FLYTRAP NEWS

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Special functions such as the Annual Social and Christmas Swap meet are held on the second Saturday and Sunday of the month respectively. Field Trips are as advertised from time to time.
Meetings are regularly held on the second Friday of the month as shown below.
TIME: 7.30 - 10.00pm
VENUE: Woodstock Community Centre, Church St, Burwood.

Meeting Dates for 1997				
			12th July Social	Venue and time to be advised
14th February	***Nepenthes*** by Ken Harper		8th August	
14th March	***Heliamphora*** by Jose Da Costa		12th September	
11th April			10th October	
9th May			14th November	
13th June AGM	Tuberous ***Drosera*** by Ken Harper		15rd December	Christmas ***Swap Meet.***

CURRENT MEMBERSHIP RATES

Single Membership within Australia	**$A17**
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Chat Corner — Jessica Biddlecombe

Hi fellow CPer's! Happy New Year to all. To end 1996 Peter and I caught up with Denis and went on a "field trip" to Bundanoon organised by David and Nathan. We missed the first day but I believe Justin had a good time although it was a bit drizzly. Denis recorded all the events with his trusty camera. It was interesting seeing ***Drosera binata*** and ***D. spathulata*** growing in the different areas. We also saw a large "***Sphagnum*** Raft" in a creek where it was quite swampy and, I thought, a good area for CP's. We saw some great spots and the lunch in the park was much appreciated after the walks the guys took us on. Nathan's ideas of a level easy track differs from mine. At one stage we went down so far into a valley I was feeling the heat and thought I had finally met my end. (No harp's and angels for me!!!) Nathan and David revived me with a much needed cup of tea before we left and I must say we had a good time. Sorry for all those CPer's who could not make it.

Nathan writes:- "I guess that the first impression of a Carnivorous Plant came with the viewing of a bizarre (at the time for me) VFT. As anything that is different intrigues me, I simply had to have one. Once I obtained my first clump of plants things never looked back. Over the years I stuck to the old VFT, trying various methods to accentuate winter dormancy - the most bizarre was cutting all traps and roots off and placing it in the fridge. Didn't really do wonders and there were a few times when they almost became that special ingredient in a stir fry.

After some time this became tedious. Then as things began to feel normal with the crowd pleasing ***Dionaea***, along popped the first glimpse of a ***Sarracenia***. Even more alien looking, off trotted me with the very plant from Coffs Harbour "Big Banana". It survived the bus trip back home to Wollongong and went on to thrive, eventually producing three robust plants. With such success on my side I moved on to ***Drosera***'s and bush exploring in the Mittagong High Range area.

Once I moved from Wollongong my passions for all CP's exploded, bringing me to where I am today. Nowadays, the South American ***Heliamphora***'s are my latest obsession, until the aliens present me with plants even more bizarre.

Overall for me carnivorous plants represent the exciting and romantically enticing wonders of nature. From the traps of the ***Dionaea*** to the sticky tentacles of the ever hungry ***Drosera*** and the lethal downward hairs of the ***Sarracenia***, they truly do add a great dimension to my overall love of the plant kingdom. One thing that has made my recent passions even more sensible, if that is possible, is the knowledge that these wonders are in danger of becoming extinct, and I can play an important part in their continued survival. As I am only still a "young lad" who knows what else will lie ahead for me in my quests amidst the world of Cp's. Oh! most of all is the weird and wacky people I have met along the way. Some days the plants look quite dull next to their fastidious owners that rush about in technicolour suits like pollen-crazed insects. With all this absent life sure would be dull. My ***Heliamphora*** babes are calling me, so I will end it here until next time round.

Nathan Clemens.

We knew our 60's clothes would come in handy. Oh for a tie-died T shirt and flares again!!! I think Richard Sullivan has some competition coming up:-

"Hi! I'm Jayde Sullivan. I have got one plant, it is a VFT. It might sound stupid but it has a name, "Venie". By looking in dad's books it is a VFT ***Dionaea***. I like the ***Pinguicula***, ***Nepenthes*** and ***Drosera***. That's all I have to say. Bye."

Jayde is only 10 years old and will we end up with "Sullivan and Family" in the future? Look out Richard!!!

It has been great to hear from others as it adds more personal touches and shows we are not all crackpots. (Just a little off beat.) As Kristie found out my persistence and nagging is paying off. So to all those others out there ..... I may be in your year next!!!

Thanks to Ken Harper for the interesting talk on ***Nepenthes*** (meeting of 14th February 1997). What a way to start the meetings for 1997. I am sure all those that were at the February meeting were agog at the size of some of the pitchers on some of the plants. The old and new members that were there would have learnt more that they thought they knew.

The input from members such as Ken, Jose and Kristie adds so much interest to meetings and makes the meeting nights so informative. Keep it up.

Your friendly CP'er
Jessica Biddlecombe

Confessions of a Recent Convert **Kristie Wulf**

Dedicated to Jessica, for her persistence.

A short story, sad but true. It all began one Easter when to my great joy my sister arrived home from the Royal Easter Show (Yes, this was the NSWCPS stall, and I still have the leaflet to prove it) with a Venus fly trap as a present for me. How special I felt. But my joy turned to mourning when next summer following an unsuccessful repotting, rest its soul, my first plant passed away. However Venus fly trap Mark II arrived, bringing me yet another happy Easter. This time I was ready, armed with my two dollar book on growing carnivorous Plants. I named this plant, as one does a pet, Sabre (as in Sabre-toothed Tiger). It is still alive today the original plant having divided into a happy nine or ten. Wandering through markets in the following years I acquired two Sarracenia plants, each with pet names now forgotten, and the local creek provided me with a few ***Drosera*** plants.

I started to get an inkling of my addiction when I began engaging in decidedly odd behaviour. To use up the end of a roll of film, I would take photos of my plants, just as any other suburban dweller would take photos of their pet cat or dog. It was then that I knew something had to be done.

I needed more plants. I had outgrown my hardy but unspectacular collection of Venus fly trap, two ***Sarracenia*** plants and a few ***Drosera*** plants, and was in search of greener sphagnum bogs. So I scribbled of a letter to the CP society, and fronted up to my first meeting, only to find out that my ***D. capensis*** which was growing so well that I thought I must be doing something right, in fact grows like a weed (as I have now discovered).

My collection has now more than doubled, which wasn't hard considering my humble beginnings. And I have surpassed my earlier plant snapshots entering the world of 3-D plant photos (I have photographed though my small army of plants, so if anyone believes that have a particularly photogenic plant which they would like immortalised on film, I will be more than willing to help out). Initially baffled by the scientific names, I now proudly point out ***D. spathulata***, ***D. binata*** and ***D. auriculata*** whilst hiking in the Blue Mountains, somewhat to the bemusement of my friends.

I still have a lot to learn, and many more plants to acquire. So if a mere beginner like myself can make a contribution, however meagre, I urge all those out there with a special interest or insight, to write in and share your experiences.

I would like to see a problem page in *Flytrap News* where people can write in with both problems and solutions. So, here is my problem:

Dear Problem Page,

I keep getting wrigglers (mosquito larvae) in my water trays. I don't like mosquitos, because they love to bite me, but I don't want to have to keep tipping out my precious rain water. What can I do?

Yours in search of an answer Concerned Carnie

Problem Page Denis Daly

Dear Kirstie

Good idea. Yours is the first problem for FlyTrap News' new regular feature Problem Page.

Indeed Russell Dixon, in correspondence to me as recent as 6th February 1997 suggests that I should bring to everyone's attention the subject of mosquito control by growing some aquatic ***Utricularia*** in your water trays. They love newly hatched mosquito lavae so you may have to tip out your water from your trays just once, to get rid of the larger wrigglers before adding the aquatic ***Utricularia***. ***U. vulgaris*** springs to mind.

Indeed the problem of Ross River Fever and other viruses that mosquito's carry is starting to generate some concern on talk back radio. Concerns for the environment particularly frogs prevent wholesale pesticide spraying programs or other obnoxious practices such as pouring diesel oil on the water surface.

However there are some problems associated with trying to grow aquatic ***Utricularia***. The first is that the pH in the tray should never go above 7.0 or so or the ***Utricularia*** will die, thus your water trays need to be kept full of humus and other rotting things.

Second is the problem of how to grow masses of aquatic ***Utricularia*** fast enough to fill up your trays and replenish those plants that die (dried out tray or onset of winter) or whose turions are washed out in winter and lost. If one is truly fearful of mosquitoes then it would be advisable to set up an indoor heated aquarium (20 to 25°C) equipped with fluorescent lights and carbon dioxide injection (from yeast and sugar) to ensure a continuous supply of ***Utricularia***. (See my article on growing ***Aldrovanda*** on page 13 of this issue of FlyTrap News.)

I hope that will solve your problem Kristie, Regards, Denis.

Peter Biddlecombe poses the following problem:-

My problem is I use Follimat 50 (systemic with a three month residual effect) in October, December and March to get rid of insects pests but I find that the first new growth after spraying is deformed. I would like to determine if others have this same problem with Follimat 50 and whether they have been able to overcome it or have found a better product.

In the winter I use Carbaryl which has an initial contact kill followed by a short term residual by accumulating in the insect's stomach. This does not deform the new growth but is not as effective against hoards of insects that one encounters in the spring, summer and into the autumn. Carbaryl also has a fungicidal effect which is useful as a preventative against fungus in winter.

Dear Peter,

I don't spray unless the problem is severe as I have to avoid poising my daughters Axolotl's food supply, however I infrequently use Malathion (non systemic, slight residual) as a soil drench, particularly when I notice soil castings on the surface of the pots or upon poor growth or upon conducting a regular search of the sphagnum in the pots discover that the curl grubs are getting stuck into my ***Sarracenia*** rhizomes.

Given that these pests can readily devour the plant in a few days I don't really care about the first new growth being deformed as I am too relieved that there is new growth to care what it looks like. However I would like to find a systemic insecticide that kills most pests and certainly kills curl grubs and cut worm that can be applied without getting too much "spray drift" or can be applied as a soil drench.

Regards
Denis

The Problem Page

The problem page is intended to publicise problems and their solutions. These problems and solutions may indeed be proposed and solved at meetings but the publication is intended to keep those who cannot attend one or more meetings informed and to record for future reference such matters. I may well be that you have the same problem and are looking for a solution or indeed have found the solution. Either way the problem page would like to hear from you.

If a solution to your problem is forthcoming in the intervening period between publication the editor will mail you the known solutions as soon as they are received so that you can attend to the problem immediately. So all those who have solutions to any problem (i.e. You have a problem or had a problem and solved it.) are urged to send details to the editor. Such problems and their solutions are indeed part of the **Repository of Information on Propagation and Cultivation of CP's** (Flytrap News Vol 9 No 2, October/November/December 1995.) Don't keep problems and solutions to yourself. Share them around and help others and be helped yourself.

Regards
Denis

Carnivorous Plant Sites on the Internet **Kristie Wulf**

(A Book Review of a Different Kind)

To save you hours of searching here is a quick review of what is available and where to find it. For those without access to the internet you could try convincing your friends to allow you to use their computer or visit a library (particularly those at Universities) where you can play (sorry, research) on the internet.

How to find what you want. When using a program which connects you to the internet, normally one or several search engines will be available, such as Excite, Yahoo, Infoseek, Magellan etc. A search engine is just a program which will search the internet to find what you want. As "carnivorous plants" is quite a specific topic a search will usually reveal many relevant sites, ranked by what the computer thinks is the closest match to your search words. A double click of the left mouse button on the title of the site you wish to visit will take you there. Many sites contain links which will allow you to easily access other sites on similar or related topics. These links will be listed in hypertext, indicated by coloured or underlined words, and a simple double click of the mouse on these words will take you to the indicated site.

Alternatively, using an address, you can go directly to a particular site or homepage. Simply type the net address (without using spaces) in the box which lists the address where you currently are, and miraculously you will find yourself where you wanted to go.

If this sounds complicated, it is not. But I warn you that it is addictive as you will always find something more which you are interested in. And playing on the internet chews time. The links to some sites may take some time, so be prepared to wait. At low demand times on the computers at uni I have been using two computers at once, searching for different things, to overcome this waiting time.

A few good places to start are Barry Rice-Meyers great Carnivorous Plant FAQ which answers all your questions, in an easy to navigate and search document which contains some fabulous computer manipulated graphics of literally man eating plants.

The FAQ can be found at **http://www.indirect.com/www/bazza/faq.html** this page also contains links to other cp pages and a nice little animation piece at **http://www.indirect.com/www/bazza/animate/animate.html**

Peter Cole also has an action paced page with an excellent set up and graphics, although the multiple windows were a little difficult to use at first. This page at **http://www.angel.co.uk/flytrap.htm** also has a large number of links.

Another place to get started is Chris Frazier's cp archive server at **http://randomaccess.unm.edu/www/cp/cparchive.html** Unfortunately the computer I have been using sometimes has problems making links from this page.

As we all know, what good is a great looking plant unless you can show it off to your friends and rivals. So there are many cper's out there showing off their best plants on their own home pages. Nepenthes pictures are a particular favourite, look out for homepages from Andreas Wistuba **http://www.rhein-neckar.de/~carnivor/frameset.html** , Johannes Marabini **http://home.t-online.de/home/johannes.marabini@t-online.de/index.htm** and many more **http://www.schwaben.de/home/schmidt/nepenthes/cpframes.html**

Simply because a carnivorous plant grower can use a computer and set up a home page, does not mean that the cultivation information provided bears any weight beyond personal experience and opinion. I have found more than one homepage (I will not name names) where feeding plants insects, meat, egg or mice have been suggested, a practice which in my opinion is highly dubious.

However some out there in cyberspace have a keen eye and pedant for accuracy, and at **http://redtail.unm.edu/cp/cperrata.txt** you can find a list of suspected miss-identifications in published carnivorous plant books, as well as Ivo Koudela's comprehensive list of cp books at **http://redtail.unm.edu/cp/cpbooks.txt**

You can expect to find a wide variety, from highly technical articles, and translations of historic texts, to handy tips on growing plants, an pictures from enthusiastic beginners. If you can read Japanese or German there are even more sites you can visit. You can even find out what is available, buy and sell over the computer.

If you are interested in something particular or simply don't know what to do on a rainy Saturday, you can find some carnivorous plants on your computer. Even the NSWCPS is listed on the net, you can read about what an exciting society we are, but of course you already know that.

Disclaimer - I am not a computing student, and have only an average working knowledge of computers and the internet, I welcome any corrections or additions to the information herein provided. Pages on the internet are liable to change and many more are still under construction, all information was correct at the time of publication.

Roridula - Carnivory by Proxy and Evolution at Work

Russell Dixon

The genus ***Roridula*** has long been regarded as not being a true Carnivorous Plant due to its lack of digestive enzymes. [1] Why then should it be so adept at trapping insects? Apparently specimens were hung upside down in homes of some South Africans to act as flypaper. [1] What benefit does the plant receive if it cannot make use of its captives in a nutritional sense?

Researchers Allan Ellis and Jeremy Midgley from the University of Cape Town were similarly intrigued by this behaviour. They fed a radioactive isotope of nitrogen to yeast cells which were used as a food source for fruit flies (presumably ***Drosophila***). The flies, in turn, were "fed" to the ***Roridula*** plants, allowing for any "carnivorous" nitrogen uptake to be traced. It was found that the nitrogen isotope was absorbed as if digested by the plant, an apparently impossible feat due to a lack of appropriate enzymes. [1]

The answer lay with ***Pameridea roridulae***, an insect, belonging to the group ***Hemiptera***, or "True Bugs". These insects have piercing mouth parts; some ***Hemipterans*** tap into the sap stream of plants (e.g vegetable bugs) or are predatory, such as water striders and ***Pamerideans***. It turns out that ***Pameridea*** acts as a surrogate gut, feeding on insects trapped by ***Roridula*** without itself becoming stuck. After feeding, urea is excreted onto the leaves and absorbed directly by the plant. [1]

Many plants will lap up urea, but generally via their root system; leaf absorption by ***Roridula*** is apparently a more efficient method of nitrogen (from urea) uptake. [1]

Barry Juniper, a C.P. expert with Oxford University says that this opens up a whole range of possibilities for carnivory in the plant world, with Petunias, Tobacco and Potatoes, possible inclusions in the "semi-carnivorous" category. [1]

Roridula, has been proposed as a possible intermediate in the development of carnivory in plants. [1] My thoughts on this matter have lead me to propose that trapping mechanisms in genera such as ***Drosera***, ***Triphyophyllum*** and ***Roridula*** may have evolved initially as a defence mechanism for resisting (insect) predation, with digestion and absorption a later development.

Some of the chemicals (enzymes) involved in the trapping predators may have possessed digestive activity; plants with such digestive capacity in conjunction with enhanced absorptive ability would have a greater survival advantage genetically conferred upon themselves. Movement into acidic environments is the next logical step (note acidic not infertile) due to a greater ability to supply nitrogen, a breakdown product of protein, in organic form; nitrogen uptake by roots is difficult under increasingly acidic conditions, with the greatest number of CP's possibly being found in boggy environments.

Marshes, bogs and other extreme acidic environments are exploited by relatively few species. "Nitrogen trapping" CP's would find such places a low competition home.

Of course the process described above would not happen singly, but act together over time. How the evolution of flypaper types relates to that of pitfall forms (***Sarracenia***, ***Darlingtonia***, etc.,) I do not know, but similarity of floral parts cannot be ignored (floral parts in numbers of 5).

There is the possibility of convergent evolution in action, where organisms from different origins develop similar structures when in the same environment, such as with dolphins and fish. An example may occur with ***Cephalotus*** and ***Nepenthes***, which have similar trapping mechanisms; the former has floral parts in 6, the later in 5's. Australia's ancient geographical isolation from Asia and ***Cephalotus'*** south western location add further weight to this notion.

If anyone has any further thoughts on the above or relevant information please pass them on.

Reference:-

[1] Paul Simons review of Ellis' and Midgley's article in Oecologia (vol 106, page 478) appearing on page 16 of the New Scientist of 31st August 1996

Establishing *Darlingtonia californica* in the wild near Lithgow

Philippe Reyter

A few years ago my collection of pitcher plants (***Sarracenia*** and ***Darlingtonia californica***) got an infestation of caterpillars which I controlled by spraying the plants with ROGOR E R (e.g. a systemic insecticide) as there were too many caterpillars to remove by hand.

The insecticide worked well and before long no caterpillars were to be seen. But it affected the ***Darlingtonia californica's*** which started to look very sick. Out of about 4 or 5 plants all but one died and that last one did not look like it was going to last very long. With nothing to loose I decided to plant that last ***Darlingtonia*** in a natural spring on a farm which is fenced off to keep out the cattle. This farm is about 20 km from Lithgow NSW and at an altitude of about 1100 meters above sea level. The summers are hot (though not as hot as Sydney) and the winters cold with frosts down to minus 3 or 4°C and some years snow.

Thinking that the ***Darlingtonia*** was in its last leg, so to speak (or should that be last root), I was pleasantly surprised when the next time I visited the site the ***Darlingtonia*** was thriving. My guess is that the conditions at the spring are close to what ***Darlingtonia*** experiences in its native habitat.

I planted the ***Darlingtonia*** in slow flowing water about 25 mm (1 inch) deep. The soil is decomposed granite with some clay and organic material. The vegetation in the area consists of various grasses and some wattle trees (***Acacia*** species) one of which is near the ***Darlingtonia*** and provides some light shade.

During recent droughts the surface water disappeared but the soil was still wet just below the surface. Over the years since I first planted that small ***Darlingtonia*** in the spring, the plant has sent out many stolons (runners) from the main rhizome. Some of these I relocated nearby and others I potted up to bring home.

Unfortunately not everyone interested in growing ***Darlingtonia*** has access to a property that has a spring on it and must therefore grow their plants in less than ideal conditions. At home I grow ***Darlingtonia*** in large squat plastic pots. I prefer white pots so as not to absorb the heat of any sunlight that might shine on them thus keeping the roots cool. These are placed in a large plastic tray (again white) with water half way up the pots beneath the bench in my igloo where they are protected from the hot midday sun.

I use sphagnum moss as potting mix with good results. The large area of water around the pots and the sphagnum moss within the pots all contribute to provide a cool, humid environment around the plants, especially the roots within the pots.

Darlingtonia californica naturalised near Lithgow NSW by Philippe Reyter.

Editors note:

On Saturday 7th December 1996 while on route to Bathurst to attend Richard Sullivan's Peel Market show the following day, Sunday, I took up Philippe Reyter's invitation to visit the site where he had established ***Darlingtonia californica*** in a wild state. Philippe gave us (me and my wife Janette) a tour of a some CP sites, close to Lithgow, where ***D. binata*** **T form, *D. spathulata*** and ***sphagnum*** were growing. Then it was off along some back country roads, with Philippe directing, to the farm.

At the farm we set off in a borrowed 4WD over various paddocks. Guess who had to get out in the rain, in knee high grass, to open and close the paddock gates? Arriving at the spring head I stumbled about in the drizzling rain in plastic bags and raincoats through wet grass that often reached shoulder height, desperately trying to keep the camera dry. I was able to make the usual multiple photographic exposures to produce the preceding photograph.

Leaving Philippe at the farm to sponge a ride back to Lithgow we proceeded to retrace our path to the main back road and then turned to follow Philippe's directions to Bathurst. We actually were able to follow the signs and not get lost even though I am certain that I could not find my way back to that farm again. We had lunch at an historic pub on the way, arriving at Richard Sullivan's late on Saturday afternoon in preparation for the Peel market show the next day.

On previous visits to Lithgow I had bought several ***Darlingtonia*** plants from Philippe, all of which had been recovered from the farm site before Philippe sold them. They are all vigorous healthy plants and I am extremely pleased with them.

A word of warning though. In the wild Philippe's ***Darlingtonia's*** are submerged for long periods BUT the water is flowing (and thus aerated) and the soil of "decomposed granite with some clay and organic material" is a highly pedal one that allows aerated water to continually flow past the roots. (Refer to my article on soil on pages 7 to 10 of the last issue of FlyTrap News ... Vol 10 No 2).

Note that Philippe uses sphagnum to grow ***Darlingtonia's*** in at home. Sphagnum will hold around 20 times its own weight of water in special cells and yet is just moist to the touch. (I have personally confirmed this water holding capacity of sphagnum using a microwave and a scientific milli gram balance.)

Gluttony in Certain *Drosera* Species

Kirk Harsch

It has come to this author's attention that certain growers of carnivorous plants love nothing better to do than to dump inordinate amounts of chemicals onto their innocent plants. These growers also tend to have either large numbers of plants and cannot give them the individual attention of the standard hobbyist; either that or they see themselves as amateur mad scientists who just love to experiment on their hapless plants. Even many of the amateur growers follow the ways of expert advice and apply trace elements, nitrates, phosphates, and potassium solutions onto their species to appease their appetites.

Far be it from this author to dictate the only proper method of rearing many botanical, hungry little mouths. Yes, I feed my plants, yet my philosophy toward carnivorous plants might just lean towards a more zoo-pomorohic viewpoint. Why have a carnivorous plant if you can't feed it; watch it eat; have the pleasure of a hands on bonding with some unique adaptation of the floral world? Well, like any kind of nurturing skill, one's horticulture knowledge needs to recognise when his or her green wards are full.

It seems that the main representative of carnivorous plants, good old ***Dionaea muscipula***, appreciates a break between feasts. One can certainly overfeed a specimen. A good gestalt rule learned by much trial and error over many years by this author is feed just one trap at a time for smaller plants; two for medium sized plants and three for large plants with many leaves. If the foliage of bigger plants tends towards scarcity, stick to two. This rule goes for the red varieties and the shark toothed ones as well. Don't worry if a plant catches something all on its own and gets four victims to digest. The plant will compensate. Remember, this is a rule of thumb standard. It does not have to be precise.

Now, for the main species focus of **Droseraceae**, the ***Drosera spp.***. This author has come to find the glistening, sticky foliage most aesthetic. This author has also made a profound discovery; he has not come across a single ***Drosera*** species yet that can be fed to death. Two of the native tropical species, ***D schizandra*** and ***D. prolifera***, are finicky eaters, for only their newest leaves have a digestive capacity. The older ones do not form glistening drops. This has no scientific validity, for the two specimens in question are quite small.

However, one from the Queensland region, ***D adalae***, is quite a glutton. After one massive feeding, where the entire surface of the leaves were coated in ants, the plant literally doubled in size in less than three weeks and sent out many new leads. This author is reticent to feed this specimen again, for fear of it taking over the entire growing tray.

Another species growing right beside this monstrous plant are 5 plants of ***D. burmanii***. Talk about indulgence! Right after placing these young members, some were given great volumes of ants. On top of that one caught a moth twice the size of its leaf as well! Wow, did these take off! This ***Drosera*** pulled all of those remains into the centre of its leaves, creating a blackened ball of bodies. Within just one week new leaves were already unfurling over the older ones; all of them larger then their former ones. Just after three weeks they were sending up flowers, all of them.

With ***D. regia***, this author has covered over half the surface area of each leaf with prey, especially larger ants and other insects. Having bought the plant in November 1996, it has tripled in size since then. ***D. coccicaulis*** has sent up two flowering spikes since its purchase in November of 1996 and grown twice as tall. ***D. aliciae*** and ***D. pulchella*** are quite healthy and abundantly acquiring beautiful size and colour. These species will also daintily devour as many creatures as this author can cram onto their leaves.

D. magliesburg tends to have a small surface area for digestion. It has gone from a small, sickly looking sprout to a larger, much more robust plant with sideshoots galore after one attempt at putting as much prey as would fit on all available leaves. It has not done the monstrous growth indicated by the other ***Drosera*** types.

Of the weed-like species, ***D. capensis*** and ***D. spathulata***, this author lets ***D. capensis*** fend for itself, and it manages quite nicely off the few soil gnats an occasional mossie. If given the same amount of biomass as the test species, it would most certainly be the dominate plant in the carnivore trays. This author encourages the **D. spathulata** growing around the flytraps, ***Dionaea muscipula***. They provide protection from ants that have developed a technique of robbing the FlyTrap by chewing open the closed traps to eat the prey themselves. So far this species shows a readiness to feed or not to feed that other the former ***Drosera*** species do not exhibit. When it is full, the leaves do not glisten, and it will not accept prey.

D. binata and ***D. hamiltonii*** also exhibit such behaviour. However this author believes other factors are involved. ***D. binata*** had been overfed with overly vigorous results; just like ***D. adalae***. There was fear that it would overgrow and threaten to crowd out its neighbour, the ***D. regia***. At that time the ***D. regia*** species was merely about 3 cm high (now the largest leaf is 11 cm). The behaviour of ***D. binata*** and the ***D. hamiltonii*** to dry up their digestive dew was dismaying. This author believes that since exposed to higher winds growing on the 3rd story of a gusty area, the free standing, tall leaves of ***D. binata*** have this adaptation built in.

It is surmised that ***D. hamiltonii***, has similar restraints. After rainy weather, nearly all the other ***Drosera*** types were at their most glistening. Just before the rains was a drier spell of not so humid conditions. This was when the ***D. coccicaulis*** was losing its glistening surface and the ***D. regia*** had the glands at minimal. Adversely, the ***D. hamiltonii*** was showing that typical ***Drosera*** glean. Indeed, it fed quite profusely and grew well.

The last specimen for analysis should not really count. ***D. cistiflora*** did consume just after purchase in November 1996 and for a few months afterwards. Yet its growing tip withered, and soon the plant entered dormancy. Whether the plant was sickly and simply died (it was the last one available and was mighty spindly), or whether it did enter its dormancy like it was supposed to will be seen. The prey was digested by the foliage though.

After all these ***Drosera*** species show roughly the same response to vast quantities of insects being applied to their leaf surfaces. This author is about to embark on a similar venture with his newly acquired ***Byblis gigantea***. Look for an update in the next CP of NSW Newsletter, where other genera will also be reviewed. After all, who really knows the hunger of ***Heliamphora***; the needs of ***Nepenthes***; the satiations of ***Sarracenia***; the pinning's of ***Pinguicula***; the certainties of ***Cephalotus***, or even the daring's of ***Darlingtonia***. Inquiring minds want to know.

Trying to grow *Aldrovanda vesiculosa*

Denis Daly

At the end of September 1995 after reading an article in the ACPS's bulletin [1] I purchased ***Aldrovanda vesiculosa*** from David Wilson of Palmerston in the Northern Territory. During the wait for my order to be filled I set up a spare aquarium as detailed in David's article [1]. In due course (early October 1995) a large specimen and a few small plants arrived in a plastic test tube which were placed in the prepared aquarium

I decided to use a special purpose yeast and sugar brewer to generate carbon dioxide, treating the residue of the brew as effluent. I considered injecting hydrochloric acid on to shell grit every day to be cumbersome while renting a carbon dioxide cylinder to be inconvenient in getting refills as well as expensive. Using the carbon dioxide given off by a home brewing kit was rejected as a potential health hazard due to the highly likely possibility that the home brew could be contaminated with micro organisms.

At first things went very well, the large plant and the smaller plants doubled in size in two weeks. Then in trying to get the yeast brewing carbon dioxide (CO_2) generator going I gave it a vigorous shake. It frothed up, overflowed and injected yeast into the aquarium. I was not using an overflow reservoir. No fertiliser was added as I now do to ensure reliable "starting" of the brewing process. The prototype was simply a 2 litre PET soft drink bottle with an air line attachment tentatively glued in and attached to a carbon dioxide bell.

At that time (on a week day evening) it was panic stations. Attempting to get rid of the yeast I replaced all the water in the aquarium but did not have time to clean the gravel and soil. The pH went high while I was at work even though a couple of hours after the water replacement it was around 7.0. The high pH is probably what killed the large ***Aldrovanda*** plant. One of the smaller plants lasted for a month. Then the algae moved in and the remaining plants in the aquarium died.

So in late December 1995 I wrote to tell David Wilson that I had killed the plants and ordered more. This time I aimed to purchase enough plants for the heated aquarium and for backup to be placed in an external tank that is very stable, algae free, full of bacteria and other carbon dioxide (CO_2) generating organisms, where aquatic ***Utricularia*** had grow well for 3 years, forming turions in winter.

Those replacement plants succumbed over the autumn and winter of 1996. In November 1996 I again wrote to David Wilson with the bad news and with the hope of purchasing some more ***Aldrovanda*** plants. I had been determined to establish ***Aldrovanda*** in cultivation ever since this Society published a three part article "In search of ***Aldrovanda vesiculosa***" by David Colbourn in December 1993[8], March 1994[9] and concluding in June 1994[10].

"Out of the blue", on a Saturday morning in late November 1996, David rang me. He approved of my persistence in attempting to cultivate ***Aldrovanda*** and appreciated my correspondence detailing what I had done, what went wrong and how I had the aquarium set up at that time. He felt it was time to "put me straight" on the finer points of growing aquatic plants.

David is an Aquarist who has, on occasions, provided interested persons and scientists with unusual aquatic plants including ***Utricularia*** and ***Aldrovanda***. That morning David told me enough details to enable me to start to set up the aquarium correctly. In any regard he would send me the detailed instructions on how to grow aquatic plants in an aquarium. Once the aquatic plants were established and growing well he would supply me with ***Aldrovanda***.

So that day I completely stripped the aquarium, purchased a "power head" aquarium pump and started from scratch.

Actively growing ***Aldrovanda*** all year in Sydney necessitates setting up a heated aquarium. A good aquarium (typically 1m x 45 cm x 35 cm) can cost around A$95 unless one can pick up a second hand one or shop around. Specially sized aquariums can make the display attractive but one needs to go direct to an aquarium manufacturer.

These can be found in the telephone directory. For example Sans Souci Aquariums of 6 Ritchie Street Sans Souci (02 9529 8360) offered good value when I had a special sized aquarium made recently (January 1997) for my daughters Axolotl's (***Ambystoma mexicanum***) .

An "under cushion" is vital to prevent the aquarium shattering should any irregularity be present on the aquarium stand. I recommend using a 25 mm thick polystyrene sheet as an "under cushion". I purchased a 25 mm polystyrene sheet at Clark Rubber's Caringbah store (A$6) and cut it to size.

The aquarium stand MUST be a substantial piece of furniture (preferably steel reinforced) as an aquarium full of water is very heavy. The floor beneath the stand must be stable and capable of supporting the weight of the stand and full aquarium.

Those of you who are familiar with David's original article in the ACPS's Bulletin of September 1995[1] will, as you read on, find that David has revised his method of ***Aldrovanda*** cultivation to some extent.

In David's words the substrate (soil in bottom of aquarium) is **"50% vermiculite and 50% garden loam. Wet the vermiculite thoroughly and then mix with wet soil. Fill bottom of the aquarium with 75 to 100 mm of soil preparation then place 20 - 25 mm** of well **washed gravel (particle size 3 to 5 mm) over top. Plant heavily with fast growing cutting plants. Start CO_2 (carbon dioxide) brew** next **day after planting, start adding Pelagic fertiliser after one or two weeks."** [2]

David suggested a number of suitable types of plants for the mass planting of the aquarium prior to placing any ***Aldrovanda*** in the aquarium **"that will grow fast and prevent algae taking hold. This list is what comes to mind, there are** many **others. Plant them in groups of the same species."** [2]

" Water wysteria, Macranthamen, red or thin Ludwegia, Amazon Sword Plants, Hygrophila Ploysperma, Pink Baby tears, Macranda, Blue Stricta, Ambulia." [2]

If you have difficulty tying to get all of these specifically suggested plants don't worry too much for whatever plants you can obtain their suitability will be determined during the aquarium's establishment phase. Some will be slow to grow, others will take over and will need severe pruning and possible culling when other more suitable species have established themselves while others will be unsuited to the low pH, temperature etc., and die. The object is to establish a forest of plants that successfully prevent algae from growing by "out competing" the algae for the nutrients in the aquarium. Refer to references [3] & [6] for details of a range of aquarium plants.

David has revised the original aquasol and iron fertiliser that he recommended in 1995 [1] and provided me with the formula for Pelagic (top of water) and Benthic (bottom or substrate) fertiliser for aquatic plants that he obtained from the Internet and now uses for aquatic plants. **These fertilisers have minimum phosphorous content to keep algal growth from exploding.** I have made adjustments to relate the measures to a per litre basis as well as detailing components for a typical trace element part. Feeling that the potassium content was a little high I also took the liberty to increase the magnesium content somewhat in an attempt to maximise photosynthesis by hopefully increasing the chlorophyll content of the plants. (A magnesium atom is at the heart of each chlorophyll molecule. [7])

These "public domain" fertiliser formula's have been designed for use with aquatic plants by various (and unknown, to me) contributors to the Internet. The fertilisers, with my magnesium boost, seem to work well, for general companion aquatic plants as well as ***Utricularia*** and ***Aldrovanda*** in my aquarium in conjunction with carbon dioxide injection. Component details, and instructions for use, that I used are presented below. (These formulations are not necessarily applicable to terrestrial carnivorous plants.)

Pelagic Fertiliser Stock Solution

Chemical	Formula	Qty per Litre
Magnesium Sulphate (Epsom's salts)	$MgSO_4 \cdot 7H_2O$	58 g/L
Potassium nitrate	KNO_3	16g/L
Potassium Sulphate	K_2SO_4	50g/L
Chelated Iron	Fe Na EDTA	16 g/L
Ferrous Sulphate	$FeSO_4 \cdot 7H_2O$	1.6 g/L
Hydrochloric Acid	2 molar (or 2 normal) HCl	4.4 mL per litre
Manganese Sulphate	$MnSO_4 \cdot 5H_2O$	700 mg/L
Zinc Sulphate	$ZnSO_4 \cdot 7H_2O$	250 mg/L
Copper Sulphate	$CuSO_4 \cdot 5H_2O$	73 mg/L
Boric Acid	H_3BO_3	360 mg/L
Sodium Molybdenate	$Na_2MoO_4 \cdot 2H_2O$	0.73 mg/L
Nickel Sulphate	$NiSO_4 \cdot 6H_2O$	0.76 mg/L

The Pelagic fertiliser stock solution (i.e. full strength as detailed above) is shaken up each night, (i.e. daily application) to mix the sediments in the bottle, just before drawing off, and adding to the aquarium water, 5 mL for each 100 litres of water in the aquarium.

Benthic Fertiliser Stock Solution

Chemical	Formula	Qty. per Litre
Ammonium Sulphate	NH_4SO_4	60.0 g/L
Potassium Nitrate	KNO_3	10.0 g/L
Magnesium Sulphate (Epsom's salts)	$MgSO_4 \bullet 7H_2O$	7.8 g/L
Mono ammonium Phosphate	$NH_4H_2PO_4$	2.0 g/L (see Note 1)
Calcium Hydroxide (Slaked lime)	$Ca(OH)_2$	1.0 g/L
Chelated Iron	Fe Na EDTA	1.0 g/L
Ferrous Sulphate	$FeSO_4 \bullet 7H_2O$	212 mg/L
Sodium Chloride (cooking salt)	NaCl	70 mg/L
Manganese Sulphate	$MnSO_4 \bullet 5H_2O$	95 mg/L
Zinc Sulphate	$ZnSO_4 \bullet 7H_2O$	34 mg/L
Copper Sulphate	$CuSO_4 \bullet 5H_2O$	9.8 mg/L
Boric Acid	H_3BO_3	48 mg/L
Sodium Molybdenate	$Na_2MoO_4 \bullet 2H_2O$	0.1 mg/L
Nickel Sulphate	$NiSO_4 \bullet 6H_2O$	0.1 mg/L
Vitamin B_1 • HCl	$C_{12}H_{17}Cl\,N_4\,O\,S$ • HCl	Use a health food tablet with 50 mg of Vitamin B1 (Thiamine)

Note 1:- may be able to be omitted or reduced in quantity if fish are used to provide phosphorous for plants.

The solution of the Benthic fertiliser (detailed above) is shaken up to disperse sediment and then diluted 10:1 (i.e. 200 mL and top up to 2 litres) to produce the "working fertiliser" solution so that it is not necessary to continually have to shake it up every time I "draw up" a dose into my "soil injector". I inject 10 to 20 mL of the "working fertiliser" into approximately 6 to 10 random areas of the soil once each week.

A soil injector can be made from a 25 mL hypodermic syringe. (Available at any Chemist.) You do not need the needle (purchased separately anyhow). Use a short length of aquarium air line to connect to a 6 mm poly propylene tube as used in gardening watering systems. Remove the 5 mm threaded coupling to prevent blockages as it is pushed through the gravel. (You will need to place the end of the plastic air line tube in boiling water to soften it sufficiently to stretch over the 6 mm polypropylene tube.)

SAFETY Warning:- The use of a residual current device (RCD or safety switch to Australian Standard AS3190) plugged into the 240 volt power outlet used to power the aquarium equipment (i.e. submersible power head pump, heater and light) is necessary to protect you from electrocution. The cost (i.e. A$45 from Dick Smith Cat No M7294) is a good investment in your, or your family's life. In newly built homes the power points in the electrical installation may already be protected by such a device. But if in doubt seek the advice of a licensed electrician or simply buy a plug in unit as outlined above.

To set the photo period an electrical timer is required. The prices can vary from less than A$20 for a simple 24 hour electric clock type timer to A$50 for an electronic programmable timer. (I use 15 hours light plus natural light through a south facing window)

The aquarium light can be made from a standard twin 20W fluorescent fitting and adapted to your aquarium decor. Unless you are an electrician you are advised to buy a light assembly, complete with power cord and power plug, from a lighting or aquarium shop. At this time I recommend that the fluorescent tubes be Grolux colour (i.e. reddish) type. However I suspect that ordinary "cool white" fluorescent tubes will do.

The important thing to remember when purchasing fluorescent tubes is to insist upon tri-phosphor fluorescent tubes, even though they may cost more, because the light output lasts the life of the tube and does not fade off within a few weeks. Generally fluorescent tubes bearing the name of a reputable company (e.g. NEC, GEC, Thorn, Osram, Phillips etc., etc.) will be tri-phosphor tubes.

The aquarium heater will need to be sufficient to keep the aquarium warm (20 to 26°C) in the winter. Around 150 watts (typically A$40) for a 120 litre aquarium. To connect this and all the other equipment to the electricity supply (Via your RCD device!) a 4 way power board is necessary. (Dick Smith Cat No M 7119 at A$13.)

David Wilson has revised his original method of using a bell to effect carbon dioxide injection.[1] The revised method of injection of carbon dioxide is to connect the outlet of a yeast brewing carbon dioxide generator direct into the inlet of an aquarium filter pump where the relatively large bubbles of carbon dioxide periodically injected by the yeast generator will interact with the impeller of the pump dissolving carbon dioxide into the water.

Do not waste your time with feeding carbon dioxide into the sucking venturi that is available on the outlet of some aquarium pumps. (I first tried using the sucking venturi on the pump outlet, however when David rang me again the next week to ensure I had received his letter and to correct an omission in it, luckily I casually mentioned the use of the venturi and he was able to put me straight on that point.) If your pump has such a sucking venturi on its outlet you can use it as part of the aquarium aeration equipment. (More about that later in this article.)

Thus following David's latest method, I used an "Otto PH400" under gravel filter power head and attached a "air uplift" (separate unit to the power head that I made up from scrap fittings) to its inlet, feeding carbon dioxide in from the yeast generator as one would have normally fed air from an aquarium air pump to an "air uplift".

There is no water filtering function performed by this pump. Occasionally (say once a month) it and the "air uplift" tube must be cleaned to ensure trouble free operation. The bottom of the "air uplift" was plugged off (leave the end "un-plugable" to facilitate cleaning with bottle brush) so that it formed an inlet water screen.

Initially I drilled a multitude of 0.5 mm holes in the "air uplift" tube to make it into an inlet screen but these holes blocked within a few hours with various plant debris floating in the aquarium. Opening the holes to 1 mm diameter has produced a excellent inlet screen.

The ***Aldrovanda*** aquarium pH is taken below 6.2 and aquatic plants grow at a phenomenal rate.

Before filling the aquarium I glued (with silicon sealer) a small section of 6 mm thick glass to the side wall of the aquarium to support the "Otto PH400" pump in such a way as to keep the "air uplift" vertical.

While waiting for the ***Aldrovanda*** aquarium to age and the plants to grow I had to "set up" an Axolotl (***Ambystoma mexicanum)*** aquarium for my daughters'. I decided to temporarily inject carbon dioxide (CO_2) into that aquarium (without the Axolotl's) to establish plant cuttings. (These were supplied by the surplus I then had in the ***Aldrovanda*** aquarium.) The mechanical arrangement of the Otto submersible filter pump, purchased for this aquarium, rendered access to the pump inlet impracticable. The practical solution was to use any method, even if less efficient, of carbon dioxide injection during the plant establishment. I was thus afforded the opportunity of evaluating the efficiency of carbon dioxide (CO_2) injection by several methods.

I already established that carbon dioxide bubbles rising from a fine "air stone" to up under a bell, (a variant of David's original "top fed" bell), used over the winter of 1996, is reasonable though not as efficient as his latest method. Making a mess under the aquarium's lid gluing in a temporary bell eliminated this method.

As David had told me using the air sucking venturi to suck carbon dioxide (CO_2) from the yeast generator was virtually useless. Using an "fine air stone" driven from, the yeast generator in such a position that the rising carbon dioxide bubbles are swept around the tank by the water flowing from the pump outlet sufficed to "get the plants established" in the Axolotl's (*Ambystoma mexicanum*) aquarium. The plant growth rate was not as good as either David's latest method nor his original "bell" and there are other problems.

Difficulties are experienced after 5 or 6 days when the yeast generator cannot produce enough pressure to overcome the pressure drop across the fine air stone, injection of carbon dioxide (CO_2) ceases. (The yeast generator when connected into the aquarium as per David's latest method is effective for around 7 - 9 days.)

These methods are definitely not recommended for *Aldrovanda* growing. I suspect that the success of David's latest method is due to a significant amount of carbon dioxide (CO_2) being dissolved in the water during the interaction with the pump impeller. Indeed the fine bubbles then dispersed around the aquarium are not readily absorbed. Stick to David's latest method of injecting carbon dioxide into the inlet of a power head pump.

My yeast brewing carbon dioxide generator and overflow container are "Willow 10 litre carry all cans" made of blue poly propylene with 50 mm gasket sealed screw lid. (Available from super markets for A$11.) While I have fitted the brewer with a 110 mm x 165 mm poly carbonate view port, which is very helpful in observing the condition of the brewing yeast, it is not absolutely essential to its function.

To start the brewer "going" I dissolve 250 g of sugar and add 10 mL of carnivorous plant fertiliser (Cami Thrive Mark 3 at the same working strength that I apply to all my plants in order to supply the yeast with nitrogen, the exchangeable cations of potassium, calcium, and magnesium [5, pages 43 - 46], phosphorous, sulphur and the trace elements) into 1 to 1.5 litres of warm to hot water. I add another 2 to 4 litres of cold water to cool the water below 30°C then add a 5 (or 7) gram packet of brewer's yeast (available in supermarket grocery's). In Sydney in summer such a yeast brewing carbon dioxide generator lasts between 7 to 9 days. Thus each week the brewer is emptied and thoroughly rinsed out and recharged.

I make no attempt to recycle any yeast as I have found from experience that you cannot be certain that it will start brewing again. Often it has died (as alcohol content rises above 15% or by being contaminated with other micro organisms).

Pressure sealing of the connections to the brewers was initially a problem as the different components are not "glueable". Forget all the claims from sales persons that they have a glue (including claiming that the use of a "primer" is why it works) that can reliably glue polypropylene, polyethylene and nylon. Waste of time and money.

I use 5 mm (diameter) x 0.8 mm (pitch) threaded fittings (made from plastic and nylon tube and garden water "sprinkler" system components) screwed together (and into the polypropylene bottles) and sealed with "car gasket" silicon. Excellent sealing gaskets can be moulded in situ by first applying excess silicon, then screwing the components together leaving enough space for a gasket to form, waiting until the silicon is touch dry on the outside and then gently tightening a little more before leaving to cure for 24 hours.

My brewer design specifies two tube attachments fitted near the screw lid (easy to work on). One to feed carbon dioxide to the overflow reservoir and the other to use to connect an air line to pressurise the system after recharging. That line is then temporally "bent over" while being fitted with a plug to maintain pressure. The overflow reservoir has two tube attachments fitted near the screw lid (again easy to work on), one connects to the brewer while the other connects to the "air lift" that I attached to the inlet of the power head pump. In the reservoir it is important that these inlet/outlets be fitted at right angles to each other in order to prevent yeast/water/sugar splashes from the tube connected to the brewer from reaching the outlet tube leading to the aquarium.

It is only necessary to clean the overflow reservoir occasionally (or after a yeast mishap). Thus before removing the brewer for recharging each week one can clamp off the tube to the yeast brewer, to conserve the carbon dioxide contained therein, and only release the clamp when the brewer has been recharged, replaced and pressurised.

An assortment of aquarium air line and plastic hardware fittings can be used to make the appropriate connections. Tools needed should, with the possible exception of a 5 mm (diameter) x 0.8 mm (thread pitch) taper tap and tap holder together with a 5 mm (diameter) x 0.8 mm (thread pitch) die and stock, be normally available in most home tool boxes. (If the salesman does not recognise this precise description of the tap and die then either ask to talk to a more experienced person or go to another store where they know about tools.)

PVC, perspex, and, with luck PET bottles, can be glued with "PVC solvent cement" (45% Methyl ethyl ketone) after cleaning the surfaces with "PVC priming fluid" (100% Methyl ethyl ketone). (METHYL ETHYL KETONE IS DANGEROUS. IT CAN BLIND YOU. FOLLOW MANUFACTURERS INSTRUCTIONS PRECISELY. WEAR EYE PROTECTION. USE ONLY IN A VENTILATED AREA.) The caps of the PET bottles cannot be glued satisfactorily and they are too thin to tap.

Small fish such as Neon Tetras (*Hyphessobrycon innesi*) or Cardinal Tetra's (*Cheirodon axelrodi*) can be introduced into the aquarium. If they are fed on a normal flake fish food they should produce enough phosphorous [5, page 138] to satisfy the total needs of your plants in the aquarium [2] provided that they are suited to the low pH[3] and can get enough oxygen.

Ripples (turbulence) on the surface of the air water interface ensures gas diffusion into and out of the water. This combined with air movement across the water surface aerates the water. Air bubbles injected into an aquarium produce surface ripples and induce water currents which mix the aerated surface water throughout the aquarium. The volume of air used to produce the air bubbles provides the fresh air flow across the surface of the water within the enclosed space above the water in the aquarium.

In *Aldrovanda* cultivation the density of the raft of plants makes use of an air stone to create surface ripples useless. A section of free surface area can be rippled by directing the outlet of the power head pump so that a wave is created at the water surface. This wave action will help prevent the raft of plants from claiming the area, however you will have to assist by occasionally pruning the plant raft.

When you are injecting carbon dioxide into the aquarium the undissolved carbon dioxide bubbles will displace any air from the enclosed area above the water in the aquarium. This space will become virtually pure carbon dioxide and unable to provide air (oxygen) to aerate the aquarium. You must provide an air flow through this space to prevent this happening.

You could put an air supply from an aquarium pump into this "air" space (not an air stone in the water) to provide this fresh air flow. However if the power head has an outlet air sucking venturi you can use this to suck in fresh air from outside the aquarium. This has a minor beneficial effect by creating more ripples on the rippled surface produced by the outlet of the pump being directed toward the water surface. (To regulate air input via the venturi use a clamp on its "breather" hose to restrict the quantity of air "sucked in".)

Aerating the water results in diffusion of some carbon dioxide from the water but both plants, as well as fish, require oxygen (from air or air dissolved in water) for respiration. Warm water holds less dissolved gasses (i.e. oxygen and carbon dioxide) than does cold water. If the aeration is insufficient the effects will be first seen deep in the aquarium were oxygen levels may not be sufficient to support the respiration of fish, and in extreme conditions the respiration of the understorey plants. (Provided there is air in the aquarium space above the water the surface plants, and those close to the surface, will have access to oxygen.)

It should be noted that David's latest method of carbon dioxide "injection" involves periodically injecting carbon dioxide bubbles into the pump inlet rather than a continuous diffusion of carbon dioxide into the water. Also note that the water currents mixing the water are created by the power head pump rather than air stones and that the periodic shot of carbon dioxide enriched water is rapidly removed from the vicinity of the water surface and thus the effect of aeration on the carbon dioxide concentration will be minimised as well as being able to be monitored by taking periodic pH readings. (Anyhow it is better for the carbon dioxide concentration to be reduced and slow the plant's growth than for the respiration (oxygen) to fail and the plants die.)

Hopefully now, having been able to enjoy specific personal guidance from David who as an aquarist has heaps of experience in growing aquatic plants, the ***Aldrovanda*** plants just received (introduced to the aquarium on Monday 24th February 1997) will thrive and thus enable me to successfully cultivate ***Aldrovanda***.

David has no objections to me providing supplies of ***Aldrovanda vesiculosa*** to fellow CP'ers from my surplus stock as it grows. Certainly better, both environmental and cost effective, than having David or his friend Ossie immersed in Girraween Lagoon for four hours to find two small samples.[1]

When my stocks of ***Aldrovanda*** build up I will be able to provide plants to interested members who can demonstrate, by sending a photograph, that they have an appropriate aquarium with a massed planting of aquatic plants established.

I intend to kept the cost minimal, say slightly more than the packing and postage, in order to ensure that this plant is established in cultivation without ripping out wild stock to provide commercial supplies. Please note that I would prefer to trade ***Aldrovanda*** for such items as ***Nepenthes*** cuttings.

I will accept expressions of interest from members who have, or are setting up aquariums in order to assemble a waiting list in anticipation of the ***Aldrovanda*** stock increasing. When surplus ***Aldrovanda*** stock becomes available those whose aquariums are ready will be supplied. Those whose aquariums are not ready will remain on the list for supply when their aquariums are ready.

Next summer, when stocks of ***Aldrovanda*** build up, I will attempt to acclimatise some ***Aldrovanda*** to cold growing (form turions in winter) so that I may grow, supply and assist others to grow ***Aldrovanda*** outdoors in non heated tanks. However initially I will be only able to assist in ***Aldrovanda*** cultivation in tropical fish like conditions at constant temperatures of between 20 and 26°C.

Top up water Footnotes:

Sodium thiosulphate at a dose rate of 10 mg per litre of water, or two hours in the sun, will eliminate free chlorine ions from chlorinated and chloraminated water. Contrary to opinions expressed by some aquarium proprietors, Sydney's Water Supply Authority advises that their tests show that sodium thiosulphate, at 10 mg per litre, is effective in de chlorination of chlorinated or chloraminated water.[4]

The pH of Sydney's water supply can range from 6 to 8 before corrections to the pH are undertaken. A pH range of 6 to 8 is considered to be neutral water. If the pH goes outside this range their disinfection processes of chlorination or chloramination become ineffective and corrective action is taken.[4]. The usual pH range for Sydney, arising from the soil types and arrangement of the water catchment and distribution system, is between 7 and 8.[4] As the chemistry of water disinfection would be similar all over the world these basic considerations should apply just about everywhere. Check with your local water supplier for confirmation and for advice on the range of pH.

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Cultivation of Carnivorous Plants at Bathurst (Part 2)

Richard Sullivan

Continuing on from my first article the following notes are a continuation of how I grow some of my plants at Bathurst. I am not proposing that this is the only way to grow them but that these methods work for me. I can grow plants below the temperatures suggested in many books. I hope that these notes will be of some help to other growers of Carnivorous Plants.

Drosera sessifolia
Potting medium is 50% peat moss and 50% coarse sand.
Propagation is by seed.
Position:- Full sun to 25% shade.
Note. Plants are watered by a water tray.
Temperature range in glass house from 0°C to a high of 38°C.
References [6,13]

D. callistos (P)
Potting medium is 50% peat moss and 50% coarse sand.
Propagation is by seed and gemmae
Position:- I try to have my plants in full sun they seem to like the west facing side of the glass house.
Note. A lovely plant with a large flower. Easily grown from seed or gemmae. 5" (125 mm) pot recommended. Starts to produce gemmae in May
Temperature range in glass house from 0°C to a high of 38°C.
References [6,14]

D. ericksonae (P)
Potting medium is 50% peat moss and 50% coarse sand.
Propagation is by seed and gemmae.
Position I try to have my plants in full sun they seem to like the west facing side of the glass house.
Note Watered by tray. 5" (125 mm) pot recommended.
Starts to produce gemmae around May
Temperature range in glass house from 0°C to a high of 38°C.
References [4, 6, 14]

D. nitidula ssp allantostigma
X
D. ericksonae (P)

Potting medium is 50% peat moss and 50% coarse sand.
Propagation is by gemmae.
Position I try to have my plants in full sun they seem to like the west facing side of the glass house.
Note Watered by tray. 5" (125 mm) pot recommended.
Starts to produce gemmae around May
Temperature range in glass house from 0°C to a high of 38°C.
References [6, 14]

D. nitidula ssp omissa
X
D. occidentalis ssp occidentalis (P)

Potting medium is 50% peat moss and 50% coarse sand.
Propagation is by gemmae.
Position I try to have my plants in full sun they seem to like the west facing side of the glass house.
Note Watered by tray. 5" (125 mm) pot recommended.
Starts to produce gemmae around May
Temperature range in glass house from 0°C to a high of 38°C.
References [6, 14]

D. nitidula ssp omissa
X
D. pulchella (P)

Potting medium is 50% peat moss and 50% coarse sand.
Propagation is by gemmae.
Position I try to have my plants in full sun they seem to like the west facing side of the glass house.
Note Watered by tray. 5" (125 mm) pot recommended.
Starts to produce gemmae around May
Temperature range in glass house from 0°C to a high of 38°C.
References [6, 14]

D. pulchella (P)

Potting medium is 50% peat moss and 50% coarse sand.
Propagation is by seed and gemmae.
Position I try to have my plants in full sun they seem to like the west facing side of the glass house.
Note Watered by tray. 5" (125 mm) pot recommended.
Starts to produce gemmae around May
Temperature range in glass house from 0°C to a high of 38°C.
References [1a, 1b, 3, 4, 6, 10, 14]

D. pygmaea (P)

Potting medium is 50% peat moss and 50% coarse sand.
Propagation is by seed and gemmae.
Position I try to have my plants in full sun they seem to like the west facing side of the glass house.
Note Watered by tray. 5" (125 mm) pot recommended.
Starts to produce gemmae around May
Temperature range in glass house from 0°C to a high of 38°C.
References [1a, 1b, 3, 4, 6, 10, 14]

D. roseana (P)

Potting medium is 50% peat moss and 50% coarse sand.
Propagation is by seed and gemmae.
Position I try to have my plants in full sun they seem to like the west facing side of the glass house.
Note Watered by tray. 5" (125 mm) pot recommended.
Starts to produce gemmae around May. Two months after gemmae were laid on top of mix there was growth.
Temperature range in glass house from 0°C to a high of 38°C.
References [6, 10, 14]

D. cistiflora

Potting medium is 50% peat moss and 50% fine sand.
Propagation is by seed and leaf cuttings and division.
Position:- full sun to 25% shade.
Note. Watered by tray. 5" (125 mm) pot recommended. I have not had this plant flower for me yet. Last year the largest plant was over 128 mm in height. The plant goes dormant around January and starts to grow again in April. When the plant is dormant I keep the pot just damp. The new plant comes from the old roots so I leave the pot alone until there is a need for repotting.
Temperature range in glass house from 0°C to a high of 38°C.
References [1a, 1b, 3, 4, 6, 13]

D. pauciflora f "pink flower"

Potting medium is 50% peat and 50% sand.
Propagation is by leaf cuttings, division and root cuttings
Position:- full sun to 25% shade.
Note. Watered by tray. 6" (150 mm) full length pot recommended. This plant has the largest flower of any of my ***Drosera***. The flowers open for only one day and only fully open for one hour. The plant has the same growth habit as ***D. cistiflora***. This is a large plant when mature with six plants filling a 6 inch (150 mm) pot.
Temperature range in glass house from 0°C to a high of 38°C.
References [6, 13]

D. trinervia

Potting medium is 50% peat and 50% sand.
Propagation is by seed.
Position:- full sun to 25% shade.
Note. Watered by tray. 5" (125 mm) pot recommended.
Temperature range in glass house from 0°C to a high of 38°C.
References [1b, 3, 6, 13]

D. prolifera

Potting medium is part peat moss, 1 part sand, 1 part chopped up sphagnum moss.
Propagation is by cuttings and stolons.
Position:- under bench in my glass house in clear plastic tent (with my ***Nepenthes***.)
Note. This species has not yet spent a winter in my glass house. I obtained plants from Fred Howell in mid 1996. The plants are planted in a 6 inch (150 mm) dwarf pot.
Temperature low of 7°C to a high of 37°C.
References [1b, 3, 4, 6, 10]

References:-

[1a] SLACK Adrian, **The Carnivorous Plants**, 1979, Alphabooks, ISBN 0 589 50142 9
[1b] SLACK Adrian, **Insect Eating Plants and how to grow them**, 1986, Alphabooks, ISBN 0 906670 35 7
[2] SCHNELL, Donald E., **Carnivorous Plants of the United States and Canada**, 1976, John F. Blair ISBN 0 910244 90 1
[3] PIETROPAOLO, James and Patricia, **Carnivorous Plants of the World**, 1986, Timber Press, ISBN 0 88192 356 7
[4] CHEERS, Gordon, **A guide to the Carnivorous Plants of the World**, 1992, Colins, Angus and Robertsons, ISBN 0 207 16186 0
[5] Conversations with Allen LOWRIE
[6] Personal Observations
[7] Conversations with Denis DALY
[8] Conversations with and correspondence with Fred HOWELL
[9] Conservations with Phillip REYTER
[10] ERICKSON, Rica, **Plants of Prey**, 1982, University of Western Australia Press, ISBN 0 85564 099 5
[11] Conservations and correspondence with Russell DIXON
[12] DALY Denis, Propagation of some Specific Species of Carnivorous Plants, **FlyTrap News Vol 9 No 1**, July/August/September, 1995, The Carnivorous Plant Society of NSW, ISSN 1323-8159.
[13] Correspondence with Paul GEE
[14] LOWRIE Allen, Carnivorous Plants of Australia Volume 2, 1989, University of Western Australia Press, ISBN 0 85564 300 5

Introducing a Buy, Swap and Sell page Denis Daly

After that special plant? Have surplus of those rarer species that you would like to sell or trade for a plant that you do not have? You need to advertise. But you are not dealing in a lot of plants? Then the Buy Swap and Sell page is for you. It is free service for members. What are you into. Let others know

Meeting Report Jessica Biddlecombe

Jose Da Costa gave a great talk at the 14th March 1997 meeting which answered many questions we had on ***Heliamphora***. Jose showed us his ***H.tatei, H. heterodoxa*** and ***H. minor***. These were eye openers for those who had not seen them before. I learnt that I had mine not only in the wrong light but I was wrong in everything I did. ***Heliamphora*** are very basic carnivorous plants but are so interesting. Jose has grown seed in different mixes (straight ***sphagnum***, peat and sand & ***sphagnum*** and peat). He did get varying results but all were successful. Thank you Jose for an interesting night.

Also at the same meeting Kristie Wulf gave an impromptu slide show. (She just happened to have her slide projector with her.) After focussing and lighting problems we were under way. One "close up" showed the fine hairs on a ***Sarracenia purpurea***. We could also see the trigger hairs in a VFT. The slide of her first ***Sarracenia rubra*** *ssp jonesii* was great, pity that this plant is no longer with us. Thanks Kristie.

The meetings have become so interesting that we have taken a vote not to miss any month. Check the additional meeting dates on page 2 of this issue of FlyTrap News. Note particularly the July social (venue to be decided at meeting on 11th April 1997. Come along to meetings for a great time.