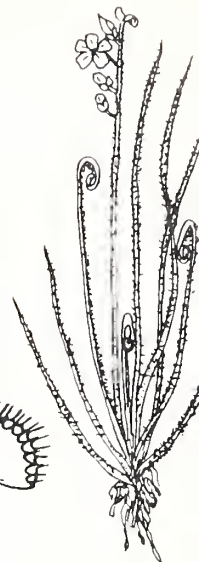




CARNIVOROUS PLANT NEWSLETTER



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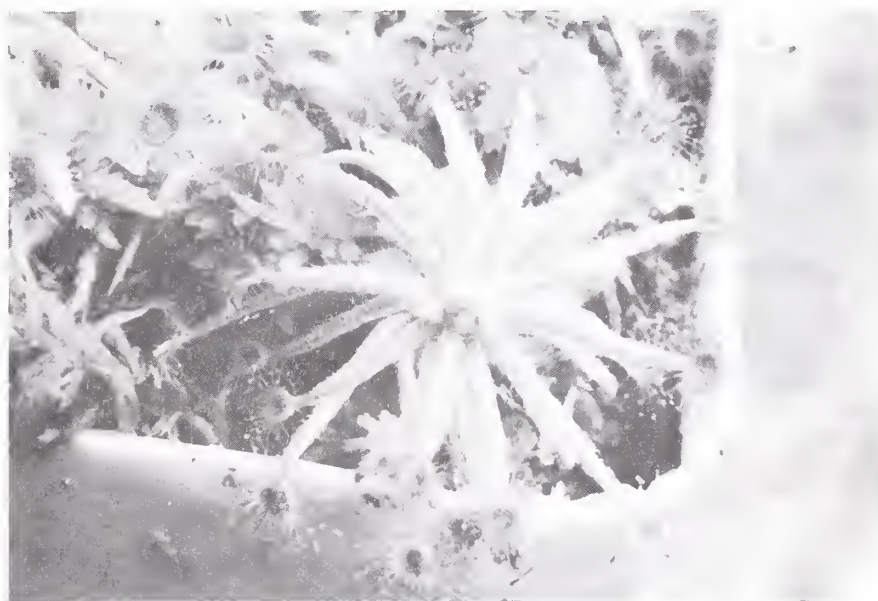
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DROSERA PETIOLARIS

Photo by J. Mazrimas

EDITOR'S CORNER

First, let me welcome all you new subscribers and a hearty welcome back to the old-timers. Many things have happened during the past year. We have added two new co-editors, and The Arboretum at California State University, Fullerton, has assumed the task of publishing and distributing CPN. All subscriptions, as well as any claims for missing or defective issues, should be addressed to The Arboretum. The Arboretum is also handling all business related to the sale of the back volumes. Pat Hansen, a long time friend of the Arboretum, is doing all of the typing and lay-out and bookkeeping. Please address your inquiries/orders to The Arboretum; Department of Biological Science; California State University, Fullerton; Fullerton CA 92634; USA. All checks and money orders should be made payable to "Arboretum Foundation Fund." Until further notice, all subscriptions will be on an annual basis only.

We would also like to announce the beginning of a membership drive. Last year the number of subscribers reached 650 by mid-July when the available spaces ran out. This year we plan to take all comers. As the number of subscribers grows, the price for each copy of CPN drops. Rapid growth will also help to keep the subscription price stable while allowing for more extras such as more illustrations, some of which we would like to publish in color once we have a sufficient number--about 3000. So every member get at least one new member or more for Volume VI.

The record cold in some parts of the world, especially in the Eastern United States and the resulting energy shortage may have affected some of our readers. We would be pleased to hear of how they are dealing with gas/oil shortages as well as other weather-related problems (drought, freezes, etc.). Any information on the effect of these weather extremes on the natural populations of CP would also be greatly appreciated and will be published as soon as possible.

BEGINNER'S CORNER by L. C. Song

This marks the beginning of a new column in response to many inquiries received by your editors about the culture, propagation, hybridization, etc., of CP. Each of the co-editors will take turns writing about various aspects of CP; at first, the column will contain general information. This is to establish a foundation on which to build for later columns which will contain more specialized information limited to specific genera and possibly specific species.

Much has been written on the culture of CP in the last few years, and many excellent reference works are available that cover general cultural practices for all groups of CP. One of the best sources of cultural information is contained in a book by Don Schnell, *Carnivorous Plants of the U.S. and Canada*. Another source is Alan Swensen's book, *Cultivating Carnivorous Plants*. (See Review of Recent Literature section). My advice to serious beginners is to review the chapters on the cultivation of CP. This should answer the majority of questions concerning basic cultural practices.

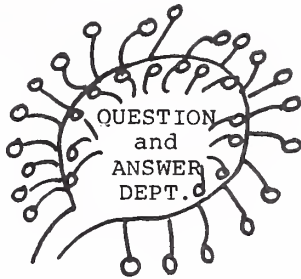
These basic practices can be summed up as the light, temperature, water relations, edaphic (soil or growing medium), and nutrient factors. Other things to be considered are basic horticultural techniques such as propagation, potting practices, pest control, structures for housing of plants, etc.

Now for a brief definition of terms. The light factor takes into consideration the intensity of quantity (brightness), quality (spectral composition), and photo-period (the duration of light during a diurnal or daily period as well as a seasonal time period). The temperature factor would be the diurnal (day-night) and seasonal range in temperature. Water relations as used here would concern the maintenance of proper moisture levels within the plant through regulation of humidity (amount of water vapor in the air) and irrigation (both pertaining to quantity of water) as well as the quality of water (purity--amount of dissolved salts, pH, etc.), taken on a daily and seasonal basis. The edaphic (soil or growing medium) factor concerns the type of materials that would be used to grow CP. The nutrient factor would concern itself with the application of fertilizers as organics (animal/plant derived products such as fish emulsion, bone-meal, kelp extract, living or dead insects, worms, etc.) or inorganics (mineral nutrients such as chemical compounds containing nitrogen, phosphorous, potassium, etc.).

Basic horticultural techniques would include categories such as propagation (making more numbers of a given plant by either sexual means--by seeds, or asexual means--any type of cutting such as leaf, stem or root or the newer methods using aseptic culture), plant handling techniques (the actual how to plant the seeds, make the cuttings, transplanting, proper types of containers, etc.), pest control (detection and treatment of plant diseases and disorders caused by bacterial, viral, fungal, insects and other animals, environmental factors which would include any imbalance in the factors mentioned previously as well as toxic substances such as smog, other pollutants, etc.). Structures for the housing of CP could be most anything that would contribute to the maintenance of a proper balance of the basic factors.

NEXT: The Light Factor

We are looking for a catchy logo for this column. The winner will get a free subscription for 1978. Please send them to Leo Song, address on front cover.



Q. I'm having trouble with my *D. spathulata*. It was growing great until I transplanted it. The leaves don't unfold like they did before. What's wrong? I haven't had much success with leaf cuttings. Why?--K. L., Los Alamitos, CA.

A. If you transplanted this species too deeply in the new container, it may rot. Also, it takes time to overcome the shock and perhaps some injury to the roots may contribute to the problem. Try to give this plant good drainage and good light. Leaf cuttings of this species are difficult to start, and I would suggest you try root cuttings.

Q. In regard to *Darlingtonias*, would it be practical to apply freeze packs (previously frozen) close to the plant's roots?--P. L., Tulsa, OK.

A. It sounds like you're willing to do a lot of work to grow this plant, and this is one of several methods to lower root temperatures during the hot months of summer, especially at night. Let me know how it works out a year from now.

Questions and answers for this column will be published from time to time and selected for general interest to all CPN readers. Normally, we can't answer all questions from readers either personally or through this column. However, we intend to publish as many as we can in the future.

NEWS AND VIEWS

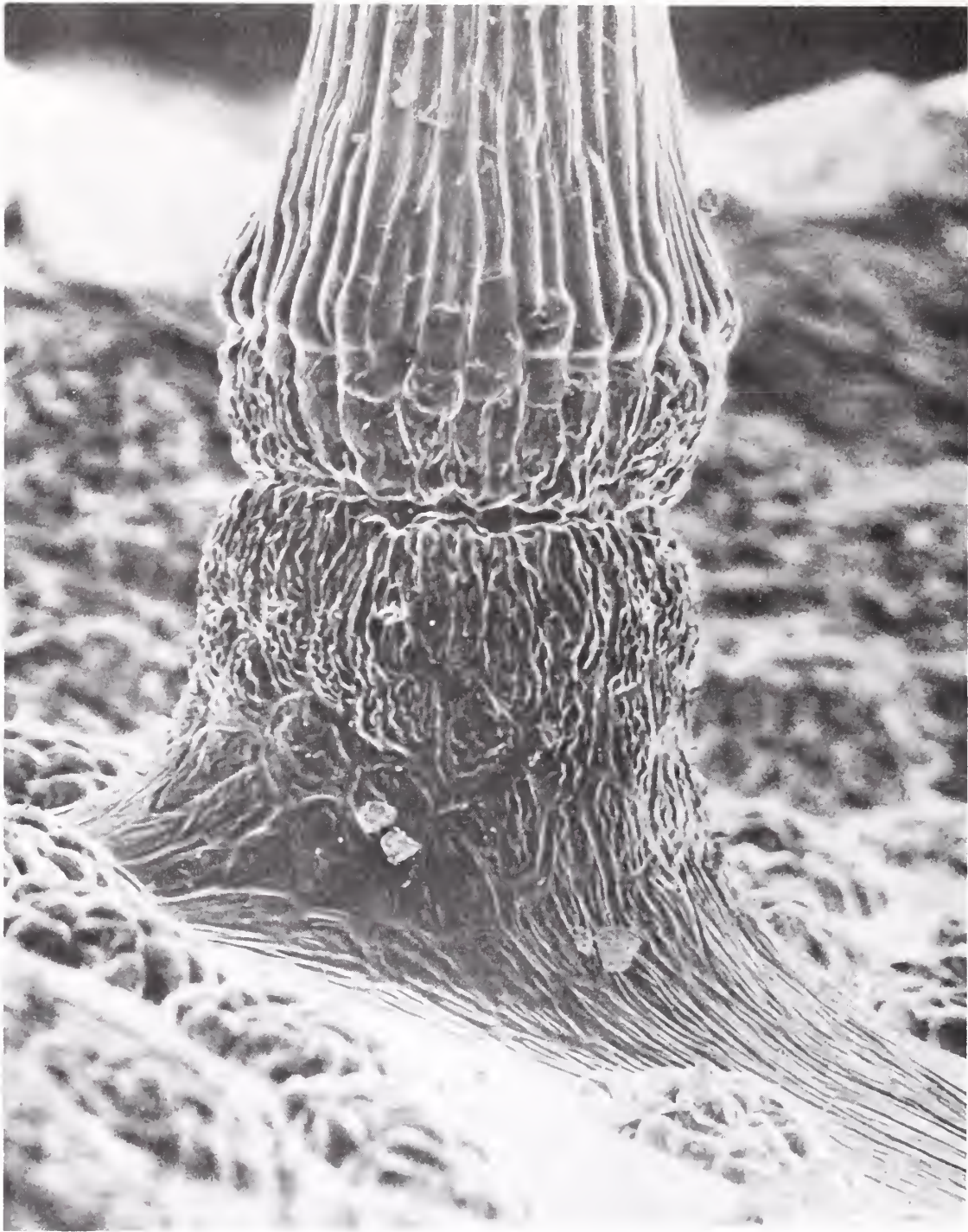
LES KAUFMAN writes: Enclosed please find our contribution to CPN, entitled "On the foraging strategies of carnivorous plants: I. Evidence for an adaptive response to low prey availability in the Venus' Fly Trap, *Dionaea muscipula*." The two of us (Mary and myself) are interested in the general life history of all carnivorous plants, and any information that other readers could provide would be most helpful. In particular, however, we would at this moment like to get some information on two matters in addition to that discussed within this paper: a) differences in prey taken by filamentous-leaved and spatulate-leaved sundews, and b) any information on the occurrence of leaf-like structures in carnivorous plants: when, what they look like, how regularly do they occur, etc. We have the full library search and have been combing back issues of CPN through it.

JOE MAZRIMAS writes: Did you ever hear of carnivorous seed? Neither did I until I read this report which reviews the subject. It seems like the mustard family has a plant called the shepherd's purse (*Capsella bursa-pastoris*), a very common weed in everyone's yard which seems to have seed with carnivorous properties. When this seed imbibes water, the surrounding mucilage layer hydrates, swells rapidly and bursts through the cell walls enveloping the seed with a sticky pellicle. Mosquito larvae, nematodes and microorganisms can stick to this coating. Using Azacoll, a proteinase detector molecule which releases dye in the presence of proteolytic activity, the authors found significant activity associated with the mucilage but not in the buffer in which the seeds were incubated. In their natural environment, the seeds seemed to attract nematodes which die at a significantly faster rate than do nematodes in a similar situation but lacking seeds. The ecological significance of this form of carnivory rests on the fact that seeds of *C. bursa-pastoris* are rather small and contain minimum food reserves. Also, the plant grows in semi-arid soils of low fertility. Perhaps, the presence of proteolytic enzymes acting on captured prey produces a nutritiously rich environment immediately surrounding the seed which may allow germination to take place. The competitive advantage over other nearby plant seeds from other species is obvious. Whatever the true meaning of this adaptive mechanism is, it certainly is a good example of meat coming to the mustard!

Ref.: Barber, J. T. & C. R. Page III, Mucilaginous Seed Pellicles. What's New in Plant Physiology 8, No. 6 (1976).

Thanks to STEVE WILLIAMS for sharing with us this passage from a book by Reginald Farrer titled *Alpine and Bog Plants* written in 1908:

DROSERA: Evil little things they are, with their carnivorous habit. One wonders what crime the past lives of Drosera can have held, that now their race should be compelled to draw so ominous and unpleasant a weird of murder and fraud. When will Sundews be free of the burden, through some self-sacrificing individual plant who shall starve to death rather than take life, and so redeem his race into happier paths of peace and virtue?



R. W. Lutz, Photography, Iowa City, Iowa
SEM Mag. 210X

R. W. LUTZ writes: I have enclosed a scanning electron micrograph showing the basal portion of a trigger hair from *Dionaea muscipula*. The constricted portion of the trigger hair results from a ring of specialized cells. These cells have a notch in their outer cell walls and are thought to be especially sensitive to compression or extension which would result from any movement of the trigger hair.

If your readers enjoy scanning electron micrographs, I would like to suggest that they investigate a book by Kessel and Shih entitled: *Scanning Electron Microscopy in Biology--A Student's Atlas on Biological Organization*. Springer-Verlag, Publisher. The book includes micrographs of botanical and zoological interest and includes two micrographs of *Dionaea*.

ROBERT MULLER writes: I have growing in a glass jar a *Nepenthes superba*. As an experiment, since I grow a few ferns hydroponically, I decided to try a cutting of *Nepenthes*. At first, I had no hope because I thought the cutting would rot off on the bottom. It is doing fine with some new top growth and a healthy root system. I used rain water collected from my roof downspout and followed procedures described in books for hydroponic culture with one difference. Since it is a known fact that *Nepenthes* roots should be disturbed as little as possible, I did not make the monthly changes of fresh water. I did, however, add water as evaporation occurred. Twice in the 6 months of growing, I have given a very weak feeding of ORTHO-GRO fertilizer when adding the evaporated water. So far so good. Ever been tried with success before? I don't even hope for pitchers because the humidity in my home runs around 55% in winter with gas heat and a humidifier going constantly. I hope to get another cutting started and try changing water to see what happens.

MICHAEL HUNT writes: I just recently did some CP field work north/northwest of McClellanville, South Carolina. I would like to report a very impressive field of *S. flava* and *S. minor*. Upon further observations of this site, I found *S. rubra*. I also found *P. lutea* scattered about; they were all growing in clumps. I found *D. brevifolia* and *D. capillaris*; both of the *Drosera* (species) were fairly abundant.

STEVE ROSE writes: Some tuberous *Droseras* that are found in Western Australia and where and how they grow here are listed below followed by some cultural notes on how to grow them. Some are unnamed species.

Drosera bulbosa is a sand tuber that grows in poorly drained sandy swamps that are dry in the summer.

Drosera bulbosa (hills form) This form was formerly called *D. "species" Erickson* and grown in poorly drained loams and areas in the hills. The areas are also dry in summer.

D. zonaria always grows in deep well drained white quartz sand. It can stand plenty of sun and a deeper pot than usual should be used.

D. "El Cabello Blanco" This species has no official name yet but it belongs in the *D. rosulata*, *D. macrophylla* group. It's a beautiful plant that grows with orchids in poorly drained loam only. This species has forms which are really strange since some of them produce a few or no glandular sticky hairs. The plants just come up like a flat rosette of hairless leaves and then dies back again without hassling insects.

D. microphylla This species is difficult to find but grows in shady areas with leaf mould in loamy soils that are always well drained.

D. pallida This large form grows along with *D. drummondii* in deep white quartz sand or a slight silt base. It should be planted deep in a pot.

When potting tuberous *Droseras*, use 4-6 inch pots (6" are better) and the medium should be well drained and firm around the tubers and still have moderate drying qualities when needed. Don't use terra cotta pots. The *Droseras* should be sprayed at one-half or full emergence with a systemic insecticide such as Metasystox (6 drops per pint of water). This will knock any nematodes, and this method is also helpful with pygmy *Droseras* since they will respond gratefully. I have had less rot using a systemic insecticide.

The *Byblis gigantea* colony that was under fire now shows thousands of seedlings everywhere. Most of them are found around the parents and in areas of greater moisture retention. The heat of the fire must trigger the seeds to germinate and also sterilize the soil for about 1-2" deep, which is an important factor. Perhaps the ash on the surface of the soil turned the soil somewhat neutral in pH. By the way, the seeds that germinated must have been from prior years of dispersal as the current season's seeds were unripe and destroyed in the fire. Perhaps *Byblis* seed can remain dormant for years. I expect most of the seedlings to die in the first season due to dehydration. Some are poorly advanced while others are over 6" high. Assassin bugs certainly keep the plants clean. I noticed that this plant exudes a very sweet smell which is quite distinctive. In the field, it flowers for nearly 5 months from October to the end of March (mid-spring to early fall). Its roots readily generate new plants in large numbers when the stem is disturbed or broken.

MAKOTO HONDA compliments CPN on its contents. He also informs us that a Japanese newspaper company is running a continuing series of weekly magazine features that when assembled will be an encyclopedia of horticulture. The section on CP (#64) is due in early 1977, probably January or February. Makoto has contributed some photos to the issue which will be about 30 pages, half of which will be photos with Latin plant names (text in Japanese). This can be purchased for ¥ 360 (about \$1.20) from Asahi Shimbun Publications Dept., Shimbashi, Minatoku, Tokyo, Japan. The name of the magazine is weekly SASHI-HYAKKA, SEKAI NO SHYOKUBUTSU (Plants of the World), No. 64.

ROBERT M. HAYNES writes: I currently have *N. x Dickensoniana* and *N. x superba*. Both are currently outdoors and pitching well even though it drops to below 50° at night here in Berkeley, Ca. They are in an upright plastic lined frame on casters and a Ward's humidifier mounted in the upper portion of the assembly supplies constant humidity. When I was living in the apartment on Durant St., the plants never did well even though they had daily care. Now that I have them outside, everything is working well: my *Dionaea* had small green traps averaging 1/2" long in the apartment. In 3 months, they have increased to 1-1/4" long and are bright red. The other plants have responded in a similar fashion. Also, I have been using Berkeley tap water and have experienced no "browning" or other symptoms of high mineral content. However, I do leach the growing medium every two months or so with plenty of running water and this may be the reason for my success.

At one time or another, we have all suspected the admonition that CP should not be fertilized by way of their soil medium. LANDON T. ROSS took a preliminary look at this problem. The question is whether *Sarracenias*, for instance, grow in such poor soils because of decreased competition, or are nutrients in richer soils toxic or depressant in some way. He set up four plastic pots for his experiment, each containing pure Canadian peat and buried to the rim in his outdoor bog area. Watering was by means of rain usually, tapwater occasionally. The test plant was *S. minor* divisions from the same large clone. Soil and plant modifications, and results, are as follows: (1) Draining holes of pot open, 100% peat--Plant healthy and doing well after 26 months. (2) Pot drainage holes closed, 50% peat and 50% composted sheep manure--Died after 24 months without doing well. (3) Pot drainage holes closed, 100% pure peat--Plant healthy and doing well after 26 months. (4) Pot drainage holes open, 50% peat, 50% manure--Died after 18 months with practically no growth since transplanting. It would appear that relative degree of hydration (or other factors involved in drainage or lack thereof) was not important; but soil richness was. Landon cautions against extrapolating too much from these results.

JOE MAZRIMAS and DON SCHNELL report confirmation of Don's original findings that soaking in a solution of potassium gibberellate (up to 1000 ppm, made up from either 10% or 75% salt) will stimulate germination of *Byblis gigantea* seeds. (CPN 4:66-67 1975) Don's seeds germinated on German Peat in 10-14 days in a terrarium under fluorescent lights. Joe germinated his seed in plastic petri dishes on several layers of filter paper soaked with the hormone solution. These dishes were also exposed to fluorescent lights (18 hr. on, 6 hr. off). During this period of time none of the control seed samples germinated. Neither Don nor Joe noted the seedling deformity and die-off that was reported originally. This time, Don partially covered the seeds with peat rather than leaving them lie on top. Meanwhile, Joe carefully transplanted the seeds showing a 0.5 cm. root growth to a sphagnum moss-perlite mixture where the plantlets resumed normal growth. There was no need to heat or treat the seeds with fire as in previous reports.

ROUND ROBIN LETTER EXCHANGE

TERRY BROKENBRO, 937 Laburnham Gardens, Upminster, Essex, RM14 1HX, Great Britain) started this letter exchange to help CPNers with similar interests to correspond with one another and also supply a future information source for publishing in CPN. Anyone interested in joining the exchange should write to Terry first enclosing details of CP that they are interested in. The rules are as follows:

- (1) All CPN subscribers are eligible.
- (2) Send full details of particular interests (e.g. *Nepenthes*, *Drosera*, *Pinguicula* or CP in general). Even if there is a particular interest in one species (e.g. *Drosera binata* complex) this should be mentioned so that if the demand is great enough, a R.R. could be started just for this.
- (3) Each Robin would consist of approximately 8-15 participants although more than one R.R. can be set up for any one subject.
- (4) CPN subscribers may join as many Robins as they wish.
- (5) R.R. participants should realize that in fairness to others, they should not join when there is a possibility of having to cease correspondence after a few months due to personal circumstances.
- (6) Upon receiving correspondence, this should be read and passed to the next participant as soon as possible in order to have an uninterrupted flow. Participants are invited to add any comments or information to the letter or they may choose to just pass it on to the next person on the list with a suitable explanatory note. Also, remove your letter after it has made the complete circuit.

However, please be patient while waiting for your R.R. to begin as its formation will depend upon the number of requests that have been received for that particular subject. Remember that for the price of a stamp, you will be corresponding with several growers at a maximum of every two months and learning to help your own knowledge and collection. So why not work out your own Round Robin interests and drop Terry a line today. After all, you will be helping CPN since a good portion of the information may find its way into CPN pages for others to share.

SEED AND PLANT EXCHANGE NEWS

The CPN Seed and Plant Exchange is now into its fourth year and as any organism under stress, is continually evolving to survive. The latest Exchange list contained 452 separate plant entries which include hybrids, forms, subspecies, and varieties (136 entries for *Drosera*, 70 for *Nepenthes*, 41 *Pinguicula*, 71 *Utricularia*, 114 *Sarracenia*, and 20 others). About 75% of these entries were offered for trade by one or more of the 154 participants.

In the past Bob Ziemer has coordinated the Exchange program and produced the exchange lists, first quarterly and later semiannually. Leo Song has reproduced and mailed the lists to the participants. Partly as a result of the rapid growth of the Exchange and partly due to increased printing and postage costs, the frequency of new lists has been reduced to only one list per year. This severely limits the usefulness and timeliness of the exchange information. Thus a new system is evolving.

The present CP list which listed CP that are being grown, seed or plants, to trade will now be limited to a simple inventory and will be published annually. Bob Ziemer, who has done an excellent job in the past will continue in his role to gather the data for the inventory list. Lynn Macey will handle the computer work and L. Song will publish and distribute them as before. Due to Bob's increasing work commitments and the large number of participants, the seed/plant exchange business will be handled under a different system. The coeditors feel that in the interest of fairness to Bob, a seed bank should be set up and a nominal fee be charged for packets of seed to cover labor pertaining to storage, packaging, cost of materials, postage, etc. A list of seeds available from the seed bank will be published in CPN whenever significant changes occur. We would like to solicit a volunteer to handle the seed bank: collecting donations of seed (for which the donor would be given credit in future purchases), storage, packaging and mailing, as well as the associated bookwork and notification of CPN of seed inventory.

As far as cuttings and plant exchange is concerned, this will be handled through the Want Ads. Due to the changes being made, please revise and send in your inventory as soon as possible to Bob Ziemer (P.O. Box 4562, Arcata, CA 95521). Do not remit any money. The funds sent in by previous donors will be used to defray the cost of reproducing the future lists.

If our readers have any suggestions, criticisms, ideas, etc., please write to any of the coeditors. The system as proposed above is still subject to change depending on reader reaction and further developments.

COMPUTERIZED CARNIVOROUS PLANT BIBLIOGRAPHIC SERVICE--THE KWIC SYSTEM

LYNN MACEY (511 North Eby, McPherson, KS 67460) originated this exciting new project and is managing it very well. We have seen complete printouts of all the bibliography in storage thus far and the results are fantastic. What he has done is store all available bibliographic references to carnivorous plants in citation form along with rather complete summaries where they could be obtained. The co-editors get a lot of mail inquiring into carnivorous plant literature and this service is the answer. Lynn is one of many of you who did not have access to a complete botanical library or in-depth literature citations, so he very effectively decided to do something about it. This service will not only be useful to anyone working on a specific project, but also to anyone who wishes to develop a thorough CP bibliography. There is a variety of printouts, including routine alphabetical author, genus, species, special subjects such as ecology, growing tips, etc. Lynn will send a complete description of the system along with the sample printouts if you request it and send him a SELF-ADDRESSED ENVELOPE WITH TWO FIRST CLASS STAMPS. He only charges his actual cost in postage, paper and printing--his efforts and the computer time are voluntary. By the way, Lynn soaks up new material to add to his computer storage like a sponge. Many citations still need summaries of the complete nature he prefers (even to the listing of all species in entire books!) since they are from foreign or otherwise unavailable sources, and he requests reprints of all CP material published by any of our subscribers, future, current and past. So go through those old stacks of reprints and keep Lynn in mind when mailing out reprints of any future papers. Send for his synopsis today--you will be pleased (do not forget the envelope with two stamps). Please send a legal sized or larger envelope.

Lynn considers a reference incomplete if it lacks an abstract or is not fully described with the key word items. It is better to err on the side of including too much information rather than too little. He would like copies of the article if possible and is willing to return articles to their owners if they prefer. So to those people who are publishing their research, Lynn requests reprints to keep his service up-to-date!

SHORT NOTES*FROST PROTECTION FOR DORMANT CP*

by Terry W. Brokenbro

In CPN IV, No. 4, page 58, Joe Mazrimas discussed conditions and preparations for the dormancy of *Sarracenias* and North American *Drosera*. Although these plants, once dormant, can stand extremely cold conditions, they are at their most vulnerable, as regards tender growths, during late fall and early spring. Therefore, the following points may be worth noting as regards frost protection of these growths. Once the CP are truly dormant, or risk of frost over, any coverings, etc., mentioned can then be removed.

1) Local buildings, trees, hedges, etc., can often determine the possibility of frost. For example, cold wind mixing with higher warm air can lessen the risk while an area protected from the wind would increase the possibility.

2) A light, dry soil loses heat more quickly than a heavy, compact one which will tend to draw heat from lower depths. Even in both soils, if wet, heat will be conducted more efficiently and the risk of frost reduced.

3) A badly air-drained site will lead to a frost pocket and thus greatly increase the frost risk (see diagram). These sites are usually found on a slight slope where a katabatic wind (slow moving volume of cold air) can form, which will flow like water down the slope to the valley bottom. If the drainage is blocked on route, e.g. by a high wall in your garden, a pocket can develop in which a very severe frost can develop. This can not only be dangerous to partially dormant CP, but also increase a glass house fuel bill considerably. The most famous frost-hollow (valley bottom into which the katabatic wind flows) is found in the Austrian Alps, near Vienna. Here temperatures have been recorded as low as minus 60°F, while the nearby mountains (10,200 feet plus) were a "mild" minus 2°F.

4) On a night when frost is expected any cover which can be applied over the plants will slow down the rate of loss of radiating heat and lessen the risk of frost. For example, fruit tree nettings, shading, sheets of glass and placing plants under the canopy of shrubs and bushes (evergreens) are especially effective. A mist spray used over outside plants will protect tender growths as when ice is formed, heat is released and therefore a wet surface can protect a tender growth from a minor frost. Further, it should also be remembered that there is no better insulator than snow and this should be used on any occasion which permits.

5) Even local weather stations may not be able to say whether you are likely to have a frost in your back garden that night because of varying local features such as woods, lakes or even skyscrapers which help to create peculiar microclimates. However, the following should be noted as bad signs for possibility of frost, using a few simple instruments: a) No wind, b) cloudless evening or night, c) rising barometer, d) low humidity, e) falling temperature. Yet these signs should never be relied upon 100% as it is too easy for a windy, warm and cloudy evening to change to a still, cold and cloudless but humid 3 a.m. the next morning with a severe frost.

The following may be of interest in winter glasshouse use, including those which are heated as well as unheated.

1) Clear glass is absolutely essential during winter months otherwise valuable incoming heat and light are lost.

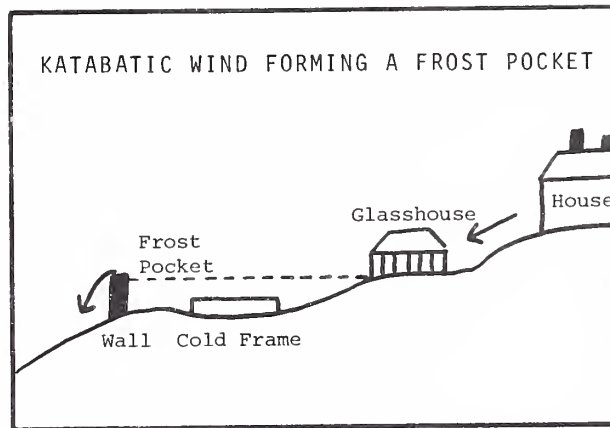
2) Double glazing is valuable especially in the glasshouse roof for cutting heat loss. During extremely cold weather, snow will also settle more readily as another bonus.

3) Even during mid-afternoon, with the sun shining, both air and soil temperatures are beginning to fall. All glasshouse ventilators should therefore be closed as early as possible and shading applied to the glasshouse roof during late afternoon (or earlier if no sun is shining) with considerable effect.

4) A couple of hurricane lamps placed in a small sized glasshouse (say 8 feet x 6 feet) will keep quite a severe frost at bay. It is not the heat itself from the lamps but the movement of air preventing the formation of frost and damaging the plants therein. Failing all else even a couple of sheets of newspaper placed directly over the plants will prevent any damage occurring during a light frost.

5) If tender plants have been subjected to frost, spray plants with cold water the first thing next morning, especially if the sun is shining.

6) Containers with dormant aquatic *Utricularias* left in them should not be prevented from having ice formed across the surface. The ice forms and floats but the temperature in the bottom mud where the winter buds lay will remain constant at about 4°C.



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A POSSIBLE ALTERNATIVE FOOD FOR CARNIVOROUS PLANTS

by Jeffrey Del Col

George Sergeant's note in Vol. V, No. 1 of CPN about feeding powdered milk to *Droseras* led me to do some thinking about other possible non-living foods for carnivorous plants. I recognize, of course, that living insects are the best food for our plants, but we must concede that live insects are a seasonal item and that indoor gardeners face special problems in feeding live insects to their plants. Probably the best live insects for home culture are the wingless or vestigial winged mutants of the common fruit fly. I formerly raised thousands of fruit flies to feed to tropical fish and am aware of the difficulties in culturing them. The cultures must be carefully maintained lest they spoil, run out of nutrient, or become contaminated by wild-type *Drosophila*. This last problem is a serious one. The wild flies quickly overwhelm the less vigorous mutants, and the person growing the flies soon has a large swarm of winged pests loose in the home.

If living insects are undesirable in the home, what other foods are suitable? Classically, raw meat and cooked egg white have been used to maintain carnivorous plants. However, proportions of these may be hard to gauge, and they must be prepared and refrigerated. My experience with tropical fish leads me to make the following proposal: we may be able to feed our plants some of the commercial freeze-dried tropical fish foods.

These foods are relatively cheap, clean, and require no care other than seeing to it that the lid of the container is kept tightly shut. An amazing variety of freeze-dried insects, worms, crustaceans and meat are available. Freeze-dried brine shrimp is the most common food, but I have purchased or seen freeze-dried daphnia, squid flakes, meal worms, mosquito larvae, beef liver and tubifex worms. All these are high protein foods with a protein content ranging from around thirty to seventy per cent protein according to the analyses printed on the containers. They can be readily portioned and even powdered for smaller plants. Because a container of these foods should last a long time, they are quite cheap over the long run.

I must emphasize that this is only a suggestion. I have done no experiments, though I plan to this summer using *D. rotundifolia*. One possible drawback to brine shrimp may be a residue of salt that could harm the plants. No sodium content was listed on the labels I have checked, so research is needed to discover how much salt is in brine shrimp and other freeze-dried foods. I hope other CP enthusiasts will be willing to try some of these foods. Only by experiment can we know if they are a convenient and beneficial food for our plants.

SEEKING THE PYGMY DROSERAS

by Steve Rose

Many of the plants that I will describe are new species and forms and have yet to be named by botanists. I have seen these plants growing in their native locations and so flower colors and locations will have to suffice as means of identification. It's rather confusing, but it's the only way to identify the plants so far. Locations are in quotes.

"TOODYAY" PINK. This plant grows in heavy ground silt, a sandy clay and rarely in sand with wetter ground than for *D. miniata* and *D. platystigma*. The flower color in 4 locations is much the same but color intensity changes as well as a very slight stipule shape. It likes to grow in open areas between bushes that have roots in moist ground all year. It is late to go dormant and I have seen it in a sandy swamp with "MUCHEA" pink (see below) and *D. nitidula*. I grow it in sand and peat mix, and it grows easy and flowers well. I can even keep it in water all the time, and it grows even in summer. It goes dormant after flowering as with most pygmy *Droseras*.

D. platystigma (common). This is an easy and best variety of plant that grows in heavy gravel country with dry summers and late dormancy. It's never found in wet ground like the Albany variety, but I grow it in a sandy-peat mix or light gravel and peat. I stand it in water all summer.

D. miniata. This is a common and easy plant to grow in sand-peat mix. It dries out in summer and has a late dormancy. I stand it in water in summer, and it seems to grow alright. It naturally grows near or with *D. platystigma* and produces gemmae very well.

The "MT. MANYPEAK" type. A robust species that grows quite large in heavy gravel where it is very windy and dry. The leaves, nevertheless, remain sticky which is amazing considering the conditions. It has large purple-pink flowers and a late dormancy and prefers to grow in dry, rough conditions rather than in sand. This plant is similar to *D. drummondi* and seems to be part of a group of 2-3 species and related to a few from Albany and 1 or 2 from Gidgegannup. The plants grow tall and send out aerial roots. I grow in washed gravel on the surface and a sandy peat mix underneath. I found some down in Albany with gemmae buds in summer which is 4-5 months out of season, but they grew well after rooting and take about 6-8 weeks to establish.

D. nitidula. This is a highly unusual robust and giant type of the species with the possibility of it being a new species. It grows in the Cannington swamps and I grow it in a peat-sand mix and allow it to stand in water in summer. It takes similar conditions as the common *D. nitidula* and *D. pulchella*.

Big *D. leucoblata* is the most unusual and beautiful because of its brilliant metallic orange flower with a dark brown center. Another form has an even larger flower which is bright yellow and may be a new species. It is easy to lose because of rot, and I have much difficulty establishing them. It grows in sandy conditions unlike other forms and is late to go dormant. Although the ground is dry in summer, I prefer to keep them damp and shaded, and some seem to survive. Gemmae derived plants will be easier as they can become conditioned much more easily. Again, I use a layer of washed sand on the surface and a sand-peat below.

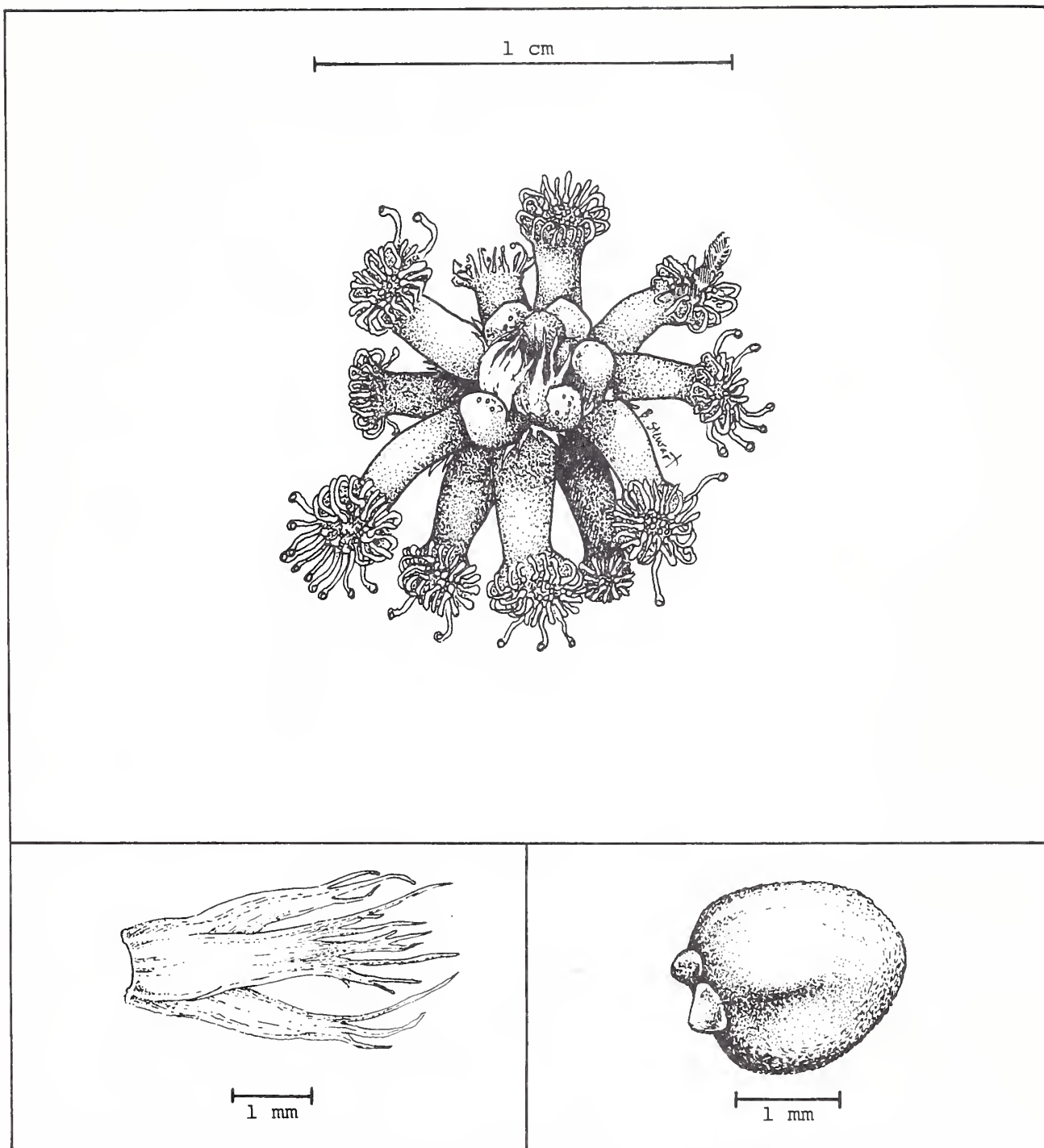
(Ed. I use Benlate spray on all pygmy *Droseras* before planting them and follow this procedure up with another spray over the plants and medium about 7-10 days later. As a result, I have cut down on the number of plants which succumb to rotting by a considerable amount. J.A.M.)

D. pyenoblata is a pygmy plant that grows in deep sand in a desert with semi-arid conditions. It produces a large dormancy bud and sometimes grows with big *D. leucoblata* and other forms. Although the plant rots easily in cultivation probably because it can't adjust readily to summer watering which is necessary to survival in pots, I manage to grow some in the sand on the surface and sand-peat mixture underneath method, but one needs some luck in growing it.

"MUCHEA" PINK species from Seven Mile swamp Gingin is a fairly easy one with pink flowers and has a very late dormancy or not at all in some locations. It's a golden green plant that seems easy to grow in just a sand-peat mixture.

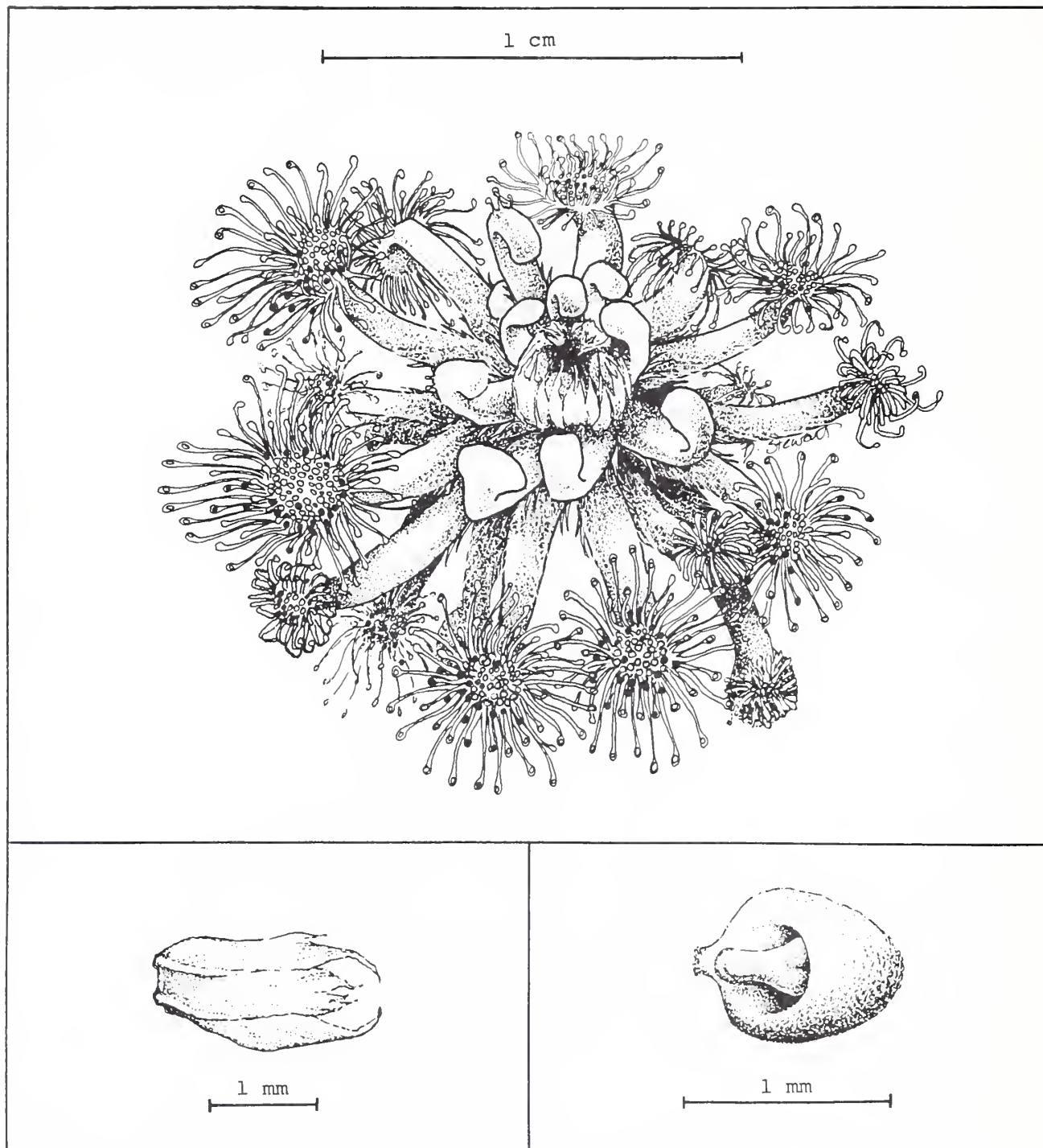
D. leucoblata. This is the common type which is very variable under all different conditions. I found this species growing dry in loam, sand, clay and gravel. It has an early dormancy and its flower is plain orange or a bright orange-red color. Some forms even have very pale flowers (Wongan Hills) but all seem to have the same consistent stipule shape. The extreme forms differ in stipule shape. I find this one hard to cultivate, especially with some forms, but others grow with 50% survivors. I have some in plain dark peat moss in water, and they grow alright, while others are dormant out of water and remain so regardless of watering but remain green. A change in temperature may induce awareness.

Drosera "Bannister"



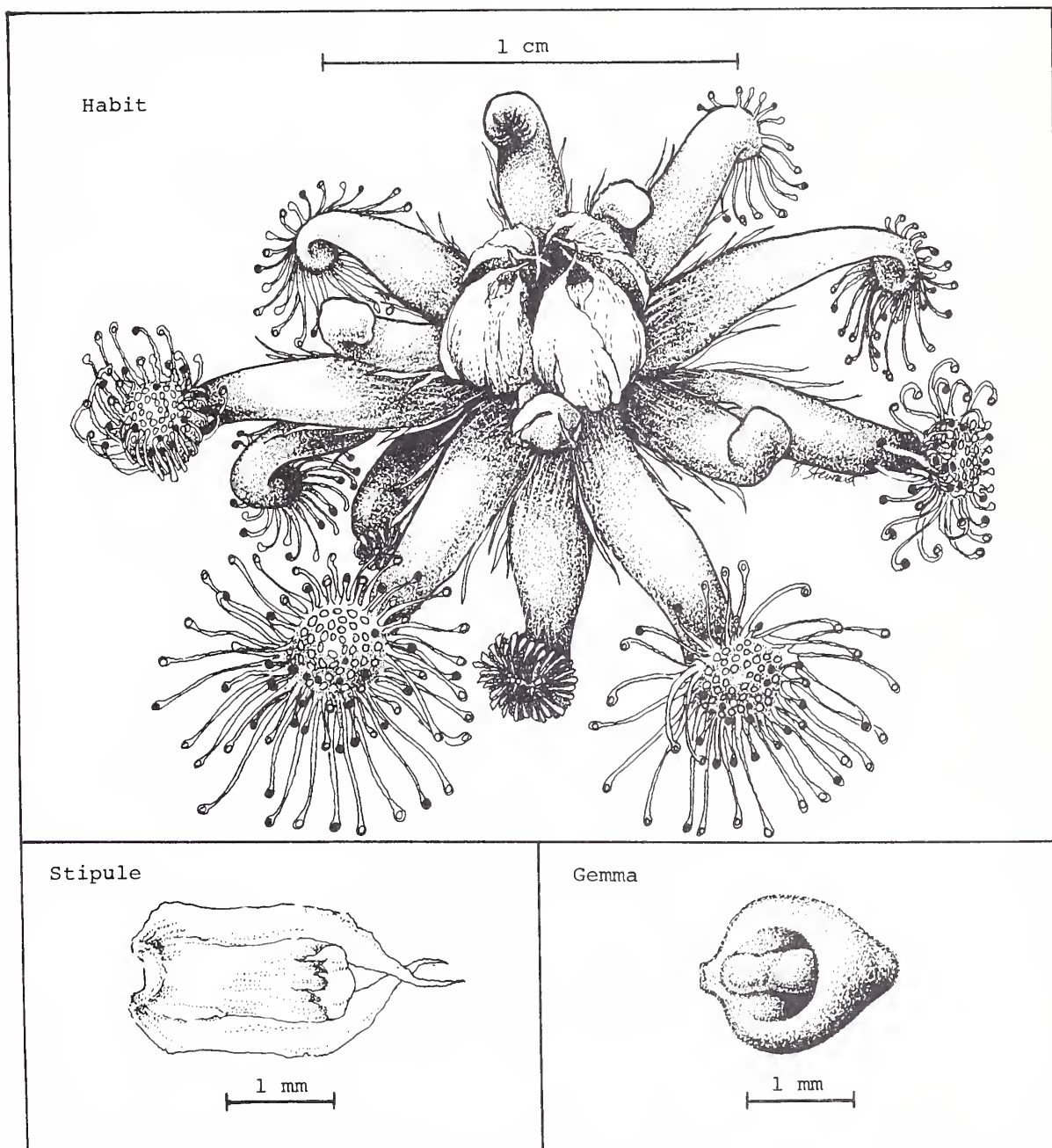
(Drawing by Barbara Stewart)

Drosera palacea



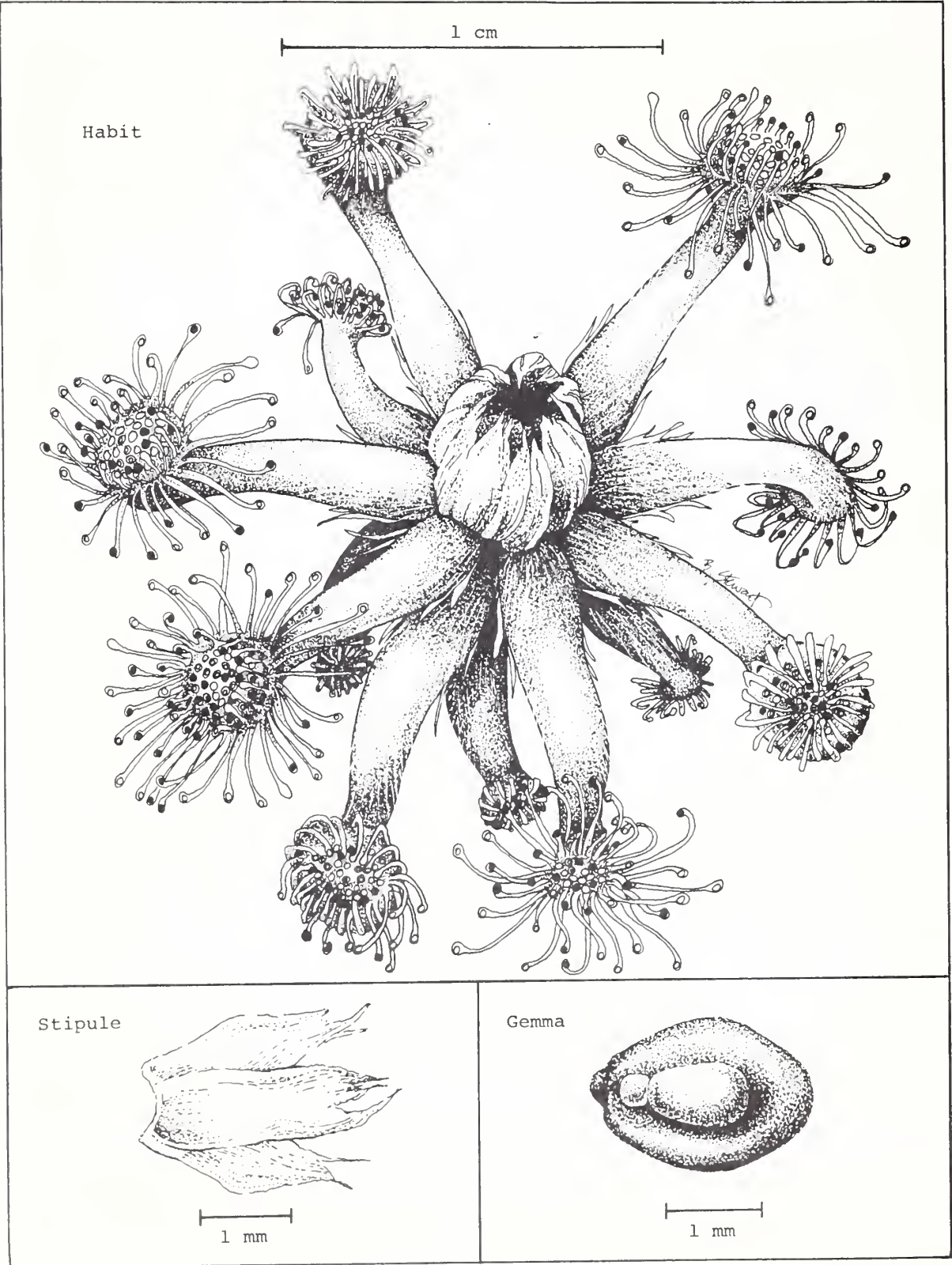
(Drawing by Barbara Stewart)

Drosera platystigma



(Drawing by Barbara Stewart)

Drosera scorpioides



(Drawing by Barbara Stewart)

Variable *D. platystigma* from Chittering may be a new species and grows quite easily in heavy gravel--an ironstone gravel. It is cultivated easily, and I keep mine standing in water in a sand-peat mix.

YELLOW-FLOWERED *DROSERA* from Regans Ford (Gingin). This plant was found four years ago and remains unnamed today, but it grows in deep yellow-white sand sometimes with *D. paleacea* nearby but never together. It has an early dormancy and sports a nice pale-bright yellow flower. I grow it in washed sand surface by pressing the buds into the sand, and it's kept moist, not wet. I lost 80% of my original collection, but it was made at the wrong time.

EXTRA LARGE "MUCHEA" PINK. This plant grows in peat moss in shade and grows very robust in only one small location by a spring in thick bush. It does not like hot, sunny conditions but flowers very well showing large flowers on multiple stalks (about 4-6). I grow mine on sawdust in 3" pots that sit in water, and the leaves stay sticky and may go dormant but should not go altogether.

LAKE "BADGEBUP" WHITE FLOWER. A new species that's easy to grow which grows along with *D. nitidula* by the lake's shores in sand the little black peat. It's also associated with *D. pulchella* and seems to look like a hybrid of *D. nitidula* and *D. occidentalis*, but I cannot find *D. occidentalis* in the area as yet. It's easy to grow in sand-peat mix and does not seem to grow so well in straight peat. The pot is stood in water in summer. The single white flower have an unusual blood-red clubbed stigma which is very uncommon in this kind of *D. occidentalis* group which has about 3-4 new species in addition to the old ones.

"BANNISTER" PALE PINK. A very new species also easy to grow in most conditions even in pine leaf mold on the edge of a pine forest by the road's side. Found in fairly damp creek sides, wet hollows and some remain growing all year as others go dormant. Mine stand in peat-sand mix in water. Plants get a deep red with nice pink flowers with strange stigmas that look boat-shaped.

"WALYINGA" PINK. These plants like the dry conditions of *D. platystigma* but will also grow in sand. Mine have all gone dormant except 2-3 gemmae forming plantlets late in season. It needs a dry summer and grows a nice metallic pink flower which leads me to believe it's a new species. I use a sand-peat mix, but it doesn't respond favorably, and many are lost.

ORANGE FLOWER--"BROOKTON". It may be *D. leucoblata* but the main difference is that it is underwater some time of the year. This one grows in a sand pit in deep white quartz sand with *D. zonaria* and *D. miniata* as well as in wetter places with *D. nitidula*. If it is *D. leucoblata*, then it is the only form so far which will cultivate readily standing in or out of water or in a variety of mixtures. I use a sand-peat mix and do not stand in water until established.

D. scorpioides. Found in Albany and grow as *D. nitidula* in peat moss and sand mix or chopped sphagnum. Plant them deep but leave the plant above the surface and plant will find its height of growth according to moss growth. Grow in light shade and needs patience to establish.

SMALL PINK--"NORTH BEERMULLAH". This new species is part of the *D. occidentalis* group. The best plants are grown in peat moss and/or sand/peat mix standing in water and part shade. Too much sun will lead to dehydration, especially in W. A. This species flowers freely and has a small, single pink flower.

D. pulchella--ORANGE FLOWER. This species is the same as the ordinary one but differs in flower color. There are now four color forms of this species: dark pink, pale pink, apricot and orange.

D. androsacea. This unusual species grows in many areas and conditions of soil, but it does best in sandy loam, so use a sand/peat mix for cultivation. It has an early dormancy, and it's hard to keep growing, but gemmae plants may stay sticky longer and may not go completely dormant. It's found associated with *D. pycnoblata* and *D. leucoblata*.

SOME GENERAL NOTES ON PYGMIES

by Steve Rose

When trying to establish the pygmy *Droseras* in your collection, there are several do's and don'ts. First, don't allow the plants to dry out at all and never give them too much sun. Second, never let them stand in water unless they are the swamp kinds like *D. pulchella*, *D. occidentalis*, white flower "Lake Badgebup," small pink "North Beermullah" and *D. nitidula*. Also pink flower "North Bannister" and extra large "Mucnea" pink can stand in water. Third, never water with a heavy spray or hose since sand can splash onto the leaves of the young plants and over-stimulate the leaves with loss of overall power of the plant trying to digest the sand as well as peat moss. I use a syringe and water between the plants and NOT on top of them.

I use fish tanks with lids and find this to be really good. Deep pots should be used for the sand and gravel growing kinds with a minimum depth of about 12 cm. (about 5 in.). The swamp ones are planted in a container with depth of 6-8 cm. (about 3 in.) and standing in about 1.5-2 cm. of water (3/4 in). I use only deionized or distilled water to prevent algae and scum build-up on the surface as most pygmies DO NOT grow in mossy areas but in clean, washed gravel sand conditions which are even free of visible humus.

Pygmy *Droseras* are worth the fuss and experiment. I have some unusual cases. *D. drummondii* is growing in live sphagnum moss in water and many seem to do well in sawdust in water or not or in *Pinus pinaster* leaf mold and sand. Others are in washed river sand, in washed quartz gravel (no humus) and many in straight peat moss (sand growing ones). Only a full growing year can tell of success.

In summer keep the plants shaded and humid except the one from Manypeaks.

When washing sand, I use ordinary water and wash until all fine silt has gone. Finally, rinse with deionized water and then mix in sieved peat moss. My mixes are usually about 2 parts sand to one peat, or less peat depending on species. I also knock the pot on the ground to settle the contents so that excess air is driven out. Then the surface is firmed down to bond the sand the peat so that watering the peat does not float over the tiny plants.

Regarding light, be your own judge since some prefer more shade than others, and I prefer to have a green *D. pulchella* than a dead red one. This even happens in the bush.

When the gemmae buds come or appear, sow them on a looser surface soil to enable root penetration and be careful not to ROT them. Some may have to be urged into the soil. Usually gemmae derived plants are stronger and cultivate more easily than collected mature plants by far. Certain species may only be cultivated this way.

NOTES ON A TRIP TO NORTH CAROLINA

by Les Kaufman

I must have been about eight years old when my father first brought home a Venus fly-trap, and since that time it had remained a favorite daydream to go and see what they looked like in nature. Recently the dream was realized under the aegis of science, as I visited Beaufort, North Carolina, to continue work on the foraging of carnivorous plants. The science will have to wait until the data has been analyzed; here I wish to communicate my concern over the plants' survival based on what I saw in late October, 1976.

Most of my work was concentrated in a triangular region bordered by US Routes 24, 70, and Nine Foot Road. Within this area, one of the sites chosen for study coincided with a study area used by Roberts and Oosting in their classic treatment of *Dionaea* (1958). This, a small pocosin bordered by longleaf pine and sandy savannah, was still infested with *Dionaea* twenty years after their published work, and is today marked by a neat wooden marker, apparently erected by the University of North Carolina. The region along Nine Foot road is peppered with sphagnum dishes, mud pans and ponds, all inhabited by *Pinguicula*, *Drosera*, and *Utricularia* ssp., but the distribution of *Dionaea* is more closely related to older drainage ditches and logging roads than to its original habitat, the border of pocosin and drier savannah. Controlled burning, against a grid of old ditches and pocosin, will insure the survival of this plant on private and protected lands in this region. The private owners I met were aware of the need to protect *Dionaea*, and were extremely helpful in pointing out locations so long as I promised not to dig the plants up in large numbers. One nursery owner I spoke to, however, was surprised that I was purchasing *Sphagnum* when I could dig it up in the woods with as many flytraps as I wanted, just as they had been doing for years. They obligingly directed me to one of my recently chosen study areas, on private land, where they said they "always went to get them (flytraps) for selling."

Ranger Jan Smith of Camp Sam Hatcher was a refreshing new face. The tract of land he manages for boy scouts and other camping groups is a stronghold for *Dionaea* and other carnivores, including *Sarracenia flava* and *S. purpurea venosa*. To my surprise, I found old ditches running through second-growth woods to be filled, not only with *Sphagnum*, but with robust *Dionaea*, many with a strong tinge of red in the traps, and old withered flower scapes at their sides, all in what seemed like deep shade! Roberts and Oosting (1958) were of the opinion that *Dionaea* populations were viable mainly in their restricted ecotone, and that other populations were peripheral and of low reproductive potential. I am anxious to return to the wooded ditches in the spring and early summer, to estimate seed set in this "peripheral" (but increasingly widespread) artificial habitat.

As I poked about other potential CP sites, I made mental note of the kinds of disturbances that were going on, and tried to guess their effects over twenty or thirty years. Through some economic scenario that escapes me, mobile home parks are sprouting like weeds in the middle of nowhere. Medium-sized tracts of magnificent savannah are being destroyed with no apparent long-range planning in mind.

One afternoon I was lucky enough to accompany an employee of the Duke Marine Lab on a trip to the Open Grounds. This 45,000 acre tract of longleaf pine and pocosin is now slashed by V-shaped drainage ditches approximately two meters deep, sometimes deeper, cut through the wilderness to lower the water table in preparation for using the land as pasture. After the ground has oozed for nearly a year, bulldozers push the dying vegetation into long piles, and the ground is burned and limed. The scale of this transformation is beyond belief; in the words of one ranger at Croatan, the activities at the Open Grounds "look like somebody's garden" compared to two other tracts of land, larger by an order of magnitude, where the unique heathlands of North Carolina are also going to make more cows.

North of the Open Grounds is a tract owned by a paper company. A brief foray along the edge of their property revealed an abundance of *Drosera*, including some of the largest *D. intermedia* I have ever seen. I would guess that the central regions of the paper company's land will retain a high enough water table for CP's as long as the land is under present ownership . . . but it was a gnawing question during the whole trip: I simply didn't know the fate of the land, and my stomach turned at the thought of such a vast, unspoiled wilderness being transformed into farmland without a careful evaluation of the relative merits of agriculture versus a kind of wilderness that is not duplicated anywhere else in the world. The night before I left to return to Baltimore, I was browsing through the county library in Beaufort when I came across a book written in 1932 by B. W. Wells, *The Natural Gardens of North Carolina* (University of North Carolina Press, Chapel Hill). Here was a photograph of the Open Grounds at least forty five years earlier, pictures of flowering pocosin and savannah in all seasons, and a small complex of buildings representing an experimental agricultural station. I was struck by a sense of collapsed time, and the clear impression that Croatan is all that will remain of the coastal plain ecosystems unless there is a quick reappraisal of priorities.

Meanwhile, thousands of acres of bogland with scattered patches of *Sarracenia* are being "reborn" in another world. Perhaps we should obtain permission to explore these areas, and collect those plants which are valuable for scientific study and esthetic appreciation . . . we should at least get a grip on the doomed.

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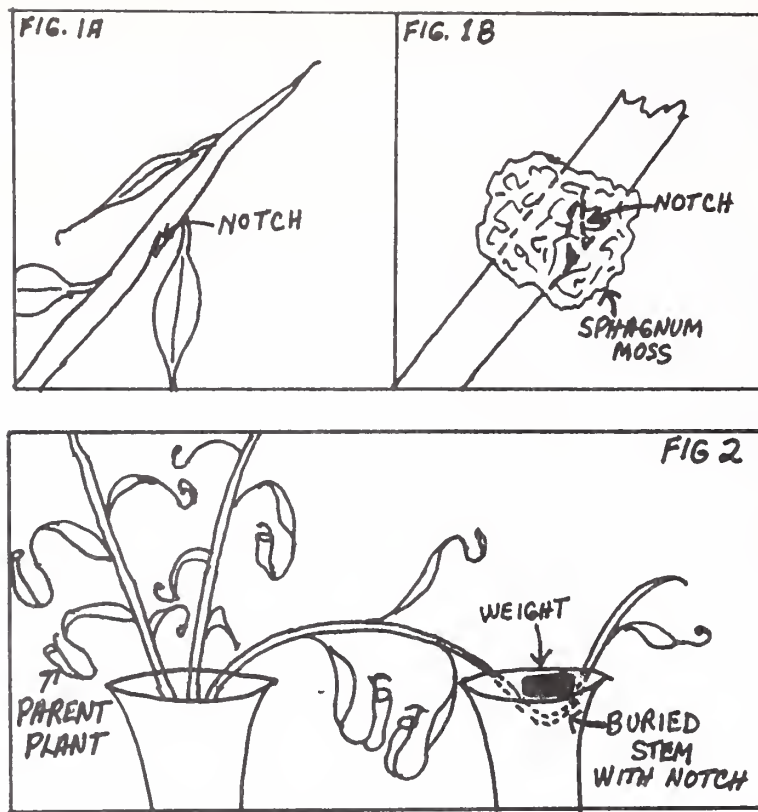
PROPAGATION OF NEPENTHES BY LAYERING

by Terry Brokenbro

Through personal correspondence, I have noticed that some CPNers (including myself at times) have trouble propagating *Nepenthes* from cuttings. During hot, sunny weather, plants (cuttings) and compost will often dry out far too quickly while at the other extreme, the compost stays too wet for too long and so the dreaded rot sets in. Therefore, for those "heavy handed" CPNers who have problems, the following two propagation methods may be of some help. Soil layering is probably the more successful method although the air method is best for those with less room available.

AIR LAYERING:

First, a mature branch (without formed pitchers) is selected for propagation. A section of leaves are removed and the stem is bruised by twisting and/or cutting a notch in it. This will then reduce the sap flow and promote the formation of roots. Rooting hormone powder is then applied to the area and sphagnum moss wrapped around the wound and a plastic bag applied. (See Fig. 1a and 1b) In one or two months fine roots should then be seen through the plastic bag which can then be removed and the top plant section potted. This method is often used by professional nurserymen for the propagation of rubber plants (*Ficus elastica*) on a large scale.



SOIL LAYERING:

This propagation method is similar to the above method except that it is usually more successful because not only is the stem bruised but also propagated at an angle thus making rooting much more likely. A suitable, supple branch is selected which can be bent into an adjacent pot containing normal growing medium and without detaching from the growing plant. (See Fig. 2) A weighted object is then placed above the bent stem to hold it in place and removed in approximately one to two months. Test the new plant by gently lifting it with a pencil and when roots are visible on the damaged portion of the stem allow the plant to re-establish itself by growing on for two to three weeks, when it can be detached from the parent plant and grown on by itself in the normal way.

ON THE FORAGING STRATEGIES OF CARNIVOROUS PLANTS:

I. EVIDENCE FOR AN ADAPTIVE RESPONSE TO LOW PREY AVAILABILITY IN THE VENUS' FLY TRAP, *DIONAEA MUSCIPULA*.

by Les Kaufman and Mary Schwarzbeck

Abstract

Young Venus' Fly Traps which were protein-starved produced significantly greater numbers of traps, and held a greater proportion in operating condition, than plants which were fed on hamburger. In nature, such a response might increase the probability of capturing prey when prey are scarce.

Introduction

Animals, by virtue of their mobility and behavioral capabilities, can correct deficiencies in energy or protein by looking for an appropriate source. Hummingbirds, for example, can balance nectar against insects; bees, nectar against pollen; humans, potatoes and gravy against beef. Carnivorous plants must also face periodic variation in the availability of protein in the form of insect carcasses, and one would expect selection for plants with some way of maintaining a balanced diet. (By "balanced diet" we mean an optimal rate of acquisition of potential energy/protein for a given set of circumstances). On the habitat scale experienced by the tiny plants of the genus *Dionaea*, prey availability is likely to vary considerably from place to place and week to week throughout the growing season. Presumably, such a plant might better its chances of obtaining sufficient

nitrogen for continued growth and reproduction by setting higher numbers of traps where and when prey are relatively depauperate. In fact, it would make good sense for many kinds of carnivorous plants to be able to vary the number of functioning traps at any given time. We therefore hypothesized that if two groups of Venus' Fly Traps were grown under identical conditions, except that one group starved while the other fed, the "hungry" plants should produce significantly higher numbers of traps per plant than those that had been fed regularly. In addition, we wished to investigate the effect of shading on trap production in starved and fed plants.

Materials and Methods

One hundred small bulblets of *Dionaea muscipula* were obtained from Peter Paul's Nursery in Canandigua, New York. These (which, by the way, arrived in excellent condition) were planted in late May, 1976, in an all-glass aquarium. Soil consisted mostly of dried sphagnum cut with smaller amounts of perlite and fine silica sand, to a depth of about five centimeters. The tank was divided into four quadrants, two of which (in opposite corners) were shaded by taping double-thickness computer printout paper on the tops and sides. After planting, the tank was installed in the University's greenhouse. At the flip of a quarter, it was decided which plots would be destined for feeding and which would be starved. Most extraneous insects were kept out by a glass cover, and would have probably reached all plants with frequencies independent of the experimental treatments. The experiment thus took the form of a 2 X 2 factorial analysis-of-variance with, when terminated after six weeks by vandalism, the following numbers of replicates:

	Fed	Not Fed
Full Light	25	22
Shade	25	24

Each week for six consecutive weeks the numbers of traps in three stages of development were tallied for every plant, as follows:

- Stage 1: developing trap; spines not yet visible.
- Stage 2: trap developed (spines distinct) but nonoperational
- Stage 3: trap fully developed and operational (will close when stimulated).

Each week, all open traps in the groups designated for feeding were offered small bits of hamburger and stimulated to close.

Results

Some time after the sixth-week measurements were made, the experiment was destroyed, but most of the plants were rescued and are in good condition, awaiting repeat of these experiments.

A 2 X 2 factorial analysis-of-variance (ANOVA), several one-way ANOVA's on mail effects, and a few nonparametric tests were carried out on sixth-week data. The ANOVA's are suspect because variances of the four populations were not homogeneous. The reader with a statistical background is invited to readjust the data, as presented in Table I, such that all of the basic assumptions for ANOVA are met. The data provided are a random sample of the entire populations yielding equal numbers of observations for each treatment group, which vastly simplifies many statistical calculations. We will gladly provide more information to anyone wishing to play further with our results.

From our observations and analyses of the data, we have reached the following tentative conclusions:

- I. The Venus' Fly Trap will produce more traps when it is starved than when it is fed (Table II).
- II. The proportion of traps in stage 3 (operational) is higher among starved than among fed plants (Table III and Figure I).
- III. The differences between starved and fed plants are partially obscured (though still significant) when the plants are grown in the shade (Table II).

Discussion

Our experiences in carrying out this experiment support the *a priori* hypothesis that at least one species of carnivorous plant varies the number of set traps according to prey availability. Further conclusions must wait for repetition of the experiment under more rigorously controlled conditions and over a longer period of time. The next experiment will also include controlled reversal of treatments. Many readers may, however, have relevant data or anecdotal observations bearing on these and related hypotheses, and such contributions would be most appreciated.

Conclusions

It is possible that *Dionaea muscipula* can balance its diet by varying the number of functional traps on each plant. Similar experiments to the one described above should be carried out with other carnivorous plants that set many small traps at frequent intervals (e.g., *Drosera* ssp., *Utricularia* ssp., fungi) to seek patterns in the "foraging strategies" of these plants.

Acknowledgements

We thank Paul Ringold for his random quarter, and Mel Sambol for his photography. This research was supported in part by the Department of Earth and Planetary Sciences, Johns Hopkins University.

TABLE I: Number of traps/plant in four experimental populations of *Dionaea muscipula*.

Count	Fed Plants		Starved Plants	
	Light	Shade	Light	Shade
1	5	1	9	9
2	3	5	11	1
3	2	6	6	6
4	7	7	8	6
5	1	5	5	4
6	7	4	9	3
7	6	5	6	3
8	3	5	7	4
9	3	6	8	5
10	2	6	0	3
11	4	5	8	5
12	5	3	7	5
13	4	0	8	7
14	5	6	10	7
15	0	5	12	7
16	2	0	9	4
17	4	7	8	0
18	1	0	7	7
19	3	0	7	2
20	7	7	8	1

TABLE II: Mean numbers of traps per plants in four populations of *Dionaea muscipula*.

	Full Light	Shade
Fed	3.7	4.15
Starved	7.65	4.45

TABLE III: Proportions of traps in three stages of development.

	Stage 1	Stage 2	Stage 3
Fed in Light	21%	21%	58%
Fed in Shade	18%	24%	58%
Starved in Light	13%	10%	77%
Starved in Shade	18%	14%	78%

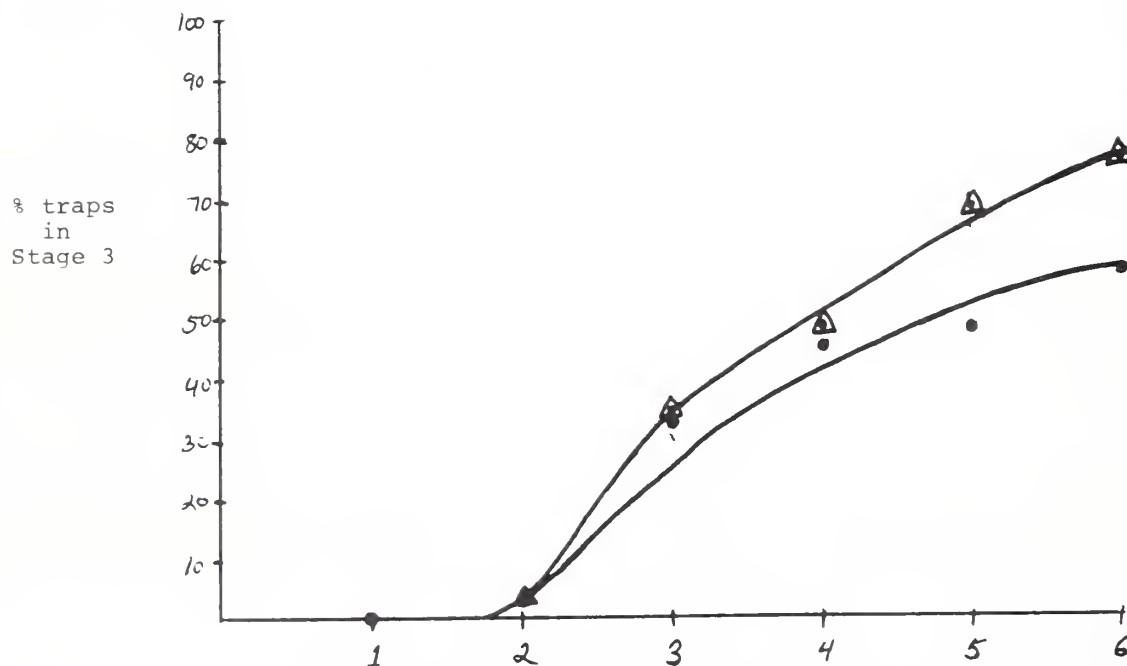


Figure 1: Proportion of traps in Stage 3 (fully operational) in two populations of *Dionaea muscipula*, over six weeks.

• (lower curve) Fed in Full Light
 Δ (upper curve) Starved in Full Light

BOTANIST'S CORNER

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"Confound it! Another plant name change. No sooner do I learn a plant's scientific name than those botanists have to go and change it. Why do they do it?"

This seems to be a common situation for laymen who are seriously interested in plants and who make an effort to learn their Latin names. Indeed, to many people the mere thought of hearing, much less learning, a long Latin name is enough to make them lose confidence, and interest. While it may be true that some Latin names are long and seemingly unpronounceable, there are quite a few with which we have become relatively comfortable as common names, such as *Rhododendron* and *Chrysanthemum*. I must admit that even I have had some trouble pronouncing and getting used to such carnivorous plant names as *Poly-pompholyx*!

Many laymen would prefer to stick with common names for all plants which they encounter, and this may suffice in many instances where the common names and the plants are unambiguous. Such may be the case when referring to *Utricularia* as bladderworts. However, this brings us to one of the real reasons for writing this article, and one of the most belabored topics in botany with which laymen

and professionals alike are constantly confronted. That is, the fact that common names are most often not precise enough to specify the exact plant to which you may be referring, at all times and all places. Because they are products of local usage and folk taxonomy, several common names may have originated which refer to the same plant in different parts of the country; the same common name may equally be applied to different plants in different regions. A familiar example which would encompass both situations just mentioned would be the common name for the genus *Sarracenia*: Pitcher Plants, Trumpets, Fly-traps, Huntsmen's horns, Bog-bugles, Dumb-watches, Watches, Eve's Cups, and Buttercups. Depending on which common name you use, you may or may not have a clear idea of what is being referred to; believe me, you may just run into any or all of these names if you talk with country folks in the regions where these plants grow. As you may know, Buttercups are generally members of the genus *Ranunculus* (related to larkspur and clematis); but they may also be members of the genus *Narcissus*, and may be called Daffodils. Fly-traps may, of course, be referring to *Dionaea*, Venus' Fly-trap. You see how confusing it can become. Of course, common names will always be used, and I am definitely *not* against them (because they are colorful and usually descriptive); but we must recognize their limitations and try to understand that scientific names should be used in conjunction with common names, especially in writing, in order to avoid ambiguity and misleading information.

Now that we know that the exclusive use of common names can lead to confusion, let us go back and examine the purpose for names in the first place. The purpose of a name, *any* kind of name, is to facilitate communication, to aid in talking and writing about something. It allows us to refer to a specific thing without having to go through a long description. It seems logical, then, that for a name to fulfil its designated use, it must apply to only one object, no matter who uses the name, and conversely, that object must have only one name. Thus it is with scientific names, which enable us to track down all available information about the plants we may be interested in. In order that scientific names may be made and used correctly, the International Code of Botanical Nomenclature (ICBN), which should be accepted and followed by all legitimate botanists and laymen the world over, sets forth the rules which govern the formation and usage of all scientific names of plants (except strictly cultivated plants, which have a separate code). This should lead to a certain degree of uniformity and stability.

A little bit more background might be appreciated before we get on to our main concern of name changes. Scientific names are, of course, in Latin. This is specified by the Code and must be used the world over no matter what other languages or alphabets are used (this is because Latin was the language of European scholars during the 1600-1700's when botany was becoming a formal science). Thus, we would be able to recognize the Latin name of a plant in a book written in Chinese, Japanese or Russian, even though the rest of the text would be in an unfamiliar language *and* alphabet. Just think about the poor Japanese botanist who not only has to learn some Latin grammar and meanings, but who also has to learn the Roman alphabet with which we are automatically familiar!

As a result of our acceptance of the *binomial* ("two name") system of nomenclature developed by the very famous and important Swedish botanist Linnaeus (1707-1778), the scientific names of plants consist of basically two words, the genus name and the

specific epithet (often erroneously called the species name). For example, the scientific name of yellow pitcher plant is *Sarracenia flava* (Latin names are always italicized in print, or underlined in writing and typing). *Sarracenia* is the genus, or generic name; *flava* is the specific epithet, and grammatically it is an adjective modifying the generic name. *Sarracenia flava* is thus the name of the species, or one particular type of the several pitcher plant types in the genus *Sarracenia*. The species name, which may be abbreviated *S. flava*, is made up of a combination of the generic name and the specific epithet. (The family name, the category to which genera belong, in this case would be the *Sarraceniaceae*, or pitcher plant family. It is analogous to the Smith family, with its members Smith, John; Smith, Judy; and Smith, Johnny analogous to the scientific name *Sarracenia flava*). Hopefully both parts of the scientific name will convey some useful or interesting information about the plant it represents to help make it easier to remember. In this case, *Sarracenia* is the Latinized form of the man's name, Sarrazin, who first discovered the purple pitcher plants in Quebec about 1700; *flava* (correctly pronounced fla'-va, both a's as in car) is Latin for yellow. There are rules for Latin pronunciation, but they are sometimes disregarded in favor of personal preference. In general every letter and every syllable is enunciated, with emphasis on the third from the last syllable. For additional information on the meanings of the scientific names of some CP's see Don Schnell's new book on the CP of US and Canada.

In some cases species may be broken down into subcategories which may be designated as subspecies, variety, or form; and a certain plant may thus have a name consisting of three parts, such as *Sarracenia purpurea* subspecies (abbr. ssp.) *venosa*, the southern counterpart to the northern *S. purpurea* ssp. *purpurea*. In this case, the species *S. purpurea* is considered by many to contain two recognizably different types. While I personally believe that these additional categories have specifically defined applications, their use can be quite controversial, arbitrarily applied, and otherwise questionable because the rules do not govern their exact application; but they do exist among CP names, and you will run across them constantly.

We will not go further into the intricacies of the Code as it applies to the definitions of names. For an excellent discussion of this subject see C. Jeffrey, 1968. *An Introduction to Plant Taxonomy*, esp. Pp. 62-93.

REVIEW OF RECENT LITERATURE

- Anon. (We would be, too!) 1976. Venus Flytraps. Science Digest, Dec., p. 81-2. This is the sort of few paragraphs one should avoid and is herein reviewed as such. Typical of most of the "Digest" type magazines, and in an effort to be "cutesy," the paragraphs are full of misinformation and misguidance for those who are likely misguided already. One gains the impression that the plant trots about the house like the family cat, fending off vermin. One also learns that when he goes on vacation, he should simply put his plant in the refrigerator. One also wonders if he or she should be angry or just sad over this sort of trash.
- Berglund, E. R. & A. C. Mace, Jr. Diurnal albedo variations of black spruce and sphagnum-sedge bogs. Can. Jour. For. Res. 6(3):247-252. 1976. Light measurements on two types of bogs were taken in northern Minnesota, USA. The black spruce stand's diurnal albedo was parabolic with a maximum at 1200 h (7-8%) and decreased. Greatest variation was in the summer months. The sphagnum-sedge type bog showed a M-shaped diurnal variation with minimum at 1200 h between two maxima. Maxima occurred as a result of specular reflection and changes in solar radiation quality.
- Carlquist, S. Wood anatomy of Roridulaceae: Ecological and Phylogenetic implications. Am. J. Bot. 63(7):1003-8. 1976. The wood anatomy of *Roridula* (a non-carnivorous plant) is compared to *Byblis* and found to have very similar secondary xylem features. The author feels it should be excluded from *Droseraceae*.
- Chandler, G. E. & J. W. Anderson. Studies on the nutrition and growth of *Drosera* species with reference to the carnivorous habit. New Phytol. 76(1):129-41. 1976. *Drosera whittakeri* was grown on sand with inorganic salt solutions lacking either nitrogen, sulfur, phosphorus or microelements. Application of fruit flies to the leaves were applied to plants growing on media deficient in P or microelements, there was no effect on growth but the phosphorus content of the plant increased significantly. Insects could not serve as a carbon source for photosynthesis. The best growth of *D. binata* and *D. whittakeri* occurred on plants fed fruit flies while growing in a nitrogen deficient medium. Nitrates in the nutrient medium inhibited growth. Optimum growth of these *Droseras* was not achieved by growing plants on complete nutrient solution in the absence of insects. Phosphorus was very important in the tuberous *Drosera* both for early emergence and for development of new rhizomes on which new tubers formed.

- Chandler, G. E. & J. W. Anderson. Studies on the origin of some hydrolytic enzymes associated with leaves and tentacles of *Drosera* species and their role in heterotrophic nutrition. *New Phytol.* 77(1):51-62. 1976.
Extracts of the leaves of *Drosera whittakeri*, *binata* and *auriculata* had protease activity over a very wide range of pH optima. These were taken from field plants. However, only distinct pH optimum of proteinase activity (pH 2.6) was determined in the sterile axenic cultures of *D. binata*. Many bacteria associated with field-grown plants were found to secrete many of the proteinases with acid pH optima. The authors concluded that microbial enzymes play a significant role in the digestion process of captured insects.
- Fish, D. Insect-plant relationships of the insectivorous pitcher plant *Sarracenia minor*. *Fla. Entomol.* 59(2):199-203. 1976.
The noctuid moth, *Exyra semicrocea*, damaged 66% of the 80 plants studied rendering them non-functional. Young larva were present in 22.5% of the remaining functional leaves. In addition, the sarcophagid *Blaesoxipha jonesii* were present in 64% of the leaves and consumed as much as 50% of the plant's prey. However, the author noted that 90% of the leaves captured ants and *S. minor* may be specialized in doing so.
- Hayakawa, M. Sources of seed. *Pacific Horticulture* 37, No. 4:54-7. 1976.
The author provides a listing of Societies and collectors where rare and wild seed of a variety of plants may be found. Included in the list is our own CPN seed exchange.
- Heslop-Harrison, Y. 1976. Carnivorous plants a century after Darwin. *Endeavor* 35:114-22.
An excellent historical review of CP glandular anatomy and physiology with particular emphasis on enzyme secretion studies. Twenty figures.
- Kondo, K. A cytotaxonomic study in some species of *Drosera*. *Rhodora* 78(815): 532-41. 1976.
The chromosome numbers of six species of *Drosera* are reported for the first time. The 2N number of the *Drosera* species are: *cuneifolia*=32, *gigantea*=28, *hamiltonii*=28, *petiolaris*=12, *adelsae*=28, *Kanto spathulata*=40, and *Yakushima spathulata*=40. *Drosera petiolaris* showed the largest chromosomes ever seen in the genus *Drosera* and has the lowest number.
- Sawyer, J. O. Preservation of Rare and Endangered Plants. *Pacific Horticulture* 38(1):56-7. 1977.
Some 700 species of California's plant species representing about 10% of the total state's flora are listed as rare or endangered. The author urges citizens to be aware of this problem. *Darlingtonia californica* is mentioned as a plant that is endangered because of commercial exploitation.
- Schnell, D. E. 1976. Carnivorous plants of the United States and Canada. John F. Blair Publisher (1406 Plaza Dr. SW, Winston-Salem, NC 27103), 125 p. + ix, 117 color photos + drawings and maps. \$19.95 (+ .35 postage).
Complete coverage of CP in the area, including 117 photos in full color. Discussion covers basic biology, identifying descriptions, ranges, specific facts about each species, and a chapter on cultivation. Glossary and definitions of scientific names in appendix.
- Schnell, D. E. 1976. You catch more bugs with a sundew. *Plants Alive* 4:14-5.
A short popular article very generally describing *Droseras* and their culture. Four black and white photos.
- Siddiqui, S. A. Studies in the *Lentibulariaceae*: 7. The development of endosperm and embryo in *Utricularia coerulea* var. *filicaulis* Clarke. *Bot. Not.* 128(4):432-7. 1975.
The first division of the primary endosperm cell is transverse. Next, the division in both primary cells is longitudinal and walls laid down are complete. After this, the author observed considerable variations in the plane and early cell divisions in the development of the endosperm. The mature embryo differentiates only into epidermis and its meristematic apical region.
- Swenson, Allan A. 1977. Cultivating Carnivorous Plants. Doubleday & Co., Inc. Publisher (Garden City, New York), 152 p. + B&W photos.
This book describes the culture, and care of various genera of carnivorous plants. Furthermore, it describes experiments and informs the reader on organizations, periodicals and locations of plant displays. Finally, it reproduces the CPN World Listing of CP at the end of the book. One of the faults that the author gets into is the confusion of *Sarracenia leucophylla* (the preferred name) and *S. drummondii* which he seems to use interchangeably. To less extent, he uses *S. sledgei* for the preferred name *S. alata*. Despite this, the book will be another useful information source for the amateur CP grower.

Wallace, R. L. Distribution of sessile rotifers in an acid bog pond with particular emphasis on *Ptygura beauchampi* (Edmondson). Ph.D. dissertation, Dartmouth College, June, 1975.

One plant, *Utricularia vulgaris*, because of its unique relationship with the sessile rotifer *Ptygura beauchampi* was studied in more detail. Prey captured by this carnivorous macrophyte were studied by dissecting and examining the prey-capturing organs for recognizable prey remains. Three distinct prey capturing organs distinguished by differences in size, morphology, and leaf position, were found on each leaf whorl. For convenience they were designated large, small, and stem bladders. An analysis showed that the prey captured differed between trap types with regards to size and type. Widths of bladder trap doors were shown to be correlated to prey lengths in large ($p < 0.05$) and small ($p < 0.001$) but not in stem bladders. *Cladocera* were the most abundant prey type (>50%) in all three bladder types. Analyses of prey size showed that all prey caught by each bladder type were different in size ($p < 0.001$; large > stem > small). *Cladocera* caught by small and stem bladders were equal in size ($p = 0.55$), but those caught by large bladders were shown to be large ($p < 0.001$). Glandular trichomes present on each of the three bladder types were described. They undergo a developmental sequence which culminates in a bacterially colonized corona of mucilage surrounding the bulbous head cell.

A detailed analysis of the adult substrate distribution and larval site selection activities of *P. beauchampi* were undertaken. This sessile rotifer was found to be limited to the vestibular or trap door region of the large bladder of *U. vulgaris*, although four other congeneric species were present. The presence or absence of captured prey was unimportant to adult distribution. Larval selection experiments confirmed these field observations. Observations were made on larvae of known ages. Five age classes were described in which morphology, swimming behavior and speed, reaction to substrates, and probability of settling all differ. Larvae undergo characteristic behavioral movements when encountering *U. vulgaris* large bladder vestibules. They will attach to the substrate then bend over from the point of attachment, touch the substrate, straighten up and repeat the process again and again, advancing to the left or right and eventually circumscribing a circle. Glandular trichomes which have attained a certain stage of development stimulate larvae to settle. A hypothetical mechanism for larval substrate selection is presented, and the supportive evidence is discussed. Larval site selection activity including the behavioral movements, permanent attachment and metamorphosis, is begun when larvae tactually sense a stimulus unique to *U. vulgaris* large bladders. This stimulus is relatively stable and of plant and not bacterial origin. It is associated with glandular trichomes which have attained a certain developmental state. Characteristic of this stage is the formation of a bacterial-mucilage complex. However, the mucilage is not the source of the larval settling stimulus. The stimulus may be chemical in nature arising from the head cell of the glandular trichome.

Woelkerling, W. J. Wisconsin desmids: I Aufwuchs and plankton communities of selected acid bogs, alkaline bogs, and closed bogs. *Hydrobiologica* 48(3):209-32. 1976. The greatest diversity of the plankton community at a given site occurred in association with the macrophyte host *Utricularia*. The author discusses the relationships between the occurrence of desmid genera and parameters of the chemical environment among the 28 acid bogs, 5 alkaline bogs and 12 closed bogs found in the state.

Zahl, P. A. Southwest Australia's wild gardens: Bizarre and beautiful. *Nat. Geographic* 150, No. 6:858-68. 1976.

This article describes some plant species which have developed some strange and beautiful adaptations to the harsh environment. Included in the list of described species are *Cephalotus follicularis* (a splendid photo!), *Drosera pulchella* and *Drosera platypoda*.

SOURCES

We are offering an update of the annual list of carnivorous plant commercial sources. It is our experience that spring is the best season to order these plants. *We do not endorse any of these sources.* Those sources who have volunteered a letter stating that all stock is propagated rather than scavenged from the field, are listed first and marked (*).

Name and Address	Catalogue	Genera
SUN DEW ENVIRONMENTS * P.O. Box 111 Denver, NY 12421	50¢	Dionaea, Drosera, Sarracenia, Pinguicula, Darlingtonia, Utricularia
WORLD INSECTIVOROUS PLANTS * Rt. 1, Box 338S Arroyo Grande, CA 93420	Self-addressed stamped envelope or 25¢	Dionaea, Drosera, Utricularia, Byblis liniflora

Carolina Exotic Gardens Box 1492 Greenville, NC 27834	25¢	Sarracenia, Darlingtonia, Dionaea
Peter Paul Nurseries Darcey Road Canandaigua, NY 14424	25¢	Dionaea, Drosera, Sarracenia, Pinguicula, Darlingtonia, Utricularia, Nepenthes seed
Armstrong Associates, Inc. Box 94 Kennebunk, ME 04043	25¢	Dionaea, Drosera, Sarracenia, Pinguicula Darlingtonia
Arthur E. Allgrove North Wilmington, MA 01887	25¢	Dionaea, Sarracenia, Pinguicula, Drosera, Darlingtonia
Insectivorous Botanical Garden P. O. Box 5 Hampstead, NC 28443	25¢	Dionaea, Drosera, Sarracenia, Darlingtonia, Pinguicula
Edelweis Gardens 54 Robbinsville-Allentown Road Robbinsville, NJ 08691	35¢	Dionaea, Drosera, Sarracenia, Darlingtonia Nepenthes
Tote Em in Zoo Route 2, Box 368 Wilmington, NC 28401	25¢	Drosera, Sarracenia, Pinguicula (Sells in large quantities only)
Marcel Lecoufle 5 Rue de Paris 94470 Boissy-Saint-Leger, France	Inquire	Drosera, Dionaea, Sarracenia, Nepenthes, Darlingtonia, Pinguicula
Harold Welsh Black Copper Kits 266 Kipp Street Hackensack, NJ 07601	25¢	Dionaea, Drosera, Sarracenia, Darlingtonia

A FEW REFERENCE BOOKS (*Not* available through CPN. Order direct from publisher or your local bookshop.) * = Book intended primarily for children.

<i>Title</i>	<i>Author</i>	<i>Publisher</i>	<i>Source - Cost</i>
Insectivorous Plants	Charles Darwin	John Murray	2nd Hand Bookstores
Plants of Prey in Australia	Rica Erickson	Univ. of W.A. Press 1968	Inter. Scholarly Book Services 2130 Pacific Ave. Forest Grove, OR 97116 \$10.00 postpaid
Carnivorous Plants	F. E. Lloyd	Chronica Botanica 1942 & Dover Pub.	2nd Hand Bookstores Soft Cover (1976)
Carnivorous Plants	Randall Schwartz	Praeger Publishers 1974	111 4th Ave., New York NY 10003 \$6.95
Carnivorous Plants	Randall Schwartz	Avon Books (soft cover) 1975	959 Eighth Avenue, New York, NY 10019 \$1.25
Carnivorous Plants	Anabel Dean	Lerner Publications 1975	241 First Avenue Minneapolis, MN 55401 \$3.95
The World of Carnivorous Plants	J. and P. Pietropaolo	R. J. Stoneridge 1974	Peter Pauls Nurseries \$6.30
Insect-Eating Plants *	L. and G. Poole	T. Y. Crowell 1963	666 Fifth Avenue New York, NY 10003 \$4.50
Carnivorous Plants *	John F. Waters	Franklin Watts, Inc. 1974	845 Third Avenue, New York, NY 10022 \$3.90

Plants that Eat Animals *	Linda Bentley	McGraw-Hill Book Company 1968	1221 Ave. of Americas New York, NY 10036 \$4.72
CP of the U.S. and Canada	D. E. Schnell	John F. Blair, Publisher 1976	1406 Plaza Dr. SW Winston-Salem, NC 27103 \$19.95 (+35¢ postage)
Cultivating Carnivorous Plants	Allen Swenson	Doubleday & Co. 1977	Garden City, NY 11535 \$7.95

The following CP books mentioned in our listing can be purchased from B. Dalton, Bookseller, 303 B Tanforan Park, El Camino Real & Sneath Ln., San Bruno, CA 94066. Attn: Chuck.

Carnivorous Plants--Randall Schwartz. \$6.95 hardcover (1974), \$1.25 paperback (1974)
Cultivating Carnivorous Plants--Allen Swenson. \$7.95 (1977)
Carnivorous Plants--Donald Schnell. \$20.00 (1976)
Carnivorous Plants--F. E. Lloyd. \$4.50 (1976)

These books can be mailed anywhere for a handling fee of 75¢. California residents should add sales tax.

International Bookfinders are the people to contact as a source of books that are out of print. They circulate a newsletter around the country to used book stores listing books that are being sought. When they locate the book, they contact you with price information plus their service fee. You are not obligated to buy the book if the price is too excessive for you. They are a reputable firm. The address:

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THE CPN SHOP

We are providing CPN members the privilege of ordering CP books published in Japan. They are written in Japanese, but many of them are generously interspersed with excellent pictures both in color and B&W. Books that we offered in the past are now sold out or out of print. So, while a limited supply lasts, we offer the following books at prices that include all postage (overseas and domestic). Please send your check or money order to J. Mazrimas before April 20, 1977. Expect a delay of two or three months before you receive the books you ordered. All books sent by surface mail.

<i>Author</i>	<i>Title</i>	<i>Pages</i>	<i>Price</i>
Shimizu	The Mystery of Carnivorous Plants	54	3.50
Suzuki	Insectivorous Plants (Cult. and Coll.)	168	2.50
-----	Aldrovanda vesiculosa at Hanyu-City	32	5.25
Kondo	Carnivorous Plants	292	8.50
Komiya	Syst. Studies on Lentibulariaceae (Eng.)	124	10.50
Kurata, S.	Nepenthes of Mt. Kinabalu (Eng.)	80	5.00

OTHER ITEMS FOR SALE

WORLD LIST OF CARNIVOROUS PLANTS. An updated list of all species with synonymy and native areas mentioned. While based broadly in Index Kewensis, many references and experts were consulted during the task of preparing this worldwide listing. Limited Supply----60¢ postpaid surface, \$1.20 air overseas.

THE 1976 CPN SUBSCRIBER LISTING. A current listing of 1976 CPN members arranged according to country and zip code rather than in alphabetical order. Limited number of copies left----\$1.00 postpaid surface, \$2.00 air overseas.

To order any of the above items, send payment to J. A. Mazrimas, 329 Helen Way, Livermore, CA 94550.

We wish to thank Chris Sowers, a graduate student at UNCE, for the Botanist's Corner and Want Ads logos.



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WANT ADS

Above is a standardized form for submitting your want ads. There is a charge of ten cents per numbered item with a limit of 10 items per person per issue of CPN or one dollar maximum. Also, you see four letters before each item which stands for Want, Trade, Sell or Buy. Please print all information clearly for best results and to eliminate mistakes. The Want Ads are limited to carnivorous plants, terrariums, greenhouses, and moss.

Send coin or check along with the form to: Arboretum, Want Ads
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All funds derived from this department will go for costs of an extra large issue of CPN or more pictures. So support your CPN!

SPECIAL NOTICE

Please be sure to note that the address for both the reprints of back issues of CPN and subscriptions are the *same*. Checks should be made payable to ARBORETUM FOUNDATION FUND in both cases.

The co-editors of CPN would like everyone to pay particular attention to the following policies regarding your subscription to CPN:

All complaints about missing issues, pages, damaged issues and lost issues should be sent to the Arboretum and NOT to the co-editors. Please explain fully your problem and any attempts you made on your own to correct them. Any change of address should also be sent to the Arboretum.

All material for publication, comments and general correspondence about your plants, field trips or special noteworthy events relative to CP should be directed to one of the co-editors. We are interested in all news related to carnivorous plants and rely on the membership to supply us with this information so that we can share it with others. Comments on the new publisher, new printing and mailing service will be greatly appreciated.

Names and addresses of the publisher and the co-editors will be found in each issue under our bannerhead.

PHOTOS WANTED

We are very interested in having prints of your photographs relating to carnivorous plants. Photos should be glossy, black and white with good contrast, and not too large (3x5 is a good size). Please include some item, such as a toothpick, in the photo for size reference. Also, please provide us with a description.

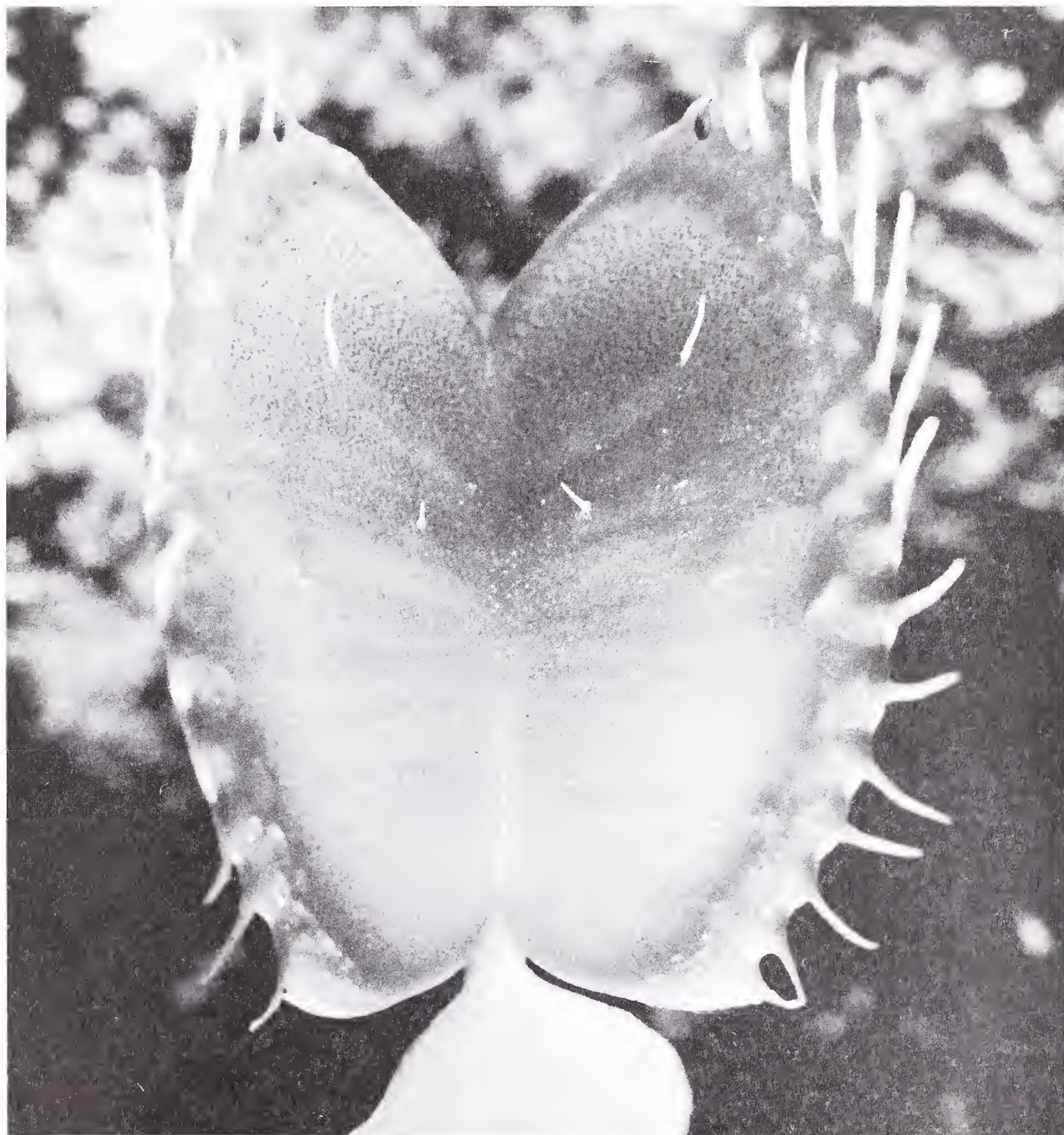
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CARNIVOROUS PLANT NEWSLETTER

VOLUME VI, NO. 2

June, 1977



Close-up of Venus Flytrap, *Dionaea muscipula*. Note the trigger hairs.
Photo by Steven A. Frowine, The Garden Center of Greater Cleveland.

EDITOR'S CORNER

The Editors sincerely wish to apologize for any inconvenience that resulted from the snafu in the California State University's mailroom that caused the loss of all mailings outside the United States. Replacement issues have been sent to all those whose subscriptions were in at the time of the first mailing. If you still haven't received your first issue by the time you are reading these words, please notify The Arboretum. Future mailings will be handled by us bypassing the mailroom. In any case, claims for missing numbers should always be sent to The Arboretum.

L. Song has noted that, due to his oversight, the World List was not included in the first printing of the back issues. If you have ordered Vol. III from the Arboretum and the World List was not included, please notify them and a World List will be sent at no cost.

SEED/PLANT EXCHANGE NEWS

Revision of the Seed/Plant Exchange continues as noted in the News & Views Column. The former Seed/Plant Exchange List will now be issued on an annual basis as a *listing only* of CP that any particular individual has. These will be computerized and offset printed resulting in a more permanent record and will be sent to anyone who orders them. A charge will now have to be made as we cannot expect the Biology Dept. and the University to pay the cost of printing and mailing as before. For the US, Canada and Mexico, \$1.00 surface, first class; all others \$2.00 air, first class. These can be henceforth ordered when renewing your subscription to CPN, or upon ordering back volumes, or separately. We regret taking this step, but we feel that our activities should be on a self-supporting basis as much as possible.

SEED BANK NEWS

We have selected Patrick Dwyer (St. Michael's Episcopal Church; 49 Killeen Park; Albany, NY 12205; USA) as the keeper of the Seed Bank. Please address all inquiries about seed to him with regards to availability. Cost will be \$.50 per packet. Persons wishing to donate seed should note date of collection, name, source of plants from which seed was gathered (wild or cultivated), and any other information, especially if the seed was wild collected. Send to him as soon as possible for maximum viability. There should be sufficient seed for at least 10 packets each which would be enough to sow an area approximately 5cm/2 inches in diameter in the case of fine seed and at least 25 seeds for larger seeded species. Credit will be given that will entitle the donor to a free packet for each species donated. The inventory of the Seed Bank will be given in each issue of CPN.

We are pleased to announce the April publication of THE GREEN PAGES: A COMPLETE INDOOR PLANT CATALOGUE. This publication is full of information of dozens of different indoor plants and contains a wealth of information on clubs, newsletters, equipment, books, and plant sources. Our own CPN and CP are described within its pages. This book sells for \$7.95 and may be ordered from Random House/Ballantine Books, Order Entry, Westminster, Maryland 21157.

CONGRATULATIONS to SCOTT RICHARDSON on winning the Beginner's Corner Logo Contest. Scott's design, which appears on the next page, wins him a free subscription to CPN for 1978.

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Beginner's Corner

by Larry Mellichamp

LIGHT

Of all the essential factors involved with good plant growth, light is perhaps the most important. Even with carnivorous plants, where proper soil and water are of critical concern, light is still probably the most important cultural factor.

What is light and why is it so important that growers often spend hundreds of dollars on artificial light fixtures or greenhouses to let in more light? Visible white light as we see it is actually a mixture of colors, literally all of the colors of the rainbow: red, orange, yellow, green, blue, and violet. In addition, infrared and ultraviolet are non-visible portions of this spectrum which may affect plant growth, the former producing heat and the latter producing strong radiation which may burn. Red and blue light are the most important colors for plant growth.

First of all, light is important because it is the energy source by which green plants manufacture their basic food materials. They need soil only for essential inorganic elements such as copper, iron, sulfur, etc., in very small quantities. The rest of their raw materials come from the air and water. Even carnivorous plants produce the vast majority of their food by this method called photosynthesis, feeding on insects as a nutrient (especially nitrogen) supplement.

Second, light is very important in the life cycle of most plants because it acts as nature's timing regulator. The length of day and quality of light help determine when a plant is to start growing in the spring, when to flower and set seed in the summer, and when to go into dormancy in the fall in rhythm with the naturally occurring seasons. Of course, temperature plays a part in completing the cycle, but light is the main environmental trigger.

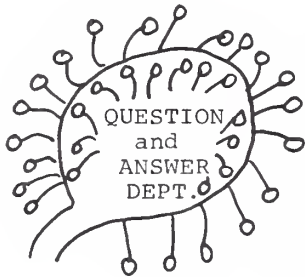
How much light is necessary? For many carnivorous plants, you can't give them too much--THE LOVE IT. This goes for all the native North American species. Some species from other parts of the world, however, require less than full sun (which is normally about 10,000 footcandles of light at high noon in eastern U.S.). Those types which prefer some shade would include *Nepenthes*, *Cephalotus*, and some tropical *Droseras*, *Utricularias*, and *Pinguiculas*.

How does one provide adequate light? Natural sunlight, of course, is ideal--in a greenhouse or out in the open. Unfortunately, plants grown in a greenhouse will get too hot in the summer due to the build-up of heat (the "greenhouse effect") and shading is always required. This shading (either whitewash material applied to the greenhouse covering directly, or shade-cloth) cuts down on the total amount of light reaching the plants, but allows the shade-requiring types to be grown with relatively little light problems. Also, greenhouse coverings (glass or plastic) filter out ultraviolet rays and the plants are protected from such exposure. Thus, you should never place greenhouse-grown plants abruptly in full sunlight because they will burn. Expose them gradually. When plants are grown in full sun, or strong light intensities either under glass or under artificial light, they develop varying amounts of red coloration in the leaves and stems, especially young leaves. This is a protective device, much like tanning in humans, which prevents the leaves from being burned. This red pigment production is a natural response, and is often desirable in cultivation as it brings out the "healthy-looking" colors in the plants. Like tanning, however, it may not be desirable in the long run; but it is the price the plant pays for being able to endure the intense sunlight where maximum photosynthesis can occur.

Now just because you don't have a greenhouse doesn't mean you can't grow CP. Half days or more sun through a window may be enough for satisfactory growth in many types, as long as the plants don't get too hot by being too close to the glass. If you grow CP in a terrarium, do not let it stand tightly closed where direct sun's rays will strike it, or there will be a build-up of heat inside and you can literally boil your plants.

Artificial light indoors is fast becoming a very popular and effective way to grow carnivorous plants. The plants would best be grown in large terraria, either planted out or kept in individual pots, where relatively high humidity can be maintained. The heights of the plants must be considered, but it is usually the smaller types which are best suited for this arrangement. The major problems have been to provide adequate light without heat build-up; and to provide the proper colors of the spectrum most useful to the plants, so that they grow and look natural. Fluorescent lights are highly preferred because they are cooler and cheaper to operate than incandescent lights. A mixture of cool white and wide spectrum Gro-lux seems to be optimal as far as providing the proper mixture of blue and red light at a reasonable cost. For example, a fixture holding 4, 48", 40-watt tubes suspended several inches above the plants would provide for satisfactory growth in most species. The more light fixtures you have, the better for light-loving plants. Usually the lights are set on an automatic timer to shine from 14-18 hours a day. Natural timing will be altered, but most carnivorous plants will grow (and flower) as long as these conditions are maintained. Providing artificial dormancy during the winter is desirable for temperate species and this may be accomplished by gradually decreasing the length of the artificial "day" each day over a period of six weeks, then placing the plants in a cool place for several weeks, to simulate winter conditions: 40°F and eight-hour day length. Dormancy requirements will be discussed more fully in a later article. For more information on indoor light gardening in general, consult the excellent popular books by Fitch or Elbert.

In the next issue, Don Schnell will discuss temperature and dormancy.



Q. I would like to know how to control the black rot that destroys CP's, especially *Dionaea*, *Pinguicula* and *Drosera*? G.M., Mission Viejo, CA.

A. Most CP rot under one of three circumstances: 1) Growth in undrained container without proper attention--beginners should use drain-hole containers; 2) Damage to rhizome through handling; 3) Forcing growth during dormancy, sometimes unwittingly, such as too warm winter greenhouse or not making proper adjustments when growing under lights. (Light growers must make annual cyclic adjustments when growing temperate plants!)

Q. Of all my *Sarracenia*, I have the most trouble growing *S. rubra* ssp. *jonesii*. Why? J.M., Livermore, CA.

A. I have no trouble growing *S. rubra* ssp. *jonesii*. It is in drained pots with live sphagnum. For some reason, the plants do not do as well outdoors in this climate, likely because of the cyclic periods of warm weather during the winter which partially breaks dormancy, conditions they are subjected to less in the colder mountains. Here in central North Carolina, the best plants do very well in my cool *Sarracenia* greenhouse with minimum nighttime temps down to 40°F. This is certainly warmer than the mountains, but does not provide as violent a swing. Steady slightly warm temps are better than wide swings throughout the winter.

Q. What is the preferred pronunciation for the species of *Sarracenia* known as *leucophylla*? R.H., Arroyo Grande, CA.

A. I pronounce *leucophylla* as *leucophyll'a*. According to the strict Latin rules, it would be pronounced *leuco'phylla*, enunciating the third from the last syllable. D.B. Jackson's *Glossary of Botanic Terms*, a sort of standard classic work, gives pronunciation as I do, *leucophyll'a*. Likewise for *purpurea*: Jackson gives it as *purpur'ea*, as I would pronounce it. However, I often hear it *purpure'a*. The *purpu'rea* is according to the rule; the latter is not, but is like the pronunciation of *leucophyll'a*--so there is no consistency. I think a lot has to do with sound and ease of saying the syllables in each case. Hope this helps.

NEWS AND VIEWS

JOE MAZRIMAS writes: Recently, I made three observations regarding some aspects of CP that I would like to share with CPN subscribers. First, I noticed a dramatic improvement in the growth and flowering of the Mexican *Pinguiculas* after a one-time watering of lime water. A thimbleful of hydrated agricultural lime was added to a pint of deionized water and shaken vigorously for two minutes. A cupful was poured into each pot and I tried to avoid splashing any on the plant leaves. Most of the plants are growing in an even mixture of perlite and living sphagnum moss. I continued to water them with deionized water and I noticed a rapid spurt of growth after about 3-4 weeks followed by the production of many flower spikes. The plants that were affected the most were: *P. x kewensis*, *P. caudata*, *P. hirtiflora*, *P. gypsicola*, *P. colimensis*, *P. oblongiloba*. Many of these species were even stimulated to have secondary buds growing out of the mother plant. I use this treatment about twice a year and have been satisfied with it for several years. This treatment mimics the calcareous soil and gypsum-like formations where the plants grow naturally. Second, I'm glad to finally see some careful research into the digestive activities of carnivorous plants with the surprising results reported by Chandler and Anderson of Australia (see literature review, CPN VI, No. 1). It seems to me that microbiologists should become more involved with the role that various microorganisms play in synergism with the plant's endogenous enzymes to provide nutrients for pitcher plants as well as *Drosera*. In many cases, the pitcher becomes just the pot or incubator for the bacterial soup and may be the dominant factor in digesting the captured organisms. As these two biochemists point out, the complicated numbers of various species of bacteria and other microorganisms exist in an ecological niche which is important to the growth and well-being of various CP. The plant's enzymes play such an insignificant role in the whole digestion process that I wonder if these plants are indeed carnivorous in the strict sense of the term or are they just taking advantage of more useful and powerful means at their disposal over the course of evolution. A more quantitative assessment of this situation should be taken up by others in the field so that we may know the actual role that microorganisms contribute to these plants.

Third, I had the opportunity of irradiating some seed with ionizing radiation of the gamma type. *Dionaea* seed were divided into lots and irradiated with varying doses from 5,000 rads to 25,000 rads in 5,000 rad increments. I sowed the seed on peat moss and noted the results. In this preliminary report, I observed that there was a considerable delay in germination with the higher doses--as much as 90 days. Also, seed killing was proportional to radiation dose, i.e. only about 10-15% of the total seed germinated at 25,000 rads. The seedlings that survived at this dose grew extremely slowly and in fact some never grew beyond the cotyledon stage. They seemed to have a central corm-like growth from which the new leaves emerged. All parts of these plants seemed normal in shape and size but there was some unevenness in the anthocyanin coloration inside the traps which made the trap look striped. On the other hand, the low doses and in particular the 5,000 rad dose gave surprising results. First, these seeds germinated before the control seed by 5-7 days. They grew very fast and in fact, in a year's time they were about twice as large as the control plants. Also, the plants will probably mature faster although they haven't flowered yet. I surmise that the radiation stimulated the hormone system in the seed stage so that it became activated sooner than normal plants or the radiation might have unbalanced the normal hormone system so that growth hormones were relatively less damaged by the radiation.

BILL HANNA sends us information that many of the tuberous species of *Drosera* are said to have HCN or prussic acid, a deadly poison. Although no records of feeding tests have been noted in the literature, some of the species suspected as poisonous in Australia are: *D. auriculata*, *D. peltata*, *whittakeri* and *D. spathulata*. These species were listed in a book titled: *Poisonous Plants of Australia* by Selwyn L. Everist.

DAVID TAYLOR suggests that it would be a good idea to have photographs of CPN subscribers in the newsletter at some time for it would be interesting for many CP collectors to see photos of their friends in other lands with whom they have been corresponding.

DAVID GRABER writes: I grow *Sarracenia flava* outdoors in a pot, where it does quite well in Berkeley's climate. This fall I noticed that a small population of Argentine ants, *Iridomyrmex humilis*, was established in the live moss of the pot. These ants were climbing the stalks of the *Sarracenia* and entering their pitchers. The young pitchers successfully captured the ants that entered them. In the older pitchers, however, the ants were able to enter the pitchers and escape with parts of the insects captured there, presumably because these older pitchers had lost their slick inner surfaces. Thus there was an energetic trade-off between the ant colony and the pitcher plant, an ad-hoc symbiosis of sorts, in which ants were sacrificed to the young pitchers that could best utilize them, in exchange for food from the older pitchers that were no longer efficiently utilizing the captured food resource.

STEVE ROSE writes: Why not look for pygmy *Drosera* in areas between roads and highways? It's because many pygmy *Drosera* grow at their best along roadside ditches. In virgin bush, they are scattered, miserable and hard to find. There are very large tracts of native virgin woodlands in Australia all bearing some CPs. Introduced grasses choked out all but the hardiest CPs and animals destroy them underfoot. When the hard mulching dirt around the base of the pygmy *Drosera* is disturbed or moved, it soon dies in summer. This is true for most CPs except for *Cephalotus* and *Drosera bulbosa* hills. The *D. bulbosa* grows like a weed in some places like football ovals and caravan parks where there is adequate water and grass being cut to keep shade to a minimum. I have even seen this *Drosera* actually overtake couch grass in one place and choke it out. The pygmy plants formed a maroon red carpet with almost no visible portions of soil or grass between.

I recognize two distinct clones of *Nepenthes mirabilis* from North Queensland. They are the WEIPA form from the northwest coast of Cape York Peninsula which has a smaller and fatter pitcher. The BAMAGA form is from the northeast coast of C.Y.P. and has a long and narrow pitcher. The plants remain constant to each area in growth.

Here are some more observations on *Byblis gigantea* in the field. *Byblis* is indiscriminately pollinated by a rather fat native bee who goes around and shakes the twisted stamens by "buzzing" them with his abdomen. The pollen is released in a small puff and off he goes on to the next one. I saw this happen a few weeks ago and the bee did not release great amounts of pollen because I have seen more released from wind movement as I mentioned before.

Is *Byblis* carnivorous? Only a positive test can prove it one way or another. There are some interesting habits that should not be overlooked. It shares with most pygmy *Droseras* a symbiotic relationship with Assassin bugs. There are three different kinds on *Byblis* but pygmy *Droseras* seem to have only one type per species or share one. One of the bugs on *Byblis* is on *Drosera* plants also. *Byblis* also has a sweet smell. Why should a plant develop a sweet odor to attract insects and then they would serve no other purpose other than to eat the plant if it was not carnivorous or did not have sticky glands or Assassin bugs. Perhaps it attracts and catches insects solely for the Assassin bugs? Who knows? And for what purpose? These carnivorous plants are attacked by thrips and aphids which Assassin bugs devour with gusto. In fact, I had two pots of *D. drummondii*, one with and one without its relevant bug. The one without was infested with aphids and almost rotted while the other pot remained untouched and not an aphid to be seen. Why should *Byblis* have the sweet, sticky glands, Assassin bugs when it may get by without these factors? *Byblis* is really a desert-like plant in the Northern areas. It grows in a mixture of coarse laterite (ironstone) and quartz. This area receives rain all in a 3-4 month period between May and August. Less than 18 inches of rain falls per year. It can go about 6-8 months without as much as one drop of rain. Pygmy *Droseras* (*D. drummondii*, *D. leucoblata*) and tuberous *Droseras* (*D. macrantha*, *D. erythrorhiza* and *D. pallida*) survive here also. So if the *Droseras* survive these desert conditions, then the carnivorous habit can also survive in the form of *Byblis gigantea*.

BOB WALLACE has informed us that there is a newsletter devoted to naturalists interested in rotifers and called the ROTIFER NEWS. Perhaps some CPN readers are interested in these little animals. Three issues have already been published, the cost is free, and back issues can still be obtained. Write: Dr. JJ Gilbert, Editor, Rotifer News, Dept. of Biological Sciences, Dartmouth College, Hanover, NH 03755.

BILL NETHERBY writes: 1. Schnell's article in Vol. III, Issue 3, p. 35, on moth larvae pests . . . anybody tried controlling larvae with *Bacillus thuringiensis*? (Two trade names are "Thuricide" and "Biotrol") It's a biological control harmful (as far as I know) only to lepidoptera and is used on oak moth and webworm infestations. There isn't any phytotoxic effect.

2. Concerning chemicals (for pests and diseases) that have bad effects . . . some excellent information based on current research with tropical foliage crops is available in issues of "Florida Foliage Grower" (free subscription), c/o Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Fla. 32601. An article on "Soil-Borne Fungus Diseases" (and their control) is in the March 1976 issue, (Vol. 13, #3) and notes on plant damage from fungicides. A warning note: back issues are variously unobtainable; both budget and quantities per issue are very limited. Last year I learned that the complete set of "F.F.G." "will be offered by the Ornamental Horticulture Club at a donation cost of \$65.00 per set." (Checks payable to the O.H. Club, 101 Rolfs Hall, University of Florida, Gainesville, Fla. 32601.)

I think these publications are very useful to all growers of exotics, CP species, et al. The sensitivity of many plants to chemicals such as Cygon, TEPP, etc., shows the commonality between many plant families.

3. Still on chemicals . . . *cytokinins* were just mentioned in the *Bromeliad Society Journal*, Jan-Feb/77, pp. 31-33: "Induction of Lateral Growths on *Vrieseas* by Cytokinins." Some bromeliads, like some CP species, offer very little propagation material per season. Encouraging *multiple* offsets on species that normally produce *one* annually with cytokinins is exciting in its possible applications by CP growers. The compound in the article is *N6-(benzylamino)-9H-purine (N6-benzyladenine)* mostly non-soluble in water. The author made a 2%-strength salve in a mixture with anhydrous lanolin. It was applied to both plant and flower scape, results positive on both in a matter of weeks. What the cytokinins do is to activate dormant meristematic tissue just beneath the surface, gently scarifying the bark of "skin" especially at nodes and leaf bases, then applying the salve is recommended.

4. CP seed germination and energy conservation tip: I use my stove top for starting seeds. A pot of water over the pilot light, with a cookie tray covering it, pots of seeds sitting on the tray. Soil temperatures stay at 27°C. (about 80°F.) I also have near-hot water in the morning for preparing breakfast and tea.

5. Artificial lighting: I've grown CP species under balanced fluorescent lighting, using about the same as everybody regarding fixtures, but I manage to get the most out of the light intensity as possible. I conserve or maximize the foot-candle production by surrounding the terrarium or propagating chamber with panels painted flat white. About 90% or more of the light is reflected back to the plants. Shiny aluminum tinfoil used for cooking is almost as effective, reflecting 80-85%. While I'm playing around with numbers and the issue of conservation, using conventional incandescent fixtures (the old "light bulbs") wastes about 80% of the electricity invested, converting the energy into either heat or unusable light waves . . . according to one publication (Kent State University). Conversely, the right fluorescent tube wastes only 10-15% of the energy.

6. I'd like to see articles on research into CP species' "biological clocks" . . . i.e. many species' stolid "attention" to the calendar, despite attempts by growers to change the plants' growing seasons. The article by Clemesha (Vol. III, #1, p. 13) mentioned his problems with *Darlingtonia* in Australia.

Has anyone managed with success to overcome this difficulty so common to plants from defined-season areas?

7. I hope there'll be reports in CPN covering the effects of this last winter on CP species and their habitats (in the eastern U.S.A.).

Also, I'd like to hear how western U.S. species have fared as a result of the current drought.

8. Seed propagation: Has anybody used *thiourea* on species with seeds that tend to stay dormant through the winter? This chemical was referred to by Dara Emery in "Seed Propagation of Native California Plants" (Feb/1964), a 14-page booklet (Vol. I, #10) one of the issues of "Leaflets of the Santa Barbara Botanic Garden" (address is 1212 Mission Canyon Road, Santa Barbara, CA 93105) and the cost is \$1.00.

Emery describes "internal dormancy" caused by alkaloid chemicals. Soaking the seed in thiourea straight or mixed with sulfuric acid or gibberellic acid has been used on California species (proportions not given).

The booklet covers no CP ssp. but deals with many herbaceous and woody plants with "problem seeds" much like *Byblis gigantea*. Tried-and-true methods of seed treatment are listed along with several hundred taxa native to California.

PHILIP THOMAS writes: I would like to report a *Dionaea* that I collected near Hampstead, N.C. that has an exceptional number of trigger hairs. An instance of this was also reported by Mr. A. Simon in CPN Vol. III, No. 3, p. 33. At first I noticed an irregular number on one lobe, six, and then also I noticed that its mate had four. This aroused my curiosity, so I checked around for more on that plant. On almost every trap there was an irregular number of these. I suppose it may be a genetic mutation. On this particular plant, four trigger hairs on each lobe seemed to be the dominant number. Several of the other plants in its vicinity had slight variations in trigger hair numbers. If anyone is seriously interested in this occurrence and might like to a research project on it, let me know and I will try to send you a cutting or some seed of this plant, depending on how well it does this spring and other circumstances.

I had a worm (caterpillar, more correctly) caught in a *Dionaea* trap. I noticed it on January 31. The posterior 1/3 of it had been caught. I observed it every day until February 6, when it apparently died. That's right; it had been living with its posterior section in a trap for an entire week! About the 3rd, I checked to see if it had been possibly eating the trap for a source of food, but no damage had been done. It had woven several strands of "silk" on the cilia of the traps, but other than that, no harm had been done. I was hoping that it would live until

the lobe reopened to see if it would get caught again, but I did not get to find this out. If anyone else has had a similar occurrence, please let me know. Oddities like this always fascinate me.

I know this might sound silly, but just out of curiosity, I once fed a *Dionaea* lobe a "Dynamint." I thought that the trap would shortly reopen because of no continued stimulation of the trigger hairs, or else quickly rot the trap, but I was proven wrong. Two weeks later, the trap was still closed, quickly pouring digestive fluids over its "victim." It was pouring out all sides of the trap and was interesting to observe. About one week after that, it reopened with a small undigested portion that had stuck to the lobe with only a very slight browning around the edge of one lobe. After two more weeks, this darkening has not spread, so I guess it was just because of direct contact with its "prey" for so long. This plant definitely has a "sweet tooth." (Tooth!?)

DON BURDEN writes to tell us of a method of rooting *Nepenthes*: Take a clear plastic cup (3in x 4in high) and fill it with a one inch layer of perlite and fill the rest with live sphagnum, perlite and fine tree-fern fiber (4:2:1). Make five drain holes in the bottom by melting the plastic with a hot nail.

Take four leaf cuttings, pinch off the growing tip, cut the ends at a 45° angle and cut back the leaves so that there is about 2 inches left. Dip the entire cutting in benomyl solution (1 tsp/gal) for a minute and coat the cut surfaces with rootone. Place a piece of wetted fine bark at the bottom of the cutting so that a callous will form. The cuttings are then buried half way into the moss and a plastic bag is secured by a rubber band. One turn of a heating cable can be wrapped around the cup. Water when the cup is nearly dry and only with distilled or boiled rain water. The cuttings should root in 4-6 weeks but leave them alone until roots are seen clearly and then repot in 6 inch plastic pots. I have rooted a cutting of *N. x boissiensae* var. *rubra* using this method.

BILL HANNA writes about his most recent trip to Taiwan: I visited with Professor Fan-Tuang Kuo who published two papers ("Studies on *Droseraceae* of Taiwan" and "Studies on *Lentibulariaceae* of Taiwan", published in the *Biological Bulletin* of Nat. Taiwan Normal University, published in 1966 and 1968 respectively.) He lives in a place called Hsin-Chu (pronounced Sin Shoe, which means windy city. If you ever visit there, you will understand why.) I rang him from Taipei, and we arranged a day for me to come and visit him. After many hassles, I finally found someone at the railway station who spoke English (the station master was the only one), and I booked my ticket for the day before we left. I got up that morning and went down to the station to find someone else who could speak English so I could find out what platform the train left from. After an hour and fifteen minutes, I arrived at Hsin-Chu. I was met at the station by Professor Kuo and his son. First of all, they took me into town to meet his wife at her shop; his eldest daughter was there also. Then we went on a detailed sight-seeing tour of Hsin-Chu, visiting a Buddhist temple topped by a great enormous statue, which is apparently of the first Chinese Fung Fu master, who is in some parts worshipped as a god. After that we went to his place where we had an incredible Cantonese style (I think) Chinese meal. It was so vast you could not jump over it--apparently his mother and two daughters had been cooking all morning for us. At a local Chinese Restaurant I would estimate such meals cost somewhere between \$60 and \$70. There were two types of soup in gigantic bowls--one was very fatty and one was gorgeous; it had mushrooms and little bits of shallots. In amongst that were great tasting meat balls wrapped in a fancy pastry. As far as I could tell, the meat inside consisted of small pieces of pork, shrimp and perhaps some beef and poultry. We ate our meal in conjunction with a bowl of fried rice with a difference--instead of being grains of rice, it was rice noodles. We had genuine Peking duck, sweet and sour squid, sliced beef with capisican, a plate of some shell fish (which didn't look very appealing, so I didn't try it), and another plate of something else which didn't appeal to European tastes. In each plate there was not just a little bit, but a whole mountain of food.

After lunch we went out to have a look at the local *Drosera* (*burmannii*, *indica* and *spathulata*). To get to where the *burmannii* and *spathulata* grew we drove for about half an hour, over bumpy unpaved country roads, until the road got so narrow we had to get out and walk, slipping and sliding, almost falling, down the very greasy narrow yellow clay road. After some walking we went across a dried out rice paddy and on a little dirt embankment, which was used for maintaining the water level of the paddy field. Above it were growing numerous plants of *spathulata* with an occasional clump of *burmannii* here and there. From here we hopped in the car and drove for about another 45 minutes, for the last part down roads that were so narrow that the wheels of the car fitted very neatly in the gutter on each side of the road. We got out and climbed up an embankment, hopped over an irrigation channel, and walked along the top of one of the little risen paths which criss-cross the paddies so as to allow easy access and to maintain the water levels. We must have spent

about an hour looking around the edges of this large field and finally on one of the inside criss-crosses Professor Kuo found a plant of *Drosera indica*, and a little way up we found another, then another until all told we notched up four or five plants. This quite amazed the Professor, as when he visited the same place two years ago there were hundreds of them everywhere, and it had taken us over an hour to find four or five. The sharp drop in numbers he attributed to fertilizers. There was a farmer working the field; he showed him what we were collecting and asked him if he knew what had happened to all the plants like we had been collecting that used to grow there. The farmer didn't know, just that there were hardly any of them anymore.

On the way home to Taipei (the Professor drove me all that way) Prof. Kuo's generosity came through again--he gave me two copies of his works in Chinese and one English translation of the work on *Utricularias*. He also gave me some large cardboard sheets with a specimen mounted on each--together they were all the CP that grew in Taiwan. He also gave me six copper incense burners and six boxes of scented incenses to burn in them. He said for me to give them as presents to my friends back home as a bit of Chinese culture. The Professor had an incredible sense of humour and would go into almost fits of hysteria at the drop of a hat. He has invited me back next year to go and see the *Utricularias*, which, he said, are found on some islands either to the south or the north (I am not sure which). All I know is that it will be a three-day trip, but I doubt that I will have the cash to go back. One last thing before I sign off with Taiwan (it's probably not of much importance): the soil in which *spathulata* and *burmannii* grew was a very sandy yellow clay, whereas the *indica* was growing in pure greasy yellow clay. It seemed very strange that the *burmannii* and *indica* were growing there as the weather was freezing cold. There was even snow on some of the mountains (not close, but the breeze was blowing off it). What all of this is leading to is that I thought of these as being tropical to semi-tropical types. Should you like some I have collected seed of *spathulata* from Taiwan. The Professor collected some *burmannii* and *indica* for me, but they didn't look like they would last long enough for me to get home with them, so I gave them to Dorothy and Kenneth U.

Regarding *Nepenthes* in Taipei: they have quite a few plants, but there is only one variety. They don't know which one it is, only that it came from Japan. The place is called SHIH LIN GARDEN, 604, Chung Shan North Road, Section 5, Shin Lin Taipei, Taiwan, Republic of China. I bought one myself and successfully smuggled it back into the country.

Some disturbing news whilst in Singapore: I saw my friend from the Botanic Gardens a few times, and Mahmud told me that all of the *Nepenthes* in the secondary jungle where he had taken me out collecting the year before were gone. They had all been eradicated by the government. This is really mind-boggling if you could have seen their numbers and how gorgeous they looked in their natural splendor. It is really sad that where people are breaking their necks to get *Nepenthes* there are none; where they are reasonably common and no one grows them, they are out to destroy them all. Perhaps CPN readers might be interested in Mahmud's name and address: Mahmud Bin Awang, C/O Botanic Gardens, Cluny Road, Singapore 10, Republic of Singapore. They would have to buy the plants from him, but I would say they would not want to wait too long or there might be none left for him to collect.

MICHAEL HUNT writes: I had the chance to visit a relic bog in the mountains of northwestern Virginia. I was told one could find *D. rotundifolia* and *S. purpurea* in this bog. I was not prepared to go into the bog itself so I confined all of my observations to the outer edge of the bog, which was bordered by a stream. Sphagnum grew very lushly on both sides of the bog and formed a thick carpet throughout. The only CP I could find, however, was *Utricularia*, which was growing in scattered clumps in parts of the stream. I think this *Utricularia* to be *U. intermedia*, but I'm not sure. I did take home a small clump of sphagnum for closer study. After about three months the clump was covered with *D. rotundifolia*, which proved that this *Drosera* was growing after all in this fairly large bog even though I did not see it at first, nor did I ever find *S. purpurea purpurea*. The next time I'm in this region I plan to give this area closer attention.

The new book, *The Swamp*, by Bill Thomas published by W. W. Norton & Company is a very interesting book. It sells for \$24.95 and has over 300 color photos. This book goes into great detail about many large swamps in the United States. It has many interesting photos of CP, including *Sarracenia*, *Utricularia*, and *Drosera*. But by far the best photo is that of a prairie in the Okefenokee Swamp of Georgia. This spectacular photo is that of a huge stand of many hundreds of *U. inflata* in flower and covers two pages. This book will prove to be most interesting to those with interests in swamps.

DON SCHNELL writes: I'm glad everyone received their *Nepenthes* cuttings in good order. The reason for the large quantity of *Nepenthes gracilis* being sent out is because this plant grows like a weed. We also receive many questions regarding the availability of plants such as *N. x Dicksoniana*, *x dyeriana*, *rafflesiana* and *ampullaria*. These plants have short internodes and although they are growing superbly here, they are slow growers with little prunable stem elongation. When they do get long enough to cut, the lower stem is getting woody and it is time to restart new top cuttings, hence I seldom let them go, although slowly over a period of years I arrive at a point where there are three or four excess rooted cuttings to give away. *Nepenthes ampullaria* also grows slowly and I keep it in fluorescent terraria indoors since it does not seem to take the heat and sunlight in this part of the country as well as other species.

PHILIP THOMAS writes: After rereading the article in CPN VI, (1), 7 (1977) on the exchange, I'm not sure that I understand it clearly. I hope that I am not misinterpreting it when it states that the list will show what plants that you own ("simple inventory") and that it will not tell whether or not you have plants and/or seeds for trade. This will be absolutely terrible!!! If, for instance, someone had to list all his plants for trade in the "Want Ads," it would cost him a small fortune, and with only 10 entries per person, it would take two volumes worth of CPNs to complete his trading inventory. It is such a convenience now, I would utterly go mad if I did not know who had what to trade. It would defeat the whole purpose of the "Exchange" which would then have to be changed to a "List." What good would it do for anyone?

I am strongly opposed to this, if in fact it is actually what is going to happen, and I hope that other CPN members let you know. If it is not going to change from its present way of operation, you need to write a short note of explanation for misled people like me.

ED: The changes the editors are making in the seed-plant exchange setup are the result of observing the results of the present setup, reading and hearing many comments about it, and about a year of discussion among the editors and present custodians of the exchange. What we have proposed for trial is certainly not permanently engraved in stone: we have no doubt that additional modifications will be necessary, and--depending on total response--possibly returning to a system much like the preceding one if necessary. We therefore encourage all readers to follow suit with Philip Thomas and let us know how you feel. However, we would respectfully ask that you give the system a try for a year or so in order that your remarks--positive or negative--will be backed by some experience. The individual chosen to be in charge of the CPN seed bank is charged with answering all correspondence within a few days (barring illness and vacation) and submitting a complete list of what is in the bank for each issue of CPN. Thus the readers will be promptly and completely informed of the seed situation without having to ask or guess. The fine horticultural list that Bob Ziemer has worked so hard to develop will continue as such and will be available for cost purchase--we feel it is quite necessary to know what is in cultivation. The list will be sans triangles, circles, underlines, etc. Finally, the want-ads (the charge is very modest) will feature only those people who really have something to trade or sell, and those who wish something to trade or sell, and they may contact each other directly to work things out. A rough check of triangles, circles, etc. of the last exchange list under the old system indicates that if *all* people (unlikely) list all such indicated material in the want-ads, it would not fill an issue or for that matter more than a page and a half of a CPN issue, and then would be pure concentrated exchange-selling information.

GLENN CLAUDI-MAGNUSSEN writes: I also had an idea about how to lessen the cost of CPN. I felt that the price for the Want Ads could be raised slightly and also that you should allow companies to have ads about CPs, CP books, terrariums, etc. I think that you could get extra money to improve CPN.

MAKOTO HONDA writes in to inform us that the magazine "Plants of the World," which he mentioned in the last issue (Vol. VI, 5) is now available from the publisher. There are two issues, #64 and #9, which deal with CP. The photos are of suitable quality for framing and most of them are 8 x 10 inches in size or larger. Issue #9 deals with *Pinguicula* and *Utricularia*, while issue #64 deals with *Nepenthes*, *Sarracenia* and *Darlingtonia* as well as Japanese *Drosera* species. Each issue costs about \$1.20 plus \$.80 postage or a total of two (\$2.00) dollars each (surface mail). Please send all requests to the following address:

ASAHI SHIMBUN PUBLICATIONS DEPT.
Tokyo Headquarters
2-6-1 Yuraku-cho, Chiyoda-ku
Tokyo, 100, JAPAN

LARRY MELLICHAMP writes: Because *Darlingtonia* is considered difficult to grow in parts of the country outside its native Pacific Northwest, Joe and Don thought it noteworthy that I have three very healthy plants which I have maintained for the past 2-3 years here in the east. In spring 1975 Bob Ziemer sent me 2-3 plants, and then I collected 2-3 more when I was in northwestern California in August 1975. These plants were potted in a mixture of half peat, half silica sand and kept at the University of Michigan Botanical Gardens in Ann Arbor along with the *Sarracenia*s and other CP. They were kept outdoors in full summer during the summers (which can get hot in southeastern Michigan) with rather minimal daily watering with distilled water. During the winter they were kept indoors in a cool greenhouse where the temperature was around 35-40°F. During 1-1/2 years, only one plant mysteriously died. In August 1976 three plants were brought down with me to Charlotte, North Carolina, along with other *Sarracenia* and CP. They were still given full sun (with a little morning and afternoon shading) and more frequent watering with tap water, which has produced no harm. Winter storage for all CP here is cold greenhouse with a minimum of 30-35°F. This past spring (1977) two of the *Darlingtonia* flowered beautifully, I cross-pollinated them, and now have a large seed-pod forming on one. New, strong pitchers (almost 15" high) are being formed, the largest in three years; and one plant is sending out new shoots around the top of the pot and out through the drainage holes in the bottom. Prolific rascal! I do not know what I am doing right or wrong, but I'm going to try not to change. I am anxious to see how they survive another hot summer, and am tempted to put one in a controlled environment chamber and keep it cooler, just as insurance against loss due to heat. It will also be interesting to compare with outside-grown plants. Perhaps the daily watering with cool pipe-water is significant, although in Michigan they are watered with room temperature water. Seedlings germinated in 1975 and kept under more shaded conditions have grown very little since then. Perhaps I have selected some heat tolerant strain of *Darlingtonia*--it certainly seems to be thriving here. I will donate the seed pod to the seed exchange.

JIM KOROLAS writes: In Ontario, Canada, *Sarracenia purpurea* shows three varieties which are: *S. purpurea* forma *heterophylla*, *S. purpurea* var. *replicola* (Boivin) and *S. purpurea* var. *terrae-novae* (Pylaio). So what's the difference? Well, all CPNers should know that *S. purpurea* forma *heterophylla* is yellowish or golden yellow in color, never showing any red coloration in the veins. Whereas, *S. purpurea* var. *replicola* and *S. purpurea* var. *terrae-novae* are identical in coloration with the difference being pitcher size; the former plant variant has pitchers averaging about 7.62 cm (3") while the latter variant grows in extremely acidic bogs with pitcher size averaging about 17.78 cm (7").

For those CPNers who want to see *S. purp.* var. *terrae-novae* and live near Toronto, there is only one bog that I know of and had the chance to visit. The bog is located on Etobicoke Creek, the border between Mississauga and Toronto north of Lakeshore Blvd. If you visit this bog, if it's still there, please DO NOT collect the plants as they are not holding very well. However, I have noticed a good stand of *Drosera rotundifolia* in this bog.

Ed. note--Further editorial discussion with the author confirms that indeed the plants described as *S. purpurea* ssp. *purpurea* f. *heterophylla* are the real thing. This is a notable range extension. He noted four plants in a bog of 80 red forms. The *heterophylla* forms fit all criteria. D.S.

PAUL LEWIS writes: I have grown CP over sixteen years and have been fascinated by their different methods of capture but *Utricularias* topped them all despite their tiny size. A friend of mine moved to Fairfield, Texas (in Freestone County), from Tulsa in March of 1976, and I got the chance to see him in August. I knew *Drosera brevifolia*, *Sarracenia alata* and *Utricularia intermedia* grew in east Texas. So, one morning, when we went fishing, I hunted for CP (fishing I could take or leave). We went to Red Lake, 18 mi. east of Fairfield. I quickly spotted *U. intermedia*. There were millions of little yellow blooms, the middle of the bract was attached to the peduncle which was 2-3" high, bearing from 2-5 yellow flowers. These plants completely surrounded the lake (about 1/4 mile long and from 150-200 feet wide). Words could not express the satisfaction felt when finding CP in the field, especially for the first time, even though I've grown CP over half my life. I could not find *D. brevifolia* or *Sarracenia alata* at that site even though humidity was quite high due to a large lake sitting in a valley. I measured the water pH and the reading was weakly acid (6.8) and the soil (6.6). I'll try to find these two species next time.

PHILIP SHERIDAN writes: First of all, I bought a *P. caerulea* from C.E.G. and one of the leaves has developed into sort of a "Y" shape. I guess you would call it a binate *Pinguicula* leaf. I'll try to get a photo of it and send it in to you. It is really quite interesting.

An interesting device for growing CP that really require a high humidity is an aquarium-terrarium. It is sold by Aqua Engineers. It comes with only one fluorescent light fixture; I have been able to fit in another one. I'm just letting the sphagnum grow right now, but I plan to start some *Nepenthes* seeds in there and also grow another tropical CP.

Now here is the really big thing I wanted to tell you. My friends Mike Hunt and Geoffrey Goodrum are going to start a CP club! We still haven't thought up a name yet, but we'd greatly appreciate it if you would put a notice in CPN telling all interested people to write to me and suggest a suitable place for meeting and any other information that would help us really get our club rolling. We need a good name for the club, ideas on field trips, etc. (Philip Sheridan, 5729 S. 2nd Street, Arlington, VA 22204)

PETER TAYLOR has pointed out that the SEM *Utricularia* trap cover photo on the December, 1976, issue (CPN V:53) is not *Utricularia cornuta* but possibly *U. subulata*. We have rechecked with the photographer who states he received the specimen (which has never flowered for him) from a commercial nursery as *U. cornuta*, but that the same nursery also offers *U. subulata*, so contamination of the culture was likely. Peter Taylor states the photo of *U. cornuta* traps in Lloyd is correctly labeled. There certainly is a marked difference in that *U. cornuta* lacks appendages on the upper lip.

BRIAN HENDRIX writes: I just received my first copy of the Carnivorous Plant Newsletter, and I must say I enjoyed it very much. You and your associates publish a fine newsletter, as it is both educational and entertaining. I would like to point out that Carolina Exotic Gardens offers not only *Sarracenia*, *Darlingtonia*, and *Dionaea*, but has *Drosera*, *Pinguicula*, *Utricularia*, and *Nepenthes* as well. Might I suggest that perhaps CPN offer space other than the Want-Ads for the various Carnivorous Plant nurseries. I'm sure they would be willing to pay more than the price you ask for the Want-Ads.

REVIEW OF RECENT LITERATURE

- Adams, R. M. and G. W. Smith. 1977. An SEM survey of the five carnivorous pitcher plant genera. *Amer. J. Bot.* 64:265-272.
Pitcher SEM examinations on *Nepenthes rafflesiana*, *Sarracenia purpurea*, *Heliamphora heterodoxa*, *Darlingtonia californica* and *Cephalotus follicularis* were done and comparative discussions undertaken. The authors state they tried to arrange the photos for maximum clarity to both professional and layman. As a result of these studies, several new features were noted including previously unreported glands on the peristome teeth of *Cephalotus*, and the lack of previously reported glands in the smooth zone 3 of *S. purpurea*. The text and photos are excellent and very informative. Serious CPers should get a copy of the paper. (Reprints: Richard Adams II, 190 Pleasant Grove, #M-2, Ithaca, NY 14850. The author informs us that when his supply of reprints is exhausted, Sun Dew Environments will stock additional reprints for sale.)
- Chandler, G. E. and J. W. Anderson. Uptake and metabolism of insect metabolites by leaves and tentacles of *Drosera* species. *New Phytol.* 77:625-634. (1976).
Authors supplied *Drosera binata* with fruit flies labelled with radioactive sulfate. Methionine sulphoxide, cysteine, cysteic acid and sulphate of the plant was labelled. When labelled sulfate alone was given to the plant, a similar labelling pattern was found except for cysteic acid which was unlabelled. There were differences in sulfur metabolism between field grown plants and those grown in axenic cultures. The latter cultures didn't incorporate sulfur label into methionine sulfoxide.
- Frost, T. M. Investigations of the aufwuchs of freshwater sponges: I. A quantitative comparison between the surfaces of *Spongilla lacustris* and three aquatic macrophytes. *Hydrobiologia* 50(2):145-149. 1976.
The author describes the aufwuchs of the freshwater sponge and the reduced number in comparison with other plants, namely *Utricularia*.

SARRACENIA - TOUR DELUXE

by Dave Kutt

It was September 19th and autumn was well on its way. Ed Orris joined me in southern Illinois and we departed for along ride to Waycross, Georgia and the Luara S. Walker State Park. This facility has always provided a conveniently close campground for an overnight stay near the borderlines of the Okefenokee Swamp Park itself. This time it was no exception.

Upon arriving at the Waycross area we first noticed *Pinguicula caerulea* plants growing on grassy, sunny, slanted banks which usually bordered drainage ditch areas. Along with the *Pinguicula* but less conspicuous at a fast glance were two small members of the *Utricularia fibrosa* complex. One type displayed a 1/4" wide yellow flower on a six or eight inch tall scape. The other type, probably *Utricularia olivacea*, was very tiny, perhaps 1/4 to one inch tall, and had a very tiny pale yellow flower. In the shallow drainage ditch waters, we also noticed the pale purple flecks of *Utricularia purpurea* flowers. The opposite side of those same drainage ditches contained *Sarracenia minor* plants of the Okefenokee area which grow much larger than *S. minor* found anywhere else. The plants were entering their dormancy and displayed ripe seed pods. Some had solid red pitcher coloration and most of them had dark red hues on the underside of the pitcher hood and on the pitcher "lip". Many of them also approached or even exceeded three feet in height! These plants grow with a vertical rhizome terminating in an apex. Often, clonal clusters form and grow up out of the shallow water. *Sarracenia minor* found elsewhere do not characteristically grow in water. Instead, they usually occur in well-drained situations. All of the "Okee" *S. minor* that we saw were in saturated mud and often were submerged to just above their apex. All of the larger plants grew with their apex submerged. The banks themselves, in addition to the *Pinguicula*, were covered everywhere with *Drosera capillaris*. These plants were all positioned to receive full sun most of the day.

We visited the Okefenokee Swamp Park to see their pavillion with a room dedicated primarily to the insectivorous plants of the swamp. An interesting group of pavillions and displays show much about the swamp's natural ecology and wildlife, and among other things, it features freeze-dried, airbrush painted *Sarracenia* plants! We were eager to boat back into the depths of the swamps for a closer look.

To do this, it was necessary to drive 26 miles south to the Okefenokee National Wildlife Refuge near Folkston at the southeast end of the swamp. There you can rent a canoe or motor boat (we chose the latter) for a day at a reasonable cost. As we motored into the humid swamp, we were constantly on the lookout for alligators and poisonous snakes, but we saw very little of the reptile life other than an alligator or two. Several areas on the swamp map provided are designated as prairies and we headed for "Chesser" and "Grand Prairie" which were known areas of the giant *Sarracenia minor*. Several times, floating detached masses of *Utricularia purpurea* almost clogged our engine's cooling-water intake port. I never thought I'd be scared by a *Utricularia* but Ed and I were warned that a clog could soon blow a headgasket and we were 14 miles into the swamp! It all turned out without mishap though, and we did find large *Sarracenia minor* sparsely populating the border areas of deep swamp grasses in "Grand Prairie". We were unable to deeply penetrate any of the semi-solid land (floating vegetative masses) on foot, but it all appeared to be basically suitable habitat for this pitcher plant. Although, we were also looking for *Sarracenia psittacina* and possible *S. x formosa* hybrids, these didn't turn up until later that day along solid land areas adjacent to Chesser Island. Before leaving the swamp area, we climbed an observation tower for an overhead view of the swamp and saw more *S. minor*, sphagnum moss and bog plants as well as an alligator nest from the scenic "boardwalk into the swamp" at Chesser Island. It was all very interesting and unique enough to be well worth our additional time.

As we continued our trip south and west into eastern Florida, we saw no *Sarracenias* for a while. We noticed a lot of *Pinguicula caerulea* and always the *Drosera capillaris* growing everywhere. One place had a massive display of *Utricularia purpurea* growing very profusely in a roadside drainage ditch along route 121. Eventually, we saw *Sarracenia minor* again in sparse patches amongst the grass and weeds by the roadside. This time it was the typical, rather small type, quite different from the huge Okefenokee plants seen earlier. They grew in moist to wet coastal plain soil comprised of mostly white silica sand with a small percentage of organic debris. These plants also occurred in full sun. Finally, we camped for the night in Lake City, Florida.

We headed for the western Florida panhandle along U.S. route 98 and soon saw several areas containing *Drosera filiformis tracyi* and a very large form of *Pinguicula lutea* which could easily be mistaken for *P. caerulea* should it be found when not in flower. They were not in flower in late September but on a previous trip with Rich Sivertsen,

I have seen them in flower in late April. As for the *Drosera tracyi*, when heading west in Florida, this plant is seen fairly often in many habitat areas all the way through Mississippi. Later near Carabelle, Florida, we found large succulent *Pinguicula ionantha* plants growing in black mud and even under water! Some of these plants were huge--some in excess of six inches in diameter and proved to be larger than any other *Pinguicula* species we saw on our trip. They were often overgrown partially by grasses, but were otherwise growing in full sun. The very wet ground conditions in addition to the sparse grass cover provided very high humidity levels near the ground, thus providing a super-humid "micro-environment" for the *Pinguicula* plants. There was no evidence of *Pinguicula planifolia* seen here only two years earlier.

We continued on a south-west course on Florida Rt. 98/319 until we reached Florida Rt. 71 North. Along route 71, more *P. ionantha* were seen on back roads along with *S. psittacina*. There were also savannah areas containing *Sarracenia flava* very nearby and we were disgusted with what we saw there. A large, deep drainage ditch surrounded the grassy moist *Sarracenia* savannah. One half of the habitat area had been drained and plowed under already and was completely dried and lifeless. The other adjacent half had the remainder of a once large *Sarracenia flava* population. Some of the plants were huge and yellow-green with only the Florida-typical maroon patch at the throat. Others were smaller with red veins and large lids. Still others seemed to combine all these qualities. Most of the plants were large, nearly three feet tall, and were mostly very bright yellow or browned out depicting various stages into dormancy. It seemed to be a doomed habitat, as drainage was already in process for this station too.

We got off U.S. Rt. 71 and headed north for U.S. Rt. 90 on a random exploratory course using smaller roads. There we found our first traces of *Sarracenia leucophylla* growing with *S. psittacina* in wet roadside areas. The *Sarracenia psittacina* was very profuse in all stages of development from seedling to adult. Later, we camped in Marianna for the night.

The next morning, we went west on U.S. Rt. 90 where after a short walk we located an isolated bog near Crestview not visible from the road. This hidden area was a good example of a natural insectivorous garden. Here in one small area we found *S. purpurea venosa*, *S. psittacina*, *S. flava* (the vast majority), *S. rubra* and *S. leucophylla*. The F-1 hybrids were *S. rubra* x *leucophylla*, *S. purpurea* x *flava*, *S. flava* x *leucophylla* and *S. psittacina* x *rubra*. Other hybrids that were mainly backcrosses were present also. This same area also contained *Drosera tracyi*, *D. capillaris*, *D. intermedia*, *Utricularia purpurea* and *Pinguicula caerulea*. All plants grew in nearly pure white silica sand, moist to wet and in full sun. Some of the *Pinguicula* here seemed to back out of the direct sunlight into the mottled shade provided by pine trees at this habitat's outer border. This site seemed to be a meeting point for the habitat ranges of many *Sarracenia* species.

A bit further west at the Yellow River we observed primarily *S. leucophylla* and its many hybrids with *S. rubra* and *S. flava*. The lower levels of the wet, tall grass were occupied by *S. rubra* and *S. psittacina*, *S. rubra* hybrids and *Pinguicula planifolia* with beautiful maroon colored foliage. Scattered *S. flava* were a definite minority here, but a few were present. Many other hybrid backcrosses were again evident here in various shapes and sizes.

The following day we went to Alabama where we found huge *S. purpurea venosa* plants growing with *S. leucophylla* and *mitchelliana* hybrids amongst the tall grass in flat dishd areas. Then in Baldwin Co., Alabama, we witness almost solitary stands of *S. leucophylla* which literally covered acres of land. A very close examination revealed also *S. psittacina* which took advantage of the ground-level insect life.

Our visit to southern Alabama was fairly brief and was terminated after examining a few grassy, flat bogs in the western portion along the coast. Here we turned up a lot of *Sarracenia alata* with a very few *S. purpurea* present and the resulting F-1 hybrids of *S. alata* x *purpurea* here and there in the tall grass. A few of the "Gulf" *S. rubra* were seen here as well and also a very interesting and very pale form of *P. planifolia*. The *S. alata* with the dark red inner lining was seen here as well as bright yellow forms and heavily veined forms. Many *S. alata* x *S. leucophylla* hybrids were seen here too. Indeed, once the *S. alata* range really begins, pure *S. leucophylla* is just about impossible to find!

Finally, we headed to north-eastern Alabama to view a remaining stand of the rare *Sarracenia oreophila*. This site is next to a small pond and once you get past the cows, the plants can be found amongst tall weeds at the far side. Wild daisies and very tall weeds had all but completely overgrown the now dormant *S. oreophila* plants. Many of the plants were attempting to grow up through the large woody shrubs. Their rhizomes were entangled in the shrubs root systems. We gathered

seed from some of the plants and rescued a very few plants from being choked out by the bushes. The *S. oreophila* plants here occur in a strange, hard clay soil containing very fine silica sand. The area was void of apparent pine bogs or savannahs or habitats which seemed typical of CP. In fact, the majority of the trees in the area were deciduous.

In summary, we travelled about 2,550 miles in our car and a few more on foot. Although some plant collecting was done, we collected sparingly and concentrated more on acquiring seed and good photographs. Don't let the descriptions in this report mislead you into believing that *Sarracenia* occurs everywhere in the south in great abundance. They do not. Throughout the coastal states only highly specialized habitat areas allow these plants to exist at all and these habitat areas are quickly vanishing forever for one reason or another. Many of the even recently CP populated areas are now void of these plants. The larger stands of these plants took many years to spread and establish and unfortunately, new habitat areas do not usually replace the ones that are lost.

DROSERAS OF THE NEW FOREST

by David W. Taylor

The New Forest is unique in the world for its historical interest, its rare animals and plants and its living traditions. It was created by William I about AD 1079, and it lies in the county of Hampshire down in the south west corner of England. It is an area of outstanding beauty which is visited by millions of people every year.

There are three distinct types of vegetation in this vast area of land: heathland with self sown Scots pine and birch, heather, gorse, and grasses; woodland containing many thousands of trees such as beech, oak, and yew; and last of all, marshlands with large wild areas of peat and sphagnum bogs.

The bogs are many in number, and have magical names such as Bishops Dyke, Black Gutter Bottom, and Duck Hole Bog. The forest itself is situated about one hundred miles from the center of London, and is easily reached by the modern motorway.

It was in late August when I drove with my wife Diana and four children down to Everton, which is a small country village which lies just outside the forest area. We are very fortunate in the fact that my wife's parents own a retirement cottage in Everton, and that we are able to go there for the occasional week-end. From this vantage point, it is only a short car ride to many of the beautiful forest attractions. As it happened, this particular week-end turned out to be a bank holiday, and there were many tourists and campers that had made the trip down with us. A good number of them were at the local carnival that was held on the Saturday.

The following day after a good breakfast, I set off with my packed lunch on the long awaited field trip in search of the three *Droseras* native to this country, and known to be found in the New Forest area. Earlier in the summer, I had been lucky enough to borrow a very old book from a botanist friend of mine. This was on the flora of Hampshire. Every major county in England has at one time or other had a county flora book published. Unfortunately, many of them are old and very much out of date, and the Hampshire book was a prime example. However, the book had told me of the colonies of *Drosera* that were growing in the forest bogs. My main interest was to find *D. anglica*, as I had already found *rotundifolia* and *intermedia* on an earlier visit. I was informed by the book that this plant was to be found in great numbers in an area of the forest known as the Rhinefield, and particularly in bogs under the names of Holmsley, Wiverley, and Hinchelsea. It was stated that *D. anglica* could be found in abundance in Hinchelsea bog way back in 1899. This bit of information did not deter me too much, as I knew that these wild boggy lands had probably remained unchanged for hundreds of years. Although I did not expect to find the abundance of plants as described in the book, I felt that I would find at least a few scattered here and there. The Rhinefield area was only a matter of about four miles from the cottage, and I soon arrived at the small stoney car-park. In all parts of the New Forest, there are special walks that are purposely planned by the forest authorities for the public's convenience. The walks are planned to take you through the most interesting parts of any one particular area so that anything of specific interest can clearly be seen.

Having parked the car, I started my walk down the long and stoney foot-path that twisted its way straight through the middle of the Hinchelsea bog. The whole area was one big dip which rose up on the other side into woodland and pine forest. The black peaty bog was either side of the foot-path, and the occasional wild horse or pony could be seen plodding through the goo in search for green vegetation. I walked half way down the foot-path until I found a slightly drier part of the bog to walk on. This was on the left side of the path, and I was able to penetrate about ten yards into the bog. In my haste to start this venture, the one important thing that I forgot to bring with me was a pair of water-proof boots. All I had on my feet was a pair of sandals that I had worn all the way through the long hot summer and had become quite accustomed to. Eventually I was forced to take the sandals and my socks off, and with my trouser legs rolled up, I waded into the bog. I soon noticed that there were many plants of *rotundifolia* and even more of *intermedia* in the black peat of the bog. A vast number of the *intermedia* plants were of a deep crimson colour. This was obviously due the fierce heat of the sun that had been shining constantly for many days. The plants had no shelter from the sun as the whole area was very open. There was a small area of shallow water nearby, which was full of reeds and with hummocks of sphagnum around the edges. There seemed to be more *rotundifolia* plants in the moss, whereas the *intermedia* plants seemed to favour the wet peaty areas of the bog. I was a bit disappointed that there were no signs of the rarer *anglica* plants described as being abundant in this bog. However, I collected a few specimens of the *rotundifolia* and *intermedia* plants and trod my way carefully back to the foot-path, first collecting my sandals and socks. I made my way up the rest of the stoney foot-path and into the pine forest still feeling despondent at not finding *D. anglica*. I could have walked for miles, but as the sky was clouding over, I decided to walk back. When I eventually reached the perimeter of the bog, I thought perhaps I would explore the opposite side to the part I had walked in earlier on in the morning. This side of the bog was about half a mile long and when I finally reached the extreme end of it, I found myself on a new foot-path. This part of the bog was much wetter than the other side, and a small stream wound its way into the middle of it. The ground was a mixture of very wet peat intermixed with sphagnum, and it was not as flat as the other side of the bog. After studying it for a few minutes, I decided to cast aside my footwear once again and wade in. It was very boggy, but with the help of a broken off tree branch, I was able to walk in about seven yards. It would have been impossible to go any further. There was a lot of long grass about and because of this it was difficult to see much else. All of a sudden, my eyes fell on something dewy and shining in amongst the grasses. With much difficulty, I managed to squelch my way to the spot my eyes had rested on, and there it was, *Drosera anglica* in full splendour. There were quite a number of plants scattered around the area, and if I could have gone further into the bog, I think I would have found many more. After having collected a few of these plants which seemed to be the only *Droseras* there apart from a few spasmodic *intermedia* plants, I finally dragged myself from the bog. The time was one o'clock, and so I decided to sit down and eat my packed lunch. After about twenty minutes of sitting on the edge of the bog in complete quietness, and having seen only four people in the time I had spent in Hinchelsea bog, I got up and put on my foot-wear once more. A sudden clap of thunder heralded my time to depart, and I slowly made my way around the outer edge of this wild and lonely land, and back to the car. As I drove out of the Rhineland, it started to rain, but I could not care, for I had found what I had hoped to find all in the space of one morning, a morning spent with the *Droseras* of the New Forest.

CONSERVATION AND CARNIVOROUS PLANTS

by Landon T. Ross

Introduction

Almost everyone who is involved in the study or cultivation of carnivorous plants is aware, to some degree, of the urgent need for conservation efforts. A number of taxa are on the verge of extinction, many prime habitats have been destroyed, and numerous locations are in serious danger. This distressing situation has been discussed many times (for example, see Schwartz, 1974, p. 9; DeFilipps, 1976; Johnson, 1976; Mazrimas and Schnell, 1976; and Schnell, 1976, p. 9) and I will not belabor it here. Instead, I will try to offer some recommendations on how to be a CP enthusiast and, at the same time, a benefit to future scholars, hobbyists, and the plants themselves. These are, of course, my personal opinions which do not necessarily exactly reflect the views of the editors or the policies of CPN.

Field Collecting

1. *Never* remove specimens of any of the really scarce plants from the field. This applies particularly to some of the rarer types of *Sarracenia* and *Nepenthes* which have very restricted distributions. If you are fortunate enough to find such a location, and feel that you must have some of the plants for your own purposes, time your visit to coincide with the fruiting season so that you may collect a limited amount of seed. Depending upon local conditions, it may be a good idea, at the same time, to try to help the population out by sprinkling a few seeds in the least crowded parts of the site. If done carefully, cuttings may sometimes be taken for later vegetation propagation without materially damaging the plants.
2. Do not collect plants from small isolated populations of any species. These often consist of a few struggling specimens which may represent a remnant of a previously much larger population or even the beginnings of a new distribution expansion. In any case, these sites are often of great scientific interest, and may be of some considerable importance to the well-being of the species. Since this type of location is often characteristic of the distributional limits of a species, you will often find much more extensive stands of a given plant within a few miles.
3. When collecting plants, especially in situations contrary to the above recommendations, try to exercise your self control. In marginal locations and in the case of scarce species, an altruistic hobbyist gathering specimens for all his friends can do as much damage as any commercial collector. It is always best, even when dealing with common plants, to only take what you feel you really need. If you are at all unsure of your ability to grow a given kind of plant, you should be even more cautious about field-collecting specimens. Test your horticultural talents on the common varieties first.
4. Avoid breaking the law. Concern for our environment, and specifically for the continued existence of some of the more endangered organisms, has led to the creation of a large number of conservation-oriented laws at all governmental levels. Many of these apply rather directly to carnivorous plants. A great deal of scientific expertise has often (but not always) gone into the formulation of these, and if they were carefully obeyed, many taxa and populations would be in much less danger. Since the legal penalties are often relatively severe, this recommendation should also be considered from a practical standpoint. Although you should check for yourself, as a general rule the following types of laws will be found: 1) all plants in parks, wildlife refuges, and similar areas are protected, 2) certain very scarce CP are protected in all areas, and 3) CP which are rare in a local area, are often protected there even if they are common elsewhere. In the United States, at least, you are likely to find that it is illegal to collect most CP unless you have specific permission of the landowner.
5. Be cautious about informing others of the locations of isolated populations or rare species. It is now becoming apparent, especially to the scientific community, that great damage can result from the release of this type of information. Commercial exploration has historically often followed on the heels of the publication of even moderately explicit locality data. Because of this, the scientist in particular is now placed in the very uncomfortable position of withholding important information to protect the object of his interests.

Purchasing Plants

6. Buy your plants only from reputable dealers who you can be sure did not field-collect the plants they are selling. I only know of two such dealers in the United States, "Sun Dew Environments" and "World Insectivorous Plants," although there may be others. Avoid dealers, such as "Peter Pauls Nurseries," which have been known to have solicited field-grown material.* There are almost certainly a considerable number of dealers of this type presently in business. It would be of great benefit for all CP growers to have seen the ravages which can be caused by commercial exploitation, the trampled and cratered fields which were once pristine bogs or savannahs.

Positive Conservation Measures

The above recommendations have essentially consisted of things which you should avoid doing. If you would like to do something of positive benefit, there are a number of courses of action available.

* A letter of documentation is on file with the editors of CPN.

7. Work for better laws to protect carnivorous plants. If you live in an area where there are native CP, find out if any of them are in need of more protection and then contact your local lawmakers. You may find them to be quite helpful, in the absence of any particular opposition to your request, and willing to add a "conservation" feather to their caps. Be careful, however, to make your point as reasonably and logically as possible. It is probably of even more importance, at the same time, to attempt to find if the existing laws are being enforced. They are probably not. Since this type of law is usually handled by agencies which also regulate hunting and fishing, plant protection may be given a low priority. Report any incident which you feel may be in violation of the carnivorous plant protection laws. You will probably not have enough evidence to lead to any real action, but this type of report may lead to an increased awareness of the need for improved enforcement on the part of the agency. With respect to the type of activity discussed here, there is no substitute for acquiring some knowledge as to how your government works (local conservation organizations will be delighted to help you), followed by the writing of letters to all appropriate governmental officials and employees.

8. Make some effort to see that significant CP habitats are preserved. This is not an easy task at all, but is probably the most important single action you can take. Many persons involved with carnivorous plants are aware of some prime location which is vulnerable to elimination. Indeed, many are all too familiar with such sites which have already been destroyed. The most efficient use of your time can probably be made by contacting local conservation groups and educating them as to the uniqueness and intrinsic scientific value of such locations. (You should, of course, also beware of publicizing these places, as previously noted.) They will often know the right mechanisms for placing these lands in the public trust, and for seeing that they are intelligently managed in the future. Once again, a letter-writing campaign may be relatively effective.

9. If you are one of those individuals who is fortunate enough to be growing some of the rarer or more endangered plants, propagate and distribute them as widely as possible. I do not have a great deal of faith in the concept that individual growers will, in the long run, be able to preserve species which have been exterminated in the wild. However, it is fairly obvious that if all growers who were interested in, for instance, *Sarracenia rubra jonesii*, had several specimens, there would be no incentive for the collection of the wild plants.

Conclusions

Hopefully, it is now obvious that there are many things which any CP enthusiast can do to further the cause of conservation. Some of these may be accomplished by a little positive action, but many require only that the grower's interest in obtaining as many species as possible in the shortest time be slightly curtailed. I do realize, though, how difficult this may be, and must admit that I have not, in the past, always followed my own recommendations. This was often due to ignorance of the real need for conservation measures, but was sometimes caused by a belief that the only way in which I might obtain a given plant was by collecting it or purchasing it from any willing seller. There may, previously, have been some slight validity in this belief, but with few exceptions, it is no longer true. Many people involved with the CPN Seed and Plant Exchange are willing to help out less advanced growers, often to the point of distributing scarce material *gratis*, and the conscientious commercial sources are doing their best to expand their lists of available species. You will find, given sufficient patience, that you will eventually be able to obtain almost any plant you wish and keep an entirely clear conscience in the process.

Whatever your interests in carnivorous plants may be, try to always keep in mind their precarious status. Realize the fragile nature of most of their habitats, the endangered status of some of the species, and act accordingly. To do so is to assure the future of these marvelously interesting plants.

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Schwartz, R. 1974. Carnivorous plants. Praeger, New York. 128 p.

BOTANIST'S CORNERL
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We will now discuss the reasons for name changes. Botanical history goes back for several hundred years during which time new plants were being discovered and named. In many cases, due to the lack of efficient communications, two botanists could get hold of the same plant and each would give it a different scientific name without knowing what the other was doing. Years later it would be discovered that there was one plant species (NOTE: the word "species" is always used as a plural form, whether it applies to one plant specimen, one species, or several species. The use of the word "specie" is never correct) with two scientific names, a situation which could not exist without much confusion.

What was to be done? Well, one of the most important rules of the International Code of Botanical Nomenclature, which attempts to stabilize nomenclature and allow for the fewest changes, is the rule of *priority*. This simply

states that the *first* name to be validly published for a plant is to be the one and only correct one, and this is usually the oldest name. Valid publication involves giving the plant a proper Latin binomial name with a brief Latin description, and published where it has a reasonable chance of being available to most botanists. So, if there are two scientific names for a plant, one has to be the correct name and the other becomes a synonym. Thus, one way a well-known name can be changed is for someone to discover that another name had been proposed earlier than the one currently in use. This applies either to the generic name or the specific epithet. For example, the names *Sarracenia drummondii* and *S. sledgii*, well-known a generation ago, had to be changed to *S. leucophylla* and *S. alata*, respectively, when it was discovered that the latter names were older. These changes would not affect later generations of botanists and laymen who would be learning "*S. leucophylla*" and "*S. alata*" for the first time; but they would have to know about the earlier used synonyms if they had to look up any information about these species in the older literature.

Names may be also be changed when a botanist, or layman, studying a group of plants decides that the classification of these plants must be altered to reflect a more accurate view of the evolutionary relationships of the plants. He would come to this decision after exhaustive studies of the plants in the field, in the garden plot, in the laboratory and in the literature, and it is not a thing to be taken lightly. He may thus *transfer* a species from one genus to another, or he may change the rank of some species, for example, from a subspecies to a species, or vice versa. For example, "*Sarracenia jonesii*," from the mountains of North Carolina, may be recognized as *S. jonesii*, *S. rubra* ssp. *jonesii*, or *S. rubra* variety *jonesii*, depending on your taxonomic interpretation of the biological significance of the plant populations. (See C. R. Bell, A cytotaxonomic study of the Sarraceniaceae of North America, J. Elisha Mitchell Sci. Soc. 65:137-166 + 14 pl., 1949; S. McDaniel, The genus *Sarracenia*, Bull. Tall Timbers Research Station (Tallahassee, FL), No. 9, 1971; F. W. and R. B. Case, The *Sarracenia rubra* complex, Rhodora 78:270-325, 1976; D. E. Schnell, The Carnivorous Plants of the United States and Canada, Blair Publisher (Winston-Salem, NC), 1976; and D. E. Schnell, Intraspecific variation in *Sarracenia rubra*, Castanea (in press), 1977.)

The foregoing two situations indicate that these types of name changes will always be occurring; and, though inevitable, supposedly they reflect our ever increasing botanical knowledge and our changing (improving) views regarding populations of living, dynamic plants. I would agree that this concept goes against the notion of stability of names and facilitation of communication; but scientific names are still more specific than common names (because at any one time, there can be only one scientific name) and scientific names must be flexible to be useful in an ever changing field. At this point I embarrassingly bring up the case of the Douglas Fir of western North America. Over the past 200 years or so it has had four different scientific names, but it has always been known as "Douglas Fir." This is definitely an exception to the general situation.

At the risk of seeming contradictory to the previous discussion, I bring up one final point. Because name changes *are* annoying, no matter how important, and because they *may* interfere with the availability and flow of information and must be avoided whenever possible, the Code has a special clause that provides for the conservation

of names to prevent *certain* changes in the interest of stability. According to this provision, an incorrect name can be conserved (i.e., preserved) if it is widely known to and used by horticulturists, botanists, foresters, laymen, etc. Conservation thus can occasionally be used to avoid an otherwise inevitable name change which would inconvenience a great many people (See Jeffrey, 1968). By legislative action names can be conserved by the vote of a committee of the International Botanical Congress. They are then listed in the Code book along with the corresponding rejected names. Conservation is thus a limitation to the principle of priority in that the earliest name may not be used. Conservation itself has one limitation however: conservation applies only to names of genera and families; specific names cannot be conserved. As an example of conservation of names, take the names *Darlingtonia* and *Chrysamphora* which have both received varying degrees of acceptance as the correct generic name for the California Cobra plant. Under the rules of priority, *Chrysamphora* is the oldest *legitimate* name that applies to these plants because when the name *Darlingtonia* was proposed to refer to the cobra plant, the same name (*Darlingtonia*) had already been given to another entirely different species--and the same name can't be used twice (so *Darlingtonia* for the cobra plant had to be dropped, theoretically). However, by time this confusing situation had been discovered, the name *Darlingtonia* had been in use for a long time and had become well known as the California cobra plant. (The original "Darlingtonia" being a much more obscure member of the legume family). Thus, it was decided by a very narrow vote that *Darlingtonia*--as the California Cobra plant--should be conserved over the other use of the name, and therefore conserved over *Chrysamphora* also. Consequently, by legislative action, *Darlingtonia* is now and forever more (no matter what else might turn up) the correct name of the California cobra plant.

In conclusion, this has been a brief and highly simplified article in which I have tried to indicate that though botanists and laymen alike are annoyed by name changes of well-known plants, we must realize that there are special reasons for the changes; and taxonomic botanists are not to be scorned as merely name-jugglers, playing some silly game. Names can only be changed in accordance with the very specific rules layed down in the ICBN. You cannot alter the name of a plant just because you want to, or because you think the name is inappropriate, objectionable, misleading, etc. Scientific names are very important to botanists and laymen and they have their special uses, just as do common names. We must make the best of things and not let anything dampen our interest in the plants we enjoy, which after all, is the most important part of our concern. Fortunately, the plants remain unchanged and intriguing no matter what their names.

COMING IN THE NEXT ISSUE . . .

"Notes on Tuberous *Droseras* of Western Australia" by Steve Rose

"Notes on *Nepenthes mirabilis* and other Carnivorous Plants in Queensland"
by P. S. Lavarack

More pictures



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WANT ADS

- Robert Syrlik, 217 Drake Ave., Apt. 3J, New Rochelle, NY 10805.
(B) *Cephalotus follicularis*
- Lenny Hoffman, Jr., 365 Beach St., Berea, OH 44017
(B) *D. petiolaris*, any *Nepenthes*; (W) Any *Utricularia*
- Joseph P. Cantasano, 2717 Jerusalem Ave., North Bellmore, NY 11710
(B) *Cephalotus*, *Nepenthes rafflesiana*, *N. burki*, *N. dycriona*, *N. villosa*, *N. x kinabaluensis*,
N. edwardsiana, *N. harryana*, *N. bicalcarata*, *N. ampullaria*
- Patrick Dwyer, St. Michael's Episcopal Church, 49 Killeen Park, Albany NY 12205
(WT) *Androvanda* plants or seed, *Genlisea* sp. plants or seed, Mexican *Pinguicula* sp. (not
P. caudata) plants or seed, seed of CP's, *Drosera regia* plants or seed.
- Robert Cantlay, 30672 Paseo Del Niguel, Laguna Niguel, CA 92677
(WB) *Aldrovanda* plant, *Cephalotus* Fl plant, *Byblis gigantea* plant, *Drosera regia* plant
- Paul F. Kukuchka, P.O. Box #631, Montgomeryville, PA 18936
(WB) *Nepenthes maxima*, *Drosophyllum*
- Scott Plamondon, 6639 S.E. Yamhill Ct., Portland, Oregon 97215
(WTB) *Heliamphora*, *Cephalotus follicularis*, *Drosera schizandra*, *Drosera peltata*
(TS) *Darlingtonia californica*
- Thomas Crisalli, 145 Nelson St., Brooklyn, NY 11231
(B) *Drosera rotundifolia*, *D. linearis*, *D. anglica*, *D. intermedia*, *D. capillaris*, *D. filiformis*,
U.S.A. hybrids, *S. purpurea* ssp. *venosa*, *Dionaea muscipula* large, *Byblis*
- Aric Bendorf, 1121 North Signal St., Ojai, CA 93023
(WB) *Nepenthes* plants, cuttings or seeds, *Cephalotus follicularis* plants or seeds, *Byblis*
gigantea plants or seeds
- Steve Smith, P.O. Box 544, Hancock, NY 13783
(W) Single specimen *Cephalotus follicularis*
- Archibald F. Mills, 1517 Glenwood Lane, Bishop, CA 93514
(B) *Drosera binata*, *D. capensis*, *D. capillaris*, *D. filiformis*, *D. spathulata*, *Cephalotus*
follicularis, *Byblis gigantea*, *Nepenthes dicksoniana*, *N. gracilis*, *N. rafflesiana*
- Henry Peltz, 1511 Calvin Ave., Muskegon, Mich. 49442
(W) *Drosera petiolaris*

When submitting Want Ads, please be sure to print clearly for best results and to eliminate mistakes. Please circle the correct letter before each item (Want, Trade, Sell or Buy). Want ads are limited to carnivorous plants, terrariums, greenhouses and moss. There is a charge of ten cents per item, with no limit to the number of items you may submit per issue.

Send coin or check along with the form to: Arboretum, Want Ads
California State University
Fullerton, CA 92634

SEND YOUR PHOTOS!

We like David Taylor's suggestion (see News & Views) that subscribers send in pictures of themselves for publication in CPN. Contributors to Short Notes and News & Views should also send in pictures relevant to the article submitted. Photos should be glossy, black and white with good contrast (preferably with a light background), and not too large (3x5 is a good size). Please include a description.

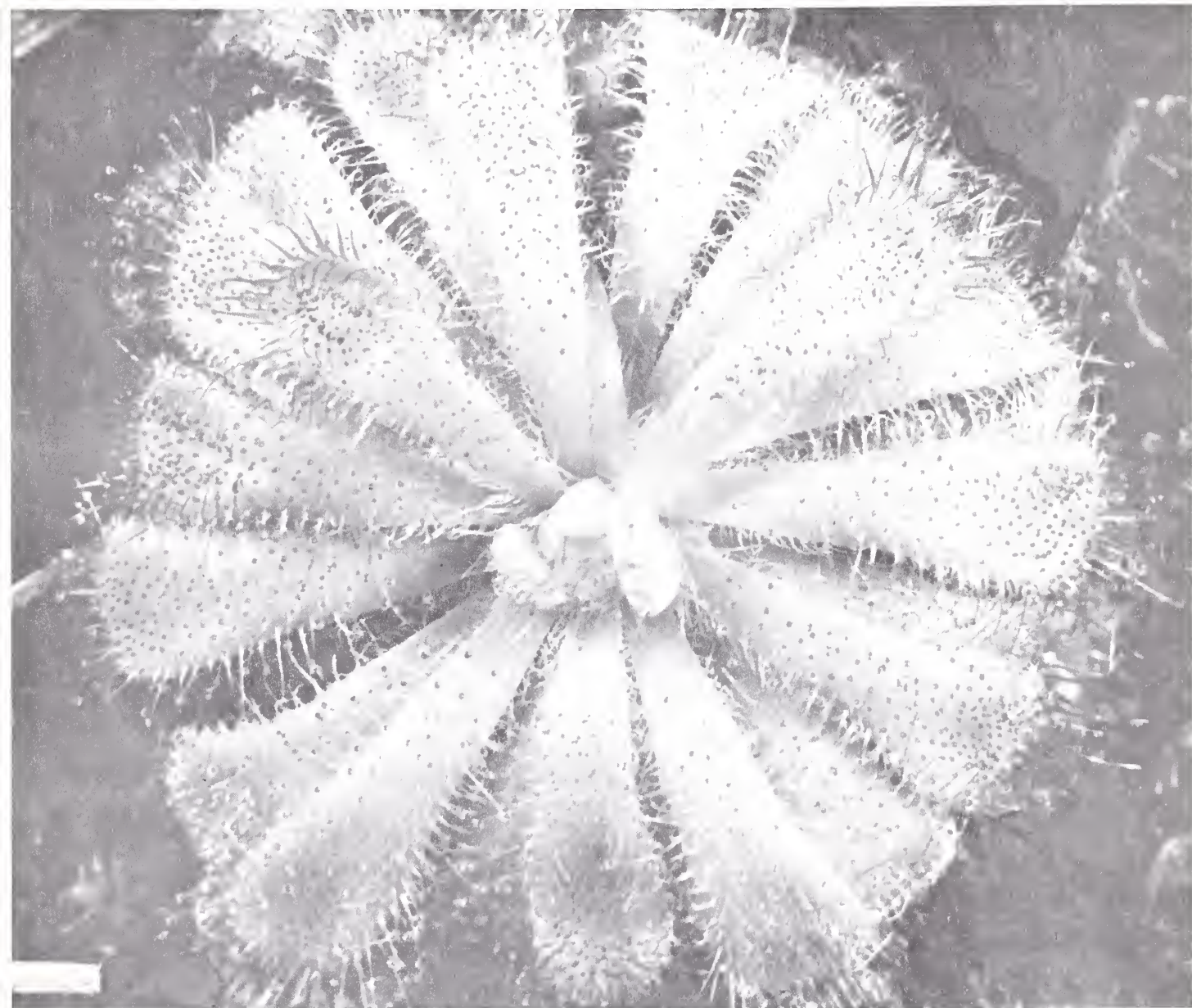
THE ARBORETUM
Department of Biological Sciences
California State University
Fullerton, CA 92634 USA



CARNIVOROUS PLANT NEWSLETTER

VOLUME VI, No. 3

September, 1977



Drosera spathulata Sundew

Photo by Steven A. Frowine
The Garden Center of Greater Cleveland

EDITOR'S CORNER

The past year has indeed been a busy one filled with accomplishments to advance the stature of CPN, but there have also been problems. We have been informed that all mailings, especially to places outside the USA, must now be wrapped--that is, enclosed in some sort of cover other than the type we have used for so many years. It is with this in mind, as well as the possibility of putting out a more professional looking newsletter with an added bonus--COLOR--that the following is proposed.

The present looseleaf 8-1/2 x 11 inch format would be changed to a 6 x 9 inch booklet such as used by the Begonia Society and the Los Angeles International Fern Society (LAIFS). We would be working with Kandid Litho Company which specializes in this type of newsletter. The booklet would have a *color cover* with occasional bonus color in the inside pages. Typeset would be double column "journal style" in 10 point type. For example, under the new format, Larry Mellichamp's Botanist's Corner in the June issue would take one page without the logo. There would be 24 inside pages plus the three sides of the cover, but since we would have to print all the covers at once, only non-timely information would be on these pages--probably black and white pictures with a caption of a few paragraphs. Upon examining a sample copy of CPN, the typesetter said that 24 inside pages would be sufficient with room for a few pictures. Weightwise, in an envelope, the whole package comes to well under two ounces, which we use as a standard mailing weight since the airmail rates we use for overseas come in two ounce increments.

The present format now costs about \$400 per issue for 1000 copies. The proposed format would cost about \$610 per issue for 1000 copies. Therefore, rates would have to be raised about \$2 to cover the increased printing costs. Now, the decision will have to be made as to whether the increase be applied across the board or should the domestic subscribers, which comprise the bulk of the total membership, partially subsidize the overseas subscribers? Due to currency and cost of living differences, overseas subscribers are in effect paying double the posted rates. In conversing with other societies, such as the Los Angeles International Fern Society, we find this is essentially the case; that is, they have only one subscription price with the idea that since the domestic subscribers far outnumber the overseas subscribers, the differences in postal rates, cost of living, etc., balance out.

We solicit your opinions. Please use the enclosed ballot and mail as soon as possible, as the results will have to be announced in the December issue along with the rates for the following year. The present format has been cut one sheet to cover the weight of the envelope, which results in the loss of one page of text since the Want Ads must now be incorporated into the paginated section of CPN.

SEED BANK

As announced in the last issue of CPN, the Seed Bank will be handled by Patrick Dwyer, Director, St. Michael's Episcopal Church Gardens and Arboretum, 49 Killiean Park, Albany, N.Y. 12205. Contributions and orders should be addressed to him.

To send seed: Please remove seed from the seed capsules and place it in small envelopes (preferably paper so that they dry out enough to prevent mold). Label with the origin and date of collection, including habitat if it is exotic. Fold the envelope over once or twice before taping so that the seeds don't stick to the tape. After the seed is received it will be placed in smaller packets; donors will be informed of how many packets they have donated. A donation of 10-19 packets earns one free seed packet of comparable rarity, with one free for each additional 10 packets.

Do not ask to trade for seed from the bank. Everyone will have to buy all but their free packets. When you send seed, indicate whether it is for the seed bank, for Patrick's seed project or for a personal trade. The seed bank is separate from his collection.

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To order seed: Please enclose payment. List the seeds desired and an equal number of substitutes in order of preference. If requested, Patrick will add any cultural instructions of which he is aware. Patrick will answer all letters and orders as quickly as possible; if you receive no response within two weeks (U.S.) to a month (outside U.S.) please write again.

Each issue of CPN will include an update of the inventory. Please do not ask for a list unless you have joined after this initial listing.



PATRICK DWYER, director of the botanical garden at St. Michael's Episcopal Church in Albany, N.Y., is a recent graduate of the State University of New York at Albany with a B.S. degree in Biology. The garden at St. Michael's occupies 2+ acres and contains approximately 750 species of plants. It includes gardens of native wildflowers, ferns, and orchids of northeastern U.S.A., alpine plants, herbs and "normal" cultivated flowers. In several small greenhouses are collections of CP's, cacti, bromeliads, palms, ferns and native orchids. Visitors are welcome.

Although carnivorous plants are his primary interest, Patrick has many others, including several collections (ranging from fossils to stamps). He plays USVBA volleyball and coaches a high school team; he also helps with the church youth and younger children of the parish four nights a week. He is a member of ten conservation groups and nearly as many plant societies and hopes that by overseeing the seed bank he can be of service and fulfill a need. "I would like to ask everyone that subscribes to CPN to please send as much seed as you can spare! The seed bank will only work if everyone does his or her part!"

SEED BANK INVENTORY - August, 1977

Cost: \$.50/packet. Please list substitutes.

Darlingtonia californica

Dionaea muscipula

Drosera affinis (2)*, *D. aliciae*, *D. anglica*, *D. auriculata* (6), *D. binata* (3), *D. binata* hybrid (3), *D. brevifolia* (4), *D. burmannii*, *D. capensis*, *D. capensis* (narrow leaf), *D. capillaris*, *D. capillaris*? "Spathulata Type" (1), *D. communis* (2), *D. erythrorhiza*, *D. filiformis* *filiformis*, *D. glanduligera*, *D. heterophylla* (2), *D. indica* (3), *D. intermedia* "Roraima Type" (1), *D. linearis* (4), *D. montana*, *D. peltata* (3), *D. pygmaea* (1), *D. rotundifolia*, *D. spathulata* (2), *D. spathulata* "Australian Type" (2), *D. spathulata* "Kanto Type" (2), *D. trinervia* (10), *D. villosa* (4), *D. sp.* "v. Capelle" - Holland (1)

Drosophyllum lusitanicum

Nepenthes macfarlanei (10)

Pinguicula alpina (1), *P. alpina* & *P. vulgaris* mix, *P. corsica* (4), *P. grandiflora*, *P. grandiflora* f. *pallida* (7), *P. grandiflora* ssp. *rosea*, *P. leptoceras* (3), *P. pumila* (1), *P. vallisneriifolia* (2), *P. vulgaris* f. *bicolor* (6)

Roridula gorgonias

Sarracenia alata (x-ray treated, 100 rads), *S. x exornata* (5), *S. flava*, *S. leucophylla*, *S. x mitchelliana* (8), *S. oreophila x alata* (5), *S. purpurea venosa*, *S. rubra*, *S. rubra* var. *jonesii*

Utricularia longifolia (3), *U. nipponica* (1), *U. subulata* (1)

*Number of packets is listed if there are fewer than 15.

NEWS & VIEWS

WALTER BARNETT writes: I would like to report a method of killing algae and bacteria colonies in the trays of pygmy *Drosera* that I grow. I am currently growing several species of pygmy *Drosera* under fluorescent light. After many weeks of good growth, a slime-like algae invaded the area. I treated this with several applications of Benomyl. One month later, after three treatments, the algae was still existent. Recently, white mold appeared throughout the trays. Everyday, for one week, I placed the trays out in direct sunlight for 60-90 minutes. The ultraviolet and infrared light of the sun slowly burned off the bacteria and algae. The fluorescent lights do not contain sufficient quantities of invisible light to eradicate the hardy varieties of algae. The key to remember is not to overexpose fluorescent grown plants to long periods of sunlight. One treatment of sunlight is not enough to kill algae and fungus. Often, several weeks of one hour exposures are necessary.

TERRY BROKENBRO observed some ants crawling up the stem of his *Drosera binata* (T-form) and one which got caught seemed to inject some formic acid into the leaf and managed to kill off the whole leaf. He hasn't come across this before, and ants seem to become trapped by *Drosera capensis* and *Dionaea muscipula* without any problems.

On another subject regarding an up-date for the Round Robin Letter Exchange, Terry reports the following:

IN OPERATION: 1) Seed germination/raising robin (9 participants)
2) *Drosera* robin (8 participants)
3) *Nepenthes* robin (11 participants)

A LISTING AWAITING MORE PARTICIPANTS:

- 1) General robin (6 listed)
- 2) *Pinguicula* robin (2 listed)
- 3) *Sarracenia* robin (2 listed)
- 4) *Darlingtonia* robin (2 listed)
- 5) *Cephalotus* robin (2 listed)
- 6) Pygmy *Drosera* robin (2 listed)
- 7) *Heliamphora* robin (2 listed)

You will notice from the above that several interesting subjects are listed as possible future RRs. During the past couple of months, I have not had any RR inquiries so perhaps it is time for another call for more members to join. How about this, CPN members? Write to Terry at: 37, Laburnham Gardens, Upminster, Essex, Great Britain RM14 1HX.

BILL COOK'S ramblings from The Plant Shop's Botanical Gardens, Reseda, CA: My partner Bob Cole and I own and operate a small botanical garden. In over 15 years of chronic collecting, we have amassed a large and impressive collection, which in the last few years has been open to the public, without charge, five days a week. Our *Nepenthes* collection, housed in the main tropical house, is about 50 feet long and is suspended over one of the walks so that one may better see and examine, against ceiling light, the insects in the liquid of the traps.

We pride ourselves on our one-to-one relationship with customers and find that they will return if they are successful with the plants. We have a fairly constant supply (though limited variety) of *Nepenthes* for sale. *Drosera* seem to be most popular, probably because they are easy to grow in small areas. *Sarracenia* trail right behind the *Drosera*, slowed only by their average height. Some customers are making plexi-glass tubes by bending single sheets of plastic to make extending devices for terraria, thus obtaining taller "clean" traps.

One of the few plants we refuse to sell or keep is *Darlingtonia*. In this climate they must be field collected and have a short life span in cultivation. There are other plants that are more rewarding.

Unfortunately, along with several other collections in the L.A. area, we have had three recent burglaries and lost the bulk of our *Cephalotus*, *D. schizandra* and more. We have had to remove some one-of-a-kind plants from the public area, though the entire *Nepenthes* collection and a sampling of others are still on view. A word to the wise . . . know not only your material but where it comes from!

In the latest issue there was a reference to *Bacillus*. We have been using dormant *Bacillus thuringiensis*, distributed in the RO water, for some time. I have found soaking to be the best method of application in the carnivore house; outside we spray. We've been using insecticides (such as Plantfume, Cygon and Enstar) for years. We have hopes that 50% Sevin wettable powder will keep down the damage which occurs from petroleum base carriers and heat. If this proves as successful for us as the liquid Sevin has been, we will then offer it to customers. By fogging in with Enstar (a synthetic juvenile insect hormone which halts development), we can reach areas and ceilings without worrying about danger to us or to customers. The \$42/pint price is worth it to us but prohibitive for the average collector. We've also used Cygon, Malathion, Kelthane and Zectran; the latter two cause the most phytotoxic reaction, and the others will do some foliar harm. We are getting some signs of damage on *Ixora* and *Adiantum* with the rather new Orthene, so we will proceed slowly with the carnivores and will advise you of results. We are using Benomyl combined with Truban with success, but there is some tip burning in *Sarracenia*.

A bone of contention or two: hybridizing and stone-throwing! Hybridizing should not be done without good reason! Many species are already tenuous in their identification and indiscriminate hybridizing will only further confuse the issue. Often a surge of plant interest will cause a rash of mislabeling and confusion will occur. Place the correct cross information on each tag, e.g., *Nepenthes alata* x *N. rafflesiana*, and don't name them unless you plan to publish a description. It is exciting and fun to create a new plant, but please proceed slowly.

About throwing stones . . . I don't feel it fair to clutter such a fine publication with personal attacks. (Refer to CPN VI92):38-40. Conservation and Carnivorous

Plants.) If one wishes to make a point about field collecting, well and good. The article was informative and much appreciated until it became personal.

*A later note from Bill indicates delayed damage which may have been caused by Orthene and which resulted in the death of many CP. It is therefore recommended that caution be used until further evaluation is available. They have discontinued use of Orthene for the time being. ED.

ROBERT GRIESBACH reports further locations of *Sarracenia purpurea* ssp. *purpurea* f. *heterophylla* farther west (see also CPN 6:33): Early this summer, I went canoeing in the Superior National Forest of northern Minnesota. The first location of *heterophylla* was on the eastern half of the Trost River. It was found growing at the water's edge. The second location was about ten miles further east on an island in Glee Lake. The total number of plants in these two locations was four.

JIM KOROLAS writes: I think the idea of pictures of CPN members is a great idea. However, I think the co-editors should also have their pictures published (on the front cover or on the back of the front cover).

JIM LAVRICH writes: In the previous issue of CPN Phillip Thomas wrote concerning *Dionaea* collected in Hampstead, N.C., which possessed an irregular number of trigger hairs. I have also discovered this phenomenon on some specimens which I have been cultivating for some time now. These traps contained an average of one extra trigger hair per trap. Upon testing of these trigger hairs, I found them very operable. However, the only traps which possessed extra trigger hairs were the larger ones between 25 and 30 mm. in length. From this fact I have hypothesized that perhaps larger traps occasionally have more trigger hairs to better aid the capture of prey. Since there is more surface area on the larger traps, there would be less chance that an organism would be effectively captured by a trap with the normal numbers of trigger hairs.

LARRY McCULLUH just purchased a new book called *Wild Flowers of America*, ed. H. W. Rickett, 12th printing. It has 400 color plates of American wild flowers by Mary V. Walcott. Included in these are seven plates of the *Sarracenia* from her rare book, *North American Pitcher Plants* that he has. There are also plates of *Dionaea*, *Pinguicula vulgaris*, *Pinguicula elatior* (*caerulea*). Reproduction of the plates is very good and can't be distinguished from the originals. It can be obtained from Crown Publishers for \$7.99.

JOE MAZIRMAS informs us that there is a third issue of the magazine "Plants of the World" which is available from the publisher. In addition to issues #64 and #9 mentioned before (CPN VI, 32, 1977) showing *Nepenthes*, *Sarracenia*, *Drosera*, *Pinguicula* and *Utricularia*, the new issue (#46) shows one page of *Cephalotus*. Send \$2.00 for each issue to:

ASAHI SHIMBUN PUBLICATIONS DEPT.
Tokyo Headquarters
2-6-1 Yuraku-cho, Chiyoda-ku
Tokyo, 100, JAPAN

Another issue of Garden Life 16(7) 1977 features additional CP. This magazine from Japan was first mentioned in CPN 2:51 (1973) which at that time featured *Nepenthes*. Now, this new issue features a great number of beautiful pictures of representative CP species with a text in Japanese. Send \$3.00 per issue to: Seibundo Shinkosha Pub. Co., Nishikicho, Kanda Chiyoda-ku, Tokyo, JAPAN.

There are extra copies of Kurata's book "*Nepenthes* of Mt. Kinabalu" still available from me for \$5.00 postpaid. This book is 80 pages in length and has an *English* text with numerous color photos of the finest pitchers in the *Nepenthes* genus. Anyone who is really interested in *Nepenthes* should own a copy. Please send check for \$5.00 to Joe Mazrimas. Address is on inside back page of cover.

BOB NELSON writes: Seeds of *Nepenthes khasiana* may be obtained by first obtaining the catalog from GEO. W. PARK SEED CO., INC. P.O. Box 31, Greenwood, South Carolina 29647. There is no price for the catalog. The price for the seeds is: 25 seeds for 75¢, 50 seeds for \$1.25. *Darlingtonia californica* (*Chrysamphora*) seeds and plants are also available.

DON SCHNELL writes: Since finishing my paper on *Sarracenia rubra* (see Literature reviews this issue), I have continued further exploration of the area north of Montgomery, Alabama, with the kind assistance of several local and other informants. While most typically mature pitchers of *S. rubra* ssp. *alabamensis* have a moderately red veined upper pitcher interior with a yellow-green exterior mostly lacking vein pigment, I have come across many clones now where there is equally strong red venation of the pitcher exterior, the vein network pattern being typical of *S. rubra*.

In addition, these pitchers often assume a dusky red color in mid and late summer. These locations are very much off in the bush and apparently have not been previously evaluated since property owners recalled no one else with interest in these plants. By the way, some have made statements implying that only varying degrees of *S. rubra* hybrids assume a diffuse red color anytime, that "pure" plants of the species never do so. This is quite erroneous as anyone who carefully follows plants in the field in all seasons and cultivates them properly can attest.

From the "THERE'S STILL HOPE" Dept.: On 8 July, 1977, it was announced that The Federal Paper Board Company would donate 13,850 acres of the Green Swamp (Brunswick County, North Carolina) to the Nature Conservancy for permanent preservation. The Conservancy will administer the land until the State is prepared to take it over. The land will be treated as a natural area and recreational development will not occur. This very generous parcel includes many fine CP areas that have been little tampered with due to drainage problems the company encountered. Green Swamp trekkers will appreciate that such areas as the well-known, large spring-fed bog of *Sarracenias* along and east of NC 211 will now be preserved. Tough luck, commercial collectors!

I would like to remind readers that those CPN members who have papers published to be sure and send reprints to the co-editors and to indicate if they wish to have a reprint availability and address announcement at the end of the review. This helps those readers with little or no library access to the scientific literature.

Just got back from the east coast the other day. There is essentially no winter damage at all, and all of my CP outdoors here in the cooler piedmont also came through with flying colors, including the Gulf species. The main problem in the eastern coastal plain this year has been early spring drought. In late April, the area was almost desert. Now there has been rain, but all ditches, pools, bays, etc. are still only wet up to about 50% capacity, but that is better than dry, as they were earlier. Flowering occurred on time, but leafing is much later, about a month behind, likely because of the drought. Species such as *S. rubra* and *S. minor* which should be in mature pitcher by now are just coming up or opening. *Utricularia* are far fewer (flowers) this year, even in good pools and ditches. This may be a reflection of the cold winter, but while species such as *U. inflata* and *U. purpurea* seem to have roughly alternate good and bad years anyway, this is the lightest year I have seen.

While travelling through the Mississippi town of Escatawpa, located in the heart of *Sarracenia alata* country, late one weary field trip afternoon, I noted this street sign. It was worth a second look and some photos because I wondered if I was suffering from field fatigue--too many warm, humid sun-shined hours looking at and for *Sarracenia* and beginning perhaps to see them everywhere. The town was not botanically partial: It also boasted a Mimosa St. and an Azalea St. close by. If I had been so inclined, further explorations of other parts of the town may have disclosed additional street sign oddities. However, then it was time to be done with asphalt bogs and to be back into live bogs, but carrying the thought that perhaps it would be appropriate one day if on this road someone built a home for aged and retired CP botanists who in senior and calmer years, somewhat like old warriors looking back on ancient battles, might sit on a wide veranda and discuss old times in fields long grown over, and yes, even be serene and mellow with such once great issues as the *S. rubra* problem.



PHILIP SHERIDAN writes: About the aquarium-terrarium, I forgot to give the address of Aqua Engineers which is 250 Cedar St., Ortonville, Michigan 48462. The cost of the catalog is \$1.00. I have had a little salt build-up and I would recommend using distilled water. The best light can be achieved by using "Spectralite" or "Vita-Lite". For growing *Nepenthes* from seed it is best to start them in a chamber with bottom heat and then transplant to the aquarium-terrarium.

Now about our club. We will shortly be coming into the use of the neighborhood recreation center for meetings. We plan on having plant shows, lectures and slide shows. I would like everyone to know that we would greatly appreciate any slides that could be loaned us. We need anything that anyone is willing to contribute in the way of a presentation on CP. So, if you have any pictures or slides lying around from a CP trip or related topic, please let me know.

I would also like to say that our club is open to anyone who would like to join. We now have plans for a color bulletin and the more people that join the cheaper the price. It stands now at about \$1.75 per bulletin. So if you'd like to join just drop a line to me at 5729 S. 2nd Street, Arlington, VA 22204.

From OWEN TALLMAN: Just remembered there were *two* mentions in last CPN that you should allow commercial firms to advertise as a source of revenue. Good idea, but also something to consider very carefully as you can get trapped when, in the future, you come to count on the ad money too much and you feel the pressure to compromise. I have a suggestion. Take commercial advertising in a strictly controlled form. Rather than a yearly March listing *gratis* have one annual, complete list, free, then carry a part of a page as a paid listing (every issue, with the *same* content)--sort of a controlled classified where you determine exactly what can be said. For instance, each firm that paid \$20.00 for an ad would get name and address listed, perhaps a slogan or "line of advertising" as in the phone book, and perhaps a list of available genera, whether plants and/or seeds are sold in general, or perhaps if books and supplies are sold. I would appreciate it if, should such a thing come about, the distinction between field-collected and our horticultural CP could be made. I think in general that such a listing would eliminate jousting for space and keep the editors from having to consider the truth of claims made in the ads.

SHORT NOTES

NOTES ON *NEPENTHES MIRABILIS* AND OTHER CARNIVOROUS PLANTS IN QUEENSLAND

by P. S. Lavarack

Over the last five years I have spent several weeks each year travelling in remote parts of North Queensland. Much of this work has centered on Cape York Peninsula, with the objective of locating areas suitable for National Park Reservations, but I have taken the opportunity to indulge my botanical interests which include carnivorous plants and orchids. Here I must admit that while my orchid work has been scientific, including the discovery and formal description of a few new species, my association with carnivorous plants has been rather more casual, taking the form of general observations. Nevertheless the following notes may be of interest to readers of CPN.

Cape York Peninsula is a large triangular mass of land about 550km at the base and 700km in length. The climate is hot all year round with an average maximum for the hottest month (January) of 32°C and for the coldest month (July) of 27°C. Respective average minima are 23°C and 18°C. There is a marked dry season between May and November during which about 10% of the yearly rainfall occurs. Most of the area is low lying, there are few high mountains, but there is a plentiful supply of small streams and rivers, particularly near the eastern coast. The soil is uniformly poor, being derived from mesozoic sediments. The major vegetation types are open *Eucalyptus*-dominated forest, heath and some limited areas of rain-forest.

In describing the carnivorous plants of this area I will divide the Peninsula into two parts: Firstly the bulk of the area and secondly a small area in the southeast corner situated between Cooktown and Townsville and west about 100km.



The major feature of the Peninsula proper in terms of carnivorous plants is undoubtedly *Nepenthes mirabilis*. This is a locally very abundant plant from about Coen north. It also occurs in New Guinea and many other localities in southeast Asia and is, in fact, the most widespread of the genus. Cape York provides an extensive area of habitat suitable for *N. mirabilis*, particularly near the east coast. It is always found in areas that are at least seasonally boggy--in swamps and on stream banks. In some areas the soil may dry out in the long dry season, and I have quite often seen plants growing in dry sandy soil in full sun. Many of the moister swamps have only very low vegetation and in these sunny positions *Nepenthes* is usually a low shrub of up to 1m. Such plants often have a lot of red colouring in leaves and pitchers, but are nonetheless healthy. In more shady positions this plant often grows into a long vine climbing up to 10m into the trees and bearing very few pitchers.

The pitchers vary in size from about 4cm to about 25cm but most are in the 8-12cm range. Colour is also variable but green predominates--often with a red lid. The upper parts of the pitcher may be red or red-spotted while occasional plants may have evenly red coloured pitchers. This colouring does not appear to be entirely governed by sunlight but it is not clear just to what extent it is environmental.

As in other places, a peculiar relationship between insect larvae and the pitchers has been noted. Dr. E. N. Marks of Brisbane has reported three species of mosquito which, quite probably, breed only in pitchers (Marks 1971), while larvae of other insects have also been observed doing very well in the same fluid which means death to most other insects.

N. mirabilis has been collected in flower in August-September. I have found mature seeds only in December and these proved to have a good rate of germination.

Drosera. Five species of *Drosera* occur on the Peninsula--all except one are wide-spread species outside Australia.

D. indica occurs across the north of Australia and at least as far south as Fraser Island. It occurs in wet, but sunny areas and appears to be in evidence at all times of the year.

D. burmanii with its rosettes of usually green leaves and small white flowers appears to favour more sheltered areas. It occurs at least as far south as northern New South Wales.

D. spathulata. A common plant in the open swamps in heath vegetation. It has apparently not been recorded north of Cairns previously but this must surely be because no one bothered to look.

D. petiolaris. A common species in Northern Australia, it prefers better drained positions than the previously described species. It survives the dry season by forming a compact resting bud which quickly grows with the onset of the wet season.

D. banksii. A dwarf species with elongate stems, this plant is reasonably common across the northern part of the continent but has not been recorded outside Australia. It is often overlooked due to its small size. I have seen it only once, on the margin of a swamp in half shade.

Utricularia are the most abundant carnivorous plants in Eastern Australia, but identification remains a problem. I have been sending specimens to Peter Taylor at Kew and so far the following species have been recorded: *U. chrysantha*, *U. caerulea*, *U. uliginosa*, *U. bifida*, *U. exoleta* and an undescribed species. *Utricularia* species are particularly abundant in many areas and there is a good chance of discovering further new species in the future.

One other genus of carnivorous plants occurs in this area. This is *Byblis liniflora*, and although it is apparently quite common, I have not yet stumbled across it. It occurs in the Northern Territory and south to about Rockhampton.

In the southeast part of the Peninsula between Cooktown and Townsville, the climate is much less seasonal, and rainforests are widespread. Soil types vary, being derived granite or from basalt over much of the area, but on the whole are more fertile than those further north. This is a mountainous area of year-round humid climate and high rainfall.

It is isolated from the moister parts of the Peninsula by a very dry belt of low-lying land. These conditions have given rise to a group of three species of *Drosera* which are found nowhere else. These are *D. schizandra*, *D. adelae* and *D. prolifera*. *D. schizandra*, which has a broad leaf, is a plant of the humid, shady rainforests and occurs at moderate elevations (300-1000m). *D. adelae* is more common usually along creek banks and in swampy areas at low altitudes. It occurs in the area near Cardwell where plants with leaves up to 15cm long have been collected.

Much more rarely seen is *D. prolifera*, which apparently is restricted to the area near Thornton's Peak. The original collection was made in 1932 and since then no further specimens have been collected to my knowledge. I can recall several years ago seeing a colony of plants which can only have been *D. prolifera* near a creek in the foothills of Thornton's Peak at low altitude. When opportunity permits I will visit this area and confirm my identification.

Reference:

- Marks, E. N. (1971). Mosquitoes that breed in pitcher plants.
News Bulletin Ent. Soc. Qld. 78-8-10.

(Received April 28, 1977)

NOTES ON TUBEROUS *DROSERA* OF WESTERN AUSTRALIA

by Steve Rose

The notes will list *Drosera* species in a similar sequence as appears in Rica Erickson's book *Plants of Prey*. Numbers correspond to book.

19. *D. species* is, according to N. Marchant and myself, really the "hills" form of *D. bulbosa*. It goes deep maroon as it matures. It is found quite wide-spread in loams, gravel and silty sands. Plants grow from 4-10 cm in diameter depending on climatic conditions. Usually the leaves vary very little in shape but leaf color is variable depending upon age, soil and sun concentration. Usually I can count as many as 15 leaves in one particular specimen. The flowers often appear before the rosette and even more so after a bushfire.
20. *D. bulbosa* (sand form). This species is smaller and rarely grows more than six leaves. It always is found deeply colored because of poor soils, and proportionately sparse shrubs and less overhead shade. It grows in several slow drying sand swamps in association with *D. menziesii*, *D. heterophylla*, *D. gigantea* and *U. menziesii*. The tubers are very small and white or pink, rarely deep red. The "hills form" tuber is always dark orange and size varies from a few mm to 2 cm in width. It has characteristic scales whereas the "sand form" does not. The "sand form" tuber is nearly round in shape but the larger sized "hills form" is heart-shaped. (Fig. 1)



SAND FORM HILL FORM

Fig. 1

- D. bulbosa* (Mount Many Peaks type). This form grows in shallow soils over laterite rock in an area that is very impoverished and poorly drained. The plants are extremely small compared to the other forms. The miniature rosettes rarely exceed 1 cm in diameter. There are usually 1-2 flowers which are nearly as large as the rosette. Only a small percentage of the plants flower but they seem to divide adequately by vegetative means. The plants are deep red in color even in the shade of shrubs which are 10-30 cm tall. There are normally only 3-5 leaves per plant.
21. *D. macrophylla*. This plant is extremely rare because of the destruction of its habitat and grows under Jam trees around York and Northam, about 50-60 miles east of Perth. I feel that no one has this species in cultivation. I have never collected it, and I have misnamed *D. erythrorhiza* "hills form" as *D. macrophylla*. There are many differences and Erickson's descriptions are accurate. This species does not develop red pigment at all.
22. *D. erythrorhiza*. There are two main forms: the sand and hill forms. The sand form is the one drawn in Erickson's book. It has 3-5 leaves and sometimes 6 leaves which are somewhat more blunt than the "hills form". Strangely enough, it never turns a deeper color than the "hills form" and is shorter lived in terms of surface life. It goes dormant weeks before the "hills form" and also tends to flower less but forms dense colonies by simple division. This form grows in association with *D. macrantha*, *D. menziesii* (sand form), *D. pallida* and sometimes *D. paleacea*. It is widespread and common where conditions are favorable. Always found in well drained sand.

The "hills form" is a robust plant that is found in laterite gravel, peaty loam, loam, silty sand and heavy soils. It grows best in deep shade and deep leaf mold. It requires well drained conditions and can be grown in fully to semi-exposed sunlight. Those that are more exposed are naturally redder and longer lived in surface life. The number of leaves are usually 8-10 in number and rarely up to 13 leaves. The tuber size averages about 1.5-3.0 cm in diameter whereas the sand form is much smaller. Both tubers have scales and are deep red in color. The "hills form" flowers more readily without fire but almost all plants of adequate size will flower after a fire, even if the plant completely exhausts itself and dies. This is not uncommon. This form is by far the most luxuriant rosetted *Drosera* in W. A. It grows up to 15 cm (actually more) across and that is big! Perhaps, I have seen some larger ones but the measuring tape was not at hand. The big ones grow in filtered sun (never direct) in 45 inches of rainfall per year, well drained, deep leaf mold and loose laterite gravel which are all perfect conditions.

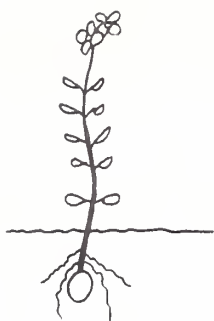


Fig. 2

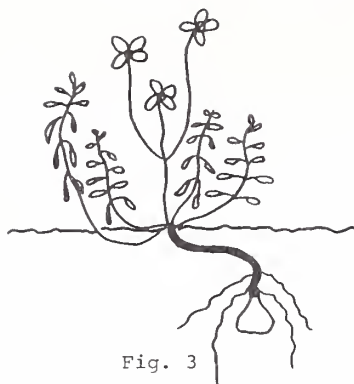


Fig. 3



Fig. 4



Fig. 5

23. *D. zonaria*. This is a beautifully colored *Drosera* which grows in a variety of locations but always in deep, well-drained silica sand. It comes up late and is short lived on the surface. It readily divides but usually in 2-3 smaller tubers. I've seen it literally carpet the ground where it flourishes in cleared bush and where conditions are right. I have not found it north of Perth but a lot south and east of here. It turns up in some small, sandy pockets at the washouts of old streams that may cover a total area of 20-30 square meters. I really don't know how they get there especially when they rarely flower! I noticed that the tubers go down comparatively deep (about 15-20 cm) and are adequate in relation to the size of the plant. The tubers are scaled and deep red in color, never pale. As the plants dry out, they turn a unique golden orange only. This species is extremely constant.

26. *D. stolonifera*. There are about three main forms of this species. The forms vary in emergence habit and branching.

The upright form (Fig. 2). This form resembles *D. platypoda* but is much more robust and goes redder in color with leaf differences. This form likes to grow in sand as well as laterite soil and is not as common as the other forms. The flower is at its apex of growth late in the season after most of the stem has developed. It develops more red pigment than other forms since others are more orange.

The center flowering form (Fig. 3). This form is as common as the form below and the only difference is the pre-emergence of the flower spike in the center and usually there are no flowers on the stems bearing leaves.

The leaf-stem flowering form (Fig. 4). Here the flower usually terminates at the apex of the leaf growth which is present on many branches beginning at ground level.

The two forms above vary greatly in habit in different locations. They are inconsistent but still remain distinct from the upright form by the flowering habit and the non-creeping vegetative bud. The creeping bud can grow and break surface and then meander under fine or deep leaf mold for a few to 10 cm or more. Then the bud will rise a little and slowly swell over a period of time. Finally, it will grow in a burst and complete its growing cycle above ground. *D. stolonifera* always flowers best after brushfires although they are not absolutely imperative. One extreme form of *D. stolonifera* grows in Cannington swamps area. It has black pigmentation on all of the glands and vivid green elsewhere. Lacking red pigmentation for the most part, this form comes from very wet sandy peat and is an uncommon habitat for the species.

Usually, all the forms grow in well-drained soils of differing nature. Commonly, it is found in laterite soils of the hills area and in part shade in leaf mold. Although the most colorful plants rarely grow in very exposed areas, the tuber is always deep red, scaled and dished at the top with a very rounded base (Fig. 5) It is kidney-shaped in cross-section. Its range occurs over most of the state with the finest specimens found in the heavier rainfall areas (35-45 inches per annum).

27. *D. platypoda*. This species is very consistent within my limited experience with it. In a place where there was a previous brushfire, I have seen it flower only at the Stirling Range. The soil here was stony laterite mixed with white sand and a heavy concentration of humus. The soil appeared to be rather poorly drained. However, in an area east and west of Albany, the soils are mostly well-drained sandy loam or sandy clay. In these locations, the soils dry out in summer and are wet again by winter rains. The tuber is small in relation to the size of the plant (Fig. 6). It is usually or almost always oval-shaped with a



Fig. 6

point to the bottom. I have never seen *D. platypoda* or *D. stolonifera* growing together or even in close proximity. In the Stirling range, *D. platypoda* grows with a form of *D. platystigma* and around Albany, it grows with or near *D. pallida* (swamp form), *D. sulphurea*, and another unidentified climber.

28. *D. ramellosa*. I haven't seen this species yet.

30. *D. macrantha*. This beautiful species is extremely common. The leaves and stem contain no red pigments but develop a golden green color of pure brilliance. It turns slightly orange as it matures after flowering. The flowers are scented and are large. I found it growing in a variety of conditions and soils over the southwest. The sand growing specimens develop sooner and recede to larger tubers than the hills or heavier soil forms. It seems that the heavier soil forms not only emerge later but recede later. In both extremes of soil types, the species develops to its utmost. It does seem more prolific in sandy soils surrounding swampy areas. The tuber is white to pale cream in color and when bruised there is a reddish brown scab formed. On exposure to sun the tubers can take on a pinkish color. Usually the tuber is kidney shaped and has small warts all over the surface (Fig. 7). There are no scales. This species is very consistent throughout its range although very poor soils and harsh conditions do contribute to extreme growth variations. However, standard cultivation makes equal characteristics of all. I found that the soils are almost always well drained, fairly rich, and it prefers shade or the necessity of having a host to climb upon. In cultivation, this plant can grow to more than 6 inches in length but soon recedes at the end of flowering regardless of moisture and temperature.



Fig. 7

31. *D. subhirtella*. This species is another brilliantly yellow-flowered semi-climbing *Drosera*. It grows in poor soils of heavy texture with other CPs. It grows in the wheatbelt areas with rainfall 10-20 inches per annum. Later in the season, the plant does turn reddish as it matures. In one location, I have seen plants up to 80 cm tall under ideal conditions, but this is uncommon. At a location close to Perth, they grow in a layer of heavy soil over granite rocks with *D. bulbosa* and *D. erythrorhiza*. The tuber is smooth, round to kidney shape and bright yellow in color.

32. *D. strictacaulis*. A golden green plant with attractive flowers which is uncommonly found in its normal habitat because of destruction, or salt intrusion through land clearing as well as other pollutants. It prefers shady conditions with soils of a heavy texture and poorly drained, but drying in late spring-summer. The tuber is oval and small, red, scaled and usually not too deep. The growth habit is in the form of clusters of up to 3, 4, 5 plants with several seedlings surrounding it. It's quite a beautiful sight on a sunny, humid day.

33. *D. andersoniana*. Not seen as yet.

34. *D. menziesii*. This species is a variable erect or semi-erect sundew with three main forms and possibly two distinct species, but not enough information is known.

Swamp form. Sometimes called the heath form which commonly grows in nearly all swamps in the northwest that can be habitable to CPs. It grows from a few centimeters to about 20 centimeters. Its tuber is dark red, small and buried not too deep. The plant develops an intense maroon pigment to the extent that there is no green to be found on the plant at all. These *Droseras* appearing with thousands of large pink flowers swaying in a gentle breeze is something not easily forgotten. The swamp form grows in a variety of locations and soil types. Soils range from very poorly drained sands to pure peat or to mud or clay. Often, they form clumps of plants up to 20-30 in number. These tufts appear at a distance like dark red shrubs or small bushes. It grows with *D. pulchella*, *D. heterophylla*, *D. gigantea*, *D. neesi* and others.

Wheatbelt form. This form is unusual because of the definite blood red or crimson flower as compared with the pale to dark pink or even light mauve in the sand form. Under good conditions, this form grows a little larger than the swamp form but generally is much smaller in very exposed areas. Again, this form has the deep red-maroon pigmentation. I found it growing in association with *D. leucoblata*, *D. pyenoblata* and sometimes *D. zonaria*, and *D. pallida* in the low rainfall areas.

Sand form. This form is very large--up to 70-80 or even 100 cm high. It is erect but large plants are always in company of a leaning post. This form has

a pale mauve to pink flower and is larger than the other forms. The tuber is unusual, being pale pink in color, small and very deep. Most tubers are found so deep that it's almost unreasonable to dig them up since they go down about 30-50 cm in hard soils. Usually, they go down 25-30 cm but break off easily when the final move is made. The plants go redder as they mature, but usually most retain some green coloring. It grows always in well-drained areas and is found in association with *D. macrantha*, *D. pallida*, *D. paleacea*, *D. erythrorhiza* (sand), *D. zonaria*, *D. stolonifera* (sand form). At one location this form grows in abundance on the slopes of a stream and in association with *D. platystigma*, *D. miniata*, *D. erythrorhiza* and *D. bulbosa* "hills" form. The soil was laterite of a heavy texture with thick scrub and small trees. This may be an unclassified species but right now it's known as *D. menziesii*.

35. *D. microphylla*. This is an attractive, erect and uncommon sundew. Its leaf and stem have a combination of deep green and almost iridescent red. The flower is bizarre and easily noticed when in flower. I find that this plant is hard to find but usually grows in shady locations and in leaf mold around tall trees in laterite soils. It forms clumps up to six or more plants with seedlings nearby. The tuber is small and oval, deep red and scaled (Fig. 8). Erickson reports that this species grows in tussocks on granite rocks but as yet I have not seen it in this habitat. Plants are much larger further south in wetter areas.
36. *D. huegelii*. Only once have I seen this species (about five years ago) but I can't remember much.
37. *D. heterophylla*. This species is fairly common in wet areas that dry in summer. It is not fussy with soil just as long as it's wet in winter and spring. It often forms dense colonies and usually in association with *D. bulbosa* and *D. menziesii*. The tuber is white, smooth and round with a slightly top. Sometimes it is slightly scaled. It turns yellow-brown when bruised. The tuber is never found buried too deep and is usually covered with black remnants of previous growth. The flowers are white and many petalled, large and faintly perfumed. The leaves and stalk are semi-iridescent orange-green while the glands are black pigmented. It's a rather colorful plant with many contrasts that is easy to grow and often forms consistent dense clumps.
38. *D. pallida*. This species is a variable climbing sundew--a smooth mostly green plant. It is very rarely that this plant develops any dark pigmentation at all. An extreme form I once gathered at Badginarra, north of Perth, had tubers about 4-6 cm in diameter and grew extremely tall (2m). They grew with *D. drummondii* in very well-drained coarse quartz sand with about 10-20% laterite rock. They were on a slope of a laterite hill. Nowhere within one hundred miles did I see any more *D. pallida* to match these for their robust habit. These tubers developed mostly yellow and rarely pink pigment. Specimens from local haunts are varied in size but vegetatively consistent. It grows in most soils around here and down south but favors sandy conditions where it can climb on a host.
- The tuber is white or very pale cream, sometimes yellowish when exposed to the sun, or rarely pink (pale). It has warts similar to *D. macrantha* but not as pronounced. (More like pits than warts!!) The shape varies with the shape of the surrounding soil, but usually is round to kidney shaped. One form that grows down in the swamps with *Cephalotus follicularis* has small pink or reddish tubers and is almost smooth in texture. This form grows more than 8 feet in length and may be a new species. It is rather long lived above the ground.
40. *D. bulbigena*. I've seen this species only once growing near Waterloo in a swamp by the side of the road. The soil was sandy peat that dries out in summer. It was hard and very poorly drained. Unspoiled or intact plants are almost impossible to find since the plant is very small. I never saw the tubers.
41. *D. modesta*. I've seen this species only once, also in South Sterlings, growing in sandy soil in relation with supporting shrubs. This yellow-green plant is usually found in well-drained soil.
42. *D. sulphurea*. This uncommon species is limited in its range to constantly damp swamps with adequate exposure. It's associated with *Cephalotus* and other swamp *Drosera* and *Utricularia*. The flower is a very conspicuous brilliant yellow. The soil ranges from sandy peat to pure peat moss and the yellow colored tuber is slightly pitted sometimes. It seems to have a long life above the soil line in Spring and Summer, but it is late rising as other Southern swamp species are. The leaves and stem rarely develop darker pigment because it is nearly always sheltered somewhat. Finally, it grows fairly consistently throughout its range.



Fig. 8

43. *D. neesii*. This species is fairly common in varying habitats that are always dry by summer. It never develops any red pigment and appears always golden-green with a pink flower. The tuber is a smallish pink color and round to kidney shape and smooth. Being a very late riser, it is still around when other tuberous plants are going dormant even when the soil has dried somewhat. This species is also very consistent throughout its range.
44. *D. myriantha*. This uncommon species grows in mossy swamps around *Cephalotus* in soils ranging from sandy peat to living moss. It can continue to grow after flowering as can the other swamp growing climbing species and shows consistent characteristics throughout its range.
47. *D. gigantea*. This plant resembles asparagus shoots as it emerges from dormancy. It is late in rising from its deep cool hideaway in the soil. The shoots come up with folded scales with a smooth appearance and are either yellow-green or deep red in color. Pigmentation is very diverse varying from pale yellowish green to deep maroon. The whole plant is very striking especially when seen in colonies around the perimeters of some swamps. It is rather common and as long as there is slow moving water in winter and little competition for summer moisture, then you will probably find this species there. Its habitat usually dries out in summer but does so very slowly. The flowers are small, white and numerous. The whole plant usually keeps on growing until conditions become too inadequate and then it recedes to the deep tuber. Tubers of mature plants can be 3-4 cm in diameter with a deep red outershell but orange inside, scaled, kidney shaped and easily damaged.

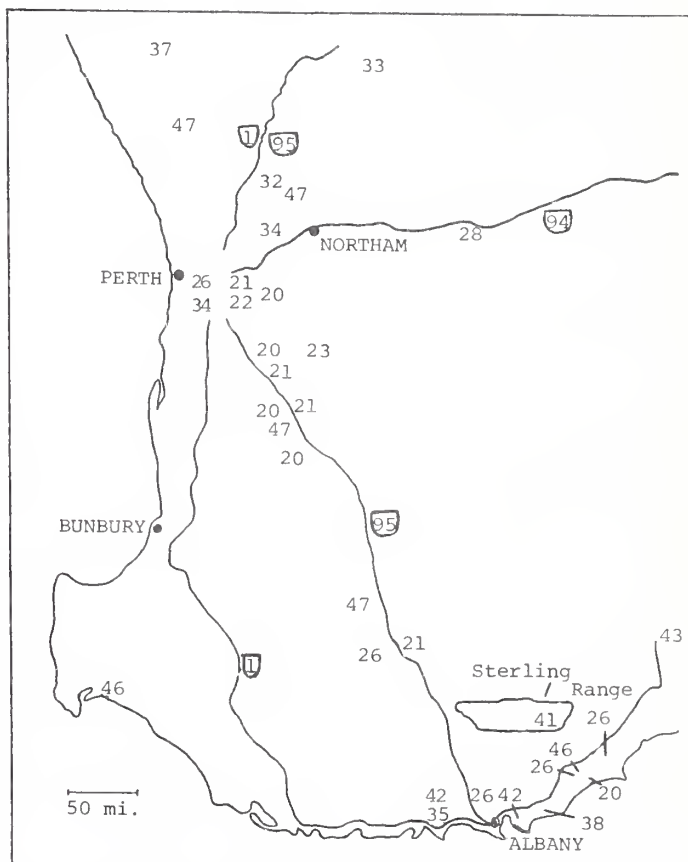
It grows in association with many other CPs, although in some habitats this is the only species that can survive. This is especially so in salty creeks or heaths where other CPs have been wiped out years ago. Vagrant and introduced grasses and annual herbs which colonize wetlands do not seem to worry this species unduly but seedlings cannot survive--only the mature plants.

D. species (El Cabello Blanco). This new species is found from the Great Eastern Highway, near a horse stud farm called El Cabello Blanco. There is only one small location left near this place and soon it will be gone. Although this species resembles others in the *D. rosulata* group, much more work has to be done. It seems that the plant never develops red pigmentation but instead remains golden green with darker glandular pigmentation that's almost black in some plants. It grows in a heath of an even textured poorly drained loam. Nearby, *D. bulbosa* (hills form) and *D. menziesii* and several native terrestrial orchids grow here. *D. macrophylla* is closely related to this species.

This ends my list of tuberous *Drosera* of SW. - West Australia, but there are a few more species identified or unidentified as yet that I have not found or seen. So, in a future article I will describe them for you.

(Received May 6, 1977)

We owe a debt of gratitude to PHIL MANN for providing us with the information and plot of the various tuberous *Droseras* which grow in Western Australia. The numbers refer to the species described by STEVE ROSE and some of their locations. The enclosed numbers refer to major highway routes in the area.



Beginner's Corner

TEMPERATURE AND DORMANCY by Don Schnell

I think the question most often asked regarding temperature is about the extremes: How high or how low a temperature will my plants withstand? The answer is not at all simple and generalizations may not apply to your particular species or situations.

Generally, the upper extremes of temperature a "typical" carnivorous plant will endure without dying are related to the character of its native habitat, and whether humidity elevation also accompanies an increase in air and soil temperatures. Regarding the first factor, a cool growing plant of *S. purpurea* ssp. *purpurea* or *Drosera linearis* native to cool bogs of northern Michigan or Canada will not do as well transplanted to outdoors Florida as would a plant of *S. purpurea* ssp. *venosa* or other *Drosera* obtained much further south. Obviously, as anyone who has bogged in the north knows, summer air temperatures midday can become awfully stifling--but plunge your hand into the sphagnum and note how cool rhizomes and roots are due to the percolation of cold spring waters and the natural cooling effect of sphagnum. The problem of growing *Darlingtonia* in very hot climates has been discussed often in past issues of CPN, as another example.

The second factor involved in upper temperature extreme endurance is a bit more ephemeral and relative. Generally, many CP can endure higher temperatures during the active growing season if the humidity is also elevated. During particularly bright (and dry) days, the temperature of my *Nepenthes* house often rises to 120°F, but there is no harm since I keep the relative humidity up to 80%+. However, *Nepenthes* root systems clearly must be genetically more tolerant of higher temperatures since this same concept would never work with our previous examples of northern *Sarracenia* and *Drosera*.

As far as low temperature extremes, again refer back to the plant's native habitat. In North America, I do not believe any of us would subject our exotic tropicals to freezing, but they will adapt to temperatures just above freezing during dormant periods. A friend once lost all of his *Drosera capensis* during a power failure and they came back from roots the following spring. This brings out the point that as long as rhizomes and roots do not freeze hard, many CP are quite hardy to at least short periods of very cold temperatures. In North America, all native CPs can be overwintered outdoors as far north as Michigan as long as there is some protection against deep freezing, such as burying pots or tubs in the ground, mulching or snow cover. However, I would strongly advise an outdoor overwinter experiment with some excess plants if you have any doubts about your area. Also, beware of frost "heaving" which gradually works previously buried rhizomes up into freezing air.

Regarding dormancy, all temperate growing plants require a period of winter dormancy. If you are growing outdoors, you will have no problem. In greenhouses, you will have to reduce temperatures and watering (to just barely damp soil) as photoperiods decrease and winter comes on. Under lights, you will have to do all of the above plus shorten your photoperiod in daily increments. If you try to force plants prematurely from dormancy or try to bypass it altogether, you are inviting rot. Dormancy and light (see previous Beginner's Corner) are the two most difficult areas I have seen with beginning growers.

Even tropicals have a modified period of dormancy, this most often corresponding to dry periods in the native habitat rather than winter cooling and shorter photoperiod. These rhythms will most often continue into cultivation and you will note a slowdown in plant growth, often during warm weather. At this point, give the plant a bit more shade and decrease watering until it again shows increasing growth at which time *gradually* place back into optimum light and watering conditions for that species.

Dormancy has evolved in plants as a natural protective mechanism against inclement conditions. A tender, growing plant is less likely to withstand freezing than a metabolically resting plant or a hibernaculum or over-wintering bud (e.g. *Drosera filiformis*, *D. intermedia*, etc.). Further, biological clock mechanisms are often built in so that the plant must have a minimum time in dormancy or be exposed to a minimum temperature before it will properly resume growth, and then must be in appropriate conditions. You may wish to experiment with refrigeration, but again do so only with material you can spare.

Next is Water and Growing Medium by Joe Mazrimas.

BOTANIST'S CORNER

Flowers, Sex, and Hybridization
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The flower is a remarkably specialized plant organ. It is characteristic exclusively of the Flowering Plants (Angiosperms) of which there are some 300,000 living on the earth today. They are by far the dominant life forms in most habitats, and they owe a large part of their success to the efficient functioning of the flower in sexual reproduction.

Sexual reproduction is important in the life of plants and animals because it allows for the combination of different genetic material from two parents into the offspring, creating a great deal of genetic diversity necessary for long term adaptation to continually changing and diverse habitats. Flower production is one of the most highly tuned and coordinated processes in the plant kingdom.

The flower is specifically designed to bear sex organs (male stamens, and female pistils) and to attract the insects (and other animals) so important for ensuring cross pollination. The large, colorful petals are the main attractive organs while nectar may also act as a lure and a reward. In order to be more successful with routine seed production and special attempts at hybridization of different species when dealing with our hobby of growing CP at home, it is desirable to understand how the flower works and what the possible arrangements can be.

The most desirable situation from the plant's point of view when engaging in sexual reproduction is of course for *outcrossing*, that is, for the *pollen* (containing sperm and produced by the stamens) of one flower to be carried to the *stigma* (receptive portion of the female pistil) of another flower on a *different* plant of the same species. This brings about the uniting of the most different genetic material from the parents to the offspring (seed). Most plants go to great lengths to ensure outcrossing; the following is an enumeration of the possible situations.

Flowers may be *perfect* (a single flower bearing *both* male and female organs) or *imperfect* (a single flower being either male or female, but not both). We will consider perfect flowers first:

PERFECT FLOWERS

Self-pollinating: while most plants want to cross-pollinate, if this does not happen, self-pollination may occur. This happens when the pollen is deposited on the stigma of the same flower. Self-pollination is usually a last resort when an insect does not come to transfer pollen to another flower; it ensures that at least some seed are produced for the next generation. Mechanically, this is accomplished by the movement of the stamens, or the stigmas, so that they come in contact with one another. You can do it with a small brush gently moved about inside the flower, making sure all stamens and stigmas are touched in the process.

CP which exhibit self-pollination are: (at least some) Sundews and Cephalotus (?). Some Sundews and very small Bladderworts may exhibit a type of self-pollination where the flowers never open. This is termed *cleistogamy*, and seed production occurs only by self-pollination. We do not know why this occurs, but it seems to be successful for the plants which exhibit it.

Cross-pollination may be ensured in two ways:

Self-incompatibility (genetic): this occurs when, even though both sex organs are produced in the same flower, the pollen will not function on the stigma of the same flower in which it was produced. Thus each flower can both give and receive pollen, but another flower must be involved in every case of successful seed production. There is usually a chemical factor involved which prevents "self" pollen from functioning. In some cases, two flowers on the same plant will be different enough genetically to cross, while in most cases, the two flowers must be on entirely different plants to overcome the genetic incompatibility factor. This implies that two plants which originally came from the same clump, or rootstock, even when separated and grown as individuals, will not produce seed when crossed. Each parent must be from a separate original plant, and not from a *clone*, or clump of vegetatively propagated individuals. This is the most common way of ensuring cross-pollination and is best exhibited by Venus' Flytrap.

While many CP can be self-pollinated by hand, cross-pollination is desirable and can be accomplished by taking pollen on a brush from one plant and gently brushing the stigmas of the flowers on another plant, and doing the reciprocal. Thus you cross-pollinate two flowers at the same time. There is very little knowledge about which CP are actually *self-sterile*, as it is termed. The more common situation is the following:

Mechanical prevention of self-pollination: In this case, the stamens and pistils of each flower are positioned in such a way that the stamens can never deposit pollen on their own stigmas--an insect (or human!) must intervene. Usually the flowers are irregular in shape and the stamens and pistils are hard to see; you almost have to dissect the flower to find them. Thus, hand pollination is difficult and practice is needed. In all cases, however, nature has "fixed" it so that certain insects are perfectly adapted to "fit" into each species of plant's flower. Thus, each size and shape of flower attracts a particular size and shape insect to pollinate it, sometimes exclusively. This keeps natural hybridizations between species to a minimum.

The CP which exhibit this situation are *Utricularia*, *Pinguicula*, *Sarracenia*, and *Darlingtonia*. Small bees and flies effectively pollinate the former two; while large bees, such as bumble bees, work on the larger flowers of the latter two. Very little work has been published on the pollination biology of CP.

To cross these types at home, you must first find the stamens, then transfer pollen by brush to the stigma of another flower on the same plant, or more likely, different plant (depending on whether or not that species is self compatible). *Sarracenia* are self-compatible. Try different combinations and keep records of your crosses and see what works.

IMPERFECT FLOWERS

Separate male and female plants: In CP, there is one situation where cross-pollination is absolutely ensured. This occurs in *Nepenthes* where the flowers on a given plant are *unisexual*, either male or female, but not both. The plants are thus either male or female. (In some other species of plants, the male and female flowers may be in different places on the same plant.) In *Nepenthes*, then, an insect *must* carry pollen from one plant to another. In nature this may sometimes present a problem if the two plants are not growing near one another; but usually the insect can locate the opposite sex with no trouble. In cultivation, it is another problem because female plants of *Nepenthes* are relatively rare; and when a grower has both sexes, they may not always bloom at the same time as they do in nature. When they do coincide, it is a simple task to transfer pollen. If you are dealing with the same species, or two species which are capable of hybridizing, good seed set should occur.

(To be continued)

In the next issue:

"Unseasonal Blooming in *Sarracenia* in Western Florida" by Landon T. Ross

"Of Barn Swallows and Droseras" by Owen Tallman

"Building Your Own Solar Water Distiller" by Scott A. Richardson

"Carnivorous Plant Companies" by Glenn Claudi-Magnussen

"Where We Came from and Where We Hope to Go" by Joe Mazrimas and Don Schnell

REVIEW OF RECENT LITERATURE

Casper, S.J. and K. Kondo. 1977. A new species of *Pinguicula* from Mexico. *Brittonia* 29:112-115.

Annual or biennial *Pinguicula sharpii* (Sect. *Isoloba*, 2n=16) from Chiapas, Mexico is described for the first time. The plant is quite small and must be reproduced by seed.

Chhabra, S.C., Gupta, S.R., Seshadri, T.R. and Sharma, N.D. Chemical investigation of Dikamali gum: Isolation of two new flavones. *Indian J. Chem Sect B Org. Chem Incl. Med. Chem.* 14(9):651-653 1976.

Two new flavones were isolated from the above gum. One of them is isoscutellarein which was previously isolated from *Pinguicula vulgaris*.

- Clancy, F.G. and Coffey, M. Acid phosphatase and protease release by the insectivorous plant *Drosera rotundifolia*. Can J. Bot. 55(4):480-488 1977.
When plants were given gelatin, enzymes were released 1-2 days after feeding. Maximum was reached after 4 days and declined. Both enzymes had optimal activity at acid pH. The authors discuss the apparent induction of the acid phosphatase enzyme.
- Hortus Third: A Concise Dictionary of Plants Cultivated in the United States and Canada. L.H. Bailey Hortorium, Cornell Univ. 1290 p. Macmillan Pub. Co., New York, N.Y. 1976. \$99.50
This 7 lb. book is a monumental opus which is concise and is really a dictionary, not an identification manual, on many types of plants including our beloved CP. This dictionary joins the other classic productions from the Bailey Hortorium which also describe CP in historical perspective. They are: Cyclopedia of American Horticulture (1900-1902), Standard Cyclopedia of Horticulture (1914-1917), Hortus (1930), Hortus Second (1941), and Manual of Cultivated Plants (1940, 1949).
- Jung, W., *Utricularia* turions (winter buds) from the interglacial period of Zeifen/upper Bavaria. Mitt. Bayer Staatssamm. Palaeontol. Hist. Geol 16, 99-104 1976.
A number of hairy turions were found in West Germany in the Eemian (Quaternary) which were determined to be of the genus *Utricularia*.
- Kohlmeyer, J. New records of angiosperms and terrestrial fungi from Carteret Co., N.C. J. Elisha Mitchell Sci. Soc. 92(1):27-30 1976.
One of the rare plants listed is *Sarracenia rubra*.
- Komiya, S. Exotic species of the Lentibulariaceae in Japan Part 2. Bull. Nippon Dental Univ., Gen. Ed. Vol 6 1- 21 (1977).
This article diagrams and pictures 25 species of carnivorous plants grown in Japan belonging to three genera: *Pinguicula*, *Polypompholyx* and *Utricularia*.
- Kondo, K. Segawa, M. & Nehira, K. A cytotaxonomic study in four species of *Drosera*. Mem. Faculty Integrated Arts & Sciences. Ser. IV, Vol. 2:27-36 1976.
The chromosome numbers of three species of *Drosera* are: *D. dichrosepala* Turcz. (2n=18), *D. pulchella* Lehmann (2n=18), and *D. pygmaea* DC. (2n=28). The basic chromosome number of the former two species, X=9, may cover the gap between X=8 and X=10 in the aneuploid *Drosera*. The *D. adelae* F. Muell listed here (2n=30) differs from that published previously (2n=28; Kondo 1976).
- Lichtner, F.T. and S.E. Williams. 1977. Prey capture and factors controlling trap narrowing in *Dionaea* (Droseraceae). Amer. J. Bot. 64:881-886.
Having defined and described the nature of and action potentials involved in the fast phase of closure, the authors now turn to aspects of capture and the second or "narrowing" ("sealing") phase of closure. The data indicate that this latter phase as well as secretion are initiated by mechanical stimulation (action potentials detected on trap surface for many hours after capture) and maintained by chemical stimulation (of hemolymph contents) after death of the prey. Various chemical substances were evaluated for their effects (or lack of effect) on narrowing and secretion by instillation into closed traps in the laboratory, and results are tabulated. A list of field prey indicates that there is no particular attraction to particular insects and most seem to be trapped as they wander in or seek a resting place. Nearly a third of such prey in June in the study location were ants, another 27% were spiders, and flies were only 2%. This is an information packed study and must be read in its entirety by serious students. (Reprints available from author for \$0.50 in U.S. Address: S. E. WILLIAMS, Dept. of Biology, Lebanon Valley College, Annville, PA 17003)
- Paul, S.R., New plant records for Bihar from Netarhat Plateau. I. Botanique (Nagpur) 7(1):29-32 1976.
This paper reports among other plants that *Drosera peltata* is a new species in Bihar State in India.
- Schnell, D.E. 1977. Intraspecific variation in *Sarracenia rubra* Walt.: Some observations. Castanea 42:149-170.
Five infraspecific disjunct variants of the species are described, discussed and illustrated. The author feels there is insufficient discontinuity of characters to declare any of these separate species, and detailed reasoning and comparisons are offered. It is recommended that the combination *S. rubra* ssp. *jonesii* be retained and that it not be re-elevated to species level as recently proposed by another author. Two recently described "species" from this group are reduced to subspecies: *S. rubra* ssp. *alabamensis* and *S. rubra* ssp. *wherryi*. (Reprints: D.E. Schnell, Rt. 4, Box 275B, Statesville, NC 28677)



WANT ADS

- Jan Anthony, 10 Walnut St., Narragansett, RI 02882. (WB) *Cephalotus follicularis*, *Drosera schizandra*, *D. peltata*, *Sarracenia leucophylla*, *Pinguicula planifolia*, *P. primuliflora*, *Heliamphora*
- Andrew Arvai, 4 Indian Trail Ct., Novato, CA 94947. (WB) *Nepenthes rafflesiana*, *N. sanguinea*, *N. Hookeriana*, *N. Kampotiana*, *Cephalotus follicularis*
- Bryce R. Augustine, 768G. Cypress Wk. Goleta, CA 93017. (WB) *Pinguicula caudata*, *P. primuliflora*, *P. grandiflora*, *Sarracenia oreophila*, *S. psittacina*, *Drosera adelae*
- Mark Bankey, 309 Orchard, San Marcos, Texas 78666. (WB) *Byblis gigantea*, *Drosera regia*
- Jay Brodie, 10 Brookside Dr., Apt. 3H, Greenwich, CT 06830. (WTB) *Drosophyllum* seed, *Byblis gigantea* seed, *Sarracenia oreophila* seed, *S. hybrids* (seed or rhizome cuttings), aquatic *Utricularia* (not *U. vulgaris*), *Drosera montana* plants, *D. filiformis* v. *tracyi* plants
- Rick Chapman, Box 22, Versailles, N.Y. 14168. (WTB) *Heliamphora*, *Dionaea muscipula* (very large 15-20 years), *Drosera schizandra*, *D. capensis* (seeds), live or milled moss. (WTS) 2 young *Pinguiculas* (var. uncertain)
- Harvey Dickler, CLU, 33 Cloverfield Road, Valley Stream, NY 11581. (B) *flava* x *rubra*, *flava* x *psittacina*, *minor* x *rubra*, *alata* x *psittacina*, *flava* (heavily veined)
- Paul Duval, 25138 Andreo, Lomita, CA 90717. (WB) *Nepenthes* x *nobilis*, *N. nigro-purpurea*, *N. truncata*, *N. veitchii*, *N. x mastersiana*, *N. villosa*, *N. ampullaria*, *N. x hookeriana*, *N. x excelsa* (don't confuse with *excelsior* or *excellens*), *Cephalotus*
- Ken Griffo, 33 Sherbrooke Dr., Florham Park, NJ 07932. (WB) any *Cephalotus*, any *Nepenthes*, *Heliamphora*, *Drosophyllum*, *Byblis*
- James D. Hummer, 134 Lido Way, Upland, CA 91786. (WB) *Dionaea muscipula*, *Nepenthes*, *Sarracenia*, *Drosera petiolaris*
- Michael Hunt, RFD 25, Box 11714, Oakton, VA 22124. (S) *Cephalotus follicularis*, *N. alata*. (B) *S. purpurea* forma *heterophylla* (TB) *S. flava* x *S. minor*
- Jim Korolas, 36 Eastlea Cres., Agincourt, Ont., M1T 3A6, Canada. (TS) *S. purpurea* var. *riplicola* (WTB) *S. flava* (no red), *S. oreophila*, *S. oreophila* hybrids, any *Nepenthes* (WT) *S. flava* (red top), *S. flava* (red throat)
- Scott Plamondon, 18018A S.E. Blanton, Milwaukie, Oregon 97222. (WTB) *Heliamphora*, *D. schizandra*, *D. petiolaris*, *Byblis gigantea*, *Drosophyllum lusitanicum*, any *Nepenthes*, *Aldrovanda* (TS) *Darlingtonia*
- The Plant Shop's Botanical Gardens, 18007 Topham Street, Reseda, CA 91336. Want to buy rare carnivores.
- Alan Schueler, 16345 Martincoit, Poway, CA 92064. (WB) any *Nepenthes* seed, plant, or stem cutting, *Cephalotus follicularis*, *Drosera peltata*
- Peter A. Taverna, c/o P.O. Upper Sturt, S.A. 5156, Australia. (W) *D. anglica*, *D. linearis*, *D. longifolia*, *Genlisea* seed (T) *D. pygmaea*, *D. glanduligera*, *D. whittakeri*, *D. planchonii*, *D. peltata*, *D. auriculata*
- Philip Thomas, Rt. 4, 144 Monticello Road, Weaverville, NC 28787. (TS) *Drosera binata*, *D. burmanni* (Taiwan) seed, *D. capensis* (narrow leaf) seed, *D. capillaris* seed, *D. filiformis tracyi* seed, *D. x nagamoto*, *D. filiformis filiformis* seed, *D. intermedia* seed, *D. spathulata*, *D. spathulata* (Japan, spatulate form), *D. filiformis tracyi*, *Dionaea* (seedlings), *Sarracenia flava* seed, *S. flava*, *S. minor* seed, *S. rubra jonesii* seed, *Utricularia subulata*, *Pinguicula pumila* seed. (WTB) Any *Nepenthes* (seed esp.), *N. gracilis*, *S. rubra jonesii* (yellow flower), *P. primiflora*, *D. peltata*, *Roridula* ssp.

SPECIAL ANNOUNCEMENTS

Due to the low number of orders for copies of the 1977 Plant List, and the desire to provide more up-to-date information, Lynn Macey, Carnivorous Plant Information Service, 511 N. Eby, McPherson, KS 67460 (USA), has agreed to store the information for retrieval on demand. A computer copy of the Plant List is available from him for \$1.00 postpaid. Bob Ziemer has also requested that due to this new service, all updates of plant inventories be sent directly to Lynn. People who have ordered the Plant List from The Arboretum will receive their copies from Lynn. Payment will be forwarded to him from The Arboretum.

We apologize for failing to mention in the March issue that Sundew Environments is also a source for the books by Lloyd, Darwin and Schnell.

When submitting Want Ads, please be sure to print clearly for best results and to eliminate mistakes. Please indicate the correct letter before each item (Want, Trade, Sell or Buy). Want ads are limited to Carnivorous plants, terrariums, greenhouses and moss. There is a charge of ten cents per item, with no limit to the number of items you may submit per issue.

Send coin or check along with your want ad to:

Arboretum, Want Ads
California State University
Fullerton, CA 92634



CARNIVOROUS PLANT NEWSLETTER

VOLUME VI, No. 4
December, 1977



Pinguicula planifolia Butterwort

Photo by Steven A. Frowine
The Garden Center of Greater Cleveland

EDITOR'S CORNER

First, let us start by wishing everyone a happy holiday season and a most successful New Year. We will be starting the New Year with the new 6 X 9 inch color cover booklet format. Only about 25% of the total ballots sent out were returned, and of these the change to the new format (versus retaining the original 8-1/2 X 11 inch format) passed by about three to one. With regards to the dues structure, the vote on the \$7/\$9 and \$7 worldwide was so close that we have decided to adopt the \$7 worldwide price. Therefore, the 1978 dues will be \$7 anywhere. The same policy of accepting all comers will still be in effect, but please try to send in all renewals before March, 1978. Subscriptions will continue to be on a calendar year basis. For those subscribers who have joined us recently, please do not be taken aback that it is already time to subscribe to Volume VII. The rates for the back volumes have also been revised. See enclosed leaflet. Please feel free to duplicate and distribute it to spread the good word.

We hope to be able to hold the line on dues and, if so, we will be in a position to accept multiple year subscriptions. More on this later next year.

SPECIAL ANNOUNCEMENTS

NEPENTHES CUTTINGS. Once again Joe Mazrimas and Don Schnell will have some spare *Nepenthes* cuttings to send to CPN subscribers in the spring of 1978 (April). We are now accepting requests; in your letter of request, please include the following information:

1. Your current growing conditions and dimensions of the *Nepenthes* area.
2. A current listing of *Nepenthes* species you are growing.
3. A list of desired species, but final selection will depend on available material.

Send all requests to Joe Mazrimas (who will collate all requests) before March 15, 1978. We regret that this offer is only available to U.S., Great Britain and continental Europe because of strict import and inspection certificate restrictions elsewhere. This offer is an attempt to effectively and rapidly spread *Nepenthes* plants among new growers of this genus for a cost of twice the postage on the package to be paid promptly upon receipt of the package.

For this year we are also offering, on a limited basis, one other rare plant. Seedlings of the rare *Sarracenia rubra* ssp. *jonesii* (grown from seed of cultivated plants) will be given away to those CPN subscribers who wish to grow them. All of the above plants will be sent off in the spring of 1978.

JOE MAZRIMAS (329 Helen Way, Livermore, CA 94550) still has plenty of copies of the book *Nepenthes of Mt. Kinabalu* by Kurata left for \$5.00 postpaid. It would make an idea gift for a friend who is interested in these unusual but beautiful plants. It has an English text with many fine color photos.

LOST OR DAMAGED-IN-THE-MAIL ISSUES OF CPN? We regret any inconvenience resulting from our mailing difficulties this year and will gladly replace any issue lost or severely damaged in the mail. Please address requests to Pat Hansen, CPN, The Arboretum, Dept. of Biology, California State Univ., Fullerton, CA 92634.

BOB HANRAHAN (Rt. 1, Box 338-T, Arroyo Grande, CA 93420) is an amateur radio operator (call letters WB6GWY). He would like telephone numbers of subscribers in the Far East, Australia and New Zealand. Perhaps he will be calling you via short wave and phone patch.

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NEWS & VIEWS

RICHARD ADAMS (L.H. Bailey Hortorium, Cornell University, 467 Mann Library, Ithaca, NY 14853) and OWEN TALLMAN (Box 111, Denver, NY 12421) wish to announce they have started preparation of a comprehensive horticultural treatise covering *Drosera*, *Dionaea*, *Aldrovanda*, *Byblis*, and perhaps *Roridula*. They solicit any information concerning cultural tips or idiosyncracies that readers may wish to contribute based on their own experience. Such outside information and input is widely sought in scientific writing, and Rich and Owen feel it could greatly fortify the popular literature. It is understood that such ideas and information are contributed without compensation or any restriction on use or disclosure, but contributors' ideas that are used will be acknowledged if possible. Information concerning the availability of high quality color slides or black and white glossy prints for publication is also solicited. (Please write before sending photos.)

JAY BRODIE (54 Butler St., Cos Cob, CT 06807) sends us a newspaper clipping from the *New York Times*, Oct. 6, 1977, page B1 titled "The Countless Mysteries of Peatland" by Jane E. Brody. The article describes the ecological research taking place in the BIG BOG by Dr. Gorham and his students in the state of Minnesota. In this sphagnum bog, there are *Sarracenia purpurea* and *Drosera rotundifolia* plants. Some species of *Utricularia* were also observed in flower among the mosses, irises and ferns. In previous studies, it was shown that this bog existed for over 4,000 years since the bottom layers 85 inches beneath the surface showed evidence of peat accumulation.

JOE P. CANTASANO (2717 Jerusalem Ave., North Bellmore, NY 11710) writes: I spoke to some CP growers and most of them did lose some CP due to the heat, but I have not lost one. I mist my plants twice daily, and I have gone as far as to dig the middle section out of my greenhouse. I removed the soil a few inches in depth from the greenhouse and lined the trench with plastic, then filled it with sand and water to create a small bog. The sun beats down on this and evaporates the water, resulting in a very moist atmosphere inside. The humidity is close to 100% day and night, and although this bog is a watery mess, my plants never looked so good.

The San Francisco County Fair Flower Show which took place on August 26-28 featured among the roses, fuschias, begonias and many other plant genera, carnivorous plants as a separate division. Some 30 plants representing seven genera were spotlighted in an interesting display planned by Anthony Rae and Raul Hernandez. Seven participants donated their plants to make this display a real showstopper. Prizes and ribbons were awarded to the first, second and third place winners. Among the participants were Harold Charns, Byron Aarstad, Antonio Brito, Raymond Triplett, Larry Logotetta, Joe Mazrimas and Anthony Rae. The organizers hope to make next year's show of CP even bigger and better. So start growing those showplace plants now!

BILL HANNA (32 Allen St., New Lambton, Newcastle, NSW, Australia 2305) sends us an article: *The Overlander* magazine Aug/Sept, 1977 describes on page 63 a trip taken by some adventurers into the Queensland area of Australia. They found *Nepenthes mirabilis*, *Drosera* and some *Utricularia* in the rugged areas they were exploring.

BOB HANRAHAN (Rt. 1, Box 338-T, Arroyo Grande, CA 93420) writes: I experienced a severe problem this year with my *Dionaea* in that the plants grew normally until mid-June and then began to defoliate and rot away. I grow my *Dionaea* fairly dry in a 2 to 1 mix of #4 vermiculite and Canadian peat moss to prevent rot which can easily overcome this species. I began weekly applications of benomyl 50 WP at 1/2 strength as a precautionary measure against fungus. In late July, a plant tissue specialist, Mr. Martin J. Crehan, stopped by to chat and view the collection. I had him examine the infected *Dionaea* to get his expert opinion. He was just beginning to work on meristematic *Dionaea* and was unfamiliar with this problem. A few days later, I received from Mr. Crehan a copy of the *Plant Disease Reporter* for May, 1972. It was titled "Foliar blight of *Dionaea muscipula* incited by *Colletotrichum gloeosporioides*." This paper described a study of a fungus and its control.

The disease begins as a small, water-soaked elliptical spot that soon becomes light grey with a black center. These lesions turn black and join together to cover the leaves of the plant. Defoliation follows with a general decrease in the size of the rhizome. Photos of the diseased plants included in the article duplicated the spots on my plants perfectly. Effective control of *Colletotrichum gloeosporioides* can be attained with benomyl 50 WP (3/4 lb/100 gal, or 1-1/2 tbsp/2 gal.), chlorothalonil 75 WP (1-1/2 lb/100 gal) or zinc plus maneb 80 WP (1-1/2 lb/100 gal.) weekly until eradicated (2-4 applications).

There was no plant damage (phytotoxicity) evident from the application of any of the fungicides. It was noted in this article that leaves of *Dionaea* should be kept dry to assist in erradicating the fungus. After following the prescribed prescription with benomyl, the mysterious defoliation problem with *Dionaea* has disappeared as well as my nightmare.

(Ed. note: Growers who use tightly sealed terraria or similar setups to grow *Dionaea* and are constantly losing these plants should note the above problems and solution. J.M., ed.)

Ref.: *Plant Disease Reporter*, Vol. 56, No. 5. May 1972, pp. 391-3.

SCOTT HENDERSON (215 N. Cuyamara St., El Cajon, CA 92020) writes: Recently I visited the CP display at Sea World. Chuck Kline has made some nice improvements since I first saw the display a year ago. A whole set of graphics that explain many of the abilities of CPs is mounted in wood over two large terraria. Right now he is using wide spectrum fluorescent lights, but he mentioned that the plants still need a little more light. Nevertheless, his *Nepenthes* hybrid had a number of large colorful pitchers, and the rest of the plants were doing quite well. The display contains a sampling of the following genera: *Drosera*, *Dionaea*, *Sarracenia*, *Pinguicula*, *Utricularia* (terrestrial), and *Nepenthes*.

LYNN MACEY (511 N. Eby, McPherson, KS 67460) is offering a five year complete index for CPN. This index includes an author index, a subject index and plant species index for Volumes I through V, and it's available from him for the price of \$1.00. Lynn will send a free copy of the index to anyone who supplies him with journal articles on CP that they have recently published or copies of articles that he doesn't have. Lynn has a list of 1,107 CP references on which he would like more information or, better yet, a copy of the article.

JOE MAZIRMAS (329 Helen Way, Livermore, CA 94550) reports that the recent edition of *Hortus Third* reviewed here in CPN under the Literature Review section (CPN VI(3):59) has some interesting information regarding the names of certain hybrids commonly used by many CP people. According to *Hortus Third*, the following names DO NOT have any botanical standing: *Nepenthes* x *boissiensis*, *N.* x *goettin-gensis*, *Drosera* x *capulata* (a reputed hybrid between *D. capensis* and *D. spathulata*), *D. elliptica*. *D. longifolia* is a confused name applied to both *D. anglica* and *D. intermedia*. Those who are exchanging plants under the above names should be aware of the shaky status of these names.

Report on drought conditions in California: I have visited several bogs in the Sierras and it seems that the two year drought is taking its toll on many carnivorous plants. In one place, where there was once a fairly large pond about 100 meters across, I now saw only a small puddle of about three meters in diameter which was rapidly evaporating in the hot summer sun. This pond once had thousands of *Utricularia vulgaris* plants and other *Utricularia*. *Darlingtonia* bogs seemed to be intact, although I noticed several dead plants around the edges. The companion plants of *Drosera rotundifolia* seemed to be surviving the worst drought in a century, perhaps due to mountain spring waters which flow quite briskly from aquifers of unknown size or capacity. How many more years of subnormal rainfall these bogs can survive is not known at this time, but it's clear now that CP sites which depend on rainfall to supply moisture are in jeopardy, while those that depend on spring water from underground sources are still in good shape.

Our only hope for the rainfall-dependent bogs is that the seed from previous years will sprout upon the return of the rains, which should be torrential.

PETER McLAUGHLIN (Dana Lane, Colts Neck, NJ 07722) writes that last summer he had a chance to visit the New Jersey Pine Barrens twice. Observations were made on *Drosera intermedia*, *D. filiformis* v. *filiformis*, *D. rotundifolia*, *Sarracenia purpurea* ssp. *venosa* and *Utricularia intermedia*. On both of these trips, each to a different location, similar observations were made. He noted that *D. rotundifolia* grew mainly on or near cedar root balls in the shade, while *D. intermedia* grew near the water's edge in very wet conditions in full sun. *S. purpurea* grew farther up the bank in semi-wet conditions. Being familiar with the root system of *S. purpurea*, he said that the roots probably reached the water table.

D. filiformis was noticed only by the presence of its small purple flowers growing in what he thought was quite dry conditions and was not associated with the aforementioned species. *U. intermedia* grew in both sunny and shady waters. The sun plants were smaller, and they had more bladders. These two trips have given him a good insight in the cultivation of *D. intermedia*, *D. filiformis*, *D. rotundifolia*, *S. purpurea* and *U. intermedia*.

LARRY MELLICHAMP (Dept. of Biology, UNCC, Charlotte, NC 28223) sends this SPECIAL NOTE: All subscribers to CPN will soon be receiving in the mail a colorful brochure announcing the availability of a limited number of high quality collector's prints. The prints are reproductions of an original painting done by a renowned wildlife artist in North Carolina, Josette Gourley. The painting is entitled "Carolina Swamp" and depicts the native carnivorous plants of North Carolina (four species of *Sarracenia*, *Drosera*, *Dionaea*, *Pinguicula*, and *Utricularia* growing in their native habitat with associated plants. Each print in this limited edition is numbered and signed by the artist. The size of the print is 24 X 18-1/2 inches. The cost is \$25 plus postage. Watch your mail for information regarding this beautiful and important work of art which uniquely captures the spirit of our beloved CP.

EDMUND PALMER (#70 Eagle Point Community, Punta Gorda, FL 33950) has found at least one answer to a frequently asked question: Where can one buy live sphagnum in the US? He has found that Mosser Lee Co., Millston, WI 54643, can supply live sphagnum for \$2.95 per bushel, but the bushel weighs nearly 35 lbs., and so UPS shipping costs are high (about \$7.00 to Florida, for example). However, the moss was of good quality and definitely alive upon arrival. Mosser Lee is a dealer in gardening material and can supply dried long fiber sphagnum quite reasonably. Catalog is free.

PETER PRAGER (10923-1/4 Ayres Ave., Los Angeles, CA 90064) notes the following observations in his cultivated *Drosera* this summer: On the stem, just below the flowers of *D. spathulata* (unknown variety) grew several leaves. Though they were only half the size of normal basal leaves, they appeared typical in all other aspects. On a leaf of *D. binata dichotoma*, at each of the four leaf tips, the ends had curled inward and a plant grew!

TOM PUMMER (11 Gray Circle, Lynn, MA 01902) writes: While many of the notes sent to CPN deal with observations of plants in the field, I would like to comment on some carnivorous plant models I happened to see recently. The Botanical Museum at Harvard University includes among its public exhibits the Blaschka Glass Models of Plants. This collection is one of the most amazing achievements I have ever seen because the models are so accurately executed that it becomes difficult to tell that they are not real plants! The collection includes *Nepenthes maxima*, *N. sanguinea*, *Drosera filiformis*, *D. rotundifolia*, *Sarracenia flava*, *S. purpurea*, *Pinguicula vulgaris*, *Dionaea muscipula*, and *Darlingtonia californica*. The *Nepenthes* models were done from live specimens obtained from Veitch's Nurseries, London, in 1906.

KIM SIKORYAK (2101 Cheyenne St., Golden, CO 80401) writes: A note on Burbidge's hypothesis concerning the teeth of *N. bicalcarata*: Granted their function needs more study, but we may as well at least get the identification cleared up a little. I have seen the critter supposedly snared by the above plant variously described as a rodent, an insectivore, and a lemur. *Tarsius spectrum*, the little fellow in question, is none of the above but a member of the family *Tarsiidae*. Tarsiers are primates, as are men. In fact, they are thought by some to be the most ancient group in the order. Nocturnal, arboreal, carnivorous; these are creatures of scrub or second growth jungle. Adults are 85-160mm in length with 135-270mm tails and weigh between 80-150 grams. They can be tamed, so for those looking for the right touch for their Bornean greenhouse.... As for their vulnerability to *N. bicalcarata*, only the tarsier knows for sure.

JOHN TURNBULL (Dept. of Botany and Genetics, University of Guelph, Guelph, Ontario, CANADA N1G 2W1) writes: While you and the other co-editors are rethinking the format of CPN, I would like to suggest that the address of the author of short notes and News & Views letters be published under the title. Readers could then write to the author to enquire. As you know, this is the normal policy of most journals.

(We have decided to do just that beginning in this issue. Ed.)

BOB ZIEMER (P.O. Box 4562, Arcata, CA 95521) mentions a book translated from Russian called *Interrelation of Forest and Bog*, N. I. P'yavchenko, ed. and published by Amerind Pub. Co., Pvt. Ltd., New Delhi, 1976. It contains a series of chapters on plants and bogs found in Western Siberia.

SHORT NOTES*GENERAL CULTURAL INSTRUCTIONS FOR GROWING TUBEROUS DROSERAS*

by Steve Rose
(125 Edward St., Bedford Park, West Australia 6052)

Although the tuberous droseras come from very varied conditions, they can be nearly all grouped together for common cultivation as long as correct procedures for dormancy and pre-emergence are followed.

There are two main groups of tuberous droseras:

1. Well-drained type: a) Sand forms or drained heavier soils.
b) Drained laterite soil.
2. The not-so-well-drained type: a) Swamp (wet).
b) Swamp (drying).

Emergence, I believe, is controlled mainly by temperature although water must be adequate or emergence may be retarded.

Dormancy can be triggered by several factors; maturity through flowering, temperature or water restriction. The two latter reasons are not usually the dominant ones because tuber formation takes place as soon as flowering in most plants begins. By the time flowering has ended, tuber formation is either finished or partly completed. The dormancy after flowering can be retarded by cool damp conditions, even to the extent of producing secondary growth. The tuber does not increase in size but can even lead away to rotting by not drying out enough with rise in temperature.

I regard the actual drying out of the plant as the MOST IMPORTANT ASPECT IN THE WHOLE CULTURE OF TUBEROUS DROSERAS. The drying out process must be slow and never wet, the period being at least one month to total dryness from moist conditions. The pots containing unexposed tubers can then be even exposed to very high temperatures up to 140°F. But this is not at all necessary. The pots can be stored in a sheltered shed away from wind, sun and rain until autumn. As soon as the plant shows signs of die back after maturity or flowering, it MUST be allowed to DRY off or else the tuber will be lost.

All tuberous droseras develop fibrous root systems. The extent and concentration varies from species to species and most of all on the particular soil. Most roots grow close to and extend below the tubers (Fig. 1).

So, keeping this fact in mind, potting a tuberous drosera would mean using a deep pot and a good, well-drained soil mix. For the latter, I use two main components, sand and peat moss. The ratio of the mixture varies with the species but common sense tells one that more sand is needed for well-drained species and more peat for the swampy types. For well-drained species use two parts sand to one part peat in a 6-8" pot. For the swamp species use one part sand and two parts peat in a 5-6" pot. The medium should always be loose.

Watering should also be practised using common sense. Never overly wet even for the swamp species. It's better to give them semi-shade and cool and humid conditions than too much sun and water.

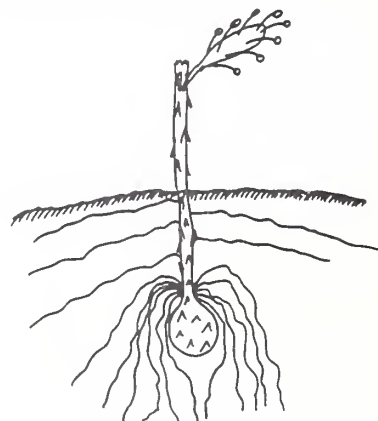


Fig. 1

Fertilisation IS GOOD FOR TUBEROUS DROSERAS. But please, use common sense on this. Foliar feeding is effective in increasing tuber size toward the end of the season but not so for increasing leaf size in rosetted ones. Erect and climbing droseras nearly always produce mature size leaves regardless of height. Fertilization will increase vigor and tuber size for next year. Feeding should not be heavy at any time or else the roots will burn. About one-fourth strength once every two weeks is all right.

(Received for publication May 6, 1977)

UNSEASONAL BLOOMING IN *SARRACENIA* IN WESTERN FLORIDA

by Landon T. Ross

(1012 Ridge Road, Tallahassee, FL 32304)

The phenomenon of unseasonal blooming in *Sarracenia* is briefly noted by McDaniel (1971), but otherwise seems to have gone unmentioned by most students of the genus. It is not uncommon in cultivated specimens which are often subject to rapid environmental changes and the concomitant physiological shock, although examples among wild populations seem to be a good deal less frequent.

During the interval between the spring blooming seasons of 1975 and 1977, about fifteen field trips were made through western Florida. One goal was to record unseasonal blooming. Five separate instances were observed, and these are listed in the accompanying table. All plants were large, mature specimens, and there was no evidence of any particular damage or recent habitat modification which might have been expected to have triggered flowering. It seems notable that only single flowers were produced by each of the plants, except for the *S. purpurea venosa* which had two. The size of the plants was such that considerably more flowers would have been expected under normal circumstances. Also, the flowers which were produced were not always of normal dimensions. Those of the *S. purpurea venosa* were about 25% smaller than usual, and in both cases the *S. leucophylla* flowers were approximately 50% of the typical size and were borne on abnormally short scapes.

<u>Species</u>	<u>Date and day length when observed blooming</u>	<u>Expected approximate date and day length during normal blooming cycle</u>
<i>Sarracenia leucophylla</i>	4 Sept. 1976 12 hr. 40 min.	10 April 12 hr. 45 min.
<i>S. leucophylla</i>	17 Sept. 1976 12 hr. 18 min.	10 April 12 hr. 45 min.
<i>S. minor</i>	19 Oct. 1975 11 hr. 21 min.	30 April 13 hr. 20 min.
<i>S. purpurea venosa</i>	1 Sept. 1975 12 hr. 48 min.	25 March 12 hr. 15 min.
<i>S. rubra</i> *	18 Sept. 1975 12 hr. 17 min.	19 April 13 hr. 0 min.

Observations of unseasonal blooming in *Sarracenia*

To facilitate further observations, the plants of *Sarracenia minor*, *S. purpurea venosa*, and *S. rubra* were moved to an artificial bog. These plants bloomed normally during the spring of 1976, and failed to produce any further unseasonal blooms. The specimen of *S. minor* did, however, continue to bloom through 6 June, 1976, considerably later than is usual for the species.

It might be expected that unseasonal blooming bears some relationship to length of day. For this reason, day lengths for the subject area for the observed blooming dates are included in the table. Also listed are approximate dates and day lengths for the midpoints of the normal blooming periods for the same general area. These are somewhat modified, based on recent observations in western Florida, from blooming periods given by Bell (1952). The data in the table lead one to suspect that this relationship does actually exist to some degree, particularly since no unseasonable blooms were observed during periods of very long or very short day length (excepting the continuation of blooming under cultivation of the *S. minor*). Further records are needed, however, for any type of accurate analysis to be made.

It may be of interest to note that unseasonal blooms were not observed in either *Sarracenia psittacina* or *S. flava*. Since populations of *S. psittacina* are not likely to be particularly dense, and since the plants themselves tend to be concealed by other vegetation, particularly during the later part of the year, the lack of observations for that species is not surprising. In the case of *S. flava*, however, more individual plants were probably examined than in all other species combined, without a single instance of unseasonal blooming being noted.

Literature Cited

- Bell, C. R. 1952. Natural hybrids in the genus *Sarracenia*. I. History, distribution and taxonomy. J. Elisha Mitchell Sci. Soc. 68:55-79.
McDaniel, S. 1971. The genus *Sarracenia* (*Sarraceniaceae*). Bull. Tall Timbers Research Station. 9:1-36

*Shows slight signs of introgressive influence from *S. leucophylla*

OF BARN SWALLOWS AND DROSERAS

by Owen Tallman
(P.O. Box 11, Denver, NY 12421)

In early May this year I returned from an early morning errand to find the greenhouse quite warm from the bright sun. I went in to see how everyone was doing and found that a barn swallow had gotten in and was sitting on top of one of the structural members.

When he saw me he took off towards the bright end of the greenhouse, and I saw that he had fallen for the light-window effect, for the way out was not towards the light of the sun but back through the dark shed on the north side of the greenhouse through which he had entered. The light end offered no escape; only the dark shed did. The shed functions as a kind of winter airlock and general workspace.

I tried a few times to chase him out through the shed but he persistently swooped around my gesturing arms toward the light, consistently finding no way out there. I thought momentarily of the similarity between this situation and that of a flying insect inside a window, or inside the hood of a *Sarracenia minor*. In the house, I could either open the window or swat the bug. Here, as inside a pitcher plant, there was only one way out. It did not help me to try to imagine what I would do inside a pitcher plant, so I forgot about it and went outside where I found two large pieces of cardboard. I thought with these I could make it clear to the bird what he had to do by putting a barrier up wherever he tried to fly past me in the wrong direction.

Now this greenhouse is set up in several levels, each consisting of a pair of rows of plastic flats (or trays) about 12" x 24", suspended on wooden frames with a walkway in between. Chasing this poor bird, who eyed me in terror and puffed and panted in the heat, I was standing on the frame/bench structure about three feet off the ground, waving my cardboard shields above my head so that I blocked the walkway with my body and the passage above my head with the cardboards. Faced with this the bird plunged headlong into a flat of about 70 rather large narrow-leaf *Drosera capensis* and stopped.

I was about to grab him when I realized that he wasn't going anywhere. He had landed all right, with his wings spread, but that was what did it--the combined sticking power or this army of sundews had got him wing, foot and tail. If he thought these plants would provide a landing platform he misjudged, though he was acting in panic. I watched him struggling for a few moments to be certain that he was caught then picked him up, slippery and tacky, and tossed him out the door. He flew straight away.

I suppose that I might be accused of missing an opportunity to document the animal-trapping and digesting ability of these large South African sundews, but it was my fault the bird got stuck, and in fact the whole episode arose from my interference, since in all the years the swallows had lived in these buildings they'd had no reason to expect to end up in a greenhouse/trap after flying into a dark shed.

I don't know if the bird could have escaped, but having seen similar groups of plants in inadvertent cooperation capture and literally draw and quarter very large moths, I had no inclination to test the idea. Besides, I couldn't see myself explaining with any aplomb the feathery remains on this group of plants to visitors. People have enough strange ideas about CP as it is.

(Received for publication July 11, 1977)

CARNIVOROUS PLANT COMPANIES

by Glenn Claudi-Magnussen
(26861 Queredo Lane, Mission Viejo, CA 92675)

There are many CP companies, which vary greatly in quality, price, etc. I have received plants and catalogs from some of these companies, and here are my reactions.

World Insectivorous Plants (Rt. 1, Box 338S, Arroyo Grande, CA 93420). This company is one of the best. The plants are all greenhouse grown, which lessens the strain on the plants in their natural environment. All the plants are very healthy and are rather mature (i.e. no seedlings). Many are blooming or ready to. They are also very prompt in sending the plants. The prices are very good, much better than for most plants taken from the wild. They carry *Sarracenia* as well as the plants mentioned in CPN VI(1):20. Their selection is very large.

Sun Dew (or Sun Dew Environments) (P.O. Box 111, Denver, NY 12421). This company is also very good, and they *do* grow their own plants. As with WIP, the quality, price and shipping are very good. The only disadvantage is that the plants are often younger and smaller, but don't let this stop you from buying from them, because they are a good company. About four times a year this company sends updates, increasing the number of available species. They are now limited to *Drosera*, *Byblis* and *Utricularia*, but soon hope to get other genera.

Peter Pauls Nurseries (Darcey Road, Canandaigua, NY 14424). This company offers a wide variety of plants. They are also the only company I know that sells CP seeds. The plants are in good condition, but they are rather expensive.

Edelweiss Gardens (54 Robbinsville-Allentown Road, Robbinsville, NJ 08691). This company carries only about 10 species, all of which are expensive.

Arthur E. Algrove (North Wilmington, MA 01887). Again there are only a few species sold by this company. They do not carry *Darlingtonia* or *Drosera*, as CPN VI(1):20 says. The plants they do have, though, are very inexpensive.

Harold Welsh (Black Copper Kits, 266 Kipp St., Hackensack, NJ 07601). This company has some of the American CP, especially *Sarracenia*. The plants are in very good condition and are rather inexpensive.

Carolina Exotic Gardens (Box 1492, Greenville, NC 27834). This company sells a wide variety of plants. Aside from the genera listed in this year's CPN, they also sell *Nepenthes khasiana*, many *Drosera*, some *Pinguicula*, and *Utricularia*. The prices range from very expensive to very cheap.

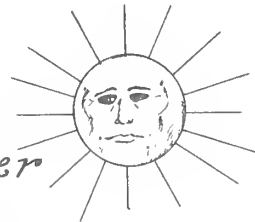
Conclusion

All of these companies have advantages (some more than others). When looking for a plant, I suggest going to World Insectivorous Plants or Sun Dew. All of the other companies sell plants taken from the wild, and are generally not as good. There are enough greenhouse grown plants available or soon to be available to satisfy most CP collectors.

(Received for publication August 10, 1977)

BUILDING YOUR OWN *Solar Water Distiller*

by Scott A. Richardson
(333 N. Bender Ave., Covina, CA 91724)



When I moved my carnivorous plants out of the sealed aquaria and into a small greenhouse, I knew there would be both advantages and disadvantages.

On the bright side, I could give them more sun because the greenhouse was ventilated; they would also be able to catch more insects by themselves. I found, however, the major disadvantage was that they needed much more water than before because of the added ventilation.

Unfortunately, the water here in Southern California is very hard and mineral-laden, so I was forced to buy distilled water which becomes slightly expensive at 10¢ a half gallon, not to mention the inconvenience of constantly getting it. Distilling my own water seemed to be the answer, but the question was how.

One possibility was to boil tap water on the stove and condense it, but, being somewhat energy conscious, I knew there must be a better way. That's when I decided to invent a solar water distiller that would be simple to build and maintain.

The idea I hit upon utilized the old aquaria I had left over. I remembered how the moisture inside the aquaria would condense on the sides and drip down when the sun hit them. That is the basis for my design.

The distiller consists of a 10-gallon aquarium propped up about 10° on one end. This will let the condensed water fall down to the lower end of the aquarium. A black 8" x 10" photographic developing tray full of tap water is put inside the aquarium and leveled. A piece of glass is then put over the top to seal the aquarium. The sealed aquarium is then positioned so that it will receive as much direct sun as possible.

The principle on which it works is that the black photo tray absorbs the sun's rays and converts them to heat thus heating the water to between 135° and 150°F. The water begins evaporating and, eventually, the air inside the sealed aquarium becomes saturated with water vapor. The water begins to condense around the sides and forms droplets which fall to the shaded bottom of the aquarium under the photo tray. This is distilled water, made using only the sun's rays. I collect this water by squeezing it up with a baster or an auto battery bulb and then store it in jugs.

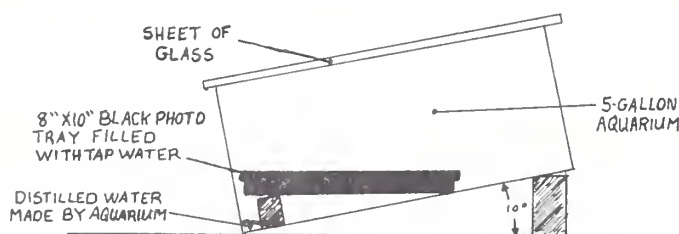
By using this method, I can distill between 10 and 16 oz. of water per aquarium each day. Presently, I have three solar distillers operating, and they give me nearly all the water I need.

The mineral crust that develops in the photo trays attests to the fact that the minerals have been left behind. This crust, incidentally, should be cleaned out periodically.

I used 10-gallon, "bargain" aquaria 10-1/2" wide, 12-1/2" deep, and 20" long. The photo trays are standard 8" x 10" black plastic and are available at photo stores. Be sure to use black trays as they will get the water hottest. The tray is placed about 1/4" away from the walls of the aquarium in order to let the condensed water fall to the bottom.

Efficiency of the solar water distiller will depend upon the time of the year and the amount of sunlight it receives. I will be happy to receive any comments or questions about the solar distiller.

(Received for publication July 20, 1977)



CPN--WHERE WE CAME FROM AND WHERE WE HOPE TO GO

by Joe Mazrimas and Don Schnell

Many newer subscribers have wondered and asked what CPN is and how it came about, so we thought it worthwhile recounting CPN's history briefly along with a few ideas on the present and future. You old-timers just reminisce along awhile.

Back in 1970, the two of us were independently studying and growing carnivorous plants when we were introduced into correspondence by a mutual friend--to this day we have never laid eyes on each other. We both carried on a wide-ranging correspondence with others, often the same people, and, of course, these letters were often packed with an interchange of useful bits or masses of information regarding the cultivation of CP, their response in culture, transplanting and, of course, much on natural history. Our letters and interests knew no national boundaries and often each of us handled dozens of letters each week, many of these covering similar ground.

In August of 1971, we began asking each other, why not some other system of exchange to avoid repetitions and reach correspondents better, something more efficient than a round-robin, perhaps a sort of *small* newsletter? We took our cue from some zoologists (well, they're not too far from CP) and their *Bat Research News*, a mimeographed quarterly of 6-8 pages, \$1.00 annually, and featuring news, short notes and current literature reviews.

Next, we needed a name, a bannerhead to distinguish this little newsletter to be dashed off quarterly. AMPHORA, which means "pitcher," was one suggestion,

but seemed a bit esoteric and less likely to identify in the potential reader's mind as the final selection, *Carnivorous Plant Newsletter*, which also lent itself conveniently to the now rather famous "CPN."

It is now January, 1972, and if this thing was going to get off the ground some work was needed. We devised a rather nondescript one page mimeo introductory letter which we sent out to all our mutual correspondents as well as major universities and botanical gardens throughout the world, 300 of these having been sent by February since we wanted the first quarterly issue to appear in April, 1972. In that initial letter the well-known, and we hope sustained, principles of CPN were stated, "and English speaking communication among people with our common interest in these fascinating plants," and the amazingly low subscription rate of \$1.00 was to cover costs with no profit. Since, of course, those costs have risen along with the cost of everything else.

We waited with great anticipation the flood of mail in response to our letter. There seemed to be hundreds of things to do and coordinate for the big day. Joe agreed to handle the dreary chores of subscriptions, literature review and mailing. Don arranged the final copy, cajoled his secretary to be typist for five years, and saw to the printing. We had decided the 8-1/2 x 11 format would be best in the beginning since it was convenient for binder storage and there was sufficient space for pictures and text. Dr. Ritchie Bell of the University of North Carolina, Chapel Hill, graciously helped with the printing which was done with a new rapid photo-offset now in rather common use by rapid printing establishments throughout the country. The equipment could also produce black and white pictures for us. Meanwhile, Katsu Kondo, who was a graduate student at UNC at that time donated his considerable artistic talent and came up with our bannerhead, still used to this day. We received about 25 years' worth of the bannerhead blanks for front pages, so someone had faith in us!

Subscriptions only dribbled in so that by mid-March of 1972 we had less than two dozen! We did not worry too much about this but plunged ahead to get the first issue out by April. We hoped that the subscriptions would increase as word spread during the year so that towards the end, we might be able to sell out and recoup costs from an inventory of 100 issues. Everything was rolling now. Copy was set up and typed to masters, then sent over to UNC for printing. In April, the first slightly fuzzy (old typewriter) 15-page copy rolled off the press, and this seemed to solidify our thoughts and aims and did away with doubts that the massive project could be accomplished. We had initially envisioned a 4-6 page newsletter, but the need for communication immediately sent us into the 15-20 page issue, and later we were able to add 1/3 more words per mailing weight of 20 pages by a print size reduction method. Pictures were also improved by at first using separate plates for the covers and special picture pages (when we could afford it), then the rapid photo offset process also improved so we could get away from plates.

This first issue was sent to the meager subscriber list, which did leap ahead at one crucial point when our Japanese friends who had had a newsletter of their own for many years joined us with a mass of subscriptions from their organization. We exchanged letters of excitement when one after another CP expert subscribed, complimented or made positive suggestions for the newsletter. We were pleased with letters indicating how happy those with an amateur interest in CP were with some means of communicating, sharing, and acquiring knowledge. People with CP interests who lived in the same city, sometimes blocks from each other but never knowing there was someone nearby with similar interests, were thus able to meet.

Growth then came at an unpredictable rate, from all over the world, as word spread through personal communications and those authors kind enough to mention us in their articles and books. Reprints were needed. Off-prints of special articles in CPN were printed. Special projects such as the World List were started, and volunteers Bob Ziemer and Lynn Macey conceived the seed and plant exchange and an information service. The number of subscribers passed 600 in July, 1976, and the work of keeping records, typing, printing and mailing became so much that Leo Song kindly arranged to have all this taken over by Pat Hansen at The Arboretum at California State University, Fullerton, so we could concentrate on editing and solidifying long range plans and conceptions. To this end, Leo and Larry Mellichamp (a professional botanist at the University of North Carolina, Charlotte) also became co-editors to help us bring you a better, more useful newsletter with even more services. All this in five years.

So ends the beginning. What about the present? What plans for the future? More to come....

Beginner's Corner

WATER AND THE GROWING MEDIUM by Joe Mazrimas

One of the most overlooked factors that is indispensable to healthy growth of carnivorous plants is the quality of the water. Taking nature's course, one of the best sources of water is rainwater simply because it contains a low concentration of salt. If rainwater is not available, then a good substitute is either distilled or deionized water. These substitutes can be purchased but over a long period of time they can become very expensive especially if you need large quantities.

Carnivorous plants grow best when the salt content of your water does not exceed 150 ppm in total salt content. You can inquire from your local water company office on the hardness of your water. One must use water with low salt concentration in order to minimize the damage that occurs to the soil medium. Most CP grow in acidic soils or soil that contains a high concentration of peat or sphagnum moss. These acidic substances can act like ion exchangers by substituting hydrogen ions from the plant for cations that are in the water. The most common cations are sodium, magnesium, potassium and calcium with smaller concentrations of metal ions such as mercury, lead and iron. When these cations bind to the moss (either dead or alive), the moss in turn releases hydrogen ions which, of course, is responsible for the production of acidity needed by the plants. If the water contains a very high concentration of salts, then the exchange capacity of the moss is exceeded rather quickly (the moss can't grow fast enough) and you have a rapid salt buildup changing the growing medium from acidic to alkaline. It is this high salt buildup and alkaline medium which spells doom for your plants.

If you choose to grow your plants in a closed system such as a terrarium, then I would recommend using distilled water since only small amounts are needed to replace that which evaporates. Most of it gets recycled. In open systems, evaporation will be considerable and cost of distilled water becomes prohibitive and so some other substitute must be found.

One system that is simple to use is to make your own water with a process called reverse osmosis. A previous article in CPN described its function, and so I won't go into detail here (CPN IV:43, 1975). Usually, such systems can give you water that is about 10 times lower in salt content than your tap water, and it uses no other energy source than the water pressure from your tap. A unit that will give you a minimum of five gallons a day of low salt water can be rented for less than \$10/month. A home unit is available from the Culligan Water Co. called the H-5 model. The artificial membranes which filter the water will last a year or more depending on use.

For CP to thrive over a long period of time, they require an acidic soil with good drainage but still capable of holding moisture. I find that a good soil mixture consisting of Canadian sphagnum peat moss and perlite makes a light and ubiquitous medium for almost any situation that confronts CPs. This peat moss is good because of its homogeneous consistency which lends itself to starting seeds of any size from *Utricularia* to that of *Drosophyllum*. I add either perlite or sand in various amounts up to 50% by volume to aid in keeping the roots well oxygenated and to allow for good drainage. By adding sand or perlite, there is less tendency for the surface to form a hard crust which later becomes impervious to water and discourages the formation of surface algae.

For those growers who prefer to use living sphagnum moss, it is important to remember that this moss doesn't like to be packed tightly but instead prefers a loose but firm structure in order to sustain growth. Perlite can be used to increase the volume of chopped sphagnum moss which keeps the moss healthy and contributes to good drainage. One can use up to 50% by volume of perlite mixture for most of your CP needs.

In conclusion of this series of articles, I want to say that carnivorous plants are normally slow growers in comparison to other plants such as crop or house

plants. This means that for the effort expended, one must exercise extreme patience in growing your plants. Never try to hurry them up into fast growth since that would only result in abnormal growth or form. Some species only put out a few leaves (pitchers) a year, but that is probably normal under the circumstances and not to worry about this. All we ask is that you grow your favorite CP the best way you know how, and that's where all the fun of growing these plants begins!

NEXT: A series on PROPAGATION

BOTANIST'S CORNER

Flowers, Sex, and Hybridization in Carnivorous Plants (*cont.*)

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HYBRIDIZATION

I should make a final comment regarding hybridization. This is usually considered to occur when you successfully cross two different *species*. The more closely related genetically two species are, the better the chance of hybridizing them. It rarely occurs in nature because of the differences between habitats, pollinators, and flowering dates. It is much more likely to occur in cultivation where the grower can control all environmental factors, in addition to the actual pollen transfer. Some species will hybridize readily, others will not. *Sarracenia* are a classic example of species which are all capable of hybridization with one another, and the hybrids can then in turn be used in further hybridizations to produce some spectacular results.

Other species, such as in *Pinguicula*, are more difficult or impossible to hybridize because the species are just too different genetically.

Any attempts at hybridization in cultivation could be important and produce novel plants, as well as indicate something about the genetic relationships of the plants involved. It is worth the practice to become proficient at crossing (both within and between species) to produce seed for exchange and preservation, and for ornamental purposes. Whenever you make artificial crosses at home, keep good records indicating what the species are, which is the female parent (received the pollen), and what the success of seed production is. Any seeds of pure species made available for exchange should indicate whether they are from cross or self-pollinated individuals. (If cross-pollinated, make sure both individuals are good, pure, typical specimens for that species.)

Problems encountered with artificial crossing can usually be attributed to poor timing (old pollen or unreceptive stigmas); actually not getting pollen on the stigma; plant in such poor health that it cannot produce a seed crop (unlikely, if the plant produces flowers in the first place); the crossing of incompatible plants (either flowers on the same plant, or plants of the same genetic clone); or the two species involved just will not hybridize (you can never be sure of this until you've tried many times). If you are doing critical hybridization work, whenever you cross two plants it is best to put bags made of silk stockings (or similar lightweight material) around the pollen-receiving flowers to keep insects from bringing additional unknown pollen to that flower.

For additional practical discussion of hybridization in CP, see appropriate portions of D.E. Schnell's *Carnivorous Plants of the U.S. & Canada* and Pietropaolo's *The World of Carnivorous Plants* (see CPN VI(1) for publishers). A good introductory botany textbook would provide further information on flower structure and terminology.

NOTE: I would be pleased to receive comments from readers regarding the contents of this column. I hope I am presenting information that is useful and interesting in a manner that is understandable. Although I have ideas for future articles, I would rather have ideas from you, the Reader, as to what you would be most interested in knowing more about. How about: a list of the pronunciation of CP names; the meanings of the scientific names of CP; the history of the discovery, naming, and early horticulture of CP. Send your comments and suggestions on a postcard or in a letter; none of your questions or suggestions will be considered inappropriate. DO IT TODAY! (T.L. Mellichamp, Biology Dept., UNCC, Charlotte, NC 28223).

LITERATURE REVIEW

Barber, John. Mucilaginous seeds: Interactions with microorganisms. Abstract in Plant Physiology 59, No. 6, June 1977.

The author demonstrated that mucilaginous pellicles (coverings) surrounding certain seeds possess protease (protein decomposing) activity which are capable of attracting, entrapping and killing mosquito larvae in the laboratory. He presumes that the prey is digested and products of digestion are taken up by the seed. In the natural environment, the seeds may actually attract and digest nematodes, protozoans and motile bacteria.

Cooper, J. & Williams, S. Decay of the activated state induced by stimulation of the trigger hairs of *Dionaea*. Abstract in Plant Physiology 59, No. 6, June 1977.

Debuhr, L.E. Sectional reclassification of *Drosera* subgenus *Ergaleium* (*Droseraceae*). Aust. J. Bot. 25(2):209-218. 1977.

The new species of Australian *Drosera*, *D. fimbriata*, was placed into a new *Drosera* section *Stolonifera*.

Lichtner, F.T. & Spanswick, R.M. Ion relations in *Dionaea*. Abstract in Plant Physiology 59, No. 6, June 1977.

These authors show that changes in ion concentration in the inner wall of the trap take place before and after stimulation. The monitored ions were K^+ , Na^+ , αCl^- .

Marton, L. Early application of electron microscopy to biology. Ultramicroscopy 1(4):281-296, 1976.

Did you know that the very first biological electron micrograph made was that of a thick section of *Drosera intermedia* stained with OsO_4 in 1934?

Schnell, D.E. 1977. Pitcher plants. Plants Alive 5:24-25.

A popular article on sarracenias. Six black and white photos accompany a brief discussion of natural history and conservation problems.

Stauffer, R.E. Insectivorous Plants. Swamp News XX(3):1-7, September 1977.

General review article on insectivorous plants illustrated by five black and white photos.

Tinaglia, S. *Drosera binata*. House Plants and Porch Gardens, Dec. 1977, pp. 17-21.

A description of the *Drosera* species with three color photos are given.

Williams, Stephen E. The response of *Dionaea* traps to raindrops. Abstract in Plant Physiology 59, No. 6, June 1977.

Plants of *Dionaea* were observed both in clear weather and during heavy rain. The closure rate for the traps during the night with no rain was 0.16 closures/leaf/week with 40% containing insects. The same population of traps had a closure rate of 0.24 during the rainy night but had zero captures. Therefore, closure rate was 50% higher when it rained while the capture rate was 100% lower.



Nepenthes ampullaria ground pitchers.

Bark chips are about 1.5 cm at most. Plant was sent as a seedling/rooted cutting to California State University, Fullerton, by P.A. Morrow. Photo by Leo Song.

SEED BANKComplete List of Seed Bank

November 1, 1977

PATRICK DWYER (49 Killeen Park, Albany, NY 12205) writes: I would like to tell everyone that there has been an amazing response (over 200 packets in the first five days!). Unfortunately we quickly ran out of many kinds. We need donations of all species, especially the rarer ones. A list of contributors to the Seed Bank will be published in the next update.

Byblis gigantea (5)*, *B. liniflora*

Cephalotus follicularis (4)

Darlingtonia californica

Dionaea muscipula

Drosera aliciae (2), *D. arcturi* (1), *D. burkeana* (1), *D. burmannii*, *D. x californica* (10), *D. capillaris*, *D. capillaris* (long leaf) (1), *D. capillaris* (long leaf) - *D. capensis* (narrow) mix (5), *D. capensis*, *D. capensis* (narrow leaf), *D. filiformis filiformis*, *D. gigantea* (13), *D. intermedia*, *D. macrophylla* (14), *D. menziesii* (4), *D. montana* (7), *D. pulchella*, *D. pygmaea* (3), *D. rotundifolia*, *D. spathulata* (4), *D. stonolifera*, *D. sulphurea* (3)

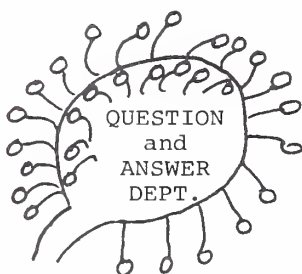
Nepenthes khasiana, *N. mirabilis*

Pinguicula alpicola (probably *P. vulgaris*) (1), *P. grandiflora* ssp. *rosea* (4), *P. ionantha* (1), *P. leptoceras* (1), *P. macroceras* (4), *P. planifolia* (2)

Polypompholyx multifida (8)

Sarracenia alata, *S. alata* (x-ray, 100 rads), *S. alata* (x-ray, 550 rads) (12), *S. flava*, *S. flava* (copper lid) (10), *S. flava* (red veined) (8), *S. leucophylla*, *S. leucophylla* (x-ray, 100 rads) (5), *S. leucophylla* (x-ray, 1000 rads) (4), *S. minor*, *S. oreophylla* (10), *S. psittacina* (2), *S. purpurea purpurea*, *S. purpurea riplicola*, *S. purpurea venosa* (1), *S. purpurea venosa* (x-ray, 100 rads) (6), *S. purpurea venosa* (x-ray, 550 rads) (3), *S. purpurea* (pink flower) (3), *S. purpurea* (white flower) (2), *S. rubra* (4), *S. rubra* "Gulf" (5), *S. rubra jonesii*, *S. alata x leuco.*, *S. alata x leuco.?* (14), *S. x catesbaei*, *S. x chelsoni* (5), *S. flava x leuco.* (1), *S. x harperi* (15), *S. leuco. x minor?* (2), *S. leuco. x rubra?* (13), *S. x mitchelliana* (10), *S. purp. x minor* (3), *S. rubra x leuco.* (8), *S. rubra x oreo.* (2), *Utricularia longifolia*, *U. montana* (10)

*Number of packets is listed if there are fewer than 15.



Q. Is it OK to feed a *Utricularia* plant live brine shrimp? What's the best thing to feed *Nepenthes* plants? L.H., Berea, Ohio.

A. It's all right to feed brine shrimp to *Utricularia* provided you wash the shrimp in fresh water before you add it to the culture. *Nepenthes* can be fertilized on the roots with a mild fertilizer such as fish emulsion 5-2-2. J.A.M.

Q. The traps of my *Sarracenia flava* and my *S. psittacina* are being destroyed by some kind of bugs. What should I do? D.H., Greensburg, PA.

A. The trouble you describe sounds like the pitcher plant moth, *Exyra ridingsii*, which infests principally *S. flava*, and/or *Exyra semicrocea*, which is found throughout the South, according to CPN 3:35. They can be dispatched by cutting off the top of the pitcher and killing the larvae with a wire or toothpick. There should be only one per pitcher. Examine all dead pitchers for pupae. Damage consists of the inside tissue being eaten, leaving the outer epidermis only. A web of silk usually covers the pitcher mouth. (The pitcher moth is one of the hazards of material that has been field collected.) L.S.



A larger form of *Nepenthes alata* from the vicinity of Quezon City, Luzon, Phillipine Islands, growing in a hanging pot in the greenhouse at California State University, Fullerton. Culture medium is medium size orchid bark chips. Pot size is one gallon. Photo by Leo Song.



A portion of the one gallon section of *Sarracenia* in the lathhouse at California State University, Fullerton. Species as well as hybrids are evident in this photo by Leo Song.



Drosera cuneifolia in a 2-1/4" pot
Photo by Bob Hanrahan



Drosera cuneifolia flower, side view. Note how flat the flower is, probably to present maximum surface area for landing platform for pollinators. Photo by Bob Hanrahan.



When submitting Want Ads, please be sure to print clearly for best results and to eliminate mistakes. Please indicate the correct letter before each item (Want, Trade, Sell or Buy). Want ads are limited to carnivorous plants, terraria, greenhouses and moss. There is a charge of ten cents per item, with no limit to the number of items you may submit per issue.

Send coin or check along with your want ad to:

Arboretum, Want Ads
California State University
Fullerton, CA 92634

WANT ADS

- Ronald Bell, 9534 Alta Mira, Dallas, TX 75218. (WB) *Sarracenia psittacina*, *Drosera peltata*, *S. purpurea* var. *ripicola* (Boivin)
- Aric Bendorf, 1121 North Signal St., Ojai, CA 93023. (WTB) Live sphagnum, *Drosera brasiliensis*, *D. cuneifolia*, *D. gigantea*, *D. neo-caledonica*, *D. pallida*, *D. whittakeri*, *Heliamphora*, *Nepenthes merrilliana*, *N. burkei*, *N. mirabilis*, *D. zonaria*
- Jay Brodie, 54 Butler St., Cos Cob, CT 06807. (T) *Drosera montana* plants, *D. filiformis* v. *tracyi* plants
- Joseph Cantasano, 2717 Jerusalem Ave., North Bellmore, NY 11710. I will send *Nepenthes khasiana* "female" cuttings to anyone willing to pay the postage.
- Robert Cantlay, 30672 Paseo Del Niguel, Laguna Niguel, CA 92677. (WB) *Nepenthes alata*, *Utricularia macrorhiza*, *Pinguicula planifolia*
- Gordon D. Hanna, 168 Kilaben Road, Kilaben Bay. 2283, NSW Australia. (W) *Byblis gigantea*, *Drosera cicutifolia*. (T) *Nepenthes maxima*
- Trevor A. Kuchel, Box 110, P.O., Murray Bridge, S.A. 5253, Australia. (WB) Any *Nepenthes* (seeds or source), any *Heliamphora* (seeds or source), seeds of the following: *Sarracenia alata albiflora*, *S. alabamensis*, *S. flava* (red), *S. flava* (green swamp), *S. flava* (short savannah), *S. flava* (tall Gulf Coast), *S. flava* (giant), *S. leucophylla* var. *Alba Reade*, *S. leucophylla* (red pitcher), *S. minor* (giant), *S. minor* (tall Gulf Coast), *S. purpurea* var. *ripicola*, *S. purpurea venosa* (maroon pitchers), *Sarracenia psittacina* (giant), *S. rubra* (longbeak), *S. rubra* (tall Atlantic Coast), *Sarracenia* complex hybrid 'studs' (seeds or plants), *Drosera regia* (seeds)
- Scott Henderson, 215 N. Cuyamaca St., El Cajon, CA 92020. (WB) *Heliamphora*, *Sarracenia leucophylla* x *S. psittacina*, *S. oreophila* (seed or plants), *Byblis gigantea*, *Nepenthes bicalcarata*, *N. ampullaria*, *N. maxima*, *Pinguicula planifolia*, *Drosera zonaria*, *D. gigantea* (tuber or seed). (W) *S. minor*, *S. psittacina*. (T) *S. purpurea purpurea*, *Byblis liniflora*, *Utricularia longifolia*, *U. prehensilis*, *P. caerulea*, *D. capensis* (narrow leaf), *D. x nagamoto*, *D. intermedia* x *filiformis*, *D. brevifolia*, *S. rubra*.
- Alan Schueler, 16345 Martincourt, Poway, CA 92064. (WB) *Drosophyllum* plants or seed, *Drosera schizandra* plant or seed, *Drosera linearis* plant or seed, any *Sarracenia* plants, any *Pinguicula* plants, *Cephalotus follicularis*, rooted *Nepenthes* or cuttings, *Byblis gigantea*, *D. binata*, *D. spathulata*



Cephalotus follicularis
Mature pitchers

Photo by Bob Hanrahan

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