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Utricularia gaagudju, a new species for the Northern Territory, and a recircumscription of *U. kimberleyensis* C.A.Gardner

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Abstract

A new species of *Utricularia* (Lentibulariaceae) is recognised for the Northern Territory. A description of *Utricularia gaagudju* R.W.Jobson & Cherry is provided along with a new circumscription for the Western Australian species *U. kimberleyensis* to which it was previously assigned. Diagnostic features are illustrated, and distribution, habitat, and conservation status are discussed.

Introduction

Taylor (1989) placed *U. kimberleyensis* within section *Pleiochasia* Kamiénski of subgen. *Polypompholyx* sensu Müller & Borsch (2005) which, based on molecular data, is now expanded to include section *Pleiochasia sensu lato* (Jobson *et al.* 2003). After the molecular phylogenetic study of Jobson *et al.* (2017), *U. kimberleyensis* was moved to the newly assigned section *Lasiocaules* R.W.Jobson & Baleeiro. Based mainly on similarity of their basisolute bracts and bracteoles, Taylor (1989) considered *U. kimberleyensis* to be most closely related to the Kimberley endemic *U. georgei* P.Taylor and differentiated these two species based on the lack of raised palette ridges and deeply three-lobed lower corolla lip of the latter species.

Taylor's (1989) concept of *Utricularia kimberleyensis* C.A.Gardner was quite variable and included entities distributed from the west Kimberley in Western Australia to eastern Arnhem land in the Northern Territory, all possessing two short prominent ridges at the base of the corolla lower lip limb in either orange, yellow, or white (Lowrie 2013; Jobson *et al.* 2017, 2018).

The molecular phylogeny of Jobson *et al.* (2017) provides strong evidence that *U. kimberleyensis* is polyphyletic which led to the separation and description of the white palate ridged taxon *U. bidentata* R.W.Jobson & Baleeiro which was found to be allied with *U. dunlopii* P.Taylor and *U. wannanii* R.W.Jobson & Baleeiro in their clade F3. *Utricularia bidentata* as currently defined has a distribution scattered across the north Kimberley region with disjunct records in the Edith River area of the Northern Territory (Jobson *et al.* 2017).

All other accessions of *U. kimberleyensis* used in the phylogenetic study of Jobson *et al.* (2017) were placed sister to *U. georgei* P.Taylor in clade F2. Within clade F2, *U. kimberleyensis* formed two sister clades exhibiting an allopatric distribution; the first contained two accessions from the Kimberley region, and these possessed orange ridges at the base of the corolla lower lip and a fully glabrous peduncle (Jobson *et al.* 2017). The second clade was an assemblage of accessions possessing yellow ridges at the base of the corolla lower lip, hispid lower

peduncle, and a distribution across the Top End of the Northern Territory. The latter taxon is here described as the new species *Utricularia gaagudju* R.W.Jobson & Cherry. When specimens were compared against the *U. kimberleyensis* type material (*C.A.Gardner 1412*, PERTH 01625179; Fig 1.) we found that the accessions in group 1 matched the type specimen in both morphology and geography.

Taxonomic descriptions and illustrations of *U. kimberleyensis* provided in Taylor (1989) and Lowrie (2013) combine *Utricularia gaagudju, U. kimberleyensis*, and *U. bidentata*; the latter of which is discussed in Jobson *et al*. (2018).

In addition to the molecular evidence of Jobson *et al*. (2017) we here use morphological evidence to support separation of the new species *Utricularia gaagudju* from *U. kimberleyensis* and provide descriptions for both species.

Taxonomy

Utricularia kimberleyensis C.Gardner, *For. Dep. Bull. W. Austral*. No. 32: 90 (1923)

Type: Ashton Creek, Head of Charnley River, Kimberley, W.A., *C.A.Gardner 1412*; lecto: PERTH 01625179!; isolecto: NSW 58108!; PERTH 3779696 [as *Gardner 912*]!.

Illustrations: R.Erickson, *Pl. Prey* t. 17, fig. 4 (1968). P.Taylor, *Kew Bull., Addit. Ser.* 14: fig. 15: 2–4 (1989); A.Lowrie, *Carn. Pl. Aust. Mag. Op.* Vol 3, fig. 12.69: B (2013).

Small to medium-sized, annual or probably rarely perennial, terrestrial herb. *Rhizoids* capillary, simple, up to 5 mm long, tapering from 0.3 mm thick at base to 0.08 mm near apex, numerous from base of peduncle. *Stolons* few, filiform, hollow, *c*. 7–12 mm long, 0.1–0.2 mm thick. *Leaves* few, from base of peduncle, and 1 or 2 at stolon node, petiolate; lamina obovate or orbicular, 1–2 mm long, 1–2 mm wide, no nerve observed, apex rounded. *Traps* stalked, globose, few at base of peduncle and 1 at nodes and internodes of stolon, ± uniform, ovoid, 1–3 mm long; mouth basal, with a short, broad, dorso-lateral, sometimes fimbriate appendage up to *c*. 0.4 mm long; ventral wing appendages deeply fimbriate, 1–1.5 mm long. *Inflorescence* erect, 50–200 mm tall, solitary; peduncle terete, glabrous, solid, 0.2–0.5 mm diam. *Scales* absent. *Bracts and bracteoles* basally connate, unequal, basisolute; bracts 0.7–1.5 mm long, lanceolate with apex acute; bracteoles shorter, ovate with apex rounded. *Flowers* 1–2, pedicels erect, filiform, slightly tapering apically, 8–15 mm long. *Calyx* lobes unequal; upper lobe *c*. 3.2 mm long, 1.5 mm wide, ovate with apex rounded; lower lobe *c*. 1.8 mm long 1.5 mm wide with apex emarginate. *Corolla* mauve, 12–18 mm long; *upper lip limb* 3.5–5.2 mm long, constricted near middle, superior part obovate with apex bilobed with rounded apices, inferior part ovate, ciliate on margin; *lower lip limb*, obovate in outline, 5–11 mm long, apex shallowly 3-lobed, with two prominently raised orange ridges at base and 2 slightly longer, raised dark mauve ridges on either side; palate shortly pubescent, with raised margin; *spur* cylindrical from a conical base, straight, constricted at the middle, tapering to a narrowly rounded apex, at *c*. 120° to lower-lip limb. *Staminal* filaments slightly curved, *c*. 1.6 mm long, anther thecae sub-distinct. *Ovary* globose, *c*. 1.1 mm long; style short (half as long as ovary); stigma with lower lip transversely elliptic, upper lip smaller, deltoid. *Capsule* globose, 4.1 mm diam., walls thin, dehiscing by a single, ventral, longitudinal, marginally thickened slit. *Seeds* not seen. *Pollen*: 3-colporate, *c*. 32 × 32 µm (*R.W. Jobson 2667 & W. Cherry*; *R.L. Barrett 563*). **Figs 1, 2a, c, e**.

Additional specimens examined: WESTERN AUSTRALIA: KIMBERLEY: 4.2 km E of New Theda Station Homestead, *R.L. Barrett 3256 & M.D. Barrett*, 21 Feb 2006 (PERTH); Theda Station, *R.W. Jobson 2667 & W. Cherry*, 16 Apr 2015 (NSW); Karunjie Station, west of confluence of Nugget Creek and Chapman River, *K.R. Thiele 4987*, 4 Jun 2014 (PERTH); south of Mount Barnett Roadhouse, *P. Docherty 286*, 15 Apr 2012 (PERTH); 8 km SE of Beverley Springs Homestead, *R.L. Barrett 563*, 11 Apr 1993 (PERTH); north of Beverley Springs Homestead, *K.F. Kenneally 1993*, 12 Aug 1974 (PERTH); north of old Mitchell River Station, *B.L. Koch 575*, 9 Jun 1987 (PERTH); On Theda Station, *K.F. Kenneally 6717*, 20 May 1978 (PERTH); north-west of Barton Plains Outcamp on Drysdale River, *K.F. Kenneally 5296*, 24 Jun 1976 (PERTH); south of Coucal Gorge, Drysdale River National Park, *A.S. George 13912*, 16 Aug 1975 (PERTH).

Phenology: Flowers and fruits recorded from April to August.

Distribution and ecology: Endemic to the Kimberley regions of northern Western Australia. Abundant in north-west Kimberley between Charnley River and Drysdale River National Park, and occasional in the central Kimberley. Grows in wet sand in grassland (Fig. 4a).

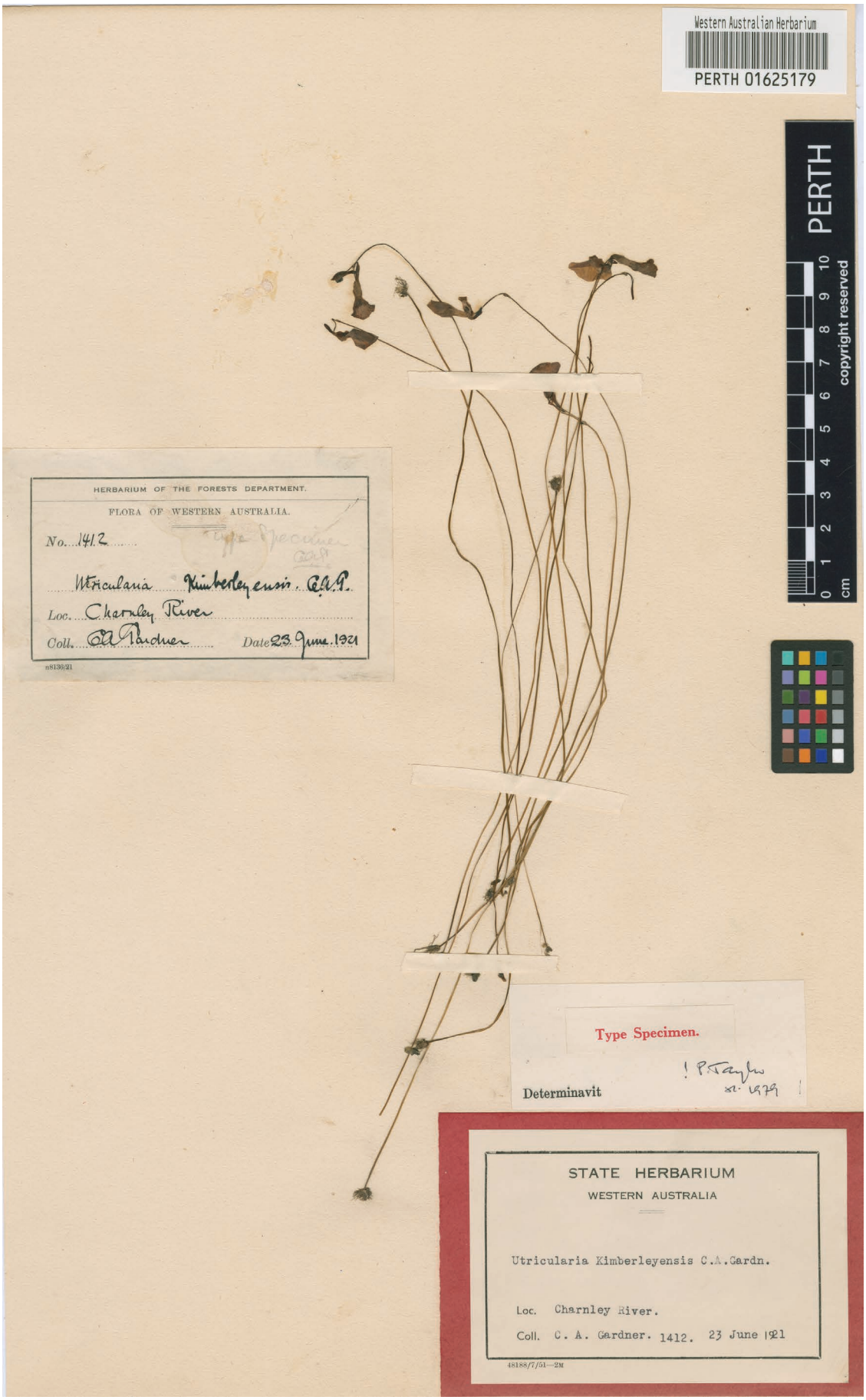

Fig. 1. Lectotype of *Utricularia kimberleyensis* C.A.Gardner (PERTH 01625179).

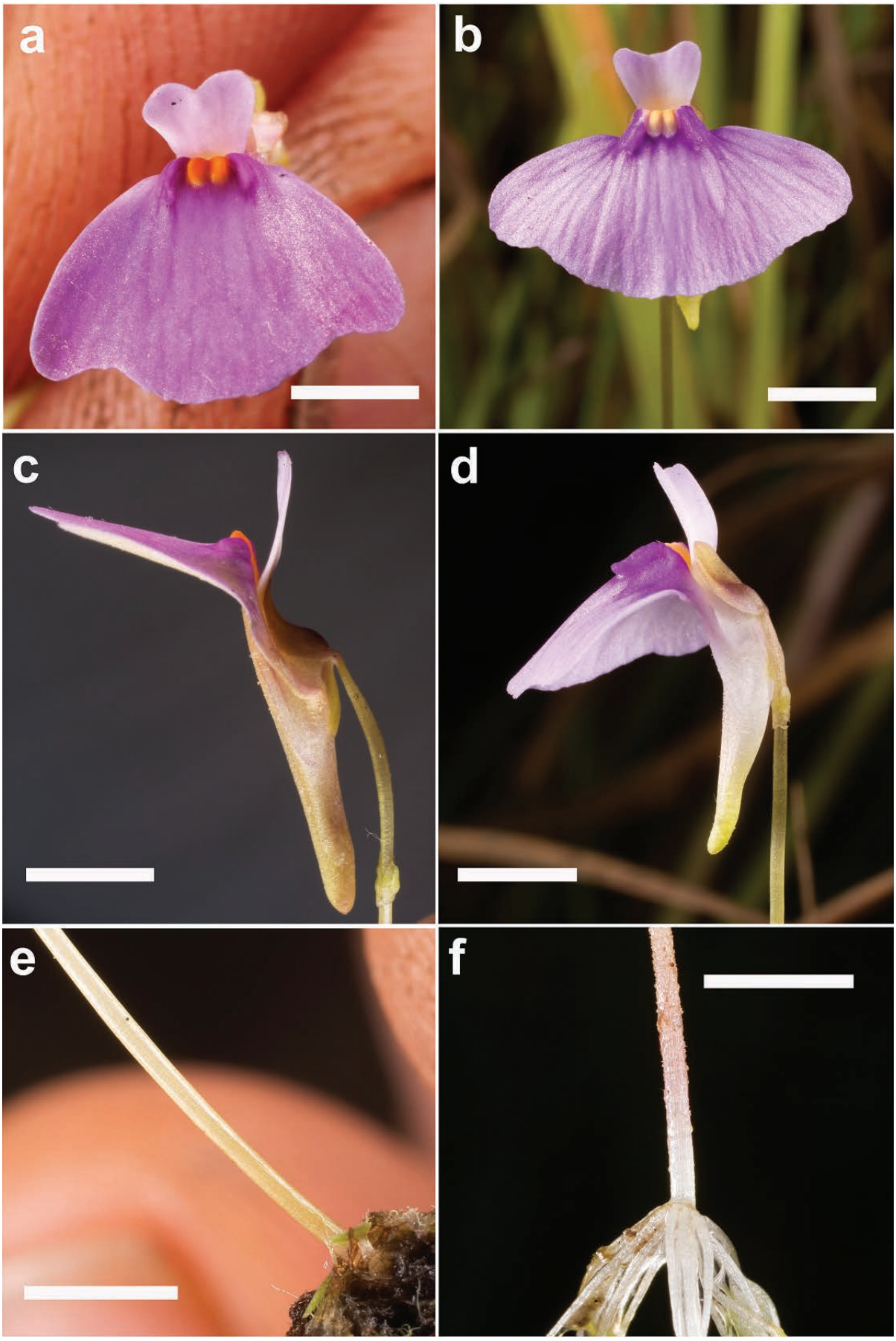

Fig. 2. *Utricularia kimberleyensis* (a, c, e) and *U. gaagudju* (b, d, f): a & b, corolla frontal view; c & d, corolla lateral view; e & f, peduncle base. Scale bars: a–f = 3 mm. Material used: a, c, e from *Jobson 2667 & Cherry* (NSW 909478); b, d, f from *Jobson 2683 & Cherry,* (NSW 909516). Images: all by W. Cherry.

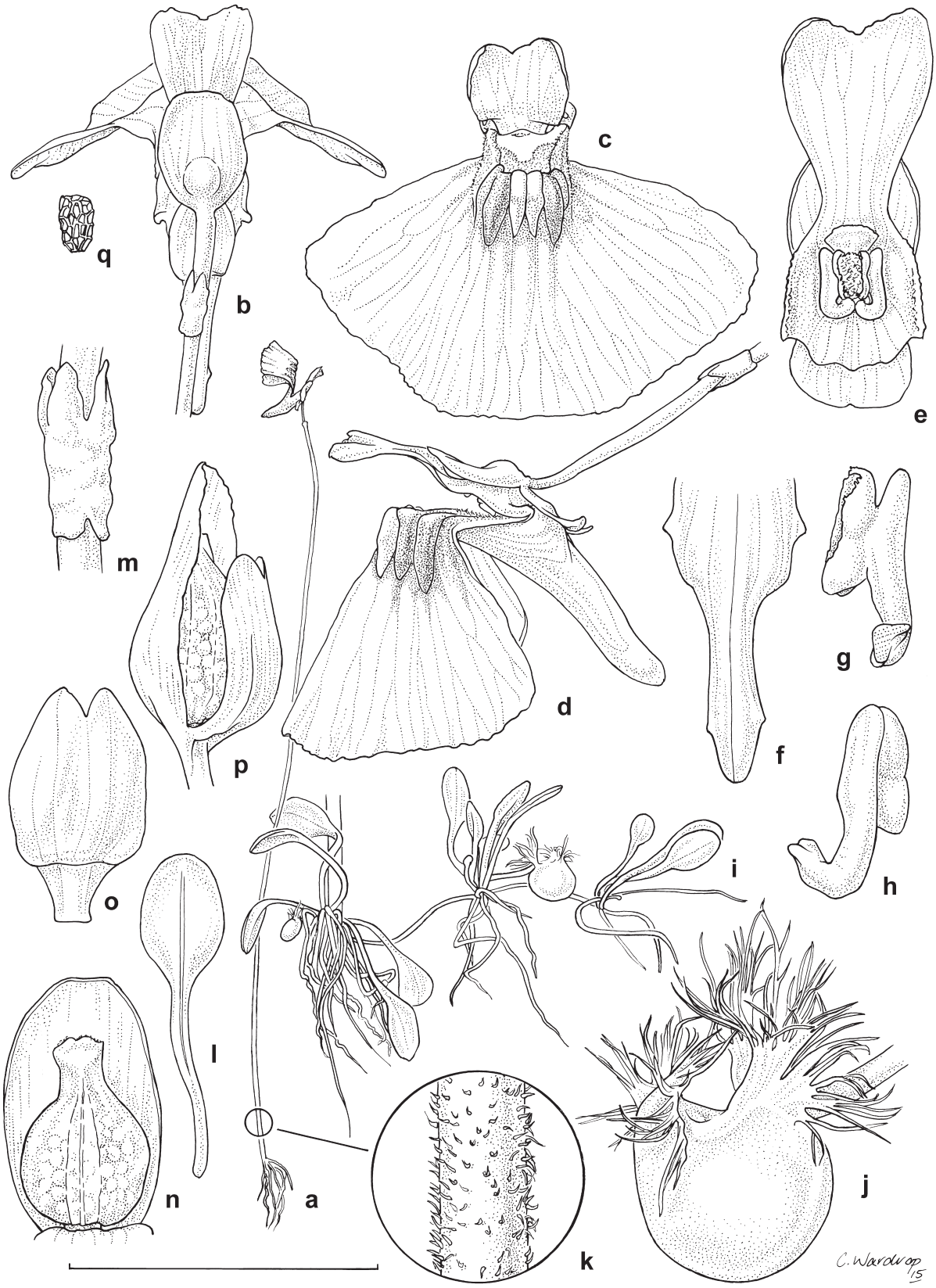

Fig. 3. *Utricularia gaagudju*. **a**, habit; **b**, flower dorsal view; **c**, flower frontal view; **d**, flower lateral view; **e**, upper lip frontal view; **f**, spur ventral view; **g**, stamen lateral view; **h**, stamen dorsal view; **i**, rhizomes; **j**, bladder-trap lateral view; **k**, peduncle base showing hairs; **l**, leaf dorsal view; **m**, bracts and bracteoles; **n**, immature fruits capsule; **o**, lower calyx lobe; **p**, fruit capsule lateral view; **q**, seed. Scale bars: a = 60 mm; b–d = 10 mm; e, f, l = 6 mm; g & h = 2.5 mm; i = 15 mm; j = 33 mm; k & q = 2 mm; m = 3 mm; n–p = 5 mm. Material used: All from *Jobson 2683 & Cherry* (NSW 927127 spirit, NSW 909516 sheet) except q from *Murfet 5942 & Lowrie* (AD 216176).

Fig. 4. Habitat of **a**, *U. kimberleyensis* (Kimberley: Theda Station, *R.W. Jobson 2667 & W. Cherry*), and **b**, *U. gaagudju* (type site). Images: all by R.W. Jobson.

Conservation status: *Utricularia kimberleyensis*, as circumscribed here, has a distribution across the north-west and central Kimberley region of Western Australia. It occurs within the conservation areas Drysdale River and Mitchell River National Parks, and it is also known to occur in Prince Regent National Park (R.L. Barrett pers. communication). Although it is patchy within colonies, it is locally abundant (R.W. Jobson pers. observation), and is not considered threatened.

Notes: Gardner's original collection number (*Gardner 912*) was used for the specimen lodged in his personal herbarium, whereas he allocated a different number (*Gardner 1412*) for an identical specimen now lodged at PERTH. As was Gardner's custom for his early collections (~1921), the latter collection number was exactly 500 higher than the former (Wilson 1988). Taylor (1989) cited the type of the name *Utricularia kimberleyensis* as 'Australia, W. Australia, Charnley River, *C.A.Gardner 1412* (PERTH holo.; NSW iso.).' We here treat this as effective lectotypification. Taylor's citation meets the relevant requirements of ICN Art. 7.11, and therefore his use of the terms 'holo' and 'iso' are correctable under ICN Art. 9.10.

Utricularia gaagudju R.W.Jobson & Cherry, ***sp. nov***.

Diagnosis: Similar to *U. kimberleyensis* C.A.Gardner but differs in having a light purple corolla, a lower corolla lip with an entire margin and two yellow central ridges at the base, and a basally hispid peduncle.

Type: Australia: Northern Territory: 55 km NE of Pine Creek, on the Kakadu Hwy., *R.W. Jobson 2683 & W. Cherry*, 17 April 2015 (holo: NSW 909516; iso: DNA, NSW 927127).

Illustration: P.Taylor, *Kew Bull., Addit. Ser.* 14: fig. 15: 1, 5–9, as *U. kimberleyensis* (1989). A.Lowrie, *Carn. Pl. Aust. Mag. Op.* Vol 3, fig. 12.69: C–D, as *U. kimberleyensis* (2013).

Medium-sized, probably annual, terrestrial herb. *Rhizoids* capillary, simple, up to 20 mm long, tapering from 0.4 mm thick at base to 0.09 mm near apex, numerous from base of peduncle. *Stolons* few, filiform, hollow, *c.* 20–30 mm long, 0.2–0.3 mm thick. *Leaves* numerous, from base of peduncle, and 1 or 2 at stolon node, petiolate; lamina obovate or linear-obovate, 2–5 mm long, 1–2.2 mm wide, with a single nerve, apex rounded. *Traps* stalked, globose, numerous at base of peduncle and 1 at nodes and internodes of stolon, ± uniform, ovoid, 1.2–7.2 mm long; mouth basal, with a short, broad, dorso-lateral, deeply fimbriate appendage 1–3 mm long, sometimes folded downwards adnate to the mouth; ventral wing appendages deeply fimbriate, 3–5 mm long. *Inflorescence* erect, 150–270(300) mm tall, solitary or in pairs; peduncle terete, glabrous above, hispid below, solid, 0.5–0.1 mm diam. *Scales* absent. *Bracts and bracteoles* 0.8–1.4 mm long, basally connate, unequal, basisolute, bracts lanceolate with apex acute, bracteoles shorter, ovate with apex rounded. *Flowers* 1–2, pedicels erect, filiform, slightly tapering apically, 8–25 mm long. *Calyx* lobes unequal; upper lobe *c.* 3 mm long, 2.2 mm wide, broadly ovate with apex rounded; lower lobe *c.* 1.7 mm long 1.2 mm wide with apex emarginate. *Corolla* light purple, 12–13 mm long; *upper lip limb* 3.5–4 mm long, constricted near middle, superior part obovate with apex emarginate, inferior part ovate, ciliate on margin; *lower lip limb*, transversely elliptic in outline, 6–7.5 mm long, with apex rounded, with two prominently raised yellow (becoming white near each base) ridges at base, and 2 longer raised purple ridges on either side, bordered by 2–4 darker streaks around edge; palate shortly pubescent, with raised margin; *spur* cylindrical from a conical base, slightly curved forward, restricted at the middle, tapering to a narrowly rounded or truncate apex, at *c.* 90° to lower-lip limb. *Staminal* filaments curved, *c.* 1.5 mm long, anther thecae sub-distinct. *Ovary* globose, *c.* 1.5 mm long; style short (half as long as ovary); stigma with lower lip transversely elliptic, upper lip smaller, deltoid. *Capsule* globose, 3.5 mm diam., walls thin, dehiscing by a single, ventral, longitudinal, broadly thickened slit. *Seeds* obovoid, *c.* 0.5 mm long, 0.22 mm wide. *Pollen*: 3-colporate, *c.* 36 × 36 μm (*R.W. Jobson 2683 & W. Cherry*). **Figs. 2b, d, f; 3**.

Additional specimens examined: NORTHERN TERRITORY: Bathurst Island: Big Pig Swamp, *C.R. Mitchell 1449 & R.K. Harwood*, 4 May 1998 (DNA); Site BI-9, *K.G. Brennan 4682 & I.D. Cowie*, 13 Mar 2001 (DNA); Darwin and Gulf District: 3.2 km NNE of Adelaide River, *R.W. Jobson 3185 & P.C. Baleeiro*, 18 Apr 2016 (NSW); NE of Jabiru on Road to Oenpelli, *R.W. Jobson 2218 & P.C. Baleeiro*, 19 Apr 2014 (NSW); 140 km NE of Pine Creek on Kakadu Hwy, *R.W. Jobson 2204 & P.C. Baleeiro*, 18 Apr 2014 (NSW); Howard River about 6 km out on Gunn Point road, *D.E. Murfet 5942 & A. Lowrie*, 2 Mar 2008 (AD); 38 km N of Katherine on Stuart Highway, *D.E. Murfet 5581 & A. Lowrie*, 3 Mar 2007 (AD); *c.* 6 miles NE of Pine Creek, *L.G. Adams 1743*, 27 Mar 1967 (CANB).

Etymology: The specific epithet is a noun in apposition that refers to the Australian Aboriginal language Gaagudju formerly spoken in Arnhem Land, in the vicinity, and the namesake of, Kakadu National Park.

Phenology: Flowers and fruits recorded in March and April.

Distribution and ecology: Northern Territory from Pine Creek to Jabiru, Daly Basin, and Darwin region. Also collected on Bathurst and Melville Islands. Grows in silty areas near boggy creeks with sedges and grasses (Fig. 4b).

Conservation status: Widely distributed across the Top End of the Northern Territory and protected within Kakadu and Litchfield National Parks. Not considered threatened.

Notes: *Utricularia gaagudju* was previously confused with *U. kimberleyensis* C.A.Gardner, with the most salient difference involving colour of the corolla (light purple *v.* mauve), the margin of corolla lower lip (entire

v. slightly three-lobed), the raised central palate ridges (yellow *v*. orange) (Fig. 2a, b), the corolla spur (curved forward *v*. straight – Fig. 2c, d), and the peduncle (basal third hispid *v*. glabrous – Fig. 2e, f). The two species tend to differ in habitat, with *U. kimberleyensis* typically found growing in low grassland in alluvial silt on sand flats derived from sandstone (Fig. 4a), while *U. gaagudju* grows in silty areas near boggy creek-lines on sandstone substrate (Fig. 4b). The third member of Taylor's circumscription of *U. kimberleyensis* (Taylor 1989) involves *U. bidentata* (Jobson *et al*. 2018), which can be distinguished from the two above mentioned species based on the size and colour of the two central ridges at the base of the corolla lower lip (not raised relative to adjacent ridges and yellow / orange *v.* prominently raised relative to adjacent ridges and white).

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