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Remarkably unremarkable: *Tecticornia enodis* (Chenopodiaceae), a new samphire with smooth seeds from the arid interior of Western Australia

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SHORT COMMUNICATION

'…unglamorous and humble weeds of marsh and swamp, of graceless aspect and monotonous colour… the flowers of the Salicornieae are remarkable in their obscurity' (Dawson 1945).

With their succulent, bead-like stems and uncharismatic, sac-like flowers with a single anther and ovary, salt-loving species in the genus *Tecticornia* Hook.f. (subfam. Salicornioideae Ulbr., Chenopodiaceae) have few obvious diagnostic features. Indeed, they could be considered a 'taxonomic nightmare', a phrase coined by experts to describe other species in the closely related genus *Salicornia* L. (Kadereit *et al.* 2007). Commonly known as samphires, these plants can exhibit considerable morphological plasticity when grown under different conditions (Ungar 1987). They are also genetically problematic as DNA sequence variation is relatively low, likely due to the relatively recent evolution and rapid radiation of the group. The presence of hybrids and polyploids pose further significant challenges (Shepherd & Yan 2003; Shepherd *et al*. 2004; Kadereit *et al*. 2006; Piirainen *et al*. 2017). Seed coat ornamentation is often useful for identification, particularly among the soft-fruited species of the genus (Wilson 1980; Shepherd *et al.* 2005); however, seeds are seasonally limited, very small (usually less than 2 mm long), and best observed under a microscope. As a result, the accurate identificaion of plants, particularly sterile specimens, can be very challenging.

The new species described below, first collected in 2001 during a biological survey of the Little Sandy Desert led by Dr Stephen van Leeuwen (DBCA), is a case in point. I initially thought it to be rather unremarkable since its tiny vegetative articles were similar to those observed in members of the widespread *T. halocnemoides* (Nees) K.A.Sheph. & Paul G.Wilson complex, a group further characterised by small, red-brown to black ornamented seeds with short protrusions on the outer margin; however, later inspection of material under a microscope revealed golden-brown seeds that were surprisingly smooth. Since then, other scattered populations in the arid interior east of Newman have been discovered allowing the taxonomic status of this remarkably unremarkable species to be resolved.

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Tecticornia enodis K.A.Shep., *sp. nov.*

Type: Lake Disappointment, Canning Stock Route, Western Australia [precise locality withheld for conservation reasons], 23 August 2007, *R. Davis* 11206 (*holo*: PERTH 07682751; *iso*: AD, CANB, MEL).

Tecticornia sp. Sunshine Lake (K.A. Shepherd et al. KS 867), Western Australian Herbarium, in *FloraBase*, https://florabase.dpaw.wa.gov.au/ [accessed 29 January 2018].

Perennial, erect shrub 0.15–0.5 m high, 0.35 to 0.5 m wide. *Vegetative articles* globular to obovoid, not compressed, glossy green to red, 0.9–3.5 mm long, 1–2.4 mm wide, epidermis smooth, apex truncate, margin entire. *Inflorescence* 5–75 mm long, 1–2.4 mm wide, forming a spike 3–32 nodes long, cylindrical, with an even or gently sinuate outline; terminal to main or lateral branches; florets in each 3-flowered cyme bisexual. *Bracts* globular to obovoid, fused, cylindrical or shallowly convex in face view with the upper edge straight to gently curved, cylindrical or shallowly concave in side view with the upper edge straight or gently curved, outer face of bract flat to slightly rounded, epidermis smooth, glossy; apex truncate, margin entire; upper bracts free from subtending bracts. *Flowers* exposed above subtending bracts; free from bracts above and below, free from adjacent florets. *Perianth* fused, laterally square or sometimes rounded with a truncate apex and the adaxial and abaxial surfaces horizontal to shallowly ascending; lobes 3, with a small, rounded abaxial lobe inside two lateral lobes, margins entire. *Stamen* 1, anther oblong, 0.8–0.9 mm long. *Ovary* free from the stem cortex, style bifid, membranous. *Fruiting spike* scarcely expanded, papery. Apical vegetative growth absent. *Fruitlets* exposed above subtending bracts, free from bracts above and below, usually free from lateral fruits (sometimes appearing fused in the dried state (due to extruded salt crystals), eventually breaking away from the axis; fruiting perianth laterally rounded, apex acute due to the slightly protruding remnant base of the style, papery, sometimes fused with the pericarp. *Pericarp* membranous, not enclosing the seed, with the base exposed, not dehiscing in the medial plane. *Seed* horizontal to shallowly ascending relative to the stem axis, rounded, 0.4–0.6 mm long, beak small to 0.1 mm long, opaque to semi-transparent, golden brown sometimes darker at the apex, smooth; embryo straight. (Figure 1)

Diagnostic characters. This species is readily distinguished from all other species within the *T. halocnemoides* complex by the combination of small (0.9–3.5 mm long), green to red, glossy articles and smooth, golden-brown seeds that are 0.4–0.6 mm long.

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 13 Dec. 2005, *P. Armstrong* 05/965 (PERTH); 23 Aug. 2007, *R. Davis* 11206 (PERTH); 14 Aug. 2012, *N. Gibson, S. van Leeuwen, M.A. Langley & K. Brown* NG 7131 (PERTH); 23 Aug. 2004, *W.P. Muir* WPM 716 (PERTH); 19 Aug. 2001, *K.A. Shepherd, S. van Leeuwen & C. Wilkins* KS 867 (PERTH); 28 Apr. 2015, *G. Wells* TEC 25-4 (PERTH); 9 Nov. 2015, *G. Wells* LS 0015-1 (PERTH); 25 May 2013, *J. Williams s.n.* (PERTH 08727120, PERTH 08726981); 17 Oct. 2013, *J. Williams s.n.* (PERTH 08727058, PERTH 08727155).

Phenology. Flowering from May through to August, with fruits forming from late spring through to summer.

Distribution and habitat. *Tecticornia enodis* is found in the Great Sandy Desert, Little Sandy Desert and Murchison bioregions of the Eremaean Floristic Province, usually around the margins of salt lakes,

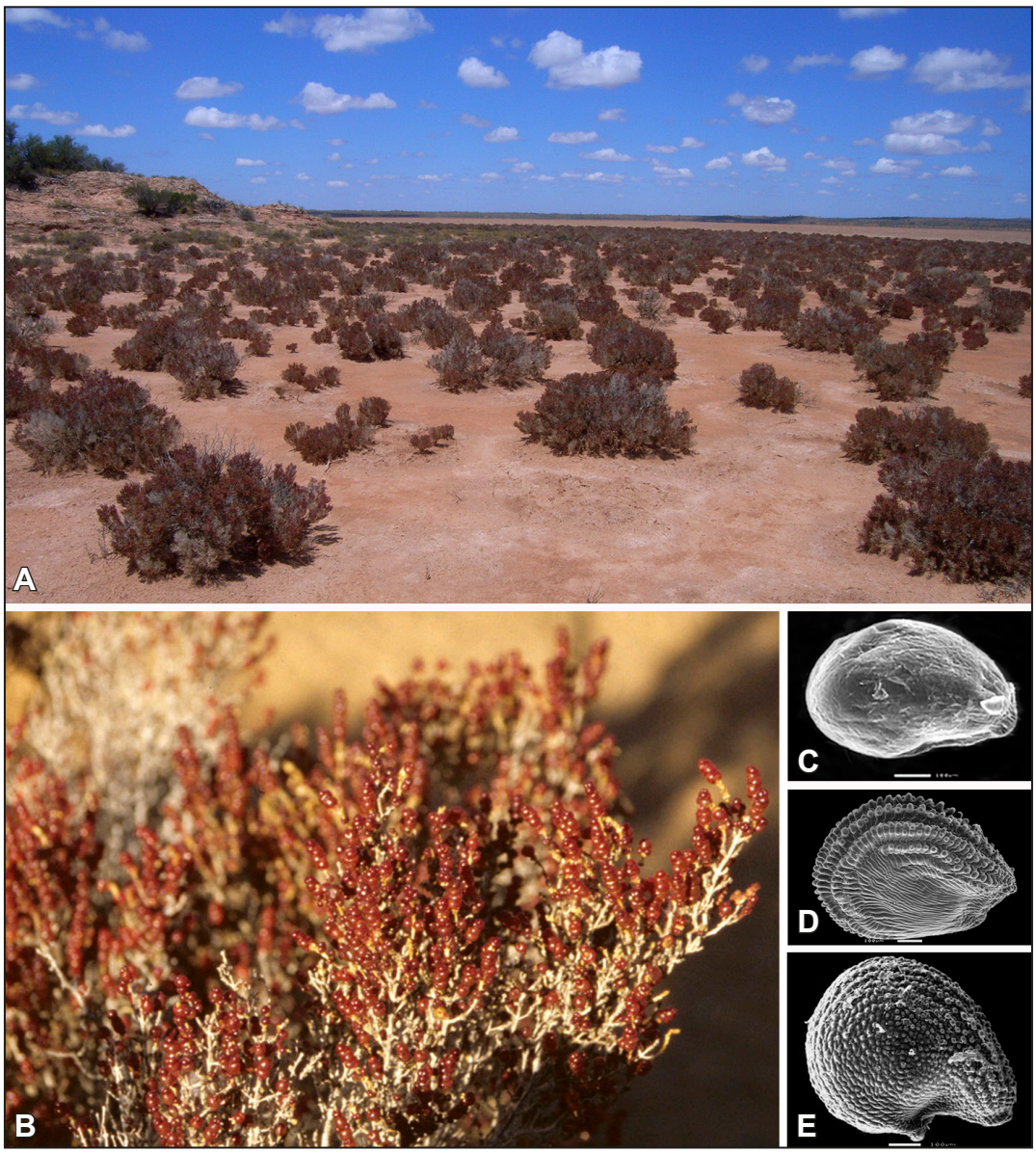

Figure 1. *Tecticornia enodis*. A – plants forming the dominant vegetation along the shoreline of a salt lake in the Little Sandy Desert; B – branchlets showing the red, glossy articles and bracts; C – seed; D – seed of *T. halocnemoides* subsp. *caudata*; E – seed of *T. halocnemoides* subsp. *tenuis*. Scale bars = 100 µm. Vouchers: *G. Wells* TEC 25-4 (B); *K.A. Shepherd, S. van Leeuwen & C. Wilkins* KS 867 (C); *P.G. Wilson* 8273(D); *K.A. Shepherd* KS 791 (E). Images by G. Wells (A, B) and K.A. Shepherd (C–E).

with one collection from a low rise within the lake bed a few hundred metres from the shoreline. It grows in salt encrusted, red-brown, grey or brown clay or well drained loamy clay and sand, associated with low shrublands dominated by *Tecticornia* with *Maireana*, *Frankenia*, *Gunniopsis*, *Dysphania*, *Scaevola collaris* and *Swainsona laciniata*.

Conservation status. Listed by Smith and Jones (2018) as Priority One under Conservation Codes for Western Australian Flora, under the name *T.* sp. Sunshine Lake (K.A. Shepherd et al. KS 867).

Populations vary from a few scattered individuals to 100–300 mature plants that form the dominant vegetation. While the few known populations of *T. enodis* are relatively widespread, none are situated within the conservation estate. This species remains poorly known and potential threats include grazing by feral animals and wildfire. Mineral exploration activity has also increased in the region in recent years and may pose a future threat.

Etymology. From the Latin *enodis* (without knots, smooth), in reference to the lack of ornamentation on the seeds.

Vernacular name. Smooth-seeded Samphire.

Affinities. Molecular phylogenetic analyses based on the internal and external transcribed spacer (ITS and ETS respectively) sequences (N. Dakin unpub. data) support *T. enodis* as distinct and sister to a clade of taxa characterised by their very small vegetative articles, a perianth with a rounded to truncate apex, and red-brown to black, ornamented seeds. This groups includes two phrase-named taxa, *T.* sp. Dennys Crossing (K.A. Shepherd & J. English KS 552) and *T.* sp. Chinocup (K.A. Shepherd KS 1191), and some representatives from the *T. halocnemoides* complex. Wilson (1980) stated that *T. halocnemoides* (then known as *Halosarcia halocnemoides* (Nees) Paul G.Wilson) likely represented a species aggregate and acknowledged that he had applied a very broad species concept, noting that further taxa should be recognised from within this group. He was unable to do this at the time of his treatment due to the frequent absence of seeds on specimens. Morphology and nrDNA sequence data indicate that *T. halocnemoides* is not monophyletic (Shepherd *et al.* 2004, 2005; N. Dakin *et al.* unpublished data) and that a number of its subspecies should be recognised as distinct species. Furthermore, there remain many more potentially new but as yet unrecognised taxa in this group (K.A. Shepherd *in sched.*). While *T. enodis* shares a number of morphological features that characterise this group, it is distinct by virtue of its smooth, golden brown seeds.

Tecticornia leptoclada (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson has papery fruits and smooth, golden brown seeds like those of *T. enodis*; however, it generally has dull vegetative articles (vs glossy in *T. enodis*) that are 5–8 mm long (vs 0.9–3.5 mm), generally shorter inflorescences (up to 10 mm long vs 5–75 mm) and larger seeds (0.8–1 mm long vs 0.4–0.6 mm).

Notes. A notable feature of *T. enodis* is that salt appears to be extruded from the floral bracts as specimens dry. Dense crystals can appear along the length of the inflorescence, sometimes disrupting the structure of the perianth as they form.

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