

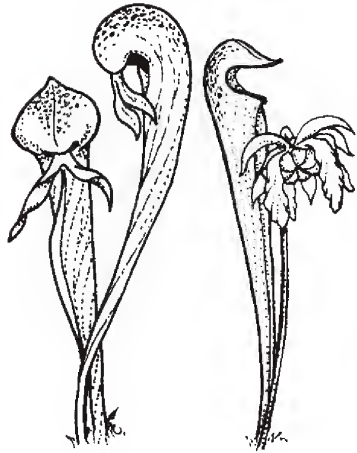
CARNIVOROUS PLANT NEWSLETTER

Journal of the International Carnivorous Plant Society

Volume 40, No. 4

December 2011





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Journal of the International
Carnivorous Plant Society
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Front Cover: Possibly the last photo of *Drosera x hybrida* at Lake Absegami, New Jersey. Photo taken 11 May 2008 by Jason Ksepka. Article on page 112.

Back Cover: *Sarracenia* 'Deep Throat'. Photo by Damon Collingsworth. Article on page 139.

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. Advertisers should contact the editors. Views expressed in this publication are those of the authors, not the editorial staff.

All correspondence regarding dues, address changes and missing issues should be sent to the Membership Coordinator at the ICPS. Do not send such correspondence to the editors. Checks for subscriptions should be made to the ICPS in US funds. Dues for 2012 are \$35 for the first year of membership; renewals are \$30 per year.

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2012 ICPS CONFERENCE UPDATE

Planning continues for the 2012 ICPS Conference! Registration for the conference will start on January 1, 2012. Those who register before April 15 will receive a \$50 discount. The conference website will be activated with a pricing outline. See necps.org/icps2012 for details!

Call for Abstracts: This conference will have speaking programs and poster sessions. If you are interested in presenting at the conference, please submit an abstract to emily.troiano@gmail.com by June 1.

Along with the academic presentations, we will have classes and presentations open to the public. Conservation issues continue to challenge carnivorous plants across the globe. What inspires you about these plants...the wonder of seeing them in the wild, seeing how they lure and capture their prey, finding new techniques for growing them at home, or something else? What better way to raise awareness and inspire conservation than through sharing that passion for these plants? If you are interested in giving a presentation to the public, please submit a brief proposal to emily.troiano@gmail.com by June 1.

Plans are also coming together for the field trips following the conference. Along with trips to local bogs, a few friends have volunteered to lead trips in the Jersey Pine Barrens and the Green Swamp. Whether this is your first trip to these famous sites or your hundredth, making this journey with the ICPS will be an experience not-to-be-missed!

On behalf of the New England Carnivorous Plant Society, we are looking forward to hosting you at the 2012 ICPS Conference. See you this summer!

Emily Troiano, NECPS Vice President

THE ICPS SEED BANK

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The International Carnivorous Plant Society offers its members exclusive access to a variety of carnivorous plant seeds. Seeds are ordered online at the ICPS Store:

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DROSERA × *HYBRIDA* REST IN PEACE

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Keywords: history: *Drosera* × *hybrida*

In the final years of the 19th century, the Scottish botanist John Muirhead Macfarlane was uniquely situated to discover, describe, and understand a plant he named *Drosera hybrida* (Macfarlane 1899). He was classically trained in all the minutia related to structural botany and probably spent a large part of his early life sitting at a microscope. His scientific method was to observe and describe nature, then philosophize about what he discovered.

Macfarlane's major passions were evolution and heredity. He was an adherent of Charles Darwin's theory of evolution from an early age and much of his life's work was exploring the mechanisms of evolution (see Macfarlane 1909). He understood that one of the key, but inadequately explained aspects of evolutionary theory in the late 19th century was the mechanism for generating variation that was the grist for the struggle of the fittest. The gradualism of Darwin was slow and did not explain how so many different species could evolve so fast. Through his study of *Nepenthes* in general and *Nepenthes* hybrids in particular, Macfarlane saw that the generation of new species by hybridization could be a significant factor in evolution (Macfarlane 1889, 1893). These new species were a blend of the existing species and, as he observed, could combine the best of both parents.

In his pre-rediscovery of Mendel world, Macfarlane was squarely in the blending inheritance camp. Under blending inheritance, the "generative substance" in the cells of hybrids was thought to blend like paint colors producing a new species intermediate in appearance between the parent species. The generative substance was thought not to segregate or unblend in the offspring of hybrids. The hybrids were considered a new stable type and thus a new species. In 1892 while at the University of Edinburgh, Macfarlane published a major paper on plant hybrids: *A comparison of the minute structure of plant hybrids with that of their parents, and its bearing on biological problems* (Macfarlane 1892a). In the paper he illustrated in exquisite detail how hybrids are a mix of characters present in the parents. He focused mainly on microstructural elements, measuring a range of variation in the parents and comparing them to the hybrid. To Macfarlane, the mixing of the parental traits was proof of blending inheritance and a way to produce instant species.

Macfarlane also lived in a pre-modern philosophy of science world. Before the philosopher Karl Popper in the 1930s pointed out that it was impossible to prove a theory is correct (see Popper 1959), scientists spent their time trying to amass as much data supporting their theories under the assumption that the theory with the most support was correct. After Popper, science became a more iterative process of hypothesis, prediction, and testing where scientists are involved in proving a prediction of a hypothesis is wrong rather than correct. In his attempts to prove blending inheritance was true, Macfarlane did note that occasionally he found characters that more closely match one parent or the other and wondered in his writing how that worked. But he dismissed those cases as not the norm rather than use them to question blending inheritance. What baffled him most was that unlike in his study of *Nepenthes* where all the hybrids were fertile, *Drosera* × *hybrida* and a few other hybrids he examined were sterile and had pollen, ovules, and mature seeds not intermediate between the parents (Macfarlane 1892a). These observations did not square with his understanding of inheritance and he presumed the generative substance for sexual characteristics is unable to blend

properly. Today instead of saying, “OK, so a few observations don’t fit my theory but in bulk it is true” we would focus on the observations that do not fit and say the theory is wrong. But Macfarlane was not there yet. He was on the lookout for plant hybrids, especially ones between very different parents, to accumulate yet more data to support his theories.

Macfarlane was very much interested in carnivorous plants from the start of his career. In the mid 1880s, he performed a major study of the pitcher plants *Nepenthes*, *Sarracenia*, *Heliamphora*, *Darlingtonia*, and *Cephalotus* (Macfarlane 1889, 1893). This *tour de force* included descriptions of the morphology and histology of pitchers and flowers as well as arrangements for pollination and, of course, a study of *Nepenthes* and *Sarracenia* hybrids. In 1891 Macfarlane visited the USA to give a talk on *Dionaea muscipula* at an American Association for the Advancement of Science conference. After the conference he spent three months on the east coast studying carnivorous plants including additional detailed observations on trap closure in *Dionaea muscipula* (Macfarlane 1892b, 1892c). The abstract for his talk could have been used for a talk that was given at the ICPS 2000 conference 109 years later: timing of triggering of the trigger hairs, triggering the trap by poking the leaf anywhere on the lamina, and chemical triggering, along with a discussion of parallels between what happens in *Dionaea* leaves and animal nerves. While on that trip he was offered a job at the University of Pennsylvania and moved there in 1893 becoming a professor of botany (Steckbeck 1943).

It comes as no surprise that when Macfarlane arrived at Penn he visited local carnivorous plant sites and it is even less of a surprise what he did when he found a hybrid between two very different sundew species. This would provide more data for his theory of inheritance! In his 1899 paper he described the trip where he discovered *Drosera* × *hybrida*:

ACCOMPANIED by a few of my students, an excursion was made, during the third week of June, to the rich botanizing grounds near Atco, N. J. Amongst the pine-barren swamps of that locality was an area several acres in extent, that was partially flooded, but clothed with a profuse surface vegetation of swamp or bog plants. These consisted almost entirely of the four species, *Eriocaulon septangulare* [*Eriocaulon aquaticum*, Seven-angle pipewort], *Drosera intermedia*, *D. filiformis*, and a yellow-flowered *Utricularia*.

The later blooms of *D. filiformis* were still abundant, but the involute flower stalks of *D. intermedia* were just unrolling, and as was proved later, these did not bloom fully till the second week of July. Casting one’s eye across the swampy mass of vegetation, the clusters of pale pink elongated leaves of *D. filiformis* contrasted strongly with the short, dense clusters of crimson-pink leaves belonging to *D. intermedia*.

After a considerable stretch of the marsh had been examined, my attention was arrested by a rather distant group of plants, somewhat intermediate in height and color between the two common species around. A nearer examination of the eleven plants composing the group, suggested the possibility of their being natural hybrids between the above-named species. They were carefully removed, without injury, to one of the greenhouses in the University Botanic Garden, where they have since been grown and watched. A continued and careful exploration of the swamp failed to reveal the presence of additional plants or plant clusters like those already found.

Detailed comparison of the leaves, flower stalks, inflorescence, flowers and period of blooming, still further confirmed the suspicion entertained on finding them. Histological investigation of the three, as well as of *D. rotundifolia*, which was only sparingly present in the marsh, shows that the last-named species does not contribute to the formation of the plants in

question. It equally demonstrates a minute blending, in all parts of the hybrids, of the histological peculiarities of *D. filiformis* and *D. intermedia*.

When the eleven specimens were collected, care was taken to remove sods of both parent species, and all three were grown in neighboring flats in the greenhouse.

In other words, John Muirhead Macfarlane, an expert on plant hybrids with a keen interest in carnivorous plants, went to one of his favorite botanizing locations and found eleven hybrid sundew plants. He then shovel collected ALL of them plus “sods” of the parental species so he could add to his proof of blending inheritance. So it goes for *Drosera* × *hybrida* at the type location.

Macfarlane’s study of *Drosera* × *hybrida* is a classic example of late 19th century botany. He measured what today we would consider all the important taxonomic details of the plants but then went into great detail about cell size, stomata size and location, chloroplast sizes and distribution among cell types, the trachea and cell structure in tentacular hairs, and then apologized for not going into the minute details of the flower ovaries and seeds. On top of this it was almost unheard of for scientific papers of this era to have tables of data. So Macfarlane was not forced to put his data in a form that required some consistency and is easy to visualize. And forget about statistics, it did not exist yet. Table 1 summarizes his key data as described in the text of his paper. Figure 1 shows flowers of the parents and three different hybrid clones; Figure 2 is a reproduction of the plate accompanying the text.

Table 1. Taxonomically relevant measurements from Macfarlane (1899). Measurements in English units were converted to metric.

Character	<i>D. filiformis</i>	<i>D. × hybrida</i>	<i>D. intermedia</i>
Leaf length	20 cm average, to 25-28 cm summer	4.4-5.1 cm spring, 9 cm average summer	3.8 cm average
Leaf petiole length	1.0-1.6 cm	1.3-1.6 cm spring, 2.2-2.5 cm summer	not mentioned in text, 2.6 cm from Plate XII
Tentacular hair color	head crimson	head + top 1/3 to 1/2 stalk crimson	head + top 2/3 stalk crimson
Tentacle head size	220 μ × 165 μ	210 μ × 125 μ	230 μ × 105 μ
Scape length	25 cm average	17 cm average	14 cm average
Number flowers	14 average	10 average	8 average
Bloom size	22 mm	9.5 mm	6.4 mm
Bloom period	7 - 28 June	until 3 August	3 July - 15 August
Bloom color	purple-pink	white/faint pink flush	white
Sepal glandular hairs	180 - 380 μ long	1/4 to 1/3 <i>D. filiformis</i>	not present
Sepal sessile glands	2 and 4 celled	2 and 4 celled, both in reduced number	2 celled
Pollen	richly granular, up to 56 μ across	empty, 48 – 50 μ across	granular and plump, 44 μ across
Ovules	normal	small, empty or nearly empty	normal



Figure 1: Flowers of *Drosera filiformis* and *D. intermedia* left to right on the top row. Three clones of *D. × hybrida* on the bottom row. The images are approximately proportional to the actual sizes. Note how the stigmas of the species are close to the stamens while in the hybrid the styles are relatively longer putting the stigmas beyond stamens. This could affect the efficiency of self-pollination.

Macfarlane summarized his data saying:

A glance at the comparative results, however, equally demonstrates that in this, as in some other hybrids studied, certain parts or organs tend more toward one parent than another. The balance of development throughout in the present case is evidently toward *D. intermedia*. Thus, in the relative size of the tentacular hair heads, in the amount of thickening of the indurated cortex cells, in the greatly reduced size of the glandular hairs of the sepals as inherited from *D. filiformis*, and in the color and size of the flowers, there is a decided preponderance in morphological detail of *D. intermedia* over the other parent, or the former exercises a certain swamping-effect on the growth vigor handed down from the latter parent. This is all the more remarkable when one considers that the apparently prepotent parent is the smaller and more delicate species.

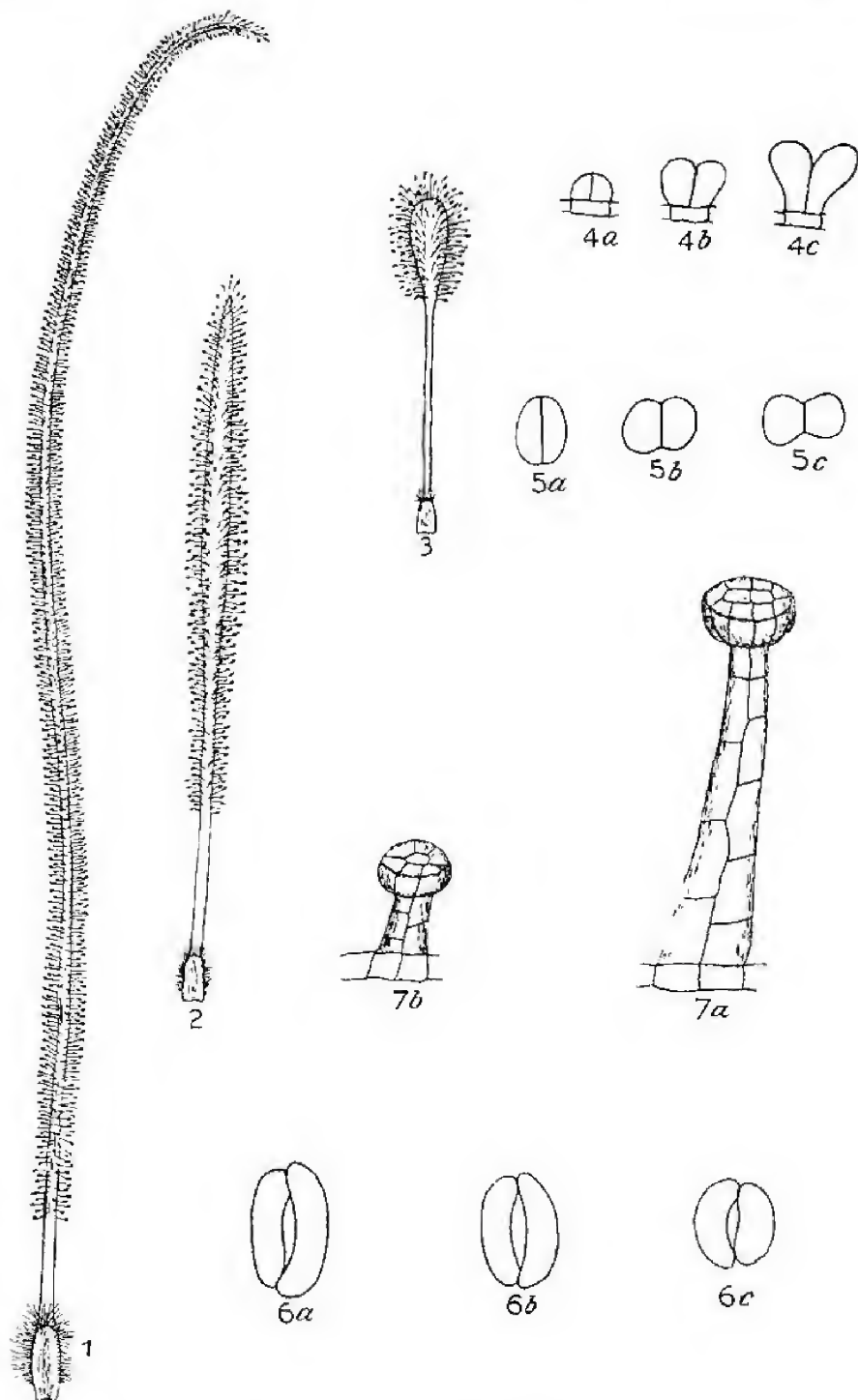
Macfarlane then went on to frame the result of *D. × hybrida* being more like *D. intermedia* than *D. filiformis* shoehorned into blending inheritance terms. And notice how his normally beautiful classic English prose degenerates as he starts making things up to support his theory.

The phenomenon which the writer termed bisexual hybridity [in Macfarlane 1892a] receives several striking exemplifications. Where two more or less diverse growths occurred, one on either parent, these have been shown to be reproduced not in blended fashion, but as distinct structures reduced either in size or number or both. The elongated glandular hairs on the sepals of *D. filiformis*, and the sessile two-celled glands of *D. intermedia* alike appear in the hybrid. Such a morphological pattern is frequent in hybrids whose parents are somewhat removed in systematic affinity, and suggests interesting cytological speculation. For, if every cell in the hybrid be, as its structure proclaims it to be, a combined effect of two parental conditions each reduced by half, some appropriate explanation must be given to the special case before us. [...] It will be more consonant with the principles of heredity, if we suppose that at a certain cell centre in the epidermis, a special growth-potentiality is inherited from one parent, that stimulates to the formation of a hair characteristic of it, and that while the hereditary influence of the other parent, that is devoid of such hairs, is sufficient to reduce or check back growth of the hair to at least half the size of the parental one, it fails to prevent the development of a structure peculiar to one parent alone. Neither is there any need to suppose that there is a separation or sorting out of chromatic elements in the process.

The last sentence is a stab at the nascent field of genetics. Macfarlane used his data to narrate his version of heredity and developmental biology, waving his arms where he got an unexpected result, producing a modified version of blending inheritance for traits that do not blend equally. He was not prepared to believe that blending inheritance is not true or that new hybrids are not instant species. For this result Macfarlane sacrificed his new *Drosera hybrida* on the altar of science! Had Macfarlane instead focused on the traits that did not fit blending inheritance he might have made key discoveries that would have contributed to the modern synthesis of genetics and evolution. To do this he would have had to do actual experiments testing hypotheses. Macfarlane did not do experiments.

What did Macfarlane get right? Macfarlane could not have been more correct about the importance of hybridization in plant evolution and speciation. The importance of hybridization has been known at some level from the time of Carl Linnaeus but the full understanding has required genetic studies, many of which are summarized by Grant (1981). Hybridization is not only a major factor in the production of new plant species but also facilitates gene transfer between related species (Cronn & Wendel 2004). However hybridization does not produce instant species. It may be a first step in speciation but a species is more than just one or a handful of unique individuals. Macfarlane was also right that interspecific hybrids in general are a blend of the parents. But virtually sterile interspecific hybrids are not the appropriate plants to study if you want to know how heredity works. To understand heredity requires using hybrids that are fully fertile and not only making first generation hybrids but also selfing the hybrids and backcrossing the hybrids to the parents. This way you can see the segregation of the genes responsible for discrete character differences. Had Macfarlane wanted to and been able to do crosses with *D. × hybrida* he probably could have seen the segregation of flower color in the next generation and convinced himself that blending inheritance was wrong.

What would someone in Macfarlane's position 110 years later do if they stumbled across a previously unknown plant hybrid in nature? Remember Macfarlane was a professor at a preeminent university. His job promotions and stature in the scientific community would depend on publishing



MACFARLANE ON HYBRID DROSERAS.

Figure 2: Plate from Macfarlane (1899). 1. Leaf of *Drosera filiformis*. 2. Leaf of *Drosera* × *hybrida*. 3. Leaf of *Drosera intermedia*. 4a. Gland cells of *Drosera filiformis*; 4b of *D.* × *hybrida*; 4c of *D. intermedia*, all in vertical view. 5a, 5b, 5c. Surface views of last. 6a. Stoma of *D. filiformis*; 6b of *D.* × *hybrida*; 6c of *D. intermedia*. 7a. Capitulate glandular hair from sepal of *D. filiformis*; 7b of *D.* × *hybrida*.

significant contributions to the field of botany. According to Steckbeck (1943) Macfarlane enjoyed teaching and interacting with students and in fact was out in the field with his students when he found his hybrid so I expect a modern Macfarlane would think “this would be a great project for my undergraduate field botany class”. It would not be something on which he would spend much of his own personal research time. Hybrids are expected whenever two closely related species grow near each other, bloom at the same time, and share pollinators. But he would hedge his bets because the parental species in this case do not normally grow with each other or bloom at the same time so he might find something worth a research publication. He might even bother to publish a name for the hybrid. Unfortunately the modern Macfarlane cannot go back to the Atco botanizing site and do a follow up to see if any more hybridization occurred. Rich Sivertsen (pers. comm.) spent years looking for *D. × hybrida* in the Atco area and concluded after talking to residents that the Atco bog was where a drag strip and motocross racetrack are located today.

This would be the end of the story of *Drosera × hybrida* if Rich Sivertsen and Dave Kutt (Sivertsen 2008) had not accidentally discovered it in 1974 at Lake Absegami, New Jersey, 38 km southeast of Atco. Lake Absegami is an artificial lake in the Bass River State Forest, Burlington County, New Jersey. The lake has a sandy beach with a boat launch area. The higher than historical water level brought together *D. intermedia*, a species usually found in or near shallow water, and *D. filiformis*, which is usually found in sandy areas with the water level below the soil surface. Peter D’Amato (2011) related this story about *D. intermedia* from a visit to the lake as a teenager:

Once as a kid I saw a woman move away from the people on the main part of the beach and she laid her towel on the sand closest to where the cove was, I think she wanted to be alone. To my teenage horror, she threw her towel right over some sundews. I went over to her and said something like “Excuse me, you’re crushing rare plants lying there!” She sat up on her elbows and a sundew was uprooted sticking to her arm! I told her “that’s a carnivorous plant eating your arm!” She rapidly moved to the main beach area not because she cared about sundews but because I think she thought I was insane.

As Macfarlane noted, *D. intermedia* and *D. filiformis* do not usually bloom at the same time. For some reason the two species did bloom together at Lake Absegami, probably from *D. filiformis* having delayed flowering after being stepped on, and produced a new population of *D. × hybrida*. Initially Sivertsen noticed stunted “*D. filiformis*” near the boat launch in an area of heavy traffic and thought those plants would be killed anyway so why not collect some of them during the spring while dormant for himself and Kutt who was visiting from Ohio. By summer Sivertsen and Kutt realized something was wrong with their new “*D. filiformis*”. The leaves were short and wide with petioles too long plus the flowers opened white and closed with a light purple flush. Sivertsen sent plants to Don Schnell and Joe Mazrimas for identification. Schnell responded that the plant was the long lost *D. × hybrida*. Sivertsen distributed the plants widely including Europe and Japan.

Schnell visited the Lake Absegami plants with Sivertsen later in 1974 (Schnell *et al.* 1974). It was noted that the *D. × hybrida* plants occurred singly and in clumps among the parent species and that there seemed to be variation among the hybrids. Some plants were more *D. filiformis*-like but most were definite intermediates between the parents. I wonder what Macfarlane would have thought of the *D. filiformis*-like plants! The last known record of *D. × hybrida* at this location was May 2008 (see Front Cover). Sivertsen (pers. comm.) visited Lake Absegami in August 2011 and failed to find any *D. × hybrida*. No *D. filiformis* were present either and had not been for a few years



Figure 3: *Drosera filiformis* seedlings growing from seedpods on an intact flower stalk. The Martha Furnace *Drosera* × *hybrida* were found under a similar situation although the plants were almost blooming size. Photo by Jason Ksepka.

so a regeneration of the hybrid could not happen there again. So it goes for the second coming of *D.* × *hybrida* in a natural population.

In 1978, Jim Bockowski, while giving Philip Sheridan and Mike Hunt a tour of the pine barrens (Sheridan 1978) discovered *D.* × *hybrida* near the ruins of Martha Furnace, Burlington County, New Jersey. Martha Furnace was an early 19th century bog iron smelter along a branch of the Oswego River in the pine barrens 10 km northwest of Lake Absegami. The ore deposits were scraped off the banks of the rivers, melted into pigs at the furnace, and boated down the rivers to the coast. The location where the plants were found was where a bank had eroded into an inlet to the river branch forming a sandy area with *D. intermedia* growing in a solid mat along and in the water and thousands of *D. filiformis* growing a meter or two from the water. Several clumps of *D.* × *hybrida* plants were growing out of the seedpods of one flower stalk in the mud near the *D. intermedia* (Bockowski pers. comm., see Fig. 3). Bockowski collected one of the clumps and over the next few years distributed plants and leaf cuttings widely. Bockowski and others have returned to the location several times since 1978 but have not been able to find any *D.* × *hybrida*. So it goes for the third coming of *D.* × *hybrida*.

Was the Lake Absegami *D.* × *hybrida* actually a “natural” population and for that matter was Macfarlane’s roadside bog “natural” or Bockowski’s sand slump? Lake Absegami is a very disturbed area ecologically. The plants are in the middle of a recreational area where families go to play. Sivertsen regularly took his family there on vacation. D’Amato was there with his family. It is highly possible the Atco bog was also not fully natural. In the mid to late 19th century, Atco, New Jersey, was in a major glass producing area with a 3000-acre production area nearby (The Atco Town Crier 2008). The Martha Furnace location was in an area with major disturbance a century prior to the plants being there. Bockowski did not think it looked “disturbed” at the time although it was not exactly a stable or typical site. What is apparent is that it takes special circumstances to produce an environment where the hybridization can occur and those locations may be transient.

Whether it takes human disturbance or not to produce *Drosera × hybrida*, it has not been found anywhere else. In well over 40 years exploring the New Jersey pine barrens, Sivertsen and others have observed many sites where both *D. intermedia* and *D. filiformis* occur in very close proximity without finding any hybrids between them. Schnell (2002) reports that he also failed to find *D. × hybrida* where *D. intermedia* and *D. filiformis* grow together in North Carolina and Florida. Again, the most likely reason for this is *D. filiformis* blooms in the early summer while *D. intermedia* blooms in the late summer. To get the hybrid, something has to happen to make *D. intermedia* bloom early or *D. filiformis* bloom late.

As far as is known, all *D. × hybrida* in cultivation are either from an area the size of a dining room table at Lake Absegami, one clump of plants from one seedpod at Martha Furnace, or are artificial hybrids. It is not known how many clones of *D. × hybrida* exist. It is possible there are clones produced from seeds. As Macfarlane found, the plants produce pollen and seeds but all the ones he examined were hollow. This means that at an extremely low rate *D. × hybrida* should produce viable seed because the plants have the functional machinery to produce pollen and seeds. During meiosis the unpaired chromosomes segregate more or less at random or do not segregate at all. This is what causes the apparent sterility. For *D. × hybrida* the pollen and ovules could contain no genetic material, or all 20 chromosomes, or any number of chromosomes in between. To get a viable seed would require an ovule to be pollinated with pollen containing a complementary set of chromosomes. Any of the rare viable seeds with a full complement of chromosomes, and thus the new plants, could be an exact duplicate of the original clone (the exact same 20 chromosomes), aneuploids (uneven assortment of chromosomes), triploids (double set from one parent and single set from the other with 30 chromosomes), or tetraploids (double duplicate of the original with 40 chromosomes). Anyone who has enough of the plants should be able to produce progeny of each of these types via seed. However I think most if not all the clones represented in captivity result from different hybridization events. It is quite possible each of the plants collected by Sivertsen represented different clones. I have identified clones with different leaf lengths and flower colors. Of these the only one I can confidently trace back to Lake Absegami has the longest leaves and pale pink flowers. The most common clone on the west coast probably descends from the plants Sivertsen sent to Joe Mazrimas and it has relatively short leaves and almost white flowers. I cannot confirm this because Mazrimas (pers. comm.) was unable to maintain the plants long term at his house in the mild climate of the San Francisco bay area. We could maintain what appeared to be a different clone in Davis 90 km to the northeast but the plants were dormant 8 months of the year and thus quite boring. They were discarded. Because we were dealing with virtually sterile clones there was no easy way to select for a clone that grew well in captivity.

Even though no natural *D. × hybrida* are now known in the wild, that is no reason to plant out the plants on private property you do not own or on public property or even at the locations where they were discovered. There is nothing special from a modern scientific or conservation point of view about *D. × hybrida* and especially the original wild clones. Macfarlane did an excellent job characterizing the nature of the hybrid. What he did not understand is how common plant hybrids are and the vast majority of them suffer the same fate as *D. × hybrida*. From a conservation standpoint, *D. × hybrida* is not a plant typical of the New Jersey pine barrens. The plants at Lake Absegami cannot predate the artificial lake, it is unlikely the eleven plants at Atco predate the sand mining and logging of the 19th century, and the few plants at Martha Furnace could not have been more than one or two years old.

For horticulturalists *D. × hybrida* is a fascinating plant. There are nice diploid clones of *D. × hybrida* available from artificial crosses and some day there will be a fertile tetraploid available. The

Lake Absegami clones are not the easiest to grow. They are temperate plants with a very short growing season. Forget about growing them long term in a terrarium or outside in a mild climate. What would be most interesting is to make new clones of *D. × hybrida* with parents from different locations, say the Florida *D. filiformis* and the Cuban *D. intermedia*. These plants would make better hobby plants. It may also be possible to make hybrids between *D. tracyi* and *D. intermedia*. That could be a fun plant! All you need is plants of both species blooming at the same time to make your own hybrid.

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CHASING *NEPENTHES* ON CAPE YORK, QUEENSLAND

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Keywords: field studies: *Nepenthes mirabilis*, *Nepenthes tenax*, *Nepenthes rowaniana*, Cape York, Australia

Little is known of the distribution, status and systematics of *Nepenthes* in the Austro-Papuan region and there is some confusion about the number of species present (Clarke & Kruger 2006). A project currently being conducted by staff and students of the Australian Tropical Herbarium and James Cook University in Cairns, Queensland and Monash University, Sunway Campus, Kuala Lumpur, Malaysia, is seeking to redress the situation. The study area extends from northern Queensland across the lowlands of the Trans-Fly Ecoregion in Papua New Guinea and West Papua, Indonesia, in the area south of Young's Line. This line delineates the northern margin of the Australia plate and the area is often contiguous when sea levels are lower, most recently c. 8000 years BP (see Figure 1).

This is a report on a recent field trip by PhD candidate Gary Wilson and staff Fanie Venter and Robyn Wilson to Cape York to familiarize themselves with the taxa and habitat of *Nepenthes* there,

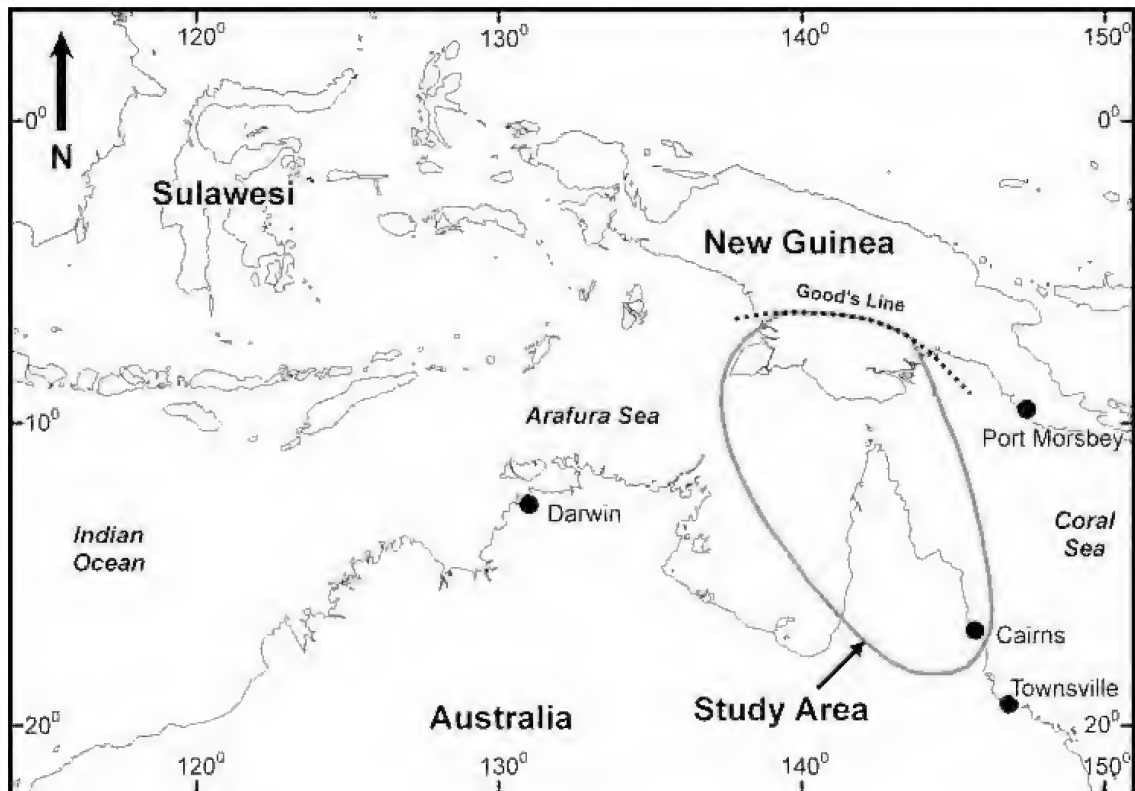


Figure 1: The study area.



Figure 2: *Nepenthes mirabilis* and expended female fruit at Sheldon Lagoon (left); Fanie Venter with *Nepenthes mirabilis* in wetland habitat (right).

collect herbarium specimens and material for DNA sequence analysis, and choose locations for ecological studies to be conducted in the 2011 Dry Season when temperatures and rainfall are lower and study sites more easily accessible. The Cape constitutes the Cape York bioregion of 127,175 km², an area slightly less than that of England. It is renowned for its diverse flora and fauna, some of which is shared with New Guinea, and is a mecca for Australian and overseas visitors alike. Fieldwork on the Cape is always a challenge; the single access road is unsealed and often impassable during the Wet Season, *c.* mid-November through April. A four-wheel drive vehicle is a necessity, temperatures can be high, and the presence of estuarine crocodile, *Crocodylus porosus*, makes caution about swamps and at river-crossings a must.

We undertook the trip in October and early November 2010, heading north at the end of the Dry Season when water levels in swamps are lowest and most visitors are heading south to escape the impending Wet. Given the time of the year and a forecast for a heavy Wet Season the strategy adopted was to head for The Tip and work south. While *N. mirabilis* occurs in a small area south of Cairns in the Wet Tropics bioregion, *Nepenthes* on the Cape are of interest because three species, *N. mirabilis*, *N. tenax*, and *N. rowaniae*, occur there, often growing in distinct habitats but close proximity, and frequently hybridizing. In addition, several populations of *Nepenthes* of uncertain taxonomic status occur (see Clarke & Kruger 2005, 2006; Beasley 2009) and these warrant further investigation.

Australian state and national herbaria records show *N. mirabilis* has been collected widely in a number of habitats across the Cape. However, they also show *N. tenax* and *N. rowaniae* have not often been collected and are restricted to swamps and their margins north of the Jardine River in the northern most part of the Cape. We encountered the first substantial populations of *N. mirabilis* at Cockatoo Creek and nearby Sheldon Lagoon in the deep leached sands of Heathlands National Park; while we were familiar with the species from near Cairns, there was a palpable sense of excitement in seeing them in this habitat so far from home. Many plants were in flower and samples were collected and a photographic record was made (see Figure 2). From here we skirted northwards and found *N. mirabilis* in every area of suitable habitat, but the other species remained elusive until we crossed the Jardine River. We then skirted the southern margins of the Jardine and Sanamere Swamps that flood an area of >400 km² on a seasonal basis and are full of crocodiles.



Figure 3: *Nepenthes tenax*.



Figure 4: *Nepenthes rowanae* in wetland habitat.

We continued on north to Bamaga and touched base with AQIS (Australian Quarantine Inspection Service) staff, part of a team responsible for the health of flora and fauna in the northern Cape and adjacent Torres Strait, for a briefing on local conditions. Then it was through the Lockerbie Scrub to the site of the colonial settlement of Somerset, type location of *N. rowanae*. We were not successful in finding this species here, probably due to our unfamiliarity with its habitat requirements. However, we found huge numbers of the toxic Cane Toad, *Bufo marinus*, whose introduction to Australia has caused the diminution of so many native species of fauna; at one site they were so noisy through the night we thought we had stumbled on a Harley-Davidson convention. We were also concerned about the numbers and activities of feral pigs, *Sus scrofa*, which are ripping up extensive areas of *Nepenthes* habitat. However, *N. mirabilis* was common and we surveyed and sampled populations in open freshwater wetland and closed riverine forest habitats. Morphological, morphometric, ecological, and AFLP (amplified fragment length polymorphism) DNA data from these populations will later be compared with those from the Wet Tropics and New Guinea.



Figure 5: *Nepenthes tenax* (left) and *N. mirabilis* (right) in Sanamere Swamp.

We next headed to Sadd Point, in the far northeast of the Cape, to collect *Nepenthes* there. Previous collections from this location had been identified as *N. mirabilis*, but local botanist John Beasley had commented (Beasley 2010) that the morphology in some plants varied from those of typical *N. mirabilis*. Beasley observed that leaves of some plants retained finely hairy margins and upper pitchers with characteristics such as wings with finely serrate margins, otherwise typical of lower pitchers, through to maturity. We made several collections, including one showing a development sequence from the form commented on by Beasley through mature upper pitchers with morphology of typical *N. mirabilis*. While analysis of DNA sequence data will confirm or otherwise this, at the moment we are happy to assign all of the material to this species.

Back on the main track and just east of the ferry crossing on the Jardine River we finally encountered both *N. tenax* and *N. rowaniae* (see Figures 3 and 4) at the head of Cowal Creek in the Sanamere Swamp. The habitat here is peat over sand with a mixed vegetation of sedges and low shrubs, and is cut by numerous channels flowing away to creeks and rivers in the north and west. Huge numbers of *Nepenthes* are present and it is an exciting and awe-inspiring sight. *Nepenthes mirabilis* is most com-

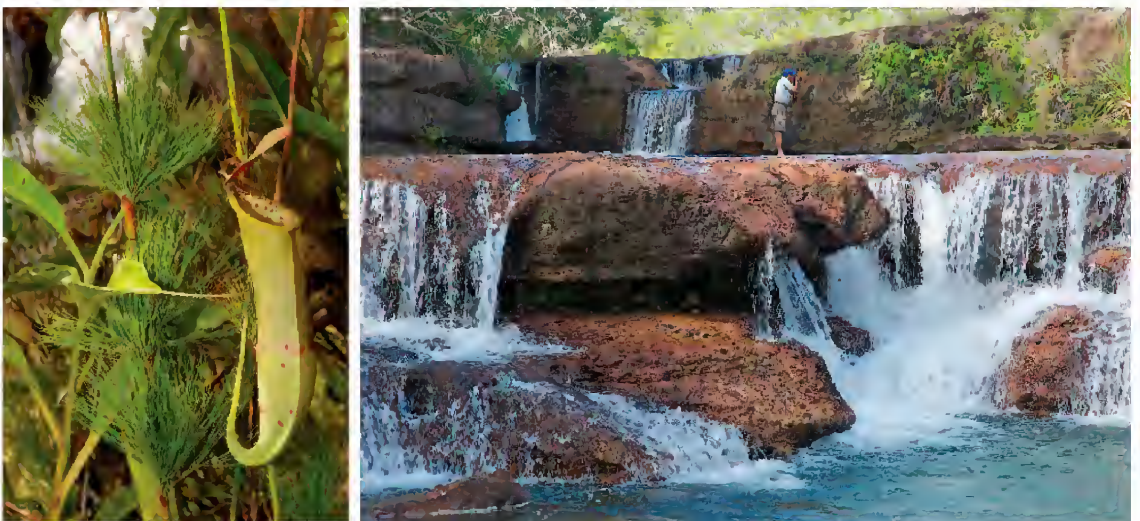


Figure 6: *Nepenthes mirabilis* at Twin Falls.

mon in slightly drier areas and *N. tenax* and *N. rowaniae* in wetter areas. While the former often has a scrambling habit and tends to climb into higher vegetation, the other two form discrete clumps and sub-shrubs. In some areas *N. tenax* and *N. mirabilis* co-occurred and in these situations the differences in the two species were quite apparent (see Figure 5). At this location, plants of each species would be submerged in water in the Wet Season and frequently subjected to wildfires during the Dry Season.

Studying *N. tenax* and *N. rowaniae* is challenging due to the difficulty in moving about in this habitat. In addition, the shade temperatures were 38 and 39°C on successive days. The sky was clear and so bright that reviewing digital images in the camera was almost impossible. The situation is further complicated as the species hybridize and we believe that several as yet undescribed entities also occur there. One of them, colloquially known as “mini-tenax”, occurs deep in the swamps and is difficult to study, as crocodiles are common in the waist deep water of their habitat.

We continued our way south, stopping to photograph *N. mirabilis* on sandstones on the edge of the water at Twin Falls (see Figure 6) and to have a much-needed swim (it is one of the few places



Figure 7: *Utricularia chrysantha*.



Figure 8: *Nepenthes* sp. juvenile lower pitcher at Steve Irwin Reserve.



Figure 9: *Nepenthes mirabilis* (upper pitcher) and Robyn Wilson with *Nepenthes mirabilis* in habitat at Tozer Gap.

on Cape York where it is safe to do so). Plants of *N. mirabilis* grew here in a narrow ecotone between water's edge and dry surrounding forest and some pitchers were held emergent from stems growing in the water. A few kilometers further south and a little further upstream at Fruit-bat Falls, in addition to *N. mirabilis* we photographed the carnivorous Sun Bladderwort, *Utricularia chrysantha* (see Figure 7) and the small, but exquisite, Straggly Rush Orchid, *Conostalix paludicola* (= *Dendrobium lobbii*).

North of Weipa, the largest town on Cape York and service centre for a local large alumina mine, we visited the Steve Irwin Research Reserve on the Wenlock River to study and sample *Nepenthes* growing in a spring at the base of a low bauxite plateau. Both *N. mirabilis* and what had been identified as *N. tenax* had previously been collected from the site and we were keen to ascertain the veracity of the latter, as by this time our experience further north suggested it was unlikely *N. tenax* would be present. The substrate at the spring was peaty sand and alluvium and supported a floristically distinct rain forest community that was in excellent condition due to the control of feral pigs by the resident ranger staff. We recollected both taxa and are of the opinion we are seeing variation in *N. mirabilis* – the second taxon (see Figure 8) has some differences in the developmental sequence of lower pitchers and additional study and the results of sequence data analysis will provide

a definitive answer – certainly it is not *N. tenax sensu stricto*.



Figure 10: *Myrmecodia beccarii* at Tozer Gap.

We worked our way south and our final destination was Tozer Gap in the Iron Range National Park on the east coast of the Cape. Here *N. mirabilis* grows on leached sand in an elevated heathland (see Figure 9). Iron Range is a mecca for both botanists and ornithologists, with a suite of species otherwise only found in New Guinea present here in the largest area of lowland rain forest in Australia, so we stopped work for a day and took in the sights. Several species of epiphytic ant plants (*Myrmecodia*

and *Hydnophytum*) were present and, although not carnivorous, were of interest because colonies of ants and sometimes the larvae of *Theclinesstes* butterflies live in them. These ant plants are in the Rubiaceae and we were delighted to find several plants of *Myrmecodia beccarii* in flower and fruit (see Figure 10), the small aromatic white flowers and red-coloured fleshy berries being remarkably similar to those of *Coffea* (coffee), also in the Rubiaceae.

Back in Cairns and with the specimens in the drier, tissue samples collected to silica gel archived for later analysis, and images and morphometrics datasets backed up on the hard drive, we had time to consider what we had accomplished. In three weeks we had travelled 3000 kilometers, dodged the descending Wet, surveyed and sampled populations of three species across a range of habitats, re-sampled a population of dubious taxonomic status, and substantially expanded our knowledge of the ecology of *Nepenthes* in Cape York.

Our initial impressions are that *N. mirabilis* is morphologically variable and occupies a broader ecological niche and occupies a much wider area than the other two named taxa; that accessing additional populations and conducting ecological studies of *N. rowaniae* and *N. tenax* is going to be challenging, and that more work is required to determine the status of the undetermined taxa. Only after this work is completed will we extend our activities to similar habitats across Torres Strait on the island of New Guinea.

Acknowledgements: Collections on this trip were made under Department of Environment and Resource Management (DERM) Permit # WISP05396710. We thank AQIS staff Eric Cottis and James Bond in Bamaga, Senior Rangers at Heathlands NP, Iron Range NP, and Lakefield NP, Bernard Charlie of the Injinoo Council, Barry and Shelley Lyon at the Steve Irwin Scientific Reserve, and John Beasley of Kuranda for their guidance and assistance in our activities.

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COMPARISON OF *BYBLIS* ‘GOLIATH’ (*B. FILIFOLIA*),
BYBLIS ‘DAVID’ (*B. LINIFLORA*), AND THEIR
PUTATIVE FERTILE HYBRID

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Keywords: *Byblis filifolia*, *Byblis liniflora*, cross pollination, hybrids

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Abstract

Seed derived plants from the cultivars, *Byblis* ‘Goliath’ (Barnes 2009) and *Byblis* ‘David’ (Barnes 2010) were cross pollinated. While the *Byblis* ‘Goliath’ needs buzz-pollination to release pollen, the hybrid between these two taxa develops self-pollinating flowers, like its robust *B. liniflora* parent. This paper is a study of these cross pollination events and its results.

Introduction

A strongly branching plant of *Byblis filifolia* ‘Goliath’ (Barnes 2009) and the self-pollinating *Byblis liniflora* ‘David’ (Barnes 2010, similar varieties have been common in German CP-collections since the mid 1980s) were cross pollinated. While the mother plant *B. ‘Goliath’* needs buzz-pollination to release pollen, the supposed hybrid (see Figs. 1 and 2) develops self-pollinating, obviously very fecund flowers, like its male ancestor *B. ‘David’*. This paper is a comparative study of the three plants.

Settings and experiment

Both parental plants (P-generation) grow side by side in our tropical greenhouse in Weil am Rhein (Germany). They receive full sunlight (southwestern exposure) and get only de-ionized water. The summer temperatures vary around 24–36°C during daytime (winter = 15–26°C) and between 16–24°C during nighttimes (winter = 12–15°C). During winter additional HQI-lighting and heating is provided. At the time of pollination no other *Byblis* species have been present in our collection; therefore any other accidental cross-pollination can be excluded with certainty.

Since the mid 1980s, the small self-pollinating variety of *B. liniflora* has been part of our collection. The richly produced seeds remain fertile for several years, so it’s no problem to keep the cultivation pattern going even over decades. With our conditions, individual plants survived up to two years, but they are annual in the wild, due to seasonal droughts. Without cutting the tip or injuring the stem, during more than 25 years this variety never developed any branches under our growing conditions. The species remains relatively small and rarely exceeds 18–20 cm height. We produced two time-lapse videos of our plants to demonstrate the leaf-movement by pulvinus (Hartmeyer & Hartmeyer 2010).

Weil am Rhein - 2011 July 10



Figure 1: *Byblis cf. filifolia* × *liniflora* dried plant showing branching pattern and general habit. Photo by S. Hartmeyer.

Brian Barnes (Barnes 2010) described a larger growing form of *Byblis liniflora*, as *Byblis* 'David' (see Fig. 3) also a self-pollinating plant. The seed for this selected cultivar was obtained from Rarexoticseeds in Canada.



Figure 2: *Byblis* cf. *filifolia* × *liniflora* details. Photo by S. Hartmeyer.

For many years we have also been growing a large *B. filifolia* from the Eastern Kimberley region, which needs buzz-pollination to release pollen. Holding the tip of an electrical tooth brush (without brush) close to the flower, while keeping a sheet of paper below, is a very easy and effective way to harvest pollen. However, a second and genetically different plant is necessary for successful pollination and seed production, as *B. filifolia* is self-sterile.

Byblis ‘Goliath’ is a robust cultivar of *B. filifolia* described by Brian Barnes (Barnes 2009, see Fig. 4).

In spring 2010, Brian Barnes asked us to grow and compare his cultivar *Byblis* ‘Goliath’ with plants grown from seeds labelled *Byblis guehoi* (ex CPUK seed bank), and to report the movement of leaves in the genus by pulvini which Brian found out and published first (Barnes 2009), on video. Sown in March 2010 after a treatment with 0.1% Gibberellic acid for 24 hours, seeds of both plants germinated within 5–7 days, which is actually fast. Both plants grew with the same speed, branching strongly from the beginning and starting flowering after about 6–7 weeks. All plants including the small *B. liniflora* possess pulvini for the movement of leaves and pedicels.

We grew about 10 plants from each seed pack, so the pollination of the self-fertile species was no problem. But only *Byblis* ‘Goliath’ produced healthy seed pods (pollen released with a tooth brush) during the whole season, the other plants from seeds labelled *B. guehoi* (ex CPUK seed bank) proved to be totally sterile. This was the only, but interesting difference we observed between the plants. Even the typical bright yellow anthers showed an identical single brown structure, which varies in number with different *Byblis* taxa and may even be totally absent. In our



Figure 3: *Byblis* 'David' details. Photo by S. Hartmeyer.

opinion both plants appear to be very closely related, extremely branching varieties of *B. filifolia*, one fertile and one infertile.

Considering possible cross-pollination that may result in partly fertile hybrids, it cannot be excluded with certainty that large and extreme branching plants like our *Byblis* 'Goliath' are indeed the result of former unnoticed hybridization in a greenhouse or even in nature.

In autumn 2010, we pollinated two *Byblis* 'Goliath' flowers, dipping a flower of *Byblis* 'David' on them. A pot with *Drosera ultramafica* was standing beneath the flowers. Unfortunately we missed the moment when the seed pods opened and were therefore happily surprised when we found (after our return from a USA CP-trip in May 2011) healthy seedlings growing in that pot with *D. ultramafica*. Five of seven plants developed homogeneously very fast. Two plants remained small and unbranched unlike the large parent species. These could have been seedlings of selfed *B. liniflora* and were therefore not included in the measurements for Table 1.

While the growing shape appears like an airy form of *Byblis* 'Goliath', the flowers are self-pollinating, looking like those of the smaller *Byblis* 'David'. Self-pollination takes place in the afternoon and we were able to document that with our USB-microscope. Almost every flower of these apparent F1-hybrids (see Fig. 5) automatically produced a seed pod containing lots of healthy seeds, which ripen fast and germinate without any treatment (GA3, etc.) within only 7–9 days. Twenty one of these F2 generation plants thrive and are now 20–45 mm high. These F2 plants needed some more weeks to flower at the time of writing, but it will be very interesting to



Figure 4: *Byblis* 'Goliath' details. Photo by S.Hartmeyer.

see what variation of growing shapes, pollination-type, branching and size of flowers and seed pods will appear.

To verify if the described hybridization is reproducible, we repeated the cross-pollination experiment at our greenhouse in early August 2011, using this year's generation of *Byblis* 'David' and

Character	<i>Byblis</i> 'David'	<i>Byblis</i> cf. <i>filifolia</i> × <i>liniflora</i>	<i>Byblis</i> 'Goliath'
Largest flowers*	12–15 mm	20 mm	27 mm
Seed pods	4–5 mm	5–6 mm	10 mm
Longest leaves	50 mm	70 mm	50–70 mm**
Pedicel	45 mm	55 mm	60–95 mm**
Branching	No	5–9	> 10

* *Byblis* 'Goliath' and *Byblis* cf. *filifolia* × *liniflora* also partly produce clearly smaller flowers (while the flower size of *B. liniflora* is relatively constant), therefore we took only the size of the largest flowers for comparison.

** Our one-year-old *B.* 'Goliath' plant is still flowering, but now with mainly creeping branches, it usually develops only very short leaves (mainly approx. 40 mm), much shorter than during the erect growth in the first 6 months. Also the pedicels are now mainly 60–70 mm long.



Figure 5: *Byblis* cf. *filifolia* × *liniflora* mature plant with maturing seedpods. Photo by S. Hartmeyer.

Byblis ‘Goliath’, grown from seeds of the P-generation (2010). Six days later the first pollinated flower showed a clearly swollen ovary and after 10 days a healthy developing seed pod was visible. After 20 days the seed pod opened at a size of 5 mm diameter, and released four healthy looking and three undersized seeds. Also a second of three cross-pollinated flowers showed a swollen ovary at the beginning, but withered after two weeks because the pedicel had been damaged below the sepals, probably during pollination. This single (it was the only *Byblis* ‘Goliath’ plant in our collection in 2011) self-sterile plant never produced seed pods without being artificially pollinated either with a *Byblis* ‘David’ flower or with pollen of another *Byblis* ‘Goliath’ plant, harvested by the “electrical tooth brush method”.

The successful repetition of this cross-pollination verifies that interspecific hybrids can be produced artificially in the genus. Considering that meanwhile both parental cultivars exist in many CP-collections and even nurseries, cross-pollination of the parent plants could be a very easy way to establish the showy self-pollinating hybrid in larger quantities in cultivation.

The supposed hybrid appears intermediate between its supposed parents *B. 'Goliath'* and *B. 'David'* and is self-pollinating and self-fertile. Table 1 shows a comparison of representative measurements of the five homogeneously growing plants (excluded are two non-branching plants of uncertain parentage). The branching pattern is like the maternal *B. 'Goliath'* plant, the flowers look like those of *B. 'David'*.

Discussion

So far the only successful hybridization of *Byblis* has been reported by Brian Barnes in March 2008, crossing the cultivar *Byblis 'Goliath'* with *Byblis rorida*, while other authors stated that cross pollination in the genus has never been observed in the wild (A. Lowrie, ICPS Conference Leiden 2010). An internet search for *Byblis* hybrids shows only the mentioned report by Brian Barnes, and a failed experiment to cross *B. gigantea* with *B. filifolia*. Stewart McPherson reports (McPherson 2010, page 972): “No naturally occurring *Byblis* hybrids have been recorded with certainty.”

However, the successful interspecific cross pollination under greenhouse conditions should encourage field researchers to now look particularly for natural *Byblis* hybrids in tropical Australia, where different species are sympatric. If fertile hybrids occurred also in the wild, the identification of taxa could be complicated by back crossing, comparable to the situation in some taxa of *Nepenthes* and *Sarracenia*, where hybrids occur commonly in the field.

Acknowledgement: We thank Brian Barnes for the trustful provision of *Byblis 'Goliath'* seeds (P-generation) and personal communication such as his observations on pulvini in the genus, which enabled our time-lapse documentation on video as well as the experiments which finally led to the appearance of the supposed hybrid.

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NEW CULTIVARS

Keywords: cultivar: *Sarracenia* 'Seurat', *Sarracenia* 'Gorey', *Sarracenia* 'Leo Song', *Sarracenia* 'Deep Throat', *Sarracenia* 'Red and White', *Dionaea* 'JA1'

Sarracenia 'Seurat'

Submitted: 5 September 2011

This plant was discovered in the personal collection of James Northrop Sr. in May 1996, which was being sold off by one of his daughters a few months after his death. It is an introgressive *Sarracenia* × *formosa*, i.e. ((*S. minor* × *S. psittacina*) × *S. minor*).

After observing this plant in my collection for many years, I decided that it was worthy of cultivar status and have nominated the proposed cultivar name for the plant.

Sarracenia × *formosa* is a commonly-occurring hybrid of *S. psittacina* and *S. minor*. Most frequently seen east of the Okefenokee Swamp in Charleton County, Georgia, examples are also known from the far-western edge of the range of *S. minor*, in Liberty and Franklin counties, Florida.



Figure 1: *Sarracenia* 'Seurat' pitchers and flower. Photo by Jay Lechtman.

Sarracenia 'Seurat' is notable primarily for its areoles, splashing the hood of the plant with bright pink polka dots on a background of brick red, which suffuses the upper portions of each upright, stout pitcher (see Fig. 1). Lower portions of each pitcher narrow as they approach the crown, and the red fades into green. Flower petals are a deep rose in color, and sepals are green dusted with red.

Sarracenia 'Seurat' is named for the French Post-Impressionist painter Georges Seurat (1859–1891). The distinctive pink areoles of this cultivar are reminiscent of the artistic technique of pointillism he introduced in 1886.

Sarracenia 'Seurat' must be propagated by vegetative means to retain the characteristics of the cultivar.

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Sarracenia 'Gorey'

Submitted: 5 September 2011

This plant is a naturally-occurring *Sarracenia* × *gilpinii* hybrid (*S. psittacina* × *S. rubra* subsp. *gulfensis*) discovered in Okaloosa County, Florida.



Figure 2: *Sarracenia* 'Gorey' pitchers. Photo by Jay Lechtman.

Sarracenia 'Gorey' must be propagated by vegetative means to retain the characteristics of the cultivar.

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After observing this plant in my collection for many years, I decided that it was worthy of cultivar status and have nominated the proposed cultivar name for the plant.

Sarracenia × *gilpinii* is occasionally found in areas where *S. rubra* subspecies and *S. psittacina* overlap. In my own observations, I have seen it most commonly with *S. rubra* subsp. *wherryi* in Baldwin County, Alabama; less frequently with *S. rubra* subsp. *gulfensis* (as in this case). I have never observed *S.* × *gilpinii* hybrids with *S. rubra* subsp. *rubra* as the parent, although the ranges of the two species do overlap.

Sarracenia 'Gorey' bears large, blood red, wickedly hooked closed pitchers. Small areoles can be white or tinged with pink (see Fig. 2).

Sarracenia 'Gorey' honors American illustrator and author Edward St. John Gorey (1925–2000), known for his macabre humor and gothic style – adjectives that describe this cultivar admirably. I'm also enamored of the equally appropriate play on words.

Sarracenia 'Leo Song'

Submitted: 31 August 2011



Figure 3: *Sarracenia* 'Leo Song'. Photo by Damon Collingsworth.

Another creation of Leo Song's during the years he ran the greenhouses at California State University in Fullerton, this is a hybrid between *Sarracenia pupurea* subsp. *venosa* and *S. oreophila*.

Of compact growth, the pitchers, never more than 20 cm in length, are strongly curved at the base, swelling to no more than 3 cm wide below the pitcher lip. The lip and throat are nearly blackish red in color, while the pitcher tube is a purplish red in full sun, with darker veins, and is finely hirsute (see Fig. 3). The ala is never more than 0.5 cm at its widest, along the pitcher seam.



Figure 4: Clump of *Sarracenia* 'Leo Song'. Photo by Damon Collingsworth.

Most striking in this clone is the sizable flared collar or lid, reminding one of an outraged frilled lizard. It can be 10 cm across at its widest point. The interior of the collar is olive green with an extensive network of purple-red veining radiating outward from the mouth. The lid interior also inherits the spiny, silvery hairs of its *S. purpurea* parent. The collar edge is slightly kinked and undulating. The lower exterior of the collar has an unusual curling edge at either end reminiscent of the eyes of a primitive aboriginal ritual mask.

Flower petals are pinkish red and intermediate in length between the two parents. All the curved pitchers face inward toward the grow point and common off-shoots can develop into extensive clumps over time (see Fig. 4). Thanks to its *S. oreophila* parent, *S.* 'Leo Song' is also very cold hardy.

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Sarracenia 'Deep Throat'

Submitted: 31 August 2011

In the early 1990s, I crossed *Sarracenia leucophylla* 'Red and White' (see page 139) with *S. minor* var. *okefenokeensis*. Nearly all of the progeny were very large and colorful intermediates between the parents, handsome forms of *S. × excellens*. There were a few notable exceptions and *S.* 'Deep Throat' is one of them.



Figure 5: *Sarracenia* 'Deep Throat'. Photo by Damon Collingsworth.



Figure 6: *Sarracenia* 'Red and White', standard picture (Photo by P. D'Amato).

The tallest pitchers can reach 53 cm in height. From a tapered-red base, the body gradually expands and then rapidly inflates in its upper portion to a sideways diameter of up to 8 cm (see Fig. 5). The pitcher tube is green to olive green with very fine longitudinal red veins, and the narrow ala along the pitcher seam is edged in red (see Back Cover).

The upper portion of the pitcher invariably turns brick red mottled with greenish yellow spots, heavily concentrated on the upper back or neck of the pitcher. Looking within the pitcher, these vaguely approach the aureoles of its parent *S. minor*, but are diffuse and opaque as opposed to nearly transparent.

The yawning mouth, its most prominent feature, has a curvaceous red lip that dips abruptly to meet the ala, forming a broad, v-shaped spout. The wide lid is broader than long, overhanging the sides of the mouth. The lid can be horizontal to the lip or held in a more upright gaping fashion.

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Sarracenia 'Red and White'

Submitted: 31 August 2011

The description of this cultivar was published previously (D'Amato 1998, page 82). This form of *S. leucophylla* is typical in all respects except the veining in the upper part of the pitcher is colored in deep red instead of a mix of red and green veins (see Fig. 6).

References

D'Amato, P. 1998. *The Savage Garden: Cultivating Carnivorous Plants*. Ten Speed Press, Berkeley, California, USA.

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Figure 7: *Dionaea* 'JA1' plants in July. Photo by J.A.González Domínguez.



Figure 8: *Dionaea* 'JA1' open flower. Photo by J.A.González Domínguez.

Dionaea 'JA1'

Submitted: 15 September 2011

I discovered this plant in a garden center on 20 September 2005. After 6 years in cultivation I can assure that the special characteristics of this plant are stable. This clone has these special characteristics:

- Its growth behavior is like any other typical *Dionaea* (see Figs. 7 & 8). Summer's leaves are short and horizontal.
- The traps don't get too much color, almost green, but under very strong light they can get a very light pink color.
- Each row of teeth has, only in the middle zone of each row, a few fused teeth (see Fig. 9).
- The fused teeth only appear in summer.

Originally the epithet was a code that I gave to the plant (JA = Julio Alberto and 1 = first) in April 2006. Since the plant has been distributed with this name, I prefer not to change it in order to prevent confusion. I have seen this clone under the names "Julio's fused tooth", and "Julio Alberto's fused tooth", meaning that the plants came from me.



Figure 9: *Dionaea* 'JA1' trap showing fused teeth in September. Photo by J.A.González Domínguez.

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LITERATURE REVIEWS

Reviews by Barry Rice and Jan Schlauer

Akhriadi, P., Hernawati, Primaldhi, A., and Hambali, M. 2009. *Nepenthes naga*, a new species of Nepenthaceae from Bukit Barisan of Sumatra. *Reinwardtia* 12(5): 339-342.

Yet another new species belonging to the polymorphic and rapidly growing (in terms of names for taxa of various degrees of distinctness) *Nepenthes bongso* (syn. *N. carunculata*)/*N. lingulata*/*N. ovata* -complex that is distributed from G. Merapi in West Central Sumatra to G. Pangulubao in the north of the island. Geographically and morphologically the new species lies well within the boundaries of this complex (and beyond the distribution and variability of *N. spathulata* from southernmost Sumatra, that is also compared to the new taxon in the paper). The most striking (reliably?) distinguishing feature of the new species is the bifid appendage on the lower surface of the pitcher lids, reminiscent of a snake's tongue (the name "naga" means dragon in the local language). (JS)

Ansaldi, M., and Casper, S.J. 2009. *Pinguicula mariae* Casper nova spec. and *Pinguicula apuana* Casper et Ansaldi nova spec. — A contribution to the occurrence of the genus *Pinguicula* L. (Lentibulariaceae) in the Apuan Alps (Italy). *Wulfenia* 16: 1-31.

Both "new" taxa have been known for a long time but *P. mariae* had been assigned to *P. reichenbachiana* (*P. longifolia* subsp. *reichenbachiana*), while *P. apuana* had been identified as *P. leptoceras* or *P. vulgaris* before. Now both are considered distinct at species level by the present authors.

P. mariae is morphologically closest to *P. poldinii* from the Prealpi Carniche (northeastern Italy) but differs essentially by missing longitudinal violet stripes on the white palate patch of the central lower corolla lobe. As both are restricted to small areas well separate from each other, specific distinction is acceptable although the present reviewer would have preferred infraspecific classification, considering the high variability and subtle morphological differences.

P. apuana is closest to the widespread *P. vulgaris* from which it differs by the larger more expanded corolla with a characteristic two-parted white palate patch and by a longer spur. The paper closes "what's about the *P. vulgaris*-like populations (...) of the northern Apennines between Tuscany and Liguria"? As long as there is no satisfactory answer, specific distinction appears clearly premature in this case. (JS)

Campos, G.L., Cheek, M., and Giulietti, A.M. 2010. Uma nova espécie de *Utricularia* L. (Lentibulariaceae) da Chapada Diamantina, Bahia, Brasil. *Sitientibus Série Ciências Biológicas* 10(2-4): 233-235.

Although the rather sketchy drawing of the trap and other details do not readily identify it as a member of section *Aranella*, upon closer examination the allegedly new species, *Utricularia catole-sensis*, is indistinguishable from *U. rostrata* (see review in CPN 38(3):95, 2009). (JS)

Fleischmann, A., Robinson, A.S., McPherson, S., Heinrich, V., Gironella, E., and Madulid, D.A. 2011. *Drosera ultramafica* (Droseraceae), a new sundew species of the ultramafic flora of the Malesian highlands. *Blumea* 56: 10–15.

The new species is most closely related to *D. neocaledonica* but differs by its shorter (with respect to the lamina) and less coarsely hairy petioles and reticulate rather than foveolate seeds. So

far it is known from ultramafic soils in the Philippines (Palawan), Malaysia (Borneo), and Indonesia (Sumatra). It would be interesting to know whether an intermediate vicariant exists in Celebes or New Guinea, further Malesian territories rich in ultramafic outcrops. (JS)

Fleischmann, A., Wistuba, A., Nerz, J. 2009. Three new species of *Heliamphora* (Sarraceniacae) from the Guayana Highlands of Venezuela. *Willdenowia* 39(2): 273-283.

H. uncinata is similar to *H. exappendiculata* but differs by its larger (25-35 cm) pitchers with helmet-shaped appendages arising from a very broad base and with an acute hook-like triangular apex. *H. ciliata* is similar to *H. minor* but differs by the sparsely ciliate median pitcher nerves and by spoon-shaped appendages arising directly from a triangular neck, slightly narrowed at the base and covered with a conspicuous tuft of deciduous white ciliae on the external (abaxial) surface. *H. huberi* is similar to *H. minor* but differs by its elongate (20-30 cm) pitchers that are up to 6 cm wide and by its appendages with narrow bases and a short beak at the apex. The new taxa had previously been confused with *H. heterodoxa* or *H. minor*, respectively, on the examined herbarium sheets. (JS)

Gibson, R.P., Conn, B.J., and Conran, J.G. 2010. *Drosera hookeri* R.P.Gibson, B.J.Conn & Conran, a replacement name for *Drosera foliosa* Hook.f. ex Planch., *nom. illeg.* (Droseraceae). *J. Adelaide Bot. Gard.* 24: 39-42.

In a paper that is certain to be controversial in some quarters, Gibson *et al.* have concluded that what is often treated as a variant form of *Drosera peltata* merits full species status. This is not the first time this plant has been recognized at some level—in the past it was named *D. peltata* var. *foliosa* Benth. When the authors decided to raise this plant to the species level, selecting a name was challenging. The obvious choice was *Drosera foliosa*, but since this had already been used, the authors coined a new name—*Drosera hookeri*.

Drosera hookeri very much resembles *Drosera peltata*, with the calyx surfaces being villous to pubescent (or at least, with fringed margins); however it is a multibranched plant, while *D. peltata* is nearly or completely unbranched. *Drosera hookeri* ranges from southern New South Wales to central Victoria, southern South Australia, and north-eastern Tasmania.

At this point, where some might see a rather variable species—*Drosera peltata*—the authors see five separate taxa: *Drosera auriculata*, *D. bicolor*, *D. gracilis*, *D. hookeri*, and *D. peltata*. This will no doubt be received with some skepticism. However, Dr. Gibson's opinion in this matter should not be taken lightly, as he has spent years attempting to puzzle out order in this absolutely confounding group of plants. (BR)

Lee, C.C., McPherson, S., Bourke, G., and Mansur, M. 2009. *Nepenthes pitopangii* (Nepentha-ceae), a new species from central Sulawesi, Indonesia. *Gardens' Bulletin Singapore* 61(1): 95-100.

The new species differs from its supposedly closest congener *N. glabrata* by the widely infundibular upper pitchers with reduced wings and by its overall higher robustness. As only one individual is known of the new species, its variability cannot be assessed. Nevertheless, a hybridogenic origin is denied by the authors. (JS)

Souza, P.C.B., and Bovem, C.P. 2011. A new species of *Utricularia* (Lentibulariaceae) from Chapada dos Veadeiros (Central Brazil). *Systematic Botany* 36(2): 465-469.

The plant described as *U. densiflora* is evidently based on juvenile (and/or cleistogamous?) individuals of a species belonging to sect. *Oligocista*. According to the distinguishing features it is closest to *U. erectiflora* and *U. meyeri*, both being known from Chapada dos Veadeiros (F. Rivadavia,

pers. comm.). Judging from the (unripe!) seed characters (strongly longitudinally ribbed interior testa walls), it appears closer to the latter species. Ripe specimens (preferably with expanded flowers of normal size and shape) would be crucial for a reliable identification of this taxon. (JS)

Studnička, M. 2009. Brazilian bladderwort *Utricularia reniformis* is a blend of two species. *Thaiszia J. Bot.* 19: 131-143.

By studying live specimens, and especially germinating seedlings, the author concludes that plants frequently identified as *Utricularia reniformis* St. Hil. actually consist of two species. As a result, he defines *Utricularia reniformis* more narrowly to include somewhat smaller plants, while the new *Utricularia cornigera* Studnička consists of larger, more robust plants. Horticulturists might be familiar with these plant groups under their previously defined cultivar names *Utricularia* 'Big Sister' and *Utricularia* 'Enfant Terrible', for *U. cornigera* and *U. reniformis*, respectively (Rice & Studnička, 2004, New cultivars, Carniv. Pl. Newslett. 33: 52-55).

Based upon the data in this paper and in earlier cultivar descriptions, the key characteristics separating the two species are as follows.

- *Utricularia reniformis*: Mature plants produce leaves that range in size from only a few mm to up to 10.5 × 8.5 cm; leaves are yellow-green and pliable; the two parallel linear marks on the flower lower lip are pale yellow and bordered with white; bladder appendages are short and curved, on robust plants they extend forwards. Specimens studied were from Serra da Mantiqueira.

- *Utricularia cornigera*: Mature plants produce only large leaves (up to 17.5 × 13.5 cm); leaves are grey-green and rigid; the two parallel linear marks on the flower lower lip are orange; bladder appendages are long and curve along the bladder lateral surfaces. Specimens studied were from Serra dos Órgãos.

The author noted that intermediate specimens have not been observed. However, it will be interesting to see, with further research, whether the ranges of these plants overlap and if hybrids or intermediate populations can be detected. Further work may also elucidate differences in seed characteristics. At least one researcher has proposed that *U. cornigera* may be a hybrid between *U. nelumbifolia* and *U. reniformis* (F. Rivadavia, pers. comm.). (BR)

Suksathan, P., and Parnell, J.A.N. 2010. Three new species and two new records of *Utricularia* L. (Lentibulariaceae) from northern Thailand. *Thai Forestry Bulletin (Botany)* 38: 23–32.

The notoriously under-collected (most species except *U. striatula* occupy restricted localities in montane areas difficult to access) section *Phyllaria* of *Utricularia* (type: *U. striatula*) is obviously even more polymorphic than anticipated in Peter Taylor's monograph (*The Genus Utricularia*, Kew, 1989). All three taxa described as new species in the present paper (*U. inthanonensis*, *phusoidaoensis*, *spinomarginata*) belong to this section, adding a few morphological features (or bridging the morphological gaps between the taxa separated previously, depending on perspective). The first two are compared to *U. garrettii* (of which the known distribution in Thailand is extended by a new find reported in the present paper), the last one is more similar to *U. striatula*. *U. furcellata* (likewise sect. *Phyllaria*) and *U. babui* (sect. *Oligocista*), both originally described from India, are reported as new for Thailand.

Somehow the authors forgot to credit Andreas Fleischmann for reporting on remarkably similar findings (based on field observations made in 2005) already in 2008 (<http://www.cpukforum.com/forum/index.php?showtopic=27920>). (JS)

Wakabayashi, H. 2010. *Utricularia linearis* (Lentibulariaceae), a new species from the Howard Springs, Northern Territory, Australia. *Journal of the Insectivorous Plant Society (Japan)* 61(2): 33-38.

The new taxon belongs to sect. *Pleiochasia* and is (A. Lowrie & A. Fleischmann, pers. comm.) identical to *U. fistulosa* although its white flowers are more similar to and almost indistinguishable from *U. albiflora* (which is not known from the Howard Springs area yet). (JS)

Wakabayashi, H. 2010. *Utricularia ramosissima* (Lentibulariaceae), a new species from north-eastern Thailand. *Journal of the Insectivorous Plant Society (Japan)* 61(4): 88-92.

The features (branched inflorescence, spur longer than corolla lower lip) said to distinguish the new taxon from *U. geoffrayi* (sect. *Meionula*) are (A. Fleischmann, pers. comm.) not sufficiently constant to warrant taxonomic distinction. (JS)

Zamudio, S., and Olvera, M. 2009. A new species of *Utricularia* (Lentibulariaceae) from Guerrero, Mexico. *Brittonia* 61(2): 119-125.

Within *Utricularia* sect. *Psyllosperma*, the new species (*U. regia*) is similar to two other Mexican endemics, *U. hintonii* and *U. petersoniae*. It differs by the upper lip of the corolla being divided into two linear-spatulate divergent lobes that are separated almost to the base. Both lobes are again divided about a quarter of their length into two smaller lobes, yielding a four-lobed upper lip, a characteristic that is otherwise very uncommon in the genus. (JS)



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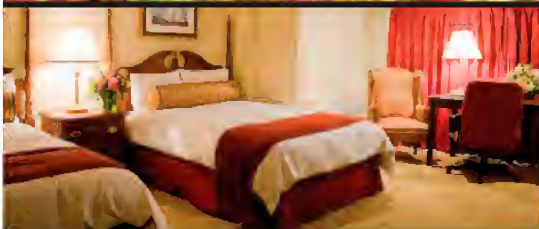
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