarely

lacking; perfect anthers 2-celled. *Capsules* ovoid to subglobular; seeds 4-furrowed, with c. 6–20 transverse ridges.

Distribution. Most species occur in the Kimberley region of northern Western Australia, but a few occur in northern Northern Territory and north Queensland. In wet situations, woodland, stony ground and on rock faces.

Notes. The section includes the following newly described species, as well as *L. cleistandra* W.R.Barker, *L. eremophiloides* W.R.Barker, *L. macrosiphonia* (F.Muell.) W.R.Barker, *L. hypandra* W.R.Barker, *L. chrysoplectra* W.R.Barker, *L. aplectra* W.R.Barker, *L. tectanthera* W.R.Barker and *L. barkeri* Wannan.

The flowers, fruits and seeds of *L. macrosiphonia* are remarkably large.

Key to species of *Lindernia* sect. *Didymadenia*

1. Basal leaves subulate or narrow linear
 2. Corolla 9–10 mm long; anthers 1.2 mm long; lower filaments golden-spurred ***L. chrysoplectra***
 - 2: Corolla 5.5–7.3 mm long; anthers 0.4 mm long; lower filaments without spurs ***L. aplectra***
- 1: Basal leaves foliose, spatulate
 3. Flowers subtended by foliose bracts throughout the inflorescence; plant foliose, procumbent on ground or pendent from vertical rock faces
 4. Corolla tube 70–100 mm long ***L. macrosiphonia***
 - 4: Corolla tube up to 15 mm long along the upper side
 5. Leaves alternate; sepals fused for 1/8 to 1/3 their length ***L. eremophiloides***
 - 5: Leaves opposite; sepals free almost to base
 6. Pendent perennial, growing on rock faces
 7. Pedicels hardly lengthened in fruit, exposed; capsule 5.5–9.5 mm long **6. *L. scopularis***
 - 7: Pedicels turned back and elongated into dense foliage or deep into crevices; capsule 3.5–5.5 mm long ***L. cleistandra***
 - 6: Procumbent annual **7. *L. petrensis***
 - 3: Flowers subtended by narrow linear to subulate bracts, apart sometimes for the basal nodes of the inflorescence; plant erect annual, with cluster of leaves at base, and stem with scattered leaves reduced in size or a scape
 8. Flower regularly oriented
 9. Stamines without a spur
 10. Stamines outcurved, conspicuous, yellow, terminated often with an obscure vestigial anther often with a very short to short filiform white filament; robust, erect, scapiform herb; leaves usually confined to a basal rosette, sometimes of reduced size at a few nodes up the stem or main branches ***L. tectanthera***
 - 10: Stamines porrect, white; delicate erect to scandent herb; leaves broadest in middle nodes of stem up to the node below the inflorescence ***L. barkeri***
 - 9: Stamines porrect to outcurved, with a terminal spur and a short to long filament arising behind its tip **8. *L. lobelioides***
 - 8: Flower resupinate
 11. Corolla tube narrowly dilated ***L. hypandra***
 - 11: Corolla tube broadly dilated **9. *L. porphyrodinea***

6. *L. scopularis* W.R.Barker, sp. nov.

Holotypus: W.R. Barker 7080 & R.M. Barker, 5 June 1994, Bessie Springs, Northern Territory (AD 99818368). **Isotypi:** BRI, CANB, CNS, DNA, GH, K, MEL, NSW, PERTH.

L. sp. Cliff lover (P.K. Latz 10123) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Perennial glabrous herb, usually with pendent branches to c. 40 cm or more long, or, when smaller, forming small cushions. *Leaves* spatulate, (1–) 2–4 (–6) cm long, usually coarsely serrulate, sometimes entire. *Inflorescences* terminal, leafy, with to 10 or more flowers, with pedicels shorter than the leafy bracts, c. 1–10 mm long, in fruit recurved but not elongating. *Corolla* 8–10 mm long along the upper side, usually white, with fine blue striations extending from tube to lobes, sometimes “pale lilac” or “pale mauve”. *Stamens* 2, in adaxial position, the abaxial pair reduced to staminodes; adaxial anthers 1–1.4 mm long, 2-celled; abaxial staminodes obloid, yellow or white, tipped by a very short lateral filament and vestigial anther. *Capsule* ovoid, 5.5–9.5 mm long, glabrous; seeds narrow obloid, often curved, 1.4–1.8 mm long, 4-angled, with 10–12 transverse ribs between.

Distribution. Inland from the west coast of the Gulf of Carpentaria, Northern Territory, east-northwest and southwest of Borroloola in the Nathan River station area to the Abner Range (Bessie Springs).

Etymology. The adjectival epithet is derived from the Latin *scopulus*, cliff, and the suffix *-aris*, belonging to, alluding to the cliff face habitat of this species.

Selected additional specimens

NORTHERN TERRITORY: 28 km S Nathan River homestead, 11 Sep. 1995, P.K. Latz 14547 (AD); McArthur River area, 27 Jan. 1976, L.A. Craven 3413 (NT); 11 km S of Balbarini Homestead, 10 Nov. 1988, P.K. Latz 11041 (AD, DNA).

7. *L. petrensis* W.R.Barker, sp. nov.

Holotypus: W.R. Barker 7838 & K. Brennan, 5 Apr. 1999, on south face of Nourlangie Rock, c. 200 m N and above Anbangbang rock art site, Northern Territory (AD 279073). **Isotypi:** BRI, CANB, CNS, DNA, PERTH.

L. sp. Kakadu (J.L. Egan 4819) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Procumbent, rarely scandent, much-branched, glandular-pubescent annual, with stem and main branches 5–30 cm long. *Leaves* spatulate, 0.2–4 cm long, serrulate, rarely entire. *Inflorescence* rarely solitary, usually a few flowers in a leafy open raceme; bracts leaf-like or shorter, 0.3–2.5 cm long, the pedicels to 2.5 cm long, deflexed in fruit. *Corolla* 6.5–9 mm long along upper side, with white tube and mid blue-purple limb. *Stamens* 2, adaxial perfect, the anthers 0.5–0.6 mm long, 2-celled, deep blue; abaxial staminodes linear,

golden yellow, tipped by a vestigial anther. *Capsule* globular, 2.5–4.2 mm long, glabrous; seeds obloid, 0.8–1.3 mm long, 4-angled.

Distribution. Across northern Arnhem Land, Northern Territory, and to the south and south-west on Bradshaw Station. Between sandstone rocks in dense sorghum over herbfield or in bare sandstone gravel.

Etymology. An adjectival epithet from the Greek *petra*, rock, shelf or ledge or rock; *petrensis*, among rocks, alluding to the habitat on flattish ground in skeletal soil on or between rocks.

Selected additional specimens

NORTHERN TERRITORY: Arnhem Land, c. 81 km SSW of Maningrida, 23 Mar. 2000, I.D. Cowie 8738 (DNA); East of entry to Merl camping area, 21 Apr. 1999, W.R. Barker 7887 & I. Cowie (AD); Upper Liverpool River, Chester Ck Kulnguki area, 20 Apr. 2009, K.G. Brennan 7983 (DNA); Bradshaw Station, near Fire Plot 3, 18 Feb. 1999, C. Mitchell 2183 (DNA).

8. *L. lobelioides* (F.Muell.) F.Muell.

Syst. Census Austral. Pl. (1882) 97. — *Vandellia lobelioides* F.Muell., *Trans. Philos. Inst. Victoria* 3 (1859) 61, basionym (“Sect. Bonnaya”) [non *V. lobelioides* Oliv., *Trans. Linn. Soc. London* 29 (1875) 120, *nom. illeg.* (= *Craterostigma newtonii* (Engl.) Eb. Fisch., Schäferh. & Kai Müll.)]. — *Ilysanthes lobelioides* (F.Muell.) Benth., *Fl. Austral.* 4 (1868) 498. — **Type citation:** “A companion of *Vandellia clausa* to which it stands in close affinity. ... [From treatment of *V. clausa* referred to in the protologue] On sand-plains, subject to occasional inundations, on the Victoria River and its tributaries.” — **Lectotypus (hic designatus):** *F. Mueller s.n., s.dat.*, Victoria River, from the Depot Creek to the main camp [the latter at c. 15°34'S, 130°22'E] / *Dr M[ueller] s.n.*, May [18]56, Victoria River, below Steep Head, [c. 15°33'S, 130°55'E] (MEL 1552811; Fig. 2). **Isolectotypus:** *Dr M[ueller] s.n., s.dat.*, Victoria River (K 859763; Herb. Hooker) (“Bonnaya (*Ilysanthes*) *lobelioides* ferd. Mueller” in Mueller’s hand). **Syntypus possibilis sed exclusus:** *F.Muell. s.n., s.dat.*, Victoria River (MEL 1552812; “*Vandellia lobelioides* ? / *Lindernia*” in Mueller’s hand).

Typification. The lectotype was collected between 6th and 9th May 1856. During this period, the Gregory exploring party returned to the Bynoe Range on the Gregory River where Steep Head is located (Birman 1979).

The MEL lectotype is the better of the two syntypes; it has a clearly discordant label (the mid in the right-hand group of three) with handwritten notes and a sketch by Mueller showing unilocular anthers matching those of *L. clausa* (F.Muell.) F.Muell., which Mueller collected on the same expedition (MEL 1552814, MEL 1552815).

The collection MEL 1552812 has also been considered a potential syntype. However, it is not this species; the capsules are elongated as evidenced by the distinctly narrow septum.

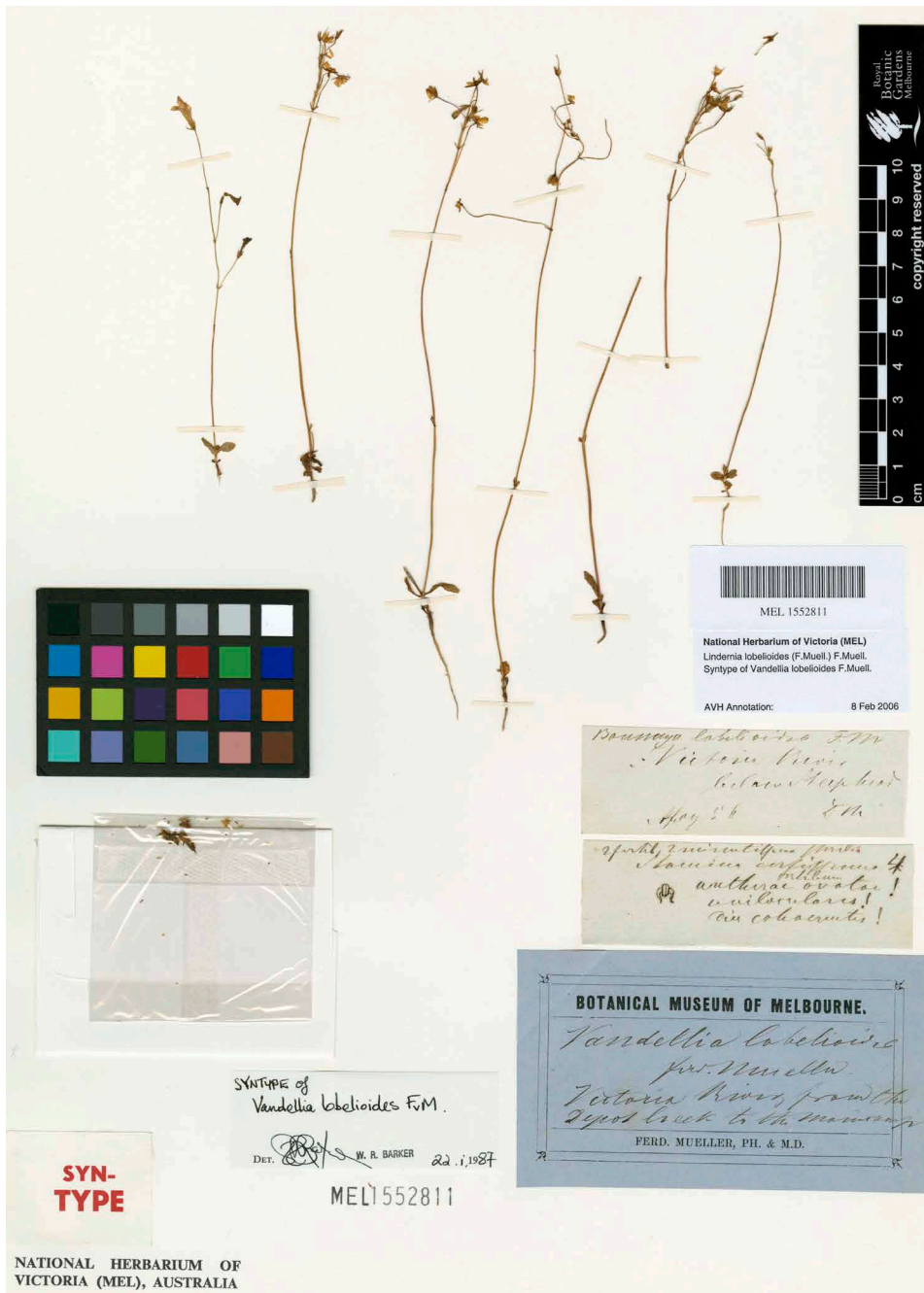
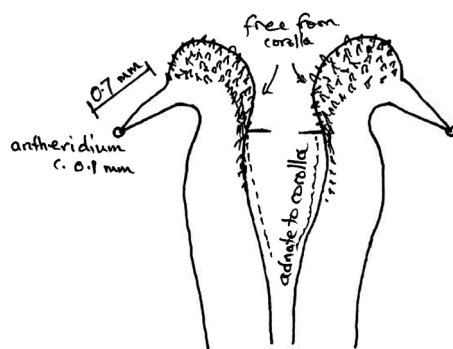


Fig. 2. Lectotype of *Vandellia lobelioides* F. Muell. at the National Herbarium of Victoria (MEL 1552811; reproduced with permission from the Royal Botanic Gardens Victoria).



Lindernia lobelioides
Staminodia of detached flower. Rehydrated & drawn by N.G. Walsh 7.viii.2017

Fig. 3. Staminodes in lectotype of *Vandellia lobelioides* F. Muell. (MEL 1552811). Del. Neville Walsh (published with his permission).

Notes. The descriptions of *L. tectanthera* by Barker (1990, 1992a) encompass both *L. lobelioides* and *L. tectanthera* except in the description of the staminal spurs.

L. lobelioides and *L. tectanthera* are both widespread in the Kimberley and are very similar in almost all respects, in floral shape and coloration, and in habit, although the latter is rosulate with multiple scapes, the former usually erect with larger leaves above the ground, and a single terminal inflorescence. The staminodes, however, are very different morphologically, as presented in the above key. Results of DNA analysis (Barker & Biffin, in prep.) show the two taxa to be phylogenetically well separated.

9. *L. porphyrodinea* W.R.Barker & M.D.Barrett, sp. nov.

Holotypus: *M.D. Barrett 4647 & K.W. Dixon*, 20 Mar. 2015, near Bachsten Creek [precise locality withheld for conservation reasons], Western Australia (PERTH 8926859). **Isotypi:** AD, BRI, CANB, DNA, K.

Erect glabrous annual herb to c. 20–35 cm high. *Leaves* in rosette at plant base, sessile or very shortly subpetiolate, obovate, 10–20 mm long, along stem subulate, 2–5 mm long. *Inflorescences* floriferous open racemes terminating the branches or in upper leaf axils, the pedicels much longer than the bracts, widely spreading in fruit. *Flower* resupinate, the corolla bilabiate, 6.5 mm long along the upper (adaxial) side, purple with the throat marked with a white longitudinal band along the lower side and a pair of white striations on each side. *Stamens* 2 functional, positioned abaxially, anthers c. 0.8–1 mm long; staminodes 2, positioned adaxially, stout, yellow. *Capsules* globular, 2.5 mm long, glabrous; seeds (2 seen) narrow obloid, 0.4–0.5 mm long, finely 4–5 angled.

Distribution. In the Prince Regent River watershed, western Kimberley, Western Australia. On sand flats in mixed herbfield or damp clay in closed grassland.

Note. A patch of hundreds of plants, most in full flower, co-occurred with *L. hypandra* which was only just coming into flower (*M.D. Barrett 671*, AD).

Etymology. The adjectival epithet is derived from the Greek *porphyro-*, purple, *dinos*, cup, and *-eus*, noted for (Stearn 1966, p. 267), alluding to the distinctively open-mouthed purple-limbed corolla.

Selected additional specimen

WESTERN AUSTRALIA: Blyxa Creek, Prince Regent River Reserve, 19 Aug. 1974, *A.S. George 12432* (CANB, PERTH).

C. *Lindernia* sect. *Scapigeræ* W.R.Barker, sect. nov.

Typus: *L. scapigera* R.Br.

Annuals; stems and branches erect or narrowly ascending to procumbent, terminated by open racemes. *Leaves* subpetiolate, narrow to broadly ovate to obovate. *Pedicels* erect or ascending, in fruit sometimes deflexed, hardly elongating. *Corolla* regular, lacking internal longitudinal flaps; tube conspicuous, as long or longer than the limb; upper lip porrect or slightly upturned, emarginate. *Stamens* 4, with the abaxial filaments bearing a lateral cylindrical spur; anthers 2-celled. *Capsules* ovoid to subglobular; seeds longitudinally 4–8-ribbed, with 5–9 (–?10) transverse ridges.

Distribution. From the Kimberley, Western Australia, to north and east Queensland.

Note. The section includes *L. alsinoides* R.Br., *L. pubescens* (Benth.) F.Muell. and *L. scapigera* R.Br. Three further species that have been confused with *L. scapigera* are separated.

Key to species of *Lindernia* sect. *Scapigeræ*

1. Corolla to c. 6 mm long along upper side ***L. alsinoides* s. lat.**
- 1: Corolla greater than 6 mm long along upper side
2. Stems and leaves glandular hairy ***L. pubescens***
- 2: Stems and leaves glabrous
3. Corolla blue to blue-purple
4. Scandent, often multi-stemmed annual; leaves entire through undulate to coarsely serrulate within a population; corolla blue, purple or blue-purple with white tube, rarely white, with deeper blue-purple blotches on either side of the lowest lobe **10. *L. scapigera***
- 4: Erect, free-standing annual; leaves entire to coarsely serrate within a population; corolla mid blue with lower lip splashed with white **11. *L. grossidentata***
- 3: Corolla yellow
5. Corolla light to deepish yellow throughout, often with a few red streaks in the mouth; hood, 1.3–2.5 mm long; adaxial staminal spur 1.6–2.4 mm long **12. *L. tiwiensis***
- 5: Corolla white inside, yellow in throat extending onto lower lip, with outside of tube above yellow to brown; hood 0.8–1.5 mm long; adaxial staminal spur 0.6–1.5 mm long **13. *L. leucochroa***

10. *L. scapigera* R.Br.

Prodr. (1810) 441. — *Vandellia scapigera* (R.Br.) Benth. in DC., *Prodr.* 10 (1868) 415. — *Tittmannia scapigera* (R.Br.) Spreng., *Syst. Veg.*, ed. 16, 2 (1825) 800. — *Ilyogeton scapigera* Benth. in DC., *Prodr.* 10 (1868) 415, *pro syn.* (this combination in *Ilyogeton* Endl. did not appear in Walp., *Rep. Bot. Syst.* 3: 297, as attributed by Bentham). — **Type citation:** “(T.) v.v.” [from the tropical region of Australia, seen living *in situ*]. — **Lectotypus** (Philcox 1968: “holotype”): *R. Brown Iter Australiense 2696*, lect. 20 Dec. 1802, desc. 21 Dec. 1802, Carpentaria Islands h, cfr *Vandelioides* a facing Island. / North Coast, *Lindernia gracilis*. / *R. Brown s.n.*, Northern Territory, North Island (island h), Sir Edward Pellew Group (BM 1040723; Fig. 4). **Isolectotypi:** *R. Brown s.n.*, 20 Dec. 1802, Northern Territory, North Island (island h), Sir Edward Pellew Group (BM 1040724); *R. Brown Iter Australiense 2696*, *s. loc.* (“*Lindernia scapigera*, *Vandellia scapigera*”; K 859768, photo); [*R. Brown*] *s.n.*, *s.dat.*, Carpentaria (ex Herb. R. Brown 8/80). / “*Vandellia scapigera*, Bth [sic!]” (K 859770).

Typification. The name *L. scapigera* has been applied to several taxa of similar appearance across northern Northern Territory. High quality photographs of the types available on-line through JSTOR Global Plants enable confirmation that the type belongs with a species that extends from south of Darwin to the Sir Edward Pellew Group of islands in the Gulf of Carpentaria. This is the only species in the east of the range of the complex (Barker, in prep.). Brown collected and immediately described the collection in detailed notes. The collection is represented by three sheets (syntypes), necessitating a lectotypification. The specimen BM 1040723 is the best collection as it has multiple labels by Robert Brown and has several plants in flower and fruit. This is the syntype annotated with the species identity by Philcox (1968) for his revision of Malesian *Lindernia*, in which he cited the BM specimen as a holotype: “Carpentaria Island Dec., R. Brown ‘2696’ (Holotype BM, isotype K)”. The ICN (Art. 9.9: McNeill *et al.* 2012) indicates Philcox’s published designation of holotype is to be interpreted as a lectotypification.

The syntypes in BM and K are clearly from the same collection from the annotations and the similarity of the specimens; they are also in good condition.

L. scapigera 2: Biffin *et al.*, *Austral. Syst. Bot.* 31 (2018), in press.

Distribution. In Northern Territory, from south of Darwin across northern Arnhem Land to Vanderlin Island in the Sir Edward Pellew Group islands in the Gulf of Carpentaria.

Selected additional specimens

NORTHERN TERRITORY: Angularli Creek, Coburg Peninsula, 23 Aug. 2009, *D.E. Murfet 6570* (AD, DNA); Hades Flat Met[eorological] Station, 1 km W of Oenpelli road, 17 km from Arnhem Highway, 6 May 1983, *R.M. Barker 458* (AD); Gulungul Creek crossing on Arnhem Highway, c. 600 m W of turnoff to Jabiru Airport, 16 May 1994, *W.R. Barker 6881*, *R.M. Barker & M.C. O’Leary* (AD);

Arafura Swamp, east side, c. 17 km SE of Ramingining, 10 Dec. 1998, *I.D. Cowie 8129 & R.K. Harwood* (AD); 5 km NNW of Lake Eames, Vanderlin Island, 24 July 1988, *P.K. Latz 10747* (AD); Near Gulbuwangay River on track to Mirrnaja, 11 Oct. 2009, *D.E. Murfet 6616* (AD; voucher for Biffin *et al.*, in press).

11. *L. grossidentata* O.Schwarz

Repert. Spec. Nov. Regni Veg. 24 (1927) 96. — **Type citation:** “9 mi E of Darwin, wet patch of ground: Bleser 186”. — **Neotypus (hic designatus):** *W.R. Barker 7050 & R.M. Barker*, 1 June 1994, Howard Springs Park Estate, pending subdivision; c. 400 m down Parakeet Road from Bronzewing Road; 50 m N of road, Northern Territory (AD 99818363). **Isonotypi:** CANB, DNA, NSW.

Typification. No type material has been located despite a search of on-line resources (see p. 61). The species to which the name is applied here, and to which the neotype belongs, matches the protologue closely, particularly in the aniseed scent and often coarsely toothed leaves (“*margine remote et acute grossidentata*”; Schwarz 1927).

L. sp. Mount Bunday (*C.R. Dunlop 8840*) [N.T. Herbarium]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Distribution. In Northern Territory, in the vicinity of Darwin, extending to the Fish River area.

Note. Schwarz (1927) provides a detailed description of the species.

Selected additional specimens

NORTHERN TERRITORY: Mount Bunday Quarry, 12 Apr. 1991, *Dunlop 8840 & Cowie* (DNA); Charles Darwin National Park, 6 Mar. 1998, *P.S. Short 4667 & C.R. Dunlop* (AD, DNA); Douglas Hot Springs road, 17.6 km from old Stuart Highway, 29 Apr. 1983, *R.M. Barker 360* (AD).

12. *L. tiwiensis* W.R.Barker, sp. nov.

Holotypus: *I.D. Cowie 8462*, 16 Feb. 2000, Melville Island, c. 7 km SE of Garden Point, Northern Territory (AD 279773). **Isotypi:** DNA, BRI, CANB, K, MEL, NY, PERTH.

L. sp. Melville Island (*C.R. Dunlop 4609*) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007), partly.

Erect to scandent, glabrous, annual herb, simple or with up to 5 stem-like branches, these 8–40 cm long. *Leaves* in spaced pairs, spatulate, 5–25 mm long, entire to coarsely serrate. *Inflorescences* open terminal racemes of up to 10 flowers; pedicels much longer than the subulate to linear bracts, 7–25 mm long, deflexed in fruit. *Corolla* 6–6.7 mm long along the upper side, yellow, sometimes with red streaks; upper lip a porrect hood, 1.3–2.5 mm long. *Stamens* 4, perfect, with abaxial spur narrow cylindrical, straight or distally curved outwards and/or upwards, 1.6–2.4 mm long; anthers 2-celled, white. *Capsule* narrow obloid-ovoid to



Fig. 4. Lectotype of *Lindernia scapigera* R.Br. at the Natural History Museum, London (BM 001040723; image by Natural History Museum, CC-BY 4.0).

ovoid, 3.2–4 mm long; glabrous; seeds c. 0.5–0.6 mm long, with c. 5–6 longitudinal ribs.

Distribution. Confined to the Tiwi Islands, Northern Territory.

Etymology. The adjectival epithet alludes to the restriction of this species to the Tiwi Islands.

Selected additional specimens

NORTHERN TERRITORY: Melville Island, 8 Sep. 1977, C.R. Dunlop 4609 (AD, DNA); northern part, headwaters of Dudwell Ck, 28 Oct. 2014, I. Cowie 13702 & N. Cuff (DNA);

Bathurst Island, 30 Apr. 1998, C. Michell 1288 & R.K. Harwood (DNA); Melville Island, 10 km NW Pickertaramoor, 7 Jun. 1987, J. Russell-Smith 2496 & D. Lucas (DNA).

13. *L. leucochroa* W.R.Barker, sp. nov.

Holotypus: W.R. Barker 9116, R.M. Barker & K. Brennan, 12 May 2013, c. 250 m towards Jabiru from Nourlangie Rock turnoff on the Kakadu Highway to Pine Creek, Northern Territory (AD 268116; voucher for Biffin *et al.*, in press). **Isotypi:** CANB, DNA, PERTH.

L. sp. Melville Island (C.R. Dunlop 4609) [W.R.Barker]; R.A.Kerrigan & Alb., Checkl. N. Territory Vasc. Pl. (2007), partly.

L. scapigera 1: Biffin *et al.*, *Austral. Syst. Bot.* 31 (2018), in press.

Scandent to suberect, glabrous, annual herb, with stem and main branches 12–40 cm or more long. *Leaves* spatulate, distally 0.5–1.8 cm long, entire to coarsely serrulate. *Inflorescence* an open terminal raceme, the pedicels reflexed in fruit, much longer than the tiny bracts. *Corolla* 8–11 mm along the upper side, in front view with the lower lip white and the throat yellow, with the outer surfaces pale yellow, the hood sometimes flushed brown and then sometimes with its extremities flushed with blue. *Stamens* 4, perfect, with abaxial spur narrow cylindrical, yellow; anthers 0.8–1 mm long, white. *Capsules* ellipsoid to broad ovoid, 3–4.5 mm long, glabrous; seeds obloid to ellipsoid, 0.3–0.4 mm long, longitudinally 5–8-ribbed.

Distribution. From Daly River to central Arnhem Land plateau, Northern Territory, in herbfield or woodland.

Etymology. An adjective, formed by the elision of the Greek adjectives *leucos*, white, and *ochros*, yellow, alluding to white face of the flowers with conspicuous yellow encompassing the throat and mouth and often at the back of the limb.

Selected additional specimens

NORTHERN TERRITORY: Nigalaye Brook, 30 km WNW of Cannon Hill Ranger Station, 30 May 1980, *M. Lazarides 9099* (AD, DNA ex OSS); On Jabiru-Oenpelli road, on jump up at NE end of crossing of Magela Creek floodplain, 23 May 1994, *W.R. Barker 6991 & R.M. Barker* (AD); Margins of Flying Fox Creek, c. 50 m W of bridge, 12 May 2013, *W.R. Barker 9123 & R.M. Barker* (AD); Noonamah, Jenkins Road near creek, 12 July 2008, *D.E. Murfet 6060* (AD).

D. *Lindernia* sect. *Heterandrae* W.R.Barker, sect. nov.

Typus: *L. thyridostoma* W.R.Barker

Annuals; stems and branches erect or narrowly ascending terminated by open scapiform racemes. *Leaves* subpetiolate, broadly ovate to obovate. *Pedicels* erect or ascending, in fruit sometimes deflexed. *Corolla* regular, lacking internal longitudinal flaps; tube much shorter than limb; upper and lower lips widely spread forming an open throat. *Stamens* 4, with the abaxial

filaments with the lateral spur reduced to a swelling; adaxial anthers 2-celled, abaxial with a single perfect cell. *Capsules* narrow ovoid to subglobular; seeds 4-ribbed, with 6–9 transverse ridges.

Distribution. Confined to northern Northern Territory, this section comprises the following two species.

14. *L. thyridostoma* W.R.Barker, sp. nov.

Holotypus: *W.R. Barker 7812, K. Brennan & R.M. Barker*, Edge of hill c. 3 km NW of Nabarlek air strip, Northern Territory (AD 269127). **Isotypi:** BRL, CANB, CNS, DNA, K, PERTH.

L. sp. Open throated (J. Russell-Smith 5581) [W.R.Barker]; R.A.Kerrigan & Alb., Checkl. N. Territory Vasc. Pl. (2007).

Erect, rarely scandent, usually rosulate, delicate annual herb, 1.5–30 cm high, with a single stem or up to 15 stem-like branches, with long flexuous glandular hairs on the leaves and in the inflorescence. *Leaves* spatulate, 0.5–10 cm long. *Inflorescences* usually open racemes, rarely few-branched panicles, with pedicels much longer than the subulate bracts. *Corolla* 3.5–4 mm long along upper side, darkish blue with the mouth marked by a yellow spot on the lower side, often with brown-purple speckling on either side, and a translucent spot on either side of the dilated rear of the tube. *Capsule* ovoid, 3–4.5 mm long, glabrous or with tiny glandular hairs; seeds 0.3–0.4 mm long, with 4 longitudinal angles.

Distribution. Widespread across northern Northern Territory, in caves or sheltered places on rock faces.

Etymology. The adjectival epithet derives from the Greek, *thyris*, *-idos*, small door or window, and *stoma*, throat, alluding to the pale translucent blotches on the upper side of the corolla throat.

Selected additional specimens

NORTHERN TERRITORY: Tributary of Fitzmaurice River, 23 Feb. 1994, *G.J. Leach 4203* (AD, DNA); Litchfield National Park south, Tableland Creek Gorge, 14 Feb. 1996, *I.D. Cowie 6167 & R. Booth* (AD, DNA); Radon Springs [Upper Baroalba Creek, Mt Brockman], 13 May 1987, *B.S. Wannan & C.J. Quinn UNSW 20271* (AD); UDP Falls, Waterfall Creek Nature Reserve, 9 May 1983, *R.M. Barker 496* (AD); Gulungul, Kakadu National Park, 23 Mar. 1995, *J. Russell-Smith 10214* (DNA); Limmen National Park, St Vidgeons block SW corner, c. 65 km from St Vidgeons ruins, 24 Apr. 2009, *D.L. Lewis 1106* (AD).

Key to species of *Lindernia* sect. *Heterandrae*

1. Corolla blue-purple and often red-spotted, with a gullet mouth, the very back dilated, distally with parallel sides and with two translucent patches at the rear **14. *L. thyridostoma***
- 1: Corolla mid blue through pink to white, with a widely dilated dish-like mouth with widely spread sides **15. *L. scutellata***

15. *L. scutellata* W.R.Barker, sp. nov.

Holotypus: *W.R. Barker 9108, R.M. Barker, K. Brennan & S. Ranger*, 9 May 2013, c. 500 m direct NNW from crest of road over Koongarra Saddle at head of Baroalba Creek valley, on W side of creekline (AD 268119).

Isotypi: CNS, DNA, PERTH.

L. sp. Small whitish corolla (I.D. Cowie 5661) [W.R.Barker]: R.A.Kerrigan & Alb., Checkl. N. Territory Vasc. Pl. (2007).

Erect to scandent delicate annual herb, 6–70 cm high, with a single stem to several stem-like branches arising from ground level, sometimes with tiny glandular hairs in the inflorescence. *Leaves* often subrosulate, largest near ground level, spatulate, 7–55 mm long, entire to irregularly coarsely undulate. *Inflorescence* an open terminal raceme or panicle, with pedicels much longer than the subulate bracts. *Corolla* like an open saucer, 2–4 mm long along upper side, mid blue to white, with a yellow tube and a yellow spot on the lower side of the mouth. *Capsule* ovoid or narrowly so, 2.7–4.3 mm long, covered by sparse tiny glandular hairs, rarely glabrous; seeds obloid, c. 0.4–0.5 mm long, with 4 blunt longitudinal ribs.

Distribution. Confined to the northwest and western Arnhem Land escarpment and plateau in the Northern Territory.

Etymology. The adjectival epithet derives from the diminutive of *scutum*, shield, and *scuta* flat tray, platter, *scutella*, a small flat dish or plate, alluding to the saucer shaped corolla.

Selected additional specimens

NORTHERN TERRITORY: Myra Falls vicinity, Tin Camp Creek, 29 May 1973, *T.G. Hartley 13807* (CANB); c. 700 m WSW of the East Alligator River, c. 3.4 km S of Cahill's Crossing, c. 23.5 km NNW of Jabiru Airstrip, 20 Apr. 1999, *W.R. Barker 7885 & I. Cowie* (AD); 22 km SE of Jabiru airstrip, Magela Creek upper catchment, 12 Apr. 1995, *I. Cowie 5661 & K. Brennan 3122* (AD, DNA); 1 km direct S of Koongarra Saddle, 20 May 1994, *W.R. Barker 6928, K. Brennan & R.M. Barker* (AD).

E. *Lindernia* sect. *Hemiarrhena* (Benth.) W.R.Barker, comb. et stat. nov.

Hemiarrhena Benth., *Fl. Austral.* 4 (1868) 518, basionym. — **Type:** *L. plantaginea* (F.Muell.) F.Muell.

Annual, rarely perennial, herbs; stems and branches erect or narrowly ascending to procumbent. *Leaves* subpetiolate, narrow to broadly ovate to obovate. *Inflorescences* open racemes, often scapiform, or dense scapiform heads. Pedicels short, erect or ascending, in fruit sometimes deflexed, hardly elongating. *Corolla* regular, lacking internal longitudinal flaps; tube conspicuous, as long or longer than the limb; upper lip perfect or sharply reflexed upwards, emarginate or lobed. *Stamens* 2, the abaxial pair absent or present as a pair of staminodes; anthers 1-celled. *Capsules* narrow obloid to

subglobular; seeds 4-angled, shallowly furrowed, with c. 5–9 fine, sometimes obscure, transverse ridges.

Distribution. Apart from *L. clausa*, *L. plantaginea* and *L. dunlopii*, which extend to northern Western Australia, and *L. mitrasacmoides*, which extends more widely in northern Northern Territory, the group is confined to western and northern margins of the Arnhem Land plateau, Northern Territory, where it is very diverse.

Note. The species have narrow ecologies in the overall range of the section, which includes savannah woodland, herbfields, skeletal soil on damp sandstone pavements, in caves in sandstone cliffs, on top of outcrops, and, in at least one instance, in a gorge with remnant rainforest.

16. *L. mitrasacmoides* (O.Schwarz) W.R.Barker, comb. nov.

Ilysanthes mitrasacmoides O.Schwarz, *Repert. Spec. Nov. Regni Veg.* 24 (1927) 96, basionym. — *Lindernia mitrasacmoides* O.Schwarz, *nom. inval.*: Dunlop *et al.*, *Checkl. Vasc. Pl. N. Terr.* (1987) 74. — **Type citation:** “Port Darwin, 10 miles E (Bleeser no. 206, flor.), 4 miles N (Bleeser no. 315, fruct.); bruised plant smells strongly of aniseed.” — **Lectotypus (hic designatus):** *F.A.K. Bleeser 315*, Apr. 1927, Darwin (NSW 50225; Fig. 5). **Isolectotypus:** DNA A0030367.

Nomenclatural note. Previous instances of publication of this combination in *Lindernia* are invalidly published. After 1 Jan. 1953, a new combination requires the basionym to be clearly indicated and directly referenced (McNeill *et al.* 2012: Art 41.5).

Typification. The syntype material seen by Schwarz is lost (see p. 61). The NSW and DNA specimens are isosyntypes, the NSW specimen being referred to as such (“duplicate of a syntype of *Ilysanthes mitrasacmoides* O.Schwarz”) by McKee (1963). In keeping with the citation of the syntypes in the protologue, the NSW specimen is largely, but not entirely, in fruit, and bears a faint number “315” written on a newspaper rectangle, similar to the collector number labels on other Schwarz types, e.g. those of *Acacia pellita* O.Schwarz, *Capparis citrifera* O.Schwarz and *Calophyllum ramiflorum* O.Schwarz, seen on-line (JSTOR Global Plants 2017). Like the NSW *Lindernia* specimen, dated “4/1927”, these three examples were collected in 1927 and sent to Berlin in time for Schwarz’s publication later in the same year. The NSW specimen is the better quality of the two isosyntypes and therefore the choice for lectotype. Furthermore, from copied annotations, the DNA specimen has been segregated from the NSW material, which was presumably amongst the many collections sent directly by Bleeser to Blakely in Sydney (McKee 1963).

Ilysanthes lobelioides auct. non F.Muell: Specht, *Rec. Amer.-Austral. Sci. Exped. Arnhem Land* 3 (1958) 298, partly. — *L. lobelioides* auct. non (F.Muell.) F.Muell.: Dunlop *et al.*, *Checkl. Vasc. Pl. N. Terr.* (1995) 102.

Distribution. In the northern mainland margin of the Northern Territory between the Darwin region and north-west Arnhem Land.

Key to species of *Lindernia* sect. *Hemiarrhena*

1. Anthers 2-celled
2. Aniseed-scented annual; leaves, bracts and sepals smooth-surfaced, the leaves undulate to coarsely serrulate; inflorescence a moderately dense head; capsules ovoid or narrowly so **16. *L. mitrasacmoides***
- 2: Flyspray-scented annual; leaves, bracts and sepals pustulate, the leaves usually pinnatifid to pinnatifid, rarely coarsely serrate; capsules broad ovoid **17. *L. pustulosa***
- 1: Anthers 1-celled
3. Filaments behind the anther connective terminated by an obloid swelling ***L. clausa***
- 3: Filaments evenly narrow to the anther connective
4. Flowers in dense heads; pedicels hardly longer than subulate bracts
5. Corolla hood porrect; abaxial staminodes absent; anthers awned by the long distal attenuation
6. Perennial herb with woody rootstock; leaf blades narrow elliptic to narrow obovate, entire to shallowly coarsely serrate **18. *L. plantaginea***
- 6: Annual, with undeveloped rootstock; leaf blades narrowly to broadly ovate to obovate, entire to minutely sinuate, rarely denticulate **19. *L. dunlopii***
- 5: Corolla hood with a distal upturned bilobed lip; abaxial staminodes present; adaxial anthers acute distally **20. *L. brennanii***
- 4: Flowers in open racemes; pedicels longer than subulate bracts
7. Corolla hood well-developed, coloured; anthers included in tube, under hood or against the front of the hood
8. Corolla hood with recurved lip
9. Upper corolla lip glabrous
10. Perennial, with long scandent branches **21. *L. lucrusmiana***
- 10: Annual, with erect branches **22. *L. venustula***
- 9: Upper corolla lip eglandular hairy **23. *L. enypniastina***
- 8: Corolla hood porrect; anthers under tip of hood, distally awned **24. *L. acrandra***
- 7: Corolla hood reduced, hardly coloured; anthers exposed, yellow, projected well in front of corolla hood
11. Anthers horizontal, in line with the filament, with dehiscence slits facing lower side of mouth
12. Anthers 1.6–1.8 mm long **25. *L. pronanthera***
- 12: Anthers 0.6–1 mm long **26. *L. robyniae***
- 11: Anthers vertical, at right angles to the filament, with dehiscence slits facing forward; anthers 1.1–1.35 mm long **27. *L. calliandra***
-

Note. Schwarz (1927) provides a detailed description of the species.

Selected additional specimens

NORTHERN TERRITORY: Charles Darwin National Park, 4 Sep. 1998, *P.S. Short 4750 & C.R. Dunlop* (AD); Howard Springs Park Estate, pending subdivision, c. 400 m down Parakeet Road from Bronzewing Road, 50 m N of road, 1 June 1994, *W.R. Barker 7051 & R.M. Barker* (AD); 12.5 km S of Cannon Hill Ranger Station, 28 May 1980, *L.A. Craven 6018* (AD); c. 9 km by road towards Jabiru from Nourlangie Rock turnoff on the Kakadu Highway from Pine Creek, 12 May 2013, *W.R. Barker 9117, R.M. Barker & K. Brennan* (AD); 19 km NNW of Twin Falls, 3 June 1980, *L.A. Craven 6298* (DNA).

17. *L. pustulosa* W.R.Barker, sp. nov.

Holotypus: *W.R. Barker 7833, R.M. Barker & K. Brennan*, 4 Apr. 1999. Beside vehicular track, c. 1.0 km direct S of Koongarra Saddle, Northern Territory (AD 268130). **Isotypi:** CNS, CANB, DNA, PERTH, MEL.

L. sp. Dissected leaf (*N.B. Byrnes 1520*) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Robust, erect, often branched, annual 12–35 cm high, with the scent of flyspray, stem often branched from the base, with short glandular hairs in the inflorescence, the surface of the leaf segments, bracts and sepals prominently pustulate. *Leaves* pinnatifid to lobulate, 3–16 mm long. *Inflorescences* open terminal floriferous racemes, the pedicels 5–15 mm long, much exceeding the narrow deltoid to linear bracts. *Corolla* 10–12 mm long along the upper side, pale pink to blue,



Fig. 5. Lectotype of *Ilysanthes mitrasacmoides* O.Schwartz. **A** Herbarium sheet from the National Herbarium of New South Wales (NSW 50225), seedpacket folded upwards and not shown; the label at the bottom left of the lectotype has a faint, largely erased number not discordant with "315". **B** Label in packet with annotation by H.S. McKee. **C** Contents of packet. (Reproduced with permission of the Royal Botanic Gardens Sydney).

with long tube and closed mouth. *Stamens*: the adaxial pair perfect, with anthers c. 0.7 mm long, 2-celled; the abaxial staminodes terminated by a reduced empty anther, with a blue or yellow linear oblong spur. *Capsules* broad ovoid, 3–3.8 mm long; seeds 0.25–0.4 mm long, mid brown, sharply 4-angled.

Distribution. Known from northern and western margins of the Arnhem Land plateau, Northern Territory, on exposed sandstone rock sheets prone to inundation.

Etymology. The epithet is adjectival, deriving from the Latin *pustula*, blister, bubble, and the suffix *-osus*,

denoting abundance, alluding to the heavily blistered leaf segments, bracts and sepals.

Selected additional specimens

NORTHERN TERRITORY: Spencer Range, 43 km E of Oenpelli Mission, 17 Feb. 1973, *L.G. Adams 3014* (CANB); Edge of hill c. 3 km NW of Nabarlek air strip, 3 Apr. 1999, *W.R. Barker 7815*, *K. Brennan & R.M. Barker* (AD); Mt Brockman, 26 Mar. 1995, *J. Egan 4474* (DNA); 17 km SE of Twin Falls, 20 Mar. 1988, *R. Fensham 886* (DNA); Waterfall Creek, 1 m [ile] above falls, 2 Apr. 1969, *N. Byrnes 1520* (CANB, DNA).

18. *L. plantaginea* (F.Muell.) F.Muell.

Fragm. 6 (1867) 102 (at least as to the type “ad flumen Victoriae F.M.”); R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007), partly. — *Vandellia plantaginea* F.Muell., *Trans. Philos. Inst. Victoria* 3 (1859) 62 (“Sect. Bonnaya”), basionym. — *Hemiarrhena plantaginea* (F.Muell.) Benth., *Fl. Austral.* 4 (1868) 518, partly (as to Mueller and Marten collections). — **Type citation:** “In moist meadows near Macadam Range”. — **Lectotypus (hic designatus):** *Dr M[uell.] s.n., s.dat.*, Bonnaya ? *plantaginea* n.sp. / A rare plant, [moist] but ... between McAdam Range & Providence Hill (K 859761, Herb. Hooker; Fig. 6a). **Isolotypus possibilis:** *Ferd. Mueller*, Between Providence Hill & McAdam Range. / *Ferd. Mueller*, Sept [18]55, Ad ostium fluminis Victoriae / FM, 1855, Arnhem’s Land. *Hemiarrhena plantaginea* Benth. (MEL 1552813; Fig. 6b).

Typification. In the protologue, Mueller indicates: “This species is extremely rare, and the only flowering specimen which was found is deposited in Sir Wm. Hooker’s herbarium, at Kew.” A possible syntype MEL 1552813, identifiable by one of two more specific locality labels, has a single individual plant. It is in poor condition by comparison with the two K plants on the lectotype sheet; it lacks flowers and has apparently been detached from its root base. A second label referring to the mouth of the Victoria River appears to be discordant; the type location between Providence Hill and the Macadam Range, appearing on the first label, is some distance to the north. Rather than the Victoria River reference being a general regional statement, it is possible that it signifies that the MEL material is from a second distant collection.

Another collection (*F. Mueller s.n.*, 10 Jul. 1856, Elsey’s Creek, MEL 2255630), possibly of *L. aplectra* W.R.Barker, is annotated *Hemiarrhena plantaginea* by Mueller. However, as it is not annotated with the name “Bonnaya *plantaginea*” or mentioned in the protologue by citation of its locality, it is not considered a syntype.

L. sp. Long-leaved (*J.L. Egan 5112*) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Note. *L. plantaginea* differs from the following species, with which it has been confused to this time, by its perennial rootstock, alluded to in the protologue and early publications, and its consistently narrow leaves.

Selected additional specimens

WESTERN AUSTRALIA: Blyxa Creek, Prince Regent River Reserve, 19 Aug. 1974, *A.S. George 12419* (PERTH); Drysdale River crossing, 25 km SE of Carson River Station, 1 July 1997, *K.F. Kenneally 11880* (PERTH).

NORTHERN TERRITORY: Keep River National Park, SW of Jarrnarm, 19 May 1995, *J. Egan 5112* (AD, DNA).

19. *L. dunlopii* W.R.Barker, sp. nov.

Holotypus: *R.M. Barker 468* & *C. Dunlop*, 7 May 1983, Little Nourlangie Rock, 12.2 km from Jim Jim road, turnoff 21 km from Arnhem Highway, Northern Territory (AD 98504060). **Isotypi:** AD 98504061, CANB, CNS, DNA, K, MEL, NSW, PERTH.

L. plantaginea auctt. non (F.Muell.) F.Muell.: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007), partly; Biffin *et al.*, *Austral. Syst. Bot.* 31 (2018), in press, partly.

Erect, scented, rosulate, annual, 10–62 cm high, with non-woody rootstock, glandular hairy in upper parts. *Leaves* spatulate, to 4.3 cm long, entire to very shallowly sinuate. *Inflorescence* a dense floriferous terminal head, sometimes with secondary inflorescences from upper stem nodes, with bracts narrow elliptic-ovate to -obovate, 1–2.5 mm long, longer than the pedicels. *Corolla* 7.8–10.5 mm long along the upper side, pale blue; hood porrect, auriculate, attenuating into entire obtuse apex. *Stamens* an adaxial pair, the abaxial pair absent, slightly exerted; anthers distorted-obovoid, 0.5–1 mm long, mid to deep blue, 1-celled, awned. *Capsule* broad ovoid to almost globular, 2.5–3 mm long, covered by blister glands and dense glandular hairs; seeds obloid-ellipsoid, c. 0.3–0.35 mm long, 4-angled.

Distribution. Widespread from the Kimberley, Western Australia, to Arnhem Land, Northern Territory, in herbfield and woodland understorey.

Etymology. Named in recognition of Clyde Dunlop’s major contribution to floristic knowledge of northern Australia and to the infrastructure and community understanding of plant systematics in the Northern Territory.

Selected additional specimens

WESTERN AUSTRALIA: 2.3 km by road SE of Mt Elizabeth Homestead, on southward vehicular track, 17 May 2000, *W.R. Barker 8027* & *R.M. Barker* (AD); Outside mess hut, Amax Capsite, Mitchell Plateau, 26 June 1976, *K.F. Kenneally 5356* (PERTH); Above the E bank of Wonga Creek c. 25 km W of Kalumburu Mission, 31 May 1996, *A.A. Mitchell 4366* (AD).

NORTHERN TERRITORY: Litchfield National Park, c. 750 m direct E of car park at north end of Lost City, on vehicular track above first jump-up, 19 May 2013, *W.R. Barker 9127* & *K. Brennan* (AD; voucher for Biffin *et al.*, in press); 1 km direct S of Koongarra Saddle, 20 May 1994, *W.R. Barker 6930*, *K. Brennan* & *R.M. Barker* (AD); Katherine Gorge National Park, 21 June 1975, *C. Dunlop 3775* (AD).

20. *L. brennanii* W.R.Barker, sp. nov.

Holotypus: *W.R. Barker 6936*, *K. Brennan* & *M. O’Leary*, 21 May 1994, On Arnhem Land plateau, c. 32 km ESE of Jabiru, Northern Territory (AD 99843024). **Isotypi:** CANB, CNS, DNA, MEL, NSW.

L. sp. Cleft hood (*C.S. Robinson 686*) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Erect rosulate, scapose annual, 17–40 cm high, usually simple, sometimes with up to 14 erect stem-like branches, sometimes branched at upper nodes, perceived by some as scented, minutely glandular hairy in upper



Fig. 6. *Vandellia plantaginea* F.Muell. **A** Lectotype at the Kew Herbarium (K 859761; copyright of the Board of Trustees of the Royal Botanic Gardens, Kew). **B** Possible syntype at the National Herbarium of Victoria (MEL 1552813; reproduced with permission from the Royal Botanic Gardens Victoria).

parts. *Leaves* spatulate, 0.8–4.5 cm long, entire to irregularly shallowly coarsely sinuate. *Inflorescences* dense floriferous heads, with bracts deltoid, 2–2.5 mm long, longer than the pedicels. *Corolla* 8–12 mm long along the upper side (to the point of recurvature of the hood), blue, the hood distally recurved into a deeply emarginate, 2-lobed lip. *Stamens* in 2 pairs; adaxial pair fertile, with anthers ellipsoid-obloid, 0.7–1 mm long, blackish-purple, 1-celled, with obtuse to subacute, non-aristate ends; abaxial pair reduced to a pair of oblong to linear spurs. *Capsule* obovoid to ellipsoid or broadly so, 2.2–3 mm long, covered by tiny glandular hairs c. 0.02 mm long; seeds obloid, 0.4–0.5 mm long, with 4 sharp to blunt longitudinal ridges.

Distribution. Northern Territory, confined to the Arnhem Land plateau or north and west on surrounding watershed plains, in open, seasonally inundated situations.

Etymology. Named after Kym Brennan, long-time field botanist in northern Northern Territory, whose knowledge of the flora is held by few others, for his guidance in seeking out the diversity of *Lindernia*, and for his invaluable floral photographs.

Selected additional specimens

NORTHERN TERRITORY: On E side of Murgenna Creek crossing, on Oenpelli road, 26 May 1994, *W.R. Barker 7019, R.M. Barker 826 & M. O'Leary* (AD); Rum Bottle Creek, 28 May 1972, *D.E. Symon 7936* (AD); Edge of hill c. 3 km NW of Nabarlek air strip, 3 Apr. 1999, *W.R. Barker 7816, R.M. Barker & K. Brennan* (AD); At creek crossing c. 1 km direct S of Koongarra Saddle, 20 May 1994, *W.R. Barker 6929, K. Brennan & R.M. Barker* (AD); Site 70, 10 km N of Twin Falls, 28 May 1980, *L.A. Craven 6056* (AD); above Gunlom Falls, 11 Apr. 1993, *K. Brennan 2219* (DNA ex OSS).

21. *L. lucrusmiana* W.R.Barker, sp. nov.

Holotypus: *D. Lucas 118*, 16 June 1988, Steep boulder gorge, Kakadu, Northern Territory (DNA 43216). **Isotypus:** BRI (n.v.).

L. sp. Robust branched (*D. Lucas 118*) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Procumbent to erect, glabrous, perennial herb, with main branches 20–50 cm or more long, rooting at lowest nodes. *Leaves* spatulate, 1.5–7 cm long, entire to coarsely serrulate. *Inflorescence* a simple erect terminal raceme of a few flowers; pedicels at lower nodes in fruit 8–10 mm long, variously spreading in fruit. *Corolla* 8.5–9.5 mm long along the upper side, purple or bluish purple, with a bi-lobed recurved upper lip, greatly exceeded by an elongated decurved lower lip 7–8 mm long. *Stamens:* adaxial pair perfect, the abaxial missing; anthers ellipsoid, c. 1 mm long, 1-celled, borne under upper corolla lip. *Capsules* narrow ellipsoid, c. 4.5 mm long; seeds ellipsoid-obloid, 0.45–0.5 mm long, 4 angled.

Distribution. On the north-western escarpment of the Arnhem Land plateau, Northern Territory. Known from two collections only from the same general location.

Etymology. The name concatenates the initial letters of the surnames of Jeremy Russell-Smith and Di Lucas, long-time Arnhem Land ecologists, in recognition of their continued substantial contribution to knowledge of the biodiversity of the region. They are the plant's only collectors and are ecological authorities on its rainforest habitat (e.g. Russell-Smith *et al.* 1993).

Additional specimen examined

12 km E of Mudginberri Homestead, 7 Jan. 1991, *Russell-Smith 8387 & Lucas* (DNA, MEL n.v.).

22. *L. venustula* W.R.Barker, sp. nov.

Holotypus: *K. Brennan 3131*, 14 Apr. 1995, Jabiru Dreaming, East Alligator River, Northern Territory (AD 99530166). **Isotypi:** DNA, CANB, CNS, NSW, PERTH, K.

L. sp. Recurved hood (*I.D. Cowie 1171*) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Erect or decumbent annual, 3–40 cm tall, with stem usually branched, rarely simple, glabrous but for minute antrorse eglandular hairs lining the sepals. *Leaves* spatulate, 0.3–6 cm long, the longest entire to coarsely serrulate. *Inflorescences* usually simple, sometimes branched open racemes, with pedicels in fruit spreading to greatly deflexed. *Corolla* 2–10 mm long along the upper side, mid blue, rarely white or pink; upper lip recurved into two obtuse lobes divided by deep cleft. *Stamens* 2 in adaxial position, with no abaxial pair; anthers 0.4–0.95 mm long, usually mid blue, sometimes brown. *Capsule* cylindrical, 3.5–6.5 mm long, glabrous; seeds 0.3–0.35 mm long, with 4 weak longitudinal angles.

Distribution. Confined to the western escarpment and plateau of Arnhem Land, Northern Territory, in skeletal soil associated with rock faces, at their base, in caves, or on their summit.

Etymology. The adjectival epithet derives from the Latin *venusta*, Venus-like, elegant, graceful, and the diminutive *-ulus*, indicating a tendency, alluding to the curvaceous flowers noticeable in the type and other longer limbed variants of this species.

Selected additional specimens

NORTHERN TERRITORY: Ubirr Aboriginal Art Site, c. 30 m E of Main Gallery, c. 250 m N of car park, 19 May 1997, *W.R. Barker 7717, R.M. Barker & J.A. Barker* (AD); c. 5.5 km E of Mt Howship, c. 27 km SSW of Nabarlek, 3 Apr. 1999, *W.R. Barker 7817 & R.M. Barker* (AD); Headwaters of East Alligator River, 13 May 1997, *G. Leach 4605* (AD); N facing wall in central part of Mt Brockman, 23 Feb. 1973, *L.A. Craven 2360* (DNA); Upper Baroalba Creek, 17 Apr. 1995, *K. Brennan 3143* (AD); near Kurundie Creek, 20 Apr. 1990, *I. Cowie 1167, 1171 & G. Leach* (AD, DNA).

23. *L. enypniastina* W.R.Barker, sp. nov.

Holotypus: *K. Brennan 3182*, 26 Apr. 1995, Narridj Creek area, Northern Territory (AD 99528336).

Isotypi: BRI, CANB, CNS, DNA, K, MEL, NSW, PERTH.

L. sp. Narridj Creek (R.K. Harwood 981) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Much-branched, delicate, glabrous or eglandular hairy annual, usually forming leafy clumps, rarely an unbranched stem, 8–30 cm high. *Leaves* spatulate, 8–40 mm long, coarsely serrulate, rarely ± entire. *Inflorescence* a terminal raceme of up to 15 flowers; pedicels 2–5.5 mm long, deflexed in fruit. *Corolla* deep blue purple, c. 9 mm long along the upper side; hood with 2 upturned rounded lobes; lower lip decurved, 5–6 mm long. *Stamens* the adaxial pair only; anthers obovoid, 1 mm long, 1-celled, positioned in front of tip of corolla hood, acute at the lower end. *Capsules* narrow ellipsoid, 6–6.5 mm long; seeds obloid-ellipsoid, 0.3–0.4 mm long, with 4 rounded longitudinal angles.

Distribution. Known from two sites on the north Arnhem Land escarpment, Northern Territory, in the north of Jabiru, and about 150 km to the west in the Cadell River watershed.

Etymology. An adjectival epithet from the Greek, *enypniastes*, m., a dreamer, and the suffix *-inus*, indicating possession, in recognition of the first Australians and their continuous spiritual ties to the land and its flora encompassing at least 65,000 years, evidence for which has been recently firmly established with an archaeological site found on the same plateau outlier as the type locality (Clarkson *et al.* 2017).

Selected additional specimens

NORTHERN TERRITORY: Foot of small gap high on outlier W of main escarpment, c. 250 m S of Narradj Creek plain, 8 May 2013, *W.R. Barker 9096*, *K. Brennan*, *Ambrose Djandjul & R.M. Barker* (AD); c. 2 km NW of Korlobidahda, Plot 2358, 13 Apr. 2000, *R.K. Harwood 981* (AD, DNA).

24. *L. acrandra* W.R.Barker, sp. nov.

Holotypus: *W.R. Barker 7810*, *K. Brennan & R.M. Barker*, 3 Apr. 1999, Edge of hill c. 3 km NW of Nabarlek air strip, Northern Territory (AD 279774).

Isotypi: BM, CANB, CNS, DNA, MEL, NSW.

L. sp. Nabarlek (K. Brennan 3156) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Delicate, erect, eglandular hairy, annual herb, 6–40 cm high. *Leaves* spatulate, 0.7–8.5 cm long, shallowly coarsely serrate. *Inflorescence* a terminal floriferous raceme; pedicels in fruit usually reflexed to spreading down, sometimes upward spreading, 5–7 mm long. *Corolla* 9–12.7 mm long along the upper side, deep blue purple, with the hood porrect, the lower lip broad, flat, spreading, 6.5–8 mm long. *Stamens* 2, adaxial, projected in front of the corolla hood; anthers joined, 1-celled, obloid, 1.4–1.7 mm long, white or pale

yellow. *Capsule* narrow obloid-ovoid, 5–7 mm long, sparsely eglandular pubescent, obloid to ellipsoid, often broadly so, 0.25–0.3 mm long, almost round in cross section, 4 angled, the cross-walling obscure.

Distribution. Known from north-west Arnhem Land in Northern Territory.

Etymology. An adjectival epithet, from the Greek *acro-*, at the apex, and *andros*, androecium, alluding to the anthers projected well in front of the corolla hood.

Selected additional specimens

NORTHERN TERRITORY: Nabarlek, 8 Apr. 1989, *R. Hinze 514* (DNA); c. 3 km SE of Mt Howship, c. 28 km SSW of Nabarlek, 3 Apr. 1999, *W.R. Barker 7822* (AD).

25. *L. pronanthera* W.R.Barker, sp. nov.

Holotypus: *W.R. Barker 7814*, *K. Brennan & R.M. Barker*, 3 Apr. 1999, Edge of hill c. 3 km NW of Nabarlek air strip, Northern Territory (AD 268131).

Isotypi: BRI, CANB, CNS, DNA, K, MEL, NSW, PERTH.

L. sp. Brennan's showy anthers (K. Brennan 3155) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Floriferous, fragile to robust, erect, rarely scandent, eglandular hairy, annual herb 8–35 cm high. *Leaves* spatulate, the upper or penultimate pair largest, 1.5–3.5 cm long, coarsely serrulate to serrate in the distal $\frac{1}{2}$ – $\frac{2}{3}$. *Inflorescences* terminal, open, floriferous racemes or panicles; pedicels 6–15 mm long, in fruit probably hardly elongated, narrowly spreading upward to almost vertically deflexed. *Corolla* 1.8–2 mm long along the upper side as far as the tip of the mid yellow tube; hood more or less absent; lower lip 4.5–5 mm long, mid yellow proximally, distally blue-purple. *Stamens* glabrous: abaxial pair absent; adaxial pair with anthers single-celled, ellipsoid, 1.6–1.8 mm long, mid yellow, directed forwards. *Capsules* narrow ellipsoid, 4–5 mm long, glabrous; seeds (*Barker 7814 et al.*) oblong to ellipsoid, 0.3–0.35 mm long, with 4 longitudinal angles, shallow furrows between traversed by c. 9 fine ridges.

Distribution. Confined to north-west Arnhem Land in Northern Territory.

Etymology. The epithet is an adjective derived from the elision of the Latin adjective *promus*, inclined forward, facing downward, and noun, *anthera*, in epithets also used adjectivally, alluding to the disposition of the prominent anthers.

Selected additional specimen

NORTHERN TERRITORY: Kakadu National Park, northern outliers S of Fire Plot 143, 12 July 2008, *K. Brennan 7751* (DNA).

26. *L. robyniae* W.R.Barker, sp. nov.

Holotypus: *W.R. Barker 7859* & *K. Brennan*, 14 Apr. 1999, Cliffs below Mary River Ranger Station, Northern Territory (AD 268126). **Isotypi:** CANB, CNS, DNA, NSW, PERTH.

L. sp. Robyn's showy anthers (*R.M. Barker 497*) W.R.Barker, ined.

L. sp. Robyn's showy anthers (*L.A. Craven 6234*) R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Erect to narrowly spreading, simple or branched, glabrous annual, 4.5–35 cm high. *Leaves* spatulate, 0.5–4.5 cm long; entire through sinuate to irregularly coarsely dentate. *Inflorescences* open racemes, with pedicels deflexed to broadly downwardly spreading in fruit, much longer than the narrow-linear minute bracts. *Corolla* 2–3 mm long along the upper side, blue throughout, with yellow patch at base of lower lip behind anthers; lower lip spreading 2–4.8 mm long. *Stamens* 2, in the adaxial position, with abaxial pair absent; anthers projected well in front of hood, almost horizontal, ellipsoid-ovoid, 0.9–1.0 mm long, yellow, 1-celled. *Capsule* narrow ovoid-obloid, 3.8–7 mm long; seeds obloid to ellipsoid, 0.35–0.45 mm long, with 4 longitudinal angles.

Distribution. On south-western Arnhem Land escarpment, Northern Territory, and Mount Douglas not far to the west, in skeletal soil in rocky areas.

Note. While generally correctly applying the phrase name to this species using my manuscript keys, the Northern Territory Herbarium chose as the voucher in their collection a specimen of the following species (*L. calliandra*).

Etymology. The epithet is a Latin noun in the possessive case, in recognition of Robyn Barker, who has been a participant in my investigations into Australian *Lindernia*, having reported on its remarkable diversity before my own experiences.

Selected additional specimens

NORTHERN TERRITORY: Mt Douglas, W side, 6 July 1999, *I.D. Cowie* & *R.K. Harwood 8358* (AD); Ikoymarrwa Lookout, Kakadu National Park, 21 Mar. 2011, *D.E. Murfet 7191* & *A. Lowrie* (AD); c. 400 m upstream from Ferny Gully picnic area (at end of entrance track), 15 Apr. 1999, *W.R. Barker 7865* (AD); UDP Falls, 108 km NE of Pine Creek, 9 May 1983, *R.M. Barker 497* (AD).

27. *L. calliandra* W.R.Barker, sp. nov.

Holotypus: *K. Brennan 3139*, 14 Apr. 1995, Little Nourlangie Rock, Northern Territory (AD 99528344).

Isotypi: CNS, DNA, PERTH.

L. sp. Showy anthers (*L.A. Craven 2393*) [W.R.Barker]: R.A.Kerrigan & Alb., *Checkl. N. Territory Vasc. Pl.* (2007).

Erect to decumbent or scandent, glabrous herb, 3.5–36 cm high. *Leaves* spatulate, 0.4–6.5 cm long, entire to serrate. *Inflorescences* open, terminal, rarely

subpaniculate racemes, with pedicels in fruit spreading widely to strongly deflexed, much longer than the narrow linear-subulate bracts. *Corolla* 1.5–2.5 mm long along the upper side, yellow proximally on the tube and upper lip, which is blue-purple distally. *Stamens:* the abaxial pair absent; the adaxial pair with anthers in front of and almost at right angles to the corolla tube, facing forward, ellipsoid, 1.1–1.3 (–1.35) mm long, 1-celled, mid yellow. *Capsule* narrow ovoid-obloid glabrous 3–8 mm long; seeds obloid or irregularly so, 0.3–0.4 mm long, with 4 longitudinal angles.

Distribution. Confined to the west margins of the Arnhem Land plateau, Northern Territory, associated with rock faces and boulders, in sand, often in shade.

Etymology. The adjectival epithet derives from the Greek prefix *calli-*, beautiful, and *andros*, male, masculine, alluding to the showy anthers.

Selected additional specimens

NORTHERN TERRITORY: Site 64, 14.5 km NE of Jabiru East, 26 May 1980, *L.A. Craven 5951* (DNA); in small gorge c. 0.5 km SW of summit of Little Nourlangie Rock, on low sloping rock sheet, c. 50 m NW of edge of rock where vehicular track turns to Anbangbang Billabong, 20 May 1997, *W.R. Barker 7719, 7719A, R.M. Barker* & *J.A. Barker* (AD); Magela Creek upper catchment, 11 Apr. 1995, *I. Cowie 5599* & *K. Brennan* (AD, DNA); Twin Falls, c. 72 km SSW of Jabiru, Site 86, 1 June 1980, *L.A. Craven 6234* (AD, DNA).

Acknowledgements

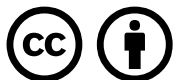
In relation to typifications in this paper I gratefully acknowledge the assistance of Pina Milne, Wayne Geberts and Taryn Ellis (MEL) for arranging high quality photographs of Muellerian types, of Neville Walsh for the examination of flowers on type material of *L. lobelioides*, of Richard Jobson and Shelley James (NSW) for arranging examination of the type of *L. mitrasacmoides* and gaining improved material of *L. prolata*, of Chelsea Novice (AD) for photography of the *L. mitrasacmoides* type, of Matt Barrett and Julia Percy-Bower (PERTH) for a higher quality type of *L. porphyrodinea*, and of Carolyn Ricci (AD) for assistance with anatomical studies. Russell Barrett, an unnamed referee, Jürgen Kellermann and Robyn Barker are thanked for reviewing the manuscript, together with John McNeill who advised on the nomenclatural options for the establishment of a homotypic section based on subg. *Didymadenia*.

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