Technical Refereed Contribution

AN ACCOUNT OF DROSERA SECTION PROLIFERA

RICHARD NUNN • Malvern • South Australia • Australia • Richardjnunn1@gmail.com
GREG BOURKE • Manager, Blue Mountains Botanic Gardens • NSW • Australia • Greg.bourke@bgcp.nsw.gov.au

Introduction

The species that comprise Drosera section Prolifera, Drosera adelae, D. prolifera, and D. schizandra, or as commonly known, “The Three Sisters”, are endemic to Far North Queensland. They are unique to the genus in that they are found growing exclusively in rainforest habitat. Over the past 8 years the authors have made four separate field trips to observe these unusual and uncommon Drosera. The literature published to date on these taxa is general, often based on observations of cultivated plants. One can easily form the superficial view that they grow relatively close to each other in similar micro-habitats, it is only when herbarium sheets, field observations, and personal accounts are scrutinized that a different story emerges. The objective of this account is to show the broad area these species occur and to highlight the similarities and differences in their micro-habitat. Australia is a vast continent and the area that these species inhabit is approximately a 400 km stretch of hinterland that runs roughly parallel to the coast from Townsville, north to Cape Tribulation.

Taxonomy, Distribution and Habitat
(adapted from, Lowrie 2014 and Lowrie et al. 2017 and annotated with the author’s field observations)

Drosera section Prolifera C.T.White

Type species: Drosera prolifera C.T.White

Plants perennial; hairy-rooted; leaves erect to semi erect, together forming an open, leafy rosette; lamina when mature, reniform, lanceolate or obovate; stipules red, reduced to 2 small trichomes attached to base of petiole on upper side; styles 3 or 4, terete, reddish in lower half, white above, bilobed at apex to form a ± Y-shape configuration, each free lobe apex truncate; stigmas white, simple, at the tips of each spreading lobe, papillose.

Key to Drosera section Prolifera
1a: Plant with an open rosette of erect and semi erect leaves.........................................................2
1b: Leaves in a rosette ....................................................................................................................3

2: Leaves narrowly lanceolate .....................................................................................................Drosera adelae

3a: Leaf lamina reniform..............................................................................................................Drosera prolifera
3b: Leaf lamina obovate .............................................................................................................Drosera schizandra
**Drosera adelae** F.Muell. (Fig. 1; Back Cover)
Type location: Dalrymple’s Creek, Rockingham Bay

*Etymology*

The epithet *adelae* is possibly derived from “Adelae de L’Arbre”, or the genitive singular of Adela, a Latinized form of Adele. The identity of the lady in question is unknown (Australian Plant Census).

*Distribution*

*Drosera adelae* is endemic to Queensland. Its range extends from Rockingham Bay, Hinchinbrook Island, Cardwell, Abergowrie to Kennedy. Additional sub-populations have been documented in the extensive Walter Hill Range, particularly Tully Gorge National Park.

*Habitat and Field Notes*

This species grows in the foothills of mountains along the sandy banks of creeks, seeps, among rocks and the splash zones of waterfalls, it also follows creek lines into the coastal plains. *Drosera adelae* is a relatively widespread species of the lowlands, but highly localized. This may be because *D. adelae* tolerates a broader range of conditions; it can be found by waterfalls in full sun, through to dark, closed-canopy rainforest but always associated with areas that remain wet well into the dry

Figure 1: *Drosera adelae* in shaded conditions near Cardwell, North Queensland (left; photo by Greg Bourke). Flower at same location (right; photo by Richard Nunn).

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season. Plant coloration may be related to exposure to light, those in brighter conditions producing more red pigmentation, however observations of cultivated plants from several locations indicate there may also be genetic variation (G. Bourke pers. obs).

**Site 1: Waterfall, Kennedy, North Queensland**

A short drive up an old disused road in the hills behind Kennedy to an elevation of 500 m. The plants were observed growing in rock crevices in the spray zones of a perennial waterfall. At various times of the day the plants are exposed to full sun.

**Site 2: Creek crossing, Bruce Highway, Cardwell area, North Queensland**

Along the Bruce Highway at various intervals, creeks, fueled by water from the rainfall in the hinterland, make their way to the ocean. In some of these creeks *Drosera adelae* can be found growing on the banks in peaty sand. Dense populations thrive in the permanently wet, shady, and warm conditions. Mosquitos and ants are abundant, making field observations an uncomfortable experience. In most years these creeks are constantly in flow, however it has been observed in the driest years that there is no water and the plants recede to fleshy roots.

**Description (Lowrie 2014)**

A fleshy, hairy-rooted perennial herb with a loose, open rosette. Stem 2-10 cm tall, generally 1.5-2 mm diameter. Leaves in the early stages of growth erect and circinate, becoming horizontal with age, spent leaves lying prone around the basal portion of the stem. Juvenile leaves are obovate, subsequent leaves narrowly elliptic, and mature leaves lanceolate, alternately arranged in a spiral along the stem. Petiole short, almost sessile and glabrous. Lamina 10-25 cm long, 7-10 mm wide, with a raised longitudinal midrib on both surfaces along its entire length. Inflorescence a terminal, one-sided helicoid cyme, 25-35 cm long, many-flowered. Peduncle and pedicels covered with scattered sessile glands and scattered wispy pilose hairs. Pedicels 5-6 mm long, semi-erect and lengthening in fruit. Flowers 0.6-0.8mm in diameter, red, reddish orange or cream, petals broadly lanceolate, margins entire, 2.5-3.5 mm long, 0.3-0.4 mm wide at the base, dilated to 1.2-1.5 mm wide near the center, then abruptly narrowing to 0.5-0.6 mm wide and forming an acuminate apex. Sepals green, lanceolate, 2-2.5 mm long, 0.5-0.6 mm wide at the base, dilated to 0.8-0.9 mm wide near the center, then quickly narrowing to 0.3-0.4 mm wide and forming a long acuminate apex, margins and apex entire, abaxial surface glabrous. Stamens 5, each 4-4.5 mm long, the filaments and anthers white, bi-lobed and reddish at the apex, the pollen creamy white, or yellow in the red flowered forms. Ovary green or reddish, subglobose, 0.9-1 mm long, 1-1.5 mm diameter. Styles 3 or 4, rust-orange at the base, white at the apex, 0.6-0.7 mm long, 0.1-0.15 mm in diameter, bi-lobed at the apex and forming a T-shape with each free lobe, 0.4-0.5 mm long, curved along its length. Stigmas white, simple, located at the tips of the free paired lobes, papillose, style-stigmas positioned horizontally from the apex of the ovary.

**Phenology**

This species flowers from June to November. It is capable of perennating through adverse conditions by retreating to its fleshy roots, as happens at locations within its range that dry out completely during the dry season. Whilst self-fertile, *Drosera adelae* often forms large clonal colonies through the formation of plantlets along its roots and rarely from its leaves. It is also capable of producing plantlets directly from its flowers in a similar manner to *D. prolifera*. 

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**Drosera prolifera** C.T. White (Fig. 2)
Type location: Cook District: Thornton Peak (in sheltered places near the summit) alt. 4000 ft.

**Etymology**
The epithet *prolifera* is from the Latin *proles* (offspring) and *fero* (to bear), a reference to the ability of this species to produce offshoots, usually arising from the inflorescence.

**Distribution**
*Drosera prolifera* is endemic to North Queensland. It is recorded from the summit and flanks of Thornton Peak and a small number of watercourses draining from that mountain.

**Habitat and Field Notes**
This species grows in rainforest areas among rocks and on sandy banks along creeks occasionally flooded by monsoonal rains. The ability of *Drosera prolifera* to produce additional plants on every flowering peduncle ensures that crowded colonies of plants are quickly formed in suitable sites.

**Site 1: River embankment, Noah Creek, North Queensland**
A difficult 3-hour walk up a branch of Noah Creek. Initial part of the walk required struggling through rainforest filled with Rattan (*Calamus muelleri*) and Screw Pine (*Pandanus tectoris*) and...
the odd Cassowary nest, followed by 2 hours of climbing over progressively larger boulders, some reaching the size of a small house. Plants were observed on a small moss-covered embankment, forming dense colonies in partially shaded rainforest habitat. Plants grew down to the water’s edge and at time of higher rainfall would have been inundated.

Site 2: Thornton Peak, North Queensland
Although the authors did not visit the type location, it is worthy of including notes from others as the habitat and conditions are clearly different at this higher elevation. Plants found at and near the summit of Thornton Peak, on moist rock ledges. The vegetation at this elevation, although rainforest, is more open and stunted than at lower elevations. Rainfall is 10 m per year and the weather is cooler and more unpredictable than lowland areas.

Description (Lowrie 2014)
A green, fleshy, hairy-rooted, perennial herb with a small number of erect to semi-erect active leaves, together forming an open leafy rosette up to 6-8 cm in diameter, leaves erect at first, then semi-erect and later flat on soil surface to make way for new, central leaves. Flowering peduncles long, lateral, positioned just above soil surface, peduncles similar to strawberry plant runners in that they produce additional plantlets at their tips after flowering, thus producing crowded colonies of individual plants. Lamina when mature, reniform, 20-25 cm long, 22-27 mm wide, adaxial surface with clear white or red tipped insect-catching glands positioned around margins and smaller red tipped glands within, abaxial surface glabrous; petiole 2-4.5 cm long, 2.5-3 mm wide, semi lenticulate in section, with a longitudinal rib on adaxial surface, dilated a little at base, glabrous. Stipules red, reduced to 2 small trichomes attached to base of petiole on upper side. Inflorescence peduncles 1 to 4, 18-20 cm long, producing a vegetative shoot at its apex after anthesis, flowers 4 to 8, widely-spaced; pedicels curved, 3-5 mm long; bracts linear, 1-2 mm long, opposite and slightly below pedicel, fruiting peduncles almost prostrate. Sepals beige, lanceolate, 0.8-0.9 mm wide at base, dilated to 1-1.2 mm wide just above center, then quickly narrowing to 0.3-0.4 mm wide and forming long ± sharp, but gnawed acuminate apex, 3.5-4 mm long, margins entire, abaxial surface glabrous, in face view apices positioned within corolla at angles of a perfect pentagon shape, each sepal perfectly positioned between petals. Petals adaxial and abaxial surfaces reddish purple, obovate, 0.5-0.55 mm wide at base, dilated to 1.8-2 mm wide near apex, 2.2-2.5 mm long, margins entire, apex crenate. Stamens 5, 1-1.2 mm long; filaments dilated in upper half, white in lower half, reddish above; anthers and pollen white. Ovary reddish, broadly obovoid, 1.2-1.5 mm long, 1.2-1.5 mm in diameter at anthesis, glabrous. Styles 3 or 4, terete, reddish in lower half, white above, 0.8-0.9 mm diameter, 0.6-0.7 mm long, bilobed at apex to form a ± Y-shape configuration, each free lobe, 0.4-0.5 mm long, apex truncate. Stigmas white, simple, at tips of each spreading lobe, papillose, Styles positioned horizontal from apex of ovary. Seeds dark brown to black (mainly black), ± an ovoid to obovoid shape, sides irregular distorted in and out slightly, 0.53-0.63 mm long, 0.35-0.4 mm in diameter, apical pole often narrowing, apically truncate, funicle positioned proud of basal pole, 0.013-0.015 mm long, 0.01-0.013 mm in diameter, surface deep irregular reticulate-alveolate honeycomb-like cells, cell ridges smooth and undulating.

Phenology
This species flowers all year round. Plants may die back to their fleshy roots if habitats dry out in the dry season.
Etymology

The epithet *schizandra* is from the Greek *schistos* (divided) and *andrus* (male), in reference to the divided anthers of this species.

Distribution

*Drosera schizandra* is endemic to Queensland, where it is known only from the rainforest covered lower slopes of Mount Bartle Frere.

Habitat and Field Notes

This species grows in rainforest at an altitudinal range of 300-600 m. in areas among rocks in deep shade, and in damp sand along the banks of streams. Large, mostly clonal colonies exist along some of the old logging trails on the lower slopes of Mount Bartle Frere. Plantlets form along exposed roots, while broken leaves occasionally produce plantlets in the wet season. *Drosera schizandra*, *D. adelae* and *D. prolifera* grow in similar rainforest habitats. However, of the three, *D. schizandra* favors the darkest, most shady habitats.
Site 1 and 2: Logging Trail, Mount Bartle Frere, North Queensland

Although only about 80 km from Cairns, Mount Bartle Frere, takes about 2 hours to drive from Cairns. A 45-minute walk along a disused logging trail covered in Rattan, Pandanus and wild Strawberry, with copious leeches. The first site is a small embankment in near total shade, yielding a dense colony of plants growing in sandy clay. Plants range in size up to a dinner plate in diameter. Further along the trail, a much larger colony of plants was found growing in more sun but still in rainforest habitat. The plants had colonized the disturbed and exposed embankment cutting along the side of the trail. Warm days and cool nights are experienced at this intermediate elevation.

Site 3: River edge, Mount Bartle Frere, North Queensland

Along the same trail a few hours more walking down to approximately 300 m, the trail finishes at a fast-flowing river. *Drosera schizandra* was observed growing amongst the rocks in moist sand. These plants were smaller and more exposed to the elements than those at the previous 2 sites.

**Description (Lowrie 2014)**

A large, fleshy-rooted perennial herb with a few-leaved rosette 16-20 cm in diameter, each leaf varying in length and width, mature leaves semi-erect and adpressed to the soil. Lamina when mature obovate, 8-10 cm long, 4-5 cm wide, entire except irregularly crenate apex and commonly a little emarginate, mid vein prominently raised on adaxial and abaxial surfaces, with additional venation branching outwards from mid vein on both surfaces, but prominently raised only on abaxial surface, adaxial surface covered with long, translucent white trichomes with red-tipped glands, abaxial surface sparsely hirsute, hairs mainly along raised midrib and lateral veins. Juvenile leaves distinctly petiolate; mature leaves sessile or very shortly petiolate; stipules laciniate, attached to base of petiole on upper side; petiole semi-terete in section, 2-2.5 mm in diameter. Inflorescence 1, peduncle 12-14 cm long, 10-25-flowered, arising from center of rosette; peduncle and pedicels covered with non-glandular hairs; pedicels 5-10 mm long. Bracts linear 2.7-3 mm long. Sepals greenish, lanceolate, 4-5 mm long, 0.9-1 mm wide at base, dilated to 1.6-1.8 mm wide just above center, then narrowing towards apex, margins entire in its lower parts, irregularly serrate in upper parts, with a deeply serrate apex, abaxial surface covered with non-glandular hairs. Petals adaxial and abaxial surfaces a very dark reddish purple, obovate, 1.5-2 mm wide at base, dilated to 4-5 mm wide near apex, 5.5-6.5 mm long, margins entire, apex crenate. Stamens 5, red; filaments V-shaped, base leg dilated in middle, 1.3-1.5 mm long, apex bilobed and reflexed, 0.9-1 mm long; anthers and pollen yellow, positioned on underside of reflexed apical lobes of filament. Ovary red, obovoid, 1.2-1.5 mm long, 1.1-1.4 mm in diameter at anthesis; carpels 3, bilobed, glabrous. Styles 3, terete, red, 0.9-1 mm long, semi-erect, bilobed, lobes curved and reflexed a little, each lobe with 1-3 white stigma lobes. Stigmas papillose. Seeds unknown.

**Phenology**

This species flowers from November to July. Although a rare event, it can retreat to its fleshy roots if its habitat dries out in the dry season.

**Discussion**

*Drosera adelae*, *D. prolifera*, and *D. schizandra*, although differing morphologically, especially in terms of their leaf shape, appear to have evolved from a common ancestor, they have similar floral parts; the stamens and receptive styles are prominently displayed at anthesis because the petals fully
reflex. The anthers, being on the underside of the exposed reflexed lobes of the stamens, shelter the pollen grains from the frequent, heavy rains. In addition to these floral similarities, all have chromosome counts of $2n = 30$, as well as similar seedling characteristics that indicate a close relationship (Lowrie 2014).

**Conclusion**

The fieldwork undertaken in conjunction with a detailed literature and herbarium review provides the following conclusions

1. The species in *Drosera* section *Prolifera* are closely related and have evolved from a common ancestor, although they are now morphologically quite different.
2. All three taxa inhabit rainforests, however their micro-habitats are different, with *Drosera adelae* being a tropical lowland species, *D. schizandra* preferring more shade at elevations ranging between 300-600 m, and *D. prolifera* being predominantly a montane species occurring on the summit of Thornton Peak at 1300 m, but with isolated populations close to sea level.
3. Although endemic to Far North Queensland, each species is geographically isolated, and they never co-occur.

**References**


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### Table 1: Micro-habitat observations of *Drosera* section *Prolifera* sites.

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<th>Substrate</th>
<th>Light</th>
<th>Moisture</th>
<th>Growth cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Drosera adelae</em> site 1</td>
<td>20 m</td>
<td>sandy peat</td>
<td>50% shade</td>
<td>normally constant but can dry out in extreme drought</td>
<td>can die back to roots in drought</td>
</tr>
<tr>
<td><em>Drosera adelae</em> site 2</td>
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<td>accumulated organic matter in rock crevices</td>
<td>bright light</td>
<td>year-round moisture from waterfall.</td>
<td>year-round</td>
</tr>
<tr>
<td><em>Drosera prolifera</em> site 1</td>
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<td>moss growing over granite</td>
<td>50% shade</td>
<td>constant, fed by seeps</td>
<td>year-round</td>
</tr>
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<td>very wet in rainy season, dryer in winter months</td>
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<td>year-round</td>
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<td>300 m</td>
<td>moist sand</td>
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</tbody>
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* the authors were unable to visit the type location for *Drosera prolifera* on the summit of Thornton Peak and hence have relied on literature and personal accounts for the data in the table.
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International Carnivorous Plant Society, Inc.
2121 N. California Blvd., Suite 290
Walnut Creek, CA 94596-7351, USA
icps@carnivorousplants.org

President    Marcel van den Broek, marcel@carnivorousplants.org
Vice President   Richard Nunn, richardnunn@carnivorousplants.org
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Media Coordinator Chad Williams, chad@carnivorousplants.org
Seed Bank Manager Joe Griffin, joe@carnivorousplants.org
CPN Editors editor@carnivorousplants.org
Managing Editor Bob Ziemer
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