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The Editor – *NUYTSIA*
Western Australian Herbarium
Dept of Environment and Conservation
Locked Bag 104 Bentley Delivery Centre
Western Australia 6983
AUSTRALIA

Telephone: +61 8 9334 0500
Facsimile: +61 8 9334 0515
Email: nuytsia@dec.wa.gov.au
Web: science.calm.wa.gov.au/nuytsia/



Department of
Environment and Conservation
Western Australian Herbarium

Contributions to Western Australian orchidology: 3. New and reinstated taxa in *Eriochilus*

Stephen Hopper¹ and Andrew Brown²

¹School of Plant Biology, The University of Western Australia, 35 Stirling Highway, Crawley, Western Australia 6009

²Species & Communities Branch, Department of Environment and Conservation,
PO Box 51, Wanneroo, Western Australia 6065

Abstract

Hopper, S.D. & Brown, A.P. Contributions to Western Australian Orchidology: 3. New and reinstated taxa in *Eriochilus* *Nuytsia* 16(1):29–61 (2006). The systematics of Western Australian members of Brown's (1810) genus *Eriochilus* R.Br. has been controversial, confused and poorly understood. This paper provides a revision drawing upon recent fieldwork, collections and herbarium studies that considerably resolve the taxonomic situation. We describe the following taxa as new: *E. helonomos*, *E. pulchellus*, *E. valens*, *E. dilatatus* subsp. *magnus*, *E. dilatatus* subsp. *orientalis*, *E. dilatatus* subsp. *undulatus*, and *E. scaber* subsp. *orbifolia*. New combinations are *E. dilatatus* Lindley subsp. *multiflorus* (Lindley) Hopper and A.P. Br. and *E. dilatatus* Lindley subsp. *brevifolius* (Benth.) Hopper and A.P. Br. The genus is thus enlarged in Western Australia to 6 species. *E. dilatatus* is geographically variable, now with six subspecies. *E. scaber* subsp. *orbifolia* is the only threatened taxon in Western Australia, known from a single locality near Walpole.

Introduction

Eriochilus is an endemic Australian genus of terrestrial geophytic orchids comprising at least eight species, commonly known as bunny orchids. Six of the eight named species are endemic to Western Australia, the other two *Eriochilus* being south-east Australian.

Eriochilus was first described by Brown (1810), who placed it near *Caladenia* and *Glossodia*. It has remained in use as a genus ever since, but its relationships to other genera of Australasian Diurideae have been less certain. Prior to molecular studies, a consensus among most independent workers had been reached that *Eriochilus* was best placed in the subtribe Caladeniinae, together with a number of other genera, including *Adenochilus*, *Burnettia*, *Caladenia sens. lat.*, *Elythranthera*, *Glossodia*, and *Lyperanthus* (Pfitzer 1889; Schlechter 1926; Lavarack 1976; Dressler 1981, 1993; Burns-Balogh and Funk 1986; Clements 1995; Szlachetko 1995).

Molecular studies have progressively improved understanding of the generic relationships of *Eriochilus*. Kores *et al.* (1997) using plastid *rbcL* sequences, found a strongly supported clade comprising *Eriochilus* sister to *Caladenia/Glossodia*. Subsequently, a single ITS tree published by Clements and Jones (2002) and Clements *et al.* (2002) was used to segregate *Eriochilus* from Caladeniinae in the new subtribe Eriochilidinae. However, both the ITS and plastid sequence studies of Kores *et al.* (2001, Kores

et al. in Hopper and Brown 2001), as well as a combined *matK* and ITS analysis of Caladeniinae (P. Kores, M. Molvray pers. comm.), showed, in strict consensus trees, that *Eriochilus* was embedded with strong bootstrap support in the subtribe between *Adenochilus* and all other genera. On this evidence, Hopper and Brown (2004) choose to leave *Eriochilus* in Caladeniinae as traditionally placed.

With the exception of *Caladenia* subgenus *Drakonorchis*, *Eriochilus* differs from other Caladeniinae in its hairy labellum. *Eriochilus* has a claw that is closely appressed to the column and about the same length as the labellum lamina. *Eriochilus* is unique within the subtribe in its pollinia that are divaricated, almost contracted into caudicles. It also differs from all other genera (except *Leptoceras*) in its naked tuber, not enclosed in the upper half by a persistent shaggy fibrous sheath (tunica).

The systematics of Western Australian members of Brown's (1810) genus *Eriochilus* has been controversial, confused and poorly understood. Lindley's (1840) description of five species endemic to W.A. was a major contribution, although based on limited material primarily collected by James Drummond. Subsequent authors have treated Lindley's species in many different ways (Endlicher 1846; Reichenbach 1871; Bentham 1873; Rogers 1920; Pelloe 1930; Erickson 1965; Nicholls 1969; George 1971; Hoffman and Brown 1984; Green 1985; Jones 1988; Clements 1982, 1989).

While collections in herbaria have steadily improved over the past 200 years, the above authors were not able to invest sufficient time in the field to develop an adequate understanding of population variation in fresh material. Consequently, there are disagreements as to the status of Lindley's (1840) five species, and the existence of several undescribed taxa has been overlooked. Here, we clarify the status of Lindley's species and describe seven new taxa on the basis of extensive field surveys, and an examination of herbarium collections.

We understand that new taxa have been identified in eastern Australia as well, and will be described elsewhere (Bates 1989; Bates and Weber 1990; Jones and Clements 2004, pers. comm.). Jones and Clements (2004) have recently described *Eriochilus petricola* as a necessary new name for *E. autumnalis* R.Br., the latter "rendered invalid when, in the original publication, Brown listed *Epipactis cucullata* Labill. (= *Eriochilus cucullatus* (Labill.) Reeb.f.) as a synonym."

An amended generic description and key to species in Western Australia is provided here before all Western Australian species and subspecies known to us are described.

Taxonomy

Eriochilus R. Br., Prod. 323 (1810). *Type* (here selected): *Eriochilus cucullatus* R. Br. [*Eriochilus autumnalis* R.Br. *nom. illeg.*, *fide* Jones & Clements 2004.]

Illustrations. *Eriochilus* R. Br., Prod. 323 (1810); Lindley, Gen. sp. orch. pl. 426 (1840); Lindley, Sketch Veg. Swan Riv. Col. 53 (1840); Endl. in Lehm., Pl. Preiss. 2: 10 (1846); Reichb. f., Beitr. Syst. Pfl. 27, 62 (1871); Benth., Fl. Aust. 6: 371 (1873); E. Pelloe, *West Australian Orchids* 39–40 (1930); H.M.R. Rupp, *Orchids of New South Wales*, 52–53 (1943); Blackall & Grieve, *How to Know Western Australian Wildflowers*, Part 1, 91 (1954); R. Erickson, *Orchids of the West*, 61–63 (1965); Nicholls, *Orchids of Australia* 53 (1969); Cady & Rotherham, *Australian Native Orchids in Colour* 54–55 (1970); A.S. George, *A checklist of the Orchidaceae of Western Australia* Nuytsia 1:181 (1971); Pocock, *Ground Orchids of Australia* 35–36

(1972); J. Weber & R. Bates, Orchidaceae. In Jessop, J.P. & Toelken, H.R. (eds.). *Flora of South Australia*. Part I, Third Edition, 417–418 (1978), & Part IV, Fourth Edition, 2090–2091 (1986); M. Clements, *Preliminary checklist of Australian Orchidaceae* 106–107 (1982); N. Hoffman & A. Brown, *Orchids of South-West Australia*, 1st ed., 348–353 (1984); W.R. Elliot & D.L. Jones, *Encyclopedia of Australian Plants Suitable for cultivation Vol. 3*, 469–470 (1984); C. Woolcock & D. Woolcock, *Australian Terrestrial Orchids*, 6–7 (1984); D.L. Jones, *Native Orchids of Australia*, 157–160 (1988); M.A. Clements, *Catalogue of Australian Orchidaceae. Australian Orchid Research* 1, 77–78 (1989); M. Hodgson & R. Paine, *Field Guide to Australian Orchids*, 151–152 (1989); R. Bates & J. Weber, *Orchids of South Australia*, 88–89 (1990); N. Hoffman & A. Brown, *Orchids of South-West Australia*, 2nd ed., 177–188 (1992) and rev. 2nd edn with suppl., 177–188 (1998); G. Backhouse & J. Jeanes, *The Orchids of Victoria*, 185–186 (1995); T. Bishop, *Field Guide to the Orchids of New South Wales and Victoria*, 163–164 (1996); D. Jones, H. Wapstra, P. Tonelli & S. Harris, *The Orchids of Tasmania*, 145–146 (1999); D. & B. Jones, *A Field Guide to the Native Orchids of Southern Australia*, 137–139 (2000); J.J. Riley & D.P. Banks, *Orchids of Australia*, 152–155 (2002).

Perennial geophytic *herbs*. *Root tuber* annually replaced, daughter tuber produced off a short root-like stolon adjacent to parent tuber forming an unequal pair; tuber globose, white, fleshy, naked, not enclosed in upper half by a persistent shaggy fibrous sheath (tunica). *Leaf* solitary, larger and fully expanded on nonflowering plants and in unburnt communities, partly or fully developed at anthesis, basal and sessile or on a long ensheathing petiole with a cauline lamina; *lamina* fleshy to subcoriaceous, flat to cupped, orbicular–ovate to navicular; usually horizontal to semi-erect, discolorous, green above, sometimes with paler linear or reticulate nerves, paler green or dark maroon below, glabrous or sparsely hirsute with patent eglandular trichomes to 2 mm long. *Scape* wiry or rarely somewhat fleshy, stiff, sparingly hirsute with simple patent trichomes lacking an enlarged basal cell, *cauline bracts* absent; *floral bract* solitary, shortly ensheathing the pedicel and base of ovary, erect, foliaceous, obtuse, sparsely hirsute externally. *Inflorescence* erect, terminal, solitary, single or many flowered in a loose raceme or panicle. *Flowers* sometimes scented, nectar-producing or nectarless, generally cream to pink, sometimes with dark maroon markings, sessile or on sparsely hirsute short pedicels <5mm long. *Perianth* variously hirsute, eglandular, remaining fully opened irrespective of temperature after anthesis, not glossy above. *Sepals and petals* (excluding labellum) dissimilar, not glossy above, lacking spots below, short, not long-acuminate, usually with sparse short hairs on the abaxial surface. *Dorsal sepal* incurved over the column and narrower than lateral sepals, with darker incurved margins. *Lateral sepals* free, flat, usually spreading, wider than the dorsal sepal and petals, uniformly coloured. *Petals* usually spreading (rarely erect against column), equal in length or shorter than labellum when flattened, narrower than lateral sepals, with darker incurved margins and apices. *Labellum* hirsute, lacking calli, stiffly hinged by an elongate claw same length as lamina, attached to the anterior column base, with difficulty pushed away from column and springing back to original appressed position on release; *lamina* undivided or 3-lobed with very small erect lateral lobes, linguiform; large middle lobe ovate, strongly convex, recurved up to 360°, convex in lateral cross section at widest point, with a median basal usually glabrous channel, sometimes extended longitudinally towards the apex, margins incurved, entire, hirsute; hairs many, small, few-celled; claw to 4 mm long. *Column* erect to obliquely ascending, straight, narrow, thickening in lateral view from the base to the stigma, lacking a horn-like apical mucro, slenderly winged. *Anther* not terminating in a definite point. *Pollinia* eight, divaricated, almost contracted into caudicles, lamillate, yellow. *Stigma* wider than high, transversely ovate to variously convoluted, lacking an acute apex. *Ovary* sparsely covered with fine patent trichomes.

Notes. *Eriochilus* is a genus of at least eight species, possibly up to 12. Six are endemic in Western Australia and at least two in the eastern States. The eastern Australian taxa are currently under review (Jones and Clements 2004, pers. comm.).

Pridgeon (1994), in a limited sample of specimens and taxa, found that leaf anatomical features supported the retention of *Eriochilus*. Within the genus, he noted that “*Eriochilus scaber* differs from *E. autumnalis* (= *Eriochilus petricola*) and *E. multiflorus* in having papillae instead of multicellular, eglandular trichomes and in stomata that are different in size and shape.” He did not extrapolate from this conclusion to a taxonomic recommendation, and our research similarly does not attempt a formal infrageneric treatment in view of the need for further basic research at species level across Australia.

Until this is done, it will be difficult to determine affinities of all the new W.A. taxa described below and distinguished in the following key.

The six species of *Eriochilus* endemic to Western Australia are distinguished in the following key.

Key to Western Australian species of *Eriochilus*

1. Leaf basal on flowering plants 2
2. Scape glabrous, usually taller than 10 cm; leaf uniformly green on non-flowering plants; flowers Sept.–Nov. **E. tenuis**
- 2: Scape hirsute, usually less than 10 cm; leaf striped above and red beneath on non-flowering plants; flowers July–early Oct. **E. scaber**
- 1: Leaf cauline, inserted a quarter to half way up flowering scape 3
3. Scape often solitary-flowered (rarely 2–5), less than 20 cm tall; leaf usually ovate, usually less than 15 mm long (rarely to 20 mm), not prominently ribbed beneath when fresh on flowering plants at anthesis 4
4. Leaf apex acuminate acute, margins often undulate; labellum 2–4 mm wide, with scattered clusters of dark red or opaque hairs; flowering not dependent on fire; confined to winter-wet swamps and granite rocks from Cataby to Cape Riche **E. helonomos**
- 4: Leaf apex shortly acute, margins flat or slightly undulate; labellum 3–6 mm wide, with a central longitudinal channel and green band conspicuously devoid of coloured hairs, flanked by dense clusters of dark red hairs; flowering dependent on summer fire; confined to margins of winter-wet swamps in the Albany–Walpole–Manjimup area **E. valens**
- 3: Scape usually 3–7-flowered (sometimes 1, 2, to 20+), 5–50 cm tall; leaf ovate–navicular, 10–105 mm long, prominently ribbed beneath when fresh on flowering plants at anthesis 5
5. Leaf fleshy, 14–20 mm long; scape fleshy, 3–15 cm tall, 3–5-flowered (rarely 1–2, or 6–11); flowers with dark red markings; flowering not stimulated by fire; confined to moss swards on granite or rarely limestone; disjunct in the Northcliffe–Albany, Perth and Esperance–Balladonia areas **E. pulchellus**
- 5: Leaf thin, 10–105 mm long; scape wiry, usually 10–60 cm tall, usually 4–15-flowered; flowers with pale purple markings; flowering often stimulated by fire; widespread in various habitats from Shark Bay to Israelite Bay **E. dilatatus**

Eriochilus dilatatus Lindley, Sketch Veg. Swan Riv. Col. 53 (1840). *Type*: Swan River, *J. Mangles s.n.* (*holo*: K-L!).

See under subspecies for synonyms.

Leaf cauline, not fleshy, glabrous, ovate–navicular, 1.0–10.5 cm long, prominently ribbed beneath when fresh on flowering plants at anthesis; apex shortly acute; margins flat or undulate. *Leaf of non-flowering plant* 3.0–10.5 cm × 0.5–3.5 cm. *Leaf of flowering plant* inserted a quarter to half way up scape, usually smaller than on non-flowering plant, 1.5–7.5 cm × 0.5–1.5 cm. *Scape* wiry, uniformly green, to 60 cm tall. *Floral bract* narrowly ovate, to 5 × 2 mm. *Inflorescence* usually 4–15-flowered. *Dorsal sepal* cream with brownish-red marginal markings, 5–10 mm × 2–4 mm. *Lateral sepals* cream, 7–20 mm × 2.5–4 mm. *Petals* obliquely ascending away from column at full anthesis, with brownish-red marginal longitudinal stripes, 5–8 mm × 0.5–1.5 mm. *Labellum* 6–11 mm long × 3–5 mm wide; *lamina* 3–7 mm long × 3–5 mm wide, prominently decurved, flattened-orbicular when viewed from front, with a central longitudinal channel, greenish cream, with scattered clusters of creamy to pale purple hairs; *claw* 3–5 mm long. *Column* 5–7 mm × 2–3 mm; stem uniformly pale green, tapering slightly towards base. *Anther* greenish yellow with red markings near the margins. *Stigma* clearly visible through a transversely oval orifice; margins of orifice greenish yellow, becoming dark red; upper and lower margins with a central downward dip. *Ovary* green. (Figure 1)

Distribution and habitat. WESTERN AUSTRALIA: Ranges widely from Dirk Hartog Island in Shark Bay south-east to Toolinna Cove, and extends inland to near Merredin. Grows in a broad range of communities and soil types, from coastal limestone outcrops to granitic rocks inland.

Flowering period. March to June, some subspecies stimulated by summer fire.

Notes. This is the most common and widespread species of *Eriochilus* in southwest Australia. It is variable in leaf morphology and the number of flowers in the scape. *E. dilatatus* differs from *E. pulchellus* in its thinner leaves and scapes; its paler coloured flowers; and its widespread occurrence in forests and shrublands, rather than being confined only to granite outcrops. When *E. dilatatus* grows on granite outcrops in forest areas it favours shaded sites rather than being exposed to full sun whereas *E. pulchellus* grows in full sun. *E. helonomos* has similar flowers to *E. dilatatus*, but differs in its shortly ovate acute leaf and in usually being solitary-flowered. *E. valens* also differs from *E. dilatatus* in its usually single-flowered inflorescence, its ovate leaf, and its prominently coloured labellum.

The identity of typical *Eriochilus dilatatus* has been unclear until now. Lindley (1840) distinguished *E. dilatatus* from his *E. multiflorus*, *E. latifolius*, *E. tenuis* and *E. scaber* on the basis of its leathery linear–lanceolate leaf with a dilated base, and the few-flowered inflorescence with glabrous ovaries. There are two specimens on the holotype sheet (Figure 1) with leaves 2.5 and 3.5 cm long that were partly folded when pressed giving the appearance of being only about 2 mm wide. Their bases also appear somewhat dilated compared with the types of Lindley’s other W.A. species. Both specimens have three flowers.

Lindley (1840) diagnosed *Eriochilus latifolius* by its linear–oblong leaf, its multi-flowered scape with pubescent apices, its oblong bracts, ciliate stems and tomentose ovaries, its sub-rotund labellum, its elongated column and dorsal sepal, and the tomentose anther rim. The single specimen on the type sheet has a leaf 3 cm long × 5 mm wide, and two flowers on the scape. The latter character conflicts with the “multiflowered” description in the protologue, suggesting that other specimens existed when Lindley described *E. latifolius*.

In any event, subsequent authors have concluded that *Eriochilus latifolius* is a variant of *E. dilatatus*. It was recognised formally at varietal rank by Bentham (1873), with the note that var. *latifolius* was “rather larger; leaves lanceolate. Flowers 2 to 4 and rather longer”. Bentham believed that var. *dilatatus* had only 1, 2 or rarely 3 flowers. We have found no other references to *latifolius* until Nicholls (1969) and then George (1971) gave it as a synonym of *E. dilatatus*. Clements (1989) regarded *E. latifolius* as a synonym of *E. multiflorus*.

Our field and herbarium studies have confirmed that the differences between *Eriochilus dilatatus* and *E. latifolius* described by Lindley (1840) fall well within the range of variation found in populations of *E. dilatatus*. Hence we do not recognise *E. latifolius* as a species or subspecies.

The status of *Eriochilus multiflorus* has been more contentious. Lindley (1840) distinguished this species by its ovate–acuminate leaf, its multi-flowered scape with pubescent apices, its oblong bracts, ciliate stems and tomentose ovaries, its labellum oval and obtuse, its shortened column and dorsal sepal, the glabrous anther rim, and with flowers much smaller than those of *E. latifolius*. Bentham (1873) accepted Lindley’s concept of *E. multiflorus* as a species distinct from *E. dilatatus*.

Rogers (1920), however, having seen much more material, noted the variation within collections of *Eriochilus dilatatus*, and argued that “it is doubtful whether this species (*E. multiflorus*) should be separated from *E. dilatatus* on the characters assigned to it by Lindley and Bentham.” Pelloe (1930) disagreed, and recognised *E. multiflorus* as a distinct species. Many other authors did not (e.g. Erickson 1965; Nicholls 1969; Cady and Rotherham 1970; George 1971; Pocock 1972; Clements 1982; Hoffman and Brown 1984).

Jones (1988) and Clements (1989) reinstated *Eriochilus multiflorus* but circumscribed it somewhat differently to Lindley (1840). They agree that *E. multiflorus* has an ovate leaf. Jones (1988) stated that “*E. multiflorus* is closely related to *E. dilatatus* but has a much smaller leaf and smaller flowers.” He also described *E. dilatatus* as having a labellum “sparsely and irregularly beset with tufts of stiff hairs”, whereas for *E. multiflorus*, the words ‘sparsely and irregularly’ were not used. The midlobe of the labellum was described as “broad, much-expanded” in both species. Jones (1988) suggested that *E. dilatatus* was widespread and in almost all habitats from the coast to well inland in the wheatbelt, whereas *E. multiflorus* was believed to be endemic to the extreme southwest, where it is “common in coastal scrubs”.

Clements (1989), reversed these notions of abundance and geographical distribution, proposing that *Eriochilus multiflorus* “is the common widespread species in Western Australia that has been called *E. dilatatus*.” He regarded *E. dilatatus* as in fact being rare and localized, possibly confined to the southwest jarrah forest region. Clements (1989) also stated that *E. dilatatus* differed from *E. multiflorus* in its “linear leaves and in having a narrower labellum on which there are fewer cilia”. He did not contrast floral size in the two species, and, in fact, gave *E. latifolius* as a synonym of *E. multiflorus*. However, as Lindley (1840) noted, the types of these two taxa differ significantly in floral size.

We have examined the types of *Eriochilus multiflorus* and *E. dilatatus*, and completed extensive field and herbarium studies of variation in these orchids. We find flower size, labellum shape and the abundance of hairs on the labellum all to be variable characters that are uncorrelated and of limited taxonomic significance. The only characters that appear to distinguish geographically-based taxa are leaf size and shape, and the number of flowers in the inflorescence. Six races are recognisable. Thus, mainly coastal populations west of Israelite Bay consistently have navicular leaves and usually 3–5 flowers, matching typical *E. dilatatus*. Most *Banksia* woodland and jarrah forest populations and those on wheatbelt granite outcrops have small narrowly ovate to ovate leaves, often not fully expanded on flowering scapes, and have 3–20 flowers seen mainly after fire, matching typical *E. multiflorus*.

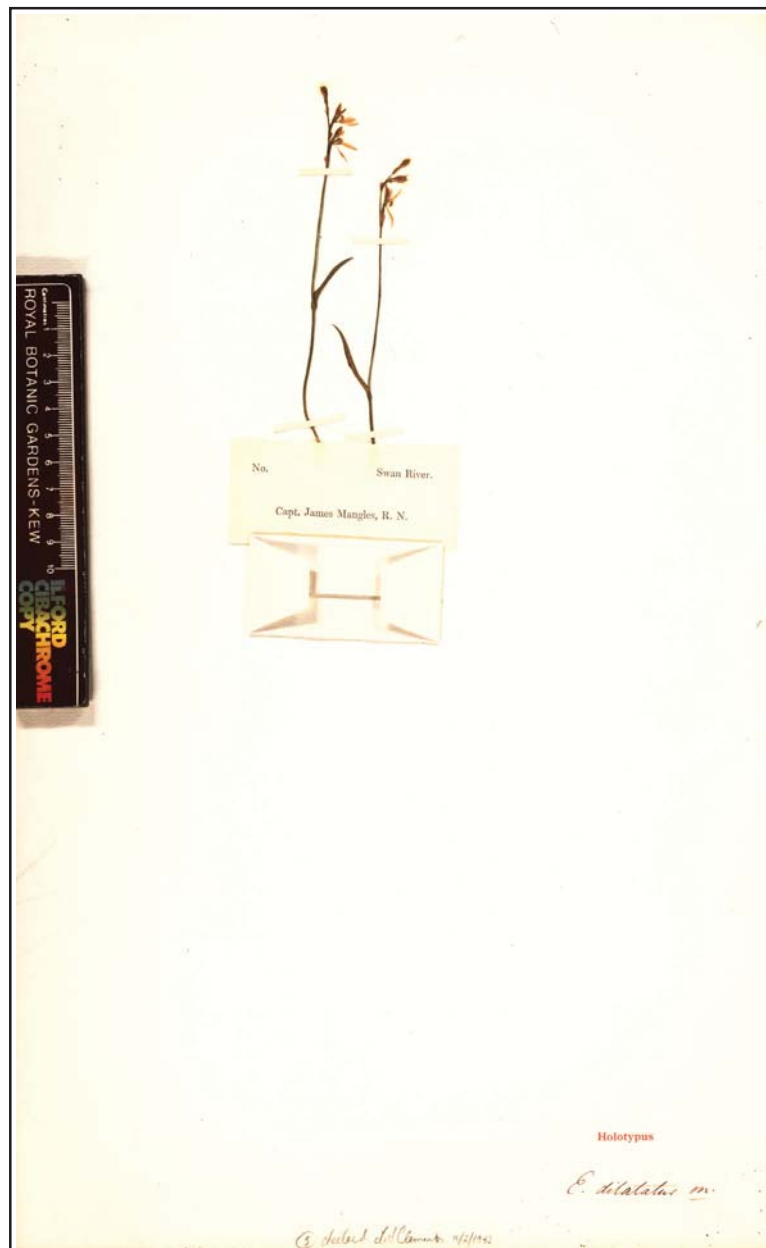


Figure 1. Holotype of *Eriochilus dilatatus*. Mangles s.n.

Wheatbelt shrubland and wandoo woodland plants typically have small ovate leaves with undulate margins and 1–3 flowers. They do not require fire to flower, and represent the subspecies described below as *undulatus*. Eastern plants on limestone near Toolinna Cove on the Great Australian Bight which also do not require fire to flower have broadly ovate leaves with rarely undulate margins, fully expanded at anthesis, with moderately fleshy stems and with 2–7 flowers per scape are described as subspecies *orientalis*. Karri and high rainfall jarrah forest plants have large ovate leaves and up to 20 flowers—the new subspecies *magnus* described below. Lastly, populations in the Kalbarri–Dongarra region removed from the coast have small leaves and dark-coloured fleshy scapes. They flower later and do not require fire to flower. They match Bentham’s (1873) *E. dilatatus* var. *brevifolius*, which we recognize below as a subspecies.

Our research indicates that these races intergrade extensively where their ranges overlap. Because of this intergradation, we consider subspecific rank to be appropriate, and thus treat below *Eriochilus multiflorus* and the other five races as subspecies of *E. dilatatus*. The six subspecies are distinguished in the following key.

Key to subspecies of *Eriochilus dilatatus*

1. Leaf on flowering plants usually >30 mm long 2
2. Leaf on flowering plants navicular to narrowly navicular with an attenuate acute apex; coastal calcareous soils **E. dilatatus** subsp. **dilatatus**
- 2: Leaf on flowering plants narrowly ovate–ovate with a shortly acute apex; ubiquitous in high-rainfall habitats except calcareous coastal soils **E. dilatatus** subsp. **magnus**
- 1: Leaf on flowering plants usually <30 mm long 3
3. Leaf on flowering plants navicular to narrowly navicular with an attenuate acute apex; confined to coastal calcareous soils **E. dilatatus** subsp. **dilatatus**
- 3: Leaf on flowering plants usually narrowly ovate–ovate with a shortly acute apex; not on coastal calcareous soils (except for subsp. *orientalis*) 4
4. Scape of 3–20+ flowers; high rainfall forests and/or wheatbelt granite outcrops 5
- 4: Scape of 1–3 (–7) flowers; semiarid country, absent from high rainfall forest 6
5. Leaf on flowering plants usually fully expanded; lateral sepals usually 15–18 mm long; ubiquitous in high-rainfall habitats **E. dilatatus** subsp. **magnus**
- 5: Leaf on flowering plants often usually fully expanded; lateral sepals usually 10–15 mm long; high rainfall forests and wheatbelt granite outcrops **E. dilatatus** subsp. **multiflorus**
6. Leaf on flowering plants often not fully expanded, with flat margins; 3–20+ flowers per scape; wheatbelt granite outcrops **E. dilatatus** subsp. **multiflorus**
- 6: Leaf on flowering plants usually fully expanded, with or without undulate margins; 1–3 (–7) flowers per scape; shallow soils on limestone or sandstone, or deeper wheatbelt soils 7
7. Leaf on flowering plants with margins rarely undulate; scapes fleshy, 15–25 cm tall; flowers 2–7 per scape; confined to limestone near Toolina Cove **E. dilatatus** subsp. **orientalis**
- 7: Leaf on flowering plants with margins undulate; scapes wiry or fleshy, 5–20 cm tall; flowers 1–3 per scape; on sandstone or in deep wheatbelt soils 8
8. Leaf pale maroon with greenish streaks below; scapes green, wiry; flowering April–mid-May; widespread in wheatbelt and adjacent semi-arid woodlands on deep soils **E. dilatatus** subsp. **undulatus**
- 8: Leaf uniformly pale maroon below; scapes pale maroon, thick; flowering mid-May–June; restricted to red loams in well-watered areas and shallow soil in sandstone areas from Dongara north to the Murchison River area **E. dilatatus** subsp. **brevifolius**

Eriochilus dilatatus* Lindley subsp. *dilatatus

Eriochilus latifolius Lindley in Edward's Bot. Reg. 1–23: Swan River Appendix liii (1840); *Eriochilus dilatatus* Lindley var. *latifolius* (Lindley) Benth., Fl. Austral. 6: 373 (1873). Type: Swan River, 1839, *J. Drummond s.n.* (holo: K-L!; iso W!).

Illustrations. D. Jones, *Native Orchids of Australia*, p. 159, extreme right drawing, as *E. dilatatus* (1988); M. Hodgson & R. Paine, *Field Guide to Australian Orchids*, 151 – possibly this subspecies (1989); N. Hoffman & A. Brown, *Orchids of South-West Australia*, 2nd ed., 179 (1992) and rev. 2nd edn with suppl., 179 (1998); D. Jones & B. Jones, *A Field Guide to the Native Orchids of Southern Australia*, p. 138 (2000).

Leaf on flowering plants concolorous, green, usually fully expanded at anthesis, navicular to narrowly navicular with an attenuate acute apex and flat margins, 5–70 mm long, 2–10 mm wide; *scape* green, wiry, 10–35 cm tall; *inflorescence* with 1–7 widely spaced flowers; *lateral sepals* 15–20 mm long; *labellum* hairs pale cream.

Specimens examined. WESTERN AUSTRALIA: *s.loc., s.dat., Anonymous s.n. (a)* (PERTH 00243760); Stokes National Park, 33° 49' 00" S, 121° 10' 00" E, 05 May 1989, *K. Bradbury DL4* (PERTH 1828681); Stokes National Park, 33° 49' 00" S, 121° 10' 00" E, 04 May 1989, *K. Bradbury S13* (PERTH 1828746); Peelhurst Rd, c. 830 metres W of Mandurah–Fremantle road, opposite House Number 120, 32° 29' 30" S, 115° 45' 00" E, 01 June 1988, *A. Brown 817* (PERTH 01026127); Ledge Point, due E of Albany, overlooking King George Sound, 35° 01' 00" S, 118° 00' 00" E, 02 May 1989, *A. Brown 926* (PERTH 01029223); Ludlow Tuart Forest, c. 14.6 km NE of Busselton, 33° 37' 00" S, 115° 28' 00" E, 09 May 1989, *A. Brown 930* (PERTH 01026100); Moses Rock, between cleared farmland and ocean, 33° 46' 00" S, 114° 59' 00" E, 09 May 1989, *A. Brown 931* (PERTH 01026097); Near Augusta, Mar. 1926, *W.E. Champion s.n.* (PERTH 00242357); Rest Point–Walpole Inlet, 21 Apr. 1973, *R.A. Congdon s.n.* (PERTH 00914363); Ocean Reef Beach, 30 May 1978, *R.J. Cranfield 662A* (PERTH 00241784); N of Mullaloo on boundary of Ocean Reef, 30 5 1978, *R.J. Cranfield 662B* (PERTH 00241865); 3km SE of Natural Bridge turnoff on Frenchmans Bay Rd, Albany, 35° 06' 00" S, 117° 55' 00" E, 18 Apr. 1980, *R.J. Cranfield 1421* (PERTH 00269190); W side of Gairdner River Estuary, Fitzgerald River National Park, 20 May 1978, *S. Downes s.n.* (PERTH 00269212); Naraling, NE of Geraldton, 13 May 1961, *A.S. George 2358* (PERTH 00244252); c. 25 miles E of Dindiloo, NE of Geraldton, 14 May 1961, *A.S. George 2382* (PERTH 00243787); W of Two Wells, Dirk Hartog Island, 26° 01' 00" S, 113° 11' 00" E, 08 Sep. 1972, *A.S. George 11613* (PERTH 00242268); c. 7km W of Israelite Bay, 33° 38' 00" S, 123° 48' 00" E, 14 Aug. 1980, *A.S. George 16013* (PERTH 00241342); S Bunbury, *s.dat., B.T. Goadby s.n.* (PERTH 00241814); Albany, *n.dat., B.T. Goadby s.n. (a,c)* (PERTH 00242748); South Bunbury, May 1929, *B.T. Goadby s.n. (c,d)* (PERTH 00242241); 8km W of Lake Logue, 29° 52' 00" S, 115° 06' 00" E, 01 June 1978, *E.A. Griffin 1019* (PERTH 00244198); Sandy Hook Island, Archipelago of the Recherche, 34° 02' 00" S, 122° 00' 00" E, 01 May 1982, *S.D. Hopper 2244* (PERTH 00241377); Ocean Reef, NW of (PERTH, c. 500 metres NW of intersection of Ocean Reef Rd and Dampier Avenue, 12 May 1985, *S.D. Hopper 4394* (PERTH 00793779); Woolbale Hills, W of Walpole, 34° 59' 00" S, 116° 36' 00" E, 17 Apr. 1990, *W. Jackson BJ 170* (PERTH 01699989); Isthmus Hill, Flinders Peninsula, Torndirrup National Park, 11 May 1988, *G.J. Keighery 10024* (PERTH 01124293); William Bay National Park, 35° 01' 00" S, 117° 15' 00" E, 01 1984, *C.V. Malcolm 66* (PERTH 00899585); Garden Island, 10 May 1951, *W. McArthur s.n.* (PERTH 00913308); Cape Naturaliste, A.P.B. (Agricultural Protection Board) Rabbit Study Area, Grid square 0411, 22 May 1980, *M.H. Robinson s.n.* (PERTH 00269611); Torpedo Rocks, Yallingup, 31 July 1950, *R.D. Royce 3221* (PERTH 00243698); Cape Le Grand National Park, 21 Oct. 1969, *R.D. Royce 8739* (PERTH 00244236); Coomalbidgup Swamp, Map 422/80 24633, 23 Apr. 1978, *D.R. Voigt 31* (PERTH 00243256); West Ridge (more or less below Flinders Peak) Middle Island, Recherche Archipelago, 34° 06' 00" S, 123° 10' 00" E,

14 Nov. 1974, *A.S. Weston* 9896 (PERTH00269638); Middle Island, Recherche Archipelago, 34°06'00" S, 123°11'00" E, 17 Nov. 1973, *A.S. Weston & M.E. Trudgen* ASW 8761 (PERTH 00242837); Mount Hopkins, Walpole–Nornalup National Park, 18 May 1978, *T.G. Wilson s.n.* (PERTH00243221).

Distribution and habitat. Confined to coastal and insular calcareous soils often over limestone from Dirk Hartog Island in Shark Bay to Israelite Bay. A wide range of vegetation types provide habitat, including coastal heaths, scrubs and peppermint woodlands, and tuart forest. (Figure 2A)

Flowering period. March to May, more profuse following summer fire.

Notes. The navicular leaves and calcareous near-coastal habitat west of Israelite Bay distinguish the typical subspecies from the others. Flowering is often fire-stimulated. Intergrades with *Eriochilus dilatatus* subsp. *multiflorus* where jarrah and *Banksia* woodlands or coastal granite vegetation abuts calcareous coastal heath, peppermint woodlands and tuart forest. Also intergrades with *E. dilatatus* subsp. *undulatus* along the south coast (e.g. *S.D. Hopper* 7155).

Eriochilus dilatatus* subsp. *brevifolius (Benth.) Hopper & A.P. Br., *comb. nov.*

Eriochilus dilatatus Lindley var. *brevifolius* Benth., Fl. Austral. 6: 373 (1873), *pro parte*. *Typus:* Murchison River, *Oldfield s.n.* (a) (*lecto:* K-L!, here chosen).

Leaf on flowering plants discolorous, green above and uniformly pale maroon below, often not fully expanded at anthesis, usually narrowly ovate–ovate with a shortly acute apex, margins undulate, 8–14 mm long, 5–8 mm wide; *scape* pale maroon, thick, usually 6–15 cm tall; *inflorescence* with 1–3 widely spaced flowers; *lateral sepals* 7–10 mm long; *labellum* hairs pale cream with maroon suffusions.

Specimens examined. WESTERN AUSTRALIA: Warribanno Chimney Rd, 1.2 km N of Ajana–Kalbarri Rd, 27°56'21" S, 114°36'36" E, 13 June 1999, *A.P. Brown* 2536 (PERTH); Binu West Rd, 9.2 km W of NW Coastal Hwy, 28°02'46" S, 114°34'52" E, 13 June 1999, *A.P. Brown* 2537 (PERTH); NW Coastal Hwy, 37.6 km N of Galena Bridge, 28°01'05" S, 114°18'17" E, 13 June 1999, *A.P. Brown* 2538 (PERTH); NSW); Murchison River Gorge, c. 15 miles NE of Ajana, 13 May 1961, *A.S. George* 2379 (PERTH00243701); Red Bluff, 5 km S of Kalbarri, 27°45'00" S, 114°09'00" E, 06 May 1968, *P.G. Wilson* 6519 (PERTH00242330).

Distribution and habitat. Known from red earths with Allocasuarina–Acacia scrub with scattered eucalypts, from shrublands on red rocky bluffs, and from well-watered depressions in kwongan and woodlands from Dongara northwards to the Murchison River region. (Figure 2B)

Flowering period. mid-May to June, not dependent on summer fire.

Notes. This subspecies is distinctive in its discolorous leaves with undulate margins, its thickened scapes, and its late flowering season. *Eriochilus dilatatus* subsp. *dilatatus*, for example, grows very close to *E. dilatatus* subsp. *brevifolius* in coastal habitats at Kalbarri, but is finished flowering by mid-May when subsp. *brevifolius* is just commencing to flower. *E. dilatatus* subsp. *brevifolius* is the only taxon in the genus to grow in red clay-loam in Western Australia.

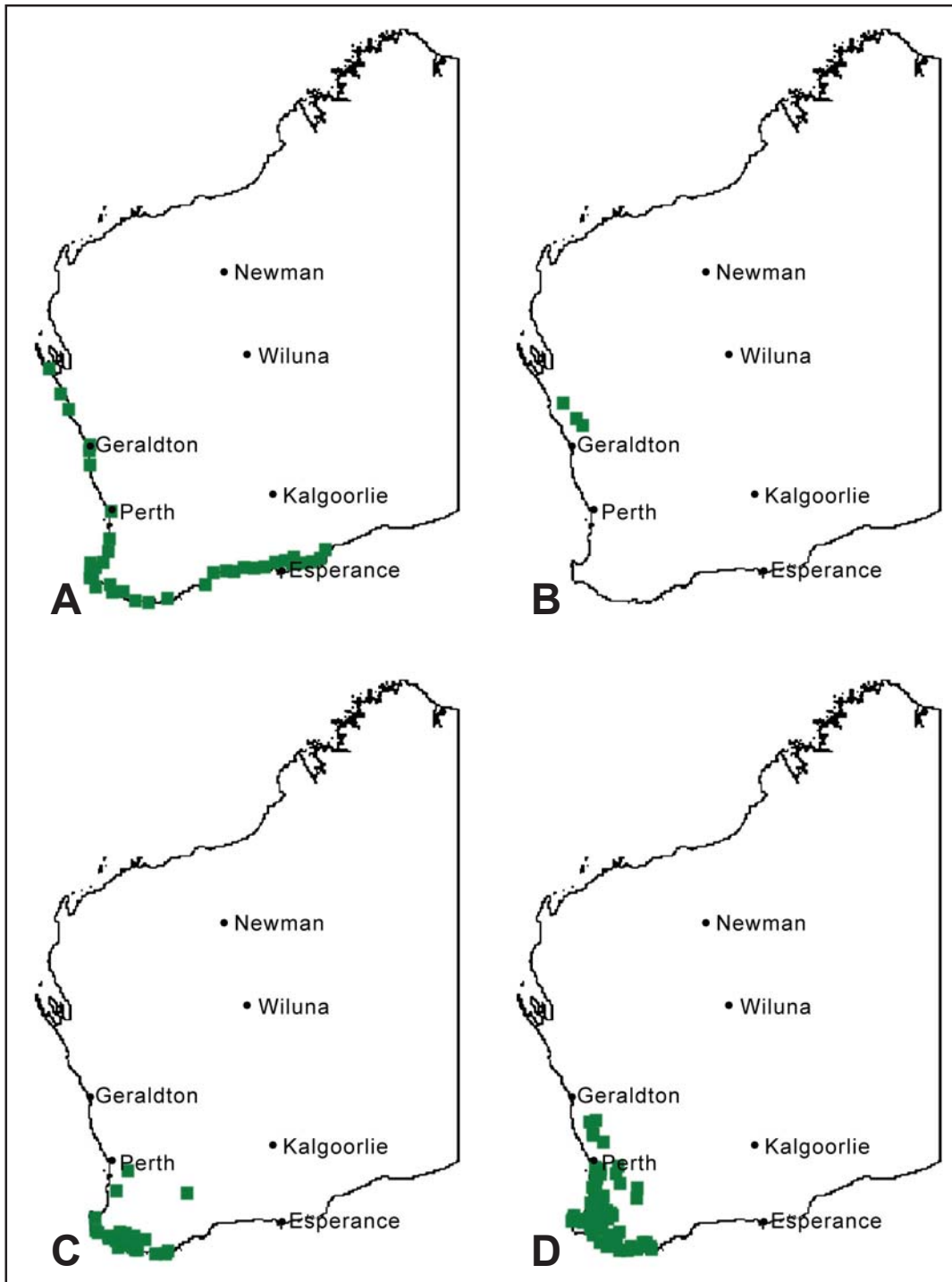


Figure 2. Distribution maps. A – *Eriochilus dilatatus* subsp. *dilatatus*; B – *Eriochilus dilatatus* subsp. *brevifolius*; C – *Eriochilus dilatatus* subsp. *magnus*; D – *Eriochilus dilatatus* subsp. *multiflorus*.

Eriochilus dilatatus subsp. *brevifolius* is most similar to *E. dilatatus* subsp. *undulatus*, from which it differs in its discoloured leaf, green above, pale maroon with greenish streaks below, its pale maroon, fleshy scapes, its later flowering in mainly mid-May–June, and in being restricted to well-watered depressions and rocky areas from Dongara north to the Murchison River area.

Bentham (1873) cited two collections under his *Eriochilus dilatatus* var. *brevifolius* – Swan River, Drummond, and the lectotype, Murchison River, Oldfield. The Drummond specimen appears to be *E. dilatatus* subsp. *multiflorus*.

***Eriochilus dilatatus* subsp. *magnus* Hopper & A.P. Br., subsp. nov.**

A subspeciebus aliis *E. dilatato* R.Br. folio ovato magniore 2–6 cm longis et 12–22 mm latis, marginibus planis, et scapoque multifloribus differt.

Typus: Warren National Park, c. 10 km N of the Pemberton–Northcliffe Rd, 34°28' S 115° 57' E, 10 May 1989, A. Brown 936 (*holo*: PERTH 1029207!)

Illustrations. R. Erickson, *Orchids of the West*, 2nd ed., plate 19, left illustration, as *E. dilatatus* (1965); W. Nicholls, *Orchids of Australia*, plate 198 b, as *E. dilatatus* ‘a broad-leafed form’ (1969); N. Hoffman & A. Brown, *Orchids of South-West Australia*, 2nd ed., p. 181 (1992) and rev. 2nd edn with suppl., 181 (1998).

Leaf on flowering plants concolorous, green, narrowly ovate to ovate with a shortly acute apex and flat margins, usually fully expanded at anthesis, 15–75 mm long, 6–30 mm wide; *scape* green, wiry, usually 15–50 cm tall; *inflorescence* with many (usually 4–10, rarely to 20+) widely spaced flowers; *lateral sepals* usually 15–18 mm long; *labellum* hairs pale cream to maroon.

Specimens examined. WESTERN AUSTRALIA: Windy Harbour Rd, c. 900 metres N of Mount Chudalup, 34° 46' 00" S, 116° 04' 00" E, 10 May 1989, A. Brown 938 (PERTH 01029193); Forest Grove, 09, *E. Coleman* s.n. (PERTH 00242772); Gordon State Forest, c. 2 km NW of One Tree Bridge, Donnelly River, 500 metres NE of intersection of Adam Rd and Lewin Rd, 34° 13' 00" S, 115° 57' 00" E, 17 Apr. 1988, S.D. Hopper 6349 (CBG, PERTH 01191446); Sabina River, Sabina Rd, Whicher Range, 33° 45' 00" S, 115° 26' 00" E, 17 May 1991, G.J. Keighery 12371 (PERTH 01668617); Big Brook, Pemberton, *n. dat.*, M. Koch 2580 (PERTH 00242314).

Distribution and habitat. Confined to high rainfall forests of karri, jarrah and marri from the Darling Scarp near Perth south to Augusta and east to the Porongorups. Favours rich loams. (Figure 2C)

Flowering period. April to May, more profuse after summer fire.

Etymology. Named from the Latin *magnus* (large), alluding to the large leaf and tall scapes of the subspecies.

Notes. *Eriochilus dilatatus* subsp. *magnus* is the tallest member of the genus, with scapes to 50 cm tall. It is related to *E. d.* subsp. *multiflorus*, differing in its larger leaf on flowering plants and the more widely spaced flowers on the inflorescence. It flowers most prolifically after fire. *E. dilatatus* subsp. *magnus* intergrades with *E. d.* subsp. *dilatatus* on coastal granite outcrops on the Leeuwin–Naturaliste Ridge (e.g. A. Brown 931, R.D. Royce 3321).

Eriochilus dilatatus* subsp. *multiflorus (Lindley) Hopper & A.P. Br., *comb. nov.*

Eriochilus multiflorus Lindley, Sketch Veg. Swan Riv. Col. 53 (1840). *Type*: Swan River, *Drummonds s.n.* (*holo*: K-L! (Figure 3); *iso*: K!).

Illustrations. W. Nicholls, *Orchids of Australia*, plate 198a, as *E. dilatatus* (1969); Cady & Rotherham, *Australian Native Orchids in Colour* 55, t. 45 (1970); N. Hoffman & A. Brown, *Orchids of South-West Australia*, 1st ed., p. 352, as *E. dilatatus* (1984); D. Jones, *Native Orchids of Australia*, p. 159, extreme left illustration, as *E. multiflorus* (1988); E. Bennett, *The Bushland Plants of Kings Park Western Australia*, (Fig. 232, as *E. dilatatus* (1988); N. Hoffman & A. Brown, *Orchids of South-West Australia*, 2nd ed., p. 180 (1992) and rev. 2nd edn with suppl., 180 (1998); J. Riley & D. Banks, *Orchids of Australia*, p. 155, as *E. multiflorus* (2002).

Leaf on flowering plants usually concolorous, green, occasionally with dull maroon markings beneath, narrowly ovate to ovate with a shortly acute apex and flat margins, often not fully expanded at anthesis, 8–30 mm long, 3–10 mm wide; *scape* green, wiry, 15–40 cm tall; *inflorescence* usually with up to 5 widely-spaced flowers or rarely to 20+ closely packed flowers; *lateral sepals* usually 10–15 mm long; *labellum* hairs pale cream to maroon.

Specimens examined. WESTERN AUSTRALIA: Kalamunda, May 1915, *W.B. Alexanders s.n.* (PERTH 00241830); Wambyn Nature Reserve, 14 km W of York, 16 May 1985, *G.J. Keighery & J.J. Alford* 307 (PERTH00578509); Claremont, 08 June 1902, *C. Andrews s.n.* (PERTH00241776); Guildford, Apr. 1901, *C. Andrews s.n.* (PERTH00241806); Guildford, Apr. 1901, *C. Andrews s.n.* (PERTH00242306); Guildford, Apr. 1901, *C. Andrews s.n. (a)* (PERTH00244643); Claremont, Apr. 1901, *C. Andrews s.n. (b)* (PERTH00244651); N.I., *n.dat.*, *Anonymous s.n.* (PERTH00243779); N.I., 07 Apr. 1932, *Anonymous s.n.* (PERTH00269239); N.I., *n.dat.*, *Anonymous s.n. (b)* (PERTH00909580); W of Tunnel Rd, study plot 64, Worsley Mine Site, 10 km S of Boddington, 22 Apr. 1982, *K.J. Atkins* KA162 (PERTH00240893); Bunbury, 7 May 1929, *I. Banks s.n.* (PERTH00242284); South Bunbury, *n.dat.*, *I. Banks s.n.* (PERTH00242276); Junction of Hines and Scarp Rds, c. 4 km ENE of North Dandalup, 32° 30' 00" S, 116° 01' 30" E, 01 June 1988, *A. Brown* 818 (PERTH01029177); Bakers Junction Nature Reserve, on the track running parallel to the E boundary, c. 50 metres W of the boundary, 34° 56' 00" S, 117° 55' 00" E, 02 May 1989, *A. Brown* 925 (PERTH01029231); Gravel reserve at the junction of South-West Hwy and Marbellup Rd due W of Marbellup Nature Reserve, 34° 59' 00" S, 117° 43' 00" E, 02 May 1989, *A. Brown* 928 (PERTH01029258); Bunbury Bypass, c. 1 km E of Bussell Hwy on S side, 33° 20' 00" S, 115° 39' 00" E, 09 May 1989, *A. Brown* 929 (PERTH01029215); 250 meters S of Cowaramup Bay road, c. 700 meters W of Caves Rd, 33° 52' 00" S, 115° 01' 00" E, 09 May 1989, *A. Brown* 934 (PERTH01026119); Brockman Hwy, at Alexandra Bridge, 34° 10' 00" S, 115° 12' 00" E, 10 May 1989, *A. Brown* 935 (PERTH01029185); Carey Brook, Donnelly River, 20 Mar. 1965, *W.H. Butler s.n.* (PERTH00269182); Mills Rd, Gosnells, 12 May 1980, *R.J. Cranfield* 1196 (PERTH00241296); 1 km SW of Horne Rd, 4.5 km W of main road to Manjimup, 34° 27' 00" S, 116° 12' 00" E, 27 May 1989, *R.J. Cranfield* RJC7653 (PERTH01667521); N of Cranbrook, 21 Apr. 1931, *R. Erickson s.n.* (PERTH00923923); Junction of Nannup Rd and Sabina Rd, Busselton, Apr. 1978, *M.E. Foote s.n.* (PERTH00269220); Bartram Rd, Jandakot, 02 May 1960, *A.S. George* 829 (PERTH00241849); Bartram Rd, Jandakot, 30 Apr. 1961, *A.S. George s.n.* (PERTH00241393); 2 miles E of Nornalup, 23 Apr. 1962, *A.S. George s.n.* (PERTH00242810); 2 miles SW of Donnybrook, 20 Apr. 1966, *A.S. George* 7714 (PERTH00243213); Warton Rd, 31 July 1977, *A.S. George s.n.* (PERTH00241768); Glen Forrest, May 1936, *B.T. Goadby s.n.* (PERTH00242292); King George Sound, Apr. 1899, *B.T. Goadby s.n. (e)* (PERTH00870463); Marbellup Townsite Reserve, 15 km W of Albany, 22 Apr. 1980, *J.W. Green* 4951 (PERTH00240915); Capel, May 1920, *D.A. Herbert s.n.* (PERTH00244201); Junction of McAlinden–Power Station Roads, c. 7 km SE of Collie, 32° 24' 00" S, 116° 12' 00" E, 26 Mar. 1986, *S.D. Hopper* 4778 (PERTH00910120); 0.5 km N along

Old School Rd, Elleker, c. 15 km W of Albany, 35°01'00" S, 117°44'00" E, 04 May 1989, *S.D. Hopper* 7161 (AD, CBG, PERTH01191470); 1.2 km W of C.A.L.M. Walpole, on the South Western Hwy, 34°59'00" S, 116°44'00" E, 4 May 1989, *S.D. Hopper* 7168 (CBG, PERTH01191861); Shannon Rock, E side of South Western Hwy, 8.4 km NW of Shannon River Bridge, c. 40 km SE of Manjimup, 34°32'00" S, 116°23'00" E, 4 May 1989, *S.D. Hopper* 7170 (CBG, PERTH01191454); Nillup, 1934, *L. Horburys.n.* (PERTH00242780); Nillup, 1934, *L. Horburys.n.* (PERTH00242721); Nillup, 1934, *L. Horburys.n. (c)* (PERTH00870471); North Boyanup Rd opposite Bunbury Airport, c. 10 miles NE Bunbury, 21 May 1970, *G.J. Keighery* 708 (PERTH00241857); 22 km SSE of Nannup on Pemberton Rd, 23 Apr. 1973, *G.J. Keighery* 4322 (PERTH00241288); Kojaneerup Spring, E Stirling Ranges, 16 May 1982, *G.J. Keighery* 5693 (PERTH00240907); Margaret River District, 28 Apr. 1919, *A.H. Mann s.n.* (PERTH00244171); Canningvale, 1 km S along Ranford Rd from Nicholson Rd, 32°06'00" S, 115°52'00" E, 14 May 1986, *R. Peakall* 103 (PERTH00847291); Kendenup, 221 mile peg (Perth–Albany Rd (3 km N of Mount Barker), 7 Apr. 1932, *W. Rowe s.n.* (PERTH00242349); Cut Hill, W of York, 7 May 1905, *O.H. Sargent s.n.* (PERTH00242799); Cut Hill, W of York, 19 May 1907, *O.H. Sargent* 451 (PERTH00242764); Cut Hill, W of York, 19 May 1907, (?) *O.H. Sargent s.n.* (PERTH00244244); Reserve C8120, Coulston Rd, Boya, 26 May 1985, *P. Sawyer* 013 (PERTH00404160); Bickley, 06 May 1948, *N.H. Speck s.n.* (PERTH00927104); Bickley, May 1949, *N.H. Speck s.n.* (PERTH00927082); Bickley, May, *N.H. Speck s.n.* (PERTH00927090); 16 km N of Albany on road to Borden, 09 May 1969, *P.G. Wilson* 8301 (PERTH00244163).

Distribution and habitat. Found in the jarrah (*Eucalyptus marginata*) forest from north of Perth to Albany, and in banksia woodlands on the Swan Coastal Plain, extending southwards to the Leeuwin–Naturaliste Ridge. Grows in sand or laterite. Also extends eastwards on wheatbelt granite outcrops. (Figure 2D)

Flowering period. March to May, more profuse following summer fire.

Notes. A common subspecies often found in large numbers after fire. Intergrades with other subspecies where their habitats overlap. It is recognized by its usually larger number of flowers (only subsp. *magnus* is similarly as multi-flowered) and its leaf often not fully expanded on flowering scapes.

We concur with Lindley (1840), Jones (1988) and Clements (1989) that *Eriochilus dilatatus* subsp. *multiflorus* has a smaller more ovate leaf than the typical subspecies. However, our studies have not confirmed consistent differences described by these authors in flower size, labellum shape nor in the abundance of labellum hairs. Consequently, we propose subspecific status rather than recognizing *multiflorus* as a species.

Eriochilus dilatatus* subsp. *orientalis* Hopper & A.P. Br., *subsp. nov.

A subspeciebus aliis *E. dilatato* R.Br. folio ovato lanceolato 15–30 mm longis et 7–10 mm latis, marginibus planis, et scapoque multifloribus differt.

Typus: Toolinna Cove, 32°45'00" S, 124°59'00" E, 26 April 1988, *G.J. Keighery & J.J. Alford* 1945 (*holo:* PERTH01751492; *iso:* CBG!).

Leaf on flowering plants concolorous, green, narrowly ovate with a shortly acute apex and flat margins (rarely undulate), fully expanded at anthesis, 15–30 mm long, 7–15 mm wide; *scape* green, fleshy, 15–26 cm tall; *inflorescence* with 1–7 (usually 3–5) widely spaced flowers; *lateral sepals* 8–12 mm long; *labellum* hairs usually maroon.

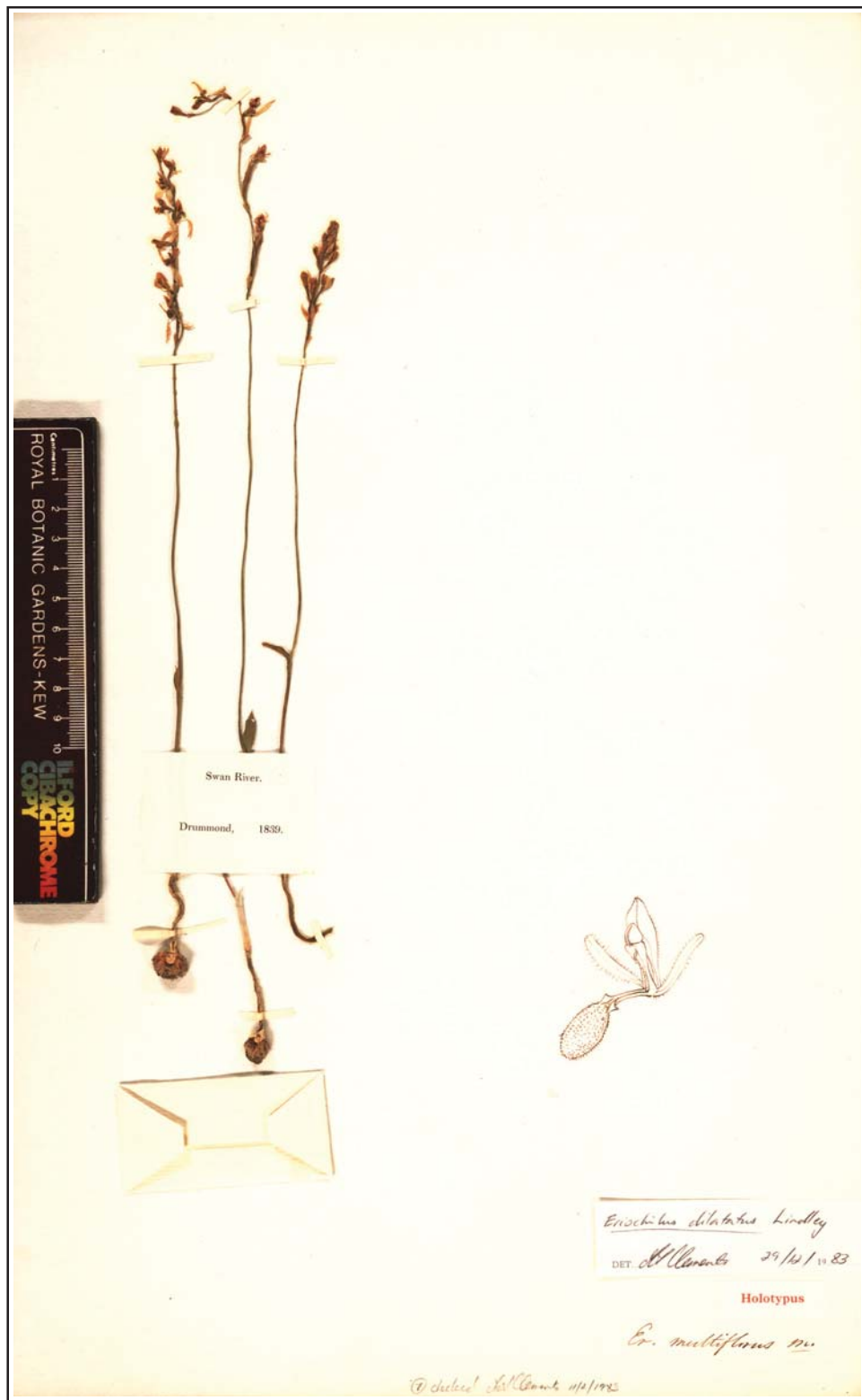


Figure 3. Holotype of *Eriochilus multiflorus*. Swan River, Drummond 1839.

Specimens examined. WESTERN AUSTRALIA: Toolinna Cove, 6 May 2004, *A.P. Brown* 7162 (PERTH 07319169); 32.5 km S of Caiguna via Baxters Memorial Track; Caiguna is c. 380 km E of Norseman, 24 Aug. 1983, *M.J. Fitzgerald* B93 (PERTH 00241385).

Distribution and habitat. Confined to coastal limestones in the Toolina region on the Great Australian Bight where it grows in low heath of *Melaleuca pulchella*, *Templetonia retusa*, *Westringia dampieri*, *Bossiaea obcordata*, *Goodenia varia* and *Acacia* sp., mainly in shallow soil pockets, extending inland into low mallee of *Eucalyptus angulosa* and *E. surgens*. Other orchids that occur in the same area include *Pterostylis sanguinea*, *Caladenia microchila*, *Microtis media* and *Genoplesium nigricans*. (Figure 4A)

Flowering period. April to May, not dependent on summer fire.

Etymology. Named from *orientalis* (east), alluding to the geographical position of the subspecies relative to all others.

Notes. *Eriochilus dilatatus* subsp. *orientalis* is the most easterly and disjunct subspecies, distinguished by its leaf on flowering plants fully expanded, narrowly ovate, with margins rarely undulate, its scapes fleshy, 15–25 cm tall and its flowers 2–7 per scape. It is related to *E. dilatatus* subsp. *multiflorus*, differing in its fleshy scapes and leaves, the latter fully expanded at anthesis, flowering regardless of fire, and its fewer-flowered inflorescence. *E. dilatatus* subsp. *orientalis* has only been collected over the past two decades, due to the remoteness of its habitat, which contains other recently described taxa such as *Eucalyptus surgens* (Brooker and Hopper 1993).

Eriochilus dilatatus* subsp. *undulatus* Hopper & A.P. Br., *subsp. nov.

A subspeciebus aliis *E. dilatato* R.Br. folio ovato 1.5–3.5 cm longis et 5–11 mm latis, marginibus undulatis, et scapoque paucifloribus differt.

Typus: E side of Fowler's Gully in the Wongan Hills, 2 km S of Wongan Hills–Piawaning Rd, 30°50'S 116°38'E, 14 May 1980, *K.F. Kenneally* 7191 (*holo:* PERTH 1220470!; *iso:* PERTH - spirit collection No. 3655/A!).

Illustrations. R. Erickson, *Orchids of the West*, 2nd ed., plate 19, right illustration, as *E. dilatatus* (1965); N. Hoffman & A. Brown, *Orchids of South-West Australia*, 2nd ed., p. 182 (1992) and rev. 2nd edn with suppl., 182 (1998).

Leaf on flowering plants discolorous, green above, pale maroon with greenish streaks below, usually fully expanded at anthesis, usually narrowly ovate with a shortly acute apex, margins undulate, 5–20 mm long, 2–7 mm wide; *scape* green, wiry, 10–20 cm tall; *inflorescence* with 1–3 (rarely more) widely spaced flowers; *lateral sepals* 8–15 mm long; *labellum* hairs pale cream with maroon suffusions.

Specimens examined. WESTERN AUSTRALIA: Key Farm, Toodyay, May 1936, *Anonymous s.n.* (PERTH 00916951); Hatters Hill, E of Varley; Grid Line: 752/1344, 32°49'00" S, 119°59'00" E, 21 Aug. 1990, *P. Armstrong s.n.* (PERTH 1828665); Collie, May 1929, *I. Banks s.n.* (PERTH 00243752); Stokes National Park, 33°49'00" S, 121°10'00" E, 05 May 1989, *K. Bradbury* DL7 (PERTH 1828673); Stokes National Park, 33°49'00" S, 121°10'00" E, 04 May 1989, *K. Bradbury* S14 (PERTH 1828711); Stokes National Park, 33°49'00" S, 121°10'00" E, 05 May 1989, *K. Bradbury* S15 (PERTH 1828738); 211 mile peg, 3 Springs to Mingenew (c. 10 km N of Arrino on Midlands Rd, between Three Springs and Mingenew), 5 May 1964,

A.R. Fairall 1450 (PERTH00242322); c. 1.5 miles W of Quairading, 22 May 1960, *A.S. George* 833 (PERTH00243310); 10 miles N of Hopetoun, 21 Apr. 1962, *A.S. George* s.n. (PERTH00243280); Aurora, 15 Apr. 1932, *B.T. Goadby* s.n. (PERTH00269603); Clackline–Lawnswood, 27 May 1950, *J. Hennelly* s.n. (PERTH00916552); Willsea farm, (Ray Lock's property), c. 10 km SSW of Wellstead, 34° 32' 00" S, 116° 23' 00" E, 03 May 1989, *S.D. Hopper* 7155 (PERTH01191888); Puskins reserve, Leeder Rd, Clackline, 12 June 1986, *G.J. Keighery & J.J. Alford* 514 (PERTH00792209); Conways property, E side of Wongan Hills, 194 km NE of Perth, 19 May 1977, *K.F. Kenneally* 6336 (PERTH 01220489); Irwin River, 28 May 1950, *W.M. McArthur* s.n. (PERTH00913316); Wyalkatchem, May 1960, *B. Rosier* 277 (PERTH00243795); Cut Hill, W of York, 19 May 1907, *O.H. Sargents* s.n. (PERTH00243736); Helena Valley, May 1978, *J. Seabrook* 552 (PERTH 00241792); Avon Location 19405, SW of Manmanning, 1973, *B.M. Smith* s.n. (PERTH 00243728); 100–200 metres N of Canning Mills Rd, 1.5 km E of junction with Tonkin Hwy, 5 June 1989, *A.N. Start* s.n. (CBG, PERTH 01197770); Corner of Scaddan and Savage Rds, E of Esperance, 13 Aug. 1978, *D.R. Voigt* 50pp (PERTH 00243248); S slope of East Mount Barren, above road, 14 July 1971, *A.S. Weston* 6299 (PERTH00241318); Darlington, 16 May 1931, *R.F. Williams* s.n. (PERTH00922811).

Distribution and habitat. Occurs throughout the wheatbelt from Northampton to east of Esperance, and inland to Mt Jackson and Queen Victoria Rocks in a variety of habitats (e.g. granite outcrops, mallee woodlands, shrublands), extending into the northern jarrah forest and down the Darling Scarp in wandoo woodlands and on granite outcrops. (Figure 4B)

Flowering period. April to May, not dependent on summer fire.

Etymology. Named from the Latin *undulatus* (undulate), alluding to the undulate margins of the leaf on flowering plants.

Notes. *Eriochilus dilatatus* subsp. *undulatus* occurs further inland than other subspecies, and flowers in the absence of fire. Its undulate leaf margins and usually 1–2-flowered scapes are characteristic except for *E. d.* subsp. *brevifolius*. The latter subspecies, ranging from Dongara to the Murchison River area, differs from typical *E. d.* subsp. *undulatus* in its leaf green above and uniformly pale maroon below, its pale maroon, fleshy scapes, its later flowering in mainly mid-May–June, and in being restricted to well-watered depressions and rocky areas.

The pollination of *Eriochilus dilatatus* subsp. *undulatus* by native bees (*Hylaeus dorotheiae*) near Bolgart was first described by Erickson (1965). Flowers have been observed with droplets of nectar at the base of the column (e.g. SDH, pers. obs. at Wambyn Nature Reserve). It would appear that these orchids thus offer a genuine food reward to pollinators, rather than relying on mimicry and deception as do most southwest orchids (Stoutamire 1974, 1975, 1981, 1983; Brown & Hopper, unpubl.). *E. dilatatus* subsp. *undulatus* is similar to *E. helonomos*, but the latter species differs in its shorter ovate leaf, and its restriction to winter-wet habitats.

***Eriochilus helonomos* Hopper & A.P. Br., sp. nov.**

A. E. dilatato R.Br. folio parviore minus 17 mm longo, saepe ovato marginibus undulatis, et petalis adpressis ad columnam per anthesin differt.

Typus: 2.8 km W along South-Western Hwy from T-junction with Lower Denmark Rd, c. 10 km E of Denmark, 34°57'S 117°28'E, 4 May 1989, *S.D. Hopper* 7164 (*holo:* PERTH 1751484!; *iso:* AD! CBG! K!).

Illustrations. N. Hoffman & A. Brown, *Orchids of South-West Australia*, 2nd ed., p. 185 (1992) and rev. 2nd edn with suppl., 185 (1998).

Leaf cauline, glabrous, ovate–acute, acuminate, 7–17 mm long, underside smooth and sometimes suffused dark purple when fresh, margins often undulate. *Leaf of non-flowering plant* 7–17 mm × 2–10 mm. *Leaf of flowering plant* inserted a quarter to a third the way up scape, same size as on nonflowering plants. *Scape* wiry, suffused with dark purple near the base, green above, 8–15 cm tall. *Floral bract* narrowly ovate, to 3 × 2 mm. *Inflorescence* usually single-flowered, rarely 2–3. *Dorsal sepal* cream with brownish-red marginal markings, 6–11 mm by 2–3 mm. *Lateral sepals* cream, underside sometimes faintly suffused pink with a pale median stripe, 7–15 mm by 2–4 mm. *Petals* clasping the column at full anthesis, cream with brownish-red marginal longitudinal stripes, 6–10 mm by 0.5–1.5 mm. *Labellum* 6–9 mm long by 2–4 mm wide; *lamina* 3–4 mm long × 2–4 mm wide, prominently decurved, flattened-orbicular when viewed from front, greenish cream, with scattered clusters of dark red or opaque hairs; *claw* 2.5–4 mm long. *Column* 5–7 mm by 2–3 mm; stem uniformly pale green, tapering slightly towards base. *Anther* greenish yellow with red markings near the margins. *Stigma* clearly visible through a transversely oval orifice; margins of orifice pinkish cream, becoming dark red; lower margins with central and extreme lateral downward dips. *Ovary* green.

Specimens examined. WESTERN AUSTRALIA: Guildford, May 1915, *W.B. Alexander s.n.* (PERTH 00241822); Brookton Hwy, SE of Perth, at the 69.2 km peg, 32° 15' 00" S, 116° 27' 00" E, 31 May 1988, *A. Brown* 813 (PERTH 01197746); 250 metres S of Cowaramup Bay Rd, c. 700 metres W of Caves Rd, 33° 52' 00" S, 115° 01' 00" E, 09 May 1989, *A. Brown* 933 (PERTH 01197711); Boyup Brook–Donnybrook road, c. 25 km NW of Boyup Brook, 33° 40' 00" S, 116° 16' 00" E, 10 May 1989, *A. Brown* 940 (PERTH 01197738); Lots 65 and 66, Junction of Keane Rd and Anstey Rd, Canning Vale, 32° 05' 00" S, 115° 55' 00" E, 17 May 1989, *A. Brown* 941 (PERTH 01197703); Hammond Rd, Jandakot, 14 May 1960, *A.S. Georges s.n.* (PERTH 00244279); Applecross, May 1929, *B.T. Goadby s.n. (a,b)* (PERTH 00241873); Parking Bay on the E side of Albany Hwy, c. 80 km NW of Williams Post Office, 32° 27' 00" S, 116° 20' 00" E, 01 May 1989, *S.D. Hopper* 7143 (PERTH 01197754); On Eyre River, near Sandalwood Rd, c. 12 km SE of Wellstead, 34° 33' 00" S, 118° 42' 00" E, 3 May 1989, *S.D. Hopper* 7153 (PERTH 01197762); Canning Dam, down slope from quarry, 32° 09' 00" S, 116° 07' 00" E, 28 June 1989, *A.N. Start s.n.* (CBG, PERTH 01197681).

Distribution and habitat. WESTERN AUSTRALIA: Ranges widely from Cataby area to Cape Riche. Favours clay-based winter-wet swamps and seeps on granite outcrops. (Figure 4C)

Flowering period. April to June, not dependent on summer fire.

Etymology. Named from the Greek *helos* (marsh, swamp), alluding to the preferred habitat of the species.

Notes. *Eriochilus helonomos* is allied to *E. dilatatus*, especially subspp. *undulatus* and *brevifolius*, but is readily distinguished by its small strongly acute ovate leaf, its inflorescence usually single-flowered, its petals appressed to the column and partly enclosed by the dorsal sepal, and its preference for winter-wet habitats. Vegetative leaves are often found in clumps, suggesting that the species is colonial.

Eriochilus helonomos has been found growing with or adjacent to populations of both *E. dilatatus* and *E. valens*. No hybrids have been found.

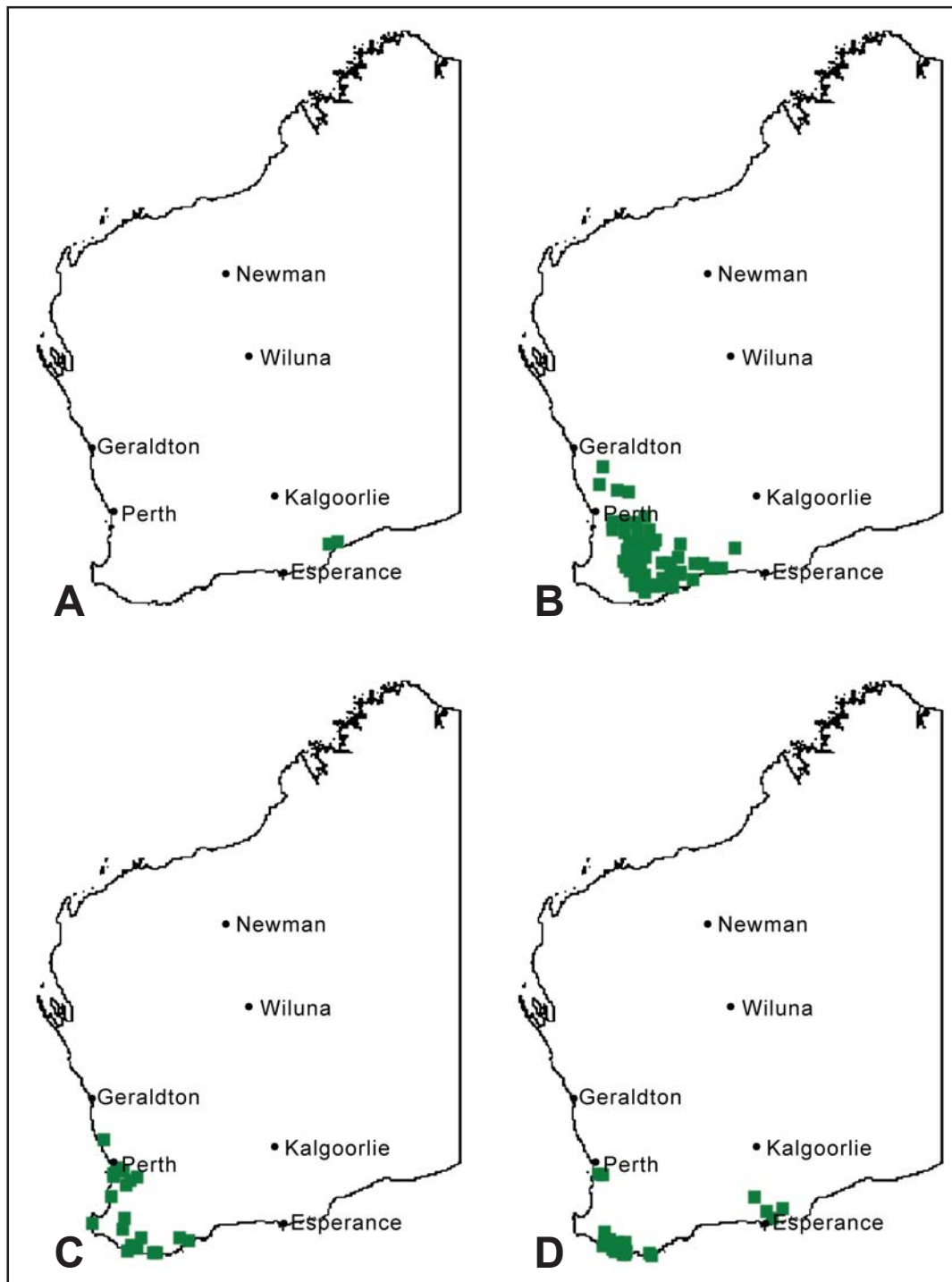


Figure 4. Distribution maps. A – *Eriochilus dilatatus* subsp. *orientalis*; B – *Eriochilus dilatatus* subsp. *undulatus*; C – *Eriochilus helonomos*; D – *Eriochilus pulchellus*.

Eriochilus pulchellus Hopper & A.P. Br., *sp. nov.*

A. E. dilatato R.Br. folio scapoque carnosio, scapo brevi (5–15 cm alto), floribus 3–10 maculatis prominentibus atropurpureis differt.

Typus: Shannon Rock, E side of South-western Highway, 8.4km NW of Shannon River Bridge, c. 40km SE of Manjimup, 34°32'S 116°23'E, 4 May 1989, *S.D. Hopper* 7169 (*holo*: PERTH 1751476!; *iso*: AD! CBG! K! MEL!).

Illustrations. N. Hoffman & A. Brown, *Orchids of South-West Australia*, 2nd ed., p. 183 (1992) and rev. 2nd edn with suppl., 183 (1998).

Leaf cauline, fleshy, narrowly ovate and shortly acute, 14–20 mm long, underside prominently ribbed and pale green or dark purple when fresh, margins flat. *Leaf of non-flowering plant* 14–20 mm × 5–7 mm. *Leaf of flowering plant* inserted a quarter to a third the way up scape, same size as on non-flowering plants. *Scape* fleshy, uniformly green or dark purple towards the base and green above, 3–15 cm tall. *Floral bract* narrowly ovate, to 4 × 2 mm. *Inflorescence* usually 3–5-flowered, rarely 1–2, or 6–11. *Dorsal sepal* cream with dark brownish-red marginal markings, 7–10 mm by 3–4 mm. *Lateral sepals* 12–15 mm by 3–4 mm, cream, underside sometimes suffused pink towards the apex. *Petals* spreading away from the column at full anthesis, cream with dark brownish-red marginal longitudinal stripes, 7–9 mm by 1.0–1.5 mm. *Labellum* 8–10 mm long by 2.5–3 mm wide; *lamina* 3–4 mm long by 2.5–3 mm wide, prominently decurved, flattened-orbicular when viewed from front, with a central longitudinal channel devoid of coloured hairs, greenish cream with dense to scattered clusters of dark red hairs; *claw* 3–5 mm long. *Column* 5–8 mm by 2.5–3.5 mm; stem uniformly pale green, tapering slightly towards base, inconspicuously winged. *Anther* greenish yellow with red markings near the margins. *Stigma* clearly visible through a transversely oval orifice; margins of orifice pinkish cream, becoming dark red; lower margins with central and extreme lateral downward dips. *Ovary* green.

Specimens examined. WESTERN AUSTRALIA: Mount Beaumont, 9 Aug. 1980, *A. Browns* n. (PERTH 00292877); Windy Harbour Rd, c. 900 metres N of Mount Chudalup, 34°45'00" S, 116°05'00" E, 10 May 1989, *A. Brown* 937 (PERTH 01197673); Mount Ney, 30 Aug. 1984, *M.A. Burgman* & *C. Layman* MAB 3227 (PERTH 00240885); Condingup, 25 May 1965, *T. Daniell* 12 (PERTH 00913790); NW base of Mount Ney, 33°24'00" S, 122°28'00" E, 7 Aug. 1980, *A.S. George* 15841 (PERTH 00241334); N side of Mount Heywood, 33°20'00" S, 122°32'00" E, 8 Aug. 1980, *A.S. George* 15869 (PERTH 00241326); Sheoak Hill, SE of Mount Ragged, 33°37'00" S, 123°39'00" E, 14 Aug. 1980, *A.S. George* 16030 (PERTH 00241350); SW side of Mount Ragged, 33°28'00" S, 123°28'00" E, 15 Aug. 1980, *A.S. George* 16051 (PERTH 00241369); Junana Rock, 33°23'00" S, 123°24'00" E, 16 Aug. 1980, *A.S. George* 16092 (PERTH 00248096); 13 km SE of Albany on Isthmus Hill in Torndirrup National Park, 35°06'00" S, 117°56'00" E, 23 May 1991, *S.D. Hopper* 7935 (PERTH 1828983); 13 km SE of Albany, 200 metres WNW of lighthouse in Torndirrup National Park, 35°07'00" S, 117°56'00" E, 24 May 1991, *S.D. Hopper* 7936 (PERTH 1828991); Granite outcrop, below and N of Mount Frankland, 34°50'00" S, 116°47'00" E, 25 Apr. 1990, *W. Jackson* BJ171 (PERTH 01700022); SW foothills of Mount Ragged, on breakaway at foot of range, above campsite, 33°27'00" S, 123°29'00" E, 03 Apr. 1989, *M. Lyons* s.n. (PERTH 01190857); Mount Chudalup, near Northcliffe, 34°46'00" S, 116°05'00" E, 13 May 1972, *G.G. Smith* s.n. (PERTH 00928127); Near Mount Merivale Exchange, Map 423/80, 28170, 23 Apr. 1978, *D.R. Voigt* 14pp (PERTH 00243264); Orchid Rocks, Map 391/80, 22 Apr. 1978, *D.R. Voigt* 25 (PERTH 00243272); Wittenoorn Hills, W slope, 13 Aug. 1978, *D.R. Voigt* 47pp (PERTH 00244260); Wireless Hill, Esperance, 23 Apr. 1978, *D.R. Voigt* 6 (PERTH 00243744); Western

Edge SW corner of Mount Ragged, 2 Sep. 1978, *D.R. Voigt* 79 (PERTH00243302); Boyatup Hill, 71 miles E of Esperance, N side of Fisheries Rd, 4 Sep. 1979, *D.R. Voigt* 63pp (PERTH00243205); Giants Block, Valley of the Giants, E of Walpole, 34° 59' 00" S, 116° 54' 00" E, May 1989, *G. Wardell-Johnson* s.n. (CBG, PERTH1828401); Shannon Rock, SE of Manjimup, 34° 15' 00" S, 116° 09' 00" E, 18 May 1978, *A. Wilson* s.n. (PERTH00269204).

Distribution and habitat. Confined to three disjunct areas – high rainfall sites near Perth, and between Northcliffe and Albany, and in the Esperance–Balladonia region. Usually grows in *Campylopus* moss swards on granite outcrops, but one of the Albany populations is in wind-pruned low coastal heath on skeletal limestone. (Figure 4D)

Flowering period. April to May, not dependant on summer fire.

Etymology. Named from the Latin *pulcher* (beautiful), and the diminutive suffix *-ellus*, alluding to the brightly coloured flowers and diminutive stature of the type population of the species.

Notes. *Eriochilus pulchellus* is allied to *E. dilatatus* but is readily distinguished by its fleshier stouter leaves and scapes, its more colourful flowers, and its preference for rock outcrops.

Populations of *Eriochilus pulchellus* at Shannon Rock and Little Mt Chudalup appear to be light sensitive, with all flowers facing northwards towards the sun. The species does not require fire to flower well. It is colonial in habit.

Eriochilus scaber Lindley, Sketch Veg. Swan Riv. Col. 53 (1840). *Type:* Swan River, *Drummond* s.n. (*holo:* K-L! (Figure 5); *iso:* K!).

Leaf basal, orbicular or narrowly ovate to ovate, shortly acute, 3–20 mm long, margins flat. *Leaf of non-flowering plant* glabrous, discolorous, lamina flat; upper surface dark green with five white longitudinal stripes, evenly hirsute; margins and lower surface dark maroon becoming paler greenish cream towards the centre, 3–12 mm × 2–10 mm. *Leaf of flowering plant* inserted a tenth or less the way up scape, concolorous, yellowish green, glabrous, lamina cupped around scape, larger than on nonflowering plants in subsp. *scaber*, 7–17 mm × 7–15 mm; similar in size to those on nonflowering plants in subsp. *orbifolia*, 8–20 mm × 10–15 mm. *Scape* wiry, uniformly green (sometimes becoming suffused dull maroon near ovary), usually less than 10 cm tall, sparsely hirsute. *Floral bract* broadly ovate, to 6 × 4 mm. *Inflorescence* 1–3-flowered. *Dorsal sepal* conspicuously hairy on outside, glabrous inside, with pale pink markings, 6–8 mm × 2–3 mm. *Lateral sepals* conspicuously hairy on the outside, glabrous inside, broadly lanceolate, pale pink (rarely cream), 8–12 mm × 3–5 mm. *Petals* appressed to column at full anthesis, sparingly hirsute on apical margins only, with dark pink median and marginal longitudinal stripes, 5–8 mm × 1.5–2 mm. *Labellum* 5–8 mm long × 2–3 mm wide; *lamina* 1.5–4 mm long × 2–3 mm wide, prominently decurved, flattened-orbicular when viewed from front, uniformly dark rose pink, with dense clusters of hairs; *claw* 3–5 mm long. *Column* to 5 × 2 mm; stem uniformly pale green, slender (0.5–1 mm wide), tapering slightly towards base, inconspicuously winged, becoming shortly hirsute towards the stigma. *Anther* uniformly dark pink except for white irregularly serrate margins. *Stigma* scarcely visible through a slender horizontal orifice; margins of orifice white, becoming dark pink elsewhere. *Ovary* brownish maroon to dark red, hairs sometimes grouped in longitudinal clusters along ribs.

Distribution and habitat. In scattered populations from the Lesueur National Park near Jurien south to Augusta and eastwards to Cape Arid National Park. Usually occurs in winter-wet swamps. On the Swan Coastal Plain it favours swamps on the Bassendean Dunes, and is rare in clay-based swamps of the Pinjarra Plain and Darling Plateau. In the southern forests and along the south coast, the species occurs on the margins of sandy and peaty swamps, and may also occur in damp situations away from swamps. It occurs in swamps near Esperance, but is confined to damp run-off areas on granite outcrops to the north and east thereof.

Associated vegetation varies throughout wide geographical range of the species, from *Melaleuca* dense heath near Jurien, *Pericalymma*–*Melaleuca* heath with emergent *M. preissiana*–*Banksia littoralis* low woodland near Perth and Busselton, *Homalospermum*–*Beaufortia* heath and jarrah-marri forest near Manjimup, Walpole and Albany, low heath near Esperance, and in *Borya* herbfields on granite outcrops.

Flowering period. July to August between Jurien and Busselton, and also near Esperance; September to early October along the south coast between Augusta and Albany. Dependent on summer fire.

Typification. There are two specimens mounted on the holotype sheet in the Lindley Herbarium at K (Figure 5). The sheet is clearly annotated “*Er. scaber* m.” in Lindley’s hand, and the specimens match the protologue in every detail. There are no problems, therefore, in applying the name.

Notes. *Eriochilus scaber* has been traditionally regarded as close to *E. cucullatus sens. lat.* (e.g. Nicholls 1969), and more recently to *E. tenuis* (e.g. Jones 1988). However, *E. autumnalis* may well be the closest named relative of *E. scaber* because both have basal leaves that are dark green, hairy and prominently veined, and both have hairy scapes and pale pink (occasionally cream) flowers. *E. scaber* differs from *E. tenuis* in its shorter hirsute scapes usually less than 10 cm tall, its leaf on non-flowering plants striped above and red beneath, and its generally earlier flowering from July–October.

The leaves of non-flowering plants are held flat on the ground and are darker green, hirsute and more prominently veined than those on flowering plants. This dimorphism in leaves of non-flowering and flowering plants is the most striking of any southwest orchid.

A race of *E. scaber* confined to coastal heath near Walpole is here described as subsp. *orbifolia*, and distinguished from the type subspecies in the following key.

Key to subspecies of *Eriochilus scaber*

1. Leaf orbicular, held flat on ground; petiole creamy green,
1–3 mm above ground ***E. scaber* subsp. *orbifolia***
- 1: Leaf narrowly ovate to ovate, obliquely ascending; petiole
dark maroon or creamy green, 2–12 mm above ground ***E. scaber* subsp. *scaber***

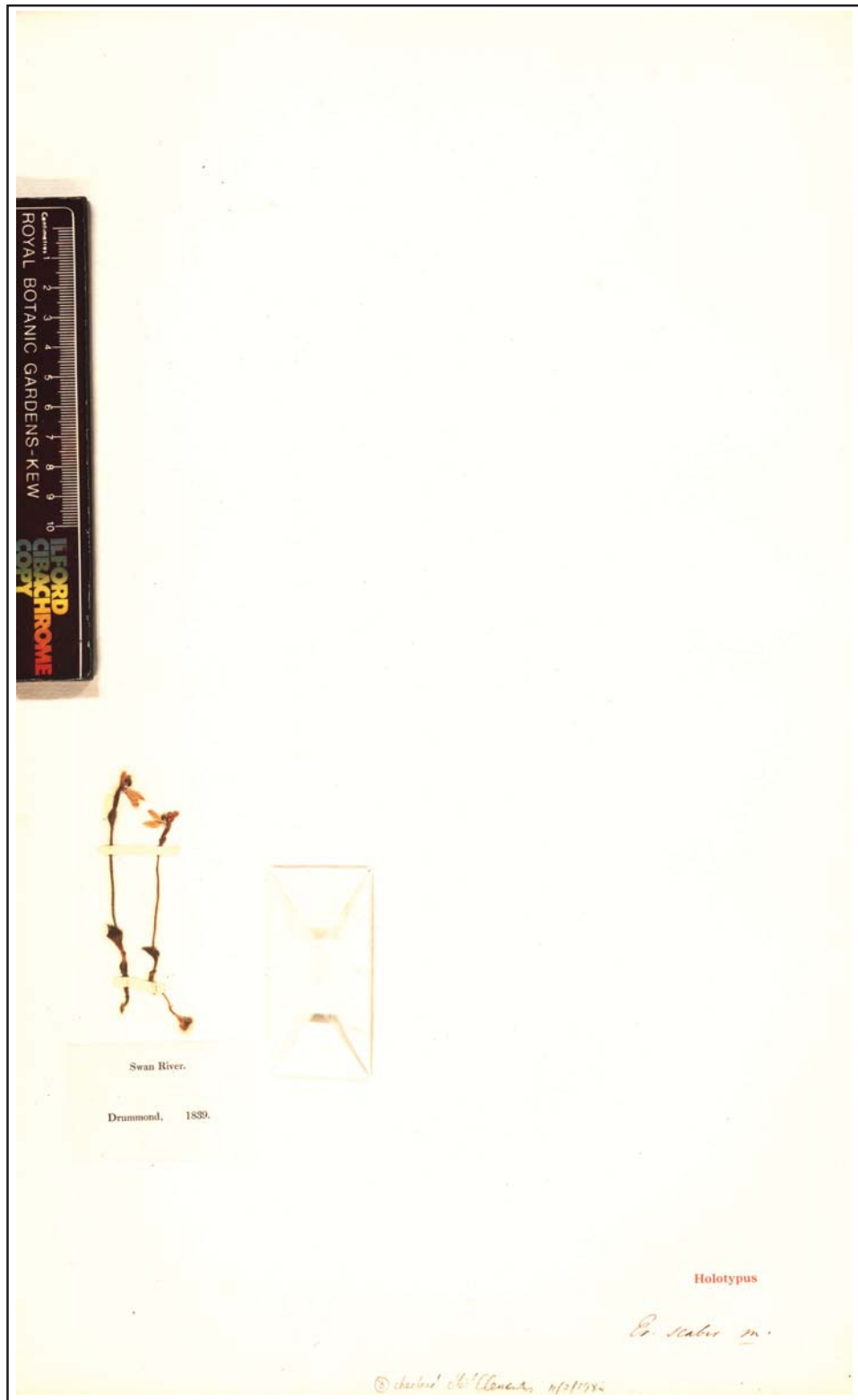


Figure 5. Holotype of *Eriochilus scaber*. Swan River, Drummond s.n.

Eriochilus scaber Lindley subsp. **scaber**

E. lindleyi Endl. in Lehm., Pl. Preiss. 2:10 (1846) – *E. scaber* Lindley var. *lindleyi* (Endl.) H.G. Reichb., Beitr. Syst. Pfl. 62 (1871). *Typus*: near Canning River, 22 July 1839, *L. Preiss* 2206 (*lecto*: W!, *fide* A.S. George, *Nuytsia* 1: 182, 1971; *iso*: G! P! W!, *fide* A.S. George, *Nuytsia* 1: 182, 1971).

Illustrations. R. Fitzgerald, *Australian Orchids*, Vol. 2. Pt 2 (1876, reprinted 1977); W. Blackall & B. Grieve, *How to Know Western Australian Wildflowers*, Part 1, p. 91 (1954); W. Nicholls, *Orchids of Australia*, plate 200a–i (1969); R. Erickson, A. George, N. Marchant & M. Morcombe, *Flowers and Plants of Western Australia*, 1st ed., p. 34 plate 67 (1973); N. Hoffman & A. Brown, *Orchids of South-West Australia*, 1st ed., p. 350 (1984); C. Woolcock & D. Woolcock, *Australian Terrestrial Orchids*, plate 2C (1984); D. Jones, *Native Orchids of Australia*, p. 158 bottom photograph, p. 159 top illustration (1988); M. Hodgson & R. Paine, *Field Guide to Australian Orchids*, p. 152 (1989); N. Hoffman & A. Brown, *Orchids of South-West Australia*, 2nd ed., p. 187 (1992) and rev. 2nd edn with suppl., 187 (1998); D. Jones & B. Jones, *A Field Guide to the Native Orchids of Southern Australia*, p. 139 (2000).

Leaf narrowly ovate to ovate, obliquely ascending, petiole dark maroon or creamy green, 2–12 mm above ground.

Specimens examined. WESTERN AUSTRALIA: Riverton, Canning, Aug. 1919, *W.B. Alexander s.n.* (PERTH00247146); Cannington, Aug. 1902, *C. Andrews s.n.* (PERTH00247103); Guildford, July 1901, *C. Andrews s.n.* (PERTH00247537); Kendenup, 6 Aug. 1931, *Anonymous s.n.* (PERTH00248002); 1 km N of Mount Heywood, 8 Aug. 1980, *A. Brown s.n.* (PERTH 00293288); Mount Burdett, 1 Sep. 1984, *M.A. Burgman & C. Layman* MAB 3288 (PERTH00246670); Busselton, *n.dat.*, *E. Coleman s.n.* (PERTH 00270172); Busselton, Oct. 1929, *E. Coleman s.n.* (PERTH00248088); Busselton, Oct. 1929, *E. Coleman s.n.* (PERTH00247588); Youngs Siding, 12 July 1933, *R. Erickson s.n.* (PERTH00923362); Wagin, July 1924, *C.A. Gardner s.n.* (PERTH00247561); Great Northern Hwy, 30 mile peg (c. 4 km from Bullsbrook towards Bindoon on Great Northern Hwy), 28 July 1957, *A.S. George s.n.* (PERTH00917494); Bartram Rd, Jandakot, 2 Aug. 1959, *A.S. George s.n.* (PERTH00270199); Bow River, W of Denmark, 34° 58' 00" S, 116° 56' 00" E, 12 Oct. 1969, *A.S. George* 9702 (K, MEL, NSW, PERTH00247065); NE base of Mount Heywood, 33° 20' 00" S, 122° 32' 00" E, 8 Aug. 1980, *A.S. George* 15879 (PERTH00292796); SW of Mount Ney, 33° 28' 00" S, 122° 22' 00" E, 9 Aug. 1980, *A.S. George* 15924 (PERTH00292869); Mount Burdett, 33° 27' 00" S, 122° 09' 00" E, 10 Aug. 1980, *A.S. George* 15947 (PERTH00294691); S side of Boyatup Hill, 33° 44' 00" S, 123° 02' 00" E, 13 Aug. 1980, *A.S. George* 15987 (PERTH00246662); King George Sound, Apr. 1899, *B.T. Goadby* 19 (PERTH00247553); Maida Vale, Aug., *B.T. Goadby s.n.* (PERTH00247111); Albany, Aug. 1901, *B.T. Goadby s.n.* (PERTH 00248045); Bayswater, Aug. 1927, *B.T. Goadby s.n.* (PERTH 00270180); Maida Vale, July 1932, *B.T. Goadby s.n.* (PERTH00247138); N.I., 5 Aug. 1932, *B.T. Goadby s.n.* (PERTH00247626); Bayswater, July 1935, *B.T. Goadby s.n.* (PERTH00247049); Porongurups, Sep. 1930, *B.T. Goadby s.n.* (PERTH 00248010); Bellevue, *n.dat.*, *B.T. Goadby s.n.* (PERTH 00247529); Pemberton, Aug. 1928, *C. Hamilton s.n.* (PERTH00247596); Wharton Beach, Duke of Orleans Bay, Cape Le Grand National Park, 19 July 1977, *A.J. Harrington s.n.* (PERTH00248517); Mowen Rd, c. 5.7 km E of Great North Rd, 33° 56' 00" S, 115° 24' 00" E, 10 Sep. 1985, *S.D. Hopper* 4522 (PERTH00863866); Nillup, 1934, *L. Horburys s.n.* (PERTH00246654); Nillup, 1934, *L. Horburys s.n. (a,b)* (PERTH00242802); Alexandra Bridge, 10 Aug. 1975, *G. Hos* 20/5 (PERTH00242756); Albany, 1919, *Dr A. Syme Johnson s.n.* (PERTH 00247618); 1 km W of Kamballup to Mount Barker, 4 Aug. 1986, *G.J. Keighery* 9880 (PERTH00854654); 1 mile W of car park at Nancy Peak, Porongurups National Park, 9 Oct. 1972, *G.J. Keighery & B.J. Banyard s.n.* (PERTH00927619); Area number 209 (W.A.L.), on private land (behind Ivans farm), 18 Aug. 1965, *K.F. Kenneally s.n.* (PERTH00919152); Margaret River District, 24 July 1919, *A.H. Mann s.n.* (PERTH 00247634); Moberup, 30 Aug. 1958, *M. Marriotts s.n.* (PERTH00925535); West Mount Barren, 20 Sep. 1969,

K.R. Newbey 2895 (PERTH00248495); 11 miles SE of Ongerup, 26 Aug. 1973, *K.R. Newbey* 3721 (PERTH 00248061); 2 km WSW of Nicholson and Ranford Rd junction, Jandakot, 32°06'00" S, 115°52'00" E, 28 July 1986, *R. Peakall* 110 (PERTH00847305); Beermullah, 16 miles NW of Gingin, 7 Sep. 1973, *R. Roe* s.n. (PERTH00248509); Pemberton, 16 Oct. 1919, *O.H. Sargents* s.n. (PERTH00270164); 1 mile from Denmark–Walpole road along Valley of the Giants road, near Bow River, 17 Sep. 1966, *E.M. Scrymgeour* 1164 (PERTH00270156); Corner of Ring Rd and Bussell Hwy, Bunbury, 22 Aug. 1972, *G. Stone* s.n. (PERTH 00247081); Collie, 5 Sep. 1906, *Mrs Tapp* s.n. (PERTH00248053); Coomalbidgup Swamp, Ravensthorpe Rd side, 24633, Map 422/80, Aug. 1977, *D.R. Voigt* 22pp (PERTH00248037); Wittenoom Hills, 13 Aug. 1978, *D.R. Voigt* 47pp (PERTH00247073); Condingup Lookout, 13 Aug. 1978, *D.R. Voigt* 48 (PERTH 00247057); E end of Mount Howick, Condingup area, 4 Sep. 1978, *D.R. Voigt* 70pp (PERTH00246646); Slope of Mount Heywood, 8 Aug. 1980, *T. Voigt* s.n. (PERTH 00293296); S of Nannup, 14 Sep. 1962, *F.W. Went* 96 (PERTH00248029).

Distribution and habitat. Wide-ranging from Jurien to east of Esperance, inland as far as York, the Stirling Range and granite outcrops such as Mt Ney. Grows predominantly in winter-wet sites except for high rainfall country where it grows in free-draining soils. (Figure 6A)

Flowering period. July to October, dependant on summer fire.

Notes. The type subspecies is a very common diminutive orchid. It is colonial, and exhibits variation in floral colour between clones, some rich pink and others white. The ovate obliquely ascending leaf held above the soil surface primarily distinguishes subsp. *scaber* from subsp. *orbifolia*.

***Eriochilus scaber* subsp. *orbifolia* Hopper & A.P. Br., subsp. nov.**

A subspeciebus *scaber* folio orbiculato plane tenentibus in terra differt.

Typus: Walpole, 3 August 1989, *S.D. Hopper* 7282 (*holo:* PERTH 1751514!; *iso:* CBG!).

Illustrations. None published. [N. Hoffman & A. Brown, *Orchids of South-West Australia*, 2nd ed., p. 188 (1992) and rev. 2nd edn with suppl., 188 (1998) – this photo is of *E. scaber* subsp. *scaber*.]

Leaf orbicular, held flat on ground, petiole creamy green, extending 1–3 mm above ground.

Specimens examined. WESTERN AUSTRALIA: Type location: 12 July 1994, *W. Jackson* BJ 287 (PERTH 4122720); 24 July 1994, *W. Jackson* BJ 286 (PERTH 4303121); 6 Aug. 1994, *W. Jackson* BJ 283 (PERTH 4303148); 12 Aug. 1994, *W. Jackson* BJ 284 (PERTH 4261909).

Distribution and habitat. Confined to undulating broad swales in coastal consolidated dunes near Walpole. Associated vegetation is *Desmocladus flexuosa* sedgeland with scattered emergent *Agonis flexuosa* or *Banksia littoralis*. (Figure 6B)

Flowering period. July to August, dependant on summer fire.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. *E. scaber* subsp. *orbifolia* is highly geographically restricted, being known only from a single location west of Walpole.

The type site has been searched on a number of occasions since 1989, including after a late autumn fire, and was rediscovered in 1994 by the late Bill Jackson.

Etymology. Named from the Latin *orbifolius* (round leaf), alluding to the leaf shape of the subspecies.

Notes. *Eriochilus scaber* subsp. *orbifolia* is a poorly known taxon distinctive in its orbicular leaf held flat on the ground. Its distribution along the high rainfall south coast requires further investigation. Repeated visits to the type location over a number of years by the late Bill Jackson (pers. comm.) established that the subspecies flowers only the first year after summer wildfire.

Eriochilus tenuis Lindley, Sketch Veg. Swan Riv. Col. 53 (1840). *Typus*: Swan River, 1839, Drummond (*holo*: K-L! (Figure 7); *iso*: K!).

Eriochilus tenuis Lindley var. *robustior* H.G. Reichb., Beitr. Syst. Pfl. 62 (1871). *Typus*: King George Sound, Maxwell (*holo*: W!).

Illustrations. D. Jones, *Native Orchids of Australia*, p. 159 lower two illustrations (1988); N. Hoffman & A. Brown, *Orchids of South-West Australia*, 2nd ed., p. 186 (1992) and rev. 2nd edn with suppl., 188 (1998).

Leaf basal, narrowly ovate, shortly acute, 12–35 mm long, uniformly green on upper and lower surfaces; lamina slightly concave; margins flat. *Leaf of non-flowering plant* held flat on ground, evenly hirsute above, 12–35 mm × 5–15 mm. *Leaf of flowering plant* inserted a twentieth or less the way up scape, obliquely ascending, glabrous, same size as on nonflowering plants. *Scape* glabrous, wiry, slender, green, 10–25 cm tall. *Floral bract* broadly ovate, to 5 by 5 mm. *Inflorescence* single-flowered, rarely two. *Dorsal sepal* pale pink, 7–10 mm × 2–3 mm. *Lateral sepals* cream, often pink tinged, 7–10 mm × 3–4 mm. *Petals* appressed to column at full anthesis, with dark pink median and marginal longitudinal stripes, 4–6 mm × 2–2.5 mm. *Labellum* 6–8 mm × 3–4.5 mm; *lamina* 5–7 mm × 3–4.5 mm, prominently decurved, flattened-orbicular when viewed from front, uniformly rose pink, with dense clusters of hairs; *claw* to 4 mm long. *Column* 4–6 mm × 2–2.5 mm; stem uniformly pale green, slender (0.5–1 mm wide), tapering slightly towards base, inconspicuously winged. *Anther* uniformly dark pink except for white irregularly serrate margins. *Stigma* scarcely visible through a slender horizontal orifice; margins of orifice white, becoming dark pink elsewhere. *Ovary* brownish maroon to dark red, hairs sometimes grouped in longitudinal clusters along ribs.

Specimens examined. WESTERN AUSTRALIA: Muir Hwy, 15 Oct. 1980, A. Brown s.n. (PERTH 00247154); Between Bullcreek and Rossmoyne, 8 Oct. 1970, A.S. George 10400 (PERTH 00247545); Near source of Gingin Brook, 24 Oct. 1971, A.S. George 11145 (PERTH 00270148); Donnelly River Boat Landing, 5.5 km SSW along Landing Rd from Nannup–Pemberton road, c. 20 km W of Pemberton, 22 Oct. 1985, R. Peakall 0079 (PERTH 00561061); “Sand Springs”, near York, 8 Oct. 1919, O.H. Sargent 825 (PERTH 00248118); “Sand Springs”, near York, 8 Oct. 1919, O.H. Sargent s.n. (PERTH 00248487).

Distribution and habitat. Extends from Guildford in suburban Perth to Albany throughout the high rainfall southwest. Grows in winter-wet peaty swamps or creeklines under paperbark melaleucas. (Figure 6C)

Flowering period. September to November, dependant on summer fire.

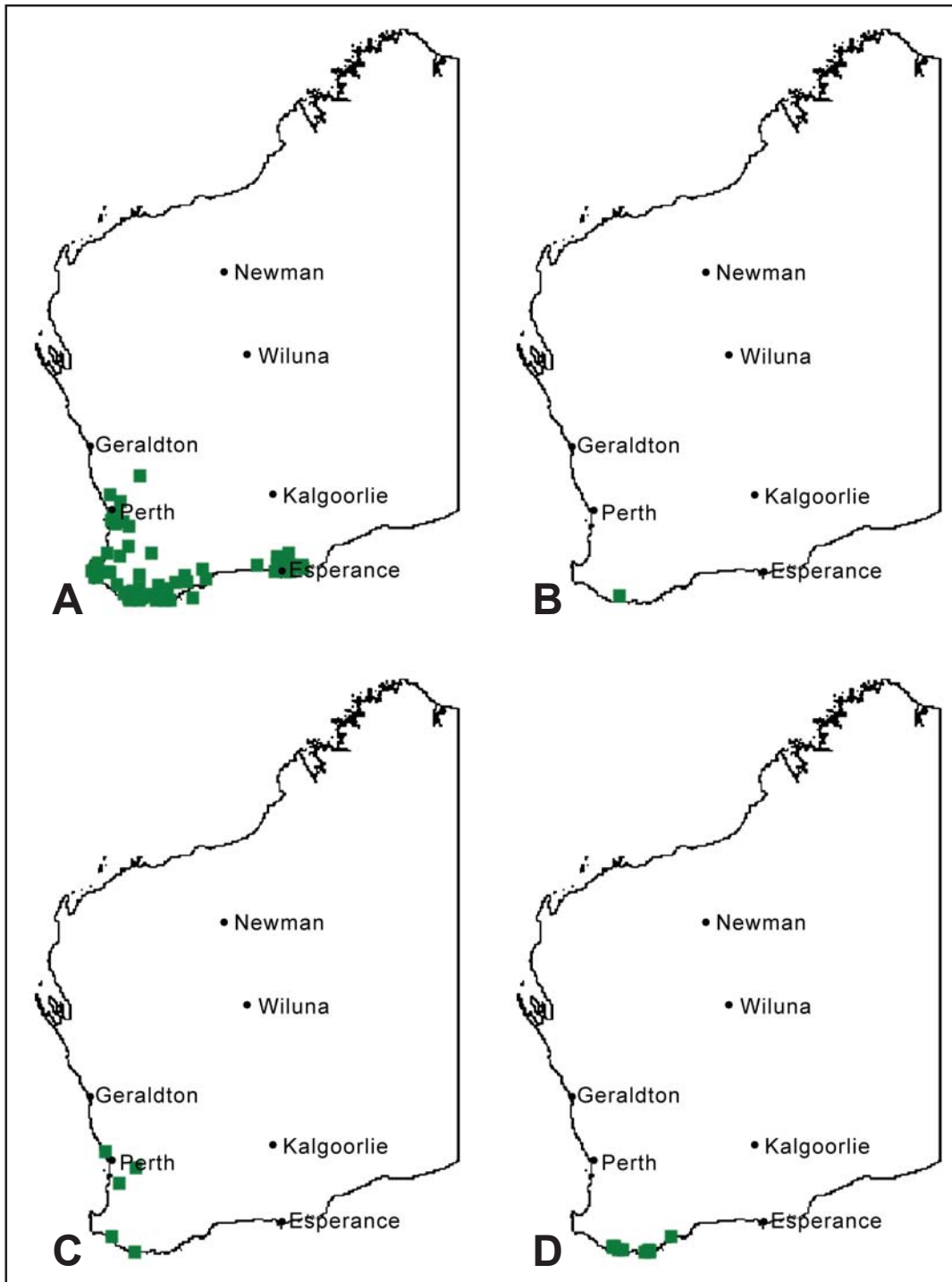


Figure 6. Distribution maps. A – *Eriochilus scaber* subsp. *scaber*; B – *Eriochilus scaber* subsp. *orbifolia*; C – *Eriochilus tenuis*; D – *Eriochilus valens*.

Notes. Until recently *Eriochilus tenuis* has received varied treatment and has been the subject of some confusion. Lindley (1840) distinguished *E. tenuis* from *E. scaber* by its less leathery elongate ovate–oblong leaf with a more obtuse apex, its more slender and taller scapes, and by its glabrous ovate bracts. Bentham (1873) accepted *E. tenuis* as a distinct species, highlighting in his key to species its narrow leaves and glabrous stems as diagnostic characters differing from the wide leaves and villous stems of *E. scaber*. Reichenbach (1871) also accepted *E. tenuis*, and named the variety *robustior*, the type of which falls within the normal range of variation of typical *E. tenuis*.

Rogers (1920) did not mention *Eriochilus tenuis* in his discussion of *Eriochilus*. Pelloe (1930) correctly diagnosed the species but gave an unlikely flowering date of May for the Guildford population. Erickson (1965) also gave a brief accurate diagnosis of *E. tenuis*, but stated that it was ‘perhaps a form of *E. dilatatus*’. The latter idea was supported by Nicholls (1969) and by Cady and Rotherham (1970). Neither Erickson (1965), Nicholls (1969) nor Cady and Rotherham (1970) elaborated on why they considered *E. tenuis* might be a form of *E. dilatatus* rather than of *E. scaber*. These authors did not illustrate *E. tenuis* and presumably they had not seen fresh specimens of the species.

George (1971) regarded *E. tenuis* as a tall, slender form of *Eriochilus scaber*, and did not recognise these taxa as distinct. This view was followed by Clements (1982), Hoffman and Brown (1984), Green (1985) and Rye (1987).

Jones (1988) and Clements (1989) argued for the reinstatement of *Eriochilus tenuis*. Jones (1988) provided the more complete description, which differs from ours (above) in several respects. Jones (1988) stated that *E. tenuis* flowers from July to September (we have not seen flowers before September), the leaf is described as ‘to 18 mm × 8 mm, narrow–ovate to heart-shaped, ground hugging, dark green and glabrous’ (we have observed leaves to 35 mm × 15 mm, always narrowly ovate and not heart-shaped, ground hugging only in non-flowering plants, obliquely ascending in flowering plants, light green in colour, and glabrous only when flowering, evenly hirsute on the upper surface of leaves on non-flowering plants). The flowers were described by Jones (1988) as ‘white’, but we find that they vary from cream to pale pink. The labellum was described as ‘greenish ... with stiff white hairs’, whereas we have observed it to be uniformly rose pink with red hairs. Clements (1989) also claimed that the flowers of *E. tenuis* were white rather than pink, and that the species had a glabrous leaf.

Thus, we agree with Jones (1988) and Clements (1989) that *Eriochilus tenuis* should be reinstated as a species distinct from *E. scaber*, but provide here for the first time a full description of the species based on an examination of fresh and dried specimens from many localities.

We are uncertain as to the affinities of *Eriochilus tenuis*, as there are some taxa yet to be described from eastern Australia, including from peat bogs (Bates 1989; Bates and Weber 1990), and it may be that the nearest relatives of *E. tenuis* are among these.

The species differs from *Eriochilus scaber* in its leaves to 35 mm × 15 mm, always narrowly ovate and not heart-shaped, ground-hugging only in non-flowering plants, obliquely ascending in flowering plants, light green in colour, and glabrous only when flowering, evenly hirsute on the upper surface of leaves on non-flowering plants, and its more slender, glabrous and taller scapes.

Eriochilus tenuis is poorly collected and rarely seen, though locally common in our experience.

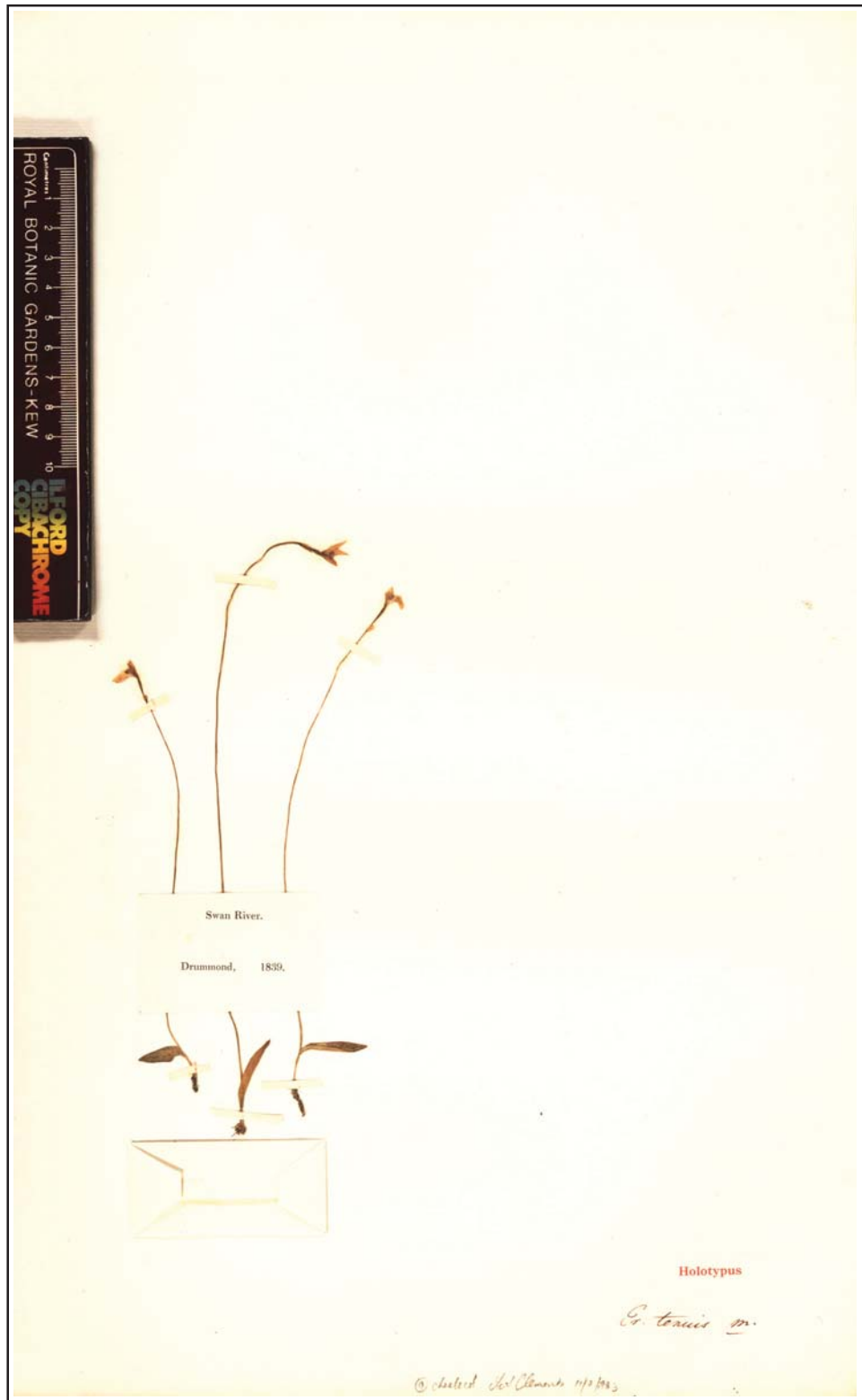


Figure 7. Holotype of *Eriochilus tenuis*. Swan River, Drummond s.n.

Eriochilus valens Hopper & A.P. Br., *sp. nov.*

A. E. dilatato R.Br. labello magno 3–6 mm lato maculatis atro purpureis differt.

Typus: Bakers Junction Nature Reserve, on the track running parallel to the E boundary, c. 50 metres W of the boundary, 34° 56' 00" S, 117° 55' 00" E, 02 May 1989, *A. Brown* 924 (*holo*: PERTH 01197266!).

Illustrations. N. Hoffman & A. Brown, *Orchids of South-West Australia*, 2nd ed., p. 184 (1992) and rev. 2nd edn with suppl., 184 (1998).

Leaf cauline, ovate, acute, 10–20 mm long, concolorous, green, underside not prominently ribbed when fresh, margins flat or slightly undulate. *Leaf of non-flowering plant* 10–20 mm long and 6–12 mm wide. *Leaf of flowering plant* inserted a quarter to a third of the way up scape, similar in size to that on non-flowering plant. *Scape* wiry, uniformly green or dark purple towards the base and green above, 10–20 cm tall. *Floral bract* ovate, to 5 × 3 mm. *Inflorescence* usually single-flowered, rarely up to 5. *Dorsal sepal* cream with dark brownish-red marginal markings, 7–10 mm × 3–4 mm. *Lateral sepals* 11–14 mm × 3–4 mm, cream, underside sometimes faintly suffused pink towards the apex. *Petals* appressed to the column at full anthesis, cream with dark brownish-red marginal longitudinal stripes, 6–9 mm × 1.0–1.5 mm. *Labellum* 8–11 mm × 3–6 mm; *lamina* 4–6 mm × 3–6 mm, prominently decurved, flattened-orbicular when viewed from front, with a central longitudinal channel and green band conspicuously devoid of coloured hairs, flanked by dense clusters of dark red hairs; *claw* 3–5 mm long. *Column* to 7 × 3 mm; stem uniformly pale green, tapering slightly towards base, winged. *Anther* dark red, creamy pink on the margins. *Stigma* clearly visible through a transversely oval orifice; margins of orifice pinkish cream, becoming dark red; lower margins with central and extreme lateral downward dips *Ovary* green. (Figure 8)

Specimens examined. WESTERN AUSTRALIA: Hooper Rd, NE of Albany and W of Oyster Harbour, 34° 57' 00" S, 117° 56' 00" E, 2 May 1989, *A. Brown* 927 (PERTH 01197274); Loc 33307 Recreation Reserve, just N of Lake Powell on the Albany–Torbay Rd, 35° 01' S 117° 45' E, 3 May 1989, *A. Brown* s.n. (PERTH 01751506); Albany, *s.dat.*, *B.T. Goadby* s.n. (PERTH 00870455); King George Sound, Apr. 1899, *B.T. Goadby* s.n. (*a,b,c,d,f*) (PERTH 00242829); 0.5 km SE along track off Old School Rd, c. 10 metres E of Allan Rd, c. 15 km W of Albany, 35° 01' 00" S, 117° 44' 00" E, 4 May 1989, *S.D. Hopper* 7162 (PERTH 01197258); 7 miles N of Boat Harbour, 27 Apr. 1963, *K.R. Newbey* 746 (PERTH 00244228).

Distribution and habitat. Confined to high rainfall sites between Manjimup and Albany. Grows in low heath fringing winter-wet swamps, with *Adenanthos obovatus*, *Dasypogon bromeliifolius*, *Anarthria scabra*, *Desmodcladus flexuosa*, *Beaufortia sparsa*, *Agonis parviceps* and scattered emergent marri and jarrah. Soils are sandy. (Figure 6D)

Flowering period. March to May, dependant on summer fire.

Etymology. Named from the Latin *validus* (strong, robust), alluding to the large colourful labellum of the species.

Notes. *Eriochilus valens* is a rarely seen south coastal orchid in need of further survey to establish its conservation status. It forms small clumps of up to 10 plants. It grows with *E. scaber* subsp. *scaber*, *E. helonomos* and *E. dilatatus* subsp. *multiflorus*, initially flowering earlier than the latter two, and a few months earlier than *E. scaber*. *E. valens* differs from *E. dilatatus* and *E. helonomos* in its large more colourful labellum 3–6 mm wide.

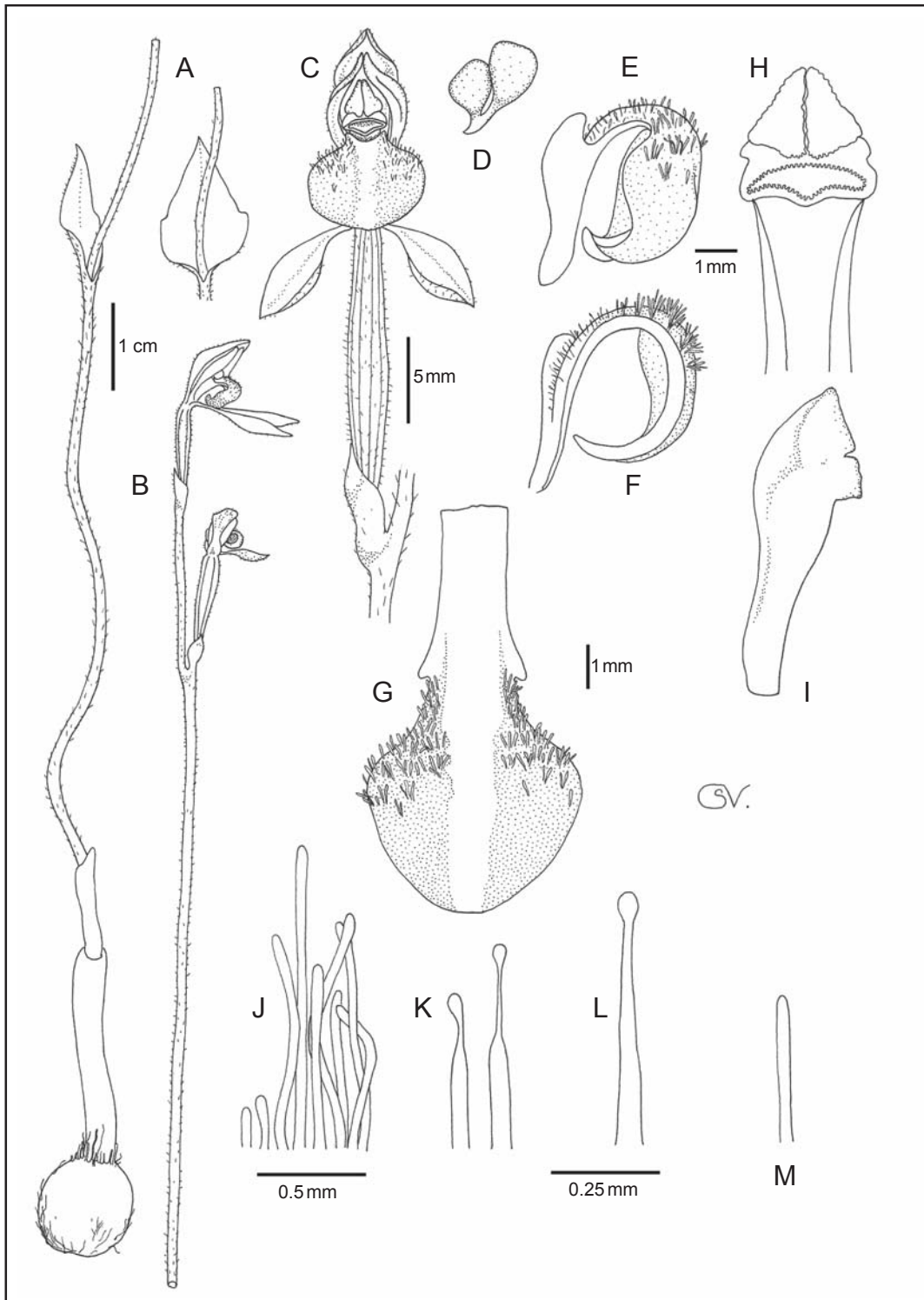


Figure 8. *Eriochilus valens* from north of Lake Powell on the Albany–Torbay Road, A.P. Brown s.n. (PERTH 01751506). A – leaf and tuber; B – flowers; C – flower from front; D – pollinia; E – labellum from side; F – longitudinally sectioned labellum from side; G – flattened labellum from above; H – column from front; I – column from side; J – labellum lamina calli; K – hairs from lower scape; L – glandular hairs on ovary; M – hairs from petals and sepals. Drawn by C. Vassilu.

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