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Meeting are held on the second Friday of each month
Time: 7.30pm—10.00pm
Venue: Woodstock Community Centre
Church St, Burwood

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July	Tuberous Drosera	Greg Bourke
August	Trivia night	Kirstie Wulf
September	Trigger Plants	Greg Bourke
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Enlarged glandular bracts in some *Drosera* species

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Three species of sundew, at least, are known to occasionally have enlarged glandular bracts on their inflorescence. This feature has been interpreted as an important taxonomic feature, leading, temporarily to the instalment of *Drosera corsica* in Mediterranean Europe. However, it now appears that this is variably developed feature, which has implications on the origins of bracts.

During my travels in South Africa and Europe in 1997/1998 I had the great fortune to study *Drosera* in the wild and in cultivation, as well as to read literature not readily available in Australia. It was during this time I learnt of populations of *Drosera rotundifolia* and *Drosera capensis that had the unusual development of leaf-like* bracts. In subsequent study at the Queensland Herbarium in Brisbane I found that this feature had also developed in at least one population of *Drosera spatulata.*

Drosera rotundifolia

Whilst in Rouen, France, I read of *Drosera corsica,* a taxa closely allied to *Drosera rotundifolia,* and identical to it in all but one respect; this taxon has enlarged glandular bracts that resemble miniature leaves. This sundew was elegantly illustrated in Baffray *et al.* (1985: page 98), Figure 1, and was stated as being endemic to the margins of high altitude lakes on this large Mediterranean island. The bracts were shown to equal the length of the sepals of the finished flowers.

Further perusal of the literature, with the enthusiastic help of Pierre Sibille revealed that this taxon had been reduced to varietal status of *Drosera rotundifolia* by Bernieri (2000). In addition this variant had been observed in the wild in the Ardenne region of France, to the north east of Paris by Legendre (1999).

Drosera capensis

Over the summer of 1997/98 I was in Cape Town, at Eric Green's place. Amongst his amazing plant collection was a plant of *Drosera capensis* that had enlarged glandular bracts on the inflorescence (Figure 2). The bracts were up to 5 mm long by 2 mm wide, with long stalked glandular hairs that resembled miniature leaves. These were better developed in the lower part of the scape and were commonly folded about the midpoint.

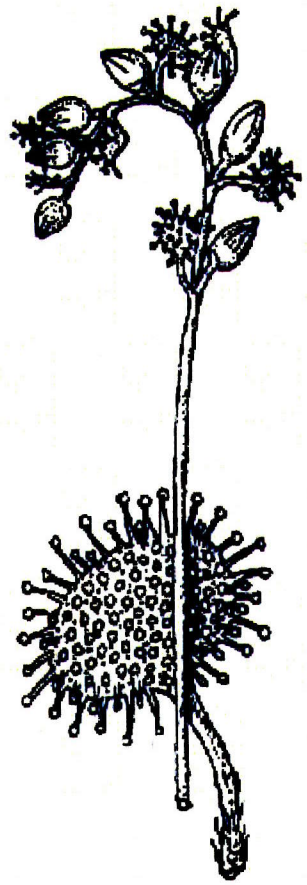

Figure 1. Detail of the inflorescence of *Drosera* "*corsica*" by Baffnay et al. (1985). This species has been reduced to synonym to *Drosera rotundifolia*.

Seeing a live plant in cultivation is one thing, and during my summer visit to Cape Town I had the privilege of seeing this variant in the wild. During an expedition to the Koude Bokkeveld region; a mountainous area to the north west of Ceres, about 150 km north east of Cape Town. One site visited with Gunther Eitz, and his wife and son, and Eric Green, was a dam on a dry sandstone mountain slope that had a dense stand of *Drosera capensis* on the muddy bank. The plants were thriving in open areas between sedges. Amongst the thousands of plants present I found one with enlarged glandular bracts, similar to the plant in Eric's collection. This was a great thrill.

Drosera spatulata

During 1999 I had the opportunity to study at the Queensland Herbarium. Whilst there I was struck by a collection of *Drosera spatulata* from Fraser Island. This was made by C. T. White in October 1921, and no precise location details were provided. It consisted of nine flowering rosettes and a detached scape. As luck would have it, only the de-

tached scape displayed enlarged glandular bracts. These were as long as the ripening fruit, often obscuring them. At least it shows that this feature has developed in this variable species and in a stated part of its range.

Discussion

So what does all this mean? Bracts with glandular hairs are well known in many subgenera of *Drosera,* and are a key feature of such distantly related species as *Drosera regia* and *Drosera intricata* (Obermeyer, 1970; Lowrie, 2000). At this stage it appears that enlarged glandular bracts is a novelty that comes at a seemingly small cost to the plant. Likely advantages include increased photosynthesis and perhaps the addition of some extra protein, whilst affording the flowers and developing fruit extra protection. In these three species the enlarged bracts resemble miniature leaves in shape and the presence of stalked glands, suggesting that these features are modified leaves. It would be interesting to study plants with this feature in the wild, especially in comparison to the more typical form of the species. It also offers the prospect of the development of novel cultivars of some commonly grown and well-known sundews if, as it seems, this feature becomes permanently expressed in at least a small number of plants.

The aim of this article is to draw the reader's attention to the development of unusual features, in this case enlarged bracts on the inflorescence, on some well-known species.

Figure 2. Enlarged bracts with stalked glandular hairs on the inflorescence of a *Drosera capensis* plant grown by Eric Green. The size of the bracts varies per plant, and in this case is best developed near the apex.

Acknowledgements:

I wish to thank Pierre Sibille for his assistance in tracking down literature on this subject. His kindness and great interest in *Drosera* was most appreciated. Thoughtful discussions with Denis Robert, Ivan Snyder and William Dilapi also were of assistance with this article.

References:

Baffnay, M.; Brice, F. and Danton, P. (1985). Les Plantes Carnivores de France: Histoire, Botanique, Uses. (Sequences, Aigre, France).

Bernieri, F. (2000) *Drosera rotundifolia* var. *corsica*. A.I.P.C. News, 11, Juillet.

Legendre, L. (1999). '*Drosera corsica* dans les Ardennes?" *Dionee* (Supplement) 3: 35.

Lowrie, A. (1999). A taxonomic review of the yellow-flowered tuberous species of *Drosera* (Droseraceae) from south-west Western Australia. *Nuytsia* 13: 75-87.

Obermeyer, A.A. (1970). Droseraceae In 'Flora of Southern Africa', 13: 187-201.

MOTHER NATURE'S CRUEL

The Tunnel House

Owen O'Neil

For the last 8 years or so I've been growing all my CPs outside with pretty good results. I grow *Sarracenia* and VFTs (*Dionaea muscipula*) as my mainstay and dabble in the odd *Cephalotus* and *Drosera*. The biggest problem with my plants has been the burn off of emerging pitchers when they've been struck by late frosts. I live in Goulburn in the Southern Tablelands of New South Wales Australia. In winter we experience frost and the odd snowfall. Temperatures can drop to a chilly -7°C. but generally hit the -2°C to -3°C. This is not a problem for my plants during the winter season extending from the end of May until late September, early October.

Frequently the start of October brings warm weather and bright sunny conditions that spur the plants out of dormancy and every thing is looking up for that magic season where my plants are going to look better than ever.... Then it invariably hits, the late frost. Tender new growth withers and shrivels; emerging flower buds turn black and drop their heads in defeat to Mother Nature's cruel trick. The plants will recuperate by mid to late December and continue to thrive until about the end of April when once again the temperatures drop down into the first scattered minuses and the daylight levels have dropped to where dormancy kicks in.

Well folks I'm sick to death of these late frosts so after years of dreaming and designing I've bitten the bullet and purchased a greenhouse. The structure is situated out on my parent's property situated north east of Goulburn around 25km from town and at an extra 100m or so elevation. Goulburn is at around 620m above sea level and we experience high gusty winds. Therefore the green house had to be strong enough to stand up to days on end of punishment. I did some homework and decided on a grow tunnel from VP industries in Queensland. The tunnel is 16m long x 6m wide and around 4m high at the top of the dome. Each side has winch operated side curtains and the ends have a large hinged vent above double doors.

After putting the tunnel up my next challenge was constructing that dream tray arrangement we all have floating around in our heads. The first designs were elaborate metal benches with fibro tops that stepped down between each bench so I could achieve a constant gravity feed stream effect, being pumped back through the trays via a submersible pump situated in a sump at the end of the lowest tray. As with all the best dreams the rude awakening comes once the costs of materials are added up and reality sets in. With a little brainstorming a solution was found that was not only a lot cheaper but also even better. I constructed two of the eventual four trays using 90mm x 19mm treated pine decking timber. Trays sit level on the greenhouse floor on a bed of fine soil; each tray is double lined with heavy-duty black plastic the trays are separated by gravel paths. Trays measure 14m long x 0.8m wide.

At the moment I fill them using a hose connected to the garden water supply that is pumped from the house dam. I fill the trays to within 1cm of the top and let the water level fall to around 0.5cm before refilling. I still haven't given up on the constant flow idea and when money permits I'm going to install a pump that will move 1800l per hour and connect each tray via 32mm connections made for joining water tanks together. The other addition will be a sump sunk into the ground at the head end of the first tray containing a float valve that drops 40mm before opening and refilling the trays. Because the VFTs don't appreciate such a high water table as the *Sarracenias* I'm intending to raise them by placing washed gravel in the trays and sitting the VFT pots on this gravel bed. With a maximum water depth of 85mm dropping to a low of 45mm the pots could happily sit elevated to 40mm above the tray bottoms without fear of water logging or drying out. Another benefit of the gravel in theory is that as the water moves through the trays small particles of debris such as peat moss will be trapped in the gravel acting as a natural filter. Sphagnum moss could then be grown as a top dressing on the gravel beds giving me an added bonus of a growing potting medium and an indicator as to the water quality in the system.

The green house has already established itself as a mini ecosystem with a nice population of frogs taking up residence amongst the pots of plants that are thriving without having to suffer at the hands of the dreaded late frost. As I've men-

tioned this is still a work in progress and in coming issues of the bulletin I hope to keep you updated on the improvements, what has worked and what has failed. I'll also put some photos and sketches together when things are a tad more complete. Until next time, Good growing and best of luck with your CP dreams.

Threatened by poachers. *Nepenthes lowii* and *Nepenthes macrophylla*. From Gunung Trus Madi. **Sabah**! Greg Bourke

Drosera Section Arachnopus Under the Microscope

by Siegfried R.H. Hartmeyer
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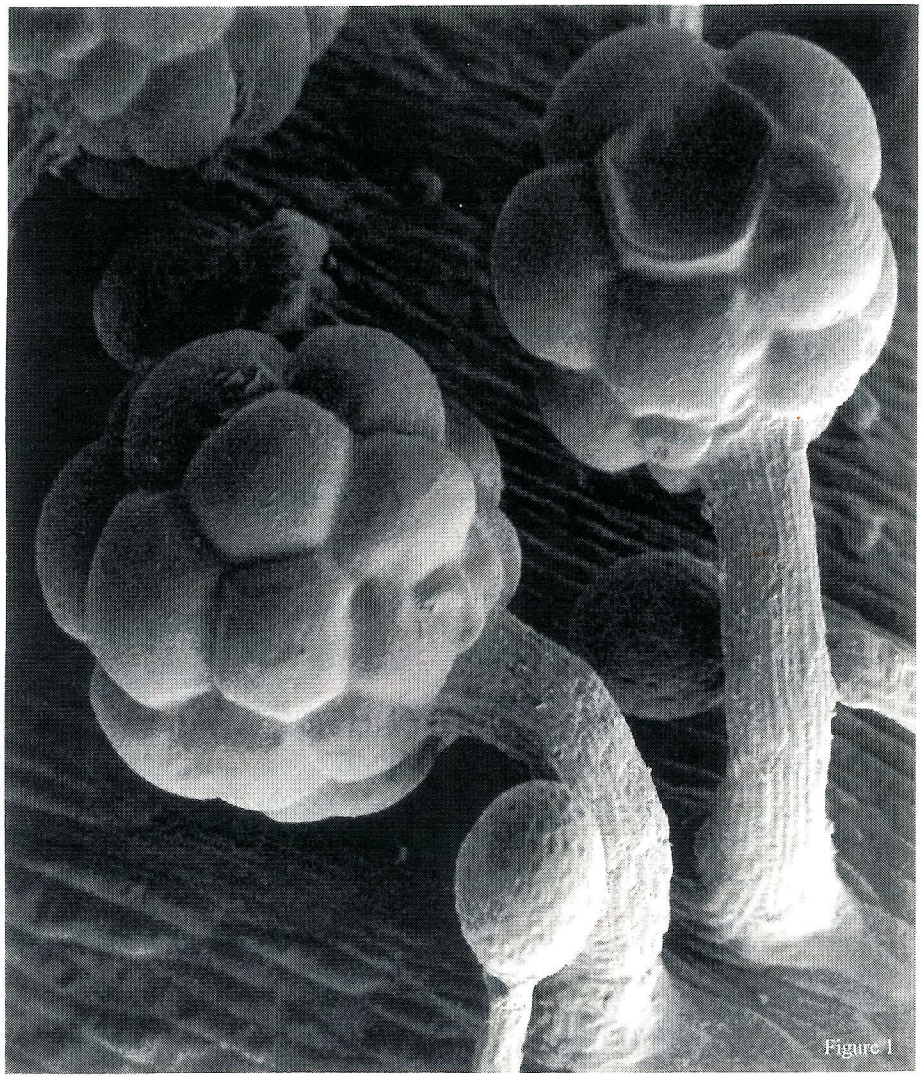
The Indian Sundew (*Drosera indica*) occurs with a huge extension, from South Africa over Madagascar up to India and through Southeast Asia down to Australia. The plant colour reaches from yellowish-green to dark red, the flowers are white, orange or pink - or start white and become pink after some days - and the size varies from only a few centimetres (i.e.: Howard Springs, AUS) up to respectable more than 150 cm (i.e.: South Africa). They all grow in tropical or subtropical environments. Despite of several obviously distinct varieties, until December 2000 they all have been classified as one species into the monotypic (since the three North Queensland Sundews have been separated into section *Prolifera*) *Drosera* section *Arachnopus*. Then Dr. Jan Schlauer described the Australian *D. hartmeyerorum* and classified it as a second species on its own into section *Arachnopus*. Closely related to *D. indica*, this dark red plant from the Eastern Kimberley is clearly distinguished by light yellow emergences of approx. tentacle size at the leaf base, which are even unique for the whole genus. Their purpose or function is still puzzling and object of further investigation. But there is one more surprise: the microscope shows very minute and distinct structures spread over the leaves of different varieties of *D. indica*.

At the 4th International Carnivorous Plant Conference in Tokyo (Japan 2002) I have been invited by Prof. Kondo to show parts of our video "FLEISCHIMANIA", on which the yellow (magnified) emergences of *D. hartmeyerorum* are visible (including plants and habitat). This species found a lot of interest and I was very pleased, when after the lecture Prof. Dr. Stephen Williams (Lebanon Valley College, USA) offered a common project (together with Prof. Al Wolf and Ms. Regina Kettering) to investigate the species with a Scanning Electron Microscope (SEM). Well, to realise such a project would normally be very expensive, so I agreed without hesitation. The chemicals to prepare some Sundew leaves - grown from seed at our

greenhouse in Weil am Rhein, Germany - arrived soon from Pennsylvania USA, and only a few days later I returned the specimen for the SEM investigation. This is still ongoing, however, I am very grateful for the approval of Stephen and his team, to show the excellent two SEM-pictures (figures 1 and 2), to accompany this article.

Actually the description of the yellow emergences caused a discus-



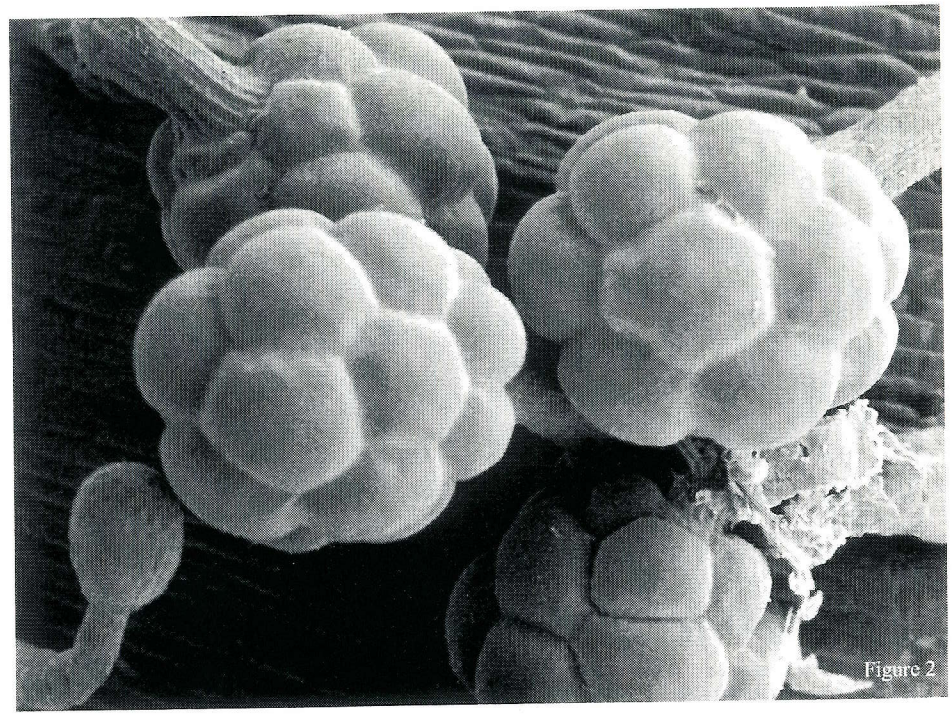


Figure 1 left and 2 above. Scanning Electron Microscope pictures of *Drosera hartmeyerorum* Schlauer. The collapsed cell on one emergence (top right of figure 1) shows, that the "lenses" are hollow. The normal tentacles beside allow to match the size. (Photos by Regina Kettering. Published with the kind approval of Prof. Dr. Stephen Williams and his team at the Lebanon Valley College, USA)

sion on the Internet and motivated several persons world wide to take a closer look through the microscope. Thus I was again very pleased, when I received some excellent colour photos (Figure 3) by Dr. Barry Meyers-Rice (editor of "*Carnivorous Plant Newsletter*", USA) who did not use a microscope, but a special combination of photo-lenses to achieve the great magnification. Again I am very grateful for Barry's approval to show one of them to accompany this article.

Together with the SEM pictures a good general impression of the unique yellow emergences becomes possible.

The story was getting even more exciting when Dr. Eberhard Koenig

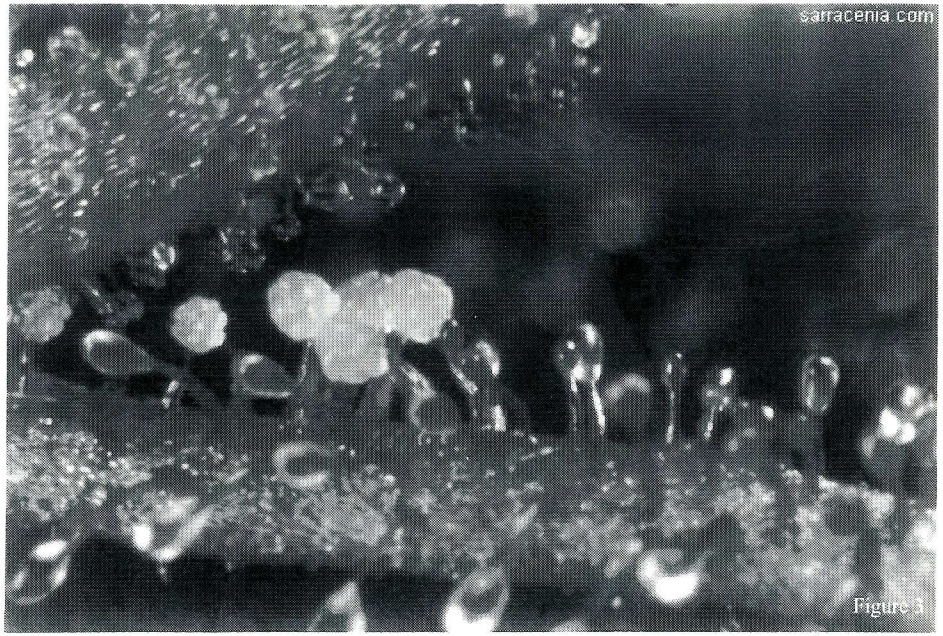


Figure 3. *D. hartmeyerorum* photographed by Barry Meyers-Rice (www.sarracenia.com) with a special lens combination. This is a good comparison between the yellow emergences and the deep red leaves.

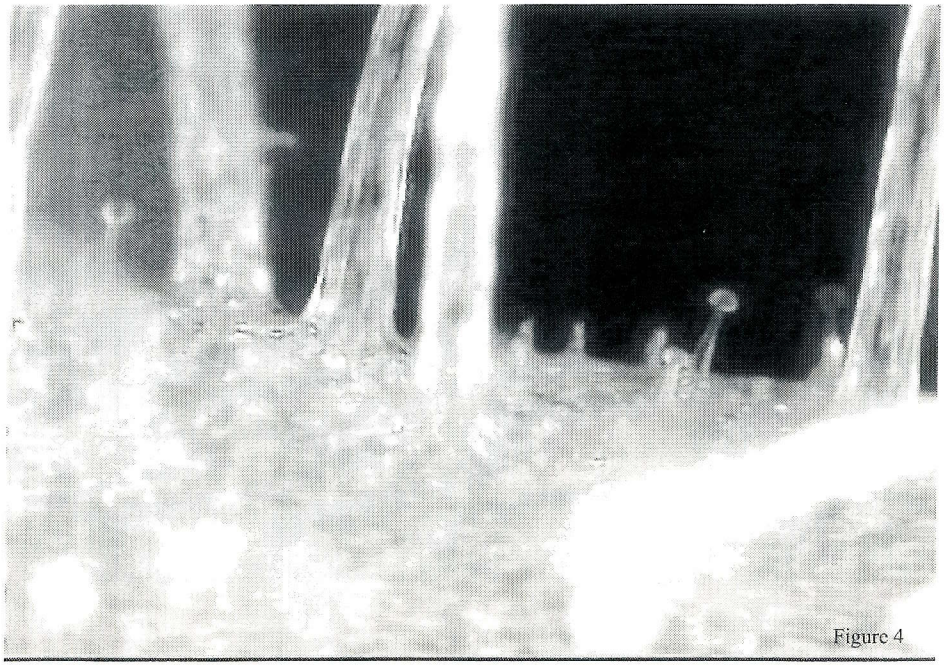


Figure 4

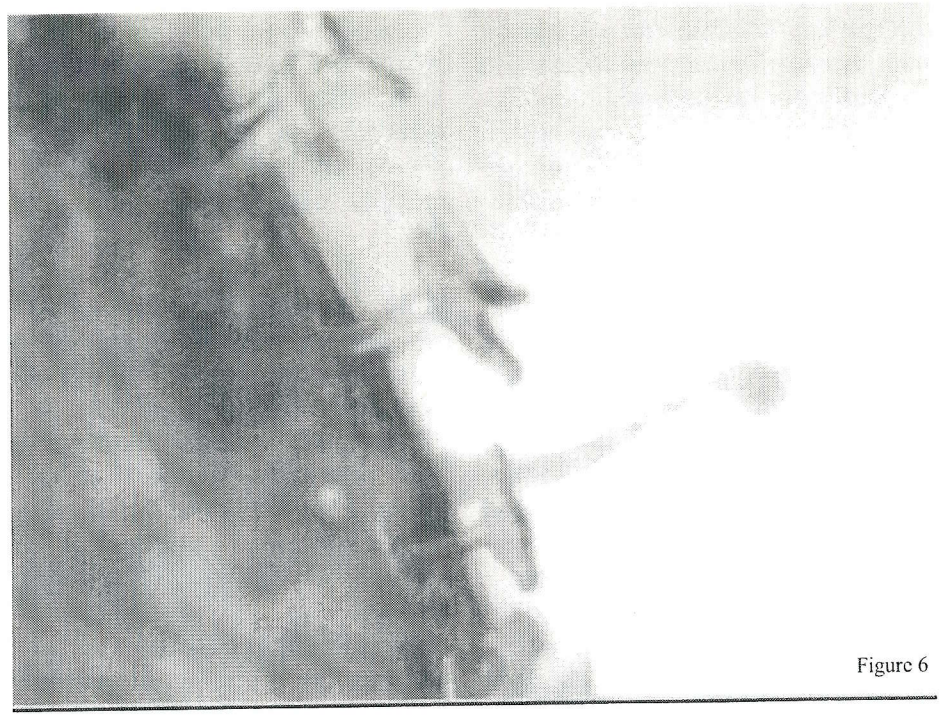
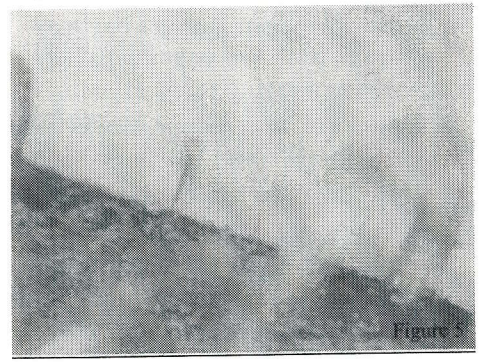


Figure 6



Figures 4 and 5. On this *Drosera indica* "pink flower" (200 x mag.) - growing in the Eastern Kimberley - the whole lamina shows several only 0.1 - 0.2 mm small emergences with yellow heads. Unfortunately the head structure (my impression: blackberry-like) is not clear visible. Actually they are no normal tentacles.
Photos: S. Hartmeyer

Figures 6 and 7. On this more than 1 metre big *Drosera indica* "white flower" (200 x mag.) - growing in South Africa - mushroom like emergences appear, which are a little bigger than those on the Australian variety. Like bed-mites both structures are invisible for the human eyes.
Photos: S. Hartmeyer

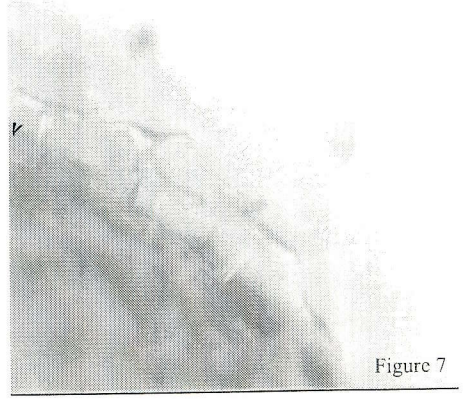
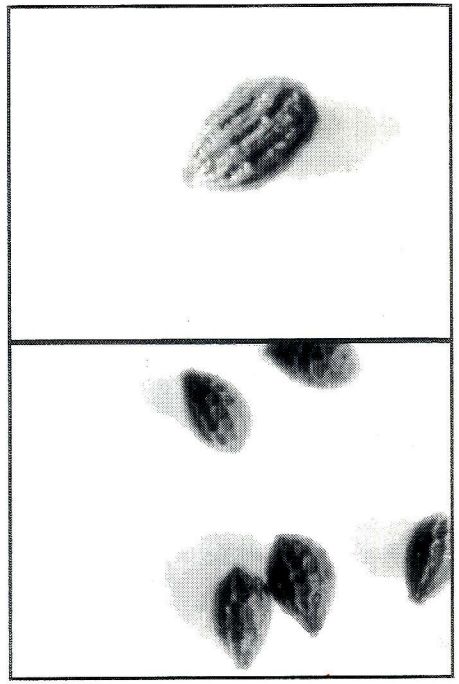


Figure 7

(Germany) told me, that a big green *D. indica* that he has on his list, shows very minute mushroom-like structures on the whole lamina. Visible only under a microscope with 200 times magnification. I recalled a comment by Stephen Williams, that apparently the "head" of the yellow emergences of *D. hartmeyerorum* is built by only a few giant cells (one "lens" = one single cell. Could it be possible that varieties of *D. indica* can be distinguished by those very small structures which have not been found until now, because of their minuteness??

At a meeting of the German CPS "*GFP*" in Wuerzburg (German town) 2002, I met Andreas Fleischmann who has an excellent knowledge on the Droseraceae. He also found different very minute emergences on his *Drosera indica* and he offered some seeds of such varieties. They germinated well and thanks to a weekly feeding with fish-food (using tweezers with a magnifier) they grew quickly. For closer observations I decided to buy a USB-microscope (Internet order approx. US$ 250,-), which is connected directly to the computer (by USB-port) enabling 30 and 200 times magnification. A light source is integrated and combined with a



Comparison between seed of Drosera indica (Top) and Drosera hartmeyerorum. Both are magnified x200

laptop the microscope can be used even in the field on living plants. Unfortunately the resolution of the resulting pictures is just poor, but good enough to get more information. A high quality microscope with camera adapter would be 10-20 times more expensive!

When the plants had grown big enough to investigate the adult leaves, I needed 200 x magnification and could then clearly confirm

the observations of Eberhard Koenig and Andreas. As mentioned above: the resolution of the resulting pictures is only poor for printing, but I believe they are interesting enough to show them. (Figures 4-7)

Due to the huge extension of *D. indica* it will be a long lasting and hard work for everybody who tries to publish an extensive and complete documentation of all varieties (or new species?) of this Sundew. To investigate the very minute emergences on the world-wide existing dried herbaria specimen will certainly be not so easy. And in addition there is still a bigger problem: no matter if anybody is looking on the minute emergences, genome or seed structures of the species, actually, at this time much more field observation will still be necessary because several unexplored growing sites between the African and the Australian east-coast are still waiting with unexpected surprises.

The intention of this article was not to deal with any new species names, but to motivate as much CP enthusiasts as possible to point their view on the minute emergences on *D. indica* varieties within their own collection. There are more shapes than the shown examples! Good luck! It would be great to hear from you by email.

References:

Hartmeyer, S. 2003, Neues vom Sonnentau: Die Sektion Arachnopus unter dem Mikroskop
DAS TAUBLATT 2003/3: 04-08

Schlauer, J. (2001), *Drosera hartmeyerorum* spec. nov. (Droseraceae), a New Sundew in sect. *Arachnopus* from North Australia, Carnivores Plant Newsletter 30/4: 104 - 106

Hartmeyer, I. & Hartmeyer, S. (2001), Observations on a New *Drosera* Species in the Ord River Region (Australia), Carnivores Plant Newsletter 30/4:107 - 110

Hartmeyer, I. & Hartmeyer, S. (2001), FLEISCHIMANIA, Hunting Veggies® Digital Video, 60 minutes (German and English language), private production

Hartmeyer, I. & Hartmeyer, S. (2001), The 4th Carnivorous Plant Conference in Tokyo, Hunting Veggies® Digital Video, 170 minutes (English language), private production

A Walk Through A North American Temperate Bog

William Dawnstar
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Always envious of the incredible diversity of Australian CP, I was hard pressed to come up with a topic related to CP to submit to this fine Journal. What can one living in New York State, U.S.A. have to offer to the readers in Australia by way of a "CP experience"?

Well, Australia has never known glaciers, and so there are no sphagnum bogs for you to tromp through and enjoy. I hope this account proves of interest to readers "down under"! Put your old sneakers on and come along with me as I take you on a visit to my local sphagnum bog.

Glaciers moved through this area in the last Ice Age: huge sheets of ice that towered to the heights where cumulus clouds now form. In the slow process of their movement, they ploughed the land, carving long furrows into it. In a very real sense, the Ice Age is still ending here in Oswego County, New York where I reside as will be seen.

Temperate bogs are always cool spots. The ridges carved by the glaciers act in a larger scale like the radiator fins in a car engine. Prevailing winds move through these gullies, drawing off the heat that the sun produces. When the glaciers melted, the ice cold water filled the low places creating conditions which discouraged the presence of Nitrobacteria, creating a habitat ideal for the presence of temperate CP species. This coolness has been maintained by the topographical air flow as mentioned.

The result is a unique sort of niche, tending towards acidic conditions which continue to discourage the process of decomposition, and the release of stored nutrients associated with this process. As the initial glacial waters receded, pools remained of ice cold pure water. Eventually sedges began to grow about the edges of these pools, extending their roots into the water, and dropping their leaves season after countless season. Because there is so little decomposition, this detritus built up over the ages, slowly filling in the "protobog". Eventually a mat began to form, extending further and further towards the centre of the pond, and this mat became the substrate for later colonization by sphagnum moss species.

Sphagnum and other companion species drew up the available nutrients present in the substrate, and locked them up while at the same time further acidifying the area. Acting like a huge purifying filter, the protobog became more mineral free over time as the mat continued to extend toward the center of the pond. CP species took advantage of the reduced competition!

The changes in the biotype are evident as you drive into the area. 15 minutes before reaching the bog proper, the air becomes distinctly cooler. The transition is very sudden. Up to this point, the woodlands are dominated by hardwood trees, but soon conifers become more and more plentiful, until the are the dominant tree form.

Walking down the bank to the bog, one notices the proliferation of mosses and other acid loving bryophytes, and many fungi all profiting from the continual humidity the bog provides. At the base of the bowl like depression there is an area of standing water that must be crossed via a rotting log. Don't slip on the rotting surface: here you will sink hip deep in the muck. At this point, nutrient runoff from the land does allow some decomposition, and the smell if you go in is not....nice.

Once over the log, the adventure begins. You step into a spongy but firm surface of Sphagnum. Here at the edge, this is solid, but this will soon change! The first thing that strikes me is the feeling of excitement. I believe that this might have to do with the high oxygen content of the air filling the bowl like depression! Every square inch of this 200 acre area is photosynthetic. There is no "ground", only green. Since there is no decomposition or rotting, the air is very clean and sweet smelling. It is a hydroponic wonderland of plant life.

The actual CP presence in these bogs varies. In my area there is *Sarracenia purpurea var. purpurea*, *Drosera rotundifolia* and *Drosera intermedia*. Few enough species to be sure, but I visit them often! In higher elevations, these populations can be extensive: literally millions of *Drosera* spreading into the distance like a red mist, growing on every available surface. In my own local bog, the populations are not so

extensive. The Pitcher Plants may be found nearly from the moment you step onto the floating mat of sphagnum. Further towards the centre there are *Drosera rotundifolia* growing amongst the sphagnum and sedges. *Drosera intermedia* appears at the edge of standing pools, preferring the mucky peat to the live moss, and often partly aquatic.

The varieties of Sphagnum moss is bewildering: every shade of green, gold and red imaginable. Common phytosocial associations are with cranberries, several orchids, bog thyme, bog rosemary, and sedges. Hemlock has begun to root here and there, and there are a few small trees growing in the bog. Eventually other conifers will root there in a process that will in time fill in the bog, culminating in a hardwood forest in a process known as succession. The bog will be filled in and will be gone: it is but a transitory remnant of the last ice age.

The wetness continues to increase

Do your carnivorous plants produce seed?

How about donating some to the societies seed bank! For the seed bank to work successfully it relies on donations. Any spare seed you have can be forward to the societies address but it must be clean and labelled.

What do we mean by clean?

You must ensure the seed is separated from all other flower parts.

How should it be labelled?

With the full species name e.g. *Drosera rotundfolia* NOT *D. rotundifolia.* If sending seed from outside Australia, it must also have a customs declaration stating what is in the package. This avoids delays with customs.

If you wish to donate seed, it is advisable to contact the Seed Bank Manager seedbank@auscps.com to ensure that it is OK to donate that particular species, i.e. some species are protected by CITES while others are listed as potential weeds in Australia.

Please donate seed and help others enjoy growing carnivorous plants!

as we move toward the open centre of the bog. Soon every step finds water filling the depressions our feet make. The mat is getting thinner. Progressively, the size of the Sarracenia increase, until one pushes through a surrounding ring of ericaceous shrubs to the very edge of the mat. Here, every step sinks one to the hip, and the surrounding shrubs all rock back and forth, as if we were walking on a huge water bed. One thinks often what would happen if one were to break through the mat. I suppose we would be found 4,000 years later, perfectly preserved in our tie dye t-shirts, clutching our digital cameras: an enigma for posterity to ponder!

In this spot, the Sarracenia are huge. I have seen individuals to 11 inches tall, and I could nearly place my fist in their mouths. I hope their precarious position will spare them from collection: so far so good! Now and again, a deer fly or a mossie buzzes by, but not too often really.

In the spring (about early June) the bog flowers with great beauty. Pink orchids, pink cranberry flowers threading through the moss, deeper magenta orchids....and of course the real stars of the show: Sarracenia flower scapes rise above the moss where the plants have become buried in the spring growth of moss! Suddenly the populations are visible by way of this advertisement. Later in the summer the *Drosera* species flower, and then one can occasionally find the endangered Pink Lady Slipper Orchid. I have only found it once.

In July the *Drosera* flower, and by the end of August they begin to form their winter hibernacula to carry them through the winter cold which can reach -20F. By October, the moss has grown thickly over all, providing the insulation that help these species survive. The sedges have all made cottony seedpods, and these spread out into the distance like white stars. In winter, snow accumulation spreads a blanket up to 5 feet deep over all, and the land becomes a playground for crazies bombing around on motorized ski sleds while the species sleep beneath the deep coverings of moss and snow.

Sabah!

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Flying over the South China Sea towards Kota Kinibalu had me on the edge of my seat. Not because I hate flying but because I was only hours away from visiting the famous Nepenthes site, Gunung (Mount) Kinibalu! The coast of Brunei was visible on the horizon as we passed numerous oil rigs then as we came close to the coast of Sabah we could see the city Kota Kinibalu and not far inland was..... NOTHING BUT CLOUD!

This was to be the second leg of a memorable trip with Richard Riles. After the success of our first leg in the Genting Highlands we had expected to see it all in Sabah and were not too be disappointed.

According to the travel agent in Australia, our guide for Sabah, Phil knew about Nepenthes and would be able to take us to see at least four species! Well as you could guess when I jumped in the car, the first thing I asked was can we stop at the first Nepenthes site. He answered, "What's a Nepenthes?" After I picked myself up off the floor I said "You know....Pitcher Plants?" Well, he knew Pitcher Plants and not only that, he knew people who knew Pitcher Plants! We were set.

Several hours of windy road later we arrived at Kinibalu National Park where we were to stay for the evening before heading up the mountain. Here we signed in and collected our passes to climb. The passes are issued to all visitors who climb the mountain to keep track of them. Conditions can change rapidly and in the passed people have become lost and have perished. Gunung Kinibalu is the highest mountain in Borneo at 4095.2 metres and it's still growing!

Following a great nights sleep, dreaming of what lay ahead, we rose early to see the summit almost directly above us! There was no way I was going to get up that thing. Not without a bloody big Nepenthes dangled in front of me. We met James, our guide for the climb. James is one of the fittest people I have ever met. There is a sign at the entrance to the track with the times of the fastest runners to have conquered the mountain. James explained that the 19km 2 day trek can be done in just over two and a half hours. He also boasts that he had done it in about three! He had walked or run this trail on average three times a week for the passed 7 years, and most importantly, he knew where to find the Pitcher Plants! He explained that even though the area was in drought, we would be able to see four or five types of Nepenthes.

We wasted little time to admire the scenery until *Nepenthes tentaculata* was spotted. Out with the camera. This beautiful little plant is commonly seen from about 1600 metres till roughly 2100 metres. The upper pitchers are mostly green and only 7 to 12 centimetres tall. The lower pitchers range in colour from speckled red and green to almost black. With its distinctive filiform appendages on the lid this species was a delight to observe.

As we climbed higher, James ran ahead to check on some plants off the track and to see if they were in pitcher. *Nepenthes lowii* was not, but he took us off the trail to a site where *Nepenthes* x *harryana* (*edwardsiana* x *villosa*) and *Nepenthes* x *kinibaluensis* (*rajah* x *villosa*) were growing. The latter was not in pitcher but *Nepenthes* x *harryana* had two beautiful little pitchers that we were able to photograph. The pitchers were intermediate between their closely related parents.

While photographing *Nepenthes* x *harryana* I made a discovery that I had not expected. I was delighted to find *Utricularia striatula* growing on the moss covered rock. Unfortunately this was the one place where I was not carried my extension tubes required to photograph a species this small.

U*tricularia striatula* grows as a lithophyte or epiphyte and can be found from Asia to tropical Africa.

***Nepenthes* x *harryana*, Kinibalu N.P.**

Utr***icularia striatula***

It is a beautiful little species with variable flower shape (Taylor, 1989). The flowers on the specimens we saw were quite large with a long corolla to 15mm. The plants were well spaced with only one to four flowers per colony.

Several hundred metres higher we ducked off the trail to photograph some large pitchers on *Nepenthes* x *kinibaluensis*. These pitchers were the largest I had ever seen (30 cm) and beautifully coloured. Again this hybrid is intermediate between both parents but did not appear to be as vigorous as either.

Nepenthes villosa occurs from 2300 to 3200 metres (9000 to 10300ft). The vegetation is quite sparse consisting mostly of Tea trees (*Leptospermum recurvum*), Sedges and Mosses. Although *Nepenthes villosa* is confined to Gunung Kinibalu, it is very common within its altitudinal distribution. This almost alpine species has very solid pitchers with a well developed peristome. When signing in at Kinibalu headquarters everyone is given a map of the summit trail. This has a few pictures on it of interesting features to look out for during your ascent including a picture of *Nepenthes villosa*. Unfortunately this picture is labelled as *Nepenthes Rajah.*

At 3272 metres (approx 10500ft) we arrived at the Laban Rata Guesthouse. The guesthouse is the largest of six huts at high altitude and is a great place to relax and socialise.

The next morning we rose at 2:30am for the difficult three hour hike to the summit. I arrived a half hour before sun rise. The view from the summit on a clear morning is fantastic and I'm glad I made the effort. From the summit we could also see Sabah's second highest mountain, Gunung Trus Madi. The decision was made right then. If we could organise the guides, we would climb it.

The descent of Kinibalu was more painful than the ascent but back at the headquarters there was a cool shower, a cold beer, and the promise that tomorrow we were going to see the most famous of all the Nepenthes.

Once again greeted with a fine day, we met Phil for a tour of the Kinibalu Park Gardens. Many of the parks rare Orchids as well as its Nepenthes are represented here including the all mighty *Nepenthes rajah*. Unfortunately these were quite immature plants.

Nepenthes lowii x *stenophylla* was a delight to see. The one large pitcher on the potted specimen was 25cm tall. This natural hybrid cannot be confused with any other as it has cylindrical pitchers with similar colouration to *stenophylla* and the *lowii* characteristic bristles under the lid with the strange white sugary crystals exuded from special glands.

Nepenthes edwardsiana is one of the most beautiful of all species. The lanky two metre specimen had one large cylindrical pitcher. The peristome of this species is well developed had me transfixed. Unfortunately my photos of did not turn out and I could not fit the plant in my bag.

By mid morning the cloud had thickened and rain began to fall lightly but we were on our way to Masilau Nature Reserve. This is one of the easiest places to see Nepenthes rajah. At the visitors centre you can register for a small fee and the *Nepenthes* guru Ansow will take you through the locked gate to the plants. Ansow has a good knowledge of the flora in Sabah. As we walked to the Nepenthes garden he told us about the various plants and the medicinal properties. *Nepenthes Burbidgeae* was growing around the path. It was introduced by Ansow in the late 90's. *Nepenthes burbidgeae* has large colourful lower pitchers. I'm sure that now the plants will have begun climbing through the Leptospermums and are producing upper pitchers.

There were two *Nepenthes lowii* plants just off the trail. One plant was juvenile with lower pitchers, the second was more mature with the characteristic upper pitchers. *Nepenthes lowii* has suffered in the Kinibalu area to collectors.
Nepenthes fusca and *Nepenthes reinwardtiana* have also been introduced from nearby areas by Ansow. Unlike *Nepenthes burbidgeae*, these were introduced as plants but have settled in well although the *Nepenthes reinwardtiana* did not

Nepenthes burbidgeae

have pitchers.

Nepenthes tentaculata was abundant. The pitchers on these plants were much darker and more squat than those we had seen on the summit trail. Some were almost black.

Nepenthes rajah was confined to the steep slopes. These areas are subject to land slides and Ansow explained that without them, *Nepenthes rajah* may not exist. Where the trees are able to grow thick, there is not enough light. He also suggested that it would be a good idea to set explosives along the side of the mountain to create new habitat for Nepenthes rajah. I wasn't sure if he was serious or not.

The pitchers of *Nepenthes rajah* were an incredible site. They were much bigger than I thought they would be. Pitchers up to 40cm were not uncommon. They were well hidden amongst the sedges and were generally seen only when we were standing right above them. The young pitchers had reddish green peristomes while the older ones were maroon. Older pitchers were filled with a rich soup of mosquito larvae and decomposing insects. The soil was also quite heavy, a conglomerate of gravels and clay. We snapped quite a few photos as one would expect and explored as many plants as possible. If you included the small seedlings, we would have seen close to a thousand plants. There was one plant about 40cm in diameter that was a bit different. It was fairly obvious that this was a hybrid with *Nepenthes fusca.* It showed intermediate pitcher characteristics between both parents. The pitchers were mottled like *Nepenthes fusca* but fairly squat like *Nepenthes rajah*. The dark peristome was raised towards the orbicular shaped lid. The plant itself resembled *Nepenthes rajah*. I think this would be a great plant for cultivation.

Our next stop for the day was to be Poring where we were promised a soothing bath from the thermal spring but *Nepenthes* were spotted a few kilometres from the village so we stopped once more. *Nepenthes mirabilis* was the dominant species scrambling over the coral ferns and high into the trees. *Nepenthes gracilis* was found growing under the coral fern in very dark conditions. Both were fairly typical and of little interest. We also passed a sign which read "Rafflesia". Phil explained that we were very lucky to catch this parasitic plant in flower as it was quite rare in this area. We decided that we'd check it out in the morning.

Nepenthes rajah

Once at Poring we were left by Phil so he could try to arrange some guides to climb Gunung Trus Madi. If he could not, we would spend five days walking in the Crocker Range. I'm not so sure that Richard was too keen to trek up another mountain but I was insistent. I wanted to see *Nepenthes macrophylla*. That afternoon we ate some sort of curried fish at what is best described as a corrigated iron restaurant. The table was shared with some local cats who were keen to eat what ever we didn't. Then we returned to the bungalow to watch the Squirrels and Langures jump about in the Giant Bamboo.

After a night dreaming of Nepenthes we were off to the Orchid garden. Here was the most impressive display of Orchids I have ever seen. Dozens of Slipper Orchids and huge Dendrobiums were in bloom as well as some of the smallest Orchids in the world. *Nepenthes* were also represented with *Nepenthes ampullaria, Nepenthes mirabilis,* and either *Nepenthes hirsuta* or *macrovulgaris.*

There is also a walk through the forest where you can see some in-

Amphorphallus lambii

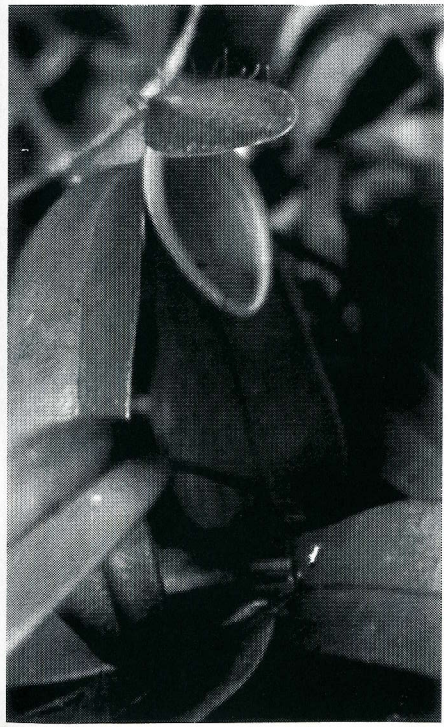
teresting native animals including a talking Hill Myna bird, the unusual Pangolin, and the endangered Orang Utan. The Orang Utan was not caged and we stood quiet as it came closer. Unfortunately there were also some loud American tourists (I'm not saying all Americans are loud) who got a little too excited and scared it off.

Our next visit was to the farm where we had seen the Rafflesia sign and after paying our RM15 we were guided for a short 5 minute walk into the forest. There were at least 20 flower buds of the famous *Rafflesia arnoldii* and one open flower. This species has the largest flowers in the plant kingdom though this particular specimen was quite small at about 60cm. We were also privileged to see another interesting species at the same site. *Amorphophallus lambii* is not as famous as the giant Titan Arum (*Amorphophallus titanium*) but it does have a modest inflorescence of 90cm. The size and the unpleasant smell makes this species really stand out in the jungle.

After another night of relaxation we were off to pick up our guides and food for the final leg of our Sabah visit. Gunung Trus Madi! We now had a party of six including the two of us. The area around the base of Gunung Trus Madi is a maze of logging trails and we are driven to an altitude of about 1200 metres where the road had been washed away. The driver was told to return in three days and we were off. It was extremely hot and humid at this altitude but still there was no rain. A single plant of *Nepenthes fusca* was found growing beside the track at 1600 metres ASL. This plant had some nice upper pitchers that were all green with dark peristomes but there was little time to admire them as we had to reach the base camp at 2200 metres.

Although not as steep a climb as Kinibalu, the track up Trus Madi was quite overgrown. We had to crawl under fallen trees and between the roots of others. Everything was damp and mossy and therefore slippery. The fact that there were some interesting varieties of *Nepenthes tentaculata* and numerous Orchids along the way did not help our cause.

At approximately 1900 metres, two of our guides left us to go ahead and set up camp as it was getting dark. Not long after this we began seeing *Nepenthes Lowii* as the canopy became lower and the sun began to set. We arrived on dark to a cooked meal of rice and more rice with a little rice on the side.



Nepenthes tentaculata, G. Trus Madi

The night was a cool 12°C and with only the sweat soaked clothes on our backs to sleep in, it was not the most comfortable nights sleep. According to Richard I snored all night but I didn't hear a thing.

At first light we were woken by the loud calls of the Bornean Gibbon. The five metre wide ridge we were camped on fell away almost vertically on both sides for approximately 200 metres. Not a safe place for sleep walkers. In the distance poking through the clouds, the summit of Kinibalu could be seen while on the other side clouds poured over the surrounding ridges into the valley. There was no sign of civilisation to be seen or heard. I could wake to this every day of my life.

For breakfast we quickly shovelled down some rice and were off up the knife edge ridge in search of Nepenthes. It was not long before we were surrounded by *Nepenthes lowii*, *Nepenthes macrophylla* and the aptly named hybrid of the two *Nepenthes* x *trusmadiensis*. *Nepenthes* x *trusmadiensis* pitchers are

(like many natural hybrids) intermediate between the two parents. *Nepenthes macrophylla* is almost on par with *Nepenthes edwardsiana* in my mind as the most spectacular of all Nepenthes. The plants are enormous in all dimensions with metre long leaves and even longer tendrils hanging 40cm pitchers through the canopy. The woody pitchers varied in colour from green to red. Plants climbed high into the trees where ever possible and strategically placed their pitchers below the canopy. Unfortunately the day exploring the summit was over far too quickly and it was time to pack the tents and make our way down.

We made one more discovery on our way down the slope, more than 15 of the largest pitchers of *Nepenthes macrophylla* and *Nepenthes lowii* cut for the black market. They were hidden under logs upside down to dry. We photographed some of them for a story in the local paper. If the locals are encouraged to protect these plants for the future, these rare species may have some chance of survival.

There were no more Nepenthes sites to be visited on this leg of the journey. We would have to wait two days till our arrival in Bako National Park, Sarawak, but that's another story.

Looking into the rain filled belly of *Nepenthes lowii*. The waisted body may help to prevent the pitcher losing its prey during heavy rain

References:

Clarke, C.M. (1997) *Nepenthes of Borneo*, Natural History Publications (Borneo) Kota Kinibalu

Notes to contributors

Contributions including articles, letters, photographs and drawings to the journal are greatly appreciated and may be forwarded to the societies postal address or online. The views expressed in this journal are of the authors not necessarily those of the Australasian Carnivorous Plant Society Inc.

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Dedicated to Conservation and Education

***Nepenthes lowii* on Gunung Trus Madi.**