

## A review of the genus *Pileanthus* (Myrtaceae)

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### Abstract

G.J. Keighery. A review of the genus *Pileanthus* (Myrtaceae). *Nuytsia* 15(1): 37–51 (2002). *Pileanthus* Labill., a small genus of floriferous shrubs endemic to southern Western Australia, is reviewed. Eight species are recognised, one of which has two subspecies. Four new species (*Pileanthus auranticus* Keighery, *P. bellus* Keighery, *P. rubronitidus* Keighery and *P. septentrionalis* Keighery) and one new subspecies (*P. peduncularis* subsp. *piliferus* Keighery) are described, and *P. vernicosus* F. Muell. is reinstated.

### Introduction

*Pileanthus* is a small genus of floriferous shrubs endemic to southern Western Australia. Four species had been described prior to Bentham's (1867) treatment of the genus in "Flora Australiensis", but Bentham reduced one of these, *P. vernicosus*, to synonymy. Kuntze (1903) divided the genus into two sections, sect. *Pileanthus* [as *Eupileanthus* nom. illeg.] with stamens divided (now comprising *P. limacis*, *P. septentrionalis*, *P. filifolius* and *P. vernicosus*) and sect. *Monopileanthus* with the stamens undivided (now comprising *P. auranticus*, *P. bellus*, *P. rubronitidus* and *P. peduncularis*). These sections are perhaps essentially different pollination syndromes and are comprised of species from very different species complexes that are probably not closely related.

Recent studies of the genus, partly in collaboration with N.G. Marchant, have demonstrated the need to reinstate *P. vernicosus* and have resulted in four new species and a new subspecies being recognised. This paper provides concise descriptions, illustrations, distribution maps and a key for the eight species now recognised in the genus.

*Pileanthus* is a very distinctive member of the *Chamelaucium* alliance (Briggs & Johnson 1979, Johnson & Briggs 1985) and is closely related to *Chamelaucium* Desf., *Darvinia* Rudge and *Verticordia* DC. It differs from those genera in having 20 perfect stamens and no staminodia, the sepals deeply bilobed giving the appearance of 10 calyx segments, a silky hairy hypanthium and large soft petals. The genus has the largest and most colourful flowers of the genera that make up the *Chamelaucium* alliance, and populations are spectacular when in full flower.

## Materials and methods

Herbarium collections from PERTH and most major Australian herbaria were examined during the course of the study. Type collections and/or photographs of type collections were examined from relevant herbaria. All measurements were taken from dry pressed material supplemented by observations of living plants in the field and cultivation.

The conservation codes given in this paper are those used by the Department of Conservation and Land Management. An explanation of these codes is given in each issue of *Nuytsia*.

## Taxonomic treatment

**Pileanthus** Labill., Nov. Holl. Pl. Sp. 2, 11, t. 149 (Feb. 1801). – *Pileanthus* Labill. sect. *Pileanthus* [as sect. *Eupileanthus* nom. illeg. in T. von Post & O. Kuntze, Lex. Gen. Phan. 438 (Dec. 1903)]. *Type*: *Pileanthus limacis* Labill.

*Pileanthus* sect. *Monopileanthus* Kuntze in T. von Post & O. Kuntze, Lex. Gen. Phan. 438 (Dec. 1903). *Type*: *Pileanthus peduncularis* Endl.

*Shrubs* to 3 m tall. *Branchlets* terete, brown, with oil glands epidermis becoming grey and shedding, with persistent stipular outgrowths often present in the leaf axils. *Leaves* opposite and decussate, sometimes in dense opposite clusters, sessile, linear to clavate, with prominent oil glands, margins entire to lacinate. *Floral leaves* similar to vegetative ones except in *P. limacis*. *Inflorescence* of solitary flowers in upper axils. *Bracteoles* 2, opposite, united at base into a cup, enclosing the bud, scarious, usually prominently umbonate, often viscid with a white oily exudate, free portions above the cup caducous; cup turbinate, around the hypanthium. *Flowers* regular, bisexual, large. *Hypanthium* campanulate, pilose outside, adnate to ovary for most of its length. *Sepals* 5, erect to spreading, deeply bilobed giving the appearance of separate lobes, usually sparsely pilose. *Petals* 5, soft, exceeding the calyx, often brightly coloured, margins usually shortly dentate. *Androecium* of 20 stamens in a single row, with one stamen opposite each sepal and petal and the rest alternating between the sepals and petals, united at the base, antipetaline stamens often distinctly longer than antisepaline ones, the anthers sometimes also distinctly different in size; free filaments slender but dilated at the base; anther cells parallel, opening longitudinally, either attached contiguous to the thickened end of the filament or separately attached to the branches of a forked filament. *Ovary* 1-celled, with 4 or 8 ovules in 2 rows on an erect free basal placenta. *Style* simple, filiform, terete; stigma small, terminal. *Fruit* usually a 1-seeded nut formed from the hardened base of the hypanthium, dispersed as a unit with the dried upper hypanthium and sepals attached.

*Chromosome number.*  $n = 11$  has been recorded for four species. There are no records of polyploidy or dysploidy in the genus (Rye 1979).

*Distribution and habitat.* The genus *Pileanthus* consists of eight species endemic to southern Western Australia. Members are found on sandy soils in the Avon Wheatbelt and Geraldton Sandplain Biogeographic regions of south Western Australia and extend into the adjacent Carnarvon Biogeographic region of arid Western Australia. There is a concentration of species on the northern margins of the Geraldton Sandplains. This is a very different pattern to that shown by the related genera *Chamelaucium*

and *Darwinia* which are species-diverse on the Mt Lesueur area of the southern Geraldton Sandplains and on the Esperance Sandplains with minor centres in the Avon Wheatbelt.

*Etymology.* From the Greek, *pileos* – cap and *anthos* – flowers, referring to the close fitting bracteoles of the flower bud.

*Pollination biology.* The pollination syndrome in the related genera *Chamelaucium*, *Darwinia* and *Verticordia* involves the deposition of their pollen in an oily droplet onto a pollen presenter at the end of the style before the flowers open. This does not happen in *Pileanthus*. Very specific bee pollination has been documented in one species (*P. dilatatus*), which has bilobed stamens (Houston 1992).

### Key to species of *Pileanthus*

1. Anther cells contiguous on club-shaped filaments.
  2. Leaves clustered on short side branchlets. Ovules 8 ..... **8. *P. peduncularis***
  2. Leaves not clustered. Ovules 4.
    3. Flowers pink or red. Style hairy at base.
      4. Flowers pink. Tepaline anthers erect ..... **6. *P. bellus***
      4. Flowers red. Tepaline anthers incurved ..... **7. *P. rubronitidus***
    3. Flowers orange. Style glabrous ..... **5. *P. auranticus***
1. Anther cells on forked filaments.
  5. Flowers cerise or red.
    6. Flowers cerise. Petals 12–15 mm long. Bracteole umbo pointed ..... **1. *P. filifolius***
    6. Flowers red. Petals 8–11 mm long. Bracteole umbo blunt ..... **2. *P. vernicosus***
  5. Flowers white or pale pink.
    7. Leaves *c.* 1 mm wide. Petals pale pink or white with pink to red centre, *c.* 8 mm long ..... **4. *P. limacis***
    7. Leaves *c.* 0.3 mm wide. Petals white, 3–4 mm long ..... **3. *P. septentrionalis***

**1. *Pileanthus filifolius*** Meisn., *J. Linn. Soc., Bot.* 1: 45 (1857). *Type:* “in planitie arenosa prope Colbourne Springs.” [Colburn Salt Springs, near Arrowsmith River, Western Australia], 1850–1851, *J. Drummond* 6th coll., no. 42” (*iso:* K, MEL).

*Shrub* to 1 m high. *Young branches* glabrous, brown, with occasional raised oil glands, becoming grey and shedding glands; leaf decurrencies prominent, raised, 3-angled, almost winged below attachment. *Leaves* not densely clustered, linear, triquetrous but flattened at base, (6)7–13(20) mm long, *c.* 1 mm wide, gland-dotted, apex acute. *Peduncle* 7–20 mm long, circular to elliptic in cross-section, glabrous. *Bracteole pair:* cup bilobed, 3–5 mm long; free portions 6–8 mm long, brown, gland-dotted, with a pungent umbo 1–2 mm long. *Hypanthium* broadly campanulate, 6–8 mm long, pilose. *Sepals* imbricate, 4–6 mm long, 3–4 mm wide, striate, laciniate, silky-pilose outside, glabrous inside, margins membranous, apex obtuse. *Petals* overlapping, 12–15 mm long, 9–14 mm wide, cerise, margin laciniate-dentate. *Androecium* with bilobed filaments; antipetaline filaments 1.5–2 mm long; antisepaline filaments *c.* 1 mm long. *Ovules* 4. *Style* 4–6 mm long, glabrous; stigma globose, inconspicuous. (Figure 1A–D)

*Selected specimens examined.* WESTERN AUSTRALIA: Three Springs, 24 Sep. 1940, *W.E. Blackall* 4898 (PERTH); Arrino, Dec. 1945, *C.A. Gardner* (PERTH); 2 km SSE of Mt Lesueur, 5 Dec. 1979,

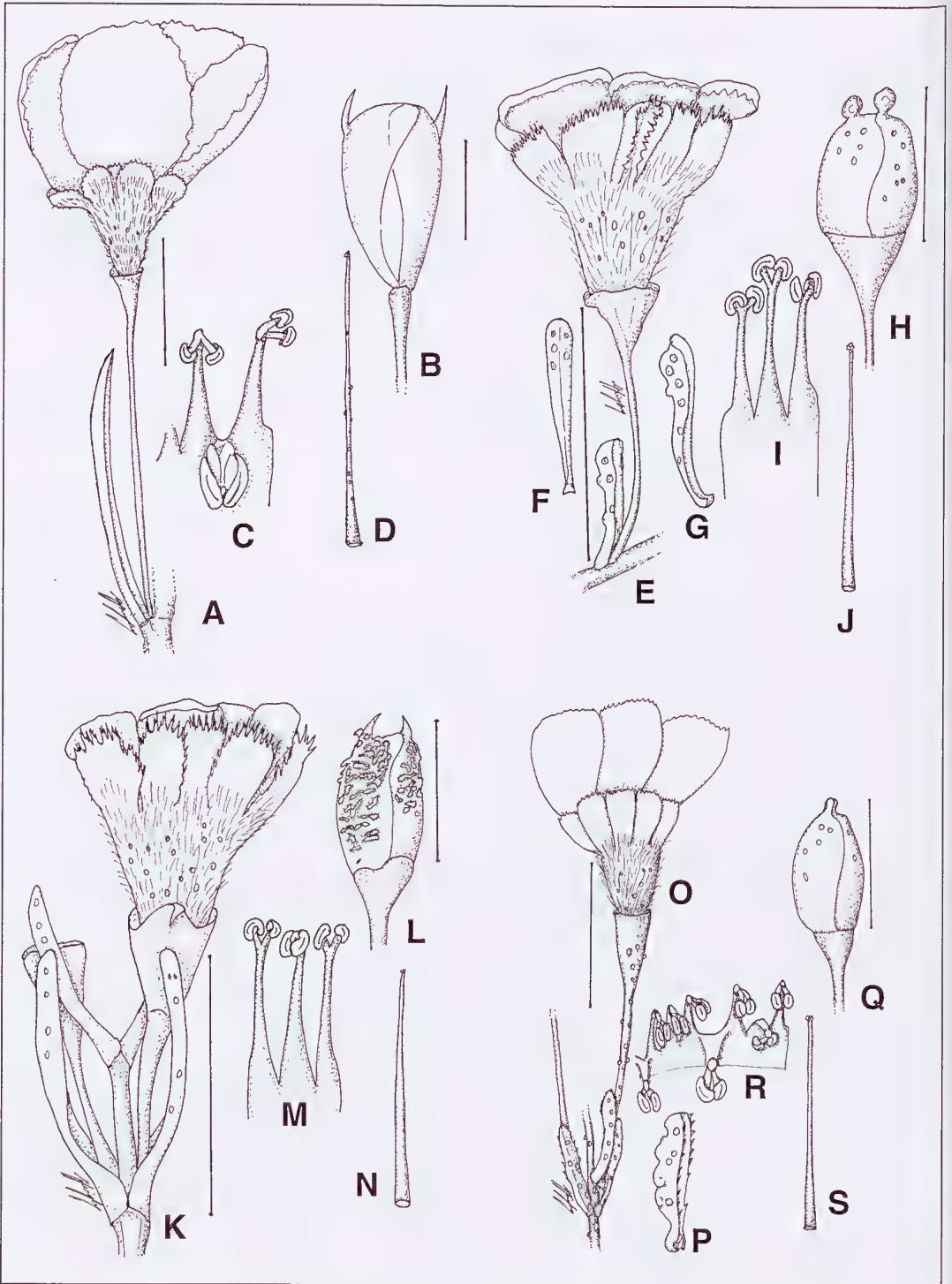


Figure 1. A-D. *Pileanthus filifolius*. A - leaf and flower, B - bracteoles, C - stamens, D - style; E-J. *P. limacis*. E - leaf and flower, F - leaf from below, G - leaf from side, H - bracteoles, I - stamens, J - style; K-N. *P. septentrionalis*. K - flowering branchlet, L - bracteoles, M - stamens, N - style; O-S. *P. vernicosus*. O - leaves and flower, P - leaf, Q - bracteoles, R - stamens, S - style. Drawn from C.A. Gardner 5 Jan. 1931 (A-D), S.J. Claymore & A.S. Weston 264 (E-J), C.A. Gardner 3184 (K-N) and A.S. George 16949 (O-S). Scale bars for bracteoles = 5 mm, for flowers = 10 mm.



Figure 2. Distribution maps. A – *Pileanthus filifolius* ●, *P. limacis* ■ and *P. septentrionalis* ◆; B – *P. vermicosus* ●.

E.A. Griffin 2661 (PERTH); Bartlets Well Reserve, N of Gingin, 22 Jan. 1987, G.J. Keighery & J. Alford 1584 (PERTH); Mingenew, 8 Nov. 1956, A.R. Main (PERTH).

*Distribution and habitat.* Occurs between Dongara, inland to Mingenew and south to north of Gingin. Grows on sand or lateritic sand, in *Banksia hookeriana* heath, *Banksia* low woodland and *Eucalyptus todtiana* Mallee over heath. (Figure 2A)

*Flowering period.* Flowering mainly December to January.

*Conservation status.* Widespread and well conserved. Recorded for at least eight nature reserves and five National Parks.

*Etymology.* From the Latin *filum* (thread) and *folium* (leaf), referring to the filiform leaves of this species.

*Notes.* Houston (1992) documented the pollination of this species by the monolectic bee, *Euryglossa semaphore*. Further studies on the pollination of the genus are underway. This species has the largest flowers of the genus.

See the notes given under *Pileanthus peduncularis* regarding the application of the name *Chamelaucium dilatatum*.

**2. *Pileanthus vernicosus*** F. Muell., *Fragm. Phyt. Austral.* 1, 225 (Dec. 1859). *Type citation:* "Ad flumen Murchison. Oldfield et Walcott." [Murchison River, Western Australia], *Oldfield* (syn: MEL!).

Upright slender *shrub* to 1 m tall. *Young branches* brown, oil glands prominent; leaf decurrencies obvious, with red triangular-shaped stipules in axils. *Leaves* clustered on short opposite shoots, linear-triquetrous, 3–5(9) mm long, c. 1 mm wide, oil glands prominent, margins and midrib with prominent tooth-like hairs, apex truncate to acute. *Floral leaves* similar to vegetative leaves but not as clustered. *Peduncle* slender, 7–15 mm long, with prominent oil glands. *Bracteole pair:* cup c. 3 mm long, 1–2 mm wide; free portions 3–5 mm long, with midrib not prominent, margins entire, umbo not obvious but apex area thickened with prominent oil glands. *Pedicel* 2–3 mm long. *Hypanthium* campanulate, 3–4 mm long, c. 3 mm diam., silky-pilose, adnate portion 2–2.5 mm long. *Sepals* oblong, c. 3 mm long, c. 2 mm wide, with scattered hairs becoming silky-pilose towards base, apex obtuse. *Petals* 8–11 mm long, 7–9 mm wide, red with base pinkish, margins lacinate, apex blunt. *Androecium:* antipetaline filaments conspicuously bilobed, 1–1.5 mm long; antisepaline filaments less prominently bilobed, less than 1 mm long. *Ovules* 4. *Style* 2–3 mm long, glabrous; stigma globose, inconspicuous. (Figure 10–S)

*Selected specimens examined.* WESTERN AUSTRALIA: Cape Lesueur, Peron Station, 9 Nov. 1982, R.J. Cranfield 2527 (PERTH); Cooloomia Nature Reserve, 19 Sep. 1979, S.D. Hopper 1385 (PERTH); 40 km N of Geraldton on North West Coastal Highway, K.F. Kenneally 4707 (PERTH); 392 mile peg [85 km] N of Geraldton, 18 Sep. 1974, B.L. Powell 74140 (PERTH); Kalbarri National Park, R.C. Wemm 1 (PERTH).

*Distribution and habitat.* Occurs between Geraldton and Peron Peninsula, Shark Bay. Grows on red or yellow sand in *Banksia sceptrum* shrubland, Tree heath, coastal heath and Acacia shrubland. (Figure 2B)

*Flowering period.* Between mid September and early November.

*Chromosome number.*  $n=11$  (Rye 1979), voucher B.L. Powell 74140 [as *Pileanthus* sp. 1].

*Etymology.* From the Latin *vernicosus* abounding in varnish, probably referring to the shiny oily coating on the young floral buds.

*Conservation status.* Restricted in occurrence but well conserved in Kalbarri National Park, Zuytdorp National Park and proposed reserves within the Shark Bay World Heritage area.

*Notes.* Closely related to *Pileanthus filifolius*, a northern replacement for that species. A single record notes plant size as 2.5 m high by 2.5 m across.

### 3. *Pileanthus septentrionalis* Keighery, *sp. nov.*

Frutes effusus circa 1 m altus et 4 m latus. Folia linearia, triquetra, 3–8 mm longa, 0.3 mm lata. Petala non-imbricata, 3–4 mm longa, 2–3 mm lata.

*Typus:* Wogoola, near Winning Pool, Western Australia, 28 August 1932, C.A. Gardner 3184 (*holo:* PERTH 02504278; *iso:* CANB, MEL, PERTH 02504268, 02504324).

Spreading open *shrub*, to 1.5 m tall, to 4 m wide. *Branches* pale brown with glandular extrusions, prominent on older branches. *Leaves* linear, triquetrous but flattened towards base, 4–7 mm long, *c.* 3 mm wide, with prominent raised oil glands, apex obtuse. *Peduncle* (4)6–11(15) mm long, with prominent oil glands. *Bracteole pair:* cup to 4 mm long; free portions to 7 mm long, brown, prominently gland-dotted, with a pungent conical umbo 0.5–1 mm long. *Hypanthium* to 5 mm long, to 4 mm wide, free part 0.5–0.75 mm long, white-hirsute, with oil glands. *Sepals* chartaceous, *c.* 3 mm long, *c.* 3 mm wide, hirsute outside, margins dentate. *Petals* not overlapping, 3–4 mm long, 2–3 mm wide, white, apex lacinate-dentate. *Androecium:* antipetaline filaments bilobed, to 3 mm long; antisepaline filaments not deeply bilobed, to 1.5 mm long. *Ovules* 4. *Style* to 5 mm long, glabrous; stigma minute, globose. (Figure 1K–N)

*Selected specimens examined.* WESTERN AUSTRALIA: 42 km WSW of Barradale Roadhouse on North West Coastal Highway, 2 Sep. 1988, D.J. Edinger 640 (PERTH); Wogoola Station, near Winning Pool, 28 Aug. 1932, C.A. Gardner 3184 (PERTH); 8 miles [12 km] S of Learmonth, 31 Aug. 1960, A.S. George 1413 (PERTH); 35 km NW of Mt Sandiman, Kennedy Range, 21 Aug. 1987, K.R. Newbey 11721 (PERTH); cultivated at Kings Park, ex 303 km N of Carnarvon, 14 Feb. 1973, B.L. Powell 73026 (PERTH).

*Distribution and habitat.* Occurs between Cape Range and the Kennedy Range, on the Eastern side of Lake McLeod on red sand dunes. (Figure 2A)

*Flowering period.* August to October.

*Chromosome number.*  $n=11$  (Rye 1979), voucher B.L. Powell 73026 [ as *Pileanthus* sp. aff. *limacis*].

*Conservation status.* Widespread and well conserved. Present in Cape Range, Kennedy Range National Parks, Dorre and Bernier Nature Reserves.

*Etymology.* The epithet is derived from a Latin word for northern. This is the northern-most member of the genus.

*Notes.* Closely related to *P. limacis* but differing in the smaller white flowers with non overlapping petals and the thin leaves. Note that D.J. Edinger 640 differs from the other specimens in having stipules.

**4. *Pileanthus limacis*** Labill., Nov. Holl. Pl. Sp. 2, 11, t. 149 (Feb. 1806). *Type:* “in terrâ Van-Leeuwin” [Western Australia] (FI!).

Low spreading or prostrate *shrub* to 80 cm tall, to 1 m wide. *Young branches* hidden by leaf decurrencies or rarely red-brown, gland-dotted, becoming grey and shedding glands. *Leaves* crowded

at ends of branches, 5–8 mm long, *c.* 1 mm wide, covered by oil glands, adaxial surface flat, adaxial curved, margins hyaline with small tooth like projections, apex obtuse. *Peduncle* 4–8(15) mm long. *Bracteole pair*: cup 2–3 mm long; free portions 4–6 mm long, 4–5 mm wide, brown, with conspicuous oil glands, soon caducous, with a more or less globular umbo *c.* 1 mm long. *Hypanthium* broadly campanulate, 4–5 mm long, 4–5 mm wide, silky-pilose, gland-dotted. *Sepals* deeply divided, lobes 3–5 mm long, 4–5 mm wide, slightly pilose, apex obtuse, dentate. *Petals* overlapping, *c.* 8 mm long, *c.* 6 mm wide, white with centre flushed pink to red, or pale pink, margins lacinate, apex rounded. *Androecium*: antipetaline stamens bilobed, to 3 mm long; antisepaline stamens not deeply bilobed, *c.* 2 mm long. *Ovules* 4. *Style c.* 5 mm long, glabrous; stigma minute, globular. (Figure 1E–J)

*Selected specimens examined.* WESTERN AUSTRALIA: Blowholes, Quobba Station, 18 July 1964, *J.S. Beard* 3480 (PERTH); Waroora Station, near homestead, Sep. 1962, *J.C. Malone s.n.* (PERTH); Dorre Island, Disaster Cove, 15 July 1959, *R.D. Royce* 5876 (PERTH); N end of Bernier Island, 5 Oct. 1947, *D.L. Serventy s.n.* (PERTH).

*Distribution and habitat.* Occurs in near coastal situations and offshore islands from Shark Bay to Waroora Station, on coastal dunes usually over limestone. (Figure 2A)

*Flowering period.* July to October, depending on rainfall.

*Conservation status.* Widespread and not endangered.

*Etymology.* From *limacis* Greek for slug, owing to the short fat leaves having a resemblance to a slug.

*Notes.* Although often noted as having white flowers, this species normally has pale pink flowers or white flowers suffused pink unlike *P. septentrionalis* where they are invariably white. *Pileanthus limacis* and *P. septentrionalis* occur entirely within the arid Carnarvon Basin, one along the coast and the other inland.

## 5. *Pileanthus auranticus* Keighery, *sp. nov.*

*Futex erectus, 2.5 m altus. Differt a Pileantho bello foliis 10–17 mm versus 4–12 mm longis. Flores auranticis, umbonibus curvatis longis pungentibus.*

*Typus:* 30.1 km west of North West Coastal Highway on Vermin Proof Fence, 27°15'S, 114°19'E, Western Australia, 21 October 1995, *M.N. Lyons* 2379 (*holo:* PERTH; *iso:* CANB, K, MEL).

Upright woody *shrub* to 2 m tall, densely branched at base. *Young branches* with raised oil glands and occasional hairs; leaf decurrences prominent, becoming grey and shedding. *Leaves* not densely clustered, linear, 10–17 mm long, *c.* 1 mm wide, with raised oil glands, upper surface deeply grooved, undersurface convex, apex acute. *Peduncle* filiform 15–20 mm long, with prominent oil glands. *Bracteole pair*: cup 3–4 mm long; free portions 9–11 mm long, greenish yellow, with prominent oil glands, with a curved pungent umbo 3–4 mm long. *Hypanthium* narrow-campanulate, 5–6 mm long, 3–4 mm diam., free part *c.* 2 mm long. *Sepals* deeply divided, lobes 3–4 mm long, 4–5 mm wide, slightly pilose, apex obtuse, dentate. *Petals* overlapping, *c.* 8 mm long, *c.* 6 mm wide, orange, margins lacinate, apex rounded. *Androecium* with entire filaments; antipetaline stamens *c.* 2 mm long; antisepaline stamens 0.5–1 mm long. *Ovules* 4. *Style c.* 5 mm long, glabrous; stigma minute. (Figure 3A–E)



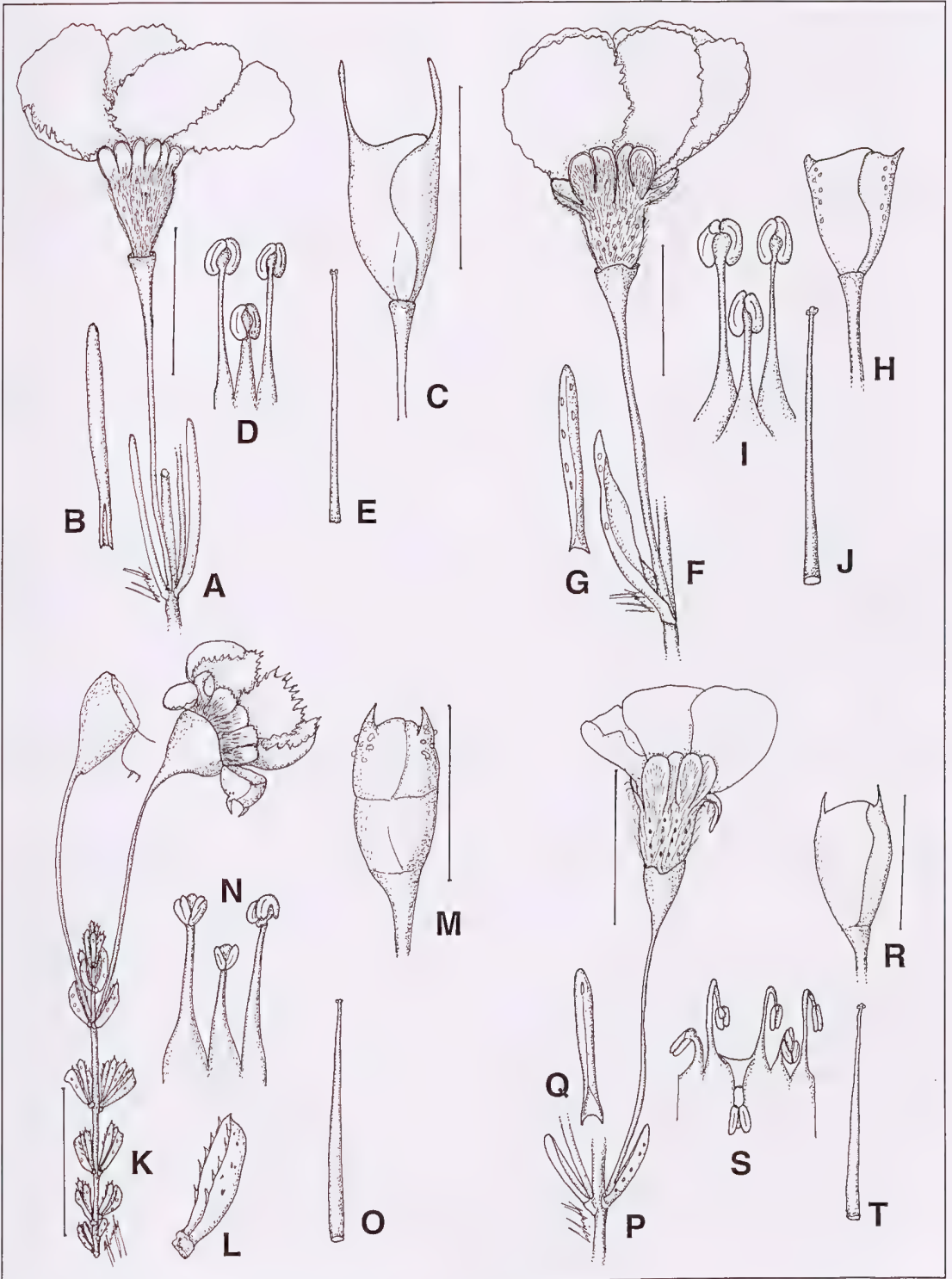


Figure 3. A–E. *P. auranticus*. A – leaves and flower, B – leaf, C – bracteoles, D – stamens, E – style; F–J. *Pileanthus bellus*. F – leaf and flower, G – leaf, H – bracteoles, I – stamens, J – style; K–O. *P. peduncularis* subsp. *peduncularis* K – leaf and flower, L – leaf, M – bracteoles, N – stamens, O – style; P–T. *P. rubronitidus*. P – leaves and flower, Q – leaf, R – bracteoles, S – stamens, T – style. Drawn from M.N. Lyons 2380 (A–E) B. & D. Bellairs 4026 (F,G,I,J), C.A. Gardner 16289 (H), R.D. Royce 9380 (K–O) and S. DeLa Hunt Oct. 1961 (P–T). Scale bars for bracteoles = 5 mm, for flowers = 10 mm.

*Other specimens examined.* WESTERN AUSTRALIA: near northern boundary of Murchison House Station on Vermin Proof Fence, 29 Oct. 1986, A.S. George 16848 (PERTH); 32.3 km W of North West Coastal Highway on Vermin Proof Fence, 21 Oct. 1995, M.N. Lyons 2380 (PERTH); 32.6 km west of North West Coastal Highway towards Zuytdorp Cliffs, 1 Nov. 1985, P. Roberts 755 (PERTH).

*Distribution and habitat.* Found on the north-west corner of the Eurady sand sheet, in undulating sandplain dominated by *Actinostrobos arenarius* shrubland over low heath. In this area all collections are from interdunal sites on yellow sand over yellow sandy clays. One collection has been recorded on red sand over limestone in low mixed heath closer to the coast. (Figure 4A)

*Flowering period.* Recorded flowering in October.

*Conservation status.* Conservation Codes for Western Australian Flora: Priority One. Has a very restricted range and populations are entirely on pastoral lands in Murchison House Station. It is highly likely the species also occurs in the adjoining Shark Bay World Heritage area.

*Etymology.* From the Greek *auranticus* for the orange flowers of this species.

*Notes.* Closely related to *Pileanthus bellus*, differing in the longer slender floral leaves, curved pungent umbo and orange flowers. The two species do not appear to occur together or overlap in distribution. *Pileanthus bellus* occurs on the tall yellow sand dunes of the Eurady Dune System (as does another endemic of these dunes, *Verticordia coolomia*) which occurs to the east of the range of *P. auranticus*.

## 6. *Pileanthus bellus* Keighery, *sp. nov.*

Frutex erectus, 3 m altus. Foliis 4–12 mm longis. Differt a *Pileantho aurantico* floribus roseis, umbonibus brevibus pungentibus.

*Typus:* near number one tank [North West Coastal Highway, just north of Murchison River crossing], Western Australia, 2 November 1965, C.A. Gardner 16289 (*holo:* PERTH 04365550; *iso:* CANB, K, MEL).

Erect *shrub* to 3 m tall. *Young branches* brown, with prominent oil glands; leaf decurrencies not prominent, becoming grey and shedding, with large stipular outgrowths in the leaf axils. *Leaves* not densely clustered, linear, triquetrous, 4–12 mm long, *c.* 1 mm wide, glabrous, with prominent oil glands, adaxial surface grooved, abaxial convex, margin with scattered hairs but not hyaline, apex obtuse or acute. *Peduncle* slender, 10–15 mm long. *Bracteole pair:* cup narrowly turbinate, 2–3 mm long; free portions 4–6 mm long, brown, margins minutely denticulate, with a pungent conical umbo *c.* 1 mm long. *Hypanthium* turbinate, 3–5 mm long, 3–4 mm wide, silky-pilose, gland-dotted, free part 1–1.5 mm long. *Pedicel* 2–4 mm long. *Sepals* bilobed, 2–4 mm long, 3–4 mm wide, shortly pilose, apex obtuse, margin minutely toothed, fused for *c.* 1 mm at base. *Petals* 7–8 mm long, *c.* 8 mm wide, pink, base erose, margin entire. *Androecium* with entire filaments; antipetaline stamens *c.* 2 mm long; antisepaline stamens *c.* 1 mm long. *Ovules* 4. *Style* 4–7 mm long, ciliate at base; stigma minute. (Figure 3F–J)

*Selected specimens examined.* WESTERN AUSTRALIA: 10 km NW of North West Coastal Highway along track to Z bend, Kalbarri National Park, 30 Oct. 1996, B. & D. Bellairs 4026 (PERTH); 15 km

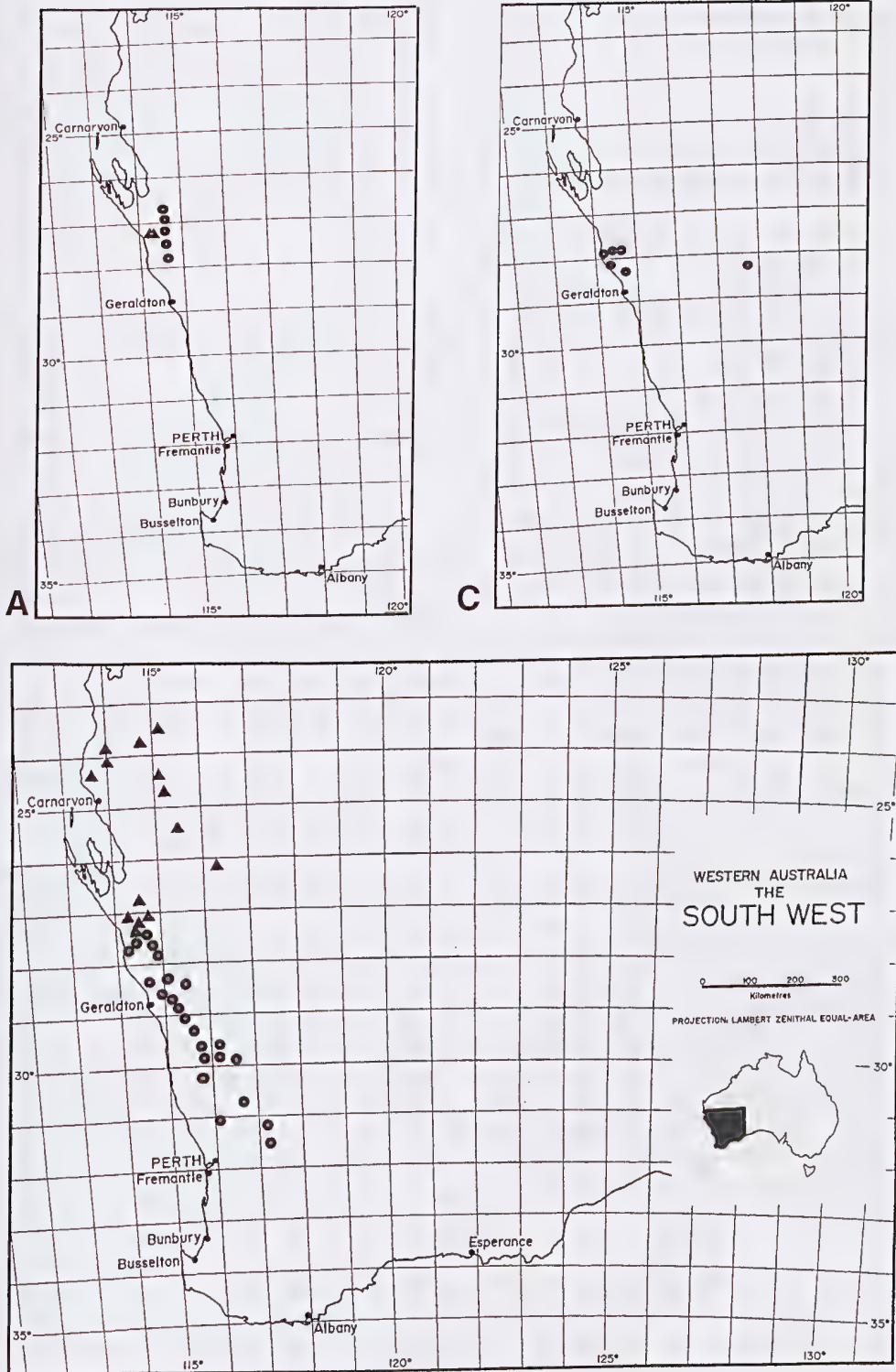


Figure 4. Distribution maps. A – *Pileanthus auranticus* ▲ and *P. bellus* ●; B – *P. peduncularis* subsp. *peduncularis* ● and *P. peduncularis* subsp. *piliferus* ▲; C – *P. rubronitidus*.

N of Murchison River Crossing on North West Coastal Highway, 12 Dec. 1984, *H. Demarz* 10489 (PERTH); 410 mile peg on North West Coastal Highway [157 km N of Geraldton], 30 Oct. 1963, *F. Lullfitz* 2848 (PERTH).

*Distribution and habitat.* Mainly confined to the Eurardy sand dunes, where it occurs on tall yellow dunes dominated by *Actinostrobus arenarius* shrubland, but also a disjunct southern record from shallow grey sands over sandstone emergent from low heath. (Figure 4A)

*Flowering period.* October to December.

*Conservation status.* Conservation Codes for Western Australian Flora: Priority Three. Currently of restricted distribution, but present in Kalbarri National Park and adjacent uncleared pastoral and unallocated Crown lands. Probably not at risk, but requiring further survey.

*Etymology.* From the Greek, *bellus* for beautiful, referring to this species when in flower it is a stunning sight.

*Notes.* A putative hybrid (*A.S. George* 16858) between *Pileanthus bellus* and *P. peduncularis* has been collected at 45.8 km north of Galena Bridge, Murchison River on the North West Coastal Highway. This, if correct, is the only record of natural hybridisation in the genus.

## 7. *Pileanthus rubronitidus* Keighery, *sp. nov.*

*Pileantho filifolio habitu et floribus apparenter similis, sed differt floribus rubris, petalis 7–8 mm versus 12–15 mm longis, staminibus non bilobis.*

*Typus:* 4 km west-north-west of Yerina Spring, 28°04'S, 114°19'E, Western Australia, 1 October 1979, *J. Taylor* 1047, *M.D. Crisp & R. Jackson* (*holo:* PERTH 02503921; *iso:* BISH, CANB).

Erect *shrub* to 1 m tall. *Young branches* brownish-red, with prominent oil glands forming a sticky exudate; leaf decurrencies prominent, persistent, becoming grey, with large red stipular outgrowths in the leaf axils. *Leaves* not very clustered, linear, triquetrous, 5–13 mm long, less than 1 mm wide, glabrous, with prominent oil glands, adaxial surface grooved, abaxial convex, margin entire, apex obtuse or acute. *Peduncle* slender, (8)12–22 mm long, yellow-red. *Bracteole pair:* cup narrowly turbinate, 2–3 mm long; free portions 4–6 mm long, brown, margins minutely denticulate, with a conical pungent umbo *c.* 1 mm long. *Pedicel* 2–4 mm long. *Hypanthium* turbinate, 3–5 mm long, 3–4 mm wide, silky-pilose, gland-dotted, free part 1–1.5 mm long. *Sepals* 5, 2–4 mm long, 3–4 mm wide, the two lobes fused for *c.* 1 mm at base, shortly pilose, apex obtuse, margin minutely toothed. *Petals* 7–8 mm long, *c.* 8 mm wide, red-orange, base erose, margin entire. *Androecium* with entire filaments; stamens usually *c.* 1 mm long, (Mount Magnet collection much longer). *Ovules* 4. *Style* 4–7 mm long, ciliate at base; stigma globose, minute. (Figure 3 P–T)

*Selected collections examined.* WESTERN AUSTRALIA: Hutt River, *W.H. Butler* 198 (PERTH); Mount Magnet, 2 Oct. 1959, *W.H. Butler s.n.* (PERTH); cultivated at Kings Park, ex Murchison, 12 Feb. 1973, *B.L. Powell* 73025 (KPBG); 25 km E of Kalbarri, 7 Nov. 1986, *P. Roberts* 766 (PERTH).

*Distribution and habitat.* Occurs between Kalbarri and west of Northampton, with one very disjunct collection from Mount Magnet. This collection requires confirmation. Grows on grey sand over sandstone, white sand, in heath or *Banksia sceptrum* shrubland. (Figure 4C)

*Flowering period.* Between late September and early November.

*Chromosome number.*  $n=11$  (Rye 1979), voucher B.L. Powell 73025 [as *Pileanthus filifolius*].

*Conservation status.* Well conserved in Kalbarri National Park.

*Etymology.* From the Latin: *rubro* meaning red and *nitidus* meaning shiny, referring to the shiny red petals of this species.

*Notes.* This species has been known informally as *Pileanthus* sp. Kalbarri (D. & B. Bellairs 1684). It has been frequently confused with *P. dilatatus* in the past, but differs in flower size, petal colour and in having entire stamens.

The isolated Mount Magnet collection of *P. rubronitidus* has longer stamens than the western material of this species. This highly disjunct population needs recollecting.

**8. *Pileanthus peduncularis*** Endl., Stirp. Herb. Huegel. 3, 196 (1838). *Type*: "In Novae Hollandiae austro-occidentalis interioribus, inter Swan river et King Georges Sound legit cl. Roe" between Swan River and King George Sound, interior of south-west [Western Australia], *Roe* (BM!, W, photograph seen).

?*Chamelaucium dilatatum* Drumm., *Hooker's J. Bot. Kew Gard. Misc.* 5: 402–403 (1853). *Type*: not specified but species described from north-east of Perth, Western Australia.

Low spreading *shrub* to 1.5 m tall by 3 m wide, usually less. *Young branches* brown, oil glands prominent, turning grey and shedding; leaf decurrences prominent, with small stipular outgrowths in the axils. *Leaves* clustered on short opposite shoots, linear or clavate, triquetrous, 2–4 mm long, glabrous or hairy, with prominent oil glands, margin often with tooth-like hairs, apex obtuse or subacute. *Floral leaves* not clustered, navicular, to 3 mm long, broader than vegetative leaves, base winged. *Peduncle* slender, 9–20 mm long, with prominent oil glands. *Bracteole pair*: cup 3–5 mm long, *c.* 3 mm wide; free portions 6–9 mm long, with prominent oil glands, midrib not prominent, margins entire, with a broadly conical umbo *c.* 0.5 mm long. *Pedicel* 2–3 mm long. *Hypanthium* campanulate, 3–5 mm long, 3–4 mm wide, silky pilose, adnate part 1–2 mm long. *Sepals* oblong or ovate, 3–4 mm long, *c.* 2 mm wide, silky pilose, gland-dotted or with tuberculate hairs, margin entire. *Petals* 7–9 mm long, 4–6 mm wide, orange throughout or with a purple or reddish base, margins lacinate. *Androecium* with entire filaments; stamens 1–2 mm long, purple or pinkish red. *Ovules* 8. *Style* 5–7 mm long, glabrous, purple, becoming paler at apex; stigma, globose, minute. **Coppercups**

*Distribution.* Occurs from Minilya to Bruce Rock (Figure 4B).

*Conservation status.* This is the most widely distributed species of *Pileanthus*, and both subspecies have quite large ranges.

*Notes.* The species *Chamelaucium dilatatum* Drum., described by Drummond (1853: 403) as having vermilion petals and twenty stamens “united by a beautiful dark purple membrane” is probably a synonym of *Pileanthus peduncularis* as it appears to have been collected in an area where only that species occurs and because the description seems appropriate. However, it is also possible that the name applies to the species currently known as *P. filifolius*, in which case it would be the earliest description of that species and a new combination would be required. This needs to be investigated further.

Two morphologically distinct subspecies are recognised. They are largely geographically separated but overlap between Kalbarri and Nerren Nerren Station. No intermediates have been recorded in the area of overlap, but there has been little detailed collecting in this area. Until further studies of the variation in this species are completed it seems best to treat these geographical entities as subspecies.

### Key to the subspecies of *Pileanthus peduncularis*

1. Leaves glabrous. Flowers orange with a purple or reddish base and purple anthers ..... subsp. **peduncularis**
1. Leaves with scattered hairs. Flowers orange, sometimes with pinkish red anthers ..... subsp. **piliferus**

### 8a. *Pileanthus peduncularis* Endl. subsp. **peduncularis**

*Vegetative leaves* glabrous. *Bracteoles* glabrous. *Petals* purple or reddish at the base, orange above. *Anthers* purple. (Figure 3 K–O)

*Selected specimens examined.* WESTERN AUSTRALIA: near Bruce Rock, Sep. 1929, *W.E. Blackall s.n.* (PERTH); 8 km E of Kalbarri, *L.A. Craven* 7063 (PERTH); 48 km S of Nerren Nerren Station, 8 Nov. 1979, *H. Demarz* 7739 (PERTH); Wongan Hills, 13 Nov. 1985, *H. Demarz* 11058 (PERTH); Mogumber, 9 Nov. 1897, *R. Helms s.n.* (PERTH); East Yuna reserve, 70 km NE of Geraldton, 12 Oct. 1976, *B.G. Muir* 382 (PERTH); Tammin National Park, 13 Nov. 1970. *R.D. Royce* 9380 (PERTH).

*Flowering period.* August to November.

*Distribution and habitat.* Occurs from Nerren Nerren Station south to Mogumber, inland to East Yuna, Wongan Hills and Bruce Rock, growing on sand usually in heath. (Figure 4B)

*Chromosome number.*  $n=11$  (Rye 1979), voucher *B.L. Powell* 74092.

### 8b. *Pileanthus peduncularis* subsp. **piliferus** Keighery, *subsp. nov.*

Differt a *Pileantho peduncularis* subsp. *peduncularis* foliis piliferis eglanduligeris, floribus auranticis, antheris roseis, bracteolis piliferis tuberculatis.

*Typus:* 75 miles [121 km] north of Carnarvon on Onslow road, Western Australia, 24 August 1963, *J.S. Beard* 2997 (*holo:* PERTH 02506882; *iso:* KPBG).

*Vegetative leaves* covered in non-glandular hairs. *Bracteoles* covered in tubercular hairs. *Petals* orange throughout. *Anthers* orange or pinkish red.

*Selected specimens examined.* WESTERN AUSTRALIA: Kennedy Range, 23 Aug. 1965, *J.S. Beard* 4404 (PERTH); 20 km E of Kalbarri, 20 Nov. 1980, *D.E. Bellairs* 1686 (PERTH); Wogoola, Minilya River, 28 Aug. 1932, *C.A. Gardner* 3186 (PERTH); 45.8 km N of Galena Bridge on North West Coastal Highway, 29 Oct. 1986, *A.S. George* 16857 (PERTH); 76 miles [122 km] N of Carnarvon, Aug. 1963, *J. Tonkinson s.n.* (PERTH).

*Distribution and habitat.* Occurs from Minilya to Kalbarri. Grows on red or yellow sand dunes, or red, yellow or white sandy flats in *Banksia sceptrum* heath. (Figure 4B)

*Flowering period.* August to November.

*Notes.* This subspecies has been known as *Pileanthus peduncularis* subsp. *borealis* Keighery ms. It differs from *P. peduncularis* subsp. *peduncularis* in having either pure orange petals without any contrasting colour of red or purple at the base. Plants may have either orange or pinkish red anthers. The vegetative leaves are covered in non-glandular hairs and the bracteoles are covered with tubercular hairs.

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