

NEW SOUTH WALES
DEPARTMENT OF AGRICULTURE

CONTRIBUTIONS
FROM THE
NEW SOUTH WALES
NATIONAL HERBARIUM



Flora Series: No. 102

1967

G 1865

CONSPECTUS OF FAMILIES OF VASCULAR PLANTS REPRESENTED IN THE FLORA OF NEW SOUTH WALES

(The account of each family, or consecutive group of families as issued, will appear with separate pagination; the names of those families that have been published to date are in italics.)

GYMNOSPERMAE

- | | |
|------------------------|-----------------------|
| 1 <i>Zamiaceae</i> | 4 <i>Pinaceae</i> |
| 2 <i>Podocarpaceae</i> | 5 <i>Cupressaceae</i> |
| 3 <i>Araucariaceae</i> | |

ANGIOSPERMAE—MONOCOTYLEDONES

- | | |
|-----------------------------|---|
| 6 <i>Typhaceae</i> | 28 <i>Eriocaulaceae</i> |
| 7 <i>Sparganiaceae</i> | 29 <i>Commelinaceae</i> |
| 8 <i>Pandanaceae</i> | 30 <i>Pontederiaceae</i> |
| 9 <i>Potamogetonaceae</i> | 31 <i>Philydraceae</i> |
| 10 <i>Ruppiaceae</i> | 32 <i>Juncaceae</i> |
| 11 <i>Zannichelliaceae</i> | 33 <i>Liliaceae</i> |
| 12 <i>Najadaceae</i> | 34 <i>Xanthorrhoeaceae</i> |
| 13 <i>Zosteraceae</i> | 35 <i>Agavaceae</i> |
| 14 <i>Aponogetonaceae</i> | 36 <i>Philesiaceae</i> |
| 15 <i>Posidoniaceae</i> | 37 <i>Smilacaceae</i> |
| 16 <i>Juncaginaceae</i> | 38 <i>Haemodoraceae</i> |
| 17 <i>Alismataceae</i> | 39 <i>Amarylidaceae</i> |
| 18 <i>Hydrocharitaceae</i> | 40 <i>Hypoxidaceae</i> |
| 19 <i>Gramineae, Part I</i> | 41 <i>Alstroemeriaceae</i> |
| 20 <i>Cyperaceae</i> | 42 <i>Dioscoreaceae</i> |
| 21 <i>Palmae</i> | 43 <i>Petermanniaceae</i> |
| 22 <i>Araceae</i> | 44 <i>Iridaceae</i> |
| 23 <i>Lemnaceae</i> | 45 <i>Zingiberaceae</i> |
| 24 <i>Flagellariaceae</i> | 46 <i>Cannaceae</i> |
| 25 <i>Restionaceae</i> | 47 <i>Burmanniaceae</i> |
| 26 <i>Centrolepidaceae</i> | 48 <i>Orchidaceae. See H.M.R. Rupp: The</i> |
| 27 <i>Xyridaceae</i> | <i>Orchids of New South Wales. 1943.</i> |

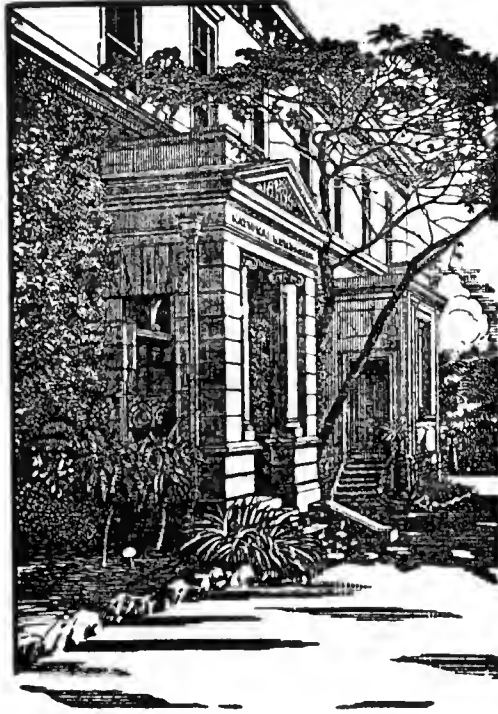
ANGIOSPERMAE—DICOTYLEDONES

- | | |
|----------------------------|----------------------------|
| 49 <i>Casuarinaceae</i> | 71 <i>Portulacaceae</i> |
| 50 <i>Piperaceae</i> | 72 <i>Basellaceae</i> |
| 51 <i>Salicaceae</i> | 73 <i>Caryophyllaceae</i> |
| 52 <i>Fagaceae</i> | 74 <i>Nymphaeaceae</i> |
| 53 <i>Ulmaceae</i> | 75 <i>Cabombaceae</i> |
| 54 <i>Moraceae</i> | 76 <i>Ceratophyllaceae</i> |
| 55 <i>Cannabiaceae</i> | 77 <i>Ranunculaceae</i> |
| 56 <i>Urticaceae</i> | 78 <i>Berberidaceae</i> |
| 57 <i>Protocaccae</i> | 79 <i>Menispermaceae</i> |
| 58 <i>Loranthaceae</i> | 80 <i>Winteraceae</i> |
| 59 <i>Santalaccac</i> | 81 <i>Annonaceae</i> |
| 60 <i>Olacaceae</i> | 82 <i>Eupomatiaceae</i> |
| 61 <i>Aristolochiaceae</i> | 83 <i>Trimeniaceae</i> |
| 62 <i>Polygonaceae</i> | 84 <i>Monimiaceae</i> |
| 63 <i>Chenopodiaceae</i> | 85 <i>Lauraceae</i> |
| 64 <i>Dysphaniaceae</i> | 86 <i>Cassythaceae</i> |
| 65 <i>Amaranthaceae</i> | 87 <i>Papaveraceae</i> |
| 66 <i>Nyctaginaceae</i> | 88 <i>Fumariaceae</i> |
| 67 <i>Phytolaccaceae</i> | 89 <i>Cruciferae</i> |
| 68 <i>Gyrostemonaceae</i> | 90 <i>Capparidaceae</i> |
| 69 <i>Molluginaceae</i> | 91 <i>Resedaceae</i> |
| 70 <i>Aizoaceae</i> | 92 <i>Droseraceae</i> |

(Continued on inside back cover)

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FLORA OF NEW SOUTH WALES

by

VARIOUS BOTANISTS

Produced under the Direction of

K. MAIR

Director and Chief Botanist,

National Herbarium of New South Wales

No. 102 GERANIACEAE

EDITOR: JOYCE W. VICKERY

Formerly produced under the direction of R. H. Anderson, 1961-1964

102. GERANIACEAE

(By R. C. Carolin*)

Flowers bisexual, regular or irregular, protandrous, solitary and terminal or arranged in terminal cymes which appear to be axillary due to sympodial growth. Sepals 5 (rarely 4 but not in Australian species), persistent. Petals equal in number to the sepals (rarely absent), free. Stamens as many as the petals or twice as many (rarely three times as many but not in Australian species), free or connate, some frequently staminodial, hypogynous; anthers 2-locular, introrse with longitudinal slits. Ovary usually 5-locular with 1-2 \pm superposed pendulous ovules in each cell. Fruit a schizocarp (sometimes a capsule but not in Australian species) splitting into 5 one-seeded mericarps each bearing part (an awn) of the elongated style (rostrum). Seeds with or without endosperm. Annual or perennial herbs or shrubs with simple and capitate-glandular hairs. Leaves opposite or alternate, petiolate, usually stipulate; laminae dentate and/or lobed, dissected or occasionally compound, very rarely entire.

A family of 11 genera and ca. 600 species, centred in southern Africa but very widespread in temperate parts of the world, in the tropics mainly at higher altitudes. Three genera in Australia, all these occurring in New South Wales, mainly in the less arid regions.

1. Flowers \pm regular with no sepaline spur.
 2. Fertile stamens 10. Awns of the mericarps without long hairs on the inner surface *Geranium* 1.
 - 2.* Fertile stamens 5. Awns of the mericarps with long hairs on the inner surface *Erodium* 2.
- 1.* Flowers irregular with a nectary spur adnate to the pedicel (very short in *P. inodorum*) *Pelargonium* 3.

1. GERANIUM L.

Herbs, usually with one or more short basal leaf-bearing stems (caulorrhizae) from which arise, sympodially, one or more leafy flowering stems. Cauline leaves opposite or alternate, smaller than the basal ones, deeply or shallowly dissected into lobes, or broadly toothed. Peduncles terminally arranged in cincinnal sequence, often with supernumerary accessory buds at each node. Flowers in pairs or solitary, with four or two (respectively) bracteoles at the base of the pedicel, i.e. at junction of peduncle and pedicel. Sepals 5, imbricate. Corolla regular; petals 5, free, imbricate. Stamens 10, all bearing anthers or, very rarely, 5 staminodial (but not in Australian species); filaments broad, free or united at the base. Glands 5, alternating with the petals. Ovary 5-lobed, 5-locular with 2 \pm superposed ovules per loculus, with a deeply 5-fid style. Fruit with one basal axile seed per loculus, septicial and often septifragal so that the seed is actually exposed, this dehiscence carried on upwards into the enlarged style, each mericarp thus being surmounted by a curved awn which is glabrous on the inside and separated from the central rostrum except at the summit. Seed frequently with a distinctly patterned testa and a funicle often equipped with stiff hairs; endosperm very little or absent; embryo with massive induplicate or convoluted cotyledons.

* I am indebted to Dr. R. C. Carolin, of the University of Sydney, for this contribution to the Flora of New South Wales. K.M.

A large genus of about 250–300 species, mostly temperate but extending into tropical mountains. Ten native and 3 naturalized species occur in Australia of which 11 are found in New South Wales. The species of the South Western Pacific Area have been revised by Carolin in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 326–361.

1. Surface of the mericarp glabrous and usually wrinkled *G. molle* 1.
- 1.* Surface of the mericarp hirsute to pilose, sometimes with some minute glandular hairs, smooth; Seeds black or dark brown.
 2. Flowers mostly in pairs (binate).
 3. Hairs of the pedicel retrorse-appressed.
 4. Tap-root branched, not napiform. Leaf-lobes broad. Seeds dark-brown with more or less elongated alveolae *G. homeanum* 6.
 - 4.* Tap-root napiform. Leaf-lobes usually linear. Seeds black or very dark-brown with isolateral alveolae *G. retrorsum* 7.
 - 3.* Hairs of the pedicel retrorse-reflexed or patent, never appressed, stiff. Seeds black with large alveolae *G. solanderi* 8.
 - 2.* Flowers solitary.
 5. Flowering stems usually shorter than the basal leaves or reduced to a single peduncle and pedicel. Seeds black, smooth or with minute alveolae.
 6. Hairs of the pedicel retrorse-appressed. Petals narrow-oblong to obovate *G. sessiliflorum* spp. *brevicaule* 9.
 - 6.* Hairs of the pedicel antrorse-appressed. Petals oblong to obovate....
..... *G. antrorsum* 10.
 - 5.* Flowering stems usually longer than the basal leaves. Seeds with distinct alveolae.
 7. Tap-root napiform. Sepals obtuse *G. obtusisepalum* 5.
 - 7.* Tap-root not napiform. Sepals with a distinct mucro.
 8. Petals ca. 14 mm. long. Pedicel and peduncle together ca. 8 cm. long *G. neglectum* 3.
 - 8.* Petals up to 10 mm. long. Pedicel and peduncle together up to 5 cm. long.
 9. Petals quite white. Seeds black with large alveolae.. *G. graniticola* 4.
 - 9.* Petals almost always pink or tinged with pink, when quite white the seeds dark brown with small alveolae.. *G. potentilloides* 2.

1. **G. molle* L. Sp. Pl. ed. 1 (1753) 682; Burm. f., Spec. Geran. (1759) 25; Benth., Fl. Austral. I (1863) 296; Knuth, Pflanzenr. LIII (Geran.) (1912) 57; Gardner, Enum. Pl. Austral. Occ. (1930) 68; Ewart, Fl. Vict. (1931) 683; Black, Fl. S. Austral. ed. 2, II (1948) 482; Blackall, W. Austral. Wildflowers I (1954) 249; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Dist. (1963) 170; Eichler, Suppl. Black's Fl. S. Austral. (1965) 195. Decumbent or usually ascending annual or short-lived perennial herb with thin much-branched roots. Stems up to 50 cm. long, softly hairy. Leaves opposite; petioles of the basal leaves up to 7 cm. long, those of the cauline leaves shorter, villous with spreading hairs; laminae orbicular to reniform in outline, 1–1.5 cm. long, up to 3 cm. wide, 5- to 9-lobed to about the middle with narrow sinuses, each lobe divided into 3–5 obtuse teeth towards the apex, with scattered villous hairs on both surfaces. Stipules lanceolate to oblong, up to 4 mm. long, membranous, villous. Flowers in pairs. Peduncles with villous divergent simple

hairs and some glandular hairs, 0.8–1.5 cm. long. Bracteoles minute, more or less deltoid to ovate, villous. Pedicels densely covered with spreading, small, villous and glandular hairs, up to 12 mm. long, more or less geniculate in the fruiting condition. Sepals narrow-oblong to elliptic, ca. 4 mm. long and 2 mm. wide, villous and glandular-hairy with a very short blunt mucro. Petals obovate, about as long as or slightly longer than the sepals, ciliate towards the base, emarginate or bifid. Stamens 10; filaments lanceolate, up to 3 mm. long with a few long hairs on the margin; anthers \pm globular, mauve, ca. 0.5 mm. long. Ovary glabrous or nearly so; stigmas yellow, white or green, ca. 1 mm. long. Fruit: mericarps glabrous, transversely wrinkled, or smooth, ca. 2 mm. long; funicular hairs absent or extremely small; awns glandular- and simple-hairy; rostrum 6–9 mm. long. Seeds ellipsoid, greenish-brown or brown, almost quite smooth; raphe \pm basal.

1. Mericarps wrinkled var. *molle*
 1.* Mericarps smooth var. *aequale*

var. *molle*. Mericarps wrinkled.

Coast, Tablelands and Central Western Slopes, on disturbed land, cultivated or waste places. A native of Europe and Africa, now very widely dispersed. Wollongbar, Crofts 9.1952 (42549); Dorrigo, Jessup & Gray No. 3014, 9.1954 (42543); Armidale, Pearson 1959 (61019); Murrurundi, Story No. 7519, 10.1960 (61020); Murrurundi, Cambage No. 1797, 10.1907 (42557); Mullion Creek, Burbidge No. 6903, 12.1960 (63916); Pennant Hills, Fraser 12.1939 (SYD); Cheltenham, Johnson 10.1946 (42548); Ryde, Zeck 9.1949 (42558); Cowra, Beadle 10.1943 (SYD); Kurnell, Carolin No. 535, 9.1958 (SYD); La Perouse, Michael No. 1965, 1929 (42559); Botany, Evans 11.1942 (SYD); Woodstock, Anderson 11.1932 (42555); Illawarra, Hamilton 10.1900 (42553); Mt. Kembla, Hamilton 1900 (42511); Jamberoo, Shire Clerk 10.1941 (42552); Kangaroo Valley, Rodway 10.1921 (61021); Kangaroo Valley, Rodway 9.1930 (42562); Kangaroo Valley, Rodway 10.1927 (77647); Kangaroo R., Rodway 9.1923 (42561); Nowra, Rodway 9.1931 (42560); Nowra, Rodway 9.1947 (42547); Nowra, Rodway 10.1915 (42563); Lake George, Gray No. 5121, 10.1961 (57069); Tharwa, Cambage No. 3001, 11.1911 (42556); Balldale, McBarron 9.1950 (SYD). Also in Queensland, Victoria, South Australia, Tasmania and Western Australia.

var. *aequale* *Babington*, Man. Brit. Fl. ed. 2 (1847) 65; Clapham, Tutin and Warburg, Fl. Brit. Isles, ed. 2 (1962) 309. Mericarps quite smooth. *G. molle* f. *preuschoffii* *Abromeit.*, Flora von Ost- und West-Preussen (1898) 156.

South Western Slopes on disturbed ground. 9-mile Hill Reserve, Albury, McBarron No. 3672, 10.1949 (42545). Also in Tasmania and New Zealand. A native of Europe.

2. *G. potentilloides* *L'Hér. ex DC.*, Prodr. I (1824) 639; Hook. f., Fl. Tasm. I (1860) 57; Carolin in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 336; nec Spreng. (1826), nec Bonpl. ex Wedd. (1855), nec Klotzsch (1862). Perennial herbs with thickened but not napiform tap-roots and few (usually only 1 or 2) caulorrhizae up to 4 cm. long covered with the brown persistent leaf-bases and stipules. Flowering stems decumbent to ascending, up to 50 cm. long, pubescent with soft, retorse, often closely appressed or very short hairs, sometimes glabrescent basally often rooting at the nodes. Basal leaves not persistent through the summer, larger than, the cauline but otherwise similar. Cauline leaves opposite; petioles slender, 1.5–3.5 cm. long, pubescent with retorse hairs; laminae deeply palmately 5- to 7-lobed, semiobovate to broad-ovate in outline, 1–3 cm. long, 1–5 cm. wide, pubescent on both surfaces, usually paler and sometimes purplish on the lower surface; lobes oblong to narrow-obovate, the central one divided into 3 (rarely 5–7) obtuse secondary lobes or teeth, the lateral lobes less divided and usually making the lamina distinctly cordate; stipules lanceolate, 3–1 mm. long, long-acuminate, often 2-fid, sucherbaceous at the midrib, becoming membranous towards the margin, pubescent.

Flowers solitary (very rarely in pairs); pedicel and peduncle together 2–4 cm. long, slender, pubescent with soft short retrorse-appressed hairs or puberulent, with two linear to lanceolate sub-herbaceous pubescent bracteoles ca. 2.5–4 mm. long, the pedicel as long as or slightly longer than the peduncle, geniculate at the bracteoles when mature and swollen in the upper part in the fruiting condition. Sepals 5, lanceolate to narrow-elliptic, 4–6 mm. long, 1.5–2.5 mm. wide, acuminate, pubescent with short, more or less appressed hairs and some longer hairs, ciliate, scarcely convex in the fruiting stages. Petals 5, obovate, 5–6 mm. long, ca. 3 mm. wide, pink, paler below and with translucent veins, ciliate at the margins. *Stamens* 10; filaments lanceolate-acuminate, ca. 3 mm. long and 0.5 mm. wide, ciliate at the base. Ovary hirsute; stigmas white or pale pink, ca. 1 mm. long. Fruit: mericarps oblong, ca. 3.5 mm. long and 1.5 mm. wide, brown, covered with stiff spreading hairs and some minute glandular hairs; funicular hairs ca. 25; awns densely covered with short, stiff, simple hairs and some minute glandular hairs on the outer surface; rostrum 9–10 mm. long. Seeds dark brown, oblong, 2 mm. long, covered with shallow, somewhat elongated alveolae, minutely punctate; raphic lateral. *G. dissectum* L. var. *australe* Benth. "race" *potentilloides* (L'Hér. ex DC.) Benth., Fl. Austral. I (1863) 296; Bailey, Fl. Qld. I (1899) 178; Bailey, Compr. Cat. Qld. Pl. (1913) 72; *G. pilosum* Forst. f. var. *potentilloides* (L'Hér. ex DC.); Ewart, Fl. Vict. (1931) 682; Black, Fl. S. Austral. ed. 2 (1948) 482; *G. philonothum* DC., Prodr., I (1824) 639; *G. microphyllum* Hook. f., Fl. Antarct. I (1844) 8, t. 5; Knuth, Pflanzenr. LIII (Geran.) (1912) 151; Maiden & Betche, Census N.S.W. Pl. (1916) 111; Domin in Bibl. Bot. XX, Heft 89^{III} (1926) 831; Curtis, Stud. Fl. Tas. I (1956) 91; Bergseng in Madroño XVIII (1966) 213; *G. potentilloides* var. β . *microphyllum* (Hook. f.) Hook. f., Fl. N. Zeal. I (1852) 40; *G. potentilloides* var. *debile* Hook. f., Fl. N. Zeal. I (1852) 40; *G. sarawakatense* Knuth in Feddes Repert. XIV (1938) 61; *G. microphyllum* var. *obtusatum* Simpson et Thomson in Trans. Soc. N. Zeal. LXXIII (1943) 156; *G. microphyllum* var. *discolor* Simpson et Thomson, loc. cit.

1. Seeds brown with small alveolae. Bracteoles \pm midway from flower to base of pedicel-peduncle var. *potentilloides*
- 1.* Seeds black with large alveolae. Bracteoles usually towards base of pedicel-peduncle var. *abditum*

var. **potentilloides**. Indumentum mostly retrorse-appressed, that of the sepals soft and antrorse-appressed. Seeds brown with small but not minute alveolae. Pedicel about as long as the peduncle.

Tablelands in woodlands and damp grasslands. Ebor Falls, Davis 1,1941 (42598); Point Lookout, New England, Carolin No. 753, 1,1959 (SYD); 6 miles E of Nundle, Carolin No. 2064, 12,1960 (SYD); Scout's Alley, Barrington Tops, Carolin No. 480, 4,1958 (SYD); Barrington Tops, Lawson 1,1925 (SYD); Carcy's Peak, Barrington Tops, Carolin No. 484, 4,1958 (SYD); Mt. Cameron NE of Clarence, Carolin No. 2039 (SYD); Mt. Wilson, Carolin No. 605, 11,1958 (SYD); Mt. Wilson, Maiden 4,1896 (42605); Mt. Irvine, Carolin No. 604, 11,1958 (SYD); Mt. Tomah, Rodd 11,1966 (94790); Katoomba, Camfield 12,1908 (42604); 2 miles S of Hampton, Johnson & Briggs 11,1966 (84814); Sassafras, Rodway 6,1936 (42672); Mt. Kosciusko, Helms 2,1901 (42575); Spencer's Creek, Carolin No. 770, 1,1959 (66130); Trapyard Creek, Mt. Kosciusko, Eichler No. 13500, 1,1957 (AD; SYD); Toolong Range, Thompson 1,1958 (42769). Also in Victoria, Tasmania and South Australia.

var. **abditum** Carolin in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 340. Indumentum as in var. *potentilloides*. Seeds black with large alveolae. Peduncle usually very short or obsolete.

Central and Southern Tablelands. Mostly in woodlands, occasionally in sod-tussock grasslands where hybrids with *G. sessiliflorum* ssp. *brevicaule* may occur. Kanangra Walls, Carolin No. 887, 3,1959 (SYD); Munyang near Guthega, Carolin No. 785, 1,1959 (66125);

Spencer's Creek, Skottsberg & Costin 3.1949 (42567); Perisher Gap, Taylor 3.1954 (42570); Kosciusko, Fraser 2.1930 (42568); Happy Jack's River, Filmer 2.1957 (42565); Pretty Point, Maiden & Forsyth 1.1899 (42566); Island Bend, Woodward 1.1958 (SYD). Also in Victoria.

3. *G. neglectum* *Carolin* in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 343. Decumbent or prostrate perennial herbs ascending only when supported, with a thick but not napiform tap-root and thick, short (usually less than 3 cm.), more or less woody caulorrhiza bearing dead stipules and leaf bases. Flowering stems terete, reddened, up to 120 cm. long, often much branched, bearing a few closely appressed hairs or almost glabrous, often rooting at the nodes. Basal leaves larger than the cauline but otherwise similar. Cauline leaves opposite; petioles slender, 2.5–4 cm. wide with scattered appressed hairs on both surfaces although more concentrated on the veins of the paler lower surface, deeply palmately 5- to 7-lobed; lobes obovate to oblong, further divided into 2–5 mucronate secondary lobes; stipules membranous, long-deltoid or lanceolate-acuminate, 4–6 mm. long, 1–2 mm. wide, ciliate and with some scattered villous hairs towards the base. Flowers solitary; pedicel and peduncle slender, together up to 10 cm. long, sparsely covered with retrorse-appressed hairs becoming denser towards the top and with two linear herbaceous almost glabrous bracteoles ca. 3 mm. long, the pedicel about as long as the peduncle and swelling in the upper part in the fruiting condition. Sepals lanceolate to narrow-elliptic, 6–9 mm. long, 2–2.5 mm. wide with scattered appressed hairs, more or less flat in the fruiting stages; margins broad, membranous, ciliate. Petals obovate, ca. 14 mm. long and 6 mm. wide, pink becoming white towards the base and with darker veins, ciliate on the margins towards the base. Stamens 10; filaments lanceolate-acuminate, ca. 6 mm. long and 0.5 mm. wide, pale yellow to white, ciliate, surmounted by an oblong anther about 1 mm. long; pollen yellow. Ovary hirsute-villous; stigmas yellow, ca. 2.5 mm. long. Fruit: mericarp oblong, 4 mm. long, 2 mm. wide, very dark brown, covered with short stiff hairs especially above and some minute glandular hairs; funicular hairs ca. 25; awns covered with more or less appressed hairs and some minute glandular hairs; rostrum ca. 15 mm. long. Seeds dark brown, oblong, 3 mm. long, 1.5 mm. wide, covered with very small, almost isolateral alveolae, the raphe lateral.

Tablelands. Creek banks and swamps. Clarence River, Beckler (MEL); New England, Stuart (MEL); Torrington, Deane 3.1906 (42585); Gloucester Tops, Coveny 1.1967 (95340); banks of the Boyd River, Jenolan-Kanangra, *Carolin* No. 916, 3.1959 (66124); Mt. Werong, Cambage No. 3177, 12.1911 (42607); Oberon, Constable 3.1950 (42600); Edith, Constable 3.1950 (42600); Isabella, Oberon district, Althofer 1967 (84816); Tidbinbilla Valley, Adams No. 576, 3.1963 (90414); Brown Mountain, Betche 2.1893 (42571). Also in Queensland and Victoria.

4. *G. graniticola* *Carolin* in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 345. Weakly ascending or decumbent perennial herbs with thick but not napiform tap-roots and short branched caulorrhizae covered with dead stipules and leaf bases. Flowering stems up to 50 cm. long, frequently rooting at the nodes, terete or somewhat compressed, puberulent with short, patent or very slightly retrorse hairs. Basal leaves similar to the cauline leaves but larger. Cauline leaves opposite; petioles slender, up to 20 cm. long, puberulent; laminae reniform to semi-orbicular, somewhat cordate at the base, up to 30 mm. long and 40 mm. wide, deeply palmately 5- to 7-lobed, each lobe obovate and with 3–5 secondary lobes towards the top, pubescent on both surfaces. Flowers solitary; pedicel and peduncle together 2–4 cm. long, pubescent with retrorse-spreading hairs, with two linear membranous to subherbaceous pubescent bracteoles; pedicel slightly longer than the peduncle, geniculate at the bracteoles and swelling towards the top at maturity. Sepals lanceolate to elliptic or oblong, ca. 4 mm. long, 1–2 mm. wide, pubescent, acute to

acuminate with a short mucro, membranous and ciliate at the margins, frequently reflexed in the fruiting stages. Petals obovate, ca. 5 mm. long and 3.5 mm. wide, entire or undulate at the apex, white, ciliate on the margins towards the base. Stamens 10; filaments membranous, lanceolate, long-acuminate, up to 4 mm. long, sparsely ciliate at the margins; anthers oblong, 0.5 mm. long, yellow with purple dehiscence lines. Ovary hirsute-villous; stigmas white, ca. 1 mm. long. Fruit: mericarps oblong, 3 mm. long, 1 mm. wide, covered with short spreading hairs and minute glandular hairs especially towards the top; funicular hairs ca. 20; awns covered with very short simple hairs and minute glandular hairs on the outer surface; rostrum 9–11 mm. long. Seeds black, oblong, 2.5 mm. long, 1.5 mm. wide, covered with prominent elongated reticulations, minutely punctulate, the raphe lateral.

Central Tablelands, in woodlands. Oberon, Carolin No. 919, 3.1959 (66128); Duekmaloi River S of Oberon, Carolin No. 877, 3.1959 (SYD); Kanangra Walls, Carolin No. 888, 3.1959 (SYD); Jenolan Caves valley, Carolin No. 883, 3.1959 (SYD).

5. *G. obtusisepalum* Carolin in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 344. Decumbent or ascending perennial herbs with a very short erect caulorrhiza covered with persistent leaf bases and stipules and with a napiform tap-root. Flowering stems obscurely angled or terete, decumbent or ascending, up to 30 cm. long, thickly covered with short soft hairs and some longer villous hairs. Basal leaves similar to the cauline but larger. Cauline leaves opposite; petioles 1–6 mm. long, densely pubescent; laminae orbicular to reniform, 1–2 cm. long, 1–3 cm. wide, hirsute on both surfaces, deeply palmately 5- to 7-lobed the lobes obovate and mostly divided into three obtuse secondary lobes towards the top; stipules linear-lanceolate, acuminate, 3 mm. long, 1 mm. wide, pubescent, ciliate with long hairs. Flowers solitary; pedicel and peduncle together 2–4 cm. long, pubescent with the upper hairs often retrorse-appressed; pedicel about as long as the peduncle, geniculate at the bracteoles and becoming swollen in the upper part as the fruit matures, with a pair of linear pubescent bracteoles at the base. Sepals elliptic to oblong, 5–7 mm. long, 3–4 mm. wide, pubescent or hirsute, obtuse or with a very short blunt mucro; margins membranous and ciliate. Petals obovate, ca. 6 mm. long and 3 mm. wide, emarginate or 3-toothed at the apex, ciliate towards the base, pink but paler towards the base. Stamens 10; filaments linear-lanceolate, ca. 3.5 mm. long and 0.5 mm. wide, almost glabrous, ciliate at the margins; anthers more or less globular; pollen white to pale yellow. Ovary hirsute; stigmas green to white or very pale pink, 1.5 mm. long. Fruit: mericarp covered with coarse simple hairs and small glandular hairs above, ovoid, 3 mm. long, 2 mm. wide, brown; funicular hairs ca. 25, mostly erect; awns covered with antrorse, simple hairs and numerous, much smaller, glandular hairs on the outer surface; rostrum 10–14 mm. long. Seeds ovoid, dark brown, with small obscure alveolae, 2 mm. long, 1.5 mm. wide; raphe lateral.

Southern Tablelands, in woodlands and grasslands. Mungyang near Guthega, Carolin No. 783, 1.1959 (66126); Kiandra, New Chum Mine, Carolin No. 758, 11.1959 (SYD); Upper Tumut River near Junction Shaft, Filmer 2.1957 (42564).

6. *G. homeanum* Turcz. in Bull. Imp. Nat. Hist. Soc. Mosc. XXXVI (1863) 591; Carolin in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 346. Annual or perennial herbs with thick, fleshy but not napiform tap-roots which may be much branched, and very short caulorrhiza covered with persistent stipules and leaf-bases. Flowering stems decumbent, ascending only when supported, much branched, up to 70 cm. long but usually about 30 cm., sparsely covered with coarse retrorse hairs or sometimes almost glabrous. Basal leaves similar to the cauline but larger. Cauline leaves opposite; petioles up to 5 cm. long, covered with coarse retrorse hairs; laminae palmately 3- to 5-lobed, semiorbicular to reniform, 2–4 cm. long, 3–5 cm. wide with scattered, coarse, appressed hairs on either side; lobes oblong-obovate.

usually divided near the top into 3 secondary lobes or deep teeth with more or less mucronate tips; stipules linear-lanceolate to linear-deltoid, 3–6 mm. long, 0.5–1 mm. wide, acuminate, membranous, brown, ciliate and with coarse appressed hairs on the lower surface especially towards the midrib or glabrous. Flowers usually borne in pairs; peduncles 1.8–2.4 cm. long; bracteoles linear, 3 mm. long and ca. 0.5 mm. wide, almost glabrous on the surfaces but ciliate at the margins; pedicels 1.5–2.2 cm. long, covered with coarse retrorse-appressed hairs becoming denser towards the top and more or less divergent above in the fruiting condition, geniculate at the bracteoles and swelling above in the fruiting condition. Sepals elliptic to oblong, 4–5 mm. long, 1.5–1.0 mm. wide, sparsely covered with coarse appressed hairs and some smaller ones; margins membranous, minutely denticulate or entire. Petals pale pink to almost white, broad-oblongate to obovate, 2–4 mm. long, ca. 1.5 mm. wide, entire at the apex, ciliate towards the base. Stamens 10; filaments lanceolate-acuminate, ca. 2.5 mm. long, 0.5 mm. wide, ciliate but not dentate; anthers reniform to orbicular, white with purple dehiscence lines. Ovary hirsute; stigmas green, 1 mm. long. Fruit: mericarps covered with coarse, often divergent hairs with a few minute glandular hairs towards the top, ovoid, 3 mm. long, 2 mm. wide; funicular hairs 20–30; awns covered with short antrorse hairs and with some minute glandular hairs on the outer surface; rostrum 8–11 mm. long. Seeds dark brown, ovoid, ca. 2.5 mm. long, covered with shallow elongate alveolae and with a lateral raphe. *G. parviflorum* Willd., Enum. Hort. Berol. (1809) 716 nec Curtis (1798), nec Andrews (1805); *G. potentilloides* var. *parviflorum* (Willd.) Hook. f., Fl. Tasm. 1 (1860) 57; *G. dissectum* var. *glabratum* Hook. f., Handb. N. Zeal. Fl. (1864) 36; *G. glabratum* (Hook. f.) Small ex Hanks et Small in Underwood & Britton, N. Amer. Fl. XXV (1907) 10.

Coast and Tablelands in forests, usually in the damper parts, and frequently on the margins of rainforest. Mt. Lindesay, Qld.—N.S.W. border, Carolin No. 944, 5.1959 (SYD); Curtis' Creek near Grafton, Carolin No. 767, 1.1959 (SYD); Stoekyard Creek, Oxley Highway, Carolin No. 506, 6.1958 (SYD); 10 miles SE of Nowendoc, Carolin No. 2061, 12.1960 (SYD); Comboyne Plateau near Mt. Gibraltar, Carolin No. 2050, 12.1960 (SYD); Comboyne Hill, Carolin No. 2048, 12.1960 (SYD); Coopernook State Forest N of Taree, Carolin No. 2059 (SYD); Pokolbin State Forest, Constable 9.1954 (30960); Avoca Beach, Blackmore 1.1950 (42650); Mt. Cameron, NE of Clarence, Carolin No. 2030 (SYD); East Lindfield, McKee No. 6640, 10.1958 (SYD); Pennant Hills, Fraser 1934 (42651); Dee Why, Michael 1929 (42649); Port Jackson (42653); New Holland, Banks & Solander 1770 (90177); Glenbrook Gorge, McKee No. 6770, 1.1959 (SYD); Nepean River, Douglas Park, McBarron No. 12353, 4.1966 (95342); Jenolan Caves, Johnson & Briggs 11.1966 (95431); Byrne's Gap, Yerranderie-Kowmung River, Johnson 3.1948 (5017); foot track to Sublime Point, Woodward 3.1957 (SYD); Kowmung River at Gingra Ck., Johnson 3.1951 (42603); Garie Beach, Carolin No. 940, 3.1950 (SYD); Bulli Pass, Carolin No. 500, 4.1958 (SYD); Macquarie Pass, Carolin 1958 (SYD); Carrington Falls, Constable 1.1955 (42669); Bungonia Caves, Carolin No. 842, 3.1959 (SYD); Nowra, Rodway 3.1948 (42673); Nowra, Rodway 3.1949 (42674); Nowra, Rodway 1.1943 (42670); Nowra, Rodway 1.1952 (61018); Mollymook via Ulladulla, Gray No. 5806, 12.1965 (90410); Mollymook via Ulladulla, Gray No. 5804, 12.1965 (90409); Towamba (Eden district), McKee No. 6932, 1.1960 (SYD). Also in Victoria, Queensland, New Zealand and Java.

7. *G. retrorsum* L'Hér. ex DC., Prodr. 1 (1824) 644; Carolin in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 348. Perennial herbs with swollen napiform tap-root and short thick caulorrhiza frequently covered with dead stipules and leaf-bases. Stems decumbent or ascending, up to 40 cm. long, covered with short, soft, retrorse, appressed hairs, glabrescent below. Basal leaves similar to the cauline but larger and somewhat more deeply dissected. Cauline leaves opposite; petioles 2–7 cm. long, covered with short, soft, retrorse-appressed hairs; laminae ovate to orbicular or reniform, 1–2 cm. long, 1.5–3.0 cm. wide, deeply palmately (3-) 5- to 7-dissected or lobed, each segment or lobe divided into 3 narrow, more or less acute secondary lobes, covered with appressed hairs on both surfaces; stipules membranous, brown, lanceolate to narrow-deltoid, up to 3 mm. long, covered with soft appressed hairs.

Flowers in pairs or very rarely solitary; peduncles 6–20 (–80) mm. long, densely clothed with soft retrorse-appressed hairs, the bracteoles 4, linear to linear-deltoid, 2–3 mm. long, pubescent, ciliate at the margins; pedicels similar to the peduncles, 18–35 mm. long, geniculate at the bracteoles and becoming swollen above in the fruiting stages. Sepals elliptic to oblong or ovate, 4–6 mm. long, 3–4.5 mm. wide, densely covered with more or less appressed hairs and with some scattered, more or less divergent hairs particularly towards the margins, mucronate. Petals obovate, 5–10 mm. long and 2–4 mm. wide, pink but paler towards the base with yellowish veins, almost quite entire at the apex or very slightly emarginate. Stamens 10; filaments lanceolate-acuminate, 3–4 mm. long, 0.5 mm. wide, ciliate at the margins with long hairs. Ovary hirsute; stigmas white or green, ca. 1.5 mm. long. Fruit: mericarps 2 mm. long, 1.5 mm. wide, covered with coarse, often divergent hairs and with minute glandular hairs towards the top, dark gray; funicular hairs 20–35; awns covered on the outer surface with short antrorse simple hairs and some minute glandular hairs; rostrum 8–15 mm. long. Seeds black or very dark brown with coarse, usually deep, more or less isolatral alveolae, sub-globular, 2–3 mm. long. *G. dissectum* L. var. *patulum* Hook. f., Handb. Fl. N. Zeal. (1864) 36; *G. pilosum* Sol. ex Willd. var. *grandiflorum* Knuth, Pflanzenr. LIII (Geran.) (1912) 75, nom. superfl.; *G. pilosum* Sol. ex Willd. var. *retrosum* (L'Hér. ex DC.) Jepson, Man. Calif. Pl. (1926) 588; *G. australe* Nees in Lehm., Pl. Preiss. I (1844) 162, non (Willd.) Poir. (1800); *G. pilosum* var. *australe* (Nees) Ostenf. in Dansk. Vid. Selsk. Biol. Medd. III (1921) 71.

Tablelands, South Coast, Western Slopes and eastern part of the Western Plains, mainly in open woodland and grassland. Warialda, Browne 8.1933 (42685); Oakwood, near Inverell, Cutler 10.1936 (42594); Burren Junction, White 9.1917 (42682); Burren Junction, Rouse 3.1913 (42683); Guyra, Vickery 1.1958 (42756); Armidale, Carolin No. 757, 1.1959 (SYD); Armidale, Davis 11.1939 (42597); Gunnedah, Agricultural Department 11.1901 (42684); Curlewis, Breakwell 8.1913 (42681); Scone, Breakwell 8.1913 (42689); Sunny Corner, Boorman 11.1899 (42611); Oberon, Constable 3.1950 (61016); Orange, Reynolds 9.1911 (42613); Bathurst, Peacock 11.1901 (42606); Marsden, Blomfield 10.1912 (42693); Derain, Public School Teacher 11.1908 (42666); Temora, Dwyer 9.1915 (42697); Mittagong, Farm Home, Superintendent 1918 (63688); South Goulburn, Lumsden 11.1906 (42579); Cowra, Beattie 11.1915 (42692); Michelago Creek, Gray No. 5899, 2.1966 (90423); Picnic Point, Murray River, 7 miles E of Mathoura, Johnson & Constable 3.1959 (47266); Albury, McBarron No. 1938, 9.1948 (SYD); Tabletop, McBarron No. 1141, 10.1947 (SYD); Tabletop, Flynn 10.1962 (63686); Cooma, Walker 1.1962 (68975); Bega, Rodway 12.1920 (42679). Also in Victoria, South Australia, Western Australia and New Zealand.

8. *G. solanderi* Carolin in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 350. Perennial herbs with napiform or merely thickened tap-roots and short, more or less erect caulorrhiza covered with dead stipules and leaf-bases. Flowering stems decumbent or more or less ascending, up to 50 cm. long, angular or compressed above but terete below, covered with coarse, retrorse-divergent or patent, more or less villous hairs. Basal leaves similar to the cauline but larger and frequently more dissected. Cauline leaves opposite; petioles up to 5 cm. long, covered with reflexed or patent hairs; laminae deeply 5- to 7-lobed, semiorbicular to reniform, frequently cordate at the base, 1–2.5 cm. long, 1.5–4 cm. wide, with coarse sub-appressed hairs on both surfaces, the lobes obovate, divided into 3–5 mucronate to acuminate secondary lobes near the top; stipules sub-herbaceous, lanceolate to narrow-deltoid, 3–9 mm. long, up to 1–5 mm. wide, acuminate, covered with short appressed hairs and ciliate at the margin, rarely almost glabrous. Flowers in pairs; peduncles 1–4 cm. long, hirsute or villous with reflexed or patent hairs; pedicels 2.5–5 cm. long, geniculate at the base and swollen above at fruiting stages, the indumentum as on the peduncles; bracteoles lanceolate to linear-deltoid, up to 4 mm. long, membranous, villous, ciliate at the margins. Sepals elliptic to ovate, 5–9 mm. long, 2–5 mm. wide, acute to acuminate, usually concave in the fruiting condition, covered with villous-patent hairs and with longer hairs at the margins and on the veins, the margins

membranous and ciliate. Petals obovate, 5–12 mm. long, 2–5 mm. wide, entire or emarginate, pink but paler towards the base and often with yellowish veins. Stamens 10; filaments lanceolate, narrow-acuminate, 4–10 mm. long, membranous, villous with long hairs at the margin and on the mid-rib near the base; anthers subglobular, yellow. Ovary hirsute; stigmas green or pale pink, 1–3 mm. long. Fruit: mericarps oblong-obovoid, 2.5–4 mm. wide, covered with stiff simple hairs and some minute glandular hairs; funicular hairs ca. 35; awns covered with stiff, patent or antrorse, simple hairs with some minute glandular hairs on the outer surface; rostrum 9–20 mm. long. Seed black, subglobular, 2–8 mm. long with coarse, more or less isolateral alveolae and a basal raphe. *G. pilosum* Sol. ex Willd., Sp. Pl. III (1801) 706, non Cav. (1788); Moore & Betche, Handb. Fl. N.S.W. (1893) 55; Knuth, Pflanzenr. LIII (Geran.) (1912) 75; Maiden & Betche, Census N.S.W. Pl. (1916) 111; Gardner, Enum. Pl. Austral. Occ. (1930) 68; Ewart, Fl. Vict. (1931) 682; Black, Fl. S. Austral. ed. 2, 11 (1948) 482; Blackall, W. Austral. Wildflowers I (1954) 249; Curtis, Stud. Fl. Tasm. I (1956) 9; *G. dissectum* var. *pilosum* (Sol. ex Willd.) Hook. f., Fl. Tasm. I (1860) 57; *G. dissectum* var. *australe* Benth., Fl. Austr. I (1863) 296 ("race" *pilosum*); Bailey, Qld. Fl. I (1899) 177; Bailey, Compr. Cat. Qld. Pl. (1913) 72.

1. Petals ca. 6 mm. long var. *solanderi*
 1.* Petals ca. 12 mm. long var. *grande*

var. **solanderi**. Tap-root almost always napiform. Stems decumbent, sometimes rooting at the nodes; whole plant covered with reflexed or patent hairs. Sepals ca. 5 mm. long. Petals ca. 6 mm. long. Stigmas 1 mm. long. Mericarps ovoid, ca. 2.5 mm. long. Rostrum 9–12 mm. long.

Coast, Tablelands and Slopes, in open woodlands and grasslands. Mt. Lindesay, Carolin No. 2068, 11.1957 (SYD); Glen Innes, Boorman 12.1913 (42583); Glen Innes, Fraser 13.1934 (SYD); Glen Innes, Wenholz 3.1913 (42582); Inverell, Thomas 10.1911 (42588); Chandler's Peak, Boorman 3.1917 (42595); Stonehenge, Maiden 12.1899 (42592; SYD); Guyra, Fraser 12.1934 (42593); Guyra, Fraser 12.1934 (SYD); Ebor Falls, Carolin No. 430, 11.1957, No. 507, 6.1958, No. 508, 6.1958, No. 763, 1.1959 (SYD); Ebor Range, Carolin No. 762, 1.1959 (SYD); Ebor, Carolin No. 430, 11.1957 (SYD); Dorrigo, Salasoo No. 1861, 1.1960 (61017); Meldrum, Boorman 11.1913 (42587); Granite Knoll, Davis 5.1939 (42596); Point Lookout, Carolin No. 752, 1.1959 (SYD); Armidale, Davis 1.1940 (42599); Armidale, Boorman 3.1914 (42581); Bendemeer, Carolin No. 2087, 1.1961 (SYD); Kentueky, Fraser 12.1961 (SYD); Nandewar Mts. Cambage No. 2307, 11.1909 (42586); Gilgandra, Simon No. 6846, 10.1913 (42696); Wallabadah, Goode No. 107, 11.1954 (42686); Nundle, Carolin No. 2066, 2.1960 (SYD); Nowendoc, Carolin No. 2064, 12.1960 (SYD); Port Macquarie, Evans 8.1927 (SYD); Port Macquarie, Breakwell 11.1914 (42656); Bundulla State Forest, Burrows No. 3019, 10.1913 (42688); Belltrees, White 11.1903 (42691); Singleton, Breakwell 6.1912 (42660); Dungog, Breakwell 5.1912 (42688); Merrygoen, Brown 6.1899 (42690); Dubbo, Boorman 6.1900 (42695); Owen's Gap, Carolin No. 2069 & 2068 12.1960 (SYD); Baerami Creek, Carolin No. 815, 1.1959 (SYD); Minore, Boorman 2.1899 (42694); Wiekham, Smith 5.1904 (42658); Mt. Corieudgy, Peacock 10.1958 (SYD); Cox's Gap, Carolin No. 2070, 12.1960 (SYD); Glendon, Leiehardt 2.1823 (42609, 42663); Capertee, Boorman 1.1900 (42601); Mt. Cameron, Carolin No. 938, 3.1959 (SYD); Richmond to Windsor, Blaxell 12.1963 (90175); Tarana, McKee No. 7045, 1.1960 (SYD); Mullion Creek, Burbidge No. 6903, 12.1960 (63916); Ryde, Evans 9.1914 (SYD); Minehinbury, Carolin No. 862, 3.1959 (SYD); Jenolan Caves, Blakely 1.1899 (42612); Jenolan Caves, Carolin No. 861, 862, 863, 875, 3.1959 (SYD); Liverpool, Evans 1.1948 (SYD); Liverpool, Fraser 12.1934 (SYD); Liverpool, Evans 12.1925 (SYD); Burruga, Carolin No. 929, 938, 3.1959 (SYD); Oberon, Constable 3.1950 (42609); Oberon, Carolin No. 920, 3.1959 (SYD); Garie Beach, Carolin No. 940, 3.1959 (SYD); The Oaks, Mackay 3.1958 (SYD); Yerranderie, Cambage No. 3137, 12.1911 (42602); Stanwell Park, Carolin 4.1963 (SYD); Bald Head, Woodward 3.1959 (SYD); S. Goulburn, Lumsden 10.1906 (42578); Shellharbour, Constable 12.1950 (19190); Nowra district, Coolangatta Hill, Rodway 10.1941 (42676); Bowral, Carolin No. 820, 2.1959 (SYD); Staek Island, Rodway No. 2909, 3.1939 (42655); Bungonia Caves, Carolin No. 782, 871, 1.1959 (SYD); Currarong, Rodway 2.1926 (42675); Burrinjuck, Boorman 2.1911 (42569); Queanbeyan, McKee No. 7267, 9.1960 (56319); Queanbeyan, Cambage No. 3380, 1.1912 (SYD); near Mt. Coree, Gray No. 4971, 1.1961 (56041); Mt. Coree, Cambage

No. 3275, 12.1911 (42577); Gudgenby, Cambage No. 3380, 1.1912 (42574); Tumut, Maiden & Boorman 8.1903 (42576); Yarrangobilly Caves, *Carolin* No. 762, 1.1959 (SYD); Lake Burrill, Gray No. 5802, 12.1965 (90404); Bateman's Bay, Boorman 6.1906 (42678); Moruya, Breakwell 12.1913 (42677); Munderoo State Forest, McBarron No. 2824, 12.1948 (42573; SYD); Cooleman Caves, Rodd No. 77, 4.1965 (75457); Hay, Leigh No. 5246, 11.1964 (73820); Wanganella, Officer 10.1903 (42667); Deniliquin, Leigh No. 267, 11.1964 (73821); Albury, Paterson No. 175, 10.1916 (42668); Guthega, *Carolin* No. 782, 1.1959 (SYD); Guthega, *Carolin* No. 784, 1.1959 (SYD); Island Bend, *Carolin* No. 365, 2.1957 (SYD); Sawpit Creek, *Carolin* No. 775, 1.1959 (SYD); Jindabyne, Woodward 1.1958 (SYD); Jindabyne, McKee No. 6950, 3.1959 (SYD); Jindabyne, *Carolin* No. 773, 1.1959 (SYD); Geehi, *Carolin* No. 815, 1.1959 (SYD); Nimmitabel, Salasoo No. 1979, 12.1960 (53116); Kosciusko, *Carolin* No. 786, 1.1959 (SYD); Thredbo River, Johnson & Constable 1.1951 (15864). Also in Queensland, Victoria, Tasmania, South Australia, Western Australia and New Zealand.

var. *grande* *Carolin* in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 353. Tap-root thick, woody, branched and swollen but not napiform. Stems apparently not rooting at the nodes. Flowering stems ascending, up to 60 cm. tall. Whole plant covered with soft patent hairs. Basal leaves with petioles up to 20 cm. long; laminae 7- to 10-lobed, up to 4 cm. long and 6 cm. wide; stipules ca. 9 mm. long. Peduncles 3-4 cm. long; pedicels 3-5 mm. long. Sepals 6-9 mm. long. Petals obovate, 12 mm. long, 5 mm. wide. Stigmas pale pink, ca. 3 mm. long. Mericarps oblong, ca. 4 mm. long.

Northern Tablelands in open woodland. Ebor Gorge, *Carolin* No. 766, 1.1959 (66129); Guy Fawkes Creek Gorge, *Carolin* No. 424, 11.1957 (SYD); Glen Innes, Rupp 1.1914 (42580); Glen Innes, Boorman 12.1913 (42583); Mt. Lindsay, Nandewar Mtns., Rupp 1.1914 (42591); Mt. Lindsay, Cambage No. 2370, 11.1904 (42586); Koolah Station, Leiehardt 3.1843 (42610).

9. *G. sessiliflorum* Cav., Diss. IV (1787) 198; Willd., Sp. Pl. III (1800) 696; DC., Prodr. I (1824) 639; Hook. f., Fl. Antarct. (1847) 252; Benth., Fl. Austr. I (1863) 297; Hook. f., Handbk. N. Zeal. Fl. (1864) 36; Sprg. in Anal. Mus. Buenos Aires VII (1902) 254; Cheeseman, Man. N. Zeal. Fl. (1906) 89; Knuth, Pflanzenr. LIII (Geran.) (1912) 83. A description of the species is supplied by *Carolin* in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 354.

South America, New Zealand and Australia.

Carolin, loc. cit., recognises three subspecies: the type subspecies in South America, ssp. *novaezealandiae* *Carolin* in New Zealand, and the following subspecies in Australia.

ssp. *brevicaule* (Hook.) *Carolin* in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 357. Compact perennial with thick usually much branched tap-roots and much branched woody caulorrhiza up to 7 mm. thick and covered with the very persistent stipules and petioles. Basal leaves crowded on the upper parts of the caulorrhiza; petioles 2-10 cm. long, covered with long patent villous hairs and short appressed hairs; laminae semiorbicular to reniform in outline, palmately 5- to 7-lobed or dissected, 10-20 mm. long, 15-30 mm. wide, covered thickly or thinly with coarse appressed hairs on both sides; lobes oblong-ovate in outline with three secondary lobes distal to each, each secondary lobe obtuse with a callous tip or the lateral ones tending to be acute; stipules pale to dark brown, oblong to lanceolate-acuminate, ca. 6 mm. long and up to 2 mm. wide, covered with short appressed hairs, ciliate at the margin, united to the petiole with only the tips free. Flowers solitary, borne on the usually very short annual branches; bracteoles membranous, brown, lanceolate to linear-lanceolate, ca. 6 mm. long and 1 mm. wide, covered with short appressed hairs, ciliate at the margin; pedicel and peduncle together 0.5-3.0 cm. long, more or less erect, densely covered with retrorse-appressed hairs, often also with some long divergent hairs; pedicel about twice as long as the peduncle, not swollen above

in the fruiting stages. Sepals lanceolate to narrow-elliptic or narrow-oblong, 4–8 mm. long and up to 2.5 mm. wide, acuminate at the tip, covered with long spreading hairs and shorter antrorse-appressed hairs, thinner but scarcely membranous towards the margin, ciliate, very slightly convex or flat in the fruiting stages. Petals oblong to narrow-elliptic or obovate, 4–8 mm. long, 1–3 mm. wide, deep pink to white with translucent veins, paler towards the base, with minute hairs scattered over the surface at the margin or rarely glabrous. Stamens 10; filaments broad-lanceolate, acuminate, divergent at the apex, ca. 2.5 mm. long, ciliate; anthers yellow, more or less orbicular, ca. 1 mm. long, with 2–3 bristles at the apex. Ovary hirsute; stigmas deep pink or white, ca. 1 mm. long. Fruit: mericarps brown, oblong to ellipsoid, 3 mm. long, 1.5 mm. wide, covered with stiff spreading hairs; funicular hairs mostly erect, ca. 25; awns covered with stiff short simple hairs and some minute glandular hairs on the outer surface; rostrum 8–10 mm. long. Seeds black to very dark brown, ovoid to ellipsoid, ca. 2.5 mm. long and 1 mm. wide, obscurely reticulate; raphe lateral. *G. brevicaulis* Hook. in Journ. Bot. I (1834) 252. *G. sessiliflorum* var. *glabrum* Knuth in Engl. Bot. Jahrb. XXXVII (1906) 565 et Pflanzenr. LIII (Geran.) (1912) 85. As the species has not generally been segregated into subspecific taxa, this subspecies has been referred to *G. sessiliflorum* Cav., loc. cit., by Benth., Fl. Austral. I (1863) 297; Moore & Betche, Handb. Fl. N.S.W. (1893) 55; Maiden & Betche, Census N.S.W. Pl. (1916) 111; Ewart, Fl. Vict. (1931) 682; Curtis, Stud. Fl. Tasm. I (1956) 91.

Southern Tablelands at high elevations, in alpine herbfield, sod-tussock grassland and alpine woodland. Kiandra, Betche 2.1897 (42540); Bett's Creek, Kosciusko, Johnson & Constable 1.1951 (15782); Daner's Gap, Kosciusko, Woodward 1.1958 (SYD); White's River Hut near Guthega, *Carolin* No. 798A, 1.1959 (SYD). Also in Tasmania.

10. *G. antrorsum* *Carolin* in Proc. Linn. Soc. N.S.W. LXXXIX (1965) 357. Perennial herb with thick, fleshy, branched tap-roots and numerous much branched caulorrhiza usually less than 3 mm. long, covered with very persistent stipules and petioles. Flowering stems very short and bearing reduced leaves or reduced to a pedicel and peduncle. Basal leaves crowded towards the top of the caulorrhiza; petioles 3–16 cm. long, densely covered with appressed hairs and some more or less spreading villous hairs; laminae semiorbicular to cuneate, palmately 5- to 7-dissected or lobed, 1–4 cm. long, 1.5–3.0 cm. wide, covered with coarse appressed hairs on both surfaces; lobes obovate, further divided into 3 secondary lobes above, the central lobe obtuse but the two laterals tending to be acute, scarcely mucronate; stipules brownish, membranous, oblong to elliptic or lanceolate, 4–6 mm. long, up to 2 mm. wide, obtuse or slightly acuminate, ciliate at the margins and with a distinct ciliated midrib. Flowers solitary, the pedicel and peduncle together 1–4 cm. long, erect, densely covered with antrorse sub-appressed hairs; pedicel ca. twice as long as the peduncle, not swollen above in the fruiting stages; bracteoles lanceolate to linear-lanceolate, ca. 6 mm. long, ciliate and pubescent. Sepals lanceolate to narrow-elliptic, long acuminate, 5–11 mm. long, 2–3 mm. wide, covered with closely antrorse-appressed hairs and with spreading hairs on the veins and on the membranous margins, concave in the fruiting stages and with spreading tips. Petals obovate, 6–12 mm. long, deep-pink with translucent veins, paler towards the base, entire. Stamens 10; filaments lanceolate-acuminate, 2–3.5 mm. long, ciliate; anthers globular, ca. 1 mm. diam., yellow with purple dehiscence lines. Ovary hirsute-villous; stigmas pink, ca. 2 mm. long. Fruit: mericarps dark brown, covered with spreading hairs; funicular hairs erect, ca. 25; awns covered with short, coarse, simple hairs and some minute glandular hairs on the outer surfaces; rostrum ca. 11 mm. long. Seeds black, ovoid, ca. 2.5 mm. long and 1.5 mm. wide, obscurely reticulate; raphe lateral.

Southern Tablelands, in alpine herbfield, sod-tussock grassland and alpine woodland. Cooleman Plains, Walker No. ANU 950, 12.1962 (66521); 8 miles NNE of Rule's Point, Briggs 12.1960 (52851); Kiandra to Adaminaby 3 miles, Carolin No. B103, 2.1957 (SYD); Kiandra district, Betche 2.1897 (90169); a few miles E of Kiandra, Thompson 1.1958 (42771); Yarrangobilly Caves, Carolin No. 761, 1.1957 (SYD); Happy Jack's Plains, Thompson 1.1958 (42770); Brooks Hut, Happy Jack's Plains, Phillips No. SMA 3326, 12.1957 (42815); White's River Hut near Guthega, Carolin No. 798B, 1.1959 (SYD); Kosciusko Hotel dam, Carolin No. 778B, 1.1959 (66132); Nimmitabel, Boorman 12.1916 (42539); Nimmitabel, Cambage No. 1850, 2.1908 (42541). Also in Victoria.

G. sp. There is a specimen from Dry Plains on the Southern Tablelands which does not correspond to any of the species noted above. It appears closest to *G. antrorsum* but the close, silvery indumentum and the deeply dissected leaves distinguish it. Neither has it been possible to identify it with any extra-Australian species to date. Further material is necessary before any conclusions as to its systematic position can be drawn. Dry Plains via Cooma, Dulhunty 1.1934 (42536).

**Geranium purpureum* Vill., Pl. Delph. (1785) 72, has been collected in cultivated soil at Dripstone and Burrendong arboretum, G. W. Althofer 10.1966 (84799, 84066) but it does not appear to be completely naturalized. It can be distinguished by the ridged mericarps which bear a tuft of long white hairs near the apex (see Carolin, Proc. Linn. Soc. N.S.W. LXXXIX (1965) 330). Native of Europe, particularly the Mediterranean region, and southwards into Africa (Uganda). Introduced into New Zealand.

**Geranium dissectum* L. occurs in Victoria close to the New South Wales border and may ultimately be found in New South Wales. It may be distinguished by the presence of glandular hairs on the rostrum. Native of Europe, now very widely spread.

2. ERODIUM L'Hér.

Herbs, usually with simple or branched basal stems (caulorrhizae), or shrubby (but not in Australian species). Flowering stems \pm short-lived. Leaves opposite or alternate, usually pinnately or palmately lobed or dissected. Flowers arranged in terminal cincinnal umbels or solitary. Sepals 5, imbricate. Corolla regular or slightly irregular; petals 5, free. Fertile stamens 5, alternating with 5 staminodes. Ovary 5-lobed, 5-locular and with a distinctly 5-fid style. Mericarps separating completely from the rostrum and surmounted by a spiral awn with \pm long stiff hairs on the inner surface; on either side at the base of the awn is a pit (fovea) often with several folds below it. Seeds usually retained with the pericarps.

A genus of about 80 species widely distributed in temperate regions particularly of the Old World, extending into Tropical Regions only rarely. 8 species occur in Australia, 2 of which are certainly endemic, all the others almost certainly introduced. See Carolin, Proc. Linn. Soc. N.S.W., LXXXIII (1958) 92 and LXXXVIII (1964) 315.

1. Fovea with some large glandular hairs.
 2. Leaves pinnately compound *E. moschatum* 7.
 - 2.* Leaves ternately lobed.
 3. Leaves ovate, slightly lobed. Sepal awn ca. 1 mm. long, conspicuous.
..... *E. malacoides* 3.
 - 3.* Leaves ovate-oblong, deeply lobed to ternately compound. Sepal awn 0.5
mm. long, inconspicuous *E. aureum* 4.
- 1.* Fovea with no glandular hairs.
 4. Leaves pinnately compound, the leaflets deeply pinnatisect..... *E. cicutarium* 8.

- 4.* Leaves deeply lobed to pinnatisect or ternate.
5. Hairs of the calyx mostly simple (except the minute ones)..... *E. crinitum* 5.
- 5.* Hairs of the calyx mostly glandular.
6. Hairs on the stems glandular. Leaves 3-lobed
..... *E. cygnorum* ssp. *glandulosum* 6.
- 6.* Hairs on the stems coarse, only simple hairs present towards the base.
Leaves pinnately lobed or dissected.
7. Fovea hirsute, with an obtuse rim; rostrum 5.5–8.5 cm. long
..... *E. obtusiplicatum* 2.
- 7.* Fovea glabrous with an acute chartaceous rim; rostrum usually
longer than 8.5 cm..... *E. botrys* 1.

1. **E. botrys* (Cav.) Bertol., Moen. Ital. (1819) 35; Knuth, Pflanzenr. LIII (Geran.) (1912) 256; Asch. & Graebn., Syn. Mittel-Europ. Fl. VII (1913) 79; Gardner, Enum. Pl. Austral. Occ. (1930) 68; Ewart, Fl. Vict. (1931) 684; Wagner & Biswell in Madroño VII (1943) 188; Black, Fl. S. Austral. ed. 2, II (1948) 483; Blackall, W. Austral. Wildflowers I (1954) 249; Carolin in Proc. Linn. Soc. N.S.W. LXXXVIII (1964) 313; Eichler, Suppl. Black's Fl. S. Austral. (1965) 196. Annual herbs. Stems several, up to 40 cm. long, rarely less than 5 cm., ascending or decumbent, covered with stiff or \pm curled, white, simple hairs below but often glabrescent towards the base and with numerous (often dense) glandular hairs above. Basal leaves: laminae pinnately dissected, oblong to elliptic, up to 10 (usually ca. 6) cm. long and 3 cm. wide, obtuse, covered with scattered, mostly simple hairs especially on the veins; lobes serrate-dentate; petioles hirsute, usually longer than or as long as the laminae. Cauline leaves opposite, smaller with acute teeth and becoming sessile towards the top; stipules broad-ovate, 5 mm. long, 4 mm. wide, white to pale brown, membranous, glabrous except for the ciliate margin. Flowers in umbels of 2–3, sometimes solitary; peduncle up to 5 cm. long, densely covered with glandular hairs; pedicels similar, 10–15 mm. long; bracts numerous, similar to the stipules but smaller, narrower, and more acute. Sepals narrow-oblong, up to 1.5 cm. long, 3 mm. wide, densely covered with glandular hairs and with some simple hairs especially towards the margin and the base; mucro ca. 1 mm. long. Petals blue, \pm obovate, somewhat longer than the sepals. Filaments of the stamens lanceolate, 3 mm. long; staminodes \pm ovate, ca. 1 mm. long. Fruit: rostrum 8–11 cm. long; mericarp ca. 1 cm. long with simple \pm spreading hairs lying away from the sutures and some very short glandular hairs; fovea deep and glabrous with two concentric folds which have glabrous, chartaceous, acute and \pm irregular margins; awns flattened towards the base but not narrower than in the middle, shortly pubescent with appressed hairs on the outer surface and with numerous bristles on the inner surface which are very long about the middle. *Geranium botrys* Cav., Diss. IV (1787) 218.

Naturalized on the North Coast, South Western Slopes and Far Western Plains on disturbed land. Broken Hill, Morris 9.1920 (74790); Wingham, Brewer 10.1952 (74787); Kolodong via Taree, Noonan 9.1954 (74786); Raymond Terrace, Armstrong 11.1940 (74784); Rand-Goombargana, McBarron No. 3469, 8.1949 (74788); Culcairn, Gibbs 6.1946 (1933); Gerogery, McBarron No. 2461, 11.1948 (74783); Albury, Glenfield Veterinary Research Station No. 958, 5.1931 (74789); 9-mile Hill, Albury, McBarron No. 3650, 10.1949 (74785). Throughout temperate Australia. Native of the Mediterranean region.

Whittet, Weeds (1958) 281, states that this species is not readily eaten by sheep; the sharp pointed "seeds" (mericarps) are likely to cause damage by penetrating the flesh of sheep.

2. **E. obtusiplicatum* (Maire, Weiller et Wilczek) J. Howell in Leaflet West. Bot. V (1947) 67; Munz, Calif. Fl. (1959) 44; Carolin in Proc. Linn. Soc. N.S.W.

LXXXVIII (1964) 314. Annual herb. Stems several, up to 30 cm. long, ascending or decumbent, covered with stiff, white, simple hairs below and with shorter glandular hairs becoming predominant towards the top. Basal leaves: laminae pinnatisect or lobed, obtuse, oblong to ovate, up to 5 cm. long and 2.5 cm. wide with scattered, \pm stiff, white hairs especially towards the margins, the lobes serrate-dentate; petioles hirsute, 2–8 cm. long; stipules ovate to almost orbicular, 2–4 mm. long, acuminate, ciliate, membranous, brown to whitish. Cauline leaves smaller, becoming sessile towards the top. Flowers in umbels of 2–3 (–4) or rarely solitary; peduncles 2–3.5 cm. long, densely covered with glandular hairs but scarcely any simple hairs; bracts 3 to numerous, similar to the stipules but smaller, narrower and more acute; pedicels 6–10 mm. long, densely covered with glandular hairs and some simple hairs. Sepals narrow-oblong to elliptic, 8–10 mm. long, densely covered with glandular hairs and some simple hairs towards the membranous margin and base, shortly mucronate. Petals obovate, blue, slightly longer than the sepals. Filaments of the stamens elliptic, ca. 4 mm. long; staminodes ca. 2 mm. long. Fruit: rostrum 5.5–8.5 cm. long; mericarps ca. 8 mm. long with stiff white hairs diverging diagonally from the suture; folds shallow and usually with some stiff simple hairs, and with one shallow groove with obtuse margins, frequently hirsute, not chartaceous and \pm smooth; awns with some long bristles, flattened towards the base. *E. botrys* var. *obtusipli-catum* Maire, Weiller et Wilczek in Bull. Soc. Hist. Nat. Afr. Nord. XXVI (1935) 120; *E. botrys* f. *montanum* Brumh. in Feddes Repert. II (1906) 118; Wagner & Biswell in Madroño VII (1943) 188.

Naturalized on the Central Western and South Western Slopes on disturbed land. Young district, Byrne 8.1950 (74795); Albury, McBarron No. 3622, 9.1949 (74799); Albury, McBarron No. 1994, 9.1948 (74796); Bulgandry Reserve, McBarron No. 3558, 9.1949 (74797); Dudal Comer Reserve, 6 miles SW of Henty, McBarron No. 3538, 9.1949 (74792); Goombargana, McBarron No. 3584, 9.1949 (74791). Also in Queensland, South Australia and Victoria. Native of the Mediterranean region.

3. **E. malacoides* (L.) Willd., Phyt. I (1794) 10 et Sp. Pl. III (1801) 639; Knuth, Pflanzenr. LIII (Geran.) (1912) 245; Asch. et Graebn., Syn. Mitt.-Europ. Fl. VII (1914) 72; Vierhapper in Verh. K.K. zool.-bot. Ges. Wien (1919) 146; Curtis, Stud. Fl. Tasm. I (1956) 93; Carolin in Proc. Linn. Soc. N.S.W. LXXXVIII (1964) 315; Eichler, Suppl. Black's Fl. S. Austral. (1965) 196. Annual herbs. Stems several, up to 50 cm. long, erect or \pm ascending, covered with simple hairs interspersed with somewhat smaller glandular hairs. Basal leaves: laminae ovate-cordate, 5- to 7-lobed, up to 4 cm. long and 3 cm. wide, sprinkled with soft pubescent hairs on both surfaces, the lobes dentate or crenate; petioles hirsute, 4–8 cm. long. Cauline leaves smaller and with shorter petioles; stipules membranous, white, ovate to orbicular, ca. 5 mm. long, ciliate towards the obtuse apex and with a few simple hairs on the green midrib. Flowers in umbels of 5–7; peduncles 3–5 cm. long, covered with simple and glandular hairs; bracts 2 or usually 4–6, similar to the stipules but narrower and more acute, 3–4 mm. long, free; pedicels similar to the peduncles, ca. 15 mm. long. Sepals oblong to elliptic, 4–5 mm. long, 2–2.5 mm. wide, densely covered with glandular hairs and with some long simple hairs towards the base and apex and with an awn ca. 1 mm. long. Petals obovate to oblanceolate, 5.5 mm. long, deep pink to mauve. Filaments of the stamens linear to linear-lanceolate, 3.5 mm. long, entire; staminodes oblong-elliptic, 2.5 mm. long. Fruit: rostrum 2–2.5 (–3) cm. long; mericarps 6 mm. long, hirsute with stiff hairs \pm divergent away from the sutures; folds well defined with one wide furrow beneath each the margins of which are \pm acute, both furrow and furrow with large glandular hairs; awns as wide at the base as at the middle, spirally twisted to the base. *Geranium malacoides* L., Spec. Pl. I (1753) 680.

Naturalized on the Western Plains. Hay, Gray 9.1961 (74800). Also in Victoria, Tasmania and South Australia. Native of the Mediterranean region.

Ewart, Fl. Vict. (1931) 683, misidentified material of this species as *E. chium* Willd.

4. **E. aureum* *Carolin* in Proc. Linn. Soc. N.S.W. LXXXIII (1958) 92; *Carolin* in Proc. Linn. Soc. N.S.W. LXXXVIII (1964) 315; Eichler, Suppl. Black's Fl. S. Austral. (1965) 197. Usually dwarf annual (or short-lived perennial) herb with an ascending rosette of radical leaves. Stems 1-3, decumbent or ascending, up to 20 cm. long, covered with soft glandular and simple hairs. Basal leaves oblong to ovate-lanceolate, 1.8-3.0 cm. long, 7-15 mm. wide, lobed or deeply dissected with three primary lobes right to the midrib, the margins dentate, the surface covered with both simple and glandular hairs; petioles slender with scattered hairs. Cauline leaves few, smaller and almost sessile. Flowers in umbels of (2-) 3 (-5) or rarely solitary; pedicels covered with glandular and (fewer) simple hairs. Sepals 5, oblong-lanceolate, 5-8 mm. long, 2-3 mm. wide, covered with glandular and simple hairs, shortly awned (0.5 mm.) or obtuse, ciliate on the membranous margin. Petals 5, pink to pale purple with darker veins, elliptic to obovate, ca. 8 mm. long and 6 mm. wide. Filaments of the stamens narrow-lanceolate, 1 mm. wide at their widest, 4-5 mm. long including the long-aristate, often purple apex, entire; anthers red; staminodes narrow-lanceolate ca. 4 mm. long. Stigmas yellow. Fruit: rostrum 2.5-3.5 cm. long; mericarp ca. 5 mm. long and 2 mm. wide; fovea distinct with a concentric groove, both well defined and bearing at least one or two large glandular hairs; awns of equal thickness from top to bottom, bearing a large number of long bristles towards the base, and spirally twisted to the base.

Naturalized on the Far Western Plains in open communities. Paroo R., Betche 9.1900 (78335); Broken Hill, Morris 9.1920 (78332); Broken Hill, Morris 8.1921 (78333); Broken Hill, Pidgeon & Vickery 8.1939 (78334). Also in all other States except Victoria and Tasmania. Probably introduced from south-west Asia or North Africa.

5. *E. crinitum* *Carolin* in Proc. Linn. Soc. N.S.W. LXXXIII (1958) 93; Beadle, Evans & *Carolin*, Handb. Vasc. Pl. Syd. Dist. (1963) 171; Eichler, Suppl. Black's Fl. S. Austral. (1965) 195. Decumbent or ascending herbaceous annual or short-lived perennial with thick fleshy rootstock. Stems 1 to numerous, 5-50 cm. tall with long, stiff, white, simple hairs scattered over the surface. Basal leaves ovate, 1.5-4.0 cm. long, 1.5-3.0 cm. wide, deeply palmately dissected to the midrib with three principal lobes, with long simple hairs scattered over the surface, dentate, the median lobe 1.5-4.0 cm. long, 1.0-2.5 cm. wide; petioles slender with scattered simple hairs especially in the groove, and very short glandular hairs; stipules and bracts acute. Flowers in umbels of (2-) 4 (-6), very rarely solitary; pedicels covered with long simple hairs. Sepals 5, lanceolate or narrow-oblong, 6-10 mm. long, 2-3 mm. wide, hirsute with long, suberect, white, simple hairs and very short glandular hairs where exposed in bud, shortly mucronate, ciliate and membranous towards the margin especially where covered in bud. Petals 5, blue-purple with yellow or white veins and base, obovate, ca. 10 mm. long and 5 mm. wide. Stamens 5; filaments oblanceolate or narrow-oblong, 4 mm. long, 1.5 mm. wide, acuminate-aristate with an awn ca. 1 mm. long; anthers yellow; staminodes 5, ovate-triangular, 1.5 mm. long, 1.5 mm. wide, almost obtuse, occasionally toothed, one third to one half as long as the staminal filament. Stigmas yellow. Fruit: rostrum 4-7 cm. long; mericarps 5, oblanceolate to obovoid, 6.5 mm. long and 1.5 mm. wide, covered with long, white, simple hairs appressed diagonally to the long axis; awn 4.0-7.0 cm. long with two folds at the base and often two folds beneath each pit, flattened and spirally twisted to the base, with long bristles especially towards the base. Chromosome number: $2n=40$ (*Carolin* in Proc. Linn. Soc. N.S.W. LXXXIII (1958) 93). "Crowfoot"

Throughout New South Wales except the North Coast, in open woodland, scrub, grassland and saltbush communities. Tibooburra, Crouch 8.1913 (78375); Enngonia, *Carolin* No. 673, 8.1958 (SYD); Culgoa River, Webb 9.1901 (78300); Inverell, Thomas 10.1912 (78313); Inverell, Hicks & Earle No. 208 (64933); Bingara, Blundell 5.1911 (78302); Walgett, Little 10.1899.

(78361); Narrabri, Breakwell 9.1913 (78312); Walroodah, Barraba, Hay 9.1903 (78376); Armidale, Davis 2.1941 (78360); head of Gwydir River, Leichhardt (78369); Toorale to Goonery, Boorman 10.1912 (78311); Boggabri, Cabbage No. 3624, 10.1912 (78303); Mungerie, Coonamble, Fetherstonhaugh 7.1913 (78305); Gunnedah, Narr 3.1941 (78363); Coolabah, Peacock 9.1898 (78309); Tamworth, Goode No. 95a, 11.1954 (78371); Tilpa, Turner 5.1911 (78355); Gulargambone, 9.1903 (78358); Boppy Mtn., Cobar, Boorman 7.1903 (78357); Cobar, Cunningham 1964 (78299); 29 miles W of Nyngan, Pidgeon & Vickery 8.1939 (78379); Nyngan, Boorman 8.1903 (78353; 78351); Binnaway, Salasoo No. 2198, 1.1962 (78345); Gilgandra, Simon 10.1913 (78354); Butler's Peak Range, Fowler's Gap, Carolin 6.1956 (SYD); Broken Hill, Morris 7.1920 (78374); E of Broken Hill, Ford 8.1946 (78372); Belltrees via Scone, White 2.1920 (78381); Scone, Breakwell 8.1913 (78315); Trangie, Robards 9.1965 (89384); Dubbo, Boorman 8.1903 (78308); Narromine, Maiden 9.1898 (78344); South Mudgee, Tindale 10.1953 (78316); Fifield, Cabbage 9.1908 (78307); 4 miles S of Peak Hill, McKee No. 119, 9.1952 (SYD); Ivanhoe, Crisp 9.1939 (78359); Condobolin, Breakwell 8.1913 (78310); Sunny Corner, Boorman 11.1899 (78352); Canowindra, Garden 10.1949 (78377); Cowra, Breakwell 9.1913 (78346); Marsden, Blomfield 10.1912 (78356); Pennant Hills, Fraser 1934 (78306); Concord West, Evans 10.1942 (SYD); Prospect, Rodway 9.1927 (78343); Griffith, Blakely 7.1928 (78350); Wombeyan Caves, Rodway 12.1921 (78362); Joadja, Rodway 10.1919 (90751); Ardlathan, Cabbage No. 4185, 9.1916 (78367); Temora, Dwyer 9.1915 (78383); Griffith, Blakely & Shiress 7.1928 (78350); Hay, Fletcher 9.1889 (78304, 78380); Yanco Experiment Farm, Wenzholz 2.1913 (78368); Yanco Experiment Farm, Breakwell 11.1913 (78370); Nowra, Rodway 9.1941 (78361); Hall, A.C.T., Mowle No. 132, 10.1963 (68969); Jerilderie, Dwyer 10.1920 (78348, 78373); Hcnty, McBarron No. 3079, 2.1949 (78382) and No. 3687, 10.1949 (78365); Culcairn, McBarron No. 3542, 9.1949 (78364); Goombargana near Walbundrie, McBarron No. 3818, 10.1949 (78314); Goombargana Hill near Walbundrie, McBarron No. 3814, 10.1949 (78366); ca. 3 miles E of Cooma, Pullen No. 3948, 11.1963 (68972); Bega, Breakwell 12.1913 (78349); Bega, Rodway 12.1920 (78378). Also in all mainland States and the Northern Territory. Occurs as an alien in Western Europe.

Generally considered to be good fodder for stock.

6. *E. cygnorum* Nees in Lehm., Plant, Preiss. I (1844) 162; Knuth, Pflanzenr. LIII (Geran.) (1912) 249. A specific description is supplied by Carolin in Proc. Linn. Soc. N.S.W. LXXXIII (1958) 95.

The type subspecies occurs in Western Australia whilst ssp. *glandulosum* occurs in the eastern States.

ssp. *glandulosum* Carolin in Proc. Linn. Soc. LXXXIII (1958) 97; Eichler, Suppl. Black's Fl. S. Austral. (1965) 196. Annual herbs. Stems 1 to numerous, 10–60 cm. tall, covered with soft glandular hairs. Basal leaves ovate, 2.0 cm. long, 1–4 cm. wide, lobed with three dentate principal lobes, the sinuses never reaching the midrib, the hairs almost all glandular on both surfaces; petioles slender, 2–13 cm. long, glandular-hairy, except in the groove which has long, stiff, simple hairs; stipules ovate, 3–6 mm. long, acute to acuminate, glandular-hairy, ciliate. Flowers in umbels of 2–6, very rarely solitary; pedicels slender, glandular-hairy, up to 4 cm. long; bracts ovate, similar to the stipules. Sepals, 5 oblong-elliptic, 8–13 mm. long, 3–4 mm. wide, mucronate, covered with soft glandular hairs and very few or no simple hairs, membranous and ciliate towards the margins, especially where covered in bud. Petals 5, blue-purple with red veins and base, obovate, ca. 12 mm. long and 7 mm. wide. Stamens 5; filaments lanceolate or narrow-oblong, 4 mm. long, 15 mm. wide, acute, occasionally toothed; anthers red; staminodes 5, oblong-lanceolate, 35 mm. wide. Stigmas red. Fruit: rostrum 8–12 cm. long, rarely shorter; mericarps 5, oblanceolate or oblong, ca. 1 cm. long and 0.2 cm. wide, covered with long, white-brown, simple hairs appressed for the most part parallel to the long axis; awns with long bristles especially towards the base and flattened and spirally twisted to the base with usually two folds beneath each. Chromosome number: $2n = 60$ (Carolin, loc. cit.).

Far Western Plains in open, arid and semi-arid communities. Butler's Peak Range near Fowler's Gap, Carolin No. E4, 6.1956 (SYD); Umberumberka, Johnson 8.1940 (74832); Broken

Hill, Andrews 9.1918 (74833); Broken Hill, Morris 7.1921 (74834); Broken Hill, Pidgeon & Vickery 8.1939 (74835); 1 mile S of Rockwell Hotel, Broken Hill–Menindee Road, Constable 7.1955 (74831); Yanco Glen, Brough & Beadle 8.1939 (SYD). Also in South Australia, Queensland and the Northern Territory.

Generally considered to be good fodder for stock.

7. **E. moschatum* (L.) *L'Hér. ex Ait.*, Hort. Kew. ed. 1, 1 (1789) 414; Knuth, Pflanzr. LIII (Geran.) (1912) 281; Hegi, Illust. Fl. Mitt.-Europ. IV (1924) 724; Gardner, Enum. Pl. Austral. Oec. (1930) 68; Ewart, Fl. Vict. (1931) 683; Black, Fl. S. Austral. ed. 2, II (1948) 483; Blackall, W. Austral. Wildflowers I (1954) 249; Curtis, Stud. Fl. Tasm. (1956) 93; Carolin in Proc. Linn. Soc. N.S.W. LXXXVIII (1964) 316; Beadle, Evans & Carolin, Handb. Vase. Pl. Syd. Dist. (1963) 171; Eichler, Suppl. Black's Fl. S. Austral. (1965) 196. Annual herbs with a musk-like odour. Stems several, up to 40 cm. long, ascending, densely covered with simple and glandular hairs becoming less dense towards the base. Basal leaves: laminae pinnate-compound, \pm oblong, 2–20 cm. long; leaflets sessile, ovate to elliptic, 9–30 mm. long, 5–20 mm. wide, dentate, covered with simple and glandular hairs; petioles 2–16 mm. long, \pm pubescent. Cauline leaves smaller; stipules ovate to orbicular, up to 8 mm. long, glabrous, scarcely ciliate but with a few minute teeth. Flowers in umbels of 4–7; peduncles (1–) 8–16 cm. long, \pm pubescent; bracts similar to the stipules but frequently \pm ciliate towards the apex, free; pedicels (6–) 10–18 mm. long, densely glandular-hairy. Sepals oblong, 7 mm. long, 2.5 mm. wide with short mucro, \pm glandular-hairy with some simple hairs. Petals obovate, pink, slightly longer than the sepals. Filaments of stamens narrow-lanceolate, 3 mm. long, sometimes with two irregular teeth; staminodia narrow-elliptic, ca. 2 mm. long. Fruit: rostrum 2.5–3.5 cm. long; mericarps ca. 8 mm. long with stiff hairs diverging diagonally from the suture; fovea well defined with a deep concentric groove, the fovea at least (and usually the groove as well) bearing large glandular hairs; awns with long bristles particularly towards the base, spirally twisted to the base which is flattened and not narrower than the middle region. *Geranium moschatum* L., Sp. Pl. (1753) 6. "Musky Crowsfoot".

Naturalized on the Central and South Coast, Central and Southern Tablelands, Western Slopes and Western Plains, on disturbed ground. Inverell, Thomas 10.1912 (74825); Barraba, Rodway 9.1924 (74807); Gilgandra, Simon 10.1913 (74822); Parkes, Russell 19.1911 (74817); Maitland district, Cotton 9.1914 (74816); Tichborne, Watson 9.1937 (74815); Forbes, Raymond 9.1900 (74808); Bathurst, Rodway 9.1929 (74804); Canowindra, Garden 10.1949 (74819); Beecroft, Cowman 10.1946 (74806); Cheltenham, Johnson 1947 (74809); Cootamundra, per Glenfield Veterinary Research Station 10.1932 (74824); Goulburn, Lumsden 10.1906 (74823); Leeton, Rice Research Station 10.1938 (74814); Whitton, Jacobs 12.1912 (74821); Binalong, D'Arnay No. 144, 10.1960 (56038); Yass, Dwyer No. 42, 9.1911 (74826); Hall, A.C.T., D'Arnay No. 141, 10.1960 (56039); Nowra, Rodway 9.1919 (74803); Talbingo, Newman 11.1952 (74812); Bulgandry, McBarron No. 2042, 9.1949 (74878); Bega, Rodway 12.1920 (74805). Also in all the other States except the Northern Territory. Native of Europe and North Africa.

Whittet, Woods (1958) 282, mentions this as not being relished by animals because of its musky odour and taste.

8. *E. cicutarium* *L'Hér. ex Ait.*, Hort. Kew., ed. 1, II (1789) 414; Benth., Fl. Austral. I (1863) 298; Bailey, Qld. Fl. I (1899) 178; Knuth, Pflanzenr. LIII (Geran.) (1912) 274; Bailey, Compr. Cat. Qld. Pl. (1913) 72; Hegi, Illus. Fl. Mitt.-Europ. IV (1924) 1719; Gardner, Enum. Pl. Austral. Oec. (1930) 68; Ewart, Fl. Viet. (1931) 684; Black, Fl. S. Austral. ed. 2, II (1948) 483; Blackall, W. Austral. Wildflowers 2 (1954) 249; Curtis, Stud. Fl. Tasm. I (1956) 93; Carolin in Proc. Linn. Soc. N.S.W. LXXXVIII (1964) 317; Beadle, Evans & Carolin, Handb. Vase. Pl. Syd. Dist. (1963) 171; Eichler, Suppl. Black's Fl. S. Austral. (1965) 196. Annual or biennial herbs. Stems decumbent, ascending or erect, hirsute or glandular-hairy.

Basal leaves: laminae pinnate-compound with each leaflet deeply pinnatifid, ovate to oblong, up to 5.5 cm. long, hirsute or glandular-hairy; lobes of the leaflets acute, often \pm dentate; petioles hirsute or glandular-hairy, up to 4 cm. long; stipules membranous, lanceolate-deltoid to ovate-acuminate, 3–7 mm. long, white, brown or red, \pm translucent. Cauline leaves \pm smaller. Flowers in umbels of 2–5, rarely solitary; peduncles glandular-hairy or hirsute with scattered hairs to almost glabrous, 4–8 mm. long; bracts connate into a wide funnel-shaped tube and appearing as lobes or large teeth upon it, ca. 2 mm. long, ciliate; pedicels 9–22 mm. long, glandular-hairy, hirsute with scattered hairs, or hirsute and glabrescent. Sepals oblong to elliptic, 5–7 mm. long, membranous and ciliate at the margins, hirsute or glandular-hairy, mucronate. Petals obovate to oblanceolate, \pm irregular, pink to white, sometimes with dark spots or lines towards the base. Staminal filaments lanceolate, 5 mm. long; staminodes narrow-lanceolate to narrow-elliptic, 2.5–3 mm. long. Fruit: rostrum 3.0–4.5 cm. long; foveae shallow and only occasionally with a glabrous furrow below each.

Throughout New South Wales except the North Coast. Culgoa River, Webb 9.1901 (61006); Inverell, Thomas 10.1912 (61005); Bourke, Constable 9.1947 (4561); Jew's Lagoon, 50 miles W of Narrabri, Blakely 8.1936 (61004); Narrabri, Breakwell 9.1913 (61003); Guyra, McKie 11.1929 (61002); Barraba, Rodway 10.1924 (61015); Armidale, Davis 8.1939 (61966), 10.1939 (61065), 1.1941 (61064); ca. 8 miles S of Armidale, Begg 10.1951 (60962); Gunnedah, Boorman 9.1910 (61000); Werris Creek, Johnson 6.1947 (5073); Wilcannia, Vickery 8.1939 (60980); Broken Hill, Andrews 9.1918 (60984); Broken Hill, Morris 7.1920 (60985); Belltrees, Scone, Maiden 8.1899 (61001); W of Ivanhoe, Whaite No. 1243, 7.1953 (60970); Euchareena, Boorman 6.1900 (60974); 23 miles NW of Parkes, Charles 8.1952 (60974); Parkes, Russell 10.1911 (60977); Condobolin Flats, Maiden 8.1897 (60975); Molong, Breakwell 8.1913 (60961); Orange, Reynolds 9.1911 (60960); Sunny Corner, Boorman 11.1899 (60956); Canowindra, Garden 10.1949 (60992); Cowra, Breakwell 9.1913 (60979); 53 miles N of Wentworth, Constable 7.1955 (60971); Bell, Johnson 9.1949 (60991); Hawkesbury Agricultural College, Richmond, Carne 10.1911 (60976); Hawkesbury Agricultural College, Musson 11.1912 (60973); Hampton, Cambage No. 4094, 8.1914 (60959); Jenolan Caves, Blakely 10.1899 (60978); Cook's River, Hamilton 10.1909 (60989, 60963); near Berrima, Fletcher 4.1889 (60995); "Cotta Walla", Crookwell, Ellsmore 11.1915 (60957); Ardlethan, Cambage 10.1916 (60982); Hay, Fletcher 9.1889 (61007); Wallendbeen, Breakwell 11.1913 (60990); Lceton, pcr Rice Research Station 10.1938 (60972); Euston, Whaite No. 797, 8.1950 (60958); Yanco, Wenholtz 8.1912 (61011); Juncce, Dwyer 9.1915 (60988); Wagga, Fletcher 10.1889 (60996); Canberra, Cambage No. 2975, 11.1911 (60986); Canberra, Mowle No. 141, 10.1963 (68966); Canberra, Rodway 9.1924 (60969), 10.1936 (60968); Black Mt., Canberra, Gray No. 4901, 10.1960 (56050); Black Mt., Canberra, McKee No. 11769, 11.1964 (77661); Qucanbeyan, Breakwell 8.1913 (61009); Henty, McBarron No. 3632, 9.1949 (60998); Braidwood, Cambage No. 2076, 10.1908 (60983); Bateman's Bay, Boorman 6.1906 (60981); Mulwala, Fletcher 10.1890 (60994); Burrumbuttock, McBarron No. 3603, 9.1949 (60997), No. 3600, 9.1949 (60993); 9 mile Hill Reserve, Albury, McBarron No. 3490, 8.1949 (60999); Mt. Dromedary, Reader 8.1880 (61012); 3 miles E of Cooma, Pullen No. 3947, 11.1963 (68971); Cooma, Boorman 9.1913 (60987); Cooma to Nimmitabel, Maiden 12.1898 (61013); Nimmitabel, Betche 2.1893 (61010); Delegate, Jeffreys 6.1912 (61008). Found in all other States. A very variable weed found almost throughout the temperate regions of the world. Probably a native of Europe.

3. PELARGONIUM L'Hér. ex Ait.

Annual or perennial herbs or low shrubs. Leaves simple to almost compound, dentate, lobed to deeply dissected, hairy with long single hairs and short glandular hairs or almost glabrous, often aromatic; margins sometimes undulate. Flowers irregular, arranged in dichasia passing into monochasia in the ultimate branches and condensed into simple umbels; inflorescences terminal, themselves arranged in cincinni. Sepals 5, usually quincuncial, connate basally; posterior sepal with a nectary-spur or pocket adnate to the pedicel. Petals 5, usually convolute, free, often clawed, white to deep pink or purple; posterior petals usually larger and often marked with darker veins or spots. Stamens 10, 3–8 bearing anthers; filaments more or less lanceolate to elliptic, often irregularly united basally.

Ovary 5-locular with 2 ascending ovules in each loculus inserted on the axis near the base, hirsute. Fruit a schizocarp splitting into 5 mericarps each containing a single seed, open on the ventral suture and without a pronounced tuft of hairs on the funicle; outer part of style persistent as a coiled awn terminal on the mericarp and with long hairs on the inner surface, glabrous outside; rostrum hirsute. Seed not distinctly reticulate, sometimes punctate and usually eventually released from the pericarp.

A large genus of ca. 250 species centred in Southern Africa. Seven species are endemic in Australia of which four occur in New South Wales. Three naturalized species are found in Australia, all in New South Wales. The Australian species have been revised by Carolin in Proc. Linn. Soc. N.S.W. LXXXVI (1962) 280. A large number of species is cultivated as ornamentals in Australia and these are commonly referred to as "Geraniums". The nomenclature of many of these species is extremely involved.

1. Leaves deeply pinnately or palmately dissected; hairs harsh *P. × asperum* 6.
- 1.* Leaves shallowly lobed or almost entire; hairs villous to pubescent or puberulent, soft.
 2. Lobes of the leaf acute *P. domesticum* 7.
 - 2.* Lobes of the leaf obtuse.
 3. Fertile stamens, 3-5, rarely 6. Perennial stems (caulorrhizae) short and not succulent.
 4. Hairs on the calyx dense; sepals obtuse *P. helmsii* 2.
 - 4.* Hairs on the calyx scattered; sepals acute *P. inodorum* 1.
 - 3.* Fertile stamens 6-8, very rarely 5 and then the perennial stems semisucculent.
 5. Roots not tuberous. Nectary spur seldom as long as the calyx lobes. Simple hairs on calyx long and villous.
 6. Bracts broad-ovate. Plants shrubby *P. capitatum* 5.
 - 6.* Bracts lanceolate. Plants herbaceous *P. australe* 3.
 - 5.* Roots tuberous. Nectary spur as long as or longer than the calyx lobes. Simple hairs on calyx short or absent *P. rodneyanum* 4.

1. *P. inodorum* Willd., Enum. Pl. Hort. Reg. Bot. Berol. (1809) 702; Knuth, Pflanzenr. LIII (Geran.) (1912) 409; Maiden & Betche, Census N.S.W. Pl. (1916) 111; Domin, Bibl. Bot. XX, Heft 89^{III}, (1926) 832; Curtis, Stud. Fl. Tasm. I (1956) 94; Carolin in Proc. Linn. Soc. N.S.W. LXXXVI (1962) 283; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Dist. (1963) 172. Weak, erect, annual or short-lived perennial, more or less odoriferous herbs with fleshy, tapering tap-roots. Flowering stems terete, 5-35 cm. tall, usually branched, with simple, usually short but rarely long, patent hairs scattered over the surface, and with shorter glandular hairs. Leaves opposite; laminae ovate-cordate, 8-4 mm. long, 8-5 mm. wide, often 5- to 7-lobed, crenate, with scattered hairs present on both surfaces or the upper surface quite glabrous; petioles slender, 1-4 (-5) cm. long, slightly hairy; stipules brown, scarious-membranous, deltoid, 2-4 mm. long, 1-3 mm. wide, sometimes drawn out into a short awn, ciliate; bracts brown, scarious-membranous, narrow-lanceolate, ca. 3 mm. long and 0.5-1 mm. wide, often shortly aristate, ciliate. Peduncles 3-8 cm. long. Flowers arranged in umbels of 3-14 flowers, subsessile or on slender pedicels up to 3 mm. long in the flowering stage, lengthening to 2-10 mm. in the fruiting stage. Sepals 5, united basally into a tube 1 mm. long or less; lobes broad-lanceolate or ovate, 2-4 mm. long (including a short mucro), 1.5-2.0 mm. wide, covered with usually short, coarse, simple hairs with some very short

glandular hairs, membranous towards the margins, about as long as the mericarps and therefore not incurved around them in the fruiting stage; nectary spur 0.5–1 mm. long. Petals usually deep pink, ligulate, sometimes with darker veins; anterior petals smaller; posterior petals 2–4 mm. long and 1 mm. wide; all scarcely exceeding the sepal lobes although sometimes half as long again. Stamens 10; filaments broadened below and irregularly united, 3–5 bearing anthers, the others sterile, 3 of them usually longer than the remainder. Fruit: mericarp pilose, obovoid, 2 mm. long, 1 mm. wide, terminated by an awn 7–11 mm. long; rostrum, 8–12 mm. long, the upper glabrous region together with the stigmatic lobes 1.0–1.5 mm. long. Seeds black or grey, striate, 1.5 mm. long, 1 mm. wide or less. Chromosome number $n = 11$ (*Carolin* in Proc. Linn. Soc. N.S.W. LXXXVI (1962) 294). *P. clandestinum* L'Hér. ex Hook. f., Fl. N. Zeal. (1852) 41; *P. australe* var. *clandestinum* (L'Hér. ex Hook. f.) Hook. f., Handb. New Zeal. Fl. (1864) 37; *Erodium peristeroides* Turcz. in Bull. Soc. Imp. Nat. Mosc. XXXVI (1863) 592.

Coast, and more rarely Tablelands and Western Slopes, in woodlands and forests. Tenterfield to Sandy Flat, Maiden 12.1898 (42515); Point Lookout, Gibraltar Range, 30 miles NE of Glen Innes, Constable 4.1956 (42508); N of Dorrigo to Matthew's Creek, Salasoo No. 1860, 1.1960 (49420); Linton, Barraba district, Rupp 11.1913 (42505); Port Stephens, Boorman No. 409, 9.1911 (42529); Hawkesbury R., between Gunderman and Courangra, Briggs 10.1961 (57463); Mt. Wilson, Hamilton 12.1898 (42530). Kurrajong Heights, Tabarag Ridge, Salasoo No. 1761, 9.1959 (49419); Jenolan Caves, Blakely 11.1899 (42510); Parramatta, Betehe 12.1882 (42517); Flemington, Camfield 2.1899 (43612); Narrabeen, Salasoo No. 1025, 1.1953 (26545); Port Jackson, Camfield 2.1889 (42535); Kogarah, Camfield 10.1900 (42516); Como, Betehe 9.1886 (42514); Como, Fletcher 3.1887 (42520); Waterfall, Fletcher 9.1888 (42573); Morangarell, 25 miles NNE of Temora, Boorman 11.1917 (42504); Coree, A.C.T., Cambage No. 3242, 12.1911 (42506); Termiel to Bateman's Bay, Rodway 1.1924 (42520); Moruya, Boorman 11.1911 (42511); Big Badja, Costin 1.1950 (42507). Also in southern Queensland, Victoria, Tasmania and New Zealand.

Bentham placed this taxon under *P. australe* var. *erodioides* (Hook. f.) Benth., Fl. Austral. I (1863) 299, which is a nomenclatural synonym of *P. erodioides* Hook. f., a taxonomic synonym of *P. australe* Willd.

2. *P. helmsii* *Carolin* in Proc. Linn. Soc. N.S.W. LXXXVI (1962) 285. Ascending odoriferous herbs up to 25 cm. tall with fleshy, thickened, but not tuberous, tap-roots and short perennial stems. Flowering stems terete, densely covered with very short simple and glandular hairs. Leaves opposite; laminae reniform-orbicular, 1–4 cm. long, 1–4.5 cm. wide, often shallowly lobed, crenate, covered with short scattered hairs; petioles slender, up to 13 cm. long, thickly covered with short hairs; stipules brown, deltoid or lanceolate, 4 mm. long, 3 mm. wide; bracts ovate or broad-lanceolate, 2.5 mm. long, 1.5 mm. wide, scarious-membranous, acute, hairy, ciliate. Peduncles slender, 3–7 cm. long, pubescent. Flowers arranged in compact umbels of 5–12. Pedicels densely pubescent with very short, simple and glandular hairs, ca. 2 mm. long. Sepals united basally into a short tube about 1 mm. long; lobes elliptic-oblong, 3–5 mm. long, 2–3 mm. wide, almost obtuse, thickly clothed with very short, simple and glandular hairs; spur less than 1 mm. long. Petals deep pink, more or less unguulate; posterior petals ca. 8 mm. long and 3 mm. wide, sometimes with dark pink lines; anterior petals smaller. Stamens 10; filaments broadened in the lower part and irregularly united basally, 4–5 of them fertile and contracted and awn-like below the reniform anthers. Fruit: mericarp hirsute, ovoid, ca. 3 mm. long and 2 mm. wide with an awn 9–13 mm. long, glabrous on the outside but with long golden hairs on the inner surface; rostrum covered with simple hairs; glabrous upper region together with the stigmatic lobes ca. 1 mm. long. Seeds smooth or minutely striate, 2–5 mm. long, 1 mm. wide, black or dark grey.

Southern Tablelands, usually at high altitudes. Mt. Kosciusko, Helms 2.1893 (42523); Mt. Kosciusko, Helms 1901 (42545); White's River Hut near Guthega, *Carolin* No. 794 (SYD); Lake Kilimacoola, N of Cooma, Walker No. ANU 171, 1.1962 (68974) (possible hybrid with *P. rodneyanum*); Mt. Kosciusko district, Skottsberg and Costin 3.1947 (42524). Also in Victoria.

3. *P. australe* Willd., Spec. Pl. III (1801) 675; Sweet, Geran. I (1820) t. 68; Benth., Fl. Austral. I (1863) 298; Moore & Betche, Handb. Fl. N.S.W. (1893) 55; Bailey, Qld. Fl. I (1899) 179; Knuth, Pflanzenr. LIII (Geran.) (1912) 409; Maiden & Betche, Census N.S.W. Pl. (1916) 111; Bailey, Compr. Cat. Qld. Pl. (1913) 72; Oliver in Trans. N.Z. Inst. XLIX (1917) 140; Gardner, Enum. Pl. Austral. Occ. (1930) 68; Ewart, Fl. Vic. (1931) 681; Black, Fl. S. Austral., ed. 2, 1 (1948) 483; Blackall, W. Austral. Wildflowers I (1954) 249; Curtis, Stud. Fl. Tasm. I (1956) 94; Carolin in Proc. Linn. Soc. N.S.W. LXXXVI (1962) 288; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Dist. (1963) 72; Eichler, Suppl. Black's Fl. S. Austral. (1965) 198. Herbaceous, scarcely odoriferous perennials with tough, more or less fleshy, but not tuberous, tap-root and short, often rhizomatous, perennial stems. Flowering stems terete, erect to semi-prostrate, up to 50 cm. long, branching, covered with long or short, soft, villous hairs or pubescent or rarely almost glabrous, always with some minute glandular hairs. Leaves opposite; laminae almost orbicular to ovate, sometimes shallowly undulate, 5- to 7-lobed, sometimes obscurely so, crenate, pubescent or almost glabrous, 2-9 cm. long, 2-8 cm. wide or even larger; petioles up to 13 cm. long, villous to pubescent or glabrous; stipules deltoid, 3-4 mm. long and 3 mm. wide, acute, membranous, often hairy; bracts narrow-deltoid to lanceolate, ca. 3 mm. long and 0.5 mm. wide, villous or pubescent especially on the thickened midrib or glabrous. Peduncles 3-10 cm. long, villous to pubescent and bearing an umbel of 4-12 flowers. Pedicels 1.2-2 cm. long (rarely longer) or the flowers subsessile, often elongating during the fruiting stages, villous, pubescent or almost glabrous. Sepals 5, united basally into a short tube; lobes lanceolate to narrow-oblong, 4-7 mm. long, 2-3.5 mm. wide, acute, villous, pubescent or glabrous but almost always with numerous minute glandular hairs; nectary spur 1-8 mm. long. Petals 5, longer than the sepals, pink to white; posterior petals oblanceolate to obovate, unguulate, ca. 8 mm. long and 4-6 mm. wide, the veins deep pink and often with deep pink spots; anterior petals narrow. Stamens 10; filaments broadened and irregularly united below, 7-8 fertile (rarely only 6) and bearing anthers; anthers oblong; pollen yellow to white. Fruit: mericarp villous to pubescent, ovoid, ca. 2.5 mm. long and 1 mm. wide; awn 6-12 mm. long; rostrum covered with simple and glandular hairs, the glabrous upper region together with the stigmatic lobes 2-3 mm. long. Seeds oblong, black or grey, very minutely pitted or smooth. Chromosome number $n = 18$ (Carolin in Proc. Linn. Soc. N.S.W. LXXXVI (1962) 294). *Geranium glomeratum* Andr., Geran. II (1805) 87; *P. glomeratum* (Andr.) Jacq., Ec. Pl. Rar. (1816) 146; *P. erodioides* Hook. in Journ. Bot. I (1834) 252; *Geranium australe* (Willd.) Poir., Encycl. II (1800) 754; *Geranospermum australe* (Willd.) O.Ktze., Rev. Gen. I (1891) 94; *P. australe* var. *glabrata* Hook. f., Fl. Tasm. I (1860) 57; *P. australe* var. *major* Hook. f., loc. cit.

Coast, Central and Southern Tablelands, higher parts of the Western Slopes, and Far Western Plains; Lord Howe Is.; on the coast generally on sand dunes or cliffs, inland usually on rocky outcrops. North Coast, Leichhardt No. 168, 11.1842 (43416); Coonabarabran to Timor Rock, Salasoo No. 2205, 11.1962 (57437); Warrumbungle Ranges, Althofer 3.1847 (42533); Tuncurry, Salasoo No. 2879, 1.1964 (63885); Dripstone, Althofer 11.1952 (42421); Glen Alike, Jamison 10.1952 (42509); Boree, McKee 11.1952 (42534); Tuggerah, Boorman 10.1900 (42415); Chinaman's Bay, Tuggerah Lakes, Darnell-Smith 2.1946 (42528); Manly, Fletcher 8.1888 (42423); Maroubra Bay, Johnson 10.1946 (42418); Botany Bay, Camfield 10.1898 (26542); Green Cape, Rodway 12.1920 (74852); Cronulla, Ford 10.1944 (4244); Cape Solander, Johnson 10.1945 (42435); Wollongong, Goode 12.1954 (42425); 5 miles W of Balranald, Leigh No. S90, 10.1963 (63747); Yammatree, Bethungra, Constable 3.1959 (47279); Kiama, Alkin 1905 (42414); Nowra, Rodway 2.1943 (43518); Huskisson, Rodway 1.1931 (42433); Jervis Bay, Rodway 10.1915 (42421); Broulee Head, Rodway 12.1948 (42427); Wreck Bay, Maiden 2.1917 (42518); Lake Conjola, Rodway 2.1933 (42429); Red Head Beach, 10 miles NE of Milton, Constable 10.1957 (78384); Tabourie Is., Rodway 1.1940 (42430); Ulladulla, Constable 12.1950 (16309); Coree, Cambage No. 3314, 12.1911 (26539), No. 3329, 12.1911 (2450); summit of Mt. Coree, Darbyshire No. 529, 11.1961 (57594); Little Tinderry, Mt. Michelago, Boorman 1.1909 (42451); Tinderry Range, SW of Round Flat, Adams No. 571, 3.1963 (90416); S. Tollgate Is., Rodway 1.1924 (42422); Upper Tumut River near Kiandra,

Whitfield No. 896, 3.1924 (42532); Paddy's R. Falls, Tumberumba, McBarron No. 7405, 1.1963 (68989); 10 miles S of Tumberumba, Dwyer No. 1238, 12.1921 (43452); Milton, Cambage No. 3500, 12.1911 (42433); Montague Is., Rodway 2.1933 (43428); Dickie Cooper Creek, Gittins No. 428, 1.1962 (74850); Eden to Pambula, Maiden 11.1901 (26541); Disaster Bay, Constable 10.1954 (42426); Lord Howe Island (91494). Also in all other States except the Northern Territory.

4. *P. rodneyanum* Mitch. ex Lindl. in Mitch., Three Exped. II (1839) 44; Benth., Fl. Austral. I (1863) 299; Moore & Betehe, Handb. Fl. N.S.W. (1893) 55; Knuth, Pflanzenr. (Geran.) LIII (1912) 356; Maiden & Betehe, Census N.S.W. Pl. (1916) 111; Ewart, Fl. Viet. (1931) 680; Black, Fl. S. Austral. ed. 2, I (1948) 484; Carolyn in Proc. Linn. Soc. N.S.W. LXXXVI (1962) 290; Eichler, Suppl. Black's Fl. S. Austral. (1965) 197. Erect perennials with basal perennial stems, the lower part of which may be a narrow vertical rhizome expanding above, and with a number of brown, red or whitish tuberous swellings on the roots sometimes arranged in chains. Flowering stems terete, 8–35 cm. tall, usually simple or once branched, covered with short glandular hairs, occasionally with some long simple hairs scattered over the surface. Leaves mostly on the basal stems, few on the flowering stems, opposite; laminae ovate-cordate or ovate, 2–4 cm. long, 1.5–4 (–5) cm. wide, sometimes slightly 5- to 7-lobed, crenate, with a few scattered hairs present on the veins; petioles slender, (1.5–) 7–10 cm. long; stipules yellow, scarious, ovate to elliptic, 3–4 mm. long, 2–3 mm. wide, usually obtuse but sometimes acute, glandular-hairy, ciliate on the margins; bracts usually deltoid, occasionally lanceolate, 2–3 mm. long, 1–1.5 mm. wide, otherwise similar to the stipules. Peduncles often arising from the base of the plant. Flowers 2–7 per umbel; pedicels slender, 1.3–2.2 cm. long, puberulent and rarely with a few spreading villous hairs. Sepals deep pink, united basally into a tube ca. 1 mm. long; lobes lanceolate to narrow-elliptic, 3–5 mm. long, 1–3 mm. wide, acute, often with a small mucro, puberulent with glandular hairs and a few short simple hairs or these sometimes absent; nectary spur (3–) 5–9 mm. long. Petals deep pink, very unequal; posterior petals obovate, 13–17 mm. long, 6–8 mm. wide, unguulate and with darker streaks and spots; anterior petals narrow-subligulate. Stamens 10; filaments broadened and irregularly united below, 7–8 fertile, longer than the others, and bearing oblong anthers. Fruit: mericarp pilose, oblanceolate, 2 mm. long, 1 mm. wide, terminated by a long awn; rostrum 1.6–2.0 cm. long, hirsute, the upper glabrous region together with the stigmatic lobes ca. 4 mm. long. Seeds dark grey, minutely striate, 1.5 mm. long, 1.0 mm. wide.

Extreme south of Central Tablelands and Southern Tablelands. Bungonia Lookout, Constable 1.1956 (36703); Barber's Creek, Maiden 12.1897 (26540); Endrick River near Nerriga, Rodway 11.1932 (42455); Shoalhaven R. Gorge, W of Nerriga, Rodway 12.1940 (42449); Long Point, Shoalhaven River, Whaithe No. 2992, 11.1965 (90380). Also in Victoria and South Australia.

5. *P. capitatum* (L.) Ait., Hort. Kew. ed. 1, II (1789) 424; Knuth, Pflanzenr. LIII (Geran.) (1912) 467; Carolyn in Proc. Linn. Soc. N.S.W. LXXXVI (1962) 291; Beadle, Evans & Carolyn, Handb. Vasc. Pl. Syd. Dist. (1963) 172. Straggling, odoriferous, shrubby perennials up to 1 m. tall. Stems terete and covered with soft, spreading, villous hairs. Leaves alternate or opposite; laminae ovate-cordate, 2–8 cm. long, 2–8 cm. wide, deeply 3- to 7-lobed, dentate, undulate, villous; petioles 2–6 cm. long, villous; stipules ovate-acuminate or acute, usually quite broad, ca. 8 mm. long; bracts elliptic to oblong, ca. 6 mm. long and 2.5 mm. wide, otherwise similar to the stipules. Peduncles terminal, villous, 3–12 cm. long. Flowers 7–12 in an umbel; pedicels up to 4 mm. long, villous. Sepals ovate-elliptic, 5–6 mm. long, ca. 3 mm. wide, villous, with a small mucro; nectary spur nearly as long as the pedicel. Petals pink; posterior petals narrow-obovate, ea. 10 mm. long and 3 mm.

wide; anterior petals narrower. Stamens 10; filaments broadened, irregularly united below, pink above, about 7 fertile and somewhat longer than the others; pollen orange. Fruit villous; mericarp oblanceolate, 5 mm. long; awn ca. 2 mm. long; upper glabrous part of the villous rostrum together with the stigmatic lobes ca. 7 mm. long. Seeds brown, reticulate-striate.

Naturalized on the Central Coast, on sand-dunes and cliffs near the coast. Lady Robertson's Beach, Hamilton No. 297, 8.1913 (53299); Bondi, Blakely 10.1913 (42441); Bonnie Doon Golf Club, Anderson 5.1951 (42443); Cape Solander, Johnson 10.1945 (42435); Kurnell, Carolin No. 530, 9.1958 (SYD); Kurnell, Boorman 6.1907 (26543). Also in Western Australia. Native of South Africa.

6. **P. × asperum* Ehrh. ex Willd., Sp. Pl. III (1800) 678; Moore in Bailey III (1955) 5; Carolin in Proc. Linn. Soc. N.S.W. LXXXVI (1962) 292; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Dist. (1963) 172; Eichler, Suppl. Black's Fl. S. Austral. (1965) 198. Shrubs up to 1 m. tall with a characteristic odour. Stems terete, erect, ca. 6 mm. thick, covered with harsh hairs. Leaves alternate or opposite; laminae ovate with recurved margins, up to 7 cm. long and 6 cm. wide, deeply and more or less pinnately dissected into 5-7 lobes, dentate, hirsute with harsh hairs, aromatic, paler on the undersurface; petioles 4-10 cm. long, hirsute; stipules scarious, ovate or deltoid, 7 mm. long, 4 mm. wide, ciliate; bracts lanceolate to narrow-ovate. Peduncles 3-6 cm. long, bearing an umbel of 5-10 flowers. Flowers subsessile or with pedicels up to 6 mm. long. Sepals lanceolate to narrow-elliptic, 6-9 mm. long, 2-4 mm. wide, united basally into a very short tube, hirsute, membranous towards the margins and sometimes with a short mucro; nectary spur 2-4 mm. long. Petals pink, oblanceolate to obovate; posterior petals obovate, unguulate, 1-2 cm. long and about 5 mm. wide, marked with pink to purple lines and/or spots; anterior petals smaller and with smaller dark markings. Stamens 10; filaments broadened below, about 6 fertile and bearing oblong anthers, somewhat longer than the others; pollen orange. Fruit: mericarp ovoid to oblanceolate with a terminal awn bearing harsh brown hairs on the inner surface; rostrum hirsute, the upper glabrous part together with the stigmatic lobes 5-7 mm. long. Seeds dark grey, ovoid; seed-set usually poor compared with the indigenous species.

Central and South Coast. Woy Woy, McKee No. 6694, 12.1958 (SYD); Castle Crag, McKee 7.1950 (SYD); Northbridge, McKee 2.1953 (42448); south end of Jervis Bay, Rodway 10.1954 (90675).

This taxon appears to be derived from hybrids between *P. graveolens* L'Hér. and *P. radens* H. E. Moore. It has been referred to *P. graveolens* L'Hér. in the past by Ewart, Fl. Vict. (1931) 681.

Widely cultivated; originated in the Mediterranean region.

7. **P. domesticum* L. H. Bailey has been recorded once on sand-dunes near Sydney. It appears, however, that it has so far been unable to establish itself as part of the flora.

La Perouse, D. Kilgannon 9.1959 (SYD).

Several other cultivated species may be found where garden rubbish has been dumped but none has so far become naturalized.



93	Crassulaceae	143	Melastomataceae
94	Escalloniaceae	144	Onagraceae
95	Pittosporaceae	145	Haloragiaceae
96	Cunoniaceae	146	Araliaceae
97	Davidsoniaceae	147	Umbelliferae
98	Rosaceae	148	Alangiaceae
99	Mimosaceae	149	Ericaceae
100	Caesalpinaceae	150	Epacridaceae
101	<i>Papilionaceae, Part I</i>	151	Myrsinaceae
102	<i>Geraniaceae</i>	152	Primulaceae
103	Oxalidaceae	153	Plumbaginaceae
104	Linaceae	154	Sapotaceae
105	Erythroxylaceae	155	Ebenaceae
106	Zygophyllaceae	156	Symplocaceae
107	Rutaceae	157	Olcaceae
108	Simaroubaceae	158	Loganiaceae
109	Burseraeae	159	Gentianaceae
110	Meliaceae	160	Menyanthaceae
111	Tremandraceae	161	Apocynaceae
112	Polygalaceae	162	Asclepiadaceae
113	Euphorbiaceae	163	Convolvulaceae
114	Callitrichaceae	164	Polemoniaceae
115	Anacardiaceae	165	Hydrophyllaceae
116	Aquifoliaceae	166	Boraginaceae
117	Celastraceae	167	Verbenaceae
118	Siphonodontaceae	168	Avicenniaceae
119	Hippocrateaceae	169	Labiatae
120	Stackhousiaceae	170	Solanaceae
121	Icacinaceae	171	Scrophulariaceae
122	Sapindaceae	172	Selaginaceae
123	Akaniaceae	173	Bignoniaceae
124	Rhamnaceae	174	Pcdaliaceae
125	Vitaceae	175	Martyniaceae
126	Elacocarpaceae	176	Orobanchaceae
127	Tiliaceae	177	Gesneriaceae
128	Malvaceae	178	Lentibulariaceae
129	Sterculiaceae	179	Acanthaceae
130	Dilleniaceae	180	Myoporaceae
131	Eucryphiaceae	181	Plantaginaceae
132	Hypericaceae	182	Rubiaceae
133	Elatinaceae	183	Caprifoliaceae
134	Frankeniaceae	184	Dipsacaceae
135	Violaceae	185	Cucurbitaceae
136	<i>Flacourtiaceae</i>	186	Campanulaceae
137	Passifloraceae	187	Lobeliaceae
138	Cactaceae	188	Goodeniaceae
139	Thymelaeaceae	189	Brunoniaceae
140	Lythraceae	190	Stylidiaceae
141	Rhizophoraceae	191	Compositae
142	Myrtaceae		

PTERIDOPHYTA

192	Lycopodiaceae	205	Pteridaceae
193	Selaginellaceae	206	Adiantaceae
194	Isoetaceae	207	Vittariaceae
195	Psilotaceae	208	<i>Davalliaceae</i>
196	Ophioglossaceae	209	<i>Grammitidaceae</i>
197	Marattiaceae	210	<i>Polypodiaceae</i>
198	Osmundaceae	211	<i>Aspidiaceae</i>
199	Schizaceae	212	Thelypteridaceae
200	Gleicheniaceae	213	Aspleniaceae
201	<i>Hymenophyllaceae</i>	214	Blechnaceae
202	Cyatheaceae	215	Marsileaceae
203	Dicksoniaceae	216	Azollaceae
204	Lindsaeaceae	217	Salviniaceae

