A taxonomic revision of *Dicrastylis* sect. *Dicrastylis* (Lamiaceae subfamily Chloanthoideae)

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Abstract

Rye, B.L. & M.E. Trudgen. A taxonomic revision of *Dicrastylis* sect. *Dicrastylis* (Lamiaceae subfamily Chloanthoideae). *Nuytsia* 12(2): 207–228(1998). The south-western Australian plant group *Dicrastylis* Drumm. ex Harv. sect. *Dicrastylis* (Lamiaceae subfamily Chloanthoideae) is revised. A key and distribution maps are given for the 11 taxa currently recognized in the section, of which nine have been formally named as species and two are known only by phrase names. *Dicrastylis morrisonii* Munir is reduced to a synonym of *D. incana* Munir. Two new species, *Dicrastylis maritima* Rye & Trudgen and *D. soliparma* Rye & Trudgen, are described and illustrated. *Dicrastylis maritima* is noteworthy in growing on the strand and coastal dunes. About half of the taxa appear to be rare and have been included on the Western Australian Priority Flora List.

Introduction

This paper presents a taxonomic revision of *Dicrastylis* sect. *Dicrastylis*. *Dicrastylis* is treated here as belonging to Lamiaceae subfamily Chloanthoideae rather than to family Chloanthaceae as in a previous paper (Rye 1996). Recent studies of anatomical and morphological characters (Cantino *et al.* 1992) and DNA studies (Olmstead *et al.* in press) have indicated that the Chloanthaceae should not be treated as a separate family but combined with the Prostanthereae to form a subfamily of the Lamiaceae.

Dicrastylis sect. *Dicrastylis* is endemic to the south-west of Western Australia. Prior to 1978 only two species belonging to this section had been described. Five additional species were described by Munir (1978, 1991), who also defined the boundaries of the section. Two further members of sect. *Dicrastylis* were recognized during a flora survey of the Shark Bay area (Trudgen & Keighery 1995) and were given the phrase names *Dicrastylis* sp. Shark Bay (*J.J. Alford* 1318) and *Dicrastylis* sp. Peron Peninsula (*M.E. Trudgen* 7373). The former species is especially interesting as it is adapted to a harsh maritime environment, growing on the strand and foredunes, a significant extension of the habitat range for the genus.

Recently two more taxa that appear to be new species have been distinguished among the *Dicrastylis* herbarium specimens at PERTH. These have been allocated phrase names and placed on the Western Australian Priority Flora List. *Dicrastylis* sp. Cue (*A.A. Mitchell* 764) is known only from immature material and *Dicrastylis* sp. Denham (*M. Lewis* 42/92) from a single specimen. More collections are needed urgently to determine the taxonomic and conservation status of these poorly known taxa, as they may be endangered.

Methods

Except where otherwise indicated, all specimens cited are housed at PERTH, although duplicates may exist in other herbaria. All measurements were taken from dry pressed material. Leaf measurements were obtained from the larger leaves on each specimen. Flower length was taken only from well pressed flowers and did not include the stamens and style. Measurements of the corolla lobes for each species were taken from 5-merous flowers. Anthers were measured at the onset of dehiscence.

Indumentum length was taken as the distance the hairs protrude vertically above the surface to which they are attached. The width of dendritic hairs can be considerably greater than their length especially if they have only a very short stalk and a much larger branched portion that is horizontal.

Distribution maps were plotted such that each symbol indicates the recorded occurrence of a taxon in a 0.25 degree latitude by 0.25 degree longitude area. The conservation codes given in this paper are those used by the Western Australian Department of Conservation and Land Management. An explanation of these codes is given at the end of this *Nuytsia* issue.

Taxonomy

Dicrastylis Drumm. ex Harv. sect. **Dicrastylis**

Type: Dicrastylis fulva Drumm. ex Harv.

Pityrodia sect. *Xenotheca* F. Muell. (Mueller 1859: 236). *Type: Dicrastylis myriantha* F. Muell. [= *Dicrastylis fulva* Drumm. ex Harv.].

Shrubs with a dense indumentum of branched (usually dendritic) hairs on the stems, on the lower surface of leaves and bracts and on the inflorescences. *Leaves* opposite and decussate or rarely in whorls of three; petiole short or absent. *Cymes* arranged in fairly lax corymbose panicles, usually obvious but sometimes hidden by the indumentum and appearing to be condensed into heads, with decussate branches each subtended by a leaf or bract, the uppermost bracts sessile, the basal peduncle usually much shorter than the main lateral branches of the panicle; upper bracts glabrous to sparsely hairy inside or hairy only near apex. *Flowers* 4–6-merous. *Pedicels* with a dense white indumentum of dendritic hairs. *Calyx* densely dendritic-hairy outside, glabrous inside or rarely with a few hairs towards apex; lobes slightly shorter than to much longer than tube. *Corolla* white, the indumentum also white, usually unequally 5-lobed, the abaxial lobe largest and the two adaxial lobes shortest, with long simple hairs inside concentrated at throat but glabrous or largely glabrous elsewhere, with usually appressed dendritic hairs and scattered sessile glands on outside of lobes and extending at least a short distance

below the base of each lobe but glabrous at base of tube; lobes about as long as or longer than tube, entire (not crenate). *Stamens* exserted but often exceeded in length by the largest corolla lobe, glabrous or with a few simple hairs on the base of the filament; filament inserted shortly below summit of floral tube, white; anther with sessile glands on the abaxial surface near the junction of the two cells. *Style* exserted, deeply 2-branched, with large white dendritic hairs densely arranged on the basal part and often extending onto the style branches (but usually with only a few scattered hairs towards the base of each branch). *Fruit* globular to broadly obovoid, usually with scattered sessile glands at least on summit, largely covered by a dense white indumentum; gynophore short, glabrous, often multi-ribbed.

Distribution and habitat. The section consists of at least 9 species, occurring in sandy habitats in the south-west of Western Australia. It is absent from the extreme south-west but widespread in the remainder of the South West Botanical Province, with a concentration of species in the northern part of the province and the adjacent part of the Eremean Botanical Province, and with one of the southern species extending into the South-western Interzone. These botanical regions are defined in Beard (1980). The distributions of all members of section *Dicrastylis* are shown in Figures 1 and 2.

Phenology. There are no significant differences in flowering times between members of section *Dicrastylis*, with all species flowering predominantly in the last three months of the year. As in many other plant groups in south-western Australia, those species with the more northern distributions tend to commence and complete flowering earlier than those with more southern distributions. Fruiting quickly follows flowering but seed set is poor. Although each ovary contains 4 ovules, most fruits contain only aborted seeds or undeveloped ovules. A few of the fruits examined had a single mature seed but none had more than one mature seed.

Notes. The main morphological characters distinguishing sect. *Dicrastylis* from other sections of the genus are the relatively lax corymbose panicles and the long corolla lobes in relation to the length of the corolla tube. These features are well illustrated in Figures 6–13 of Munir's (1978) revision, with the contrasting features of the other sections illustrated in Figures 1–5 & 14–31. Other sections of *Dicrastylis* have cymes condensed into head-like or spike-like clusters and either have corolla lobes all distinctly shorter than the corolla tube or (in the South Australian species *D. verticillata* J.M. Black) highly zygomorphic flowers with an exceptionally large abaxial corolla lobe. In sect. *Dicrastylis*, the abaxial corolla lobe varies from being distinctly larger than the other lobes to almost the same size, this feature tending to vary more within species than between species.

Indumentum characters, particularly the type and size of the hairs on various parts of the plant, are very important in distinguishing the species. Five distinct types of branched hairs are recognized here, as illustrated in Figure 3. Two of these (A, C) are clearly dendritic and two (D, E) are modified from the dendritic form to appear more scale-like. The last type of hair (B) is very distinctive, having a single sub-basal whorl of branches, and is possibly a modified stellate hair with a long central ray. All of these branched hairs have a patent stalk, but some of the more scale-like hairs have a very reduced stalk and the branched upper portion appressed to the stem. For simplicity, dendritic hairs that have the upper part borne perpendicular to the stem are referred to here as 'patent', those with the upper part horizontal but borne on a definite short stalk as 'peltate-dendritic' and those largely horizontal with an extremely short stalk as 'subsessile scale-like'.

Other important characters for distinguishing the taxa are leaf shape and size, flower length and anther length.

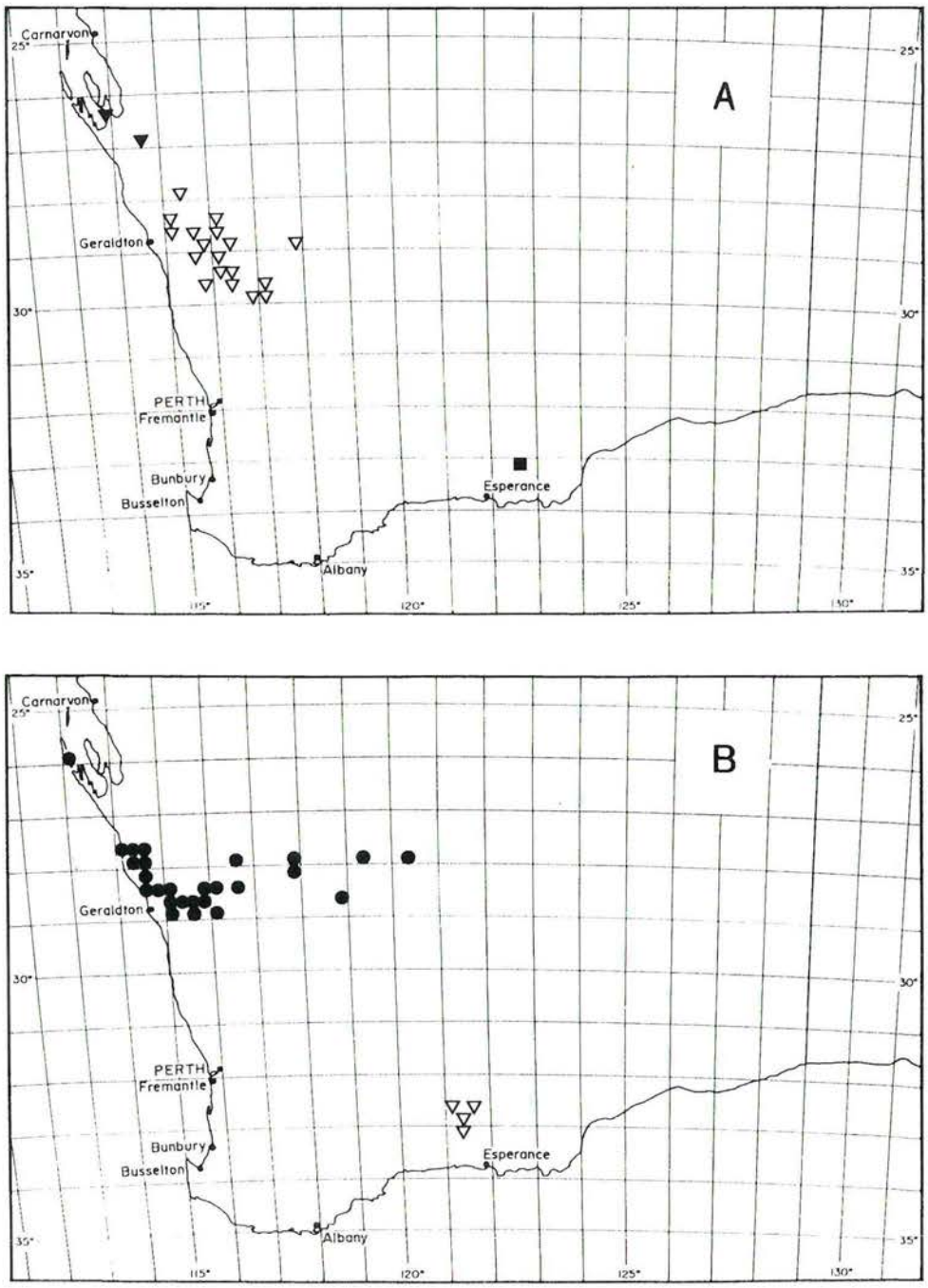

Figure 1. Geographical distributions A – *Dicrastylis archeri* ■, northern variant of *D. soliparma* ▼ and typical variant of *D. soliparma* ▽; B – *D. fulva* ● and *D. obovata* ▽.

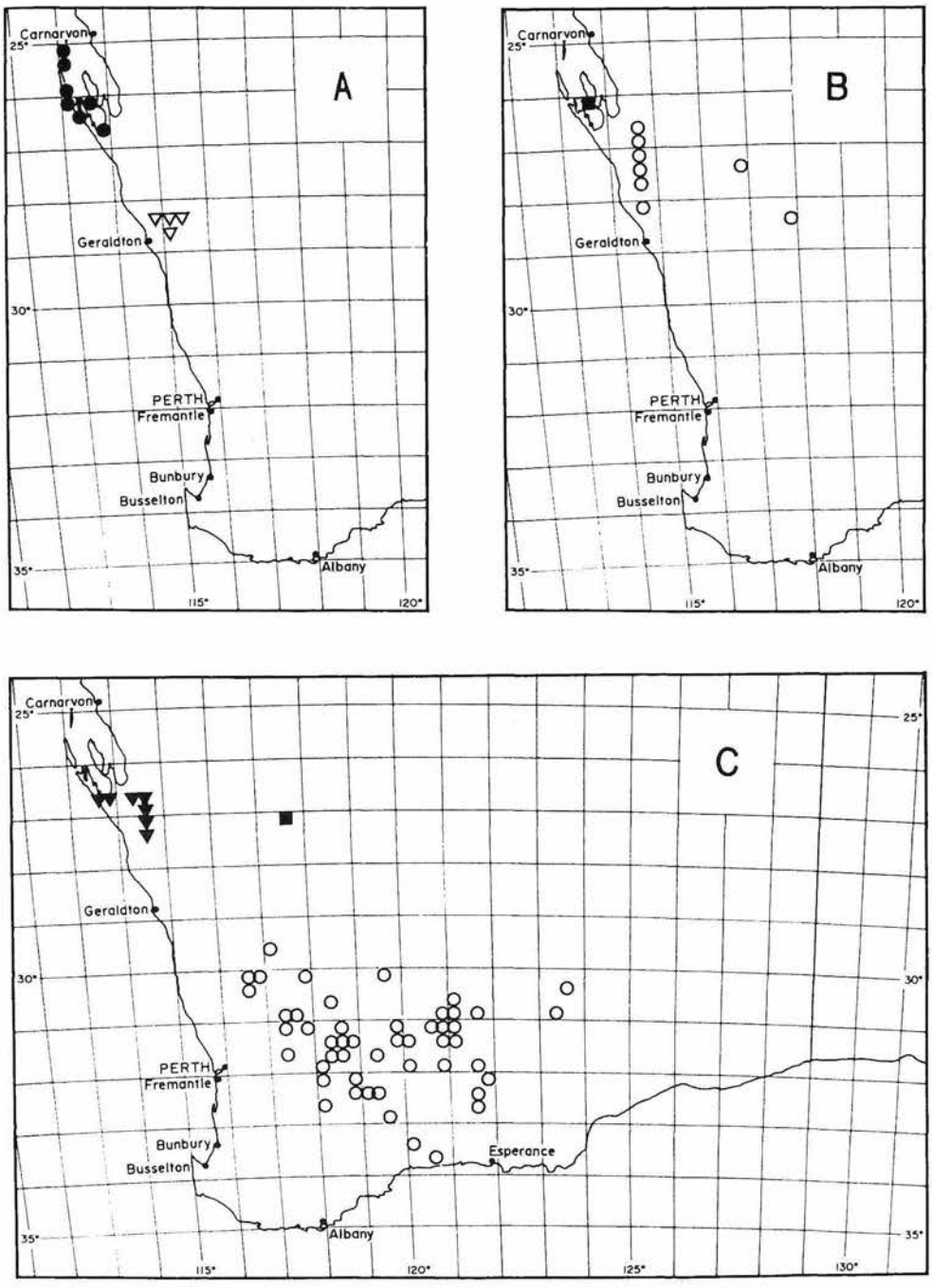

Figure 2. Geographical distributions. A – *Dicrastylis incana* ▽ and *D. maritima* ● ; B – *D. linearifolia* ○ and *D.* sp. Denham ■ ; C – *D. micrantha* ▼, *D. parvifolia* ○ and *D.* sp. Cue ■.

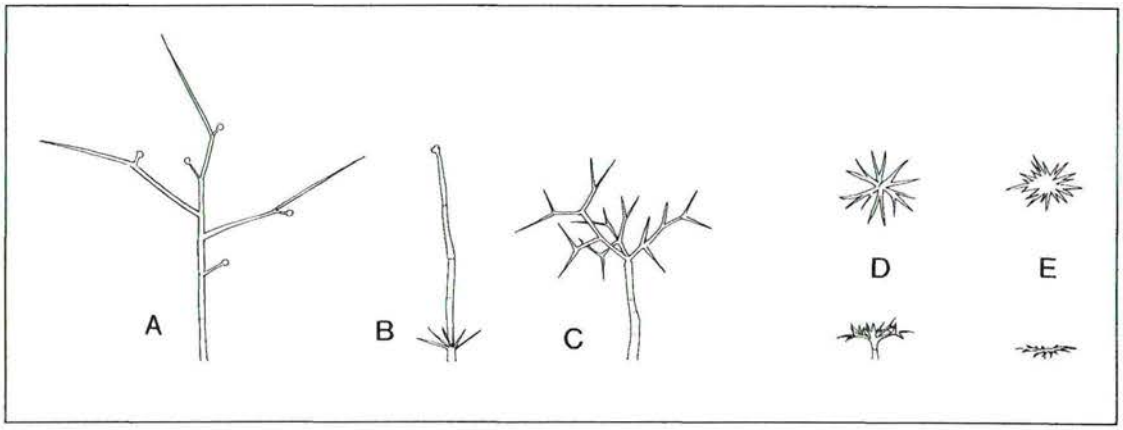

Figure 3. Stem hair types. A–C. Patent branched hairs, from side view. A – glandular dendritic hair of *Dicrastylis incana*; B – glandular hair of *D. micrantha* with sub-basal whorl of non-glandular branches; C – non-glandular dendritic hair of *D. fulva*. D,E. Non-glandular modified dendritic hairs with the branched portion horizontal, from top and side view. D – peltate-dendritic hair of *D. soliparma*; E – subsessile scale-like hair of *D. obovata*. Drawn from *C.I. Stacey* 564 (A), *E.M. Bennett* 1477 (B), *M.E. Phillips* 27723 (C), *C.A. Gardner* Nov. 1933 (D) and *G.F. Craig* 2910 (E).

Key to species

1. Pedicel and calyx with an appressed indumentum of subsessile scale-like hairs (Figure 3E) less than 0.2 mm long
   2. Leaves obovate or broadly obovate, 6–16 x 3–10 mm; upper surface fairly uniformly hairy. Anthers 0.4–0.5 mm long. Occurs east of Hyden. (Frank Hann National Park area.) ..... **D. obovata**
   2. Leaves almost linear to narrowly obovate, 13–45 x 1–6 mm; upper surface glabrous throughout or with the bullae becoming glabrous. Anthers usually 0.6–0.7 mm long. Occurs either north of Geraldton or east of Esperance
      3. Upper leaf surface shallowly bullate, hairy between the bullae. Stamens usually 5; filament 2.5–3.7 mm long. (Meadow Station to Binnu to Mount Magnet) ..... **D. linearifolia**
      3. Upper leaf surface prominently reticulate-patterned, glabrous. Stamens usually 4; filament *c.* 1.5 mm long. (Mt Heywood area) ..... **D. archeri**
1. Pedicel with patent dendritic hairs 0.2–3.5 mm long; calyx with either patent dendritic (Figure 3C) or peltate-dendritic (Figure 3D) hairs 0.2–3 mm long
   4. Stem indumentum including glandular hairs (the glands sometimes lost with age); largest hairs up to 3.5 mm long, if less than 2 mm long then with a sub-basal whorl of simple branches. Leaves sessile
      5. Largest hairs 2–3.5 mm long, dendritic, with several of the branches terminated by a gland (Figure 3A). Calyx lobes 1.2–2.3 mm long, with hairs 0.8–3 mm long. (Chapman River to Greenough River) ..... **D. incana**
      5. Largest hairs 0.5–1.3 mm long, with a sub-basal whorl of simple non-glandular branches and with a single terminal gland (Figure 3B). Calyx lobes 1–1.5 mm long, with hairs 0.2–0.35 mm long. (Useless Loop to Kalbarri National Park) ..... **D. micrantha**
   4. Stem indumentum of non-glandular hairs; largest hairs up to 1.5 mm long, dendritic. Leaves usually subsessile or shortly petiolate

6. Calyx with hairs 0.2–0.4 mm long
   7. Corolla lobes with a dense indumentum reaching the margin. Anthers 0.4–0.6 mm long, pale yellowish to medium brown. Occurs on the coast on strand, dunes and limestone. (Dorre Island to Salutation Island) ..... **D. maritima**
   7. Corolla lobes with a distinct glabrous border. Anthers 0.25–0.35 mm long, purple to black. Occurs either well inland or in hummock grassland close to, but not on, the coast
      8. Leaves 5–20 x 1–3.5(5) mm. Panicles 15–75 mm across. (Wubin area to Oldfield River to Queen Victoria Springs) ..... **D. parvifolia**
      8. Leaves (as far as known) 20–30 x 8–10 mm. Panicles *c.* 130 mm across. (Peron Peninsula) ..... **D.** sp. Denham
6. Calyx with hairs 0.5–1.5 mm long
   9. Leaves mostly narrowly ovate, the larger ones 35–40 mm long; undersurface prominently reticulate, with minute hairs not covering the large lacunae. Flowers *c.* 3 mm long. (Cue area) ..... **D.** sp. Cue
   9. Leaves varying from narrowly to broadly ovate or obovate, the larger ones 10–33(37) mm long, if more than 33 mm long then narrowly obovate; undersurface with small lacunae and/or with large hairs obscuring lacunae. Flowers 4-6 mm long
      10. Stem indumentum (not including inflorescence branches) of patent dendritic hairs 0.4–1.4 mm long (Figure 3C). Leaves mostly narrowly to broadly ovate, 5–14 mm wide. (Mainly Kalbarri to Agnew) ..... **D. fulva**
      10. Stem indumentum (not including inflorescence branches) of peltate-dendritic hairs up to 0.3 mm long (Figure 3D). Leaves mostly narrowly obovate or obovate, 3–9 mm wide. (Peron Peninsula to Jibberding Station) ..... **D. soliparma**

Dicrastylis archeri Munir (Munir 1991: 86–89). *Type:* North of Mt Heywood [precise locality withheld], Western Australia, 1 December 1990, *W.R. Archer* 112907 (*holo:* AD *n.v.*, illustration seen; *iso:* PERTH 02504847).

Illustration. The holotype is illustrated in Munir (1991: Figure 1).

Shrubs 0.4–1 m high, with a dense appressed indumentum on the young stems and inflorescences; indumentum of subsessile scale-like hairs. *Young stems* pale to medium grey at first, becoming dark grey, with white and ferruginous hairs up to 0.1 mm long. *Leaves* opposite, antrorse, subsessile or shortly petiolate. *Petioles* up to 1.5 mm long. *Leaf blades* narrowly or very narrowly obovate, 13–26 x 1.3–3.3 mm, acute or sometimes obtuse, with prominently recurved margins; lower surface pale green to whitish, closely covered by a dense short white indumentum; upper surface glabrous, medium green, prominently reticulate-patterned. *Panicles* 15–40 x 20–50 mm, many-flowered, with a dense appressed indumentum of rather scale-like white hairs on the axes, bracts, pedicels and calyx, often also with ferruginous hairs; basal peduncle up to 10 mm long. *Bracts* subtending upper branches usually narrowly oblong-elliptic, the larger ones 2–3 mm long. *Pedicels* up to 4 mm long; indumentum *c.* 0.1 mm long. *Flowers* 4- or 5-merous or heteromerous (with 5 calyx lobes, 4 or 5 corolla lobes and 4 stamens), *c.* 3 mm long. *Calyx* with hairs *c.* 0.1 mm long; tube *c.* 0.5 mm long; lobes ovate or narrowly

ovate, *c.* 1.4 mm long, usually narrowly obtuse. *Corolla*: tube *c.* 1.4 mm long, the outside sparsely dendritic-hairy above the middle, with the indumentum becoming denser towards summit; lobes ovate or broadly ovate, the largest lobe *c.* 2 mm long and the others slightly shorter, obtuse, with a distinct glabrous border around the margin outside. *Stamens*: filament *c.* 1.5 mm long; anther *c.* 0.6 mm long, pale-coloured. *Style* with peltate-dendritic hairs *c.* 0.3 mm long; entire portion *c.* 1.4 mm long; branches commonly 2–2.5 mm long. *Fruit c.* 1.6 x 1.4 mm but not seen at maturity, fairly uniformly hairy. *Seed* not seen.

Other specimen examined. WESTERN AUSTRALIA: NW of Mt Ney Rd [precise locality withheld], 21 May 1993, *G.F. Craig & B. Haberley* 2776.

Distribution. Occurs in the south-east of the South West Botanical Province, known from a small area near Mt Heywood (east of Grass Patch).

Habitat. Recorded in white sand in open mallee woodland.

Phenology. Flowers and fruits: November to December.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority One. This species is known only from two collections, probably both made from the same population.

Notes. The extent of morphological variation in this species is scarcely known, as only one of the two available specimens is in flower and there are no mature fruits. The single flowering specimen has more 4-merous flowers than 5-merous ones, and also many heteromerous flowers with 5 calyx lobes and 4 stamens. In all other members of sect. *Dicrastylis*, most of the flowers are 5-merous.

Dicrastylis fulva J.R. Drumm. ex Harv. (Harvey 1855: 56). *Type:* Northern districts, [Western Australia], *J. Drummond* coll. 6, *s.n.* (*lecto:* TCD, *fide* Munir (1978: 479); *isolecto:* MEL 40849, 40851, 40854, 40856, 40857, 41230).

Pityrodia myriantha F. Muell. (Mueller: 1859: 236, 244). *Type:* Murchison River, [Western Australia,] *A. Oldfield* (*holo:* MEL 40855).

Illustration. Munir (1978: Figure 11).

Shrubs 0.3–1.2(1.6) m high, with a dense indumentum on the young stems, leaves and inflorescences, the young shoots pale to medium ferruginous. *Young stems* pale to dark ferruginous, with patent dendritic hairs, the larger ones 0.4–1.5 mm long. *Leaves* opposite or very rarely in whorls of three, widely spreading, often somewhat retrorse, subsessile or shortly petiolate, densely hairy at first. *Petioles* up to 1.5 mm long. *Leaf blades* usually ovate to elliptic or broadly so, sometimes narrowly ovate or narrowly obovate to obovate but the uppermost leaves subtending the main branches of the panicle always more or less ovate, (12)14–33 x (5)6–14 mm, narrowly to broadly obtuse, with recurved margins, medium grey-green or somewhat ferruginous at first, becoming dark green on both surfaces or somewhat paler on lower surface; lower surface becoming sparsely hairy with age and the sessile glands within the pits then becoming visible; upper surface moderately deeply to deeply bullate, with hairs 0.3–1.2 mm long. *Panicles* (15)30–160 x (25)70–190 mm, with pink or ferruginous hairs as well as white hairs on the axes, bracts and calyx lobes; basal peduncle up to 60 mm long. *Bracts* subtending upper branches ovate, the larger ones 4–7.5 mm long. *Pedicels* up to 6.5 mm long; indumentum

0.4–1.1 mm long. *Flowers* mostly 5-merous, with occasional 6-merous flowers sometimes present, 5–6 mm long. *Calyx* with white and coloured (pink or ferruginous) hairs 0.7–1.5 mm long; tube 0.4–1 mm long; lobes ovate or narrowly ovate, 0.8–1.5 mm long, usually narrowly obtuse or acute. *Corolla*: tube 1.3–2.0 mm long, the outside glabrous or subglabrous on the ribs but hairy at base of each corolla lobe, the hairs usually becoming denser towards summit; lobes obovate-oblong or broadly so, the largest lobe 1.5–4.3 mm long and the others 1.3–3.5 mm long, broadly obtuse, with a distinct glabrous border around the margin outside. *Stamens*: filament 1.6–3.5 mm long; anther 0.4–0.6 mm long, dark purplish black. *Style* with patent dendritic hairs 0.4–0.9 mm long; entire portion 1.0–2.1 mm long; branches 1.5–2.5 mm long. *Fruit* possibly not fully mature, the largest seen *c.* 1.8 x 1.3 mm, with the largest hairs towards the summit. *Seed* not seen. (Figures 3C, 4A–C)

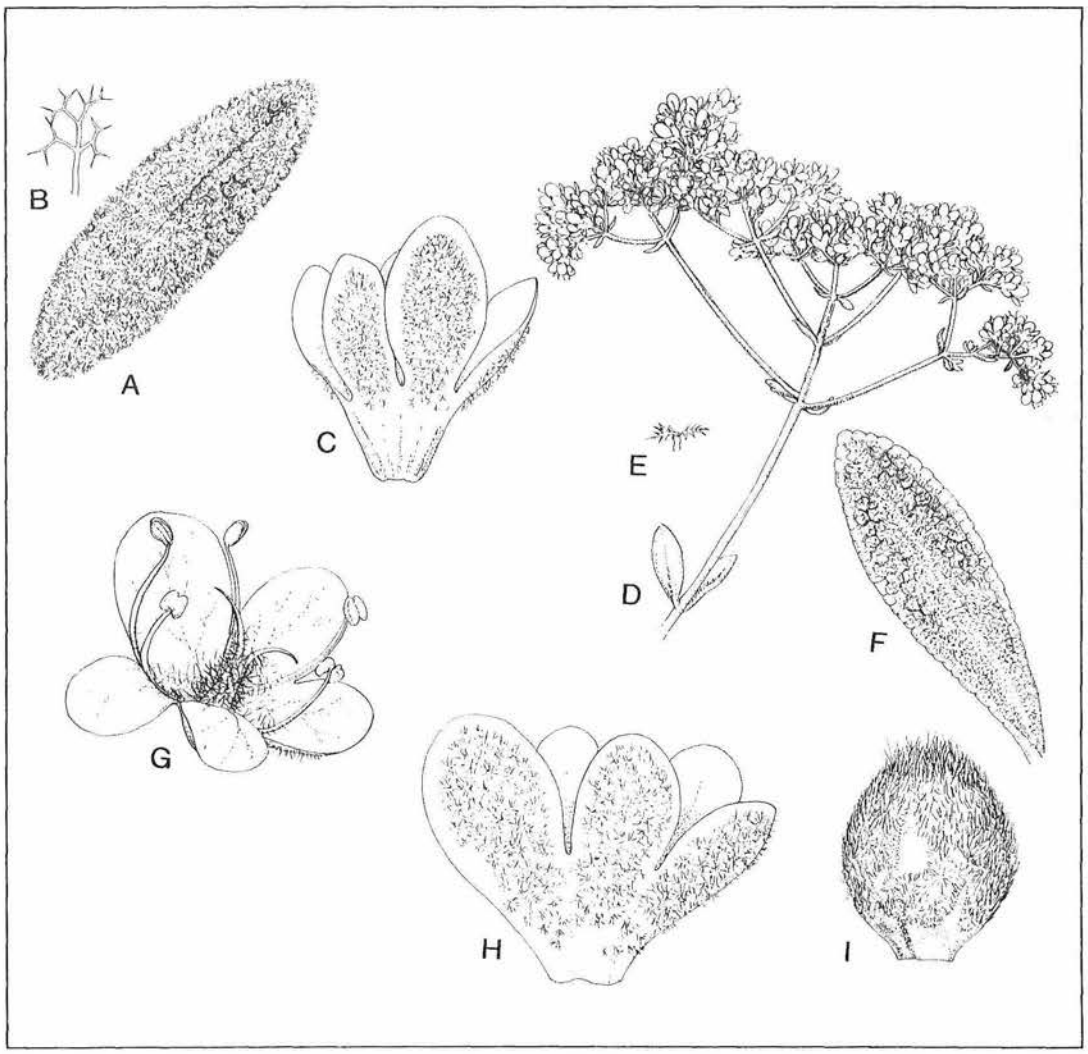

Figure 4. A–C. *Dicrastylis fulva*. A – leaf (x2); B – leaf hair (x20); C – corolla (x8). D–I. *Dicrastylis soliparma*. D – flowering branch (x1); E – stem hair (x30); F – leaf (x2); G – flower (x8); H – corolla (x8); I – fruit (x12). Drawn from *G.E. Brockway* Oct. 1947 (A–C). *R.J. Cranfield & P. Spencer* 8378 (D,E,G,H) and *F. Lullfitz* 3165 (F,I).

Selected specimens examined. WESTERN AUSTRALIA: Near Youanmi, Oct. 1931, *G.E. Brockway* 33; 28 miles [45 km] N of Ajana, Oct. 1947, *G.E. Brockway*; 10 miles [16 km] along Mullewa–Morawa road, 6 Oct. 1984, *A.C. Burns* 3; Mount Magnet, 2 Oct. 1959, *W.H. Butler*; 158.3 km WSW of Yalgoo towards Mullewa, 31 Aug. 1976, *R. Coveny* 7941 *& B.R. Maslin*; Northampton, Nov. 1901, *Diels & Pritzel*; 21.6 km N of Northampton Post Office on North West Coastal Highway, 2 Oct. 1988, *J.M. Fox* 88/107; E of Casuarinas Rd, E of Geraldton, 24 Oct. 1992, *E.A. Griffin* 7528; Dirk Hartog Island, *Martin* 32 (MEL); State Farm, Chapman River, 1 Nov. 1903, *A. Morrison*; East Yuna Reserve, Oct. 1976, *B.G. Muir* 344; 58 km W of Yalgoo, 8 Oct. 1989, *B. Nordenstam & A. Anderberg* 438; 4 miles [6 km] inland from Kalbarri, 18 Sep. 1968, *M.E. Phillips*; *c.* 8 km W of Mullewa, 5 Oct. 1969, *D.J.E. Whibley* 3126.

Distribution. Extends from Eurardy Station and Kalbarri National Park in the north of the South West Botanical Province east to near Agnew in the Eremean Botanical Province. A very isolated record 200 km further north from Dirk Hartog Island (*Martin* 32, MEL) may be inaccurate in its locality as no collections have been made since of the species from this island. The Dirk Hartog Island specimen has no date but must have been collected by 1883 because it was cited in Mueller (1883).

Habitat. Occurs in a variety of sandy soils, probably mainly on plains, in vegetation dominated by varied shrub and tree species.

Phenology. Flowers mainly August to December, also recorded July. Fruits recorded October to December, but only one specimen (*G.E. Brockway* 33) appears to have mature fruits.

Conservation status. Dicrastylis fulva is a fairly common species, with a range of over 600 km, and is not considered to be at risk.

Notes. A single specimen of *D. fulva* (*A.C. Burns* 3) is atypical in having leaves in whorls of three, all other specimens having opposite leaves. Occasional floral abnormalities are found in a few specimens. For example, one specimen (*R. Coveny* 7941 *& B.R. Maslin*) has a few flowers that have eight calyx lobes and three style branches.

In *Dicrastylis fulva* most of the leaves are elliptic to broadly ovate rather than narrowly obovate or obovate as in its closest relative *D. soliparma*.

Dicrastylis incana Munir (Munir 1978: 484–486). *Type:* 35 miles [56 km] from Geraldton towards Mullewa, Western Australia, 30 September 1962, *M.E. Phillips* (*holo:* CBG 020641 *n.v.*, photograph PERTH 03200973).

Dicrastylis morrisonii Munir (Munir 1978: 485–489). *Type:* State Farm, upper Chapman River, north-east of Geraldton, Western Australia, 5 November 1903, *A. Morrison* (*holo:* PERTH 01173626).

Illustrations. The holotype of *D. incana* is illustrated in Figure 12 and the holotype of its synonym *D. morrisonii* in Figure 13 of Munir (1978).

Shrubs 0.3–1.5 m high, with a dense indumentum on the young stems, leaves and inflorescences, the young shoots usually pale grey-green; indumentum of long patent dendritic hairs with multiple glands each terminating a short branch. *Young stems* pale greyish or rarely pale brown or ferruginous, the larger hairs 2–3.5 mm long. *Leaves* opposite, usually antrorse, sometimes widely spreading, sessile,

narrowly ovate-triangular to narrowly ovate, 11–25 x 2.5–7.5 mm, narrowly to broadly obtuse, with prominently recurved margins, densely hairy at first, medium grey-green or somewhat ferruginous at first; lower surface sometimes scarcely visible between the recurved margins, pale grey-green, with a dense indumentum of long white hairs; upper surface deeply or very deeply bullate, dark green, with white hairs mainly between the bullae, the larger hairs 1.5–3 mm long at first but generally becoming broken off towards the base in older leaves. *Panicles* 30–80 x 45–140 mm, many-flowered, with white and sometimes also ferruginous hairs on the axes, bracts and calyx lobes; basal peduncle up to 15 mm long. *Bracts* subtending upper branches narrowly or very narrowly ovate to linear, the larger ones 4–10 mm long. *Pedicels* up to 5(10) mm long; indumentum 0.8–2.3(3.5) mm long. *Flowers* mostly 5-merous with occasional 6-merous flowers sometimes present, possibly also occasionally some 4-merous flowers, 3–5 mm long. *Calyx* with white or rarely pale ferruginous hairs 0.8–2(3) mm long; tube 0.3–0.4 mm long; lobes narrowly triangular to narrowly ovate, 1.2–2.3 mm long, usually narrowly obtuse or acute. *Corolla*: tube 1.6–2.2 mm long, glabrous or sparsely hairy on the ribs outside; lobes obovate-oblong to ovate or broadly so, the largest lobe 2.2–3.6 mm long and the others 1.3–2.8 mm long, broadly obtuse, with a distinct glabrous margin outside. *Stamens*: filament 0.8–2 mm long; anther 0.4–0.5 mm long, dark purplish. *Style* with patent dendritic hairs 0.4–0.5 mm long; entire portion 0.7–2.0 mm long; branches 1.2–2.3 mm long. *Fruit c.* 1.6 x 1.5 mm, with the largest hairs on the summit. *Seed* not seen. (Figure 3A)

Other specimens examined. WESTERN AUSTRALIA: East Yuna Reserve, Oct. 1976, *B.G. Muir* 331; 12 km E of Greenough River crossing on Geraldton–Mullewa road, 5 Oct. 1994, *S. Patrick* 2034; 14.8 km N along Valentine Rd from Geraldton–Mount Magnet road W of Eradu, 1 Nov. 1994, *S. Patrick* 2143; 0.5 mile [0.8 km] E of Greenough River at Eradu, 31 Oct. 1963, *R.D. Royce* 8020; 11 km SE of Yuna, 29 Sep. 1976, *C.I. Stacey* 564; Eradu, Nov. 1934, *H. Steedman*; *c.* 36 km E of Yuna, 8 Nov. 1990, *N. & J. Tunbridge* 4.

Distribution. Occurs in the northern part of the South West Botanical Province, extending from the upper Chapman River south to Eradu and east to north of Pooten Crossing (Greenough River).

Habitat. Occurs in sandy soils, often in low or very open woodlands, dominated by a variety of sandplain species in genera such as *Actinostrobus* and *Grevillea.*

Phenology. Flowers: September to November. Fruits recorded in November.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Two. Previously listed twice on the Priority Flora List, first as *D. incana* with Priority One and the second time as a presumed extinct species *D. morrisonii.* Now known from more localities including a flora reserve and consequently given a reduced priority level.

Notes. This species is the only member of sect. *Dicrastylis* to have glandular dendritic hairs of the type illustrated in Figure 3A. These hairs have a number of short branches each terminated by a gland.

The name *Dicrastylis morrisonii* was published at the same time as *D. incana*, with both taxa described from single collections, the former taxon representing an extreme of the variation found within this species. Seven additional collections are cited above, all closer to the latter type but including some intermediate states in the characters originally used to distinguish the two taxa. The type of *D. morrisonii* appears to be a particularly lush specimen, possibly collected close to the banks of the Chapman River. *D. morrisonii* is here reduced to a synonym of the more commonly used name *D. incana.*

Although most specimens have the greyish appearance implied by the epithet *incana* owing to their long white or off-white indumentum, one collection (*C.I. Stacey* 564) has pale ferruginous hairs. All specimens at PERTH have 5-merous flowers and several (e.g. *B.G. Muir* 331) have occasional 6-merous flowers. The type specimen of *D. incana* was reported to have occasional 4-merous flowers (Munir 1978: 485).

Dicrastylis linearifolia Munir (Munir 1978: 468–470). *Type:* 473 mile post on North West Coastal Highway [262 km north of Geraldton, south of Billabong Roadhouse], Western Australia, 12 December 1971, *A.M. Ashby* 4496 (*holo:* AD *n.v.*, illustration seen; *iso:* PERTH 01082167).

Illustration. The holotype of *D. linearifolia* is illustrated in Munir (1978: Figure 7).

Shrubs 1.5–3 m high, with a dense appressed indumentum on the young stems and inflorescences; indumentum of subsessile scale-like hairs, the young shoots pale grey-green or pale ferruginous-green. *Young stems* bright orange or dark orange-brown, with mainly ferruginous hairs up to 0.2 mm long. *Leaves* opposite, antrorse or sometimes fairly widely spreading, shortly petiolate. *Petioles* 1–4.5 mm long. *Leaf blades* almost linear to narrowly obovate, 16–45 x 3–6 mm, acute or obtuse, with recurved margins; lower surface pale grey-green, densely covered by an appressed white indumentum, with scattered sessile glands sometimes visible; upper surface medium to dark green, shallowly bullate on upper surface and becoming glabrous on the bullae but retaining very short white hairs between the bullae. *Panicles* usually many-flowered and 20–45 x 30–55 mm, rarely reduced to a few flowers and only *c.* 10 mm long, with ferruginous hairs as well as white hairs on the axes, bracts and calyx lobes; basal peduncle up to 13 mm long. *Bracts* subtending upper branches usually narrowly ovate to ovate, the larger ones 1–2 mm long. *Pedicels* up to 3.5 mm long; indumentum *c.* 0.05 mm long. *Flowers* mostly 5-merous with occasional 4-merous flowers sometimes present, 4.5–6.5 mm long. *Calyx* with an indumentum *c.* 0.05 mm long; tube 0.5–1.3 mm long; lobes narrowly triangular to ovate, 0.9–1.6 mm long, usually acute. *Corolla:* tube 1.7–2.3 mm long, the outside sparsely hairy for a short distance below the middle and fairly densely hairy above the middle; lobes usually obovate or broadly obovate, the largest lobe 2.8–4 mm long and the others 2.2–3.3 mm long, broadly obtuse, with a distinct glabrous margin outside. *Stamens*: filament 2.5–3.7 mm long; anther 0.6–0.7 mm long, pale-coloured or red-brown. *Style* with patent dendritic hairs *c.* 0.3 mm long; entire portion 1.5–3 mm long; branches 1.5–2.5 mm long. *Fruit* 1.8–2.4 x 1.6–1.8 mm, fairly uniformly hairy. *Seed* not seen.

Other specimens examined. WESTERN AUSTRALIA: Iona Station, near Mount Magnet, 25 Sep. 1973, *J.S. Beard* 6666; Meadow turnoff, Carnarvon road, 17 Nov. 1968, *H. Demarz* 707; 0.5 mile N of 419 mile peg on North West Coastal Highway [173 km N of Geraldton], 7 Dec. 1972, *H. Demarz* 4177; 439 mile peg on Carnarvon road [204 km N of Geraldton], 10 Dec. 1974, *H. Demarz* 5531; 413 mile peg, Great Northern Highway [163 km N of Geraldton], 21 Jan. 1976, *H. Demarz* 5991; 438 mile peg on North West Coastal Highway [203 km N of Geraldton], *C.A. Gardner* 2185; Cistern 1, 40 km N of Murchison River, 20 Dec. 1962, *C.A. Gardner* 14274; 0.75 mile N of 415 mile peg on Carnarvon road [167 km N of Geraldton], 14 Dec. 1964, *F.W. Humphreys* 6333; Binnu, 18 Dec. 1962, *F. Lullfitz* 1954; 438 mile peg [203 km N of Geraldton], *F. Lullfitz* 2185; 435 mile peg on North West Coastal Highway [198 km N of Geraldton], 7 Dec. 1965, *F. Lullfitz* 4553; 436 mile peg on North West Coastal Highway [200 km N of Geraldton], 11 Dec. 1966, *F. Lullfitz* 5956; Botra paddock, Meka Station, 10 Dec. 1980, *A.A. Mitchell* 842.

Distribution. Occurs in the northern part of the South West Botanical Province from Meadow Station south to Binnu. Also known from Meka and Iona Stations (both near Mount Magnet) in the Eremean Botanical Province.

Habitat. Recorded in red sandy soils. Of the two inland records, one is given as a sand ridge and the other as "bowgada [*Acacia*] sand plain". The western collections give no information on associated vegetation or landforms except for one mention of sandheath.

Phenology. Flowers recorded in November to December. Fruits recorded December to January.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Three. This species is now known from about ten localities over a range of almost 400 km, but none from conservation reserves.

Notes. This species has the shortest indumentum and the most obviously petiolate leaves known for section *Dicrastylis*. Although the panicles are occasionally reduced to a few flowers, some many-flowered panicles are present on all specimens. Most specimens appear to have uniformly 5-merous flowers but some of the flowers are 4-merous on *F. Lullfitz* 1954.

Dicrastylis maritima Rye & Trudgen, *sp. nov.*

Dicrastyli soliparmae affinis sed floribus parvioribus et indumento calycis breviore.

Typus: Peron Peninsula, Western Australia, 4 November 1989, *M.E. Trudgen* 7375 (*holo:* PERTH 01224751; *iso:* CANB, K, MEL).

Shrubs 0.1–0.5 m high, erect or decumbent, often spreading, with a silvery appearance resulting from a dense white indumentum of patent dendritic hairs on the stems and leaves. *Stems* with hairs commonly 0.2–0.4 mm long on young stems, up to 0.8 mm long on older stems. *Leaves* opposite, widely spreading and often somewhat retrorse, subsessile or shortly petiolate. *Petioles* up to 1.3 mm long. *Leaf blades* narrowly ovate or narrowly oblong to elliptic, 7–24 x 3–9 mm, obtuse or acute, with recurved margins, pale green or grey-green, the indumentum in young leaves commonly 0.1–0.2 mm long over most of blade but often 0.3–0.5 mm long along the midvein, in old leaves becoming sparse and up to 1 mm or more long; lower surface with a dense indumentum and scattered sessile glands; upper surface very shallowly bullate. *Panicles* 10–45 x 15–85 mm, many-flowered, with ferruginous hairs as well as white hairs on the axes, bracts and calyx lobes; basal peduncle up to 32 mm long. *Bracts* subtending upper branches ovate, the larger ones 2–2.5 mm long. *Pedicels* up to 2.5 mm long; indumentum 0.2–0.3 mm long. *Flowers* 4–6-merous but mostly 5-merous, 3–4 mm long. *Calyx* with white and ferruginous hairs 0.2–0.3 mm long; tube 1.0–1.4 mm long; lobes ovate or broadly ovate, 1.0–1.4 mm long, narrowly obtuse or acute. *Corolla*: tube 1.4–1.8 mm long, the outside hairy above the middle, the indumentum becoming denser towards summit; lobes ovate or broadly ovate, the largest lobe 1.6–2.4 mm long and the others 1.3–2.0 mm long, broadly obtuse, with a very dense indumentum throughout the outer surface. *Stamens*: filament 1.8–3 mm long; anther 0.5–0.6 mm long, pale yellowish to medium brown. *Style* with patent dendritic hairs 0.4–0.6 mm long; entire portion 1.0–1.8 mm long; branches 1.5–2 mm long. *Fruit* 2.0–2.5 x 1.9–2.2 mm, fairly uniformly hairy or with some longer hairs on summit. *Seed c.* 1.5 x 0.9 mm, soft, white, with an inconspicuous extremely fine reticulate pattern on the surface. (Figures 3D, 5)

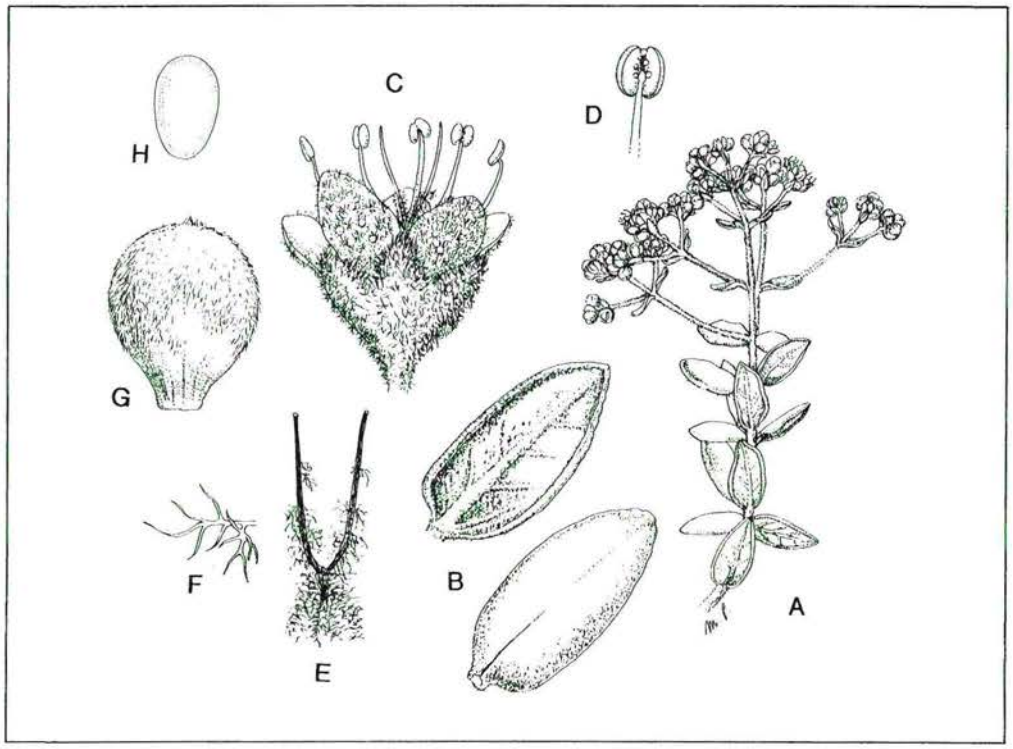

Figure 5. *Dicrastylis maritima*. A – flowering stem (x1), B – lower and upper surfaces of leaf (x3), C – flower (x7), D – stamen (x13), E - style (x10), F – dendritic hair from a style branch (x60), G – fruit (x10), H – seed (x8.5). Drawn from *M.E. Trudgen* 7375 (A–C), *H. Demarz* 5508 (C–F) and *P.G. Wilson* 8238 (G,H).

Other specimens examined. WESTERN AUSTRALIA (all PERTH): Salutation Island, Freycinet Estuary, 12 Sep. 1989, *J.J. Alford*; Salutation Island, Freycinet Estuary, 14 Sep. 1989, *J.J. Alford* 1318; 2 km N of Eagle Bluff, Peron Station, 11 Nov. 1982, *R.J. Cranfield* 2560; Eagle Bluff, 6 Dec. 1974, *H. Demarz* 5508; Behind White Beach, Dorre Island, 11 Nov. 1973, *T. Evans*; By Homestead, Dirk Hartog Island, 7 Sep. 1972, *A.S. George* 11617; Dorre Island, 16 Dec. 1973, *K.F. Kenneally* 12; Sandy Point, Dirk Hartog Island, 6 Sep. 1967, *M.H. Manning*; Near southern part of Useless Inlet, 29 Sep. 1989, *M.E. Trudgen* 7374; South Transect, Dorre Island, 16 Aug. 1977, *A.S. Weston* 10527; S of South Transect, Dorre Island, 18 Aug. 1977, *A.S. Weston* 10545; N of Goulet Bluff, Peron Peninsula, 22 Mar. 1969, *P.G. Wilson* 8238.

Distribution. Restricted to the Shark Bay region, extending from Dorre Island south to Useless Loop in the Eremean Botanical Province and also recorded from Salutation Island in the far north of the South West Botanical Province.

Habitat. Occurs on off-shore islands and along the coast on the mainland, growing in deep sand on the upper strand and coastal dunes, also in sand over limestone on coastal cliffs. Recorded in low coastal shrublands and *Spinifex* hummock grasslands. Sometimes *Dicrastylis maritima* is the dominant shrub species. Like many other coastal plants, the species sometimes has long, more or less horizontal main stems buried in the shifting sands.

Phenology. Flowers recorded August to December. Fruits recorded December to March.

Conservation status. Although of fairly restricted distribution and habitat, this species is not considered to be at risk at present. Known from at least ten locations including three nature reserves or national parks.

Etymology. From the Latin *maritimus* – by the sea, referring to the coastal distribution of the species.

Notes. The phrase name *Dicrastylis* sp. Shark Bay (*J.J. Alford* 1318) has been applied to this species at PERTH. *Dicrastylis maritima* can be distinguished from the other members of sect. *Dicrastylis* by the more extensive indumentum on the outside of its corolla lobes, which reaches and protrudes slightly beyond the margin, the other species having a distinct glabrous border to the corolla lobes. It shows greatest similarity to *D. soliparma*, differing vegetatively in its usually shorter and broader leaves, which are more often patent to retrorse than in the other species, and its more erect branches on the stem hairs. It also differs from *D. soliparma* in its usually smaller panicles, smaller flowers, shorter calyx indumentum and paler anthers.

Dicrastylis maritima is the only member of its genus recorded from coastal dunes, and certainly the only one known from the strand. It occurs north or north-west of the known ranges of other members of sect. *Dicrastylis*, overlapping slightly with *D. micrantha* and possibly also overlapping with *D. fulva*. One odd specimen collected from Peron Peninsula appears to be intermediate in morphology between *D. maritima* and *D. micrantha*. This might possibly be a hybrid or a new variant of one of the two species but is currently treated as a distinct species under the phrase name *Dicrastylis* sp. Denham (*M. Lewis* 42/92).

Two vegetative specimens (*M.H. Manning* 6/9/1967 and *A.S. Weston* 10545) of *D. maritima* differ from the flowering and fruiting specimens in having larger mature leaves with a longer sparser indumentum. Occasional 6-merous flowers or heteromerous flowers (e.g. with six calyx lobes but only five corolla lobes) have been observed on a number of specimens and occasional 4-merous flowers observed on other specimens such as the type. The description given above for the fruit and seed is based on a few fruits from *P.G. Wilson* 8238 and *H. Demarz* 5508, the only known fruiting specimens.

Dicrastylis micrantha Munir (Munir 1978: 475–478). *Type:* About 175 km north of Geraldton, Western Australia, 2 October 1966, *E.A. Shaw* 610 (*holo:* AD *n.v.*, illustrations seen).

Illustrations. The holotype of *D. micrantha* is illustrated in Munir (1978: Figures 9,10).

Shrubs 0.4–1 m high, with a dense indumentum on the young stems, leaves and inflorescences, the young shoots pale grey-green or pale ferruginous, the vegetative indumentum of minute and much larger patent branched hairs; large hairs with a sub-basal whorl of non-glandular branches and a thick main axis terminated by a gland. *Young stems* dark red-brown to pale ferruginous, the glandular hairs 0.5–1.3 mm long. *Leaves* opposite, usually antrorse, sometimes widely spreading, sessile, usually narrowly obovate, sometimes narrowly oblong-elliptic or narrowly ovate, 17–38 x 3–9.5 mm, acute to broadly obtuse, with recurved margins; lower surface usually somewhat paler than upper surface, the indumentum mainly of short star-like hairs but also some long glandular hairs especially on the midvein, with sessile glands visible within the pits; upper surface moderately deeply to deeply bullate, medium to dark green, with a mixture of short star-like and long glandular hairs, the glandular hairs up to 1 mm long. *Panicles* (25)40–160 x (30)60–200 mm, many-flowered, with deep pink or ferruginous hairs as well as white hairs on the axes, bracts and calyx lobes; basal peduncle up to 50 mm long. *Bracts* subtending upper branches narrowly ovate to narrowly obovate, the larger ones

2.5–4 mm long. *Pedicels* up to 3 mm long; indumentum 0.2–0.4 mm long. *Flowers* 4–6-merous but mostly 5-merous, 2–3 mm long. *Calyx* with hairs 0.2–0.35 mm long; tube 0.3–0.5 mm long; lobes ovate or narrowly ovate to narrowly oblong, 1–1.5 mm long, usually narrowly obtuse or acute. *Corolla*: tube 1.2–1.7 mm long, the outside hairy near base of each corolla lobe and glabrous or subglabrous on the ribs; lobes obovate to broadly ovate, the largest lobe 1.4–2 mm long and the others 0.9–1.6 mm long, broadly obtuse, with a distinct glabrous margin outside. *Stamens*: filament 1.4–2.5 mm long; anther 0.3–0.4 mm long, dark purple to black. *Style* with patent dendritic hairs 0.3–0.4 mm long; entire portion 0.6–1.3 mm long; branches 0.5–1.5 mm long. *Fruit c.* 1.3 x 0.7 mm but possibly not fully mature, with the largest hairs on the summit. *Seed* not seen. (Figure 3B)

Other specimens examined. WESTERN AUSTRALIA: Carnarvon–Geraldton road nearer Geraldton, Sep. 1968, *K. Baird*; Between Hamelin and Tamala, 10 Oct. 1973, *J.S. Beard* 6796; 436 miles along North West Coastal Highway [200 km N of Geraldton], 2 Oct. 1966, *E.M. Bennett* 1477; Tamala Station, 12 Oct. 1973, *J.S. Beard* 6816; Useless Loop–Tamala road, 27 Oct. 1974, *J.R. Cannon* 331; 0.5 mile N of 441 mile peg on Carnarvon road [209 km N of Geraldton], 17 Nov. 1968, *H. Demarz* 711; 23 km N of Nerren Nerren, 3 Oct. 1985, *H. Demarz* 10802; Murchison area, 11 Dec. 1985, *H. Demarz* 11187; 16 miles [26 km] S of Wannoo Roadhouse, North West Coastal Highway, 9 Sep. 1970, *A.S. George* 10368; Carnarvon District, Oct. 1966, *J.N. Hutchinson*; 410 mile peg on North West Coastal Highway [158 km N of Geraldton], 20 Dec. 1962, *F. Lullfitz* 1962; 426 mile peg on North West Coastal Highway [184 km N of Geraldton], 20 Oct. 1965, *F. Lullfitz* 4294; *c.* 14.5 miles [23 km] S of Wannoo, 17 Sep. 1968, *M.E. Phillips*.

Distribution. Extends from Useless Loop in the Eremean Botanical Province south-east to between Nerren Nerren Station and Kalbarri National Park in the north of the South West Botanical Province, a range of *c.* 170 km.

Habitat. Recorded from red sand or sandplain, one record from "intermediate sandplain (*Acacia-Hakea-Melaleuca*)".

Phenology. Flowers: September to December. Fruits recorded in December.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Three. Known from a fairly restricted distribution (150 km) and not known from any conservation reserves.

Notes. This species can be readily identified by the very distinctive indumentum on its stems. The larger hairs are comprised of a thick patent axis of *c.* 5 elongate cells and a whorl of short spreading non-glandular branches located at the junction of the two basal cells, the axis terminated by a gland (Figure 3B). All other species in sect. *Dicrastylis* have the hairs branched towards the summit or for most of their length, not just near the base and not forming a simple whorl.

The largest leaves of the PERTH specimens are all in the range 3–9.5 mm wide, but according to the original description the leaves are occasionally as large as 10–15 mm wide. Although the flowers are small, they are arranged in a very large inflorescence with long branches. Flowers are mostly 5-merous, with occasional 4-merous flowers observed on a number of specimens, while 6-merous flowers were observed only on *J.S. Beard* 6816.

Two specimens collected from areas that are far outside the known range of this species were previously included under it but are excluded here. These have now been redetermined as *D. parvifolia* and are discussed under that species.

Dicrastylis obovata Munir (Munir 1978: 465–468). *Type:* Frank Hann National Park, west of 90 Mile Tank, Western Australia, 10 December 1971, *R.D. Royce* 10231 (*holo:* PERTH 01603574).

Illustration. The holotype of *D. obovata* is illustrated in Munir (1978: Figure 6).

Shrubs 0.4–1.7 m high, with a dense appressed indumentum on the young stems and inflorescences, the young shoots pale grey-green; indumentum of subsessile scale-like hairs. *Young stems* yellowish to orange-brown at first, becoming dark ferruginous with age, with white and ferruginous hairs up to 0.2 mm long. *Leaves* opposite or rarely in whorls of three, antrorse, subsessile or shortly petiolate. *Petioles* up to 1.3 mm long. *Leaf blades* obovate or broadly obovate, 6–16 x 3–10 mm, broadly obtuse, with recurved margins, usually moderately densely hairy at first, with scattered sessile glands often visible; lower surface usually appearing slightly paler then upper surface and more distinctly reticulate-patterned, the pits densely white-hairy, the ridges tending to become glabrous and medium green; upper surface very shallowly bullate to rugose, medium green, with hairs *c.* 0.1 mm long. *Panicles* 15–50 x 15–65 mm, many-flowered, with ferruginous hairs as well as white hairs on the axes and bracts; basal peduncle up to 4 mm long. *Bracts* subtending upper branches usually narrowly ovate, the larger ones commonly 2–4 mm long. *Pedicels* up to 4 mm long; indumentum *c.* 0.1 mm long. *Flowers* mostly 5-merous, with occasional 4-merous flowers sometimes present, 4–6 mm long. *Calyx* often with deep pink and/or ferruginous hairs as well as white hairs *c.* 0.1 mm long; tube *c.* 0.5 mm long; lobes ovate or narrowly ovate, commonly 1.5–2 mm long, usually narrowly obtuse, with a distinct glabrous margin outside. *Corolla*: tube commonly 1.7–2.5 mm long, largely glabrous outside but hairy below each corolla lobe; lobes broadly or very broadly ovate, the largest lobe 2.4–3 mm long and the others 1.3–2 mm long, broadly obtuse. *Stamens*: filament 2–2.5 mm long; anther 0.4–0.5 mm long, pale-coloured. *Style* with peltate-dendritic hairs 0.2–0.3 mm long; entire portion 1.5–2.3 mm long; branches 1.5–2.5 mm long. *Fruit c.* 1.5 x 1.4 mm but not seen at maturity, fairly uniformly hairy. *Seed* not seen. (Figure 3F)

Other specimens examined. WESTERN AUSTRALIA: 36.9 km E of Vermin Proof Fence along Lake King–Norseman road, Frank Hann National Park, 19 Sep. 1993, *G.F. Craig* 2910; Lake King–Norseman road, 30 Oct. 1988, *E.J. Croxford* 6244; 25 miles [40 km] W of 90 Mile Tank, 17 Oct. 1974, *H. Demarz* 5366; Between Forrestania and Lake King, 25 Nov. 1964, *C.A. Gardner*; 46.2 miles [74 km] E of Lake King crossroads, 14 Nov. 1965, *F.W. Humphreys*; 46.3 miles [75 km] E of Lake King crossroads, 14 Nov. 1965, *F.W. Humphreys*; 45 km SW of 90 Mile Tank, Frank Hann National Park, 13 Nov. 1979, *K.R. Newbey* 6505; 28 miles [45 km] W of 90 Mile Tank, 17 Oct. 1974, *E. Wittwer* 1446; 23 miles [37 km] E of vermin fence, Lake King to Daniel, 28 Nov. 1974, *E. Wittwer* 1487.

Distribution. Recorded from west of Lake Hope and from Frank Hann National Park in the South West Botanical Province.

Habitat. Recorded mainly growing in yellow sand on ridges or low dunes, with *Grevillea excelsior* or other shrub or mallee species.

Phenology. Flowers: October to November. Fruits: November to December, judging from the only fruiting specimen (*E. Wittwer* 1487), which bore immature fruits in late November.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Two. Although the species occurs in a large national park, it is known from only a few localities in a small area and a recent survey of this area (Diana Papenfus pers. comm.) has failed to relocate the species.

Notes. Readily distinguished from other members of section *Dicrastylis* by its rather short and broad obovate leaves.

Dicrastylis parvifolia F. Muell. (Mueller 1861: 160). *Type:* East River, near Stokes Inlet, [Western Australia], *G. Maxwell* (*lecto:* MEL 40917, *fide* Munir (1978: 470); *isolecto:* MEL *n.v.*).

Dicrastylis? rosmarinifolia Turcz. (Turczaninow 1863: 226). *Type:* [Western Australia], *J. Drummond* coll. 4, 236 (*holo:* KW *n.v.*, photograph PERTH; *iso:* PERTH 01603582).

Illustration. (Munir 1978: Figure 8).

Shrubs 0.15–0.6 m high with a dense semi-appressed indumentum of peltate-dendritic hairs on the young stems and inflorescences, the young shoots pale grey-green to almost white. *Stems* pale grey-brown to ferruginous or white at first, with white or ferruginous hairs, the larger ones 0.1–0.2 mm long. *Leaves* opposite, antrorse or sometimes widely spreading, usually subsessile. *Petioles* up to 0.7 mm long. *Leaf blades* usually almost linear or narrowly ovate to narrowly obovate, rarely ovate to obovate, 5–20 x 1–3.5(5) mm, narrowly to broadly obtuse, with recurved margins, usually concolorous; lower surface with a dense white indumentum and scattered sessile glands; upper surface shallowly bullate, with hairs up to 0.2 mm long. *Panicles* 12–115 x 15–65 mm, many-flowered, with ferruginous hairs as well as white hairs on the axes and sometimes on the bracts and apex of each calyx lobe; basal peduncle up to 30 mm long. *Bracts* subtending upper branches ovate or narrowly ovate, the larger ones 1.7–2.5 mm long. *Pedicels* up to 1 mm long; indumentum 0.3–0.6 mm long. *Flowers* 4–6-merous but mostly 5-merous, 2–3 mm long. *Calyx* with hairs 0.2–0.4 mm long; tube 0.4–0.6 mm long; lobes ovate or narrowly ovate, 0.5–1.0 mm long, usually obtuse. *Corolla*: tube 0.9–1.5 mm long, glabrous or subglabrous on the ribs outside, often only sparsely hairy near base of each corolla lobe; lobes obovate-oblong or broadly so, the largest lobe 1.5–2.3 mm long and the others 0.8–1.7 mm long, broadly obtuse, with a distinct glabrous margin outside. *Stamens*: filament 2.1–2.7 mm long; anther 0.25–0.3 mm long, pale to medium brown. *Style* with patent dendritic hairs 0.3–0.5 mm long; entire portion 0.4–1.3 mm long; branches 2.0–3.3 mm long. *Fruit* 0.6–1.3 x 0.6–0.7 mm, fairly uniformly hairy. *Seed* not seen.

Selected specimens examined. WESTERN AUSTRALIA: Burra Rock Nature Reserve, 60 km SE of Coolgardie, 14 Nov. 1988, *A. Chapman* 28; 16 km ESE of Biljahnie Rock on vermin fence, 3 Dec. 1997, *R.J. Cranfield* 11747; 3 km N of Lake Kurrenkutten, 22 Nov. 1995, *R. Davis* 363; 32.5 km N of Hyden, 22 Nov. 1985, *D.B. Foreman* 1165; Water Reserve 1, Kulin, 15 Dec. 1994, *S. Murray* 158; Stennet Rock, *c.* 50 km SSW of Norseman, 27 Sep. 1980, *K.R. Newbey* 7674; N of Gabbin, 27 Oct. 1963, *S.B. Rosier* 385; Goddard Creek, N of Zanthus, 27 Jan. 1956, *R.D. Royce* 5344; 58 km N of Salmon Gums, 9 Nov. 1982, *A. Strid* 21299.

Distribution. Occurs in the South West Botanical Province and South-western Interzone, extending from Whitewells Station (north-east of Wubin) and Wubin, south-east to Oldfield River and east to Queen Victoria Springs.

Habitat. Occurs in sandy soils, commonly on sandplains, dominated by a wide variety of shrub and tree species.

Phenology. Flowers: mainly late October to January. Fruits recorded December to January.

Conservation status. The most common and widely distributed member of sect. *Dicrastylis*.

Notes. This widespread species is extremely variable. A specimen from north of Zanthus (*R.D. Royce* 5344), which was included by Munir (1978) in *D. micrantha*, is actually a particularly large-leaved variant of *D. parvifolia* with lush growth, presumably due to its growing near a watercourse in very favourable conditions. A second specimen (*S.B. Rosier* 385) previously included in *D. micrantha* is quite typical of *D. parvifolia*.

Dicrastylis parvifolia can produce an interrupted series of erect stems along a horizontal underground stem as in *A.S. George* 5956, although the single-stemmed shrub habit is far more common.

Most specimens of *D. parvifolia* can be readily distinguished from other members of section *Dicrastylis* by their very small narrow leaves. The species generally has more deeply divided styles than other species, the entire portion only 0.4–1.2 mm long and the two branches up to seven times longer. Where the style is not more deeply branched than in other species, it differs instead in having the dendritic hairs restricted to the base of the entire portion rather than extending up to the branches of the style.

Dicrastylis soliparma Rye & Trudgen, *sp. nov.*

Dicrastylis fulva f. *angustifolia* Munir (Munir 1978: 484). *Type:* 300 mile peg on Mullewa–Morawa road, Western Australia, 22 September 1968, *A.C. Burns* 74 (*holo:* PERTH 01603108).

Dicrastyli fulvae arcte affine sed pilis supra caulem brevioribus et magis lepidoideis, foliis praecipue anguste obovatis vel obovatis differt.

Typus: Canna Siding, Western Australia, November 1933, *C.A. Gardner s.n.* (*holo:* PERTH 03666697; *iso:* CANB, K).

Shrubs 0.3–1(1.5) m high, with a dense white and/or ferruginous indumentum on the young stems, leaves and inflorescences, the young shoots white to pale green or pale ferruginous. *Young stems* pale to dark ferruginous, with peltate-dendritic to subsessile hairs, the larger hairs 0.05–0.2(0.3) mm long, often with somewhat longer hairs occurring on the inflorescence axes. *Leaves* opposite, usually antrorse to patent, rarely retrorse, subsessile or shortly petiolate, densely covered at first by an indumentum of somewhat scale-like hairs. *Petioles* up to 1 mm long. *Leaf blades* mostly narrowly obovate to obovate, 10–27(39) x 3–9 mm, narrowly to broadly obtuse, with recurved margins; lower surface usually distinctly paler than upper surface at maturity, becoming sparsely hairy with age and the sessile glands within the pits becoming visible; upper surface usually pale to medium green at first and becoming dark green, shallowly to moderately deeply bullate, with hairs *c.* 0.1 mm long. *Panicles* 20–65 x (25)35–110(145) mm, with ferruginous hairs as well as white hairs on the axes and bracts; basal peduncle up to 60 mm long. *Bracts* subtending upper branches ovate or narrowly ovate, the larger ones 2.5–5 mm long. *Pedicels* up to 4 mm long; indumentum 0.3–0.8 mm long. *Flowers* mostly 5-merous with occasional 6-merous flowers sometimes present, 4–6 mm long. *Calyx* with hairs 0.5–1.3 mm long, either with all the hairs white or with ferruginous or pink hairs in distal half; tube 0.5–1 mm long; lobes ovate or narrowly ovate, 0.9–1.4(2.3) mm long, usually narrowly obtuse. *Corolla*: tube 1.3–2.2 mm long, the outside uniformly dendritic-hairy above the middle or hairy between the ribs, with hairs sometimes becoming denser towards summit; lobes obovate-oblong or broadly so, the largest lobe 2.2–3.4 mm long and the others 1.1–2.0 mm long, broadly obtuse, with a distinct glabrous border around the margin outside. *Stamens*: filament 1.3–3 mm long; anther 0.4–0.5 mm long, dark purplish black. *Style* with patent dendritic hairs 0.4–1.1 mm long; entire portion 0.8–2.3 mm long; branches

1.3–3 mm long. *Fruit* 1.5–2.2 x 1.4–1.8 mm, with the longest hairs towards summit. *Seed c.* 1.3 x 0.65 mm, soft, pale yellow-brown or whitish, with an inconspicuous fine reticulate pattern on the surface. (Figures 3E, 4D–I)

Selected specimens examined (typical variant). WESTERN AUSTRALIA: Wilroy, 4 Dec. 1962, *J. Beard & F. Lullfitz*; SE of Coolcalalaya Station, 13 Oct. 1988, *A.H. Burbidge* 4433; 2 miles [3 km] N of Perenjori, 8 Dec. 1955, *N.T. Burbidge* 4695; 22.5 km NE of Yandanooka, 24 Oct. 1994, *A. Carr* 311; 25.8 km N of Perenjori on Morawa road, Oct. 1982, *J. Coleby-Williams* 248; 19 km SSW of Mt Gibson, 21 Nov. 1992, *R.J. Cranfield* 8510; Latham, 1945, *C.A. Gardner*; 6 miles [10 km] W of Pindar, 10 Oct. 1945, *C.A. Gardner* 7780; Along the road between Wubin and Paynes Find, 30 Nov. 1994, *E.D. Kabay* 1189; N of East Yuna Reserve on Wandin Rd, 7.6 km E of the junction with Bindoo Rd, 1 Nov. 1994, *S. Patrick* 2149; 10 miles [16 km] S of Tardun, 1 Oct. 1962, *M.E. Phillips* 1698; 51.5 km W of Yalgoo, 14 Oct. 1983, *C.I. Stacey* 742.

Specimens examined (northern variant). WESTERN AUSTRALIA: 13 km S of Wannoo, 24 Nov. 1996, *T.F. Houston* 900-5; Peron Peninsula, 20 Nov. 1989, *M.E. Trudgen* 7373.

Distribution. Occurs mainly in the north of the South West Botanical Province, extending from Peron Peninsula south-east to near Jibberding Station (north-east of Wubin), with one record from the Eremean Botanical Province near Wydgee (north of Paynes Find). The typical variant extends from west of Lake Nerramyne south-east to Jibberding and Wydgee. An atypical northern variant has been recorded from Peron Peninsula and near Wannoo, the disjunction between these specimens and the remainder of the known range of the species being about 115 km.

Habitat. Occurs in a variety of sandy soils, often on sandplains.

Phenology. Flowers October to December. Fruits November to January.

Conservation status. The typical variant is known from numerous populations and is not considered to be at risk. However, the northern variant is known from only two collections and needs further study to determine its taxonomic status and conservation status.

Etymology. From the Latin *sol* – sun and *parma* – small shield, referring to the parasol-like nature of the hairs, with the much-branched summit forming a covering perpendicular to the stalk.

Notes. The phrase name *Dicrastylis* sp. Peron Peninsula (*M.E. Trudgen* 7373) has been used at PERTH for the poorly known northern variant of this species. This differs from the typical variant in its more silvery appearance and usually shorter calyx indumentum. It does not appear to be sufficiently distinct to treat as a separate species but may warrant recognition at the subspecific level and may need to be added to the Priority Flora List. One of the northernmost collections (*S. Patrick* 2149) of the typical variant has rather silvery leaves and shows the closest approach to the northern variant.

The typical variant of *Dicrastylis soliparma* was included within *Dicrastylis fulva* by Munir (1979). The latter species can be distinguished by its longer indumentum on the stems, with patent dendritic hairs rather than peltate-dendritic ones, and by its mostly elliptic to broadly ovate leaf blades. *D. fulva* also tends to have more ferruginous young leaves, longer bracts that are subsessile rather than sessile, more commonly reddish-haired flower buds, and a longer corolla that is usually less hairy on the outside of the tube, but the two species show some overlap in all of these characters.

Included within the typical variant of *Dicrastylis soliparma* are a few specimens with relatively long narrow leaves and a more distinctly crenate margin than usual that have been called *Dicrastylis fulva* f. *angustifolia*. These specimens intergrade fully with other specimens, some of which have long narrow leaves with the margin not very distinctly crenate and some of which have shorter broader leaves with a distinctly crenate margin. Consequently the form is not recognized here.

Probable new taxa

The specimens discussed below cannot be placed in the taxa described above and appear to represent new species, but could be abnormal specimens or hybrids. There is also a possible new infraspecific taxon noted under *D. soliparma* (see above).

Dicrastylis sp. Cue (*A.A. Mitchell* 764). This taxon is known from two immature specimens, both collected in the Cue area by A.A. Mitchell and possibly both from the same granite outcrop on Coodardy Station (Andrew Mitchell pers. comm.). *Dicrastylis* sp. Cue is a large shrub 1–3 m high and has very large leaves, perhaps in response to its preference for the runoff zone of granite outcrops. Its indumentum and other characters seem to place it closest to *D. fulva* and *D. soliparma*, but it tends to be more glandular, having numerous sessile glands on the undersurface of the leaves. The two specimens of *Dicrastylis* sp. Cue are in bud in September and mid October respectively, but the one collected in October has a few flowers just opened, which appear to be smaller than the flowers of *D. fulva* and *D. soliparma*. CALM Conservation Codes for Western Australian Flora: Priority One.

Dicrastylis sp. Denham (*M. Lewis* 42/92). The only known collection of this taxon was made on 26 September 1992 from south of Denham on the Peron Peninsula, in grey sand with hummock grassland. *Dicrastylis* sp. Denham is similar to *D. micrantha* in its habit, inflorescence form and floral characters, such as its black anthers *c.* 0.3 mm long, but is more like *D. maritima* in its indumentum on the vegetative parts and in its shortly petiolate leaves. More material is needed to determine its taxonomic status. CALM Conservation Codes for Western Australian Flora: Priority One.

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