

A taxonomic treatment of tribe Anthemideae (Asteraceae) in Australia

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Abstract

A concise taxonomic treatment of tribe Anthemideae (Asteraceae) in Australia is presented, with descriptions of all 43 species in the 19 genera in Australia. Keys to genera and species are presented. The South African species *Pentzia globosa* Less. is recognised for the first time as naturalised in Australia.

Introduction

Tribe Anthemideae is a large tribe of 1741 species in the Asteraceae (Bremer & Humphries 1993). It is widely distributed in Eurasia and Africa and to a lesser extent in North America. Australia, however, is rather poorly represented in terms of native species. Nineteen genera in the Anthemideae are represented in Australia, with 17 of these entirely of introduced species. *Cotula* is represented by both native and introduced species, and *Leptinella* is represented by only native species. No genera are endemic. Genera in Australia come from a broad range of subtribes. There are single generic representatives from eight of the 12 subtribes recognised in Bremer & Humphries (1993). Conversely, seven genera are from subtribe Matricariinae.

All species occurring in Australia have their entire or major part of their Australian distribution in temperate latitudes. Many species in tribe Anthemideae have become naturalised in Australia through escape from gardens, and most of these species are only found close to human habitation. They can be considered to be weakly naturalised. Five genera, *Centipeda*, *Ceratogyne*, *Dimorphocoma*, *Elachanthus* and *Isoetopsis*, that until recently had been included in tribe Anthemideae, are now being placed elsewhere and are not described here.

The taxonomic review presented here is drawn from a *Flora of Australia* account of the Anthemideae recently prepared by the author. As it is likely to be several years before the *Flora* account is published, it is considered desirable to present the findings of my research at this time.

The Anthemideae are herbs or shrubs that are often glandular and aromatic and they typically possess truncate-penicillate style-branches. The following features, although not defining for the tribe, are frequently seen in species in Australia: leaves are often much-divided; the disc and receptacle often becomes conical as flowering progresses, and if the capitula are radiate, e.g. species in *Chamaemelum* and *Anthemis*, the ray florets tend to persist and rays become deflexed to form an apron below this conical disc; involucre bracts often have a prolonged hyaline apex; and the pappus of achenes is generally either corona-like or lacking. The glands of the many glandular species appear as minute golden or orange globular structures located on the surface of various structures, including stems, leaves, bracts, corollas and achenes.

Three genera of the Matricariinae, *Leptinella*, *Cotula* and *Soliva*, are closely related. They comprise dwarf herbs with compressed, unribbed achenes, and often with sheathing leaf-bases. The involucre bracts of the species are more or less uniform in length. In the

latter two genera, the outer florets mostly lack a corolla, and in *Cotula*, the florets are sometimes pedicellate.

Individual species in two genera, *Anacyclus* and *Santolina*, have been collected in Australia but are not considered naturalised at this time. Nonetheless, they are included in the key to genera. *Anacyclus radiatus* Lois., native to southern Europe and north-western Africa, was collected from a rubbish dump in Adelaide in 1918 and has been described in South Australian floras. *Santolina chamaecyparissus* L., native to southern Europe, was collected from the Stanthorpe district in far south-eastern Queensland in 1971, but it is unknown whether the plant was from a naturalised population. Species in *Achillea*, *Santolina*, and *Tanacetum* that have been collected but not considered naturalised are discussed under their respective generic treatments.

Tribe ANTHEMIDEAE

Herbs, subshrubs or shrubs, often aromatic and glandular, not spinescent, taprooted or not; latex lacking. Hairs simple. Leaves alternate, occasionally opposite or rosulate, pinnate-veined, not spiny. Capitula radiate, disciform or discoid, pedunculate, or \pm sessile in *Artemisia* and *Soliva*; involucre generally 2–multiseriate with bracts imbricate, all of similar size or more often grading to longer inwards, free, without outgrowths; receptacle commonly convex to conical, epaleate or paleate. Florets of radiate capitula: disc florets actinomorphic, bisexual; ray florets zygomorphic, female, with tube glabrous; ligules mostly yellow or white, with apex obtuse, hardly lobed or weakly 2- or 3-lobed. Florets of disciform capitula: central florets actinomorphic, bisexual or functionally male; outer florets actinomorphic or lacking a corolla, female, in *Cotula turbinata* zygomorphic florets present between central and outer florets. Florets of discoid capitula all actinomorphic, bisexual. Anthers mostly ecalcarate, ecaudate, or caudate in *Achillea*, with apical appendage rounded to acute, peracute to subulate in *Artemisia*. Style glabrous; style-branches short to long, not tapering, often penicillate apically, with hairs obtuse, with two stigmatic lines. Achenes homomorphic or dimorphic, terete, angular or compressed, not beaked, with ribs mostly smooth or unribbed. Pappus small, membranous, or of showy scales in *Ursinia*, or absent.

Notes: The terms female, male and bisexual for florets indicates the functional sex of the florets, e.g. a female floret will be both pistillate and fertile. All central or disc florets have both pistils and stamens.

Key to genera

- 1 Capitula radiate, with ligules 1–50 mm long (if < 4 mm long then \geq 2 mm wide)
 - 2 Receptacle paleate
 - 3 Leaves entire or 1-pinnatisect with a few entire segments, sericeous; involucre bracts 8 or 9, with inner bracts fused and copiously villous.....**14. Eriocephalus**
 - 3: Leaves 1–3-pinnatisect, not sericeous; involucre bracts > 10, with inner bracts free, glabrous or nearly so
 - 4 Plants rhizomatous; mid-stem leaves with l:w ratio 4–7 and mostly with 15–25 primary segments per side; inflorescences dense, corymbiform, of numerous capitula; ligules c. 5 per capitulum, 1–3 mm long**4. Achillea**
 - 4: Plants not rhizomatous or if so capitula 1 or few per inflorescence; mid-stem leaves not entirely as above; inflorescences various; ligules > 5 per capitulum, > 3 mm long

- 5 Involucral bracts of outer and middle series ovate, conspicuously delineated by a darker margin; paleae forming a cylinder around disc florets; achene with a pappus of ovate white scales c. 4 mm long..... **1. Ursinia**
- 5: Involucral bracts of outer and middle series variously shaped, not delineated by a darker margin; paleae not forming a cylinder around disc florets; achene with pappus not as above or absent
- 6 Receptacular paleae c. 2–4 mm wide; ligules yellow..... **Anacyclus (see Introduction)**
- 6: Receptacular paleae c. 0.3–1 mm wide; ligules white or yellow
- 7 Peduncle commonly > 10 cm long; stereome of involucral bracts 1.5–2 mm wide; palea with a red longitudinal resin duct; achenes copiously woolly..... **5. Lasiospermum**
- 7: Peduncle < 10 cm long; stereome of involucral bracts 0.5–1 mm wide; palea lacking a red longitudinal resin duct; achenes glabrous
- 8 ± Erect annuals or biennials; involucre dull to slightly lustrous, variably hairy; receptacular paleae with apex peracute to spine-like; achenes c. 8–10-ribbed..... **7. Anthemis**
- 8: Rhizomatous, ascending perennials; involucre somewhat lustrous, sparsely haired; receptacular paleae with apex subacute to obtuse; achenes 3-ribbed..... **6. Chamaemelum**
- 2: Receptacle epaleate
- 9 Leaves 2- or 3-pinnatisect, with rachides and segments < 1 mm wide
- 10 Involucre 5–7 mm long; mature receptacle hemispherical; achenes 1.8–2.2 mm long, prominently 3-ribbed on one face, with a prominent pair of large glands distally..... **12. Tripleurospermum**
- 10: Involucre 2–3 mm long; mature receptacle narrow-conical to ovoid; achene c. 1 mm long, 4- or 5-ribbed on one face, without prominent glands..... **13. Matricaria**
- 9: Leaves undivided, lobate or if 1- or 2-pinnatisect then at least the rachis > 1 mm wide
- 11 Plants to c. 0.3 m tall; ray florets sterile, with a white ligule and a corona c. 2 mm long..... **10. Mauranthemum**
- 11: Plants to c. 1.0 m tall; ray florets fertile, with a white or yellow ligule, but no corona
- 12 Involucre 3–5 mm long with bracts keeled; inner series of bracts with hyaline extension c. 0.2 mm long..... **2. Tanacetum**
- 12: Involucre 7–12 mm long, with bracts not keeled; inner series of bracts with hyaline extension 1–5 mm long
- 13 Ligules white; leaves undivided or lobate; ray achenes ± terete, c. 1 mm diam..... **11. Leucanthemum**
- 13: Ligules yellow, or if white then leaves pinnatisect; ray achenes with lateral wings, 1.2–4 mm diam.
- 14 Shrubs; base of leaves ≤ diam. of adjacent stem; ligules white..... **8. Argyranthemum**

- 14:** Perennial herbs; at least the upper-stem leaves with base > diam. of adjacent stem; ligules yellow **9. *Chrysanthemum***
- 1:** Capitula discoid or disciform (if any ligules/ligule-like processes evident then these < 1 mm long or not from outer series of florets)
- 15** Plants mostly > 50 cm high; capitula disciform
- 16** Leaves silvery or grey on one or both surfaces, with up to 5 primary segments per side; inflorescences pyramidal to spiciform; capitula sessile or nearly so and/or grey-tomentose **3. *Artemisia***
- 16:** Leaves ± green on both sides, with 10 or more primary segments per side; inflorescences corymbiform; capitula clearly pedunculate, not grey-tomentose **2. *Tanacetum***
- 15:** Plants < 50 cm high; capitula discoid or disciform; if ever slightly higher than 50 cm then capitula discoid
- 17** Plants herbaceous, prostrate or if erect then at least outer florets pedicellate; involucre bracts all ± equal in length; capitula disciform
- 18** Capitula sessile; style persisting as a spine in fruit **19. *Soliva***
- 18:** Capitula pedunculate; style not persisting as a spine in fruit
- 19** Plants erect, sprawling or prostrate, not truly rhizomatous; leaves eglandular; disc florets fertile **17. *Cotula***
- 19:** Plants prostrate, rhizomatous; leaves glandular; disc florets sterile
- 20** Plants glabrous; outer florets lacking a corolla **17. *Cotula***
- 20:** Plants with hairs sparse to dense, but sometimes early glabrescent; outer florets with a corolla (corolla persisting in fruit) **18. *Leptinella***
- 17:** Plants woody or herbaceous, erect or sprawling; florets not pedicellate; involucre bracts gradational or all ± equal in length; capitula discoid
- 21** Woody sub-shrubs; leaves often greyish, 1- or 2-pinnatisect; primary segments of leaves 0.5–2 (–4) mm long
- 22** Leaves < 1 cm long; receptacle epaleate; corolla 1.5–2 mm long **16. *Pentzia***
- 22:** Leaves > 1 cm long; receptacle paleate; corolla 3–4 mm long ***Santolina* (see Introduction)**
- 21:** Annual herbs; leaves green, 2- or 3-pinnatisect; primary segments of at least larger leaves > 4 mm long
- 23** Plants glabrous; capitula ovoid, with disc greenish-yellow; corolla c. 1 mm long **13. *Matricaria***
- 23:** Plants with scattered hairs; capitula globose or sub-globose, with disc yellow; corolla c. 2 mm long **15. *Oncosiphon***

1. URSINIA Gaertn., *Fruct. Sem. Pl.* 2: 462 (1791)

Annual or perennial herbs or subshrubs, erect or sprawling. Leaves 1- or 2-pinnatisect. Capitula 1 to several per stem, radiate (in Australia) or discoid; involucre multiseriate, with bracts gradational in length; receptacle paleate. Ray florets neuter or female, sterile or fertile; disc florets bisexual, with corolla 5-lobed. Achenes ± homomorphic, ± terete, 5-ribbed. Pappus present.

A genus of 38 species mainly from South Africa, but also from Namibia, Botswana and Ethiopia. Features unique to this genus compared to other Anthemideae in Australia include the cylindrical receptacular paleae, the long hairs arising from the base of the achenes, and the pappus morphology. The margin of the outer and middle series of involucre bracts is conspicuously pigmented.

Key to species

Annuals; apex of outermost involucre bracts with hyaline extension not or hardly developed, usually hairy; paleae truncate, without any extension; achenes narrow-obloid, 5–8 mm long with a pappus of 5 broad scales only, with a basal tuft of capillary hairs.....**1. *U. anthemoides***

Perennials; apex of outermost involucre bracts with a hyaline extension c. 2 mm long, ± glabrous; paleae with a rotund apical extension; achenes obconical, c. 3 mm long, with a pappus of 5 broad scales and 5 setaceous scales, without a basal tuft of capillary hairs.....**2. *U. speciosa***

1. **Ursinia anthemoides* (L.) Poir., in J.B.A.P. de Monnet de Lamarck, *Encycl.* 8: 257 (1808)

Arctotis anthemoides L., *Amoen. Acad.* 4: 330 (1763).

Type: Locality unknown, Herb. Linn. 1036.22; holo: LINN *n.v.*, *fide* M.Prassler, *op. cit.* 429.

Annuals to c. 0.5 m high, sparsely or sometimes moderately hairy on stems and leaves. Leaves to c. 5 cm long; rachides and ultimate segments < 1 mm wide, with acicular tips if present c. 0.1 mm long; primary segments up to 10 per side. Capitulum 1 per stem, 12–25 mm diam.; peduncle 5–15 cm long, sparsely hairy or glabrous at anthesis. Involucre 5–8 mm long, patchily cobwebby; outer series of bracts c. 2 mm long, without a hyaline extension, hairy distally; inner series of bracts with hyaline extension 1–2 mm long; paleae narrow-oblong, c. 10 mm long, 0.5–1 mm wide, truncate apically, golden-brown. Ray florets 7–12, neuter; ligule c. 5–15 mm long, orange or yellow adaxially (pale when dried). Disc florets: corolla c. 3 mm long, with tube longer and much narrower than limb; lobes c. 0.3 mm long, usually purplish. Achenes narrow-obloid, 5–8 mm long, glabrous, pale or dark, with a basal tuft of capillary hairs. Pappus comprising 5 ovate spreading scales, c. 4 mm long, white with a triangular brown or purple patch baso-medially.

Notes: Native to South Africa. Occurs in south-western Western Australia. Grows in disturbed sites such as roadsides and wasteland on a variety of soils. Flowers Aug.–Sept.

The subsp. in Western Australia. is subsp. *anthemoides*. Subsp. *versicolor* (DC.) Prassler has capitula with ligules that are longer and with a dark basal patch.

Representative specimens: WESTERN AUSTRALIA: Graham Rock, c. 18 km E of Hyden, *E.N.S.Jackson 3393* (AD, PERTH); 26 km S of Yalingup on Caves Rd, *N.S.Lander 1192* (PERTH); NE foot of Peak Charles, Fitzgerald Peaks, Roe district, *J.Taylor 702*, *M.D.Crisp & R.Jackson* (CANB, MEL).

2. **Ursinia speciosa* DC., *Prodr.* 5: 690 (1836)

Type: Locality unknown, Southern Africa, *Drege 6368*; lecto: G, *fide* M.Prassler, *Mitt. Bot. Staatssamml. Munchen* 6: 462 (1967).

[*U. chrysanthemoides auct. non* (Less.) Harv. (1865): J.R.Tovey, *Proc. Roy. Soc. Victoria* 22(1): 25 (1907); S.W.L.Jacobs & J.Pickard, *Pl. New South Wales* 87 (1981)]

Perennials to c. 40 cm high, ± glabrous. Leaves to c. 4 cm long; rachides and ultimate segments < 1 mm wide, with acicular tips commonly 0.3–0.5 mm long; primary segments up to 5 per side. Capitulum 1 per stem, 25–40 mm diam.; peduncle 5–15 cm long. Involucre 7–9 mm long, glabrous; outer series of bracts 2–4 mm long, with a hyaline extension 2–4 mm long, glabrous; inner series of bracts with a hyaline extension; paleae narrow-oblong, c. 5 mm long, 0.5–1 mm wide, with a rotund hyaline apical extension, pale to golden. Ray florets 15–25, neuter; ligule c. 15 mm long, orange adaxially (drying yellow). Disc florets: corolla c. 3 mm long, with tube longer and narrower than limb; lobes c. 0.6 mm long, purplish. Achenes obovoid, c. 3 mm long, glabrous, pale or reddish, without a basal tuft of capillary hairs. Pappus comprising an outer series of 5 ovate spreading scales c. 4 mm long white with a pale baso-medial patch and an inner series of 5 filiform scales.

Notes: Native to southern Africa. Occurs predominantly in south-western Western Australia, but also established in Stockton, eastern New South Wales. There are old records from Melbourne, Victoria, but populations do not appear to have persisted. Grows in grey or white sand, and has been recorded from woodland. Flowers spring. The name *U. chrysanthemoides* was incorrectly applied to specimens of *U. speciosa* collected in New South Wales.

Representative specimens: WESTERN AUSTRALIA: 2 km E of Hamelin Bay, *G.J.Keighery* 9201 (PERTH); East Katanning, 21 Sept. 1958, *A.Browne* (PERTH). NEW SOUTH WALES: alongside ‘Stanley Park’, Fullerton Cove Rd, *J.R.Hosking* 2531 & *G.C.Pritchard* (CANB, MEL, NSW). VICTORIA: Coode Is., Oct. 1908, *J.R.Tovey* & *C.French Jr* (MEL).

2. TANACETUM L., *Sp. Pl.* 2: 843 (1753)

Perennial herbs, erect. Leaves lobate or 1- or 2-pinnatisect. Capitula several to numerous per stem, radiate or disciform; involucre multiseriata, with bracts gradational in length; receptacle epaleate. Outer florets female; disc florets bisexual, with corolla 5-lobed. Achenes ± homomorphic, ± quadrangular, regularly 5–12-ribbed, glabrous. Pappus present.

Species in Australia are rhizomatous, odorous on crushing, with weakly keeled involucre bracts, with linear peduncular bracts, and with achenes bearing a minute corona. *Tanacetum ptarmiciflorum* (Webb & Berthel.) Sch.Bip., a popular horticultural species from the Canary Is. with distinctive lacy foliage and white ligules, has been recorded from a roadside near Rhynie in far south-eastern Australia (*R.Bates* 14151 AD), and *T. cinerariifolium* (Trevir.) Sch.Bip. has been recorded from a roadside in north-eastern Tasmania. Neither are considered naturalised. The latter is cultivated in some parts of the world to obtain pyrethrum, a natural insecticide.

Key to species

- 1 Leaves grey
 - 2 Capitula several per inflorescence *T. ptarmiciflorum* (see notes above)
 - 2: Capitula solitary *T. cinerariifolium* (see notes above)
- 1: Leaves green
 - 3 Leaves with 10–20 primary segments per side; ligules lacking 2. *T. vulgare*
 - 3: Leaves with 3–7 primary lobes/segments per side; ligules present 1. *T. parthenium*

1. **Tanacetum parthenium* (L.) Sch.Bip., *Tanaceteeen* 55 (1844)

Matricaria parthenium L., *Sp. Pl.* 2: 890 (1753); *Chrysanthemum parthenium* (L.) Bernh., *Syst. Verz.* 145 (1800).

Type: Europe; *n.v.*

Plants to c. 70 cm high, hairy on stems and leaves. Leaves to c. 9 cm long, 1- or 2-pinnatisect; primary segments 3–7; major rachides usually 3–8 mm wide. Capitula a few to numerous per stem, generally not congested, radiate, 12–20 mm diam.; peduncle to c. 5 cm long. Involucre 3–5 mm long, cobwebby or glabrous; inner series of bracts with hyaline extension c. 0.2 mm long. Ray florets 10 to numerous, fertile; ligule 4–8 mm long, white. Disc florets: corolla 1.5–2 mm long, with tube ± as broad as and as long as the yellow limb. Achenes of disc florets obovoid, 1–1.5 mm long, 5–8-ribbed, pale brown. *Feverfew*.

Notes: Native to Europe. Occurs in south-eastern South Australia, eastern New South Wales, southern Victoria, and eastern Tasmania. Grows in disturbed sites such as roadsides. Flowers spring–autumn.

A garden escape that is weakly naturalised. Horticultural variants include plants with increased numbers of ligulate florets. Plants without non-radiate capitula also occur but these have not been recorded in Australia.

Representative specimens: SOUTH AUSTRALIA: along Torrens at St. Peters, *R.J.Bates* 35629 (AD, MEL). NEW SOUTH WALES: Moss Vale, 28 Feb. 1971, *E.J.McBarron* (NSW). VICTORIA: E side of Yarrowee R., Ballarat, *V.Stajsic* 1168 (CANB, MEL); near the Chalet, Mt Buffalo, *A.R.Bean* 9459 (BRI, MEL). TASMANIA: Russell Falls, Mt Field National Park, 13 Jan. 1943, *W.M.Curtis* (HO).

2. **Tanacetum vulgare* L., *Sp. Pl.* 2: 844 (1753)

Chrysanthemum vulgare (L.) Bernh., *Syst. Verz.* 144 (1800).

Type: Herb. Clifford 398, *Tanacetum* no. 3; lecto: BM, *fide* C.J.Humphries, *Regnum Veg.* 127: 92 (1993)

T. boreale Fischer ex DC., *Prodr.* 6: 128 (1838). Type: Ukraine and Russian Federation; *n.v.* [*T. huronense* auct. non Nutt. (1818): J.M.Black, *Nat. Fl. S. Australia* 83 (1909); The author also erroneously ascribed the authority to Fischer]

Plants to c. 150 cm high, transiently pubescent on stems and leaves. Leaves to c. 25 cm long, 1–sub-3-pinnatisect; rachides and ultimate segments c. 1–3 mm wide; primary segments 10–20 per side, variously dissected. Capitula several to numerous per stem, moderately congested, disciform, 5–9 mm diam.; peduncle to c. 5 cm long. Involucre 3–5 mm long, slightly cobwebby or glabrous; inner series of bracts with hyaline extension c. 1 mm long. Outer florets with corolla 3-lobed, yellow. Central florets: corolla 1.5 mm long, with tube as broad as and as long as the yellow limb. Achenes of disc florets obovoid, 1.2–1.8 mm long, 5-ribbed, pale brown. *Common Tansy*.

Notes: Native to Europe, northern Asia and northern North America. Occurs in south-eastern South Australia, south-eastern Queensland, eastern New South Wales, southern Victoria, and eastern Tasmania. Flowers summer–autumn. An occasional garden escape. In South Australia there appears to be a distinctive form with leaves that are more deeply dissected, often moderately hairy, and with ultimate teeth/segments that are strongly infolded on pressing. This may be referable to *T. boreale*, a taxon more recently subsumed in *T. vulgare* or treated as a subspecies of it.

Representative specimens: SOUTH AUSTRALIA: Port MacDonnell, c. 25 km S of Mt Gambier, 14 Feb. 1948, *J.B.Cleland* (AD). QUEENSLAND: c. 6 km W of Mudgeeraba, 22 Jan. 1969, *M.Sampe* (BRI). NEW SOUTH WALES: c. 1 km E of East Kangaloon, c. 3.5 km due NNW of Robertson, *P.G.Kodala 141*, *T.A.James* & *M.Westmacott* (CANB, MEL, NE, NSW). AUSTRALIAN CAPITAL TERRITORY: Victoria St, near Hall, *E.M.Canning 6858* (AD, CANB, MEL, NSW). VICTORIA: Genoa, E Gippsland, *R.V.Smith 68/73* (MEL). TASMANIA: crossing of Clyde R., Bothwell, *A.E.Orchard 5349* (HO, MEL).

3. ARTEMISIA L., *Sp. Pl.* 2: 845 (1753)

Annual or perennial herbs, subshrubs or shrubs, erect. Leaves entire, lobed or variously pinnatisect. Capitula commonly numerous per stem, disciform, pedunculate or sessile; involucre 2- or 3-seriate, gradational in length or not; receptacle epaleate. Outer florets female, 2–4-lobed; disc florets bisexual (in Australia), sometimes functionally male, with corolla 5-lobed. Achenes \pm homomorphic, quadrangular, \pm smooth or 2-ribbed, glabrous. Pappus absent.

A genus of 388 species predominantly from the Northern Hemisphere. Species in Australia are all rhizomatous perennial herbs. Inflorescences are leafy panicles and even peduncular bracts are often leaf-like and exceed the involucre. Capitula are small and the female florets of the outer series have an obliquely tubular corolla not exceeding the involucre. Also distinctive in this genus is the apical appendage of the anthers which is peracute to subulate rather than acute to rounded. *Artemisia ludoviciana* Nutt. subsp. *albula* (Wooton) D.D.Keck was briefly naturalised in Oxley Park, Tamworth in north-eastern New South Wales. (*J.R.Hosking 728* CANB, MEL, NE, NSW); however, the only known population has now been removed.

Key to species

- 1 Leaves densely hairy on lower surface only **2. *A. verlotiorum***
- 1: Leaves densely hairy on both surfaces
 - 2 Capitula 1.5–2 mm diam., subsessile; uppermost leaves and panicle-bracts entire ***A. ludoviciana*** (see notes above)
 - 2: Capitula 3–6 mm diam., many distinctly pedunculate; uppermost leaves and panicle-bracts pinnatisect **1. *A. arborescens***

1. **Artemisia arborescens* L., *Sp. Pl.* 2nd edn, 1188 (1763)

Type: 'Italia, Oriente' [Italy, Asia]; Herb. Linn. No. 988.10; lecto: LINN, *vide* Y.Ling, *Taxon* 47: 353 (1998).

Plants to c. 200 (–300) cm high, with a dense appressed wool on stems and branches. Leaves to c. 10 cm long, 1- or 2-pinnatisect, petiole-like basally, \pm concolorous, with margin entire; rachides and ultimate segments usually 1–2 mm wide; primary segments commonly 2 or 3 per side; both surfaces completely obscured by appressed hairs. Capitula 4–7 mm diam.; peduncle subsessile or to c. 2 cm long. Involucre 3–5 mm long, densely woolly; most bracts of similar length; receptacle densely hairy. Outer florets c. 10, with corolla c. 1.2 mm long. Central florets numerous; corolla c. 1.5 mm long, with tube becoming firm, creamy-white, as broad as and as long as the yellow limb. Achenes of disc florets obovoid, c. 0.7 mm long. *Silver Wormwood*.

Notes: Native to the Mediterranean region and Middle East. Isolated occurrences in south-western Western Australia, south-eastern South Australia, southern New South

Wales, and Victoria. Grows in disturbed sites and often persists as a hedge near abandoned farmhouses. Flowers spring–summer.

A species that in the past was often grown to form hedges around rural properties. It is only weakly naturalised and has a scattered distribution. *Artemisia absinthium* L., is used horticulturally in Australia but is not considered naturalised. It resembles *A. arborescens* but is lower-growing (generally less than 100 cm high) and tends to sprawl, and is less densely sericeous so that plants look slightly greener. Furthermore, the leaves have relatively broader segments, panicles are laxer, and capitula are smaller (3–5 mm diam.) and with a greenish-yellow disc.

Representative specimens: WESTERNAUSTRALIA: Layman Block, Tuart Forest, *G.J.Keighery 14034* (PERTH). SOUTH AUSTRALIA: Clayton Rd, road to Kangarilla from Blewitt Springs, *H.P.Vonow 542* (AD, NSW). NEW SOUTH WALES: 10 km SE of Deniliquin, *W.E.Mulham 1453* (CANB). VICTORIA: near Sturgess Point on public land, Port Campbell, *G.W.Carr 0207-86* (AD, CANB, HO, MEL).

2. **Artemisia verlotiorum* Lamotte, *Mem. Acad. Sci. Belles-Lett. Clermont-Ferrand* 511 (1876)

Type: *n.v.*

Plants to c. 200 cm high, with a short pubescence on stems and branches. Leaves to c. 8 cm long, mostly 1- or 2-pinnatisect, petiole-like basally except for small pinnatisect auricles, strongly discolorous, with margin entire; rachides and ultimate segments usually 2–6 mm wide; primary segments 1–5 per side; upper surface glabrous or nearly so; lower surface appressed woolly. Capitula c. 2 mm diam.; sessile or peduncle to c. 2 mm long. Involucre 2.5–4 mm long, cobwebby; bracts gradational in length; receptacle glabrous. Outer florets c. 8–12, with corolla c. 1.2 mm long. Central florets c. 8–12; corolla c. 2.5 mm long, with tube narrower than and as long as the purple limb. Achenes of disc florets ellipsoid, c. 0.8 mm long. *Chinese Wormwood*.

Notes: Native to south-western China, the Himalayas and Malaysia. Occurs in south-eastern Australia in south-eastern Queensland, New South Wales and in Melbourne in south-central Victoria. Also naturalised in Europe, northern Africa and South America. Grows adjacent to watercourses, mostly in disturbed environments. Flowers summer–early winter.

There appears to be a few forms of this species in Australia. Plants collected in Canberra (e.g. *M.Gray & E.D'Arnay 6486* CANB) have inflorescences that have a high number of relatively narrow capitula that are extremely congested along branchlets. Plants in southern Queensland, e.g. a collection (e.g. *A.R.Bean 19043* BRI, CANB, MEL, NSW) have relatively few, less congested and smaller capitula and the disc is yellow-green. The indumentum of the branchlets differs in being spreading and curly. In Victoria, the capitula are largest, with the involucre 3–3.5 mm long, and c. 2 mm diam. Plants collected in the early 1900s from Melbourne, Victoria, are similar to *A. verlotiorum* but may be *A. vulgaris* L. Definitive separation of *A. verlotiorum* from *A. vulgaris* requires evidence of an extensive rhizomatous habit and overwintering rosettes. These early Melbourne collections lack this evidence but they differ from specimens determined as *A. verlotiorum* in having smaller and slightly more intricately dissected leaves, inflorescences with fewer capitula, and involucre larger (c. 4 mm long).

Representative specimens: QUEENSLAND: Zealey Rd, Nambour, *A.R.Bean 19043* (BRI, CANB, MEL). NEW SOUTH WALES: alongside Dumaresq Ck, upstream of Marsh St bridge,

J.R.Hosking 1575 & E.L.Cottage (CANB, MEL, NSW). AUSTRALIAN CAPITAL TERRITORY: Farrer, Canberra, *M.Gray & E.D'Arnay 6486* (CANB, NSW). VICTORIA: quarry on Myers Ck Rd, Healesville district, *M.G.Corrick 2718* (MEL).

4. *ACHILLEA* L., *Sp. Pl.* 2: 896 (1753)

Perennial herbs, subshrubs or shrubs, erect. Leaves 1–3-pinnatisect. Capitula commonly numerous per stem, radiate (in Australia) or discoid; involucre c. 3-seriate, with bracts gradational in length; receptacle paleate. Ray florets female; disc florets bisexual, sometimes functionally male, with corolla 5-lobed. Anthers caudate. Achenes ± homomorphic, compressed, 2-ribbed, glabrous. Pappus absent.

A genus of c. 85 species from Europe and Asia. Species in Australia all rhizomatous perennial herbs. Readily recognised by their dense corymbiform inflorescences, small capitula with involucre longer than broad and with keeled bracts, short c. orbicular ligules. The pinnatisect leaves are also distinctive in the combination of a relatively high length:width ratio (mostly 4–7) and a high number of primary segments 15–25 that arise throughout the length of the leaf. All three species in Australia are moderately pubescent throughout. *Achillea filipendulina* Lam. has been collected on Scholcroft Rd Uraidla near Adelaide in south-eastern South Australia (*R.Bates 9234* AD) and from Island Bend dam viewpoint in the Snowy Mts, far south-eastern New South Wales (*M.E.Phillips s.n.* CANB, NSW), but is not considered naturalised.

Key to species

1 Ligules white or purple

- 2 Leaves ± planar in fresh state; leaf-rachis mostly 1.3–2.5 mm wide; ligules purple.....**1. *A. distans***
 2: Leaves with a 3-dimensional arrangement of segments in fresh state; leaf-rachis mostly 0.6–1.2 mm wide; ligules commonly white, occasionally purplish.....**2. *A. millefolium***

1: Ligules yellow

- 3 Leaves planar in fresh state, 1- or sub-2-pinnatisect; involucre c. 1.8 mm diam.; ligules c. 1 mm long ***A. filipendulina* (see notes above)**
 3: Leaves with a 3-dimensional arrangement of segments in fresh state; 2- or 3-pinnatisect; involucre c. 2.5 mm diam.; ligules 1–2 mm long..... **3. *A. tomentosa***

1. **Achillea distans* Waldst. & Kit. ex Willd., *Sp. Pl.* 4th edn, 3: 2207 (1803)

Type: *n.v.*

Achillea tanacetifolia All., *Fl. Pedem.* 1: 183 (1785); *A. distans* subsp. *tanacetifolia* (All.) Janch., *Oesterr. Bot. Z.* 91: 292 (1942). Type: northern Italy; *n.v.*;

Plants to c. 60 cm high. Leaves to c. 8 cm long, 1- or 2-pinnatisect, ± planar in fresh state; rachis of mid-stem leaves 1.3–2.5 mm wide, often dentate between primary segments. Capitula 6–9 mm diam.; peduncle to c. 0.7 cm long, moderately hairy. Involucre 4.0–5.5 mm long; outer and middle series of bracts with margin unpigmented or brown; inner series of bracts with hyaline extension c. 0.3 mm long; paleae c. 5 mm long. Ray florets c. 5, with a purple ligule 1.5–3 mm long. Disc florets 8–20; corolla c. 2.5 mm long, with tube narrower than and c. as long as purple limb. Achenes c. 2 mm long.

Notes: Native to Europe. Occurs in far south-eastern South Australia, south-eastern Queensland, eastern New South Wales, southern Victoria, and eastern Tasmania. Grows in disturbed sites such as roadsides, often at moderate altitudes. Flowers spring–summer.

An occasional garden escape. In recent Australian floras Australian material has been recognised as subsp. *tanacetifolia*. Plants are uniform in morphology but it is not clear whether they are referable to this or the type subspecies. Based on the length of ligules and the presence of teeth on the winged rachis between primary segments, they are referable to subsp. *distans*; however, this subspecies is considered to have white florets normally.

Representative specimens: SOUTH AUSTRALIA: roadside, Stirling East, 6 May 1944, *J.B.Cleland* (AD). QUEENSLAND: Killarney, 25 Nov. 1917, *C.T.White* (BRI). NEW SOUTH WALES: Eucumbene Dam, Snowy Mtns, 13 Jan. 1965, *M.E.Phillips* (CANB). AUSTRALIAN CAPITAL TERRITORY: Uriarra Ck, N of Uriarra Stn, on road to Brookvale Stn, Jan. 1966, *M.Gray* (CANB). VICTORIA: roadside S of Aberfeldy, *J.R.Hosking 1070* (CANB, MEL, NE, NSW). TASMANIA: Hayes, Jan. 1944, *W.M.Curtis* (HO, MEL).

2. **Achillea millefolium* L., *Sp. Pl.* 2: 899 (1753)

Type: Europe; *n.v.*

Plants to c. 60 cm high. Leaves to c. 8 cm long, 2- or 3-pinnatisect, with segments arranged 3-dimensionally in fresh state; rachis of mid-stem leaves 0.6–1.2 mm wide, mostly entire between primary segments, sometimes dentate. Capitula 4–8 mm diam.; peduncle to c. 1.0 cm long, slightly to moderately hairy. Involucre 3.0–4.5 mm long; outer and middle series of bracts with margin light or often dark brown; inner series of bracts with hyaline extension c. 0.3 mm long; paleae 3–4 mm long. Ray florets c. 5, ligule 2–3 mm long, white or less often pink to purple. Disc florets c. 8; corolla c. 2 mm long, with tube narrower than and c. as long as white limb. Achenes c. 2 mm long. *Milfoil, Yarrow.*

Notes: Native to Europe. Occurs in south-eastern South Australia, south-eastern New South Wales, southern Victoria, and in northern and eastern Tasmania. Isolated records from Perth in south-western Western Australia, Stanthorpe in far south-eastern Queensland, and from far north-western Victoria. Grows in disturbed sites such as roadsides, often at moderate to high altitudes. Flowers late spring–autumn.

Pink-flowered forms of *A. millefolium* can be difficult to distinguish from *A. distans*, especially some that are intermediate in leaf morphology. The two species probably co-occur at a number of localities and hybridisation and introgression is the likely reason for these difficult specimens.

Representative specimens: WESTERN AUSTRALIA: Vincent St, Leederville, *G.J.Keighery 11445* (PERTH). SOUTH AUSTRALIA: on road to Nelson, c. 5 km S of Mt Gambier, *R.J.Bates 40461* (AD). QUEENSLAND: Stanthorpe, 14 Dec. 1986, *P.S.Crew* (BRI). NEW SOUTH WALES: Cabramurra township, *P.C.Jobson 4621, R.G.Coveny & P.G.Kodala* (AD, BRI, CANB). AUSTRALIAN CAPITAL TERRITORY: 3.5 km N of Piccadilly Circus, Brindabella Ra., *B.J.Lepschi 112* (CANB). VICTORIA: Howmans Gap, c. 3 km direct line NW of Falls Ck Village, *I.C.Clarke 3042* (CANB, MEL). TASMANIA: W side of Ridgley Rd, 6 km S of Burnie, *P.C.Jobson 3453* (HO, MEL, NSW).

3. **Achillea tomentosa* L., *Sp. Pl.* 2: 897 (1753)

Type: ‘G.Narbonensi, Vallesia, Tataria’ [France, Switzerland, Russia to central Asia]; *n.v.*

Plants to c. 40 cm high. Leaves to c. 8 cm long, 2- or 3-pinnatisect, with segments arranged 3-dimensionally in fresh state; rachis c. 1 mm wide, entire between primary segments. Capitula 4–6 mm diam.; peduncle to 0.5 cm long, hairy. Involucre c. 4 mm

long, outer and middle series of bracts not pigmented on margin; inner series of bracts with hyaline extension c. 0.5 mm long; paleae 2–3 mm long. Ray florets 5, with ligule 1–2 mm long, yellow. Disc florets c. 20; corolla c. 2.5 mm long, with tube narrower than and c. as long as the yellow limb. Achenes c. 3 mm long. *Woolly Yarrow*.

Notes: Native to south-western Europe. Occurs in south-eastern South Australia. Grows in disturbed sites such as roadsides. Flowers late spring–summer.

An occasional garden escape that is only weakly naturalised. Apart from the colour of the ligules, *A. tomentosa* can be distinguished from the other two species of *Achillea* in Australia by the more numerous disc florets and the entirely stramineous involucre bracts with an unpigmented hyaline margin.

Representative specimens: SOUTH AUSTRALIA: Rly line between Owen and Mallala, H.E.Orchard 6169 (AD); roadside, Hope Valley, 6 Dec. 1947, J.B.Cleland (AD).

5. LASIOSPERMUM Lagasca, *Gen. Sp. Pl.* 31 (1816)

Annual to perennial herbs, ascending to erect. Leaves 1- or 2-pinnatisect. Capitula 1 per stem or branch, radiate (in Australia) or discoid; involucre 2- or 3-seriate, with bracts mostly of similar length, a few outer ones shorter; receptacle paleate. Ray florets female; disc florets bisexual, with corolla 5-lobed. Achenes \pm homomorphic, terete, 8–10-ribbed, hairy. Pappus absent.

A genus of four species from South Africa, Namibia and Egypt.

**Lasiospermum bipinnatum* (Thunb.) Druce, *Bot. Exch. Club. Brit. Isles Rep.* 631 (1917)

Lidbeckia bipinnata Thunb., *Prodr. Pl. Cap.* 161 (1800).

Type: not designated.

Lasiospermum radiatum Trevir., *Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.* 13(1): 205 (1824). Type: *n.v.*

Perennials to c. 40 cm high, glabrous, with eglandular stems and leaves. Leaves to c. 5 cm long, fleshy; primary segments up to c. 10 per side; rachides and ultimate segments 0.8–1.5 mm wide. Capitula 1 per stem, 20–25 mm diam.; peduncle 10–30 cm long; peduncular bracteoles several, ovate–lanceolate; disc c. 7–10 mm diam. Involucre 4–5 mm long; bracts not keeled or with pigmented margin; inner series of bracts with hyaline extension 1–2 mm long; mature receptacle convex; paleae c. narrow-oblong c. 2.5 mm long, c. 1 mm wide, hyaline, with a red resin duct medially, acute at apex. Ray florets 15–20; ligule c. 10–15 mm long, white. Disc florets: corolla c. 3 mm long, with tube narrower and slightly shorter than the yellow limb. Achenes narrow-obloid, c. 4 mm long, completely hidden by a dense long tan-coloured wool. Pappus absent.

Notes: Native to South Africa. Occurs in south-eastern Tasmania in and around Hobart. Flowers spring. Readily distinguished in fruit by the woolly achenes. The involucre bracts are distinctive compared with other radiate species in Australia. They are c. oblong and have a relatively broad green stereome and this helps distinguish this species from similar-sized white ligulate species such as *Chamaemelum nobile*, *Anthemis cotula* and *A. arvensis*.

Representative specimens: TASMANIA: Municipal Tip, Campania, D.I.Morris 8441 (AD, HO, MEL, NSW); Hayes, W.M.Curtis (HO).

6. CHAMAEMELUM Mill., *Gard. Dict.* abr. edn 4 (1754)

Annual or perennial herbs or sub-shrubs, erect, ascending or decumbent. Leaves 1- or 2-pinnatisect. Capitula radiate (in Australia), disciform or discoid, solitary or few; involucre 2–4-seriate, with bracts gradational in length; receptacle paleate. Ray florets female or sterile; disc florets bisexual, with corolla 5-lobed. Achenes slightly dimorphic in length, slightly compressed, with inner face ribbed, glabrous. Pappus absent.

A genus of 6 species from the Canary Is., Mediterranean, and Middle East. Like in *Anthemis*, the corolla of species in this genus becomes saccate basally and surrounds the distal portion of the achene.

**Chamaemelum nobile* (L.) All., *Fl. Pedem.* 1: 185 (1785)

Anthemis nobilis L., *Sp. Pl.* 2: 894 (1753).

Type: Europe; *n.v.*

Ascending perennial herbs to c. 30 cm high, rhizomatous, odorous on crushing, usually sparsely hairy on stems and leaves. Leaves to c. 5 cm long; primary segments mostly 6–10 per side, arising along entire length of leaf, markedly larger in distal half; rachis < 1 mm wide; secondary rachides and ultimate segments < 0.5 mm wide. Capitulum 20–25 mm diam.; peduncle moderately hairy distally. Involucre 4–5 mm long, cobwebby; bracts not keeled or with a pigmented margin; inner series of bracts with hyaline extension 1–1.5 mm long; mature receptacle obovoid; paleae narrow-obovate or oblong-elliptic, c. 0.8 mm wide, subacute to obtuse, sometimes lobed. Ray florets 10–20, fertile; ligule 8–12 mm long, white. Disc florets: corolla 2.5–3 mm long, with tube longer than and as broad as the yellow limb. Achenes obovoid, 1–1.5 mm long, with 3 slender pale ribs, grey-brown.

Notes: Native to south-western Europe. Occurs near Adelaide in south-eastern South Australia, in southern Victoria, and in eastern Tasmania. Grows in roadsides, waste areas and lawns. Flowers late spring–autumn.

Similar to species of *Anthemis* in having hairy stems and leaves, denser on the peduncle, gland-dotted leaves and a paleate receptacle. Used horticulturally as a herb and in lawns and used medicinally and in beverages. The involucre is generally moderately lustrous due to the relatively well-developed hyaline margins. Ray florets persist and the ligules become deflexed post-anthesis. This feature is also evident in the genera *Anthemis*, *Matricaria*, *Tripleurospermum* and *Argyranthemum*.

Representative specimens: SOUTH AUSTRALIA: Bridgewater, c. 20 km SE of Adelaide, 27 Nov. 1937, *E.H.Ising* (AD). VICTORIA: roadside between Trentham and East Trentham, 9 Apr. 1990, *K.Dormouse* (MEL). TASMANIA: Westbury, 20 Feb. 1948, *W.M.Curtis* (HO).

7. ANTHEMIS L., *Sp. Pl.* 2: 893 (1753)

Annual to perennial herbs or subshrubs, erect. Leaves 1–3-pinnatisect. Capitula radiate (in Australia) or discoid, solitary or not; involucre 2- or 3-seriate, with bracts gradational in length; receptacle paleate (in Australia). Ray florets female or sterile; disc florets bisexual, with corolla mostly 5-lobed. Achenes ± homomorphic, sometimes compressed, 4 or 5-angled and/or 10-ribbed. Pappus present or absent.

A genus of 211 species, from Europe, Asia and northern Africa. Characterised by obconical, thick-walled fruits and a basally swollen corolla-tube. The indumentum is frequently of dolabriform (axe-shaped) hairs. In species in Australia the disc is much broader than the length of the generally hairy involucre, the mature receptacle is narrow-

conical and the paleae have a peracute or spine-like apex. Involucral bracts are not keeled as in species of *Oncosiphon* and *Tanacetum*, and the margin is not pigmented brown as in species of *Tripleurospermum* and *Mauranthemum*.

Key to species

- 1** Ligules yellow; pappus a small corona **1. *A. tinctoria***
1: Ligules white; pappus absent
- 2** Plant hardly odorous when crushed; capitula (15–) 20–35 mm diam.; peduncle with hairs largely appressed; involucre 4–6.5 mm long, with hyaline extension 1–2 mm long; receptacular paleae 0.5–1 mm wide, arising throughout; achenes 1–2 mm diam., with ribs smooth; ray florets fertile. **2. *A. arvensis***
2: Plant strongly odorous when crushed; capitula 15–25 mm diam.; peduncle with hairs somewhat untidily arranged; involucre c. 4 mm long, with hyaline extension 0.5–1 mm long; receptacular paleae 0.3–0.7 mm wide, only associated with inner group of disc florets and arising only from upper half of receptacular cone; achene of disc florets c. 0.8 mm diam., with ribs tuberculate; ray florets sterile. **3. *A. cotula***

1. **Anthemis tinctoria* L., *Sp. Pl.* 2: 894 (1753)

Type: 'Sueciae, Germaniae' [approximately modern Sweden and Germany]; *n.v.*

Biennial to perennial herbs to c. 60 cm high, with odour not known, moderately hairy. Leaves to c. 7 cm long, 1- or sub-2-pinnatisect. Capitulum 20–40 mm diam.; peduncle with appressed hairs at anthesis. Involucre 5–6 mm long, densely hairy; inner bracts with hyaline extension c. 1 mm long; paleae subtending all florets, narrow-lanceolate, c. 1 mm wide. Ray florets c. 15, female; ligule c. 10 mm long, golden-yellow. Disc florets: corolla c. 3 mm long. Achenes obovoid, c. 2 mm long. Pappus a membranous corona. *Yellow Chamomile*.

Notes: Native to Europe and western to central Asia. Isolated records from south-eastern South Australia and northern Tasmania. Also naturalised in North America. Flowers summer–autumn.

A popular species in horticulture that appears to be only weakly naturalised. The source of Chamomile tea and used as a source of yellow dye. There are several subspecies of *A. tinctoria*. Collections in Australia may be referable to subsp. *australis* R.R.Fern., but this requires further investigation.

Representative specimens: SOUTH AUSTRALIA: E of Tanunda, *R.J.Bates 29571* (AD). TASMANIA: Launceston, Mar. 1961, *J.Somerville* (HO).

2. **Anthemis arvensis* L., *Sp. Pl.* 2: 894 (1753)

Type: Europe; *n.v.*

Annual herbs to c. 60 cm high, hardly odorous on crushing, sparsely to moderately hairy. Leaves to c. 5 cm long, sub-2 to 3-pinnatisect. Capitulum 25–35 mm diam.; peduncle with largely appressed hairs distally at anthesis, ± sericeous when dense. Involucre 4–6.5 mm long, hairy; inner bracts with hyaline extension 1–2 mm long; paleae associated with all disc florets, narrow-elliptic, to 0.5–1 mm wide. Ray florets 15–20, fertile; ligules 8–16 mm long, white. Disc florets: corolla 2.5–3 mm long. Achenes of disc florets obovoid, c. 2 mm long, commonly c. 1 mm diam., sometimes c. 2 mm diam., slightly 4-angled, smooth along ribs. Pappus absent or a vestigial ring. *Field Chamomile*.

Notes: Native to Europe, northern Africa and western Asia. Occurs in eastern New South Wales and Tasmania. A widespread weed in North America, South Africa and New Zealand. Grows in disturbed areas near human habitation. Flowers summer.

The paleae are distinctly broader than those of *A. cotula* and compared to *Chamaemelum nobile* the paleae have a more acute apex and are relatively longer. The variation in achene diameter is unusual. In the absence of fruit and odour characters, *A. arvensis* and *A. cotula* are best distinguished by size of florets, indumentum of peduncles and the length of hyaline extensions of the inner involucre bracts.

Representative specimens: NEW SOUTH WALES: Bannaby Travelling Stock Reserve, 12.5 km directly ESE of Taralga, *I.Crawford* 5228 (CANB, NSW). TASMANIA: Tarraleah, 7 Feb. 1945, *W.M.Curtis* (HO).

3. **Anthemis cotula* L., *Sp. Pl.* 2: 894 (1753)

Type: Europe; *n.v.*

Annual herbs to c. 60 cm high, strongly odorous on crushing, usually sparsely to moderately hairy. Leaves to c. 5 cm long, 2- or 3-pinnatisect. Capitulum 15–25 mm diam.; peduncle with an untidy indumentum of mainly divergent to spreading hairs distally at anthesis. Involucre 4–5 mm long, hairy; inner bracts with hyaline extension 0.5–1 mm long; paleae arising only from distal half of receptacle, linear to linear lanceolate, 0.3–0.7 mm wide. Ray florets 10–15, sterile; ligule 5–9 mm long, white. Disc florets: corolla 2–3 mm long. Achenes obovoid, 1.2–1.5 mm long, c. 0.8 mm wide, ± terete, usually tuberculate along ribs, sometimes nearly smooth. Pappus absent. *Stinking Mayweed*.

Notes: Native to Europe, northern Africa and western Asia. Occurs in south-eastern South Australia, south-eastern Queensland, eastern New South Wales, southern Victoria, and Tasmania. There is also a single old record from Western Australia. Grows in disturbed environments such as agricultural land and wasteland. Flowers late spring–summer.

Anthemis cotula has been confused with *Tripleurospermum maritimum* subsp. *inodorum* q.v. which, apart from its distinctive fruits, differs in having a broader and more gently convex disc, longer involucre bracts, more sparsely haired peduncle, and in being epaleate. *Chamaemelum nobile* has similar-looking capitula to *A. cotula* but the former is a rhizomatous perennial, its leaves have a higher length:width ratio, its involucre bracts are more lustrous and less hairy, and its achenes have three fine ribs rather than c. 10 tuberculate ribs. A specimen from Woolnorth in far north-western Tasmania. (*A.C.Rozefelds* 1307 HO) resembling *A. cotula* has achenes that are not tuberculate and the corolla is differently shaped, and with longer lobes. It is uncertainly identified as *A. lithuanica* Bess ex DC., native to Russia. It is unknown whether it persists at this location.

Representative specimens: WESTERN AUSTRALIA: Mumballup, 21 Jan. 1933, *K.Wilson* (PERTH). SOUTH AUSTRALIA: Hundred of Comaam, Coonawarra area, *M.Gartner* 7754 (AD). QUEENSLAND: Gatton, Nov. 1916, *E.W.Burch* (BRI). NEW SOUTH WALES: ‘Tawarri’, 12 km from Orange on Pinnacle Rd, *R.Medd* 160383 (NSW). VICTORIA: between Wodonga and Albury, 1.3 km SSW of Murray R., *I.C.Clark* 3038 (CANB, MEL). TASMANIA: Gilbertson’s abattoirs, Longford, *D.I.Morris* 8516 (HO, MEL).

8. ARGYRANTHEMUM Webb ex Sch.Bip., in Webb & Berth., *Phyt. Canar.* 2: 245 (1844)

Shrubs and subshrubs, with stems and leaves eglandular. Leaves 1- or 2-pinnatisect. Capitula solitary or few, radiate; involucre multiseriate, with bracts gradational in length;

receptacle epaleate. Ray florets female; disc florets bisexual, with corolla 5-lobed. Achenes dimorphic; ray achenes trigonous, incurved with lateral wings and a posterior keel; disc achenes obconical compressed, 1-winged. Pappus present.

A genus of 22 species endemic to Macaronesia (Canary Is., Madeira and the Salvage Is. in the North Atlantic Ocean).

**Argyranthemum frutescens* (L.) Webb ex Sch.Bip., in P.B.Webb & S.Berthelot, *Hist. Nat. Iles Canaries* 2: 264 (1844)

Chrysanthemum frutescens L., *Sp. Pl.* 2: 887 (1753).

Type: Locality unknown, Hort. Cliff.; holo: BM *n.v.*, *fide* C.J.Humphries *op. cit.* 181 (1976).

Plants to c. 1.0 m high, glabrous or nearly so, often glaucous, eglandular. Leaves 1- or 2-pinnatisect, with rachides and segments 0.5–4 mm wide; primary segments 1–5 per side, with average position distal to halfway, entire or with secondary lobes or segments; base narrow. Capitula few; 3–6 cm diam., with peduncle 4–12 cm long. Involucre 7–10 mm long; outer series of bracts 2–5 mm long, with margin brown; inner series of bracts with hyaline extension 3–4 mm long; mature receptacle conical, slightly taller than wide. Ray florets c. 15–20; ligule 8–35 mm long, white. Disc florets numerous; corolla 2.5–3 mm long. Achenes dimorphic, 3–7 mm long; ray achenes 2–5 mm wide, with broad firm lateral wings and an adaxial wing; disc achenes of disc 2.5–4 mm long, 1–2 mm wide, inner series c. quadrangular, ribbed, outer series with a moderate adaxial wing. Pappus an oblique adaxially longer corona to 2 mm long, of similar texture to achenes.

There are two forms naturalised in Australia, both probably horticulturally modified. These are referred with some uncertainty to two subspecies.

Key to subspecies

Plants green, not glaucous; mid-branch leaves with rachis 2–4 mm wide; ligules 15–30 mm long..... **a.** subsp. *frutescens*
 Plants usually bluish-green, slightly to moderately glaucous; mid-branch leaves with rachis 1–2 mm wide; ligules 8–15 mm long **b.** subsp. *foeniculaceum*

a. **Argyranthemum frutescens* (L.) Webb ex Sch.Bip. subsp. *frutescens*

Plants green, not glaucous. Leaves: rachis of mid-branch leaves 2–4 mm wide; primary segments commonly 3 or 4 per side. Ligules > 15 mm long.

Notes: Probably only weakly naturalised. Occurs in southern South Australia and eastern Victoria. Grows in various soils including sand dunes and over limestone, mostly on or near the coast. Flowers spring–autumn.

Representative specimens: SOUTH AUSTRALIA: 10 km S of Port Lincoln, *R.J.Bates* 37126 (AD). VICTORIA: Gabo Is., 6 Oct. 1993, *K.Twyford s.n.* (MEL).

b. **Argyranthemum frutescens* subsp. *foeniculaceum* (Pit. & Proust) C.Humphries, *Bull. Brit. Mus. (Nat. Hist.), Bot.* 5: 187 (1976).

Argyranthemum frutescens var. *foeniculaceum* Pit. & Proust, *Iles Canaries* 230 (1909).

Type: Agulo, La Gomera, Canary Is., 13 Apr. 1905, *C.-J.M.Pitard* 195; holo: G, iso: L, Z all *n.v.*, *fide* C.J.Humphries, *loc. cit.*

[*Chrysanthemum anethifolium* auct. non Brouss. ex Willd. (1809): J.M.Black, *Fl. S. Australia* 2nd edn, 4: 878 (1957)]

[*C. foeniculaceum* auct. non Willd.: Hj.Eichler, *Fl. S. Australia* 2nd edn, suppl. 303 (1965)]

[*A. foeniculaceum* auct. non (Willd.) Webb ex Sch.Bip. (1908): N.S.Lander in N.G.Marchant *et al.* (eds), *Fl. Perth Region 2*: 659 (1987)]

Plants usually slightly to moderately glaucous. Leaves: rachis 1–2.5 mm wide; primary segments 1 or 2 (or 3) per side. Ligules 8–12 mm long.

Notes: Occurs in south-western Western Australia and southern South Australia. Grows in various soils including sand dunes and over limestone, mostly on or near the coast. Flowers spring–autumn.

This subspecies is far more common than subsp. *frutescens*. Ligules are longer than described for plants in their native habitat. Naturalised plants in Australia are likely to be of garden origin and have larger capitula because of plant breeding. There are numerous horticultural forms but only one appears to be naturalised.

Representative specimens: WESTERN AUSTRALIA: Peppermint Grove, *A.S.George 14839* (PERTH). SOUTH AUSTRALIA: Coffin Bay to Port Lincoln tramway track, c. 10 km SW of Coffin Bay, *H.P.Vonow 889* (AD, BRI, CANB).

9. CHRYSANTHEMUM L., *Sp. Pl.* 2: 887 (1753)

Annual herbs, erect. Leaves undivided, lobate or 1- or 2-pinnatisect. Capitula solitary or few, radiate; involucre c. 3-seriate, with bracts gradational in length; receptacle epaleate. Ray florets female; disc florets bisexual, with corolla 5-lobed. Achenes slightly dimorphic; ray achenes winged-trigonous; disc achenes terete or slightly trigonous. Pappus absent.

A genus of two species native to Europe, Asia and North Africa. Both species weakly naturalised in Australia. Species of *Chrysanthemum* have been widely cultivated and plant breeding has produced numerous varieties with modified floral features. Formerly a very large genus of species with radiate, epaleate capitula but, by degrees, several segregate genera including *Leucanthemum*, *Argyranthemum* and *Mauranthemum* have been created or resurrected. Australian representatives of this group of genera are eglandular.

Key to species

- Leaves 1- or 2-pinnatisect; all achenes with at least an adaxial wing.....**1. *C. coronarium***
 Leaves dentate, lobate or entire; disc achenes cylindrical; ray achenes only with lateral wings.....**2. *C. segetum***

1. **Chrysanthemum coronarium* L., *Sp. Pl.* 2: 890 (1753)

Type: Crete, Sicily; *n.v.*

[*C. segetum* auct. non L. (1753): S.W.L.Jacobs & J.Pickard, *Pl. New South Wales* 75 (1981)]

Plants to c. 90 cm high, glabrous apart from transient hairs on newer growth. Leaves obovate to ovate in outline, to c. 12 cm long, 1- or 2-pinnatisect, with up to 10 primary divisions per side; base half-clasping; margin entire or with occasional teeth; uppermost leaves similar. Capitula few; 4–6 cm diam., with peduncle c. 3–8 cm long. Involucre 8–10 mm long; outer series of bracts 4–5 mm long, with margin light brown; inner series of bracts with hyaline extension c. 4 mm long; mature receptacle convex. Ray florets: ligule

c. 15–25 mm long. Disc florets numerous; corolla 4–5 mm long, with tube narrower and slightly shorter than limb. Achenes c. 3 mm long, with body hardly compressed, c. 8-ribbed, but with some ribs expanded into wings, brown, glandular; ray achenes 3–4 mm wide, with prominent lateral and adaxial wings; disc achenes c. 2 mm diam. with only adaxial wing prominent. *Summer Chrysanthemum*.

Notes: Native to the Mediterranean region and north-western Iran. Occurs in south-western Western Australia, south-eastern South Australia, and far north-western New South Wales. Grows in disturbed sites. Flowers spring–summer.

A garden escape that is only weakly naturalised. The adaxial wing of the achenes is broadest apically and often forms an acute point.

Representative specimens: WESTERN AUSTRALIA: Vincent St, Leederville, Perth, *G.J.Keighery 11459* (MEL, PERTH); near beach, town limits of Dongara, *R.M.King 9530 & R.M.Garvey* (CANB, PERTH). SOUTH AUSTRALIA: Prospect, 29 Sept. 1907, *S.A.White ex South Australia. museum* (AD). NEW SOUTH WALES: Paldrumatta Bore, Oct. 1901, *P.Corbett* (NSW).

2. **Chrysanthemum segetum* L., *Sp. Pl.* 2: 889 (1753)

Type: Europe; *n.v.*

Plants to c. 80 cm tall, glabrous. Leaves oblong or obovate in outline, to c. 7 cm long, acutely dentate to deeply lobate, with up to 4 primary divisions per side, concentrated distally; base hardly or half-clasping; margin entire or with occasional teeth; uppermost leaves often entire. Capitula few; 3–5 cm diam., with peduncle c. 3–8 cm long. Involucre 8–12 mm long; outer series of bracts c. 4 mm long, with margin light brown; inner series of bracts with hyaline extension 3–5 mm long; mature receptacle convex. Ray florets: ligule c. 10–20 mm long. Disc florets numerous; corolla 4 mm long, with tube narrower and slightly shorter than limb. Achenes 2–3 mm long, with body hardly compressed, several-ribbed, without adaxial wings, pale, eglandular; ray achenes 1.2–2.5 mm wide, with lateral wings; disc achenes c. 1 mm diam., regularly ribbed, without wings. *Corn Marigold*.

Notes: Occurs in south-western Western Australia. Grows as a garden escape near human habitation. Flowers late winter–spring.

Representative specimens: WESTERN AUSTRALIA: New Norcia, Nov. 1963, *F.T.Hardy* (PERTH); Bunbury, *C.V.Cahill 1* (PERTH).

10. MAURANTHEMUM Vogt & Oberprieler, *Taxon* 44(3): 377 (1995)

Annual herbs, erect. Leaves lobate. Capitula solitary, radiate; involucre multiseriate, with bracts gradational in length; receptacle epaleate. Ray florets sterile (in Australia) or female; disc florets bisexual, with corolla 5-lobed. Achenes homomorphic, ± terete, 7–10-ribbed. Pappus present on ray florets.

A genus of 4 species from Europe and northern Africa. One species naturalised in Australia. In fruit the corolla-tube is basally swollen. Achenes have dark-red secretory canals.

**Mauranthemum paludosum* (Poir.) Vogt & Oberprieler, *Taxon* 44(3): 377 (1995)

Chrysanthemum paludosum Poir., *Voy. Barbarie* 2: 241 (1789); *Leucoglossum paludosum* (Poir.) B.H.Wilcox, K.Bremer & Humphries, *Bull. Nat. Hist. Mus., Ser. Bot.* 23: 142 (1993).

Type: *n.v.*

Plants to c. 30 cm tall, glabrous, eglandular. Leaves to c. 6 cm long, lacerately lobate; base developing lobes above mid-stem; margin serrate with apex peracute. Capitulum solitary, 2–3 cm diam. Involucre 4–6 mm long; outer series of bracts 2–3 mm long, not keeled, with margin darkly pigmented; inner series of bracts with blackish hyaline extension 0.5–1 mm long; mature receptacle conical. Ray florets sterile; ligule c. 10 mm long, white with a green base. Disc florets numerous; corolla 2–2.5 mm long, 5-lobed. Achenes obovoid, c. 2 mm long, red between very prominent pale ribs. Pappus of ray florets a corona to c. 2 mm long.

Notes: Native to Spain and northern Africa. Occurs in south-western Western Australia, south-eastern South Australia, south-eastern New South Wales, and south-central Victoria. Grows in disturbed sites such as roadsides. Flowers summer.

A garden escape that relatively recently has become weakly naturalised. Similar to *Leucanthemum vulgare* but an annual with lighter green leaves with peracute lobes and teeth, and with outer involucre bracts cordate-based, smaller capitula, ray florets sterile, and a corona well-developed on ray florets.

Representative specimens: WESTERN AUSTRALIA: Cargill St, Victoria Park, Perth, *B.J.Lepschi 2090* (CANB, PERTH). SOUTH AUSTRALIA: track into Chambers Gully, c. 400 m from Waterfall Gully Rd, *A.G.Spooner 15409* (AD); Burra and Burra North, *R.J.Bates 34152* (AD). NEW SOUTH WALES: Princes Hwy N of Milton, 3 July 1998, *K.Mills s.n.* (NSW). VICTORIA: Yan Yean, 45 km N of Melbourne, *D.Senyschyn 27* (MEL); paddock at end of Neale Rd c. 50 m down Opie Rd, Deer Park, 25 Aug. 1986, *C. Le Breton* (MEL).

11. LEUCANTHEMUM Mill., *Gard. Dict.* abr. edn 4 (1754)

Perennial herbs, erect. Leaves undivided or lobate. Capitula solitary or several, radiate (in Australia) or discoid; involucre multiseriate, with bracts gradational in length; receptacle epaleate. Ray florets female; disc florets bisexual, with corolla 5-lobed. Achenes sometimes dimorphic, ± terete, 10-ribbed. Pappus present on ray florets.

A genus of 33 species from Europe and northern Africa. A key defining character for this genus is the anthocyanin red coloration of the root tips. Plants have eglandular stems and leaves, the corolla-tube is basally swollen and spongy at maturity, and the achenes have red secretory canals.

Key to species

- Leaves variably toothed or crenulate, sometimes also lobed; margin of involucre bracts delineated by pigment throughout; capitula 4–6 cm diam. including rays; outer involucre bracts 3–5 mm long; achene of ray florets 1.5–2.5 mm long with corona c. 0.5 mm long..... **1. *L. vulgare***
- Leaves ± evenly serrulate; margin of involucre bracts not delineated by pigment throughout; capitula 6–10 cm diam. including rays; outer involucre bracts 5–8 mm long; achene of ray florets 3–4 mm long with corona c. 2 mm long..... **2. *L. ×superbum***

1. **Leucanthemum vulgare* Lam., *Fl. Franç.* 2: 137 (1779)

Chrysanthemum leucanthemum L., *Sp. Pl.* 2: 888 (1753).

Type: Europe; *n.v.*

Plants to c. 100 cm high, with scattered coarse hairs on lower parts of stems and on lower-stem leaves, glabrescent. Leaves with few–several lobes or undivided; base

developing basal lobes above mid-stem; margin dentate to crenulate, with up to c. 15 teeth/crenulations per side; mid-stem leaves oblanceolate to narrow-oblong, to c. 4 cm long. Capitula 1–3, 3–6 cm diam.; peduncle glabrous. Involucre 7–10 mm long, glabrous; outer series of bracts lanceolate, 2.5–7 mm long, not keeled, with margin brown; inner series of bracts with hyaline extension c. 1 mm long; mature receptacle convex. Ray florets: ligule c. 10–15 mm long, white. Disc florets numerous; corolla 2–2.5 mm long, with tube as long as and becoming as wide as the yellow limb. Achenes obovoid, c. 1.5–2 mm long, mid to dark red between raised pale ribs. Pappus absent. *Ox-eye daisy*.

Notes: Native to Europe. Occurs in far south-eastern South Australia, eastern New South Wales, southern Victoria, and northern Tasmania. A widespread weed in other parts of the world. Grows in disturbed sites such as roadsides. Flowers spring–summer.

One of the most widespread weeds in tribe Anthemideae. A noxious weed in Victoria, excluding the Melbourne metropolitan area.

Representative specimens: SOUTH AUSTRALIA: Mt Lofty township, *F.M.Hilton 1223A* (AD). NEW SOUTH WALES: alongside New England Hwy, 2 km S of the intersection with Duri Dungowan Rd, S of Timbumburi, *J.R.Hosking 1826* (CANB, NSW). VICTORIA: summit of Mt Skene, 48 km from Jamieson on road to Licola, *D.E.Albrecht 120* (CANB, MEL). TASMANIA: Leven Gorge, *L.Richley 163* (HO); Longley, Dec. 1943, *W.M.Curtis* (HO).

2. **Leucanthemum* ×*superbum* (Bergmans ex J.W.Ingram) D.H.Kent, *Watsonia* 18(1): 89 (1990)

Chrysanthemum ×*superbum* Bergmans ex J.W.Ingram, *Baileya* 19: 167 (1975).

Type: cult. at Ithaca, New York, grown from seed, Dreer 1948, 26 June 1921, *L.H.Bailey s.n.; n.v.*

[*Chrysanthemum lacustre* non Brot. (1804): J.H.Willis, *Handb. Pl. Victoria* 2: 741 (1972)]

[*Leucanthemum maximum* non (Ramond) DC. (1838): J.A.Jeanes in N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 929; E.A.Brown in G.J.Hardin (ed.), *Fl. New South Wales* 3: 288 (1992); D.A.Cooke in J.P.Jessop & H.R.Toelken (eds), *Fl. S. Australia* 4th edn, 3: 1618 (1986)]

Plants to c. 150 cm high, nearly glabrous or with occasional coarse hairs on stems and leaves. Leaves undivided; base not developing basal lobes; margin strongly serrulate, with 15–30 serrulations per side; mid-stem leaves narrow-elliptic, to c. 14 cm long. Capitula 1 (–3), 5–10 (–13) cm diam.; peduncle glabrous. Involucre 9–12 mm long; outer series of bracts narrow-ovate to lanceolate, 4–7 mm long, not keeled, with margin pale or tinged brown; inner series of bracts with hyaline extension 3–4 mm long, pale or tinged brown; mature receptacle convex. Ray florets: ligule c. 20–45 mm long, white. Disc florets numerous; corolla 4–4.5 mm long, with tube as long as and becoming as wide as the yellow limb. Achenes obovoid, c. 2–4 mm long, with thick raised pale ribs, with red coloration sometimes seen between ribs. Pappus present on ray florets, coronate, c. 2 mm long. *Shasta Daisy*.

Notes: Occurs in Busselton in far south-western Western Australia, far south-eastern South Australia, south-eastern New South Wales and southern and eastern Victoria. Grows in disturbed sites associated with human habitation or activity. Flowers summer–autumn.

Naturalised in areas of moderate to high rainfall. Much cultivated, this species is considered to be a hybrid between *Leucanthemum lacustre* (Brot.) Samp. and *L. maximum* (Ramond) DC. A cultivar with deeply dissected ligules has been recorded from far eastern Victoria.

Representative specimens: WESTERN AUSTRALIA: N margin of Broadwater, near Busselton, G.J.Keighery 8030 (PERTH). SOUTH AUSTRALIA: Mt Compass, Feb. 1967, T.Smith (AD). NEW SOUTH WALES: Mt Boyce, 3.4 km SE of Mt Victoria, R.Coveny 7363, R.Barry & K.Wilson (NSW). VICTORIA: Upper Kiewa Rd, 3.8 km NW of Falls Creek Village, R.J.Adair 981 (MEL).

12. TRIPLEUROSPERMUM Sch.Bip., *Tanacetee*n 31 (1844)

Annual or perennial herbs, erect. Leaves commonly 3-pinnatisect. Capitula solitary or few, radiate (in Australia) or discoid; involucre multiseriate, with bracts gradational in length; receptacle epaleate. Ray florets female; disc florets bisexual, with corolla 4- or 5-lobed. Achenes \pm homomorphic, c. 4-angled, 3-ribbed, with prominent apical glands. Pappus present.

A genus of c. 30 species from Europe, Asia and northern Africa. A genus with distinctive achenial features.

**Tripleurospermum maritimum* (L.) Koch. subsp. *inodorum* (L.) Applequist, *Taxon* 51: 760 (2002)

Matricaria inodora L., *Fl. Suec.* 2nd edn, 297 (1755); *T. maritimum* (L.) Koch. subsp. *inodorum* (L.) Hyl. ex Vaar., *Proc. 7th Int. Bot. Congr.* 1950, 279 (1953), *comb. inval.*; *T. inodorum* (L.) Sch.Bip., *Tanacetee*n 32 (1844)

Type: Locality unknown, Herb. Linn. 1012.12; lecto: LINN, *vide* C.J.Humphries, *Taxon* 47: 364 (1998).

Matricaria perforata Mérat, *Nouv. Fl. Env. Paris* 332 (1812); *T. perforatum* (Mérat) Lainz, *An. Jard. Bot. Madrid* 39(2): 412 (1983). Type: *n.v.*

Erect herbs to c. 100 cm high, glabrous except for transient scattered hairs, with stems and leaves eglandular. Leaves to c. 15 cm long, 3-pinnatisect, with rachides and ultimate segments generally < 1 mm wide. Capitula solitary or few, 3–5 cm diam.; peduncle sparsely hairy. Involucre 5–7 mm long; outer and middle series of bracts not keeled, sometimes with margin brown; inner series of bracts with hyaline extension c. 0.5 mm long; receptacle hemispherical. Ray florets c. 12; ligule 8–18 mm long, white. Disc florets: corolla c. 2 mm long, with tube c. as long as and narrower than the yellow 5-lobed limb. Achenes obovoid, 1.8–2.2 mm long, with 3 prominent pale ribs on one face, generally dark and minutely wrinkled between ribs, with 2 large glands distally. Pappus a scarious rim c. 0.2 mm long. *Scentless Mayweed*, *Scentless False Chamomile*.

Notes: Native to Europe and temperate Asia. Occurs in north-eastern New South Wales with isolated records from southern Victoria and north-western Tasmania. A widespread weed around the world. Grows in disturbed environments such as roadsides. Flowers mostly spring–summer.

A pair of large glands embedded in the achene are visible from both the unribbed face and from above. Although the achene has three thick ribs, the achene appears somewhat quadrangular when viewed from above. The corolla-lobes are yellow but have an oval gland (orange-red on dried specimens) near the apex. This character, and the relative

lack of hairs on branches and leaves, further distinguishes this species from vegetatively similar white-rayed species such as *Matricaria recutita*, *Anthemis cotula*, *A. arvensis* and *Chamaemelum nobile*.

The correct name and rank for this taxon has been the subject of considerable debate overseas and is possibly still not settled. In New South Wales it had until recently been referred to as *T. inodorum*, and in Victoria as *Matricaria perforata*.

Representative specimens: NEW SOUTH WALES: c. 40 km S of Glen Innes on Guyra–Glen Innes Rd, *N.S.Lander 519* (BRI, NSW). VICTORIA: NE corner of intersection of Punt Rd & Swan St, Richmond, *J.C.Reid 2470* (MEL). TASMANIA: Brittons Swamp, May 1975, *B.J.Collins* (CANB).

13. MATRICARIA L., *Sp. Pl.* 2: 891 (1753)

Annual herbs, erect. Leaves 2- or 3-pinnatisect. Capitula solitary or few, rarely subsessile, radiate or discoid; involucre c. 3-seriate, with all or nearly all bracts ± equal in length; receptacle epaleate. Ray florets female; disc florets bisexual, with corolla 4- or 5-lobed. Achenes ± homomorphic, terete or slightly compressed, with 4 or 5 ribs concentrated adaxially. Pappus present.

A genus of seven species widespread in the northern hemisphere, with some species widely distributed in the southern hemisphere as weeds. Species in Australia have eglandular stems and leaves, have at least 2-pinnatisect leaves with rachides and ultimate segments < 1 mm wide, capitula with a prominently domed disc, and an ovoid mature receptacle. Red longitudinal resin canals are often evident in the midline of involucre bracts and in achenes.

Key to species

Capitula radiate; peduncle usually > 2 cm long.....1. *M. recutita*
 Capitula discoid; peduncle mostly < 2 cm long.....2. *M. matricarioides*

1. **Matricaria recutita* L., *Sp. Pl.* 2: 891 (1753)

Chamomilla recutita (L.) Rauschert, *Folia Geobot. Phytotax.* 9: 255 (1974).

Type: Locality unknown, *J.Podpera in Fl. Exsicc. Reip. Boh.-Slov.* 946.II; neo: K, *vide* C.Jeffrey, *Taxon* 41: 566 (1992).

Plants to c. 60 cm high, glabrous. Leaves to c. 7 cm long. Capitula solitary or few, radiate, 10–25 mm diam.; peduncle 3–9 cm long. Involucre 2–3 mm long; inner series of bracts with hyaline extension c. 0.5 mm long; mature receptacle ovoid. Ray florets 9–15; ligule 6–10 mm long, white. Disc florets: corolla c. 1.5 mm long, with tube c. as long as and slightly narrower than the 5-lobed yellow limb. Achenes obovoid, 1.0 mm long, c. 0.8 mm wide. Pappus of ray achenes an oblong scale c. 1 mm long; pappus of disc achenes a minute scarious rim. *Wild Chamomile*.

Notes: Native to Europe. Isolated occurrences in south-western Western Australia, south-eastern South Australia, eastern New South Wales, and Tasmania. Grows in disturbed sites, usually on roadsides. Flowers spring–summer.

Representative specimens: WESTERN AUSTRALIA: Coorow, 23 Sept. 1998, *P.Stubbs* (PERTH). SOUTH AUSTRALIA: roadside, Grange, 14 Jan. 1964, *J.B.Cleland* (AD). NEW SOUTH WALES: E of Forbes on Eugowra Rd, 28 Oct. 1959, *C.K.Ingram* (NSW). AUSTRALIAN CAPITAL TERRITORY: Canberra, *H.S.McKee 8855* (NSW). TASMANIA: Scotts Rd, Risdon Vale, *D.I.Morris 86494* (CANB, HO).

2. **Matricaria matricarioides* (Less.) Porter, *Mem. Torrey Bot. Club* 5: 341 (1894).

Artemisia matricarioides Less., *Linnaea* 6: 210 (1831).

Type: 'Unalasccha', *Chamisso*; syn: *n.v.*; 'Kamtschatca', [former U.S.S.R.], *I.Redowski*; syn: *n.v.*

Santolina suaveolens Pursh, *Fl. Amer. Sept.* 2: 520 (1814); *Chamomilla suaveolens* (Pursh) Rydb., *N. Amer. Fl.* 34: 232 (1916). Type: *n.v.*

Matricaria discoidea DC., *Prodr.* 6: 50 (1838). Type: California, U.S.A., *Douglas*; *n.v.*

Plants to c. 45 cm high but mostly 5–20 cm high, glabrous. Leaves to c. 4.5 cm long. Capitula solitary or few, discoid, 5–9 mm diam.; peduncle to c. 1 cm long. Involucre 3–4.5 mm long; inner series of bracts with hyaline extension c. 1 mm long. Florets: corolla c. 1 mm long, with tube usually slightly longer and broader than the 4-lobed, greenish limb. Achenes obovoid, 1.2–1.5 mm long. Pappus a minute scarious rim. *Rounded Chamomile*, *Rayless Chamomile*, *Pineapple Weed*.

Notes: Native to Europe, Asia and possibly North America. Occurs in eastern New South Wales, southern and central Victoria, and eastern Tasmania. Also naturalised in New Zealand. Grows in waste areas in urban environments. Flowers spring–summer.

Generally compact, much-branched plants, with distinctive greenish, domed capitula on short peduncles. Recorded as pineapple-scented.

Representative specimens: NEW SOUTH WALES: C.I.G. footpath, Orange, *R.Medd 161187* (NSW). VICTORIA: outside Melbourne Cricket Ground, Jolimont, *D.E.Albrecht 4599* (AD, CANB, MEL). TASMANIA: St Helens, *T.Shea 10* (HO).

14. *ERIOCEPHALUS* L., *Sp. Pl.* 2: 926 (1753)

Shrubs, erect. Leaves entire or 1-pinnatisect. Capitula solitary or few, radiate (in Australia) or disciform; involucre 2-seriate, with bracts similar in length, with the densely villous inner series often connate; receptacle paleate. Ray florets female; disc florets bisexual or functionally male, with corolla 5-lobed. Achenes homomorphic, dorsiventrally compressed, with 2 lateral ribs, hairy. Pappus absent.

A genus of 26 species from South Africa and Namibia. Leaves of axillary shoots are commonly crowded together with the subtending leaf, giving the foliage a fasciculate appearance.

**Eriocephalus africanus* L., *Sp. Pl.* 2: 926 (1753)

Type: 'Aethiopia' [central-eastern Africa]; *n.v.*

Plants to c. 60 cm high, sericeous. Leaves to c. 2 cm long, entire and linear or 1-pinnatisect with segments few. Capitula radiate, solitary but grouped to appear corymbiform, 6–8 mm diam. Involucre c. 3 mm long, silky-hairy; outer series of bracts 4 or 5, free, ovate, with margin brown; inner bracts 3, fused; paleae 3–4 mm long, 0.8 mm wide, hairy; mature receptacle not seen. Florets: ray florets 3 or 4, with ligule c. orbicular, 3–4 mm long, white. Disc florets: corolla c. 2.5 mm long, with tube c. equal limb and much narrower; limb deep purple, 5-lobed. Achenes obovate in profile, c. 3 mm long, pale, woolly.

Notes: Native to South Africa. Occurs in south-central New South Wales. Ecological preferences not known. Flowers winter.

It is unknown whether the Condobolin population has persisted.

Representative specimens: NEW SOUTH WALES: Nerathong area, Condobolin, G.M.Cunningham & P.L.Milthorp 2600 (NSW).

15. ONCOSIPHON Källersjö, *Bot. J. Linn. Soc.* 96: 310 (1988)

Annual herbs, erect. Leaves 2- or 3-pinnatisect. Capitula 1 to numerous per stem, discoid (in Australia) or radiate; involucre 3-seriate, with bracts gradational in length; receptacle epaleate. Ray florets female; disc florets bisexual, with corolla 4-lobed. Achenes ± homomorphic, ± terete, regularly 4-ribbed, glabrous. Pappus present.

A genus of c. eight species from South Africa and Namibia. Features of these species include the globose capitula and the inflated and brittle corolla-tube. The two Australian species formerly placed in *Pentzia*.

Key to species

Capitula 3–5 mm diam. at anthesis; receptacle conical to obloid at maturity, c.1 mm diam..... **1. *O. suffruticosum***
 Capitula 5–8 mm diam. at anthesis; receptacle ellipsoid at maturity, 2–2.5 mm diam..... **2. *O. piluliferum***

1. **Oncosiphon suffruticosum* (L.) Källersjö, *Bot. J. Linn. Soc.* 96: 313 (1988)

Tanacetum suffruticosum L., *Sp. Pl.* 2: 843 (1753); *Matricaria multiflora* Fenzl ex Harv., in W.H.Harvey & O.W.Sonder, *Fl. Cap.* 3: 166 (1865); *Matricaria suffruticosa* (L.) Druce, *Bot. Exch. Club Soc. Brit. Isles 1913*: 421 (1914); *Pentzia suffruticosa* (L.) Hutch. & Merxm., *Mitt. Bot. Staatssamml. München* 6: 486 (1967).

Type: 'Aethiopia' [central-eastern Africa], Herb. Linn. 987: 11; holo: LINN *n.v.*, *vide* M.Källersjö, *loc. cit.*

Erect annuals to c. 60 cm high, with stems and leaves glandular, pubescent. Leaves to c. 4 cm long, 2- or 3-pinnatisect, with rachis and ultimate segments < 1 mm wide; segments 4–6 per side. Capitula numerous to 100s per stem, congested, 3–5 mm diam.; peduncle with scattered flattened hairs distally at anthesis. Involucre 2–3 mm long, ± glabrous; bracts of outer and middle series keeled; inner bracts with hyaline extension up to 1 mm long; mature receptacle conical, c. 1 mm diam. Florets: corolla c. 2 mm long, with tube longer than and c. as wide as the yellow limb. Achenes obovoid, c. 1 mm long, c. 3-angled, gland-dotted between ribs, grey-brown. Pappus a corona to c. 0.3 mm long, with margin usually lobed. *Calomba Daisy*.

Notes: Native to South Africa. Occurs in south-western Western Australia, southern South Australia, and far north-western Victoria. Grows in disturbed sites. Flowers summer.

A class 2 noxious weed in South Australia. The common name is derived from the town of Calomba in south-eastern South Australia where, presumably, it was first recorded in Australia.

Representative specimens: WESTERN AUSTRALIA: 21.5 km SSW of Nanambinia HS, Parmango Track, Coolgardie Botanical District, *W.R.Archer 1011907* (MEL). SOUTH AUSTRALIA: 1 km SE of Dublin on the Adelaide Rd, *S.W.L.Jacobs 6633* (MEL, NSW). VICTORIA: SW of L. Walla Walla, 13 Nov. 1986, *D.C.Cheal* (MEL).

2. **Oncosiphon piluliferum* (L.f.) Källersjö, *Bot. J. Linn. Soc.* 96: 314 (1988)

Cotula pilulifera L.f., *Suppl. Pl.* 378 (1781); *Matricaria pilulifera* (L.f.) Druce, *Bot. Exch. Club Soc. Brit. Isles 1916*: 635 (1917).

Type: Locality not given, *Nordenstam 161*; neo: S, *fide* M.Källersjö, *loc. cit.*

Cotula globifera Thunb., *Prodr. Pl. Cap.* 2: 162 (1800); *Matricaria globifera* (Thunb.) Fenzl ex Harv., in W.H.Harvey & O.W.Sonder, *Fl. Cap.* 3: 165 (1865); *Pentzia globifera* (Thunb.) Hutch., *Bull. Misc. Inform.* 1916: 251 (1917). Type: *n.v.*

Similar to *O. suffruticosum* but differing in the following respects: plants to c. 40 cm high; leaves to c. 2 cm long, 2-pinnatisect; capitula several to numerous per stem, 5–8 mm diam.; receptacle ellipsoidal at maturity, 2–2.5 mm diam.; achenes 3- or 4-angled. *Globe Chamomile.*

Notes: Native to South Africa. Occurs in south-western Western Australia. There are old collections from Port Philip Bay in Victoria and Stockton in eastern New South Wales, but populations are presumed not to have become established at these localities. Grows on rocky rises in woodland and in farmland. Flowers spring.

The capitula of this species are globose, with the involucre confined to the proximal quarter. The capitula of *O. suffruticosum*, although similar, are smaller and subglobose, i.e. with the distal half somewhat flattened.

Representative specimens: WESTERN AUSTRALIA: 12 km SSE of Trayning, *J.Dodd 487* (BRI, PERTH); North Miling, *J.Dodd 519* (BRI, PERTH).

16. PENTZIA Thunb., *Prodr. Pl. Cap.* 2: 145 (1800)

Shrubs, erect. Leaves 1- or 2-pinnatisect. Capitula 1 per branch (in Australia), discoid; involucre c. 3-seriate; gradational in length; receptacle epaleate. Florets bisexual, with corolla 4- or 5-lobed. Achenes ± homomorphic, quadrangular, regularly 5-ribbed, glabrous. Pappus present.

A genus of 23 species mostly from South Africa, but also from Namibia, Morocco and Algeria. Species in Australia are readily recognisable by their small leaves.

Key to species

Leaves commonly greyish, with 1 or 2 (or 3) primary segments per side, commonly confined to distal half; outer series of involucre bracts ovate..... **1. *P. incana***
 Leaves green, with 3–5 primary segments per side, arising ± evenly throughout length; outer series of involucre bracts linear-lanceolate..... **2. *P. globosa***

1. **Pentzia incana* (Thunb.) Kuntze, *Revis. Gen. Pl.* 3: 166 (1898)

Chrysanthemum incanum Thunb., *Prodr. Pl. Cap.* 2: 161 (1800).

Type: not designated.

Pentzia virgata Less., *Syn. Gen. Compos.* 266 (1832), *nom. illeg.* Type: *n.v.*

Low shrub to c. 40 cm high, with younger stems and leaves usually tomentose. Leaves to c. 1 cm long, 1-pinnatisect, with rachis and ultimate segments < 1 mm wide; segments 1 or 2 per side, confined to distal half of leaf (excluding auricles if present). Capitula 1 or few per branch, 4–7 mm diam.; peduncle appressed-tomentose distally at anthesis. Involucre 2.5–3 mm long; bracts of outer and middle series ovate, keeled, with margin usually brown, slightly cobwebby or glabrous; inner series of bracts with hyaline extension 0.5–1 mm long; mature receptacle shallowly domed. Florets: corolla 1.5–2 mm long, with tube ± equal in length but slightly narrower than the 5-lobed, yellow or purplish limb. Achenes of disc florets obovoid, 1–1.5 mm long, 5-ribbed, grey-brown. Pappus an oblique white corona c. 1 mm long. *African Sheep Bush.*

Notes: Occurs in central-eastern South Australia, with an old record from Nyngan in central New South Wales. Grows in arid saltbush shrublands. Flowers at various times.

Introduced by the CSIR, now CSIRO, at Koonamore in South Australia in the 1930s. The single old record from Nyngan differs from the South Australian records in having leaf-segments less consistently concentrated distally.

Representative specimens: SOUTH AUSTRALIA: c. 60 km N of Yunta, Koonamore Stn, *M.D.Crisp 307* (CANB). NEW SOUTH WALES: Nyngan, Nov. 1913, *J.H.Maiden* (NSW).

2. **Pentzia globosa* Less., *Syn. Gen. Compos.* 266 (1832)

Type: *n.v.*

Similar to *P. incana* but differing in the following: leaves \pm glabrous, sometimes 2-pinnatisect; primary segments of leaves 3–5 per side, arising regularly throughout length; involucre bracts of outer and middle series linear-lanceolate, without a hyaline margin; inner series of bracts with hyaline extension c. 0.2 mm long; mature receptacle conical; corolla-tube much narrower than the limb; corona c. 0.3 mm long.

Notes: Occurs near Jamestown in south-eastern South Australia, with an old record from Gosford on the central coast of New South Wales. Ecological preferences unknown. Flowers recorded in autumn.

The South Australian population has persisted since at least 1897 when it was first collected (*J.H.Maiden* NSW). The tiny secondary segments of the 2-pinnatisect leaves arise at or near the base of the primary segment.

Representative specimens: SOUTH AUSTRALIA: near Bundaleer Picnic Ground, near Jamestown, *R.Bates 14272* (AD). NEW SOUTH WALES: Gosford, Feb. 1894, *coll. unknown* (NSW).

17. COTULA L., *Sp. Pl.* 2: 891 (1753)

Annual to perennial herbs, erect to sprawling. Leaves entire, lobate or 1- or 2-pinnatisect. Capitula solitary, disciform (in Australia) or discoid, with zygomorphic florets present in *C. turbinata*; involucre 2- or 3-seriate, with bracts all of similar length; receptacle epaleate. Florets often pedicellate; outer florets 1–several-seriate, female; central florets bisexual or functionally male, with corolla mostly 4-lobed. Achenes usually dimorphic, dorsally compressed, unribbed, hairy or not. Pappus absent.

A genus of c. 50 species, mostly from the southern hemisphere, with four species native to Australia and three of these endemic. Of the total of seven species in Australia, all are eglandular except for *C. alpina*, and all have stem-sheathing leaves. The involucre bracts are often tinged purple and do not have an elongate hyaline apex, and the outer florets are in some species prominently pedicellate. Central florets, if pedicellate, have much shorter pedicels. The outer florets are female and lack a corolla except for a weakly developed one in *C. bipinnata*.

Key to species

- 1 All leaves entire, filiform, to c. 1 mm wide, with hairs on basal sheath
- 2 Outer florets in a single series on slender pedicels, or outer florets absent; central florets numerous, with corolla lobes purple, producing achenes (south-eastern Australia) 1. *C. vulgaris*

- 2: Outer florets in several series, none on slender pedicels; central florets several, with corolla lobes yellow, not producing achenes (Western Australia)..... **2. *C. cotuloides***
- 1: Some or all leaves divided, or if all entire then not filiform, > 1 mm wide and/or entirely glabrous
- 3 Peduncle stout, arising from a rosette of leaves; leaves dotted with minute glands; outer florets in several series, not pedicellate **7. *C. alpina***
- 3: Peduncle slender, not arising from a rosette of leaves; leaves without glands; outer florets in a single series, pedicellate, or female florets not developed
- 4 Peduncle becoming obconical in distalmost 3–8 mm following anthesis; intermediate series of florets zygomorphic, with ligules white or pink..... **4. *C. turbinata***
- 4: Peduncle not becoming obconical or at least not as above; all florets actinomorphic or lacking a corolla
- 5 Stems and leaves usually moderately hairy; achenes of outer florets in several series, papillose on both faces..... **3. *C. australis***
- 5: Stems and leaves glabrous or with hairs rather sparse; achenes of outer florets in 1 series or undeveloped, papillose only on inner face
- 6 Largest leaves usually 1- or 2-pinnatisect, occasionally entire if plants depauperate; peduncle mostly < 2 cm long, with scattered hairs at anthesis; outer florets absent or up to c. 10, with corolla present, with pedicel not tapering **6. *C. bipinnata***
- 6: Largest leaves entire, lobate, or 1-pinnatisect; peduncle mostly > 2 cm long, glabrous; outer florets numerous, with corolla absent, with pedicel tapering distally..... **5. *C. coronopifolia***

1. *Cotula vulgaris* Levyns var. *australasica* J.H.Willis, *Victorian Naturalist* 73: 201 (1957).

Type: Swamps, Shire of Dimboola, Victoria, 25 Sept. 1892, *F.M.Reader*; holo: MEL; iso: AD, NSW.

[*Cotula filifolia* auct. non Thunb. (1800): J.M.Black, *Fl. S. Australia* 606 (1929); A.Ewart, *Fl. Victoria* 1167 (1931)]

Annuals to c. 20 cm high. Stems sparsely hairy, glabrescent, with hairs antrorse. Leaves to c. 4 cm long, entire and narrow-linear, glabrous except for hairs on sheath. Capitula 3–5 mm diam.; peduncle mostly 2–6 cm long, c. 0.3 mm broad (pressed specimens), with distalmost 1–2 mm sometimes obconical at maturity, usually sparsely to moderately hirsute at anthesis, with hairs antrorse to divergent. Involucral bracts 5–8; outer bracts broad-ovate, 2–3 mm long, with apex rounded. Outer florets up to c. 8, 1-seriate, sometimes absent, with pedicels 0.3–0.6 mm long. Central florets numerous, with pedicels hardly longer than broad; corolla c. 1 mm long, with limb usually purplish. Achenes of outer florets c. 1.5 mm long; faces broad-elliptic, glabrous, with papyraceous wings as broad as or broader than body; achenes of central florets 1.2–1.5 mm long; faces elliptic, glabrous. *Slender Cotula*.

Notes: Occurs in southern Australia from south-central South Australia east to western Victoria, and in eastern Tasmania. Grows in damp saline areas such as the margin of salt lakes and coastal marshes. Flowers late winter–summer.

Differs from the type variety from South Africa which has glabrous peduncles and longer corollas. The achenes of the female florets are both cordate-based and apically-notched due to the large but thin wings.

Representative specimens: SOUTH AUSTRALIA: Butchers Gap, South Kingston, *P.Gibbons* 219 (AD). VICTORIA: Murtnagurt Lagoon, L. Connewarre Game reserve, 15 Sept. 1983, *J.Z.Yugovic* (MEL). TASMANIA: Croppies Point, *A.M.Buchanan* 1609 (HO).

2. *Cotula cotuloides* (Steetz) Druce, *Bot. Exch. Club Soc. Brit. Isles for 1916, suppl.* 2: 617 (1917)

Gymnogyne cotuloides Steetz, in J.G.C.Lehmann, *Pl. Preiss.* 1: 432 (1845); *Cotula gymnogyne* F.Muell. ex Benth., *Fl. Austral.* 3: 549 (1867), *nom. illeg.*

Type: Perth, Western Australia, 1839, *J.A.L.Preiss* 101; holo: MEL; iso: MEL.

Annuals to c. 20 cm high. Stems with scattered long hairs. Leaves to c. 6 cm long, entire and narrow-linear, glabrous except for hairs on sheath. Capitulum 4–12 mm diam.; peduncle 2–10 cm long, 0.3–0.5 mm broad (pressed specimens), not obconical distally at maturity, hirsute at anthesis with hairs antrorse to almost spreading. Involucral bracts c. 10; outer bracts broad-ovate, 2–3 mm long, with apex rounded. Outer florets numerous, multi-seriate, attached to tubercles. Central florets several, ?functionally male, sessile; corolla c. 1 mm long, with limb pale yellow. Achenes of outer florets c. 1.5 mm long; faces c. orbicular, glabrous, with papyraceous wings much broader than body. *Smooth Cotula*.

Notes: Occurs in south-western Western Australia. Grows in a variety of soils in swampy areas, the margin of salt lakes and around granitic outcrops. Flowers spring to early summer.

Similar vegetatively to *C. vulgaris* var. *australasica* but having the proportions of outer female to disc florets reversed. The disc florets of *C. cotuloides* do not appear to produce achenes and they become hidden below the achenes of outer florets as they develop. A single collection containing numerous plants, *P.S.Short* 2240 & *L.R.Haegi* (AD, MEL, PERTH) from near Australind has relatively small capitula with significantly narrower involucral bracts than typical *C. cotuloides* and may warrant taxonomic recognition.

Representative specimens: WESTERN AUSTRALIA: 19.5 km ESE of Mt Newmont, *W.R.Archer* 14119213 (MEL); c. 54 km from Paynes find along road to Cleary, eastern edge of L. Moore, *P.S.Short* 2590, *N.S.Lander* & *B.A.Fuhrer* (AD, MEL, PERTH).

3. *Cotula australis* (Sieber ex Spreng.) Hook.f., *Fl. Nov.-Zel.* 1: 128 (1853)

Anacyclus australis Sieber ex Spreng., *Syst. Veg.* 3: 497 (1826); *Strongylosperma australe* (Sieber ex Spreng.) Less., *Syn. Gen. Comp.* 261 (1832); *Pleiogyne australis* (Sieber ex Spreng.) K.Koch, in D.F.L.Schlechtendal & H.Mohl (eds), *Bot. Zeitung (Berlin)* 40 (1843); *Lancisia australis* (Sieber ex Spreng.) Rydb., *N. Amer. Fl.* 34: 286 (1916)

Type: Precise locality unknown, [Sydney area], New South Wales, 1823, *F.W.Sieber* 331; n.v.

Annuals or short-lived perennials to c. 10 cm high. Stems moderately hairy with hairs antrorse-divergent to spreading. Leaves to c. 4 cm long, 1- or 2-pinnatisect, moderately hairy. Capitulum 2–8 mm diam.; peduncle mostly 2–8 cm long, c. 0.1–0.6 mm broad (pressed specimens), hardly obconical at maturity, moderately hirsute at anthesis, with hairs antrorse, appressed to divergent. Involucral bracts 5–20, oblong to oblong-ovate, 1.5–3 mm long, with apex rounded. Outer florets numerous, multi-seriate, with pedicels

0.5–1 mm long. Central florets 15–25, with pedicels hardly longer than broad; corolla c. 0.5 mm long, with limb pale yellow to white. Achenes of outer florets c. 1–1.5 mm long; faces oblong, minutely papillose, with fleshy wings slightly narrower than face; achenes of central florets c. 1 mm long; faces oblong, glabrous. *Common Cotula*, *Carrot Weed*.

Notes: Widespread in southern Australia and occurs in all states and territories. Also native to New Zealand. A weed in North and South America, India, Portugal and Southern Africa. Grows in moist environments; and a common weed of urban environments. Flowers at most times of the year. Leaves of *C. australis* often have small near-basal lobes. This species is also distinctive among species in Australia in having a single prominent resin canal in the midline of the involucre bracts (other species have indistinct resin canals or 3 or 4 ± equally distinct) and in having greenish outer achenes. The involucre bracts sometimes have scattered hairs, whereas in other species of *Cotula* in Australia the bracts are glabrous.

Representative specimens: WESTERN AUSTRALIA: Road bore, Yoothapinna Stn, E block, R.J.Cranfield 5667 (CANB, PERTH). NORTHERN TERRITORY: Desert Springs Motel, Alice Springs, P.K.Latz 12975 (MEL). SOUTH AUSTRALIA: Ravine des Casoars, 8 km E of Cape Borda, Kangaroo Is., P.G.Wilson 686 (AD). QUEENSLAND: Warren point Stn, Mitchell, 22 Aug. 1968, P.Martensz s.n. (BRI, CANB). NEW SOUTH WALES: Joe's tank, Bundella Stn near Elura mining lease, 42.5 km NNW of Cobar, M.D.Crisp 4222 (AD, CANB, NSW). AUSTRALIAN CAPITAL TERRITORY: Black Mtn, Canberra, F.Davies 20 & I.R.Telford (CANB, MEL, NSW). VICTORIA: near Long Forest Rd, 6 km ENE of Bacchus Marsh and 1.2 km N of Western Hwy, T.B.Muir 6227 (CANB, MEL). TASMANIA: Andersons Creek, N of Broadmarsh, P.Collier 3461 (HO).

4. **Cotula turbinata* L., *Sp. Pl.* 2: 892 (1753)

Type: 'Aethiopia' [central-eastern Africa]; Herb. Clifford: 417, *Cotula* No. 1; lecto: BM, *vide* C.J.Humphries, *Taxon* 47: 359 (1998).

Annuals to c. 40 cm high. Stems moderately hairy, with hairs spreading. Leaves to c. 5 cm long, 1- or 2-pinnatisect, with spreading hairs. Capitula 5–10 mm diam.; peduncle mostly 4–10 cm long, c. 0.5 mm broad (pressed specimens), with distalmost 3–8 mm obconical at maturity, hirsute at anthesis with hairs antrorse-divergent, glabrous distally. Involucre bracts c. 10, broad-ovate, 2–3 mm long, with apex acute to obtuse. Outer florets numerous, c. 1-seriate, with pedicels to c. 1 mm long. Intermediate florets numerous, c. 1-seriate, bisexual, with a white and usually abaxially purple ligule c. 2 mm long. Central florets very numerous, with pedicels hardly longer than broad; corolla tubular, c. 1 mm long, with limb yellow. Achenes of female florets c. 1.5–2 mm long; faces broad-elliptic, glabrous or papillose, with fleshy wings c. as broad as body; achenes of central florets 1.0–1.3 mm long; faces obovate-oblong, glabrous. *Ferny Cotula*.

Notes: Occurs in far south-western Western Australia, with a single record from coastal New South Wales. Grows in sandy and loamy soils, in disturbed sites and including roadsides and lawns. Flowers winter to mid-spring.

A readily recognisable species in flower with its series of ligulate florets and turbinate distal peduncle. Similar to *C. vulgaris* var. *australasica* in that the involucre and peduncle are sometimes glaucous. The margin of the achenes of the female florets is often minutely papillose.

Representative specimens: WESTERN AUSTRALIA: c. 1 km N of Australind on Mandurah Rd, P.S.Short 2245 & L.Haegi (AD, CANB, MEL, PERTH); roadside (along the ocean road) just

N of Bunbury, *B.L. Turner 5485* (MEL). NEW SOUTH WALES: top of cliffed dune terrace, near playschool, Stockton, *P.C. Heyligers 98010* (MEL, NSW).

5. **Cotula coronopifolia* L., *Sp. Pl.* 2: 892 (1753)

Type: 'Aethiopia' [central-eastern Africa]; *n.v.*

Cotula integrifolia Hook.f., *Fl. Tasman.* 1: 192 (1856), *nom. illeg. non* Burch (1822).
Type: Locality unknown, *R.C. Gunn 1153*; *n.v.*

Perennials to c. 30 cm high, glabrous. Leaves to c. 8 cm long, acutely lobate or 1-pinnatisect, rarely entire with l:w ratio up to 8, or sub-2-pinnatisect. Capitulum 5–12 mm diam.; peduncle mostly 2–8 cm long, 0.3–1.0 mm broad (pressed specimens), not obconical distally. Involucral bracts numerous; outer bracts narrow-ovate or oblong, 3–5 mm long, with apex rounded. Outer florets numerous, c. 1-seriate, with pedicels 1–1.8 mm long. Central florets numerous, with pedicels longer than broad; corolla c. 1 mm long, with limb bright yellow. Achenes of outer florets 1.5–2 mm long; faces broad-oblong, papillose on inner face, with spongy wing c. as broad as body; achenes of central florets c. 1.3 mm long, c. oblong, papillose on inner face. *Water-buttons*.

Notes: Native to South Africa. Widespread in southern Australia and occurring in all states. Also naturalised in New Zealand. Grows in damp or wet places in both saline and fresh water. Flowers mainly winter–spring.

More succulent than other species of *Cotula* in Australia. Grows in shallow water or mud and stems readily take root at nodes. There has been some conjecture about whether this species is native based on the number and extent of early records in Australia. Rarely, depauperate specimens may have entire leaves less than 1 mm wide. These plants can be distinguished from *C. vulgaris* and *C. cotuloides* vegetatively because they are glabrous. A dwarf form occurs on islands in southern Western Australia with smaller leaves with more crowded lobation. Further investigation may be warranted to determine whether these differences are purely ecological. A probable hybrid between *C. coronopifolia* and *C. australis* has been recorded from Mt Chappell Is., in Bass Strait (*J.S. Whinray 223* CANB).

Representative specimens: WESTERN AUSTRALIA: small un-named lake/swamp 0.5 km N of Ledge Point, *A.E. Orchard 5929* (HO, PERTH). SOUTH AUSTRALIA: The Big Point, Bool Lagoon, *J.Z. Weber 7553* (AD, CANB). QUEENSLAND: Claverton Stn, 20 km S of Wyandra, 3 Sept. 1996, *S. Moffat* (BRI). NEW SOUTH WALES: Jerseyville, Trial Bay, near Arakoon, *P. Martensz Q185* (NSW). VICTORIA: Point Wilson, Sperm Whale Head, *T.B. Muir 2273* (MEL). TASMANIA: Ocean Beach, 5 km W of Strahan, *A.E. Orchard 5929* (AD, CANB, HO, MEL, NSW); Whites Valley, Hamilton, *A.M. Buchanan 13679* (HO).

6. **Cotula bipinnata* Thunb., *Prodr. Pl. Cap.* 162 (1800)

Type: not designated.

Annuals to c. 40 cm high. Stems glabrous or with occasional appressed to spreading hairs. Leaves to c. 6 cm long, 1- or 2-pinnatisect, or uppermost leaves sometimes entire, sparsely hairy or glabrous. Capitulum 6–8 mm diam.; peduncle 0.5–2 (–3) cm long, c. 0.3 mm broad (pressed specimens), hardly obconical at maturity, sparsely hirsute at anthesis, with hairs antrorse to spreading. Involucral bracts numerous; outer bracts oblong-ovate or oblong, 2–3 mm long, with apex rounded to truncate. Outer florets up to c. 10, 1-seriate, or absent, with pedicels c. 1 mm long. Central florets numerous, with pedicels much longer than broad; corolla c. 1 mm long, with limb pale yellow. Achenes of outer florets

1–1.5 mm long, broad-oblong, with inner face papillose, with thin to slightly spongy wings as broad as body. Achenes of central florets c. 1–1.5 mm long, oblong, glabrous or inner face sparsely papillose. *Ferny Cotula*.

Notes: Native to South Africa. Occurs in south-western Western Australia, southern South Australia, western New South Wales, and western and northern Victoria. Also recorded from the Northern Territory. Grows mostly in seasonally moist saline areas. Flowers late winter–summer.

Although depauperate specimens of *C. coronopifolia* can look similar, *C. bipinnata* has a shorter and more often purplish peduncle bearing scattered hairs at anthesis, a differently coloured disc, and fewer female florets. The involucre bracts are also more frequently purple in *C. bipinnata*. Unlike other species of *Cotula* in Australia, outer florets develop a small corolla.

Representative specimens: WESTERN AUSTRALIA: W of Northern Inland Hwy on Perenjori Rd, *A.M.Ashby 5218* (CANB, PERTH). NORTHERN TERRITORY: roadside, c. 200 km N of Tennant Ck (between Elliot and Renner Springs), *C.R.Alcock 7210* (AD, BRI, DNA). SOUTH AUSTRALIA: 10 km NW of Nuriootpa, Northern Lofty, *R.J.Bates 29155* (AD). NEW SOUTH WALES: 1 km NW along Oxley Rd from the Hay–Maude Rd, *R.G.Coveny 18676*, *G.Chapple*, *P.G.Kodala & H.McPherson* (AD, BRI, MEL, NSW). VICTORIA: E side of Hume Freeway, 100 km N of Melbourne, *I.C.Clarke 3062* (CANB, MEL).

7. *Cotula alpina* (Hook.f.) Hook.f., *Fl. Tasman.* 1: 192 (1856)

Ctenosperma alpinum Hook.f., in *W.J.Hooker, London J. Bot.* 6: 115 (1847).

Type: Marlborough, Tasmania, *R.C.Gunn; n.v.*

Scapose, annuals or short-lived perennials to c. 10 cm high, stoloniferous, glabrous. Rosette leaves to c. 4 cm long, 1-pinnatisect, minutely glandular. Capitula 3–7 mm diam.; peduncle to 5 cm long, 1–3 mm broad (pressed specimens), not obconical distally at maturity. Involucre bracts numerous; outer bracts broad-oblong or ovate, 2–3 mm long, with apex rounded. Outer florets numerous, 3- or 4-seriate, sessile. Central florets few, functionally male, sessile; corolla c. 1.0 mm long, with limb yellow-green. Achenes of outer florets 1.5–2 mm long; faces ± obovate, glabrous or papillose, with fleshy wings nearly as broad as body. *Alpine Cotula*.

Notes: Occurs in far south-eastern New South Wales, eastern Victoria, and Tasmania. Grows mostly at high altitudes in various soils including basalt-derived loam, in grassland, sedgeland and forest. Flowers summer to autumn.

Sits uncomfortably between *Cotula* and *Leptinella* as it has functionally male central florets, multiseriate female florets, glandular leaves, and a stoloniferous habit as in the latter genus, but without a corolla on the female florets as in the former. Often confused with *Leptinella filicula* which occupies similar habitats, but hairs are always evident in the latter on close inspection. The hyaline margin of *C. alpina* is often pigmented purple or brown apically; this is a feature of a number of species of *Leptinella* from New Zealand, but is not generally evident in Australian species.

Representative specimens: NEW SOUTH WALES: S along internal road, c. 2 km S of Kydra Reefs, *R.G.Coveny 19004 & A.E.Orme* (MEL, NSW). VICTORIA: 1.25 km SE of Mt Jim, Bogong High Plains, *R.J.Adair 1613* (MEL). TASMANIA: Bluff R., *A.Moscal 8215* (HO); Junction Boat Ramp & Central Plateau roads, E side of Great Lake, *A.Brown 189* (HO).

18. LEPTINELLA Cass., *Bull. Sci. Soc. Philom. Paris* 127 (1822)

Perennial herbs, prostrate. Leaves 1–3-pinnatisect. Capitula solitary, disciform; involucre 2- or 3-seriate, with bracts all of similar length; receptacle epaleate. Outer florets 2–4-seriate, female; central florets functionally male, with corolla mostly 4-lobed. Achenes compressed, unribbed, glabrous. Pappus absent.

A genus of c. 33 species, mostly from New Guinea, Australia, New Zealand and South America. A genus characterised by stoloniferous growth, outer florets in a few series, more numerous than the disc florets and with an inflated macroscopic corolla, and by functionally male disc florets with an unbranched style. There are four species in Australia, all endemic. Roots are fleshy and outer florets are female. *Leptinella maniototo*, native to NZ, has been recorded from a bowling green in Parndana, Kangaroo Is., South Australia, but is not considered naturalised. It has entire leaves or 1-pinnatisect leaves with very short pinnae. Two further collections from southern Tasmania, from Turua Beach in far south-east Tasmania (*A.M.Buchanan* 9721 HO) and from Ummarrah Ck (*A.M.Buchanan* 7910 HO) in the far south, may represent two further species of *Leptinella* from New Zealand. The identity of these collections requires further investigation.

Key to species

- 1 Leaves 1-pinnatisect, dilating gradually to form basal sheath; peduncle relatively short and stout at anthesis (length: diam. ratio < 40); achenes oblong-elliptic, with persistent corolla taller than broad.....**1. *L. filicula***
- 1: Leaves 1–3-pinnatisect, dilating abruptly to form basal sheath; peduncle relatively long and slender at anthesis (length: diam. ratio > 40); achenes obovate, with persistent corolla broader than tall
 - 2 Leaves once-pinnatisect to sub-bipinnatisect with secondary segments usually only arising in middle to distal third; achenes 2–3 mm long**4. *L. longipes***
 - 2: Leaves bi- or tripinnatisect, with secondary pinnae arising in proximal thirds as well as middle and distal thirds; achenes 1.5–2 mm long
 - 3 Stems transiently villous, soon glabrescent.....**2. *L. reptans***
 - 3: Stems persistently densely villous.....**3. *L. drummondii***

1. *Leptinella filicula* (Hook.f.) Hook.f., *Fl. Tasman.* 1: 194 (1856)

Symphyomera filicula Hook.f., in W.J.Hooker, *London J. Bot.* 6: 116 (1847); *Cotula filicula* (Hook.f.) Benth., *Fl. Austral.* 3: 551 (1867).

Type: *n.v.*

Plants with stems villous. Leaves to c. 6 cm long, with l:w ratio c. 2–4, 1-pinnatisect, gradually dilating basally to form sheath, with scattered or sparse hairs; primary segments ± restricted to distal half, mostly c. elliptic, sometimes lobed. Capitula 3–6 mm diam.; peduncle to 3 cm long at anthesis, c. 0.8 mm diam., villous. Involucral bracts c. 10–20, broad-elliptic or slightly obovate, 2.0–2.5 mm long, with apex rounded, usually hairy. Outer florets with corolla longer than broad. Central florets several; corolla c. 1 mm long. Achenes (excl. corolla) 1.5–2 mm long, 0.7–1.0 mm wide, with faces oblong-elliptic, brown with a pale margin. *Mountain Cotula*.

Notes: Occurs in far south-eastern Australia from Barrington Tops in central-eastern New South Wales SSW to eastern Victoria, and in central Tasmania. Grows in wet forest. Flowers summer–autumn.

Similar to *Cotula alpina* but hairy, densely so at growing points, and with conical glandular corollas present on outer florets and persisting on fruit. The leaf is commonly infected with the fungus *Febraea rhytismoides* resulting in a conspicuous black mark on each pinna. This is illustrated in Corrick and Fuhrer (2000). The basal leaf-sheath is sometimes lobed.

Representative specimens: NEW SOUTH WALES: eastern side of Barrington Trail, Barrington Tops National Park, *J.R.Hosking 2315* & *J.M.Bakonji* (CANB, MEL, NE, NSW). AUSTRALIAN CAPITAL TERRITORY: between Blackfellows Gap & Upper Cotter R., *N.Burbidge 6354* (CANB, MEL). VICTORIA: Blue Rag Ra., c. 15 km SE of Mt St. Bernard on Hotham to Dargo road, *L.Haegi 1640* (MEL, NSW). TASMANIA: Tarraleah, Central Plateau, 7 Feb. 1945, *W.M.Curtis* (HO).

2. *Leptinella reptans* (Benth.) D.G.Lloyd & C.J.Webb, *New Zealand J. Bot.* 25: 103 (1987)

Strongylosperma reptans Benth., in S.L.Endlicher *et al.*, *Enum. Pl.* 60 (1837), as *Strongylospermum*; *Pleioogyne reptans* (Benth.) K.Koch, in D.F.L.Schlechtendal & H.Mohl (eds), *Bot. Zeitung (Berlin)* 40 (1843); *Cotula reptans* (Benth.) Benth., *Fl. Austral.* 3: 551 (1867).

Type: Locality unknown, 'Ferd. Bauer'; *n.v.*

Leptinella intricata Hook.f., in W.J.Hooker, *London J. Bot.* 6: 117 (1847). Type: South Cape, Tasmania, *R.C.Gunn*; *n.v.*

Leptinella multifida Hook.f., in W.J.Hooker, *London J. Bot.* 6: 118 (1847); *Pleioogyne multifida* (Hook.f.) Sond., *Linnaea* 25: 484 (1852); *Leptinella intricata* var. *multifida* (Hook.f.) Hook.f., *Fl. Tasman.* 1: 194 (1856). Type: 'Kangaroo Point', Tas.; *n.v.*

Plants with sparse to scattered hairs c. 0.5–1 mm long but often soon glabrescent. Leaves to c. 10 cm long, with l:w ratio c. 3–5, 2- or 3-pinnatisect, abruptly dilated basally to form sheath, with scattered hairs or glabrous; primary segments restricted to distal 1/3–1/2, ovate, elliptic or sub-orbicular in outline; secondary segments arising from proximal, middle and distal thirds. Capitula 2–4 mm diam.; peduncle to c. 7 cm long at anthesis, c. 0.5 mm diam., sparsely to moderately hairy, glabrescent. Involucral bracts c. 6–12, broad-elliptic or orbicular, 1.5–2 mm long, with apex rounded, glabrous or hairy. Outer florets with corolla broader than long. Central florets with corolla c. 1 mm long. Achenes (excl. corolla) 1–2 mm long; faces obovate, pale tan to brown, usually with a paler margin.

Notes: Occurs in south-eastern South Australia, southern Victoria, and Tasmania, with an isolated record from north-eastern New South Wales. Grows beside water typically, sometimes in saline environments such as seashores, in grassland, sedgeland and forest. Flowers spring–summer.

Representative specimens: SOUTH AUSTRALIA: south-western banks, southern arm of L. Bonney, *N.N.Donner 9640* (AD, HO). NEW SOUTH WALES: Werrikimbe National Park, 6 Dec. 1987, *J.R.Hosking s.n.* (NSW). VICTORIA: Gunyah Gunyah Rainforest Reserve, Grand Ridge Rd, *J.Yugovic 460* (MEL). TASMANIA: Granville Harbour, *A.E.Orchard 5628* (AD, HO, MEL, NSW, PERTH).

3. *Leptinella drummondii* (Benth.) D.G.Lloyd & C.J.Webb, *New Zealand J. Bot.* 25: 103 (1987)

Cotula drummondii Benth., *Fl. Austral.* 3: 550 (1867).

Type: Locality unknown, Western Australia, *Drummond 3rd collection, 113*; syn: MEL; Don R., Western Australia, *A.F.Oldfield*; syn: MEL.

Plants with stems villous. Leaves to c. 7 cm long, with l:w ratio c. 3–5, 2- or 3-pinnatisect, abruptly dilated basally to form sheath, with scattered or sparse hairs; segments in distal 1/3–1/2, elliptic to sub-orbicular in outline. Capitula 2–4 mm diam.; peduncle to 7 cm long at anthesis, c. 0.5 mm diam., sparsely to densely villous. Involucral bracts c. 6–12, broad-elliptic or orbicular, 1.5–2 mm long, with apex rounded, glabrous or sparsely haired. Outer florets with corolla broader than long. Central florets with corolla c. 1.5 mm long. Achenes not seen.

Notes: Occurs in south-western Western Australia. Grows in red clay-loam on river banks in woodland. Flowers late spring–autumn.

A poorly known species very similar to *C. reptans*.

Representative specimens: WESTERN AUSTRALIA: Willgarup R. crossing with Tick Rd, *C.Day & A.Annels MJ 75.1* (PERTH); Blackwood R. near bridge, Sue's Rd, Nillup, E of Karridale, *R.D.Royce 10498* (PERTH).

4. *Leptinella longipes* Hook.f., in W.J.Hooker, *London J. Bot.* 6: 117 (1847)

Cotula longipes (Hook.f.) W.M.Curtis, *Stud. Fl. Tasmania* 2: 463 (1963); *Cotula reptans* var. *major* Benth., *Fl. Austral.* 3: 551 (1867).

Type: Circular Head, Tasmania, *R.C.Gunn; n.v.*

Plants glabrous or with transient hairs mostly 0.1–0.5 mm long. Leaves to c. 30 cm long, with l:w ratio c. 3–6, 1- or sub-2-pinnatisect, abruptly dilated basally to form sheath, glabrous apart from inconspicuous mostly early caducous hairs; primary segments restricted to distal 1/2–1/3 (–1/4), elliptic to sub-orbicular or obovate in outline; secondary segments if present usually only arising from middle to distal third. Capitula c. 3–5 mm diam.; peduncle to 10 cm long at anthesis, c. 0.5 mm diam., with transient hairs sometimes present distally. Involucral bracts c. 6–8, broad-elliptic or orbicular, 2.0–2.5 mm long, with apex rounded, glabrous or sparsely haired. Outer florets with corolla broader than long. Central florets several to numerous, with corolla c. 1 mm long. Achenes (excl. corolla) 2–3 mm long, 1.0–1.5 mm wide; faces obovate, pale throughout.

Notes: Occurs in far south-eastern Queensland, eastern New South Wales, southern Victoria, far south-eastern South Australia, and eastern Tasmania. Grows on margin of wet often saline areas. Flowers spring–autumn.

The fruits of this species are relatively large, somewhat trigonous and pale throughout, and pressed specimens usually have a wrinkled surface, probably due to the drying out of a fleshy pericarp. Very similar to and occupying similar habitats to *L. reptans*. Without mature fruit *L. longipes* can be distinguished from *L. reptans* by a combination of being earlier glabrescent with shorter hairs, having longer leaves with a relatively longer petiolar portion, and by having less dissected leaves. Leaves of both species are variably elongate depending on environmental conditions.

Representative specimens: QUEENSLAND: Currumbin, *C.T.White 8729* (BRI). SOUTH AUSTRALIA: across Glenelg R. from Donovan's Landing, c. 30 km SE of Mt Gambier, *B.Copley 3015* (AD). NEW SOUTH WALES: near the mouth of Little Ck, Nadgee Nature Reserve, South Coast, *D.E.Albrecht 1472* (MEL). VICTORIA: W bank of Wallagaraugh R., c. 1 km downstream from Gipsy Point settlement, East Gippsland, *N.G.Walsh 3136* (BRI, CANB, HO, MEL); near mouth of Seal Ck, Croajingolong National Park, *D.E.Albrecht 4849* (HO, MEL, NSW). TASMANIA: mouth of Curries R., Beechford, *A.M.Buchanan 10589* (HO).

19. SOLIVA Ruiz & Pav., *Fl. Peruv. Prodr.* 113, t. 24 (1794)

Annual herbs, ± prostrate. Leaves 1–3-pinnatisect. Capitula solitary, sessile, disciform; involucre 1- or 2-seriate, with bracts all of similar length; receptacle epaleate. Outer florets multiseriate, female; central florets functionally male, with corolla 3- or 4-lobed. Achenes compressed, unribbed, glabrous or hairy. Pappus absent.

A genus of c. 9 species from South America. Species are low-growing, rosetted, and developing prostrate stems after an initial flowering. They are eglandular and are readily recognised by the strongly flattened fruits with the style persisting and developing into a prominent spine. The outer florets do not develop a corolla. The central florets are relatively few in number and their styles are unbranched.

Key to species

- 1 Achenes c. 2.5–4 mm wide, with broad scarious wings, not villous apically **1. *S. sessilis***
- 1: Achenes 1–1.5 mm wide, without broad scarious wings, villous apically or not
- 2 Achenes glabrous, smooth with no distinct marginal region **2. *S. valdiviana***
- 2: Achenes villous apically, with a distinct, transversely corrugated marginal region
- 3 Leaves to c. 13 cm long, 2- or 3-pinnatisect; achenes obtuse to rounded apicolaterally (i.e. at shoulders) **3. *S. anthemifolia***
- 3: Leaves to c. 4 cm long, 1- or 2-pinnatisect; achenes acute apicolaterally (i.e. at shoulders)..... **4. *S. stolonifera***

1. **Soliva sessilis* Ruiz & Pav., *Syst. Veg. Fl. Peruv. Chil.* 113, t. 24 (1794)

Type: *n.v.*

Gymnostyles pterosperma Juss., *Ann. Mus. National Hist. Nat.* 4: 262, t. 61 fig. 3 (1804); *S. pterosperma* (Juss.) Less., *Syn. Gen. Compos.* 268 (1832). Type: *n.v.*

Plants with scattered hairs c. 0.5–1 mm long. Leaves to c. 5 cm long, 2-pinnatisect, with primary segments elliptic to orbicular in outline, with hairs largely abaxial. Capitulum 3–6 mm diam. Involucre 3–6 mm long; bracts 5–8, ovate to lanceolate, acute, with hyaline margin lacking. Outer florets 12–30. Central florets: corolla c. 2 mm long, c. 0.5 mm diam. Mature receptacle narrow conical. Achenes (excl. spine) c. rotund to oblate in profile, 2–2.5 mm long, 2.5–4 mm wide, not woolly apically; body c. 1 mm wide, with scattered tubercle-based papillose hairs on both sides; wings 0.7–1.5 mm wide, incurved, entire or more often slightly to deeply notched towards base, forming an acute spine-like process apically, scarious, smooth; stylar spine 1.8–2.6 mm long. *Jo-Jo*, *Onehunga*, *Bindyi*.

Notes: Occurs in far south-western Western Australia, south-eastern South Australia, southern Queensland, New South Wales, Victoria, and south-eastern Tasmania. Grows in lawns and other disturbed sites. Flowers most times of the year.

A noxious weed (in pest plant category) in the Shire of Melville in Western Australia. Webb (1986) has suggested that because of their ability to interbreed, that members of subgenus *Soliva*, including *S. pterosperma*, *S. sessilis* and *S. valdiviana* be treated as one species. This was based on a study of populations introduced to and occurring around Auckland, New Zealand. Although taxonomic interpretations perhaps should more desirably be derived from studies carried out within species' native distributions, in this treatment the conclusions of Webb are followed in that *Soliva pterosperma* is regarded

as conspecific with *S. sessilis*. The close similarities in achene morphology suggest that typical *S. pterosperma* (deeply notched wings) and typical *S. sessilis* (unnotched wings) are merely extremes in a continuum of variation of one species. However, all specimens of *S. sessilis* collected in Australia with the exception of a few from Melbourne, Victoria, have deeply notched wings near the base. A different opinion is formed regarding *S. valdiviana* which, on the basis of specimens seen from Australia, has a fundamentally different achene morphology. Plants with achene morphology intermediate between this species and *S. sessilis* were identified by Webb, but these might reasonably be interpreted as hybrids between two species that have come unnaturally together.

Representative specimens: WESTERN AUSTRALIA: Cargill St, Victoria Park, Perth, *B.J.Lepschi 2089* (CANB, MEL, PERTH). SOUTH AUSTRALIA: Upper Waterfall Gully, c. 11.5 km ESE of Adelaide, *Hj.Eichler 18905* (AD). QUEENSLAND: Tozer Gully, Cootharaba Rd, Gympie, *A.R.Bean 17041* (BRI). NEW SOUTH WALES: Barraba, Sept. 1929, *F.A.Rodway* (NSW). VICTORIA: Strathmerton, *H.I.Aston 2354* (HO, MEL). TASMANIA: Cloudy Bay Lagoon, South Bruny Is., *A.M.Buchanan 4547* (HO).

2. **Soliva valdiviana* Phil., *Linnaea* 33: 168 (1864)

Type: province of Valdivia, Chile; *n.v.*

Vegetatively similar to *S. sessilis*; achenes glabrous, without wings, often purple at maturity.

Notes: Occurs in Melbourne in south-central Victoria. and Hobart in south-eastern Tasmania. Recorded from lawns. Flowers most times of year.

This species is uncertainly naturalised. Its achene morphology is quite distinct from that of *S. sessilis* *q.v.*, and this treatment follows the view of Aston (1982) who recognised this species as distinct. Further collections are desirable to help characterise any further morphological differences between this species and *S. sessilis*. According to Aston (per voucher *H.I.Aston 2150* MEL), the leaves of this species are a deeper green than in *S. sessilis*.

Representative specimens: VICTORIA: Queen Victoria Gardens, between St Kilda Rd and the Floral Clock, *H.I.Aston 2150* (CANB, HO, MEL); beside Camberwell Town Hall, Camberwell, *H.I.Aston 2231* (MEL). TASMANIA: Rose Bay, 21 Dec. 1981, *R.B.Pears* (MEL).

3. **Soliva anthemifolia* (Juss.) Sweet, *Hort. Brit.* 243 (1827)

Gymnostyles anthemifolia Juss., *Ann. Mus. National Hist. Nat.* 4: 262, t. 61, fig. 1 (1804).

Type: *n.v.*

Plants with scattered hairs c. 0.5–1.5 mm long. Leaves to c. 13 cm long, 2- or 3-pinnatisect, with primary segments elliptic to orbicular in outline. Capitulum 5–12 mm diam. Involucre 2.5–3 mm long; bracts numerous, narrow-oblong to narrow oblong-elliptic, rounded, with a narrow pale or purplish hyaline margin. Outer florets up to c. 100. Central florets: corolla c. 2 mm long, c. 0.3 mm diam. Achenes (excl. spine) obovate in profile, c. 1.8–2.2 mm long, woolly apically; body 0.5 mm wide; wings/margins c. 0.6 mm wide, plane, entire, obtuse to rounded apically, thick, prominently transversely ridged; stylar spine c. 2–3.5 mm long.

Notes: Occurs inland, from Didcot in south-eastern Queensland SSW to northern Victoria, and further west to far south-eastern South Australia. Grows in loam and sandy-loam in lawns and on margins of watercourses in woodland. Flowers winter–spring.

This species and *S. stolonifera* are members of subgenus *Gymnostyles*, and these two species differ most obviously from the two species of subgenus *Soliva* (*S. sessilis* and *S. valdiviana*) in having achenes with thickened transversely wrinkled margins and with long apical hairs.

Representative specimens: SOUTH AUSTRALIA: c. 3.5 km downstream from Lock 6, Murray R., environs of Chowilla, *C.R. Alcock 10313* (AD). QUEENSLAND: 28 km W of Bollon, *H.I. Aston 2421* (BRI, MEL). NEW SOUTH WALES: Salt Caves Dam, Denbollie State Forest, *J.R. Hosking 1894* (CANB, MEL, NSW); O'Briens Ck where crossed by Newell Hwy, c. 2.5 km SW of Narrabri, *H.I. Aston 2414* (AD, BRI, MEL, NSW). VICTORIA: near Murray R. 3 km S of Tocumwal P.O., *A.C. Beauglehole 63962* (MEL).

4. **Soliva stolonifera* (Brot.) R.Br. ex G. Don, in J.C. Loudon, *Hort. Brit.* 364 (1830)

Hippia stolonifera Brot., *Fl. Lusit.* 1: 72 (1804).

Type: *n.v.*

Plants with few to scattered hairs to c. 0.3 mm long or ± glabrous. Leaves to c. 4 cm long, 1-pinnatisect, with segments oblong or elliptic, entire or with 1 or 2 lobes. Capitulum 4–7 mm diam. Involucre 2.5–3 mm long; bracts 15–20, narrow-oblong to narrowly oblong-elliptic, rounded, with a narrow pale or purplish hyaline margin. Outer florets numerous. Central florets: corolla c. 1.2 mm long, c. 0.2 mm diam. Achenes (excl. spine) obovate in profile, c. 1.8–2.2 mm long, woolly apically; body 0.1–0.2 mm wide; wings/margins c. 0.6 mm wide, acute apically, thick, prominently transversely ridged; stylar spine 1–2 mm long.

Notes: Occurs inland, from south-eastern Queensland, SSW through New South Wales to central Victoria. Grows in woodland, shrubland and *E. camaldulensis* forest. Flowers winter–spring.

Representative specimens: QUEENSLAND: Texas Lagoon, southern outskirts of Texas township, *A.R. Bean 17919* (BRI). NEW SOUTH WALES: Peak Hill, between Dubbo and Parkes, *H.I. Aston 2389* (HO, MEL, NSW). VICTORIA: S of Glenluce Springs and Loddon R., 4 Nov. 1989, *E. Perkins s.n.* (MEL).

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