

Pomax ammophila Ngugi (Rubiaceae), a new species from arid, central Australia

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Summary

Ngugi, L.B. (2022). *Pomax ammophila* Ngugi (Rubiaceae), a new species from arid, central Australia. *Austrobaileya* 12: 107–116. *Pomax ammophila* is described as new, distinguished from the related *P. rupestris* F.Muell. by the recurved peduncles; the leaves, fruits and stems with abundant short uncinuate hairs and the larger fruit and seed. The new species is sporadically widespread on red sand dunes in arid central Australia in the Northern Territory, Queensland, South Australia and Western Australia. Notes are provided on distinctive features, habitat, phenology and conservation status, along with detailed images and a distribution map.

Key Words: Rubiaceae; *Pomax*; *Pomax ammophila*; flora of Australia; flora of Northern Territory; flora of Queensland; flora of South Australia; flora of Western Australia; new species; taxonomy

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Introduction

Pomax Sol. ex DC. (Rubiaceae) is endemic to Australia and is classified in the tribe *Anthospermeae* Cham. & Schldl. (Puff 1982). Puff described *Anthospermeae* as comprising small trees or shrubs with inconspicuously coloured, actinomorphic, nectarless, odourless and wind pollinated flowers. Together with *Opercularia* Gartn., Puff (1982) further classified *Pomax* into the subtribe *Operculariinae* Benth. Molecular data have provided some support for the morphological classification outlined by Puff (1982). Anderson *et al.* (2001) constructed a molecular phylogeny of *Anthospermeae*, but with poor support for this subtribal classification. Thureborn *et al.* (2019) concluded that *Pomax* formed a sister clade to *Leptostigma* Arn. (subtribe *Coprosmiinae* Fosberg) on the basis of plastid data; however, when nuclear data was used, the relationship was with *Opercularia*. This inconsistent phylogenetic relationship was considered to require further study, with Thureborn *et al.* (2019) continuing to support the placement of both *Opercularia* and *Pomax* within *Operculariinae*.

Pomax was described by the Swiss taxonomist de Candolle (1830), with two species *P. glabra* DC. and *P. hirta* DC. Richard (1834) added a previously described species from *Opercularia* as *P. umbellata* (Gaertn.) Sol. ex A.Rich. and Mueller (1853) named *P. rupestris* F.Muell. Bentham (1867) in treating *Pomax* for *Flora Australiensis*, reduced all taxa to a single species, *P. umbellata*. Bailey (1913) continued to recognise the genus as consisting of a single species. Domin (1929) then split this species into five varieties; however, these names have not been applied in Australian herbaria and remain of uncertain application (CHAH 2011). Eichler (1965) expressed doubts regarding the inclusion of all material of *Pomax* under a single species and included *P. glabra*, *P. hirta* and *P. rupestris* as doubtful synonyms of *P. umbellata*.

Recent consensus has been to recognise two described species in *Pomax* (CHAH 2022): *P. umbellata* and *P. rupestris*. *Pomax umbellata* is a woody herb, prostrate or up to 40 cm tall, with stems pubescent or minutely so; leaves with petioles 1–9 mm long, and with leaf lamina ovate to obovate or narrowly

so (Bentham 1867; Stanley & Ross 2002; PlantNet 2022; VicFlora 2022). It is the most widespread species of the genus and grows on sandy soils derived from a broad range of geologies in *Eucalyptus* dominated woodlands in eastern Australia (Queensland Herbarium 2021). *Pomax rupestris* is a small shrub to about 50 cm tall with leaves that are glabrous, sessile or shortly petiolate, lanceolate-ovate or rarely elliptic (Flora NT 2022). It occurs from western to central and southern parts of Australia (AVH 2022) in rocky screes (WAH 2022).

A review was undertaken of the morphological variation of *Pomax umbellata* in Queensland, the only species recorded for the state (Forster & Halford 2021). A single collection from western Queensland did not match this species and had been determined by David Halford as *Pomax* sp. (*Richter DR282 & Turpin*). After a second collection was made from the same location, it could be confirmed that this material represented a new and distinctive species restricted to sand dunes. Further investigation revealed that this species extends into adjacent states of Australia (AVH 2022). Botanists in Western Australia and the Northern Territory independently recognised this species within their collections, applying different phrase names. The Northern Territory herbarium listed this first as *Pomax* A89438 Sand Dunes (Dunlop 1995) then in 2011, listed it as *Pomax* sp. Sand dunes (P.G.Wilson 752) NT Herbarium, while Western Australia listed it as *Pomax* sp. desert (A.S.George 11968) WA Herbarium (CHAH 2011). *Pomax* sp. Sand dunes (P.G.Wilson 752) NT Herbarium became the accepted name for *Pomax* sp. desert (A.S.George 11968) WA Herbarium (CHAH 2018). In this paper a new species for arid Australia is described based upon these collections and of the author.

Materials and methods

This study is based on a morphological examination of herbarium collections held at the Queensland Herbarium (BRI) and specimens loaned from the Northern Territory Herbarium (DNA, NT), the State Herbarium of South Australia (AD) and the

Western Australian Herbarium (PERTH). The measurements for corolla, stamens and style are based on dried material reconstituted with hot water, while all other measurements were from dried material using a ruler or microscope eyepiece graticule. Stereomicroscopy and Scanning Electron Microscopy (SEM) were also used to clearly visualise and characterise the stem indumentum, presence of colleters in stipules, leaf indumentum, fruit dehiscence and position of seeds, and idioblasts on the seeds. The distribution map was compiled from localities and/or geocode information provided on the labels of specimens at AD, BRI, DNA, NT and PERTH and was mapped using DIVA-GIS Software.

Taxonomy

Pomax ammophila Ngugi, sp. nov.

With affinity to *Pomax rupestris*, differing by the presence of uncinat hairs on stems, leaves and fruits; recurved peduncles; fruit with larger, campanulate capitula; larger seeds and a sand dune habitat. **Typus:** Australia: Queensland. GREGORY SOUTH DISTRICT: 14 km from Carrinya Homestead, about 60 km from Windorah, 28 September 2021, *L.B. Ngugi 112 & G.P. Turpin* (holo: BRI [AQ1026842, comprising 2 sheets]; iso: AD, CANB, MEL, NSW, NT, PERTH).

[*Pomax umbellata* auct. et pro parte, non DC.: Marsden (1981: 283–284) (referring to ‘dunes’); Green (1985: 155)].

Pomax A89438 Sand Dunes: Dunlop (1995: 99); CHAH (2011).

Pomax sp. Sand dunes (P.G.Wilson 752) NT Herbarium: CHAH (2011, 2018).

Pomax sp. desert (A.S.George 11968) WA Herbarium: WAH (2011); Percy-Bower (2019: 13).

Perennial, woody subshrub, erect, 10–50 cm high. Stems terete, indumentum comprising mixed short uncinat or flexuose, or erect hairs, 0.1–0.3 mm long. Mature stem with outer surface layers decorticating in long vertical plates. Stipules interpetiolar, narrowly triangular or sometimes lobed, 0.9–5 mm long, 0.4–1.4 mm wide; hairs uncinat 0.05–

0.3 mm long, mostly along margins; colleter along margins. Leaves opposite, narrowly elliptic or lanceolate, 7.5–26 mm long, 2.2–7 mm wide, light green, margins fimbriate; base sessile or attenuate; apex acute or attenuate; laminae indumentum predominantly 0.05–0.4 mm long, but up to 0.5 mm long on veins and along margins, abaxial indumentum longer and denser compared to adaxial side. Inflorescence terminal or axillary near the top; 1–3 flowers fused at their bases to form a capitulum; andromonoecious. Flowering peduncles 0.5–5 mm long; indumentum uncinata, reflexed or erect, 0.05–0.3 mm long, elongating as it matures; calyx lobes variable in shape and size. Pistillate flowers: corolla 2–3.7 mm long, lobes 5 or 6, 0.1–1.5 mm long, green, indumentum external, uncinata, 0.05–0.4 mm long, sparse; style filiform, 3–6.5 mm long, deeply bifid more than $\frac{3}{4}$ its length, stigma papillate. Staminate flowers: corolla 2–4 mm long, 5–6 lobed, 0.6–2.5 mm long, indumentum 0.01–0.1 mm long, very sparse, mostly around the outside edges; stamens 3–5, filament exerted for 1–5 mm, anthers 1.3–2.5 long. Fruiting peduncles 1.5–6.5 mm long, recurved; calyx lobes variable in shape and size, 2.4–3.2 mm long. Fruits an operculate campanulate capsule, non-fleshy, 3–5 mm long, 2–5 mm wide; locules 1–3, seed per locule 1; indumentum uncinata, 0.01–0.2 mm long, very sparse; operculum deciduous releasing the seed; empty capitulum persistent for some time after seed dehiscence. Seeds obdeltoid, 2.2–3.8 mm long, 1.4–2 mm wide and 0.3–0.9 mm broad, ridge on dorsal surface $\frac{1}{2}$ to $\frac{3}{4}$ of seed length; covered with white idioblasts containing calcium oxalate crystals (raphides). **Figs. 1–4.**

Additional specimens examined: Western Australia. 80 km NNE of Bondya Homestead, c. 100 km N of Laverton, Aug 1968, *Wilson 7384* (PERTH); Hill N of Good Camp Rockhole, South Carnarvon Range, Little Sandy Desert, Aug 1998, *Blackhouse et al. BEMJ 180* (PERTH); On S side of Lake Kerrilyn, c. 5.9 km on a bearing of 25° from Mt Methwin, Birriliburu Indigenous Protected Area, Aug 2012, *Gibson et al. NG7030* (BRI, PERTH). **Northern Territory.** Wild Eagle Plain, Temple Downs Station, Sep 2014, *Jobson 11515 & Latz* (DNA, K, MEL, PERTH); c. 5 km W [of] Redbank Yard, Owen Springs Station, Sep 2000, *Albrecht 9402* (DNA); 3 km NE of Mt Winter, 80 km WNW of Kings Canyon, Aug 3003, *Latz 18953 & Albrecht* (DNA, MEL);

Norman Gully, Finke Gorge NP, 0.2 km E of fenceline, Jun 2006, *Schubert 137* (DNA). **Queensland.** GREGORY SOUTH DISTRICT: 14 km from Carrinya Homestead, c. 60 km from Windorah, Sep 2011, *Richter DR282 & Turpin* (BRI). **South Australia.** 30 km W of Vokes Corner, along track to Serpentine Lakes, Aug 1980, *Weber 6408* (AD, KRA, PE); 11 km NE Mount Finke, Denton's track, Oct 1987, *Simon 1083* (AD).

Distribution and habitat: *Pomax ammophila* occurs in central inland Australia in Western Australia, Northern Territory, Queensland and South Australia (**Map 1**). It is confined to red sand dunes in open shrublands over *Triodia* hummock-dominated grassland. In the Northern Territory, typical associated species include *Calandrinia polyandra* Benth., *Calotis erinacea* Steetz, *Chrysocephalum apiculatum* (Labill.) Steetz, *Eremophila willsii* F.Muell. and *Grevillea stenobotrya* F.Muell. In Western Australia, typical associated species include *Acacia ligulata* A.Cunn. ex Benth., *Corymbia chippendalei* (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson, *Eremophila platythamnos* Diels and *G. stenobotrya*. In Queensland, *P. ammophila* has been recorded only near Windorah in sparse to open grassland dominated by *Trachymene cyanantha* Boyland and *Triodia basedowii* E.Pritz, with scattered *Acacia* species, *Corymbia aparrerinja* K.D.Hill & L.A.S.Johnson, *C. terminalis* (F.Muell.) K.D.Hill & L.A.S.Johnson and *Dodonaea* species (**Fig. 5**). The Queensland Regional Ecosystem (RE) is 5.6.5/5.5.3b (Neldner *et al.* 2020); this is described as a variable sparse to open-herbland or shrubland on dune flanks, crests and sandy interdunes.

Phenology: Flowers have been recorded from May to October, and fruits recorded for every month of the year.

Notes: The peduncles of *Pomax ammophila* at the fruiting stage are recurved (**Fig. 1A & B**), unlike *P. umbellata* which has erect peduncles. The surface of the leaves, fruits and stems are rough to the touch (at least when dried), likely because of the abundant short uncinata hairs (**Fig. 2C**), while *P. rupestris* is glabrous and leathery to the touch, and *P. umbellata* is hairy and feels smooth. The hairs on the abaxial leaf surface of *P. ammophila* are longer and denser compared with those on

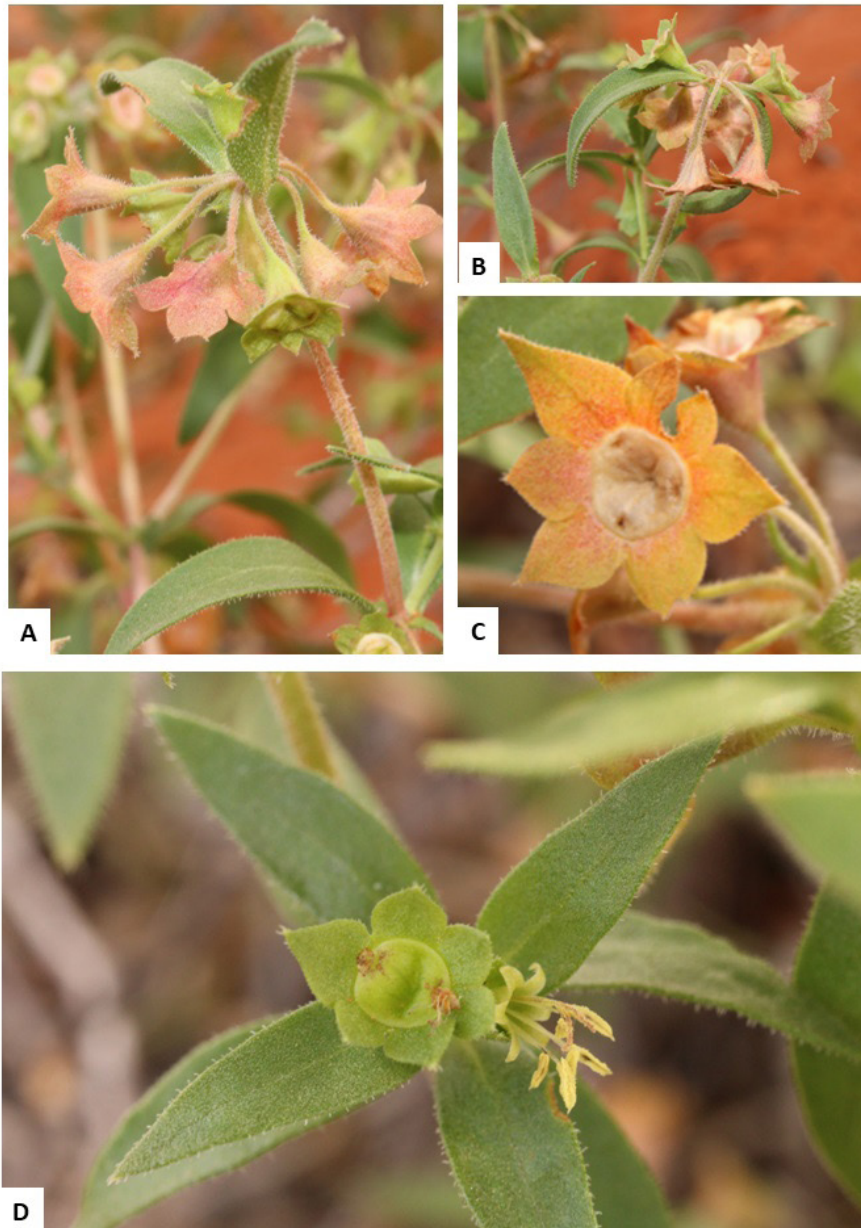


Fig. 1. Flowers and fruit of *Pomax ammophila*. A. & B. mature fruits showing recurved peduncles. C. empty fruit persistent on plant. D. bisexual flower showing pistillate and staminate parts. All from *Ngugi 112 & Turpin* (BRI).

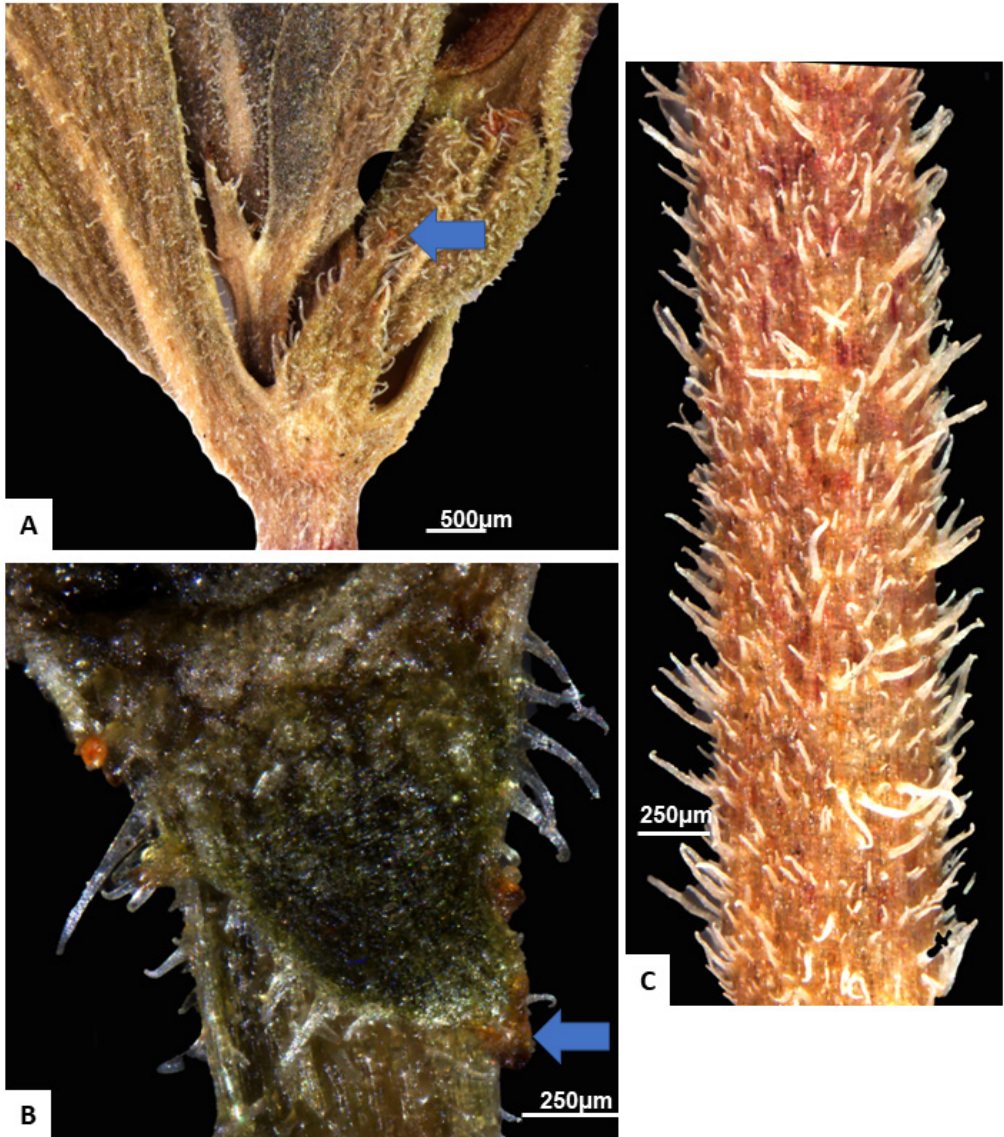


Fig. 2. Indumentum on vegetative parts of *Pomax ammophila* as seen under stereomicroscope. A. interpetiolar stipule abaxial surface showing the colleters (indicated by blue arrow). B. interpetiolar stipule adaxial surface showing the colleters (indicated by blue arrow). C. young stem showing uncinata hairs. A from *Jobson 11515 & Latz* (NT); B & C from *Richter 282 & Turpin* (BRI).

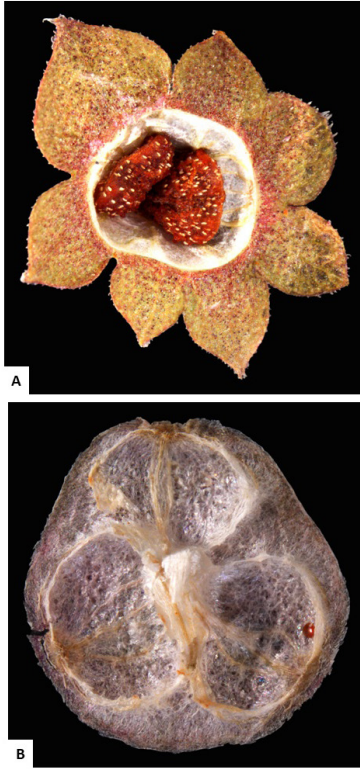


Fig. 3. Fruit of *Pomax ammophila*. A. fruit showing seed position and idioblasts on seeds. B. inside view of fruit cap lid showing three locules. From Ngugi 112 & Turpin (BRI).

the adaxial leaf surface. The fruit size (3–5 mm long, 2–5 mm wide) (Fig. 1A–D) and the seed size (up to 3.8×2 mm) (Fig. 4A & B) are also much larger than the other species of *Pomax*.

Colleters on the stipules of *Pomax ammophila* are congruent with those described for a large number of species of Rubiaceae (Robbrecht 1988). A study of colleter types in Rubiaceae found that colleters with uniform appearance like those of *Cinchona calisaya* Wedd., are widespread in the tribe in which *Pomax* was included, although the genus was not directly mentioned (Lersten 1975). In recent years, colleters have only been noted

to be present or absent (WAH 2022). The colleters of *P. ammophila* are cylindrical to conical, amber in colour, tapering towards the tip on rims of the interpetiolar stipules (Fig. 2A & B).

The occurrence of calcium oxalate crystals in all organs of *Pomax ammophila* are congruent with the description for Rubiaceae (Robbrecht 1988). Crystals such as druses and styloids are usually observable with the naked eye or under low magnifications as translucent points in leaf blades and so may serve as practical identification or taxonomic characters (Robbrecht 1988; Teixeira *et al.* 2016). Specialised white cells called idioblasts containing needle like raphide crystals are found in the seeds of *P. ammophila* (Fig. 4A–C). Druses found on leaf surfaces and hairs of *P. ammophila* are noticeably shinier than in other species of *Pomax*.

The fruit of *Pomax* (Fig. 3A & B) is a pome and has two parts: the capitulum is the lower part shaped like a cup and surrounded by the calyx in variable shapes and sizes; and the operculum is the fruit's apical lid, with an almost round shape. When the fruit has matured, the operculum opens up along a transverse dehiscence line. Seeds dehisce through the operculum and empty fruits persist for some time (Fig. 1C).

Conservation status: *Pomax ammophila* is widespread with many populations scattered over inland arid Australia. It occurs in a number of conservation reserves and protected areas in Western Australia, Northern Territory and South Australia; however, in Queensland it only occurs on private grazing land. The recommended conservation status for the species is **Least Concern** based on criterion B (IUCN 2021).

Etymology: The specific epithet is derived from the Greek *ammophila*, which means sand-loving. This refers to the sand dune habitat where *Pomax ammophila* grows and also pays recognition to one of its phrase names *Pomax* sp. Sand dunes (P.G.Wilson 752) NT Herbarium.

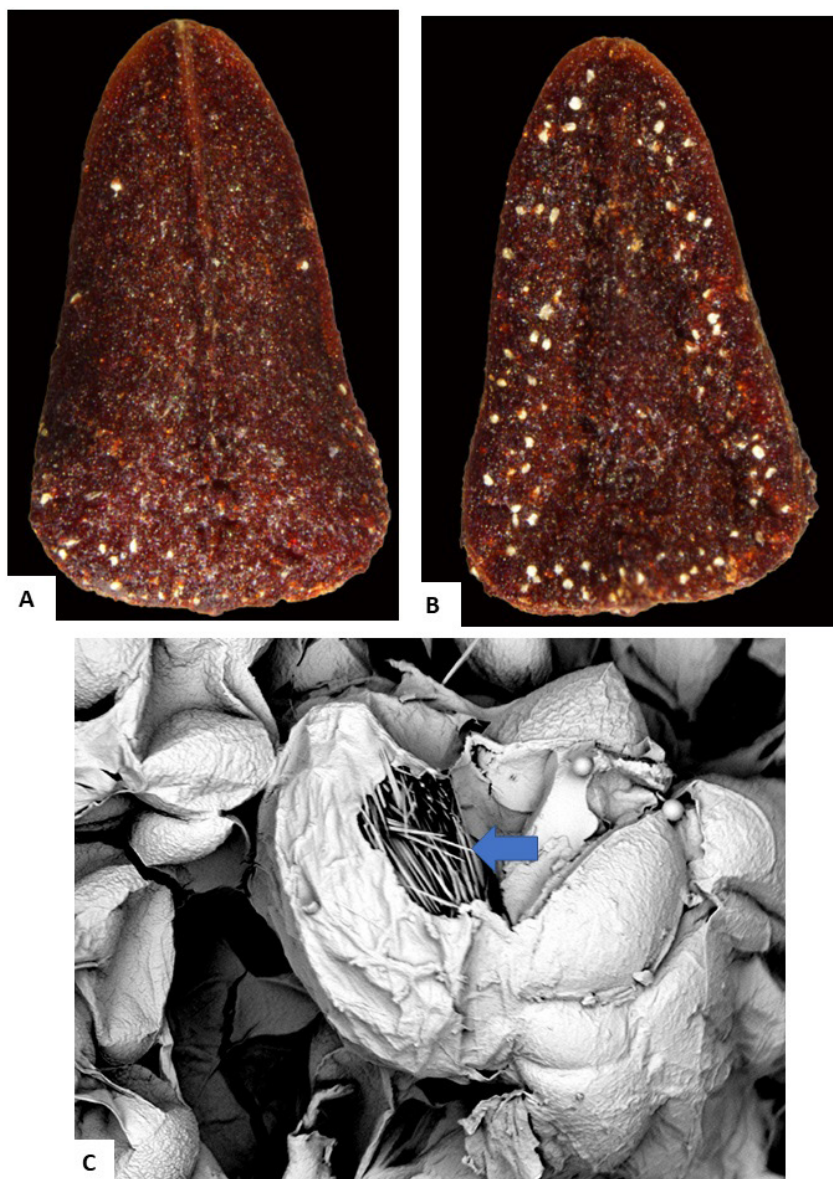


Fig. 4. Seeds of *Pomax ammophila* showing white idioblasts. A. dorsal view. B. ventral view. C. SEM of idioblast showing multiple needle-like raphides crystals (indicated by blue arrow). A & B from Richter 282 & Turpin (BRI); C from Ngugi 112 & Turpin (BRI).



Fig. 5. Habitat for *Pomax ammophila* at the type locality. Photo: L.Ngugi.

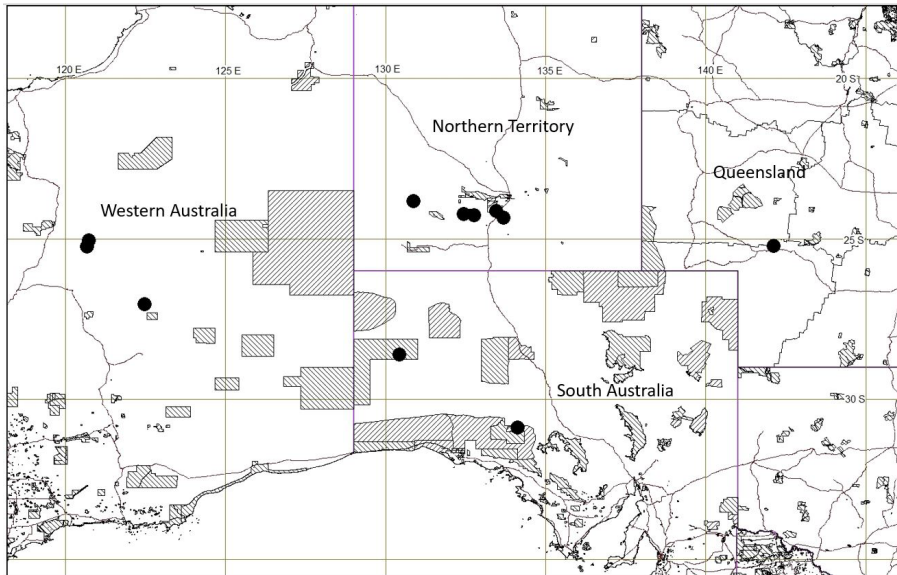
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Map 1. Distribution of *Pomax ammophila* based on cited herbarium specimens.