

Severing the first head of the Hydra: *Drosera actinioides*, a new species from the *D. paradoxa* complex of *D. sect. Lasiocephala* (Droseraceae)

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Abstract

Juve, N.O., Fleischmann, A. & Krueger, T. Severing the first head of the Hydra: *Drosera actinioides*, a new species from the *D. paradoxa* complex of *D. sect. Lasiocephala* (Droseraceae). *Nuytsia* 36: 75–84 (2025). *Drosera actinioides* Juve, A.Fleischm. & T.Krueger, a new species of *D. sect. Lasiocephala* Planch. from the Northern Kimberley bioregion (Western Australia), is described and illustrated. It can be distinguished from all known members of this section by its distinctive floral features comprising highly branched, blackish red styles and metallic orange petals, among other characters. Detailed notes on its ecology, distribution, and conservation status are provided.

Introduction

Drosera L. sect. *Lasiocephala* Planch. (Droseraceae), commonly known as woolly sundews or colloquially as the ‘*D. petiolaris* complex’, was established by Planchon (1848) to circumscribe the only two species previously recognised as belonging to this affinity: *D. petiolaris* R.Br. ex DC. (the type species of the section) and *D. fulva* Planch. Molecular phylogenetic reconstructions reveal *D. sect. Lasiocephala* as sister to the Western Australian pygmy sundew lineage of *D. sect. Bryastrum* Planch. (Rivadavia *et al.* 2012; Fleischmann *et al.* 2018). Both sections are today placed in the Australian evolutionary clade *D. subgenus Ergaleium* (DC.) Drude following the infrageneric classification of Fleischmann *et al.* (2018).

Drosera sect. *Lasiocephala* currently comprises 16 species of perennial or annual carnivorous herbs that primarily occur in tropical northern Australia (Lowrie *et al.* 2017). However, the distribution of *D. petiolaris* extends from northern Queensland into adjacent southern coastal New Guinea while *D. banksii* R.Br. ex DC. is known from tropical northern Australia, New Guinea, and an isolated, disjunct occurrence in the Philippines (Lowrie 2014; Robinson 2017). *Drosera* sect. *Lasiocephala* is characterised by long-petiolate leaves that typically form a compact or open rosette, a distinctive and often seasonally influenced petiole indumentum comprising varying densities of white hair, ± orbicular laminae, flower scapes with a woolly indumentum (in most species), and a lack of floral bracts (Lowrie *et al.* 2017). Half of the known species were described by the late Allen Lowrie in the 1990s (Lowrie 1994, 1996a, 1996b, 1997, 1998), including the taxonomically difficult *D. paradoxa* Lowrie, an intricate stem-forming species with a terminal, subglobose rosette and short-pedicellate (often almost sessile) flowers bearing few-branched styles. Among several undescribed taxa known to the authors within *D. sect. Lasiocephala* are two that exhibit morphological similarity to *D. paradoxa* and are currently encompassed within the concept of that species in Lowrie (2014), Lowrie *et al.* (2017), and Nunn and Lowrie (2021). In the present work, these two undescribed taxa are informally referred to as *D. paradoxa* ‘orange flowered form’ and *D. paradoxa* ‘swamp form’. The entire group—comprising *D. paradoxa* s. str., the two aforementioned undescribed taxa, and additional, morphologically similar, undescribed taxa—is collectively referred to herein as the ‘*D. paradoxa* complex’ or *D. paradoxa* s. lat. During herbarium studies and field work for an

ongoing revision of this complex, we discovered an orange-flowered taxon with dark, heavily branched styles, and disproportionally tall inflorescences. This distinctive character combination is not known to occur in other taxa in the complex or any other members of the genus.

The single known herbarium gathering of this new taxon, housed at the Western Australian Herbarium (PERTH), was made on 16 May 1981 by the late Herbert Demarz, a German-born entomologist, seed collector, and curator of the Western Australian Seed Technology Centre at Kings Park Botanic Garden from 1970–1990 (Sweedman 2007; Barrett & Barrett 2015: 47). Recent targeted fieldwork led to the rediscovery of this taxon, which is herein formally described and illustrated as a species new to science.

Methods

The description was prepared from examination of the type material housed at PERTH and *in situ* observations made at five locations in the Northern Kimberley bioregion during the early dry season of May 2024. In the absence of a collecting permit, voucher specimens could not be obtained; however, precise locality data has been provided to the Western Australian Department of Biodiversity, Conservation and Attractions. Herbarium specimens of *D. paradoxa* s. lat. were studied for comparison, with measurements taken from material at DNA, K, L, NY, and PERTH (herbarium acronyms follow Thiers (2008–)) as well as plants studied *in situ* at numerous localities in northern Western Australia and the Northern Territory from 2014 to 2024. The distribution map was prepared using DIVA-GIS (Hijmans *et al.* 2012) and edited in Adobe Photoshop 6.0 (Adobe, USA).

Taxonomy

Drosera actinioides Juve, A.Fleischm. & T.Krueger, *sp. nov.*

Type: N of Kalumburu Mission, Western Australia [precise locality withheld for conservation reasons], 16 May 1981, *H. Demarz* 8887 (*holo:* PERTH 05863104!).

Annual herb or possibly a facultatively short-lived *perennial*, (16–)29–54 cm tall including inflorescence. *Roots* predominantly adventitious, sparse, simple, terete, blackish brown, slightly fleshy at initial development, sparsely branching and becoming wiry with age, persistent. *Stem* short and column-like, erect, self-supporting, rarely becoming prostrate with full weight of inflorescence(s) by end of wet season and at senescence, terete, unbranched, 1.0–2.5 cm long, *c.* 1–2 mm diam.; internodes usually very short, largely invisible beneath spent leaves and stipules, lengthiest during middle of wet season with new internodes becoming increasingly compressed towards anthesis. *Leaves* in an apical, semi-globose rosette, erect to horizontal, persistent but becoming strongly reflexed during senescence (contacting ground at *c.* 45°), 8.5–24.0(–40.5) mm long during wet season, 2.0–7.7 mm long during dry season, stipulate; stipule prominent, adnate to adaxial side of petiole base, often subequal to petiole of shorter dry season leaves, papery, membranous, stiff (bristle-like when dry), 3-lacinate to *c.* 80% of its length, narrowly rectangular in outline, translucent-white, 3–5 mm long, *c.* 0.5 mm wide, lateral margins irregularly serrulate near base; stipule segments slightly diverging, linear to very narrowly triangular and further divided into 2 or 3 long, fimbriate setae with minutely denticulate lateral margins; petiole linear, slightly arcuate abaxially (curved downwards), transversely elliptic in cross-section with the abaxial side shallowly domed, greyish green, turning yellowish green towards lamina, 7.0–24.0(–38.3) mm long during wet season, 1.7–6.5 mm long during dry season post-anthesis, 0.3–0.6 mm wide, tapering to 0.1–0.3 mm towards lamina; wet season petiole adaxially and abaxially very sparsely covered with appressed, antrorse, simple, terete, minutely denticulate, translucent-white hairs to 1.6 mm long; dry season petiole adaxially and abaxially densely covered with appressed, antrorse, simple (occasionally sparsely ramified), terete, minutely denticulate, translucent-white hairs to 0.9 mm long and often obscuring the epidermis so that the petiole appears greyish green, increasing in length (but also decreasing in density) towards lamina; lamina ± orbicular, yellow to orange (rarely tinged reddish pink), 1.2–2.1 × 1.1–1.8 mm during wet season, 0.6–1.3 × 0.5–1.1 mm during dry season, adaxial surface covered with stalked, carnivorous secretive capitate glands (tentacles);

tentacle stalks translucent, to 1.9 mm long at lamina margin, 0.1–1.5 mm long on inner lamina surface (gradually increasing in length towards margin); tentacle gland heads radially symmetric, pink to red, *c.* 0.1 mm long; lamina abaxial surface covered with same type of hair as on petiole. *Inflorescences* 1(–3), each forming a (10–)25–69-flowered, ebracteate, one-sided scorpioid cyme; peduncle terete, ascending but often descending up to 5 mm below the peduncle insertion before curving strongly upwards, yellowish green to reddish but turning brown or blackish brown with age, 13–26 cm long, (0.5–)0.7–1.6 mm diam. near base, subglabrous to sparsely covered with antrorse, translucent-white, minutely denticulate hairs basally, hair density and length steadily increasing distally; rachis 11–31 cm long, 0.2–0.8 mm diam.; rachis, pedicels, and calyx with a dense woolly indumentum of appressed, antrorse, simple (occasionally sparsely branched), terete, shallowly curled, translucent-white (occasionally drying yellowish brown) hairs and a few patent hairs up to 2 mm long, hair density and length increasing distally; pedicels terete, linear and erect at anthesis, strongly arcuate and pendulous in fruit, 1.0–2.6 mm long, 0.1–0.4 mm diam., spaced by 2–11 mm (reducing towards apex of inflorescence). *Flowers* 14.5–19.0 mm diam. *Sepals* 5, ovate to elliptic, basally adnate, 3.0–5.3 × 0.8–2.7 mm at anthesis, elongating to 6.4 mm post-anthesis, persistent and clasping or patent in fruit; apex acute or obtuse, shallowly truncate to irregularly crenulate; lateral margins entire; abaxial surface with a dense woolly indumentum of translucent white hairs 0.9–1.2 mm long (as per rachis and pedicels). *Petals* 5, metallic orange, obovate to broadly obovate, 5.5–9.0 mm long, 5.0–6.0 mm wide, usually with truncate apex, apical margin entire to slightly crenulate and occasionally scarcely involute; petal midvein prominent in basal 1/3–1/2 of petal, pale orange to whitish with red to dark orange margins, *c.* 0.3 mm wide at widest point, tapering distally. *Stamens* 5, 2.0–2.8 mm long; filaments linear, slightly dilated towards anthers, elliptic in cross-section, bright orange, 1.3–2.2 mm long, 0.3–0.4 mm wide, widening to 0.5 mm near apex; apex of the connective obtuse to acute, not exceeding the thecae; anthers bithecate, *c.* 0.5–0.6 mm long, 0.5–0.7 mm wide, yellow; pollen yellow. *Ovary* with 3 fused carpels, globose, usually shallowly 3-lobed in outline, dark red to blackish red, 1.0–1.3 mm diam., glabrous. *Styles* 3, divided ± dichotomously multiple times into (11–)15–18 terete arms, dark red, (<1.0–)1.0–1.3 mm long (including stigmatic part), glabrous; stigmas (33–)45–66, cylindrical with an obtuse apex, dark red to blackish red (often marginally darker than ovary and style arms), 0.45–0.60 mm long, 0.10–0.15 mm diam., stigmatic surface microscopically papillate. *Seeds* numerous, broadly ellipsoidal, 270–360 µm long, 190–240 µm wide, black with slight iridescence of the periclinal walls; testa longitudinally reticulate, anticlinal walls thin and shallow, periclinal walls tabular and minutely rugose. (Figures 1, 2; 3A, E, I)

Diagnostic features. *Drosera actinioides* can be readily distinguished from all known members of the genus *Drosera* by its combination of metallic orange petals, blackish red styles that are highly branched into (33–)45–66 segments, and a (16–)29–54 cm tall inflorescence.

Phenology. Flowering has been recorded during May but likely extends from March to June based on the phenology of individuals studied *in situ*. Seed is likely to be shed during the dry season from April to July.

Distribution and habitat. Known from an area bordering Napier Broome Bay between north of Kalumburu and Cape Talbot, in the Northern Kimberley bioregion of Western Australia (Figure 4). Colonises skeletal sandy or lateritic soils with underlying sandstone, growing in open *Eucalyptus* woodland amongst *Triodia* and other grasses (Figure 2J). Frequently associated with *Byblis filifolia*, *Xyris*, and other species of *Drosera* sect. *Lasiocephala* (*D. dilatatopetiolaris* and *D. ordensis*).

Conservation status. To be listed as Priority One under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.). Data Deficient (DD) according to IUCN criteria (IUCN Standards and Petitions Committee 2024). Known from six locations in an area *c.* 40 km long. None of these locations occur on land managed by the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA). Based on satellite imagery (Figure 4), suitable nearby sandstone habitat close to the coast may also occur to the south and west of Napier Broome Bay, and possibly to the east of the Drysdale River, although further surveys are required to confirm the species' presence in those areas. Bauxite mining represents a plausible threat to this species given several mining tenements exist around Kalumburu, including one on the south-western side of Napier Broome Bay that likely comprises suitable habitat for

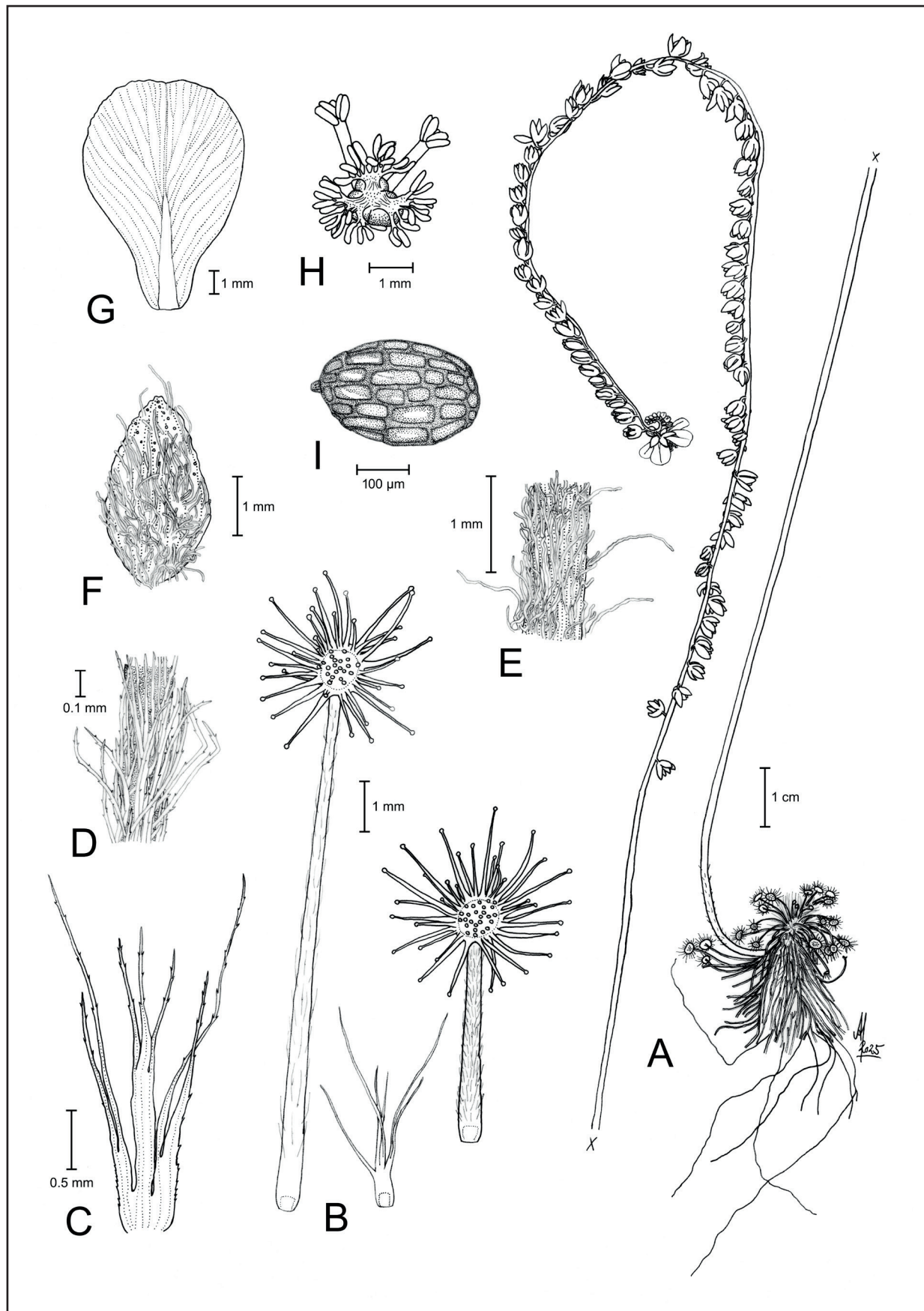


Figure 1. *Drosera actinioides*. A – habit (inflorescence indumentum not depicted); B – a detached stipule flanked by a long, wet season leaf (left) and shorter dry season leaf (right); C – stipule; D – petiole indumentum; E – peduncle indumentum; F – sepal; G – petal; H – ovary with styles and two adjacent stamens (the other three stamens not shown); I – seed. Illustration by A. Fleischmann from macro photographs of *H. Demarz* 8887 (A, C–F, I) and *in situ* photographs (B, G, H).

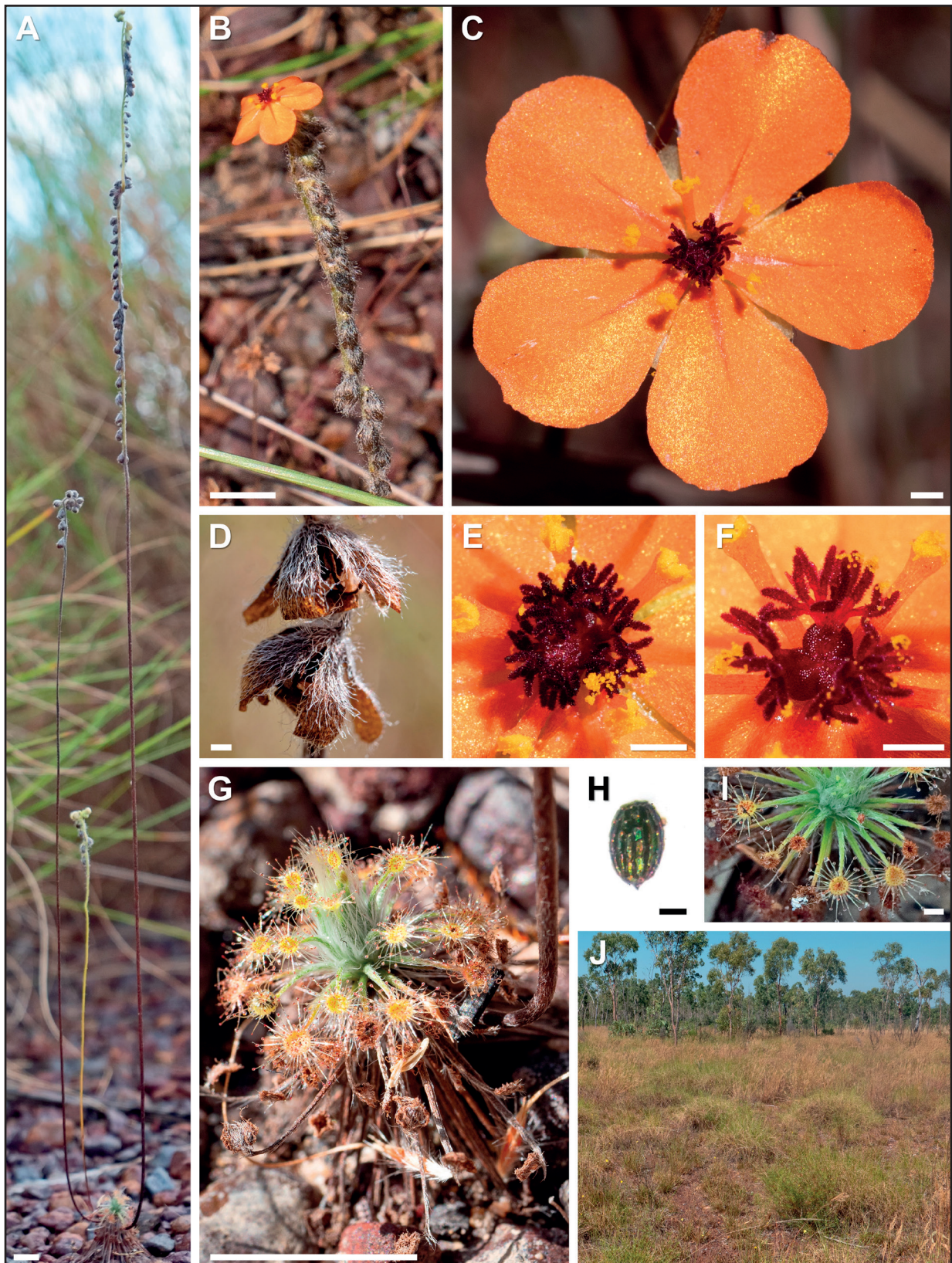


Figure 2. *Drosera actinioides*. A – flowering plant *in situ*, note the disproportionately tall inflorescences in relation to rosette size (robust individual with three inflorescences); B – flower and upper part of inflorescence (showing several aborted capsules); C – flower, note the characteristic dark styles in the centre; D – ripe fruit with spreading sepals, showing the long white hairs covering the sepals; E, F – close-up of styles and ovary; G – rosette, note the reflexed, senesced wet season leaves supporting the plant; H – seed; I – top view of rosette; J – habitat. Scale bars = 1 cm (A–D, G); 1 mm (E, F, I); 100 μ m (H). Photographs taken *in situ* by N. Juve (A–G, I, J), and from the holotype H. Demarz 8887 by T. Krueger (H).



Figure 3. Comparison of *Drosera actinioides* (left column), *D. paradoxa* 'orange flowered form' (centre-left column), bicoloured individuals of *D. paradoxa* 'swamp form' (centre-right column), and *D. brevicornis* (right column). A–D – herbarium specimens, showing differences in inflorescence number and length in relation to rosette size; E–H – flowers, with anthers shown in inset. Note the differences in ovary colour, style colour and shape, and pollen colour, and the presence of a prolonged anther connective, or 'stamen hook', in H (indicated with yellow arrow); I–L – side view of leaf rosettes during the beginning of the dry season, showing the comparatively flat rosette of *D. brevicornis* (L); M–P – habitat. Note the moist herbfield habitats inhabited by *D. paradoxa* s. lat. (N, O) in contrast to the dry laterite or white sand habitats inhabited by *D. actinioides* (M) and *D. brevicornis* (P). Herbarium specimen images by the Western Australian Herbarium, Department of Biodiversity, Conservation and Attractions. Photographs by N. Juve (E, G, I, K, L, M, P), T. Krueger (F, H, N, O), and A. Fleischmann (J).

D. actinioides (Environmental Protection Authority 2021). Changing fire regimes and rainfall patterns may represent additional threats.

Etymology. The specific epithet is derived from the widespread sea anemone genus *Actinia* Linnaeus, 1758 (from Greek ‘*aktis*, *aktin*’ = ray, beam) and the Greek suffix ‘-oides’ (denoting likeness to), a reference to the distinctive, highly branched styles (Figure 2E, F), which superficially resemble the red tentacles produced by species of *Actinia*. The semi-globose leaf rosette and highly divided, long, narrow stipules also display an allusion to the medusoid morphology of *Actinia*.

Affinities. *Drosera actinioides* is morphologically most similar to *D. paradoxa* s. lat., as evidenced by its elongated internodes, semi-globose leaf orientation, prominent stipules, and late-season flowering. While its floral morphology resembles *D. paradoxa* ‘orange flowered form’ (which likewise has orange petals but is not known to occur within the range of *D. actinioides*) and bicoloured individuals (first depicted in Lowrie *et al.* 2017: 853) of *D. paradoxa* ‘swamp form’ (which also have red to dark red styles and are known from within the range of *D. actinioides*), it is easily distinguished by its highly branched styles, yellow pollen, and a disproportionally tall inflorescence with a long, thick, self-supporting peduncle (Table 1; Figure 3). *Drosera brevicornis* Lowrie shares several notable features with *D. actinioides* (i.e. a similarly robust inflorescence, highly branched styles, and a preference for arid, often lateritic habitats), but differs by its flat rosette, pink (or rarely white) petals, and distinctive stamen ‘hooks’ (prolonged anther connectives; Table 1; Figure 3). Examination of herbarium specimens and recent surveys have failed to document *D. brevicornis* within the known range of *D. actinioides*, although it was recorded from c. 18 km south of the southernmost *D. actinioides* location. The poorly known, undescribed *D.* species ‘Bigge Island’ (Lowrie 2014; Nunn & Lowrie 2021) is morphologically similar in size and habit (small rosettes; long, bristly stipules; short, column-like stems; long inflorescences with a many-flowered rachis) but differs from *D. actinioides* in its putatively perennial growth, pink petals, and wider pedicel spacing.

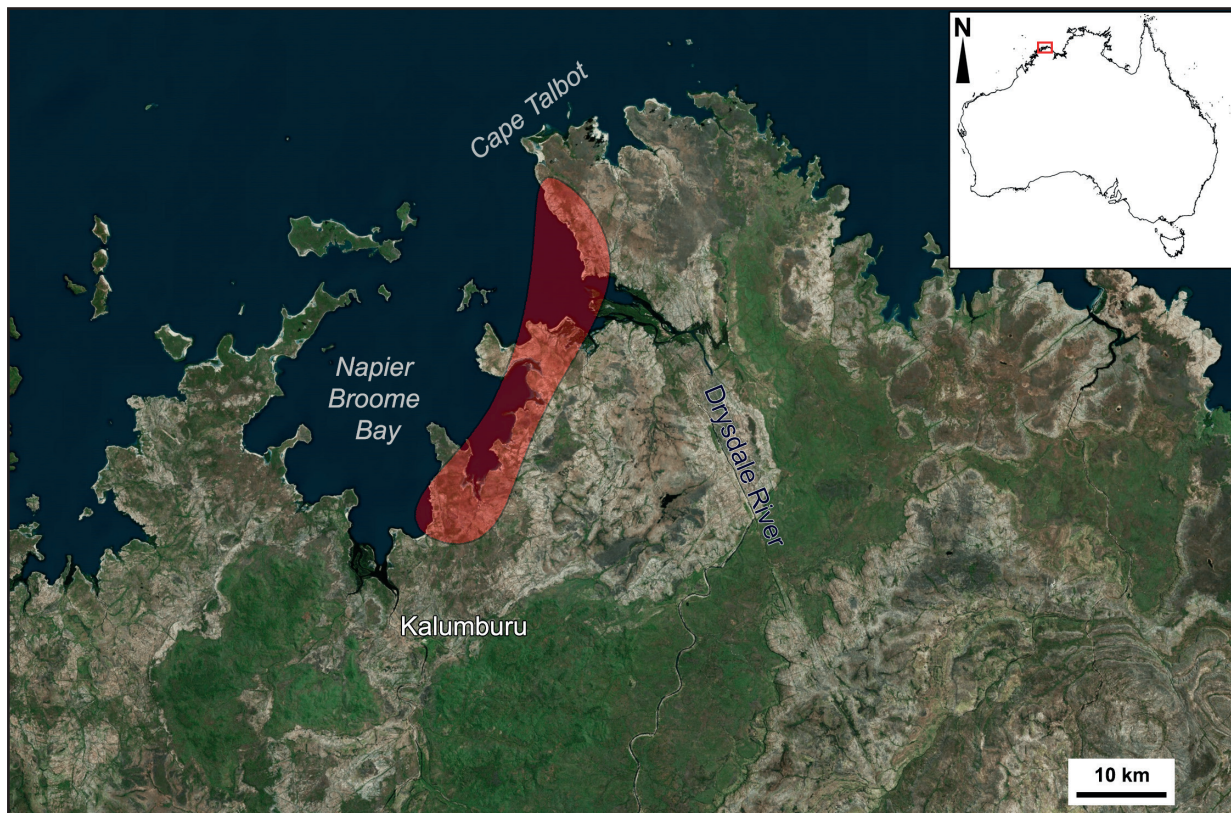


Figure 4. Known distribution of *Drosera actinioides* in the Northern Kimberley bioregion, Western Australia, based on the type collection and five additional localities observed by the authors. Background satellite map ©OpenStreet-Map (data is available under the Open Database License; <https://www.openstreetmap.org/copyright> [accessed 1 February 2025]). Map prepared by A. Fleischmann.

Table 1. Comparison of *Drosera actinioides* with morphologically similar taxa from *D.* sect. *Lasiocephala*.

	<i>Drosera actinioides</i>	<i>Drosera paradoxa</i> 'orange flowered form'	<i>Drosera paradoxa</i> 'swamp form' – bicoloured individuals	<i>Drosera brevicornis</i>
Stem length	1.0–2.5 cm	0.8–4.0 cm	0.9–3.7 cm	< 1.0 cm
Inflorescence number per leaf rosette	1(–3)	1–4	1–4	1(2)
Inflorescence shape	Peduncle thick, strongly ascending, erect, self-supporting, inflorescence disproportionally tall compared to rosette size	Peduncle thin, ascending, erect and self-supporting at early anthesis, later often supported by co-occurring herbs or becoming prostrate	Peduncle thin, ascending, erect and self-supporting at early anthesis, later often supported by co-occurring herbs or becoming prostrate	Peduncle thick, ascending, self- supporting, inflorescence disproportionally large compared to rosette size
Plant height (including inflorescence)	(16–)29–54 cm	7–24 cm	20–45 cm	16–50 cm
Peduncle diameter (near base)	(0.5–)0.7–1.6 mm	0.3–0.7 mm	0.3–0.8 mm	0.8–1.6 mm
Petal colour	Metallic orange	Metallic orange	White (rarely pink) with red or purple base	Pink or white
Stamen 'hooks'	Absent	Absent	Absent	Present
Pollen colour	Yellow	Reddish orange	Reddish orange	Yellow to orange
Ovary colour	Dark red to blackish red	Pale green	Pale green	White, pink, red, or dark purple
Style colour	Dark red to blackish red	White to yellow	Red to dark red	White, pink, red, or purple
Stigma number	(33–)45–66	9–18	11–24	24–45
Anthesis time	March–June	December–April	March–July	December–May
Habitat	Exposed sandy or lateritic flats overlying sandstone associated with <i>Triodia</i> spp.	Grassy seasonal herbfields overlying sandstone pavement	Grassy seasonal herbfields overlying sandstone pavement	Sandy or lateritic flats associated with <i>Sorghum</i> spp.

Drosera actinioides further differs from *D. paradoxa* 'orange flowered form' and bicoloured individuals of *D. paradoxa* 'swamp form' in habitat preference. In contrast to the seasonally wet herbfield habitats overlying sandstone pavement in which the last two taxa occur, *D. actinioides* thrives on shallow, well-drained sandy or lateritic soils apparently lacking sufficient moisture retention to sustain dense vegetation cover (Table 1; Figure 3). Furthermore, flowering of *D. actinioides* is confined to the late wet season and early dry season months (March to early June), in contrast to the primarily annual *D. paradoxa*

‘orange flowered form’ (which can flower earlier, from December to April) and bicoloured individuals of *D. paradoxa* ‘swamp form’ (which can flower later, from March to July; Table 1).

Notes. As a putative member of the *D. paradoxa* complex, sharing the erect stems present in all taxa from that affinity, the shoot apex of *D. actinioides* is elevated above the hot lateritic or white sand soil. In contrast, rosetted perennial members of *D. sect. Lasiocephala* either reduce growth during the dry season to produce a smaller and often densely woolly, insulated rosette (e.g. *D. broomensis* Lowrie, *D. lanata* K.Kondo, and *D. petiolaris*), or are geophytes, retreating to a subterranean rhizomatous bulb (e.g. *D. caduca* Lowrie, *D. falconeri* K.Kondo & Tsang, and *D. kenneallyi* Lowrie). *Drosera actinioides* has no such protection, indicating the species is most likely an annual therophyte, perishing during May and June. No individuals with condensed stem segments consisting of internodes noticeably reduced in length for the dry season (indicating multi-year stem growth) were observed *in situ* or on the type specimen. Even diminutive individuals with a rosette as little as 0.9 cm in diameter were observed to produce inflorescences, indicating that flowering occurs towards the end of the growth cycle regardless of plant size, a feature observed in other obligate annuals (e.g. *D. banksii*). That said, there is the potential for individuals to persist into the following season in exceptional cases of moisture availability.

Despite its annual habit and short growing season, *D. actinioides* produces the greatest scape length and flower number in relation to rosette diameter known in *D. sect. Lasiocephala* (and possibly among all *Drosera* species). It appears to be the only obligate outcrossing (self-incompatible) species among the three described annuals in *D. sect. Lasiocephala* (*D. actinioides*, *D. banksii*, and *D. subtilis* N.G.Marchant), a breeding mode inferred from the numerous empty capsules on the infructescences, these being smaller and with fully clasping sepals (Figures 1A; 2B,D). It is possible that the unusually tall inflorescence of *D. actinioides* increases pollination success (see Anderson 2010; Cross *et al.* 2018), which is important for a therophyte highly dependent on seed production. Additionally, no clonal propagation via stem division (as is common in many perennial species of *D. sect. Lasiocephala*) was observed in *D. actinioides*. Notably, the exceptionally robust inflorescence of *D. actinioides* is reliably held upright, despite arising from the stem at a height of up to 2.5 cm above the soil surface. To avoid bending along the stem (which would result in an undesirable, prostrate inflorescence orientation), the species likely supports its inflorescence through the combination of a thickened, strongly ascending peduncle, and a conical arrangement of wet season leaves reflexed by *c.* 45° in relation to and firmly contacting the ground (Figure 2G).

The orange and black flowers of *D. actinioides* superficially parallel those of certain pygmy sundews (*D. sect. Bryastrum*) native to south-western Australia, which are associated with beetle pollination (Robinson *et al.* 2018). Lacking the petal bicolouration displayed by these members of *D. sect. Bryastrum*, the dark styles of *D. actinioides* are responsible for the contrasting colour pattern of the floral display. Analogous to the strong ecological association between red and white-flowered and orange and black-flowered pygmy sundew species, which often co-occur in the same habitat (Lowrie 2014; Lowrie *et al.* 2017), bicoloured individuals of *D. paradoxa* ‘swamp form’ are particularly abundant within the geographic range of *D. actinioides*.

Acknowledgements

Les and Joy Davey of Honeymoon Bay, Western Australia, are thanked for their kind collaboration, land access permission, and boat charter services utilised during fieldwork. Skye Coffey and Shelley James (PERTH) are thanked for providing access to specimens, assisting with herbarium work, and for approving the use of specimen photographs for this article. Jennifer Brown and Julia Percy-Bower (PERTH) are thanked for supplying digitised specimen images; Hans Mühle (Nussdorf), Allen M. Sundholm, Max Kühbandner (Munich), and Shane Turner (Curtin University, Perth) for providing information on the collector Herbert Demarz. Elisha Juve is thanked for his prolonged period of accompaniment, 4WD vehicle capabilities, and general utilitarian services, which proved critical to the rediscovery of *D. actinioides* in this remote region of Western Australia. Juliet Wege and Alastair Robinson are thanked for helpful comments on the manuscript. Thilo Krueger was supported by a Postgraduate Research Stipend Scholarship from Curtin University, Western Australia.

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