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Meeting are held on the second Friday of each month

Time: 7.30 p.m.—10.00 p.m.

Venue: Woodstock Community Centre
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Photo Andreas Fleischmann

Back Cover: A spectacular squat pitcher of *Nepenthes peltata* **Photo** Stewart McPherson

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UPCOMING SPEAKERS AND EVENTS

Date	Subject	Speaker(s)
11 th June 2010	Rare plant auction and plant trivia	Retailers & members
9 th July 2010	Carnivorous Plant Photography Carnivorous plants of South America	Greg Bourke Stewart McPherson
13 th August 2010	<i>Drosera cistiflora</i>	Kirk Hirsch
10 th September 2010	<i>Sarracenia</i> propagation	Jessica Biddlecombe
8 th October 2010	Propagation of temperate carnivorous plants	Greg Bourke
12 th November 2010	Growing in Terrariums	Peter Biddlecombe

Committee 2010

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Cultivation of South American *Drosera*

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SUMMARY

In this article the rarely cultivated and diverse South American *Drosera* are discussed. Cultivation and propagation techniques are described as well as feeding and pests and diseases.

Key Words: cultivation: *Drosera*, South America

The South American *Drosera* are a very diverse group, both in terms of morphology and shape as well as in ecological needs. Therefore they cannot be grown altogether under the same conditions in cultivation. I will report my cultivation techniques and experiences for several South American *Drosera*, and group those species which have similar needs and therefore will grow under the same conditions in cultivation.

I have grown several species of South American *Drosera* for many years now, both in the temperate and tropical greenhouse as well as indoor in terrarium setups under artificial lights. Some species will grow extremely well under all conditions, whereas some other species have proven to be more tricky and difficult to grow as they seem to demand certain needs (usually cool temperatures, especially at night for some highland species; or a short dry dormancy period in some Brazilian *Drosera*).

As I live in Southern Germany, the natural photoperiod for greenhouse-grown plants in winter is much shorter than in their natural habitats near the equator. I noticed that several species will not grow very well without artificial lights (at least 8 hours of light, best is 10-12 hours in winter) in a greenhouse in winter. The plants grow slowly, and are very sensitive to rot by grey mould (*Botrytis*). The photoperiod for my terrarium grown plants is 12 hours of light a day year round. Most species of *Drosera* (and all South American sundew species) require high levels of light, and will not look very healthy if grown under Natrium-lights. To get healthy plants with good colouration, I use light bulbs. I had good results with T8-bulbs, but now switched to T5-bulbs (OSRAM Lumilux, combination of two 36Watt bulbs per terrarium, lightcolours "cool white" (840) and "daylight" (865), but any other lightcolours or growlights will do well). The more light the *Drosera* get, the better they will grow. However, the

light-bulb setups produce a lot of extra warming, which is disliked by some cool-loving highland species (like *D. hirticalyx* or *D. graminifolia*). Take care when your plants in a terrarium are putting up a flower-scape. When the scape reaches too close to the hot light bulbs, it will easily get burned. I noticed that almost all South American *Drosera* species will need some air circulation and reduced humidity when

in flower, and I therefore never had any seed set in most species under damp and humid terrarium conditions (exceptions are *D. intermedia*, *D. capillaris*, *D. felix*, *D. kaieteurensis*, *D. brevifolia* and the newly discovered *D. spec. 'Amazonas'* for example, which will set seed easily after selfing even under very humid conditions). In order to get fertile seed from my plants, I remove flowering plants into my tem-



Figure 1: *Drosera communis* in the Gran Sabana



Figure 2: *Drosera roraimae* on Amurí-tepui

perate greenhouse or in and uncovered terrarium.

I noticed that almost all South American *Drosera* will grow well in a soil mix of milled dead long-fibered Sphagnum and pure white quartz sand. The plants will grow fast in this substrate, and seedlings grow fast and cuttings will root quickly. However I observed that the plants grown in sphagnum seem to be a little weaker and more pale coloured compared to plants grown in a peat-sand mix (ca. 50:50). Thus, in order to receive vividly coloured plants, I usually transplant ma-

ture plants into a peat-based substrate, and use milled sphagnum for raising seedlings and cuttings.

All South American *Drosera* proved to grow easily from seed under my conditions, and usually germination of fresh seed is good and fast. Seedlings of most species will grow and increase in size quickly, although some species (*D. hirtella*-complex, *D. sessilifolia*) seem to benefit from some artificial feeding (I use spring tails from a zoo shop for my seedlings; applying any artificial fertilizer to my *Drosera* seedlings so far usually lead to loss of the seedlings).

Seed of South American *Drosera* can

be stored well in dry conditions in a cooler (at about 8°C), except of seed of *D. communis* and *D. grantsau*, which should be sown immediately after you receiving it! These two species have very short-lived seed, which cannot be stored for long. On the other hand, seed of some species (*D. graminifolia*, *D. chrysolepis*, *D. ascendens*, *D. villosa*) is relatively long-lived and I had 5-year old seed still germinate well.

These groupings below are species that I experienced to grow well under the same growing conditions. They do not reflect systematic relationships or geo-

graphical origin of the plants. I personally do not distinguish between "Guayana Highland *Drosera*" or "Tepui *Drosera*" and "Brazilian *Drosera*", as several of these tropical South American *Drosera* will share the same needs in cultivation. These growing tips are based on my own experience and observations as a "sundew grower", but are no guarantee for successful growing of these plants. My conditions may fail when tried for some other growers, and totally different growing techniques may also work well for someone. But I hope that I can provide at least some hints for the culti-



Figure 3. *Drosera meristocaulis* in cultivation



Figure 4: *Drosera graminifolia*—Giant form in cultivation. Note the large stipules and hairs on the leaves.

vation of one or another species, and get more people interested in trying to grow these fantastic South American *Drosera*.

Species that can be kept wet in tray system all year round; species that will grow well both in a terrarium and under greenhouse conditions: "Beginner species":

Guayana *Drosera*

Drosera roraimae (Figure 2), . Grows under highland to intermediate conditions on the Guayana Shield in Vene-

zuela, Brazil and the Guianas, both on the tepui summits and in the higher elevated parts of the Gran Sabana. Plants from different locations sometimes can look very different. Very easy, beginner plant. Easy to grow from seed, both leaf- and root cuttings work well. The wetter the plants are kept, the more readily they will form a tall stem. Plants in the greenhouse tend to rot in winter without artificial light, and will require some cooling during very hot summer days. Best temperature to grow is about 15-25°C, the cooler the better.

Drosera felix. Grows under intermediate conditions on the Guayana Shield in Venezuela, and the Guianas, in the



Figure 5: *Drosera arenicola* from Amuri-tepui, Venezuela

higher elevated parts of the Gran Sabana and on some of the lower tepuis. Easy, beginner plant. Easy to grow from seed, both leaf- and root cuttings work well. Plants in the greenhouse tend to rot in winter without artificial light, and will require some cooling during very hot summer days. Best temperature to grow is about 15-25°C, the cooler the better.

Drosera kaieteurensis. Same as *D. felix*. I have had no success with leaf-cuttings so far.

D. capillaris, *D. biflora*, *D. intermedia*,

D. spec. nov. 'Amazonas': Very easy, especially in a terrarium. Easy to grow from seed (the plants are self-pollinating and set seed readily even in a closed terrarium), both leaf- and root cuttings work well. These plants are tropical intermediate to lowland species and can be grown warmer than the other species mentioned here.

Other rather easy tropical South American *Drosera* are *D. esmeraldae* and *D. aff. esmeraldae* from Serra Araca, same as *D. felix*.

Brazilian *Drosera*

D. ascendens. Plants from different locations sometimes can look very different. Very easy, beginner plant. Easy



Figure 6: *Drosera arenicola* from Amuri-tepui, Venezuela

to grow from seed and root cuttings. Most location forms will grow well in the greenhouse year round. Best temperature to grow is about 15-25°C, the cooler the better.

D. tomentosa (= *D. montana* var. *to-*

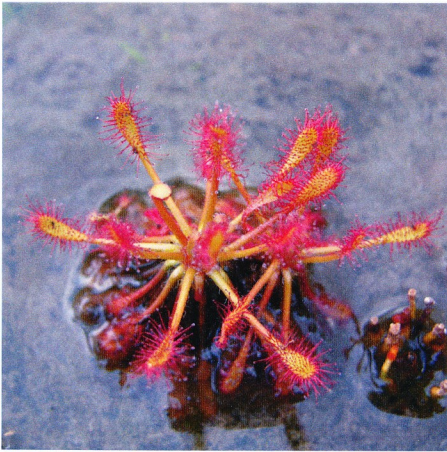


Figure 7: *Drosera communis*

mentosa). Same as *D. ascendens*.

D. sessilifolia. Annual species, but can grow for more than one year in cultivation. Same in cultivation as *D. burmannii*. Lowland species, need warm to hot conditions.

More difficult South American *Drosera*: these species require some extra needs to grow well and survive for a long time in cultivation.

D. meristocaulis (Figure 3), . Needs less humid conditions, plants kept in tray system all time tend to rot. Greenhouse grown plants will need artificial lights in winter.

D. graminifolia (Figure 4), *D. chrysolepis*, *D. villosa*: These species are not easy to maintain in cultivation. They do not grow well under terrarium conditions, and all of them can easily rot from the roots in hot summers. Cool conditions, especially for the roots, and do not keep plants permanently wet during summer. Artificial lights in winter, otherwise plants will easily rot! Provide a lot of air circulation, as these plants have large stipules and are hairy to collect moisture in their centre of the rosette. This part of the plant is very sensitive to rot and Botrytis. Root-cuttings work well, leaf-cuttings sometimes produce offspring. Not easy to grow, but if you have success with long-term cultivation of *Drosera regia*, you should give them a try.

D. schwackei (*D. montana* var. *schwackei*), *D. viridis* and *D. camporupestis* (= *D. aff. chrysolepis*

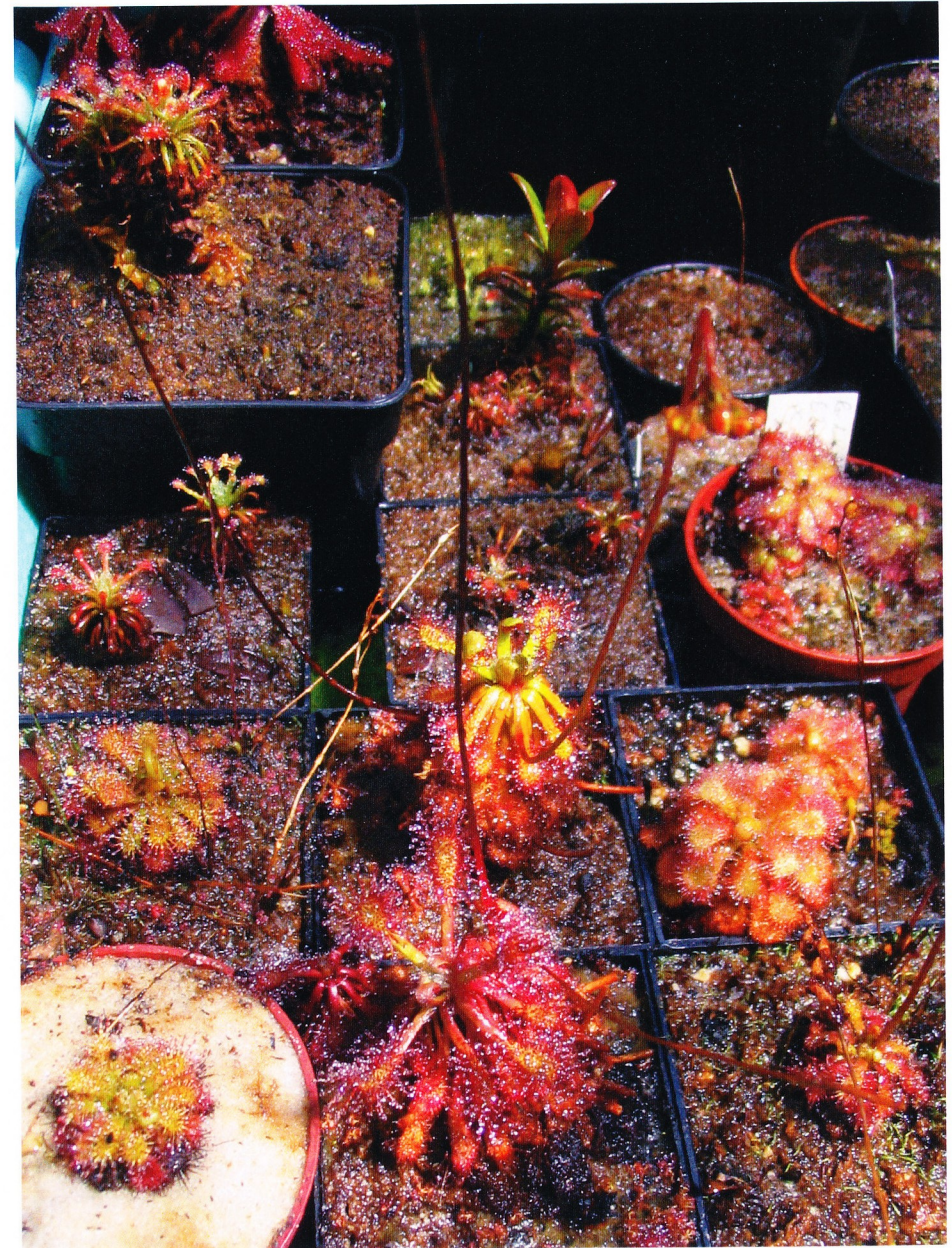


Figure 8: Tropical *Drosera* setup.

'stemless'). Not as difficult as the ones above, but require a little cooler conditions. Otherwise as easy as *D. ascensdens*.

D. solaris and *D. arenicola* (Figures 5 & 6). Like *D. felix*, but like a little drier conditions. Old plants easily tend to rot if kept wet and humid in a terrarium all time. Easy from seed and root-cuttings.

D. montana (ssp. *montana*), *D. hirtella*, *D. brevifolia*, *D. cayenensis*, *D. spec.* 'flat red *communis*', some location forms of *D. communis*: these species naturally experience a short dry dormancy, which they survive as thick fleshy tap root (like *D. cisitflora*). In the greenhouse, these plants will die back to the roots after flowering in summer. I keep them only slightly moist at this stage, just like *D. cistiflora* for example. However all these summer-dormant South American *Drosera* can be grown wet year round in a terrarium.

D. hirtella seems to prefer slightly higher air humidity than other species (see *D. communis* below). All of them easy from fresh seed, root-and leaf-cuttings work well, too.

D. communis (Figures 1 & 7) and *D. grantsau*. I had not much success trying to grow these species in the greenhouse. Both seem to like more air humidity, and do grow well in an enclosed terrarium. Root and leaf-cuttings work well. Easy from seed, both seed is very short lived!

D. hirticalyx. This is the most difficult species among the South American species under my growing conditions! This plant is a real ultra-highland tepui *Drosera*, and it only grows on the summits of high elevation tepuis. You can maybe call it the "*Nepenthes villosa* or *N. rajah* among the South American *Drosera*", as it shares the same temperature needs. Plants require very cool conditions, and greenhouse plants will start dying quickly if they had to suffer from long periods of hot day temperatures. If possible, keep the plant as cool as possible, and provide a distinct temperature drop at night (temperature can be down to 5°C without any problems, plants even experience temps of just around 0°C on the tepuis in some cold nights!). On the other hand, this species needs a lot of bright light, to grow well. But even if grown in full sunlight (always providing cool temperatures of the soil!), the plants are rarely as vividly red-coloured as plants in natural habitats. Both root and leaf-cuttings did work under my growing conditions. Fresh seed readily germinates, however a lot of seedlings die before they reach a certain size. Seedlings seem to benefit from artificial feeding (I use spring-tails, not fertilizer). Only experienced sundew-growers should try growing this rare species, as the risk of loosing the plant in cultivation is fairly high.

On the hunt for *Nepenthes* in West Central Java

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SUMMARY

Locating *Nepenthes* in the wild particularly near populated areas is becoming more difficult particularly in Indonesia where popularity has grown considerably in recent years. The author discovers that although *Nepenthes gymnamphora* is a fairly ordinary looking species as it is one of only two found naturally in Java it is under pressure from collectors.

Key words: *Nepenthes gymnamphora*; habitat; Java; conservation.

In November 2008 I travelled to the island of Java with friend and *Nepenthes* expert Ch'ien Lee. Our aim was to locate *Nepenthes gymnamphora* as well as see (or at least hear) some of the islands native bird species.

Day 1 (08/10/2008) Jakarta

We arrive in Jakarta. Upon arrival we are informed that our host for the trip Adrian Yusuf, (a local *Nepenthes* enthusiast) is in Singapore and will arrive tomorrow at 12 noon. We meet Mhd. A. Suska of Suska Nursery, Bogor, (a *Nepenthes* cultivation specialist) at the hotel who contacts another *Nepenthes* grower, Pak Yantoe, working at a nearby school for food and *Nepenthes* chit chat.

We are also invited out for an evening's entertainment by Tony, another

of Ch'ien's friends who runs an export reptile business.

After our meal in the afternoon and another meal in the early evening (!), we are whisked away to a night club... which was quite an experience!

Day 2 (09/10/2008) Jakarta

Adrian's flight to Jakarta is delayed: ETA 2pm.

We leave the hotel at 3pm in a hired van with Adrian, his driver, the driver of the van (!), Adrian's friend, Suska, Ch'ien and I. We travel to Garut, first through the Jakarta traffic, and then through the general traffic to our destination, arriving at about 7.30 pm. Nothing much to do in the sticks of Garut so we have an early night.

Day 3 (10/10/2008) Garut.

Up at the crack of dawn, back in the van, and off to find our mountain. Travelling through west central Java's volcanic mountain scenery we encounter the agricultural heart of the land. Rich fertile soil and the relatively high altitude at the base of the mountains provides ideal growing conditions for rice, grown on attractive rice terraces, all manor of fruit (including a strawberry farm!) and as we get progressively higher carrots, potatoes and eventually tea.

As the mountain that we were aiming to explore was new to Adrian we had some trouble finding it. The locals in their inevitable enthusiasm where sending us around in circles! Many a land mark was passed time after time until we eventually found the national tree plantation office in a remote village, down a remote lane... of remoteness. We chatted with the plantation officers sitting on the 'office' floor (if you could call it an office) drinking water. I picked up the visitors book, out of interest, and found that we were the first such thing since 2005, which probably explains the enthusiasm for which we were received.

Having explained our plans we were invited to stay in a locals house (next to the 'office') who was to act as our guide for the following days foray, and although we had been travelling around in circles for some time, time was still on our side, it was only 11.00 am.

After a small debate (perhaps even a

mass debate) we decide to visit local *Nepenthes* sites Adrian was familiar with.

Java is a bit of a conundrum as far as *Nepenthes* is concerned, Borneo to the north with 26 species, Sumatra to the west with approximately the same amount, and Sulawesi, and Irian Jaya to the east with there own fair share. Strange but true, Java with 2! Probably something to do with the Sunda shelf, but hey you had better ask Alfred Wallace about that one.

We extricated ourselves from our remote position to the surrounding country lanes meandering our way through hills, dales and the occasional dingily dell we arrived at a road side site. A typical stretch of *Nepenthes* habitat was a rarity amongst the usual reaches of cultivation, but this stretch of low cliff, stunted growth, and the occasional tree fern was defiantly not within the current reaches of hill farming! Although not a large area (approximately a kilometre long and 150ft high) it remained a viable habitat for a small self sustaining colony of *N. gymnamphora*, that was until now! Adrian's initial visit had made claim to a substantial number of mature and infant plants spreading across the whole area, but even with the aid of binoculars and a strenuous trek up the cultivated side of the cliff not a single plant was spotted.

Nepenthes collection and sale is a fairly recent pursuit in Indonesia and from the information available (Adrian's) it is likely that as recently as 2007 *Ne-*

penthes were not looked upon as a means of income. This recent addition to ornamental plant sales has taken Java by storm and from its humble position of an enthusiast's oddity it has become a full scale fixture in flower shows and nurseries across the country. Demand has outstretched availability and the consequence for the wild stock has been catastrophic, with one species in Indonesian Kalimantan, *Nepenthes clipeata*, on the brink of extension (C. C. Lee pers. comm.).

We continued our journey, somewhat dejected, pausing at similar small stretches of steep sided habitat and eventually stop at another of Adrian's

'sites'. Almost immediately we spot a small *N. gymnamphora* and on closer inspection an increasing number were found. Although nothing like the sprawling vines of before at least we had found a surviving site! Another likely site was encountered a few kilometres yonder, and being in the vicinity of a coffee 'shack' a few of us stocked up on caffeine. We took to wondering this stretch for an hour or so encountering a few more small plants and a surprising number of mature ones in a roadside café come plant stall (**Figure 1**), evidence (if any was ever needed!) of collecting from the wild. A couple of small children looked on as we inspect the fruits of their labour, some



Figure 1: Roadside Café with wild collected plants for sale



Figure 2: The active crater on Gunung Papandaya

ten *Nepenthes* plants (destined to death at a lower altitudes) were observed along with ten rare slipper orchids, again collected from the wild and already in the throws of death from potting in the wrong medium! All very sobering, and with the addition of a couple of caged fledgling Long-tailed Shrikes we are given a stark reminder of the desperation to earn a few Rupees more.

We turned tail and retreated to Gunung Papandaya.

Retracing our steps through volcanic cultivation we journeyed to the lower reaches of Gunung Papandaya and the starting point of our ascent towards montane habitat (1600 meters).

At about the same time as our van started to overheat Adrian called us to a stop. Some way short of the summit and directly alongside the road we have arrived at our third confirmed *N. gymnamphora* site, and not entirely to our

surprise we find nothing... well not quite nothing, but not *Nepenthes* life as we know it! After searching through the undergrowth and along a well trodden path we find the remains of tens of cut *Nepenthes* vines littering the ground and vegetation. Brown pitchers hanging limp and dry from their fellow dry and limp brown vines, yards and yards of discarded plant parts considered irrelevant are the only sign of this once thriving site. Undoubtedly part of the wild plant trade, the vines have been hacked away in favour of the lower rosettes and roots which will grace the homes (not for long) of potentially ignorant paying punters. Yet again we have been duped by the collectors!

We pack our bags and continue up hill.

Our search for the elusive *Nepenthes* temporarily takes back seat as we trek our way towards a fiery furnace. Gunung Papandaya (**Figure 2**) is one of many active volcanoes in the area, and to make up (somewhat) for previous disappointments we are greeted to a spectacular steaming crater. Yellow sulphur abounds amidst clouds of acrid mist, a barren rocky landscape in an alien world, a backdrop of black charcoal stick forest testament to a recent eruption which prevented public access for a number of weeks.

We head back to the village for a well earned rest.

Day 4 (11/10/2008) Gunung Mandalagiri.

After a light breakfast we're ready to explore Gunung Mandalagiri, so along with our local guide we are joined by all 3 park officers, intent, it seems on being part of this rare spectacle! Our route - by way of a well used path to a distant hill village - is some 4km of gentle ascent to the summit, so without further ado we set off through fields of tomatoes, cabbage and corn. We soon lose sight of level ground making our way first through commercial tree plantations, then grassy scrub (no doubt cultivated in the past) and finally onward and upwards to the natural tree line. Not much wildlife is encountered on the way but as soon as we reach the natural forest we are greeted to a mixed flock bird wave encountering endemics and common montane species alike.

In this a potentially ideal *Nepenthes* habitat we are immediately more enthusiastic about our lot and commence in scrutinising the vegetation. Our search is soon rewarded as we approach a steep embankment in a moist mossy location. Almost immediately we find vines and pitchers... unfortunately all dead! Evidence of yet more collecting and although a few small live plants remain within view we move on. Our path meanders through disturbed (cutting for fire wood) montane forest which seems to be getting progressively dryer, and although we physically search the forest floor and inspect the upper storey (with binoculars) we are unable to find any signs of *Nepenthes* life. We stop for lunch and plan our next move. Considering we have travelled from ini-



Figure 3: *Nepenthes gymnamphora*

tially damp habitat (ideal *Nepenthes* growing conditions) to progressively dryer we decide to turn back.

Retracing our steps reveals little in the way of *Nepenthes* although we do spot a White-flanked Sunbird (Endemic to Java), a number of orchids (on a fallen branch) and a Scorpion fly, apparently an unusual insect in its own order (Mecoptera). Arriving back at our steep embankment we set about a thorough search of the area. Some half a kilometre long, steep, rather high and cloaked in stunted vegetation we are convinced that mature plants exist...although it's going to be hard work to find them! We attack the objective with a pincer movement, Ch'ien and his group, and me on my own. From the lower left end of the embankment we ascend through

dense vegetation to a point some three quarters of the way up. Ch'ien and his group then work a parallel path across the face while I continue the ascent (towards the top) where I hope to drop (perhaps fall) into a likely area. Ch'ien has already found something and in the distance I hear the description of a good *N. gymnamphora* specimen. I continue, now slightly worried that I will find nothing, to a likely dropping off point. The undergrowth abates somewhat where the trees are taller (on the top of the embankment) and I find clear access to the face. It's pretty steep down there but I'm encouraged by the stunted trees and vegetation... something to grab hold of in the event of a slip! I clamber down to start my search. I'm not having much luck when once again I hear Ch'ien's enthusiastic cry of discovery, yet another, even better specimen! He decides this is the one, and immediately sets about taking one of his mediocre (ha-ha joke!) photographs. Feeling even more dejected I soldier on. Although steep a lot of leaf litter has accumulated amongst the vegetation, and a shifting dappled shade is making it difficult to distinguish between plants. I'm also finding good support hard to come by so am relieved to find a sturdy tree and roots to anchor myself. *Nepenthes*, *Nepenthes*...ah, a leaf...another...a stem, I'm getting somewhere here, but where are the pitchers? I follow the stem down but still no pitchers. I find another stem, still no result. I shout across to Ch'ien "I found a plant but it doesn't seem to have any pitchers". 'OK, search around at the stem base, they are

very often hidden in the leaf litter," "OK". I proceed to carefully pick away at the leaves and quite quickly find a rosette, a little more and a beautiful green pitcher with a pink speckled inner waxy zone is exposed *N. gymnamphora*. I eventually find a number of plants using this method and am able to take some mediocre (really!) photographs (**Figures 3 & 4**).

Back on the trail we make a final visual search of the embankment and discover a mature flowering female plant tangling its way through trees, high up on the embankment...the future...?

Trekking back on a different path we are rewarded with breath taking views



Figure 4: *Nepenthes gymnamphora*

of the volcanic scenery, and as we descend through the tree plantation we strike it lucky with a snake. Our local guide cry's out then runs along the trail, what is it? A snake! Where is it? I struck out with my stick and ran, he says. Disappointed he disturbed it we make a search of the area. Some minutes later and we spot it, a foot (or so) long, dark with a yellow stripe down its back, Ch'ien *thinks* it's a Racer. Time for another photo shoot and I'm the bait. Just hold its tail while I set up, are you sure it's not poisonous? Yes don't worry. So we get ready and while I swing a little stick around its face it rears up in a striking position, I try again but no luck it wouldn't raise to *this* bait again. Wiggle your finger around say Ch'ien, that should do it. No way man it's a snake, don't worry it's a Racer there're not poisonous, so I start to wiggle my finger around, much to the amazement of the amassed guides, and it works a treat, the snake rises, mouth open in the striking position. Ch'ien unfortunately doesn't get his shot and asks me to do it again. Wiggle, wiggle goes my finger and up raises the snake, mouth open, striking position...and...it strikes! Shocked to find a snake attached to my finger I wiggle a lot harder to get the bastard off. I glance around and notice the locals open mouthed in awe so I fall on my back and play dead. Ch'ien laughs and some seconds later the locals- realizing it's a joke, laugh too. I manage to extract the snake, briefly checking to see if it has any fangs (which fortunately it hasn't) and wipe away the tiny spots of blood its little gum like teeth

have produced. Ch'ien does get a few photos, and the snake gets me...3 times, each time bringing a cry of a laughter from the spectators. We decide the snake has had enough, (nobody asked if I'd had enough!) let it go and make the village before dark. I'm sure the locals were expecting me to die on the way back!

We bundle our gear into the van and after a brief meeting with *Nepenthes* enthusiasts in Bandung arrive in Jakarta (through the traffic) at about 10pm.

Day 5 (12/10/2008) Jakarta.

Day of rest, Jakarta. Evening of activity. 6pm and we are on our way (through the traffic) to meet yet another *Nepenthes* enthusiast in Bogor. After a good meal and a lot of *Nepenthes* talk we hit the sack.

Day 6 (13/10/2008) Bogor.

I was under the impression that we were going to Bogor Botanical Gardens for the day but after driving straight past the entrance and on (through the traffic) for a few hours, decided to enquire of our intended destination. Gunung Halimun - Salak, National Park was the reply. "Oh, sounds good." On and on, hours and hours, up and down, in and out we drive. At one point we reach what looks like the end of the road, but no, a rough track continues. The van almost immediately gets stuck and we pile out to give it a push. Up a touch more then the track takes a dive. Um me thinks if we can't go any further forward, for some rea-

son (rough track, boulders, mud and the like spring to mind) we ain't getting back up there in a hurry! The van winds slowly down (avoiding said obstacles), so slowly in fact that we opted to walk to A. get some blood back into our butts and B. because it's a lot quicker... until we reach the road coming towards us!

A small gang of Indonesian road workers, a small road roller, and various other odd bits of small road building equipment emerge through the haze (sounds good but there was no haze really!). Had we met our nemesis? Well I thought so, but as there was no way back the van had to negotiate piles of rock (hard core), piles of sand (sand), and general piles (piles!), not to mention a small road roller that was adamant about rolling his rough rock road before making way.

Well to cut a story short we were soon on our way, but which way? Had we been experts on the ways of Indonesian roads I don't think we'd find this in a hundred years, let alone want to be on it! Never the less I found it all very interesting passing through villages full of rustic and traditional appeal. We had quite a few, if not all, the people staring at our progress and little children would wave and shout (after there initial shyness) when we stopped to ask for directions. Back on course we managed to find the Gunung Halimun - Salak, National Park HQ, but strangely enough it's some 3 hours drive to the actual park! Don't ask me!

Time being against us we started back to meet yet another *Nepenthes* enthusiast in Cibadak.

Cibadak.

After many more hours of driving (through traffic) we meander our way to the cool climes of a modern Indonesian 'hill station'. With its convenient location to Jakarta, Cibadak is a hive of hotels, motels, and retreats for the weekend weary well to do. We had met Pak Yantoe on our first day when he had kindly taken us for makan (food) and on this our next meeting we were treated to some top notch R&R. After making a turn down a very narrow lane we came to a halt outside a white gated, white walled garden. The gates are opened and we enter into another world... gone is the dust and dirt, gone are ramshackle huts and houses, and gone are the holes and holes. A tropical garden par excellence, a clean comfortable home, and a Morris Standard 8 in the driveway! It's been a long day, but the fatigue just melts away.

After settling into our spacious accommodation we proceed to examine (probably) the best 'amateur' collection of *Nepenthes* in Indonesia! At the rear of the property Pak Yantoe has constructed a singularly delightful nursery. Efficient and effective, complete with humidifiers, drainage and shade, it is home to a multitude of lowland, intermediate and highland species. We observe many fine specimens, examine, discuss and photograph to our hearts desire. Not content with *Nepenthes* alone we are treated to a fine collection

of orchids, sundews and American carnivorous plants (*Heliamphora*). Quite a show! After a splendid meal I settle down to my best sleep in days.

Day 7 (14/10/2008) Cibadak

Having woken Ch'ien up (he had decided to make the most it too!) we set off to the local Botanical Gardens, Bogor Highland Gardens, for a tour of the nursery and gardens...all very nice! Done and dusted we head for the airport, once again through the traffic.

Many thanks to Adrian Yusuf for his generosity and hospitality, without whose help this trip would not have been possible.



Figure 4. *Nepenthes gymnamphora* in cultivation from Sumatra. Note the colouration differs from the Java type. Photo Greg Bourke

Nepenthes peltata

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SUMMARY

Nepenthes peltata is a recently described species of pitcher plant from the Philippines. Its habit and habitat are described here as well as its relationships with other pitcher plants and its conservations status is discussed.

Key words: *Nepenthes peltata*; habitat; philippines; conservation.

In 2008, a remarkable new species of pitcher plant was named from the Philippines. The plant is called *Nepenthes peltata* (**Figure 1**), and is named because of its peltate leaf structure. Presently, *N. peltata* is presently known only from the upper slopes of Mount Hamiguitan in Mindanao, although it may have a wider distribution than is currently appreciated, especially since much of the highlands of southern Mindanao remain little explored due to continuing separatist violence and conflict.

On Mount Hamiguitan, *N. peltata* occurs from approximately 865 m to the summit of the mountain, which stands at 1,635 m. It grows terrestrially in mossy upper montane forest, degraded or recovering secondary vegetation, on bare substrate on exposed cliffsides and landslide areas, and in stunted scrub on ridgetops and the upper slopes of Mount Hamiguitan. *N. peltata* grows terrestrially and forms a short, rigid,



Figure 1: The spectacular pitchers of *Nepenthes peltata*

upright stem up to 1 m long which grows above or through surrounding vegetation. It is very distinctive from most other pitcher plants, because the



Figure 2: The unusually coloured leaves of *Nepenthes peltata*

upper surface of its leaves is dark green, and the lower surface is usually (although not always) dark red (**Figure 2**). All parts of the leaves and pitchers are also lined with long, coarse, brown hairs.

The lower pitchers are extremely variable in shape and size (**Figures 1, 3 & back cover**). They are up to 28 cm long and 16 cm wide, and may be wholly ovate, amphora shaped, ellipsoidal, or urceolate. Wings up to 10 mm wide, fringed with filaments up to 9 mm long run down the front of the lower pitchers. The peristome is loosely cylindrical, up to 2 cm wide and expanded towards the sides and

back of the pitcher opening. The peristome is lined with ribs up to 1.5 mm high, spaced up to 2 mm apart. Sometimes the ribs are elongated on the inner edge of the peristome and form inward protruding, spikes up to 1 mm long, although often peristome spikes are lacking. The peristome is slightly raised at the back of the pitcher opening, immediately below lid. The outer margin of the peristome is recurved and often crenellated. The inner edge of the peristome extends into the pitcher opening for several millimetres, particularly below the lid. The lid is elliptic or ovate, up to 8 cm long, 6 cm wide. A well formed appendage is generally lacking, but a pronounced keel (sometimes somewhat triangular in shape) that may extend downwards several millimetres (particularly close



Figure 3: A slightly elongated lower pitcher of *Nepenthes peltata*

to the base of the lid) may be present (although is very variable). Many large (up to 3 mm wide), conspicuous nectar glands are distributed across the underside of the lid. The spur is narrow, unbranched, up to 12 mm long and is often hairy.

The colouration of the lower pitchers is exceptionally variable. The exterior may yellow, orange, pink, red or purple, mottled with dark purple or black blotches. The interior of the trap is light yellow or green, often with faint dark red or purple flecks. The peristome may be bright yellow, orange, red, or purple, often striped with variable bands of yellow, orange or red. The lid may be yellow, orange, red or dark reddish purple, often with dark red, purple or black blotches and flecks.

The second pitcher type of this species, (the so called upper pitchers) are not known. All known herbarium specimens of this species lack upper pitchers, and during my observations of this plant in the wild, I did not encounter any. It seems likely that upper pitchers are produced rarely, or hardly at all, perhaps only when climbing stems are produced.

Although *N. peltata* is closely related to many other species of pitcher plants (notably *N. attenboroughii*, *N. deaniana*, *N. mantalingajanensis* and *N. mira*), it is easily distinguished from all of these species by its strongly peltate leaves, prominent hairs and leaf colouration.

Even though *N. peltata* is known only from the upper slopes of one mountain, this plant is not currently threatened. The upper slopes of Mount Hamiguitan remain remote, inaccessible and seldom visited, and the populations of *N. peltata* are extensive and widespread. A local movement led by the municipal Mayor of San Iditro (the honourable Apolinar Ruelo) to permanently protect Mount Hamiguitan as a world heritage site is gaining support and studies of the flora and fauna in support of this proposal are currently being undertaken – see <http://www.sanisidro.gov.ph>. If world heritage status is successful obtained, the future of this plant will be permanently secure in the wild.

***Byblis* – The Rainbow Plants**

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SUMMARY

In this article the author describes the members of the genus *Byblis*. The history of genus is discussed as well as habit, habitat and distribution.

Key words: *Byblis*; ecology; conservation

Byblis is the most beautiful genus of all of the sticky-leaved insect-eating plants. All *Byblis* plants produces delicate, leaves lined with sparkling droplets of glue which reflect light with a silvery brilliance, and this has earned the genus the English name 'The Rainbow Plants'.

Byblis are named after the story of the Greek goddess Byblis which is recorded in Publius Ovidius Naso's (Ovid's) work *Metamorphoses* written around 8 AD. Ovid records that Byblis, the daughter of Miletus and Tragasia of Crete and granddaughter of Apollo, fell deeply in love with her brother Caunus and wrote him a letter in which she declared her undying love for him. In her letter, Byblis listed incestuous couples of the immortal gods that were brothers and sisters in an attempt to justify her feelings to her brother. Caunus was appalled by Byblis' attraction and immediately left Crete and abandoned her. Byblis was heartbroken

but also so in love with Caunus that she followed him through Caria and Lycia to Phoenicia where she wept for her lost love and in desperation and exhaustion, died and turned into an eternal fountain of tears as a testimony to her sorrow. *Byblis* is so called, because the plants' glittering leaves of *Byblis* bare similarity to the fountain which Byblis became.

The genus was first discovered during Captain James Cook's first voyage to Australia. On June 11th 1770, Captain Cook's vessel, the H.M.S. Bark Endeavour, ran aground on a shoal of the Great Barrier Reef and over the course of several weeks, the ship was repaired on the banks of what is now the Endeavour River in Queensland, Australia. The delay in the voyage enabled Joseph Banks, Herman Spöring Jr. and Daniel Solander, the naturalists on board the H.M.S. Bark Endeavour to study the local flora and fauna and collect many specimens of Australian



Figure 1: The spectacular foliage of *Byblis gigantea*. Photo Stewart McPherson.



Figure 2: The glistening leaves of *Byblis gigantea*. Photo Stewart McPherson.

plant life in the surrounding area to take back to England. The three naturalists explored the area that now surrounds the settlement of Cooktown (where the H.M.S. Bark Endeavour was brought aground and repaired) and among the plants which they collected were specimens of *Byblis liniflora* – recorded as growing along the banks of the Endeavour River. In 2006, I travelled to Cooktown in an attempt to refind the original population of *Byblis* which the naturalists discovered. Despite a long search, I could not find *Byblis* plants nor any remaining *Byblis* habitat and it is possible that both may have since been entirely wiped out around the Cooktown area.

In 1808, the first species of this genus (*B. liniflora*) was formally described

and named by English botanist Richard Anthony Salisbury. 31 years later, a second species *B. gigantea* (**Figure 1 & 2**) was collected by James Drummond and published by John Lindley in 1839. Benjamin Bynoe, a surgeon and naturalist aboard the H.M.S. Beagle, collected specimens of a further species apparently in 1848, and this led to the naming of the third species *B. filifolia*, which was described by the botanist Jules Émile Planchon. Until very recently, it was widely regarded that the genus consisted of only two species (*B. gigantea* and *B. liniflora*) and that *B. filifolia* was a synonym of *B. liniflora*. However, the recent research of Australian botanist Allen Lowrie and colleagues has proven that this is not the case and *B. filifolia* has been rightly reinstated and a further four distinct species have since been described. Based on the current classifications, the seven species of this genus can be divided into two sub groups – the perennial species (*B. lamellata* and *B. gigantea*) and the annual species (*B. aquatica* (**Figures 3 & 4**), *B. filifolia* (**Figure 5**), *B. guehoi*, *B. liniflora* and *B. rorida* (**Figures 6 & 7**)). The perennial species are considerably larger and more robust than the annual ones although it should be noted that in ideal conditions, in some cases, some of the annual species can survive for more than one year.

Byblis are herbaceous annual or perennial plants which produce long, delicate, filiform leaves that taper towards their ends. The foliage is loosely arranged in a generally erect or some-



Figure 3: *Byblis aquatica* in the wild Cape York, Qld. Photo Stewart McPherson.

times scrambling rosette and plants consist either of one main stem, or often in the case of the perennial species, several stems. All parts of the plants, except the flowers and the roots, are lined with sessile and stalked glands. The glue-secreting stalked glands produce a sticky, water based, adhesive liquid. Unlike most sticky-leaved insect-eating plants, the stalked glands of *Byblis* are typically devoid of colour which gives the leaves of *Byblis* a pure silver shine.

Older specimens of the perennial species of *Byblis* can form erect, somewhat woody stems, gradually accumu-

lating a skirt of dead foliage. The roots of the annual species of *Byblis* are fine, fibrous and relatively delicate and serve to mainly anchor the plants in the soil. Those of the perennial species are fleshy and can extend up to 50cm in length, and evidently represent organs for the storage of water and nutrients.

The flowers of *Byblis* are borne individually on long, glandular scapes that are reminiscent of the leaves. The flower consists of five large petals which vary in shape and size between the seven known species. Generally, the petals are 5 – 20mm long and 5 – 15mm wide, and are triangular or almost circular in shape. The margins of the petals can be either smooth or notched depending on the species in question.

The petals of the flowers of all species of *Byblis* are typically violet, mauve or purple (**Figures 4, 5 & 7**), but pale lavender and white flowered forms of *B. gigantea* and *B. filifolia* have been discovered and may exist in the other species too. The flower bears five conspicuous curved stamens that are 2 – 10mm in length and release bright yellow pollen from an apical pore. The pistil is 2 – 8mm in length and extends away from the centre of the flower. The pistil is often curved and the stigma is small, circular and rough in texture. The sepals are oval or triangular and in most species, lined heavily with small stalked glands. The flowers of *B. gigantea* and *B. lamellata* (and probably most if not all other species of *Byblis*) incorporate a buzz-pollination mechanism which releases pollen only to a specific range of pollinators that regularly visit the flowers of *Byblis* and

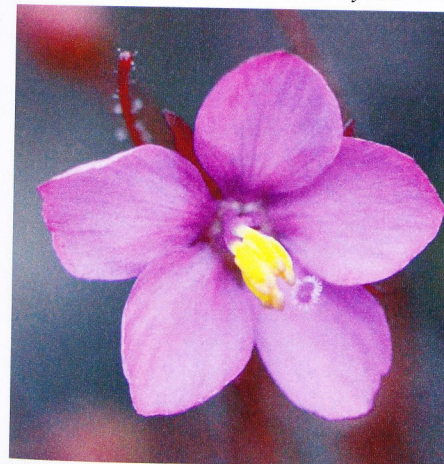


Figure 4: The flower of *Byblis aquatica* in the wild Cape York, Qld. Photo Greg Bourke



Figure 5: The flower of *Byblis filifolia* in the wild near Broome, WA. Photo Greg Bourke

therefore will reliably deliver the valuable pollen to nearby *Byblis* plants. It is the low-frequency buzzing vibration of the beating wings of certain insects that releases the pollen from the anthers. The vibrations of the beating wings of the insects cause the pollen to spurt out from a hole at the end of the anthers and stick to the insects' bodies, ready to be delivered to the stigma of another flower. This pollinator-selective mechanism may have evolved as a result of the overall relative rarity of *Byblis* populations and the relative abundance of plants that produce flowers of similar shapes and colours.

All seven species of *Byblis* occur in Australia and in the case of at least one species (probably *B. filifolia*) also on the island of New Guinea (in the Indonesian province Papua). The perennial



Figure 6: *Byblis rorida* in typical tropical savannah habitat near Derby, WA. Photo Greg Bourke.

Byblis are found only in Western Australia and are distributed across small geographic ranges in the vicinity of Perth. Unfortunately many of the original stands of the perennial species of *Byblis* have since been destroyed through urban expansion and agricultural development and the status of the wild populations of these species appears to be increasingly worrying.

The annual species of *Byblis* are distributed across the tropical north of Australia although at least one species of *Byblis* (probably *B. filifolia*) also

occurs across the strait on the island of New Guinea, in both the Indonesian half of the island (the province of Papua) and also in the independent country of Papua New Guinea. Unfortunately most herbarium specimens of the *Byblis* from New Guinea were collected at a time when it was thought that the genus only consisted of *B. gigantea* and *B. linifolia* and so it remains unclear precisely which annual species occur there.

Considering the vast size of the wetlands of the island of New Guinea, the remote north of Australia and the Cape York Peninsula and also considering how short the history of botanical exploration across these regions has been, it seems highly possible that further species of *Byblis* may await discovery. It should be acknowledged that the ranges of many of the annual species will probably be expanded as our understanding of the distribution of the *Byblis* species increases.

All species of *Byblis* predominantly grow in highly leached, acidic, seasonally moist substrate that consists of peaty-loam and quartzitic sand. All seven species display a clear dislike of heavily shaded habitat and grow in greatest abundance and most healthily in areas where surrounding vegetation is low growing and sparse. Grass trees (*Xanthorrhoea* sp.) are sympatric to the perennial species of *Byblis* in Western Australia and in that region, populations of *Byblis* are often found growing in open, sunny clearings.

Byblis habitats are seasonally moist or seasonally wet, often consisting of depressions that are temporarily flooded or the margins of bogs.

Rainfall across northern Australia is highly seasonalised and generally concentrated during the summer months of December to April. In contrast, Western Australia has a winter wet season and receives rain mainly between May and September. The differing rainfall patterns across the continent cause the various species of *Byblis* to grow at different times depending on their location. The perennial species of Western Australia grow predominantly during the winter and spring of the southern

hemisphere whereas the annual species grow during the southern hemisphere's summer and autumn.

Byblis are among the most beautiful of all carnivorous plants, but also are among the least well known. The survival of these incredibly beautiful plant species depends upon the conservation of their delicate natural habitats, both in Australia and New Guinea. With responsible management and the right conservation policies, these unique and remarkable species will have a future in the wild.



Figure 7: *Byblis rorida* flowers near Derby, WA. Photo Greg Bourke.

