A taxonomic revision of *Thryptomene* section *Thryptomene* (Myrtaceae)

B.L. Rye and M.E. Trudgen

Western Australian Herbarium, Department of Conservation and Land Management,
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983

Abstract

B.L. Rye & M.E. Trudgen. A taxonomic revision of *Thryptomene* section *Thryptomene* (Myrtaceae). *Nuytsia* 13(3): 509–528 (2001). A revision of *Thryptomene* Endl. sect. *Thryptomene* is presented covering the nine species now included, with distribution maps and a key for all species and illustrations of selected taxa. Five new species and a new subspecies are described. These are *Thryptomene australis* subsp. *brachyandra* Rye & Trudgen, *T. costata* Rye & Trudgen, *T. eremaea* Rye & Trudgen, *T. duplicata* Rye & Trudgen, *T. salina* Rye & Trudgen and *T. striata* Rye & Trudgen. *Thryptomene johnsonii* F. Muell. is reinstated, *T. prolifera* Turcz. is reduced to a synonym of *T. mucronulata* Turcz., and a lectotype is selected for *T. dielsiana* E. Pritz., which is another synonym of *T. mucronulata*.

Introduction

Thryptomene sect. *Thryptomene* (Myrtaceae) is endemic to south-western Australia and is now considered to include nine species, one of which has two subspecies. The section was first defined by Stapf (1924), who included three of the currently recognized species, *T. johnsonii*, *T. mucronulata* and the type species, *T. australis*, as well as two species now reduced to synonymy. Another species included in the section here, *T. decussata*, had been described as a species of *Scholtzia* Schauer and was transferred to *Thryptomene* by Green (1985). Three additional species had been recognized as distinct at the Western Australian Herbarium (PERTH) by the application of informal geographic names and several other new taxa were recognized as new members of the section during this study.

Identification of members of this section has been difficult owing to the small size of the leaves and flowers of these plants, the existence of undescribed taxa, the lack of good keys and descriptions for named taxa, and the misapplication of published names. While the taxonomic revision presented in this paper addresses most of the problems in section *Thryptomene*, there remain many unnamed Western Australian species of *Thryptomene*, most of which belong to section *Astraea* Stapf, but also a few that do not fit readily into either section. Other papers dealing with *Thryptomene* and related genera, including a revision of *Thryptomene* sect. *Astraea*, are presently in preparation.

Methods

Type material was borrowed from MEL and all other specimens examined are housed at PERTH. All measurements were taken from dry pressed material. Leaf measurements were obtained from the larger leaves on each specimen. Flower diameter was taken with petals fully outspread, even though this may be an unnatural measurement in taxa such as *T. mucronulata* in which the petals do not open widely. Since each flower has the sepals that were innermost in bud larger and more fully petaloid than the outer sepals, sepal measurements were taken only from the inner sepals. Fruit shapes and sizes include the encasing hypanthium and disc.

Distribution maps were based on those available from Florabase, the Western Australian Herbarium's database for Western Australian flora, with the Biogeographic Regions shown on them (and referred to elsewhere by codes) being those defined by Thackway & Cresswell (1995). The conservation codes given in this paper are those used by the Western Australian Department of Conservation and Land Management. An explanation of these codes is given at the end of this *Nuytsia* issue.

Distinguishing features of *Thryptomene* sect. *Thryptomene*

Sect. *Thryptomene* is much more closely related to sect. *Astraea* than to the other three sections included in the genus by Stapf (1924). Sect. *Astraea* and sect. *Thryptomene* have a distinctive anther morphology that is restricted to these two sections, while the other sections all have distinct types of anthers (variously differing in the orientation and degree of fusion of the lobes, connective gland and dehiscence characters) and are also distinguished either by inflorescence or hypanthium characters. Although most Western Australian species with the typical *Thryptomene* anther type clearly belong to sect. *Thryptomene* or to the larger sect. *Astraea*, there are several unnamed taxa that do not fall readily into either section, so there may be a need to recognize additional sections in the genus. For simplicity in the discussion below, these few unplaced species are covered by the comments given for sect. *Astraea*.

The typical section is defined primarily by the appearance of the hypanthium, which is prominently longitudinally ribbed but with no other patterning (see Figure 1F,I). The ribs are variable in number and length, with most of them running from the top of the hypanthium to the base while the shorter ones extend part way down from the summit, where there is more space for them. The ribs usually remain closely packed on the fruit. In contrast most members of sect. *Astraea* have a variety of prominent pits, wrinkles or other ornamentations on the hypanthium, sometimes combined with less prominent ribs. The few remaining members of that section either have a smooth hypanthium or more regular ribbing, with 5 ribs opposite the sepals and often a further 5 ribs opposite the petals, and the ribs become widely spaced on the fruit. Members of the other sections recognized by Stapf usually also have 5 or 10 ribs, or a smooth hypanthium.

The other main distinguishing feature of sect. *Thryptomene* is that the species referred to it have 4–8(9) ovules, whereas the members of the other sections have only 2 ovules. A few species of sect. *Astraea* have the two ovules separated in a 2-locular or partially 2-locular ovary, but members of sect. *Thryptomene* and the other three sections always have a unilocular ovary.

Stamen number and arrangement is less definitive but also helps to separate the sections of *Thryptomene* as shown in Table 1. With the fewer species known to Stapf (1924), he was able to simply

Table 1. Comparison of stamen number and arrangement in the sections of *Thryptomene*. Symbols: – absent, + rare, ++ fairly common, +++ common. *Includes a few hexamerous species with 6 sepals and 6 stamens. **When irregularly arranged, some of the stamens are more or less opposite sepals and petals while others are more or less alternating between the sepals and petals.

Stamen number	Stamen arrangement	Sect. *Astraea*	Sect. *Thryptomene*	Other three sections
5*	opposite sepals	+	+	+++
10	opposite sepals & petals	+	+++	–
10	alternating with sepals & petals	+++	–	–
variable, (5)6–10(12)	irregular**	++	+++	+
15–30	in 2 whorls	–	++	–

categorize the sections into two groups with 10 stamens (sect. *Astraea* and sect. *Thryptomene*) and 5 stamens (three sections) respectively. This distinction no longer holds so precisely but, with very few exceptions, the two sections of the former group do have larger stamen numbers than the three sections of the latter group.

While there is also no complete separation between sections *Astraea* and *Thryptomene* in stamen number and arrangement, some differences are evident in Table 1. A majority of species in the former section have 10 stamens alternating between the sepals and petals, a situation unknown in sect. *Thryptomene*, in which the regularly 10-staminate species have the stamens opposite the sepals and petals. Unique to the typical section is the occurrence of 15–30 stamens in two whorls, with some exactly opposite the sepals and petals and others at various intermediate positions, sometimes with two stamens (one from each whorl) in the same position (see Figure 1E).

Formal taxonomy

Thryptomene Endl. sect. **Thryptomene**

Shrubs usually medium-sized to tall, glabrous; leaf-bearing stems 4-angled, with whitish bark, usually gland-dotted; older stems losing the white bark in strips to reveal a usually yellowish-brown bark but soon becoming dark grey, rough, commonly fissured, flaky or fibrous. *Leaves* opposite and decussate, rather to very crowded on the branchlets, with a very short petiole; blade concolorous, usually medium green, gland-dotted, entire or denticulate. *Inflorescence* of one to many pairs of axillary units, each unit comprised of a solitary peduncle bearing 1 or rarely 2(3) flowers, each flower sessile within 2 subtending bracteoles, the peduncle very short to far exceeding the subtending leaf. *Bracteoles* imbricate and partially to fully enclosing flower in bud, shorter and more scarious than the

leaves, the thickened midvein usually prominent on abaxial surface, with a subterminal abaxial protrusion or a terminal point. *Hypanthium* united to ovary and to margin of disc, in two species extended with the disc lining for some distance above the ovary, narrowly obconic or obconic at first, becoming more swollen and inverted-campanulate in fruit, longitudinally ribbed, with no other prominent ornamentation; ribs irregular and variable in number, 8–16 extending the full length of the hypanthium and some of these branched to produce some shorter ribs, usually initially acutely angled and separated by more or less v-shaped or broader sinuses but sometimes separated only by fine line-like indentations, usually remaining closely packed in fruit. *Sepals* 5, widely spreading, with a somewhat herbaceous and gland-dotted centre-base and the remainder more petaloid in flower, becoming scarious in fruit, the herbaceous portion usually greenish at first, the petaloid portion white to deep pink, entire or denticulate. *Petals* 5, erectly positioned in a cup-shaped formation in flower or somewhat more spreading, directed inwards and overlapping in fruit, broadly obtuse, white to deep pink. *Stamens* 5–30, commonly 10 opposite the sepals and petals or 7–10 in an irregular arrangement, if 5 then opposite the sepals, if 15–30 then occurring in two whorls both opposite and between the sepals and petals; filament tapering from the base to the apex or sometimes rather slender throughout; anther 2-celled, the cells divergent at base and each dehiscent by a large pore or very short slit, red-brown or red at first and becoming brown; connective gland prominent, at least half as large as each anther cell, often yellowish at first, united to connective at one end, the other end protruding beyond the top of the anther cells, its apex free and directed inwards, releasing contents via an apical pore when pollen is released from anther cells. *Disc* either concave or deep and cup-shaped in flower, the portion attached to the ovary becoming convex in fruit, gland-dotted, often deep pink in late flower. *Ovary* 1-celled, with a near-basal placenta; ovules 4–8(9), all or mostly in 1–4 obliquely superposed pairs (when the ovule number is odd, the uppermost or lowest ovule is unpaired), each pair usually collateral and touching. *Style* central, terminal (not in a depression), with a simple capitate stigma. *Fruit* (including the hypanthium and disc enclosing it) dry, hard, indehiscent, with sepals and petals persistent, when fertile usually 1-seeded, rarely 2-seeded; seed(s) more or less kidney-shaped, soft, with a thin pale yellowish brown coat.

Size and distribution. Nine species are currently recognized. The section is endemic to south-western Australia, with a centre of distribution in the northern part of the South West Botanical Province, but also occurring in the South-western Interzone and the south-western part of the Eremean Botanical Province, with one species extending from there to the southern part of the South West Botanical Province.

Genetic and breeding systems. Two chromosome numbers have been recorded (Rye 1979) for the typical section of *Thryptomene*, the diploid n = 11 in *T. mucronulata* [as *T. prolifera*] and the tetraploid n = 22 in *T. australis*. All species appear to be protandrous, with pollen also well separated physically from the stigma so that autogamous self-pollination is not possible. Their flowers are attractive to a variety of small insects which could act as vectors for the sticky mixture of pollen and glandular secretion.

The fruit of *Thryptomene* species is normally a nut, with a hard indehiscent casing formed by the disc and hypanthium enclosing a single very soft seed. Since the ovary contains at least two, and in sect. *Thryptomene* at least four ovules, regular production of 1-seeded fruits could only be achieved by a physiological or genetic system, perhaps favouring either the first-fertilised ovule or the genetically fittest zygote to produce the solitary seed. The occasional occurrence of 2-seeded fruits in a number of *Thryptomene* species indicates that those species do not have any fully effective system to prevent more than one seed developing.

Thryptomene australis has an unusually high seed set for the genus. Up to a third of all fertile fruits of this species sampled by Rye & James (1992) were 2-seeded rather than 1-seeded, and there was no evidence of any system to limit seed set to one per fruit. Some kind of incomplete system tending to limit seed set was found, however, in *T. mucronulata* [as *T. prolifera*], because the observed frequency of 2-seeded fruits in that species was significantly lower than the expected frequency based on the number of empty and 1-seeded fruits scored in a large sample.

Key to species and subspecies of *Thryptomene* sect. *Thryptomene*

1. Stamens 15–30, in 2 whorls, arranged both opposite and between the sepals and petals
   2. Sepals and petals of about the same length. Style 2.5–3.5 mm long. Ovules 5–7. (Shark Bay to Leonora) ..... **T. decussata**
   2. Sepals distinctly shorter than petals. Style *c.* 0.7 mm long. Ovules 4. (Binnu area) ..... **T. duplicata**
1. Stamens 5–10(12), in one whorl, variously arranged
   3. Stamens 5, opposite the sepals. (East of Hyden) ..... **T. salina**
   3. Stamens 7–10(12), not all opposite the sepals
      4. Stamens variable in number and irregularly arranged, with some opposite and some between the sepals and petals
         5. Leaves fairly flat, obovate to almost circular, with a recurved mucro or point 0.2–0.5 mm long. Bracteoles persistent in fruit. Ovules 4. (Kalbarri National Park.) ..... **T. johnsonii**
         5. Leaves very thickened at least towards the apex, linear to obovate in outline, with a recurved point 0.5–1.5 mm long. Bracteoles deciduous. Ovules 5–8
            6. Leaves triangular or indented-triangular in TS towards the apex and tending to be more flattened below, 3–9 mm long, tapered at apex to a terminal recurved point 0.5–1 mm long. (Dalwallinu to Williams to Cape Arid National Park to Kalgoorlie) ..... **T. australis**
               7. Stamens almost reaching the style when pressed inwards; filament usually 0.8–1 mm long. Style *c.* 0.8 mm long ..... subsp. **australis**
               7. Stamens well separated from style when pressed inwards; filament usually 0.4–0.6 mm long. Style *c.* 0.4 mm long ..... subsp. **brachyandra**
            6. Leaves almost terete with an adaxial groove, 2.5–4 mm long, swollen at apex and with a subterminal recurved point 0.8–1.5 mm long. (Menzies to Queen Victoria Springs) ..... **T. eremaea**
      4. Stamens 10, opposite the sepals and petals
         8. Leaves with a prominent recurved apical point 1–2 mm long. Style 0.3–0.6 mm long. Ovules 6–9. Occurring on granite outcrops and other rocky sites. (Cue area to Wubin to Menzies) ..... **T. costata**
         8. Leaves with no mucro or a small mucro up to 0.5 mm long. Style 0.6–0.8 mm long. Ovules 4–6. Occurring in low-lying winter-wet habitats or along drainage lines on higher ground

9. Margins of leaves directly below the inflorescences entire or denticulate. Flower buds with hypanthium ribs rounded to almost acute and separated by v-shaped sinuses. (Wilroy to Gingin and Ejanding) ..... **T. mucronulata**

9. Margins of leaves directly below the inflorescences with at least a few narrow protrusions up to 0.25 mm long. Flower buds with ribs flattened and closely pressed together giving a striate appearance. (Kalbarri National Park) ..... **T. striata**

Thryptomene australis Endl. (Endlicher 1838: 4). *Type:* "ad orientem ab urbe New-York, Nova Hollandia austro occidentalis", [east of York, Western Australia], *Roe* (*iso:* K *n.v.*, photograph PERTH 01621408).

Shrubs erect, 0.8–3.5 m high. *Leaves* antrorse or appressed, with apex recurved and apical point widely antrorse to patent w.r.t. stem. *Petioles* 0.7–1 mm long. *Leaf blades* linear to narrowly obovate in outline (usually very narrowly obovate) and much thickened near the apex where the TS is either triangular (two outer faces formed by the keeled abaxial surface of the leaf and the other by a flat adaxial surface) or modified from triangular by indentation of the adaxial surface, (3)4–7 x 0.5–1.2 mm not including the prominent apical point, truncate at base, entire, with numerous prominent oil glands on both surfaces, the larger glands *c.* 0.1 mm diam. or less; apical point recurved, 0.5–0.8 mm long, yellowish or white, sometimes with a pink-tinged base. *Inflorescence* with flowers in 1–11 pairs in a subterminal cluster or spike-like arrangement on each branchlet; peduncles 1-flowered, 1–3 mm long in fruit. *Bracteoles* somewhat scarious, pinkish, narrowly ovate or ovate, usually with an erect to incurved terminal mucro or non-mucronate apex (rarely with a recurved mucro), 1.4–2.4 mm long including point, folded/keeled, caducous or deciduous. *Flowers* 6–7 mm diam.; disc concave. Sepals depressed ovate to very broadly elliptic, 1.3–1.5 mm long, 1.6–2.0 mm wide, white or pale pink, entire. *Petals* broadly or very broadly ovate, 2.0–2.4 mm long, white, entire. *Stamens* 7–10(12), irregularly arranged, some opposite and others between the sepals and petals; filament 0.4–1 mm long. *Ovules* 5–7. *Style* 0.4–0.8 mm long. *Fruit* 2–2.6 mm long, *c.* 2.5 mm diam., 1- or 2-seeded, with 9–11 full-sized and several shorter longitudinal ribs; seed(s) *c.* 1.4 mm long. (Figure 1A)

Distribution and habitat. South West Botanical Province: AW, ESP, JF, MAL; also South-western Interzone: COO. Extends from near Kalannie (east of Dalwallinu) south to Tarwonga (near Williams), south-east to Cape Arid National Park and inland to near Kalgoorlie. Occurs mainly on granite outcrops and other granitic sites, but also recorded on basalt, in shrublands with a variety of species (e.g. *Acacia lasiocalyx* and *Melaleuca elliptica*) that are normally associated with granite.

Phenology. Flowers mainly July to November. Fruits recorded October to December.

Conservation status. Both subspecies are widespread and common.

Notes. Very closely related to *Thryptomene eremaea* as discussed under that species. *T. australis* appears to set two seeds per fruit more commonly than do other members of the section. Like related species with high and variable ovule numbers, *T. australis* has its ovules mostly in superposed pairs but the uppermost or lowest level often consists of an unpaired ovule. Sometimes the lowest pair consists of two ovules somewhat superposed rather than collateral to fit the narrowed shape of the base of the ovary.

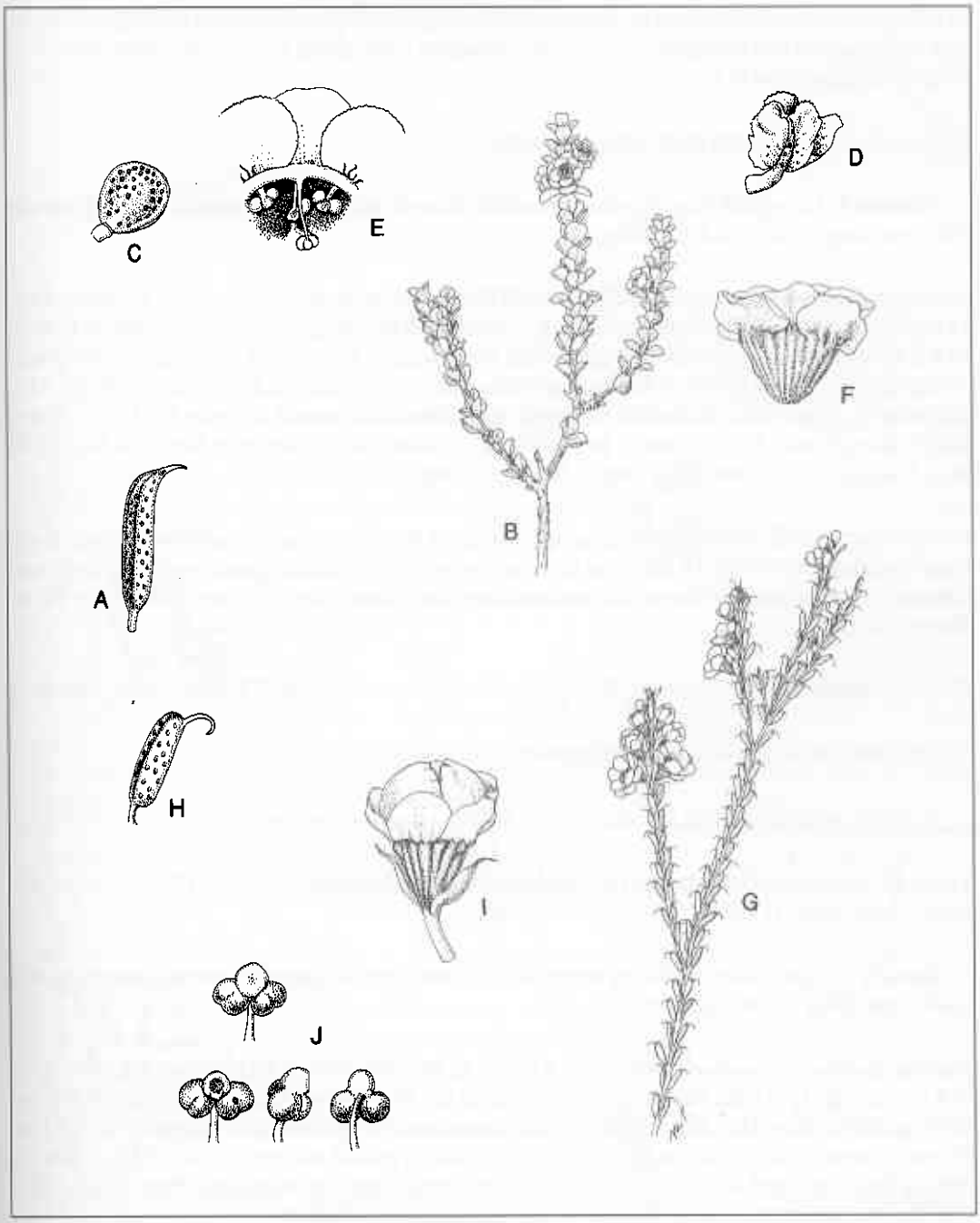

Figure 1. A – *Thryptomene australis* leaf (x5); B–F. *Thryptomene duplicata*. B – flowering branch (x1), C – upper surface of leaf (x5), D – peduncle and bracteoles (x5), E – top view of several stamens with associated petals and sepal, showing 2 stamens from different whorls (one long and one short) arising together opposite a sepal (x10), F – side view of immature fruit (x5); G–J. *Thryptomene eremaea*. G – flowering branch (x1), H – side view of leaf (x5), I – peduncle, bracteoles and flower (x5), J – stamen before (top view) and after (lower three views) dehiscence (x25). Drawn from *M. Bennett* 35 (A), *M.E. & M.R. Trudgen* 12012 (B–F) and *D.J. Pearson* 2212 (G–J).

Thryptomene australis is a widespread species showing considerable geographic variation, with its two main variants treated here as subspecies, the typical one in the western part of the species range with long stamens and the eastern one with short stamens. Specimens from certain areas such as the Fitzgerald region tend to have short leaves.

a. Thryptomene australis Endl. subsp. **australis**

Stamens 8–12 (usually 9 or 10), almost reaching the style when pressed inwards; filament usually 0.8–1 mm long. *Style c.* 0.8 mm long.

Selected specimens examined. WESTERN AUSTRALIA: West Arthur shire, behind Tarwonga Hall, 14 July 1992, *V. Crowley* 4; Wattengutten Hill, *c.* 27 km ESE of Wongan Hills, 23 Oct. 1992, *A.M. Lyne* 833, *L. Craven & F. Zich* (ex CBG); Wilgyne Hill, N of Campion, 9 Sep. 1942, *C.A. Gardner* 6456; near Young River, *c.* 21 km NNW of the coast at Stokes Inlet, 20 Oct. 1968, *A.E. Orchard* 1679 (ex AD); cultivated in Kings Park, ex Bremer Bay road, near Cape Riche turnoff, 26 May 1973, *B.L. Powell* 73090; King Rocks, E of Hyden, 7 July 1974, *B.L. Powell* 74028; Boyagin Rock, 28 July 1976, *M.E. Trudgen* 16911; Dunn Rock Nature Reserve, 25 Sep. 1995, *S. Walsh* 13.

Distribution. Occurs in all of the Biogeographic Regions listed for the species although almost absent from the Interzone (COO). It occupies the western part of the species range, extending from near Kalannie south to near Williams and eastwards to Frank Hann National Park and Young River. (Figure 2A)

Chromosome number. n = 22, *c.* 22 (Rye 1979). Voucher specimens: *B.L. Powell* 73090, 74028.

b. Thryptomene australis subsp. **brachyandra** Rye & Trudgen, *subsp. nov.*

A subsp. *australi* staminis et stylo breviore differt.

Typus: 98.1 km east of Norseman on Eyre Highway, Western Australia, 16 August 1995, *R.J. Cranfield* 10063 (*holo:* PERTH 04390962; *iso:* CANB, MEL).

Stamens 7–10 per flower, distinctly separated from the style when pressed inwards; filament usually 0.4–0.6 mm long. *Style c.* 0.4 mm long.

Selected specimens examined. WESTERN AUSTRALIA: 2 km ESE of Mt Newman, 23 Nov. 1990, *W.R. Archer* 23119112 (ex MEL); Newman Rock, 52 km W of Balladonia, 31 Aug. 1985, *B.J. Conn* 1878 (ex NSW); Cave Hill, 38 km WSW of Widgiemooltha, 10 Nov. 1994, *D.J. Edinger* 930; NE base of Peak Charles, 3 Oct. 1986, *J.M. Fox* 86/282 (ex CANB); granite outcrop *c.* 10 km ESE of Howick Hill, 19 Sep. 1968, *E.N.S. Jackson* 1240 (ex AD); Red Hill, 3 km E of Kambalda West, 9 Aug. 1981, *K.R. Newbey* 8458; 20 km W of Kumarl, 9 Oct. 1966, *P.G. Wilson* 5659.

Distribution. South West Botanical Province: ESP, MAL; also South-western Interzone: COO. Extends from the Kalgoorlie area via Peak Charles south to the Esperance area and south-east to Cape Arid National Park. (Figure 2A)

Etymology. From the Greek *brachy* – short and *andros* – man, male, referring to short stamen length.

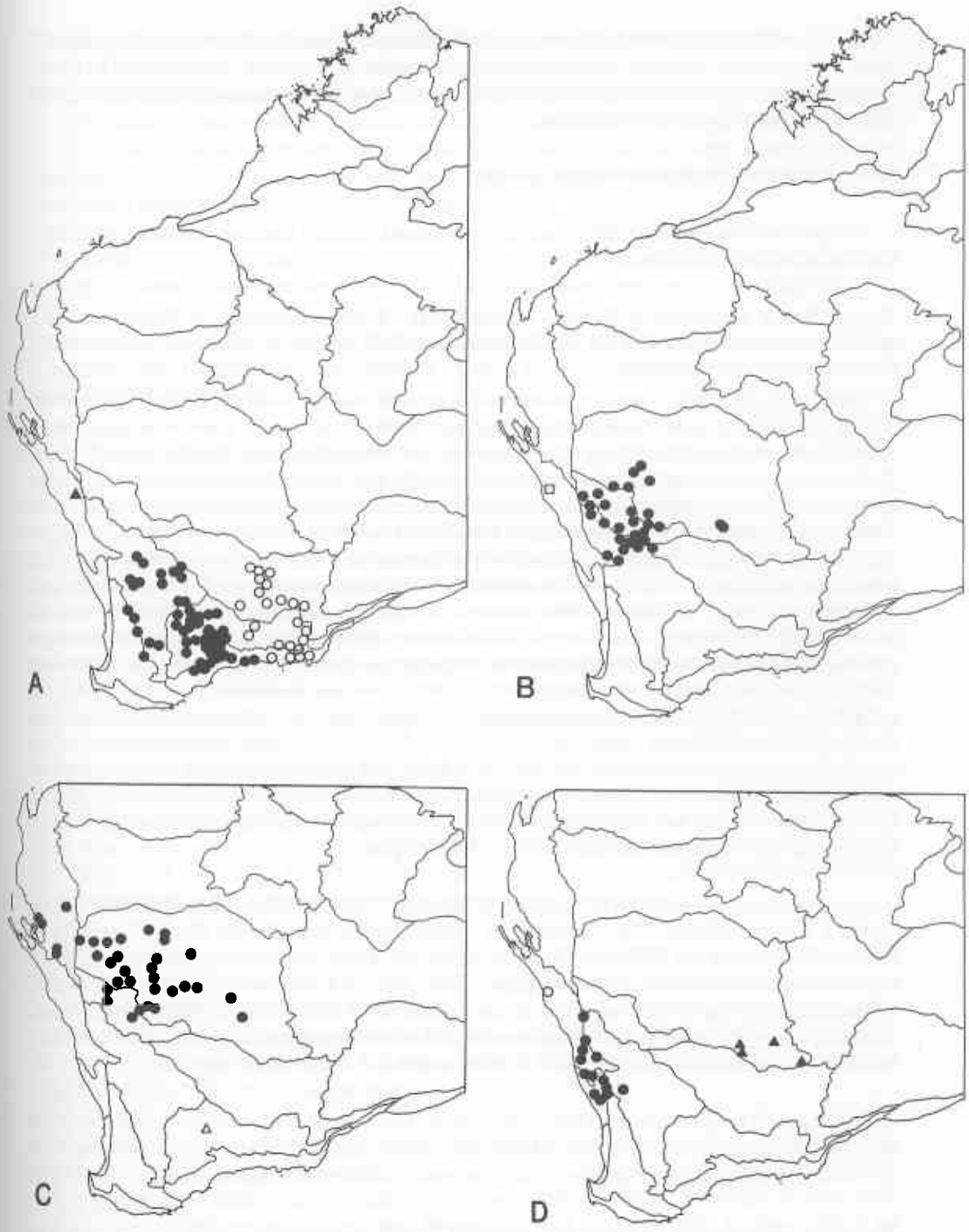

Figure 2. Distributions maps. A – *Thryptomene australis* subsp. *australis* ●, *T. australis* subsp. *brachyandra* ○ and *T. duplicata* ▲; B – *Thryptomene costata* ● and *T. johnsonii* □; C – *Thryptomene decussata* ● and *T. salina* △; D – *Thryptomene eremaea* ▲, *T. mucronulata* ● and *T. striata* ○.

Notes. As well as having shorter stamens and style than subsp. *australis*, the new subspecies tends to have fewer stamens, although both subspecies quite commonly have 9 or 10 stamens. The known geographic distributions of the two subspecies show no overlap, with subsp. *australis* occurring in the west and subsp. *brachyandra* in the east.

Thryptomene costata Rye & Trudgen, *sp. nov.*

Thryptomene mucronulata affinis sed acumine apicali foliorum longiore, bracteolis deciduis et floribus grandioribus differt.

Typus: 300 m north-west of Eastern Tallering Peak, Western Australia, 14 September 1978, *M.E. Trudgen* 2226 (*holo:* PERTH 02193574; *iso:* CANB, K, MEL).

Shrub erect, (0.5)1–3 m high, single-stemmed at extreme base but usually with numerous branches arising just above the base. *Leaves* antrorse, with apex recurved and usually more or less patent w.r.t. the stem. *Petioles* 0.4–0.7 mm long. *Leaf blades* obovate or broadly obovate, 2–4.3 x 1.4–1.8 mm not including the prominent apical point, truncate or concave at base, entire, dotted with numerous or fairly numerous oil glands, the larger glands *c.* 0.1 mm diam. or less, fairly flat, the lower surface more or less concave, the upper surface flattened along the keel in lower half of for most of length but with the upper part of keel forming a fold-line/ridge; apical point recurved, 1–1.8 mm long, yellowish at first, sometimes with the base red-tinged, becoming white. *Inflorescence* of up to 6 pairs but usually of 1–4 pairs of flowers at adjacent nodes, rarely of a single flower; peduncles usually 1-flowered, sometimes 2(3)-flowered, 1–2 mm long, if multi-flowered then with 1 or 2 additional stalks arising at summit and somewhat shorter than the peduncle. *Flowers* 7.5–9.5 mm diam.; disc concave. *Bracteoles* early-deciduous (before older bud stage), with a green herbaceous keel and clear scarious sides or sometimes pinkish, narrowly to broadly obovate, 1.3–3 mm long, with a short terminal point, entire, the margins incurved/folded. *Sepals* depressed obovate, 2–2.5 x 2.8–3.5 mm, white or pale pink, entire. *Petals* almost circular or depressed obovate, 2.5–3.3 mm long, white to deep pink, usually pale pink, entire. *Stamens* 10, opposite the sepals and petals; filament 0.5–0.7 mm long, pink (where recorded). *Ovules* 6–8(9). Style 0.3–0.6 mm long. *Fruit* 2.3–3 mm long, 3–4 mm diam., with 10–14 full-length and several shorter longitudinal ribs; seed(s) *c.* 1.4 mm long.

Selected specimens examined. WESTERN AUSTRALIA: 7.7 km E of Coorow on Waddi Rd, 15 Oct. 1982, *J. Coleby-Williams* 216; 5.6 km W of Yalgoo turnoff from Paynes Find, 17 Sep. 1977, *R.J. Chinnock* 4024 (ex AD); 24.5 km SSE of Sunday Bore, Perrinvale Station, 7 Sep. 1988, *R.J. Cranfield* 7129; 43 km N of Mount Magnet, 16 Oct. 1981, *L.A. Craven* 7131 (ex CANB); Wubin, 6 September 1959, *Mrs S. Dela-Hunty*; N of Cue, 1 Sep. 1977, *J.W. Green* 6647; White Wells Station, near third cattle grid on road to homestead from Great Northern Highway, 14 Sep. 1995, *T.R. Lally* 761; 18 km N of Paynes Find, 24 Sep. 1991, *P.G. Wilson* 1235 & *R. Rowe* (ex NSW).

Distribution and habitat. Eremaean Botanical Province: COO, MUR, YAL; also South West Botanical Province: AW, possibly also GS. Extends from north of Cue south to Wubin and from Tallering Peak east to Riverina Station (near Menzies). Occurs on granite outcrops and other rocky sites. (Figure 2B)

Phenology. Flowers May to November, especially August to September. Fruits mainly August to November. Some of the young fruits had 2 equal-sized immature seeds present suggesting that 2-seeded mature fruits are occasionally produced.

Conservation status. A relatively common species with a fairly wide distribution.

Etymology. From the Latin *costa* – rib, referring to the prominently ribbed hypanthium.

Notes. The name *Thryptomene mucronulata* has been widely misapplied to this taxon. Although closely related to *T. mucronulata*, *T. costata* is readily distinguished by the longer apical point on its leaves and its deciduous bracteoles. It also tends to have longer peduncles, larger flowers, a shorter style and more numerous ovules. The two taxa occupy distinct habitats and geographic areas, with their known ranges being almost parapatric. (Figure 2B,D)

Most flowers have 10 stamens opposite the sepals and petals but occasional flowers with abnormal numbers of stamens have been observed such as an 11-staminate flower on *R.J. Cranfield* 6043.

Thryptomene decussata (W. Fitzg.) J.W. Green (Green 1985: 6). – *Scholtzia decussata* W. Fitzg. (Fitzgerald 1904: 19–20). *Type:* Mount Magnet, Western Australia, September 1903, *W.V. Fitzgerald* (*holo:* PERTH 01631918).

Shrub erect, usually 1–3 m high, often with large galls on the flowers or branchlets; galls globular to pear-shaped with a broad beak, 3–6 mm diam. *Leaves* crowded on the branchlets, mostly widely antrorse. *Petioles* 0.1–0.3 mm long. *Leaf blades* broadly obovate to depressed ovate-cordate or rarely obovate, 1.3–2.3 mm long, 1.3–2.7 mm wide, truncate or shallowly concave at base, not mucronate, entire, with a moderately prominent keel and fairly numerous oil glands prominent on both surfaces, the largest glands *c.* 0.1 mm diam. or less, with the keel incurved and not pointed at the apex, the lower surface concave and the upper surface convex. *Inflorescence* with flowers in 1–3 pairs in a subterminal almost globular cluster on each branchlet; peduncles 1-flowered, *c.* 0.2 mm long. *Bracteoles* with a narrow keel bordered on each side by a green gland-dotted herbaceous portion and broad scarious incurved margins, depressed obovate, 2–3.3 mm long, with the keel usually terminating level with the scarious margins or exceeded by them, rarely produced at apex into a point 0.2–0.3 mm long, sometimes pink-tinged, persistent after fruit shed. *Flowers* 7.5–9.5 mm diam.; disc deeply cupped. *Sepals* depressed ovate, 2.2–3.3 mm long, 3.3–4.4 mm wide, pink-tinged, tending to become reddish then fading, minutely denticulate or denticulate. *Petals* broadly or depressed obovate, 2.5–3.5 mm long, pink, often deep pink, tending to become reddish or rusty-coloured with age, minutely denticulate or denticulate. *Stamens* in 2 whorls, *c.* 20 to *c.* 30, the largest ones with a filament 2.3–3.3 mm long. *Ovules* 5–7. Style 2.5–3.5 mm long. *Fruit* 2.3–2.7 mm long, 2.5–3 mm diam., 1-seeded (where known), with 12–16 full-length and 2–6 shorter longitudinal ribs; seed *c.* 1.4 mm long.

Selected specimens examined (broad-leaved variant). WESTERN AUSTRALIA: 3 miles [5 km] S of Meekatharra, 26 Oct. 1965, *J.V. Blockley* 128; creek crossing on track to Callytharra Spring, Callytharra Station, 25°49'S, 115°23'E, 31 Aug. 1995, *G.J. Keighery & N. Gibson* 974; 496 mile peg on North West Coastal Highway [Carbla Station, *c.* 45 km S of Wooramel Roadhouse], 29 Oct. 1963, *L. Lullfitz* 2831; 38 km W of Sandstone, 11 Oct. 1977, *C.I. Stacey* 597; 77.5 km N of Paynes Find on Great Northern Highway, 2 July 1976, *M.E. Trudgen* 1676.

Selected specimens examined (typical variant). WESTERN AUSTRALIA: Bronzewing-McClure mining site, Melita Station, 30 Nov. 1999, *J. Prosser*; 2 km W of Cue, 1 Sep. 1977, *J.W. Green* 4649; 30 km E of Hillview Station, 26 Sep. 1982, *A.A. Mitchell* 1049; 41 km SW of Leonora, 22 Aug. 1977, *A.Z. Parker* 175; half way up SE side of hill, Mount Magnet, 2 July 1976, *M.E. Trudgen* 1680; 2 km from Leonora to Wiluna road intersection on the road to Leinster, 10 Apr. 1992, *F.A. Zich* 117 (ex CANB).

Distribution and habitat. Eremaean Botanical Province: CAR, MUR, YAL. Quite widely distributed, extending from near Shark Bay inland to Melita Station, near Leonora. Commonly occurs on lateritic breakaways and other high rocky sites, but in the north-western part of the species range also recorded on lower sandy sites, often in Bowgada (*Acacia ramulosa*) shrublands. (Figure 2C)

Phenology. Flowers and fruits mainly July to November.

Conservation status. Known from many populations over a wide area.

Notes. Although this species has been confused with *Thryptomene johnsonii*, it is more closely related to *T. duplicata*; for more details see the notes under those two species. *T. decussata* has shorter peduncles and longer stamens and styles than all other members of sect. *Thryptomene* and tends to have more prominently herbaceous bases to the sepals with the oil glands more obvious and the veins prominent and often rib-like. It also tends to have the hypanthium ribs more widely separated on the fruit than is usual for the section.

A few specimens have labels recording the flower colour as white, but these all have only a few very old faded flowers or fruits attached.

The typical variant of *T. decussata* has mostly broadly obovate to more or less circular leaves 1.3–2.3 x 1.3–1.8 mm and occurs in the eastern inland region from Mount Magnet to Leonora. A variant with mostly depressed ovate-cordate leaves 1.3–2 x 1.5–2.7 mm, occurring in the north-western and central part of the species range and extending east to Anketell (Sandstone area), overlaps with the range of the typical variant. A few very broad leaves are also present on specimens of the typical variant and a few leaves longer than broad are often present on specimens of the broad-leaved variant. There appears to be no clear distinction between the two variants, which apparently intergrade in and west of the Sandstone area. Possibly the typical variant tends to have smaller flowers with shorter stamens than the more common broad-leaved variant, but material of the typical variant is poor with no properly pressed flowers and its flowers are often galled, so comparison is difficult.

Thryptomene duplicata Rye & Trudgen, *sp. nov.*

Thryptomene decussata affinis sed pedunculis longioribus, floribus parvioribus et ovulis paucioribus differt.

Typus: Binnu area [precise locality withheld], Western Australia, 12 December 1993, *M.E. Trudgen* 12012 *& M.R. Trudgen* (*holo:* PERTH 04278283; *iso:* CANB, K, MEL).

Shrub c. 0.8 m high, spreading to *c.* 2 m wide. *Leaves* antrorse to patent, overlapping, the distal half often slightly recurved, the apex slightly incurved to slightly recurved. *Petioles* up to 1 mm long. *Leaf blades* broadly or very broadly obovate, *c.* 2.6 x 2.5–3.5 mm, indented at base, without a mucro or with a small erect one, entire or minutely serrulate, prominently gland-dotted on both surfaces, with usually 8–12 or more main glands *c.* 0.1 mm diam. and less obvious glands, the lower surface concave and the upper surface convex. *Inflorescence* with flowers in 2 or 3 pairs in a small subterminal cluster on each branchlet; peduncles 1-flowered, 0.7–1.4 mm long in fruit. *Bracteoles* with a thick herbaceous gland-dotted keel and broad petalloid margins, more or less obovate, *c.* 2 mm long, the apex recurved and petalloid margins incurved, minutely denticulate on the margins, persistent in fruit. *Flowers* *c.* 6 mm diam.; disc cupped. *Sepals* depressed obovate, *c.* 1.4 mm long, 2.5–4 mm wide, minutely denticulate. *Petals* broadly obovate to almost circular with a very short basal claw, *c.* 2 mm long,

minutely denticulate. *Stamens* apparently *c.* 15 or more in two whorls, often two stamens arising together opposite each sepal, one with a long filament terminating the stamen rim and the other with a short filament arising lower from inside of stamen rim, others located between the sepals and petals or opposite petals, the largest ones with a filament *c.* 0.8 mm long. *Ovules* 4. *Style c.* 0.7 mm long. *Fruit c.* 2 mm long, *c.* 2.5 mm diam., with *c.* 16 full-length and usually several shorter longitudinal ribs; seed not seen at maturity. (Figure 1B–F)

Distribution and habitat. South West Botanical Province: GS. Known from a single population near Binnu, north of Northampton. Recorded in pale yellow sand in a tall open shrubland dominated by *Actinostrobus*. (Figure 2A)

Phenology. Fruits: November to December.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority One. This species is known from only one collection.

Etymology. From the Latin *duplicatus* – doubled, referring to the large number of stamens in two whorls, roughly double the number found in most members of the genus.

Notes. Previously known by the phrase name *Thryptomene* sp. Binnu East Road (*M.E. Trudgen* 12012 *& M.R. Trudgen*).

This species and *Thryptomene decussata* are the only members of the section to have a deeply cupped disc and numerous stamens in two whorls. *T. decussata* has larger flowers than *T. duplicata*, with the sepals almost as long as the petals, longer stamens and styles, and more numerous ovules. It also differs in having almost sessile flowers and fruits. The four ovules of *T. duplicata* are broader (more rounded) than those of species, such as *T. australis*, that have a narrower hypanthium.

Thryptomene eremaea Rye & Trudgen, *sp. nov.*

Thryptomene australis arcte affinis sed foliis brevioribus tumidioribus apicd late obtuso et acumine longiore subterminali (nec terminali) differt.

Typus: 39.5 km west of Queen Victoria Spring, Queen Victoria Spring Nature Reserve, Western Australia, 27 July 1992, *D.J. Pearson* 2212 (*holo:* PERTH 0321796; *iso:* CANB).

Shrubs erect, 0.5–1.5 m high. *Leaves* antrorse to appressed, with a recurved apical point. *Petioles* up to 0.6 mm long. *Leaf blades* more or less obovoid or narrowly obovoid but with a longitudinal indentation on adaxial surface, 2.5–4 x 0.6–0.9 mm, rounded-truncate at base, broadly obtuse at apex and with a prominent subterminal point, entire, prominently gland-dotted on both surfaces, sometimes with the glands each at the centre of a prominent recession, the larger glands usually *c.* 0.1 m diam.; subterminal point recurved, 0.8–1.5 mm long, whitish. *Inflorescence* with flowers in 1–5 pairs in a small subterminal, often spike-like cluster on each branchlet; peduncles 1-flowered, 1–2 mm long in fruit. *Bracteoles* not enclosing flower bud, somewhat scarious, pinkish, more or less elliptic to ovate, with a long recurved terminal point, 2–2.5 mm long including point, folded/keeled, minutely denticulate on the margins, deciduous. *Flowers c.* 7 mm diam.; disc concave. *Sepals* very broadly or depressed ovate, 1.5–2 mm long, 2–2.5 mm wide, white or pale pink, minutely denticulate. *Petals* broadly or very broadly ovate, 2.7–3.5 mm long, white or pale pink, minutely denticulate or entire.

Stamens 10(11), irregularly arranged, some opposite and others between the sepals and petals; filament *c.* 0.6 mm long. *Ovules c.* 7. *Style c.* 0.6 mm long. *Fruit* not seen at maturity, with *c.* 12 full-length and *c.* 3 shorter longitudinal ribs. (Figure 1G–J)

Other specimens examined. WESTERN AUSTRALIA: 6 miles [10 km] N of Menzies, 16 Sep. 1927, 7 June 1985, *C.A. Gardner* 2154; near Menzies, Sep. 1927, *C.A. Gardner & W.E. Blackall*; Comet Vale district, Dec. 1916, *J.T. Jutson* 214 (ex NSW); Edjudina Station, 7 July 1989, *H. Pringle* 2362.

Distribution and habitat. Eremean Botanical Province: MUR. Extends from Menzies east to Queen Victoria Spring Nature Reserve. Recorded in yellow sandy soils at Edjudina Station and Queen Victoria Springs Nature Reserve, the former record from shallow soil over granite, the latter in sandplain dominated by shrubland mallee with *Eucalyptus youngiana* and *Triodia scariosa*. Also recorded in red sand near Menzies. (Figure 2D)

Phenology. Flowers July to December.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Two.

Etymology. This species has a more inland distribution than other members of its section and its epithet *eremaea* reflects its occurrence in the Eremaean Botanical Province.

Notes. Previously known by the phrase name *Thryptomene* sp. Queen Victoria Springs (*D.J. Pearson* 2212).

This species is closely related to *Thryptomene australis*, and both species have a particularly prominent gland on the anther (see Figure 1J). The leaves of *Thryptomene australis* are more angular and less thickened than those of *T. eremaea*, and are tapered at the apex into a terminal point, whereas the leaves of *T. eremaea* end abruptly in a longer subterminal point (Figure 1A, H). The bracteoles of *T. australis* tend to broader, with a shorter more incurved apical point, and shed earlier than those of *T. eremaea*. *Thryptomene australis* apparently also has narrower sepals and shorter petals, and it tends to have more entire margins to the sepals and petals. The two species appear to be allopatric, with *T. eremaea* occurring further inland than *T. australis* and apparently mainly on sandplain, whereas *T. australis* occurs predominantly on granite outcrops.

Thryptomene johnsonii F. Muell. (Mueller 1864: 77). *Type:* "In Australia occidentali, forsitan ad flumen Murchison" [perhaps at the Murchison River], Western Australia, ?*F. Mueller* (*holo:* MEL 70701).

Shrub erect, *c.* 2 m high, sometimes with large galls on the branchlets; galls *c.* 4.5 mm diam. *Leaves* antrorse or widely antrorse, overlapping and often crowded on the branchlets, with a recurved apical point. *Petioles* 0.4–0.5 mm long. *Leaf blades* mostly obovate to very broadly obovate, 1.7–3.4 x 1.3–1.5 mm not including the apical point, truncate or indented at base, entire, with usually 4–8 very prominent glands *c.* 0.15 mm diam. in an irregular row or more scattered and also smaller glands on the lower surface, more uniformly and usually less prominently gland-dotted above, the lower surface concave; apical point recurved, 0.2–0.5 mm long, whitish. *Inflorescence* with flowers in 1–4 pairs in a small subterminal almost globular cluster on each branchlet; peduncles 1-flowered, 0.4–0.7 mm long. *Bracteoles* largely scarious, with a narrow keel bordered on each side by a narrow gland-dotted herbaceous portion and broad incurved margins, more or less broadly or very broadly obovate,

1.5–2 mm long, keeled, with a subterminal recurved point 0.1–0.3 mm long, denticulate on the margins, persistent after fruit shed. *Flowers* 6–7 mm diam.; disc concave. *Sepals* very broadly ovate to depressed elliptic, 1.3–1.4 mm long, 2–2.4 mm wide, probably pink, entire or very slightly denticulate. *Petals* broadly obovate to almost circular, *c.* 2.5 mm long, pink, the centre-base gland-dotted, entire. *Stamens* 8(9), irregularly arranged with some opposite sepals and others between the sepals and petals; filament *c.* 0.7 mm long, pink. *Ovules* 4. *Style c.* 0.8 mm long. *Fruit* 1.3–1.5 mm long, 1.8–2 mm diam., with commonly 12–14 full-length and several shorter longitudinal ribs, 1- or 2-seeded; seed(s) not seen at maturity but reportedly '2/3 line' [*c.* 1.3 mm] long (Mueller 1864).

Other specimen examined. WESTERN AUSTRALIA: Kalbarri National Park [precise locality withheld], 3 Oct. 1992, *D.R. & B. Bellairs* 1149A.

Distribution and habitat. South West Botanical Province: GS. Known only from Kalbarri National Park, recorded on grey sand with sandstone on a sandplain slope, with *Acacia saligna*. (Figure 2B)

Phenology. Flowers and fruits recorded in early October.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Two. This species is known only from the type collection made over 130 years ago and a single recent collection in a national park. In the notes provided for the latter collection, the species was reported to be abundant.

Notes. The identity of this species has long been in doubt. Its name was widely misapplied to *T. decussata* before Green (1985: 6) incorrectly relegated it to synonymy under *T. mucronulata*, a name that was itself misapplied to *T. costata*. Finally in 1992, a second collection of true *T. johnsonii* was made, providing the first indications of the habitat and other aspects of the species' biology.

Thryptomene johnsonii is reinstated here. It is a quite distinct species, differing from both *T. decussata* and *T. costata* in the length of the apical point and number of oil glands on the leaves, stamen number and ovule number, as well as having a quite distinct distribution. It is more similar to *T. mucronulata* but differs in habitat, leaf morphology (especially the smaller number of oil glands) and its lower stamen number.

The type material of *Thryptomene johnsonii* has a few mature fruits, but no flowers, so a complete description of this species was not possible originally. The largest branch examined on the type material was *c.* 0.3 m long and, judging from the leaf orientation, appeared to have been fairly erect. Bentham (1867) recorded 2 ovules for the species but this appears to be incorrect as ovule number is difficult to determine from fruiting material and the recent collection has 4 ovules. Whereas Mueller (1864) described the species as 1-seeded, Bentham recorded 1 or 2 seeds.

Thryptomene mucronulata [as *mucromulata*] Turcz. (Turczaninov 1847: 156–157). *Type:* "Nova Hollandia" [south-west of Western Australia], 1844, *J. Drummond* [coll. 3] n. 33 (*holo:* KW *n.v.*; *iso:* PERTH (ex K) 01621955).

Thryptomene davisiae Diels (*in* Ostenfeld 1921: 95). *Type:* Moora, Western Australia, 25 September 1915, *G. Davies* Ostenfeld No. 1429 (*n.v.*).

Thryptomene dielsiana E. Pritz. (Diels & Pritzel 1904: 412). *Type:* near Mingenew, Western Australia, 12 September 1901, *L. Diels* 4255 (*lecto:* PERTH (ex B) 01621432, here designated; *isolecto:* PERTH (ex B) 01621424 in part).

Thryptomene prolifera Turcz. (Turczaninov 1862: 324–325). *Type:* "Ad fl. cygnorum Novae Hollandiae" [between Moore and Murchison Rivers, Western Australia], 1850–1851, *J. Drummond* "coll. 7" [coll. 6] n. 62 (*holo:* KW *n.v.*, photograph PERTH).

Shrub usually erect but occasionally rather low-growing, (0.3)0.5–2(4) m high, up to 2 m wide. *Leaves* antrorse, overlapping. *Petioles* 0.5–0.8 mm long. *Leaf blades* mostly narrowly obovate or obovate, sometimes also a few broadly obovate, (2)2.8–7 x 0.9–1.8 mm, truncate or concave at base, with a mucro 0.1–0.5 mm long or lacking a mucro, entire or denticulate, prominently gland-dotted on both surfaces, the larger glands *c.* 0.1 mm diam. or less, the lower surface concave or flat and the upper surface often partially flat. *Inflorescence* with flowers in 1–9 pairs in a small subterminal globular to spike-like cluster on each branchlet; peduncles 1-flowered (possibly sometimes 2-flowered), 0.7–1 mm long in fruit. *Bracteoles* with a gland-dotted keel and broad scarious margins, ovate to obovate or broadly so, 1.8–2.5 mm long, keeled, terminating in an small erect point, the scarious margins incurved, denticulate on the margins, persistent after fruit shed. *Flowers* 4.5–6 mm diam.; disc concave. *Sepals* depressed obovate, 1.2–1.7 mm long, 1.8–2.5 mm wide, paler pink than the petals, minutely denticulate. *Petals* broadly obovate to almost circular, 1.5–2.5 mm long, pale pink to deep purplish pink, entire. *Stamens* 10, opposite the sepals and petals; filament 0.5–0.7 mm long, pink. *Ovules* 4–6. *Style* 0.6–0.8 mm long. *Fruit* 1.5–2 mm long, *c.* 2 mm diam., with 10–12 main and several somewhat shorter longitudinal ribs, 1- or rarely 2-seeded; seed(s) *c.* 1.3 mm long.

Selected specimens examined. WESTERN AUSTRALIA: Mogumber, Sep. 1903, *C. Andrews*; 13 miles [21 km] N of Gingin, 15 Sep. 1976, *J.S. Beard* 7803; Hill River crossing on Brand Highway, 10 Dec. 1992, *R.J. Cranfield & P. Spencer* 8456, 8457; 3 km along Morowa water supply road from Arrino West Rd, 2 Oct. 1981, *L.A. Craven & C. Chapman* 6841 (ex CANB); 10 km SW of Winchester, 3 Oct. 1981, *L.A. Craven & C. Chapman* 6898 (ex CANB); 20 km NE of Eneabba, 18 Dec. 1986, *H. Demarz* 11615; E of Green Head, SE of Green Lake, at "Lakeland" entrance and branching point of Grover Rd, 30 Sep. 1991, *W. Greuter* 22400; 7 km S of Eneabba, 2 Aug. 1977, *E.A. Griffin* 950; Wotto Nature Reserve, NE of Eneabba, 5 Oct. 1992, *E.A. Griffin* 6865; 1 km S of Wilroy Siding, 6 June 1977, *B.G. Muir;* cultivated in Kings Park, 26 Aug. 1973, *B.L. Powell* 73099; S side of Cantabilling Rd, *c.* 22 km E of Munbinea Rd, 17 Oct. 1999, *M. Puckridge* 110; Ejanding, Oct./Nov. 1959, *S.B. Rosier* 196; Moore River National Park, 2 Oct. 1971, *R.D. Royce* 9499; 29.3 km S of Moora on road to Mogumber, 19 May 1976, *M.E. Trudgen* 1658; Wongan Hills area, 3.2 km N of Mortlock Creek crossing, 25 May 1976, *M.E. Trudgen* 1664; Hill River, 1 Nov. 1965, *P.G. Wilson* 3789.

Distribution and habitat. South West Botanical Province: AW, GS, SWA. Extends from Wilroy south to near Gingin and Ejanding (north-west of Wyalkatchem). A single specimen annotated with the locality "Murchison" (*E.W. Hursthouse* Oct. 1902, ex NSW) is too vague to map but may have been collected further north than any other specimens included here. Occurs in low-lying winter-wet sites associated with swamps and watercourses, also recorded from higher ground along drainage lines, often with a mixture of clay and sand, sometimes in sand over laterite. (Figure 2D)

Phenology. Flowers: June to November. Fruits: September to December.

Chromosome number. n = 11 (Rye 1979). Voucher specimen: *B.L. Powell* 73099.

Conservation status. Not considered to be at risk as a whole although some variants of the species may be rare.

Typification. Of the available specimens from the two syntypes of *T. dielsiana*, the one chosen here as the lectotype is the one with the more precise locality on the label. The excluded former syntype is: between Moore and Murchison Rivers, Western Australia, *E. Pritzel* 640 (PERTH (ex B) 01621424 in part, 02194848).

Notes. Very closely related to *Thryptomene striata*, which possibly should be regarded as a subspecies but appears to show sufficient differences (see note under *T. striata*) to be treated as a distinct species. *T. mucronulata* includes a number of variants differing in the number of flowers and the morphology of their subtending leaves on each branchlet as well as the morphology of the other leaves, bracteoles and possibly also the hypanthium. Further collecting is needed as there are currently too few specimens of each of the variants to determine their status.

A variant with very narrow leaves and bracteoles, apparently including the type of *T. prolifera*, is restricted to the western part of the species range, recorded from east of Green Head south-east to Hill River (e.g. *R.J. Cranfield & P. Spencer* 8456, 8457). Most specimens, including those from the western part of the range, from Eneabba to Moore River, have broader leaves and inland specimens all have relatively broad leaves and bracts, some very broad.

The type specimen of *T. mucronulata* has leaves at the broad extreme of the leaf shape variation in the species. It probably came from the southern part of the species range, possibly in the region "north or east of Bolgart", one of the areas where Drummond obtained his third collection of specimens (Erickson 1969), as other areas listed for this collection are well outside the known range of the species. The type matches material collected from near Gingin and Mogumber fairly well.

The type of *Thryptomene daviesiae* has not been examined but was collected from Moora and possibly matches other specimens collected from that general area, such as *M.E. Trudgen* 1658. The type of *T. dielsiana* has the largest leaves of any specimens in the *mucronulata* complex and does not clearly match any of the variants but perhaps shows most similarity to two specimens from Eneabba (*H. Demarz* 11615, *E.A. Griffin* 950).

Thryptomene salina Rye & Trudgen, *sp. nov.*

Thryptomene mucronulata affinis sed costis supra hypanthium paucioribus et staminibus quinque differt.

Typus: near Emu Rock [precise locality withheld], east of Hyden, Western Australia, 9 October 1981, *K.R. Newbey* 9171 (*holo:* PERTH 02159481; *iso:* CANB, MEL).

Shrub up to 1.1 m high and 1.5 m wide. *Leaves* antrorse, overlapping. *Petioles c.* 0.5 mm long. *Leaf blades* broadly or very broadly obovate or narrowly obovate, *c.* 2.3 x 2.3–2.6 mm, truncate or shallowly concave at base, often mucronate, the keel usually incurved at apex, with prominent fairly numerous glands mostly less than 0.1 mm diam. on both surfaces, the lower surface concave and the upper surface concave; mucro (when present) subterminal, short and broad. *Inflorescence* with flowers commonly in 3–5 pairs in a small subterminal cluster on each branchlet; peduncles 1-flowered, *c.* 0.8 mm long. *Bracteoles* scarious, with a narrow keel and broad gland-dotted incurved margins, very broadly ovate, *c.* 1.5 mm long, pink-tinged, entire or denticulate on the margins, degree of persistence unknown but still present in late bud. *Flowers* not seen at maturity, white in early bud and becoming pale pink in late bud; hypanthium with *c.* 8 full-length ribs and *c.* 6 shorter ribs; disc concave. *Sepals* depressed

ovate, *c.* 1.5 mm long, pinkish at least towards base, entire. *Petals* not seen at maturity. *Stamens* 5, opposite the sepals; filament *c.* 0.4 mm long. *Ovules* 5. *Fruit* not seen.

Distribution and habitat. South West Botanical Province: MAL. Recorded from near Emu Rock, east of Hyden, in *Melaleuca hamulosa* scrub in deep alluvial sand on a flat along a saline creek. (Figure 2C)

Phenology. Apparently flowers in October.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority One. This species is known only from a single collection.

Etymology. From the Latin *salinus* – salty, referring to the plant's apparent environmental preference.

Notes. A very poorly known species, with its single collection in early to late bud. In its habitat preference it appears to be closest to *T. mucronulata* and *T. striata*, which also favour low-lying sites. These two species can be readily distinguished from *T. salina* by their more numerous ribs on the hypanthium and their ten stamens. *T. salina* differs from all other members of the section in having only five stamens.

Thryptomene striata Rye & Trudgen, *sp. nov.*

Thryptomene mucronulata arcte affinis sed foliis flores subtentis plus manifeste denticulatis, bracteolis plus manifeste carinatis, et costis hypanthii juvenis planioiribus arcte contiguis differt.

Typus: Junga Dam, Kalbarri National Park, Western Australia, 22 September 1994, *A.G. Gunness* 2383A (*holo:* PERTH 04256468).

Shrubs erect, rounded, 0.5–1 m high and 1–1.5 m diam. *Leaves* antrorse, overlapping. *Petioles* *c.* 0.6 mm long. *Leaf blades* narrowly to broadly obovate, 2.5–3.8 x 1–2.3 mm, truncate at base, with the keel incurved at apex, not mucronate or with an erect mucro up to 0.1 mm long, prominently gland-dotted on both surfaces, the larger glands usually *c.* 0.1 mm diam., the lower surface concave and upper surface keeled, the leaves directly below the inflorescences always broad and with at least a few narrow protrusions up to 0.25 mm long mainly near centre and towards base of each margin. *Inflorescence* with flowers in 2–7 pairs in a small subterminal globular to spike-like cluster on each branchlet; peduncles *c.* 0.7 mm long in fruit. *Bracteoles* with a thick herbaceous gland-dotted keel and very broad scarious margins, more or less obovate or broadly obovate, *c.* 2 mm long, keeled, terminating in an small erect point, the scarious margins incurved, denticulate on the margins, persistent after fruit shed. *Flowers* 5–6.5 mm diam; disc concave. *Sepals* depressed obovate, 1.4–1.6 mm long, 2.0–2.4 mm wide, with the centre-base gland-dotted and slightly to distinctly herbaceous, the remainder scarious and deep purplish around the herbaceous portion, minutely denticulate. *Petals* broadly obovate to almost circular, 2–2.8 mm long, pink or mauve-pink, entire. *Stamens* 10, more or less opposite the sepals and petals; filament *c.* 0.7 mm long, pink. *Ovules* 4. *Style* deep pink, *c.* 0.7 mm long. *Fruit* 1.3–1.6 mm long, *c.* 2.4 mm diam., with *c.* 12 full-length ribs and *c.* 4 shorter ones, more or less flat and closely pressed, the narrow indentations between them resembling lines; seed(s) not seen at maturity.

Other specimens examined. WESTERN AUSTRALIA: Junga gravel pit on Kalbarri road, 23 Sep. 1989, *Bellairs* 1652; Junga Dam, Kalbarri National Park, 21 Sep. 1990, *B.J. Conn* 3198 & *J.A. Scott* (ex NSW); Junga Dam, Kalbarri National Park, 22 Sep. 1994, *A.G. Gunness* 2383B.

Distribution and habitat. South West Botanical Province: GS. Occurs in Kalbarri National Park in a broad low depression in a sandplain of red sandy soil with ironstone on the surface. According to one record, *T. striata* is the dominant plant at the site. The associated vegetation consists of in a low shrubland including *Melaleuca* and *Malleostemon* species and a herbfield. (Figure 2D)

Phenology. Flowers and fruits recorded in September.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Two. This species is known from four collections from a small area, probably all from a single population, in a national park.

Etymology. From the Latin *striatus* – furrowed, striped, referring to the fine grooves resembling lines between the flattened ribs of the floral tube.

Notes. The phrase name *Thryptomene* sp. Junga Dam (*R.J. Cranfield* 4833) has been applied to this species. *Thryptomene striata* is very closely related to *T. mucronulata* but differs in having narrow projections on the margins of some of the young leaves (especially those directly below the inflorescence), the apex to the leaf keel more incurved, a more herbaceous keel on the bracteoles, and the hypanthium ribs more flattened and closely pressed together even on the flower buds, which therefore appear striate. It may also tend to have longer petals.

Thryptomene mucronulata occurs in a variety of relatively damp habitats including swamps, and *T. striata* appears also to show a preference for damp habitats as the only known locality is in a broad low depression. *T. striata* occurs further north than *T. mucronulata*, the distance between their known ranges being over 150 km.

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