Nuytsia
The journal of the Western Australian Herbarium

Volume 35: 217–223
Published: 28 November 2024
https://doi.org/10.58828/nuy01084

Tecticornia crotalus and *T. dactylifera* (Chenopodiaceae), two new, short-range species endemic to the Goldfields of Western Australia

Kelly A. Shepherd[1,2,3,5] and Anže Žerdoner Čalasan[1,3,4]

[1]Western Australian Herbarium, Biodiversity and Conservation Science,
Department of Biodiversity, Conservation and Attractions,
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983
[2]School of Biological Sciences, The University of Western Australia,
35 Stirling Highway, Crawley, Western Australia 6009
[3]School of Molecular and Life Sciences (MLS), Faculty of Science and Engineering,
Curtin University, GPO Box U1987, Perth, Western Australia 6845
[4]Faculty of Biology, Ludwig-Maximilians-Universität München,
Menzinger Str. 67, Munich, Germany, 80638
[5]Corresponding author, email: Kelly.Shepherd@dbca.wa.gov.au

SHORT COMMUNICATION

Species of *Tecticornia* Hook.f. (subfamily Salicornioideae Ulbr. in the Chenopodiaceae–Amaranthaceae clade) can be broadly categorised into two morphological groups characterised by either having hard fruits and mostly smooth seeds, or soft, papery fruits and ornamented seeds, with a few exceptions. In the latter group, seeds generally fall from the adult plant as soon as the fruits mature and begin to disintegrate, while fruits in the former group may be retained on the adult plant for more than one season. Once the small seeds are released, they are readily transported away from the parent plant by wind and water, so it would be expected that many species are widely dispersed, particularly within the soft-fruited group. However, at least nine soft-fruited taxa in Western Australia have a relatively restricted distribution, each being recorded from five or less populations, with an additional three Priority One taxa only known from a single population. Similarly, the two new soft-fruited species described herein are also only recorded from a single location. *Tecticornia crotalus* K.A.Sheph. & Zerdoner was first collected in 1994 from Lake Baladjie northwest of Bullfinch by Nic Casson and Mal Graham, while *T. dactylifera* K.A.Sheph. & Zerdoner was discovered on Lake Cowan near Norseman by Jenny Borger in 2021. Molecular analyses confirm these species are genetically distinct (Žerdoner Čalasan *et al.*, unpublished).

While *T. crotalus* and *T. dactylifera* are rather unassuming low-lying plants, they are quite distinctive in the landscape due to where they grow, as both are confined to a narrow band of the salt pan bed near the edge of the high-water mark. It is unclear why these plants are not more widespread as they have papery fruits and small seeds that are presumably readily dispersed. Perhaps these species cannot outcompete other *Tecticornia* present higher in the landscape, where plants are denser and the water table is lower. It is likely that these species are naturally range-restricted as no other populations have been discovered despite widespread mining activity and associated vegetation surveys in and around salt lakes in the Goldfields over the decades. Due to their apparently restricted distribution and narrow habitat niche, and increasing potential threats from changes to hydrology through climate change or impacts from infrastructure development from proposed mining activity, it is suspected these species may be under threat of extinction.

ISSN 2200-2790 (Online)
https://florabase.dbca.wa.gov.au/nuytsia/

Tecticornia crotalus K.A.Sheph. & Zerdoner, *sp. nov.*

Type: Lake Baladjie, north-west of Bullfinch, Western Australia [precise locality withheld for conservation purposes], 6 December 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1950 (*holo*: PERTH 09541667; *iso*: AD, CANB, M, MEL, NSW, NY).

Decumbent *perennial*, to 0.1 m high. *Vegetative articles* obovoid, ellipsoid or spheroid, not compressed, light green tinged with yellow or bright red, 4–9 mm long, 4–6 mm wide, without lateral grooves; epidermis smooth, glossy; apex truncate, sometimes with a very short apiculus; margin narrow, entire. *Inflorescence* spike-like, terminal, cylindrical, with a slightly undulate outline, 14–26 mm long, 6–7 mm wide, with 6–16 paired bracts, with opposite, decussate, axillary 3-flowered cymes; florets in each cyme bisexual, equally sized. *Bracts* fused at base of inflorescence otherwise free, obovoid to rectangular in face-view (flowers facing forward), 1.3–3.8 mm long, 3.1–6.2 mm wide, with upper edge shallowly convex and gently curved; bracts in side-view 1.2–1.6 mm long (only basal bracts fused, remaining bracts are free and thus length cannot be measured), with upper edge sharply concave, outer face slightly protruding; epidermis smooth, glossy; apex truncate; margin narrow, entire. *Flowers* obscured by subtending bracts, free from bracts above and below, free from adjacent florets, clearly separated from opposite 3-flowered cyme. *Perianth* fused, dorsiventrally flattened with a truncate apex, abaxial surface strongly ascending, adaxial surface slightly to strongly ascending; lobes 2 or 3, sometimes with a small, ± obsolete abaxial lobe; margin entire. *Stamen* 1; anther oblong to elliptic, 1–1.2 mm long, 0.5–0.6 mm wide. *Ovary* free from stem cortex; style bifid, membranous. *Fruiting spike* scarcely expanded, chartaceous; apical vegetative growth absent. *Fruits* obscured by subtending bracts, free from bracts above and below, free from adjacent florets, clearly separated from opposite 3-flowered cyme; fruiting perianth scarcely expanded, chartaceous, outer surface texture dull; aperture flat. *Pericarp* fused to fruiting perianth or free, base of seed exposed; fruiting style membranous. *Seeds* slightly ascending relative to stem axis, ovate, 1.1–1.5 mm long, 0.7–1 mm wide, sometimes with a small beak up to 0.1 mm long, slightly transparent to opaque, brown to reddish brown, long edge opposite radicle with up to 4 rows of faintly granular bumps, sides with flat cells appearing smooth. (Figures 1A, 2)

Diagnostic features. *Tecticornia crotalus* is readily distinguished from all other *Tecticornia* by virtue of the following combination of characters: a low, decumbent habit to 0.1 m high; articles glossy, light green tinged with yellow or red, 4–9 mm long, 4–6 mm wide; inflorescence terminal, spike-like, with a slightly undulate outline, 14–26 mm long, 6–7 mm wide, with 6–16 paired bracts, basal pair of bracts fused and the remainder free; cymes with 3 bisexual flowers; flowers dorsiventrally flattened, obscured by subtending bracts; fruiting spike chartaceous, scarcely expanded; seeds brown to reddish brown, 1.1–1.5 mm long, with ornamentation of up to 4 rows of faintly granular bumps on the outer surface, sides appearing smooth.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 10 Dec. 1994, *N. Casson & M. Graham* G 17.4 (PERTH 04178114); 1 Apr. 2002, *K.A. Shepherd & S.R. Willis* KS 883 (MEL 2420004, NSW 947807, PERTH 08680175); 1 Apr. 2002, *K.A. Shepherd & S.R. Willis* KS 884 (PERTH 08680191); 1 Apr. 2002, *K.A. Shepherd & S.R. Willis* KS 885 (MEL 2420005, PERTH 08680183); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1951 (CANB, M, PERTH 09541624); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1952 (BRI, M, PERTH 09541586); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1953 (K, M, PERTH 09542507); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1954 (M, PERTH 09542558); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1955 (M, PERTH 09542590); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1956 (M, PERTH 09542639); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1957 (M, PERTH 09542671); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1958 (M, PERTH 09542736); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1959 (M, PERTH 09542779).

Phenology. Flowering from spring to early summer. Fruiting from mid to late summer.

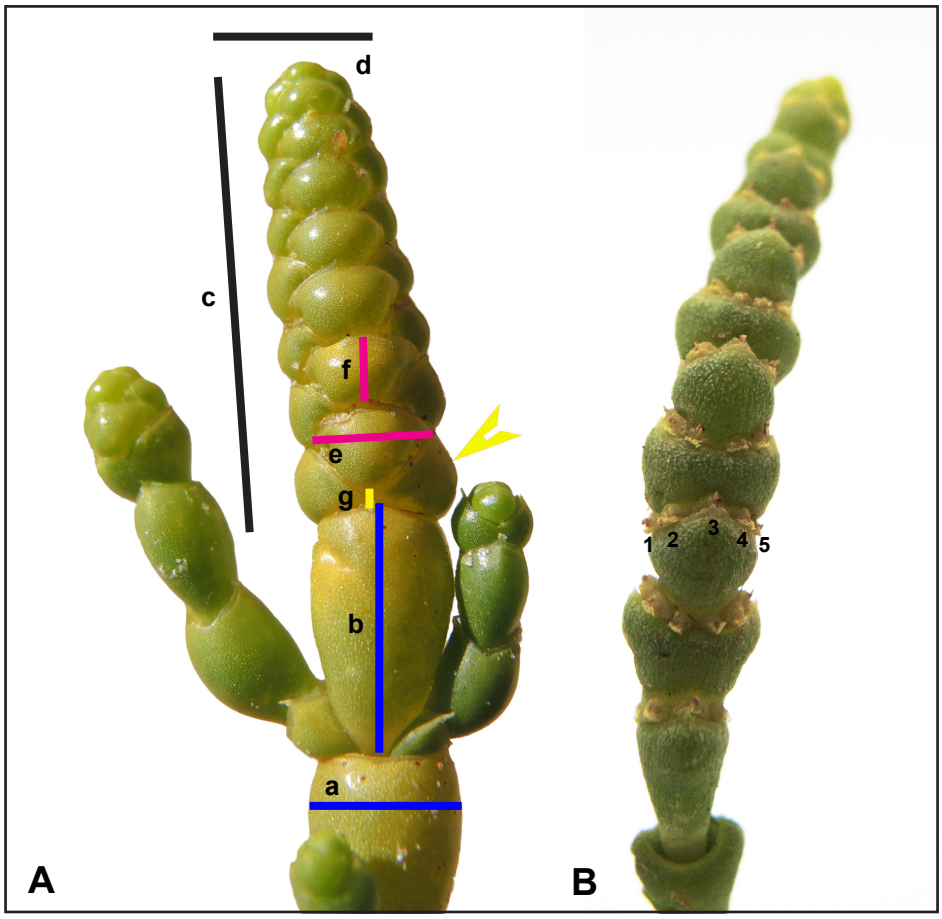

Figure 1. A – *Tecticornia crotalus* highlighting features used in the taxonomic description: vegetative article width (a) and length (b); inflorescence length (c), width (d) (the inflorescence being comprised of up to 16 'nodes' of opposite and decussate pairs of bracts); bract in face-view width (e) and length (f) (flowers facing forward are obscured behind the subtending bract); bract in side-view length (g), which can only be measured in the fused basal pair (yellow arrow) as the others are free so the length is reduced to zero (this cannot be easily observed as the free base is obscured by each subtending bract); and curvature of bract in side-view (yellow arrow). B – *T. dactylifera* inflorescence showing the apex of flowers exposed above the subtending bracts, the flowers are numbered in one of the cymes above a bract in face view. Vouchers: *K.A. Shepherd & A. Žerdoner Čalasan* KS 1950 (A) and *K.A. Shepherd & L. Webb* KS 1993 (B). Images: K.A. Shepherd.

Distribution and habitat. Known from Lake Baladjie, north-west of Bullfinch, where it is found on a gentle slope near the shoreline in pale brown clayey sand. Nearby vegetation includes *T. pergranulata*, with *Maireana* sp., *Podolepis capillaris*, *Atriplex nana*, and *Hakea preissii* occurring further up the dune slope.

Conservation status. To be listed as Priority Two under Conservation Codes for Western Australian Flora (Tanya Llorens pers. comm.). This species is currently known only from a single, small population within a nature reserve, with plants confined to a narrow band *c.* 500 m long near the highwater line. This population is likely to be significantly impacted by any changes to the salinity or hydrology of the lake, for example due to ongoing climate change.

Etymology. Named after the rattlesnake genus *Crotalus*, as the inflorescence shape resembles a rattlesnake's tail. The epithet is formed as a noun in apposition.

Affinities. Based on molecular sequence data from target enrichment capture using a customised bait set, *T. crotalus* is most closely related to *T. indefessa* K.A.Sheph. (Žerdoner Čalasan *et al.*, unpublished data), a Priority Two species from near Truslove, north of Esperance. *Tecticornia crotalus* is readily distinguished from *T. indefessa* by its decumbent habit (vs mat-like), larger inflorescence (14–26 mm ×

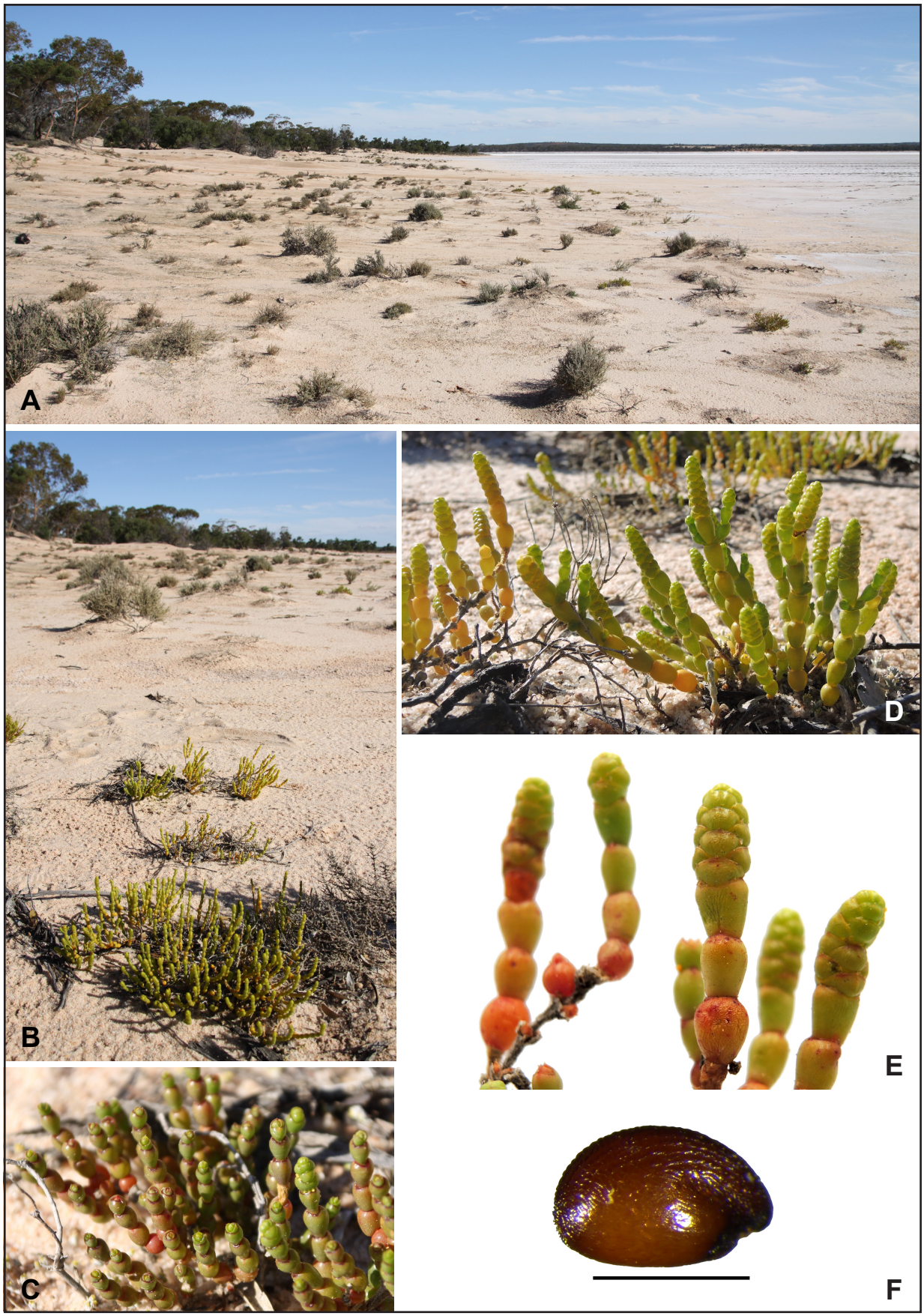

Figure 2. *Tecticornia crotalus*. A – habitat at the type locality; B – habit; C – glossy green vegetative articles with a red tinge; D – plants showing terminal, spike-like inflorescences; E – branchlet showing the obovoid to spherical vegetative articles and inflorescence with distinctive overlapping free bracts, reminiscent of a rattlesnake's tail; F – seed, scale bar = 1 mm. Vouchers: *K.A. Shepherd & A. Žerdoner Čalasan* KS 1950 (A–E); *K.A. Shepherd & S.R. Willis* KS 885 (F). Images: K.A. Shepherd.

6–7 mm vs 5–10 mm × 3.2–6 mm) with 6–16 paired bracts that are free with the exception of the basal pair (vs with 3–7 fused bracts), and larger seeds (1.1–1.5 mm long vs 0.7–0.8 mm).

Tecticornia crotalus appears most morphologically similar to *T. flabelliformis* (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson, and was previously mistaken for that species due to its shared similar habit and the presence of free rather than fused bracts. Despite this superficial similarity, these species are not particularly closely related (Žerdoner Čalasan *et al.*, unpublished data). *Tecticornia crotalus* can be recognised as distinct from *T. flabelliformis* by its glossy vegetative articles and bracts (vs dull), shorter and broader inflorescences that usually have fewer bracts (14–26 mm × 6–7 mm with 6–16 paired bracts vs 18–37 mm × 3.5–4 mm with 12–30 paired bracts), wider bracts in face view (3.1–6.2 mm wide vs 2.9–3.2 mm), and dorsiventrally flattened flowers that are completely covered by subtending bracts (vs cuboid flowers that are two thirds to fully exposed above the bracts).

Tecticornia dactylifera K.A.Sheph. & Zerdoner, *sp. nov.*

Type: Lake Cowan, Norseman, Western Australia [precise locality withheld for conservation purposes], 9 February 2023, *K.A. Shepherd & L. Webb* KS 1993 (*holo*: PERTH 09553355; *iso*: CANB, M).

Decumbent *perennial*, 0.1–0.12 m high. *Vegetative articles* obovoid, cylindrical or spheroid, not compressed, yellowish green, 2.3–8 mm long, 2.8–4.3 mm wide, without lateral grooves; epidermis smooth, dull; apex apiculate; margin narrow to obsolete, entire. *Inflorescence* spike-like, terminal, cylindrical, with a slightly undulate outline, 19.5–37 mm long, 3–4 mm wide, with 12–20 paired bracts, with opposite, decussate, axillary 5-flowered cymes; florets in each cyme bisexual, central flower slightly larger, lateral flowers not always fully developed. *Bracts* fused, cylindrical to obovoid in face-view (flowers facing forward), 1.8–3.9 mm long, 2.2–3.3 mm wide, with upper edge convex and moderately curved; bracts in side-view 0.6–1.8 mm long, with upper edge shallowly concave, outer face slightly protruding; epidermis smooth, dull; apex truncate with a small apiculus; margin narrow to obsolete, entire. *Flowers* two thirds to fully exposed above subtending bracts, free from bracts above and below, free from adjacent florets, almost contiguous with opposite 5-flowered cyme. *Perianth* fused, cuboid with a truncate apex, abaxial surface ascending, adaxial surface slightly ascending; lobes 3, abaxial lobe obvious and external; margin entire with abaxial lobe margin sometimes denticulate. *Stamen* not seen. *Ovary* free from stem cortex; style bifid, membranous. *Fruiting spike* scarcely expanded, chartaceous; apical vegetative growth absent. *Fruits* fully exposed above subtending bracts, free from bracts above and below, free from adjacent florets, contiguous with opposite 5-flowered cyme; fruiting perianth scarcely expanded, chartaceous, outer surface texture dull; aperture flat. *Pericarp* fused or free from fruiting perianth, base of seed exposed; fruiting style absent. *Seeds* horizontal relative to stem axis, ovate, 1–1.2 mm long, 0.7–0.9 mm wide, sometimes with a small beak up to 0.05 mm long, slightly transparent, brown to reddish brown, long edge opposite radicle with up to 4 or 5 rows of contiguous bumps, sides with flat cells appearing smooth. (Figures 1B, 3)

Diagnostic features. *Tecticornia dactylifera* can be recognised within the genus based on the following key features: a low, decumbent habit 0.1–0.12 m high; articles dull, yellowish green 2.3–8 mm long, 2.8–4.3 mm wide; inflorescence terminal, spike-like, with a slightly undulate outline, 19.5–37 mm long, 3–4 mm wide, with 12–20 pairs of fused bracts; cymes with 5 bisexual flowers; flowers cuboid with a truncate apex, exposed above the subtending bracts; fruiting spike chartaceous, scarcely expanded; seeds brown to reddish brown, 1–1.2 mm long, with ornamentation of up to 4 or 5 rows of contiguous bumps on the outer surface, sides appearing smooth.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 25 Nov. 2021, *J. Borger* Yogi 10-1 (PERTH 09555412); 25 Nov. 2021, *J. Borger* Yogi 10-2 (PERTH 09555285); 9 Feb. 2023, *K.A. Shepherd & L. Webb* KS 1994 (AD, MEL, PERTH 09553312); 9 Feb. 2023, *K.A. Shepherd & L. Webb* KS 1995 (M, PERTH 09553401).

Phenology. Flowering presumably from spring to early summer. Fruiting late summer.

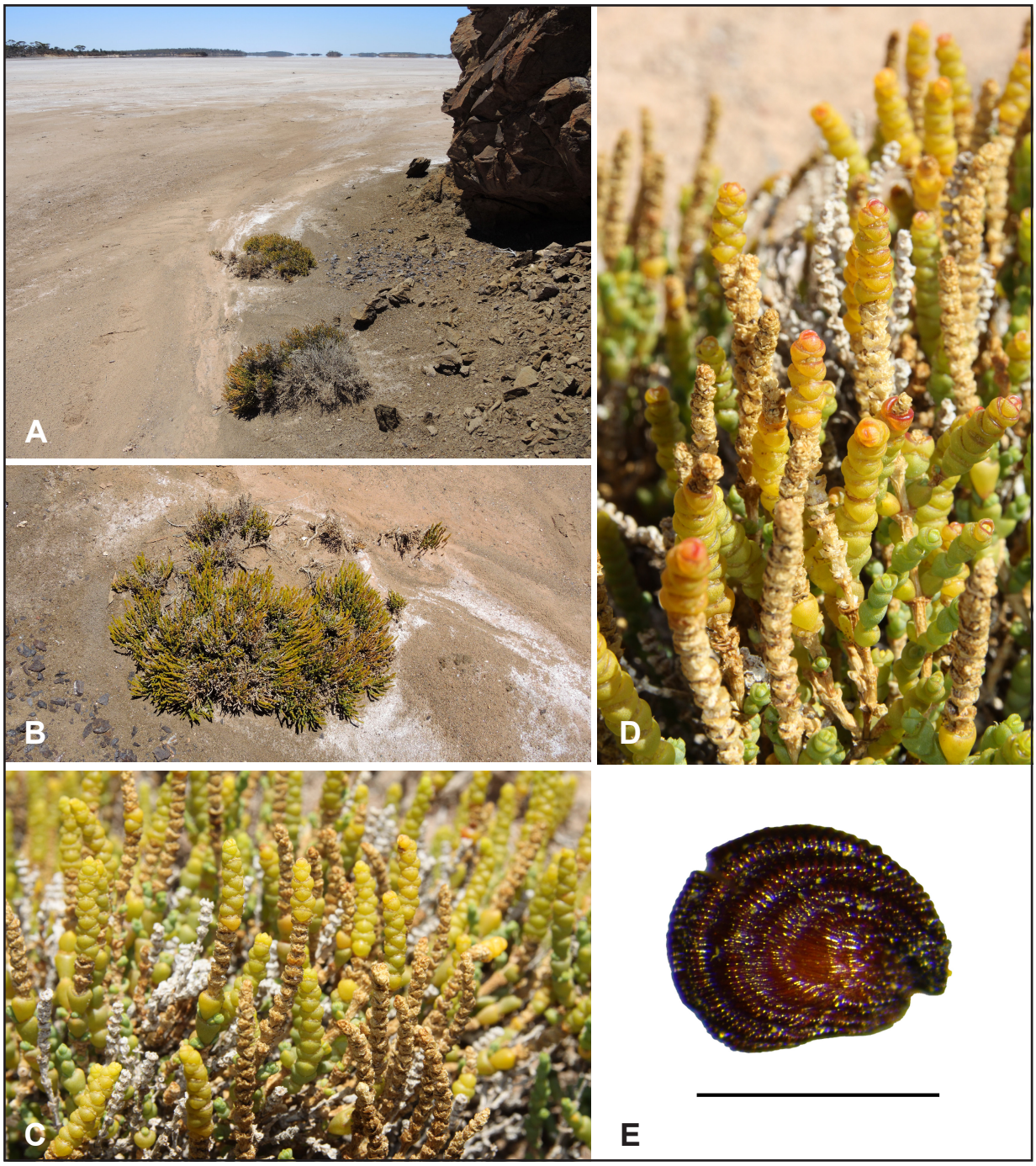

Figure 3. *Tecticornia dactylifera*. A – habitat at the type locality; B – habit; C – plant showing the long, terminal, spike-like inflorescences; D – dull yellowish green inflorescences becoming chartaceous in fruit; E – seed, scale bar = 1 mm. Voucher: *K.A. Shepherd & L. Webb* KS 1993. Images: K.A. Shepherd.

Distribution and habitat. This species is confined to a narrow margin at the edge of Lake Cowan, where it can be found growing near a rocky outcrop in pale brown sandy loam. Nearby vegetation includes *Tecticornia* sp. with *Melaleuca lateriflora*, *Frankenia glomerata* and *Maireana amoena* occurring further away from the lake shoreline.

Conservation status. Currently known only from a single population. To be listed as Priority One under Conservation Codes for Western Australian Flora (Tanya Llorens pers. comm.). This species may be under potential threat of extinction from changes to hydrology through infrastructure development and habitat damage by off-road vehicles.

Etymology. From the Latin *dactyl-* (finger-) and *-fer* (bearing) in reference to its the long, narrow, finger-like inflorescences.

Affinities. Molecular analyses by Žerdoner Čalasan *et al*. (unpublished data), confirm *T. dactylifera* as a genetically distinct species placed sister to *T. pluriflora* (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson, a species that is widespread in South Australia with a few scattered populations in New South Wales. Species of *Tecticornia* usually have 3-flowered cymes but they are 5-flowered in *T. dactylifera* and 5–7-flowered in *T. pluriflora* (with the lateral flowers often reduced in size). *Tecticornia dactylifera* can be distinguished from *T. pluriflora* by its low, decumbent habit (0.1–0.12 m high vs erect shrub 0.5–1 m), longer and broader inflorescences (19.5–37 mm × 3–4 mm vs 7–11 mm × 1.5–2 mm), and smaller bracts in side-view (0.6–1.8 mm long vs 2.4–3.5 mm).

Acknowledgements

We thank Melissa Mykytiuk (DBCA) and Alex Dent (Anglo Gold Ashanti) who provided cheerful field support, Nikita Vennik (DBCA) for collecting seeds of *T. flabelliformis* for comparison with *T. crotalus* and David Pickles (DBCA) for generating maps of remote areas in the Goldfields that helped us to avoid getting lost. Staff at the DBCA Kalgoorlie office are acknowledged for logistical support, accommodation and for providing a fleet vehicle, while photographer Lyn Webb (https://www.rangsgraphics.com/lynn-webb-photography) is sincerely thanked for generously taking KAS into the field in his own 4WD to collect *T. dactylifera* after said vehicle had unexpected engine troubles. Peri Coleman is gratefully acknowledged for providing the review, as are Julia Percy Bower and Tanya Llorens for curatorial and conservation checks, and Juliet Wege for providing helpful editorial comments.

References

AVH (2024). *The Australasian Virtual Herbarium*. Council of Heads of Australasian Herbaria. https://avh.chah.org.au [accessed 10 July 2024].

Western Australian Herbarium (1998–). *Florabase—the Western Australian Flora*. Department of Biodiversity, Conservation and Attractions. https://florabase.dbca.wa.gov.au/ [accessed 11 July 2024].