

Two new species of *Utricularia* (Lentibulariaceae) from the North West region of Western Australia

Richard W. Jobson¹ and Paulo C. Baleeiro^{1,2}

¹National Herbarium of New South Wales, Mrs Macquaries Road, Sydney, NSW 2000, Australia.

richard.jobson@rbgsyd.nsw.gov.au

²Department of Botany, University of Sao Paulo, St. Rua do Matão, 277. 05508-900 São Paulo, Brazil.

paulobaleeiro@gmail.com

Abstract

Two new species of *Utricularia* (Lentibulariaceae) from the North West region of Western Australia. *Utricularia byrneana* R.W.Jobson & Baleeiro and *U. wannanii* R.W.Jobson & Baleeiro are described as new and are considered members of *Utricularia* subgen. *Polypompholyx* section *Pleiochasia*. The distribution and habitat preferences of these species are discussed. Two individual taxonomic keys are provided representing the groups in which the new species are most likely to be closely related. Specifically, *Utricularia byrneana* is compared with species from Western Australia possessing hollow peduncles namely *U. fistulosa* P.Taylor and *U. tubulata* F. Muell., while *U. wannanii* is compared to species possessing connate bracts and bracteoles namely *U. dunlopilii* P.Taylor, *U. georgei* P.Taylor and *U. kimberleyensis* C.A.Gardener, as well as close relative *U. uniflora* R.Br.

Introduction

The two species named here possess a two-parted calyx, lack scales on their peduncles, and have bladder-traps with a single unbranched dorsal appendage and are therefore considered members of *Utricularia* subgen. *Polypompholyx* (Lehm.) P.Taylor sect. *Pleiochasia* Kamiński (Taylor 1989; Jobson *et al.* 2003; Reut and Jobson 2010).

Recognition as distinct species is supported by morphological data (this paper), and preliminary molecular phylogenetic results (Jobson *et al.*, *in prep*). Within sect. *Pleiochasia*, *U. byrneana* is found to always have a hollow peduncle (Figs 1, 2); a synapomorphy for members of the 'group B' clade (Reut and Jobson 2010), mostly distributed across Northern Australia (Fig. 5).

Utricularia wannanii is found to have basisolute bracts and bracteoles with the inferior part connate forming a sleeve-like structure (Figs 3, 4), a character restricted to three other northern Australian species *U. georgei* P.Taylor (Taylor 1989, fig. 16, p. 124), *U. dunlopilii* P.Taylor (*ibid.*, fig. 34, p. 164), and *U. kimberleyensis* C.A.Gardner (*ibid.*, fig. 15, p. 122).

The south east Australian species *U. uniflora* R.Br. (Taylor 1989, fig. 14, p. 120) was phylogenetically placed sister to *U. kimberleyensis* (Reut and Jobson 2010), and on close examination of the bracts and bracteoles across a number of herbarium species, these organs were found to be shortly basisolute, with inferior parts forming slight connections towards the base (Jobson pers. observation; Taylor 1989, fig. 14, p. 120).

These two new taxa are herein named and their morphology is compared with related species, for which distinguishing characters are discussed and presented in two diagnostic identification keys. This paper also provides notes on their distribution and ecology, phenology, and conservation status. Terminology, including corolla colour, follows Taylor (1989).

Methods

Relevant dried and alcohol-preserved material representing all related species, held at the National Herbarium of New South Wales (NSW) and Western Australia Herbarium (PERTH), were examined. Material of *U. byrneana* was examined from fresh and sheet collections, while examination of *U. wannanii* was performed on spirit material of a single collection held at NSW. Seed and pollen were examined using an Olympus CH compound microscope (magnification X100). The distribution map presented (Fig. 5) was generated using DIVA-GIS 7.1.7 (Hijmans *et al.* 2005).

Taxonomy

Utricularia byrneana R.W.Jobson & Baleeiro *sp. nov.*

Diagnosis: Similar to *U. fistulosa* P.Taylor but differs in having leaves lanceolate, corolla mauve with two raised yellow ridges at base, corolla spur cylindrical, apex rounded, shorter than lower lip, seeds cylindrical, trap dorsal appendage short.

Type: AUSTRALIA: WESTERN AUSTRALIA: Dampierland: Taylors Lagoon, E of Broome (17.785°S, 122.893°E), 30 April 2014, R. W. Jobson 2325 & P. Baleeiro (holo: NSW; iso: PERTH).

Small to medium-sized perennial, terrestrial herb. Rhizoids capillary, simple, up to 15 mm long, tapering from 0.2 mm thick at base to 0.07 mm near apex, numerous from base of peduncle, rarely with one from node of stolon. Stolons few, filiform, hollow, 0.2–0.3 mm thick, up to 30 mm long, internode length 5–7.5 mm long. Leaves numerous, few from base of peduncle and in pairs, or sometimes in whorl of four from stolon internodes, not obviously petiolate; lamina lanceolate, c. 10–22 mm long, 0.3–0.7 mm wide, hollow near base, single nerve, apex acute or rounded. Traps stalked, few at base of peduncle and rarely 1 at nodes of stolon, \pm uniform, ovoid, 1–2 mm long; mouth lateral, with a short dorsal appendage c. 0.4 mm long; two lateral appendages simple, short c. 0.4 mm long, ventral wings absent. Inflorescence erect, solitary 60–170 mm long; peduncle terete, glabrous, hollow, 0.2–0.9 mm thick. Scales absent. Bracts and bracteoles 1–1.5 mm long, \pm similar, basifixed, slightly gibbous at base, narrowly ovate with apex rounded. Flowers rarely 1, usually 2 in opposite pairs, or a whorl of three, pedicels erect, filiform, slightly tapering apically, 2–10 mm long. Calyx lobes unequal; upper lobe c. 3 mm long, 2.3 mm wide, broadly ovate with apex rounded; lower lobe c. 2 mm long 2.2 mm wide with apex emarginate. Corolla mauve; lower lip 3–8 mm long with two prominently raised yellow (becoming white near apices) ridges at base, with 3 prominently raised mauve ridges on either side, bordered by dark violet V-shaped markings forming a thick band, outer and central ridges equal in length; upper lip constricted near base, superior part obovate with apex emarginate or slightly bilobed, inferior part broadly ovate, ciliate on margin. Lower lip limb transversely elliptic or \pm flat, weakly 3-lobed with apex rounded; palate shortly pubescent, with a marginal rim; spur cylindrical, straight or curved forwards near middle, apex rounded, parallel with, and c. half as long as lower-lip. Staminal filaments straight, c. 1.5 mm long, anther thecae sub-distinct. Ovary ovoid, c. 1 mm long; style short (half as long as ovary); stigma with lower lip transversely elliptic, upper lip smaller, deltoid. Capsule globose, 2–3 mm diam., walls thin, dehiscent by a single, ventral, longitudinal, marginally thickened slit. Seeds cylindrical, c. 0.35 mm long, 0.15 mm wide. Pollen: 3-colporate, c. 30 \times 30 μ m and 35 \times 20 μ m (Jobson 2325, NSW852619) (Figs 1, 2a, b).

Additional specimens examined: WESTERN AUSTRALIA: Dampierland: Broome, Taylors Lagoon, G. Byrne 3502, 26 Jul 2008 (PERTH8097070); Dampier Peninsula, A. Lowrie 4024, 23 Jul 2009 (HL, NSW854053); Dampier Peninsula, 1 km S of track to La-Djardarr Bay, R. W. Jobson 2323 & P. Baleeiro, 29 Apr 2014 (NSW852612).

Etymology: The specific epithet honours Dr Geoff and Ruth Byrne who together recognised the uniqueness of this species and made the first known collection of *U. byrneana*.

Phenology: Flowers and fruits recorded in April and late July. Seed-set has been observed in three specimens: R. W. Jobson 2325 & P. Baleeiro (type), R. W. Jobson 2323 & P. Baleeiro, and Lowrie 4024 representing northern and southern populations. Personal observation at the type location indicates fresh flowers emanate a strong sweet musk-like fragrance.

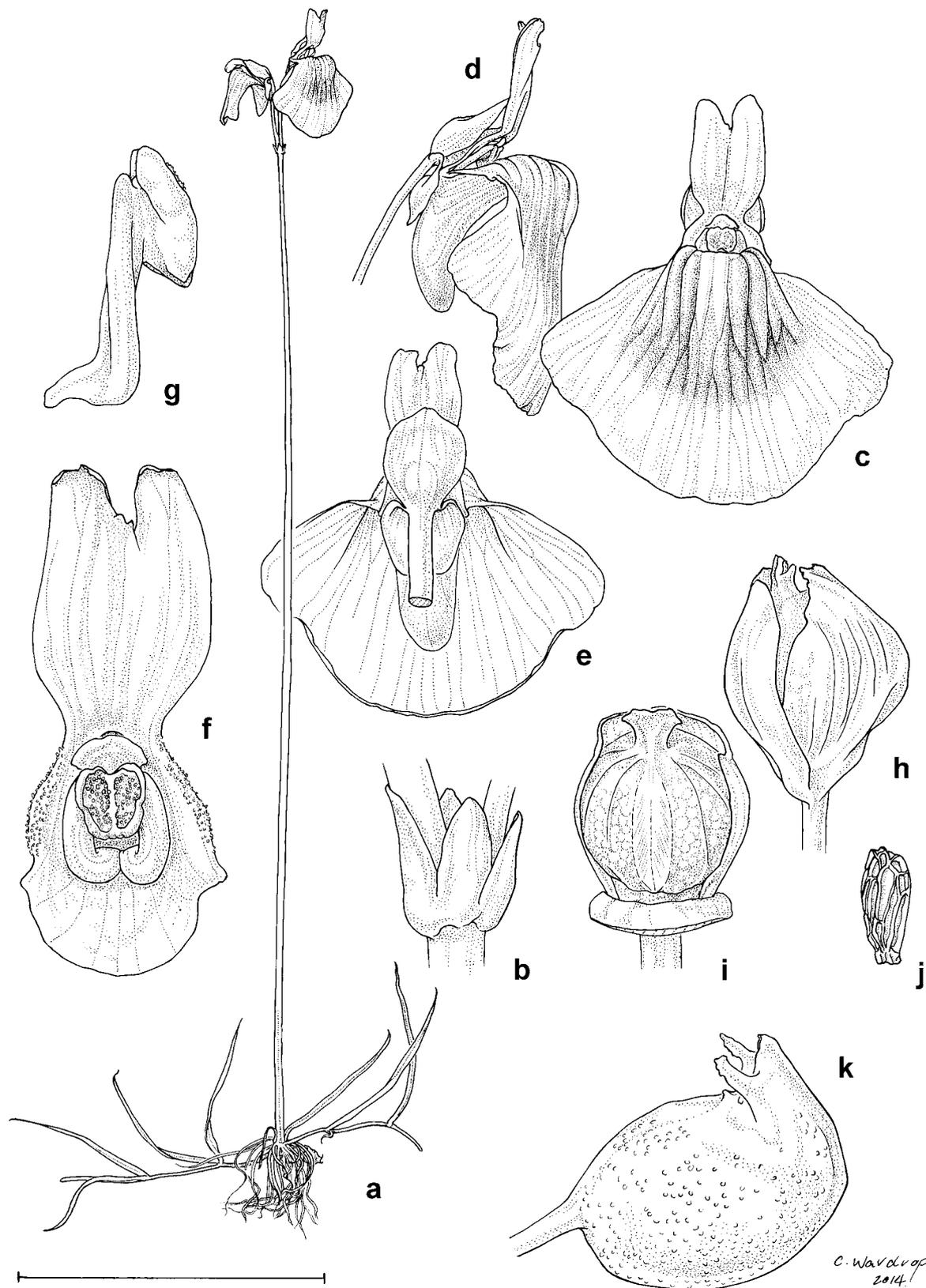


Fig. 1. *Utricularia byrneana* **a**, habit; **b**, bracts and bracteoles with pedicel base *in situ*; **c**, flower in frontal view; **d**, flower in lateral view; **e**, flower in dorsal view; **f**, upper lip of corolla; **g**, stamen; **h**, fruiting capsule with calyx in lateral view; **i**, fruiting capsule showing suture; **j**, seed; **k**, bladder-trap in lateral view. Scale bar: a = 3 cm; b = 0.3 cm; c–e = 1 cm; f = 0.4 cm; h, i = 0.5 cm; j = 0.1 cm; g, k = 0.2 cm. Material used: a, k = R. W. Jobson 2325 (NSW954556 spirit, NSW852619 sheet).

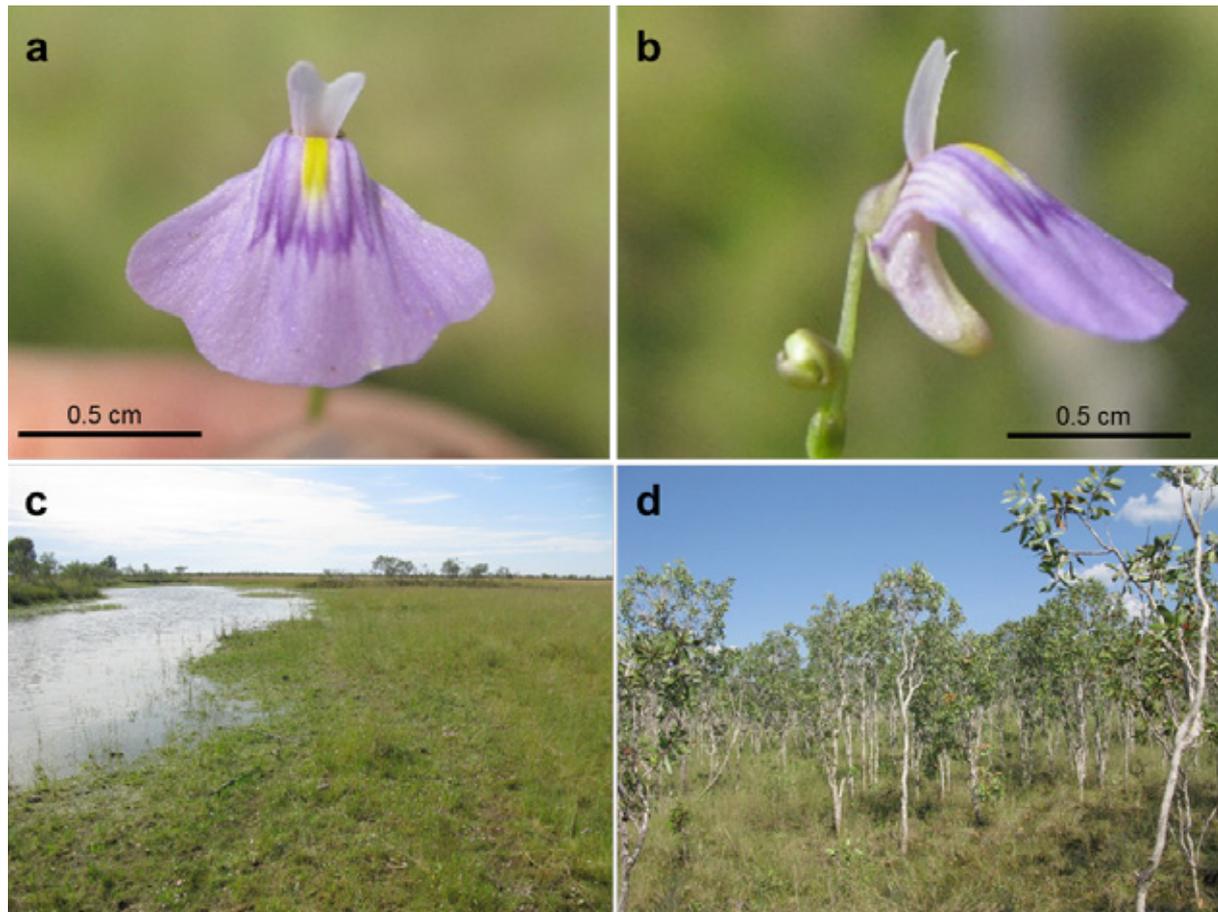


Fig. 2. Images *U. byrneana* **a**, flower frontal view; **b**, lateral view, **c**, habitat at southern site; **d**, habitat at northern site. Photos by R. Jobson.

Distribution and ecology: Australia: Western Australia: Dampier Peninsula. Recorded from two swamps separated by c. 100 km (Fig. 5). The northern most location is c. 19 km W of La-Djardarr Bay settlement situated near Disaster Bay (16.881°S, 122.967°E; alt. 56 m), while the southern site is Taylors Lagoon c. 70 km E of Broome (17.7794°S, 122.889°E ; alt. 42 m).

This species is locally common inhabiting shallow edges of ephemerally wet swamps and lagoons (Fig. 2c, d). The northern site is a system of large swamps (Yarps) on deep sand, within undisturbed vegetation, fringed by *Melaleuca nervosa* (Lindl.) Cheel woodland (Fig. 2d), while the southern site is on a similar substrate with recent disturbance and possible loss of the *Melaleuca* woodland component (Fig. 2c). At both locations *U. byrneana* is found in association with grasses, sedges, *Xyris* spp., *Drosera* spp., *Utricularia* spp., *Byblis filifolia* Planch., *Nymphoides beaglenensis* Aston and *N. indica* (L.) Kuntze, while *Glossostigma drummondii* Benth. and *Peplidium muelleri* Benth. are common associates at the southern site (Fig. 5).

Conservation status: *Utricularia byrneana* seems to be restricted to finite ephemeral swampy habitats (Fig. 2c, d). The northern site is located within the Beagle Bay Aboriginal Reserve (Lowrie 4024, Jobson 2323 & Baleeiro), while the southern site is on unprotected crown land (Byrne 3502, Jobson 2325 & Baleeiro – type). Given the remoteness and seasonally ephemeral nature of these habitats, this species may be more widespread than appears across the Dampier Peninsula (Fig 5). However, large swamps are relatively uncommon in the region and this species is likely uncommon and highly localised. It is therefore recommended that this species be listed in Western Australia as a candidate for declaration as rare flora (Priority Two – Poorly Known Taxa), requiring further study to more definitively determine conservation status.

Notes: Although *U. byrneana* appears most closely allied with *U. fistulosa*, a molecular phylogeny places it sister to the highly modified suspended aquatic *U. tubulata* F.Muell., together forming a clade sister to the *U. dichotoma* Labill. complex (Jobson *et al.* in prep.).

Key to related species from north-western Western Australian

(Modified from Taylor 1989)

- 1a. Freely suspended aquatic; leaves verticillate, narrowly linear; peduncle inflated; corolla very pale pink with a very slender spur, 1.5–2 cm long (W.A., N.T., Qld) *U. tubulata*
- 1b. Terrestrial or affixed aquatic; leaves not verticillate 2
- 2a. Corolla mauve, palate with 2 yellow ridges, lower lip longer than spur (W.A.) *U. byrneana*
- 2b. Corolla white, palate with yellow tinged spot, lower lip shorter than spur (W.A., N.T.) *U. fistulosa*

Utricularia wannanii R.W. Jobson & Baleeiro *sp. nov.*

Diagnosis: Has bracts and bracteoles similar to those of *U. georgei* but differs in having corolla lobes of the upper and lower lip long, subulate, with strongly reduced spur, peduncle up to 15 mm long, seeds ovoid.

Type: AUSTRALIA: WESTERN AUSTRALIA: Gardener: Garimbu Creek, Prince Regent National Park (15.362°S; 125.510°E), 24 June 2014, *B. Wannan 6685* & *M. Wardrop* (holo: NSW; iso: CANB).

Small sized probably annual, lithophytic herb. Rhizoids capillary, simple, up to 8 mm long, c. 0.1 mm thick, several from base of peduncle. Stolons two or three linking other rosettes, filiform, hollow, 0.15–0.2 mm thick, up to 12 mm long, internodes absent. Leaves several, in a loose rosette at base of peduncle, petiole fleshy, c. 0.5 mm long; lamina obovate, 1.5–2.5 mm long, 1–1.3 mm wide, single nerve, apex rounded. Traps stalked, few at base of peduncle and rarely 1 on stolons or rhizoids, uniform, ovoid, 1–1.5 mm long; mouth lateral, with a dorsal appendage c. 0.25 mm long; two lateral appendages simple, c. 0.25 mm long, ventral wings narrow with margin fimbriate, or simple. Inflorescence erect, solitary or in pairs 8–15 mm long; peduncle terete, glabrous 0.1–0.3 mm thick. Scales absent. Bracts and bracteoles basisolate ± similar 0.7–0.8 mm long, superior parts ovate with apex acute c. 3.5–4 mm long, inferior parts connate forming tube c. same length as superior parts. Flowers usually 1, rarely 2 in pairs, pedicels erect, filiform, slightly tapering apically (rarely flattening), 2–4.5 mm long. Calyx lobes unequal; upper lobe obovate with round or acute apex c. 0.9 mm long, 0.6 mm wide; lower lobe ovate, apex emarginate, c. 0.8 mm long 0.7 mm wide. Corolla white; lower lip 2–3 mm long deeply 3-lobed, two outer lobes broadly subulate, apex acute; central lobe broadly ovate at base graduating to a subulate limb with apex acute; palate ciliate, with a marginal rim; spur short, broadly cylindrical, apex rounded. Upper lip constricted near base 3–4.5 mm long, superior part ovate, constricted near middle, deeply divided into two subulate lobes, canaliculated on lower half; inferior part broadly ovate, minutely glandular on entire surface. Staminal filaments curved, c. 0.9 mm long, anther thecae sub-distinct. Ovary ovoid, c. 0.7 mm long; style short (half as long as ovary); stigma with lower lip transversely elliptic, upper lip smaller, deltoid. Capsule globose, 1.0 mm diam., walls thin, dehiscing by a single, ventral, longitudinal, marginally thickened slit. Seeds ovate, c. 0.3 mm long, 0.2 mm wide. Pollen: 3-colporate, c. 20 × 20 μm (*B. Wannan 6685* & *M. Wardrop*, NSW 924583) (Figs 3, 4a, b).

Additional specimens examined: None known.

Etymology: The specific epithet honours Dr Bruce Wannan, botanist and environmental scientist at the Queensland Herbarium (BRI), and collector of *U. wannanii*.

Phenology: Flowers and fruits recorded in June. No other information available.

Distribution and ecology: Only known from the type location at Garimbu Creek (alt. 177 m), a tributary of the Roe River catchment, western Kimberley region (Figs 4d, 5). Found growing on seepage of shaded south facing sandstone rock-faces (vertical and horizontal) in the lithophytic habit (Fig. 4a–c), with nearby drier areas containing a *Stylidium* sp.

Conservation status: Known from a single colony in a tributary of the Roe River, protected within the Prince Regent National Park, and accessible only by helicopter (Fig. 5). Given the limited botanical knowledge of these watercourses, *U. wannanii* may be more widespread than currently appears. However, due to the lack of previous collections of this species, despite a number of surveys in this general area, the species is likely to be highly localised. It is therefore recommended that this species be listed in Western Australia as a candidate for declaration as rare flora (Priority Two – Poorly Known Taxa), requiring further study to assess conservation status and determine potential threats.

Notes: Preservation of botanical samples in 70% ethanol is thought to destroy the molecular structure of DNA. However, in the case of *U. wannanii* (*Wannan 6685* & *Wardrop*) a short storage time in ethanol (<3 months) allowed for successful extraction and amplification of chloroplast molecular markers, allowing *U. wannanii* to be included in a phylogenetic study of the subgen. *Polypompholyx* (Jobson *et al.*, in prep.). Thus far, preliminary unpublished results place *U. wannanii* with those species included in the relevant discussion above and key below.

With its lithophytic habit, small size, and uniquely shaped flowers, *U. wannanii* is unlikely to be confused with any other Australian species of *Utricularia*.

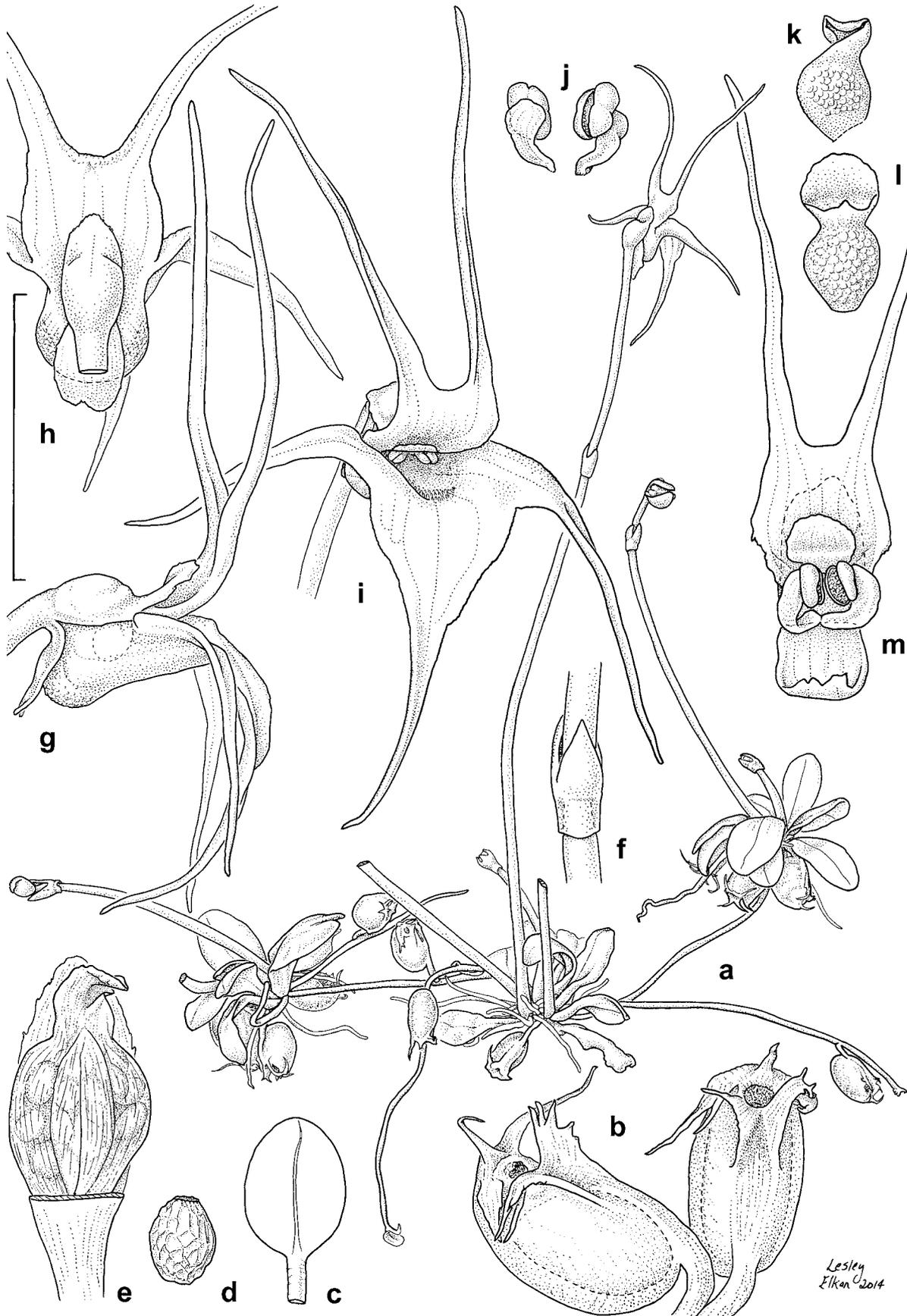


Fig. 3. *Utricularia wannanii* a, habit; b, bladder traps; c, leaf; d, seed; e, fruiting capsule showing suture; f, bracts & bracteoles with pedicel base in situ; g, flower in lateral view; h, flower in dorsal view; i, flower in $\frac{3}{4}$ frontal view; j, stamens; k, ovary in lateral view; l, ovary in frontal view; m, upper lip of corolla with stamens, stigma, and lower calyx lobe *in situ*. Scale bar: a = 0.8 cm; b, e, f, j–m = 0.2 cm; c = 0.6 cm; d = 0.1 cm; g–i = 0.25 cm. Material used: a–m = *B. Wannan* 6685 & *M. Wardrop* (spirit –NSW 924583).

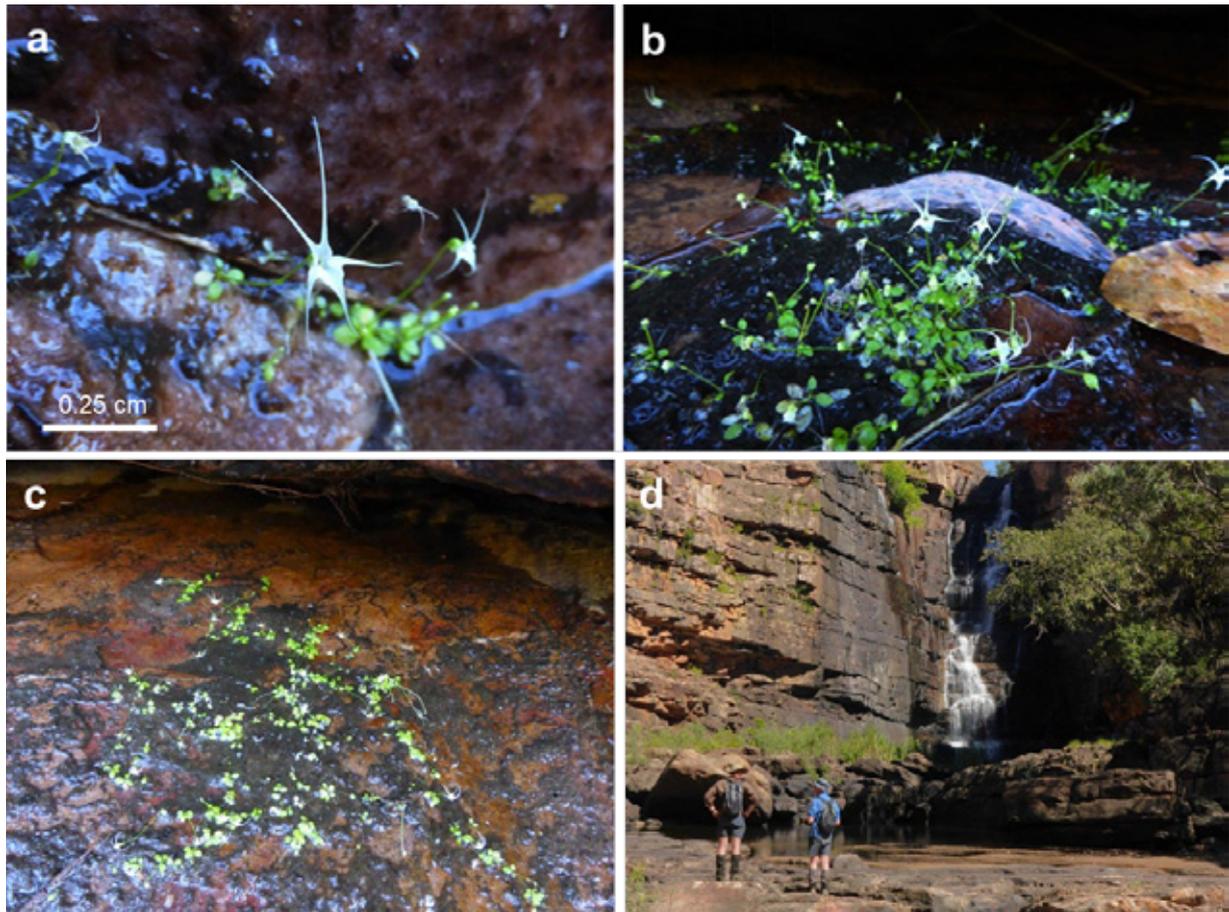


Fig. 4. Images *U. wannanii* **a**, flower frontal view; **b**, colony, **c**, habit; **d**, habitat near waterfall. Photos by Bruce Wannan

Key to related species (Modified from Taylor 1989)

- 1a. Bracts and bracteoles basifixed or shortly basisolute inferior parts not connate (Tas., Vic., N.S.W.) *U. uniflora*
- 1b. Bracts and bracteoles basisolute, inferior parts connate **2**
- 2a. Corolla yellowish or brownish-pink with 2 capillary lobes extending vertically above the flower arising from the apex of the corolla upper lip (N.T., W.A.) *U. dunlopii*
- 2b. Corolla pale to bright violet, or white **3**
- 3a. Corolla violet, lower lip shallowly 3-lobed or entire, with a prominent, lobed basal swelling (N.T., W.A.) *U. kimberleyensis*
- 3b. Corolla lower lip deeply 3-lobed without a prominent basal swelling **4**
- 4a. Corolla white with violet and yellow at base of lower lip, three lower lip lobes apically rounded, upper-lip bifid (W.A.) *U. georgei*
- 4b. Corolla entirely white, three lower and two upper lip lobes long, subulate (W.A.) *U. wannanii*

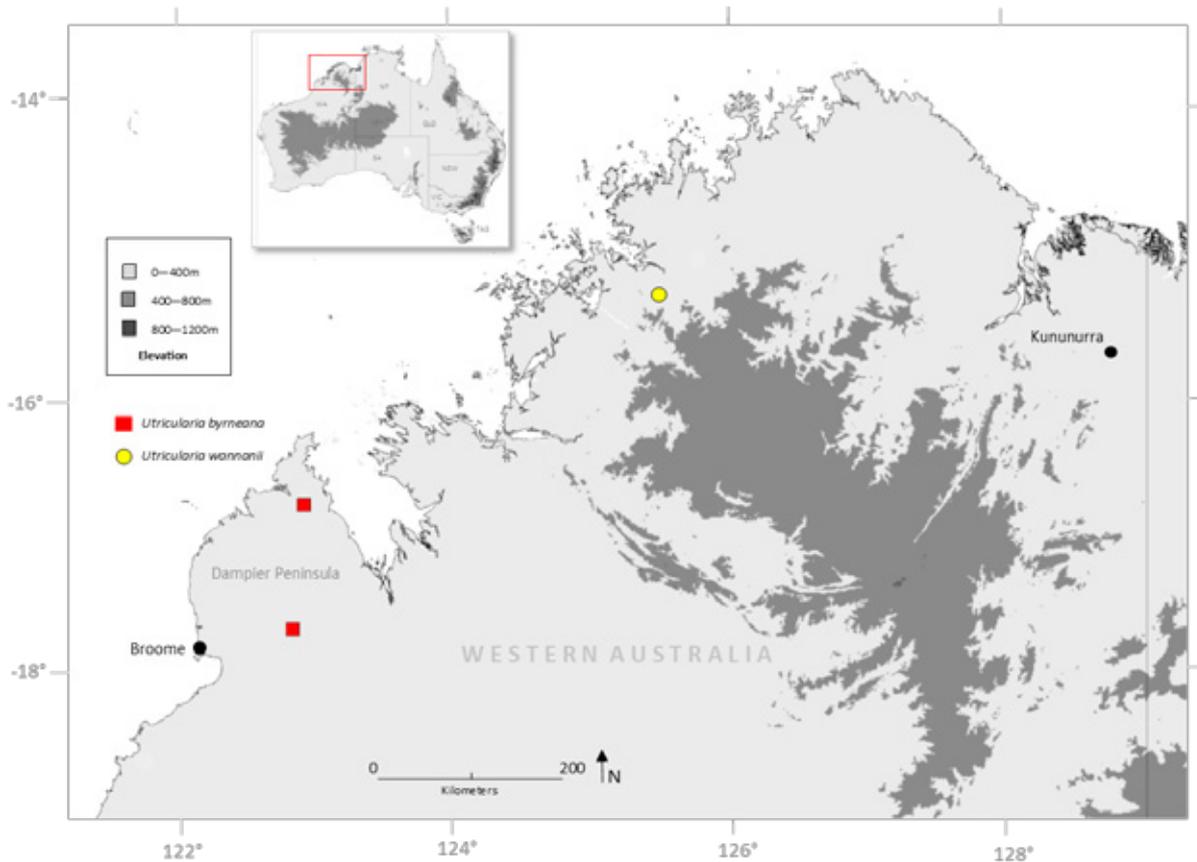


Fig. 5. North-west Kimberley region of Western Australia, showing known distribution of *U. byrneana* (red squares), and *U. wannanii* (yellow circle).

Acknowledgments

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