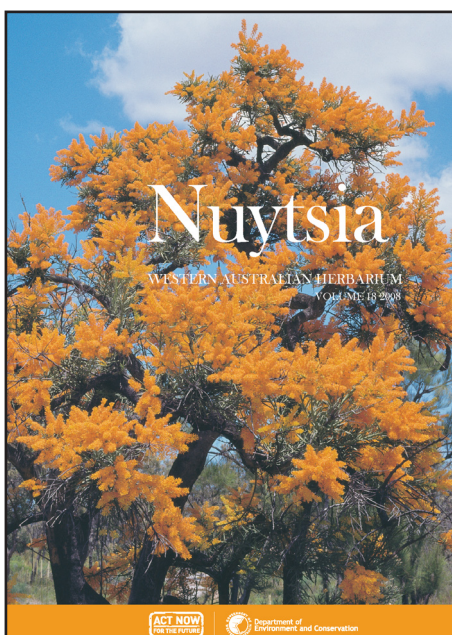


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***Tecticornia papillata* (Chenopodiaceae: Salicornioideae), a new
andromonoecious samphire from near the Carnarvon Range,
Western Australia**

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Abstract

Shepherd K.A., *Tecticornia papillata* (Chenopodiaceae: Salicornioideae), a new andromonoecious samphire from near the Carnarvon Range, Western Australia. *Nuytsia* 18: 259–266 (2008). *Tecticornia papillata* K.A. Sheph., described here as new, has an unusual fruit structure previously only observed in *T. disarticulata* (Paul G. Wilson) K.A. Sheph. & Paul G. Wilson. It differs from this species in having vegetative articles and bracts with strongly fimbriate margins and caudate apices, and a distinctly papillate epidermis for which the species is named. As this new species has a restricted distribution it has a Priority One conservation status. A distribution map and images of the species are presented. In addition, the molecular and morphological diversity within *T. disarticulata* is discussed.

Introduction

Five species previously included in the genus *Sclerostegia* Paul G. Wilson and the monotypic *Pachycornia* Hook.f. (now all placed in *Tecticornia* Hook.f.; see Shepherd & Wilson 2007) are the only representatives of the subfamily Salicornioideae (Chenopodiaceae) that are andromonoecious. Samphires are typically bisexual, having spike-like inflorescences comprising sessile, 3-flowered cymes arranged in decussate pairs. In the andromonoecious species, each 3-flowered cyme has a bisexual central floret and two male lateral florets. Recent morphological and molecular studies have demonstrated, however, that the genus *Sclerostegia* is not monophyletic and that andromonoecy has evolved independently among the species previously included in that genus (Shepherd 2004; Shepherd *et al.* 2005b; Shepherd & Wilson 2007). *Tecticornia disarticulata* (Paul G. Wilson) K.A. Sheph. & Paul G. Wilson (formerly *Sclerostegia disarticulata* Paul G. Wilson) has florets within each 3-flowered cyme that are horizontal in orientation with the central bisexual floret being much larger than the two lateral male florets (Figure 1A, B), a perianth with two lateral lobes and a smaller abaxial lobe at the apex, and seeds with a length:width ratio of 1–1.9:1. In contrast, the other four species formerly included in *Sclerostegia* have vertical florets that are relatively equal in size, with only two perianth lobes at the apex, and seeds that are much longer than broad with a length:width ratio of 2–2.9:1 (Shepherd *et al.* 2005a).

Tecticornia disarticulata also has fruits that are unique within the subfamily Salicornioideae. Samphire fruits generally consist of a persistent perianth with a pericarp which may be free or fused



Figure 1. *Tecticornia disarticulata*. A – typical habit growing on high ground away from lake shorelines (K.A. Shepherd & J.A. Wege KS903); B – inflorescence with the large, bisexual central floret with stigma exserted (arrow) and small male lateral florets either side (K.A. Shepherd & J.A. Wege KS903); C – unusual form growing on the margin of a salt lake north of Bullfinch (K.A. Shepherd & S.R. Willis KS880); D – inflorescences that are slightly longer and wider than the typical form (K.A. Shepherd & S.R. Willis KS880).

to the inner surface of the perianth or the outer surface of the seed (Shepherd 2004). Only the central floret in the andromonoecious species produces a mature fruit containing a single seed. However, when the central floret matures in *T. disarticulata* it becomes apparent that there are two nodes of tissue similar in texture to the hardened pericarp fused to each side of the central fruit. These hardened nodes appear to be derived from the lateral florets and it is inferred that these flowers are male through the secondary loss of female organs. In contrast, the fruiting perianth/pericarp in the remaining four species formerly included in *Sclerostegia* remains membranous, with no trace of gynoeceal material. The independent origin of andromonoecy in *T. disarticulata* is supported by molecular evidence, as this species did not resolve as sister to the other species formerly included in *Sclerostegia* (Shepherd *et al.* 2004, 2005b).

Tecticornia papillata K.A.Sheph., the new species described here, was first collected by Daphne Edinger in 1999, from the base of a quartzite hill near the Carnarvon Range north of the now abandoned Blue Hill station. Two years later she and Kevin Kenneally made another collection of this taxon and of *T. disarticulata* (PERTH 05850215) from the same region. On examination it is apparent that this species has the distinctive fruit previously only seen in *T. disarticulata*, but is readily distinguished by its conspicuously papillate epidermis, and the fimbriate margins and caudate apices of the vegetative articles and bracts.

Methods

Measurements were made from herbarium specimens lodged at the Western Australian Herbarium (PERTH) using calipers and a microscope graticule. Floral and fruit characters were measured using material rehydrated in a weak solution of hot water and detergent. Terminology used to describe the inflorescence structure follows Shepherd (2007). An electron micrograph of the seed was taken using an Environmental Scanning Electron Microscope following the methods of Danilastos (1993). The distribution map was created using DIVA-GIS Version 5.2.0.2 and show IBRA Version 6.1 regions (Department of the Environment, Water, Heritage and the Arts 2008). Precise localities were withheld due to conservation concerns.

Taxonomy

Tecticornia papillata K.A.Sheph., *sp. nov.*

Tecticorniae disarticulatae (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson affinis a qua bracteis marginibus fimbriatis, apicibus caudatis et epidermide papillata, differt.

Typus: east-north-east of Blue Hill Station, south of boundary of Carnarvon Range, Western Australia [precise locality withheld for conservation reasons], 28 August 1999, *D.J. Edinger Nats* 61 (*holo*: PERTH 05428998; *iso*: CANB, MEL).

Sclerostegia sp. Blue Hill (D.J. Edinger Nats 61), in G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 210 (2000).

Tecticornia sp. Blue Hill (D.J. Edinger Nats 61), Western Australian Herbarium, in *FloraBase*, <http://florabase.dec.wa.gov.au> [accessed 13 February 2008].

Perennial, erect sub-shrub to 0.4 m high. *Vegetative articles* obovoid in outline, circular to oval in cross section, dull yellow-green, 3–7 mm long, 1.8–4.5 mm wide, epidermis papillate, apex caudate, margin strongly fimbriate with fringe to 0.2 mm long. *Inflorescence* 3–13.5 mm long, 2–4.5 mm wide, of 3-flowered andromonoecious cymes, each triad comprising a bisexual central floret that is much larger than the male lateral florets, forming a spike of 3–9 nodes, with a sinuate or almost smooth, ovoid to ellipsoid outline, terminal to main or lateral branches. *Bracts* obovoid, free or fused, convex in face view with the upper edge curved, concave in side view with the upper edge curved, outer face of bract flat, epidermis papillate, apex caudate, 0.3–0.7 mm long, margin fimbriate with fringe 0.05–0.2 mm long, with overlapping subtending bracts. *Flowers* fully covered by subtending bracts or the apex of the central floret partially exposed, free from bracts above, fused to adjacent florets

and sometimes fused to bracts below, free from opposite florets. *Perianth* fused, the adaxial surface horizontal and the abaxial surface ascending, sometimes becoming dorsiventrally flattened, apex truncate; lobes 3 with a small abaxial lobe inside two lateral lobes, margins slightly fimbriate. *Stamen* 1, the anther rounded to elliptic, 0.7–0.8 mm long, abaxial to the ovary. *Ovary* free from the stem cortex, style bifid, membranous. *Fruiting spike* expanded, pithy or crustaceous, disarticulating and falling from the branches at maturity. *Fruitlets* obscured by subtending bract or apex of the central fruit apparent, free from bracts above and below, remnant lateral fruits fused to large central fruit, free from opposite fruit; fruiting perianth membranous to areolate, upper edge papillate, not enclosing the pericarp, style at fruiting stage membranous or absent. *Pericarp* broadly obovoid with two nodes either side, crustaceous, enclosing the seed, eventually dehiscent in the medial plane. *Seed* free from the pericarp, vertical relative to the stem axis, ovate with a beak, 1.3–1.5 mm long, transparent, gold-brown without ornamentation. *Embryo* straight, perisperm present. (Figures 2, 3)

Specimens examined. WESTERN AUSTRALIA: [locality withheld for conservation reasons] 8 Aug. 2001, K.F. Kenneally & D.J. Edinger K 12254 E 2719 (PERTH 05850207).

Distribution and habitat. Occurs near the Carnarvon Range in the Gascoyne IBRA region of the Eremaean Botanical Province (Figure 4). This species is found growing on quartzite rubble on the flats below a quartzite hill.

Phenology. Flowering specimens seen in August. Fruits retained on plants for some months.

Conservation status. As this species is currently only known from a restricted population near the Carnarvon Range, Western Australia it was recently listed as Priority One under *Tecticornia* sp. Blue Hill (D.J. Edinger Nats 61), according to the Department of Environment and Conservation (DEC) Conservation Codes for Western Australian Flora.

Etymology. From the Latin *papillatus* (bearing papillae) in reference to the dense papillae covering the epidermis.

Affinity. *Tecticornia papillata* is closely allied to *T. disarticulata* in being andromonoecious, having free and fused bracts within the inflorescence (which disarticulates at maturity), a central floret much larger than the lateral florets in each 3-flowered cyme, and two nodes of hardened gynoeceal tissue fused to each side of the central fruit. It is readily distinguished from *T. disarticulata* in having a distinctly papillate epidermis and in both the vegetative articles and bracts being strongly fimbriate and having caudate apices.

Tecticornia papillata appears superficially similar to *T. fimbriata* (Paul G. Wilson) K.A. Sheph. & Paul G. Wilson, which also has caudate articles, bracts with fimbriate margins and a somewhat papillate epidermis. However, this species is bisexual and is readily distinguished from the andromonoecious *T. papillata* with its distinctive flowers and fruits. The seed of *T. fimbriata* is covered in small rounded bumps on the outer margin (Shepherd 2004; Shepherd *et al.* 2005a) while that of *T. papillata* is smooth (Figure 3B).



Figure 2. Holotype of *Tecticornia papillata* (D.J. Edinger Nats 61), scale = 3cm.

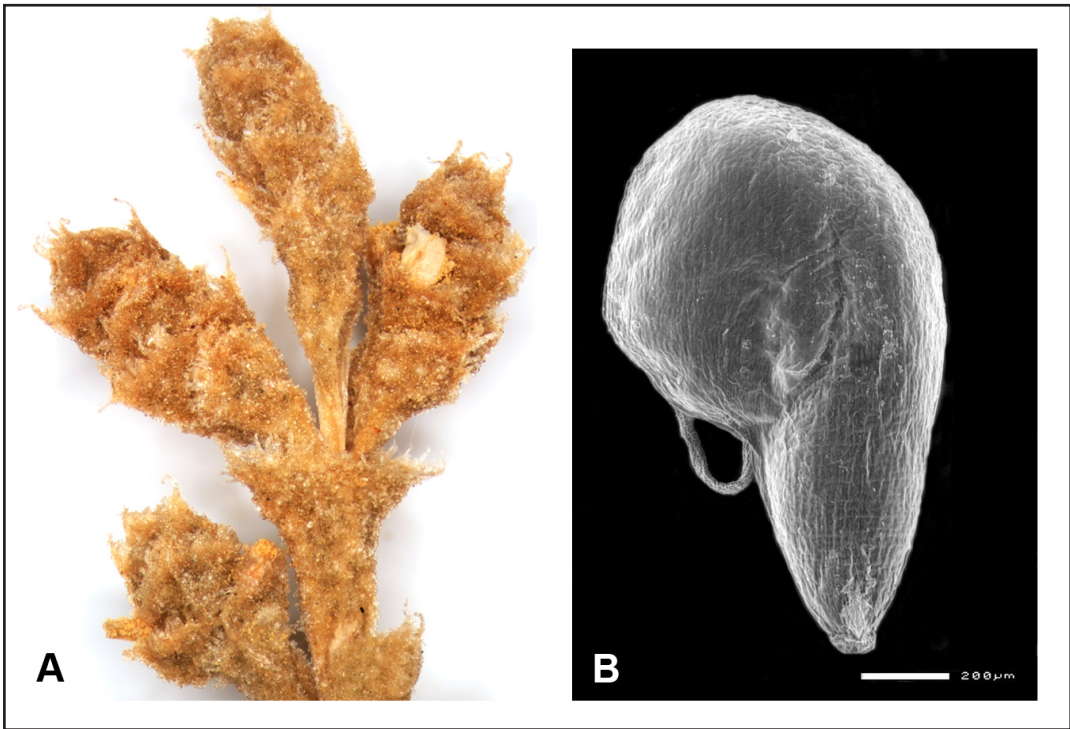


Figure 3. *Tecticornia papillata*. A – papillate epidermis of the inflorescences, showing the caudate apex and fimbriate margins of the bracts (D.J. Edinger Nats 61); B – ESEM image of a seed (D.J. Edinger Nats 61), scale bar = 200 μm.

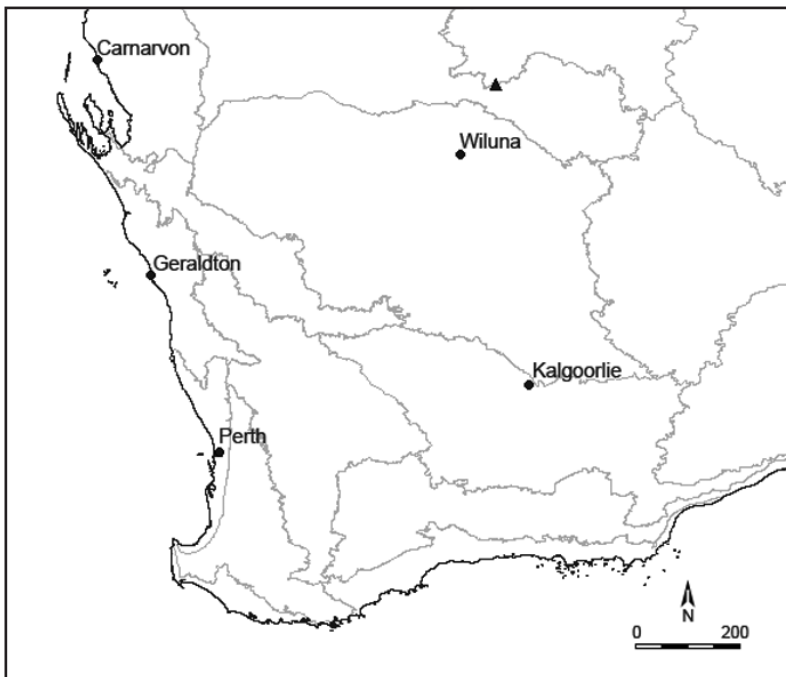


Figure 4. Distribution of *Tecticornia papillata* (▲) in Western Australia.

Notes on *Tecticornia disarticulata*

In the initial description of *Tecticornia disarticulata* (under *Sclerostegia*) Wilson (1980) noted two specimens, *D.G. Wilcox* 158 (PERTH 02676192) and *C.A. Gardner* 6141 (PERTH 02676184), had ‘more deeply lobed articles which, with the bracts, are prominently denticulate on their margins.’ Another six specimens at the Western Australian Herbarium (PERTH 02487322; PERTH 02487616; PERTH 05919274; PERTH 02487837; PERTH 02676257; PERTH 02487853) also have bracts with denticulate margins but these are much less divided than the fimbriate margins observed in *T. papillata*. Moreover, these specimens have a typically smooth epidermis.

Another specimen, *K.A. Shepherd & S.R. Willis* KS880 (PERTH 07692536) that was thought to be possibly distinct from *T. disarticulata*, on the basis of its longer and slightly wider inflorescences and that it occurs in a different habitat (growing on red sand near the northern end of Lake Baladjie rather than on stony hillsides or over limestone where this species is commonly found) (Figure 1C, D), was included in a molecular phylogenetic analysis as *Sclerostegia disarticulata* affin. KS880 (Shepherd *et al.* 2004). This specimen resolved as sister to *T. disarticulata* but had a number of unique base pairs. Further, recent collections of *T. disarticulata* from east of Parabado in the Karijini National Park (PERTH 07802366, 07802374), also appear to be somewhat morphologically distinct from the typical species in having longer, thinner inflorescences and glaucous articles. However, after examining the *c.* 110 specimens of *T. disarticulata* lodged at PERTH from across Australia, it is apparent that this species occurs in a relatively wide range of habitats and like most samphires, is morphologically variable. Neither the PERTH specimens with denticulate margins, the *K.A. Shepherd & S.R. Willis* KS880 specimen, nor the collections from east of Parabado can be clearly delineated from *T. disarticulata s.s.* It is clear that further molecular and morphological studies which sample widely across the range of *T. disarticulata* are required to resolve the status of potentially new taxa. It is anticipated that any taxa that may be distinguished from *T. disarticulata* would most likely be recognised at the infraspecific level, as the differences currently observed among the specimens are not as distinct as those that differentiate *T. papillata* from *T. disarticulata*.

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