

Flora of South Australia

5th Edition



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Flora of South Australia

5th Edition | Edited by Jürgen Kellermann

AMARANTHACEAE¹

J. Palmer² (family description and key by J. Palmer & C.H. Miller²); *Ptilotus* by T.R. Lally²

Ephemeral, annual, biennial or perennial herbs or shrubs; leaves opposite or alternate and spiral, margins entire or rarely crenulate, sinuate or denticulate; petiolate to sessile; stipules absent. **Inflorescence** terminal or axillary, glomerules, spikes, racemes or panicles, single to several in leaf axils; flowers bisexual or unisexual, regular; each flower subtended by 1 bract and 2 bracteoles; perianth of 3–5 tepals, equal to subequal, imbricate, free or united, enclosing fruit and falling with it, or persistent; stamens 2–5, opposite the tepals, free or fused; anthers 1- or 2-locular, dorsifixed, versatile, dehiscing by extrorse longitudinal slits; staminodes present or absent; pseudostaminodes present or absent; ovary superior, unilocular with one (to many) ovules; style single, entire or branched, terminal, rarely eccentric; stigma 1 (capitate) or 2–3, bilobed to filiform. **Fruit** either an indehiscent utricle or a circumscissile capsule, rarely a succulent berry; seeds 1, rarely many, embryo curved.

A family of 71 genera and over 1,000 species with a world-wide distribution in tropical and warm temperate regions; in Australia there are 15 genera, (including 4 introduced) and about 190 species. Black (1948) included *Achyranthes aspera* L., which is widespread in other parts of Australia, but there are no collections from S.A. at this time.

Hemichroa is included in Amaranthaceae here, but outside Australia the genus is often included in Chenopodiaceae.

Several species are grown as ornamentals, e.g. *Amaranthus caudatus* L. (love-lies-bleeding), *A. tricolor* L. (Joseph's coat), *Celosia cristata* L. (cockscomb) and *Gomphrena globosa* L. (globe amaranth). A few species are cultivated as grain crops in Central and South America, e.g. *Amaranthus cruentus* (red shank), while other species such as *Alternanthera sessilis* are cultivated as vegetable crops in Asia. Several species have also become widespread weeds, e.g. *Alternanthera philoxeroides* (alligator weed), *Alternanthera pungens* (khaki weed)..

Reference: Black (1948), Townsend (1985, 1993).

- 1. Leaves succulent; bracts leaf-like..... 6. **Hemichroa**
- 1: Leaves not succulent; bracts membranous, not leaf-like
 - 2. Leaves opposite
 - 3. Tepals (perianth segments) fused into a tube for at least half of length..... 5. **Guilleminea**
 - 3: Tepals (perianth segments) free to base
 - 4. Flower spikes axillary; stigma entire, capitate..... 2. **Alternanthera**
 - 4: Flower spikes terminal; stigma bilobed or bifid..... 4. **Gomphrena**
 - 2: Leaves alternate
 - 5. Flowers unisexual

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6. Tepals glabrous or with glandular hairs on margins only 3. **Amaranthus**
 6: Tepals densely hairy on outer surface 1. **Aerva**
 5: Flowers bisexual 7. **Ptilotus**

1. **AERVA** Forssk.

Fl. Aegypt.-Arab. 170 (1775).

(*Erona*, the Arabic name for a member of this genus.)

Prepared by J. Palmer

Perennial herbs, prostrate or erect; leaves alternate, entire. **Inflorescence** of terminal and axillary, sessile simple or branched spikes of many flowers; flowers solitary, sessile, bisexual or dioecious (in S.A.); bracts and bracteoles persistent, membranous; tepals 5, falling with mature fruit, membranous, hairy on outer surface; stamens 5; filaments united in a short cup at the base; anthers 2-locular; staminodes 0; pseudostaminodes 5, alternating with free filament portions; ovary with 1 ovule; style slender; stigmas 2, filiform. **Fruit** a membranous, indehiscent, compressed utricle; seed 1, black, shiny.

About 10 species native to the tropics especially Africa, 2 species naturalised in Australia, 1 species occurs in S.A.

Reference: Townsend (1985).

1. ***Aerva javanica** (Burm.f.) Juss., *Ann. Mus. Natl. Hist. Nat.* 2: 131 (1803). — *Iresine javanica* Burm.f., *Fl. Ind.* 212 (err. "312"), t. 65, f. 2 (1768). — **Illustr.:** *Fl. Centr. Austral.* 77, fig. 99 (1981); C.C.Towns. in Polhill (ed.), *Fl. Trop. E. Africa, Amaranthaceae* 87, fig. 19 (1985); *Fl. S. Austral.* 1: 313, fig. 175 (1986).

Perennial herb, erect to spreading, to 150 cm high, dioecious, covered with densely matted dendritic hairs on stems and leaves; leaves indistinctly petiolate, lanceolate or narrowly elliptic to oblanceolate or spathulate, 15–77 × 4–14 (–24) mm, hairs dense or sparse above. **Inflorescence** of spikes in dense terminal panicles; spikes 10–85 (–135) × 4–8 mm; bracts ovate, up to 1.7 mm long, hairy; bracteoles very broadly ovate, up to 2.5 mm long, ± hairy at the apex, white to pink; male flowers: outer 2 tepals ovate, up to 2.25 mm long, filaments delicate, anthers subequal to tepals, ovary small, style very short, stigmas rudimentary *n.v.* (*vide* Townsend 1985); female flowers: tepals, up to 3 mm long, outer 2 tepals obovate, hairy at base, inner 3 tepals narrowly elliptic to narrowly oblong, completely hairy, stamens rudimentary, anthers absent, style including stigmas up to 1.6 mm long, stigmas papillose. **Fruit** up to 1 mm long; seed 0.7–1 mm long. **Kapok bush. Fig. 1.**

S.A.: *LE; *W.A.; *N.T.; *Qld; *N.S.W. Widespread in the drier parts of the tropics and subtropics from western Africa across the Middle East to Burma. A single record from a tip at Oodnadatta in 1977. Commonly found on roadsides and disturbed areas in other states. Flowers: Oct. (Apr. –Nov. in other states).

The species was introduced in the 1880s to help regenerate rangeland areas. Only female plants occur in Australia. Even so, seeds are still produced and the plants are assumed to be apomictic (Khan *et al.* 1970). — R.M. Barker (AD).



Fig. 1. *Aerva javanica*: A, twig; B, portion of stem with bract; C, female flower; D, pistil; E, seed. Illustration by G.R.M. Dashorst, from *Flora of South Australia* 1: 313, Fig. 157 (1986).

2. ALTERNANTHERA Forssk.

Fl. Aegypt.-Arab. 28 (1775).

(Latin *alternans*, alternating; *anthera*, anthers; filaments without anthers often alternate with fertile stamens.)

Prepared by J. Palmer

Annual or perennial herbs; stems prostrate, erect, floating or scrambling; leaves opposite, sessile or petiolate. **Inflorescence** of solitary or clustered axillary spikes, sessile or pedunculate; flowers solitary, bisexual, sessile; bracts persistent, membranous, sessile; bracteoles persistent or falling with mature fruit, membranous, sessile; tepals 5, falling with mature fruit, free, equal or unequal, scarious, usually white; stamens 2–5; filaments united at the base into a cup or short tube; anthers 1-locular; staminodes 0 or 2–3, filament-like; pseudostaminodes 0–5, alternating with stamens and staminodes; ovary with 1 ovule; style very short or absent; stigma capitate. **Fruit** an indehiscent utricle, compressed, membranous; seed 1. **Joyweeds**.

A large genus of c. 100 species mainly occurring in the tropics and subtropics of the New World. About 10 species occur in Australia, including four naturalised species. Five species occur in South Australia. As the whole genus of *Alternanthera* in Australia is in need of revision, this treatment largely follows existing taxonomic concepts (e.g. George 1981, Jessop 1986).

A single specimen of *Alternanthera bettzichiana* has been collected from a footpath in an Adelaide suburb (Bates 42332). This species is commonly cultivated as a garden plant. It has a scrambling habit, purplish-tinged leaves that are somewhat fleshy, and small inflorescences of white flowers in the leaf axils.

Alternanthera sessilis is often grown as a leafy vegetable in Asia while some species are cultivated as ornamentals; the introduced species *A. philoxeroides* (alligator weed) is a declared noxious weed in Australia, but has not been recorded in S.A. at this time.

Reference: George (1981), Jessop (1986).

1. All 5 tepals similar in shape and size
 2. Tepals woolly in the lower half..... 1. **A. angustifolia**
 - 2: Tepals glabrous
 3. Leaves elliptic or oblong to narrowly ovate, 10–25 × 6–10 mm..... 3. **A. nana**
 - 3: Leaves linear to linear-oblong, oblong or narrowly elliptic, 20–80 × 2–8 mm long
 4. Clusters of flower spikes usually 5–10 mm wide; tepals 2–3 mm long, acute or shortly acuminate..... 2. **A. denticulata**
 - 4: Clusters of flower spikes usually 10–20 mm diam.; tepals 4–5 mm long, long-acuminate 4. **A. nodiflora**
- 1: Outer 3 tepals differing in shape and size from inner 2 tepals
 5. Outer 3 tepals 3–6 mm long; longest 2 tepals pungent, small tufts of hairs present on the back near the base 5. **A. pungens**
 - 5: Outer 3 tepals 2.5–3 mm long; longest 2 tepals not pungent, hairy on the back for some or all of length..... **A. bettzichiana**

1. **Alternanthera angustifolia** R.Br., *Prodr.* 417 (1810). — **Illustr.:** *Fl. N.S.W.* 1: 250 (1990); *Flora Kimberley Reg.* 111, fig. 27B (1992); Kenneally *et al.*, *Broome and Beyond: Pl. People Dampier Penins., Kimberley, W. Austral.* 54 (1996).

Annual or ephemeral herbs, prostrate or ascending; stems glabrous or pubescent; leaves oblong to narrowly obovate, 10–50 mm long, glabrous or sparsely tomentose. **Inflorescence** of sessile globular or ovoid spikes, 5–10 mm long, sometimes clustered; rhachis woolly; bracts and bracteoles narrow, acute, c. 1 mm long; tepals narrowly ovate, 2.5–4 mm long, equal, acute, densely woolly in the lower half, base and midrib hardened; stamens 3; staminodes 2; pseudostaminodes 0; style very short. **Fruit** obovate, c. 1.5 mm long, shorter than tepals, apex rounded or emarginate, margins thickened. **Narrow-leaved joyweed. Fig. 2A–B.**

S.A.: NW, LE, EA; W.A.; N.T.; Qld; N.S.W. Banks of ephemeral creeks on mulga flats, gibber plains, inter-dune swales or springs. Flowers: June–Nov., Jan. and Apr.

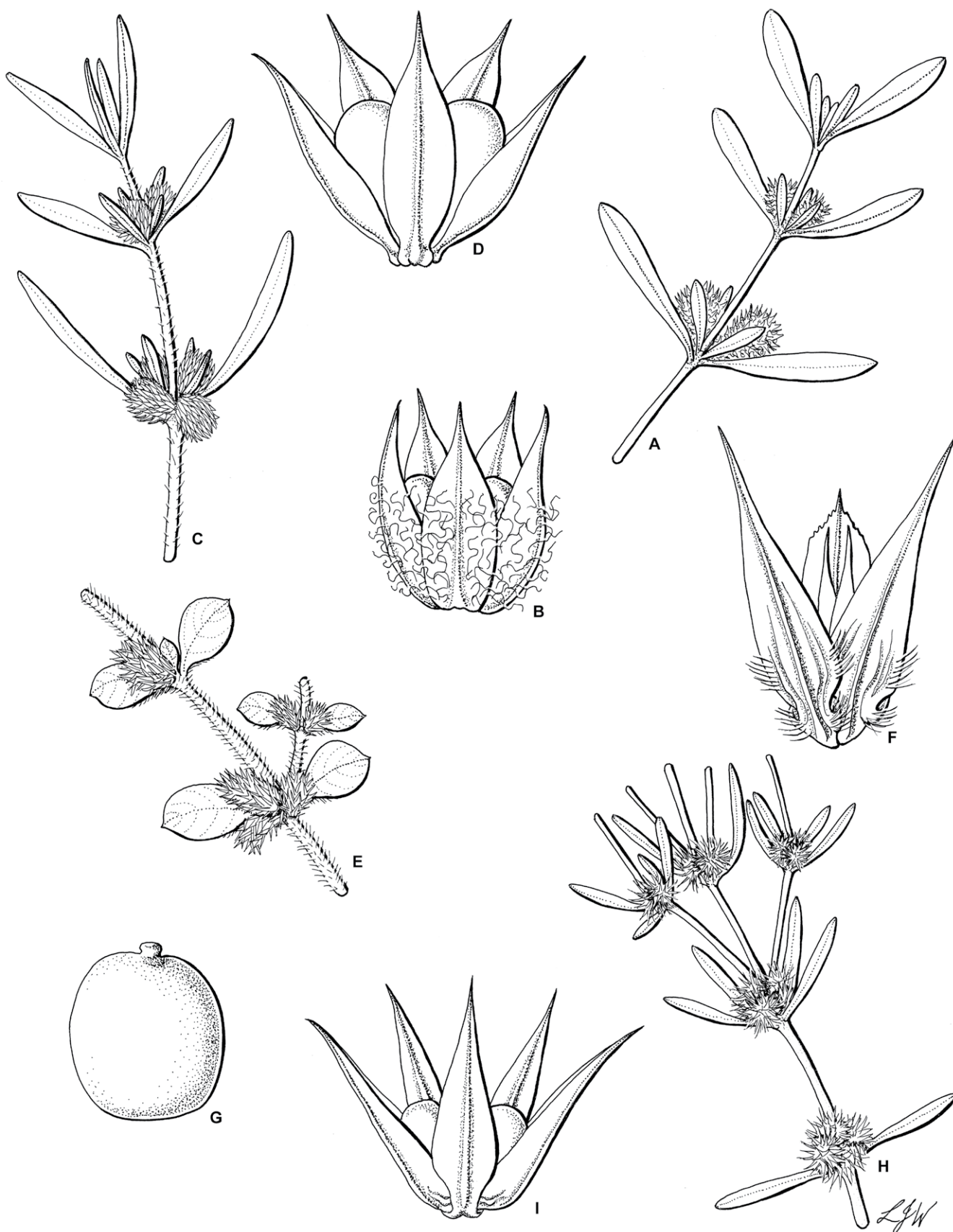


Fig. 2. A–B, *Alternanthera angustifolia*: A, inflorescence; B, old flower with fruit. **C–D, *A. denticulata*:** C, inflorescence; D, old flower with fruit. **E–G, *A. pungens*:** E, inflorescence; F, flower; G, fruit. **H–I: *A. nodiflora*:** H, inflorescence; I, old flower with fruit. Illustrations by L.J. Waters, funded in collaboration with ABRS, Canberra.

This species is very variable across its range especially with respect to tepal size, hairiness and leaf width and is currently under review.

2. ***Alternanthera denticulata*** R.Br., *Prodr.* 417 (1810). — **Illustr.:** *Pl. W. N.S.W.* 281 (1982); *Fl. N.S.W.* 1: 250 (1990); *Fl. Victoria* 3: fig. 38C–D (1996).

Annual, ephemeral or perennial herbs, prostrate or ascending to erect; stems glabrous or with hairs restricted to 2 decurrent lines on young stems and the nodes; leaves linear to linear-oblong or narrowly elliptic, 20–60 × 2–8 mm, acute or obtuse, entire or minutely denticulate, glabrous or sparsely hairy on the margins and midrib. **Inflorescence** of sessile globular to oblong spikes, solitary or clustered; rhachis glabrous or hairy; spike clusters 5–10 mm wide; bracts and bracteoles narrowly ovate, c. 1–2 mm long, acuminate; tepals narrowly ovate to ovate, 2–3 mm long, equal, acute or shortly acuminate, glabrous; stamens 3; staminodes 2; pseudostaminodes 0; stigma ± sessile. **Fruit** obovate, 1–1.5 mm long, shorter than tepals, obcordate. **Lesser joyweed. Fig. 2C–D. Pl. 1A–C.**

S.A.: NW, LE, GT, FR, EA, NL, MU, SL, KI, SE; W.A., N.T., Qld, N.S.W., Vic., Tas. On banks and in shallow water at the edge of freshwater rivers, creeks and swamps. Flowers: mainly Nov.–Apr. but also throughout the year.

This species is very variable across its range and is currently under review. Some specimens from south-eastern S.A. may also be the closely related *Alternanthera* sp. A (Jacobs & Lapinuro 1990), but further investigation is required to establish this.

3. ***Alternanthera nana*** R.Br., *Prodr.* 417 (1810). — **Illustr.:** *Pl. W. N.S.W.* 283 (1982); *Fl. N.S.W.* 1: 250 (1990); *Fl. Kimberley Reg.*, 111 fig. 27D (1992).

Ephemeral herbs, prostrate or erect; stems pubescent; leaves ± sessile, elliptic or oblong to narrowly ovate, 10–25 × 6–10 mm, acute, pubescent to loosely hirsute. **Inflorescence** of sessile globose to ovoid spikes, 5–10 mm long, clustered; rhachis woolly; bracts and bracteoles ovate, 0.5–1 mm long, acute to acuminate; tepals oblong to narrowly ovate-oblong, 2–3 mm long, equal, acute to acuminate, glabrous, base thickened, midrib hardened; stamens 3; staminodes 2; pseudostaminodes 0; style c. 0.5 mm long. **Fruit** obovate, 1–1.5 mm long, shorter than tepals, rounded to truncate. **Hairy joyweed, downy pigweed.**

S.A.: NW, LE, GT, FR, MU; W.A.; N.T.; Qld; N.S.W. On seasonally flooded areas. Flowers: Jan.–June and Oct.

4. ***Alternanthera nodiflora*** R.Br., *Prodr.* 417 (1810). — *Alternanthera triandra* auct. non Lam.: F.Muell. & Tate, *Trans. & Proc. Rep. Roy. Soc. South Australia* 16: 344 (1896). — **Illustr.:** *Pl. W. N.S.W.* 283 (1982); *Fl. N.S.W.* 1: 250 (1990).

Annual or ephemeral herbs, decumbent or ascending to erect; stems to 30 (–100) cm high, often rooting at the nodes, hairy at the nodes and in 2 lines along the stems or becoming glabrous; leaves linear to oblong or narrowly elliptic, 20–80 × 3–8 mm, acute, entire or minutely denticulate, glabrous or very sparsely hairy. **Inflorescence** of sessile globular spikes, often densely clustered, rhachis hairy; spike clusters 10–20 mm wide; bracts and bracteoles narrowly ovate, 1–3 mm long, acute; tepals narrowly ovate, 4–5 mm long, equal, long-acuminate, glabrous; stamens 3; staminodes 2; pseudostaminodes 0; style very short. **Fruit** obovate, 1–1.5 mm long, shorter than tepals, obcordate. **Common joyweed. Fig. 2H–I, Pl. 1D.**

S.A.: NW, LE, GT, FR, MU; W.A.; N.T.; Qld; N.S.W.; Vic. Grows on banks and beds of creek and river channels and low lying areas that undergo periodic inundation in sandy or clay soils with *Eucalyptus camaldulensis*, *E. microtheca* or *E. coolabah* in open woodland often with an understorey of *Muehlenbeckia florulenta* (lignum) and/or chenopods. Flowers: throughout the year.

5. ****Alternanthera pungens*** Kunthin Humb., Bonpl. & Kunth, *Nov. Gen. Sp. (Quarto Edn)* 2(7): 206 (1818). — *Achyranthes repens* L., *Sp. Pl.* 1: 205 (1753). *Alternanthera repens* (L.) Link, *Enum. Hort. Berol. Alt.* 1: 154 (1821), *nom. illeg.* — **Illustr.:** *Pl. W. N.S.Wales*, 283. (1982); *Fl. N.S.W.*, 250 (1990).

Ephemeral or perennial herbs, prostrate or ascending; stems and nodes densely hairy to glabrescent; leaves on petioles up to 5 mm long or sessile, obovate to broadly obovate or orbicular, 10–50 × 7–20 mm, obtuse or acute, mucronate, glabrous or hairy particularly on midnerve and margins. **Inflorescence** of sessile ovoid spikes, 8–10 mm long, clustered; rhachis ± hairy; bracts and bracteoles narrowly ovate, 3–5 mm long, cuspidate to

aristate, pungent; tepals unequal, narrowly ovate to oblong or elliptic, margins entire to serrate; outer 3 tepals 3–6 mm long, small tufts of long or short hairs on the back near the base, longest 2 tepals acuminate, cuspidate to aristate, pungent, third outer tepal acute, mucronate to cuspidate; inner 2 tepals 0.2–3.2 mm long, acute, cuspidate, long dense hairs along midrib; stamens 5; staminodes 0; pseudostaminodes 5; style \pm absent. **Fruit** globose, 0.5–1.5 mm long, shorter than tepals, rounded. **Khaki weed. Fig 2E–G, Pl. 1E–F.**

S.A.: *NW, *LE, *GT, *FR, *EA, *EP, *NL, *MU, *YP, *SL, ?*KI; *W.A., *N.T., *Qld, *N.S.W., *Vic. Native to South America. A troublesome weed of lawns and disturbed areas; harmful to stock. Flowers: Dec.–May.

(Proclaimed S.A. plant.)

3. AMARANTHUS L.

Sp. Pl. 1: 989 (1753).

(From the Greek *a*, not; *marantos*, withering; used for an everlasting flower.)

Prepared by J. Palmer

Annual, ephemeral or perennial herbs; leaves alternate, entire, usually glabrous, petiolate. **Inflorescence** of dense axillary clusters, and/or axillary and terminal simple or branched spikes, sessile; flowers solitary, unisexual, sessile; bracts and bracteoles similar, membranous; tepals 2–5, falling with mature fruit, free, usually equal, membranous or sometimes becoming hardened in fruit, glabrous or with glandular hairs on margins only; stamens 3–5; filaments free; anthers 2-locular; staminodes 0; pseudostaminodes 0; ovary with 1 ovule; style short or lacking; stigmas 2 or 3. **Fruit** an indehiscent utricle bursting irregularly or a circumscissile capsule, membranous; seed 1, reddish to brownish black or black, shining. **Amaranthus.**

About 60–75 species, from the tropics and the warm temperate regions worldwide. In Australia there are 26 species, including 14 naturalised and one introduced species. Sixteen species occur in S.A.

Tepal descriptions are for female flowers in fruit unless specified otherwise and fruit measurements do not include the remnant style and stigmas.

Several species are grown as vegetable or grain crops, as ornamentals or they are troublesome weeds.

Reference: Palmer (2009).

1. Inflorescences all or mainly axillary clusters, rarely also forming a very small leafless terminal spike or panicle
2. Bracts and bracteoles 2.5–4 mm long, acuminate, shortly aristate, pungent..... 1. **A. albus**
- 2: Bracts and bracteoles 1–3 mm long, acute, acuminate or mucronate to shortly aristate but not pungent
3. Fruit a circumscissile capsule..... 7. **A. graecizans** subsp. **silvestris**
- 3: Fruit an indehiscent utricle
4. Fruit smooth to rugose, with prominent (rarely faint), longitudinal, straight ribs or inflated undulate ribs
5. Midnerve of tepals at the fruiting stage broad, 0.3–1 mm wide, for some or all of length
6. Fruit 1.2–1.5 mm long, obovoid to globose; ribs inflated and undulate..... 12. **A. mitchellii**
- 6: Fruit 1.5–3 mm long, ellipsoid; ribs slightly raised, straight..... 3. **A. centralis**
- 5: Midnerve of tepals at the fruiting stage narrow, c. 0.1 mm wide, for entire length..... 10. **A. interruptus**
- 4: Fruit rugulose to rugose, without prominent, longitudinal, straight ribs or inflated undulate ribs
7. Fruit (2–) 3–5 mm long, ellipsoid
8. Tepals of female flowers 5, 4–8 mm long; fruit slightly shorter than tepals..... 8. **A. grandiflorus**
- 8: Tepals of female flowers 3 (rarely 4 or 5), to 3 mm long; fruit longer than tepals..... 11. **A. macrocarpus**
- 7: Fruit 1–2.5 mm long, globose or obovoid

- 9. Tepals at the fruiting stage broadly spatulate, obovate-spatulate or rounded-obtrullate-spatulate, spreading to recurved 5. **A. cuspidifolius**
- 9: Tepals at the fruiting stage narrowly obovate-spatulate or narrowly obovate, usually erect..... 10. **A. interruptus**
- 1: Inflorescences all or mainly terminal, leafless, elongated spikes or panicles, although smaller spikes or axillary clusters may also be present
- 10: Inflorescence pendulous, deep red to maroon or rarely greenish 2. **A. caudatus**
- 10: Inflorescence erect, various colours other than deep red to maroon (green or tinged reddish in *A. cruentus*)
- 11: Fruit an indehiscent utricle
- 12: Tepals 5 in female flowers, or if 4, then bracts and bracteoles 1 mm long or longer
- 13: Tepals becoming hardened in fruit, midnerve broad, 0.6–1 mm wide; fruit ellipsoid, smooth to rugose, longitudinally ribbed..... 3. **A. centralis**
- 13: Tepals remaining membranous in fruit, midnerve narrow, c. 0.1 mm wide; fruit globose or obovoid, rugulose to rugose, not or faintly ribbed
- 14: Leaves ovate to trullate; stems sparsely hairy..... 10. **A. interruptus**
- 14: Leaves linear to narrowly elliptic or narrowly ovate; stems glabrous..... 13. **A. muricatus**
- 12: Tepals 3 (rarely 2) in female flowers, or if 4, then bracts and bracteoles less than 1 mm long
- 15: Plants perennial, prostrate or decumbent, stems hairy; fruit 2–3 mm long, smooth..... 6. **A. deflexus**
- 15: Plants annual, erect or prostrate, stems ± glabrous; fruit 1–2 mm long, rugose 16. **A. viridis**
- 11: Fruit a circumscissile capsule
- 16: Young stems and inflorescences sparsely to densely hairy, tepals obtuse or emarginate 15. **A. retroflexus**
- 16: Young stems and inflorescences glabrous to sparsely hairy; tepals acute or acuminate
- 17: Bracts and bracteoles 2–3 mm long
- 18: Spikes greenish, usually 4–7 mm wide; fruit slightly shorter than or equal to tepals 9. **A. hybridus**
- 18: Spikes green or tinged reddish, 7–12 mm wide; fruit equal to or longer than tepals..... 4. **A. cruentus**
- 17: Bracts and bracteoles 3.5–6 mm long..... 14. **A. powellii**

1. ***Amaranthus albus** L., *Syst. Nat.* ed. 10, 2: 1268 (1759). — **Illustr.:** *Pl. W. N.S.W.* 283, (1982); *Fl. N.S.W.* 1: 252 (1990); *Fl. Victoria* 3: 204, fig. 36H (1996).

Annual herb, erect or prostrate, to 100 cm high, glabrous or almost so; stems rounded to angular, rigid, white; leaves on petioles 5–25 mm long, narrowly ovate, ovate to obovate or spatulate, (5–) 10–50 × 3–20 mm, obtuse to slightly emarginate. **Inflorescence** of axillary, few-flowered spikes to 10 mm long, mostly female flowers present; bracts and bracteoles narrowly ovate, 2.4–4 mm long, acuminate, shortly aristate, pungent, longer than tepals; tepals 3, narrowly ovate, 1–2 mm long, acute. **Fruit** a circumscissile capsule, globose, 1–2 mm long, about as long as tepals, rugose; seed lenticular, c. 1 mm diam., reddish-brown to black. **Tumbleweed, stiff tumbleweed. Fig. 3C–D, Pl. 2A–B.**

S.A.: *GT, *FR, *NL, *MU, *YP, *SL, *SE, *W.A.; *N.S.W.; *Vic.; *Tas. Native to North America, naturalised in South America, Eurasia, Africa and Australia. A weed of roadsides and disturbed areas. Flowers: Jan.–Apr. and June.

2. ***Amaranthus caudatus** L., *Sp. Pl.* 2: 990 (1753). — **Illustr.:** Anon., *Encycl. Austral. Gardening* 1: 85 (1980); S.Macoboy, *What Flower is That?* 26 (1986); Heywood *et al.*, *Fl. Pl. Fam. World* 29 (2007).

Erect annual herb to 150 cm high; stems ribbed, sparsely hairy; leaves on petioles 2–80 mm long, narrowly ovate to ovate or elliptic, 30–90 × 18–50 mm, obtuse, mucronate. **Inflorescence** of mainly terminal and axillary spikes

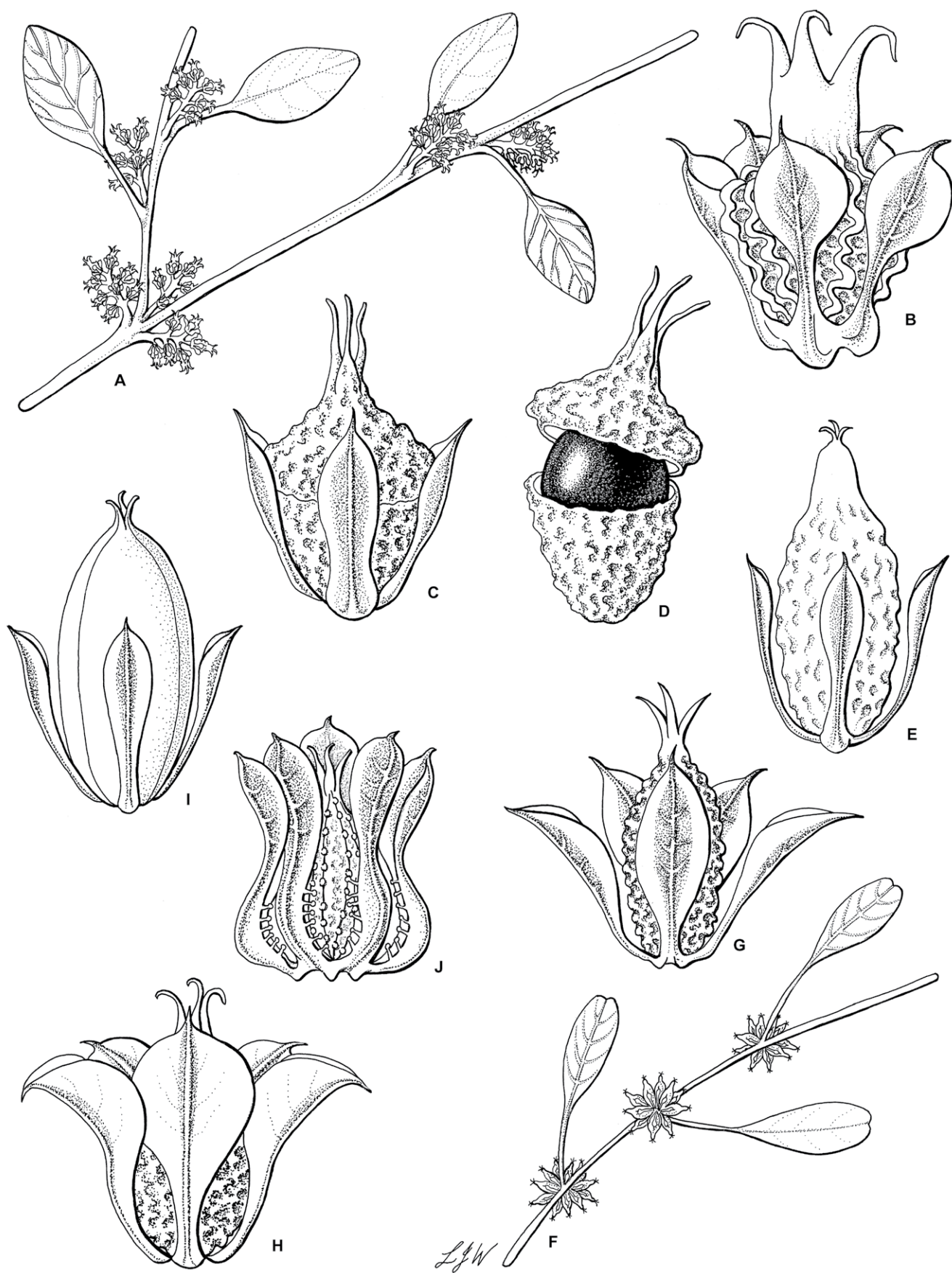


Fig. 3. A–B, *Amaranthus mitchelli*: A, inflorescence; B, old flower with fruit. C–D, *A. albus*: C, old flower with fruit; D, opening fruit with seed. E–F, *A. macrocarpus* var. *macrocarpus*: E, old flower with fruit; F, inflorescence. G–J, Old flowers with fruits: G, *A. grandiflora*; H, *A. cuspidifolius*; I, *A. deflexus*; J, *A. centralis*. Illustrations by L.J. Waters, funded in collaboration with ABRIS, Canberra.

to 20 cm long, often forming a panicle, pendulous, deep red or maroon (rarely greenish), male and female flowers present; bracts and bracteoles ovate, 2.5–3.5 mm long, longer than tepals, acuminate, aristate, pungent; tepals 5, 1.5–2.5 mm long; tepals of male flowers ovate or elliptic, acute or acuminate; tepals of female flowers obovate, obtuse, mucronate or shortly aristate. **Fruit** a circumscissile capsule, globose, 2–2.5 mm long, about equal to or slightly longer than tepals, smooth; seed lenticular, c. 1 mm long, reddish-black. **Love-lies-bleeding, tassel flower. Fig. 4H–I.**

S.A.: *LE, *FR, *EP, *NL, *MU, *YP, *SL; *W.A.; *N.T.?; *Qld; *N.S.W.; *Vic. (sparingly). Native to South America, now widespread and commonly cultivated as a garden ornamental. Occasionally found as a garden escape in disturbed areas, often after rain. Flowers: Jan.–Jul. and Sep.

3. **Amaranthus centralis** J.Palmer & Mowatt, *Nuytsia* 19: 111 (2009). — *A.* sp. Todd River (G.Chippendale 482) J.Palmer in W.R.Barker *et al.* (eds), *J. Adelaide Bot. Gard. Suppl.* 1: 46 (2005). *A. mitchellii* auct. non Benth.: Jessop in Jessop & Toelken, *Fl. S. Austral.* 1: 318 (1986), partly. — **Illustr.:** *Nuytsia* 19(1): 111, fig. 1, 2A (2009).

Erect annual herb, up to 60 cm high; stems angular, sparsely glandular or multicellular hairy or becoming glabrous; leaves on petioles 2–20 (–35) mm long, elliptic or ovate, 6–35 (–55) × 4–17 (–25) mm, obtuse to emarginate, mucronate. **Inflorescence** of mainly axillary, globular clusters and sometimes erect terminal spikes to 60 mm long, greenish, male and female flowers present; bracts and bracteoles ovate, 1.2–1.8 mm long, shorter than the tepals, acuminate, mucronate; tepals 5; tepals of male flowers elliptic to narrowly obovate, 1.5–2 mm long, obtuse to acute, mucronate, margins membranous, glabrous, midnerve c. 0.1 mm wide; tepals of female flowers narrowly obovate-spathulate to obovate-spathulate or spatulate, 2–4 mm long, obtuse, mucronate, erect to recurved, margins membranous, glandular hairy along some or all of length, midnerve 0.6–1 mm wide, green; tepals at the fruiting stage becoming hardened in the lower part and often sigmoid in outline, dark green to brown or straw-coloured. **Fruit** an indehiscent utricle, ellipsoid, 1.5–3 mm long, shorter than tepals, slightly rugose, usually ribbed; ribs slightly raised, straight, longitudinal, slightly tuberculate; seed obovoid to broad-obovoid, 1.2–1.4 mm long, reddish-brown to black. **Fig. 3J.**

S.A.: NW, LE, FR; W.A.; N.T.; Qld. Grows in red sand in sandy or rocky ephemeral watercourses, sandy to clayey loam on creek banks and edges of permanent pools in eucalypt lined channels, *Acacia* shrubland, or open tussock grassland. It also occurs in areas of permanent watering, e.g. gardens. Flowers: Feb.–Aug. and Oct.

This species is similar to *Amaranthus mitchellii* and *A. cuspidifolius* and can often be found growing with *A. cuspidifolius*. Both these species though are distinguishable from *A. centralis* by having spatulate to broadly spatulate tepals in female flowers and rugose fruit that are either without ribs (*A. cuspidifolius*) or with prominent inflated undulate ribs (*A. mitchellii*).

4. ***Amaranthus cruentus** L., *Syst. Nat.* ed. 10, 2: 1269 (1759). — *A. paniculatus* L., *Sp. Pl.* ed. 2, 2: 1406 (1763); *A. hybridus* var. *cruentus* Mansf., *Kulturreflanze* 2: 54 (1959). *A. patulus* auct. non Bertol.: Eichler, *Suppl. Black's Fl. S. Austral.* 130 (1965); Jessop in Jessop & Toelken, *Fl. S. Austral.* 1: 316 (1986).

Erect annual herb to 100 cm high; stems angled, glabrous or young stems and inflorescences sparsely hairy; leaves on petioles 15–140 mm long, ovate to elliptic, 35–160 (–210 non-S.A. specimens) × 20–70 (–90) mm, obtuse to acute or acuminate, ± mucronate. **Inflorescence** of mainly terminal and axillary spikes 7–12 mm wide, often forming dense open panicles to c. 300 mm long, erect, greenish but often tinged reddish, male and female flowers present; bracts and bracteoles ovate, 2–3 mm long, equal to or longer than tepals, acuminate, aristate, pungent; tepals 5, ±unequal, elliptic; tepals of male flowers 2–2.5 (–3) mm long, acuminate, mucronate to shortly aristate; tepals of female flowers 1.5–2 mm long, acute to acuminate, mucronate to shortly aristate. **Fruit** a circumscissile capsule, globose, c. 1.5 mm long, equal to or longer than tepals, smooth. Seed lenticular, 1–1.5 mm long, reddish or reddish-black. **Red shank. Fig. 4F–G.**

S.A.: *FR, *EA, *MU, *YP, *SL; *W.A.; *N.S.W.; *Vic. (sparingly naturalised). Probably originated as a grain crop in southern Mexico or Guatemala but is now widely grown as a dye plant, ornamental and potherb in central America, Europe, China, India, SE Asia, and Africa. Uncommon weed mainly occurring spontaneously in gardens and disturbed areas. Flowers: Jan.–May, Jul. and Sep.

5. **Amaranthus cuspidifolius** Domin, *Biblioth. Bot.* 89: 78 (1921). — *Amaranthus mitchellii* auct. non Benth.: Jessop in Jessop & Toelken, *Fl. S. Austral.* 1: 318 (1986). partly. — **Illustr.:** *Fl. N.S.W. Suppl.* 1: 27 (2000).

Erect or decumbent annual or ephemeral herb to 50 cm high, glabrous; leaves on petioles 2–35 mm long, oblong to elliptic or ovate, 5–40 × 3–12 mm, obtuse or emarginate, mucronate. **Inflorescence** of axillary clusters of predominantly female flowers; bract and bracteoles narrowly ovate or ovate, 1–2 mm long, shorter than tepals, acuminate, shortly aristate; tepals 5; tepals of male flowers ovate, c. 2 mm long, acute to acuminate; tepals of female flowers broadly spatulate, obovate-spatulate or rounded obtrullate-spatulate, 1.8–3 mm long, spreading to recurved, obtuse, shortly aristate. **Fruit** an indehiscent utricle, globose, 1–2 mm long, equal to or shorter than tepals, rugose; seed lenticular or obovoid, 0.8–1 mm long, reddish-brown or black. **Fig. 3H, Pl. 2C.**

S.A.: NW, LE, GT, FR, EA, EP; W.A.; N.T.; Qld; N.S.W. Grows on rocky (often granite) outcrops, hillsides and crevices and in creek lines in sandy to gravelly soil. Also found in areas of gypseous soils along drainage lines with other ephemerals. Flowers: Dec.–Oct.

This species is often confused with *Amaranthus mitchellii*. It differs by having rugose fruit that lack the defined inflated, wavy ribs of *A. mitchellii*. Also *A. cuspidifolius* can be found in rocky or sandy habitats compared to *A. mitchellii* which mostly occurs on river floodplains in grey, brown or black clays. Specimens apparently intermediate between *Amaranthus cuspidifolius*, *A. mitchellii* and *A. cochleitepalus* Domin have been seen. See notes under *A. mitchellii* for further details; *A. cochleitepalus* is not known from S.A., though it has been collected from near the S.A./N.T. border.

6. ***Amaranthus deflexus** L., *Mant. Pl. Altera* 295 (1771). — **Illustr.:** *Fl. N.S.W.* 1: 252 (1990); *Fl. Victoria* 3: 204, fig. 36j (1996).

Prostrate to decumbent perennial herb; stems up to 20 cm high and c. 50 cm long, sparsely to densely pubescent; leaves on petioles 7–15 mm long, rhomboid-ovate, 5–40 × 3–25 mm wide, obtuse or acute. **Inflorescence** of dense or sometimes interrupted terminal spikes to 50 mm long and clusters in upper leaf axils, erect, green or light brownish; bracts and bracteoles oblong-ovate, 0.5–1 mm long, shorter than tepals, acute, mucronate; tepals 2 or 3, linear to oblong, narrowly obovate or spatulate, 1–2 mm long, acute or obtuse, mucronate. **Fruit** an indehiscent utricle, ellipsoid, 2–3 mm long, distinctly longer than tepals, smooth with 3 longitudinal veins; seed ellipsoid-obovoid, c. 1 mm long, reddish-black. **Spreading amaranth. Fig. 3I.**

S.A.: *EP, *YP, *SL; *N.S.W., *Vic., *Tas. Native to South America and now naturalised in North America, the Mediterranean and Australia. An occasional weed of disturbed ground. Flowers: Dec.–Apr. and Oct.

7. ***Amaranthus graecizans** L., *Sp. Pl.* 2: 990 (1753), subsp. **silvestris** (Vill.) Brenan, *Watsonia* 4: 273 (1961) as '*sylvestris*'. — *Amaranthus silvestris* Vill., *Cat. Pl. Jard. Strasbourg* 111 (1807). *Amaranthus angustifolius* auct. non. Lam.: Eichler, *Suppl. Black's Fl. S. Austral.* 131 (1965); Jessop in Jessop & Toelken, *Fl. S. Austral.* 1: 316 (1986). — **Illustr.:** *Fl. Victoria* 3: 204, fig. 36i (1996) as '*sylvestris*'.

Erect annual herb to c. 70 cm high, much-branched, usually glabrous; leaves on petioles 8–15 mm long, elliptic to ovate, 15–35 × 5–17 mm, acute or obtuse, mucronate. **Inflorescence** of small axillary clusters to 10 mm long, predominantly female flowered; bracts and bracteoles ovate, 1.2–1.6 mm long, shorter than the tepals, acuminate; tepals 3, ovate to narrowly elliptic, 1.2–2.2 mm long, acute to acuminate. **Fruit** a circumsissile capsule, globose-ellipsoid, 1.8–2.6 mm long, longer than tepals, rugulose to smooth on cap; seed lenticular, 1–1.5 mm diam., reddish-brown to black.

S.A.: *YP, *SL, *MU; *Qld (doubtfully naturalised); *Vic.; *Tas. Native to southern Europe, northern Africa and western Asia, although now widely naturalised. A weed of disturbed areas. Flowers: Dec.–May.

8. **Amaranthus grandiflorus** (J.M.Black) J.M.Black, *Trans. & Proc. Roy. Soc. South Australia* 60: 166 (1936). — *A. mitchellii* var. *grandiflorus* J.M.Black, *Trans. & Proc. Roy. Soc. South Australia* 47: 368 (1923). — **Illustr.:** *Fl. N.S.W.* 1: 253 (1990); *Fl. Victoria* 3: 204, fig. 36N (1996).

Erect annual or ephemeral herb up to 40 cm high; stems rigid, rounded to angular; leaves on petioles 10–25 mm long, ovate to narrowly ovate, 10–50 × 4–12 mm, acute to obtuse, mucronate. **Inflorescence** of dense globose axillary clusters or short spikes to 17 mm long, predominantly female flowers present; bracts and bracteoles narrowly ovate, 1–3 mm long, shorter than tepals, acute; tepals 5; tepals of male flowers narrowly ovate to elliptic, c. 2 mm long, acuminate; tepals of female flowers narrowly obovate to spatulate, 4–8 mm long, erect to recurved, acuminate, mucronate to shortly aristate. **Fruit** an indehiscent utricle, ellipsoid, 3.5–5 mm long, slightly

shorter than tepals, rugose; seed compressed obovoid, 1.4–2 mm long, reddish-brown to black. **Large-flowered amaranth. Fig. 3G.**

S.A.: NW, LE, GT, FR, EA, EP, NL, MU, YP; N.T.; Qld; N.S.W.; Vic. Grows on sand dunes and sand plains in red or yellow sand or in sandy pockets of stony watercourses responding quickly after rain events. It has also been recorded from disturbed areas along roadsides or in pastures and crops. Flowers: Nov.–Sep.

9. ***Amaranthus hybridus** L., *Sp. Pl.* 2: 990 (1753). — *A. patulus* Bertol., *Comment. Itin. Neapol.* 19, t. 2 (1837). — **Illustr.:** *Pl. W. N.S.W.* 283 (1982); *Fl. N.S.W.* 1: 253 (1990); *Fl. Victoria* 3: 204, fig. 36E (1996).

Annual herb, erect, to 200 cm high, sparsely pubescent; stems ribbed, older stems becoming angular; leaves on petioles 6–85 mm long, ovate to elliptic, 15–110 (–140) × 6–65 (–70) mm, acute to obtuse. **Inflorescence** of mainly terminal and axillary spikes to 90 × 4–7 (–10) mm that often form dense panicles up to 24 cm long, erect, greenish, male and female flowers present; bracts and bracteoles ovate, 2–3 mm long, longer than tepals, acuminate, aristate, pungent; tepals 5, unequal, oblong or elliptic, acute, mucronate; tepals of male flowers 2.2–2.5 mm long; tepals of female flowers 1.2–2.2 mm long. **Fruit** a circumsissile capsule, urceolate, 1.2–1.5 mm long, slightly shorter to c. equal to tepals, smooth or slightly rugulose above; seed lenticular, 0.8–1.2 mm long, reddish-black. **Slim amaranth, spleen amaranth, princes feather, Prince of Wales feather.**

S.A.: *SL; *W.A.; *N.T., *Qld; *N.S.W.; *Vic. Native to North America. A weed of cultivation and disturbed areas. Flowers: Feb. (2 records).

This species can be distinguished from *A. cruentus* by having greenish, more slender, narrower spikes and slightly smaller seed. It is also similar to *A. powellii* but has shorter bracts, bracteoles and tepals, and *A. retroflexus* but is distinguished from that species by the acute rather than obtuse or emarginate tepal apices and sparsely pubescent rather than the sparsely to densely pubescent young stems and inflorescences.

10. **Amaranthus interruptus** R.Br., *Prodr.* 414 (1810). — **Illustr.:** K.A.W. Williams, *Native plants of Queensland* 1: 17 (1980); *Fl. Austral.* 50: fig. 36D (1993).

Annual or ephemeral herb, erect or decumbent, to 70 cm high; stems sparsely pubescent, often reddish; leaves on petioles 3–30 (–60) mm long, ovate to trullate, 5–50 × 6–18 mm, obtuse to acute, mucronate. **Inflorescence** of axillary clusters and dense or interrupted terminal spikes to 22 cm long, sometimes forming panicles, erect, greenish, predominantly female flowers present; bracts and bracteoles ovate, narrowly ovate to elliptic, 1–2 mm long, shorter than tepals, acute to acuminate; tepals 1.5–3 mm long, acute or obtuse, mucronate to shortly aristate; tepals of male flowers 3 or 5, narrowly ovate, elliptic or narrowly obovate; tepals of female flowers 5, narrowly obovate to narrowly obovate-spathulate, usually erect, membranous, midnerve c. 0.1 mm wide. **Fruit** an indehiscent utricle, globose to obovoid, 1.2–2.5 mm long, shorter than or c. equal to tepals, rugose, ± faintly ribbed, ribs longitudinal; seed lenticular, c. 1 mm long, reddish-black. **Native amaranth. Fig. 4J–K.**

S.A.: NW, LE, FR, EA; W.A.; N.T.; Qld. Grows on rocky outcrops and slopes and in gullies often of granite, in sand in Low Open Woodland or *Triodia* grassland. Flowers: Apr., Jul.–Aug. and Oct.

Differs from *Amaranthus mitchellii* in having terminal, as well as axillary inflorescences and rugose only or very faintly ribbed fruit as opposed to fruit with inflated wavy ribs.

11. **Amaranthus macrocarpus** Benth., *Fl. Austral.* 5: 216 (1870). — **Illustr.:** *Fl. N.S.W.* 1: 252 (1990).

Annual herb, erect or prostrate, to 30 cm high, glabrous; stems angular; leaves on petioles 2–25 mm long, ovate, oblong or obovate, 10–27 × 4–13 mm, obtuse to deeply emarginate, mucronate. **Inflorescence** of dense, globose, axillary clusters, 7–8 mm long, predominantly female flowers present; bracts and bracteoles elliptic, 1 mm long, shorter than tepals, acute; tepals usually 3 (rarely 4 or 5), narrowly obovate to spathulate, 1.75–3 mm long, acute, mucronate to shortly aristate. **Fruit** an indehiscent utricle, ellipsoid, (2–) 3–5 mm long, longer than tepals, rugulose to rugose; seed compressed-obovoid, c. 1–1.5 mm long, reddish brown. **Dwarf amaranth, Boggabri weed.**

Flowers: sporadically throughout the year.

1. Utricle black or dark brown 11a. **A. macrocarpus** var. **macrocarpus**
1. Utricle pallid or straw coloured 11b. **A. macrocarpus** var. **pallidus**

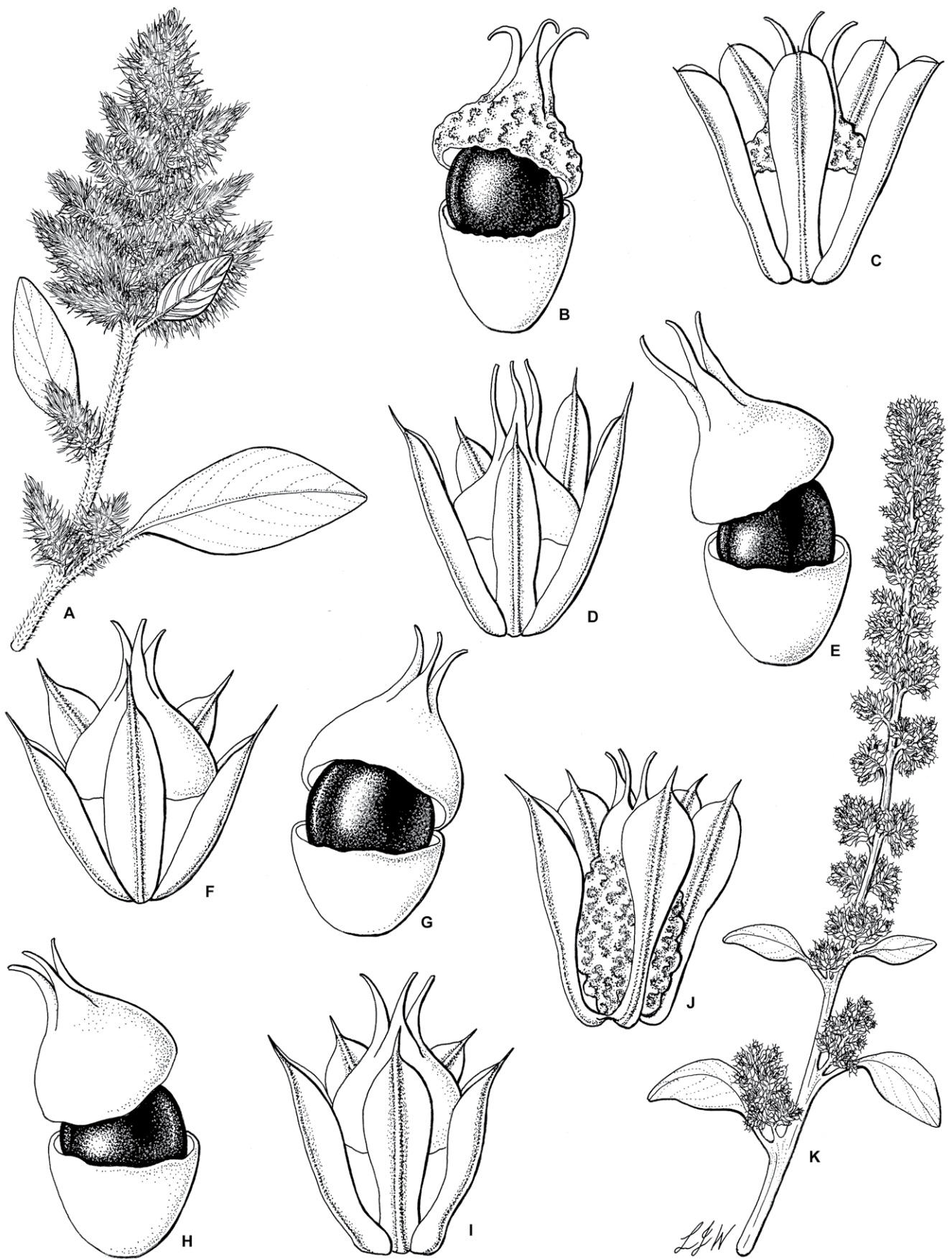


Fig. 4. A–C, *Amaranthus retroflexus*: A, inflorescence; B, opening fruit with seed; C, old flower with fruit. **D–E, *A. powellii*:** D, old flower with fruit; E, opening fruit with seed. **F–G, *A. cruentus*:** F, old flower with fruit; G, opening fruit with seed; **H–I, *A. caudatus*:** H, opening fruit with seed; I, old flower with fruit. **J–K, *A. interruptus*:** J, old flower with fruit; K, inflorescence. Illustrations by L.J. Waters, funded in collaboration with ABRIS, Canberra.

- 11a. **Amaranthus macrocarpus** Benth. var. **macrocarpus** — **Illustr.** *Fl. Victoria* 3: 204, fig. 36M (1996).

Fruit black or dark brown. **Fig. 3E–F.**

S.A.: LE, EA, MU; N.T.; Qld; N.S.W.; Vic. Grows on flooded plains in clay. Flowers: Mar., May, Aug. and Dec.

- 11b. **Amaranthus macrocarpus** var. **pallidus** Benth., *Fl. Austral.* 5: 216 (1870). — **Illustr.** *Pl. W. N.S.W.*, 283 (1982), as *A. macrocarpus*.

Fruit pallid or straw coloured.

S.A.: EA; Qld; N.S.W. On flooded clay along drainage line, old river plain. Flowers: Dec. (1 record).

12. **Amaranthus mitchellii** Benth., *Fl. Austral.* 5: 214 (1870). — *Euxolus mitchellii* (Benth.) F.Muell. in E.Giles, *Geogr. Travels Centr. Aust.* 214 (1875). — **Illustr.** *Fl. N.S.W.* 1: 252 (1990).

Annual or ephemeral herb, erect or ascending, up to 60 cm high, glabrous; stems slightly angular; leaves on petioles 9–40 mm long, ovate or narrowly ovate to oblong, 10–45 (–55) × 6–12 (–17) mm, obtuse or emarginate, mucronate. **Inflorescence** of axillary, dense, globose clusters or short spikes to 10 mm long, predominantly female flowers present; bracts and bracteoles narrowly ovate to ovate, 1.5–2.5 mm long, equal to or slightly shorter than tepals, acuminate, mucronate to shortly aristate; tepals 5, broadly spatulate to spatulate, 2–3 mm long, indurated below, erect to reflexed above, obtuse to acute, mucronate to shortly aristate, midnerve 0.3–0.6 mm wide. **Fruit** an indehiscent utricle, obovoid to globose, 1.2–1.5 mm long, shorter than to c. equal to tepals, rugose, ribbed; ribs inflated, undulate, longitudinal; seed broadly obovoid, 1–1.5 mm long, reddish-brown or black. **Boggabri weed. Fig. 3A–B.**

S.A.: NW, LE, GT, FR, EA; W.A.; N.T., Qld; N.S.W. Grows on drainage lines, floodplains or banks of watercourses in grey clay particularly after flooding events. Also occurs in drainage lines on stony tablelands in brown clay. Flowers: Jan.–Aug. and Oct. –Nov.

Several collections from northern and north-eastern S.A. represent plants apparently intermediate between *A. mitchellii*, *A. cuspidifolius* and *A. cochleitepalus* (northern Australia). These plants have narrowly ovate to ovate, obtuse to emarginate leaves as in *A. mitchellii*, inflorescences of dense sessile clusters of flowers in the leaf axils as in *A. cochleitepalus* and broadly spatulate, reflexed tepals similar to *A. cuspidifolius* and *A. mitchellii*. Further research is required to ascertain the status of these plants and whether they warrant recognition as a distinct taxon.

13. ***Amaranthus muricatus** (Moq.) Hieron., *Pl. Diaph. Fl. Argent.* 227 (1882). — *Euxolus muricatus* Moq. in A.DC., *Prodr.* 13(2): 276 (1849). — **Illustr.** *Fl. N.S.W.* 1: 253 (1990); *Fl. Victoria* 3: 204, fig. 36I (1996).

Perennial herb, prostrate or ascending, to 30 cm high, glabrous; stems rounded; leaves on petioles 3–10 mm long, linear to narrowly elliptic or narrowly ovate, 15–80 × 2–12 mm, obtuse, mucronate. **Inflorescence** of terminal panicles of spikes; spikes interrupted or continuous, to 12 cm long, erect, greenish to brownish, predominantly female flowers present; bracts and bracteoles ovate, 1–1.8 mm long, shorter than tepals, acute; tepals 4 or 5, narrowly obovate, 1.2–2 mm long, acute, membranous, midnerve c. 1 mm wide. **Fruit** an indehiscent utricle, globose, 1.3–2 mm long, c. equal to tepals, rugulose to rugose, with faint longitudinal ribs; seed broadly obovoid, 1–1.5 mm long, reddish-black. **Rough-fruited amaranth.**

S.A.: *GT, *EP, *NL, *MU, *YP, *SL; *W.A., *N.S.W.; *Vic. Native to South America. A weed of disturbed ground along footpaths, vacant blocks, degraded pasture and gardens. Flowers: Nov.–May.

Distinguished by its narrow leaves, perennial habit, black rachis of the inflorescence when mature and 4 or 5 tepals in both male and female flowers.

14. ***Amaranthus powellii** S.Watson, *Proc. Amer. Acad. Arts* 10: 347 (1875). — **Illustr.** *Fl. N.S.W.* 1: 252 (1990); *Fl. Victoria* 3: 204, fig. 36F (1996).

Annual herb, erect, to 200 cm high; stems angular, grooved, sparsely pubescent to glabrescent; leaves on petioles 3–55 mm long, ovate or elliptic to rhombic, 25–85 × 9–45 mm, obtuse or slightly emarginate, mucronate. **Inflorescence** of dense terminal and upper axillary spikes, to 32 cm long, sometimes forming panicles, sometimes also axillary clusters below, erect, greenish, predominantly female flowers present; bracts and bracteoles ovate,

3.5–6 mm long, longer than tepals, acuminate, short-aristate, very pungent; tepals 3–5, unequal, 2–4 mm long, acute or acuminate, mucronate to shortly aristate; tepals of male flowers narrowly ovate; tepals of female flowers narrowly oblong, narrowly ovate or narrowly elliptic. **Fruit** a circumscissile capsule, obovoid, 2–2.5 mm long, shorter than the tepals, smooth to rugulose; seed obovoid, 1–1.2 mm long, reddish-black. **Powell's amaranth. Fig. 4D–E.**

S.A.: *FR, *NL, *SL, *SE; *W.A., *Qld, *N.S.W., *Vic., *Tas. Native to North and South America. A weed of disturbed sites, especially in areas under cultivation. Flowers: Dec.–May.

Distinguished from *A. hybridus* by the longer bracts, bracteoles and tepals and very angled and grooved stems (at least in dry material); and from *A. retroflexus* by having sparsely hairy to glabrescent stems and acute tepals.

15. ***Amaranthus retroflexus** L., *Sp. Pl.* 2: 991 (1753). — **Illustr.:** *Pl. W. N.S.W.*, 284 (1982); *Fl. Victoria* 3: 204, fig. 36G (1996).

Annual herb, erect, to 100 cm high or more; stems rounded, sparsely to densely woolly pubescent particularly on young stems and inflorescences; leaves on petioles 15–55 mm long, ovate or elliptic to rhombic, 20–140 × 10–80 mm, often crenulate and/or undulate, obtuse or rarely emarginate, ±mucronate, sparsely hairy on abaxial surface. **Inflorescence** of terminal and axillary spikes to 10 cm long, often forming a dense terminal panicle, erect, greenish, predominantly female flowers present; bracts and bracteoles narrowly ovate, 3–5 mm long, longer than tepals, acuminate, aristate, pungent; tepals 5, oblong to narrowly obovate, 1.5–3 mm long, often recurved, obtuse or emarginate, often mucronate. **Fruit** a circumscissile capsule, obovoid, 1.5–3 mm long, slightly shorter than tepals, smooth below with a rugose cap; seed obovoid, 1–1.5 mm long, reddish-brown to black. **Redroot amaranth. Fig. 4A–C, Pl. 2D–E, 3A**

S.A.: *GT, *FR, *EP, *YP, *NL, *SL, *MU, *SE; *W.A.; *N.T.; *Qld; *N.S.W.; *Vic. Native to North America, now a widespread weed in temperate areas. A weed of disturbed ground along footpaths, vacant land and under cultivation. Flowers: Dec.–June.

Distinguished from *A. powellii* and *A. hybridus* by its oblong, obtuse to emarginate tepals and woolly pubescent stems.

16. ***Amaranthus viridis** L., *Sp. Pl.* ed. 2, 2: 1405 (1763). — *A. gracilis* Desf., *Tabl. École Bot.* 1: 43 (1804). — **Illustr.:** *Pl. W. N.S.W.*, 284 (1982); *Fl. N.S.W.* 1: 252 (1990); *Fl. Victoria* 3: 204, fig. 36K (1996).

Annual herb, erect, ascending or rarely creeping, to 90 cm high; stems angular, young stems sparsely hairy; leaves on petioles to 75 mm long, ovate, (5–) 15–55 (–90) × (5–) 15–40 (–60) mm, obtuse or slightly emarginate, mucronulate, glabrous, nerves white and prominent on the undersurface. **Inflorescence** of terminal and axillary spikes to 12 cm long, sometimes forming panicles and axillary clusters, erect, greenish, predominantly female flowers present, those at apex of spikes usually male; bracts and bracteoles ovate, 0.5–1.5 mm long, shorter than tepals, acute, mucronate; tepals 3, obovate to oblong, 1–1.5 mm long, acute, mucronate. **Fruit** an indehiscent utricle, broadly obovoid, 1.2–1.7 mm long, about equal to or slightly longer than tepals, rugose; seed lenticular to broadly obovoid, 0.9–1.2 mm long, dull, faintly reticulate, reddish-brown to black. **Green amaranth, kerb weed. Pl. 3B–D.**

S.A.: *NW, *LE, *FR, *EA, *EP, *NL, *MU, *YP, *SL, *SE; *W.A.; *N.T.; *Qld; *N.S.W.; *Vic. Probably native to Europe but now a cosmopolitan weed. Common on disturbed ground in settled and cultivated areas. Flowers: Nov.–May or throughout the year.

4. GOMPHRENA L.

Sp. Pl. 1: 224 (1753).

(Used by Plinius to describe a kind of amaranth; *Gomphrena* may be a Latin modification of the Greek word *Gromphraena*.)

Prepared by J. Palmer

Annual or perennial herbs with erect, prostrate or ascending stems; leaves cauline and sometimes basal, opposite, sessile. **Inflorescence** a spike, terminal or terminal and axillary, sessile within the uppermost leaves or pedunculate, solitary or clustered, elongating as mature flowers fall or not; rachis hairy; flowers solitary, sessile, bisexual; bracts

and bracteoles membranous, usually entire; bracts persistent, sessile or stalked, usually glabrous; bracteoles falling with mature fruit, sessile, apex usually straight, midnerve entire or rarely crested; tepals 5, falling with mature fruit, free, imbricate, equal or unequal in length, margins membranous, usually entire, outer surface glabrous or hairy, inner surface usually glabrous; stamens 5; filaments united for part or all of length in a tube that is shorter to longer than fruit; anthers 1-locular; staminodes 0; pseudostaminodes 5, alternating with free filament portions, entire or toothed, or absent; ovary with 1 ovule; style simple; stigma shortly bi-lobed or bifid. **Fruit** a membranous indehiscent utricle; seed 1, smooth, brown, dull.

About 125 species occurring in tropical South America, Central America, southern United States of America and Australia. Thirty three species occur in Australia, with 30 species endemic to northern and central Australia, one species extending to Timor, and two species naturalised. Two species occur in S.A.

One specimen of *Gomphrena serrata* has been collected as a weed from a garden in Gawler; it is very similar to *G. celosioides* (see that species for more detail). It has the potential to become weedy in the wild as it has similar perennial growth habit and fruit dispersal to *G. celosioides*.

Gomphrena globosa, sparingly naturalised in Australia, is widely used in the horticultural and cut flower trade.

Reference: Palmer (1998).

1. Spikes semi-globose or globose, solitary or 2 to 3 clustered together; bracteole mid-nerve without a dorsal crest; tepals up to 4 mm long..... 2. ***G. lanata***
1. Spikes globose or ovoid to cylindrical, solitary; bracteole mid-nerve with a dorsal crest; tepals > 4 mm long..... 1. ***G. celosioides***

1. ****Gomphrena celosioides*** Mart., *Beitr. Amarantac.* 93 (1825); *Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.* 13(1): 301 (1826). — **Illustr.:** *Fl. N.S.W.* 1: 255 (1990); *Fl. Kimberley Reg.* 115, fig. 28D (1992).

Annual or perennial herb, decumbent to ascending, to 30 cm high and 60 cm diam.; leaves narrowly elliptic, oblanceolate, ovate, elliptic or obovate, 10–45 (–80) × 4–18 mm, glabrous or sparsely hairy above, densely hairy below. **Inflorescence** a terminal spike; spikes sessile within 2 leaves, solitary, globose or ovoid to cylindrical, 10–15 mm wide, elongating; bracts ovate to ovate-triangular, 3–3.5 mm long, sessile, translucent throughout or opaque white at apex; bracteoles ovate, 5.5–6.5 mm long, equal to or slightly longer than tepals, opaque white for 1/2 to most of length, mid-nerve with a short irregular dentate crest just below the bracteole apex; tepals lanceolate, 4.7–6.2 mm long, translucent or white, outer surface densely hairy for length of mid-nerve; stamens 5–6 mm long; filaments united for almost entire length, resultant tube longer than fruit; pseudostaminodes absent; style 0.2–0.3 mm long. **Fruit** compressed ovoid, 1.8–2.2 × 1.3–1.7 mm.

***Gomphrena* weed. Fig. 5.**

S.A.: *NW, *EA, *MU; *W.A.; *N.T.; *Qld; *N.S.W., *Vic. Native to South America and now a weed of tropical and subtropical parts of the world. Found on disturbed ground and rough lawn. Flowers: Dec.–Jan. (all year round in other states).

One specimen of *G. serrata* has been collected from a garden in Gawler (*Bates 52256*), but this species is not considered naturalised at this stage. It is similar to *G. celosioides*, but can be distinguished by the bracteoles as they have a serrated crest that runs half to the full

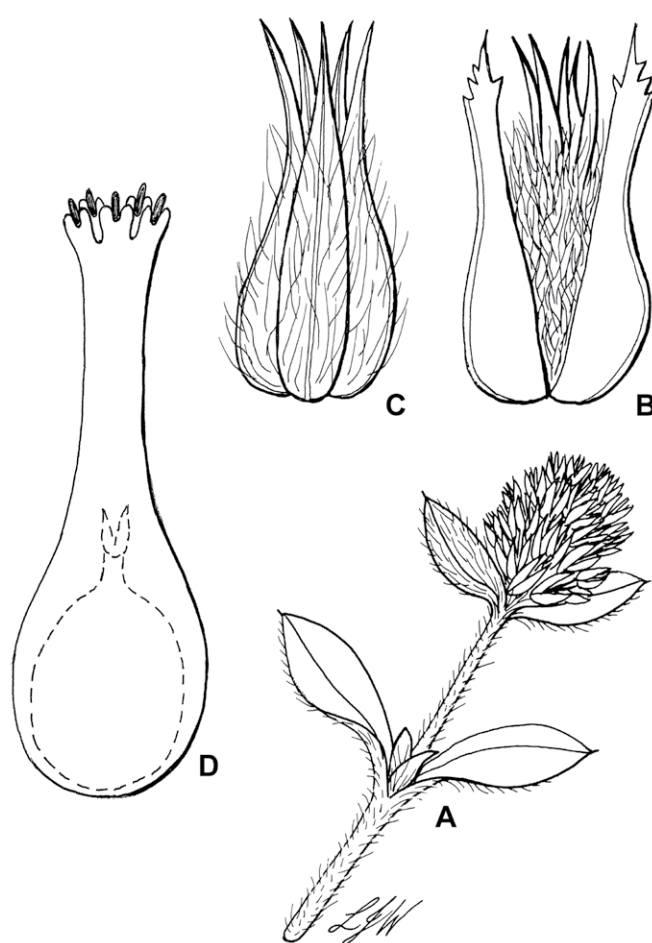


Fig. 5. *Gomphrena celosioides*: A, branchlet with inflorescence; B, flower with bracts; C, flower with bracts removed; D, staminal tube and ovary. Illustrations by L.J. Waters, funded in collaboration with ABRS, Canberra.

length of the midnerve rather than a short irregularly dentate crest just below the apex of the bracteoles as in *G. celosioides*.

2. **Gomphrena lanata** R.Br., *Prodr.* 416 (1810). — *G. brownii* Moq., in DC., *Prodr.* 13(2): 397 (1849), *nom. illeg.*; *Alternanthera baueri* Moq., in DC. *Prodr.* 13(2): 354 (1849). *Gomphrena brachystylis* auct. non F.Muell.: A.S.George in Jessop (ed.), *Fl. Central Austral.* 84 (1981). — **Illustr.:** *Fl. S.Austral.* 1: 319, fig. 181 (1986).

Annual herb, erect to spreading, to 30 cm high; leaves linear or linear-lanceolate, 11–35(–43) × 1–3(–4) mm, sparsely or densely hairy above and below or glabrous above. **Inflorescence** of terminal and axillary spikes, sessile within 2 (–4) leaves or pedunculate, solitary or 2 or 3 clustered together, semi-globose to globose, 7–14 mm wide, not elongating; bracts narrowly ovate to ovate, 2.5–4.5 mm long, ±stalked, glabrous; bracteoles ovate, 3.1–5.5 mm long, equal to or slightly longer than tepals; bracts and bracteoles opaque white for up to 1/2 of length or bracts translucent throughout; tepals lanceolate to elliptic, 2.2–4 mm long, translucent, white or pink, densely hairy for almost entire length; stamens 1.5–2.3 mm long; filaments united for 1/2–3/4 of length, tube shorter than fruit; pseudostaminodes present, much shorter than or ± equal to free filament portions; style 0.2–0.5 mm long. **Fruit** ovoid, 1.5–2.4 × 0.9–1.4 mm.

S.A.: NW, LE; W.A., N.T.; Qld. No habitat data available from S.A. specimens. In other states it grows in red sand in grassland with *Triodia* spp. on low dunes, flat plains and in drainage lines; or in red to brown loamy soils in woodlands of *Acacia* and *Eucalyptus* spp. Also grows in skeletal soils in low woodland or with spinifex species in areas of granite, sandstone or limestone outcrops on scree slopes or ridge tops. Flowers: Mar. (Jan.–Aug. or occasionally all year round in other states).

This taxon has been confused with *G. brachystylis* subsp. *brachystylis* in the past but that species differs in having broader leaves (3–9 mm), tepals that are hairy for only the length of the midnerve and a shorter style, and it occurs further north in the Kimberley, W.A. and northern N.T.

5. GUILLEMINEA Kunth

in Humb., Bonpl. & Kunth, *Nov. Gen. Sp.* 6: 40 (1823).

(After J.B.A.Guillemin, 1796–1842, a French botanist.)

Prepared by J. Palmer

Brayulinea Small, *Fl. S.E. U.S.* 394 (1903).

Perennial herbs with prostrate, often hairy branches; taproot swollen; leaves radical and cauline; cauline leaves opposite. **Inflorescence** of dense, sessile, 2–30-flowered spikes in axillary clusters; flowers solitary, sessile or pedicellate, bisexual; bracts persistent, sessile, membranous; bracteoles falling with fruit, membranous; tepals 5, falling with mature fruit, fused for at least half of length, 1–3 nerved, membranous, woolly on abaxial surface; stamens 5; filaments united for some of length, attached to the fused tepals; anthers 1-locular; staminodes 0; pseudostaminodes 0; style short. **Fruit** a membranous indehiscent utricle; seed 1, brown.

Two species native to North and South America. One species naturalised in Australia.

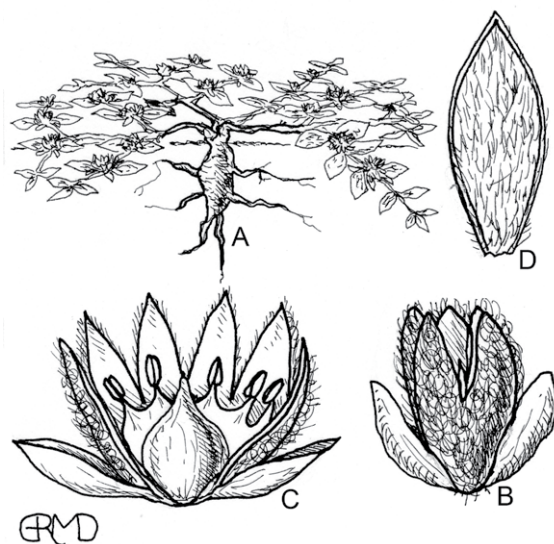


Fig. 6. *Guilleminea densa*. A, plant; B, unopened flower; C, opened flower; D, leaf. Illustration by G.R.M. Dashorst, from *Flora of South Australia* 1: 320, Fig. 182 (1986).

1. ***Guilleminea densa** (Humb. & Bonpl. ex Schult.) Moq.in A.DC., *Prodr.* 13(2): 338 (1849). — *Illecebrum densum* Humb. & Bonpl. ex Schult. in Roemer & Schult., *Syst. Veg.* 5: 517 (1819); *G. illecebroides* Kunth in Humb., Bonpl. & Kunth, *Nov. Gen. Sp.* 6: 42 (1823), *nom. illeg.*; *Brayulinea densa* (Humb. & Bonpl. ex Schult.) Small, *Fl. S.E. U.S.* 394 (1903). — **Illustr.:** Henrickson, *Sida* 12(2): 311, fig. 2 (1987); C.C.Towns. in Polhill (ed.), *Fl. Trop. E. Africa, Amaranthaceae*, 120, fig. 28 (1985); *Fl. N.S.W.* 1: 255 (1990).

Perennial mat-forming herb with stems to 30 cm or more long, woolly especially on the younger parts; leaves radical and cauline; radical leaves falling early; leaf petiole winged; leaf blade narrowly-elliptic to elliptic or

narrowly to broadly ovate, 5–17 mm × 2–10 mm, acute, ± glabrous above, sparse to dense matted hairy below. **Inflorescence** of spikes; spikes sessile, 2–5 mm long, rachis hairy; bracts and bracteoles elliptic to ovate, 1.6–2.5 mm long, obtuse, translucent; tepals 2–2.5 mm long, united in the lower half, densely woolly outside, white or translucent, free lobes elliptic to ovate, 1–1.5 mm long, unequal, acute to rounded, midnerve prominent for 2/3 of length; stamens united for entire length, adnate to tepals below free lobes. **Fruit** broadly ovoid, 1–1.5 × 0.8–1.1 mm. **Small matweed. Fig. 6.**

S.A.: *MU; *W.A.; *N.T.; *Qld; *N.S.W. Native to southern United States of America, Mexico and western South America; naturalised in southern Africa and Australia. Known from two records, one from a caravan park in Renmark and the other from a property near Waikerie. Habitats in other states include disturbed areas, footpaths, roadsides and mown lawns. Flowers: Jan. and Mar. (Nov. to June in other states).

Henrickson (1987) indicates that this species is variable across its natural range and considers specimens from Australia to be the typical variety.

6. HEMICHROA R.Br.

Prodr. 409 (1810).

(Greek *hemi*, half; *chroa*, colour; the perianth of *H. pentandra* is sometimes pink inside, whitish outside.)

Prepared by J. Palmer

Polycnemum L. *Sp. Pl.* 1: 35 (1753) *p.p.* (Australian taxa only).

Perennial herbs or shrubs, often woody; leaves alternate or opposite, sessile, succulent, clavate to semi-terete, usually flattened to channelled on the adaxial surface, mucronate. **Inflorescence** a terminal spike; flowers solitary, sessile, bisexual, axillary; bracts persistent, opposite to sub-opposite or alternate, similar to leaves at flowering, base hardening at fruiting or not; bracteoles persistent, subequal, membranous, entire, mid-nerve keeled on the back; tepals 5, free, persistent, glabrous; nerves 1–3, prominent on back; margins entire, membranous; Stamens 2 or 5; anthers 2-locular; staminodes 0; pseudostaminodes 0; ovary with 1 ovule; style with a bifid stigma. **Fruit** an indehiscent, membranous utricle remaining within persistent bracts; seed 1, smooth.

There are three species, all endemic to Australia, with all three species occurring in South Australia.

In Australia *Hemichroa* is included in the Amaranthaceae due to the presence of two bracteoles that subtend each flower and the stamens that are partly fused into an open or closed tube. *Hemichroa* has been placed by some authors in the Chenopodiaceae (Willis 1972; Kühn 1993), or the Polycnemaceae (Jacobs & Pickard 1981).

References: Jacobs & Pickard (1981); Kühn (1993); Willis (1972).

1. Decumbent to erect shrubs, young branches glabrous to papillose; stamens 2
2. Dense low shrubs to 50 cm high; fruiting bracts erect to spreading, free part 4.8–11 × 1.7–2.7 mm, base swollen..... 1. **H. diandra**
2. Erect divaricate shrub 50–150 cm high; fruiting bracts spreading to reflexed, free part 10–22 × 3–11 mm wide, base prominently swollen 2. **H. mesembryanthema**
- 1: Prostrate to trailing perennial herbs, young branches pubescent; stamens 5..... 3. **H. pentandra**

1. **Hemichroa diandra** R.Br., *Prodr.* 409 (1810) — *Polycnemum diandrum* (R.Br.) F.Muell., *J. Bot.* 15: 276 (1877). — **Illustr.:** *Fl. S. Austral.* 1: 320, fig. 183 (1986); *Fl. Victoria* 3: 204, fig. 36C–D (1996); *Fl. Central Austral.* 85, fig. 104 (1981).

Dense low, decumbent to ascending shrub or subshrub to 50 cm high and up to 100 cm wide; stems glabrous or minutely papillose; leaves alternate, 3–20 (–25) × 1–3 mm often uncinatate at the tip, rarely papillose, bright green to red. **Inflorescence** of solitary, axillary flowers; bracts alternate; at flowering similar to leaves, basal adaxial surface concave, 3–9.5 × 1.2–2.5 mm; at fruiting becoming slightly enlarged, erect to spreading, free part 4.8–11 × 1.7–2.7 mm, base swollen; bracteoles lanceolate to ovate, 1.8–3.2 × 0.6–1.8 mm, acute, white; tepals narrow-ovate, 2–5 × 0.6–2.2 mm, acute, 1-nerved, pink or white; stamens 2, united in the lower 1/3 and adpressed on one side of the ovary, pink to red; style shortly notched at the summit. **Fruit** persistent in bract axils; seed obovoid, brown. **Mallee hemichroa. Fig. 7D–F, Pl. 4A–B.**

S.A.: .NW, LE, NU, GT, FR, EP, NL, YP, SL, KI; W.A.; NT; N.S.W.; Vic. Grows with samphire species in coastal

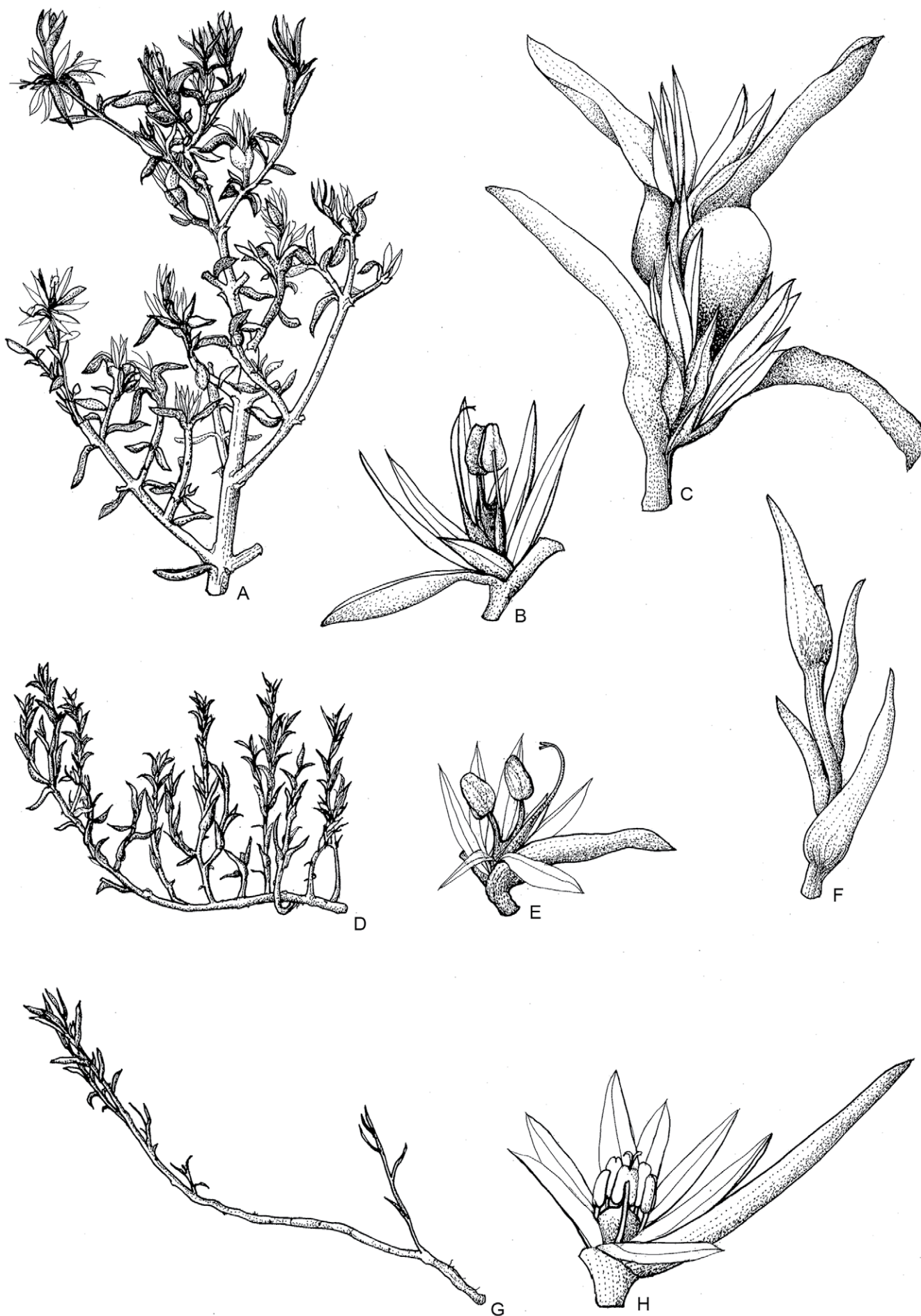


Fig. 7. A–C, *Hemichroa mesembyanthera*: A, habit; B, flower; C, flowering shoot. **D–F, *H. diandra*:** D, habit; E, flower; F, shoot. **G–H, *H. pentandra*:** G, twig; H, flower. Illustrations by D. Boyer for *Flora of Australia*, reproduced with permission from ABRIS.

salt marshes and mangrove swamps, also on limestone cliffs. In inland areas it grows on salt-pan and lake margins in sandy gypseous soils. Flowers: Nov.–Feb. (Jul. in other states); fruits persist into next flowering season.

Plants in north-west coastal Western Australia tend to have opposite to sub-opposite leaves and bracts. Collected from Kangaroo Island (KI) in 1883 but has not been seen since.

2. **Hemichroa mesembryanthema** F.Muell., *Fragm.* 8: 38 (1873). — *Polycnemum mesembryanthemum* (F.Muell.) F.Muell., *J. Bot.* 15: 276 (1877). — **Illustr.:** R.J.Chinnock & F.J.Badman, *Muelleria* 6(3): 207, fig. 2 (1986).

Erect, bushy, woody shrub 50–150 cm high; stems divaricate, finely striate, glabrous or papillose, often somewhat spine-tipped; leaves opposite, 6–20 × 1.5–4 mm, grey-green. **Inflorescence** of solitary, axillary flowers; bracts opposite to sub-opposite; at flowering similar to leaves, basal adaxial surface concave, 7–12 × 2–3.5 mm; at fruiting enlarged and thickened, spreading to reflexed, the free part 10–22 × 3–11 mm, base prominently gibbous, brown; bracteoles lanceolate, 3.5–7 mm × 1–2.3 mm, acuminate, white; tepals lanceolate, 6–10 × 1.5–3.5 mm, acuminate, 1-nerved, white; stamens 2, united in the lower 2/3 and adpressed, on one side of the ovary, pink to red; style notched. **Fruit** persistent in bract axils; seed pyriform to obovoid, light-brown. **Fig. 7A–C, Pl. 4C–E.**

S.A.: LE; Qld. Grows with samphire and chenopod species on low-lying flats, mound springs, or along drainage systems in saline clay loam. Flowers: Mar.–Apr., fruit persists into next flowering season.

Originally collected by Ernest Giles in the late 1800's and not rediscovered until 1984 (Chinnock & Badman, 1986). Plants from Queensland tend to have longer (up to 30 mm) and narrower leaves, longer (up to 18 mm) and narrower flowering bracts and longer (up to 30.5 mm) and narrower fruiting bracts.

(Vulnerable status in S.A.)

3. **Hemichroa pentandra** R.Br., *Prodr.* 409 (1810). — *Polycnemum pentandrum* (R.Br.) F.Muell., *Pap. & Proc. Roy. Soc. Tasmania* 1877: 15 (1878). — **Illustr.:** F.Mueller, *The Native Plants of Victoria Succinctly Defined* 162, fig. 36 (1879), as *Polycnemum pentandrum*; *Stud. Fl. Tas.* 3: 576, fig. 122 (1967), in *Chenopodiaceae*; *Fl. Victoria* 3: 204, fig. 36A–B (1996).

Prostrate to trailing perennial herb, stems ascending up to 10 cm high; stems pubescent towards the tip, smooth; leaves alternate, 4–18 × 1–4 mm, light to bright green. **Inflorescence** of solitary, axillary flowers; bracts similar to leaves, 3.5–1.7 × 1–3.5 mm, no marked change at fruiting; bracteoles ovate, 2–2.6 × 1.2–1.8 mm, acute, white; tepals lanceolate to ovate, 2.5–4 mm × 1.2–2.5 mm, acute, 3-nerved, white or pale pink; stamens 5, united at the base in a cup around the ovary, pink; style bifid or rarely divided halfway to ovary. **Fruit** persistent in bract axils; seed lenticular, deep red to black, shiny. **Trailing hemichroa. Fig. 7G–H, Pl. 4F.**

S.A.: EP, MU, YP, SL, KI, SE; W.A.; Vic.; Tas. Grows on saltpan margins and banks of tidal rivers with *Melaleuca* and samphire species. Flowers: and fruits: Oct.–Mar.

7. Ptilotus R.Br.

Prodr. 415 (1810).

(Greek *ptilotos*, feathered or winged.)

Prepared by T.R. Lally

Trichinium R.Br., *Prodr.* 414 (1810).

Shrubs, undershrubs or herbs, perennials or ephemeral annuals; vegetative parts hairy, glabrescent or glabrous; leaves alternate, cauline or cauline and basal, margins flat or undulate, leaf bases attenuate, long-attenuate, cuneate or truncate, sessile or rarely petiolate. **Inflorescences** sessile or pedunculate, usually terminal or pseudo-terminal, less commonly axillary, globular, ovoid, obloid, hemispherical or cylindrical spikes, or rarely compound corymbs; flowers bisexual; bract and pair of bracteoles subtending each perianth, ovate and broadly concave, scarious or hyaline, milky white or silvery-white, often also brown or golden-brown in part or entirely, variously hairy, glabrescent or glabrous; perianths of 5 linear, sublinear or narrowly-ovate tepals, white or silver, cream, green, yellow, mauve, purple, pink or red; tepals basally ribbed, thickened or keeled, shortly connate to a narrowed, hardened, basal tube, or free to base, hairs on outer surface of tepals various; outer pair of tepals usually longer than inner three, glabrous inside; inner tepals with hairs along the margins inside, usually basally, covering the inner floral organs, or rarely glabrous; stamens

5, either fertile or sterile (staminodes), filaments fused into a short, membranous cup, attached to the perianth tube, the cup rim sometimes with interstaminal hairs, teeth, fringes or ciliate lobes; anthers 2-celled; ovary unilocular and uniovulate, variously hairy, or glabrous, subsessile or stalked, the stipe as long as the perianth tube when present; style slender, straight or often sinuate, glabrous or occasionally hairy, attached centrally or eccentrically at ovary summit; stigma capitate, undivided. **Fruit** single seeded, wall membranous; seed globose or ovoid, glabrous, dull or shiny, brown, golden-brown or black. **Pussytails, mulla mullas.**

About 100 species in arid, semi-arid, subtropical and tropical regions of Australia, all endemic except one (*P. conicus* R.Br.) extending to southern Malaysia.

Ptilotus leucocoma (Moq.) F.Muell. was recorded by Black in the second edition of *Fl. S. Austral.* (1948), but does not occur in S.A.

Reference: Bean (2008), Burbidge (1972), Lally (2008), Lally & Barker (2010).

1. Inflorescences mostly in the axils of fully-developed leaves
 2. Perianth 4.5–6 mm long
 3. Perianth 4.9–6 mm long; bracteoles 6–7.5 mm long, enclosing the perianth 14. **P. latifolius**
 - 3: Perianth 4.5–4.9 mm long; bracteoles 2.8–3.5 mm long, shorter than the perianth 1. **P. aervoides**
 - 2: Perianth 2–4.2 mm long
 4. Bract and bracteoles 3–4.2 mm long, enclosing the perianth 7. **P. decipiens**
 - 4: Bract and bracteoles 1–1.7 mm long, shorter than the perianth 16. **P. murrayi**
- 1: Inflorescences mostly terminal, or pseudo-terminal (borne in the axils of reduced upper leaves)
 5. Perianth 18–30 mm long
 6. Outer tepal surface with short, verticillate hairs beneath long, nodose hairs 17. **P. nobilis**
 - 6: Outer tepal surface with short, simple or nodose hairs beneath long, nodose hairs
 7. Stems and fully expanded (mature) leaves persistently (usually densely) hairy 6. **P. clementii**
 - 7: Stems and fully expanded (mature) leaves glabrous or glabrescent
 8. Herb to 20 cm high; bract and bracteoles (8-)9–13 mm long; perianth 18–25 mm long; Kangaroo Island and lower Eyre Peninsula only 4. **P. beckerianus**
 - 8: Herb to 80 cm high; bract and bracteoles 6–10 mm long; perianth 20–30 mm long; widespread 15. **P. macrocephalus**
 - 5: Perianth < 18 mm long
 9. Fully expanded (mature) leaves with scattered hairs, or glabrous
 10. Perianth 9–18 mm long
 11. Basal leaves long-attenuate proximally, narrowed basal portion more than half the length of upper wider portion, sometimes longer
 12. Stems sprawling
 13. Perianth 7.5–12 mm long; inflorescences usually cylindrical or conical 28. **P. spathulatus**
 - 13: Perianth 13–17 mm long; inflorescences globular, ovoid or hemispherical
 14. Perianth 13–15 mm long, pink or red; tepal hairs not exceeding apices 5. **P. chippendalei**
 - 14: Perianth 15–17 mm long, green, grey or white; tepal hairs equal to or slightly longer than apices 26. **P. seminudus**
 - 12: Stems erect
 15. Outer tepal surface with short, verticillate hairs beneath long nodose hairs
 16. Outer tepal surface with longest hairs to 5 mm long; style 3–4 mm long 2. **P. aristatus** subsp. **aristatus**
 - 16: Outer tepal surface with longest hairs to 10 mm long; style 10–20 mm long 17. **P. nobilis**
 - 15: Outer tepal surface with nodose hairs only

17. Upper portion of outer tepal surface with hairs along midrib only; tepals straight..... 11. **P. gaudichaudii**
- 17: Upper portion of outer tepal surface with hairs covering most of surface; tepals usually curved upwards at anthesis 9. **P. erubescens**
- 11: Basal leaves absent, obscure, or with narrowed basal portion less than half the length of upper wider portion
18. Inflorescences cylindrical, most more than 2 times as long as wide, to 12 cm long; leaves to 140 mm long 20. **P. polystachyus**
- 18: Inflorescences various, if cylindrical, less than 1.5 times long as wide, to 5 cm long; leaves to 75 mm long
19. Fully expanded (mature) leaves attenuate or cuneate basally, most leaves usually > 2 mm wide
20. Stems and leaves glabrous 30. **P. whitei**
- 20: Stems and leaves hairy
21. Tepal hairs exceeding apices by 1–2 mm; prostrate, decumbent, lax shrubs 29. **P. symonii**
- 21: Tepal hairs not exceeding apices; erect, often woody shrubs
22. Outer tepal surface with nodose hairs only along the midrib distally..... 11. **P. gaudichaudii**
- 22: Outer tepal surface with short, verticillate hairs beneath long, nodose hairs, covering most of surface
23. Bract and bracteoles ≥ 5 mm long, apices aristate; perianth (9–) 12–17.5 mm long; style ≤ 4 mm long..... 2. **P. aristatus** subsp. **aristatus**
- 23: Bract and bracteoles < 5 mm long, apices mucronate; perianth 9–13 mm long; style 6–7.5 mm long..... 23. **P. remotiflorus**
- 19: Fully expanded (mature) leaves truncate basally, leaves ≤ 2 mm wide
24. Leaves linear, to 60 mm long; perianth green or greenish-white..... 10. **P. fusiformis**
- 24: Leaves ovate or obovate, to 5.5 (–7) mm long; perianth pink, purple or purplish-pink
25. Stems and leaves glaucous (new growth); bract (3.2–) 4.5–6 mm long, equal length to bracteoles 21. **P. propinquus**
- 25: Stems and leaves not glaucous; bract 3–3.5 mm long, shorter than bracteoles 19. **P. parvifolius**
- 10: Perianth < 9 mm long
26. Perianth ≤ 7 mm long
27. Outer tepal surface with short, verticillate hairs beneath long, nodose or subverticillate hairs; bract < 2 mm long..... 8. **P. disparilis**
- 27: Outer tepal surface with long, simple, nodose or subverticillate hairs only; bract 2.5–4 mm long
28. Bracteoles 6–7.5 mm long, enclosing the perianth; outer tepal surface with hairs to 6 mm long, attached basally, matted in at least the lower two thirds of perianth..... 14. **P. latifolius**
- 28: Bracteoles 2.4–4.3 mm long, shorter than the perianth; outer tepal surface with hairs not as above 25. **P. schwartzii**
- 26: Perianth > 7 mm long
29. Outer tepal surface with short, verticillate hairs beneath long, nodose or subverticillate hairs; bract ≥ 4.5 mm long 28. **P. spathulatus**
- 29: Outer tepal surface with nodose or subverticillate hairs only; bract < 4.5 mm long

30. Upper portion of outer tepal surface with hairs only along the midrib; tepals straight; herbaceous 11. **P. gaudichaudii**
- 30: Upper portion of outer tepal surface with hairs covering most of surface; tepals usually splayed outwards and reflexed at anthesis; woody shrub .. 3. **P. barkeri**
- 9: Fully expanded (mature) leaves conspicuously hairy, at least on lower surface
31. Perianth 9.5–18 mm long
32. Outer tepal surface with short, verticillate hairs beneath long, nodose or subverticillate hairs; style 6.5–8 mm long, glabrous 27. **P. sessilifolius**
- 32: Outer tepal surface with long, nodose or subverticillate hairs only; style 7.5–12 mm long, hairy 20. **P. polystachyus**
- 31: Perianth \leq 9.5 mm long
33. Outer tepal surface with short, verticillate hairs beneath long, nodose or subverticillate hairs
34. Perianth 4–6.5 mm long; outer tepal surface without obvious hairs on upper half 24. **P. robynsianus**
- 34: Perianth 6–10 mm long; outer tepal surface with hairs on upper half
35. Peduncles branching, each 3–30 mm long, often giving rise to a corymbose conflorescence; lower leaves with moderate to dense short hairs; bract and bracteoles $<$ 5.5 mm long 18. **P. obovatus**
- 35: Peduncles not branching, each 0–3 mm long, with inflorescences scattered along branchlets; lower leaves with very dense longer hairs; bract and bracteoles \geq 5.5 mm long 13. **P. incanus**
- 33: Outer tepal surface with long, nodose or subverticillate hairs only
36. Perianth 6.5–8 mm long 12. **P. helipteroides**
- 36: Perianth 4.8–6.2 mm long 22. **P. pseudohelipteroides**

1. **Ptilotus aervoides** (F.Muell.) F.Muell., *Fragm.* 6: 231 (1868). — *Trichinium aervoides* F.Muell., *Fragm.* 3: 123 (1862). — **Illustr.:** A.A.Mitch. & D.G.Wilcox, *Arid Shrubl. Pl. W. Austral.*, ed. 2, 60–61 (1994).

Prostrate herbs to 4 cm high \times 70 cm wide; stems sometimes reddish, densely hairy, glabrescent with age; leaves obovate, ovate or subspathulate, sparsely hairy, glabrescent with age, basal leaves to 60 \times 20 mm, bases long-attenuate, equal to or longer than upper expanded portion, cauline leaves 50 \times 16 mm, bases usually attenuate. **Inflorescences** mostly axillary, \pm globose, ovoid or cylindrical, to 3 cm long, to 40-flowered; bract 3–4 mm long, apex acuminate; bracteoles 2.8–3.5 mm long, apices acute or \pm mucronate; perianth 4.5–4.9 mm long, green or cream to brown, apices sometimes purplish; tepals with dense, nodose to subverticillate hairs to 0.5 mm long marginally, and to 2.5 mm long medially, upper portion with scattered to moderately dense, verticillate hairs to 0.5 mm long, or sometimes glabrous, apices acuminate to \pm aristate; fertile stamens 2 or 3, filaments to 2 mm long, staminodes 2 or 3; ovary densely hairy; style 0.4–0.5 mm long, central. **Mat mulla mulla.**

S.A.: NW; W.A.; N.T. Occurs in clay or ironstone gibber, on Mitchell grass stony plains. Flowers: Apr.–Oct.

2. **Ptilotus aristatus** Benl subsp. **aristatus**, *J. Adelaide Bot. Gard.* 1: 204 (1979). — *P. eichlerianus* Benl, *Mitt. Bot. Staatssamml. München* 7: 310 (1970); *P. aristatus* var. *eichlerianus* (Benl) Benl & H.Eichler, *Muelleria* 5: 259 (1984). *P. blackii* auct. non Benl: Benl, *J. Adelaide Bot. Gard.* 1: 204 (1979); Benl in Jessop & Toelken (eds), *Fl. S. Austral.* 1: 324 (1986), partly. — **Illustr.:** Benl, *Trans. Roy. Soc. South Australia* 88: 54, fig. 1 (1964), as *P. blackii*.

Erect herbs to 40 cm high; stems and leaves hairy, glabrescent with age; leaves spathulate, obovate, ovate or elliptic, basal leaves to 110 \times 25 mm, bases long-attenuate, equal to or longer than upper expanded portion, cauline leaves to 52 \times 14 mm, bases cuneate or attenuate. **Inflorescences** terminal, hemispherical, ovoid, or rarely obovoid or \pm cylindrical, to 6 cm long, to 80-flowered; bract 5–8.5 mm long; bracteoles 6–8 mm long, both with apices aristate; perianth (9–) 12–17.5 mm long, pink to purplish-pink; tepals with sparse to dense, nodose or subverticillate hairs to 5 mm long, shortening near apex, sparse to dense, verticillate hairs to 0.8 mm long beneath, apices erose, obtuse or truncate; fertile stamens 2 (rarely 3), filaments to 6.5 mm long, staminodes 2 or 3; ovary sparsely hairy apically, or rarely glabrous; style (3–) 3.2–4 mm long, eccentric. **Fig. 9A–B, Pl. 5A.**

S.A.: LE; N.T. Occurs in loam or clay textured soils, with open vegetation on gibber plains or slopes, sometimes extending into adjacent floodouts. Flowers: mainly Jul.–Sep., also recorded other months throughout the year.

3. **Ptilotus barkeri** Benl, *J. Adelaide Bot. Gard.* 11: 195 (1989). — **Illustr.:** Benl, *J. Adelaide Bot. Gard.* 11: 196, fig. 1 (1989).

Erect shrubs to 40 cm high; stems hairy, glabrescent with age; leaves ovate or obovate, glabrous, or with some scattered hairs basally or marginally, to 10 × 4 mm, bases attenuate. **Inflorescences** terminal or pseudo-terminal, ± hemispherical or ovoid, to 3 cm long, to 35-flowered; bract 2.4–3.2 mm long; bracteoles 2.8–4 mm long, both with apices aristate or ± mucronate; perianth 7.5–8.5 mm long, white, pinkish tinged when fresh, often curved; tepals with dense, nodose hairs to 0.5 mm long on lower half, hairs to 1.5 mm long on remainder, tepals usually recurved at anthesis, apices minutely erose, truncate; fertile stamens 4, filaments to 3.5 mm long, staminode 1; ovary densely hairy; style 2.8–3 mm long, central. **Pl. 5B–D.**

S.A.: LE. Grows in white gypsum or limestone soils on slopes of breakaways with scattered *Acacia* spp., chenopods and herbs. Flowers: May–Aug.

(Rare status in S.A.)

4. **Ptilotus beckerianus** (F.Muell.) F.Muell. ex J.M.Black, *Fl. S. Austral.* 2: 326 (1948). — *Trichinium beckerianum* F.Muell., *Linnaea* 25: 436 (1853); *P. beckeri* F.Muell., *Fragm.* 6: 233 (1868), *nom. illeg.*

Erect herbs to 20 cm high; stems and leaves glabrous; leaves spatulate, obovate or narrowly elliptic, basal leaves to 50 × 10 mm, bases long-attenuate, usually shorter than, or sometimes equal to, upper expanded portion, cauline leaves to 32 × 7 mm, bases attenuate. **Inflorescences** terminal, hemispherical, ovoid, globose or shortly cylindrical, to 9 cm long, to 60-flowered; bract 8–10 mm long; bracteoles 9–13 mm long, both with apices acuminate or apiculate; perianth 18–25 mm long, white or greenish-white, apices pinkish; tepal surface with dense, nodose hairs to 4 mm long on lower third, hairs to 9 mm long on upper two thirds, shortening near apex, with scattered to moderately dense, simple hairs to 1 mm long beneath, apices ± erose, acute or obtuse; fertile stamens 4, filaments to 17 mm long, staminode 1, staminal cup with interstaminal fringed lobes to 0.5 mm long; ovary sparsely hairy apically, or glabrous; style 18–20 mm long, hairy basally, eccentric. **Ironstone mulla mulla. Fig. 8A–C, Pl. 5E.**

S.A.: EP, KI. Occurs in sand, laterite or ironstone gravel, on flats or gentle slopes, or in disturbed, regenerating areas, such as roadsides or mined areas, in open areas of low open woodland or heath communities. Flowers: usually Aug.–Jan.

The restricted distribution and low stature of *P. beckerianus* distinguish it from the similar *P. macrocephalus*.

(Vulnerable status in S.A.)

5. **Ptilotus chippendalei** Benl, *Mitt. Bot. Staatssamml. München* 5: 223 (1964). — **Illustr.:** G.Benl, *Mitt. Bot. Staatssamml. München* 5: 227, fig. A–E (1964).

Prostrate herbs to 7 cm high × 80 cm wide; stems and leaves sparsely hairy, glabrescent with age; basal leaves broadly obovate or elliptic, to 95 × 22 mm, bases long-attenuate, equal to or longer than upper expanded portion, cauline leaves obovate or subspathulate, to 50 × 20 mm, bases attenuate. **Inflorescences** terminal or pseudo-terminal, hemispherical, obloid-ovoid, or ± globose, to 3.5 cm long, to 50-flowered; bract 6–6.8 mm long, apex aristate; bracteoles 6.5–7.5 mm long, apices acuminate to aristate; perianth 13–15 mm long, pink or red; tepals with dense, subverticillate hairs to 2.5 mm long basally, hairs sparse and to 4 mm long on remainder, shortening near apex, dense to sparse, verticillate hairs to 0.3 mm long beneath, apices erose, obtuse; fertile stamens 2, filaments to 5.5 mm long, staminodes 3; ovary hairy apically, style 4.3–5 mm long, eccentric.

S.A.: NW; W.A.; N.T. Occurs in red loam or sandy loam, with open mulga woodland. Flowers: usually Apr.–Sep.

In S.A. the species is only known from a single collection in the extreme north-west corner of the State.

6. **Ptilotus clementii** (Farmer) Benl, *Mitt. Bot. Staatssamml. München* 2: 405 (1958). — *Trichinium clementii* Farmer, *Bull. Herb. Boissier* ser. 2, 5: 1088 (1905). — **Illustr.:** P. Moore, *Guide Pl. Inland Austral.* 254 (2005).

Erect herbs to 75 cm high; stems and leaves densely hairy, hairs persisting with age; leaves obovate, elliptic or narrowly elliptic, to 80 × 14 mm, bases attenuate or long-attenuate. **Inflorescences** terminal, hemispherical, ovoid, globose or shortly cylindrical, to 8 cm long, to 80-flowered; bract 7–10 mm long; bracteoles 6–9.5 mm long, both with apices apiculate or aristate; perianth 18–21 mm long, green, greenish-white or yellowish-green, apices purple; tepal surface with dense, nodose hairs to 3 mm long on lower third, hairs to 7.5 mm long on upper third to two thirds, shortening near apex, with scattered to moderately dense, simple hairs to 0.2 mm long beneath, apices acute; fertile stamens 5, filaments to 15 mm long, staminal cup with interstaminal fringed lobes to 1.5 mm long; ovary glabrous; style 13–17 mm long, central. **Tassel top. Pl. 5F–G.**

S.A.: NW (Tomkinson Ranges); W.A.; N.T.; Qld. Occurs in sands, loams or clays, on stony hills or limestone ridges, in low open woodland or *Triodia* grasslands. Flowers: most months of the year.

7. **Ptilotus decipiens** (Benth.) C.A. Gardn., *Enum. Pl. Austral. Occid.*: 41 (1930) — *Alternanthera decipiens* Benth., *Fl. Austral.* 5: 251 (1870). *Ptilotus hoodii* F. Muell., *Fragm.* 8: 232 (1874).

Low herbs, sometimes semi-prostrate, to 30 cm high; stems and leaves hairy, glabrescent with age; leaves ovate, elliptic or rarely obovate, to 35 × 15 mm, bases cuneate or attenuate. **Inflorescences** mostly axillary, globose or ovoid, to 1.2 cm long, to 30-flowered; bract and bracteoles 3–4.2 mm long, both with apices acuminate to aristate; perianth 2.7–4.2 mm long, cream, white or greenish, apices sometimes purple or reddish; outer pair of tepals with dense, simple or nodose hairs to 2.5 mm long marginally on lower half, medially and distally glabrous, inner tepals hairy distally, glabrous basally, apices acute to acuminate, fertile stamens 5, filaments to 0.5 mm long; ovary glabrous; style 0.2–0.3 mm long, central. **Pl. 5H–J.**

S.A.: NW, LE (N end of Flinder Ranges), GT, FR, EA (Bibliando), EP (Gawler Ranges & Moonabie Range); W.A.; N.T.; Qld. Grows in small patches, on rocky skeletal soils on slopes and crests of quartzite hills or sandstone ridges, with mixed shrubs and herbs. Flowers: all year, but mainly Jul.–Sep.

Easily recognised by its numerous axillary inflorescences, and small, hairy flowers, enclosed in the longer bract and bracteoles.

8. **Ptilotus disparilis** Lally, *J. Adelaide Bot. Gard.* 22: 38 (2008). — *P. parvifolius* var. *laetus* auct. non Benl: Benl in Jessop & Toelken, *Fl. S. Austral.* ed. 4, 1: 330 (1986), partly. — **Illustr.:** Lally, *J. Adelaide Bot. Gard.* 22: 39, fig. 1 (2008).

Spinescent, erect shrubs to 30 cm high; stems divaricate, stems and leaves hairy, glabrescent with age; leaves narrowly obovate, elliptic or ovate, to 5.5 × 1 mm, bases truncate. **Inflorescences** terminal or pseudo-terminal, ± obovoid, to 0.5 cm long, to 8-flowered; bract 1–1.5 mm long; bracteoles 2–2.5 mm long, both with apices mucronate; perianth 5.5–6.5 mm long, grey-white or pinkish-purple; tepals with moderately dense, nodose or subverticillate hairs to 1.5 mm long, wavy at apex, equal to or just exceeding apices, with moderately dense, verticillate hairs to 0.1 mm long beneath, often difficult to discern, apices erose, obtuse or acute; fertile stamens 2, filaments to 3 mm long, staminodes 3, staminal cup with interstaminal hairs to 1 mm long; ovary glabrous or sparsely hairy apically; style 2.2–3.5 mm long, eccentric.

S.A.: FR. Recorded in stony brown clay, on rises around saline depressions and podsol breakaways near mine tailings, in low saltbush shrubland. Flowers: mainly Oct.–Apr.

9. **Ptilotus erubescens** Schldtl., *Linnaea* 20: 575 (1847). — *Trichinium erubescens* (Schldtl.) Moq. in A. DC., *Prodr.* 13(2): 293 (1849). *T. linifolium* Cunn. ex Moq. in A. DC., *Prodr.* 13(2): 292 (1849). — **Illustr.:** *Fl. N.S.W.* 1: 259 (1990); *Fl. Victoria* 3: 211, fig. 37M–N (1996).

Erect herbs to 40 cm high; stems and leaves sparsely hairy, glabrescent with age; leaves narrowly elliptic to narrowly obovate, basal leaves to 115 × 4.5 mm, bases long-attenuate, equal to or up to twice as long as upper expanded portion, cauline leaves to 25 × 2 mm, bases attenuate. **Inflorescences** terminal, ovoid or ± hemispherical, to 4 cm long, to 30-flowered; bract (5–) 7–9.8 mm long; bracteoles (5–) 6.5–9 mm long, both with apices acuminate-aristate; perianth 12–17 mm long, curved upwards at anthesis, white or greyish, tinged pink or purple; tepals with dense, nodose hairs to 1.2 mm on lower half, to 5 mm long on upper half, shortening near apex, apices erose,

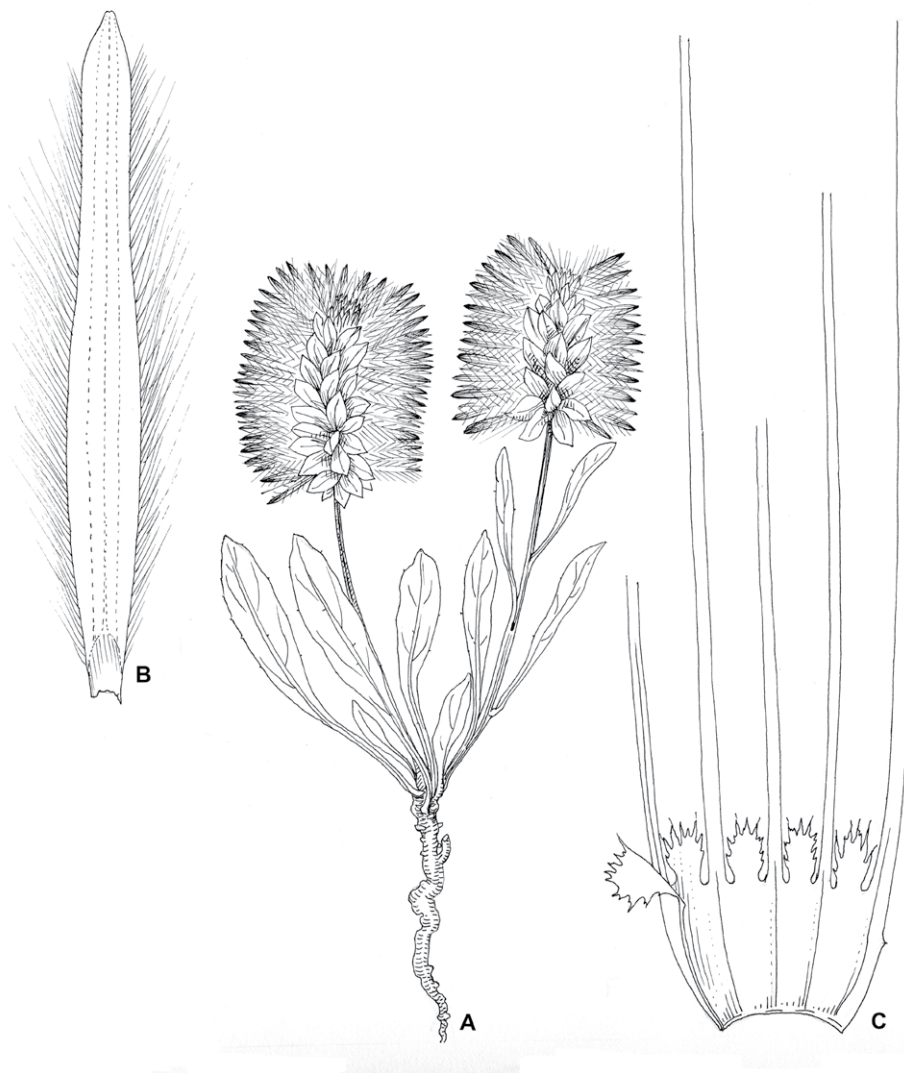


Fig. 8. A–C, *Ptilotus beckerianus*: **A**, plant; **B**, perianth-segment; **C**, staminal cup. Illustration by L. Dutkiewicz, from *Fl. S. Australia* 1:323, Fig. 184 (1986).

truncate or obtuse to acute; fertile stamens 4, filaments to 6.5 mm long, staminode 1; ovary hairy apically; style 4–5 mm long, \pm central. **Hairyheads, hairytails. Pl. 5K–L.**

S.A.: FR (Tarcowie hills), NL, MU (eastern Mt Lofty Ranges), SL, SE; N.S.W.; Vic. Grows in loamy, often rocky soils, on seasonally moist hills, flats or depressions, supporting grassland and low woodland communities. Flowers: mainly Nov.–Feb.

(Rare status in S.A.)

10. ***Ptilotus fusiformis*** (R.Br.) Poir.in Lam., *Encycl. Suppl.* 4: 619 (1816). — *Trichinium fusiforme* R.Br., *Prodr.* 415 (1810); *T. fusiforme* var. *typicum* Domin, *Biblioth. Bot.* 89: 82 (1921), *nom. inval.* — **Illustr.:** *Fl. Kimberley Reg.* 127, fig. 32E (1992); P.Moore, *Guide Pl. Inland Austral.* 256 (2005).

Erect herbs to 75 cm high; stems and leaves glabrous or sparsely hairy; leaves linear, to 60 \times 1 mm, bases truncate. **Inflorescences** terminal, globose or shortly cylindrical, to 3 cm long, to 40-flowered; bract 1.5–2.5 mm long, apex acute; bracteoles 3.5–4.5 (–5.5) mm long, apices obtuse; perianth 10.5–13 mm long, green or greenish-white; tepals with dense, nodose hairs to 4 mm long, mainly on lower third, hairs to 6 mm long marginally in upper portion, shortening near apex, medially glabrescent, apices acute; fertile stamens 4, filaments to 8.5 mm long, staminode 1, staminal cup with dense interstaminal hairs to 2 mm long; ovary hairy apically; style 6–11.5 mm long, eccentric. **Fig. 10.**

S.A.: LE (Strzelecki overflow); W.A.; N.T.; Qld. Occurs in flooded sandy loam, by lignum swamp.

In S.A. known only from a single collection, occurring far south of its present known range.

11. **Ptilotus gaudichaudii** (Steud.) J.M.Black, *Trans. Roy. Soc. South Australia* 69: 309 (1945). — *Trichinium gaudichaudii* Steud., *Nom. Bot.* ed. 2, 2: 700 (1841); *T. corymbosum* Gaudich., *Voy. Uranie, Bot.* 444 (1829), *nom. illeg.*

Erect herbs to 70 cm high; stems and leaves sparsely hairy; leaves narrowly obovate or narrowly elliptic, rarely subspathulate or ovate, basal leaves usually withered and senescent by anthesis, to 65 × 8 mm long, bases long-attenuate, shorter than or equal to upper expanded portion, cauline leaves to 47 × 5 mm long, bases cuneate or attenuate. **Inflorescences** terminal or pseudo-terminal, globose, shortly cylindrical, or hemispherical, to 3 cm long, to 35-flowered; bract 2.7–5 mm long, bracteoles 3–5.4 mm long, both with apices apiculate; perianth 7.5–15 mm long, green, yellow or white, sometimes reddish; tepals with nodose hairs to 3.5 mm long basally, remainder with moderately dense, nodose hairs to 1 mm long medially, forming two comb-like rows, apices acute; fertile stamens 3 or 4, filaments to 10 mm long, staminodes 1 or rarely 2, staminal cup with interstaminal fimbriate hairs to 0.3 mm high; ovary hairy or glabrous apically; style 4–10.5 mm long, eccentric. **Paper foxtail.**

Two subspecies are recognised in South Australia.

1. Perianth 10–15 mm long; style 7–10.5 mm long 11a. **P. gaudichaudii** subsp. **gaudichaudii**
1. Perianth 7.5–9 mm long; style 4.5–5 mm long 11b. **P. gaudichaudii** subsp. **parviflorus**

- 11a. **Ptilotus gaudichaudii** (Steud.) J.M.Black subsp. **gaudichaudii** — **Illustr.:** P.Moore, *Guide Pl. Inland Austral.* 256 (2005).

Inflorescences to 3 cm long; bract 4–5 mm long; bracteoles 4.5–5.2 mm long; perianth 10–15 mm long; staminal filaments 8.5–10 mm long; style 7–10.5 mm long.

S.A.: NW, LE, NU, GT, EP; W.A.; N.T. Occurs on dunes, plains or creek banks, in red or brown sand, loam or clay-loam, in open mulga (*Acacia aneura*) woodland, chenopod shrubland or *Triodia* communities. Flowers: mainly Apr.–Nov.

- 11b. **Ptilotus gaudichaudii** subsp. **parviflorus** (Benth.) Lally, *J. Adelaide Bot. Gard.* 24: 48 (2010). — *Trichinium corymbosum* var. *parviflorum* Benth., *Fl. Austral.* 5:226 (1870); *Hemisteirus psilotrichoides* F.Muell., *Linnaea* 25: 435 (1852); *Ptilotus hemisteirus* F.Muell., *Fragm.* 4: 90 (1864), *nom. illeg.*; *P. gaudichaudii* var. *parviflorus* (Benth.) Benl, *Mitt. Bot. Staatssamml. München* 3: 36 (1959). — **Illustr.:** *Fl. N.S.W.* 1: 259 (1990).

Inflorescences to 2 cm long; bract 2.7–4.2 mm long; bracteoles 3–5.4 mm long; perianth 7.5–9 mm long; staminal filaments 4.5–5 mm long; style 4–5.3 mm long.

S.A.: FR (near Moro Gorge), EA, MU; N.T.; Qld; N.S.W. Grows on flats or low rises in red sand, loam or clay-loam, sometimes with stones or gravel particles, growing in open eucalypt and mulga (*Acacia aneura*) woodland or shrubland, grassland or herbfields. Flowers: mainly Aug.–Oct.

12. **Ptilotus helipteroides** (F.Muell.) F.Muell., *Fragm.* 6: 231 (1868). — *Trichinium belipteroides* F.Muell., *Fragm.* 3: 122 (1862). *T. brachytrichum* F.Muell., *Fragm.* 3: 161 (1862). — **Illustr.:** P.Moore, *Guide Pl. Inland Australia* 257 (2005).

Erect herbs to 40 cm high; stems and leaves hairy, hairs persisting with age; leaves linear or narrowly obovate, ovate or elliptic, to 45 × 8 mm, bases cuneate or attenuate. **Inflorescences** terminal or pseudo-terminal, ovoid or globose to subglobose, to 3 cm long, to 55-flowered; bract 6–8 mm long, apex apiculate to aristate; bracteoles 3.2–4 mm long, apices apiculate; perianth 6.5–8 mm long, purple, mauve or pink; tepals with moderately dense, simple or ± nodose hairs to 1.5 mm long basally, nodose hairs to 2 mm long, mostly marginally and simple hairs to 0.5 mm long medially, apices erose, truncate or acute; fertile stamens 4, filaments to 3 mm long, staminode 1, staminal cup with interstaminal ciliate or fimbriate lobes to 1 mm long, staminode basally merged with lobes to 1.8 mm long; ovary hairy apically; style 2–3.2 mm long, central. **Hairy mulla mulla, woolly tails.**

S.A.: NW, LE, EA; W.A.; N.T.; Qld. Grows in red sand on stony or lateritic flats and low slopes, with open mulga scrub or scattered eucalyptus woodland, over tussocky spinifex grassland. Flowers: throughout the year, most frequently Aug.–Nov.

Differs from the similar *P. pseudobelipteroides* by its longer perianths, bracts and styles.



Fig. 9. A–B, *Ptilotus aristatus* subsp. *aristatus*: A, twig; B, perianth-segment. C–D, *Ptilotus latifolius*: C, twig; D, staminal cup. Illustrations by L. Dutkiewicz, from *Fl. S. Australia* 1: 325, Fig. 185 (1986).

13. ***Ptilotus incanus*** (R.Br.) Poir. ex F.Muell., *Syst. Census Austral. Pl.* 28 (1882). — *Trichinium incanum* R.Br., *Prodr.* 415 (1810). *T. gnaphalodes* Cunn. ex Moq. in A. DC., *Prodr.* 13, 2: 285 (1849). *T. incanum* var. *parviflorum* Ewart & J.White, *Proc. Roy. Soc. Victoria* 22: 97 (1909); *P. helmsii* F.Muell. & Tate ex Ewart & J.White, *Proc. Roy. Soc. Victoria* 22: 97 (1909), *nom. inval., pro syn.*; *P. incanus* var. *parviflorus* (Ewart & J.White) Benl, *Mitt. Bot. Staatssamml. München* 3: 38 (1959). *P. obovatus* var. *griseus* Benl, *Trans. Roy. Soc. South Australia* 88: 58 (1964). — **Illustr.**: *Fl. Kimberley Reg.* 129, fig. 33A (1992).

Erect shrubs or herbs to 60 cm high; stems and leaves densely hairy, hairs persisting with age; leaves elliptic or obovate, to 65 × 20 mm, bases attenuate. **Inflorescences** terminal, pseudo-terminal, or rarely ± axillary, ovoid, shortly cylindrical or hemispherical, to 1.5 cm long, to 35-flowered, pedunculate, peduncles not branching, 0–3 mm long; bract 5.5–6 mm long, apex aristate or acute; bracteoles 5.5–6 mm long, apices aristate; perianth 8.5–9.5 mm long, pink, purple or greenish; tepals with moderately dense, nodose or subverticillate hairs to 1.8 mm long on lower third, hairs to 3.5 mm long on remainder, shortening near apex, with moderately dense, verticillate hairs to 0.4 mm long beneath, apices erose, truncate; fertile stamens usually 3, filaments to 4.2 mm long, staminodes 2; ovary glabrous; style 3–4 mm long, eccentric.

S.A.: NW; W.A.; N.T.; Qld. Occurs on rocky hills and plains, in red sandy soils, with open *Acacia* spp. and eucalypt woodland over chenopods. Flowers: mainly Aug.–Oct., occasionally in other months.

Similar to *P. obovatus*, differing by the inflorescences having non-branching peduncles, the peduncles 3 mm or less long, and the lower leaves with longer, denser hairs.

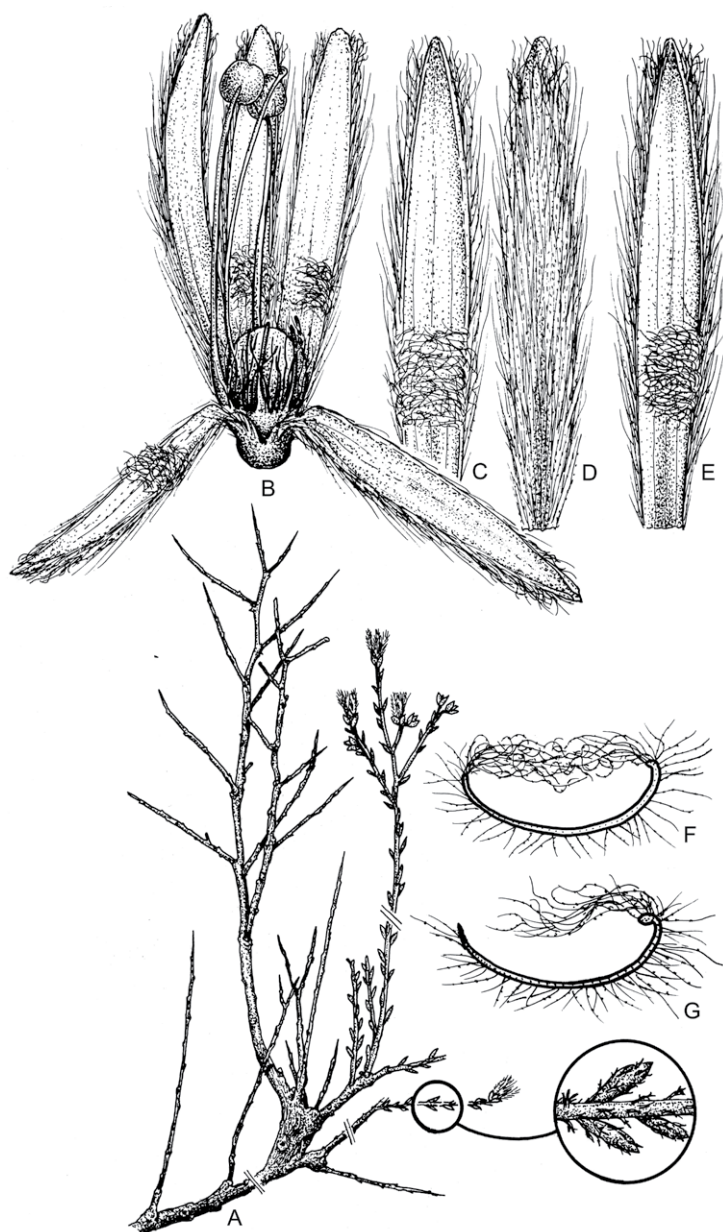


Fig. 10. *Ptilotus disparilis*: A, habit; B, flower, opened out; C, E, inner tepal, outer surface; D, inner tepal, inner surface; F, G, inner tepal, cross section. Illustration by G.R.M. Dashorst, from J. Adelaide Bot. Gard. 22: 39, Fig. 1 (2008).

Erect herbs to 80 cm high; stems and leaves sparsely hairy, glabrescent or glabrous; leaves linear or narrowly elliptic, basal leaves to 160×15 mm, bases long-attenuate, shorter than or sometimes equal to upper expanded portion, cauline leaves to 90×10 mm, bases attenuate. **Inflorescences** terminal, hemispherical, conical or \pm cylindrical, to 15 cm long, to 120-flowered; bract 7–15 mm long, apex acuminate; bracteoles 6–10 mm long, apices rounded, mucronate; perianth 20–30 mm long, green, cream or white, apices pinkish; tepals with moderately dense, simple and nodose hairs to 3 mm long on lower third, hairs to 9 mm long on remainder, shortening near apex, with sparse to moderately dense, simple or \pm nodose hairs to 0.5 mm long beneath, apices acute or obtuse; fertile stamens 4, filaments to 20 mm long, staminode 1, staminal cup with interstaminal hairs to 0.5 mm long, not always obvious; ovary hairy apically; style 17–22 mm long, hairy basally, eccentric. **Green pussytails, featherheads, feathertails, square-headed foxtail.**

S.A.: NW, LE, SE; W.A.; N.T.; Qld; N.S.W.; Vic. Grows mainly in sandy red brown soils, on plains or small rises, associated with woodlands of *Acacia* and *Eucalyptus* spp. Flowers: most of the year, peaking in Jul.–Dec.

Differs from the similar *P. nobilis* by having only simple and nodose hairs on the outer tepals, longer bract and bracteoles, and a hairy style.

14. ***Ptilotus latifolius*** R.Br., *Bot. Sturt's Exped. Australia* 88 (1849). — *Trichinium latifolium* (R.Br.) Ewart & O.B.Davies, *Fl. N. Territory* 100 (1917). — **Illustr.:** *Pl. W. N.S.W.* 287 (1981); *Fl. N.S.W.* 259 (1990); P.Moore, *Guide Pl. Inland Austral.* 257 (2005).

Compact, rounded, or sometimes spindly or straggling, erect or suberect shrubs to 1 m high; stems numerous, tangled, stems and leaves hairy, glabrescent with age; leaves obovate or broadly obovate, spatulate, ovate or rarely narrowly elliptic, to 52 (– 75) \times 25 mm, bases attenuate. **Inflorescences** terminal, pseudo-terminal and axillary, globose, obovoid-ovoid or narrowly cylindrical, to 4 cm long, to 25-flowered; bract 3–4 mm long, apex acuminate-apiculate; bracteoles 6–7.5 mm long, apices acuminate; perianth 4.9–6 mm long, pale-pink or silvery-white, apices pink; tepals with dense, woolly, simple hairs to 6 mm long, attached basally, bundled in lower two thirds of perianth, remainder with sparse, crisped, simple hairs to 3 mm long, apices acuminate; fertile stamens 5, filaments to 1.4 mm long, staminal cup with interstaminal lobes to 0.2 mm long; ovary glabrous; style 0.8–1 mm long, central. **Tangled mulla mulla, white foxtail. Fig. 9C., D.**

S.A.: NW, LE, GT; W.A.; N.T.; Qld; N.S.W. Occurs on red sand dunes, in open hummock grassland, or low heathland. Flowers: all year, especially Jul.–Oct.

Recognisable by the large bracteoles, enclosing the tangled woolly perianths.

15. ***Ptilotus macrocephalus*** (R.Br.) Poir.in Lam., *Encycl. Suppl.* 4: 620 (1816). — *Trichinium macrocephalum* R.Br., *Prodr.* 415 (1810). *T. angustifolium* Moq. in A.DC., *Prodr.* 13(2): 293 (1849); *T. pachcephalum* Moq. in A.DC., *Prodr.* 13(2): 294 (1849); *P. pachcephalus* (Moq.) F.Muell., *Fragm.* 6: 228 (1868). *T. fusiforme* auct. non R.Br.: Lindl. in T.Mitch., *J. Exped. Trop. Austral.* 383 (1848). — **Illustr.:** *Pl. W. N.S.W.* 287 (1981); *Fl. Kimberley Reg.* 131, fig. 34B (1992); *Fl. Victoria* 3: 211, fig. 37G–H (1996).

16. **Ptilotus murrayi** F.Muell., *Fragm.* 3: 145 (1863). — *P. murrayi* var. *major* J.M.Black, *Trans. & Proc. Roy. Soc. South Australia* 47: 368 (1923). — **Illustr.:** *Fl. Kimberley Reg.* 131, fig. 34C (1992).

Prostrate herbs to 15 cm high × 80 cm wide, densely matted; stems and leaves glabrous; leaves ovate, obovate or elliptic, to 30 × 10 mm, bases attenuate or long-attenuate. **Inflorescences** axillary, subglobose, or shortly cylindrical, to 2.5 cm long, to 30-flowered; bract 1–1.5 mm long; bracteoles 1–1.7 mm long, both with apices obtuse; perianth 2–3.8 mm long, white or cream, apices pink to purplish; tepals with dense, tangled, simple or ± nodose hairs to 8 mm long, matted in lower two thirds of tepals, apices obtuse; fertile stamens 5, or rarely 4, filaments to 0.5 mm long; ovary glabrous; style 0.2–0.5 mm long, central.

S.A.: LE; W.A.; Qld. Grows in skeletal or pebbly clayey loam, on interdune swales or drainage channels, with low chenopod shrubland. Flowers: mainly May–Nov.

17. **Ptilotus nobilis** (Lindl.) F.Muell., *Fragm.* 6: 227 (1868). — *Trichinium nobile* Lindl. in T.Mitch., *Three Exped. Austral.* 2: 23 (1838). *P. exaltatus* Nees in Lehm., *Pl. Preiss.* 1: 630 (1845); *T. exaltatum* (Nees) Benth., *Fl. Austral.* 5: 227 (1870).

Erect herbs or shrubs to 1 m high; stems and leaves sparsely hairy, glabrescent with age, often densely hairy when young; leaves obovate, narrowly obovate, narrowly elliptic or spatulate, basal leaves coriaceous, sometimes glaucous, to 110 × 34 mm, bases attenuate or long-attenuate, cauline leaves to 55 × 25 mm, bases cuneate or attenuate. **Inflorescences** terminal, conical, hemispherical, ovoid or cylindrical, to 12 cm long, to 200-flowered; bract 7.5–12 mm long, apex acute or acuminate; bracteoles 7.5–12.5 mm long, apices apiculate or aristulate; perianth 13–27 mm long, purple, pink, pale yellow, green, creamy-white or greenish-white; tepals with sparse to moderately dense, nodose to subverticillate hairs to 10 mm long on upper third, shortening near apex, dense, verticillate hairs to 1 mm long beneath and on remainder, apices minutely erose, obtuse; fertile stamens 2–4, filaments to 19 mm long, staminodes 1–3; ovary glabrous, or hairy apically; style 10.5–20 mm long, eccentric. **Yellow tails, pink mulla mulla, tall mulla mulla, showy foxtail, regal foxtail, broad foxtail.**

The following three subspecies are recognised.

1. Basal leaves 16–34 mm wide, bases attenuate, less than one third length of upper expanded portion; inflorescences usually cylindrical, rarely ovoid..... 17b. **P. nobilis** subsp. **nobilis**
1. Basal leaves 1–15 mm wide, bases long-attenuate, more than half length of upper expanded portion; inflorescences usually hemispherical or ovoid, rarely cylindrical
2. Perianth 21–27 mm long; style > 15 mm long; southern South Australia. 17a. **P. nobilis** subsp. **angustifolius**
2. Perianth 13–22 mm long; style < 15 mm long; eastern South Australia, Victoria, New South Wales and Queensland..... 17c. **P. nobilis** subsp. **semilanatus**

- 17a. **Ptilotus nobilis** subsp. **angustifolius** (Benl) Lally & W.R.Barker, *J. Adelaide Bot. Gard.* 24: 51 (2010). — *P. nobilis* var. *angustifolius* Benl, *Mitt. Bot. Staatsamml. München* 3: 43 (1959). — **Illustr.:** Benl, *Mitt. Bot. Staatsamml. München* 3: 41, fig. 60 (1959).

Herbs or shrubs; basal leaves not coriaceous, not glaucous, 4–15 mm wide, bases long-attenuate, longer than half upper expanded portion. **Inflorescences** usually hemispherical or ovoid, rarely cylindrical, to 3 cm long, to 45-flowered; perianth 21–27 mm long; style 16–17 mm long.

S.A.: FR, EP (Baroota, southern Flinder Ranges), NL, SL. Grows on rocky slopes or hills, occurring with eucalypts. Flowers: Oct.–Nov.

Endemic to the Mt Lofty and southern Flinders Ranges. An early imprecise collection labeled as Yorke Peninsula probably derives from the margins of the northern Mt Lofty Ranges.

- 17b. **Ptilotus nobilis** (Lindl.) F.Muell. subsp. **nobilis** — *Trichinium densum* A.Cunn. ex Moq. in A.DC., *Prodr.* 13(2): 289 (1849). *P. exaltatus* var. *pallidus* Benl, *Mitt. Staatsamml. Bot. München* 15: 164 (1979). — **Illustr.:** *Pl. W. N.S.W.* 285, as *P. exaltatus* var. *exaltatus*, 288, as *P. nobilis* (1981); *Fl. Kimberley Reg.* 127, fig. 32D (1992), as *P. exaltatus*; *Fl. Victoria* 3: 211, fig. 37E–F, as *P. nobilis* var. *nobilis*, O–P, as *P. exaltatus* var. *exaltatus* (1996).

Shrubs, often robust; basal leaves coriaceous, sometimes glaucous, 16–34 mm wide, bases attenuate or long-

attenuate, usually shorter than one third, or rarely equal to, upper expanded portion. **Inflorescences** usually cylindrical, rarely ovoid, to 10 cm long, to 200-flowered; perianth 20–24 mm long; style 18–20 mm long. **Fig. 11A–B.**

S.A.: NW, LE, NU, GT, FR, EA, EP, NL, MU; W.A.; N.T.; Qld; N.S.W.; Vic. Found in a variety of habitats, on hillsides or plains, in red sands, sandy loams or clays, often rocky or stony ground. Occuring in *Acacia* spp. shrubland, mallee-eucalypt woodland, or grassland with chenopods and *Triodia* spp.

- 17c. **Ptilotus nobilis** subsp. **semilanatus** (Lindl.) A.R.Bean, *Telopea* 12: 242 (2008). — *Trichinium semilanatum* Lindl. in T.Mitch., *J. Exped. Trop. Australia* 45 (1848); *P. exaltatus* var. *semilanatus* (Lindl.) Maiden & Betche, *Census N.S.W. Pl.* 72 (1916); *P. semilanatus* (Lindl.) F.Muell. ex J.M.Black, *Fl. S. Austral.*, ed. 2, 2: 327 (1948). *T. pulchellum* A.Cunn. ex Moq. in A.DC., *Prodr.* 13: 290 (1849); *T. setigerum* A.Cunn. ex Moq. in A.DC., *Prodr.* 13: 290 (1849). — **Illustr.:** *Pl. W. N.S.W.* 286 (1981), as *P. exaltatus* var. *semilanatus*; *Fl. N.S.W.* 1: 260 (1990), as *P. semilanatus*; *Fl. Victoria* 3: 211, fig. 37Q–R (1998), as *P. exaltatus* var. *semilanatus*.

Herbs or shrubs; basal leaves not coriaceous, not glaucous, 1–10 mm wide, bases long-attenuate, longer than upper expanded portion. **Inflorescences** usually hemispherical or ovoid, rarely cylindrical spikes to 6 cm long, to 60-flowered; perianth 13–22 mm long; style 10.5–14 mm long. **Hairy tails, lamb tails.**

S.A.: SE; Qld; N.S.W.; Vic. Occurs on rocky hills or plains, in grey or black cracking clay or sandy loam. Associated with *Eucalyptus* or *Allocasuarina* spp. woodland, or grassland with herbs. Flowers: Oct.–Mar.

(Endangered status in S.A.)

18. **Ptilotus obovatus** (Gaudich.) F.Muell., *Fragm.* 6: 228 (1868). — *Trichinium obovatum* Gaudich. in Freyc., *Voy. Uranie, Bot.* 445 (1829); *T. obovatum* Gaudich. var. *obovatum*. *Trichinium lanatum* Lindl. in T.Mitch., *Three Exped. Austral.* 2: 12 (1838) non *T. lanatum* (A.Cunn ex Moq.) Druce, *nom. illeg. nec P. lanatus* A.Cunn. ex Moq.; *Trichinium variable* F.Muell., *Linnaea* 25: 436 (1853); *Ptilotus lindleyi* F.Muell., *Fragm.* 6: 233 (1868). *P. asterolasius* auct. Non F.Muell.: Benl in Jessop & Toelken, *Fl. S. Austral.* 1: 323–324 (1986). — **Illustr.:** *Pl. W. N.S.W.* 288 (1981), as *P. obovatus* var. *obovatus*; *Fl. N.S.W.* 1: 257 (1990); P.Moore, *Guide Pl. Inland Austral.* 259 (2005).

Erect shrubs, sometimes rounded, to 1.2 (–2) m high; stems and leaves densely hairy, hairs persisting with age; leaves obovate, ovate or elliptic, to 45 × 22 mm, bases attenuate or cuneate. **Inflorescences** terminal or pseudo-terminal, hemispherical, ovoid, globose, shortly cylindrical, or often forming loose compound corymbs, to 3 (–5) cm long, to 40-flowered, pedunculate, peduncles 3–30 mm long; bract 1.9–4.5 mm long, apex acute or apiculate; bracteoles 2.5–5.5 mm long, apices acuminate to aristate-apiculate; perianth 6–9.5 mm long, pink, purple or mauve; tepals with moderately dense, nodose or subverticillate hairs to 5 mm long, shortening near apex, with a dense skirt of hairs to 1.5 mm long just below apex, with dense, verticillate hairs to 0.2 mm long beneath, apices erose, truncate or obtuse; fertile stamens 3, filaments to 5.2 mm long, staminodes 2; ovary hairy apically or all over; style 2.5–4.2 (–5) mm long, eccentric. **Silver mulla mulla, silver tails, silverbush, white fox tail, cottonbush, smokebush.**

S.A.: NW, LE, NU, GT, FR, EA, EP, NL, MU, YP; W.A.; N.T.; Qld; N.S.W.; Vic. Inhabiting a wide range of habitats including open flats or plains, rocky slopes or outcrops, creek beds, clay-pan depressions and coastlines. Grows in sandy clay or loams, sometimes with gravels or calcareous pebbles. Occurs in open shrubland, mallee woodland or tussock grassland, with eucalypts, *Casuarina*, *Acacia* and *Dodonaea* spp., and chenopods. Flowers: all year, but mainly June–Nov.

A variable species, especially perianth length, and the degree of hairiness on the vegetative and floral parts.

19. **Ptilotus parvifolius** (F.Muell.) F.Muell., *Fragm.* 6:229 (1868). — *Trichinium parvifolium* F.Muell., *Rep. Pl. Babbage's Exped.* 19 (1859). *P. parvifolius* var. *laetus* auct. non Benl: Benl, *Mitt. Bot. Staatssamml. München* 7: 315 (1970); Benl in Jessop & Toelken, *Fl. S. Austral.* 1: 330 (1986), *partly*. — **Illustr.:** Lally, *J. Adelaide Bot. Gard.* 22: 41, fig. 2 (2008).

Rounded, subspinescent, erect shrubs to 25 cm high; stems divaricate, stems and leaves glabrous or sparsely hairy; leaves ovate or obovate, to 5.5 (–7) × 2 mm, bases truncate. **Inflorescences** terminal, hemispherical, ovoid, globose, or sometimes shortly cylindrical, to 2 (–4) cm long, to 20-flowered; bract 3–3.5 mm long, bracteoles 4–5.3 mm long, both with apices mucronate; perianth 11–12 mm long, pink or pinkish-purple; tepals with dense, nodose or subverticillate hairs to 4 mm long, shortening near apex, with sparse, subverticillate to verticillate hairs

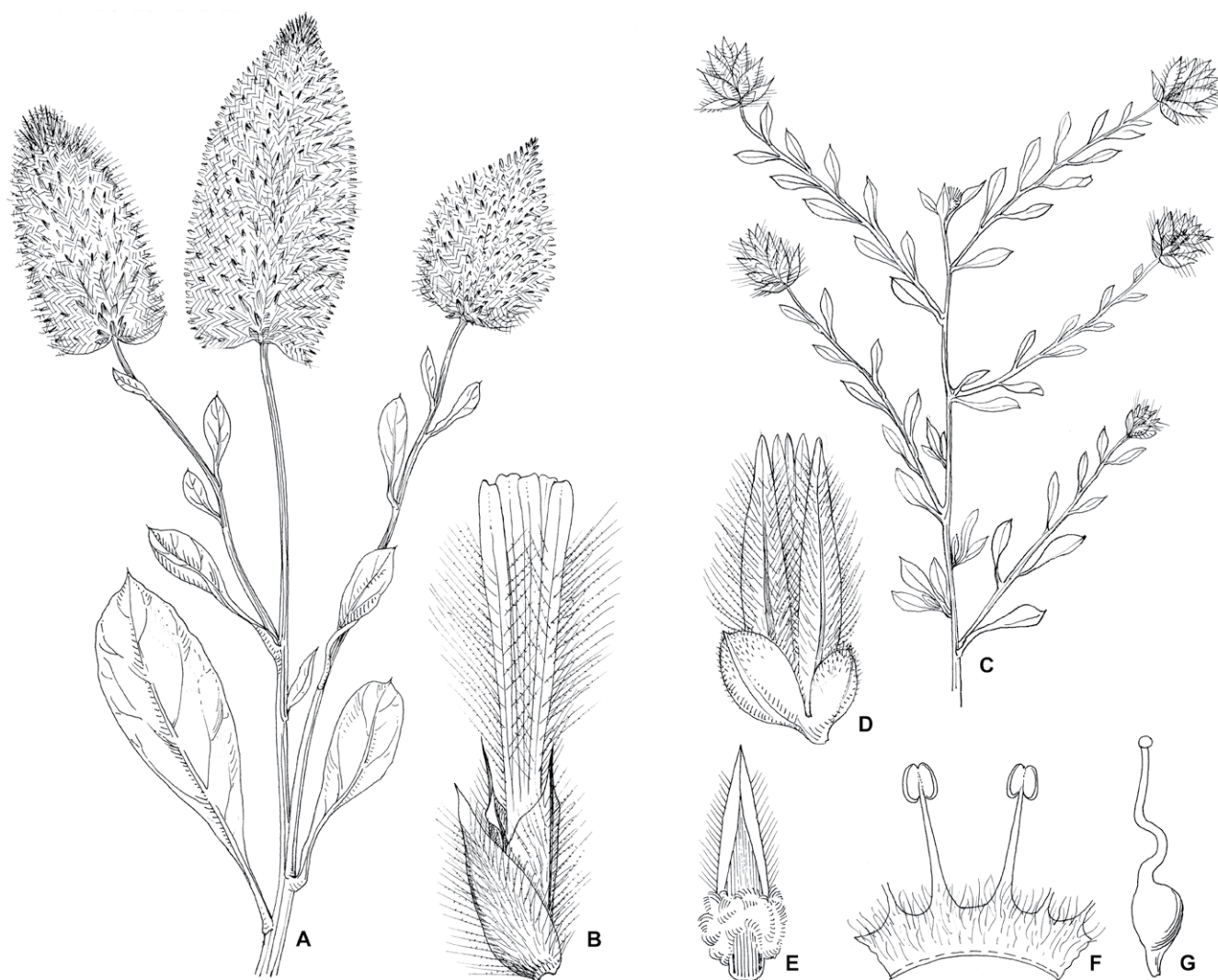


Fig. 11. A–B, *Ptilotus nobilis* subsp. *nobilis*: A, twig; B, flower. **C–G, *Ptilotus whitei*:** C, twig; D, flower; E, inner perianth segment; F, staminal cup; G, pistil. Illustration by L. Dutkiewicz, from *Fl. S. Australia* 1: 329, Fig. 186 (1986).

to 0.3 mm long beneath, apices \pm acute; fertile stamens 2, filaments to 7 mm long, staminodes 3, staminal cup with interstaminal hairs to 0.8 mm long; ovary glabrous, or sparsely hairy apically; style 6–7 mm long, eccentric. **Fig. 12.**

S.A.: GT, LE (Billa Kalina). Grows in red, brown or grey skeletal soils on rocky scree slopes, gibber flats, drainage lines and on edges of salt lakes. Associated with chenopods and herbs in low shrubland. Flowers: Jul.–Jan.

This species is most similar to *P. propinquus*, differing by the non-glaucous leaves and stems, and the bracts shorter than the bracteoles.

20. ***Ptilotus polystachyus*** (Gaudich.) F.Muell., *Fragm.* 6: 230 (1868). — *Trichinium polystachyum* Gaudich. in Freyc., *Voy. Uranie*, Bot. 445 (1829). *T. alopecuroides* Lindl. in T.Mitch., *Three Exped. Australia* 2: 12 (1838); *T. candicans* Nees in Lehm., *Pl. Preiss.* 1: 629 (1845); *T. preissii* Nees in Lehm., *Pl. Preiss.* 1: 629 (1845); *T. pallidum* Moq. in Candolle, *Prodr.* 13(2): 295 (1849); *P. alopecuroides* (Lindl.) F.Muell., *Fragm.* 6: 227 (1868); *T. alopecuroides* Lindl. var. *rubriflorum* J.M.Black, *Trans. & Proc. Roy. Soc. South Australia* 40: 61 (1916); *P. alopecuroides* f. *rubriflorus* (J.M.Black) Benl, *Mitt. Bot. Staatssamml. München* 3: 518 (1960). — **Illustr.:** *Fl. Kimberley Reg.* 131, fig. 34D (1992); P.Moore, *Guide Pl. Inland Austral.* 260 (2005).

Erect shrubs to 1.5 m high; stems and leaves hairy, glabrescent with age; leaves linear, narrowly ovate or obovate, margins often undulate, upper leaves often much reduced, to 140 × 25 mm, bases attenuate. **Inflorescences** terminal or pseudo-terminal, cylindrical, or conical when immature, to 12 cm long, to 180-flowered; bract 3.5–4.8 mm long, apex acute; bracteoles 3.5–5 mm long, apices rounded, minutely apiculate; perianth 9.5–16 mm long, green, cream, yellowish, sometimes with red, pink or mauve tepal apices; tepals with moderately dense, nodose or subverticillate hairs to 4 mm long, shortening near apex, apices obtuse to acute; fertile stamens 3–4, filaments to

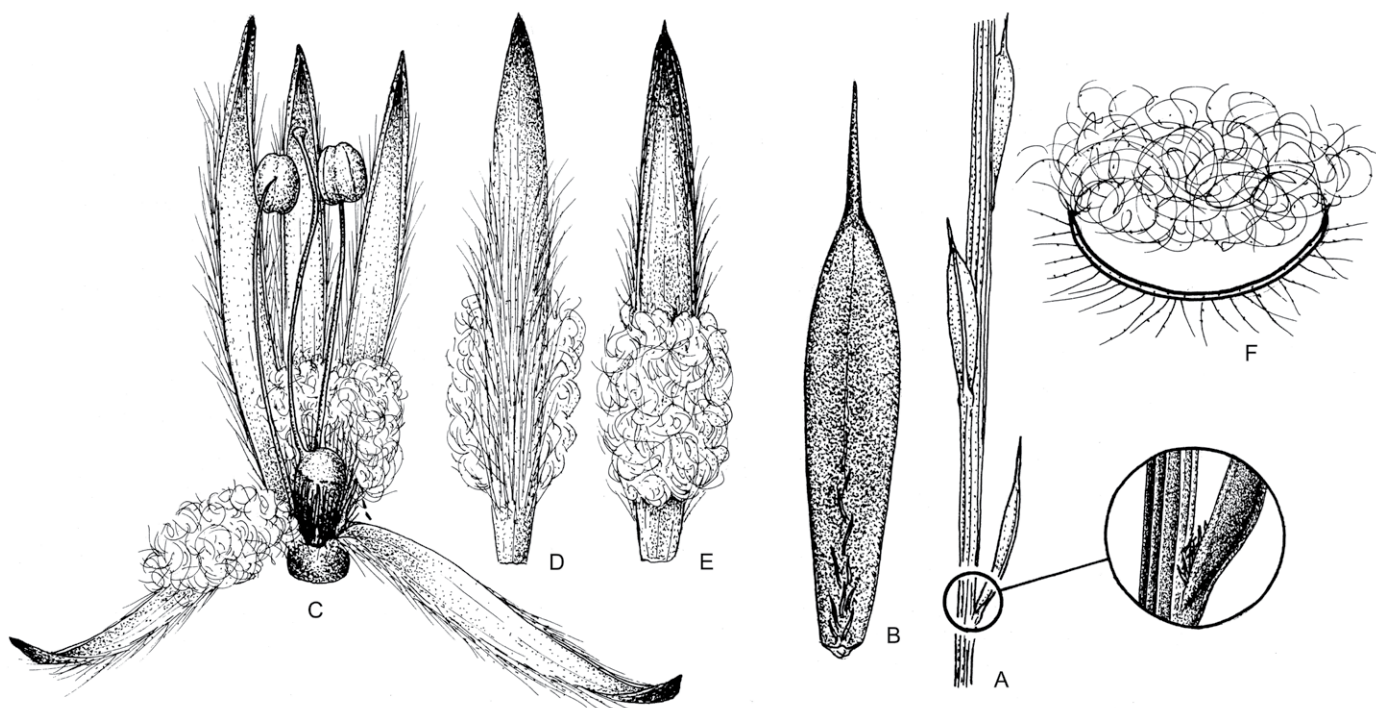


Fig. 12. *Ptilotus parvifolius*: **A**, habit (base of leaf in insert); **B**, leaf; **C**, flower, opened out (hairs removed to show ovary); **D**, inner tepal, outer surface; **E**, inner tepal, inner surface; **F**, inner tepal, cross section. Illustration by G.R.M. Dashorst, from *J. Adelaide Bot. Gard.* 22: 41, Fig. 2 (2008).

10 mm long, staminodes 1–2, staminal cup with interstaminal ciliate lobes or hairs to 0.3 mm long, staminodes basally merged with lobes to 0.8 mm long; ovary glabrous or hairy apically; style 7.5–12 mm long, often exerted from perianth, hairy, eccentric. **Long tails, bottle washers, Prince of Wales feather.**

S.A.: NW, LE, NU, GT, FR, EA, EP, MU, SL; W.A.; N.T.; Qld; N.S.W.; Vic. Grows in sandy loam on plains and dunes, or on hill slopes over calcrete or granite, with low open woodland or hummock grasslands. Flowers: most of the year, particularly May–Nov.

21. ***Ptilotus propinquus*** Lally, *J. Adelaide Bot. Gard.* 22: 40 (2008). — *P. parvifolius* var. *laetus* auct. non Benl: Benl in Jessop & Toelken, *Fl. S. Austral.* 1: 330 (1986), partly. — **Illustr.:** Lally, *J. Adelaide Bot. Gard.* 22: 40, fig. 3 (2008).

Rounded, subspinescent, erect shrubs to 60 cm high; stems divaricate, stems and leaves glabrous or sparsely hairy, glaucous (new growth); leaves ovate or obovate, to 3.5 × 1 mm, bases truncate. **Inflorescences** terminal or pseudo-terminal, hemispherical, cylindrical or ovoid, to 5 cm long, to 50-flowered; bract and bracteoles (3.2–) 4.5–6 mm long, apices aristate to mucronate; perianth 11–12.5 mm long, pink or purple; tepals with moderately dense, nodose or subverticillate hairs to 6 mm long, shortening near apex, with moderately dense, subverticillate to ± verticillate hairs to 0.4 mm long beneath, apices laciniate, acute; fertile stamens 2, filaments to 7 mm long, staminodes 3, staminal cup with interstaminal hairs to 0.5 mm long; ovary glabrous or sparsely hairy apically; style 5.5–6.5 mm long, eccentric.

S.A.: FR, EA (S of Chambers Gorge). Recorded growing in bare shaley clay soil, on ironstone hills, gypseous breakaways or rocky gullies, with chenopods in low open woodland. Flowers: mainly Mar.–Jul., but also recorded for Sep. and Nov.

22. ***Ptilotus pseudohelipteroides*** Benl, *Muelleria* 1: 105 (1959). — *Trichinium helipteroides* F. Muell. var. *minor* J.M.Black, *Fl. S. Austral.* 2: 212 (1924); *P. helipteroides* var. *minor* J.M.Black, *Fl. S. Austral.* ed. 2, 2: 328 (1948), *nom. inval.*; *P. helipteroides* var. *minor* (J.M.Black) H.Eichler, *Suppl. J.M.Black's Fl. S. Austral.* 2: 130 (1965). — **Illustr.:** Benl, *Muelleria* 1: 106, fig. 3c–d (1959).

Erect herbs to 20 cm high; stems and leaves hairy, hairs persisting with age; leaves obovate or narrowly elliptic, to 35 × 8 mm, bases cuneate or attenuate. **Inflorescences** terminal or pseudo-terminal, globose or ovoid, to 1.5 cm long, to 35-flowered; bract 4–5 mm long, apex acuminate to apiculate; bracteoles 3–4.2 mm long, apices acuminate; perianth 4.8–6.2 mm long, pink, purple or greenish; tepals with moderately dense, simple or ± nodose

hairs to 0.5 mm long basally, nodose hairs to 2 mm long, mostly marginally and simple hairs to 0.5 mm long medially, apices erose, truncate or acute; fertile stamens 4, filaments to 2 mm long, staminode 1, staminal cup with interstaminal ciliate to fimbriate lobes to 0.7 mm long, staminode basally merged with lobes to 0.9 mm long; ovary hairy apically; style 1.4–1.7 mm long, central.

S.A.: NW, LE; W.A.; N.T.; Qld. Occurs along rocky creeks or gravelly rises, in red clay, associated with open mulga woodland. Flowers: mainly Apr.–Oct.

Very similar to *P. helipteroides*, being a diminutive form of this species.

23. **Ptilotus remotiflorus** Benl, *Mitt. Bot. Staatssamml. München* 12: 335 (1976). — *P. parvifolius* var. *laetus* Benl, *Mitt. Bot. Staatssamml. München* 7: 315 (1970). *P. sp.* Cordillo Downs (B.Lay 1487) W.R.Barker in W.R.Barker *et al.*, *J. Adelaide Bot. Gard. Suppl.* 1: 47 (2005). — **Illustr.:** Benl, *Mitt. Bot. Staatssamml. München* 12: 337, figs A–G (1976); *Pl. W. N.S.W.* 288 (1981), as *P. parvifolius* var. *laetus*; *Fl. N.S.W.* 1: 259 (1990), as *P. parvifolius* var. *laetus*..

Subspinescent, erect shrubs to 60 cm high; stems divaricate, stems and leaves hairy, glabrescent with age; leaves ovate or narrowly ovate, to 18 × 5 mm, bases attenuate or rarely cuneate. **Inflorescences** terminal or pseudo-terminal, hemispherical or shortly cylindrical, to 3 cm long, to 20-flowered; bract and bracteoles 3–4.5 mm long, apices mucronate; perianth 9–13 mm long, purple or deep pink; tepals with moderately dense, nodose or subverticillate hairs to 5 mm long, shortening before apex, with sparse to moderately dense, subverticillate to verticillate hairs to 0.5 mm long beneath, apices erose, acute; fertile stamens 2, filaments to 7 mm long, staminodes 3, staminal cup with dense interstaminal hairs to 1 mm long; ovary glabrous or sparsely hairy apically; style 6–7.5 mm long, eccentric.

S.A.: LE; Qld; N.S.W. Grows in skeletal soils on hillsides, slopes and gullies of tableland country, in low shrubland. Flowers: mainly June–Nov., occasionally in other months of the year.

24. **Ptilotus robynsianus** Benl, *Bull. Jard. Bot. État. Bruxelles* 27: 365 (1957). — **Illustr.:** G.Benl, *Bull. Jard. Bot. État. Bruxelles* 27: 365, fig. 34 (1957).

Shrubs, sometimes rounded, to 20 cm high; stems and leaves densely hairy, hairs persisting with age; leaves obovate or elliptic, to 20 × 5 mm, bases cuneate or attenuate. **Inflorescences** terminal or pseudo-terminal, an irregular, compound corymb, to 0.7 cm long, to 9-flowered; bract 2.2–3.6 mm long; bracteoles 2.5–3 mm long, both with apices acute; perianth 4.5–6.5 mm long, pink or purple; tepals with sparse, subverticillate or verticillate hairs to 1 mm long basally, remainder glabrous or with some subverticillate or verticillate hairs to 0.6 mm long, with sparse, verticillate hairs to 0.2 mm long beneath, apices erose, acute; fertile stamens 2 or 3, filaments to 3.2 mm long, staminodes 2 or 3, filamentous or tepal-like; ovary hairy apically; style 2.3–2.6 mm long, eccentric.

S.A.: FR; N.T. Flowers: Oct.

Although vegetatively very close to *P. obovatus*, this species differs in its smaller less hairy flowers, and having staminodes which are tepal-like, the flowers often appearing to have up to 8 tepals. Only two collections from the 1950's are known for this species. As it is very similar to the common *P. obovatus*, it may be easily overlooked by collectors.

(Vulnerable status in S.A.)

25. **Ptilotus schwartzii** (F.Muell.) Tate, *Trans. Proc. & Rep. Roy. Soc. South Australia* 12: 82 (1889). — *Ptilotus fraseri* var. *schwartzii* F.Muell., *Proc. Linn. Soc. New South Wales* 3: 163 (1888); *T. schwartzii* (F. Muell.) Farman, *Bull. Herb. Boissier* sér. 2, 5: 1087 (1905); *Trichinium fraseri* var. *schwartzii* F.Muell. ex J.M.Black, *Fl. S. Austral.* 2: 211 (1924), *nom. inval. pro syn.* — **Illustr.:** P.Moore, *Guide Pl. Inland Austral.* 261 (2005).

Erect shrubs, sometimes rounded, to 1 m high; stems and leaves glabrous, sometimes glaucous; leaves linear to narrowly elliptic, scattered, often appearing leafless, to 40 × 2.2 mm, bases attenuate. **Inflorescences** terminal or pseudo-terminal, globose, obovoid, ± hemispherical or narrowly cylindrical, to 4 cm long, to 25-flowered; bract 2.5–4.2 mm long, apex acuminate; bracteoles 2.4–4.3 mm long, apices acuminate to apiculate; perianth 5–7 mm long, white or grey, tinged pink or purple; tepals with moderately dense, simple or ± nodose hairs to 0.8 mm long on lower half and medially, hairs to 2.5 mm long marginally on upper portion, shortening near apex, apices erose, acute; fertile stamens usually 5, filaments to 3.8 mm long, staminodes occasionally 1 or 2, staminal cup with

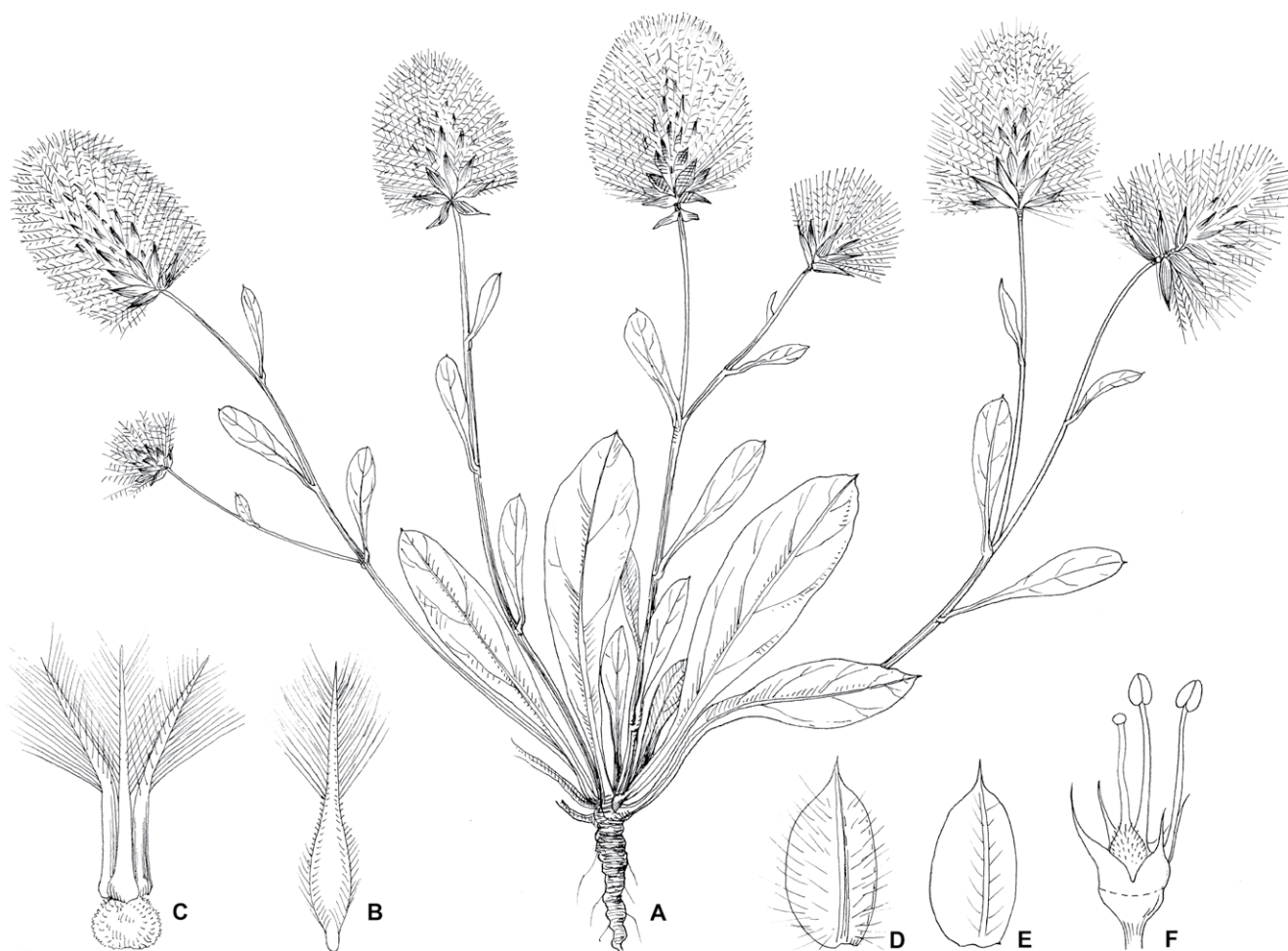


Fig. 13. *Ptilotus seminudus*. A, plant; B, perianth; C, inner perianth; D, bract; E, bracteole; F, pistil and stamens. Illustration by L. Dutkiewicz, from *Fl. S. Australia* 1: 332, Fig. 187 (1986).

interstaminal ciliate to fimbriate lobes to 1 mm long; ovary hairy apically, rarely glabrous; style 1.6–3 mm long, central. **Horse mulla mulla.**

S.A.: NW; W.A.; N.T.; Qld. Occurs on plains, breakaways and hill slopes in sandy clay loam, associated with open mulga woodland over grasses. Flowers: usually May–Sep., occasionally in other months.

Further work is required on this widespread species to formally deal with the infraspecific taxa, especially in Western Australia. Until this work progresses, taxa in S.A. are best referred to as *Ptilotus schwartzii*, in line with those in eastern Australia, as treated by Bean (2008).

(Rare status in S.A.)

26. ***Ptilotus seminudus*** (J.M.Black) J.M.Black, *Fl. S. Austral.* ed. 2, 2: 328 (1948). — *Trichinium seminudum* J.M.Black, *Trans. & Proc. Roy. Soc. South Australia* 40: 61 (1916). — **Illustr.:** *Fl. N.S.W.* 1: 259 (1990); *Fl. Victoria* 3: 211, fig. 37K–L (1996).

Prostrate or semi-prostrate herbs to 10 cm high × 30 cm wide; stems hairy, glabrescent with age; basal leaves obovate or elliptic, glabrous, to 90 × 20 mm, bases long-attenuate, shorter than upper expanded portion, cauline leaves ovate, obovate or elliptic, sparsely hairy, to 20 × 8 mm, bases cuneate or attenuate. **Inflorescences** terminal or pseudo-terminal, globose or ovoid, to 5 cm long, to 50-flowered; bract 7.5–9 mm long; bracteoles 8–10 mm long, both with apices aristate; perianth 15–17 mm long, green, grey or white; tepals with lower third glabrous, except some verticillate hairs to 0.5 mm long marginally, remainder with moderately dense, nodose or ± subverticillate hairs to 10 mm long, hairs exceeding apices, with moderately dense, verticillate hairs to 0.4 mm long beneath, apices lacinate, ± acute; fertile stamens 2, filaments to 4.5 mm long, staminodes 3; ovary hairy apically; style 3.8–5 mm long, eccentric. **Rabbit tails.** **Fig. 13.**

S.A.: EP, NL, MU, YP; W.A.; N.S.W.; Vic. Grows in red-brown silty or sandy loams, on low dunes and between ridges, in mallee scrub associations. Flowers: most frequently Aug.–Dec.

27. **Ptilotus sessilifolius** (Lindl.) Benl, *Mitt. Bot. Staatsamml. München* 29: 500 (1990). — *Trichinium sessilifolium* Lindl. in T. Mitch., *Three Exped. Australia* 2: 12 (1838). *T. atriplicifolium* A. Cunn. ex Moq. in A. DC, *Prodr.* 13(2): 286 (1849); *T. obovatum* var. *atriplicifolium* (A. Cunn. ex Moq.) Domin, *Biblioth. Bot.* 89: 80 (1921); *P. atriplicifolius* (A. Cunn. ex Moq.) Benl, *Mitt. Bot. Staatsamml. München* 2: 404 (1958). *T. obovatum* var. *grandiflorum* Benth., *Fl. Austral.* 5: 221 (1870); *T. incanum* var. *grandiflorum* (Benth.) J. M. Black, *Trans. & Proc. Roy. Soc. South Australia* 41: 380 (1917); *P. obovatus* var. *grandiflorus* (Benth.) Ewart & O. B. Davies, *Fl. N. Territory* 100 (1917). *T. incanum* var. *intermedium* Ewart & Jean White, *Trans. & Proc. Roy. Soc. Victoria* 22: 97 (1909). *P. oblongifolius* Gand., *Bull. Soc. Bot. France* 66: 222 (1919). — **Illustr.:** *Pl. W. N.S.W.* 285 (1981), as *P. atriplicifolius* var. *atriplicifolius*; *Fl. N.S.W.* 1: 259 (1990), as *P. atriplicifolius* var. *atriplicifolius*; *Fl. Victoria* 3: 211, fig. 37A–B (1996), as *P. sessilifolius* var. *sessilifolius*.

Erect shrubs, sometimes rounded, to 70 cm high; stems and leaves densely hairy, hairs persisting with age; leaves obovate or elliptic, to 75 × 30 mm, bases cuneate or attenuate. **Inflorescences** terminal or pseudo-terminal, hemispherical or cylindrical, to 2.5 cm long, to 20-flowered; bract 2.8–4 mm long, apex apiculate or aristate; bracteoles (2.5–) 3.5–5.5 mm long, apices apiculate; perianth 10–15 mm long, pink, purple or mauve; tepals with moderately dense, sub-verticillate hairs to 6 mm long on upper half only, or entire length, shortening near apex, with dense, verticillate to dendritic hairs to 0.8 mm long beneath, apices erose, truncate or obtuse; fertile stamens 3, filaments to 9 mm long, staminodes 2; ovary glabrous or rarely sparsely hairy apically; style 6.5–8 mm long, eccentric. **Silver tails, crimson fox tail.**

S.A.: NW, LE, NU, GT, FR, EA, EP, NL, MU; W.A.; N.T.; Qld; N.S.W.; Vic. Grows in sand on dunes or interdune flats and floodplains, with very open shrubland of *Acacia*, *Hakea* and *Eremophila* spp., and tussock grassland. Flowers: all year round but most frequently June–Oct.

Variation is evident in this species across its range with respect to tepal size and perianth hairiness. In S.A. there are two forms present: plants with longer tepals, the over-topping outer tepal hairs occurring along the entire tepal length, and plants with shorter tepals, the over-topping outer tepal hairs on the top half only. Further research is required to determine if this variation is taxonomically significant.

28. **Ptilotus spathulatus** (R.Br.) Poir. in Lam., *Encycl. Suppl.* 4: 620 (1816). — *Trichinium spathulatum* R.Br., *Prodr.* 415 (1810). *T. mucronatum* Nees in Lehm., *Pl. Preiss.* 1: 628 (1845). *P. spathulatus* f. *angustatus* Benl, *Mitt. Bot. Staatsamml. München* 5: 568 (1965). — **Illustr.:** *Fl. Victoria* 3: 211, fig. 37i–j (1996); P. Moore, *Guide Pl. Inland Australia* 261 (2005).

Low prostrate or decumbent herbs to 25 cm high × 40 cm wide; stems and leaves sparsely hairy, glabrescent with age; leaves spathulate or subspathulate, obovate or occasionally elliptic, basal leaves to 95 × 10 mm, bases long-attenuate, longer than or often to twice length of upper expanded portion, cauline leaves 17 × 8 mm, bases attenuate. **Inflorescences** terminal or pseudo-terminal, cylindrical, or less commonly conical or ovoid, to 9 cm long, to 100-flowered; bract 4.5–8 mm long, apex long-acuminate; bracteoles 3.8–7.5 mm long, apices apiculate; perianth 7.5–12 mm long, green, greenish-yellow or cream; tepals with dense to moderately dense, nodose or subverticillate hairs to 5 mm long, hairs exceeding apices, with sparse to moderately dense, verticillate hairs to 0.4 mm long beneath, apices lacinate, ± acute; fertile stamens 2 or 3, filaments to 3.3 mm long, staminodes 2 or 3; ovary hairy apically; style 1.5–2.2 mm long, eccentric. **Pussy tails, cats paws.**

S.A.: GT, FR, EA, EP, NL, MU, YP, SL, KI, SE; W.A.; N.S.W.; Vic.; Tas. Occurs in a wide range of habitats from coastal limestone cliffs and sand dunes, to inland undulating hills, on hill crests and foot slopes. Grows in limestone, sandy loam, clay loam, cracking clay and skeletal or gravelly soils. Vegetation includes *Melaleuca* spp. and *Acacia* spp. shrubland, open eucalypt woodland or tussock grassland. Flowers: Jul.–Mar., most frequently Sep.–Dec.

Some morphological variation is evident for this species, especially in the floral characters, across its widespread distribution.

29. **Ptilotus symonii** Benl, *Trans. Roy. Soc. South Australia* 92: 33 (1968). — **Illustr.:** *Trans. Roy. Soc. South Australia* 92: 33, fig. 1 (1968).

Prostrate, decumbent, lax shrubs to 50 cm high × 50 cm wide, often growing through other shrubs; stems and leaves hairy, glabrescent with age; leaves narrowly elliptic or ovate, to 20 × 5 mm, shortly petiolate, bases attenuate. **Inflorescences** terminal or pseudo-terminal, globose or hemispherical, to 2.5 cm long, to 30-flowered; bract 3–4 mm long; bracteoles 4.3–7 mm long, both with apices acuminate; perianth 9.5–11 mm long, white, cream or

green; tepals with nodose or \pm subverticillate hairs to 9 mm long, mostly on lower half of tepal, exceeding apices by 1–2 mm, apices erose, \pm truncate; fertile stamens 3, filaments to 2.2 mm long, staminodes 2; ovary glabrous; style 1.2–1.5 mm long, eccentric.

S.A.: NU; W.A. Occurs on sheet limestone, in *Acacia* spp. woodland, or open mallee scrub. Flowers: mainly Sep.–Nov., but also between June–Feb.

(Rare status in S.A.)

30. ***Ptilotus whitei*** (J.M.Black) Lally, *J. Adelaide Bot. Gard.* 22: 42 (2008) — *Trichinium whitei* J.M.Black, *Trans. & Proc. Roy. Soc. South Australia* 38: 464 (1914). *T. parvifolium* auct. non. F.Muell.: J.M.Black, *Fl. S. Austral.* 2: 211 (1924), *partly*; *Ptilotus parvifolius* auct. non. (F.Muell.) F.Muell.: J.M.Black, *Fl. S. Austral.* ed. 2, 2: 327 (1948), *partly*. *P. parvifolius* var. *parvifolius* auct. non (F.Muell.) F.Muell.: Benl, *Mitt. Bot. Staatssamml. München* 7: 315 (1970), *partly*; Benl in Jessop (ed.), *Flora of Central Australia* 79 (1981), *partly*; Benl in Jessop & Toelken (eds), *Fl. S. Austral.* ed. 4, 1: 330 (1986). — **Illustr.:** *Fl. S. Austral.* ed. 2, 2: 327, fig. 460 (1948), as *Ptilotus parvifolius*; *Fl. S. Austral.* ed. 4, 1: 330, fig. 186 (1986), as *Ptilotus parvifolius* var. *parvifolius*.

Erect shrubs to 1 m high; stems glabrous, occasionally glaucous, sometimes divaricate; leaves narrowly to broadly obovate, sometimes subspathulate, rarely linear, glabrous, to 15 × 6 mm, bases attenuate. **Inflorescences** terminal or pseudo-terminal, hemispherical to shortly conical, to 4 cm long, rarely to 7 cm, to 40-flowered; bract and bracteoles 3.5–6 mm long, apices mucronate to aristate; perianth 9–12.5 (–14) mm long, pale pink or purple, or red with grey hairs; tepals with moderately dense, nodose hairs to 6 mm long, shortening near apex, with dense, subverticillate to verticillate hairs to 0.4 mm long beneath, apices obtuse or acute; fertile stamens 2, filaments to 6.5 mm long, staminodes 3, staminal cup with dense interstaminal hairs to 1 mm long; ovary glabrous; style 5.6–7.5 mm long, eccentric. **Fig. 11C–G.**

S.A.: NW, LE; N.T. Grows in red, brown or yellow skeletal soils of gravelly clay or sand, on gibber plains, scree slopes, quartzitic sandstone hills, limestone outcrops, rocky breakaways, gullies and creekbeds. Associated with chenopod and *Acacia* spp. scrub, or tall shrubland, often with a grassy understorey. Flowers: mainly Apr.–Oct., and occasionally in other months of the year.

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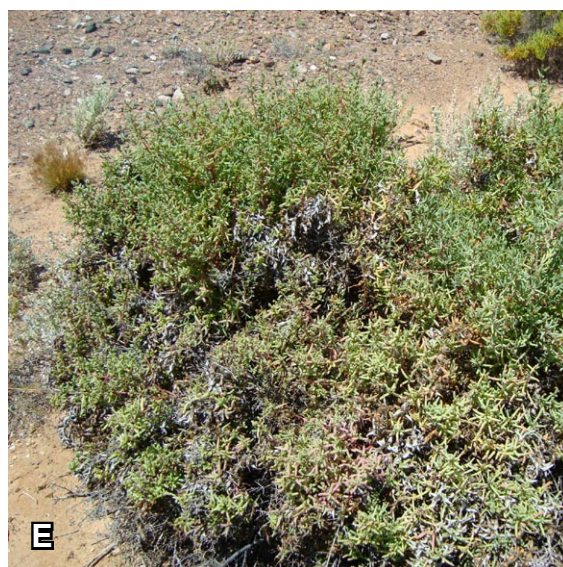
Pl. 1. **A–C, *Alternanthera denticulata*:** A, flowering spikes; B, habit; C, flowering stems and foliage. **D, *A. nodiflora*:** dezsnelly clustered flowering spikes and foliage. **E–F, *A. pungens*:** F, young inflorescences and leaves; E, habit. Photos: A–C, A.C. Robinson; D, D.N. Kraehenbuehl; E–F, D.E. Murfet.



Pl. 2. A–B, *Amaranthus albus*: A, flowering stems; B, fruit. C, *A. cuspidifolius*, habit. D–E, *A. retroflexus*: D, inflorescence; E, a small plant. Photos: A, B, D & E, P.J. Lang; C, A.C. Robinson, DENR.



Pl. 3. A, *Amaranthus retroflexus*, root. B–D, *A. viridis*: B, detail of fruiting inflorescence; C, flowering stem; D, plant viewed from above. Photos: A–C, P.J. Lang; D, J.G. Conran.



Pl. 4. A–B, *Hemichroa diandra*: A, flowering stems; B, habit of plants on windswept Nullarbor cliffs. **C–E, *H. mesembryanthema*:** C, flowering stems; D, fruiting stems with persistent brown bracts; E, habit. **F, *H. pentandra*,** thick-leaved form in flower, near Goolwa. Photos: A & B, P.J. Lang, DENR; C & F, D.E. Murfet; D & E, D.J. Duval, DENR.



Pl. 5. A, *Pilolotus aristatus* subsp. *aristatus*, (a small individual); B–D, *P. barkeri*: B, flowers; C, young leaves and buds; D, habit (a large shrub). E, *P. beckerianus*, flowering plant and non-flowering rosettes, on on typical ironstone substrate; F–G, *P. clementii*, N of Mt Isa, Qld; F, inflorescence; G, habit. H–J, *P. decipiens*: H, habit; I, leaves and developing inflorescences; J, flowering stems. K–L, *P. erubescens*, prostrate plant in native grassland, Mokota Conservation Park; K, habit; L, flowers. Photos: A, K & L, A.C. Robinson; B–D, D.J. Duval, DENR; E, K. Pobke, DENR; F–G, M. Fagg, Australian National Botanic Gardens.