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CARNIVOROUS PLANT NEWSLETTER

Journal of the International Carnivorous Plant Society

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Front cover: *Drosera tentaculata* at Gouvea, Minas Gerais state. See article on page 79.

Back Cover: The bog garden at Balboa Park, California. See article on page 69.

Carnivorous Plant Newsletter is dedicated to spreading knowledge and news related to carnivorous plants. Reader contributions are essential for this mission to be successful. Do not hesitate to contact the editors with information about your plants, conservation projects, field trips, or noteworthy events. Contributors should review the "Instructions to Authors" printed in the March issue of each year. Advertisers should contact the editors. Views expressed in this publication are those of the authors, not the editorial staff.

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| <p><i>Darlingtonia californica</i>—Oregon, USA</p> <p><i>Drosera anglica</i>—Alaska, USA</p> <p><i>D. anglica</i>—California × Hawaii, USA</p> <p><i>D. anglica</i>—Germany</p> <p><i>D. binata</i></p> <p><i>D. binata</i>—Coromandel, NZ</p> <p><i>D. burmannii</i></p> <p><i>D. capensis</i>—narrow leaf</p> <p><i>D. capensis</i> ‘Albino’—white flower</p> <p><i>D. capensis</i>—red leaf</p> <p><i>D. capensis</i>—wide leaf</p> <p><i>D. capillaris</i></p> <p><i>D. dielsiana</i></p> <p><i>D. filiformis</i> var. <i>filiformis</i></p> <p><i>D. glanduligera</i></p> <p><i>D. indica</i>—NSW, Australia</p> <p><i>D. intermedia</i></p> <p><i>D. intermedia</i>—Cuba</p> <p><i>D. intermedia</i>—Florida, USA</p> | <p><i>D. intermedia</i>—Germany</p> <p><i>D. intermedia</i>—New Jersey, USA</p> <p><i>D. intermedia</i>—North Carolina, USA</p> <p><i>D. nidiformis</i></p> <p><i>D. rotundifolia</i>—Germany</p> <p><i>D. rotundifolia</i>—New Jersey, USA</p> <p><i>D. spatulata</i>—Kanto</p> <p><i>D. stolonifera</i> subsp. <i>stolonifera</i></p> <p><i>D. tokaiensis</i></p> <p><i>Pinguicula ionantha</i> (CITES App. 1)</p> <p><i>P. moranensis</i></p> <p><i>P. planifolia</i></p> <p><i>P. primuliflora</i></p> <p><i>Sarracenia flava</i></p> <p><i>S. leucophylla</i></p> <p><i>S. purpurea</i> subsp. <i>purpurea</i></p> <p><i>Sarracenia</i>—complex hybrid seed</p> <p><i>Utricularia multifida</i></p> |
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This is a partial list of the seeds available. A complete list is online at the ICPS web site, <http://www.carnivorousplants.org/> or by sending a self-addressed, stamped (if USA), envelope to the seed bank address.

Seed packets are US\$1 each. Please include US\$3 postage and handling for each order. You may pay by cash, check, or money order in US\$. Many members pay with cash. Please make checks and money orders payable to “ICPS Seed Bank”.

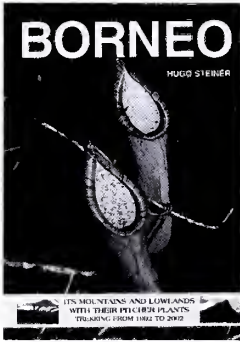
The seed bank is a members-only benefit. The quantity of seed available to each member is 1 packet of each variety per month and 40 packets total in any 12 month period. Please list alternative seed selections, as other orders will arrive before yours. If you have an e-mail address, please include it so we can correspond should any issues arise. Seeds purchased through the seed bank are intended for your personal use only and may not be sold.

You are encouraged to stock the seed bank with seed produced by cultivated plants. The ICPS policy on wild seed collection is on line at the ICPS web site. Cultivation-produced seeds of species protected by the US Endangered Species Act are distributed within the US only, and in accordance with the ICPS’s US Fish & Wildlife Service permit.

Donate seed and get credit for free seed from the seed bank. Seeds of selected varieties are available free to teachers for use in the classroom and to scientists and conservation organizations. It is ICPS policy not to sell internationally seed of plants protected by CITES Appendix I or the US Endangered Species Act.

John Brittnacher, Manager • john@carnivorousplants.org

BOOK REVIEW



Steiner, Hugo. 2002. Borneo—its Mountains and Lowlands with their Pitcher Plants. Toihaan Publishing Company Sdn. Bhd., Kota Kinabalu, Malaysia. ISBN 983-40421-1-6. Approximately 190 color photographs, figures and maps, 136 pages. Hard cover, 19.5 × 26 cm (8 × 10 in), \$US43 .

Reviewed by Siegfried R.H. Hartmeyer

Visiting Borneo in 1992, the retired Swiss endocrinologist Hugo Steiner and his wife “became trapped” by the beauty and fascination of Borneo’s famous *Nepenthes*. They returned every year for a month, until 2002, to visit the habitats in Sabah and Sarawak, supported by local guides. They met experts like Charles Clarke and Ch’ien C. Lee (who provided a nice photo of his recently rediscovered *Nepenthes campanulata* for the book). They define the aim of their book as “...to give an impression of their [pitcher plants] natural habitats by detailed photographs...not as a serious scientific account, but instead to focus our presentation on the aesthetic aspect...”

Turning through the pages of this book, the numerous colour photographs combining landscapes and plant details let the reader’s imagination dive into the unique atmosphere of tropical habitats. This is supplemented by entertaining text, maps and tables. People looking for an interesting but not too technical or scientific work on Borneo and its pitcher plants would especially benefit from this book. While the author refers to the published work of Martin Cheek and Matthew Jebb, the important contribution by these authors in *Flora Malesiana* (“Series I - Seed Plants—Nepenthaceae”, ISBN 90-71236-49-8), is unfortunately not listed in the references.

Conservation, biology and ecology are discussed in separate chapters. Pictures and descriptions of the Sabah and Sarawak species are provided, and the Kalimantan (Indonesian Borneo) species are mentioned. A treatment of *Nepenthes boschiana*, however, is missing. The aesthetic aspect remains very good despite two or three low quality photographs, and a printing mistake in one figure caption (“Male inflorescence of an upper pitcher”) should be corrected to “Upper pitcher and male inflorescence”.

I disagree with one statement the author makes concerning the survival of endangered species. In a case where the original habitat is destroyed, but then new habitat later is made available, the author suggests that a “marginal, and rather theoretical method” to save the rare species would be to hybridize them (because hybrids often survive more easily in cultivation), and then later try to reclaim a pure genome from the hybrid. Even though the author mentions this method only very carefully, I would like to declare it as a deadly threat to any natural species because the idea that it is possible to reconstruct the original species genome from a hybrid is only fiction. Finally, I do not know any source reporting the production of alcohol to support digestion inside the pitchers, as mentioned two times in the book. But even in spite of these critical remarks I would like to underline that Hugo Steiner has achieved his above mentioned goal: to publish an aesthetic book on the pitcher plants of Borneo. For carnivorous plant enthusiasts this work should not be considered a competitor but a richly illustrated supplement to Charles Clarke’s famous book “*Nepenthes of Borneo*” (ISBN 983-812-015-4), and for laymen it is a recommendable easy to read entrance into the fascinating world of tropical pitcher plants in the midst of their natural habitats. I like it.

SHARE THE JOY

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Keywords: outreach: education, societies.

Knowledge is not knowledge unless it is shared
—Tao of Leo Song

I have been growing carnivorous plants for about seven years, and during this time, I have noticed something about many carnivorous plant growers: they prefer to share their passion for carnivorous plants only with a few other carnivorous plant growers, and they almost never attempt to “reach out” to the uninformed public to share information about the joys of carnivorous plant growing. Oh, I have seen all of the web sites, and they are commendable, but most are directed at other carnivorous plant growers—the rest of the world does not even know these web sites exist!

A couple of years ago, I assisted with the formation of the San Diego Carnivorous Plant Society (SDCPS). In the process of contacting other carnivorous plant enthusiasts in our area, we noticed this isolationist attitude in quite a few growers. So we decided that spreading the word should be an important part of our Society.

One of the most important objectives of the SDCPS is to educate the general public about carnivorous plants. Not only is this personally rewarding to our members, but this education process has also resulted in many new growers getting started in our area, several of whom have joined our society.

We accomplished this education objective in several ways. First, our President and founder, David Simon, wisely designed our web site (www.sdcps.com) to be very entertaining. When newcomers log onto our site, they are not confronted with an overwhelming volume of complex scientific information and carnivorous plant jargon. Instead, they find a very entertaining site, and they quickly understand that a person can have FUN while growing carnivorous plants!

We reach out to the public in several other ways. To date, we have given a free 45-minute carnivorous plant class to over 3,500 adults and schoolchildren all over the San Diego area. Besides the lecture, we display live plants, conduct feeding demonstrations, and show video clips. Virtually everyone who has attended this class has become enthusiastic about carnivorous plants, and many have become growers.

In addition, we make every effort to have a carnivorous plant display at any and every plant show, fair, exhibit, etc. When visitors see the words, “carnivorous plants”, they flock to our display. They love the plants, and they go home to log onto our site.

The project that is probably having the greatest impact on the public in our area is our sponsorship of carnivorous plant bog gardens. We provide guidance about construction, water, growing media and plant sources. Our members have contributed some of their plants. To date, we have assisted the City of San Diego in establishing a 3 meter × 3 meter (10 foot × 10 foot) raised bog garden in the Botanical Building at Balboa Park (see Back Cover), and we worked with the San Diego Zoo to build a small bog garden near the Zoo’s gorilla exhibit (Figure 1). The Balboa Park bog has more than 150 carnivorous plants in it, including a few *Nepenthes* hanging overhead. The Zoo has included a much larger carnivorous plant bog in its Heart of the Zoo III construction project

that is underway now.

All of these projects are accompanied by SDCPS business cards and flyers that are passed out in large numbers. This encourages bog garden visitors to call and request carnivorous plant classes. Then, class attendees log onto our site. Then, site visitors go to our next plant show, open house, etc. Interest is building all over our area.

There is no secret to how we are accomplishing these things. First, we established the objective of educating the public. Then we pursued that objective through many phone calls and e-mails. We have much more that we want to accomplish. And we are having more fun than we ever imagined we would!



Figure 1: A little bog garden at San Diego Zoo.



Figure 2: The exciting and enticing SDCPS logo.

WHAT IS THE ACCEPTED NAME FOR THIS PLANT?

-OR-

DO I HAVE TO CALL IT *SARRACENIA ROSEA*?

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Keywords: botany.

As a coeditor for Carnivorous Plant Newsletter, one of my jobs is to make sure that the articles in the journal are in accordance with correct botanical practice—in particular, Jan and I make sure authors always use validly published botanical names. While this might seem sensible, I get a constant stream of complaints about our strict practice in this regard. There is also a great deal of confusion about how Latin names should be used. Maybe this article will help our readers understand a little more about Latin names, and maybe I will get fewer complaints from angry, albeit creative authors!

First, let me describe the difference between a “good” Latin name and a “bad” Latin name. It is not correct to write an article about a plant and just casually refer to it using a Latin name that you made up. If we allowed this, chaos would rule as everyone would have their own set of pet rules and names, and we would never know what all the names referred to. Fortunately, there is a book of rules that governs how plants are named, and this is called the International Code of Botanical Nomenclature (ICBN). The ICBN clearly outlines everything that authors must do in order to publish a new botanical Latin name validly. Look at any new plant description in Carnivorous Plant Newsletter or other reputable journals, and you will see a number of features not found in the regular articles (such as Latin descriptions, designations of “type” specimens, etc.). If an author trying to publish a new Latin plant name writes an article which does not contain all of these features, the name is instantly considered illegitimate. When a Latin name is not clothed with all the trappings of a correct botanical description, it is called a “naked name”, or *nomen nudum*.

An example of a *nomen nudum* familiar to many carnivorous plant growers is “*Drosera coccicaulis*.” You will often see this plant mentioned in seed catalogues and articles. This plant was apparently introduced into cultivation more than a decade ago, and whoever did so called the plant “*Drosera coccicaulis*.” Unfortunately, to this day we do not know where this plant came from, or exactly what it really is. (Gibson (2002) provides a good review of this plant, and concludes it may be related to *Drosera natalensis* or *Drosera venusta*.) I really wish the person who introduced this plant had followed botanical rules when he or she introduced it, and did not dub it with a *nomen nudum* to confuse us all! (By the way, “*Drosera coccicaulis*” translates to “berry-stem”! Does anyone want to guess what that means?)

A special kind of illegitimate name involves “ranks.” For example, consider the North American species *Drosera filiformis*. Typically, this species is subdivided into two varieties, the northern *Drosera filiformis* var. *filiformis* and the southern *Drosera filiformis* var. *tracyi*. Meanwhile, some authors consider the two plants to be sufficiently different to be properly treated as two separate species. However, as Schnell (2002, p.273) notes, no one ever bothered to write a paper that elevated the southern plant from varietal rank to a species rank. So if you read an article about “*Drosera tracyi*”, you should be aware that the article is using an illegitimate name.

(In this particular case it is not likely that you will confuse the name for anything other than the southern variety of *Drosera filiformis*, but if the rank name being incorrectly elevated were something more common like “*alba*” or “*major*”, you can see the opportunity for confusion.) So whether or not you believe that the southern plant should be treated as a separate species or subspecies, you can only call it *Drosera filiformis* var. *tracyi* until someone writes an paper—following ICBN form—which publishes the new name validly.

It is particularly confusing when multiple names for the same plants exist. There are two different kinds of cases for this.

Suppose a botanist validly published a fine Latin species name for a plant. For example, “*Sarracenia minor*” was described by a botanist named Walter in 1788 (the describing author’s name becomes part of the plant’s full name, in this case *Sarracenia minor* Walter). Subsequently, in 1804 a botanist named Smith gave this very same plant a name, also at the species rank: *Sarracenia adunca* Smith. This second name is just a repeat “synonym” of *Sarracenia minor* Walter, and the ICBN rules state that in the case of synonyms, the first name published validly is the name you must use. (Notice that both these names are at the same rank—in this case they are both species names—which is one of the reasons they are considered synonyms.)

In a different kind of situation, the ICBN does allow multiple names—at different ranks—for the same sets of plants; this is acceptable because scientific opinions may vary on how the plants should be classified. Indeed, scientists do not always unanimously agree on when plants should be considered species, subspecies, varieties, etc., and the resulting arguments can turn into multi-decadal feuds of unmatched vitriol.

Here are some examples.

Sarracenia rubra is a plant which has been classified as consisting of five separate subspecies, i.e. *S. rubra* subsp. *rubra*, *Sarracenia rubra* subsp. *alabamensis*, *S. rubra* subsp. *wherryi*, *S. rubra* subsp. *jonesii*, and *S. rubra* subsp. *gulfensis*. However, some botanists prefer to group the second and third plants in that list into subspecies of a different species. They would prefer to use the names *Sarracenia alabamensis* subsp. *alabamensis* and *S. alabamensis* subsp. *wherryi* (which they could, because these names were validly published in accordance with the ICBN rules). Additionally, some botanists consider *S. rubra* subsp. *jonesii* to be a separate species: *Sarracenia jonesii*. Incorporating all these alternative names, the list of plants at the beginning of this paragraph could be rewritten as *Sarracenia rubra* subsp. *rubra*, *S. alabamensis* subsp. *alabamensis*, *S. alabamensis* subsp. *wherryi*, *S. jonesii*, and *S. rubra* subsp. *gulfensis*. You should use whichever sets of names that reflect your own beliefs on the nature of these plants.

A recent paper by Naczi *et al.* (1999) validly published the name *Sarracenia rosea* for a plant already bearing the name *Sarracenia purpurea* subsp. *venosa* var. *burkii*. You are free to use whichever of these two names you think is more appropriate. If you feel that this plant is a member of the species *Sarracenia purpurea*, then you could call it *Sarracenia purpurea* subsp. *venosa* var. *burkii*. If you feel it is different enough to warrant being called a separate species, you could call it *Sarracenia rosea*. I have been contacted by a number of people who think it should be considered a separate subspecies—however, the names “*Sarracenia purpurea* subsp. *burkii*” or “*Sarracenia purpurea* subsp. *rosea*” have not been published in accordance with the ICBN, so using either would be only creating another illegitimate name, and more confusion.

Similar examples of these matters: Some botanists divide *Drosera brevifolia* into *Drosera leucantha* and *Drosera annua*; some botanists divide *Utricularia dichotoma* into *Utricularia dichotoma*, *Utricularia monanthos*, and *Utricularia novae-zelandiae*. It is up to you to decide which names to use. Just stay away from the *nomen nudum* forbidden list! If you are ever confused about

the status of a carnivorous plant name, look at Jan Schlauer's definitive on-line database (http://www.omnisterra.com/bot/cp_home.cgi). If this web address ever changes in the future, I am sure you will be able to find it through links at the ICPS home page.

I hope I have not bored you with a review of these guidelines. Perhaps in the future you will be more certain about which names you must use, which names you must not use, and which names you can use at your own discretion. Carnivorous Plant Newsletter will continue to use names that are both in accordance with its submitting authors' wishes, but also always in compliance with the ICBN. If our journal were not in compliance with the ICBN, many of our writers would not feel comfortable contributing articles describing new species to our journal, and readers would have to consider our publication a little (or a lot!) less reliable.

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IN VITRO PROPAGATION OF *BYBLIS FILIFOLIA* (BYBLIDACEAE)

MATTHEW C. PELTO AND JON T. LINDSTROM • Department of Horticulture • University of Arkansas • 316 Plant Sciences Building • Fayetteville, AR 72701 USA • mpelto@uark.edu

Keywords: cultivation: *Byblis filifolia*, tissue culture.

Introduction

Byblis filifolia Planch. belongs to the family Byblidaceae Domin. (a family closely related to Lentibulariaceae L. Rich. which includes the genera *Pinguicula* L., *Utricularia* L., and *Genlisea* St. Hil.), the genus *Byblis* also includes the species *B. gigantea* Lindl. (a perennial), and *B. liniflora* Salisb., *B. aquatica* Lowrie & Conran, and *B. rorida* Lowrie & Conran (annuals or short-lived perennials) (D'Amato, 1998; Lowrie & Conran, 1998). *Byblis filifolia* has a long, meandering central stem with occasional branching and numerous linear leaves. The form of *B. filifolia* used in this study has mauve flowers with a white outer surface. Members of *Byblis* Salisb. are considered to be a carnivorous plants because the outer surface of the stems and leaves are covered with perpendicularly oriented trichome-like glands (the traps) that each exude a droplet of a clear, sticky substance from the distal end. The secretions of a second type of laterally oriented glands purportedly digest the soft portions of trapped insects (D'Amato, 1998). The digestive secretions of the second gland-type contain neither enzymes nor bacteria, and some conjecture that *Byblis* taxa may actually be subcarnivores and that the digestive process is actually facilitated by fungi or, as is the case with *Roridula* L., by assassin bugs (D'Amato, 1998).

Byblis is commonly propagated with seed; however, consistent germination can be difficult to achieve due to the necessity of smoke and/or plant growth regulator treatments, and the seedlings that do germinate are commonly killed by damping off (D'Amato, 1998; Schnell, 1975). Also, seedling populations can exhibit phenotypic variation limiting the value of seed propagation in producing large numbers of plants that consistently exhibit desired characteristics such as specific flower color or size. In vitro propagation methodologies can be used to further improve seed germination (and seedling viability) and to vegetatively propagate (via micropropagation) large numbers of true-to-type clones of plants exhibiting especially desirable characteristics (Bunn, 1985; Stoutamire, 1972).

Materials and Methods

Byblis filifolia seed purchased from Allen Lowrie (6 Glenn Place, Duncraig, 6023, Western Australia) were soaked in a 2.9 mM (1,000 mg·L⁻¹) solution of GA₃ (gibberellic acid) for 24 hours. The seed were then disinfected for 20 minutes in a calcium hypochlorite solution (prepared by stirring 10 grams of calcium hypochlorite in 140 mL of water for 1 hour and then decanting the solution through a Buchner funnel to remove the sediment), rinsed with sterile deionized water, and aseptically transferred to an in vitro germination medium (Stoutamire, 1972).

The in vitro germination medium consisted of one-fifth strength Murashige and Skoog (MS) basal salts with the full strength MS vitamin complement (100 mg·L⁻¹ myo-inositol, 0.1 mg·L⁻¹ thiamine, 2.0 mg·L⁻¹ glycine, 0.5 mg·L⁻¹ nicotinic acid, and 0.5 mg·L⁻¹ pyridoxine), 30 g·L⁻¹ sucrose, and 0.5 g·L⁻¹ MES (2-N-morpholinoethanesulfonic acid)

(Murashige and Skoog, 1962). The medium was solidified with 6.8 mg·L⁻¹ agar, and the pH was adjusted to 5.7 with 1 M potassium hydroxide. No PGRs (plant growth regulators) were added. Culture vessels were 125-mL glass jars capped with Magenta-B® lids (Magenta Corp., Chicago, Illinois.), and the interface between the lid and the jar was sealed with a single layer of parafilm to prevent excessive moisture loss. The vessels contained 30 mL of the medium. Cultures were maintained at 24°C under bright white fluorescent lights (55 mmol·s⁻¹·m⁻², approximately 4400 lx for our light source) for a 16-hour day-length. Seedlings were transferred to fresh media after 35 days.

Propagules (isolated shoot tips or shoot masses used to continue propagation) were transferred to media with the same composition as the germination medium except that full strength MS salts were used with the Linsmaier and Skoog (1965) vitamin complement (100 mg·L⁻¹ myo-inositol and 0.4 mg·L⁻¹ thiamine), 0.1 µM IBA (4-[3-Indolyl]butyric acid) was added to the medium, and either 1.0 µM or 2.0 µM BA (*N*-[phenylmethyl]LH-purine-6-amine) was added. Propagules were also transferred to a medium with the aforementioned composition except that 2.0 g·L⁻¹ of Phytigel™ (Sigma, St. Louis, Missouri) was used in place of agar.

In an effort to determine if *Byblis* shoots excised from shoot masses would be amenable to ex vitro rooting and acclimation, thirty 2 to 3 cm shoots were removed from in vitro culture, dipped in Clonex® (Growth Technology™, Freemantle, Australia)—a commercial rooting formulation containing 14.7 µM IBA—to facilitate root formation, and placed into Bio sponge plugs (Park's Seed Company, Greenville, S.C.) that were then enclosed in the Park's Bio Dome seed starter box. After 15 days, vents on the cultivation box were opened halfway to begin acclimating the plantlets to lower humidity. *Byblis* plants were observed for three months after rooting and acclimation were initiated.

Results, Observations, and Discussion

Only 8 of the 20 seed placed on the in vitro media germinated; however, this result was better than our efforts at germinating *B. filifolia* seed on a peat-based soil free mix in which 50 seed were sown with only two seed germinating (which promptly died from the damping-off syndrome). All seedlings that germinated in vitro survived and grew on the medium. Plants that were left on the germination medium for the duration of a second 35-day interval enlarged from less than 0.5 cm in height to 4 to 6 cm and produced roots in vitro.

Removing the apical meristem (disrupting apical dominance) from a plant on the germination medium caused the plant to produce 2 or 3 lateral branches that could be removed and used as propagules for further propagation. Placing shoots onto media containing PGRs caused the shoots to develop into 3 to 5 cm high shoot masses (see Figure 1) from which 5 to 8 shoots could be typically isolated after 35 days. The addition of 1.0 µM BA produced more new shoots than 2.0 µM BA, but the 2.0 µM level caused the shoots produced to be larger. The addition of PGRs and the full-strength MS salt complement also caused the shoot leaves to be thicker and greener than shoots that had been maintained on the PGR-free germination medium. Shoot masses on the PGR-free germination invariably exhibited yellowing and senescing leaves after 35 days. Microshoots produced on media solidified with Phytigel™ were hyperhydric (structures were translucent and water-logged), so the use of Phytigel™ was discontinued because hyperhydricity can interfere with acclimating the microshoots to ex vitro conditions.

Twenty-eight of the original 30 microcuttings that had been dipped in Clonex® and placed in the Park's Bio Dome seed starter began rooting 15 days later. The two shoots that had not rooted after this interval desiccated and died. The surviving plants, which had attained a length of approximately 10 cm, were photographed one month after rooting was first observed (see Figures 2, 3).

Byblis shoot masses have been maintained in in vitro culture for one year at

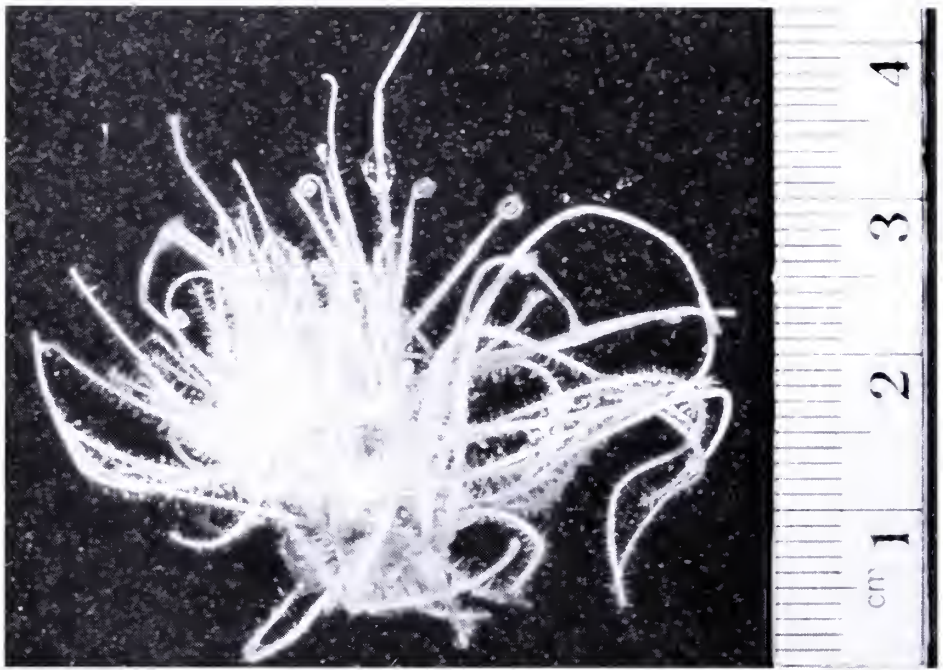


Figure 1: Shoot mass produced by *B. filifolia* on the proliferation medium.



Figure 2: Rooted *B. filifolia* plants in the Bio Dome seed starter box (without the cover).



Figure 3: Single rooted *B. filifolia* plant in a Bio sponge plug.

this writing, and we believe that the system of in vitro propagation, ex vitro rooting, and acclimation described herein would permit rapid, continuous production of *B. filifolia* and would prove suitable for rapidly propagating other *Byblis* species. This is the first report on the in vitro proliferation of *B. filifolia*. In vitro rooting of *B. gigantea* had been previously reported by Bunn (1985); however, our observations presented here comprise the first report of successful ex vitro rooting with tissue culture generated *Byblis* microcuttings.

Future work on *Byblis* in vitro culture should entail determining if BA concentrations lower than 1.0 μM are more appropriate for culturing *B. filifolia* and determining if PGR treatments with combinations of PGRs, as suggested by Schnell (1975), might produce better germination of *B. filifolia* seed than GA_3 alone.

Acknowledgements: We would like to thank Meagan Love for assistance with disinfection and subculturing.

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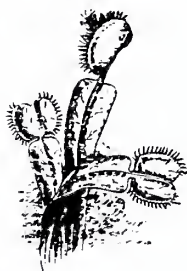
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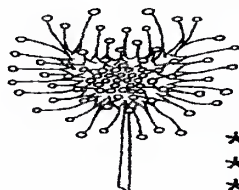
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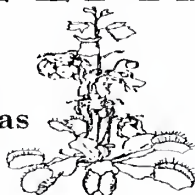
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FOUR NEW SPECIES OF SUNDEWS, *DROSERA* (DROSERACEAE), FROM BRAZIL

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Keywords: new taxa: *Drosera tentaculata*, *Drosera grantsau*, *Drosera camporupestris*, *Drosera viridis*, Brazil.

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Abstract

Four new species are described from Brazil for the sundew genus *Drosera* (Droseraceae): *Drosera tentaculata* F.Rivadavia *spec. nov.*, *D. grantsau* F.Rivadavia *spec. nov.*, *D. camporupestris* F.Rivadavia *spec. nov.*, and *D. viridis* F.Rivadavia *spec. nov.* The morphological characters distinguishing these from other similar or related taxa are discussed together with habitat information, detailed illustrations, and distribution maps. *Drosera grantsau* and *D. viridis* are included in subgen. *Drosera* sect. *Drosera*, whilst *D. tentaculata* and *D. camporupestris* are included in subgen. *Drosera* sect. *Oosperma*. Furthermore, *D. chrysolepis* Taubert and *D. graminifolia* A.Saint-Hilaire are moved from sect. *Drosera* to sect. *Oosperma*.

Introduction

The sundews of the genus *Drosera* comprise nearly 150 species spread worldwide, mostly in the Southern Hemisphere and especially in southwestern Australia (Diels, 1906; Schlauer, 1996). Around fifteen *Drosera* species are presently known to occur in Brazil (Diels, 1906; Silva & Giulietti, 1997), the first of which were published by A.Saint-Hilaire (1824a; 1824b).

Initiated by this author in 1990, ongoing field studies with *Drosera* spp. throughout Brazil have resulted in the discovery of four new species, all of which were previously mistaken for other similar or related taxa. However, upon closer examination each of these new species is clearly distinctive from all other Brazilian *Drosera* taxa in their vegetative, floristic, and ecological characteristics. These new taxa and other native Brazilian *Drosera* species were cultivated in a greenhouse in São Paulo over a five year period, during which observations and comparisons were carried out.

Results

Drosera tentaculata F.Rivadavia, *spec. nov.* TYPE — BRAZIL. Minas Gerais: Município de Diamantina, no alto da Cachoeira dos Cristais, estrada para Biribiri, c.1000 m alt., 31/Jul./2002, Rivadavia & Gibson 1376 (holotype — SPF). Figure 1:A-J.

Drosera montana A.Saint-Hilaire var. *tomentosa* (A.Saint-Hilaire) Diels *affinis sed plantis frequenter columnas brevibus e foliis defunctis compactis formantibus, margine laminae apice glandulis 8-12, 2-9 mm longis, rectangularibus, longe stiptatis obsita; foliis obovato-cuneatis; scapibus 3.5-18.5 cm longis (inflorescentia inclusa); inflorescentia 1-9-flora; seminibus ovoideo-ellipsoideis.*

Perennial herbs with leaves in rosettes flat on the ground or atop short columns of dead leaves up to 2.5 cm high. Stipules 2-4 mm × 0.8-1.5 mm, translucent white in color, the upper half to two-thirds divided into 7-11 filaments, stipule filaments shorter towards the center of the stipules. Leaves 3-13(-17) mm long excluding retentive glands, obovate-cuneate (cuneate), orange-green to deep wine-red in exposed habitats, green in shadier habitats; petioles 0.5-4(-8) mm × 0.8-1.5 mm, usually greener than the lamina, sparsely eglandular-pilose to glabrous adaxially, abaxially sparsely to densely covered with shaggy white eglandular hairs up to 1 mm in length; lamina 2-9 mm × 1.5-4(-8) mm, more or less eglandular-pilose abaxially, especially near the base and along the margins, adaxially covered with numerous red retentive glands, including 8-12 red, horizontally flat, retentive glands on the apical margin, 2-9 mm long, each with a narrowly-obcuneiform stalk and a linearly-rectangular head. Inflorescences 1-3 per plant, 3.5-18.5 cm long including scape, with 1-9 flowers each, erect, never bifurcating, glandular-pilose especially towards the apex, eglandular-pilose on lower one-third of the scape, especially towards the base; pedicels 2-5 mm long, inserted 2-20 mm apart, glandular and

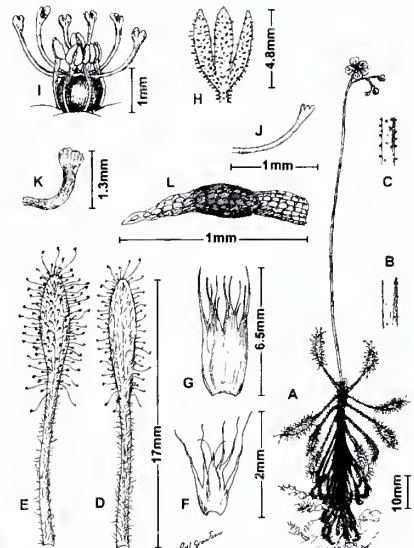
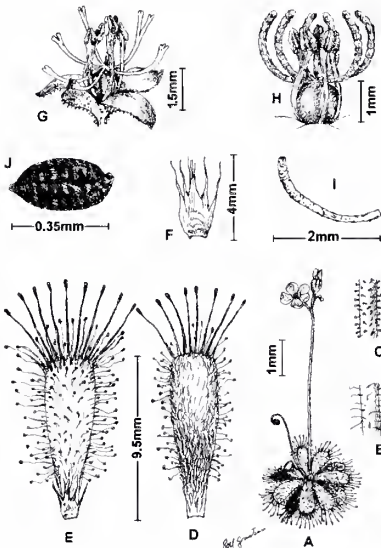


Figure 1: *Drosera tentaculata* F.Rivadavia showing variation of style morphology from three locations; A: habit; B: lower inflorescence, detail of indumentum; C: upper inflorescence, detail of indumentum; D: leaf, abaxial view; E: leaf, adaxial view with stipule; F: stipules; G: calyx, gynoecium and stamens; H: gynoecium and stamens; I: style; J: seed. (A-F, H, and J based on *Rivadavia & Mullins 541* (SPF) from the Serra do Cipó; G based on *Rivadavia & Pinheiro 451* (SPF) from Diamantina; I based on *Rivadavia 629* (SPF) from the Serra do Cabral.) Figures based on live, pressed and alcohol-preserved specimens.

Figure 2: *Drosera grantsau* F.Rivadavia showing variation of style morphology from three locations; A: habit; B: lower inflorescence, detail of indumentum; C: upper inflorescence, detail of indumentum; D: leaf, abaxial view; E: leaf, adaxial view; F and G: stipules; H: calyx; I: gynoecium and stamens; J: style; K: style; L: seed. (A-F, I, and L based on *Rivadavia 410* (SPF) from Jaguariáiva; H based on *Rivadavia 328* (SPF) from Itacambira; J based on *Rivadavia & Cardoso 422* (SPF) from the Chapada dos Guimarães; G and K based on *Rivadavia & Ganev 491* (SPF) from the Chapada Diamantina.) Figures based on live, pressed and alcohol-preserved specimens.

often eglandular-pilose; sepals 5 united for 1/3 to 1/2 of length, 2-4 mm × 0.7-1.5 mm, oblong-ovate, abaxially glandular and often eglandular-pilose; petals 5.5-8.5 mm × 3-4 mm, obovate, dark pink-lilac in color; ovary 1-1.7 mm long at anthesis, trilobed, globose, becoming ellipsoid in fruit, 2-2.5 mm long; carpels 3; styles 3, 2-4 mm long, stigmata indistinct, basally bifurcate, thickening somewhat towards the apex with several constrictions or without constrictions or with distinct stigmata inconspicuously flabellate to bifurcate; stamens 5, 2.5-4 mm long; seeds black, 0.3-0.45 mm long, black, ovoid-ellipsoid, reticulate. Roots fine and fibrous.

Drosera tentaculata is placed in subgen. *Drosera* sect. *Oosperma* sensu Schlauer (1996). It is easily distinguishable by its obovate-cuneate leaves with 8-12 large apical retentive glands 2-9 mm long, each with a narrowly-obcuneiform stalk and a linearly-rectangular head. Such tentacles are only found in one other New World species, *D. sessilifolia* A.Saint-Hilaire, which differs in its annual habit, yellowish to orange-reddish cuneate leaves, 5 carpels, 5 stigmata (without basal bifurcations), and ovoid seeds.

The styles with several constrictions and indistinct stigmata found on *D. tentaculata* from the Serra do Cipó are unique in the genus *Drosera*. Yet this character is apparently variable in *D. tentaculata* since the styles of plants from the Serra do Cabral do not have constrictions while those from the Diamantina region have distinct stigmata varying from inconspicuously flabellate to bifurcate. Such variability in style and especially stigmata morphology has also been observed in other *Drosera* spp. in Brazil, especially *D. montana* var. *montana*.

Also variable in *D. tentaculata* is the amount and distribution of eglandular hairs on the inflorescences, which are more frequent near the base and apex of the inflorescence but are often almost completely absent. The number and distribution of eglandular hairs have even been observed to vary on different inflorescences belonging to the same plant.

Drosera tentaculata is most commonly confused with *D. montana* var. *tomentosa* due to similarities in overall shape and size, inflorescence pubescence, and to the fact that both taxa often occur sympatrically. Other than the absence of the large apical retentive glands, *D. montana* var. *tomentosa* can easily be distinguished by its oblongo-obovate leaves; on average longer petioles; inflorescences up to 33 cm in length, often bifurcate, with as many as 22 flowers each; and seeds cuneate-ellipsoid.

This new species is commonly found growing near or sympatrically with other *Drosera* spp. such as *D. camporupestris* F.Rivadavia, *D. chrysolepis*, *D. graminifolia*, *D. montana* var. *montana*, *D. m.* var. *schwackei* Diels, and *D. m.* var. *tomentosa*. No hybrids between any of these and *D. tentaculata* have ever been observed, including the morphologically more similar taxa of the *D. montana*-complex. *Drosera tentaculata* occurs in "campo rupestre" vegetation, usually in areas that suffer intense desiccation during the dry season, which is when flowering usually occurs (July to October). It is found predominantly among sparse grasses in fine white sand mixed with white quartz gravel, or in sand mixed with black humus, or even on bare sandstone surfaces. The rosettes often lose vigor after flowering, growing slowly over the following few months.

Although it is apparently better suited to survive in relatively dry habitats, *D. tentaculata* has been found growing in very boggy soil at one location, where the leaves were exceptionally large and cuneate in shape (Rivadavia & Gibson 1402 and Rivadavia 1591—SPF). These unusual measurements are included between parenthesis in the above description of this new taxon.

Drosera tentaculata is endemic to the Cadeia do Espinhaço Highlands in the states of Minas Gerais and Bahia, where it has been collected on the Pico das Almas (c.1500 m elevation), Serra do Cabral (c.1280 m elevation), and Serra do Cipó

(c.1250-1400 m elevation) as well as on highlands near the towns of Diamantina (c.950-1400 m elevation), Gouvea (c.1260 m elevation), Milho Verde (c.1100 m elevation), and Itacambira (c.1200-1350 m elevation). (Figure 5) .

The epithet "*tentaculata*" refers to the exceptionally large tentacle-like retentive glands present on the apex of the leaves of this new species.

Paratypes — BRAZIL. Bahia: Rio de Contas, lower NE slopes of the Pico das Almas, 17/Feb./1977, *Harley et al. 19568* (SPF). Minas Gerais: Diamantina, estrada p/ Medanha, 12/Oct./1984, *Mello-Silva et al. 5379* (SPF); Diamantina, cachoeira dos Cristais, 7/Jul./1995, *Rivadavia & Pinheiro 451* (SPF); Diamantina, estrada p/ Curvelo, 27/Feb./1997, *Rivadavia & Pinheiro 571* (SPF); Diamantina, estrada p/ Tapetes Arraiolos, 27/Feb./1997, *Rivadavia & Pinheiro 580* (SPF); Diamantina, estrada p/ Tapetes Arraiolos, 10/Jul./1999, *Rivadavia, et al. 1106* (SPF); Diamantina, cachoeira dos Cristais, 31/Jul./2002, *Rivadavia & Gibson 1376* (SPF); Gouvea, estrada Diamantina-Curvelo, 2/Aug./2002, *Rivadavia & Gibson 1402* (SPF); Gouvea, estrada Diamantina-Curvelo, 6/Apr./2003, *Rivadavia 1591* (SPF); Itacambira, estrada p/ M.Claros, 5/Mar./1997, *Rivadavia 614* (SPF); Itacambira, estrada p/ M.Claros, 14/Jul./1999, *Rivadavia & Pinheiro 1143* (SPF); Itacambira, estrada p/ M.Claros, 29/Jul./2002, *Rivadavia & Gibson 1364* (SPF); Jaboticatubas, km 142 rodovia L.Santa-C.M.Dentro, 27/May/1972, *Joly et al. 2111* (SP); Jaboticatubas, estrada da usina, 21/Aug./1972, *Joly & Semir 3067* (SP); Jaboticatubas, km 138-9 rodovia L.Santa-C.M.Dentro, 8/Sep./1972, *Joly & Müller 3433* (SP); Jaboticatubas, 10/Apr./1980, *Barros 200* (SP); Jaboticatubas, Serra do Cipó, trilha p/ mirante do canyon Bocaina, 5/Jun./1994, *Rivadavia 289* (SPF); Jaboticatubas, Serra do Cipó, Fazenda da Serra do Cipó, 11/Sep./1994, *Rivadavia 305* (SPF); Jaboticatubas, Serra do Cipó, estrada p/ o mirante do canyon Bocaina, 23/Feb./1996, *Rivadavia & Mullins 541* (SPF); Jaboticatubas, Serra do Cipó, km 112 ou 113 da estrada p/ C.M.Dentro, 9/Jul./1999, *Rivadavia, et al. 1096* (SPF); Joaquim Felício, alto da Serra do Cabral, 7/Mar./1997, *Rivadavia 629* (SPF); Santana do Riacho, caminho da Lapinha, 11/Feb./1991, *Arbo et al. 4851* (SPF); Santana do Riacho, rodovia B.Horizonte-C.M.Dentro, 6/Sep./1980, *Forero et al. 7762* (SPF) (mixed collection with *D. montana* var.*tomentosa*); Santana do Riacho, 2.5 km após acampamento Serra Morena, 28/Jul./2002, *Rivadavia & Gibson 1362* (SPF); Serro, Milho Verde, trilha p/ cachoeira do Arco-Íris, 5/Apr./2003, *Rivadavia & Neves 1561* (SPF); Serro, Milho Verde, planície ao lado da cidade, 5/Apr./2003, *Rivadavia & Neves 1570* (SPF).

Drosera grantsau F.Rivadavia, *spec. nov.* TYPE — BRAZIL. Minas Gerais: Município de Grão Mogol, morro do Jambreiro, nascente brejosa na base do morro, c.7 km da cidade pela estrada para Montes Claros, c.700 m alt., 8/Sep./1994, *Rivadavia 299* (holotype — SPF). Figure 2:A-L.

Drosera communis A.Saint-Hilaire *similis sed caulibus 1-28 cm longis; stipulis aeneis; foliis spatulato-linearibus; petiolo 2-12 × 0.2-0.5 mm, villosis; lamina 2-11 × 0.5-1.5 mm, oblongo-linearis, facie inferiore pilis simplicibus sparsioribus obtectis; inflorescentia erecta; seminibus cuneato-fusiformibus.*

Perennial herbs with delicate stems 1-28 cm long beset with the deflexed remains of older leaves. Stipules 2-6 × 0.3-1.5 mm at the base, translucent bronze-colored, the apical 2/3 to 1/3 divided into 7-15 filaments shorter towards the stipule center, or stipule with longer lateral filaments and weakly divided into two filament-bearing lobes in the center. Leaves 4-23 mm long, spatulate-linear, alternate on stems, reddish-green or pinkish-red in exposed habitats, green in shadier habitats; petioles 2-12 × 0.2-0.5 mm, sparsely eglandular-pilose; lamina 2-11 × 0.5-1.5 mm, oblong-linear, sparsely eglandular-pilose abaxially, covered with numerous red

retentive glands adaxially. Inflorescences 1-3, erect, not bifurcating, sparsely covered with minute glands throughout, especially towards the apex, 3-26.5 cm long including scape, with 1-5 flowers each; pedicels 2-9 mm long, glandular-pilose, inserted 4-15 mm apart; sepals 5 united at basal 1/4 of length, 1.5-4.5 × 0.5-1 mm, oblong-ovate, abaxially glandular-pilose with occasional simple hairs; petals 5, 2-4 × 2-3 mm, obovate, varying from light pink to white to light lilac; ovary 1-1.5 mm long at anthesis, hexalobed or trilobed or smooth, ellipsoid or globose or ovoid, when in fruit ellipsoid, 2 mm long; carpels 3; styles 3, 1.7-2.2 mm long, each basally bifurcate, stigmata flabellate; stamens 5, 1.6-2.8 mm long; seeds dark brown, 1-1.5 mm long, cuneate-fusiform, inconspicuously reticulate, translucent. Roots fine and fibrous.

Drosera grantsau is included in subgen. *Drosera* sect. *Drosera sensu* Schlauer (1996). It is distinguished by its conspicuous stems 1-28 cm long, erect inflorescences, spatulate-linear leaves, oblong-linear lamina (eglandular-pilose abaxially), and cuneate-fusiform seeds. *Drosera grantsau* is reminiscent of a diminutive *D. chrysolepis*, but the latter is larger overall, more densely covered with long shaggy white hairs, and has narrowly ellipsoid-ovoid seeds 0.7 mm in length. The recently described *D. peruensis* T.Silva & M.D.Corrêa (Silva & Corrêa, 2002) has similarly shaped leaves but differs from *D. grantsau* in its short stocky stems 2-4 cm long, inflorescences 4-7 cm long with eglandular hairs and bearing 2-4 flowers, sepals with eglandular hairs, and seeds oblong *c.* 4 mm long.

Drosera grantsau is most often mistaken for *D. communis* (e.g. Silva & Giulietti, 1997) not only because these two taxa often occur sympatrically but also due to the similarity in leaf length, their delicate glandular-pilose inflorescences with few flowers each, and seed shape. *Drosera communis* (Figure 4: A-G) is distinguished by its stemless rosettes (except when growing underwater) with patent to semi-erect leaves; petioles up to 1 mm wide; obovate to rotundate lamina up to 4 mm wide, glabrous abaxially; stipules translucent white in color; scapes conspicuously ascending at the base; and seeds fusiform. No intermediate specimens have ever been observed in habitats where *D. grantsau* and *D. communis* are sympatric, suggesting that these two taxa are not interfertile. However, rigorous experimental cross pollination experiments have not yet been attempted.

Although most similar to *D. communis*, *D. grantsau* may in fact be more closely related to *D. montana* var. *tomentosa* with which it hybridizes at most locations where these two species occur in the same or in neighboring habitats in the states of Bahia, Goiás, and Minas Gerais. Although the hybrid is apparently infertile, unexpectedly it is often found in large numbers. It most closely resembles *D. m.* var. *tomentosa*, differing however in its semi-erect leaves only up to 3 mm wide and petioles 3-10 mm long.

Drosera grantsau is surprisingly widespread and common throughout eastern and central-western Brazil, ranging nearly 2000 km east to west and 1500 km north to south. It is very uniform across this range with only slight variations in overall size, especially stem and leaf length, and in the density of eglandular pubescence on the leaves—all of which can be attributed to ecological or weather conditions, including even the petal coloration which has been observed to vary from year to year in a same population for *D. grantsau*, *D. communis* and *D. villosa* A.Saint-Hilaire.

Drosera grantsau apparently has no definite flowering period and can be found in bloom year-round, although it is most common to find plants in bloom late in the dry season, between August and November. This species is found in sandy or peaty soils among sparse to dense grasses in perennially humid to wet habitats, such as seepages or along streams and small rivers. It occurs between 550-1550 m elevation on the Brazilian central highlands, in campo rupestre vegetation on sand-

stone formations or in areas of “cerrado” vegetation (Brazilian savanna) along “veredas” (stands of *Mauritia flexuosa* L., Palmae, which grow in grass-covered natural springs). In Brazil *D. grantsau* is known from the states of Bahia, Goiás, Distrito Federal, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Paraná, São Paulo, and Tocantins. A single collection is known from Caaguazú Department in south-central Paraguay (*Casas & Molero 6431*—NYBG). (Figure 5)

The epithet “*grantsau*” is in honor of the biologist Rolf Grantsau (see acknowledgements).

Paratypes—BRAZIL. Bahia: Abaíra, Catolés, Campo da Mutuca, 23/Mar./1992, *Stannard & Silva 52792* (SPF) (mixed collection with *D. communis*); Abaíra, Catolés, Campo da Mutuca, 23/Mar./1992, *Stannard & Silva 52793* (SPF) (mixed collection with hybrid *D. grantsau* X *D. montana* var. *tomentosa*); Abaíra, Catolés, trilha para o Campo da Mutuca, 29/Jul./1995, *Rivadavia & Ganev 491* (SPF); estrada Bahia-S.Domingos, córrego Contagem, 21/May/1983 (UFG); Piatã, Serra do Santana, 27/July/1995, *Rivadavia & Ganev 485* (SPF). Distrito Federal: Parque Municipal do Gama, 3/Sep./1964, *Irwin & Soderstrom 5900* (UB); Parque Municipal do Gama, 12/Nov./1965, *Irwin et al. 10222* (UB); Parque Municipal do Gama, 21/Mar./1966, *Irwin et al. 14143* (UB); Parque Municipal do Gama, 10/Apr./1971, *Sastre 1134* (UB). Goiás: Alto Paraíso de Goiás, córrego Santana, 1/Feb./1993, *Rivadavia 190* (SPF); Alto Paraíso de Goiás, córrego Cristal, 2/Feb./1993, *Rivadavia 195* (SPF); Alto Paraíso de Goiás, estrada Brasília-A.Paraíso, 15/Apr./1995, *Rivadavia & Ogassavara 390* (SPF); Alto Paraíso de Goiás, Chapada dos Veadeiros, estrada A.Paraíso-Teresina de Goiás, 19/Mar./1997, *Rivadavia 655* (SPF); Between Rio Torto and Paranau, 26/May/1895, *Glaziou 21121* (P); Caiapônia, cachoeira do Sereno, 30/Oct./2001, *Rivadavia 1306* (SPF); Mineiros, Parque Nacional das Emas, rio Formoso, 27/Jul./1991, *Rivadavia & Marino 19* (SPF); Mineiros, Parque Nacional das Emas, córrego Avoador, 28/Jul./1991, *Rivadavia 21* (SPF); Mineiros, Parque Nacional das Emas, rio Formoso, 4/May/1999, *Rivadavia & Sato 1060* (SPF); São Domingos, Parque Estadual de Terra Ronca, 3/Nov./2002, *Rivadavia, et al. 1433* (SPF). Mato Grosso: Chapada dos Guimarães, Colégio Buriti, 15/Oct./1973, *Prance et al. 18979* (mixed collection with *D. communis*) (NYBG); Chapada dos Guimarães, próximo ao Colégio Buriti, 29/Apr./1995, *Rivadavia & Cardoso 422* (SPF); Vila Bela da Santíssima Trindade, Chapada dos Parecis, 27/Jul./1986, *Emmerich et al. 6044* (R). Mato Grosso do Sul: Costa Rica, salto da Rapadura, 28/Oct./2001, *Rivadavia 1300* (SPF). Minas Gerais: Botumirim, Serra da Canastra, 19/Nov./1992, *Mello-Silva et al. 677* (SPF); Botumirim, Serra da Canastra, 21/Dec./1994, *Rivadavia 339* (SPF); Botumirim, Serra da Canastra, 13/Oct./2001, *Rivadavia 1271* (SPF); Diamantina, garimpo da antiga Lagoa Azul, 28/Feb./1997, *Rivadavia & Pinheiro 583* (SPF); Diamantina, estrada p/ Tapetes Arraiolos, 13/Jul./1999, *Rivadavia & Pinheiro 1129* (SPF); Diamantina, estrada que sai de Tapetes Arraiolos, 31/Jul./2002, *Rivadavia & Gibson 1370* (SPF); Diamantina, estrada p/ Biribiri, 31/Jul./2002, *Rivadavia & Gibson 1378* (SPF); Gouvea, estrada Diamantina-Curvelo, 2/Aug./2002, *Rivadavia & Gibson 1400* (SPF); Gouvea, estrada Diamantina-Curvelo, 6/Apr./2003, *Rivadavia 1590* (SPF); Grão Mogol, trilha da Tropa, 2/Jun./1994, *Rivadavia 279* (SPF); Grão Mogol, morro do Jambeiro, 3/Jun./1994, *Rivadavia 285* (SPF); Grão Mogol, trilha da Tropa, 7/Sep./1994, *Rivadavia 293* (SPF); Grão Mogol, morro do Jambeiro, 12/Oct./2001, *Rivadavia 1261* (SPF); Itacambira, SW da cidade, 18/Dec./1994, *Rivadavia 328* (SPF); Grão Mogol, estrada p/ M.Claros, 16/Dec./1994, *Rivadavia 311* (SPF); Grão Mogol, estrada p/ M.Claros, 5/Mar./1997, *Rivadavia 601* (SPF); Grão Mogol, estrada p/ M.Claros, 14/Jul./1999, *Rivadavia & Pinheiro 1134* (SPF); Grão Mogol, estrada p/ M.Claros, 13/Oct./2001, *Rivadavia 1290* (SPF); Jaboticatubas, Serra do Cipó, Fazenda da S.Cipó, 24/Feb./1996, *Rivadavia &*

Mullins 553 (SPF); Joaquim Felício, alto da Serra do Cabral, 6/Mar./1997, *Rivadavia 618* (SPF); Moeda, Serra da Moeda, 12/Mar./2002, *Rivadavia 1342* (SPF); Serro, estrada Milho verde p/ Diamantina, 6/Apr./2003, *Rivadavia 1585* (SPF); São Roque de Minas, Parque Nacional da Serra da Canastra, 2/Apr./1999, *Rivadavia & Peixoto 884* (SPF); Serranópolis, trilha que atravessa a Cadeia do Espinhaço, 17/Jul./1999, *Rivadavia & Pinheiro 1151* (SPF). Paraná: Jaguariaíva, rio Cajurú, 24/Apr./1995, *Rivadavia 410* (SPF); Sengés, rio Funil, 24/Apr./1995, *Rivadavia 413* (SPF). São Paulo: Itararé, rio Verde, 24/Apr./1995, *Rivadavia 418* (SPF). Tocantins: Dianópolis, rio Manoel Alvinho, July/1951, *Costa 171* (ALCB). s/lloc, s/d, *Armond 62532* (R). PARAGUAY. Caaguazú: Yhú, cerca y al sur de Yhú, 22/Feb./1982, *Casas & Molero 6431* (NYBG) (mixed collection with *D. sp. aff. cayenensis* Sagot ex Diels).

Drosera camporupestris F.Rivadavia, *spec. nov.* TYPE — BRAZIL. Minas Gerais: Município de Jaboticatubas, Serra do Cipó, em campos rupestres dentro da Fazenda da Serra do Cipó, 19°17.597'S 43°34.829'W, 1215 m de altitude, 6/Jul./1995, *Rivadavia 447* (holotype — SPF). Figure 3:1A-F.

Drosera chrysolepis affinis sed caulibus 5-30 × 3-9 mm; stipulis 7-13 × 2-6 mm, cuneatis apice in filamenta brevia pauca divisis; modo 1-2(3) foliis vivis; petiolis 30-105 × 0.5-1 mm; laminis 10-50 mm longis; seminibus anguste ovoideo-ellipsoideis subtiliter reticulato-foveolatis, 0.6 mm longis.

Perennial herbs with short stems 5-30 × 3-9 mm. Stipules 7-13 × 2-6 mm, translucent bronze-colored, triangular, sometimes apically fimbriate. Leaves 3.5-14 cm long, erect, 1-2(3) functional per plant, several decumbent and dead, deep wine-red in color with green petiole bases in exposed habitats, green in shadier habitats; petioles 25-105 × 0.3-1.5 mm, abaxially and adaxially eglandular-pilose especially towards the base; lamina 10-50 × 1-3 mm, lanceolate, abaxially eglandular-pilose, adaxially covered with numerous red retentive glands up to 6 mm long, the longest located at the base and apex of the lamina. Inflorescences 1-2, erect, occasionally bifurcate at the apex, densely eglandular-pilose, 8.5-23 cm long including scape, with 1-14 flowers each; pedicels 1-4 mm long, inserted 4-16 mm apart, densely eglandular-pilose; sepals 5 united at basal 1/3 of length, 4-7 × 0.5-1 mm, oblong-ovate, densely eglandular-pilose and sparsely glandular-pilose abaxially; petals 5, 6-9 × 3-5 mm, obovate, light to dark pink-lilac colored, occasionally darker at the base; ovary 2 mm long at anthesis, smooth to trilobed, ellipsoid, growing to 3-4 × 2 mm when in fruit; carpels 3; styles 3, 3 mm long, each basally bifurcate, stigmata flabellate sometimes shallowly cupulate; stamens 5, 4 mm long; seeds black, 0.6 mm long, narrowly ovoid-ellipsoid, finely reticulate-foveolate. Roots fine and somewhat succulent.

Drosera camporupestris is included in subgen. *Drosera* sect. *Oosperma* *sensu* Schlauer (1996) and is related to *D. chrysolepis* (Figure 3:2A-F). *Drosera camporupestris* is distinguished by its short stocky stems; stipules 7-13 mm long, apically fimbriate; only 1-2 (rarely 3) functional leaves; and petioles 25-105 × 0.3-1.5 mm long. *Drosera chrysolepis* differs in its stems 5-46.5 × 0.1-0.5 cm, thickening towards the apex; stipules only up to 10 mm long, the upper 1/2 to 1/3 divided into 5-9 filaments; 3-13 functional leaves per plant; and petioles only up to 45 mm long.

The only place known where both *D. camporupestris* and *D. chrysolepis* occur is the Serra do Cipó. Although never observed growing sympatrically, these two taxa have been found in neighboring habitats only a few meters apart without the presence of intermediates—suggesting there is reproductive incompatibility and supporting their status as separate species.

At the Serra do Cipó both *D. camporupestris* and *D. chrysolepis* occur in campo

rupesre vegetation, but in somewhat different habitats. *Drosera chrysolepis* is usually found growing in year-round humid soil among tall grasses in sand mixed with black humus or among short sparse grasses in fine sand with white quartz gravel, but it has also been found in boggy humus-rich soil. *Drosera camporupestris* is found exclusively in seepage habitats with sandy or humus-rich black soils that are boggy during the summer (wet season) but which often dry up completely during the winter (dry season). Although *D. chrysolepis* is known to occasionally lose its leaves in the late dry season, *D. camporupestris* is not deciduous nor does it go dormant.

Drosera camporupestris flowers year round, but is more commonly found in bloom early in the dry season, around June or July. Curiously, the petals of *D. camporupestris* are sometimes a darker pink-lilac at the base. This is the first record of a New World *Drosera* species with (at least occasional) distinctly bicolored petals. (However, very weakly bicolored petals of other New World *Drosera* have been observed, see for example the color plate in Schnell, 2002: p.246.)

Silva & Giulietti (1997) mistook *D. camporupestris* for toppled *D. chrysolepis* which had their stems decomposed after being covered by soil. Numerous field observations over a ten year period leave no doubt that the above conclusion is wrong. Buried stem remains were never found on any *D. camporupestris* and greenhouse germination experiments showed that these two taxa grow true from seed to maturity, maintaining their respective differences such as stem length and leaf number.

Drosera camporupestris is endemic to central Minas Gerais state, southeastern Brazil, where it has been collected on highlands near the towns of Congonhas do Norte (c.1250 m elevation), Diamantina (c.1320 m elevation), Gouvea (c.1260 m elevation), Milho Verde (c.1100 m elevation), as well as on the Serra do Cipó (c.1240-1400 m elevation) (see Figure 5).

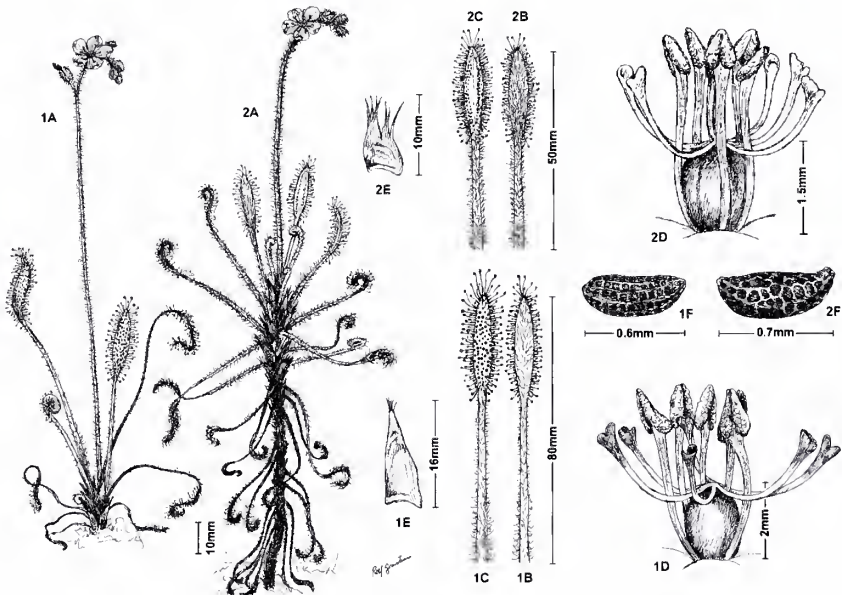


Figure 3: Comparison between (1.) *Drosera camporupestris* F.Rivadavia (based on *Rivadavia* 447 (SPF) from the Serra do Cipó) and (2.) *D. chrysolepis* (based on *Rivadavia* 212 (SPF) from the Serra do Cipó); A: habit; B: leaf, abaxial view; C: leaf, adaxial view; D: gynoecium and stamens; E: stipules; F: seed. Figures based on live, pressed and alcohol-preserved specimens.

An incomplete specimen identified as *D. chrysolepis* collected on the Cordillera Cóndor in southern Ecuador (near the border with Peru) at 2090 m altitude (*Gentry 80306*—MO) and examined at SPF is apparently conspecific with *D. camporupestris*. Yet I hesitate to include it under *D. camporupestris* since it was collected over 4000 km from any of the known sites in Brazil. Further and more complete specimens from Ecuador would need to be examined first. Another specimen collected at 2500 m altitude on the Cordillera Cóndor (*Gentry 80462*—MO) is also identified as *D. chrysolepis*, but was unfortunately not examined by this author. The epithet “*camporupestris*” refers to the vegetation typical of the Serra do Cipó and other sandstone highlands of Brazil called “campo rupestre” in which this sundew grows.

Drosera chrysolepis and *D. graminifolia* (a species closely related to *D. camporupestris* and *D. chrysolepis* and also endemic to campos rupestres of Minas Gerais) were initially placed in sect. *Drosera*, which includes the species of subgen. *Drosera* with fusiform seeds (Schlauer 1996). A closer analysis of these two species showed that their seeds are clearly more ovoid than fusiform in shape. Therefore, *D. chrysolepis* and *D. graminifolia* are here removed from sect. *Drosera* to sect. *Oosperma*.

Paratypes—BRAZIL. Minas Gerais: Congonhas do Norte, Serra da Mangabeira, 23/Sep./1982, *Furlan et al. 8464* (SPF); Diamantina, estrada p/ Tapetes Arraiolos, 5/Jun./1998, *Rivadavia 751* (SPF); Gouvea, estrada Diamantina—Curvelo, 2/Aug./2002, *Rivadavia & Gibson 1398* (SPF); Gouvea, estrada Diamantina—Curvelo, 6/Apr./2003, *Rivadavia 1594* (SPF); Jaboticatubas, Serra do Cipó, Fazenda da Serra do Cipó, 26/Feb./1992, *Rivadavia 90* (SPF); Jaboticatubas, Serra do Cipó, Fazenda da Serra do Cipó, 5/Jun./1994, *Rivadavia 291* (SPF); Jaboticatubas, Serra do Cipó, Fazenda da Serra do Cipó, 6/Jul./1995, *Rivadavia 447* (SPF); Jaboticatubas, Serra do Cipó, Fazenda da Serra do Cipó, 24/Feb./1996, *Rivadavia & Mullins 544* (SPF); Jaboticatubas, Serra do Cipó, alguns km antes do Alto do Palácio, 25/Feb./1997, *Rivadavia & Pinheiro 556* (SPF); Jaboticatubas, Serra do Cipó, km 112 ou 113 da estrada p/ C.M.Dentro, 9/Jul./1999, *Rivadavia, et al. 1097* (SPF); Jaboticatubas, Serra do Cipó, km 112-113 da estrada p/ C.M.Dentro, 4/Apr./2003, *Rivadavia 1542* (SPF); Santa Luzia, Serra do Cipó, km 118, 23/Aug./1933, *Mello-Barreto 2433* (BHCB); Santa Luzia, Serra do Cipó, km 122, 14/Apr./1935, *Mello-Barreto & Brade 1260* (BHCB) (mixed collection with *D. chrysolepis*); Santana do Riacho, Serra do Cipó, s/d, *Grandi et al. 1414* (BHCB); Santana do Riacho, Serra do Cipó, 24/Jul./1966, *Emygdio et al. 2247* (R); Santana do Riacho, km 109 da estrada L.Santa-C.M.Dentro, 6/Sep./1980, *Forero et al. 7763* (SP); Santana do Riacho, S.do Cipó, 400 m antes da bifurcação p/ M.do Pilar e C.M.Dentro, 22/Sep./1993, *Campos & Souza 13394* (SPF); Santana do Riacho, Serra do Cipó, estátua do Juquinha, 26/Sep./2002, *Feres et al. 50* (UEC); Serro, estrada Milho verde p/ Diamantina, 6/Apr./2003, *Rivadavia 1586* (SPF); Serro, Milho Verde, trilha p/ cachoeira do Arco-Íris, 13/Jan./1998, *Chaves s/n* (BHCB); Serro, Milho Verde, trilha p/ cachoeira do Arco-Íris, 5/Apr./2003, *Rivadavia & Neves 1553* (SPF). *Doubtful specimens*—ECUADOR. Morona-Santiago: Gualaquiza Cantón, Cordillera del Cóndor, 15 km east of Gualaquiza, 21/Jul./1993, *Gentry 80306* (MO); Gualaquiza Cantón, Cordillera del Cóndor, 26/Jul./1993, *Gentry 80462* (MO).

Drosera viridis F.Rivadavia, *spec. nov.* TYPE—BRAZIL. São Paulo: Município de Paranapiacaba, estrada de terra para Paranapiacaba, paralela aos trilhos de trem, 2 km antes da cidade, 2/Feb./1996, *Rivadavia & Cardoso 510* (holotype — SPF). Figure 4:1A-G.

Drosera communis affinis sed robustior; foliis viridibus, petiolis glabris marginibus complanatis exceptis; stylibus rectis, stigmatibus indistinctis; seminibus elongatis rectangularibus.

Perennial herbs with leaves in rosettes flat on the ground or semi-erect in wetter habitats. Stipules 1.5-3 × 0.3-0.5 mm, translucent white to reddish in color, the upper 1/2 to 3/4 divided into 5-9 filaments. Leaves 5-28 mm long, spatulate, entirely green; petioles 1.5-15 × 0.5-1 mm, eglandular-pilose along the margins only, elliptical in cross section but somewhat flattened near the margins; lamina 2-13 × 1-7 mm, obovate-rotundate, glabrous abaxially, adaxially covered with numerous pink or red-tipped retentive glands. Inflorescences 1-3, erect or ascending at the base (rarely bifurcating at the apex), glabrous or nearly so at the base of the scape, glandular-pilose especially towards the apex of the inflorescence, 7.5-30 cm long including scape, with 2-12 flowers each; pedicels 0.5-7 mm long, inserted 2-10 mm apart, glandular-pilose; sepals 5 united at basal 1/4 of length, 2-5 × 0.5-1.5 mm, oblong-ovate, abaxially glandular-pilose; petals 5, 3-6 × 2-3 mm, obovate, light to dark-lilac colored; ovary 1-1.5 mm long at anthesis, globose, trilobed, becoming ellipsoid when in fruit, 3-4 mm long; carpels 3; styles 3, 1.5-2.5 mm long, erect, each basally bifurcate, crowded over the ovary, stigmata indistinct; stamens 5, 2.5-4 mm long; seeds dark brown, 0.8-1 mm long, rectangular, reticulate. Roots fine and fibrous.

Drosera viridis is included in subgen. *Drosera* sect. *Drosera sensu* Schlauer (1996). It is distinguished from *D. communis* by its overall larger size; leaves always green, never turning red even when exposed to direct sunlight; eglandular-pubescent present only on the petiole margins (which are flattened in relation to the center of the petiole); indistinct stigmata, and rectangular seeds. *Drosera viridis* is related to *D. communis* (Figure 4:2A-G) which differs in its reddish leaves when exposed to sunlight; overall more diminutive size; petioles elliptical in cross section (not flattened on the margins) and eglandular-pilose (more or less) abaxially and adaxially; scapes sharply ascending at base; stigmata bilobed to bifurcate; and seeds narrowly fusiform-cuneate, 1-1.2 mm long.

Drosera viridis is usually found growing in waterlogged habitats on stream-sides and in seepages, occasionally submerged in water with only the lamina breaking the surface. It occurs among sparse to dense grasses in white-clayey, reddish-lateritic, or even blackish-brown soil rich in humus. Where *D. viridis* is sympatric with *D. communis*, the latter occupies a wider range of habitats, extending further into drier soils. A few weak specimens have been found which may represent hybrids between *D. viridis* and *D. communis*. Because both taxa are clearly distinguishable when mature it is suspected that even if they do occasionally cross, the hybrids do not reach maturity or are very rare and infertile.

Drosera viridis has been collected in eastern Paraná and São Paulo as well as central Santa Catarina, growing at 550-1100 m elevation. (Figure 5) Santos (1980) described *D. communis* from Paraná, Santa Catarina, and Rio Grande do Sul as having petioles glabrous or with only a few hairs on the margins and illustrates rectangular seeds. This strongly suggests that at least one, if not all, of the specimens examined in this study by Santos belong to *D. viridis*, and not *D. communis*. *Drosera viridis* may therefore be widespread in southern Brazil and possibly even in adjacent Argentina, Paraguay, and Uruguay. Like *D. communis*, *D. viridis* may be found in flower year-round, apparently without a definite flowering period, although larger numbers of plants are usually found in flower in the wet season from December to March.

The epithet "*viridis*" refers to the typical green coloration of the plants, even when growing in fully exposed habitats where other *Drosera* species, including *D. communis*, commonly acquire a reddish coloration.

Paratypes — BRAZIL. Paraná: Castro, canyon Guartelá, 22/Apr./1995, *Rivadavia, et al.* 402 (SPF); Jaguariaíva, rodovia p/ P.Grossa, 12/Jan./1983, *Pirani et al.* 388 (SP); Jaguariaíva, estrada P.Grossa-Sengés, 23/Apr./1995, *Rivadavia* 407

(SPF); Jaguariáiva, rio das Mortes, 24/Apr./1995, *Rivadavia* 409 (SPF); Jaguariáiva, rio Cajúru, 24/Apr./1995, *Rivadavia* 411 (SPF); Palmeira, rio dos Papagaios, 21/Apr./1995, *Rivadavia*, et al. 396 (SPF); São Luís do Purunã, estrada Curitiba-P.Grossa, 21/Apr./1995, *Rivadavia*, et al. 392 (SPF); Sengés, rio Funil, 25/Jan./1993, *Rivadavia* 171 (SPF). Santa Catarina: Irani, campo de Irani, 15/Dec./1964, *Smith & Klein* 13959 (R). São Paulo: Cotia, estrada p/ Ibiúna, 13/Feb./1996, *Rivadavia*, et al. 511 (SPF); Itararé, rio Verde, 24/Apr./1995, *Rivadavia* 417 (SPF); Itararé, rio Verde, 13/Nov./1994, *Souza et al.* 7210 (ESA); Mogi das Cruzes, 9/Mar./1999, *Rivadavia*, et al. 841 (SPF); Paranapiacaba, estrada velha p/ Paranapiacaba, 20/Apr./1991, *Rivadavia & Demets* 2 (SPF); Paranapiacaba, estrada velha p/ Paranapiacaba, 17/Dec./1992, *Rivadavia* 156 (SPF); Paranapiacaba, estrada que sai por trás da cidade, 9/Oct./1999, *Rivadavia*, et al. 1178 (SPF); Paranapiacaba, estrada que sai por trás da cidade, 26/Jan./2003, *Rivadavia*, et al. 1537 (SPF); Paranapiacaba, estrada de terra paralela aos trilhos de trem, 26/Jan./2003, *Rivadavia*, et al. 1539 (SPF); Parelheiros, ao lado do trilho de trem, 23/Mar./1995, *Rivadavia*, et al. 344 (SPF).

Discussion

Due to the fact that many closely related plant species or even genera are capable of hybridizing and often producing fertile offspring, plant taxonomists (unlike animal taxonomists) tend to avoid using reproductive isolation as support for specific rank. This habit is enforced by the sad fact that ecological information is usually not available to plant taxonomists when describing new taxa, many of which are based on herbarium specimens alone. However when such information is available, species rank is often applied to similar plant taxa occurring in the same geographic area and yet maintaining reproductive isolation, and therefore retaining their distinctness despite the opportunity to cross. In counterposition when not

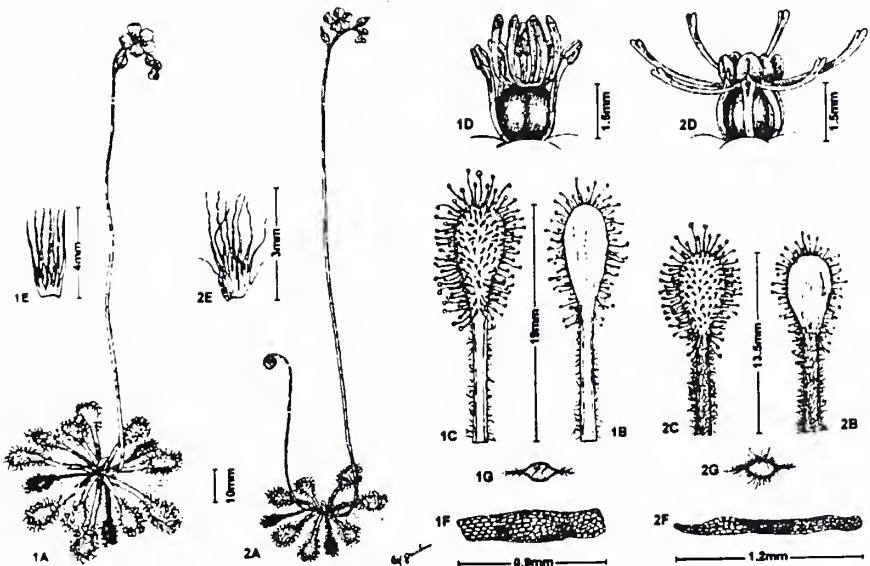


Figure 4: Comparison between (1.) *Drosera viridis* F.Rivadavia (based on *Rivadavia & Cardoso* 510 (SPF) from Paranapiacaba) and (2.) *D. communis* (based on *Rivadavia*, et al. 343 (SPF) from Parelheiros): A: habit; B: leaf abaxial view; C: leaf adaxial view; D: oviposits; E: leaf abaxial view; F: leaf surface; G: oviposits.

enough information is available, subspecies rank is more commonly used when variation is imperfectly known and taxonomists may even assume that subspecies boundaries will be blurred by crossing when there is geographic overlap (Goodall & Marchant, 1996).

Therefore, although reproductive isolation is not commonly employed in plant taxonomy it is believed that this is mostly due to lack of information at the moment of publication. In conjunction with the morphological characters described above, reproductive isolation is felt to support the specific status of *D. camporupestris*, *D. grantsau*, *D. tentaculata*, and *D. viridis*, which are seemingly isolated reproductively from each other and from all other *Drosera* species known to occur sympatrically or in neighbouring habitats. The only natural hybrid known is that between the morphologically very distinct *D. grantsau* and *D. montana* var. *tomentosa*, but this cross is apparently sterile and not capable of backcrossing with either of the parental taxa with no intergradation having ever been observed.

Further support for the specific status of *D. camporupestris*, *D. grantsau*, *D. tentaculata*, and especially *D. viridis* is provided by the shapes of their seeds. Seed

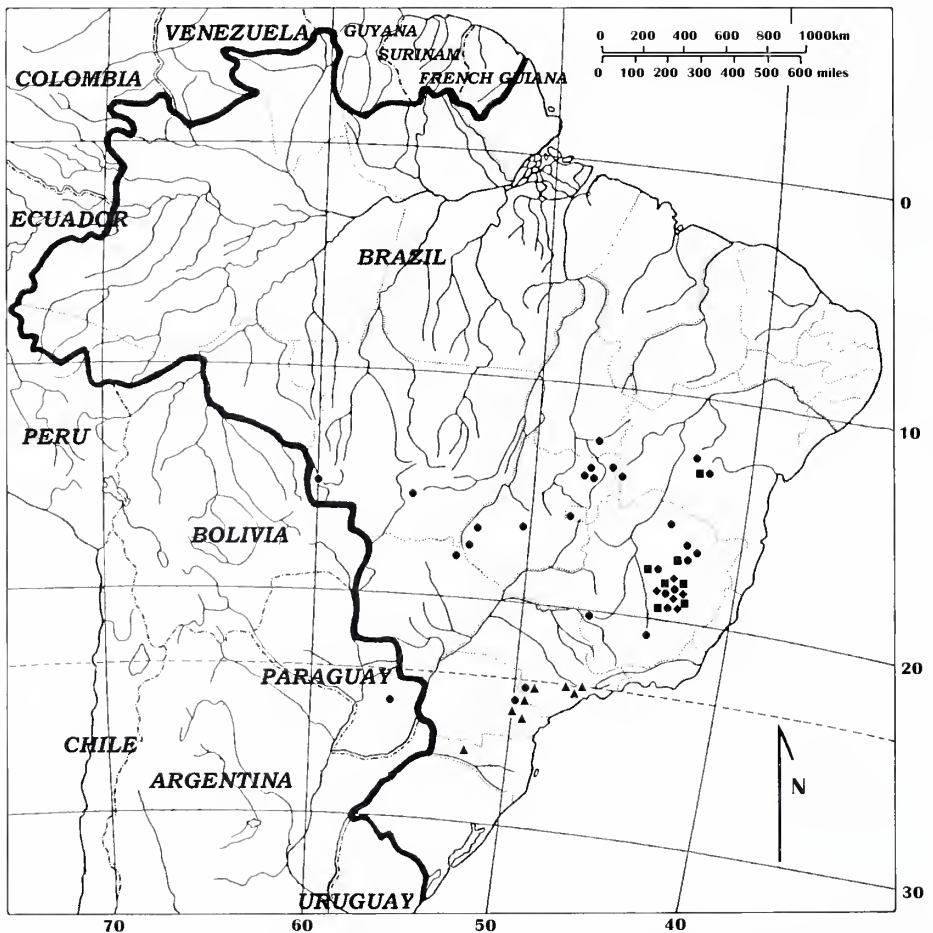


Figure 5: Map showing the known distribution of *Drosera tentaculata* F.Rivadavia (squares), *D. camporupestris* F.Rivadavia (diamonds), *D. grantsau* F.Rivadavia (circles), and *D. viridis* F.Rivadavia (triangles). Many of the sites indicated on the map represent collection locations for more than one herbarium specimen listed in this paper.



Figure 6: *Drosera camporupestris* at Gouvea, Minas Gerais state.

Figure 7: *Drosera grantsauii* at Itacambira, Minas Gerais state.



Figure 8: *Drosera viridis* (green plant left of center) surrounded by *Drosera communis* at Paranapiacaba, São Paulo state.

shape is considered a very important taxonomic character in the genus *Drosera* and has been used to separate otherwise very similar species, such as *D. esmeraldae* (Steyerm.) Maguire & Wurdack and *D. capillaris* Poir. (Maguire & Wurdack, 1957) or *D. peltata* Thunb. and *D. auriculata* Backh. ex Planch. (Diels 1906). More recently, seed shape was used as the decisive character in the description a new species from Brazil, *D. graomogolensis* T.Silva, distinguishing it from the also Brazilian *D. villosa* (Silva & Giuliatti, 1997).

Acknowledgements

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DROSERA GRANTSАUI —A NEW INTRODUCTION FROM BRAZIL

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Keywords: cultivation: *Drosera grantsаui*.

My favorite carnivorous plant explorer/superhero Fernando Rivadavia generously provided the following background information on *Drosera grantsаui*:

I first found *Drosera grantsаui* at the Emas National Park in central Brazil in 1991. Over the following years I repeatedly stumbled across this species at numerous other localities in the states of Paraná, São Paulo, Goiás, Mato Grosso, Minas Gerais, Distrito Federal, Tocantins, and Bahia. This perennial is surprisingly widespread and common throughout eastern and central-western Brazil, ranging nearly 1500km in both a north-south and an east-west axis. It occurs mostly on sandstone highlands in open vegetation, between approximately 550-1550m elevation.

Drosera grantsаui is somewhat reminiscent of *D. scorpioides* or a diminutive *D. chrysolepis*, but has been traditionally misidentified as *D. communis*, since both are relatively small species, both often occur in the same habitats, and because both have elongated seeds. Inhabiting perennially humid to wet habitats such as seepages or along streams and small rivers, *Drosera grantsаui* may grow on sphagnum, in boggy humus-rich soil, and more rarely in humid rocky-sandy soil or humid lateritic soil. Depending on the habitat, the stems may be barely noticeable, or they may reach nearly 30cm in length. It is often sympatric with other species of *Drosera*, *Genlisea*, and *Utricularia*. It apparently has no definite flowering period and can be found in bloom year-round, the flowers varying in color from white to light-lilac or light-pink.

I received seed of *Drosera grantsаui* (from Serra da Canastra, Minas Gerais, Brazil) in the middle of 1999, with a warning that it is very short-lived. I had seen photos of this beautiful new species on Fernando Rivadavia's and Marcelo Fontana's fabulous web page (Fontana and Rivadavia-Lopes, 2001) and also in an article in Carnivorous Plant Newsletter, where it was featured as a front cover photograph (Rivadavia, 1992), so I knew it was special! Needless to say, I planted that seed the minute I received it! Seed was sown on "No Damp Off" (Mosser Lee's brand name for dead milled sphagnum moss) and placed in a baggie, off to the side of my fluorescent lights. I typically keep seed pots away from strong light to slow the growth of moss, algae and slime mold. However, since fungus seems to thrive under these lower light levels, I lightly mist seed pots with distilled water every few days. This inhibits the growth of fungus well.

After about a month or so, I had several seedlings. Once it was clear that I was not going to get much more germination, I moved these seedlings into a 40 liter (10 gallon) terrarium similar to the ones in which I grow all my other plants. This tank

was placed 4 cm (1.5 inches) under 40 watt fluorescent lights (2 cool white, 1 warm white and 1 plant and aquarium bulb) with a 11-13 hour photoperiod (which I adjust seasonally). The distance between the plants and lights was approximately 23 cm (9 inches). The bottom of the tank serves as a reservoir for distilled water and is allowed to dry out between waterings. A glass cover placed on top of the tank provides very high humidity.

Summer room temperatures range from 16-26°C (60-78°F) and winter temperatures range from 10-20°C (50-68°F). However, daytime temperatures inside the tanks get higher due to the heat generated by the lights above them.

The *Drosera grantsau* seedlings were slow growing at first. However, after about 18 months most of my plants began flowering. Two of the plants flowered so much they exhausted themselves—they died back for several months, but eventually grew back from the stems of each of the seemingly dead plants. Fresh seed of this species has a very high germination rate and I got a good crop of seedlings from these plants.

I have since learned that once they have passed their seedling stage, *Drosera grantsau* and most of the other South American *Drosera* I grow greatly prefer New Zealand sphagnum moss over the Mosser Lee “No Damp Off” mix. While use of the “No Damp Off” mix (or peat moss mixes, which most of my plants hate!) often results in redder plants, those growing in long fiber moss perform much better for me. It is no surprise that, since switching to New Zealand sphagnum, this new crop of seedlings is growing much faster than the first crop. (I have been very disappointed in commercially available American sphagnum moss, as it is often full of weeds and of much lower quality. Chilean sphagnum moss is better but still not as good as the more expensive New Zealand moss.)

After having success with the form from Serra da Canastra, I received seed of another form of *Drosera grantsau* which I suspect is from Diamantina, also in Minas Gerais state, Brazil. This form looks quite different from the first one, although it is growing under identical conditions. While I am sure that some degree of variation among wild populations is due to differences in environmental factors, it seems like certain traits are genetic. Under my conditions, the Serra da Canastra form is generally shorter and greener, with slightly wider leaves and sometimes twisted lamina on older leaves (though I am unsure if this is genetic). The Diamantina (?) form is redder, has longer stems and petioles, with longer nodes and old leaves folding down parallel to the stem. Its growth type reminds me of that of the tropical African form of *D. madagascariensis*, although *Drosera grantsau* is a smaller plant. I have not yet grown the Diamantina plants to flowering, so I cannot comment on flower differences at this time. My plants from Serra da Canastra typically produce fewer than four very light lilac flowers per scape.

Drosera grantsau, like many other South American *Drosera*, is an ideal plant for those of us who grow plants indoors, under lights. It is also growing well under natural light, in a friend's greenhouses. It is a unique plant which is surely worthy of being included in even general carnivorous plant collections as it is a beautiful, easy grower. I have a limited number of plants available for sale or will trade for other South American or African *Drosera*, *Genlisea* or *Heliophora*. As a final note, more photos of these plants (and many others) in my collection can be seen on my website at <http://www.sundewgrower.com>. Please be sure to visit Fernando and Marcelo's site as well!

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NEWS AND VIEWS

Barry Rice (barry@carnivorousplants.org) writes: “A correspondent alerted me to a change in status for trade in *Dionaea muscipula* in Australia. Several years ago, the Australian Department of Agriculture, Fisheries, and Forestry awarded “Plant Breeders Rights” status to the registrant of a red *Dionaea muscipula* called “Royal Red”. (Note this was not a cultivar name, in the sense of being registered with the ICPS.) This award was controversial among horticulturists, who felt it was too broadly defined. In any event, the Plant Breeders Rights for “Royal Red” has been terminated, so the related restrictions on Australian trade of red *Dionaea muscipula* are no longer in existence.”

Chris Teichreb (cteachreb@hotmail.com) writes: “Several years ago, a group of carnivorous plant enthusiasts from the Vancouver, B.C. region did a planting in a small island bog in what was thought to be a secluded location near the Lower Mainland region. As often happens with bogs, developers near the site decided that housing took precedence over nature and proceeded to log and clear the area around it, leading to what most thought was its demise. However, I recently visited the site and found numerous plants still thriving. While the original planting apparently included a real mix of different carnivorous plants thought to be hardy and suitable for the location, there now only remains a single *Sarracenia flava* and numerous *Sarracenia purpurea*, including the all-green *Sarracenia purpurea* f. *heterophylla*, all growing alongside the native *Drosera rotundifolia*. The failure of the other carnivorous plants to establish themselves is likely not due to the climate, as almost all North American carnivorous plant genera thrive outside in Vancouver year-round with no protection, but rather due to the fact that the growing substrate is pure live sphagnum which is seasonally flooded, making it unsuitable for those plants that prefer slightly drier conditions. The *S. purpurea* consisted of several clumps of five or more growing points while the *S. flava* appeared to be a single crowned plant. Most of the plants still had seed pods from last year, but closer inspection found these to be empty. However, small *S. purpurea* plantlets were evidence of successful pollination at some point in the brief history of this colony.

“Unfortunately, when I last visited this site the weather was dreadful and I did not take any photos. I do plan on returning and by the time you read this, may be able to provide a photo via e-mail upon request. My feelings on the planting itself are mixed. On the one-hand, we should strive to protect carnivorous plant habitat and avoid introducing species that may compete for resources or carry pests and diseases. On the other hand, seeing these plants thriving so far away from their natural habitat is thrilling! I am neither condoning nor condemning this planting, I just want naturalists and botanists who may stumble across this population to be aware of its existence.”

LOOKING BACK: CPN 25 YEARS AGO

Alain Godbout provided several quotes from letters of Charles Darwin, including this November 1860 note to Lyell (often mistakenly attributed to a letter to Gray) about his work, which ultimately resulted in his book, *Insectivorous Plants*: “I will and must finish my *drosera* ms., which will take me a week, for, at the present moment, I care more about *drosera* than the origin of all the species in the world. But I will not publish on *drosera* till next year, for I am frightened and astounded at my results.” In a February 1875 letter to Hooker, he said, “You ask me about my book, and all that I can say is that I am ready to commit suicide; I thought it was decently written, but find so much wants rewriting....I begin to think that every one who publishes a book is a fool.” The editors of CPN can sympathize.

