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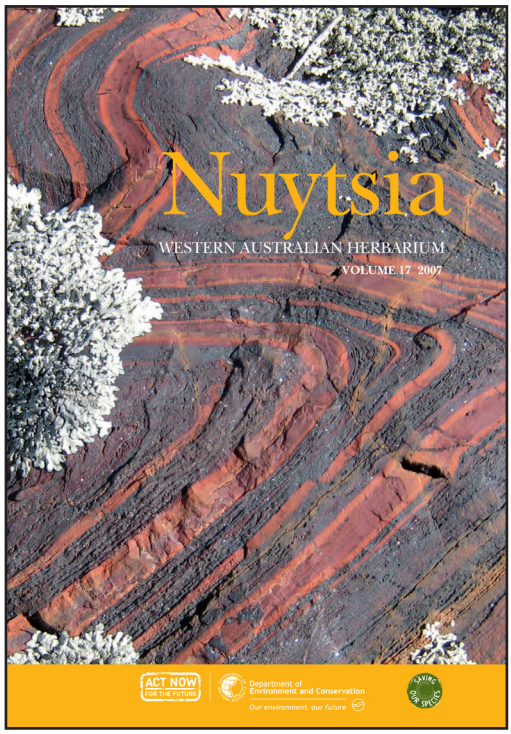

Wilkins, C.F. & Chappill, J.A.

Five new species of *Eutaxia* (Leguminosae: Mirbelieae) from south-western Australia

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Five new species of *Eutaxia* (Leguminosae: Mirbelieae) from south-western Australia

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Abstract

Wilkins, C.F. & Chappill, J.A. Five new species of *Eutaxia* (Leguminosae: Mirbelieae) from south-western Australia. *Nuytsia* 17: 469–482 (2007). Five species of *Eutaxia* R.Br. of the legume tribe Mirbelieae are here described as new: *Eutaxia actinophylla* Chappill & C.F.Wilkins, *E. andocada* Chappill & C.F.Wilkins, *E. lasiocalyx* Chappill & C.F.Wilkins, *E. nanophylla* Chappill & C.F.Wilkins and *E. rubricarina* Chappill & C.F.Wilkins. They occur in the south-west of Western Australia and are here described prior to completion of the generic revision since all species, except for *E. rubricarina*, are listed as Priority Flora by the Western Australian Department of Environment and Conservation.

Introduction

Eutaxia R.Br. was first described by Brown (1811) and is a small genus of eight currently recognised species, belonging to the endemic Australian legume tribe, Mirbelieae. Seven of these species are restricted to the south-west of Western Australia (WA) with only *Eutaxia microphylla* (R.Br.) C.H.Wright & Dewar occurring also in South Australia, Queensland, New South Wales, Victoria and Tasmania.

The name *Eutaxia* comes from the Greek *eu* (well) and *taxis* (arrangement), referring to the regular arrangement of the leaves, and the most recent comprehensive key to the Western Australian legumes (Grieve 1998) defines the genus by its opposite, ± decussate leaves. The revision of *Eutaxia* for "Flora of Australia", originally undertaken by Gemma Henderson as an honours project at The University of Western Australia, was continued by Chappill and Wilkins and is being concluded by Wilkins and Crisp following Chappill's death. None of the species described here were delimited by Henderson. While the majority of species from this genus have opposite and decussate leaves, this phyllotaxis is no longer a definitive character for *Eutaxia*, with three of the new species described here having either alternate or whorled leaves, and the remaining two having alternate or opposite-decussate leaves. Although *Eutaxia* is currently poorly defined, the generic concept held by Chappill is maintained for this publication. As these new taxa, apart from *E. rubricarina* Chappill & C.F.Wilkins, have special conservation needs, they are described here prior to completion of the generic revision.

It should be noted that recent molecular phylogenetic analyses of Mirbelieae genera (Chandler *et*

al. 2001; Crisp & Cook 2003a, 2003b; Orthia *et al.* 2005a) have found that generic boundaries within the monophyletic NA (no antipodal cells) group (Cameron & Prakash 1994; Crisp & Cook 2003a), to which *Eutaxia* belongs, are contentious. It has therefore been proposed that all genera within the *Pultenaea s. lat.* group (including *Eutaxia*) be synonymised (Crisp & Cook 2003a) under *Pultenaea* Sm. (Orthia *et al.* 2005a, 2005b). If such a combination goes ahead, it will not be in the near future and therefore the name *Eutaxia* is maintained here for these new species.

Methods

Specimens from MEL and PERTH were examined and morphological information was recorded from PERTH specimens. Duplicates to other herbaria were not seen by the senior author but may have been annotated by Chappill. The acronyms BELY. and NEW. refer to Western Australian regional herbaria at Beverley and Newdegate, respectively. Rehydrated flowers were used for floral measurements and dried specimens for the remaining measurements. Filament width was measured at the broadest section i.e. at the base, for filaments that gently taper from base to apex, and a third of the way along the filament from the base, for filaments with a conspicuously broad base which then tapered to the apex. Style width was measured at the base. Distribution maps were produced using Online Map Creation (http://www.aquarius.geomar.de/omc_intro.html). Precise localities for threatened species are withheld.

Species descriptions

Eutaxia actinophylla Chappill & C.F.Wilkins, *sp. nov.*

Folia in verticillis trium regulares ordinata, propietas singularis in genere.

Typus: new Norseman Hyden Track, Western Australia [precise locality withheld for conservation purposes], 29 September 1999, *B. Archer* 1387 (*holo*: PERTH 07463472; *iso*: CANB, NSW).

Eutaxia (sp. Norseman, B. Archer 1387), *in sched.*

Eutaxia verticillata Chappill ms, Western Australian Herbarium, in FloraBase, http://florabase.dec.wa.gov.au/ [accessed June 2007].

Shrub erect, compact, 0.15–0.5 × 0.3–0.6 m, with ascending branches. *Stems* green with yellow ribs, or red-brown with red ribs, not spinescent, without tubercles, glabrous. *Stipules* cream, 0.05–0.1 × 0.04–0.1 mm. *Leaves* spreading, in whorls of 3, internode length shorter than leaf length; *petiole* 0.2–0.25 mm long; *pulvinus c.* 0.3 mm long; *blade* concolorous, mid-green to grey-green, or discolorous with additional purple markings on abaxial surface, concave, elliptic to obcordate, 2.3–5.5 × 0.7–1.3 mm, both surfaces glabrous, not verrucose, veins not visible or single, apex obtuse and straight. *Flowers* axillary, solitary. *Bracts* absent, replaced by a smaller leaf at base of pedicel. *Bracteoles* persistent on upper pedicel at base of calyx, green, ovate, 1.2–1.7 × 0.5–1.2 mm, glabrous, veins not visible. *Pedicels* straight, 0.4–1.3 mm long. *Buds* 2.4–4.5 × 1.5–2.8 mm, glabrous, apex straight with apiculum to 0.15 mm long. *Hypanthium* 0.5–0.6 mm long. *Calyx* ribs absent or with 5 faint ribs, green with red spots at junction of lobes and red tinged or striped towards apex, lobes symmetrical; adaxial lobes 2, straight, valvate, 1.5–1.9 × 1.4–1.5 mm, apex acute, calyx tube below lobes 1.8–2.6 mm long; abaxial

lobes 3, imbricate, 2.0–2.6 × 1.1–1.3 mm, apex acute, calyx tube below lobes 1.4–1.6 mm long. *Standard* golden-yellow with basal, ovate, irregularly margined, pale yellow eye with no marginal markings, claw 1.1–1.6 × 0.6–0.75 mm, lamina broadly elliptic, 3.8–5 × 6–7.4 mm, auricles absent, apex emarginate to 0.4–0.5 mm depth. *Wings* golden-yellow, straight, claw 0.9–1.3 mm long, lamina oblong, 3.7–4.7 × 1.4–2 mm, apex obtuse, adaxial spur absent. *Keel* lemon-yellow, straight, claw 1.1–1.3 mm long, lamina oblong, 3.3–4.7 × 1.6–2.8 mm, apex obtuse. *Stamens* free; *filaments* broad at base and tapering towards the apex, 2.5–3.5 × 0.3–0.4 mm; *anthers* cream to yellow with red connective, 0.6–0.7 × 0.4–0.5 mm. *Gynoecium* sessile or with stipe to 0.2 mm long; *ovary* 1.7–2.1 × 0.6–0.9 mm, with dense, spreading, straight hairs (0.6–1.0 mm long); *style* hooked just below the apex, otherwise straight, 1.6–2.2 × 0.15–0.2 mm, with dense, spreading, straight hairs (0.2–0.7 mm long) on lower third, glabrous above; *stigma* simple to slightly capitate; *ovules* 2. *Fruit* inflated, ellipsoid, straight, 3.6–4.8 × 2.5–2.6 mm, with dense, spreading, wavy hairs (*c.* 0.7 mm long); petals persistent. *Seeds* black, ellipsoid, 1.8–2.0 × 1.2–1.4 mm, with translucent, white, U-shaped aril surrounding hilum. (Figure 1)

Specimens examined. WESTERN AUSTRALIA: [localities withheld] 29 Sep. 1999, *B. Archer* 1386 (CANB, MEL, NSW, PERTH 07463464); 9 Dec. 2001, *B. Archer* 2071 (MEL, PERTH 06251242); 9 Dec. 2001, *B. Archer* 2073 (AD, CANB, MEL, PERTH 06251234); 3 Nov. 1990, *W.R. Archer* 3119015 (MEL, PERTH); 10 Oct. 1931, *W.E. Blackall* 995 (PERTH 00703915).

Distribution and habitat. *Eutaxia actinophylla* occurs in southern WA near Norseman, Salmon Gums and Mt Newmont (Figure 2A). This species grows in shrubland on red clay-loam with a shallow covering of gravel or red sandy loam over granite.

Flowering period. September to December.

Conservation status. Recently listed as Priority One under the Department of Environment and Conservation's (DEC) Conservation Codes for Western Australian Flora, as it is only known from a few collections on the Hyden to Norseman track and an old collection at Salmon Gums.

Etymology. *Eutaxia actinophylla* is named for the arrangement of its leaves in regular whorls of three, a unique feature in the genus.

Notes. *Eutaxia actinophylla* shares the features of a yellow corolla and glabrous outer surface of the calyx with *E. acanthoclada* G.R.Henderson & Chappill, however, in addition to the whorled leaves, it differs in having non-spinescent apices of branchlets and an erect rather than prostrate habit.

Although previously listed on FloraBase (Western Australian Herbarium 1998–) as *E. verticillata* Chappill ms, this name is not adopted here as *Pultenaea verticillata* Turcz. is already described and these genera may be combined in the future.

Eutaxia andocada Chappill & C.F.Wilkins, *sp. nov.*

Eutaxiae rubricarinae Chappill & C.F.Wilkins affinis sed foliis alternatis non oppositis, et carina aurantiaco-lutea apice atro-rubra non omnino rubra differt.

Typus: north-east of Peak Charles, Western Australia [precise locality withheld for conservation purposes], 16 September 2000, *J.A. Chappill, M.D. Crisp & L. Cook* JAC 6439 (*holo*: PERTH 07460392; *iso*: CANB, NSW).

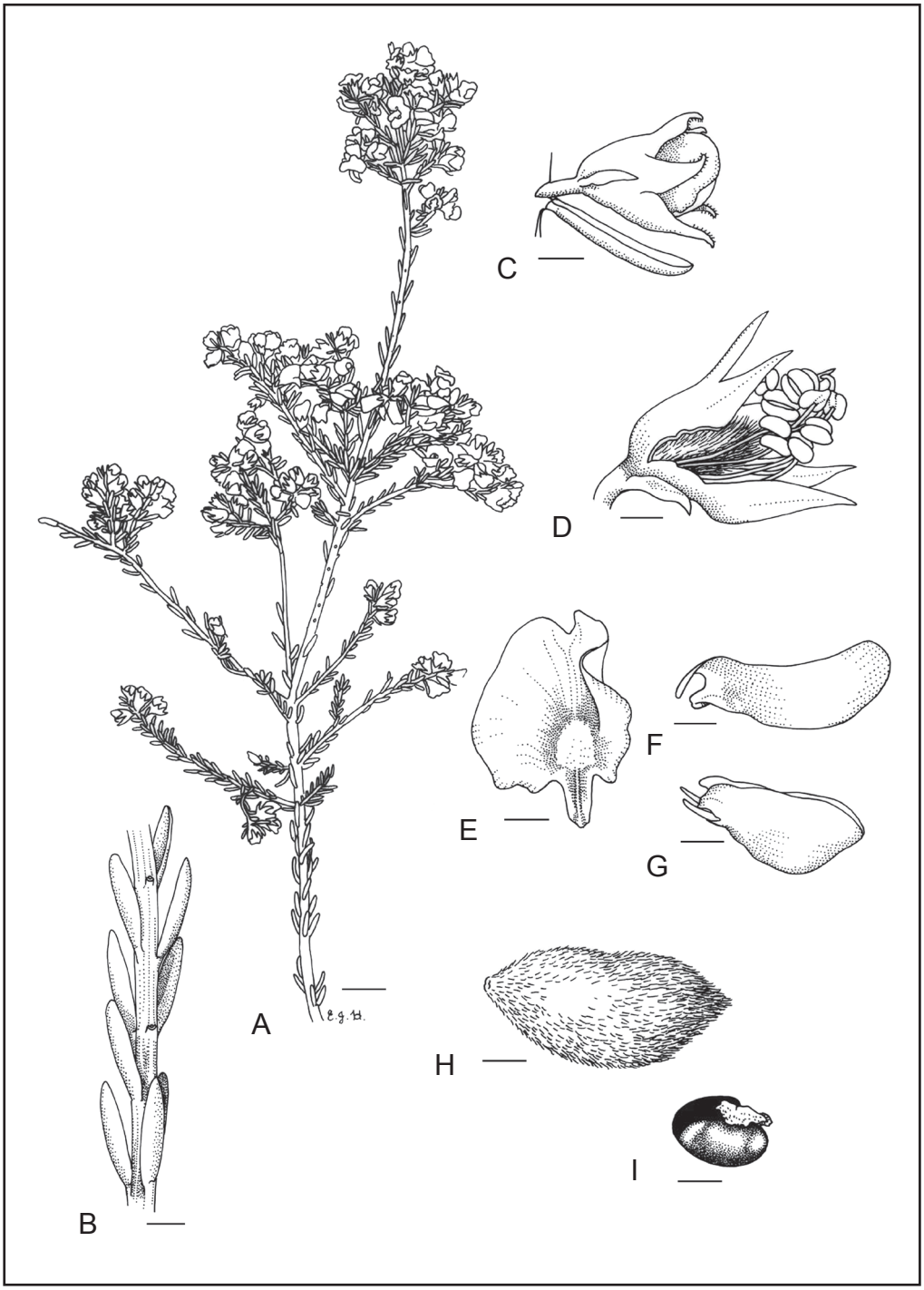

Figure 1. *Eutaxia actinophylla*. A – habit; B – branch detail showing leaves in whorls of three (some fallen); C – bud showing imbricate abaxial calyx lobes, glabrous calyx, and exposed petals; D – view of ovary, anthers and filaments within calyx, petals removed; E – standard; F – wing; G – keel; H – ellipsoid and inflated fruit; I – seed, with lateral view of aril (not visible, aril is horseshoe shape around hilum). Drawn from *B. Archer* 1387 (A–G); *B. Archer* 2071 (H, I). Scale bars = 8 mm (A); 2 mm (B); 1 mm (C– I).

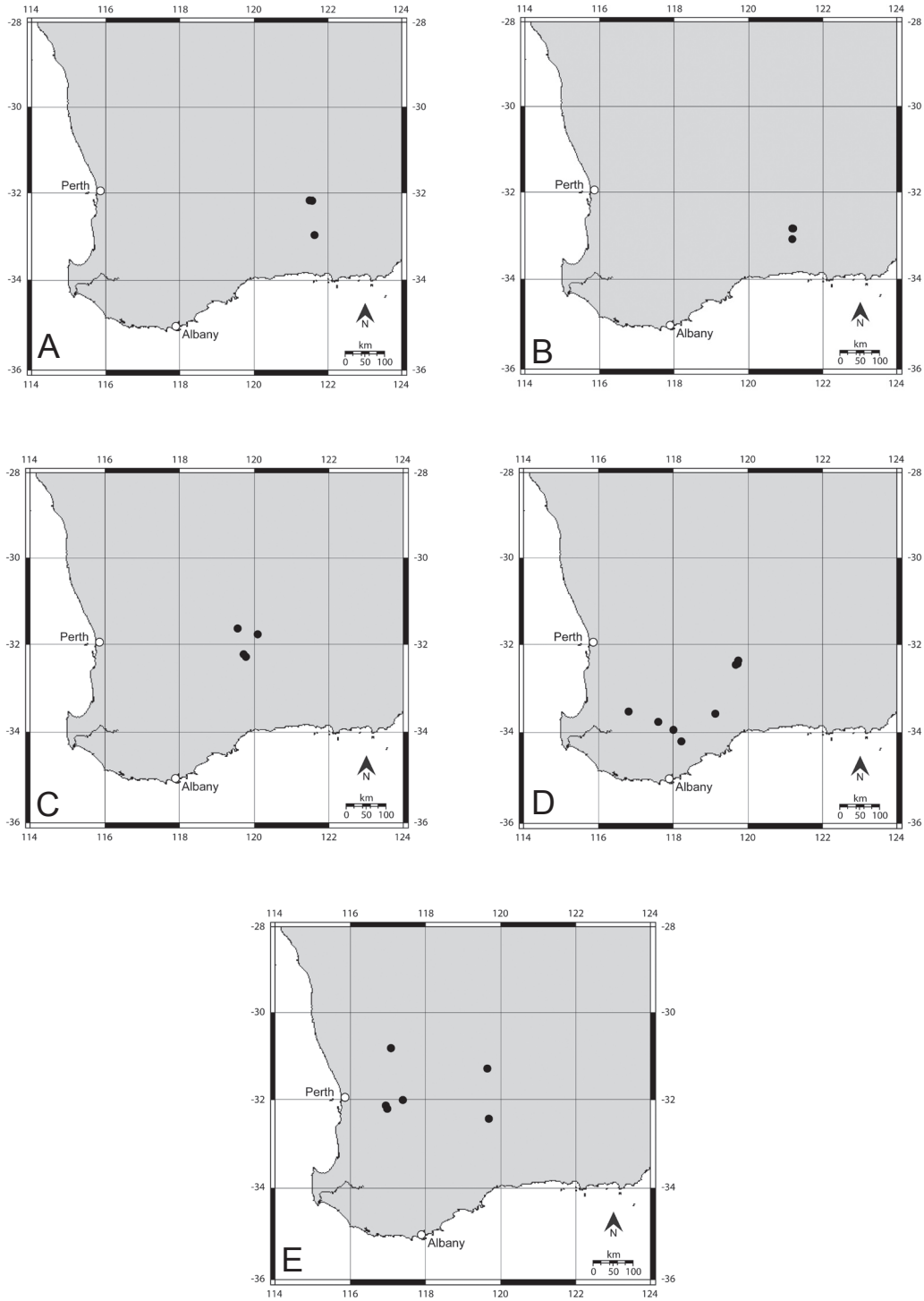

Figure 2. Distribution in south-west Western Australia of A – *Eutaxia actinophylla*; B – *E. andocada*; C – *E. lasiocalyx*; D – *E. nanophylla*; E – *E. rubricarina*.

Eutaxia sp. Peak Eleanora (M.A. Burgman 3862), Western Australian Herbarium, in FloraBase, http://florabase.dec.wa.gov.au/ [accessed June 2007].

Eutaxia alternifolia Chappill ms, *in sched.*

Eutaxia alternifolia Chappill & C.F.Wilkins ms, Western Australian Herbarium, in FloraBase, http://florabase.dec.wa.gov.au/ [accessed June 2007].

Shrub erect, 0.2–0.4 × 0.3 m, with sparse, ascending branches. *Stems* red-brown, smooth, not spinescent, without tubercles, with moderately dense, spreading, straight hairs (*c.* 0.2 mm long). *Stipules* usually absent, if present then cream, *c.* 0.15 × 0.1 mm. *Leaves* appressed, alternate, internode length shorter than leaf length; *petiole* 0.1–0.25 mm long; *pulvinus* 0.2–0.3 mm long; *blade* scarcely discolorous, adaxial surface pale grey-green, abaxial surface pale grey-green with a tinge of red, concave, elliptic, rarely obovate, 1.3–4.3 × 0.7–1.8 mm, adaxial surface smooth, glabrous, abaxial surface tuberculate with scattered, spreading, straight hairs (*c.* 0.15 mm long) on lamina and margin, distinctly 3-ribbed, apex obtuse and straight. *Flowers* axillary, solitary. *Bracts* absent, replaced by smaller leaf at base of pedicel. *Bracteoles* persistent on upper pedicel just below the calyx, grey-green, becoming red-brown, lanceolate or obovate, 0.8–2.1 × 0.3–0.8 mm, glabrous, 3 indistinct veins on abaxial surface. *Pedicels* straight, 0.7–1.7 mm long. *Buds* 3.0–4.2 × 1.3–1.7 mm, with scattered, spreading, straight hairs (*c.* 0.15 mm long) mainly on the margin of calyx lobes, apex straight or curved downwards, with an apiculum 0.1–0.3 mm long. *Hypanthium* 0.5–0.6 mm long. *Calyx* not prominently ribbed, green with a red tinge, with dark red spots at junction of lobes, lobes symmetrical; adaxial lobes 2, valvate, straight, 0.9–1.7 × 0.9–1 mm, apex acute, calyx tube below lobes 1.8–2.8 mm long; abaxial lobes 3, imbricate, 1.4–2.5 × 1.1–1.2 mm, apex acute, calyx tube below lobes 1.1–1.5 mm long. *Standard* yellow-orange with a basal pale lemon, ovate to triangular eye, usually containing minute orange markings, frequently with red stripes following main veins, claw 1.4–1.9 × 0.4 mm, lamina broadly elliptic, 3.5–5.0 × 4.9–7.0 mm, auricles absent, apex emarginate to 0.2–0.5 mm depth. *Wings* yellow-orange with central red marking, straight, claw 1.1–1.9 mm long, lamina oblong, 4–5 × 1.3–1.7 mm, apex rounded, adaxial spur present. *Keel* orange-yellow with dark red tip, straight, claw 1.1–2.0 mm long, lamina obovate, 3.9–4.7 × 1.5–2.7 mm, apex rounded. *Stamens* free; *filaments* scarcely wider towards base than at apex, 3.3–5.5 × 0.1–0.2 mm; *anthers* cream to brown with red connective, 0.4–0.5 × 0.3–0.35 mm. *Gynoecium* with stipe 0.5–1.1 mm long; *ovary* 1.1–2 × 0.6–0.9 mm, with dense, spreading, straight hairs (0.5–0.8 mm long); *style* curved, 2.8–3.9 × 0.15–0.2 mm, with scattered, appressed, straight hairs (0.3–0.5 mm long) at base, glabrous above; *stigma* simple; *ovules* 2. *Fruit* and *seed* not seen. (Figure 3)

Specimens examined. WESTERN AUSTRALIA: [localities withheld] 28 Sep. 1984, *M.A. Burgman* 3862 (PERTH 00714941); 22 Aug. 1995, *R. Davis* 29 (PERTH 04404114).

Distribution and habitat. *Eutaxia andocada* is only known from the vicinity of Peak Charles and Peak Eleanora (Figure 2B). This species grows in shrubland on white sand or brown sandy clay over granite.

Flowering period. August to September.

Conservation status. Priority One under DEC Conservation Codes for Western Australian Flora (Atkins 2006).

Etymology. The specific epithet *andocada* (Gr. *andokadon* = alternately) refers to the alternate leaves present in this species.

Notes. This species differs from *E. rubricarina* in having alternate, rather than opposite, leaves, and the keel is orange-yellow with a dark red tip rather than all red.

This species has been placed on FloraBase as *E. alternifolia* Chappill and C.F.Wilkins ms, however, an alternative epithet is here used, as *Daviesia alternifolia* Endl. is already described and these genera may be combined in the future.

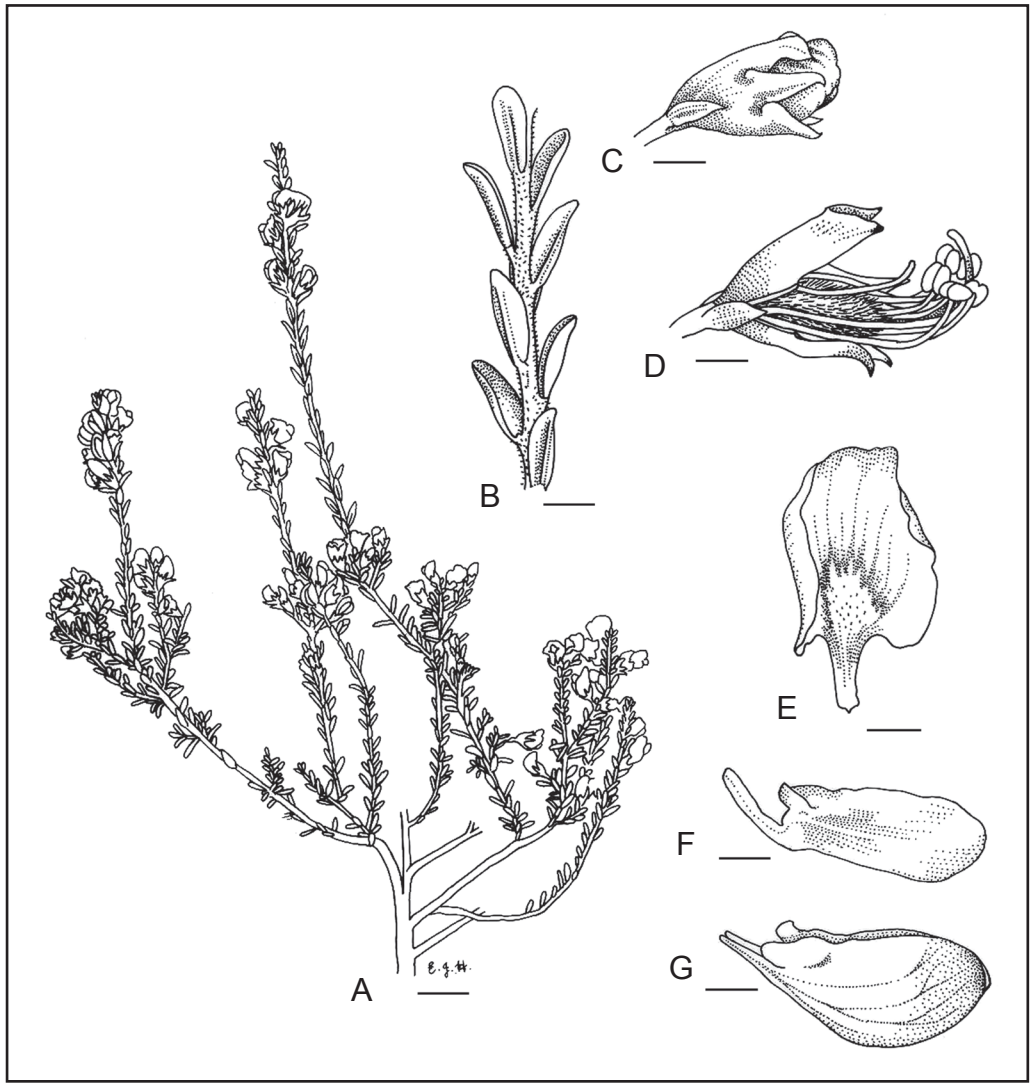

Figure 3. *Eutaxia andocada*. A – habit; B – branch detail showing alternate leaf arrangement; C – bud showing imbricate abaxial lobes of calyx and exposed petals; D – androecium and gynoecium in calyx, petals removed; E – standard; F – wing; G – keel. Drawn from the holotype (*J.A. Chappill, M.D. Crisp & L. Cook* JAC 6439). Scale bars = 8 mm (A); 2 mm (B); 1 mm (C–G).

Eutaxia lasiocalyx Chappill & C.F.Wilkins, *sp. nov.*

Eutaxiae rubricarinae Chappill & C.F.Wilkins affinis sed carina flava differt, et *E. andocadae* Chappill & C.F.Wilkins affinis sed calyce piloso differt.

Typus: Marvel Loch, Western Australia [precise locality withheld for conservation purposes], 7 November 1984, *B.H. Smith* 543 (*holo*: PERTH 00710237; *iso*: CANB, MEL).

Eutaxia lasiocalyx Chappill ms, *in sched.*

Shrub low, spreading, *c.* 0.15 × 0.6 m, with dense, ascending branches. *Stems* grey-brown with pale tan ribs, sometimes spinescent, without tubercles, glabrous or with sparse to dense, spreading, straight hairs (*c.* 0.1 mm long). *Stipules* absent. *Leaves* spreading, alternate, internode length shorter than leaf length; *petiole* 0.05–0.15 mm long; *pulvinus* 0.2–0.4 mm long; *blade* slightly discolorous, adaxial surface mid green, abaxial surface paler green without additional purple markings, concave, oblong to ovate, 0.5–2 × 0.35–0.9 mm, adaxial surface smooth, abaxial surface verrucose with 1 prominent rib, both surfaces glabrous or with sparse to moderately dense, spreading, straight hairs (*c.* 0.1 mm long) on lamina and margin or only on margin, apex obtuse and straight. *Flowers* axillary, solitary. *Bracts* absent, replaced by a smaller leaf at base of pedicel. *Bracteoles* persistent on upper pedicel just below the calyx, red-green or green, lanceolate, 0.8–1.5 × 0.4–0.6 mm, with sparse, spreading, straight hairs (*c.* 0.15 mm long) on abaxial surface and margin, 1 prominent central vein. *Pedicels* straight, 0.6–1.7 mm long. *Buds* 3–3.8 × 1.3–1.8 mm, with moderately dense, spreading, straight hairs (0.2–0.4 mm long) on surface and margin of lobes, apex straight or curved downward, apiculum absent. *Hypanthium c.* 0.6 mm long. *Calyx* faintly 10-ribbed, reddish to brownish-red with upper part of lobes sometimes green, without markings, lobes symmetrical; adaxial lobes 2, valvate, straight, 1.4–1.6 × 0.7–0.75 mm, apex acute, calyx tube below lobes 1.5–1.7 mm long; abaxial lobes 3, imbricate, 1.8– 2.5 × 0.7–0.9 mm, apex acute, calyx tube below lobes 1–1.2 mm long. *Standard* yellow without markings, claw 1–1.3 × 0.4 mm, lamina broadly ovate or broadly elliptic, 3.5–4.1 × 4.7–6.1 mm, auricles absent, apex emarginate to *c.* 0.3 mm depth. *Wings* yellow, straight, claw *c.* 1.2 mm long, lamina oblong, 3.6 × 1.1–1.5 mm, apex rounded, adaxial spur present. *Keel* yellow, straight, claw *c.* 0.7 mm long, lamina oblong, *c.* 3.4 × 1.4–1.8 mm, apex rounded. *Stamens* free; filaments scarcely wider towards base than at apex, 2.2–3.3 × 0.15–0.2 mm; *anthers* cream with pale red connective, 0.5–0.6 × 0.3–0.35 mm. *Gynoecium* with stipe 0.15–0.3 mm long; *ovary* 1.3–1.5 × 0.5–0.7 mm long, with dense, spreading, straight hairs (*c.* 0.8 mm long); *style* curved, 2.7–3.0 x 0.1–0.15 mm, with sparse, spreading, straight hairs (*c.* 0.2 mm long) at base, glabrous above; *stigma* simple; *ovules* 2. *Fruit* and *seed* not seen. (Figure 4)

Specimens examined. WESTERN AUSTRALIA: [localities withheld] Nov. 1971, *W.H. Butler s.n.*, (PERTH 00634042); 16 Sep. 1994, *N. Gibson & M. Lyons* 1997 (PERTH 05359023); 14 Oct. 2003, *V. Yeomans* 17 (PERTH 06601081).

Distribution and habitat. *Eutaxia lasiocalyx* is known from Parker Range, Mt Holland, Forrestania and Lake Barker (Figure 2C). This species occurs in red sandy loam, in woodland or mallee, on lateritic or quartzitic substrates.

Flowering period. September to November.

Conservation status. Recently listed as Priority Two under DEC Conservation Codes for Western

Australian Flora as it is known from only a few locations, but occurs within a conservation reserve.

Etymology. The specific epithet *lasiocalyx* refers to the hairy calyx present in this species.

Notes. This species differs from *Eutaxia lasiophylla* G.R.Henderson & Chappill ms in the hairy calyx, from *E. andocada* and *E. acanthoclada* in the hairy leaves and calyx, and from *E. rubricarina* in having a yellow keel and the standard lamina without markings.

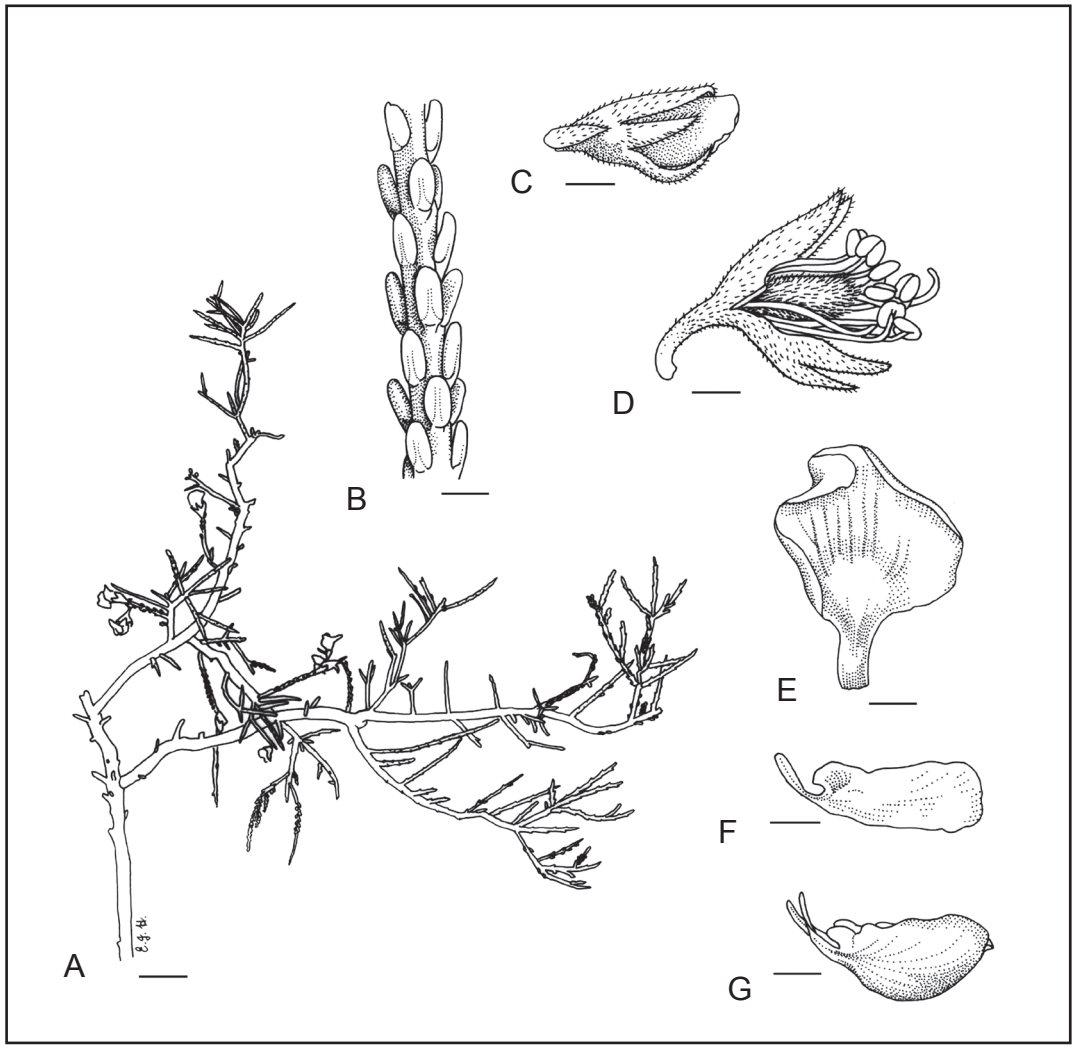

Figure 4. *Eutaxia lasiocalyx*. A – habit; B – branch detail showing alternate leaf arrangement; C – bud showing hairy outer surface of calyx and exposed petals; D – androecium and gynoecium in calyx, petals removed; E – standard; F – wing; G – keel. Drawn from the holotype (*B.H. Smith* 543). Scale bars = 8 mm (A); 2mm (B); 1 mm (C–G).

Eutaxia nanophylla Chappill & C.F.Wilkins, *sp. nov.*

Ob foliis parvulis nominates, a *Eutaxia microphyllae* (R.Br.) C.H.Wright & Dewar, caulis apice non spinoso et a *E. lasiocalyxe* Chappill & C.F.Wilkins calyce glabro et carina rubra differt.

Typus: north-west of Lake Cronin, Western Australia [precise locality withheld for conservation purposes], 13 September 1981, *K.R. Newbey* 8800 (*holo*: PERTH 00627445; *iso*: CANB).

Eutaxia nanophylla Chappill ms, *in sched.*

Shrub spreading or rounded, 0.15–0.35 × 0.3–0.55 m, with sparse ascending branches. *Stems* red-brown, with faint red-brown ribs and scattered to moderately dense, spreading, straight hairs (0.15–0.2 mm long), without tubercles, not spinescent. *Stipules* absent. *Leaves* spreading, opposite decussate and alternate, internode length mainly shorter, rarely greater than leaf length; *petiole* 0.05–0.1 mm long; *pulvinus* 0.2–0.3 mm long; *blade* concolorous, mid-green without markings, concave, ovate, 0.5–2.7 × 0.5–0.8 mm, adaxial surface smooth with scattered white, spreading hairs (to 0.15 mm long), abaxial surface slightly verrucose, glabrous, with marginal hairs (to 0.15 mm long), ribs indistinct or 1 visible on the abaxial surface, apex obtuse and straight. *Flowers* axillary, solitary. *Bracts* absent, replaced by smaller leaf at base of pedicel. *Bracteoles* persistent on upper pedicel just below the calyx, red-green, lanceolate, 1.3–1.7 × 0.5–1.0 mm, glabrous or with scattered, spreading, straight hairs (*c.* 0.1 mm long) on margin, 1 central rib. *Pedicels* straight, 0.8–1.3 mm long. *Buds* 2.7–3.7 × 1.5–1.8 mm, glabrous, apex straight or curved downwards, apiculum absent. *Hypanthium* 0.35–0.6 mm long. *Calyx* faintly 6-ribbed (a central rib in each of the five lobes plus a rib at the join of the two adaxial lobes), red-brown or green with dark red markings towards apex, lobes symmetrical; adaxial lobes 2, valvate, straight, 0.95–1.3 × 0.6–0.9 mm, apex acute, calyx tube below lobes 1.4–1.8 mm long; abaxial lobes, 3, imbricate, 1.4–2.4 × 0.65–1.0 mm, apex acute, calyx tube below lobes 0.9–1.4 mm long. *Standard* yellow-orange with a basal, pale yellow, triangular eye, bordered with bright red veins, claw 1.2–1.6 × 0.3–0.5 mm, lamina broadly ovate, 3.3–4 × 4.4–6.1 mm, auricles absent or very small, apex emarginate to *c.* 0.3 mm depth. *Wings* yellow, straight, claw 1.2–1.5 mm long, lamina oblong, 3.1–3.5 × 1.2–1.5 mm, apex rounded, adaxial spur present. *Keel* red, straight, claw 1.1–1.5 mm long, lamina oblong, 3–3.7 × 1.5–2.4 mm, apex rounded. *Stamens* free; *filaments* scarcely wider towards base than apex or conspicuously wider towards base, 1.8–4.7 × 0.25–0.3 mm; *anthers* yellow with red connective, 0.3–0.5 × 0.25–0.35 mm. *Gynoecium* with stipe 0.5–0.7 mm long; *ovary* 1.5–1.9 × 0.5–0.8 mm, with dense, spreading, straight hairs (0.4–0.6 mm long); *style* curved, 2–2.7 × 0.1–0.15 mm, with scattered, spreading, straight hairs (*c.* 0.15 mm long) at base, glabrous above; *stigma* simple; *ovules* 2. *Fruit* and *seed* not seen. (Figure 5)

Specimens examined. WESTERN AUSTRALIA: [localities withheld] 11 Sep. 1947, *N.T. Burbidge* 2422 (CANB); 2 Nov. 1998, *A.M. Coates* 4458 (NEW., NSW, PERTH 05246199); 26 Oct. 1993, *V. Crowley* DKN 321 (PERTH 04700619); 1 Oct. 1928, *C.A. Gardner* 2088 (K, PERTH 00703893); 3 Oct. 1979, *K.R. Newbey* 6202 (PERTH 00710733); 7 Oct. 1981, *K.R. Newbey* 9240 (PERTH 00630861); 10 Sep. 1982, *P.S. Short* 1676 (AD, CANB, HO, MEL, NSW 665580, PERTH 07313098).

Distribution and habitat. *Eutaxia nanophylla* is known from Lake Cronin to the northern Stirling Ranges with the westernmost collection from Duranillin (Figure 2D). This species occurs in woodland or shrubland on sand over clay or stony clay-loam, or red clay.

Flowering period. September to November.

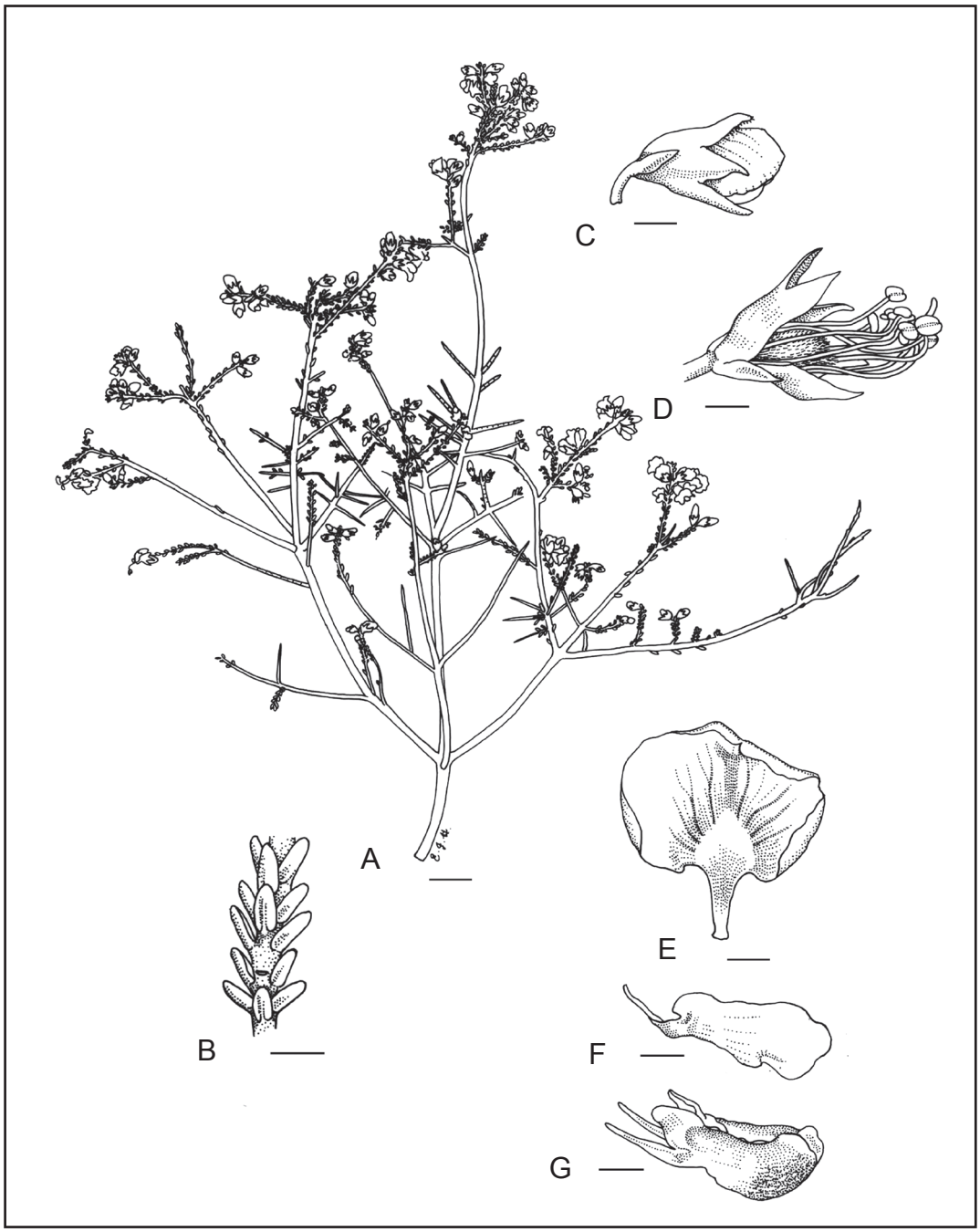

Figure 5. *Eutaxia nanophylla*. A – habit; B – branch detail showing opposite, decussate arrangement of very small leaves; C – bud showing glabrous calyx, imbricate abaxial lobes and exposed petals; D – exposed androecium and gynoecium, petals removed; E – standard; F – wing; G – keel. Drawn from the holotype (*K.R. Newbey* 8800). Scale bars = 8 mm (A); 1 mm (B– G).

Conservation status. This species is known from six localities; however, its presence at early Burbidge and Blackall collection sites has not been recently confirmed. Recently listed as Priority Three under DEC Conservation Codes for Western Australian Flora.

Etymology. *Eutaxia nanophylla* is named for the very small leaves present in this species.

Notes. This species differs from *E. microphylla* in the stem apices being non-spinescent and from *E. lasiocalyx* in having a glabrous calyx and red keel.

Eutaxia rubricarina Chappill & C.F.Wilkins, *sp. nov.*

Species calyce et foliis pilosis, foliis ovatis concavis supra pilosis, a *Eutaxia lasiocalyxe* Chappill & C.F.Wilkins carina atro-rubra non flava differt.

Typus: Kokeby School Reserve, Western Australia, 16 August 2002, *T. Watson* 225 (*holo*: PERTH 06358616; *iso*: CANB, MEL).

Eutaxia rubricarina Chappill ms, *in sched.*

Shrub erect, spreading or prostrate, 0.2–0.5 × 0.5 m, with straggling, ascending, sparse branches. *Stems* brown or green with cream ribs, not spinescent, without tubercles, with dense, spreading, curled hairs (*c.* 0.2 mm long). *Stipules* absent. *Leaves* spreading, alternate or opposite, internode length shorter than leaf length; *petiole* 0.05–0.1 mm long; *pulvinus c.* 0.2 mm long; *blade* usually concolorous, green or red-green, sometimes with additional purple markings on abaxial surface, concave, linear to ovate, 0.8–3.3 × 0.4–1.3 mm, adaxial surface smooth, abaxial surface verrucose and distinctly 1- or 3-ribbed, both surfaces and margin with scattered, spreading, straight hairs (*c.* 0.15 mm long), apex obtuse and straight. *Flowers* axillary, solitary. *Bracts* absent, replaced by a smaller leaf at base of pedicel. *Bracteoles* persistent on upper pedicel just below the calyx, grey-green or red-green, ovate-lanceolate, 1.3–2 × 0.7–1 mm, with scattered, spreading, straight hairs (*c.* 0.15 mm long) on both surfaces and margin, 1 or 3 veins on abaxial surface. *Pedicels* straight, 0.4–1.1 mm long. *Buds* 2.8–3.7 × 1.7–2 mm, with scattered to moderately dense, spreading, straight or wavy hairs (0.15–0.3 mm long) on outer surface and margin of calyx lobes, apex curved down but becoming straight when mature, apiculum absent. *Hypanthium c.* 0.5 mm long. *Calyx* not ribbed, green with or without purple blotches and stripes, without red spots at junction of lobes, lobes symmetrical; adaxial lobes 2, valvate, straight, 1.2–1.3 × 1–1.1 mm, apex acute, calyx tube below lobes 1.9–2.3 mm long; abaxial lobes 3, imbricate, 2.1–2.4 × 1.1–1.4 mm, apex acute, calyx tube below lobes *c.* 1.3 mm long. *Standard* yellow, with a basal small, yellow, ovate to triangular eye, bordered with deep red markings following the veins, claw 1.5–2.1 × 0.35–0.7 mm, lamina reniform, 4.5–5.6 × 7–7.8 mm, auricles present, apex emarginate to 0.5–0.7 mm depth. *Wings* yellow, straight, claw 1.7–2 mm long, lamina oblong, 4.9–5.9 × 1.8–2.1 mm, apex rounded, adaxial spur present. *Keel* dark red, straight, claw 1.3–1.8 mm long, lamina obovate, 4.8–5.1 × 2.8–3 mm, apex rounded. *Stamens* free; *filaments* conspicuously broader towards the base, 3.0–5.2 × 0.2–0.3 mm; *anthers* and connective cream to grey-brown, 0.5 × 0.35–0.4 mm. *Gynoecium* with stipe 0.7–0.8 mm long; *ovary* 1.2–1.7 × 0.7 mm, with dense, spreading, straight hairs (0.7–1 mm long); *style* curved, 3.3–4.3 × 0.15–0.2 mm, with scattered, spreading, straight hairs (0.2 mm long) at base, glabrous above; *stigma* simple; *ovules* 2. *Fruit* and *seed* not seen. (Figure 6)

Specimens examined. WESTERN AUSTRALIA: Quairading, SW of Merredin, 5 Oct. 1933, *W.E. Blackall* 3276 (PERTH 00704369); Yellowdine Rock, 7 Oct. 1986, *T. Macfarlane* 1691 (PERTH 04947754);

9 km SW of Lake Cronin, 23 Aug. 1979, *K. Newbey* 5802 (PERTH 00683299); Beverley Airfield Reserve, *c.* 1 km S of Beverley townsite, 18 Sep. 2000, *M. Ochtman & D. Lynch* 6 (BELY., PERTH 05913799); Manmanning, 31 July 1988, *B.H. Smith* 1056 (BRI, CANB, MEL); Quadrat 17, Kokeby Water Reserve, 3 Oct. 2002, *T. Watson & P. Clynk* 370 (BELY., PERTH 06358578).

Distribution and habitat. *Eutaxia rubricarina* is known from the south-west of Western Australia, from Manmanning to Quairading and east from Yellowdine to Lake Cronin (Figure 2E). This species

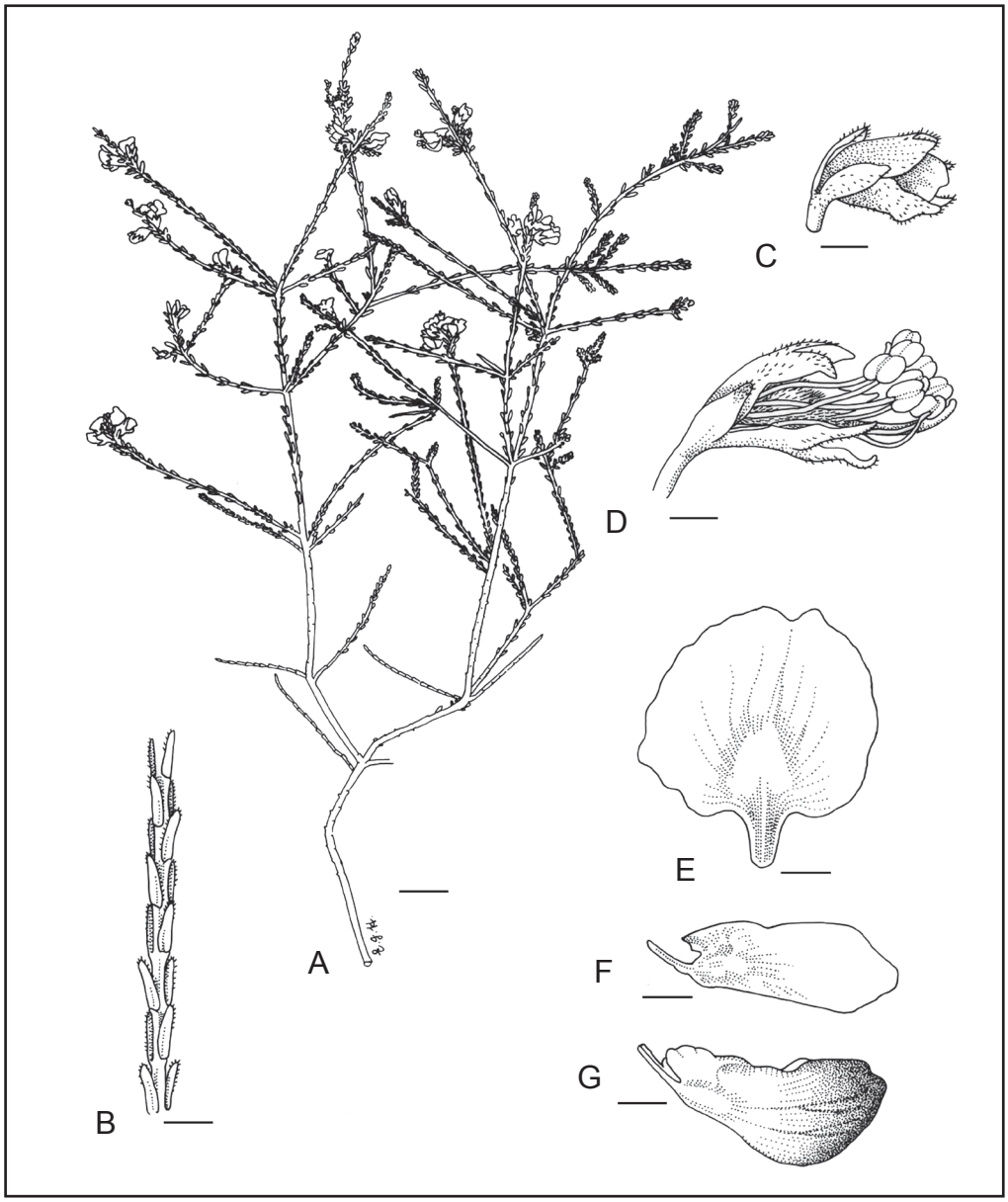

Figure 6. *Eutaxia rubricarina*. A – habit; B – branch detail showing opposite or alternate leaves; C – bud showing hairy outer calyx and exposed petals; D – exposed androecium and gynoecium, petals removed; E – standard; F – wing; G – keel. Drawn from the holotype (*T. Watson* 225). Scale bars = 8 mm (A); 2 mm (B); 1 mm (C–G).

grows in open woodland on grey, gravelly sand, red loam or pinkish-white sandy clay with gravel.

Flowering period. July to October.

Conservation status. No known special conservation needs, however, it is unknown if this species remains at earlier locations such as Quairading, Yellowdine, Lake Cronin, or Manmanning.

Etymology. The specific epithet *rubricarina* refers to the red keel present in this species.

Notes. *Eutaxia rubricarina* is characterised by the hairy calyx and leaves that are ovate, concave and hairy on the adaxial surface. It is distinguished from *E. lasiocalyx* by the red rather than yellow keel and the standard lamina has a basal eye with red markings following the veins, rather than no markings.

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Until her death in August 2006, Jennifer Chappill was the principal investigator, collaborating with Michael Crisp, for an ongoing *Eutaxia* revision for "Flora of Australia."

References

Atkins, K.J. (2006). "Declared Rare and Priority Flora list for Western Australia." (Department of Environment and Conservation: Kensington, Western Australia.)

Brown, R. (1811). Genera et species plantarum e variis familiis qua in Horto Kewensi coluntur. *In*: W. Aiton, "Hortus Kewensis." 2nd Edn, Vol. 3: 16.

Cameron, B.G. & Prakash, N. (1994). Variations of the megagametophyte in the Papilionoideae. *In*: I.K. Ferguson & S. Tucker (Eds) "Advances in legume systematics, part 6. Structural botany." pp. 97–115. (Royal Botanic Gardens, Kew: London.)

Chandler, G.T., Bayer, R.J. & Crisp, M.D. (2001). A molecular phylogeny of the endemic Australian genus *Gastrolobium* (Fabaceae: Mirbelieae) and allied genera using chloroplast and nuclear markers. *American Journal of Botany* 88(9): 1675–1687.

Crisp, M.D. & Cook, L.G. (2003a). Phylogeny and embryo sac evolution in the endemic Australasian papilionoid tribes Mirbelieae and Bossiaeeae. *In*: B.B. Klitgaard & A. Bruneau (Eds) "Advances in legume systematics, part 10. Higher level systematics." pp. 253–268. (Royal Botanic Gardens, Kew: London.)

Crisp, M.D. & Cook, L.G. (2003b). Molecular evidence for definition of genera in the *Oxylobium* group (Fabaceae: Mirbelieae). *Systematic Botany* 28(4): 705–713.

Grieve, B.J. (1998) "How to Know Western Australian Wildflowers." Part 2. (University of Western Australia Press: Perth.)

Orthia, L.A., Cook, L.G. & Crisp, M.D. (2005). Generic delimitation and phylogenetic uncertainty: an example from a group that has undergone an explosive radiation. *Australian Systematic Botany* 18(1): 41–47.

Western Australian Herbarium (1998–). FloraBase – The Western Australian Flora. Department of Environment and Conservation. http://florabase.dec.wa.gov.au/ [accessed June 2007]