An account of *Drosera* section *Arcturia*

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Abstract: Two most uncommon species of *Drosera* can be found in the alpine regions of southern Australia and New Zealand, *D. arcturi* (New Zealand, southern Australia and Tasmania), and *D. murfetii* (Tasmania). The objective of this paper is to synthesise the current knowledge of these species into one account, including field observations and images from the author.

Introduction

Robert Gibson (Gibson 1999) gave the last account of *Drosera* section *Arcturia* in this journal in 1999, since this time *D. murfetii* has been described and further field observations have been undertaken by the author and others.

Drosera are rare in true alpine habitats (Lowrie *et al*. 2017), but a number of species occur in sub-alpine wetlands, habitats that are characterised by a prevalence of water variably derived from rain or from the meltwaters of glaciers or snow in adjacent higher elevation zones. The elevations at which they occur vary according to latitude, generally being found close to the treeline at over 2500 m in equatorial regions (New Guinea, eastern Africa), but close to sea level at high latitudes like southern Chile, southernmost Tasmania, New Zealand and associated sub-Antarctic islands. Low temperatures for much of the year may limit periods of growth to the short summer months, and conditions year-round can be harsh, with frequent inclement weather.

Botanical history

Ronald Campbell Gunn (1808-1881), botanist, public servant and politician, was the first European to observe *Drosera arcturi* at Mt. Arthur, at Lilydale, northwest of Launceston. Gunn arrived in Tasmania from Edinburgh in 1830. He became assistant superintendent of convicts at Launceston in December 1830, justice of the peace in 1833, and police magistrate at Circular Head in 1836 (Burns & Skemp 1966). Gunn's interest in botany stemmed from his friendship with Robert W. Lawrence, the son of an influential landholder at Formosa and Penquite, in the Launceston area (Burns & Skemp 1966). Lawrence introduced Gunn by letter, in June 1832, to the eminent British botanist, William Jackson Hooker at Glasgow University, who was seeking collectors of the Tasmanian flora (Buchanan 1988). A month later, Gunn sent a batch of plant collections to Hooker from Launceston, the first of many consignments he forwarded over the next decade and a half. From this consignment, Hooker described and published *D. arcturi* in his Contributions Towards a Flora of Van Dieman's Land in The Journal of Botany 1834 (Hooker 1834).

Lowrie provides us with an interesting anecdote on determining the true type location of *Drosera arcturi* (Lowrie 2014). The "Mount Arthur" location information for the type material of this species is somewhat vague, as there are several possible Mt. Arthur locations in Tasmania. Wellington Park, NE flank of Mt. Wellington, Mt. Arthur State Reserve, SW of Port Arthur and Lilydale, NW of Launceston. Lilydale, northwest of Launceston appears to be the true origin of

Gunn's *D. arcturi* specimens, collected in 1832. Gunn was residing in Launceston at the time that he sent his first consignment of herbarium specimens to William Hooker at Glasgow University in 1832. These specimens were from east of Launceston, principally from Ben Nevis and Mt. Arthur. This suggests that Gunn collected the type material for *D. arcturi* from Lilydale's Mt. Arthur.

180 years after *Drosera arcturi* was published, a second species in *Drosera* section *Arcturia*, *D. murfetii* was formally described. Having observed these two species growing together, there are significant and easily observable differences, and it seems strange that these were not recorded much earlier. In the 1990s and early 2000s, reports from southwest Tasmania started to appear of large, robust plants of *D. arcturi*, including a form bearing several conspicuous, basal glabrous leaves, a usually single, large trapping leaf, with obvious glandular hairs, and often several flowers per scape, each with 4–5 larger, greenish-white or cerise stigmas (Gibson 1998,1999; Lowrie 1998; Clayton 2003).

It wasn't until 2005-06 that Allen Lowrie and Denzel Murfet made a thorough survey of populations of this putative new taxon. The author first observed and recorded these robust plants in 2012 following discussions with Allen Lowrie confirming that he and John Conran were going to publish this as a new species, *Drosera murfetii*, which they duly did in 2014.

The vegetative morphological differences between the two forms, as well as inflorescence and floral characteristics clearly support the justification to treat these two taxa as distinctive species (Lowrie & Conran 2014).

Taxonomy

Adapted from Lowrie *et al*. 2017.

Drosera section *Arcturia* Planch.
Publication: Annales des Sciences Naturelles; Botanique. Series 2–10 ser. 3, 9: 91, 1848.
Type species: *Drosera arcturi* Hook.
Etymology: The section name *arcturia* is derived from the same source as the epithet of *Drosera arcturi*, formerly the only species within this section, namely the Latin *arcturus* (Arthur), referring to Mount Arthur in Tasmania.

1. *Drosera arcturi* Hook. (Front Cover, Figs. 1, 3A, 4)
Publication: The Journal of Botany 1: 247, 1834.

Etymology

The epithet *arcturi* comes from the Latin *arcturus* (Arthur), referring to the type locality, Mount Arthur, Tasmania.

Description

A fibrous-rooted perennial herb, plant dying back for dormancy. When dormancy is broken, 2–3 small, lanceolate, apically acute, non-glandular leaves 3–10 mm long, 0.7–1 mm wide, emerge, followed by 1 to 6 glandular leaves in a ± loose, fan-like arrangement. Leaves (glandular) semi-erect, commonly 3–5(–7) cm long on robust specimens; petioles at base sheathed and shrouding the base of the following leaf, 0.6–0.8 mm wide at the exposed basal part, 1.5–1.8 mm wide where it joins the lamina, glabrous. Lamina narrowly oblong, apex rounded, 15–25 mm long, 2–6 mm at its widest point, adaxial surface bearing insect-catching glands usually just inside the leaf margins, not on

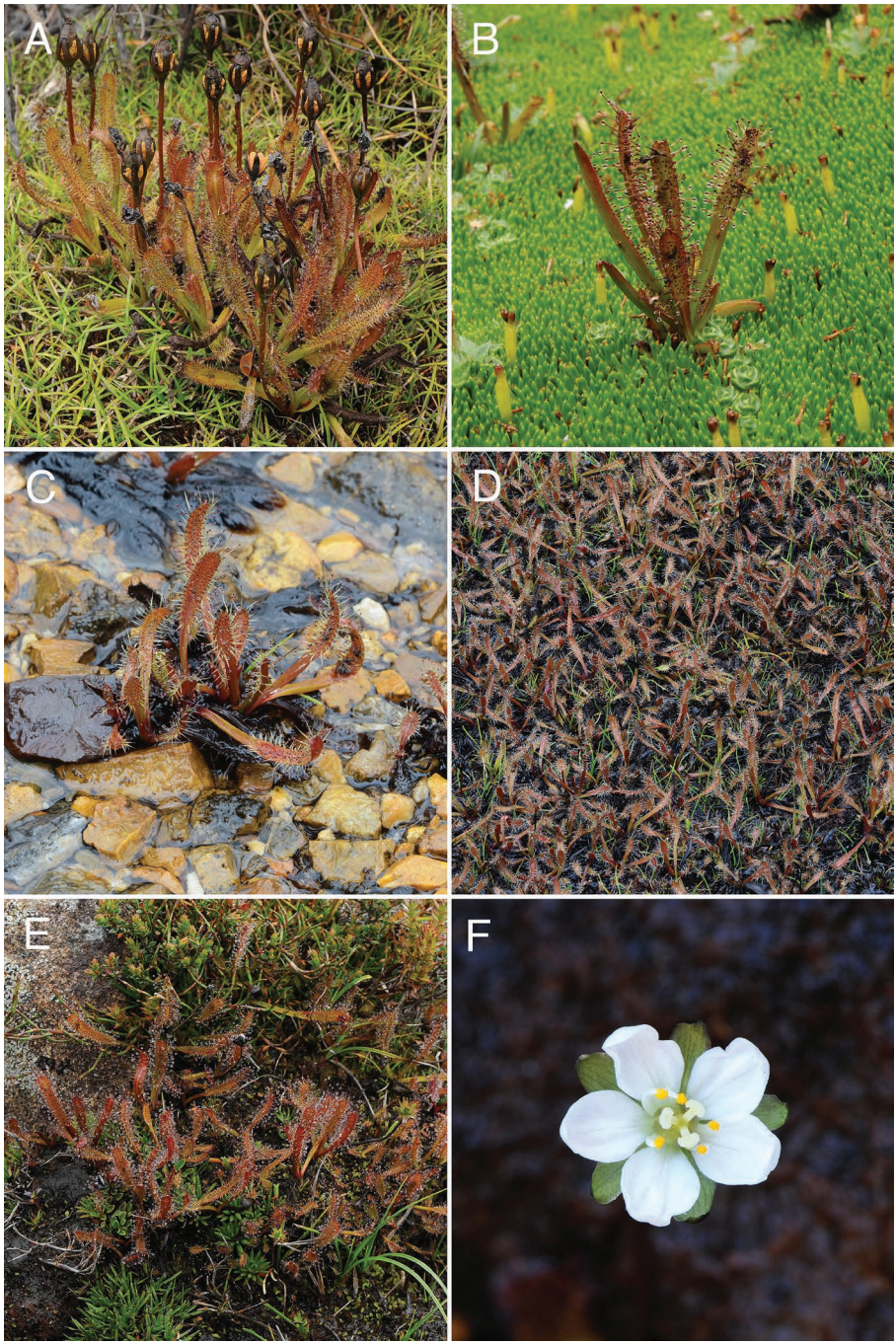

Figure 1: *Drosera arcturi*. (A) Cradle Mountain, Tasmania, (B) plant growing in *Donatia novae-zealandiae* Pine Lake, Tas., (C) growing in a shallow creek, Scotts Peak Dam, Tas., (D) dense colony, Scotts Peak Dam, Tas., (E) Hartz Mountains, Tas., (F) flower, Mt. Wellington, Tas.

the margins themselves, with smaller glands within, abaxial surface bearing a longitudinal midrib, glabrous. Inflorescence terminal, 1-flowered on a solitary peduncle 4–8 cm long, 0.4–0.5 mm in diameter, arising from the basal sheaths of the upper leaves, glabrous; pedicel a continuation of the peduncle; bracts subulate, solitary, often present a short distance below the flower, 2–2.5 mm long, 0.4–0.6 mm at its widest, erect in fruit. Sepals greyish green, narrowly elliptic, apex obtuse, margins entire, apex irregularly crenate, 5–7 mm long, 1.5–2 mm wide, adaxial surface concave, horizontal at anthesis, glabrous, abaxial surface glabrous. Petals white, obovate, 5.5–8 mm long, 2.5–3.5 mm wide. Stamens 5, 4–6 mm long; filaments white; anthers and pollen yellow. Ovary ellipsoidal, green, 4–4.5 mm long, 2.5–2.7 mm in diameter at anthesis. Styles 3, white to pale yellow, 0.5–0.6 mm long excluding stigmas, semi-erect, fusiform, but flat in section. Stigmas white, ± reniform when viewed from above, but mushroom-shaped in profile, 0.6–0.7 mm at its widest, 0.2–0.3 mm thick, peltate, stigmatic papillae confined to the adaxial surface of each stigma. Capsule ellipsoidal, 10–11 mm long, 4–4.5 mm in diameter, containing ca. 50–60 seeds. Seeds brown, irregularly ± obovoid, longitudinally somewhat flattened, funicle at narrow end sulcate, surface minutely reticulate-fovelate, 1–1.3 mm long, 0.6–0.7 mm wide.

Phenology

This species flowers from October to January, when plants are generally free of snow. (Fig. 1F)

2. *Drosera murfetii* Lowrie & Conran (Figs. 2, 3B, 4, Back Cover)

Publication: Journal of the Adelaide Botanic Gardens 27:17, 2014.

Etymology

This species is named in honour of its discoverer, Denzel Edwin Murfet (1957–), communications technician, botanist, carnivorous plant, *Stylidium* and orchid enthusiast, who discovered the species in the Hartz Mountains of Tasmania.

Description

A fibrous-rooted perennial herb dying back for dormancy. When dormancy is broken, 2–3 large, robust lanceolate, apically acute, non-glandular leaves 2–3(–6) cm long, 0.5–0.7 mm wide emerge in a ± fan-like arrangement, followed by 1 to 3 longer erect glandular leaves. Leaves 1–2(–3), petioles sheathed, shrouding base of the following leaf, 1.5–2.5 cm long, 1.5–2 mm wide where it meets the lamina, glabrous. Lamina lanceolate, apex blunt, or narrowly oblong, apex rounded, 7–20 cm long, 2–6 mm at its widest, adaxial surface bearing glandular tentacles confined to the adaxial surface of the lamina but absent from the margin, with smaller glands towards the centre of the lamina, abaxial surface glabrous. Inflorescence terminally 1–2-flowered on a solitary peduncle 6–15 cm long, 0.5–0.6 mm in diameter, arising from upper leaves basal sheath, glabrous; pedicel a continuum of peduncle, or when divided 1.5–12 mm long, erect in fruit; bract often present 5–15 mm below flower, subulate, 1–7 mm long, 0.4–0.5 mm at its widest. Sepals greyish green, narrowly elliptic, apex truncate, irregularly crenulate, margins entire 10–16 mm long, 2.3–2.5 mm wide, adaxial surface concave, horizontal at anthesis, glabrous, abaxial surface glabrous. Petals white, obovate, 8–12 mm long, 4.5–5 mm wide. Stamens 5, 6–7 mm long; filaments white; anthers and pollen yellow. Ovary ellipsoidal, green, 7–8.5 mm long, 4–6 mm in diameter at anthesis. Styles 4 to 5, white, black at base, 0.8–2 mm long (excluding stigmas), 0.2–0.3 mm wide, semi-erect, terete, but flat in section. Stigmas reddish cerise, ± reniform when viewed from above, 1.5–2.5 mm at its widest, 0.5- 0.6 mm thick, peltate, stigma

papillae surface confined to adaxial surface of each stigma. Fruit ellipsoid, 10–11 mm long, 7–7.7 mm in diameter, containing ca. 80–90 seeds. Seeds dark brown, irregularly ± obovoid, longitudinally somewhat flattened, funicle surface (narrow end) sulcate, remainder of seed surface minutely reticulate-fovelate, 1.5–2 mm long, 0.7–0.8 mm wide.

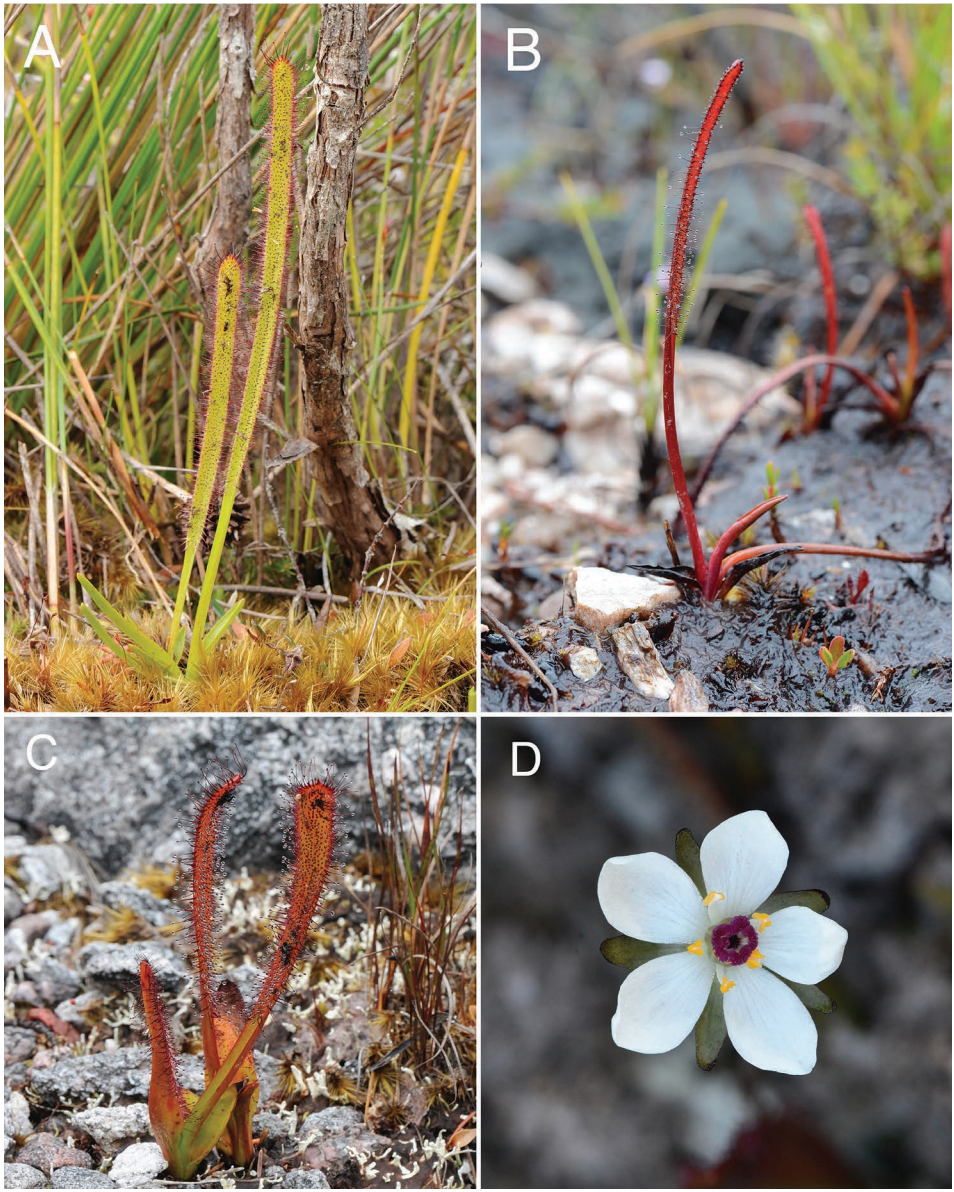

Figure 2: *Drosera murfetii*. (A) giant form Lake Plimsoll, Tasmania, (B) plant in exposed conditions Scotts Peak Dam, Tas., (C) emergent leaves and carnivorous leaves, Lake Plimsoll, Tas., (D) flower, Hartz Mountains, Tas.

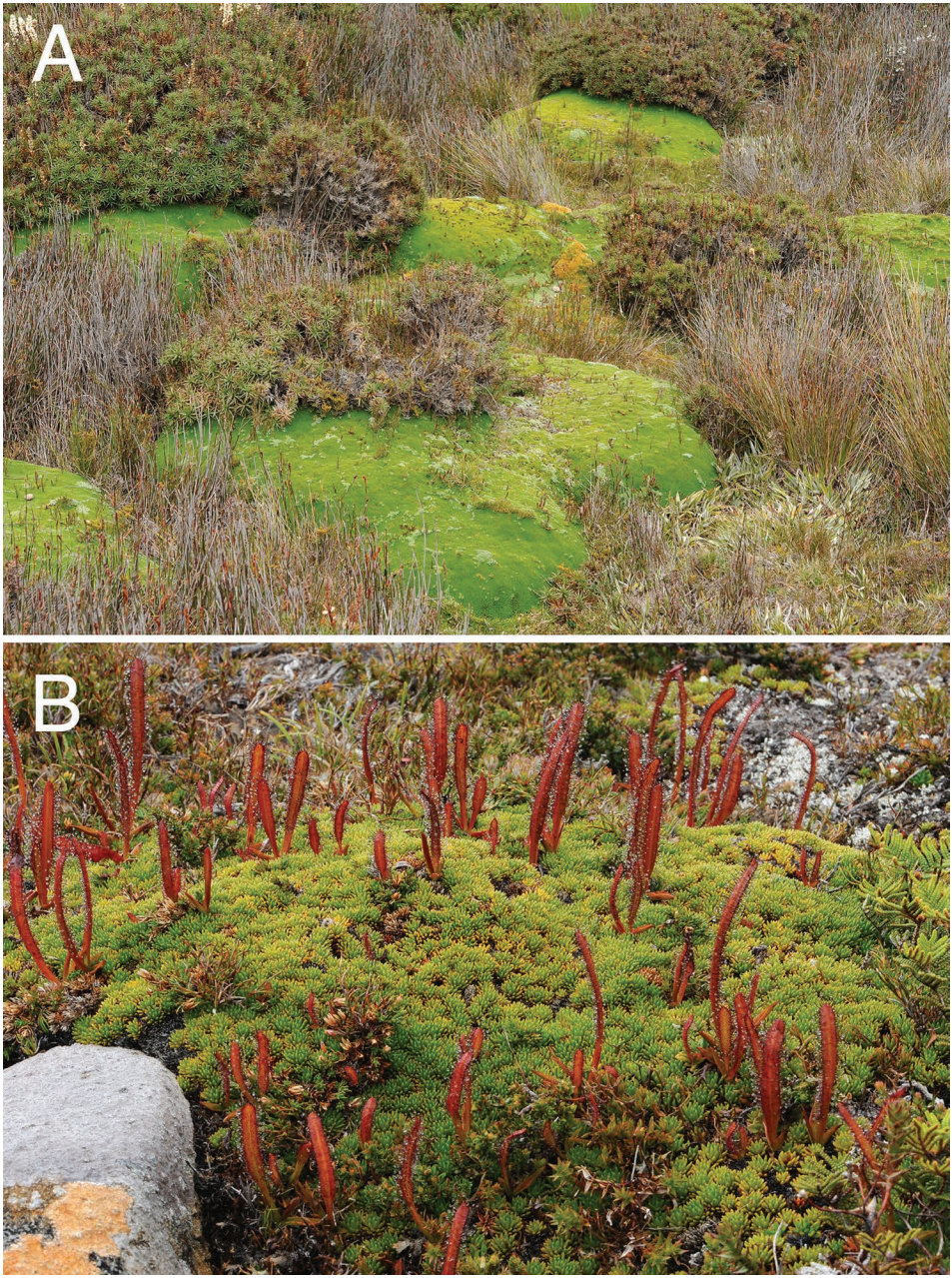

Figure 3: Habitat. (A) *Drosera arcturi* Pine Lake, Tasmania, (B) *D. murfetii* Hartz Mountains, Tas.

Phenology

This species flowers in November to January, sometimes enduring snowy conditions during its flowering season. (Fig. 2D)

Discussion

The most obvious difference between the two species relates to the possession of broad, glabrous non-trapping leaves (Lowrie & Conran 2014). These are completely absent in *D. arcturi*, where the leaves instead all being typical, mostly semi-erect to spreading *Drosera* glandular trapping leaves. In contrast, *D. murfetii* have broad, obviously photosynthetic outer leaves with only 1–2 larger, erect, inner gland-bearing leaves. These features, combined with the overlapping distributions of the plants in south-western Tasmania and absence in the field of any obvious intermediate plants for these features, even when both taxa are growing in mixed populations, support the conclusion that they represent discrete taxa at species level.

Key to the species of *Drosera* section *Arcturia*

Leaves linear-oblong, 3–20 cm long; flowers 1–4

1: Basal leaves small or absent; glandular leaves numerous, often semi-erect ……. *D. arcturi*

2: Basal leaves broad, spreading, glabrous; inner leaves (0–) 1–2 (–4), glandular, erect …… *D. murfetii*

The growth cycle and survival adaptations of these two remarkable species are well adapted to the harsh environment in which they exist.

Drosera arcturi is a relatively common herb of the alpine and sub-alpine regions of mainland Australia, where it is recorded from Victoria and New South Wales, Tasmania, where it is widespread in upland areas across the island, and New Zealand. In New Zealand (Salmon 2001) it is especially widespread on the South Island, where it ranges across the Southern Alps and Kaikoura Ranges but descending towards sea level in the south of the island. In the North Island it is mainly found in the Raukumara Ranges, Tararua Ranges and the volcanic plateau.

A cold tolerant, fibrous-rooted perennial herb, the plant dies back to a hibernaculum of small, bud-like non-glandular basal leaf sheaths for dormancy. Underground stems are covered with remains of the previous seasons' leaf bases, spent leaves often persistent above ground after dormancy. The bases of the previous growing season's leaves form a sheath around this bud and in doing so protect it from the harsh winter conditions. Their environment can often be under several feet of snow for months at a time (Salmon 2001). When dormancy is broken, 2–3 small, lanceolate, apically acute, non-glandular leaves, emerge, followed by 1 to 6 glandular leaves in a loose, fan-like arrangement (Lowrie 2014).

Drosera arcturi grows in Sphagnum bogs on alpine heathlands (Fig. 1A & 1D), as well as in black peat soils (Fig. 1E) along the margins of mountain streams, rivulets (Fig. 1C) and tarns. *Drosera arcturi* also grows amongst and within cushion-plants (Fig. 1B & 3A) such as *Donatia novae-zealandiae* and *Dracophyllum minimum*, and sometimes alongside its relative *Drosera murfetii*. The temperature within these cushion-plants is more stable than that of the surrounding air and remains above freezing, protecting the plants that grow within them (Lowrie 2014).

Drosera murfetii appears to be endemic to Tasmania. It is a common herb of the sub-alpine and alpine regions of Tasmania. *Drosera murfetii* grows on alpine heathlands (Back Cover) near the shores of tarns, seeps and amongst cushion plants (Fig. 3B) (*Donatia novae-zealandiae* and *Dracophyllum minimum*), sometimes alongside its relative, *D. arcturi* (pers. obs. R. Nunn) (Fig. 4).

Drosera murfetii was initially thought to be restricted to the Hartz Mountains (Lowrie & Conran 2014), however further field studies have found this taxon to be widespread in south-western Tasmania. The author has encountered this taxon at the type location in the Hartz Mountains, and also near Scotts Peak Dam and Lake Plimsoll. The Lake Plimsoll site yielded some extremely large specimens with lamina reaching over 20 cm (Fig. 2A) and the more exposed hillside at Scotts Peak Dam resulted in plants that were less robust (Fig. 2B) than the type form of this species.

A fibrous-rooted perennial herb, the plant dies back for dormancy to a ground level bud-like hibernaculum, derived from non-glandular basal leaf sheaths covering the rhizome apex. The plant forms an underground rhizome covered with remains of the previous seasons' leaf bases; above ground spent dry leaves often persist for some time after dormancy. When dormancy is broken, 2–3 large, robust lanceolate, apically acute, non-glandular leaves emerge in a fan-like arrangement, followed by 1 to 3 longer erect glandular leaves (Lowrie 2014).

The emergent leaves of *Drosera murfetii* are notable in being conduplicate (Fig. 2C) (Lowrie *et al*. 2014), that is, folded along the middle so that the opposing sides of the lamina are pressed against one another; they may remain thus until the development of the leaf is relatively advanced, finally opening out from the base upwards to become almost flat. This form of development may protect the developing glands from the harsh and unpredictable spring weather.

Figure 4: *Drosera arcturi* and *D. murfetii* growing sympatrically, Hartz Mountains, Tasmania.

Conclusion

The two species of the *Drosera* section *Arcturia* are uncommon in cultivation and are not often encountered in the field due to their relatively remote alpine locations, which experience weather extremes even in the middle of summer. They have developed survival strategies to survive these harsh conditions and thrive in large numbers in these undisturbed habitats. It is hoped this paper will help shed more light on this remarkable and unusual section of the genus *Drosera*.

Acknowledgements: The author would like to thank the late Allen Lowrie for many hours of discussion on the *Drosera* of Tasmania. The following friends are also thanked for their company and sharing their knowledge during field trips to observe *Drosera arcturi* and *D. murfetii,* Greg Bourke, Darren Cullen, Steve Fretwell, and Lauren Black.

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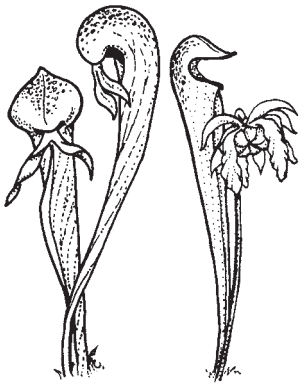

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Front Cover: *Drosera arcturi*, Scotts Peak Dam area, Tasmania. Photo by Richard Nunn. Article on page 19.

Back Cover: *Drosera murfetii* type location, Hartz Mountains, Tasmania. Photo by Richard Nunn. Article on page 19.

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