

The classification of the genus *Waitzia* Wendl. (Asteraceae: Gnaphalieae)

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Abstract

Wilson, Paul G. The classification of the genus *Waitzia* Wendl. (Asteraceae: Gnaphalieae). *Nuytsia* 8(3): 461-477 (1992). The circumscription of *Waitzia* is discussed and a narrow generic concept proposed. Five species and two infraspecific taxa are recognised. A key is provided and full synonymy given. One new species combination, *W. nitida*, is made; two new varieties are described. *Waitzia citrina*, *W. conica* and *W. paniculata* are excluded from the genus.

Introduction

During an ongoing investigation into the taxonomy of the Australian species placed in *Helipterum* DC. and *Helichrysum* Miller it became evident that the genus *Waitzia* Wendl. (1808) should also be studied since some of the species included in it appeared to be closely related to species of *Helipterum* and *Helichrysum*. Further investigation indicated that as currently accepted it was polyphyletic. However, with three of the taxa transferred to other genera it consists of five closely related species. The characters that have been used to discriminate these related species in Floras and in revisional papers over the past 150 years have not permitted them to be correctly distinguished. Moreover an examination of specimens in Australian and some overseas herbaria, including specimens studied by George Bentham (1867) and Ferdinand Mueller (1896), indicated that botanists have always had confused concepts of the taxa. I have therefore investigated the taxonomy of the genus and have endeavoured to place it in the context of its related taxa.

Since the family Asteraceae will shortly be written up and published in vols 37 and 38 of the Flora of Australia I have only provided descriptions for the infraspecific taxa. Because of the absence of species descriptions I have included in the key rather more detail than is strictly necessary for the purpose of identification.

Historical

Waitzia Wendl. (1808) was the third generic name published in the *Helipterum* - *Helichrysum* complex that was based on an Australian plant, the two earlier names being *Podolepis* Labill. (1806) and *Podosperma* Labill. (1806) (*nom.rej.* = *Podotheca* Cass.), both of which are relatively distinct

from the remainder of the complex (Short 1989) and do not affect the application of Wendland's name. The delimitation of *Waitzia* is thus clearly of particular significance, since, depending on its circumscription, it could encompass a few or numerous species in the *Helipterum* - *Helichrysum* complex.

The name *Waitzia* Wendl. (1808) was based on *W. corymbosa*, a plant cultivated in the royal gardens of Herrenhausen in Germany. The origin of the plant was indicated as doubtfully 'Neu-Holland'. The plant illustrated and described is of a species found only near the west coast of Western Australia from about 160 km north of Geraldton to Shark Bay. It is probably from the Shark Bay region that the seed originated since this is the only portion of that general area that had been visited by plant collectors prior to 1808. The generic name was ignored by early 19th century botanists including de Candolle (1838) and Bentham (1837) but recognised by Steetz (1845) who correctly synonymized under it *Viraya* Gaudich. (1830) and *Morna* Lindley (1837). Bentham (1837) treated a number of species under *Leptorhynchus* Less. (1832) which were later accepted as such by de Candolle (1838) but which Steetz (1844) transferred to *Waitzia* and Bentham (1867) later accepted as belonging here.

The genus *Viraya* was described by Gaudichaud (1830) who based it on a plant collected from Shark Bay. The name was considered by de Candolle (Jan. 1838) to be a later homonym of *Vireya* Blume (1826), *Vireya* Raf. (1814), and *Vireo* Adans. (1763). He also considered that the name should be spelt *Vireya* (since it honoured J.-J. Virey) and would then be a precise homonym of Blume's generic name. De Candolle therefore placed *Viraya* Gaudich. (1830) in synonymy under *Leptorhynchus* Less. (1832) even though the latter name was published two years after the former. Under *Leptorhynchus* two informal sections were recognised by de Candolle; the first 'section' he associated with the name '*Aphanorhynchus* Less. syn. 273' and placed under it those species with short achene beaks (which included the two syntype species of *Leptorhynchus*), while the second 'section' he associated with the name *Viraya* Gaudich. and placed under it species with long beaks (which included species now placed in *Waitzia*). Lessing does not appear to have published the name to which his authorship was attached and its use by de Candolle was therefore possibly the result of personal communication between the two botanists for it is known that de Candolle widely distributed draft copies of his Compositae 'Prodromus' treatment some years before its publication (Wilson 1989). Use of the name by de Candolle may also have been due to the long illness that he suffered about this time. His illness delayed publication of the Compositae treatment and was probably responsible for numerous errors in its text (Bentham 1873b). The monotypic genus *Morna* Lindley (1837) was also recognised by de Candolle (1838) but with an indication of uncertainty since he had seen no material. Later Endlicher (June 1838) formally published the name '*Leptorhynchus* a. *Aphanorhynchus*' (without indication of rank) based on *Chrysocoma squamata* Labill. (the type of *Leptorhynchus*). Endlicher also adopted de Candolle's other informal section but called it '*Leptorhynchus* b. *Morna*', not 'b. *Viraya*', since he similarly considered the name *Viraya* Gaudich. to be illegitimate (a later homonym) while he recognised *Morna* Lindley to be a synonym of it.

Meissner (1839) recognised *Morna* and *Leptorhynchus* as separate genera and clearly discriminated the two. However Reichenbach (1841) once more united them but under the name *Aphanorrhynchus* which he published as a replacement for *Leptorhynchus* Less. since the latter, he explained, was illegitimate having been used already for a genus of insects; he again recognised *Morna* as an infrageneric group. These infrageneric names were given the formal rank of *sectio* by Pfeiffer (1873).

Therefore, until 1845, botanists recognised only one genus for the taxa now placed in *Leptorhynchus* and in *Waitzia* (the recognition of *Morna* by de Candolle and Meissner being due to lack of personal knowledge of its type species). Since the generic name *Waitzia* had been overlooked, and because

Viraya Gaudich. (1830) was considered to be a later homonym, the name *Leptorhynchus* (1832) was by some botanists accepted as correct; while those who considered that plant names should not duplicate names already applied to animals the name *Aphanorrhynchus* Reichb. (1841) was accepted.

In 1845 Steetz resurrected the name *Waitzia* Wendl. (1808) and clearly distinguished the genus from *Leptorhynchus* on the lines previously adopted by Meissner. He also described the monotypic genus *Pterochaeta* which he considered to be intermediate between *Waitzia* and *Helipterum*. This name was synonymized under *Waitzia* by Bentham (1867) along with *Viraya* and *Morna*.

Changes made since Bentham (1867) have been at the species level. In 1883 Mueller misapplied the name *Waitzia podolepis* (Gaudich.) Benth. to a plant collected by 'Polak' near the Gascoyne River and provided a description. The species represented by this collection has since been described as *Waitzia conica* B. Turner (1966). Mueller posthumously (1896) published corrections to the various *Waitzia* species names used by Bentham and these amendments were later accepted by Diels and Pritzel (1905) who also discussed the ecology and distribution of the various taxa. They indicated that *W. steetziana* (i.e. *W. citrina*) was distinct from *Waitzia s.str.* and a derivative of *Helipterum* while *W. paniculata* they considered to be of a very different origin again.

I agree with Diels and Pritzel that both *Waitzia citrina* and *W. paniculata* are anomalous in this genus and, along with the subsequently described *W. conica*, I have transferred them to other genera (Wilson 1992a). *Waitzia paniculata* is transferred to the monotypic genus *Pterochaeta* as *P. paniculata* Steetz, *W. citrina* to the expanded genus *Rhodanthe* as *R. citrina* (Benth.) Paul G. Wilson, and *W. conica* to the new genus *Haptotrichion* as *H. conicum* (B. Turner) Paul G. Wilson.

Generic affinities

The genus *Waitzia* was placed in the tribe Gnaphalieae subtribe Helichryseae by Bentham (1867) and later (1873a) in the tribe Inuleae ('Inuloideae') subtribe Gnaphalieae series Helichryseae. The latter classification at tribal level has been accepted until recently. Anderberg (1989) provided a history of the various classifications and proposed a reassessment of the Inuleae *sensu lato* in which the Gnaphalieae *s.str.* is recognised as a distinct tribe. The genus *Waitzia*, Anderberg concluded, should be placed in the Gnaphalieae *s.str.* to form part of the 'Waitzia clade' along with the genera *Leptorhynchus*, *Podolepis*, *Asteridea*, and some Australian *Helipterum* and *Helichrysum* species. Anderberg later (1991) indicated that *Waitzia* should be placed in the *Waitzia* group of the subtribe Angianthinae along with *Gratwickia*, *Chrysocephalum*, *Leptorhynchus*, *Asteridea*, *Podolepis*, and *Triptilodiscus* all of which had involucre bracts with divided stereomes; he pointed out that as currently circumscribed *Waitzia* was polyphyletic and that *W. citrina* differed from the other species in having an undivided stereome and in lacking the diagnostic trichomes on the achenes.

I concur with Anderberg as to the relationship of *Waitzia sensu stricto* to these genera and accept his tribal and subtribal classification.

The position of *Waitzia* within the 'Waitzia group' requires an explanation. The genus *Waitzia* had been associated by Bentham (1867, 1873a) and by later authors with *Leptorhynchus* Less., *Helipterum* DC., *Helichrysum* Miller, *Ixiolaena* Benth., and *Asteridea* Lindley (as *Athrixia*).

The two genera *Leptorhynchos* and *Asteridea* form a close knit group the species of which possess organs that share a number of similar characters. The narrow elliptic achenes (with or without a neck) have a thin translucent pericarp with 2-celled tooth-like papillae with one cell overtopping the other (Anderberg 1989), a thick soft testa free from the pericarp, and persistent barbellate pappus bristles; the corolla tubes are curved and overhang the involucre with the vascular strands passing to the apex of the corolla lobes; the apical appendages of the anther are small (c. 0.2 mm long) and are made up of unthickened cells, and the style apices are relatively small and truncate.

Waitzia, in the strict sense, consists of plants with linear leaves, an arachnoid and glandular-stipitate indumentum, capitula with scarious bracts that have terete glandular stipes (linear in the innermost two series), apical appendages of anther relatively large (ovate, c. 0.5 mm long, with narrow-oblong unthickened cells), deltoid to narrowly elliptic style apices in which the stout vascular strand extends to the tip, achenes with slender necks and 2-celled tooth-like papillae in which the lower cell overtops the upper, pericarp thin and transparent, testa thick and ruminant with oblong crystals and with oblong epidermal cells that are regularly corrugate on their margins, pappus bristles barbellate and shortly united at the base with the pappus eventually deciduous as a whole from the apex of the achene neck.

The genera *Helipterum* and *Helichrysum* (in Australia) are a polyphyletic assemblage of species (Anderberg 1989, Wilson 1989) and it is to some members of these genera, in particular to the *Helipterum albicans* group of species, that *Waitzia* is clearly allied. The *Helipterum albicans* group, which is referred to the genus *Leucochrysum* (DC.) Paul G. Wilson (Wilson 1992b), consists of *Helipterum albicans* (A.Cunn.) DC., *H. fitzibbonii* F. Muell., *H. albicans* var. *graminifolium* Paul G. Wilson, *H. molle* (DC.) Paul G. Wilson, and *H. stipitatum* (F.Muell.) Benth. These five species resemble *Waitzia* in indumentum, leaf-shape, and in the morphology of the involucre bracts, corolla, anthers, and style apices. The species differ from *Waitzia s.str.* in habit, in having plumose pappus bristles that are shed by breaking shortly above the base, in the lack of an achene neck, and in the absence of 2-celled tooth-like achene papillae.

Morphological characters

The characters used in the past to distinguish the species of *Waitzia* sect. *Waitzia* have been based largely on the colour and shape of the involucre bracts. This has led to some confusion since two of the species have both white and yellow variants and a range of bract shapes. It has therefore been necessary to incorporate other characters into the discrimination of the species. These additional characters are found in the indumentum, capitulum shape, and in the arrangement, relative size, and surface texture of the bracts.

Indumentum. All species have some septate-flagellate hairs (Ramayya 1962) on leaves and stem. The flattened oblong cells of the biseriate to uniseriate proximal portion of the hairs vary in number with species and with their position on the plant while the uniseriate filiform distal portion varies considerably in length. Depending on the density of the hairs and the lengths of the proximal and distal portions the indumentum can be rough or smooth and thinly to densely arachnoid.

Most of the species also have biseriate or uniseriate capitate glandular hairs on the leaves and stem, or these may be restricted to the branches of the inflorescence. In *Waitzia acuminata* and *W. nitida*

they are absent (except on the stipes of the involucre bracts). Both types of hairs are sometimes shed above the base to leave a short hard projection that produces a rough surface to the leaf. The glandular hairs on the stipes of the bracts have a single globular cell at the apex.

Sessile globular glandular hairs are present on the leaves and branches of some species in addition to the longer hairs.

Leaf shape. In all species the leaves are sessile, linear to very narrowly oblong (or the basal leaves very narrow-obovate) and usually with the margin recurved, at least on drying. The upper leaves may be slightly decurrent and sometimes semiamplexicaul. Variation within a species is considerable and probably largely environmentally induced since plants in cultivation have, in general, broader and flatter leaves than their wild counterparts.

Involucre. This can be hemispherical, cup-shaped or, in *W. acuminata*, turbinate at the base with the involucre bracts descending along the peduncle.

Involucre bracts (see Figure 1). The bracts, except for the innermost two series, have stipe-like claws that are shortly glandular pilose and arachnoid; the lamina varies from ovate-cordate to narrowly triangular, obtuse to acute or acuminate, entire to fimbriate-serrate. The two innermost series of bracts have linear claws with a shortly glandular pilose stereome and a narrow scarious margin; the lamina is very small, scarious, and white or coloured.

The surface of the laminae may be smooth or minutely roughened due to the emergent distal ends of some of the epidermal cells. In *W. corymbosa* the two innermost series of involucre bracts lengthen during anthesis to well exceed the intermediate and outer bracts. The outer and intermediate involucre bracts may remain erect, or become reflexed or spreading during anthesis.

Pappus (see Figure 2). The pappus bristles are barbellate (or pilose at the base) and eventually deciduous as a whole from the achene neck. They are generally colourless, white, or faintly tinged with yellow near the base, except in *W. nitida* in which the distal half of the pappus is always pale yellow.

Mycorrhizal relationship. *Waitzia* species form ectomycorrhiza as do species in *Leucochrysum* and in *Leptorhynchos* (Warcup 1990). In this they differ from species in the *Rhodanthe* complex.

Achene venation. The species of *Waitzia* have a very short vascular strand in the testa which contrasts with the situation in *Leucochrysum* in which the strand passes to the apex of the seed. The vascular strands of the testa and pericarp are arranged in a lateral position in relation to the cotyledons which is the same position as is found in *Leucochrysum*.

Chromosome numbers. Turner (1970) has recorded a count of $n = 10$ for *W. nitida* and of $n = 12$ for *W. suaveolens*. No count has been published for the species now placed in *Leucochrysum*.

Hybridization

Hybridization between species appears to be rare in *Waitzia* and only two possible cases have been observed.

A collection from Kojonup (*Meebold* 7323, PERTH) consists of specimens that appear to have been gathered from a hybrid swarm involving *W. acuminata* subsp. *acuminata* and *W. suaveolens* var. *suaveolens*.

Some specimens gathered between Kalbarri and Geraldton appear to be intermediate between *W. suaveolens* var. *suaveolens* and *W. acuminata* subsp. *albicans*. They have bracts that are only very faintly scabridulous and are somewhat intermediate in shape between those of the putative parents, while some of the specimens lack the stipitate glands that are present in *W. suaveolens* but absent in *W. acuminata*. Examples are: *R.C.Wemm* 1111B, *D. & N. McFarland* 1203, *M.G.Corrick* 8122, and *A.J. Cough* 269, all PERTH.

Both of the putative parents are found near the area where these specimens were collected.

Waitzia Wendl.

Wendl., Coll. Pl. 2:13 t.42(1808). *T: Waitzia corymbosa* Wendl.

Viraya Gaudich. in Freyc., Voy. Uranie 466 t.89(1830); Post et Kuntze, Lexicon Gen. Phan. 590(1903) '*Vireya*' pro syn. sub *Waitzia*. - *Leptorrhynchus* sect. *Viraya* (Gaudich.) DC. ex Pfeiffer, Nom. Bot. 2:86(1874). *T: Viraya podolepis* Gaudich.

Morna Lindley, Bot. Reg. t.1941(1837). - *Aphanorrhynchus* 2. *Morna* (Lindley) Reich., Deut. Bot. Herb.-Buch. 1:90(1841) nom.illeg. - *Aphanorrhynchus* sect. *Morna* (Lindley) Reich. ex Pfeiffer, Nom. Bot. 1:229(1873) nom.illeg. - *Leptorrhynchus* b. *Morna* (Lindley) Endl., Gen. Pl. 445(1838). - *Leptorrhynchus* sect. *Morna* (Lindley) Endl. ex Pfeiffer, Nom. Bot. 1:229(1873). *T: Morna nitida* Lindley.

Note: The generic name *Aphanorrhynchus* (Endl.) Reich. (1841) is ultimately based on *Leptorrhynchus* Less. (1832). The latter name was considered by Reichenbach to be illegitimate since there existed an insect genus *Leptorrhynchus*.

Annual erect herbs, sparsely to moderately cobwebby with septate flagellate hairs with or without stalked glandular hairs (that may leave a hard base when shed to form a scabrid surface). Leaves alternate, linear to narrow-oblong, sessile, margin mostly recurved on drying. Inflorescence terminal, cymose, the uppermost leaves grading into linear capitula-subtending bracts (or these with scarious narrow-elliptic laminae) that grade into the outer involucre bracts. Involucre ± hemispherical to turbinate. Outer and intermediate bracts multiseriate, stipitate; stipe terete with divided stereome, with stalked glandular hairs and ± cobwebby; lamina scarious, ovate or narrow-triangular, entire to serrate, smooth or minutely scabridulous from the emergent distal apices of the epidermal cells, white to violet, yellow or gold, erect or at length spreading or reflexed on the stipe. Innermost bracts erect, shorter than or exceeding intermediate bracts; stipe linear with narrow scarious margin and prominent

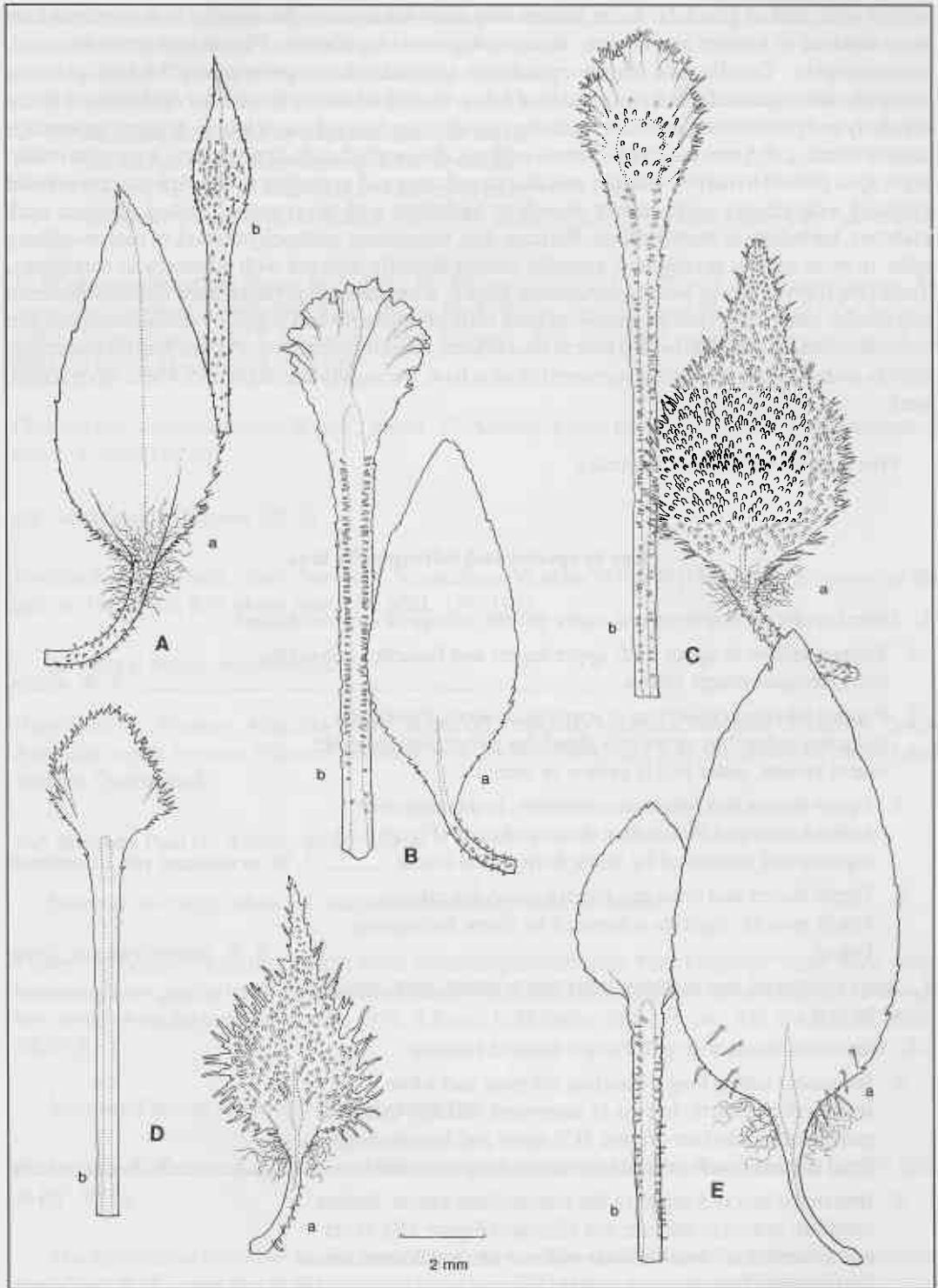


Figure 1. Intermediate and inner involucral bracts of *Waitzia* species. A - *W. nitida*. B - *W. podolepis*. C - *W. corymbosa*. D - *W. acuminata* var. *acuminata*. E - *W. suaveolens* subsp. *suaveolens*. (a - intermediate bract; b - inner bract.) A from R. Saffrey 147. B from W. Blackall 563. C from P Wilson 12198. D from P. Wilson 12036. E from J. Koch 465.

midrib with stalked glandular hairs; lamina very short otherwise either similar to the intermediate bract-laminae or hyaline and minute. Receptacle rounded, glabrous. Florets numerous, bisexual, actinomorphic. Corolla tube narrow-cylindrical, turbinate above, prominently 5-lobed, glabrous except for short glandular hairs on outside of lobes, smooth within; cells of inner epidermis of throat regularly and prominently undulate; vascular strands extending to base of lobes. Anthers: appendage narrow-ovate, c. 0.5 mm long; cells narrow-oblong, thin-walled; tails slender, firm, \pm equal to collar. Style apex deltoid to narrow elliptic; vascular strand stout and extending to tip. Achene compressed ellipsoid with slender neck, almost smooth or barbellate with myxogenic 2-celled papillae; neck glabrous, barbellate or shortly pilose. Pericarp thin, translucent, collenchymatous, of narrow-oblong cells, in most species myxogenic; vascular strands laterally oriented with reference to cotyledons. Testa free from pericarp, weakly coriaceous, brown, with scattered crystals; apex laterally flattened and sterile; outer epidermis of narrow-oblong cells prominently and regularly undulate on margin; vascular strand confined to base or to near base of seed, laterally orientated. Pappus bristles numerous, shortly united at base, dentate, sometimes pilose at base, eventually deciduous as a whole from achene neck.

Five species endemic to Australia.

Key to species and infraspecific taxa

1. Inner involucre bracts yellow, outer yellow, orange or straw-coloured
 2. Pappus yellow in upper half; upper leaves and branches cobwebby, not glandular; bracts yellow 3. *W. nitida*
 2. Pappus white or colourless in upper half; upper leaves and branches cobwebby or shortly glandular pilose; intermediate bracts yellow, outer bracts yellow or orange
 3. Upper leaves and branches cobwebby, bracts minutely scabridulous and descending down peduncle (Figure 1A), capitula not subtended by linear herbaceous bracts 1. *W. acuminata* var. *acuminata*
 3. Upper leaves and branches shortly glandular pilose; bracts smooth; capitula subtended by linear herbaceous bracts 5. *W. suaveolens* var. *flava*
1. Inner involucre bracts white, outer bracts white, pink, orange, or brown
 4. Innermost bracts with pale brown mottled laminae
 5. Innermost bracts long exceeding the pink and white intermediate bracts; lamina of innermost variably crinkled, prominently ciliolate (Figure 1C); outer and intermediate bract-laminae soon reflexed on stipes, long acuminate 2. *W. corymbosa*
 5. Innermost bracts \pm equal to the intermediate bracts, lamina crinkled, minutely dentate, not ciliolate (Figure 1B); outer and intermediate bract-lamina white or straw coloured, not or tardily spreading, acute to obtuse 4. *W. podolepis*
 4. Innermost bracts with white or hyaline laminae

6. Capitula not obviously subtended by linear herbaceous bracts. Involucral bracts acuminate, slightly rough (Figure 1D); upper branches and leaves somewhat cobwebby not shortly glandular pilose 1. *W. acuminata* var. *albicans*
6. Capitula subtended by linear herbaceous bracts. Involucral bracts acuminate to acute or obtuse (Figure 1B); upper branches and leaves shortly glandular pilose with or without cobwebby hairs 5. *W. suaveolens* var. *suaveolens*

1. *Waitzia acuminata* Steetz in Lehm., Pl. Preiss. 1:453(1845). (Figure 2). Type citation: 'In Australasia orientali-occidentali leg. c. Preiss. Herb. Preiss. sine No. Roe! Drummond! (V.s. in herb. aulico Vindobonnense!)'. *Lectotype* (here chosen): *Roe s.n.* (W); *syntypes*: *Preiss s.n.* (LD, MEL 221975), *Drummond 286* (W).

[*Waitzia corymbosa* auct. non Wendl.: Benth., Fl. Austral. 3:635(1867); Chittenden, Dict. Gardening edn 2, 4:2258(1977)]

var. ***acuminata*** (Figures 1D, 2)

Waitzia discolor Turcz., Bull. Soc. Imp. Naturalistes Moscou 24/1:194(1851). *T*: *J. Drummond* 4th coll. n. 198 (holo: KW photo seen; iso: MEL 1585193).

Involucral bracts orange-yellow.

Distribution. Western Australia south of the 23° latitude, southern Northern Territory, South Australia, north western Victoria, western New South Wales, and extreme southern central and western Queensland.

var. ***albicans*** Paul G. Wilson, subsp. nov.

Bractae involucri albae vel bracteis exterioribus violaceo-rubrae.

Typus: Western Australia, 21 km from Northampton towards Port Gregory, 'buds deep pink, becoming more pale as head opens and eventually white, disc florets yellow, numerous plants amongst low scrub on rocky outcrop', 6 Oct. 1972, *S. Paust* 1258 (holo: PERTH; iso: AD, CANB, K, MEL, NSW, S).

Involucral bracts white or the outer violet-red.

Distribution. Western Australia, near the west coast between York and Hamelin Pool (c. 31° 30'S to 26° 30'S).

The distribution of the two varieties overlaps between Hamelin Pool and Geraldton but I have seen no evidence to suggest that in this area they grow together in the same locality. However, collections made by J.H. Gregory at Northam in 1901 and by Keighery & Alford c. 17 km west of York in 1985 (both PERTH) are of a mixture of both varieties. These two localities are at the southernmost

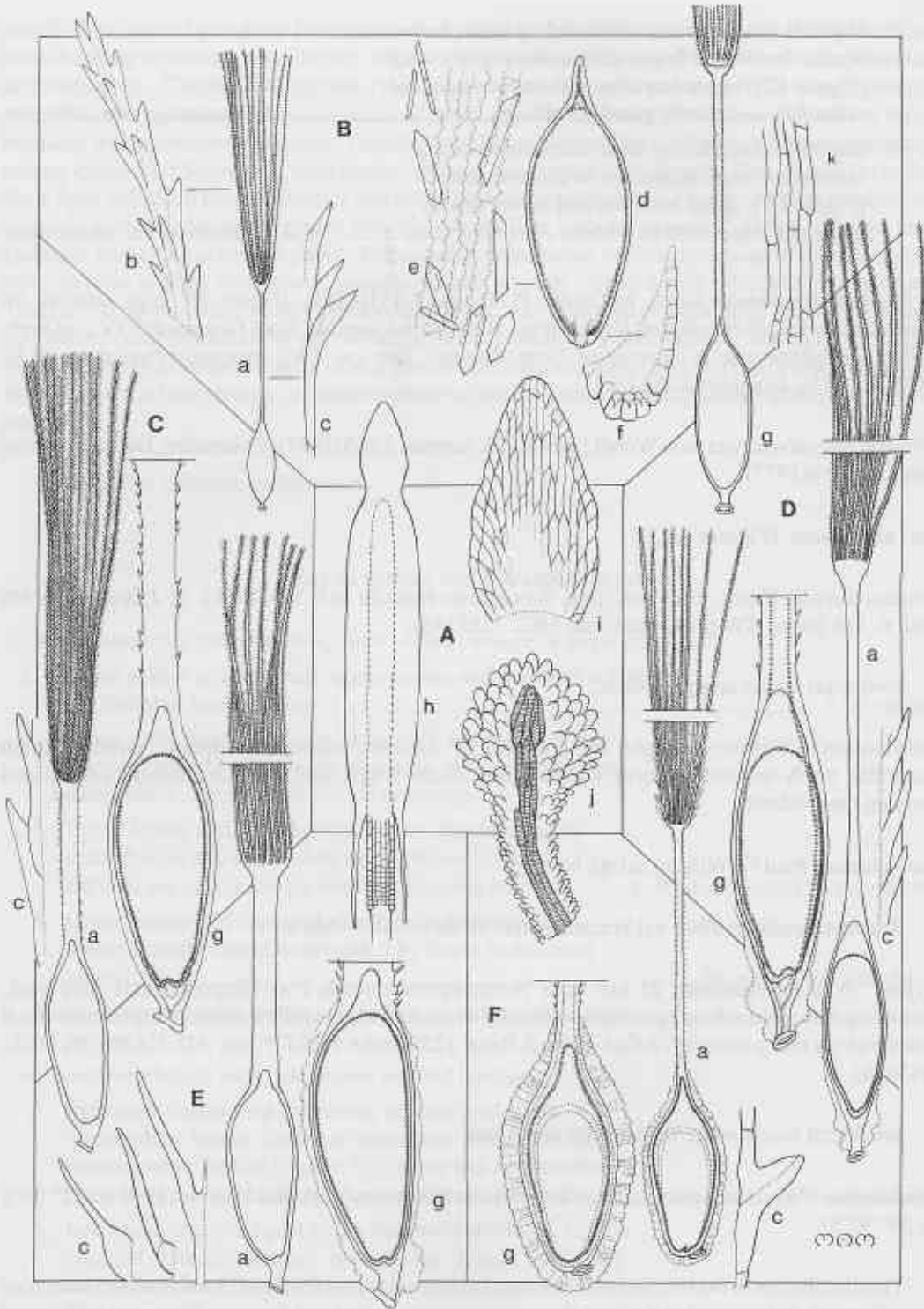


Figure 2. A & C - *Waitzia suaveolens*. B - *W. acuminata*. D - *W. corymbosa*. E - *W. podolepis*. F - *W. nitida*. (a - achene with pappus; b - apex of pappus bristle; c - barbellate hairs of achene neck; d - seed removed from pericarp; e - surface view of testa showing undulate cells and calcium oxalate crystals; f - basal portion of testa; g - achene; h - anther; i - anther appendage; j - style apex; k - surface view of cells of pericarp.)

A & C from R. Royce 4731. B from A.S. George 8437. D from P. Wilson 12198. E from H. Demarz 8996. F from R. Saffrey 147.

distribution of var. *albicans* and the westernmost distribution (at that latitude) of var. *acuminata*. Where the two varieties grow together they differ only in the colour of the involucre bracts.

2. *Waitzia corymbosa* Wendl., Coll. Pl. 2:13, t.42(1808). - *W. corymbosa* f. *wendlandiana* Steetz, Pl. Preiss. 1:451(1845) excluding specimen cited, *nom. illeg.* - *W. corymbosa* var. *wendlandiana* (Steetz) Diels & Pritz., Bot. Jahrb. 35:626(1905) *nom. illeg.* Type citation: 'Das Vaterland: Neu-Holland?' *Lectotype* (here chosen): Wendland *op.cit.* t. 42. (Figures 1C, 2D)

Distribution. Shark Bay south to Kalbarri.

The name *Waitzia corymbosa* has been incorrectly used by previous authors. The species was unknown to Bentham (1867) who misapplied the name to plants of *W. acuminata*, and unknown to Mueller (1896) who misapplied the name principally to collections of *Waitzia suaveolens* var. *suaveolens*. Diels and Pritzl (1905) considered it to be conspecific with *W. nivea* (i.e. to *W. suaveolens*). The name was omitted by Grieve and Blackall (1975) who included the species under the misapplied name *W. podolepis*.

The specimen on which Wendland based his description could not be found in the Wendland herbarium (herb. GOET), *fide* G. Wagenitz, pers. comm. I have therefore designated the illustration that accompanied the description as the lectotype.

3. *Waitzia nitida* (Lindley) Paul G. Wilson, comb. nov. (Figures 1A, 2F)

Morna nitida Lindley, Bot. Reg. t.1941(1 March 1837). Type citation: 'inhabiting the dry country about the Swan River, whence it was introduced in the year 1835, by Sir James Stirling. The first time it was publicly seen in this country was at one of the great exhibitions held in the Garden of the Horticultural Society in 1836, when the judges awarded to Robert Mangles, Esq. who exhibited it, a Knightian Medal.' *Lectotype* (here chosen): Right-hand specimen on sheet labelled 'TYPE. *Morna nitida* Lindl.' (CGE, photo seen). See note below.

Leptorhynchos aureus Benth. in Endl. *et al.*, Enum. Pl. Hügel 64(April 1837). - *Waitzia aurea* (Benth.) Steetz in Lehm., Pl. Preiss. 1:452(1845). Type citation: 'King Georges Sound et Swan-River. (Hügel.)'. *Lectotype* (here chosen): 'Freemantle', Hügel (W, isolectotype: K); *syntype*: 'King George's Sound', Hügel (W).

? *Waitzia grandiflora* W. Thompson in T. Moore, Florist & Pomologist 4:41 & tab.(March 1865); Naudin, Revue Hort. (Paris) 185(1865); Chittenden, Dict. Gardening edn 2, 4:2258(1977). Typification: 'I received this fine species from Dr. F. Mueller, of Melbourne'.

Note: Lindley initially (1 March 1837) stated that *Morna nitida* was introduced in 1835 by James Stirling, the governor of Swan River Colony. He subsequently (Bot. Reg. 23: sub tab. 1944, 1 April 1837) corrected this statement by adding a note written by Donald Mackay, the gardener of Robert Mangles. In this note Mackay indicated that seeds of *Morna nitida* were received by Robert Mangles early 1836 and sown on 2 February 1836. A sheet in CGE has a label stating that it is the type of *Morna nitida*; the sheet bears two specimens the smaller of which has 'R. Mangles Esq.' written beside it while the other has a printed label attached which reads 'Swan River/ Capt. James Mangles, R.N.'. James was the brother of Robert Mangles in whose garden the plant was first grown. I have designated as lectotype the right-hand specimen with the James Mangles label but it is likely that the specimens had a common origin.

Waitzia grandiflora was described as having a capitulum much larger than that of *W. aurea* (i.e. of *W. nitida*) and to be almost glabrous. It is probably a variant of *W. nitida*. No material under the name *W. grandiflora* has been located in Australian herbaria nor in K or BM (*vide* G. Leach pers. comm.). Although the name is still used in horticulture in Europe (see above) I have been unable to discover to what species it is being applied.

Chromosome number: n=10 *vide* Turner (1970).

Distribution. Western Australia: Shark Bay (? Broome) south to Albany and Ravensthorpe and east to Merredin (? Kalgoorlie). Two collections are labelled as having come from localities that are outside the distribution range as otherwise recorded for this species; they are as follows: *E. Kelso*, 1900, Broad Arrow, north of Kalgoorlie (PERTH); Roebuck Bay (near Broome), pre 1867, *Dr Marten* (MEL 1585029).

Waitzia nitida shows very little variation throughout its range and does not intergrade with any other species.

The concept of *W. nitida* (as *W. aurea*) held by previous authors including Steetz (1845), Bentham (1867), Mueller (1896), Diels & Pritzel (1905), and Grieve & Blackall (1975) also included specimens of *W. suaveolens* var. *flava* which may be most readily distinguished by its colourless pappus.

4. *Waitzia podolepis* (Gaudich.) Benth., Fl. Austral. 3:637(1867). - *Viraya podolepis* Gaudich. in Freyc., Voy. Uranie 466 t.89(1830). - *Leptorhynchos podolepis* (Gaudich.) DC., Prod. 6:160(1838). *Lectotype* (here chosen): Collected by *Gaudichaud* at Shark Bay (P'Baie de Ch. Marin, C. Gaudichaud'). (Figures 1B, 2E)

[*W. corymbosa* auct. non Wendl.: F. Mueller, Z. Allg. österr. Apotheker-Vereines 34(36):935(1896) p.p.]

Distribution. Western Australia: Irwin River north to Shark Bay.

An accurate description of this species was provided by Diels and Pritzel (1905) based on an original collection in herb. B which evidently came from Kunth's herbarium. They pointed out that Mueller (1896) had misapplied the name *Waitzia podolepis* to a J. Pollack collection of an undescribed species that was new to them. This unknown species was described by Turner (1966) under the name *Waitzia conica*. The microfiche photograph of the possible type specimen seen by de Candolle (G-DC) and cited by him in the *Prodromus l.c.*, is not sufficiently clear to confirm its identity, however, the description provided by de Candolle is accurate.

5. *Waitzia suaveolens* (Benth.) Druce, Bot. Exch. Club Soc. Brit. Isles 4:652(1917). - *Leptorhynchos suaveolens* Benth. in Endl., et al., Enum. Pl. Hügel 64(1837). - Type citation: 'Swan-River (Hügel.)' *non vidi*.

No type material of this name has been located in the herbaria W, BM, and K. The application of the name is based on the description and on contemporary collections made around Perth in the areas visited by Hügel.

var. **suaveolens** (Figures 1E, 2A, 2C)

Morna nivea Lindley, Bot. Reg. 24:t.9(Feb.1838). - *Waitzia nivea* (Lindley) Benth., Fl. Austral. 3:636(1867). Type citation: 'raised from Swan River seeds in the garden of Robert Mangles, Esq., of Sunning Hill.' (holo: CGE 'Hort. Mangles July 1837' photo seen).

Waitzia corymbosa f. *benthamiana* Steetz in Lehm., Pl. Preiss. 1:451(1845). Based on *Leptorhynchos suaveolens* Benth., *Morna nivea* Lindley, L. Preiss 12, Hügel s.n., and *F. Bauer s.n.* Lectotype (here chosen): *Leptorhynchos suaveolens* Benth..

? *Helichrysum rigidulum* DC., Prod. 6:193(1838). T: Nova Hollandia, Cult. 1832, Sweet (holo: G-DC photo seen).

Waitzia odontolepis Turcz., Bull. Soc. Imp. Naturalistes Moscou 24/1:77(1851); Chittenden, Dict. Gardening edn 2, 4:2258(1977). T: Western Australia, J. Drummond 5th coll. no. 382 (holo: KW photo seen; iso: MEL).

[*Waitzia corymbosa* auct. non Wendl.: F. Muell., Z. Allg. Österr. Apotheker-Vereines 34(36):935(1896) p.p. maj.; Diels & Pritzel, Bot. Jahrb. 35:626(1905).]

[*Waitzia corymbosa* f. *wendlandiana* auct. non Steetz: Steetz in Lehm., Pl. Preiss. 1:451(1845)]

Upper branches and leaves cobwebby or glandular stipitate. Corymbs congested or loose. Outer involucre bracts acuminate to acute, white, straw coloured, or purplish pink; inner involucre bracts obtuse to acute, white. Pappus colourless.

Chromosome number: $n = 12$ fide Turner (1970), see comment below.

Distribution. South west Western Australia: Geraldton to the south coast and east to Esperance.

Note 1. The description of *Helichrysum rigidulum* by de Candolle is not sufficiently detailed, nor the microfiche photograph of the type in G-DC sufficiently clear, for me to be sure that this name is synonymous with *W. suaveolens*.

Note 2. A western entity of var. *suaveolens* has obtuse inner involucre bracts whereas an eastern entity has acute (or even acuminate) inner bracts, however, the extremes of the two (which also differ in the degree of glandular indumentum, size of capitula, and openness of inflorescence) grade into each other. The eastern more glandular entity has smaller capitula and more open inflorescences, it is in some areas virtually identical with var. *flava* except in colour of bracts.

var. **flava** Paul G. Wilson, var. nov.

[*Waitzia aurea* auct. non (Benth.) Steetz: Benth., Fl. Austral. 3:636(1867) p.p.; F. Muell, Z. Allg. Österr. Apotheker-Vereines 34(36):935(1896) p.p.; Grieve & Blackall, How to know Western Australian Wildflowers pt 4:844(1975) p.p.]

Bractae involucri flavae, anguste triangulares acutae vel acuminatae.

Typus: Mt Ridley, Western Australia, granitic slope, 7 August 1970, *K.M. Allan* 360 (holo: PERTH; iso: CANB, K).

Upper branches and leaves glandular stipitate. Corymbs loose. Involucral bracts narrowly triangular, acute or the inner acuminate, smooth, yellow. Innermost bracts with lamina ovate to oblong, scarious or pale yellow. Pappus colourless.

Distribution. Norseman area south-east to Balladonia and west to Stirling Range.

Specimens of var. *flava* have been generally referred in herbaria and in literature to *W. aurea*. The latter species differs in having an cobwebby indumentum without glandular hairs, in having obtuse bracts (not acute to acuminate) and in having yellow pappus bristles (not colourless); in addition the capitula of *W. aurea* are larger than those of var. *flava* (but of a similar size to the capitula of the western entity of var. *suaveolens*).

As noted above, var. *flava* differs from some forms of the eastern entity of var. *suaveolens* almost solely in the colour of the bracts. The two varieties may sometimes be found growing together and it was from such a mixed population that Turner, *l.c.*, recorded the chromosome number of $n = 12$.

Excluded Names

Waitzia brachyrrhyncha F.Muell., *Linnaea* 25:407(1853) = *Leucochrysum molle* (Cunn. ex DC.) Paul G. Wilson, *Nuytsia* 8:444(1992).

Waitzia brevirostris Steetz in Lehm., *Pl. Preiss.* 1:451(1845) = *Rhodanthe citrina* (Benth.) Paul G. Wilson, *Nuytsia* 8:407(1992).

Waitzia citrina (Benth.) Steetz in Lehm., *Pl. Preiss.* 1:454(1845) = *Rhodanthe citrina* (Benth.) Paul G. Wilson, *op. cit.*

Waitzia conica Turner, *Sida* 2:428(1966) = *Haptotrichion conicum* (B. Turner) Paul G. Wilson, *Nuytsia* 8:425(1992).

Waitzia dasycarpa Turcz., *Bull. Soc. Nat. Moscou* 24:77(1851) = *Rhodanthe citrina* (Benth.) Paul G. Wilson *op. cit.*

Waitzia paniculata (Steetz) Benth., *Fl. Austral.* 3:(1867) = *Pterochaeta paniculata* Steetz (see *Nuytsia* 8:422(1992).)

Waitzia steetziana Lehm., *Pl. Preiss.* 1:454(1845) = *Rhodanthe citrina* (Benth.) Paul G. Wilson, *op. cit.*

Waitzia sulphurea Steetz in Lehm., *Pl. Preiss.* 1:453(1845) = *Rhodanthe citrina* (Benth.) Paul G. Wilson, *op. cit.*

Waitzia tenella Hook., *Bot. Mag.* t.5342(1862) = *Rhodanthe citrina* (Benth.) Paul G. Wilson, *op. cit.*

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