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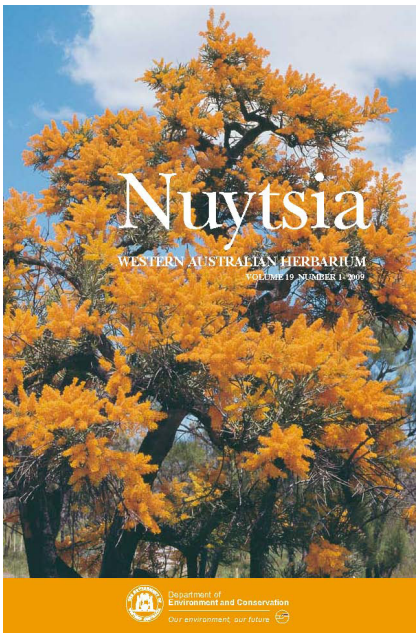

Shepherd K.A. & Lyons, M.N.

Three new species of *Tecticornia* (Chenopodiaceae, subfamily Salicornioideae) identified through Salinity Action Plan surveys of the wheatbelt region, Western Australia

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All enquiries and manuscripts should be directed to:

The Managing Editor – *NUYTSIA*
Western Australian Herbarium
Dept of Environment and Conservation
Locked Bag 104 Bentley Delivery Centre
Western Australia 6983
AUSTRALIA

Telephone: +61 8 9334 0500
Facsimile: +61 8 9334 0515
Email: nuytsia@dec.wa.gov.au
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Three new species of *Tecticornia* (Chenopodiaceae, subfamily Salicornioideae) identified through Salinity Action Plan surveys of the wheatbelt region, Western Australia

Kelly A. Shepherd[1,2,4] and Michael N. Lyons[3]

[1]Western Australian Herbarium, Department of Environment and Conservation,
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983
[2]School of Plant Biology, The University of Western Australia, 35 Stirling Highway, Crawley, Western Australia 6009
[3]Woodvale Research Centre, Department of Environment and Conservation, PO Box 51, Wanneroo, Western Australia 6946
[4]Corresponding author. Email: Kelly.Shepherd@dec.wa.gov.au

Abstract

Shepherd K.A. & Lyons, M.N. Three new species of *Tecticornia* (Chenopodiaceae, subfamily Salicornioideae) identified through Salinity Action Plan surveys of the wheatbelt region, Western Australia. *Nuytsia* 19(1): 167–180 (2009). A number of potentially new species have been discovered through ongoing Government surveys of the wheatbelt region of Western Australia. Three new samphires identified from collections made in saline areas during these surveys are described here: *Tecticornia annelida* K.A.Sheph. & M.Lyons, *T. sparagosa* K.A.Sheph. & M.Lyons and *T. loriae* K.A.Sheph. & M.Lyons. Distribution maps and illustrations of these new species are included.

Introduction

A major biological survey of the Wheatbelt region of Western Australia was conducted from 1997 to 2001 as part of the Western Australian Government's Salinity Action Plan (SAP). The survey aimed to document biodiversity values and patterning across the region to inform conservation planning in response to the threats to biodiversity posed by dryland salinity (Agriculture Western Australia, Department of Conservation and Land Management, Department of Environmental Protection, Water and Rivers Commission 1996; State Salinity Council 2000). While the full topographic catena of the region was sampled, emphasis was placed on low lying areas including valley floor terrestrial habitats and wetlands, as these were seen to be under greatest threat from hydrological change (Keighery *et al.* 2004). Within the wetlands component further emphasis was placed on the diverse array of naturally saline wetlands and their associated landforms that characterise the region (Lyons *et al.* 2004).

Halophytic species of the genus *Tecticornia* Hook.f., more commonly known as samphires, comprise the dominant vegetation fringing naturally saline wetlands. While the succulent, articulated stems characteristic of samphires ensure they are easily recognised as an assemblage, their modified morphology and reduced floral features provide considerable taxonomic challenges. Many find these plants difficult to identify to the species level and as a consequence, samphires are often ignored and are generally poorly collected. The systematic approach of the regional SAP survey program significantly increased the number of collections of samphires from a range of saline areas in the Wheatbelt region of Western Australia. Through this work a number of taxa were identified as potentially new,

highlighting the importance of biological surveys particularly when focused on regions where there may have previously been a lack of focus. Through ongoing taxonomic work on the genus *Tecticornia* three new taxa, discovered through these SAP surveys, are now confirmed as new species and are formally described here.

Methods

This study is based on the examination of fresh or spirit material (preserved in 70% ethanol) and herbarium specimens lodged at PERTH. Measurements were made using calipers and a microscope graticule. Where spirit material was unavailable floral and fruit characters were measured from dried herbarium sheets and from material re-hydrated in a weak solution of hot water and detergent. The terminology used to describe the structure of the bracts follows Shepherd (2007a). An Environmental Scanning Electron Microscope was used to produce images of seeds (Danilastos 1993). Distribution maps were produced using DIVA-GIS Version 5.2.0.2 and include the Interim Biogeographic Regionalisation for Australia (IBRA) categories Version 6.1 as modified on *FloraBase* (Department of the Environment, Water, Heritage and the Arts 2008). The precise locality for species known from only a few populations is obfuscated due to conservation concerns.

Taxonomy

Tecticornia annelida K.A.Sheph. & M.Lyons *sp. nov.*

Ab andromonoeciis *Tecticorniae* Hook.f. speciebus aliis omnibus humili habitu, floribus bisexualibus, bracteis marginibus membranaceis, seminibus 2–2.2 mm longis.

Typus: north of Mingenew, Western Australia [precise locality withheld for conservation reasons], 30 September 2000, *M.N. Lyons & S.D. Lyons* 4189 (*holo*: PERTH 07872976, *iso*: AD, CANB, DNA, MEL).

Halosarcia sp. Gunyidi (M.N. Lyons 2607); *Tecticornia* sp. Gunyidi (M.N. Lyons 2607) Western Australian Herbarium, in *FloraBase*, http://florabase.dec.wa.gov.au [accessed December 2008].

Perennial decumbent or low sub-shrub 0.1–0.3 m high. *Vegetative articles* ovoid to obovoid, circular in cross section, glaucous, pale green, 4–9 mm long, 3–6 mm wide, epidermis smooth, apex truncate, margin entire, membranous, 0.3–0.5 mm wide. *Inflorescence* 12–50 mm long, 3.5–6 mm wide, forming a spike 5–11 nodes long, cylindrical with an even to sinuate outline; terminal to main or lateral branches; florets in each 3-flowered cyme bisexual. *Bracts* obovoid, fused, convex in face view with upper edge shallowly curved, concave in side view with upper edge shallowly curved, outer face of bract flat, epidermis smooth; apex truncate, margin entire, membranous, 0.45–0.7 mm wide; upper bracts free from subtending bracts or with slightly overlapping subtending bracts. *Flowers* with apex partially exposed above subtending bracts, fused to bracts above, fused to adjacent florets, contiguous with opposite florets. *Perianth* fused, adaxial and abaxial surfaces steeply ascending, laterally rounded or dorsiventrally flattened, apex truncate; lobes 2 large lateral lobes overlapping, margins entire. *Ovary* free from stem cortex, style sometimes bifid, membranous. *Fruiting spike* scarcely expanded, papery or pithy. Apical vegetative growth absent. *Fruitlets* exposed above subtending bracts, fused to bracts

above, fused to lateral fruits, contiguous with opposite fruits; fruiting perianth laterally rounded or dorsiventrally flattened, membranous-papery or pithy, enclosing and fused with the pericarp, style at fruiting stage membranous or absent. *Pericarp* firm, enclosing seed, not dehiscing in medial plane. *Seed* free from pericarp, vertical relative to stem axis, ovate with a beak, 2–2.2 mm long, transparent, green to faintly gold-brown without ornamentation. *Embryo* straight, perisperm present. (Figure 1)

Specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 4 Sep. 1999, *M.N. Lyons* 2610 (PERTH 05518121); 5 Sep. 1999, *M.N. Lyons* 2609 (PERTH 05518148); 28 Sep. 1999, *M.N. Lyons* 2607 (PERTH 05518105); 26 Sep. 2000, *M.N. Lyons & S.D. Lyons* 3625 (PERTH 07917678); 5 Oct. 2000, *M.N. Lyons & S.D. Lyons* 3685 (PERTH 07877633); 10 June 2002, *K.A. Shepherd & J. Wege* KS 898 (PERTH 07904983).

Distribution and habitat. This species is only known from three populations in the Geraldton Sandplains and Yalgoo IBRA regions of the Eremaean Botanical Province (Figure 2). *Tecticornia annelida* occurs on saline flats, low dunes associated with salt pans or on lower slopes associated with braided drainage lines in moderately saline orange, brown to cream-brown sand over clay. This species may be associated with samphire flats or with low herbs and open shrubs such as *Acacia eremaea*, *Melaleuca lateriflora* subsp. *acutifolia*, *Lawrencia squamata*, *Frankenia bracteata*, *Maireana amoena*, *M. oppositifolia*, *Atriplex holocarpa*, *Rhagodia drummondii*, *Eragrostis dielsii* and *Gunniopsis quadrifida*.

Phenology. This species most likely flowers in July and August as fruits are starting to mature from September to October.

Conservation status. As *Tecticornia annelida* is relatively uncommon and currently only known from three populations it is listed as Priority One under the Department of Environment and Conservation (DEC) Conservation Codes for Western Australian Flora.

Etymology. When dried the inflorescence of this species appears like a segmented worm due to the upright flowers and membranous margin of the bracts being paler in colour. Segmented worms belong to the Phylum Annelida taken from the Latin *annellus* meaning 'little ring' and the epithet *annelida* alludes to this feature.

Affinity. *Tecticornia annelida* is a low sub-shrub that is distinct in having large, upright florets that are laterally rounded. At maturity the membranous margin of the vegetative articles and fertile bracts are obvious and the upright fruits are readily observed above the subtending bracts. The ovate, translucent seeds are also distinctive, as at 2–2.2 mm in length they are among the largest recorded in the subfamily Salicornioideae (Shepherd 2004, Shepherd *et al*. 2005). Similar seeds have only been observed in four other species that were previously included in the former genus *Sclerostegia* (*Tecticornia arbuscula* (R.Br.) K.A.Sheph. & Paul G.Wilson*, T. medullosa* (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson, *T. moniliformis* (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson and *T. tenuis* (Benth.) K.A.Sheph. & Paul G.Wilson) (Shepherd & Wilson 2007). *Tecticornia annelida* is readily distinguished from these species as it has bisexual florets rather than being andromonoecious, where the lateral florets are male and the central floret is bisexual in each 3-flowered cyme.

Notes. Characters originally used to segregate the mostly endemic Australian samphires now placed in *Tecticornia* Hook.f. (formerly *Halosarcia* Paul G.Wilson*, Sclerostegia* Paul G.Wilson*, Pachycornia* Hook.f. and *Tegicornia* Paul G.Wilson: see Shepherd & Wilson 2007) included the presence of a single abaxial anther and a lack of sclereids in the palisade chlorenchyma (Wilson 1980). In contrast,

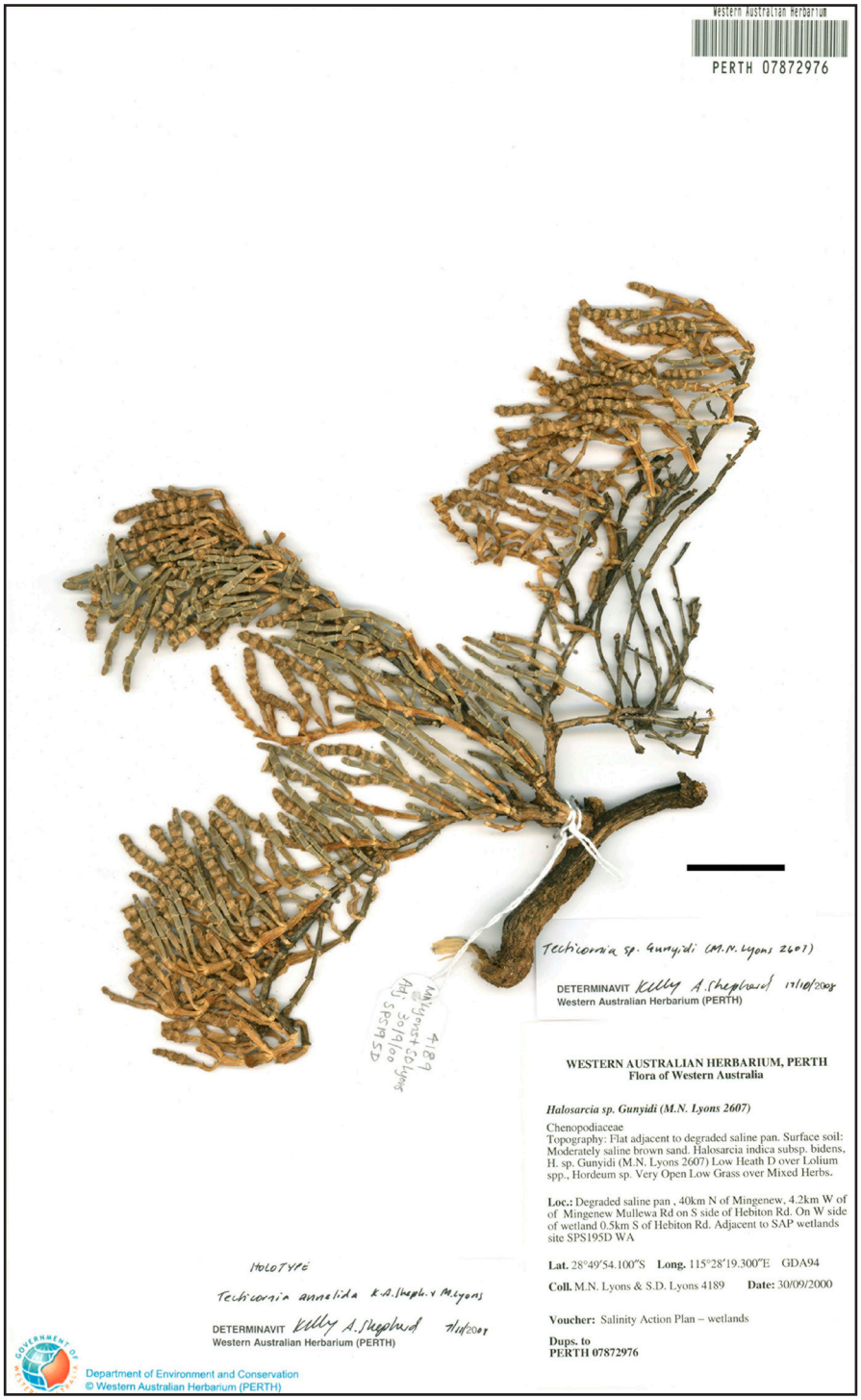

Figure 1. Holotype of *Tecticornia annelida* (*M.N. Lyons & S.D. Lyons* 4189). Scale bar = 3cm.

other common genera of the tribe Salicornioideae such as *Arthrocnemum* Moq., *Salicornia* L. and *Sarcocornia* A.J.Scott, have both an abaxial and adaxial anther in each flower and sclereids generally abundant in the palisade. These sclereids are usually spirally thickened, although some variants of *Sarcocornia quinqueflora* (Bunge ex Ung.-Sternb.) A.J.Scott have evenly thickened sclereids. More recently, Paul Wilson (pers. comm.) noted that sclereids were also present in the palisade of *Halosarcia* sp. Gunyidi (M.N. Lyons 2607), described here as *T. annelida*, which was later confirmed by Shepherd (2004). As the sclereids observed in *Halosarcia* sp. Gunyidi (M.N. Lyons 2607) are not associated with vascular tissues, nor do they form the more typical spiral formation, it was concluded that they are unlikely to be homologous to those typically found in *Arthrocnemum*, *Salicornia* and *Sarcocornia* (Shepherd 2004; Shepherd & Wilson 2007). This was supported by phylogenetic analyses of both nuclear and chloroplast DNA, as *Halosarcia* sp. Gunyidi (M.N. Lyons 2607) was shown to be more closely allied to species formerly included in the genus *Sclerostegia* than to the Australian species of *Sarcocornia* included in the study (Shepherd *et al.* 2004).

Fertile stamens are yet to be observed in *T. annelida* and it is noted that all herbarium specimens currently lodged at PERTH were collected in September and October. Since the anthers may be exserted early in the flowering season, further collections from late winter and early spring are required.

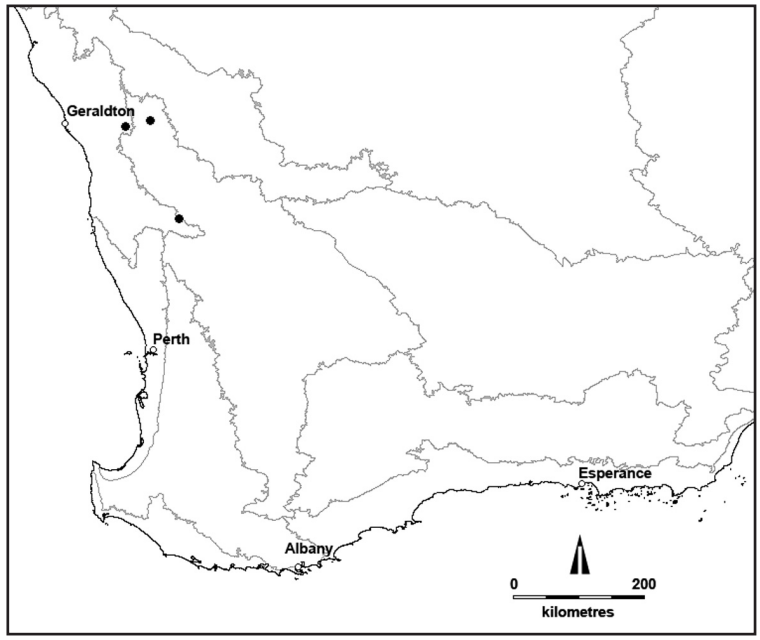

Figure 2. Distribution of *Tecticornia annelida* (•) with IBRA regions Version 6.1 in grey (Department of the Environment, Water, Heritage and the Arts 2008).

Tecticornia sparagosa K.A.Sheph. & M.Lyons *sp. nov.*

Ab *Tecticorniae indefessae* K.A. Sheph. fructibus verticalis, apicibus complanatis et acutis, basibus distentis; seminibus laevibus, 1–1.1 mm longis distinguitur.

Typus: Crown Land Reserve, *c*. 950 m north of Kendall Road on Norwood Road, east of Scaddan, Western Australia, 8 October 2007, *J.A. Wege & R. Butcher* JAW 1418 *(holo*: PERTH 07855060; *iso*: AD, CANB, MEL).

Halosarcia sp. Central wheatbelt (M.N. & S.D. Lyons 2760); *Tecticornia* sp. Central wheatbelt (M.N. & S.D. Lyons 2760), Western Australian Herbarium, in *FloraBase*, http://florabase.dec.wa.gov.au [accessed December 2008].

Perennial decumbent sub-shrub to 0.1 m high. *Vegetative articles* ovoid to obovoid, circular to ovate in cross section, pale green, flushed pink or red, sometimes glaucous, 2.5–7 mm long, 1.5–4 mm wide, epidermis smooth, dull, apex acute, margin entire or serrulate. *Inflorescence* 8–15 mm long, 3–4.5 mm wide, forming a spike 3–6 nodes long, cylindrical, with an even to sinuate outline; terminal to main or lateral branches; florets in each 3-flowered cyme bisexual. *Bracts* ovoid to obovoid, fused, convex in face view with upper edge curved to strongly curved, concave in side view with upper edge curved, outer face of bract flat, epidermis smooth, dull; apex acute, margin entire to serrulate; with overlapping subtending bracts. *Flowers* covered by subtending bracts or with the apex rarely exposed, free from bracts above and below, fused to adjacent florets, contiguous with opposite florets. *Perianth* fused, adaxial and abaxial surfaces steeply ascending, laterally dorsiventrally flattened, apex acute; lobes 2 lateral lobes overlapping, margins entire. *Ovary* free from stem cortex, style bifid, membranous. *Fruiting spike* scarcely expanded, papery or pithy. Apical vegetative growth absent. *Fruitlets* covered by subtending bracts, free from bracts above and below, fused to lateral fruits, contiguous with opposite fruits; fruiting perianth apex dorsiventrally flattened rounded towards the base, spongy to crustaceous, finely areolate, enclosing and fused with the pericarp, style at fruiting stage absent. *Pericarp* firm, enclosing seed, not dehiscing in medial plane. *Seed* free from pericarp, vertical relative to stem axis, ovate with a beak, 1–1.1 mm long, opaque, light gold-brown without ornamentation. *Embryo* straight to slightly curved, lateral perisperm present. (Figure 3)

Specimens examined. WESTERN AUSTRALIA: Lakelands Nature Reserve, 18 Nov. 1998, *E. Bennett & A. Paton* L 2.2 (PERTH 05358256); Truslove, 6 Nov. 1978, *R.J. Cranfield* 1047 (PERTH 02493527); W end, One Mile Rocks Reserve, 12 Nov. 1970, *A.S. George* 10503 (PERTH 02667584); Mortlock River East flats, 100 m W of N extension of Mussard Road, 1.4 km N of Great Eastern Highway, 5.5 km NW of Cunderdin, Jaspers Property, Salinity Action Plan wetlands site SPS207D, 12 Oct. 2000, *M.N. Lyons & S.D. Lyons* 3668 (PERTH 07877528); 24 km NE of Kulin within Kondinin Salt Marsh NR C26692, 0.3 km N of track, 4.35 km W of Fotheringhame Road along southern boundary track, adjacent to Salinity Action Plan wetlands site SPS017G, 16 Oct. 2000, *M.N. Lyons & S.D. Lyons* 3675 (PERTH 07877412); Reserve C27684, 16 km SE of Pingaring, 5.3 km from Burngup Road North on N side of Kent Road, Salinity Action Plan wetlands site SPS213B, 17 Oct. 2000, *M.N. Lyons & S.D. Lyons* 3676 (PERTH 07877404); Lake Chinocup saline flats within Chinocup Nature Reserve A28395, 50 m W of Chinocup Road 3 km S of Tees Road, *c.* 12 km WNW of Pingrup townsite, Salinity Action Plan wetlands site SPS210C, 18 Oct. 2000, *M.N. Lyons & S.D. Lyons* 3677 (PERTH 07877420); N side of Rasmussen Road, 4.1 km E of North Chinocup Road, Chinocup Nature Reserve A28395, *c*. 16 km NNW of Pingrup townsite, 20 Dec. 2002, *M.N. & S.D. Lyons* 2760 (PERTH 06614884); 21 km E of Scaddan on Styles Road, 10 Sep. 1984, *P. van der Moezel* PGV 455 (PERTH 02668599); 9 km E of Scaddan on Norwoods Road, 27 Mar. 1985, *P. van der Moezel* PGV 466 (PERTH 02668580); 600 m W of Rasmussen Road from Gray Road intersection, NNW of Pingrup, 29 Nov. 2007, *K.A. Shepherd & S.R. Willis* KS 1069 A (PERTH 07904967).

Distribution and habitat. *Tecticornia sparagosa* is found in the Avon Wheatbelt and Mallee IBRA regions of the Southwest Botanical Province (Figure 4). This species is found around the flat floodways or gentle slopes along the margins of salt lakes or beside channels within broad braided saline flats, in white or cream-brown saline or gypseous loam and sand associated with samphire mosaics or low shrubs and herblands including *Atriplex hymenotheca*, *Roycea pycnophylloides*, *Calandrinia granulifera*, *Gnephosis tridens* and *Centrolepis eremica*.

Figure 3. *Tecticornia sparagosa*. A – Mike Lyons taking a habit photograph, with more plants in the foreground; B & C – habit; D – subtending bracts completely cover the flowers in each inflorescence, in the left inflorescence creamy-yellow stigmas are exserted; E – left inflorescence shows the apex of flowers just apparent above the subtending bract (*M.N. Lyons & C. McCormick* 4890).

Phenology. Flowering specimens have been observed in September and October.

Conservation status. This species is known from a range of salt lakes in the wheatbelt region of south-west Western Australia and is not currently under threat.

Etymology. The epithet is derived from the Greek word *sparagosis* meaning 'distention' or 'swelling' in reference to the distinct shape of the mature fruit which is dorsiventrally flattened towards the apex and then bulges sharply outwards towards the base where the upright seed is enclosed.

Affinity. *Tecticornia sparagosa* has a low decumbent habit and it may be mistaken for the mat-like *T. indefessa* K.A.Sheph., particularly where they grow in the same vicinity north of Esperance. The distinct fruits of *T. sparagosa* readily distinguish it however, as the adaxial and abaxial surfaces of the mature perianth are steeply ascending, the apex is acute and dorsiventrally flattened while the base is distended outwards. In contrast, *T. indefessa* has broadly obovate fruits with a truncate apex (Shepherd 2007b) and glossy rather than dull articles that are more typical of *T. sparagosa*. While *T. annelida* has a similar decumbent habit, it is recognised as distinct from *T. sparagosa* by its fruiting perianth which is not distended at the base and its seeds, which are twice the size.

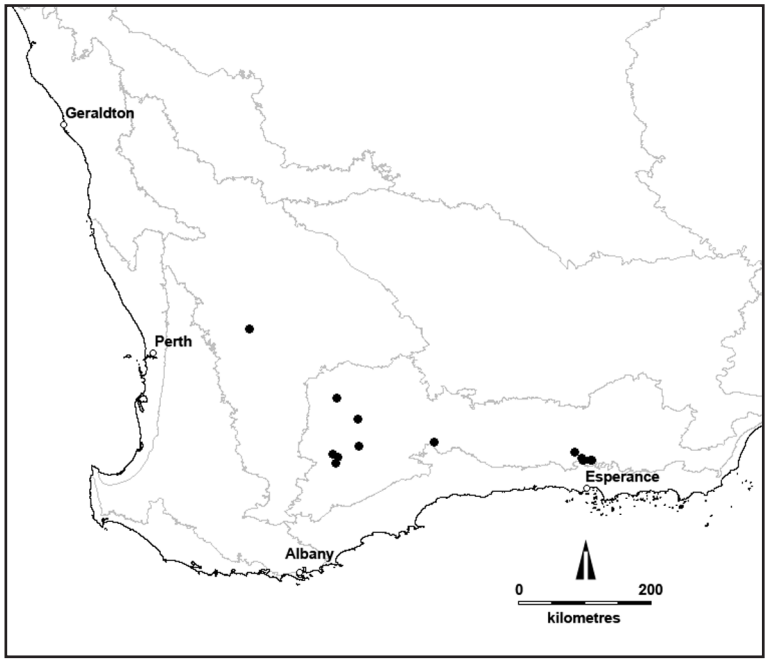

Figure 4. Distribution of *Tecticornia sparagosa* (•) with IBRA regions Version 6.1 in grey (Department of the Environment, Water, Heritage and the Arts 2008).

Notes. Fertile stamens have not been observed in *T. sparagosa* and all current specimens lodged at PERTH were collected late in the year from October to December. Thus, as for *T. annelida*, further collections obtained in early spring are required.

Tecticornia loriae K.A.Sheph. & M.Lyons *sp. nov.*

Tecticorniae halocnemoidi subsp. *catenulatae* (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson similis, sed articulis glaucis, cylindricis, seminibus rotundatis, margine externo papillis digitiformibus, cellulis lateralibus undulatis differt.

Typus: east side of Lake Moore, lake bed north of embayment of lake, 13 km north-north-west of Remlap Homestead, Site SPS 148F, Western Australia, 31 August 1999, *M.N. Lyons* 2603 (*holo*: PERTH 05501369, *iso*: AD, CANB, MEL).

Halosarcia sp. Lake Moore (M.N. Lyons 2603); *Tecticornia* sp. Lake Moore (M.N. Lyons 2603), Western Australian Herbarium, in *FloraBase*, http://florabase.dec.wa.gov.au [accessed December 2008].

Perennial shrub to 0.2–0.5 m high, 0.1–0.3 m wide. *Vegetative articles* narrowly cylindrical, circular in cross section, pale green or pink, glaucous, 2.2–10.5 mm long, 1–2.5 mm wide, epidermis smooth, dull, apex truncate to acute, margin entire. *Inflorescence* 4–19 mm long, 1.3–2.2 mm wide, forming a spike 3–9 nodes long, cylindrical, with a sinuate outline; terminal to main or lateral branches, rarely with continued vegetative growth; florets in each 3-flowered cyme bisexual. *Bracts* cylindrical to narrowly obovoid, fused, cylindrical or convex in face view with upper edge straight to shallowly curved, cylindrical or concave in side view with upper edge straight or shallowly curved, outer face of bract flat or slightly rounded, epidermis smooth, dull; apex truncate, margin entire; upper bracts

free from subtending bracts or with slightly overlapping subtending bracts. *Flowers* completely or partially exposed above subtending bracts; free from bracts above and below, free from adjacent florets, contiguous with opposite florets. *Perianth* fused, adaxial surface horizontal, abaxial surfaces horizontal to ascending, laterally square, apex truncate; lobes 3, with a small, rounded abaxial lobe inside or outside two lateral lobes, margins entire. *Stamen* 1, oblong anther 0.5–0.7 mm long abaxial to ovary. *Ovary* free from stem cortex, style bifid, membranous. *Fruiting spike* scarcely expanded, papery. Apical vegetative growth absent or rarely present. *Fruitlets* exposed and extending beyond subtending bracts, free from bracts above and below, free from lateral fruits, contiguous with opposite fruits; fruiting perianth laterally square, apex truncate, papery, fused with the pericarp, style at fruiting stage absent or membranous. *Pericarp* not enclosing seed, not dehiscing in medial plane. *Seed* free from the pericarp, vertical relative to stem axis, ovate with a beak, 0.6–0.9 mm long, opaque, light brown with rows of well spaced, finger-like, short, papillae on the outer margin and towards the centre of the seed. *Embryo* straight to slightly curved, lateral perisperm present. (Figures 5–7)

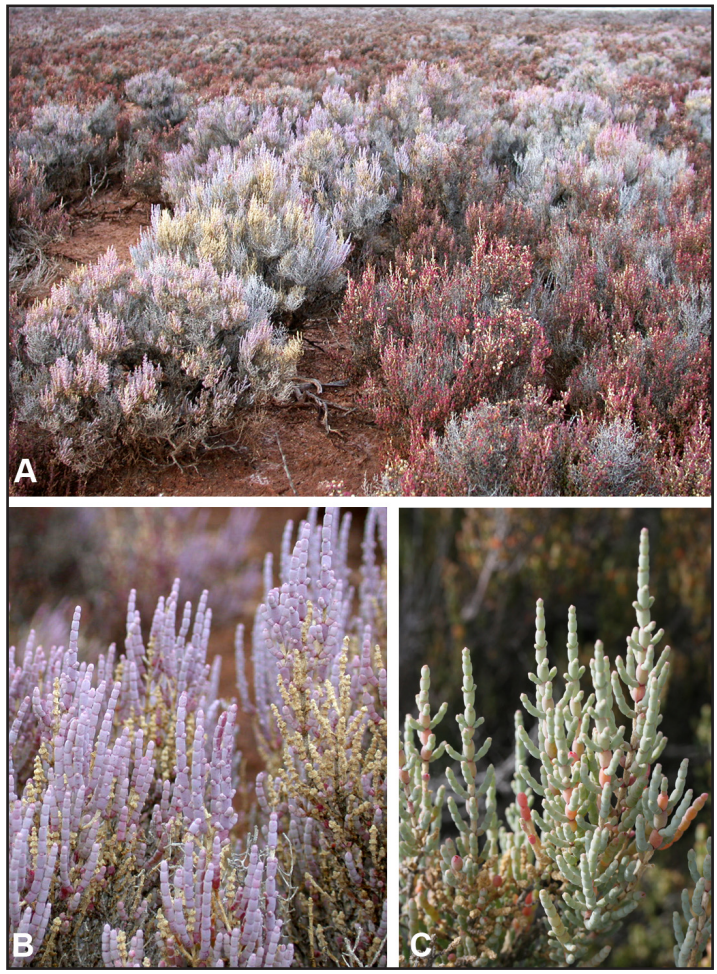

Figure 5. *Tecticornia loriae*. A – habit; B – branchlets with rectangular, pale pink articles and pale brown fruiting inflorescences (*K.A. Shepherd* KS 901); C – southern populations with pale green, rectangular articles and many secondary branchlets (*K.A. Shepherd* KS 1180).

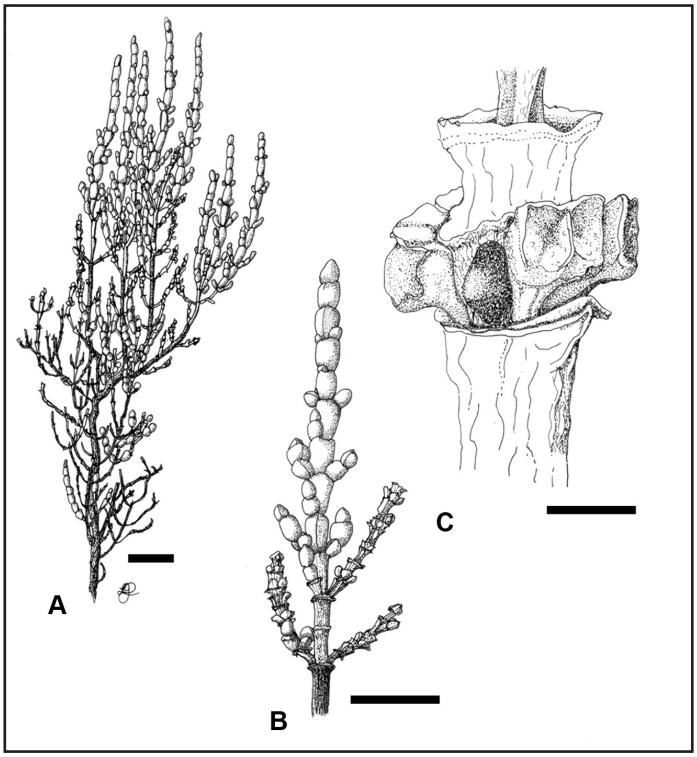

Figure 6. *Tecticornia loriae*. A – habit; B – branchlet bearing three inflorescences; C – a triad of laterally square fruits, with the left fruit removed to expose a seed (*K.A. Shepherd* KS 901). Scale bars = 10 mm (A & B), 1 mm (C).

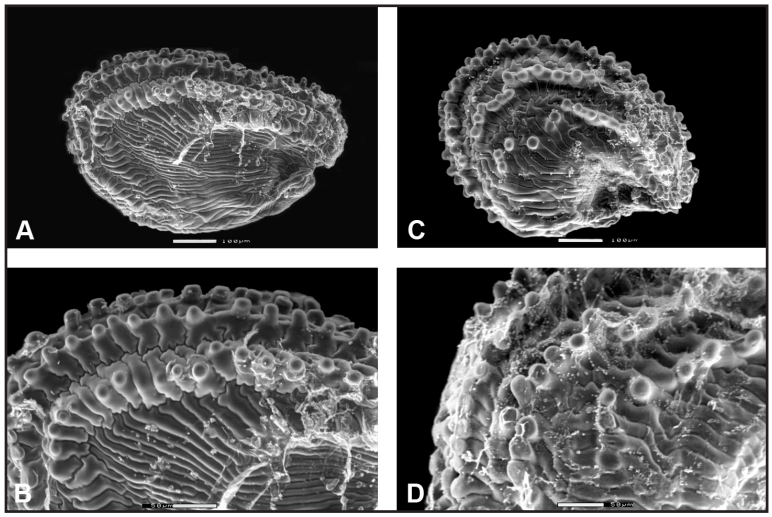

Figure 7. A & B – seeds of *Tecticornia halocnemoides* subsp. *catenulata* ; C & D – seeds of *T. loriae*. A & B – *P.G. Wilson* 8585, C – *K.A. Shepherd* KS 764; D – *B.G. Muir* 550. White scale bars = 100 µm (A & C), 50 µm (B & D).

Specimens examined. WESTERN AUSTRALIA: Linear Lake in NE, Reserve No. 26687, 13 Jan. 1995, *N. Casson & A. O'Connor* G 476.4 (PERTH 04230329); SW corner of Lake Wallambin (Reserve 21719), 21 Jan. 1995, *N. Casson & A. Harris* G 490.4 (PERTH 04230310); Lochada Station, 14 May 2002, *A. Chant & C. Forward* 1 (PERTH 06280838); on S side of Winchcombe Road, 5.4 km W of Dempster Rock Road, Lake Gulson Nature Reserve, *c*. 62 km SE of Hyden. Plot - HY02, 26 Sep. 1997, *G.J. Keighery & N. Gibson* 7092 (PERTH 06604277); on E side of English Rd, *c*. 2.5 km S of Chandler–Nungarin Rd, Lake Campion Nature Reserve, *c*. 31 km NE of Nungarin, Plot - MN09, 30 Sep. 1997, *G.J. Keighery & N. Gibson* 4175 (PERTH 07624786); Lake Harvey, 14 km N of Mollerin, centre of lake towards S end, Site SPS 143B, 14 Aug. 1999, *M.N. Lyons* 2604 (PERTH 05501385); saline pan immediately N of the Wannara [Wanarra] Road, 1.3 km E of the Mongers Lake crossing, 19 Aug. 1999, *M.N. Lyons* 2605 (PERTH 05501377); Lake Varley, 55km NE of Newdegate within Lake Varley Nature Reserve A27928, 4.5 km SW of Holt Rock town site, on SE edge of Lake Varley. SAP wetlands site SPS019C, 15 Sep. 1998, *M.N. Lyons & S.D. Lyons* 3447 (PERTH 07836074); Lake King, 8.8km W of Lake King Road on N side of Newdegate-Ravensthorpe Road within Lake King Nature Reserve A39422, SAP wetlands site SPS071B, 17 Sep. 1998, *M.N. Lyons & S.D. Lyons* 3446 (PERTH 07836058); Cowcowing Lakes, 0.7 km north of Nalkain Road on Wyalkatchem North Road, 28 Sep. 1999, *K.A. Shepherd & J. English* KS 479 (PERTH 07992270); 34.5 km N of Wubin on Great Northern Highway, near park area, 11 June 2002, *K.A. Shepherd & J. Wege* KS 901 (PERTH 07904940); 23 km NE of Scaddan on Styles Road, 27 May 1982, *P. van der Moezel* PGV 55 (PERTH 02478412); southern end of Lake Camm, 16 km NW of Lake King township, 15 Aug. 1968, *P.G. Wilson* 7144 (PERTH 02479524); southern margin of Lake Barlee, 25 Aug. 1970, *P.G. .Wilson* 8814 (PERTH 01932977; CANB); E bank of Lake King near causeway, 29 Sep. 1970, *P.G. Wilson* 9991 (PERTH 02669005).

Distribution and habitat. A widespread species occurring in the Yalgoo, Murchison and Coolgardie IBRA regions of the Eremaean Botanical Province and the Avon Wheatbelt and Mallee IBRA regions of the Southwest Botanical Province (Figure 8). *Tecticornia loriae* is found on flat floodways, sometimes in damper areas more toward the centre of salt lakes rather than the drier outer margins, in gypseous and saline light brown to red clayey sand with *Tecticornia* spp. and low open herbs and shrubs including *Atriplex holocarpa, Eremophila miniata* and *Chondropyxis halophila*.

Phenology. Flowers have been recorded from August to September and fruits begin to form in late September and October.

Conservation status. This species is known from a number of populations and is not considered to be under threat.

Etymology. *Tecticornia loriae* is named in honour of Lorraine (Lori) Cobb (1951–2008) a dear friend who was a talented and passionate botanist and gifted botanical artist (Shepherd & Butcher 2008). The illustration of *T. loriae* included here (Figure 6) is a wonderful example of her skill and was the last one she produced for Kelly Shepherd.

Affinity. *Tecticornia loriae*, like the newly phrase-named *T*. sp. Dennys Crossing (K.A. Shepherd & J. English KS 552), was previously included in the morphologically variable *T. halocnemoides* (Nees) K.A.Sheph. & Paul G.Wilson. Currently there are five subspecies recognised within *T. halocnemoides* but it is likely that many other taxa will be recognised as distinct with further taxonomic work. *Tecticornia loriae* is most closely allied to *T. halocnemoides* subsp. *catenulata* (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson within this complex. When Wilson (1980) first described this subspecies he noted there was a glaucous form with collections from Mollerin Lake, Lake Barlee, north of Norseman and

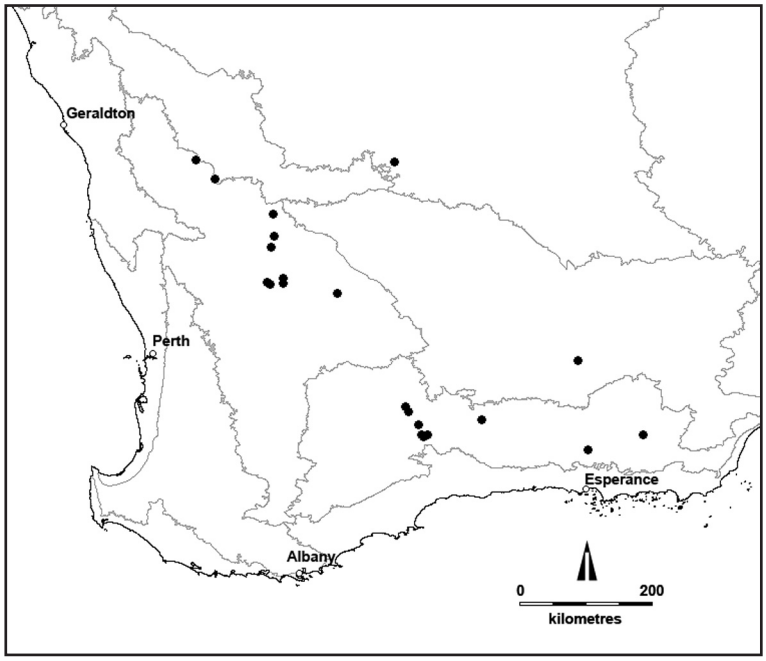

Figure 8. Distribution of *Tecticornia loriae* (•) with IBRA regions Version 6.1 in grey (Department of the Environment, Water, Heritage and the Arts 2008).

Lake King (PERTH 02478323; PERTH 01932977; PERTH 02478455; PERTH 02478439; PERTH 02478382; PERTH 02478447). Wilson commented that these glaucous articles were unique to this variant within the *T. halocnemoides* complex, as in all other variants the articles were either glossy or dull. Wilson (1980) noted that the flowers and seeds of the typical *T. halocnemoides* subsp. *catenulata* and the glaucous variant were similar and therefore it did not warrant recognition as a separate entity based on the collections available at the time. On further examination of more recent material it is apparent that the seeds of *T. loriae* are smaller and more rounded compared to the more ovate seeds of *T. halocnemoides* subsp. *catenulata* (Shepherd 2004; Shepherd et al. 2005). In both taxa the seed ornamentation includes rows of finger-like papillae on the outer margin. In *T. halocnemoides* subsp. *catenulata* there are generally only two rows of papillae. Within each row the individual papillae terminate approximately halfway around the circumference of the seed. Moreover, the flat, lateral cells on the side of each seed are long and straight. In contrast, the seeds of *T. loriae* possess at least three rows of papillae on each side, with the centremost row on the lateral face becoming irregular. The papillae on the outer rows continue around the entire circumference of the seed and the flat, lateral cells on the side of each seed are shorter and more undulate (Figure 7). Furthermore, based on nuclear DNA sequence data *T. loriae* (as *T.* sp. Lake Moore KS 719) is supported as genetically distinct from *T. halocnemoides* (Shepherd *et al.* 2004).

Tecticornia loriae looks somewhat like *T. lylei* in having narrowly cylindrical articles and laterally square fruits with a truncate apex. *T. lylei* is readily distinguished by its distinctive fruits where the base of the stigma becomes hardened and the front face of the fruit inflates outwards, appearing rounded and mammilate, while the darker articles compressed against the stem resemble *Allocasuarina* cladodes. In contrast, the fruiting inflorescence of *T. loriae* is light brown and papery and the style is either absent or membranous (Figure 5B).

Notes. Like many samphires, *Tecticornia loriae* exhibits a degree of variation across its distribution and plants may range from pale pink to blue-green in colour. Towards the northern end of its range and particularly at the type population at Lake Moore, the vegetative branches of *T. loriae* are long and slender (Figure 5B) while in other populations, for example near Lake King, the vegetative branches are shorter and numerous secondary branchlets are evident (Figure 5C). However, as all these variants have the typical glaucous, rectangular articles and the fruits and seeds are also generally consistent, it does not seem appropriate to recognise this variation at the intraspecific level.

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