

**A REVISION OF ANGIANTHUS WENDL., SENSU LATO  
(COMPOSITAE: INULEAE: GNAPHALIINAE), 2**

by

P. S. SHORT\*

(Continued from *Muelleria* 5(2):183)

5. **Chrysocoryne** Endl., Bot. Zeitung (Berlin) 1:457 (July 1843); Endl., Gen. Pl. Suppl. 3:70 (Oct. 1843); Steetz in Lehm. Pl. Preiss. 1:441 (1845); A. Gray, Hook. J. Bot. Kew Gard. Misc. 3:151 (1851); F. Muell., Trans. & Proc. Vict. Inst. Advancem. Sci. 130 (1855) (as sect. *Bisquama*); F. Muell., Hook. J. Bot. Kew Gard. Misc. 8:149 (1856) (reprint of preceding). TYPE: *C. drummondii* A. Gray (see note 1)

[*Angianthus* auct. non Wendl.: see synonymy of *C. drummondii*, *C. pusilla* & *C. uniflora*.]

[*Crossolepis* auct. non Less.: see synonymy of *C. drummondii* & *C. pusilla* & notes 1 & 2.]

[*Siloxerus* auct. non Labill.: see synonymy of *C. drummondii* & *C. pusilla*.]

[*Styloncerus* auct. non Spreng., *nom. illeg.*: see synonymy of *C. drummondii*, *C. pusilla* & *C. uniflora*.]

*Annual herbs*. Major axes ascending or erect, with scale-like glandular hairs; stem simple or forming major branches at basal and/or upper nodes. *Leaves* alternate, sometimes  $\pm$  opposite, sessile, entire, with some scale-like glandular hairs. *Compound heads* narrowly ellipsoid to ellipsoid or oblanceoloid to obovoid or cylindrical to oblong; bracts subtending compound heads not forming a conspicuous involucre but several leaf-like bracts with hyaline apices present, grading into capitulum-subtending bracts. *General receptacle* a simple undivided axis with the capitula arranged in a spike, minor receptacular axes absent. *Capitula* 30-100(250) per compound head, each capitulum with 1 abaxial, hyaline, subtending bract that overlaps the capitular bracts. *Capitulum subtending* bracts  $\pm$  widely elliptic or widely depressed ovate or  $\pm$  widely to widely depressed obovate, sometimes  $\pm$  circular; midrib large, c.  $\frac{1}{3}$  the total width and c.  $\frac{1}{2}$  the total length of the bract, entire and with an obtuse apex (or as in *C. trifida* only, distinctly lobed), glabrous or variably hairy. *Capitular bracts* 2, or to c. 10, hyaline, flat to concave, lamina with a distinct constriction in the upper part and with entire margins (*C. pusilla* only) or lacking a constriction and with the margins variably hairy; the midribs variably conspicuous; the bracts either distinctly paired and opposite one another or arranged in  $\pm$  1 or 2 whorls around the florets. *Florets* 1-5(8) per capitulum; corolla 3, 4 or 5-lobed; style branches truncate; stamens 3, 4 or 5, with tailed anthers. *Achenes*  $\pm$  obconical, variably papillose, pink or pale purple. Pappus a small jagged ring or a ring with several apically divided bristles or absent. Figs: 1a-e; 9; 10.

DISTRIBUTION (See Short 1981a, fig. 4):

Southern and central Australia. Four of the six species grow only on the margins of salt lakes in Western Australia. The lakes occur in a number of major drainage divisions and constituent systems recognised by Mulcahy & Bettenay (1972) and Bettenay & Mulcahy (1972). Species distribution appears to have been greatly affected by drainage patterns (Short 1981a,b).

ECOLOGY:

All species commonly grow on the margins of saline depressions. Only *C. pusilla* and *C. drummondii* are capable of growing in non-saline habitats.

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*Muelleria* 5(3):185-214 (1983).







Although further data are desirable it appears that sandy soils are preferred by those species restricted to salt lakes. To date no species have been collected from Lake Koorkoordine (near Southern Cross) and other lakes in that vicinity. The margins of these lakes have clay loam rather than sandy soil. Sandy soils are common throughout the systems in which species of *Chrysocoryne* occur.

Habitat differences appear to be of little importance in maintaining specific differences but *C. pusilla*, when growing on the margins of salt lakes, is rarely observed to be growing amongst samphire (primarily *Halosarcia* spp.), a common habitat of all other species.

#### NOMENCLATURAL PROBLEMS:

1. When Endlicher (1843) transferred *Crossolepis pusilla* Benth. to his new genus *Chrysocoryne* he erroneously applied the new combination to another, at that time undescribed species of *Chrysocoryne*, namely *C. drummondii* A. Gray. This is evident from both the description and the reference to an illustration published by W. J. Hooker (1841) in *Icones Plantarum*. (Hooker incorrectly referred his illustration of *C. drummondii* to *Crossolepis pusilla*). The type of the genus *Chrysocoryne* is therefore *C. drummondii* A. Gray. The combination *Chrysocoryne pusilla* (Benth.) Endl. is retained (under Art. 55) for *Crossolepis pusilla*.

2. In 1832 Lessing described the genus *Crossolepis* and placed within it a single species, *C. linifolia* Less. Despite the fact that they had not seen type material and that Lessing's description was extremely brief and the affinities of the taxon consequently unclear, subsequent authors, i.e. Bentham (1837) & Gray (1851), attributed several new species to the genus, e.g. *C. pusilla* Benth. (1837). No type material has been seen by the current author but it is quite clear that *C. pusilla* is generically distinct from *C. linifolia*. Indeed the c. 10 flowered capitula readily distinguishes *C. linifolia* from all species of *Angianthus* s.l.

#### AFFINITIES/GENERIC CHARACTERISTICS:

*Chrysocoryne* is readily distinguished from all other members of *Angianthus* s.l. by the distinctive nature of the capitulum-subtending bracts, the morphology and colour of the achenes and the presence of scale-like glandular hairs on the major axes and leaves. The nature and arrangement of the capitular bracts are also distinctive. Its affinities are unclear, the resemblance to some members of *Angianthus* s.str. being superficial.

#### EVOLUTION:

As indicated by pollen-ovule ratios (P/O's) (Short 1981a, b) three of the species of *Chrysocoryne*, namely *C. pusilla*, *C. uniflora* and *C. trifida* are outbreeders whereas *C. multiflora*, *C. drummondii* and *C. tridens*, are inbreeders. Other differences between the species occur in respect to the number of lobes per floret, number of florets per capitulum, number of capitular bracts per capitulum and number of capitula per 1 cm length of compound head (table 1). Differences in habit, bract morphology and chromosome number also occur. A tentative phylogeny may be seen in fig. 9.

Within *Chrysocoryne*, *C. pusilla* must be regarded as the taxon with the most primitive attributes. It is the only species with a pappus, has a large number of capitular bracts and florets per capitulum, has pentamerous florets, is an outbreeder and has a haploid chromosome number of 6.

*Chrysocoryne multiflora* must be closely related to *C. pusilla*. Like the latter species it has a number of capitula with 4 or more capitular bracts and also possesses 3-5-flowered capitula. However unlike *C. pusilla* the number of capitular bracts per capitulum is not more or less constant within a compound head. In fact there is apparently a general trend from c. 6-10 capitular bracts per capitulum at the base of a compound head to usually 2 bracts per capitulum in the upper half of the head. The derived nature of the species is also reflected by the presence of 3, 4 or 5-lobed florets, (sometimes within the one capitulum and certainly within any one compound head), and the low P/O.

The four remaining species possess 2 capitular bracts per capitulum. Of the four, *C. drummondii* appears to have the closest affinities with *C. pusilla* and *C. multiflora*.



Table 1. Characteristics of *Chrysocoryne* species

Species	<i>pusilla</i>	<i>uniflora</i>	<i>trifida</i>	<i>multiflora</i>	<i>drummondii</i>	<i>tridens</i>
Character						
Average P/O	1,967	1,777.5	2,043.6	105.8	121.9	48.6
Number of lobes per floret	5	5	5	3,4,5	3,4,(5)	3(4)
Number of bracts per capitulum	6-10	2	2	2-4 (c.10)	2(3,4)	2
Pappus	present	absent	absent	absent	absent	absent
Chromosome no. (n)	6	?	c.11	c.12	?	c.13
Number of florets per capitulum	2-5(8)	1 or 2	1(2)	(2)3-5(6)	(1) 2 (4)	1
Average no. of capitula per 1 cm length of compound head	28.7	37.2	26.6	114.6	70.6	47.7
Potential seed set (average no. of flowers per 1 cm length of compound head)	69.7	48.3	26.6	412.5	134.1	47.7

Although most populations contain individuals with 2-flowered capitula at least one collection (*Cronin* MEL 84705) from Western Australia has 3- and 4-flowered capitula. (A further Western Australian collection, *Andrews* PERTH s.n., contains a single individual with 1-flowered capitula). *C. uniflora*, *C. tridens* and *C. trifida* have 1- or 2-flowered capitula only. Hence floret number suggests affinities of *C. drummondii* with *C. pusilla* and *C. multiflora*. The species is also an inbreeder and has both 3- and 4-lobed florets.

Although the affinities of *C. drummondii* appear to be with the above species it is tempting to suggest that it has been derived from an outbreeding entity with 2 capitular bracts per capitulum, 2-4-flowered capitula and pentamerous florets. Such a hypothetical taxon would also explain the derivation of the remaining species. Thus *C. uniflora* is an outbreeding species with 1- or 2-flowered capitula (within any one compound head) and pentamerous florets. In this respect it differs from the hypothetical entity in floret number alone. *C. trifida* is very similar to *C. uniflora* in that it too is an outbreeder, has 1- or 2-flowered capitula and pentamerous florets. However *C. trifida* is readily distinguishable from all species of *Chrysocoryne*, by the distinctly 3-lobed nature of the midrib of the capitulum-subtending bracts and the small capitular bracts with long hairs on their upper margins. Both characters attest to the derived nature of the species, other taxa having capitulum-subtending bracts with entire midribs and more or less entire capitular bracts. In all but *C. pusilla*, which has capitular bracts with entire laminae, the upper margins of the bracts are variably ciliate. The hairs on the bracts of *C. trifida* appear to be a consequence of the 'splitting' of cells making up the entire, one cell thick, bracts. A similar process would also explain the decrease in bract number in the capitula of *C. multiflora*.

The remaining species, *C. tridens*, undoubtedly has strong affinities with *C. uniflora*. The compound heads, capitulum-subtending bracts and capitular bracts of the 2 species are almost identical, *C. tridens* differing by having strictly 1-flowered capitula, 3-lobed florets, smaller, bisporangiate anthers and an average P/O of 48.6. A difference also appears in the habit. Both *C. uniflora* and *C. tridens*, (and indeed all species of *Chrysocoryne*), occasionally produce plants which consist of nothing more than a short stem terminating in a compound head. Again all species often produce several major axes which branch from basal nodes. However, unlike other species *C. tridens* is incapable of branching from the upper nodes of major axes.

Chromosome numbers have not been determined for all species but the counts obtained, i.e. n=6, c.11, c.12 & c.13 for *C. pusilla*, *C. trifida*, *C. multiflora* and *C. tridens* respectively, suggest that the evolution of the group has primarily proceeded at the tetraploid level (Short 1981b).



## REPRODUCTIVE BIOLOGY:

There is no evidence of hybridisation within *Chrysocoryne* despite the fact that a number of species commonly grow in the same locality, e.g. all but *C. trifida* have been collected from the saline Mortlock River flats near Meckering. Specific differences are presumably maintained by a number of parameters including differences in chromosome number, habitat preferences (e.g. as in *C. pusilla*, see above ecology notes) and flowering time (e.g. *C. tridens* appears to flower some days earlier than *C. uniflora*, a species with which it commonly grows). These factors, combined with the inbreeding nature of three of the species, must present formidable barriers to interspecific crossing.

Flies and ants are commonly seen on most species of *Chrysocoryne* but their importance as pollinators is not known. It appears that the fruit of at least some species are a useful food supply for ants. Ants have been observed transporting c. 1 cm lengths of compound heads of *C. tridens* to their nests.

Potential seed set has been established for all species (table 1; Short, 1981b) and it is evident that values obtained for inbreeding ones are similar to or greater than those of closely related outbreeders. The significance of the values is open to question. It may well be that an increase in seed set is a method by which genetic heterogeneity is maintained in inbreeding taxa. On the other hand an increase in seed set, which is correlated with an increase in the number of capitula per unit length of compound head, may perhaps be a reflection of selection for reduced inflorescence size and a consequent shorter life cycle. Such an hypothesis has already been suggested to explain the large number of unrelated taxa in the "*Angianthus* group", a group characterised by having compound heads.

## KEY TO SPECIES OF CHRYSOCORYNE

1. Capitular bracts 2-6(c. 10); capitula with (2)3-5(8) florets
  2. Pappus a small jagged ring, sometimes with several apically divided bristles extending c.  $\frac{1}{2}$  the length of the floret; capitular bracts with entire margins; florets 5-lobed; compound heads narrowly ellipsoid to ellipsoid or oblanceoloid to  $\pm$  obovoid, sometimes  $\pm$  ovoid, 1-1.5(2.2) cm long, 0.3-0.5(0.7) cm diam., (fig. 10a-f) ..... 1. *C. pusilla*
  2. Pappus absent; capitular bracts with ciliate margins; florets 3, 4 & 5-lobed; compound heads narrowly oblong to oblong, c. 0.5-2 cm long, c. 0.25-0.4(0.45) cm diam., (fig. 10g-h) ..... 2. *C. multiflora*
1. Capitular bracts 2; capitula usually with 1 or 2 florets (rarely 3 or 4 in *C. drummondii*)
  3. Midrib of capitulum-subtending bracts with at least 3 distinct lobes; capitular bracts with long hairs on the upper margins, the hairs  $\frac{1}{3}$ - $\frac{1}{2}$  (c. 0.5 mm long) the length of the bracts; capitula with 1, rarely 2, florets, (fig. 10k-m) ..... 4. *C. trifida*
  3. Midrib of capitulum-subtending bracts not divided; capitular bracts with variably ciliate margins, the hairs c. 0.1 mm long; capitula with 1 or 2, rarely 3 or 4, florets
    4. Florets mainly 5-lobed; (250)300-400(500) pollen grains per anther; compound head cylindrical to narrowly oblong, c. 1.5-3(3.6) cm long ..... 5. *C. uniflora*
    4. Florets 3 or 4-lobed; (8)12-64 pollen grains per anther; compound heads cylindrical to narrowly oblong and (c. 1)3-5(6.3) cm long or narrowly oblong and c. 1-2(2.5) cm long
      5. Compound heads narrowly oblong, c. 1-2(2.5) cm long, c. 0.2-0.25(c. 0.3) cm diam.; capitula with (1)2(3,4) florets; stem simple or branching from basal &/or upper nodes, (fig. 10i-j) ..... 3. *C. drummondii*
      5. Compound heads cylindrical to narrowly oblong (c. 1)3-5(6.3) cm long, 0.15-0.2 cm diam.; capitula with 1 floret; stem simple or branching from basal nodes, never branching from upper nodes ..... 6. *C. tridens*

1. *Chrysocoryne pusilla* (Benth.) Endl., Bot. Zeitung (Berlin) 1:458 (1843) (in name only, see note 1, p.187; Steetz in Lehm. Pl. Preiss. 1:441 (1845) p.p., excl. *C. drummondii* as to ref. to Hook., Icon. Pl. 5:pl. 413 (1841). — *Crossolepis pusilla* Benth. in Endl. Enum. Pl. 61 (1837); DC., Prod. 6:158 (1838). — *Chrysocoryne huegelii* A. Gray, Hook. J. Bot. Kew Gard. Misc. 3:151 (1851), *nom. illeg.* — *Angianthus pusillus* (Benth.) Benth., Fl. Austr. 3:564 (1867); Hoffman in Engler & Prantl. Naturl. Pflanzenfam. 1V5:194, Fig. 98C-G (1890); F. M. Bail., Qd. Fl. 848 (1900); J. M. Black, Fl. S. Aust. 1st ed. 645 (1926), 2nd ed. 925 (1957); Willis, Handb. Pl. Vict. 2:729 (1973); Grieve & Blackall, W. Aust. Wildfls 813 (1975). — *Styloncerus pusillus* (Benth.) Kuntze, Rev. Generum Pl. 367 (1891) — *Siloxerus pusillus* (Benth.) Ising, Trans & Proc. Roy. Soc. S. Aust. 46:604 (1922). TYPE: "Swan River. (Hügel.)". LECTOTYPE (here designated): *Hügel s.n.*, Swan River, s.dat. (W). ISOLECTOTYPE: K.



*Angianthus pusillus* var. *polyanthus* Benth., Fl. Austr. 3:564 (1867). TYPE: "Murray and Darling Desert." LECTOTYPE (here designated): *Anon*, s.n., Victorian Expedition, Murray and Darling Desert, s. dat. (K). POSSIBLE ISOLECTOTYPES: MEL 541203, MEL 541204, MEL 84537, MEL 84538 (see note 1 below).

*Chrysocoryne angianthoides* F. Muell., Linnaea 25:404 (1853); Sond., Linnaea 25:488 (1853). TYPE: "In virgultis deserti pone Cudnaka". LECTOTYPE (here designated): *Mueller* s.n., In den gestrüppen zwischen Cudnaka & Arkaba, -x.1851 (MEL 541201). ISOLECTOTYPES: MEL 541200, MEL 541202. PROBABLE ISOLECTOTYPES: GH (ex herb. Sond.), MEL 84532 (ex herb. Sond.) (see note 2 below).

*Annual herb*, (1.7)3-10(15) cm high. Major axes erect or ascending, with scale-like glandular hairs; stem simple or forming branches at basal and/or upper nodes. *Leaves* alternate, sometimes  $\pm$  opposite, linear or elliptic to narrowly elliptic or obovate to oblanceolate, 0.2-1.5(3.3) cm long, 0.05-0.3(0.4) cm wide, a small hyaline appendage often present at the apex, all leaves with scale-like glandular hairs. *Compound heads* usually narrowly ellipsoid to ellipsoid or  $\pm$  oblanceoloid to  $\pm$  obovoid, sometimes  $\pm$  ovoid, 1-1.5(2.2) cm long, 0.3-0.5(0.7) cm diam. *Capitula* 20-80 per compound head; capitulum-subtending bract widely to widely depressed obovate or widely depressed ovate, (1.25)1.4-2.2(2.8) mm long, (1.65)1.8-3(3.3) mm wide; midrib entire, variably hairy or glabrous, sometimes with a few glandular hairs. *Capitular bracts* c. 4-10, c. 1.5 mm long and with the upper part of the laminae variably constricted, arranged in 1 or  $\pm$  2 whorls, the whorl or outer whorl of  $2 \pm$  concave bracts with distinctive midribs and 2 flat bracts with variably distinct midribs, the inner whorl of c. 3-5  $\pm$  flat to concave bracts with indistinct midribs. *Florets* (1)3-5(8); corolla 5-lobed, the tube with an abrupt taper in the lower  $\frac{1}{2}$ , 1-1.2 mm long, 0.3-0.4 mm diam., sometimes with a few glandular hairs on the tube; anthers 5, each with c. 300-450 pollen grains. *Achenes*  $\pm$  obovoid, 0.35-0.5 mm long, c. 0.3 mm diam., papillose, purplish. Pappus usually a small, jagged ring 0.1-0.2 mm high, sometimes with several apically divided bristles extending to c.  $\frac{1}{2}$  the height of the floret. Figs: 9; 10a-f.

Chromosome numbers:  $n = 6$ .

DISTRIBUTION (See Short 1981a, fig. 4):

Southern and central Australia. Common.

#### ECOLOGY:

Found in both coastal and inland situations around claypans, saline depressions and granite outcrops or in scrubland, shrubland and hummock grassland formations. Collectors' notes include "Steppe with *Myriocephalus stuartii*, *Cassia eremophila*, mulga, chenopods", "On wide, low, red sandy ridge dominated by *Triodia mitchellii* var. *brevifolia*", "In *Acacia linophylla* association on red sand dunes", "Growing in upper *Arthrocnemum* [= *Halosarcia*] zone and extending to open areas between *Melaleuca* around salty depression. Sandy loam.", ". . . salt lake . . . as close as 3 m from salt line. Growing in sand. Assoc.spp.: *Atriplex vesicaria*, *Melaleuca halmaturorum*" and "Base of granite rocks in very sandy loam".

#### NOTES:

1. The specimen of *A. pusillus* var. *polyanthus* designated as the lectotype is the only specimen in K or MEL both seen by Benthham and with the correct annotation. It contains two specimens with what is considered to be a generalised locality, i.e. "Murray and Darling Desert". Several other specimens seen by Benthham (as indicated by the initial B on the label) and collected on the Victorian Expedition exist in MEL. None is annotated as var. *polyanthus* and none has exactly the same locality details but the possibility exists that some may be isolectotypes. The collections are *Anon* s.n., Vict. Expd., Near Darling R., 28.x.1860 (MEL 541204); *Anon* s.n., Darling Desert, s. dat. (MEL 541203); *Anon* s.n., Vict. Expd., Sand hills, 29.ix.1860 (MEL 84538); *Beckler* s.n., V. Exp., near R. Darling, 1860 (MEL 84537).

2. The specimen designated as the lectotype of *C. angianthoides* is the only one for which Cudnaka is mentioned in the locality details. The label also mentions Arkaba, the locality given on the isolectotype sheets MEL 541200 and MEL 541202. Specimens on the



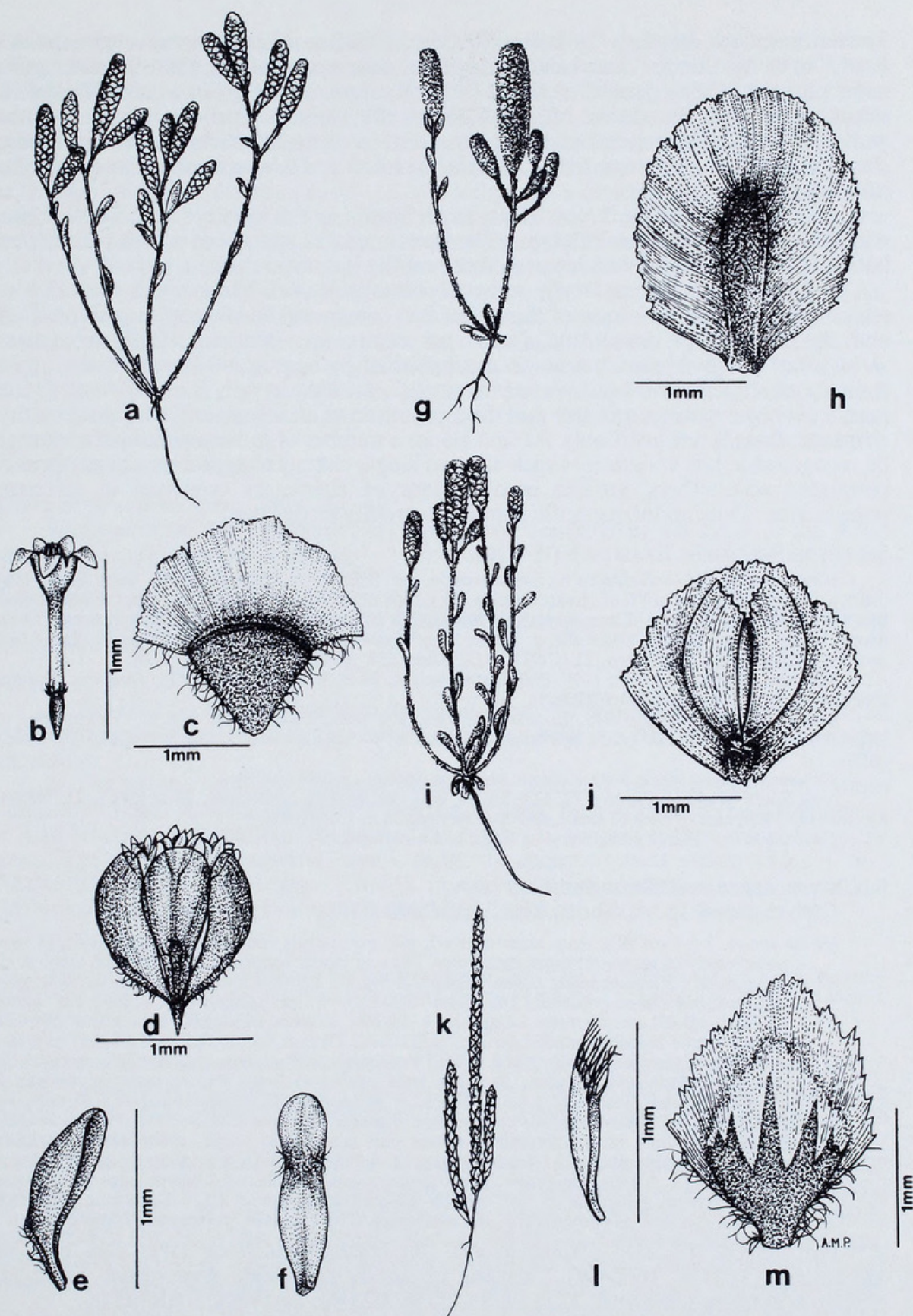


Fig. 10. Characteristics of *Chrysocoryne*. *C. pusilla*, a-f: a — habit, x 1, b — floret, c — capitulum-subtending bract, d — capitulum, e — outer concave capitular bract, f — inner flat capitular bract, (Short 902). *C. multiflora*, g-h: g — habit, x 1, h — capitulum-subtending bract, (Short 1046). *C. drummondii*, i-j: i — habit, x 1, j — inner view of capitular bracts and capitulum-subtending bract, (Short 1085). *C. trifida*, k-m: k — habit, x 1, l — capitular bract, m — capitulum-subtending bract, (Short 966).



former sheet are labelled "Arkaba. Dr. Ferd. Muller, *Chrysocoryne angianthoides* F. M." in O. W. Sonder's hand and below them, on a separate label, there are descriptive notes plus the locality details "Arkaba. N. Holl. austr. interiory" in Mueller's hand. It seems likely that the sheets MEL 514200-514202 contain specimens from the one gathering. A further collection, housed in GH and from Sonder's herbarium, is also clearly designated as coming from the Arkaba region and is also regarded as a probable isoelectotype.

Although only giving "Nov. Holl. austr. inter." as the locality MEL 84532 is also regarded as a probable isoelectotype. The sheet contains specimens which come from Sonder's herbarium and which match those on the lectotype sheet.

3. *C. pusilla* is an extremely polymorphic species exhibiting much variation in respect to the habit, the shape of the leaves and compound heads, pappus morphology and the number of bracts and florets per capitulum. Benthams (1867) recognised *A. pusillus* var. *polyanthus*, a taxon distinguished by having 3-6 florets in the upper capitula of a compound head whereas typical *C. pusilla* has only 2 or 3 florets. Floret number is however quite variable and the recognition of an infraspecific category on this character alone is not justifiable. At first glance a number of infraspecific taxa appear to be recognisable but variation is such that no single character appears to be constantly correlated with others, various combinations of characters occurring in different populations. Thus no infraspecific taxa are currently recognised.

#### SELECTED SPECIMENS EXAMINED (18/370):

*Western Australia* — Cleland s.n., Carnarvon, s. dat. (PERTH); Drummond 355, Swan River, 1844 (MEL); George 8414, 2 miles W. of Neale Junction, 10.x.1966 (PERTH); Keighery 423, Slopes of Mt. Ridley, 26.x.1975 (KP); Morrison s.n., Carnamah, 2.xi.1906 (CANB 209963, BRI 144628, PERTH); Preiss 45, Swan River Colony, s. dat. (MEL); Short 464, c. 20 km N. of Gascoyne Junction, 24.viii.1977 (AD); Short 637, Southern margins of Lake Brown, 22.ix.1977 (AD); Short 658, Roe Dam, 23.ix.1977 (AD).

*Northern Territory* — Latz 1766, Petermann Ranges, 24.ix.1971 (AD, BRI, NT); Ising s.n., 10 miles south of Finke, 25.viii.1931 (AD 97420104).

*South Australia* — Crisp 646, Koonamore, 24.x.1973 (AD, CBG); Lang 996, c. 17.8 km SW. of Hiltaba homestead, 14.x.1977 (AD); Specht & Carrodus 93, 40 miles north Nonning homestead, 16.xi.1958 (AD).

*Victoria* — Beauglehole 1090, Kulkyne National Forest, -.x.1948 (ACB).

*New South Wales* — Lander 72, 12.8 km N. of Lake Wallace homestead, 26.ix.1971 (AD, NSW); McGillivray 2908, east of Narran Lake, near Brewarrina, 22.xi.1967 (BRI).

*Queensland* — Copley 3690, Naryilco Station, 3.x.1971 (AD).

## 2. *Chrysocoryne multiflora* Short, sp. nov.

*Chrysocoryne* sp. A, Short, Muelleria 4:402 (1981).

*Herba annua*, 2.5-4 cm alta. Axes maiores erecti, pilis glandulosis varie obtectis; caulis simplex vel e nodis basalibus superioribusque ramificans. *Folia* ad basem ? opposita, super alterna, linearia vel subelliptica vel oblanceolata usque obovata, 0.3-0.5(c. 0.7) cm longa, c. 0.1-0.2 cm lata, pilis peltiformibus dense obtecta. *Glomeruli* oblongi vel ita subanguste, c. 0.5-2 cm longi, c. 0.25-0.4(0.45) cm diametro. *Capitula* c. 50-250; bractea capitulum subtendens obovata sublate usque latissime subcircularisve, (1.8)2-2.6(2.85) mm longa, (1.35)1.7-2.2(2.4) mm lata marginibus interdum ciliatis, pilis c. 0.1-0.3 mm longis; costa integra, varie villosa et nonnullis pilis glandulosis peltiformibus. *Bractae intra capitulum* 2-4(c. 10), in capitulis plurimis 2 concavis bracteis, intra cas 1 vel 2 planis, et in capitulis basalibus nonnullis 6-10 concavis planisque 2 vel 3 subverticillatis consistentes; bractae concavae (1.2)1.4-1.65(1.75) mm longae, (0.35)0.5-0.75 mm latae, marginibus ciliatis pilis 0.1-0.3 mm longis, costa distincta, glabra pilosave; bractae planae 1-1.4 mm longae, (c. 0.05)0.3-0.6(0.8) mm latae, marginibus longe ciliatis, pilis c. 0.1-0.3 mm longis, costa parum clava, interdum ad basem pilos glandulosos paucos ferenti. *Flosculi* (2)3-5(6); corolla 3-5-lobatae; antherae 3-5, unaquaeque pollinibus c. 15-40. *Achenia* ± obovoidea, c. 0.4 mm longa, 0.35 diametro, purpurea. *Pappus* carens.

**HOLOTYPE** (fig. 11): Chinnock 4411 & Wilson, Mortlock river just east of Meckering. (31°37'S, 117°05'E). Growing on sandy rises with *Angianthus*, *Stipa* sp. *Hakea*/*Melaleuca* scrubland, 22.xi.1978 (AD 98002346). **ISOTYPE**: PERTH.

*Annual herb*, 2.5-4 cm high. Major axes erect, with scale-like glandular hairs; stem simple or forming major branches at basal and upper nodes. *Leaves* ? opposite at the base, the upper ones alternate, ± elliptic or oblanceolate to obovate, sometimes ± linear, 0.3-0.5(0.7) cm long, c. 0.1-0.2 mm wide, a small hyaline appendage sometimes present at the apex, all leaves densely covered in scale-like glandular hairs. *Compound*



*heads*  $\pm$  narrowly oblong to oblong, c. 0.5-2 cm long, c. 0.25-0.4(0.45) cm diam. *Capitula* c. 50-250 per compound head; capitulum-subtending bract  $\pm$  widely to  $\pm$  very widely obovate, sometimes  $\pm$  circular, (1.8)2-2.6(2.85) mm long, (1.35)1.7-2.2(2.4) mm wide, the margins sometimes ciliate, the hairs c. 0.1-0.3 mm long; midrib entire, variably villous and with a few scale-like glandular hairs. *Capitular bracts* 2-4(c. 10); the majority of capitula with 2 concave bracts, (1.2)1.4-1.65(1.75) mm long, (0.35)0.5-0.75 mm wide, with ciliate margins, the hairs c. 0.1-0.3 mm long, with a conspicuous glabrous or hairy midrib extending c.  $\frac{2}{3}$ - $\frac{3}{4}$  the length of the bract, 1 or 2 flat bracts commonly occur within the concave bracts, the bracts 1-1.4 mm long, (c. 0.05)0.3-0.6(0.8) mm wide, with distinctly divided margins in the upper  $\frac{3}{4}$  of the bract, the hairs c. 0.1-0.3 mm long, the midrib  $\pm$  inconspicuous and sometimes with a few glandular hairs at the base; a few basal capitula often with 6-10 concave and flat bracts arranged in  $\pm$  2 or 3 whorls, the bracts resembling those of the upper capitula. *Florets* (2)3-5(6) per capitulum; corolla 3, 4 or 5-lobed, the tube tapering  $\pm$  gradually to a thickened base, c. 0.6-0.7 mm long, c. 0.2-0.35 mm diam., often with a few glandular hairs along the tube; anthers 3, 4 or 5, each with c. 15-40 pollen grains. *Achenes*  $\pm$  obovoid, c. 0.4 mm long, 0.35 mm diam., purplish. Pappus absent. Figs: 9; 10g-h; 11.

Chromosome no.:  $n = c. 12$ .

DISTRIBUTION (See Short 1981a, fig. 4):

South-west of Western Australia. Apparently confined to salt lakes of the Avon drainage system. Locally common.

ECOLOGY:

Grows in saline sandy soils on the margins of salt lakes. Commonly associated with *Melaleuca* and *Halosarcia* spp.

NOTES:

1. The specific epithet alludes to the many-flowered capitula in this species. Other inbreeding species, and usually the outbreeding *C. pusilla* as well, have fewer florets per capitulum.

2. The number and arrangement of capitular bracts is variable within any single compound head. In some compound heads examined there appears to be a trend from c. 6-10 bracts per capitulum at the base of the heads to 2 bracts per capitulum toward the apex. The majority of capitula have 2 distinctly concave bracts within which 1 or 2 further flat bracts may occur. When 2 inner bracts occur there is often a distinct difference in size and it is common to see bracts no more than 4 or 5 cells wide.

SPECIMENS EXAMINED:

*Western Australia* — Chinnock 4364, Western edge of Lake King, 12.xi.1978 (AD, PERTH); Keighery 1337, W'n edge of Lake King, 8.x.1974 (KP); Short 1046, c. 4.6 km E. of Meckering in East Branch of Mortlock River, 20.xi.1979 (AD).

**3. *Chrysocoryne drummondii*** A. Gray, Hook. J. Bot. Kew Gard. Misc. 3:152 (1851). TYPE: "Swan River, Drummond". LECTOTYPE (here designated): *Drummond 16*, Swan River, s. dat. (K). SYNTYPES OR POSSIBLE ISOLECTOTYPES: K, MEL 541601, MEL 84756 (see note 1 below).

*Chrysocoryne tenella* F. Muell., Trans & Proc. Vict. Inst. Advancem. Sci. 130 (1855); F. Muell., Hook. J. Bot. Kew Gard. Misc. 8:149 (1856). — *Angianthus tenellus* (F. Muell.) Benth., Fl. Austr. 3:564 (1867); J. M. Black, Fl. S. Aust. 1st. ed. 646 (1929), 2nd. ed. 925 (1957); Willis, Handb. Pl. Vict. 2:730 (1973); Grieve & Blackall, W. Aust. Wildfls 813 (1975). — *Stylancerus tenellus* (F. Muell.) Kuntze, Rev. Generum Pl. 367 (1891). — *Siloxerus tenellus* (F. Muell.) Ostenf., Biol. Meddel. Kongel. Danske Vidensk. Selsk. 3:138 (1921), *nom. illeg.* TYPE: "In flats subject to inundations by winter rains, between the Long Lake and the Fountain, on Spencer's Gulf. C. Wilhelmi." LECTOTYPE (here designated): *Wilhelmi* s.n., between the Fountain & Long Lake, s. dat. (K). PROBABLE ISOLECTOTYPE OR SYNTYPE: MEL 541620 (see note 2 below).

[*Crossolepis pusilla* auct. non Benth.: Hook., Ic. Pl. 5: t. 413 (1841) (see note under generic treatment of *Chrysocoryne*).]



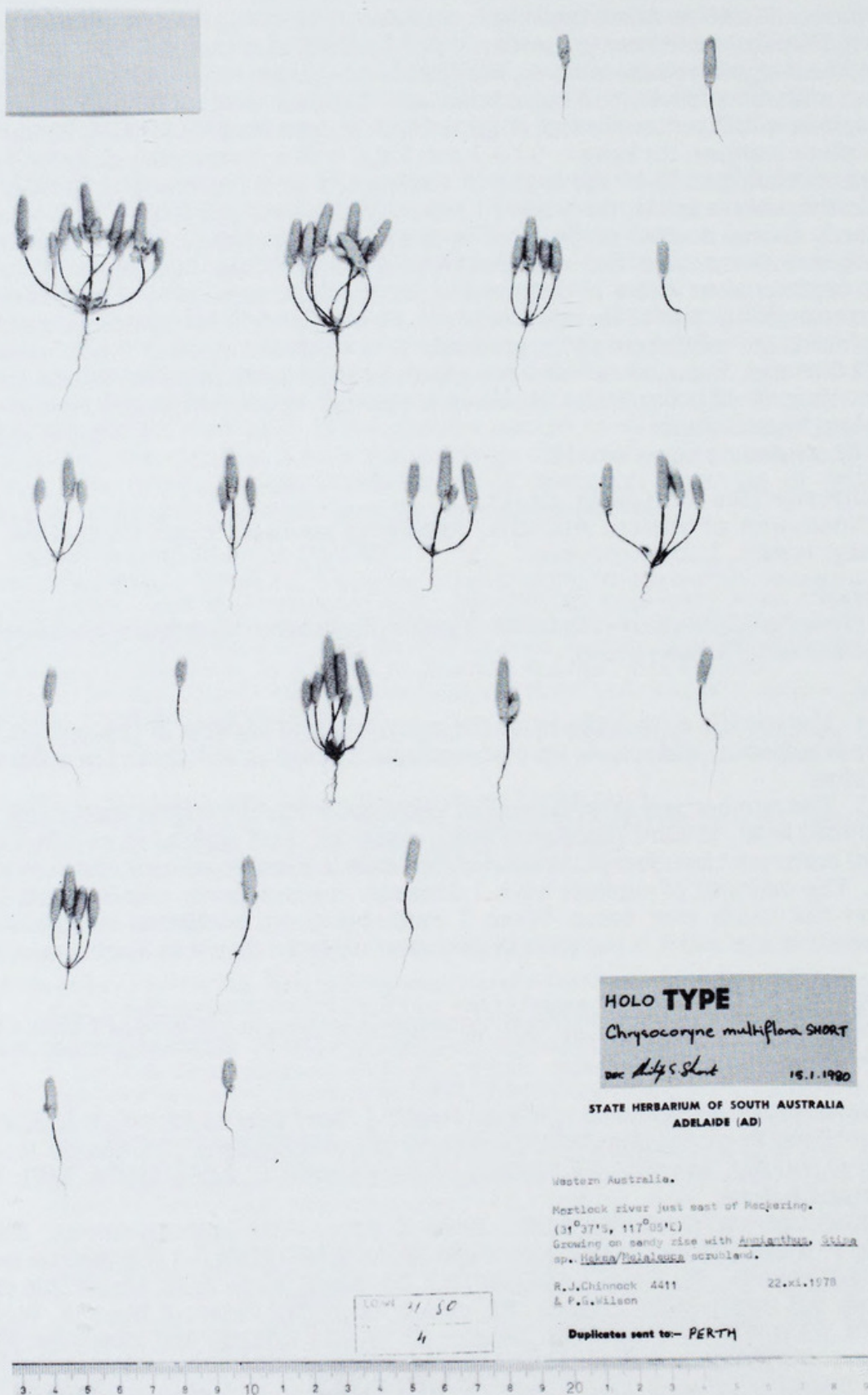


Fig. 11. *C. multiflora* Short. Holotype (Chincock 4411 & Wilson, AD).



[*Chrysocoryne pusilla* auct. non (Benth.) Endl.: Endl., Bot. Zeitung (Berlin) 1:457 (1843) (see note under generic treatment of *Chrysocoryne*).]

*Annual herb*, 3-5(c. 6) cm high. Major axes erect with scale-like glandular hairs; stem simple or forming major branches at basal and/or upper nodes. *Leaves* opposite at the base, the upper ones alternate, all leaves  $\pm$  oblanceolate to obovate or narrowly elliptic to elliptic, 0.2-0.8(1.1) cm long, 0.04-0.08(c. 0.1) cm wide, a small hyaline appendage sometimes present at the apex, all leaves densely covered in scale-like glandular hairs. *Compound heads* narrowly oblong, c. 0.5-2(2.5) cm long, c. 0.2-0.25(0.35) cm diam., with a single head occurring at the apex of an unbranched major axis or several occurring on minor axes which branch from the upper nodes of a major axis. *Capitula* c. 40-150 per compound head; capitulum-subtending bracts widely elliptic to  $\pm$  oblate or widely ovate to widely depressed ovate, (1.65)1.7-2.1(2.25) mm long, (1.8)2-2.5(2.65) mm wide; midrib entire, variably hairy, often with a few scale-like glandular hairs. *Capitular bracts* 2, concave, (1.2)1.3-1.65 mm long, 0.5-0.85 mm wide, the upper margins variably ciliate, the hairs c. 0.1 mm long; midrib inconspicuous. *Florets* (1)2(4) per capitulum; corolla 3, 4 (5)-lobed, the tube tapering  $\pm$  gradually to a thickened base, 0.65-0.8 mm long, 0.25-0.35 mm diam., sometimes with a few glandular hairs on the lower  $\frac{1}{2}$ ; anthers 3, 4 (5), each with c. 20-60 pollen grains. *Achenes*  $\pm$  obovoid, 0.4-c. 0.5 mm long, 0.25-c. 0.3 mm diam., papillose, purplish. Pappus absent.

Figs: 9; 10i-j.

Chromosome number: not known.

DISTRIBUTION (See Short 1981a, fig. 4):

South-west Western Australia, southern South Australia and south-west Victoria. Locally common.

#### ECOLOGY:

Found in both coastal and inland situations around salty depressions and granite outcrops or in open woodland. Collectors' notes include "Open sites between shrubs, in Wandoo woodland or in shrubby areas", "In open woodland with *Eucalyptus cladocalyx* as dominant. Greyish sand.", "Growing in granitic depressions with very small annual grasses, composites etc. Sandy loam", "Growing on white to greyish sand amongst *Carpobrotus*, *Arthrocnemum* [= *Halosarcia*] & *Melaleuca*" and "Near sea on granite rock".

#### NOTES:

1. Gray (1851) realised that a figure published by W. J. Hooker in *Icones Plantarum* and referred to as *Crossolepis pusilla* was in fact not of that species. Consequently he referred the figure and specimens collected by Drummond to *Chrysocoryne drummondii*. In their publications both Gray and Hooker failed to indicate Drummond's collection number for specimens from the Swan River.

At K there is a single sheet bearing apparently two distinct collections. The upper part of the sheet contains specimens and the label, "*Crossolepis pusilla*. Hugel. Swan River, 16, *Drummond*". The label appears to be in Hooker's hand. The lower part of the sheet contains specimens clearly designated as "*Chrysocoryne Drummondii* Gray". This label appears to be in Gray's hand. The original drawings of '*Crossolepis pusilla*' published in *Icones Plantarum* are attached to the left hand side of the sheet. From Gray's information there seems no reason to assume that he did not examine the upper specimens and in any case it would appear that they are the ones used by Hooker in his illustration which was directly referred to by Gray. Thus the *Drummond 16* collection has been designated as the lectotype. The lower most collection is regarded as a syntype or, in the event that the specimens are from the one gathering, as an isoelectotype.

Specimens in MEL, i.e. MEL 541601 with the label "W. A., J. Dr." and MEL 84756 (ex herb. O. W. Sonder) with the label "*Chrysocoryne Drummondii* A. Gray, Swan River-Drummond 1844. n.356", are also considered to be syntypes or, as in the former case a possible isoelectotype, because of the lack of, or Gray's failure to cite, a collector's number.

2. The only Wilhelm collection of *C. tenella* accompanied by locality information



which agrees precisely with Mueller's type citation is in K. The accompanying label indicates that the specimens were seen by Mueller and this sheet is selected as the lectotype. Although not correctly designated a further collection, MEL 541620 with the label "*Chrysocoryne tenella* Ferd. Muller, Port Lincoln, Wilhelmi" is probably an isolectotype or syntype. In Mueller's case it is not uncommon to find that collection details accompanying specimens do not agree entirely with the published information. In this case there would appear to be a major discrepancy in the locality details but similar labels have been found on possible type material of *Pleuropappus phyllocalymmeus*.

3. Despite its wide distribution *C. drummondii* exhibits little morphological variation although floret number has been observed to differ in some collections. Most collections have 2-flowered capitula but some collections with 3- and/or 4-flowered capitula (e.g. Cronin MEL 84705) and apparently 1-flowered capitula (e.g. Andrews, PERTH s.n.) have been found in Western Australia. A further collection, Eichler 20312, also from Western Australia, contains specimens with longer, narrower compound heads than those normally found in the species but other attributes suggest that it is best referred to *C. drummondii*.

#### SELECTED SPECIMENS EXAMINED (9/73):

*Western Australia* — Andrews s.n., Cannington, -x.1902 (PERTH); Burbidge 7892, Dryandra State Forest, 22.xii.1971 (CANB, PERTH); Short 943, Yorkrakine Granite Rocks, 13.xi.1979 (AD); Short 1085, c. 8.6 km W. of Lake Grace, 24.xi.1979 (AD); Short 1110, western margins of Lake Gilmore, 26.xi.1979 (AD); Wilson 10,009, c. 1 km W. of Lucky Bay, 30.ix.1970 (PERTH).

*South Australia* — Hunt 414, c. 25 km north-west of Naracoorte, 18.xi.1961 (AD); Short 807, c. 15.2 km from Edillillie along main road to Pt. Lincoln, 26.ix.1978 (AD).

*Victoria* — Phillips 406, between Apsley & Booroopki, 2.xi.1971 (CBG).

#### 4. *Chrysocoryne trifida* Short, sp.nov.

*Chrysocoryne* sp. B, Short, Muelleria 4:402 (1981).

*Herba annua*, (2)3-7 cm alta. Axes maiores ascendentes erective pilos peltiformes glandulosus ferentes; caulis interdum simplex sed plerumque ex nodis basalibus superioribusve vel ubique ramificans; ramuli maiores ipsi saepe surculos efficientes. *Folia* alterna, plerumque anguste elliptica oblanceolata, raro elliptica, 0.2-0.8 cm longa, c. 0.1-0.2 cm lata, pilos glandulosus peltiformes ferentia. *Glomeruli* cylindracei usque anguste oblongi, 1-c. 4 cm longi, 0.1-0.2 cm diametro. *Capitula* c. 30-100; bractea capitulum subtendens  $\pm$  late elliptica obovatave, 1.6-2.2 mm longa, 1.4-1.9 mm lata; costa varie pilosa, saltem 3 lobis distinctis. *Bractea intra capitulum* 2, concavae, 0.8-1.3 mm longae, 0.2-0.3 mm latae, marginibus superioribus pilis c. 0.5 mm longis; costa conspicua, circa dimidium longitudinis bractea attingens, glabra. *Flosculi* 1(2); corolla 5-lobata; antherae 5, unaquaeque pollinibus c. 350-500. *Achenia*  $\pm$  obovoidea, c. 0.3-0.4 mm longa, c. 0.2-0.3 mm diametro, papillosa, purpurea. Pappus carens.

**HOLOTYPE** (fig. 12): Short 966, 45.1 km N. of Koorda along main road to Mollerin. Salt lake. c. 30°28'S, 117°31'E. Growing in white to brown sand or very sandy loam amongst *Melaleuca*, just above *Arthrocnemum* [= *Halosarcia*] zone. *Chrysocoryne tridens* and *C. trifida* commonly found growing together, 14.xi.1979 (AD 98002348). **ISOTYPE**: PERTH.

*Annual herb*, 3-7 cm high. Major axes ascending or erect, with scale-like glandular hairs; stem sometimes simple but usually forming major branches at basal and/or upper nodes. *Leaves* alternate, narrowly elliptic or oblanceolate, rarely elliptic, 0.2-0.8 cm long, c. 0.1-0.2 cm wide, a small hyaline appendage often present at the apex, all leaves with scale-like glandular hairs. *Compound heads* cylindrical to narrowly oblong, 1-4 cm long, 0.1-0.2 cm diam. *Capitula* c. 30-100 per compound head; capitulum-subtending bracts  $\pm$  widely elliptic or  $\pm$  widely obovate, 1.6-2.2 mm long, 1.4-1.9 mm wide; midrib with at least 3 distinct lobes, variably hairy, at least the lower bracts with some scale-like glandular hairs. *Capitular bracts* 2, concave, 0.8-1.3 mm long, 0.2-0.3 mm wide, the upper margins with long hairs  $\frac{1}{3}$ - $\frac{1}{2}$  (c. 0.5 mm long) the length of the bract; the midrib conspicuous and c.  $\frac{1}{2}$  the length of the bract, glabrous. *Florets* 1(2); corolla 5-lobed, the tube tapering  $\pm$  gradually to the base or with a fairly distinct constriction in the lower  $\frac{1}{2}$ , the entire tube 0.8-1 mm long, c. 0.3-0.4 mm diam.; anthers 5, each with c. 350-500 pollen grains. *Achenes*  $\pm$  obovoid, 0.3-0.4 mm long, c. 0.2-0.3 mm diam., papillose, purplish. Pappus absent.

Figs: 9; 10k-m; 12.

Chromosome number:  $n = c. 11$ .



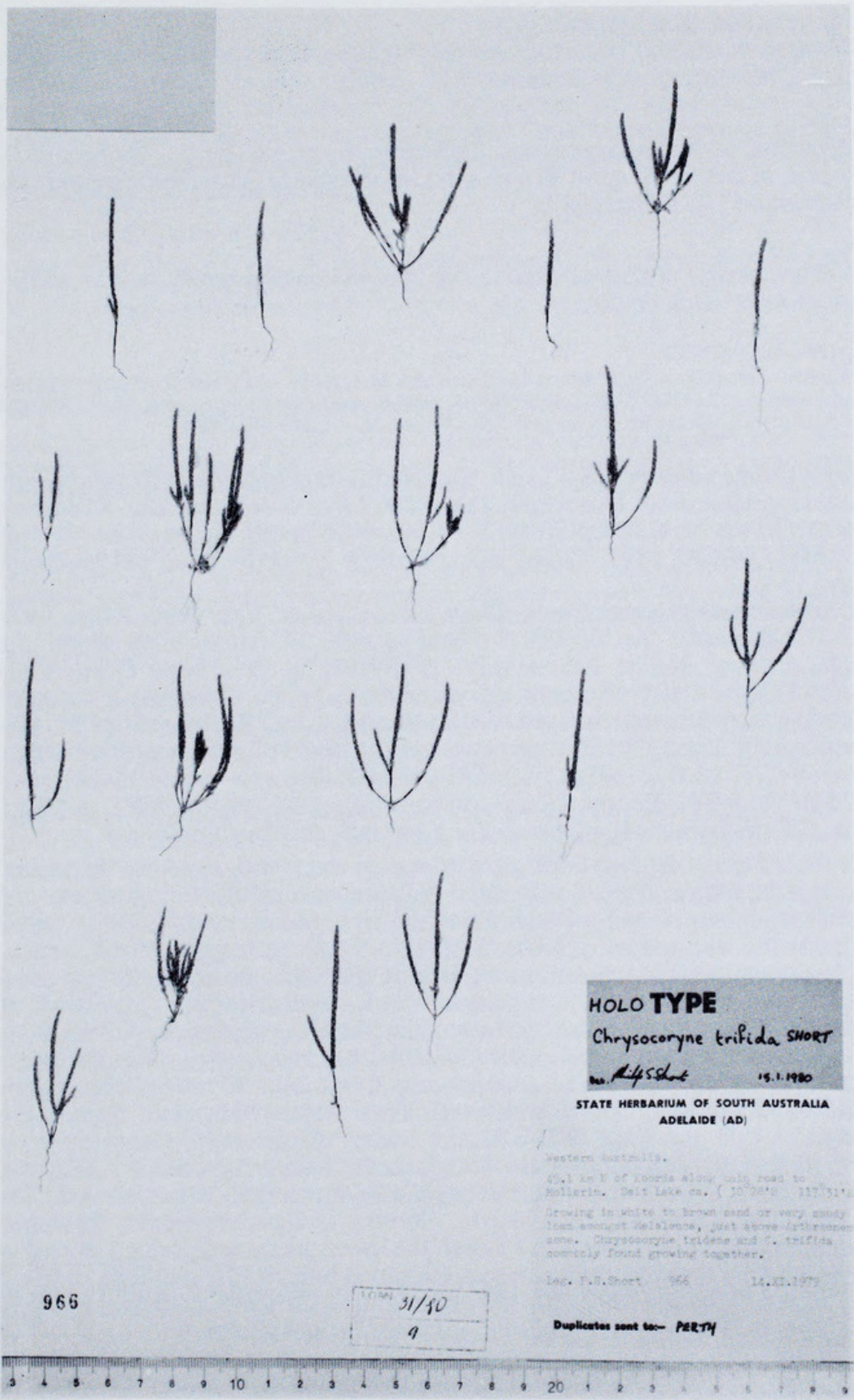


Fig. 12. *C. trifida* Short. Holotype (Short 966, AD).



DISTRIBUTION (See Short 1981a, fig. 4):

Western Australia, occurring on salt lakes in both the Eucla and South West Drainage Divisions. Locally common.

ECOLOGY:

Restricted to saline depressions. Collectors' notes include "... west side of lake. Sandy edge of clay pan" and "Brown sand to very sandy loam. Very common amongst *Arthrocnemum* [= *Halosarcia*]"

NOTES:

1. The specific epithet alludes to the conspicuous, generally trifid midrib of the capitulum-subtending bracts.

SPECIMENS EXAMINED:

Western Australia — Short 989, saline depression 34.5 km N. of Perenjori, 15.xi.1979 (AD); Wilson 6083, near Mollerin, 2.ix.1967 (PERTH); Wilson 8813, Lake Barlee, southern margin, 25.viii.1970 (PERTH); Wilson 8853, near Lake Barlee HS on west side of Lake, 26.viii.1970 (PERTH).

5. *Chrysocoryne uniflora* Turcz., Bull. Soc. Naturalistes Moscou 24 (1):188 (March 1851). TYPE: "Nova Hollandia. Drum coll. 111. n.116." POSSIBLE HOLOTYPE: KW (see p.152). ISOTYPES: GH (ex herb. Klatt), K, MEL 541599, NSW. POSSIBLE ISOTYPES: GH, K, MEL 84468, MEL 541598, MEL 541600 (all collections by Drummond but lack collector's number).

*Chrysocoryne myosuroides* A. Gray, Hook. J. Bot. Kew Gard. Misc. 3:152 (May 1851). — *Angianthus myosuroides* (A. Gray) Benth., Fl. Austr. 3:563 (1867); Hoffman in Engler & Prantl, Naturl. Pflanzenfam. IV (5):194, fig. 98B (1890); Grieve & Blackall, W. Aust. Wildfls 813 (1975), ?p.p. (as to mixed collns of *C. tridens* & *C. uniflora* in PERTH). — *Stylancerus myosuroides* (A. Gray) Kuntze, Rev. Generum Pl. 367 (1891) ('*myosuroides*'). TYPE: "Swan River, Drummond, 1845." LECTOTYPE (here designated): Drummond 116, Sw.riv., 1845 (K) (see note 1 below). ISOLECTOTYPES: GH (ex herb. Klatt), MEL 541599, NSW. POSSIBLE ISOLECTOTYPES: K, MEL 84468, MEL 541598, MEL 541600, GH (all collections by Drummond but lack collector's number).

Annual herb, 4-8(c. 14) cm high. Major axes erect, with scale-like glandular hairs; stem rarely simple, usually forming major branches at basal and/or upper nodes. Leaves opposite at the base, the upper ones alternate, all leaves narrowly elliptic to  $\pm$  elliptic, oblanceolate to obovate or  $\pm$  lanceolate, 0.2-0.5(0.8) cm long, c. 0.05-0.2 cm wide, a small hyaline appendage sometimes present at the apex, all leaves densely covered in scale-like glandular hairs. Compound heads cylindrical to narrowly oblong, c. 1.5-3.5(4.4) cm long, 0.15-0.2(0.25) cm diam., with a single head occurring at the apex of an unbranched major axis or with (2)4-10(14) heads occurring on minor axes which branch from the upper nodes of a major axis. Capitula c. 50-150 per compound head; capitulum-subtending bracts  $\pm$  widely elliptic or widely obovate to depressed widely obovate, 1.7-2.05 mm long, 1.75-2.05 mm wide; midrib entire, glabrous or variably villous, sometimes with a few scale-like glandular hairs. Capitular bracts 2, concave, 1.4-1.8 mm long, 0.4-0.7 mm wide, the upper margins variably ciliate, the hairs less than c. 0.1 mm long; midrib not conspicuous. Florets 1 or 2 per capitulum, the upper most capitula of a compound head with 1 floret, the lower ones usually with 2 florets; corolla 5-lobed, the tube tapering gradually to a thickened base, 0.75-1 mm long, 0.23-0.4 mm diam.; anthers 5, each with c. 250-350 pollen grains. Achenes  $\pm$  obovoid, 0.4-0.5 mm long, 0.25-c. 0.35 mm diam., papillose, purplish. Pappus absent. Fig. 9.

Chromosome number: not known.

DISTRIBUTION (See Short 1981a, fig. 4):

South-west of Western Australia. Salt lakes of the Murchison and South West Drainage Divisions. Locally common.

ECOLOGY:

Restricted to the margins of saline depressions. Grows in sand or sandy loam and associated with *Halosarcia* spp. and *Melaleuca*.



## NOTE:

1. The K sheet designated as having the lectotype collection of *C. myosuroides* also contains further specimens of the same species. The specimens are accompanied by the label "*Chrysocoryne*, Sw. riv., Drummond". In the bottom right hand corner of the sheet there is also a label "*Chrysocoryne myosuroides*, Gray" which appears to be in Gray's hand. It is possible that both sets of specimens were seen by Gray and furthermore both sets may be from the one gathering.

## SELECTED SPECIMENS EXAMINED (4/20):

Western Australia — Short 614A, c. 3.4 km E. of Meckering in Mortlock River, 20.ix.1977 (AD); Short 986, 7.9 km N. of Latham, 15.xi.1979 (AD); Short 991, c. 30.4 km S. of Pindar, 15.xi.1979 (AD); Short 1014, c. 54.5 km from Nugadong along main road to Gunyidi, 19.xi.1979 (AD).

6. *Chrysocoryne tridens* Short, sp. nov.

*Chrysocoryne* sp. C, Short, Muelleria 4:402 (1981).

*Herba annua*, 3-6(7.6) cm alta. Axes maiores erecti, nonnullis pilis glandulosis peltiformibus; caulis simplex vel e nodis basalibus ramificans. *Folia* ad basem opposita, superiora alterna, omnia linearia elliptica vel oblanceolata usque obovata, 0.3-0.8 cm long, 0.05-0.1 cm lata, pilis glandulosis peltiformibus dense oblecta. *Glomeruli* cylindracei usque anguste oblongi, (c. 1)3-5(6.3) cm longi, 0.15-0.2 cm diametro. *Capitula* c. 50-250; bractea capitulum subtendens late elliptica vel late obovata, 1.7-2(2.2) mm longa, (1.45)1.6-2 mm lata; costa integra, glabra vel varie pilosa, saepe pilis glandulosis pelti formibus nonnullis. *Bracteae intra capitulum* 2, concavae, 0.9-1.4 mm longae, 0.35-0.6 mm latae, marginibus superioribus varie ciliatis, pilis usque ad c. 0.1 mm longis; costa parum clara. *Flosculi* 1; corolla 3-lobata, antherae 3, unaquaeque pollinibus c. 8-28. *Achenia* obovoidea, 0.45-0.55 mm longa, 0.15-0.23 mm diametro, papillosa, purpurea. Pappus carens.

HOLOTYPE (fig. 13): Short 1041, c. 3.5 km E. of Meckering in Mortlock River flats (East Branch). c. 31°37'S, 117°02'E. Growing in whitish brown sand to very sandy brown loam amongst *Arthrocnemum* [= *Halosarcia*], *Acacia* and other shrubs. V. common, 20.xi.1979 (AD 98002347). ISOTYPE: CANB, PERTH.

*Annual herb*, 3-6(7.6) cm high. Major axes erect, with scale-like glandular hairs; stem simple or forming branches at basal nodes, never branching from upper nodes. *Leaves* opposite at the base, the upper ones alternate, all leaves linear or elliptic or oblanceolate to obovate, 0.3-0.8 cm long, 0.05-0.1 cm wide, a small hyaline appendage sometimes present at the apex, all leaves densely covered with scale-like glandular hairs. *Compound heads* cylindrical to narrowly oblong, (c. 1)3-5(6.3) cm long, 0.15-0.2 cm diam., with only a single head occurring at the apex of an unbranched major axis. *Capitula* c. 50-250 per compound head; capitulum-subtending bracts widely elliptic or widely obovate, 1.7-2(2.2) mm long, (1.45)1.6-2 mm wide; midrib entire, variably hairy or glabrous, often with a few scale-like glandular hairs. *Capitular bracts* 2, concave, 0.9-1.4 mm long, 0.35-0.6 mm wide, the upper margins variably ciliate, the hairs less than c. 0.1 mm long; midrib inconspicuous. *Florets* 1 per capitulum; corolla 3(4)-lobed, the tube tapering ± gradually to a thickened base, 0.7-0.85 mm long, 0.15-0.23 mm diam.; anthers 3(4), each with c. 8-28 pollen grains. *Achenes* ± obovoid, 0.45-0.55 mm long, 0.3-0.35 mm diam., papillose, purplish. Pappus absent. Figs: 9; 13.

Chromosome number:  $n = c. 13$ .

## DISTRIBUTION (See Short 1981a, fig. 4):

South-west of Western Australia. Salt lakes of the Eucla and South West Divisions. Locally common.

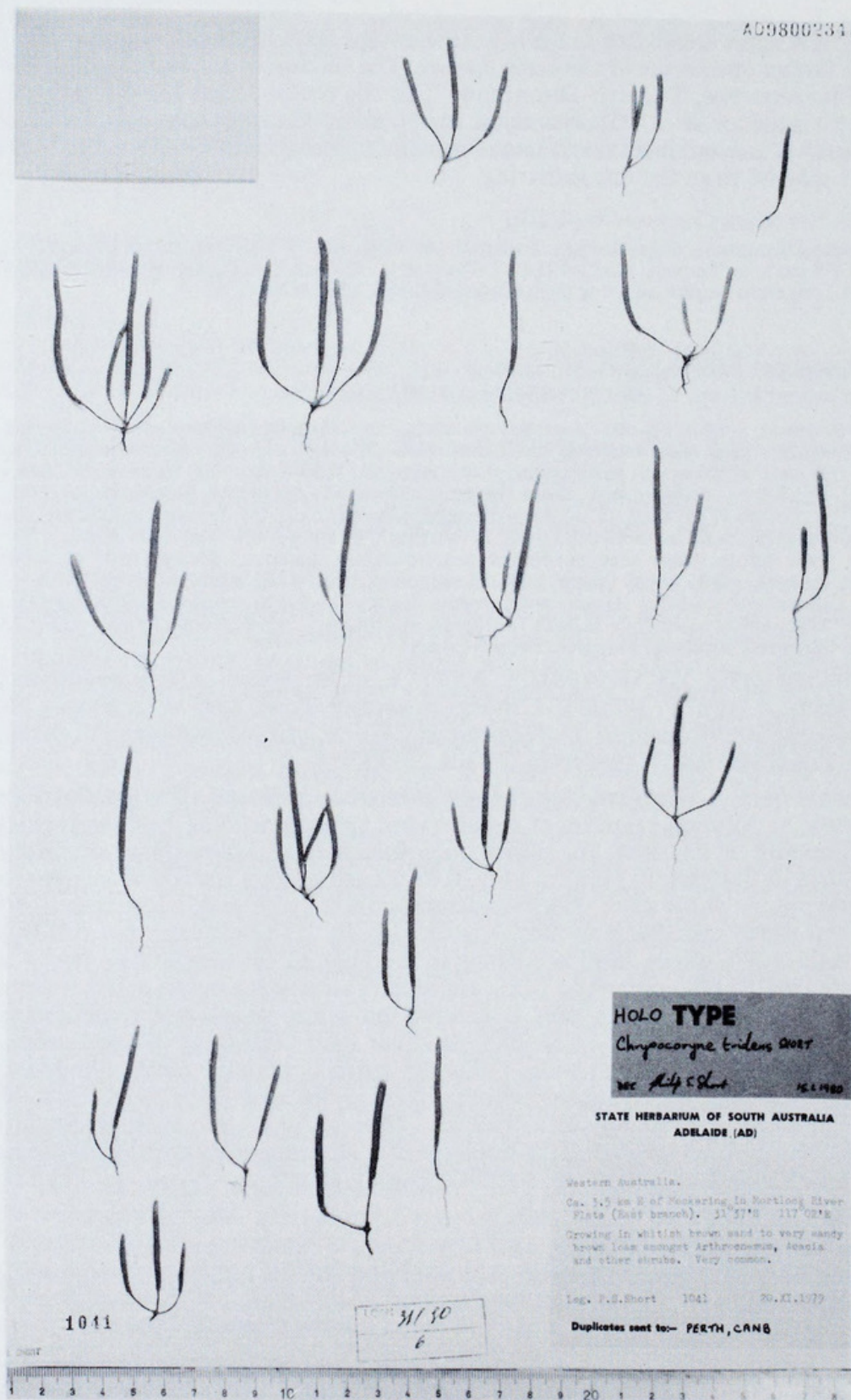
## ECOLOGY:

Restricted to the margins of saline depressions. Collectors' notes include "Clay loam on edge of salty flats . . . forming large mats on the ground", "Growing amongst *Eucalyptus*, *Melaleuca* surrounding margin of salty depression. Sandy loam" and "Salt depression. White-greyish sand between *Melaleuca*".

*C. tridens* commonly grows with *C. uniflora*. Examination of collections, e.g. Short 614A & 614B, has shown that the former species flowers some days before *C. uniflora*.



AD98002317

Fig. 13. *C. tridens* Short. Holotype (Short 1041, AD).



## NOTE:

1. The specific epithet alludes to the 3-lobed florets generally found in this species.

## SELECTED SPECIMENS EXAMINED (5/30):

Western Australia — *Short 614B*, c. 3.4 km E. of Meckering in Mortlock River, 20.ix.1977 (AD); *Short 675*, 1 km E. of Wave Rock, 25.ix.1977 (AD); *Short 972*, southern edge of Lake Moore, 14.xi.1977 (AD); *Short 1063*, Beaufort Bridge along Kojonup-Williams road, 23.xi.1979 (AD); *Short 1113*, base of Dundas Rocks, 26.xi.1979 (AD).

6. *Dithyrostegia* A. Gray, Hook. J. Bot. Kew Gard. Misc. 3:97,100 (April 1851). TYPE: *D. amplexicaulis* A. Gray.

*Gamozygis* Turcz., Bull. Soc. Naturalistes Moscou 24(2):75 (Oct. 1851). TYPE: *G. flexuosa* Turcz. (= *D. amplexicaulis* A. Gray).

[*Angianthus* auct. non Wendl.: see synonymy of *D. amplexicaulis*.]

[*Styloncerus* auct. non Spreng., nom. illeg.: see synonymy of *D. amplexicaulis*.]

*Annual herb*. Major axes erect or ascending, glabrous; stem simple or forming major branches at basal and/or upper nodes. *Leaves* alternate, sessile, ovate, concave, stem-clasping, glabrous. *Compound heads* broadly obovoid; bracts subtending compound heads 2, leaf-like, overlapping or connate in the lower  $\frac{1}{3}$ - $\frac{1}{2}$  and enclosing the compound head, glabrous. *General receptacle* a slightly expanded axis, in the largest heads  $\pm$  oblong, the capitula  $\pm$  evenly distributed over the surface, the entire receptacle densely covered with hairs which are c. the length of the florets. *Capitula* c. 10-40 per compound head. *Capitular bracts* 1 or 2, hyaline, if 2 then often partially connate, usually with long hairs at the apex, the entire part of the bracts only slightly exceeding the length of the achene. *Florets* 1 per capitulum; corolla 5-lobed; style branches truncate; stamens 5, with tailed anthers. *Achenes*  $\pm$  obovoid, densely silky hairy. Pappus of a few short, smooth bristles fused at the base, c.  $\frac{1}{5}$  the length of the corolla tube. Fig. 1g.

## DISTRIBUTION (Fig. 14):

A monotypic genus occurring in the south-west of Western Australia between latitudes c. 29°-31°S and west of longitude c. 120°E.

## AFFINITIES/GENERIC CHARACTERISTICS:

*Dithyrostegia* has no obvious affinities with other segregate genera of *Angianthus*. It is readily distinguished by the 2 leaf-like bracts which subtend the compound heads, the silky hairy achenes, capitular bracts and the concave, stem-clasping leaves.

## EVOLUTION/REPRODUCTIVE BIOLOGY:

A pollen-ovule ratio of 1,449 was determined from a single individual of *Short 344*. In keeping with values previously outlined the single species is probably an outbreeder (*Short 1981a, b*).

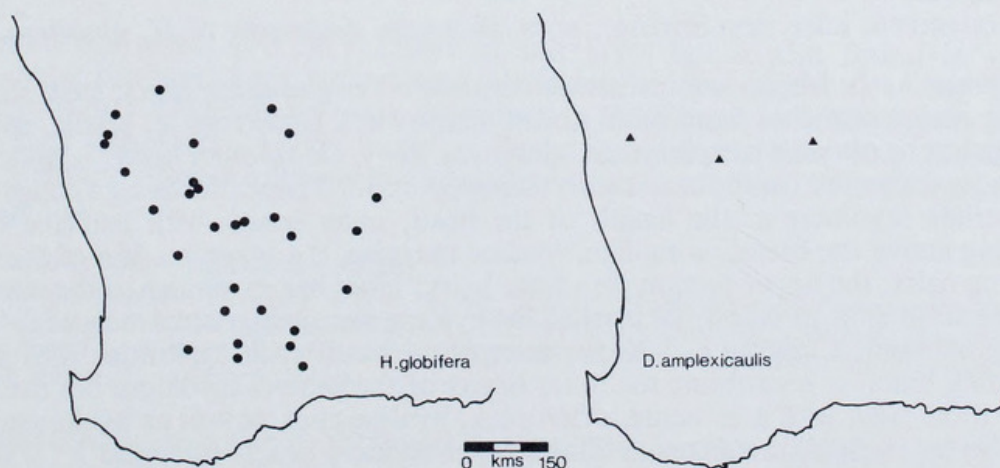


Fig. 14. Distribution of *Dithyrostegia amplexicaulis* and *Hyalochlamys globifera* (Western Australia).



**Dithyrostegia amplexicaulis** A. Gray, Hook. J. Bot. Kew Gard. Misc. 3:100 (April 1851). — *Angianthus amplexicaulis* (A. Gray) Benth., Fl. Austr. 3:568 (1867); Grieve & Blackall, W. Aust. Wildfls 816 (1975). — *Stylancerus amplexicaulis* (A. Gray) Kuntze, Rev. Generum Pl. 367 (1891). TYPE: "South-western Australia, Drummond, 1850." LECTOTYPE (here designated): *Drummond* 57, S.W. Australia, 1850 (K), (see note 1 below). ISOLECTOTYPES: GH (ex herb. Klatt), MEL 541220, NSW, PERTH (2 sheets).

*Gamozygis flexuosa* Turcz., Bull. Soc. Naturalistes Moscou 24(2):76, t.1 (Oct. 1851). TYPE: "Nova Hollandia. Drum. V.n.57." HOLOTYPE: ?CW, n.v. (see p.152). ISOTYPES: GH (ex herb. Klatt), K, MEL 541220, NSW, PERTH (2 sheets).

*Annual herb*, 3-10(16) cm high. *Leaves* 0.5-1.5(1.8) cm long, 0.1-0.5 cm wide. *Compound heads* c. 0.5-1 cm long, c. 0.3-0.8 cm diam.; bracts subtending compound heads c. 0.3-0.7 cm long, c. 0.4-0.8 cm wide. *Florets* 1; corolla 5-lobed, the lower ½ of the tube tapering abruptly to the base, c. 1.2-2 mm long, c. 0.4-0.5 mm diam.; anthers 5, each with c. 300 pollen grains. *Achenes* ± obovoid, c. 2 mm long, c. 1 mm diam., densely silky hairy.

DISTRIBUTION: See generic treatment.

#### ECOLOGY:

Only 2 collections of this species provide habitat notes. They are "Large saline depression . . . very common in upper *Arthrocnemum* [= *Halosarcia*] zone, around base of bushes" and "Growing in loam on slightly raised soil near edge of salt lake".

#### NOTES:

1. The lectotype sheet of *D. amplexicaulis* bears 8 individual specimens plus original drawings of the species. According to Gray (1851) the species was to be illustrated in *Icones Plantarum* but this did not eventuate.

2. A single collection, *Evans s.n.*, PERTH, from Yuin Station contains 4 plants which differ from typical *D. amplexicaulis*. They are dichotomously branched, have smaller leaves and compound heads, a less woolly general receptacle and the capitular bracts lack long hairs. The collection probably represents a distinct taxon but further collections are required to substantiate this view.

#### SPECIMENS EXAMINED:

*Western Australia* — *Drummond s.n.*, W.A., s.dat. (PERTH); *Short 344*, c. 12 km from Carnamah on Three Springs road, 15.viii.1977 (AD); *Wilson 6088k*, 28 km N. of Cleary, 2.ix.1967 (PERTH); *Wilson 8813a*, southern margin of Lake Barlee, 25.viii.1970 (AD, PERTH).

**7. *Hyalochlamys*** A. Gray, Hook. J. Bot. Kew Gard. Misc. 3:98,101 (April 1851). TYPE: *Hyalochlamys globifera* A. Gray.

[*Angianthus* auct. non Wendl.: various Australian floras, see synonymy of *H. globifera*.]

[*Stylancerus* auct. non Spreng., *nom. illeg.*: see synonymy of *H. globifera*.]

*Annual herb*. Major axes prostrate with scale-like glandular hairs; stem simple or forming major branches from basal nodes. *Leaves* in a basal rosette, sessile, entire, ± oblanceolate to obovate or spatulate, glandular hairy. *Compound heads* ± spheroid or ± broadly depressed ovoid; bracts subtending compound heads forming a conspicuous, multi-seriate involucre c. the length of the head; outer bracts with leaf-like midribs extending above the broad, wing-like, hyaline margins, the lower section of the midrib with long hairs, the upper section glandular hairy; inner bracts similar to the outer ones but the midrib c. at or below the level of the hyaline margins; *general receptacle* ± very broadly obovoid. *Capitula* c. 5-20 per compound head, each capitulum with a single subtending bract ± resembling the inner bracts of the general involucre but the midrib usually more rigid with a ± acute, often pink, hyaline apex as well as hyaline margins. *Capitular bracts* 3(?4), arranged so that 2 outer concave bracts surround 1(?2) smaller, inner concave bract; outer concave bracts opaque, rigid, with narrow hyaline margins; the margins with long hairs, the apex with short, flattened hairs; inner bract c. the length or slightly exceeding the length of the achene, hyaline, lacking a distinct midrib and with



long hairs on the upper margins. *Florets* 1 per capitulum; corolla (4)5-lobed; style branches truncate; stamens (4)5, with tailed anthers. *Achene*  $\pm$  obpyriform, with a distinct, whitish carpodium, the entire fruit pinkish-brown, smooth. Pappus absent. Fig. 1f.

#### DISTRIBUTION (Fig. 14):

A monotypic genus restricted to the south-west of Western Australia between latitudes c. 29°S and c. 34°S and west of longitude c. 122°E.

#### AFFINITIES/GENERIC CHARACTERISTICS:

The affinities of this genus are obscure. It has no obvious relationships with other members of *Angianthus* s.l.

*Hyalochlamys* is readily distinguished from other members of *Angianthus* s.l. by the unique morphology of the bracts of both the general involucre and the capitula and the achene morphology. The presence of scale-like glandular hairs on the leaves and axes, plus the prostrate habit, provide useful characters for readily distinguishing the species.

#### EVOLUTION/REPRODUCTIVE BIOLOGY:

The abundance of individuals in saline regions, plus the presence of scale-like hairs typical of salinity tolerant plants, suggest the evolution of the genus in the salt lake regions of Western Australia or strand habitats.

A pollen-ovule ratio of 151, determined for a single specimen (*Short 615*), suggests that the only species is an inbreeder (see Short 1981a, b).

***Hyalochlamys globifera*** A. Gray, Hook. J. Bot. Kew Gard. Misc. 3:101 (April 1851). — *Angianthus globifer* (A. Gray) Benth., Fl. Austr. 3:567 (1867); Grieve & Blackall, W. Aust. Wildfls 815 (1975). — *Stylancerus globifer* (A. Gray) Kuntze, Rev. Generum Pl. 367 (1891). TYPE: "Swan River, Drummond." LECTOTYPE (here designated): *Drummond 204*, Sw. river, s. dat. (K). ISOLECTOTYPES: PERTH, GH (ex herb. Klatt), GH (lacks collector's number but label appears to be in Gray's hand). POSSIBLE ISOLECTOTYPE: MEL 541626 (ex herb. O. W. Sonder), lacks collector's number.

*Annual herb*. Major axes 0.5-2.5 cm long. *Leaves* 0.5-1.2 cm long, 0.1-0.2 cm wide. *Compound heads* c. 0.4-0.8 cm high, 0.4-0.8 cm diam.; bracts subtending compound heads 0.5-0.7 cm long, 0.4-0.6 cm wide. *Capitular bracts* 3(?4), the two concave bracts 3-4.5 mm long, the inner bracts c. the length or slightly exceeding the length of the achene. *Florets* 1; corolla (4)5-lobed, the tube tapering gradually to an expanded base covering  $\pm$  the top of the achene, 1.7-1.9 mm long, c. 0.2 mm diam.; anthers (4)5, each with c. 30 pollen grains. *Achenes*  $\pm$  obpyriform, 1.1-1.3 mm long, 0.5-0.6 mm diam.

DISTRIBUTION: See generic treatment.

#### ECOLOGY:

Commonly grows on the margins of salt lakes but is also found in shallow depressions at the base of granite outcrops. Collectors' notes include "Growing in upper *Arthrocnemum* [= *Halosarcia*] zone extending to *Melaleuca* and *Eucalyptus* regions around salty depression. Sandy loam", "Growing on sandy rises with *Angianthus*, *Aizoon glabrum*, *Stipa*, *Frankenia* in *Hakea*/*Melaleuca* scrub" and "Sandy loam at base of granite".

#### SELECTED SPECIMENS EXAMINED (6/29):

*Western Australia* — *Chinnock 4412* & *Wilson*, Mortlock River just east of Meckering, 22.xi.1978 (AD); *Short 636*, southern margins of Lake Brown, 22.ix.1977 (AD); *Short 661*, Roe Dam, 23.ix.1977 (AD); *Short 684*, Purnta Rock, 26.ix.1977 (AD); *Tölken 6519A*, NE. end of Lake Johnston, 9.x.1979 (AD); *Wilson 8807*, Lake Barlee, 25.viii.1970 (PERTH).

8. ***Pogonolepis*** Steetz in Lehm. Pl. Preiss. 1:440 (1845). — *Skirrhophorus* DC. in Lindl. ex DC. sect. *Pogonolepis* (Steetz) A. Gray, Hook. J. Bot. Kew Gard. Misc. 3:149 (1851). TYPE: *Pogonolepis stricta* Steetz.

[*Angianthus* auct. non Wendl.: as to *A. strictus* (Steetz) Benth. & *A. lanigerus*



Ewart & J. White, used in various works.]

[*Siloxerus* auct. non Labill.: as to *S. strictus* (Steetz) Ostenf.]

[*Skirrhophorus* auct. non DC. in Lindl. ex DC.: as to *S. strictus* (Steetz) A. Gray and *S. muellerianus* Sond.]

[*Styloncerus* auct. non Spreng., *nom. illeg.*: as to *S. strictus* (Steetz) Kuntze]

*Annual herbs*. Major axes decumbent, ascending or erect, variably hairy; stem simple or forming major branches at basal and/or upper nodes. *Leaves* usually alternate (sometimes opposite), sessile, entire, glabrous or sparsely hairy, mucronate. *Compound heads*  $\pm$  broadly obovoid; bracts subtending compound heads forming a conspicuous, multi-seriate involucre c. the length of the head, the outer bracts leaf-like, the inner ones primarily hyaline and with papillae at the apex; *general receptacle* a small,  $\pm$  flat, glabrous axis. *Capitula* c. 5-40 per compound head. *Capitular bracts* 2-3, c. the length of the florets,  $\pm$  hyaline, whitish, with papillae at the apex. *Florets* 1 per capitulum; corolla 5-lobed; style branches truncate; stamens 5, with tailed anthers. *Achenes*  $\pm$  ovoid or  $\pm$  obpyramidal, covered with mucilaginous cells, brown. Pappus absent. Fig. 11.

Chromosome numbers:  $n=4, 5, 6, 7$ ,  $c. 10, c. 12$ .

The taxonomy of *Pogonolepis* is yet to be resolved. For comments see *Muelleria* 4:404-405 (Short, 1981a).

Three species normally referred to *Angianthus*, i.e. *A. lanigerus*, *A. muellerianus* (= *P. muelleriana* (Sond.) Short) and *A. strictus* (= *P. stricta* Steetz) belong to *Pogonolepis*. The new combination transferring *A. lanigerus* to *Pogonolepis* is made below.

***Pogonolepis lanigera*** (Ewart & J. White) Short, comb. nov.

BASIONYM: *Angianthus strictus* var. *lanigerus* Ewart & J. White, *Proc. Roy. Soc. Vict.* 22:92 (1909). SYNONYM: *Angianthus lanigerus* (Ewart & J. White) Ewart & J. White, *Proc. Roy. Soc. Vict.* 23:288 (1911).

9. *Siloxerus* Labill., *Pl. Nov. Holl.* 2:57 (1806); Less., *Syn. generum Comp.* 270 (1832); Ostenfeld, *Biol. Meddel. Kongel. Danske Vidensk. Selsk.* 3:134, p.p. (as to *S. humifusus* & *S. filifolius* only). — *Styloncerus* Spreng., *Syst. veg.* 3:356, 451 (1826), *nom. illeg.* — *Ogcerostylus* Cass., *Dict. Sc. Nat.* 49:221 (1827), *nom. illeg.*; Stuedel, *Nom. Bot.* 2nd. ed. 242 (1841) ('*Oxerostylus*'). TYPE: *Siloxerus humifusus* Labill.

*Chamaesphaerion* A. Gray, *Hook. J. Bot. Kew Gard. Misc.* 3:176 (June 1851). TYPE: *Chamaesphaerion pygmaeum* A. Gray (= *S. pygmaeus* (A. Gray) Short).

*Gyrostephium* Turcz., *Bull. Soc. Naturalistes Moscou* 24(2):76 (Oct. 1851). TYPE: *Gyrostephium rhizocephalum* Turcz. (= *S. pygmaeus* (A. Gray) Short).

[*Angianthus* auct. non Wendl.: see synonymy of *S. humifusus* & *S. filifolius*.]

[*Chthonocephalus* auct. non Steetz: see synonymy of *S. pygmaeus*.]

[*Gnaphalodes* auct. non A. Gray, *nom. illeg.*, later homonym of *Gnaphalodes* Miller (see Hj. Eichler, *Taxon* 12:295 (1963): as to *Gnaphalodes filifolium* Benth. (= *Siloxerus filifolius*).]

*Annual herbs*. Major axes  $\pm$  absent or if present then decumbent to erect, glabrous or hairy; stem simple and minute or forming major branches at basal and/or upper nodes. *Leaves* in a basal rosette or, if major axes present then opposite to alternate, all leaves entire, sessile, glabrous or sparsely hairy, apex mucronate, the base often with hyaline margins. *Compound heads*  $\pm$  ellipsoid to broadly ellipsoid or  $\pm$  lanceoloid to depressed ovoid; bracts subtending compound heads conspicuous, leaf-like, at least c.  $\frac{1}{4}$  to  $\frac{1}{2}$  the length of the head, often c. equal to or exceeding the length of the head; *general receptacle* of a single hairy axis which lacks minor receptacular axes, the axis becoming hollow with age. *Capitula*  $\pm$  evenly distributed over the general receptacle,  $\pm$  indistinct and lacking subtending bracts. *Capitular bracts* c. 5-15, mainly hyaline but the uppermost portion opaque and often crenulate, with a green,  $\pm$  glabrous midrib which extends c.  $\frac{1}{2}$ - $\frac{2}{3}$  the length of the bract, the bracts arranged in  $\pm 1$  or 2 indistinct whorls. *Paleae* resembling capitular bracts, one bract per floret. *Florets* 4-15(22) per capitulum; corolla 3-5-lobed; style branches truncate; stamens 3-5, with tailed anthers. *Achenes*  $\pm$  obovoid, sparsely to densely papillose, purple. Pappus of 5-7 variably jagged scales joined at the base or a jagged ring lacking distinct scales. Fig. 15.



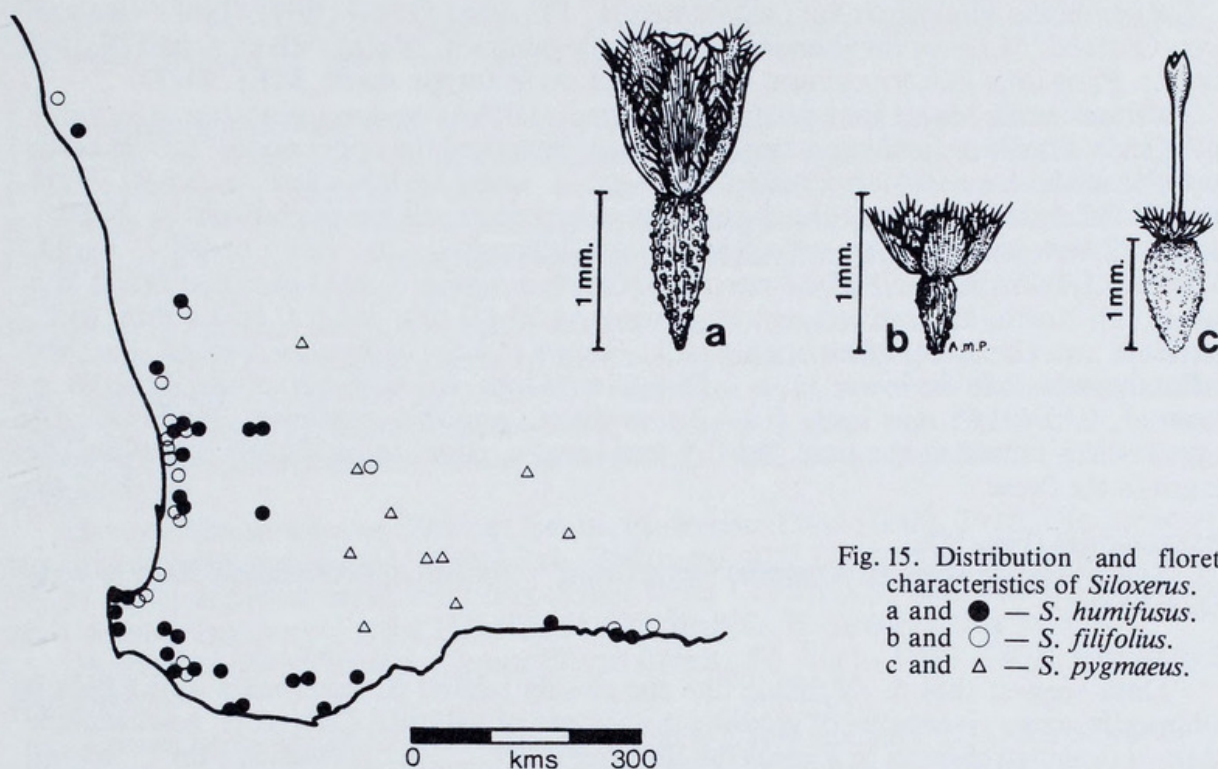


Fig. 15. Distribution and floret characteristics of *Siloxerus*.  
a and ● — *S. humifusus*.  
b and ○ — *S. filifolius*.  
c and △ — *S. pygmaeus*.

#### DISTRIBUTION (Fig. 15):

South-west of Western Australia.

#### AFFINITIES/GENERIC CHARACTERISTICS:

*Siloxerus* contains 3 species. It is readily distinguished from all other members of *Angianthus* s.l. by the presence of paleae, a hairy general receptacle, the  $\pm$  obovoid, purple, papillose achenes and the more or less rigid nature of both the capitular and receptacular bracts. Unlike other members of *Angianthus* s.l. the capitula in members of this genus are somewhat ill-defined.

The genus has no obvious affinities with other members of the “*Angianthus* group” (sensu Merxmüller *et al.*, 1977) and any affinities with other members of the Gnaphaliinae are yet to be determined.

#### EVOLUTION/REPRODUCTIVE BIOLOGY:

All species, as evidenced by approximate P/O determinations of c. 200 (Short 1981a, b), are inbreeders. They have close affinities with one another and indeed *S. humifusus* may be a polyploid directly derived from *S. filifolius* (see note 1 under *S. humifusus*).

#### KEY TO SPECIES OF SILOXERUS

1. Stem apparently absent; compound heads depressed ovoid, c. 0.4-0.6 cm long, 0.6-1.1 cm diam. . . . . 3. *S. pygmaeus*
1. Stem simple or branching, the major axes decumbent to erect, 1-7(9) cm long; compound heads ellipsoid to broadly ellipsoid or ovoid to broadly depressed ovoid, c. 0.6-2.9 cm long, c. 0.5-1.5 cm diam.
  2. Pappus c.  $\frac{1}{2}$  or rarely the length of the floret; capitular bracts and paleae (2)2.5-4.5(6.3) mm long . . . . . 2. *S. humifusus*
  2. Pappus c. equal to or slightly exceeding the length of the floret; capitular bracts and paleae 1.25-1.9 mm long . . . . . 1. *S. filifolius*

1. ***Siloxerus filifolius*** (Benth.) Ostenf., Biol. Meddel. Kongel. Danske Vidensk. Selsk. 3:136 (1921). — *Gnaphalodes filifolium* Benth., Fl. Austr. 3:578 (1867). — *Angianthus filifolius* (Benth.) C. A. Gardner, Enum. Pl. Austr, Occ. 135 (1931); Grieve & Blackall, W. Aust. Wildfls 811 (1975). TYPE: “Murray river, Oldfield.” HOLOTYPE: *Oldfield s.n.*, Tufts, low wet places, Murray R., W. Aust., s. dat. (K). ISOTYPE: MEL 84436 (see note 1).



*Angianthus humifusus* var. *minor* Benth., Fl. Austr. 3:563 (1867). TYPE: "Kalgan river, Oldfield." LECTOTYPE (here designated): *Oldfield* s.n., Kalgan River, s. dat. (K) (see note 2). PROBABLE ISOLECTOTYPES: K (mounted on lectotype sheet), MEL 84433.

*Annual herb*. Major axes decumbent to erect, 1-3(6.5) cm long, glabrous or variably hairy; stem simple or forming major branches at basal and/or upper nodes. *Leaves* often opposite at the base, the upper ones alternate,  $\pm$  linear or lanceolate, c. 0.5-1(1.7) cm long, c. 0.1 cm wide, at least the upper leaves mucronate, all leaves glabrous or sparsely hairy. *Compound heads*  $\pm$  ellipsoid or lanceoloid to very broadly ovoid, (0.6)1-2.4(2.7) cm long, c. 0.5-1.5 cm diam. *Capitulum* with c. 10-13 capitular bracts and paleae, all bracts obovate to widely obovate, 1.25-1.9 mm long, 0.65-1.4 mm wide, crenulate near the apex, white or pale pink. *Florets* c. 4-5; corolla 4 or 5-lobed, the tube distinctly swollen in the lower  $\frac{1}{2}$ , c. 0.35-0.65 mm long, 0.3-0.65 mm diam. *Achenes*  $\pm$  obovoid, c. 0.4-0.65 mm long, 0.2-0.3 mm diam., variably papillose. Pappus of 4-6 jagged scales joined at the base, 0.6-0.9 mm long, c. equal to or slightly exceeding the length of the floret. Fig. 15.

#### DISTRIBUTION (Fig. 15):

South-west of Western Australia being found within an approximately 200 km wide coastal belt.

#### ECOLOGY:

Data suggest that *S. filifolius*, like the closely related *S. humifusus* with which it commonly grows, is capable of growing in a variety of habitats. Collectors' notes include "Minor drainage channel in *Regelia* heath community . . . in open sandy sites", "on soil at base of granite rock in moist situations. Associated with *Angianthus* sp. under open *Acacia* scrub", "*Eucalyptus-Xanthorrhoea* community on deep grey sands. Growing c. 10 m from *Siloxerus humifusus*" and "Growing in open *Eucalyptus* woodland on brown sandy loam covered by coarse gravel. Growing with *Siloxerus humifusus*".

#### NOTES:

1. When describing *Gnaphalodes filifolium* Benth (1867) cited a collection made by Oldfield from the Murray River, Western Australia. This collection, said by Benth to consist of a single specimen, is housed at K. A duplicate of this collection, MEL 84436, also exists. Benth, as indicated by the initial B on the label, saw this specimen but apparently overlooked it when preparing his description of the species. The name *G. filifolium* does not appear on the sheet.

2. When describing the variety *Angianthus humifusus* var. *minor* Benth (1867) cited a single collection i.e., *Oldfield* s.n., Kalgan River. He described the taxon as having "Clusters of flower-heads and . . . flowers . . . much smaller" than var. *grandiflorus* (= *S. humifusus*) and "a pappus as nearly as long as the floret". The collection at K contains, as previously noted by Ostenfeld (1921), individuals belonging to two distinct taxa, namely *S. humifusus* and *S. filifolius*. The brief description of var. *minor* almost certainly refers to the latter species and indeed there is an envelope attached to the K sheet which contains a single specimen of *S. filifolius* and is clearly marked "var. *minor*, Kalgan river, Oldfield". This collection has been designated as the lectotype. Two further specimens of *S. filifolius* are mounted with specimens of *S. humifusus* and these too are marked as "var. *minor* Benth." However they are mounted on a separate piece of paper which has been subsequently attached to the main sheet and are referred to as probably isoelectotype material. The sheet also contains specimens of *S. humifusus* collected by Oldfield from the Kalgan River and the Gordon River, Western Australia.

A further Oldfield collection from the Kalgan River is located in MEL (MEL 84433). Although not named var. *minor* the specimens were seen by Benth (as indicated by the initial B) and are undoubtedly the same taxon. Unlike the lectotype collection it is marked with the number 84d. It is referred to here as a probable isoelectotype.

#### SELECTED SPECIMENS EXAMINED (7/43):

Western Australia — *Burbidge* 4977, 3 miles S. of Bunbury, 2.i.1956 (PERTH); *Burbidge* 7955, Twin Swamps Wildlife Sanctuary, 28.xii.1971 (CANB, PERTH); *Chinnock* 4334, Mt. Walker Rock, 10.xi.1978



(AD); *Demarz 5351*, Orleans Farm, 16.x.1974 (KP, PERTH); *Short 1056*, c. 10 km from Jarrahwood along road to Nannup, 22.xi.1979 (AD); *Short 1058*, c. 41 km from Kojonup along main Boyup Brook road, 23.xi.1979 (AD); *Willis s.n.*, North Twin Peak Island, 20.xi.1950 (MEL).

2. *Siloxerus humifusus* Labill., Pl. Nov. Holl. 2:57 (1806); Less., Syn. generum Comp. 270 (1832). — *Styloncerus humifusus* (Labill.) Spreng., Syst. Veg. 3:451 (1826); DC., Prod. 6:149 (1838); Steetz in Lehm. Pl. Preiss. 1:435 (1845). — *Ogcerostylus humifusus* (Labill.) Cass., Dict. Sci. Nat. 49:222 (1827); Steud., Nomen. Bot. 2nd ed. 2:242 (1841) ('*Oxerostylus*') (n.v.). — *Angianthus humifusus* (Labill.) Benth., Fl. Austr. 3:563 (1867); Grieve & Blackall, W. Aust. Wildfls 811 (1975). TYPE: "Habitat in terra Van-Leuwin." HOLOTYPE: ?*Labillardiere* s.n., habitat in terra van-Leuwin, s. dat. (FI).

*Styloncerus cylindraceus* Steetz in Lehm., Pl. Preiss. 1:435 (1845). TYPE: "In sinu regis Georgii III. mense Nov. 1840. Herb. Preiss. No. 41." LECTOTYPE (here designated): *Preiss 41*, In Nova Hollandia, (Swan-River Colonia) in sinu regis Georgii III, s. dat. (MEL 541624, ex herb. Steetz). ISOLECTOTYPES: LD, MEL 54151 (ex herb O. W. Sonder), S. (See p.152).

*Styloncerus suberectus* Steetz in Lehm. Pl. Preiss. 1:436 (1845). TYPE: "In arenosis terrae in ferioris, mense Dec. 1839. Herb. Preiss. no. 42." LECTOTYPE (here designated): *Preiss 42*, in arenosis terrae inferioris (Swan River Colonia), s. dat. (MEL 541622, ex herb. Steetz). ISOLECTOTYPES: LD, MEL 541623 (herb O. W. Sonder). (See p.152).

*Angianthus humifusus* var. *grandiflorus* Benth., Fl. Austr. 3:563 (1867), type as for *S. suberectus*.

*Annual herb*. Major axes decumbent to erect, 2-7(9) cm long, glabrous or variably hairy; stem simple or forming major branches at basal and upper nodes. *Leaves* often opposite at the base of the major axes, the upper ones alternate, all leaves  $\pm$  linear or lanceolate, (c. 1)1.5-3 cm long, c. 0.1-0.15 cm wide, glabrous or sparsely hairy, at least the upper ones mucronate. *Compound heads*  $\pm$  broadly ellipsoid or ovoid to broadly depressed ovoid, c. 0.6-2(2.9) cm long, (c. 0.5)0.7-1.2(1.3) cm diam. *Capitulum* with c.8-10 capitular bracts and paleae, all bracts oblanceolate to obovate, (c. 2)2.5-4.5(6.3) mm long, (0.7)0.9-1.7(1.9) mm wide, crenulate near the apex, white or pale pink. *Florets* c. 5; corolla 4 or 5-lobed, the tube distinctly swollen in the lower  $\frac{1}{2}$ , (c. 0.85)1-2(2.25) mm long, c. 0.3-0.5 mm diam. *Achenes*  $\pm$  obovoid, c. 0.7-0.95 mm long, c. 0.25-0.4 mm diam., variably papillose. Pappus of 5-7 jagged scales fused at the base, c. 0.95-1.7 mm long, c.  $\frac{1}{2}$  or rarely the length of the floret. Fig. 15.

DISTRIBUTION (Fig. 15):

South-west of Western Australia, within an approximately 200 km wide coastal belt.

#### ECOLOGY:

Grows in a variety of habitats. Collectors' notes include "Recently dried muddy depression in sandy swamp under *Acacia cyanophylla*", "Rush marsh . . . under shrubs of *Astartaea fascicularis* with *Cotula coronopifolia* and *Schoenus trachycarpus*", "*Eucalyptus-Xanthorrhoea* community on deep grey sands. Growing c. 10 cm from *Siloxerus filifolius*" and "Growing in open *Eucalyptus* woodland on brown sandy loam covered by coarse gravel. Growing with *Siloxerus filifolius*".

#### NOTES:

1. *S. humifusus* is primarily distinguishable from *S. filifolius* on differences in size of various organs, the achenes, capitular bracts, paleae, pappus scales and florets of *S. humifusus* being approximately twice the length of the same organs in the latter species. Such features suggest that *S. humifusus* may be of polyploid origin.

2. Bentham (1867) recognised two varieties of *Angianthus humifusus*, var. *minor* Benth. and var. *grandiflorus* Benth. The former variety is recognised here as a distinct species, *Siloxerus filifolius*. The latter variety was based on *Preiss 42*, the type collection of *Styloncerus suberectus* Steetz, which possesses larger capitular bracts and paleae (c. 4-6.3 mm long) than those of *Preiss 41*, (c. 3.7-4.2 mm long), the type of *Styloncerus cylindraceus* Steetz. Furthermore in *Preiss 42* the pappus is about one-half the length of



the floret whereas in *Preiss 41* it is approximately the length of the floret. Thus it is not surprising that in the past *S. suberectus* and *S. cylindraceus* have been recognised as different taxa. Initially it was felt that these separate taxa could be maintained. However, although extensive field studies have not been made, examination of other herbarium collections has shown that the recognition of two taxa is apparently not tenable, the size of the bracts and the ratio of pappus length to floret length being quite variable.

#### SELECTED SPECIMENS EXAMINED (6/97):

*Western Australia* — *Abbot 53*, Woody Island, Recherche Archipelago, ii.1976 (MEL); *Burbidge 7945*, Twin Swamps Wildlife Sanctuary, 11.i.1972 (CANB); *Burbidge 7962*, Twin Swamps Wildlife Sanctuary, 20.i.1972 (CANB, PERTH); *Congdon 75034b*, Blackwood River Estuary, 29.xi.1975 (PERTH); *Short 1055*, c. 1 km from Jarrahwod along road to Nannup, 22.xi.1979 (AD); *Short 1059*, c. 41 km from Kojonup along main Boyup Brook road, 23.xi.1979 (AD).

**3. *Siloxerus pygmaeus*** (A. Gray) Short, *Muelleria* 4:413 (1981). — *Chamaesphaerion pygmaeum* A. Gray, Hook. J. Bot. Kew Gard. Misc. 3:177 (June 1851). — *Chthonocephalus pygmaeus* (A. Gray) Benth., Fl. Austr. 3:582 (1867); Grieve & Blackall, W. Aust. Wildfls 820 (1975). TYPE: "South-western Australia, Drummond." LECTOTYPE: (here designated): *Drummond 55*, S.W. Australia, 1850 (K). ISOLECTOTYPES: GH (ex herb. Klatt), MEL 542228, PERTH (ex herb. K, ex herb. TCD).

*Gyrostephium rhizocephalum* Turcz., Bull. Soc. Naturalistes Moscou 24(2):77 (Oct. 1851). TYPE: "Nova Hollandia. Drum.V.n.55." HOLOTYPE: ? CW, n.v. (see p.000). ISOTYPES: GH (ex herb. Klatt), K, PERTH (ex herb. K, ex herb. TCD).

*Annual*, almost stemless herb consisting of a compound head surrounded by a basal rosette of c. 10-20(30) leaves. *Leaves* lanceolate, c. 0.5-1 cm long, c. 0.1 cm wide, glabrous or sparsely hairy, mucronate and usually with distinct hyaline margins at the base. *Compound heads* depressed ovoid, c. 0.4-0.6 cm long, 0.6-1.1 cm diam. *Capitulum* with (18)20-30 capitular bracts and paleae, all bracts narrowly elliptic to elliptic or sometimes oblanceolate to obovate, 3.2-4.2(4.5) mm long, (0.75)0.85-1.5 (1.85) mm wide, white. *Florets* c. 10-20; corolla 3- or rarely 4-lobed, the tube tapering gradually to the base, 1.5-1.8(2.1) mm long, 0.2-0.25 mm diam. *Achenes*  $\pm$  obovoid, 0.6-0.75(0.85) mm long, 0.3-0.5 mm diam., papillose. Pappus a jagged ring c. 0.15-0.45 mm long. Fig. 15.

Chromosome number:  $n = c. 12$  or  $13$ .

#### DISTRIBUTION (Fig. 15):

South-west of Western Australia, occurring south of latitude c. 30°S and between longitudes c. 117°E and c. 122°E.

#### ECOLOGY:

Generally restricted to saline, sandy soils surrounding inland salt lakes but also found at the base of granite outcrops. Collectors' notes include "Granite outcrops . . . Sandy loam amongst *Eucalyptus* woodland at base of rock", "White to greyish sand between *Melaleuca* and extending into *Arthrocnemum* [= *Halosarcia*] zone around salt depression" and "Growing in open areas on pale brown, very sandy loam between *Melaleuca* and *Eucalyptus* above saline depression".

#### NOTE:

1. Apparently mature achenes of this species exhibit marked size differences within any one compound head. Some fruits are c. 1½ times larger than the majority. It is difficult to ascertain their exact location but they appear to occur on the outer margins of the compound heads. The larger fruits generally appear to germinate several days earlier than the smallest ones in the heads. Such a staggering of germination times may be of adaptive value in areas of low, unreliable rainfall; that is unless sufficient moisture is available for a prolonged period of time the smaller achenes will remain dormant. A better food supply in the larger fruits may ensure their survival in adverse conditions. *S. pygmaeus*, at least in part of its range, does occur in a low rainfall area. Furthermore southern Australia has experienced greater cycles of aridity in the recent past than have occurred throughout the Tertiary period.



## SELECTED SPECIMENS EXAMINED (7/18):

*Western Australia* — *Chinnock* 4160, c. 3.5 km W. of western edge of Lake King, 26.ix.1977 (AD); *Chinnock* 4598, Phillips River, 17 km W. of Ravensthorpe, 8.x.1979 (AD); *Newbey* 4342, 16 km N. of Needilup, 4.ix.1974 (PERTH); *Short* 660, Roe Dam, 23.ix.1977 (AD); *Short* 678, 1 km E. of Wave Rock, 25.ix.1977 (AD); *Short* 949, western edge of Lake Campion, 14.xi.1979 (AD); *Short* 1071, c. 10 km SW. of Pingrup, 23.xi.1979 (AD).

## SPECIES OF UNCERTAIN AFFINITY

In this revision a number of species referred to *Angianthus* by Benth. (1867) are considered to belong to distinctive, segregate genera. However there are three species, namely *A. axilliflorus*, *A. burkittii* and *A. connatus* which clearly have no affinities with *Angianthus* s.str. or any of the segregate genera. They may represent monotypic genera or have affinities with other members of the Gnaphaliinae not yet examined by the author. For the time being it seems appropriate to refer *A. burkittii* to *Gnephosis*, the genus to which the species was originally referred by Benth. (l.c.).

Lectotypes have been chosen for the above three species and various attributes of each are noted below.

***Angianthus axilliflorus*** W. V. Fitzg. ex. Ewart & J. White, Proc. Roy. Soc. Vict. 22:315, pl. 56, figs. 1-3, (1909) ('*axiliflorus*'); W. V. Fitzg., J. Bot. 50:21 (1912); Grieve & Blackall, W. Aust. Wildfls 812 (1975) ('*axiliflorus*'). TYPE: Cowcowing, W. Australia. Max Koch, Oct., 1904. No. 1196." LECTOTYPE (here designated): *Koch* 1196, Cowcowing, 1904 (MEL 541217). ISOLECTOTYPES: AD, MEL 541218, MEL 541219, NSW (2 sheets), PERTH (see note 1 below).

## NOTES:

1. Ewart & White (1909), working in Melbourne, noted that the "species was received, marked W. V. Fitzgerald inedit. from both the collector and the Sydney Herbarium" (p. 316). All three MEL sheets bear good specimens but MEL 541217, the sheet containing the specimens received from NSW and the only one marked with the word "ined.", has been chosen as the lectotype.

2. The rigid, leaf-like capitulum-subtending bracts and the arrangement of the capitular bracts readily distinguish this species from all others included in *Angianthus* s.l.

3. The species is apparently rare. Apart from the type material the only other collection of the species seen by the author is *Blackall* 1276, collected from the edge of a salt lake near Newdegate, Western Australia in 1931.

***Angianthus connatus*** W. V. Fitzg., J. West. Aust. Nat. Hist. Soc. 2:24 (1905); Grieve & Blackall, W. Aust. Wildfls 816 (1975). TYPE: "Minginew.-W. V. F., September, 1903." LECTOTYPE (here designated): *Fitzgerald* s.n., Minginew, W.A., -ix.1903 (NSW 138682). ISOLECTOTYPES: NSW 138683, PERTH (ex W. E. Blackall) (see note 1 below).

## NOTES:

1. Both of the NSW collections, unlike the PERTH collection, are clearly designated as coming from Fitzgerald's herbarium. Of the two sheets NSW 138682 contains the best material and therefore has been designated as the lectotype. The remaining one, NSW 138683, has the word "type" written on the label, possibly in Fitzgerald's hand, but there is no reason to believe that Fitzgerald did not base his description on all of the material available to him.

2. The species is known only from the type collection. It is readily distinguished from other members of *Angianthus* s.l. by the presence of long hairs at the base of the florets or apex of the achenes and the rigid, opaque capitulum-subtending bracts. The morphology of the capitular bracts is also unique.

***Gnephosis burkittii*** Benth., Fl. Austr. 3:570 (1867). — *Angianthus burkittii* (Benth.) J. M. Black, Fl. S. Aust. 1st ed. 645, pl. 53 (1929), 2nd ed. 925, fig. 1227 (1957); Hj. Eichl., Suppl. to J. M. Black's Fl. S. Aust. 326 (1965); Willis, Handb. Pl. Vict. 2:730



(1973); Grieve & Blackall, W. Aust. Wildfls 813 (1975). TYPE: "Lake Gillies, Burkitt." LECTOTYPE (here designated): *Burkitt s.n.*, Lake Gillies, s. dat. (MEL 541211). ISOLECTOTYPE: K (see note 1 below).

*Angianthus whitei* J. M. Black, Trans & Proc. Roy. Soc. S. Aust. 37:122, pl. 4 (1913). TYPE: "Corunna Station, Eyre Peninsula, August, 1912." LECTOTYPE (here designated): *White s.n.*, Corunna Statn., W. of Pt. Augt., near Lake Gilles, 27.viii.1912 (AD 98103150). ISOLECTOTYPES: MEL 541611, NSW 7831/13.

#### NOTES:

1. Both of the sheets containing type material of *G. burkittii* were seen by Bentham. The MEL sheet contains by far the better collection and thus has been chosen as the lectotype.

2. The reddish, prostrate or ascending major axes, the woolly compound heads and the pappus of 8-12 barbed bristles readily distinguish this species from others included in *Angianthus s.l.* The capitular bracts are also unique to this species.

#### NAMES OF UNCERTAIN APPLICATION

Bentham (1867) described as new a species he called *Angianthus plumiger*. His description was based on collections made by Oldfield from the Swan and Murchison rivers. It could be expected that type specimens of this species would be housed in K and/or BM but apparently no collections of this taxon exist in either institution (A. A. Munir & J. Lewis, pers. comms, 1980). No specimens have been located in E or any Australian herbaria. From the description it seems that the name should not be applied to any species, old or new, described in the current revision of *Angianthus s.l.*

Cassini (1820) described as new the genus *Hirnellia* and attributed to it a single species *H. cotuloides* Cass. De Candolle (1838) regarded *H. cotuloides* as a possible synonym of *Angianthus tomentosus* but it was not listed as such by Bentham (1867) and subsequent workers on the Australian flora. It has not been possible to view type material but from the published description it appears that the name is not a synonym of *A. tomentosus*.

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