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CHANGES

Recently, there have been some major changes on the ICPS Board and Volunteer front. We are glad to report that Keith Becker is now handling the Secretarial work. We also reintroduced the Membership Secretary position and Sheila Stewart will perform this duty. John Brittnacher will focus more on technical issues. The Seed Bank and our Store will be managed by Joe Griffin. Finally, Ryan Ward is the new Treasurer. With all of these changes comes a transition period requiring transfers of data, access to accounts, etc. Some things may take a little longer than usual for a while. We hope you will be understanding. If you have any questions or concerns, please send an e-mail to us at inquire@carnivorousplants.org.

We would also like to thank Cindy Slezak and Richard Meyers for the many years of work and effort they put into our society.

Marcel van den Broek
President

**Biology of the Trapless Rheophytic *Utricularia neottioides*: Is It Possible to Grow this Specialized Species in Cultivation?**

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Keywords: *Utricularia neottioides*, aquatics, rheophytes, ecology, cultivation.

Abstract: The nearly trapless aquatic bladderwort *Utricularia neottioides* is one of the most remarkable and curious *Utricularia* species, growing attached to bare rock in streams of South America. It has never been cultivated due to its rheophytic habit and unknown ecological demands. As late as in 2012, one of us (KP) was able to grow this species in tissue culture from seed, so that the species has become available for cultivation and for anatomical and ecophysiological investigations. In this paper, we describe the biology of the species based on observations made in natural habitat and cultivation, its growth in *in-vitro* and *ex-vitro*, and raise the question whether it can be grown long-term *ex vitro* at all.

Introduction

The small *Utricularia* section *Avesicaria* (the sectional name, proposed by Kamienski (1891), means “without vesicles”, i.e. without traps) comprises only two South American amphibious species which grow strictly attached to bare rock in shallow streaming or seeping waters (so-called “rheophytes”), *Utricularia neottioides* A.St.-Hil. & Girard and *U. oliveriana* Steyerm. (Taylor 1989). *Utricularia oliveriana* reminds one of a typical, tiny terrestrial *Utricularia* species with distinct, spatulate leaves (actually these foliar organs represent modified shoots), bearing the typical bladder traps on stolons and petioles (Fig. 1), whereas *U. neottioides* has greatly modified, finely filamentous leaf-like shoots which gently swiftly move in swift-running waters, and which are practically trap-less (Figs. 2, 3, 4). Yet the flowers are very similar in both species.

Probably the most detailed morphological studies on the exceptional *U. neottioides* have been performed by Luetzelburg (1910). He and Kuhlman (1938) were among the very few botanists who ever found this species with a few traps present, on material collected in Brazil. A few of their specimens are the source of the scarce trap material available, on which subsequent studies (Lloyd 1932, 1942; Taylor 1989) were based. Peter Taylor mentions: “traps few or often apparently absent”, but also that “[...] traps are usually present, as in all other *Utricularia* species, and I have observed them on many of the [...] specimens that I have seen” (Taylor 1989). However Lloyd did not find any traps on the Kew material studied at his time.

*Utricularia neottioides* personally examined by one of us (AF) both in the field at several locations in Brazil and on rich herbarium material did not show a single trap on any of their vegetative organs. This species therefore even has been considered a trap-less, hence “non-carnivorous”, bladderwort (Kamienski 1891; Fleischmann 2011). Furthermore, on all cultivated...
Figure 1: *Utricularia oliveriana* growing attached to sandstone rock in shallow, running water at a river margin, Gran Sabana, Venezuela. Photo by Andreas Fleischmann.

Figure 2: *Utricularia neottioides* growing in a small stream in the Serra do Cabral, Minas Gerais, Brazil. Photo by Andreas Fleischmann.
Figure 3: Shoots of *Utricularia neottioides* from *in-vitro* culture. Scale = 1 mm. Photo by Lubomír Adamec.

Figure 4: The usually trap-less, filamentous leaves of *U. neottioides* in quickly running water, Minas Gerais, Brazil. Photo by Andreas Fleischmann.
specimens, we have never found any traps. However, Luetzelburg (1910) and Lloyd (1932, 1942) studied and illustrated some scattered traps of the species from field-collected Brazilian material. Apparently the material collected by von Luetzelburg and by Kuhlman is among the very few specimens of *U. neottioides* that possess any traps; Taylor (1989) later based his studies and illustrations on two additional, more recently collected specimens with few traps present on leaves and stolons. Lloyd (1932) and Taylor (1989) describe the traps as ovoid (or “streamlined”, following Lloyd 1942) with a deep overhang, ca. 1 mm long, dark brown in color, and apparently normally functioning. The quadrifid trap glands have been illustrated by Lloyd (1942) and Taylor (1989).

Quite in contrast to our observations (and those made by Lloyd 1932 and Taylor 1989), Kuhlman (1938), who studied the species in Brazil on several occasions, reports that this species apparently always bears traps (with three antennae on one side), although in much lower numbers than any other *Utricularia* species.

As perfectly illustrated by Luetzelburg (1910) and Taylor (1989), *U. neottioides* bears stiff, colo-
loid, claw-like rhizoids 0.2-0.4 mm thick, by use of which the plants affix themselves to the bedrock of the streams (Fig. 5). These are located on creeping thick stolons several cm long, which also bear 1-4 cm long, sparsely pinnatisect, filamentous “leaves” (in fact the “leaves” are modified leaf-like shoots, as in all aquatic *Utricularia*; see e.g. Rutishauser & Isler 2001). These leaves are bright green to bronze-colored or red, depending on light levels, and densely covered by long, unicel-
lar, transparent hairs (Fig. 7). Generally, the filamentous leaves (diameter of ca. 60 µm) are truly reminiscent of filamentous green algae, e.g. of the genus *Cladophora*. Interestingly, the “leaves” of *U. neottioides* are not only formed from the stolons in this species (like in all other *Utricularia*), but (uniquely among *Utricularia*) also from the lowermost bracts of the flower scape (Luetzelburg 1910; Fernández-Pérez 1964; Taylor 1989) – this strange morphology is paralleled in the unusual riverweeds (Podostemaceae), likewise rheophytes adapted to very similar habitats.

Not surprisingly, due to the turbulent habitat of *U. neottioides*, the leaves and shoots of this spec-
ies are inhabited comparatively by much fewer periphytic algae, such as desmids (Desmidiaceae), although aquatic *Utricularia* are generally a good habitat for these algae: Förster (1964) found only seven different taxa of desmids growing on *U. neottioides*, while other Brazilian aquatic *Utricu-
laria* had 13-94 different desmid inhabitants (for comparison: five were found on the terrestrial *U.
subulata*).

Flowering in *U. neottioides* is apparently sometimes induced by low water levels (Rivadavia 1991). The scapes can be up to 30 cm long (Taylor 1989; Rivadavia 1993). The cream-white corolla has a deeply trilobed lower lip, and the palate consists only of a shallow ring-like rim, so that the entrance to the tube and spur remains open (as seen in front view, Fig. 6). The flowers of this species (and *U. oliveriana*) have a sweet scent (AF, pers. obs.), which probably attracts a specific pollinator. Seeds are different from all other *Utricularia* (Taylor 1989), probably in adaptation to dispersal and seedling establishment in the demanding riparian habitat. The seeds become mucilaginous when wet (Lloyd 1942; van Steenis 1981) and thus can attach to rocks and stones of the riverbed, especially during the dry season when water levels are low.

Interestingly, a similar rheophytic habit has evolved in parallel in an African lineage of aquatic *Utricularia*, again a species pair (*U. rigida* Benj. and *U. tetraloba* P. Taylor), comprising *U.* section *Avescariaioides* (Taylor 1989). Molecular phylogenetic results show that these two species, which are superficially very similar to *U. neottioides*, are only distantly related to it. Thus, the rheophyte habit indeed evolved independently at least twice in *Utricularia*, and in both cases this happened from terrestrial lineages (Müller *et al.* 2006).
Figure 5: The claw-like rhizoids of *U. neotiioides* which anchor the plant firmly to the sandstone bedrock. Leaves and flower scapes are produced from the thick stolons. Photo by Andreas Fleischmann.

Figure 6: Flowers of *U. neotiioides* from Minas Gerais. Photo by Andreas Fleischmann.
Utricularia neottioides is a so-called “torrenticolous rheophyte” (van Steenis 1981), as all vegetative parts of the plant are permanently submerged in quickly running water, with only the flower stalks produced above the water-line. The plants can form large carpets in suitable habitats, where they are often the only flowering plant inhabiting the stream (Fig. 2). In shallow pools they can remain in full growth during the dry season as a perennial. However in habitats where the streams become fully dry, this species can also grow as an annual. According to Taylor (1989), U. neottioides is distributed across a relatively vast territory of tropical South America: it is recorded from Colombia, Venezuela, Bolivia, and Brazil (majority of states except southern-most). Typical habitats are shallow, swiftly flowing, cool, acidic, dystrophic (“Coca-Cola-colored”, Rivadavia 1996) torrents and streams of mountainous areas, and the plants are affixed only on rocks and stones (predominately sandstone rocks), but never on a soft sediment or sand (AF, pers. obs.). A detailed description of the habitat of this species is given by Rivadavia (1996). The species occurs at altitudes from ca. 300 to 1800 m a.s.l., but is generally restricted to cooler highland waters. The majority of these streams are dark brownish (i.e., dystrophic or humic): this fact can be important both for nutrition of this species and for the requirement of the plants for irradiance. However, at most sites (see Fig. 2), the plants grow under bright sunshine as a result of which the leaves/shoots are red and relatively thick (Figs. 4, 5) – as heliophytes; they have only very rarely been found growing in more shaded habitats (F. Rivadavia, pers. comms.).

Interestingly, the leaves of U. neottioides are often covered by fine filamentous algae (see Fig. 4) bestowing the leaves with a mucilaginous character. Moreover, as opposed to other aquatic Utricularia species growing at the margins of South American streams (e.g. U. oliveriana, U. trichophylla), the sites inhabited by U. neottioides are probably ecologically so extreme that no other aquatic
\textit{Utricularia} species co-occurs. One would guess a very low pH in these dystrophic waters but the only information on pH from some Brazilian sites available is rather surprising (pH 7.8-8.0; Vitor de Miranda, pers. comm.). Moreover, one of us (AF) several times saw \textit{U. neottiioides} surviving also in temporarily, shallow standing pools or ditches remaining from the streams after the water level has sunk in the dry season. Rivadavia (1996; pers. comm.) found the species growing as an affixed aquatic in gravel, red soil, and grey clay. Thus, these findings justify the view that \textit{U. neottiioides} may not be a strict rheophyte and support efforts in cultivation. Its rare occurrence in warm waters in lowlands justifies the view that this species may not be strictly adapted to low temperatures. Fernández-Pérez (1964) classified \textit{U. neottiioides} as having a “habit intermediate between aquatic and terrestrial” – and indeed the two rheophytes of \textit{U.} section \textit{Avesicaria} are closely related to the terrestrial species of the affinity of \textit{U. subulata} (\textit{U.} section \textit{Setiscapella}), but not to any other aquatic species, a fact already concluded by Taylor (1989) based on common morphological traits. This is also supported by molecular phylogenetic results (Müller et al. 2006). Due to its unique habitat and apparently very specific ecological needs, as well as previous failures to maintain wild-collected specimens in cultivation, \textit{U. neottiioides} species has been claimed almost un-cultivatable (Rivadavia 1996).

\textbf{Growth in in-vitro Culture}

Out of several dozens of seeds of \textit{U. neottiioides} collected at Itacambira, Minas Gerais, Brazil, and sterilized by a sodium hypochlorite solution, only one germinated in our in-vitro culture. Nevertheless, that plant grew very vigorously in a sterile tissue culture, in liquid or solid half-strength Gamborg B5 medium (for all cultivation details, see Adamec & Pásek 2009). The plants grow so rapidly under these conditions that an initial plant stock can occupy a whole E-flask in only 1.5-2 months. Therefore, it is comparatively the most rapid in-vitro growing aquatic \textit{Utricularia} species that we know of. As shown in Figs. 3 and 7, in-vitro plants form a net of poorly branched, finely filamentous, light green leaves (leaf diam. ca. 60-75 \textmu m) 2-5 cm long, while the thicker and darker rhizoids and stolons are ca. 0.2 mm wide. Most leaf filaments are terminated by a U-shaped bifurcation (Fig. 7). All shoots are densely covered by long translucent hairs. Neither traps nor inflorescences have ever been formed in-vitro. Basal rhizoids and stolons become black and decay in old in-vitro cultures. The reliable and very rapid growth in-vitro has provided sufficient plant material for some experiments in ex-vitro cultivation.

\textbf{Growth ex-vitro}

We attempted growing \textit{U. neottiioides} in many aquatic cultures, both indoors and outdoors. Fresh shoots of \textit{U. neottiioides} were inserted into several aquaria or bigger plastic containers with humic water, a method used successfully with other aquatic carnivorous plants for years (see Adamec 1999), where sedge (\textit{Carex} spp.) litter was used as the only substrate. The \textit{U. neottiioides} plants were either kept isolated in aquaria, or mixed with other aquatic carnivorous plant species. However, regardless of the indoor or outdoor position of the aquaria and other containers, their volume, irradiance, temperature, water chemistry, presence or absence of other carnivorous species, or bubbling the water gently by air, the \textit{U. neottiioides} shoots quickly became greyish, then died and decomposed completely within only 1-3 weeks. Moreover, aquarium snails \textit{Gyraulus chinensis} (Twisted ram’s-horn) very eagerly grazed the plants. Yet, even when snails were excluded through nylon netting, \textit{U. neottiioides} nonetheless failed to grow. The brighter the natural light was in the setup, the faster the
Figure 8: Terrestrial greenhouse culture of *U. neottioides* on brown peat. The maximum height of the shoots is ca. 2 cm. Photo by Kamil Pásek.

decay occurred. Surprisingly, plants survived relatively better and longer when placed at the bottom of aquaria in deeper shade. Similar to e.g. *U. floridana* shoots, the dense cover of partly hydrophobic hairs on *U. neottioides* shoots renders these hydrophobic. Due to water surface tension, the stolons remain adhered to the water surface. When a small plant fragment was enclosed in a 0.5 liter bottle containing humic water with a high CO₂ concentration, survival was somewhat longer but no new growth was observed.

It has thus become apparent to us that *U. neottioides* cannot be artificially grown as a submerged, freely floating aquatic, for unknown reasons. The same conclusion was also made in the laboratory of V. de Miranda in Brazil (pers. comm.), where again no traps were formed during cultivation trials.

Surprisingly, far better results were achieved when *in-vitro* raised *U. neottioides* shoots were softly placed on the surface of very wet, fibrous brown peat (with or without the addition of quartzitic sand), conditions similar to those used for growing terrestrial carnivorous plants. In a humid greenhouse at 15-25°C and in reduced light (ca. 10-20% light), the initial shoots regenerated within about two weeks, and new growth was observed, yet not as large and vigorous as seen in naturally growing plants – more like a stunted, terrestrial growth of this remarkable aquatic (Fig. 8). We confirmed repeatedly that the regeneration of submerged shoots into newly grown terrestrial ones started as soon as after 5-6 days and proceeded completely very quickly in 2-3 weeks. Evidently, high relative air humidity above the peat substrate is necessary for this regeneration, e.g. in a closed container. In a dry and hot greenhouse, it is possible to put *U. neottioides* shoots on brown peat in a smaller terrarium (2-3 l) which is covered by a translucent lid and which floats on the surface in a larger container filled with water for cooling. Such a thermostatted cultivation works better and
more reliably. The terrestrial *U. neottioides* shoots are much shorter (ca. only 8-18 mm) than the submerged shoots *in-vitro* but are significantly wider (ca. 100-120 μm; Fig. 9). The shape and size of the translucent hairs are very similar.

Repeated transplantations of *U. neottioides* shoots from the *in-vitro* culture onto peat substrate revealed several interesting findings. First, as a result of these transplantations and regenerations, new terrestrial shoots were formed quickly during 1-3 weeks, but further growth stopped completely afterwards. The terrestrial shoots only survived for 5-6 months. The more biomass of *U. neottioides* from *in-vitro* cultures that was placed on the peat, the denser was the resulting terrestrial outgrowth. However, no new biomass was produced: the decomposed *in-vitro* biomass was only transformed into the new terrestrial one.

The same regeneration also occurred when terrestrial shoots were carefully laid onto the peat. Under suitable growth conditions (reduced light to ca. 10-15% of that in the open, 15 to 25°C, high relative humidity), terrestrial culture could survive at a constant state for at least 5-6 months. Nevertheless, after this period, the peat was usually overgrown by filamentous algae or mosses which impaired further plant survival.

Terrestrial cultures of *U. neottioides* confirmed that this species is adapted to lower temperatures. The plants were able to survive a wide temperature range (as daily extremes) between 8 to 35°C and died at temperatures >35°C; suggesting the optimum might be 15-25°C. Similar to the *in-vitro* cultures, flowering and traps have never been observed in plants growing in any *ex-vitro* culture.

Ecophysiological Investigations

Simple investigations were conducted to explain some ecophysiological traits of *U. neottioides* and, thus, to facilitate its cultivation. Using the ‘final pH method’ in 1 mM NaHCO₃ solution (Adamec 1995), the CO₂ compensation point of photosynthesis of shoots taken freshly from the *in-vitro* culture at ca. 22°C was 17.1±1.4 μM (n=6). In a similar study of 13 aquatic carnivorous plant species (Adamec & Pásek 2009), the values of CO₂ compensation points usually ranged within 3 to 8 μM for plants grown both *in-vitro* and *ex-vitro* in containers or aquaria. This means that the photosynthetic CO₂ affinity of *U. neottioides* shoots is rather low and that plants in the wild probably rely on relatively high ambient CO₂ concentration found in fast flowing waters. Furthermore, the aerobic dark respiration rate of *U. neottioides* shoots in an aquarium, measured using an oxygen sensor, was extremely high: ca. 50 mmol kg⁻¹ (fresh weight) h⁻¹. Compared to other relevant data from shoots/
leaves of several aquatic *Utricularia* species (Adamec 2006, 2013), the respiration rate of *U. neottiooides* was around 8-12 times higher! Such a high respiration rate might predetermine plant sensitivity to O₂ shortage in the ambient water. Besides, it also means that a very high net photosynthetic rate is strictly required to counterbalance high respiration rate. Taking into mind the rather low CO₂ photosynthetic affinity of *U. neottiooides*, a very high CO₂ concentration (and possibly high irradiance) may be required in the ambient water for positive growth.

Conclusions

To our knowledge, *U. neottiooides* cannot be grown successfully in any ex-vitro culture for some reasons, but it grows vigorously in an in-vitro culture with 2.5% sucrose solution. Meeting the evident requirement of high CO₂ concentration was not sufficient to keep plants alive. It is probably impossible to fulfill the growth needs of *U. neottiooides*, except maybe if attached to sandstone in a specially designed stream pool aquarium. Considering that this almost trapless species occurs in dystrophic waters and is densely covered by long hairs, it is logical to assume that its nutrition is to a greater extent dependent on absorption of organic substances from the ambient water (e.g., humic acids) or attached filamentous algae. In this way, the necessary nitrogen might be mostly obtained from these special sources in nutrient-poor waters.

*U. neottiooides* and *U. rigida* are the only *Utricularia* species with enormously suppressed trap formation, though the capability for trap formation is kept, as exceptional traps found on the leaves and shoots of these two species show. For this trait, *U. neottiooides* was used as a model trapless species for comparative transcriptomic research (i.e., transcription of functional genes) at the University of South Bohemia at České Budějovice, Czech Republic.

Acknowledgements: This study was partly funded (to LA) by the long-term research development project of the Czech Academy of Sciences (RVO 67985939). Thanks to Vitor O. de Miranda for providing valuable data, to Fernando Rivadavia for helpful discussion, and to Paulo Gonella and Stewart McPherson for common field trips to see these rheophytic species in habitat

References


A FLORAL DESCRIPTION AND IMAGE OF THE RARE NATURAL HYBRID SARRACENIA ×CASEI MELLICHAMP (SARRACENIACEAE)

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Keywords: natural plant hybrids; Sarracenia hybrids, pitcher plant hybrids.

Abstract: Sarracenia ×casei Mellichamp is a rare natural hybrid cross between S. alabamensis subsp. wherryi and S. psittacina. In naming Sarracenia ×casei, Mellichamp (2008) briefly described the floral characteristics of this hybrid from one specimen from its only known locality. The paper provides additional floral information on this hybrid from a new locality discovered by the authors in 2014.

Sarracenia ×casei Mellichamp is a rare natural hybrid cross between S. alabamensis subsp. wherryi (D.E. Schnell) Case & R.B. Case and S. psittacina Michx. Until 2014, it was known only from its type locality north of Deer Park in Washington County, Alabama. However, the present authors discovered a second population in Baldwin County, Alabama (Neyland et al. 2014).

In naming Sarracenia ×casei, Mellichamp (2008) briefly described the floral characteristics of this hybrid from one specimen. Specifically, he stated that the flower is small and that the scape, which is much longer than the leaves, is 35 cm long. Information concerning its floral characteristics and phenology is lacking in the literature. The purpose of this paper is to provide additional floral information on this hybrid. An image is also included (Fig. 1).

Materials and Methods

This study is primarily based on field and specimen observations. Additional information, derived from the literature and from herbarium specimens, augments this study. Specimens were preserved using standard herbarium techniques. A permit for collected material was not required. Taxonomy follows Mellichamp and Case (2009). Herbarium abbreviations follow Thiers (2015).

Results and Discussion

Images of the specimen sheets for the holotype (Mellichamp s.n.) and isotype (Mellichamp s.n.) of Sarracenia ×casei were kindly

Figure 1: Image of Sarracenia ×casei flower at full anthesis.
supplied by the UNCC and NCU herbaria respectively. Leaves and a single flower are present on the holotype sheet. Only leaves are present on the isotype sheet. From the present study, herbarium specimens (leaves only) are housed in the LSU (Neyland 2478) and NCU (Neyland 2478) herbaria. The single floral specimen is housed at LSU (Neyland 2483).

The following was derived from the sole flower present in the newly discovered population (Fig. 1). Overall, the flower, when compared to those of most other taxa in the genus may indeed be characterized as small. For reference, the flower closely resembles, in size and color, that of Sarracenia psittacina.

Specifically, the calyx is 2.1 cm wide. The sepals averaged 2.3 cm long x 1.8 cm wide. Each is ovate, glossy, and maroon red. Three sepals exhibited yellow flecking. The petals averaged 2.5 cm x 0.8 cm wide. They are spatulate, involute, satin textured, and maroon red. The style is 0.9 cm wide. The flower was first at full anthesis on April 19, 2015 and bore no appreciable scent. It is noted that the date on Mellichamp’s holotype is August 7, 1985. Therefore, it appears that the flower on that herbarium sheet is well past anthesis. The scape on the newly collected specimen measured 36 cm long whereas, the holotype scape measured 35 cm.

References
A FLORAL DESCRIPTION AND IMAGE OF THE UNCOMMON NATURAL HYBRID 
SARRACENIA × NACZII MELLICHAMP (SARRACENIACEAE)

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Keywords: natural plant hybrids; Sarracenia hybrids, pitcher plant hybrids, Sarracenia ×naczii.

Abstract: Sarracenia ×naczii Mellichamp is an uncommon natural hybrid cross between S. rosea 
and S. flava. In naming Sarracenia ×naczii, Mellichamp (2008) briefly described the floral characteristics of this hybrid. This paper provides additional floral information on this hybrid from the type locality.

Sarracenia ×naczii Mellichamp is an uncommon natural hybrid cross between S. rosea Naczi 
and S. flava L. Confined to several counties in northwestern Florida, the type locality is located in a small roadside bog in Escambia County.

In naming Sarracenia ×naczii, Mellichamp (2008) briefly described the floral characteristics of this hybrid. Specifically, he stated that the flower is typically pale yellow with a pink cast. Additional information concerning its floral characteristics and phenology is lacking in the literature. The purpose of this paper is to provide additional floral information on this hybrid. An image is also included (Fig. 1).

Materials and Methods

This study is primarily based on field and specimen observations. Additional information, derived from the literature and from herbarium specimens, augments this study. Specimens were preserved using standard herbarium techniques. A permit for collected material was not required. Taxonomy follows Mellichamp and Case (2009). Herbarium abbreviations follow Thiers (2015).

Results and Discussion

Images of the specimen sheets for the holotype (Mellichamp s.n.) and isotype (Mellichamp

Figure 1: Sarracenia ×naczii flower at full anthesis.
s.n.) of *Sarracenia ×naczii* were kindly supplied by the UNCC and NCU herbaria respectively. Only leaves (no flowers) are present on these sheets. From the present study, herbarium specimens (leaves only) are housed in the LSU (Neyland 2454) and NCU (Neyland 2454) herbaria. The single floral specimen is housed at LSU (Neyland 2481).

From the type locality, several individuals were in bloom in 2015. The following data were derived from a single representative flower from the type locality (Fig. 1). Overall, the flower, when compared to others in the genus may be considered medium sized. For reference, the flower closely resembles in size that of *Sarracenia ×mitchelliana* G. Nicholson. Specifically, the calyx measured 5.5 cm wide. The sepals averaged 2.3 cm long × 1.8 cm wide. Each is ovate, and flat (not glossy) rose colored. The petals averaged 5.6 cm long × 2.1 cm wide. They are spatulate, satin textured and the same color as the sepals. A few small white spots appear on each petal. The style is 5.9 cm wide. The flower was first at full anthesis on March 30, 2015 and bore a sweet-musty scent. The scape measured 32 cm long. None of the flowers from this population appeared pale yellow as described by Mellichamp.

References
Accurate labeling of Australian *Drosera* in cultivation

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Keeping up with the correct botanical names for the full roster of Australian *Drosera* has been a complex task over the past 20 years, consequently many plants in cultivation have been incorrectly labeled and continue to be so today. One need only follow the various Groups on Facebook or CP Forums to see a large number of incorrectly named taxa regularly being posted, particularly Pygmy *Drosera*, and countries where English is not the first language. This is hardly surprising given the number of new species described, subspecies being elevated to species rank, name changes for existing species, and plants entering cultivation with location names or affinities to existing species while the taxonomic work was done to ascertain their correct status. Added to this, the fact that most of this has been carried out in English and in Journals that are not always available to the hobbyist, has further clouded the issue. Since the original 3 Volume work by Allen Lowrie, Carnivorous Plants of Australia, was released, there have been a number of partial revisions of the species roster in that publication by Lowrie, a complete attempt to revise the roster by Jan Schlauer in 1996, which saw many species reduced to sub species, and a few new species described by other authors (Gibson, Schlauer, and Mann). The result of this has been confusion to say the least, even for those of us that have been following the changes closely. The release of Magnum Opus by Lowrie in 2014, has gone a long way to clearing up this confusion, with exhaustive field work, literature reviews, and herbarium studies, that have cleared up previous errors, matched the correct type material to plants that had been elusive in the field, and also ensuring that the first published name of a species stands as the correct name. The roster of names published in Magnum Opus and reproduced in this issue of CPN is at this time the most up to date. Although new species will be added from time to time, this benchmark work should set the standard that we should all follow for the correct naming of Australian *Drosera*. Below is a list of name changes as a result of Magnum Opus that are not obvious and if read in conjunction with Lowrie’s roster, should clear up any confusion and allow plants in cultivation to be correctly labeled.

<table>
<thead>
<tr>
<th>Former name</th>
<th>New name</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Drosera dichrosepala</em></td>
<td><em>Drosera verrucata</em></td>
<td>The real <em>Drosera dichrosepala</em> has been recently rediscovered and is not widely in cultivation.</td>
</tr>
<tr>
<td><em>Drosera parvula</em></td>
<td><em>Drosera minutiflora</em></td>
<td><em>Drosera parvula</em> was an invalid name and is now in synonymy.</td>
</tr>
<tr>
<td><em>Drosera paleacea</em> subsp. <em>paleacea</em></td>
<td><em>Drosera micrantha</em></td>
<td>The real <em>Drosera paleacea</em> has been recently rediscovered and is not widely in cultivation.</td>
</tr>
<tr>
<td><em>Drosera microphylla</em> “white flowers”</td>
<td><em>Drosera esperensis</em></td>
<td></td>
</tr>
<tr>
<td><em>Drosera microphylla</em> var. <em>macropetala</em></td>
<td><em>Drosera calycina</em></td>
<td></td>
</tr>
<tr>
<td><em>Drosera menziesii</em> subsp. <em>penicellaris</em></td>
<td><em>Drosera drummondii</em></td>
<td></td>
</tr>
</tbody>
</table>
Keywords: Australian carnivorous plants, Australia's carnivorous plants roster, Byblidaceae, Byblis, Cephalotaceae, Cephalotus, Droseraceae, Aldrovanda, Drosera, Nepenthaceae, Nepenthes, Lentibulariaceae, subgenus Polypompholyx, subgenus Utricularia.

Carnivorous Plants of Australia Magnum Opus. First Published: 16 December 2013 [Kew Library & Index Kewensis accessions listed as “December 2013”].

BYBLIDACEAE


Type: NORTHERN TERRITORY. “On Redcliffe Road, ca. 1 km north of the junction with Elizabeth Valley Road, Noongarah, Northern Territory, 12° 44' S, 131° 03' E, 28 April 1995, A. Lowrie 1117” (holo: PERTH 04658906; iso: DNA, MEL).


Lectotypification. The lectotype consists of four specimens 12.9 cm tall, near the top on their own sheet. The isolectotype is a single specimen of a similar height, labeled Byblis filifolia from the same collection of Bynoe on a shared sheet with “B. liniflora, Gulf of Carpentaria (remaining hand written notes unclear)” and “B. filifolia, Sturt’s Creek, F. Mueller.”

3: Byblis gigantea Lindl. A Sketch of the Vegetation of the Swan River Colony; xxii. (1839).

Type: WESTERN AUSTRALIA. “Swan River, N [New] Holland [Western Australia], no date, Drummond s.n.” ex Herb. Lindl. in Herb.Hook. (lectotype: K, here designated, left hand element; isolectotype: K, here designated, right hand element); Swan River. 1839. Drummond s.n. ex Herb. Lindl. in Herb. Benth. (lecto: K; isolecoto: K).


Lectotypification. There are two Drummond Byblis sheets at Kew labeled Herb Hook., only one of which corresponds to Planck’s description for B. gigantea. That specimen has two elements on the sheet, and the left hand piece has been selected as the lectotype, with the right hand element regarded as an isolectotype. The other Herb. Hook. sheet fits closely to Planck’s B. lindeleyana, (named in honour of the British gardener, botanist, and pioneer Orchidologist John Lindley 1799–1865) and has thus been designated by Conran, Lowrie & Moyle-Croft as the lectotype for that epithet. These are listed above as isolectotypes.


6: Byblis liniflora Salisb. The Paradisus Londinensis t. 9 (1808).
Type: “Illustration tab. 95 in Salisbury & Hooker” (loc. cit.) as *Psyche liniflora* Salisb. nom. inval.


Type: QUEENSLAND. “in Novae-Holl. tropicae ora orientali ad Endeavour river; Banks et Soland. in herb. Mus. Brit. [Australia: Endeavour River, Queensland, Banks & Solander s.n., 1770]” (holo: BM).


Type: WESTERN AUSTRALIA. “Red Rock, 10 km south of Indee Cattle Station south of Port Hedland, Pilbara, 20°52’29.4” S, 118°35’22.8” E, Allen Lowrie 4007 & Gordon Graham, 19 July 2009” (holo: PERTH; iso: MEL.).


Type: “200 metres south-south-east of Beverley Springs Station homestead, Kimberley, Western Australia, 16°43’05” S, 125°27’32” E, 8 February 1996, R.L. Barrett 825.” (holo: PERTH 04658892; iso: DNA, MEL).

**CEPHALOTOTACEAE**


**DROSERACEAE**

1: *Aldrovanda vesiculosa* L. *Species Plantarum* 1: 281 (1753) [1 May 1753].

Type: ITALY & INDIA. “Habitat in Italiae [Italy] & Indianae [India] paludosus [swamps]. *D. Monti*,” n.v.

*Aldrovanda vesiculosa* var. *australis* Darwin. *Insectivoros Plants* : 328 (1876).

Type: “Dried leaves of this plant from Queensland in Australia were sent me by Prof. Oliver from the herbarium at Kew.”


Type: “Rockhampton, P. O’Shanesy” (syn: photo K, MEL.).


Type: SOUTH AUSTRALIA. “HOLOTYPUS. AUSTRALIA. In red loam soils in mallee scrub country west and east of Sherlock, 19 July 1991, D. E. Murfet 1059 (PERTH); iso: RSA.” (holo: PERTH; iso: RSA).


Type: QUEENSLAND. “rivum Dalrymple’s Creek sinui Rockingham Bay affectum, nec non in locis scaturiginosis montium circumjacentium. *Dallachy s.n.*” (iso: MEL).


Type: WESTERN AUSTRALIA. “Western Australia, Brand Highway, 1.3 km N of Hill River, in loam or sandy clay soils around the margins of wet depressions amongst low heath, A. Lowrie 87/056, 7/11/87 [7 November 1987] (holotypus PERTH).” (holo: PERTH).


5: *Drosera androsacea* Diels. *Botanische Jahrbucher fur Systematik* 35 (2): 205, fig. 25 (1904) [6 Dec 1904].

Type: WESTERN AUSTRALIA. “In distr. Stirling hauld procoul a visco Cranbrook in apertis glareosis flor. m. Sept. exeunte (D. 4471)” (lecto: fide Diels, B).

Type: WESTERN AUSTRALIA. “15 km W of Kununurra, Kimberley, Western Australia, 15° 46' 15" S 128° 37' 11" E. A. Lowrie 1111, 26 April 1995” (holo: PERTH; iso: DNA, Herbarium Lowrieanum).

Type: “summit of Mt Arthur Mr Gunn, (n. 139.) [Type number should read 129]” sensu Diels 1906 “Mount Arthur (Gunn n. 129…)” type sheet [bottom collection] hand notation “summit of Mt Arthur, Van Dn’s [Diemen’s] Land, 129. W. Gunn 1832” (holo: K 000215043).

Type: WESTERN AUSTRALIA. “Grevillea Creek crossing, Beverley Springs Station, Kimberley, Western Australia, 16° 29' 23" S, 125° 21' 11" E, Allen Lowrie 1193, 7 June 1995” (holo: PERTH; iso: DNA; MEL; Herbarium Lowrieanum).

Type: NEW SOUTH WALES. “Australia: New South Wales: ‘prope Sydney’, Herb. Sieber No. 176 (K215087 - right specimen); isoleceto. (K215087 - left specimen).” (lecto: K; isoleceto: K, selected by Gibson, Conn & Bruhl (2012)).


Type: WESTERN AUSTRALIA. “Western Australia: Hopetoun-Ravensthorpe Road, 43 km S of Ravensthorpe, in sandy soils overlaying laterite, often amongst laterite pebbles, A. Lowrie 87/108, 16/10/1987 (holo: PERTH)” (holo: PERTH).

Type: WESTERN AUSTRALIA. “in hort. europ., [from plants cultivated at Wembdon, Somerset in 1989; origin Western Australia: [location erroneously recorded as Lake Badgerup by the Australian discoverer, Steve Rose, in 1977. True location is Lake Jandabup, 31° 45’ 05.98” S, 115° 50’ 29.48” E] M. Cheek 1995” (holo: K; iso: BM, PERTH, RNG).


13: Drosera banksii R.Br. ex DC. Prodrumus Systematis Naturalis Regni Vegetabilis 1: 319 (1824) [mid Jan 1824].
Type: QUEENSLAND. “in Nova Hollandia prope Endeavour-river. (v.s. in h. Banks.)” (holo: BM. BM000752959).


Type: WESTERN AUSTRALIA. “Grevillea Creek crossing, Beverley Springs Station, Kimberley, Western Australia, 16° 29’ 23" S, 125° 21’ 11” E, Allen Lowrie 1207, 7 June 1995” (holo: PERTH; iso: DNA; MEL; Herbarium Lowrieanum).

Type: WESTERN AUSTRALIA. “Western Australia, Wongan Hills, W of the Agriculture Dept., in sandy clay in winter-wet depressions amongst low shrubs, A. Lowrie 12/8/84 [12 August 1984] (holotypus PERTH),” (holo: PERTH)

Type: WESTERN AUSTRALIA. “In deep white silica sand between low shrubs on heathland, on floodplain of the upper Philips River, 2.3 km from the Hyden-Ravensthorpe Road, 25 Sept. 1990, A. Lowrie [s.n.] (PERTH),” (holo: PERTH).


Drosera dichotoma Banks & Solander ex Sm. Rees’ Cyclopaedia xii. (1809).
Type: “from New South Wales.” (holo: n.v.).


Type: WESTERN AUSTRALIA. “ca. 280 m west of Reserve Road, Muchea, 31° 31' 38.07” S 115° 59' 44.13” E, Allen Lowrie 2160, 24 October 1998” (holo: PERTH iso: MEL; Herbarium Lowrieanum).

Type: NORTHERN TERRITORY. “Whistle Duck Dreaming, Kakadu National Park, Northern Territory, 11 April 1990, A. Lowrie 56” (holo: PERTH 04223624; iso: CANB, DNA, MEL).

Type: Western Australia: “Lake Campion, northeast of Broome, Western Australia, 21 April 1995, A. Lowrie 1089” (holo: PERTH 04223675; iso: CANB, DNA, MEL).

Type: WESTERN AUSTRALIA. “0.9 km south of the rock cairn on Hatters Hill goldmine, 0.1 km west of the road on the summit of a granite outcrop, Western Australia, Allen Lowrie 99, 2/9/90” (holo: PERTH; iso: MEL, RSA).

Type: WESTERN AUSTRALIA. “Coolup, Murray R. [River], (R. Helms). Wetflats, Lower Canning R. [River], A. Morrison [s.n.], 28 Sept. 1898” (syn: K, BRI, MEL.).


Drosera burmannii DC. Prodromus Systematis Naturalis Regni Vegetabilis (DC.) 1: 318 (1824) [mid Jan 1824].
Type: SRI LANKA “Habitat in Zeylona.” (holo: n.v.).


Drosera burmannii var. dietrichiana (Rechb.f.) Diels. Das Pflanzenreich 26: 76 (1906).
Type: none given, but Reichenbach’s article is titled “Bemerkungen zu der Flora von Brisbane river.”

Type: WESTERN AUSTRALIA. “On the road from Beverley Springs to Pantijan, 15 km N of the Charnley River crossing (74 km N of Beverley Springs) in the Edkins Range, Kimberley, Western Australia, 16° 03’S, 125° 23’E, January 1995, R. & M. Barrett s.n.” (holo: PERTH 04223640; iso: CANB, DNA, MEL).

Type: WESTERN AUSTRALIA. “Chidlow-York Road (Great Southern Highway) 15 km E of Great Eastern Highway, in laterite soil, A. Lowrie 83/038, 9/10/83 [9 October 1983] (holotypus PERTH).” (holo: PERTH).

Type: WESTERN AUSTRALIA. “Drummond in herb. Hook. et Soc. Linn. Londres.” (holo: MPU;
Drosera calycinca var. minor Benth. Flora Australiensis 2: 469 (1864).
Type: WESTERN AUSTRALIA. “Between Moore and Murchison Rivers, Drummond 6th Coll. n. 110,” (holo: K000215038, K; iso: MEL).

Drosera microphylla var. macropetala Diels. Das Pflanzenreich 26: 121 (1906).

Type: WESTERN AUSTRALIA. “Carbarup, beside railway line, 34° 33′ 58.66″ S, 117° 41′ 52.23″ E, 10 October 2001, Allen Lowrie 2733.” (holo: PERTH; iso: MEL).

Type: WESTERN AUSTRALIA. “in deep yellow sand between low shrubs on Brand Highway, 24 km S of Regan’s Ford, 9 October 1983, A. Lowrie 83/011 (PERTH; Iso: RSA).” (holo: PERTH, iso: RSA).

Type: “(origin Western Australia via A. Lowrie to Hennern) ex. cultivation. Hennern, Schlauer 536” (holo: FRP).


Type: WESTERN AUSTRALIA. “Darling Range E of Perth on O’Brien Road, 5 km N of Toodyay Road, in loam-laterite soils in jarrah forest, A. Lowrie 84/081, 10 June 1984 (holotypos PERTH).” (holo: PERTH).


Type: WESTERN AUSTRALIA. “Gibb River Rd, N of Adecock Gorge, Kimberley, Western Australia, 16° 53′ 59″ S, 125° 47′ 02″ E, Allen Lowrie 2542K, 5 August 2000” (holo: PERTH iso: DNA; MEL; Herbarium Lowrieanum).

Type: NORTHERN TERRITORY. “0.9 km south of Temple Avenue, Palmerston, Northern Territory, Australia, 8 April 1990, A. Lowrie 49.” (holo: PERTH 04223659; iso: CANB, DNA, MEL).


Type: “Silent Grove camping area, Kimberley, Western Australia, 5 June 1995, A. Lowrie 1182.” (holo: PERTH 04223667; iso: DNA, MEL).

Drosera scropioides var. brevipes Benth. Flora Australiensis 2: 460 (1864).
Type: WESTERN AUSTRALIA. “Nova Hollandia. Drum. Coll. V. n. 284.” [James Drummond 284, no date, two groups with same collection number, on same sheet, upper group of three specimens labeled “Swan River to Cape Riche” and stamped “Herbarium Benthamianum 1854” K000215090,
the lower group of 4 specimens labeled “Swan River” and stamped “Herbarium Hookerianum 1867;” K000215049 (iso: K).

   **Type:** NORTHERN TERRITORY. Australia. **NORTHERN TERRITORY.** Howard River Estuary, near Darwin, February 6, 1982, *D.Falconer s.n.* [Holotype: Herbarium of Faculty of Integrated Arts and Sciences, Hiroshima University (Kondo 2234); Isotypes: NCU, NY, NSW, BRI].” (holo: Hiroshima University; iso: NCU, NY, NSW, BRI).

   **Type:** WESTERN AUSTRALIA. “cum praeecedente; Drummond in herb. Hook”

*Drosera penicillaris* Benth. *Flora Australiensis* 2: 467 (1864) [October 1864]. **Lectotype:** Western Australia: “Drummond coll. III. n. 44.”


   **Type:** WESTERN AUSTRALIA. “SW Western Australia, J.Drummond s.n.” (lectotype: fide Diels 1906; isotype: K000215059, fide Marchant & George (1982).


   **Type:** WESTERN AUSTRALIA. on Jurien Road East, 27.9 km W of Brand Highway in white silica sand soils on low open heathland, 2 November 1987, *A. Lowrie* 87/053 (holo: PERTH).

   **Type:** WESTERN AUSTRALIA. “Western Australia, NE of Augusta, at the junction of Courtney Road and Scott River Road, in black peaty sand on the margins of swamps, *A. Lowrie* 83/049, 9/11/83, (holotypus PERTH).” (holo: PERTH).


   **Type:** WESTERN AUSTRALIA. “Western Australia, 30 km S of Mt Magnet, in quartz grit and loam soils in winter-wet creeks and in open ground, *A. Lowrie* 84/072, 1/7/84 [1 July 1984] (holotypus PERTH).” (holo: PERTH).

   **Type:** WESTERN AUSTRALIA. “Western Australia, ca. 20 km NW of Walpole, by southwestern Highway, in gritty loam on granite outcrop aprons, *A. Lowrie* [s.n.] 16/9/85 (holotype PERTH).” (holo: PERTH).

   **Type:** WESTERN AUSTRALIA. “south Western Australia”, *J. Drummond s.n.* (holo: CGE).


Type: NORTHERN TERRITORY. “AUSTRALIA. NORTHERN TERRITORY. a small population along the Fenris [Finness] River, April 28, 1982, D. Falconer s.n. Holotype: Herbarium of Faculty of Arts and Sciences, Hiroshima University (Kondo 2227); Isotypes: NCU, NY, NSW, BRI.” (holo: Hiroshima University; iso: NCU, NY, NSW, BRI).


Drosera angustifolia F.Muell. Transactions of the Philosophical Society of Victoria 1: 7 (1854).

Type: QUEENSLAND. “Mill Stream Falls, Ravenshoe, E.W. Vick. (June, 1913).”

Type: WESTERN AUSTRALIA. “east bank of Lily Creek, Kununurra, Kimberley, Western Australia, 15° 46’ 40” S, 128° 45’ 02” E, Allen Lowrie 2542K, 8 August 2000” (holo: PERTH; iso: MEL, DNA, Herbarium Lowrieanum).


Type: WESTERN AUSTRALIA. “Western Australia, ca. 2 km N of Brennans Ford, on Scott River Road, in black sandy soil on margins of swamps on higher ground than average water level, A. Lowrie s.n. 16/9/84 [16 September 1984]” (holo: PERTH).

Type: WESTERN AUSTRALIA. “Stirling Range National Park, Western Australia, 11 November 2006, P. Mann 06/001” (holo: PERTH 07220731; iso: CANB, K, UNE).

56: Drosera gigantea Lindl. A Sketch of the Vegetation of the Swan River Colony; 20 (1839).
Type: WESTERN AUSTRALIA. “Swan River, J. Mangles s.n.” (iso: CBE).

Type: WESTERN AUSTRALIA. “beside Grevillea Creek, Synnot Range, ca. 25 km north west of Beverley Springs Homestead, Kimberley, Western Australia, 16° 29’ 20.69” S, 125° 21’ 08.21” E, Russell L. Barrett 581, 18 April 1993” (holo: PERTH iso: MEL, DNA, K, Herbarium Lowrieanum).


Drosera patellifera (Planch.) Diels. [nom. inval., pro. syn.]. Das Pflanzenreich 26: 76 (1906).


Drosera peltata var. gracilis (Planch.) Benth. Flora Australiensis 2: 465 (1864).
Type: TASMANIA. “in insula Van Diemen, loco dicto Formosa, ad Arthur’s lake alt. 3388 ped., Hampshire hills; Gunn, no. 784, forsan etiam in Novae Cambriae crescit; quippe specimen vidi in herb. Smith cum D. peltata commixa.” (holo: K, iso: HO).

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_Type_: WESTERN AUSTRALIA. “At the east end of Baanga Hill road, near the junction of Sennetts Lake Road, ca. 20 km east of Lake King township, Western Australia, Allen Lowrie s.n. 25/9/89 [25 September 1989]” (holo: PERTH, iso: MEL).


_Type_: WESTERN AUSTRALIA. “I found this plant, in December, 1902, flowering in good quantity in a large swamp, about 1.5 miles [ca. 2 km] North of Albany, in company with Dr. Diels new species of Microtis [orchid] [C.R.P.Andrews s.n.]” (iso: K, NSW, PERTH).


_Type_: WESTERN AUSTRALIA. “Western Australia, Great Northern Highway, ca. 3 km N of Bullsbrook, in sandy soils mixed with laterite in winter wet depressions, A. Lowrie 83/045, 22/11/83 [22 Nov. 1983]” (holo: PERTH).


_Type_: WESTERN AUSTRALIA. “Habitat in solo turfoso-arenoso planitiei prope oppidulum Albany (Herb. Preisss. no. 1979)”.

Sondera preissii Lehmann. *Novarum et minus Cognitarum Stirpium Pugillus* 8: 45 (1844) [Apr 1844].

_Type_: WESTERN AUSTRALIA. “Crescet prope oppidulum Perth in locis depressis ex siccati ad fluvium Cygnorum (Herb. Preisss. no. 1989)” (iso: MEL, S).


_Type_: TASMANIA. “in insula Van Diemen loco dicto Formossa; R.C. Gunn., no. 1027, 7 Dec. 1842” (lecto: K215054 [top row, middle specimen]; isolecto: K (remaining specimens of K215054) [selected by Gibson, Conn & Conran (2010)])

68: *Drosera hugelii* Endl. *Enumeratio plantarum quas in Novae Hollandiae era austro-occidentali ad fluvium Cygnorum et in Sinu Regis Georgii collegit Carus liber baro de Hugel*; 6 (1837) [Apr 1837].


_Type_: WESTERN AUSTRALIA. “King Georges Sound. (Hügel).”, [Hügel was at King Georges Sound from 1–12 Jan. 1834, no precise location, date or number was recorded for this gathering.] (holo: W).


_Type_: “Nova Hollandia. Drum. V n. 280.”


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Type: WESTERN AUSTRALIA. “cum precedente; Drummond in herb. Hook. [south-west Western Australia, J. Drummond s.n.]” (iso K).


Type: WESTERN AUSTRALIA. “Western Australia, O’Brien Rd, ca. 6 km north of Toodyay Rd, in laterite and silica sand soils in open forest, A. Lowrie 83/012, 8/11/83 [8 November 1983] (holotypus PERTH).” (holo: PERTH).


Type: WESTERN AUSTRALIA. “cum precedente; Drummond in herb. Hook. [southwest Western Australia, J. Drummond 2nd coll. 7, in herb. Hook.]” (holo: K).

Drosera menziesii var. flavescens Benth. Flora Australiensis 2: 468 (1864).

Type: WESTERN AUSTRALIA “W. Australia, Drummond, 2nd Coll. n. 7; Hill and Vasse rivers, Oldfield. [southwest Western Australia, J. Drummond 2nd coll. 7, in herb. Hook.]” (syn: [Vasse River collection] K).


Type: QUEENSLAND. “Near Mareeba, Cape York Peninsula, March 28, 1982, leg. P.S. Lavarrack s.n. [Holotype: Herbarium of Faculty of Integrated Arts and Sciences, Hiroshima University (Kondo 2149)].” (holo: Hiroshima University).


Type: QUEENSLAND. “Queensland: Savannenwäldern bei Mareeba Sowe Bei Chillagoe auf halbnackten Stellen in Gesellschaft zahlreicher Annuellen (DOMIN II. 1910).” (holo: n.v.).


Type: WESTERN AUSTRALIA. “In loamy laterite soils on open areas with dwarf jarrah (Eucalyptus marginata) woodland on the higher scree slopes, top of crest, west end of the Porongurup Range, Porongurup, 25 November 1991, Allen Lowrie 523 (PERTH); Isotype: RSA” (holo: PERTH; iso: RSA).


78: Drosera leucoblusta Benth. Flora Australiensis 2: 458 (1864) [5 Oct 1864].

Type: WESTERN AUSTRALIA. “Drummond 2nd Coll. n. 14” (syn: K); “dry sandy flats, Kalgan river, A. Oldfield s.n.” (syn: MEL).

Lectotype: WESTERN AUSTRALIA. “Südwest-Australien: o. n. o (Drummond II. Coll. n. 12...)” (fide Diels 1906: 70). (lecto: MEL).


Type: WESTERN AUSTRALIA. “Western Australia, Brand Highway, 14.3 km NW of Cataby, in silice sand soils mixed with leaf litter humus under and between low heath, A. Lowrie 85/084, 29 September 1985 (holotypus PERTH).” (holo: PERTH).


_Type:* WESTERN AUSTRALIA. “Western Australia, Purna Rock, near Hyden-Ravensthorpe Rd, in loam soils covered with moss on the aprons of granite outcrops in the wet zones *A. Lowrie [s.n.] 12 September 1984 (holo: PERTH)***.

**81: Drosera lunata** Buch.-Ham. Ex DC. Prodrorum Systematis Naturalis Regni Vegetabilis 1: 319 (1824).


*Drosera peltata* var. *typica* C.B.Clarke. *The Flora of British India* 2 (5): 424–425 (1878);

*Drosera nipponica* Masam. *Transactions of the Natural History Society of Taiwan* 23: 207 (1933);


*Drosera peltata* var. *multisepala* Y.Z.Ruan. *Acta Phytotaxonomica Sinica* 8: 341–343 (1981);


_Type:* NEPAL. “in Indiâ Orientali circa Sembu,, Buchanan s.n., 19 July 1802 (BM725951)” (lecto: BM; selected by Gibson, Conn, & Bruhl (2012))

**82: Drosera macrantha** Endl. *Enumeratio plantarum quas in Novae Hollandiae ora austro-occidentali ad fluvium Cygnorum et in Sinu Regis Georgii collegit Carous liber baro de Hugel: 6 (1837) [Apr 1837].


_Type:* “Südwest-Australien: o.n.O. (Burges [s.n.]-Original der Varietät).” (holo: ?B).

**83: Drosera macrophylla** Lindl. *A Sketch of the Vegetation of the Swan River Colony: xx* (1839).


_Type:* Western Australia: “Südwest-Australien: im Irwin-Gebiet bei Mingemew am lehmigen Ufer einer Wasserflur, blühe und ver Anfang Juni (Diels n.
Type: WESTERN AUSTRALIA. “Australia. West Australia: [no date], Cheek 2064 [from European cultivated material]” (holo: K; iso: PERTH, CANB, P).


88: *Drosera menziesii* R.Br. ex DC. Prodromus Systematis Naturalis Regni Vegetabilis 1: 319 (1824) [mid Jan 1824].

*Drosera menziesii* var. menziesii Benth. Flora Australiensis 2: (1864).


Type: WESTERN AUSTRALIA. “in Novā-Hollandiā. (v.s.)”

*Drosera filiculsis* Endl. Enumeratio plantarum quas in Nova Hollandiae ora austro-occidentali ad fluvium Cygnorum et in Sinu Regii Georgii collegit Carous liber baro de Hugel: 6 (1837) [Apr 1837].
Type: WESTERN AUSTRALIA. “King Georges Sound, W.A., Hügel s.n.” (iso: W).


Type: WESTERN AUSTRALIA. “King Georges Sound. (Hügel),” [Hügel was at King Georges Sound from 1–12 Jan. 1834, no precise location, date or number was recorded for this gathering.] (holo: W).


93: *Drosera miniata* Diels Botanische Jahrbucher fur Systematik 35 (2): 206, fig. 26 (1904) [6 Dec 1904].

Type: WESTERN AUSTRALIA. “in colonia fluminis Cygnorum [Swan River Colony], Drummond in herb. Hook.”, no date, J. Drummond s.n. (holo: K).


Type: WESTERN AUSTRALIA. “Holotype: AUSTRALIA. In loam soils that dry out to become hard in summer, near truck bay on the north side of the York-Merredin Highway near Ettijnyn, ca. 5 km west of Bruce Rock, 11 August 1990, Allen Lowrie 100 (PERTH); isotype: RSA.” (holo: PERTH; iso: RSA).


Drosera monticola (Lowrie & N.G.Marchant.) Lowrie [comb. nov., nom. inval.] Nuytsia 15 (3): 365–367, Figs 3, 11, 14 (2005). This name at this time was invalid because the reference to the basionym was indirect, as the pagination of the whole publication was given rather than an exact beginning page reference.

Type: Western Australia: “Summit of Toolbrunup Peak, Stirling Range National Park, Western Australia, 14 November 1989, P. Mann s.n. (holo: PERTH 02642964).” (holo: PERTH).


Drosera subhirtella var. moorei Diels. Das Pflanzenreich 26: 119 (1906)

Type: WESTERN AUSTRALIA. “Inneres Südwest-Australien: Coolgardie bei den Nine-mile rocks; Bullabulling, blüh in September (Spencer Moore – Original der Varietät!).” [Nine-mile Rocks near Coolgardie, Western Australian Goldfields, Western Australia, September 1895, S. Moore s.n. “(lecto: K; (designated by Lowrie 1999)); “Bullabulling, Western Australia, September 1895, S. Moore s.n.” (paralecto: K].


Type: WESTERN AUSTRALIA. “in Novae-Holl. extratrop. ora orientali ad flumen Cygnorum; Drummond in herb. Hook. [Swan River, W.A., „J. Drummond s.n.]” (holo: MPU; iso: K)


Type: NORTHERN TERRITORY. “on Fog Bay Rd, Dundee Downs, 12° 48’ 10.8” S, 130° 29’ 59.3” E, Allen Lowrie 4330 & Denzel Murfet, Richard Nunn, Greg Bourke, 16 April 2013” (holo: PERTH iso: MEL; DNA; NSW; K; Herbarium Lowrieanum).

102: Drosera neesii Lehm. Novarum et Minus Cognitarum Stirpium Pugillus 8: 42 (1844) [Apr. 1844].

Sondera neesii var. neesii (Lehm.) Benth. Flora Australiensis 2: 466 (1864) [Oct. 1864].


Type: WESTERN AUSTRALIA. “in colonia fluminis Cygnorum; Drummond in herb. Hook” [Swan River Colony, southwest Western Australia, J. Drummond s.n.] (iso: K; MPU).


Type: WESTERN AUSTRALIA. “Western Australia, beside the Midlands Road, 37.3 km southeast of Carnamah, ca. 10 km SE of Coorow township, 22 Sept. 1990, A. Lowrie 278 (PERTH; iso: RSA).” (holo: PERTH; iso: RSA).


*Type*: WESTERN AUSTRALIA. "Sudwest-Australien: o.n.O. (Drummond s.n. Original der Art!).", [no date], *James Drummond s.n. [Kew negative No. 15707]* (iso: B†).


*Type*: WESTERN AUSTRALIA. "Western Australia, Great Southern Highway, 7.5 km S of Pingelly, in deep white sand around the margins of winter wet depressions, *A. Lowrie* 87/073, 9/11/87 [9 November 1987] (holotypus PERTH)." (holo: PERTH).


*Type*: WESTERN AUSTRALIA. "Western Australia, Bindoon-Moora Highway, 1.3 km N of Gillingar, in sandy clay soils and winter-wet depressions, *A. Lowrie* 10/6/86 (holotypus PERTH)" (holo: PERTH).


*Type*: WESTERN AUSTRALIA. "Weaber Plains Road, 7.6 km north from Hidden Valley Caravan Park, Kununurra, Western Australia, *A. Lowrie* 4, 1 April 1988" (holo: PERTH 03391175; iso: BRI, DNA, CANB, MEL, NSW).


*Type*: WESTERN AUSTRALIA. "Western Australia, Wungong, near railway crossing on Eleventh Road, ca. 0.5 km W of southwestern Highway, in clayey sand mixed with laterite pebbles on low heathland, *A. Lowrie* 87/032, 9 October 1987 (holotypus PERTH)" (holo: PERTH).

110: *Drosera paleacea* DC. *Prodromus Systematis Naturalis Regni Vegetabilis* 1: 318 (1824) [mid Jan 1824].


*Type*: WESTERN AUSTRALIA. "cum praeecedente; Drummond in herb. Hook. [in colonia fluminis Cygnorum] (iso: K).


*Type*: WESTERN AUSTRALIA. "Wren Creek, on road to Puntijan from Peter Lacy’s camp on a tributary of Bachsten Creek, Western Australia, 160° 01’ 32” S, 125° 14’ 55.7” E, 1 August 1996, *A. Lowrie* 1514" (holo: PERTH 04680502; iso: MEL).


*Type*: WESTERN AUSTRALIA. "Dookanooka Rd, ca. 15 km southwest of Three Springs, 29° 38’ 39” S 115° 38’ 36” E, *A. Lowrie* 1980, 14 November 1997" (holo: PERTH; iso: MEL).


*Type*: NEW SOUTH WALES. " ‘Ex nova Hollandia per [J.] white’; Herb. Thunberg 7720, (UPS—right specimen).’ (lecto: UPS; selected by B.J.Conn (1981))

116: *Drosera petiolaris* R.Br. ex DC. *Prodromus Systematis Naturalis Regni Vegetabilis* 1: 318 (mid Jan
1824).


Type: WESTERN AUSTRALIA. “on Great Southern Highway, ca. 10 km south of Pingelly, 32° 36’ 24” S, 117° 05’ 52” E, 10 December 1991, *Allen Lowrie* 561” (holo: PERTH; iso: MEL).


Drosera planchonii Hook.f. Flora of Tasmania i. 29.


Drosera menziesii var. albiflora Bentham. based on *Drosera planchonii* Hook.f. ex Planch. (Bentham 1864: 468). Flora Australiensis 2 (1864).

Type: TASMANIA. “in insulae Van Diemen ora orientali loco dicto Swan Port (Gunn, no. 449, in herb. Hook.).” (holo: HO, K); “nec non in Novae Hollandiae ora australi ad Port Phillip, [Vic.] (Gunn no. 5, ibid.).” (syn. n.v.): “Encounter Bay, [S.A.] (Whittaker, [s.n.] ibid.).” (syn. n.v.).


Drosera flabellata Benth. Flora Australiensis 2: 464 (1864) [5 Oct 1864].

Type: WESTERN AUSTRALIA. “W. Australia towards Cape Riche, Drummond, 5th coll. n. 281.” (iso: FL, K).

120: *Drosera platystigma* Lehm. Novarum et minus cognitarum stirpium pugillos octavus: 37 (1844) [Apr 1844].

Type: WESTERN AUSTRALIA. “Habitat in solo glareoso inter frutices densos (Plantaginet) prope “Seven Miles bridge” (Herb. Preiss. no. 1994).” (iso: MEL, S).


Type: WESTERN AUSTRALIA. “Crescit in locis arenosis montis Eiza mountain [Mount Eliza] (Perth) [Western Australia]. (Herb. Preiss. no. 1985).” (iso: K, MEL 96886, 96981 & 96983, P).


Drosera whittakeri var. praefolia (Tepper) J.M.Black. Flora of South Australia 2: 258 (1924).


Type: SOUTH AUSTRALIA. “Im August 1881 langte ich in Clarendon an, um das Dorf für einige Zeit zu meinem Wohnsitzte zu machen. Vorher war ich für einige Jahre im nordöstlichen Theile von Yorke’s peninsula ...”


Type: QUEENSLAND. “Cook District: Thornton Peak (in sheltered places near the summit), alt. 4,000 ft. L.J. Brass, No. 2272 (flowers and immature fruits), 14/3/1932 [14 March 1932]” (holo: BRI).


Type: WESTERN AUSTRALIA. “Brand Hwy,
17.2 km N of Cataby, in laterite-silica sand soils, only on hill tops in open ground on heathland, A. Lowrie 83/002, 23/6/83 [23 June 1983] (holotypus PERTH).” (holo: PERTH).


Comment: **Drosera prostrata** (N.G.Marchant & Lowrie) Lowrie [nom. inval.]. *Nuytsia* 15 (3): 374–375, Figs 6, 12, 14 (2005). This name was considered invalid because my reference to the basionym was indirect, as the pagination of the whole publication is given rather than an exact page reference (see ICBN Art. 33.4 Note. 1 (2006)). I was advised that because the first page of this species treatment is given in this citation, it is considered valid. So there are no further inconsistencies, the basionym exact page ‘374’ reference has been corrected in *Nuytsia* 21 (3): 152 (2011).


Type: WESTERN AUSTRALIA. “Kalbarri, on the road to The Loop, in yellow and white sandy soils between low shrubs on heathland, Western Australia, 14 June 1984, A. Lowrie 84/073.” (holo: PERTH).


Type: WESTERN AUSTRALIA. “Western Australia: in fine grained black sand on the flats, as well as in a soil mixture of sand, laterite, and a small amount of quartzite rock floaters on the lower scree slopes a short distance away from a small tributary of the Hamersley River, where the tributary crosses Hamersley Drive, ca. 40 km southeast of South Coast Highway, Fitzgerald National Park, Western Australia, April 23, 1990, A. Lowrie 96 (PERTH; iso: CANB, K, RSA)” (holo: PERTH, iso: CANB, K, RSA).


Type: WESTERN AUSTRALIA. “Schedula Preissiana Nr. 1977. [L. Preiss 1977] In solo turfos-arenoso prope montem ‘Wuljenap (Plantagenet)’ L. Preiss legit.” [Wolyamup Hill, 33°32’S, 117°54’E, ca. 35 km NE of Katanning, Western Australia non Mt Wilyung sensu Marchant (1982) or Wuljenup sensu Lehmann (1844) and Bentham (1864)]” (iso: P).


**129: Drosera pycnonolbasta** Diels. *Botanische Jahrbucher fur Systematik* 35 (2): 207 (1904) [6 Dec 1904].


**130: Drosera pygmaea** DC. *Prodromus Systematis Naturalis Regni Vegetabilis* 1: 317 (1824) [mid Jan 1824].

Type: NEW SOUTH WALES. “in insula ad introitum Jervis’s bay, Caley.” (holo: BM. BM001015759).

Lectotype: “Bowen Island am Eingang von Jervis’ Bay (Caley!, F. Bauer del. 530 ..)” (iso: Diels 1906 (lecto: n.v.).


**132: Drosera ramelliosa** Lehnh. *Novarum et minus cognitarum stirpium pulgillus octavus* 40 (1844) [Apr 1844].


Type: WESTERN AUSTRALIA. “in colonia Swan River [Swan River Colony southwest Western Australia], Drummond [J. Drummond s.n.] in herb. Hook.” (iso: K).


Type: WESTERN AUSTRALIA. “Kalbarri National Park, near a place called Z Bend by Murchison River, lat. 27° 39’ S, long. 114° 28’ E, [in] Heath [-land] 1–2 m tall, chiefly on yellow sand, 9 October 1982, STRID 20805; C. Isoty in B, G, K, MO,
Drosera

Bulletin

pidulum

Sondera

preparation”].

PERTH.” (holo: C; iso: B, G, K, MO. PERTH).


Type: WESTERN AUSTRALIA. “Western Australia, Millbrook Road, ca. 5 km E of Albany Highway, in peaty sand on the margins of swamps, A.Lowrie 87/025, 7 October 1987 (holotypus PERTH).” (holo: PERTH).

135: Drosera rosulata Lehm. Novarum et minus cognitarum stritrium pugillus octavus: 36 (1844) [Apr 1844].

Drosera rosulata Behr. Linnaea 20: 628 (1847).


Type: WESTERN AUSTRALIA. “Crescit locis arenosa-turfosis ad fluvium Cygnorum prope oppidulum Perth. (Herb. Preiss. No. 1893).” [south-west Western Australia: [growing locality sandy-peat near Swan River near the town of Perth] (holo: MEL; iso: S.).


Type: WESTERN AUSTRALIA. “Western Australia SW bay of salt lake, 72 km E of Lake King, thence 5 km SE, on the margins of salt lakes in salt-free sand almost at the edge of the water, A.Lowrie 84/062, 14/9/84 (holotypus PERTH)” (holo: PERTH).

138: Drosera sargentii Lowrie & N.G.Marchant.


Type: WESTERN AUSTRALIA. “At the junction of Stockyard Road and Merivale Road, in the S. E. corner, ca. 20 km E of Esperance, Western Australia, Allen Lowrie 22/11/89, [22 November 1989] (holo: PERTH; iso: MEL)” (holo: PERTH, iso: MEL).


Type: SOUTH AUSTRALIA. “South Australia: corner of South Coast Road and Elsegood Road, ca. 20 km south of Kingscote, Kangaroo Island (35 46’11’S, 137 33’34”E), 6 Sep 2003, A.Lowrie 2816 & D.E.Murfet (holo: AD; iso: PERTH, MEL)” (holo: AD, iso: PERTH, MEL).


Type: WESTERN AUSTRALIA. “in colonia fluminis Cygnorum; Drummond in herb. Hook [south western W.A., Drummond 4: 125]” (iso: K).


Type: QUEENSLAND. “Nec non in ora orientali ad ostia fluminis Endeavour; Banks et Soland. in herb. Mus. Brit.” (lecto: BM, designated by Barrett & Lowrie (2013)).


Lectotype: “...(Miss Sewell ... in herb. Berolin).”


Type: QUEENSLAND. “Opposite the south end of Fraser Island, Queensland, in swampy soil; wallam community; sea level, 18 January 1928, Anon. 4 [AQ183256]” (holo: BRI).


Type: WESTERN AUSTRALIA. “Western Australia, Bindoon-Moora Highway, 0.6 km S of Gillingarra, in loam soils covered with laterite pebbles, A.Lowrie 85/098, 20 October 1985 (holotypus PERTH).” (holo: PERTH).

Drosera squamosa Benth. Flora Australiensis 2: 463 (1864) [5 Oct 1864].


Type: WESTERN AUSTRALIA. “Southwest-Australien: o.n.O. (Drummond n. 37 – Original der Vari-


Type: *p.p.* as to Oldfield collections: Hill River, Western Australia, *A. Oldfield* s.n. (syn: MEL 96906); Vasse River, Western Australia. *A. Oldfield* s.n. (syn: MEL 96904).

Typification note: Bentham’s type citation under *Drosera menziesii* var. *flavescens* consists of three collections. The Drummond collection is also the holotype of *D. intricata*. The Hill River, and Vasse River collections of Oldfield are (Hill River) *D. subhirtella* and (Vasse River) *D. intricata*.


*Drosera neesi* var. *sulphurea* (Lehm.) Benth. *Flora Australiensis* 2: 466 (1864).


155: *Drosera thysanosepala* Diels. *Das Pflanzenreich* 26: 121 (1906) [31 July 1906].


Type: WESTERN AUSTRALIA. “Südwest-Australien: Von Doubtful Island Bay Landeinwärts auf trockenen sandigen Heiden, Blühend Anfang Oktober 1901 (Diels n. 4779-Original der Varietät!).”


Type: WESTERN AUSTRALIA. “Parker Brook Rd, Albany, 34° 56’ 37” S 117° 49’ 41” E, 10 October 2000, *A. Lowrie* 2572.” (holotype: PERTH, iso: MEL).


Type: WESTERN AUSTRALIA. “Western Australia: O’Brien Road, ca. 12 km N of Tooodyay Road, in sandy white clay with a thin overlay of laterite gravel in open heathland, *A. Lowrie* 84/081, 8 November
1984 (holotypus PERTH).” (holo: PERTH).


Type: SOUTH AUSTRALIA. “ad Encounter-bay; Whittaker ibid” [fide A. Lowrie, v.v. Parsons Beach, Encounter Bay, South Australia, 35° 37’ 59” S, 138° 28’ 45” E, 8 Sep. 2003, Allen Lowrie 2834.], no date, Whittaker s.n., (holo: n.v.).


Type: WESTERN AUSTRALIA. “Lake Seabrook, ca. 40 km north-east of Southern Cross, Western Australia, [30° 56’ 30” S, 119° 35’ 30” E], 21 August 1979, K Newby 5750 (holo: PERTH 0066960; iso: MEL).” (holo: PERTH 0066960; iso: MEL).


Type: WESTERN AUSTRALIA. “in colonia Swan River, Drummond in Herb. Hook. (Folia tantum. [leaves only])” J. Drummond s.n. (iso:K).

**NEPENTHEACEAE**


*Phyllamphora mirabilis* Lour. Flora Cochinchinensis Edn. 1, 2: 606 (1790).

Type: VIETNAM. “Habitat loca humida & agrestia Cochinchinae” (holo: n.v.).


*Nepenthes kennedyi* orth. var. F. Muell. ex Benth. Flora Australiensis 6: 40 (1873).

Type: “Ad oppidulum Somerset juxta promonto-


Type: “Cape York, whence it was sent by a correspondent some few years ago to the Queensland Aclimatization Society.”


*Nepenthes albolineata* F.M. Bailey (as ‘albo-lineata’). Queensland Agricultural Journal 3 (5): 354, 355, pl. LVIII (1898).


Type: “Cape York Peninsula, 5 miles (8 km) south of the Jardine River, Cholmondeley Jardine.” (holo: BRI).


Type: “Head of Pascoe River. R.W. Garraway, …” (holo: BRI).


*Nepenthes armbrustiae* orth. var. F.M. Bailey.

Type: “Coen, Miss F. Armbrust,”; (holo: BRI).


*Nepenthes rowaniae* orth. var. F.M.Bailey. Queensland
Agricultural Journal 1 (3): 231 (1897).

Type: QUEENSLAND. “Somerset, Cape York Peninsula, Frank L. Jardine” (holo: BRI).


Type: QUEENSLAND. “Queensland. Cook District: Head of Cowal Creek near Cape York, F.W. Whitehouse s.n. (holo: BRI [AQ46887]).” (holo: BRI).

LENTIBULARIACEAE

Utricularia subgenus Polyphompholyx, section Polyphompholyx

Each species section is given in brackets alongside the species name.


Polyphompholyx multifida (R.Br.) F.Muell. Fragmenta Phytophragiaei Australiae 6 (45): 162 (1868).

Type: WESTERN AUSTRALIA. “(M.) v.v. [Western Australia, King George Sound, Albany], R. Brown s.n.” (holo: BM).


Type: WESTERN AUSTRALIA. “King George Sound, [Albany], Hugel s.n.” (holo: n.v.).

Utricularia preissii A.DC. Prodromus Systematis Naturlis Regni Vegetabilis 8: 666 (1844).


Type: WESTERN AUSTRALIA. “Western Australia, Swan River, Preiss 1921” (holo: G-DC; iso: MEL).


Type: WESTERN AUSTRALIA. “Western Australia, Preiss 1919” (holo: G-DC).


Type: WESTERN AUSTRALIA. “Crescit in locis arenosis aquaticis prope oppidulum Perth (Herb. Pre-

iss. no 1919” (holo: S; iso: BR, MEL, W).


Type: WESTERN AUSTRALIA. “(M.) v.v. [King George Sound, R. Brown s.n.]” (holo: BM).

Tetralobus pusillus A.DC. Prodromus Systematis Naturlis Regni Vegetabilis 8: 667 (1844).

Type: WESTERN AUSTRALIA. “in Nova Hol-landia occid. ad flumen Cygnorum (Preiss! n. 1920)” (holo: G-DC; iso: MEL).

Polyphompholyx exigua F.Muell. Definitions of rare or hitherto undescribed Australian plants: 17 (1855).

Type: VICTORIA & SOUTH AUSTRALIA. “In mossy, peaty or boggy places at the Grampians, Serra and Victoria ranges Mueller s.n. (K & MEL); and in South Australia at Echunga. Mueller s.n. (K & MEL).”


Type: WESTERN AUSTRALIA. “Western Aus- tralia, Cape Le Grand National Park, P. Taylor 17008 (holo: K; iso: CANB, L, M, MEL, PERTH, US).”

LENTIBULARIACEAE

Utricularia subgenus Polyphompholyx, section Pleia-chasia.

Utricularia subgenus Utricularia, sections Aus- trales; Meionula; Minutae; Nigrescentes; Oligocista; Setiscapella & Utricularia.

Each species section is given in brackets alongside the species name.


Type: QUEENSLAND. “Banks et Soland. [Banks & Solander s.n.] (T.) B. [Point Lookout, Queensland]” (holo: BM).


Type: WESTERN AUSTRALIA. “Western Aus-
Australia, Mitchell Plateau, C.R. Dunlop 5320 (holotypus K; isotypi CANB, DNA, MEL, PERTH." (holo: K; iso: CANB, DNA, MEL, PERTH).


   Type: NORTHERN TERRITORY. “Australia, Northern Territory, ca. 65 km from Pine Creek on Oenpelli road, P. Taylor 17156 (holotypus K; isotypi CANB, DNA, L, MEL, NSW, NT, PERTH).” (holo: K; iso: CANB, DNA, L, MEL, NSW, NT, PERTH).

4: **Utricularia aurea** Lour. (section Utricularia) Flora Cochinchinesis Edn. 1, 1: 26 (1790).

   Type: VIETNAM. “Habitat in fluviis lentioris curvus in Cochinchina.” (holo: no specimen located, fide P. Taylor).

   **Utricularia flexuosa** Vahl. Enumeratio Plantarum 1: 198 (1804).

   Type: “India orientali, König s.n. “(holo: C; iso: W).


   Type: NEW SOUTH WALES. “(J.D.) v.v. – Australia, New South Wales, between Hawksbury and Paramatta, R. Brown s.n.” (holo: BM).


   Type: WESTERN AUSTRALIA. “Western Australia, near Lake Muir, ca. 300 km SSW of Perth, P. Taylor 17029 (holotypus K; isotypi CANB, MEL, PERTH).” (holo: K; iso: CANB, MEL, PERTH).

8: **Utricularia bifida** L. (section Oligocista) Species Plantarum 1: 18 (1753).


   Type: (not cited).

   **Utricularia scandens** Benj. Linnaea 20: 309 (1847).

   Type: “Ind. orient. Madras.”


   Type: “Cambodge: Kampot (464 Geoffrey).”


   Type: “Koolpinyah, [Northern Territory] sandy flat (Bleeser no. 392).”


   Type: “Kedah, on Kedah Peak (Gunong Jerai), in streams and wet spots at 3000 ft. altitude.”

Remaining synonymy extensive, see Taylor 308-309 (1989) for full citations.


   Type: NEW SOUTH WALES. “(J.) v.v. [J = R. Brown’s code for New South Wales, Sydney, & v.v. = I have seen it in the living state] R. Brown s.n. [sine numero = without a number]” (holo: BM).


   Lectotype: (lecto: MEL [chosen by Peter Taylor 1989]; iso: W).

**Utricularia lawsonii** E.E.Lloyd. The Victorian Naturalist 53: 110 (1936), (as lawsonii).

   Type: New South Wales, Sydney: “This plant was collected long ago by Mr. Charles Moore, as is evident from a single fragment which was cut off from a specimen floated out on brown paper, and is now in the Melbourne Herbarium. Type material (pl. xii) in British Museum of Natural H Melbourne, Sydney, Brisbane, Perth, and Kew.” Lloyd s.n. (holo: BM; iso: K, MEL, PERTH).


11: **Utricularia caerulea** L. (section Nigrescentes) Species Plantarum 1: 18 (1753).

   Type: SRI LANKA. “Ceylon [Sri Lanka], Hermann s.n.” (holo: BM).
   Type: NORTHERN TERRITORY. “On the Adelaide River; Mr. Holtze junior [Nicholas Holtze 1176]” (holo: MEL; iso: K, NSW).

   Type: NORTHERN TERRITORY. “Australia, Northern Territory, ca. 33 km SW of Oenpelli, P. Taylor 17145 (holotypus K).” (holo: K).

   Type: QUEENSLAND. “(T) B. [Type: Queensland, Point Lookout, Banks & Solander s.n.]” (holo: BM).

   Type: “Banks et Soland. (T) B.” (holo: BM).

   Type: “Banks et Soland. (T) B.” (holo: BM).

   Type: NORTHERN TERRITORY. “Australia, Northern Territory, E of McMinns Lagoon, ca. 25 km SE of Darwin, P. Taylor 17123 (holotypus K).” (holo: K).


Utricularia dichotoma var. typica Domin [nom. inval.]. Bibliotheca Botanica 22 (89): 1155 (1929).
   Type: TASMANIA. “in capite Van-Diemen.” (holo: FL, iso: MEL).

   Type: “(J) v.v [ Syd ney, N.S.W.]” (holo: BM, iso: K).

   Type: “(J) v.v [between Sydney & Botany Bay, N.S.W., R. Brown s.n.]” (holo: BM, iso: K).

   Type: “Found by Charles Moore, former Director of the Botanic Gardens, Sydney, in “East Australia” about 1855, though the date is not indicated. The label of the type specimen, which is in the National Herbarium, Melbourne, is in von Mueller’s writing.” (holo: MEL, iso: BM, K).


   Type: NORTHERN TERRITORY. “Australia, Northern Territory, Little Nourlangie Rock, C. R. Dunlop 4737 (holotypus K; isotypi DNA, NT).” (holo: K; iso: DNA).


   Type: NORTHERN TERRITORY. “Found by N. Holtze (No. 1340) along the Howard River, Northern Australia, 1891. Flowers with “yellowish-brown colour.” Type in National Herbarium, Melbourne; co-type in the British Museum of Natural History.” (holo: MEL; iso: BM; K, NSW).

   Type: WESTERN AUSTRALIA. “Western Australia, Prince Regent River Reserve, A.S. George 12507 (holotypus K; isotypus PERTH).” (holo: K, iso: PERTH).

*Type*: INDIA. “In Bengaliá, uliginosis, Januario [no specimen cited, possibly none preserved, *fide* Taylor (1899)].


*Utricularia baouleensis* orth. var. F.L.Erickson [Rica Erickson]. *Plants of Prey in Australia*: 82 (1968).

*Type*: IVORY COAST. “CÔTE D’IVOIRE – Baoulé, marais fangeux entre Languouassou et Mbay-akro sur la vase humide; souvent la base de la plante est sub mergée, 1er août, no 22247 (type) [Aug. Chevalier].” (*holo*: P)


*Type*: CAMBODIA. “Cambodia, Kep. Geoffray 432,” (*lecto*: P [lectotype selected by Peter Taylor (1989)]).


*Type*: WESTERN AUSTRALIA. “Western Australia, Kimberley, Mitchell River, *C.R. Dunlop* 5296 (holotypus K; *isotypi* CANB, DNA, MEL, PERTH).” (*holo*: K; *iso*: CANB, DNA, MEL, PERTH).


*Type*: UNITED STATES OF AMERICA. “Habitat in Virginia, Clayton s.n.” (*holo*: BM).

*Utricularia exoleta* R. Brown. *Prodromus Florae Novaer Hollandiae*: 430 (1810);


Remaining synonymy extensive, see Taylor 572-577 (1989) for full citations.


*Utricularia hamiltoni* orth. var. F.E.Lloyd


*Type*: WESTERN AUSTRALIA. “Western Australia, Cape Le Grand National Park, *Taylor 12016*” (*holo*: K; *iso*: BM, CANB, GH, L, MEL, NSW, NT, PERTH).


*Type*: NORTHERN TERRITORY. “Near the Adela-River; *M. & N. Holtze 1164*.” (*holo*: MEL; *iso*: AD, K).


*Type*: WESTERN AUSTRALIA. “flum. Cygnorum (Drummond n. 508 et 509 partim)”


*Type*: WESTERN AUSTRALIA. “Nova Holland. ad flum. Cygnorum. (Drummond. n. 128).”


*Type*: MALAYSIA. “Malay Peninsula, Kedah, on Kedah Peak (Gunong Jerai), in streams and wet spots at 3000 ft. altitude, *Ridley s.n.*” (*holo*: SING).

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Type: QUEENSLAND. “Tozers Flat, near Tozers Gap, ca. 18 km NW of Lockhart River, 200 m N from Portland Road, Iron Range Resource Reserve, Queensland, 12° 43’ 27.65”S 143° 12’ 29.97” E, Allen Lowrie 3506 & Paul Simmons, 20 July 2007.” (holo: NSW).


Type: NORTHERN TERRITORY. “Near the Adelaide-River; M. & N. Holtze 1158.” (holo: MEL; iso: AD, K).


Type: WESTERN AUSTRALIA. “Western Australia, Kimberley, [Bent Orchid Falls, a non gazetted name, 14° 48’ 30” S, 125° 53’ 00” E, c. 6.5 km east of Mitchell Plateau airstrip] Mitchell Plateau, K.F. Kenneally 8143 (holotypus K isotypus PERTH).” (holo: K; iso: PERTH).

34: **Utricularia kimberleyensis** C.A.Gardner. (section Pleiochasia). Bulletin (Western Australian Forests Department) 32: 90 (1923).

Type: WESTERN AUSTRALIA. “Ashton Creek, Headwaters of the Charnley River, near Mount Agnes, in sandy swampy places, among grass. Fl. m. [flowering mid] June, C.A. Gardner 1412” (holo: PERTH; iso: NSW).

35: **Utricularia lasiocaulis** F.Muell. (section Pleiochasia). Australasian Chemist and Druggist 8 (90): 50 (1885).

Type: NORTHERN TERRITORY. “Near Port Darwin; Maurice Holtze 477 (of 1885),” (holo: MEL).


Type: NEW SOUTH WALES. “(J.D.) v.v [Sydney, N.S. W., Robert Brown s.n.]” (lecto: BM; isolecto: K).

Utricularia parviflora R.Br. Prodr omus Florae Novae Hollandiae: 431 (1810); A.DC. l.c. [= at the place cited] (1844), not U. parviflora Buch.-Ham. Ex Sm. (1808).

Type: NEW SOUTH WALES. “(J.) v.v [Sydney, N.S. W., Robert Brown s.n.]” (holo: BM; iso: K).

37: **Utricularia leptpectra** F.Muell. (section Pleiochasia) Australasian Chemist and Druggist 8 (90): 50 (1885).

Type: NORTHERN TERRITORY. “Near Port Darwin; Maurice Holtze 508.” (holo: MEL).


Type: NORTHERN TERRITORY. “Port Darwin, 4 miles NE (Bleezer no. 145)” (holo: B’ [presumed destroyed in WWII].

Lectotype: “Australia, Northern Territory, 4 miles NE. of Port Darwin, Bleezer 145 (holy: B δ)”


Type: QUEENSLAND. “Banks et Soland [s.n.]. (T.) B. [Endeavour River]” (holo: BM).


Type: NORTHERN TERRITORY. “Port Darwin, 14 miles E, in water (Bleezer no. 484).” (holo: B’ [destroyed in WW II vide Peter Taylor 1899]).


Type: NORTHERN TERRITORY. “Australia, Northern Territory, Howard Springs, southeast of Darwin, 12° 27’ 37.2” S, 131° 03’ 53.1” E, Alt. 13 m, H. Wakabayashi, 14 May 2010 (holotypus NDC-13972).” (holo: NDC).


Type: WESTERN AUSTRALIA. “(M.) [Western Australia, King George Sound] D. Menzies v.s. [= vidi siccam, I have it in a dried state]” (holo: BM).

Utricularia macroceras A.DC. Prodr omus Systematis Naturalis Regni Vegetabilis 8: 666 (1844).


Type: WESTERN AUSTRALIA. “in Nova Hollandia occid. ad flumen Cygnorum [Western Australia, Swan River]” (Preiss n. 1917)” (holo: G-DC; iso: FL, MEL, W).
  Type: MALAYSIA. “Habitat circa Malacca [Malay Peninsula], König s.n.” (holo: C).

Utricularia pygmaea R.Br. Prodromus Florae Novae Hollandiae: 432 (1810);

  Type: QUEENSLAND “Banks & Solander [s.n.] (T.) [Cape Grafton] B.” (holo: BM).

  Type: TASMANIA. “Wet sandy ground near Arthur’s Lakes, Gunn 896.” (holo: K [K000779885]; iso: NSW).


  Type: NORTHERN TERRITORY. “Port Darwin, Australia Holzle 474” (lecto: MEL).

  Type: SRI LANKA. “Ceylon [Sri Lanka], Koenig s.n.” (holo: C).

  Type: CAMBODIA. “Cambodge [Cambodia]: Kampot, Geoffray 464.” (holo: P).

  Type: “Australia, Northern Territory, Koolpinyah, sandy flat (Bleeser no. 392).” (holo: B†).

  Type: (not cited).

  Type: WESTERN AUSTRALIA. “22.1 km north of Augusta, Western Australia, 34° 08’ 11” S, 115° 06’ 53” E, 7 December 1996, A. Lowrie 1655.” (holo: PERTH 04680510; iso: MEL).

  Type: WESTERN AUSTRALIA. “North East Rd, ca. 3 km south of Albany Highway, upper Serpentine River, 32°29’S, 116°18’E, Western Australia, 10 November 1990, A. Lowrie 184.” (holo: PERTH 05849500; iso: MEL, K).

  Type: NORTHERN TERRITORY. “Australia, Northern Territory, near Adelaide River, M. & N. Holzle 1177 (holotypus MEL; isotypus BM).” (holo: MEL, iso: BM).

  Type: NORTHERN TERRITORY. “Messrs. Holzle on the Adelaide-River.” [Neither status accepted by Peter Taylor.]

  Type: NORTHERN TERRITORY. “Australia, Northern Territory, Mt Girruth, Defa Adder Gorge, C.R. Dunlop 4414 (holotypus K; isotypus DNA),” (holo: K; iso: DNA).


  Type: WESTERN AUSTRALIA. “(M.) v.v. [Western Australia, King George Sound, Robert Brown s.n.]” (holo: BM).


Utricularia pachyceras O.Schwarz. Repertorium Specierum Novarum Regni Vegetabilis 24: 98 (1927)
  Type: NORTHERN TERRITORY. “Port Darwin, 4 miles NE, wet situation (Bleeser no. 212),” (holo: B†).


Synonymy is extensive see Taylor 526-528 (1989).


Type: WESTERN AUSTRALIA. “Western Australia, Revolver Creek, upper slopes of Carr Boyd Range, Hartley 14510 (holotypus CANB),” (holo: CANB).


Type: NORTHERN TERRITORY. “Australia, Northern Territory, near McMinns Lagoon, ca. 32 km SE of Darwin, J.Must 702 (holotypus K; isotypi DNA, NT).” (holo: K, iso: CANB, DNA, NT).


Type: QUEENSLAND. “In paludibus montium pone sinum Rockingham’s Bay [Cashmere]; Armit. [222]” (holo: MEL; iso: BM, BO, K).


Type: MALAYSIA. “Habitat humidiusculus Indicue orientalis [fide Peter Taylor probably Peninsular Malaysia] König [s.n.]” (holo: C; iso: LD).


Type: NEW SOUTH WALES. “(J.) v.v. [Grose River, N.S. W., Robert Brown s.n.]” (holo: BM).


Type: New South Wales: “(J.D.) v.v. [N. S. W., Sydney, R. Brown s.n. ]” (lecto: BM, selected by P. Taylor 1989).


Type: WESTERN AUSTRALIA. “Western Australia, King George Sound [Albany], R. Brown s.n.” (holo: BM).


Type: WESTERN AUSTRALIA. “(M.) v.v. [Western Australia, King George Sound, Albany], R. Brown s.n.” (holo: BM; iso: K).

References:


FIELD NOTES FROM ANDALUCÍA, SPAIN

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Keywords: Travelogue, Spain, Drosophyllum (Drosophyllaceae), Pinguicula (Lentibulariaceae).

Introduction

In late April 2013 Jürg Steiger, Heiko Rischer, and I performed a field trip to Andalusia (Andalucía), southern Spain in order to see and study some carnivorous plant species in situ. The following text is a report of our findings and conclusions.

Situated at the westernmost end of the Mediterranean Sea between 36°N and 39°N and spanning the altitudinal range from sea level to almost 3500 m (highest point in continental Spain), Andalusia is inhabited by a diverse flora composed of Mediterranean (adapted to summer drought, usually in lowlands), high mountain (adapted to snow cover and freezing in the winter, limited to high mountain elevations), oceanic (depending on permanently humid, usually frost-free conditions, predominantly in the westernmost parts of Andalusia that are strongly influenced by westerly winds from the Atlantic ocean), and a few xero-tropical (adapted to prolonged drought) elements.

The southernmost corner around Gibraltar and the southernmost cape of the Iberian Peninsula around Tarifa marks the western end of the Betic System (part of the Alpine belt) that extends from there to the easternmost border of Andalusia, and contains most of the region’s highland areas, including the Sierra Nevada near Granada as its highest peak. This series of mountain ranges separates the basin of the Guadalquivir River to the north from the Mediterranean basin to the south. It is essentially this montane area that serves as a migration route for plants that are less well adapted to drought than those of the Mediterranean element, and it consequently hosts the majority of carnivorous plants in Andalusia (Table 2), most of which are derived from temperate Subatlantic/Submediterranean (Pinguicula nevadensis, P. grandiflora, P. dertosensis, P. mundi, P. vallisneriifolia) and/or Atlantic (Drosophyllum lusitanicum, P. lusitanica) elements.

Climate

The general climate of Andalusia is determined by its position in the Mediterranean climatic zone that is marked by mild, humid winters and warm, dry summers (Table 1).

<table>
<thead>
<tr>
<th>Table 1. Climate of Andalusia.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place, alt.,</strong></td>
</tr>
<tr>
<td><strong>Koeppen-Geiger Class</strong></td>
</tr>
<tr>
<td>Tabernas (300 m) BSk</td>
</tr>
<tr>
<td>(Steppe, mid-lat.)</td>
</tr>
<tr>
<td>Gibraltar (coast) Csa</td>
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<tr>
<td>(Medit.)</td>
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<tr>
<td>Granada (738 m) Csa</td>
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<tr>
<td>(Medit.)</td>
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<tr>
<td>Cazorla (753 m) Csa</td>
</tr>
</tbody>
</table>

Places Visited

Los Alcornocales

Located at the westernmost end of the Betic System north of Gibraltar and extending from Tarifa at Spain’s southern end to Algodonales some 80 km to the north the natural park Los Alcornocales covers 1678 km² and is one of the major natural parks in Spain. The hilly country (the highest peak being Pico del Aljibe, 1092 m alt.) is mainly composed of Aquitanian (Miocene) sandstones and conglomerates (sedimentary flysch units forming the Campo de Gibraltar Complex). The climate is Mediterranean with a strong oceanic influence (Tarifa is already at the Atlantic coast) characteristic for the Tingitano-Onubo-Algarvian province. The vegetation is marked by primary cork forest where it is not disturbed by agriculture. Common woody species being cork oaks (Quercus suber), Portuguese oaks (Quercus faginea), Pyrenean oaks (Quercus pyrenaica), olive trees (Olea europaea), alders (Alnus glutinosa), holly trees (Ilex aquifolium), bay laurels (Laurus nobilis), rhododendrons (Rhododendron ponticum), and tree heaths (Erica arborea).

Sierras de Tejeda, Almijara y Alhama

Situated between Malaga at the southern Mediterranean coast of Spain (“Costa del Sol”) and Spain’s highest continental peak in the Sierra Nevada, the three ranges in the natural park of Sierras de Thejeda, Almijara y Alhama (together 407 km²) are an assemblage of mountains of moderate elevation (the highest peaks reaching 2067, 1732 and 1715 m alt., respectively). The landscape is dominated by karstic Jurassic limestone covered by Mediterranean sclerophyllous vegetation and its transition to montane vegetation at higher altitudes.

Sierra de Abrucena

This mountain range in the eastern third of the Sierra Nevada (862 km² in the core area of which is protected as a national park) is separated from the main massif by the pass Puerto de la Ragu (2038 m alt.), and it reaches its highest elevation (Chullo, 2612 m alt.) close to this incision. Like the main massif it is predominantly composed of mica schist (metamorphic), and the vegetation is similar at least at lower altitudes. The climate is slightly drier than in the western Sierra Nevada, and immediately to the east of the Sierra de Abrucena is the Desierto de Tabernas, one of the driest places in Spain (240 mm precipitation per year) and Europe’s only natural desert. At the northern slope the mountains are forested almost to their summits (which is in sharp contrast to the western Sierra Nevada where the summit area is dominated by scant alpine meadows interspersed with almost barren areas.

Sierra de Segura and Sierra de Cazorla

Surrounded and threatened by the sprawling and highly intensified olive agro-industry of the province of Jaen in north-easternmost Andalusia, the natural park Sierras de Cazorla, Segura y las Villas still harbors the richest forests in southern Spain that already provided the wood for the Spanish Armada. Covering 2143 km² it is also the largest natural park in Andalusia. The mountainous area belongs to the Prebetic System (external Betics) to the north of the Penibetic system (that comprises the Sierra Nevada and the Sierras de Tejeda, Almijara y Alhama) and is mainly composed of Jurassic limestone and locally of dolomite. The highest peak (Las Banderillas) reaches 1993 m alt. The Guadalquivir and Segura rivers (the major catchment basins in Andalusia) both originate in the Sierra de Segura.

Los Alcornocales

From a carnivorous plant perspective, Drosophyllum occupies a unique position, comparable only to the probably more famous Venus’ Flytrap or the still quite enigmatic Cephalotus. Drosophyl-
Table 2. Carnivorous plants of Andalusia.

<table>
<thead>
<tr>
<th>Places visited in 2013 (not visited in 2013)</th>
<th>Species encountered (+ literature and/or previous excursions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Alcornocales</td>
<td><em>Drosophyllum lusitanicum</em></td>
</tr>
<tr>
<td></td>
<td><em>Pinguicula lusitanica</em></td>
</tr>
<tr>
<td>Sierras de Tejeda, Almijara y Alhama</td>
<td><em>P. vallisnerifolia</em></td>
</tr>
<tr>
<td></td>
<td><em>P. dertosensis</em></td>
</tr>
<tr>
<td>(Sierra Nevada) Abrucena</td>
<td><em>(P. nevadensis)</em></td>
</tr>
<tr>
<td></td>
<td><em>(P. grandiflora)</em></td>
</tr>
<tr>
<td>Sierra de Segura</td>
<td><em>P. mundi</em></td>
</tr>
<tr>
<td></td>
<td><em>P. vallisnerifolia</em></td>
</tr>
<tr>
<td>Sierra de Cazorla</td>
<td><em>P. vallisnerifolia</em></td>
</tr>
<tr>
<td></td>
<td><em>P. dertosensis</em></td>
</tr>
</tbody>
</table>

*Lusitanicum* is the sole representative of Drosophyllaceae, and it is restricted to the westernmost part of the Iberian Peninsula and a limited area in adjacent Morocco. The affinity of *Drosophyllum* to the Droseraceae is more remote than generally appreciated, and it is obviously most closely related to the tropical West African liana family Dioncophyllaceae (to which the part-time carnivorous *Triphyophyllum peltatum* belongs). Unlike *Drosera* and most other carnivorous plants with adhesive traps, *Drosophyllum* has the glandular tentacles on the lower, abaxial leaf surface, and they are not capable of rapid movement, a feature it shares with *Triphyophyllum*. Unlike *Triphyophyllum*, all leaves of *Drosophyllum* are, however, carnivorous, and the characteristic hooked leaves of the climbing Dioncophyllaceae have never been observed in the European low shrub (or dwarf tree, as it has sometimes been called) that generally occurs outside the forests. The habitat of *Drosophyllum* is a sandy heathland with sparse competing vegetation marked by comparatively high air and soil humidity. The soil surface is, however, usually bone dry and unexpectedly solid, at least during most time of the year. *Drosophyllum* is found at several places throughout the Los Alcornocales Natural Park (Fig. 1).

*Pinguicula lusitanica* (Fig. 2) is far less exacting than *Drosophyllum* in its habitat requirements, and it is consequently quite widespread in the oceanic part of Europe and northern Africa, from Algeria to Scotland. Systematically, *P. lusitanica* occupies a basal position in the genus, and it is with some probability the oldest European butterwort. It depends on a continuous supply of surface water, so it prefers wetter places than *Drosophyllum* during active growth and is a characteristic species occurring along ephemeral trickles that may dry up completely during summer.

Sierras de Tejeda, Almijara y Alhama

In Spain, the largest group of *Pinguicula* species (*P. longifolia*, *P. dertosensis*, *P. mundi*, *P. vallisnerifolia*) is specialized on permanently wet limestone rocks (e.g., near waterfalls, along creeks and in narrow gorges) devoid of competing vegetation, usually at low altitude in high mountains, frequently associated with the maidenhair fern, *Adiantum capillus-veneris*. All three mountain ranges in the Sierras de Tejeda, Almijara y Alhama Natural Park are inhabited by at least one of these *Pinguicula* species. We chose two localities of comparatively low altitude at which the butterworts have been observed flowering as early as February in order to encounter well-developed plants in flower. The most noteworthy species is *P. vallisnerifolia* that occurs close to a waterfall in the Sierra de Alhama (Fig. 3). This population was the first to extend the known distribution of the species...
Figure 1: *Drosophyllum lusitanicum* near Los Barrios, Los Alcornocales Natural Park.

Figure 2: *Pinguicula lusitanica* growing next to a stand of *Drosophyllum lusitanicum* near Gaucín, Los Alcornocales Natural Park.
that had been considered an endemic of the Sierra de Segura and Sierra de Cazorla before. More recently (Barona et al. 2008; Navarro et al. 2010), additional populations have been discovered in the province of Valencia, i.e. even beyond Andalusia. This is a remarkable career of a species that has been considered extinct shortly after its discovery, considered extremely rare after its rediscovery, considered extremely local after the discovery of additional populations nearby, and is now known to be fairly widespread and not critically threatened as a more serious floristic investigation has commenced throughout southern Spain.

An interesting parallel is also displayed by the other species in the area, viz. *P. dertosensis*, which is represented in the Sierras de Tejeda and Almijara (Fig. 4) by one population each. This is so far the southernmost known extension of the ranges of both species. But while *P. vallisneriifolia* is apparently restricted to the Betic system, *P. dertosensis* reaches considerably further north to central Spain and Catalunya. The most obvious difference between the two species being leaf length.

**Sierra de Abrucena**

The Sierra de Abrucena attracted our attention because an outlying population of *P. grandiflora* has been reported from there. This widespread and common species has a western European distribution that is even less oceanic in character (reaching northwestern Italy) than the range of *P. lusitanica* but in southern Europe and northern Africa it is restricted to high altitudes, occurring in
wet places in (sub-)alpine meadows. 2013 saw an unusual outbreak of winter in what should have been spring in the region. The unexpected snowfall even at low altitudes in late April caused several accidents and prevented us from seeing this butterwort at 1700 m alt.

*P. nevadensis* that grows in the vicinity occurs at even higher altitudes (2000-3000 m) in wet situations with sparse vegetation, and it does usually not appear before June. As far as we know, this is the only endemic carnivorous plant species in Andalusia.

Sierra de Segura and Sierra de Cazorla

All three butterwort species occurring in this natural park are growing in wet limestone habitats comparable to those in the Sierras de Tejeda, Almijara y Alhama Natural Park. Politically, the type locality of the apparently rare *P. mundi* in the vicinity of a locally famous waterfall lies just outside Andalusia in the province of Albacete (Castilla-La Mancha) in the natural park Calares del Mundo y de la Sima (Fig. 5). Due to its unclear taxonomic status and delimitation, the total distribution of this species is not very well known. During our trip we discovered a new site of this species in the core of the Sierra de Segura (Fig. 5), so it is now known to be likewise indigenous in Andalusia.

A rather common sight (if you know where to look) is *P. vallisneriifolia* (Fig. 3) that could be called the heraldic butterwort of the Sierra de Cazorla.

So far the known number of populations of *P. dertosensis* in the Sierra de Cazorla (Fig. 4) is limited but this may well change in the near future.

Morphologically *P. mundi* occupies an intermediate position between *P. vallisneriifolia* (that has still longer, usually hanging leaves) and *P. dertosensis* (that has involute rather than wavy leaf margins) but genetically (based on ITS sequence similarity, Kondo & Shimai 2006) the affinities of *P. vallisneriifolia* lie with *P. balcanica* from the Balkan peninsula, those of *P. dertosensis* with *P. macroceras* (derived in *P. sect. Pinguicula*), and those of *P. mundi* with *P. corsica* (the only diploid in the section, nested within a core group that is widespread in Europe and also includes *P. nevadensis* and *P. grandiflora*).

While *P. vallisneriifolia* is tetraploid, *P. dertosensis* and *P. mundi* are both octoploid (Casper & Stimper 2009), and not hexaploid (as reported by Blanca et al. 1999). It nevertheless appears somewhat premature to rule out a hybridogenic origin of the latter two taxa.

Further Carnivorous Plant Species from Nearby Areas

In addition to the taxa mentioned above, Andalusia hosts two globally widespread azonal (aquatic) *Utricularia* species, *U. australis* (common in western Andalusia) and *U. gibba* (local in and
around the Donana Natural Park near Huelva), and the circumboreal *Drosera rotundifolia* (local at high altitudes in the Sierra Nevada).

*Drosera intermedia* that is fairly common in Portugal (frequently growing together with *P. lusitanica*), *P. vulgaris* that is known from the Montes Universales (E Teruel and NW Cuenca Provinces in central Spain) and from the Rif mountains in northern Morocco, and *Utricularia minor* that occurs in highlands of adjacent Castilla-La Mancha, have not been recorded from Andalusia so far.

References


ARK OF LIFE RELOADED

MARCEL VAN DEN BROEK • marcel@carnivorousplants.org

Many people will have heard of the Ark of Life project and just wondered why there hasn’t been much news lately. Others however will be completely unfamiliar with the project so let me give a short introduction to the project and then get into the actual update that is the reason why I’m writing this.

In 2009, Stewart McPherson developed the idea of an *ex situ* (specimens in cultivation) conservation project for several highly endangered species of *Nepenthes*.

Basically, Stewart found that the lists of endangered species that were in use didn’t reflect the actual situation of species in the wild. Investigating, he found several reasons for this. First, the available data on the wild situation was very limited as not many scientists actually went into the wild to collect information on these plants. The second big reason was that within organizations like CITES (which deals with trade rules for endangered plants) other species, and particularly orchids, had priority. This resulted in strange listings, like having *Nepenthes rajah* listed as CITES Appendix I (the highest level of protection), while it is relatively safe in a nature reserve and guarded by rangers. On the other hand, *Nepenthes rigidifolia*, which, based on its known locations, might very well be effectively extinct in the wild, isn’t even mentioned specifically and is relegated to Appendix II classification of “all other *Nepenthes*”.

Stewart decided that he wanted to start a project that with a limited amount of money could save the most endangered species by bringing a reasonable amount of genetic variation of those species into cultivation. This goal would be easier to achieve than *in situ* (in the wild) conservation, because saving habitat and providing protection is a slow and costly process that would likely take more time than some species had. He also made some startup capital available through his company, Redfern Natural History Productions.

In 2010, the biennial ICPS conference was held in The Netherlands and on this occasion the first Ark of Life collection was created. Redfern and the ICPS partnered to provide the initial funding and the Hortus botanicus, the botanical garden of the University of Leiden, The Netherlands agreed to house this collection and take care of it. The Ark project started as a small operation with just four target species, *Nepenthes clipeata*, *N. rigidifolia*, *N. khasiana*, and *N. aristolochioides*. Plants were donated by some large nurseries, a website and a Facebook page were created, and a not-for-profit company was set up in the UK.

Initially this went rather well and individual plants and money were donated by private individuals and local carnivorous plant societies, but in 2012 things got a bit quiet.

I would like to explain briefly what happened. Basically, Ark of Life was a one-man operation by Stewart who had no real backup and who had a lot of work on his plate. This included the production of several great books and also the shooting of a 4-part documentary series about the nature of the British overseas territories that will likely hit the screens in 2015 (watch for it, it is really worth watching). The only practical support he had was given by yours truly in the form of some paper shuffling, however, as Stewart still actually controlled everything, progress was made by periods of long waits till he was again back in civilization and short sprints until he left again.

On top of that, the website went down partly because of regular hacking and partly because the company that had built it went bankrupt. A little later, the e-mail account also stopped working.

Lots of fun, I can assure you.

That doesn’t mean that nothing was happening. The plants in The Ark received proper care, money and plants were donated, and a search for members of an actual board for The Ark started. Preparations were also made to expand The Ark with other species and policy discussions were held.
So, what is the “State of The Ark” at this moment?  
The Ark has a living collection of plants housed in Leiden that consists of several clones of *N. clipeata*, *N. aristolochoioides*, *N. khasiana*, *N. rigidifolia*, *N. vogelii*, and *N. bokorensis*.

Additional hosts where found for a South African Ark and a *Sarracenia* Ark in well-known UK growers Nigel Hewitt-Cooper and Mike King.

A board for The Ark was founded with the following volunteers:

Tim Bailey: Manager, *Sarracenia* Ark  
Marcel van den Broek: Administrator  
Christian Dietz: Manager, South African Ark  
James Ellis: Deputy Manager, *Sarracenia* Ark  
Stewart McPherson: Promotions and Fundraising  
Francois Mey: Manager, *Nepenthes* Ark  
Alastair Robinson: Advisor  
Mark Rouse: Deputy Manager, *Nepenthes* Ark  
Andy Smith: Advisor  
John van der Werf: Treasurer

As I’m writing this we are building the new and much improved website. This will be done in several phases as available time is limited, but the results will be worth it.

Species for the South African Ark have been selected and appropriate basic texts have been written. These species are:

- *Drosera capensis*  
- *Drosera cistiflora*  
- *Drosera cuneifolia*  
- *Drosera coccipetala*  
- *Drosera ericgreenii*  
- *Drosera esterhuyseniae*  
- *Drosera glabripes*  
- *Drosera hilaris*  
- *Drosera pauciflora*  
- *Drosera ramentacea*. This is the true species, not the improperly used name for the commonly occurring *Drosera madagascariensis* that the pharmaceutical industry uses.  
- *Drosera regia*  
- *Drosera slackii*  
- *Drosera zeyheri*  
- *Roridula dentata*  
- *Roridula gorgonias*

More species may be added as their conservation status becomes clearer.

To the growers of carnivorous plants, *Drosera capensis* might look like a strange addition as it is a commonly grown species and even a weed in most collections. Fact is however that most plants in cultivation can be traced back to a limited number of plants, propagated by tissue culture. The situation in the wild is different and on top of that the species appear to be quite variable and might at one point have to be divided into (sub)species.

Species for the *Sarracenia* Ark are also selected, specifically:

- *Sarracenia oreophila* var. *oreophila*  
- *Sarracenia oreophila* var. *ornata*
• Sarracenia purpurea subsp. venosa var. montana
• Sarracenia rubra subsp. alabamensis
• Sarracenia rubra subsp. jonesii

Texts for this Ark are in the draft stage.

A thorough policy paper is just about finished and deals with everything from goals, priorities, and several legal aspects.

On the last (the legal) front, a major development is in progress. The Ark is changing status from an UK based not-for-profit company to a foundation with full Charity status under Dutch Law.

These are all huge jobs and they took time, especially in setting them up.

I hope I have given you a good explanation why The Ark has been a bit silent. If all goes as planned, you will start hearing a lot about us during the upcoming year and many years after that.

THE

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JOE GRIFFIN, Seed Bank Manager, joe@carnivorousplants.org

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NEW CULTIVARS


Submitted: 16 April 2015

Sarracenia ‘Metallized’

Sarracenia ‘Metallized’ germinated in spring 2010 as a seedling in the middle of the mature red S. flava group I have in my greenhouse. The parentage of the plant is unknown. Maybe a seed fell during the seed collection in the autumn or maybe the result of a casual pollination event.

In spring 2014, the tallest pitcher was 76 cm tall (Fig. 1). At that time, the plant was still immature, since it had not yet flowered.

The pitcher color from early spring to late summer, if kept in full sunlight, is a flat and uniform red to dark red from the pitcher top to the rhizome (Figs. 1 & 2). There are no veins or color shades, with the exception of the lid where some pale veins are visible if seen against the light. The edge of the pitcher opening is irregular and angular. In autumn, some smaller pale red/pink pitchers are produced.

In spring 2015, the plant produced an 85-cm-tall flower stem with a pale red flower seen from above and yellow inside seen from below (Fig. 3). The pitchers seem to grow shorter if the plant is allowed to flower. It is possible that a mature plant could be taller than 76 cm if the flower is removed.

The name ‘Metallized’ has been chosen because the presence of vegetal waxes inside the pitcher and the absence of pubescence give to the leaves a particular metallic iridescent appearance if observed in full sun. The nuances that are seen by moving the leaves in the sun are difficult to reproduce photographically, as with the iridescence of sundews.

To preserve the unique features of this cultivar, propagation must be vegetative only.

—DANIELE RIGHETTI • via Cavezzali 10/B • 20127 Milano • Italy • flava-rugelii@hotmail.it

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Figure 2: The pitchers of *Sarracenia* 'Metallized' are dark red with an irregular and angular opening.

Figure 3: The flower of *Sarracenia* 'Metallized' is pale red when seen from above and yellow inside from below.
John Hummer obtained specimens of this unique cultivar in 1988. The Bay County, Florida site of origin is no longer extant, having been converted to a housing development about 20 years ago. The plant has entirely maroon-red pitchers top-to-bottom, and is also unique in having flower petals that are pink-red in color (Fig. 4). The distinct maroon red color spectrum of the leaves along with the unique flower petal color combination should be sufficient to distinguish this once naturally occurring *S. flava* variant from others in the field. The images explain this form better than words can describe.

—John Hummer • Ruther Glen • Virginia • USA • john4nature@gmail.com

Figure 4: *Sarracenia ‘Cooke’s Bayou Red’* maroon-red pitchers (top) and its pinkish-red flowers (bottom).
I obtained this hybrid from a French carnivorous plant specialist called “Damien Chertier” who used to sell carnivorous plants. He didn’t remember the origin of this crossing nor the parents.

*Sarracenia ‘Elvis Presley’* is a green yellowish plant wearing delicate red veins on glabrous pitchers at the beginning of the growth season, which become finely pubescent at the end of it (Fig. 5). The pale yellow flower that blooms in spring is a little bit taller than the pitchers and is difficult to pollinate. Indeed, I have almost never obtained seeds from this hybrid, or only a few sterile ones. Just before winter, the plant produces some curved phyllodes toward the ground which could suggest *Sarracenia oreophila* heritage. It grows fast and multiplies easily.

The specific name “Elvis Presley” comes from the particular shape of the lid with its wound spur, which reminds me of the hairstyle of the famous rock ’n’ roll singer Elvis Presley.

This hybrid may be the result of complex crossing between *Sarracenia oreophila*, *S. flava*, and *S. alata*. This plant should be reproduced only by vegetative means to ensure that its unique characteristics are maintained.

—ARTHUR SANGUET • 73000 Chambéry • France • arthur.sanguet@gmail.com
https://phagophytos.wordpress.com

**Figure 5:** Fresh new veined pitchers of *Sarracenia ‘Elvis Presley’* (left) and the peculiar shape of the pitcher lid at the end of the growth season is reminiscent of the hair style of Elvis Presley (right).

I bought this cute hybrid in 2006 from a French carnivorous plant specialist called “Damien Chertier” who used to sell plants. The parents are unknown.
This little Sarracenia, which rarely exceeds 35 cm in height, possesses red-veined yellowish pitchers at opening, which become all red very fast (Figs. 6 & 7), arranged in a rosette around the rhizome. The small flower with red-to-purple petals and sepals is borne on a peduncle 45 cm high (Fig. 7). The plant produces a lot of pitchers during the growth season but seems to divide very little, usually once a year during spring.

Sarracenia ‘Amphibien’ may be the result of a very complex crossing between Sarracenia psittacina, S. purpurea, and S. alata, but it is still unclear as the shape of the pitchers is very different from other hybrids.
The name “Amphibien” (amphibian in English) comes from the particular shape of the opening pitcher that reminds me a croaking frog. This plant should be reproduced only by vegetative means to ensure that its unique characteristics are maintained.

—Arthur Sanguet • 73000 Chambéry • France • arthur.sanguet@gmail.com
https://phagophytos.wordpress.com

Sarracenia ‘Rubis Rare’
Submitted: 28 April 2015

I found this plant in Marcel Lecoulfe’s greenhouse in 2005 without a label. The seller told me it was a special variety of Sarracenia rubra, which is impossible given the shape and color of the pitchers and the flowers.

The plant is 60 cm tall bearing initially orange pitchers which quickly turn red, copper, and purple (Figs. 8 & 9). The underside of the lid is pubescent. The flower is large, with bright yellow bracts and sepals (Fig. 9) that tend to become copper as the season progresses. The first spring pitchers are usually aborted, very small and broadly winged, but they become better shaped during the summer. This plant doesn’t produce a lot of well-formed pitchers.

I called this plant “Rubis Rare” (rare ruby) because of the completely red to purple color of the few pitchers at the end of the growth season.

This hybrid is probably complex, but has certain characteristics of S. purpurea. Nevertheless, its yellow flower and red pitchers indicate a probable crossing with S. flava var. rubricorpora or var. atropurpurea or with S. alata var. nigropurpurea.

Figure 8: One of the first pitchers of Sarracenia ‘Rubis Rare’ at the beginning of the growth season (left) and in the middle of the growth season (right).
I made this hybrid between *Sarracenia* ‘Rubis Rare’ × *mitchelliana* in 2008, but I didn’t take care of the seedlings until 2013. Indeed, one was larger than all the others, which increased my interest in this crossing. I transplanted it to a large pot and, the year after, it was showing all its characteristics.

The size of the pitchers and the lids are amazingly huge and the plant produces a lot of traps that sometimes fall down under their own weight. At first, pitchers are heavily veined and well colored, but after some weeks they become entirely red (Figs. 10 & 11). The pure yellow flower appears during spring (Fig. 11) and might be shorter than the pitchers. *Sarracenia* ‘Dantadelle’ produces a lot of sweet nectar and grows fast from very early spring until very late summer.

I have selected this particular plant because it was clearly bigger and different from the other seedlings of the same breeding. I gave it the name “Dantadelle” because of an old bet with friends during my bachelor’s degree; I promised them that I will give my first interesting hybrid this name. This cultivar should be reproduced only by vegetative means to ensure that its unique characteristics are maintained.

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*Sarracenia* ‘Dantadelle’

Submitted: 28 April 2015

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Figure 10: Fresh new pitcher of *Sarracenia* ‘Dantadelle’ showing green brownish coloration (left) and the particular shape and impressive size of the lid (right).

Figure 11: Three pitchers of *Sarracenia* ‘Dantadelle’ showing the huge size of the plant, the red coloration of older pitchers (left and middle), and the heavily veined new pitcher (right); and its yellow flower.
UNITRICULARIA, which is Carnivorous nately biology, brief might've your the in each distribution books, it's D. betical distinguish as there. There 164 10 Allen's third page. Allen Lowrie’s long awaited 3-volume Magnum Opus (=MO) is an awesome update to his previous 3 volumes on CPs of Australia. However it is not just a new edition of the old information! There are new combinations, new records, new taxonomic states, synonyms re-elevated to species level, new sections, and the description of several new species: 1 Byblis, 16 Drosera, 1 Utricularia, as well as new sundew hybrids.

For me, one of the biggest achievements of MO was the more comprehensive resolution of the D. indica complex – which I’d been eagerly awaiting for years. It is now split into 11 beautiful species, 10 of which occur in Australia (type D. indica does not, interestingly enough). Now to learn how to distinguish between them all....

Which brings me to what may be my biggest peeve with MO: that the species are found in alphabetical order, instead of grouped by taxonomic affinity (subgenera, sections, etc.). I found myself having to constantly flip back and forth between the 3 volumes in order to compare species in the D. indica complex, for example.

And yes, MO may be best described as massive. In fact that may be my second biggest peeve: it’s too heavy to hold for very long and needs to be read on a flat surface, instead of resting against your belly while lying in bed before sleep (which is how I do most of my reading for pleasure). It might’ve been more practical and logical to have split the 3 volumes into 5 or more smaller volumes (for example: one volume just for pygmyes, one just for tuberous sundews, etc.).

Considering what a huge piece of work MO is, there were surprisingly few typos that I could find, and even fewer instances of weirdly phrased sentences – which tells us a lot about how careful the editing was. As for overall organization, the 3 volumes are split into several sections, starting with an introduction to the types of CPs and their habitats in Australia, followed by an overview of the different groups of sundews and sundew bugs. Then comes an interesting section with keys to ID all the species, including traditional botanical keys, beautiful pictorial flower keys, and well as a pygmy sundew gemmae key.

After a brief description of the different plant parts used in taxonomy (and a beautiful but too-brief section with SEM images of their seeds, showing only a handful of species), finally the species descriptions begin, almost 200 pages into the first volume. In the usual style of Allen’s previous books, each species is treated in 4 pages.

The first page contains a full botanical description, distribution, habitat, flowering period, etymology, affinities, and (my favorite part) notes about when and how each plant was discovered by the author, natural variation, or other curiosities. For species that also occur outside of Australia the distribution is sometimes listed, but other times not, which I found a bit odd.

The second page displays Allen’s beautiful line drawings, highlighting important characters for each species. To my vexation, the majority of species were missing drawings of their seed! This was even true for the new species described, and for some species where seed were said to be exceptional in some way (e.g. D. fulva and D. verrucata, which is even named after its unusual seeds).

The third page shows a nice satellite map, etched with the species’ distribution in (but unfortunately not outside) Australia, as well as a key to the beautiful pictures on the fourth page. Although

LITERATURE REVIEW

By Fernando Rivadavia


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the majority of pictures on the fourth page are truly gorgeous, I wish there were less close-ups of flowers and more habitat shots or pictures showing the entire plant habit. For example in the *D. petiolaris* group, only *D. caduca* and *D. paradoxa* are shown as entire flowering plants. All the rest are pictured as rosette or flower close-ups only. Flower shots dominate for many of the sundew species (e.g. *D. cucullata*) and in some cases are pretty much all that is shown (e.g. *D. drummondii*). For some species there only seem to be shots in cultivation, unfortunately (e.g. *D. microphylla* and *D. menziesii*).

While reading each species description, I often found myself flipping to page 4 to see pictures of things described on page 1… only to find that they were not properly pictured or not shown at all. Unfortunately this happened a little too often, regarding certain features or oddities like the grey ovaries of *D. hyperostygma*, the club-shaped organ of *D. fragrans*, involute leaf vernation of *D. praefolia*, flower color forms of *D. pilos*, horned stamens of *D. fulva*, white form of *U. violacea*, the column-like form of *D. myriantha*, and especially descriptions of mass flowerings or large colonies of certain species.

Finally, after all the *Utricularia* in volume 3, comes a section with a biography for every single author of an Australian CP, whether one or a dozen species were named by that author. Although my initial thoughts were that 81 pages on biographies was a waste of paper in a CP book, I’ll admit that I found myself spending much more time than I expected reading the interesting stories behind all those botanists, explorers, and CPers.

Closing the 3 volumes is a taxonomic appendix containing new species descriptions, new sections, new combinations, etc., as well as a nice segment with more information on the *D. indica* complex (including some cool SEM shots of seeds and unfortunately the single picture of type *D. indica* in the whole of MO), 25 pages listing all the species treated in MO (not sure why this was included), a glossary, bibliography, index, as well as a few other bits and pieces for taxonomists (or explaining taxonomy for the lay).

This latter section also included what for me was probably the most “fun” part of the whole MO: 10 pages that teach you how to pronounce all of the species names. Even without the help of any stimulants, I had a long laugh attack trying to vocalize all of the Latin names with an Australian twang.

Cultivators often complain about the constant change in plant names, and there is plenty of it in MO. But this is inevitable since taxonomy is always in flux as new species are discovered, old species re-evaluated, and old synonyms have to be brought back from the grave. Many people don’t realize that botanists spend a lot of time studying dried herbarium specimens, sometimes centuries old, many times highly fragmented, and often missing important parts.

Numerous pictures of old (and very important) herbarium specimens are presented in MO. On page 63 of volume 1, Allen shows one particularly important specimen, the type of *D. petiolaris* from Queensland. This was collected in 1770, on Captain Cook’s first expedition to Australia, and if I’m not mistaken it was the first sundew ever collected on that continent by Europeans. Although Allen wrote that he obtained this historical collection on loan from the British Museum in 1994, I can say that it was actually in 1993, since I happened to be visiting Allen in July of that year and clearly remember seeing it. Unbeknownst to Allen, it had a huge impact on me, bigger than any live plant I saw in Western Australia on that trip. I was 21 and had only began studying CPs in the wilds of Brazil 3 years before. Botany and taxonomy were still very new concepts in my mind. I remember being awed at the excellent quality of that *D. petiolaris* herbarium sheet, at how intact the plants were, as if they’d been pressed very recently – even though the collection was over 200 years old. The reason why I remember this so clearly is because that was the moment that the historical importance of herbarium specimens finally dawned on me. Until then, I’d been hesitant to press plants in the field,
not wanting to kill beautiful sundews. But the *D. petiolaris* type specimen made me realize what an important and long-lasting snapshot of nature herbarium specimens represent. Reading page 63 of MO sent new chills down my spine.

In conclusion, I must address the most common criticism I hear regarding Allen’s numerous publications, including MO: that he is a splitter. Yes, of course there are numerous cases where taxonomic rank can be (and has been) hotly debated when it comes to Allen’s species. In MO there are many such examples where species rank is tenuous at best (*D. depauperata* vs. *D. pulchella*, *D. pygmaea* vs. *D. micra*, *D. macrophylla* vs. *D. monantha*, and several others), and yet *D. binata* was not split into the multiple taxa that it maybe deserves to be, and *D. spatulata* var. *gympiensis* was not recognized, when it could easily have been given species status.

There is no doubt that Allen is truly a splitter, but is that really a bad thing? I think it is the duty of all field researchers to study and publish all known natural variation, in the hopes that biodiversity can be preserved wherever it exists. Splitters are thus important in that they raise red flags for the environmentalists and other taxonomists, who can then probe deeper with further studies. Follow-up research will almost inevitably change taxonomic ranks one way or another, sometimes flipping multiple times over decades and centuries. However I don’t fret too much about what the exact taxonomic rank of a taxon “should” be, knowing that species concepts are not only varied but also always in flux. Taxonomic changes should not be viewed as something bad and wasteful, but as a productive and increasing accumulation of scientific knowledge.

And that is how I view Allen’s MO: as a treasure trove of knowledge about the fantastic CP biodiversity on the Australian continent that every CP lover should own. A definitive work? Quite the contrary, it is already outdated! Several new and unpublished taxa are mentioned in MO and a few new *Utricularia* recently published by Richard Jobson did not make the cut. Therefore, I am ecstatic to have these 3 massive volumes in hands to pour over all those beautiful species for now, but I look forward to buying revised editions of MO every 5–10 years for as long as Allen lives.

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